AUTODESK®
3DS MAX® 8

Reference Guide

Volume III

Autodesk®

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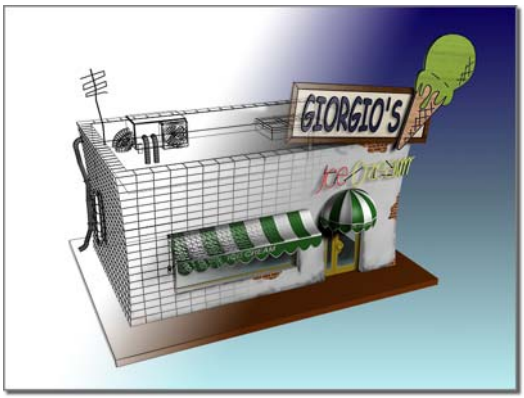
17 Rendering



Rendering "fills in" geometry with color, shadow, lighting effects, and so on.

Rendering shades the scene's geometry using the lighting you've set up, the materials you've applied, and environment settings, such as background and atmosphere. You use the *Render Scene dialog (page 3–2)* to create renderings and save them to files. Renderings are also displayed on the screen, in a *rendered frame window (page 3–5)*.

Tip: When you render a very large image, you might get a message that says "Error Creating Bitmap," or that says you are out of RAM. If this happens, turn on the Bitmap Pager. You turn on the Bitmap Pager in *Rendering Preferences (page 3–863)*. The Bitmap Pager prevents a rendering from hanging because of overuse of memory. On the other hand, it slows down the rendering process.

Environments and Rendering Effects

A variety of special effects, such as film grain, depth of field, and lens simulations, are available as rendering effects. Another set of effects, such as fog, are provided as environment effects.

Environment settings (page 3–268) let you choose a background color or image, or choose an ambient color value for when you render without using radiosity. One category of environment settings is the *exposure controls (page 3–289)*, which adjust light levels for display on a monitor.

Rendering effects (page 3–214) provide a way for you to add blur or film grain to a rendering, or to adjust its color balance.

See also

Rendering Commands (page 3–11)

ActiveShade (page 3–17)

Preview Renderings (page 3–163)

Introduction to Network Rendering (page 3–169)

Introduction to Rendering Effects (page 3–214)

Environment (page 3–267)

Object-Level Rendering Controls

You can control rendering behavior at the object level. See *Object Properties (page 1–111)* and *Object Properties Dialog (page 1–111)*.

Render Scene Dialog

Rendering menu > Render

Main toolbar > Render Scene button

Rendering creates a 2D image or animation based on your 3D scene. It shades the scene's geometry using the lighting you've set up, the materials you've applied, and environment settings such as background and atmosphere.

The Render scene dialog has multiple panels. The number and name of the panels can change, depending on the active renderer. These panels are always present:

- *Common panel (page 3–27)*

  Contains the main controls for any renderer, such as whether to render a still image or an animation, setting the resolution of rendered output, and so on.

- *Renderer panel (page 3–35)*

  Contains the main controls for the current renderer.

- *Render Elements panel (page 3–126)*

  Contains the controls for rendering various image information into individual image files. This can be useful when you work with compositing, image-processing, or special-effects software.

At the bottom of the Render Scene dialog are controls that, like those in the *Common Parameters rollout (page 3–27)*, apply to all renderers. These are described in this topic's "Interface" section, below.

Tip: When you render a very large image, you might get a message that says "Error Creating Bitmap," or that says you are out of RAM. If this happens, turn on the Bitmap Pager. You turn on the Bitmap Pager in *Rendering Preferences (page 3–863)*. The Bitmap Pager prevents a rendering from hanging because of overuse of memory. On the other hand, it slows down the rendering process.

Choice of a Renderer

Three renderers are provided with 3ds Max. Additional renderers might be available as third-party plug-in components. The renderers provided with 3ds Max are:

- *Default scanline renderer (page 3–37)*

  The scanline renderer is active by default. It renders the scene in a series of horizontal lines.

  Global illumination options available for the scanline renderer include *light tracing (page 3–43)* and *radiosity (page 3–50)*.

  The scanline renderer can also *render to textures (page 3–139)* ("bake" textures), which is especially useful when preparing scenes for game engines.

- *mental ray renderer (page 3–77)*

  The mental ray renderer created by mental images is also available. It renders the scene in a series of square "buckets."

  The mental ray renderer provides its own method of global illumination, and can also generate caustic lighting effects.

  In the Material Editor, a variety of *mental ray shaders (page 2–1520)* provide effects that only the mental ray renderer can display.

- *VUE file renderer (page 3–126)*

  The VUE file renderer is a special-purpose renderer that generates an ASCII text description of the scene. A view file can include

multiple frames, and specify transforms, lighting, and changes of view.

Production and ActiveShade Renderers

In 3ds Max, there are two different types of renderings. One, called "Production" rendering, is active by default, and is typically the one you use for finished renderings. Production renderings can use any of the three aforementioned renderers. The second type of rendering is called *ActiveShade (page 3–17)*. An ActiveShade rendering uses the default scanline renderer to create a preview rendering that can help you see the effects of changing lighting or materials; the rendering interactively updates as you change your scene. ActiveShade renderings are, in general, less precise than production renderings.

Another advantage of production renderings is that you can use different renderers, such as the mental ray or VUE file renderer.

To choose between production or ActiveShade renderings, use the radio buttons described in the "Interface" section below. To change the renderer assigned to production rendering, use the *Assign Renderer rollout (page 3–34)*.

See also

Render Scene (page 3–11)

Procedures

To render a still image:

1. Activate the viewport to render.
2. Click Render Scene.

   The Render Scene dialog appears, with the Common panel active.
3. Make sure Single is turned on in the Time Output group of the Common Parameters rollout.
4. In the Output Size group, set other rendering parameters or use the defaults.
5. Click Render.

   By default, the rendering appears in a *rendered frame window (page 3–5)*.

   Tip: To render a view without using the dialog, click *Quick Render (page 3–16)*.

To render an animation:

1. Activate the viewport to render.
2. Click Render Scene.

   The Render Scene dialog appears, with the Common panel active.
3. Open the *Common Parameters rollout (page 3–27)*. In the Time Output group, choose a time range.
4. In the Output Size group, set other rendering parameters or use the defaults.
5. In the Render Output group, click Files.
6. On the *Render Output File dialog (page 3–8)*, specify a location, name, and a type for the animation file, and then click Save.

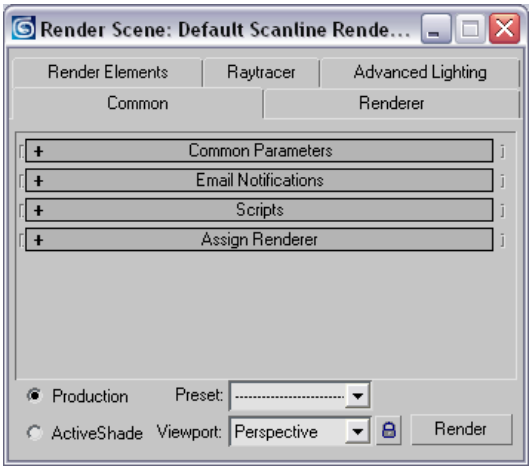
   Typically, a dialog appears that lets you configure options for the chosen file format. Change settings or accept the defaults, and then click OK to continue.

   The Save File check box turns on.
7. Click the Render button at the bottom of the dialog.

   Note: If you set a time range and do not specify a file to save to, the animation is rendered only to the window. This can be a time-consuming mistake, so an alert warns you about it.

Tip: Once you have rendered the animation this way, you can render it again without using the dialog by clicking Quick Render.

Interface



- **Production**—Choose to use the active production renderer. (This is the default.)
- **ActiveShade**—Choose to use *ActiveShade (page 3–17)*.

Render Presets drop-down list—Lets you choose from among a set of preset rendering parameters, or load or save rendering parameter settings. See *Preset Rendering Options (page 3–23)*.

Viewport—Chooses the viewport to render. By default, this is the active viewport. You can use this drop-down list to choose a different one. Only currently displayed viewports are available in the list.

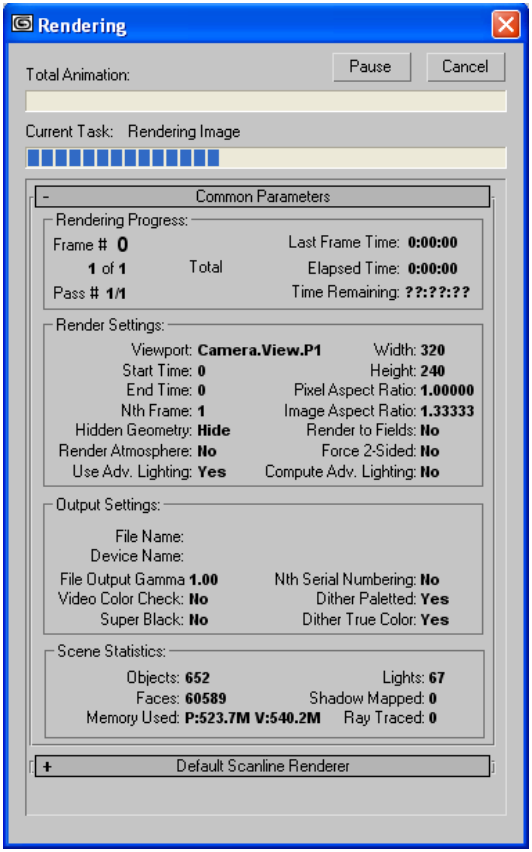
Lock View—When on, locks the view to the one shown in the Viewport list. This enables you to adjust the scene in other viewports (which become active as you use them), and then click Render to render the viewport you originally chose. When off, Render always renders the active viewport.

Render—Renders the scene.

When ActiveShade is chosen, the name of this button changes to ActiveShade, and clicking it opens a floating *ActiveShade window (page 3–17)*.

If the scene you're rendering contains bitmaps that cannot be located, a *Missing External Files dialog (page 3–504)* appears. This dialog lets you browse for the missing maps, or continue to render the scene without loading them.

Rendering Progress dialog



When you click Render, a rendering progress dialog shows the parameters being used, and a progress bar. The rendering dialog has a Pause button to the left of the Cancel button. When you click Pause, the rendering pauses, and the

button's label changes to Resume. Click Resume to continue with the rendering.

Note: The mental ray renderer does not support the Pause button. You can cancel a mental ray rendering, but you can't pause it.

Rendered Frame Window

Rendering menu > Render > Render Scene dialog > Render > Rendered Frame Window appears.

File menu > View Image File > Choose a file to view. > Open > Rendered Frame Window displays the file.

The rendered frame window displays rendered output. It has controls to:

- Save the image to a file.
- Create a clone of the window. This displays a new window so you can create another rendering and compare it with the previous one.
- Display a new rendered frame window.
- Enable or disable display of the red, green, and blue color channels.
- Display the *alpha channel (page 3–1001)*.
- Display only monochrome (gray scale).
- Clear the image from the window.

3ds Max also displays still images and image sequences in the rendered frame window when you choose the View Image File command from the File menu. When you view sequentially numbered image files or images in an *IFL file (page 3–666)*, the rendered frame window displays navigation arrows that let you step through the images.

Procedure

To zoom and pan in the rendered frame window:

You can zoom in and out and pan the image in the rendered frame window. You can even do this *while* a scene is rendering.

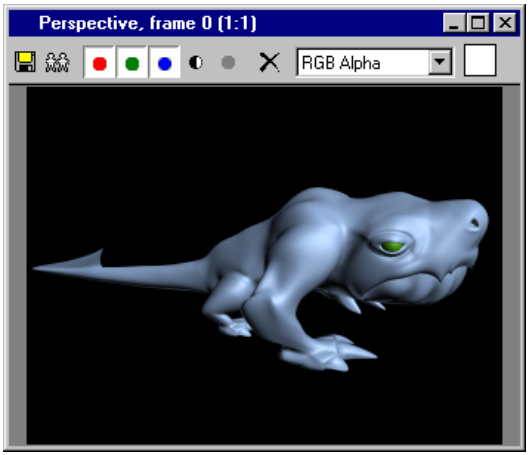
- Hold down CTRL and then click to zoom in, right-click to zoom out.
- Hold down SHIFT and then drag to pan.

If you have a three-button mouse, you can use its third button or its wheel to zoom and pan:

- Roll the wheel to zoom in or out.
- Press the wheel, and drag to pan.

  Note: You can use any third-button pointing device to pan the image. To enable this, open the Customize menu > Preferences dialog. Go to the *Viewports panel (page 3–874)*, and in the Mouse Control group choose the Pan/Zoom option.

Interface



Rendered Frame Window toolbar

Save Bitmap—Allows you to save the rendered image displayed in the rendered frame window.

Clone Rendered Frame Window—Creates another rendered frame window containing the displayed image. This allows you to render another image to the rendered frame window and compare

it with the previous, cloned image. You can clone the rendered frame window any number of times.

Enable Red Channel—Displays the red channel of the rendered image. When turned off, the red channel is not displayed.

Enable Green Channel—Displays the green channel of the rendered image. When turned off, the green channel is not displayed.

Enable Blue Channel—Displays the blue channel of the rendered image. When turned off, the blue channel is not displayed.

Display Alpha Channel—Displays the *alpha channel (page 3–1001)*.

Monochrome—Displays an 8-bit grayscale of the rendered image.

Clear—Clears the image from the rendered frame window.

Channel Display List—Lists any channel rendered with the image. When you choose a channel from the list, it is displayed in the rendered frame window.

For most kinds of files, only the RGB and alpha channels are available. If you render an *RPF file (page 3–681)* or *RLA file (page 3–680)*, additional channels can be present.

The rendered frame window displays nonvisual channels, such as Material Effects or the G-Buffer, using colors it randomly assigns to distinct values.

Layer—This spinner appears on the rendered frame window toolbar when you render to the *RPF (page 3–681)* or *RLA (page 3–680)* file format. It lets you see the information at different layers of the following channels:

- Z-buffer
- Normal
- Non-Clamped Color
- Coverage
- Node Render ID
- Color
- Sub-Pixel Weight
- Sub-Pixel Mask

Layer shows no additional information for other channels. It is useful primarily when the scene contains objects that occlude each other, and you have turned on the Render Occluded Objects toggle for these objects. (See *Object Properties (page 1–111)*.) Be aware that rendering occluded objects increases render time.

Tip: Rendering occluded objects can help you create 3D effects when you composite images with the Autodesk Combustion software.

Color Swatch—Stores the color value of the last pixel you right-clicked. You can drag this color swatch to other color swatches in the program. Clicking the color swatch displays the *Color Selector (page 1–157)*, which displays more information about the color.

You can leave the Color Selector displayed while you right-click over other pixels in the rendered frame window. (Changing the current value in the Color Selector changes the color swatch on the rendered frame window's toolbar, but it does not change the color of pixels in the rendered image.)

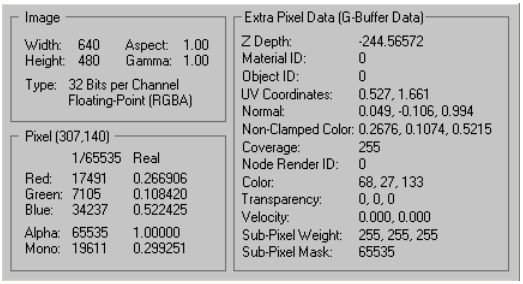
Frame-Steps (arrows)—For sequentially numbered files (such as *image0005.jpg)* or IFL files, the arrows display the next or the previous file in the sequence. Holding down CTRL and clicking an arrow jumps to the first image or the last image in the sequence.

Available if the rendered frame window is invoked using View File in the File menu.

Pixel Data

When you right-click the rendered frame window, the color swatch is updated, and information about the rendering and the pixel beneath the mouse is displayed.

If you hold the right mouse button down while dragging, the information changes with each new pixel the mouse crosses.



The display includes the following information:

Image group

Width—The width of the image in pixels.

Aspect—The pixel aspect ratio.

Height—The height of the image in pixels.

Gamma—The gamma value carried in the bitmap file.

Type—The type of image, based on color depth. For example, 64 bits (RGBA) or 32 Bits per Channel Floating-Point (RGBA).

Pixel group

Pixel information includes the pixel location in the bitmap, in parentheses following the Pixel group heading. The counting starts at 0. For example, in the above illustration, the pixel in question is the 308th from the left edge and the 141st from the top edge. Also shown in this group are channel values for red, green, blue, alpha, and monochrome, both as 16-bit integers (0 to 65535) and as floating-point values between 0.0 and 1.0.

Note: With high-dynamic-range images, the floating-point values can be greater than 1.0 or less than 0.0.

Red—The red component value (0 to 65535) and the floating-point value.

Green—The green component value (0 to 65535) and the floating-point value.

Blue—The blue component value (0 to 65535) and the floating-point value.

Alpha—The alpha component value (0 to 65535) and the floating-point value.

Mono—The monochrome values of the pixel, using the same formula used by monochrome material map channels such as bump and opacity maps.

Extra Pixel Data (G-Buffer Data) group

If the rendering is in a format, such as an *RPF file (page 3–681)* or *RLA file (page 3–680)*, that contains additional channels, the informational pop-up shows this data in the Extra Pixel Data group. The group includes all the possible channels. If a channel was not saved, its value is displayed as "N/A," for "not applicable."

Z Depth—Displays Z-Buffer information in repeating gradients from white to black. The gradients indicate relative depth of the object in the scene.

Material ID—Displays the Effects Channel used by a material assigned to an objects in the scene. The Effects Channel is a material property set in the Material Editor.

Object ID—Displays the G-Buffer Object Channel ID assigned to objects using the *Object Properties dialog (page 1–111)*.

UV Coordinates—Displays the range of UV mapping coordinates.

Normal—Displays the orientation of normal vectors.

Non-Clamped Color—Displays the "real" color value delivered to the renderer in RGB order. The renderer uses a floating-point range of 0.0 to 1.0 to represent the range of each color channel. Thus, 1.0 is 100%, or 65535 (real color values can be greater than 1, but are clamped by the renderer to 1).

Coverage—Displays the coverage of the surface fragment from which other G-Buffer values (Z Depth, Normal, and so on) are obtained. Z-Coverage values range from 0 to 255.

Node Render ID—Displays an object's G-Buffer Object channel.

Color—Displays the color returned by the material shader for the fragment.

Transparency—Displays transparency returned by the material shader for the fragment.

Velocity—Displays the velocity vector of the fragment relative to the screen.

Sub-Pixel Weight—Displays the sub-pixel weight of a fragment. The channel contains the fractions of the total pixel color contributed by the fragment. The sum of all the fragments gives the final pixel color. The weight for a given fragment takes into account the coverage of the fragment and the transparency of any fragments that are in front of a given fragment.

Sub-Pixel Mask—Displays the sub-pixel alpha mask. This channel provides a mask of 16 bits (4x4) per pixel, used in antialiased alpha compositing.

Render Output File Dialog

Rendering menu > Render > Render dialog > Common panel > Common Parameters rollout > Render Output group > Click Files. > Render Output File

The Render Output File dialog lets you assign a name to the file that the rendering will output. You can also determine the type of file to render. Depending on your choice of file type, you can also set up options such as compression, and color depth and quality.

See also

Image File Formats (page 3–657)

Procedures

To name the render output file:

1. Choose Rendering > Render, and then in the Render Output group of the Common Parameters rollout, click Files.

   The Render Output File dialog is displayed.

2. In the File Name field, enter the name for the file to be rendered.

3. Navigate the Save In field to choose the directory where you want the rendered file to be saved.

4. Choose the type of file you want to render from the Save As Type drop-down list.

5. Click Save to close the Render Output File dialog.

   A dialog is displayed that lets you set the options for the file format you chose. Adjust these settings (or leave them at their defaults), and then click OK.

6. On the Render Scene dialog, click Render to render and save the file.

   Note: If a file of the same name already exists, you will be asked if you want to overwrite it. Enable the check box if you want to

automatically overwrite this file without being prompted for the duration of the session.

To set up options for the render output file:

1. Choose Rendering > Render and then in the Render Output group of the Common Parameters rollout, click Files.

   The Render Output File dialog is displayed.

2. In the File Name field, enter the name for the file to be rendered.

3. Navigate the Save In field to choose the directory where you want the rendered file to be saved.

4. Choose the type of file you want to render from the Save As Type drop-down list, then click Save.

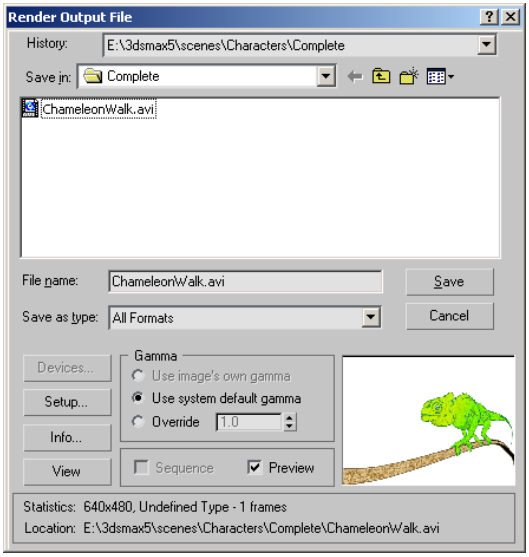
   A dialog is displayed that lets you set the options for the file format you chose. Adjust these settings (or leave them at their defaults), and then click OK.

   Note: You can also view the setup dialog by clicking Setup, if this button is available.

   Warning: Make sure the file name extension in the File Name field matches the file type in the Save As Type field. Changing the file type *does not update* the file name automatically. The file options dialog depends on the type indicated by the file name, *not* the type indicated by Save As Type.

5. If the Render Output File dialog is still open, click Save.

Interface



History—Displays a list of the most recent directories searched. Whenever an image is selected, the path used is added to the top of the history list as the most recently used path.

The history information is saved in the *3dsmax.ini* file.

Save In—Opens a navigation window to browse other directories or drives.

Up One Level—Moves you up a level in the directory structure.

Create New Folder—Lets you create a new folder while in this dialog.

View menu—Provides several options for how information is displayed in the list window:

- **Thumbnails:** Displays the contents of a directory as thumbnails, without the details.
- **Tiles:** Displays the contents of a directory as large icons, without the details. If you widen the dialog, these tile across the width.

- **Small Icons:** Displays the contents of a directory as small icons, tiled across the width, without the details.
- **List:** Displays the contents of a directory without the details.
- **Details:** Displays the contents of a directory with full details such as size and date.

List of files—Lists the contents of the directory, in the format specified by the View menu.

Tip: When Details is the active display format, the contents of the directory are displayed with Name, Size, Type, Date Modified, and Attributes. You can sort the list according to one column's contents by clicking that column's label.

File name—Displays the file name of the file selected in the list.

Save as type—Displays all the file types that can be saved. This serves as a filter for the list.

Note: The choice in this field determines the file type saved, regardless of the file name extension entered in the File Name field.

Save—Saves to the file you named, and closes the dialog.

Cancel—Cancels the file save, and closes the dialog.

Devices—Lets you choose the hardware output device, for example, a digital video recorder. To use the device, the device, its driver, and its 3ds Max plug-in must all be installed on your system.

Setup—Displays controls for the selected file type. These vary with each different file format.

Warning: The file setup dialog displayed corresponds to the type indicated by the file name extension in the File Name field, *not* to the type indicated by the Save As Type field.

Info—If you highlight an existing file in the list, clicking Info displays expanded information about the file such as frame rate, compression quality, file size, and resolution. The information here depends on the type of information saved with the file type.

View—If you highlight an existing file in the list, clicking View displays the file at its actual resolution. If the file is a movie, the Media Player is opened so the file can be played.

Gamma group

To set up Gamma options for the output file, Enable Gamma Correction must be turned on in the *Gamma panel (page 3–873)* of the Preferences dialog (Customize > Preferences > Gamma). Otherwise, the Gamma controls are unavailable in the Render Output File dialog.

Gamma—Selects the type of gamma to be used for the selected file. This is unavailable unless Enable Gamma Correction is turned on in the Gamma panel of the Preferences dialog.

Use Image's Own Gamma—This is not available in the render output file dialog.

Use System Default Gamma—Ignores the image's own gamma and uses the system default gamma instead, as set in the Gamma panel of the Preferences dialog.

Override—Defines a new gamma for the bitmap that is neither the image's own, nor the system default.

Sequence—This is not available in the Render Output File dialog.

Note: To render a sequence of still images, choose the Active Time Segment or define a range of frames in the Common Parameters rollout of the Render Scene dialog. If you have selected a still image file type, each frame will append a four-digit number to the name you have selected, incremented with each frame.

Preview—When on, enables display of the image as a thumbnail.

Image thumbnail—Displays a thumbnail of the selected file. Preview must be turned on.

Statistics—Displays the resolution, color depth, file type, and number of frames of the selected file.

Location—Displays the full path for the file.

Rendering Commands

The main commands for rendering are on the *main toolbar (page 3–733)*. Another way to invoke some of these commands is to use the default *Rendering menu (page 3–731)*, which contains other commands related to rendering.

Render Scene (page 3–11)

Render Type (page 3–13)

Quick Render (Production) (page 3–16)

Quick Render (ActiveShade) (page 3–17)

ActiveShade Viewport (page 3–20)

Preset Rendering Options (page 3–23)

Render Last (page 3–24)

See also

Render Scene Dialog (page 3–2)

ActiveShade (page 3–17)

ActiveShade Commands (Quad Menu) (page 3–21)

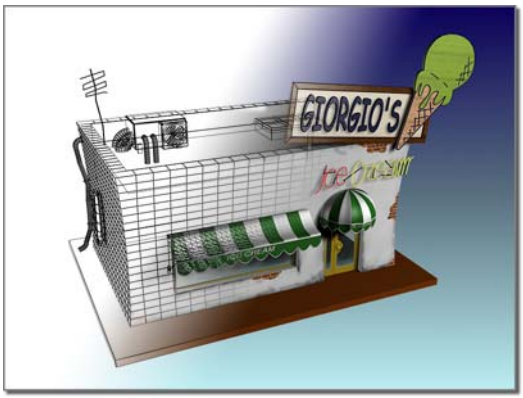
Introduction to Rendering Effects (page 3–214)

Environment (page 3–267)

Introduction to Network Rendering (page 3–169)

Render Scene

Main toolbar > Render Scene
Rendering menu > Render
Keyboard > **F10**



Rendering "fills in" geometry with color, shadow, lighting effects, and so on.

The Render Scene button displays the *Render Scene dialog (page 3–2)*, which lets you set the parameters for rendering. Rendering creates a still image or an animation. It shades the scene's geometry using the lighting you've set up, the materials you've applied, and environment settings such as background and atmosphere.

Rendering is multi-threaded and multi-processed on multiple-processor configurations. A two-processor system can render in nearly half the time a single-processor system can.

Rendering can also take place on multiple systems by using a network. See *Introduction to Network Rendering (page 3–169)*. For the mental ray renderer, also see *Distributed Bucket Rendering Rollout (mental ray Renderer) (page 3–121)*.

Missing Mapping Coordinates

If the renderer finds a parametric object that requires mapping, it automatically sets its Generate Mapping Coordinates toggle before rendering the scene. The toggle remains set after the rendering is done.

In the following cases, however, 3ds Max is unable to supply mapping coordinates automatically:

- Non-parametric objects, such as imported meshes, don't have built-in coordinates.
- Some third-party (plug-in) objects aren't provided with mapping coordinates.

In these cases, 3ds Max is unable to render the scene completely. It displays a *Missing Mapping Coordinates dialog (page 2–1433)* that lists the objects the renderer couldn't map. To resolve the problem apply a *UVW Map modifier (page 1–905)* to the objects that the dialog lists.

Note: If a material has Show Map In Viewport set when that material is assigned to an object, the object's Generate Mapping Coordinates toggle is set, if it was not previously set. (The state of Show Map In Viewport is saved with each material.)

Procedures

To render a still image:

1. Activate the viewport to render.
2. Click Render Scene.

   The *Render Scene dialog (page 3–2)* appears.
3. In the Time Output group, make sure Single is on.
4. In the Output Size group, set other rendering parameters or use the defaults.
5. Click Render.

   By default, the rendering appears in a window.

   Tip: To render a view without using the dialog, click *Quick Render (page 3–16)* or use *Render Last (page 3–24)* (press **F9**).

To render an animation:

1. Activate the viewport to render.
2. Click Render Scene.

   The *Render Scene dialog (page 3–2)* appears.
3. Open the *Common Parameters rollout (page 3–27)*. Choose a time range in the Time Output group.
4. In the Output Size group, set other rendering parameters or use the defaults.
5. In the Render Output group, click Files.
6. A *Render Output File dialog (page 3–8)* is displayed.
7. Use the file dialog to specify a name and a type for the animation file, and then click Save.

   A dialog is displayed that lets you set the options for the file format you chose. Adjust these settings (or leave them at their defaults), and then click OK.

   On the Render Scene dialog's Common Parameters rollout, the Save File toggle turns on.
8. Click Render.

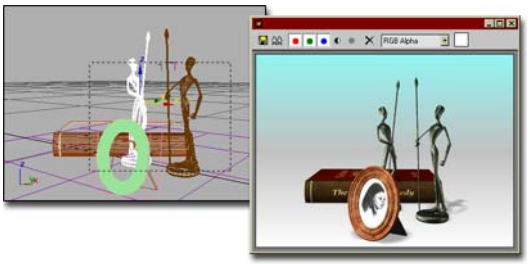
   Note: If you set a time range and do not specify a file to save to, the animation is rendered only

to the window. This can be a time-consuming mistake, so an alert warns you about it.

Tip: To render a view without using the dialog, click *Quick Render (page 3–16)* or use the Keyboard Shortcut **F9** to *Render Last (page 3–24)*.

Render Type

Main toolbar > Render Type drop-down list



Render Type lets you render only a portion of the scene.

The Render Type list lets you specify the portion of the scene that will be rendered.

Procedures

To render selected objects:

1. From the Render Type drop-down list at the right end of the toolbar, choose Selected.
2. Activate the viewport to render.
3. Select the objects.
4. Click Render Scene or Quick Render (Production).

   3ds Max displays a progress dialog that shows the progress of rendering and the rendering parameter settings. To stop rendering, click Cancel in this dialog, or press ESC.

To render a region:

1. Make the viewport active.
2. Choose Region from the list.
3. Click Render Scene or Quick Render (Production).

   A window is displayed in the active viewport, and an OK button appears in the viewport's lower-right corner.
4. Drag in the middle of the window to move it. Drag the window's handles to adjust its size.

   To preserve the window's aspect ratio, you can hold down CTRL while you drag a handle.
5. Click OK.

   3ds Max displays a progress dialog that shows the progress of rendering and the rendering parameter settings. To stop rendering, click Cancel in this dialog, or press ESC.

To render a blowup:

1. Make the viewport active.
2. Choose Blowup from the list.
3. Click Render Scene or Quick Render (Production).

   A window is displayed in the active viewport and an OK button is displayed in the viewport's lower-right corner.
4. Drag in the middle of the window to move it. Drag the window's handles to adjust its size.

   The window is constrained to the aspect ratio of the current output size.
5. Click OK.

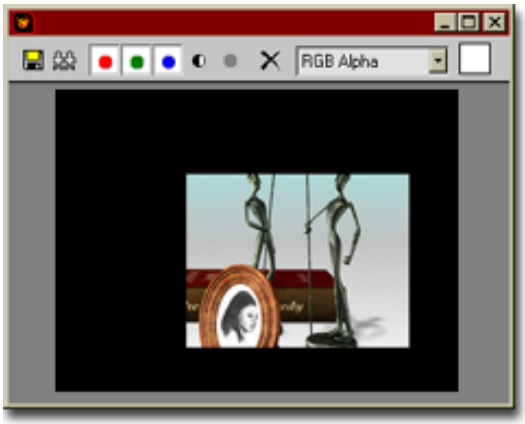
   3ds Max displays a progress dialog that shows the progress of rendering and the rendering parameter settings. To stop rendering, click Cancel in this dialog, or press ESC.

Interface

View—(The default.) Renders the active viewport.

Selected—Renders the currently selected object or objects only, and leaves the remainder of the rendered frame window intact.

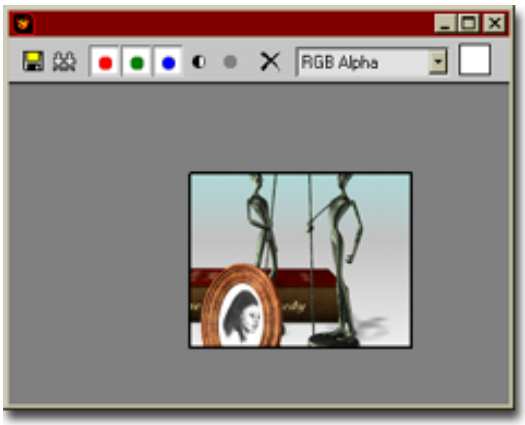
Tip: Use the Clear button before rendering to remove any existing image from the window.



Region—Renders a region within the active viewport, and leaves the remainder of the rendered frame window intact. Use this option when you need to test render a part of the scene.

Tip: Use the Clear button before rendering to remove any existing image from the window.

Note: Region rendering is meant to create a draft rendering of a selected area of a view. As such, Region rendering uses only an Area filter for antialiasing, regardless of which antialiasing is chosen in the Render Scene dialog.

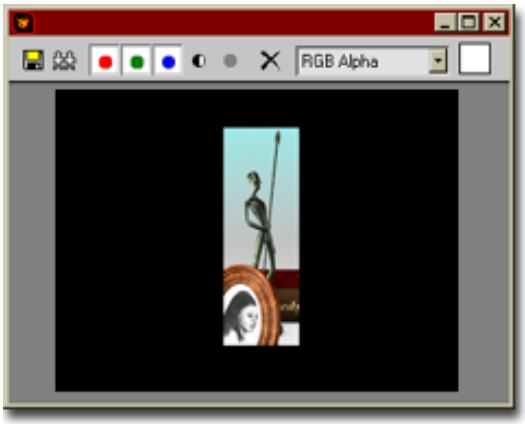


Crop—Lets you specify the size of the output image using the same region box that appears for the Region and Blowup categories.

Blowup—Renders a region within the active viewport and enlarges it to fill the output display.

A rectangular selection region appears when you render with either Blowup or Region selected in the Render Type list. You can change the size of the region by dragging its handles.

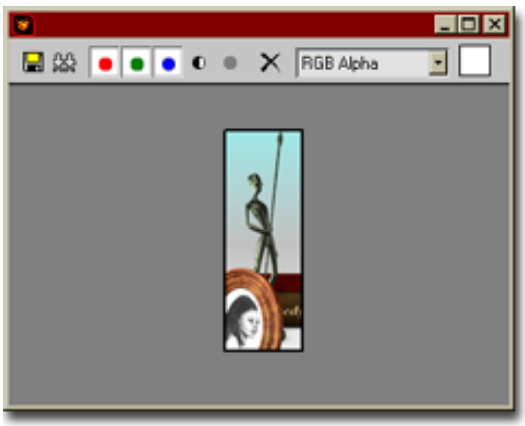
Box Selected—Calculates the aspect ratio of the current selection's bounding box, and then displays the *Render Bounding Box/Selected dialog (page 3–16)*, which lets you specify a width and height for the rendering, and provides the option of maintaining the aspect ratio.



Region Selected—When an object or objects are selected, renders those objects and other objects within the selection's bounding boxes, but does not change the rendering outside the bounding boxes.

Objects within the bounding boxes, including objects in front of or behind the selection, are rendered.

When no objects are selected, Region Selected renders the entire frame.



Crop Selected—When an object or objects are selected, renders those objects and other objects within the selection's bounding boxes. The rendering is cropped around the region defined by the bounding boxes.

Objects within the bounding boxes, including objects in front of or behind the selection, are rendered.

When no objects are selected, Crop Selected renders the entire frame.

Render Bounding Box/Selected Dialog

Select objects. > Main toolbar > Choose Box Selected from the Render Type drop-down list. > Click Quick Render (Production) > Render Bounding Box/Selected dialog

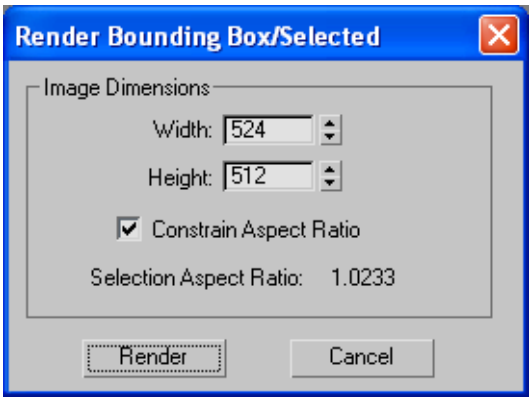
Select objects. > Main toolbar > Choose Box Selected from the Render Type drop-down list. > Click Render Scene, and then click Render. > Render Bounding Box/Selected dialog.

This dialog appears when you render a scene while the Box Selected render type is active. Box Selected renders an area that corresponds to the bounding box of the currently active selection.

See also

Render Type (page 3–13)

Interface



Width and Height—Let you set the size of the rendering, in pixels.

Constrain Aspect Ratio—When on, constrains the original aspect ratio of the selection's bounding box. Changing the Width value also changes Height, and vice versa. Default=on.

Selection Aspect Ratio—Displays the original aspect ratio of the selection's bounding box.

Quick Render Flyout

Main toolbar > Quick Render flyout

The Quick Render flyout lets you choose among these buttons:

- Quick Render (Production).
- Quick Render (ActiveShade)

The Quick Render buttons let you render the scene using the settings without displaying the *Render Scene dialog (page 3–2)*. Choosing one of these buttons also changes which rendering settings are active in the Render Scene dialog.

By default, all the rendering options use the *default scanline renderer (page 3–37)*. You can change the renderer assigned to Production or ActiveShade by using the *Assign Renderer rollout (page 3–34)* on the Render Scene dialog > Common panel.

Quick Render (Production)

Main toolbar > Quick Render flyout > Quick Render (Production)

Keyboard > **SHIFT+Q**

The Quick Render (Production) button, available from the *Quick Render flyout (page 3–16)* on the main toolbar, lets you render the scene using the current production render settings without displaying the *Render Scene dialog (page 3–2)*.

You assign which renderer to use for production rendering on the *Assign Renderer rollout (page 3–34)* of the Render Scene dialog > Common panel.

See also

Quick Render (ActiveShade) (page 3–17)

Quick Render (ActiveShade)

Main toolbar > Quick Render flyout > Quick Render (ActiveShade)
Keyboard > **SHIFT+Q** (Uses the Quick Render mode currently active on the toolbar: either Production or ActiveShade)

The Quick Render (ActiveShade) button, available from the *Quick Render flyout (page 3–16)*, creates an *ActiveShade (page 3–17)* rendering in a floating window.

You assign which renderer to use for ActiveShade rendering on the *Assign Renderer rollout (page 3–34)* of the *Render Scene dialog (page 3–2)* > Common panel.

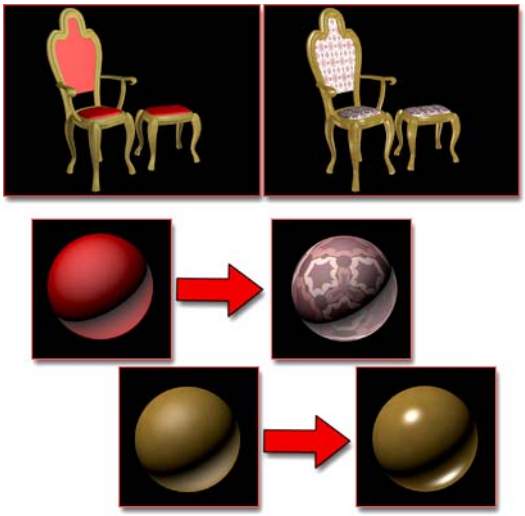
See also

Quick Render (Production) (page 3–16)

ActiveShade

Rendering menu > ActiveShade Floater or ActiveShade Viewport
Main toolbar > ActiveShade Floater or Quick Render (ActiveShade)
Right-click viewport label. > Views > ActiveShade

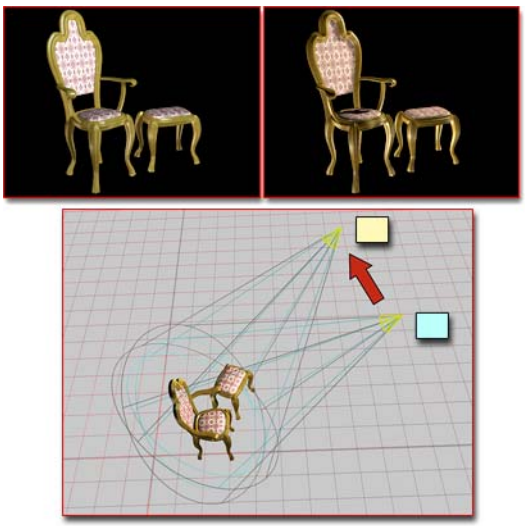
ActiveShade gives you a preview rendering that can help you see the effects of changing lighting or materials in your scene. When you adjust lights or materials, the ActiveShade window interactively updates the rendering.



ActiveShade preview of material changes

Above left: Before the update

Above right: After changing the material for the fabric to a mapped material and increasing the highlights on the material for the wood



ActiveShade preview of lighting changes

Above left: Before moving a light in a viewport

Above right: After moving the light

There are two ActiveShade options:

- **Viewport**—The ActiveShade rendering appears in the active viewport.
- **Floater**—The ActiveShade rendering appears in its own window.

Only one ActiveShade window can be active at a time. If you choose one of the ActiveShade commands while an ActiveShade window is already active, you get an alert that asks whether you want to close the previous one. If the previous ActiveShade window was docked in a viewport, the viewport reverts to the view it previously showed.

Tip: You can drag and drop materials from the *Material Editor (page 2–1253)* to ActiveShade windows and viewports, as you can with other viewports.

Note: You can't make a maximized viewport an ActiveShade window, or maximize an ActiveShade window.

ActiveShade Commands

When you right-click an ActiveShade window, the *quad menu (page 3–741)* displays an ActiveShade menu. This menu contains a number of *ActiveShade commands (page 3–21)*.

ActiveShade and Object Selection

If you select an object before you invoke ActiveShade, ActiveShade is done only for that object. This can greatly increase the speed of ActiveShade.

Similarly, once the ActiveShade window is open, the *initialize and update steps (page 3–998)* (whether automatic or manual) are done only for the selected object.

In a "docked" ActiveShade viewport, you can select objects by right-clicking, turning on Select Object in the Tools (lower-right) quadrant of the quad menu, then clicking the object you want to select. In an ActiveShade viewport, only one object at a time can be selected.

Tip: When an object in an ActiveShade window has a mapped material, select it before you change a map or adjust its parameters.

What ActiveShade Does and Doesn't Do

For the sake of interactivity, the ActiveShade window is limited in what it will and won't update interactively. An ActiveShade rendering is not necessarily the same, and in general is less precise, than a final production rendering.

Tip: When you change geometry by transforming it or modifying it, right-click the ActiveShade window and choose Tools > Initialize from the quad menu (lower-right quadrant). This updates the ActiveShade rendering.

- Moving an object does not update the ActiveShade window.
- Applying a modifier or otherwise changing object geometry does not interactively update the ActiveShade window.
- Reflections are rendered only in the Initialize pass.
- Materials are displayed as RGBA data with 8 bits per channel.
- Multiple changes to a material might lead to deterioration in image quality.

  If you see this happening, right-click the ActiveShade window and choose Tools > Initialize from the quad menu (lower-right quadrant).
- Masks are reduced from 8x8 to 4x4 subdivisions per pixel. The mask is corrected to 6-bit opacity (0 to 63 rather than 0 to 255). This might result in some visual noise around object edges.

- Because of the preceding item, filters are coarser than in full-scale renderings, but they still have significant subpixel information.
- There is a limitation of 16 subdivisions per pixel. Because of this, any objects behind the sixteenth occluding object for a given pixel will be ignored. Rendered back faces count as separate objects.
- Reshading uses compressed normals and other direction vectors. This should have no visible effect.
- ActiveShade does not render atmospheric effects, rendering effects, or ray-traced shadows (the only shadows it can render are shadow-mapped shadows).

Procedures

To display an ActiveShade window in a viewport, do one of the following:

- Choose Rendering menu > ActiveShade Viewport.
- Right-click the viewport label, choose Views, and then ActiveShade.

  Note: You can't make a maximized viewport an ActiveShade window, or maximize an ActiveShade window.

To display a free-floating ActiveShade window, do one of the following:

- Choose Rendering menu > ActiveShade Floater.
- Choose Quick Render (ActiveShade) from the *Quick Render flyout (page 3–16)*.

Note: As with Quick Render, the ActiveShade window respects the Output Size setting in the *Render Scene dialog (page 3–2)*. To use a different render size, set it first in Render Scene, and then open the ActiveShade window.

To update an ActiveShade window after moving an object or changing object geometry:

1. Right-click the ActiveShade window.
2. In the Tools (lower-right) quadrant of the quad menu, choose Initialize.

To see the toolbar in an ActiveShade viewport:

1. Click the viewport to make it active.
2. Press the spacebar to display the toolbar.

   Pressing spacebar again toggles the toolbar off, and so on.

   You can also turn toolbar display on or off by right-clicking and using the quad menu.

To change an ActiveShade viewport to another kind of viewport:

1. Turn on the toolbar in the ActiveShade viewport.
2. Right-click the toolbar.
3. In the pop-up menu, choose the type of view to display.

   You can also restore the viewport to its previous status by right-clicking the viewport and choosing View (upper-left) quad > Close.

To zoom and pan in an ActiveShade window:

You can zoom in and out and pan the image in the ActiveShade window. You can even do this *while* a scene is rendering.

1. Hold down CTRL and then click to zoom in, right-click to zoom out.
2. Hold down SHIFT and then drag to pan. (The window must be zoomed in.)

If you have a three-button mouse, you can use its third button or wheel to zoom and pan:

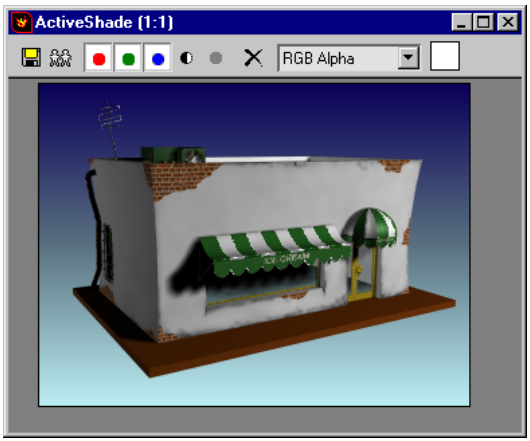
1. Roll the wheel to zoom in or out.
2. Press the wheel, and drag to pan.

Note: You can use any third-button pointing device to pan the image. To enable this, choose the Pan/Zoom option on the *Viewports panel (page 3–874)* of the Preferences dialog

Interface

Both the viewport and floating versions of the ActiveShade window have the same controls as a *rendered frame window (page 3–5)*. In an ActiveShade viewport, the toolbar is off by default. In a floating ActiveShade window, the toolbar is always visible.

Tip: In an active ActiveShade viewport, you can toggle toolbar display by pressing the spacebar. (This is a main user interface shortcut, so the Keyboard Shortcut Override Toggle can be either on or off.)



Tip: If you clear the image, you can redisplay it by right-clicking the ActiveShade window and choosing Tools > Initialize or Tools > Update Shading from the lower-right quadrant of the quad menu.

ActiveShade Floater

Main toolbar > Quick Render flyout > Quick Render (ActiveShade)

Menu bar > Rendering > ActiveShade Floater

Click ActiveShade Floater to create an ActiveShade rendering in its own window.

Only one ActiveShade window can be visible at a time. If you change a viewport to an ActiveShade view while a floating ActiveShade window is open, you get a message that asks whether you want to close the floating window, or stop the operation.

See also

ActiveShade (page 3–17)

ActiveShade Commands (Quad Menu) (page 3–21)

ActiveShade Initialize and Update (page 3–998)

ActiveShade Viewport

Rendering menu > ActiveShade Viewport

Right-click viewport label. > Views > ActiveShade

Creates an *ActiveShade rendering (page 3–17)* that is "docked" in a viewport.

Only one ActiveShade rendering can be displayed at a time. If you try to display a floating ActiveShade window while an ActiveShade viewport is displayed, you get a message that asks whether you want to close the docked ActiveShade rendering, or stop the operation. If you go ahead and close the docked ActiveShade rendering, the viewport reverts to the view it previously showed.

ActiveShade Commands

When you right-click an ActiveShade viewport, the *quad menu (page 3–741)* displays an

ActiveShade menu. This menu contains a number of *ActiveShade commands (page 3–21)*.

ActiveShade and Object Selection

If you select an object before you invoke ActiveShade, ActiveShade is done only for that object. This can greatly increase the speed of ActiveShade.

Similarly, once the ActiveShade window is open, the *initialize and update steps (page 3–998)* (whether automatic or manual) are done only for the selected object.

In a "docked" ActiveShade viewport, you can select objects by right-clicking, turning on Select Object in the Tools (lower-right) quadrant of the quad menu, then clicking the object you want to select. In an ActiveShade viewport, only one object at a time can be selected.

Tip: When an object in an ActiveShade window has a mapped material, select it before you change a map or adjust its parameters.

Procedures

To display the toolbar for the ActiveShade viewport:

- Press SPACEBAR.

  SPACEBAR toggles the toolbar display. In viewports, the toolbar is off by default.

  (This is a main user interface shortcut, so the Keyboard Shortcut Override Toggle can be either on or off.)

The controls on the toolbar for an ActiveShade viewport are the same as for a *floating ActiveShade window (page 3–20)*.

To change the ActiveShade viewport to another kind of viewport, do one of the following:

- Right-click the ActiveShade viewport, and choose Close from the View (upper-left) quadrant of the quad menu.

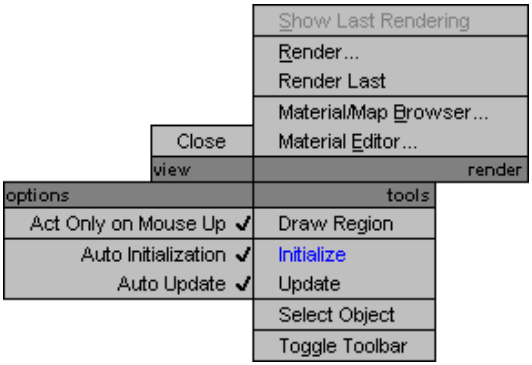
  The viewport reverts to the view it previously showed.

- If the toolbar is not visible, press SPACEBAR to display it, then right-click the toolbar and choose the kind of view to display.

ActiveShade Commands (Quad Menu)

When you right-click an ActiveShade window, the lower-left quadrant of the quad menu displays a set of commands for *ActiveShade (page 3–17)*.

Interface



Render quadrant (upper right)

These are general-purpose commands.

Show Last Rendering—Displays the last rendering in a *rendered frame window (page 3–5)*. Not available if no rendering has been made during this session.

Render—Displays the *Render Scene dialog (page 3–2)*. When you use the ActiveShade quad menu, initially Render Scene is set to render the ActiveShade window.

Render Last—Repeats the last render, using the last viewport from which you rendered.

Material/Map Browser—Displays a modeless *Material/Map Browser (page 2–1291)*.

Material Editor—Displays the *Material Editor (page 2–1253)*.

Tools quadrant (lower right)

These are the commands that perform ActiveShade operations.

Draw Region—When on, lets you draw a rectangular region of the ActiveShade window. While it is active, only the region is updated by interactive reshading. This can save time, and also help you concentrate on just a portion of the image to be rendered. Default=off.

To turn off Draw Region, click outside the rectangular region. The entire ActiveShade window is updatable again.

Initialize—Initializes the ActiveShade window. To keep the ActiveShade window current, you need to choose Initialize after transforming, modifying, or otherwise changing geometry. If you have turned off Automatic Reinitialization, you also need to choose Initialize after you update a mapped material.

Rendering can be slow. The initialize pass is meant to take care of the most time-consuming portions of rendering, to allow the update pass to take place as quickly as possible. Initialization includes the following steps:

- Evaluate the scene geometry into meshes.
- Apply space warps.
- Do transformations and clipping.
- Evaluate textures and shade materials.
- Perform optimizations to speed later processing, such as merging fragments from the same surface that are in the same pixel.

The result of initialization is a buffer. This is a compressed rendering that, like a *G-Buffer (page 3–1040)*, contains the rendering plus additional information used by the second step, updating.

During the initialize pass, progress is indicated by a row of pixels (white by default) that traverses the top edge of the ActiveShade window.

Update—Updates the ActiveShade window. Updating shading takes the buffer created by the first pass, initialization, and uses information in that buffer to change the color of pixels when you make changes to lights and materials in the scene.

During the update pass, progress is indicated by a row of pixels (white by default) that descends the right edge of the ActiveShade window.

To keep the ActiveShade window current, you need to choose Update Shading if you have previously turned off Automatic Shading Update.

Select Object—(Viewports only.) When on, you can select an object in the ActiveShade window by clicking. You can select only one object at a time.

When an objects is selected in the ActiveShade window, the Initialize pass resamples textures for that object alone. This improves the window's rendering speed, and is useful when you are adjusting texture display.

Toggle Toolbar—(Viewports only.) Toggles display of the ActiveShade window toolbar in viewports.

Keyboard shortcut: SPACEBAR

The *Keyboard Shortcut Override Toggle (page 3–912)* must be on for the spacebar to toggle the ActiveShade toolbar.

Options quadrant (lower left)

These commands control how the ActiveShade window behaves.

Act Only On Mouse Up—When on, changes you make to light and material parameters (for example, the RGB or Multiplier spinners) update the ActiveShade window only after you release the mouse. When off, changes to these parameters

are updated immediately, as you drag the mouse. Default=on.

Turning off Act Only On Mouse Up can make the ActiveShade window more responsive to changes, but it can also slow performance.

Auto Initialization—When on, changes you make to textures (mapped materials) automatically cause the ActiveShade window to initialize. Default=on.

Initialization can be time consuming in complex scenes. To save time, you can turn off Automatic Reinitialization, or use Draw Region to restrict initialization and shading updates to only a portion of the scene.

Auto Update—When on, changes you make to lighting, and materials without maps, automatically cause an update of the ActiveReshade window. Default=on.

View quadrant (upper left)

Close—Closes the ActiveShade window. If the ActiveShade window was docked in a viewport, the viewport reverts to the view it previously displayed.

Preset Rendering Options

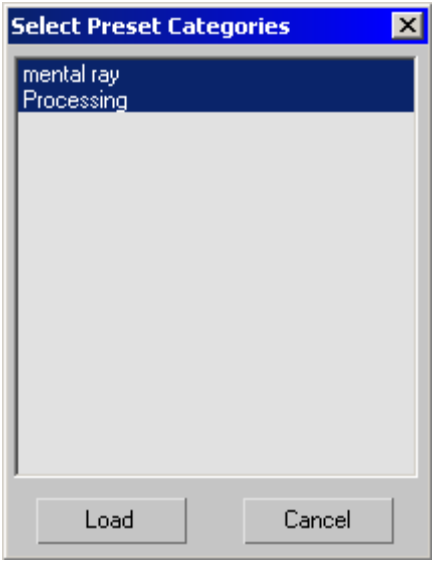
Render Scene dialog > Preset drop-down list (on the bottom row of controls)

Preset rendering options are available from the Rendering Presets drop-down list, which appears at the bottom of the *Render Scene dialog (page 3–2)*. Some of the presets are tailored for relatively quick, preview renderings; others are for slower but higher quality renderings. Presets are saved as RPS files.

Tip: The *Render Shortcuts toolbar (page 3–736)* lets you quickly switch between active presets.

In addition to the default presets that ship with 3ds Max, you can also create your own settings. At the bottom of the preset list, two choices let you create your own custom presets:

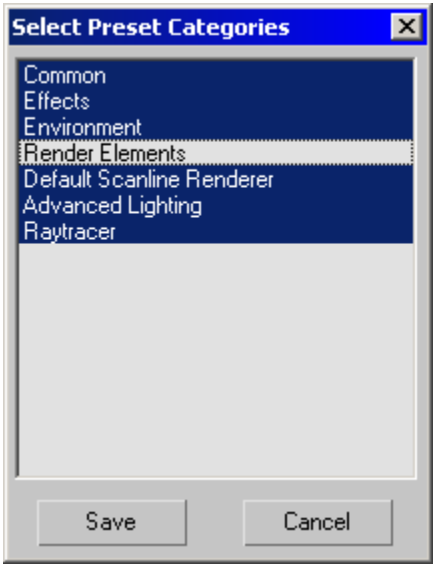
Load Preset—When you choose Load Preset, 3ds Max displays a file selector dialog that lets you choose the RPS file to load.



Each category corresponds to one panel of the Render Scene dialog. Choose which panel's settings you want to load from the RPS file, and click Load. Once you load a custom preset file, its name appears on the drop-down list, along with the default choices.

Important: Even though the renderer is assigned in the Common panel of the Render Scene dialog, renderer assignments are *not* loaded with the Common category in the RPS file. The current renderer assignment has *its own category* in the Select Preset Categories dialog. For example, if the current renderer is the Default Scanline Renderer, the Select Preset Categories dialog will have a category labeled *Default Scanline Renderer*.

Save Preset—When you choose Save Preset, 3ds Max first displays a file selector dialog, letting you name the RPS file. After that, the Select Preset Categories dialog opens.



Each category corresponds to one panel of the Render Scene dialog. Choose which panel's settings you want to save, and then click Save. Once you save a custom preset file, its name appears on the drop-down list, along with the default choices.

Important: Even though the renderer is assigned in the Common panel of the Render Scene dialog, renderer assignments are *not* saved with the Common category in the RPS file. The current renderer assignment has *its own category* in the Select Preset Categories dialog. For example, if the current renderer is the Default Scanline Renderer, the Select Preset Categories dialog will have a category labeled *Default Scanline Renderer*.

The RPS files that provide the default presets are in the *|renderpresets* subfolder of your *|3dsmax* folder. We recommend you save your own presets in this subfolder as well. If you choose a different location, 3ds Max saves the full path name. (You can also use the Configure User Paths dialog > *File I/O panel (page 3–856)* to specify your custom location.)

Show Last Rendering

Rendering menu > Show Last Rendering

Show Last Rendering displays the last rendered image. If no image has yet been rendered, this command is not available.

Render Last

Keyboard > **F9**

The Render Last command repeats the last render (whether a render view, render region, render blowup, or render selected) using the last viewport from which you rendered.

Warning: Render Last does not save to a file, even if the previous rendering did so.

Print Size Wizard

Rendering menu > Print Size Wizard

The Print Size Wizard feature is useful when you plan to print a rendered image. It lets you specify output size, resolution, and orientation in terms of the printed image; that is, using a standard measuring system rather than pixels. It also indicates the approximate uncompressed size of the image file. You can render directly from the wizard on your computer or over a network, or transfer the settings to the *Render Scene dialog (page 3–2)*.

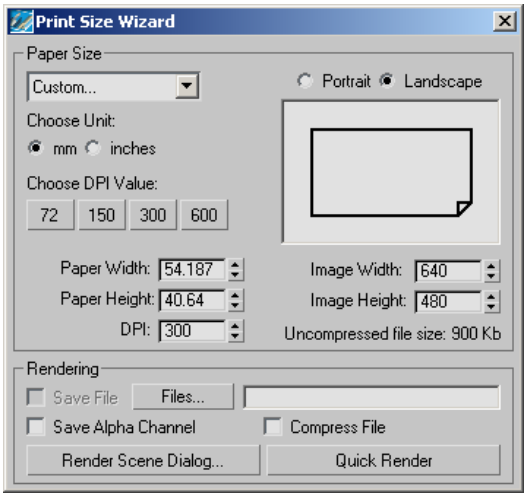
Procedure

To use the Print Size wizard:

1. Set up a scene to render.
2. From the Rendering menu, choose Print Size Wizard.

3. Choose a preset paper size, or specify a custom size in inches or millimeters. Alternatively, specify an image size in pixels.
4. Choose or specify a DPI (dots per inch) ratio for the printed output.
5. Choose an output orientation: Portrait or Landscape.
6. When ready to render to a file, turn on Save File, click the Files button, and use the resulting Select TIFF File dialog to specify an output image file.
7. Do one of the following:
   - To render immediately, click Quick Render.
   - To set further rendering properties, click Render Scene.

Interface



Paper Size group

Drop-down list—The Paper Size drop-down list lets you choose from several standard print resolutions and aspect ratios. Choose one of these formats, or leave it set to Custom to use the other controls in the Paper Size group. These are the options you can choose from on the list:

- Custom
- A - 11 x 8.5 in. (at 300 dpi)
- B - 17 x 11 in. (at 200 dpi)
- C - 22 x 17 in. (at 150 dpi)
- D - 34 x 22 in. (at 100 dpi)
- E - 44 x 34 in. (at 75 dpi)
- A0 - 1189 x 841 mm (at 75 dpi)
- A1 - 841 x 594 mm (at 100 dpi)
- A2 - 594 x 420 mm (at 150 dpi)
- A3 - 420 x 297 mm (at 200 dpi)
- A4 - 297 x 210 mm (at 300 dpi)
- A5 - 210 x 148 mm (at 300 dpi)
- Letter (11 x 8.5 in. at 300 dpi)
- Legal (14 x 8.5 in. at 300 dpi)
- Tabloid (17 x 11 in. at 300 dpi)

Tip: You can customize the Paper Size list by editing the file *plugcfg|printwiz.ini*. If you choose to edit the file, first be sure to save a backup copy of the original.

Portrait/Landscape—Choose Portrait for vertically oriented output or Landscape for horizontal output. The window image provides a graphic depiction of the orientation.

Note: Changing between Portrait and Landscape simply switches the Width and Height settings. The actual orientation depends on the image dimensions. For example, if you choose Portrait, and then specify a custom size whose width is greater than its height, the resulting orientation will be horizontal.

Tip: After changing this setting, be sure to preview the image using the *Show Safe Frame* function from the viewport right-click menu. This shows how the output orientation corresponds to the viewport.

Choose Unit—Lets you specify whether the measurement units for Paper Width and Paper Height are in millimeters (mm) or inches.

Choose DPI Value—Provides four buttons for commonly used dots-per-inch settings: 72, 150, 300, and 600. Click one to set it in the DPI property, below.

Paper Width/Height—Specifies the output width and height in mm (millimeters) or inches, depending on which is chosen under Choose Unit.

Note: Changing either setting also changes the corresponding Image size setting.

Image Width/Height—Specifies the output width and height in pixels.

Note: Changing either setting also changes the corresponding Paper size setting.

DPI—Specifies the output resolution in dots per inch. The easiest way to set this is by clicking one of the buttons under Choose DPI Value. If you're using a different resolution, set it here manually.

Only *TIFF files (page 3–684)* support DPI information. If you render to a different image format, you might have to later adjust the image resolution using an image-processing application.

Note: Changing the DPI setting also changes the Image Width/Height settings, keeping the same aspect ratio.

Uncompressed File Size—Displays the size of the rendered TIFF image file if no compression is used.

Rendering group

Rendering directly from the Print Size Wizard allows you to output the current frame to a disk file in *TIFF format (page 3–684)*. This format is commonly used in the publishing industry. To render to a different format, use the wizard's Render Scene Dialog button.

Save File—When on, the software saves the rendered image to disk when you render. Save File is available only after you specify the output file using the Files button. Default=off.

Files—Opens the Select TIFF File dialog, which lets you specify the output file name and location. If, during the current session, you already rendered an image to disk using the *Render Scene dialog (page 3–2)*, the last file name you used appears in this field.

Save Alpha Channel—When on, the software includes an eight-bit *alpha channel (page 3–1001)* in the rendered *TIFF file (page 3–684)*. Default=off.

Compress File—When on, uses compression when saving the file.

Render Scene Dialog—Opens the *Render Scene dialog (page 3–2)* and transfers any settings (such as image size) you've made in the Print Size Wizard. Here you can make further changes and then render the scene.

Quick Render—Renders the scene to the *Rendered Frame Window (page 3–5)*. Also renders to a disk file if you've turned on Save File and specified a file name.

Common Rendering Parameters

Common Panel (Render Scene Dialog)

Rendering menu > Render > Render Scene dialog > Common panel

Main toolbar > Render Scene > Render Scene dialog > Common panel

The Render Scene dialog's Common panel contains controls that apply to any rendering, regardless of which renderer you have chosen, and that lets you choose renderers.

Interface

Common Parameters Rollout (Render Scene Dialog) (page 3–27)

Email Notifications Rollout (page 3–33)

Scripts Rollout (Render Scene Dialog) (page 3–33)

Assign Renderer Rollout (page 3–34)

Common Parameters Rollout (Render Scene Dialog)

Rendering menu > Render > Render Scene dialog > Common panel > Common Parameters rollout

The Common Parameters rollout sets parameters common to all renderers.

Procedures

To set the size of the image, do one of the following:

- In the Output Size group, click one of the preset resolution buttons.
- In the Output Size group, choose one of the pre-formatted film or video formats from the drop-down list.
- In the Output Size group, choose Custom from the drop-down list, and then adjust the Width, Height, and Aspect Ratio values manually.

  Tip: Smaller images render much more quickly. For example, you can use 320 x 240 to render draft images, then change to a larger size for your final work.

To save the rendered still image in a file:

1. In the Render Output group, click Files.
2. In the file dialog, specify a name and a type for the image file, and then click OK.

   The Save File toggle turns on.

   You can later turn off Save File if you want only to view the rendering on screen.

   Note: The file dialog has a Setup button. This displays a subdialog that lets you choose options specific to the file type you are saving to.

To alter the pixel aspect ratio:

- In the Output Size group of the Render Scene dialog, adjust the Pixel Aspect Ratio to fit the requirements of your output device.

  The Image Aspect Ratio field updates to show what the aspect of the rendered image will be.

  If you alter pixel aspect ratio but also render to a window or a file, the rendered image appears distorted.

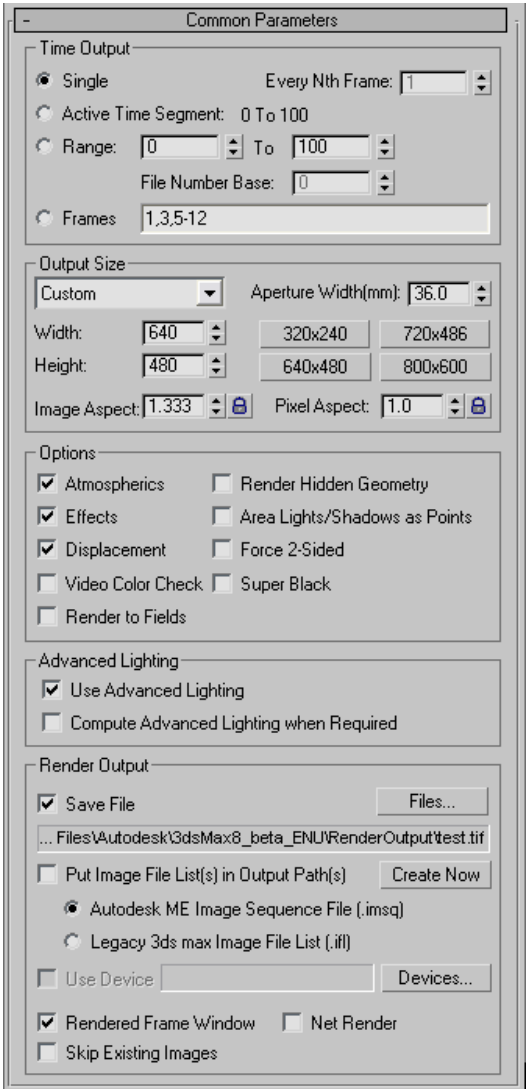
To speed up rendering time for the purpose of a test (or draft) rendering:

1. In the Options group of the Common Parameters panel, turn on Area Lights/Shadows As Points.
2. Set any other parameters and click Render.

All area and linear lights in the scene are treated as point lights during the rendering. This reduces rendering time, however some quality is lost. When you are ready to render at high quality, you can simply turn off Area Lights/Shadows As Points and render again.

Note: Scenes with *radiosity (page 3–50)* are not affected by the Area Lights/Shadows As Points toggle, as area lights do not have a significant effect on the performance of a radiosity solution.

Interface



Time Output group

Select which frames you want to render.

Single—Current frame only.

Active Time Segment—The *Active Time Segment (page 3–998)* is the current range of frames as shown in the time slider.

Range—All the frames between and including the two numbers you specify.

Frames—Nonsequential frames separated by commas (for example, 2,5) or ranges of frames, separated by hyphens (for example, 0-5).

- **File Number Base—**Specifies the base file number, from which the file name will increment. Range= -99,999 to 99,999. Available only for Active Time Segment and Range output.
- **Every Nth frame—**Regular sample of frames. For example, type 8 to render every 8th frame. Available only for Active Time Segment and Range output.

For example, if the Range of frames is set to 0-3, Every Nth Frame is 1, and the File Number Base is 15, the output files are *file0015*, *file0016*, *file0017*, *file0018*.

You can specify a negative number base, as well. For example, if you're rendering frames 50-55, and set the File Number Base to -50, the result is *file-050*, *file-051*, *file-052*, *file-053*, *file-054*, *file-055*.

Note: If you begin render a range of frames, but haven't assigned a file in which to save the animation (using the *Files button*), an alert box appears to warn you about this. Rendering animations can take a long time, and usually it doesn't make sense to render a range without saving all frames to a file.

Output Size group

Select one of the predefined sizes or enter another size in the Width and Height fields (in pixels). These controls affect the image's *aspect ratio (page 3–1005)*.

Drop-down list—The Output Size drop-down list lets you choose from several standard film and video resolutions and aspect ratios. Choose one of these formats, or leave it set to Custom to use the other controls in the Output Size group. These are the options you can choose from on the list:

- Custom
- 35mm 1.316:1 Full Aperture (cine)
- 35mm 1.37:1 Academy (cine)
- 35mm 1.66:1 (cine)
- 35mm 1.75:1 (cine)
- 35mm 1.85:1 (cine)
- 35 MM Anamorphic (2.35:1)
- 35 MM Anamorphic (2.35:1) (Squeezed)
- 70mm Panavision (cine)
- 70mm IMAX (cine)
- VistaVision
- 35mm (24mm X 36mm) (slide)
- 6cm X 6cm (2 1/4" X 2 1/4") (slide)
- 4" X 5" or 8" X 10" (slide)
- NTSC D-1 (video)
- NTSC DV (video)
- PAL (video)
- PAL DV (video)
- HDTV (video)

Note: The values of the Image Aspect and Width and Height buttons can change, depending on which output format you select from this list.

Aperture Width (mm)—Lets you specify an aperture width for the camera that creates the rendered output. Changing this value changes the camera's Lens value. This affects the relationship between the Lens and the FOV values, but it doesn't change the camera's view of the scene.

For example, if you have a Lens setting of 43.0 mm, and you change the Aperture Width from 36 to 50, when you close the Render Scene dialog (or render), the camera Lens spinner has changed to 59.722, but the scene still looks the same in the viewport and the rendering. If you use one of the

preset formats rather than Custom, the aperture width is determined by the format, and this control is replaced by a text display.

Width and Height—Let you set the resolution of the output image by specifying the width and the height of the image, in pixels. With Custom format, you can set these two spinners independently. With any other format, the two spinners are locked to the specified aspect ratio, so adjusting one alters the other. The maximum width and height is 32,768 x 32,768 pixels.

Preset resolution buttons (320x240, 640x480, and so on)—Click one of these buttons to choose a preset resolution. You can customize these buttons: right-click a button to display the *Configure Preset dialog (page 3–32)*, which lets you change the resolution specified by the button.

Image Aspect—Lets you set the aspect ratio of the image. Changing this value changes the Height value to maintain the correct dimensions for the active resolution. When you use a standard format rather than Custom, you can't change the aspect ratio, and this control is replaced by a text display.

In 3ds Max, the Image Aspect value is always expressed as a multiplier value. In written descriptions of film and video, often aspect ratio is also described as a ratio. For example, 1.33333 (the default Custom aspect ratio) is often expressed as 4:3. This is the standard aspect ratio for broadcast video (both *NTSC (page 3–1074)* and *PAL (page 3–1082)*) when letterboxing is not used. (Letterboxing shows the full width of a wide-screen film format, framed by black regions above and below.)

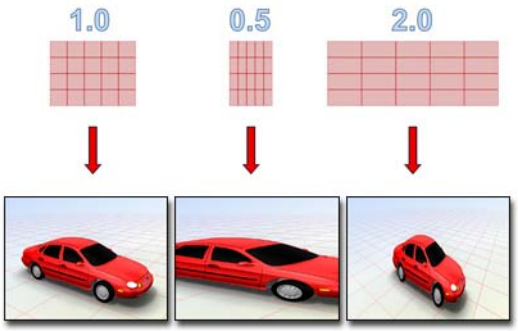
When using a custom output size, the lock button to the left of Image Aspect locks the aspect ratio. When it is on, the Image Aspect spinner is replaced by a label, and the Width and Height spinners are locked to each other; adjusting one alters the other to maintain the aspect-ratio value.

In addition, when the aspect ratio is locked, altering the Pixel Aspect value alters the Height value to maintain the aspect-ratio value.

Note: In viewports, the camera's cone changes to reflect the image aspect ratio you set in the Render Scene dialog. This change takes place when you exit the Render Scene dialog.

Pixel Aspect—Sets the aspect ratio of the pixels for display on another device. The image might look squashed on your display but will display correctly on the device with differently shaped pixels. If you use one of the standard formats rather than Custom, you can't change the pixel aspect ratio and this control is disabled.

The lock button to the left of Pixel Aspect locks the pixel-aspect ratio. When it is on, the Pixel Aspect spinner is replaced by a label, and you can't change the value. This button is available only with the Custom format.



Images with different pixel aspects appear stretched or squashed on a monitor with square pixels.

Note: For standard *NTSC (page 3–1074)*, the pixel aspect ratio is 0.9. If you are creating 16:9 (0.778) anamorphic images for NTSC, the pixel aspect ratio should be 1.184. (As in the previous discussion of Image Aspect, this assumes the image is not letterboxed.)

Options group

Atmospherics—Renders any applied atmospheric effects, such as volume fog, when turned on.

Effects—Renders any applied rendering effects, such as Blur, when turned on.

Displacement—Renders any applied displacement mapping.

Video Color Check—Checks for pixel colors that are beyond the safe *NTSC (page 3–1074)* or *PAL (page 3–1082)* threshold and flags them or modifies them to acceptable values.

By default, "unsafe" colors render as black pixels. You can change the color check display by using the *Rendering panel (page 3–863)* of the *Preference Settings dialog (page 3–859)*.

Render to Fields—Renders to video *fields (page 3–1032)* rather than frames when creating animations for video.

Render Hidden Geometry—Renders all geometric objects in the scene, even if they are hidden.

Area Lights/Shadows as Points—Renders all area lights or shadows as if they were emitted from point objects, speeding up rendering time.

Tip: This is useful for draft renderings, as point lights render much faster than area lights.

Note: Scenes with *radiosity (page 3–50)* are not affected by this toggle, as area lights do not have a significant effect on the performance of a radiosity solution.

Force 2-Sided—*2-Sided rendering (page 3–995)* renders both sides of all faces. Usually, you'll want to keep this option off to speed rendering time. You may want to turn it on if you need to render the inside as well as the outside of objects, or if you've imported complex geometry in which the face normals are not properly unified.

Super Black—*Super Black rendering (page 3–1112)* limits the darkness of rendered geometry for video compositing. Leave off unless you're sure you need it.

Advanced Lighting group

Use Advanced Lighting—When on, the software incorporates a *radiosity solution (page 3–50)* or *light tracing (page 3–43)* in the rendering.

Compute Advanced Lighting When Required—When on, the software computes radiosity when required on a per-frame basis.

Normally, when rendering a series of frames, the software calculates radiosity only for the first frame. If, in an animation, it might be necessary to recalculate the advanced lighting in subsequent frames, turn this option on. For example, a brightly painted door might open and affect the coloring of a nearby white wall, in which case the advanced lighting should be recalculated.

Render Output group

Save File—When on, the software saves the rendered image or animation to disk when you render. Save File is available only after you specify the output file using the Files button.

Files—Opens the *Render Output File dialog (page 3–8)*, which lets you specify the output file name, format, and location.

You can render to any of the still or animated *image file formats (page 3–657)* that are writeable.

If you render multiple frames to a still-image file format, the renderer renders individual frame files and appends sequence numbers to each file name. You can control this with the *File Number Base setting*.

Put Image File List(s) in Output Path(s)—Turn on to create an image sequence file, and save it in the same directory as the rendering. Default=off.

3ds Max creates one IMSQ file (or IFL file) per *render element (page 3–126)*. The files are created

when you click Render or Create now. They are generated before the actual rendering.

Image sequence files are created by the following kinds of rendering:

- The Render Scene dialog
- Batch rendering
- Command-line rendering
- MAXScript rendering
- ActiveShade rendering

They are *not* created by the following kinds of rendering:

- The Quick Render button
- Rendering to textures
- Video Post rendering
- Rendering a panorama
- **Create Now**—Click to create the image sequence file "by hand." You must first choose an output file for the rendering itself.
- **Autodesk ME Image Sequence File (.imsq)**—When chosen (the default), creates an *Image Sequence (IMSQ) file (page 3–669)*.
- **Legacy 3ds max Image File List (.ifl)**—When chosen, creates an *Image File List (IFL) file (page 3–666)* of the kind created by versions of 3ds Max prior to v8.

Use Device—Sends the rendered output to a device such as a video recorder. First click the Devices button to specify the device, for which an appropriate driver must already be installed.

Rendered Frame Window—Displays the rendered output in the *rendered frame window (page 3–5)*.

Net Render—Enables *network rendering (page 3–169)*. If this is turned on, when you render you'll see the *Network Job Assignment dialog (page 3–184)*.

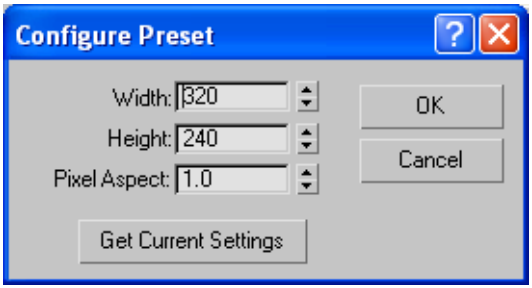
Skip Existing Images—When activated and Save File is on, the renderer will skip images in a sequence that have already been rendered to disk.

Configure Preset Dialog

Main menu > Render Scene > Render Scene Dialog > Common panel > Common Parameters rollout > Output Size group > Right-click a preset resolution button. > Configure Preset dialog

This dialog lets you change the preset resolution on a button in the Output Size group of the Common Parameters rollout.

Interface



Width—Sets the output width, in pixels.

Height—Sets the output height, in pixels.

Pixel Aspect—Sets the output pixel aspect ratio.

Get Current Settings—Gets the current Width, Height, and Pixel Aspect settings from the Output Size group, and assigns them to the spinners on this dialog.

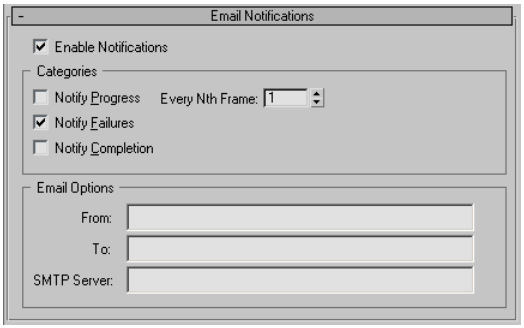
Email Notifications Rollout

Rendering menu > Render Scene dialog > Common panel > Email Notifications rollout

Main toolbar > Render Scene button > Render Scene dialog > Common panel > Email Notifications rollout

This rollout lets a rendering job send email notifications, as network rendering does. Such notifications can be useful when you launch a lengthy render, such as an animation, and don't care to spend all your time near the system doing the rendering.

Interface



Enable Notifications—When on, the renderer sends an email notification when certain events happen. Default=off.

Categories group

Notify Progress—Sends emails to indicate rendering progress. An email is sent every time the number of frames specified in Every Nth Frame has completed rendering. Default=off.

- **Every Nth Frame**—The number of frames used by Notify Progress. Default=1.

  Tip: If you turn on Notify Progress, almost certainly you want this value to be greater than the default!

Notify Failures—Sends an email notification only if something occurs to prevent the completion of a rendering. Default=on.

Notify Completion—Sends an email notification when a rendering job is complete. Default=off.

Email Options group

From—Enter the email address of the person who initiates the rendering job.

To—Enter the email address of the person who needs to know the rendering status.

SMTP Server—Enter the numeric IP address of the system you use as a mail server.

Scripts Rollout (Render Scene Dialog)

Rendering menu > Render Scene dialog > Common panel > Scripts rollout

Main toolbar > Render Scene button > Render Scene dialog > Common panel > Scripts rollout

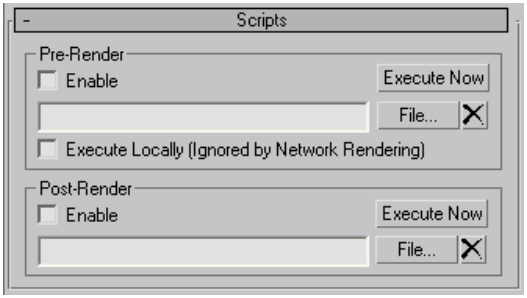
The scripts rollout lets you specify scripts to run either prior to rendering, or after rendering. The script to execute can be:

- A MAXScript file (MS)
- A macro script (MCR)
- A batch file (BAT)
- An executable file (EXE)

If relevant to its format, the script can have command-line arguments.

The pre-render script is executed before rendering (but *after* any other MAXScript scripts that are registered using the #preRender callback mechanism). The post-render script is executed after rendering has completed. You can also use the "Execute Now" buttons to run the scripts "by hand."

Interface



Pre-Render group

Specifies a script to run before you render.

Enable—When on, the script is enabled.

Execute Now—Click to execute the script "by hand."

File name field—When a script is selected, this field shows its path and name. You can edit this field.

File—Click to open a file dialog and choose the pre-render script to run.

Delete File—Click to remove the script.

Execute Locally (Ignored by Network Rendering)—When on, the script must run locally. If you use network rendering, the script is ignored. Default=off.

Post-Render group

Specifies a script to run after you render.

Enable—When on, the script is enabled.

Execute Now—Click to execute the script "by hand."

File name field—When a script is selected, this field shows its path and name. You can edit this field.

File—Click to open a file dialog and choose the post-render script to run.

Delete File—Click to remove the script.

Assign Renderer Rollout

Main toolbar > Render Scene button > Render Scene dialog > Common panel > Assign Renderer rollout

Rendering menu > Render > Render Scene dialog > Common panel > Assign Renderer rollout

The Assign Renderer rollout displays which renderers are assigned to the production and ActiveShade categories, as well as the sample slots in the Material Editor.

The Quick Render flyout on the toolbar also chooses which renderer to use:

- The Quick Render (Production) button uses the production renderer.
- The Quick Render (ActiveShade) button uses the ActiveShade renderer.

These are the renderers that ship with 3ds Max:

Default Scanline Renderer Rollout (page 3–37)

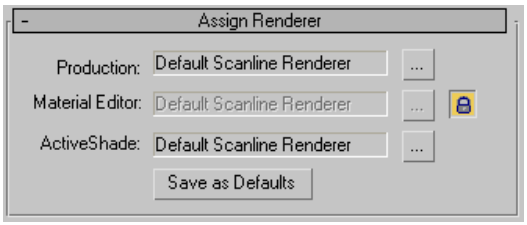
mental ray Renderer (page 3–77) (not available for ActiveShade)

VUE File Renderer (page 3–126) (not available for ActiveShade)

Additional renderers might be available if you've installed them as plug-ins.

Note: In versions prior to v4, you selected the production and draft renderers in the Rendering tab of the Preferences dialog.

Interface



For each rendering category, the rollout shows the name of the renderer currently assigned, and a button that lets you change the assignment.

Choose Renderer ("...")—Click the button with the ellipsis to change the renderer assignment. The button displays a *Choose Renderer dialog (page 3–35)*.

- **Production**—Chooses the renderer used to render graphic output.
- **Material Editor**—Chooses the renderer used to render *sample slots (page 2–1264)* in the Material Editor.

  By default, the sample slot renderer is locked to be the same as the production renderer. You can turn off the lock button to assign a different renderer for sample slots.
- **ActiveShade**—Chooses the *ActiveShade (page 3–17)* renderer used to preview the effects of lighting and material changes in the scene.

  The only ActiveShade renderer that ships with 3ds Max is the default scanline renderer.

Save as Defaults—Click to save the current renderer assignments as defaults, so they will be active the next time you restart 3ds Max.

Choose Renderer Dialog

Main toolbar > Render Scene button > Render Scene dialog > Common panel > Assign Renderer rollout > Click a Choose Renderer ("...") button.

Rendering menu > Render > Render Scene dialog > Common panel > Assign Renderer rollout > Click a Choose Renderer ("...") button.

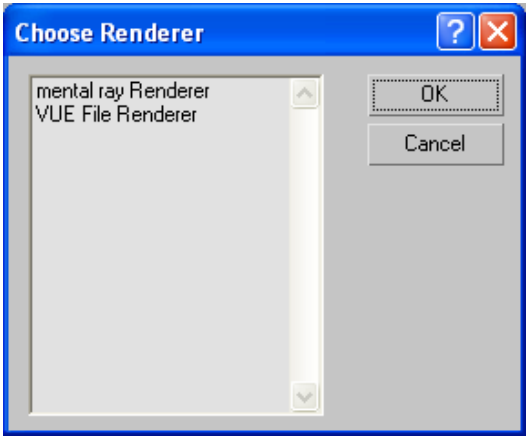
This dialog appears when you click one of the Choose Renderer ("...") buttons on the *Assign Renderer rollout (page 3–34)*.

Procedure

To change the renderer assigned to the category you picked, do one of the following:

- Click to highlight another renderer's name in the list, and then click OK.
- Double-click another renderer's name in the list

Interface



The scrollable list shows the names of renderers that you can assign, *exclusive* of the renderer that is currently assigned to the rendering category you are reassigning.

Renderers

Renderer Panel (Render Scene Dialog)

Rendering menu > Render > Render Scene dialog > Render panel

Main toolbar > Render Scene > Render Scene dialog > Renderer panel

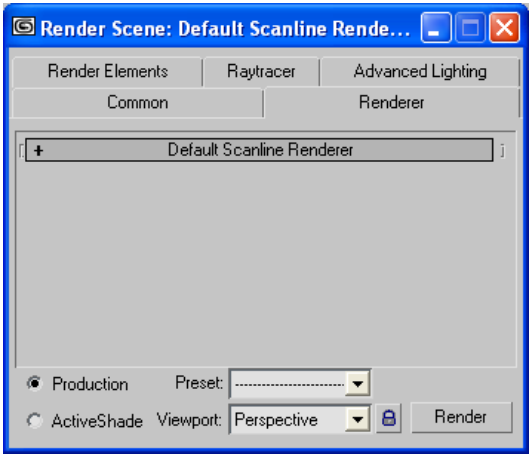
The Render Scene dialog's Renderer panel contains the main controls for the active renderer.

Depending on which renderer is active, additional panels can become available.

Tip: The *default scanline renderer (page 3–37)* and the *mental ray renderer (page 3–77)* each have their own capabilities. In general, for each scene, you will decide which renderer you want to use. It is a good idea to design materials with a particular renderer in mind. The *mental ray Connection rollout (page 2–1305)* lets you add features unique to the mental ray renderer to basic 3ds Max materials.

Interface

When the Default Scanline Renderer Is Active



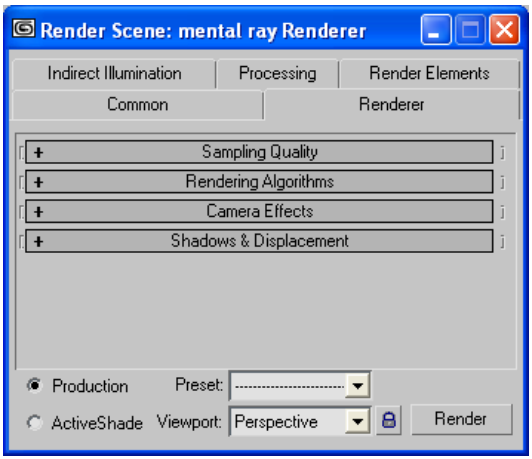
The Renderer panel contains a single rollout:

Default Scanline Renderer Rollout (page 3–37)

Additional panels are:

- *Advanced Lighting Panel (page 3–43)*
- *Raytracer Global Parameters Rollout (page 2–1369)*
- *Render Elements panel (page 3–126)*

When the mental ray Renderer Is Active



The renderer panel contains these rollouts:

Sampling Quality Rollout (mental ray Renderer) (page 3–97)

Rendering Algorithms Rollout (mental ray Renderer) (page 3–113)

Camera Effects Rollout (mental ray Renderer) (page 3–100)

Shadows and Displacement Rollout (mental ray Renderer) (page 3–111)

Additional panels are:

- Indirect Illumination panel

  Caustics and Global Illumination Rollout (mental ray Renderer) (page 3–104)

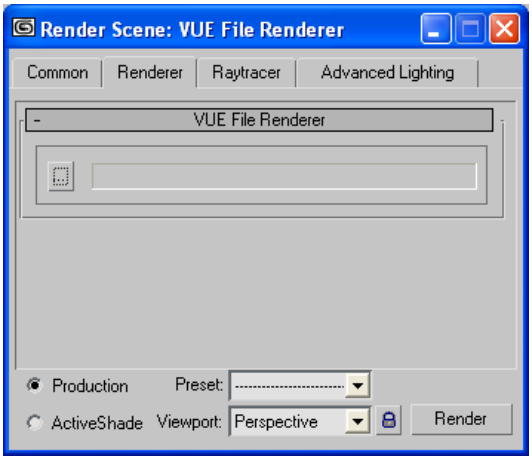
  Final Gather Rollout (mental ray Renderer) (page 3–109)
- Processing panel

  Translator Options Rollout (mental ray Renderer) (page 3–115)

  Diagnostics Rollout (mental ray Renderer) (page 3–120)

  Distributed Bucket Rendering Rollout (mental ray Renderer) (page 3–121)

When the VUE File Renderer Is Active



The Renderer panel contains a single rollout:

VUE File Renderer (page 3–126)

Default Scanline Renderer

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active draft or production renderer. > Renderer panel > Default Scanline Renderer rollout

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active draft or production renderer. > Renderer panel > Default Scanline Renderer rollout

This rollout sets parameters for the default *scanline renderer (page 3–1100)*.

Note: If your scene includes animated bitmaps, including materials, projector lights, environments, and so on, the animation file is reloaded once per frame. If your scene uses multiple animations, or if the animations are themselves large files, this can slow down rendering performance.

Environment Alpha Toggle and Filtering

To control whether or not the renderer uses the environment map's alpha channel in creating the alpha for the rendered image, choose Customize > Preferences > *Rendering (page 3–863)*, and then turn on Use Environment Alpha in the Background group. If Use Environment Alpha is off (the default), the background receives an alpha value of 0 (completely transparent). If Use Environment Alpha is on, the alpha of the resulting image is a combination of the scene and the background image's alpha channel. Also, when you render to *TGA files (page 3–683)* with *pre-multiplied alpha (page 3–1091)* turned off, turning on Use Environment Alpha prevents incorrect results.

You can also control whether or not a background image is affected by the renderer's antialiasing filter. Choose Customize > Preferences > Rendering, and then turn on Filter Background in the Background group. Default=off.

Tip: If you plan to composite 3ds Max objects in another program such as Combustion or Photoshop, render the objects against a black background. Otherwise, a fringe of environment or background color can appear around the 3ds Max objects.

Plate Match Filtering

This section describes the Plate Match/MAX R2 antialiasing filter (see *Antialiasing group (page 3–39)* for descriptions of other filtering options).

In versions of 3ds Max prior to **R2.5,** antialiasing affected only geometric edges, with the filtering of bitmaps being controlled in the Bitmap Map parameters (pyramidal, summed area, or no filtering). Current antialiasing filters affect every aspect of the object, filtering textures along with geometric edges.

While the method used in **R2.5** and subsequent versions provides superior results, this method also produces inconsistencies when rendering objects that are supposed to match the environment background, because the antialiasing filters do not affect the background by default (FilterBackground=0 in the [Renderer] section of the *3dsmax.ini* file or Customize menu > Preferences > Rendering tab > Background group > Filter Background). In order to correctly match an object's map to an unfiltered background image, you need to use the Plate Match/MAX R2 filter so the texture is not affected by the antialiasing.

There are three ways you can render objects to blend seamlessly into a background environment:

- Assign a *matte/shadow material (page 2–1393)*.
- Assign a 100% self-illuminated diffuse texture to an object using *Camera Mapping (page 1–547)*.
- Assign a 100% self-illuminated diffuse texture using Environment/Screen projection (see *Coordinates Rollout (2D) (page 2–1434)*).

  Use Plate Match/MAX R2 antialiasing when you need to match foreground objects with an unfiltered background, or when you need to match the antialiasing qualities of the 3ds Max 2 renderer.

Procedures

To set up an object for motion blurring:

1. Select the object to blur.
2. Right-click the object, and then choose Properties from the quad menu.

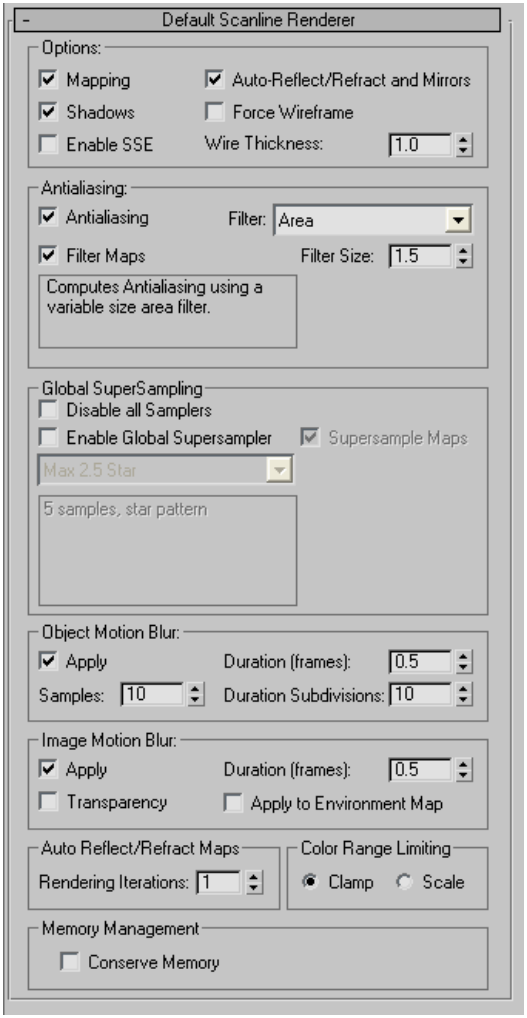
   The Object Properties dialog is displayed.
3. In the Motion Blur group, choose either Object or Image.
4. If you chose Image, you can adjust the Multiplier spinner. This increases or decreases the length of the blurred object's streak.
5. Click OK.

To add motion blur when you render the animation:

1. Click Render Scene.

   The Render Scene dialog appears.
2. On the Default Scanline Renderer rollout, turn on Apply in the Object Motion Blur group or the Image Motion Blur group.
   - For Object Motion Blur, set Duration, Duration Subdivisions, and Samples.
   - Increase Duration to exaggerate the motion blur effect. Decrease it to make the blur more subtle.
   - If Samples is less than Duration Subdivisions, the slices used are selected randomly, giving a grainy look to the blur. If Samples equals Duration Subdivisions, the blur is smooth. The smoothest blur results from larger, equal values of these two parameters, but be aware that this can slow down rendering by a factor of three to four.
   - For Image Motion Blur, adjust Duration and Apply to Environment Map.
   - Increase Duration to exaggerate the streaking. Decrease it to make it more subtle.
3. Turn on Apply to Environment map to have camera orbit movement blur the environment map. This works only with Spherical, Cylindrical, or Shrink-Wrapped environments.
4. Set other rendering parameters, and then click Render.

Interface



Options group

Mapping—Turn off to ignore all mapping information to speed up rendering for tests. Affects automatic reflections and environment maps as well as material mapping. Default=on.

Auto Reflect/Refract and Mirrors—Ignores automatic reflection/refraction maps to speed up rendering for tests.

Shadows—When off, cast shadows aren't rendered. This can speed up rendering for tests. Default=on.

Force Wireframe—Set to render all surfaces in the scene as wireframes. You can choose the thickness of the wireframe in pixels. Default=1.

Enable SSE—When on, rendering uses Streaming SIMD Extensions (SSE). (SIMD stands for Single Instruction, Multiple Data.) Depending on the CPU (or CPUs) of your system, SSE can improve render time. Default=off.

Antialiasing group

Antialiasing—*Antialiasing (page 3–1001)* smoothes the jagged edges that occur along the edges of diagonal and curves lines when rendering. Turn off only when you are rendering test images and greater speed is more important than image quality.

Turning off Antialiasing disables the Force Wireframe setting. Geometry renders according to the material assigned it even if Force Wireframe is turned on.

Turning off Antialiasing also disables *render elements (page 3–126)*. If you need to render elements, be sure to leave Antialiasing on.

Filter drop-down list—Lets you select a high-quality table-based filter to apply to your rendering. Filters are the last step in antialiasing. They work at the sub-pixel level and allow you to sharpen or soften your final output, depending on which filter you select. Below the controls in this group, 3ds Max displays a box with a brief description of the filter and how it is applied to your image.

Tip: Render Region and Render Selected give reliable results only when rendered with the Area filter.

The following table describes the available antialiasing filters.

Name	Description
Area	Computes antialiasing using a variable-size area filter. This is the original 3ds Max filter.
Blackman	A 25-pixel filter that is sharp, but without edge enhancement.
Blend	A blend between sharp area and Gaussian soften filters.
Catmull-Rom	A 25-pixel reconstruction filter with a slight edge-enhancement effect.
Cook Variable	A general-purpose filter. Values of 1 to 2.5 are sharp; higher values blur the image.
Cubic	A 25-pixel blurring filter based on a cubic spline.
Mitchell-Netravali	Two-parameter filter; a trade-off of blurring, ringing, and anisotropy. If the ringing value is set higher than .5 it will impact the alpha channel of the image.
Plate Match/MAX R2	Uses the 3ds Max **2** method (no map filtering) to match camera and screen maps or matte/shadow elements to an unfiltered background image. See the section "Plate Match Filtering," above, for a discussion of how and why you might want to use this filter.
Quadratic	A 9-pixel blurring filter based on a quadratic spline.
Sharp Quadratic	A sharp nine-pixel reconstruction filter from Nelson Max.
Soften	An adjustable Gaussian softening filter for mild blurring.
Video	A 25-pixel blurring filter optimized for NTSC and PAL video applications.

Filter Maps—Turns on or off the filtering of mapped materials. Default=on.

Tip: Leave Filter Maps turned on unless you are making test renderings and want to speed up rendering time and save memory.

Filter Size—Allows you to increase or decrease the amount of blur applied to an image. This option is available only when a Soften filter has been selected from the drop-down list. The spinner is unavailable when any other filter has been selected.

Setting the Filter Size to 1.0 effectively disables the filter.

Note: Some filters show additional, filter-specific parameters below the Filter Size control.

When you *render separate elements (page 3–126)*, you can explicitly enable or disable the active filter, on a per-element basis.

Global SuperSampling group

Disable all Samplers—Disables all *supersampling (page 3–1112)*. Default=off

Note: SuperSampling settings are ignored by the *mental ray Renderer (page 3–77)*, which has its own sampling method.

Enable Global Supersampler—When on, applies the same supersampler to all materials. When turned off, materials set to use the global settings are controlled by the settings appearing in rendering dialog. All other controls in the Global SuperSampling group of the rendering dialog will become disabled, except for the Disable All Samplers. Default=on.

Supersample Maps—Turns on or off supersampling for mapped materials. Default=on.

Tip: Leave Supersample Maps on unless you are making test renderings and want to speed up rendering time and save memory.

Sampler drop-down list—Lets you choose which supersampling method to apply. Default=Max 2.5 Star.

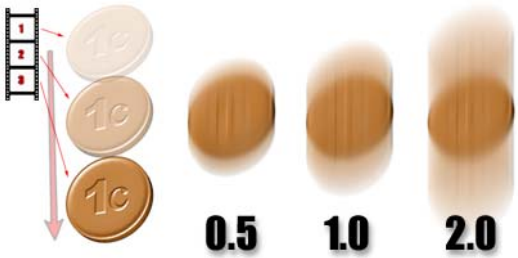
The options for a supersampling method are the same as those that appear on the *SuperSampling rollout (page 2–1302)* in the Material Editor. Some methods offer expanded options that let you better control the quality of the supersampling and the number of samples taken during rendering.

Object Motion Blur group

You determine which objects have *object motion blur (page 3–1075)* applied to them by setting Object in the Motion Blur group of the Properties dialog for that object. Object motion blur blurs the object by creating multiple "time-slice" images of the object for each frame. It takes camera movement into account. Object motion blur is applied during the scanline rendering process.

Apply—Turns object motion blur on or off globally for the entire scene. Any objects that have their Object Motion Blur property set are rendered with motion blur.

Duration—Determines how long the "virtual shutter" is open. When this is set to 1.0, the virtual shutter is open for the entire duration between one frame and the next. Longer values produce more exaggerated effects.



The effect of changing duration.

Samples—Determines how many Duration Subdivision copies are sampled. The maximum setting is 32.

When Samples is less than Duration, random sampling within the duration occurs (which is why there might be a slight granular look to the motion blur). For example, if Duration Subdivision=12 and Samples=8, there are eight random samples out of 12 possible copies within each frame.

When Samples=Duration, there is no randomness (and if both numbers are at their maximum value (32), you get a dense result (which costs between 3–4 times the normal rendering time for that specific object).

If you want to obtain a smooth blur effect, use the maximum settings of 32/32. If you want to cut down rendering time, values of 12/12 will give you much smoother results than 16/12.

Because sampling happens within the duration, the Duration value always has to be less than or equal to Samples.

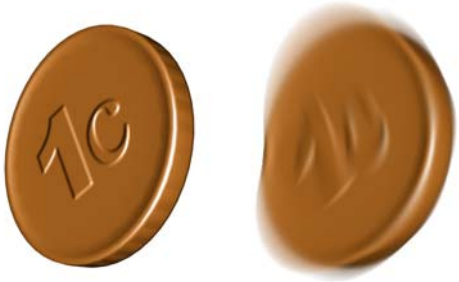
Duration Subdivisions—Determines how many copies of each object are rendered within the Duration.

Left: Same value for Samples and Subdivisions.
Right: Samples value is less than Subdivisions.

Image Motion Blur group

You determine which objects have *image motion blur (page 3–1049)* applied to them by setting Image in the Motion Blur group of the Properties

dialog for that object. Image motion blur blurs the object by creating a smearing effect rather than multiple images. It takes camera movement into account. Image motion blur is applied after scanline rendering is complete.



The coin on the right has Image Motion Blur applied

You can't put image motion blur on objects that change their topology.

Tip: When blurred objects overlap, sometimes blurring doesn't work correctly and there are gaps in the rendering. Because image motion blur is applied *after* rendering, it can't account for object overlap. To fix this problem, render each blurred object separately, to a different layer, and then composite the two layers using the Alpha Compositor in Video Post.

Note: Image motion blur doesn't work for NURBS objects that are animated so their tessellation (*surface approximation (page 1–1241)*) changes over time. This happens when sub-objects are animated independently of the top-level *NURBS model (page 3–1074)*. Nor does image motion blur work on any of the following:

- Anything with an Optimize.
- Any primitive with animated segments.
- MeshSmooth of any type with a "Smoothness" value (under iterations) other than 1.
- MeshSmooth on polygons with Keep Faces Convex on.
- Anything with Displacement Material.

In general, if you have objects with changing topology, use scene or object motion blur rather than image motion blur.

Apply—Turns image motion blur on or off globally for the entire scene. Any objects that have their Image Motion Blur property set are rendered with motion blur.

Duration—Specifies how long the "virtual shutter" is open. When this is set to 1.0, the virtual shutter is open for the entire duration between one frame and the next. The higher the value, the greater the motion blur effect.

Apply to Environment Map—When set, image motion blur is applied to the environment map as well as to the objects in the scene. The effect is noticeable when the camera orbits.

The environment map should use Environment mapping: Spherical, Cylindrical, or Shrink-Wrap. The image motion blur effect doesn't work with Screen-mapped environments.

Transparency—When on, image motion blur works correctly with transparent objects that overlap. Applying image motion blur to transparent objects can increase rendering time. Default=off.

Auto Reflect/Refract Maps group

Rendering Iterations—Sets the number of inter-object reflections in non-flat automatic reflection maps. Although increasing this value can sometimes enhance image quality, it also increases rendering time for reflections.

Color Range Limiting group

Color Range Limiting allows you handle over-brightness by toggling between either Clamping or Scaling color components (RGB)

that are out of range (0 to 1). Typically, specular highlights can cause color components to rise above range while using filters with negative lobes can cause color components to be below range. You choose one of two options to control how the renderer handles out of range color components:

- **Clamp**—To keep all color components in range Clamp will change any color with a value greater than 1 down to 1 while any color below 0 will be clamped at 0. Any value between 0 and 1 will not change. Very bright colors tend to render as white when using Clamp since hue information can be lost in the process.
- **Scale**—To keep all color components in range Scale will preserve the hue of very bright colors by scaling all three color components so that the maximum component has a value of 1. Be aware that this will change the look of highlights.

Memory Management group

Conserve Memory—When on, rendering uses less memory at a slight cost of memory time. Memory saved is in the range of 15 to 25 percent. The time cost is about four percent. Default=off.

Advanced Lighting with the Scanline Renderer

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout

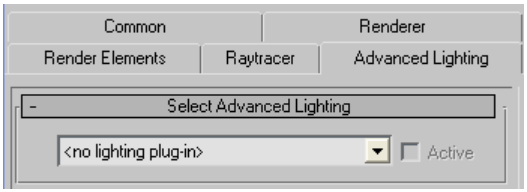
The Advanced Lighting rollout lets you select one of the advanced lighting options. Two are provided with the *default scanline renderer (page 3–37)*:

- *Light Tracer (page 3–43)*
- *Radiosity (page 3–50)*

The Light Tracer provides soft-edged shadows and color bleeding for brightly-lit scenes such as outdoor scenes. Radiosity provides physically accurate modeling of the light in a scene.

Interface

Until you choose an advanced lighting option, the Advanced Lighting panel displays a single rollout, Select Advanced Lighting.



List of plug-ins—Choose an advanced lighting option from this drop-down list. Default=No advanced lighting chosen.

Active—When an advanced lighting option is chosen, use Active to toggle whether the advanced lighting is used when you render your scene. Default=On.

Light Tracer

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Light Tracer from the drop-down list.

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Light Tracer from the drop-down list.

Character lit by skylight and one spotlight, and rendered with light tracing.

Model by Sonny Sy — orange_3D@yahoo.com — www.geocities.com/orange_3D

The Light Tracer provides soft-edged shadows and color bleeding for brightly-lit scenes such as outdoor scenes. Unlike *radiosity (page 3–50)*, the Light Tracer does not attempt to create a physically accurate model, and can be easier to set up.

Outdoor scene lit by skylight and rendered with light tracing.

Tip: Indoor scenes can use light tracing, but radiosity is usually the better choice for indoors.

Previewing the Effect of Light Tracing

- To get a quick preview of the effect the Light Tracer will have, lower the values of Rays/Sample and Filter Size.

  The result will be a very grainy version of the full effect.

- Another way to get a quick preview is to make sure Adaptive Undersampling is turned on. In this group, set Initial Sample Spacing equal to Subdivide Down To. In the General Settings group, lower the value of Rays/Sample, and set Bounces equal to 0.0. This gives a rather blotchy but fast preview of the rendering. Increase Rays/Sample and Filter Size to improve the image quality.

  In general, you can get good, fairly quick results with a lower Filter Size as long as Rays/Sample has a high value and Adaptive Undersampling is turned on.

Other Tips for Using the Light Tracer

- To improve rendering time, use the *Object Properties dialog (page 1–111)* to disable light tracing (or radiosity solving) for those objects that don't have a great impact on the final effect.

  Tip: You can also use the *Advanced Lighting Override material (page 2–1410)* to alter the effect of light tracing on particular objects. For example, if you encounter visual artefacts with a bump-mapped material, convert it to an Advanced Lighting Override material and reduce the Indirect Light Bump Scale value.

- Experiment with the adaptive undersampling settings, which restrict light tracing to the areas of your scene that need it.
- To increase the amount of color bleeding, increase the value of both Bounces and Color Bleed. Color bleeding is usually a subtle effect.
- If there are glass objects in the scene, increase Bounces to be greater than zero. (Be aware that this will increase rendering time.)
- If the main scene lighting is a *Skylight (page 2–1149)*, and you need specular highlights in your scene, add a second light: for example, a Directional light that parallels the Skylight. Make sure Shadows are turned on for this light, and on the light's *Advanced Effects rollout (page 2–1185)*, turn off Diffuse.

  If the objects with highlights don't greatly affect shadows or color bleeding, you can leave Diffuse on for this light, and use Object Properties to exclude the objects from light tracing.

- Set Key filters are not taken into account when you animate Light Tracer settings. If you wish to use Set Key to create keys for animating the Light Tracer parameters, SHIFT+right-click the spinner to create those keys.

  Important: If you use a texture map with the Skylight, you should use an image-processing program to *thoroughly* blur the map before using it. This helps reduce variance and the number of rays needed for light tracing. You can blur the map beyond recognition, and it will still look correct when used for regathering.

Procedures

To set up a scene for the Light Tracer:

This is a typical use case.

1. Create the geometry for an outdoor scene.
2. Add a *Skylight (page 2–1149)* to illuminate it.

   One or more spotlights can also work well. If you use the physically based IES Sun or IES Sky lights, using an *exposure control (page 3–289)* is essential.

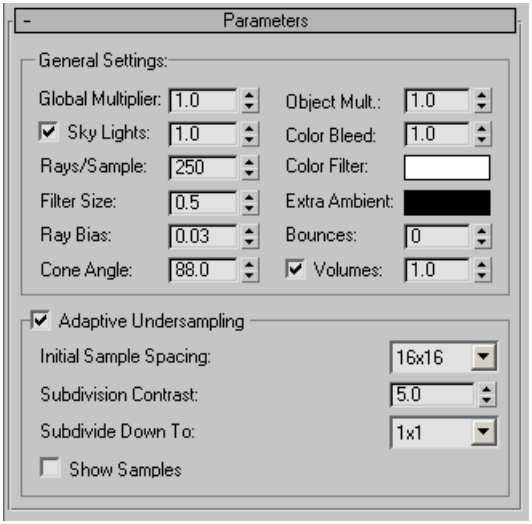
3. Choose Rendering > Advanced Lighting. On the Select Advanced Lighting rollout, choose Light Tracer from the drop-down list.

   Active should turn on, and the Parameters rollout for the Light Tracer should appear.

4. Adjust the Light Tracer parameters, right-click the viewport you want to render to make it active, and then click Render Scene.
5. Adjust your rendering settings, and then click Render.

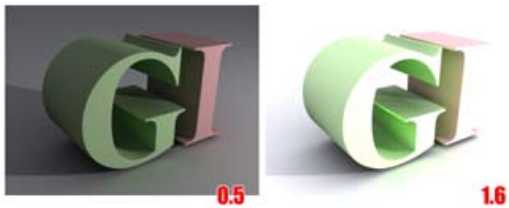
   The scene renders with soft-edged shadows and color bleeding.

Interface



General Settings group

Global Multiplier—Controls the overall lighting level. Default=1.0.



Global multiplier settings

Left: Decreasing the global multiplier

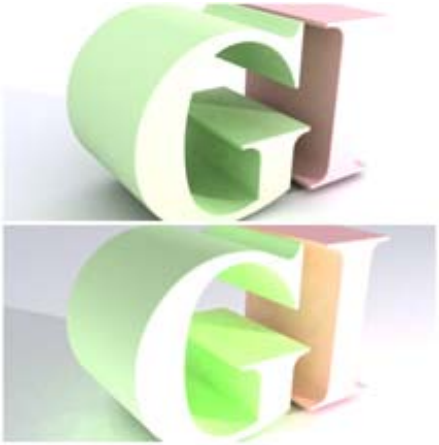
Right: Increasing the global multiplier

Object Multiplier—Controls the level of light reflected by objects in the scene. Default=1.0.

Note: This setting has little effect unless Bounces is greater than or equal to 2.

Sky Lights toggle—When on, enables regathering from the sky lights in the scene. (A scene can contain more than one sky light.) Default=on.

Sky Lights amount—Scales the intensity of sky light. Default=1.0.

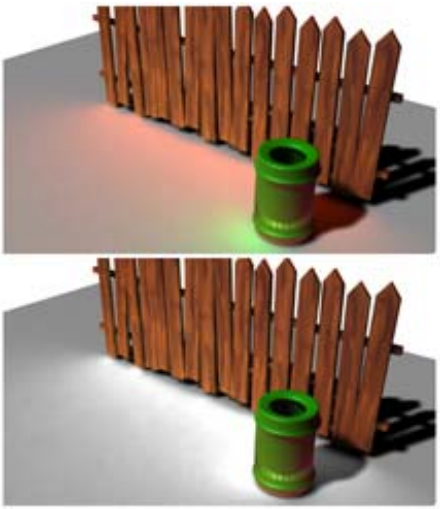


Above: Increasing the sky lights value

Below: Increasing the object multiplier

Color Bleed—Controls the strength of color bleeding. Color bleeding results when light is interreflected among scene objects. Default=1.0.

Note: This setting has little effect unless Bounces is greater than or equal to 2.



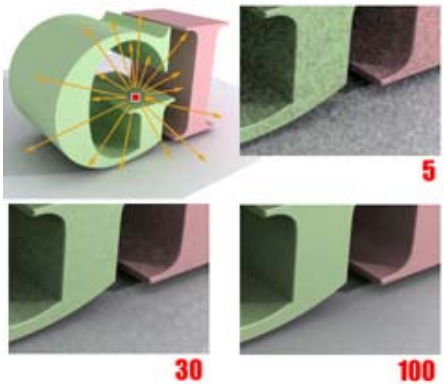
Above: Excessive color bleeding

Below: Color bleeding eliminated by setting color bleed to zero

Rays/Sample—The number of rays cast per sample (or pixel). Increasing this value increases the

smoothness of the effect, at a cost of render time. Decreasing this value results in a grainier effect, but renders more quickly. Default=250.

Tip: To get a "first draft" preview of the effect of light tracing, reduce the value of Rays/Sample and the Filter Size.

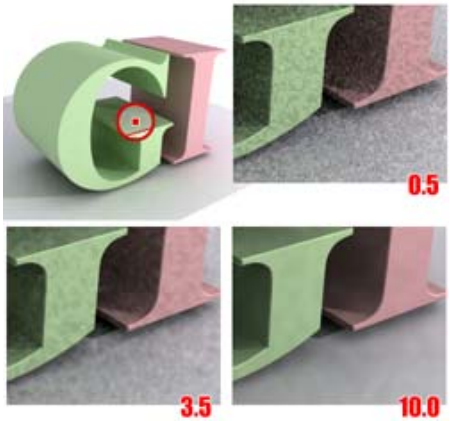


Changing the number of rays per sample.
The higher the value, the less grain.

Color Filter—Filters all light falling on objects. Set to a color other than white to tint the overall effect. Default=white.

Filter Size—The size, in pixels, of the filter used to reduce noise in the effect. Default=0.5.

Tip: Filter Size is especially useful when Adaptive Undersampling is turned off, and Rays/Sample has a low value.



Changing the filter size.
Increasing the filter size reduces noise in the rendering.

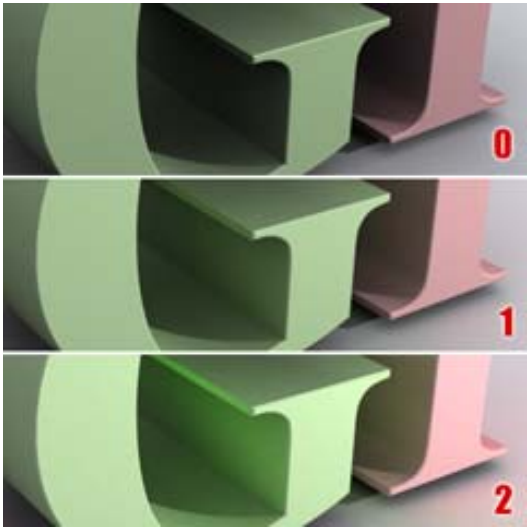
Extra Ambient—When set to a color other than black, adds that color as extra ambient light on objects. Default=black.

Ray Bias—Ray Bias, like *Ray-Trace Bias for shadows (page 3–1094)*, adjusts the positioning of the bounced light effects. Use it to correct rendering artifacts, such as the banding that can occur when an object casts shadows on itself. Default=0.03.

Bounces—The number of light-ray bounces that are traced. Increasing this value increases the amount of color bleeding. Lower values give faster results with less accuracy, and typically produce darker images. Higher values allow more light to flow through the scene, resulting in brighter, more accurate images at a cost of rendering time. Default=0.

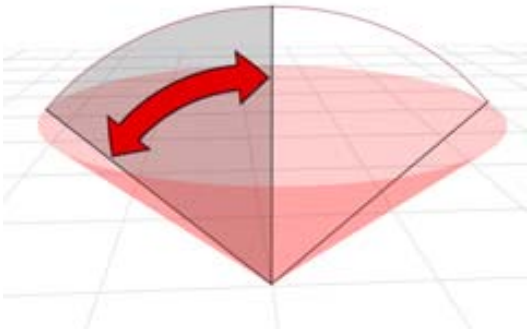
When Bounces equals 0, the Light Tracer disregards volumetric lighting.

Tip: If your scene has transparent objects such as glass, increase Bounces to be greater than zero. Be aware that this increases rendering time.



Increasing the number of bounces increases the level of global illumination and the amount of color bleeding in the rendering.

Cone Angle—Controls the angle used for regathering. Reducing this value can result in slightly higher contrast, especially in regions where lots of small geometry casts shadows on a larger structure. Range=33.0 to 90.0. Default=88.0.

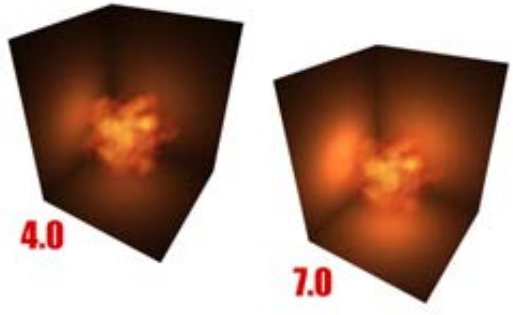


All rays initially cast are limited by the cone angle

Volumes toggle—When on the Light Tracer regathers light from volumetric lighting effects such as *Volume Light (page 3–284)* and *Volume Fog (page 3–280)*. Default=on.

For volumetric lighting to work with light tracing, Bounces must be greater than 0.

Volumes amount—Multiplies the amount of light regathered from volumetric lighting effects. Increase to increase their impact on the rendered scene, decrease to decrease their effect. Default=1.0.

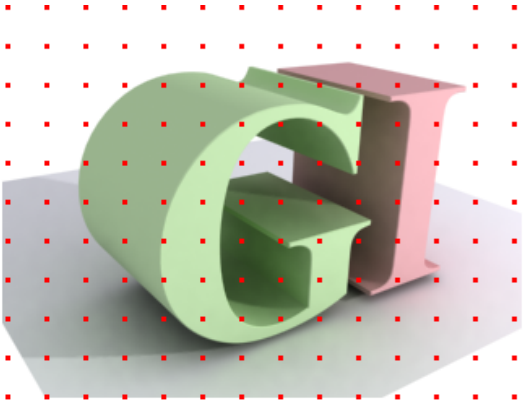


Increasing the volumes amount increases the effect of volumetric lighting in the rendering.

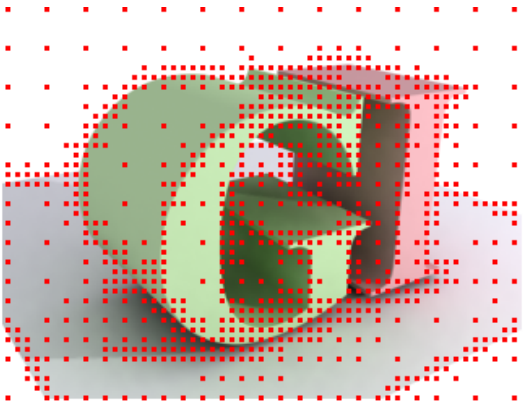
Adaptive Undersampling group

These controls can help you speed up rendering time. They reduce the number of light samples taken. The ideal settings for undersampling vary greatly from scene to scene.

Undersampling initially takes samples from a grid superimposed on the pixels of the scene. Where there is enough contrast between samples, it subdivides that region and takes further samples, down to the minimum area specified by Subdivide Down To. Lighting for areas not directly sampled is interpolated.



Initial sampling uses a regular grid.

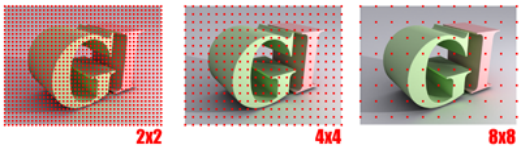


Adaptive undersampling concentrates on areas of transition.

Tip: If you use adaptive undersampling, try adjusting the Subdivision Contrast value to obtain the best results. The effect of this control depends on the value of Rays/Sample.

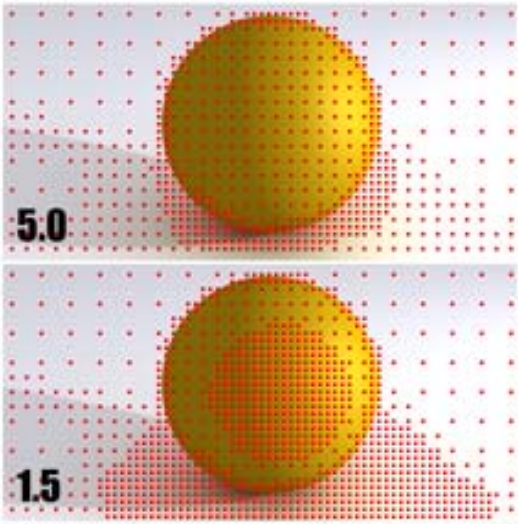
Adaptive Undersampling—When on, the Light Tracer uses undersampling. When off, it samples every pixel. Turning off undersampling can increase the detail of the final rendering, but at a cost of rendering time. Default=on.

Initial Sample Spacing—The grid spacing for the initial samples of the image. This is measured in pixels. Default=16x16.



Initial sample spacing values

Subdivision Contrast—The contrast threshold that determines when a region should be further subdivided. Increasing this value causes less subdividing to occur. Too small a value can cause unnecessary subdividing. Default=5.0.



Decreasing the subdivision contrast threshold can reduce noise in soft shadows and bounced lighting.

Subdivide Down To—The minimum spacing for a subdivision. Increasing this value can improve render time at a cost of accuracy. Default=1x1.

Depending on the scene geometry, grids larger than 1x1 might still be subdivided below this specified threshold.

Show Samples—When on, sample locations render as red dots. This shows where the most sampling has taken place, which can help you choose the optimal settings for undersampling. Default=off.

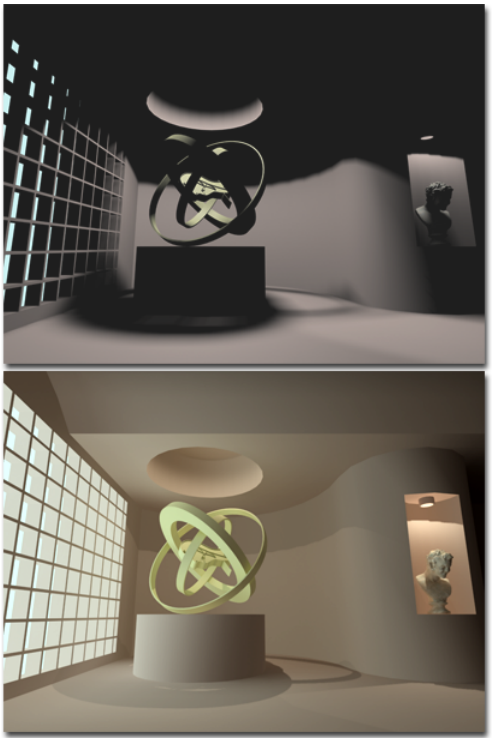
Radiosity

Modeling Global Illumination with Radiosity

Radiosity is rendering technology that realistically simulates the way in which light interacts in an environment.

This topic provides you with a conceptual overview of what radiosity is and how this global illumination technique relates to other rendering techniques available in 3ds Max. This information will help you decide which technique is most suitable for the visualization task you want to perform. By more accurately simulating the lighting in your scene, radiosity offers you significant benefits over standard lights:

- Improved Image Quality: The radiosity technology of 3ds Max produces more accurate *photometric (page 3–1087)* simulations of the lighting in your scenes. Effects such as indirect light, soft shadows, and color bleeding between surfaces produce images of natural realism that are not attainable with standard scanline rendering. These images give you a better, more predictable representation of what your designs will look like under specific lighting conditions.
- More Intuitive Lighting: In conjunction with radiosity techniques, 3ds Max also provides a real-world lighting interface. Instead of specifying lighting intensity with arbitrary values, light intensity is specified using photometric units (lumens, candelas, and so on). In addition, the characteristics of real-world lighting fixtures can be defined using industry-standard Luminous Intensity Distribution files (such as *IES (page 2–1172)*, *CIBSE (page 3–1015)*, and *LTLI (page 3–1058)*), which are obtainable from most lighting manufacturers. By being able to work with a real-world lighting interface, you can intuitively set up the lighting in your scenes. You can focus more on your design exploration than on the computer graphic techniques required to visualize them accurately.



Top: A scene rendered without radiosity.

Bottom: The same scene rendered with radiosity.

Computer Graphics Rendering

The 3D models created in 3ds Max contain geometric data defined in relationship to a 3D Cartesian coordinate system, referred to as *world space (page 3–1130)*. The model also contains other information about the material of each of the objects and the lighting in the scene. The image on a computer monitor is made up of many illuminated dots, called *pixels (page 3–1089)*. The task in creating a computer graphics image of a geometric model is to determine the color for

each pixel based on the model information and a specific viewpoint (camera).

The color of any specific point on a surface in a model is a function of the physical material properties of that surface and the light that illuminates it. Two general shading algorithms: *local illumination* and *global illumination* are used to describe how surfaces reflect and transmit light.

Local Illumination

Local illumination algorithms describe only how individual surfaces reflect or transmit light. Given a description of light arriving at a surface, these mathematical algorithms, called *shaders* in 3ds Max, predict the intensity, color, and distribution of the light leaving that surface. In conjunction with a material description, different shaders will determine, for example, if a surface will appear like plastic or metal or if it will appear smooth or rough. 3ds Max provides a robust interface for defining a wide array of different surface materials.

After defining how an individual surface interacts with light at the local level, the next task is to determine where the light arriving at the surface originates. With the standard *scanline rendering system (page 3–1100)* of 3ds Max, only the light coming directly from the light sources themselves is considered in the shading.

For more accurate images, however, it is important to take into account not only the light sources, but also how all the surfaces and objects in the environment interact with the light. For example, some surfaces block light, casting shadows on other surfaces; some surfaces are shiny, in which case we see in them the reflections of other surfaces; some surfaces are transparent, in which case we see other surfaces through them; and some surfaces reflect light onto other surfaces.

Global Illumination

Rendering algorithms that take into account the ways in which light is transferred between surfaces in the model are called global illumination algorithms. 3ds Max offers two global illumination algorithms as an integral part of its production rendering system: *ray-tracing* and *radiosity*.

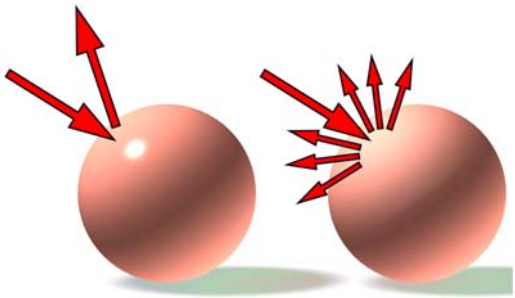
Before an explanation of how ray-tracing and radiosity work, it's useful to understand how light is distributed in the physical world. Consider, for example, the room shown in the illustration below.

Kitchen lit by two lights

This kitchen above has two light sources. One theory of light considers the light in terms of discrete particles called photons, that travel from the light source until they encounter some surface in the kitchen. Depending on the surface material, some of these photons are absorbed and others are scattered back out into the environment. The fact that photons traveling at a particular wavelength are absorbed while others are not is what determines the color of the surface.

Surfaces that are very smooth reflect the photons in one direction, at an angle equal to the angle at which they arrive at the surface, the angle of incidence. These surfaces are known as specular surfaces, and this type of reflection is known as specular reflection. A mirror is an example of a perfectly specular surface. Of course, many

materials display some degree of both specular and diffuse reflection.



Left: Specular reflection
Right: Diffuse reflection

The way in which the photons are reflected from a surface depends primarily on the smoothness of the surface. Rough surfaces tend to reflect photons in all directions. These are known as diffuse surfaces, and this type of reflection is known as diffuse reflection (shown above). A wall painted with flat paint is a good example of a diffuse surface.

The final illumination of the kitchen is determined by the interaction between the surfaces and the billions of photons emitted from the light source. At any given point on a surface, it is possible that photons have arrived directly from the light source (direct illumination) or else indirectly through one or more bounces off other surfaces (indirect illumination). If you were standing in the kitchen, a very small number of the photons in the room would enter your eye and stimulate the rods and cones of your retina. This stimulation would, in effect, form an image that is perceived by your brain.

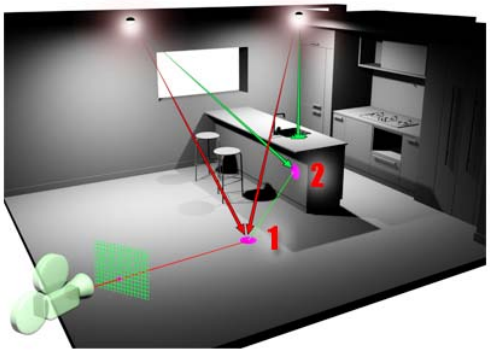
In computer graphics we replace the rods and cones of a retina with the pixels of the computer screen. One goal of a global illumination algorithm is to re-create, as accurately as possible, what you would see if you were standing in a real environment. A second goal is to accomplish this task as quickly as possible, ideally in real time (30 images per second). Currently, no single global illumination algorithm can accomplish both goals.

Ray-Tracing

One of the first global illumination algorithms developed is known as ray-tracing. The ray-tracing algorithm recognizes that although billions of photons may be traveling about the room, the photons we primarily care about are the ones that enter the eye. The algorithm works by tracing rays backward, from each pixel on the screen into the 3D model. In this way, we compute only the information needed to construct the image. To create an image using ray-tracing, the following procedure is performed for each pixel on the computer screen.

1. A ray is traced back from the eye position, through the pixel on the monitor, until it intersects with a surface. We know the reflectivity of the surface from the material description, but we do not yet know the amount of light reaching that surface.
2. To determine the total illumination, we trace a ray from the point of intersection to each light source in the environment (shadow ray). If the ray to a light source is not blocked by another object, the light contribution from that source is used to calculate the color of the surface.
3. If an intersected surface is shiny or transparent, we also have to determine what is seen in or through the surface being processed. Steps 1 and 2 are repeated in the reflected (and, in the case of transparency, transmitted) direction until another surface is encountered. The color at the subsequent intersection point is calculated and factored into the original point.
4. If the second surface is also reflective or transparent, the ray-tracing process repeats,

and so on until a maximum number of iterations is reached or until no more surfaces are intersected.



Ray-tracing: Rays are traced from the camera through a pixel, to the geometry, then back to their light sources.

The ray-tracing algorithm is very versatile because of the large range of lighting effects it can model. It can accurately account for the global illumination characteristics of direct illumination, shadows, specular reflections (for example, mirrors), and refraction through transparent materials. The main disadvantage of ray-tracing is that it can be very slow for environments of even moderate complexity. In 3ds Max, ray-tracing is used selectively on objects with *ray-trace materials (page 2–1353)* that specify ray-tracing as their shading option. Ray-tracing can also be specified for light sources as the method for rendering the shadows they cast.

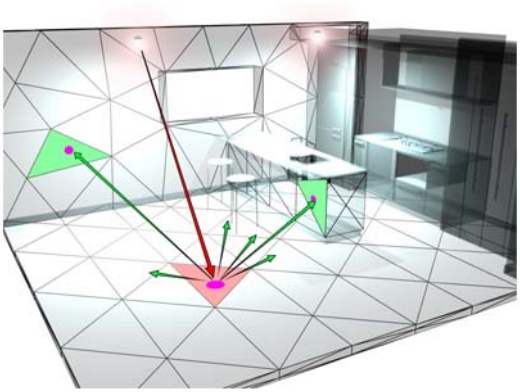
A significant disadvantage of both ray-tracing and scanline rendering is that these techniques do not account for one very important characteristic of global illumination, diffuse inter-reflections. With traditional ray-tracing and scanline rendering, only the light arriving directly from the light sources themselves is accurately accounted for. But, as shown in the room example, not only does light arrive at a surface from the light sources (direct lighting), it also arrives from other surfaces (indirect lighting). If we were to ray-trace an image of the kitchen, for example, the areas in shadow would appear black because they receive no direct light from the light sources. We know from experience, however, that these areas would not be completely dark because of the light they would receive from the surrounding walls and floor.

In scanline rendering and traditional ray-tracing (versions of 3ds Max prior to v5), this indirect illumination is usually accounted for simply by adding an arbitrary *ambient light* value that has no correlation to the physical phenomena of indirect illumination and is constant throughout space. For this reason, scanline and ray-traced images can often appear very flat, particularly renderings of architectural environments, which typically contain mostly diffuse surfaces.

Radiosity

To address this issue, researchers began investigating alternative techniques for calculating global illumination, drawing on thermal engineering research. In the early 1960s, engineers developed methods for simulating the radiative heat transfer between surfaces to determine how their designs would perform in applications such as furnaces and engines. In the mid-1980s, computer graphics researchers began investigating the application of these techniques for simulating light propagation.

Radiosity, as this technique is called in the computer graphics world, differs fundamentally from ray-tracing. Rather than determining the color for each pixel on a screen, radiosity calculates the intensity for all surfaces in the environment. This is accomplished by first dividing the original surfaces into a mesh of smaller surfaces known as *elements*. The radiosity algorithm calculates the amount of light distributed from each mesh element to every other mesh element. The final radiosity values are stored for each element of the mesh.



Radiosity: A ray of light that hits a surface is reflected by multiple diffuse rays, which can themselves illuminate other surfaces. Surfaces are subdivided to increase accuracy of the solution.

In early versions of the radiosity algorithm, the distribution of light among mesh elements had to be completely calculated before any useful results could be displayed on the screen. Even though the result was view-independent, the preprocessing took a considerable amount of time. In 1988, progressive refinement was invented. This technique displays immediate visual results that can progressively improve in accuracy and visual quality. In 1999, the technique called stochastic relaxation radiosity (SRR) was invented. The SRR algorithm forms the basis of the commercial radiosity systems provided by Autodesk.

An Integrated Solution

Although the ray-tracing and radiosity algorithms are very different, they are in many ways complementary. Each technique has advantages and disadvantages.

Lighting Algorithm	Advantages	Disadvantages
Ray-Tracing	Accurately renders direct illumination, shadows, specular reflections, and transparency effects. Memory Efficient	Computationally expensive. The time required to produce an image is greatly affected by the number of light sources. Process must be repeated for each view (view dependent). Doesn't account for diffuse interreflections.
Radiosity	Calculates diffuse interreflections between surfaces. Provides view independent solutions for fast display of arbitrary views. Offers immediate visual results.	3D mesh requires more memory than the original surfaces. Surface sampling algorithm is more susceptible to imaging artifacts than ray-tracing. Doesn't account for specular reflections or transparency effects.

Neither radiosity nor ray-tracing offers a complete solution for simulating all global illumination effects. Radiosity excels at rendering diffuse-to-diffuse inter-reflections, and ray-tracing excels at rendering specular reflections. By integrating both techniques with a production quality scanline rendering system, 3ds Max offers the best of both worlds. After you create a radiosity solution, you can render a two-dimensional view of it. In your 3ds Max scene, ray-tracing adds effects in addition to those that radiosity provides: lights can provide ray-traced shadows, and materials can provide ray-traced reflections and refractions. The rendered scene combines both techniques, and appears more realistic than either technique alone could provide.

By integrating ray-tracing and radiosity, 3ds Max offers a full range of visualization possibilities,

from fast, interactive lighting studies to images of exceptional quality and realism.

See also

How Radiosity Works in 3ds Max (page 3–55)

Radiosity Workflows (page 3–56)

Animation with Radiosity (page 3–59)

Radiosity Controls (page 3–60)

Lighting Analysis (page 3–75)

Lighting Analysis Dialog (page 3–75)

Advanced Lighting Override Material (page 2–1410)

How Radiosity Works in 3ds Max

This is an overview of how radiosity works in 3ds Max:

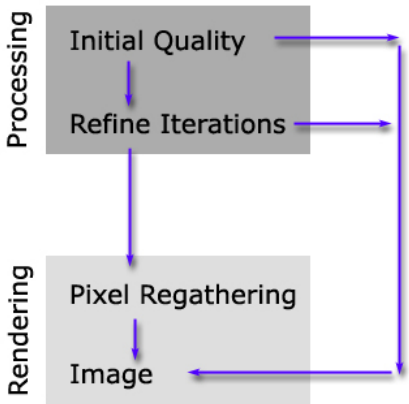
1. Object by object, 3ds Max loads a copy of the scene into the radiosity engine.
2. 3ds Max subdivides each object according to the Global Subdivision Settings in the Radiosity Meshing Parameters rollout, or according to the object's individual object properties, if those differ from the global settings.
3. 3ds Max emits a certain amount of rays, based on the average scene reflectance and number of polygons. The brightest light source will have more rays to emit than the weakest light source.
4. These rays bounce around randomly in the scene and deposit energy on the faces.
5. 3ds Max updates the viewports by taking all the energy from the faces and spreading it to the closest vertex.

See the section that follows, "Refinement Steps for Radiosity," for a more detailed description of the solution process.

Refinement Steps for Radiosity

The radiosity process involves three stages of increasing refinement. The first two stages occur during the primary radiosity processing, and the third stage can be used during the final rendering.

Within each of the first two stages, you can stop and start the processing at any time. This can be useful for evaluating interim results or increasing the level of accuracy you desire. For example, you can interrupt the Initial Quality stage at 50% and jump ahead to the Refine stage if you wish. However, once you enter the Refine stage, you cannot continue further iterations of Initial Quality unless you restart the solution.



The stages of a radiosity solution are Initial Quality, Refine, and then Regathering.

1. Initial Quality

   In the Initial Quality stage, the distribution of diffuse lighting in the scene is calculated by essentially mimicking the behavior of real photons. Rather than tracing the path of an essentially infinite number of photons, statistical methods are used to choose a much smaller set of "photon rays" whose distribution in space is representative of the actual

distribution. As with any statistical sampling process, the greater the number of rays used in the approximation, the greater the accuracy of the solution. During the initial quality stage, the overall appearance of the lighting level of the scene is established. The results can be interactively displayed in shaded viewports.

The initial quality stage performs repeated passes, which are shown in the dialog's progress bar.

2. Refine Iterations (All Objects) and Refine Iterations (Selected Objects)

   Because of the random nature of the sampling during the initial quality stage, some of the smaller surfaces or mesh elements in the scene might miss being hit by enough rays (or any rays at all). These small surfaces remain dark, and result in the appearance of "variance" or dark spots. To alleviate these artifacts, the Refine stage "regathers light" at every surface element.

   You can perform the Refine stage for the entire scene, or for selected objects in the scene.

3. Regathering

   Even after the Refine stage, it is still possible for visual artifacts to appear in a scene because of the topology of the original model. These artifacts sometimes appear as shadow or light "leaks." To eliminate even these model-based artifacts, a third, optional refinement stage known as Pixel Regathering occurs at the time of image rendering. This involves a final "regather" process for each pixel of the image. Regathering can add a considerable amount of time to the rendering of a final image, but it also produces the most detailed and artifact-free images possible.

   One benefit of using Regathering is that it means the initial modeling and mesh resolution don't need to be nearly as "refined" or "tight" as would otherwise be required.

Radiosity Workflows

The following sections describe how to set up a scene for use with radiosity.

Set Units Correctly Before Processing Radiosity

For imported geometry, you must make sure that units are consistent in your scene before processing radiosity (for example, a wall is 8 feet high, not 8 kilometers high). Units in 3ds Max must match the units of the model because the radiosity engine always uses an inverse square falloff for lights. Therefore, distance is crucial.

To make sure your units are setup correctly, use the *Units Setup dialog (page 3–891)*. The Scene Unit is the most important unit in this dialog. This is the unit that 3ds Max uses for its calculations. The Display Unit is just a tool that lets you customize how units are displayed in the user interface.

The following two scenarios show how to set unit scales after importing geometry that has been created using different units than what is currently set in 3ds Max:

Example 1: You import a table that was created in AutoCAD using metric scale. The table is 9 units long, which corresponds to an actual length of 90 centimeters. When the table is imported into 3ds Max, it will measure 9 scene units. Therefore, in the Units Setup dialog, you must set Scene Unit Scale to 1 Unit=10 centimeters. Your table is now the correct units because it is 90 centimeters long in 3ds Max model.

Example 2: You have an AutoCAD model that was created using Architectural Units. The model is a room measuring 20'-4" long. In AutoCAD, Architectural Units are stored as inches. Therefore, before importing the model to 3ds Max, make sure to set the Scene Unit Scale to 1 Unit=1 inch. Once

imported to 3ds Max, the room will measure 244 units long (20'*12+4").

Tip: Use the *Measure Distance tool (page 2–15)* to quickly check dimensions in 3ds Max.

Physically Based Workflow

Use *radiosity (page 3–50)* to create physically based lighting simulations. When doing so, keep in mind the following:

- **Scene dimensions:** Make sure your scenes are accurately dimensioned, with consistent units (a light bulb in a room 120 meters high would look a lot different than it would in a room 120 inches high).
- **Lights:** You should work exclusively with *Photometric lights (page 2–1155)*. You should also make sure that the light intensities are within a normal range.
- **Natural Lighting:** To simulate natural light, you should only use *IES sun (page 2–1163)* and *IES Sky (page 2–1165)*. These provide accurate photometric representations of sunlight and skylight based on a specified location, date and time.
- **Material Reflectance:** You should ensure that the materials you use in your scene have a *reflectance value (page 2–1274)* within the range of the physical materials they represent. For example, a painted white wall should have a maximum reflectance of approximately 80%; however, a pure white color material (RGB:255, 255, 255) would have a reflectance of 100%. This means that the material reflects 100% of the energy received.
- **Exposure Control:** The exposure control is the equivalent of the aperture of a camera. Make sure you enable the exposure control and set a value that provides the final results you desire.

To process radiosity for photometric lights using a physically based workflow:

1. Ensure that your geometry is set to a physically correct scale and that the materials have valid reflectance values.
2. Place photometric lights in your scene. The benefit of this workflow is that it allows you to place lights in your scene the same way you would in the real world. You can create new photometric lights or, using the *asset browser (page 3–505)*, drag and drop preset *luminaire objects (page 1–108)* from the included library.

   You can also refer to *Common Lamp Values (page 2–1174)*.
3. Choose Rendering > Environment to display the *Environment panel (page 3–268)*. Select the type of exposure control you want to use (typically *Logarithmic (page 3–293)*).
4. Click Render Scene to preview the lighting. At this stage, the radiosity will not be processed but you can quickly confirm that the direct lighting is correct. Adjust the position of the lights if desired.
5. Choose Rendering > Advanced Lighting > Radiosity. Make sure that Active is turned on.
6. On the Radiosity Parameters rollout, click Start to process radiosity. Once the Radiosity calculation has been completed, you should see your results in the viewports. The light levels are stored with the geometry and you can interactively navigate around the model without reprocessing the scene.
7. Click Render Scene again. The renderer will calculate the direct lighting and shadows, and the radiosity solution (indirect lighting) will be integrated as a modulated ambient light.

Lighting Analysis

After you generate a radiosity solution, you can use the *Lighting Analysis tool (page 3–75)* to analyze the lighting levels in your scene. This dialog provides data on material reflectance, transmittance, and luminance.

You can also interactively visualize the light levels in the scene by using the *Pseudo Color Exposure Control (page 3–296)*. Rendering to a rendered frame window displays an additional rendered frame with a legend below the image. The legend correlates lighting levels and color values.

If you need to generate a lighting report, you can use the *Lighting Data Exporter utility (page 3–299)* to export the luminance and illuminance data to a 32-bit LogLUV *TIFF file (page 3–684)* or a pair of *PIC files (page 3–677)* (one each for luminance and illuminance).

Note: To obtain the most accurate quantitative analysis of lighting levels, you should avoid using colored materials and diffuse maps.

Non-Physically Based Workflow

You don't necessarily have to work with physically based lights and materials in order to incorporate radiosity effects into your renderings. But there are a number of issues that you need to consider:

- **Lights:** Because the radiosity engine is physically based, *Standard lights (page 2–1142)* are interpreted by the engine as *Photometric lights (page 2–1155)*. For example, a Standard Spot light with a multiplier value of 1.0 will be translated as a Physically Based Spot light with an intensity value of 1500 candelas (default value). This translation value corresponds to the Physical Scale value in the various exposure controls.

  In addition, if your Standard lights use custom attenuation settings (for example, no attenuation, manual attenuation, or linear decay), the radiosity engine will always solve for these lights using the physically correct Inverse Square attenuation. This means that the amount of energy that bounces between surfaces might not be equivalent to the way the Standard lights render.
- **Natural Lighting:** To simulate natural lighting without using the physically based workflow described above, you can only use a *Direct Light (page 2–1145)* for the Sun and *Skylight (page 2–1149)* to produce *skylight (page 3–1106)*.
- **Exposure Control:** Since Standard lights are not physically based, you should only use exposure controls for the radiosity solution. Use the *Logarithmic Exposure Control (page 3–293)*, making sure to turn on Affect Indirect Only. The Brightness and Contrast controls of the exposure control will only affect the radiosity solution and your lights will render as usual.

To process radiosity with standard lighting:

1. Ensure that your geometry is set to a physically correct scale.
2. On the Create panel, click Lights. Create and position *standard lights (page 2–1142)* in your scene.
3. Click Render Scene to preview the lighting. At this stage, the radiosity will not be processed, but you can quickly confirm that the direct lighting is correct. Adjust the position of the lights if desired.
4. Choose Rendering > Advanced Lighting > Radiosity. Make sure that Active is turned on.
5. On the Radiosity Parameters rollout, click Start to process radiosity. Once the Radiosity calculation has been completed, you should see your results in the viewports.

6. In the Interactive Tools group of the Radiosity Processing rollout, click Setup to display the *Environment panel (page 3–268)*, where you set exposure controls.
7. When working with non-physically based lights, always use the *Logarithmic Exposure Control (page 3–293)*. On the Logarithmic Exposure Control rollout, select Affect Indirect Only. This will cause the exposure control to affect only the results of the radiosity solution. By doing so, you will maintain the way your direct lights render without radiosity. Use the Brightness and Contrast controls of the exposure control to adjust the intensity of the radiosity solution to match the lighting at an appropriate level.

   Tip: You can use the thumbnail preview to adjust brightness and contrast interactively.
8. Click Render Scene to render the scene after radiosity processing.

Summary

The following table will help you obtain good results with radiosity.

	Physically Based Workflow	Non Physically Based Workflow
Lights	*Photometric Lights (page 2–1155)*	*Standard Lights (page 2–1142)*
Daylight	*IES Sun (page 2–1163)* and *IES Sky (page 2–1165)*	*Directional Light (page 2–1145)* and *Skylight (page 2–1149)*
Exposure Control	Any	*Logarithmic (page 3–293)* — turn on Affect Indirect Only.
Units	Make sure your scene is set to the appropriate scale.	Make sure your scene is set to the appropriate scale.

Animation with Radiosity

By default, a *radiosity solution (page 3–50)* is calculated at the current frame. If you are animating objects and you want to perform a radiosity solution at every frame, select Compute Advanced Lighting When Required in the Render Scene dialog > Render panel > *Common Parameters rollout (page 3–27)* > Advanced Lighting group.

Once the renderer starts processing each frame of your animation, the radiosity solution will be computed for each frame as required. This occurs, for example, when an object moves, or a light intensity changes. If nothing changes in the scene from one frame to the next, the radiosity engine will not recalculate the solution.

Note: Due to the random statistical sampling used by the radiosity engine, there might be some flickering between frames. If this occurs, increase the value of Initial Quality or the number of Refine Iterations to solve the problem.

Tip: Before launching a lengthy animation with radiosity, you should process a radiosity solution manually for a single frame to make sure the results are acceptable.

Tip: If you animate only your camera (as in an architectural walkthrough) then you can calculate a radiosity solution for only the first frame of the animation, and reuse it in all subsequently rendered frames by turning off Compute Advanced Lighting When Required on the Common Parameters rollout of the Render Scene dialog.

Avoid using the *Automatic Exposure Control (page 3–291)* for animations. This exposure control can change from frame to frame, creating a flickering effect.

Object Animation

The radiosity solution is calculated for each frame if any object is animated in the scene (the default is to calculate the current frame only). You specify the parameters (goals/quality) you want to reach on the Advanced Lighting panel. It is recommended to run a solution first and verify if it's successful before proceeding to the whole animation. These parameters will then be reprocessed for each frame.

You go to the render dialog, Common Parameters rollout, and enable the option Compute Advanced Lighting When Required, and then render the scene. The radiosity is processed for the first frame and then rendered. 3ds Max then moves to the next frame, processes radiosity, renders, and so on.

Camera Animation

If objects remain static in the scene and only the camera moves, you can solve radiosity at frame 0, and when you render the animation, turn off Compute Advanced Lighting When Required.

Radiosity Controls

Render Scene dialog > Choose Default Scanline Renderer as the production renderer. > Advanced Lighting panel > Choose Radiosity.

Rendering menu > Advanced Lighting > Radiosity > Render Scene dialog > Advanced Lighting panel > Radiosity is chosen.

Radiosity is a technique to calculate indirect light. Specifically, radiosity calculates the interreflections of diffuse light among all the surfaces in your scene. To make this calculation, radiosity takes into account the lighting you've set up, the materials you've applied, and environment settings you've made.

The radiosity processing of a scene is distinct from the rendering process. You can render without radiosity. However, to render *with* radiosity, you must always calculate radiosity first.

Once a radiosity solution for a scene has been calculated, it can be used in multiple renderings, including multiple frames of an animation. If there are moving objects in the scene, radiosity might need to be recalculated; see *Animation with Radiosity (page 3–59)*.

For an overview of radiosity and how radiosity works in 3ds Max, see *Radiosity Solution (page 3–50)*.

For suggestions regarding workflow for using radiosity, see *Radiosity Workflows (page 3–56)*.

Note: Radiosity is also known as *global illumination*.

Important: If the dimensions of your scene are not realistic, then radiosity will not show realistic lighting, either.

See also

Modeling Global Illumination with Radiosity (page 3–50)

How Radiosity Works in 3ds Max (page 3–55)

Radiosity Workflows (page 3–56)

Animation with Radiosity (page 3–59)

Lighting Analysis (page 3–75)

Advanced Lighting Override Material (page 2–1410)

Procedures

To set units correctly:

Follow these steps if your scene does not already use real-world units.

1.

Right-click 3D Snap Toggle and on the Snaps panel, clear all the settings. Then turn on Vertex to set vertex snap. Close the dialog.

2. Choose Tools > Measure Distance to measure some object in the scene for which you know the size; for example, a door or window. The distance displays in the Coordinate Display of the status bar.
3. Choose Customize > Units Setup and adjust the Scene Unit Scale.

   For example, if your object measures 35 scene units long, and your model uses US Standard measurement, then you would enter 1 for the scale, and choose Inches from the drop-down list. This would give you an object 35 inches long.

   If your object measures 90 scene units long, and your model uses Metric measurement, then you would enter 1 for the scale, and select Centimeters from the drop-down list. This would give you an object 90 centimeters long.

Example: To process radiosity with photometric lighting:

1. Use a scene that has geometry set to the correct scale. For more information, see *To set units correctly (page 3–60)*.

   For example, if the ceiling is 96 scene units high in the model, make sure the units are set to US Standard (inches) and not Metric.
2. On the Create panel, click Lights.
3. Choose Photometric from the drop-down list. (The default is Standard.)
4. In the Object Type rollout, click Target Point.
5. Drag in a viewport. The initial point of the drag is the location of the light, and the point where you release the mouse is the location of the target.

   The light is now part of the scene.
6. Set the creation parameters.

   Tip: You can use the Move transform to adjust the location of the light or its target.
7. Click Render Scene to preview the lighting.

   Make any changes you need to adjust the rendering.
8. Choose Rendering > Environment to display the *Environment panel (page 3–268)*.
9. On the Exposure Control rollout of the Environment panel, choose Logarithmic Exposure Control from the drop-down list. Click Render Preview. The thumbnail preview shows the effect of exposure control.
10. On the *Logarithmic Exposure Control rollout (page 3–293)*, adjust the settings until the scene lighting is acceptable. The thumbnail preview updates as you adjust settings.

    For example, a brightness of 65 and a contrast of 50 can be good values for interior scenes.
11. Choose Rendering > Advanced Lighting to display the Advanced Lighting panel. On the Select Advanced Lighting rollout, choose Radiosity as the advanced lighting type.

    The rollouts for radiosity are displayed.
12. On the *Radiosity Processing Parameters rollout (page 3–63)*, click Start to begin processing radiosity.
13. Click Render Scene to render the scene after radiosity processing completes.

Example: To process radiosity with standard lighting:

Photometric lights are recommended for use with radiosity. But if you are working on a scene that already contains standard lights, you can follow these guidelines.

1. Create or load a scene containing the appropriate geometry for lighting. There is no need to adjust any scale factors.
2. On the Create panel, click Lights.

   Standard is the default choice of light type.
3. In the Object Type rollout, click a light type such as Target Spot.
4. Drag in a viewport. The initial point of the drag is the location of the spotlight, and the point where you release the mouse is the location of the target.

   The light is now part of the scene.
5. Set the creation parameters for the light.
6. Click Render Scene to preview the lighting.

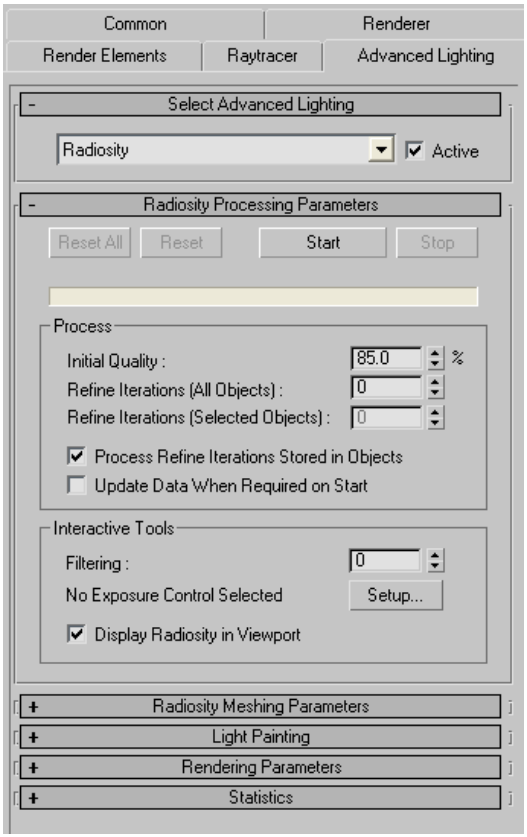
   Make any changes you need to adjust the rendering.
7. Choose Rendering > Advanced Lighting to display the Advanced Lighting panel. On the Select Advanced Lighting rollout, choose Radiosity as the advanced lighting type.

   The rollouts for radiosity are displayed.
8. On the Radiosity Processing rollout, under Interactive Tools, click Setup to display the *Environment panel (page 3–268)* where you set exposure controls.

   Note: The exposure controls allow you to control only the intensity of the indirect lighting. 3ds Max retains the original intensity and effect for the direct lighting.
9. On the Exposure Control rollout of the *Environment panel (page 3–268)*, choose Logarithmic Exposure Control from the drop-down list.
10. On the *Logarithmic Exposure Control rollout (page 3–293)*, turn on Affect Indirect Only.
11. On the same rollout, use the Physical Scale setting to assign the standard light a photometric value in candelas.
12. Click Render Scene to render the scene after radiosity processing.

Interface

Radiosity controls appear as rollouts on the Advanced Lighting panel of the Render Scene dialog. To choose radiosity, use the *Select Advanced Lighting rollout (page 3–43)*.



Radiosity Processing Parameters Rollout (page 3–63)

Radiosity Meshing Parameters Rollout (page 3–66)

Light Painting Rollout (Radiosity) (page 3–69)

Rendering Parameters Rollout (Radiosity) (page 3–70)

Statistics Rollout (Radiosity) (page 3–74)

Radiosity Rollouts

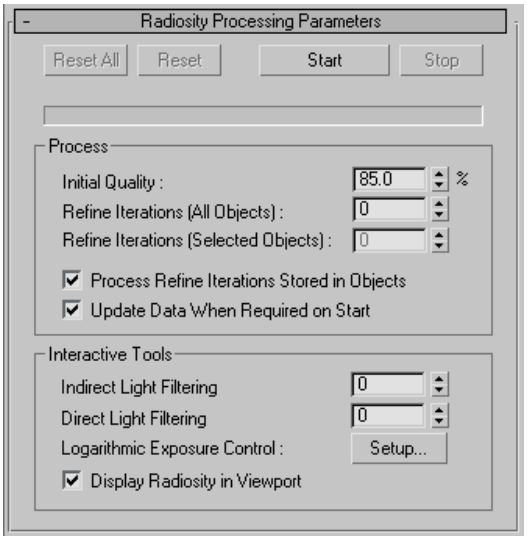
Radiosity Processing Parameters Rollout

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Radiosity Processing Parameters rollout

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Radiosity Processing Parameters rollout

Contains the main controls for processing a radiosity solution.

Interface



Reset All—When you click Start, a copy of the 3ds Max scene is loaded into the radiosity engine. Clicking Reset All clears all the geometry from the engine.

Reset—Clears the light levels from the radiosity engine, but doesn't clear the geometry.

Start—Starts the radiosity processing. Once the radiosity solution has reached the percentage amount specified by Initial Quality, this button changes to Continue.

If you click Stop *before* reaching the full Initial Quality percentage, then clicking Continue causes radiosity processing to resume, until the full percentage is reached, or you click Stop once more. You can click Stop and then Continue more than once.

In addition, you can calculate radiosity up to an Initial Quality less than 100 percent, then later increase the value of Initial Quality, click Continue, and resume solving radiosity.

In either case, Continue saves time by avoiding regenerating the radiosity solution from scratch.

Once the full Initial Quality percentage has been reached, clicking Continue has no effect.

Stop—Stops the radiosity processing. The Start menu changes to Continue. You can later click Continue to resume radiosity processing, as described for the Start menu.

Keyboard shortcut: **ESC**

Process group

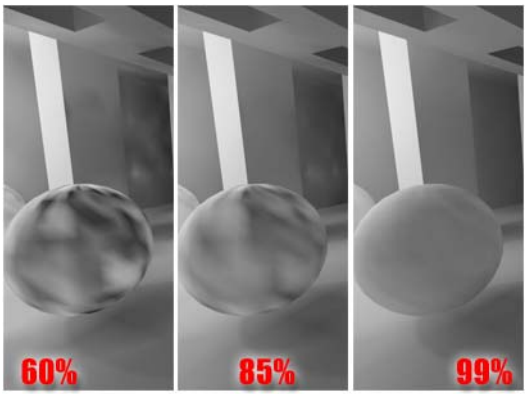
The options in this group set the behavior of the first two stages of the radiosity solution, Initial Quality and Refine.

Initial Quality—Sets the quality percentage at which to stop the Initial Quality stage, up to 100%. For example, if you specify 80%, you will get a radiosity solution that is 80% accurate in energy distribution. A goal of 80 to 85% is usually sufficient for good results.

During the Initial Quality stage, the radiosity engine bounces rays around the scene and distributes energy on surfaces. Between each iteration, the engine measures the amount of variance (noise between surfaces) that was computed.

Most of the brightness of the scene is distributed in the early iterations. The contribution to the scene's average brightness decreases logarithmically between iterations. After the first few iterations, the brightness of the scene does not increase much, but subsequent iterations reduce the variance in the scene.

Note: The "quality" refers to the accuracy of energy distribution, not to the visual quality of the solution. Even at a high Initial Quality percentage, the scene can still show considerable variance. This variance is resolved by the subsequent stages of the solution.



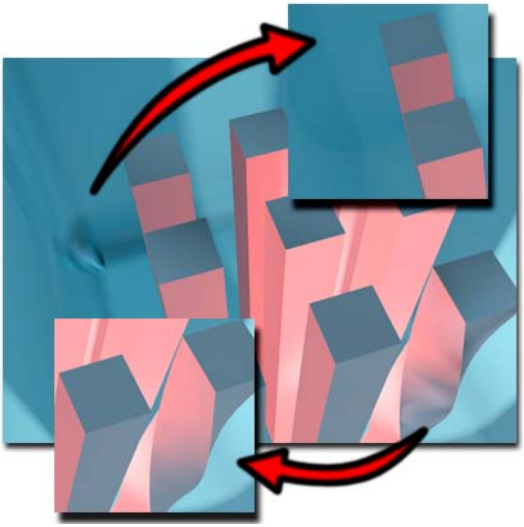
Increasing the percentage value of Initial Quality.

Increasing quality does not greatly increase the average brightness of the scene, but it decreases the variance between different surfaces in the scene, such as the faces of the sphere.

Refine Iterations (All Objects)—Sets the number of Refine iterations to perform for the scene as a whole. The Refine Iterations stage increases the quality of the radiosity processing on all objects in the scene. Gathers energy from each face in order to reduce the variance between faces using a different process from the Initial Quality stage. This stage does not increase the brightness of the scene, but it improves the visual quality of the solution and significantly reduces variance between surfaces. If you don't reach an acceptable result after processing a certain number of Refine iterations, you can increase the number and continue processing.

Tip: If you plan to use Regathering at render time, you generally don't need to perform the Refine stage to get good-quality final renderings.

Note: After 3ds Max processes Refine Iterations, Initial Quality is disabled and you can't change it until you click Reset or Reset All.



Large image with no iterations has areas of uneven illumination.

Inset images: After a number of iterations, the uneven areas have been corrected.

Refine Iterations (Selected Objects)—Sets the number of Refine iterations to perform for selected objects, using the same method as Refine Iterations (All Objects). Make an object selection and then set the number of iterations you require. Refining selected objects rather than the entire scene can save a lot of processing time. Typically, this option is useful for objects that have a lot of small surfaces and show a lot of variance, such as railings or chairs or highly subdivided walls.

Note: After 3ds Max processes Refine Iterations, Initial Quality is disabled and you can't change it until you click Reset or Reset All.

Process Refine Iterations Stored in Objects—Each object has a radiosity property called Refine Iterations. Each time you refine an object selection, the number of steps stored with these objects is incremented.

When you reset the radiosity solution and then start it again, the steps for each objects are refined automatically, provided this toggle is turned on. This is useful when you are creating animations, when the radiosity needs to be processed at every frame, and the same level of quality between frames has to be maintained.

Update Data When Required on Start—When on, the radiosity engine must be reset and then recalculated if the solution is invalidated. In this case, the Start menu changes to read Update & Start. When this is pressed, the radiosity solution is reset and the calculation starts over again.

When this toggle is off, the radiosity solution does *not* need to be reset if it is invalidated. You can continue processing your scene with the invalid solution.

Note: The radiosity solution is invalidated any time an object or light is added, removed, moved, or altered in any way.

Interactive Tools group

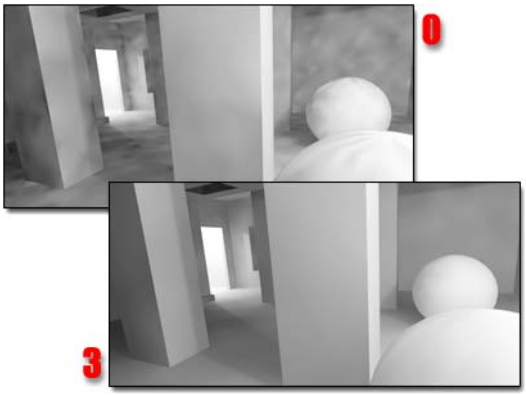
The options in this group help you adjust the display of the radiosity solution in the viewport and in the rendered output. These controls take effect immediately on an existing radiosity solution and do not require any additional processing for you to see their effects.

Indirect Light Filtering—Reduces the amount of noise between surface elements by averaging the indirect lighting levels with the surrounding elements. A value of 3 or 4 is usually sufficient. If you use too high a value, you risk losing detail in the scene. Because Indirect Light Filtering is interactive, you can readily evaluate the result and adjust it as you need.

Direct Light Filtering—Reduces the amount of noise between surface elements by averaging the direct lighting levels with the surrounding elements. A value of 3 or 4 is usually sufficient. If you use too high a value, you risk losing detail in the scene. Direct Light Filtering is interactive, so you can readily evaluate the result and adjust it as you need.

Note: Direct Light Filtering works only when you use *Shoot Direct Lights (page 3–68)*. If you're not using Shoot Direct Lights, everything is considered indirect lighting.

Filtering—Reduces the amount of noise between surface elements, by averaging the lighting levels with the surrounding elements. A value of 3 or 4 is usually sufficient. If you use too high a value, you risk losing detail in the scene. However, since Filtering is interactive, you can readily evaluate the result and adjust it as you need.



For a 65% quality solution, increasing the filter from 0 to 3 creates a much smoother diffuse light. The results are comparable to a much higher quality solution.

No Exposure Control Selected—Displays the name of the current exposure control.

(When you change the exposure control by choosing Rendering menu > Environment, the name display in the Radiosity dialog updates automatically.)

- **Setup**—Click to display the *Environment panel (page 3–268)*, where you access the Exposure Control rollout; there, you can choose the current control and the parameters rollout for a particular exposure control.

Display Radiosity in Viewport—Toggles the display in the viewports between radiosity and standard 3ds Max shading. You might want to do turn off radiosity shading to increase display performance.

Radiosity Meshing Parameters Rollout

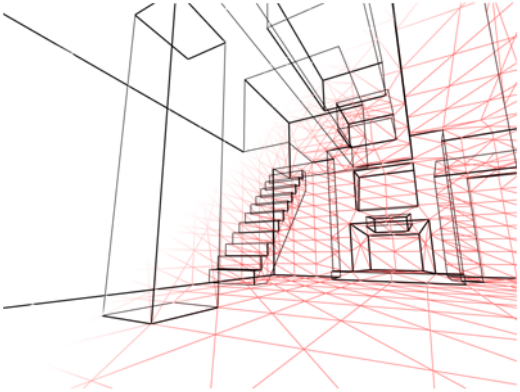
Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Radiosity Meshing Parameters rollout

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Radiosity Meshing Parameters rollout

Controls the creation of a radiosity mesh and its size in world units.

In order to create the lighting of a scene, the software calculates the intensity for discrete points in the environment by subdividing the original surfaces into elements which are part of a *radiosity mesh*. This rollout allows you to determine whether you want a mesh or not, and to specify the size of the mesh elements in world units. For quick tests, you might want to turn off the mesh globally. The scene will look flat, but the solution will still give you a quick impression of the overall brightness.

The finer the mesh resolution is, the more accurate the lighting detail will be. But there is a trade-off in time and memory.



Meshing (shown in light red) subdivides flat surfaces in the scene.

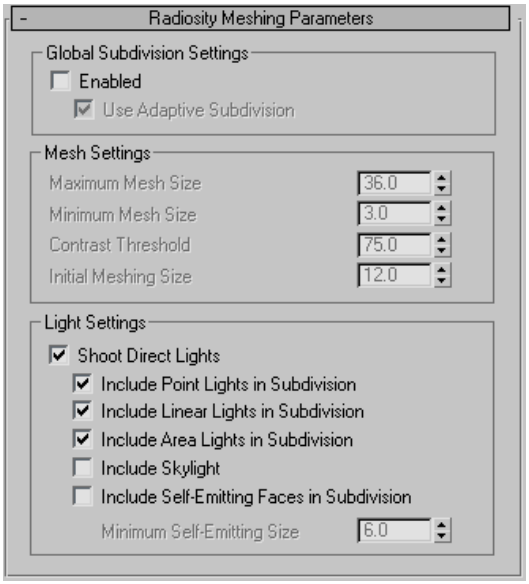
Left: No mesh. The solution looks very flat.

Middle: Coarse mesh, every 24 inches. The lighting improves.

Right: Fine mesh, every 4 inches. The lighting reveals more subtle effects.

Note: A tight meshing is not necessary when you use the regathering feature on the *Rendering Parameters rollout (page 3–70)*.

Interface



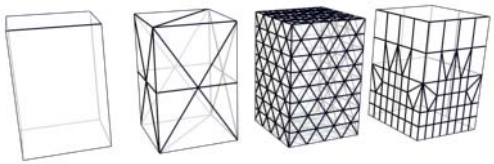
Note: You can override the subdivision settings in this group from the *Advanced Lighting panel (page 1–118)* of the Object Properties dialog. This allows you to have a different mesh resolution on some objects. For example, you might want to have a finer mesh on an important wall surface that you know will have a lot of detail. To display the Object Properties dialog, right-click a selected object and choose Properties from the quad menu.

Global Subdivision Settings group

Enabled—Turns on the radiosity mesh for the entire scene. Turn off the mesh when you want to perform quick tests.

- **Use Adaptive Subdivision**—This switch turns adaptive subdivision on and off. Default=on.

  Note: The Mesh Settings group parameters Minimum Mesh Size, Contrast Threshold, and Initial Meshing Size are available only when Use Adaptive Subdivision is on.



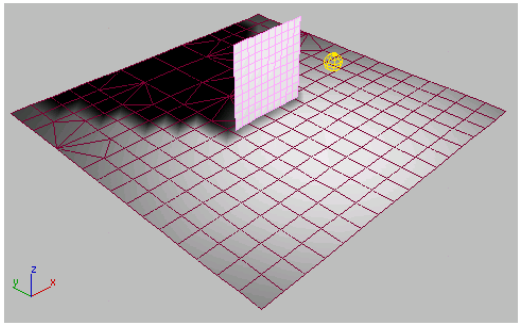
Left: A simple box with no subdivision

Middle Left: The box faces are subdivided

Middle Right: The box faces are subdivided with a smaller Meshing Size

Right: The box faces are subdivided with Adaptive Subdivision

Mesh Settings group



Adaptive Subdivision using the default mesh and light settings

Max Mesh Size—The size of the largest faces after adaptive subdivision. Default=36” for imperial units and 100cm for metric units.

When Use Adaptive Subdivision is turned off, Max Mesh Size sets the size of the radiosity mesh in world units.

Min Mesh Size—Faces are not divided smaller than the minimum mesh size. Default=3” for imperial units and 10cm for metric units.

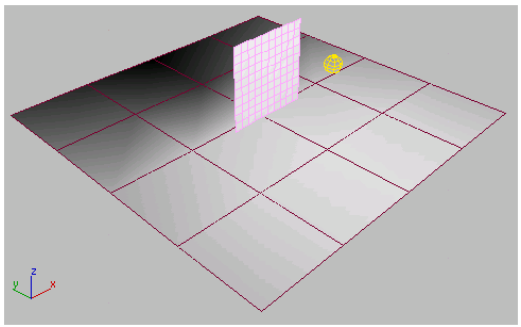
Contrast Threshold—Faces that have vertex illuminations that differ by more than the Contrast Threshold settings are subdivided. Default=75.0.

Initial Mesh Size—When improving the face shape, faces that are smaller than the Initial Mesh Size are not subdivided. The threshold for deciding whether a face is poorly shaped also gets larger as the face size is closer to the Initial Mesh Size. Default=12” for imperial units and 30cm for metric units.

Light Settings group

Shoot Direct Lights—When adaptive subdivision or shoot direct lights is on, the direct lighting on all of the objects in the scene is calculated analytically, based on the following switches. Lighting is analytically computed without modifying the object’s mesh which produces lighting that is less noisy and more pleasing to the eye. This switch is implicitly enabled when using adaptive subdivision since it is a requirement. Default=on.

This switch is available when the Use Adaptive Subdivision switch is turned off.



Adaptive Subdivision with light settings turned off

Note: Lighting from lights that are not included while shooting direct light are calculated using random sampling. These lights also are not able to affect the adaptive subdivision of objects.

Include Point Lights in Subdivision—Controls whether point lights are used when shooting direct lights. If this switch is off, then point lights are

not included in illumination calculated directly at vertices. Default=on.

Include Linear Lights in Subdivision—Controls whether linear lights are used when shooting direct lights. If this switch is off, then linear lights are not used in calculating the illumination at vertices. Default=on.

Include Area Lights in Subdivision—Controls whether area lights are used when shooting direct lights. If this switch is off, then area lights are not used in illumination calculated directly at vertices. Default=on.

Include Skylight—When turned on, skylight is used when shooting direct lights. If this switch is turned off, then skylight is not used in illumination calculated at vertices directly. Default=off.

Include Self-Emitting Faces in Subdivision—This switch controls how self-emitting faces are used when shooting direct lights. If this switch is turned off, then self-emitting faces are not used in illumination calculated at vertices directly. Default=off.

Minimum Self-Emitting Size—This is the minimum size that a self-emitting face will be subdivided when calculating its illumination. Minimum size is used rather than the number of samples to allow larger faces to be sampled more than smaller ones. Default=6.0.

Light Painting Rollout (Radiosity)

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Light Painting rollout

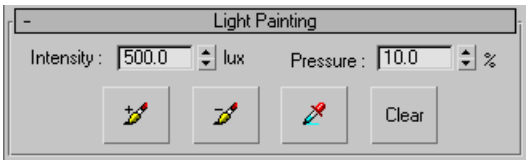
Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Light Painting rollout

The light painting tools in this rollout allow you to touch up shadowed and illuminated areas manually. You can use these tools to touch up shadow and light-leak artifacts without having to do additional remodeling or radiosity processing. Using Pick Illumination, Add Illumination, and Remove Illumination, you can add or remove illumination on one selection set at a time.

To use the light painting tools, you must first select objects, and then select a particular light painting tool: Pick Illumination, Add Illumination, or Remove Illumination. The active button is highlighted in yellow, and when it is over a selected object, the cursor changes to a crayon icon for the Add and Remove Illumination tools, or to an eyedropper icon for Pick Illumination.

You can pick, add, or remove illumination through objects. For example, if you select the floor as an object, you can work under the bookshelf, by working through it. Once in light painting mode, you can't select another object unless you cancel the operation.

Interface



Intensity—Specifies the intensity of the illumination in lux or candelas depending on the units you have selected in the Customize > *Units Setup dialog (page 3–891)*.

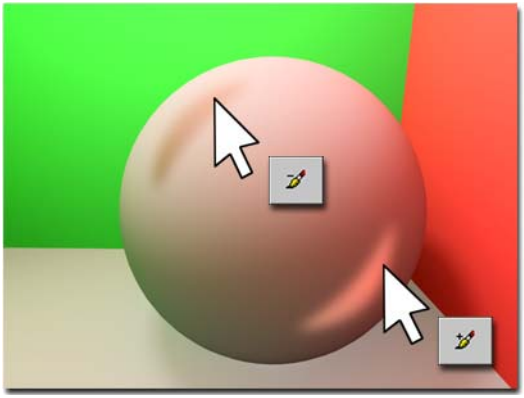
Pressure—Specifies the percentage of the sampled energy to be used when you add or remove illumination.

Add Illumination—Adds illumination starting at the vertex of a selected object. 3ds Max adds illumination based on the amount in the Pressure spinner. The pressure amount corresponds to a percentage of the sampled energy. For example, if a wall has about 2,000 lux on it, Add Illumination adds 200 lux to the surface of the selected object.

Remove Illumination—Removes illumination starting at the vertex of a selected object. 3ds Max removes illumination based on the amount in the Pressure spinner. The pressure amount corresponds to a percentage of the sampled energy. For example, if a wall has about 2,000 lux on it, Remove Illumination removes 200 lux from the surface of the selected object.

Pick Illumination—Samples the amount of illumination from a surface that you select. To save you from inadvertently making bright or dark spots, Pick Illumination uses an amount of illumination relative to the surface illumination you sample. Click the button, and move the eyedropper cursor over the surface. When you click a surface, the amount of illumination in lux or candelas is reflected in the Intensity spinner. For example, if you used Pick Illumination over a wall that has 6 lux of energy, then 0.6 lux displays in the Intensity spinner. The amount of illumination 3ds Max adds or removes on the surface will be this value multiplied by the Pressure value.

Clear—Clears all the changes you made. Processing additional radiosity iterations or changing the filtering amount will also discard any changes to the solution you made with the light painting tool.



Using light painting to add or remove light in a radiosity solution.

Rendering Parameters Rollout (Radiosity)

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Rendering Parameters rollout

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Rendering Parameters rollout

Provides parameters that allow you to control how you want to render the radiosity-processed scene.

By default when you render, 3ds Max first recalculates the shadows from light objects, then it adds the result of the radiosity mesh as ambient light.

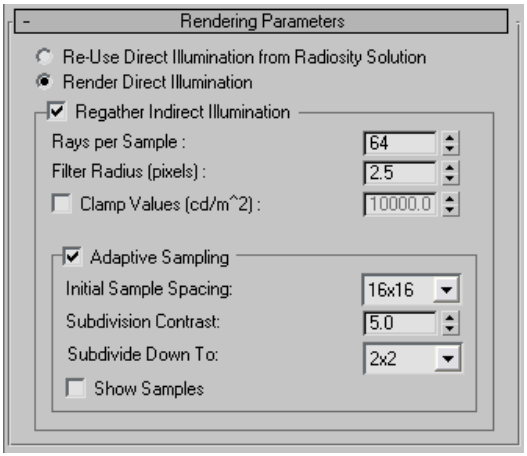
The first two options on the rollout control how the renderer treats direct illumination. Re-Use Direct Illumination From Radiosity Solution provides a quick render that displays colors from the radiosity mesh. Render Direct Illumination uses the scanline renderer to provide direct illumination

and shadows. This second option is usually slower but more accurate. With Render Direct Illumination, the radiosity solution provides only the indirect lighting.

When Render Direct Illumination is the method you choose, you can turn on regathering to correct artifacts and shadow leaks. Regathering provides the slowest but the best-quality rendering.

Note: Regathering is extremely intensive for your CPU and uses a lot of RAM, so it might not be practical for print-resolution images (for example, 4000 x 4000 pixels).

Interface



Re-Use Direct Illumination from Radiosity Solution—3ds Max doesn't render direct lights, but uses the direct lighting stored in the radiosity solution. If you turn on this option, the Regather Indirect Illumination option is disabled. The quality of shadows in the scene depends on the mesh resolution. Capturing fine shadow details might require a fine mesh, but in some situations this option can speed up overall rendering time, especially for animations, because the lights don't have to be recalculated by the scanline renderer.

You should use this option if you are using the *Assign Vertex Colors utility (page 2–1544).*

Left: Direct light only is stored in the radiosity mesh.

Middle: Indirect light only is stored in the radiosity mesh.

Right: Direct and indirect light both stored in the radiosity mesh (the shadows are usually very coarse).

Warning: If you choose this option but haven't generated a radiosity solution, rendering generates a completely black image.

Render Direct Illumination—3ds Max renders shadows from the lights at each rendering frame, and then adds indirect light from the radiosity solution. This is the default rendering mode.

Left: Direct light calculated only by the scanline renderer.

Middle: Indirect light calculated only by the radiosity mesh.

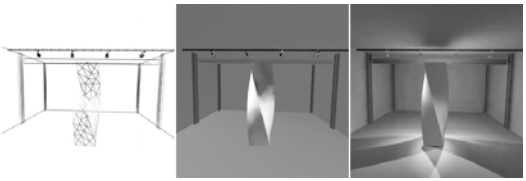
Right: Direct and indirect light combined.

Regather Indirect Illumination—In addition to recalculating all the direct lighting, 3ds Max recalculates the indirect lighting at each pixel by regathering illumination data from the existing radiosity solution. Using this option can produce the most accurate, artifact-free images, but it can add a considerable amount of rendering time.

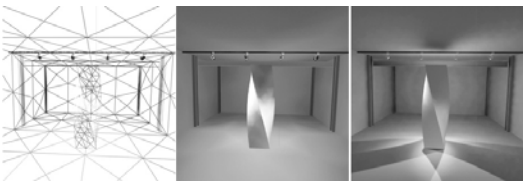
Note: If you know that you want to use the regathering option, then typically you don't need as dense a mesh for the radiosity solution. Even if you don't subdivide the surfaces at all and do an Initial Quality of 0%, the regathering will work, and might provide an acceptable visual result (useful for quick tests as well). However, accuracy and subtle details depend on the quality of the radiosity solution stored in the mesh.

The radiosity mesh is the foundation for the regathering process.

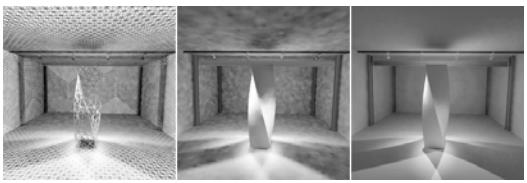
In the following illustrations, solutions were processed with an Initial Quality of 0%. There is a high variance between small surfaces when a dense mesh is used. Regathering gives acceptable results regardless of mesh density. But more subtle details appear with a denser mesh; for example, at the base of the sculpture.



No mesh
Left: Model subdivision
Middle: Viewport result
Right: Result of regathering



Coarse mesh
Left: Model subdivision
Middle: Viewport result
Right: Result of regathering



Fine mesh
Left: Model subdivision
Middle: Viewport result
Right: Result of regathering

Rays per Sample—The number of rays 3ds Max casts for each sample. 3ds Max casts these rays randomly in all directions to calculate ("regather") the indirect illumination from the scene. The more rays per sample, the more precise the sample will be. Fewer rays per sample produce more variance, creating a more grainy effect. Processing speed and precision are affected by this value. Default=64.

Filter Radius (pixels)—Averages each sample with its neighbors in order to reduce the noisy effect. Default=2.5 pixels.

Note: Pixel radius varies according to the output resolution. For example, a 2.5 radius is OK for NTSC resolution, but it might be very large for smaller images, or too precise for very large images.

Pixel radius of 2
Left: 10 rays per sample
Middle: 50 rays per sample
Right: 150 rays per sample

Pixel radius of 5
Left: 10 rays per sample
Middle: 50 rays per sample
Right: 150 rays per sample

Pixel radius of 10

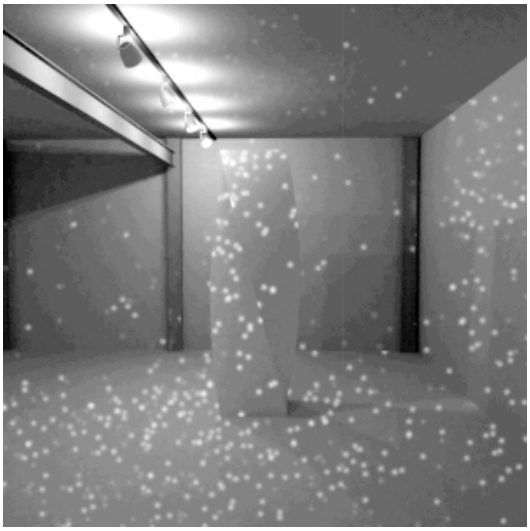
Left: 10 rays per sample

Middle: 50 rays per sample

Right: 150 rays per sample

Increasing the number of rays per sample can greatly increase rendering time. The images on the right can take nearly six times as long to render as the images on the left. Increasing the filter radius also increases render time, but not as dramatically.

Clamp Values (cd/m^2)—This control is expressed as a luminance value. Luminance (candelas per meter squared) represents how brightly you perceive a material. Clamp Value sets an upper limit on the luminance that will be considered in the Regathering stage. Use it to avoid the appearance of bright spots.



Bright polygons in the scene can create a "sparkle" effect of bright spots.

These bright spots are artifacts not of the number of samples cast, but rather of the presence of bright polygons in your scene. During the Initial Quality stage, this bright energy gets bounced in random directions, leading to a "sparkle" effect. Typically you can detect these polygons before regathering.

During the final Regathering stage, bright spots can be avoided by setting Clamp Values somewhat below the luminance of these bright surfaces and spots.

Bright spots have been reduced by clamping.

Tip: You can query the luminance of these surfaces by using the *Lighting Analysis tool (page 3–75)*.

Tip: Use *Render Region (page 3–13)* to render just the area of the bright spots to find rapidly the right clamp value to use.

Be careful with this control: Clamp Values let you clamp any intensity, and the rendering might become darker than it should be because you have clamped indirect illumination that is to be expected, thus dimming the effect of the radiosity solution.

Adaptive Sampling group

These controls can help you speed up rendering time. They reduce the number of light samples

taken. The ideal settings for adaptive sampling vary greatly from scene to scene.

Adaptive sampling initially takes samples from a grid superimposed on the pixels of the scene. Where there is enough contrast between samples, it subdivides that region and takes further samples, down to the minimum area specified by Subdivide Down To. Lighting for areas not directly sampled is interpolated.

Tip: If you use adaptive sampling, try adjusting the Subdivision Contrast value to obtain the best results.

Adaptive Sampling—When on, the radiosity solution uses adaptive sampling. When off, it does not. Turning off adaptive sampling can increase the detail of the final rendering, but at a cost of rendering time. Default=off.

Initial Sample Spacing—The grid spacing for initial samples of the image. This is measured in pixels. Default=16x16.

Subdivision Contrast—The contrast threshold that determines when a region should be further subdivided. Increasing this value causes less subdividing to occur. Reducing this value can cause unnecessary subdivide. Default=5.0.

Subdivide Down To—The minimum spacing for a subdivision. Increasing this value can improve render time at a cost of accuracy. Default=2x2.

Depending on the scene geometry, grids larger than 1x1 might still be subdivided below this specified threshold.

Show Samples—When on, sample locations render as red dots. This shows where the most sampling has taken place, which can help you choose the optimal settings for adaptive sampling. Default=off.

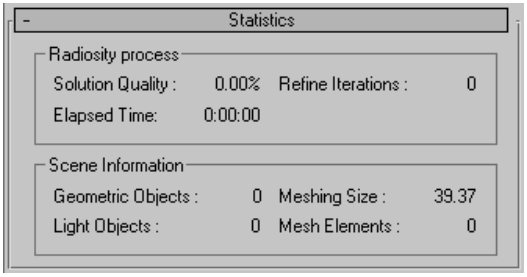
Statistics Rollout (Radiosity)

Main toolbar > Render Scene > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Statistics rollout

Rendering menu > Render > Render Scene dialog > Choose Default Scanline Renderer as the active production renderer. > Advanced Lighting panel > Select Advanced Lighting rollout > Choose Radiosity from the drop-down list. > Statistics rollout

Lists information about the radiosity processing.

Interface



Radiosity process group

Lists the current level of quality and number of refine iterations in the radiosity process.

Solution Quality—The current level of quality in the radiosity process.

Refine Iterations—The number of refine iterations in the radiosity process.

Elapsed Time—The time spent processing the solution since the last reset.

Scene Information group

Lists information on the radiosity processing of the scene.

Geometric Objects—Lists the number of objects processed.

Light Object—Lists the number of light objects processed.

Note: Self-illuminated objects count as one light per face.

Meshing Size—Lists the size of radiosity mesh elements in world units.

Note: Transparent, 2–sided, and translucent objects' faces are counted twice.

Mesh Elements—Lists the number of elements in the mesh processed.

Lighting Analysis

To query light levels, analyze the data, and produce reports, use the *Lighting Analysis dialog (page 3–75)*. This dialog provides rendering data on material reflectance, transmittance, and luminance.

For example, a lighting engineer might need to know if light fixtures in a scene provide an even level of illumination on the walls of a building. The engineer uses the Lighting Analysis dialog after placing the lights in the ceiling and processing radiosity. The engineer inspects the light levels and material reflectance in the scene and then adjusts the brightness of lights, changes units, or reduces material reflectance.

Note: You can also use the *Pseudo Color Exposure control (page 3–296)* to do lighting analysis. This tool maps luminances or illuminances to pseudo colors that show the brightness of the values 3ds Max converts. You can also export *LogLUV TIFF files (page 3–684)* or *PIC files (page 3–677)* for analysis by other software; do this by using the *Lighting Data Exporter utility (page 3–299)*.

Lighting Analysis Dialog

Select an object that has radiosity solution information. > Rendering menu > Advanced Lighting > Lighting Analysis

The Lighting Analysis dialog allows you to query light levels in the scene. You can obtain information about the luminance, illuminance, reflectance, and transmittance at a specific point, or the average values over an entire object.

Note: To use the Lighting Analysis tools, a radiosity solution must be calculated and displayed in the scene. For better feedback, use it in conjunction with the *Pseudo Color Exposure Control (page 3–296)*.

See also

Modeling Global Illumination with Radiosity (page 3–50)

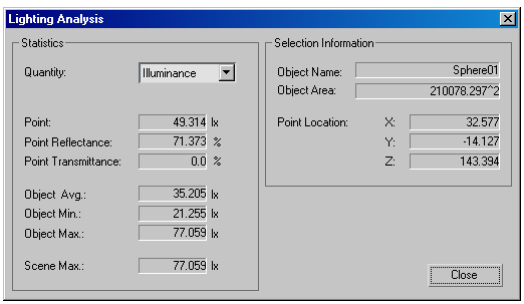
Radiosity Workflows (page 3–56)

Radiosity Controls (page 3–60)

Radiosity Preferences (page 3–866)

Lighting Data Exporter Utility (page 3–299)

Interface



Statistics group

Displays the radiosity solution lighting statistics for the object you select.

Quantity—Indicates the desired photometric value:

- **Luminance**—The amount of energy leaving a surface.
- **Illuminance**—The amount of energy arriving at a surface.

Point—The luminance or illuminance at the point on the object where you clicked.

Point Reflectance—The reflectance of the surface material at the point on the object where you clicked.

Point Transmittance—The transmittance of the surface material at the point on the object where you clicked.

Object Avg—The amount of light intensity for the object as a whole.

Object Min—The object's minimum luminance or illuminance value.

Object Max—The object's maximum luminance or illuminance value.

Scene Max—The scene's highest luminance or illuminance value.

Selection Information group

Object Name—The name of the selected object.

Object Area—The area size of the selected object.

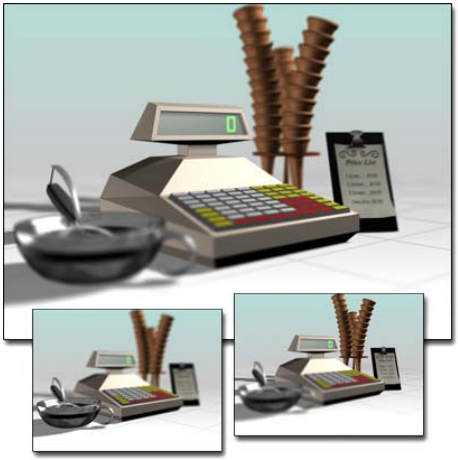
Point Location—The X,Y,Z coordinate of the point on an object you clicked.

Multi-Pass Rendering Effects

Create panel > Cameras > Target button or Free button > Parameters rollout > Multi-Pass Effect group

Multi-pass rendering effects use multiple renderings of the same frame, with slight camera movement between each rendering. The multiple passes simulate the blurring that film in a camera would register under certain conditions. Two multi-pass effects are provided:

- *Depth of field (page 2–1228)*



Multi-pass depth of field

Top: Focus is in the middle distance, near and far objects are blurred.

Bottom left: Focus on near objects, far objects are blurred.

Bottom right: Focus on far objects, near objects are blurred.

- *Motion blur (page 2–1230)*

Above: Motion blur applied to wings of the flying dragon

Below: Multiple passes appear in successive refreshes of the rendered frame window.

Tip: These effects are for the default scanline renderer. The *mental ray renderer (page 3–77)* has its own depth-of-field and motion blur effects. See *Motion Blur with the mental ray Renderer (page 3–88)* and *Depth of Field with the mental ray Renderer (page 3–89)*.

mental ray 3.4 Renderer

The mental ray® renderer from mental images® is a general-purpose renderer that can generate physically correct simulations of lighting effects, including *ray-traced reflections and refractions (page 3–87)*, *caustics (page 3–91)*, and *global illumination (page 3–92)*.

Note: mental images and mental ray are registered trademarks, and photon map is a trademark of mental images GmbH & Co. KG, Berlin, Germany.

Scene rendered with the default 3ds Max scanline renderer

Same scene rendered with the mental ray renderer

The second rendering, done with the mental ray renderer, shows caustics cast by refraction through the martini glass. Caustics are also visible in the reflection on the cocktail shaker.

The mental ray renderer in 3ds Max supports the mental ray version 2 (mi2) and version 3 (mi3) formats. It does not support the mental ray version 1 (mi1) format.

Differences Between the mental ray Renderer and the Default Scanline Renderer

Compared to the default 3ds Max scanline renderer, the mental ray renderer relieves you of the need to simulate complex lighting effects "by hand" or by generating a radiosity solution. The

mental ray renderer is optimized to use multiple processors and to take advantage of incremental changes for efficient rendering of animations.

Unlike the default 3ds Max renderer, which renders scanlines from the top of the image downward, the mental ray renderer renders rectangular blocks called *buckets*. The order in which the buckets are rendered can vary, depending on the method you choose. By default, mental ray uses the Hilbert method, which picks the next bucket to render based on the cost of switching to the next one. Because objects can be discarded from the memory to render other objects, it's important to avoid having to reload the same object multiple times. This is especially important when you have enabled placeholder objects (see the Processing panel > *Translator Options rollout (page 3–115)*).

If you use distributed rendering to render a scene, it might be hard to understand the logic behind the rendering order. In this case, the order has been optimized to avoid sending lots of data over the network. Each CPU is assigned a bucket as the bucket becomes available, so different buckets can appear in the rendered image at different times. See the Renderer panel > *Sampling Quality rollout (page 3–97)*.

Note: The mental ray renderer can also be run in a standalone fashion, using a command-line interface based on the mi2 or mi3 scene description format. This is described in the manual *mental ray Programming,* which is written for programmers writing custom *shaders (page 3–1103)*.

See also

Getting Good Results with mental ray Rendering (page 3–80)

3ds Max Materials in mental ray Renderings (page 3–82)

mental ray Concepts (page 3–87)

Enhancements to Standard Features (page 3–84)

Procedure

To use the mental ray renderer:

1. Choose Rendering menu > Render. The Render Scene dialog displays.
2. On the Common panel, open the Assign Renderer rollout, then click the "..." button for the Production renderer.

   A Choose Renderer dialog is displayed.
3. On the Choose Renderer dialog, click to select *mental ray Renderer,* and then click OK.

   Tip: After you make the mental ray renderer the active production renderer, you can click Save As Defaults to make the mental ray renderer the default renderer for all new scenes. This can be a convenient way to avoid extra setup time.

Now when you render, the Render Scene dialog appears with the mental ray controls. You can choose to render the scene with the built-in mental ray renderer, or simply to translate the scene and save it in a *.mi file (page 3–1066)* that you can render later, perhaps on a different system. Controls for choosing whether to render, save to a *.mi* file, or both, are on the *Translator Options rollout (page 3–115)*.

Rendering with the mental ray Renderer

Rendering menu > Render > Render Scene dialog > Common panel > Assign Renderer rollout > Choose mental ray Renderer as the production renderer.

Main toolbar > Render Scene > Render Scene dialog > Common panel > Assign Renderer rollout > Choose mental ray Renderer as the production renderer.

To use the mental ray translator and renderer, you must first choose mental ray as the production renderer, as described the "Procedures" section below. Once you have chosen mental ray rendering, the Render Scene dialog displays panels and rollouts that control the mental ray renderer.

Common Parameters Rollout

When you render with mental ray, controls on the Render Scene dialog > Common panel > Common Parameters rollout remain the same, and function just as they do with the default 3ds Max scanline renderer.

Limitations

The mental ray renderer does not support certain rendering features, as described here.

- Output dithering options aren't supported (in Main menu > Customize > Preferences > Preference Settings dialog > Rendering panel > Output Dithering group).
- The mental ray renderer does not fully support G-buffer options in post processing and image file output. The mental ray renderer generates all required G-buffer channels, but does not include transparency information. If two transparent objects overlap each other, the mental ray render generates information only for the frontmost object.
- When you use a bitmap as an environment (that is, as a background), the mental ray renderer will sample it and filter it. This can result in unwanted blurring. To prevent background blurring, render the scene against a solid-color background, and then composite the rendered scene with the background image.
- Sometimes when you render objects that have zero thickness, or an Extrude modifier with zero thickness, the mental ray renderer generates rendering artifacts that appear as streaks. In some cases, you can fix this by turning on Force 2-Sided in the Render Scene dialog's Common Parameters rollout. If the streaks persist, give the object or the Extrude modifier a nonzero thickness.

See also

Sampling Quality Rollout (mental ray Renderer) (page 3–97)

Camera Effects Rollout (mental ray Renderer) (page 3–100)

Caustics and Global Illumination Rollout (mental ray Renderer) (page 3–104)

Final Gather Rollout (mental ray Renderer) (page 3–109)

Shadows and Displacement Rollout (mental ray Renderer) (page 3–111)

Rendering Algorithms Rollout (mental ray Renderer) (page 3–113)

Translator Options Rollout (mental ray Renderer) (page 3–115)

Distributed Bucket Rendering Rollout (mental ray Renderer) (page 3–121)

Procedures

To use the mental ray renderer:

1. Choose Rendering menu > Render. The Render Scene dialog displays.
2. On the Common panel, open the Assign Renderer rollout, then click the "..." button for the Production renderer.

   A Choose Renderer dialog is displayed.
3. On the Choose Renderer dialog, click to select *mental ray Renderer,* and then click OK.

Now when you render, the Render Scene dialog appears with the mental ray controls. You can choose to render the scene with the built-in mental ray renderer, or simply to translate the scene and save it in a *.mi file (page 3–1066)* that you can render later, perhaps on a different system. Controls for choosing whether to render, save to a *.mi* file, or both, are on the *Translator Options (page 3–115)* rollout.

To make the mental ray Renderer the default renderer for new scenes:

- After you make the mental ray renderer the active production renderer, click Save As Defaults on the Assign Renderer rollout.

Getting Good Results with mental ray Rendering

Although the mental ray renderer is relatively easy to use once you've set it up correctly, there are several "gotchas" that you might encounter immediately, especially if you're primarily accustomed to the 3ds Max scanline renderer and its workflow. For example, see *3ds Max Materials in mental ray Renderings (page 3–82)*. Below are some basic rules of thumb for using mental ray 3.4 in 3ds Max.

Using Lights with the mental ray Renderer

When you set up a scene for rendering with the mental ray renderer, keep the following tips in mind:

- The Overshoot parameter for lights doesn't work when you use mental ray to render shadow-mapped shadows. To use Overshoot, use ray-traced shadows.
- Excluding an object from shadow casting doesn't work when you use mental ray to render shadow-mapped shadows. To exclude objects from shadow casting, use ray-traced shadows. (The Exclude button is on a light's General Parameters rollout.)
- When you assign a map to object shadows in the light's Shadow Parameters rollout, the mental ray renderer does not recognize the toggle for the map (to the left of the Map button), and renders the map whether the toggle is on or off. To stop using the map, you must click the Map button and in the Material/Map Browser, assign NONE as the map type.
- Using the default scanline renderer, you can set a light to have a value of zero, with a shadow color of white, and a shadow density of −1. With these settings, the light casts shadows but does not illuminate the scene. To get the same effect using the mental ray renderer, the light value must not be zero. Instead, set it to a value close to zero (for example, 0.001 or -0.001).
- The mental ray renderer disregards the bias parameters in the Shadow Map Params rollout and the Ray Traced Shadow Params rollout.
- The mental ray renderer assumes that all directional lights come from infinity, so objects that are behind the direct light object in the 3ds Max scene will also be illuminated.

Ray Tracing

The mental ray raytracer is fast and provides excellent quality images, but you have to use it correctly within 3ds Max.

The mental ray renderer does not fully support cubic maps for *Reflect/Refract maps (page 2–1509)*. It uses them if they have already been generated by the default scanline renderer, but it does not generate them. If Source > From File is active and the mental ray renderer can find the six cubic maps, it uses them. If Source > Automatic is active, or if the cubic maps cannot be found, the mental ray renderer generates ray-traced reflections or refractions instead.

Ray Tracing Setup

On the rendering menu, Ray Tracer Settings and Raytrace Global Include/Exclude are disabled while the mental ray renderer is active. These controls adjust ray-trace settings for the scanline renderer only. The settings of these controls have no impact on the mental ray renderer. The ray-tracing controls for mental ray appear on the

Renderer panel > *Rendering Algorithms rollout (page 3–113)*.

Tip: While the mental ray renderer ignores the global inclusion or exclusion settings for the ray tracer, you *can* enable or disable ray-tracing at the local level of a Raytrace material or map.

Ray Tracing Rules of Thumb

Let's say you're rendering a (lathed) wineglass, with an inner and outer surface and a piece of geometry representing the wine. The wine geometry is just slightly smaller than the inner surfaces of the wineglass, and capped with a flat top. Now, you go to render the glass. After rendering the scene, however, there's something wrong: the inner surfaces of the glass don't seem reflective enough, and the wine isn't refracting properly. What's wrong?

What's wrong is that you probably have the number of reflections and refractions set too low for the number of surfaces you have. To check this, go to the Renderer panel > *Rendering Algorithms rollout (page 3–113)* and look at the Maximum Trace Depth spinners. If you haven't changed the parameters, then you should see Reflection and Refractions set to the default of 6, and Sum set to 6.

There's the problem: you actually have six surfaces that need to be traced by the light rays for *both* reflections and refractions. The way to always calculate the number of rays needed for a scene is to take the ray-traced objects in your scene and draw an imaginary line through them, originating at the point of view. Then, count the number of surfaces the line intersects.

For the wineglass and wine, you need at least six reflections and refractions that correspond to the following surfaces:

- Near outer glass surface ("near" relative to your Camera viewpoint)
- Near inner glass surface
- Near wine surface
- Far wine surface
- Far inner glass surface
- Far outer glass surface

Therefore, increase the value of Sum to 12.

Caustics and Global Illumination

Before rendering with caustics, there are several things you need to set up in your scene:

- For caustics to work properly, the generating object must use a material that contains some degree of shininess, reflectivity, or refraction. Assign a Raytrace or other map as either a Reflection map or Refraction map before you render caustics.
- Most often, you'll be using very shiny, highly reflective materials (such as chrome and other metals), or transparent or translucent materials (such as glass goblets or water), to generate caustics in your scene. If you're using a glassy material, make sure it's double-sided to create the proper results.
- Make sure you have *object properties (page 1–121)* set to Receive Caustics or Generate Caustics (or both). To set up these properties, right-click an object and choose Properties. For example, if you're rendering a wineglass on a tabletop, you probably want the wineglass both to generate and receive caustics (so that caustics are scattered within the glass itself), and the tabletop only to receive caustics (unless it's chrome, say, instead of wood).
- If the rendering of your scene is washed out by light, double-check the Energy setting in the Light Properties group of the Indirect Illumination panel > *Caustics And Global Illumination rollout (page 3–104)*. This globally sets the energy level of all lights in the scene. Reducing the Energy value can eliminate washout.

If a single light object is causing the problem, you can reduce the Energy multiplier's value in that light objects' *mental ray Indirect Illumination rollout (page 2–1187)*, which is displayed on the Modifier panel.

- To improve the quality of caustics, go to the Caustics group of the *Caustics And Global Illumination rollout (page 3–104)* and increase the number of Samples.
- Be careful of the total number of photons you're emitting: a very high number (100,000 and above) can dramatically increase your rendering time. Then again, for some simple scenes, you might actually be able to set these to 1,000,000 and still render in an acceptable amount of time.

  Warning: The number of photons specified for each light indicates the number of photons that need to be stored for each light, not the number of photons to be shot. This is a pretty important distinction. If a light is pointed in a direction where there is no surface, the mental ray renderer might shoot photons forever. In the *Messages Window (page 3–86)*, the mental ray renderer will display warnings that no photons are being stored. To avoid the slowdowns related to this issue, make sure that every light points in the direction of a surface (this is sometimes impossible to do with omni lights). Another way to avoid this problem is to add a big sphere around your entire model.

Coincident Faces

When it encounters coincident faces, the mental ray renderer can produce artifacts, because it can't decide which face is nearer the camera (neither is). To fix this, move or scale one of the objects so faces are no longer coincident.

3ds Max Materials in mental ray Renderings

For the most part, the mental ray renderer treats 3ds Max maps and materials the same way the default scanline renderer does. The exceptions are listed below. In general, if the mental ray renderer does not recognize a map or material, it renders it as opaque black.

Warning: The mental ray renderer does not necessarily support maps or materials provided as plug-ins from third-party vendors. It supports third-party maps and materials only if the vendor has explicitly used the mental ray SDK to add support for the mental ray format. Unless the third-party vendor clearly specifies mental ray support, you should assume the map or material is unsupported, and will render as black.

See also

mental ray Renderer (page 3–77)

Getting Good Results with mental ray Rendering (page 3–80)

Issues for Reflections and Refractions

The maps used to create reflections or refractions, Flat Mirror, Raytrace, Reflect/Refract, and Thin Wall Refraction, are supported by the mental ray renderer. However, the mental ray renderer simply uses these maps as indications to use its own ray-tracing method, leading to some restrictions on which parameters are supported, as described in the sections "Materials" and "Maps," below.

Map Blurring

When reflections and refractions are ray traced, applying Blur (or Distortion, in Flat Mirror) does not apply to reflections or refractions of environment maps. In general, Blur and Distortion render differently than they do with the default scanline renderer, and you might have

to experiment with parameter values to get a comparable rendering result.

Tip: If Blur effects are not rendering well with the mental ray renderer, try increasing the Maximum number of samples in the Renderer panel > *Sampling Quality Rollout (page 3–97)*.

Materials

The mental ray renderer does not support these materials:

- Advanced Lighting Override material
- Lightscape material
- Morpher material

Raytrace Material

The mental ray renderer supports all Raytrace material settings except for the antialiasing parameters and the settings found under Rendering > Raytracer Settings and Rendering > Raytrace Global Include/Exclude. All these options are specific to the default scanline renderer.

Tip: While the mental ray renderer ignores the global inclusion or exclusion settings for the ray tracer, you *can* enable or disable ray-tracing at the local level of a Raytrace material or map.

Maps

- Bitmap

  The mental ray renderer can't use the Progressive JPEG (*.jpg)* format as a bitmap. Also, Summed Area filtering is not supported (in the Filtering group of the Bitmap Parameters rollout).

  PSD files are supported, but are translated into binary data, and because of this, consume a lot of memory and increase render time. To reduce the time involved, convert the PSD file to a format such as BMP.

  The same is true of TIFF files. In addition, there are certain TIFF subformats that the mental ray renderer does *not* support; specifically, LZW, CCIT (fax), or JPEG compression; non-RGB color models such as CMYK, CIE, or YCbCr; or multiple images in the same file (in this case, only the first image is used). The mental ray renderer does support bilevel (1-bit), grayscale (4- or 8-bit), color map (4- or 8-bits), RGB(A) (8-, 16-, or 32-bit) TIF images, and TIF files with image strips.

- Combustion map

  The mental ray renderer doesn't support this map.

- Flat Mirror map

  Flat Mirror is supported by the mental ray renderer, except for the First Frame Only and Every Nth Frame parameters.

- Raytrace map

  The mental ray renderer supports all Raytrace map settings except for the antialiasing parameters.

- Reflect/Refract map

  This map tells the mental ray renderer to use ray-traced reflections and refractions. Most parameters are supported, but the parameters Blur Offset, First Frame Only, Every Nth Frame, and Atmosphere Ranges are not supported.

  Note: The mental ray renderer does not fully support cubic maps for Reflect/Refract maps. It uses cubic maps if they have already been generated by the default scanline renderer, but it does not generate them. If Source > From File is active and the mental ray renderer can find the six cubic maps, it uses them. If Source > Automatic is active, or if the cubic maps cannot be found, the mental ray renderer generates ray-traced reflections or refractions instead.

Enhancements to Standard Features

The primary interface to the mental ray renderer consists of rollouts on the Render Scene dialog. You must use the Assign Renderer rollout to choose the mental ray renderer, as described the "Procedures" section of *mental ray Renderer (page 3–77)*.

In addition, object properties, lights, and the Material Editor have additional controls to support mental ray rendering.

Object Properties Enhancements

Several new parameters have been added to the *mental ray panel (page 1–121)* of the Object Properties dialog. These options support the mental ray indirect illumination features of *caustics (page 3–91)* and *global illumination (page 3–92)*.

Light Object Enhancements

Along with the mental ray renderer, new area light objects and new light settings are provided.

New Light Objects

Area lights (page 3–1004) are a feature of the mental ray renderer. Instead of emitting light from a point source, they emit light from a broader area around the source. There are two mental ray area lights: *mr Area Omni Light (page 2–1152)* and *mr Area Spotlight (page 2–1153)*. Area lights create soft-edged shadows. This can help improve the realism of your rendering.

Note: To render soft-edged shadows, shadows must be ray-traced, not shadow-mapped: see the Renderer panel > *Shadows & Displacement Rollout (page 3–111)*.

In 3ds Max, area lights are created and supported by the MAXScript scripts, *light-mentalray_areaomni.ms* and *light-mentalray_areaspot.ms*. Both scripts are installed in the directory *|3dsmax|stdplugs|stdscripts|*. Because of this, when you create an area light, you actually create a target spot or omni light. For this light, the mental ray renderer uses the parameters on the Area Light Parameters rollout. If you render with the default scanline renderer, the light behaves like any other target spot or omni light. (You can change a light from one type to another using the Type drop-down list in the light's General Parameters rollout.)

For area lights rendered with the mental ray renderer, you can still set and use other lighting parameters, such as color, the Multiplier value, the spotlight cone, and so on. Shadow maps are an exception. The mental ray renderer ignores the light's local shadow map settings. Area lights always use ray-traced shadows.

Tip: You can use a MAXScript utility to convert standard 3ds Max light objects to area lights, as described in the Procedures section of the area light topics.

New Light Settings

The *mental ray Indirect Illumination rollout (page 2–1187)* has been added to light objects to support the mental ray renderer's indirect illumination effects of *caustics (page 3–91)* and *global illumination (page 3–92)*.

The *mental ray Light Shader rollout (page 2–1189)* has been added so you can add mental ray light shaders to light objects.

Important: To see the mental ray rollouts for lights, you must use *mental ray Preferences (page 3–867)* to enable mental ray extensions. These rollouts appear only on the Modify panel. They don't appear on the Create panel.

Camera Enhancements

On the *Parameters rollout (page 2–1218)*, a "Depth Of Field (mental ray)" choice has been added to the Multi-Pass Effect drop-down list to support the mental ray renderer's depth-of-field effects. To use this, turn on both Enable in the camera's Multi-Pass Effect group (default=off), and Depth Of Field on the Render Scene dialog > Renderer panel > *Camera Effects rollout (page 3–100)*.

You can also assign mental ray lens, output, and volume shaders to cameras. These controls are also on the Render Scene dialog's Camera Effects rollout. (This rollout also contains some contour-shading controls.)

Note: When you use the mental ray renderer, reflected or refracted light rays do not always respect a camera's clipping planes (set in the Clipping Planes group of the Parameters rollout). Also, large clipping-plane values can cause poor quality in the rendering of shadow maps. To fix this, narrow the clipping range or switch to ray-traced shadows.

Material Editor Enhancements

The Material Editor works as it does with the default scanline renderer. Certain materials and maps, or some of their controls, aren't supported by the mental ray renderer; see *3ds Max Materials in mental ray Renderings (page 3–82)*.

By default, the Material Editor sample slots use the currently active renderer: typically this is either the default scanline renderer or the mental ray renderer. As of 3ds Max you assign the renderer for sample slots by using the Render Scene dialog > Common panel > *Assign Renderer rollout (page 3–34)*.

When mental ray extensions are enabled (using *mental ray Preferences (page 3–867)*) and the mental ray renderer is active, the Material Editor displays these additional mental ray features:

- A *mental ray Connection rollout (page 2–1305)* lets you add mental ray shaders to 3ds Max materials.
- When you click a material's Type button, the Material/Map Browser displays additional *mental ray materials (page 2–1384)*.
- When you click a map or shader button, the Material/Map Browser displays additional *mental ray shaders (page 2–1520)*.

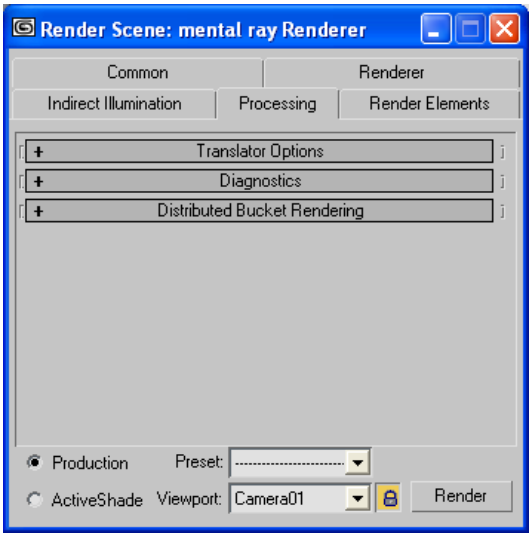
  Shaders are provided in *shader library (MI) files (page 3–1066)*. Some shaders are customized for 3ds Max, some are provided by the lume library, and most are provided by mental images libraries. Settings for the custom 3ds Max shaders are provided in this reference. Settings for the third-party lume and mental images shaders are provided in their own help files. This reference links to those descriptions; see *Shaders in the LumeTools Collection (page 2–1523)* and *mental images Shader Libraries (page 2–1522)*.

Processing Panel (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Processing panel
Main toolbar > Render Scene button > Render Scene dialog > Processing panel
Note: The Processing panel appears only when the mental ray renderer is the currently active renderer.

The Processing panel is an additional *Render Scene dialog (page 3–2)* panel. It appears only when the *mental ray renderer (page 3–77)* is active, and its controls relate to managing how the renderer operates. It also lets you generate diagnostic renderings in pseudo color.

Interface



The Processing panel contains three rollouts:

Translator Options Rollout (mental ray Renderer) (page 3–115)

Diagnostics Rollout (mental ray Renderer) (page 3–120)

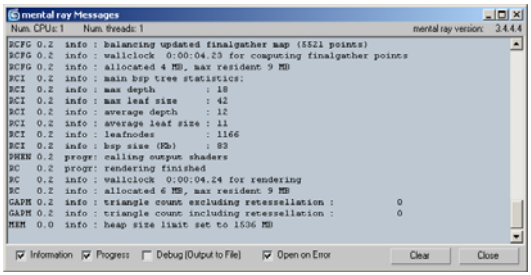
Distributed Bucket Rendering Rollout (mental ray Renderer) (page 3–121)

mental ray Messages Window

Rendering menu > mental ray Message Window

The mental ray Messages window displays log messages (other than debug messages) generated by the mental ray renderer.

Interface



Example of mental ray Messages window

Three status fields appear above the messages area:

- **Num. CPUs**—Shows the number of CPUs in use.
- **Num. threads**—Shows the number of threads being rendered.
- **mental ray version**—Shows the current mental ray renderer version, in detail.

The options beneath the messages area are equivalent to options on the *mental ray Preferences dialog (page 3–867)*.

Information—When on, the mental ray renderer generates information messages. Default=off.

This is equivalent to the preference, Show/Log Information Messages.

Progress—When on, the mental ray renderer generates progress messages. Default=off.

This is equivalent to the preference, Show/Log Progress Messages.

Debug (Output to File)—When on, the mental ray renderer generates debug messages. Default=off.

This is equivalent to the preference, Log Debug Messages (To File).

Note: Debug messages are never displayed by the Messages Window. They are numerous, and would make it difficult to find or read other messages.

Open on Error—When on, the Messages Window is displayed if the mental ray renderer logs an error message. Default=off.

This is equivalent to the preference, Open Message Window On Error.

Clear—Click to clear all messages from the messages area.

mental ray Concepts

These topics describe what the mental ray renderer can do, and explain how it accomplishes these effects. For more technical detail about mental ray capabilities, see the mental ray manual, *Programming mental ray,* and *Rendering with mental ray,* book 1, by Thomas Driemeyer (New York: Springer Verlag, 1999).

See also

Ray-Traced Reflections and Refractions with the mental ray Renderer (page 3–87)

Shadows with the mental ray Renderer (page 3–88)

Motion Blur with the mental ray Renderer (page 3–88)

Depth of Field with the mental ray Renderer (page 3–89)

Caustic Lighting Effects (page 3–91)

Global Illumination with the mental ray Renderer (page 3–92)

mental ray Volume Shading (page 3–93)

mental ray Displacement (page 3–95)

mental ray Contour Shading (page 3–95)

Ray-Traced Reflections and Refractions with the mental ray Renderer

The mental ray renderer can generate reflections and refractions by ray tracing. Ray tracing traces the path of rays sampled from the light source. Reflections and refractions generated this way are physically accurate.

Ray-traced reflections and Refractions

To reduce the time required to generate reflections and shadows, rays are limited by *trace depth*. Trace depth limits the number of times a ray can be reflected, refracted, or both.

You can turn off ray tracing. In this case, the mental ray renderer uses scanline rendering only. Turning off ray tracing makes the controls for all the effects that are specific to mental ray unavailable in the Renderer's rollouts.

Ray tracing uses one of two *ray-trace acceleration methods (page 3–1094).*

You enable ray tracing and set trace depth in the Render Scene dialog > Renderer panel > *Rendering Algorithms rollout (page 3–113).*

Shadows with the mental ray Renderer

The mental ray renderer can generate shadows by ray tracing. Ray tracing traces the path of rays sampled from the light source. Shadows appear where rays have been blocked by objects. Ray-traced shadows have sharp edges.

Ray-traced shadows

Turning off caustics makes the outlines of shadows in this scene easier to see.

You can tell the mental ray renderer to use *shadow maps (page 3–1105)* instead of ray-traced shadows. This can improve performance at a cost of accuracy.

Shadow controls are on the Render Scene Dialog > Renderer panel > *Shadows & Displacement rollout (page 3–111)*.

Shadow Generators and the mental ray Renderer

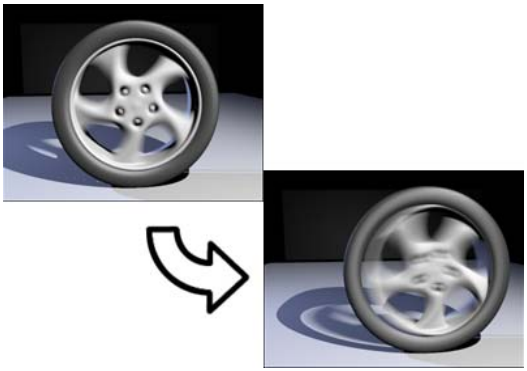
Light objects in 3ds Max let you choose a shadow generator: Ray Traced, Advanced Ray Traced, Shadow Map, and so on. Because the mental ray renderer supports only two kinds of shadow generation, ray tracing and shadow maps, some of the 3ds Max shadow generators aren't fully supported.

In 3ds Max, a special shadow generator type, *mental ray Shadow Map,* is provided to support the mental ray renderer. If shadows are enabled (on the *Shadows & Displacement rollout (page 3–111)* of the Render Scene dialog) but shadow maps are not enabled, then shadows for all lights are generated using the mental ray ray-tracing algorithm. If shadow maps are enabled, then shadow generation is based on each light's choice of shadow generator:

- **mental ray Shadow Map**—Shadows are generated using the mental ray shadow-map algorithm.
- **Shadow Map**—Settings on the Shadow Parameters rollout are translated into a mental ray equivalent before shadows are generated. The quality of shadows generated this way might not always meet expectations.
- **Area Shadows, Advanced Ray Traced Shadows, or Ray Traced Shadows**—Shadows are generated using the mental ray ray-tracing algorithm.

Motion Blur with the mental ray Renderer

Motion blur is a way to enhance the realism of a rendered animation by simulating the way a real-world camera works. A camera has a shutter speed, and if significant movement occurs during the time the shutter is open, the image on film is blurred.



Motion blur added to rendering of an animated wheel as it speeds up and rolls forward

To render motion blur with the mental ray renderer, you must turn on ray tracing (the Ray Trace parameter) on the Render Scene dialog > Renderer panel > *Rendering Algorithms rollout (page 3–113)*.

The mental ray renderer uses a Shutter parameter to control motion blur. This simulates the shutter speed of a camera. At 0.0, there is no motion blurring. At 1.0, the maximum amount of motion blurring occurs. Values between zero and one adjust the amount of motion blur. The closer to 1.0, the greater the blurring.

You turn on motion blur and adjust shutter speed on the Render Scene Dialog > Renderer panel > *Camera Effects rollout (page 3–100)*.

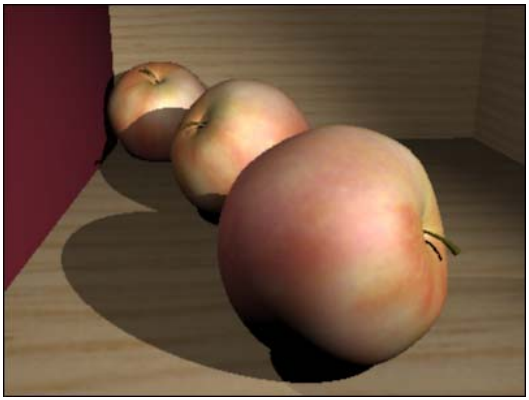
If you render using *shadow maps (page 3–1105)*, then by default mental ray applies motion blur to these as well. See the Render Scene dialog > Renderer panel > *Shadows & Displacement rollout (page 3–111)*.

Tip: mental ray motion blur is not recommended for use with particle systems, as this can increase rendering time considerably. Use a *Particle MBlur map (page 2–1486)* instead.

Note: Motion blur with the mental ray renderer does not always follow curving trajectories. Increasing the value of Motion Segments can help, but this works better for rotary motion than for traveling motion.

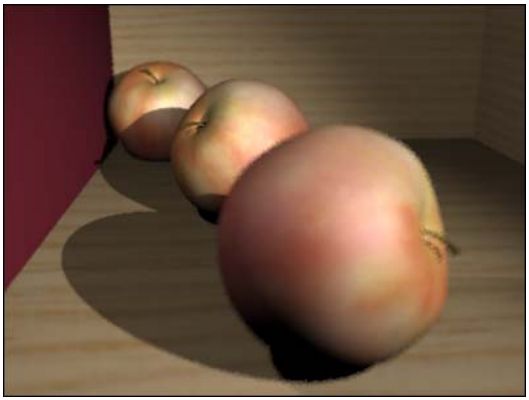
Depth of Field with the mental ray Renderer

Depth of field is a way to enhance the realism of a rendering by simulating the way a real-world camera works. With a broad depth of field, all or nearly all of a scene is in focus. With a narrow depth of field, only objects within a certain distance from the camera are in focus.



Scene rendered using no depth of field

All apples are equally in focus.



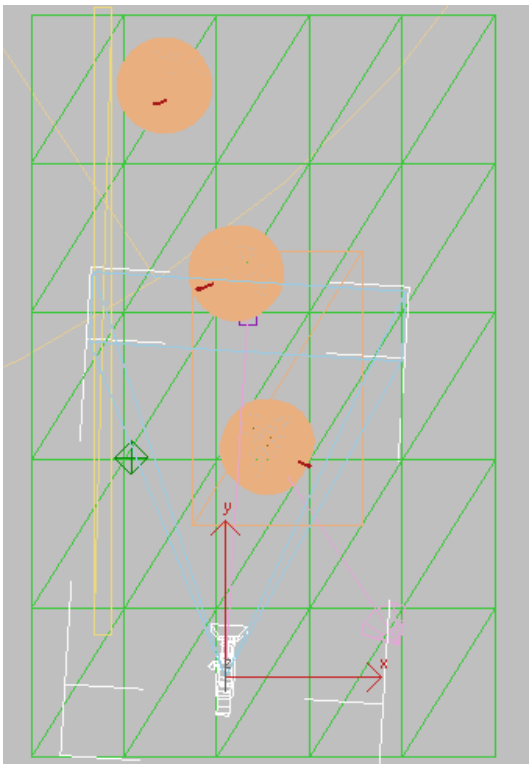
Same scene using depth of field to control focus

The middle apple is clearer than the other two.

To render depth-of-field effects with mental ray, ray tracing (the Ray Trace toggle) must be enabled on the Render Scene dialog > Renderer panel > *Rendering Algorithms rollout (page 3–113)*. You must also enable depth of field for the camera: in the camera's Multi-Pass Effect group, choose "Depth Of Field (mental ray)" as the depth-of-field type. (If you choose the scanline renderer's Depth Of Field option, the rendering that results can be out of focus.)

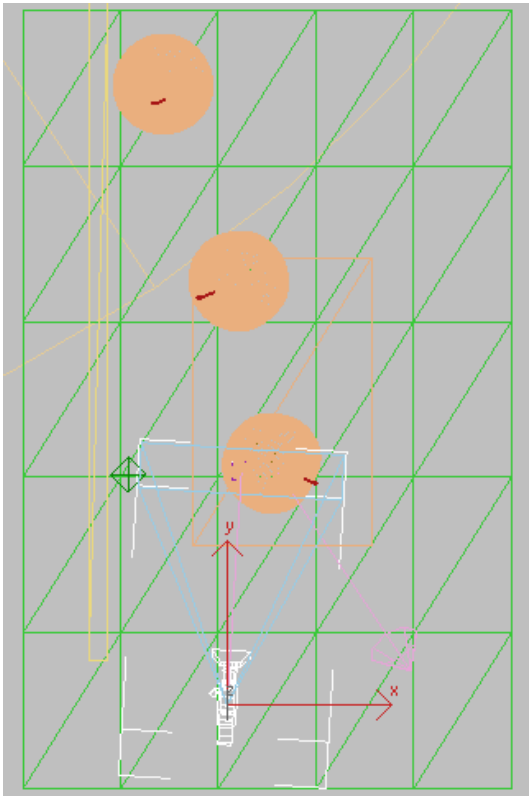
The mental ray renderer uses the camera's target distance and f-Stop parameters to control the depth-of-field effect.

The camera's target distance determines the focus plane. The focus plane is the distance from the camera at which the scene is completely in focus.



Focus plane in relation to a camera

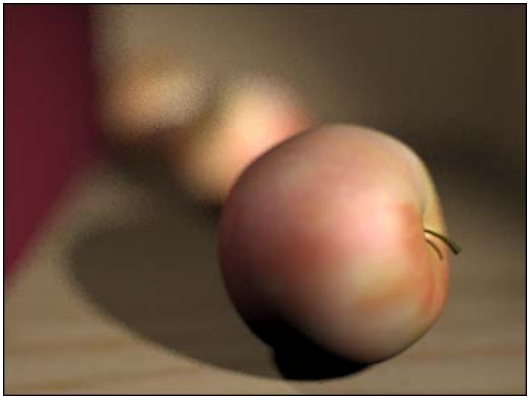
Here it is set to the middle apple, as in the previous renderings.



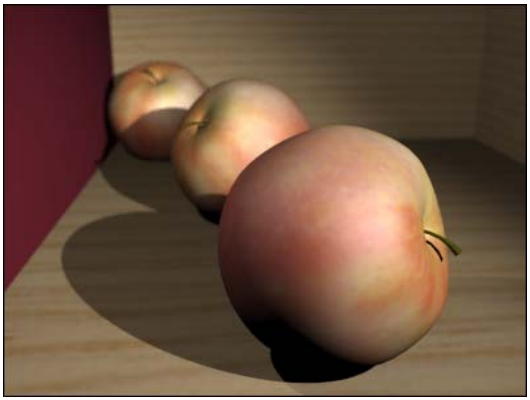
Focus plane in relation to a camera

Here it is set to the nearest apple, as in the renderings that follow.

The f-stop controls the amount of blurring at distances other than the focus plane distance. In a real-world camera, the f-stop measures the size of the lens's aperture. The lower the f-stop value, the larger the aperture and the narrower the depth of field. So increasing the f-stop value broadens the depth of field, and decreasing the f-stop value narrows the depth of field.



Decreasing the f-stop to narrow depth of field
Focal plane set at the nearest apple, and f-stop set to 0.1.



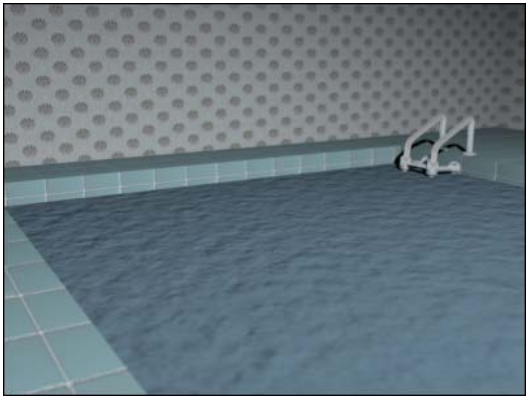
Increasing the f-stop to broaden depth of field
Focal plane in same location, f-stop increased to 1.0.

You set the f-Stop in the camera's Depth Of Field rollout. See *Depth of Field Parameter (mental ray Renderer) (page 2–1227)*.

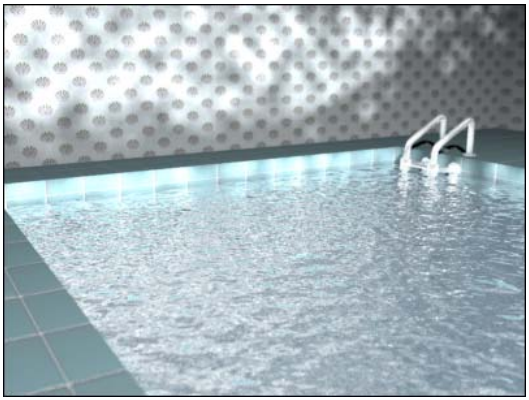
Note: For Perspective viewports, which have no camera, the Render Scene dialog > Renderer panel > *Camera Effects rollout (page 3–100)* has explicit Focus Plane and f-Stop settings.

Caustic Lighting Effects

Caustics are the effects of light cast onto an object via reflection off or refraction through another object.



Swimming pool rendered without caustics



Reflective caustics added to swimming pool

To calculate caustics, the mental ray renderer uses the *photon map technique (page 3–1088)*. (Ray tracing can't generate accurate caustics, and they aren't provided by the default scanline renderer.)

You enable caustics on the Render Scene dialog > Indirect Illumination panel > *Caustics And Global Illumination rollout (page 3–104)*. In addition, you must designate:

- Which light objects can create caustics.
- Which renderable objects can generate caustics.
- Which renderable objects can receive caustics.

The settings for generating and receiving caustics are on the Object Properties dialog > *mental ray Panel (page 1–121)*.

Refractive caustics rendered with the default of Radius turned off.

Radius size is based on scene extents; specifically, 1/100 the radius of the full scene.

Radius value explicitly set to 1.0

Radius value increased to 2.5.

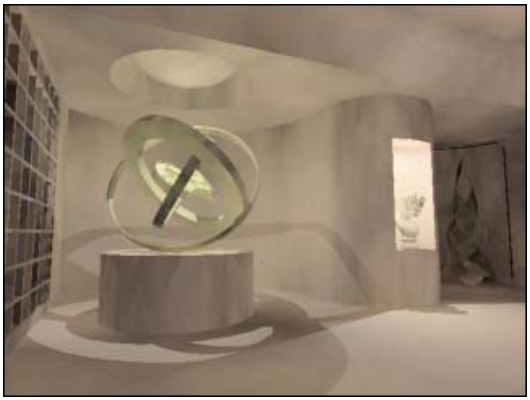
Filter type changed to Cone.

Photon count increased to 50,000 (in Global Light Properties group) for greater detail in the caustics.

Global Illumination with the mental ray Renderer

Global illumination enhances the realism of a scene by simulating radiosity, or the interreflection of light (other than *caustics (page 3–91)*) in a scene. It generates such effects as "color bleeding," where for example, a white shirt next to a red wall will appear to have a slight red tint.

Scene rendered without global illumination



Same scene with global illumination

Global illumination made smoother by final gather

To calculate global illumination, the mental ray renderer uses the *photon map technique (page 3–1088)*.

Important: The mental ray renderer generates global illumination without requiring you to generate a radiosity solution. A photon map is a model of global illumination in its own right.

Using a photon map can cause rendering artifacts such as dark corners and low-frequency variations in the lighting. You can reduce or eliminate these artifacts by turning on *final gathering (page 3–1034)*, which increases the number of rays used to calculate global illumination.

You enable global illumination and final gathering on the Render Scene dialog > Indirect Illumination panel > *Caustics And Global Illumination rollout (page 3–104)*. In addition, you must designate:

- Which light objects can generate global illumination.
- Which renderable objects can generate global illumination.
- Which renderable objects can receive global illumination.

The settings for generating and receiving global illumination are on the Object Properties dialog > *mental ray Panel (page 1–121)*.

mental ray Volume Shading

Volume shading shades a three-dimensional volume, rather than a surface. Typically, volume shaders provide atmospheric effects such as mist and fog.

Model rendered with no volume effect

Same model rendered in mist

Mist applied as a camera volume shader; realistic falloff chosen.

There are two ways to assign a volume shader:

- To a camera

  This effectively makes the entire scene a single volume.

- To a material

  This makes a volume out of objects to which the material is applied.

  Usually when you assign a volume shader to a material, you want to make its surface transparent so the shading within the volume is visible. You can do this with the mental images Transmat shader.

To assign a volume shader to a camera, use the Render Scene dialog. To assign a volume shader to a material, use the material's Volume shader component. This component is found on the *mental ray Connection rollout (page 2–1305)*, and in the *mental ray material (page 2–1385)* itself. See the "Procedures" that follow.

Procedures

To apply volume shading to a camera:

1. Choose Customize > Preferences. Go to the mental ray panel, and turn on Enable Mental Ray Extensions.

2. On the Render toolbar, click Render Scene.

   If the active renderer is not already the mental ray renderer, go to the Common panel, and on the Assign Renderer rollout, click the "..." button for the Production renderer. A Choose Renderer dialog is displayed. Highlight "mental ray Renderer" in the list, and then click OK.

3. Click the Renderer tab to go to the Renderer panel. On the Camera Effects rollout, find the Camera Shaders group, and click Volume.

   The *Material/Map Browser (page 2–1256)* is displayed.

4. Choose a volume shader from the list in the Browser, and then click OK.

To apply volume shading to an object:

1. Choose Customize > Preferences. Go to the mental ray panel, and turn on Enable Mental Ray Extensions.

2. On the Render toolbar, click Render Scene.

   If the active renderer is not already the mental ray renderer, go to the Common panel, and on the Assign Renderer rollout, click the "..." button for the Production renderer. A Choose Renderer dialog is displayed. Highlight "mental ray Renderer" in the list, and then click OK.

   Leave the Render Scene dialog open, or minimize it.

3. Open the Material Editor. Use the *mental ray Connection rollout (page 2–1305)* to assign a volume shader to the Volume component.

   Another technique would be to use the *mental ray material (page 2–1385)*, and assign a shader to the Volume component.

4. Also on the mental ray Connection rollout, click to unlock the Surface component. Click the button and use the Browser to assign the Transmat (Physics) shader to the surface.

   (If you are using the mental ray material, you don't need to first unlock the Surface component.)

5. Apply the material to objects you wish to use as shaded volumes.

mental ray Displacement

Displacement shading with the mental ray renderer is similar to *displacement mapping (page 2–1352)* of standard materials. One advantage of using mental ray displacement is that the additional polygons of displaced surfaces are stored only in the mental ray scene database, not in your 3ds Max scene, so they do not increase the memory requirements of your scene, except at render time. This can be a big improvement in performance over displacement mapping with standard materials and the scanline renderer.

Procedure

To add displacement to a mental ray rendering:

1. Choose Customize > Preferences. Go to the mental ray panel, and turn on Enable Mental Ray Extensions.

2. On the Render toolbar, click Render Scene.

   If the active renderer is not already the mental ray renderer, go to the Common panel, and on the Assign Renderer rollout, click the "..." button for the Production renderer. A Choose Renderer dialog is displayed. Highlight "mental ray Renderer" in the list, and then click OK.

   Leave the Render Scene dialog open, or minimize it.

3. Open the Material Editor. For the materials of objects you want to render with displacement, use the *mental ray Connection rollout (page 2–1305)* to assign a shader to the Displacement component.

   Another technique would be to use the *mental ray material (page 2–1385)*, and assign shaders to both the Surface and Displacement components.

4. Open the Material Editor.

5. On the mental ray Connection rollout, click to unlock the Displacement component. Click the button and use the Browser to assign a displacement shader to the surface.

   Warning: This overrides any displacement assigned to the base material as a standard map.

   Another technique would be to use the *mental ray material (page 2–1385)*, and assign a shader to the Displacement component. (If you are using the mental ray material, you don't need to first unlock the Displacement component.)

6. Apply the material to objects you wish to show the displacement.

mental ray Contour Shading

Contour shading lets you render vector-based contour lines. Contours are similar to the ink component of the Ink 'n Paint material.

Model rendered without contours

Model with contours added to the rendering
Simple contour shader

You add contour rendering by assigning one of the contour shaders to the Contour component of a material. (This component is found on the *mental ray Connection rollout (page 2–1305)* and on the mental ray material's *Advanced Shaders rollout (page 2–1388)*). Then when you render, use the *Camera Effects rollout (page 3–100)* to enable contours.

On the Camera Effects rollout, additional shaders can modify the contours, or control how they are rendered. For example, if you assign a Contour Only shader to the Contour Output component, the rendering consists of just the contours, and not the shaded model.

Rendering of the model's contours only
Contours Only output shader, background set to white

Note: Contour shading does not work with distributed bucket rendering.

Procedure

To add contours to a mental ray rendering:

1. Choose Customize > Preferences. Go to the mental ray panel, and turn on Enable Mental Ray Extensions.
2. On the Render toolbar, click Render Scene.

   If the active renderer is not already the mental ray renderer, go to the Common panel, and on the Assign Renderer rollout, click the "..." button for the Production renderer. A Choose Renderer dialog is displayed. Highlight "mental ray Renderer" in the list, and then click OK.

   Leave the Render Scene dialog open, or minimize it.
3. Open the Material Editor. For the materials of objects you want to render with contours, use the *mental ray Connection rollout (page 2–1305)* to assign a shader to the Contour component.

Another technique would be to use the *mental ray material (page 2–1385)*, and assign shaders to both the Surface and Contour components.

Tip: The Simple contour shader renders uniform lines whose color and width you can control. The other contour shaders provide variant contour styles with more direct user controls.

4. On the Render Scene dialog, go to the Renderer panel. On the Camera Effects rollout, turn on Enable in the Contours group.

   To simply add contour lines to a rendering, leave the shaders in the Camera Effects rollout set to their defaults. For other options, see *Camera Effects Rollout (mental ray Renderer) (page 3–100)*.

mental ray Renderer Rollouts

Sampling Quality Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Renderer panel > Sampling Quality rollout
Main toolbar > Render Scene > Render Scene dialog > Renderer panel > Sampling Quality rollout
Note: The Renderer panel appears only when the mental ray renderer is the currently active renderer.

The controls in this rollout affect how the mental ray renderer performs *sampling (page 3–1099)*.

Procedures

To use low sampling for previews:

- Leave the Minimum and Maximum values at their default settings of 1/4 and 4, or reduce them to 1/16 and 1/4.

  Tip: Do not assign Minimum and Maximum the same value.

To use high sampling for final renderings:

- Increase the Minimum and Maximum values to 4 and 16, respectively, or to higher values.

  Tip: Do not assign the same value to both Minimum and Maximum.

To view the pattern of sampling:

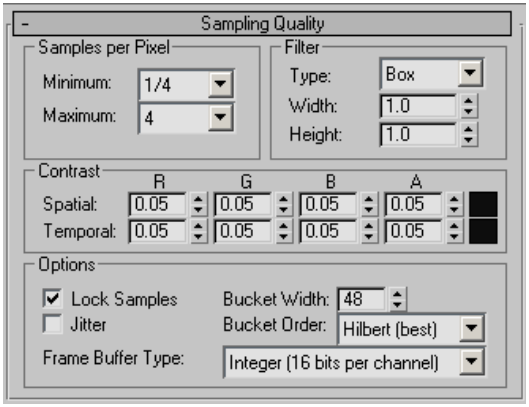
- On the *Diagnostics rollout (page 3–120)*, choose Sampling Rate, then render the scene.

  Instead of rendering the image, mental ray draws a diagram that shows the range of applied sampling values. White lines indicate edges in the scene, where the mental ray renderer took the maximum number of samples. If fractional sample limits are used (sampling down), lighter dots indicate the higher value while darker dots indicate the lower value.

  To assist with analysis, View Samples also draws red lines around each bucket, or separately rendered block.

  When the Minimum and Maximum number of samples are equal, the diagram shows all buckets as white.

Interface



Samples per Pixel group

Set the minimum and maximum sample rate.

Minimum—Sets the minimum sample rate. The value represents the number of samples per pixel. A value greater than or equal to 1 indicates that one or more samples are computed per pixel. A fractional value indicates that one sample is computed for every N pixels (for example, 1/4 computes a minimum of one sample for every four pixels). Default=1/4.

Maximum—Sets the maximum sample rate. If neighboring samples find a difference in contrast that exceeds the contrast limit, the area containing the contrast is subdivided to the depth specified by Maximum. Default=4.

The values of the Minimum and Maximum lists are "locked" together so that the value of Minimum can't exceed the value of Maximum.

Filter group

Filter type—Determines how multiple samples are combined into a single pixel value. Can be set to Box, Gauss, Triangle, Mitchell, or Lanczos. Default=Box.

Tip: For most scenes the Mitchell filter gives the best results.

- Box filter: Sums all samples in the filter area with equal weight. This is the quickest sampling method.
- Gauss filter: Weights the samples using a Gauss (bell) curve centered on the pixel.
- Triangle filter: Weights the samples using a pyramid centered on the pixel.
- Mitchell filter: Weights the samples using a curve (steeper than Gauss) centered on the pixel.
- Lanczos filter: Weights the samples using a curve (steeper than Gauss) centered on the pixel, diminishing the effect of samples at the edge of the filter area.

Width and Height—Specify the size of the filtered area. Increasing the value of Width and Height can soften the image, however it will increase rendering time.

Default=Depends on the Filter type you choose:

- Box filter: Width=1.0, Height=1.0
- Gauss filter: Width=3.0, Height=3.0
- Triangle filter: Width=2.0, Height=2.0
- Mitchell filter: Width=4.0, Height=4.0
- Lanczos filter: Width=4.0, Height=4.0

Contrast group

These controls set the contrast values used as thresholds to control sampling. Spatial contrast applies to each still image. Temporal contrast applies to *motion blur (page 3–88)*.

Spatial—If neighboring samples in a frame differ by more than this color, the mental ray renderer does recursive supersampling (that is, more than one sample per pixel), up to the depth specified by Maximum, above. Increasing the Spatial contrast values decreases the amount of sampling done, and can speed the rendering of a scene at the cost of image quality.

- **R, G, B**—Specify the threshold values for the red, green, and blue components of samples. These values are normalized, and range from 0.0 to 1.0, where 0.0 indicates the color component is fully unsaturated (black, or 0 in eight-bit encoding) and 1.0 indicates the color component is fully saturated (white, or 255 in eight-bit encoding). Default=(0.051, 0.051, 0.051).
- **A**—Specifies the threshold value for the alpha component of samples. This value is normalized, and ranges from 0.0 (fully transparent, or 0 in eight-bit encoding) to 1.0

(fully opaque, or 255 in eight-bit encoding). Default=0.05.

- **Color swatch**—Click to display a *Color Selector (page 1–157)* to let you interactively specify the R, G, and B threshold values.

  Note: The spinners in the Color Selector show the eight-bit values for color components, which range from 0 to 255, rather than the normalized values used in the Sampling Quality rollout, which range from 0.0 to 1.0.

Temporal—If samples from frame to frame differ by more than this color, the mental ray renderer does recursive supersampling, up to the depth specified by Maximum, above. Decreasing the Temporal contrast values increases the amount of sampling done, and can improve the quality of motion blur at the cost of rendering time.

Tip: If motion blur appears grainy, decrease the RGB value of the Temporal contrast color.

- **R, G, B, A, and color swatch**—These controls are the same for the Temporal threshold as they are for the Spatial threshold.

Options group

Lock Samples—When on, the mental ray renderer uses the same sampling pattern for every frame of an animation. When off, the mental ray renderer introduces a quasi-random (Monte Carlo) variation in the sample pattern from frame to frame. Default=on.

Varying the sample pattern reduces rendering artifacts in animations.

Jitter—Introduces a variation into sample locations; see *Sampling (page 3–1099)*. Turning on Jitter can help reduce aliasing. Default=off.

Bucket Width—To render the scene, the mental ray renderer subdivides the image into buckets. The smaller the bucket size, the more image updates are generated during rendering. Updating the image consumes a certain amount of CPU cycles. For scenes with little complexity, smaller buckets can increase the rendering time, while larger buckets can make things render faster. For more complex scenes, the reverse is true. Default=48 pixels.

Bucket Order—Lets you specify the method by which mental ray chooses the next bucket. If you are using placeholders or distributed rendering, you should always use the default Hilbert order. Otherwise, you can choose a method based on how you prefer to see the image appear as it renders in the Rendered Frame Window.

- **Hilbert (best)**—(The default.) The next bucket chosen is the one that will trigger the fewest data transfers.

  Tip: Always use Hilbert order when you use placeholders (see the *Translator Options rollout (page 3–115)*) or distributed rendering (see the *Distributed Bucket Rendering rollout (page 3–121)*).

- **Spiral**—The buckets begin at the center of the image, and spiral outward.
- **Left to right**—Buckets are rendered in columns, from bottom to top, left to right.
- **Right to left**—Buckets are rendered in columns, from bottom to top, right to left.
- **Top-down**—Buckets are rendered in rows, from right to left, top to bottom.
- **Bottom-up**—Buckets are rendered in rows, from right to left, bottom to top.

Frame Buffer Type—Lets you choose the bit depth of the output frame buffer:

- **Integer (16 bits per channel)**—Outputs 16 bits per channel of color information. This is the default output format, and was the only available method prior to 3ds Max 8.
- **Floating-Point (32 bits per channel)**—Outputs 32 bits per channel of color information.

This method supports high-dynamic-range imagery.

Camera Effects Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Renderer panel > Camera Effects rollout

Main toolbar > Render Scene > Render Scene dialog > Renderer panel > Camera Effects rollout

Note: The Renderer panel appears only when the mental ray renderer is the currently active renderer.

The controls in this rollout are for the camera effects *depth of field (page 3–89)* and *motion blur (page 3–88)*, as well as for *contour shading (page 3–95)* and adding camera shaders.

Procedures

To use depth of field for a Camera view:

1. On the camera's Parameters rollout, in the Multi-Pass Effect group, turn on Enable and choose "Depth Of Field (mental ray)."
2. Set the camera's target distance to the range at which you want objects to be clearly in focus.

   For a Target camera, you can select the camera's target object and move it. For a Free camera, you adjust the Target Distance on the Parameters rollout.
3. On the Camera's Depth Of Field rollout, decrease the f-Stop value to narrow the depth of field, or increase the f-Stop value to broaden the depth of field.

   You might need to experiment with f-Stop values to get the effect you want.
4. Render the scene.

To use depth of field for a Perspective view:

1. On the Render Scene dialog, go to the Renderer panel > Camera Effects rollout, and in the Depth Of Field (Perspective Views Only) group, turn on Enable.
2. Set the Focus Plane distance to the range at which you want objects to be clearly in focus.
3. Decrease the f-Stop value to narrow the depth of field, or increase the f-Stop value to broaden the depth of field.

   You might need to experiment with f-Stop values to get the effect you want. If you have trouble getting good results with f-Stop, use the drop-down list to change the method to In Focus Limits, then adjust the Near and Far values to enclose the region of the scene you want to be clearly in focus.
4. Render the scene.

To use motion blur:

1. Select each object you want to be blurred by motion, right-click and choose Properties, then on the Object Properties dialog > General panel, make sure that in the Motion Blur group, Enable is turned on and Object is chosen.

   The mental ray renderer won't generate motion blur if Image is the chosen type.
2. On the Render Scene dialog, go to the Renderer panel > Camera Effects rollout, and in the Motion Blur group turn on Enable.

   Note: With the mental ray renderer, don't use Motion Blur under the Multi-Pass Effect group of a camera's Parameters rollout.
3. Increase the Shutter value to increase the blurriness caused by motion blur.
4. On the Render Scene dialog, go to the Rendering Algorithms rollout, and make sure Ray Trace is turned on.

   Motion blur is not rendered when the mental ray renderer uses scanlines only.
5. Render the scene.

To render with contours:

1. Use the mental ray Connection rollout to assign a contour shader to an object's material.

   The mental ray material also lets you assign a contour shader.

2. On the Render Scene dialog > Renderer panel > Camera Effects rollout, in the Contours group, turn on Enable.

3. Change the contour output shader if you so desire.

   Note: By default, only one contour contrast and store shader are provided with 3ds Max. You can adjust the contour contrast shader's settings; the contrast store shader has no parameters.

4. Render the scene.

To change a contour output shader:

Note: By default, only one contour contrast and store shader are provided with 3ds Max. You can adjust the contour contrast shader's settings; the contour store shader has no parameters.

1. Click the button for the Contour Output shader.

   The Material/Map Browser is displayed.

2. Choose a contour output shader from the Browser list, and then click OK.

To assign a camera shader:

1. Click the button for a camera Lens, Output, or Volume shader.

   The Material/Map Browser is displayed.

2. Choose a shader from the Browser list, and then click OK.

To adjust the settings for a contour or camera shader assigned on this rollout:

1. Open the Material Editor.

   If you need to, arrange the open dialogs so you can see the Material Editor and the Render Scene dialog at the same time.

2. Drag the shader button from the Render Scene dialog to an unused sample slot in the Material Editor.

   An Instance (Copy) Map dialog is displayed. *Be sure to choose Instance,* and then click OK.

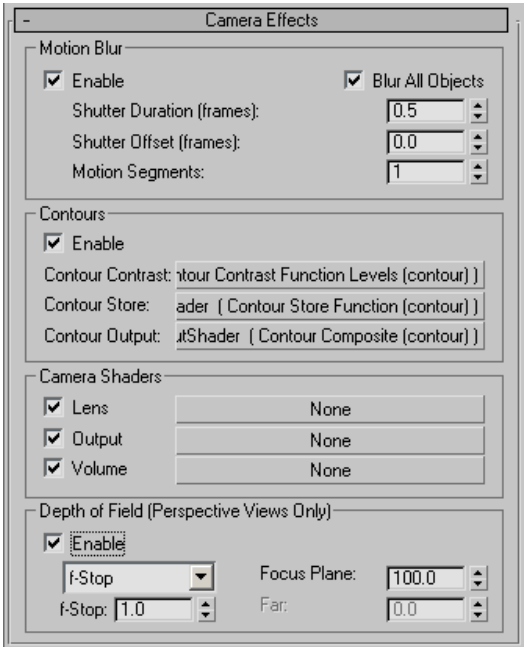
   If you don't choose Instance, changes you make to the shader settings in the Material Editor won't have any effect on the Render Scene dialog.

   Tip: If you forgot to choose Instance, change the shader settings as you choose, and then drag the shader's sample slot or its Type button back to the button in the Render Scene dialog, to update the Render Scene dialog's copy of the shader.

   The Material Editor displays the shader's parameters rollout.

3. Adjust the parameters.

Interface



Motion Blur group

Tip: mental ray motion blur is not recommended for use with particle systems, as this can increase rendering time considerably. Use a *Particle MBlur map (page 2–1486)* instead.

Note: Motion blur with the mental ray renderer does not always follow curving trajectories. Increasing the value of Motion Segments can help, but this works better for rotary motion than for traveling motion.

The Toggle (lower-right) quad of the rendering quad menu (CTRL+ALT+right-click) has a Motion Blur toggle that lets you turn on motion blur for selected objects. You can turn on Motion Blur for lights and cameras: moving lights and cameras can generate motion blur when rendered with mental ray.

Enable—When on, the mental ray renderer calculates *motion blur (page 3–88)*. Default=off.

Blur All Objects—Applies motion blur to all objects, regardless of their object property setting. Default=on.

Shutter Duration (frames)—Simulates the shutter speed of a camera. At 0.0, there is no motion blurring. The greater the Shutter Duration value, the greater the blurring. Default=0.5.

Shutter Offset (frames)—Sets the beginning of the motion-blur effect relative to the current frame. The default value, 0.0, centers the blurring around the current frame for a photorealistic effect. Default=0.0.

Motion Segments—Sets the number of segments for calculating motion blur. This control is for animations. If motion blur appears to be tangential to the actual motion of an object, increase the Motion Segments value. Larger values result in more accurate motion blur, at a cost of rendering time. Default=1.

Contours group

These controls enable contours, and let you use shaders to adjust the results of a contour shader. You assign the primary contour shader to the Contour component of the *mental ray Connection rollout (page 2–1305)* or a mental ray material (see *Advanced Shaders Rollout (mental ray Material) (page 2–1388)*).

Note: Contour shading does not work with distributed bucket rendering.

Enable—When on enables rendering of contours. Default=off.

Click a button to change a shader assignment for adjusting contours. A default is already assigned to the three components, as the button labels indicate.

Contour Contrast—The contour contrast component can be assigned the following shader:

Shader	Library
Contour Contrast Function Levels	contour

Contour Store—This component stores the data on which contours are based. It can be assigned the following shader, which has no parameters to set:

Shader	Library
Contour Store Function	contour

Contour Output—The contour output component can be assigned one of these shaders:

Shader	Library
Contour Composite	contour
Contour Only	contour
Contour PS (PostScript)	contour

To adjust the settings for a shader assigned to one of these components, drag the shader's button to an unused Material Editor sample slot. *Be sure to choose Instance* when prompted to use an instance or a copy. (If you edit a copy of the shader, you will have to drag the sample slot back to the shader button on the Camera Effects rollout before you see any changes take effect.)

Camera Shaders group

These controls let you assign mental ray camera shaders. Click a button to assign a shader to that component. After a shader is assigned, its name appears on the button. Use the toggle on the left to temporarily disable a shader that has been assigned.

Lens—Click to assign a lens shader. This component can be assigned one of these shaders:

Shader	Library
Distortion	lume
Night	lume
Shader List (page 2–1533)	3ds Max
Wrap Around	lume

Output—Click to assign a camera output shader.

Warning: No camera output shaders are provided with 3ds Max. This option is provided for users who have access to camera shaders via other shader libraries or custom shader code.

Volume—Click to assign a volume shader to the camera. These are the volume shaders you can assign:

Shader	Library
Beam	lume
Material to Shader (page 2–1533)	3ds Max
Mist	lume
Parti Volume	physics
Shader List (page 2–1533)	3ds Max
Submerge	lume

Note: You can also assign Volume shaders to the Volume component of the *mental ray Connection rollout (page 2–1305)* and the mental ray material (see *Material Shaders Rollout (mental ray Material) (page 2–1385)*).

Depth of Field (Perspective Views Only) group

These controls are comparable to the depth-of-field controls for cameras. They apply only to Perspective viewports. You can render depth-of-field effects for either Camera or Perspective views. Depth-of-field effects don't appear when you render orthographic viewports.

For a Perspective view, use the controls in this group. For a Camera view, choose "Depth Of Field (mental ray)" as the multi-pass rendering effect, then adjust the f-Stop setting. See *Depth of Field Parameter (mental ray Renderer) (page 2–1227)*.

Enable—When on, the mental ray renderer calculates *depth-of-field (page 3–89)* effects when rendering a Perspective view. Default=off.

Method drop-down list—Selects either f-Stop, for controlling depth-of field by an f-Stop parameter, or In Focus Limits, by selecting Near and Far limits. Default=f-Stop.

In most cases, the f-Stop method is easier to use. The In Focus Limits method can help when the scale of objects in the scene makes it hard to control depth of field using the f-Stop value alone.

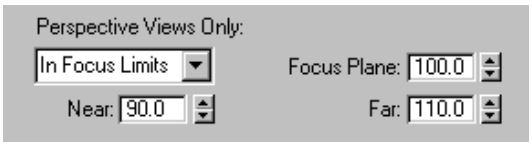
Focus Plane—For Perspective viewports, sets the distance from the camera, in 3ds Max units, at which the scene is completely in focus. Default=100.0.

For Camera viewports, the focus plane is set by the camera's target distance.

f-Stop—When f-Stop is the active method, sets the f-stop for use when you render Perspective views. Increasing the f-stop value broadens the depth of field, and decreasing the f-stop value narrows the depth of field. Default=1.0.

The f-Stop can have a value less than 1.0. This is not realistic in terms of an actual camera, but it can help you adjust the depth of field for scenes whose scale does not use realistic units.

Near and Far—When In Focus Limits is the active method, these values set the range, in 3ds Max units, within which objects are in focus. Objects lose focus when they are closer than the Near value or farther than the Far value. These values are approximate, because the transition from in-focus to out-of-focus is gradual, not abrupt.



The Near and Far values are related to each other and to the value of Focus Plane. Changing the value of Near changes Far as well, and vice versa. Specifically, if

H = Hyperfocal distance, the Focus Plane value at which the Far limit becomes infinity

D = The Focus Plane distance

D_n = The Near distance

D_f = The Far distance

Then

$D_n = HD / (H + D)$

$D_f = HD / (H - D)$

Caustics and Global Illumination Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Indirect Illumination panel > Caustics and Global Illumination rollout

Main toolbar > Render Scene > Render Scene dialog > Indirect Illumination panel > Caustics and Global Illumination rollout

Note: The Indirect Illumination panel appears only when the mental ray renderer is the currently active renderer.

The controls in this rollout are for the effects of *caustics (page 3–91)* and *global illumination (page 3–92)*.

Procedures

To render with caustics:

1. Select each object you want to generate caustics, either by reflection or refraction. Right-click and choose Properties, then on the mental ray panel of the Object Properties dialog, turn on Generate Caustics.

   Objects receive caustics by default. If you think this value might have changed for the objects you want to receive caustics, use those objects'

Object Properties dialog to make sure Receive Caustics is turned on. Also, to speed rendering time, you might want to turn off Receive Caustics for those objects that don't need to show them.

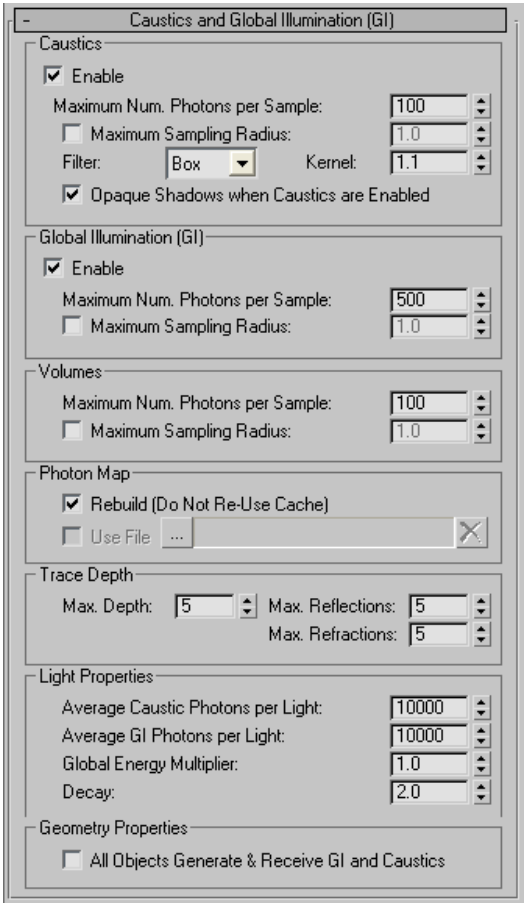
2. In the Render Scene dialog, go to the Caustics And Global Illumination rollout and turn on Caustics.
3. Adjust the caustics parameters to get the effect you want.
4. Render the scene.

To render with global illumination:

1. Select each object you want to generate global illumination. Right-click and choose Properties, then on the mental ray panel of the Object Properties dialog, turn on Generate Global Illumination.

   Objects receive global illumination by default. If you think this value might have changed for the objects you want to receive global illumination, use those objects' Object Properties dialog to make sure Receive Global Illumination is turned on. Also, to speed rendering time, you might want to turn off Receive Global Illumination for those objects that don't need it.
2. In the Render Scene dialog, go to the Indirect Illumination panel > Caustics And Global Illumination rollout and turn on Global Illumination.
3. Adjust the global illumination parameters to get the effect you want.
4. For the final rendering, turn on Final Gather as well as Global Illumination. See *Final Gather Rollout (mental ray Renderer) (page 3–109)*.
5. Render the scene.

Interface



Caustics group

Important: For caustics to render, you must also make sure to set up these other conditions in your scene:

- At least one object must be set to generate caustics.
- At least one object must be set to receive caustics.
- At least one light must be set to generate caustics.

The settings for generating and receiving caustics are on the Object Properties dialog > *mental ray Panel (page 1–121)*.

Enable—When on, the mental ray renderer calculates caustic effects. Default=off.

Maximum Num. Photons per Sample—Sets how many photons are used to compute the intensity of the caustic. Increasing this value makes caustics less noisy but also more blurry. Decreasing this value makes caustics more noisy but less blurry. The larger the Samples value, the greater the rendering time. Default=100.

Tip: To preview a caustic, set Samples to 20, then increase the value for a final rendering.

Maximum Sampling Radius—When on, the spinner value sets the size of photons. When off, each photon is calculated to be 1/100 of the radius of the full scene. Maximum Sampling Radius default=off; spinner default=1.0.

In many cases, the default photon size (Radius=off) of 1/100 the scene size gives useful results. In other cases, the default photon size might be too large or too small.

When photon reflections overlap, the mental ray renderer uses sampling to smooth them together. Increasing the number of samples increases the amount of smoothing and can create more natural-looking caustics. When photons have a small radius and don't overlap, the Samples setting has no effect. Low Radius values with a large number of photons result in dotty caustics.

Filter—Sets the filter to use for sharpening caustics. Can equal Box, Cone, or Gauss. The Box option requires less rendering time. The Cone option makes caustics appear sharper. Default=Box.

The Gauss filter uses a Gauss (bell) curve, and can be smoother than the Cone filter.

Kernel—Controls the sharpness of caustics when you choose Cone as the caustic filter. This value must be greater than 1.0. Increasing the Kernel value makes caustics more blurry. Decreasing the Kernel value makes caustics sharper, but also slightly more noisy. Default=1.1.

Opaque Shadows when Caustics Are Enabled—When on, shadows are opaque. When off, shadows can be partially transparent. Default=on.

Opaque shadows render more quickly than transparent shadows.

Global Illumination (GI) group

Enable—When on, the mental ray renderer calculates *global illumination (page 3–92)*. Default=off.

Maximum Num. Photons per Sample—Sets how many photons are used to compute the intensity of the global illumination. Increasing this value makes global illumination less noisy but also more blurry. Decreasing this value makes global illumination more noisy but less blurry. The larger the Samples value, the greater the rendering time. Default=500.

Tip: To preview global illumination, set Samples to 100, then increase the value for a final rendering.

Maximum Sampling Radius—When on, the spinner value sets the size of photons. When off, each photon is calculated to be 1/10 of the radius of the full scene. Maximum Sampling Radius default=off; spinner default=1.0.

In many cases, the default photon size (Maximum Sampling Radius=off) of one-tenth the scene size gives useful results. In other cases, the default photon size might be too large or too small.

When photons overlap, the mental ray renderer uses sampling to smooth them together. Increasing the number of samples increases the amount of smoothing and can create more natural-looking caustics. When photons have a small radius and don't overlap, the Samples setting has no effect. For global illumination, photons should overlap.

To get good results, you might need to turn on Maximum Sampling Radius and increase the photon size.

Volumes group

The controls in this group and the ones that follow are for the *photon maps (page 3–1088)* used to calculate caustics and global illumination. This group controls volumetric caustics. Volumetric caustics require a material to have a volume shader assign to its Photon Volume component.

Maximum Num. Photons per Sample—Sets how many photons are used to shade the volume. Default=100.

Maximum Sampling Radius—When the check box is on, the spinner sets the size of photons. When off, each photon is calculated to be one-tenth the size of the *scene extents (page 3–1101)*. Default: check box=off; value=1.0.

This spinner is unavailable if the check box is turned off.

Photon Map group

These controls tell mental ray how to calculate the photon map for indirect illumination.

Rebuild (Do Not Re-Use Cache)—If Rebuild is turned on, the renderer saves the recalculated photon map to the file specified by the Browse button. Default=on.

- **Use File**—When on, the mental ray renderer either saves the photon map to a *.pmap file (page 3–1089)*, or loads an existing file. The state of Rebuild determines whether the *.pmap* file is saved or loaded.

  This option is unavailable unless you click Browse ("...") to provide a name for the *.pmap* file.

- **Browse ("...")**—Click to display a file selector dialog, which lets you specify a name for the photon map (*.pmap)* file, and the folder where it is saved.

- **File name**—When you have used the Save button to specify a photon map file, the name field displays its name and path.

- **Delete File**—Click to delete the current *.pmap* file.

Trace Depth group

The Trace Depth controls are similar to those for calculating reflections and refractions, but they refer to the photons used by caustics and global illumination, rather than to light rays used in diffuse reflection and refraction.

Max. Depth—Limits the combination of reflection and refraction. Reflection and refraction of a photon stop when the total number of both equals the Maximum Depth setting. For example, if Maximum Depth equals 3 and the trace depths each equal 2, a photon can be reflected twice and refracted once, or vice versa, but it can't be reflected and refracted four times. Default=5.

Max. Reflections—Sets the number of times a photon can be reflected. At 0, no reflection occurs. At 1, the photon can be reflected once only. At 2, the photon can be reflected twice, and so on. Default=5.

Max. Refractions—Sets the number of times a photon can be refracted. At 0, no refraction occurs. At 1, the photon can be refracted once only. At 2, the photon can be refracted twice, and so on. Default=5.

Light Properties group

Controls in this group affect how lights behave when calculating indirect illumination. By default, the energy and photon settings apply to all lights in a scene. Use the *mental ray Indirect Illumination rollout (page 2–1187)* for light objects to adjust an individual light either by multiplying the global

values, or by setting local values (using multipliers is the recommended method).

Average Caustic Photons per Light—Sets the number of photons emitted by each light for use in caustics. This is the number of photons in the *photon map (page 3–1088)* used for caustics. Increasing this value increases the accuracy of caustics, but also increases the amount of memory used and the length of render time. Decreasing this value improves memory usage and render time, and can be useful for previewing caustic effects. Default=10000.

Average GI Photons per Light—Sets the number of photons emitted by each light for use in global illumination. This is the number of photons in the photon map used for global illumination. Increasing this value increases the accuracy of global illumination, but also increases the amount of memory used and the length of render time. Decreasing this value improves memory usage and render time, and can be useful for previewing global-illumination effects. Default=10000.

Global Energy Multiplier—Sets the energy of each light. Energy, or "flux," is the amount of light used in indirect illumination. Each photon carries a fraction of each light's energy. This value is independent of the light intensity determined by the light's color and Multiplier, so you can use the Global Energy Multiplier value to fine-tune indirect illumination effects without changing the light's other effects in a scene (such as providing diffuse illumination). Default=1.0.

Decay—Specifies how photon energy decays as it moves away from each light source. This value is given by $1/(distance^{decay})$, where *distance* is the distance between the light source and an object, and *decay* is the value of this setting. Default=2.0.

The most common values are:

- **0.0**—The energy doesn't decay, and photons can provide indirect illumination throughout the scene.
- **1.0**—The energy decays at a linear rate, proportionally to its distance from the light. That is, a photon's energy is $1/distance$, where *distance* is the distance from the light source.
- **2.0**—(The default.) The energy decays at an inverse square rate. That is, a photon's energy is the inverse of the square of the distance from the light source: $1/distance^2$.

In the real world, light decays at an inverse square rate (Decay=2.0), but this gives strictly realistic results only if you provide a realistic value for the energy of the light. Other values of Decay can help you adjust indirect illumination without worrying about physical accuracy.

Note: Decay values less than 1.0 are not recommended, and can cause rendering artifacts.

Geometry Properties group

All Objects Generate & Receive GI and Caustics—When on, at rendering time, all objects in the scene can generate and receive caustics and global illumination, regardless of their local object properties settings. When off, an object's local object properties determine whether it generates or receives caustics or global illumination. Turning this on is an easy way to ensure that caustics and global illumination are generated, though it can increase rendering time. Default=off.

This setting does *not alter* the object's local object properties settings for mental ray. When you turn off All Objects Generate & Receive GI And Caustics, the prior object properties settings are in effect once again.

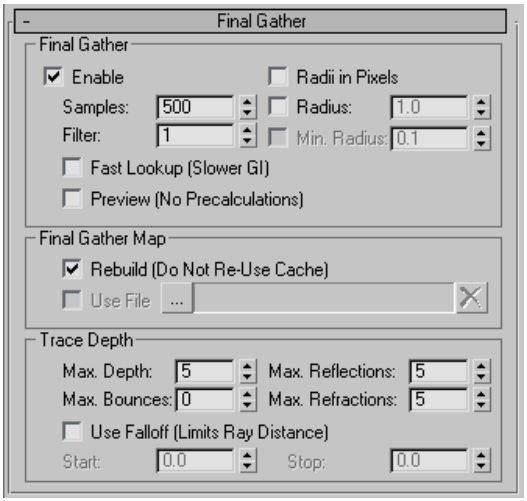
Final Gather Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Indirect Illumination panel > Final Gather rollout

Main toolbar > Render Scene > Render Scene dialog > Indirect Illumination panel > Final Gather rollout

Note: The Indirect Illumination panel appears only when the mental ray renderer is the currently active renderer.

Interface



Final Gather group

Enable—When on, the mental ray renderer uses *final gathering (page 3–1034)* to improve the quality of global illumination. Default=off.

Tip: Without final gathering, global illumination can appear to be patchy. But final gathering increases rendering time. Leave Final Gather off to preview the scene, then turn it on for the finished rendering. (Increasing the number of photons used to calculate global illumination can also improve global illumination.)

Samples—Sets how many rays are used to compute indirect illumination in a final gather. Increasing this value makes global illumination less noisy, but also increases rendering time. Default=500.

Filter—Applies a median filter using neighboring final gather rays that are shot from the same point. Default=1.

The value of Filter specifies the number of rays used for filtering: up to this value in each direction, to a maximum of $(2*\text{Filter}+1)^2$. It uses the medium irradiance value of these rays.

The practical effect of increasing Filter is to make the scene illumination smoother, at a cost of render time. However, increasing Filtering can also make the illumination somewhat darker.

Radii in Pixels—When on, the radii values are specified in pixels. When off, radii units depend on the value of the Radius toggle. Default=off.

Radius—When on, sets the maximum radius within which final gathering is used. Reducing this value can improve quality at a cost of rendering time. If Radii In Pixels is off, the radius is specified in world units, and defaults to 10 percent of the maximum circumference of the scene. If Radii In Pixels is on, default=5.0 pixels.

If both Radii In Pixels and Radius are off, the maximum radius is the default value of 10 percent of the maximum scene radius, in world units.

Min Radius—When on, sets the minimum radius within which final gathering must be used. Increasing this value can improve render quality but increase rendering time. Unavailable unless Radius is turned on. Default=0.0. If Radii In Pixels is on, default=0.5.

Fast Lookup (Slower GI)—If turned on before you render the scene, the mental ray renderer computes information to speed up the regathering process. The fast lookup computation can take a long time, but it can greatly reduce the total rendering time. Default=off.

Like photon maps and shadow maps, the fast lookup computation can be saved in a file and then reused in subsequent renderings.

Preview (No Precalculations)—When on, final gathering skips the precalculation phase. This results in a rendering with artifacts, but begins rendering more quickly, so it can useful when you want to do a series of trial renderings. Default=off.

Final Gather Map group

These controls tell mental ray how to calculate the final gather map for indirect illumination. The map is an *FGM file (page 3–1031)*.

Rebuild (Do Not Re-Use Cache)—If Rebuild is turned on, the renderer saves the recalculated final gather map to the file specified by the Browse button. Default=on.

- **Use File**—When on, the mental ray renderer either saves the final gather map to an *.fgm* file, or loads an existing file. The state of Rebuild determines whether the *.fgm* file is saved or loaded.

  This option is unavailable unless you click Browse ("...") to provide a name for the *.fgm* file.

- **Browse ("...")**—Click to display a file selector dialog, which lets you specify a name for the final gather map (*.fgm)* file, and the folder where it is saved.

- **File name**—When you have used the Save button to specify a final gather map file, the name field displays its name and path.

- **Delete File**—Click to delete the current *.fgm* file.

Trace Depth group

The Trace Depth controls are similar to those for calculating reflections and refractions, but they refer to the light rays used by final gathering, rather than to rays used in diffuse reflection and refraction.

Max. Depth—Limits the combination of reflection and refraction. Reflection and refraction of a photon stop when the total number of both equals the Maximum Depth setting. For example, if Maximum Depth equals 3 and the trace depths each equal 2, a photon can be reflected twice and refracted once, or vice versa, but it can't be reflected and refracted four times. Default=5.

Max Bounces—Sets the number of times diffuse light bounces are calculated for a single diffuse ray, which the renderer casts for this purpose. Default=0.

Like Maximum Reflections and Maximum Refractions, this value is subject to the restriction of Max Depth. If Max Bounces is set higher than Max Depth, the latter setting is automatically raised to the Max Bounces value in the *.mi* file, but not in the 3ds Max interface.

Max. Reflections—Sets the number of times a photon can be reflected. At 0, no reflection occurs. At 1, the photon can be reflected once only. At 2, the photon can be reflected twice, and so on. Default=5.

Max. Refractions—Sets the number of times a photon can be refracted. At 0, no refraction occurs. At 1, the photon can be refracted once only. At 2, the photon can be refracted twice, and so on. Default=5.

Use Falloff (Limits Ray Distance)—When on, uses the Start and Stop values to limit the length of light rays used for regathering. This can help improve regathering time, especially for scenes that are not fully enclosed by geometry. Default=off.

- **Start**—Specifies the distance, in 3ds Max units, at which rays begin. You can use this value to exclude geometry that is too close to the light source. Default=0.0.

- **Stop**—Specifies the maximum length, in 3ds Max units, of a light ray. If the ray reaches this limit without encountering a surface, then the environment is used for shading. Default=0.0.

Shadows and Displacement Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Renderer panel > Shadows & Displacement rollout

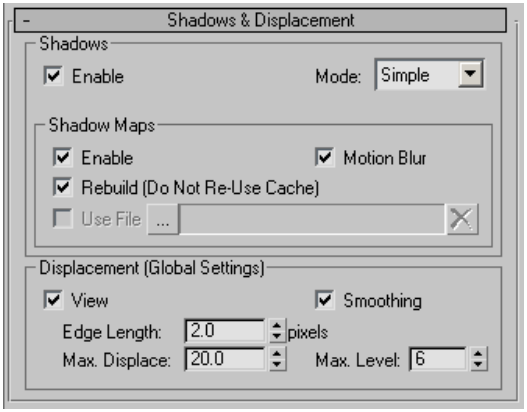
Main toolbar > Render Scene > Render Scene dialog > Renderer panel > Shadows & Displacement rollout

Note: The Renderer panel appears only when the mental ray renderer is the currently active renderer.

The controls in this rollout affect *shadows (page 3–88)* and *displacement (page 3–95)*.

Note: You can disable displacement globally by turning off Displacement in the Options group on the *Common Parameters rollout (page 3–27)*.

Interface



Shadows group

Enable—When on, the mental ray renderer renders shadows. When off, no shadows are rendered. Default=on.

When Enable is off, the other shadow controls are unavailable.

Mode—The shadow mode can be Simple, Sort, or Segments. Default=Simple.

- **Simple**—Causes the mental ray renderer to call shadow shaders in a random order.
- **Sort**—Causes the mental ray renderer to call shadow shaders in order, from the object to the light. Sort applies to third-party, external shadow *shaders (page 3–1103)*.
- **Segments**—Causes the mental ray renderer to call shadow shaders in order along the light ray from the volume shaders to the segments of the light ray between the object and the light.

Tip: Choose Simple for regular shadows, Segments for volume shadows.

Shadow Maps group

These controls specify a *shadow map (page 3–1105)* used to render shadows. When you specify a shadow map file, the mental ray renderer uses the shadow map instead of ray-traced shadows.

To stop using a shadow map and use ray-traced shadows, delete the map's name from the file name field.

Enable—When on, the mental ray renderer renders shadow-mapped shadows. When off, all shadows are ray-traced. Default=on.

When Enabled is off, the other controls in this group are unavailable.

If shadows are enabled but shadow maps are not enabled, then shadows for all lights are generated using the mental ray ray-tracing algorithm. If shadow maps are enabled, then shadow generation is based on each light's choice of shadow generator:

- **mental ray Shadow Map**—Shadows are generated using the mental ray shadow-map algorithm.

- **Shadow Map**—Settings on the Shadow Parameters rollout are translated into a mental ray equivalent before shadows are generated. The quality of shadows generated this way might not always meet expectations.
- **Area Shadows, Advanced Ray Traced Shadows, or Ray Traced Shadows**—Shadows are generated using the mental ray ray-tracing algorithm.

Motion Blur—When on, the mental ray renderer applies *motion blur (page 3–88)* to shadow maps. Default=on.

Warning: Turning on Motion Blur for both cameras and shadows can cause shadows to shift position. To avoid this effect, turn on motion blur for cameras only.

Rebuild (Do Not Re-Use Cache)—When on, the renderer saves the recalculated *shadow map (.zt) file (page 3–1131)* to the file specified by the Browse button. Default=on.

- **Use File**—When on, the mental ray renderer either saves the shadow map to a *.zt* file, or loads an existing file. The state of Rebuild determines whether the *.zt* file is saved or loaded.

  This option is unavailable unless you click Browse ("...") to provide a name for the *.zt* file.
- **Browse ("...")**—Click to display a file selector dialog, which lets you specify a name for the shadow map (*.zt)* file, and the folder where it is saved.
- **File name**—When you have used the Save button to specify a shadow map file, this field displays its name and path.
- **Delete File**—Click to delete the current *.zt* file.

Displacement group

View—Defines the space for displacement. When View is on, the Edge Length specifies the length in pixels. When off, the Edge Length is specified in world space units. Default=on.

Smoothing—Turn off to have the mental ray renderer correctly render height maps. Height maps can be generated by normal mapping; see *Creating and Using Normal Bump Maps (page 3–146)*.

When using only height maps in the scene, make sure this option is off. If some objects in the scene use height maps while others use standard displacement, apply smoothing on a per-object basis (see *mental ray Panel (Object Properties Dialog) (page 1–121)*).

When on, mental ray simply smoothes the geometry using the interpolated normals, making the geometry look better. This result, however, cannot be used for height map displacement because smoothing affects geometry in a way that is incompatible with height mapping.

Edge Length—Defines the smallest edge length. The mental ray renderer will stop subdividing an edge once it reaches this size. Default=2.0 pixels.

Max. Displace—Controls the maximum offset, in world units, that can be given to a vertex when displacing it. This value can affect the bounding box of an object. Default=20.0.

Tip: If displaced geometry appears to be "clipped," try increasing the value of Maximum Displace.

Note: When using placeholders (see the *Translator Options rollout (page 3–115)*), if this value is larger than it needs to be, it can reduce performance. If you experience slow times while displaced objects when Use Placeholder Objects is on, try lowering the Max. Displace value.

Max. Level—Controls how many times a triangle can be subdivided. Default=6.

Rendering Algorithms Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Renderer panel > Rendering Algorithms rollout

Main toolbar > Render Scene > Render Scene dialog > Renderer panel > Rendering Algorithms rollout

Note: The Renderer panel appears only when the mental ray renderer is the currently active renderer.

The controls in this rollout let you choose whether to render using ray-tracing, scanline rendering, or both. You can also choose the method used to accelerate ray-tracing.

The controls labeled Trace Depth limit the number of times each ray can be reflected, refracted, or both.

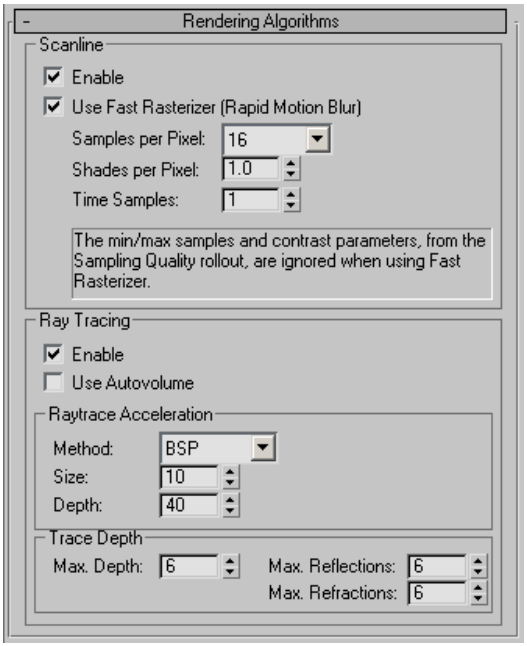
Procedure

To set trace depth for reflections and refractions:

1. Count the number of times you want an object to be reflected or refracted in the scene.
2. On the mental ray: Rendering Algorithms rollout, set Max Reflections to the number of reflections you want, and Max Refractions to the number of refractions you want.
3. Set Max Depth to equal the value you chose for Max Reflections plus the value you chose for Max Refractions.

   The greater the number of reflections and refractions, the more slowly your scene will render. On the other hand, too low a value for Max Reflections or Max Refractions (or Max Depth, controlling both) can make your rendering look unrealistic.

Interface



By default, both Ray Trace and Scanline are enabled, which lets the mental ray renderer use a combination of *ray tracing (page 3–87)* and scanline rendering to render the scene. Scanline rendering is used for direct illumination ("primary rays") only; ray tracing is used for indirect illumination (caustics and global illumination) as well as reflections, refractions, and lens effects.

You can disable one or the other option, but not both. For example, if only ray tracing is enabled and you turn it off, 3ds Max enables scanline rendering.

Scanline group

Enable—When on, the renderer can use scanline rendering. When off, the renderer uses the ray-tracing method only. Scanline rendering is faster than ray tracing, but cannot generate reflections, refractions, shadows, depth of field, or indirect lighting. Default=on.

Use Fast Rasterizer (Rapid Motion Blur)—When on, uses a fast rasterizer method to generate the first generation of rays to trace. This can improve rendering speed. Default=off.

This option works well with object motion blur, and also with scenes that have no motion blur.

The following settings are available for the fast rasterizer:

- **Samples per Pixel**—Controls the number of samples per pixel used by the fast rasterizer method. More samples result in greater smoothness, at a cost of render time. Range=1 to 225. Default=16.
- **Shades per Pixel**—Controls the approximate number of shading calls per pixel. Greater values result in more accurate renderings, at a cost of render time. Range=0.1 to 10000 (ten thousand). Default=1.0.
- **Time Samples**—When the scene uses motion blur, controls the number of times the material is shaded during each time interval (set by *Camera Effects rollout (page 3–100)* > Motion Blur group > Shutter). Range=1 to 128. Default=1.

  By default, the material is shaded only once, and then blurred. If the material changes rapidly during the shutter interval, it might be useful to increase this value, in order to obtain more accurate motion blur. Rapid changes in reflections or refractions might require a higher Time Samples value.

Ray Tracing group

Enable—When on, mental ray uses ray tracing to render reflections, refractions, lens effects (motion blur and depth of field), and indirect lighting (caustics and global illumination). When off, the renderer uses the scanline method only. Ray tracing is slower but more accurate and more realistic. Default=on.

You must turn on Ray Trace to render reflections, refractions, depth of field, and indirect lighting (caustics and global illumination).

Use Autovolume—When on, uses the mental ray *autovolume* mode. When Autovolume is on, you can render nested or overlapping volumes such as the intersection of two spotlight beams. Autovolume also enables a camera to move through the nested or overlapping volumes. Default=off.

To use Autovolume, Ray Trace must be turned on, Scanline must be turned off, and the shadow mode must be set to Segments. (You set the shadow mode on the *Shadows And Displacement rollout (page 3–111)*.) If these conditions aren't met when you click to turn on Autovolume, an alert warns you about this, and gives you the option of making the appropriate setting changes.

Raytrace Acceleration Group

Method—The drop-down list sets which algorithm to use for *raytrace acceleration (page 3–1094)*. The other controls in this group box change, depending on which acceleration method you choose. These are the alternatives:

- BSP (the default)

  The BSP method has Size and Depth controls. See *Ray-Trace Acceleration: Parameters for the BSP Methods (page 3–125)*.

  This method is the fastest on a single-processor system. Use it for small-to-medium size scenes on a single processor. BSP is also the best method to use when ray tracing is turned off.
- Grid

  The Grid method has Size, Depth, and Resolution controls. See *Ray-Trace Acceleration: Parameters for the Grid Method (page 3–125)*.

  This method uses less memory than BSP. It is also faster than BSP on multiprocessor systems.

Note: If you attempt to render motion blur with the Grid method active, the mental ray renderer automatically switches to the BSP method. This happens in the *.mi* file but is not reflected in the 3ds Max interface.

- Large BSP

  The Large BSP method has the same controls as BSP. See *Ray-Trace Acceleration: Parameters for the BSP Methods (page 3–125)*.

  This method is a variant of the BSP method. Portions of the partitioning tree it uses can be swapped in and out of memory. This enables mental to render very large scenes, at a cost of ray-tracing time. Use this method for very large ray-traced scenes, and also when Use Placeholder Objects is turned on (see *Translator Options Rollout (mental ray Renderer) (page 3–115)*). Use Placeholder Objects is recommended when you are doing *distributed rendering (page 3–121)*.

Trace Depth group

Trace depth controls the number of times a light ray can be reflected or refracted. At 0, no reflection or refraction occurs. Increasing these values can increase the complexity and realism of a scene, at a cost of greater rendering time.

Max. Depth—Limits the combination of reflection and refraction. Tracing of a ray stops when the total number of reflections and refractions reaches the Max Depth. For example, if Max Depth equals 3 and the two trace depths each equal the default value of 2, a ray can be reflected twice and refracted once, or vice versa, but it can't be reflected and refracted four times. Default=6.

Max. Reflections—Sets the number of times a ray can be reflected. At 0, no reflection occurs. At 1, the ray can be reflected once only. At 2, the ray can be reflected twice, and so on. Default=6.

Max. Refractions—Sets the number of times a ray can be refracted. At 0, no refraction occurs. At 1, the ray can be refracted once only. At 2, the ray can be refracted twice, and so on. Default=6.

Translator Options Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Processing panel > Translator Options rollout
Main toolbar > Render Scene > Render Scene dialog > Processing panel > Translator Options rollout
Note: The Processing panel appears only when the mental ray renderer is the currently active renderer.

Controls in this rollout affect the general operation of the mental ray renderer. They also control the mental ray translator, which can save to an *MI file (page 3–1066)*. The translation is in mental ray version 3 (mi3) format. The translator does not support mental ray version 1 (mi1).

See also

Distributed Bucket Rendering Rollout (mental ray Renderer) (page 3–121)

Procedures

To save the mental ray renderer settings:

- When you have a set of rendering settings you want to keep, go to the Render Scene dialog > Processing panel > Process Options rollout. In the Configuration group, click Save As Defaults.

To create a rendering from multiple passes:

1. Use the *Render Type (page 3–13)* Selected option to choose only a portion of the scene to render.
2. On the Translator Options rollout, in the Render Passes group, click the "..." button next to Save.

3. A Save As dialog is displayed. Use it to enter a name and location for the PASS file.
4. Click Render.

   The partial rendering is saved in the PASS file you specified.
5. Repeat steps 1 through 4 until you have generated all the passes for the rendering (or all the passes but the last).

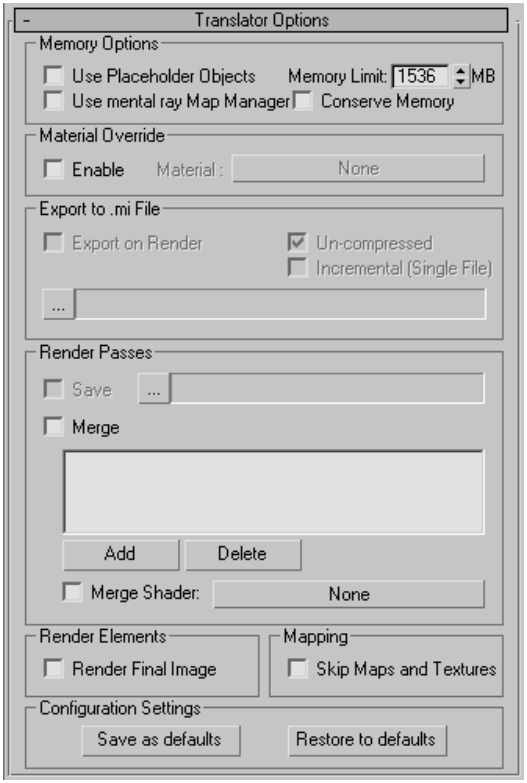
   Warning: If your scene includes an environment, render it only in the final pass. Rendering the environment in multiple passes is time consuming, and can lead to artifacts such as unwanted color changes to the background. Render all passes but the last one using a default black background.
6. In the Render Passes group, click Add to add the various pass files to the list.
7. Turn on Merge.

   At this point, you might also want to turn off Save, unless you want the final result to be saved as a PASS file as well as a rendering.
8. Click Render.

   The rendering consists of all the passes merged into one.

Tip: For some purposes, you might want to create the passes, then create a new 3ds Max scene with no objects, set the rendering resolution to match the passes, you created, then merge the passes as described in steps 7 and 8 above.

Interface



Memory Options group

Use Placeholder Objects—When on, geometry is sent to the mental ray renderer only on demand. Initially, the mental ray scene database is populated only with the size (bounding box) and position of objects in the 3ds Max scene. When the mental ray renderer renders a bucket that contains an object, the object's geometry is sent to the rendering engine only at that point. Default=off.

This option can improve rendering speed when a large amount of the scene's geometry is outside of the view you are rendering.

Tip: When you use placeholders, *always* calculate buckets in Hilbert order. See *Sampling Quality Rollout (mental ray Renderer) (page 3–97)*.

When the mental ray renderer is low on memory (as defined by the Memory Limit setting), Use Placeholder Objects enables it to increase available memory by deleting object geometry from the scene database. This can dramatically reduce memory usage, but with a possible cost in rendering speed.

Memory Limit—The mental ray renderer keeps a count of the memory it uses at render time. If it reaches the memory limit and Use Placeholder Objects is on, the geometry for some objects will be discarded in order to allocate memory for other objects. If Use Placeholder Objects is off, or if after deleting geometry more memory is still needed, the renderer releases texture-map memory as well. Default=1024 MB.

Use mental ray Map Manager—When on, maps are read from disk and if necessary, translated to a format that the mental ray renderer can read. When off, maps are accessed directly from memory, and translation is unnecessary. Default=off.

Following is a complete list of differences between turning this option on and off:

When on:

- mental ray reads textures directly from disk (mental ray is able to flush textures out of memory when memory is low). Also, textures are loaded only if needed.
- mental ray uses its built-in pyramid filtering system. These pyramid lookup tables can be flushed out of memory when memory is low.
- Texture formats not supported directly by mental ray are read by 3ds Max and sent, before rendering begins, as binary data to mental ray.

When off:

- 3ds Max reads the textures from disk, and then sends individual pixel colors to mental ray as they are needed.

  Note: 3ds Max reads the textures from disk and keeps them stored in memory between renders. This can make renders faster, because the bitmaps don't need to be reloaded every time. 3ds Max will not read the texture from disk if it was already loaded previously (for example, in a previous render, for a Material Editor preview, or for displaying the map in a viewport).
- Rendering uses a pyramid filter shader that is identical to the standard 3ds Max pyramid filter system.

Turning this option on is useful for large scenes that take a lot of memory to render. Turning it off is quicker, because textures already loaded in memory don't have to be reloaded by mental ray. But turning it off might use more memory and doesn't allow for flushing when memory is low, unless you use the 3ds Max *bitmap pager (page 3–863)*.

Note: Turning the option on and off might result in very small differences between rendered images because of the different algorithms used in the mental ray map manager and the 3ds Max map manager.

You *must* turn on "Use mental ray Map Manager" when performing these actions:

- Using distributed bucket rendering.

  See *Distributed Bucket Rendering Rollout (mental ray Renderer) (page 3–121)*.

  When rendered with distributed bucket rendering and the mental ray map manager, images with textures can look different than when rendered with 3ds Max alone, because the filtering technique is different.
- Exporting to an MI file.

  See below.

Conserve Memory—Tells the translator to be as memory efficient as it can. This can slow down the

translation process, but reduces the amount of data being sent to the mental ray renderer. Default=off.

This option is useful when you are trying to render a huge scene and time is not necessarily an issue. When you render to an MI file, this option can also help reduce the size of the output file.

When on, this toggle also tells the mental ray renderer to save frames as temporary *.map* files. This allows you to render extremely large frames without running out of random-access memory.

The location of the temporary map files is chosen in the following order:

1. If the file *|3dsmax|mentalray|rayrc* contains a registry entry called _MI_REG_FBDIR, the renderer uses this directory.

   The entry should have the form

```
registry "{_MI_REG_FBDIR}" value "<path>" end registry
```

   where <path> is the directory you want to use.

2. If the *rayrc* file has no registry entry, the renderer uses the directory specified by the TMPDIR environment variable.
3. If there is no TMPDIR environment variable, the renderer uses the directory specified by the TEMP environment variable.

Material Override group

Material Override allows you to render a scene with all its materials replaced by a single master material. For example, if you need to do a wireframe pass, you can create a Wire material and then specify it here. When you render, *all* surfaces will use the Wire material.

Enable—When on, rendering uses the override material for all surfaces. When off, surfaces are rendered with the material applied to them in the scene. Default=off.

Material—Click to display the *Material/Map Browser (page 2–1256)* and choose a material to use as the override. Once you have chosen an override material, this button displays the material name.

Export to .mi File group

These controls let you save the translated scene in a mental ray *MI file (page 3–1066)*.

Note: Exporting to an MI file is not available when you *render to texture (page 3–139)*.

Export on Render—When on, saves the translated file to a *.mi* file. Turn off to avoid saving the translated scene. Save is available only when you have clicked Files to specify an *.mi* file. Default=off.

Un-compressed—When on, the MI file is not compressed. When off, the file is saved in a compressed format. Default=on.

Incremental (Single File)—When on, an animation is rendered as a single MI file that contains a definition of the first frame and descriptors of the incremental changes from frame to frame. When off, each frame is rendered as a separate MI file. Default=off.

When you render an animation, turning on Incremental can save a considerable amount of disk space.

- **Browse ("...")**—Click to display a file selector dialog, which lets you specify a name for the *.mi* file, and the folder where it is saved.
- **File name**—When you have used the Files button to specify an *.mi* file, this field displays its name and path.

Render Passes group

Controls in this group let you create a rendering out of multiple passes that render portions a scene. This can be a useful way to render large scenes or scenes that have complex effects. It can also be a way to divide the labor on a composited

("merged") rendering. See the "Procedures" section, above, for more information.

Note: You cannot render to passes when you *render to texture (page 3–139)*.

Note: The render pass system has changed as of 3ds Max **7.5**. Render pass files created with 3ds Max **6** or **7** are not compatible with 3ds Max **7.5** or **8**.

Save—When on, saves the image currently being rendered (prior to merging) inside the specified PASS file.

- **Browse ("...")**—Click to display a file selector dialog, which lets you specify a name for the *.pass* file and the folder where it is saved.
- **File name**—When you have specified a *.pass* file, the name field displays its name and path.

If you are rendering a time segment (that is, an animation), the PASS files are created with sequence numbers appended to the main file name (for example, *test0000.pass, test0001.pass,* and so on).

Merge—When on, the PASS files specified in the list will be merged into the final rendering.

- **List of PASS files**—Lists the PASS files that will be merged into the final rendering (possibly including the pass that is currently being rendered and saved).
- **Add**—Click to add a PASS file to the list.

  If you choose a PASS file with a sequence number appended to its name, 3ds Max asks if you want to use the individual file or the entire sequence.
- **Delete**—Click to delete the highlighted PASS file from the list.

Merge Shader—Lets you choose the shader used to merge the PASS files. Clicking the shader button displays a Material/Map Browser so you can choose the shader (when a shader is chosen, its name appears on the button). When the toggle is on, this shader is used for merging.

Important: No merge shaders are provided with 3ds Max. This option is provided for users who plan to write a custom merge shader appropriate to their particular compositing project.

Render Elements group

This toggle is for when you are *rendering separate elements (page 3–126)*.

Render Final Image—When on, renders a final, "beauty" pass in addition to the separate elements. When off, renders only the elements. Default=off.

Mapping group

Skip Maps and Textures—When on, rendering ignores maps and textures, including projection maps, and uses only surface colors (diffuse, specular, and so on). Default=off.

Turning off maps can be useful, and save time, when you are adjusting global illumination.

Configuration Settings group

These buttons let you save or restore a set of settings for the mental ray translator. These are the settings in *all* of the mental ray rendering rollouts.

Save as defaults—Click to save the current mental ray translator settings as the new defaults. Saves settings from all the mental ray rollouts.

The settings are saved in a file called *maxtrans.ini,* in *the |3dsmax|plugcfg|* subdirectory. *Maxtrans.ini* is a text (ASCII) file.

Restore to defaults—Restores the set of defaults you previously saved. If the file *maxtrans.ini* isn't present (for example, if you have not used the Configuration Settings > Save button before), Restore restores the original default values (the defaults that are documented in this reference), and saves them in *maxtrans.ini.*

Diagnostics Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Processing panel > Diagnostics rollout

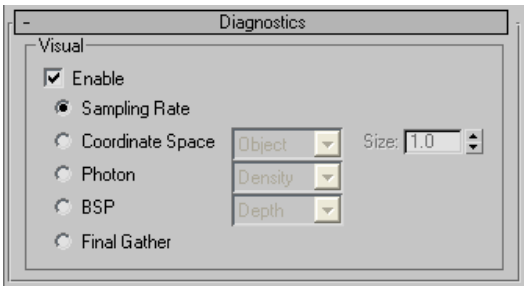
Main toolbar > Render Scene > Render Scene dialog > Processing panel > Diagnostics rollout

Note: The Processing panel appears only when the mental ray renderer is the currently active renderer.

The tools on the Diagnostics rollout can help you understand why the mental ray renderer is behaving in a certain way. The Sampling Rate tool, in particular, can help explain the renderer's performance.

Each of these tools generates a rendering that is not a photorealistic view, but a schematic representation of the functionality you have chosen to analyze.

Interface



Enable—When on, the renderer renders the graphic representation for the tool you have chosen.

Sampling Rate—When chosen, renders an image that shows where samples were collected during rendering; see *Sampling (mental ray Renderer) (page 3–1099)*. This can help you adjust the contrast and other sampling parameters.

Coordinate Space—Renders an image that shows the coordinate space of objects, the world, or camera.

- **Object**—Shows local coordinates (UVW). Each object has its own coordinate space.
- **World**—Shows world coordinates (XYZ). The same coordinate system applies to all objects.
- **Camera**—Shows camera coordinates, which appear as a rectangular grid superimposed on the view.

Size—Sets the size of the grid. Default=1.0.

Tip: To avoid busy moiré patterns in the grid, increase the value of Size.

Photon—Renders the effect of a photon map in the screen. This requires that a photon map be present (to render caustics or global illumination). If no photon map is present, the Photon rendering looks just like the nondiagnostic rendering of the scene: the mental ray renderer first renders the shaded scene, then replaces it with the pseudocolor image.

- **Density**—Renders the photon map as it is projected into the scene. High density is displayed in red, and lower values render in increasingly cooler colors.
- **Irradiance**—Similar to the Density rendering, but shades the photons based on their irradiance. The maximum irradiance is rendered in red, and lower values render in increasingly cooler colors.

BSP—Renders a visualization of the parameters used by the tree in the *BSP ray-trace acceleration method (page 3–125)*. If a message from the renderer reports excessively large depth or size values, or if rendering seems unusually slow, this can help you locate the problem.

- **Depth**—Shows the depth of the tree, with top faces in bright red, and increasingly deep faces in increasingly cool colors.
- **Size**—Shows the size of leaves in the tree, with differently sized leaves indicated by different colors.

Final Gather—Renders the scene with initial final-gather points displayed as green dots, and final final-gather points displayed as red dots.

Distributed Bucket Rendering Rollout (mental ray Renderer)

Rendering menu > Render > Render Scene dialog > Processing panel > Distributed Bucket Rendering rollout

Main toolbar > Render Scene > Render Scene dialog > Processing panel > Distributed Bucket Rendering rollout

Note: The Processing panel appears only when the mental ray renderer is the currently active renderer.

Controls on this rollout are for setting up and managed distributed bucket rendering. With distributed rendering, multiple networked systems can all work on a mental ray rendering. Buckets are assigned to systems as they become available.

While distributed bucket rendering can be used for offline rendering of animation frames, as in standard network rendering, it's best suited for speeding up the rendering of single images as you work. Especially when rendering high-resolution still images, you can get much faster results with distributed bucket rendering.

Tip: When you use distributed bucket rendering, be sure to:

- Turn on Use Placeholder Objects on the *Translator Options rollout (page 3–115)*.

  When placeholder objects are enabled, geometry is sent to the renderer only on demand.
- Leave Bucket Order set to Hilbert on the *Sampling Quality rollout (page 3–97)*.

  With Hilbert order, the sequence of buckets to render uses the fewest number of data transfers.

Note: Contour shading does not work with distributed bucket rendering.

Note: You cannot use distributed bucket rendering when you *render to texture (page 3–139)*.

Important: To use distributed bucket rendering, you must set up host systems that are capable of running the mental ray renderer. There are two ways to do so: to set up satellite systems, or to install mental ray standalone licensing on remote hosts.

Satellite Systems

"Satellite" processors allow any owner of a 3ds Max license to freely use up to eight slave CPUs to render an image using distributed bucket rendering (not counting the one or two processors on the "master" system that runs 3ds Max).

Each satellite system must have the following files installed:

- *rayrc*
- *raysat_3dsmax*<X>*.bat*
- *raysat_3dsmax*<X>*.exe*
- *raysat_3dsmax*<X>*server.exe*

where <X> is the current 3ds Max version number.

You can use the 3ds Max installation program to install these files: see the *Installation Guide* for more information.

In addition, information about each satellite should be stored in the *RAYHOSTS file (page 3–1095)*. You can set up satellite systems by using the Add button on the Distributed Bucket Rendering rollout, as described in the "Interface" section, below.

Host Systems with SPM Licenses

When you use mental ray SPM licenses, remote hosts (that is, all systems other than the one running 3ds Max) must have the mental ray renderer (*ray.exe)* and a mental ray SPM license server running. To obtain this, you must run the mental ray installer on all remote hosts,

then configure and run the SPM license server. Instructions about how to do so are provided with the mental ray renderer sold by mental images.

Once the remote hosts have been configured to run a licensed instance of *ray.exe,* you can use them for distributed rendering simply by naming them in the *RAYHOSTS file (page 3–1095).* You can add hosts to the RAYHOSTS file using the Add button described in the "Interface" section, below, just as you would add a satellite processor.

Batch Rendering (Using Backburner or the Command Line)

You can launch distributed bucket rendering from the command line, using *3dsmaxcmd.exe*.

If you use satellite processors, you cannot use Backburner to manage distributed bucket rendering. When host processors have SPM licenses, you can use Backburner to manage distributed bucket rendering.

You can use the environment variable MRMAX_OFFLINE_DBR_OVERRIDE to control whether batch rendering uses distributed bucket rendering. The state of this variable overrides the "DBR enable" flag. If it is set to "yes," "true," or "on," distributed bucket rendering is enabled; if it is set to "no," "false," or "off," distributed bucket rendering is disabled. All other values of this variable are ignored.

See also

Translator Options Rollout (mental ray Renderer) (page 3–115)

Procedures

To use mental ray distributed rendering:

1. On the Render Scene dialog, go to the Processing panel. On the Distributed Bucket Rendering rollout, turn on Distributed Render.

   Note: The Net Render option on the Common Parameters rollout has no effect on distributed bucket rendering.

2. Click to select the names of those satellite or host systems you want to use for distributed rendering.

   You can click All to select all the host names in the list, or None to select none of the hosts.

3. If other host systems have maps installed on them, with *exactly* the same file names and path names as on your local host, turn on Distributed Maps.

   With Distributed Maps turned on, remote renderers can use their local copy of maps, which saves time.

4. Render the scene.

   Each system renders the buckets assigned to it. The final rendering appears on your local system, with buckets "arriving" in an indeterminate order.

Example: To use mental ray distributed bucket rendering with Backburner:

This procedure demonstrates how to multiply the number of CPUs used for rendering without having to purchase mental ray standalone licenses, using the 3ds Max satellite technology.

If you have a few machines with 3ds Max licensed, and many machines without, you can use both the distributed rendering technology and Backburner so a rendering job would use 10 CPUs per Backburner server, thereby increasing the rendering speed.

For the purpose of this procedure, we're using a render farm comprising three machines named A, B, and C, each running a licensed copy of 3ds Max.

Note: The number of machines you can use depends on the number of machines running licensed copies of 3ds Max. You are able to use only eight external (or satellite) CPUs per licensed

copy of 3ds Max: four dual-processor machines or eight single-processor machines (or equivalent).

1. Choose which machines (other than machines A, B, and C) will serve as satellites, install 3ds Max on each, and write down each machine's IP address.
2. Use the Windows Notepad program or a text editor to open the *max.rayhosts* file on machine A, located in *C:|Program Files|Autodesk|3dsmax8|mentalray|*.
3. In the *max.rayhosts* file, under the "localhost" entry enter the IP address of each satellite CPU to be used; up to eight in all (see Figure 1).

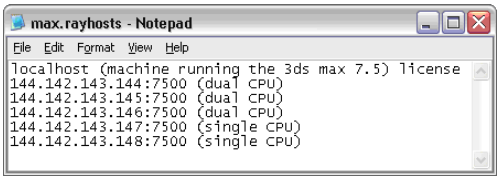


Figure 1 - Example of a rayhost file

4. Repeat the previous step on machines B and C with the remaining IP addresses.
5. Launch Backburner Manager on the machine submitting the job or any other machine. Launch the Backburner Server on machines A, B, and C.

   Warning: It is necessary for the machine running the Backburner Server to have 3ds Max licensed; a mental ray standalone license will not enable you to use the distributed bucket rendering feature, and Backburner will prompt you with a license error.
6. On the machine submitting the job choose mental ray as the renderer, and then turn on Use Placeholder Objects, Use mental ray Map Manager (see Figure 2), and the Distributed Render (see Figure 3).

Figure 2 – Translator Options

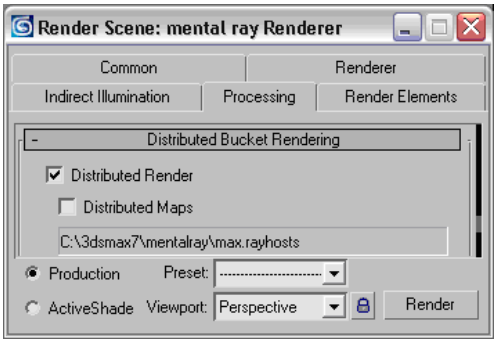
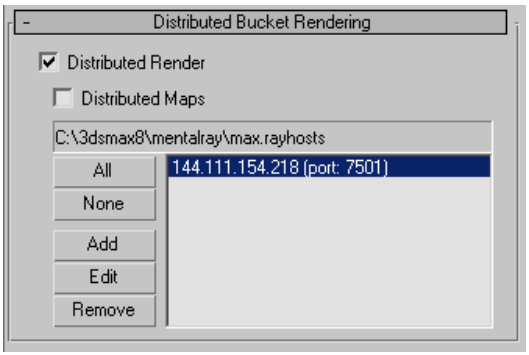


Figure 3 – Distributed Bucket Rendering

7. Submit the job to the Backburner network rendering farm.

   The job is submitted to the network rendering farm and is picked up by machines A, B, and C. Each machine uses its internal CPU as well as its eight satellite CPUs to render the job.

Interface



Distributed Render—When on, the mental ray renderer can use multiple satellite or host systems for distributed rendering. The list specifies which systems to use. Default=off.

Note: The Net Render option on the Common Parameters rollout has no effect on distributed bucket rendering.

The other distributed rendering controls are unavailable unless Distributed Render is on.

Distributed Maps—When on, specifies that maps can be found on all systems doing distributed rendering. When off, specifies that all maps used in rendering reside on the local system; that is, the system on which you start rendering. Default=off.

If you are doing local rendering only, this parameter has no effect.

Maps on all systems in distributed rendering must have *exactly* the same name and directory path.

Name field—Displays the *RAYHOSTS file's (page 3–1095)* name and path.

List of hosts—After you choose a RAYHOSTS file, this list shows the host systems available for distributed mental ray rendering. You can use this list to choose only those hosts you want to use for this particular rendering. When you render with Distributed Render on, the mental ray renderer uses only the hosts whose names are highlighted in this list. Click a host name to select it. To deselect a selected host name, click it again.

Note: The RAYHOSTS file, and therefore the host list, can contain duplicate entries. However, before you render you must select only processors that are not duplicates; otherwise, at render time 3ds Max will display an error message.

If Distributed Render is on but the list of hosts is empty when you click Render, 3ds Max will not perform distributed bucket rendering.

All—Highlights all system names in the hosts list.

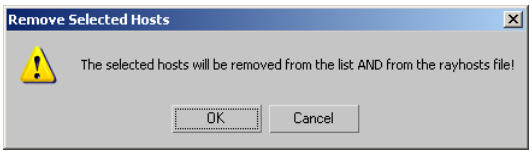
None—Clears the highlight from all system names in the hosts list.

Add—Click to display an *Add/Edit DBR Host dialog (page 3–124)*, which lets you add a host processor to the RAYHOSTS file.

Edit—Click to display the *Add/Edit DBR Host dialog (page 3–124)*, and edit the highlighted host processor's entry in the RAYHOSTS file. Available only when a single list entry is highlighted.

Remove—Click to remove the currently highlighted host processors from the list and the RAYHOSTS file. Available only when one or more list entries are highlighted.

Clicking Remove displays a Remove Selected Hosts dialog, which warns you that the host descriptors will be removed from both locations:

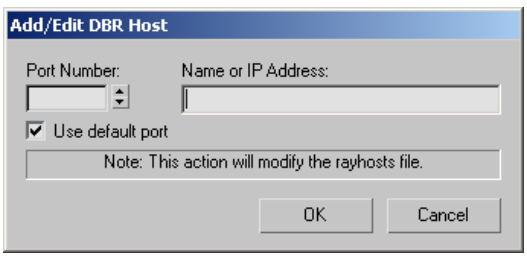


To restore a host that you have removed, use the Add button once again.

Add/Edit DBR Host Dialog

The Add/Edit DBR (Distributed Bucket Rendering) Host dialog appears when you click Add on the *Distributed Bucket Rendering rollout (page 3–121)*. It lets you add a host (or "satellite") processor to use when you render using distributed buckets. As the text on the dialog reminds you, the new host is added to the text of the *RAYHOSTS file (page 3–1095)*.

Interface



Port Number—Lets you enter a port number for the processor. This control is unavailable unless you turn off Use Default Port. When Use Default Port is off, the default port value appears in this field.

Name or IP Address—Enter the name or the numeric IP address of the processor you want to add.

Use Default Port—When on, 3ds Max assigns a port number to the new processor. The Port Number control is unavailable while Use Default Port is on. Default=on.

Ray-Trace Acceleration Parameters

Ray-Trace Acceleration: Parameters for the BSP Methods

Rendering menu > Render > Render Scene dialog > Renderer panel > Rendering Algorithms rollout > Raytrace Acceleration group > Choose BSP or Large BSP as the Raytrace Acceleration method.

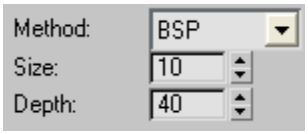
Main toolbar > Render Scene > Render Scene dialog > Renderer panel > Rendering Algorithms rollout > Raytrace Acceleration group > Choose BSP or Large BSP as the Raytrace Acceleration method.

Note: The Processing panel appears only when the mental ray renderer is the currently active renderer.

When you choose BSP or Large BSP as the Raytrace Acceleration method on the *Rendering Algorithms rollout (page 3–113)*, the parameters described here are displayed. BSP stands for Binary Space Partitioning. BSP is the default method. Large BSP is a variant whose partitioning tree can be swapped in and out of memory, making it suitable for rendering very large scenes.

Note: If the scene contains too many faces (triangles) to fit in a tree of the size specified by the Size and Depth parameters, mental ray disregards the Size value and creates larger leaf nodes. This can significantly slow down rendering. To avoid this problem, increase the value of Depth.

Interface



Size—Sets the maximum number of faces (triangles) in the leaf of a BSP tree. Increasing the Size value reduces memory consumption but increases rendering time. Default=10.

Depth—Sets the maximum number of levels in the BSP tree. Increasing the Depth value reduces rendering time, but increases memory consumption and preprocessing time. Default=40.

Tip: For large scenes, increasing the Depth value to 50 or more can greatly improve rendering time.

Ray-Trace Acceleration: Parameters for the Grid Method

Rendering menu > Render > Render Scene dialog > Renderer panel > Rendering Algorithms rollout > Raytrace Acceleration group > Choose Grid as the Raytrace Acceleration method.

Main toolbar > Render Scene > Render Scene dialog > Renderer panel > Rendering Algorithms rollout > Raytrace Acceleration group > Choose Grid as the Raytrace Acceleration method.

Note: The Processing panel appears only when the mental ray renderer is the currently active renderer.

When you choose Grid as the Raytrace Acceleration method on the *Rendering Algorithms rollout (page 3–113)*, the Size, Depth, and Resolution parameters are displayed. The grid method subdivides the scene into a grid of "voxels." A voxel is a node in the subdivided scene.

Interface

Size—Sets the maximum number of triangles in a voxel. If a voxel would contain more triangles, and the Depth setting permits it, then the voxel is subdivided into a subgrid. Default=128.

Depth—Sets the number of recursion levels. If a voxel grid contains too much detail, it is subdivided into a subgrid, which adds one level of recursion. Default=2.

Resolution—Sets the number of grid voxels in the X, Y, and Z dimensions. If the value is zero (the default), the mental ray renderer automatically sets a value. Default=0 (automatic).

VUE File Renderer

Rendering menu > Render > Render Scene dialog > Choose VUE File Renderer as the active production renderer. > Renderer panel > VUE File Renderer rollout

The VUE File Renderer creates VUE (*.vue*) files. *VUE files (page 3–1125)* use an editable ASCII format.

Procedure

To create a *.vue* file:

1. Use the Render Scene dialog's Current Renderer rollout to assign the VUE File Renderer as the Production renderer.

   You can't assign the VUE File Renderer to be the ActiveShade renderer.

2. Activate a camera viewport.

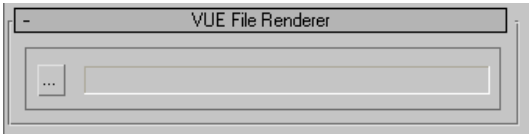
   Note: You must render from a camera viewport in order to include the coordinates for the camera itself.

3. Use the VUE File Renderer's rollout to specify a file name.

4. Render the scene.

   The VUE file is written to disk. The *rendered frame window (page 3–5)* is displayed, but it doesn't display an image.

Interface



Browse ("...")—Click to display a file selector dialog and choose a name for the VUE file to create

File name—The text field displays the name of the file.

Rendering Elements Separately

Render Elements Panel and Rollout

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout

Rendering to elements lets you separate various information in the rendering into individual image files. This can be useful when you work with some image-processing or special-effects software. You can later do compositing with the element renderings.

These are the elements you can choose to render separately:

- **Alpha:** A grayscale representation of the alpha channel, or transparency, of the scene. Transparent pixels appear in white (value=255)

and opaque in black (value=0). Translucent pixels appear in gray. The darker the pixel, the more transparent it is.

The alpha channel can be useful when you composite elements.

- **Atmosphere:** The atmospheric effects in the rendering.
- **Background:** The background of the scene.

  Other elements do not include the scene background. Include this element if you want to use the background in compositing.

  The background is not trimmed against geometry, so elements should be composited *over* the background. See *Compositing Rendered Elements (page 3–129)*.
- **Blend:** A custom combination of the previous elements.

  The Blend element displays an additional *Blend Element Parameters rollout (page 3–136)*.
- **Diffuse:** The diffuse component of the rendering.

  The Diffuse element displays an additional *Diffuse Texture Element rollout (page 3–139)*.
- **Hair and Fur:** The component of the rendering created by the *Hair and Fur modifier (page 1–506)*. See *Hair and Fur Render Element (page 3–136)*.
- **Illuminance HDR Data:** Generates an image containing 32–bit floating-point data that can be used for analyzing the amount of light that falls on a surface perpendicular to its normal. The illuminance data ignores material characteristics such as reflectance and transmittance.

  For best results, render with mental ray or another renderer that supports 32–bit floating-point output and set the output format to PIC, HDR, or EXR. If using the scanline renderer or another renderer that doesn't support 32–bit floating-point output, set the Scale Factor parameter, which acts as a multiplier, to adjust the range of values for the output data.
- **Ink:** The Ink component (borders) of *Ink 'n Paint materials (page 2–1414)*.
- **Lighting:** The effect of direct and indirect lights and shadows in the scene.

  The Lighting element displays an additional *Lighting Texture Element rollout (page 3–136)*.
- **Luminance HDR Data:** Generates an image containing 32–bit floating-point data that can be used for analyzing the perceived brightness of a surface after light has been "absorbed" by the material of the surface. The luminance data considers material characteristics such as reflectance and transmittance.

  For best results, render with mental ray or another renderer that supports 32–bit floating-point output and set the output format to PIC, HDR, or EXR. If using the scanline renderer or another renderer that doesn't support 32–bit floating-point output, set the Scale Factor parameter, which acts as a multiplier, to adjust the range of values for the output data.
- **Material ID:** Retains the material ID information assigned to an object. This information is useful when you are making selections in other image processing or special effects applications. For example, you could select all of the objects with a given material ID in another special effects application. The material ID corresponds to the value you set for the material with the material effects channel. Any given material ID will always be represented by the same color. The correlation between a specific material ID and a specific color is the same in Combustion. See *Material Effects Channel (page 2–1287)*.

- **Matte:** Renders a matte mask, based on selected objects, material effects channel (effect IDs), or G-Buffer IDs.

  The Matte element displays an additional *Matte Texture Element rollout (page 3–137)*.

- **Object ID:** Retains the object ID information assigned to the object. Similarly to the material ID, the object ID information is useful for selecting objects based on ID in another image processing or special effects application. If you know that you will want to select several objects at once, at a later time, you can assign them all the same object ID in 3ds Max. By rendering with the object ID, this information will be available in other applications. You an assign the object ID in the *Object Properties Dialog (page 1–111)*. Any given object ID will always be represented by the same color. The correlation between a specific material ID and a specific color is the same in Combustion.
- **Paint:** The Paint component (surfaces) of Ink 'n Paint materials.
- **Reflection:** The reflections in the rendering.
- **Refraction:** The refractions in the rendering.
- **Self-Illumination:** The self-illumination component of the rendering.
- **Shadow:** The shadows in the rendering. This element saves black-and-white shadows only. See *Compositing Rendered Elements (page 3–129)*.

  Note: The mental ray renderer does not include shadows created by *global illumination (page 3–104)* and *final gathering (page 3–109)* in the Shadow render element output.

- **Specular:** The specular component of the rendering.
- **Velocity:** The motion information which can be used in other applications for things such as creating motion blur or retiming an animation.

  The Velocity element displays an additional *Velocity Element Parameters rollout (page 3–137)*.

- **Z Depth:** A grayscale representation of the Z depth, or depth within the view, of objects within the scene. The nearest objects appear in white, and the depth of the scene in black. Intermediate objects are in gray, the darker the deeper the object is, within the view.

  The Z Depth element displays an additional *Z Element Parameters rollout (page 3–139)*.

When you render one or more elements, a normal complete rendering is also generated. In fact, the element renderings are generated during the same rendering pass, so rendering elements costs little extra render time.

Rendering to elements is available only when you do production rendering with the default *scanline renderer (page 3–37)* or the *mental ray renderer (page 3–77)*.

Note: The default scanline renderer supports a maximum of 32 render elements per scene. The mental ray renderer does not limit the number of render elements. If you're using a third-party renderer, check the product documentation for a possible limit on the number of render elements.

Note: When using the default scanline renderer, *Antialiasing (page 3–39)* must be on in order to render elements. With Antialiasing off, rendering elements is disabled.

Element File Names

If you have previously assigned a file name and path for the (complete) rendering on the Render Dialog's *Common Parameters rollout (page 3–27)*, the render elements feature uses this name and path as the basis for names of the various elements.

It appends an underscore (_) and then the name of the element to the basic file name.

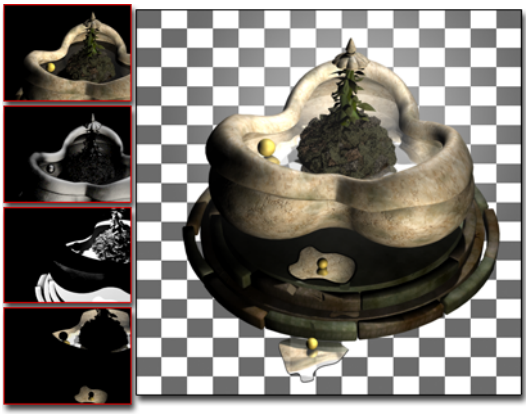
For example, if the render file name is "*C:\render\image.jpg*", when you add a Specular render element, the default path and file name for the rendered specular element is "*C:\render\image_specular.jpg*".

Similarly, when you enable output to a *Combustion workspace (CWS) file (page 3–660)*, the file name you assigned is the default name of the CWS file.

For example, if the render file name is "*C:\image.jpg*", when you enable Combustion output, the default path and file name is "*C:\image.cws*".

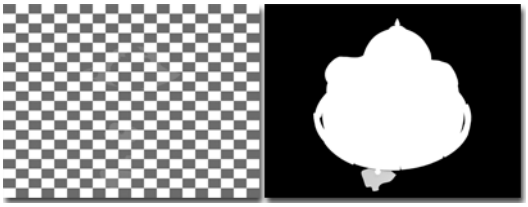
Example

Here is a rendering of a fountain, against a checkered background, and various elements.



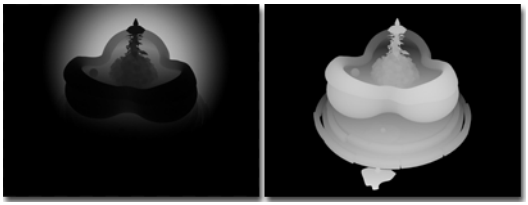
On the right is the fully rendered fountain.

On the left, from top to bottom, are diffuse, specular, shadow, and reflection elements.



Two more elements not directly related to the objects in the scene, but important when compositing the image to other sources:

on the left is the background, on the right is the alpha channel.



On the left is an atmosphere element, in this example, a light fog on the back side of the fountain.

On the right is the Z-depth. The fog uses the depth of the image and objects to determine its density. The Z-depth element contains these depth values.

Compositing Rendered Elements

In general, you can composite elements using additive composition, which is independent of the compositing order.

The main exceptions are the background element, atmospheres, and shadows.

- **Background:** The background is not trimmed against geometry, the background should be composited *under* the other elements.
- **Atmosphere:** The atmosphere element should be composited *over* all other elements.
- **Black-and-white shadows:** Black-and-white shadows should be composited over the rest of the image (aside from the atmosphere), to dim color in the shadowed areas. This technique does not take colored lighting into account.

In other words, the layers when you composite using black-and-white shadows appear like this:

Top: Atmosphere

Second from top: Shadow element

Middle: Diffuse + Specular + ... (other elements)

Bottom: Background

"Screen" Compositing for Specular and Reflection Elements

The other exception to additive composition is when specular or reflection elements have been generated by certain material shaders. These shaders generate specular and reflection elements you must composite differently:

- Anisotropic
- Multi-Layer
- Oren-Nayar-Blinn

Shaders are assigned on a per-material basis, in the Material Editor. If you render specular or reflection elements in a scene that uses these shaders, then composite them with the diffuse and other foreground components (aside from colored shadows, as described above), by overlaying them using an operation called "Screen" in some compositing programs.

Screen compositing uses this formula to combine elements:

Background * (1 - Foreground) + Foreground

The background is multiplied by the inverse of the foreground color, and then the foreground color is added to the result.

For more information, see the documentation for the compositing program you use.

Procedures

To have the Render Elements dialog assign names to the rendered element files automatically:

1. In the Render Scene dialog's Common Parameters rollout, use the Files button to assign an output file name and file type for the (entire) rendered scene.
2. In the Render Elements rollout, use the Add button to add elements for rendering.

You can render elements to files without rendering the entire scene to a file, but in this case, you have to assign the files for the elements individually or "by hand."

To add an element for rendering:

1. Click Add.
2. In the Render Elements dialog, do one of the following:
   - Click to highlight the name of an element, and then click OK.
   - Double-click the name of an element.

     If you have assigned a file name for the entire rendering, the new element is assigned a file name automatically. Otherwise, use the Files button in the Selected Element Parameters group to assign an output file name and file type for the element rendering.
3. If the element is one (such as Blend or Z Buffer) that has additional parameters, adjust these parameters in the appropriate rollout.

To render the separate elements:

1. Add the elements you want to render.

   Tip: You can use the Enable button (in the Selected Element Parameters rollout) to disable individual elements for a particular rendering pass.
2. If you haven't assigned file names automatically, use the Files button in the Selected Element Parameters group to assign an output file name and file type for the element rendering.
3. Make sure Elements Active (at the top of the Render Elements rollout) is turned on, and then click Render to render the scene.

The rendered elements are also displayed on the desktop, each in its own rendered frame window. (The rendered frame windows are displayed on top of each other.)

To generate a Combustion™ workspace (CWS) file that contains the rendered elements:

1. In the Output to Combustion group, turn on Enable.

   If you have assigned a file name for the entire rendering, the new element is assigned a file name automatically. Otherwise, use the Files button in the Output to Combustion group to assign an output file name for the CWS file.

2. If you want to change the file or pathname click ... [ellipsis].

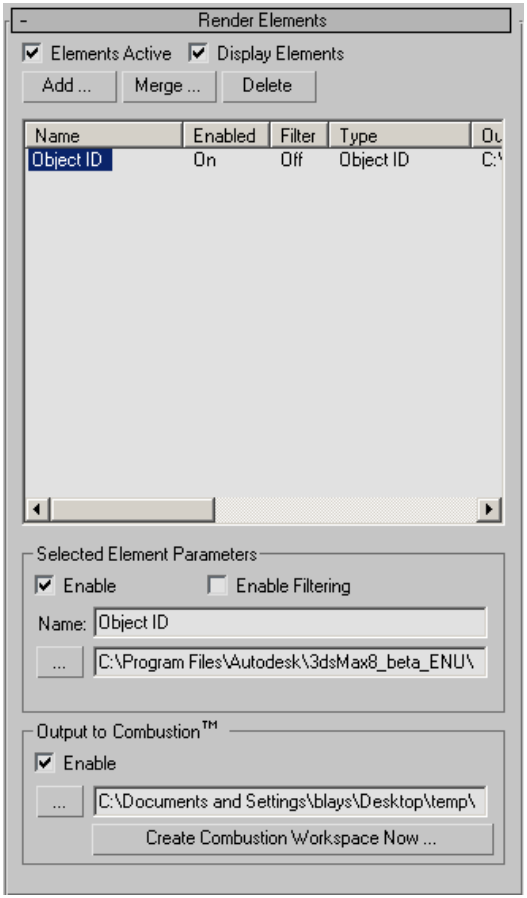
3. Do one of the following:

   - Render the scene. The CWS file is created at the time of the rendering.
   - Create Combustion Workspace Now.

     Use this button to create a Combustion workspace at any time. You do not have to render for the workspace to be created.

     Note: This only works if there is at least one Render Element selected and if your Render Output file type (set on the Common panel) is AVI, RPF, CIN, JPG, PNG, MOV, RGB, RLA, TGA, TIF, or EXR.

Interface



Add—Click to add a new element to the list. This button displays the *Render Elements dialog (page 3–133)*.

Merge—Click to merge the render elements from another 3ds Max scene. Merge displays a file dialog so you can select the scene file to get the elements from. The list of render elements in the selected file is added to the current list.

Delete—Click to delete the selected elements from the list.

Elements Active—When on, clicking Render renders the separate elements. Default=on.

Display Elements—When on, each separate element is displayed in its own *rendered frame window (page 3–5)* when you render. When off, the elements are rendered to files only. Default=on.

The buffers for each rendered element appear directly on top of each other. Move one element's buffer to see another's.

Element Rendering list

This scrollable list shows the elements to render separately, and their status. You can resize the columns in the list by clicking and dragging the border between two columns.

Name	Enabled	Filter E...	Type	Output Path
Specular	On	On	Specular	F:\models\shop\test
Diffuse	On	On	Diffuse	F:\models\shop\test
Self-Illumination	On	On	Self-Illumi...	F:\models\shop\test
Reflection	On	On	Reflection	F:\models\shop\test
Refraction	On	On	Refraction	F:\models\shop\test

Name—Shows the name of the element. You can change the default name of elements, in the Selected Element Parameters group.

To select an element, click its name in the list. Use CTRL+click to select additional elements, or SHIFT+click to select a contiguous group of additional elements.

Enabled—Shows whether the element is enabled.

Filter—Shows whether the active antialiasing filter is enabled for the element.

Type—Shows what type of element this is.

This field is useful if you have changed the name of an element.

Output Path—Shows the path and file name for the element.

Selected Element Parameters group

These controls are for editing selected elements in the list.

Enable—Turn on to enable rendering the selected elements. Turn off to disable rendering. Default=on.

The Enabled column of the elements list shows whether or not an element is enabled.

Enable Filtering—When on, applies the active *antialiasing filter (page 3–39)* to the rendered element. When off, the rendered element does not use the antialiasing filter. Default=on.

The Filter column of the elements list shows whether or not the filter is enabled for an element.

Disabling antialiasing can improve rendering time, although the rendered element that results might appear jagged.

Note: Turning off Enable Filter disables only general antialiasing and map filtering. Edge blending still occurs when this switch is off.

Name—Shows the name of the currently selected element. You can type in a custom name for the element.

This control is unavailable when multiple elements are selected.

Files—The text box lets you enter a path and file name for the element. Click the Files button to display a Render Element Output File dialog, which lets you choose a folder, file name, and file type for the element.

This control is unavailable when multiple elements are selected.

Output to Combustion group

When on, generates a *Combustion Workspace (CWS) file (page 3–660)* that contains the elements you are rendering. You can use this file in the Combustion software, and you can use Combustion workspaces in the *Combustion map (page 2–1448)*.

Warning: If you are rendering elements to composite over a background, make sure that the file format for the Diffuse, Shadows, and Alpha elements supports an alpha channel. The formats we recommend for this purpose are: *RLA (page 3–680)*, *RPF (page 3–681)*, *PNG (page 3–678)*, or *TGA (page 3–683)*.

Warning: 3ds Max supports some file types that Combustion does not. For use with Combustion do not render elements as EPS, FLC, FLI, or CEL files. If you render to one of these formats, the CWS file is not saved. See your Combustion documentation for more information on supported file formats.

Enable—When on, creates a CWS file that contains the elements you have rendered.

... [ellipsis]—The text box lets you enter a path and file name for the CWS file. Click the [...] button to display a Save to Combustion dialog, which lets you choose a folder and file name for the CWS file.

Create Combustion Workspace Now—When clicked a Combustion workspace (CWS file) is created. This button makes it possible to create a Combustion workspace without rendering.

Note: You must add at least one render element for this file to be created and the Render Output type on the Common panel is must be set to AVI, RPF, CIN, JPG, PNG, MOV, RGB, RLA, TGA, TIF, or EXR.

Render Elements Dialog

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog

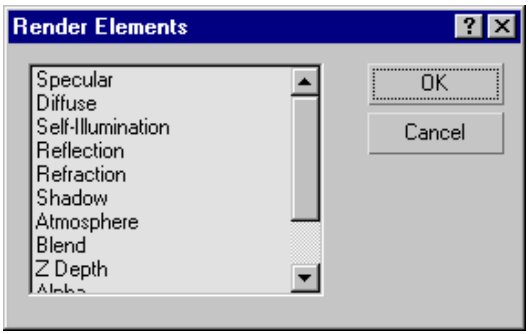
This dialog appears when you click the New button in the *Render Elements rollout (page 3–126)*.

Procedure

To choose an element to render separately, do one of the following:

- Click to highlight the element's name in the list, and then click OK.
- Double-click the element's name in the list.

Interface



The scrollable list shows the names of elements you can render separately. These are described in *Render Elements Panel and Rollout (page 3–126)*.

Render Element Output File Dialog

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements Rollout > Selected Element Parameters group > Files button

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements Rollout > Selected Element Parameters group > Files button

The Render Element Output File dialog lets you assign a name to a file that saves one element of the rendering. You can also determine the type of file you render, and set up options such as compression, and color depth and quality, depending on your choice of file type.

See also

Image File Formats (page 3–657)

Procedures

To name the render element output file:

1. Choose Rendering > Render, and then click Files in the Selected Element Parameters group of the Render Elements rollout.

   The Render Element Output File dialog is displayed.

2. In the File Name field, enter the name for the file to be rendered.
3. Navigate the Save In field to choose the directory where you want the rendered file to be saved.
4. In the Save As Type field, choose the type of file you want to render.
5. Click Save to close the Render Element Output File dialog.
6. Click Render to render and save the file.

To set up options for the element output file:

1. Choose Rendering > Render, and then click Files in the Selected Element Parameters group of the Render Elements rollout.

   The Render Element Output File dialog is displayed.

2. In the File Name field, enter the name for the file to be rendered.
3. Navigate the Save In field to choose the directory where you want the rendered file to be saved.
4. In the Save As Type field select the type of file you want to render, then click Save.

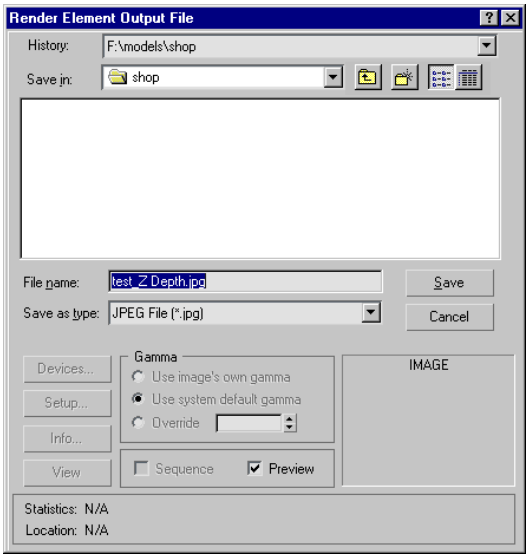
   A dialog with options appears automatically, with options for the given file format.

   You can also view the setup dialog by clicking Setup, if this button is available.

   Tip: Make sure the file name extension in the File Name field matches the file type in the Save As Type field. Changing the file type does not update the file name automatically. The file options dialog depends on the type indicated by the file name, *not* the type indicated by Save As Type.

5. Click OK to close the Render Output File dialog.
6. If the Render Output File dialog is still open, click Save.

Interface



History—Displays a list of the most recent directories searched. Whenever an image is selected, the path used is added to the top of the history list as the most recently used path.

The history information is saved in the *3dsmax.ini* file.

Save In—Opens a drop-down list to browse other directories or drives.

Up One Level—Moves you up a level in the directory structure.

Create New Folder—Lets you create a new folder while in this dialog.

List—Displays the contents of a directory without the details.

Details—Displays the contents of a director with all the details.

List Window—When details are turned on, the contents of the directory are displayed with Name, Size, Type, Date Modified, and Attributes. You can sort based on these columns by clicking the column label.

File Name—Displays the file name of the file selected in the list.

Save as File Type—Displays all the file types that can be saved. This serves as a filter for the list.

Note: The choice in this field determines the file type saved, regardless of the extension entered in the File Name field.

Save—Selects the highlighted file and closes the dialog.

Cancel—Cancels the selection and closes the dialog.

Setup—Displays controls for the selected file type. These vary with each different file format.

Note: The file setup dialog displayed corresponds to the type indicated by the file name extension in the File Name field, *not* to the type indicated by the Save as Type field.

Info—Displays expanded information about the file such as frame rate, compression quality, file size, and resolution. The information here depends on the type of information saved with the file type.

View—Displays the file at its actual resolution. If the file is a movie, the Media Player is opened so the file can be played.

Gamma Group

To set up Gamma options for the output file, Enable Gamma Correction must be turned on in the *Gamma panel (page 3–873)* of the Preferences dialog (Customize > Preferences > Gamma). Otherwise, the Gamma controls are unavailable in the Render Output File dialog.

Gamma—Selects the type of gamma to be used for the selected file. This is unavailable unless Enable Gamma Correction is turned on in the Gamma panel of the Preferences dialog.

Use Image's Own Gamma—This is not available in the render output file dialog.

Use System Default Gamma—Ignores the image's own gamma and uses the system default gamma instead, as set in the Gamma panel of the Preferences dialog.

Override—Defines a new gamma for the bitmap that is neither the image's own, nor the system default.

Sequence—This is not available in the Render Output File dialog.

Note: To render a sequence of still images, choose the Active Time Segment or define a range of frames in the Common Parameters rollout of the Render Scene dialog. If you have selected a still image file type, each frame will append a four-digit number to the name you have selected, incremented with each frame.

Preview—When on, enables display of the image as a thumbnail in the Image Window.

Image Window—Displays a thumbnail of the selected file, when Preview is turned on.

Statistics—Displays the resolution, color depth, file type, and number of frames of the selected file.

Location—Displays the full path for the file.

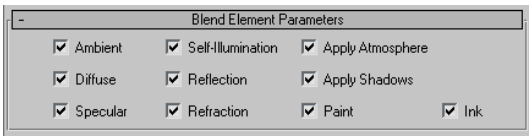
Blend Element Parameters Rollout

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Blend element to the elements list (or select an existing Blend element in the list).

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Blend element to the elements list (or select an existing Blend element in the list).

The Blend element is a custom combination of several other elements. By default, all elements are turned on in this rollout, and the Blend rendering is identical to the full, normal rendering, except for the scene background. Use the check boxes to choose your own combination of elements to appear in the Blend rendering.

Interface



Ambient—When on, include the ambient color component. Default=on.

Diffuse—When on, include the diffuse color component. Default=on.

Specular—When on, include the specular color component. Default=on.

Self-Illumination—When on, include self-illumination. Default=on.

Reflection—When on, include reflections. Default=on.

Refraction—When on, include refractions. Default=on.

Apply Atmosphere—When on, include atmospheric effects. Default=on.

Apply Shadows—When on, include shadows. Default=on.

Paint—When on, include the Paint component of *Ink 'n Paint materials (page 2–1414)*. Default=on.

Ink—When on, include the Ink component of Ink 'n Paint materials. Default=on.

Hair and Fur Render Element

Rendering menu > Render > Render Elements panel > Add > Render Elements dialog > Hair and Fur

The Hair and Fur render element produces an additional image that depicts only the elements in the scene generated by the *Hair and Fur modifier (page 1–506)*. This image can be used for compositing.

Note: The Hair and Fur render element supports only the *buffer rendering method* using the default scanline and mental ray renderers. Also, to use the render element with mental ray, be sure to turn on Render Scene dialog > Processing panel > Render Elements group > Render Final Image.

Lighting Texture Element Rollout

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Lighting element to the elements list (or select an existing Lighting element in the list).

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Lighting element to the elements list (or select an existing Lighting element in the list).

The lighting element contains the effects of lighting within the scene, including color, shadows, direct and indirect light.

This rollout lets you determine which parts of the lighting are included in the rendering.

Interface

Direct Light On— When on, the render element includes information from any direct lights in the scene. The light's color and projection map should appear.

Note: The final color for direct lighting takes surface normals into consideration.

Indirect Light On— When on, the render element includes information from ambient or bounced lighting in the scene.

Note: When using radiosity, you should expect things such as color bleed.

Shadows On— When on, the render element includes shadows.

Matte Texture Element Rollout

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Matte element to the elements list (or select an existing Matte element in the list).

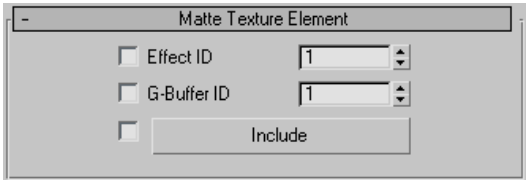
Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Matte element to the elements list (or select an existing Matte element in the list).

The Matte render element displays a matte mask for a selected object, *material effects channel (effect ID) (page 2–1287)*, or *G-Buffer ID (page 3–1040)*. Each matching element is represented with a white pixel on the mask.

For more info on matte behavior, see *Matte Object (page 3–1065)*.

Warning: The Matte render element does not work when the mental ray material is applied to objects.

Interface



Effect ID— Sets the *material effects channel (page 2–1287)* to include in the Matte render element.

G-Buffer ID—Sets the *G-Buffer ID (page 3–1040)* to include in the Matte render element.

Include— Opens the *Exclude/Include dialog (page 2–1179)*, where you can select objects in the scene to exclude or include in your Matte mask.

When *including*, all selected objects are rendered with white pixels.

When *excluding*, all pixels are white, by default. Selected objects are rendered as black pixels.

Warning: If you use Exclude, make sure the Effect ID and G-Buffer ID parameters are not turned on. These modes do not provide good results when used in combination.

Velocity Element Parameters Rollout

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Velocity element to the elements list (or highlight an existing Velocity element in the list).

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Velocity element to the elements list (or highlight an existing Velocity element in the list).

The Velocity element generates a rendering that contains information about the motion of objects in the frame. You can use the Velocity rendering to generate motion blur when you use a composition application such as Combustion or Flame. There are plug-ins for compositors that generate motion

blur; for example, those created by RE:Vision Effects, Inc.

The advantages of rendering a Velocity element are that the composition application might give you finer control over the motion blur than 3ds Max does; you can render a "beauty" frame that does not contain motion blur; and the Velocity element is quicker to render than using one of the 3ds Max motion-blur effects.

Another use of the Velocity element is to re-time clips rendered in 3D. There are specialized applications that allow you to re-time an image sequence, using velocity data to generate more accurate inbetween frames.

In the Velocity rendering, the motion information is saved as RGB color information:.red saves movement on the X axis, green saves Y-axis movement, and blue saves Z-axis movement, relative to the plane of the rendered frame.

The mental ray renderer supports this element, but *the mental ray Motion Blur camera effect must be turned off.* Also, some mental ray materials do not support render elements.

Controls on the element's rollout let you improve the precision of the motion data saved in the rendering. See the procedure, following.

Procedure

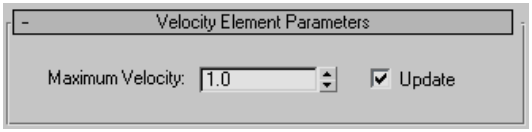
To render a velocity element for an animation sequence:

1. On the Render Scene dialog > Render Elements panel > Render Elements rollout, click Add. In the Render Elements dialog that appears, highlight Velocity, and then click OK.
2. Highlight the Velocity element in the Element Rendering list.
3. On the Velocity Element Parameters rollout, turn on Update, then render several test frames. (Choose frames where object velocity appears to be the greatest.)
4. After each test frame, make a note of the Maximum Velocity value. If you need to do so, enter the largest of these values as the Maximum Velocity to use.

   Having a specific Maximum Velocity value will give you more accurate velocity data.
5. Turn off Update.

   Now the Maximum Velocity will remain constant.
6. Render the animation.

Interface



Maximum Velocity—Enter a Maximum Velocity value based on the result collected by Update. Setting a Maximum Velocity increases the precision of the motion information. See the "Procedure," above. Default=1.0.

Update—Turn on when you render test frames, as described in the above procedure. After each rendering, Maximum Velocity is set to the value recorded by update. Use the largest of these values, and then turn off Update before you render the full animation. Default=off.

Note: The Update control does not work with mental ray distributed bucket rendering.

Z Element Parameters Rollout

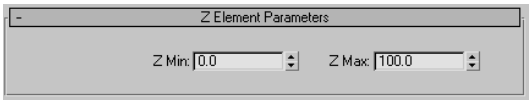
Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Z Depth element to the elements list (or select an existing Z Depth element in the list).

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Z Depth element to the elements list (or select an existing Z Depth element in the list).

The Z-depth element is a grayscale representation of the Z depth, or depth within the view, of objects within the scene. The nearest objects appear in white, and the depth of the scene in black. Intermediate objects are in gray. The darker the gray, the deeper the object is, within the view.

This rollout lets you adjust what portion of the scene is shown in the Z-depth rendering. By default, the rendering includes objects at the front of the view (Z Min=0.0), and extends for 100 3ds Max units into the scene (Z Max=100.0). If your scene is deeper than 100 units, you need to increase the value of Z.

Interface



Z Min—The minimum distance to include in the Z-depth rendering. This is a value in 3ds Max units. Default=0.0 (cannot be less than zero).

Z Max—The maximum distance to include in the Z-depth rendering. This is a value in 3ds Max units. Default=300.0.

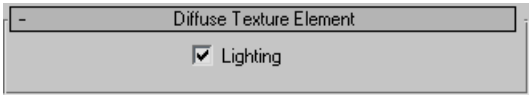
Diffuse Texture Element Rollout

Main toolbar > Render Scene button > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Diffuse element to the elements list (or select an existing Diffuse element in the list).

Rendering menu > Render > Render Scene dialog > Render Elements panel > Render Elements rollout > Add button > Render Elements dialog > Add Diffuse element to the elements list (or select an existing Diffuse element in the list).

The Diffuse render element displays the diffuse color component of objects in the scene.

Interface



Lighting— When on, the diffuse render element displays the color of objects *after* lighting has been applied.

When Lighting is turned off, the element displays the diffuse color of objects before the lighting gets applied. For textured objects, this will look like a 3D projection of the texture. However, objects with a single color will look “flat”.

Rendering to Textures

Make sure the default scanline renderer or the mental ray renderer is the active renderer. > Select one or more objects. > Rendering menu > Render To Texture

Rendering to texture, or "texture baking,” allows you to create texture maps based on an object’s appearance in the rendered scene. The textures are then “baked” into the object: that is, they become part of the object via mapping, and can be used to display the textured object rapidly on Direct3D

devices such as graphics display cards or game engines.

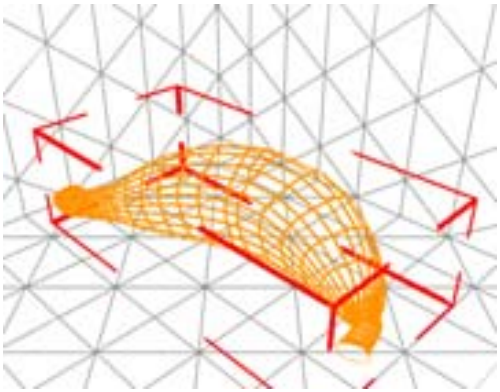
You can render to textures using the *mental ray renderer (page 3–77)*

Typical Texture Baking Method

1. Set up a scene with lighting.

Banana object in a lighted room

2. Select the objects whose textures you want to bake.



Banana object selected

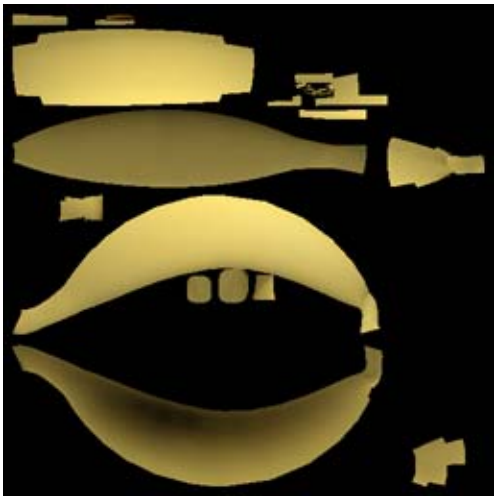
3. Choose Rendering > Render To Texture.
4. A *Render To Texture dialog (page 3–151)* appears. In this dialog, you choose which *elements (page 3–142)* of the rendering you want to bake. Elements are aspects of the rendering such as diffuse color, shadows, alpha (transparency/opacity), and so on.

   In this dialog, you can also choose various *display options (page 3–145)* for showing the baked texture in shaded viewports.

   Tip: If you have a Direct3D graphics display driver, you can use *DirectX viewport shaders (page 2–1308)* to view the baked texture in shaded viewports. They show how the baked texture will appear on DirectX devices.
5. Click Render.

After you click Render in the Render To Texture dialog, a number of things happen. (This is a typical set of events; the dialog gives you a lot of control over how texture baking actually occurs.)

- The elements you chose are rendered, each to its separate bitmap file.



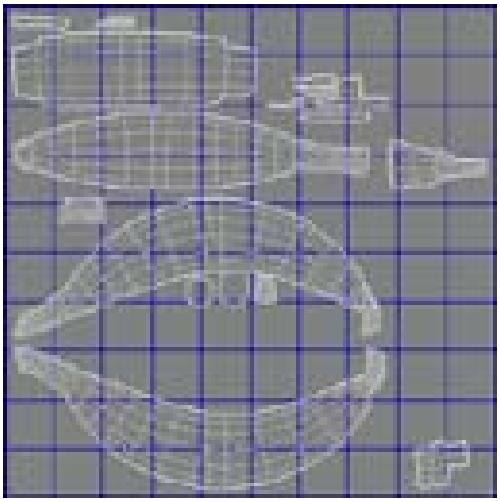
Lighting map of the banana

By default, the texture type is *Targa (page 3–683)*, and the element maps are placed in the *\images* subfolder of the folder where you installed the program.

The new textures are "flat": In other words, they are organized according to groups of object faces.

- In the modifier stack, a new modifier is applied to the object. It is called Automatic Flatten UVs. It is simply an *Unwrap UVW modifier (page 1–867)*, automatically applied.

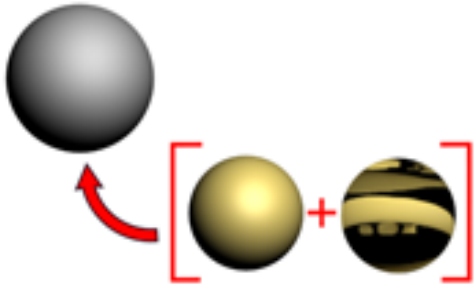
  This modifier manages the mapping of the flattened texture to faces of the object, and lets you adjust that mapping if necessary.



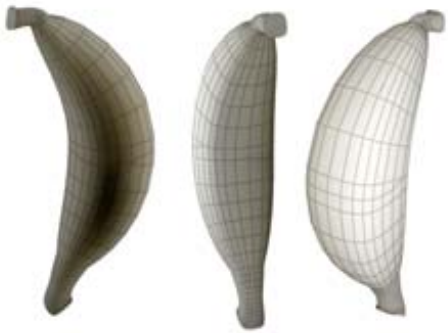
Flattened texture-mapping coordinates for the banana

- A *Shell material (page 2–1409)* is applied to the object. This material is a container for both the object's original material (you don't lose those maps and settings), and the newly created baked material, with its new textures.

  The Shell material lets you access both materials and adjust their settings, if necessary. It also lets you choose which material to view, the original material or the texture-baked material, in shaded viewports or in renderings.



New shell material contains the banana's original material (below left) and the baked texture (below right).



Rendered light map applied to the banana

With the light map, banana appears lit even when lights are turned off.

That is texture baking in a nutshell.

For best results, Logarithmic exposure control is recommended for Render To Texture.

If Linear or Automatic exposure controls are used, each object will have different lighting levels, generating a different histogram. Each object renders as if it had a different light level and in some cases, you may not get a rendering at all. This happens because Linear and Automatic exposure controls are view dependent.

Logarithmic Exposure Control is not view dependent, and will reproduce the image correctly. See the *Exposure Controls (page 3–289)* topic for more information about Linear, Automatic and Logarithmic exposure controls.

See also

Baked Texture Elements (page 3–142)

Target Map Slot Assignments (page 3–145)

Render to Texture Dialog (page 3–151)

Render to Texture: General Settings Rollout (page 3–152)

Render to Texture: Objects to Bake Rollout (page 3–153)

Render to Texture: Output Rollout (page 3–155)

Render to Texture: Baked Material Rollout (page 3–157)

Render to Texture: Add Texture Elements Dialog (page 3–160)

Shell Material (page 2–1409)

DirectX Manager Rollout (page 2–1308)

LightMap Shader Rollout (page 2–1423)

Metal Bump Shader Rollout (page 2–1424)

Baked Texture Elements

Select objects. > Rendering menu > Render to Texture > Render to Texture dialog > Selected Object Settings rollout > Click Add. > Add Texture Elements dialog > Choose elements to render.

When you render to texture or "bake" a texture, you choose one or more elements to render. These elements save aspects of the rendered scene: its geometry, lighting, shadows, and so on. Some texture elements can display in shaded viewports; others require a *DirectX viewport shader (page 2–1308)* to view in 3ds Max.

When you add an element to render, it appears in a list in the *Objects To Bake (page 3–153)* rollout. In the list, you can disable or enable rendering of that individual map, or select it to adjust which components it will include.

Note: Automatically generated reflections and refractions do not work well with rendered textures, although they are included in the Complete and Blend texture maps.

The available element maps are described in the sections that follow.

Limitations of Composite and Blend Materials

If the object has a Composite or Blend material applied to it, only certain elements render correctly. Which elements render correctly depend on the renderer you are using.

The default scanline renderer renders only these elements of a Composite or Blend material correctly:

- Diffuse color
- Specular color
- Reflections
- Ambient color
- Self-illumination color

- Refractions

The mental ray renderer renders only these elements of a Composite or Blend material correctly:

- Lighting
- Shadows
- Normals

Component Options (Unique Settings)

Many element maps let you choose to include or not include components of the rendered scene. When your element to render is highlighted in the list, these options appear on the Selected Element Unique Settings group.

See also

Render to Texture (page 3–139)

Render to Texture Dialog (page 3–151)

Complete Map

A complete map saves most surface properties of the rendered object; specifically:

- Lighting
- Diffuse color
- Specular color
- Reflections
- Shadows
- Ambient color
- Self-illumination color
- Refractions

Component Options (Selected Elements Unique Settings)

For a complete map, you can choose not to render shadows.

Specular Map

A specular map saves only the specular color of the object.

Component Options (Selected Elements Unique Settings)

For a specular map, you can choose not to render lighting or shadows.

Diffuse Map

A diffuse map saves only the diffuse color of the object.

Component Options (Selected Elements Unique Settings)

For a diffuse map, you can choose not to render lighting or shadows.

Shadows Map

A shadows map saves only the shadows cast onto the object.

Component Options (Selected Elements Unique Settings)

There are no unique settings for a shadows map.

Lighting Map

A lighting map saves only the lighting cast onto the object.

Component Options (Selected Elements Unique Settings)

For a lighting map, you can choose not to render shadows, direct light, or indirect light.

Normals Map

A normals map saves a color gradient that indicates the direction of normals on the surface of the object. With a normals map, Direct3D rendering can make simple geometry appear more complex.

With DirectX 8, you can view a normals map in shaded viewports by using the *Metal Bump Direct3D viewport shader (page 2–1424)*.

With DirectX 9, you can view a normals map in any shaded viewport.

Component Options (Selected Elements Unique Settings)

There are two unique settings for a normals map:

Output into Normal Bump—When on, assigns a Normal Bump map to the Target Map Slot, and places the rendered Normal Bump map in the Normal component of the *Normal Bump map (page 2–1541)*. Default=off.

Render Height Map into Alpha Channel—When on, renders a grayscale height map and assigns it to the alpha channel of the Normal map. If you are rendering to a file type that doesn't have an alpha channel, this setting has no effect. Default=off.

Height Map

A height map is a grayscale map that stores the relative height of the source object when you render with normal projection. (See *Creating and Using Normal Bump Maps (page 3–146)*.) You can use the height map as a displacement map on the target object. This is a way to add detail to the edges of the low-resolution object, because edges are not affected by the normal bump map itself.

Note: When using a height map as a displacement map with the mental ray renderer, be sure to use the *Height Map Displacement shader (page 2–1532)*. Also, turn off Smoothing, either *globally* or for the individual object on the Object Properties dialog > *mental ray panel (page 1–121)*. In addition, when rendering with mental ray, if you're applying the height map to a standard material, apply the map as a Displacement map on the *mental ray Connection rollout (page 2–1305)* (unlock the map first), not on the Maps rollout.

Tip: Using a paint program such as Adobe Photoshop on a height map is possible, but prone to error. The values in the height map depend on the shapes of both the low-resolution and high-resolution models, and it's easy to damage the mathematical accuracy. If you paint any changes onto the map, be careful to preserve the faceted look, and avoid the temptation to blur away the facets. You might try painting in Additive or Subtractive mode, to add to or subtract from the displacement, because Normal mode will set a fixed displacement, making it difficult for an artist to control the result.

Component Options (Selected Elements Unique Settings)

There are no unique settings for a height map.

Blend Map

A blend map is like a complete map, except that all its components, not just shadows, are optional.

Component Options (Selected Elements Unique Settings)

For a blend map, you can choose not to render any of the following components:

- Lighting
- Diffuse color
- Specular color
- Reflections
- Shadows
- Ambient color
- Self-illumination color
- Refractions

Alpha Map

An alpha map saves only the alpha channel of the rendered object.

Component Options (Selected Elements Unique Settings)

There are no unique settings for an alpha map.

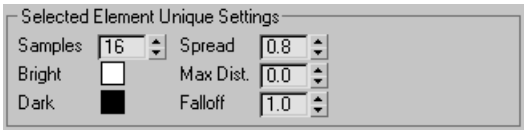
Ambient Occlusion (MR) Map

Use an ambient occlusion map when you want the surface information to describe how much ambient light the surface can receive. The ambient occlusion map considers the obstruction of the light by surface contours and surrounding objects. By using the ambient occlusion map when rendering, you do not need to set up special lighting, replace materials on the objects, or use with global overrides because the ambient occlusion map already accounts for these settings.

Ambient occlusion maps can be used with or without a Projection modifier and for many different purposes. Use them to mask layers in Adobe Photoshop, for items such as painted edits and texture maps. Also use them as dirt maps, or as masks for reflections or specular light.

Note: This map is available only with the mental ray renderer active.

Component Options (Selected Elements Unique Settings)



For an ambient occlusion map, you can set the following unique settings:

Samples— Sets the number of rays cast. More rays results in a smoother image. Default=16.

Bright—Sets the color in the map where no occlusion occurs. The default color is white. Click the swatch to change the color.

Dark—Sets the color in the map where complete occlusion occurs. The default color is black. Click the swatch to change the color.

Note: Colors between the Bright and Dark values are used to indicate partial occlusion.

Spread—Sets the spread of the ray, creating a cone shape. With a value of 0.0 a single point is sampled; with a value of 1.0 the entire hemisphere is sampled. Range=0.0–1.0. Default=0.8.

Note: You can set Spread to values greater than 1.0, but only values within the specified range are useful.

Max distance—Sets the range within which geometry is probed. A value of 0.0 samples the entire scene. For non-zero values, only objects within this range are sampled. Default 0.0.

Falloff—Defines the amount of falloff of the ray. The greater the value, the greater the falloff. Default=1.0.

Target Map Slot Assignments

Select objects. > Rendering menu > Render to Texture > Render to Texture dialog > Output rollout > Target Map Slot: drop-down list > Specify how baked textures appear in the material.

When you bake textures (render to texture), you have more control for how the baked texture displays in shaded viewports. You set these in the *Output rollout (page 3–155)* of the Render To Texture dialog. Using the Target Map Slot assignments, you can specify in detail which maps will be rendered to which slots of the existing material.

Note: The first time you use Render To Texture, all Target Map Slot are blank. After you set them and render the baked texture, those settings become the default Target Map Slot settings for future modelling sessions. The *texturebake.ini* file in the

|3dsmax8|plugcfg folder is where the Target Map Slot assignments are stored.

Creating and Using Normal Bump Maps

Normal bump mapping is a way of adding high-resolution detail to low-polygon objects. It is especially useful for real-time display devices such as game engines, and it can also be used in rendered scenes and animations.

A normals map is a three-color map, unlike the grayscale maps used for regular bump mapping (see *Bump Mapping (page 2–1347)*). The red channel encodes the left-right axis of normal orientation, the green channel encodes the up-down axis of normal orientation, and the blue channel encodes vertical depth.

Basic Workflow

3ds Max provides a number of different ways to create and use normal bump mapping, but the most straightforward and simplest workflow involves these steps:

1. Create a detailed, high-resolution model.
2. Create a simpler, low-resolution model.

   The low-resolution model should have the general shape and outlines of the high-resolution model, and typically it should be a bit smaller, so that projected detail in the high-res model will appear to be above its surface.
3. Select the low-res model.
4. Choose Rendering > Render to Texture.

   The Render To Texture dialog appears.
5. On the Objects To Bake rollout, in the Projection Mapping group, click Pick.

   A selection dialog appears.
6. Choose the high-res object, and then click Add.

   3ds Max applies a *Projection modifier (page 1–760)* to the low-res object.
7. In the Projection Mapping group, turn on Enable.

   Note: At this stage, often you will click Options to display the *Projection Options dialog (page 3–160)*, which has a variety of settings for how to generate the projection.
8. On the Output rollout, add a NormalsMap element (see *Baked Texture Elements (page 3–142)*). Assign Bump as its target map slot.
9. In the Selected Elements Unique settings group, turn on Output Into Normal Bump.
10. Click Render.

    3ds Max renders the Normals map, which stores normals data from the high-res object. As for other kinds of texture baking, it creates a Shell material and applies that to the low-res object, with the Normals map assigned as the bump component.

Components of Normal Bump Mapping

In the 3ds Max interface, controls for normal bump maps appear in three locations:

- The Render To Texture dialog

  Specifically, normal projection controls are found on the *Objects To Bake rollout (page 3–153)* and the *Output rollout (page 3–155)*.
- The *Projection modifier (page 1–760)*

  You can apply a Projection modifier yourself, or let Render To Texture do so automatically.
- The *Normal Bump map type (page 2–1541)*

  Render To Texture creates this automatically if you turn on Output Into Normal Bump (step 9, above).

Viewing Normal Bump Maps

If your display driver uses DirectX 8, you can view normal maps in viewports by using the *Metal Bump shader (page 2–1424)*. If your graphics driver is DirectX 9, you can view normal maps in any shaded viewport. See *Direct3D Driver Setup Dialog (page 3–887)*.

If your display driver is Software or OpenGL, you can't view normal maps in viewports. However, you can still render them and use normal mapping in renderings.

Normal Projection with Sub-Object Selections

You can associate different sub-object selections with different high-resolution geometry. See *Reference Geometry Rollout (Projection Modifier) (page 1–763)*.

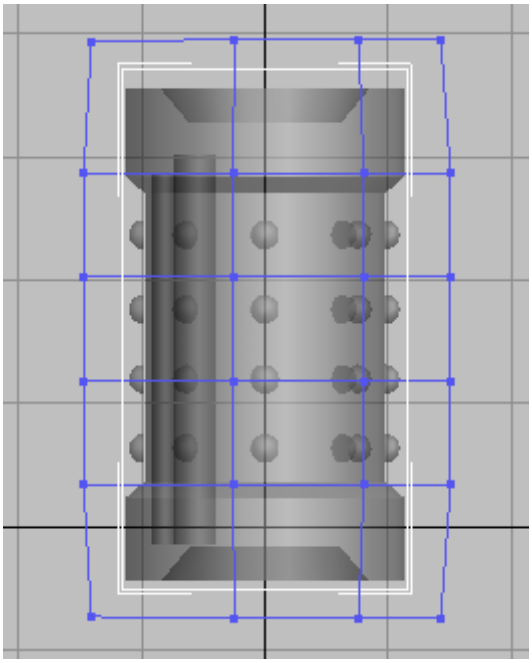
Troubleshooting Normal Bump Maps

Because of the variety of geometry and different situations that can arise, normal bump maps sometimes give unexpected results. Usually there is a workaround for the problem, or more than one. This topic describes some situations that can arise, and ways to correct them.

Parallel Projection Loses Detail

If the projection cage is set up so projected rays run parallel to part of the high-resolution geometry, that portion of geometry can be lost in the normal bump map.

For example, in this scene, the normal bump map is based on a high-resolution cylinder that has indentations at the top and bottom.

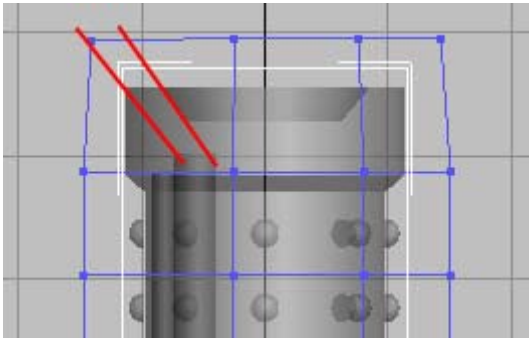


Default cage around high-res cylinder

However, the normal bump map does not show the end indentations.

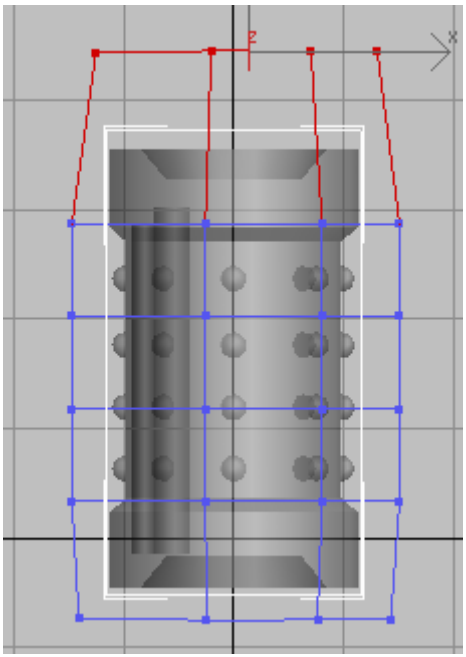
Indentation is missing from top and bottom of the cylinder's normal bump map.

The reason is that with the default projection cage, the rays parallel the sides of the indentation, and so details are lost.



Projection rays (shown in red) parallel the sides of the indentation.

To correct the problem, you can move the end of the cage upward, and scale it inward a little, so the rays don't run so nearly parallel to the side of the indentation.

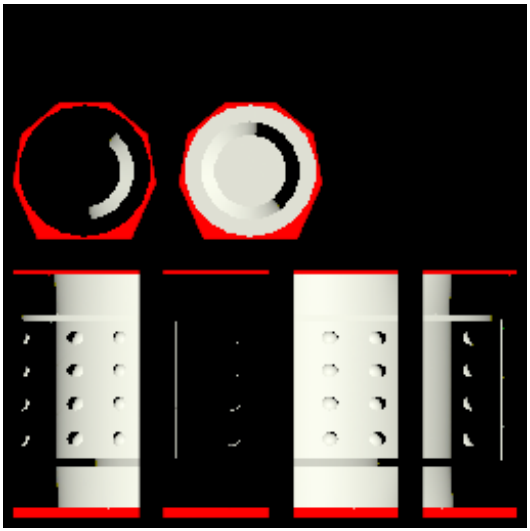


Raising and scaling the upper end of the projection cage.

When the cage is adjusted this way, the indentation appears in the normal bump map.

With the corrected cage, the upper indentation appears correctly in the normal bump map.

Tip: In situtations like this, another solution can be to use Break on the vertices in the region of the *low-resolution object* where detail is missing from the map. This increases the number of vertices in the cage, and reduces the chances of geometry being missed. If you use this method, it is likely you will need to make further adjustments to the projection cage, as well.

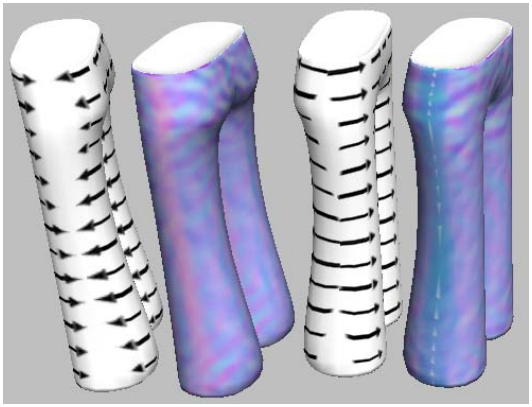


Breaking low-res vertices causes the indentations to render in the normal bump map. However, projection now misses some areas of the geometry, so the cage needs to be adjusted further.

Flipped Seams in Tangent Space

When you use tangent space for your normal bump map, usually the values used for the tangents are consistent between the hardware shader, renderers, and third-party applications. However, sometimes portions of the geometry are flipped, relative to each other, causing discontinuities when you render or use a hardware shader. Tangent space is the default option for normal bump mapping, and it is the method you should use for objects that both move and deform, such as animated characters. This problem does not arise when you use the other coordinate spaces: world, screen, or local.

For example, in the following scene, the pants show discontinuities. They are flipped relative to each other, as the arrows show.



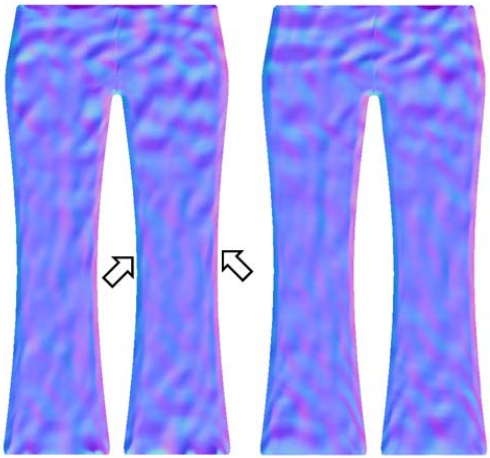
Flipped seams in rendering of pants

Left: Left side shows a discontinuous red stripe

Right: Right side shows a discontinuous blue stripe

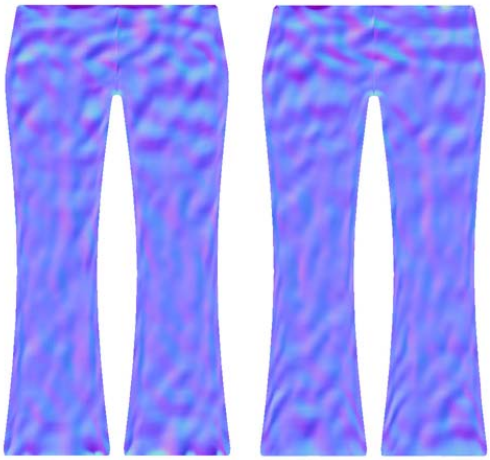
The arrows show how the maps are misaligned.

When you render a normal bump map, you can generally see flipped areas as showing a "flare" of reddish color to the right, and of bluish color to the left.



Uncorrected normal bump map shows blue and red "flares."

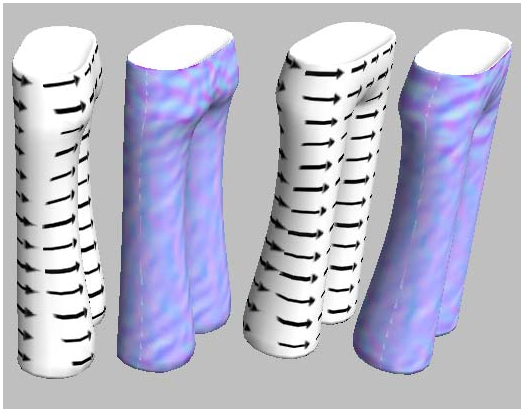
The solution is to use the UVW Unwrap modifier's Flip Horizontal command for those sub-object selections that show flaring, or an excess of red areas.



Normal bump maps corrected using Flip Horizontal

Red and blue are more evenly distributed, with blue predominating.

With the maps corrected, the full rendering, whether with 3ds Max or a hardware renderer, looks better.

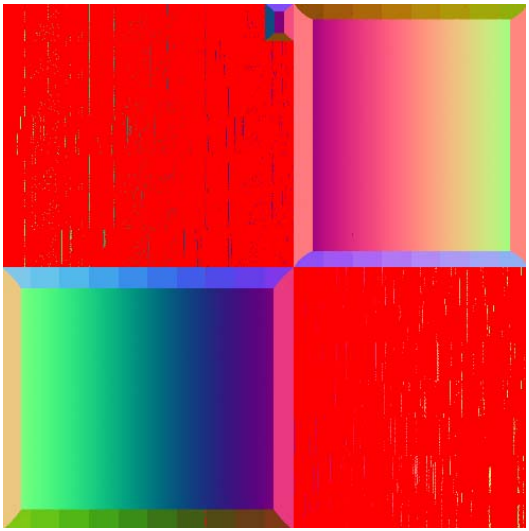


Corrected normal maps render more smoothly, without discontinuity.

The arrows show how the maps are correctly aligned to wrap around the pant legs.

Noise when Rendering a Normal Bump Map with the mental ray Renderer

If you use the mental ray renderer to render a normal bump map, and the model has overlapping faces (for example, where the low-resolution and high-resolution objects overlap in space), then the normal bump map can show noise where the faces overlap.



Red areas show noise from overlapping faces

The workaround is to adjust either the high-res or the low-res object so that faces are not coincident. One way to do so is to use a *Push modifier (page 1–769)*. After you have generated the normal map, you can turn off the Push modifier.

Tip: If another object in the scene continues to cause problems with the map rendering, you can make it invisible to normal projection by going to its Object Properties dialog, and in the Rendering Control group, turning off Visible To Reflection/Refraction.

Overlapping UV Coordinates

Overlapping UV coordinates can cause rendering errors in Render To Texture. The problem is especially noticeable on characters that have

mirrored UVs. If you are working with a character that has mirrored UVs, we recommend that you render only half the character to a texture.

For example, use a Mesh Select modifier to select half the character, then add a Delete Mesh modifier to remove it from projection. Add the Projection modifier *above* Delete Mesh, and then render the normal bump map.

Edit Normals Modifier Makes Normal Bump Mapping Incorrect

Don't apply an *Edit Normals modifier (page 1–613)* to the low-res object. Normal bump projection relies on the low-res object having standard normals, and altering them causes normal bump maps to have unpredictable results.

Render to Textures Dialog

Rendering menu > Render To Texture > Render to Texture dialog

Rendering to texture, or "texture baking," is controlled by this dialog. Most of this dialog's controls are contained in its rollouts.

See also

General Settings rollout (page 3–152)

Objects To Bake Rollout (page 3–153)

Output Rollout (page 3–155)

Baked Material Rollout (page 3–157)

Automatic Mapping Rollout (page 3–158)

Procedures

To bake an object's texture:

There are a lot of options for rendering to textures. These are the basic overall steps.

1. Select an object.

   Ideally, the object will have a texture assigned to it, or lights and shadows that fall on it, and so on.
2. Choose Rendering > Render To Texture.
3. In the same dialog, go to the Output rollout.
4. Click Add, and in the Add Texture Elements dialog, choose the element(s) you want to render.
5. Set Target Map Slots, if necessary.
6. Click Render.

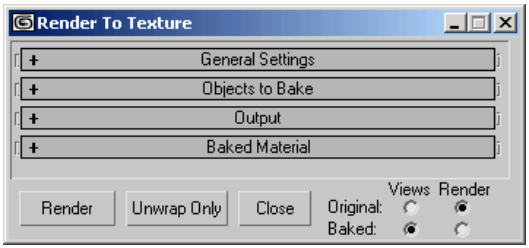
   The elements you chose to render are rendered to files, and the baked texture is displayed in shaded viewports.

To bake the texture of multiple objects:

1. Set up the texture-baking parameters of each object you want to bake. This corresponds to steps 2 through 5 of the previous procedure.
2. In the Objects To Bake rollout, change All Selected to All Prepared.
3. Click Render.

   Textures are rendered for all the objects you previously set up.

Interface



Render—Renders the scene, or the elements listed in the Objects To Bake rollout.

Unwrap Only—Applies the Automatic Flatten UVs modifier to all selected objects without rendering anything.

Close—Closes the dialog and saves any changes to settings you have made.

Original/Baked—When set to Views, the original or baked material is displayed in the viewports. When set to Render, the original or baked material is used in the rendering.

Render to Texture: General Settings Rollout

Rendering menu > Render To Texture > Render to Texture dialog > General Settings rollout

This rollout has the texture-baking controls for the current scene. It lets you control automatic unwrapping of the baked textures, map size, render settings, and where texture renderings are saved.

See also

Render to Texture (page 3–139)

Render to Texture Dialog (page 3–151)

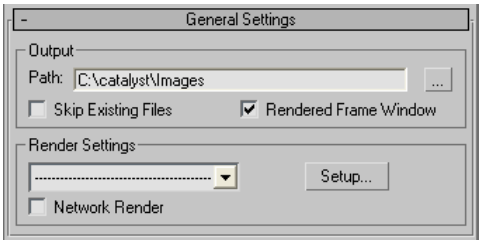
Render to Texture: Objects To Bake Rollout (page 3–153)

Render to Texture: Output Rollout (page 3–155)

Render to Texture: Baked Material Rollout (page 3–157)

Render to Texture: Automatic Mapping Rollout (page 3–158)

Interface



Output group

Text field—Specifies the folder where the rendered texture will be saved. You can enter a different folder name in this field. Default=the *\images* subfolder of the folder where you installed 3ds Max.

...—Click the ellipsis button to display a dialog that lets you browse to the directory where you want the rendered texture to be saved.

Skip Existing Files—Allows you to render only those maps that do not already exist.

Rendered Frame Window—When on, displays the complete map in a *rendered frame window (page 3–5)* as the elements are rendered. When off, does not open the rendered frame window. Default=on.

Note: The rendered frame window does not open when you use Render To Texture with the mental ray renderer. Instead, 3ds Max displays a progress dialog.

Render Settings group

These controls let you choose and set up Render Presets as well as activate network rendering.

Drop menu—Lets you choose *Load Preset (page 3–23)*. A Render Presets Load dialog appears where you can select an RPS file.

Setup—Displays the *Render Scene dialog (page 3–2)*, where you can adjust production settings, draft settings, or both.

Network Render—When on, you can assign the rendering task to Server systems. If you click Render, the *Network Job Assignment dialog (page 3–184)* displays where you can specify a server, or multiple servers, to take on the task. Default=off.

New in 3ds Max 8 is the ability to use the *Split Scan Lines option* when rendering to textures with a render farm. However, if you enable projection

mapping and turn on Sub-Object Levels, this option is unavailable.

Render to Texture: Objects to Bake Rollout

Rendering menu > Render To Texture > Render to Texture dialog > Objects to Bake rollout

This rollout has controls for the texture baking of individual objects. It lets you choose which map channel the texture will use, which elements will be rendered, and at what sizes. It also lets you control filename generation, and assign the format of rendered texture elements.

See also

Render to Texture (page 3–139)

Render To Texture Dialog (page 3–151)

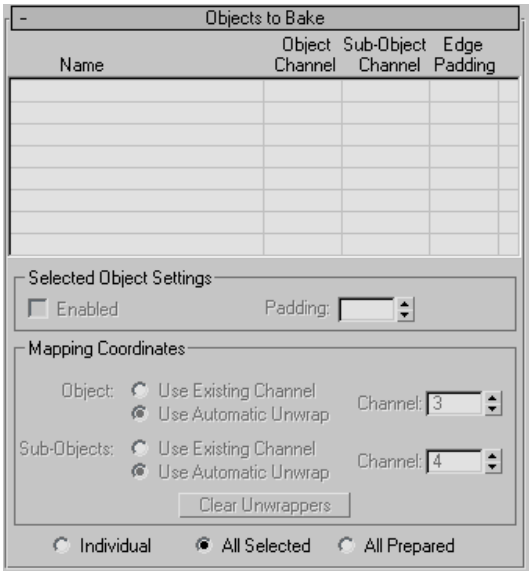
Render To Texture: General Settings Rollout (page 3–152)

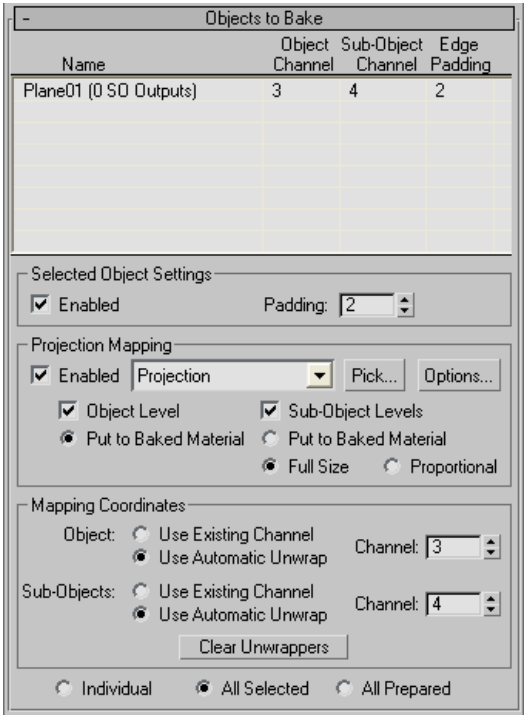
Render To Texture: Output Rollout (page 3–155)

Render To Texture: Baked Material Rollout (page 3–157)

Render to Texture: Automatic Mapping Rollout (page 3–158)

Interface





Object list

List of objects—Shows all selected objects.

- **Name column**—Lists the object's name.
- **Map Channel column**—Lists the object's current map channel setting.
- **Edge Padding column**—Lists the object's current edge padding setting.

Selected Object Settings group

Enable—When on, the Channel and Padding controls are used for individual, all selected, and all prepared objects. When off, only selected object texture rendering uses these settings; "whole scene" rendering does not. Default=off.

Padding—The amount, in pixels, that edges are allowed to overlap in the flattened ("unwrapped") texture. Default=2 pixels.

If the baked texture shows visible seams when you view it in shaded viewports or renderings, try increasing this value.

Projection Mapping group

This group contains the controls for generating a normal bump projection. See *Creating and Using Normal Bump Maps (page 3–146)*

Enabled—When on, normal bump projection is enabled using a *Projection modifier (page 1–760)*. When off, the Projection modifier is not used. Default=off.

To generate a normal map rather than a normal bump map, leave Enabled turned off.

Modifier drop-down list—When an object has been chosen, this list shows the Projection modifier. If multiple Projection modifiers have been assigned, their names are visible in the list as well.

Pick—Click to pick the high-resolution object from which the Projection modifier will derive normals. Clicking Pick displays a *Select Objects dialog (page 1–78)*, which lets you select one or more objects on which to base the normals map.

Options—Click to display the *Projection Options dialog (page 3–160)*, which contains various normal bump projection settings. When Individual is chosen (at the bottom of this rollout), the options affect the selected object; when All Selected or All Prepared is chosen, the options apply to all the selected or prepared objects.

Object Level—When on, projects from the object level of the high-resolution object. Default=on.

- **Put to Baked Material**—(The default.) When chosen, the object-level projection is rendered in the baked material.

Sub-Object Levels—When on, uses the active sub-object selection. Default=on.

- **Put to Baked Material**—When chosen, the sub-object level projection is rendered in the baked material.

The following options apply to sub-object rendering, when only a portion of the geometry is being rendered to the normal bump map:

- **Full Size**—(The default.) When chosen, the size of the normal bump map is the same as if all geometry were being rendered.
- **Proportional**—When chosen, the size of the normal bump map is fitted to the size of sub-object selection. The Proportional Multiplier on the Projection modifier's *Reference Geometry rollout (page 1–763)* can change the default size of the proportional map.

For example, consider a plane that is 4 segments x 4 segments. Each "poly" in the plane is a separate sub-object, for a total of 16 sub-objects. If the output Map Size is 64, the object rendering output is 64 x 64 pixels. If Full Size is chosen, each sub-object rendering is also 64 x 64 pixels. If Proportional is chosen, each sub-object rendering is 16 x 16 pixels. If you change Proportional

Multiplier to 2.0 in the Projection modifier, each sub-object rendering is now 32 x 32 pixels.

Mapping Coordinates group

Object—These controls are for basing the rendered texture on the object level of the source object.

- **Use Existing Channel**—When chosen, unwrapping uses an existing map channel.
- **Channel**—When Use Existing Channel is active, lets you choose the channel to use for unwrapping.
- **Use Automatic Unwrap**—(The default.) When chosen, uses automatic unwrapping, and applies an *"Automatic Flatten UVs" (Unwrap UVW) modifier (page 1–867)* to the objects whose texture is being rendered.

Sub-Objects—These controls are for basing the rendered texture on a sub-object selection of the source object.

Note: This capability was not available in releases prior to 3ds Max **7**.

- **Use Existing Channel**—When chosen, unwrapping uses an existing map channel.
- **Channel**—When Use Existing Channel is active, lets you choose the channel to use for unwrapping.
- **Use Automatic Unwrap**—(The default.) When chosen, uses automatic unwrapping, and applies an *"Automatic Flatten UVs" (Unwrap UVW) modifier (page 1–867)* to the objects whose texture is being rendered.

Clear Unwrappers—Clears the unwrap modifiers from the stack.

The radio buttons at the bottom of the rollout let you choose which objects to bake. See *Render To Texture Dialog (page 3–151)* for procedures.

Individual —Allows you to select each object and choose a set of output maps and targets for it. The list will display all selected objects.

All Selected—(The default.) Displays all the selected objects.

All Prepared—The list will display all visible and unfrozen objects in the scene, selected or not, which have unwrapped mapping on them.

Render to Texture: Output Rollout

Rendering menu > Render To Texture > Render to Texture dialog > Output rollout.

Depending on which element you have selected in the *Objects To Bake rollout (page 3–153)*, this rollout might be displayed. It lets you disable the saving of certain scene components for that particular element's map.

See also

Render to Texture (page 3–139)

Render to Texture Dialog (page 3–151)

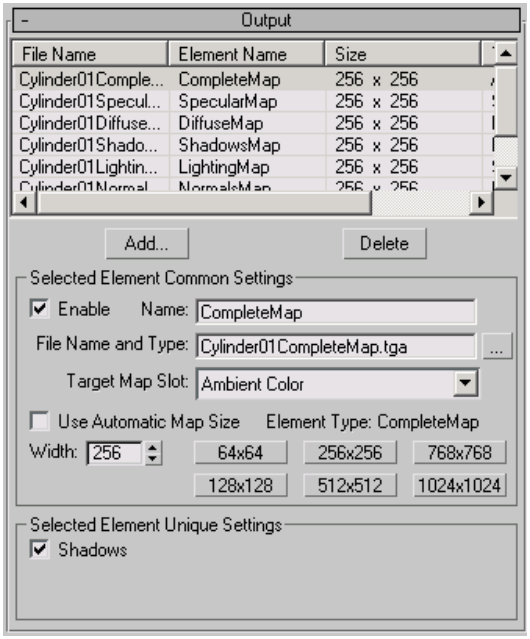
Render to Texture: General Settings Rollout (page 3–152)

Render to Texture: Objects To Bake Rollout (page 3–153)

Render to Texture: Baked Material Rollout (page 3–157)

Render to Texture: Automatic Mapping Rollout (page 3–158)

Interface



Example: Selected Element Unique Settings rollout for a lighting map

Output List—Shows maps names, element names, map sizes and designated map slots.

- **File Name column—**Lists the name of the map that will be generated.
- **Element Name column—**Shows the element corresponding to the map.
- **Size column—**Displays the map size.
- **Target Map Slot column—**Shows which map slot will be occupied by the baked texture in the material.

The output list can display entries in black, gray and blank. If a group of objects is selected that has already has output assignments, maps that are shared by all will appear black, maps not shared by all will appear gray. If resolutions or target types are shared they will appear black, if not they will be blank.

Add—Click to display an *Add Texture Elements dialog (page 3–160)* to choose one or more element types to add to the list.

See *Baked Texture Elements (page 3–142)* for a description of the different element choices.

Delete—Click to remove the currently highlighted element from the list.

Selected Element Common Settings group

Enable—When on, renders this element. When off, disables rendering of this element. Default=on.

Name—Enter the element component of the file name. Default=the name of the element type.

File Name and Type—Enter the file name of the rendered texture. Default=the object name followed by the element name, and *TGA format (page 3–683)*.

This field is disabled if All Selected or All Prepared is turned on in the *Objects To Bake rollout (page 3–153)*.

—Click this button to display a file dialog you use to choose a name, directory, and file format for the rendered texture.

Note: The File Name and Type setting specifies the path and filename only for the selected element. To set a folder where all baked textures will be stored, set the path in the Output group on the *General Settings rollout (page 3–152)*.

Target Map Slot—Display all Map Types available to the materials assigned to the objects selected minus the ones already slated for output in the current Render To Texture session.

If more than one object is selected the all map types common to all the selected objects will be listed. If you choose to *Create New Baked (page 3–157)*, then the slots for the new baked material type will be displayed.

Use Automatic Map Size—When on, sets the texture size automatically, using the values in the *General Settings rollout (page 3–152)*. When off, the texture is the size specified by the following controls in this rollout. Default=off.

Width—Lets you specify a custom resolution for the texture. Range=0 to 8192. Default=256.

Be aware that increasing texture resolution increases render time.

Note: Rendered textures are always square maps.

Preset resolution buttons (64x64, 128x128, and so on)—Click a button to specify a preset resolution for the texture.

Selected Element Unique Settings group

The contents of the Selected Element Unique Settings group vary depending on the active element. But the group always shows a list of toggles for various components of a scene, and by default, all toggles are on.

The following table shows which components apply to which elements (if the table shows "none," the Selected Elements Unique settings group is not displayed):

Map Type	Components
Complete	Shadows
Specular	Lighting Shadows
Diffuse	Lighting Shadows
Shadows	(none)
Lighting	Shadows Direct Light On Indirect Light On
Normals	Output into Normal Bump Render Height Map into Alpha Channel
Blend	Lighting Diffuse Specular Reflection Shadows Ambient Self-Illumination Refraction
Alpha	(none)
Height	(none)

For a fuller description of the rendered texture elements, see *Baked Texture Elements (page 3–142)*.

Render to Texture: Baked Material Rollout

Rendering menu > Render To Texture > Render to Texture dialog > Baked Material rollout

Material Baking operates on the entire Render To Texture session. It is not set per individual object.

Note: When you use Network Rendering, the Render To Baked Material option is disabled.

See also

Render to Texture (page 3–139)

Render To Texture Dialog (page 3–151)

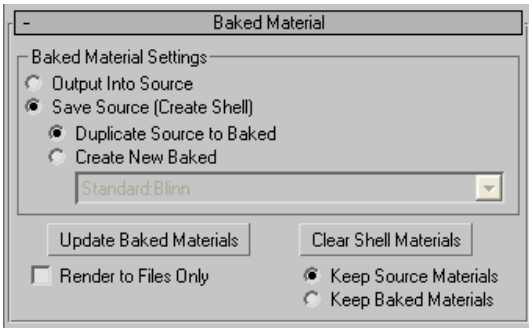
Render to Texture: General Settings Rollout (page 3–152)

Render to Texture: Objects To Bake Rollout (page 3–153)

Render to Texture: Output Rollout (page 3–155)

Automatic Mapping Rollout (page 3–158)

Interface



Baked Material Settings group

Output Into Source—When on, replaces any target map slot in the object's existing material. Care should be used with this option as it allows for un-undoable material replacement.

Note: If a selected object to be rendered has a multi/sub-object material assigned to it, the workflow will not change and the results will be as follows: output into source will put the resulting map in all sub-material slots that match, instancing all identical maps, if a sub-material doesn't have the selected output type it will be ignored; duplicate in baked will duplicate the entire Multi/Sub-Object Material into the baked material and perform the above output; create new baked will create a new single standard material.

Save Source (Create Shell)—Makes a new Shell material and assigns it to the object. When this option is turned on, you can then choose to either Duplicate Source To Baked, or to Create New Baked.

Duplicate Source To Baked—Makes a copy of the existing material as the Baked material.

Create New Baked—Puts a new material in the Baked Material slot. The type of the new material is set by the drop-down list below and subsequently determining the available Target Map Slots in the Output rollout.

Shader list—Allows you to specify a shader to be used for the newly baked texture.

Update Baked Materials—Builds a Shell material for all selected objects, and populates the baked material according to the current Render To Texture settings.

Clear Shell Materials—Removes the *Shell material (page 2–1409)* applied to the texture-baked object, and replaces it with either the original material or the texture-baked material.

The radio buttons below Clear Shell Materials give you a choice of which material in the Shell material to retain:

- **Keep Source Materials—**When chosen, the original material replaces the Shell material.
- **Keep Baked Materials—**When chosen, the baked material replace the Shell material.

Note: If you have already rendered a baked texture and decide you want to render with a different shader from the list, you must first click Clear Shell Materials and then re-render.

Render to Files Only—When turned on, the baked texture files are rendered to the folder you've specified in the Output Path field of the *General Settings rollout (page 3–152)*. Default=off

Render to Texture: Automatic Mapping Rollout

Rendering menu > Render To Texture > Render to Texture dialog > Automatic Mapping rollout

These are options specify how Render To Texture should behave when it automatically flattens UVs or chooses the map size of a baked texture.

See also

Render to Texture (page 3–139)

Render To Texture Dialog (page 3–151)

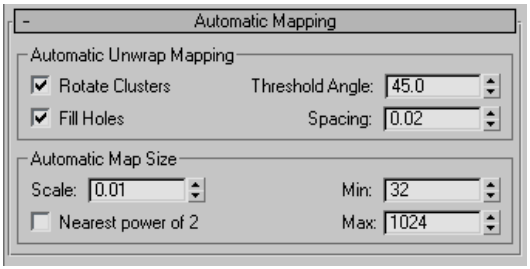
Render to Texture: General Settings Rollout (page 3–152)

Render to Texture: Objects To Bake Rollout (page 3–153)

Render to Texture: Output Rollout (page 3–155)

Render to Texture: Baked Material Rollout (page 3–157)

Interface



Automatic Unwrap Mapping group

These are options for how to flatten UVs when Use Automatic Map is chosen in the Objects To Bake rollout's Mapping Coordinates group.

Note: These controls are also provided by the Unwrap UVW modifier's *Flatten Mapping dialog (page 1–889)*.

Rotate Clusters—Controls whether clusters are rotated to minimize the size of their bounding box. For example, the bounding box of a rectangle rotated 45 degrees occupies more area than one rotated 90 degrees. Default=on.

Threshold Angle—The angle used to determine the face clusters to be mapped. Default=45.0.

As faces are gathered to be mapped, the modifier uses this parameter to determine which faces get put in a cluster. This is the maximum angle that can exist between faces in a cluster.

The higher this number, the larger the clusters will be, with consequently greater distortion introduced as a result of texture faces' proportions deviating from their geometry-equivalent faces.

Fill Holes—When turned on, smaller clusters will be placed in empty spaces within larger clusters to take the most advantage of the available mapping space. Default=on.

Spacing—Controls the amount of space between clusters. Default=0.02.

The higher this setting, the larger the gap that appears between clusters.

Automatic Map Size group

Rendering to texture can choose a map size for you. Automatic map sizing is enabled or disabled by a toggle on the *Output rollout (page 3–155)*. The controls in this group specify how to create the map, when Automatic Map Size is enabled. Automatic map sizing computes the total surface area of all objects in the selection, then multiplies that value by Scale, and creates a square texture map of those dimensions.

Scale—The amount by which to scale the total surface area of generated texture. Default=0.01.

Nearest power of 2—When on, rounds the map dimensions (length and width) to the nearest power of 2. Default=off.

Min—The minimum size, in pixels, of the length and width of the automatically sized map. Default=32.

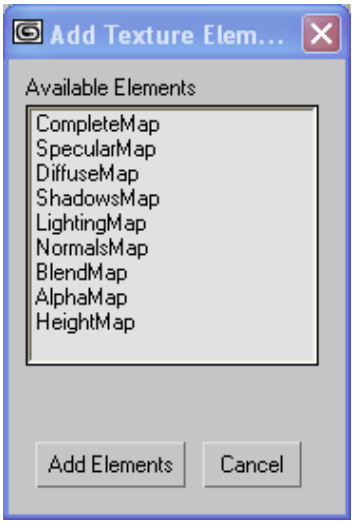
Max—The maximum size, in pixels, of the length and width of the automatically sized map. Default=1024.

Render to Texture: Add Texture Elements Dialog

Rendering menu > Render To Texture > Render to Texture dialog > Selected Object Settings rollout > Click Add to add a texture element > Add Texture Elements dialog

This dialog lets you choose which elements will be part of a baked material. Each element is an individual bitmap. When you display a baked texture in shaded viewports, some elements might not display. If you have the *Direct3D display driver (page 3–888)*, you can use a *DirectX viewport shader (page 2–1308)* to enhance baked texture display.

Interface



Available Elements—Lists the elements available for rendering. See *Baked Texture Elements (page 3–142)* for a description of the available elements. Click an element to select it. Use CTRL+click to select (or deselect) additional elements individually. Use SHIFT+click to select a group of contiguous elements.

You can also double-click a single element name to add it to the list and close the dialog.

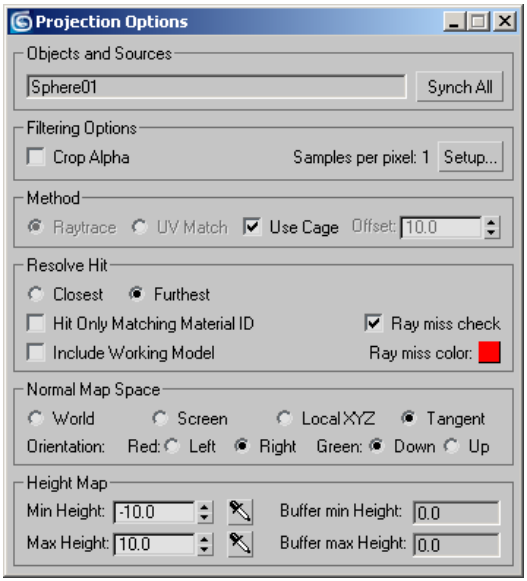
Add Elements—Click to add these elements to the list in the *Objects To Bake rollout (page 3–153)* of the Render To Texture dialog.

Render to Texture: Projection Options Dialog

Rendering menu > Render To Texture > Render to Texture dialog > Objects To Bake rollout > Projection Mapping group > Click Options. > Projection Options dialog

This dialog displays options for normal bump projection.

Interface



Objects and Sources group

The text field displays the name of the projection's source object. If more than one object is selected, it displays the source option chosen in the Render To Texture dialog: a single object name for Individual, or "All Selected" (the default), or "All Prepared."

Synch All—Click to set all Render-To-Texture sources to use the active source object and the

other current Projection Options settings. This button is available only when there is an individual source object.

Filtering Options group

Crop Alpha—Removes antialiasing from the alpha channel.

Global Supersampler—When the default scanline renderer is active, the text field shows the type of global supersampling that is currently in use. When the mental ray renderer is active, it shows the number of samples per pixel. Default=None.

- **Setup**—Click to set up global sampling. When the default scanline renderer is active, clicking Setup displays the Render dialog's *Default Scanline Renderer rollout (page 3–37)*, whose Global Supersampling group lets you globally enable supersampling, and choose the supersampling method. When the mental ray renderer is active, clicking Setup displays the Render dialog's *Sampling Quality rollout (page 3–97)*, which lets you adjust the level of sampling.

Method group

These controls let you choose how to use normals from the source object.

- **Raytrace**—(The default.) When chosen, normals are ray-traced between the source and target objects. The objects need to be perfectly aligned in *world space (page 3–1130)*. When you view both high-res and low-res objects in viewports, they must line up with each other exactly. There are no special requirements for the mapping coordinates of the high-res objects.
- **UV Match**—When chosen, normals are obtained by matching the target object's local UV coordinates to those of the source. The objects' *UV coordinates (page 3–1122)* need to be perfectly aligned. If you look at the objects using the Unwrap UVW modifier's *Edit UVWs dialog (page 1–878)*, the low-res and high-res objects must be lined up with each other exactly. The high-res object needs to have mapping coordinates on the same map channel you are using for the low-res object.

  Typically, the high-res object will have an Unwrap UVW modifier assigned to it, but this is not required.

  With this option, the high-res object does not need to be in the same physical location as the low-res object.

  Tip: You can Reset the cage (on the *Cage rollout (page 1–764)*), because UV Match does not use it.

Use Cage—When on, bases projection on the Projection modifier's cage sub-object. When off, uses an offset instead. Default=on.

Offset—Enabled only when Use Cage is turned off. Offset is the distance above the surface of the source object from which normals are projected. Default=10.0 units.

Resolve Hit group

The two radio buttons are for scenes that have semitransparent objects, in which case more than one hit can be found for each ray. The remaining controls in this group are additional projection controls.

- **Closest**—If there are multiple hits, use the closest object.
- **Furthest**—(The default.) If there are multiple hits, use the farthest object.

Hit Only Matching Material ID—When on, projection is only between material IDs that match. Turning this option on enables a single map to contain normal bump projections from different high-res source geometry. Default=off.

Include Working Model—When on, bakes from the source object if no target object can be found. Default=off.

Turning on Include Working Model can be a quick fix when a lot of the projected rays miss the target object (the Ray Miss Color will be apparent in the rendered normals map). However, if the low-res object occludes the high-res object, then Include Working Model will not have the desired effect, and the normal map will not show high-res details that you want it to. In this case, adjust the Projection modifier's cage.

This toggle is also useful when the high-res geometry is discontinuous (for example, a lattice or an array of cylinders).

Ray miss check—When on, bakes missed rays as well as rays that hit into the rendered texture, using the Ray Miss Color. Default=on

- **Ray miss color**—This color is baked into the texture when projection fails to hit the target geometry. Click the color swatch to display a *Color Selector (page 1–157)* and change the color used for missed rays. Default=red.

Normal Map Space group

There are four methods for projecting the normals:

- **World**—Project using world coordinates. This is useful mainly for objects that don't move or deform; otherwise, a moving object with world-projected normals will appear to "swim" through the texture.
- **Screen**—Project using screen coordinates; that is, flat projection in the Z axis. This method is useful mainly for stationary objects seen from a single angle only; for example, a statue seen through a window.
- **Local XYZ**—Project using the object's local coordinates. This method can be used for stationary or moving objects, but not for objects that deform: if the object deforms, the projection will appear incorrect at some frames.
- **Tangent**—(The default.) Project at a tangent to the target object's surface. This is the method to use for objects that both move and deform, such as animated characters.

Orientation

The orientation settings determines what the red and green colors will indicate in your normal map. The orientation settings are different for the Tangent method than for the other methods.

The correct setting for red and green depend on what kind of hardware shader or texture will be used to view the map. Different shaders have different requirements. The Normal Bump map has controls to flip the red and green; the Normal Bump texture should work correctly if the map was created with the default X and Y or Left and Right settings, but if the map was created with different settings, change the Normal Bump settings to make the map render correctly, instead of rendering a whole new map.

Orientation: Tangent

For the Tangent method red indicates normals that are pointed either left or right and green indicates normals that are pointed up or down.

As an example, if you use Tangent mode with Red set to right and Green set to down, areas that are red in your normal map would indicate that the normals were facing towards the right and areas that were green would indicate that your normals were facing downwards.

The following are the possible values for the Tangent method:

- **Red**—Can be Left or Right. Default=Right.
- **Green**—Can be Up or Down. Default=Down.

Orientation: World, Screen, and LocalXYZ

Orientation: Red: -X +X Green: -Y +Y

For World, Screen, and LocalXYZ red indicates that the normals are pointed either towards a positive or negative X value while the green indicates that the normals are pointed either towards a positive or negative Y value.

As an example, if you use World mode with Red set to —X and Green set to —Y, areas that are red in your normal map would indicate that the normals were facing towards —X and areas that were green would indicate that your normals were facing towards —Y.

The following are the possible values for World, Screen, and Local XYZ methods:

- **Red**—Can be —X or +X. Default=+X.
- **Green**—Can be —Y or +Y. Default=+Y.

Height Map group

Min Height—Sets a minimum height for displaced normals. Default=0.0 units.

Max Height—Sets a maximum height for displaced normals. Default=10.0 units.

Min and Max Height eyedropper—Enable the eyedropper to pick the minimum or maximum height for the displaced normals by picking or dragging in a viewport. With the button enabled, click at the desired height. You can also drag this value until the desired result is achieved. The minimum or maximum height value is updated based on your selection.

Buffer min Height—After you render a normal bump projection, this value is set to the minimum distance that a projection ray travelled. Default=0.0.

Buffer max Height—After you render a normal bump projection, this value is set to the maximum distance that a projection ray travelled. Default=0.0.

If you want to use the Height Map texture element, you can render a normal bump map to obtain the Buffer values, and then set Min Height and Max Height accordingly, in order to get the best-looking possible Height Map.

Preview Renderings

A preview is an *AVI file (page 3–658)* that can help you preview the animation in your scene. The preview uses lighting but not materials, so it renders much more quickly than a fully rendered animation.

The preview commands are on the *Animation menu (page 3–729)*.

Make Preview (page 3–163)

Make Preview Dialog (page 3–164)

View Preview (page 3–165)

Rename Preview (page 3–165)

Make Preview

Animation menu > Make Preview

Make Preview displays the *Make Preview dialog (page 3–164)*, enabling you to create an *AVI (page 3–658)* file or custom file type preview of the animation in the current viewport. You can also render a preview to a specified device.

When the preview is complete, the software starts the Media Player with the preview *_scene.avi* file ready to play. (If you don't want the Media Player

to start, choose File > Preferences > General and, in the UI Display group, turn off *Autoplay Preview File (page 3–859)*.)

Note: Do not open up any other program windows that cover up the viewport while rendering a preview. Anything that covers up the viewport will be rendered into the preview AVI file.

Procedure

To create a preview:

1. Choose Animation menu > Make Preview.

   The Make Preview dialog appears.

2. Change the preview parameters or accept the defaults, and then click OK.

   If AVI is selected as the output type, the software renders the preview and saves it in a file called *_scene.avi*. Immediately after it renders the preview, it starts the Media Player with this animation loaded.

3. View the preview by clicking Play in the Media Player.

   If you dismiss the Media Player but want to view the preview again, choose Animation > View Preview. This restarts the Media Player with *_scene.avi*.

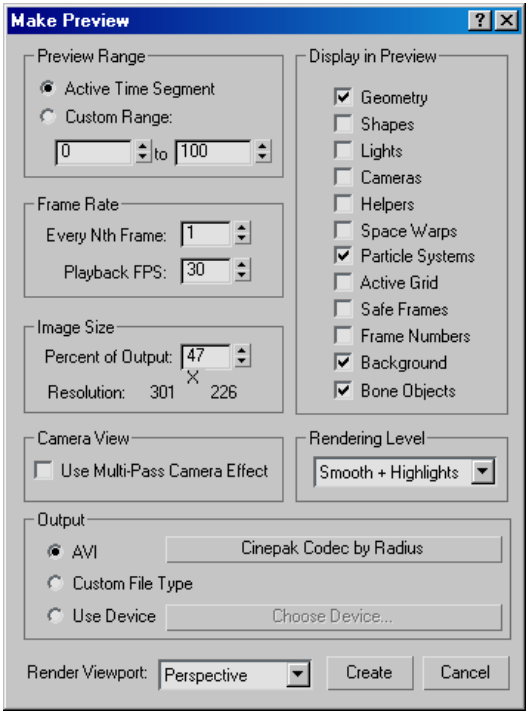
   You can save the preview under a different name, so it won't be overwritten the next time you make a preview. To do so, use Animation > *Rename Preview (page 3–165)*.

Make Preview Dialog

Animation menu > Make Preview > Make Preview dialog

The Make Preview dialog enables you to create an *AVI file (page 3–658)* preview of the animation in the current viewport.

Interface



Preview Range group

Specifies the frames to be included in the preview, either the *active time segment (page 3–998)* or a custom range of frames.

Frame Rate group

Specifies the playback *frame rate (page 3–1038)* in frames per second. Use Every Nth Frame to preview a regular sampling of the animation. For example, a value of 8 includes only every eighth frame in the preview.

Image Size group

Sets the resolution of your preview as a percentage of the current output resolution. The output resolution is set in the Render Scene dialog. For example, if the rendering output resolution

is 640x480, and you set the Percent Of Output spinner to 50, the preview resolution is 320x240.

Note: The size of the preview image is limited by the size of the viewpanel region (the region that contains the viewports). The spinner is clamped to the maximum value that allows the preview image to still fit in the viewpanel region.

Display in Preview group

Specifies the types of objects to include in the preview. Frame Numbers prints a frame number in the upper-left corner of each frame of the AVI file. Background includes the assigned viewport background in the preview.

Camera View group

Specifies whether the preview should include *multi-pass rendering effects (page 3–76)*.

Rendering Level group

Rendering Level drop-down list—Specifies the type of viewport shading to use in the preview.

Output group

Specifies the preview output format.

AVI—When chosen, the preview is output as an AVI file. The button to the right displays the current AVI *codec (page 3–1015)*. Click it to adjust the assigned codec, or choose a different codec. The quality of your output AVI file depends on the type of codec you use and the codec settings, which vary. For the highest visual quality, choose the highest compression quality. The higher the compression quality, the lower the compression, and the larger the resultant file.

Custom File Type—Outputs the preview to the specified file format. When this option is chosen, and the Create button is clicked, a file selector appears, where you name the file and specify the output file type. For example, you can output the preview as a flic by specifying a file name with a *.flc* extension. If you specify a single-image format, such as *.tga*, the preview is output as a series of sequentially numbered files.

Use Device—Lets you output the preview to an external device, such as a digital recorder. The button at right displays the name of the currently assigned device. Click it to either change the settings of the device, or assign a different device.

Render Viewport list—Displays the names of the currently visible viewports, letting you choose which viewport to render from within the Render Scene dialog. Default=name of the active viewport.

View Preview

Animation menu > View Preview

View Preview displays the Windows-standard Media Player to view the current preview file.

When you use Make Preview, 3ds Max stores the output preview in a file called *_scene.avi* by default. View Preview loads this file. If you want to keep the preview file, use Rename Preview to save it under another file name, otherwise, the next Make Preview will overwrite *_scene.avi.*

The Media Player has its own Help system.

Rename Preview

Animation menu > Rename Preview

Rename Preview renames the *_scene.avi* preview file.

When you use Make Preview, 3ds Max stores the output preview in a file called *_scene.avi* by default. View Preview loads this file. If you want to keep the preview file, use Rename Preview to save

it under another file name; otherwise, the next Make Preview will overwrite *_scene.avi.*

Procedure

To rename the preview file:

1. Choose Animation > Rename Preview.
2. Specify a folder and a name for the preview file.
3. Click Save.

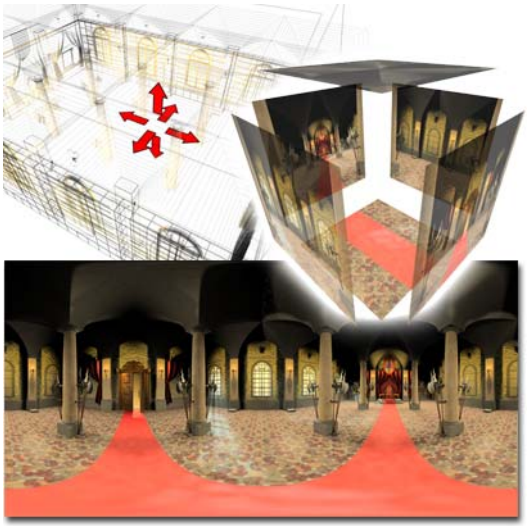
Panorama Exporter

Rendering menu > Panorama Exporter

Utilities panel > Utilities rollout > More button > Utilities dialog > Panorama Exporter

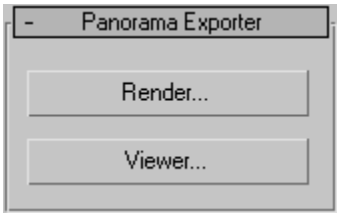
The Panorama Exporter is a rendering utility that lets you create and then view 360 degree spherical panoramas.

Note: You need at least one camera in your scene to use the Panorama Exporter.



Panorama Exporter creates a 360-degree spherical rendering.

Interface



The Panorama Exporter rollout has two buttons, which let you create or view a panoramic rendering.

Render—Opens the *Render Setup dialog (page 3–166)* for the Panorama Exporter.

Viewer— Opens the *Panorama Exporter viewer (page 3–168).*

Panorama Exporter Render Setup Dialog

Rendering menu > Panoramic Exporter > Render button

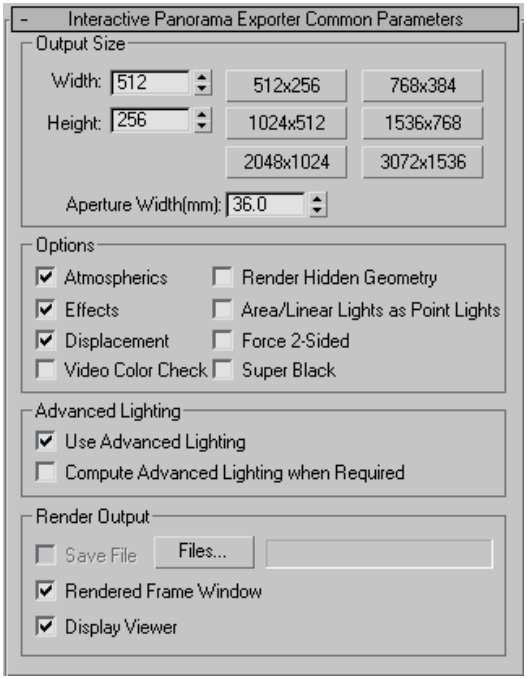
Utilities panel > Utilities rollout > Panorama Exporter > Render button

The Panorama Exporter Render Setup dialog is similar to the *Render Scene dialog (page 3–2).* However, the Panorama Exporter Render Setup dialog is *modal (page 3–1067).*

Note: You need at least one camera in your scene to use the Panorama Exporter.

Tip: In order to achieve best results, high resolutions may be necessary. A resolution of 2048x1024 is suggested unless you're working on drafts.

Interface



Output Size group

Choose one of the predefined sizes or enter another size in the Width and Height fields (in pixels). These controls affect the image's *aspect ratio (page 3–1005)*.

Width and Height—Lets you set the resolution of the output image by specifying the width and the height of the image, in pixels.

Preset resolution buttons (512x256, 1025x512, and so on)—Click one of these buttons to choose a preset resolution.

Aperture Width—Lets you specify an aperture width for the camera that creates the rendered output. Changing this value changes the camera's Lens value. This affects the relationship between the Lens and the FOV values, but it doesn't change the camera's view of the scene.

For example, if you have a Lens setting of 43.0 mm, and you change the Aperture Width from 36 to 50, when you close the Render Scene dialog (or render), the camera Lens spinner has changed to 59.722, but the scene still looks the same in the viewport and the rendering. If you use one of the preset formats rather than Custom, the aperture width is determined by the format, and this control is replaced by a text display.

Options group

Atmospherics—Renders any applied atmospheric effects, such as volume fog, when turned on.

Effects—Renders any applied rendering effects, such as Blur, when turned on.

Displacement—Renders any applied displacement mapping.

Video Color Check—Checks for pixel colors that are beyond the safe *NTSC (page 3–1074)* or *PAL (page 3–1082)* threshold and flags them or modifies them to acceptable values.

By default, "unsafe" colors render as black pixels. You can change the color check display by using the *Rendering panel (page 3–863)* of the *Preference Settings dialog (page 3–859)*.

Render Hidden Geometry— Renders all geometric objects in the scene, even if they are hidden.

Area/Linear Lights as Point Lights—Renders all area or linear lights as if they were point lights, speeding up rendering time.

Tip: This is useful for draft renderings, as point lights render much faster than area lights.

Note: Scenes with *radiosity (page 3–50)* are not affected by this toggle, as area lights do not have a significant effect on the performance of a radiosity solution.

Super Black—*Super Black rendering (page 3–1112)* limits the darkness of rendered geometry for video compositing.

Tip: Leave this off unless you're sure you need it.

Force 2–Sided—*2-sided rendering (page 3–995)* renders both sides of all faces. Usually, you'll want to keep this option off to speed rendering time. You might want to turn it on if you need to render the inside as well as the outside of objects, or if you've imported complex geometry in which the face normals are not properly unified. Default=off.

Advanced Lighting group

Use Advanced Lighting—When on, the software incorporates a *radiosity solution (page 3–50)* or *light tracing (page 3–43)* in the rendering.

Compute Advanced Lighting When Required—When on, 3ds Max computes radiosity when required on a per-frame basis.

Normally, when rendering a series of frames, 3ds Max calculates radiosity only for the first frame. If, in an animation, it might be necessary to recalculate the advanced lighting in subsequent frames, turn this option on. For example, a brightly painted door might open and affect the coloring of a nearby white wall, in which case the advanced lighting should be recalculated.

Render Output group

Save File—Saves the rendered panorama to disk. This is unavailable until you have defined a file name by clicking the Files button.

Files—Lets you specify the name, location, and file type for the rendered panorama file.

Rendered Frame Window—Enables or disables the panorama exporter's rendering display.

Display Viewer—When on, the *Panorama Exporter viewer (page 3–168)* opens upon rendering the panoramic rendering.

Viewport—Chooses the camera viewport to render. When you render a panorama, this drop-down list shows only the cameras in the scene.

Render—Click to render the panorama.

Cancel—Click to cancel the rendering.

Close—Click to close the dialog, saving any changes you've made.

Panorama Exporter Viewer

Rendering menu > Panoramic Exporter > Viewer button

Utilities panel > Utilities rollout > Panorama Exporter > Viewer button

The Panorama Exporter viewer lets you navigate a rendered panorama. You can use the viewer to export the panorama rendering with a cylindrical, spherical, or QuickTime VR format.

Note: Exporting to QTVR format requires that QuickTime® 5 or higher is installed on your system. You can download the latest version from www.apple.com/quicktime/download. For QTVR export, you must choose the "Recommended Install" rather than a custom or minimal installation. In particular, your installation must include these components:

- QuickTime Authoring
- QuickTime Internet Extras
- QuickTime Essentials

Procedures

To navigate a rendered panorama:

- Hold down the left button to rotate the camera around the panorama.

  If you move the mouse, the camera rotates in that direction until you move the mouse again. (The view of the panorama moves in

the opposite direction from the mouse and camera.)

- Hold down the middle button and move the mouse up and down to zoom in and out.
- Hold down the right button and move the mouse to rotate the camera around the panorama.

  With the right button, you must drag the mouse to see any movement, and the view of the panorama moves in the same direction as the mouse.

To export a rendered panorama:

1. Open a rendered panorama in the Panorama Exporter Viewer.
2. Click File > Export.

   Choose Cylinder, Sphere, or QuickTimeVR to set the format for your exported file.

A dialog opens, prompting you to enter the name, location, and type of file.

Network Rendering

Introduction to Network Rendering

Network rendering is a means of mass-processing multiple rendering tasks or jobs. In order to facilitate network rendering, Autodesk BackburnerTM is installed with 3ds Max. The Backburner software is responsible for coordinating how job assignments are processed.

In its most efficient form, network rendering uses multiple computers, connected over a network, to perform rendering tasks; typically the rendering of animations with hundreds or thousands of frames. Even a small network of three or four PCs can save substantial rendering time and help you meet deadlines.

However, network rendering can be equally useful if you have only a single PC and need to render a number of images. You can assign the jobs that need to be rendered and Backburner can manage the rendering of each job while you're away from the computer. Commonly, jobs are assigned submitted just before you leave the office. when you arrive the next morning, all your rendering are waiting for you to review.

Network rendering is designed to render whatever is set up in your scene; that is, it will render the viewport, part of a viewport, camera view, and so on as saved in the scene file. Backburner can also be passed batch rendering tasks from the *Batch Render tool (page 3–200)*. Tasks can be queued up from any number of cameras in a scene. Each task can be told to automatically load a save scene state or use a particular rendering preset. Network rendering is only available when you use the Default Scanline Renderer.

The requirements and procedures presented here assume you are the administrator of a closed network set up exclusively for network rendering. In practice, you can use the network for file sharing and other purposes, but if conflicts arise, you might need to cancel those uses. The easiest network to set up, operate, and maintain is one dedicated to rendering.

Note: For specific information about setting up network rendering on a single system, refer to *Basic Procedure 1: Single-System Network Rendering (page 3–171)*.

If you're a system administrator for a more complex network, you can use the information in this file as a guideline. The basic approach is the same for any network.

Important: It is strongly recommended that you follow these procedures for setting up and running network rendering. Do not attempt network rendering without reading the instructions that follow.

The links on this page are ordered like chapters in a manual: a sequence of major topics containing more specific nested topics. Links marked *Next Step* indicate the next topic in the sequence. Moving from one topic to the next takes you through the necessary steps to set up your network for rendering.

Note: Network rendering functions are also available from MAXScript. See "Network Render Interface" and "Interface: NetRender" in the *MAXScript Reference (page 3–973)*.

About Backburner

Network rendering is performed by software named Backburner. Functionality is primarily the same as in previous versions of 3ds Max with the addition of the following:

- The *Batch Render tool (page 3–200)* can pass a queue of rendering tasks to the Network Job Assignment dialog. When submitted, Backburner manages the rendering of all the active tasks and
- You can now assign various servers to groups in Backburner. From the Network Job Assignment dialog you can choose a group as the current set of servers.

Backburner Documentation

All of the general information about Backburner is described in Autodesk Backburner 3 Installation and User's Guide. Information that is specific to using Backburner with 3ds Max appears in this Network Rendering section.

Network rendering with the mental ray Renderer

The mental ray renderer supports network rendering via Backburner and the command line. The steps for setting up and submitting jobs are exactly the same as those you'd use for the scanline renderer. No additional licensing or fees are necessary.

Next Step

How Network Rendering Works (page 3–173)

See also

Setting Up for Network Rendering (page 3–180)

Basic Procedures for Network Rendering (page 3–170)

Network Job Assignment Dialog (page 3–184)

Batch Rendering with Backburner (page 3–198)

Troubleshooting Guide (page 3–177)

Autodesk Backburner 3 Installation and User's Guide

Basic Procedures for Network Rendering

This topic contains basic procedures to follow when network rendering with 3ds Max. The following conditions are assumed:

- 3ds Max has been installed on all machines to use as rendering servers. Note: You needn't license the software on machines to be used only as rendering servers.
- All network communications and protocols are installed and operating correctly.
- The computers run Windows XP Pro, Windows 2000, or NT 4.0. Limitations of other operating systems could cause network rendering to be unreliable.

- All of the computers have names that start with letters. Machine names that start with a number will fail.
- You haven't previous attempted network rendering. If you have already attempted network rendering and want to return to the original state, delete everything in the *|Program Files|Autodesk|Backburner|Network* folder except *nrres.dat*.
- Manager and Server have not been installed as services.

Summary of Procedures

- Procedure 1 - Use this procedure for configuring a single system to render jobs to itself; in other words, to perform batch rendering that is managed by Backburner.
- Procedure 2 - Use this procedure for configuring a Backburner Manager system to render to one or more Backburner Server systems. The Manager system will *not* be involved in the rendering tasks.
- Procedure 3 - Use this procedure for configuring the Backburner Manager *and* Backburner Server systems to render tasks together.

Special Consideration for Procedures 2 and 3

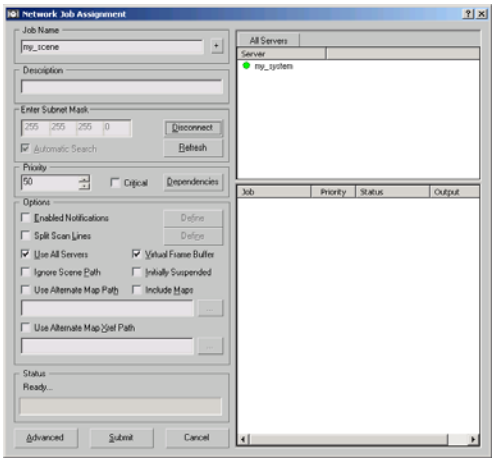
To use a render farm, you must output a frame sequence in a still-image file format; for example, a series of BMP files. You cannot render animated file formats such as AVI, MOV, and FLC to multiple systems. You must render animated files to a single system. When rendering to an animated file format, the Use All Servers check box in the Network Job Assignment dialog is unavailable.

Basic Procedure 1: Single-System Network Rendering

This procedure describes usage of network rendering on a single computer. The main advantage to this method over standard rendering is that you can submit multiple rendering jobs for the computer to render. In effect, this lets you perform batch rendering.

1. Start the Backburner Manager and Backburner Server. See Setting Up Backburner Manager for the Rendering Network and Setting Up Backburner Server for the Rendering Network.
2. Start 3ds Max and load the first scene you want to render.
3. From the Rendering menu, choose Render, or click the toolbar Render Scene button.
4. Set the rendering parameters and specify an output file name. In the Render Output group on the Common tab, turn on Net Render, and then click the Render button.

   The Network Job Assignment dialog appears.



Network Job Assignment dialog showing the server station that is also running Manager.

5. Enter a job name (it's a good idea to change the default name) and then click the Connect button.

   The name of your computer (that is, the Server) appears in the Server window to the right. It

has a green dot next to it meaning that it is a Server system that is ready to start rendering.

6. Click the Server name to highlight it in the list window, and then click the Submit button.

   The Manager submits the job to the Server, both running only on this system, and the Server begins rendering each still frame or the animation.

7. To render additional jobs, load each into 3ds Max, and then repeat steps 6-9.

   You can submit as many jobs as you like. The software will queue the jobs up and render them in the order that you submitted them.

Basic Procedure 2: Network Rendering from Server (not Manager)

When rendering across a network, you first assign one machine to be Manager, and then any number of others as Servers. In this procedure, you won't use the Manager as a rendering Server.

1. Start the Backburner Manager and start the Backburner Server on all server systems that you intend to make available for rendering jobs. See Setting Up Backburner Manager for the Rendering Network and Setting Up Backburner Server for the Rendering Network.

2. Return to the Manager system, start 3ds Max, and load the first scene you want to render.

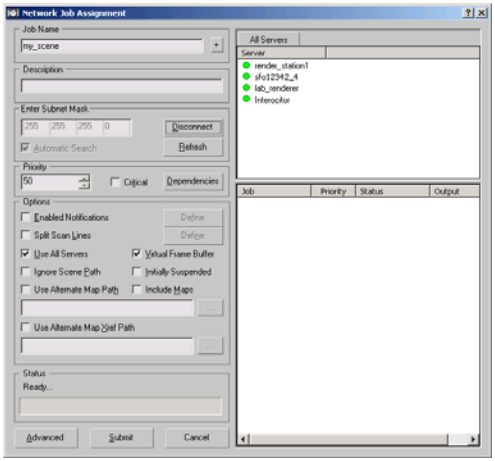
3. From the Rendering menu, choose Render, or click the toolbar Render Scene button.

4. Set the rendering parameters and specify an output path and file name.

   Tip: So that the Servers can find the output path, specify the path in the Render Output File dialog starting with Save In > My Network Places. Then navigate to the output folder, specify a file name and output format (Save As Type), and click Save.

5. In the Render Output group, turn on Net Render, and then click the Render button.

   The Network Job Assignment dialog appears.



Network Job Assignment dialog showing all the server stations. The manager station is excluded.

6. Enter a job name (it's a good idea to change the default name) and then click the Connect button.

   The names of all Servers appear in the Server window to the right. Those with green dots next to their names are ready to start rendering.

   By default, all the Servers that are listed will take part in the rendering job. To assign a specific Server to render a job, first turn off Use All Servers in the Options group, and then highlight the server(s) that you want to render the job.

7. Click the Submit button.

   The Manager submits the job to the Servers, which begin rendering .

   At this point, you can load and submit additional scenes. When the first job is complete, the next job will automatically begin rendering on the Servers.

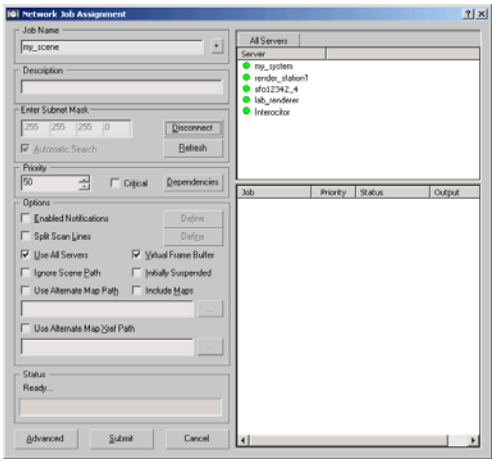
Basic Procedure 3: Network Rendering from Manager and Servers

When rendering across a network, you first assign one machine to be Manager, and then any number of others as Servers. In this procedure, you'll use the Manager computer as a rendering Server as well.

1. Start the Backburner Manager and start the Backburner Server on all server systems that you intend to make available for rendering jobs. See Setting Up Backburner Manager for the Rendering Network and Setting Up Backburner Server for the Rendering Network.
2. Return to the Manager system, start 3ds Max, and load the first scene you want to render.
3. From the Rendering menu, choose Render, or click the toolbar Render Scene button.
4. Set the rendering parameters and specify an output path and file name.

   Tip: So that the Servers can find the output path, specify the path in the Render Output File dialog starting with Save In > My Network Places. Then navigate to the output folder, specify a file name and output format (Save As Type), and click Save.
5. In the Render Output group, turn on Net Render, and then click the Render button.

   The Network Job Assignment dialog appears.



Network Job Assignment dialog showing all the server station plus the manager station that is running Server.

6. Enter a job name (it's a good idea to change the default name) and then click the Connect button.

   The names of all Servers appear in the Server window to the right. Those with green dots next to their names are ready to start rendering.

   By default, all the Servers that are listed will take part in the rendering job. To assign a specific Server to render a job, first turn off Use All Servers in the Options group, and then highlight the server that you want to render the job.
7. Click the Submit button.

   The Manager submits the job to the Servers, which begin rendering .

   At this point, you can load and submit additional scenes. When the first job is complete, the next job will automatically begin rendering on the Servers.

How Network Rendering Works

Rendering networks are sometimes called "render farms."

In the software, one computer is set up as the network Manager. The Manager "farms out" or distributes the work to rendering Servers. You can also have the same computer function simultaneously as both Manager and Server, so computing cycles don't go to waste.

Once rendering is under way, the Queue Monitor program lets you directly monitor and control the operation of the network rendering workload. The Queue Monitor allows you to edit job settings as well as to activate, deactivate, and reorder both jobs and servers involved in your render farm.

Important: When rendering using a render farm, always render to single-frame formats such as BMP or PNG. Movie file formats such as AVI depend on the ordered sequence of the frames. A network rendering situation does not guarantee that. Frames can come in in any order.

The only way to guarantee the frame sequencing in an AVI file is to render on a single computer. If rendering with multiple computers, render individual frames and, when all of them are rendered, combine them in the proper sequence with Combustion or Video Post.

How Work Is Divided

The software breaks up the task of network rendering among the rendering Servers, assigning one frame at a time to each Server. The completed output of the Servers accumulates in a common, shared directory.

Rendered frame files can also be written to a local directory on each machine, if the same path defines the directory. Frame files are sequentially numbered, making them easy to assemble later.

The Manager takes a number of different factors into account in determining how to assign frames and jobs, always striving for the most efficient usage of the rendering network. An idle rendering Server is automatically detected by the Manager and is considered for job or frame assignment. If a Server goes off-line for some reason, the Manager reclaims the Server's current frame and reassigns the frame to the next available rendering Server.

The Basic Process

Following is a step-by-step description of the sequence of events when you use network rendering:

1. The user submits a job to the network Manager.
2. On the submitting machine, the MAX file gets zipped up. If the user turned on Include Maps, all maps and XRefs are also zipped up.
3. Once the file is zipped up, the ZIP file is copied to the Manager machine's *Backburner\network\jobs\jobname* folder. In the folder is an XML file describing the job itself, specifying frame size, output filename, frame range, render settings, etc.
4. Once the Manager receives the ZIP and XML files, it looks to see which servers are sitting idle and can render jobs. It assigns the job to four servers at a time. (This is the Max Concurrent Assignments setting on the Manager General Properties dialog. See Starting Backburner Manager).
5. Each Server machine receives the ZIP and XML files into the *Backburner\network\jobtemp* folder.
6. The MAX file gets unzipped, along with the maps and XRefs if they were included.
7. 3ds Max is launched and loads the MAX file. If the maps and XRefs were not included, the software searches for them as they are defined in the MAX file. For instance, if an XRef is in *d:\foo\xref.max*, the Server will look for *xref.max* in *d:\foo* on the local machine. If there are additional map paths set in the *3dsmax.ini* file on the rendering server, it will search in those paths as well. If it does not find

the maps and XRefs, the server fails for that particular job.

This is why it is important to use UNC paths for all maps and XRefs in your scene file, so that all render servers can find them. However, if the maps and XRefs were included, then 3ds Max will get the ones that were unzipped into the *\jobtemp* folder.

8. When a frame is finished rendering, 3ds Max on the Server saves the frame to the location specified via the Render Scene dialog before you submitted it.
9. Once a Server successfully renders one frame, the Manager assigns a block of frames to the server to render; it might assign 20 consecutive frames. This minimizes the amount of communication needed between the Server and Manager.
10. The Server continues rendering frames for the job until the job is done.
11. The Server then closes 3ds Max, and goes idle. If the queue contains additional jobs, the Server picks up the next job and starts the process all over again.

    You can use this explanation to help determine the basic requirements for your network rendering setup, based on the type of usage. If your frames render quickly, you'll need a fast file server machine to handle the constant output from a number of different rendering servers. The same holds true of your scene uses a large quantity of map files that are stored in a central location. If you typically render large files, rendering will take longer, and most of the bandwidth will be required at the start, when the files are distributed to the rendering servers.

Starting Network Rendering

Once you've set up the network rendering system and *software (page 3–180)*, there are two steps to starting a network rendering session:

- Start the Manager program on one machine See Setting Up Backburner Manager for the Rendering Network and the Server program on every other machine in the network Setting Up Backburner Server for the Rendering Network. The machine being used as a manager can also be used as a rendering server.
- Start a rendering job from the software on a networked machine with an authorized copy of .3ds Max

The Manager and Server programs need to be started and left running during a network rendering session. Either program remains in operation until you shut it down or shut down the machine.

When you've set up the Manager and Server network services, you're ready to submit an animation to the network rendering queue. There are two stages to starting network rendering:

- In the Render dialog, set all desired rendering parameters, including resolution and rendered output file type, and render the scene.
- Turn on Net Render, found in the Render Output, Render Settings or Output groups, and then click Render to open the *Network Job Assignment dialog (page 3–184)*, which lets you make final decisions about the job and submit your animation to the rendering servers.

Procedures

These procedures explain how to start and submit a network rendering job in 3ds Max.

To start a network rendering job:

1. Start the Backburner Manager and Backburner Server. See Setting Up Backburner Manager for the Rendering Network and Setting Up Backburner Server for the Rendering Network
2. Start the software on a machine with an authorized copy of the program.
3. Open the scene you want to render.
4. Choose Rendering menu > Render to display the Render Scene dialog.

   You can also render from the Execute Video Post dialog or the Render To Texture dialog.
5. In the Render Output group, click the ellipsis button to display the Render Output File dialog.
6. In the File Name field, enter the *UNC (page 3–1122)* name of the output directory, followed by the name of the output file. For example:

   ||machine1|project1|images|output.tga

   As an alternative to entering the UNC name from the keyboard, you can go to Save In > My Network Places and navigate to the machine and shared directory where you want the servers to write the rendered frames. After selecting the machine and shared directory in the Map Network Drive dialog, enter the output file name (for example, *output.tga*), and then click OK. The software automatically converts the shared directory to the UNC format.

   If the output directory is mounted, enter the name and extension of the output file and choose the drive mounted for the output directory from the Save In list.
7. Click OK to display the Setup Options dialog for the file format type you have selected.
8. Make the desired settings and click OK.
9. Click OK again to return to the Render Scene dialog.

   Save File is turned on once you assign an output file.
10. After setting any other rendering parameters, turn on Render Output group > Net Render and click Render.

    The Network Job Assignment dialog appears.

    If you use Video Post, set the file location with an Add Image Output Event. After you click Execute Sequence, be sure to turn on Net Render before you click Render.

To submit a network rendering job:

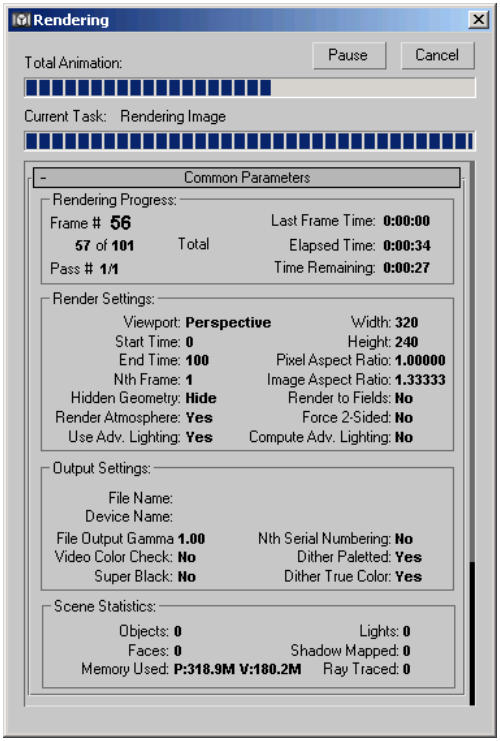
1. Start the Backburner Manager and Backburner Server. See Setting Up Backburner Manager for the Rendering Network and Setting Up Backburner Server for the Rendering Network
2. In the Network Job Assignment dialog, make sure the Automatic Search option is on, and then click Connect.

   In most cases, the software detects the Manager machine and displays its attached Servers in the Server list. If auto-detect fails, turn off Automatic Search and manually enter the name or IP address of the network machine acting as the Manager, and then click Connect.

   All rendering Servers running under the network Manager should be listed with green dots next to them. Even if a server is running an interactive session of the software, it will still render an assigned job by launching a second copy of the software.
3. By default, the job will use all available Servers. To use only specific Servers, turn off Use All Servers and choose the machines you want to use from the Server list.
4. Click Submit.

   The job is submitted to the Manager, which then distributes the job to the machines assigned in the Network Job Assignment dialog. Network rendering begins.

When network rendering begins on a rendering Server, the Rendering dialog appears on machines running *serverapp.exe*. If a machine is running the service version, no dialog appears.



Troubleshooting Guide

This is a guide to solving common problems associated with network rendering. Solutions to these problems vary, depending on whether you are using the network rendering programs as installed Windows Services, or running them in Desktop mode. Also see Troubleshooting Backburner.

PROBLEM: When I try to assign a job in the Network Job Assignment dialog, some of the servers display a gray or yellow icon.

SUGGESTION

Regardless of their state in the Network Job Assignment dialog, servers can always be assigned new jobs.

The gray icon means that the server is currently not available to render a job. This state can occur for several reasons, including:

- The server has not been correctly started (see Setting Up Backburner Manager for the Rendering Network and Setting Up Backburner Server for the Rendering Network).
- The server has been disallowed for the current time period in the Properties dialog of the Monitor (see Setting the Availability for Render Nodes in the Managing Render Nodes topic).
- The server has experienced abnormal termination.

  If you've checked for and corrected these conditions and the servers are still unavailable, stop running Server on each of the problem machines, and restart the service after a few seconds. This "purges" the server and may solve the problem. Then click Refresh in the Network Job Assignment dialog to display the most recent information about the server.

The yellow icon means that the server is busy rendering another job. If the server should not be busy, verify that the queue is clear of jobs by opening the Queue Monitor and connecting to the Manager. If the queue is clear of rendering jobs and the server is still flagged as busy, stop running server on each of the problem machines, and restart the service after a few seconds.

PROBLEM: When I submit a job to be rendered, the server fails.

SUGGESTION

Servers can fail for a variety of reasons during a network render job. Many of these reasons are covered in Troubleshooting Backburner. One reason that is specific to 3ds Max which can cause a server to fail is the presence of a scene which does not contain texture coordinates.

All errors are recorded in the appropriate log file. You can learn more about log files in Configuring Backburner Log Files.

Here are some of the error messages related to 3ds Max, along with a likely cause, that you will see in the Errors tab of the Queue Monitor when a failed server is selected:

ERR: ----- Render Error:

ERR: D:\MAPS\3DS.CEL [where this is the location of a map in the submitted scene]

The Server could not find *3ds.cel* in the local path specified, which means that the path to this map is not been correct for network rendering. To fix the problem, do one of the following:

- If all maps are being shared from a single directory, make sure the directory is correctly shared with full permissions. See *Sharing a Directory (page 3–182)*
- Make sure that you have used either the full UNC path name for the bitmaps or that the *maps* directory has been mounted to the same drive letter on each machine. In this case, verify that particular path has been added to the Configure User Paths dialog > *External Files panel (page 3–855)* of every server's local version of the software or that the particular path was used when assigning bitmaps in the scene to be rendered.
- Verify the bitmaps still reside in the shared directory.
- Add an Alternate Map Path on the Network Job Assignment dialog that points to the folder containing the missing map.

ERR: Object (UVW 1): Sphere01 requires texture coordinates and may not render correctly

Open the scene and make sure the errant object is assigned texture coordinates. This can be as simple as adding a UVW Map modifier to the object.

ERR: Frame error

Texture coordinates must be applied to the specified object to render it on the server.

ERR: Load Error: Missing DLL'S

Following this error, you will also receive a listing of each of the missing DLLs in the scene. Files needed by the server are not available to render the job. Make sure that all the plug-in DLLs used in a job reside on each of the servers rendering the job.

ERR: Job not found. Ok if just deleted

When you delete a job, the Manager sends out a notification to all clients (Monitors) telling that the job has changed. This is the same message sent when the job completes, gets suspended, resumed, etc. The monitors in turn request the job status from the manager. The manager doesn't find the job (it was just deleted) and returns this error to the monitor.

ERR: Targa - The device is not ready. (0x15)

ERR: Frame error

The server could not write the output file. "Targa" represents the file output type, and will change depending on the output file type you selected. This problem can occur for several reasons:- If you are running the Backburner Server as an installed Windows 2000/XP service, make sure that the user account that the service is logged to has adequate permissions. Administrative permissions are recommended. See Creating a

Special User Account for the Backburner Server Service. in the Setting Up Backburner Server for the Rendering Network topic.

- Check to make sure the target output directory is shared, with both read and write permissions.
- Verify that the path for saving file output in the Render Scene dialog is set to a valid UNC path name.
- Verify that the path for saving file output in the Render Scene dialog (or the Output Event dialog in Video Post) is set to a valid UNC path name.
- If you are writing to a shared directory mounted locally on each server, verify that the directory is mounted to the same drive letter on each server, and that the file output path is set for that drive letter.

PROBLEM: The Server fails to render a frame and displays the following error:

Rebooting 3ds Max **by force due to load timeout.**

SUGGESTION

The Server has exceeded either the Wait For 3ds Max To Load or Wait For 3ds Max To Render value. This is usually caused by attempting to render large files over the network. Increase these values in the *Advanced Settings dialog (page 3–193)*.

PROBLEM: I cannot assign more than one server to a job in the Network Job Assignment dialog.

If the output of a network-rendering job is an AVI, FLI, FLC, CEL, or MOV file or a single user device, the job can be assigned to a single server only. The Network Job Assignment dialog changes, depending on the file output type of a job. For example, if you are network rendering to one of the file formats above, the All and None buttons do not appear and the dialog title bar contains the word "Single."

If a job that has an AVI, FLI, FLC, CEL, or MOV file output type is stopped for any reason (to deactivate it, or because a machine goes down), re-rendering the file restarts at the first frame. Frames cannot be appended later to these file types.

SUGGESTION

To take advantage of the distributed power of network rendering we suggest you first render to a series of Targa files. Then use the Targa files as either an animated background in an empty 3ds Max scene, or as an image input event in Video Post and render the sequence out to the desired output type (for example, AVI).

PROBLEM: When I click the Render button on the Render Scene dialog, I get an error dialog stating:

Error Retrieving Configuration File

This error usually is the result of a corrupt installation of the Backburner applications which caused an errant registry setting.

SUGGESTION

Try reinstalling the Backburner components of the program or manually edit the system registry.

Editing the registry:

1. Choose Start > Run.
2. Enter RegEdit and click OK
3. Browse to HKEY_LOCAL_MACHINE > SOFTWARE > Autodesk > Backburner > 3.0
4. Check the CfgPath entry. Make sure the value is set to *c:\Program Files\Autodesk\Backburner\Network\nrapi.conf*.
5. Close the Registry Editor.

PROBLEM: Backburner not found message when clicking Render button:

Cannot network render. Backburner not found or not installed.

This error dialog appears because the path to Backburner is either not set properly in the Path environment variable or Backburner is missing altogether.

SUGGESTION

Verify that the Path variable is set properly and make sure you've installed the latest version of Backburner.

PROBLEM: Clicking Render button results in Backburner plugin error:

Error creating 3ds Max plugin instance for Backburner.

The path to 3ds Max is not set in the PlugPath section of the *|backburner|network|nrapi.conf* file.

SUGGESTION

Verify the presence of the *|backburner|network|nrapi.conf* file and check the PlugPath. It should be in the form of:

```
PlugPath=C:/Program Files/Autodesk/Backburner/
```

PROBLEM: The manager and server windows display strange, garbled text:

Your error message includes **@#$$#@**.

This error occurs if the *nrres.dat* file is missing or damaged. This files is found in:

```
PlugPath=C:/Program Files/Autodesk/Backburner/
```

SUGGESTION

Copy the *nrres.dat* file from another system that is not exhibiting the problem, or reinstall Backburner.

System Setup

Setting Up for Network Rendering

Whenever different groups need to cooperate on a project, accurate communication and common procedures are essential. A rendering farm is such a project.

Network setup can be difficult to configure, but you only need to do it once. Take your time to get the right setup. Read each topic in order and complete the steps described.

These instructions are for creating a new network dedicated specifically to network rendering. If you are configuring network rendering for an existing network or for a network that will be used for other purposes, these instructions are intended as a reference example only.

See also

Setting Up Rendering Software (page 3–180)

Setting Up Directories (page 3–181)

Software Setup

Setting Up Rendering Software

When you've configured the computers on your rendering network for TCP/IP, you're ready to load the software.

For each system you plan to use for network rendering, you need to install the **3ds Max Core**. After you've installed 3ds Max on all the systems, at least one of them needs to be authorized. This is the copy of the software that you will run

interactively and is used to submit jobs for network rendering.

Refer to the Installation Guide for details about installing 3ds Max.

Note: Systems that are intended to act a dedicated rendering servers do not require authorization.

Setting Up Directories

During network rendering, common directories (directories that are shared across the network) allow access to files needed by all the rendering servers. You can organize, share, and (if necessary) mount these directories.

There are two types of common directories:

- **Map directories—**One or more directories where maps and images are stored. These can be both project-specific and general locations.
- **Output directory—**A single directory where completed frames are sent from each rendering server, also called the target directory. You specify this directory for each job. This can also be a local directory on each machine.

The network rendering system uses the Universal Naming Convention (UNC) to identify directories and files. UNC names begin with a double backslash and do *not* include a drive letter. This is the convention:

\\machine_name\directory\subdirectory\filename

Important: To simplify network rendering, use UNC names whenever possible within a 3ds Max scene, even if the directory is on the local machine.

Tip: When entering UNC names, omit the \\ before the computer name until you've entered the entire path and file name. This eliminates search delays when entering UNC path names into file selection dialogs.

Some networks require drive letters instead of UNC names. Directories on such networks can be mounted as drive letters and shared over the network. See *Mounting a Directory (page 3–182)*.

Organizing Directories

Correctly organizing directories is critical to the success of your rendering farm. Every element in a scene needs to be available to each server for a complete rendering. The goal is to give every machine in your network the same "picture" of where files are located. Follow these rules when organizing your directories:

- *Share directories (page 3–182)* to make them available to the network.
- Use UNC file specification when assigning maps files and output directories, even when the directory is on a local machine.

Creating Map Directories

As you assign materials in a scene, the software stores the complete path to each map you use. The program searches for that particular location. If necessary, the program continues to look through the directory containing the scene file and its subdirectories.

Maps, specific to a project, should be kept in a dedicated directory that has been set up for that project. You can create subdirectories below this directory to organize files. This directory needs to be shared using Windows Explorer.

Maps for general use, such as texture libraries, can be organized as you choose. The computers containing such libraries need to be on the network, and the directories need to be shared.

Creating a Common Output Directory

A common output directory is a single directory on one hard disk where rendered frames accumulate during network rendering. When

creating a common output directory, follow these guidelines:

- Decide on a machine to accept final output. It should have enough disk space to store the largest completed animation file you're likely to render.
- Create or choose a directory for final output.
- Share that directory as a resource available to the network.

Creating a Local Output Directory

A local output directory lets you use available storage on each rendering server. Rendered frame files are sequentially numbered when assigned by the network manager. When you collect the finished frames, they automatically sort in the proper order. When creating a local output directory, follow these guidelines:

- Use the same path and name for all local directories. For example, use *|3dsmax_files|images|*.
- Specify this path for the output directory when you start network rendering. All rendering servers will then send their output to this local directory.

On any one rendering job, use either a common or local output directory. They cannot be mixed.

See also

Mounting a Directory (page 3–182)

Using Configure User Paths (page 3–183)

Sharing a Directory

You share a directory from the machine where the directory is located. This gives other machines on your network access to that directory. The instructions below are general. See your Windows XP or Windows 2000 documentation for details.

Procedure

To share a directory:

1. Go to the machine that contains the directory you want to share.
2. In Windows Explorer, right-click the directory to share, and then choose Sharing from the right-click menu.
3. If using Windows XP or Windows 2000, on the Sharing tab, choose the Share This Folder option.
4. Use the default Share Name.
5. Click Permissions and make sure permissions are set to Everyone/Full Control. Click OK to exit the Permissions dialog.
6. Click OK to accept the changes.

   Note: If you plan to use more than 10 rendering servers, both the output path and location of all scene maps should be on a system running Windows XPor Windows 2000 Server, as both Windows XP Professional and Windows 2000 Professional have a limit of 10 simultaneous connections.

See also

Mounting a Directory (page 3–182)

Using Configure User Paths (page 3–183)

Mounting a Directory

You can mount a directory to a drive letter as an alternative to using *UNC names (page 3–1122)*. In mixed UNIX/XP/2000 networks, for example, you might need to mount the output directory.

For network rendering, you mount (or map) the directory on all machines in the network. This gives all rendering servers access to the shared directory.

Before beginning this setup, choose a common drive letter for all servers to mount. If you have other drives mounted, you might need to switch assignments to free the drive letter for this mount.

If a Map or Target directory is on a rendering server, mount the directory on this machine like all the others, even if the directory is on the local disk.

When using a mounted directory, be sure that the directory to be mounted is correctly shared. When assigning bitmaps, always use the path with the common drive letter.

The steps below are general. See your Windows XP or 2000 documentation for more details.

Note: During the writing of these procedures, Windows XP was set to display a Classic Windows interface.

Procedures

To map a directory to a drive letter (Windows 2000 or XP):

1. In Windows Explorer, choose Tools > Map Network Drive to display the Map Network Drive dialog.
2. Set the Drive drop-down menu value to the common drive letter you've chosen.
3. In Folder, enter the exact location of the output directory, using UNC convention.

   You can also map a directory to a drive letter by choosing the machine and shared directory with the Browse button in the Map Network Drive dialog.
4. Click Finish to complete the mount.

   Note: If the drive maps to a server on a large corporate network, you may be required to enter your user name and password to gain access.

See also

Sharing a Directory (page 3–182)

Using Configure User Paths (page 3–183)

Using Configure User Paths

Render-only machines do not require any form of authorization. However, you cannot use unauthorized versions of the software to access the *Configure User Paths dialog (page 3–852)* to specify alternative locations for servers to search for bitmap files.

If you do not want to concern yourself with configuring paths on render-only machines (servers), then turn on the Use Alternate Map Path or Include Maps option on the *Network Job Assignment dialog (page 3–184)*.

The Use Alternate Map Paths option lets you specify an alternate folder where the rendering server can look for bitmaps if they are not found in the primary bitmap path.

If using Include Maps, network rendering will take care of making copies of the bitmaps and send them to the server assigned for rendering. When the rendering job is done, the copies are erased from the server hard drive. The files are placed in a *|network|serverjob* subdirectory of the software.

If a server cannot find a bitmap image in the path specified in the file, it then searches the paths listed in its own Bitmaps panel. Only after searching in all locations will the server fail due to missing maps. If you have followed instructions in the previous topics (*Setting Up Directories (page 3–181)*, *Sharing a Directory (page 3–182)*, and *Mounting a Directory (page 3–182)*), then you know that a common map directory on the network is the best way to proceed. Use the following steps to properly configure your paths on the machine running the authorized copy of the software and on the servers meant for render-only purposes.

Procedures

To add bitmap paths to the External Files panel from within the software:

1. Run the software on a machine running an authorized copy of the program.
2. Choose Customize > Configure User Paths to open the Configure User Paths dialog, and then click the External Files tab, if necessary.
3. Use the Add button to specify the paths (*UNC (page 3–1122)* or mounted) to every directory on the network where bitmap files are stored for rendering. Make sure you use UNC or mounted directories, even if the maps are on the local drive.
4. Click OK.

To add bitmap paths to render-only machines using the initialization file:

Use the following steps if you do not want to authorize the software on the server machine(s).

1. Install the 3ds Max core software on the server station(s).
2. Copy the *3dsmax.ini* file from your authorized 3ds Max workstation to the program directory of each of your server(s).

If you followed the previous procedure, the copied initialization file contains information about UNC or mounted directories that stores the required bitmap files.

Note: To prevent mishaps, it is usually a good idea to edit the INI file once it is copied to the server. Remember that the server machine can be configured differently than your 3ds Max workstation: The drive letter, program directory, and subdirectories may be different. Use a word processor to edit all entries under the [Directories] section to match entries of the server machine.

For example:

```
[Directories]
Fonts=d:\3dsmax\fonts
Scenes=d:\3dsmax\scenes
Import=d:\3dsmax\meshes
Export=d:\3dsmax\meshes
...
```

See also

Sharing a Directory (page 3–182)

Mounting a Directory (page 3–182)

Network Job Assignment

Rendering menu > Render > Render Scene dialog > Turn on Net Render (Render Output group) > Render
Rendering menu > Render To Texture > Render To Texture dialog > Turn on Net Render (Render Settings group) > Render
Rendering menu > Video Post > Set up a sequence with an Image Output Event > Turn on Net Render (Output group) > Render

Use the Network Job Assignment dialog to name rendering jobs, specify the computers that will participate in the rendering, and submit jobs to the rendering servers.

You can submit as many jobs as you like in a single session. Open each file you want to render and submit it following the standard procedure. Each job is placed behind the last one submitted. If you submit a job in which the frame output name is the same as another job in the queue, a warning dialog asks you if you want to overwrite the output frames from the other job.

You can divide the work of rendering a single image among any number of rendering servers. This is particularly useful when rendering a single, extremely high-resolution image intended for print. To use this feature, turn on the *Split Scan Lines option*.

Procedure

To use the Network Job Assignment dialog:

The Network Job Assignment dialog is accessible when you turn on the Net Render toggle. The Net Render toggle can be accessed from three different dialogs used for rendering.

- Rendering menu > Render > Render Scene dialog > Render Output group
- Rendering menu > Render To Texture > Render Scene dialog > Render Settings group
- Video Post dialog > Execute Sequence > Execute Video Post dialog > Output group

1. In the Render Scene dialog > Render Output group, click the ellipsis button and then specify an output file name and path using *Universal Naming Convention (UNC) (page 3–1122)*. The easiest way to specify a UNC path is to start with Save In > My Network Places.
2. Turn on Net Render.
3. Click the Render button.

   The Network Job Assignment dialog appears.
4. In the Network Job Assignment dialog, specify a job name.

   By default, this is the file name of the current scene. Click the plus (+) button next to the Job Name field to increment the job name. Unlike the plus button in the file dialogs, this button does not automatically launch the job.

   Note: The software does not let you submit multiple jobs with the same name.
5. Determine whether to find the Manager automatically or manually. By default, the software searches automatically for the Manager using a network mask that you specify in the dialog. Alternatively, turn on Manual Search and enter the name or IP address of the computer running the Manager program.
6. Click Connect to continue.

   You see a listing of all servers available for network rendering. Each server is marked with a colored icon to denote its current status:

   Green—Running and not rendering any jobs.

   Yellow—Rendering another job. You can assign jobs to busy servers, and the jobs will be rendered in the order received.

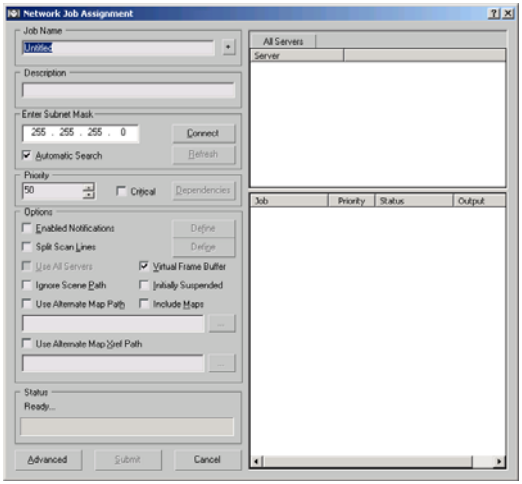
   Red—Failed. Try rebooting the server or see *Troubleshooting (page 3–177)* for more information on failed servers.

   Gray—Absent. Verify that the Server is currently running and that it has not been "Disallowed" in the Week Schedule, see Setting the Availability for Render Nodes in the Managing Render Nodes topic.

   If a rendering Server is running on a workstation that also has an interactive session of the software, you can still select that machine for rendering. A second copy of the software is launched to execute the network render.

   You can view statistics of a particular Server by right-clicking its name and choosing Properties.
7. By default, if your job is to render multiple frames, Use All Servers is on, which means all servers will participate in the rendering job. If you turn off Use All Servers, you can choose individual servers for rendering.
8. Click Submit to send the job to the rendering queue.

Interface



Job Name—Provides a field for you to name the job (mandatory). The + button beside the field adds incremental numbering (Job01, Job02, and so on).

Note: The software does not let you submit multiple jobs with the same name.

Description—Enter an optional description of the job.

Enter Subnet Mask/Enter Manager Name or IP Address group

Enter Manager Name or IP Address—When Automatic Search is turned off, enter the name of the *network Manager (page 3–1072)* machine or its IP address.

Enter Subnet Mask—When Automatic Search is on, enter a subnet mask for automatic search. For information on using subnet masks, see Configuring Backburner Server.

Connect/Disconnect—Connects to the network Manager. The software preserves the connection as a global setting so that you need to change it only when you want to specify an alternative Manager. If connected to the network manager, click Disconnect to disconnect from the current manager so you can choose a different manager.

Automatic Search—Determines whether the software connects to a specific manager or searches for one using a subnet mask when you click Connect. When off, the software attempts to connect to the manager you specify in this group. When on, it searches the network for a manager using the specified subnet mask.

Refresh—Updates the Server and Job lists.

By default, all servers are used for the job. When the Options group > Use All Servers check box is turned off, you can choose one or more servers to render the job. If rendering to a multiple-frame file format, including AVI, FLC, FLI, CEL, or MOV file, you can choose only one server.

Priority group

Priority—Specifies a priority ranking for the job. The lower this setting, the higher the job priority. Default=50.

For example, consider a job with priority 1 (Job B) that is submitted to a network manager that's already rendering a job with priority 2 (Job A). Because Job B has a higher priority, Job A will be suspended and Job B rendered. When Job B is finished, the software will resume rendering Job A.

If two or more jobs have the same priority, they're executed in order of submission.

Critical—Sends the job to the head of the queue, preempting the existing jobs. If a server is currently rendering and a critical job is sent to the queue, the server will stop rendering its current job and begin rendering the new, critical job. When finished with the critical job, the server returns to the next job it has been assigned in the queue.

Dependencies—Opens the *Job Dependencies dialog (page 3–190)*, which you can use to specify existing jobs that must finish before the current job can start.

Options group

Enabled Notifications—Lets the software send rendering-related messages via email. When this is on, its Define button becomes available. For information, see the *Notifications dialog (page 3–190)* topic.

Define—Opens the Notifications dialog, which lets you set notifications parameters.

Split Scan Lines—Lets you subdivide the rendering of each frame among the rendering servers. This is useful when rendering a single, extremely high-resolution image intended for printing. For information, see the *Strips Setup dialog (page 3–191)* topic.

When Split Scan Lines is on, its Define button becomes available.

Note: This feature does not support Render Elements. Also, it's unavailable when rendering to textures with projection mapping enabled and Sub-Object Levels on.

Define—Opens the Strips Setup dialog, which lets you set parameters for the Split Scan Lines option.

Use All Servers—Uses all Servers in the active Server group for rendering the job. Available only after you submit a multi-frame rendering job. Default=on.

To use only certain Servers, turn off Use All Servers and highlight the servers you want to use.

Virtual Frame Buffer—During rendering, displays the virtual frame buffer window on all servers running *serverapp.exe* (not *serversvc.exe*). Default=on.

Ignore Scene Path—When off, the server attempts to copy the scene file from the manager to the server. If the manager is running on Windows 2000 Professional, only 10 servers will copy the file from the manager; any machines over the limit 10 will use TCP/IP to retrieve the file. When turned on, the servers get the file via TCP/IP only. Default=off.

Initially Suspended—Adds the named job to the queue in an inactive state. The job is not started until you activate it manually from the monitor.

Use Alternate Map Path—Allows you to specify an alternate path that rendering servers can use to find bitmaps that are not found on the primary map paths. When turned on, you can manually type a path in the field below the switch or you can click the ellipsis button and browse to a folder containing maps.

Include Maps—Archives the scene, with all of its maps, any inserted Xrefs and their maps, into a proprietary-format compressed file. The compressed file is sent to each Server, where it is uncompressed into a temporary directory named *serverjob* in the *\network* subdirectory of the program and rendered. Default=off.

Use this feature if you have access only to Servers that exist over the Internet or if you have a slow network setup. It is not meant for heavy production use. However, if you don't use it, you must first ensure that all network servers have access to all map and Xref paths referred to in the scene.

Use Alternate Xref Path—Allows you to specify an alternate path that rendering servers can use to find Xrefs that are not found on the primary Xref path(s). When turned on, you can manually type a path in the field below the switch or you can click the ellipsis button and browse to a folder containing Xrefs.

Status group

Displays text messages describing the current status of the job assignment.

Server list

The Server list, located on the upper-right side of the Network Job Assignment dialog, displays all *network rendering Servers (page 3–1073)* registered with the network manager after you connect to the manager.

You can also display only members of a specific Server group you've defined in the tree view by clicking the appropriate tab above the Server list. To assign only members of a Server group to a job, you must turn off Options group > Use All Servers and manually highlight the Servers in the group before submitting the job.

If more groups are available than can fit in the space above the list, arrow buttons for scrolling the group list horizontally appear above the list's top-right corner. Click these arrow buttons to scroll the list left or right to view additional group tabs.

By default, each Server is marked with a colored status icon:

- **Green**—Running and not rendering any jobs.
- **Yellow**—Rendering another job. You can assign jobs to busy Servers, and the jobs will be rendered in the order received.
- **Red**—Failed. Try rebooting the Server or see *Troubleshooting (page 3–177)* or more information on failed Servers.
- **Gray**—Absent. Verify that the network Server is currently running and that it has not been "Disallowed" in the monitor.

By default, the software submits the rendering job to all servers, whether or not they're listed in the current group. To submit the job only to servers in the group, turn off Options group > Use All Servers, and then highlight the servers in the group.

Note: You can change the height of the server list window relative to the job list window below it by dragging the partition vertically.

Server list right-click menu

By default, servers are listed by name only. To see more information about a server, right-click its name in the list. A menu appears with these options:

Properties—Displays the Server Properties dialog, which shows aspects of the server hardware and operating system, including memory and disk space.

All Server Details—This toggle, when on, displays all details about each server to the right of its name. When off, restores the last saved set of partial server details unless the last saved set was All Server Details, in which case it restores the default set: name only. See the following item for the list of available details.

Note: You can see more details by scrolling the list with the horizontal scroll bar at the bottom, or by widening the dialog by dragging its right side with the mouse.

Partial Server Details—Opens the Set Server Property Tabs dialog, which lets you specify which details are shown in the Server list. The dialog provides check boxes for turning on and off the display of these details:

- Status: See *Server list (page 3–188)* for status details.
- Number of CPUs
- Total Physical Memory - in bytes
- Operating System
- Work Disk Space - in megabytes
- Historical Performance Index - see note below
- Handle - a hexadecimal identification number for the machine

- User - current user name

Note: The Historical Performance Index value, listed under the Perf. Index heading in the Server list window, offers information on the relative speed of the listed servers. The fastest machine is rated at 1.0, while the other servers are rated as fractions of the fastest. A machine whose average is twice as long would receive a .50 index. Each machine is rated by measuring the time it takes to complete each frame, and the accumulated time is divided by the number of frames, resulting in the average time per frame, in seconds.

Several factors can affect a machine's performance. CPU power isn't necessarily a concern when large file transfers are involved. For example, if a certain job uses several map files from a centralized server, the performance of the network throughput plays a much larger part than CPU performance, as most machines will spend the majority of the time reading maps. On the other hand, if the machine has all maps locally it will have a huge advantage (local access versus network access) regardless of which CPU it is using. The performance index provides you with information regarding your servers' rendering performance to help analyze your network rendering setup and better distribute the workload.

Job list

The job list, located on the lower-right side of the Network Job Assignment dialog, displays all jobs submitted to the network manager. Also shown are each job's priority, status, and output file path.

To change job settings and manage jobs, use the monitor application.

Advanced—Opens the *Advanced Settings dialog* *(page 3–193)*, where you can make settings for Per-Job Timeouts, TCP port number, Pre-Render MAXScripts and Job Handling.

Submit—Click Submit to exit this dialog and send the current job to the Network Manager, which places it in the queue for rendering.

When you submit a rendering job, if the output file name to be used by the job is the same as that used by an existing job, you're asked if you want to overwrite the existing file(s). Also, if the name of the submitted job replicates one already in the rendering queue, an alert notifies you; click OK, change the job name, and submit it again.

Note: Submitting a job creates a folder for the job on the manager machine in the *|Program Files|Autodesk|Backburner|Network|jobs|* folder. In that folder is a compressed file with a *.maz* extension containing the scene file. You can extract the scene from the command prompt using the *maxunzip.exe* program, found in the 3ds Max program directory. For example, to extract a file named *testfile.maz*, assuming the program is installed in a folder named *|3dsmax8|*, open the command prompt, navigate to the *|Program Files|Autodesk|Backburner|Network|jobs* folder, and enter this: **"\Program Files\Autodesk\3dsmax8\maxunzip" testfile.maz**. You must specify the *.maz* file-name extension; otherwise you'll get an error message.

Cancel—Discards changes and exits the dialog.

Job Dependencies Dialog

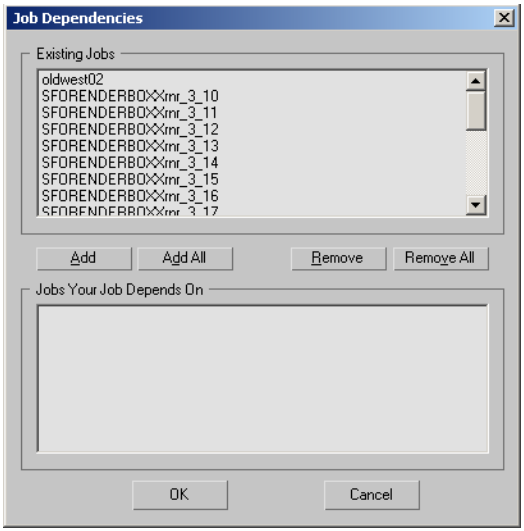
Rendering menu > Render > Render Scene dialog > Turn on Net Render (Render Output group) > Render > Network Job Assignment dialog > Connect to a Manager. > Priority group > Dependencies

Rendering menu > Render To Texture > Render To Texture dialog > Turn on Net Render (Render Settings group) > Render > Network Job Assignment dialog > Connect to a Manager. > Priority group > Dependencies

Rendering menu > Video Post > Set up a sequence with an Image Output Event > Turn on Net Render (Output group) > Render > Network Job Assignment dialog > Connect to a Manager. > Priority group > Dependencies

This dialog lets you specify jobs that shouldn't begin rendering until other jobs finish. Use the two lists and the Add and Remove buttons to build a list of jobs that must finish rendering before the current job can start.

Interface



Existing Jobs list—Lists all previously submitted jobs. To specify a dependency for the current job, add one or more of these to the Jobs Your Job Depends On list.

Add—Select one or more jobs your job is to depend on, and then click Add to add them to the Jobs Your Job Depends On list.

Add All—Adds all jobs in the Existing Jobs list to the Jobs Your Job Depends On list.

Remove—Removes highlighted jobs from the Jobs Your Job Depends On list.

Remove All—Removes all jobs from the Jobs Your Job Depends On list.

Jobs Your Job Depends On list—Lists all previously submitted jobs. To specify a dependency for the current job, add one or more of these to the Jobs Your Job Depends On list.

Notifications Dialog

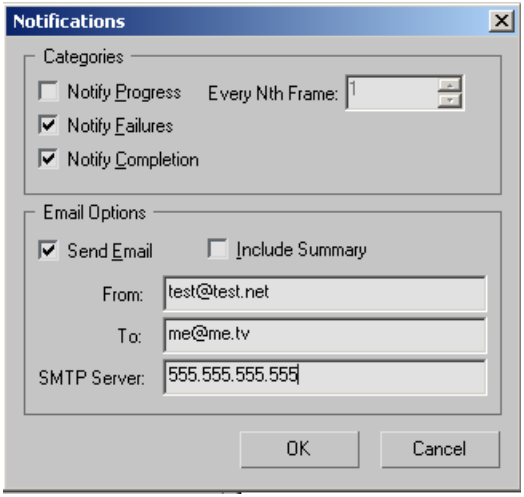
Rendering menu > Render > Render Scene dialog > Turn on Net Render (Render Output group) > Render > Network Job Assignment dialog > Options group > Turn on Enabled Notifications. > Define

Rendering menu > Render To Texture > Render To Texture dialog > Turn on Net Render (Render Settings group) > Render > Network Job Assignment dialog > Options group > Turn on Enabled Notifications. > Define

Rendering menu > Video Post > Set up a sequence with an Image Output Event > Turn on Net Render (Output group) > Render > Network Job Assignment dialog > Options group > Turn on Enabled Notifications. > Define

This dialog lets a network rendering job send notifications via email. Such notifications can be useful when you launch a lengthy render, such as an animation, and don't care to spend all your time near the network manager system.

Interface



Categories group

Notify Progress—Triggers a notification to indicate rendering progress. A notification is triggered every time the number of frames specified in Every Nth Frame has completed rendering. Default=off.

Every Nth Frame—The number of frames used by Notify Progress. Default=1.

Notify Failures—Sends an email notification only if something occurs to prevent the completion of a rendering. Default=on.

Notify Completion—Sends an email notification when a rendering job is complete. Default=on.

Email Options group

Send Email—Notifies via email.

Include Summary—Includes a summary of the network rendering progress with the notification email. Available only when Send Email is turned on.

From—Enter the email address of the person who initiates the rendering job.

To—Enter the email address of the person who needs to know the rendering status.

SMTP Server—Enter the numeric IP address of the system you use as a mail server.

See also

Configuring Backburner Log Files

Strips Setup Dialog

Rendering menu > Render > Render Scene dialog > Common tab > Turn on Net Render (Render Output group) > Render > Network Job Assignment dialog > Options group > Turn on Split Scan Lines. > Define

The Strips Setup dialog lets you specify how to split up the rendering of a single, large image among several different servers on the network. The software automatically subdivides the rendering based on settings you provide, and then fits the pieces together into the final image.

Note: A version of this feature was known as Region Net Render in previous versions of the software.

Procedure

To render a large image with a networked render farm:

1. Set up a scene to render.
2. Set up your system for *network rendering (page 3–169)*.
3. From the Rendering menu, choose Render.

   The Render Scene dialog appears, with the Common tab active.
4. In the Output Size group, specify the size to render.
5. In the Render Output group, specify an output file name and location, and turn on Net Render.
6. Click the Render button.

   The Network Job Assignment dialog appears.

7. In the Options group, turn on Split Scan Lines, and then click Define.

   The Strips Setup dialog appears. The dialog displays the output resolution, and lets you determine how to split up the rendering job by specifying the number of horizontal strips into which the image will be subdivided.

8. Specify the vertical size of each strip in pixels or as a percentage of the total image height, or set the number of strips. Changing one also changes the other.

9. Set the overlap in pixels or as a percentage.

   Using overlap isn't always necessary, but if you notice anomalies where the strips meet, increase this value.

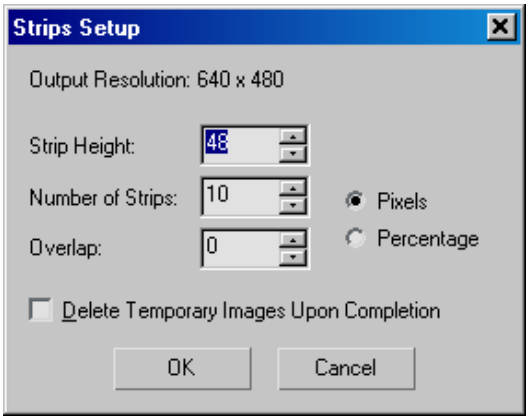
10. Connect to the manager, specify a job name, choose one or more servers on which to render, and then click Submit.

    The job is sent to the network rendering manager, which supervises the network rendering job. The job consists of first rendering each slice, and then combining, or "stitching," the slices into the final image.

11. Monitor the job via the monitor.

    Rendering and stitching passes are designated "Slice Pass" and "Stitch Pass," respectively. When all slices are finished, the job status will be Complete.

Interface



Output Resolution—This read-only field displays the horizontal and vertical resolution of the final image, in pixels.

Strip Height—Sets the height of each horizontal strip in pixels or as a percentage of the total height. Default=10 percent of the total image height, in pixels.

This setting is interdependent with and inversely proportional to the Number Of Strips setting; increase one, and the software decreases the other.

Number of Strips—Sets the number of horizontal strips to be rendered by the available servers. Default=10.

The value determines the maximum number of machines to which the job can be farmed out. For example, if you use the default setting of 10 strips, the job can be performed by 10 machines at most. In that case, assuming equal performance of all 10, rendering would take approximately one-tenth the time required by one machine.

Tip: For optimal results with render farms that comprise machines of different speeds, use a value high enough that the job can be completed most efficiently. For example, consider a two-server network with one machine four times as fast as the other. If you set Number Of Strips to 2, the job

won't be finished until the slower machine renders its half of the final image. But if you set Number Of Strips to 4, the faster machine can render three of the strips while the slower machine renders one, effectively halving the total render time.

This setting is interdependent with and inversely proportional to the Strip Height setting; increase one, and the software decreases the other.

Overlap—Set the amount by which each strip overlaps the adjoining one(s). You can set this in pixels or as a percentage of the final image height.

A certain amount of overlap is necessary to compensate for image artifacts created by antialiasing and render effects. If you notice anomalies where the image slices meet, try increasing the Overlap setting.

Pixels/Percentage—Determines whether the Strip Height and Overlap settings represent pixels or a percentage of the final image height. Choosing a different option automatically changes the two values accordingly.

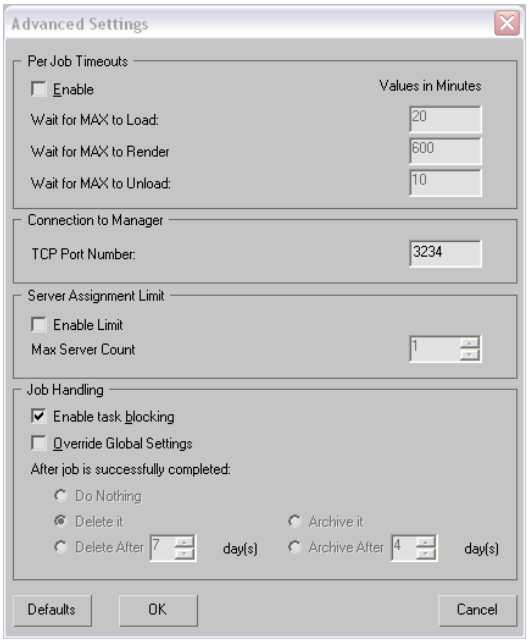
Delete Temporary Images Upon Completion—Deletes the "slice" images after the final image is created. Default=off.

Advanced Settings Dialog

Rendering menu > Render > Render Scene dialog > Turn on Net Render (Render Output group). > Render > Network Job Assignment dialog > Advanced
Rendering menu > Render To Texture > Render To Texture dialog > Turn on Net Render (Render Settings group) > Render > Network Job Assignment dialog > Advanced
Rendering menu > Video Post > Set up a sequence with an Image Output Event > Turn on Net Render (Output group) > Render > Network Job Assignment dialog > Advanced

The Advanced Settings dialog lets you set job timeouts on a per-job basis, assign the TCP port number, specify pre-render scripts and affect job handling and archive settings.

Interface



Per Job Timouts Group

Enable—Turns on the ability to set timeouts on a per-job basis. The remaining settings in this group become available only when Enable is turned on.

Wait for MAX to Load—Specifies the amount of time after a job is submitted that the Manager waits for a server to report that it received the frame and is rendering. If this value is exceeded, an error message is logged for a failed frame, and the frame is assigned to a different server.

Wait for MAX to Render—Specifies the amount of time the manager waits between when a server reports that it has started and finished rendering a frame. If a server exceeds the specified value, it is flagged as "failed" by the manager, and no more frames from that job are sent to it.

Wait for MAX to Unload—When a job is complete, the manager tells the server to unload the software, then waits for a reply from the server saying 3ds Max is down and it's ready for a new job. This spinner specifies the amount of time the Manager will wait for the Server to reply to this notification. If a server exceeds the specified value, it is flagged as "failed" by the manager, and no more frames are sent to it.

Connection to Manager group

Use this setting to specify the Manager for this job.

TCP Port Number—Specifies the port number of the Manager to which this job is to report.

Note: In 3ds Max 8, the pre-render script controls have moved to the Render Scene dialog's *Scripts rollout (page 3–33)*.

Server Assignment Limit

Enable Limit—Sets the maximum number of servers that will be allocated for a specific job. This limit can be overridden with the Use Server Limit field in the Backburner Manager General Properties so that the administrator of a render farm can control job sharing globally.

MAX server count—Specifies the number of servers.

Job Handling group

Enable Task Blocking—Allows the job to override the task blocking set in the Manager. Some jobs will have their frames processed more efficiently if task blocking is turned off. Default=on.

Override Global Settings—This switch lets you override job archiving settings made in the Backburner Manager General Properties dialog. (See Starting Backburner Manager.) It lets you set the archive settings for the job about to be submitted. When Override Global Settings is turned on, the following three switches become active. Default=off.

Note: Any setting made while Override Global Settings is turned on, remains active from one 3ds Max session to the next. For example, if you choose to leave jobs in the queue, submit the job and exit 3ds Max, the setting will be active when you choose to submit jobs in the future.

Leave It In The Queue—This switch tells the network manager to leave the job in the queue without deleting it or archiving it.

You might use this switch if you are submitting a job that might need to be re-rendered at a higher resolution without making any other changes to the scene.

Archive It—When turned on, the job is archived when the rendering is complete. Default=on.

Archiving is useful when you submit a final version of the scene and you know that there won't be any more changes to the scene. Before submitting the job, you set the job to archive upon completion.

Delete It—Upon completion, the job is deleted from the queue when this switch is turned on.

If the scene you're network rendering is just a test shot and you're just doing a quick test of the scene, you don't really want to keep the job in the queue once it's completed. Before submitting the job, turn on this switch.

Defaults—Returns all settings to their defaults.

OK—Accepts any changes and closes the dialog.

Cancel—Closes the dialog without saving changes.

Queue Monitor

Job Settings Dialog

Windows Start menu > Programs > Autodesk > Backburner > Monitor > Highlight a job. > Jobs menu > Edit Settings

Windows Start menu > Programs > Autodesk > Backburner > Monitor > Highlight a job. > right-click menu > Edit Settings

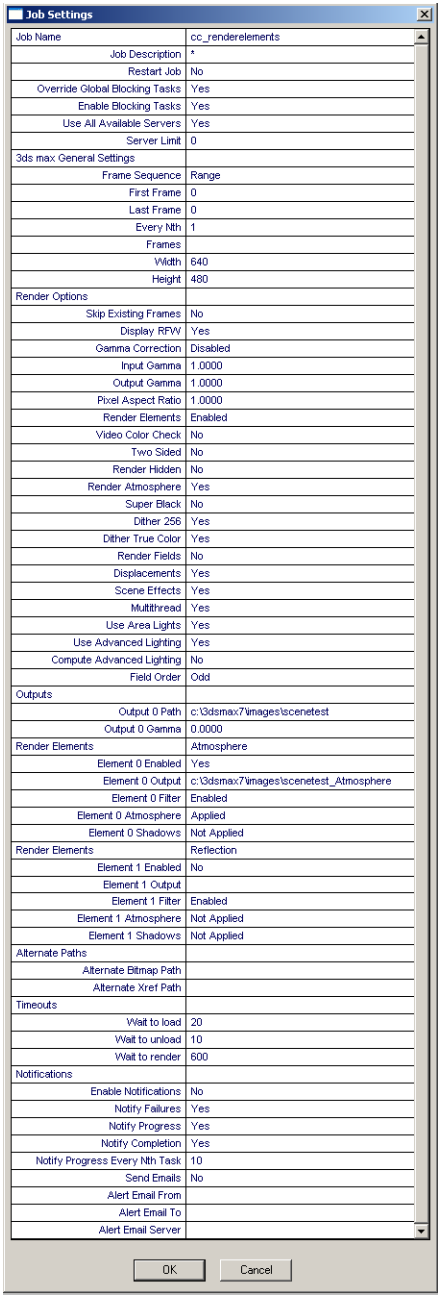
Use the Job Settings dialog to change job-related settings such as frame range, output size, and output directory, without having to use the Render Scene dialog and resubmit the job.

You can change job settings for a job while it's suspended or while it's rendering. By default in either case, after you click OK to exit the dialog, the rendering job restarts from the first frame. You can turn this feature off with the Restart Job option.

Most settings are either toggle switches or editable from the keyboard. To change a toggle setting, double-click its entry (in the right-hand column). If a setting is editable, its value turns green when you click it. To change an editable setting, click it to get the keyboard cursor, and then enter a new value from the keyboard. If you double-click the value when it's green, it highlights, and anything you type replaces it.

Note: Your machine must have control of the network for this Job Settings Dialog to be accessible.

Interface



Job Settings

Job Name	cc_renderelements
Job Description	*
Restart Job	No
Override Global Blocking Tasks	Yes
Enable Blocking Tasks	Yes
Use All Available Servers	Yes
Server Limit	0
3ds max General Settings	
Frame Sequence	Range
First Frame	0
Last Frame	0
Every Nth	1
Frames	
Width	640
Height	480
Render Options	
Skip Existing Frames	No
Display RFW	Yes
Gamma Correction	Disabled
Input Gamma	1.0000
Output Gamma	1.0000
Pixel Aspect Ratio	1.0000
Render Elements	Enabled
Video Color Check	No
Two Sided	No
Render Hidden	No
Render Atmosphere	Yes
Super Black	No
Dither 256	Yes
Dither True Color	Yes
Render Fields	No
Displacements	Yes
Scene Effects	Yes
Multithread	Yes
Use Area Lights	Yes
Use Advanced Lighting	Yes
Compute Advanced Lighting	No
Field Order	Odd
Outputs	
Output 0 Path	c:\3dsmax7\images\scenetest
Output 0 Gamma	0.0000
Render Elements	Atmosphere
Element 0 Enabled	Yes
Element 0 Output	c:\3dsmax7\images\scenetest_Atmosphere
Element 0 Filter	Enabled
Element 0 Atmosphere	Applied
Element 0 Shadows	Not Applied
Render Elements	Reflection
Element 1 Enabled	No
Element 1 Output	
Element 1 Filter	Enabled
Element 1 Atmosphere	Not Applied
Element 1 Shadows	Not Applied
Alternate Paths	
Alternate Bitmap Path	
Alternate Xref Path	
Timeouts	
Wait to load	20
Wait to unload	10
Wait to render	600
Notifications	
Enable Notifications	No
Notify Failures	Yes
Notify Progress	Yes
Notify Completion	Yes
Notify Progress Every Nth Task	10
Send Emails	No
Alert Email From	
Alert Email To	
Alert Email Server	

OK Cancel

Job Name group

The job name cannot be changed from this dialog.

Job Description—Displays a brief description of the job. Editable from keyboard.

Restart Job—When on (Yes), changing one or more job settings in the middle of a rendering job causes the job to restart at the first frame in the range, so all frames are rendered with the same settings. When off (No), the job continues rendering without restarting. Toggled by double-clicking the entry. Default=No.

You might want to turn this off if you're rendering an animation test and change a relatively minor setting, such as Video Color Check, in the middle of a job. For final renderings, you should always restart a job from the beginning after changing job settings.

Override Global Blocking Tasks—This setting corresponds with the Override Global Settings as set in the *Advanced Setting dialog (page 3–193)*. Default=Yes.

Enable Blocking Tasks—A Yes/No toggle that controls task blocking as set in the Advanced Setting dialog. When set to Yes, the task blocking set in the Manager General Properties dialog is active. Toggled by double-clicking the entry. Default=Yes.

Use All Available Servers—Uses all servers in the active Server group for rendering the job.

3ds Max General Settings group

Frame Sequence—This toggle setting alternates between Frames and Range, and, by default, uses the Range and Frames settings in the *Render Scene dialog (page 3–2)*. When set to Range, the job uses the First/Last Frame and Every Nth settings; when set to Frames, the job uses the Frames setting. Toggled by double-clicking the entry. Default=Range.

First Frame—Displays the first frame in the range to be rendered. Defaults to the first frame as submitted. Editable from keyboard.

Last Frame—Displays the last frame in the range to be rendered. Defaults to the last frame as submitted. Editable from keyboard.

Every Nth—Regular sample of frames. For example, enter 8 to render every 8th frame. Editable from keyboard.

Frames—Non-sequential frames separated by commas (for example, 2,5) or ranges of frames separated by hyphens (for example, 0-5). Editable from keyboard.

Width/Height—Lets you set the resolution of the output image by specifying the width and the height of the image, in pixels. Defaults to the output size as submitted. Editable from keyboard.

Render Options group

These settings are the same as those found in the Render Scene dialog > *Options group (page 3–31)*, with several additions:

Skip Existing Frames—When on, the software checks the output path for existing rendered frames, and doesn't render them again. When off, starting or restarting a job always begins rendering with the first frame, overwriting any existing frames. Toggled by double-clicking the entry. Default=No.

Display RFW—Displays the rendered frame window on all servers during rendering. Toggled by double-clicking the entry. Default=Yes.

Gamma Correction—When enabled, lets you defines a new gamma for the bitmap, using the Input/Output Gamma settings. Toggled by double-clicking the entry. Default=Disabled.

Input/Output Gamma—Change system input and output gamma settings for processing bitmaps.

See *Gamma Preferences Settings (page 3–873)* > Bitmap Files group. Editable from keyboard.

Pixel Aspect Ratio—Sets the shape of the pixels for display on another device. The image may look squashed on your display but will display correctly on the device with differently shaped pixels. Editable from keyboard.

Render Elements—When enabled, renders any *render elements (page 3–133)* in the scene. Toggled by double-clicking the entry. Default=Enabled.

Video Color Check—Checks for pixel colors that are beyond the safe NTSC or PAL threshold. Toggled by double-clicking the entry. Default=No.

Two Sided—2-Sided rendering renders both sides of all faces. Toggled by double-clicking the entry. Default=No.

Render Hidden—Renders all geometric objects in the scene, even if they are hidden. Toggled by double-clicking the entry. Default=No.

Render Atmosphere—Renders any applied atmospheric effects, such as volume fog, when set to Yes. Toggled by double-clicking the entry. Default=Yes.

Super Black—Limits the darkness of rendered geometry for video compositing. Toggled by double-clicking the entry. Default=No.

Dither 256—Intersperses pixels when rendering to an eight-bit image format for a greater apparent color range. Toggled by double-clicking the entry. Default=Yes.

Dither True Color—Intersperses pixels when rendering to a 24-bit (or higher) image format for a greater apparent color range. Toggled by double-clicking the entry. Default=Yes.

Render Fields—Renders to video fields rather than frames when creating animations for video. Toggled by double-clicking the entry. Default=No.

Displacements—Any displacement mapping is rendered. Toggled by double-clicking the entry. Default=Yes.

Scene Effects—Any applied rendering effects, such as Blur, are rendered when turned set to Yes. Toggled by double-clicking the entry. Default=Yes.

Multithread—Causes the software to treat the rendering task as separate threads. This option works with multiprocessor systems. Toggled by double-clicking the entry. Default=Yes.

Field Order—Selects the *field (page 3–1032)* order of rendered images when the Render Fields option is turned on. Default=Odd.

Some video devices require that the even field be first, other video devices require that the odd field be first. Determine the correct field order for your video device. If the video output of your device is strobing or appears jittery, it may be due to incorrect field order. Try changing this parameter and re-rendering your animation.

Alternate Paths group

Comparable to setting the alternate paths in the *Network Job Assignment dialog (page 3–184)*.

Alt Bitmap Path—Lets you enter an alternate path where the servers search for bitmaps. Editable from keyboard.

Alt XRef Path—Lets you enter an alternate path where the servers search for XRefs. Editable from keyboard.

Timeouts group

These settings are covered in *Advanced Settings Dialog (page 3–193)*.

Notifications group

These settings are covered in *Notifications Dialog (page 3–190)*.

Batch Rendering

"Batch rendering" is a term used to describe the process of rendering a series of tasks or jobs that have been assigned to a queue. Batch rendering is useful when you need to render images without supervision. Batch rendering can also be used when you want to see how your project looks from different camera viewpoints.

There are several methods for setting up batch rendering in 3ds Max. These methods entail using the *Batch Render tool (page 3–200)* or *network rendering (page 3–169)* with Backburner, or a combination of the two.

These are the three methods for setting up batch rendering:

- Build a queue of camera tasks that are managed by the Batch Render tool.

  If you have a MAX file that contains one or more cameras and saved *scene states (page 3–519)*, you can set up a camera queue to render different camera viewpoints. Each camera can be set to automatically load a scene state to give you several visualizations of your model.

- Set up a series of jobs as network rendering assignments to be coordinated by Backburner.

  If you have a number of separate scenes that are part of a single project or part of several projects, use network rendering even if you're rendering to a single computer. Use this method also if you have scenes that don't have a camera set up and you want to render a Perspective, Front, Left or Right viewport view.

- Use the Batch Render tool to set up a queue of camera tasks to render different views and pass them to Backburner for rendering management.

  The Batch Render tool has an option to send each camera task in the batch render list as a separate network rendering job. Use this method if you want to split the rendering of the different views among multiple computers.

See also

Batch Rendering - Batch Render Dialog (page 3–200)

Quick Start Batch Rendering

The following provides bare-bone steps on how to set up and use the Backburner Manager and Server utilities to perform batch rendering.

If your system is already properly configured for TCP/IP protocols (for example, your computer has an internet connection), information in this topic will help you get started with batch rendering in a few basic steps.

Procedures

To render in batch mode:

You need Windows XP (Home or Professional) Service Pack 1 (or higher) or Windows 2000 Service Pack 4.

Note: Backburner rendering is not supported under Windows 95, 98 or ME.

1. Run the Backburner Manager and Server applications from the Start menu, in the same program group as 3ds Max.
2. Start 3ds Max, and load the first scene you want to batch render.
3. Open the Render Scene dialog and adjust the various rendering parameters for the way you want to render the scene, including active viewport, file output, etc.
4. Turn on Net Render in the Render Output group, and then click Render.
5. In the resulting *Network Job Assignment dialog (page 3–184)*, click the Connect button.

6. Click the Submit button.

   Note: Each job should have a unique output file name and/or path to avoid overwriting output files. If you get an alert dialog that says, "Another job is using the same output name…," you can click the No button, click Cancel to exit the Network Job Assignment dialog, and then change the output name and/or path. Otherwise, you can click the Yes button and let the job overwrite the frames from the other job in the queue.

7. Load the next scene you want rendered, and then repeat steps 4 through 7.

Once you've submitted all rendering jobs, you can exit 3ds Max, if you want. If power is lost before all jobs are rendered (either by accident or by intentional powering down of your computer), when you restart the Backburner Manager and Server programs, the rendering process will resume where it left off.

Using Backburner for Batch Rendering

Using Backburner for batch rendering is a simple matter of starting the software, running the Backburner Manager and Server programs, specifying the scenes you want rendered, and then proceeding with the rendering. In this case, Backburner coordinates a series of rendering tasks that are network rendered on a single computer.

The process is very similar to rendering over a network. With network rendering, the scenes you submit to the rendering queue are called 'jobs'. The following steps show how to submit multiple jobs to the rendering queue.

Your system has to be properly configured in the TCP/IP protocol (see Setting Up TCP/IP for the Rendering Network) to perform Backburner batch rendering. If you do not have a network card or if you are not connected to the internet, then you may need to configure TCP/IP with the Microsoft Loop Back Adapter.

Note: Batch rendering by means of Backburner differs from batch rendering with the *Batch Render tool (page 3–200)*. However, you can use the Batch Render tool to create a queue of rendering tasks and then pass the tasks to Backburner to coordinate the rendering process.

Procedures

To batch render several jobs:

1. Start 3ds Max.
2. Start Backburner Manager.

   The Backburner Manager window appears. Its window displays the words: "Starting Network Manager."

3. Start Backburner Server.

   The Backburner Server window appears. Its window displays the words: "Starting Backburner Server," followed by additional startup messages.

4. In 3ds Max, load the first scene you want rendered.
5. Activate the viewport you want rendered, and click the Render Scene button on the toolbar.
6. Set up the various rendering parameters as you would if you were rendering only this scene.
7. In the Render Output group, turn on Net Render.
8. Click Render.

To assign network jobs:

At this point, the *Network Job Assignment dialog (page 3–184)* appears. Its main purpose is submit the current job to the Backburner Manager with all its render settings, including job name and net rendering specifics. The Backburner Manager then takes over and begins the rendering process.

1. In the Job Name field, either accept the default name (the name of the scene), or specify a new one.
2. Click the Connect button to connect the software to the Manager. After a moment, your TCP/IP address appears in the field over the window, and the Server appears in the window.
3. Click the server in the window so that its icon displays a green circle with an arrow through it.
4. Click the Submit button.

   Note: Each job should have a unique output file name and/or path to avoid overwriting output files. If you get an alert dialog that says, "Another job is using the same output name…," you can click the No button, click Cancel to exit the Network Job Assignment dialog, and then change the output name and/or path. Otherwise, you can click the Yes button and let the job overwrite the frames from the other job in the queue.
5. The Job Assignment dialog goes away, and the rendering begins. The Manager reports: "Job (job name) submitted." The Server reports that it has received the job, and then begins reporting each frame it's completed.
6. At this point, you can open the next scene to be rendered, and then repeat the steps, beginning with step 4 in the previous procedure.

Once you've submitted the jobs you want rendered, you can exit 3ds Max (do not shut down the Backburner Manager or Server), or you can begin working on a new scene, or editing an old scene. Keep in mind, however, that your processor is spending most of its time working on rendering, so your computer will slower than usual.

If you need to monitor the batch render processes, you can use the Backburner monitor for that purpose.

Network Files

When Backburner Manager begins a job, a series of files are created in the *|network|jobs* folder of your Backburner folder. Among other things, this means that you can shut down your computer completely (either on purpose or by accidental power failure), and when you next start Backburner Manager and Server, they'll pick up where they left off and continue with your rendering queue.

Note: The exception to the above rule is when rendering multiframe file formats, such as AVI and MOV. Due to limitations in these file formats, if you stop in the middle of rendering one of these files, when you begin rendering again, the entire file will have to be rendered from the beginning.

Batch Rendering - Batch Render Dialog

Rendering menu > Batch Render

The Batch Render tool offers you an efficient, visual approach to setting up a sequence of different tasks or scene states to render automatically. From the Batch Render dialog, you control the following:

- Image resolution, pixel aspect ratio or time sequence if it differs from the default rendering settings found on the *Render Scene dialog (page 3–2)*.
- Whether to render a specific camera view or the active viewport.
- The output path where rendered images get stored.
- Which *scene state (page 3–519)* is restored prior to rendering.
- Which *rendering preset (page 3–23)* is used per rendered view.
- Whether all the batch rendering tasks should be sent to Backburner for *network rendering*

(page 3–169) by multiple systems for even faster rendering.

- Exporting the batch rendering tasks and all parameters set in the Batch Render dialog to a BAT file for later *command line rendering (page 3–206)*.

Note: The Batch Rendering dialog is for rendering different aspects of the same scene, such as views from different cameras. To batch-render a number of different scenes, use *Backburner (page 3–198)* or *command-line rendering (page 3–206)*.

Procedures

To use the Batch Render tool:

1. Open or create a MAX scene.
2. Choose Rendering menu > Batch Render.

   The Batch Render dialog opens.
3. On the Batch Render dialog, click the Add button.

   This adds your first rendering task to the batch render queue.

   By default, the Camera parameter is set to Viewport, which means that the task will render the active viewport. To change to a set view, make sure the scene contains at least one camera, and then choose the camera view to render from the *Camera drop-down list*.
4. Review the Selected Batch Render Parameters settings and, if necessary, turn on Override Preset and then change the Frame Start, Frame End, Width, Height, and Pixel Aspect settings.
5. Click the Output Path button to set a drive location, file name and file format for the rendered image.
6. If you've saved any scene states with the model, you can choose which one is loaded during the rendering operation by opening the Scene State drop list.
7. Repeat steps 3 through 6 to continue adding rendering tasks to the batch render queue.
8. When all your tasks are set, click the Render button.

To use the Batch Render tool with Backburner:

Before attempting to use the Batch Render tool with Backburner for network rendering, make sure the Backburner Manager is running on your managing workstation and that Backburner Server is running on all the other workstations that will receive the rendering assignments. For more information on setting up Backburner Network Rendering, refer to *Introduction to Network Rendering (page 3–169)*.

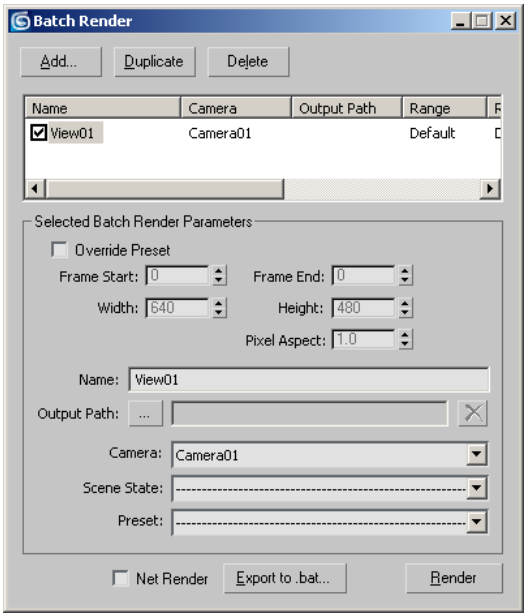
1. Set up a series of rendering tasks in the Batch Render queue as documented in the previous procedure.
2. Turn on Net Render and then click the Render button.

   The Network Job Assignment dialog opens.
3. Enter a subnet mask, or, with Automatic Search off, enter the Manager name or IP address, and then click Connect.

   The available rendering servers show up in the list on the right side of the Network Job Assignment dialog.
4. Click the Submit button to send all the Batch Render camera tasks to Backburner for network rendering to all the workstations that are running Backburner Server.

   If you are running the Backburner Queue Monitor, you'll see all the camera tasks listed as rendering jobs in the Job section of the Queue Monitor.

Interface



Add—Adds a new rendering task to the queue, using the default settings. By default, a new task is set to render the active viewport. To set it to render a particular camera, choose the camera from the *Camera drop-down list*.

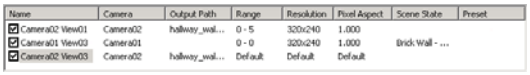
Duplicate—Adds a copy of the highlighted rendering task to the queue.

All rendering parameters that were part of the original task are duplicated for the new task.

Delete—Deletes the highlighted rendering task.

No warning appears to confirm deletion and you cannot undo a deletion.

[Task Queue]—This is a listing of all the camera tasks that have been chosen for batch rendering. The task queue consists of eight columns that show all the parameters that have been set for a particular camera task. You can control which tasks are rendered by toggling the check boxes in the list.



Selected Batch Render Parameter group

By default, any tasks you've designated for batch rendering use the current Time Output and Output Size parameters from the *Render Scene dialog (page 3–2)*.

For example, if the Output Size settings on the Render Scene dialog shows that you have a Time Output settings of Single and an of 800 width and 600 height, when you add a camera, its Selected Batch Render Parameters will mimic those settings. Likewise, if the Render Scene dialog has a Time Output set to Range and frame 0 to 25, the Frame Start and Frame End settings on the Batch Render dialog will default to those Time Output settings.

This group gives you access to changing those default parameters.

Override Preset—When on, you can override any of the default settings for the highlighted task via the Frame Start, Frame End, Width, Height, and Pixel Aspect settings. Default=off.

Frame Start—The first frame to be rendered for the highlighted task. The default setting for this parameter matches the Time Output group settings on the Common panel of the Render Scene dialog.

Frame End—The last frame to be rendered for the highlighted task. Its default state also matches the Time Output group settings on the Common panel of the Render Scene dialog.

The default Frame Start and Frame End parameters correspond to the Render Scene dialog parameters as follows:

Render Scene dialog >Time Output	Batch Render dialog Frame Start/End
Single	Defaults to the frame set by the time slider.
Active Time Segment	Defaults to 0 (zero) and the last frame of the animation as set in the *Time Configuration dialog (page 3–768)*.
Range	Defaults to the range of frames specified, such as 0 (zero) To 14 or 6 To 11.

The Frame Start and End settings also conform to the current time configuration format; i.e. Frames, SMPTE, Frame:Ticks, or MM:SS:Ticks.

Width—Allows you to specify a new image width setting if Override Preset is on. If Override Preset is off, this value matches the width set on the Render Scene dialog.

Height—Allows you to specify a new image height setting if the Override Preset is on. If Override Preset is off, this value matches the height set on the Render Scene dialog.

Pixel Aspect—Sets the aspect ratio of the pixels for display on another device. The image might look squashed on your display but will display correctly on the device with differently shaped pixels. By default, this mimics the value set on the Render Scene dialog.

Name—Lets you change the default name of the highlighted task. The default naming structure for camera tasks uses "View" plus an incremented view number, such as *View01* or *View02*. If you want, you can change the task's name to something more descriptive.

Note: After changing the name, you must press ENTER for the change to register.

Note: If you're *rendering elements (page 3–126)* as part of the batch, the task name is appended to each rendered element's specified file name. For example, if the task name is *View01* and the render element output file name is *Test_Diffuse.tga*, then the batch-rendered element output becomes *Test_Diffuse_View01.tga*.

If you're rendering an element without specifying a file name for the element, the batch renderer appends the element type to the batch output file name. For example, if the batch output file name is *MyBatch.png*, and you're rendering an Atmosphere element, then the element output name becomes *MyBatch_Atmosphere.png*.

Output Path—The ellipsis (...) button opens the *Render Output File dialog (page 3–8)* where you can specify the output path, file name and file format for the rendered image of the selected camera task.

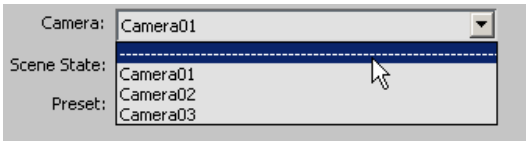
Once set, the output path and file name appears in the output path field and the file name appears in the Output Path column of the task queue.

X [Clear Output Path]—Removes the output path and file name from the Output Path field and task queue.

Camera—This drop-down list shows any cameras in the scene.

By default, a task is set to render the active viewport, as indicated by the "Viewport" entry in the Camera column of the task queue. You can use this list choose a camera from any in the scene for the highlighted task. The new camera is shown in the Camera column of the task queue.

To set the highlighted task to render the active viewport, choose the dashed line (----------) from the top of the drop-down list.



Choose the dashed line to render the active viewport.

Note: Choosing a camera changes only the camera. It does not change the name of the camera task.

Scene State—This drop-down list displays the *scene states (page 3–519)*, if any, that you can assign to the highlighted task. If no scene state is active then current scene settings are used.

Preset—Lets you choose a render preset for the highlighted task. If no render preset is active and there is no override, then the current render settings are used.

If you choose Load Preset from the drop-down list, the Render Presets Load dialog opens.

Net Render—When on, opens the *Network Job Assignment dialog (page 3–184)* when you click the Render button.

Each camera task in the Batch Render dialog is passed to the Network Job Assignment dialog as an individual rendering job instead of a single job. By default, the Network Job Assignment dialog uses the name of the MAX file as its job name, and it then appends the name of the camera task. For example, if you have a scene named Athena_High_Rise and camera tasks for three cameras, the jobs will look like this in the monitor: *Athena_High_Rise Camera02 View01*, *Athena_High_Rise Camera01 View02* and *Athena_High_Rise Camera01 View03*.

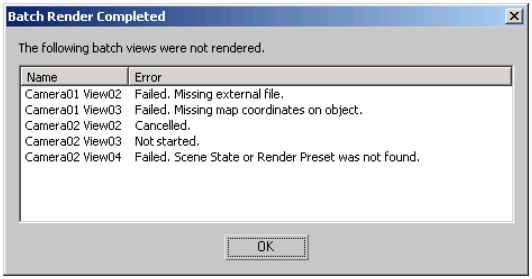
(See Monitoring Job Status.)

Export to .bat—Creates a batch file for command line rendering. This button opens the Batch Render Export To Batch File dialog where you can specify a drive location and name for the batch file that is saved.

Render—Starts the batch rendering process or opens the Network Job Assignment dialog if Net Render is turned on.

Batch Render Completed

If a problem is encountered by the Batch Renderer, you will be notified by means of the Batch Render Completed dialog. This is an error dialog that appears and notifies you about which batch renders did not complete and, if possible, provides a description of why the failure occurred.



If the cause of the error cannot be identified, then the error entry will simply state *Failed*. The most common causes for failure are:

- Missing texture maps for materials that are assigned to objects in the scene. This shows up as *Failed. Missing External File*. Once the texture map is found or map paths are properly set, this error will not occur.
- Missing UVW coordinates for objects that have texture mapped materials assigned to them. This is reported as *Failed. Missing Map Coordinates on Object* and can be alleviated by making sure new objects are created with the Generate Mapping Coords switch turned on and by assigning a UVW Map modifier to the object that is not displaying its texture mapping.

Batch Render Tool - Batch Render Warning Dialog

Rendering menu > Batch Render > Click Render to render tasks that do not have an output path set.

Rendering menu > Batch Render > Click Render to render tasks that could overwrite previously saved files.

The Batch Render Warning dialog informs you of certain conditions you may have overlooked while assigning the rendering tasks. The dialog that displays is context-sensitive, meaning that the warning will indicate when either of these two conditions exist:

- When you risk overwriting an existing file or if you have not specified an output path and output file name.
- When the output path that was specified has been renamed or no longer exists.

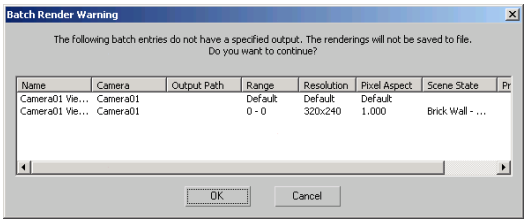
Interface

Task Queue

Both formats of the Batch Render Warning dialog include the Task Queue columns that are shown in the in the Batch Render dialog. The key difference is the exception of the check boxes that let you specify which cameras are use in the render. This Task Queue only shows the cameras that may overwrite a saved file, or do not have a path/file name set for output, or if they show an output path that is invalid.

Missing Output Path/Filename or File Overwrite

This version of the Batch Render Warning dialog appears if you click the Render button on the Batch Render dialog and one or more of the tasks to be rendered does not include an output path/file name. The dialog also appears if there is a chance you will overwrite a previously rendered image.

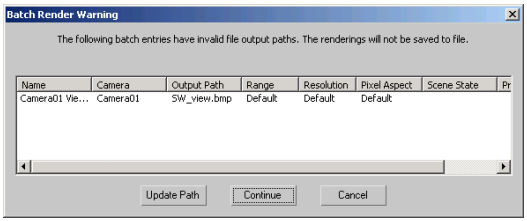


OK—Allows you to continue with the batch rendering tasks even though there are some tasks without an output path/file name or some files could be overwritten. Tasks without an output path/file name are not automatically saved and only appear in the *rendered frame window (page 3–5)*.

Cancel—Cancels the batch rendering.

Invalid Output Path

This version of the Batch Render Warning dialog only appears if you are rendering to a file that has invalid output paths. For example, if you're rendering a client's model and they've set their own output paths.



Update Path—Allows you to browse to a new directory and reassign the output path for all the entries in the Task Queue. The specified output file name remains the same.

Note: If you don't want to assign the same path to all the cameras shown in the dialog, you should Cancel and set the correct paths for each camera from the Batch Render dialog.

Continue—Allows you to continue with the batch rendering tasks even though there are some tasks without an output path. Tasks without an output

path are not automatically saved and only appear in the *rendered frame window (page 3–5)*.

Cancel—Cancels the batch rendering.

Command-Line Rendering

The command-line rendering tool lets you perform batch rendering jobs without having to manipulate parameters by hand in a MAX file. Simple, "one-shot" rendering jobs can be submitted from the Start > Run dialog. More elaborate, batched jobs can be rendered through the use of text files; for example, *MyRender.bat* or *MyRender.xml*. The ability to edit text files is what provides the power to this tool. You can quickly make changes to your rendering parameters, or output formats, simply by opening your text editor and editing the batch settings.

Command-line rendering is provided by the *3dsmaxcmd.exe* program, found in your *|3dsmax8* folder.

You can submit command-line rendering jobs that are rendered on a single workstation, or you can take advantage of *network rendering (page 3–169)* and let the Backburner utility manage the jobs across multiple systems.

Warning: Command-line rendering is a professional feature and can perform destructive operations. You will not see messages or warning dialogs informing you about potential mistakes, such as overwriting an existing frame on your drive.

Procedures

To view the *3dsmaxcmd* help file:

The *3dsmaxcmd.exe* file contains a built-in help system that you can access from a command prompt.

1. Open a command prompt window (for example, Windows Start > Run).
2. Enter the following: **"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -?** and press ENTER.

   The list of switches and options will scroll on to the window.

To view a list of sample command lines with descriptions of what they do:

The *3dsmaxcmd.exe* file also has an extensive list of sample text strings that describe many of the most common scenarios you'd use command-line rendering to accomplish.

1. Open a command prompt window.
2. Enter the following: **"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -x** and press ENTER.

Setting up the simplest rendering:

In its simplest form, just a render command using all the settings that are stored with a scene, would look like this:

1. Open a command prompt window.
2. Enter the following: **"c:\program files\autodesk\3dsmax8\3dsmaxcmd" "c:\program files\autodesk\3dsmax8\scenes\myscene.max"** and press ENTER.

Example: Rendering to a JPG file at 800x600 resolution:

Perhaps the last time you rendered your scene, you had the output resolution set to 320x240 and rendered a BMP file. Re-rendering the scene using different output settings is fast and efficient with command-line rendering.

1. Open a command prompt window.
2. Enter the following:

   "c:\program files\autodesk\3dsmax8\3dsmaxcmd" -outputName:"c:\program

files\autodesk\3dsmax8\renderoutput\myImage.jpg" -w 800 -h 600 "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

and press ENTER.

Note: The specified output path must already exist. If it doesn't, the image doesn't render and you get an error message.

Network rendering from the command line:

If you have your system networked and have access to other systems, you can take advantage of network rendering.

Note: A command-line job cannot be run on a system already running the Backburner server.

1. Open a command prompt window.
2. Enter the following:

   "c:\program files\autodesk\3dsmax8\3dsmaxcmd" -submit "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

   and press ENTER.

Example: Rendering from a text file:

Command-line rendering gives you the ability to set a series of common switches that can be quickly re-used for rendering a single job from Start > Run, or for rendering a group of scenes specified in a BAT file. You can build your text file using any text editor.

Note: A TXT file can specify only a single scene to render. For multiple scenes, use a BAT file.

1. Open your text editor.
2. Enter your list of commands, such as:

```
-bitmapPath=\\mapServer\maps\myMaps
  -cam=myCamera
  -width=800
  -height=600
  -vfb=true
  -frames=all
  -force2Sided=true
```

3. Once all the switches are entered, save the files as a TXT file, such as *myrender.txt*.
4. To render the scene, open the Windows Start > Run dialog.
5. Enter the following:

   "c:\program files\autodesk\3dsmax8\3dsmaxcmd" @c:\myrender.txt -o="c:\program files\autodesk\3dsmax8\renderoutput\myImage.tga" "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

   and click OK.

   Using a TXT file that contains your favorite settings, in conjunction with a command line that specifies the output file format and scene of your choice, gives you the flexibility to re-use the TXT file without having to edit it each time you want to render. You can create several TXT files with settings for different stages of scene development, such as *testrender.txt* or *finalrender.txt*.

Example: Rendering from a BAT file:

If you want to render several scenes in a batch process, you can create a BAT file containing all the scenes and switches needed to get the results you want. Just like a text file, you can build your BAT file using any text editor. For this example, let's say you have three scenes, in various stages, and you want each rendered using different settings.

1. Open your text editor.
2. On the first line, enter the following text. This example assumes that the scene is far from finished, but that you want to test a chunk of animation.

   "c:\program files\autodesk\3dsmax8\3dsmaxcmd" -o="c:\program files\autodesk\3dsmax8\renderoutput\scene1.jpg" -w=320 -h=240 -frame=1-33 "c:\program files\autodesk\3dsmax8\scenes\scene1.max"

The second scene is almost ready, but you need to test the look of some materials and do a video color check:

"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -o="c:\program files\autodesk\3dsmax8\renderoutput\scene2.jpg" -w=640 -h=480 -force2Sided=true -videoColorCheck=true "c:\program files\autodesk\3dsmax8\scenes\scene2.max"

The last scene is complete, and you want to render a higher-resolution image using settings you've saved in a TXT file that you always use for final renderings:

"c:\program files\autodesk\3dsmax8\3dsmaxcmd" @c:\finalrender.txt -o="c:\program files\autodesk\3dsmax8\renderoutput\scene3.jpg" "c:\program files\autodesk\3dsmax8\scenes\scene3.max"

3. After entering these three command lines, save your file as a BAT file.
4. From the Windows Start > Run dialog, browse to the BAT file and click Open.
5. Click OK to start rendering.

See also

Command-Line Rendering Switches (page 3–208)

Command-Line Rendering Switches

In order to use command-line rendering, you should be familiar with DOS and understand the structure of command lines.

Command-Line Switches

You can use the following switches after **3dsmaxcmd** on the command line of a command prompt window, or as entries in a text file. The following tables show switches and their effects.

Note: Switches are not case sensitive.

At Verbosity level 5, the output message from command-line rendering includes both a timestamp and a date stamp. The timestamp is separated from the main message by a semicolon, and the elapsed time message is separated from the Frame Completed message by a semicolon. This lets you pipe the message to a file, and then open it in a spreadsheet program with appropriate columns by setting the delimiter character.

Separators

Many switches are displayed in the following charts with trailing colons, such as **-w:** or **-h:**. The use of a colon separator is optional, and can be replaced with a space or an equal sign (=). Therefore, command lines such as:

"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -outputName:"c:\program files\autodesk\3dsmax8\renderoutput\myImage.jpg" -w:640 -h:480 "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -outputName "c:\program files\autodesk\3dsmax8\renderoutput\myImage.jpg" -w 640 -h 480 "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -outputName="c:\program files\autodesk\3dsmax8\renderoutput\myImage.jpg" -w=640 -h=480 "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

will give you the same results. The use of the equal sign can give your command-line files more of an INI file appearance.

Note: The switch **-submit:[manager_name]** is the only case where a colon is necessary.

On/Off Command-Line Switches

Many of the switches you'll use are simple on/off toggles, such as the **-rfw:** or **-renderFields:** switches. If you prefer, instead of using a **1** or **0** to designate their states, you can also use **True** or **False**. For example, to render a scene to a specified file type and display the Rendered Frame Window, your command line might look like this;

"c:\program files\autodesk\3dsmax8\3dsmaxcmd" -outputName="c:\program files\autodesk\3dsmax8\renderoutput\myImage.jpg" -rfw=true "c:\program files\autodesk\3dsmax8\scenes\myscene.max"

Basic Options

Switch	Effect
-?	Displays a list of these switches in the DOS window.
-x	Shows a list of example command lines.
-v:*#*	Sets the verbosity level, where # is an integer from 0 (least verbose) to 5 (most verbose).
@*command_file* or -cmdFile: *command_file*	Points to a separate file containing command-line options.
-preset: *<filename>* or -rps: *<filename>*	Uses a render preset file where *<filename>* is the name of the preset file.
-sceneState: *<scene-state-name>*	Loads the specified scene state file before rendering the image.
-batchRender	Renders all enabled tasks in the Batch Render dialog.
-batchRender: *<batch-render-name>*	Renders batch renders in the file named *batch-render-name*.
-preRenderScript: *<filename>* or -script: *<filename>*	Uses a pre-render script where *<filename>* is the name of the script file.
-postRenderScript: *<filename>*	Uses a post-render script where *<filename>* is the name of the script file.
-workPath: *<pathname>*	Root location for job data folders.
-pathFile: *<pathname>*	Path configuration file (MXP format).
-bitmapPath: *<pathname>*	(obsolete) Provides an extra bitmap path. Multiple paths can be entered and UNC naming conventions can be used.
-xrefPath: *<pathname>*	(obsolete) Lets you specify extra XRef paths. Multiple paths can be entered and UNC naming conventions can be used.
-split: *<strips, overlap>*	Split render; number of strips, overlap amount.
-dateFormat: *<dateformat>*	Specifies a date format to be used in message timestamp, at verbosity level 5. Defaults to locale-dependent format. For details, use the *3dsmaxcmd* -x option.
-timeFormat: *<timeformat>*	Specifies a time format to be used in message timestamp, at verbosity level 5. Defaults to locale-dependent format and 24–hour clock. For details, use the *3dsmaxcmd* -x option.

Render Parameters

Note: Any command-line switches that are on/off toggles can be switched by entering either **1**, **0**, **on** or **off**.

Switch	Effect
-outputName: *<filename>* or -o: *<filename>*	Sets an output file name and format.
-camera: *<string>* or -cam: *<string>*	Specifies a camera name.
-width: *<integer>* or -w: *<integer>*	Sets the output width in pixels.
-height: *<integer>* or -h: *<integer>*	Sets the output height in pixels.
-pixelAspect: *<number>*	Sets the pixel aspect ratio.
-start: *<integer>*	Sets the rendering sequence start frame.
-end *<integer>*	Sets the rendering sequence end frame.

Switch	Effect
-nthFrame *<integer>*	Sets the Every Nth Frame value.
-frames *<string>*	Lets you specify a frame list; for example, **(1,3,5-12)** or **all**.
-stillFrame or -sf	Indicates that this is a still-frame render; no frame suffix will be added.
-imageSequenceFile: *<0/1/2>*	Image-sequence file creation: 0=none; 1=*.imsq*; 2=*.ifl*
-gammaCorrection: *<1/0>*	Toggles gamma correction. "1"=On, "0"=Off.
-gammaValueIn: *<number>*	Sets the Input Gamma value.
-gammaValueOut: *<number>*	Sets the Output Gamma value.
-continueOnError	If an error is encountered, the software attempts to continue rendering.
-videopostJob: *<1/0>*	Turns *Video Post (page 3–307)* on or off for the job.

Render Flags

Switch	Effect
-showRFW: *<1/0>* or -rfw: *<1/0>*	Toggles the Rendered Frame Window. "1"=On, "0"=Off.
-skipRenderedFrames: *<1/0>*	Toggles Skip Existing Images. "1"=On, "0"=Off.
-videoColorCheck: *<1/0>*	Toggles Video Color Check. "1"=On, "0"=Off.
-force2Sided: *<1/0>*	Toggles Force 2-Sided. "1"=On, "0"=Off.
-renderHidden: *<1/0>*	Toggles Render Hidden. "1"=On, "0"=Off.
-atmospherics: *<1/0>*	Toggles Atmospherics. "1"=On, "0"=Off.
-superBlack: *<1/0>*	Toggles Super Black. "1"=On, "0"=Off.

Switch	Effect
-renderFields: *<1/0>*	Toggles Render Fields. "1"=On, "0"=Off.
-fieldOrder: *even or odd*	Toggles Field Order. Default="Odd".
-displacements: *<1/0>*	Toggles Displacement Mapping. "1"=On, "0"=Off.
-effects: *<1/0>*	Toggles Render Effects. "1"=On, "0"=Off.
-useAreaLights: *<1/0>*	Toggles area lights/shadows. "1"=On, "0"=Off.
-useAdvLight: *<1/0>*	Toggles use advanced lighting. "1"=On, "0"=Off.
-computeAdvLight: *<1/0>*	Toggles compute advanced lighting. "1"=On, "0"=Off.
-ditherPaletted: *<1/0>*	Toggles Output Dithering (paletted). "1"=On, "0"=Off.
-ditherTrueColor: *<1/0>*	Toggles Output Dithering (true-color). "1"=On, "0"=Off.
-renderElements: *<1/0>*	Toggles render elements (true-color). "1"=On, "0"=Off.

Backburner Job Submission

These switches concern submitting a rendering job for network rendering. For further information, see *Introduction to Network Rendering (page 3–169)*. Also, for a different method of network rendering via the command line, see *Backburner Command Line Control (page 3–212)*.

Switch	Effect
-submit[:manager_name] or -s[:manager_name]	Submits the scene, *<filename>* to a specific manager system for network rendering. Note: This is the only switch that requires a colon separator.
-port: *<integer>*	Specifies a manager port number.
-netmask: *<string>*	Lets you specify a network mask other than 255.255.255.0.
-jobName: *<string>*	Lets you specify a job name to render.

Switch	Effect
-priority *<integer>*	Sets job priority.
-suspended: *<1/0>*	Toggles initially suspended. "1"=Yes, "0"=No.
-writeJobFile	Writes all job settings to an XML file. The file uses the same name as the MAX file, so, for example, *test.max* produces *test.xml*.
-readJobFile: *<filename>*	Reads all job settings from an XML file.
-waitLoad: *<integer>*	The amount of time to wait for 3ds Max to load, in minutes. Default=20.
-waitRender: *<integer>*	The amount of time to wait for 3ds Max to render, in minutes. Default=600.
-waitUnload: *<integer>*	The amount of time to wait for 3ds Max to unload, in minutes. Default=10.

Bitmap Parameters

Switch	Effect
-BMP_TYPE: *2 or 8*	Sets the type of BMP file being rendered. "2"=paletted, "8"=true 24-bit.
-JPEG_QUALITY: *1 to 100*	Sets the JPG quality value. Ranges from 1 to 100.
-JPEG_SMOOTHING: *1 to 100*	Sets the JPG smoothing value. Ranges from 1 to 100.
-TARGA_ COLORDEPTH: *16, 24 or 32*	Sets the color depth for TGA files.
-TARGA_ COMPRESSED: *<1/0>*	Toggles TGA Compression. "1"=On, "0"=Off.
-TARGA_ ALPHASPLIT: *<1/0>*	Toggles TGA Alpha Split. "1"=On, "0"=Off.
-TARGA_ PREMULTALPHA: *<1/0>*	Toggles TGA Pre-Multiplied Alpha. "1"=On, "0"=Off.
-TIF_TYPE: *<0/1/2/3/4>*	Sets the TIF type. "0"=mono, "1"=color, "2"=logl, "3"=logluv, "4"=16–bit color.
-TIF_ALPHA: *<1/0>*	Toggles TIF file alpha. "1"=On, "0"=Off.
-TIF_COMPRESSION: *<1/0>*	Toggles TIF Compression. "1"=On, "0"=Off.
-TIF_DPI: *<number>*	Sets the dots-per-inch value for TIF files.

For each of the following **-RLA_xxxx** switches, there is a corresponding **-RPF_xxxx** option.

Switch	Effect
-RLA_COLORDEPTH: *8, 16 or 32*	Sets the RLA color bitdepth.
-RLA_ALPHA: *<1/0>*:	Toggles RLA Alpha. "1"=On, "0"=Off.
-RLA_PREMULTALPHA: *<1/0>*	Toggles RLA Premultiplied Alpha. "1"=On, "0"=Off.
-RLA_DESCRIPTION: *<string>*	Lets you specify an RLA description (in quotes).
-RLA_AUTHOR: *<string>*	Lets you specify an RLA author name (in quotes).
-RLA_ZDEPTHCHANNEL: *<1/0>*	Toggles RLA Z-Depth Channel. "1"=On, "0"=Off.
-RLA_MTLIDCHANNEL: *<1/0>*	Toggles RLA Material Effects Channel. "1"=On, "0"=Off.
-RLA_OBJECTIDCHANNEL: *<1/0>*	Toggles RLA Object Channel. "1"=On, "0"=Off.
-RLA_UVCHANNEL: *<1/0>*	Toggles RLA UV Coordinates Channel. "1"=On, "0"=Off.
-RLA_NORMALCHANNEL: *<1/0>*	Toggles RLA Surface Normals Channel. "1"=On, "0"=Off.
-RLA_ NONCLAMPEDCOLORCHANNEL: *<1/0>*	Toggles RLA Non-Clamped Color Channel. "1"=On, "0"=Off.
-RLA_COVERAGECHANNEL: *<1/0>*	Toggles RLA Coverage Channel. "1"=On, "0"=Off.

The following **-RPF_xxxx** switches *do not* have corresponding **-RLA_xxxx** options.

Switch	Effect
-RPF_NODERENDERIDCHANNEL	Turns on RPF Node Render ID Channel.
-RPF_COLORCHANNEL	Turns on RPF Color Channel.
-RPF_TRANSPCHANNEL	Turns on RPF Transparency Channel.
-RPF_VELOCCHANNEL	Turns on RPF Velocity Channel.
-RPF_WEIGHTCHANNEL*<1/0>*	Turns on RPF Sub-Pixel Weight Channel.
-RPF_MASKCHANNEL	Turns on RPF Sub-Pixel Mask Channel.

Switch	Effect
-EXR_USEEXPONENT	EXR use exponent on/off
-EXR_EXPONENT	EXR exponent value (decimal)
-EXR_PREMULTALPHA	EXR premultiplied alpha on/off
-EXR_ALPHA	EXR save alpha component on/off
-EXR_RED	EXR save red component on/off
-EXR_GREEN	EXR save green component on/off
-EXR_BLUE	EXR save blue component on/off
-EXR_BITDEPTH	EXR bit depth: 0=8–bit integers; 1=half float; 2=float
-EXR_USEFRAMENUMDIGITS	EXR use number of frame digits on/off
-EXR_FRAMENUMDIGITS	EXR number of frame digits (integer)
-EXR_COMPRESSIONTYPE	EXR compression type: 0=no compression; 1=RLE; 2=ZIP (1 scanline); 3=ZIP (16 scanlines); 4=PIZ
-EXR_USEREALPIX	EXR use RealPix RGB data on/off

Backburner Command Line Control

The Backburner command line plug-in allows you to submit batch, executable, or script files to backburner as "custom" jobs. This *cmdjob.exe* tool, found in the Backburner program folder, provides more flexibility in running custom jobs than is offered by the 3ds Max *3dsmaxcmd.exe* plug-in.

For a list of the command-line switches that you can use with the Backburner command line plug-in, see Rendering Jobs from a Command Line or Script. Some examples of how these commands can be used with 3ds Maxare listed below.

Note: In order to use command-line rendering, you should be familiar with DOS and understand the structure of command lines.

Examples of a CmdJob Usage

Please see the online version of the *User Reference* for details.

See also

Command-Line Rendering (page 3–206)

18 Effects and Environments

Effects and Environments

A variety of special effects, such as film grain, depth of field, and lens simulations, are available as *rendering effects (page 3–214)*. Another set of effects, such as fog, are provided as *environment effects (page 3–267)*.

The fog environment effect adds atmosphere to a street scene.

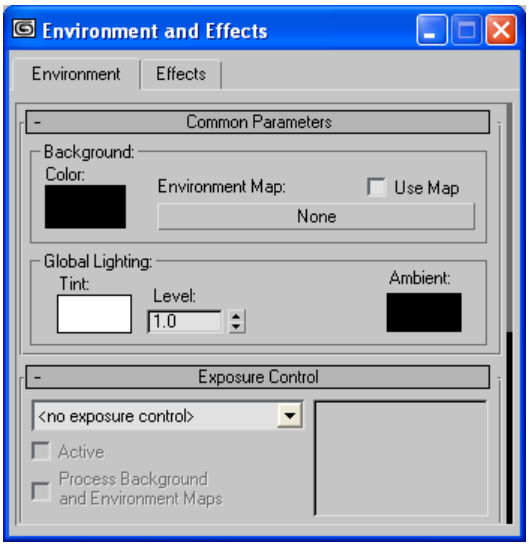
In 3ds Max, rendering effects and environments are both accessed from a single *Environment and Effects dialog (page 3–213)*.

Environment and Effects Dialog

Rendering menu > Environment
Rendering > Effects

You apply effects and environments by using the Environment and Effects dialog.

Interface



The Environment and Effects dialog has two panels, described in the following topics:

Effects Panel and Rollout (page 3–215)

Environment Panel (page 3–268)

Rendering Effects

Introduction to Rendering Effects

Rendering Effects enable you to add post-production effects without having to render the scene to see the results. Through the *Effects panel (page 3–215)* on the Environment and Effects dialog, you can add various effects and view them prior to final rendering of an image or animation.

Render Effects let you work interactively. As you adjust an effect's parameters, the *rendered frame window (page 3–5)* is updated with the final output image of both the scene geometry and the applied effects. You can also choose to continually work with an effect and then update the effect manually.

The following topics explain each Render Effect in detail.

Hair and Fur Render Effect (page 3–216)

Lens Effects Rendering Effects (page 3–219)

Blur Rendering Effect (page 3–256)

Brightness and Contrast Rendering Effect (page 3–261)

Color Balance Rendering Effect (page 3–261)

Depth of Field Rendering Effect (page 3–265)

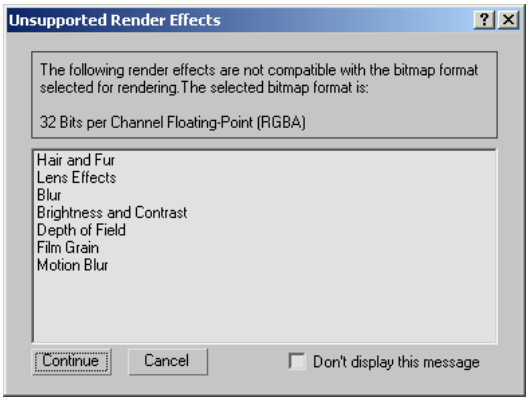
File Output Rendering Effect (page 3–262)

Film Grain Rendering Effect (page 3–264)

Motion Blur Rendering Effect (page 3–265)

Rendering Effects and 32–bit Floating-Point Output

Most rendering effects in 3ds Max are not compatible with 32-bit floating-point output, such as that provided optionally by the mental ray renderer (see *Frame Buffer Type*). If you render using one or more unsupported effects, the following dialog appears:



You can choose to continue rendering without the unsupported effects, or cancel the render.

The only supported effects are File Output and Color Balance; the rest (shown in the dialog above) are unsupported.

Rendering Effects Command

Rendering menu > Effects > Environment and Effects dialog > Effects panel

Effects displays the *Effects panel (page 3–215)* on the Environment and Effects dialog, which lets you set parameters for post-rendering effects.

From this panel, you can select and assign a class of plug-in called Render Effect, which is a post-rendering image-processing effect. This lets you apply image processing without using Video Post.

Render Effects have the added advantage of allowing animated parameters and references to scene objects. You can also adjust and view the effects interactively.

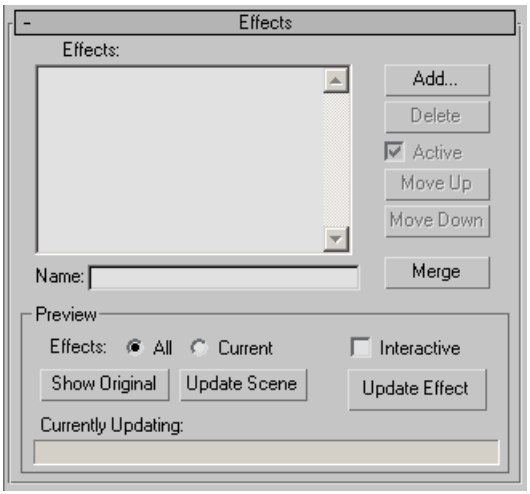
Effects Panel and Rollout

Rendering menu > Effects > Environment and Effects dialog > Effects panel

You can use the Effects panel to:

- Assign a Render Effects plug-in.
- Apply image processing without using Video Post.
- Adjust and view effects interactively.
- Animate parameters and references to scene objects.

Interface



The Effects panel has one main rollout, Effects, with the following options:

Effects—Displays a list of selected effects.

Name—Displays the name of the selected effect. Edit this field to rename the effect.

Add—Displays a dialog listing all available rendering effects. Select the effect you want added to the window list, and then click OK.

Delete—Removes a highlighted effect from the window and from the scene.

Active—Specifies whether the selected effect is active in the scene. On by default; you can deactivate an effect without actually removing it by selecting it in the window and turning off Active.

Move Up—Moves the highlighted effect up in the window list.

Move Down—Moves the highlighted effect down in the window list.

Merge—Merges rendering effects from scene (*.max*) files. Clicking Merge displays a file dialog from which you can choose a *.max* file. A dialog then appears listing all rendering effects in that scene.

Preview group

Effects—When **All** is chosen, all of the active effects are applied to the preview. When **Current** is chosen, only the highlighted effects are applied to the preview.

Interactive—When on, changes occur interactively in the *rendered frame window (page 3–5)* as you adjust the parameters of an effect. When Interactive is not activated, you can click one of the update buttons to preview the effect.

Show Original/Show Effects toggle—Click Show Original to display the original rendered image without any of the effects applied. Click Show Effects to display the rendered image with the effects.

Update Scene—Updates the rendered frame window with all changes made in Rendering Effects as well as any changes made to the scene itself.

Update Effect—Manually updates the preview rendered frame window when Interactive is not on. What is shown in the rendered frame window is only an update of any changes made in Rendering Effects. Any changes made to the scene itself will not be rendered.

Merging Effects

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Merge

The Merge button on the *Effects panel (page 3–215)* lets you merge effects from other 3ds Max (*.max)* scene files.

See also

Merge (page 3–469)

Replace (page 3–476)

Merge Animation (page 3–471)

Procedures

To merge an atmospheric effect:

1. Choose Rendering menu > Effects to display the Effects panel.
2. On the Effects rollout, click Merge.

   A Merge Effect dialog appears for file selection.
3. Select a *.max* scene.

   A Merge Atmospheric Effects dialog lists the effects in the specified file.
4. Select one or more of the effects, and then click OK to merge them into the scene.

   Only atmospheric effects appear in the merge list, but when an effect is merged, any lights or gizmos bound to the effect are merged as well.

To resolve conflicts when merged effects have the same name:

- If an effect of the same type and name already exists in the scene, an alert appears. Choose from among these options:
  - **Name field**—Allows you to rename the incoming effect.
  - **Merge**—Results in two effects in the scene with the same name.
  - **Delete Old**—Removes the existing effect in the scene.
  - **Apply To All Duplicates**—Performs the same action on all subsequent matching effects.

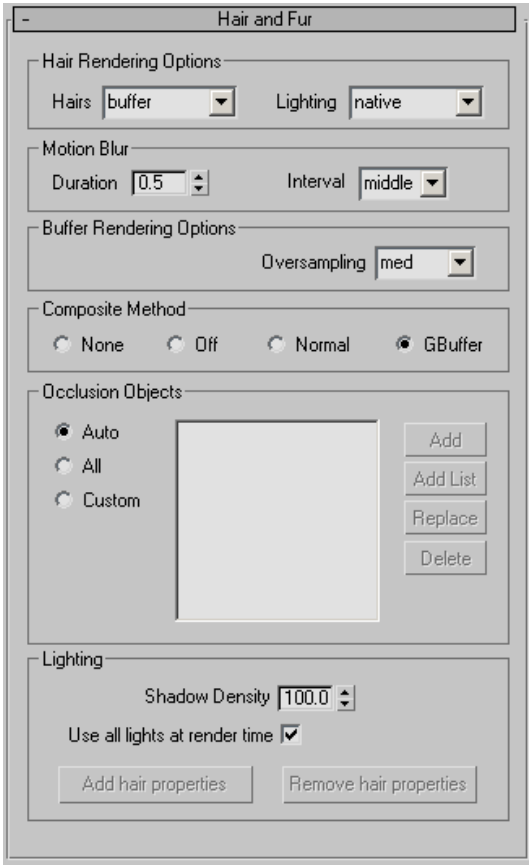
Hair and Fur Render Effect

Rendering menu > Effects > Environment And Effects dialog > Effects panel > Add > Add Effect dialog > Hair and Fur

Hair and Fur modifier > Tools rollout > Render Settings button

To render hair, the scene must contain a Hair and Fur render effect. The render effect is automatically added to the scene the first time you apply the Hair and Fur modifier to an object. If for some reason the render effect doesn't exist in the scene, you can add one by clicking the Render Settings button. This opens the Environment And Effects dialog and adds a Hair and Fur render effect. You can change the settings, or simply accept the default settings by closing the dialog after it opens.

Interface (Hair and Fur render effect)



This section describes the interface for the Hair and Fur render effect.

Hair Rendering Options group

Hairs—Sets the method to be used for rendering hair:

- **buffer**: Procedural hair generated by Hair at render time based on the modifier parameters. Buffer hair is generated by a special renderer within Hair and offers the benefit of being able to create millions of hairs with minimal memory requirements. Only one hair is in memory at a time. Also, using Buffer render offers a variety of compositing options.
- **geometry**: Creates actual geometry for the rendered hair at render time. This geometry is assigned the material ID set by the Hair and Fur modifier > *Geom Mat ID parameter*.

  Note: Geometry hair derives its texture from the growth object, not from any maps applied via the Material Parameters rollout.

  Compositing options aren't available with Geometry hair.
- **MR prim**: Hair is generated by a procedural mental ray shader that generates mental ray curve primitives directly into the mental ray rendering stream at render time.

Lighting—

- **native**: Uses standard 3ds Max calculations for light falloff.
- **emulation**: Performs a simpler internal calculation for light falloff within the buffer render. It applies only to the buffer hair rendering itself, not the 3ds Max scene. This mode omits features such as illumination textures on the hair, and light falloff calculation might be slightly inaccurate, but rendering is somewhat faster.

Motion Blur group

In order to render motion-blurred hairs, Motion Blur must be enabled for the growth object.

Duration—The number of frames over which motion blur is calculated for each frame.

Interval—The point in the duration at which the "snapshot" of the hair is captured, pre-blurring. The default is middle, which causes blurring to occur at the start and end of the duration.

Buffer Rendering Options group

This setting applies only to the *buffer rendering method*.

Oversampling—Controls the level of antialiasing applied to the Hair buffer render. The available choices are Draft, Low, Medium, High, and Maximum. The Draft setting uses no antialiasing. High is suitable for most final renders, and in extreme cases, use Maximum. The higher the Oversampling level, the greater the memory requirements and render time.

Composite Method group

This option lets you choose the method by which Hair composites hair with the rest of the scene. Compositing options are available only with the Buffer rendering method.

- **None**: Renders the hair only, with occlusion. The resulting image is ready to composite.
- **Off**: Renders hair shadows but not the hair.
- **Normal**: Does standard rendering and composites the occluded hair with the rest of the scene in the rendered frame window. Because of the occlusion, hair will not appear behind (through) transparent objects.
- **GBuffer**: Buffer-rendered hair appears behind most transparent objects. Transparent refractive objects aren't supported.

Occlusion Objects group

This setting lets you choose which objects will occlude hair in the scene; that is, if the object is closer to the camera than part of the hair array, the hairs behind it won't render. By default, all objects in the scene occlude hair behind them.

- **Auto**: All renderable objects in the scene occlude hair behind them.
- **All**: All objects in the scene, including non-renderable objects, occlude hair behind them.
- **Custom**: Lets you specify objects that will occlude hair. Choosing this option makes the buttons on the right slide of the list available. If you choose Custom but don't specify any occlusion objects, no objects will occlude the hair; that is, the hair will appear in front of all objects, whether or not it's closer to the camera than the objects.

[list]—The list of occlusion objects. To edit this list, choose Custom and then use the buttons on the right side of the list.

Add—Adds a single object to the list. Click Add and then, in a viewport, select the object to add.

Add List—Adds multiple objects to the list. Click Add and then, in a viewport, select each object to add in turn. To finish, right-click in the viewport or click Add List again to turn it off.

Replace—Replaces a highlighted object in the list with another from the scene. Highlight the object to be replaced, click Replace, and then select the replacement object in a viewport.

Delete—Deletes a highlighted object from the list. Highlight the object to be replaced and then click Delete.

Lighting group

These settings control illumination of and shadow-casting from hair by spot lights in the scene.

Note: Only spot lights can illuminate and cast shadows from hair.

Shadow Density—Specifies the relative darkness of the shadows. At the default/highest value, 100.0, shadows are darkest. At the lowest value, 0.0, shadows are fully transparent, so they don't render. Range=0.0 to 100.0. Default=100.0.

Use all lights at render time—When on, causes all spot lights in the scene to illuminate and cast shadows from hair when the scene is rendered. Note that shadows are cast only from spot lights with the Shadows switch on. When off, only spot

lights to which you've added hair properties (see following) can affect hair. Default=on.

Note: When this switch is on, the hair shadows use each light's shadow map properties as defined on the *Shadow Map Parameters rollout (page 2–1208)*, unless the light already contains hair properties (see following), in which case the shadow map uses the *Hair Light Attr(ibutes) rollout (page 2–1196)* settings. When off, for a spot light to cast shadows from hair, you must add hair properties (see following), and the shadow maps use the settings from the *Hair Light Attr(ibutes) rollout (page 2–1196)*.

These settings apply only to buffer-rendered hair (the default type, set in the Hair and Fur render effect).

Add hair properties—Adds the *Hair Light Attr(ibutes) rollout (page 2–1196)* to selected spot lights in the scene. If you want to assign hair-specific shadow properties on a per-light basis, this rollout is necessary. Available only when at least one spot light is selected.

When "Use all lights at render time" is off, only spot lights with hair properties can illuminate hair.

Remove hair properties—Removes the *Hair Light Attr(ibutes) rollout (page 2–1196)* from selected spot lights in the scene. Available only when a spot light with hair properties added is selected.

Lens Effects Rendering Effects

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects

Lens flares added as lens effects

Lens Effects is a system used to create real-life effects commonly associated with a camera. These effects include *Glow (page 3–222)*, *Ring (page 3–226)*, *Ray (page 3–230)*, *Auto Secondary (page 3–234)*, *Manual Secondary (page 3–238)*, *Star (page 3–242)*, and *Streak (page 3–246)*.

Procedures

To add an effect:

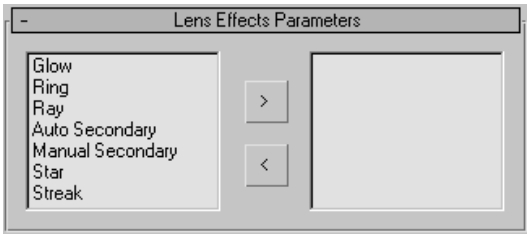
1. Select the desired effect from the list on the left side of the Lens Effects Parameters rollout.
2. Click the (>) arrow button to move it into the column on the right.

To delete an applied effect:

1. Select the effect from the list on the right side of the Lens Effects Parameters rollout.
2. Click the (<) arrow button to remove it from the list.

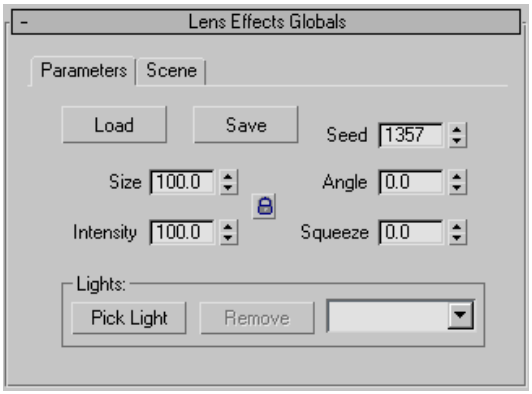
Interface

Lens Effects Parameters rollout



The Lens Effects system allows you to apply effects to your rendered image by choosing a particular effect from the list on the left and adding it to the list on the right. Each effect has its own rollout of parameters, but all effects share two panels of global parameters.

Lens Effects Globals rollout, Parameters panel



Load—Displays the Load Lens Effects file dialog that enables you to open an LZV file. The LZV file format contains information saved from a previous configuration of Lens Effects. This allows you to load and use Lens Effects that have been saved from previous sessions of the software.

Save—Displays the Save Lens Effects file dialog that enables you to save an LZV file. The LZV file format contains information saved from a previous configuration of Lens Effects. This allows you to save several types of Lens Effects and use them in multiple 3ds Max scenes.

Note: Saving an effect as an LZV file will only save the attributes of the effect on the frame that it is saved at. The LZV file format doesn't save the animation keys of an animated parameter.

Size—Affects the size of the overall Lens Effect. This value is a percentage of the size of the rendered frame.

Intensity—Controls the overall brightness and opacity of the Lens Effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Seed—Gives the random number generator in Lens Effects a different starting point, which creates a slightly different Lens Effect without changing any settings. Using Seed guarantees a different Lens Effect, even if the differences are very small. For example, if you set up a Ray effect, you will get slightly different rays in the lens flare if you adjust the seed value.

Angle—Affects the amount that the Lens Effect rotates from its default position, as the position of the effect changes relative to the camera.

Squeeze—Squeezes the size of the overall Lens Effect, either horizontally or vertically to compensate for different frame aspect ratios. Positive values stretch the effect horizontally, and negative values stretch it vertically. The value is a percentage of the size of the flare. Range=100 to -100.

Lights group

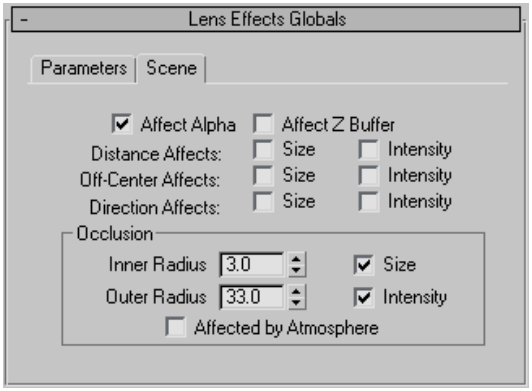
Allows you to choose lights to apply Lens Effects to.

Pick Light—Enables you to select a light directly through the viewports. You can also select a light by pressing **H** to display the *Select Objects dialog* *(page 1-78)*.

Remove Light—Removes a selected light.

Drop-down list—Provides quick access to lights that you have added to the Lens Effect.

Lens Effects Globals rollout, Scene panel



Affect Alpha—Specifies whether or not the Lens Effect affects the alpha channel of an image when the image is rendered in a 32-bit file format. The alpha channel is an extra 8 bits of color (256 colors) that indicate transparency in an image. Alpha channels are used to composite one image seamlessly over the top of another. If you want to composite a Lens Effect, or an image that contains a Lens Effect, over the top of another image, enable this option. If you are not rendering to a 32-bit file, do not enable this option.

Affect Z Buffer—Stores an object's distance from the camera. The Z-Buffer is useful for optical effects. When this option is enabled, the linear distance of the Lens Effect is recorded, and can be used in special effects that make use of the Z-Buffer.

Distance Affects—Allows distance from the camera or viewport to affect the size and/or the intensity of the effect.

Off-Center Affects—Allows an effect that is off-center from the camera or viewport to affect the size and/or the intensity of the effect.

Direction Affects—Allows direction of spot lights with respect to the camera or viewport to affect the size and/or the intensity of the effect.

The size and intensity of the effect are at a maximum when the light is pointed at the camera (or viewport).

Occlusion group

Occlusion is used to determine when a Lens Effect will be affected by an object that comes between the effect and the camera. By using two spinners to determine occlusion you can have scene objects realistically affect the look of your effect. The outer radius will determine when another scene object will begin to occlude and the inner radius will determine when the scene object will cause the effect to reach maximum occlusion.

Inner Radius—Sets the inner radius around the effect that another scene object must intersect in order to completely occlude the effect.

Outer Radius—Sets the outer radius around the effect that another scene object must intersect in order to begin to occlude the effect.

Size—Decreases the size of the effect when being occluded.

Intensity—Decreases the intensity of the effect when being occluded.

Affected by Atmosphere—Allows Atmospheric Effects to occlude Lens Effects.

Glow Lens Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Glow, and click the (>) arrow button.

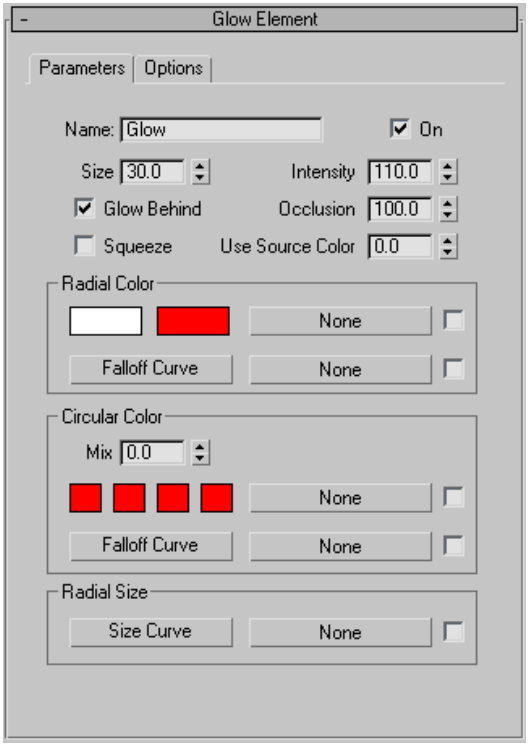
Adding glow to the light

Glow lets you add a glowing aura around any assigned object. For example, for an exploding particle system, adding a glow to the particles makes them seem as though they are brighter and hotter.

Warning: This effect is not supported by the *mental ray renderer (page 3–77)*.

Interface

Glow Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects you can have many different effects under one instance of Lens Effects. To keep them in order, it is often necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated.

Size—Determines the size of the effect.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Glow Behind—Gives the effect the ability to be displayed behind objects in your scene.

Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Squeeze—Determines whether the effect will be squeezed. When activated the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Use Source Color—Mixes the source color of the light or object you are applying the effect to and the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Radial Color group

The Radial Color settings affect the inner and outer colors of the effect. You can set the color swatches to set the inner and outer colors of the Lens Effect. You can also use bitmaps such as Gradient or Cellular to determine the radial color.

Falloff Curve—Displays the *Radial Falloff dialog (page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Circular Color group

Circular Color determines the color of the effect by using four different color swatches that are matched to the four quadrants of the effect. A map can also be used to determine circular color.

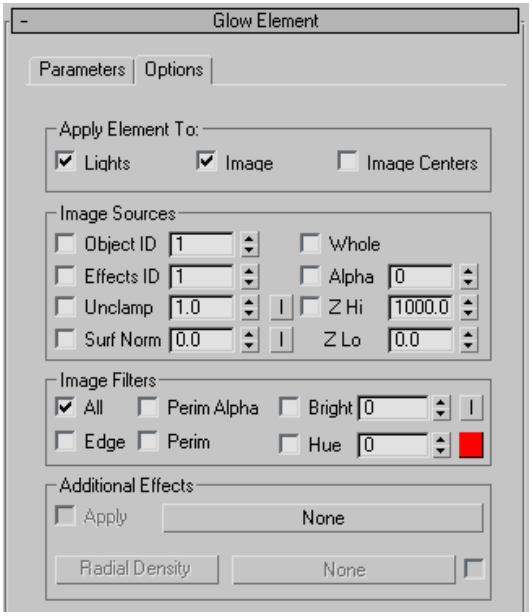
Mix—Mixes colors set in Radial Color and colors set in Circular Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Circular Color. Any value between 0 and 100 will mix between the two values.

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Circular Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Glow Element rollout, Options panel



Apply Element To group

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to the rendered image using parameters set in Image Sources.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group box.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha

channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha keeps all of the edges clean because it relies on the scene alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the **I** button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

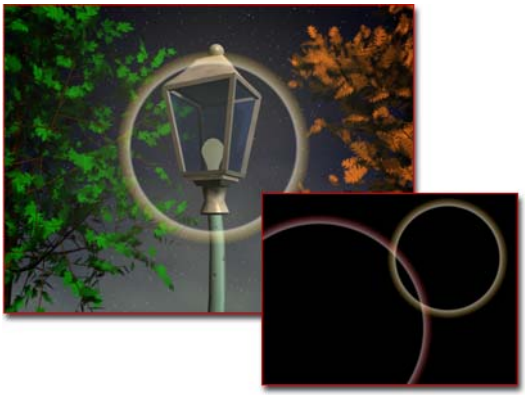
Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Ring Lens Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Ring, and click the (>) arrow button.



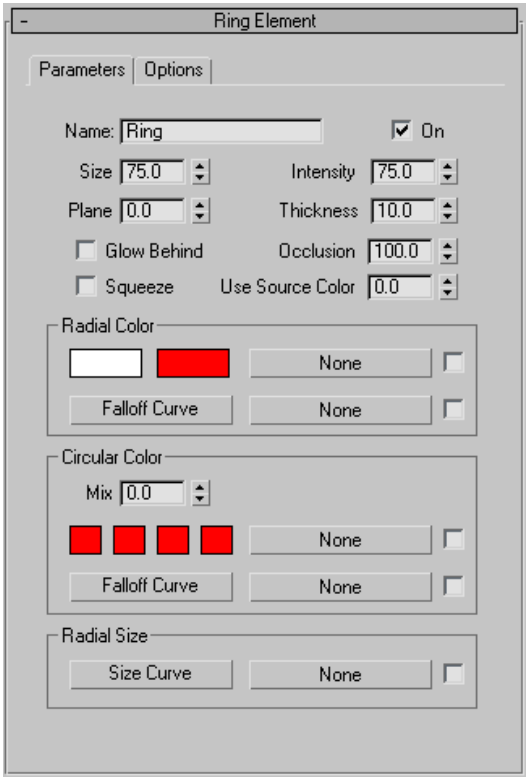
Adding a ring to the light

The ring is a circular color band that surrounds the center of the source object.

Warning: This effect is not supported by the *mental ray renderer (page 3–77)*.

Interface

Ring Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects you can have many different effects under one instance of Lens Effects. To keep them in order, it is often necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated. Default = on.

Size—Determines the size of the effect.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Plane—Sets the location of the effect along the axis of the effect which extends from the center of the effect through the center of the screen.

Thickness—Determines the thickness, in pixels, of the effect.

Glow Behind—Gives the effect the ability to be displayed behind objects in your 3ds Max scene.

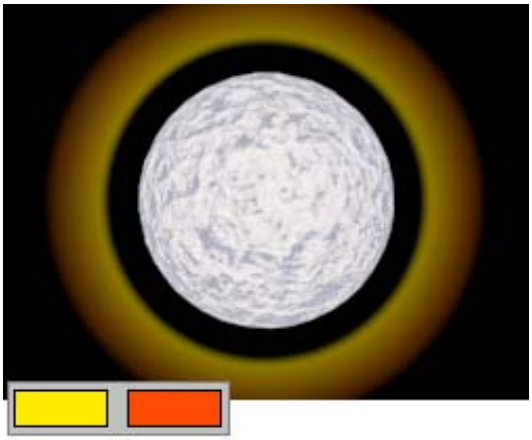
Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Squeeze—Determines whether the effect will be squeezed. When activated the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Use Source Color—Mixes the source color of the light or object you are applying the effect to with the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Radial Color group

The Radial Color settings affect the inner and outer colors of the effect. You can set the color swatches to set the inner and outer colors of the Lens Effect. You can also use bitmaps such as gradient or cellular to determine the radial color.

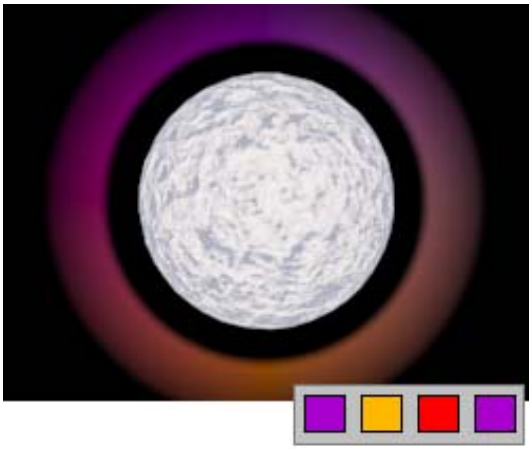


Ring using radial colors as seen in lower left inset

Falloff Curve—Displays the *Radial Falloff dialog (page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff.

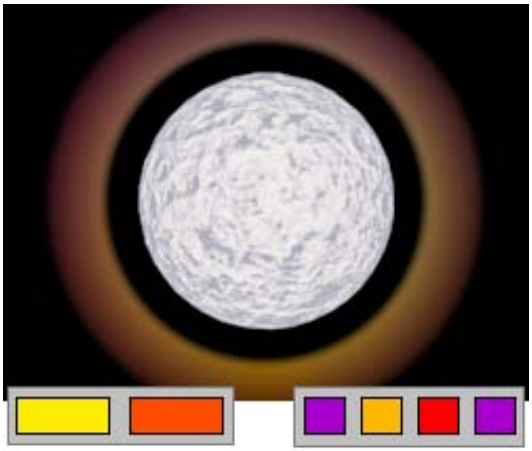
Circular Color group

Circular Color determines the color of the effect by using four different color swatches that are matched to the four quadrants of the effect. A map can also be used to determine circular color.



Ring using circular colors as seen in lower right inset

Mix—Mixes colors set in Radial Color and colors set in Circular Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Circular Color. Any value between 0 and 100 will mix between the two values.



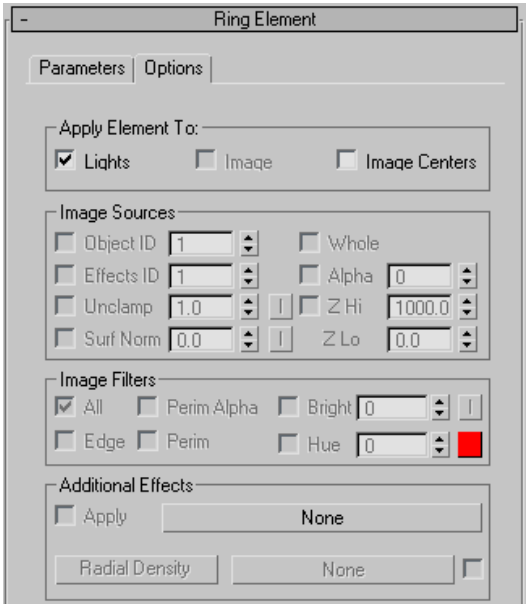
Ring using radial and circular colors mixed 50/50

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Circular Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Ring Element rollout, Options panel



Apply Element To

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to the rendered image using parameters set in Image Sources.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned

to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group box.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha keeps all of the edges clean because it relies on the scene alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you

might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the **I** button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

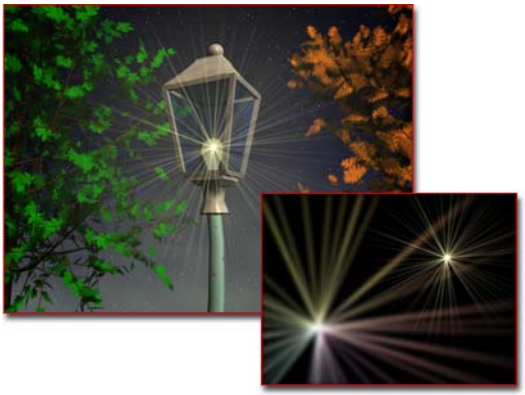
Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Ray Lens Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Ray, and click the (>) arrow button.

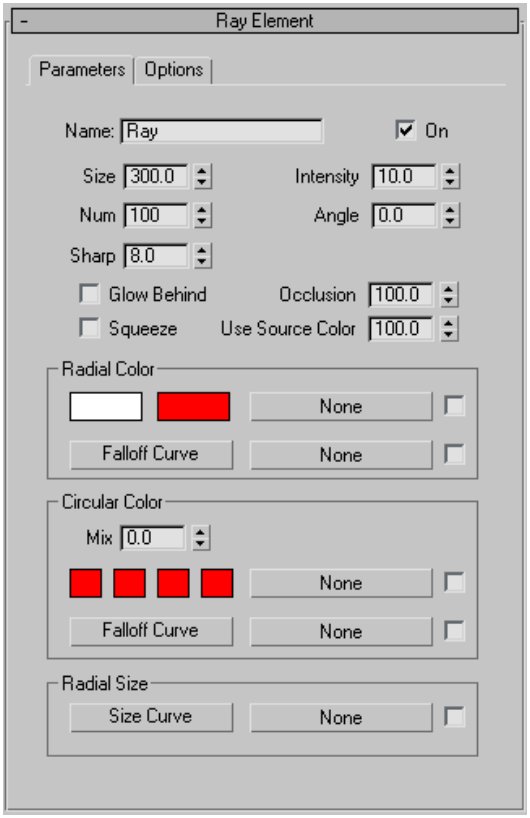


Adding rays to the light

Rays are bright lines that radiate from the center of the source object, providing the illusion of extreme brightness for the object. Rays let you emulate scratches in the lens elements of a camera.

Interface

Ray Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects you can have many different effects under one instance of Lens Effects. To keep them in order, it is often necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated. Default = on.

Size—Determines the size of the effect.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Num—Specifies the overall number of rays that appear in the lens flare. Rays are randomly spaced around the radius.

Angle—Specifies the angle for the rays. You can enter both positive and negative values so, when animated, the rays rotate in a clockwise or counterclockwise direction.

Sharp—Specifies the overall sharpness of the rays. Higher numbers produce crisp, clean, and clear rays. Lower numbers produce more of a secondary glow look. Range=0 to 10.

Glow Behind—Gives the effect the ability to be displayed behind objects in your 3ds Max scene.

Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Squeeze—Determines whether the effect will be squeezed. When activated, the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Use Source Color—Mixes the source color of the light or object you are applying the effect to and the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Radial Color group

The Radial Color settings affect the inner and outer colors of the effect. You can set the color swatches to set the inner and outer colors of the Lens Effect. You can also use bitmaps such as Gradient or Cellular to determine the radial color.

Falloff Curve—Displays the *Radial Falloff dialog (page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Circular Color group

Circular Color determines the color of the effect by using four different color swatches that are matched to the four quadrants of the effect. A map can also be used to determine circular color.

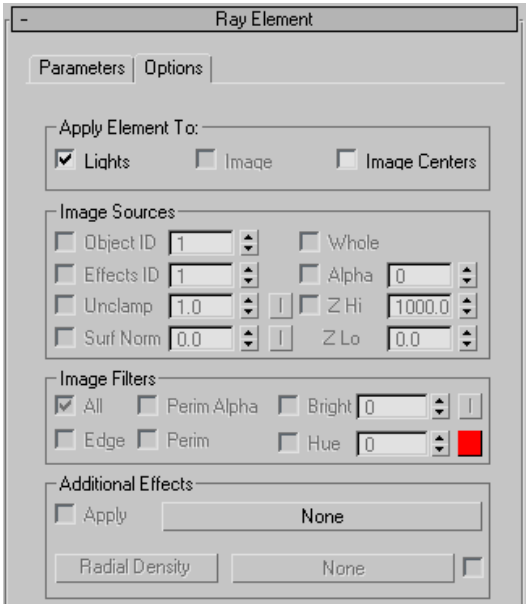
Mix—Allows you to mix between colors set in Radial Color and colors set in Circular Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Circular Color. Any value between 0 and 100 will mix between the two values.

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Circular Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Ray Element rollout, Options panel



Apply Element To group

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to the rendered image using parameters set in Image Sources.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned

to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Edge filter applied to rays emanating from object

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha keeps all of the edges clean because it relies on the scene alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the I button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

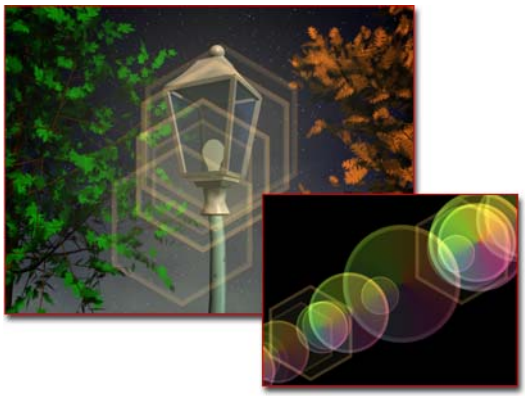
Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Auto Secondary Lens Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Auto Secondary, and click the (>) arrow button.



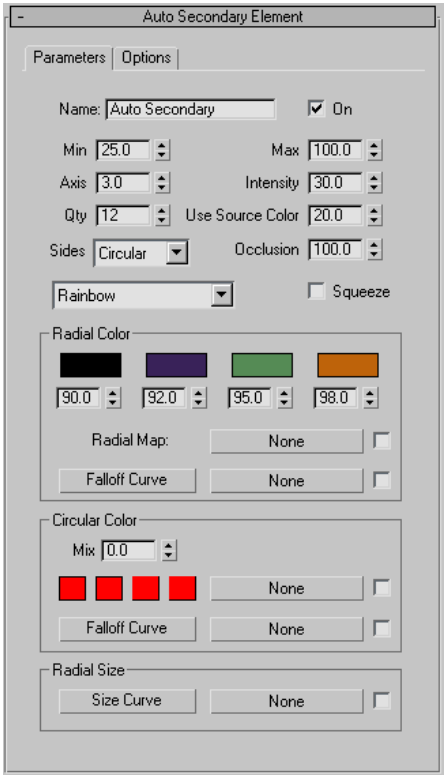
Adding secondary flares to the light

Secondary flares are the small circles you would normally see coming out from the source of the lens flare along an axis relative to the camera position. These are caused by light refracting off the different lens elements in the camera. As the

camera position changes relative to the source object, the secondary flares move.

Interface

Auto Secondary Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects you can have many different effects under one instance of Lens Effects. To keep them in order, it is necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated. Default = on.

Min—Controls the minimum size of secondary flares in the current set. This number is defined as a percentage of the overall image.

Max—Controls the maximum size of secondary flares in the current set. This number is defined as a percentage of the overall image.

Axis—Defines the overall length of the axis the automatic secondary flares will be distributed along. Increasing the value creates more space between the flares, while decreasing the value creates less space between the flares. You can set the axis from 0 to 10 degrees.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Qty—Controls the number of secondary flares that appear in the current set of flares.

Use Source Color—Mixes the source color of the light or object you are applying the effect to with the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Sides—Controls the shape of the secondary flares for the current set. The default is circular, but you can choose from 3- to 8-sided secondary flares.

Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Presets (drop-down list)—Displays a list of preset values that can be selected and applied to the rendered scene.

Squeeze—Determines whether the effect will be squeezed. When activated, the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Radial Color group

The Radial Color settings affect the inner and outer colors of the effect. You can set the color swatches to set the inner and outer colors of the Lens Effect. Each color swatch has a percentage spinner that determines at what point that color should stop and the next should start. You can also use bitmaps such as gradient or cellular to determine the radial color.

Falloff Curve—Displays the *Radial Falloff dialog (page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Circular Color group

Circular Color determines the color of the effect by using four different color swatches that are matched to the four quadrants of the effect. A map can also be used to determine circular color.

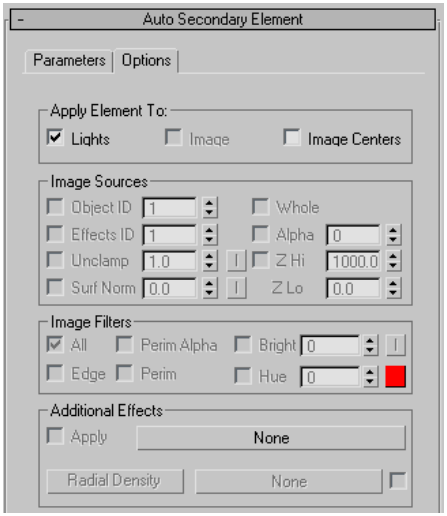
Mix—Allows you to mix between colors set in Radial Color and colors set in Circular Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Circular Color. Any value between 0 and 100 will mix between the two values.

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Circular Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Auto Secondary Element rollout, Options panel



Apply Element To group

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to the rendered image using parameters set in Image Sources.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined

when you right-click any object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group box.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha

keeps all of the edges clean because it relies on the scene alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the **I** button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Manual Secondary Lens Effect

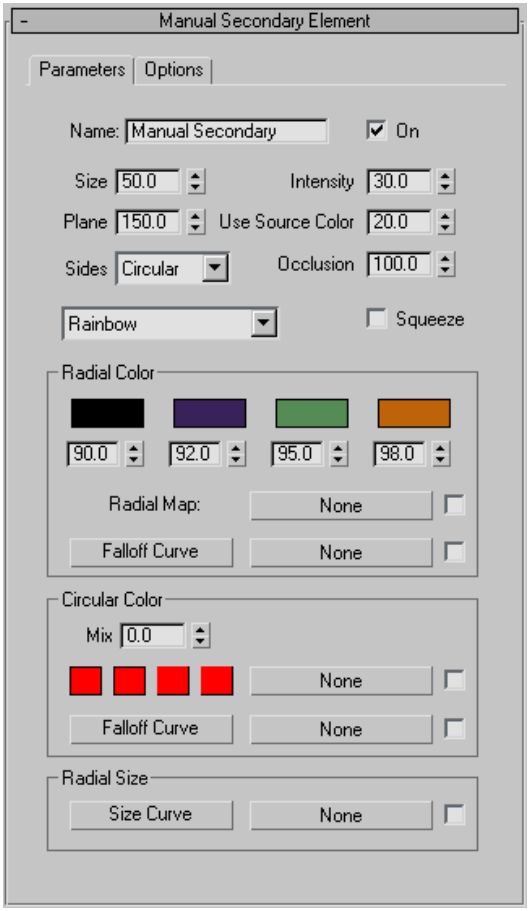
Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Manual Secondary, and click the (>) arrow button.

Manual secondary flares are additional secondary flares that are individually added to the lens flare. These can be used in addition to, or in place of *auto secondary flares (page 3–234)*.

You use Manual Secondary flares when you want to add unique flares that you don't want repeated.

Interface

Manual Secondary Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects you can have many different effects under one instance of Lens Effects. To keep them in order, it is necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated. Default = on.

Size—Determines the size of the effect.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Plane—Controls the distance, in degrees, between the flare source and the manual secondary flare. By default, the flare plane exists at the center of the chosen node source. Positive values place the flare in front of the source, while negative values place the flare behind the flare source.

Use Source Color—Mixes the source color of the light or object you are applying the effect to and the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Sides—Controls the shape of the secondary flares for the current set. The default is circular, but you can choose from 3- to 8-sided secondary flares.

Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Presets (drop-down list)—Displays a list of preset values that can be selected and applied to the rendered scene.

Squeeze—Determines whether the effect will be squeezed. When activated, the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Radial Color group

The Radial Color settings affect the inner and outer colors of the effect. You can set the color swatches to set the inner and outer colors of the

Lens Effect. You can also use bitmaps such as gradient or cellular to determine the radial color.

Falloff Curve—Displays the *Radial Falloff dialog (page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Circular Color group

Circular Color determines the color of the effect by using four different color swatches that are matched to the four quadrants of the effect. A map can also be used to determine circular color.

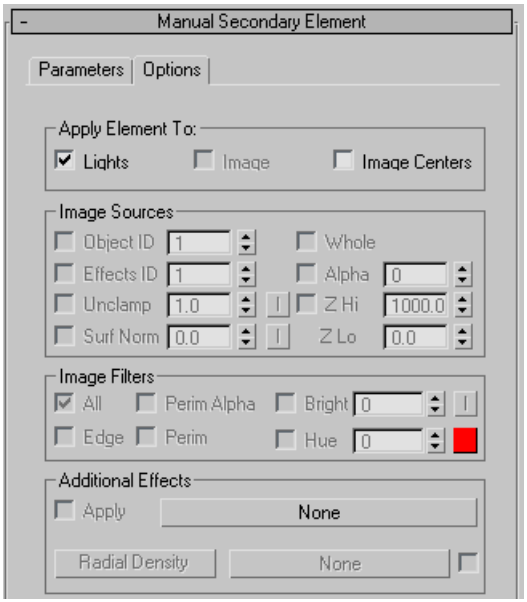
Mix—Mixes colors set in Radial Color and colors set in Circular Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Circular Color. Any value between 0 and 100 will mix between the two values.

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Circular Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Manual Secondary Element rollout, Options panel



Apply Element To group

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to the rendered image using parameters set in Image Sources.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group box.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha keeps all of the edges clean because it relies on the scene alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the **I** button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

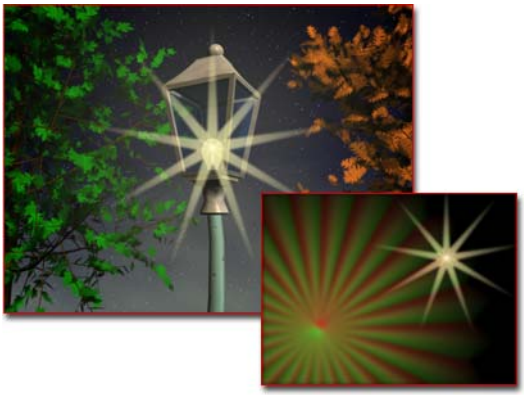
Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Star Lens Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Star, and click the (>) arrow button.

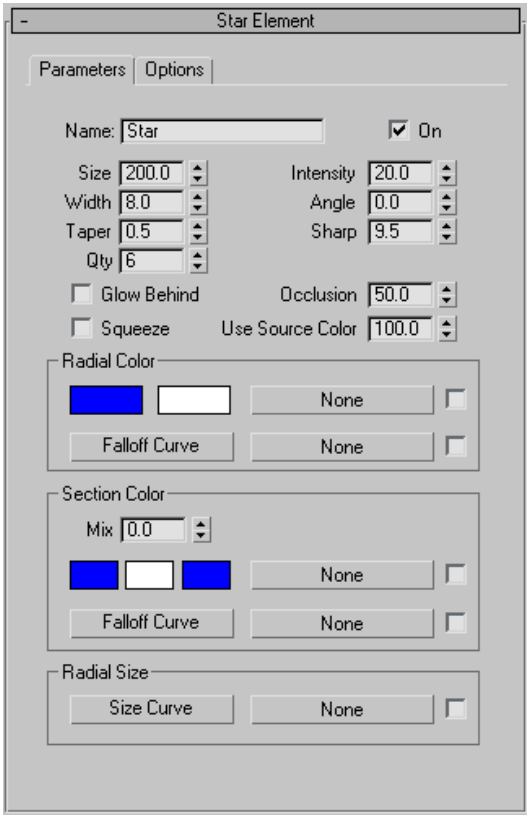


Adding a star to the light

A Star is larger than a *Ray effect (page 3–230)* and is composed of 0 to 30 spokes, instead of hundreds like a ray.

Interface

Star Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects, you can have many different effects under one instance of Lens Effects. To keep them in order, it is necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated.

Size—Determines the size of the effect.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Width—Specifies the width of the individual spokes, as a percentage of the overall frame.

Angle—Sets the starting angle in degrees in which the star spokes point. You can enter both positive and negative values so, when animated, the star spokes rotate in a clockwise or counterclockwise direction.

Taper—Controls the taper of the individual spokes of the star. Taper widens or narrows the tips of the individual star points. Low numbers create a sharp point, while high numbers flare the points.

Sharp—Specifies the overall sharpness of the star. Higher numbers produce crisp, clean, and clear stars. Lower numbers produce more of a secondary glow look. Range=0 to 10.

Qty—Specifies the number of spokes in the star effect. The default is 6. Spokes are spaced at equidistant points about the center of the flare.

Glow Behind—Gives the effect the ability to be displayed behind objects in your 3ds Max scene.

Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Squeeze—Determines whether the effect will be squeezed. When activated, the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Use Source Color—Mixes the source color of the light or object you are applying the effect to and the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Radial Color group

The Radial Color settings affect the inner and outer colors of the effect. You can set the color swatches to set the inner and outer colors of the Lens Effect. You can also use bitmaps such as gradient or cellular to determine the radial color.

Falloff Curve—Displays the *Radial Falloff dialog (page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Section Color group

Selection Color determines the color of the effect by using three different color swatches that are matched to the three sections of the effect. A map can also be used to determine section color.

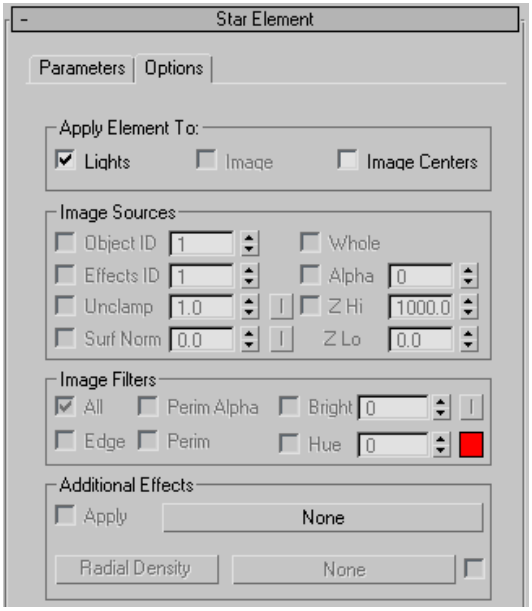
Mix—Mixes colors set in Radial Color and colors set in Section Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Section Color. Any value between 0 and 100 will mix between the two values.

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Section Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Star Element rollout, Options panel



Apply Element To group

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to the rendered image using parameters set in Image Sources.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any object and select

Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group box.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha

keeps all of the edges clean because it relies on the alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the **I** button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

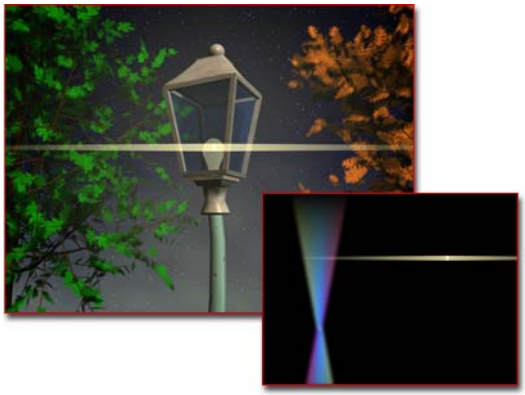
Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Streak Lens Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose Streak, and click the (>) arrow button.

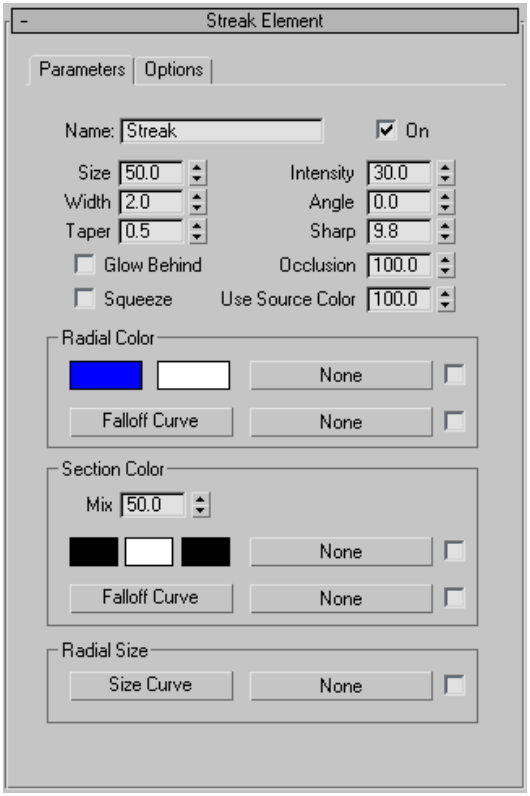


Adding a streak to the light

A streak is a wide band that runs through the center of the source object. In real camera work, it is produced when using anamorphic lenses to film a scene.

Interface

Streak Element rollout, Parameters panel



Name—Displays the name of the effect. With Lens Effects, you can have many different effects under one instance of Lens Effects. To keep them in order, it is necessary to name them to make sure that when you change parameters you are changing the parameters to the correct effect.

On—Applies the effect to the rendered image when activated.

Size—Determines the size of the effect.

Intensity—Controls the overall brightness and opacity of the individual effect. Higher values produce a bright, more opaque effect, and lower values produces a dim, transparent effect.

Width—Specifies the width of the streak, as a percentage of the frame.

Angle—Specifies the angle for the streak. You can enter both positive and negative values so, when animated, the streak rotates in a clockwise or counterclockwise direction.

Taper—Controls the taper of the individual spokes of the streak. Taper widens or narrows the tips of the individual streak points. Low numbers create a sharp point, while high numbers flare the points.

Sharp—Specifies the overall sharpness of the streak. Higher numbers produce crisp, clean, and clear streaks. Lower numbers produce more of a secondary glow look. Range=0 to 10.

Glow Behind—Gives the effect the ability to be displayed behind objects in your 3ds Max scene.

Occlusion—Determines how much the Lens Effects Scene Occlusion parameters will affect the particular effect. The value entered determines what percentage of occlusion set in the Lens Effects Globals panel will be applied.

Squeeze—Determines whether the effect will be squeezed. When activated, the effect will be squeezed according to Lens Effects Globals under the Parameters panel in the Squeeze spinner.

Use Source Color—Mixes the source color of the light or object you are applying the effect to and the color or mapping set in the Radial Color or Circular Color parameters. A value of 0 uses only the values set in the Radial Color and Circular Color parameters while a value of 100 uses only the light or objects source color. Any value between 0 and 100 will render a mix between the source color and the effect's color parameters.

Radial Color group

Falloff Curve—Displays the *Radial Falloff dialog* *(page 3–253)* in which you can set weights for the colors used in Radial Color. By manipulating the

Falloff Curve you can make the effect use more of one color or map than the other. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Section Color group

Section Color determines the color of the effect by using three different color swatches that are matched to the three sections of the effect. A map can also be used to determine section color.

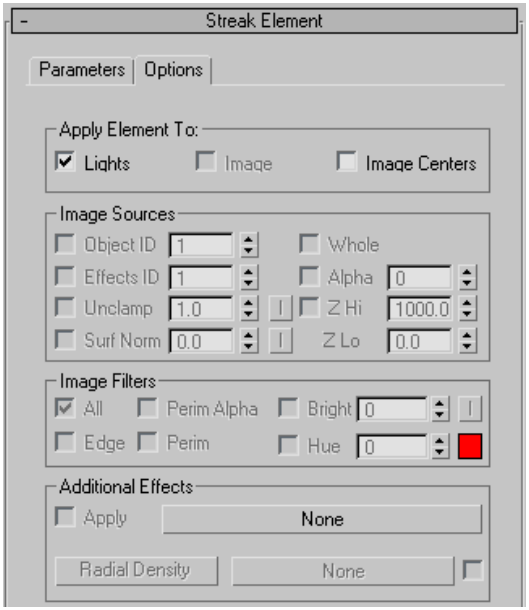
Mix—Mixes colors set in Radial Color and colors set in Section Color. Setting the spinner at 0 will only use values set in Radial Color while setting the spinner at 100 will only use values set in Section Color. Any value between 0 and 100 will mix between the two values.

Falloff Curve—Displays the *Circular Falloff dialog (page 3–250)* in which you can set weights for the colors used in Section Color. By manipulating the Falloff Curve you can make the effect use more of one color or map than another. You can also use a map to determine the falloff when a light is used as a Lens Effects source.

Radial Size group

Determines the radial size around the particular Lens Effect. Clicking the Size Curve button displays the *Radial Size dialog (page 3–255)*. Using the Radial Size dialog you can create points on a line and move those points along a graph to determine where the effect should be placed around the light or object. You can also use a map to determine where the effect should be placed. A check box is used to activate the map.

Streak Element rollout, Options panel



Apply Element To group

Lights—Applies the effect to lights picked in Lens Effects Globals under the Parameters tab in the Lights group box.

Image—Applies the effect to objects that have a corresponding Object ID channel.

Image Centers—Applies to the center of an object or to portions of an object as determined by the Image Filters.

Image Sources group

Object ID—Applies the Lens Effect to particular objects in your scene that have a corresponding *G-Buffer (page 3–1040)* (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls.

Effects ID—Applies the Lens Effect to an object or part of an object with a specific Effects ID assigned

to it. Effects ID's are applied in the materials editor by assigning the material one of the Material Effects channels that are available. The Lens Effect will only be applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different Lens Effects settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects entries to the Lens Effects Parameters list. Then set each different Lens Effect entry to affect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). The software keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that the Lens Effect is applied to. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Surf Norm—Applies the Lens Effect to part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner.

Whole—Applies the Lens Effect to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential Lens Effect source. The areas of the scene that have the Lens Effect applied to them are determined by the settings in the Image Filters group box.

Alpha—Applies the Lens Effect to the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Range=0 to 255.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted.

Image Filters group

Filters the Image Sources selections to let you control how the Lens Effect is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the Image Source as the Object ID of the spheres, which selects all of the spheres, these will be the only objects in the scene that Lens Effects will apply an effect to.

However, now that Lens Effects knows where the pixels are that effects *can* be applied, it needs to know which ones to actually apply the effect to. Lens Effects uses the filter controls to find out which source pixels to apply the effect to.

All—Selects all source pixels in the scene and applies the Lens Effect to them.

Edge—Selects all source pixels along a boundary edge and applies the Lens Effect to them. Applying a Lens Effect along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perim(eter) Alpha—Applies the Lens Effect only to the perimeter of an object based on its alpha channel. Selecting this option applies the effect only on the outside of an object without any spill on the interior. Whereas filtering by Edge produces a spill onto the object, Perimeter Alpha keeps all of the edges clean because it relies on the scene alpha channel to derive its effect.

Perim(eter)—Applies the Lens Effect only to the perimeter of an object based on Edge interference. Although not as precise as Perimeter Alpha, you

might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. The effect is only applied to objects with a brightness above the spinner setting This option can be inverted by clicking the **I** button next to the spinner

Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color

Additional Effects group

Additional Effects allows you to apply maps such as Noise to your Lens Effect. You can display the Material/Map browser by clicking the long button next to the Apply check box.

Apply—Applies the selected map when activated.

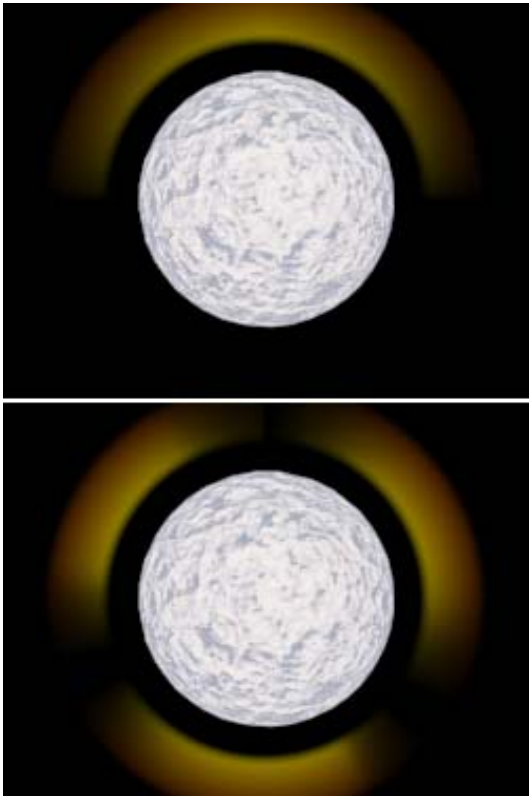
Radial Density—Determines where and how much you would like the additional effects applied. Clicking the Radial Density button displays the *Radial Density dialog (page 3–252)*. Using the Radial Density dialog you can create points on a line and move those points along a graph to determine where the additional effect should be placed around the light. You can also use a map to determine where the additional effect should be placed.

Lens Effects Dialogs

Circular Falloff Graph (Lens Effects)

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose any effect, and click the (>) arrow button. > Parameters tab of the rollout for that effect > Falloff Curve (under the Circular or Section Color group)

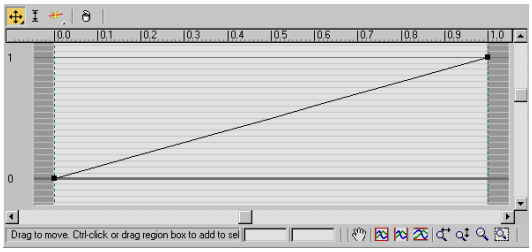
The Circular Falloff graph allows you to add weight to a particular color applied to your Lens Effect. By weighting the colors that you apply you can choose to display more of one color than another. You can also make the transition of colors gradual from one color to the next or you can create a sharp edge to the transition.



Rings with different Circular Falloff settings

The Circular Falloff graph has controls at the top for creating and moving points on a curve on the graph below. The curve represents the range of colors you have selected in the Circular Color group box to apply to the current Lens Effect. When you open the graph you will notice that there is already a line with a point on each end which represents the linear transition from one color to the next. By placing points along the curve, you can drag these points to increase or decrease a colors intensity or to eliminate it altogether.

Buttons are available at the bottom of the graph that allow you to change the display of the graph. You can also manually enter a horizontal or vertical position by entering a value into the two entry boxes.



Interface

Move—Moves selected points in any direction. Click and hold the Move button to display the flyout where you can select a button to move in any direction, move only in the horizontal direction, or move only in the vertical direction. The Move function remains active until you click another button. The button is yellow while it is active.

Scale Point—Scales a point vertically. Click once to enable Scale Point. The Scale Point function remains active until you click another button. The button is yellow while it is active.

Add Point—Allows you to add points anywhere along the Circular Falloff curve. Click and hold the Add Point button to display the flyout from which you can choose a button to add either a Corner Point or a Bezier-Smooth Point. Click once to enable Add Point. The Add Point function remains active until you click another button. The button is yellow while it is active.

Delete Point—Deletes selected points.

Horizontal Position—Allows you to manually enter a horizontal position value for a selected point.

Vertical Position—Allows you to manually enter a vertical position value for a selected point.

Pan—Allows you to click and drag the Circular Falloff graph window to move it left and right or up and down. Click once to enable panning. Pan remains active until you click another button. The button is yellow while it is active.

Zoom Extents—Fits the curve within the graph window both vertically and horizontally so that the entire curve is visible.

Zoom Horizontal Extents—Fits the curve horizontally within the graph window so that the full length of the curve is visible.

Zoom Vertical Extents—Fits the curve vertically within the Circular Falloff graph window so that the full height of the curve is visible.

Zoom Horizontally—Scales the width of the Circular Falloff graph window.

Zoom Vertically—Scales the length of the Circular Falloff graph window.

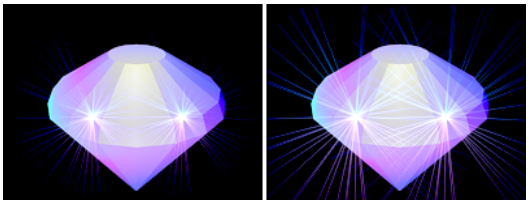
Zoom—Zooms in and out of the entire Circular Falloff graph window.

Zoom Region—Allows you to drag a region in the Circular Falloff graph window and scale that region to fill the window.

Radial Density Dialog (Lens Effects)

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose any effect, and click the (>) arrow button. > Options tab of the rollout for that effect > Radial Density (under the Additional Effects group)

The Radial Density dialog allows you to add weight to any additional effect applied to the Lens Effect. By weighting the density of the additional effect that you apply you can choose particular areas in the effect to display more of the additional effect or to eliminate it altogether. You can also use Radial Density to gradually fade the additional effect from maximum density down to zero or you can create a sharp edge to the transition.



Object with different Ray effects due to different Radial Density settings

The Radial Density dialog has controls at the top for creating and moving Points on a curve on the graph below. The curve represents the density of the additional effect being applied to the Lens Effect. When you open the dialog you will notice that there is already a line with a Point on each end which represents the density of the effect. The default falloff is a fade from a density value of **1** starting from the center of the effect toward the outer edges which has a value of **0**. This produces an effect with more density being rendered at the center of the effect and a gradual fading out to no density at the edges. By placing Points along the curve, you can drag these points to increase or decrease the density of an additional effect or eliminate it in some areas altogether.

Buttons are available at the bottom of the dialog that allow you to change the display of the dialog. You can also manually enter a horizontal or vertical position by entering a value into the two entry boxes.

Interface

Move—Moves selected points in any direction. Click and hold the Move button to display the flyout where you can select a button to move in any

direction, move only in the horizontal direction, or move only in the vertical direction. The Move function remains active until you click another button. The button is yellow while it is active.

Scale Point—Vertically scales a point up or down. Click once to enable Scale Point. The Scale Point function remains active until you click another button. The button is yellow while it is active.

Add Point—Allows you to add points anywhere along the Radial Density curve. Click and hold the Add Point button to display the flyout where you can select a button to add either a Corner Point or a Bezier Point. Click once to enable Add Point. The Add Point function remains active until you click another button. The button is yellow while it is active.

Delete Point—Deletes selected points.

Horizontal Position—Allows you to manually enter a horizontal position value for a selected point.

Vertical Position—Allows you to manually enter a vertical position value for a selected point.

Pan—Allows you to click and drag the Radial Density dialog window to move it left and right or up and down. Click once to enable panning. Pan remains active until you click another button. The button is yellow while it is active.

Zoom Extents—Fits the curve within the dialog window both vertically and horizontally so that the entire curve is visible.

Zoom Horizontal Extents—Fits the curve horizontally within the dialog window so that the full length of the curve is visible.

Zoom Vertical Extents—Fits the curve vertically within the Radial Density dialog window so that the full height of the curve is visible.

Zoom Horizontally—Scales the width of the Radial Density dialog window.

Zoom Vertically—Scales the length of the Radial Density dialog window.

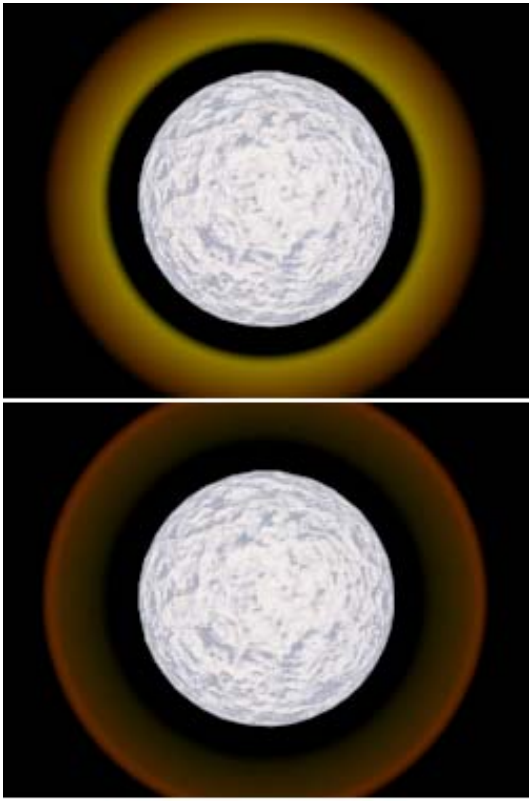
Zoom—Zooms in and out of the entire Radial Density dialog window.

Zoom Region—Allows you to drag a region in the Radial Density dialog window and scale that region to fill the window.

Radial Falloff Dialog (Lens Effects)

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose any effect, and click the (>) arrow button. > Parameters tab of the rollout for that effect > Falloff Curve (under the Radial Color group)

The Radial Falloff dialog allows you to add weight to a particular color applied to your Lens Effect. By weighting the colors that you apply you can choose to display more of one color than another. You can also make the transition of colors gradual from one color to the next or you can create a sharp edge to the transition.

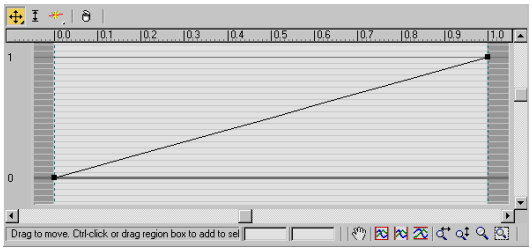


Rings with different Radial Falloff settings

The Radial Falloff graph has controls at the top for creating and moving Points on a curve on the graph below. The curve represents the range of colors you have selected in the Radial Color group box to apply to the current Lens Effect. When you open the dialog you will notice that there is already a line with a Point on each end which represents the linear transition from one color to the next. The default falloff is a fade from one color at a value of one to the other color which ends at a value of zero. This produces an effect with more intensity on the first color and a considerable fading out of the second color. By placing Points along the curve, you can drag these points to increase or decrease a colors intensity or to eliminate it altogether.

Buttons are available at the bottom of the dialog that allow you to change the display of the dialog.

You can also manually enter a horizontal or vertical position by entering a value into the two entry boxes.



Interface

Move—Moves selected points in any direction. Click and hold the Move button to display the flyout where you can select a button to move in any direction, move only in the horizontal direction, or move only in the vertical direction. The Move function remains active until you click another button. The button is yellow while it is active.

Scale Point—Vertically scales a point up or down. Click once to enable Scale Point. The Scale Point function remains active until you click another button. The button is yellow while it is active.

Add Point—Allows you to add points anywhere along the Circular Falloff curve. Click and hold the Add Point button to display the flyout where you can select a button to add either a Corner Point or a Bezier Point. Click once to enable Add Point. The Add Point function remains active until you click another button. The button is yellow while it is active.

Delete Point—Deletes selected points.

Horizontal Position—Allows you to manually enter a horizontal position value for a selected point.

Vertical Position—Allows you to manually enter a vertical position value for a selected point.

Pan—Allows you to click and drag the Radial Falloff graph to move it left and right or up and down. Click once to enable panning. Pan remains

active until you click another button. The button is yellow while it is active.

Zoom Extents—Fits the curve within the dialog window both vertically and horizontally so that the entire curve is visible.

Zoom Horizontal Extents—Fits the curve horizontally within the dialog window so that the full length of the curve is visible.

Zoom Vertical Extents—Fits the curve vertically within the Radial Falloff graph so that the full height of the curve is visible.

Zoom Horizontally—Scales the width of the Radial Falloff graph.

Zoom Vertically—Scales the length of the Radial Falloff graph.

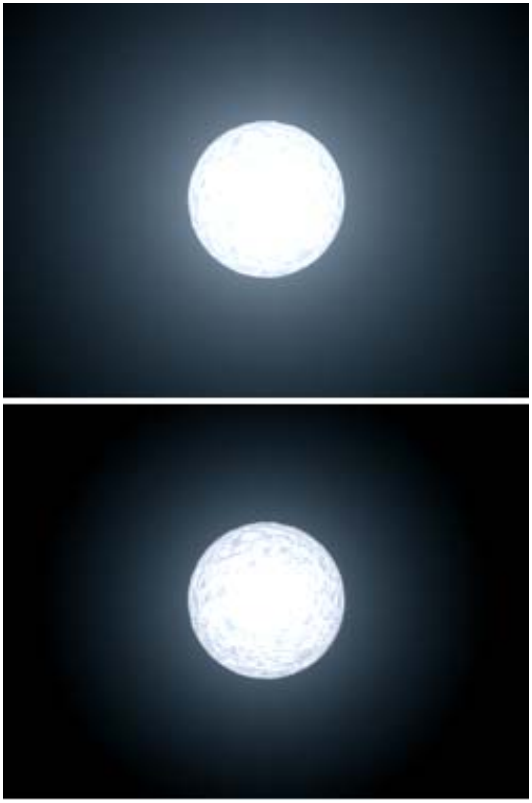
Zoom—Zooms in and out of the entire Radial Falloff graph.

Zoom Region—Allows you to drag a region in the Radial Falloff graph and scale that region to fill the window.

Radial Size Dialog (Lens Effects)

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Lens Effects > Choose any effect, and click the (>) arrow button. > Parameters tab of the rollout for that effect > Falloff Curve (under the Radial Size group)

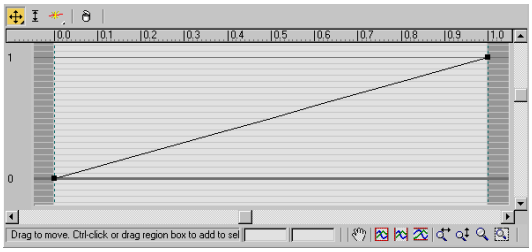
The Radial Size dialog gives you the ability to determine the size of your Lens Effect. The Radial Size dialog displays a curve with a point on each end which represents the Radial Size of your Lens Effect. The default position of the curve is one which means the Lens Effect will have the same radius around the center of the effect.



Objects with different Radial Sizes settings applied to Glow

By adding and moving points along the curve you can make areas of the effect extend further by moving a point above a value of one on the graph. You can also diminish areas of the effect by moving a point between one and zero on the graph. Finally, you can eliminate areas of the effect by moving a point below zero on the graph.

Buttons are available at the bottom of the dialog that allow you to change the display of the dialog. You can also manually enter a horizontal or vertical position by entering a value in the two entry boxes.



Interface

Move—Moves selected points in any direction. Click and hold the Move button to display the flyout where you can select a button to move in any direction, move only in the horizontal direction, or move only in the vertical direction. The Move function remains active until you click another button. The button is yellow while it is active.

Scale Point—Vertically scales a point up or down. Click once to enable Scale Point. The Scale Point function remains active until you click another button. The button is yellow while it is active.

Add Point—Allows you to add points anywhere along the Radial Size curve. Click and hold the Add Point button to display the flyout where you can select a button to add either a Corner Point or a Bezier Point. Click once to enable Add Point. The Add Point function remains active until you click another button. The button is yellow while it is active.

Delete Point—Deletes selected points.

Horizontal Position—Allows you to manually enter a horizontal position value for a selected point.

Vertical Position—Allows you to manually enter a vertical position value for a selected point.

Pan—Allows you to click and drag the Radial Size graph to move it left and right or up and down. Click once to enable panning. Pan remains active until you click another button. The button is yellow while it is active.

Zoom Extents—Fits the curve within the dialog window both vertically and horizontally so that the entire curve is visible.

Zoom Horizontal Extents—Fits the curve horizontally within the dialog window so that the full length of the curve is visible.

Zoom Vertical Extents—Fits the curve vertically within the Radial Size graph so that the full height of the curve is visible.

Zoom Horizontally—Scales the width of the Radial Size graph.

Zoom Vertically—Scales the length of the Radial Size graph.

Zoom—Zooms in and out of the entire Radial Size graph.

Zoom Region—Allows you to drag a region in the Radial Size graph and scale that region to fill the window.

Blur Rendering Effect

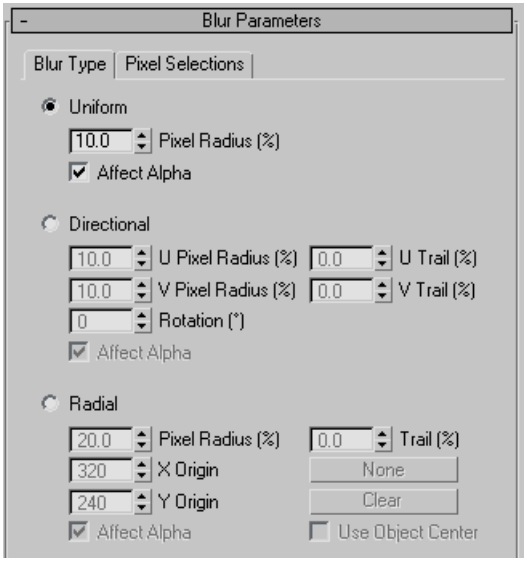
Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Blur

The Blur effect allows you to blur your image in three different methods: Uniform, Directional, and Radial. Blur works on individual pixels according to selections made in the Pixel Selections panel. You can blur an entire image, non-background scene elements, by luminance value, or by using a map mask. Blur can give your animation added realism by rendering the illusion of object or camera movement.

Object before and after adding midrange Blur effect.

Interface

Blur Parameters rollout, Blur Type panel



Uniform—Applies the Blur effect evenly across the entire rendered image.

Pixel Radius—Determines the intensity of the Blur effect. Increasing the value increases the number of surrounding pixels that each pixel will use to compute its blur. The more pixels used means a greater blur for the image.

Affect Alpha—Applies the Uniform Blur effect to the alpha channel when turned on.

Directional—Applies the Blur effect in any direction according to the Directional parameters. The U Pixel Radius and Trail blur the pixels horizontally while the V Pixel Radius and Trail blur the pixels vertically. Rotation is used to rotate the axis of the horizontal and vertical blurring.

U Pixel Radius—Determines the horizontal intensity of the Blur effect. Increasing the value increases the number of surrounding pixels that each pixel will use to compute its blur. The more pixels used means a greater horizontal blur for the image.

U Trail—Adds "direction" to your blur by weighting more blur to either side of the U axis. This adds a streaking effect and creates the illusion that your objects or your camera are rapidly moving in a particular direction.

V Pixel Radius—Determines the vertical intensity of the Blur effect. Increasing the value increases the number of surrounding pixels that each pixel will use to compute its blur, and creates a greater vertical blur for the image.

V Trail—Adds "direction" to your blur by weighting more blur to either side of the V axis. This adds a streaking effect and creates the illusion that your objects or your camera are rapidly moving in a particular direction.

Rotation—Rotates the axis of the U and V pixels that will be blurred by the U and V Pixel Radius spinners. By using Rotation with the U and V Pixel Radius spinners you can have the Blur effect applied to any direction in your rendered image. When rotation is **0**, U corresponds to the image's X axis and V corresponds to the image's Y axis.

Affect Alpha—Applies the Directional Blur effect to the Alpha channel when turned on.

Radial—Applies the Blur effect radially. Using the Radial parameters you can define a point within your rendered image to use as the center of the Radial Blur. You can use an object as the

center or an arbitrary location set by the X and Y Origin spinners. The Blur effect will apply the least amount of blur to the center origin of the effect and gradually increase the blur to the pixels further away from the center. This can be used to simulate motion blur caused by camera zoom.

Pixel Radius—Determines the intensity of the Radius Blur effect. Increasing the value increases the number of surrounding pixels that each pixel will use to compute its blur. The more pixels used means a greater blur for the image.

Trail—Adds "direction" to your blur by weighting more or less blur toward the center of the Blur effect. This adds a streaking effect and creates the illusion that your objects or your camera are rapidly moving in a particular direction.

X/Y Origin—Specifies the center of the blur, in pixels, with respect to the dimensions of the rendered output.

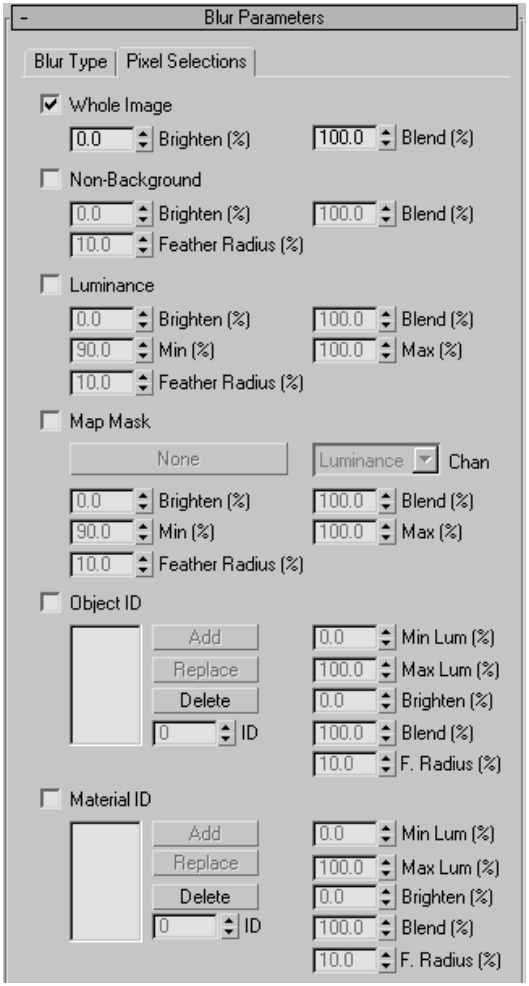
None—Lets you specify an object whose center serves as the center of the blur effect. Click this, select an object, and then turn on Use Object Center. The object name appears on the button.

Clear—Removes the object name from the button above.

Use Object Center—When on, the object specified by the None button (tooltip: Pick an object to center on.) serves as the center of the blur effect. If no object is specified and Use Object Center is on, no blur is added to the rendered image.

Affect Alpha—Applies the Radial Blur effect to the Alpha channel when turned on.

Blur Parameters rollout, Pixel Selections panel



Whole Image—Affects the entire rendered image when chosen. This is useful when the Blur effect dims your rendered image. By using Brighten and Blend you can maintain the original colors of the scene.

Brighten—Brightens the entire image.

Blend—Blends the Blur effect and the Whole Image parameters with the original rendered image. This can be used to create a soft-focus effect.

Non-Background—Affects everything but the background image or animation when chosen. This is useful when the Blur effect has dimmed your scene objects but not the background. By Using Brighten, Blend, and Feather Radius, you can maintain the original colors of the scene.

Brighten—Brightens the rendered image except for the background image or animation.

Blend—Blends the Blur effect and the Non-Background parameters with the original rendered image.

Feather Radius—Feathers the Blur effect applied to the Non-Background elements of your scene. When using Non-Background as a Pixel Selection you will notice that the scene objects have a hard edge to their blur since the objects are being blurred but the background is not. Use the spinner to feather the blur and eliminate the hard edge of the effect.

Luminance—Affects any pixels that have luminance values that fall between it's Min and Max spinners.

Brighten—Brightens pixels that fall between the Minimum and Maximum luminance values.

Blend—Blends the Blur effect and the Luminance parameters with the original rendered image.

Min—Sets the minimum luminance value necessary for each pixel in order for the Blur effect to be applied to the pixel.

Max—Sets the maximum luminance value a pixel can have in order for the Blur effect to be applied to the pixel.

Feather Radius—Feathers the Blur effect applied to pixels that fall between the Minimum and Maximum luminance values. When using Luminance as a Pixel Selection the Blur effect can create a hard edge on the effect. Use the spinner to feather the blur and eliminate the hard edge of the effect.

Map Mask—Applies the Blur effect according to the channel selected and mask applied through the Material/Map Browser. After selecting a mask you must select a channel from the Channel list. Blur then examines the mask and channel according to the values set in the Minimum and Maximum spinners. Any pixels in the mask that are of the selected channel and between the Min and Max values will have the Blur effect applied. This is useful for blurring selected portions of a scene such as a winter morning as seen through a frost covered window.

Channel—Selects a channel that the Blur effect will be applied to. After selecting a particular channel, use the minimum and maximum spinners to determine the value a mask pixel must have in order to have the effect applied to it.

Brighten—Brightens the portions of the image that the Blur effect is applied to.

Blend—Blends the Map Mask Blur effect with the original rendered image.

Min—The minimum value (RGB, Alpha, or Luminance) a pixel must have in order to have the Blur effect applied to it.

Max—The maximum value (RGB, Alpha, or Luminance) a pixel can have for the Blur effect to be applied to it.

Feather Radius—Feathers the Blur effect applied to pixels that fall between the Minimum and Maximum channel values. When using map mask as a Pixel Selection, the Blur effect can create a hard edge on the effect. Use the spinner to feather the blur and eliminate the hard edge of the effect.

Object ID—Applies the Blur effect to an object or part of an object with a specific Object ID (in the *G-Buffer (page 3–1040)*), if the object matches the Filter settings. To add or replace an Object ID, use the spinners or enter a value in the ID text box and press the appropriate button.

Min Lum—The minimum luminance value a pixel must have in order to have the Blur effect applied to it.

Max Lum—The maximum luminance value a pixel can have for the Blur effect to be applied to it.

Brighten—Brightens the portion of the image that the Blur effect is applied to.

Blend—Blends the Object ID Blur effect with the original rendered image.

F. Radius—Feathers the Blur effect applied to pixels that fall between the Minimum and Maximum luminance values. When using Luminance as a Pixel Selection, the Blur effect can create a hard edge on the effect. Use the spinner to feather the blur and eliminate the hard edge of the effect.

Material—Applies the Blur effect to a material or part of a material with a specific *Material Effects Channel (page 2–1287)*, if the material matches the Filter settings. To add or replace a Material Effects channel, use the spinners or enter a value in the ID text box and press the appropriate button.

Min Lum—The minimum luminance value a pixel must have in order to have the Blur effect applied to it.

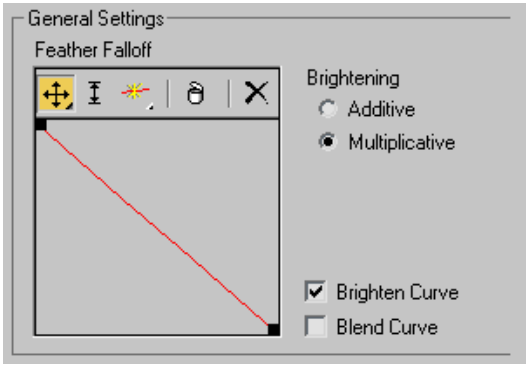
Max Lum—The maximum luminance value a pixel can have for the Blur effect to be applied to it.

Brighten—Brightens the portion of the image that the Blur effect is applied to.

Blend—Blends the Material Blur effect with the original rendered image.

F. Radius—Feathers the Blur effect applied to pixels that fall between the Minimum and Maximum luminance values. When using Luminance as a Pixel Selection, the Blur effect can create a hard edge on the effect. Use the spinner to feather the blur and eliminate the hard edge of the effect.

General Settings group



Feather Falloff control curve

The Feather falloff curve allows you to determine the feather falloff off the Blur effect based on a graph. You can add points to the graph to create a falloff curve, and adjust the interpolation in those points.

Move—Lets you move the points on the graph. This button is a flyout, providing free movement (the default), horizontal, and vertical movement.

Scale Point—Lets you scale the points on the graph. This also moves the points, but in relationship to each other. Click the points you want to scale, or draw a selection rectangle around them to select them. Then turn on Scale Point, and press any point in the selection to scale them all.

Add Point—Lets you create additional points on the falloff curve. This button is a flyout, providing linear points (the default) and Bezier points with handle.

Delete Point—Removes points from the graph.

Brightening—These radio buttons let you select additive or multiplicative brightening. Additive brightening is brighter and more distinct than multiplicative brightening. Additive brightening is useful when you use blur in combination with a *Glow effect (page 3–222)*. Multiplicative

brightening provides a soft highlight to the Blur effect.

Brighten Curve—Lets you edit the brightening curve in the Feather Falloff curve graph.

Blend Curve—Lets you edit the blend curve in the Feather Falloff curve graph.

Brightness and Contrast Rendering Effect

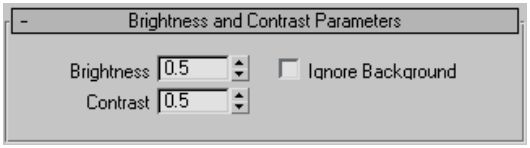
Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Brightness and Contrast

Above: Original rendering is too dark.

Below: Increasing both brightness and contrast improves clarity of the rendering.

Brightness and Contrast allows you to adjust the contrast and brightness of an image. This can be used to match rendered scene objects with background images or animations.

Interface



The Brightness and Contrast Parameters rollout contains the following parameters.

Brightness—Increases or decreases all color components (red, green, and blue). Range=0 to 1.0.

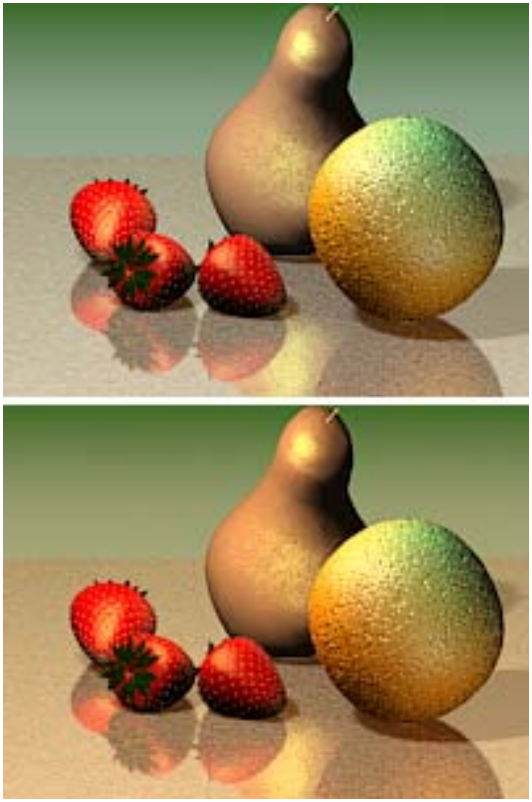
Contrast—Compresses or expands the latitude between maximum black and maximum white. Range=0 to 1.0.

Ignore Background—Applies the effect to everything in your 3ds Max scene except the background.

Color Balance Rendering Effect

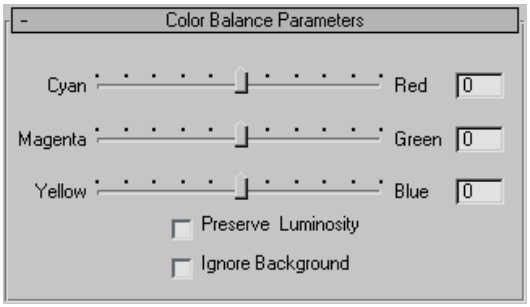
Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Color Balance

The Color Balance Effect allows you to manipulate additive/subtractive color tinting through independent control of RGB channels.



Above: Color balance effect used to correct the color cast.
Below: Original rendering has a yellow cast.

Interface



The Color Balance Parameters rollout contains the following parameters:

Cyan/Red—Adjusts the red channel.

Magenta/Green—Adjusts the green channel.

Yellow/Blue—Adjusts the blue channel.

Preserve Luminosity—When on, retains the luminosity of the image while correcting the color.

Ignore Background—When on, allows you to image correct a model without affecting the background.

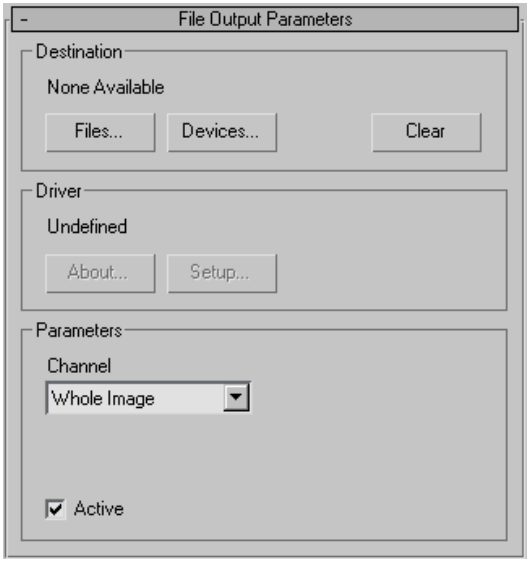
File Output Rendering Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > File Output

File Output allows you to take a "snapshot" of a rendering before some or all of the other Render Effects are applied, depending on the placement of File Output in the Render Effects stack. You can save different channels such as Luminance, Depth, or Alpha to a separate file while rendering an animation.

You can also use File Output to convert an RGB image into a different channel and send that image channel back into the Render Effects stack. The rest of the effects can then be applied to that channel.

Interface



Destination group

Files—Opens a dialog so you can save the rendered image or animation to disk.

The rendered output can be a still image or an animation, in one of the following file formats:

Autodesk Flic Image File (page 3–662) (FLC, FLI, CEL)

AVI File (page 3–658) (AVI)

BMP Image file (page 3–1011) (BMP)

Encapsulated PostScript (page 3–661) format (EPS, PS)

JPEG File (page 3–670) (JPG)

Kodak Cineon (page 3–659) (CIN)

MOV QuickTime file (page 3–670) (MOV)

PNG Image File (page 3–678) (PNG)

RLA Image File (page 3–680) (RLA)

RPF Image File (page 3–681) (RPF)

SGI's Image File Format (page 3–683) (RGB)

Targa Image File (page 3–683) (TGA, VDA, ICB, UST)

TIF Image File (page 3–684) (TIF)

Devices—Opens a dialog so you can send the rendered output to a device such as a video recorder.

Clear—Clears any file or device selected in the Destination group box.

Driver group

These buttons are available only when you choose a device as the image source.

About—Provides information on the source of the image-handler software used to bring the image into the software.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Parameters group

Channel—Lets you choose which channel you wish to save or send back in to the Render Effects stack. Choose Whole Image, Luminance, Depth, or Alpha to display more options in the Parameters group box.

Affect Source Bitmap—When activated, this will take in an image with any effects previously applied, convert it to the channel selected, and send it back into the stack for the rest of the effects to be applied. Your rendered image will be saved in the channel selected. This parameter is not available to the Whole Image channel.

Active—Turns the File Output feature on and off. Unlike the Active check box available in the Render Effects rollout, this check box is animatable allowing you to save only desired portions of a rendered scene.

Depth Parameters

When Depth is selected as a channel, new parameters are available for determining what parts of the scene should be rendered into the Depth channel image.

Copy—After choosing a camera with the None button, click Copy to use the camera's clipping planes to determine which part of the scene should be rendered into the Depth channel image file.

None—Enables you to select a camera to use for copying clipping planes. Click the none button to activate it. The None button will turn green until a camera has been selected in the viewport. The camera's name will then be displayed on the button instead of None.

Near Z—Specifies the beginning distance from the camera that should be used in determining where to start rendering the scene's geometry in the depth channel image file.

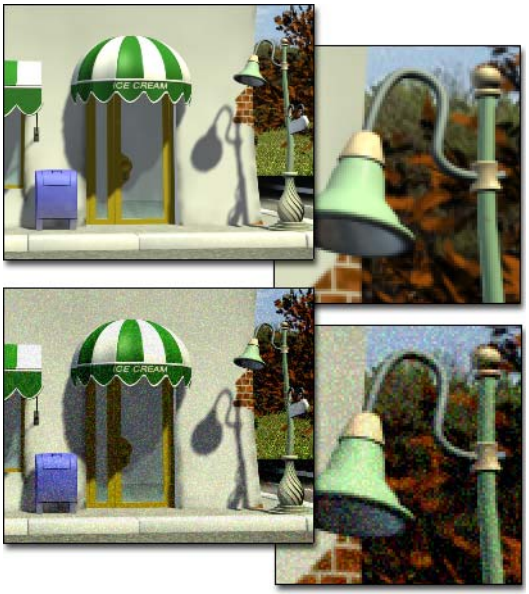
Far Z—Specifies the ending distance from the camera that should be used in determining where to stop rendering the scene's geometry in the depth channel image file.

Fit Entire Scene—Makes all other Depth parameters unavailable and will render the entire viewport's scene geometry in the Depth channel image file, automatically calculating the near and far Z required.

Film Grain Rendering Effect

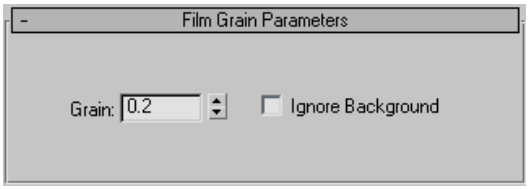
Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Film Grain

Film Grain is used to recreate the look of film grain in your rendered scene. Film Grain also allows you to match film grain from source material used as a background, such as an AVI, to the rendered scene created in the software. When applied, Film Grain automatically randomizes to create the look of moving frames.



Before and after applying Film Grain to a scene

Interface



The Film Grain Parameters rollout contains the following controls.

Grain—Sets the amount of grain added to your image. Range=0 to 1.0.

Ignore Background—Masks the background so that grain is applied only to geometry and effects in the scene. Choose this option when you use film (which already contains grain) as the background image.

Motion Blur Rendering Effect

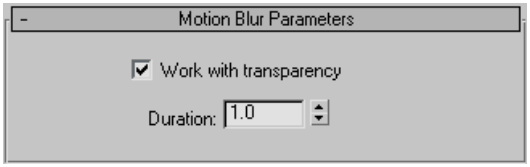
Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Motion Blur

Motion blur enhances the movement of the sword.

Motion Blur applies an *image motion blur (page 3–1049)* to your rendered scene by blurring moving objects or the entire scene. Motion blur can enhance the realism of a rendered animation by simulating the way a real-world camera works. A camera has a shutter speed, and if significant movement of objects in the scene, or of the camera itself, occurs during the time the shutter is open, the image on film is blurred.

Note: In addition, you must set motion-blur characteristics for objects to be blurred using the *Object Properties dialog (page 1–117)*.

Interface



The Motion Blur Parameters rollout contains the following controls.

Work with transparency—When on, motion blur is applied to objects behind transparent objects. When off, objects behind transparent objects receive no motion blur. Turning off this toggle can improve rendering speed. Default=on.

Duration—Specifies how long the "virtual shutter" is open. When this is set to 1.0, the virtual shutter is open for the entire duration between one frame and the next. The higher the value, the greater the motion blur effect. Default=1.0.

Depth of Field Rendering Effect

Rendering menu > Effects > Environment and Effects dialog > Effects panel > Add > Add Effect dialog > Depth of Field

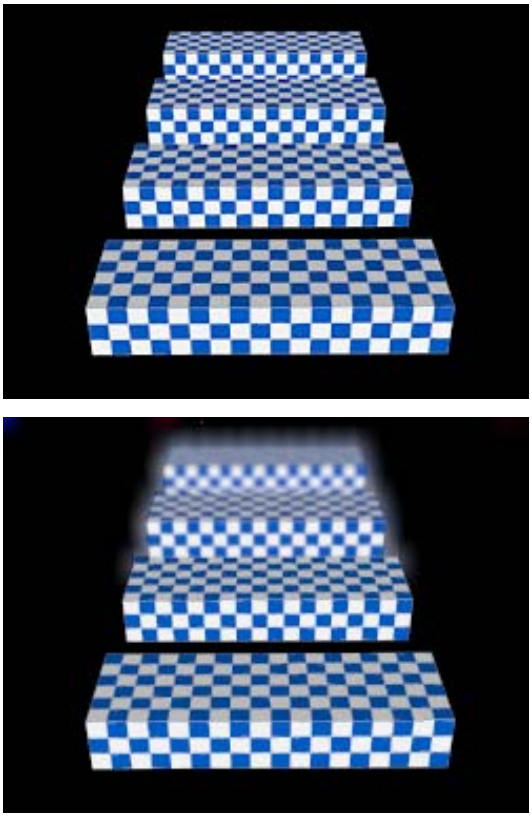
Depth of field emphasizes the scooter.

The Depth-of-Field effect simulates the natural blurring of foreground and background scene elements when viewed through a camera lens. Depth of Field works by separating the scene in Z order into foreground, background, and in-focus images. The foreground and background images are then blurred according to the values set in the Depth of Field effect parameters and the final image is composited from the processed originals.

Note: When additional Render Effects are being applied to an image or animation, the Depth-of-Field effect should be the last effect to

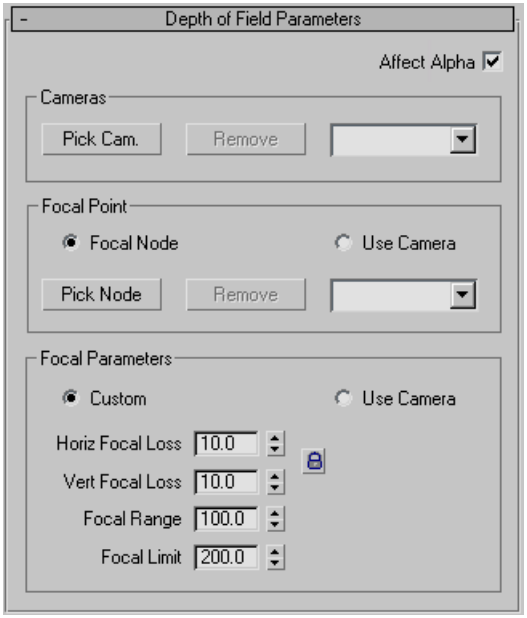
be rendered. The order of the rendered effects is listed in the Effects tab of the Environment and Effects dialog.

Tip: To minimize sampling artifacts in out-of-focus areas with the default scanline renderer, try using the Blend filter in the Antialiasing group of the *Render Scene dialog (page 3–2)* (on the Renderer panel).



Before and after applying Depth of Field effect to scene.

Interface



The Depth of Field Parameters rollout contains the following parameters.

Affect Alpha—Affects the alpha channel of the final rendering when on.

Cameras group

Pick Cam—Enables you to interactively select from the viewport which camera you want the Depth of Field effect applied to.

Remove—Deletes the camera currently selected in the drop-down list.

Camera Selection List—Lists all of the cameras to be used in the effect. You can use this list to highlight a specific camera and remove it from the list using the Remove button.

Focal Point group

Pick Node—Enables you to select an object to use as the focal node. When activated you can select an object directly from the viewports to use as the

focal node. You can also press **H** to display the *Select Objects dialog (page 1–78)* from which you can select objects to use as a focal node.

Remove—Removes the object selected as the Focal Node.

Use Camera—Specifies that the focal length from the camera selected in the Camera Selection list be used to determine the focal point.

Focal Parameters group

Custom—Uses the values set in the Focal Parameters group box to determine the properties of the Depth of Field effect.

Use Camera—Uses the values from the camera highlighted in the Camera Selection list to determine focal range, limit, and blur.

Horiz Focal Loss—Determines the amount of blur along the horizontal axis when Custom has been chosen.

Vert Focal Loss—Controls the amount of blur along the vertical axis when Custom has been chosen.

Focal Range—Sets the Z distance, in units, to either side of the focal point in which the image will remain in focus when Custom has been chosen.

Focal Limit—Sets the Z distance, in units, to either side of the focal point where blur will reach its maximum as specified by the Loss spinners when Custom has been chosen.

Environment and Environment Effects

Environment

Rendering menu > Environment > Environment and Effects dialog > Environment panel

Environment displays the *Environment panel (page 3–268)*, which is used for setting up atmospheric and background effects.

You can use the environment functions to:

- Set and animate the background color.
- Use an image in the background of the rendered scene (screen environment) or use texture maps as spherical, cylindrical, or shrink-wrap environments.
- Set and animate the *ambient light (page 3–1002)*.
- Use atmospheric plug-ins, such as volumetric light, in the scene.
- Apply exposure controls to renderings.

Atmospheres

Atmospheres are *plug-in (page 3–1089)* components that create lighting effects such as fog, fire, and so on.

Fire Environment Effect (page 3–272)

Fog Environment Effect (page 3–278)

Volume Fog Environment Effect (page 3–280)

Volume Light Environment Effect (page 3–284)

See *Environment dialog (page 3–268)* for all environment parameters.

Exposure Controls

One of the limitations of rendering perceptually accurate images is the limited dynamic range of computer monitors. Dynamic range is the ratio of the highest to lowest intensity a monitor can produce. In a dark room this ratio is approximately 100 to 1. In a bright room, this drops to approximately 30 to 1. Real environments can have dynamic ranges of 10,000 to 1, or larger.

Exposure Controls (page 3–289) map light energy values to colors. They affect the brightness and contrast of both rendered images and viewport displays. They don't affect the actual lighting levels in the scene, but only how those levels are mapped to a valid display range.

- *Automatic Exposure Control (page 3–291)*
- *Logarithmic Exposure Control (page 3–293)*
- *Linear Exposure Control (page 3–292)*
- *Pseudo Color Exposure Control (page 3–296)*

Environment Panel

Rendering menu > Environment > Environment and Effects dialog > Environment panel

Use the Environment panel to:

- Set and animate the background color.
- Use an image in the background of the viewport and rendered scene (screen environment) or use texture maps as spherical, cylindrical, or shrink-wrap environments.
- Set and animate the tint and *ambient light (page 3–1002)* globally.
- Use atmospheric plug-ins, such as volumetric light, in the scene.

  Atmospheres are *plug-in components (page 3–1089)* that create light effects such as *fire (page 3–272)*, *fog (page 3–278)*, *volume fog (page 3–280)*, and *volume light (page 3–284)*.
- Apply *exposure controls (page 3–289)* to renderings.

See also

Exposure Controls (page 3–289)

Procedures

To access environment functions, do one of the following:

- Choose Rendering > Environment.
- On the Environment and Effects dialog, click the Environment tab.

To set the background color:

1. Choose Rendering > Environment.

   The Environment panel appears.
2. In the Background group, click the color swatch.

   A *Color Selector (page 1–157)* appears.
3. Use the Color Selector to change the background color.

   The Renderer now uses this color as a background.

To choose an environment map:

1. Display the Material Editor.

   You adjust the map's parameters with the Material Editor.
2. Choose Rendering > Environment.
3. Under Background on the Environment panel, do one of the following:
   - Click the Environment Map button. The Material/Map Browser appears. Choose a map type from the list.
   - Drag a map to the Environment Map button. You can do this from a map displayed in one of the Material Editor's sample slots, or from any map button that has been assigned,

either in the Material Editor or from a projection light, and so on.

Drag a bitmap from the Material Editor's map preview to the Environment Map button.

On the Environment panel, the name of the Environment Map button changes to show the type of map you chose, and Use Map turns on.

After you have set up the map, you can later turn off Use Map to test rendering the scene without the mapped background.

You have set up the environment map, but to assign a bitmap or adjust map parameters, you need to use the Material Editor.

You can also create a standalone map in the Material Editor first, and then choose it with the Material/Map Browser.

To put the map in the Material Editor:

- Drag the Environment Map button to a sample slot.

  The map is now in the Material Editor where you can adjust it by changing its parameters.

To change the color and tint of global lighting:

1. Choose Rendering > Environment.
2. Click the color swatch labeled Tint.

   A *Color Selector (page 1–157)* appears.
3. Use the color selector to set the tint applied to all lighting except ambient light.
4. Use the Level spinner to multiply the overall lighting of the scene.

   Shaded viewports update to show global lighting changes.
5. Close the Environment dialog.

   3ds Max uses the global lighting parameters when you render the scene.

To change the color of ambient light:

Tip: You don't need to adjust ambient light if you are using *radiosity (page 3–50)*.

1. Choose Rendering > Environment.
2. Click the color swatch labeled Ambient.

   A *Color Selector (page 1–157)* appears.
3. Use the color selector to set the ambient color.

   Shaded viewports update to show ambient color changes.

   3ds Max also uses the new ambient color when you render the scene.

   The color of ambient light tints the scene. For most renderings, the color of ambient light should be black.
4. Close the Environment dialog.

To change the intensity of ambient light:

Tip: You don't need to adjust ambient light if you are using *radiosity (page 3–50)*.

1. Choose Rendering > Environment.
2. Click the color swatch labeled Ambient Light.

   A *Color Selector (page 1–157)* appears.
3. Change the Value setting (the V component of the ambient light's HSV description) to increase or decrease intensity.

   Shaded viewports update to show changes in the ambient light intensity.
4. Close the Color Selector.

   The intensity of ambient light affects contrast as well as overall illumination (the higher the intensity of ambient light, the lower the contrast). This is because ambient light is completely diffuse, so the angle of incidence is equal for all faces. Ambient light alone cannot show depth.

   Note: 3ds Max has a default ambient light setting. You can change the default by using

the Rendering panel of the Preference Settings dialog.

To add an atmospheric effect:

1. Choose Rendering > Environment.

   The Environment and Effects dialog is displayed, with the Environment panel visible.

2. Under Atmosphere on the Environment panel, click Add.

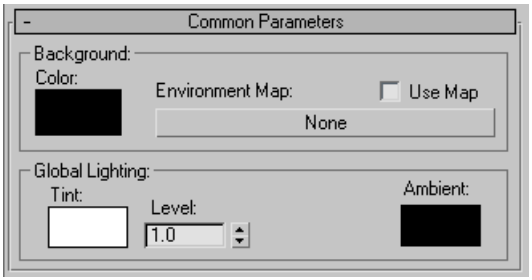
   The Add Atmospheric Effect dialog appears.

3. Choose the kind of effect you want to use, and then click OK.

   The effect has now been added. Use the Atmosphere rollout to adjust parameters.

Interface

Common Parameters rollout



Background group

Color—Sets the color for the scene background. Click the color swatch, then select the color you want in the Color Selector. You can animate the color effect by changing the background color at a nonzero frame with the Auto Key button on.

Environment Map—The button for *Environment Map (page 3–1028)* displays the name of the map, or "None" if none has been assigned. The map must use Environmental *mapping coordinates (page 3–1061)* (spherical, cylindrical, shrink wrap, and screen).

To assign an environment map, click the button and use the Material/Map Browser to choose a map, or drag a map from a sample slot or map button in the Material Editor (or anywhere else in the software; for example, a Projector Map button) and drop the map on the Environment Map button. A dialog asks if you want the environment map to be a copy (independent) or an instance of the source map.

Note: If your scene includes animated bitmaps, including materials, projector lights, environments, and so on, the animation file is reloaded once per frame. Rendering performance slows down when your scene uses multiple animations, or the animations are themselves large files.

To adjust the environment map's parameters, for example to assign a bitmap or change the coordinate settings, open the Material Editor, drag the Environment Map button, and drop it over an unused sample window.

Use Map—Uses a map for the background rather than the background color.

Global Lighting group

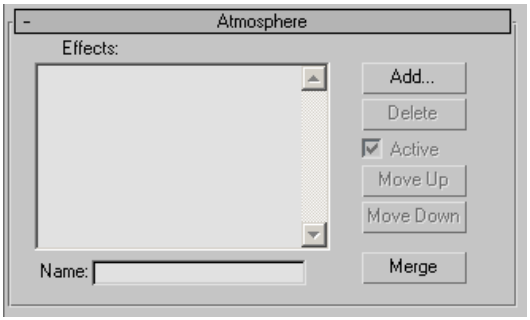
Tint—Tints all lights in the scene (except for ambient light) if this color is anything other than white. Click the color swatch to display the Color Selector, on which you can choose the tint color. You can animate the tint color by changing it at a nonzero frame with the Auto Key button on.

Level—Multiplies all lights in the scene. A Level of 1.0 preserves the original, individual light settings. Increasing the Level raises the lighting for the overall scene, and decreasing the Level lowers the overall lighting. This parameter is animatable. Default=1.0.

Ambient—Sets the color for the ambient light. Click the color swatch, and choose the color you want in the Color Selector. You can animate the

light effect by changing the ambient light color at a nonzero frame with the Auto Key button on.

Atmosphere rollout

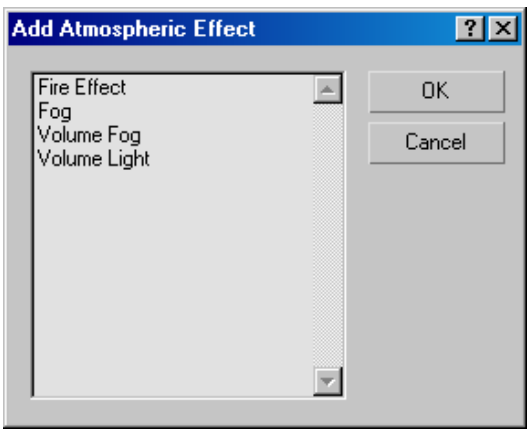


Effects—Shows the queue of effects that were added. The effects are evaluated in linear order within the scene during rendering. Depending on the selected effect, the Environment dialog adds the appropriate rollout for the effect's parameters.

Name—Gives a custom name to effects in the list.

For example, you might have different custom settings for different kinds of fire, that you could name Spark and Fireball.

Add—Displays the Add Atmospheric Effect dialog (all currently installed atmospheric effects). Select an effect and click OK to assign an effect to the list.



Delete—Deletes a selected atmospheric effect from the list.

Active—Sets the on/off state for the individual effects in the list. This is a convenient way to isolate effects within a list of complicated atmospheric functions.

Move Up / Move Down—Moves the selected item in the list up or down to change the order in which the atmospheric effects are applied.

Merge—Merges effects from other 3ds Max scene files.

When you click Merge, the Merge Atmospheric Effects dialog appears. Choose a 3ds Max scene, and then click Open. The Merge Atmospheric Effects dialog then lists the effects in the scene that can be merged. Select one or more of the effects, and then click OK to merge them into the scene.

The list shows the names of the atmospheric effects only, but when you merge an effect, the lights or gizmos bound to that effect are merged as well. If one of these objects you're merging has the same name as one already in the scene, an alert appears giving you the following choices:

- You can rename the incoming object by changing its name in the editable field.
- You can Merge the incoming object without renaming, resulting in two objects in the scene with the same name.
- You can delete the existing object in the scene by selecting the Delete Old button.
- You can select Apply To All Duplicates, which performs the same action to all subsequent matching objects.

  Note: To control whether or not the renderer uses the environment map's alpha channel in creating the alpha for the rendered image, choose Customize > Preferences > Rendering, and then turn on Use Environment Alpha in the Background Antialiasing group.

If Use Environment Alpha is turned off (the default) the background receives an alpha of 0 (completely transparent). If Use Environment Alpha is turned on, the alpha of the resulting image is a combination of the scene and background image's alpha. Also, when writing TGA files with Pre-Multiplied Alpha set to off, turning on Use Environment Alpha prevents incorrect results. Note that only background images with alpha channels or black backgrounds are supported when compositing in other programs such as Photoshop®.

Note: To control whether or not a background image is affected by the renderer's antialiasing filter, choose Customize > Preferences > Rendering and then turn on Filter Background in the Background Antialiasing group. Default=off.

Fire Environment Effect

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Atmosphere rollout > Add > Fire Effect

Scene using fire

Use Fire to produce animated fire, smoke, and explosion effects. Possible uses for Fire effects include campfires, torches, fireballs, clouds, and nebula.

Note: In earlier versions of 3ds Max, Fire was known as the "Combustion effect."

You can add any number of fire effects to a scene. The order of effects is important because effects near the bottom of the list are layered in front of effects near the top of the list.

Each effect has its own parameters. When you select a fire effect in the Effects list, its parameters appear in the Environment dialog.

Fire renders only in Camera or Perspective views. Orthographic or User views don't render Fire effects.

Tip: Fire doesn't support completely transparent objects. Set the transparency of Fire objects accordingly. Use visibility rather than transparency to make Fire objects disappear.

Note: The Fire effect does not cast any light or shadows in the scene. To simulate illumination, you must also create lights. To cast shadows, you need to go to the *Shadows Parameters rollout (page 2–1181)* of your lights, and turn on Atmosphere Shadows.

Procedures

To create fire effects:

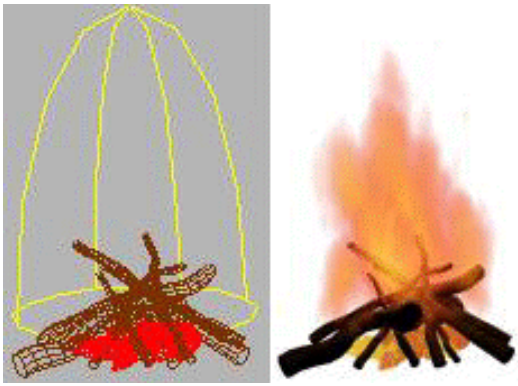
1. Create one or more atmospheric apparatus objects to locate the fire effect in your scene.
2. Define one or more fire atmospheric effects on the Environment panel.
3. Assign atmospheric apparatus objects to the fire effects.

Sample fire effects

Example: To create a campfire:

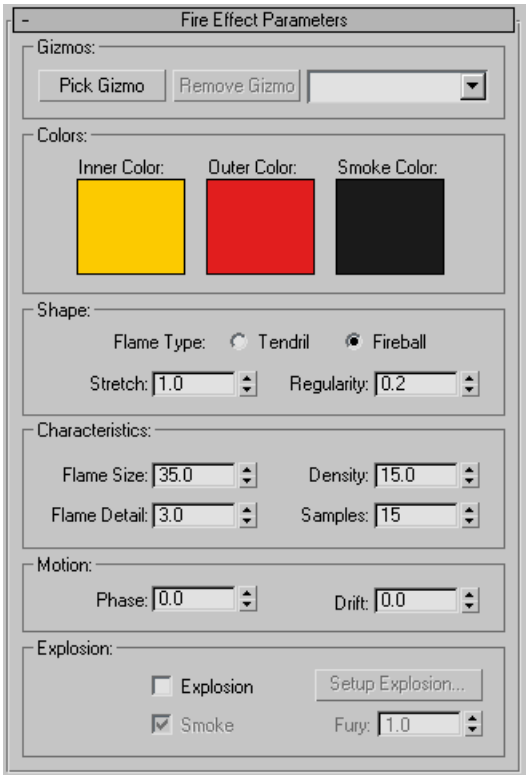
1. Click Helpers on the Create panel and choose *Atmospheric Apparatus (page 3–300)* from the subcategory list.
2. Click Sphere Gizmo. Drag the cursor in the Top viewport to define an apparatus radius of about 20 units. Turn on the Hemisphere check box in Sphere Gizmo Parameters.
3. Click Non-Uniform Scale. Click Yes in the Warning dialog (this warning doesn't apply to atmospheric gizmos), and scale the apparatus 250 percent along its local Z axis only. You can then model logs, embers, and rocks around the base of the apparatus.
4. Open the Modify panel of the Sphere Gizmo. On the Atmosphere rollout, click Add and choose Fire from the Add Atmosphere dialog.
5. Highlight Fire in the Atmospheres list under the Atmospheres & Effects rollout. Click Setup.
6. Set the following parameters under Shape and Characteristics:
   - Flame Type=**Tendril**
   - Stretch=**0.8**
   - Flame Size=**18.0**
   - Flame Density=**30.0**
7. Turn on Auto Key and advance to the end of the animation.
8. Set the following parameters under Motion:
   - Phase=**300.0**
   - Drift=**200.0**

The Fire effect doesn't cast any light in the scene. If you want to simulate illumination from the fire effect, you must create lights as well.



Example model with fire

Interface



You create a fire apparatus, or "gizmo," to position the effect in your scene and to define the maximum boundaries of the effect. The apparatus is a Helper object found in the Atmospheric Apparatus subcategory.

There are three kinds of apparatus: *BoxGizmo (page 3–300)*, *SphereGizmo (page 3–303)*, and *CylGizmo. (page 3–302)*.

You can move, rotate, and scale the apparatus, but you cannot apply modifiers.

Using non-uniform scale is a good way to change the shape of the apparatus for effects. (You will see a warning when you use this transform. Because you don't modify atmospheric apparatus, you can safely ignore the warning.)

Fire Parameters rollout

You must assign an atmospheric apparatus to a fire effect before you can render the effect. Use buttons in the Gizmos area to manage the list of apparatus objects.

Gizmos group

Gizmo for the fire in the scene shown at the beginning of this topic

Pick Gizmo—Click to enter Pick mode and click an atmospheric apparatus in the scene. The apparatus displays the fire effect when you render. The name of the apparatus is added to the apparatus list.

Multiple apparatus objects can display the same fire effect. For example, torches on a wall can all use the same effect. Assign a different seed to each apparatus to vary the effect.

You can assign single apparatus to multiple fire effects. For example, one apparatus can display both a fireball and a tendril flame effect.

You can choose multiple gizmos. Click Pick Gizmo and press **H**. This displays a Pick Object dialog on which you choose multiple objects from the list.

Remove Gizmo—Removes the gizmo selected in the gizmo list. The gizmo remains in your scene but it no longer displays the fire effect.

Gizmo List—Lists apparatus objects assigned to the fire effect.

Colors group

You can set three color properties for a fire effect using the color swatches under Colors. Click a color swatch to display the software's *Color Selector (page 1–157)*.

Inner Color—Sets the color of the densest part of the effect. For a typical fire, this color represents the hottest part of the flame.

Outer Color—Sets the color of the sparsest part of the effect. For a typical fire, this color represents the cooler, dissipating edge of the flame.

The fire effect is colored using a gradient between the inner and outer colors. The dense areas of the effect use the inner color and gradually blend to the outer color near the edges of the effect.

Smoke Color—Sets the color of smoke for use with the Explosion option.

If you turn on Explosion and Smoke, the inner and outer colors animate to the smoke color. If you turn off Explosion or Smoke, the smoke color is ignored.

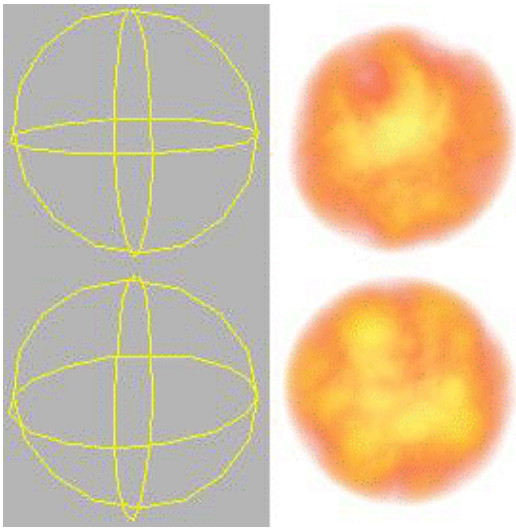
Shape group

You control the shape, scale, and pattern of flames within the fire effect using controls under Shape.

Two options set the direction and general shape of flames.

Tendril—Creates directional pointed flames with veins along their center. The flames orient along the local Z axis of the fire apparatus. Tendril creates campfire-like flames.

Fireball—Creates round puffy flames. Fireballs are well suited for explosions.



Comparing Tendril to Fireball

Above=Tendril, Below=Fireball

Stretch—Scales flames along the Z axis of the apparatus. Stretch works best with Tendril flames, but you can use it to give Fireballs an oval shape.

Values less than 1.0 compress flames, making them shorter and thicker.

Values greater than 1.0 stretch flames, making them long and skinny.

You can combine Stretch with non-uniform scaling of the apparatus. Use non-uniform scale to change the boundary of the effect and scale the shape of the flames.

Use the Stretch parameter to scale only the flames inside the apparatus. You can also use Stretch values to reverse the effect that scaling the apparatus had on the flames.

Effect of changing Stretch

Value=0.5, 1.0, 3.0

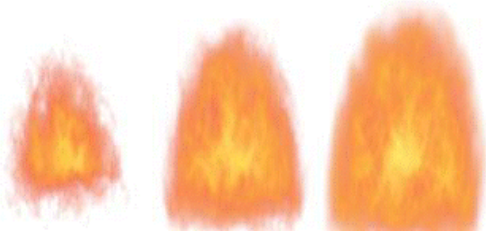
Non-uniform scaling of an apparatus

Stretch=0.5, 1.0, 3.0

Regularity—Modifies how the flames fill the apparatus. Range=1.0 to 0.0.

A value of 1.0 completely fills the apparatus. The effect fades near the edges of the apparatus, but the overall shape is still very noticeable.

A value of 0.0 produces a very irregular effect that might occasionally reach the boundary of the apparatus, but usually gets trimmed back and is smaller.



Effect of changing Regularity

Value=0.2, 0.5, 1.0

Characteristics group

You set the size and appearance of flames using parameters under Characteristics. All of these parameters depend on the apparatus size and are interdependent on each other. Changing one parameter affects the behavior of the other three.

Flame Size—Sets the size of individual flames inside the apparatus. The size of the apparatus affects the flame size. A larger apparatus requires a larger flame size. Use a range from 15.0 to 30.0 for the best results.

Large values work best for Fireballs.

Small values work best for Tendrils.

If the flame size is very small, you might need to increase Samples to see individual flames.

Effect of changing Flame Size
Value=15.0, 30.0, 50.0
Radius of apparatus=30.0

Flame Detail—Controls the amount of color change and edge sharpness seen within each flame. Range=0.0 to 10.0.

Low values produce smooth, fuzzy flames and render faster.

High values produce patterned, sharp flames and render slower.

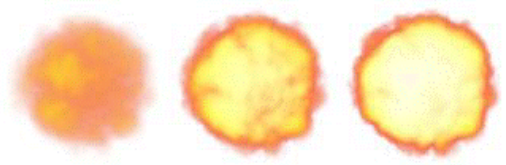
Use higher detail values for large flame sizes. If the detail value is greater than 4, you might need to increase Samples to capture the detail.

Effect of changing Flame Detail
Value=1.0, 2.0, 5.0

Density—Sets the opacity and brightness of the fire effect. The size of the apparatus affects the density. A large apparatus with the same density as a small apparatus appears more opaque and brighter because of its larger size.

Low values make the effect less opaque and use more of the outer color. High values make the effect more opaque and brighten the effect by gradually replacing the inner color with white. The higher the value, the more white the center of the effect is.

If you turn on Explosion, Density animates from 0.0 at the start of the explosion to the set density value at the peak of the explosion.



Effect of changing Flame Density
Value=10, 60, 120

Samples—Sets the rate at which the effect is sampled. Higher values produce more accurate results but take longer to render.

You might consider raising the samples value under the following conditions:

- Flame Size is small.
- Flame Detail is greater than 4.
- Any time you see color banding in the effect. The chance of color banding increases if a flat surface intersects the fire effect.

Note: 100 percent transparent objects that intersect the effect become partially visible. To use particles with Fire, consider using 3D particles instead of opacity-mapped particles.

Motion group

Use the parameters in the Motion group to animate the churning and rise of flames.

Phase—Controls the rate of change for the fire effect. Turn on Auto Key and change the phase value at different times.

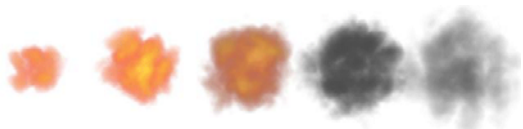
Phase value can have several meanings, depending on the state of the Explosion check box.

- If you clear Explosion, Phase controls the churning of the fire. The faster the value changes, the more furiously the fire burns. If the Phase function curve is a line, you get a steady burning fire.
- If you turn on Explosion, Phase controls the churning of the fire and the explosion timing, using values between 0.0 to 300.0. The Phase function curve for a typical explosion starts steep and flattens out.

Phase values control explosion timing in the following way:

Value	Explosion Effect
0–100	Explosion begins and builds to peak density at 100.
100–200	Explosion burns. Effect turns to smoke if Smoke is turned on.
200–300	Explosion clears and is completely gone at 300.
> 300	No effect.

Phase Function Curve Sample



Explosion effect at Phase=50, 100, 150, 200, and 250

Drift—Sets how flames are rendered along the Z axis of the fire apparatus. The value is the amount of rise in units.

Low values give a slow-burning cool fire.

High values give a fast-burning hot fire.

For the best fire effects, drift should be a multiple of the height of the fire apparatus.

You can also animate the location and size of the fire apparatus and most of the fire parameters. For example, a fire effect can animate color, size, and density.

Explosion group

Use the parameters in the Explosion group to automatically animate explosions.

Explosion—Animates size, density, and color automatically based on the animation of the Phase value.

Smoke—Controls whether or not the explosion creates smoke.

When on, fire colors change to smoke between Phase values 100 to 200. Smoke clears between Phase values 200 to 300. When off, fire colors remain at full density between Phase values 100 to 200. Fire fades away between Phase values 200 to 300.

Fury—Varies the churning effect of the Phase parameter.

Values greater than 1.0 cause faster churning. Values less than 1.0 cause slower churning.

Set Up Explosion—Displays the Set Up Explosion Phase Curve dialog. You enter a start time and end time, and then click OK. The Phase value animates automatically for a typical explosion effect.

Fog Environment Effect

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Atmosphere rollout > Add > Fog

Fog added to a scene

This command provides fog and smoke atmospheric effects. This *plug-in (page 3–1089)* provides effects such as fog which causes objects to appear to fade as they increase in distance from the camera (standard fog), or layered fog that envelops all or parts of objects in a blanket of mist.

Fog renders only in Camera or Perspective views. Orthographic or User views don't render Fog effects.

Procedures

To use standard fog:

1. Create a Camera view of your scene.
2. In the camera's creation parameters, turn on Show in the Environment Ranges group.

   Standard fog is based on the camera's environment range values.
3. Set Adjust Near Range and Far Range to include the objects you want to fog in your rendering.

   As a general guideline, set Far Range just beyond the objects, and Near Range to intersect the object geometry closest to the camera.
4. Choose Rendering > Environment.
5. Under Atmosphere on the Environment panel, click Add.

   The Add Atmospheric Effect dialog is displayed.
6. Choose Fog, and then click OK.
7. Make sure you choose Standard as the type of fog.

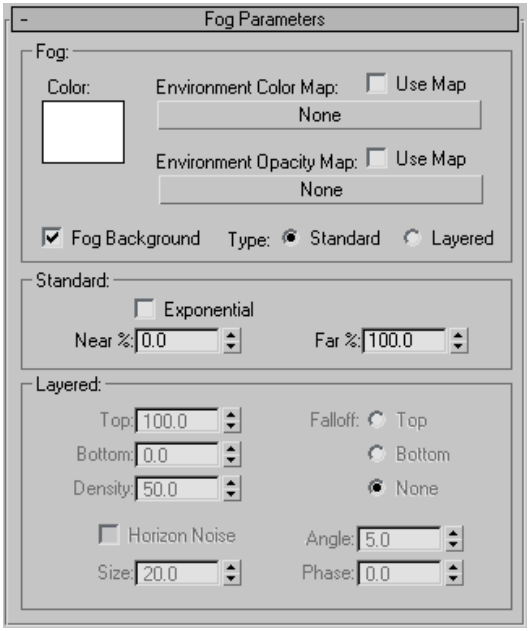
To use layered fog:

1. Create a Camera or Perspective view of your scene.
2. Choose Rendering > Environment.
3. Under Atmosphere on the Environment panel, click Add.

   The Add Atmospheric Effect dialog is displayed.
4. Choose Fog, and then click OK.
5. Choose Layered as the fog type.
6. Set the parameters for layered fog.

   You can have multiple fog layers in the scene by adding multiple Fog entries to the list and choosing Layered.

Interface



The Fog Parameters rollout appears when you select Fog under Effects in the Environment dialog. The Fog Parameters rollout has the following controls.

Fog group

Color—Sets the color for the fog. Click the color swatch, and then select the color you want in the *Color Selector (page 1–157)*. You can animate the color effect by changing the fog color at a nonzero frame with the Auto Key button on.

Environment Color Map—Derives the fog color from a map. You can map the background and the fog color, you can animate the procedural map parameters in Track View or Material Editor, and you can opacity-map the fog.

The large button displays the name of the color map, or None if no map is assigned. The map must use Environmental *mapping coordinates (page 3–1061)* (spherical, cylindrical, shrinkwrap, and screen).

To assign the map you can drag a map from a Sample slot or Map button in the Material Editor (or anywhere else in the software; for example, a projector map button) and drop it on the Environment Color Map button. A dialog asks if you want the environment map to be a copy (independent) or an instance of the source map.

Clicking the Environment Color Map button displays the Material/Map Browser, where you can choose a map type from the list. To adjust the environment map's parameters, open the Material Editor and drag the Environment Color Map button over an unused sample slot.

Use Map—Toggles the effect of this map on or off.

Environment Opacity Map—Alters the density of the fog.

You assign the opacity map, edit it, and toggle its effect in the same way as the Environment Color Map.

Fog Background—Applies the fog function to the background of the scene.

Type—When you choose Standard it uses the parameters in the Standard section and when you choose Layered is selected it uses the parameters in the Layered section.

Standard—Enables the Standard group.

Layered—Enables the Layered group.

Standard group

Thins and thickens the fog based on the distance from the camera.

Exponential—Increases density exponentially with distance. When turned off, density increases linearly with distance. Activate this check box only when you want to render transparent objects in volume fog.

Tip: If you turn on Exponential, this increases the Step Size value to avoid banding.

Near %—Sets the density of the fog at the Near Range (Camera Environment Range parameter).

Far %—Sets the density of the fog at the Far Range (Camera Environment Range parameter).

Layered group

Thins and thickens the fog between an upper and lower limit. You can have multiple layers of fog by adding multiple fog entries to the list. Because you can animate all the fog parameters, you can also animate fog rising and falling, changing density and color, and add *horizon (page 3–1047)* noise.

Top—Sets the upper extent (in world units) of the fog layer.

Bottom—Sets the lower extent (in world units) of the fog layer.

Density—Sets the overall density of the fog.

Falloff (Top/Bottom/None)—Adds an exponential falloff effect so that the density is reduced to 0 at either the Top or Bottom of the fog extent.

Horizon Noise—Turns on the horizon noise system. Horizon Noise perturbs just the horizon of the fog layer to add realism.

Size—Scale factor applied to the noise. Larger scale values make the fog tendrils larger. Default=20.

Tip: If you want tendrils to really pop out, try making the density greater than 100.

Angle—Determines the affected angle off the horizon line. For example, if the angle is set to 5 (a reasonable value), then starting at 5 degrees below the horizon, the fog will begin to break up.

This effect is mirrored above and below the horizon, which can produce strange results when the height of the fog layer traverses the horizon. Typically you'd want the fog to be either above or below the actual camera horizon. (You can use the horizon line in the camera parameters as an aid to help you position this.)

Phase—Animating this parameter animates the noise. If Phase is moving in the positive direction, then the fog tendrils will drift upward (and deform at the same time). If your fog is above the horizon you may want to animate Phase in the negative direction to make the tendrils fall downward.

Volume Fog Environment Effect

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Atmosphere rollout > Add > Volume Fog

Volume fog added to a scene

Volume Fog provides a fog effect in which the fog density is not constant through 3D space. This *plug-in (page 3–1089)* provides effects such as puffy, cloudy fog that appears to drift and break up in the wind.

Volume Fog renders only in Camera or Perspective views. Orthographic or User views don't render Volume Fog effects.

Procedures

To use volume fog:

1. Create a Camera or Perspective view of your scene.
2. Choose Rendering > Environment.

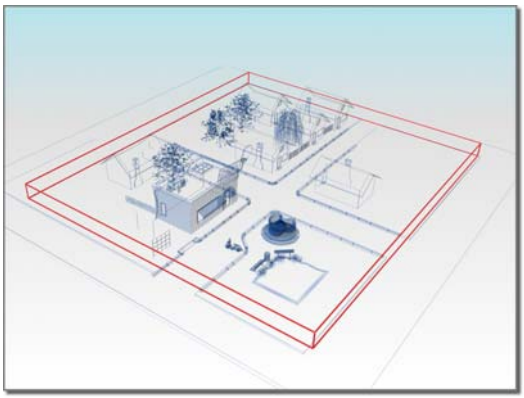
3. Under Atmosphere on the Environment panel, click Add.

   The Add Atmospheric Effect dialog is displayed.

4. Choose Volume Fog, and then click OK.
5. Set the parameters for volume fog.

   Note: If there are no objects in your scene, rendering shows only a solid fog color. Also, with no objects and Fog Background turned on, volume fog obscures the background.

To create a volume fog gizmo:



Volume fog gizmo surrounds the scene.

1. In the Helpers category of the Create panel, choose Atmospheric Apparatus from the pop-up menu.
2. Click one of the buttons to choose a gizmo shape: SphereGizmo, CylGizmo, or BoxGizmo.
3. Drag the mouse in the viewport to create the gizmo.

   You create Gizmos in much the same way as their matching geometry types. Drag the mouse to create the initial dimensions. The Sphere gizmo has an additional Hemisphere check box that turns the sphere into a hemisphere.

   In addition, each gizmo has a Seed spinner and a New Seed button. Different seed values generate different patterns. Clicking the New Seed button randomly generates a new seed value for you.

To assign volume fog to a gizmo from an apparatus modify panel:

1. Open the Modify panel of an apparatus.
2. Open the Atmospheres & Effects rollout.
3. Click Add.
4. Select Volume Fog from the Add Atmospheres dialog and click OK.
5. Highlight Volume Fog from the Atmospheres list and click setup to adjust the Volume Fog parameters.

To assign a gizmo to volume fog from the Environment panel:

1. On the Volume Fog Parameters rollout, click the Pick Gizmo button.
2. Click a gizmo in the viewport.

   The name of the gizmo appears in the list field at right.

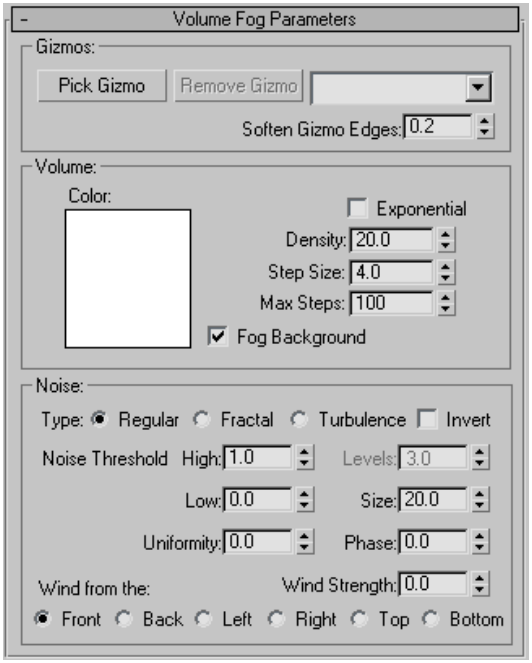
   When you render, the volume fog will be confined to the shape of the gizmo.

To remove an assigned gizmo:

1. In the Environment dialog, go to the Volume Fog Parameters rollout
2. Select the gizmo name from the pop-up list.
3. Click Remove Gizmo.

   This action doesn't delete the gizmo from the scene, but simply unbinds it from the fog effect.

Interface



The Volume Fog Parameters rollout appears when you select Volume Fog under Effects in the Environment dialog. The Volume Fog Parameters rollout has the following controls.

Gizmos group

By default, volume fog fills the entire scene. However, you can choose a gizmo (an atmospheric apparatus) to contain the fog. The gizmo can be a sphere, a box, a cylinder, or some combination of these.

Pick Gizmo—Click to enter Pick mode and click an atmospheric apparatus in the scene. The apparatus contains the volume fog when you render. The name of the apparatus is added to the apparatus list.

Multiple apparatus objects can display the same fog effect.

You can pick multiple gizmos. Click Pick Gizmo and then press **H**. This displays a Pick Object dialog on which you choose multiple objects from the list.

Changing the dimensions of a gizmo changes the region that fog affects, but doesn't change the scale of the fog and its noise. For example, reducing the radius of a spherical gizmo crops the fog, and moving the gizmo changes the fog's appearance.

Warning: When you press SHIFT while copying a gizmo, the new gizmo isn't bound to the volume fog. If you want to use the new gizmo, you must use Pick Gizmo to add it explicitly.

Remove Gizmo—Removes a gizmo from the volume fog effect. Select the gizmo in the list, and then click Remove Gizmo.

Soften Gizmo Edges—Feathers the edges of the volume fog effect. The higher the value, the softer the edges. Range=0 to 1.0.

Tip: Don't set this value to 0. At 0, Soften Gizmo Edges can cause aliased edges.

Volume group

Color—Sets the color for the fog. Click the color swatch, and then select the color you want in the *Color Selector (page 1–157)*.

You can animate the color effect by changing the fog color at a nonzero frame with the Auto Key button on.

Exponential—Increases density exponentially with distance. When turned off, density increases linearly with distance. Activate this check box only when you want to render transparent objects in volume fog.

Tip: If you turn on Exponential, increase the Step Size value to avoid banding.

Density—Controls the fog density. Range=0 to 20 (anything over that tends to obliterate the scene).

Left: Original scene

Right: Increased fog density

Step Size—Determines the granularity of the fog sampling; the "fineness" of the fog. A large step size creates coarse (and to some extent, aliased) fog.

Max Steps—Limits the amount of sampling so that computing the fog doesn't take forever (literally). This is especially useful when the fog is of low density.

When both Step Size and Max Steps have low values, aliasing results.

Fog Background—Applies the fog function to the background of the scene.

Noise group

Left: Original scene

Right: Noise added to the fog

Noise options for volume fog are comparable to the noise options for materials.

Type—Choose one of three types of noise to apply.

Regular—The standard noise pattern.

Fractal—An iterative fractal noise pattern.

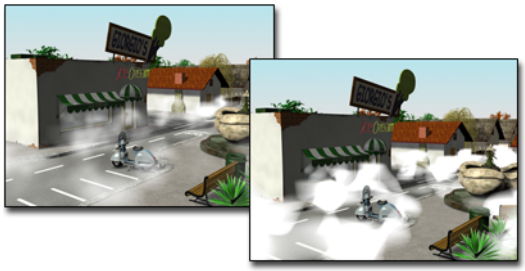
Turbulence—An iterative turbulence pattern.

Invert—Reverses the noise effect. Dense fog becomes translucent and vice versa.

Noise Threshold—Limits the noise effect. Range=0 to 1.0. When the noise value is above the Low threshold and below the High threshold, the dynamic range stretches to fill 0-1. This makes for a smaller discontinuity (First order instead of 0 order) at the threshold transition, and thus produces less potential *aliasing (page 3–1001)*.

High—Sets the high threshold.

Low—Sets the low threshold.



Left: Fog with noise

Right: Changing uniformity creates "blobby" fog

Uniformity—Ranges from -1 to 1 and acts like a high-pass filter. The smaller the value, the more transparent the volume is with discrete blobs of smoke. Around -0.3 or so your image begins to look like specks of dust. Because the fog becomes thinner as this parameter gets smaller, you'll probably need to increase the density or the volume will start to disappear.

Levels—Sets the number of times the noise is iteratively applied. Range=1 to 6, including fractional values. Enabled only for Fractal noise or Turbulence.

Size—Determines the size of the tendrils of smoke or fog. Smaller values give smaller tendrils.

Left: Fog with noise

Right: Decreasing the size

Phase—Controls the speed of the wind. If you have Wind Strength also set to greater than 0, the fog volume animates in accordance with the wind direction. With no Wind Strength, the fog churns in place. Because there's an animation track for phase, you can use the Function Curve editor to define precisely how you want your wind "gusts" to occur.

Wind moves the fog volume in the specified direction over time. Wind is tied to the phase parameter so as the phase changes, the wind moves. If Phase isn't animated there will be no wind.

Wind Strength—Controls how fast the smoke moves away from the wind direction, relative to phase. As mentioned above, if the phase is not animated then the smoke won't move, regardless of the wind strength. By having the phase animate slowly with a large wind strength, the fog moves more than it is churns.

Alternatively, if the phase changes rapidly while the wind strength is relatively small, the fog will churn fast and drift slowly. If you want the fog to just churn in place, animate the phase but keep wind strength at 0.

Wind from the—Defines the direction the wind is coming from.

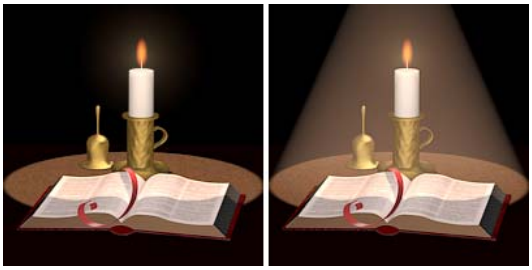
Volume Light Environment Effect

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Atmosphere rollout > Add > Volume Light

Volumetric light used in a complex environment with shadows and noise.

Volume Light provides light effects based on the interaction of lights with atmosphere (fog, smoke, and so on).

This *plug-in (page 3–1089)* provides effects such as radial glows for *omni lights (page 3–1077)*, conical glows for spotlights, and parallel beams of fog for directional lights. Objects within the light volume can cast shadows within the spotlight's cone, if using shadow maps as a shadow generator.



A simplified example where the light cone is clearly visible on the right.

Volume Light renders only in Camera or Perspective views. Orthographic or User views don't render Volume Light effects.

Procedures

To use volume light:

1. Create a scene with lights.
2. Create a Camera or Perspective view of your scene.

   Avoid making the view axis parallel to the cone of a spotlight. This tends to create only a washed-out scene, possibly with rendering artifacts.
3. Choose Rendering > Environment.
4. Under Atmosphere on the Environment panel, click Add.

   The Add Atmospheric Effect dialog is displayed.
5. Choose Volume Light, and then click OK.
6. Click Pick Light, and then click a light in a viewport to add the light to the list of volume lights.

   You can also use a Select By Name dialog to select multiple lights. Click Pick Light, and then press **H** to display the dialog.
7. Set the parameters for volume light.

To add a light to the list:

1. Click Pick Light.
2. Click the light in a viewport.

To remove a light from the list:

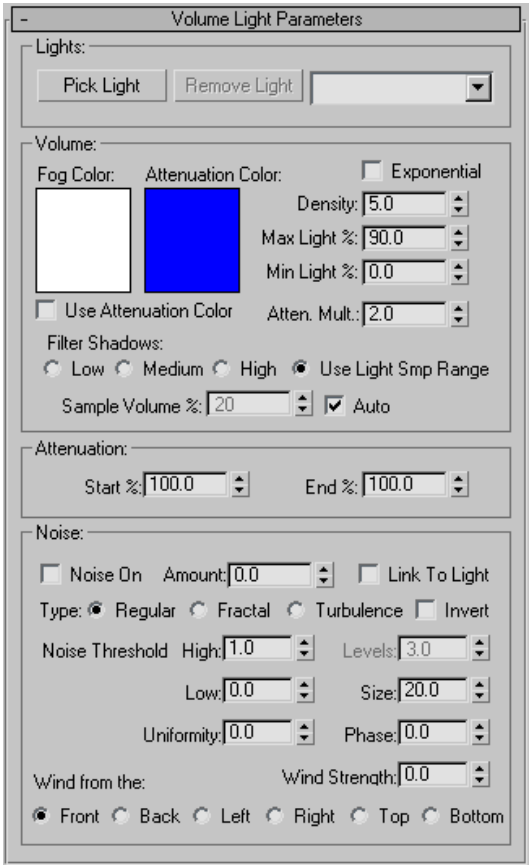
1. Open the list of volume lights.
2. Choose the light you want to remove the volume light effect from.
3. Click Remove Light.

To assign volume light to a light through the Modify panel:

1. Open the Modify panel of a light.
2. Open the Atmospheres & Effects rollout.
3. Click Add.
4. Select Volume Light from the Add Atmosphere or Effect dialog and click OK.
5. Highlight Volume Light from the Atmospheres & Effects list and click setup to adjust the Volume Light parameters.

   Note: Volume Lights don't support negative multiplier values.

Interface



The Volume Light Parameters rollout appears when you select Volume Light under Effects in the Environment dialog. It has the following controls.

Lights group

Pick Light—Click the light that you want to enable for volume light in any viewport.

You can pick multiple lights. Click Pick Light and then press **H**. This displays a Pick Object dialog that lets you choose multiple lights from the list.

Remove Light—Deletes a light from the list.

Volume group

Fog Color—Sets the color for the fog that makes up the volume of the light. Click the color swatch, and then choose the color you want in the *Color Selector (page 1–157)*.

You can animate the color effect by changing the fog color at a nonzero frame with the Auto Key button on.

Unlike the other fog effects, this fog color combines with the color of the light. Possibly the best effect is to use white fog and then color it with a colored light.

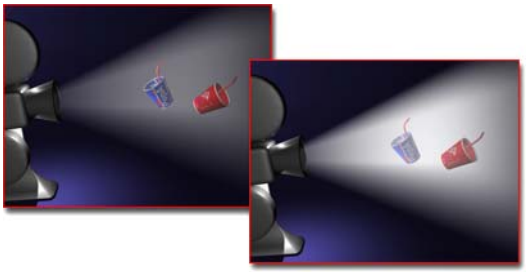
Attenuation Color—Attenuates volume light over distance. The volume light ramps from the Fog Color to the Attenuation color over the light's Near and Far attenuation distances. Clicking the color swatch displays a color selector so you can change the attenuation color.

Attenuation Color interacts with Fog Color. For example, if your fog color is red and your attenuation color is green, in the rendering your fog will shade to purple. Typically the attenuation color should be very dark and neutral—black is a good choice.

Use Attenuation Color—Makes attenuation color active.

Exponential—Increases density exponentially with distance. When turned off, density increases linearly with distance. Activate this check box only when you want to render transparent objects in volume fog.

Density—Sets the density of the fog. The denser the fog, the more the light reflects off it inside the volume. Densities of 2 to 6 percent probably make the most realistic fog volumes.



Left: Original scene

Right: Increasing the density

Max Light%—Represents the maximum glow effect that you can achieve (defaults to 90 percent). By turning this down, you can limit the brightness of the glow so that it doesn't get denser and denser as it gets farther away from the light and "whites out."

Note: When your scene includes transparent objects inside a volume light, set Max Light to 100 percent.

Min Light%—Similar to an *ambient light (page 3–1002)* setting. If Min Light% is greater than 0, areas outside the light volume will glow also. Note that this means areas of open space (where the light ray can travel forever) will end up the same as the fog color (just as with normal fog).

Without objects behind the fog, the scene will always be as bright as the fog color if the Min Light% is greater than 0 (no matter what the actual value is). This is because the fog goes to infinity and is accumulated infinitely. If you're going to use min light% values greater than 0, you should make sure that you enclose your scene by geometry.

Atten. Mult. (Attenuation Multiplier)—Adjusts the effect of the attenuation color.

Filter Shadows—Allows you to get better quality volume-light rendering by increasing the sampling rate (at the cost of some increased rendering time). These are the options:

Low—The image buffer is not filtered but directly sampled instead. This option is fine for 8-bit images, *AVI (page 3–658)* files, and so on.

Medium—Adjacent pixels are sampled and averaged. This produces a very significant improvement in cases where you're getting banding types of artifacts. It is slower than Low.

High—Adjacent pixels and the diagonal pixels are sampled, and each are given different weights. This is the slowest method and provides somewhat better quality than Medium.

Use Light Smp Range—Blurs the shadows cast in the volume based on the Sample Range value in the light's shadow parameters. Because increasing the Smp Range value blurs the shadow cast by the light, this makes shadows in the fog better match cast shadows, and helps prevent aliasing in the fog shadows.

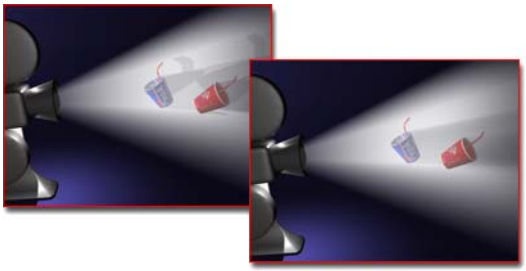
Tip: With the Use Light Smp Range option, the higher the light's Smp Range value, the slower the rendering. However, with this option you can usually get good results with a lower Sample Volume % setting (such as 4), which reduces rendering time.

Sample Volume %—Controls the rate at which the volume is sampled. Ranges 1 through 10,000 (where 1 is the lowest quality and 10,000 is the highest quality).

Auto—Controls the Sample Volume % parameter automatically and disables the spinner (this is the default). The preset sampling rates are as follows:

low=8; medium=25; high=50

Because the parameter ranges up to 100 there's still room to set it higher. Increasing the Sample Volume % parameter definitely slows things down, but in some cases you may want to increase it (for extremely high sample quality).



Left: Original scene

Right: Increasing sample volume to improve quality

Attenuation group

The controls in this section are contingent upon the settings of the Start Range and End Range *attenuation (page 3–1006)* parameters for the individual light.

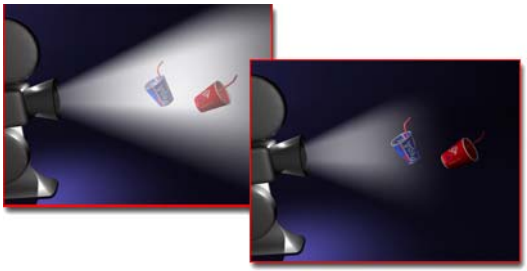
Note: Rendering Volume Light at some angles can introduce aliasing problems. To eliminate aliasing problems, activate the Near and Far Attenuation settings in the light object that the Volume Light applied to.

Start %—Sets the start attenuation of the light effect, relative to the actual light parameter's attenuation. It defaults to 100 percent, which means that it starts attenuating at the Start Range point. When you reduce this parameter, it starts attenuating the light at a reduced percentage of the actual Start Range value that is, closer to the light itself.

Because you usually want a smooth *falloff (page 3–1048)*, you can keep this value at 0, and no matter what the light's actual Start Range, you'll always get a smooth glow without *hotspots (page 3–1048)*.

End %—Sets the end attenuation of the lighting effect, relative to the actual light parameter's attenuation. By setting this lower than 100 percent, you can have a glowing attenuating light that

casts light much farther than it actually glows. Default=100.



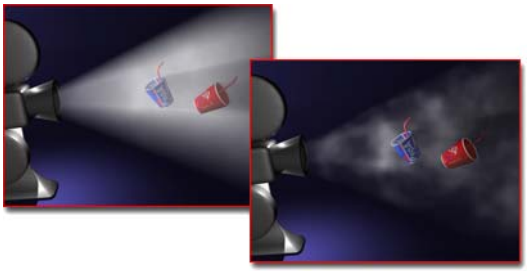
Left: Original scene

Right: Attenuation limits the range of the light.

Noise group

Noise On—Turns the noise on and off. When noise is on there is a slight increase in render time.

Amount—The percentage of noise applied to the fog. If the amount is 0, there is no noise. If the amount is 1, the fog becomes pure noise.



Left: Original scene

Right: Noise added

Link To Light—Links the noise effect to its light object, rather than to world coordinates.

Usually you want noise to look like fog or dust motes in the atmosphere, in which case, as the light moves, the noise should remain with the world coordinates. For certain special effects, however, you might want the noise linked to the light's coordinates. In these cases, turn on Link to Light.

Type—Choose one of three types of noise to apply.

- **Regular**—The standard noise pattern.
- **Fractal**—An iterative fractal noise pattern.
- **Turbulence**—An iterative turbulence pattern.

Invert—Reverses the noise effect. Dense fog becomes translucent and vice versa.

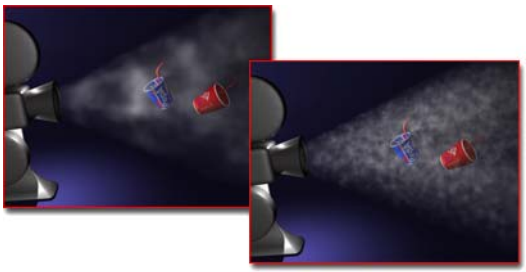
Noise Threshold—Limits the noise effect. When the noise value is above the Low threshold and below the High threshold, the dynamic range stretches to fill 0-1. This makes for a smaller discontinuity (first order instead of 0 order) at the threshold transition and thus produces less potential *aliasing* *(page 3–1001)*.

- **High**—Sets the high threshold. Range=0 to 1.0.
- **Low**—Sets the low threshold. Range=0 to 1.0.

Uniformity—Acts like a high-pass filter: the smaller the value, the more the volume is transparent with discrete blobs of smoke. By around -0.3 or so your image begins to look like specks of dust. Because the fog becomes thinner as this parameter gets smaller, you'll probably need to increase the density or the volume will start to disappear. Range=-1 to 1

Levels—Sets the number of times the noise is iteratively applied. This parameter is animatable. Enabled only for Fractal noise or Turbulence. Range=1 to 6, including fractional values.

Size—Determines the size of the tendrils of smoke or fog. Smaller values give smaller tendrils.



Left: Volume light with noise

Right: Reducing the size value

Phase—Controls the speed of the wind. If you have Wind Strength also set to greater than 0, the fog volume animates in accordance with the wind direction. With no Wind Strength, the fog churns in place. Because there's an animation track for phase, you can use the Function Curve editor to define precisely how you want your wind "gusts" to happen.

Wind moves the fog volume in the specified direction over time. Wind is tied to the phase parameter so as the phase changes, the wind moves. If Phase isn't animated there will be no wind.

Wind Strength—Controls how fast the smoke moves away from the wind direction, relative to phase. As mentioned above, if the phase is not animated then the smoke won't move, regardless of the wind strength. By having the phase animate slowly with a large wind strength, the fog moves more than it churns.

Alternatively, if the phase changes rapidly while the wind strength is relatively small, the fog will churn fast and drift slowly. If you want the fog to just churn in place, animate the phase but keep wind strength at 0.

Wind from the—Defines the direction the wind is coming from.

Exposure Controls

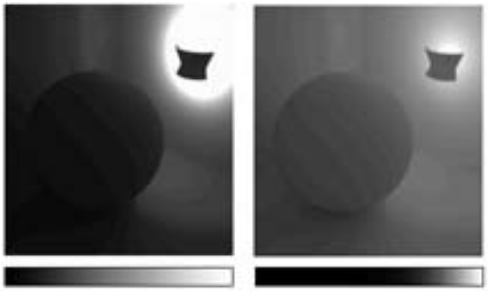
Rendering menu > Environment > Environment and Effects dialog > Environment panel > Exposure Control rollout

Exposure Controls are plug-in components that adjust the output levels and color range of a rendering, as if you were adjusting film exposure. Exposure Controls are especially useful for renderings that use *radiosity (page 3–50)*.

Exposure control compensates for the limited dynamic range of monitors. Monitors have a dynamic range of about two orders of magnitude. The brightest color that appears on a display is about 100 times brighter than the dimmest. The eye, by comparison, can perceive a dynamic range of about 16 orders of magnitude. The brightest color we can perceive is about 10 million-billion times brighter than the dimmest. Exposure control adjusts colors so they better simulate the eye's great dynamic range, while still fitting within the color range that can be rendered.

- *Automatic Exposure Control (page 3–291)* samples the rendered image and builds a histogram to give good color separation across the entire dynamic range of the rendering. It can enhance some lighting effects that would otherwise be too dim to see.
- *Linear Exposure Control (page 3–292)* samples the rendering and uses the average brightness of the scene to map physical values to RGB values. Linear Exposure Control is best for scenes with a fairly low dynamic range.
- *Logarithmic Exposure Control (page 3–293)* uses brightness, contrast, and whether the scene is outdoors in daylight to map physical values to RGB values. Logarithmic Exposure Control is better for scenes with a very high dynamic range.
- *Pseudo Color Exposure Control (page 3–296)* is actually a lighting analysis tool. It maps luminances to pseudo colors that show the brightness of the values being converted.

Important: The *mental ray renderer (page 3–77)* supports only the Logarithmic and Pseudo Color exposure controls.



Left: Linear exposure control maps intensity evenly.

Right: Logarithmic exposure control maps most intensities to low and mid tones.

Tips:

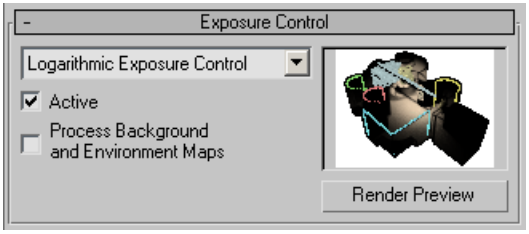
- If the primary lighting from your scene comes from standard lights (rather than photometric lights), use the Logarithmic Exposure Control and turn on Affect Indirect Only.
- Use Automatic Exposure Control for rendering still images. Automatic Exposure Control is also good for first-draft renderings.
- Use Logarithmic Exposure Control for animations with a moving camera. (Automatic and Linear Exposure Control with a moving camera can cause excessive flickering.)
- For outdoor scenes that use the Daylight system, turn on the Exterior toggle to prevent overexposure.

Exposure and Attenuation for Standard Lights

When you use standard lights that are not attenuated, renderings tend to have a low dynamic range, because light intensities don't vary greatly across the scene. In this situation, adjusting light values might be all you need to do to get a good rendering.

When lights are attenuated, on the other hand, the light might be too bright on near surfaces or too dim on far surfaces. In this situation, Automatic Exposure Control can help, because it adjusts the larger dynamic range of the (simulated) physical scene, into the smaller dynamic range of the display.

Interface



Drop-down list—Choose which exposure control to use.

Active—When on, the exposure control is used in renderings. When off, the exposure control is not used.

Process Background and Environment Maps—When on, the scene background and environment maps are subjected to exposure control. When off, they are not.

Preview thumbnail—The thumbnail displays a preview of the rendered scene with the active exposure control applied. Once a preview has been rendered, it updates interactively when you changed exposure control settings.

Render Preview—Click to render the preview thumbnail.

Automatic Exposure Control

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Exposure Control rollout > Choose Automatic Exposure Control from the list. > Automatic Exposure Control rollout

Auto exposure can affect the lighting of the whole image.

Automatic Exposure Control samples the rendered image and builds a histogram to give good color separation across the entire dynamic range of the rendering. It can enhance some lighting effects that would otherwise be too dim to see.

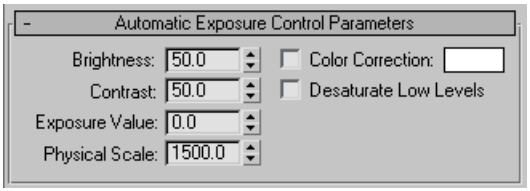
Note: Automatic Exposure Control should not be used in animations, because every frame will have a different histogram, causing your animation to flicker.

Important: The *mental ray renderer (page 3–77)* does not support the Automatic exposure control.

See also

Environment Panel (page 3–268)

Interface



Brightness—Adjusts the brightness of the converted colors. Range=0 to 200. Default=50.

This parameter is animatable.

Contrast—Adjusts the contrast of the converted colors. Range=0 to 100. Default=50.

This parameter is animatable.

Exposure Value—Adjusts the overall brightness of the rendering. Range=-5.0 to 5.0; Negative values make the image darker, and positive values make it brighter. Default=0.0.

The exposure value is comparable to the exposure compensation setting in cameras with automatic exposure. This parameter is animatable.

Physical Scale—Sets a physical scale for exposure control to use with lights that are not physically based. The result is an adjustment of the rendering that approximates the eye's response to the scene.

Each standard light's *Multiplier (page 3–1071)* is multiplied by the Physical Scale value to give a light intensity value in candelas. For example, with the default Physical Scale of 1500, a standard omni light is treated by the renderer and radiosity as a photometric isotropic light of 1500 candelas. Physical Scale is also factored into reflections, refractions, and self-illumination.

Tip: You need to set the Physical Scale when you use ray-tracing with self illumination. Set this value to the equivalent of the brightest light source in the scene. This will set the appropriate conversion scale for reflections, self-illumination, and all other non-physically based elements a material offers. In some cases, an object might reflect or emit more light than the brightest light object in the scene; in this case, use the object's Luminance value as the Physical Scale.

Range=0.0 to 200,000.0 candelas. Default=1500.0.

A single candle is approximately 1 candela (the unit can also be called a "candle"). A 100-Watt (W) incandescent light bulb is approximately 139 candelas (cd). A 60W bulb emitting in all directions is about 70 cd, while the same bulb with

a reflector is about 4500 cd because the light flux is concentrated into a narrow angle.

Photometric lights are unaffected by the Physical Scale value.

This parameter is animatable.

Color correction check box and color swatch—When the check box is turned on, color correction shifts all colors so the color displayed in the color swatch appears as white. Default=off.

Clicking the color swatch displays a *Color Selector (page 1–157)* so you can choose the color to adapt to.

You can use this control to simulate how the eye adjusts to lighting. For example, even when the light in a room has a yellow hue from an incandescent light bulb, we will continue to perceive objects that we know to be white, such as printed pages, as white.

Tip: For the best results, use a very pale color correction color, such as a pale blue or pale yellow.

Desaturate Low Levels—When on, renders dimly lit colors as if the light were too dim for the eye to distinguish between colors. When on, renders even dimly lit colors. Default=off.

Desaturate Low Levels simulates the eye's response to dim lighting. In dim lighting, the eye does not perceive colors and sees tones of gray instead.

The effect of this setting is not apparent except at very low light levels, below 5.62 footcandles (lumens per square foot). When the illuminance is less than 0.00562 footcandles, the scene is completely gray.

Note: 1 footcandle (fc) equals 10.76 lux (lumens per square meter).

Linear Exposure Control

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Exposure Control rollout > Choose Linear Exposure Control from the list. > Linear Exposure Control rollout

Linear Exposure Control samples the rendered image and uses the average brightness of the scene to map physical values to RGB values. Linear Exposure Control is best used for scenes with a fairly low dynamic range.

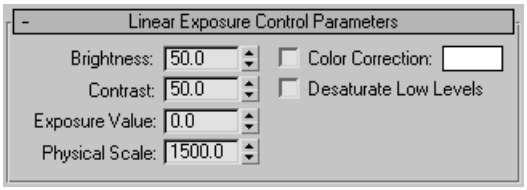
Note: Linear Exposure Control should not be used in animations, because every frame will have a different histogram, causing your animation to flicker.

Important: The *mental ray renderer (page 3–77)* does not support the Linear exposure control.

See also

Environment Panel (page 3–268)

Interface



Brightness—Adjusts the brightness of the converted colors. Range=0 to 200. Default=50.

This parameter is animatable.

Contrast—Adjusts the contrast of the converted colors. Range=0 to 100. Default=50.

This parameter is animatable.

Exposure Value—Adjusts the overall brightness of the rendering. Range= -5.0 to 5.0. Negative values make the image darker, and positive values make it brighter. Default=0.0.

The exposure value can be thought of as an exposure compensation setting in cameras with automatic exposure control.

This parameter is animatable.

Physical Scale—Sets a physical scale for exposure control to use with lights that are not physically based. The result is an adjustment of the rendering that approximates the eye's response to the scene.

Each standard light's *Multiplier (page 3–1071)* is multiplied by the Physical Scale value to give a light intensity value in candelas. For example, with the default Physical Scale of 1500, a standard omni light is treated by the renderer and radiosity as a photometric isotropic light of 1500 candelas. Physical Scale is also factored into reflections, refractions, and self-illumination.

Tip: You need to set the Physical Scale when you use ray-tracing with self illumination. Set this value to the equivalent of the brightest light source in the scene. This will set the appropriate conversion scale for reflections, self-illumination, and all other non-physically based elements a material offers. In some cases, an object might reflect or emit more light than the brightest light object in the scene; in this case, use the object's Luminance value as the Physical Scale.

Range=0.0 to 200,000.0 candelas. Default=1500.0.

A single candle is approximately 1 candela (the unit can also be called a "candle"). A 100-Watt (W) incandescent light bulb is approximately 139 candelas (cd). A 60W bulb emitting in all directions is about 70 cd, while the same bulb with a reflector is about 4500 cd because the light flux is concentrated into a narrow angle.

Photometric lights are unaffected by the Physical Scale value.

This parameter is animatable.

Color Correction check box and color swatch—When the check box is turned on, color correction shifts all colors so the color displayed in the color swatch appears as white. Default=off.

Clicking the color swatch displays a *Color Selector (page 1–157)* so you can choose the color to adapt to.

You can use this control to simulate how the eye adjusts to lighting. For example, even when the light in a room has a yellow hue from an incandescent light bulb, we will continue to perceive objects that we know to be white, such as printed pages, as white.

Tip: For the best results, use a very pale color correction color, such as a pale blue or pale yellow.

Desaturate Low Levels—When on, renders dimly lit colors as if the light were too dim for the eye to distinguish between colors. When on, renders even dimly lit colors. Default=off.

Desaturate Low Levels simulates the eye's response to dim lighting. In dim lighting, the eye does not perceive colors and sees tones of gray instead.

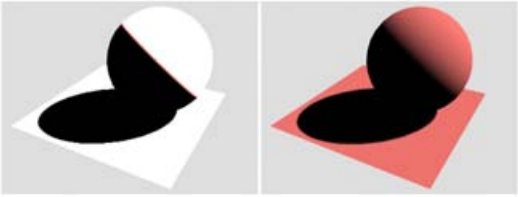
The effect of this setting is not apparent except at very low light levels, below 5.62 footcandles (lumens per square foot). When the illuminance is less than 0.00562 footcandles, the scene is completely gray.

Note: 1 footcandle (fc) equals 10.76 lux (lumens per square meter).

Logarithmic Exposure Control

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Exposure Control rollout > Choose Logarithmic Exposure Control from the list. > Logarithmic Exposure Control rollout

Logarithmic Exposure Control uses brightness, contrast, and whether the scene is outdoors in daylight to map physical values to RGB values. Logarithmic Exposure Control is better for scenes with a very high dynamic range.



Left: The intensity of an IES sun light completely overexposes a scene.

Right: Logarithmic exposure control corrects the overexposure.

Note: Logarithmic Exposure Control is the best type of exposure control for animations because it doesn't use histograms.

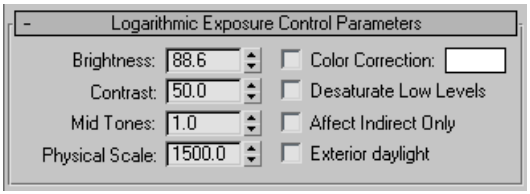
Note: You can use the Logarithmic exposure control with the *mental ray renderer (page 3–77)*.

Note: If you need to use *Render To Texture (page 3–139)*, you should not use Automatic or Linear exposure controls. For the best results, use Logarithmic exposure control.

See also

Environment Panel (page 3–268)

Interface



Brightness—Adjusts the brightness of the converted colors. Range=0 to 200. Default=50.

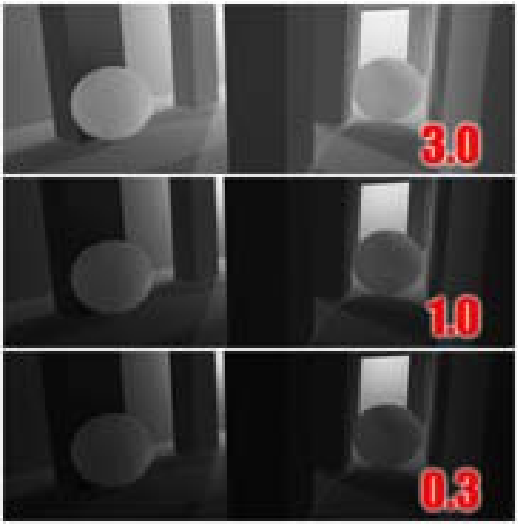
This parameter is animatable.

Contrast—Adjusts the contrast of the converted colors. Range=0 to 100. Default=50.

This parameter is animatable.

Mid Tones—Adjusts the mid-tone values of the converted colors. Range=0.01 to 20.0. Default=1.0.

This parameter is animatable.



Adjusting the value of mid tones

Physical Scale—Sets a physical scale for exposure control to use with lights that are not physically based. The result is an adjustment of the rendering that approximates the eye's response to the scene.

Each standard light's *Multiplier (page 3–1071)* is multiplied by the Physical Scale value to give a light intensity value in candelas. For example, with the default Physical Scale of 1500, a standard omni light is treated by the renderer and radiosity as a photometric isotropic light of 1500 candelas. Physical Scale is also factored into reflections, refractions, and self-illumination.

Tip: You need to set the Physical Scale when you use ray-tracing with self illumination. Set this value to the equivalent of the brightest light source in the scene. This will set the appropriate conversion scale for reflections, self-illumination, and all other non-physically based elements a material offers. In some cases, an object might reflect or emit more light than the brightest light object in the scene; in this case, use the object's Luminance value as the Physical Scale.

Note: The mental ray renderer treats Physical Scale in the same way the scanline renderer does in terms of its effect on reflections and refractions. Physical Scale does affect the appearance of self-illuminated materials.

Range=0.0 to 200,000.0 candelas. Default=1500.0.

A single candle is approximately 1 candela (the unit can also be called a "candle"). A 100-Watt (W) incandescent light bulb is approximately 139 candelas (cd). A 60W bulb emitting in all directions is about 70 cd, while the same bulb with a reflector is about 4500 cd because the light flux is concentrated into a narrow angle.

Photometric lights are unaffected by the Physical Scale value.

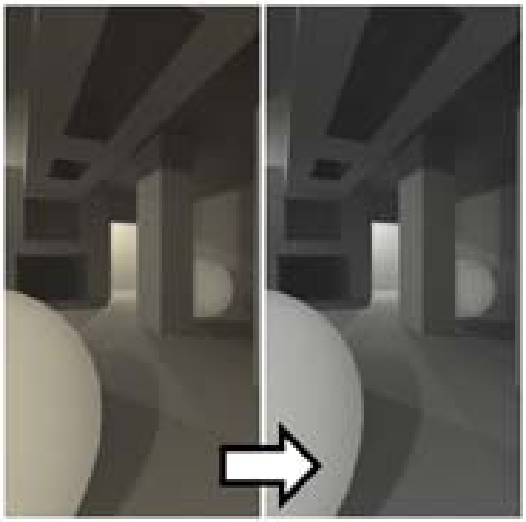
This parameter is animatable.

Color Correction check box and color swatch—When the check box is turned on, color correction shifts all colors so the color displayed in the color swatch appears as white. Default=off.

Clicking the color swatch displays a *Color Selector (page 1–157)* so you can choose the color to adapt to.

You can use this control to simulate how the eye adjusts to lighting. For example, even when the light in a room has a yellow hue from an incandescent light bulb, we will continue to perceive objects that we know to be white, such as printed pages, as white.

Tip: For the best results, use a very pale color correction color, such as a pale blue or pale yellow.



Color correction can remove the color "cast" that comes from a light source.

Desaturate Low Levels—When on, renders dimly lit colors as if the light were too dim for the eye to distinguish between colors. When off, renders even dimly lit colors. Default=off.

Desaturate Low Levels simulates the eye's response to dim lighting. In dim lighting, the eye does not perceive colors and sees tones of gray instead.

The effect of this setting is not apparent except at very low light levels, below 5.62 footcandles (lumens per square foot). When the illuminance is less than 0.00562 footcandles, the scene is completely gray.

Note: 1 footcandle (fc) equals 10.76 lux (lumens per square meter).

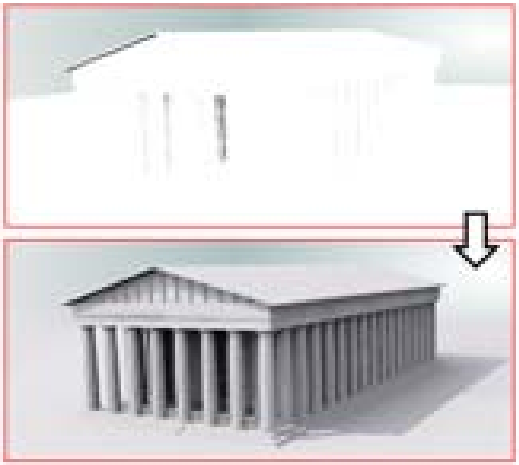
Affect Indirect Only—When on, Logarithmic Exposure control is applied only to areas of indirect lighting. Default=off.

Turn on this toggle when the primary lighting for your scene comes from standard lights rather than photometric lights. When you use standard lights and turn on Affect Indirect Only, radiosity and exposure control yield results similar to the default

scanline renderer. When you use standard lights but leave Affect Indirect Only off, radiosity and exposure control yield results that can be quite different from the default scanline renderer.

In general, you don't need to turn on Affect Indirect Only when the primary lighting for your scene comes from photometric lights.

Exterior daylight—When on, converts colors for an outdoor scene. Default=off.



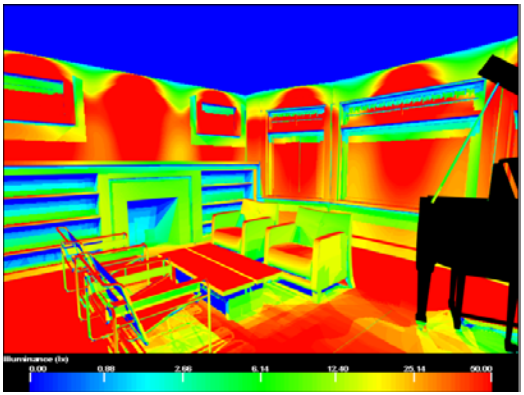
The exterior daylight setting compensates for the extreme intensity of an IES sun light.

Pseudo Color Exposure Control

Rendering menu > Environment > Environment and Effects dialog > Environment panel > Exposure Control rollout > Choose Pseudo Color Exposure Control from the list. > Pseudo Color Exposure Control rollout

Pseudo Color Exposure Control is actually a lighting analysis tool that provides you with an intuitive way of visualizing and evaluating the lighting levels in your scenes. It maps *luminance (page 3–1058)* or *illuminance (page 3–1049)* values to pseudo colors that show the brightness of the values being converted. From darkest to brightest, the rendering shows blue, cyan, green, yellow, orange, and red. (Alternatively, you can choose a grayscale where the brightest values are white, and the darkest are black.) The rendering includes the colored or grayscale spectrum bar as a legend for the image.

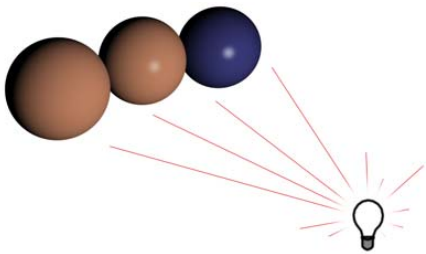
Note: You can use the Pseudo Color exposure control with the *mental ray renderer (page 3–77)*.



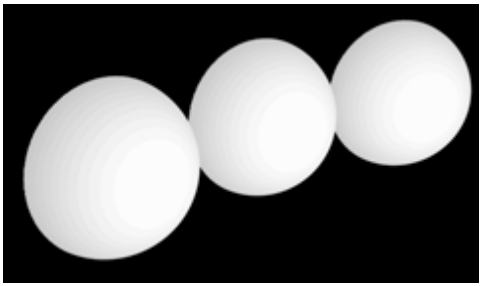
Pseudo color exposure of a scene with radiosity. Areas in red are overlit, areas in blue are underlit, and areas in green have a good lighting level.

If you render a scene using this exposure control, a special *render element (page 3–133)* named Illuminance is created in order to obtain accurate luminance and illuminance data.

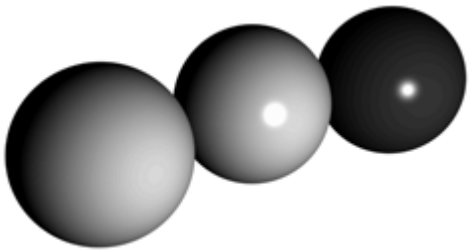
Tip: If you get a file write error when you try to render a pseudo color image, check the path and file name of the Illuminance element, or the permissions of the PNG file that saves the illuminance data.



Three spheres at an equal distance from a light source. The sphere on the left has a matte material, the sphere in the middle is glossy, and the sphere on the right is glossy but has a much darker color.



A display of illuminance shows that it is the same for all three spheres.

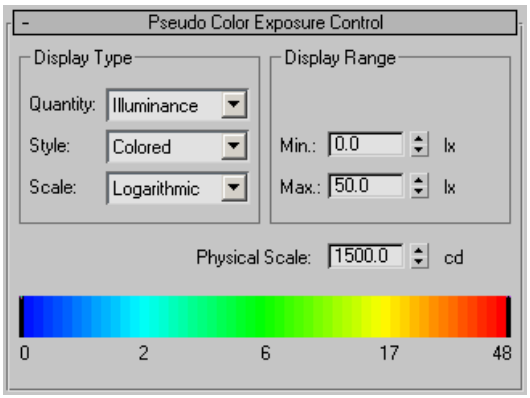


A display of luminance shows that the two spheres on the left reflect about the same amount of light, but the darker sphere on the right reflects little light except for its highlight.

See also

Environment Panel (page 3–268)

Interface



Display Type group

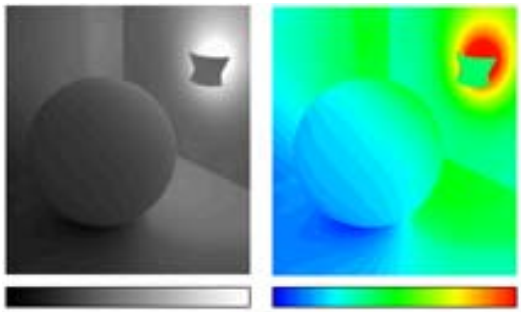
Quantity—Chooses the value being measured.

- Illuminance (the default) displays values of light incident on surfaces.
- Luminance displays values of light reflected off surfaces.

Style—Chooses the way to display values.

- Colored (the default) shows a spectrum.
- Grayscale shows gray tones that range from white to black.

  The spectrum bar displays the values the rendering will use.

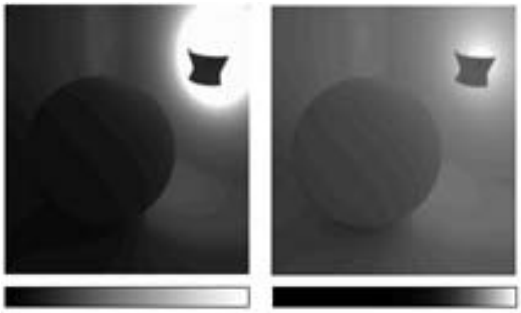


Pseudo color display style:
Left: Grayscale
Right: Colored scale

Scale—Chooses the technique used to map values.

- Logarithmic (the default) uses a logarithmic scale.
- Linear uses a linear scale.

  The Logarithmic scale is useful when the illumination of the surfaces of interest is low compared to the maximum illumination in the scene.



Left: Linear scale

Right: Logarithmic scale

Display Range group

Minimum (Min.)—Sets the lowest value to measure and represent in the rendering. Values at this quantity or below it all map to the leftmost display color (or grayscale level).

Maximum (Max.)—Sets the highest value to measure and represent in the rendering. Values at this quantity or above it all map to the rightmost display color (or grayscale value).

Physical Scale—Sets a physical scale for exposure control to use. The result is an adjustment of the rendering that approximates the eye's response to the scene.

Each standard light's *Multiplier (page 3–1071)* is multiplied by the Physical Scale value to give a light intensity value in candelas. For example, with the default Physical Scale of 1500, a standard omni light is treated by the renderer and radiosity as a photometric isotropic light of 1500 candelas. Physical Scale is also factored into reflections, refractions, and self-illumination.

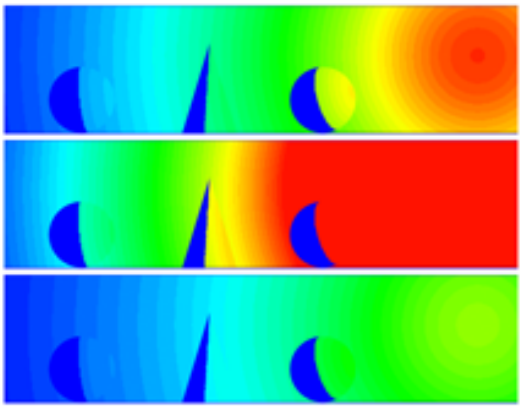
Tip: You need to set the Physical Scale when you use ray-tracing with self illumination. Set this value to the equivalent of the brightest light source in the scene. This will set the appropriate conversion scale for reflections, self-illumination, and all other non-physically based elements a material offers. In some cases, an object might reflect or emit more light than the brightest light object in the scene; in this case, use the object's Luminance value as the Physical Scale.

Range=0.0 to 200,000.0 candelas. Default=1500.0.

A single candle is approximately 1 candela (the unit can also be called a "candle"). A 100-Watt (W) incandescent light bulb is approximately 139 candelas (cd). A 60W bulb emitting in all directions is about 70 cd, while the same bulb with a reflector is about 4500 cd because the light flux is concentrated into a narrow angle.

Photometric lights are unaffected by the Physical Scale value.

This parameter is animatable.

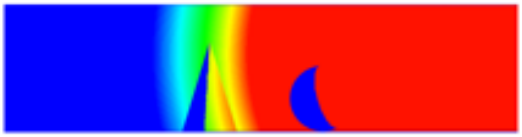


Adjusting the range to analyze:

Above: Correct range for a scene

Middle: Too narrow a range

Below: Too great a range



Narrowing the range to focus on a single object

General Guidelines for Physical Scale Values

- If you use only *Photometric lights (page 2–1155)*, *IES Sun (page 2–1163)*, and *IES Sky*

(page 2–1165), the Physical Scale value is disregarded, and you don't need to change it.

- If you use *Standard lights (page 2–1142)*, the Physical Scale value acts as a conversion scale that the radiosity engine uses to calculate energy. Set it to the equivalent of the brightest light source in the scene. This will set the appropriate conversion scale for reflections, self-illumination, and all other non-physically based elements a 3ds Max material offers.

  However, if you use the Affect Indirect Only flag in the *Logarithmic Exposure Control (page 3–293)*, you don't need to worry about the physical scale setting.

Spectrum bar—Shows the spectrum-to-intensity mapping. The numbers below the spectrum range from the Minimum to the Maximum settings.

When rendering with pseudo color, the spectrum bar is displayed beneath the pseudo color image, labeled either Luminance or Illuminance.

Lighting Data Exporter Utility

Utilities panel > Utilities rollout > Lighting Data Export

The Lighting Data Exporter renders the active viewport to images that include *luminance (page 3–1058)* and *illuminance (page 3–1049)* data that can be used for lighting analysis.

The Lighting Data Exporter does not render the files unless you have applied an *exposure control (page 3–289)* to the scene.

You can render to either the *TIFF file (page 3–684)* format. If you export to a TIFF file, the utility renders a single image file that has separate channels for luminance and illuminance (the file is of the 32-bit SGI LogLUV image type).

You can also render to the *PIC file (page 3–677)* format. If you export to a PIC file, the utility renders two images: one containing luminance data, and the other containing illuminance data (see the description of the File Name button, below).

Interface

File Name—Click the button to specify a file name for the rendering.

When you export to the PIC format, the Lighting Data Exporter renders two files. It appends the string "_Illuminance" to the name of one file, and "_Luminance" to the other. For example, if you type **house** as the file name, the exporter renders to *house_illuminance.pic* and *house_luminance.pic*.

Image Size group

Width—Sets the output width, in pixels. Default=640.

Height—Sets the output height, in pixels. Default=480.

Export—Click to render luminance and illuminance data.

Warning: Unlike the renderer, if you click Export more than once, this overwrites previously rendered files.

Atmospheric Apparatus Helper Objects

Create panel > Helpers > Atmospheric Apparatus (from drop-down list)

You can create three types of atmospheric apparatuses or *gizmos (page 3–1043)*: a box, a cylinder, or a sphere. These gizmos limit the spread of fog or fire in your scene.

BoxGizmo Helper (page 3–300)

CylGizmo Helper (page 3–302)

SphereGizmo Helper (page 3–303)

See also

Fire Environment Effect (page 3–272)

Fog Environment Effect (page 3–278)

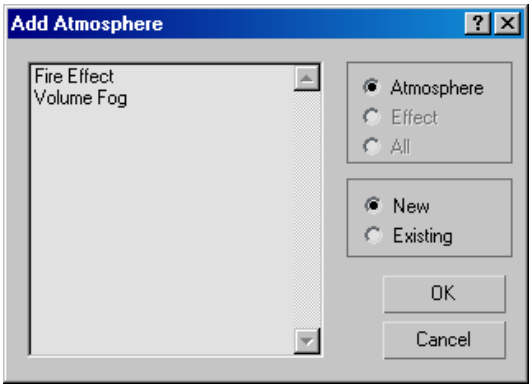
Volume Light Environment Effect (page 3–284)

Add Atmosphere Dialog

Select Atmospheric Apparatus object. > Modify panel > Atmospheres & Effects rollout > Add button

The Add Atmosphere dialog lets you associate an atmosphere with the *Atmospheric Apparatus (page 3–300)*.

Interface



List of atmospheres—Displays the atmospheres that you can associate with the apparatus.

New or existing group

These radio buttons choose between new or existing atmospheres.

New—Lists only new atmospheres.

Existing—Lists only atmospheres that have been already assigned to other apparatuses in the scene.

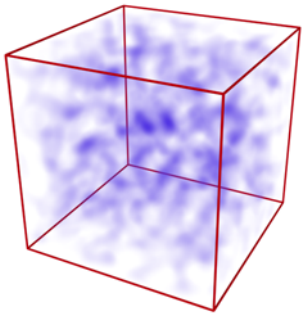
Adding an existing atmosphere creates a new atmosphere whose settings are initially identical to the previous one.

BoxGizmo Helper

Create panel > Helpers > Atmospheric Apparatus (from drop-down list) > BoxGizmo

Create menu > Helpers > Atmospherics > BoxGizmo

BoxGizmo lets you create a box-shaped gizmo in your scene. Clicking the BoxGizmo button displays the Box Gizmo Parameters rollout.



Box gizmo with volume fog

Procedures

To create the BoxGizmo:

1. Drag in a viewport to define the initial length and width, then release the mouse and drag vertically to set the initial height.
2. Click to end BoxGizmo creation.

To add a new atmosphere:

1. Select the apparatus gizmo.
2. In the Modify panel, on the Atmospheres & Effects rollout, click Add. This displays the *Add Atmosphere dialog (page 3–300)*.
3. Choose an atmosphere from the list.
4. Click OK.

   This associates a new atmosphere with the apparatus.

To add an existing atmosphere:

1. Select the apparatus gizmo.
2. In the Modify panel, on the Atmospheres & Effects rollout, click Add. This displays the *Add Atmosphere dialog (page 3–300)*.
3. In the dialog, choose Existing.
4. Choose an atmosphere from the list.
5. Click OK.

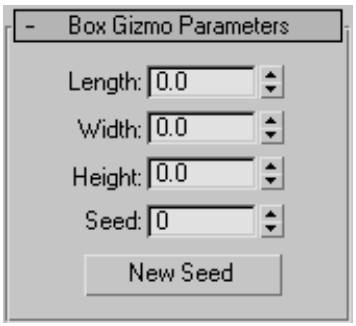
   This creates a duplicate atmosphere for the apparatus. Its settings are initially identical to the atmosphere you chose. You can adjust them using Setup.

Interface

Name and Color rollout

The *Name and Color rollout (page 3–800)* lets you rename objects and change their wireframe color.

Box Gizmo Parameters rollout



Length, Width, and Height—Set the dimensions of the box gizmo.

Seed—Sets a base value used to generate the atmospheric effect. Each apparatus in the scene should have a different seed. If more than one apparatus uses the same seed and same atmospheric effect, they will produce nearly identical results.

New Seed—Click to generate a random number automatically and place it in the seed field.

Atmospheres & Effects rollout

The Atmospheres & Effects rollout, available from the Modify panel, allows you to add and set up atmospheres directly to the gizmo.

Add—Displays the *Add Atmosphere dialog (page 3–300)* from which you can add an atmosphere to the BoxGizmo.

Delete—Deletes a highlighted atmospheric effect.

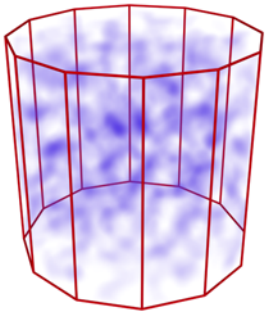
Setup—Displays the *Environment panel (page 3–268)*, where you can edit the highlighted effect.

CylGizmo Helper

Create panel > Helpers > Atmospheric Apparatus (from drop-down list) > CylGizmo

Create menu > Helpers > Atmospherics > Cylinder Gizmo

CylGizmo lets you create a cylinder-shaped gizmo in your scene. Clicking the CylGizmo button displays the Cylinder Gizmo Parameters rollout.



Cylinder gizmo with volume fog

Procedures

To create the CylGizmo:

1. Drag in a viewport to define the initial radius, then release the mouse and drag vertically to set the initial height.
2. Click to end CylGizmo creation.

To add a new atmosphere:

1. Select the apparatus gizmo.
2. In the Modify panel on the Atmospheres & Effects rollout, click Add. This displays the *Add Atmosphere dialog (page 3–300)*.
3. Choose an atmosphere from the list.
4. Click OK.

   This associates a new atmosphere with the apparatus.

To add an existing atmosphere:

1. Select the apparatus gizmo.
2. In the Modify panel on the Atmospheres & Effects rollout, click Add. This displays the *Add Atmosphere dialog (page 3–300)*.
3. In the dialog, choose Existing.
4. Choose an atmosphere from the list.
5. Click OK.

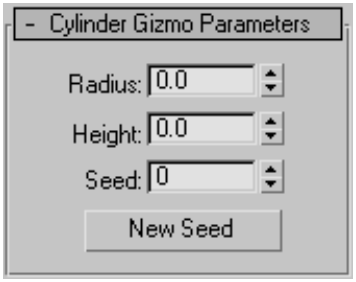
This creates a duplicate atmosphere for the apparatus. Its settings are initially identical to the atmosphere you chose. You can adjust them using Setup.

Interface

Name and Color rollout

The *Name and Color rollout (page 3–800)* lets you rename objects and change their wireframe color.

Cylinder Gizmo Parameters rollout



Radius and Height—Set the dimensions of the cylinder gizmo.

Seed—Sets a base value used to generate the atmospheric effect. Each apparatus in the scene should have a different seed. If more than one apparatus uses the same seed and same atmospheric effect, they will produce nearly identical results.

New Seed—Click to generate a random number automatically and place it in the seed field.

Atmospheres & Effects rollout

The Atmospheres & Effects rollout, available from the Modify panel, allows you to add and set up atmospheres directly to the gizmo.

Add—Displays the *Add Atmosphere dialog (page 3–300)* from which you can add an Atmosphere to the CylGizmo.

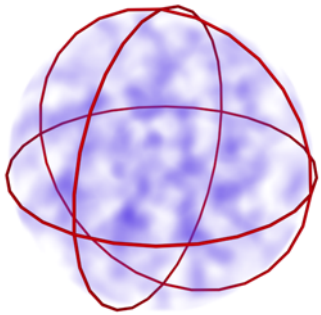
Delete—Deletes a highlighted atmospheric effect.

Setup—Displays the *Environment panel (page 3–268)*, where you can edit the highlighted effect.

SphereGizmo Helper

Create panel > Helpers > Atmospheric Apparatus (from drop-down list) > SphereGizmo
Create menu > Helpers > Atmospherics > Sphere Gizmo

SphereGizmo lets you create a sphere- or hemisphere-shaped gizmo in your scene. Clicking the SphereGizmo button displays the Sphere Gizmo Parameters rollout.



Sphere gizmo with volume fog

Procedures

To create the SphereGizmo:

1. Drag in any viewport to define the initial radius.
2. Adjust the radius with the spinner.

To add a new atmosphere:

1. Select the apparatus gizmo.
2. In the Modify panel on the Atmospheres & Effects rollout, click Add. This displays the *Add Atmosphere dialog (page 3–300)*.
3. Choose an atmosphere from the list.
4. Click OK.

   This associates a new atmosphere with the apparatus.

To add an existing atmosphere:

1. Select the apparatus gizmo.
2. In the Modify panel on the Atmospheres & Effects rollout, click Add. This displays the *Add Atmosphere dialog (page 3–300)*.
3. In the dialog, choose Existing.
4. Choose an atmosphere from the list.
5. Click OK.

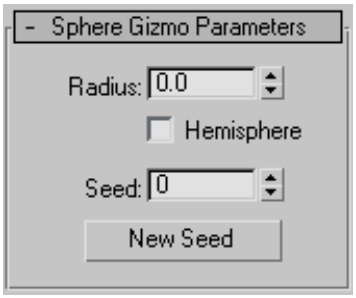
   This creates a duplicate atmosphere for the apparatus. Its settings are initially identical to the atmosphere you chose. You can adjust them using Setup.

Interface

Name and Color rollout

The *Name and Color rollout (page 3–800)* lets you rename objects and change their wireframe color.

Sphere Gizmo Parameters rollout



Radius—Sets the radius of the default sphere.

Hemisphere—When turned on, the bottom half of the SphereGizmo is discarded, creating a hemisphere.

Seed—Sets a base value used to generate the atmospheric effect. Each apparatus in the scene should have a different seed. If more than one apparatus uses the same seed and same atmospheric effect, they will produce nearly identical results.

New Seed—Click to generate a random number automatically and place it in the seed field.

Atmospheres & Effects rollout

The Atmospheres & Effects rollout, available from the Modify panel, allows you to add and set up atmospheres effects directly to the gizmo.

Add—Displays the *Add Atmosphere dialog (page 2–1195)* from which you can add an Atmosphere to the SphereGizmo.

Delete—Deletes a highlighted atmospheric effect.

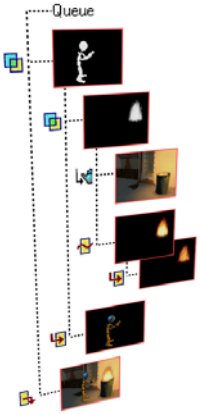
Setup—Displays the *Environment panel (page 3–268)*, where you can edit the highlighted effect.

19 Video Post-Production

Video Post

Rendering menu > Video Post

Video Post provides composited rendered output of various types of events, including the current scene, bitmap images, image processing functions, and so on.



A video post queue can include scene geometry, background images, effects, and masks for compositing them.

The result of video post: a composited frame

Video Post is a self-contained, modeless dialog, similar in appearance to Track View. The edit window of the dialog shows when each event occurs in the finished video. Each event is associated with a track that has a range bar.

The Video Post dialog contains the following window components:

Video Post Queue (page 3–308): Shows the sequence of post-production events.

Video Post Status Bar/View Controls (page 3–317): Shows information about the active Video Post controls and lets you control the display of tracks in the event tracks area.

Video Post Toolbar (page 3–319): Provides Video Post commands.

Procedure

To use the Video Post dialog:

1. Choose Rendering > Video Post.

   This displays the Video Post dialog.

2. Create a new Video Post sequence by adding events to the queue, or open an existing Video Post file in order to edit it.

Video Post Queue

Rendering menu > Video Post > Video Post window > Video Post Queue

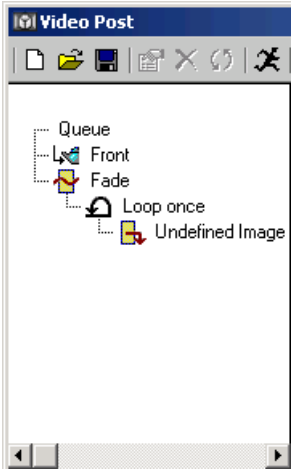
Video Post Queue provides a hierarchical list of the images, scenes, and events to be composited.

The Video Post queue in the Video Post dialog is similar to other hierarchical lists in the Track View and Material Editor. In Video Post, the list items are images, scenes, *animations (page 3–1003)*, or external processes that together make up the queue. The items in the queue are called *events*.

The order that the events appear in the queue is the order in which they are executed, from top to bottom. Consequently, to correctly composite an image, the background bitmap must appear before, or above, the image that is to overlay it.

There is always at least one item in the queue (a placeholder labeled Queue). It is the queue's parent event.

The queue can be linear, but some kinds of events, such as Image Layer, combine other events and become their parent.



Procedures

To add an event to the queue:

- Click an event button.

  When you add an event, a dialog displays where you can specify settings for that event. The settings offered on the dialog depend on the type of event; some events have different kinds of subtypes.

  In general, the new event appears at the end of the queue - but some kinds of events require that you first select one or more events in the queue. An event button is unavailable if the selection in the queue (or the absence of one) is not legal input to the button's type of event.

  To highlight an event already in the queue, click its icon, label, or range-bar area.

To delete any event in the queue:

- Select the event and press the Delete key.

  You can delete both enabled and disabled events, which are unavailable.

To switch the positions of two events in the queue:

1. Highlight both events.
2. Click Swap.

This operation might not be allowed if the result would be impossible to execute. At the top level of the queue, you can almost always swap events; at lower levels, an event's output must be legal input to its parent event.

To edit an event in the queue, do one of the following:

- Select the event and click *Edit Current Event (page 3–320)*.
- Double-click the event name.
- Double-click the event's range-bar area in the edit window.

  Use one of the second two methods for disabled events.

Useful Video Post Procedures

Rendering menu > Video Post

There are some tasks that you will use Video Post for more than others. This primer describes some of the more common sequences you'll find yourself using Video Post to create. The procedures are outlined in their simplest forms.

The following procedures are outlined:

- *Make an object glow (page 3–309)*
- *Create an animation from a series of still images (page 3–310)*
- *Render a scene with a starfield (page 3–310)*
- *Set up a simple cross fade between two images (page 3–311)*
- *Resize a series of images (page 3–312)*
- *Composite two image sequences (page 3–313)*
- *Render a scene over an image sequence or an animation (page 3–313)*
- *Join two animations – end to end (page 3–314)*
- *Switch between views (page 3–315)*
- *Render a scene in reverse (page 3–316)*

Procedures

Example: Make an object glow:

One of the most common things you'll want to do with the Glow filter is make an object glow. Here's how to do it in its simplest form.

1. In the Perspective viewport, create a Sphere with a radius of about 30.
2. Choose Rendering > Video Post.
3. Click *Add Scene Event (page 3–325)* and set the view to Perspective.

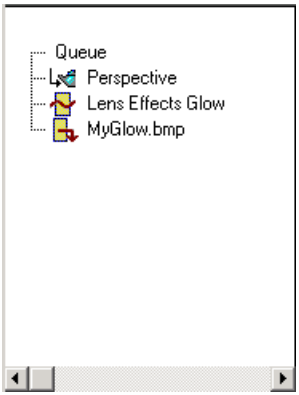
   Click OK to close the Add Scene Event dialog.
4. Click *Add Image Filter Event (page 3–330)* and choose Lens Effects Glow from the Filter Plug-In list.

   Click OK to close the Add Image Filter Event dialog.
5. Click *Add Image Output Event (page 3–334)* and then click Files.
6. Set the output file format to BMP Image File and enter a filename like **MyGlow**.

   Click Save when you've set the name and format
7. Click OK to accept the default setting on the BMP configuration dialog.

   Then click OK to close the Add Image Output Event dialog.
8. Right-click the Sphere to bring up the Quad Menus and select Properties.
9. Set the Object Channel in the G-Buffer group to **1** and click OK.
10. Click the *Execute Sequence button (page 3–321)*.
11. Click Render on the Execute Video Post dialog.

    You'll see the a glowing sphere in the render window.



Example: Create an animation from a series of still images:

Another common process you'll use Video Post to achieve is taking a series of still images you've rendered and convert them to an animation. To accomplish this task, you need an *IFL file (page 3–666)*.

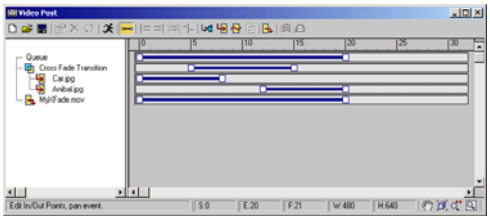
1. Use the *IFL Manager Utility (page 3–668)* to create an IFL file containing the sequentially number image files you want to process.
2. Choose Rendering > Video Post.
3. Click *Add Image Input Event (page 3–328)* and then click Files.

   Choose the IFL file you created at step 1 and then click Open to close the selection dialog.
4. Click OK to close the Add Input Image Event dialog.
5. Click *Add Image Output Event (page 3–334)* and then click Files.
6. Set the output file format to *AVI File (page 3–658)* and enter a filename like **MyAnimation**.

   Click Save when you've set the name and format
7. Select a *codec (page 3–1015)* from the Video Compression dialog and click OK.

   Then click OK to close the Add Image Output Event dialog.
8. Click the *Execute Sequence button (page 3–321)*.
9. Click Render on the Execute Video Post dialog.

   The final product is an animation.



Example: Render a scene with a starfield:

At some time, you'll want to create a night scene that requires a starry sky. The key thing to remember when creating a star field is adding a camera to the scene. The Starfield filter only works with a camera. Here are the steps to set that up.

1. In the Top viewport, create a Sphere with a radius of about 30 and a Target Camera.

   Place the camera to one side and have it pointing at the center of the sphere.
2. Right-click in the Perspective viewport and type **C** to change the viewport display to Camera01.
3. Choose Rendering > Video Post.
4. Click *Add Scene Event (page 3–325)* and set the view to Perspective.

   Click OK to close the Add Scene Event dialog.
5. Click *Add Image Filter Event (page 3–330)* and choose Starfield from the Filter Plug-In list.

   Click OK to close the Add Image Filter Event dialog.
6. Click *Add Image Output Event (page 3–334)* and then click Files.

7. Set the output file format to BMP Image File and enter a filename like **MyStarfield**.

   Click Save when you've set the name and format

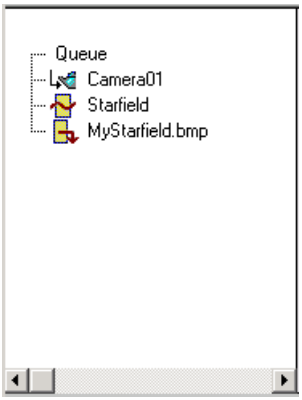
8. Click OK to accept the default setting on the BMP configuration dialog.

   Then click OK to close the Add Image Output Event dialog.

9. Click the *Execute Sequence button (page 3–321)*.

10. Set the time output to Single and click Render on the Execute Video Post dialog.

    The final product is a sphere against a starry background.



Set up a simple cross fade between two images:

Sometimes you want to transition from one view or animation to another. This set of steps with show you how to set up a cross fade from one image to another. For this example the complete cross fade will occur over 20 frames displaying the first image for five frames, cross fade for ten frame and then display the second image for the last five frames.

The resulting animation produced by this process could be used as an Image Input Event for a different Video Post sequence.

1. Choose Rendering > Video Post.

2. Click *Add Image Input Event (page 3–328)* and then click Files.

   Choose your first image and click Open and then click OK to close the Add Image Input Event dialog.

3. Click Add Image Input Event again and click Files.

   Choose your second image and click Open and then click OK to close the Add Image Input Event dialog.

4. Click *Add Image Output Event (page 3–334)* and then click Files.

5. Set the output file format to MOV File and enter a filename like **MyXFade**.

   Click Save when you've set the name and format

6. Click OK to accept the default setting on the Compression Settings dialog.

   Then click OK to close the Add Image Output Event dialog.

7. Select the first Image Input Event and then hold down the CTRL key while selecting the second Image Input Event.

   Both events will highlight in gold.

8. Click *Add Image Layer Event (page 3–331)* and choose Cross Fade Transition from the list of compositors and transitions.

   Click OK to close the Add Image Layer Event dialog. Notice how the Image Layer Event becomes the parent of the two Image Input Events.

9. Click Zoom Extents to view the entire set of tracks.

10. On the Queue track bar, click and drag the right-hand end of the range-bar to frame 20.

    This adjusts all the tracks.

11. Select the Cross Fade Transition event and drag the left-hand end of the range-bar to frame 5 and then drag the right-hand end of the range-bar to frame 15.

    This sets the period in time when the cross fade occurs.

12. Select the track for the first Image Input Event and the right-hand end of the range-bar to frame 8.

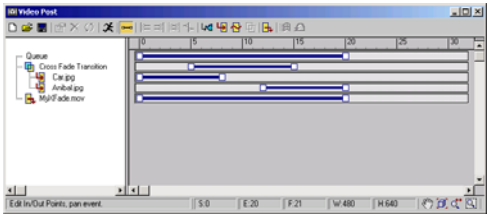
    By setting the end to frame 8 instead of 5, you'll have three frames during which the first image will fade to black.

13. Select the track for the second Image Input Event and the left-hand end of the range-bar to frame 12.

    Similarly, setting this end to frame 12 ensures that the second image will fade in over three frames and display in full color for the last five frame of the transition.

14. Click the *Execute Sequence button (page 3–321)*.

15. Click Render on the Execute Video Post dialog.



Example: Resize a series of images:

Perhaps you've rendered a series of still images but it turns out they were at the wrong resolution. You might normally think you have to re-render the entire scene again which will tie up all the systems to do the same work they just completed. Video Post can be used to resize the images without having to use all the systems.

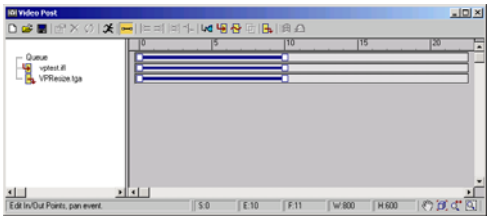
1. Use the *IFL Manager Utility (page 3–668)* to create an IFL file containing the sequentially number image files you want to resize.
2. Choose Rendering > Video Post.
3. Click *Add Image Input Event (page 3–328)* and then click Files.

   Choose the IFL file you created at step 1 and then click Open to close the selection dialog.
4. Click OK to close the Add Input Image Event dialog.
5. Click *Add Image Output Event (page 3–334)* and then click Files.
6. Set the output file format for the new set of still images to TGA and enter a filename like **MyResize**.

   Click Save when you've set the name and format
7. Click OK to accept the default setting on the Targa Image Control dialog.

   Then click OK to close the Add Image Output Event dialog.
8. Click the *Execute Sequence button (page 3–321)*.
9. On the Execute Video Post dialog, set the new output resolution you want for the images and then click Render.

   When the rendering is complete, you will have a new series of resized images that have a name prefix of MyResize. So, if there were ten images listed in the IFL file, there will be ten new images named *MyResize0000.tga* through *MyResize0009.tga* stored in your image folder.



Example: Composite two image sequences:

Compositing two sets of images together is one of the "workhorse" operations of Video Post. This is commonly done when a project is nearing completion and it lets you combine all the images your artists have been rendering.

1. Use the *IFL Manager Utility (page 3–668)* to create an IFL file for each set of images sequences you want to composite.
2. Choose Rendering > Video Post.
3. Click *Add Image Input Event (page 3–328)* and then click Files.

   Choose your first IFL file and click Open and then click OK to close the Add Image Input Event dialog.
4. Click Add Image Input Event again and click Files.

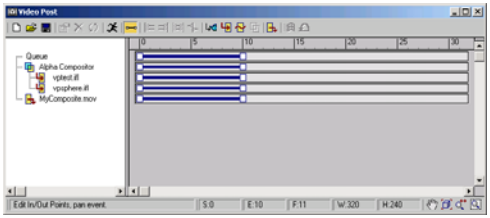
   Choose your second IFL file and click Open and then click OK to close the Add Image Input Event dialog.
5. Click *Add Image Output Event (page 3–334)* and then click Files.
6. Set the output file format to MOV File and enter a filename like **MyComposite**.

   Click Save when you've set the name and format
7. Click OK to accept the default setting on the Compression Settings dialog.

   Then click OK to close the Add Image Output Event dialog.
8. Select the first Image Input Event and then hold down the CTRL key while selecting the second Image Input Event.

   Both events will highlight in gold.
9. Click *Add Image Layer Event (page 3–331)* and choose *Alpha Compositor (page 3–363)* from the list of compositors and transitions.

   Click OK to close the Add Image Layer Event dialog. Notice how the Image Layer Event becomes the parent of the two Image Input Events.
10. Click the *Execute Sequence button (page 3–321)*.
11. Click Render on the Execute Video Post dialog.



Example: Render a scene over an image sequence or an animation:

This process in similar to the last one except you might have an animation or series of still images you want to use as the background for your existing scene.

1. Use the *IFL Manager Utility (page 3–668)* to create an IFL file for the set of images that will be the background for your current scene.
2. Choose Rendering > Video Post.
3. Click *Add Image Input Event (page 3–328)* and then click Files.

   Choose your IFL file or animation and click Open and then click OK to close the Add Image Input Event dialog.

4. Click *Add Scene Event (page 3–325)* and set the view to Perspective or a Camera you have in the scene.

   Click OK to close the Add Scene Event dialog.

5. Click *Add Image Output Event (page 3–334)* and then click Files.

6. Set the output file format to AVI File and enter a filename like **MyScene**.

   Click Save when you've set the name and format

7. Select a *codec (page 3–1015)* from the Video Compression dialog and click OK.

   Then click OK to close the Add Image Output Event dialog.

8. Select the first Image Input Event and then hold down the CTRL key while selecting the Scene Event.

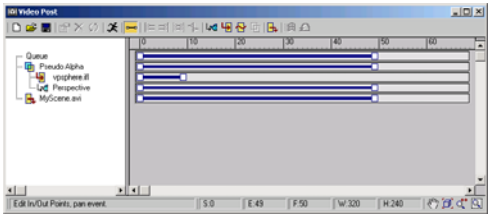
   Both events will highlight in gold.

9. Click *Add Image Layer Event (page 3–331)* and choose *Pseudo Alpha (page 3–363)* from the list of compositors and transitions.

   Click OK to close the Add Image Layer Event dialog. Notice how the Image Layer Event becomes the parent of the two Image Input Events.

10. Click the *Execute Sequence button (page 3–321)*.

11. Click Render on the Execute Video Post dialog.



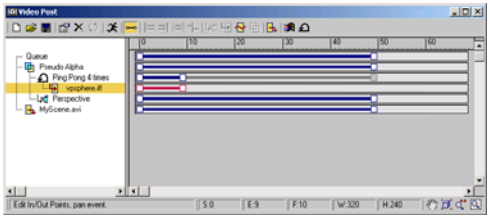
   Notice that the Image Input Event in this example is only ten frames long. Normally, you'd choose a set of background images that equals the number of frames in your scene. When this sequence is executed, as is, the images in the IFL file will only appear for the first ten frames and then disappear.

12. Select the Image Input Event just under the Pseudo Alpha layer event.

13. Add a Loop Event and set the number of times to **4**.

   The Image Input Event becomes further nested in the queue. If you want, you can use the default Loop setting or change it to Ping Pong then click OK to close the Add Loop Event dialog.

14. Click the Execute Sequence button again and render the scene.



Join two animations – end to end:

If you're working in a production environment, you probably do not work on an entire animation by yourself. Instead, you might work on one part while other artists are working on other parts. At the end of the project, everyone's animations need to be joined together.

1. Choose Rendering > Video Post.

2. Click *Add Image Input Event (page 3–328)* and then click Files.

   Choose your first animation file and click Open and then click OK to close the Add Image Input Event dialog.

3. Click Add Image Input Event again and click Files.

   Choose the next animation file and click Open and then click OK to close the Add Image Input Event dialog.

4. Repeat the last step for any other animations that need to be joined.

5. Click *Add Image Output Event (page 3–334)* and then click Files.

6. Set the output file format to MOV File and enter a filename like **MyFinal**.

   Click Save when you've set the name and format

7. Click OK to accept the default setting on the Compression Settings dialog.

   Then click OK to close the Add Image Output Event dialog.

8. Select the first Image Input Event and then hold down the CTRL key while selecting the second Image Input Event.

   Both events will highlight in gold.

9. Click the *Abut Selected button (page 3–325)*.

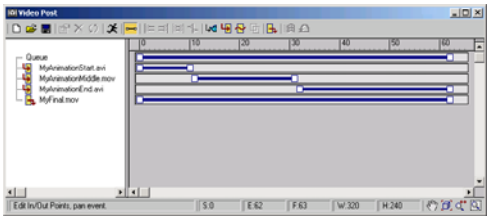
10. Repeat the last two step with subsequent Image Input Events.

11. Click Zoom Extents to view the entire set of tracks.

12. Select the Image Output Event and drag the right end of the range-bar to match the total number of frames in the queue.

13. Click the *Execute Sequence button (page 3–321)*.

14. Click Render on the Execute Video Post dialog.



Switch between views:

It's not often that a final scene shows views from only one viewpoint. Either the camera moves or there are multiple cameras from which images are rendered. This sequence shows you how to switch from one camera view to another.

1. In the Perspective viewport, create a Box with a length of 15, a width of 30 and a height of 15.

2. In the Top viewport, create two Target Cameras pointing at the box from different angles.

3. Right-click the viewport label in the Left viewport and choose Views > Camera01.

4. Right-click viewport label in the Perspective viewport and choose Views > Camera02.

5. Choose Rendering > Video Post.

6. Click *Add Scene Event (page 3–325)* and set the view to Camera01.

   Click OK to close the Add Scene Event dialog.

7. Click Add Scene Event again and set the view to Camera02.

   Click OK to close the Add Scene Event dialog.

8. Select the first Scene Event and then hold down the CTRL key while selecting the second Scene Event.

   Both events will highlight in gold.

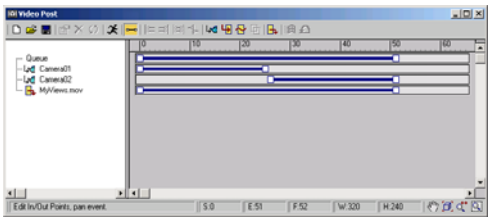
9. Click the *Abut Selected button (page 3–325)*.

10. Click in an empty part of the queue to deselect the two Scene Events.

11. Click *Add Image Output Event (page 3–334)* and then click Files.
12. Set the output file format to MOV File and enter a filename like **MyViews**.

    Click Save when you've set the name and format
13. Click OK to accept the default setting on the Compression Settings dialog.

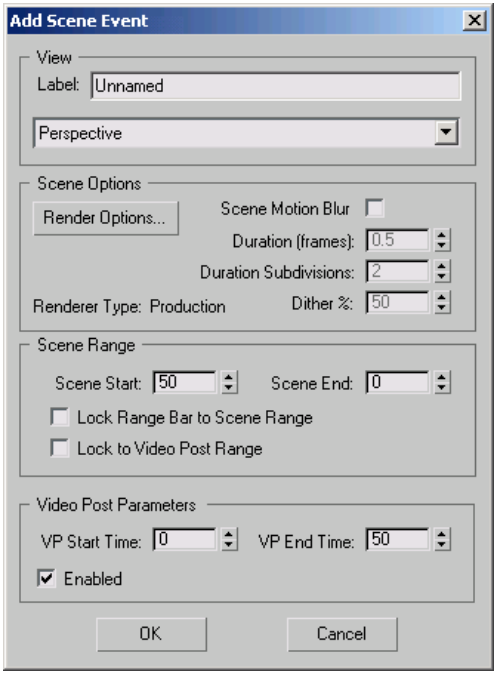
    Then click OK to close the Add Image Output Event dialog.
14. Click the *Execute Sequence button (page 3–321)*.
15. Click Render on the Execute Video Post dialog.



Render a scene in reverse:

It's not too commonly done but when you need to render a scene in reverse you could spend hours trying to accomplish it. Video Post makes it easy.

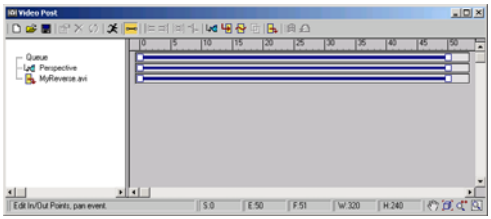
1. Choose Rendering > Video Post.
2. Click *Add Scene Event (page 3–325)* and set the view to Perspective or a camera in the scene.
3. In the Scene Range group, turn off Lock To Video Post Range and set the Scene Start value to the last frame of animation.
4. Turn off Lock Range Bar To Scene Range and set the Scene End value to 0.



5. Click OK to close the Add Input Image Event dialog.
6. Click *Add Image Output Event (page 3–334)* and then click Files.
7. Set the output file format to AVI File and enter a filename like **MyReverse**.

   Click Save when you've set the name and format
8. Select a *codec (page 3–1015)* from the Video Compression dialog and click OK.

   Then click OK to close the Add Image Output Event dialog.
9. Click the *Execute Sequence button (page 3–321)*.
10. Click Render on the Execute Video Post dialog.



Video Post Status Bar / View Controls

Rendering menu > Video Post > Video Post Status Bar

The Video Post Status Bar contains an area for prompt and status information and for buttons to control the display of tracks in the event tracks area.

Interface

Prompt Line

Edit In/Out Points, pan event.

Displays instructions for using the currently selected function.

Status (Start, End, Frames, Width, Height)

S:0	E:201	F:202	W:720	H:486

Displays the Start frame and End frame for the current event, the total number of frames and the output resolution of the entire queue.

S/E—Shows start and end frames of the selected track. If no track is selected, shows the start and end frames of the entire queue.

F—Shows the total frames in the selected track or for the entire queue.

W/H—Shows the width and height of the image that results from the rendering of all the events in the queue.

Pan

Lets you drag horizontally in the event tracks area to shift the view left and right.

Zoom Extents

Adjusts the size of the event-track area horizontally so that all the frames of the longest track bar are visible.

Use Zoom Extents to quickly reset the display to show all frames after zooming in on a selection of frames with the Zoom Time button.

Zoom Time

Displays a greater or lesser number of frames in the event tracks area, allowing you to scale or zoom the display. The time ruler displays the current time display unit.

Drag horizontally in the event tracks area to zoom time.

Drag right to display fewer frames in the track area (zoom in).

Drag left to display more frames in the track area (zoom out).

Zoom Region

Magnifies a region that you define by dragging a rectangle in the event tracks area.

Troubleshooting Video Post

While Video Post offers many useful functions and creative effects, invariably you will set up a queue that looks like it should work or even appears to render correctly only to give you an animation that does not include the desired effect. Here are some troubleshooting tips to reference when a queue just isn't doing what you expect.

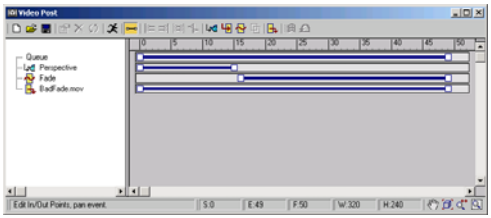
There are two key things that can cause a Video Post queue to fail. The first is incorrect ordering and nesting of events in the queue. The second is faulty positioning and/or overlapping of the range bars.

When you come up again a problem, especially if you're attempting to set up a very complex queue, the best way to diagnose the problem is to create a new queue that should only result in the effect that is failing. If you can get the simplified queue to work, you can compare it to the structure of the failing queue to see what might be out of order.

Here are two very common scenarios that look like they should work but ultimately don't give you the result you expected. These examples are shown in their simplified state, but could very easily be buried in more complex queues.

- **The object simply disappears instead of fading out.**

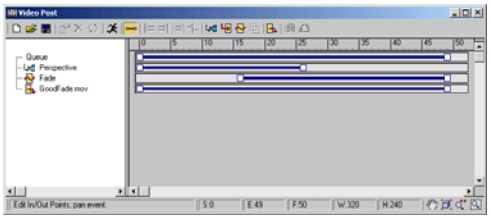
  The first example illustrates a problem where you expect the scene to render for fifteen frames before fading to black to finish the animation. However, at frame sixteen, the scene abruptly goes black.



  This queue shows all the correct events in the proper order in the queue. The problem is the timing and positioning of the range bars. The most likely cause of this problem is using the *Abut Selection (page 3–325)* when it's not necessary. In order for the Fade event to work properly, it needs to overlap the animation for the amount of time you want to fade to occur.

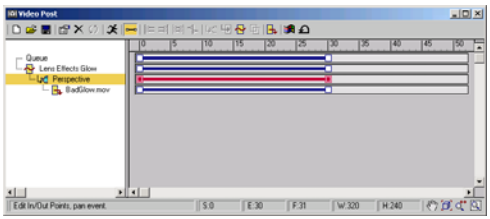
  You need to take into account the number of frames where the scene actually fades.

  To fix this queue, you have to decide how many frames over which the fade will occur. Let's say you want the scene to fade to black over ten frames. You would need to drag the right end of the Perspective event range bar ten frames to the right to overlap the Fade event.



- **The object glows during rendering, but not in the animation.**

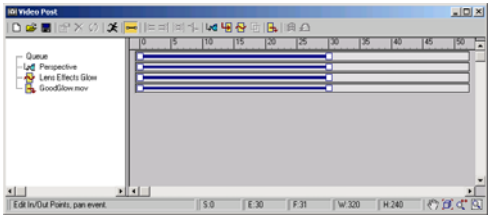
  This second example is even more misleading than the first. The infuriating thing about this problem is that while the scene is rendering, the object in the scene shows the glow effect. When the resultant animation is played back, the Glow effect is not present.

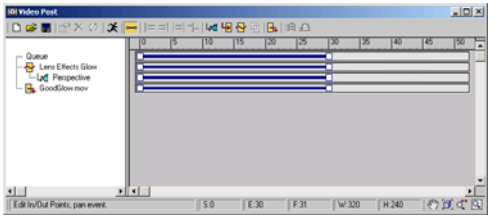


  Once again, this queue shows all the correct events, but the problem here is the ordering of the events in the queue. This problem is commonly caused when an event is selected while other events are being added. In this case, the Perspective event was select when the Lens Effects Glow and output events were added.

  There are two ways to create this queue to give you the correct results. You can recreate the queue and add each event so there is no nesting,

or you remove the current output event and add it again, making sure no other events are selected. The following images show the two ways this queue could be set up to successfully show the glowing object.





Video Post Toolbar

Rendering menu > Video Post toolbar

The Video Post Toolbar contains tools for handling Video Post files (*VPX files (page 3–1125)*) and for managing the individual events displayed in the Video Post queue and event tracks area.

New Sequence

Rendering menu > Video Post > Video Post toolbar > New Sequence

The New Sequence button creates a new Video Post sequence by clearing existing events from the queue.

You'll be prompted to confirm the deletion of any entries in the current queue.

Procedure

To create a new Video Post file:

- Click New Sequence.

Warning: This command erases all the current Video Post data.

Use New Sequence after you have saved to a different Video Post (VPX) file. Choosing Video Post from the Rendering menu displays the Video Post data (if any) saved with your 3ds Max scene.

Open Sequence

Rendering menu > Video Post > Video Post toolbar > Open Sequence

The Open Sequence button opens a Video Post sequence stored on disk.

Video Post sequences contain all the information relating to the queue and all associated settings and references. *VPX files (page 3–1125)* have the file extension *.vpx* and are stored by default in the *|3dsmax|vpost* folder.

Procedure

To open an existing Video Post file:

- Click Open Sequence.

  Use the file selection dialog that appears to choose the VPX file you want to execute or edit.

To import an existing Video Post sequence:

You can also use Open Sequence to import the Video Post queue from a 3ds Max scene (MAX file).

1. Click Open Sequence.

2. On the Open Sequence dialog, change the Files Of Type setting to All Files (*.*)
3. Browse to the folder where you store your MAX files.
4. Select the MAX file that contains the Video Post sequence you want to execute or edit and click Open.

   Video Post loads only the Video Post data from the existing *.max* file, leaving your current scene unchanged.

Save Sequence

Rendering menu > Video Post > Video Post toolbar > Save Sequence

The Save Sequence button saves the current Video Post sequence to disk.

All of the Video Post configuration data, the queue events themselves, and any queue event external data are saved in the MAX file. You can also save the Video Post sequence to a separate file for sharing with other 3ds Max users.

Video Post sequence files contain all the information relating to the queue and all associated settings and references. *VPX files (page 3–1125)* have the file extension *.vpx* and are stored by default in the *|3dsmax|vpost* folder.

Procedure

To save the active Video Post data:

- Click Save Sequence.

  A file selection dialog appears to let you enter a name for the new Video Post file.

  By default, Save Sequence stores the VPX file to the *|3dsmax|vpost* subdirectory. You can change the default path to another directory via the Configure User Paths dialog > *File I/O panel (page 3–856)*.

Edit Current Event

Rendering menu > Video Post > Video Post window > Select an event. > Video Post toolbar > Edit Current Event

The Edit Current Event button displays a dialog that lets you edit the properties of the selected event.

The Edit Event dialog changes to provide different controls, depending on the type of event you've selected. The top field in each event dialog is an editable label field. If the field is left blank, the event uses its assigned label. If you enter an event name, the Video Post Queue displays your event name in the field.

You can edit the following types of events:

Edit Scene Event (page 3–338)

Edit Image Input Event (page 3–341)

Edit Filter Event (page 3–344)

Edit Layer Event (page 3–345)

Edit Output Image Event (page 3–347)

Edit External Event (page 3–348)

Edit Loop Event (page 3–349)

Procedure

To edit an event in the queue, do one of the following:

- Select the event and click the Edit Current Event button.
- Double-click the event name.
- Double-click the event's range-bar area in the edit window.

Use the second or third method above with *disabled* events.

Delete Current Event

Rendering menu > Video Post > Video Post window > Select an event. > Video Post toolbar > Delete Current Event

The Delete Current Event button deletes the selected event from the Video Post Queue.

You'll be asked to confirm event deletion.

Procedure

To delete any event in the queue:

- Select the event and press the Delete key.

  You can delete both enabled and disabled events, which are unavailable.

Swap Events

Rendering menu > Video Post > Video Post window > Select two events. > Video Post toolbar > Swap Events

The Swap Events button switches the position of two selected events in the queue.

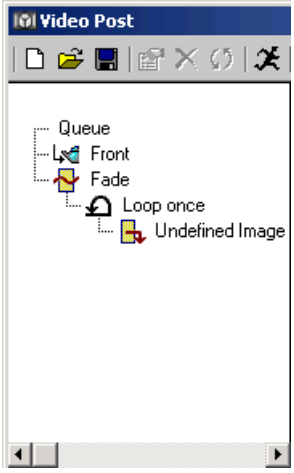
This is useful if you have images in the wrong order for compositing. The background image has to be first and the foreground image with the *alpha channel (page 3–1001)* has to be second.

Procedure

To switch the positions of two events in the queue:

1. Highlight both events.
2. Click Swap.

Swap Events might not be allowed if the result would be impossible to execute.



In this sample queue, the two top level events, Front and Fade, could be swapped. You can almost always swap events at the top level.

However, at lower levels, where events start getting nested, the output of a lower level event must be valid input to its parent event. In the sample queue, the output of the Loop Once event would not be recognized by the Fade event, so the Swap Events button remains inactive and you cannot swap them.

Execute Sequence

Rendering menu > Video Post > Video Post toolbar > Execute Sequence

You execute the Video Post queue as the final step in creating a post-produced video. Execution is different from rendering because rendering is done for scenes only and you can use Video Post to composite images and animations without including the current 3ds Max scene.

Although the Execute Video Post controls are similar to those in the Render Scene dialog, the setting are independent, and do not affect each other.

During execution, you can move or close the rendered frame window, but you can't use the rest of 3ds Max until the execution is completed or cancelled.

The rendering time for the last rendered frame in the Video Post sequence is displayed in the prompt line of the main 3ds Max window.

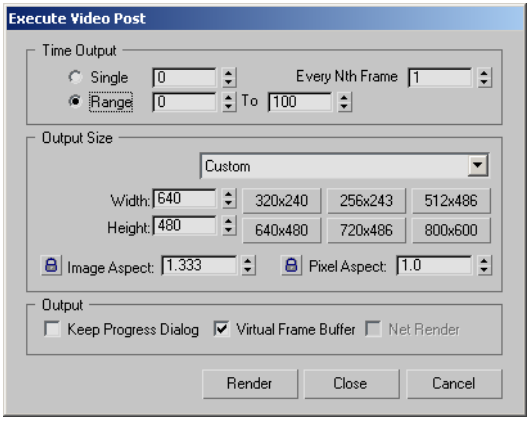
Procedure

To execute the queue:

1. Click Execute Sequence.

   An Execute Video Post dialog appears.
2. Set the time range and output size, and then click Render to create the video.
3. When execution is done, click Close to dismiss the Video Post progress dialog if it is still open.

Interface



Time Output group

Select the frames to execute:

Single—Current frame only.

You can execute a single frame only if it falls within the current range.

Range—All the frames between and including the two numbers.

Every Nth frame—Regular sample of frames. For example, enter 8 to execute every 8th frame.

Output Size group

Format—Choose Custom or a standard film or video format from the list. For Custom, you can set the aperture width of the camera, the rendering output resolution, and the image aspect ratio or pixel aspect ratio. When you choose a standard format, the aperture width and aspect ratios are locked, but you can change the resolution.

Width/Height—Specify the width and height of the image, in pixels. For Custom, you can set these two spinners independently. For other formats, the two spinners are locked to the specified aspect ratio, so changing one changes the other.

Resolution Buttons—Specifies a preset resolution. Right-click a button to display a *subdialog (page 3–323)* that lets you change the resolution specified by that button.

Image Aspect—Sets the aspect ratio of the image. As you alter the Image Aspect, you also alter the Height value to maintain the correct aspect ratio. For standard formats, the image aspect ratio is locked, and this spinner is replaced by a text display.

If you lock the Image Aspect (by clicking the Lock button), Width and Height are locked to each other, so that changing one changes the other to maintain the image aspect ratio, and changing the Pixel Aspect value changes the Height value to maintain the image aspect ratio.

Pixel Aspect—Sets the aspect ratio of the pixels of the image. For standard formats, the pixel aspect ratio is determined by the format and this spinner is replaced by a text display.

If you lock the pixel aspect ratio (by clicking the Lock button), the Pixel Aspect spinner is replaced by a text display. The Lock button is available only for the Custom format.

Output group

Keep Progress Dialog—Forces the Video Post Progress dialog to remain displayed when the Video Post sequence has finished executing. By default, it closes automatically. If this option is selected, you must click the Close button to close the dialog.

Rendered Frame Window—Displays the Video Post execution in a window on the screen.

Net Render—Enables *network rendering (page 3–1073)*. If Net Render is turned on, when you render you'll see the *Network Job Assignment dialog (page 3–184)*.

Configure Presets

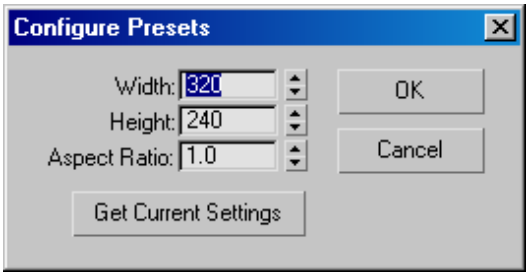
Rendering menu > Video Post > Video Post toolbar > Execute Sequence > Right-click any Resolution button. > Configure Presets dialog

If you use the Custom format for *Execute Sequence (page 3–321)*, you can change the values for any preset resolution button by right-clicking the button.

If you use one of the standard formats, the Width and Height spinners are locked to the standard's image aspect ratio, and the Aspect Ratio spinner is replaced by a text display.

After you change these values and exit the Configure Presets dialog, you must click the button to apply the new values to the Execute Sequence dialog.

Interface



Width—Specifies the width of the image, in pixels.

Height—Specifies the height of the image, in pixels.

Aspect Ratio—Sets the aspect ratio of the image. As you alter the Image Aspect value, you also alter the Height value so that the correct aspect ratio is maintained for the resolution.

Edit Range Bar

Rendering menu > Video Post > Video Post toolbar > Edit Range Bar

The Edit Range Bar provides editing functions for the range bars that appear in the event tracks area.

When Edit Range Bar is on, you can:

- Select any event by clicking its range bar (it turns red when selected).
- Move the range bar while maintaining its range by dragging in the middle of the bar.
- Change the start or end frame of the range by dragging either end of its bar.

Procedures

To select a range bar, do one of the following:

- Click the range bar in the event tracks area.
- Click the associated event name or icon in the queue.

To select multiple range bars:

1. Click a range bar.
2. Hold down CTRL and click additional range bars.

To select multiple contiguous range bars:

1. Click a range bar.
2. Hold down SHIFT and click another range bar.

   Both range bars you clicked and all range bars between them, if any, are selected.

   Note: In a multiple selection, the last range bar you select becomes the current event, displayed with red squares in its endpoints. The align commands use the current event.

To move a range bar:

- Click and drag the center of the range bar left or right.

To change the length of a range bar:

- Click and drag one of range bar's endpoints left or right.

  If multiple range bars are selected, dragging one endpoint changes all selected range bars.

To change the number of frames in an event:

- Double-click the range bar in the event tracks area or select the event and click the Edit Current Event button.
- Change the VP Start Time or VP End Time values.

Align Selected Left

Rendering menu > Video Post > Video Post window > Select two or more range bars. > Video Post toolbar > Align Selected Left

The Align Selected Left button left-aligns two or more selected range bars.

When you select two or more range bars, the last one selected is the current event. The end boxes of the other events are white, while the end boxes of the current event are red. When you click Align Selected Left, the current event stays in place, and the remaining selected events are aligned to its left end.

Procedure

To change the number of frames in an event, do one of the following:

- Double-click the range bar in the event tracks area.
- Click the Edit Current Event button in the toolbar.

Align Selected Right

Rendering menu > Video Post > Video Post window > Select two or more range bars. > Video Post toolbar > Align Selected Right

The Align Selected Right button right-aligns two or more selected range bars.

When you select two or more range bars, the last one selected is the current event. The end boxes of the other events are white, while the end boxes of the current event are red. When you click Align Selected Right, the current event stays in place, and the remaining selected events are aligned to its right end.

Procedure

To change the number of frames in an event, do one of the following:

- Double-click the range bar in the event tracks area.
- Click the Edit Current Event button in the toolbar.

Make Selected Same Size

Rendering menu > Video Post > Video Post window > Select one or more events. > Video Post toolbar > Make Selected Same Size

The Make Selected Same Size button makes all selected events the same size as the current event.

When you select two or more range bars, the last one selected is the current event. The end boxes of the other events are white, while the end boxes of the current event are red. When you click Make Selected Same Size, the current event stays in place, and the remaining selected events are expand or shrink to cover the same number of frames.

Procedure

To change the number of frames in an event, do one of the following:

- Double-click the range bar in the event tracks area.
- Click the Edit Current Event button in the toolbar.

Abut Selected

Rendering menu > Video Post > Video Post window > Select events in the queue. > Video Post toolbar > Abut Selected

The Abut Selected button places the selected events end-to-end, so that when one ends the next one starts.

The selected events are placed end-to-end according to their order in the queue.

Add Scene Event

Rendering menu > Video Post > Video Post window > Make sure no events are selected in the queue. > Video Post toolbar > Add Scene

The Add Scene Event button adds the scene in the selected camera viewport to the queue.

The scene is rendered exactly as it would be by the *scanline renderer (page 3–1100)*, with the additional options listed below. The resulting scene image has an *alpha channel (page 3–1001)*.

Procedures

To add a Scene event:

1. Make sure no events are selected in the queue.
2. Click Add Scene.

   An Add Scene Event dialog appears.
3. Choose a view to use from the View list.
4. Click Render Options to change rendering settings from the way you have set them in the Render Scene dialog.

   Note: Unlike settings in the Execute Video Post dialog, changes you make to the Scene event rendering options change the settings in the Render Scene dialog, and vice versa.
5. Set the Scene Range options and click OK.

   The Scene event appears at the end of the queue.

To match the scene's frames with Video Post frames:

- Make sure Lock to Video Post Range is selected.

  Lock to Video Post Range is the default. Frames in the scene match Video Post frames and have the same frame number. That is, frame 0 in the scene is frame 0 in the Video Post dialog, frame 15 in the scene is frame 15 in Video Post, and so on. The range bar for the Scene event represents which portion of the scene is selected. If the range bar covers Video Post frames 25 to 35,

executing the queue renders scene frames 25 to 35. Moving the range bar for the scene is like moving a time window within the scene.

Other Scene Range options are disabled when Lock to Video Post Range is selected.

To offset the scene in time:

- Select Lock Range Bar to Scene Range.

  The Scene Start control is enabled but the Scene End control remains disabled - synchronization is controlled by the Scene Start value and the length of the range bar.

  The Scene Start value is the scene frame number where playback begins. If Scene Start is 0, frame 0 of the scene is the first frame played back; if Scene Start is 12, frame 12 is the first frame to play, and so on.

  The range bar length determines how many frames of the scene to play. Dragging the end point of the range bar changes the length of the playback range. Although Scene End is unavailable, its value updates to show the frame number of the last scene frame that will be played.

  Dragging the range bar changes where the scene is played within the final video. For example, if you set Scene Start to 5 and move the range bar to begin at Video Post frame 20, frame 5 is played at frame 20 of the final video, and so on.

To offset the scene and change scene playback rate:

- Clear Lock Range Bar to Scene Range.

  With Lock Range Bar to Scene Range clear, both Scene Start and Scene End are enabled. As before, Scene Start specifies the first scene frame to play. Scene End specifies the last scene frame to play, and the length of the range bar determines playback speed.

  If the range bar specifies the same number of Video Post frames as there are corresponding scene frames, then playback is at the scene's playback rate. If the range bar specifies fewer frames, the scene is sped up. If the range bar specifies more frames, the scene is slowed down. When it executes, Video Post automatically skips frames or adds frames to control the speed of scene playback.

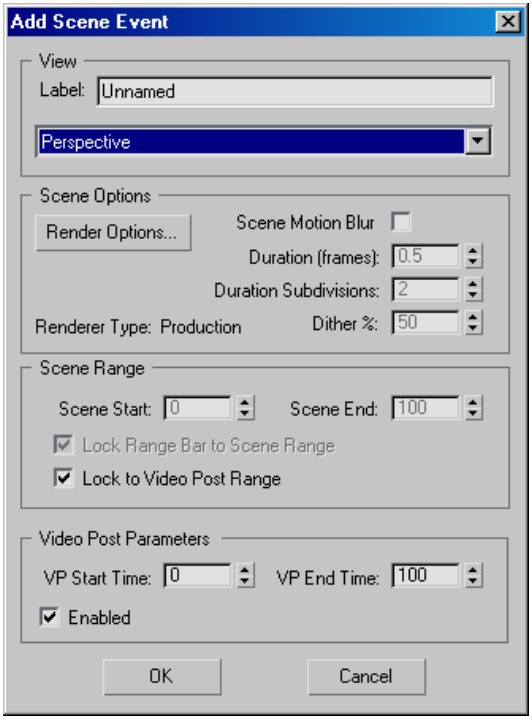
  For example, if Scene Start is frame 5 and Scene End is frame 35, the range bar represents 30 frames overall. If the range bar covers only 10 Video Post frames, scene playback is sped up to fit 30 frames into 10 of the final video. If on the other hand, the range bar covers 120 frames, scene playback is stretched to slow it down.

To add scene motion blur:

1. Select Scene Motion Blur in the Scene Event dialog.
2. Set the scene motion blur parameters.

   The Scene event generates motion blur by simulating a camera with an open shutter. It interpolates and then renders movement within a frame, to generate a series of images of the moving object, instead of the default single image.

Interface



The Add Scene Event dialog provides the following controls:

View group

Select the viewport you want to render and give it a unique name in the Label field.

Scene Options group

Enables various rendering effects.

Render Options—Displays a subset of the parameters in the Render Scene dialog. For information on these controls, see the *Common Parameters (page 3–27)* and *MAX Default Scanline A-Buffer (page 3–37)* help topics. Changes you make to the Scene Event Render Options affect the Render Scene dialog, as well.

Scene Motion Blur—Turns on the *scene motion-blur (page 3–1101)* effect for the whole scene. This is different from *object motion blur (page 3–1075)*, which creates motion blur for individual objects in the scene.

Scenes created with previous versions of 3ds Max that use both Object Motion Blur and Scene Motion Blur may not render correctly, due to changes to Object Motion Blur. Execute some test frames and adjust your blur settings if needed.

When you render with Scene Motion Blur activated, the Render Progress dialog tells you which subsample is being rendered. The information appears in parentheses to the right of the "Rendering Image" text. For example:

Duration—Sets the virtual shutter speed for motion blur. When it's set to 1.0, the virtual shutter is open for the entire duration between one frame and the next. When it's set to a smaller number (for example, 0.25), the number of subdivisions specified in the Duration Subdivision field will be rendered within the specified portion of the frame (in this example, in the first .25 of the duration between one frame and the next).

Duration Subdivision—Determines how many sub-frame slices are rendered within the Duration. The default is 2 slices, but you'll want at least 5 or 6 to get a decent effect.

Dither %—Sets the amount of *dithering (page 3–1023)* between blurred pixels of overlapping frame slices. If Dither % is set to 0, no dithering occurs.

Scene Range group

Sets the range of scene frames to be rendered.

Lock Range Bar to Scene Range—Becomes available when you deselect Lock to Video Post Range. When it's available, the End spinner is disabled and locked to the Video Post range. When you change the Start spinner it automatically updates the End spinner based on the Video Post range set for this event.

If you clear the box, you can change either Start or End spinners to whatever you want. This allows you to keep your scene range locked to its native length, and still provides flexibility for mapping an arbitrary scene range to an arbitrary Video Post range.

Lock to Video Post Range—Renders the same range of scene frames as Video Post frames. You can set the Video Post range in the Execute Video Post dialog.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Add Image Input Event

Rendering menu > Video Post > Video Post window > Make sure no events are selected in the queue. > Video Post toolbar > Add Image Input Event

The Add Image Input Event adds a still or moving image to the scene. Image Input events place an image in the queue, but unlike Scene events, the image is a file that was saved beforehand or a device-generated image.

The image can be in one of the following file formats:

AVI Files (page 3–658)

BMP Files (page 3–659)

CIN (Kodak Cineon) Files (page 3–659)

CWS (Combustion Workspace) Files (page 3–660)

FLC Files (page 3–662)

GIF Files (page 3–662)

HDRI Files (page 3–663)

IFL Files (page 3–666)

MOV (QuickTime Movie) Files (page 3–670)

MPEG Files (page 3–671)

JPEG Files (page 3–670)

PNG Files (page 3–678)

PSD Files (page 3–678)

RLA Files (page 3–680)

RPF Files (page 3–681)

RGB (SGI Image) Files (page 3–683)

TGA (Targa) Files (page 3–683)

TIFF Files (page 3–684)

YUV Files (page 3–685)

DDS Files (page 3–660)

Procedure

To add an Image Input event:

1. Make sure no events are selected in the queue.
2. Click Add Image Input Event.

   An Add Image Input Event dialog appears.
3. Click Files to choose a bitmap or animation as the image, or click Devices to choose an image-generating device.

   If you click Files, a file dialog appears to let you choose the bitmap or animation file.

   If you choose Devices, a Select Image Input Device dialog appears. This dialog has a list of installed device options.

4. Click Options to choose the size and placement of the image in the final video frames.

   An Image Input Options dialog appears.

5. Adjust other Image Input settings, and then click OK.

   The Image Input event appears at the end of the queue.

   Tip: Think of images that share the same time range as layers, comparable to matted film images in a compositor. Images that share a time range must be composited with an Image Layer event; otherwise, the second image in the queue "overwrites" the first.

Interface

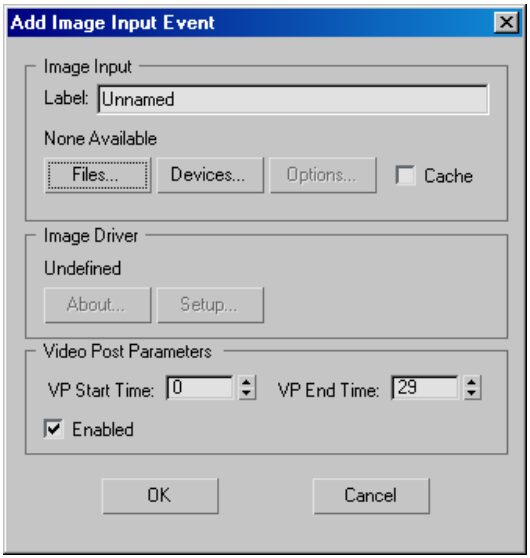


Image Input group

Label—Lets you give the event a unique name, making it easier to distinguish in a long list of events.

Files—Lets you choose the bitmap or animation image file.

Devices—Lets you choose an installed hardware input device, for example, a digital disk recorder.

Options—Displays the *Image Input Options dialog* *(page 3–342)* to allow you to set up alignment, size, and frame range for the input image.

Cache—Stores a bitmap in memory. If you are using a single-image bitmap, you can choose this option. Video Post won't reload or scale the image for each frame.

Image Driver group

These buttons are available only when you choose a device as the image source.

About—Provides information on the source of the image-handler software used to bring the image into 3ds Max.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Add Image Filter Event

Rendering menu > Video Post > Video Post window > Make sure no events are selected in the queue. > Video Post toolbar > Add Image Filter Event

The Add Image Filter Event provides image processing for images and scenes. Several kinds of image filters are provided, see list below. For example, the Negative filter inverts the colors of an image and the Fade filter fades an image in or out over time.

An Image Filter event is usually a parent event with a single child (which can itself be a parent with children), for example, a Scene event, an Image Input event, a Layer event that contains Scene or Image Input events, or a Filter event that contains Scene or Image Input events. You can also add an Image Filter without a child event, in which case the Image Filter processes the result of the previous events in the queue.

Available Image Filters

Add Contrast Filter (page 3–357)

Add Fade Filter (page 3–358)

Add Image Alpha Filter (page 3–358)

Add Lens Effects Filter (page 3–358)

Add Negative Filter (page 3–359)

Add Pseudo Alpha Filter (page 3–360)

Add Simple Wipe Filter (page 3–360)

Add Starfield Filter (page 3–361)

Procedures

To add an image filter event:

1. Either select a valid child event, or make sure no event is selected in the queue.
2. Click Add Image Filter Event.

   An Add Image Filter Event dialog appears.
3. Choose the kind of filter you want from the Filter Plug-In list.
4. If the Setup button is enabled for this kind of filter, click Setup to set the filter options.
5. Choose a mask if you want the filter to be masked or if the kind of filter you're using requires it.
6. Adjust other Image Filter settings, and then click OK.

   If you selected a child event, the Image Filter event becomes its parent. If no event was selected, the Image Filter event appears at the end of the queue.

To choose the mask file:

1. Click Files.
2. Use the file dialog to choose the mask file, and then click OK.
3. Choose the channel to use from the drop-down list of channels.

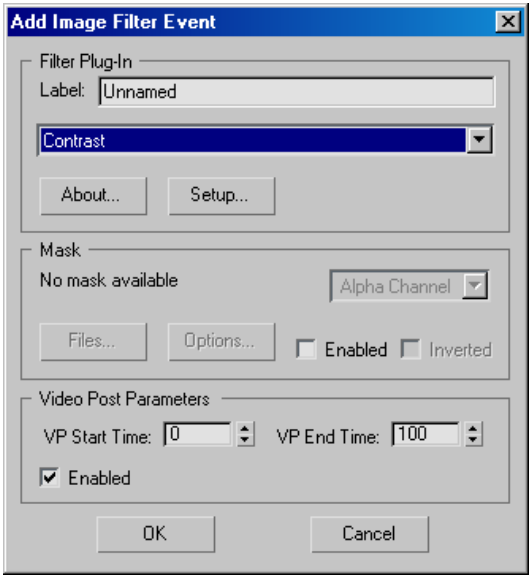
To position or resize the mask:

- Click Options.

  An Image Input Options dialog appears, identical to the dialog you use with Image Input events.

  If the mask is animated, you also use this dialog to specify its time range and playback speed.

Interface



Filter Plug-In group

Label—Lets you give the event a unique name, making it easier to distinguish in a long list of events.

Filter List—Lists the filter *plug-ins (page 3–1089)* you have installed.

See the separate help topics for a description of the filters that come with 3ds Max by clicking any of the listed filters above.

About—Provides version/source information specific to the plug-in.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Mask group

Channels—If you are using a bitmap as the mask file, you can use the Alpha channel, the Red, Green, or Blue channel, Luminance, Z-Buffer, Material Effects, or Object ID.

Files—Select a file to use as a mask. The name of the selected file appears above the Files button.

Options—Displays an *Image Input Options dialog (page 3–342)* where you can set alignment and size, relative to the frames of video output. For animated images, you can also synchronize the mask with the frame sequence of video output. This is the same dialog used for Image Input Event options.

Enabled—Enables the mask. If this box is clear, Video Post ignores any other mask settings.

Inverted—When selected, the mask is inverted.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Add Image Layer Event

Rendering menu > Video Post > Video Post window > Make sure the two child events are in the order you want the Image Layer event to use them. > Select the two events. > Video Post toolbar > Add Image Layer Event

The Add Image Layer Event adds a compositing *plug-in (page 3–1089)* to layer the selected images in the queue.

Provides compositing plug-ins that use the previous event in the queue as a source, and composite the next event, using the parameters

of the plug-in compositor. The list might include plug-ins for special transformations, such as wipes, etc.

An Image layer event is always a parent event with two children. The children can themselves be parents with children. The children of an Image Layer event can be Scene events, Image Input events, Layer events that contain Scene or Image Input events, or Filter events that contain Scene or Image Input events.

Available Image Layer Event Filters

Add Alpha Compositor (page 3–363)

Add Cross Fade Compositor (page 3–363)

Add Pseudo Alpha Compositor (page 3–363)

Add Simple Additive Compositor (page 3–364)

Add Simple Wipe Compositor (page 3–364)

Procedures

To add an image layer event:

1. Make sure the two child events are in the order you want the Image Layer event to use them.
2. Select the two events.

   Click to select the first event, then hold CTRL and click to select the second.
3. Click Add Image Layer Event.

   An Add Image Layer Event dialog appears.
4. Choose the kind of layer event you want from the Layer Plug-In drop-down list.
5. If the Setup button is enabled for this kind of layer event, click Setup to set the options.
6. Choose a mask if you want the layer event to be masked.
7. Adjust other Image Layer settings, and then click OK.

   The Image Layer event becomes the parent of the two child events you selected.

To choose the mask file:

1. Click Files.
2. Use the file dialog to choose the mask file, and then click OK.
3. Choose the channel to use from the drop-down list of channels.

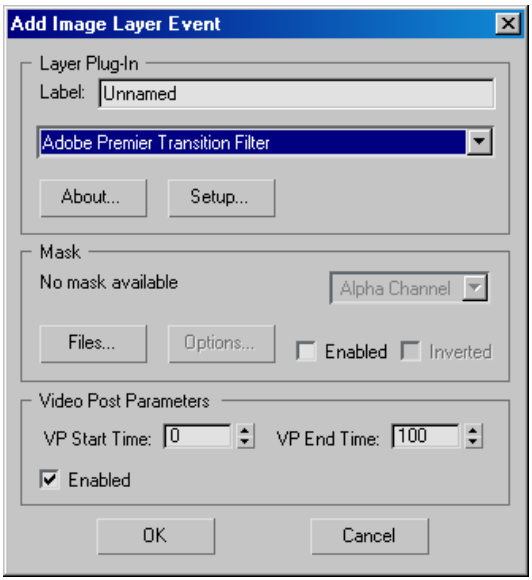
To position or resize the mask:

- Click Options.

  An Image Input Options dialog appears, identical to the dialog you use with Image Input events.

  If the mask is animated, you also use this dialog to specify its time range and playback speed.

Interface



The Add Layer Image Event dialog provides the following controls:

Layer Plug-In group

Label—Lets you give the event a unique name, making it easier to distinguish in a long list of events.

Layer List—Selects the compositor 3ds Max uses for layering the rendered images in the queue. Alpha is the default compositor, but you can also choose from any others you have installed. See the separate help topics for descriptions of the compositors that come with 3ds Max.

Adobe Premiere Transition—Lets you create a transition between Adobe Premiere video events.

Alpha Compositor—Composites the two images using the *alpha channel (page 3–1001)* from the foreground image. The background image appears wherever the foreground image's alpha channel is transparent.

Cross Fade—Composites the two images over time, crossfading from the background image to the foreground image. The rate of the crossfade is determined by the length of the Cross Fade Transition filter's time range.

Pseudo Alpha—Composites a foreground image against the background by creating an alpha channel for the foreground image based on the foreground image's upper-left-corner pixel. All pixels in the foreground image that use this color become transparent. Because only one pixel color becomes transparent, edges of the opaque areas in the foreground image are aliased. Use this method when the foreground image is a bitmap whose format does not have an alpha channel.

Simple Additive Compositor—Composites the two images using the foreground image's intensity (HSV value) to determine transparency. Areas of full intensity (255) are opaque. Areas of zero intensity are transparent. Areas with intermediate transparency are translucent.

Simple Wipe—Reveals or erases the foreground image with a wipe transition. Unlike the *Wipe Filter (page 3–360)* event, Wipe Layer moves the image, sliding it in or out. Under Setup, you can choose the direction of the wipe and whether to reveal the foreground image (Push) or erase it (Pop).

About—Provides version/source information specific to the *plug-in (page 3–1089)*.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Mask group

Channels—If you are using a bitmap as the mask file, you can use the Alpha channel, the Red, Green, or Blue channel, Luminance, Z-Buffer or Material Effects channel, or Object ID.

Files—Select a file to use as a mask. The name of the selected file appears above the Files button.

Options—Displays the *Image Input Options dialog (page 3–342)* where you can set alignment and size, relative to the frames of video output. For animated images, you can also synchronize the mask with the frame sequence of video output. This is the same dialog used for Image Input Event options.

Enabled—Enables the mask. If this box is clear, Video Post ignores any other mask settings.

Inverted—When selected, the mask is inverted.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example,

disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Add Image Output Event

Rendering menu > Video Post > Video Post toolbar > Add Image Output Event

The Add Image Output Event provides controls for editing an output image event.

Image Output events send the result of executing the Video Post queue to a file or a device. You must add an Image Output event to the end of the queue if you want to save the final video. Otherwise, the results are displayed in the rendered frame window only. The Image Output event's range bar must include the entire range of frames you want to output.

You can have multiple output image events, outputting to different devices. This lets you monitor your queue with VTR output devices and view your output at any level of the Video Post queue during rendering.

The rendered output can be a still image or an animation, in one of the following file formats:

AVI Files (page 3–658)

BMP Files (page 3–659)

CIN (Kodak Cineon) Files (page 3–659)

EPS and PS (Encapsulated PostScript) Files (page 3–661)

FLC Files (page 3–662)

HDRI Files (page 3–663)

JPEG Files (page 3–670)

PNG Files (page 3–678)

MOV (QuickTime Movie) Files (page 3–670)

RLA Files (page 3–680)

RPF Files (page 3–681)

RGB (SGI Image) Files (page 3–683)

TGA (Targa) Files (page 3–683)

TIFF Files (page 3–684)

Procedure

To add an image output event:

1. Click Add Image Output Event.

   Image Output disregards whether any events in the queue are selected or not.

2. Click Files to save the final video in a file, or Devices to send the video to a device.

   If you click Files, a file dialog appears to let you choose the bitmap or animation file.

   If you choose Devices, a Select Image Output Device dialog appears. This dialog has a drop-down list of installed device options.

3. Adjust other parameters, and then click OK.

   The Image Output Event appears at the end of the queue.

   If you choose a device, its configuration controls are enabled:

Interface

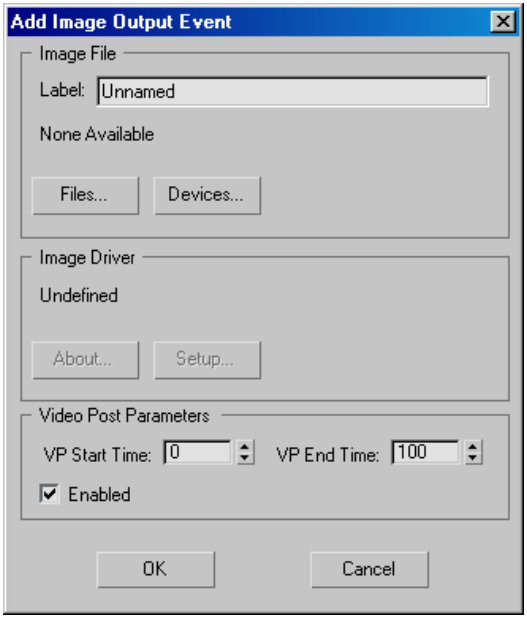


Image File group

Label—Lets you give the event a unique name, making it easier to distinguish in a long list of events.

Files—Lets you name the output image file and choose an image file format.

Devices—Lets you choose the hardware output device, for example, a digital video recorder. The device, its driver, and its 3ds Max plug-in must all be installed on your system to use device output.

Image Driver group

The two buttons in this area are available only when you choose a device as the image source.

About—Provides information on the source of the image-handler software used to create the image from 3ds Max.

Setup—Displays device-specific setup options.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Add External Event

Rendering menu > Video Post > Video Post toolbar > Add External Event

An External event is typically a program that performs image processing. It can also be a batch file or utility that you want to run at a specific point in the queue, or a way to transfer images from or to the Windows clipboard.

An External event is always a child event. If you select an event in the queue before you add the External event, the External event becomes the selected event's child. Child events are evaluated before their parents.

Procedure

To add an external event:

1. Select an event.
2. Click Add External Event.

   An Add External Event dialog appears.
3. Click Browse.

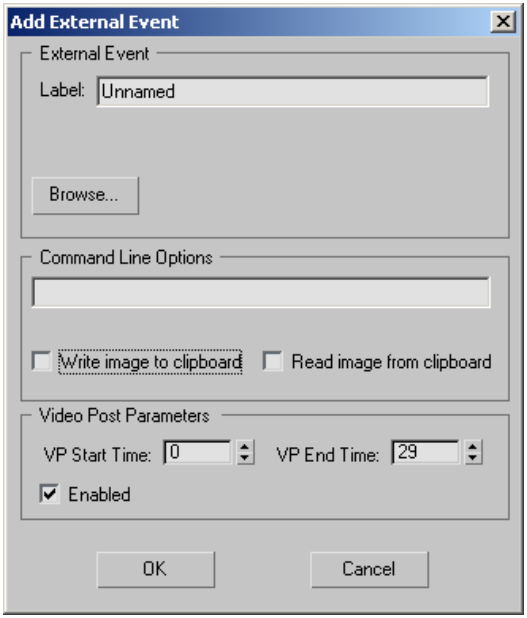
   A file dialog appears.

4. Use the file dialog to choose the external program you want to execute, and then click OK.
5. If the external program accepts command-line options, enter these in the Command Line Options field.
6. If you want the external program to read the current Video Post image, select Write Image to Clipboard.
7. If you want Video Post to use the result of the external program, select Read Image from Clipboard.
8. Click OK.

   If you selected an event, the External event becomes its child. If no event was selected, the External event appears at the end of the queue.

Warning: The image that the External event reads from the clipboard is placed in the Video Post queue. If the external program does not do what you want, this can erase or overwrite the result of all Video Post post-processing.

Interface



External Event group

Label—Lets you give the event a unique name, making it easier to distinguish in a long list of events.

Browse—Lets you select an external program. For example, you can specify Adobe Photoshop™ or another image-processing application.

Command-Line Options group

For external programs that accept command-line options, lets you send real-time data to the external program. 3ds Max parses three special commands. When found in a string, these commands are replaced with real-time data as in these examples:

%f is replaced with a 4-digit frame number (for example, 0001)

%w is replaced with a 4-digit image width (for example, 0640)

%h is replaced with a 4-digit image height (for example, 0480)

For example, if the given command line option is:

-w%w -h%h -oframe%f.tga

The string sent to the external program might be:

-w0640 -h0480 -oframe0001.tga

Write image to clipboard—Writes the current rendered image to the Windows clipboard for retrieval by an external application.

Read image from clipboard—Reads the contents of the Windows clipboard after processing by the external application. When the processed image is saved to the clipboard it automatically appears in Video Post. With an automated script, it is possible to run the image through any external image processor and get it back automatically.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Add Loop Event

Rendering menu > Video Post > Video Post toolbar > Add Loop Event

Loop events cause other events to repeat over time in the output video. They control sequencing, but perform no image processing.

A Loop event is always a parent event with a single child. The child itself can be a parent with children. Any type of event can be the child of a Loop event, including another Loop event.

The Loop event's range bar displays the original duration of the child event's playback in color and the range of looped events in gray. You can change the duration of the child event's playback by dragging the child's frame range or the child's original range in the Loop event's track, but you can adjust the full length of the loop (the gray part of the range bar) only by changing the Number of Times parameter in the Edit Loop Event dialog.

Procedure

To add a loop event:

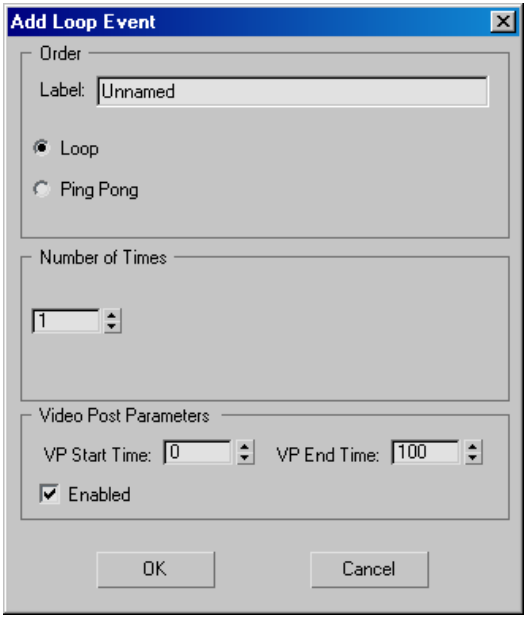
1. Select the child event.
2. Click Add Loop Event.

   An Add Loop Event dialog appears.
3. Choose the loop settings, and then click OK.

   The Loop event appears as the parent of the selected event.

   The Loop event repeats the child event over the course of the Loop event's range.

Interface



Order group

Label—Lets you give the event a unique name, making it easier to distinguish in a long list of events.

Loop—Repeats the child event by starting it over when the child event reaches the end of its range. This is the default.

Ping Pong—Repeats the child event by playing it first forward, then backward, then forward, and so on. The last frame of the child event is not repeated.

Number of Times group

Specifies the number of times to repeat the loop or ping pong, in addition to the first time that the child event is played.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Editing Events

Edit Scene Event

Rendering menu > Video Post > Video Post window > Select a scene from the Video Post Queue. > Video Post toolbar > Edit Current Event

A Scene event is a view of the current 3ds Max scene. You can choose which view to display and how to synchronize the scene with the final video. Like Image Input events, Scene events place an image in the queue, but a Scene event is the current 3ds Max scene and it must be rendered when you execute the Video Post queue.

You can use multiple Scene events to show two views of the same scene simultaneously or to cut from one view to another. If you have more than one Scene event in the queue, and they occupy the same time range, composite them with an Image Layer event like Cross Fade or Simple Wipe. Otherwise, the second Scene Event overwrites the first even though your system has spent the time processing both events.

Procedures

To match scene frames with Video Post frames:

- Turn on Lock to Video Post Range.

  Frames in the scene match Video Post frames and have the same frame number. Frame 0 in the scene is frame 0 in the Video Post dialog, and so on. The range bar for the Scene event represents which portion of the scene is selected. If the range covers Video Post frames 25 to 35, executing the queue renders scene frames 25 to 35. Moving the range bar for the scene is like moving a time window within the scene.

To offset the scene in time:

- Turn on Lock Range Bar to Scene Range.

  The Scene Start control is enabled but the Scene End control remains disabled - synchronization is controlled by the Scene Start value and the length of the range bar.

  The Scene Start value is the scene frame number where playback begins. If Scene Start is 0, frame 0 of the scene is the first frame played back; if Scene Start is 12, frame 12 is the first frame to play, and so on.

  The range bar length determines how many frames of the scene to play. Dragging the end point of the range bar changes the length of the playback range. Although Scene End is unavailable, its value updates to show the frame number of the last scene frame that will be played.

  Dragging the range bar changes where the scene is played within the final video. For example, if you set Scene Start to 5 and move the range bar to begin at Video Post frame 20, frame 5 is played at frame 20 of the final video, and so on.

To offset the scene and change scene playback rate:

- Turn off Lock Range Bar to Scene Range.

  With Lock Range Bar to Scene Range clear, both Scene Start and Scene End are enabled. As before, Scene Start specifies the first scene frame to play. Scene End specifies the last scene frame to play, and the length of the range bar determines playback speed.

  If the range bar specifies the same number of Video Post frames as there are corresponding scene frames, then playback is at the scene's playback rate. If the range bar specifies fewer frames, the scene is sped up. If the range bar specifies more frames, the scene is slowed down. When it executes, Video Post automatically skips frames or adds frames to control the speed of scene playback.

  For example, if Scene Start is frame 5 and Scene End is frame 35, the range bar represents 30 frames overall. If the range bar covers only 10 Video Post frames, scene playback is sped up to fit 30 frames into 10 of the final video. If on the other hand, the range bar covers 120 frames, scene playback is stretched to slow it down.

To render the full scene backwards:

1. Turn off Lock to Video Post Range.
2. Turn off lock Range Bar to Scene Range.
3. Set Scene Start to the last frame in the scene.
4. Set Scene End to the first frame in the scene.

   The length of the range bar also determines the playback speed of the reversed scene.

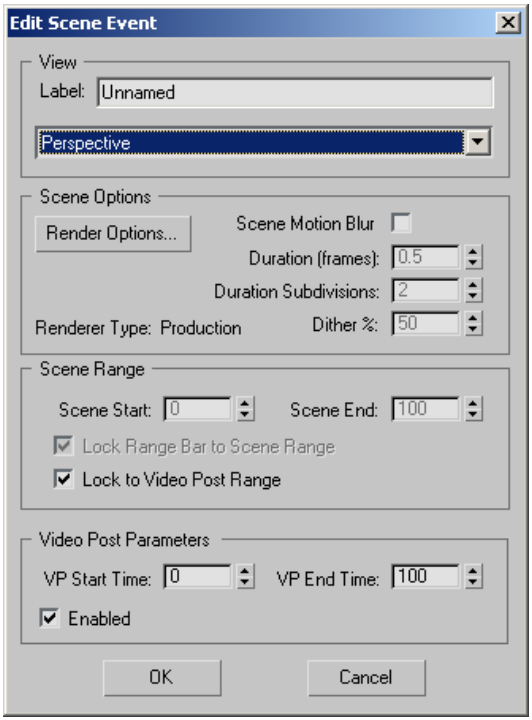
To add scene motion blur:

1. Select Scene Motion Blur in the Scene Event dialog.
2. Set the scene motion blur parameters.

   The Scene event generates motion blur by simulating a camera with an open shutter. It interpolates and then renders movement within a frame, to generate a series of images of the

moving object, instead of the default single image.

Interface



View group

Label—Lets you edit the event name.

Viewport—Select the viewport you want to render.

Scene Options group

Enables various rendering effects.

Render Options—Displays a subset of the parameters in the Render Scene dialog. For information on these controls, see the *Common Parameters (page 3–27)* and *MAX Default Scanline A-Buffer (page 3–37)* help topics. Changes you make to the Scene Event Render Options affect the Render Scene dialog, as well.

Scene Motion Blur—Turns on the *scene motion-blur (page 3–1101)* effect for the whole scene. This is different from *object motion blur (page 3–1075)*, which creates motion blur for individual objects in the scene.

Duration—Sets the virtual shutter speed for motion blur. When it's set to 1.0, the virtual shutter is open for the entire duration between one frame and the next. When it's set to a smaller number (for example, 0.25), the number of subdivisions specified in the Duration Subdivision field will be rendered within the specified portion of the frame (in this example, in the first .25 of the duration between one frame and the next).

Duration Subdivision—Determines how many sub-frame slices are rendered within the Duration. The default is 2 slices, but you'll want at least 5 or 6 to get a decent effect.

Dither %—Sets the amount of *dithering (page 3–1023)* between blurred pixels of overlapping frame slices. If Dither % is set to 0, no dithering occurs.

Scene Range group

Scene Start/End—Sets the range of scene frames to be rendered.

Lock Range Bar to Scene Range—Becomes available when you deselect Lock to Video Post Range. When it's available, the End spinner is disabled and locked to the Video Post range. When you change the Start spinner it automatically updates the End spinner based on the Video Post range set for this event.

If you clear the box, you can change either Start or End spinners to whatever you want. This allows you to keep your scene range locked to its native length, and still provides flexibility for mapping an arbitrary scene range to an arbitrary Video Post range.

Lock to Video Post Range—Renders the same range of scene frames as Video Post frames. You can set the Video Post range in the Execute Video Post dialog.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Edit Image Input Event

Rendering menu > Video Post > Video Post window > Select an Image Input Event. > Video Post toolbar > Edit Current Event

Image Input events add a still or moving image to the scene. Image Input events place an image in the queue, but unlike Scene events, the image is a file that was saved beforehand or a device-generated image. The image can be in one of the following file formats:

AVI Files (page 3–658)

BMP Files (page 3–659)

CIN (Kodak Cineon) Files (page 3–659)

CWS (Combustion Workspace) Files (page 3–660)

FLC Files (page 3–662)

GIF Files (page 3–662)

HDRI Files (page 3–663)

IFL Files (page 3–666)

JPEG Files (page 3–670)

MOV (QuickTime Movie) Files (page 3–670)

MPEG Files (page 3–671)

PNG Files (page 3–678)

PSD Files (page 3–678)

RLA Files (page 3–680)

RPF Files (page 3–681)

RGB (SGI Image) Files (page 3–683)

TGA (Targa) Files (page 3–683)

TIFF Files (page 3–684)

YUV Files (page 3–685)

DDS Files (page 3–660)

Procedures

To align the input image, do one of the following in the Image Input Options dialog:

- Choose Presets and then click one of the preset alignment buttons.
- Choose Coordinates and then enter the X,Y coordinates for the image's location.

  The upper-left corner is (0,0) for both the input image and the output frame. Increasing X moves the image to the right, and increasing Y moves the image down. Negative values move the image in the opposite direction. X and Y values specify pixels.

To set the input image size, do one of the following in the Image Input Options dialog:

- Choose Do Not Resize to maintain the image's original resolution.
- Choose Resize to Fit to change the image size to match the output frame.

This can change the image resolution, causing it to be rescaled for every frame.

- Choose Custom Size and then enter the width and height of the image in the output frame.

To control playback of an animated image:

1. In the Frames group of the *Image Input Options (page 3–342)* dialog, set the input animation frame range and speed.
2. Select Loop At The End if you want the animation to repeat. Clear Loop At The End if you want the animation to stop after playback.

   This option applies only when the input animation is shorter than the final video.

Interface

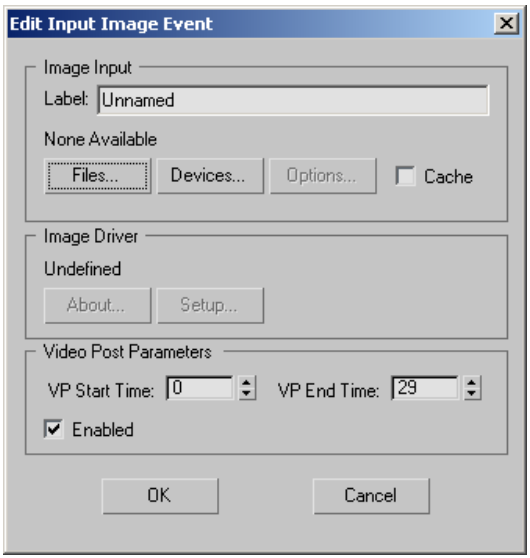


Image Input group

Label—Lets you edit the event name.

Files—Lets you choose the bitmap or animation image file.

Devices—Lets you choose an installed hardware input device, for example, a digital disk recorder.

Options—Displays the *Image Input Options dialog (page 3–342)* to allow you to set up alignment, size, and frame range for the Image Input.

Cache—Stores a bitmap in memory. If you are using a single-image bitmap, you can choose this option. Video Post won't reload or scale the image for each frame.

Image Driver group

These buttons are available only when you choose a device as the image source.

About—Provides information on the source of the image-handler software used to bring the image into 3ds Max.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Image Input Options

Rendering menu > Video Post > Video Post window > Make sure no events are selected in the queue. > Video Post toolbar > Add Image Input Event > Select a file for input. > Options

The Image Input Options dialog contains controls for setting the image's size and placement relative to the frames of video output. For animated input,

you also use it to synchronize the Image Input event with the frame sequence of video output. The same dialog appears when you click Options from the Mask area of the Filter Event and Layer Event dialogs.

Procedures

To align the input image, do one of the following in the Image Input Options dialog:

- Choose Presets and then click one of the preset alignment buttons.
- Choose Coordinates and then enter the X,Y coordinates for the image's location.

  The upper-left corner is (0,0) for both the input image and the output frame. Increasing X moves the image to the right, and increasing Y moves the image down. Negative values move the image in the opposite direction. X and Y values specify pixels.

To set the input image size, do one of the following in the Image Input Options dialog:

- Choose Do Not Resize to maintain the image's original resolution.
- Choose Resize to Fit to change the image size to match the output frame.

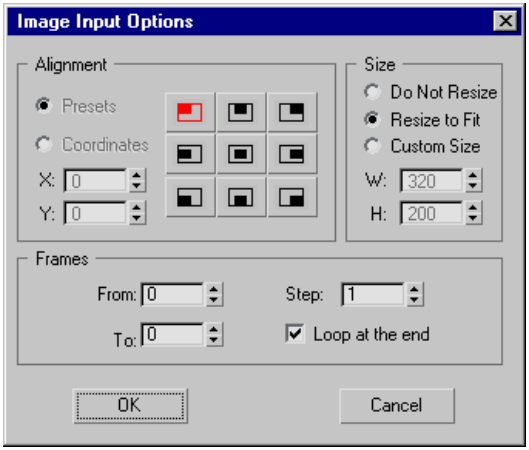
  This can change the image resolution, causing it to be rescaled for every frame.
- Choose Custom Size and then enter the width and height of the image in the output frame.

To control playback of an animated image:

1. In the Frames group, set the From, To and Step values.
2. Select Loop at the End if you want the animation to repeat. Clear Loop at the End if you want the animation to stop after playback.

   This option applies only when the input animation is shorter than the final video.

Interface



Alignment group

Presets—Positions the image according to one of the preset buttons: Top-left, Center, Top-right, and so on. Mutually exclusive with Coordinates.

Coordinates—Positions the image according to coordinates you enter. Mutually exclusive with Presets.

Size group

Do Not Resize—Retains the image's original, stored dimensions.

Resize to Fit—Resizes the image to the size of the Video Post rendered image (default).

Custom Size—Resizes the image according to width and height units you enter.

Frames group

From/To—Specifies the range of frames to use if the image input file is an animation or video.

Step—Sets the interval between the frames you want to use. For example, if this spinner is set to 7, 3ds Max uses every seventh frame.

Loop at End—Plays the frames from the beginning when the last frame is reached. This will take effect

if the frame range used is less than the Video Post frame range.

Edit Filter Event

Rendering menu > Video Post > Video Post window > Select a filter from the Video Post Queue. > Video Post toolbar > Edit Current Event

When a Filter Event is selected in the queue, the Edit Current Event button opens the Edit Filter Event dialog to provide image processing for images and scenes. Several kinds of filters are provided, see list below. For example, the Negative filter inverts the colors of an image and the Fade filter fades an image in or out over time.

An Image Filter event is usually a parent event with a single child (which can itself be a parent with children), for example, a Scene event, an Image Input event, a Layer event that contains Scene or Image Input events, or a Filter event that contains Scene or Image Input events. You can also add an Image Filter without a child event, in which case the Image Filter processes the result of the previous events in the queue.

Available Filters

Edit Contrast Filter (page 3–350)

Edit Fade Filter (page 3–351)

Edit Image Alpha Filter (page 3–351)

Add Lens Effects Filter (page 3–358)

Edit Negative Filter (page 3–352)

Edit Pseudo Alpha Filter (page 3–352)

Edit Simple Wipe Filter (page 3–353)

Edit Starfield Filter (page 3–353)

Procedures

To choose the mask file:

1. Click Files.
2. Use the file dialog to choose the mask file, and then click OK.
3. Choose the channel to use from the drop-down list of channels.

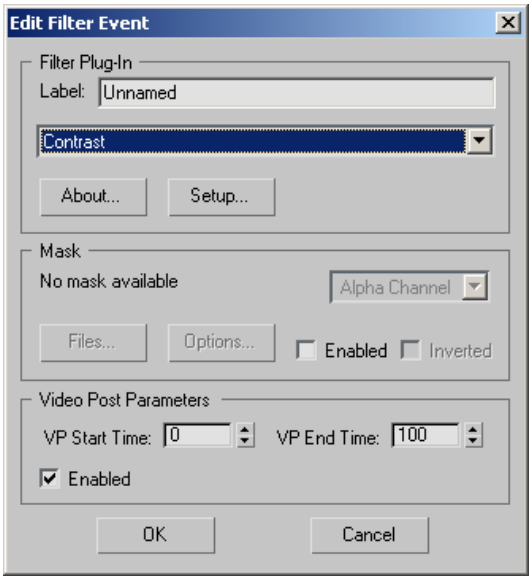
To position or resize the mask:

- Click Options.

  An *Image Input Options dialog (page 3–342)* appears, identical to the dialog you use with Image Input events.

  If the mask is animated, you also use this dialog to specify its time range and playback speed.

Interface



When you click the Edit Filter Event button on the Video Post toolbar, the Edit Filter Event dialog appears with the following options:

Filter Plug-In group

Label—Lets you edit the event name.

Filter List—Lists the filter *plug-ins (page 3–1089)* you have installed.

See the separate help topics for a description of the filters that come with 3ds Max.

About—Provides version/source information specific to the plug-in.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Mask group

Channels—If you are using a bitmap as the mask file, you can use the Alpha channel, the Red, Green, or Blue channel, Luminance, Z-Buffer, Material Effects ID, or Object ID.

Files—Select a file to use as a mask. The name of the selected file appears above the Files button.

Options—Displays a *Image Input Options dialog (page 3–342)* in which you can set alignment and size, relative to the frames of video output. For animated images, you can also synchronize the mask with the frame sequence of video output. This is the same dialog used for Image Input Event options.

Enabled—Enables the mask. If this box is clear, Video Post ignores any other mask settings.

Inverted—When selected, the mask is inverted.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Edit Layer Event

Rendering menu > Video Post > Video Post window > Select a Layer Event. > Video Post toolbar > Edit Current Event

Image Layer events composite other images and scenes. Several kinds of layer events are provided, see list below.

An Image Layer event is always a parent event with two children, which can themselves be parents with children. The children for an Image Layer event can be Scene events, Image Input events, Layer events that contain Scene or Image Input events, or Filter events that contain Scene or Image events.

Available Layer Filters

Edit Alpha Compositor (page 3–355)

Edit Cross Fade Compositor (page 3–355)

Edit Pseudo Alpha Compositor (page 3–356)

Edit Simple Additive Compositor (page 3–356)

Edit Simple Wipe Compositor (page 3–357)

Procedures

To choose the mask file:

1. Click Files.
2. Use the file dialog to choose the mask file, and then click OK.
3. Choose the channel to use from the drop-down list of channels.

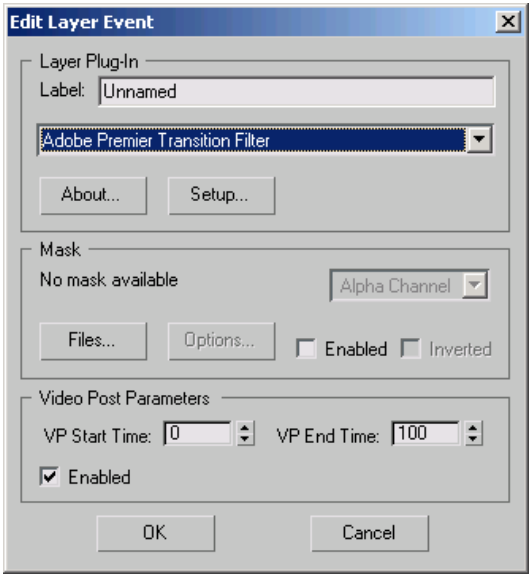
To position or resize the mask:

- Click Options.

An *Image Input Options dialog (page 3–342)* appears, identical to the dialog you use with Image Input events.

If the mask is animated, you also use this dialog to specify its time range and playback speed.

Interface



Layer Plug-In group

Label—Lets you edit the event name.

Layer List—Selects the compositor 3ds Max uses for layering the rendered images in the queue. Alpha is the default compositor, but you can also choose from any others you have installed.

Adobe Premiere Transition—Lets you create a transition between Adobe Premiere video events.

Alpha Compositor—Composites the two images using the *alpha channel (page 3–1001)* of the foreground image. The background image appears in areas where the foreground image's alpha channel is transparent.

Cross Fade—Composites the two images over time, cross fading from the background image to the foreground image. The rate of the cross fade is determined by the length of the Cross Fade Transition filter's time range.

Pseudo Alpha—Composites a foreground image against the background by creating an alpha channel for the foreground image based on the foreground image's upper-left-corner pixel. All pixels in the foreground image that use this color become transparent. Because only one pixel color becomes transparent, edges of the opaque areas in the foreground image are aliased. Use this method when the foreground image is a bitmap whose format does not have an alpha channel.

Simple Additive Compositor—Composites the two images using the foreground image's intensity (HSV value) to determine transparency. Areas of full intensity (255) are opaque. Areas of zero intensity are transparent. Areas with intermediate transparency are translucent.

Simple Wipe—Reveals or erases the foreground image with a wipe transition. Unlike the *Wipe Filter (page 3–360)* event, Wipe Layer moves the image, sliding it in or out. Under Setup, you can choose the direction of the wipe and whether to reveal the foreground image (Push) or erase it (Pop).

About—Provides version/source information specific to the *plug-in (page 3–1089)*.

Setup—Displays a setup dialog specific to the plug-in. Some plug-ins may not use this button.

Mask group

Channels—If you are using a bitmap as the mask file, you can use the Alpha channel, the Red, Green, or Blue channel, Luminance, Z-Buffer, Material Effects ID, or Object ID.

Files—Select a file to use as a mask. The name of the selected file appears above the Files button.

Options—Displays a *Image Input Options dialog (page 3–342)* in which you can set alignment and size, relative to the frames of video output. For animated images, you can also synchronize the mask with the frame sequence of video output. This is the same dialog used for Image Input Event options.

Enabled—Enables the mask. If this box is clear, Video Post ignores any other mask settings.

Inverted—When selected, the mask is inverted.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Edit Output Image Event

Rendering menu > Video Post > Video Post window > Select an Output Image Event. > Video Post toolbar > Edit Current Event

Image Output events send the result of executing the Video Post queue to a file or a device. You must add an Image Output event to the end of the queue if you want to save the final video. Otherwise, the results are displayed in the *rendered frame window (page 3–5)* only. The Image Output event's range bar must include the entire range of frames you want to output.

The rendered output can be a still image or an animation, in one of the following file formats:

AVI Files (page 3–658)

BMP Files (page 3–659)

CIN (Kodak Cineon) Files (page 3–659)

EPS and PS (Encapsulated PostScript) Files (page 3–661)

FLC Files (page 3–662)

HDRI Files (page 3–663)

JPEG Files (page 3–670)

PNG Files (page 3–678)

MOV (QuickTime Movie) Files (page 3–670)

RLA Files (page 3–680)

RPF Files (page 3–681)

RGB (SGI Image) Files (page 3–683)

TGA (Targa) Files (page 3–683)

TIFF Files (page 3–684)

You also have the option to direct the output to a VTR controller output device or if you have multiple output image events, you can output to different devices. This lets you monitor your queue with VTR output devices and view your output at any level of the Video Post queue during rendering.

Interface

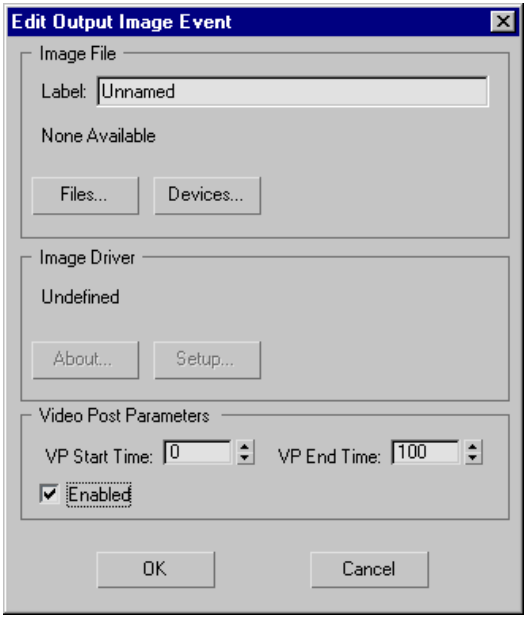


Image File group

Label—Lets you edit the event name.

Files—Lets you name the output image file.

Devices—Lets you choose the hardware output device, for example, a digital video recorder. The device, its driver, and its 3ds Max plug-in must all be installed on your system to use device output.

Image Driver group

The two buttons in this area are available only when you choose a device as the image source.

About—Provides information on the source of the image-handler software used to create the image from 3ds Max.

Setup—Displays device-specific setup options.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

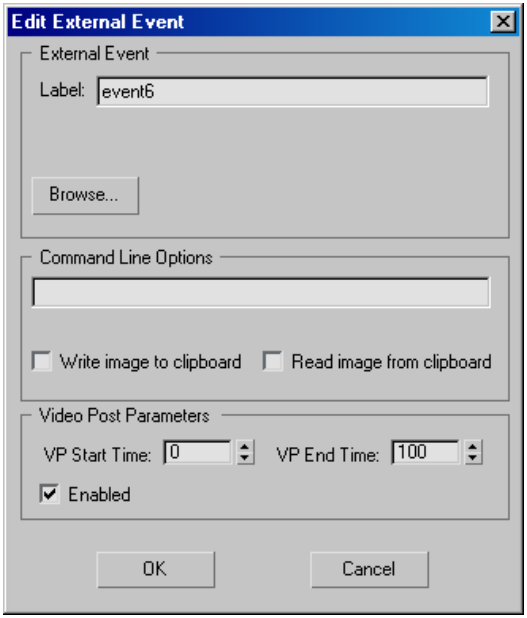
Edit External Event

Rendering menu > Video Post > Video Post window > Select an External Event. > Video Post toolbar > Edit Current Event

An External event is typically a program that performs image processing. It can also be a batch file or utility that you want to run at a specific point in the queue, or a way to transfer images from or two the Windows clipboard.

An External event is always a child event. If you select an event in the queue before you add the External event, the External event becomes the selected event's child. Child events are evaluated before their parents.

Interface



External Event group

Label—Lets you edit the event name.

Browse—Lets you select an external program to be executed. For example, you can specify Adobe Photoshop™ or another image-processing application.

Command Line Options group

For external programs that accept command-line options, lets you send real-time data to the external program. 3ds Max parses three special commands. When found in a string, these commands are replaced with real-time data as in these examples:

%f is replaced with a 4 digit frame number (for example, 0001)

%w is replaced with a 4 digit image width (for example, 0640)

%h is replaced with a 4 digit image height (for example, 0480)

For example, if the given command line option is:

-w%w -h%h -oframe%f.tga

The string sent to the external program might be:

-w0640 -h0480 -oframe0001.tga

Write image to clipboard—Writes the current rendered image to the Windows clipboard for retrieval by an external application.

Read image from clipboard—Reads the contents of the Windows clipboard after processing by the external application. When the processed image is saved to the clipboard it automatically appears in Video Post. With an automated script, it is possible to run the image through any external image processor and get it back automatically.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Edit Loop Event

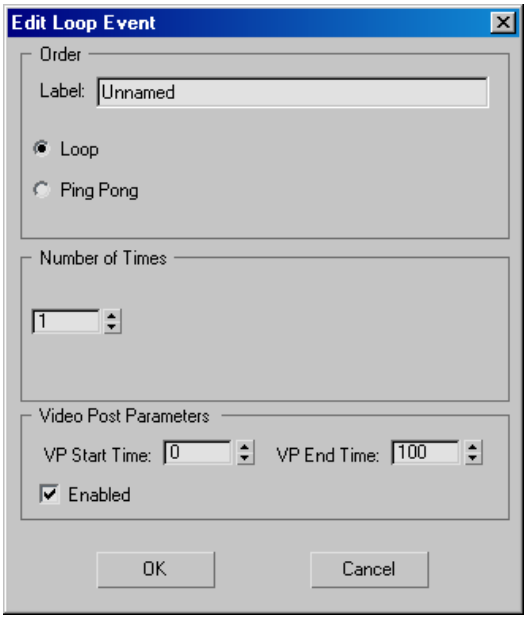
Rendering menu > Video Post > Video Post window > Select a Loop Event. > Video Post toolbar > Edit Current Event

Loop events cause other events to repeat over time in the output video. They control sequencing, but perform no image processing.

A Loop event is always a parent event with a single child. The child itself can be a parent with children. Any type of event can be the child of a Loop event, including another Loop event.

The Loop event's range bar displays the original duration of the child event's playback in color and the range of looped events in gray. You can change the duration of the child event's playback by dragging the child's frame range or the child's original range in the Loop event's track, but you can adjust the full length of the loop (the gray part of the range bar) only by changing the Number of Times parameter in the Edit Loop Event dialog.

Interface



Order group

Label—Lets you edit the event name.

Loop—Repeats the child event by starting it over when the child event reaches the end of its range. This is the default.

Ping Pong—Repeats the child event by playing it first forward, then backward, then forward, and so on. The last frame of the child event is not repeated.

Number of Times group

Specifies the number of times to repeat the loop or ping pong, in addition to the first time that the child event is played.

Video Post Parameters group

VP Start Time/End Time—Sets the starting and ending frames for the selected event within the overall Video Post queue. Video Post renders the event over the number of frames specified here.

Enabled—Enables or disables the event. When this box is clear, the event is disabled and Video Post ignores it when rendering the queue. Each event must be disabled individually. For example, disabling a composite layer event does not disable the composited image events. The range bars of disabled events are unavailable in the event track area.

Editing Filter Events

Edit Contrast Filter

Rendering menu > Video Post > Video Post window > Select a Contrast Filter. > Video Post toolbar > Edit Current Event > Setup

Allows you to adjust the contrast and brightness of an image.

Interface

Contrast—Set the spinner between 0 and 1.0. This compresses or expands the latitude between maximum black and maximum white by creating a 16-bit look-up table for any given gray value in the image. The computation of the gray value depends on whether you select Absolute or Derived.

Brightness—Set the spinner between 0 and 1.0. This increases or decreases all color components (red, green, and blue).

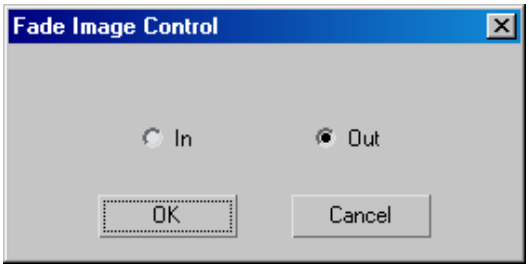
Absolute/Derived—Determines the computation of the gray value for Contrast. Absolute uses the highest value of any of the color components. Derived uses an average of the three color components.

Edit Fade Filter

Rendering menu > Video Post > Video Post window > Select a Fade Filter. > Video Post toolbar > Edit Current Event > Setup

The Fade Filter fades an image in or out over time. The rate of the fade is determined by the length of the Fade filter's time range.

Interface



You can set the following controls in the Setup Options:

In—Fade in.

Out—Fade out.

Edit Image Alpha Filter

Rendering menu > Video Post > Video Post window > Select an Alpha Filter. > Video Post toolbar > Edit Current Event

The Image Alpha Filter replaces the image's alpha channel with the channel specified by the filter mask.

The filter takes whatever channel is selected in the channel options under Mask (including *g-buffer (page 3–1040)* channel data) and applies it to the queue's alpha channel, thereby replacing what's there.

If you don't choose a mask, this filter has no effect.

There are no Setup options for this filter.

Procedure

To set an object's G-Buffer ID:

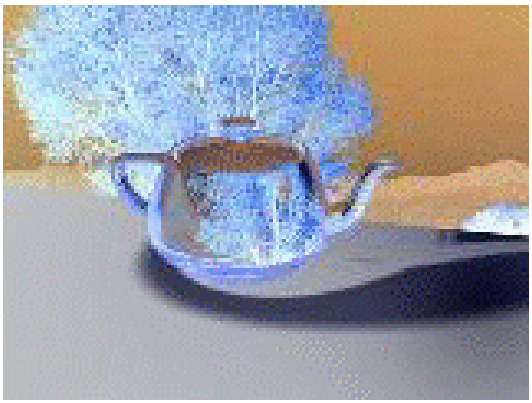
1. Select the object.
2. Right-click the object and then choose *Properties (page 1–111)* from the popup menu.
3. In the Object Properties dialog, set G-Buffer Object Channel to a non-zero value, and then click OK.

The G-Buffer ID can be any positive integer.

If you give the same G-Buffer ID value to more than one object, all these objects will be post-processed.

Edit Negative Filter

Rendering menu > Video Post > Video Post window > Select a Negative Filter. > Video Post toolbar > Edit Current Event > Setup

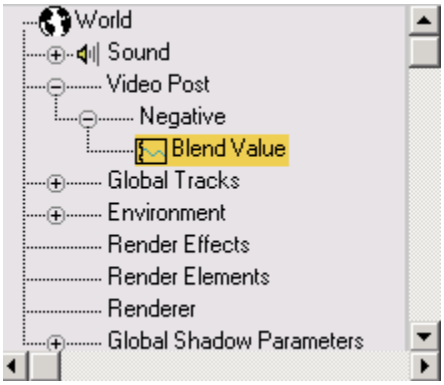


Effect of negative filter

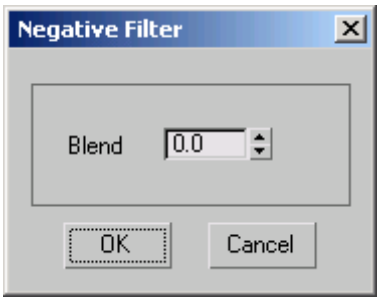
The Negative Filter inverts the colors in the image, making it negative like a negative color photograph.

When you click the Setup button in the Edit Filter Event dialog for the Negative filter, the Video Post dialog is replaced by a modeless Negative Filter dialog with a Blend spinner. You can turn on Auto Key, move the time slider, and change the Blend value to create keys. (You can also use other 3ds Max functions; for example, you can create objects.) When you've set all the keys you want, click the OK button to return to Video Post.

After creating keys from the Video Post filter, you'll find the track for the new keys as a child of the Video Post track in the Track View – Curve Editor. Specifically, in the above example, you'll find the following hierarchy in the Curve Editor:



Interface



You can set the following:

Blend—Sets the amount of blending that occurs.

Edit Pseudo Alpha Filter

Rendering menu > Video Post > Video Post window > Select a Contrast Filter. > Video Post toolbar > Edit Current Event

The Edit Pseudo Alpha Filter creates an alpha channel for the image based on the image's first pixel (the upper-left corner pixel). All pixels that have the same color as this pixel become transparent.

Because only one pixel color becomes clear, edges of the opaque areas are aliased. The main use for this filter is when you want to composite a bitmap whose format does not have an alpha channel.

There is also a layer event called the *Pseudo Alpha Compositor (page 3–356)*.

There are no Setup options for this filter.

Edit Simple Wipe Filter

Rendering menu > Video Post > Video Post window > Select a Simple Wipe Filter. > Video Post toolbar > Edit Current Event > Setup

The Simple Wipe Filter reveals or erases the foreground image with a wipe transition. Unlike the *Wipe Layer (page 3–357)* event, Wipe Filter wipes across a fixed image.

Wipes from image to image (or image to black). The filtered image stays in place, but is revealed or erased with a wipe across the image. If you're using a Wipe as a Filter event, you'll usually want to use an Alpha Compositor as a Layer event as well.

A typical queue sequence would be: Alpha Compositor (layer)

-->Image #1

-->Simple Wipe (filter)

------>Image #2

The rate of the wipe is determined by the length of the Wipe filter's time range. The area not covered by the image renders as black unless you use an Image Layer event to composite the Wipe filter with another image.

Interface

Direction

Right-pointing arrow—Wipes from left to right.

Left-pointing arrow—Wipes from right to left.

Mode

Push—Reveals the image.

Pop—Erases the image.

Edit Starfield Filter

Rendering menu > Video Post > Video Post window > Select a Starfield Filter. > Video Post toolbar > Edit Current Event > Setup

The Starfield Filter generates a realistic starfield with optional motion blur. The Starfield filter requires a camera view. Any motion of the stars is a result of camera motion.

Procedure

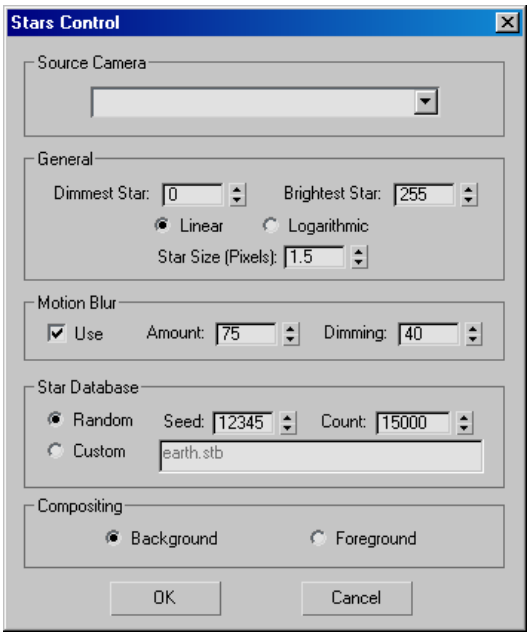
To use the Starfield filter:

1. Create a camera and (optionally) animate the camera's or target's position, field of view, and roll.
2. Choose Rendering > Video Post and add a Scene Event, using the camera for the view.

3. Select the Scene Event in the queue, click Add Image Filter, select the Starfield filter, and click the Setup button.
4. In the Stars Control dialog, make sure that the selected camera matches the camera used in the Scene Event.

   If these don't match, the stars will not match the camera's motion. If there is only one camera in the scene, the field will default to that camera.
5. Set the starfield parameters, then exit the Stars Control dialog and the Edit Filter Event dialog.
6. Execute the Video Post sequence to see stars.

Interface



You can set the following controls in the Setup Options:

Source Camera—Lets you choose from a list of cameras in the scene. Choose the same camera as the one being used to render the scene.

General—Sets the brightness range and size of the stars.

Dimmest Star—Specifies the dimmest star. Range = 0 to 255.

Brightest Star—Specifies the brightest star. Range = 0 to 255.

Linear/Logarithmic—Specifies whether the range of brightness is calculated linearly or logarithmically.

Star Size (Pixels)—Specifies the size of the stars, in pixels. Range = 0.001 to 100.

Motion Blur group

These settings control the streaking effect of the stars when the camera moves.

Use—Determines whether to use the motion blur. If clear, the stars appear as dots, no matter what the camera's motion.

Amount—The percentage of the frame time that the camera "shutter" is open. Default = 75%.

Dimming—Determines how the streaked stars will dim as their trails lengthen. The default of 40 provides a good effect for video, dimming them a bit so they don't appear to flash.

Star Database group

These settings specify the number of stars in the starfield.

Random—Generates the number of stars indicated by the Count spinner, using the random number Seed to initialize the random number generator.

Custom—Reads the file specified. A provided star database, *earth.stb*, contains the brightest stars in Earth's sky.

Seed—Initializes the random number generator. By using the same Seed value in different animations, you're guaranteed identical starfields.

Count—Specifies the number of stars generated when Random is chosen.

Compositing group

Background—Composites the stars in the background. This is the default.

Foreground—Composites the stars in the foreground.

Editing Layer Events

Edit Alpha Compositor

Rendering menu > Video Post > Video Post window > Select an Alpha Compositor > Video Post toolbar > Edit Current Event

The Alpha Compositor composites the two images using the *alpha channel (page 3–1001)* of the foreground image. The background image appears in areas where the foreground image's alpha channel is transparent.

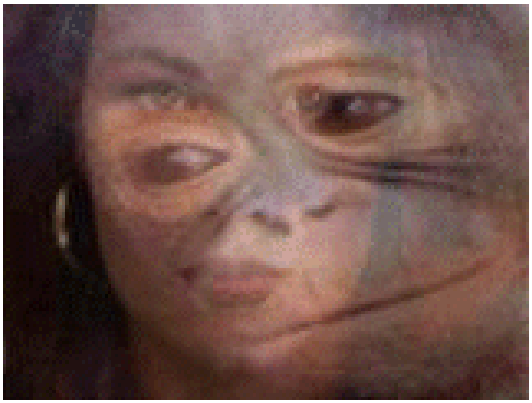
Procedure

To use the Alpha Compositor filters:

1. Add two Scene or Image Input events to the queue.
2. Select both events and assign an Image Layer event consisting of the Alpha Composite Filter.
3. Select the Image Layer event and click Edit Current Event.

Edit Cross Fade Compositor

Rendering menu > Video Post > Video Post window > Select a Cross Fade Compositor. > Video Post toolbar > Edit Current Event



Cross fade fades one image into another over time.

The Cross Fade Compositor composites the two images over time, crossfading from the background image to the foreground image. The rate of the crossfade is determined by the length of the Cross Fade Transition filter's time range.

There are no Setup options for this compositor.

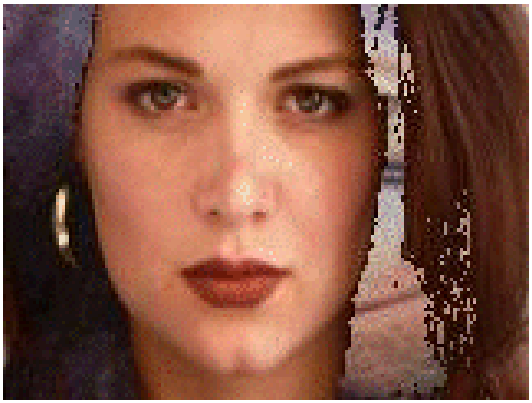
Procedure

To use the Cross Fade Compositor:

1. Add two Scene or Image Input events to the queue.
2. Select both events and assign an Image Layer event consisting of the Cross Fade Compositor.

Edit Pseudo Alpha Compositor

Rendering menu > Video Post > Video Post window > Select a Pseudo-Alpha Compositor. > Video Post toolbar > Edit Current Event



Pseudo alpha compositing

The Pseudo-Alpha Compositor composites a foreground image against the background by creating an alpha channel for the foreground image based on the foreground image's upper-left-corner pixel. All pixels in the foreground image that use this color become transparent.

Because only one pixel color becomes transparent, edges of the opaque areas in the foreground image are aliased. Use this method when the foreground image is a bitmap whose format does not have an alpha channel.

There are no setup options for this compositor.

There is also a *Pseudo Alpha Filter Event (page 3–360)*.

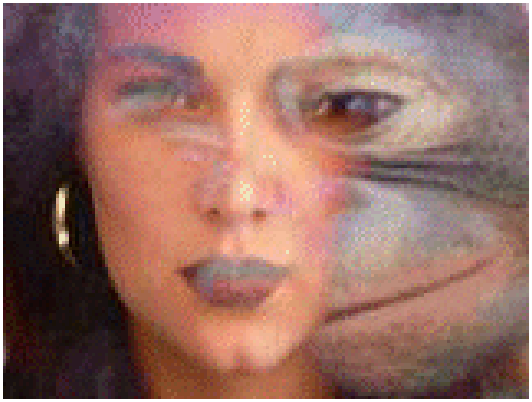
Procedure

To use the Pseudo-Alpha Compositor:

1. Add two Scene or Image Input events to the queue.
2. Select both events and assign an Image Layer event consisting of the Pseudo-Alpha Composite Filter.

Edit Simple Additive Compositor

Rendering menu > Video Post > Video Post window > Select a Simple Additive Compositor. > Video Post toolbar > Edit Current Event



Additive compositing

The Simple Additive Compositor composites the two images using the second image's intensity (HSV value) to determine transparency. Areas of full intensity (255) are opaque; areas of zero intensity are transparent; and areas with intermediate transparency are translucent.

This layer event can be useful when the second image is a bitmap whose format does not have an alpha channel.

There are no Setup options for this compositor.

Procedure

To use the Simple Additive Compositor:

1. Add two Scene or Image Input events to the queue.
2. Select both events and assign an Image Layer event consisting of the Simple Additive Compositor.

Edit Simple Wipe Compositor

Rendering menu > Video Post > Video Post window > Select a Simple Wipe Compositor. > Video Post toolbar > Edit Current Event

The Simple Wipe Compositor reveals or erases the foreground image with a wipe transition. Unlike the *Wipe Filter (page 3–353)*, the Wipe Layer event moves the image, sliding it in or out.

The rate of the wipe is determined by the length of the Wipe compositor's time range.

Procedure

To use the Simple Wipe Compositor:

1. Add two Scene or Image Input events to the queue.
2. Select both events and assign an Image Layer event consisting of the Simple Wipe Compositor.
3. Select the Image Layer event and click Edit Current Event.
4. Click Setup to display the Simple Wipe Compositor Setup dialog.

Interface

Direction

Right-pointing arrow—Wipes from left to right.

Left-pointing arrow—Wipes from right to left.

Mode

Push—Reveals the image.

Pop—Erases the image.

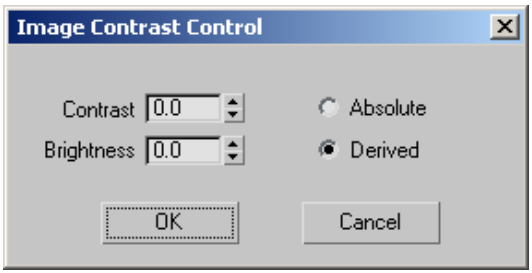
Adding Image Filter Events

Add Contrast Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Contrast Filter from the Filter Plug-In list.

The Contrast Filter allows you to adjust the contrast and brightness of an image.

Interface



Contrast—Set the spinner between 0 and 1.0. This compresses or expands the latitude between maximum black and maximum white by creating a 16-bit look-up table for any given gray value in the image. The computation of the gray value depends on whether you select Absolute or Derived.

Brightness—Set the spinner between 0 and 1.0. This increases or decreases all color components (red, green, and blue).

Absolute/Derived—Determines the computation of the gray value for Contrast. Absolute uses the

highest value of any of the color components. Derived uses an average of the three color components.

Add Fade Filter

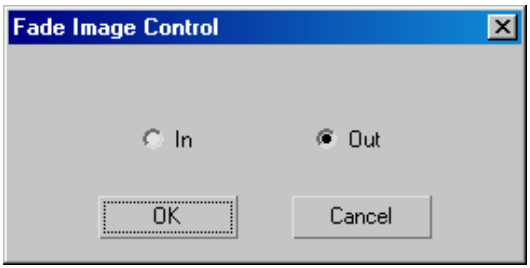
Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Fade Filter from the Filter Plug-In list.

The Fade Filter fades an image in or out over time.

Fade fades out to black or in from black, over time.

The rate of the fade is determined by the length of the Fade filter's time range.

Interface



You can set the following controls in the Setup Options:

In—Fade in.

Out—Fade out.

Add Image Alpha Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Image Alpha Filter from the Filter Plug-In list.

The Image Alpha Filter replaces the image's alpha channel with the channel specified by the filter mask.

The filter takes whatever channel is selected in the channel options under Mask (including *g-buffer (page 3–1040)* channel data) and applies it to the queue's alpha channel, thereby replacing what's there.

If you don't choose a mask, this filter has no effect.

There are no Setup options for this filter.

Procedure

To set an object's G-Buffer ID:

1. Select the object.
2. Right-click the object and then choose Properties from the popup menu.
3. In the Object Properties dialog, set G-Buffer Object Channel to a non-zero value, and then click OK.

   The G-Buffer ID can be any positive integer.

   If you give the same G-Buffer ID value to more than one object, all these objects will be post-processed.

Add Lens Effects Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose a Lens Effects Filter from the Filter Plug-In list.

The Lens Effects Filter adds realistic camera flares, glows, gleams, glimmers, and depth-of-field blurring to your scenes. Lens Effects can affect an

entire scene or can be generated around specific objects in your scene.

Lens Effects are applied through the Video Post interface. To learn about adding scene and image filter events to the video post queue, see *Add Scene Event (page 3–325)*, and *Add Image Filter Event (page 3–330)*.

Lens Effects includes the following filters:

- *Lens Effects Flare (page 3–366)*: Creates the optical effect that occurs when a bright light reflects across the lens of a camera.
- *Lens Effects Focus (page 3–377)*: Creates a blur on objects based on their distance from the camera. tracks an object's distance from the camera using a Z-Buffer. Focus uses the Z-Buffer information from the scene to create its blurring effects.
- *Lens Effects Glow (page 3–380)*: Creates a glowing light around any assigned object, such as a laser beam or the thruster on a space ship.
- *Lens Effects Highlight (page 3–385)*: Creates a bright cross star effect on a designated object.

Warning: When you animate Lens Effects parameters, this creates pointers into the actual scene, so Lens Effects animation is lost if you save the Video Post queue in a *VPX file (page 3–1125)*. To preserve the animation, save the Video Post data, including Lens Effects animation, in the MAX file.

Procedures

Len Effects like Glow and Highlight can be set to affect specific objects in your scene based on their *G-Buffer ID (page 3–1040)*. This lets you apply glows and highlights to the object, or to the material, or both.

To set an object's G-Buffer ID:

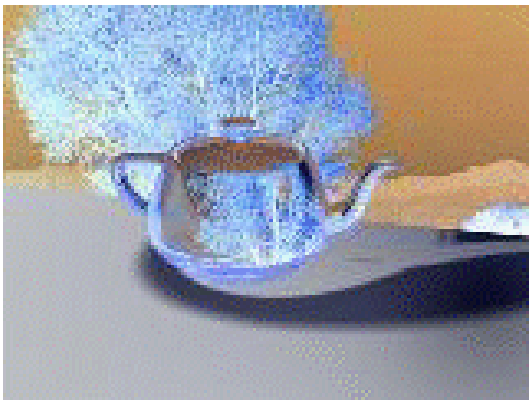
1. Select the object.
2. Right-click the object and then choose Properties from the quad menu.
3. In the Object Properties dialog, set G-Buffer Object Channel to a non-zero value, and then click OK.

   The G-Buffer ID can be any positive integer.

   If you give the same G-Buffer ID value to more than one object, all these objects will be post-processed.

Add Negative Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Negative Filter from the Filter Plug-In list.



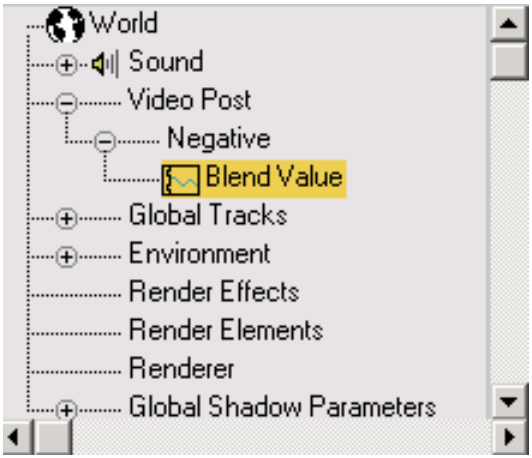
Effect of negative filter

The Negative Filter inverts the colors in the image, making it negative like a negative color photograph.

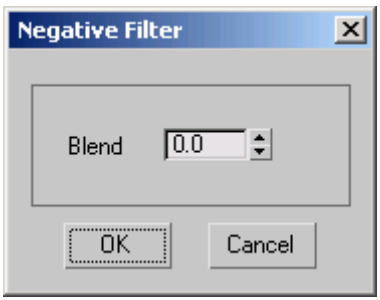
When you click the Setup button in the Edit Filter Event dialog for the Negative filter, the Video Post dialog is replaced by a modeless Negative Filter dialog with a Blend spinner. You can turn on the Auto Key button, move the time slider, and change the Blend value to create keys. (You can also use other 3ds Max functions; for example, you can create objects.) When you've set all the keys you want, click the OK button to return to Video Post.

After creating keys from the Video Post filter, you'll find the track for the new keys as a child of the

Video Post track in the Track View – Curve Editor. Specifically, in the above example, you'll find the following hierarchy in the Curve Editor:



Interface



You can set the following:

Blend—Sets the amount of blending that occurs.

Add Pseudo Alpha Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Pseudo Alpha Filter from the Filter Plug-In list.

The Pseudo Alpha Filter creates an alpha channel for the image based on the image's first pixel (the upper-left corner pixel). All pixels that have the same color as this pixel become transparent.

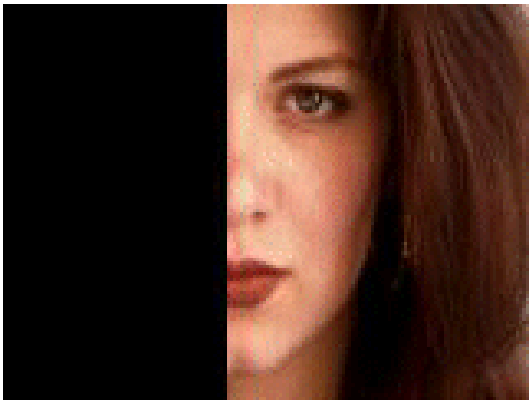
Because only one pixel color becomes clear, edges of the opaque areas are aliased. The main use for this filter is when you want to composite a bitmap whose format does not have an alpha channel.

There is also a *Pseudo Alpha Layer Event (page 3–352)*.

There are no Setup options for this filter.

Add Simple Wipe Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Simple Wipe Filter from the Filter Plug-In list.



Wipe reveals an image by wiping from one side to the other, over time.

The Simple Wipe Filter reveals or erases the foreground image with a wipe transition. Unlike the *Wipe Layer (page 3–331)* event, Wipe Filter wipes across a fixed image.

Wipes from image to image (or image to black). The filtered image stays in place, but is revealed or erased with a wipe across the image. If you're using a Wipe as a Filter event, you'll usually want to use an Alpha Compositor as a Layer event as well.

A typical queue sequence would be: Alpha Compositor (layer)

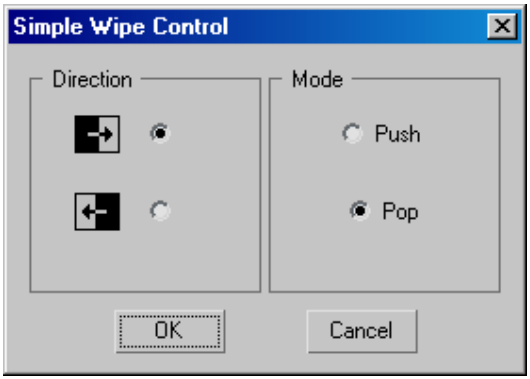
-->Image #1

-->Simple Wipe (filter)

------>Image #2

The rate of the wipe is determined by the length of the Wipe filter's time range. The area not covered by the image renders as black unless you use an Image Layer event to composite the Wipe filter with another image.

Interface



Direction

Right-pointing arrow—Wipes from left to right.

Left-pointing arrow—Wipes from right to left.

Mode

Push—Reveals the image.

Pop—Erases the image.

Add Starfield Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Starfield Filter from the Filter Plug-In list.

The Starfield Filter generates a realistic starfield with optional motion blur. The Starfield filter requires a camera view. Any motion of the stars is a result of camera motion.

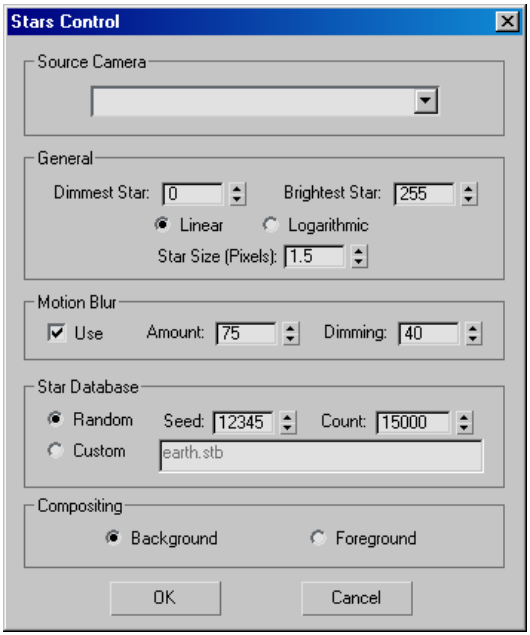
Procedure

To use the Starfield filter:

1. Create a camera and (optionally) animate the camera's or target's position, field of view, and roll.
2. Choose Rendering > Video Post and add a Scene Event, using the camera for the view.
3. Select the Scene Event in the queue, click Add Image Filter, select the Starfield filter, and click the Setup button.
4. In the Stars Control dialog, make sure that the selected camera matches the camera used in the Scene Event.

   If these don't match, the stars will not match the camera's motion. If there is only one camera in the scene, the field will default to that camera.
5. Set the starfield parameters, then exit the Stars Control dialog and the Edit Filter Event dialog.
6. Execute the Video Post sequence to see stars.

Interface



You can set the following controls in the Setup Options:

Source Camera—Lets you choose from a list of cameras in the scene. Choose the same camera as the one being used to render the scene.

General—Sets the brightness range and size of the stars.

Dimmest Star—Specifies the dimmest star. Range = 0 to 255.

Brightest Star—Specifies the brightest star. Range = 0 to 255.

Linear/Logarithmic—Specifies whether the range of brightness is calculated linearly or logarithmically.

Star Size (Pixels)—Specifies the size of the stars, in pixels. Choose any value from 0.001 to 100.

Motion Blur group

These settings control the streaking effect of the stars when the camera moves.

Use—Determines whether to use the motion blur. If clear, the stars appear as dots, no matter what the camera's motion.

Amount—The percentage of the frame time that the camera "shutter" is open. Default = 75%.

Dimming—Determines how the streaked stars will dim as their trails lengthen. The default of 40 provides a good effect for video, dimming them a bit so they don't appear to flash.

Star Database group

These settings specify the number of stars in the starfield.

Random—Generates the number of stars indicated by the Count spinner, using the random number Seed to initialize the random number generator.

Custom—Reads the file specified. A provided star database, *earth.stb*, contains the brightest stars in Earth's sky.

Seed—Initializes the random number generator. By using the same Seed value in different animations, you're guaranteed identical starfields.

Count—Specifies the number of stars generated when Random is chosen.

Compositing group

Background—Composites the stars in the background. This is the default.

Foreground—Composites the stars in the foreground.

Adding Image Layer Events

Add Alpha Compositor

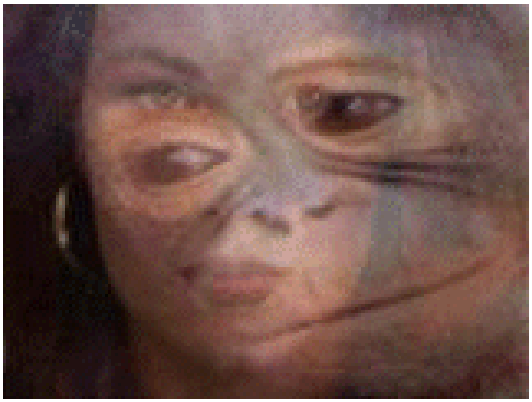
Rendering menu > Video Post > Video Post window > Make sure the two child events are in the order you want the Image Layer event to use them. > Select the two events. > Video Post toolbar > Add Image Layer Event > Choose Alpha Compositor from the Layer Plug-in list.

The Alpha Compositor composites the two images using the *alpha channel (page 3–1001)* of the foreground image. The background image appears in areas where the foreground image's alpha channel is transparent.

There are no Setup options for this compositor.

Add Cross Fade Compositor

Rendering menu > Video Post > Video Post window > Make sure the two child events are in the order you want the Image Layer event to use them. > Select the two events. > Video Post toolbar > Add Image Layer Event > Choose Cross Fade Compositor from the Layer Plug-in list.



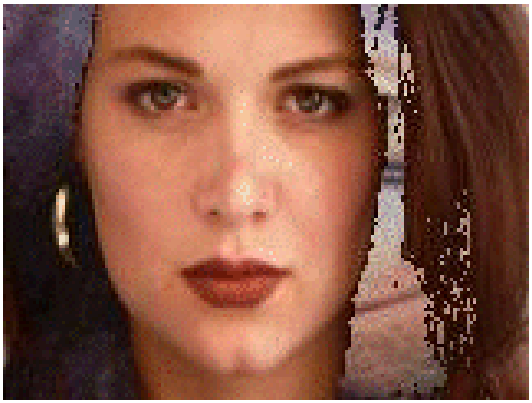
Cross fade fades one image into another over time.

The Cross Fade Compositor composites the two images over time, cross fading from the background image to the foreground image. The rate of the cross fade is determined by the length of the Cross Fade Transition filter's time range.

There are no Setup options for this compositor.

Add Pseudo Alpha Compositor

Rendering menu > Video Post > Video Post window > Make sure the two child events are in the order you want the Image Layer event to use them. > Select the two events. > Video Post toolbar > Add Image Layer Event > Choose Pseudo-Alpha Compositor from the Layer Plug-in list.



Pseudo alpha compositing

The Pseudo-Alpha Compositor composites a foreground image against the background by creating an alpha channel for the foreground image based on the foreground image's upper-left-corner pixel. All pixels in the foreground image that use this color become transparent.

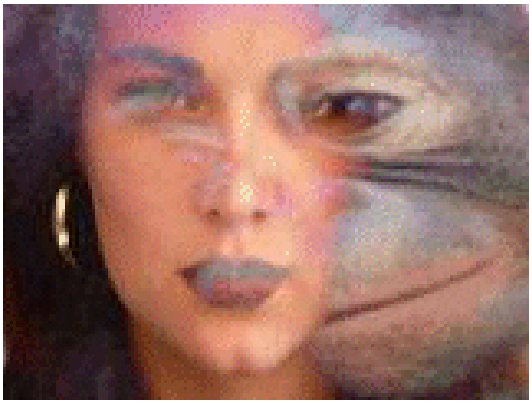
Because only one pixel color becomes transparent, edges of the opaque areas in the foreground image are aliased. Use this method when the foreground image is a bitmap whose format does not have an alpha channel.

There is also a *Pseudo Alpha Filter Event (page 3–360)*.

There are no Setup options for this compositor.

Add Simple Additive Compositor

Rendering menu > Video Post > Video Post window > Make sure the two child events are in the order you want the Image Layer event to use them. > Select the two events. > Video Post toolbar > Add Image Layer Event > Choose Simple Additive Compositor from the Layer Plug-in list.



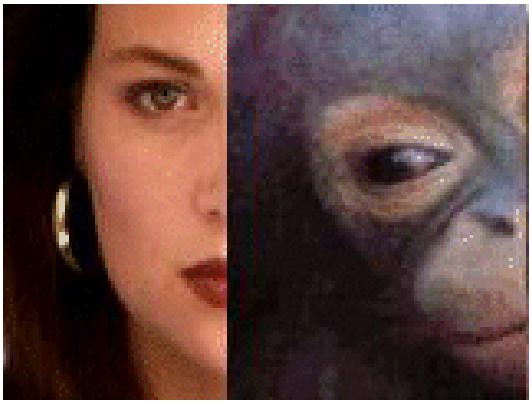
Additive compositing

The Simple Additive Compositor composites the two images using the second image's intensity (HSV value) to determine transparency. Areas of full intensity (255) are opaque; areas of zero intensity are transparent; and areas with intermediate transparency are translucent.

This layer event can be useful when the second image is a bitmap whose format does not have an alpha channel.

Add Simple Wipe Compositor

Rendering menu > Video Post > Video Post window > Make sure the two child events are in the order you want the Image Layer event to use them. > Select the two events. > Video Post toolbar > Add Image Layer Event > Choose Simple Wipe Compositor from the Layer Plug-in list.



Wipe reveals an image by wiping from one side to the other, over time.

The Simple Wipe Compositor reveals or erases the foreground image with a wipe transition. Unlike the *Wipe Layer (page 3–345)* event, Wipe Filter wipes across a fixed image.

Wipes from image to image (or image to black). The filtered image stays in place, but is revealed or erased with a wipe across the image. If you're using a Wipe as a Filter event, you'll usually want to use an Alpha Compositor as a Layer event as well.

A typical queue sequence would be: Alpha Compositor (layer)

-->Image #1

-->Simple Wipe (filter)

------>Image #2

The rate of the wipe is determined by the length of the Wipe filter's time range. The area not covered by the image renders as black unless you use an

Image Layer event to composite the Wipe filter with another image.

Interface

Direction

Right-pointing arrow—Wipes from left to right.

Left-pointing arrow—Wipes from right to left.

Mode

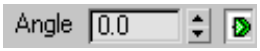
Push—Reveals the image.

Pop—Erases the image.

Lens Effects Filters

Animating Lens Effects Properties

Lens Effects lets you use Track View to control parameters which can be animated while Video Post remains open. Any parameter with a green arrow button next to it can be animated.



When the Auto Key button is selected, the associated spinner or variable is displayed in Track View and can be animated. If it is not selected, the green button turns gray to indicate the parameter can no longer be animated.

There are two ways to set Lens Effects parameters for use in animation:

- Enable the Auto Key button, set the frame in which you want to create a key, and set the value.
- Use Track View.

Using Track View

To use Track View with Lens Effects, one of the Lens Effects dialogs for a particular filter must be open when you start Track View.

Note: If you open Track View without one of the Lens Effects dialogs being open, the first Lens Effects object does not appear in the Track View List. If you have more than one Lens Effects object in the scene, you will see multiple Lens Effects objects in Track View.

When Track View is open, the Lens Effects filters you have applied are listed under Video Post on the left side of the Track View interface. Under each filter are the parameters which can be animated. These are displayed individually. You can animate only the parameters you need to.

When viewing Gradients in Track View, notice that the first two flags have only a color track associated with them. This is because they are the start and end points of the gradient and never move. Any flags created after the first two will also have a position track associated with them. This means that you can animate not only the color of any flag in any gradient, but also its position over time as well.

If you disable the animation capabilities for a particular lens flare parameter, the corresponding entry in Track View immediately disappears. For more information, see *Track View (page 2–483)*.

Warning: When you animate Lens Effects parameters, this creates pointers into the actual scene, so Lens Effects animation is lost if you save the Video Post queue in a *VPX file (page 3–1125)*. To preserve the animation, save the Video Post data, including Lens Effects animation, in the MAX file.

Flare Filter

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup

The Lens Effects Flare dialog lets you add lens flare effects as a post process to rendering. Flares are usually applied to lights in your scene. The lens flare will then be generated around that object. You can control all aspects of the lens flare in the Lens Effects Flare dialog.

Procedure

To save your flare settings, do one of the following:

You can save all of your lens flare settings to a file, so you can reload them any time. Lens Effects Flare files are saved to an *LZF file (page 3–1059)* (*.lzf*).

- Click the Reset button.

  This resets Lens Effects Flare to its default settings.

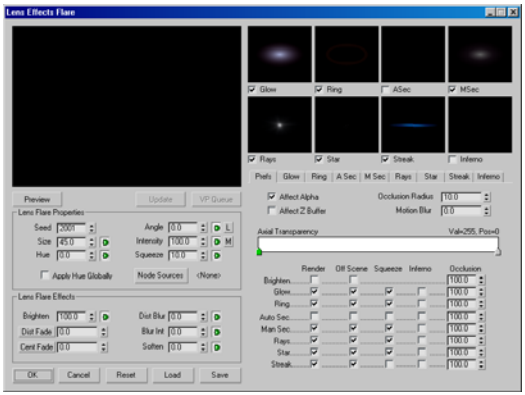
- Click the Load button.

  This displays a Windows-standard file open dialog from which you can select the settings file you want to load.

- Click the Save button.

  This displays a Windows-standard Save As dialog in which you specify a directory and filename.

Interface



Preview group

The large black window in the left corner is the main preview window. To the right of this window are smaller preview windows for each part of the flare. You can generate continual previews by clicking the Preview button under the main preview window.

There are nine Lens Effects Flare preview windows. The main preview window in the upper left corner of the Lens Effects dialog shows you the complete scene. The eight smaller preview windows in the upper right corner show the individual parts of the lens flare. Each small preview window has a check box below the window to display the flare effect.

You might notice that an individual part of the lens flare effect might not appear as bright in the smaller preview windows, compared to the main preview. This is because the brightness of a lens flare in the main preview is a result of combining the brightness of multiple effects, the total brightness being greater than a single part.

All of the preview windows are multi-threaded to increase redraw speed and take advantage of multi-processor systems. When you make an adjustment to a lens flare property and the preview window is active, the preview updates automatically. A white line at the bottom of the

main preview window indicates that it is updating a change made within the lens flare dialog.

Preview—When you click the Preview button, the window displays your flare in the upper left corner if your flare has automatic or manual secondary elements. If your flare does not contain these elements, the flare is centered in the preview window. If the VP Queue button is not on, the preview displays a generic flare to which you can make adjustments. Each time you change a setting, the preview automatically updates. A white line appears at the bottom of the preview window to indicate the preview is updating.

Update—Redraws the entire Main Preview window, as well as the smaller windows each time you click this button. This function is critical when you need to view changes you have made in the Video Post queue, such as moving the Time Slider to a different frame, changing your geometry or a light, or changing another filter that precedes the current one in the Video Post queue. The VP Queue button must be on to preview the contents of the Video Post queue. In this case, clicking the Update button causes a small dialog to appear, with an indicator showing the progress of the update.

VP Queue—Displays the contents of the Video Post queue in the main preview window. The Preview button must also be turned on. Rather than having to test render every time you want to see the result of the effect in the scene, VP Queue displays a final composite, combining the effect you are editing with the contents of the Video Post queue.

Note: If you leave the Preview and VP Queue buttons active when you exit Lens Effects Flare, it will take several seconds to re-render the scene in the main preview window the next time you start Lens Effects Flare.

The view in the main preview window also depends upon which lens flare options you have set in the *Preferences panel (page 3–369)*.

Lens Flare Properties group

Specifies global settings for the flare, such as the source for the flare(s), the size, seed number, rotation, and so on.

Seed—Gives the random number generator in Lens Effects a different starting point, which creates slightly different lens flares without changing any settings. Using Seed guarantees a different lens flare, even if the differences are very small. For example, if you set up a ray effect for your lens flare, you will get slightly different rays in the lens flare if you adjust the seed value.

Size—Affects the size of the overall lens flare. This value is a percentage of the size of the rendered frame. Default = 30.

Other parts of the lens flare, such as glow, ring, etc., also have size adjustments, but this size setting affects the entire lens flare, including secondary flares. Adjusting individual sizes does not affect this size variable, or vice versa. This parameter can be *animated (page 3–365)*. Animating the Size parameter causes flares to grow or diminish in size over the course of your animation.

Hue—If Apply Hue Globally is selected, it controls the amount of Hue applied to the Lens Flare effect. This parameter can be animated.

Apply Hue Globally—Globally applies the Hue of the Node Source to the other Flare effects.

Angle—Affects the amount that the flare rotates from its default position, as the position of the flare changes relative to the camera. This parameter can be animated. The lock button to the right of the Auto Key button locks the secondary flares so they do rotate. When the button is disabled, the secondary flares will not rotate.

Animating the Angle parameter does not animate the manual and automatic secondary flares unless you turn on the L button. The default behavior

mimics a camera, in which the aperture does not rotate.

Rays, stars, and streaks don't animate either unless you turn on their individual Auto Rotate toggles.

Intensity—Controls the overall brightness and opacity of the flare. Higher values produce bright, more opaque flares, and lower values produce dim, transparent flares. This parameter can be animated.

Squeeze—Squeezes the size of the lens flare, either horizontally or vertically to compensate for different frame aspect ratios. You can set Squeeze from 100 to -100. Positive values stretch the flare horizontally, and negative values stretch it vertically. The value is a percentage of the size of the flare. This parameter can be animated.

For example, if you convert a film for use on TV, applying Squeeze would cause the lens flare to look correct on the smaller screen, and not thin and tall, although a wide-screen 35-MM film image is much wider than a regular TV.

Although Squeeze is a global setting, you can apply this effect to selected portions of your flare through the *Preferences panel (page 3–369)* so that only the flare elements you want are distorted. The Squeeze spinner value is given as a percentage of the size of the flare.

Node Sources—Lets you select the source object for the lens flare effect. The source of the lens flare may be any object in the scene, but is generally a light, such as a target spot light, or an omni light. Clicking this button displays the Select Flare Objects dialog. You must select a source for the flare to key off.

Note: If you select a source object, then rename the object later, you must reselect the object to ensure the correct generation of the lens flare.

Lens Flare Effects group

Controls specific effects for the flare, such as fades, brightness, softening, and so on.

Brighten—Lets you set an overall brightness that affects the whole image. When a bright effect, such as a lens flare, appears in an image, the whole image should appear brighter. This effect is available only when the Brighten option is enabled under the Render section of the Preferences panel. This parameter can be *animated (page 3–365)*. Animating the Brighten spinner is an easy way to create flares that "flash" the scene as they appear.

Dist Fade—Causes the effect of the lens flare to fade with its distance from the camera. This option is used only when the Dist Fade button is turned on. The values are in 3ds Max world units. This option is used when you want to create the effect of flares disappearing at a certain point away from the camera.

Cent Fade—Fades the secondary flares near the center of the row of flares along the main axis of the flare. This is an effect that can be seen in many lens flares seen through a real camera lens. This value is in 3ds Max world units. This setting is only active when the **Cent Fade** button is selected.

Dist Blur—Blurs the flare based on its distance from the camera. This value is in 3ds Max world units. This parameter can be animated.

Blur Int—Controls the strength of the blur when it is applied to the lens flare. The value set in this spinner takes full effect as the flare reaches the Dist Blur distance in your scene. Flares closer to the camera plane get a percentage of the intensity setting. This parameter can be animated.

Soften—Provides an overall softening effect for the lens flare This parameter can be animated.

Flare Parameter tabs

Let you create and control the lens flare. Each of the nine tabs controls a specific aspect of the lens flare.

Warning: When you animate Lens Effects parameters, this creates pointers into the actual scene, so Lens Effects animation is lost if you save the Video Post queue in a *VPX file (page 3–1125)*. To preserve the animation, save the Video Post data, including Lens Effects animation, in the MAX file.

A flare is composed of eight basic parts. Each part of a flare is controlled on its own panel in the Lens Effects Flare interface. Each part of the lens flare can be individually activated and deactivated to create different effects.

Prefs (page 3–369): This page lets you control which parts of a lens flare are active and how they effect the overall image.

Glow (page 3–371): A general glow centered around the source object of the flare. You can control the color, size, shape, and other aspects of the glow.

Ring (page 3–371): A circular color band that surrounds the center of the source object. You can control the color, size, shape, and other aspects of the ring.

A Sec (page 3–372): Auto Secondary Flares. The small circles you would normally see coming out from the source of the lens flare. As the camera position changes relative to the source object, the secondary flares move. The secondary flares are automatically generated when this option is active.

M Sec (page 3–373): Manual Secondary Flares. Additional secondary flares added to the lens flare effect. They appear in the same axis as the automatic secondary flares and look very similar.

Rays (page 3–373): Bright lines that radiate out from the center of the source object, providing the illusion of extreme brightness for the object.

Star (page 3–374): Bright lines that radiate out from the center of the source object, generally composed of 6 or more spokes, (instead of hundreds, like a ray). Stars are generally thicker and extend out farther from the center of the source object than rays.

Streak (page 3–375): Wide horizontal bands that run through the center of the source object.

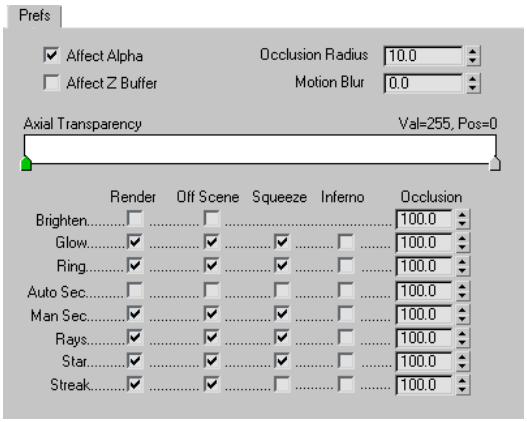
Inferno (page 3–376): Lets you add special effects, such as explosions, to your flare effect.

Flare Preferences

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Prefs tab

In the Prefs panel, you can control whether or not specific parts of the lens flare, such as the rays or the star are rendered by turning them on or off. You can also control the axial transparency of the lens flare.

Interface



Affect Alpha—Specifies whether or not the lens flare affects the alpha channel of an image, when the image is rendered in a 32-bit file format. The alpha channel is an extra 8 bits of color (256 colors) that indicate transparency in an image.

Alpha channels are used to composite one image seamlessly over the top of another. If you want to composite a lens flare, or an image that contains a lens flare, over the top of another image, enable this option. If you are not rendering to a 32-bit file, do not enable this option.

Affect Z Buffer—The Z-Buffer stores an object's distance from the camera. The Z-Buffer is useful for optical effects such as fog. When this option is enabled, the linear distance of the lens flare is recorded, and can be used in special effects that make use of the Z-Buffer, for example, the *Focus (page 3–377)* effect. To use Focus with a lens flare, enable this option.

Occlusion Radius—A radius around the center of the flare that determines when the lens flare effect will begin to fade as it passes behind another object. This radius is measured in pixels.

When the lens flare or scene is animated and the source of the lens flare goes behind another object, if occlusion is enabled, the flare dies down and disappears until the source object reappears on the other side of the hiding object. The radius makes the flare gently fade when it is occluded, instead of blinking out.

Motion Blur—Determines whether or not an animated lens flare is rendered using Motion Blur. Motion Blur renders multiple copies in short increments to the same frame, which gives the illusion of a blurred object in motion. When an object is moving rapidly across the screen, it animates more smoothly if motion blur is turned on. Using motion blur can add considerable time to your rendering.

You can set the amount of blur with the Motion Blur spinner. Values range from 0 to 100, and are based on the number of samples the motion blur should use.

Axial Transparency—A standard circular transparency gradient that affects the transparency of the lens flare secondary elements along their axis and relative to their source. This lets your secondary elements be brighter on one side than the other, adding extra realism to your flare effects.

Render—Specifies whether or not each part of the lens flare is rendered in the final image. Use this set of check boxes to turn parts of the lens flare on and off.

Note: Effects such as secondary flares are available in sets. The Render button and Off Scene determine whether the secondary flares are present in the scene. The individual secondary flare sets are controlled on their respective pages.

Off Scene—Specifies whether or not lens flares that have their sources outside the scene will affect the image. For example, if a lens flare source is just off the edge of a frame, the secondary flares, and possibly the star or ring, could still be showing on the screen. Without Off Scene, the lens flare does not appear at all. You can turn this option on or off for each part of the flare.

Squeeze—Specifies whether the Squeeze setting affects a particular part of the lens flare. This setting depends on the Squeeze setting in the lens flare properties.

Inferno—Defines whether the *inferno (page 3–376)* settings are active for this portion of the lens flare.

Occlusion—Defines the percentage of the flare part that appears when it is occluded by another object. A value of 100 indicates that the whole object will disappear. Lower settings cause the lens flare to wrap around the occluding object, making it fade, but not disappear entirely. For example, if you look at a cylinder with a bright light behind it, the light makes the cylinder appear thinner at the brightest areas.

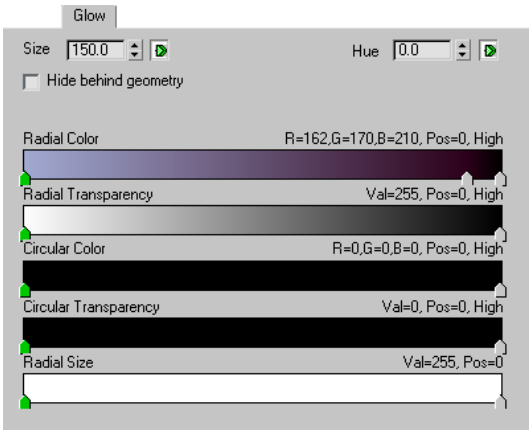
Note: The Occlusion spinners work in conjunction with the Occlusion Radius spinner in the top right of the Preferences panel.

Flare Glow Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Glow tab

The glow of a lens flare is centered around the source object of the flare. The parameters on the Glow panel let you control each aspect of the glow.

Interface



Size—Specifies the diameter of the glow of the lens flare as a percentage of the overall size of the frame. This value is separate from the overall size value set in the *Flare Properties (page 3–366)*. This parameter can be *animated (page 3–365)*.

Hue—Specifies the gradation of color for the glow. Clicking the green arrow button lets you animate this control. This parameter can be animated.

Hide Behind Geometry—Places the glow behind the geometric forms.

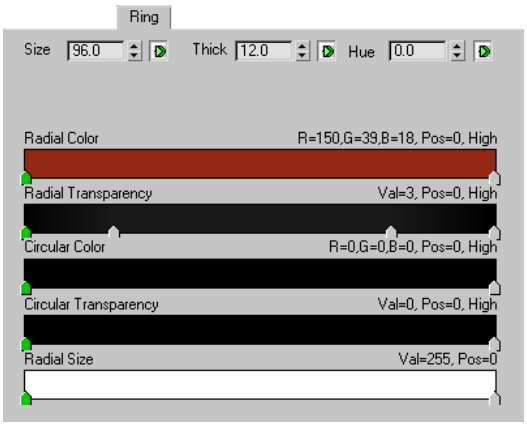
Gradients—Use radial, circular, transparency, and size *gradients (page 3–392)*. Glow gradients are subtler than flare gradients, because they are glowing an area larger than a pixel.

Flare Ring Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Ring tab

The ring is a circular color band that surrounds the center of the source object. You set ring options on the Ring panel of the Lens Effects Flare dialog.

Interface



Size—Specifies the overall size of the ring as a percentage of the overall frame and represents the diameter of the ring. The ring radius should be larger than the glow radius to make the lens flare look convincing. This parameter is separate from the overall size spinner in the Lens Flare Effects section of the dialog. This parameter can be *animated (page 3–365)*.

Thick—Specifies the overall thickness of the ring, as a percentage of the overall size of the frame. When the ring is fairly thick, the size of the ring is measured to the inner radius. The thickness controls how thick the ring is from that point outward. This parameter can be animated.

Hue—Specifies the gradation of color for the ring. This parameter can be animated.

Gradients—Use radial, circular, transparency, and size *gradients (page 3–392)*.

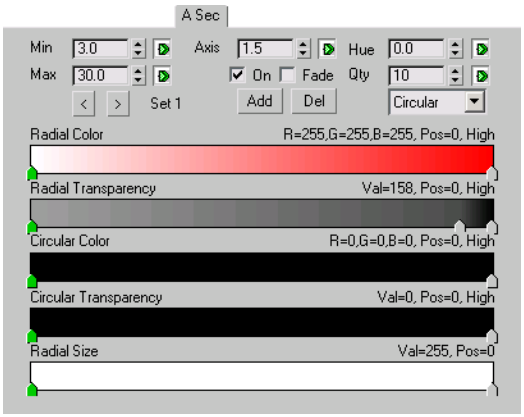
Automatic Secondary Flare Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > A Sec tab

Secondary flares are the small circles you would normally see coming out from the source of the lens flare along an axis relative to the camera position. These are caused by light refracting off the different lens elements in the camera. As the camera position changes relative to the source object, the secondary flares move. These secondary flares are automatically generated when this option is selected in the Preferences section of the dialog.

You create sets of secondary elements that share common parameters instead of building them one at a time. Many of the controls on the A Sec panel are for individual sets of elements, not all sets.

Interface



Min—Controls the minimum size of secondary flares in the current set. This number is defined as a percentage of the overall image. This parameter can be *animated (page 3–365)*.

Max—Controls the maximum size of secondary flares in the current set. This number is defined as a percentage of the overall image. This parameter can be *animated (page 3–365)*.

Sets—Specifies which set of secondary flares you are working with. You can have as many sets of automatic secondary elements as you wish, each having their own properties. By default, seven sets are available. You can scroll through them by clicking the forward and reverse arrow icons beside the name of the set.

To add another set to your flare, click the Add button beneath the On check box. To delete a set, click the Del button.

Axis—Defines the overall length of the axis the automatic secondary flares will be distributed along. Increasing the value creates more space between the flares, while decreasing the value creates less space between the flares. You can set the axis from 0 to 5 degrees. This parameter can be *animated (page 3–365)*.

On—Defines whether a group or set of secondary flares is active or not.

Fade—Determines whether or not axial fade is active for the current set of secondary flares.

Hue—Specifies the gradation of color of the secondary flares. This parameter can be animated.

Qty—Controls the number of secondary flares that appear in the current set of flares. This parameter can be animated.

Shape—Controls the shape of the secondary flares for the current set. The default value is circular, but you can choose from 3 to 8 sided secondary flares.

Gradients—Defines the *gradient (page 3–392)* for the secondary flare.

Manual Secondary Flare Parameters

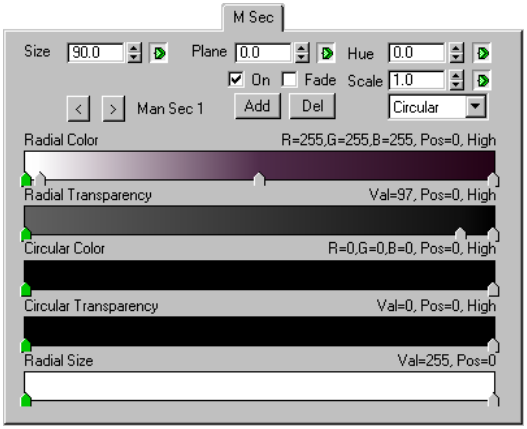
Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > M Sec tab

Manual secondary flares are additional secondary flares that are individually added to the lens flare. These can be used in addition to, or in place of *automatic secondary flares (page 3–372)*.

You use Manual secondary flares when you want to add unique flares that you don't want repeated.

You can have groups of secondary flares, instead of just one set. Many of the controls in this dialog are for a specific set of flares, not all sets.

Interface



Size—Controls the size, as a percentage of the overall image, of the manual secondary lens flare. This parameter can be *animated (page 3–365)*.

Plane—Controls the distance, in degrees, between the flare source and the manual secondary flare. By default, the flare plane exists at the center of the chosen node source. Positive values place the flare in front of the source, while negative values place the flare behind the flare source. This parameter can be animated.

Tip: In live camera work, there are often one or two secondary elements behind the light source, so you should have one or two as well.

On—Turns manual secondary flares on or off. This option must be selected in both the Manual Secondary and Preferences tabs for the manual secondary flares to render.

Fade—Specifies whether or not the current set of secondary flares has axial fade.

Sets—Specifies which set of secondary flares you are working with. You can have as many sets of manual secondary elements as you wish, each having their own properties. By default, seven sets are available. You can scroll through them by clicking the forward and reverse arrow buttons next to the name of the set.

To add another set to your flare, click the Add button beneath the On check box. To delete a set, click the Del button.

Hue—Specifies the gradation of color of secondary flares. This parameter can be animated.

Scale—Specifies how to scale secondary flares. This parameter can be animated.

Shape—This menu controls the overall shape of the secondary flares.

Gradients—Defines the *gradient (page 3–392)* for the secondary flare.

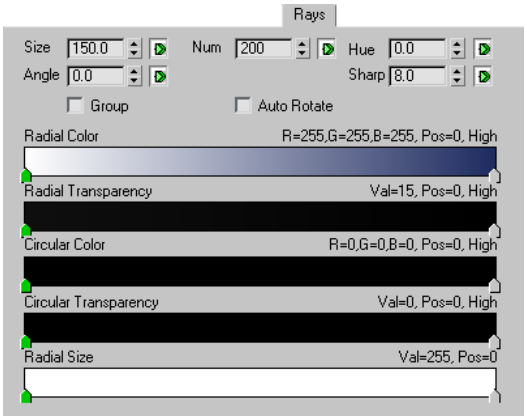
Flare Ray Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Rays tab

Rays are bright single-pixel lines that radiate from the center of the source object, providing the illusion of extreme brightness for the object. Rays let you emulate scratches in the lens elements of a camera.

You control the parameters for rays in the Rays panel of the Lens Effects Flare dialog.

Interface



Size—Specifies the overall length of the rays as they radiate from the center, as a percentage of the frame size. This parameter can be *animated (page 3–365)*.

Angle—Specifies the angle for the rays. You can enter both positive and negative values so, when animated, the rays rotate in a clockwise or counterclockwise direction. This parameter can be animated.

Group—Forces the grouping of rays into eight equidistant groups of equal size. Rays that are part of a group are evenly distributed within that group. Increasing the number of rays makes each grouping more dense, and therefore more bright.

Number—Specifies the overall number of rays that appear in the lens flare. Rays are randomly spaced around the radius. This parameter can be animated.

Auto Rotate—Adds the angle specified in the Angle spinner on the Rays panel to the angle set in the Angle spinner under Lens Flare Properties. Auto Rotate also ensures that the rays maintain their relative position to the flare as it is being animated.

Hue—Specifies the gradation of the color of the rays. This parameter can be animated.

Sharp—Specifies the overall sharpness of the rays. Higher numbers produce crisp, clean, and clear rays. Lower numbers produce more of a secondary glow look. Values range from 0 to 10. This parameter can be animated.

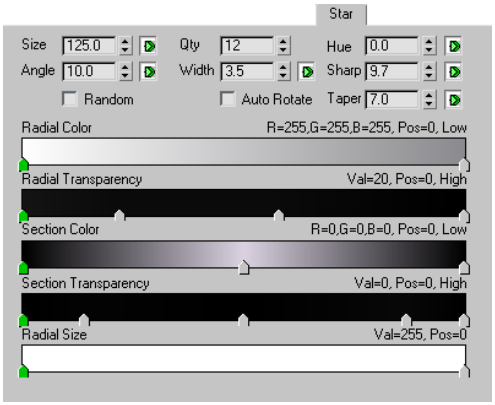
Gradients—Defines the *gradient (page 3–392)* for the rays.

Flare Star Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Star tab

A Star is larger than a ray effect and is composed of six or more spokes, instead of hundreds like a ray. Stars are thicker and extend out farther from the center of the source object than rays. You control the settings for stars on the Star panel of the Lens Effects Flare dialog.

Interface



Size—Specifies the overall size of the star effect, as a percentage of the overall frame. This parameter can be *animated (page 3–365)*.

Angle—Sets the starting angle in degrees in which the star spokes point. You can enter both positive

and negative values so, when animated, the star spokes rotate in a clockwise or counterclockwise direction. This parameter can be animated.

Random—Enables random spacing of star spokes around the flare center.

Qty—Specifies the number of spokes in the star effect. Default = 6.

Spokes are spaced at equidistant points about the center of the flare. This parameter can be animated.

Width—Specifies the width of the individual spokes, as a percentage of the overall frame. This option can be animated.

Auto Rotate—Adds the angle specified in the Angle spinner on the Rays panel to the angle set in Angle spinner under Lens Flare Properties. Auto Rotate also ensures that the stars maintain their relative position to the flare as it is being animated.

Hue—Specifies the gradation of the color of the star. This parameter can be animated.

Sharp—Specifies the overall sharpness of the star. Higher numbers produce crisp, clean, and clear stars. Lower numbers produce more of a secondary glow look. This parameter can be animated. Range = 0 to 10.

Taper—Controls the taper of the individual spokes of the star. Taper widens or narrows the tips of the individual star points. Low numbers create a sharp point, while high numbers flare the points. This parameter can be animated. Default = 0.

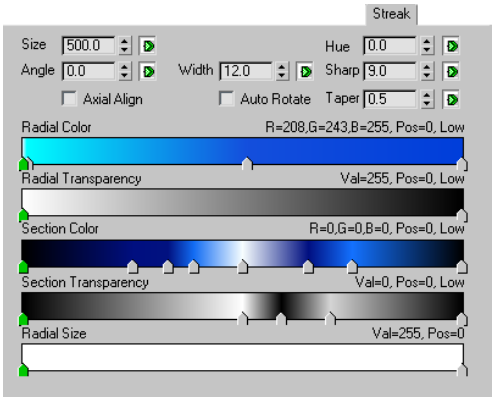
Gradients—The *gradients (page 3–392)* are the same for the Star effect as for others, except for two gradients: **Section Color** and **Section Transparency**. These options are useful when you want to create a "soft" look to the spokes. Both gradients work from the center of each spoke to the outer edge of the spoke.

Flare Streak Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Streak tab

A streak is a wide horizontal band that runs through the center of the source object. In real camera work, it is produced when using anamorphic lenses to film a scene. You set streak options on the Streak panel of the Lens Effects Flare dialog.

Interface



Size—Specifies the overall size of the streak, as a percentage of the overall frame. This parameter can be *animated (page 3–365)*.

Angle—Specifies the angle for the streak. You can enter both positive and negative values so, when animated, the streak rotates in a clockwise or counterclockwise direction. This parameter can be animated.

Axial Align—Forces the streak to align itself to the axis of the secondary flares and the lens flare itself.

Width—Specifies the width of the streak, as a percentage of the frame. This parameter can be animated.

Auto Rotate—Adds the angle specified in the Angle spinner on the Streak panel to the angle set in

Angle spinner under Lens Flare Properties. Auto Rotate also ensures that the stars maintain their relative position to the flare as it is being animated.

Hue—Specifies the gradation of the color of the streak. This parameter can be animated.

Sharp—Specifies the overall sharpness of the streak. Higher numbers produce crisp, clean, and clear streaks. Lower numbers produce more of a secondary glow look. Valid values are from 0 to 10. This parameter can be animated.

Taper—Controls the taper of the individual spokes of the streak. Taper widens or narrows the tips of the individual streak points. Low numbers create a sharp point, while high numbers flare the points. Default = 0. This parameter can be animated.

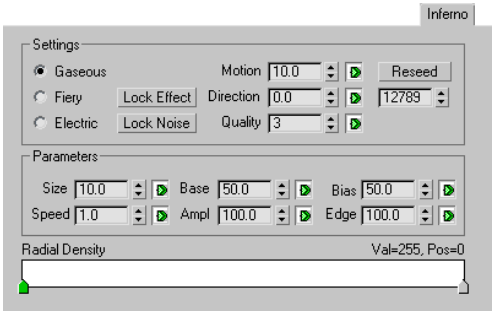
Gradients—The *gradients (page 3–392)* are the same for the Streak effect as for others, except for two gradients: **Section Color** and **Section Transparency**. These options are useful when you want to create a "soft" look to the streak spokes. Both gradients work from the center of each spoke to the outer edge of the spoke.

Flare Inferno Parameters

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose Lens Effects Flare from Filter Plug-In list. > Setup > Inferno tab

Infernos let you use lens flare to create explosions, fire, and smoke effects and add a bit of fractal noise to any part of the lens flare. This noise comes in three types: Gaseous, Electric, and Fiery.

Interface



You add the Inferno effect to other lens flare effects. Inferno is selected in the Preferences panel. The lens flare effect you are adding Inferno to, such as glow, must also be selected for Inferno to work correctly. The Inferno panel is divided into two sections: Settings and Parameters.

Settings group

Gaseous—A loose and soft pattern, often used for clouds and smoke.

Fiery—Fractal patterns with bright, well-defined areas, often used for fires.

Electric—Long, well-defined tendril pattern that can be used to produce arcing electricity, when animated. By adjusting the quality of the pattern to 0, you can create the effect of water reflection.

Lock Effect—Locks the inferno effect to the lens flare. When the lens flare moves across the screen, the inferno effect moves with it. Use this option when you want the noise pattern to move with the flare for effects like torches.

Lock Noise—Locks the inferno noise patterns into the screen. When the lens flare is animated and moving across the screen, the noise pattern stays in one spot and the flare moves through it. This is often used for creating plasma trails and cloud patterns.

Motion—When you animate the inferno, motion specifies how fast the inferno patterns move in

the direction set by the Direction spinner. For example, if you want to simulate a raging fire, you want the fractal patterns to move upward. This parameter can be *animated (page 3–365)*.

Direction—Specifies the direction, in degrees, of the inferno effect motion. By default, 0 is aligned in the 12 o'clock position, and works clockwise. This parameter can be animated.

Note: The Motion and Direction spinners control the motion of the fractal pattern in the X and Y directions. You can control the Z direction using the Speed option under Inferno Parameters.

Quality—Specifies the overall quality of the fractal noise patterns in the inferno effect. Higher values result in more iterations of the fractals, more detail in the effect, and slightly longer render times. This parameter can be animated.

Reseed—The number that the fractal routines use as a starting point. Set this spinner to any number to create different fractal effects. The Reseed button randomly selects a new number.

Parameters group

Size—Specifies the overall size of the fractal patterns. Smaller numbers produce small, grainy fractals. Higher numbers produce larger patterns. This option can be animated.

Speed—Sets the overall speed of the turbulence in the fractal patterns as they are animated. Higher numbers produce faster turbulence in the pattern. This parameter can be animated.

Base—Specifies the brightness of the colors in the inferno effect. Higher values result in brighter color ranges and brighter infernos. Lower values result in dark, softer effects. The Base spinner only affects Fiery and Electric inferno types This parameter can be animated.

Amplitude—With the Base spinner, controls the maximum brightness for each portion of the fractal inferno patterns. Higher values result in fractal patterns with brighter colors. Lower values result in the same patterns, with muted colors. This parameter can be animated.

Bias—Shifts the colors of the effect toward one end of the color range or the other. At a setting of 50, Bias has no effect. Above 50, the colors are brighter, and below 50, they are darker and softer. This parameter can be animated.

Edge—Controls the contrast between the light and dark areas of the fractal patterns. High values produce a high contrast and more well-defined fractal patterns. Low values result in less defined, subtler effects. This parameter can be animated.

Radial Density—Controls the density of the inferno effect in a radial fashion from the center of the effect to the edge. Wherever there is white in the gradient, you only see inferno noise. Where the gradient is black, you can see the underlying flare. If you set the right side of the gradient to black and the left side to white, and apply the Inferno to the Glow effect of a flare, the inferno effect appears toward the outer edges of the glow, while the center of the glow is still visible.

Focus Filter

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Focus from Filter Plug-In list. > Setup

The Lens Effects Focus dialog lets you blur objects based on their distance from the camera. Focus uses the Z-Buffer information from the scene to create its blurring effects. You can use Focus to create effects such as foreground elements in focus and background elements out of focus.

Like Flare, Glow, and Highlight, you can load and save your focus settings for future use. Focus settings are saved to *LZO files (page 3–1059)* (*.lzo*).

Warning: This filter is not supported by the *mental ray renderer (page 3–77)*.

Procedure

To save your focus settings, do one of the following:

You can save all of your lens focus settings to a file, so you can reload them any time. Lens Effects Focus settings are saved as LZO files.

- Click the Reset button.

  This resets Lens Effects Focus to its default settings.

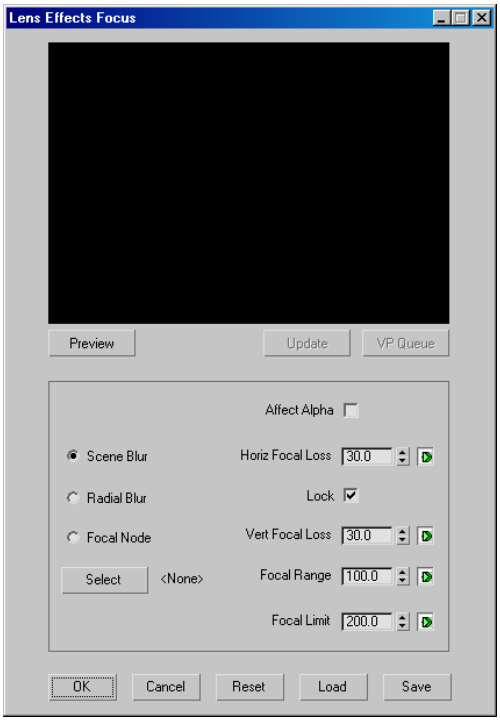
- Click the Load button.

  This displays a Windows-standard file open dialog from which you can select the settings file you want to load.

- Click the Save button.

  This displays a Windows-standard Save As dialog in which you specify a directory and filename.

Interface



The Lens Effects Focus dialog contains a preview window, and an area below to control the parameters of Focus.

Preview group

Preview window—Lets you quickly preview the Focus effect.

Preview—Displays a generic scene to which you can quickly set up a Focus effect. Appears light green when selected.

VP Queue—Lets you preview the scene in the Video Post queue. Preview must be selected for the VP Queue function to work.

Focus Control group

The settings on the left side of the panel let you select a method for blurring your scene. The settings on the right side of the dialog let you

determine how much blurring is applied to the scene.

Scene Blur—Applies the blurring effect to the entire scene, not just a portion of it.

Radial Blur—Applies the blurring effect to the entire scene in a radial fashion, starting at the center of the frame. This is useful for emphasizing fish-eye lens effects and effects where the edges of the frame are blurred. This type of Focus depends on the Focal Range and Limit settings.

A scene with a radial blur is applied.

Focal Node—Lets you select a specific object in the scene as the focal point for blurring. The selected objects remains in focus, while objects outside of the set **Focal Limit** are blurred.

Select—Displays the Select Focal Object dialog so you can select a single 3ds Max object to use as the focal object. The object you select can be animated over time, which results in animated follow focus effects. You can also choose your camera target as the focal object so its depth in the scene determines the focus.

Affect Alpha—When this option is selected, the blur effect is also applied to the Alpha channel of the image when you render to a 32-bit format. Select this option to composite the blurred image over another.

Horiz. Focal Loss—Specifies the amount of blur applied to the image in the horizontal (X-axis) direction. Values range from 0 to 100% focal loss. This parameter can be *animated (page 3–365)*.

Lock—Locks the horizontal and vertical loss settings together. When selected, the vertical focal loss is automatically updated to match your changes to the horizontal loss.

Vert. Focal Loss—Specifies the amount of blur applied to the image in the vertical (Y-axis) direction. Values range from 0 to 100% focal loss. This parameter can be animated.

Focal Range—Specifies how far away from the center of the image (Radial Blur) or from the camera (Focal Object) the blur effect begins. Increasing values move the radius of the effect farther away from the camera or the center of the image. This parameter can be animated.

Focal Limit—Specifies the distance from the center of the image (Radial Blur) or the distance from the camera (Focal Object) at which the blur effect is at full strength. Setting a high Focal Limit with a low Focal Range, produces a gradual increase in the amount of blur in the scene, while setting Focal Limit and Range close together produces a rapid blur effect over a short distance. This parameter can be animated.

Note: Do not set Focal Range and Focal Limit to the same value. This produces an abrupt change from a blur to a sharp focus, producing an undesirable visual effect.

Warning: When you animate Lens Effects parameters, this creates pointers into the actual scene, so Lens Effects animation is lost if you save the Video Post queue in a *VPX file (page 3–1125)*. To preserve the animation, save the Video Post data, including Lens Effects animation, in the MAX file.

Button group

Reset—Resets Lens Effects Flare to its default settings.

Load—Displays a Windows-standard file open dialog from which you can select the settings file you want to load.

Save—Displays a Windows-standard Save As dialog in which you specify a directory and filename. Lens Effects Focus settings are saved as LZO files.

Glow Filter

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Glow from Filter Plug-In list. > Setup

The Lens Effects Glow dialog lets you add a glowing aura around any assigned object. For example, for an exploding particle system, adding a glow to the particles makes them seem as though they are brighter and hotter.

The Lens Effects Glow module is multi-threaded and will take advantage of multi-processing machines.

Procedures

To save your glow settings, do one of the following:

You can save all of your lens glow settings to a file, so you can reload them any time. Lens Effects Glow settings are saved to *LZG files (page 3–1059)* (*.lzg*).

- Click the Reset button.

  This resets Lens Effects Glow to its default settings.

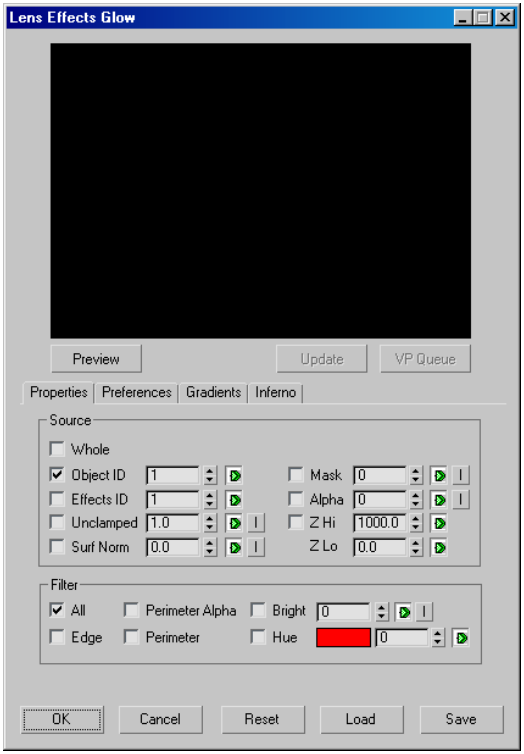
- Click the Load button.

  This displays a Windows-standard file open dialog from which you can select the settings file you want to load.

- Click the Save button.

  This displays a Windows-standard Save As dialog in which you specify a directory and filename.

Interface



The Lens Effects Glow dialog contains a preview window, and an area below to control the parameters of Glow.

Preview group

Preview window—Lets you quickly preview the glow effect. The preview window is multi-threaded to take advantage of systems with multiprocessors, and updates every time you make a change to any of the glow settings that might affect the scene.

Preview—Displays a generic scene to which you can quickly set up a Glow effect. Appears light green when selected.

VP Queue—Lets you preview the scene in the Video Post queue. Preview must be selected for the VP Queue function to work.

Focus Control tabs

The Lens Effect Glow dialog contains four tabs:

Properties (page 3–381), *Preferences (page 3–383)*, *Gradients (page 3–392)*, and *Inferno (page 3–384)*

Button group

Reset—Resets Lens Effects Glow to its default settings.

Load—Displays a Windows-standard file open dialog from which you can select the settings file you want to load.

Save—Displays a Windows-standard Save As dialog in which you specify a directory and filename. Lens Effects Glow settings are saved as LZG files.

Glow Properties

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Glow from Filter Plug-In list. > Setup > Properties tab

The Lens Effects Glow properties let you determine which pieces of geometry in your scene will exhibit the effects of the glow filter, as well as how much of a glow is applied.

Procedures

To set a material's Effects Channel ID:

1. In the Material Editor, make the material you want to be post-processed the active material.
2. Choose a non-zero ID from the Material Effects Channel flyout.

   The Effects Channel ID can range from 1 to 15.

   If you give the same Effects Channel ID value to more than one material, all these materials will be post-processed.

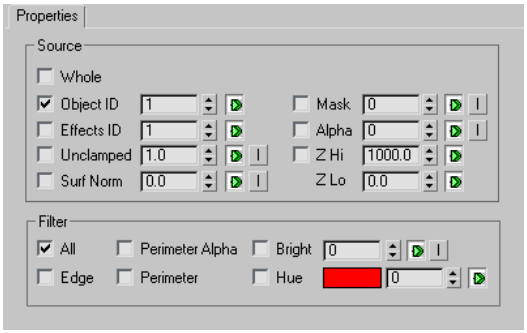
   Note: For Multi/Sub-Object materials, post-processing applies at the sub-object/sub-material level. The Effects Channel ID of the parent Multi/Sub-Object material is ignored.

To set up an RLA file so it saves Object and Material Effects channel data:

1. Place an Image Output Event in the Video Post Queue.
2. In the Image Output Event dialog, click Files.
3. Choose the *.rla file type (page 3–680)* and a file name, and then click Setup.
4. In the RLA Image File Format dialog, select Object, Material Effects, and then click OK.
5. Click OK.

   When the RLA file has saved the Object and Material Effects channels, you can use the rendered scene file as an Image Input event or a Filter or Layer mask, and continue to use the Object or Material Effects Channel data.

Interface



The Properties panel is divided into two sections: **Source** and **Filter**.

Source group

Specifies the objects in the scene to which a glow is applied. You can select more than one source option at a time.

Whole—Applies a glow to the whole scene, not just a particular piece of geometry. This makes each

pixel in the scene a potential glow source. The areas of the scene that have glow applied to them are determined by the settings in the Filter section of the dialog.

Object ID—Lets you apply the glow to an object or part of an object with a specific Object ID (in the *G-buffer (page 3–1040)*), if the object matches the Filter settings. To apply an Object ID glow for an object, right-click the object and select properties from the menu. Then, set the Object Channel ID. Set this field to match, and Lens Effects glow will apply the glow to that object and any other objects with the same ID. This parameter can be *animated (page 3–365)*.

Effects ID—Lets you apply the glow to an object or part of an object with a specific Effects ID, if the object or part of the object matches the Filter settings. You apply a Effects ID in the Materials Editor by assigning the material to one of the available Material Effects channels. This parameter can be animated.

The glow will be applied only to areas of the geometry where the ID is present.

Note: To apply different glow settings to different pieces of geometry or IDs, add more glow entries to the video post queue. Set each glow entry to affect a different Effect or Object ID, and set the appropriate settings. This process will call the glow routine multiple times, increasing your rendering time. Try to keep the number of glow routines to a minimum per frame.

Unclamped—An unclamped color is brighter than pure white (255,255,255). 3ds Max keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that is glowed. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated.

Surf Norm—Glows part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated.

Mask—Glows the mask channel of an image. The spinner value represents the level of grayscale present in a Mask. When this is set, any part of the Mask images larger than the set value will be glowed in the final image. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated. Range = 0 to 255.

Alpha—Glows the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. This parameter can be inverted, and can also be animated. Range = 0 to 255.

Z Buffer Hi and Lo—Glows objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be glowed. These parameters can be animated.

Filter group

Filters the Source selections to let you control how the glow is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the **Source** as the Object ID of the spheres, which selects all of the spheres, that is the only place in your scene that Glow applies an effect.

However, now that Glow knows where the pixels are that *can* be glowed, it needs to know which

ones to actually apply the Glow to. Glow uses the filter controls to find out which source pixels to apply a glow to.

All—Selects all source objects in the scene and applies a glow to them.

Edge—Selects all source objects along a boundary edge and applies a glow to them. Applying a glow along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.

Perimeter Alpha—Applies a glow only to the perimeter of an object based on its alpha channel. Selecting this option glows only the outside of an object without any spill on the interior. Perimeter Alpha keeps all the edges clean because it relies on the scene alpha channel for its effect.

Perimeter—Applies glow effect only to the perimeter of an object based on Edge inferencing. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.

Bright—Filters the source objects based on their brightness values. Only objects with a brightness above the spinner setting are selected and glowed. This option can be inverted. This parameter can be animated.

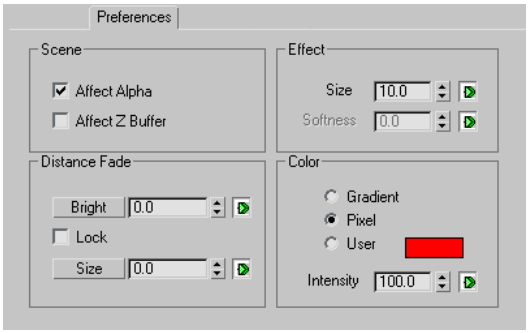
Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color. This parameter can be animated. Range = 0 to 255.

Glow Preferences

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Glow from Filter Plug-In list. > Setup > Preferences tab

Glow Preferences define the size of the glow, its occlusion, and whether or not it affects the Z-Buffer or alpha channels.

Interface



The Preferences panel is divided into four sections: Scene, Distance Fade, Effect, and Color.

Scene group

Affect Alpha—Specifies whether or not the glow affects the alpha channel of the image, when rendered to a 32-bit file format.

Affect Z Buffer—Specifies whether or not the glow affects the Z-Buffer of the image. When this option is enabled, the linear distance of the glow is recorded, and can be used in special effects that make use of the Z-Buffer. For example, Lens Effects Focus blurs objects based on their Z-Buffer information. To use Focus with a glow, you must enable this option.

Distance Fade group

These controls fade the glow effect, based on its distance from the camera. This is the same as distance fade for the lens flare.

Bright—Lets you fade the brightness of the glow effect based on the distance from the camera. This is ideal for submarine running lights and any other effect where you want your glow to disappear into the distance. This parameter can be *animated (page 3–365)*.

Size—Lets you fade the size of the glow effect based on the distance from the camera. In most circumstances, you want the overall size of the glow to diminish as it gets farther away from the camera. This parameter can be animated.

Lock—When selected, locks the Bright and Size values together, so that the size and brightness fading is synchronized.

Effect group

Size—Sets the size of the overall glow effect. This parameter can be animated.

Softness—Softens and blurs the glow effect. Values range from 0 to 100. This control is enabled only when you use Gradients as the color method (see the next section). Softness is only available when the Gradient option in the Color area is selected. This parameter can be animated.

Color group

Gradient—Creates the glow based on the settings in the Gradients panel. When you use this method, you can use the Softness spinner in the Effect area.

Pixel—Creates the glow based on the pixel color of the object. This is the default method. It is very fast.

User—Lets you select a color for the glow effect. Click the color swatch to display the *Color Selector (page 1–157)* and choose a color.

Intensity—Controls the intensity or brightness of the glow effect. Values range from 0 to 100. This control is enabled only when Pixel or User is the chosen color method.

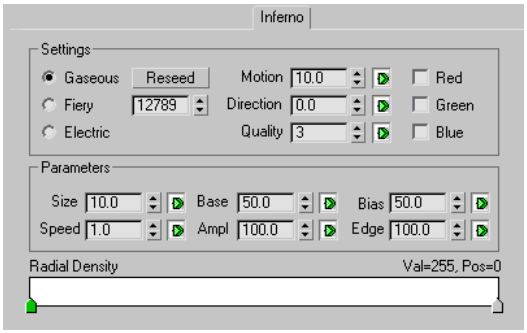
Glow Inferno

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Glow from Filter Plug-In list. > Setup > Inferno tab

The Inferno panel lets you create explosions, fire, and smoke effects by combining the lens flare glow with black and white fractal noise.

The Glow inferno effect is like the Inferno effect in *Lens Flare (page 3–376)*, but it is applied to the Glow through the R, G, and B color channels.

Interface



The Inferno panel is divided into two sections: Settings and Parameters.

Settings group

Gaseous—A loose and soft pattern, often used for clouds and smoke.

Fiery—Fractal patterns with bright, well-defined areas, often used for fires.

Electric—Long, well-defined tendril pattern that can be used to produce arcing electricity, when animated. By adjusting the quality of the pattern to 0, you can create the effect of water reflection.

Reseed—The number that the fractal routines use as a starting point. Set this spinner to any number to create different fractal effects. The Reseed button randomly selects a new number.

Motion—When you animate the inferno, motion specifies how fast the inferno patterns move in the direction set by the Direction spinner. For example, if you want to simulate a raging fire, you want the fractal patterns to move upward. This parameter can be *animated (page 3–365)*.

Direction—Specifies the direction, in degrees, of the inferno effect motion. By default, 0 is aligned in the 12 o'clock position, and works clockwise. This parameter can be animated.

Note: The Motion and Direction spinners control the motion of the fractal pattern in the X and Y directions. You can control the Z direction using the Speed option under Inferno Parameters.

Quality—Specifies the overall quality of the fractal noise patterns in the inferno effect. Higher values result in more iterations of the fractals, more detail in the effect, and slightly longer render times. This parameter can be animated.

Red/Green/Blue—Selects the color channel to use for the Inferno effect.

Parameters group

Size—Specifies the overall size of the fractal patterns. Smaller numbers produce small, grainy fractals. Higher numbers produce larger patterns. This option can be animated.

Speed—Sets the overall speed of the turbulence in the fractal patterns as they are animated. Higher numbers produce faster turbulence in the pattern. This parameter can be animated.

Base—Specifies the brightness of the colors in the inferno effect. Higher values result in brighter color ranges and brighter infernos. Lower values result in dark, softer effects. The Base spinner only affects Fiery and Electric inferno types This parameter can be animated.

Amplitude—With the Base spinner, controls the maximum brightness for each portion of the fractal inferno patterns. Higher values result in fractal patterns with brighter colors. Lower values result in the same patterns, with muted colors. This parameter can be animated.

Bias—Shifts the colors of the effect toward one end of the color range or the other. At a setting of 50, Bias has no effect. Above 50, the colors are brighter, and below 50, they are darker and softer. This parameter can be animated.

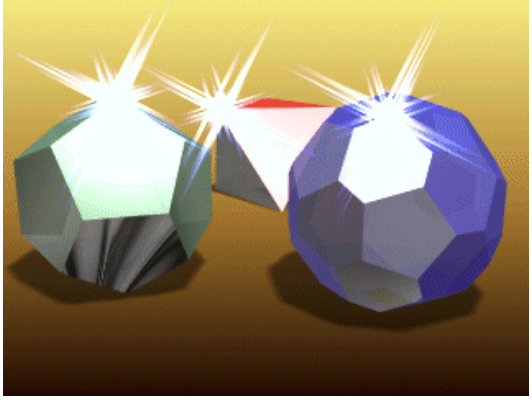
Edge—Controls the contrast between the light and dark areas of the fractal patterns. High values produce a high contrast and more well-defined fractal patterns. Low values result in less defined, subtler effects. This parameter can be animated.

Radial Density—Controls the density of the inferno effect in a radial fashion from the center of the effect to the edge. Wherever there is white in the gradient, you only see inferno noise. Where the gradient is black, you can see the underlying glow. If you set the right side of the gradient to black and the left side to white, and apply the Inferno to the Glow effect of a flare, the inferno effect appears toward the outer edges of the glow, while the center of the glow is still visible.

Highlight Filter

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Highlight from Filter Plug-In list. > Setup

The Lens Effects Highlight dialog lets you assign bright, star-shaped highlights. Use it on objects that have shiny materials. For example, a shiny, red car might show highlights in bright sunlight.



Example of highlights

Another good example of an effect perfect for Highlight is the creation of pixie dust. If you create a particle system and animate it moving in a straight line with small four-point Highlight stars applied to each pixel, it will look a lot like twinkling magic.

The Lens Effects Highlight module is multi-threaded and will take advantage of multi-processing machines, making it one of, if not the fastest highlight routines available.

Procedures

To save your highlight settings:

You can save all of your lens highlight settings to a file, so you can reload them any time. Lens Effects Highlight settings are saved as *LZH files (page 3–1059)* (*.lzh*). Do one of the following:

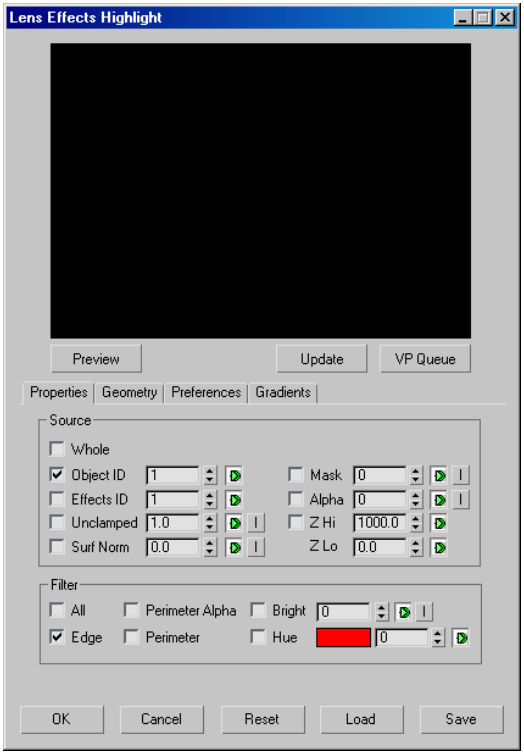
- Click the Reset button.

  This resets Lens Effects Highlight to its default settings.
- Click the Load button.

  This displays a Windows-standard file open dialog from which you can select the settings file you want to load.
- Click the Save button.

  This displays a Windows-standard Save As dialog in which you specify a directory and filename.

Interface



When you select Lens Effects Highlight from the Image Filter Event drop-down list and click Setup, the Highlight dialog is displayed.

The Lens Effects Highlight interface is almost identical to the Glow module, with a large preview window, and tabs to control every aspect of your highlight effects.

Preview group

Preview window—Lets you quickly preview the glow effect. The preview window is multi-threaded to take advantage of systems with multiprocessors, and updates every time you make a change to any of the glow settings that might affect the scene.

Preview—Activates a generic cross star filter so you can quickly set up a Highlight effect. However, as with the Glow module, it is more effective seeing your entire scene and how your effect will interact with your geometry.

VP Queue—Lets you preview the scene in the Video Post queue. Preview must be selected for the VP Queue function to work.

Highlight Control tabs

Similar to the Glow settings, Highlight is also broken down into tabbed sections for fine control over each aspect of the Highlight effect. The four tabs are:

Highlight Properties (page 3–387)

Highlight Geometry (page 3–389)

Highlight Preferences (page 3–391)

Lens Effects Gradients (page 3–392)

Button group

Reset—Resets Lens Effects Highlight to its default settings.

Load—Displays a Windows-standard file open dialog from which you can select the settings file you want to load.

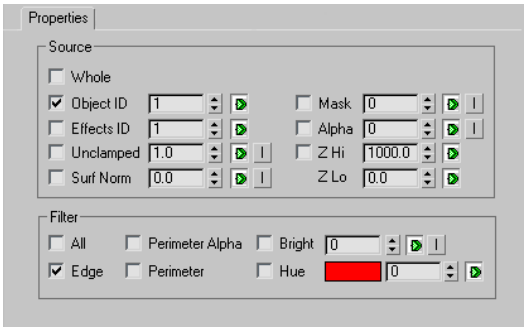
Save—Displays a Windows-standard Save As dialog in which you specify a directory and filename. Lens Effects Highlight settings are saved as LZH files.

Highlight Properties

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Highlight from Filter Plug-In list > Setup > Properties tab

The Lens Effects Highlight properties enable you to determine which parts of your scene will have highlights applied to them, as well as how the highlights are to be applied.

Interface



The Properties panel is broken down into two sections: Source and Filter.

Source group

The **Source** section lets you select any G-Buffer data in the scene that will have a highlight applied to it. Lens Effects Highlight will begin the process by finding the source pixels from your scene that you want to glow.

Whole—Lets you apply highlights to the whole scene, not just a particular piece of geometry. This, in effect, makes each pixel in the scene a potential highlight source. The areas of the scene that have highlights applied to them are determined by the settings in the **Filter** section of the dialog.

Object ID—The Object ID Lets you apply highlights to particular objects in your scene that have a corresponding G-Buffer (or Object) ID. The G-Buffer is a geometry buffer and can be defined when you right-click any 3ds Max object and select Properties from the menu. Then, set the Object Channel ID under the G-Buffer ID controls. This parameter can be *animated (page 3–365)*.

Effects ID—The Effects ID lets you apply the highlight to an object or part of an object with a specific Effects ID assigned to it. Effects ID's are applied in the materials editor by assigning the

material one of the eight Material Effects channels that are available. See *G-Buffer (page 3–1040)*. This parameter can be animated.

The highlights are then only applied to areas of the geometry where that particular ID is present.

Note: In many instances, you may want to apply different highlight settings to different pieces of geometry or ID's. To accomplish this, add additional Lens Effects Highlight entries to the Video Post queue. Then set each different Highlight entry to effect a different Effect or Object ID and proceed.

Unclamped—An unclamped color is brighter than pure white (255,255,255). 3ds Max keeps track of these "hot" areas which tend to show up when your scene contains bright metallic highlights or explosions. This spinner lets you determine the lowest pixel value that is highlighted. Pure white has a pixel value of 1. When this spinner is set to 1, any pixels with a value above 255 will be glowed. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated.

Surf Norm—Highlights part of an object, based on the angle of the surface normal to the camera. A value of 0 is coplanar, or parallel to the screen. A value of 90 is normal, or perpendicular to the screen. If you set Surf Norm to 45, only surfaces with normal angles greater than 45 degrees will be glowed. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated.

Mask—Highlights the mask channel of an image. The spinner value represents the level of grayscale present in a Mask. When this is set, any part of the Mask images larger than the set value will be glowed in the final image. You can invert this value by clicking the **I** button to the right of the spinner. This parameter can be animated. Range = 0 to 255.

Alpha—Highlights the alpha channel of an image. The transparency of an alpha channel is interpreted opposite that of the Mask channel. Values range from 0 to 255. This parameter can be inverted by clicking the **I** button to the right of the spinner, and can also be animated.

Z Buffer Hi and Lo—Highlights objects based on their distance (Z-Buffer distance) from the camera. The Hi value is the maximum distance and the Lo value is the minimum. Any objects between these two Z-Buffer distances will be highlighted. These parameters can be animated.

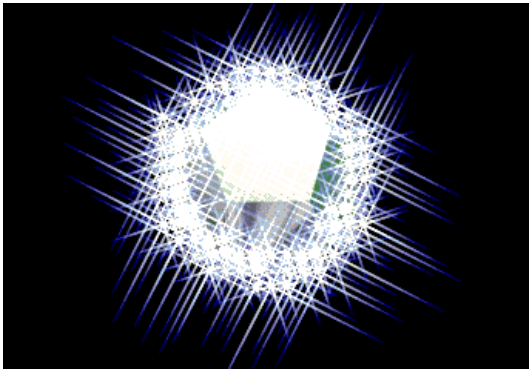
Filter group

Filters the Source selections to let you control how the highlight is applied. For example, you can have ten spheres in your scene, each with the same Object ID, but different colors. If you set the **Source** as the Object ID of the spheres, which selects all of the spheres, that is the only place in your scene that Highlight will apply an effect.

However, now that Highlight knows where the pixels are that *can* be highlighted, it needs to know which ones to actually apply the highlights to. Highlight uses the filter controls to find out which source pixels to apply the highlight to.

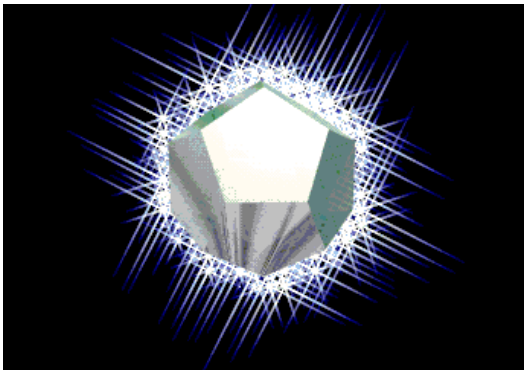
All—Selects all source pixels in the scene and applies a highlight to them.

Edge—Selects all source pixels along a boundary edge and applies a highlight to them. Applying a highlight along the edges of objects produces a soft halo that exists on both inside and outside edges of your object.



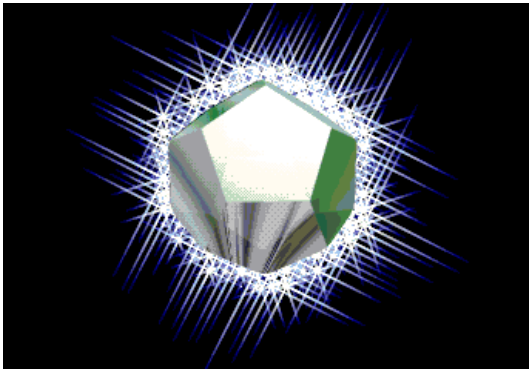
Edge highlights

Perimeter Alpha—Applies a highlight only to the perimeter of an object based on its alpha channel. Selecting this option highlights only the outside of an object without any spill on the interior. Whereas highlighting by **Edge** produces a spill onto the object, Perimeter Alpha keeps all of the edges clean because it relies on the scene alpha channel to derive it's effect.



Perimeter alpha highlights

Perimeter—Applies highlight effect only to the perimeter of an object based on Edge inferencing. Although not as precise as Perimeter Alpha, you might need to use the Perimeter option at times when the alpha channel is unavailable.



Perimeter highlights

Bright—Filters the source objects based on their brightness values. Only objects with a brightness above the spinner setting are selected and highlighted. This option can be inverted by clicking the **I** button next to the spinner. This parameter can be animated.

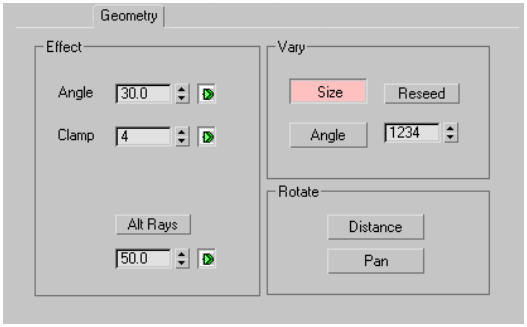
Hue—Filters the source objects by their hue. Select the hue by clicking the color swatch next to the spinner. You can choose hue values from 0 to 255. The spinner beside the Hue color swatch lets you enter a variance level so that the glow can find several different hues in the same range as the chosen color This parameter can be animated.

Highlight Geometry

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Highlight from Filter Plug-In list > Setup > Geometry tab

The Geometry panel is where you set the initial rotation of the highlights as well as how the elements are affected over time. The Geometry panel consists of three areas: Effect, Vary, and Rotate.

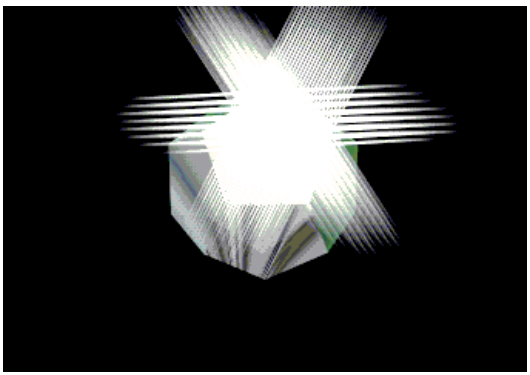
Interface



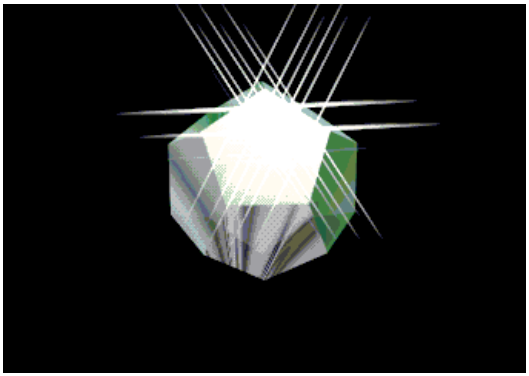
Effect group

Angle—Controls the angle of the highlight points over the course of the animation. This parameter can be *animated (page 3–365)*.

Clamp—Determines the number of pixels highlight must read to place a single highlight effect. In many cases, you want to key your highlight effects off of the brightness of objects that can produce a lot of pixels to generate from. The end result is something that looks like stadium lights from a Monday Night Football game, where each pixel has the highlight cross drawn on top of it, which blurs the overall effect. When you want only one or two highlights, use this spinner to adjust how highlight processes the chosen pixels. This parameter can be animated.



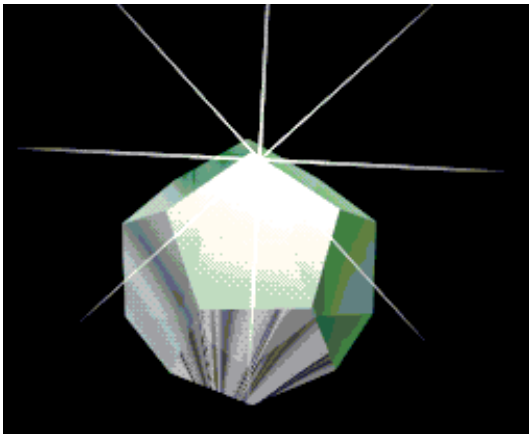
Clamp value of 5



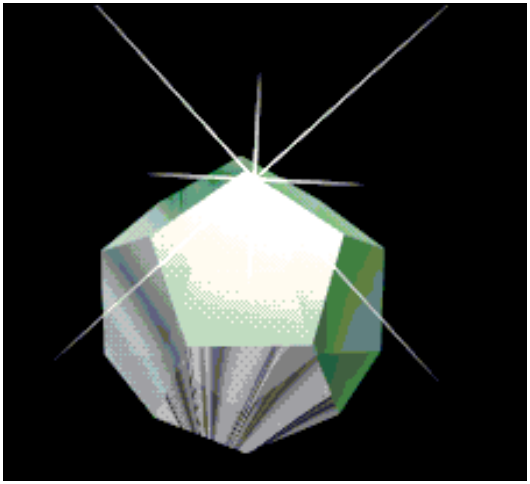
Clamp value of 15

As you can see, the Clamp value lets you maximize or minimize the overall number of highlights drawn over the same image. This can be a tremendous time saver.

Alt. Rays—Alternates the lengths of points around the highlight. It works on every other ray point, changing from the ray's full length to a smaller one based on the percentage spinner beneath it. This parameter can be animated.



Alt. Rays turned off



Alt. Rays turned on and set to 40%

Vary group

The Vary group of controls adds randomness to your Highlight effects. You can quickly adjust your effects so that no two look alike. In many instances, you want to avoid having your Highlights rotate in formation, and the Size and Angle buttons control that.

Size—Varies the overall size of the individual Highlights.

Angle—Varies the initial orientation of the individual Highlights.

Reseed—Forces Highlight to use a different random number to generate parts of its effects.

Rotate group

These two buttons let you have your highlights automatically rotate based on their relative position in the scene.

Distance—Automatically rotates the individual highlight elements as they recede into the distance. The faster your elements recede, the faster they will rotate.

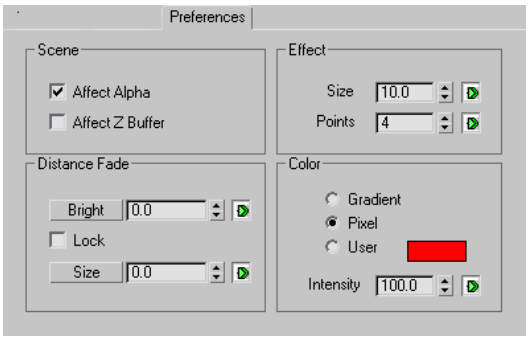
Pan—Automatically rotates the individual Highlight elements as they move laterally across the screen. If you have objects in your scene that are passing by the camera, they can be automatically rotated based on their position. The faster your elements move across the screen, the faster they will rotate.

Highlight Preferences

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Highlight from Filter Plug-In list > Setup > Preferences tab

The Preferences panel defines the size and number of points on the highlight, occlusion settings, and whether or not it affects the Z-Buffer or alpha channels.

Interface



Scene group

Affect Alpha—Determines whether or not the highlight settings affect the alpha channel of the image when you render to a 32-bit file format.

Affect Z Buffer—Determines whether or not the highlight affects the Z-Buffer of the image. When this option is selected, the linear distance of the highlight is recorded, and can be used in special effects that make use of the Z-Buffer. For example, the Focus module that ships with Lens Effects blurs objects based on their Z-Buffer information.

If you want to use Focus to blur a highlight, you must select this option. If you are not sure about whether or not to select this option, leave it disabled, because you probably don't need it.

Distance Fade group

Bright—Lets you fade the brightness of the highlight effect based on the distance away from the camera. This parameter can be *animated (page 3–365)*.

Lock—Locks the Bright and Size spinner values together.

Size—Lets you fade the size of the highlight effect based on the distance from the camera. In most circumstances, you want the overall size of your highlights to diminish as they get farther from the camera. This option takes care of that for you. This parameter can be animated.

Effect group

Size—Lets you determine the overall size of the highlight effect, and is calculated in pixels. This parameter can be animated.

Points—Controls the number of points to be generated for a highlight effect. This parameter can be animated.

Color group

Gradient—Lets you create the highlight based on the settings in the Gradients panel.

Pixel—Lets you create the highlight color based on the pixel color of the highlighted object. This is the default method for Lens Effects Highlight and is exceptionally fast.

User—Lets you select a specific color for the highlights through the standard 3ds Max *Color Selector (page 1–157)*. The color swatch shows you the currently selected color.

Intensity—Lets you control the intensity or brightness of the highlights. Values range from 0 to 100. This spinner functions only when you are using either the *Pixel* or *User* color methods to control the brightness of the highlight effect. This parameter can be animated.

Lens Effects Gradients

Video Post toolbar > Add Image Filter Event > Choose Lens Effects Highlight from Filter Plug-In list > Setup > Gradients tab

A gradient is a smooth linear transition from one color or brightness to another, as shown below. Lens Effects use gradients to control aspects of the lens flares, such as colors and transparency. Lens Effects use several *gradient types (page 3–395)*.

Lens Effects Gradients are always interpreted from left to right.

Gradient Flags

Gradients use Flags to indicate points along the gradient bar where you want different colors or brightness values to be. The colors between the flags are interpolated automatically by Lens Effects. Each Gradient inside Lens Effects can contain up to 100 flags. The current flag is highlighted and green. The position number above the gradient bar indicates the position of the current flag, in relation to the overall length of the gradient.

A gradient always has non-moveable start and end flags. You can add up to 98 intermediate flags to alter the overall appearance of your gradients. You can also change the color or brightness of the end flags to suit your needs.

When you place two gradient flags on top of one another, you create a sharp break in the gradient. When a third flag is placed on top of the second flag, a sharp edge appears in the gradient.

Warning: When you animate Lens Effects parameters, this creates pointers into the actual scene, so Lens Effects animation is lost if you save the Video Post queue in a *VPX file (page 3–1125)*. To preserve the animation, save the Video Post data, including Lens Effects animation, in the MAX file.

Procedures

To add an intermediate flag:

- Click the gradient bar where you want to place the new flag.

  The flag uses the color of the gradient at the point where you placed it. To adjust the color, double-click to display the *Color Selector (page 1–52)*.

To adjust the position of a flag:

- Drag the flag left or right.

  The gradient updates to show you the changes.

To delete a flag:

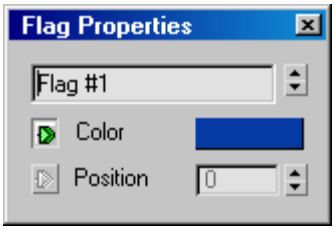
- Drag the flag outside the gradient bar.

  The flag turns red, and the mouse point changes to a down arrow pointing to a bucket. When you let go of the mouse button, the flag is deleted.

To change a flag's properties:

1. Right-click the flag to display a menu.
2. Click Properties and change any settings you want.

Interface



Right-clicking a gradient flag and selecting Edit Properties displays the Flag Properties dialog. To change *gradient options (page 3–394)*, right-click the gradient bar, not the flags.

The Flag Properties dialog lets you change the name of the flag, its color, and its position.

Name—By default, flags are named Flag #. You can enter a different name for the current flag. The arrows to the right of the name box let you choose other flags on the same gradient.

Color—The Color swatch lets you control the color or brightness component of the gradient at the position where the flag is located. Click the color swatch to display the color picker and choose a different color. The green arrow to the left of the color swatch indicates that this flag parameter can be *animated (page 3–365)*.

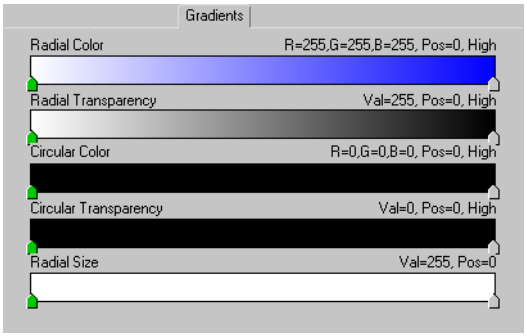
Position—Each gradient has 100 possible positions from left to right. The number in the spinner represents the position of the flag along the gradient. Gradients are read from left to right so a value of zero aligns the flag with the left edge of the gradient. This flag parameter can be animated.

Gradient Options

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose a Lens Effects Filter from the Filter Plug-In list. > Setup > Gradient tab

Each gradient in Lens Effects has a set of common options. Right-clicking the gradient bar displays a shortcut menu with the following options.

Interface



Reset—Resets the gradient back to its default parameters. This action cannot be undone.

Load Gradient—Displays a file open dialog in which you can load a particular gradient. Gradients are saved with a *.dgr* extension.

Save Gradient—Displays a file save as dialog where you specify the path and filename for the gradient.

Load UV Map—Lets you load a bitmap image and use each row of pixels of the bitmap as an animated gradient. When a bitmap is loaded into a gradient control, Lens Effects reads the first 100 pixels across the top row of the image (for the 100 divisions of its gradient controls) and makes them the gradient. With each successive frame, Lens Effects reads in the next row of pixels as the gradient. When you scrub the animation slider, you can see the gradient change over time.

Note: If the animation is longer than the chosen bitmap is tall, then the bitmap pattern is repeated.

Load Bitmap—Displays a 3ds Max file browser so you can select a bitmap to use as your gradient. Unlike UV Map, the Load Bitmap option only reads the first row of pixels for the entire animation. This is a good option when you need to have a complex but static gradient.

Flag Mode—Indicates you are using flags to set the colors of your gradient instead of using a bitmap as the source. Flag Mode is selected by default.

Compositing Methods

The last five options on the shortcut menu are different types of compositing methods. When you work with Color and Transparency gradient controls in any of the Lens Effects filters, you must be aware of *both* the Radial and Circular gradients. Both Lens Effects color gradients and both Transparency gradients are "locked together" and will work together based on the compositing method you choose to create an effect.

Each compositing method works on a pixel-by-pixel basis on the positional value in both gradients. The compositing methods define how the colors and brightness values are combined to form a single color. When combining the colors, the algorithms evaluate each color channel of the color to find the end result. This lets you create five very different looking effects with the same two gradients.

High Value—When this option is selected, the higher color or brightness value between the two gradients is selected. For example, if you had a color with RGB values of 255,210,255 and another with 225,240,225, the resulting color would be 255,240,255. This option generally results in a slightly brighter lens flare than the default settings.

This is the most common way of using only one gradient. Set one gradient to the color or brightness you desire, then set the other gradient to pure black. This assures that all of the values

you set in one gradient are used exclusively to achieve the effect.

Average—Calculates an average value between the colors. In the example above, the resulting color would be 175, 225, 225. This option is good if you want to mix gradient values and results in effects that are not as bright as High Value.

Low Value—Selects the lower color values, resulting in a less intense lens flare and a more subtle overall effect. In the example above, the resulting color would be 100,210,295.

Additive—Adds colors values together, pushing their composite value toward pure white, producing the brightest but most washed-out effects. Additive compositing is good when you want to burn effects out.

Subtractive—Subtracts colors values from each other, resulting in slightly muted and less intense colors.

These compositing methods may be applied to all types of gradients, except size gradients. The type of compositing being used for a gradient is noted above the gradient bar.

Compositing methods are applied to every gradient. Some gradients are linked together, so if you assign a specific compositing method to one, the compositing method is automatically assigned to the other.

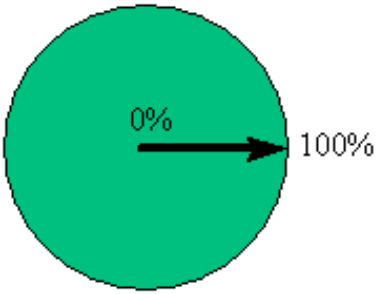
Types of Gradients

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose a Lens Effects Filter from the Filter Plug-In list. > Setup > Gradient tab

There are two different kinds of gradients in Lens Effects, Radial and Circular. Between the two types, you can achieve almost limitless effects.

Interface

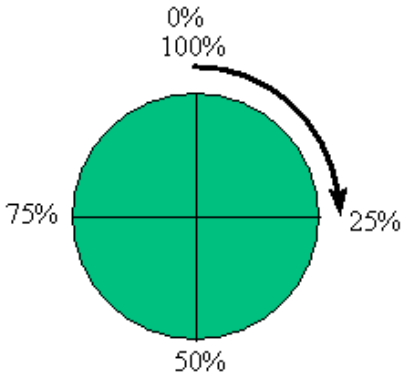
Radial—Radial gradients work from the center point to the outer edge of a Lens Effects feature, changing color or brightness in a straight line from left to right as you scan the gradient bar. The left edge of the gradient is aligned with the center of the effect and the right edge is aligned with the outer edge of the effect.



Scheme of a radial gradient

Circular—Changes colors in a circular manner, working clockwise around a Lens Effects feature. If you mark North, East, South, and West on a circle, these points represent the 0%, 25%, 50%, and 75% marks of the gradient.

Each parameter panel in Flare, Glow, and Highlight that utilizes gradients contain five gradient controls. The five controls are:



Scheme of a circular gradient

Color (Radial and Circular)—Defines the *colors used (page 3–396)* for an effect. This is based on the RGB color system, but can also be set with HSV. Within each set of gradient controls, there is a Radial and Circular Color gradient. Radial Color works with Circular Color to produce the overall color for the Lens Effects element.

Transparency (Radial and Circular)—Varies the visibility of parts of the effect. The transparency gradients only make use of brightness (or luminance) values, which are essentially grayscale values. This black-to-white ramp of values provides you with 256 levels of transparency for your effects. Just like the Color gradients, both Transparency gradients are tied together to generate the overall visibility of effect. See *Gradient Options (page 3–394)*.

Size—Varies the size of specific parts of the Lens Effect. Most size gradients are used to affect the radius of a lens flare part, such as a glow. Like transparency gradients, only the brightness values are used to provide you with 256 different sizes.

The Radial Size gradient, for example, works both like a Radial and Circular gradient. This gradient is applied in a clockwise fashion, starting at 12 o'clock. The values in the gradient are applied from the center of the effect toward the outer edge, with brighter values producing bigger sizes and darker values producing shorter sizes.

Gradient Colors

Rendering menu > Video Post > Video Post toolbar > Add Image Filter Event > Choose a lens effects filter from the Filter plug-in list. > Setup > Gradient tab

Colors in 3ds Max are interpreted in two different ways: RGB and HSV. In RGB (red, green, blue), you can select one of 256 shades of red, green, and blue, giving you a palette of 16.7 million colors (24 Bit). In HSV (Hue, Saturation, Value), you can select one of 256 hues of color, then adjust the saturation or the value of the color. The saturation can also be considered the blackness of a color and value can be considered the whiteness of a color.

For transparent and size gradients, you adjust the vertical whiteness slider just to the left of the RGB and HSV sliders. The white triangle on the right side of the vertical bar is the slider. This controls the overall value of the color in terms of HSV. In RGB terms, it is the same as adjusting all three colors equally at the same time. Higher values on the whiteness scale represent more transparency, or smaller sizes.

See also

Color Selector Dialog (page 1–157)

20 Managing Scenes and Projects

Managing Scenes and Projects

These topics are concerned with managing scenes, projects, and the files that make them up.

Working with AutoCAD and Architectural Desktop

3ds Max contains many features designed to streamline the design visualization workflow. See *Working with Drawing Files (page 3–425)*. The *File Link Manager (page 3–431)* allows you to create a live link to a DWG file. You can then apply materials and animations in 3ds Max, but still update your geometry if any changes are made to the original file.

File-Handling Commands

The principal commands for *handling files (page 3–398)* are found on the default *File menu (page 3–721)*, as in most Windows applications.

File-Handling Utilities

Several utilities help you manage files:

- The *Asset Browser (page 3–505)* provides another way to find and preview files and use them in 3ds Max scenes
- The *Bitmap / Photometric Path Editor utility (page 3–511)* lets you view bitmap paths or remove them from the scene file.
- The *File Finder (page 3–511)* is another resource for finding 3ds Max scenes.
- The *Resource Collector (page 3–513)* copies or moves a scene's bitmaps into a single directory.
- The *Fix Ambient utility (page 3–513)* resolves lighting issues with older versions of scene files.
- The *Bitmap Pager Statistics dialog (page 3–515)* provides information that helps you resolve issues with scenes that require large amounts of memory for texture maps.

Geometry File Formats

You can import a variety of *geometry file formats (page 3–524)* into a scene.

Image File Formats

You can use *image file formats (page 3–657)* in a variety of ways: as textures for materials, as backgrounds to viewports, as background environments, as Image Input events in Video Post, and as images projected from a light.

RAM Player

You can preview images by using the *View File command (page 3–503)*, or by using the more interactive *RAM Player (page 3–685)*.

External References (XRefs) to Objects and Scenes

External references (page 3–405) to objects and scenes are a powerful way to manage a project, especially when it involves multiple contributors.

Schematic View

Schematic View (page 3–690) displays the scene as a graphic schema instead of as geometry. It gives you an alternate way to select or rename the objects in your scene, and to navigate among modifiers. It is especially useful for viewing objects in a hierarchy.

File-Handling Commands

The main file-handling commands are on the default *File menu (page 3–721)*. These commands are for creating, opening, and saving scenes; importing and exporting other 3D file formats; viewing a 2D image file; displaying or changing a scene file's properties; exiting 3ds Max and other operations.

New (page 3–399)

Reset (page 3–399)

Open (page 3–400)

Open Recent (page 3–402)

Save (page 3–402)

Save As (page 3–403)

Save Copy As (page 3–404)

Save Selected (page 3–404)

File Link Manager Utility (page 3–431)

XRef Objects (page 3–406)

XRef Scene (page 3–416)

Merge (page 3–469)

Merge Animation (page 3–471)

Replace (page 3–476)

Import (page 3–490)

Export (page 3–491)

Export Selected (page 3–491)

Archive (page 3–500)

Archive > *Archive (page 3–500)*

Archive > *Resource Collector Utility (page 3–513)*

Archive > *Bitmap/Photometric Path Editor Utility (page 3–511)*

Summary Info (page 3–500)

File Properties (page 3–501)

View Image File (page 3–503)

Exit (page 3–504)

See also

Asset Browser Utility (page 3–505)

Geometry File Formats (page 3–524)

Image File Formats (page 3–657)

RAM Player (page 3–685)

New

File menu > New

Keyboard > **CTRL+N**

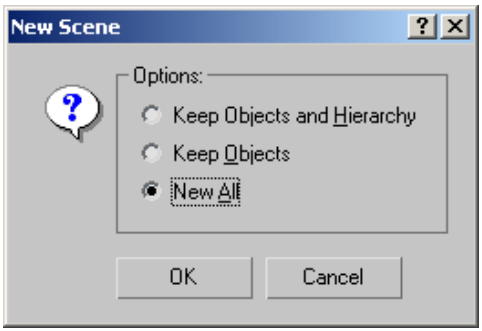
New clears the contents of the current scene without changing system settings (viewport configuration, snap settings, Material Editor, background image, and so on). The New command also gives you the option, when you use it while a populated scene is active, to reuse objects from the current scene in the new one.

Procedure

To create a new scene:

1. Choose File > New or press **CTRL+N**.
2. In the New Scene dialog, specify the types of objects to keep, if any.
3. Click OK.

Interface



The New Scene dialog has the following controls:

Keep Objects and Hierarchy—Keeps the objects and the *hierarchical links (page 3–1045)* between them, but removes any animation *keys (page 3–1054)*.

Note: If the current scene has any file links, 3ds Max performs a Bind operation on all linked files.

Keep Objects—Keeps the objects in the scene, but removes any links between them and any animation keys.

Warning: This option should not be used when working with a scene containing linked or imported objects.

New All (Default)—Clears the contents of the current scene.

Reset

File menu > Reset

Reset clears all data and resets the program settings (viewport configuration, snap settings, Material Editor, background image, and so on). Resetting restores the startup defaults, saved in the file *maxstart.max*, and removes any customization you might have done during the current session.

Resetting has the same effect as exiting and restarting 3ds Max.

Tip: To change the startup defaults, start 3ds Max and make the adjustments you would like to see at startup. Then save the file to your *scenes/* directory as *maxstart.max*.

Procedure

If you have made changes since the last Save operation, a dialog prompts you whether you want to save your changes.

To reset 3ds Max:

1. Choose File > Reset.

   If you have made any changes since the last Save operation, a dialog prompts you to save them. As further protection against data loss, a confirmation dialog appears.
2. When asked if you really want to reset, click Yes.

   Clicking No on this dialog cancels the Reset operation.

Open

File menu > Open

Keyboard > **CTRL+O**

Open loads a scene file (MAX file), character file (CHR file), or VIZ Render file (*DRF File (page 3–528)*) from an Open File dialog. You can also choose a previously opened file and use *command-line options (page 3–719)*.

The MAX file type is a complete scene file.

A CHR file is a character file saved with Character menu > Save Character. For more information on the CHR file format, see *Character Assembly (page 2–681)* and *Save Character (page 2–686)*.

A DRF file is a scene file from VIZ Render, a rendering tool included with Autodesk Architectural Desktop 2005. The DRF file type is very similar to MAX files from previous versions of Autodesk VIZ.

If the file you're loading was created using plug-ins that are not installed, a dialog lists them. You can still load the file, but any entities in the scene that were created by the missing plug-ins are replaced with stand-ins; non-rendering boxes or placeholder modifiers. You can safely delete these from the scene, unless you are sharing the scene with a user who has the plug-ins installed.

If the file you are loading contains bitmaps that cannot be located, a *Missing External Files dialog (page 3–504)* appears. This dialog lets you browse for the missing maps, or continue opening the file without loading them.

Automatic Unit Conversion

When Respect System Units In Files is turned on in the System Unit Scale group of the *System Unit Setup dialog (page 3–891)*, loaded files that have a different scene unit scale display a *File Load: Units Mismatch dialog (page 3–895)*. This dialog lets you rescale the loaded scene to the current scene unit scale, or change the current scene unit scale to match the one in the loaded file. No conversion is done when loading files created in 3ds Max **1.x**.

- If you choose to match the units in the loaded file, the System Unit Scale setting in the System Unit Setup dialog is changed to the setting in the scene file.

  This is the recommended choice, and it is the default in 3ds Max.

  For example, if the current system unit scale is set to 1 unit = 1 inch, and the incoming file was set to 1 unit = 1 foot, a sphere with a radius of 100 feet remains 100 feet.

- If you rescale the file objects, the objects are scaled as if they had been created using the current scene unit scale.

  For example, if the current system unit scale is set to 1 unit = 1 inch, and the incoming file was set to 1 unit = 1 foot, a sphere with a radius of 100 feet becomes 1200 inches in radius (assuming the unit display is set to generic units).

If Respect System Units In Files is off (which is not recommended), 3ds Max disregards the units chosen in the loaded scene file.

For example, a 100-unit radius sphere that was created in a 1 unit = 1 foot scene becomes a 100-inch sphere in a 1 unit = 1 inch scene.

Procedures

To reopen a previously opened file:

- From the bottom of the File menu, choose the file name.

  You set the number of files listed by changing the *Recent Files In File Menu (page 3–870)* field on the Files panel of the Customize > Preferences dialog.

To start 3ds Max and open a specific file:

- In a command prompt window, specify the file name after the executable name. For example:

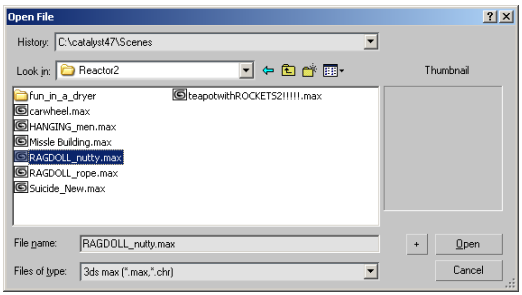
  c:\3dsmax\3dsmax.exe myproject.max

To start 3ds Max and open the last file you worked on:

- In a command prompt window, type **-L** after the executable name:

  c:\3dsmax\3dsmax.exe –l

Interface



The Open File dialog has standard Windows file open controls. At the right, the Thumbnail area shows a preview of the scene whose file name is highlighted in the list on the left.

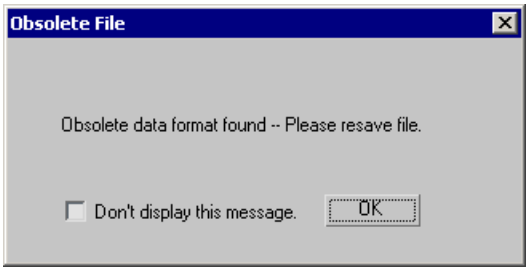
Tip: You can resize the dialog by dragging an edge or a corner.

Clicking the plus button appends a sequence number to the file name you entered, or increments the sequence number if the name already has one, and then opens the file of that name, if it is present.

For example, if you have highlighted a file named *test00.max*, clicking the plus button changes the name to *test01.max* and then opens *test01.max*.

Opening an Obsolete File

When opening a scene created in an earlier version of 3ds Max, you will see an Obsolete File dialog.



If you resave the scene, you will overwrite the file. You can still edit it using 3ds Max **7**, but you will no longer be able to edit it in earlier versions of the software.

Don't display this message—When turned on, you will not see the Obsolete File dialog. The dialog is also controlled by the Display Obsolete File Message switch on the Customize > Preferences > Files panel.

Note: If you still need to open the scene using an earlier version of 3ds Max, use File > *Save As (page 3–403)* and save the file using a different name. Then you will be able to open the orginal file with the earlier version.

Open from Vault

File menu > Open from Vault

The Open From Vault command lets you open a MAX file directly from Autodesk Vault, the data-management provider included with 3ds Max. This allows for secure control and versioning of assets used in the digital-content creation process without the need to use the Vault client.

Note: Open From Vault appears on the File menu only if you installed the Vault client, an optional part of the 3ds Max software installation.

See also

Asset Tracking Dialog (page 3–492)

Procedure

To use Open From Vault:

1. Open the File menu and choose Open From Vault.
2. If you're not logged in to a provider, you're asked to log in via the *Vault Log In dialog*. Fill out the form and then click OK.
3. Use the Open File From Vault dialog to browse the vault and choose a MAX file to open.
4. At this point, one of two things happens:
   - If the file is available for checkout, a dialog opens letting you know that the file is under version control and asking you if you want to check it out before making edits. Click Yes.
   - If another user has the file checked out, a dialog opens notifying you of this and telling you that you won't be able to save edits. Click OK to open the file in read-only mode. If you attempt to save this file, a dialog appears notifying you that the scene file is read-only and will not be overwritten.
5. If you attempt to open a different file or use the New or Reset command while the file is checked out, a dialog appears asking if you want to check the files back in. Enter a comment, if appropriate, and then click OK to check the file in.

   Alternatively, if you just want to create a new version on the provider, turn on Keep Checked Out and then click OK. A new version will be created, but the file will still be checked out to you.

Interface

Note: If you haven't set a working folder, the following dialog appears when you attempt to open a file from the vault:

After you click OK, the Browse For Folder dialog opens, which you can use to specify a working folder.

Open Recent

File menu > Open Recent

Open recent displays a list of recently opened and saved files. The list is sorted in chronological order, with the most recent files at the top.

Procedure

To change the number of files displayed in the Open Recent list:

1. Choose Customize > Preferences > Files tab > File Handling.
2. Set a value for Recent Files In File Menu. The upper limit is 50.

Save

File menu > Save

Keyboard > **CTRL+S**

Save updates the current scene by overwriting the last save of the scene. If no scene was previously saved, this command works like *Save As (page 3–403)*.

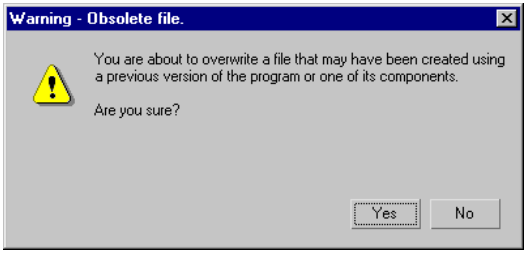
See also

Save As (page 3–403)

Save Copy As (page 3–404)

Saving to an Obsolete File

When you open a file that was created with an earlier version of the software, and then attempt to save it in a current version of 3ds Max, an alert is displayed, warning you are about to overwrite the obsolete file.



Choose Yes to go ahead and overwrite the original file, No to stop the Save. If you choose No, you can use *Save As (page 3–403)* to save the file under a different name.

If you save to the original file name, you can still edit it using the current version of the software, but you will no longer be able to edit it in earlier versions of 3ds Max.

Interface

When you save a scene, you also save the program settings. When you open the file again, it opens with the same viewport configuration, view and zoom levels, snap and grid settings, and so on.

You can incrementally number saved files, and make automatic backup files at specified time intervals. These options, Increment On Save and Backup On Save, are on the *Files panel (page 3–870)* of the Preference Settings dialog.

Save As

File menu > Save As

Save As saves the current scene file, *.max* or *.chr*, under a different file name.

A *.chr* file is a character file saved with Character menu > Save Character. For more information on the *.chr* file format, see *Character Assembly (page 2–681)* and *Save Character (page 2–686)*.

Note: 3ds Max lets you number saved files incrementally and make automatic backup files at specified time intervals. The options to set up Increment On Save and Backup On Save are on the *Files panel (page 3–870)* of the Preference Settings dialog.

See also

Save (page 3–402)

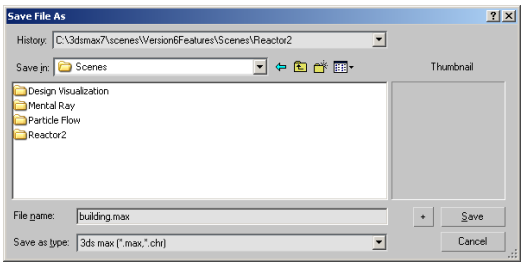
Save Copy As (page 3–404)

Procedure

To save a file to a different name:

1. Choose File > Save As.
2. Do one of the following:
   - Enter a name in the File Name field.
   - Click the Increment button.

Interface



The Save File As dialog has standard Windows file save controls. At the right, the Thumbnail area shows a preview of the scene whose file name is highlighted in the list on the left.

Tip: You can resize the dialog by dragging an edge or a corner.

Clicking the plus button appends a sequence number to the file name you entered, or increments the sequence number if the name already has one, and then saves the file to that name.

For example, if you have highlighted a file named *test00.max*, clicking the plus button changes the name to *test01.max* and then saves *test01.max*.

Save Copy As

File menu > Save Copy As

Save Copy As allows you to save a copy of the current scene under a different file name. It does not change the name of the file being worked on.

Important: Save Copy As does not update the original file name as Save does, and Save does not update the file you last saved using Saved Copy As. For example, if you make edits to a 3ds Max scene named *filename.max*, then use Save Copy As with the file name *filename01.max*, make additional edits, and then click Save, your second set of edits will be saved as *filename.max* but *not* as *filename01.max*.

See also

Save (page 3–402)

Save As (page 3–403)

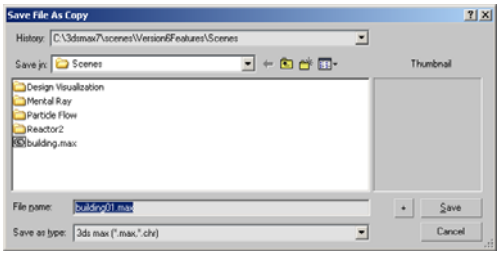
Auto Backup (page 3–870)

Procedure

To save a copy of the file to a different name:

1. Choose File > Save Copy As.
2. Browse or type the name of the file you want to create or update.
3. Click the Save button.

Interface



Save Copy As displays a standard Windows save dialog. Save Copy As increments the number at the end of the file name in order to propose unique but similarly-named files each time the command is used.

Clicking the Save button saves the file to the name displayed in the File Name text box.

Tip: You can resize the dialog by dragging an edge or a corner.

Clicking the plus button saves the file with a name ending in a number one increment greater than that displayed in the File Name text box.

Save Selected

Select objects to save. > File menu > Save Selected

Save Selected saves the selected geometry as a scene file under a different file name.

Identically named bitmaps with different properties are stored as different files. Objects linked to a selected object are also saved. The following dependencies are preserved for a Save Selected operation:

- Ancestors of selected child objects are saved, all the way to the root of the hierarchy.
- Space Warps to which selected objects are bound are saved.
- IK follow objects to which selected objects are bound are saved.

Procedure

To save selected objects to a new file:

1. Select one or more objects.
2. Choose File > Save Selected.
3. Enter a name in the File Name field.
4. Click Save.

External References (XRefs) to Objects and Scenes

Referencing Objects, Materials, and Scenes

You can use two kinds of externally referenced files (XRefs): *XRef Objects (page 3–406)* and *XRef Scenes (page 3–416)*. Using these external references allows for a team approach to animation, where the modeling, materials, and animation can be handled in separate files by different artists. It can also make large files much easier to deal with through the use of *proxy objects*.

You access XRef Objects and XRef Scenes from the File menu.

The two types of references have distinct purposes:

- Referenced scenes bring in a file that cannot be selected or inadvertently changed. An animator can bring in the environment or set as a referenced scene and won't have to worry about mistakenly selecting walls and floors while trying to animate legs and arms.

  The file renders as part of the animation, but will not hinder the workflow. Referenced scenes can be bound to an object in the scene so you can scale, rotate, or reposition the scene if necessary.

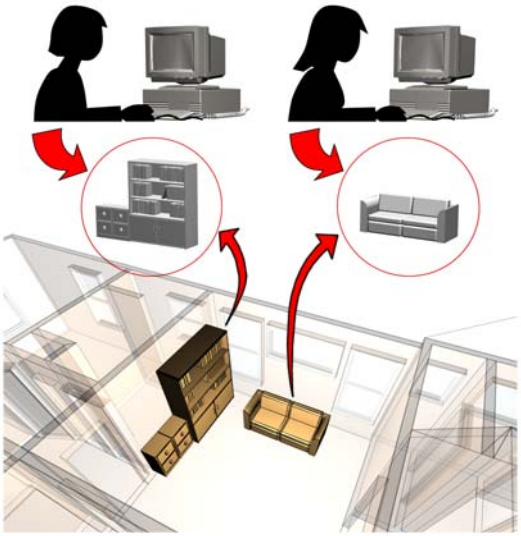
- Referenced objects appear in the scene and can be animated. Depending on the object's XRef settings, you might or might not be able to edit the object's modifier stack, as well as any manipulators applied to the object. You can add modifiers or transform animation to the referenced objects, but you cannot inadvertently change the model's structure. Referenced objects allow for the substitution of a proxy object, so you can animate a low-polygon version of a complex model and then render the polygon-intensive version.

  In 3ds Max **8,** you can also XRef materials. This is part of the process of referencing objects, or you can also use the special *XRef material (page 2–1425)*.

  Note: Any atmospherics applied in an XRef object's source file will be carried into the scene.

The use of referenced objects and scenes allows you to continue to work on models and materials while the animation process is under way. You can choose to have the models and materials update automatically, as soon as changes are saved to the original file, or to update manually, on demand.

There are also tools for easy conversion of scene objects into referenced objects, and a button to merge referenced objects back into the scene as normal objects.



Objects in a scene can be XRefs, created and maintained by other users.

XRef Objects

File menu > XRef Objects

Externally referenced objects, *XRef objects*, appear in your current scene, but are actually referenced from external 3ds Max files.

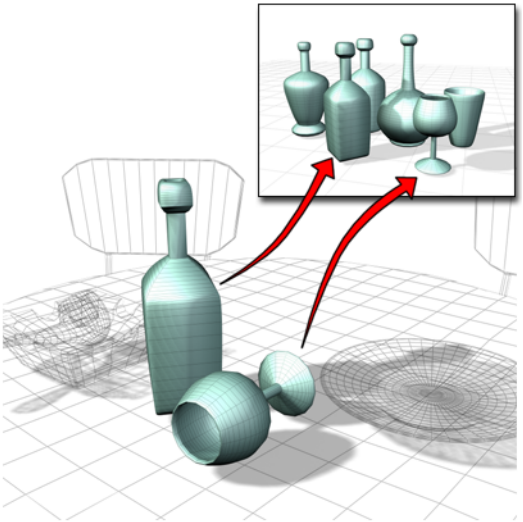
As a result, the *source* objects are protected from modifications you make to the XRef objects. Updates or changes made to the source objects are also updated in the target file where the XRef appears.

An XRef object appears like any other object in your scene. However, depending on your XRef settings, modifiers and manipulators applied to your source object might or might not be available to change. If you selected XRef or Ignore in the Modifiers group of the *XRef Objects dialog (page 3–408)*, the only entry in the modifier stack will be "XRef Object." You can add additional modifiers to the object, but you cannot access the original ones unless you merge the XRef object into the scene.

However, if you merge the objects into the target scene, you can edit them in the stack. However, changes that you make to the modifier stack in the target file have no effect in the source file.

Note: The XRef behavior of world-space modifiers is different than the object-space modifiers. If you add a world-space modifier and use the XRef or Ignore options, the world-space modifiers will be separated from the XRef object and appear on the top of the modifier list.

Similarly, manipulators in your source file will be treated depending on the Merge Manipulators setting in the XRef Objects dialog.



Objects in a scene can be XRefs from other scenes. They can be transformed and positioned in the scene as desired.

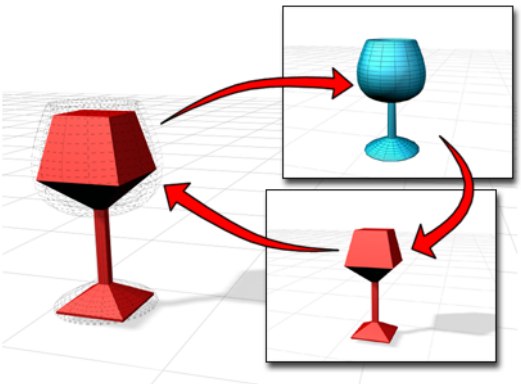
When an XRef object is loaded into the target file from the source file, it can have an XRef material assigned to it. When the object is loaded into the target scene, you can either merge the material information or you can maintain it as a live connection with the source file.

Note: Both objects and materials are XRefed based on their names. Names are case-sensitive. Changing the name of an object or material in

the source file can cause XRefs in the target file to become unresolved.

XRef objects can be modified or transformed in your current scene just like any other object. XRef objects also allow the use of proxy objects to stand in or substitute for geometry. Use XRef objects to manage the complexity of your scene during animation by substituting "lightweight" proxy objects for more complex geometry.

You can create a proxy by simplifying a clone of your existing model or you can build simple substitute objects like boxes or cylinders, or you can save a copy of the model in the early stages of modeling before you add the detail. You can even use an object from another scene.



A proxy object is substituted in the scene, but the reference to the real object is always available.

Choosing XRef Objects displays the *XRef Objects dialog (page 3–408)*, where you add XRef objects and materials to your target scene, and control their visibility, merge states, and other options.

If your XRef object relies on another object in the source scene, the relationship will be preserved in the destination file. Examples of this include objects with path constraints, atmospherics, particle arrays with object emitters, or space warps bound to an object.

Note: Render effects such as glow or flare are not carried in XRefs. To use render effects from the source file, merge them in using the Merge buttons found in the Environment And Effects dialog.

Procedures

To add an XRef object:

1. Choose File > XRef Objects.
2. Click the Create XRef Record From File button in the XRef Objects dialog. The Open File dialog appears. Highlight the file you want by highlighting it in the list, then click Open. The *XRef Merge Dialog (page 3–416)* appears.

   If the Merge Manipulators toggle is off before you click Create XRef Record From File, manipulators applied to XRef objects remain linked (XRefed) to the source file. In a similar way, the Modifiers drop-down list gives you three alternatives for how to handle object modifiers.

   Note: If the Merge Materials toggle is off before you click Create XRef Record From File, materials applied to XRef objects remain linked (XRefed) to the source file. If Merge Materials is on, the materials are merged with the target scene (as they always were in versions of 3ds Max prior to v8).
3. Select the objects that you'd like to appear in your current scene as XRef objects.

   You can choose as many as you want by holding down the CTRL key and highlighting them in the list. If the source scene has a lot of object types you don't need to include, you can filter the list by using the List Types radio buttons. Use the All button to select all of the entries, the None button to select no entries and the Invert button to highlight the opposite of your current selection.

   Tip: You can also turn on Include All in the XRef Objects dialog *before* you click Create XRef

Record From File. This includes all objects and materials, and bypasses the XRef Merge dialog.

4. The XRef record appears in the upper list of the XRef Objects dialog and has the same name as its source file. The entities appear in the lower list, where an entity can be either an object or a material. Make additional choices at this time if you like. You can control how the objects will update (either automatically or on demand). Updating is done at the file level: all objects and materials from a single source file are updated at the same time.

To substitute a proxy object for an XRef object:

With proxy objects, you can avoid loading your detailed model in memory, and speed up the time of test renderings.

1. Select an XRef object.
2. On the Modify panel > Proxy rollout, click the Browse button, and use the File Open dialog to choose the file that contains the proxy.

   A Merge dialog appears.
3. Pick the object to use as a proxy.

   When you have picked the proxy object, the Enable toggle should turn on.
4. Turn on Use In Rendering to use the proxy object in renderings.

To add further objects to an XRef Record:

1. In the XRef Objects dialog, highlight an XRef record (in the top list) that contains objects that have not already been added to the scene.
2. On the Entities List toolbar (the lower toolbar), click Add Objects.

   This button is not available if all of the objects in the source file have already been added to the XRef record.

   The XRef Merge dialog appears.
3. Highlight the objects that you want to add as XRefs, and then click OK.

   The selected objects are added. Depending on the dialog settings, materials might also be added as XRefs.

To change an XRef object into a scene object:

- Highlight the XRef object in the Entities list (the lower list), and then click Merge In Scene. The XRef object becomes a full-fledged object in the scene, giving you access to its modifier stack.

  Tip: This button is also available in the upper Records list, where it merges *all* entities from the highlighted source record into the current, target scene.

XRef Objects Dialog

File menu > XRef Objects > XRef Objects dialog

The XRef Objects dialog provides the interface for loading XRef entities into your target scene (the scene where you create the XRefs) from a source scene (the scene file that contains the entities that you want to externally reference). XRef entities can be XRef objects, XRef materials, and XRef manipulators. An XRef record can be made up of one or more XRef entities.

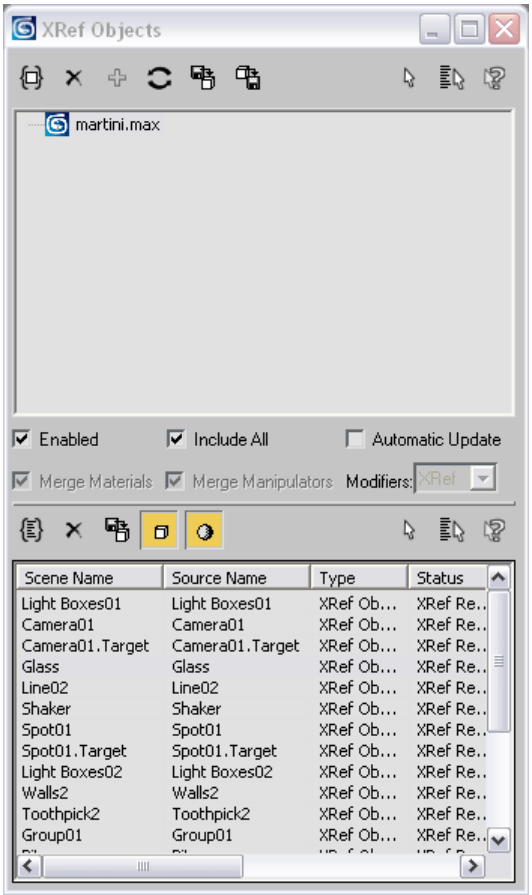
The XRef Objects dialog is divided into the XRef Record section at the top and the XRef Entities section at the bottom. The XRef Objects dialog provides controls to add and remove XRef objects, XRef materials, and XRef manipulators.

When you XRef an object into your scene, all atmospheric effects are carried over, and optionally, their manipulators and modifiers can also be merged into your scene.

Note: When you create XRefs, they are resolved uniquely, so there is not the danger of name

conflict that there was in versions of 3ds Max prior to v8. However, if you choose a different source object for an *existing* XRef object, this is resolved by object name. In this case, if the XRef source file contains multiple objects with the same name, 3ds Max might not properly define which one will be used.

Interface



Tip: You can resize the XRef Objects dialog. This can be useful if you want to see all of the columns in the XRef Entities list. You can also adjust the relative height of the two lists in the dialog: drag the horizontal line that is just above the XRef Entities toolbar (the lower of the two toolbars).

XRef Record toolbar

Use these tools to create and update XRef records.

Create XRef Record from File—Launches a file dialog so you can select the source file for your XRef record. When you a select a file, the *XRef Merge dialog (page 3–416)* appears.

Any *transform* animation assigned to the source objects can be merged along with the XRef object itself, but it will not be updated with the source object.

Remove XRef Record—Deletes the highlighted XRef records after you confirm the action. All entities associated with the highlighted records are removed.

Note: Once you have removed an XRef record, you cannot undo this action.

Combine XRef Records—Click to combine the contents of more than one XRef record into one record. This is useful when you want to clean up the organization of your XRef records. Rather than having multiple entries of the same file, you can group all of the objects and materials from that file under the same record. This button is available only when you highlight two records that refer to the same file; both records must have identical settings. XRef records must refer to the same file with the same XRef entities. Combine XRef Records only allows you to consolidate all of the entities of one file into one XRef record entry. It does not allow you to combine the contents of different files, even if the files have the same name.

Update—Refreshes the contents of all XRefs. If the objects, materials, or manipulators referenced have changed in the source scene, you will see these changes in your target scene.

Note: The changes must be saved in the source file before you see them in the target file.

Warning: If you update an XRef in a scene with *radiosity (page 3–50)*, probably this will invalidate the radiosity solution. After you update the XRef, reset the radiosity solution and then recalculate it.

Merge in Scene—Converts all objects for the highlighted record into native objects in your target scene. The objects, materials, and manipulators are no longer referenced from the source file but become part of your target scene. A prompt appears so you can confirm the action. Since a merged XRef object becomes part of the scene and is no longer an XRef, its name is removed from the list below. This works on a XRef record basis, so all entities belonging to the highlighted XRef record are converted. The contents of the source file are not affected by this button.

Merging an XRef object loads the full modifier stack of the original object into the target scene (your current scene), while maintaining any additional stack items that were added while the object was an XRef. Thus, you can use Merge In Scene to update an object that has been modified as an XRef.

Convert Selected Object(s) as XRef Record—Creates a source file for currently selected objects. This means that you can select objects in the current scene and then save them to a scene file. This file is then listed as an XRef record that contains only the objects you selected.

Note: This option works best for new objects, not objects that have been XRefed already. If you use it for an object that is already an XRef, it creates a nested XRef. Nested XRefs still behave as you expect, but they can reduce performance when you open a scene or render it.

Select—Selects all of the objects that belong to the currently highlighted XRef record.

Select by Name—Opens the Select Objects dialog, which lists all objects and highlights those belonging to the currently highlighted XRef Record. Use this dialog to select specific XRef objects.

Highlight selected object(s) XRef Records—Based on the current object selection, the corresponding records are highlighted in the XRef Objects dialog.

XRef Record list

Displays the names of the source files that contain the source objects used as XRef objects in the current scene. These files are added using the Create XRef Record button and removed using the Remove XRef Record button.

To see the full path of the source file, move the cursor over the name of an XRef record. The full path is displayed in a tool tip.

If a source file itself contains XRefs, a plus/minus icon appears to the left of its name. Click the icon to expand or collapse the display of nested XRef entries. Nested XRef records that are missing and unresolved are displayed in gray.

Right-clicking the XRef Record list displays a *pop-up menu (page 3–413)* that has further options for managing the list and its records.

Enabled—Turn off to disable all XRef objects referenced from the *.max* files currently highlighted in the XRef Record list. Disabled XRef files and objects are listed in gray in the lists and are not loaded into memory. Default=on.

Include All—If you turn this on before you add a new XRef record, all the objects in the source file are included as XRefs. This option bypasses the XRef Merge dialog. Default=off.

If you create an XRef record when Include All is turned off, only those entities selected for that XRef record (in the XRef Merge dialog) will be a part of the record: any new objects created in the source file will not be part of the record. If Include All is turned on when you create a record, then any new objects created in the source file will be included in the XRef record when you reopen or Update the target file.

If the source scene includes nested XRefs, using Include All can cause some confusion if you are not careful about your tree of scenes. Consider the following arrangement:

```
target.max (Include All) -->
a.max (Include All) --> b.max
```

If you later open *b.max,* create new objects, and save it, then open *master.max* without first opening and saving *a.max,* you won't see the new objects created in *b.max*. The scene *target.max* is simply reading *a.max,* and since *a.max* hasn't changed, the new objects aren't present.

Automatic Update—When on, changes made to referenced objects, materials, and manipulators in the source scene are automatically updated in the target file as soon as the source file is saved. There's no need to click Update. Default=off.

Note: You can change the state of Enabled, Include All, and Automatic Update after a record is created.

Merge Materials—Combines all materials from the source file into the target file. This means that the material will be loaded in the master file but will then no longer have a live connection with the source file. This is useful if you don't require the live connection, and you want to alter the materials. Default=off.

To use Merge Materials, you must turn on this option *before* you add the XRef record (source) file.

When Merge Materials is on and there are name conflicts between materials in the target scene and materials in the XRef source scene (or between materials in two XRef records), 3ds Max displays a *Duplicate Name dialog (page 2–1296)* so you can resolve the conflicts.

Merge Manipulators— When on, any *manipulator (page 2–26)* applied to the XRef object in the source file is combined into the scene. Manipulators are applied to the XRef object and can be changed. However, these changes have no effect in the XRef source file. Default=off.

To use Merge Manipulators, you must turn on this option *before* you add the XRef record (source) file.

Modifiers—Determines how modifiers from the source file will be loaded into your target file. Modifiers are not listed as XRef entities. To see an XRef modifier on the Modify panel, you must use the Merge option. Otherwise, you have the choice of either not merging the modifier information at all (with the Ignore option) or merging the information with the object with the XRef option.

You must choose the Modifiers option *before* you add the XRef record (source) file.

- **XRef**—Modifiers are contained within the XRef object and cannot be changed. When you load the XRefed file, you will see the changes of the modifier but they will not be listed separately from the object on the Modify panel. Additional modifiers can be applied to the XRef object, and will be a part of the scene; however, they will not be reflected back to the source file.

  Note: World-space modifers remain at the top of the modifier stack and are not merged with XRef objects.

- **Merge**—Modifiers assigned to the XRef object (in the source file) are merged into the scene. When you load the XRefed file, you will see the changes caused by the modifier and they

will appear in the modifier stack in the Modify panel. They are applied to the XRef object and can be changed in the modifier stack. However, if you make changes in the target file, these changes are not reflected back into the source file.

- **Ignore**—Any modifiers assigned to the XRef object (in the source file) are disregarded and the base object is brought into the scene as an XRef object. When you load the XRefed file the modifiers are not applied to the object so the modifications in the source file will not be reflected in the master file.

Although the Merge Materials, Merge Manipulators, and Modifiers settings are disabled after you add a record, when you highlight the record in the XRef Record list, the toggles and list field show the settings used when the record was created.

XRef Entities toolbar

Add Objects—Click to add further entities to the highlighted XRef record. This button is available only when the highlighted XRef record contains objects that you have not yet XRefed. The XRef Merge dialog appears, with a list of the available objects. Highlight the objects to XRef, and then click OK.

Delete XRef Entity—Click to delete the highlighted XRef. An alert prompts you to confirm the action. All highlighted entities are removed from the scene. You can delete XRef objects or materials.

Merge in scene—Merges the current selection in the XRef Entities list into the target scene (the current scene). Use this button to change XRef objects or materials into objects that are native to the current scene. The connection between the object in the source scene and in your target scene is broken, and the object or material that you merged is no longer updated when the source scene changes.

3ds Max prompts you to confirm the merge.

Since a merged XRef object becomes part of the scene and is no longer an XRef, its name is removed from the list.

Merging an XRef object loads the full modifier stack of the original object, while maintaining any additional stack items that were added while the object was an XRef. Thus, you can use Merge to update an original object that has been altered as an XRef. If you do this, use Convert Selected to save out the "improved" original into a file, which then can be merged back into the original source.

List Objects—When on, shows the XRef objects for the current XRef record in the XRef Entities list.

List Materials—When on, shows the XRef materials for the current XRef record in the XRef Entities list.

Note: You can enable any combination of the List buttons to show certain types of entities and hide others. This is useful for navigating the list of entities.

Select—Selects the currently highlighted XRef object.

Select by Name—Opens the Select Objects dialog, which lists all objects belonging to the currently highlighted XRef Record. Use this dialog to select objects.

Highlight Selected XRef Records (Entity)—Highlights entries in the XRef Entities list for currently selected XRefs.

XRef Entities list

Displays the XRef objects and materials that belong to the record that is currently highlighted in the XRef Record list. If no source file is highlighted, this list is empty.

Right-clicking the XRef Entities list displays a *pop-up menu (page 3–415)* that has further options for managing the list and the objects and materials in it.

This list contains the following information for each XRef entity:

Scene Name—Name of the entity in the target (current) scene. By default, the name of the entity in the target scene is the same as the name of the entity in the source file. If you change the name of the entity on the *command panel (page 3–800)* and then click Refresh, the name will update in the XRef Entities list.

Source Name—Name of the entity in the source file. You cannot change this name from the target file. If the name of the entity changes in the source file, the XRef in the master file will become unresolved.

Type—Whether the entity is an XRef object or material.

Status—Usually this field displays "XRef Resolved" to indicate that the XRef is valid. When an XRef is unresolved this field displays "Unresolved!" An unresolved XRef indicates that there is no longer a connection between the entity in your master file and the source file. This can happen for a number of reasons. For example, the entity in the source file might have been renamed or deleted.

Note: If you resolve the cross reference the XRef will be resolved again when you click Update.

Proxy—Whether a proxy is enabled for the entity. You enable and disable proxies for XRef entities on the Proxy Object rollout. Displays "–––" when the proxy is disabled and "Enabled" when the proxy is enabled.

You can assign a proxy object using the *Proxy Object rollout (page 3–423)*.

Proxy Render—Whether the proxy will be used in the rendering. Displays "–––" when the XRef object will be rendered and "Enabled" when the proxy object will be rendered.

Proxy Name—Name of the proxy object that will be used as the XRef object.

Proxy Filename—Name of the file that contains the proxy object to use for the XRef object.

Proxy Path—Path of the file for the proxy object to use for the XRef object.

XRef Files List Right-Click Menu

File menu > XRef Objects > XRef Objects dialog > Right-click the list of XRef files (records).

In the *XRef Objects dialog (page 3–408)*, when you right-click the upper list of files or "records," this pop-up menu appears. It gives you some further options for managing the list.

Some of the options on this menu are unavailable unless you have selected a record in the Files list.

Interface

Create XRef Record from File—Launches a file dialog so you can select the source file for your XRef record. When you a select a file, the *XRef Merge dialog (page 3–416)* appears.

Remove XRef Record—Deletes the highlighted XRef records after you confirm the action. All entities associated with the highlighted records are removed.

Note: Once you have removed an XRef record, you cannot undo this action.

File Submenu

Open—Opens the source file. If you have not saved changes to the current, target file, 3ds Max prompts you to do so.

Browse—Displays a file dialog that lets you browse for a new source file. The file you choose *replaces* the selected file record in the XRef Objects dialog.

Reveal Location in Explorer—Launches an instance of Windows Explorer, open to the folder in which the selected source file resides.

Strip Path—Removes path information from the file name, saving only the file name itself. The source file location is saved relative to the target file location.

Warning: If you strip the path before you have saved the target file, the record's XRefs can become unresolved. This is because there is no location for the *Untitled,* unsaved MAX scene.

Resolve Path to UNC Location—If the record's file name has had its path stripped, this option restores the full path name.

Combine XRef Records—Click to combine the contents of more than one XRef record into one record. This is useful when you want to clean up the organization of your XRef records. Rather than having multiple entries of the same file, you can group all of the objects and materials from that file under the same record. This option is available only when you highlight two records that refer to the same file; both records must have identical settings. XRef records must refer to the same file with the same XRef entities. Combine XRef Records only allows you to consolidate all of the entities of one file into one XRef record entry. It does not allow you to combine the contents of different files, even if the files have the same name.

Update—Refreshes the contents of all XRefs. If the objects, materials, or manipulators referenced have changed in the source scene, you will see these changes in your target scene.

Note: The changes must be saved in the source file before you see them in the target file.

Warning: If you update an XRef in a scene with *radiosity* *(page 3–50)*, probably this will invalidate the radiosity solution. After you update the XRef, reset the radiosity solution and then recalculate it.

Select—Selects all of the objects that belong to the currently highlighted XRef record.

Select by Name—Opens the Select Objects dialog, which lists all objects and highlights those belonging to the currently highlighted XRef Record. Use this dialog to select specific XRef objects.

Highlight Selected Object's XRefs Records—In the XRef Entities list, highlights the entries for objects that are selected in the scene.

Highlight All—Selects all records in the list.

Highlight Inverse—Inverts the current list selection.

Highlight None—Deselects all records in the list.

Merge in Scene—Converts all objects for the highlighted record into native objects in your target scene. The objects, materials, and manipulators are no longer referenced from the source file but become part of your target scene. A prompt appears so you can confirm the action. Since a merged XRef object becomes part of the scene and is no longer an XRef, its name is removed from the

list below. This works on a XRef record basis, so all entities belonging to the highlighted XRef record are converted. The contents of the source file are not affected by this button.

Merging an XRef object loads the full modifier stack of the original object into the target scene (your current scene), while maintaining any additional stack items that were added while the object was an XRef. Thus, you can use Merge In Scene to update an object that has been modified as an XRef.

Convert Selected Object(s) as XRef—Creates a source file for the currently highlighted objects. This means that you can highlight entities in the current scene, including materials, and then save them to a scene file. This file is then listed as an XRef record that contains only the entities you highlighted.

XRef Entities List Right-Click Menu

File menu > XRef Objects > XRef Objects dialog > Right-click the list of XRef entities (objects and materials).

In the *XRef Objects dialog (page 3–408)*, when you right-click the lower list of entities (objects and materials) this pop-up menu appears. It gives you some further options for managing the list.

Interface

Add Objects—Displays an *XRef Merge dialog (page 3–416)* so you can add entities to the list.

If all entities in the source scene are already XRefed, this choice has no effect.

Delete XRef Entity—Deletes the entities whose names are highlighted.

A prompt asks if you really want to delete these XRefs.

Select—Selects the objects whose names are highlighted.

Select by Name—Opens the Select Objects dialog, which lists all objects and highlights those whose names are highlighted in the entities list.

Highlight Selected Object's XRefs—When XRef objects are selected in the scene, this choice highlights their entries in the entities list.

Highlight All—Highlights all entities in the list.

Highlight Inverse—Inverts the current set of entities that are highlighted.

Highlight None—Turns off highlighting for all entities in the list.

List Objects—Toggles display of XRef objects in the list.

List Materials—Toggles display of XRef materials in the list.

The state of List Objects and List Materials is the same as the state of the toolbar buttons in the XRef Objects dialog. Changing the state in the menu changes the button state, and vice versa.

Merge in Scene—Merges the current selection in the XRef Entities list into the target scene (the current scene). Use this button to change XRef objects or materials into objects that are native to the current scene. The connection between the object in the source scene and in your target scene is broken, and the object or material that you merged is no longer updated when the source scene changes.

3ds Max prompts you to confirm the merge.

Apply XRef Material(s) to Object(s)—Applies the original, XRefed material to the highlighted objects. This can be useful if you have assigned a local material to the object (for example, to use in renderings of the target scene) and now want to restore the object's original material. It can also

restore the XRefed source material if the material was originally merged into the target scene.

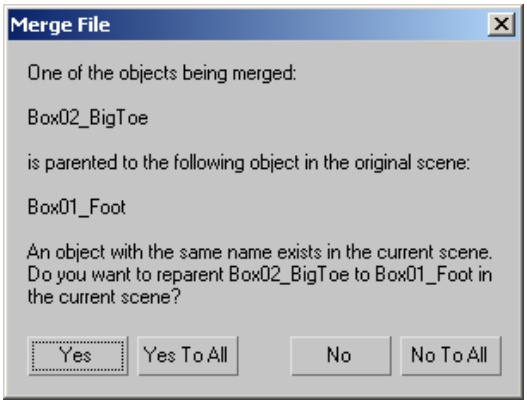
Merge XRef File Dialog

File menu > XRef Objects > XRef Objects dialog > XRef Files window > Add

When you merge an object that's linked to a parent object in a source scene, and an object of the same name as the original parent exists in the current scene, you can recreate the same hierarchy using this dialog.

Interface

If you merge an object that's linked to a parent object in a source scene, and an object of the same name as the original parent exists in the current scene, a dialog appears asking if you want to link the incoming object to the existing parent object.



Yes—Reparents the specified object and continues prompting for all subsequent merging objects that might need reparenting.

Yes To All—Reparents the specified object and all subsequent merging objects that need reparenting.

No—Merges the specified object without reparenting, but continues to prompt for subsequent objects.

No To All—Doesn't reparent any of the incoming objects. When an object is merged without reparenting, it becomes a child of the world.

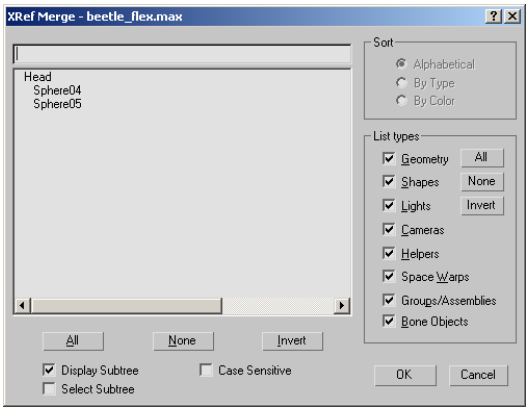
Note: This same alert appears when adding an XRef object to the scene, if the XRef source object is linked to an object and an object of the same name exists in the current scene.

This feature can also be used to reconnect parent objects to children in the scene.

XRef Merge Dialog

File menu > XRef Objects > XRef Objects dialog > Add button > Open File > XRef Merge dialog

The XRef Merge dialog lets you choose which objects to add as XRef objects to the scene. This behaves similarly to the *Merge command (page 3–469)*; controls in this dialog are similar to those in the *Select by Name dialog (page 1–78)*.



XRef Scene

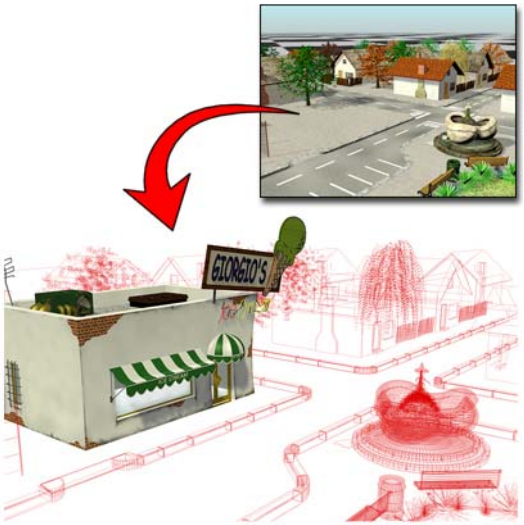
File menu > XRef Scene

An externally referenced scene, or XRef scene, appears in your current file, but is actually loaded temporarily from another *.max* file. As a result, the

source scene is protected from any modifications you might make to the XRef scene. Updates or changes made to the source scenes are also updated in the target file once the changes are made and saved to the source file.

The XRef scene feature allows team members working on a project to have access to each other's work without the risk of changing the files. A modeler can create a setting, while a second modeler might create a character. The animator can externally reference the setting as a scene and animate the character in the setting without being able to make changes to the setting. If the setting file is changed, those changes will be reflected in the animator's scene.

XRef scenes do not appear in the Select Objects dialog, the modifier stack, or the Track View. They can be animated in the current file only by using the Bind To Parent function in the XRef Scenes window.



Importing the whole village model into the building model as an XRef

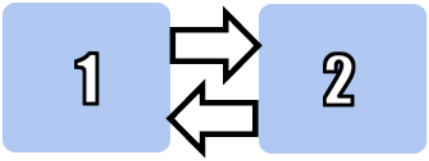
Radiosity solution data cannot be part of an XRef if objects have duplicate names. To solve this, change the duplicate names. Also, to reference radiosity data externally, the Save Scene Information In MAX File switch must be on in the *Radiosity panel (page 3–866)* of the Preferences dialog. (It is on by default.)

Be aware that render effects and environment effects are not carried in XRefs. To use the render effects (such as glow or flare) or environment effects (such as atmosphere or fog) from the XRef file, merge them in using the Merge buttons found in the Environment And Effects dialog.

Choosing XRef Scene displays the *XRef Scenes dialog (page 3–420)*.

Overlays

Overlays allow multiple scene references without the risk of circular dependencies. The overlay is loaded only into the target scene that references it, and is not visible in other scenes that might XRef the target file that uses the overlay. Consider two scenes that reference each other:

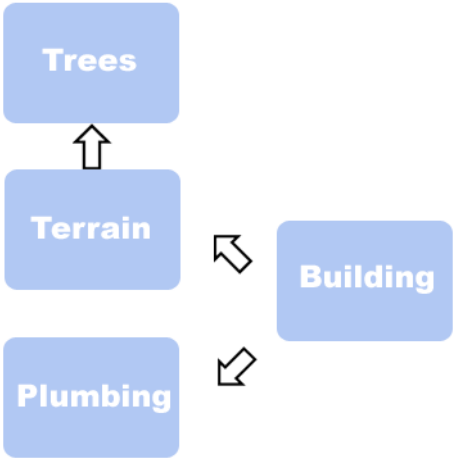


Ordinarily, 3ds Max would recognize this as a circular dependency, and disallow it. But in 3ds Max 8, you can set up such a combination of XRefs by following these steps:

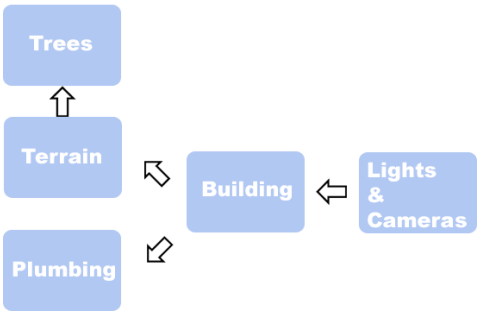
1. In scene 2, XRef scene 1 and use the toggle to flag it as an overlay.
2. Save scene 2.
3. Open scene 1, and XRef scene 2.

The previous example is not notably practical. But suppose you want to mask off part of your scene so other artists who XRef the scene will not see it. For example, you are working on a building and have

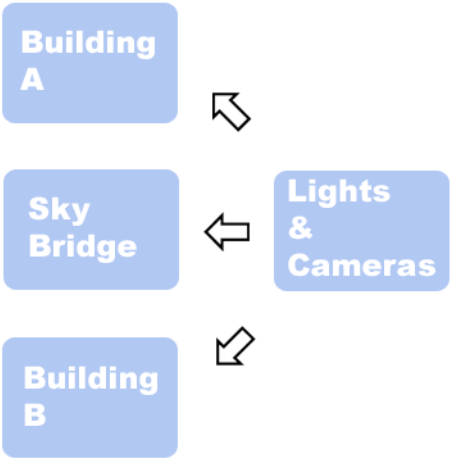
XRefed a CAD file that lays out the plumbing of the building, as well as a scene of ground terrain that contains some XRefs to some trees. The XRef scene graph might look like this:



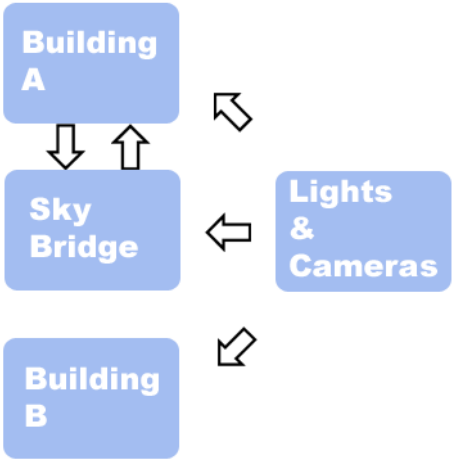
The building scene XRefs the terrain and the plumbing data. The terrain scene XRefs the trees. You decide you are the only one who needs to see the CAD plumbing data. The CAD plumbing data is needed only to line up where the sinks need to be in the building, so you set up the CAD plumbing data XRef to be an overlay. Other scenes that include the building scene won't see the plumbing. For example, another artist who is responsible for the lighting and cameras sets up an XRef to the building scene. Now the XRef graph looks like this:



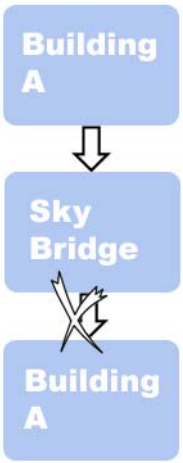
In this case, an overlay is used to simply hide data information from other target scenes. Another use of overlays is to avoid circular XRefs. For example, picture four artists working on a scene of a city block. Two of them are working on individual buildings, one is working on a sky bridge that connects the two buildings, and the fourth artist is setting up the cameras and the lights. The graph of XRefed scenes might look like this:



But the artists working on Building A and the artist working on the sky bridge need to see each other's work to make sure everything lines up. The obvious solution would be to XRef each other's scene file:



However, 3ds Max detects a circular XRef and won't allow this, unless both the Building A scene and the Sky Bridge scene flag their XRef as an Overlay.



Warning: If you turn off the Overlay flag for an existing XRef scene, you can cause circular XRefs to occur, that aren't detected until you or another user tries to open one of the scenes in the project.

Procedures

To add an XRef scene:

1. Choose File > XRef Scene.
2. Click the Add button. An Open File dialog appears that lets you locate the *.max* file you wish to reference. A thumbnail display is provided to help you identify your file.
3. Click Open to bring the XRef scene into your current *.max* scene.
4. The path and file name of the selected file appears in the XRef Files window.

   You can add as many files as you like; each one appears in the XRef Files window.
5. Make additional choices in the XRef Scene window if you want.

   You can affect the display of the XRef scene, making it visible or not, or making objects in the referenced scene appear as bounding boxes. You can ignore the file's lights, cameras, shapes, helpers, or animation. You can control when the file updates, either automatically or on demand. You can have the file enabled or disabled, or you can merge in it completely, severing the XRef relationship and inserting the scene into your current file. You can bind the scene to a Parent object to reposition or animate the XRef scene.

To scale, rotate, or reposition an XRef scene:

1. Create an object in your current scene to be the parent object.
2. Choose the XRef scene from the XRef File window.
3. Click Bind (in the Parent group), and then select the parent object by clicking it in the viewport. The XRef scene jumps to match the pivot point of the parent object.
4. Transform the parent object. The XRef scene will follow.

This works best if both the parent object and the XRef scene have their pivot points positioned at 0,0,0. You can do this by using Transform Type-In to move the parent object.

If the XRef scene was created a large distance from the origin, you can run into a problem. As you try to scale, the XRef scene will move away from the center. To counteract this problem, you can create a second dummy object centered over the XRef scene. Then select and link the original dummy object to the centered dummy object. You can then scale the centered dummy and the XRef will not move toward or away from the origin.

An alternative method for scale problems is to use the *Rescale World Units Utility (page 2–49)* on the original file.

XRef Scenes Dialog

File menu > XRef Scene > XRef Scenes dialog

The XRef Scenes dialog lets you add and remove XRef scenes. It also gives you tools to control the display of the XRef scene, options to ignore various components of the scene, and the ability to bind to a parent object so you can scale, rotate, or move the XRef scene.

Accessing XRef Scenes

Although XRefs are inaccessible "boxes" in the scene, they can be accessed in various ways.

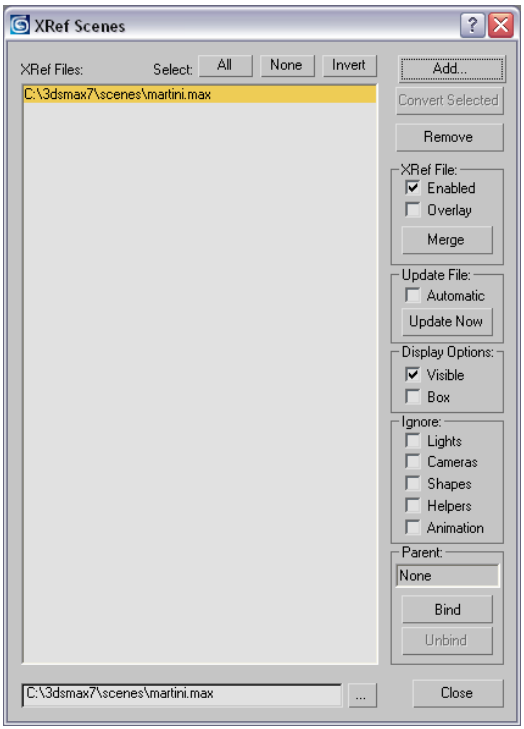
- Cameras and lights in the XRef scenes can be accessed in the Viewports list and assigned to viewports in the current scene.
- Objects from the XRef scenes are included in the Summary Info dialog.

Nesting XRef Scenes

XRef scenes can be nested. That is, an XRef scene can contain other XRef scenes, which can in turn contain other XRef scenes.

Note: For a nested XRef scene to update automatically, all of its parent scene files (files that include it as an XRef) must have Auto Update turned on.

Interface



XRef Files list—Displays all XRef scenes in the current scene, and lets you select them for operations. XRefs that have been disabled (by turning off Enabled) are listed in gray rather than black. If an XRef is listed in red, that means its file could not be loaded. Either the file is corrupted, or the path is not pointing to the correct directory or file name.

XRef File path field—Lets you change the path or file pointed to by a selected XRef scene. To use, choose one of the XRef scenes in the list, and then change the information in the field. You can either directly enter a new file name or path, or you can click the Browse button to the right of the field, and then choose a new file from the resulting file dialog. The new XRef scene that you choose replaces the one currently highlighted in the list.

Add—Displays a file dialog from which you can choose a *.max* scene file to be loaded into the current scene as an XRef. The selected scene appears in the list at left, and the geometry appears in the viewports.

You can also add a scene by dragging a *.max* file from the Windows Explorer into the list.

Convert Selected—Lets you take any selected objects in your scene and create XRefs from them. Basically, this does a Save Selected for the objects, which are automatically cut from the *.max* file and pasted into a new file. A file dialog lets you name the new file. They remain in the viewport but are now XRefs.

Remove—Removes the XRef scene currently chosen in the list, and removes it from the current scene. To use, choose one or more XRef scenes in the list, and then click the Remove button.

Select buttons

These standard buttons change the pattern of selection in the list.

All—Selects all items in the list.

None—Deselects all items in the list.

Invert—Inverts the current selection pattern in the list.

XRef File group

Enabled—Turn this off to disable the highlighted XRef. When an XRef is disabled, it's listed in gray in the list, and it's not loaded into memory.

Overlay—When on, treats the referenced source scene as an *overlay (page 3–417)*. Default=off.

Overlays allow multiple scene references without the risk of circular dependencies. The overlay is loaded only into the target scene that references it, and is not visible in other scenes that might XRef the target file that uses the overlay. See *Overlays (page 3–417)* for more information.

Warning: If you turn off the Overlay flag for an existing XRef scene, you can cause circular XRefs to occur, that aren't detected until you or another user tries to open one of the scenes in the project.

Merge—Click this to merge selected XRefs into the scene as real geometry. A prompt appears so you can confirm the action. Since a merged XRef becomes part of the scene and is no longer an XRef, its name is removed from the list.

Update File group

Determines how and when the XRef scenes are updated. These options are applied to the selected XRefs; for example, one XRef can have automatic updating, while another can have manual updating (using the Update Now button).

Warning: If you update an XRef in a scene with *radiosity (page 3–50)*, you will likely invalidate the radiosity solution. After you update the XRef, reset the radiosity solution and then recalculate it.

Automatic—When this check box is turned on, the selected XRef scene is automatically updated when its source scene is saved.

Update Now—Click this to update a selected XRef scene when you're not using Automatic (or when several XRef scenes are selected and some of them

are not set to Automatic). When you click Update Now, the XRef is updated to match the latest saved version of the source scene.

Display Options group

These options let you specify how the selected XRefs are displayed in viewports. These options have no effect on the rendered scene.

Visible—Turn on or off to display or hide the selected XRefs. This affects the visibility of the XRef in the viewports only (not in renderings). Note, also, that this behavior is different from the "Enabled" check box. Turning off Visible does not remove the XRef from memory.

Box—Turn this on to display the selected XRefs as bounding boxes. Turn off to display the full geometry.

Ignore group

This group box lets you specify categories that you do not want included with the XRef scene. For example, if you turn on Lights, the lights in the XRef source scene are not included in the current, target scene. You can switch these categories on and off at any time, but if you Merge an XRef scene while a category is turned off, that category of objects will not be merged into the scene.

Lights—Turn this on to ignore the lights.

Cameras—Turn this on to ignore the cameras.

Shapes—Turn this on to ignore the shapes.

Helpers—Turn this on to ignore the helpers.

Animation—Turn this on to ignore the animation. All animation in the scene is disabled and the scene appears as it would at frame 0 of the source scene.

Warning: Children of an ignored object are also ignored. For example, if you have mesh objects linked as children to a dummy object and ignore Helpers, then the mesh objects are ignored as well.

Parent group

These controls let you position and animate XRef scenes within the current scene by binding the XRef scene to a parent object.

Parent Name field—Displays the name of the parent for the currently selected XRef.

Bind—Click this, and then pick an object in the current scene to become the parent of the highlighted XRefs. The XRef scene is moved so that its original origin is placed at the pivot point of the parent object. Once an XRef is bound to a parent object, the transforms of the parent are inherited by the XRef. Thus, you can animate the XRef by animating the transforms of the parent.

Unbind—Click to unbind the highlighted XRefs from whichever parent they'd been bound to. The XRef immediately moves so that its original origin is placed at the world origin of the current scene.

Binding XRefs to objects is similar to *linking* objects, as performed with the Link/Unlink buttons on the toolbar, but it is not quite the same. When you Bind an XRef scene to an object, the XRef scene moves so that the origin of the XRef scene is placed at the pivot point of the parent object. If you unbind an XRef scene, it again moves so that its origin is at the origin of the current scene. (The origin of an XRef scene is typically the 0,0,0 world origin of the *.max* file scene from which it came.)

If you Merge a linked XRef scene, converting it to objects in the current scene, the objects in the XRef scene become linked children of the binding parent. At this point, you could Unlink them (using the toolbar command), and they'll maintain their offset position to the parent.

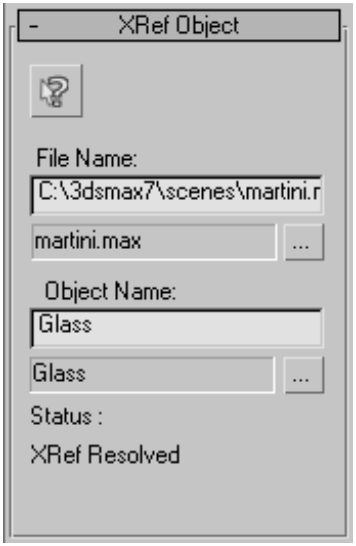
Close—Click to close the dialog.

XRef Object Rollout

Select an XRef object. > Modify panel > XRef Object rollout

When you've selected an XRef object in a scene, the XRef Object rollout appears along with the *Proxy Object rollout (page 3–423)* on the Modify panel. The modifier stack for the XRef object simply displays "XRef Object."

Interface



XRef group

The items here let you change the file path, file name, and object name of the source of the XRef object. From here, you can also assign proxy objects to appear in the viewport or the rendered scene.

Important: The specified file must contain an object of the specified name, or no XRef object will appear in your scene. Instead, a small, yellow 'x' appears as a placeholder.

Highlight Corresponding XRef Record in the XRef Dialog—Click to display the *XRef Objects dialog (page 3–408)*, with the object highlighted in the XRef Objects list.

File Name field—Displays the path and file name of the *.max* file containing the source of the XRef object. You can edit this to point to a different path and file.

File name display—Displays the file name only, without the path.

Path button—Click to display a file dialog from which you can specify a different path and file name for the source file.

Object Name field—Displays the name of the source object pointed to in the source file.

Object Name display—Displays the name of the source object.

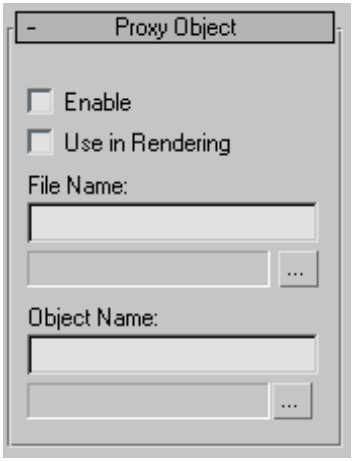
Path button—Displays an *XRef Merge dialog (page 3–416)* pointing to the scene in the XRef File Name field. Here, you can specify a different object to be used as the XRef object.

Proxy Object Rollout

Select an XRef object. > Modify panel > Proxy Object rollout

When you've selected an XRef object in a scene, the Proxy Object rollout appears along with the *XRef Object rollout (page 3–423)* on the Modify panel. The modifier stack for the XRef object simply displays "XRef Object."

Interface



Enable—Turn this on to display the specified proxy object in the viewports. Turn off to display the original XRef object. Note: If you turn this on when no proxy object has been specified, the XRef object appears in the viewports as a small, yellow 'X.'

Use in Rendering—When this is on, the proxy object is also displayed in the rendering. When off, the original XRef object is rendered.

File Name field—Specify the path and file name of the *.max* scene containing the proxy object.

... **Path button**—Click to display a file dialog from which you can specify the .max scene containing the proxy object.

Object Name field—Specifies the name of the proxy object in the specified scene.

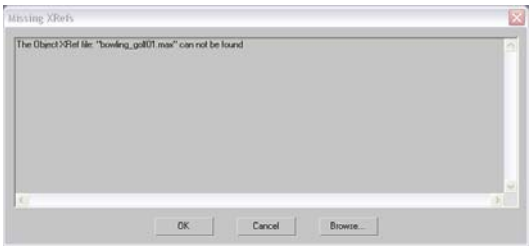
... **Path button**—Click to display a Merge dialog listing the objects in the specified scene file. From here, you can select an object to be used as the proxy.

Missing XRef Paths Dialog

File menu > Open > Open a file that references other missing files.

If you load or render a scene with XRefs, but the originally specified path of the XRef object or scene can't be found, or if the XRef object name doesn't match the object name in the source file, an alert appears telling you this. The alert works in the same way as the missing bitmap dialog, and provides you with three options, described below.

Interface



OK—Lets you open the file. The referenced scene will have placeholders, but will not exist in the scene.

Cancel—Cancels when you are rendering. OK and Cancel behave the same during file opening. Whichever you choose, the file still opens and the missing XRefs appear as red in the XRef Scenes dialog.

Browse—Displays the XRefs panel of the Configure User Paths dialog, which you can use to specify the correct file path. This lets you add, delete, modify, and change the list position of the paths 3ds Max uses to look for missing files.

This panel is identical to the one displayed by choosing Customize > Configure User Paths > *XRefs (page 3–857)*.

If this problem occurs during network rendering, the dialog doesn't appear, but the errors are written to the network log file.

Using File Link with AutoCAD and Architectural Desktop Files

File Link Basics

Working with Drawing Files

You can attach any *DWG file (page 3–1024)* (or *DXF file (page 3–1024)*) with the *File Link Manager (page 3–431)*. This feature allows you to work in another design software's environment, such as AutoCAD®, Autodesk® Architectural Desktop, or Autodesk Revit® while maintaining a single design database.

Note: For this documentation, the term "drawing" is used as reference to either DWG or DXF files created with AutoCAD and Architectural Desktop, or exported from Revit.

Creating Links to Files

You can establish, reload, and detach links to any number of linked files. You can also edit out unnecessary information by using layers and other filters. The File Link Manager defines which geometry is included in the scene from the linked file, how the geometry is organized, and when it's regenerated. You can also create links to files using the drag and drop feature. The objects that you bring in from linked files behave just like any other object created in 3ds Max. You can scale, rotate, and move them as well as attach modifiers and materials.

When 3ds Max stores linked file data, you'll need to decide how the objects from the linked files will be organized in the scene. For example, drawings are commonly organized by layers, blocks, and objects, and 3ds Max scenes are organized by hierarchies of objects. For translating between systems, 3ds Max includes object types called *VIZBlocks (page 3–1125)* and *Block/Style Parents (page 3–1012)*.

Working with VIZBlocks and Block/Style Parents

A VIZBlock and a Block/Style Parent is like a nested block; it has an object/sub-object or parent/child hierarchy structure. In many cases, linked drawing data initially appears as a VIZBlock or Block/Style Parent (depending on the *Derive AutoCAD Primitives By options* you choose). Using VIZBlocks is helpful when you're working with layering and color schemes. You can create multiple links to the same linked file, so you can use the same geometry in different combinations.

Dynamic Blocks in 3ds Max

Dynamic Blocks are new in AutoCAD 2006 and they give blocks flexibility and intelligence. A dynamic block reference can easily be changed in a drawing while you work. You can manipulate the geometry through custom grips or custom properties.

The File Link Manager handles dynamic blocks much the same way as any other block found in a DWG file. Dynamic block instances, even those that have been grip-edited, display certain types of instance behavior such as material propagation. For more detailed information about dynamic block handling in 3ds Max, see *Blocks (page 3–464)*.

Reloading, Binding and Detaching Links to Files

You can also reload or detach linked files. When you reload a linked file, any changes you've made to the linked file are applied to the reloaded

geometry in your scene. Note, however, that 3ds Max won't edit or change your original linked file. The integrity of your other software's design database is never compromised by the File Link Manager. Finally, if you decide to break a link to a linked file, there are two options. You can use Bind to keep the objects from the linked file in your scene, or you can use Detach to have them removed along with the link. For more information, see *File Link Tips (page 3–428)*.

Note: Both Detach and Bind are available from the Files panel of the File Link Manager.

ObjectDBX Objects

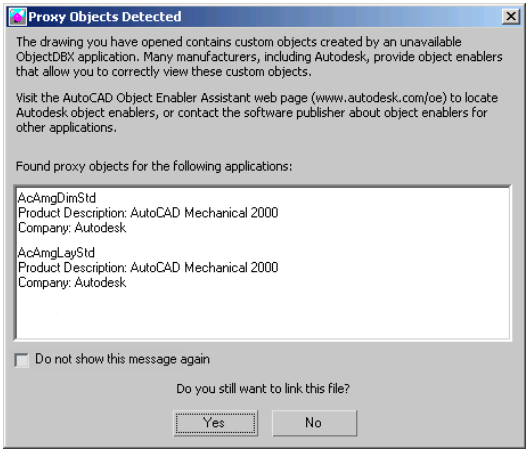
3ds Max supports the display and use of custom AutoCAD objects. These custom objects are created using the ObjectDBX™ or ObjectARX® APIs. Applications and products that work with either of these APIs can read and write to AutoCAD drawings, and ObjectARX products can extend the available feature set of AutoCAD.

Note: To improve file performance, some of the ObjectDBX rules have been updated. This means that some DXF files, ones built by non-Autodesk products or very old DXF files, may no longer import or file link into 3ds Max.

Object Enablers

AutoCAD and AutoCAD vertical applications, such as Architectural Desktop (ADT), have custom objects that are unique to the product. In order to view them in 3ds Max, you need the appropriate Object Enabler (OE). Object Enablers let you access, display, and manipulate these objects in 3ds Max, as well as the other vertical applications, including 3ds Max.

When you use the File Link Manager to Attach a DWG file to your scene, you may encounter a Proxy Objects Detected dialog. This means there are custom objects in the drawing that require special Object Enablers before you can edit the objects in 3ds Max.



Do not show this message again—Check this option to not display this message the next time proxy objects are detected.

For a list of downloadable OEs, see the Autodesk Web site

File Link Basics

Data synchronization between drawing files created with AutoCAD, Architectural Desktop, or Revit and 3ds Max is implemented using the File Link Manager, which keeps drawing data linked to the scenes. It is best understood through a few simple principles:

- **Changes in AutoCAD, Architectural Desktop, or Revit *can* change the data viewed in 3ds Max, but changes in 3ds Max *never* change the data in AutoCAD, Architectural Desktop or Revit.**

  Creating a file link is a one-way process that supports the central role of AutoCAD, Architectural Desktop or Revit in developing and keeping a record of your core design database. Many changes made in AutoCAD, Architectural Desktop or Revit will appear in

3ds Max after a file link reload. These include adding or removing objects, moving objects, changing material assignments (specific to ADT and Revit drawings), and enabling Live Section objects (specific to ADT drawings). Changes made in 3ds Max, such as moving objects, changing material assignments, and adding lights, will never appear in your AutoCAD, Architectural Desktop or Revit drawing.

- **Changes you *can* make in AutoCAD, Architectural Desktop or Revit *should* be made in AutoCAD, Architectural Desktop or Revit.**

  Changes that you make in AutoCAD, Architectural Desktop, or Revit become part of that database, whereas changes you make in 3ds Max will appear only in the renderings you produce.

- **Changes in AutoCAD, Architectural Desktop, or Revit aren't reflected in 3ds Max unless you choose them to be.**

  When you make changes to drawing files, those changes will not appear in 3ds Max unless you use the *Reload command (page 3–431)* on the File Link Manager. When you reload a link in 3ds Max, you can choose to update just the geometry from AutoCAD, Architectural Desktop, or Revit, you can reload only specific objects, or (with Architectural Desktop and Revit drawings) you can choose to update both the geometry and the material assignments.

  Note: After changing your Revit project, you must export a new DWG file and then reload that file into 3ds Max. 3ds Max *cannot* link a native Revit project, RVT file, directly.

  You can transform (move, rotate, or scale) AutoCAD, Architectural Desktop or Revit objects and blocks that appear in 3ds Max, and these types of changes are not lost upon reload. If you have moved, rotated, or scaled linked objects and want the objects to resume the position and scale they have in the original drawing file, use the *Reset Position function (page 3–448)*.

- **3ds Max integrates linked AutoCAD, Architectural Desktop, or Revit data with non-AutoCAD, Architectural Desktop, or Revit data.**

  In addition to the linked AutoCAD, Architectural Desktop, or Revit geometry and material assignments, 3ds Max allows you to create or merge into your scene many types of data from other sources, including:

  - *Lighting objects* for simulating light fixtures and daylight conditions.
  - *Entourage objects* such as surrounding buildings, terrain, trees, cars, and people.
  - *Advanced rendering material effects* that simulate the rich visual variety of any imaginable material. You can take advantage of materials that appear on objects created in 3ds Max, and you can create your own material effects using the Material Editor. Materials created with the Material Editor can be assigned to any component in your scene.
  - *Bitmaps* for use as environment backgrounds. You can use still images in a variety of formats, or even animated movies, as a rendering background to create stunning photomontages that appear to place your proposed design right into the actual location.

See also

File Link Manager Utility (page 3–431)

Resetting Transforms on Linked AutoCAD Objects (page 3–448)

File Link Tips

Here are some tips for choosing File Linking options and avoiding common pitfalls.

Linked Data and Face-Normal Conventions

Face normals (page 3–1074) can be a source of confusion when linking to AutoCAD, Architectural Desktop, or Revit drawing files. In 3ds Max, every face has a front and a back, corresponding to the inside or outside surface of a solid object. In a cube, for example, there is seldom the need to view the inside surface of any of the six squares that make up the cube. So for many viewing and rendering operations, 3ds Max ignores a face if it's facing away (that is, if its face normal is directed away) from a point of view.

When you create objects in AutoCAD, Architectural Desktop or Revit, 3ds Max generally understands which way faces should be oriented and manages face normals accordingly. However, occasionally you may encounter linked drawing geometry that displays correctly in AutoCAD, Architectural Desktop or Revit, but doesn't strictly respect face-normal conventions. This can make it appear as though elements visible in the drawing file are missing or appear "inside-out" in 3ds Max.

If this happens, try one of these four options:

- During file link or import of the DWG file, turn on the Unify Normals switch in either the Basic panel of the File Link Settings dialog or the Geometry Options group of the AutoCAD DWG/DXF Import Options dialog.
- If the drawing is already linked or imported, assign a *Normal modifier (page 1–738)* to the object that is not displaying properly. Turn on the Unify Normals switch to force all the normals to face the same direction. If the object then appears to be "inside-out", also turn on the Flip Normals switch.
- Turn on the Force 2-Sided switch in the *Render Scene dialog* (to render the faces correctly), and turn on Force 2-Sided in the *Viewport Configuration dialog* (to display the faces correctly in the viewports.)
- Apply a material with the 2–Sided switch turned on.

Note: Using the Force 2–Sided options can result in slower performance, particularly when rendering. Using either of the Unify Normals options is the preferred method of handling face normals.

If you are experiencing a high volume of face normal problems in a particular file, you should verify that the Weld switch is turned on in the *File Link Settings dialog (page 3–435)*, and then reload the drawing. Weld forces nearby faces to share edges and vertices. This can still result in groups of face normals that are flipped in 3ds Max so the Unify Normals switch should also be used.

Note: The disadvantage of welding is that it can be time-consuming when you attach and reload the linked file. The time penalty is much greater when 3ds Max is creating objects that have very large numbers of individual faces.

Linking Files with High Numbers of Linear Line Segments

Two-dimensional elements in drawing files, such as lines, polylines, circles, and arcs, are represented as splines in 3ds Max. These splines carry much more information at each vertex than typical AutoCAD 2D structures. Since some drawing files contain large quantities of 2D data, exercise caution when linking files containing a high number of discrete line segments. There are two ways these elements can be left out of your 3ds Max scene;

- by freezing their layers in AutoCAD, Architectural Desktop, or Revit before you start 3ds Max and before each subsequent reloading process.

- by excluding specific layers during the File Link Attach/Reload process or Import process so you do not have to freeze layers in the drawing. This is the preferred workflow.

If you need this type of 2D geometry in your visualization, try to use polylines instead of connected lines to get cleaner geometry in 3ds Max and to reduce the final size of your scene.

3D Solids Objects Linked into a 3ds Max Scene

3D Solids objects in a drawing file will be tessellated (that is, turned into mesh objects with faces), when you link them into a 3ds Max scene. The fineness of the tessellation is controlled by the *Surface Deviation For 3D Solids setting* in the File Link Settings dialog. A high value results in coarser tessellation. 3ds Max uses less memory in the scene, but poor approximations of curved surfaces could result. For acceptable performance, keep this value as high as you can.

Tip: You can change the value of the Surface Deviation For 3D Solids control at any time by turning on *Show Reload Options* on the Files panel of the File Link Manager dialog, and then adjusting when you reload the file.

Spline Objects Linked into a 3ds Max Scene

Splines are not rendered in 3ds Max unless they have rendering parameters applied to them. Normally, you have to collapse a shape to an editable spline object in order to apply rendering parameters; however, this is not possible with spline objects from AutoCAD.

Instead, you can apply a *Renderable Spline modifier (page 1–771)* to the spline. This lets you set rendering properties without having to collapse to an editable spline.

External References and Block Names

A linked AutoCAD or Architectural Desktop drawing can include xrefs that themselves reference different files but use the same block names. 3ds Max keeps the blocks distinct by prepending xref names to block names.

In Revit, a DWG, DXF or RVT file can be linked to the project. This kind of link is called a *RVT Link (page 3–1098)*. When the project is exported to a DWG file, this type of link is represented in the exported drawing as an xreferenced drawing. In this case, more than one drawing file may be created, with one referencing the other(s).

Circular References

An xref file that contains a sequence of nested references that refers back to the xref file itself is considered a circular reference. 3ds Max resolves xrefs until it detects a circular reference. For example, if you have the circular reference A|B|C|A, 3ds Max detects and breaks the circularity between C and A. This is consistent with the way AutoCAD or Architectural Desktop handles circular xref dependencies.

Overlay External References

3ds Max treats overlay xrefs in the same way as AutoCAD when resolving xrefs.

For more information regarding overlay xrefs, refer to your AutoCAD User Reference.

Cloning Actively Linked Objects

If you want to clone actively linked objects, you should only use the Copy option. Creating references or instances of actively linked objects is not recommended, as reliability issues can arise when the instanced or referenced object is deleted in the linked file.

When you copy actively linked objects, linked through the *File Link Manager (page 3–431)*, the

copies are automatically converted to editable mesh or editable spline objects. If your selection contains several objects which instance another object, the resulting copies also instance the same object.

Compound Objects Containing Actively Linked Objects

If you use an actively linked object as part of a compound object, you should always choose Copy when you specify how the linked object is transferred to the compound object. Choosing Reference or Instance can cause instability in the software.

Attaching Actively Linked Objects to an Editable Mesh, Poly, Patch, or Spline Object

Actively linked objects should *not* be attached to editable objects, as this introduces instability to the software. Instead, make a copy of the actively linked object, and attach the clone to the editable object.

Creating Hierarchies with Actively Linked Objects

Creating parent-child links between actively linked objects AND 3ds Max objects can cause unpredictable results. For this reason, 3ds Max does not allow you to link an actively linked object to a 3ds Max object. However, you *can* link a 3ds Max object to an actively linked object.

The existing hierarchies of linked objects cannot be broken in 3ds Max. This would compromise the structure of Blocks and Styles. Any changes must be made in the original DWG file.

Similarly, actively linked objects cannot be included in the creation of *Group (page 1–102)* or *Assembly (page 1–104)* objects in 3ds Max.

Controller Assignments

Actively linked objects should not be included in any IK animation chains, as they will cause unpredictable results. Likewise, animation controllers should not be applied to actively linked objects.

Assignments to avoid include:

- *HI IK Solver (page 2–427)*
- *IK Limb Solver (page 2–454)*
- *Spline IK Solver (page 2–455)*
- *HD IK Solver (page 2–442)*
- *Inherit Link Info (page 2–482)*
- *Link Inheritance Utility (page 2–416)*
- *Assign Controller (page 2–523)*

Interpreting Layer Data from AutoCAD, Architectural Desktop, or Revit

3ds Max has its own Layer system that looks and operates like a simplified version of the system you are familiar with from AutoCAD or Architectural Desktop. As in AutoCAD or Architectural Desktop, you can hide and unhide layers, freeze and unfreeze them, and change the display color for all objects on the layer.

Note: Categories in your Revit project are similar to Layers in AutoCAD. When you export your project to a DWG, categories are mapped to AutoCAD Layers via the *Export Layers* table. For more information regarding Export Layers, refer to your *Autodesk Revit Help* file.

Layer operations are accessed through the tools on the Layers toolbar, and also on an object-by-object basis using the *quad menu (page 3–741)*.

Unlinked objects, such as 3ds Max objects or drawing geometry that has been bound into the scene using the Bind command, may be assigned

to any layer you choose, including layers created by the File Link Manager.

Linked objects from AutoCAD, Architectural Desktop or Revit, with some minor exceptions, will be assigned to the same layers they occupy in program where the drawing was created.

Any changes made to the layer settings in 3ds Max (hidden/unhidden, frozen/unfrozen, display color) affect linked objects just as they do unlinked objects. Also, any changes you make to the layers are ***not*** reset when you reload the drawing.

You can rename layers created by the File Link Manager. When the next reload occurs, the renamed layer is not affected by the File Link Manager. Objects on the renamed layer are updated; however, they remain on the same layer. The original layer is only recreated when a new object has been created in the DWG file. New objects are never placed on the renamed layer. You can also delete layers imported by the *File Link Manager (page 3–431)*; but only if they don't contain any objects.

You can move actively linked objects between layers in 3ds Max. When the next reload occurs, the objects are updated; however, they are not moved back to their original layers. You can also place non-linked objects, such as 3ds Max objects or drawing geometry that has been bound into the scene, on any of the imported layers.

Objects contained in layers that are frozen in AutoCAD or Architectural Desktop are not linked to 3ds Max. Objects that were originally linked to 3ds Max are removed if their layer is frozen in AutoCAD or Architectural Desktop and the link is reloaded, but they are added again, upon reload, after their layer is unfrozen in the program where the drawing is created.

Note: This is only the case if Skip all Frozen Layers is active on the *Select Layers dialog (page 3–444)*.

If you select the layers individually from a list, you can bring in data on frozen layers.

See also

Using Layers to Organize a Scene (page 3–704)

Scale Synchronization

3ds Max automatically manages the scale conversion on linked geometry and materials. 3ds Max has its own *system unit* for internal representation of geometrical scale.

If you find that any geometry is not shown at the size you intended it to be, it is because it was created at the improper scale in the originating program.

See also

Using Units (page 2–3)

File Link Manager

File Link Manager Utility

Utilities panel > Utilities rollout > Click More. > Utilities dialog > File Link Manager

File menu > File Link Manager

The File Link Manager utility allows you to work in either another design software's environment (such as AutoCAD) or in 3ds Max while maintaining a single design database. If you use AutoCAD drawings, this feature works with drawings from AutoCAD Release 12 through AutoCAD 2005, including the Mechanical/Architectural Desktop and Revit applications.

You can establish, refresh, and break links to any number of linked files. You can also edit out unnecessary information by using layers and other filters. The File Link Manager defines which geometry is included in the 3ds Max scene from the linked file, how the geometry is organized, and when it's regenerated.

The objects that you bring in from linked files behave just like any other object created in 3ds Max. You can scale, rotate, and move them, as well as attach modifiers and materials.

You can also refresh or break links to linked files. When you refresh a linked file, any changes you've made to the linked file are applied to geometry in your scene. Note, however, that 3ds Max won't edit or change your original linked file. The integrity of your other software's design database is never compromised with the File Link Manager.

Finally, if you decide to break a link to a linked file, you can either keep the objects from the linked file in your scene or have them removed along with the link.

See also

File Link Basics (page 3–426)

File Link Tips (page 3–428)

Working with AutoCAD, Architectural Desktop, and Revit Files (page 3–446)

Procedures

To link a drawing file:

You can link drawings in the form of DWG or DXF files. A DWG is the native file format for AutoCAD and Architectural Desktop, but you must first export a DWG when working from a Revit project. The File Link Manager does not recognize RVT files.

1. Choose File menu > File Link Manager.
2. On the Attach panel, click Files to select a file from the appropriate directory on either your local or network system, and click Open.
3. Choose a Preset from the pull-down list, if you have one defined.

   Tip: If this is your first File Linking, and you have not defined any presets, you may want to create one on the *Presets panel (page 3–443)* of the dialog.
4. Turn on the Rescale switch and adjust the Incoming File Units, if necessary.
5. Click Attach This File.

To reload a drawing:

Reload is most often used when your drawing or project has been changed in AutoCAD, Architectural Desktop, or Revit, or if the linked drawing file has been moved and you have to tell the File Link Manager where to find the drawing.

Note: If your Revit project has been updated, remember to export a new DWG file that can be reloaded.

1. On the Files panel of the File link Manager, click the file name in the Linked Files list and click Reload.

   Linked files that have been changed are prefaced with the symbol.

   Tip: Turn on the Show Reload Options switch if you want to make changes to the settings used to link the drawing. Otherwise, the reload process will use the same settings you originally used when creating the link.
2. If Show Reload Options is turned on, the *File Link Settings dialog (page 3–435)* is displayed where you can change your settings in the Basic and Advanced panels.

   Note: You cannot change the sorting or layer options when reloading a drawing.

3. Click OK to reload the file.

Interface

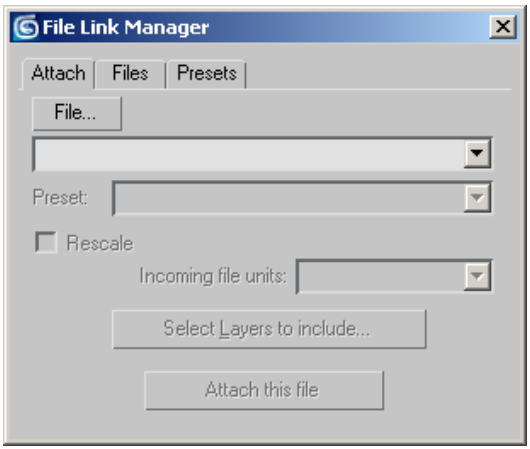
The File Link Manager dialog contains three panels for listing linked files:

- *Attach (page 3–433)*
- *Files (page 3–434)*
- *Presets (page 3–435)*

These panels let you attach files, update attachments and settings, and change presets used by File Link. The terminology is similar to the terminology for managing AutoCAD external references, or *xrefs (page 3–1130)*.

Note: An xref is an AutoCAD external reference. This is different from a 3ds Max *Xref (page 3–1131)*, which is an externally referenced file that can be a 3ds Max object or scene.

Attach panel



File—Displays an Open dialog that you can use the browse for DWG and DXF files that you want to link. When a file is selected, its path and name appears in the File list.

File list—The file to be attached to your scene. You can enter the file location, or you can expand the list to display a history of the last ten attached files.

Note: You can resize the File Link Manager dialog by dragging any corner or edge. This is useful for viewing a file path if it's too long to fit in the file list field.

Preset—Displays a list of preset settings you can choose to use when attaching the file. Each list entry in this list represents a unique collection of attach and reload settings. You can create additional presets in the Presets panel of the File Link Manager dialog.

Rescale—Alters the scale of the geometry from a linked file to match the *system unit scale (page 3–893)* in 3ds Max. When Rescale is on, you can specify what the base units should be for the geometry in the linked file. For example, if the length of a line in the linked file is 2 units, you can specify that these units be considered as any of the units listed under File Units (below), such as inches, millimeters, or parsecs.

When Rescale is on, and the units you specify are different from the system units currently set in the 3ds Max scene, the incoming objects are scaled appropriately. For example, if a door measures 914 units in the linked file, and you specify millimeters to convert from, the door will measure 36 inches in the 3ds Max scene.

Note: You can't change units when you reload a linked file.

Note: By default, system units are inches in 3ds Max. Consider carefully before changing the default system units. For more information, see *Using Units (page 2–3)*.

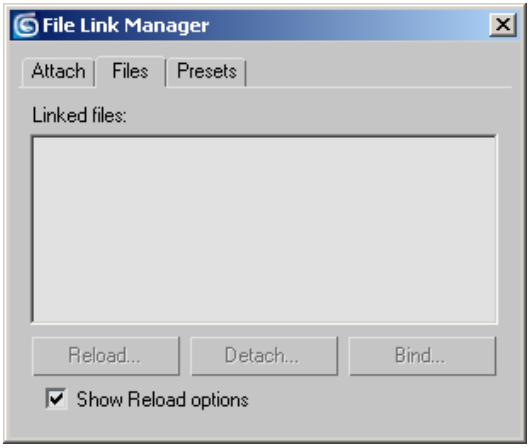
Incoming File Units—Displays the unit of measure found in the original drawing file and lists the units to which you can choose to rescale the attached file. This is only active when Rescale is on.

Select Layers to Include—Displays the *Select Layers dialog (page 3–444)*, which you use to select the layers to import from the linked file.

Attach This File—Attaches the selected file to your scene, using the settings selected in the Preset list, if one was selected.

Close—Cancels all changes to settings and closes the dialog.

Files panel



Linked Files—Lists linked files. The File Link Manager displays an icon next to the path name of each linked file. The icon reflects the status of the linked file, as described below:

The linked file hasn't changed and there are no errors.

The linked file can't be found at the specified location.

The linked file has changed or another file has been selected by changing the path or using the browser from this list. If you want to update your scene with the changes in this file, you must *reload* your link.

You can change the path name by highlighting it and clicking again to enter its location. This also displays a file browser button to the right of the file name that you can use to locate a file. If the directory of a linked file is no longer valid, then you must enter a new, valid path name.

Reload—Refreshes the link between the file and the 3ds Max session. This feature is useful when the file has been modified and you want to see the changes reflected in your 3ds Max scene. If you turn on Show Reload Options, the *File Link Settings dialog (page 3–435)* displays when you click this button.

Changes that have been made to the base file will be applied to the objects at the bottom of the 3ds Max modifier stack. If you have 3ds Max materials applied to walls in a floor plan in your scene, the same materials are applied to the walls when you reload an updated version of the linked file.

Note: This option is available only when the file is highlighted in the Linked Files list.

Detach—Removes an existing link to a file. Detach also removes all geometry associated with or dependent on the link.

When you click this button, you receive a warning that you're about to remove all objects associated with the linked file. You can either proceed or cancel the operation.

Note: This option is available only when the file is highlighted in the Linked Files list.

Bind—Removes the link to the file. The geometry in the scene remains unchanged, but it's no longer linked back to the original file and, if the original file changes, it can't be updated using Reload.

When you click this button, you receive a warning that you're about to break the link between the objects in the current 3ds Max scene and the file.

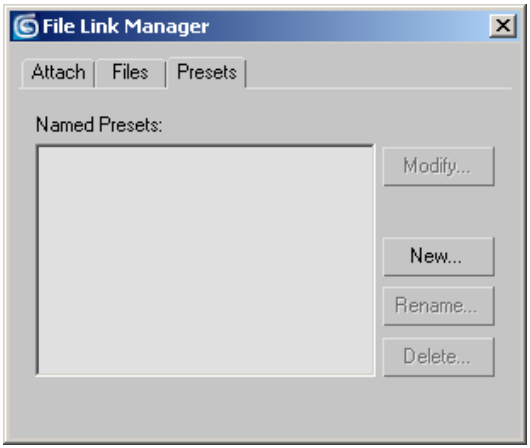
Note: This option is available only when the file is highlighted in the Linked Files list.

Show Reload Options—Displays the *File Link Settings dialog (page 3–435)* when you click Reload, and uses these settings for reloading. When you turn off this option, the File Link

Manager uses the reload settings stored in the current scene.

Close—Cancels all changes to settings and closes the dialog.

Presets panel



Named Presets—Lists all existing presets.

Modify—Opens the *File Link Settings dialog (page 3–435)*, letting you change the settings of the selected preset.

New—Opens the *New Settings Preset dialog (page 3–443)*, creating a new preset with default settings.

Note: New is only available when no preset is selected in the list. If a preset is selected, this button changes to Copy.

Copy—Opens the *New Settings Preset dialog (page 3–443)*, creating a new preset with the same settings as the currently selected preset.

Note: Copy is only available when a preset is selected in the list. If no preset is selected, this button changes to New.

Rename—Opens the *Rename Settings Preset dialog (page 3–443)*, letting you change the name of the selected preset.

Delete—Deletes the selected preset.

Close—Cancels all changes to settings and closes the dialog.

File Link Settings Dialog

File menu > File Link Manager > Files tab > Turn on Show Reload Options. > Click Reload.

Utilities panel > Utilities rollout > More button > File Link Manager > Files tab > Turn on Show Reload Options. > Click Reload.

The File Link Settings dialog gives you control over the detailed aspects of how geometry is translated from DWG or DXF files and interpreted in 3ds Max. It also allows you to control whether only a portion of the 3ds Max objects will be affected by subsequent reloading. The File Link Settings dialog is displayed when Show Reload Options is turned on in the File Link Manager dialog, or when editing a file link Preset.

The File Link Settings dialog lets you:

- View and exclude layers in a linked file.
- Control how geometry is converted.
- Define how linked objects are converted to 3ds Max objects, referred to as *VIZBlocks*.

The selections you make in the File Link Settings dialog can affect the amount of memory used by 3ds Max to hold the linked data. Use the *Select Layers To Include option* to reduce the amount of information added to your scene.

In some cases, it might be more efficient to create multiple links to the same file, making different file link settings for each file.

See also

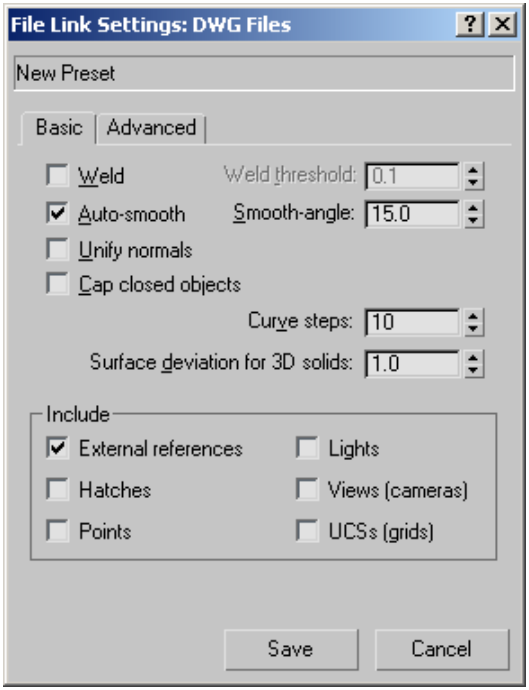
File Link Tips (page 3–428)

Basic File Link Settings

File menu > File Link Manager > Reload a linked file with Show Reload turned on. > File Link Settings dialog > Basic panel
File menu > File Link Manager > Presets panel > Select an existing preset and click Modify. > File Link Settings dialog > Basic panel
File menu > File Link Manager > Presets panel > Create a new preset. > Select the newly created preset and click Modify > File Link Settings dialog > Basic panel
Utilities panel > Utilities rollout > More button > File Link Manager > Reload a linked file with Show Reload turned on. > File Link Settings dialog > Basic panel
Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Highlight an existing preset and click Modify. > File Link Settings dialog > Basic panel
Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Create a new preset. > Highlight the newly created preset and click Modify > File Link Settings dialog > Basic panel

The Basic panel of the *File Link Settings dialog (page 3–435)* defines how 3ds Max converts the linked file's objects into corresponding 3ds Max objects.

Interface



Weld—Sets whether to weld nearby vertices of converted objects according to the Weld Threshold setting. Welding smooths across seams and unifies normals of objects with coincident vertices. Welding occurs only on vertices that are part of the same object.

Weld Threshold—Sets the distance that determines whether vertices are coincident. If the distance between two vertices is less than or equal to the weld threshold, the vertices are welded together. To use the Weld Threshold, turn on Weld.

Auto-Smooth—Assigns smoothing groups according to the Smooth Angle value. Smoothing groups determine whether faces on an object render as a smooth surface or display a seam at their edges, creating a faceted appearance.

Smooth Angle—Controls whether smoothing occurs between two adjacent faces. If the angle between the two face normals is less than or equal

to the smooth angle, the faces are smoothed (that is, put in the same smoothing group).

Unify Normals—Analyzes the face normals of each object and flips normals where necessary, so they all point in a direction that is consistent with adjoining faces. If the imported geometry isn't properly welded, or if the AutoCAD geometry did not contain or specify normal information, normals might be oriented in the wrong direction. Use the *Edit Mesh (page 1–613)* or *Normal (page 1–738)* modifiers to flip normals.

When Unify Normals is off, normals are calculated according to the face vertex order in the linked file. Face normals for AutoCAD solids are already unified. Turn off Unify Normals when importing only AutoCAD solid models from Architectural Desktop.

Cap Closed Objects—Applies an *Extrude modifier (page 1–671)* to all closed objects, and selects the Cap Start and Cap End options of the modifier. The Extrude modifier Amount value for a closed object with no thickness is set to 0. Capping makes closed objects with thickness appear solid and closed objects without thickness appear flat. When Cap Closed Objects is off, the Extrude modifier Cap Start and Cap End options for closed objects with thickness are clear. No modifiers are applied to closed objects without thickness.

Tip: Unless you chose the One-to-One sorting option, you won't immediately see the Extrude modifier when selecting an object. To see it, look through the modifier stack for the *VIZBlock (page 3–1125)* sub-objects. In a nested VIZBlock, the Extrude modifiers appear at the bottom of the stack. You can then edit the Extrude modifier parameters.

Texture Mapping—The texture mapping settings reduce the loading time of models that have many objects with stored UVW Coordinates for texture mapped materials.

Note: This setting only applies to geometry that is stored as a mesh in the scene. Spline shapes marked as renderable have separate controls for UVW coordinate generation on the *Spline Rendering panel (page 3–441)*.

- **Generate Coordinates On Demand**—When Generate Coordinates On Demand is used, the File Link Manager will not generate texture coordinates that get stored in the mesh objects that are linked.

  Actively linked objects generate UVW coordinates on demand, so if you assign a material to an object and the material requires texture coordinates, the UV coordinates are silently assign to that object. If the material or texture map is set to display in viewport, the coordinates are assigned as soon as the material is applied; if not, the coordinates are assigned when the scene is rendered.

  This option gives you faster loading speed, but no UVW coordinate generation.

  Note: Objects in drawings created in Architectural Desktop explicitly pass texture coordinates to 3ds Max when you attach the drawing. If you rely on 'on-demand' coordinate generation, they may not match the coordinates that were specified in the original drawing. The map scaling is the same, but the texture offsets may be altered.

- **Generate Coordinates For All Objects**—This option forces all objects to have UVW coordinates generated when the drawing is linked.

  This option tells the File Link Manager to create UVW coordinates, but loading time is increased while the coordinate generation occurs.

Curve Steps—For objects such as splines, the number of knot points determines the spline's shape and curvature. The Curve steps value

defines the number of segments between knot points. A low value gives you a more linear interpolation between the knot points; a higher number gives you a more accurate curve.

Surface Deviation for 3D Solids—Specifies the maximum allowable distance from the 3ds Max surface mesh to the parametric AutoCAD solid surface. Small numbers produce more accurate surfaces with a greater number of faces. Large numbers produce less accurate surfaces with fewer faces.

Include group

This group allows you to toggle the inclusion of specific parts of a DWG file during the file link process.

External references—Imports xrefs attached to the DWG file.

Hatches—Imports hatches from the DWG file.

Warning: This stores each line or dot in the hatch pattern as a separate spline that defines the hatch; this can create a very large number of objects in your scene.

Points—Imports points from the DWG file.

Note: The imported point objects are represented in 3ds Max as Point Helper objects.

Lights—Imports lights from the DWG file.

Views (cameras)—Imports named views from the DWG file, and converts them to 3ds Max cameras.

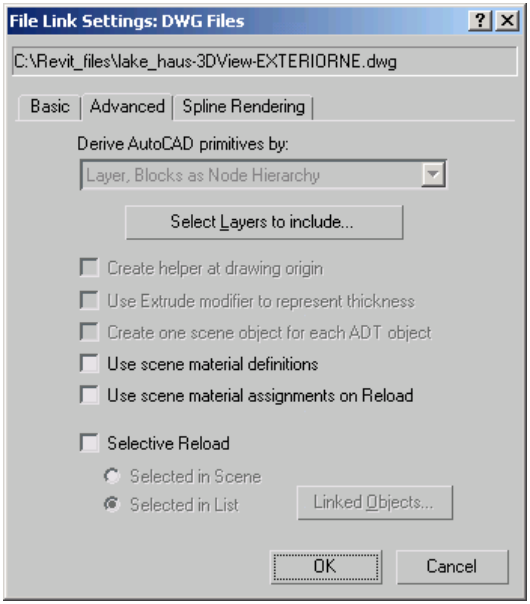
UCSs (grids)—Imports user coordinate systems (UCS) from the DWG file and converts them to 3ds Max grid objects.

Advanced File Link Settings

File menu > File Link Manager > Reload a linked file with Show Reload turned on. > File Link Settings dialog > Advanced panel
File menu > File Link Manager > Presets panel > Select an existing preset and click Modify. > File Link Settings dialog > Advanced panel
File menu > File Link Manager > Presets panel > Create a new preset. > Select the newly created preset and click Modify > File Link Settings dialog > Advanced panel
Utilities panel > Utilities rollout > More button > File Link Manager > Reload a linked file with Show Reload turned on. > File Link Settings dialog > Advanced panel
Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Highlight an existing preset and click Modify. > File Link Settings dialog > Advanced panel
Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Create a new preset. > Highlight the newly created preset and click Modify > File Link Settings dialog > Advanced panel

The Advanced panel of the *File Link Settings dialog (page 3–435)* controls how the software derives AutoCAD primitives and whether 3ds Max uses the scene material definitions when linking to or reloading the AutoCAD drawing. It also lets you selectively reload your scene, so that you only reload specific objects and not the entire file.

Interface



Derive AutoCAD primitives by:—Lists the sorting options for the imported DWG file.

Note: This sorting only applies to standard AutoCAD primitives. Specialized objects, such as those from Autodesk Architectural Desktop are sorted differently.

Tip: Except in special circumstances, you should always use the *Layer, Blocks as Node Hierarchy* or *Entity, Blocks as Node Hierarchy* options.

There are six options to choose from:

- **Layer, Blocks as Node Hierarchy**—Linked objects are combined in 3ds Max, according to their assigned layer or block.

  Tip: This is usually the best option for file linking. It preserves all ADT information, and generally maintains the same granularity as you would expect in AutoCAD.

- **Entity, Blocks as Node Hierarchy**—Every linked object is represented as a separate object in the 3ds Max scene, including objects within xrefs or blocks.

  Note: This Derive By setting may cause unreliable material propagation when linking drawings containing dynamic blocks. Materials may propagate to some block instances and not to others.

  Warning: This option has the potential to create an enormous number of objects in your scene.

- **Layer**—Linked objects are combined in 3ds Max, according to their layer. Objects on each of the associated application's layers are put into one VIZBlock, with the exception of block inserts, which are represented as individual 3ds Max objects. Multiple inserts of the same block are represented using instances in the scene.

- **Color**—Linked AutoCAD objects are combined in 3ds Max, according to their color. All objects from the associated application which are of the same color are put into one VIZBlock, with the exception of block inserts which are represented as individual 3ds Max objects. Multiple inserts of the same block are represented using instances in the scene.

  Note: Blocks can contain objects with different colors. However, when sorting, 3ds Max considers only the color of the block itself. Also, 3ds Max objects can only display one color, unless a material is applied.

- **Entity**—Provides one-to-one linking between linked objects and VIZBlocks. For each linked object or block in the file, the File Link Manager creates an independent object in the scene.

  Note: When working with drawings exported from Revit, it is recommended that you do *not* use this setting.

- **One Object**—All linked objects are rolled into a single VIZBlock.

Select Layers to Include—Displays the *Select Layers dialog (page 3–444)*, which you use to select layers to import from the linked file.

Note: Excluding unnecessary objects from linking can improve the performance of the reload operation.

Create helper at drawing origin—When this is on, 3ds Max inserts the user coordinate system icon as an origin point helper. 3ds Max places this helper at the world origin of the linked file. It's a reference point for all the geometry of the linked file. After attaching, the helper is selected, allowing you to easily move, rotate, or scale all the geometry that was just added to the scene. Each linked file gets a unique helper object.

Use Extrude modifier to represent thickness—When on, linked objects with thickness receive an Extrude modifier to represent the thickness value. You can then access the parameters of this modifier and change the height segments, capping options, and height value.

When off, objects with thickness (and closed capped objects) are converted directly to a mesh.

Create One Scene Object For Each ADT Object—Architectural Desktop (ADT) objects are linked as a single object instead of being separated into their constituent components. This means that if you link an ADT door object, the door is represented as one object instead of three. Turning on this switch make linking faster and the scene size is smaller.

Note: This switch presents several modeling concerns that you need to be aware of.

- Material assignments from ADT are not translated during the file link process.
- If you want to assign materials to these objects, you'll have to use Multi/Sub-Object materials.
- Depending on the Texture Mapping option you choose, UVW coordinates are translated correctly.

Use scene material definitions—When on, 3ds Max checks the 3ds Max scene for any currently used materials matching the exact same name as a material name in the linked DWG file. If a match is found, File Link does not translate the drawing's material, and instead uses the material defined in the scene.

When off, the File Link Manager *always* uses the material definitions contained in the DWG file, and will overwrite scene materials with the same name, regardless of which objects the material is applied to. All material definitions stored in the DWG file are reloaded (even when using a selective reload). If you make changes to a linked material, in 3ds Max, then reload, those changes will be lost (if the switch is off).

Tip: When reloading a file, most of the materials from the DWG file will have already been created in the scene by 3ds Max; they may not need to be re-translated. If you want to update a scene material with the definition contained in the drawing, turn this switch off.

Note: Material assignments can only be transferred from Autodesk Architectural Desktop files and drawings exported from Revit.

Note: Material name comparison is case-sensitive.

Use scene material assignments on Reload—When on, linked objects with a material already assigned to them in the 3ds Max scene will not have that material assignment changed. This is the case regardless of whether the material was assigned automatically by the File Link Manager or manually by the user.

When off, linked objects have their material assignment "coordinated" with the drawing, so that the two are in sync.

Note: Material assignments can only be transferred from Autodesk Architectural Desktop files.

Selective Reload—Lets you perform a partial reload of your linked file. Use a partial reload when you know what has changed in the linked file, and

want to speed up the time it takes to reload the geometry.

The following options are available:

- **Selected in Scene**—Reloads only the objects currently selected in your scene.
- **Selected in List**—Reloads only the objects that you choose from a named list. This list is defined by clicking Linked Objects.

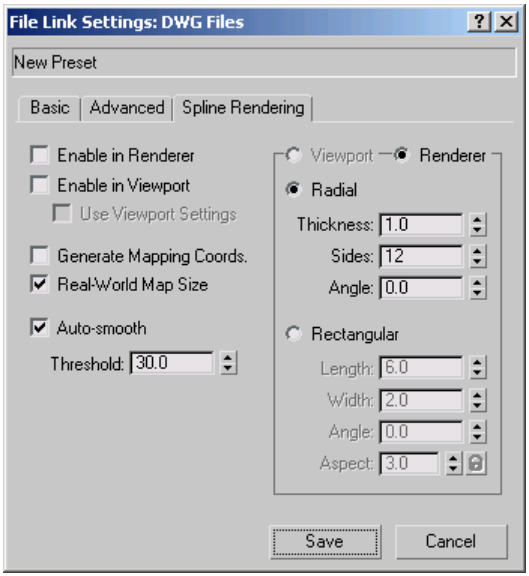
Linked Objects—Allows you to reload only objects that you choose from a named list. The list is created from the objects linked in the file. When you click Linked Objects, the *Select Linked Object dialog (page 3–446)* is displayed.

Spline Rendering File Link Settings

File menu > File Link Manager > Reload a linked file with Show Reload turned on. > File Link Settings dialog > Spline Rendering panel
File menu > File Link Manager > Presets panel > Select an existing preset and click Modify. > File Link Settings dialog > Spline Rendering panel
File menu > File Link Manager > Presets panel > Create a new preset. > Select the newly created preset and click Modify > File Link Settings dialog > Spline Rendering panel
Utilities panel > Utilities rollout > More button > File Link Manager > Reload a linked file with Show Reload turned on. > File Link Settings dialog > Spline Rendering panel
Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Highlight an existing preset and click Modify. > File Link Settings dialog > Spline Rendering panel
Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Create a new preset. > Highlight the newly created preset and click Modify > File Link Settings dialog > Spline Rendering panel

The Spline Rendering panel of the *File Link Settings dialog (page 3–435)* controls how shapes will appear in the scene once the DWG or DXF file is linked. You can control the appearance of the shape, its smoothing, mapping coordinates and if they can be rendered.

Interface



The controls on this panel are identical in name and operation to those found on the *Rendering rollout (page 1–262)* for splines. The values of these settings are set for all imported shapes. Once the import is complete, you can change the settings as necessary for each object.

Enable in Renderer—When on, the shape is rendered as a 3D mesh using the Radial or Rectangular parameters set for Renderer. In previous versions of the program, the Renderable switch performed the same operation.

Enable in Viewport—When on, the shape is displayed in the viewport as a 3D mesh using the Radial or Rectangular parameters set for Renderer. In previous versions of the program, the Display Render Mesh performed the same operation.

Use Viewport settings—Lets you set different rendering parameters, and displays the mesh

generated by the Viewport settings. Available only when Enable In Viewport is on.

Generate Mapping Coords—Turn this on to apply mapping coordinates. Default=off.

3ds Max generates the mapping coordinates in the U and V dimensions. The U coordinate wraps once around the spline; the V coordinate is mapped once along its length. Tiling is achieved using the Tiling parameters in the applied material. For more information, see *Mapping Coordinates (page 2–1249)*.

Real-World Map Size—Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's *Coordinates rollout (page 2–1434)*. Default=on.

Auto Smooth—If Auto Smooth is turned on, the spline is auto-smoothed using the threshold specified by the Threshold setting below it. Auto Smooth sets the smoothing based on the angle between spline segments. Any two adjacent segments are put in the same smoothing group if the angle between them is less than the threshold angle.

Threshold—Specifies the threshold angle in degrees. Any two adjacent spline segments are put in the same smoothing group if the angle between them is less than the threshold angle.

Viewport—Turn this on to specify Radial or Rectangular parameters for the shape as it will display in the viewport when Enable in Viewport is turned on.

Renderer—Turn this on to specify Radial or Rectangular parameters for the shape as it will display when rendered or viewed in the viewport when Enable in Viewport is turned on.

Radial—Displays the 3D mesh as a cylindrical object.

Thickness—Specifies the diameter of the viewport or rendered spline mesh. Default=1.0. Range=0.0 to 100,000,000.0.

Splines rendered at thickness of 1.0 and 5.0, respectively

Sides—Sets the number of sides (or facets) for the spline mesh n the viewport or renderer. For example, a value of 4 results in a square cross-section.

Angle—Adjusts the rotational position of the cross-section in the viewport or renderer. For example, if the spline mesh has a square cross section you can use Angle to position a "flat" side down.

Rectangular—Displays the spline's mesh shape as a rectangle.

Length—Specifies the size of the cross–section along the local *Y* axis.

Width—Specifies the size of the cross–section along the local *X* axis.

Angle—Adjusts the rotational position of the cross-section in the viewport or renderer. For example, if you have a square cross-section you can use Angle to position a "flat" side down.

Aspect—Sets the aspect ratio for rectangular cross-sections. The Lock check box lets you lock the aspect ratio. When Lock is turned on, Width is locked to Length that results in a constant ratio of Width to Length.

New Settings Preset Dialog

File menu > File Link Manager > Presets panel > Copy or New

Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Copy or New

The New Settings Preset dialog creates a new preset in the *File Link Manager (page 3–431)*. The settings of the new preset either use default values (if you clicked New), or they inherit the values of a selected preset (if you clicked Copy).

After creating the preset, you can change its settings by clicking Modify.

Procedures

To create a new preset:

1. On the Presets panel of the File Link Manager, click New.

   Note: New is available only if no named presets are highlighted.

2. On the New Settings Preset dialog, enter a name for your preset, and click OK.

   A new preset is created with default settings.

To copy a preset:

1. On the Presets panel of the File Link Manager, choose a named preset.
2. Click Copy.

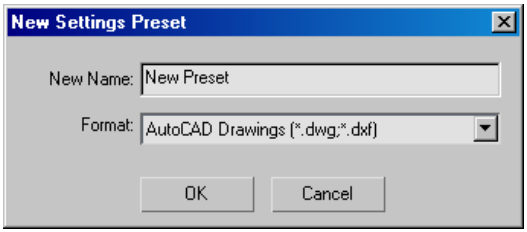
   Note: Copy is available only if a named preset is highlighted.

3. In the New Settings Preset dialog, rename the preset, and click OK.

   A new preset is created with the same settings as the selected preset.

   Note: If you do not rename the preset, it will cancel the command.

Interface



New Name—The name of your preset.

Format—The file type for the preset.

Rename Settings Preset Dialog

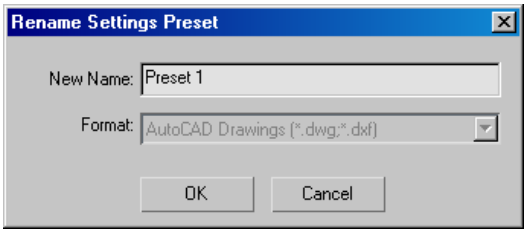
File menu > File Link Manager > Presets panel > Click a preset > Rename

Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Click a preset > Rename

The Rename Settings Preset dialog lets you rename your preset.

Note: You cannot use names beginning with 'Preset', so names like "Preset 1" or "Preset with Welding" are not allowed.

Interface



New Name—The name of your preset.

Format—The file type for the preset.

Note: By default, presets can be created only for AutoCAD file types (*.dwg*, *.dxf*). Other file types might be available, depending on the third-party plug-ins you have installed.

Preset Editing

File menu > File Link Manager > Presets panel > Click a preset > Modify

Utilities panel > Utilities rollout > More button > File Link Manager > Presets panel > Click a preset > Modify

After you've created a preset, you can use this function to adjust its settings. For instance, you might want to make sure Weld is on, or perhaps to include lights or views (cameras).

Procedures

To edit or modify a preset:

1. On the Presets panel of the File Link Manager, choose a named preset.
2. Click Modify.

   The *File Link Settings dialog (page 3–435)* is displayed.
3. From the Basic, Advanced and Spline Rendering panels, make the settings you want associated with the preset and click Save.

Differences Between Layers and Blocks in AutoCAD and 3ds Max

AutoCAD has special handling for objects in the block definition that are associated with layer 0. When a block contains objects on layer 0, and those objects have a color property of "ByLayer" or "ByBlock", the color of the object is determined either by the color of the block or by the layer assigned to the *block reference (page 3–1011)* in AutoCAD. When blocks are nested, this color system can get complex.

Select Layers Dialog

File menu > File Link Manager > Files panel > Reload button > File Link Settings dialog > Advanced panel > Select Layers to Include button

Utilities panel > Utilities rollout > More button > File Link Manager > Files panel > Reload button > File Link Settings dialog > Advanced panel > Select Layers to Include button

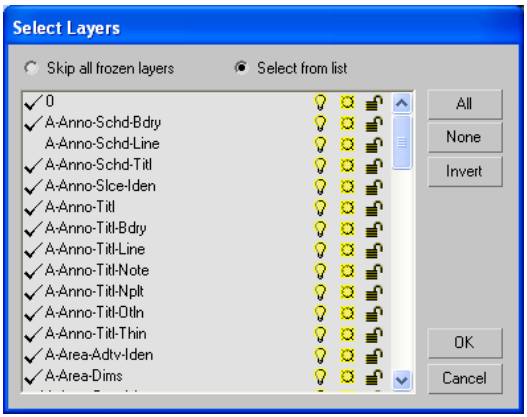
This dialog lets you toggle a layer's include/exclude status and choose other options, as described in this topic.

Note: You toggle the include/exclude status of a layer by clicking anywhere on a row in the list of layers. The dialog lists included layers with a check mark to the left of the layer name. This list of included layers is retained for subsequent reloads of the linked file. For informational purposes, the property icons display the state of the layers' properties, but you can't change their status in this dialog.

See also

Layer Properties Dialog (page 3–711)

Interface



Skip all frozen layers—Excludes all layers frozen in the linked file. All active files are included.

Select from list—Lets you select individual active layers to include/exclude. A check mark beside the layer name indicates the layer is selected.

All—Includes all layers in the linked file by selecting all of them. You can then deselect just the layers you want to exclude.

None—Excludes all layers in the linked file by deselecting all of them. You can then select just the layers you want to include from importing.

Invert—Reverses the current selection of layers in the linked file.

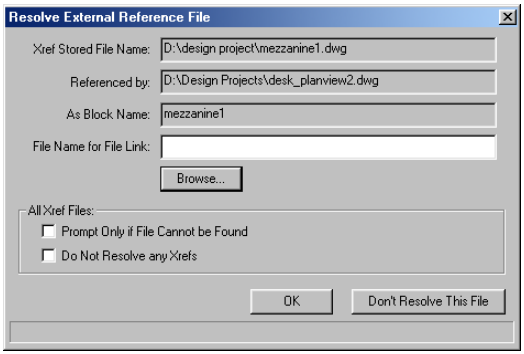
Resolve External Reference File Dialog

The Resolve External Reference File dialog is displayed when 3ds Max can't find the externally referenced files it needs in an attached DWG file.

See also

File Link Tips (page 3–428)

Interface



Xref Stored File Name—Displays the xref path stored in the attached drawing.

Referenced by—Displays the path of the attached drawing.

As Block Name—Displays the name of the block reference in the attached drawing. The block name is usually the same as the xref name, but it can be different.

File Name for File Link—When 3ds Max can't locate the linked file, use this field to enter another path and file name. 3ds Max verifies that the file exists at that location and reports its status in the lower left of the dialog.

Browse—Lets you use the file system to find another file for the link. Choosing a file this way enters file path and name in the File Name For File Link field.

All Xref Files group

Controls whether and how 3ds Max resolves xrefs.

Prompt Only if File Cannot be Found—Searches for the externally referenced file and all unresolved xrefs in the attached drawing by using the stored file name in the locations listed in this dialog and in the order they appear.

Do Not Resolve any Xrefs—Doesn't resolve this externally referenced file or any other unresolved xrefs in the attached drawing. However, any xrefs resolved before you turn on Do Not Resolve Any Xrefs will still be resolved.

OK—Resolves this externally referenced file.

Don't Resolve This File—Doesn't resolve this externally referenced file, but will prompt for any other xrefs to resolve.

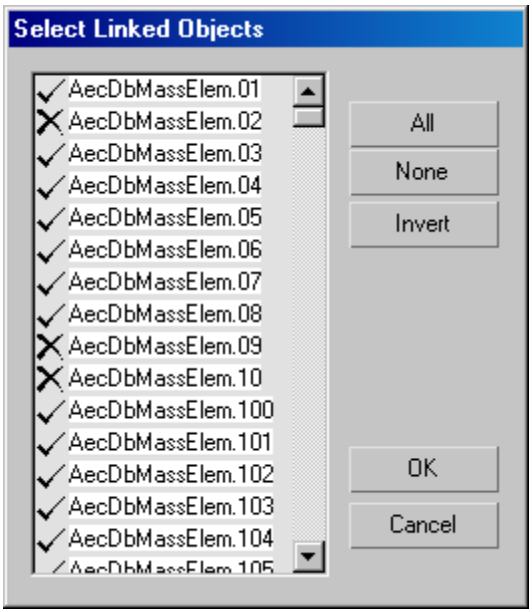
Select Linked Objects Dialog

File menu > File Link Manager > Files panel > Select file to reload. > Reload button > File Link Settings dialog > Advanced panel > Turn on Selective Reload. > Linked Objects

Utilities panel > Utilities rollout > More button > File Link Manager > Files panel > Select file to reload. > Reload button > File Link Settings dialog > Advanced panel > Turn on Selective Reload. > Linked Objects

The Select Linked Objects dialog displays the linked objects associated with the selected linked file, including *VIZBlocks (page 3–1125)*, lights, and cameras. You use this dialog when reloading a linked file so that you can include/exclude specific objects from the reloading process. You might want to do this in order to reload only the objects which have changed.

Interface



List of Objects—Lists the VIZBlocks, cameras, and lights associated with the selected linked file. A check mark beside the object name indicates the object is selected; an X mark indicates the object is deselected.

All—Selects all linked objects in the linked file. You can then deselect specific linked objects by clicking their rows.

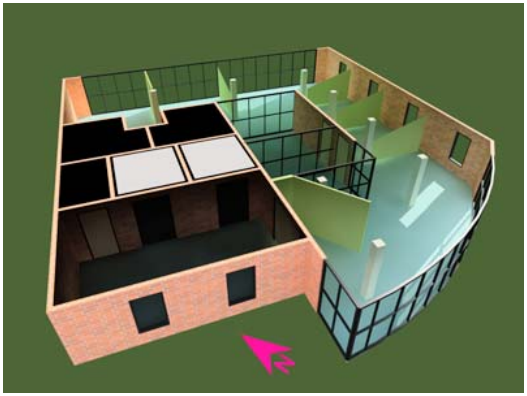
None—Deselects all linked objects in the linked file. You can then select specific linked objects by clicking their rows.

Invert—Reverses the current selection of linked objects in the linked file.

Working with AutoCAD, Architectural Desktop, and Revit Files

Working with AutoCAD, Architectural Desktop, and Revit Files

3ds Max produces rich visualizations based on your drawing design data. In order to produce high-quality visualizations, you need to add and adjust many design variables that affect the visual impact of your design, but don't really belong in your core AutoCAD, Architectural Desktop, or Revit data. You may want to test your design under different lighting conditions, experiment with different texture and material effects, animate components, or move through a space. 3ds Max allows you to enhance your design with this "extra" data while maintaining the integrity of the underlying AutoCAD, Architectural Desktop, or Revit design.



Using the *File Link Manager (page 3–431)*, 3ds Max maintains a live data link to AutoCAD, Architectural Desktop, or drawings exported from Revit that allows you to use the linked object data in your 3ds Max scene. You can perform various operations on this linked data in 3ds Max for visualization purposes, but nothing you do in 3ds Max will change the base data you see in the source application. The data link allows you to periodically refresh your 3ds Max scene with revised drawing data.

If a live data link is not important to you, the DWG/DXF Import functionality processes drawings, exported from Revit, in the same intelligent way as the File Link Manager. You just don't have the benefit of the live data link.

See also

Using Layers to Organize a Scene (page 3–704)

File Link Basics (page 3–426)

Interpreting Layer Data from AutoCAD, Architectural Desktop, or Revit (page 3–430)

AutoCAD Geometry in 3ds Max

AutoCAD Geometry in 3ds Max

The basis of your model in 3ds Max is the geometry of the objects, blocks, and other entities that are transferred through the file linking functionality. In many cases, these objects behave just like the editable meshes and splines you create in 3ds Max. But because the link to the source drawing plays such a central role in your workflow, 3ds Max has special rules and tools for handling linked AutoCAD geometry.

When you are working with linked objects and blocks from AutoCAD, you will find that these are composed as groups of related objects in 3ds Max. These groups are organized hierarchically below a 3ds Max *VIZBlock* object. VIZBlocks are special objects created by the file linking functionality that are used to contain other file linked objects in a group. VIZBlocks don't contain any geometry directly, so for example it is meaningless to apply modifiers to them. However, they do reference the components below them so that transforms applied to a VIZBlock will be applied to all the component objects it contains.

See also

Styles (page 3–467)

Instanced Objects (page 3–463)

Blocks (page 3–464)

AutoCAD Entities and Blocks in 3ds Max

AutoCAD blocks in 3ds Max are treated similarly to AutoCAD objects, though the rules for

propagation of transforms are slightly different to mirror the behavior of blocks in AutoCAD.

As with AutoCAD objects, linked AutoCAD blocks, of any type, and externally referenced drawings appear in 3ds Max as objects hierarchically grouped below a VIZBlock to reflect the structure of the block or xref in AutoCAD.

When non-nested blocks, of any type, are linked to a scene, the naming for the incoming block instances are based on the original block definition in the form of *Block: block_name* where *block_name* is the actual name of the block definition. For example, if you link a drawing containing a series of blocks named *office chair*, their name will show as *Block: office chair* in 3ds Max.

Nested blocks in AutoCAD will be analogously nested in 3ds Max under nested VIZBlocks. The grouping and naming follows the parent-child structure of *xref drawing name:block name:nested block name:entity*.

Note: Entities that lie on layer 0 of an AutoCAD block definition will appear as *Layer:0* in 3ds Max, even though they may appear to reside on a different layer when they are inserted in AutoCAD.

With linked Architectural Desktop objects, material assignments to linked AutoCAD blocks can propagate automatically to all other instances of those block components in the 3ds Max scene, depending on how *Propagate Materials To Instances (page 2–1276)* is set. Modifiers applied to block components, however, propagate automatically to all other block instances, regardless of how the *Auto Material Propagation toggle (page 2–1276)* is set.

If you transform (move, rotate, or scale) the top-level VIZBlock that contains a block reference, all the components of that block will be transformed together and no other VIZBlocks will be affected. If, however, you transform a block *component*, including a nested VIZBlock, that transformation will automatically propagate to all other instances of that block in the scene. This mirrors the behavior of blocks in AutoCAD when reference-editing a block definition.

See also

Blocks (page 3–464)

Resetting Transforms on Linked AutoCAD Objects

Select a linked AutoCAD object. > Modify panel > Linked Geometry rollout > Reset Position

You can move, rotate, or scale linked AutoCAD objects in 3ds Max, and these transformations will remain intact even after the linked AutoCAD drawing has been reloaded. But you can choose to eliminate the transforms on an object-by-object basis using the Reset Position function, available on the Modifier panel.

Note: The Reset Position functionality is only available for linked files. It is *not* available when you Import a DWG file, or when you have bound a linked file.

Every linked AutoCAD object and component has a Reset Position function associated with it. Clicking this button automatically resets all transformations that have been applied to this object or component in 3ds Max, so that the component resumes the location, rotation, and scale it held in the linked AutoCAD drawing when it was last reloaded.

Warning: Transforms applied to block components are applied to all instances of that component in all other linked block insertions in the 3ds Max scene. Resetting the transformation of *any* instance will reset *all* of them.

To reset the transforms applied to a linked AutoCAD object:

1. Select a linked object in your scene.
2. On the Command panel, click the Modify tab to display the Modify panel.

   The name of the linked object appears at the top of the Modify panel, and the modifiers that have been added to the object (if any) are shown on the modifier stack.
3. At the bottom of the list of applied modifiers, click either *Linked Geometry*, *VIZBlock*, or *Block/Style Parent*, whichever appears, if it is not already highlighted.

   A Linked Geometry rollout appears at the bottom of the Modify panel.
4. Click the Reset Position button

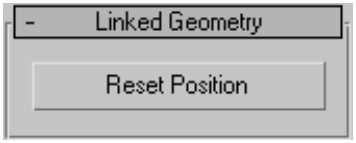
   The linked object reverts back to its original location, rotation, and scale in the linked AutoCAD drawing.

Note: When Reset Position is applied to a linked object that has been animated (in other words, has transform keys for different frames) only the transform for frame 0 is reset.

See also

File Link Basics (page 3–426)

Interface



Reset Position—Resets the selected object's transforms to those of the original AutoCAD object when the drawing was last reloaded.

Restrictions on Editing AutoCAD Geometry

Many operations that are allowed on mesh, spline, or shape objects in 3ds Max are not allowed on linked AutoCAD geometry, and other operations behave differently.

The following operations are not allowed on linked geometry:

- Deletion
- Altering the parent-child hierarchy
- Collapsing the linked geometry into an editable mesh or an editable spline

If you must perform any of these operations, you must either do them in AutoCAD or else bind the drawing data to 3ds Max, which breaks the link back to AutoCAD.

Applying Modifiers to Linked AutoCAD Geometry

You can apply modifiers to linked AutoCAD geometry and these modifiers will persist when you reload the geometry. This can be a very powerful way to intelligently manage your design intent, but it can also lead to some unexpected results, especially when using *topology-dependent* modifiers.

"Topology-dependent" simply means that the modifier is relying on the particular arrangement and number of faces and vertices that comprise the mesh representation of the object. It is common, for example, for the modifier to cause an action to be performed on the *nth* element it encounters, say the "twelfth" face or the "fourth through the twentieth" vertex. It is easy to perform edits on the base object in AutoCAD that would cause the definition of the *nth* element to change, which would result in the modifier yielding unexpected results when the drawing is reloaded in 3ds Max.

Not all modifiers are topology-dependent. When you attempt to use a topology-dependent modifier on linked AutoCAD geometry, a warning dialog is displayed that gives you an opportunity to continue or abort the operation.

When you use modifiers on linked AutoCAD objects and blocks, remember that the VIZBlock object you see in 3ds Max does not contain any geometry directly; applying modifiers to VIZBlocks will never have any visible effect. Instead, apply modifiers to the component objects below the VIZBlock in the 3ds Max object hierarchy.

Copying Actively Linked Objects

You can *copy* actively linked objects in 3ds Max; the copies are automatically converted to editable mesh objects. If your selection contains several objects that instance another object, the resulting copies also instance the same object.

However, it is recommended that you do not instance or reference actively linked objects, as this can introduce instability to the scene.

See also

Using Modifiers (page 1–479)

Select Objects Dialog (page 1–78)

Architectural Desktop Files in 3ds Max

Architectural Desktop Files

DWG files from Autodesk Architectural Desktop often contain additional information, such as special ADT objects, material definitions, and styles. 3ds Max is thoroughly compatible with ADT, and it recognizes all of these specialized objects and definitions during the file link process.

Architectural Desktop Objects in 3ds Max

Each instance of an Architectural Desktop object is represented by multiple objects in 3ds Max. Whenever the file link process detects a useful distinction between elements of an Architectural Desktop object, it automatically separates, names, and groups the elements in 3ds Max to make them easier to work with. The new objects created in 3ds Max through file linking are grouped together hierarchically below a special object called a *VIZBlock*, allowing you to deal with individual objects in the hierarchy or with all of them as a group. You can view this hierarchy, but you cannot change it in 3ds Max. You can only change the hierarchy indirectly by editing the objects in Architectural Desktop, and then reloading them into 3ds Max using the *File Link Manager (page 3–431)*.

Note: 3ds Max does not display linked Architectural Desktop light objects. The best way to link lights from your Architectural Desktop design to 3ds Max is to define them as blocks in Architectural Desktop, and then use the *Substitute modifier (page 1–830)* to replace them with 3ds Max lights with *photometric (page 3–1087)* parameters. This allows you to use 3ds Max *radiosity functions (page 3–50)* to simulate the behavior of real lights in your scene.

Criteria for Subdividing Architectural Desktop Objects

The File Link Manager divides an Architectural Desktop object into multiple objects in 3ds Max if it detects distinctions based on the following features:

- Component name

- Component subtype (for example, in sectioned bodies)
- Layer
- Material assignment

So, for example, if a window object in Autodesk Architectural Desktop contained a mullion component, but a portion of the component had a different material assignment than the rest of it, the mullion component would appear as two separate objects when linked into 3ds Max. The objects will be linked together with all the other components of the window, but you could modify the material properties of the two mullion objects separately. If you changed the material assignments in Architectural Desktop so that the entire mullion component only had one material assignment, then when you reloaded the drawing in 3ds Max there would only be one mullion object present.

Note: Material assignment and Layer are two of the properties used to separate one component from another. When these are changed in the ADT drawing, new objects are created in 3ds Max, or geometry may move from one object to another. In either case, some scene properties are changed, such as assigned material or scene layer.

3ds Max organizes and names file linked objects to reflect their structure in Architectural Desktop, using a parent-child hierarchy. The parent object will be a VIZBlock named *object class <style>*, and this VIZBlock will have one or more child objects named *object class <style name> component1, object class <style name> component2,* and so forth. Objects that originate in an xref drawing in Architectural Desktop are grouped together under a VIZBlock that is named for the xref drawing.

The following table lists some examples of the naming conventions of Architectural Desktop objects that are file linked in 3ds Max.

Name in 3ds Max	Remarks
Xref:Drawing1XRef: 5701	A VIZBlock containing one or more objects found in *drawing1.dwg*, which is an xref in the linked Architectural Desktop drawing.
Window <Picture-Arched>	A VIZBlock for an object of class=*Window* and style=*Picture-Arched*. There will one or more components that belong to this object instance, which will be child objects with the VIZBlock as their parent.
Window <Picture-Arched> Frame	A component to the object, named *Frame*.

Note: It is possible for instances of the same Architectural Desktop object to subdivide differently into 3ds Max objects. Architectural Desktop objects are considered instances of the same object if their type, style name, and component name are exact matches, and this will affect their instancing behavior for 3ds Max functions such as substitution as well as material propagation.

See also

Instanced Objects, Elements, Blocks and Styles (page 3–463)

Styles (page 3–467)

Materials and Linked Architectural Desktop Objects

Materials and Linked Architectural Desktop Objects

Materials in 3ds Max are vital to making your visualizations compelling and realistic. The native material attributes that 3ds Max relies on are those

that tell it how to render the surface of an object given certain lighting conditions. Those material properties that are so central to architectural visualization (that convey surface coloring, surface texture, transparency, and so forth) are only one of many sets of properties covered in an Autodesk Architectural Desktop material definition. To make your work more efficient, the rendering material properties stored and assigned in Architectural Desktop are designed to flow transparently to 3ds Max through the *File Link Manager (page 3–431)*.

See also

Propagate Materials to Instances (page 2–1276)

Assigning Materials to Linked Architectural Desktop Objects

Material assignments exhibit special behavior on linked Autodesk Architectural Desktop objects and blocks, and the behavior is controlled by the *Propagate Materials To Instances toggle (page 2–1276)*.

In the default state, assigning a material to any component of any linked Architectural Desktop object or block is equivalent to assigning the same material to every instance of that component of that object or block throughout your scene.

As an example, let's say you have multiple instances of a block named Telephone in your Architectural Desktop drawing, which consists of two nested blocks named Handset and Base. If you assign a material to one Handset anywhere in your scene, all the Handsets in all the Telephones throughout the scene will receive that material.

If you want to keep materials from propagating between instances in your scene, turn off the *Propagate Materials To Instances toggle (page 2–1276)*.

See also

Instanced Objects (page 3–463)

Blocks (page 3–464)

Making Changes to Architectural Desktop Materials

Architectural Desktop object components frequently appear in 3ds Max carrying rendering material assignments that were made in Architectural Desktop. You can use these materials, adjust them, or replace them with new rendering materials for use in 3ds Max. If you modify or replace the materials in 3ds Max, or if they change in the linked Architectural Desktop drawing, you can choose either to retain the current material in 3ds Max or else to revise the material assigned in 3ds Max with the current material in Architectural Desktop when you use the *File Link Manager (page 3–431)* to reload the linked drawing.

Note: When 3ds Max encounters additional material references among xref files that use a material name that is already in use, it compares the properties of the two material definitions in an attempt to determine whether they really represent identical materials. If the two materials appear to be the same material being used in different drawings, 3ds Max will use only one of the material definitions for all objects assigned either material. But if 3ds Max determines that this is merely a naming conflict between two different materials, it will slightly modify the name of one of the materials and keep the materials and their assignments distinct.

Legacy Materials in Architectural Desktop

Longtime users of AutoCAD may be familiar with an older form of material creation and assignment associated with the RMAT command in AutoCAD

that is still present in Architectural Desktop. Materials developed in this way can be viewed in Architectural Desktop and rendered with the legacy AutoCAD renderer. Any assignments of these materials to geometry in Architectural Desktop that is made through the RMAT command or its Material dialog in Architectural Desktop will be ignored in 3ds Max.

In theory, RMAT materials could be assigned to Architectural Desktop objects (not AutoCAD objects) by incorporating them into Architectural Desktop material definitions, and using these material definitions in edits to Architectural Desktop styles or object overrides. Materials created and assigned in this way would appear in 3ds Max assigned to the linked Architectural Desktop objects. However, this practice is not recommended because the native 3ds Max Architectural materials have more complete information on the surface characteristics of objects, and are easier to create and share. In other words, you work faster, share easier, and get better results using native 3ds Max rendering materials in both Architectural Desktop and 3ds Max.

See also

Material Editor, Materials, and Mapping (page 2–1239)

UVW Mapping in Architectural Desktop Objects

An important consideration in how many materials render is how they are "mapped" to the surfaces of the objects they are assigned to. This is especially important for materials that use *bitmaps (page 3–1011)* to define the diffuse color of a material, or the bump and cutout special effects. As an example, you may have scanned a picture of wood grain for use in a material, but when the material is applied to an object, how large should the image of the wood grain be? Which way do you want the grain to run, and how do you want the grain to wrap around the corners of a three-dimensional object?

How two-dimensional maps are applied to three-dimensional surfaces is represented by *mapping coordinates (page 3–1061)*, which are stored as *UVW coordinates (page 3–1122)*. In cases where mapping coordinates are likely to be important to the rendered appearance of an object, Architectural Desktop assigns UVW coordinates to object components. 3ds Max translates these coordinates and stores them in the object mesh that is displayed and rendered in the 3ds Max scene. You can adjust these coordinates in 3ds Max using the *UVW Xform modifier (page 1–916)*, or you can redefine them all at once using the *UVW Map modifier (page 1–905)*.

Important: Make sure that Rescale is turned on in the Attach Panel of the File Link Manager dialog. Otherwise, if the units do not match, the UVW coordinates will be incorrectly scaled when linked to 3ds Max.

Drawings Exported from Revit in 3ds Max

Drawings Exported from Revit

The Export function in Autodesk Revit lets you export models to DWG or DXF file formats. In Revit 6.1 and 7.0, the exported drawing entities contain additional information, "*Revit data,*" such as their originating Category, Family, Type, and Material.

The *File Link Manager (page 3–431)* and DWG/DXF Import functionality looks for and processes this additional information. When

"Revit data" is found with an object, the object is treated differently by the import/file link process. The primary differences are:

- object naming conventions
- scene organization of incoming geometry (how the objects are combined)
- parent-child hierarchy of scene objects
- possible automatic material assignments

Important: 3ds Max cannot directly import (or link) a native Revit project (RVT). You must first export a DWG or DXF file from Revit before you can import the model into 3ds Max. The imported or linked file will contain scene objects that correspond directly to individual Revit objects. In addition, most materials are translated and assigned to the objects, giving Revit customers a head start toward better visualization and faster rendering of their models.

Note: If you're working in 3ds Max 7.0 and you perform a File Link Reload of an Autodesk VIZ 2006 scene containing a linked Revit model, the scene may not reload correctly. This limitation is corrected when you're running 3ds Max 7.5 or higher.

See also

Revit Elements in 3ds Max (page 3–454)

Material Translation and Linked Revit Objects (page 3–459)

Revit Elements in 3ds Max

Whenever you use the File Link Manager or DWG/DXF Import functionality, 3ds Max detects a useful distinction between categories of a Revit elements. It automatically separates names and groups the elements in 3ds Max to make them easier to work with. The new objects created in 3ds Max through file linking are grouped together hierarchically below a special object called a *Block/Style Parent (page 3–1012)*, allowing you to deal with individual objects in the hierarchy or with all of them as a group. This hierarchy is similar to the one created when Architectural Desktop objects are linked.

You can view this hierarchy, but you cannot change it in 3ds Max. You can change the hierarchy only indirectly by editing the elements in Revit, exporting an updated DWG, and then reloading the drawing.

Criteria for Subdividing Revit Elements

The File Link Manager organizes Revit elements into multiple 3ds Max objects based on the following classification of elements:

- **Categories—**Categories are the most general class of element. They are subdivided into *model categories* and *annotation categories*. Model categories include doors, windows, walls, and furniture. Annotation categories include dimensions, grids, levels, and text notes.
- **Families—**Families are classes of elements within a category that group elements with a common set of parameters (properties), identical use, and similar graphical representation. Different elements within a family may have different values of some or all properties, but the set of properties—their names and meaning—is the same.

  For example, six-panel colonial doors are one family, although the doors that compose the family come in different sizes and materials. Most families are component family files, which means you can load them into your project or create them from family templates. You can determine the set of properties and the graphical representation of the family. Other families are called *system families* and are not available for loading or creating in Revit. Autodesk Revit predefines the set of

properties and the graphical representation of system families; they include walls, dimensions, ceilings, roofs, floors, and levels.

Besides being a class of elements, families are also a template that allows you to generate new types of items that belong to this family.

- **Types**—Types, also called a family types, are a class of elements within a family that have the exact same values for all type properties. For example, all 32x78 six-panel doors belong to one type, while all 24x80 six-panel doors belong to another type. Like a family, a type is also a template that generates new instances of this type.
- **Instances**—Instances are the actual items that have specific locations in the building (model instances) or on a drawing sheet (annotation instances).

3ds Max organizes and names file linked objects to reflect their structure in Revit, using a parent-child hierarchy. The parent object is a Block/Style Parent named *category <family : type>*, and the Block/Style Parent has one or more child objects named *category <family : type> subcategory1, category <family : type> subcategory2,* and so forth.

For example, if a single-flush door object in Revit is linked to 3ds Max, it will have a parent-child hierarchy displayed as a parent object, *Doors <Single-Flush : 34" x 80">*, with three children, *(2) Doors <Single-Flush : 34" x 80"> Frame/Mullion* and a *Doors <Single-Flush : 34" x 80"> Panel*. The objects will be linked together with all the other components of the door, but you could modify the material properties of the two frame/mullion objects separately. If you changed the material assignments in Revit so that the entire frame/mullion component only had one material assignment, then when you reloaded the drawing in 3ds Max there would only be one frame/mullion object present.

When working in Revit, you also have the ability to link AutoCAD drawings or other Revit projects to your current project. This is comparable to using xrefs in AutoCAD. Objects that originate as a linked drawing in Revit are grouped together as Linked Geometry that is named for the linked drawing. In this case, the parent object is named *Import Symbol <drawing.dwg>* and its children are named *Import Symbol <drawing.dwg> subcategory1, Import Symbol <drawing.dwg> subcategory2*, etc. The subcategories are derived from the layers that the objects reside on in the drawing.

The following table lists some examples of the naming conventions of Revit objects that are imported or file linked in 3ds Max.

Imported/File Linked Name	Remarks
Door <Single-Flush : 34″ x 80″>	A Block/Style Parent for an object of catagory=*Door*, family=*Single-Flush* and type=*34″ x 80″*. This parent object has one or more components, that are child objects displayed as Linked Geometry.
Window <Casement with Trim : 24″ x 48″> Frame/Mullion	A component to an object named, *Window <Casement with Trim : 24″ x 48″>*. This is a child object and is displayed as Linked Geometry. In Revit, the Frame/Mullion is a subcategory of Windows.

Imported/File Linked Name	Remarks
Casework <Base Cabinet-4 Drawers : 18″> Casework <Base Cabinet-4 Drawers : 18″> Casework <Base Cabinet-4 Drawers : 18″> Cabinet	A Block/Style Parent object named, *Casework <Base Cabinet-4 Drawers : 18″>* and the two, child components, *Casework <Base Cabinet-4 Drawers : 18″>* and *Casework <Base Cabinet-4 Drawers : 18″> Cabinet*
Import Symbol <drawing1.dwg>	This object is Linked Geometry containing one or more components found in *drawing1.dwg,* which is a drawing that is linked to the Revit drawing. This linkage is comparable to an xref in AutoCAD.

Note: It is possible for instances of the same Revit element to subdivide differently into 3ds Max objects. Revit elements are considered instances of the same element if their category, family, and type name are exact matches, and this will affect their instancing behavior for 3ds Max functions such as material propagation.

Revit Cameras and Views

In order to navigate a Revit drawing more efficiently, you might have set up a series of 3D views by means of placing cameras at different viewpoints around the drawing. The File Link Manager and Import functions of 3ds Max allow camera views to be treated as 3ds Max cameras.

You must meet two conditions in order for 3ds Max to understand Revit camera views.

- A camera view must be active *before* you export the DWG file from Revit.

  Note: Only the active camera view is exported.

- You have to make sure you've turned on the Views (cameras) switch in the *Basic File Link Settings dialog (page 3–436).*

When the drawing is linked to 3ds Max, that camera and its target appear in the scene named *Camera:viewname* and *Camera:viewname.Target*.

Light Sources

Drawing files, exported from Revit, can contain light sources, however, they do not export with the DWG or DXF files. What does get exported is the 3D mesh geometry representing the light fixture. Therefore, when you import or link the drawing to 3ds Max, the light object is strictly geometry, not an actual light source like a spotlight or omni light that you can adjust.

These pieces of geometry are still useful in that you can use them as reference points for placing and aligning lights you add in 3ds Max.

DXF Files

Along with the ability to export DWG files, Revit can also export to the DXF file format. The only difference is in how they handle drawings that are linked (RVT links) to the Revit drawing.

When exporting to DXF, the linked drawings are automatically bound to the drawing. Therefore, while exporting to a DWG honors the linked drawings and treats them as AutoCAD xrefs, an exported DXF file will not have xrefs. Instead, the linked drawings are converted to blocks.

The resulting scene organization will be slightly different when linking or importing a DXF as opposed to a DWG, but only when RVT links are present in the drawing.

See also

Instanced Objects, Elements, Blocks and Styles (page 3–463)

Styles (page 3–467)

Suggested Settings and Workflow

Suggested Settings for Revit Projects

The File Link Manager and DWG/DXF Importer have many settings that you can adjust so you get the best results when linking or importing a drawing that you've exported from Revit. In this section, you'll find some recommended settings that you can use when linking or importing your DWG files. These settings are found on the *Basic File Link Settings dialog (page 3–436)*, the *Advanced File Link Settings dialog (page 3–438)*, the *Spline Rendering File Link Settings dialog (page 3–441)*, and the *AutoCAD DWG/DXF Import Options dialog (page 3–537)*.

Use the Revit Preset

3ds Max includes a preset named "*Revit*" that you can use when using File Link to link a drawing that is exported from Revit. The Revit preset has many of the following suggested settings turned on by default. Or, you can use the Revit preset as a basis for your own customized Revit preset containing the settings you prefer.

The Revit preset can be assigned from the Preset list on the Attach panel of the *File Link Manager (page 3–431)*. You can *edit the preset (page 3–444)* by choosing the Revit preset shown on the Presets panel of the File link Manager.

If you plan on creating your own presets or modifying the Revit preset, use these settings to streamline the file linking process.

Turn on Weld and set a Weld Threshold

- Weld and Weld Threshold are found on the Basic panel of the File Link Settings dialog or in the Geometry Options group of the AutoCAD DWG/DXF Import Options dialog.

When Revit exports model geometry to a DWG file, objects are translated as multiple surface meshes. For example, a single wall is made up of 6 or more AutoCAD entities; each a polyface mesh with vertices that overlap their neighbors. When the meshes get linked to 3ds Max, the File Link Manager or DWG/DXF Importer recombines them back to a single object. However, when the meshes are recombined, their vertices are not welded, so you end up with a larger and less elegant model than expected. By turning on the Weld option and setting an appropriate Weld Threshold (like 0.1" or smaller), coincident vertices are welded together and the file structure is more efficient.

Note: This is particularly important if you plan to do radiosity rendering because gaps in the model can cause leaks that greatly increase the rendering time.

Turn on Views (cameras)

- Views (cameras) is found in the Include group on the Basic panel of the File Link Settings dialog and the AutoCAD DWG/DXF Import Options dialog.

If you've set up one or more cameras in your Revit project, the File Link Manager or DWG/DXF Importer will recognize and link a camera when the Views (cameras) option is turned on. There is, however, a catch. Before you export a DWG from Revit, the camera view must be active and *only* the active camera will be exported.

Avoid Entity and Entity, Blocks as Node Hierarchy

- On the Advanced File Link Settings dialog, when choosing a Derive AutoCAD Primitives By option, avoid Entity and Entity, Block as Node Hierarchy.

Elements are occasionally missing Revit embedded data. When this data is missing, the objects are "derived" according to the Derive AutoCAD Primitives By setting. Deriving by either of the Entity choices will not, generally, give you the end result you want and could result in a scene in 3ds Max that contains a vast number of individual objects. In particular, these settings can cause issues with railing balusters.

Use Layer, Blocks as Node Hierarchy

- On the Advanced File Link Settings dialog, use Layer, Block as Node Hierarchy, when choosing a Derive AutoCAD Primitives By option.

The Layer, Blocks as Node Hierarchy derive by option, often gives the best results for linking DWG files, especially when the Revit project has other drawings, *RVT links (page 3–1098)*, linked to it. Combining by Layer (node hierarchies or not) is the preferred setting. RVT links get exported to the DWG as xrefs. If you want the File Link Manager to preserve color and material assignments of those objects, Layer, Blocks as Node Hierarchy is the setting to use.

Turn on Material Definitions and Assignments

- The Use Scene Material Definitions and Use Scene Material Assignments on Reload switches are on the Advanced File Link Settings dialog.

These two switches are quite important when you've got materials assigned in your Revit project.

When the Use Scene Material Definitions switch is turned on, 3ds Max checks the scene for any currently used materials matching the exact same name as a material name in the linked DWG file. If a match is found, File Link does not translate the drawing's material, and instead uses the material defined in the scene.

When turned off, the File Link Manager always uses the material definitions contained in the DWG file, and will overwrite scene materials with the same name, regardless of which objects the material is applied to. In addition, material definitions are always reloaded from the DWG file, so if you make changes to a linked material, then reload, those changes will be lost.

If the Use Scene Material Assignments on Reload switch is turned on, linked objects with a material already assigned to them in the 3ds Max scene will not have that material assignment changed. When turned off, linked objects have their material assignment 'coordinated' with the drawing, so that the two are in-sync.

Determine how you want Splines Handled

- The settings on the Spline Rendering File Link Settings dialog control how shapes and splines are linked or imported into 3ds Max.

In your original project, you may have used 2D lines to represent joints between sidewalk pavers or as mullions separating sections of a curtain wall. The settings on the Spline Rendering panel let you use those lines more advantageously.

When you turn on Enable In Renderer and/or Enable In Viewport, lines are visible when you render the scene or are treated as selectable objects in the scene. You can also adjust the appearance of lines by having them display as radial or rectangular geometry.

Tip: Using the *Sweep modifier (page 1–839)* with 2D splines or shapes lets choose a cross-sectional shape that is swept along the spline resulting in much more scene detail.

Suggested Workflow for Revit to 3ds Max Projects

Most of the work you do on your Revit project will be done in Revit. The initial design, layout and modeling all occurs from within the Revit

program. 3ds Max comes into play when you're ready to produce some higher end renderings and perhaps add some final details.

Following is a basic description of the expected workflow between Revit and 3ds Max:

1. You've completed most of the design work in Revit and you're ready to add finishing touches and create some presentation renderings.
2. From Revit, export a DWG file.

   Exporting to a DWG file is necessary because the File Link Manager cannot accept the "native" Revit project (RVT) files.
3. Start 3ds Max and use the File Link Manager to link the DWG file.

   Link the drawing using presets that include the linking settings you want as described in the *Suggested Settings for Revit Projects (page 3–457)* section.
4. Adjust materials or make final modifications in 3ds Max in preparation for rendering.

   Depending on the results at this stage, you may find that the Revit project needs to be changed and updated.
5. In Revit, makes changes to the project like moving walls, adding new doors and windows or adding/removing objects.

   For structural changes like adjusting walls, doors, windows, etc., it's best to make these changes in Revit because those changes need to be included in the originating project. File Link is a one way link so any changes you can make in Revit, should be made in Revit. Otherwise, you'd have to remember to make the same changes in both 3ds Max and Revit.
6. When the changes are completed, export another DWG file with the same name as the original DWG file you exported in step 2.

   If you give a new name to the exported DWG, the File Link Manager will not show that the currently linked file has been updated.
7. In 3ds Max, open the File Link Manager and review the Files panel. Select the updated file link and click the Reload button — Turn on Show Reload Options if you want to change link settings.

   The changed model reloads to 3ds Max and changes made to the model in 3ds Max prior to the reload are retained.

   The symbol means the DWG file has been updated.

Materials and Linked Revit Objects

Material Translation and Linked Revit Objects

When you export a DWG or DXF from Revit projects, materials are translated into a format that 3ds Max can understand. Revit creates materials in the same format as used by Architectural Desktop, VIZ Render and 3ds Max. There are two kinds of materials associated with the Revit project; AccuRender materials and Revit materials. When a Revit material references an AccuRender material, the AccuRender material's parameters are used; otherwise, the Revit material parameters are used.

There is an important caveat to this. AccuRender materials that reference a bitmap file are translated in 3ds Max without any problems, while AccuRender materials that are considered "procedural" are only translated at the most basic level.

Therefore, an AccuRender material that uses a bitmap image in the base texture definition will provide a more accurate translation to 3ds Max.

Note: There are some limitations on what is translated between Revit/AccuRender materials and 3ds Max materials because there is not a one-to-one correlation between the two material definitions.

Material Assignments

The Revit DWG Exporter puts embedded information on each object it exports. Amongst this information are identifiers specifying material assignments. Revit creates the same kind of material definitions used by Architectural Desktop, VIZ Render and 3ds Max. When imported or linked, 3ds Max uses this information to translate and maintain the material assignment to the resulting scene object.

Because the material identifier is embedded, if you opened the DWG in AutoCAD, you would not see the applied materials.

Revit offers many options for specifying a material to an object or class of objects. Likewise, there are many ways where material assignments can be overridden. The results you see in the 3ds Max scene, in terms of how the materials are applied, match what you see in the Revit model.

The exception to the rule would be if many of the materials are AccuRender procedural materials. In these cases, you will see only the diffuse color.

Texture Coordinates

Material textures on imported or linked objects have the same appearance as within Revit or AccuRender. Of course, the exception to this rule is when AccuRender procedural textures are used.

When materials from Revit are viewed in the 3ds Max Material Editor, you'll notice that some settings are not translated or they are not set as you're used to seeing in 3ds Max. For example, if the texture map of a flooring material has a rotation of 45 degrees in the Revit project, the rotation setting does not translate when the model is linked/imported to 3ds Max. The rotation for the texture map is set to zero in the 3ds Max Material Editor.

Map Scaling

The scale of material textures is of primary importance. The File Link Manager or DWG/DXF Importer attempts to read and translate the offset and tiling of the materials so the texture maps appear in 3ds Max as they do in Revit.

However, map scaling may differ because the Tile Size settings in Revit are measured in decimal feet or meters even if your Project Units are set to Decimal Inches or Millimeters. Once the model is linked or imported to 3ds Max, you can turn on Use Real-World Scale and match the Tile Size settings. The main thing is to pay attention to the Tile Size settings when you create the material in Revit.

As a example, let's say you've created a material in Revit that uses a brick texture map with an X: Tile Size set to 20 and a Y: Tile Size set to 16. If you open that material in the 3ds Max Material Editor, you will find that the Width and Height Size settings are automatically set to 20' and 16' respectively. The texture mapping will always be scaled correctly in the scene. How a material is displayed in the Material Editor depends on whether Use Real-World Scale is turned on or off.

See also

Propagate Materials to Instances (page 2–1276)

Applying Materials to Linked Revit Objects

As with models that are imported or linked from Architectural Desktop, there are special behaviors exhibited with materials assigned to linked Revit objects. The behavior is controlled by the *Propagate Materials To Instances toggle (page 2–1276)*.

When applying materials to a linked drawing in 3ds Max, family and type plays an important role in material management. Assigning a material to any component of any linked Revit object is equivalent to assigning the same material to every instance of that component in every object with the same family and type throughout your scene.

As an example, say you have multiple instances of a *Doors <Single-Flush : 34" x 80">* door in your drawing, which consists of three components: two Frame/Mullion components representing the inside and outside trim and a Panel component. If you assign a material to one Panel component anywhere in your 3ds Max scene, all the Panels for all the Doors of that family and type throughout the scene will receive the new material.

If you want to keep materials from propagating between instances in your scene, turn off the *Propagate Materials To Instances toggle (page 2–1276)* from the Material Editor's Options menu.

See also

Instanced Objects (page 3–463)

Blocks (page 3–464)

Editing Revit Materials in 3ds Max

Once a drawing is linked or imported to 3ds Max, you can modify or replace the materials. The File Link Manager maintains a list of materials that it links to 3ds Max. If you change the properties of an assigned material while working in 3ds Max, the new properties can get overwritten the next time you reload an updated drawing, exported from Revit.

During a File Link reload, if the Show Reload Options switch is turned on, you can control how materials are handled by using the *Use Scene Material Definitions* or *Use Scene Material Assignments on Reload* options.

Procedures

To retain material settings made in 3ds Max during a reload:

1. On the Files panel of the File Link Manager, make sure the Show Reload Options switch is active.
2. Select the updated DWG file from the Linked Files list and click Reload.
3. Open the Advanced tab and turn on *Use Scene Material Definitions* and then click OK.

   The updated DWG file is reloaded and Revit materials retain the setting changes you made in 3ds Max.

AccuRender Materials

AccuRender materials consist of one or more base materials. For each base material you can set attributes such as color, reflectivity, transparency, index of refraction, bump maps, and image maps.

The Procedures list displays the simple materials that combine to form your final material definition and the rules for combining them. For simple materials, there is only one item in the list: Base. For complex materials, a tree indicates how the components combine. For example, the marble procedure consists of a Base material and a Vein material. While the Base material is considered a 'procedure', it is translated because it's at the bottom level of the material. The Vein material is ignored.

AccuRender materials that are applied to objects in the Revit drawing are translated when you link or import the drawing to 3ds Max. If the texture used for the material is a digital bitmap like a BMP or JPG file, the texture will be included with the material.

However, if the texture being used is one of the Procedures, the texture is not translated when the drawing is brought into 3ds Max. In these cases, you will see only the diffuse color.

See also

Material Editor, Materials, and Mapping (page 2–1239)

UVW Mapping on Revit Elements

An important consideration in how many materials render is how they are "mapped" to the surfaces of the objects they are assigned to. This is especially important for materials that use *bitmaps (page 3–1011)* to define the diffuse color of a material, or the bump and cutout special effects. As an example, you may have scanned a picture of wood grain for use in a material, but when the material is applied to an object, how large should the image of the wood grain be? Which way do you want the grain to run, and how do you want the grain to wrap around the corners of a three-dimensional object?

How two-dimensional maps are applied to three-dimensional surfaces is represented by *mapping coordinates (page 3–1061)*, which are stored as *UVW coordinates (page 3–1122)*. Revit assigns UVW coordinates to object components, so in cases where mapping coordinates are important to the rendered appearance of an object, 3ds Max translates these coordinates and stores them in the object mesh that is displayed and rendered in the 3ds Max scene.

Using Revit Materials on 3ds Max Geometry

After you've linked a DWG file that has been exported from Revit, you may find that some of the materials that were created in Revit could be used on new geometry you're adding while working on the model in 3ds Max. Reusing a material is often easier than creating a brand new one.

For example, let's say a wall element in the Revit project has a brick material that you'd like to use on an object you added to the model while working in 3ds Max. If you simply apply the material to the new object, you'll find that the texture map does not show as it does on the wall that came from Revit. This is because UVW coordinates of the new object are not set up to coordinate with the Tiling parameters of the Revit material.

When using Revit materials with objects created in 3ds Max, there are really two things to keep in mind;

- All materials from Revit use real-world scaling.
- Real-world scaling must be active for objects you've created in 3ds Max.

There are a few way to make sure your 3ds Max objects are using real-world scale.

- If you're working with a primitive object, like a box or cylinder, make sure Real-World Map Size is active.
- For more complex objects, apply a *UVW Map modifier (page 1–905)* and make sure Real-World Map Size is active.
- Assign the object a *MapScaler modifier (page 1–705)*.

Instanced Objects, Blocks, and Styles

The primary structural entities you will find in a model or project that is linked/imported to 3ds Max from AutoCAD, Architectural Desktop or Revit are *style-based objects (page 3–467)* (in ADT models), family elements (in Revit projects) or *blocks (page 3–464)* (in both ADT and AutoCAD files). Each style-based object, family element, or block will most likely have many *instances (page 3–463)* in the 3ds Max scene.

- *Instances* are multiple occurrences of objects such as style-based objects or blocks that are clone instances. When you link a model or drawing that contains instanced objects to 3ds Max, those objects remain instances of one another.
- *Family Elements* in a Revit project represent different items of a building and are separated into two general categories; Model and Annotation. The Model category includes such elements as walls, doors, windows and stairs while the Annotation category includes dimensions, text notes and section tags. When a DWG is exported from Revit and linked to 3ds Max, elements appear in the Modifier panel as *Block/Style Parents (page 3–1012)*, meaning you've selected the element at its topmost level, or as *Linked Geometry (page 3–1056)*, meaning one of the element's subcomponents.
- *Blocks* are reusable objects made in AutoCAD or Architectural Desktop. Blocks are made of one or more objects that can be inserted into a scene at different locations, scales and orientations. Blocks can also be an amalgam of other blocks. A block that is made of other blocks is referred to as a *nested block*. Once linked to 3ds Max, blocks appear in the Modifier panel as VIZBlocks, meaning you've selected the block at its topmost level, or as Linked Geometry, meaning one of the block's subcomponents.

  Note: If you use one of the "node hierarchy" Derive By settings, you will see Block/Style Parent objects in the Modifier panel and not VIZBlocks.
- Architectural Desktop *style-based objects* are complex objects like Doors and Windows whose components rely on style definitions to control how they appear in the scene. For example, style definitions for a door set the type of door, the door thickness, the materials assigned to the various components, and so forth. Altering the style definitions changes the appearance of the object in the scene.

See also

Object Properties Dialog (page 1–111)

Instanced Objects

Modifiers and materials that are applied and assigned to an instanced object propagate throughout all instances of the object. For example, if all the doors in a scene have glass panes and you change the glass material of one door, all the doors of the same style will adopt that material. Propagation of materials can be controlled by toggling *Propagate Materials To Instances (page 2–1276)*.

Once you link a model to 3ds Max, instanced objects can be transformed (moved, rotated, or scaled). If you don't like the way an object is transformed, you can use the Undo command or *Reset Transform button (page 3–448)* on the Modify panel.

Family Elements

When modifiers and materials are assigned to family elements that are imported or linked to 3ds Max, they propagate throughout all instances of the element if their family and type match exactly. For instance, one particular part of your model shows a room with three doors. Two of the doors are *Doors <Single-Flush : 32" x 80">* and the third is a *Doors <Single-Flush : 36" x 80">*. If you change the panel material of one of the *Doors <Single-Flush : 32" x 80">* doors, the panel of the other *Doors <Single-Flush : 32" x 80">* door will also change because their family, *Doors*, and type, *Single-Flush : 32" x 80"*, are identical.

Propagation of materials can be controlled by toggling the *Auto Material Propagation Toggle (page 2–1276)*.

Blocks

The concept of *blocks* originated in AutoCAD. Blocks allow you to combine one or more objects into a single reusable object. Blocks can be repeatedly inserted in the drawing at various locations, orientations, and scales. Changes made to a block propagate automatically to all instances of that block throughout the drawing. Like all drawing construction, inserting or deleting blocks occurs while you work in AutoCAD or Architectural Desktop.

You then link the DWG file to 3ds Max, where your goal is to beautify the scene in preparation for rendering. Some of those preparations include such procedures as selecting a block instance so you can apply or adjust a material, applying texture mapping coordinates, unifying or flipping normals, and setting rendering properties. These procedures affect all other block instances in the scene.

The structure of *nested blocks*, blocks that are made from multiple sub-blocks, is maintained when you link an AutoCAD drawing to 3ds Max. For example, if the block *Desk1* is made using several blocks, *Desk*, *Chair* and *Return*, you will be able to select any of *Desk1*'s sub-blocks to alter their rendering properties or materials. You can only access rendering properties for block components that appear as Linked Geometry on the Modifier panel. Blocks or sub-blocks, that appear as VIZBlocks in the Modify panel, do not have rendering properties because they are not renderable.

Note: A change to the drawing in AutoCAD is reflected in 3ds Max when you reload the linked model. Changes made in 3ds Max do not propagate back to AutoCAD.

Block and Modifying Linked Geometry

Linked objects show up as *linked geometry* objects in the modifier stack. These objects don't allow access to sub-object levels where minor editing can occur at Vertex or Face levels. You must first add an Edit Mesh modifier to the object in order to access sub-object levels where you can perform operations like welding vertices or deleting faces. If you add a modifier to a block, the modifier is applied to all instances of that block. Likewise, any sub-object level editing to the originally selected block propagates to all other instances.

Note: Any modifiers you apply to a block or block component in 3ds Max are preserved if you reload the file with the *File Link Manager (page 3–431)*.

If you move, rotate, or scale blocks or block components in 3ds Max, their new transform is preserved even if the linked model is reloaded from AutoCAD. Transforms applied to linked geometry in 3ds Max are relative to the transforms applied to the same objects in AutoCAD. Further, the transform propagates to all instances of that block or component. For example, if you move the

Chair component of *Desk1*, the *Chair* component of all *Desk1*s in the scene will be moved. If the transform is undesirable, you can use the *Reset Transform button (page 3–448)* on the Modify panel to put the block or component back to its original position.

When a modifier is applied to a block or block component, it propagates throughout all instances of the block or block component in the scene.

Limitations of Blocks

Blocks have some limitations when you link a drawing to 3ds Max.

- You cannot change the structure of actively linked blocks or their components in 3ds Max. In order to delete a block or component, you will have to bind the file, breaking the link.
- You can only access rendering properties for block components that appear as Linked Geometry on the Modifier panel. Blocks or sub-blocks, that appear as VIZBlocks in the Modify panel, do not have rendering properties because they are not renderable.

Blocks and Materials

When assigning a material in 3ds Max to an instance of a block or block component, all the instances of that block or component are assigned the same material automatically. This is called *automatic material propagation*. This feature helps align 3ds Max behavior with that of Architectural Desktop.

If you find that a material you've assigned to a block or block component is not what you wanted, you can undo the material assignment by choosing Edit menu > Undo or pressing **CTRL+Z**. If you undo a material assignment, the undo will propagate to all instances of the objects to which you assigned the material.

Note: When assigning a material to a block or block component, you are not prompted to accept or cancel the material propagation. You can only control propagation of materials by toggling *Propagate Materials To Instances (page 2–1276)*.

For more information about working with materials and assigning materials to blocks in 3ds Max, see the *Material Editor, Materials, and Mapping (page 2–1239)* topic.

Multi-View Blocks (MVBlocks)

3ds Max accommodates both AutoCAD blocks and Autodesk Architectural Desktop multi-view blocks through the file linking functionality, and for the most part the two block types behave similarly in 3ds Max with some exceptions.

The structure of Architectural Desktop multi-view blocks is expressed differently in 3ds Max, when compared to AutoCAD blocks. Rather than peer into the internal structures of multi-view blocks as is done with AutoCAD blocks, 3ds Max relies on the multi-view block's own ability to draw its own 3D view, much as it does in the Architectural Desktop Object Viewer. Because of this, you will notice that multi-view blocks never exhibit nesting in their object structure when they are file linked into 3ds Max.

Behavior of instanced Architectural Desktop multi-view objects is different from that of AutoCAD blocks as well. Multiple instances of multi-view blocks require more memory in 3ds Max than multiple instances of AutoCAD blocks. But multiple instances of multi-view blocks are better behaved when being cut by live section objects than their AutoCAD counterparts.

Dynamic Blocks

The File Link Manager handles dynamic blocks the same way as other blocks found in a DWG file. When linked to a scene, the naming for the incoming dynamic block instances are based on

the original dynamic block definition in the form of *Block: block_name* where *block_name* is the actual name of the dynamic block definition.

Dynamic block instances, even those that have been grip-edited, display certain types of instance behavior such as material propagation, if the setting is activated from the *Material Editor Options menu (page 2–1272)*. Below is a table showing instance behavior of dynamic blocks.

Property	Behavior
Modifiers	Modifiers applied to one component are applied to the same component in other instances, but only when those instances have the same grip property values.
Materials	When material propagation is turned on, materials are applied to all block instances. When turned off, materials are applied only to the current selection set. Note: If you use the *Entity, Blocks as Node Hierarchy* Derive By setting for drawings containing dynamic blocks, materials may propagate to some block instances and not to others.
Node Properties	Changes to node properties are not propagated to block instances.
Transforms (on components)	Transforms, like move, rotate and scale, of one component will affect that same component in other block instance only when those instances have the same grip property values.

Keep in mind that elements of a dynamic block can be turned on and off by certain grip-edit operations depending on the way the dynamic block is defined. When one instance has a component and another doesn't, instance behaviors cannot occur between them because they are treated as instances of one another.

Modifier behavior of Dynamic Blocks during a File Link Reload

There is no change in modifier behavior for dynamic blocks that have not been grip-edited between one Reload and the next. All properties (materials, modifiers, node properties) are preserved. Dynamic blocks that have been grip-edited preserve their node name, node properties, scene-applied transform, and materials, but may lose applied modifiers and/or may inherit modifiers. This table shows the behavior of modifiers during a File Link Reload before and after dynamic block editing.

The Block Insert ...		
... has unique parameter values before it was edited.	... has unique parameter values after it was edited.	... shows this modifier behavior upon Reload.
Yes	Yes	Modifiers are preserved.
Yes	No	Applied modifiers may be lost, and it may inherit modifiers from the instance(s) it now matches.
No	Yes	Applied modifiers are lost.
No	No	Applied modifiers may be lost, and it may inherit modifiers from the instance(s) it now matches.

Note: 3ds Max 7 does not contain the enhancements necessary to fully handle dynamic blocks so performing a File Link Reload might not accurately reflect changes in a drawing that has been grip-edited. The File Link Manager of 3ds Max 7.5 handles dynamic blocks correctly.

Blocks and Interactive Selection and Navigation

Once blocks and block components are linked to 3ds Max, you can begin adjusting their materials and properties. In a drawing for a small apartment, blocks are pretty easy to locate because the drawing is not very congested. You can simply select a block or one of its components in the viewport and alter it.

When drawings get very complex, finding the block or block instance you want can pose a problem. For example, a common block you might add to a drawing is a table. If you're designing a corporate headquarters that makes use of several different types of tables, finding the one you want to change becomes more difficult. There are several ways for you to find and select a block more precisely in 3ds Max.

- One way is by means of the block's name. When you link a drawing to 3ds Max, file linking creates a name such as *Block: ConferenceTable*. The first part of the name identifies the object's type, *Block*. The second part of the name indicates the block name, *ConferenceTable*. With this sort of naming breakdown, you can easily find a block using the Select Objects dialog.
- Another selection method uses the Layer or Color setting you made for your block when you created it in Architectural Desktop. Because layer and color data is also linked to 3ds Max, you can select entire groupings of blocks using Select By Color or Select By Layer.
- Finally, you can select blocks by the type of material that's applied to them. Take care when selecting blocks this way because the material assigned to the block may also be assigned to other objects in the scene.

  Once a block or set of block instances is selected, you can isolate them from the remainder of the model to work on them more efficiently.

To select block by color:

1. Choose Edit menu > Select By > Color.
2. Select a block in the scene.

   All blocks that share that color are selected.

To select blocks by name:

1. Choose Edit menu > Select By > Name, or press the **H** key to open the Select Objects dialog.

   Alternately, you could use the Selection Floater, accessed from the Tools menu. While similar to the Select Objects dialog, the Selection Floater is modeless and can remain on-screen while you're working.
2. While holding down the CTRL key, select blocks with common names.

   You can also enter the block name in the name field at the top of the dialog.
3. Click Select.

   All blocks that share the specified name are selected.

To select blocks by layer:

1. Choose Edit menu > Select By > Layer.
2. Select a block in the scene.

   All the blocks sharing that layer are selected.

To isolate selected objects:

1. Using one of the previous selection methods, select some blocks.
2. Choose Tools menu > Isolate Selected.

   All objects are hidden except for the selected blocks. A dialog is displayed, indicating that isolation mode is active.

Styles

Styles are sets of parameters that you can assign to objects in Autodesk Architectural Desktop to determine their appearance. This means an Architectural Desktop object references a style in order to determine certain aspects of its appearance. For example, a door style in Architectural Desktop determines the type of door represented in the drawing, such as single or

double hung, bifold or hinged, solid core or glass pane. You can assign one style to more than one object, and you can modify the parameters of that style to change all the objects that have the same style assigned to them.

For more information about how to work with styles in Architectural Desktop, refer to the *Architectural Desktop Reference.*

A style is made up of components. Each component defines dimensions and display properties per view. For example, the hatch pattern defined for component1 in Plan view can be different from the hatch pattern for the same component in Model view. Styles are grouped in categories that mirror the categories of Architectural Desktop objects. You perform model management, such as creating and deleting styles and style-components in Architectural Desktop, and reload the modified scene into 3ds Max using the *File Link Manager utility (page 3–431)*.

When a model is linked to 3ds Max from Architectural Desktop, styles play an important role in assigning render materials and texture coordinates to Architectural Desktop object components described by style components. Components of an Architectural Desktop object often have predefined materials in their style definitions. This means that if you have many instances of an object in your drawing, you can quickly replace materials on all the objects without having to select each instance of the object.

'Style-based objects' is a more common term for Architectural Desktop objects that reference styles.

Limitations of Styles

Styles-based Architectural Desktop objects do have some limitations when a model is linked to 3ds Max.

- Changes to styles and their components performed in 3ds Max will not propagate back into Architectural Desktop.
- The structure of a style-based object in 3ds Max cannot be changed. You cannot add components to or delete them from a linked object.
- Objects on frozen layers in Architectural Desktop will not be displayed when the model is linked to 3ds Max.

  Note: This is not the case when Skip All Frozen Layers is turned off in your File Link settings.

Styles and Materials

The primary purpose of linking a model from Architectural Desktop to 3ds Max is preparing the scene for presentation to your clients and rendering. AEC Objects are made up of components that have default architectural materials assigned through their styles. Components can be selected from the *Select Object dialog (page 1–78)* or Selection Floater and new materials can be assigned or the existing material can be altered in the Material Editor.

For example, a door that is assigned the "Hinged – Single – Full Lite" style is made up of five components in Architectural Desktop. The components are the Frame, Panel, Stop, Glass, and Muntins. Each component has a material assigned to it. For instance, the default material assigned to the Panel component of this type of door is "finish carpentry.wood.mahogany". If you want to change the Panel material in 3ds Max, you can select the Panel component and drag a new material to it from the Material Editor.

Because the Panel material is part of the door's style, your new material will automatically propagate to any other door in the scene that is assigned the "Hinged – Single – Full Lite" style.

Note: If you need to apply a material to individual objects, or object selections, rather than to all objects of the same style, you can use the command *Propagate Materials To Instances (page 2–1276)*.

For more information about working with materials and assigning materials to objects in 3ds Max, see *Materials (page 2–1239)*.

Styles and Interactive Selection and Navigation

Architectural drawings range from simple details to highly complex floor plans, so finding different components of a drawing can be difficult. Style-based objects from Architectural Desktop all have styles associated with them. So if you link a drawing to 3ds Max, objects with styles will be associated with them both in Architectural Desktop and in 3ds Max. Furthermore, in 3ds Max, the name of the object will contain the Architectural Desktop object category name (Door, for example), style name (Double Hinged) and component name (Panel).

You make most object and component selections in 3ds Max by selecting objects in the viewports. However, in complex models where objects and components may be spread across multiple layers or located in congested areas, style definitions help streamline the selection of reusable components in a drawing.

Once objects and components are selected, you can also isolate them from the remainder of the model to work on them more efficiently.

To select objects or components by color:

1. Choose Edit menu > Select By > Color.
2. Select an object in the scene.

   All objects or components that share that color are selected.

To select objects or components by name:

1. Choose Edit menu > Select By > Name, or press the **H** key to open the Select Objects dialog.

   Alternately, you could use the Selection Floater, accessed from the Tools menu. While similar to the Select Objects dialog, the Selection Floater is modeless and can remain on-screen while you're working.
2. While holding down the CTRL key, select objects or components with common names.

   You can also enter the object or component name in the name field at the top of the dialog.
3. Click Select.

   All objects or components that share the specified name are selected.

To select objects or components by layer:

1. Choose Edit menu > Select By > Layer.
2. Select an object in the scene.

   All objects or components that share that layer are selected.

To isolate selected objects:

1. Using one of the previous selection methods, select some objects.
2. Choose Tools menu > Isolate Selected.

   All objects are hidden except for the selected objects or components. A dialog appears indicating that isolation mode is active.

Merge

File menu > Merge

Merge allows you to bring objects from other scene files into the current scene. You can also use merge if you want to combine an entire scene with another.

Automatic Unit Conversion

When Respect System Units in Files is turned on in the *Units Setup dialog (page 3–891)*, in the System Unit Scale group, merged objects from a file with a different scene unit scale are scaled to maintain their correct size in the new scene. No conversion is done when merging files created in 3ds Max 1.x.

Note: If Respect System Units is off (which is not recommended), a 100-foot radius sphere that was created in a 1 unit = 1 foot scene becomes a 100-inch sphere in a 1 unit = 1 inch scene.

Resolving Conflicts When Merged Objects Have the Same Name

When one or more incoming objects have the same name as objects in the scene, an alert gives you the following options:

Merge—Merges the incoming object using the name in the field at the right. To avoid having two objects with the same name, type a new name before proceeding.

Skip—Does not merge the incoming object.

Delete Old—Deletes the existing object before merging the incoming one.

Apply to All Duplicates—Treats all subsequent incoming objects with duplicate names the same way you specified for the current object. No further alerts will appear. This option is not available if you renamed the current object.

Cancel—Cancels the merge operation.

When one or more materials assigned to incoming objects have the same name as materials in the scene, an alert gives you the following options:

Rename Merged Material—Defines the name for incoming material.

Use Merged Material—Assigns the characteristics of the incoming materials to the same-named scene materials.

Use Scene Material—Assigns the characteristics of the scene materials to the same-named incoming materials.

Note: Only top-level material names (not sub-materials) are checked for duplicates.

Auto Rename Merged Material—Automatically renames the incoming materials to new names. Uses Material number names based on the next available Material number.

Apply to All Duplicates—Treats all subsequent incoming Materials with duplicate names the same way you specified for the current object.

See also

Merge Animation (page 3–471)

Merging Effects (page 3–216)

Open (page 3–400)

Replace (page 3–476)

Procedures

To merge items:

This is the general procedure. Detailed steps follow.

1. Choose File > Merge.
2. Select a file from which to merge items.
3. Choose a group or an item to merge.

To specify object types to list, do any of the following:

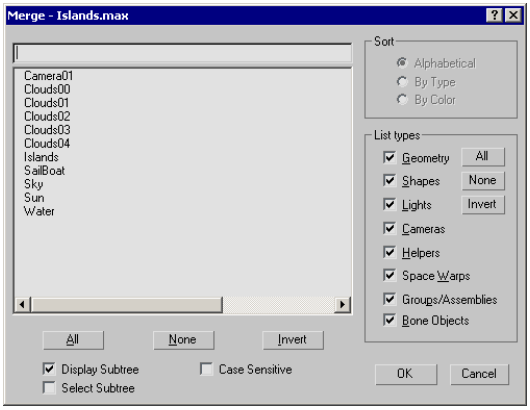
- Display or hide the subtree. If the subtree is not displayed, you can sort items in the list alphabetically or by type or color.
- Select the object types that you want displayed in the list box.
- Click All or None to select or clear all of the object types.

To select objects to merge, do any of the following:

- Enter the name of an item, or use wildcard characters to specify multiple items that share a set of characters in their names.
- Click to select single objects.
- Press CTRL and click to add and remove single objects from the selection.
- Press SHIFT and click to select all objects between the previously selected object and the current object.
- Click All or None to select or deselect the entire list.
- Click and drag to select items to merge from the list on the left.

Interface

In the standard file selector dialog, select the scene file to merge. To see more than one file type at a time, choose the All Files file type.



After you select a file, select the objects to merge in the Merge dialog. Either enter the object name or select the object from the Object List.

All/None—Selects all list items or no items.

Invert—Reverses the current list selection.

Display Subtree—Displays the objects in the list in an indented format. Turn off this option to activate the Sort group options.

Select Subtree—When this option is turned on, all items indented below the selected one are also selected.

Case Sensitive—Distinguishes between uppercase and lowercase for item names.

Sort group

Options allow you to sort the list on the left. If the Display Subtree check box is on, these options are not available.

Alphabetical—Sorts from A at the top to Z at the bottom.

By Type—Sorts by category, using the same order as the check boxes in List Types.

By Color—Sorts by object wireframe color.

List Types group

Determines which components in the scene are displayed in the list on the left: geometry, shapes, lights, cameras, helpers, space warps, or groups/assemblies. Group, assembly, and bone object names appear in brackets.

All/None—Turns all check boxes on or off.

Invert—Reverses the current status of check boxes.

Merge Animation

Select an object, group, or hierarchy > File menu > Merge Animation

Select a character assembly node > Modify panel > Character Assembly Rollout > Animation group > Insert Animation

Merge Animation merges (transfers) animation data from one object to another. Animation data can be transferred from one scene to another, or

between objects in the same scene. Animation data from several objects can be merged at the same time.

Within the Merge Animation dialog, objects eligible for transferring or receiving animation data are called *nodes*. *Source nodes* refer to objects from which animation data can be transferred, while *current nodes* can receive animation data. *Merge nodes* are source nodes that have been mapped to (matched up with) current nodes in the Merge Animation dialog in preparation for merging.

In order for a particular attribute's animation data to be transferred from a merge node, the corresponding current node must have the same attribute. For example, if a merge node has an animated Bend modifier applied to it, the current node must also have a Bend modifier applied to it for the animation data to transfer successfully.

The Merge Animation feature is ideal for transferring animation data between similar hierarchies, such as character structures. In character creation, it is a common practice to name bones for different characters with the character name plus a suffix or prefix that describes the bone. For example, you might have one character called Alien with bones named Alien_Pelvis, Alien_LeftHand, etc. Another character called Chef would have bones named Chef_Pelvis, Chef_LeftHand, etc. The Merge Animation dialog can automatically filter prefixes and suffixes so you can quickly map the merge nodes for complex hierarchies.

Note: If you plan to merge animation data to and from characters, the process will be much easier if you use the same bone-name prefixes or suffixes for each character.

See also

Merge (page 3–469)

Merging Effects (page 3–216)

Replace (page 3–476)

Procedure

To replace the animation in the current scene with the animation from another scene:

1. Load the scene that will receive the merged animation data.
2. Choose File menu > Merge Animation.
3. In the Merge Animation dialog, click Source File to choose the file from which to merge animation data. The objects appear under Source Nodes in the Object Mapping rollout.
4. On the Object Mapping rollout, drag and drop the source nodes to the Merge Nodes column, matching them with the appropriate current nodes.
5. In the Source Time Range group, choose Replace Animation.
6. Specify the source node attributes that will be merged.
7. Click Merge Animation to merge the animation data from the merge nodes to the current nodes.

To insert animation data from one character to another:

The Source Objects and Current Objects entry fields allow you to enter wildcard expressions to filter prefixes and suffixes of node names. The filtered text is ignored by the Auto Name Mapping tool, so complex structures of similarly-named nodes can be mapped quickly. This feature is handy for transferring an animation between character structures, providing the source and current nodes have been named with the same conventions.

1. Load the file with the character to which animation data will be merged.
2. Choose File menu > Merge Animation.

3. Click Source File and choose the animation source file.
4. In the Merge Animation dialog, under Source Objects, use a wildcard expression to specify multiple items that share a set of characters in their names. For example, if the character bones are named *Skater_Head, Skater_RFoot,* and so on, enter **Skater*** under Source Objects.
5. Click Refresh for Source Objects.
6. Under Current Objects, use a wildcard expression to filter the current nodes' prefix or suffix. Click Refresh.
7. Click Auto Name Mapping.

   Source nodes are placed in the Merge Nodes column, corresponding with current nodes with the same prefix or suffix.
8. Specify whether to replace or paste animation data from the source file. If pasting animation data, the frame times for the merge nodes are added to the current nodes.
9. Specify the source node attributes that will be merged.
10. Click Merge Animation to merge animation data from merge nodes to corresponding current nodes.

To insert animation from one character assembly to another:

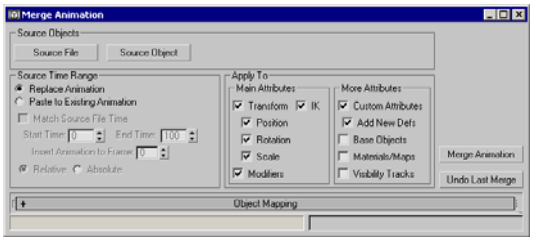
For *character assemblies (page 2–681)*, the Insert Animation feature can be used to merge animation data.

1. Load the file into which the animation data will be merged.
2. Select the character assembly node.
3. On the Modify panel, click Insert Animation. Select the source file from which animation data will be merged.
4. Follow the previous procedure from step 4.

To merge animation data from objects in the same scene:

1. Choose File menu > Merge Animation.
2. Click Source Object, and choose the object from which animation data will be transferred. This object and its hierarchy appear under Source Nodes in the Object Mapping rollout.
3. On the Object Mapping rollout, drag and drop source nodes to the Merge Nodes column, matching them with the appropriate current nodes.
4. Specify whether to replace or paste animation data from the source file. If pasting animation data, the frame times for the merge nodes are added to the current nodes.
5. Specify the source node attributes that will be merged.
6. Click Merge Animation to merge the animation data from the merge nodes to the current nodes.

Interface



The Merge Animation dialog has the following controls.

Source Objects group

Source File—Click to select a source file containing the animation data. Animation data from this file will be merged into the current scene. All objects in the scene are displayed under Source Nodes in the Object Mapping rollout.

Source Object—Selects a source object from within the current scene. If a source object is selected, the Source File selection is ignored.

Merge Animation—Merges the animation data based on settings on this dialog. Before animation data can be merged, Merge Nodes must be listed for their corresponding Current Nodes on the Object Mapping rollout. The progress bar at the bottom of the dialog shows the progress of the merge operation. After merging, this dialog remains on-screen so you can check whether the merge was performed properly before closing the dialog.

Undo Last Merge—Undoes the last merge. If the merge was not performed properly, you can change settings and try again.

Source Time Range group

Replace Animation—Completely replaces existing animation data in the current scene with the animation data from the source file.

Paste to Existing Animation—Appends the source file animation data to the existing animation data based on the following time parameters.

Match Source File Time—Sets the source time range to match the active time segment in the source file.

Start Time—Start Time and End Time set the frame range to merge from the source file. Start Time sets the first frame in the range.

End Time—Sets the end frame number to merge from the source file.

Insert Animation to Frame—Sets the start time in the current scene. Animation data will be pasted into the current scene starting at this frame. Any existing animation data in the current scene prior to this frame will remain the same.

Relative—Animation data pasted into the scene will change the current scene objects relative to their current status. For example, if an object in the source file is animated to move from the XYZ position 0,0,0 to 12,0,0, the object receiving the animation data in the current scene will start at its current position and move 12 units along the X axis.

Absolute—Animation data pasted into the scene will replace the current animation data. For example, if an object in the source file is animated to move from the XYZ position 0,0,0 to 12,0,0, the object receiving the animation data in the current scene will start at exactly 0,0,0 and animate to 12,0,0.

Main Attributes group

Specify the source file attributes whose animation data will be merged. Current nodes must have the same attributes as merge nodes for the attribute animation data to be merged.

Transform—Enables selection of Position, Rotation and Scale animation data for merging.

IK—Merges animation data of IK chains created with IK solvers.

Position—Merges Position transform animation data.

Rotation—Merges Rotation transform animation data.

Scale—Merges Scale transform animation data.

Modifiers—Merges animation data of modifiers. In order for animation data of a modifier to be transferred, the current object must already have the same modifier applied to it.

More Attributes group

Selects additional attributes to be merged from the source file.

Custom Attributes—Merges animation data of any custom attributes on source objects.

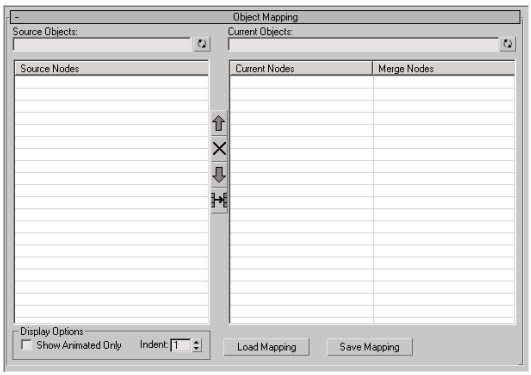
Add New Defs—Adds custom attribute definitions to the current object if it doesn't have the same definitions as the source object.

Base Objects—Merges animation data of parameters at the object base level. For example, if a sphere's Radius parameter is animated, checking this option will merge the Radius animation data. This option will also merge animation data at an object's sub-object level, such as the animation of vertices on a spline or Editable Mesh object.

Materials/Maps—Merges animation data of materials and/or maps.

Visibility Tracks—Merges animation data of visibility tracks.

Object Mapping rollout



Sets up a one-to-one correspondence (mapping) between source objects and current objects. Animation data on objects in the Merge Nodes column will be merged to the corresponding object in the Current Nodes column.

To move objects to the Merge Nodes column, drag them from the Source Nodes column, or use Auto Name Mapping to automatically map objects with the same names or partial names.

Source Objects—Allows you to specify wildcard expressions for filtering source objects. Click Refresh to view objects specified by the wildcard expression.

Refresh—Refreshes the display based on wildcard expressions entered in the Source Objects field.

Source Nodes—Displays the object selected with the Source Object option, and all its children. Objects with keyframed animation are listed in red, and objects with procedural controllers (such as a Noise or Expression controller) are listed in green. The display can be limited with wildcard expressions entered in the Source Objects field.

Current Objects—Allows you to specify wildcard expressions for filtering current objects. Click Refresh to view objects selected by the wildcard expression.

Refresh—Refreshes the display based on wildcard expressions entered in the Current Objects field.

Current Nodes—Displays objects in the current scene. Animated objects are listed in red. Display can be limited by wildcard expressions in the Current Objects field.

Merge Nodes—Lists the current objects that will receive animation data from the corresponding object under Current Nodes. To place an object in the Merge Nodes column, drag and drop the item from Source Nodes, or use Auto Name Mapping to automatically map objects with the same or similar names.

Move Up—Moves the selected Merge Node up one row.

Clear Selected—Clears selected entries under Merge Nodes.

Move Down—Moves the selected Merge Node down one row.

Auto Name Mapping—Automatically maps source objects to the Merge Nodes column, matching names with current objects. The mapping process filters any wildcard expressions entered in the

Source Objects and Current Objects fields. If no wildcard expressions are entered, source objects are mapped only to current objects with identical names.

Display Options group

Show Animated Only—Displays animated objects only.

Indent—Sets the number of characters by which child objects are indented in the display.

Load Mapping—Loads a previously saved *.mnm* file. This type of file can be loaded and saved only on the Merge Animation dialog.

Save Mapping—Saves the current mapping in an *.mnm* file. The name of the source file and the mapping of source and current objects are saved. This type of file can be loaded only with the Load Mapping option on the Merge Animation dialog.

Replace

File menu > Replace

Replace lets you substitute the geometry of one or more objects in a scene by merging objects with *duplicate* names. Use Replace when you want to work with less complex geometry to set up your scene and animation, and then replace it with more detailed geometry before rendering.

- When you replace an object in your scene, you replace its geometry, including its modifiers, but not its transforms, space warps, hierarchy, or materials.
- To replace the object with *all* its characteristics, use *Merge (page 3–469)*.
- If the object that you're replacing has instances in the scene, all of the instances are replaced with the new object.
- All objects in the scene with the same name as the incoming object are replaced by that object. If you have more than one object in the scene with the same name as the incoming object, all of those objects are replaced.

See also

Merging Effects (page 3–216)

Merge Animation (page 3–471)

Procedures

To replace items:

1. Choose File > Replace to display the Replace File dialog.

   To see more than one file type at a time, choose the All Files file type.
2. Select a file from which to choose replacement items.
3. On the Replace dialog for that file, choose a group or a replacement item. (See the following procedure.)

   An alert asks if you want to replace the materials along with the objects.

   - If yes, the materials from the incoming objects replace the current materials.
   - If no, only the geometry is replaced, while the material assigned to the original object is retained.

To select objects to replace, do one of the following:

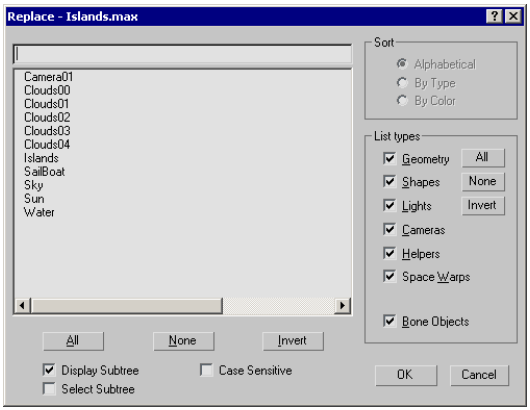
- Enter the name of an item, or use wildcard characters to specify multiple items that share a set of characters in their names.
- Click to select single objects.
- Press CTRL and click to add and remove single objects from the selection.

- Press SHIFT and click to select all objects between the previously selected object and the current object.
- Click All or None to select or deselect the entire list.

Interface

When you choose replace, a standard file selector dialog is displayed. Use the file selector to choose the scene file with the replacement objects. After you click Open, the Replace dialog is displayed.

Tip: In the file selector, you can see more than one file type at a time by choosing the All Files file type.



In the Replace dialog, select the objects to replace. Either enter the object name or select the object from the list.

All—Selects all objects in the list.

None—Deselects all objects in the list.

Invert—Inverts the current list selection.

Display Subtree—Displays object hierarchies in an indented format.

When this option is off, the Sort group is enabled.

Select Subtree—When this option is on, all items indented below the selected one are also selected.

Case Sensitive—When on, distinguishes between upper and lower case in object names.

Sort group

These are options for sorting the object list. If the Display Subtree check box is on, these options are not available.

Alphabetical—Sorts from A at the top to Z at the bottom.

By Type—Sorts by category, using the same order as the check boxes in List Types.

By Color—Sorts by object wireframe color.

List Types group

Determines which object types are displayed in the list: geometry, shapes, lights, cameras, helpers, space warps, or bone objects.

All—Turns on all check boxes in the group.

None—Turns off all check boxes in the group.

Invert—Inverts the current state of the check boxes.

Saving and Loading Animation

You can save and load animation data for any number of objects separately from the actual scene via Load Animation and Save Animation commands available on the File menu. These commands use two file formats:

- XAF (XML Animation File) contains the animation data.
- XMM (XML Animation Map File) contains mapping information: how the incoming animation data is assigned to objects in the current scene.

Mapping is quite flexible: as long as data is comparable, it can be assigned. For example, each key for both position and rotation animation contains three numbers, so you could, if you wanted, assign incoming position data to a current object's rotation track, or vice versa.

See also

Save Animation (page 3–481)

Load Animation (page 3–479)

Map Animation Dialog (page 3–483)

Procedure

To use the Save Animation and Load Animation commands:

You start by saving animation data from the current scene.

1. Select any number of objects in your scene that contain animation. The animation can be of any type: procedural, manually keyframed, IK, and so on.

   The frame range from which the animation is saved is the same for all objects, so make sure you select only objects from which you want to save the same frame range.

   You can save animation only from selected objects.

2. From the File menu, choose *Save Animation (page 3–481)*.

3. Set the save parameters.

   By default, the command saves all keys animated tracks from selected objects, including constraints. If you turn on Save Segment, you can then set a frame range from which to save animation.

4. Specify a file name and then click Save, or click the + button next to Save to increment the file name and save under the new file name.

   If the selected objects contain no savable animation, the message "No animation tracks to save" appears. If this happens, create animation to save or change the Save Animation parameters as needed.

   Next, you load the animation data.

5. Set up or load a new scene and then select any objects that are to receive the loaded animation.

   You can load animation only to selected objects.

6. From the File menu, choose *Load Animation (page 3–479)*.

7. Find and highlight the XAF file from which to load animation.

8. Click Load Motion. If the objects you're loading animation to are the same as those you saved the animation from, the animation loads and is mapped automatically. If mapping is required, you're given the opportunity to set it up. Or, if you've already set up mapping for the scene and incoming animation data, choose a mapping (XMM) file from the Motion Mapping/Retargeting drop-down list and then click Get Mapping. Otherwise, click Edit Mapping.

   Clicking Edit Mapping opens the *Map Animation dialog (page 3–483)*, which contains three lists: from left to right, Current, Mapped, and Incoming. The Current list shows selected objects in the scene and their animation tracks; the Incoming list shows animation tracks in the XAF file, and the Mapped list shows, for each track in the Current list, the animation track in the Incoming list that will map to it. In certain cases, such as with objects that have the same name, some tracks are mapped automatically and appear in the Mapped column as soon as you open the dialog. The tracks that are already mapped are shown in gray in the Current and Incoming columns.

9. To map a pair of tracks manually, click a track in the Current list and another in the Incoming list, and then click the left-arrow (<-) button to the left of the Incoming list.

   This places the name of the incoming track in the Mapped list, opposite the Current-list track to which it is assigned.

10. To remove a mapping assignment, click its entry in the Mapped list, and then click the -> button.

11. Continue setting up the mapping assignments as needed. When you're finished, click Save Mapping or Save Mapping As, and then specify a file name to save.

    After you save the mapping file, the Load Motion button becomes available, and you can proceed with loading the animation.

12. Click Load Motion.

    The animation data is loaded and assigned to the selected objects, and any animation keys appear on the track bar.

To retarget an incoming animation:

This is a continuation of the previous procedure, and explains the basic workflow of node retargeting. *Retargeting* means to scale the animation so it matches the objects onto which you are mapping the motion. You can use this feature any time you need to transfer an animation between two objects or rigs of different sizes and proportions. For example, an animation of a cat stretching could be retargeted to a bigger dog model, resulting in a scaled animation to fit the dog's skeleton.

Once your track-mapping assignments are complete, the Retargetable Nodes list on the Retargeting rollout displays the mappings available for retargeting.

For steps that describe retargeting a character rig, see *To retarget one character onto another (page 3–487)*.

1. First, in the Scale Origin group, choose the Incoming and Current objects to use as the origin and basis for scaling.

   For example, when retargeting a rig, you would use each rig's root object.

2. Next, in the Derive Scale Between Chains group, chose comparable IK or FK chains from the Incoming and Current models to obtain a Scale Factor that proportionally retargets the incoming animation onto the current model.

3. Click Set to apply the retargeting.

4. If different portions of the model are differently proportioned, you might need to repeat steps 2 and 3 for different selections of mapped tracks. You might also need to use the FK Retargeting Extent group to account for the different proportions. See *Retargeting Rollout (page 3–486)* for more details.

5. When you're finished, save your mapping to preserve the retargeted data, and then click Load Motion to apply the animation to the currently selected objects.

   Retargeting is essentially a "by hand" process. You might need to try different settings to get the result you need. You can remove retargeting by highlighting a mapped track in the Retargetable Nodes list, and then clicking Clear.

6. Close the Map Animation dialog.

Load Animation

Select one or more objects. > File menu > Load Animation

Load Animation lets you load animation from an XAF (XML Animation File) file to objects in your scene. Part of the animation-loading process is

mapping the animation; that is, specifying which objects in the scene are to receive the loaded animation tracks.

For a procedure that outlines the basic method of saving and loading animation, see *To use the Save Animation and Load Animation commands (page 3–478)*.

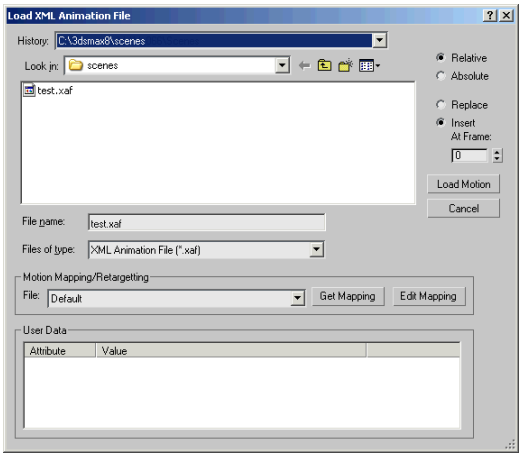
See also

Saving and Loading Animation (page 3–477)

Save Animation (page 3–481)

Map Animation Dialog (page 3–483)

Interface



File controls—The controls in the upper-left corner of the dialog are standard file-browsing controls.

Relative/Absolute—Determines how incoming animation affects existing values. Relative starts the loaded motion at the current values of the selected objects in the scene. Absolute sets the values of objects in the scene the scene to those of the motion; so, for example, it would move a character to a new location and start the animation there. Default=Relative.

Replace/Insert—Determines how existing keys are treated when the animation is loaded. Replace overwrites the keys in the scene with the incoming motion, starting at the chosen frame. Insert inserts the motion at the chosen frame and moves any subsequent, existing keys to the end of the incoming motion. Default=Insert.

At Frame—The frame at which the incoming animation is applied. Default=0.

Load Motion—If mapping information is available, loads the animation from the file specified in the File Name field and applies it to current objects according to the mapping information. If no mapping has been specified, you're given the opportunity to create a map file. If you then click Yes, the *Map Animation dialog (page 3–483)* opens, but if you click No, no animation is loaded.

Cancel—Closes the dialog without loading any animation.

Motion Mapping/Retargeting group

File—Shows the current mapping file, or "Default" if no mapping file has been chosen. Choose a mapping file from the drop-down list.

The list contains the most recently loaded mapping files. If the file you want to use isn't available in the list, use the Get Mapping button.

Tip: If the paths in the drop-down list are too long to see the file name itself, you can resize the dialog to make the dialog and the list wider.

Get Mapping—Lets you browse to load a mapping file. Use this if the file doesn't appear in the Use Mapping drop-down list. The file then appears in the list for easy reloading.

Edit Mapping—Opens the *Map Animation dialog (page 3–483)* for setting up animation assignments between incoming tracks and existing tracks. Available only after an animation (XAF) file has been chosen.

User Data group

The User Data list shows any user data present in the XAF file specified in the File Name field. User data can be created via the Save Animation dialog, or by editing the XAF file directly.

Save Animation

Select one or more animated objects. > File menu > Save Animation

Save Animation lets you store animation from your scene to disk in the XML Animation File (XAF) format. The XAF file format lets you save and load animation for any number of objects separately from the actual scene.

For a procedure that outlines the basic method of saving and loading animation, see *To use the Save Animation and Load Animation commands (page 3–478)*.

See also

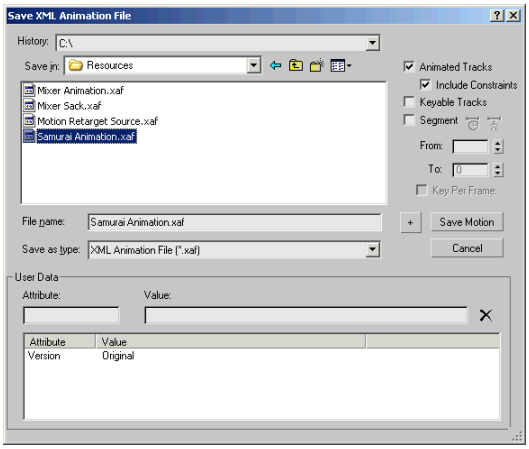
Saving and Loading Animation (page 3–477)

Load Animation (page 3–479)

Map Animation Dialog (page 3–483)

Interface

To use Save Animation, select the objects from which to save animation data, and then choose Save Animation from the File menu. Settings in the Save XML Animation dialog apply only to objects that are selected when you save the animation.



File controls—The controls in the upper-left corner of the dialog are standard file-browsing controls.

Animated Tracks—Saves only animated tracks. This is on by default, and should generally be left on.

- **Include Constraints**—When on, includes constraints. When off, animation accomplished only by constraints, such as the Link constraint, is not saved. Default=on.

  Note: This doesn't apply to constraints such as the *Path constraint (page 2–380)*. Because this constraint assigns the animation directly to the constrained object, rather than deriving it from the constraining object, Save Animation saves path-constrained animation even if Include Constraints is off.

Keyable Tracks—When on, saves only *keyable (page 2–505)* tracks with controllers, as defined in Track View. Turning this on allows keyless animation tracks to be saved. Default=off.

If both Animated Tracks and Keyable Tracks are on, any tracks that contain animation but are not keyable won't be saved. You can use this option to avoid saving tracks that aren't relevant to the scene into which you're loading the animation. For example, if you want to save constraint data, but not data from a LookAt constraint (because LookAt tends to be specific to the scene), you can

turn off Keyable for the LookAt track, and then save with Keyable Tracks on.

Note: Animated Tracks overrides Keyable Tracks. If a track is keyable but doesn't contain any animation data, and Animated Tracks is on, the track won't be saved even if Keyable Tracks is on.

Note: Tracks without controllers, such as nonanimated creation-parameter tracks, won't be saved even if Keyable Tracks is on. To save a nonanimated creation-parameter track, add a controller, turn off Animated Tracks, and turn on Keyable Tracks.

Save Segment—Lets you save a specific frame range, as opposed to the entire animation. Default=off.

- **Active Time Range**—Click to set the From and To fields to the currently active time range. Available only when Save Segment is on.
- **Objects Time Range**—Click to set the From and To fields to the time range that corresponds to the keys of the currently selected objects. Available only when Save Segment is on.
- **From**—Sets the starting frame for the range to save. Available only when Save Segment is on.
- **From/To**—Sets the ending frame for the range to save. Available only when Save Segment is on.

Key Per Frame—Saves an animation key per frame, thus "baking" the animation to keyframes.

This can be useful if you are applying a procedural animation, such as a dynamics simulation, to an object that won't be participating in a dynamics simulation in the target scene.

+—Increments the number at the end of the file name and saves the animation file with the new name. If the file name doesn't currently end with a number of two or more digits, clicking + appends "*01*" to the file name (before the extension), and then saves the file.

Save—Saves the animation using the current file name.

Cancel—Closes the dialog without saving any animation.

User Data group

These controls let you enter user attributes and names. This could simply be notes about the animation file, or they could be actual data for use by custom plug-ins and utilities.

To enter user data, type a value in the Attribute field, press TAB and type a value in the Value field, and then press ENTER to add the attribute and value to the list below. These values are saved with the XAF file and can be viewed with the Load Animation dialog.

Attribute—Enter an attribute name.

Value—Enter an attribute value. This can be any combination of alphanumeric characters. To add the attribute and value to the file, press ENTER while the cursor is in this field.

Delete User Data—Deletes the highlighted attribute from the list along with its corresponding value.

Attribute list—Shows all attributes and values in the file. To change a value, click the corresponding attribute in the list to highlight it and place it in the Attribute and Value fields, edit the Value field, and then press ENTER. You can also edit the Attribute field, but this creates a new entry.

To remove an attribute, highlight its name in the list and then click Delete User Data.

Map Animation Dialog

File menu > Load Animation > Open dialog > Edit Mapping

File menu > Load Animation > Open dialog > Load Motion > XML Animation dialog > Click Yes.

The Map Animation dialog lets you assign incoming animation tracks when using the *Load Animation (page 3–479)* command. The dialog is resizable and contains three rollouts: for setting up basic parameters, doing the actual mapping, and doing retargeting.

For a procedure that outlines the basic method of saving and loading animation, see *To use the Save Animation and Load Animation commands (page 3–478)*.

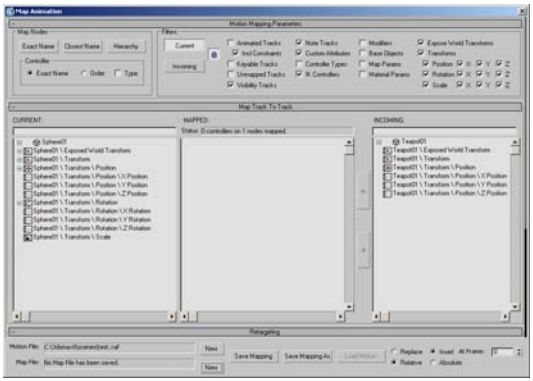
See also

Saving and Loading Animation (page 3–477)

Save Animation (page 3–481)

Load Animation (page 3–479)

Interface



Most controls on this dialog are contained in three rollouts:

Motion Mapping Parameters Rollout (page 3–484)

Map Track to Track Rollout (page 3–486)

Retargeting Rollout (page 3–486)

Motion File—Shows the path and name of the current animation (XAF) file.

- **New**—Click to display a file dialog and specify a new animation file to load.

  With this option, you don't need to return to the Load Animation dialog.

Map File—Shows the path and name of the current map (XMM) file.

- **New**—Click to display a file dialog and specify a new map file to load.

  With this option, you don't need to return to the Load Animation dialog.

Save Mapping—Click to save the current mapping assignments to an XMM file. If a file name is already displayed in the Map File field, it is overwritten; otherwise, 3ds Max displays a file dialog so you can enter a name for the new file.

Save Mapping As—Click to save the current mapping assignments to an XMM file using a different file name. This displays the Save XML Animation map file dialog.

Load Motion—Click to load the animation from the XAF file, and maps the animation tracks as specified.

This button is available only when the Map File field contains a valid map file name.

Replace / Insert—These options determine how existing keys are treated when you load an animation. Replace overwrites the current scene's keys (if any) with the incoming motion, starting at the chosen frame. Insert inserts the motion at the chosen frame and moves any existing keys to the end of the incoming motion. Default=Insert.

- **At Frame**—The frame at which the incoming animation is written (Replace) or inserted. Default=0.

Relative/Absolute—These options determine how incoming animation affects existing values. Relative starts the loaded motion at the current values of the selected objects in the scene. Absolute sets the values of objects in the scene to those of the incoming motion. For example, when you load a character animation, Relative starts the animation from the character's current position, while Absolute first moves the character to the position of the character in the scene from which the animation was saved. Default=Relative.

Motion Mapping Parameters Rollout

File menu > Load Animation > Open dialog > Edit Mapping

File menu > Load Animation > Open dialog > Load Motion > XML Animation dialog > Click Yes.

This rollout provides controls for automatically mapping animation tracks and for filtering tracks to reduce clutter.

Interface

Map Nodes group

These controls let you perform automatic mapping by name or hierarchical order. Mapping is done first by node (object) name, and then within each node's hierarchy by controller (track) name.

The default method of automatic mapping is Exact Name for both nodes and controller. When you first open the Map Animation dialog, any node/controller pairs whose names match exactly are automatically mapped. To change the mapping, remove any existing assignments in the Mapped list (highlight them and then click the -> button), and then choose an alternate method.

Exact Name—This maps node to node, by name. If the names do not match exactly, the tracks will not map, and the status line will report how many nodes did not map

Closest Name—Finds a match in the object names, and uses the Controller options (described below) to confirm the match.

For example, if the incoming is *R Toe 01* and the choice in the Current list is between *Right Index Toe* and *R Toe Helper*, it will look at the controller structure and compare by name, or type or order, and try to determine which node is the closest to the incoming. When the choice is close like this, the status line reports that there was another close match, and highlight the close, but unmapped, nodes in the incoming list in red.

Hierarchy—This option turns off the above options. It matches by node order; for example, *Bone01>Bone02>Bone03* would map to *Leg>Calf>Foot,* if Controller is set to Order and the leg is mapped to *Bone01*. The Hierarchy option ignores the names.

Controller—Determines how automatic mapping is performed within nodes:

- **Exact Name**—(The default.) Matches controllers by name, regardless of order. This applies specifically to lists, morph channels, maps, custom attributes, and any other tracks that are listed by a user-defined name that might be reordered for some reason.
- **Order**—This maps by controller order only, regardless of name or type, and it turns the other options off. For example, it will map the first controller in a list to the first controller in a list. If necessary, it "bakes" the animation by creating per-frame keys.

If any controllers are not mappable (for example, a Bezier controller getting mapped into a script), the status line will report the error and highlight the node that couldn't map in the incoming list.

Type—When on, allows mapping only between controllers of the same type. It prevents mapping between two controllers of different types. For example, a controller such as Noise and its parameters will map only to another Noise controller. Default=off.

Filters group

The Filters options are similar to those available in Track View: they enable viewing only certain types of tracks. Filtering is can be a help with large, complex animation setups, because it lets you focus on tracks of specific interest and ignore the rest.

The following information describes the action of filters that are on. Unless otherwise specified, when a filter is off, the track type it applies to is hidden. In some cases, a track will *not* be hidden because a different filter that is on permits display of that track.

Note: The Incoming list contains only animation tracks that were saved in the XAF file, so it cannot display unavailable tracks. For example, if you don't animate an object's creation parameters, toggling the Base Objects switch won't change the Incoming list contents.

Current/Incoming—Determines whether the filters are applied to the Current list or the Incoming list.

Lock—When the Lock button is on, the filters are applied to both lists. Default=locked.

When the Lock button is off, only one of these is active at a time, and 3ds Max remembers different sets of on/off values for the filtering parameters.

Animated Tracks—Displays tracks that contain animation keys.

Include Constraints—Displays constraint tracks, even if they are not animated.

Keyable Tracks—Displays tracks that are set to keyable, regardless of whether they contain animation.

Unmapped Tracks—When on, hides mapped tracks. When off, all tracks are displayed.

Visibility Tracks—Displays visibility tracks.

Note Tracks—Displays note tracks. When a note track is mapped, the notes are added to an existing note track in the current scene.

Custom Attributes—Displays custom attribute tracks.

Controller Types—Displays controller types (names) in the list. For example, the Position X track reads "Position X: Bezier Float."

IK Controllers—Displays any IK controllers.

Modifiers—Displays animatable modifier tracks.

Note: In order for modifier tracks to display in the Current column, the Base Objects filter must also be on.

Base Objects—Displays creation-parameter tracks for parametric objects such as Box and Sphere.

Map Parameters—Shows map tracks, such as Tiling for Bitmaps and Mix Amount for Mix maps.

Material Parameters—Shows tracks for materials; for example, animated Diffuse color values, Opacity, and so on.

Expose World Transforms—Displays tracks for world transforms. These let you map all transform animation between two objects using a single track, named *Exposed World Transform*.

Transforms—Enables or disables display of all transforms other than the exposed world

transforms. The toggles that follow control display of individual transforms:

- **Position/X/Y/Z**—The Position check box lets you toggle display of all Position tracks, while the X/Y/Z check boxes let you toggle display of the track for each axis.
- **Rotation/X/Y/Z**—The Rotation check box lets you toggle display of all Rotation tracks, while the X/Y/Z check boxes let you toggle display of the track for each axis.
- **Scale/X/Y/Z**—The Scale check box lets you toggle display of all Scale tracks, while the X/Y/Z check boxes let you toggle display of the track for each axis.

Map Track to Track Rollout

File menu > Load Animation > Open dialog > Edit Mapping

File menu > Load Animation > Open dialog > Load Motion > XML Animation dialog > Click Yes.

This rollout comprises three list windows. The left (Current) and right (Incoming) show node/controller hierarchies, as in Track View.

Because the Map Nodes group functions apply to highlighted tracks, you can use standard highlighting methods. Click to highlight an entry, CTRL+click to highlight multiple entries, and SHIFT+click to highlight a range. Also, in the Current and Incoming windows, you can right-click to open a menu that lets you highlight all tracks (Select All), invert the current highlighting (Select Invert), and turn off highlighting for all tracks (Select None).

In addition, you can use the right-click menu to expand and collapse any track with a - or + icon next to its name.

Interface

Current[list—Shows animation tracks for selected objects in the scene, using the same hierarchical display as Track View. Unassigned tracks use black characters, while assigned tracks use gray characters.

Status—This read-only field shows the number of controllers and the number of nodes mapped.

Mapped list—Shows tracks that have been mapped.

<-—Assigns the highlighted animation track in the Incoming list to the highlighted animation track in the Current list. The assignment then appears in the Mapped list, opposite the corresponding Current list entry.

If the two tracks don't contain comparable data, nothing happens when you click the button.

->—Removes the highlighted Mapped list entry.

Incoming list—Shows animation tracks in the loaded XAF file, using the same hierarchical display as Track View. Unassigned tracks use black characters, while assigned tracks use gray characters.

Retargeting Rollout

File menu > Load Animation > Open dialog > Edit Mapping

File menu > Load Animation > Open dialog > Load Motion > XML Animation dialog > Click Yes.

When you map an animation from one rig or object onto another, use this rollout to establish

retarget references between the incoming nodes in regards to their scale dependency. *Retargeting* means to scale the animation so it matches the objects onto which you are mapping the motion. You need to retarget only when the size or proportions of the incoming model differ from the size or proportions of the current model.

Retargeting applies to *any kind of animation,* from matching fight choreographies, to changing a weather balloon's fly-through trajectory over hills and valleys. The down side of this is that essentially you have to set up the scaling relationships by hand; the good news is that the steps are fairly straightforward, and that once you have retargeted, the settings are reusable for all animation mapped between the same two sets of objects.

While retargeting is a general-purpose feature, it is especially useful for transferring animation from one character to another, when the characters are of different sizes, and possibly of different proportions (for example, a human model to a gorilla, or vice versa). You can transfer IK animation onto an FK rig, or vice versa. There are some rules of thumb when you work with mapping character animation:

- In a walk cycle, the root of a character moves, and all other movement is typically rotation.

  Because of this, usually you want to map the root motion and the rotation tracks, and leave the others alone.

  The exception to this is when arms or other parts (tentacles?) are animated by IK. When IK is present, you need to take the additional step of mapping and retargeting the IK goals.
- The legs need to reach the "ground," and feet should not slide.

  Because of this, use the legs as the basis of recalculating the scale for the target character.
- Characters are usually symmetrical.

  Because of this, usually retargeting one limb does the trick for both.

  If a character's limbs are *not* symmetrical, retarget each of them individually. If the current model uses forward kinematics, then use the FK Retargeting Extent controls as well.

Procedure

To retarget one character onto another:

This procedure is not a detailed procedure, but an overall workflow. It assumes you have already saved the incoming character's animation, then loaded it onto the current character, as described in *To use the Save Animation and Load Animation commands (page 3–478)*.

Note: If the animation you are saving is unkeyed world-space animation (as opposed to IK or FK), turn off Animated Tracks when you save.

1. On the *Map Track To Track rollout (page 3–486)*, map the motion tracks of the incoming character's root to the current character's root.

   For example, if you are retargeting a *Biped (page 2–701)* onto another, you would map the incoming *Biped* object's position and rotation tracks onto the current *Biped*.
2. Map the rotation tracks of the incoming character's limbs onto the current character's limbs.

   There is one exception here: if a hand (for example) is going to use IK in the current scene, either don't map it at all, so you can animate it later, or if you are mapping from an FK model to an IK model, map the *Exposed World Transform* to transfer the incoming FK trajectories to current IK controls.
3. Go to the Retargeting rollout.
4. In the Scale Origin group, choose both the Incoming and Current root objects.

If the characters are symmetrical and have the same proportions, you can now choose all the mapped tracks in the Retargetable Nodes list. If the characters are not symmetrical, or their proportions are different, then you need to take further steps.

5. In the Derive Scale Between Chains group, choose the Start and End nodes of both Incoming and Current chains to correspond to either the left or right leg of the character: for example, *Thigh* to *Toe*.

   Read the Scale Factor that is set on the basis of the two chains.

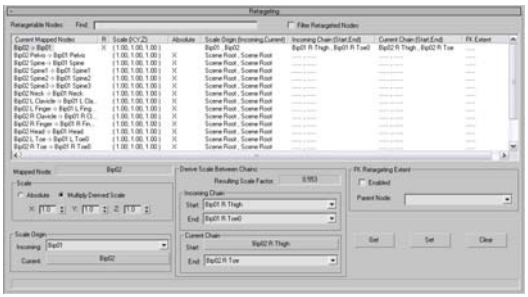
6. Click Set to retarget the highlighted mapped tracks.

   If the two current legs are not the same length, repeat step 5 for the other leg, then choose that leg's *Foot* (or *Toe)* node, turn on Enabled in the FK Retargeting Extent group, and choose the top of the leg (for example, *Thigh)* as the parent to use. Click Set.

7. Save the retargeted mapping file.

8. Click Load Motion to animate the current character, and then close the Map Animation dialog.

Interface



Retargetable Nodes list—This list shows the tracks that have been mapped using the *Map Track To Track rollout (page 3–486).* Each of these mappings can be retargeted.

The fields in this list are as follows:

- **Current Mapped Node—**Shows the node-to-node mapping, as in "CurrentObject->IncomingObject."
- **R—**When a mapping has been retargeted, this field shows an "X."
- **Scale (X,Y,Z)—**Shows the current scaling factor for each dimension of the current node.
- **Absolute—**When a mapping uses absolute scaling, this field shows an "X."
- **Scale Origin (Incoming,Current)—**Shows the incoming and current scale origins for this mapping. If the mapping hasn't been retargetted, this field shows "Scene Root , Scene Root."
- **Incoming Chain (Start,End)—**If the mapping has been retargeted, shows the incoming chain used to calculate scale.
- **Current Chain (Start,End)—**If the mapping has been retargeted, shows the current chain used to calculate scale.
- **FK Extent—**If a mapped track's FK extents have been recalculated, shows the parent node used in the recalculation.

Find—Enter a name to search for a particular object, then press ENTER. 3ds Max highlights matching entries in the list.

Filter Retargeted Nodes—When on, the list shows only those mappings that have been retargeted. When off, all mappings are listed. Default=off.

Mapped Node—Shows the currently highlighted mapped node. If more than one list entry is highlighted, shows "—Multiple—."

Scale group

- **Absolute—**When chosen, scaling for the currently highlighted mappings is absolute, and based on the XYZ settings in this group alone.

- **Multiply Derived Scale**—(The default.) When chosen, scaling for the selected mappings is based on both the XYZ settings in this group, and calculations from the Derive Scale Between Chains group and the FK Retargeting Extent group (if that is used).

X/Y/Z—You can use these fields to explicitly set the scaling factor for the currently highlighted mappings.

Scale Origin group

Incoming—Choose the incoming object from which to derive the scaling origin. This is a drop-down list obtained from the list of incoming nodes.

Current—Click to display a Select dialog and chose the current object from which to derive the scaling origin. The dialog shows all currently selected objects.

Typically, you set these two to be the incoming root node and current root node, whose motion tracks are already mapped.

Derive Scale Between Chains group

Resulting Scale Factor—Displays the scale factor derived from the Scale Origin and Incoming/Current Chain settings. Check this value to see that it matches the apparent difference in proportion between the objects or characters you are retargeting.

Incoming Chain—These controls set the incoming IK or FK chain to use in calculating the Scale Factor.

- **Start**—Choose the start of the incoming chain. This is a drop-down list obtained from the list of incoming nodes.

  When retargeting character animation, typically you choose the top of the incoming character's leg; for example, the thigh.

- **End**—Choose the end of the incoming chain. This is a drop-down list that is restricted to children of the incoming Start object.

  When retargeting character animation, typically you choose the end of the incoming character's leg; for example, the toe.

Current Chain—These controls set the incoming IK or FK chain to use in calculating the Scale Factor.

- **Start**—Click to display a Select dialog and choose the start of the current chain. The dialog shows all currently selected objects.

  When retargeting character animation, typically you choose the top of the current character's leg (using the same side as you used for the incoming chain).

- **End**—Choose the end of the current chain. This is a drop-down list that is restricted to children of the current Start object.

  When retargeting character animation, typically you choose the end of the current character's leg.

If a character's legs are symmetrical, which is usually the case, you only need to calculate the retargeting scale for one leg, and then Set that value to both. If the character's legs are *not* symmetrical, you need to calculate values for both legs, and also use the FK Extents controls (described below).

FK Retargeting Extent group

When the current model uses IK, 3ds Max knows the extent to retarget because it is defined by the IK solution. But if the current model uses FK, you should specify the extent of retargeting. For example, mapping rotation animation from a long leg to a short leg with different link lengths requires that the short leg's foot be chosen to retarget so it ends up meeting the floor in the same way the long leg does. In order for 3ds Max to know how far up the chain from the foot to do the retargeting, the parent of the desired chain (for

example, the thigh) must be specified. By defining the two chains to compare, 3ds Max can adjust the resulting rotations such that the feet don't slide.

When a character's limbs are not symmetrical, you can also use these controls to keep rotations proportional. First, highlight the current child (for example, a foot or toe) in the Retargetable Nodes list. Turn on Enabled, and then use the drop-down list to choose the upper parent (for example, the thigh) of the limb you are retargeting. Finally, click Set.

Enabled—Turn on to enable retargeting extents. Default=off.

Parent Node—Choose the current upper parent of the limb you are retargeting. This drop-down list is restricted to parents of the currently highlighted current object.

Get—Click to set controls in the Scale, Derive Scale Between Chains, and FK Retargeting Extents groups based on the currently highlighted mapping in the list.

If multiple mappings are selected, Get fetches the first highlighted mapping in the list.

Set—Click to apply the current Scale Factor to the mappings that are currently highlighted in the list.

Clear—Click to clear retargeting values from the mappings that are currently highlighted in the list.

Import

File menu > Import

Import loads or merges geometry files that are not 3ds Max scene files. See the following procedure for a complete list of file types you can import.

Procedure

To import a file:

1. Choose File menu > Import.
2. Choose an import file type from the Files Of Type list in the file selector dialog. To see more than one file type at a time, choose the All Files file type.

   3D Studio Mesh (3DS) (page 3–531)

   3D Studio Project (PRJ) (page 3–532)

   3D Studio Shape (SHP) (page 3–534)

   Adobe Illustrator (AI) (page 3–534)

   AutoCAD (DWG) (page 3–537)

   AutoCAD (DXF) (page 3–547)

   Autodesk Inventor (IPT, IAM) (page 3–553)

   Initial Graphics Exchange Standard (IGES) (page 3–567)

   FiLMBOX (FBX) (page 3–559)

   LandXML /DEM /DDF (DEM, XML, DDF) (page 3–590)

   Lightscape Solution (LS), Lightscape Preparation (LP), and Lightscape View (VW) (page 3–609)

   Motion Analysis Hierarchical Translation-Rotation (HTR) (page 3–624)

   Motion Analysis TRC (TRC) (page 3–626)

   Stereolithography (STL) (page 3–635)

   VRML (WRL, WRZ) (page 3–639)
3. Select a file to import.
4. For some file types, a second dialog appears, with options specific to that file type. Choose the import options you want.

Export

File menu > Export

Export converts and exports 3ds Max scenes in various formats. See the following procedure for a complete list of file types you can export.

See also

Export Selected (page 3–491)

Procedure

To export a file:

1. Choose File menu > Export.
2. Choose an export file type from the Files Of Type list in the file selector dialog.

   3D DWF (page 3–556)

   3D Studio (3DS) (page 3–533)

   Adobe Illustrator (AI) (page 3–535)

   ASC Scene Export (ASE) (page 3–535)

   AutoCAD (DWG) (page 3–545)

   AutoCAD (DXF) (page 3–552)

   Shockwave 3D (page 3–628)

   Kaydara (FBX) (page 3–562)

   Initial Graphics Exchange Standard (IGES) (page 3–569)

   Lightscape Material (ATR) (page 3–607)

   Lightscape Blocks (BLK) (page 3–602)

   Lightscape Parameter (DF) (page 3–608)

   Lightscape Layers (LAY) (page 3–607)

   Lightscape View (VW) (page 3–600)

   Lightscape Preparation File (LP) (page 3–591)

   Motion Analysis Hierarchical Translation-Rotation (HTR) (page 3–627)

   Stereolithography (STL) (page 3–636)

   VRML97 (WRL) (page 3–640)
3. Enter a name in the File Name field.
4. Depending on the file type you choose, you might be presented with options available for that export choice. If a second dialog appears, choose the export options you want.

Export Selected

Select one or more objects. > File menu > Export Selected

Export Selected exports selected geometry as 3D Studio Mesh (3DS), Adobe Illustrator (AI), ASCII Scene Export (ASE), 3D Design Web Format (DWF) or AutoCAD Drawing Interchange Format (DXF) files. 3ds Max also supports export to Shockwave 3D (W3D) format.

For information on what data 3ds Max exports for the supported formats, see:

Exporting to 3DS (page 3–533)

Exporting to Adobe Illustrator (page 3–535)

Exporting to ASCII (page 3–535)

Exporting 3D DWF Files (page 3–556)

Exporting to DXF Files (page 3–552)

Exporting to Shockwave 3D (page 3–628)

When you choose Export Selected, a file dialog appears, from which you can choose a type of format from the Save as type list.

Procedure

To export selected objects to a file:

1. Select one or more objects.
2. Choose File menu > Export Selected.
3. Enter a name in the File Name field.
4. From the Save As Type drop-down list, choose a file format.

5. Click the Save button.

Asset Tracking

Asset Tracking Dialog

File menu > Asset Tracking

The Asset Tracking feature provides direct access within 3ds Max to asset tracking systems (ATS), also known as providers. You use asset tracking systems to share files such as scene files and bitmaps used in materials with other members of your development team. With the Asset Tracking dialog, you can check files in and out, add files to the ATS, get different versions of files, etc., all from 3ds Max without the need to use separate client software.

Asset tracking provides full support for the Autodesk Vault data-management solution, and basic version-control support for other providers, such as Perforce and Microsoft SourceSafe. In general, asset tracking supports version-control providers that are capable of integrating into Microsoft Visual Studio, sometimes referred to as MSSCC support. This topic assumes usage of Autodesk Vault.

Note: When you have Vault installed, you can open files directly from the Vault database with the File menu command *Open from Vault (page 3–401)*. This command mimics the file open dialog, but browses the vault instead of the file system. In addition to opening the scene file, it downloads or updates any dependent scene files, such as bitmaps and XRefs.

Another important function of the Asset Tracking dialog is for *repathing*; locating missing files. For example, if you move bitmap files used by materials in your scene to the same folder as the scene file, the bitmaps will be loaded when you open the scene file, but the materials will still use the original, no-longer-valid path for the bitmap files, and the Asset Tracking dialog will show the files as missing. To resolve the incorrect paths, you can use the tools available from the Paths menu.

Note: The Asset Tracking dialog provides the principal functionality for working with the Vault data-management solution from within 3ds Max, but you can also work directly with Vault using the Vault Explorer client software, which is included with 3ds Max. To run Vault Explorer, go to Windows Start menu > Autodesk > Autodesk Data Management and choose Autodesk Vault Explorer. To learn more about using Vault Explorer, open the Autodesk Vault Explorer Help menu and choose Autodesk Vault Help Topics, or simply press **F1** while the Vault Explorer window is active.

See also

Open from Vault (page 3–401)

Prompts Dialog (page 3–499)

Asset Tracking Dialog Icons (page 3–499)

Procedure

To coordinate local files with Vault files:

For optimal coordination between your local files and those in the Vault, maintain a one-to-one correspondence between the folder structure in the database and the structure on your local drive (the *working folder* and its subdirectories), and keep all files that you'll be checking in and out in the local version of the structure. Create a local folder structure for Vault files and then use Options to map the top of the local structure to the top of the Vault structure (i.e., *Vault($)*).

1. Create a working folder on a local drive to contain all files to be coordinated with other

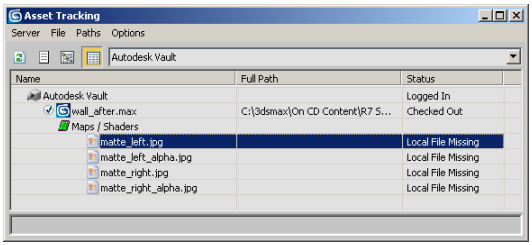
users via the Vault. For example, you could call the working folder *My_ Vault*.

2. Open the Asset Tracking dialog and log in to the tracking database if necessary.
3. On the Asset Tracking dialog, choose Server menu > Options.
4. On the Vault Options dialog, click the Change button and then use the Browse For Folder dialog to choose the folder you created in step 1.

   Tip: You can also use the Browse For Folder dialog to create this folder.

   Now, when you *open a file from the Vault (page 3–401)*, the folder structure in which the file resides in the Vault is replicated in your local folder, if necessary. Likewise, when you add a file to the Vault, the local structure is replicated in the Vault, if necessary. For example, if you open a character mesh from *Vault($)|max_files|characters|* and the file uses a bitmap stored in *Vault($)|max_files|characters|face_maps|*, the character mesh is stored locally in *My_ Vault|max_files|characters|* and the map file is stored locally in *My_ Vault|max_files|characters|face_maps|*.

Interface



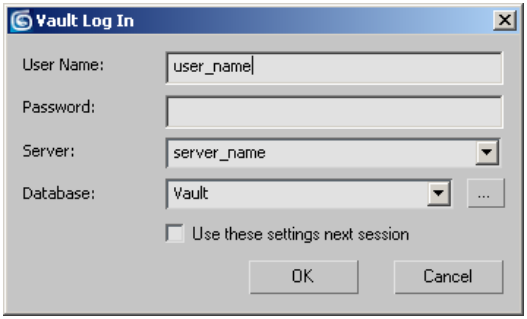
Menu bar

The menu bar provides access to most Asset Tracking functions. Most of the menu functions are also available from the right-click menu available in the dialog window.

Note: If you highlight and then CTRL+right-click one or more assets all of which reside in the same directory, a version of the Windows Explorer context menu opens. This lets you perform such functions as cutting or copying the file, or sending it to the desktop as a shortcut for easy access.

Server menu

Log in—Displays the Vault Log In dialog. Enter your user name, password, server name, and database, and then click OK. After entering a server name, you can click the ellipsis (...) button display all available databases and choose one from the dialog.

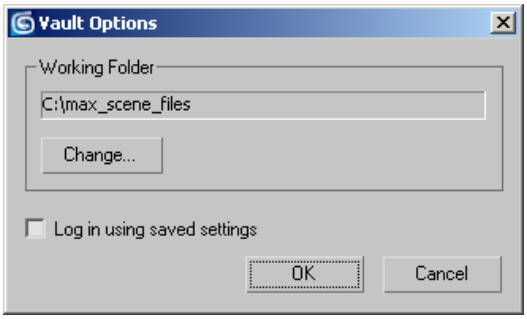


You can log in automatically in future sessions without having to use the Vault Log In dialog if you turn on "Use these settings next session." This also turns on Options > "Log in using saved settings."

The login settings are stored in the file *3dsmax8|plugcfg|ATSVaultLogin.ini*.

Log out—Logs you out of the database.

Options—Opens the Vault Options dialog, where you can view the *working folder* and specify a new one (click the Change button). Available only when logged in.



Important: The working folder is a folder on your local drive that mirrors the top-level folder of the provider database structure. For further information, see *this procedure (page 3–492)*.

You can log in automatically in future sessions, bypassing the Vault Log In dialog, if you turn on "Log in using saved settings." This also turns on Vault Log In > "Use these settings next session."

Launch Provider—Opens the database client program. This is the same as running the program from the Start menu. It doesn't necessarily open to the same database you're using in 3ds Max.

File menu

Most of the File menu commands are available only when you're logged in.

Checkout—Lets you check out the highlighted assets in the Asset Tracking dialog list of assets, if the assets are available for checking out. This opens a dialog that lets you confirm the checkout, specify whether to replace the local copies with the checked-out version, and enter a comment.

If you enter a comment, it's copied to the *Working Comment dialog*.

Tip: Always be sure to check out an asset before modifying it, even if you have a writable version on a local drive. This prevents other users from modifying the file at the same time, and lets you maintain strict version control over the asset.

Checkin—Lets you check in the highlighted assets in the Asset Tracking dialog list of assets. This opens a dialog that lets you confirm the checkin, specify whether to keep the assets checked out, and enter a comment. Also, if the assets have been edited but not saved locally, you're prompted to save first.

Checking in an asset increments the current version number of the asset as stored in the database, and saves the current Comment text along with the asset.

Undo Checkout—Reverses a checkout, setting the highlighted assets' status to checked in, without saving any changes.

Add Files—Lets you add files in the scene, such as bitmaps used in materials, to the provider database. To add a file, load it (such as a scene file) or add it to the scene (such as a bitmap used in a material), highlight it in the Asset Tracking dialog, and then use Add Files.

You can add multiple files at the same time.

Note: You cannot add a file that doesn't exist on a local drive, such as an unsaved scene file. Also, you cannot add a file that's not in the working folder, as specified via *Options*. For best results, before adding a file, make sure it exists in a local folder within a structure that mirrors the one in the Vault. For details, see *this procedure (page 3–492)*.

Get Latest—Downloads the most recent (highest-numbered) version of the highlighted asset from the database. Use this when a teammate has updated an asset such as a bitmap.

History—Opens a History dialog from which you can get any version of the highlighted asset. When the dialog opens, highlight the version to get by clicking it and then click Get Version. You can also right-click the asset and choose Get Version from the context menu.

Properties—Opens a read-only dialog that shows information about the highlighted asset such as vault and local locations, versions, and check-out status.

Get From Provider—Lets you copy files from the database to the local working folder. Use the Get Files dialog to navigate to the folder from which to get files, highlight any number of files, and then click Open. The highlighted files and any dependent files, such as bitmaps and XRefs, are copied to the local folder, using the same folder hierarchy as that of the database.

Working Comment—Opens a dialog that containing a common text buffer for the current session.

When you check out a file, any comment you enter in the Asset Tracking dialog is copied to the Working Comment dialog. You can edit this text at any point during the session. When you check a file back in, all Working Comment text appears in the Asset Tracking dialog; you can edit it as necessary without affecting the original text before completing the check in. The checked-in comments remain with that version of the file in the Vault.

Browse—Lets you browse the local directories for missing files such as bitmaps. Use the Browse dialog to find the file, and then click Open.

View Image File—Opens a window showing the highlighted image file. The file must be present in a local directory.

Reveal In Explorer—Opens a Windows Explorer dialog showing the location of the highlighted asset.

Custom Dependencies—Opens a dialog that lets you specify files to be dependents of the current scene; files that aren't necessarily present in the current scene but should be associated with it. On the Custom Dependencies dialog, click the Add button and then use the Add Custom Dependencies file browser to open dependent files.

The Custom Dependencies function lets you associate files that aren't true scene dependencies. A true dependent file is required for rendering, animation, exporting, etc. A custom dependency might be reference art work, a text file with scene documentation or tasks to accomplish, custom scripts, etc. Basically, any collection of files that should "travel along" with the scene.

One potential use for a custom dependency is as a way to perform simple project management. For example, you could add a file called *GameTitle-A.txt* as a custom dependency to any scene file associated with GameTitle-A. You could then instruct the provider client, such as Vault Explorer, to display all files that are dependent on *GameTitle-A.txt*, which would give you a list of files associated with that project.

Refresh—Reloads the asset listing from the local scene and updates the window contents.

Paths menu

The tools on this menu help you resolve file-path issues such as missing files. They include functionality also available in the *Bitmap/Photometric Path Editor Utility (page 3–511)*, but their integration into the Asset Tracking dialog helps speed the workflow of managing scene assets.

Highlight Editable Assets—Highlights all assets whose paths can be affected by the remaining commands on this menu.

For example, if your scene materials use bitmaps from a number of different folders, you could copy all the bitmaps to a common directory within your working folder, use Highlight Editable Assets to highlight all the bitmap assets, and then use Set Path (see following) to designate the common directory.

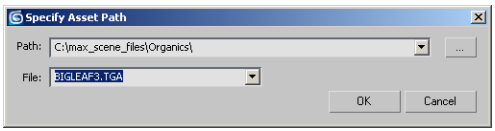
Set Path—Opens a dialog for editing the scene's record of the highlighted asset's or assets' path and,

in the case of a single asset, the file name. Both versions of the dialog include drop-down history lists for reverting to a previous path or file name.

The primary function for this command is to change the path pointed to by 3ds Max for existing assets whose locations have changed. However, for output files such as rendered images and render elements, you can also use Set Path to create and use new output directories. If you change an output path to one that doesn't exist, you're prompted to confirm that you want to create the folder(s). if you confirm, the output paths are changed in all appropriate locations, such as the Render Scene dialog.

The version of the dialog that appears depends on the number of highlighted assets:

- If a single asset is highlighted, you can change the path and the file name. The following dialog appears.

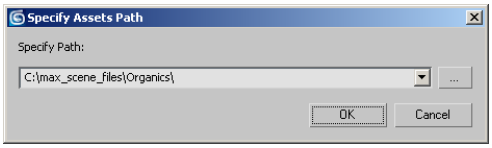


  To change the path, edit the Path field or use the ellipsis [...] button to browse for a new path. This changes the path only.

  To revert to a previous path, choose it from the drop-down list.

  To change the file name, edit the File field or choose a name from the drop-down history list. Note that this changes only the name of the asset file as pointed to in the scene; it doesn't change the actual asset file name. Use this to update the scene if the asset file name has changed.

- If multiple assets are highlighted, you can change the path but not file names. The following dialog appears.



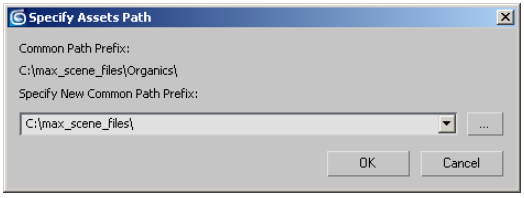
  The dialog shows the portion of the current path that the highlighted assets and lets you specify a new one, either by editing the Specify Path field contents or by clicking the ellipsis [...] button and browsing to a different path.

  For example, if two assets are highlighted, and one asset's path is *c:\max_files\maps1* while the other's is *c:\max_files\maps2*, the Specify Path field will show *c:\max_files*. Changing this changes the *complete* path for all highlighted assets. Of course, they must all be present there for the program to find them.

  To revert to a previous path, choose it from the drop-down list.

  To change only the portion of the path that all highlighted assets have in common, use Retarget Common Root (see following).

Retarget Common Root—Lets you change only the part of the path that all highlighted assets have in common. This command opens a version of the Specify Assets path dialog that shows the common path prefix for the highlighted assets and lets you specify a new one, either by editing the Specify New Common Path Prefix field contents or by clicking the ellipsis [...] button and browsing to a different path. Use Retarget Common Root for repathing multiple files, particularly those in different directories within the common root.



For example, if all maps were originally in various subdirectories within *c:|maps|* and the entire subdirectory structure was moved to *d:|resources|maps|*, you could repath all files simultaneously using Retarget Common Root.

To revert to a previous path, choose it from the drop-down list.

If you change the common root for *output* files to a path that doesn't exist, you're prompted to confirm that you want to create the folder(s). if you confirm, the output paths are changed in all appropriate locations, such as the Render Scene dialog.

Strip Path—Strips all path information from the highlighted assets, leaving only the file names.

Stripped path information is saved in the Set Paths dialog drop-down list. To restore stripped paths, highlight the assets, choose Paths menu > Set Paths, and then choose the desired path to restore from the drop-down list.

Resolve Path to UNC Location—Resolves highlighted paths that point to mapped drives to *Universal Naming Convention (UNC) format (page 3–1122)*.

Configure User Paths—Opens the *Configure User Paths dialog (page 3–852)*, which you can use to resolve locations for support files such as bitmaps.

Convert file paths to UNC—When on, paths shown in the Asset Tracking dialog for any added assets present on a mapped drive use *Universal Naming Convention (UNC) format (page 3–1122)*. When off, each path starts with the mapped drive letter (e.g., *w:|*).

This switch is linked to the *Convert file paths to UNC* switch on the Preferences dialog > Files panel. Toggling either one toggles both.

Note: This switch affects only newly added paths. Toggling it has no effect on existing paths. For example, if you add an asset from a mapped drive with the switch on, turning it off does not change the path to the mapped version.

Options menu

Disable Asset Tracking—Turns off asset-tracking functionality. Choosing this command logs you out of the database and makes most asset-tracking functions unavailable. To restore asset tracking, turn off Disable Asset Tracking and then log back in.

Prompts—Opens the *Prompts dialog (page 3–499)*, which lets you toggle two different options for each of various actions in the Asset Tracking dialog: actions and prompts.

Auto Login—Logs you in to the Vault, if necessary, whenever you cause a MAX scene file to be present in memory; for example when you load or save a scene. You can bypass the Vault Log In dialog If you've turned on Options dialog > "Log in using saved settings" or Vault Log In > "Use these settings next session."

Display Excluded Files—Displays files that are set to Excluded status. When off, these files aren't shown in the dialog window. For information about excluding files, see *Filtering Files (page 3–498)*. You can also set output files to Excluded status; see following.

Exclude Output Files—Sets output files such as rendered images to Excluded status; you can prevent the dialog from displaying such files by turning off Display Excluded Files (see preceding).

Tree View—Displays a simplified, hierarchical listing of the assets in the current scene. You can expand and collapse hierarchy branches by clicking the + and - icons to the left of the branch names.

Table View—Displays listing of the assets in the current scene in tabular format along with the full path and for the local version of each asset. The

branches are hierarchical, but cannot be expanded or collapsed.

Toolbar

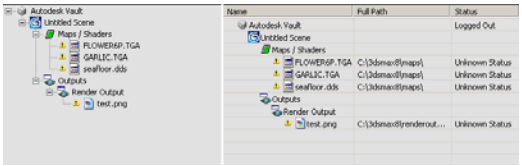
Refresh—Reloads the asset listing from the local scene and updates the window contents.

Status Log—Opens a read-only window showing all status messages received from the Vault during the current session.

Tree View—Displays a simplified, hierarchical listing of the assets in the current scene without path or status information. You can expand and collapse hierarchy branches by clicking the + and - icons to the left of the branch names.

Table View—Displays listing of the assets in the current scene in tabular format along with the full path and status for the local version of each asset. The branches are hierarchical, but cannot be expanded or collapsed.

[window]



Left: Asset Tracking dialog window in Tree View

Rightt: Asset Tracking dialog window in Table View

The Asset Tracking dialog window lists all assets in the current scene in a tree or table view, depending on the current setting. Listed assets include the scene file, any images used by the scene in materials, etc., XRefs, and photometric files. By default, output files such as rendered images also appear in the window listing; you can *turn off* display of these if you wish.

Also shown are icons for each assets showing the type of asset (3ds Max scene file, map branch, etc.) and status, as appropriate. Most status icons are documented in the Vault Explorer Help > Autodesk Vault Explorer Icon Reference topic. For a reference to the most common icons, see *Asset Tracking Dialog Icons (page 3–499)*.

Note: No status icons appear if you don't have any version-control provider installed.

In general, status errors can be resolved by being careful to coordinate the local folder/file structure with that of the Vault, as described in the above procedure.

You can access most dialog commands by right-clicking an asset in the window; the commands applicable to the asset are available in the context menu. These commands are the same as those documented above.

Filtering Files

You can configure individual asset-tracking-system providers via the provider configuration file, *ATSProviders.xml*, which resides in *3dsmax8|plugcfg*. 3ds Max reads this file, but doesn't write to it.

The primary configuration function is filtering. Filters define criteria the software uses to determine whether a file should be excluded from a provider's control. If a file is determined to be excluded from a provider, the file is never sent to the provider for status check or any other action. This feature is useful when using multiple providers within the same pipeline or if your studio still uses file servers for certain file types.

When a file is excluded, its icon is grayed out and its status message indicates that it is excluded. You can also toggle the display of excluded files in the dialog window with the *Display Excluded Files option*.

A example filter file, *3dsmax8|plugcfg|ATSProviders_Example.xml* is included with the software. The file includes comments, so you can load it into a text editor to see how it works and edit it. If you're using Autodesk Vault as your

provider, you can rename the provider field (in the <Provider> section, near the beginning of the file) to Autodesk Vault, as follows:

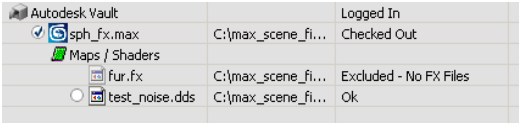
Change:

```
<Name>Sample Provider Name Example</Name>
```

to:

```
<Name>Autodesk Vault</Name>
```

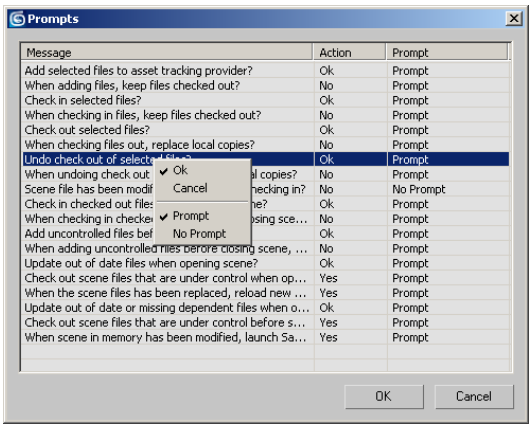
One of the effects of the example file is to exclude FX files, as shown in the following illustration:



Prompts Dialog

File menu > Asset Tracking > Asset Tracking dialog > Options menu > Prompts

The Prompts dialog lets you specify what happens when you perform a number of different functions via the *Asset Tracking dialog (page 3–492)*. For each message, you can choose an action and toggle the prompt using a right-click menu. If you turn off the prompt, the option you set on the top part of the menu takes place automatically.



Procedure

To set prompts for asset tracking:

1. From the Asset Tracking dialog > Options menu, choose Prompts.
2. Right-click the message to set prompts for.

   The right-click menu shows check marks next to the active settings. For each message, you have two options:

   - Yes/No or Ok/Cancel
   - Prompt/No Prompt
3. Change the options to suit your preferences.

   For example, if you know that you always want to keep files checked out that you add to the vault, set the option "When adding files, keep files checked out?" to Yes and No Prompt.

   The changed settings are saved with the program.

Asset Tracking Dialog Icons

The *Asset Tracking dialog (page 3–492)* uses a number of icons to indicate the status of assets listed in the dialog window. The following table lists these icons and describes their functions:

Icon	Meaning
	If no icon is displayed, the file is under version control, but you do not have a local copy of the file on your computer.
	File is under version control and available to be checked out. The version in your working folder is the same as in the provider. Also referred to as the Latest Version.
	File is under version control and available to be checked out, but the local version is newer than the latest version. This typically means that your local file was changed without checking it out.
	File is under version control and available to be checked out, but the local copy is out of date.

Icon	Meaning
	File is checked out to you and the local version is the latest.
	File is checked out to you and the local copy is newer than the latest version. This typically means that you made changes to the file since it was checked out but have not checked it back in.
	File is checked out by someone else, and the local copy is the same as on the provider. Also referred to as the Latest Version.
	File is checked out to someone else, but the local copy is newer than the latest version.
	File is checked out to someone else, but the local copy is older than the latest version.
	Status for the file could not be obtained. This typically means you are not logged into the provider.
	The file is not under version control.
	You are not logged in to the provider.
	You are logged in to the provider.

File menu > Archive

Archive creates a compressed archive file or a text file listing the scene bitmaps and their path names.

3ds Max automatically finds the files referenced in the scene and creates the archive file in the executables folder. During the archiving process, a log window is displayed.

Compressed archive files are created using an external program. You specify the name and location of the *archive program (page 3–870)* you want to use in the Files tab of the Preferences dialog.

Procedures

To set up an external archive program:

1. Choose Customize > Preferences.
2. Click the Files tab to display the Files panel.
3. In the Archive System group, enter the full path and executable file name, and any command-line option you want for your external archive program in the Program field.

To archive a file:

1. Choose File > Archive > Archive.
2. Enter a name for the archive in the File Name field.

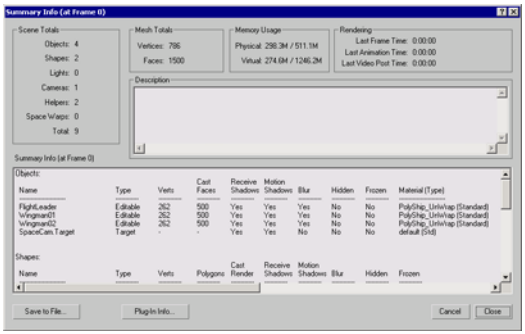
   Include the appropriate file extension (for example *.zip*).
3. Choose a file type: 3ds Max Archive or List Of Files.
   - To create an archive file, choose 3ds Max Archive in the Save As Type list. The archive file contains the scene plus all bitmaps used for the scene, including Video Post bitmaps.
   - To create a text file, choose List Of Files (*.txt) in the Save As Type list. The resulting file is an ASCII list of scene files.

Summary Info

File menu > Summary Info

Summary Info displays statistics about the current scene.

Interface



The Summary Info dialog includes the following information:

Scene Totals—Number of objects in your scene listed by type.

Mesh Totals—Total number of vertices and faces in the scene.

Memory Usage—Physical and virtual memory used and available.

Rendering—Time spent rendering the last frame, animation, and video post.

Description—Lets you enter notes about the scene. Information that you add to the Comments field on the *File Properties dialog (page 3–501)* will appear in the Description field and vice-versa.

Summary Info—Lists materials in the scene. The information is sorted by category and includes object name, assigned material name, type of material, object vertex and face counts, and so on. Materials are listed at the bottom of the list. Bitmaps used by the materials are listed with the materials. Environmental and atmospheric maps are listed separately. The Other Maps category lists all other maps used in the scene, such as Displace maps, and any maps assigned by third-party plug-ins.

Video Post maps are not included.

The buttons at the bottom of the Summary Info dialog have the following functions:

Save to File—Saves the contents of the dialog and descriptive text to a *.txt* (text) file.

Plug-In Info—Displays a subdialog with information about the *plug-ins (page 3–1089)* used in the scene. By default, the subdialog shows the name and a brief description of each plug-in.

Show Details—Shows information about all of the classes supported by each plug-in.

Show Used Only—Restricts the view to only those plug-ins that have been used in the scene.

File Properties

File menu > File Properties

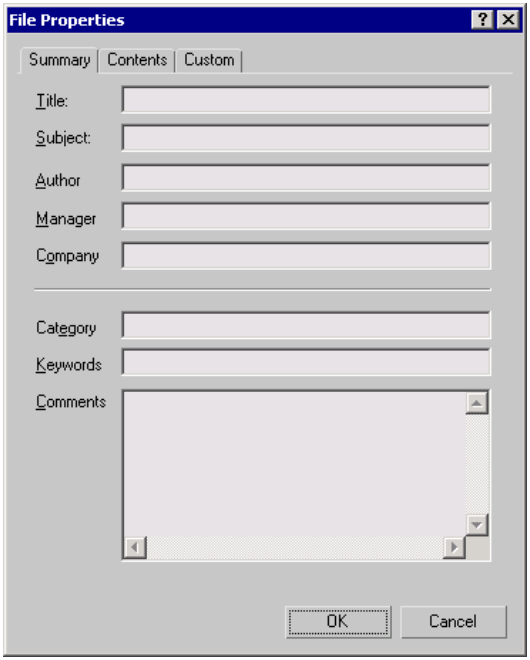
File Properties allows you to enter information about a scene that can later be read by Windows NT 4.0 or later and Windows 98 or later, using a program such as Windows Explorer to view the properties of the scene file.

This information can also be used to locate scene files with the *File Finder utility (page 3–511)*.

The Properties dialog comprises three tabs:

- The Summary panel displays predefined fields that are commonly used.
- The Contents panel displays scene information available after the scene had been saved.
- The Custom panel enables you to create new fields that can also be used by the File Finder utility.

Interface



Summary panel

Summary provides fields for entering information related to the saved scene. Many commonly used fields are available from the Summary tab. If there is a field you would like that is not represented in the Summary tab you can use the Custom tab to define new fields for information.

Title—Enter the title of your scene or animation here.

Subject—Enter the subject of your scene or animation here.

Author—Enter the author of your scene or animation here.

Manager—Enter the manager of your scene or animation here.

Company—Enter the name of your company here.

Category—Enter the category of your scene or animation here.

Keywords—Enter keywords that identify your scene here.

Comments—Enter personal comments here. Information that you add to the Description field on the *Summary Info dialog (page 3–500)* will appear in the Comments field and vice-versa.

Contents panel

When a scene is saved, a summary list of everything contained in the scene is generated and displayed in the Contents tab. If a scene has not been saved, the Contents tab remains empty.

Note: There is currently a bug in Windows NT 4.0 that causes the information in the Contents tab to look garbled when you view a MAX file in Windows Explorer. The problem has been corrected in Windows 98. Although the information looks garbled, it is internally correct and the File Finder utility can still read it.

Custom panel

The Custom panel lets you create custom fields. Custom is useful when there is more information that needs to be entered into the properties of a scene but there is no field or no room in the Summary panel.

Name—Enter the name of a custom field. You can manually enter anything you want into the Name field. A drop-down list provides commonly used field types.

Type—Specifies the type of information to be entered into the Value field: choose from Text, Date, Number, and Yes or No. This dictates the type of information to be entered into the Value field.

Value—Enter the data here.

Add—Adds the Custom properties entered into the Name, Type, and Value fields to the Properties list.

Delete—Removes a selected Custom property from the Properties list.

Properties—Displays all Custom properties entered into the scene.

View Image File

File menu > View Image File

Select and view still images, numbered image sequences, images in an *.ifl* file, or animation files using options in the View File dialog. Selected still images and numbered image sequences appear in the *rendered frame window (page 3–5)*.

If you select an *.ifl* file in the file dialog, the Info button displays the ASCII *.ifl* file in Windows Notepad.

You can zoom in and out and pan the image, even while a scene is rendering. If you have a Microsoft IntelliMouse, you can use its third-button/wheel to zoom and pan. See the following procedures.

If you select an animation file (*AVI (page 3–658)*, *FLC (page 3–662)*, or *QuickTime (page 3–670)*), the software starts the Windows Media Player so that you can play it. The Media Player has its own Help system.

Procedures

To view a file:

1. Choose File > View Image File.
2. Choose a file type from the Files of Type list.
3. Select a file to view.

   Note: The View File dialog uses the last location where a file was chosen, rather than the default Images path defined on the Configure User Paths dialog.

To zoom in the rendered frame window:

- Press CTRL and click.

To zoom out in the rendered frame window:

- Press CTRL and right-click.

To pan the rendered frame window:

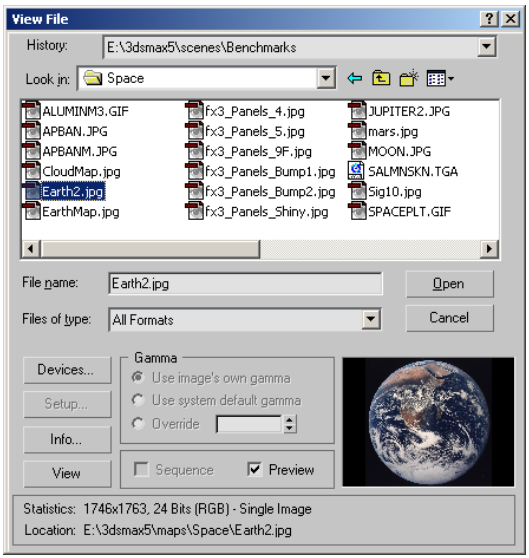
- Press SHIFT and drag.

To use a Microsoft Intellimouse to zoom and pan:

1. Roll the wheel to zoom in or out.
2. To pan, while zoomed in, press the wheel and drag. (You can use any third-button device to pan the image.)

   Note: You must select the *Pan/Zoom option (page 3–870)* in the Preferences dialog > Viewports page > Mouse Control group in order to use the third button for panning and zooming.

Interface



History—Whenever an image is selected, the path used is added to the top of the history list as the most recently used path.

File selections from other areas of the interface, such as Views > Viewport Background, are stored

here also. The history information is saved in the *3dsmax.ini* file.

Look In—Browses drives and directories.

File Name—Displays the name of the selected file.

Files of type—Selects the type of files to list in the directory window.

Devices—Lets you choose the hardware output device, for example, a digital video recorder. To use the output device, the device, along with its driver, and its plug-in must all be installed on your system.

Setup—This is unavailable in View Image File.

This option is available only in file dialogs like the Render Output File dialog or the Viewport Background dialog. Displays a dialog to specify image attributes for saved files or, in the Select Background Image dialog, the arguments for creating an *.ifl* file.

Info—Displays image information.

View—View the selected image or animation.

Sequence—This is unavailable in View Image File. This option is available in the Views > Viewport Background > Files > *Select Background Image dialog (page 1–42)*. It is used in conjunction with Setup to create *.ifl* files.

Preview—Toggle the image preview display.

Preview Window—Displays the selected image.

Gamma group

Use image's own gamma—Use image gamma.

Use system default gamma—Use system gamma.

Override—Specify gamma for the image.

Status group

Displays file statistics and the file's full directory path.

Exit

File menu > Exit

Exit closes 3ds Max. If you have unsaved work, you'll be asked if you want to save it.

Procedure

To exit the program:

1. Choose File > Exit.
2. Click the Yes, No, or Cancel button.

   If you click Yes the scene is saved, if you click No the scene is not saved, if you click Cancel the Exit operation is canceled.

   Note: You can also click the Close button (the X) in the upper-right corner of the 3ds Max window to exit.

Missing External Files Dialog

This dialog appears when you attempt to open or render a scene with *bitmaps (page 3–1011)* or photometric files (*IES (page 2–1172)*, *CIBSE (page 3–1015)*, *LTLI (page 3–1058)*) whose path is no longer current. This can happen if the bitmaps have been moved or deleted, or if the scene has been placed on a system with a different drive mapping than the system on which it was created.

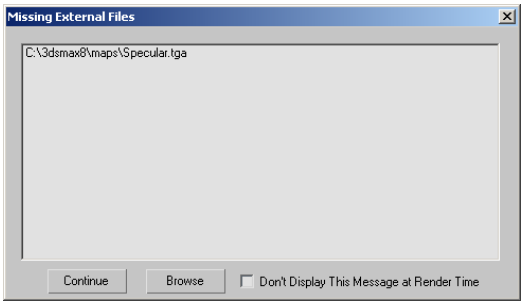
See also

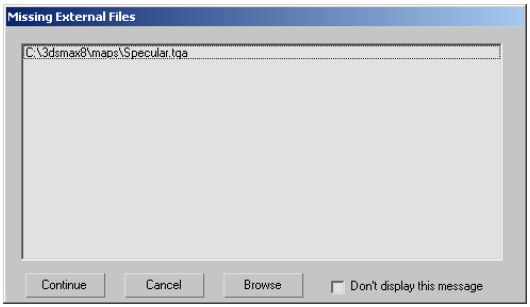
External Path Configuration (page 3–855)

Bitmap / Photometric Path Editor Dialog (page 3–517)

Interface

Two slightly different versions of the dialog exist: One appears when you load a scene that references missing files, and the other appears when you attempt to render such a scene.





Top: This dialog appears at load time.

Bottom: This dialog appears at render time.

List of external files—Lists the bitmaps or photometric files that cannot be located, along with their path names.

Continue—Opens or renders the file anyway, without loading the missing bitmaps or photometric files.

If you continue rendering the scene, the bitmaps do not appear, or the lights assigned missing photometric files will render using the default isotropic distribution.

Cancel—Cancels the render. This button appears only at render time.

Browse—Displays a Configure External File Paths dialog, to let you add the missing files' paths to the search sequence. This dialog has the same controls as the Configure User Paths dialog > *Configure External Files Paths panel (page 3–855)* .

Don't Display This Message at Render Time—Appears only when loading a scene with missing files. When on, the program does not display this dialog if you render the scene without resolving the missing files.

Don't Display This Message—Appears only at render time. When on, the software does not display the dialog the next time external files cannot be found.

File-Handling Utilities

Asset Browser Utility

Utilities panel > Utilities rollout > Asset Browser button

The Asset Browser provides access from your desktop to design content on the World Wide Web. From within the Browser you can browse the Internet for texture samples and product models. This includes bitmap textures (BMP, JPG, GIF, TIF, and TGA), or geometry files (MAX, DWG, and so on). You can drag these samples and models into your scene for immediate visualization and presentation. You can use the CTRL key to drag geometry into predefined locations. You can also use the Asset Browser to browse thumbnail displays of bitmap textures and geometry files on your hard disk or shared network drives. Then you can either view them or drag them into your scene or into valid map buttons or slots.

Note: The thumbnail display of a geometry file is a bitmap representation of a view of the geometry. Since the thumbnail display is not a vector-based representation, you can't rotate it or perform zooms on it.

You can drag most graphic images that are embedded in a Web page into your scene. The exception is images or regions of a Web page that are tagged as hyperlinks or other HTML controls

(such as when a bitmap is tagged as a button with hypertext links).

Important: Downloaded content might be subject to use restrictions or license of site owner. User is responsible for obtaining all content license rights.

Drag and Drop

You can assign files represented by the thumbnail images by dragging the thumbnails over various parts of the Asset Browser or the 3ds Max user interface. There are three basic methods of using drag in the Asset Browser :

Local Drag and Drop: You can drag thumbnails to the directory tree, and you can copy or move files from one directory to another. As the default, when you drag to a folder within the same partition or device, you perform a move. If you drag beyond the current partition or device (to another drive, for example), you perform a copy. If you hold down the CTRL key, you perform a copy regardless of the destination. If you hold down the SHIFT key, you perform a move. You can manipulate bitmap and scene thumbnails in this way.

Bitmap Drag and Drop: You can drag the thumbnails that represent bitmap files to any bitmap or map slot in the interface or onto any object in a viewport. You can also drag the thumbnails into the viewport background. When you drag a bitmap onto an object, the program creates a new standard material with the bitmap as the diffuse map and assigns the material to that object.

Scene Drag and Drop: You can drag the thumbnails representing *.max* scene files directly over an active viewport to merge the scene with the current scene. When you drag the thumbnail over the active viewport and release the mouse, the objects in the file appear attached to the mouse. Place them where you want them, and then click the mouse. Choose from the menu whether you want to open the file, merge the file to the current scene, or XRef the file. To cancel, you can select from the menu, or right-click. If you hold down the CTRL key, and drag the thumbnail over the active viewport, when you release the mouse button the objects in the dragged file will snap into their old location in their original file.

Tip: When you drop scene files into your current scene, you can use *AutoGrid (page 2–7)* to position the geometry file on an object.

Procedures

To drag scene files from the World Wide Web:

1. In the Address bar, enter the URL of the scene files on the World Wide Web.
2. Select the thumbnail of the scene file with your mouse and drag it over the active viewport.

   The *Internet Download dialog (page 3–516)* appears.
3. If you want objects placed in the viewport automatically, then in the Options group, turn off Place Objects When Download Completes.
4. If you skipped step 3 (that is, if Place Objects When Download Completes is still on), then when you release the mouse, the objects in the file appear attached to the mouse. Place them where you want them, and then click the mouse. Choose from the menu whether you want to open the file, merge the file to the current scene, or XRef the file. To cancel, you can select from the menu, or right-click. If you hold down the CTRL key when you drag the thumbnail, the objects in the file are placed at the world space origin of the current scene.

To drag thumbnails to the directory tree:

1. In the Asset Browser directory tree, make sure the place you want to copy or move the thumbnail to is visible.
2. Select the thumbnail with your mouse and drag it to the directory tree destination.

3. As a default, if you drag to a folder within the same partition or device, a move is performed. If you drag beyond the current partition or device (to another drive, for example), a copy is performed. If you hold the CTRL key down, a copy is performed, regardless of the destination. If you hold the SHIFT key down, a move is performed.

To drag bitmaps onto a map slot in the Material Editor:

1. Open the Material Editor and click the Maps rollout.
2. Open the Asset Browser and select the thumbnail of a bitmap with your mouse.
3. Drag the thumbnail to the map button of your choice on the Material Editor Maps rollout.

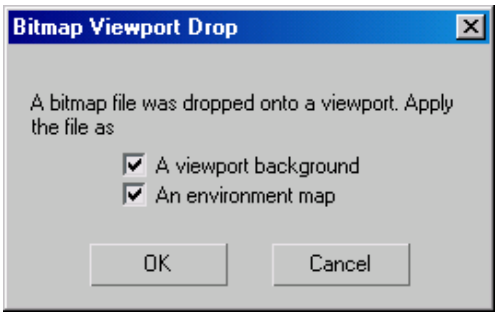
   This assigns the bitmap as a map type for use in the Material Editor.

To drag a bitmap onto an object in a viewport:

1. Select a thumbnail of the bitmap with your mouse and drag it onto an object in a viewport.

   Note: If you miss the object, the bitmap becomes the viewport background image.

   The Bitmap Viewport Drop dialog is displayed:



   A viewport background—Puts the bitmap into the viewport as a background.

   An environment map—Includes the bitmap when you render the viewport.

2. A new standard material is created. The bitmap is assigned to its diffuse component, and the new material is applied to that object.

To drag scene files from a local or shared disk:

1. From the Asset Browser's menu bar, choose Filter and then a geometry filter such as All Geometry, Importable Files, or 3ds Max Files.
2. Select the thumbnail of the geometry file with your mouse and drag it over a viewport.
3. When you drag the thumbnail over the active viewport and release the mouse, the merged objects appear attached to the mouse. Place them where you want them, and then click the mouse. Choose from the menu whether you want to open the file, merge the file to the current scene, or XRef the file. To cancel, you can select from the menu, or right-click. If you hold down the CTRL key when you drag the thumbnail, the objects in the file are placed at the world space origin of the current scene.

Interface

When you first start the Asset Browser, a window appears displaying the home page that is installed locally on your computer system.

Note: You can't change the *home page* for the Asset Browser.

Each subsequent time that you start the Asset Browser, it displays what was displayed last in the previous Asset Browser session.

The Asset Browser window contains:

- A *menu bar (page 3–508)*.
- A *toolbar (page 3–510)*.
- An *address bar*.
- A pane on the left displaying your computer system's directory hierarchy.
- A pane on the right displaying a Web page, thumbnails, or an Explorer view of file names.

At the bottom of the window, there is also a tabbed *favorites bar (page 3–510)* (by default, it first contains a Startup button) and a *status bar*.

Asset Browser menu bar

Contains the menus for the Asset Browser.

File menu

Contains commands for managing files.

Preferences—Displays the *Preferences dialog (page 3–515)*, with which you can manage the cache directory and control drag-and-drop operations.

Properties—Displays information about the file of the selected thumbnail.

Show Image—Displays the currently selected bitmap thumbnail in a *rendered frame window (page 3–5)*. You can also double-click a thumbnail. This does not work for geometry thumbnails.

Print—Prints the page displayed in the Web pane. Print is available only when a Web page is displayed.

Exit—Closes the Asset Browser window.

Filter menu

Filters the display of thumbnails according to the category or file type you select.

All images—Displays thumbnails of all supported bitmap files, such as BMP, JPG, GIF, TIF, and TGA.

All geometry—Displays thumbnails of all supported geometry files, such as DWG and MAX.

All in cache—Displays thumbnails of all images stored in your cache directory. When turned on, the left pane displaying the directory tree goes away, and the thumbnails you see might be in various directories. Because the thumbnails point to the correct directories, you can still use them to access the files and display or drag them to areas in the 3ds Max user interface.

Important: If a file has been subsequently renamed, deleted, or moved from the directory it was in when its thumbnail was first created, then the thumbnail represents only the thumbnail bitmap itself. If you assign that image to a map slot in the software, you'll be assigning the thumbnail bitmap rather than the original image.

All files (*.*)—Displays thumbnails for all files.

See the following topics for information on the file types listed on the Filter menu:

AutoCAD DWG Files (page 3–1024)

IGES Files (page 3–1048)

AVI Animation File (page 3–658)

BMP Image File (page 3–659)

Kodak Cineon (page 3–659)

CWS (Combustion Workspace) Files (page 3–660)

Autodesk FLIC Animation File (page 3–662)

GIF Image File (page 3–662)

Radiance Image File (HDRI) (page 3–663)

IFL Image File (page 3–666)

JPEG File (page 3–670)

PNG Image File (page 3–678)

Adobe PSD File Reader (page 3–678)

MOV QuickTime File (page 3–670)

MPEG Files (page 3–671)

SGI's Image File Format (page 3–683)

RLA Image File (page 3–680)

RPF Image File (page 3–681)

Targa Image File (page 3–683)

TIF Image File (page 3–684)

YUV Image File (page 3–685)

Thumbnails menu

Sorts and sets the size of the displayed thumbnails.

Create Thumbnails—Creates thumbnails for bitmap and geometry files.

Sort by Name—Sorts by file names.

Sort by Type—Sorts by file extensions.

Sort by Size—Sorts by file size.

Sort by Date—Sorts by file creation date.

Large (200X200)—Sets the size to large (200 by 200 pixels).

Medium (100X100)—Sets the size to medium (100 by 100 pixels).

Small (50X50)—Sets the size to small (50 by 50 pixels).

Display menu

Controls the display of:

- The left pane, where the directory tree displays your computer system's folders.
- The right pane, which can display files as thumbnails (a Thumbnail pane), or Web pages (a Web pane).
- The Favorites and status bars located at the bottom of the Asset Browser window.

Directory Tree—Turns the directory tree in the left pane on or off. The directory tree displays the available directories on your system. You can navigate and select the directories where you want to view images. When you select and enter a directory containing valid bitmaps, the Browser displays their thumbnails in the Thumbnail pane to the right. Right-clicking in the directory tree pane displays a menu allowing you to change directories, delete directories, and add a directory to your Favorites list.

Tip: To refresh the contents of the directory tree, press **SHIFT+F5**.

Favorites Bar—Turns the Favorites bar on or off. The Favorites bar is located at the bottom of the Asset Browser window.

Status Bar—Turns the status bar on or off. The status bar is located at the bottom of the Asset Browser window.

Thumbnail Pane—Displays valid bitmaps and geometry files of a selected directory as thumbnails in the right pane.

Thumbnail bitmaps for MAXScript files (*.ms*, *.mcr*, and *.mse*), dropScript files (*.ds*), and zipped script files (*.mzp*) display in the Thumbnail pane. By right-clicking the thumbnail, you can view the file, look at its properties, run the script, or open it in the Web Pane. By double-clicking the thumbnails for *.ms*, *.mcr*, and *.ds* files, you can open them in the MAXScript editor window. Double-clicking *.mzp* files will open them in the associated zip utility.

Explorer Pane—Displays valid bitmaps and geometry files of a selected directory as file name icons in the right pane. This is similar to how Windows displays file name icons in the Explorer.

Web Pane—If there's a file named *maxindex.htm* in the selected directory, the program displays it as a Web page in the right pane. You can use the *.htm* file to display selected bitmaps as a Web page. Also if you enter a URL in the address bar, the program displays the page in this pane.

Favorites menu

Adds and deletes Web sites and path names to the Favorites menu and the Favorites bar.

Add to Favorites—Displays the *Favorite Location dialog (page 3–517)*.

Delete All Favorites—Removes all Web site and path name shortcuts from the Favorites menu and the Favorites bar.

Browse menu

Allows you to refresh thumbnails and Web pages, to move forward and backward between recently viewed Web pages, to return to your home page, and to stop loading a Web page.

Refresh—For a Thumbnail pane, rereads the directory and redraws the thumbnails. For a Web pane, rereads the URL and redisplays the Web page.

Forward—For a Web pane, displays a Web page you viewed before clicking the Back button.

Back—Returns to the last Web page viewed in the Web pane.

Home—Returns to the local copy of the home page that is installed on your computer system. This is the page that displays when you first start the Asset Browser.

Stop—Stops loading a Web page. Use this button when a page you're trying to view takes too long to load.

Toolbar

The buttons on the toolbar provide some of the same functions as the menu items on the menu bar.

Back to previous page—Returns to the last Web page viewed in the Web pane.

Forward to next page—Displays a Web page you viewed before clicking Back to previous page.

Stop—Stops loading a Web page. Use this button when a page you're trying to view takes too long to load.

Refresh content—For a Thumbnail pane, rereads the directory and redraws the thumbnails. For a Web pane, rereads the URL and redisplays the Web page.

Homepage—Returns to local copy of the Browser home page that is installed on your computer system. This is the page that displays when you first start the Asset Browser.

Add to Favorites Bar—Displays the Favorite Location dialog that allows you to add Web sites and path names to the Favorites menu and the Favorites bar. When you want to open that page or view the files from a path name, you can click the appropriate shortcut button from the Favorites bar, or click the appropriate menu item from the Favorites menu

Address—Displays the current path name or URL. Clicking the history arrow at the right end of the address bar displays a list of recently viewed sites. You can select one of these to return to that site.

Favorites Bar

The Favorites bar is at the bottom of the Asset Browser window. It displays tabbed buttons for the startup page and for any shortcuts to directories and Web pages that you added to your favorites list. Right-clicking over a favorites tab that you've added displays a menu that you can use to *modify* *(page 3–517)* or delete the favorites.

Startup—Returns to the directory or Web page where the Asset Browser started in the current session.

Status Bar

The status bar is under the Favorites bar at the bottom of the Asset Browser window. The bar is divided into three sections. The first section displays a progress meter when the program loads thumbnails. The second section displays the current filter selection (such as "All in cache"). The third section displays messages, file names, or Web page shortcut labels when you move your cursor over such items.

Bitmap/Photometric Path Editor Utility

Utilities panel > Utilities rollout > More button > Utilities dialog > Bitmap/Photometric Path Editor

The Bitmap/Photometric Path Editor lets you change or remove the paths of *bitmaps (page 3–1011)* and photometric distribution files (IES) used in the scene. It also lets you see which objects use a resource in question.

By default, 3ds Max stores a path with the name of the files it references. This can be a problem when you share scenes among different users. Another user might have the same scene and resources, in the same directory structure, but on a different disk drive; this will cause the scene to "lose" the resources.

Removing paths from resource references eliminates this problem. When paths are not saved with the resource file, they are searched for in these directories:

1. The directory of the current scene.
2. The paths listed in the *External Files panel (page 3–855)*, starting at the top of the list.

Removing paths from bitmap and photometric references can be useful for *network rendering (page 3–169)* as well.

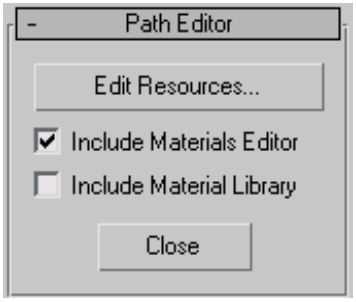
See also

Asset Browser Utility (page 3–505)

Configure Paths (page 3–852)

Resource Collector Utility (page 3–513)

Interface



Edit Resources—Click to display the *Bitmap/Photometric Path Editor dialog (page 3–517)*. Most of this utility's functionality is provided by this dialog.

Include Materials Editor—When on, the Bitmap Path Editor dialog shows materials in the Material Editor, as well as those assigned to objects in the scene. Default=on.

Include Material Library—When on, the Bitmap Path Editor dialog shows materials in the current material library, as well as those assigned to objects in the scene. Default=off.

Close—Click to close this utility.

MAX File Finder Utility

Utilities panel > Utilities rollout > More button > Utilities dialog >MAX File Finder

Run *maxfind.exe* in the 3ds Max root directory.

The MAX File Finder utility lets you search for MAX files containing specific properties, for example:

- Search the hard drive for all MAX files containing the "Pink Carpet" material.
- Search the 3ds Max program directory and below for all MAX files using the *raymtl.dlt* plug-in.

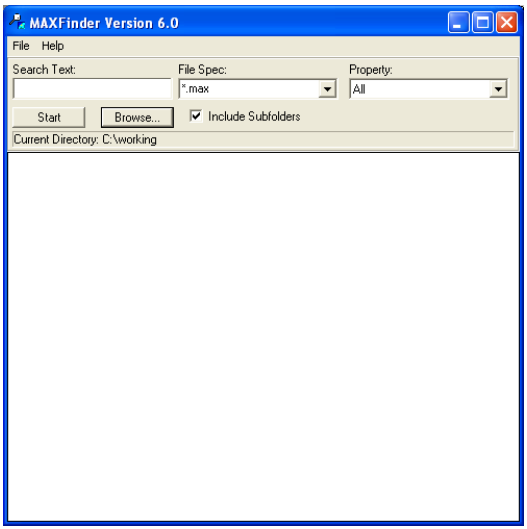
The utility comes in two formats: a standard utility, and a standalone executable. Both work identically.

File Finder demonstrates how to read a MAX file's properties from an external application. These properties include predetermined data such as object and plug-in names, plus information you provide via the File menu > Properties dialog. You can also view this data from outside the software with Windows Explorer or an equivalent program by viewing a file's properties.

Tip: You can combine this tool with the powers of the Properties dialogs. If you have a team of animators, you can have the individual animators use the File menu > Properties dialog to create Categories, Keywords and Comments that you can search for using the File Finder. They can also use the Contents and Custom Tabs as well. All are searchable using the Finder.

You can also create similar structures at the Object level. The *Object Properties dialog (page 1–111)* has a User Defined tab to enter any properties you like, and use that to organize your projects.

Interface



File menu

Reset—Clears the list box of any files previously found.

Exit—Exits the application

Help menu

About—Displays something fun to play with while Finder is searching for files. The search continues in the background while this dialog is active.

Program window

Search Text—Specifies the text to search for. If you leave the field empty, all files that contain the specified property will be found.

File Spec—Specifies which file types to search through. The predefined file type is **.max*. You can enter a different file type, such as **.dwg*. To search through all files, use *.*.

The currently selected item in this list is restored the next time you run Finder.

Property—Specifies the property you want to search for. Use All to search for any property.

Start—Activates the search. During a search, the button title switches to Cancel. Click Cancel to abort the search.

Browse—Specifies the directory for the search, using the standard Windows Browse for Folder dialog.

Include Subfolders—When on, Finder searches the current directory and all subdirectories. When off, only the current directory is searched.

File List—Lists all files that were found and match the current search criteria.

Double-click a found file in this list to display the property viewer for the file. The information presented in this dialog is the same that is displayed with File menu > Properties inside the software.

Use the << and >> buttons to step to the previous or the next file in the found list.

While in the property viewer, the search continues in the background.

Resource Collector Utility

Utilities panel > Utilities rollout > More button > Utilities dialog > Resource Collector

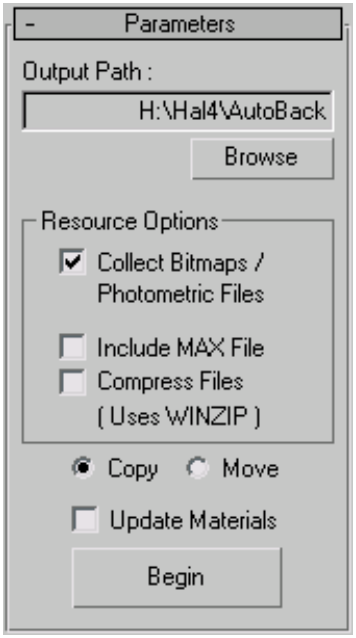
The Resource Collector gathers the resource files used by a scene (*bitmaps (page 3–1011)*, photometric distribution files (IES), and optionally, the scene itself into a single directory.

Warning: The Resource Collector does not collect maps used for displacement mapping or as light projections.

See also

Bitmap/Photometric Path Editor Utility (page 3–511)

Interface



Output Path—Displays the current output path. This can be changed using the Browse button.

Browse—Click to display a Windows file dialog that lets you choose the output path.

Resource Options group

Collect Bitmaps/Photometric Files—When on, the Resource Collector places the scene's bitmaps, and photometric files, in the output directory. Default=on.

Include MAX File—When on, the Resource Collector places the scene itself (the *.max* file) in the output directory. Default=off.

Compress Files—When on, compresses the files into a ZIP file, saved in the output directory. Default=off.

Copy or Move—Choose Copy to make a copy of the files in the output directory. Choose Move to move the files (they are deleted from the directory in which they originally were saved). Default=Copy.

Update Materials—When on, updates material paths. Default=off.

Begin—Click to collect the resource files according to the settings above this button.

Fix Ambient Utility

Utilities panel > Utilities rollout > More button > Utilities dialog > Fix Ambient

The Fix Ambient utility solves a compatibility problem that sometimes occurs when you use 3ds Max to open files from earlier versions of 3ds Max or Autodesk VIZ.

In 3ds Max, the *ambient (page 3–1002)* and *diffuse (page 3–1023)* color channels are locked for standard materials. However, this was not always the case with earlier versions of 3ds Max

and Autodesk VIZ. As a result, files might render differently than expected.

The Fix Ambient utility looks for standard materials in the current scene whose ambient and diffuse colors are different, presenting you with the option to copy the diffuse color to the ambient color channel. This will ensure that your renderings are consistent with earlier versions of products.

Interface

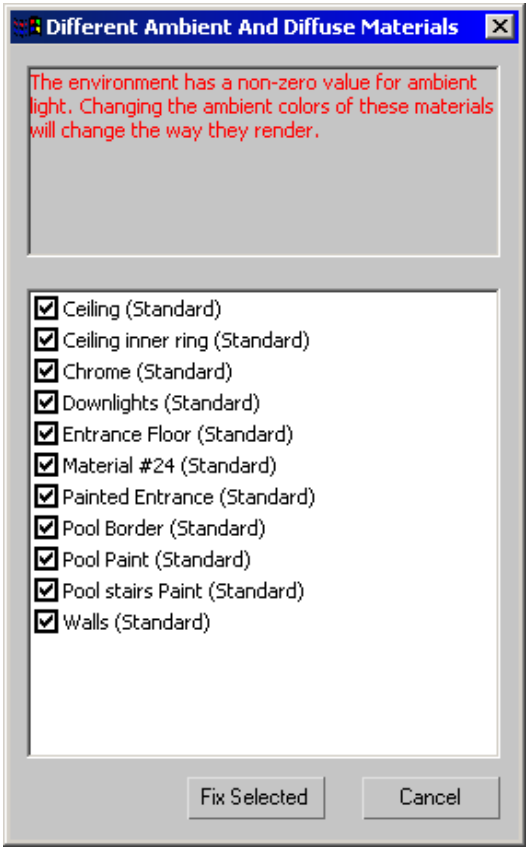
Find All— The utility searches the entire scene for materials with different ambient and diffuse colors.

Find Selected— The utility searches the current selection for materials with different ambient and diffuse colors.

Help— Opens the help file to this topic.

Different Ambient and Diffuse Materials

This dialog appears after clicking Find All or Find Selected.



Status Message— This area displays a message indicating whether your scene (or selection) has materials with different ambient and diffuse values.

Material List— Lists all of the materials with different ambient and diffuse values.

Fix Selected— Locks the ambient and diffuse channel for the materials selected in the dialog.

Cancel— Closes the dialog without making any changes.

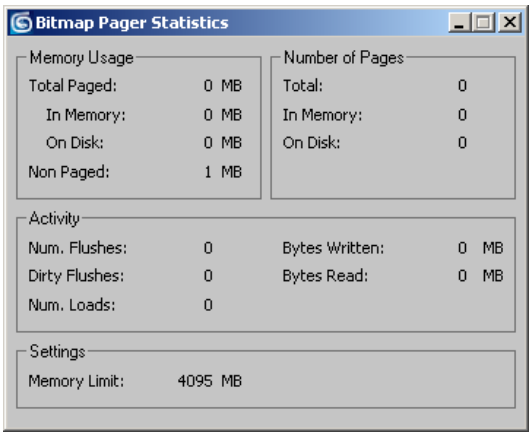
Bitmap Pager Statistics Dialog

Customize menu > Customize User Interface > Category: All Commands or Render > Action: Bitmap Pager Statistics Toggle > Assign to hotkey, menu, etc.

The Bitmap Pager Statistics dialog provides information that helps you resolve issues with scenes that require large amounts of memory for texture maps. It is intended for advanced users to debug scenes and help shorten render times.

By default, the dialog is not available in the interface; it must be added as a hotkey, menu item, or toolbar button via *Customize User Interface (page 3–836)* functionality.

Interface



The dialog is read-only, and shows statistics in four categories:

- Memory Usage
- Number of Pages
- Activity
- Memory Limit

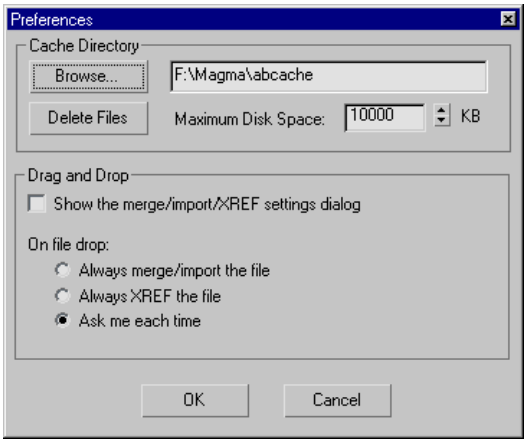
Asset Browser Subdialogs

Preferences Dialog (Asset Browser)

Utilities panel > Utilities rollout > Asset Browser button > File menu > Preferences

Contains the settings with which you can manage the Asset Browser's cache directory and control drag and drop operations.

Interface



Cache Directory group

Provides settings and controls for the cache directory.

Browse—Displays the Choose Cache Directory dialog where you can specify a new directory to use for your cache. The adjacent text box displays the path of the cache directory where the thumbnail images are stored. You can change the path either by editing the field or choosing a directory from the pane below the Folders field.

Note: When you change directories, you're asked if you want to clear the cache from the previous directory. If you choose to do so, the program

erases all thumbnail files from the cache directory you were using previously.

Delete Files—Removes all thumbnail files from your cache directory.

Maximum Disk Space—Sets the maximum size of the cache directory. When you exit Asset Browser, the program selects the size of the cache directory. If it's over the maximum size, the program deletes the oldest thumbnail files until the total size is 50 percent of the Maximum Disk Space setting.

Drag and Drop group

Provides controls for importing or linking files after dragging and dropping them into a viewport.

Show the merge/import/XREF dialog—Displays the merge/import/XREF dialog after you drop a file into a viewport.

Always merge/import the file—Imports the file without prompting for confirmation after you drop it into a viewport.

Always XREF the file—Links the file as an XREF without prompting for confirmation after you drop it into a viewport.

Ask me each time—Displays a popup menu to confirm importing or linking after you drop a file into a viewport.

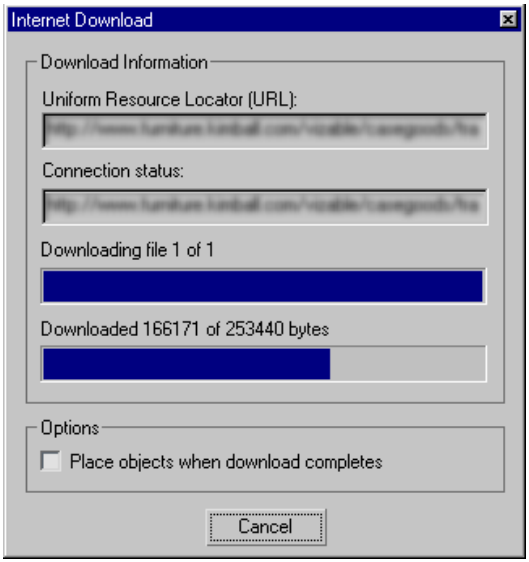
Internet Download Dialog

Utilities panel > Utilities rollout > Asset Browser button > Address bar > Enter URL of geometry files on World Wide Web. > Drag thumbnail over active viewport.

Menu bar > Tools > Asset Browser > Address bar > Enter URL of geometry files on World Wide Web. > Drag thumbnail over active viewport.

When you drag geometry files from the World Wide Web using the Asset Browser, the Internet Download dialog appears. How long this dialog remains on-screen depends on the size of the file you're downloading.

Interface



Download Information group

Displays the URL of the download, the pathname of the file being saved, and a meter indicating the bytes downloaded.

Uniform Resource Locator (URL)—Displays the URL and file name that you're downloading.

Saved as Local File—Displays the pathname of the file being saved as a result of the download.

Options group

Specifies whether or not to place the objects when the download is complete. If you leave this option selected, 3ds Max allows you to position the mouse at the location of your choice.

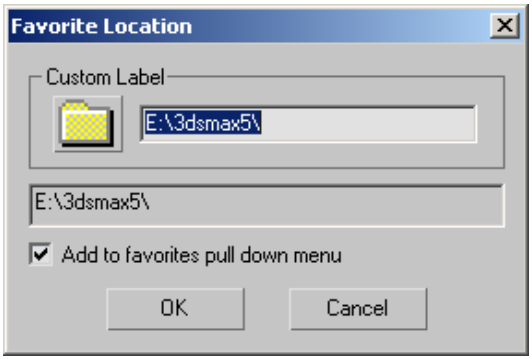
Favorite Location Dialog

Utilities panel > Utilities rollout > Asset Browser button > Favorites menu > Add to Favorites

Menu bar > Tools > Asset Browser > Favorites menu > Add to Favorites

The Favorite Location dialog allows you to add Web sites and path names to the Asset Browser Favorites menu and Favorites bar. When you want to open that page or view the files from a pathname, you can click the appropriate shortcut button from the Favorites bar, or click the appropriate menu item from the Favorites menu.

Interface



Custom Label

The button displays the Load Custom Icon dialog. Use this dialog to select an icon file to associate with the Web site or path name you're adding to the Favorites. You must use icon files that have an *.ico* extension.

The text box adjacent to the button displays the URL of the Web page, or the path name that you're adding to the Favorites. You can edit this to wording of your choice. The unedited URL or pathname displays in the label below the Custom Label group.

Add to favorites pull down menu—When you turn this on, Web site or path-name shortcuts are added to the Favorites menu. When this box is not selected, the Web site or path-name shortcuts are added only to the Favorites bar.

Bitmap Path Editor Subdialogs

Bitmap / Photometric Path Editor Dialog

Utilities panel > Utilities rollout > More button > Utilities dialog > Bitmap/Photometric Paths > Edit Resources button

This dialog is the main part of the interface to the *Bitmap / Photometric Path Editor utility (page 3–511).*

See also

Asset Browser Utility (page 3–505)

Missing External Files Dialog (page 3–504)

Resource Collector Utility (page 3–513)

Procedure

To correct the path name for a missing map:

You must first locate the missing bitmap or photometric files. The Windows Search program can help you with this.

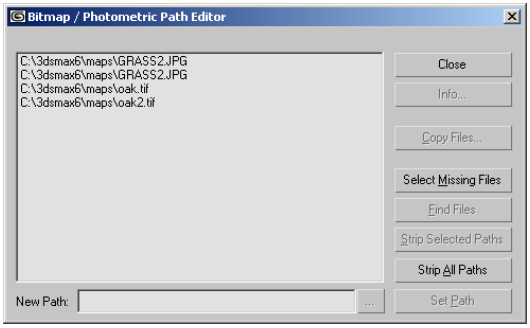
1. On the Bitmap / Photometric Path Editor dialog, click Select Missing Files.
2. Click to select a single missing file in the list.

   If a group of missing files are in the same directory, you can leave all of them selected.
3. Click Strip Selected Paths.
4. Click Set Path.

5. Enter the correct path in the New Path field, or click the "..." button to browse to the correct path in a Windows file dialog.

   The Bitmap/Photometric Path Editor updates the selected maps' path to use the new path.

Interface



List of maps and photometric files—Shows all bitmaps and photometric files (*IES (page 2–1172)*, *CIBSE (page 3–1015)*, *LTLI (page 3–1058)*) used in the scene, along with their current path.

When no file is selected in the list, the only controls available in the dialog are Close, Select Missing Maps, and Strip All Paths.

Close—Click to close the dialog.

Info—Click to display a *Resource Information dialog (page 3–518)*.

This button is available only when a single file is selected in the list.

Double-clicking a name in the list is another way to display the Resource Information dialog.

Copy Files—Copies the selected files to a directory you choose. This button displays a Windows file dialog that lets you choose the destination directory.

Select Missing Files—Highlights the names of missing files in the list.

Find Files—Click to search for the maps or photometric files in the current selection. This button displays an alert that shows how many files are findable, how many files are missing.

Strip Selected Paths—Click to strip the path from the selected files. An alert appears to warn you that the scene will lose this information.

Strip All Paths—Click to strip the path from all files in the list. An alert appears to warn you that the scene will lose this information.

Set Path—Click to apply the New Path field to the selected files.

If the New Path field is identical to the selected file or files, clicking Set Path clears New Path.

New Path—Lets you enter a path for the currently selected file or files. Default=The path of the currently selected file, or none if multiple files with differing paths are selected.

"..." button—(To the right of the New Path field.) Displays a Windows file dialog to let you browse for a path.

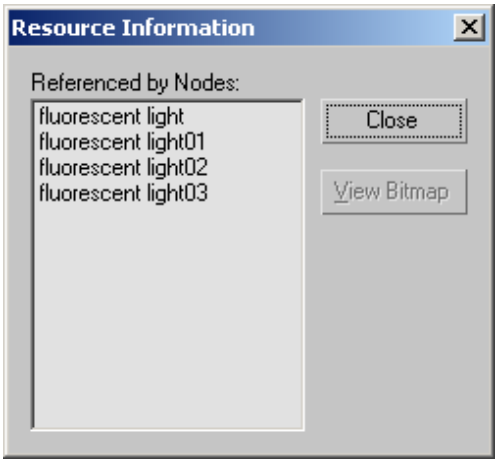
Resource Information Dialog

Utilities panel > Utilities rollout > More button > Utilities dialog > Bitmap/Photometric Path Editor > Edit Resources button > Select a single bitmap or photometric file name. > Info button

Utilities panel > Utilities rollout > More button > Utilities dialog > Bitmap/Photometric Path Editor > Edit Resources button > Double-click a bitmap or photometric file name.

The Resource Information dialog displays information about where a bitmap is used in other materials or photometric distribution files and shows an image of the bitmap.

Interface



Referenced by Nodes—Lists the objects ("nodes") that are assigned materials that use this bitmap or use a given *photometric distribution file (page 2–1155)*.

Close—Closes the dialog.

View Bitmap—Displays a *rendered frame window (page 3–5)* that shows the bitmap. This button is unavailable if the file is a photometric file, and it has no effect if the map is missing.

Scene States

Managing Scene States

Tools menu > Manage Scene States

Right-click to open the quad menu. > Display (upper-right) quadrant > Manage Scene States

The Scene States feature provides a fast way to save different scene conditions with various lighting, camera, material, environment, and object properties that can be restored at any time and rendered to produce numerous interpretations of a model. You save and restore scene states with the *Manage Scene States dialog (page 3–521)*, which makes it a convenient way to quickly compare how different parameter settings affect how each scene looks. Because scene states are saved with the MAX file, they are easily accessible to everyone on a design team.

Scene states also allow you to experiment with different scene setups without having to save the entire MAX file each time a change is made. This means you don't need to open and close files in order to render different conditions of the same model. As well, scene states do not add to the size of the file.

When you save a scene state, you can choose which aspects of the scene to record:

- **Light Properties**—Light parameters such as color, intensity, and shadow settings are recorded with the scene for each light or luminaire.
- **Light Transforms**—Transforms such as position, orientation, and scale are recorded for each light.
- **Object Properties**—Current Object Properties values are recorded for each object. This includes settings for Advanced Lighting and mental ray.
- **Camera Transforms**—Camera transform modes such as position, orientation and scale are recorded for each camera.
- **Camera Properties**—Camera parameters such as FOV and depth of field, including any corrections made by the *Camera Correction modifier (page 2–1237)* are recorded for each camera.
- **Layer Properties**—Records the settings for each layer in the Layer Properties dialog at the time the scene state is saved.
- **Layer Assignment**—Records each object's layer assignment.

- **Materials**—All materials and material assignments used in the scene are recorded.
- **Environment**—Records these *Environment (page 3–267)* settings: Background, Ambient, and Tint colors; Global Lighting > Level; Environment Map; Environment Map on/off state; Exposure Control rollout settings.

Tips for Managing Scene States

- When first becoming familiar with scene states, minimize changes to make it easier to keep track of what each scene state contains.
- Saving all scene aspects in a scene state allows you more flexibility when restoring. When you include all the parts of the scene, you can choose to restore all or just a few of the aspects that were originally saved.
- Additions made to a scene after a scene state has been saved affect how the restored scene will render. For example, say you already have a scene state named *Omni* that contains omni lights. You then decide to save another scene state named *Free Spot* that contains a free spot light. When you restore the *Omni* scene state, the scene will contain both the omni lights and the free spot light.

  If you decide to add other lights to the scene that you don't want to render with the existing lights, you need to remember to turn off the new lights and overwrite any existing scenes that have Light Properties saved. See *Saving Changes to an Existing Scene State (page 3–521)* on how to overwrite an existing scene state.
- Use descriptive names for scene states. If scene state names are too long to see in the dialog, resize the Manage Scene States dialog or use the scroll bar at the bottom of the dialog.

  If you select individual parts to be saved with a scene state, it is useful to note in the scene state name which parts are recorded.
- If the scene contains more than one camera, restore the desired scene state first, then change the viewport to the desired camera view.

Scene State Limitations

- Even though you can select multiple scene states from the Manage Scene State dialog, only one scene state can be restored at a time.
- The currently restored scene state name is not displayed in the user interface. It's helpful to save rendered scenes by their scene state name as a reference.
- Materials must be reopened in the Material Editor after a scene state containing objects with material assignments is restored.
- If part of a scene state is later deleted or hidden, a warning does not display when the scene state is restored indicating that there are missing parts or that the scene will not be restored as it was when originally recorded.
- Likewise, if you delete one or more scene states from the Manage Scene States dialog, you are not presented with a warning that you are about to delete them. However, you can restore deleted scene states with Undo.
- Viewport configurations are not saved as part of the scene state. Therefore, you cannot use scene states to control which viewport is active or whether viewports are minimized or maximized.

Scene States and Batch Render

Scene states do not store viewport layouts, such as which camera view is active, so you can use the *Batch Render tool (page 3–200)* to coordinate rendering from any camera that is saved with the model. With each camera task that you assign to the batch render tool, you can specify a saved scene state that will be automatically loaded and rendered.

See also

Manage Scene States Dialog (page 3–521)

Batch Rendering - Batch Render Dialog (page 3–200)

Manage Scene States Dialog

Tools menu > Manage Scene States

Right-click to open the quad menu. > Display (upper-right quadrant) > Manage Scene States

The Manage Scene States dialog is a modeless dialog where you can select, save, rename, and delete *scene states (page 3–519)*.

Procedures

To save a scene state:

1. Set up the scene in the viewport.

   Tip: It is best to first render the scene to see if it is set up the way you want before saving it. If it isn't, make the desired changes and render again before proceeding to the next step.
2. Right-click in a viewport and choose Save Scene State from the quad menu.
3. In the Save Scene State dialog, highlight the parts you want saved in the scene state, then enter a descriptive name. For descriptions of these parts, see *Managing Scene States (page 3–519)*.
4. Click the Save button. This saves the scene state to the MAX file.

To restore a scene state:

1. Right-click in a viewport and choose Restore Scene State from the quad menu.
2. Choose the scene state to restore from the flyout list.
3. Highlight the parts you want restored with the scene state. Only the parts that were originally saved with the scene state are listed.
4. Click Restore.

   The scene state is restored in the viewport.

To rename a scene state:

1. Right-click in a viewport and choose Manage Scene States from the quad menu.
2. In the scene state list, highlight the scene state you want to rename.
3. Click the Rename button.
4. In the Rename Scene State dialog, enter a new name for the scene state.
5. Click OK. The new name is displayed in the scene state list.

To delete a scene state:

1. Right click in a viewport and choose Manage Scene States from the quad menu.
2. In the scene state list, highlight the scene state you want to delete.
3. Click the Delete button. The scene state is deleted from the MAX file.

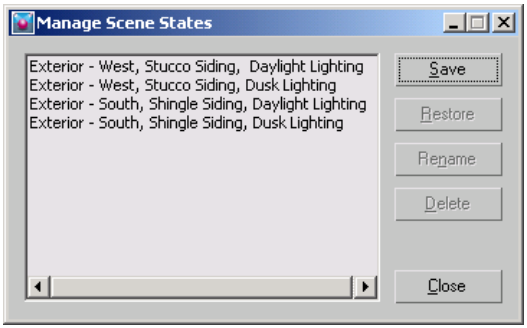
   Note: You can undo to restore the deleted scene state.

To save changes to an existing scene state:

1. In the Manage Scene States dialog, highlight the scene state you want to overwrite.
2. Click the Save button.

   The Scene State Manager displays a message confirming if you want to overwrite the scene state.
3. Click OK.

Interface



The dialog lists all the scene states that are saved in the MAX file.

Save—Opens the *Save Scene State dialog (page 3–522)* where you enter a name for the current scene state. To select a continuous range of parts, drag or SHIFT+click. To select noncontinuous parts, press CTRL+click.

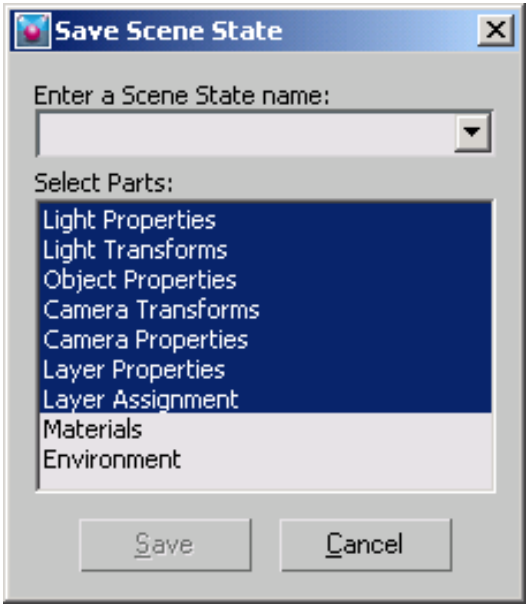
Restore—Opens the *Restore Scene State dialog (page 3–523)* for the selected scene state.

Rename—Opens the *Rename Scene State dialog (page 3–523)* for the selected scene.

Delete—Deletes the highlighted scene state(s) without first warning you if you are sure you want to delete the scene. To select a continuous range of entries, drag or SHIFT+click. To select noncontinuous entries, press CTRL+click.

Close—Closes the Manage Scene States dialog.

Save Scene State



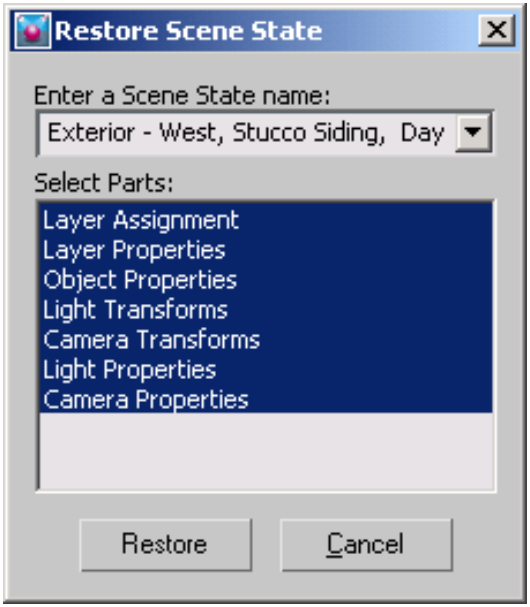
Enter a Scene State name—A text field where you enter a descriptive name for the scene state.

Select Parts—Lists the parts you can save in the scene state. By default, all parts are highlighted except for Materials and Environment. When you make a different selection set, it is "sticky," which means the next time the dialog is displayed, the parts you highlighted previously are highlighted.

Save—Saves the scene state with the name you supplied and the parts you selected. The scene state is saved in the MAX file.

Cancel—Closes the dialog without saving the scene state.

Restore Scene State



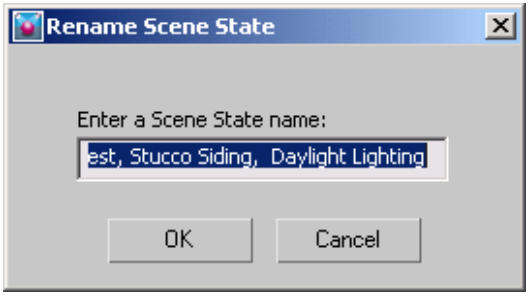
Enter a Scene State name—Displays the scene name that was selected in the Manage Scene States dialog. Use the drop-down list to select a different scene state to restore.

Select Parts—Displays a list of scene parts from which you can restore for the scene state. To highlight a continuous range of parts, drag or SHIFT+click. To highlight noncontinuous parts, use CTRL+click.

Restore—Click to restore the scene state in the active viewport.

Cancel—Closes the dialog without restoring the selected scene state.

Rename Scene State



Enter a Scene State Name—Enter a new name in the Name field for the highlighted scene state. Click OK to accept the change or Cancel to close the dialog without renaming the scene state.

Internet Access

The *Asset Browser (page 1–17)* can locate locally or network-stored materials, textures, geometry, and other 3D assets that can be easily dragged and dropped into the 3ds Max workspace. The Browser can also access the Internet to do the same.

The Asset Browser provides embedded Web browser functionality, so you can go directly to the Internet to capture 2D and 3D content for use in 3ds Max. For example, a visit to any of several manufacturers' sites, such as www.formica.com, can yield flooring, countertop, or other samples in bitmap form. Provided a site encourages such use of its content (and most do), these thumbnails can be dragged into 3ds Max with a single mouse movement and dropped onto objects in a scene for instantaneous "what if" visualizations of different textures and treatments. They can also be saved for later use.

2D and 3D geometry can also be captured off the Internet and put to immediate use in 3ds Max scenes. You can also use the Asset Browser with topographical maps, detailed aerial and satellite

photos, and any design data in MAX or STL form. In this way, you are assured instant access to the latest design content, free from leading vendors around the world, without leaving your desktop.

For Web Content Providers

Any Web page that uses standard HTML source code can easily be enhanced so that 3ds Max users can access it for content. Making bitmap textures (.BMP, .JPG, .GIF, .TIF, etc.) available for downloading requires no special HTML coding, but there are guidelines you should follow for optimum utility to 3ds Max users. Making geometry files (*.max*) available to 3ds Max user requires some simple modifications to your HTML source code.

See also

i-drop Indicator (page 3–524)

i-drop Indicator

In order to support the World Wide Web as a primary source of product information, Autodesk has introduced the i-drop™ Indicator. This enables manufacturers and design professionals to publish and acquire design data using standard Web pages.

The i-drop Indicator is used to transfer content from the World Wide Web by means of a drag-and-drop operation. The content can be any type of file (such as a geometry or a raster file) that the content producer has made available and that the application will accept.

For example, imagine that you are a lighting designer and require a specific fixture to embed within your 3ds Max scene. Now imagine that a lighting company such as ERCO has a Web site containing a library of their fixtures online. You can browse this library, then drag and drop the appropriate fixture into your scene. You don't need to download the file and then insert it. Now you can drag any MAX file from an i-drop-enabled web site and drop its geometry directly into your Autodesk product.

In addition to geometry, you can drag and drop photometric data, cost information, materials, and so on.

An i-drop object in a Web page is an open gateway between the content provider's server and the Autodesk software user's desktop. Web pages that contain i-drop objects can be designed to look and behave exactly like standard Web pages in a standard Web browser. You simply drag the i-drop object from the provider's Web page and drop it onto a desktop or into an application.

The desktop or application is the i-drop target. The i-drop target requests the data in one or more specific clipboard formats and receives the content. This is called being "i-drop aware." i-drop can also deliver data in any of the system default clipboard formats. What the application gets depends on what clipboard format it requires. For example, if the user drags to the desktop, the desktop takes a file. If the user drags to a text editor, the text editor takes textual data. What the desktop or application takes is independent of i-drop.

For more information, see http://idrop.autodesk.com.

Geometry File Formats

The *Import (page 3–490)* and *Export (page 3–491)* commands on the *File menu (page 3–721)* let you share 3D geometry with other 3D modeling programs. The software can import and export a variety of file formats.

3ds Max can also open *DRF Files (page 3–528)*, which are created in VIZ Render, a rendering

tool that is packaged with Autodesk Architectural Desktop 2005.

See also

Asset Browser Utility (page 3–505)

Internet Access (page 3–523)

i-drop Indicator (page 3–524)

Compatible File Formats

MAX Files (from Autodesk VIZ) (page 3–526)

VIZ Render (DRF) Files (page 3–528)

Importable File Formats

Importing 3DS Files (page 3–531)

Importing PRJ Files (page 3–532)

Importing SHP Files (page 3–534)

Importing Adobe Illustrator 88 Files (page 3–534)

Importing AutoCAD Drawing Files (page 3–537)

Importing DXF Files (page 3–547)

Importing FBX Files (page 3–559)

Importing Autodesk Inventor Files (page 3–553)

Importing IGES Files (page 3–567)

Importing LandXML/DEM Models (page 3–590)

Importing Lightscape Files (page 3–609)

Importing HTR/HTR2 Files (page 3–624)

Importing TRC Files (page 3–626)

Importing STL Files (page 3–635)

Importing VRML Files (page 3–639)

Importing Wavefront (OBJ, MTL) Files (page 3–637)

Exportable File Formats

Exporting 3D DWF Files (page 3–556)

Exporting to 3DS (page 3–533)

Exporting to Adobe Illustrator (page 3–535)

Exporting to ASCII (page 3–535)

Exporting to AutoCAD DWG Files (page 3–545)

Exporting to DXF Files (page 3–552)

Exporting FBX Files (page 3–562)

Exporting IGES Files (page 3–569)

Exporting JSR-184 Files (page 3–570)

Exporting Lightscape Files (page 3–577)

Exporting HTR/HTR2 Files (page 3–627)

Exporting to Shockwave 3D (page 3–628)

Exporting to STL (page 3–636)

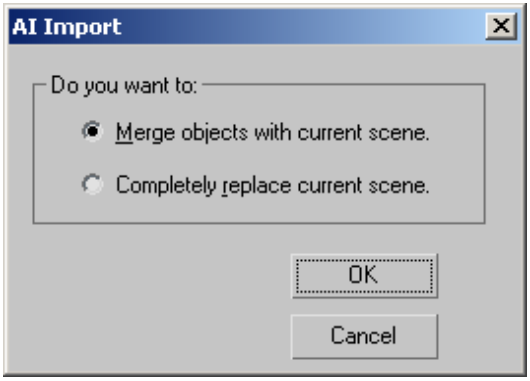
Exporting to VRML97 (page 3–640)

Exporting Wavefront Object (OBJ) Files (page 3–637)

Exporting Wavefront Material (MTL) Files (page 3–639)

Importing Geometry

When you import geometry, using the Import command on the File menu, in most cases a dialog is displayed that asks whether you want the imported geometry to be added to the scene, or to replace the scene entirely. For example:



Merge objects with current scene—Merges imported data with the current scene.

Completely replace current scene—Completely replaces the current scene with the imported data.

In general, once you respond to this dialog, a second dialog with geometry-specific options is displayed, as described in the topics that follow. (For some geometry formats, only one dialog appears, and these options are merged with the geometry-specific options.)

Working with MAX Files from Autodesk VIZ

Although they share the same file type, 3ds Max files and Autodesk VIZ files are quite a bit different. This topic describes some of the differences, and recommends ways to obtain the desired results from your files.

See also

Working with Drawing Files (page 3–425)

Defaults

3ds Max ships with several market-specific defaults sets. If you are working on design visualization types of files, you should load the *Design VIZ* default settings. For more information on how to do this, see *Market-Specific Defaults (page 3–834)*.

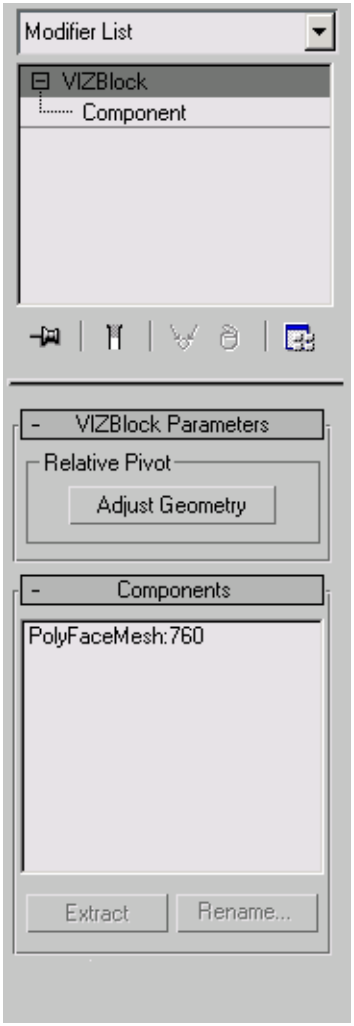
Objects

AEC objects (walls, doors, windows, etc.) in an Autodesk VIZ file retain all their original properties as AEC objects when opened in 3ds Max. Autodesk VIZ models can also contain File Link created objects that appear as VIZBlocks or Linked Geometry.

File Linked VIZBlocks in 3ds Max

A VIZBlock is a compound object similar to a nested AutoCAD or Architectural Desktop block. If a drawing containing nested blocks is file linked to Autodesk VIZ, the block objects display in the Modify panel as VIZBlocks.

3ds Max recognizes VIZBlocks when you open a MAX file created in Autodesk VIZ. You can access the sub-object hierarchy, rename sub-object components and even extract sub-objects of the VIZBlock. You are also allowed to add modifiers on top of the sub-objects. You cannot attach objects to a VIZBlock as you could in Autodesk VIZ.



The VIZBlock user interface on the Modify panel

Note: VIZBlocks can contain both mesh and spline geometry. This can cause some confusion when applying modifiers like Edit Mesh. If a spline component is closed, it will be converted to a mesh with no extrusion. If a spline is not closed, it will disappear and leave behind stray vertices in the mesh.

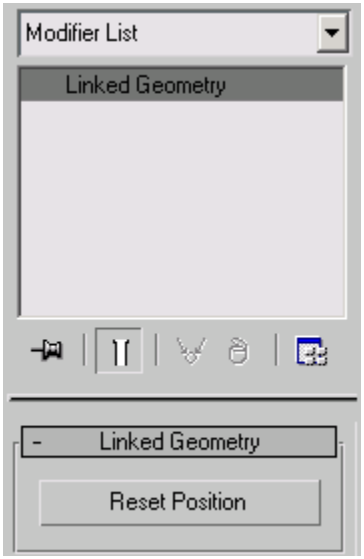
VIZBlocks are assigned a special controller called a LinkTM controller. If a sub-object component is extracted and converted to an Editable Mesh or Editable Spline, the LinkTM controller is replaced with a PRS controller. Likewise, if an entire VIZBlock is converted to an Editable Mesh or Spline, the LinkTM controller for the node is replaced with a PRS controller.

When using Track View, sub-object components of VIZBlock do not display. Data pertaining to the LinkTM controller is not displayed, however, you can access the PRS subcontroller.

While working on VIZBlocks, it is very possible that the you might lose portions of the original data organization of the scene, for example, when a sub-object component is extracted from an instanced VIZBlock, the extracted object is not instanced the same number of times.

File Linked Geometry in 3ds Max

This file linked object type appears in Autodesk VIZ when you use the Entity Combine-By option or if you extract a component from a VIZBlock. These objects display in the Modify panel as Linked Geometry. If a linked geometry object is moved, rotated, or scaled, you can use the Reset Position option.



The Linked Geometry user interface on the Modify panel

3ds Max recognizes Linked Geometry objects when you open a MAX file created in Autodesk VIZ. Since Linked Geometry objects offer no parameters on the Modify panel, you have to modify these objects by converting them to Editable Mesh or Splines or applying modifiers on top of them.

Linked Geometry objects are also assigned a LinkTM controller. If the object is converted to an Editable Mesh or Editable Spline, the LinkTM controller is replaced with a PRS controller.

File Link Reloading

If you plan on working on an Autodesk VIZ 2006 scene in 3ds Max, you should download the latest service pack for the product. The latest service pack includes functionality that makes 3ds Max more compatible with Autodesk VIZ 2006.

Materials

In 3ds Max, the *ambient (page 3–1002)* and *diffuse (page 3–1023)* color channels are locked for standard materials, however this is not the case in Autodesk VIZ. As a result, MAX files from Autodesk VIZ may render differently in 3ds Max.

To solve this issue, use the *Fix Ambient utility (page 3–513)*.

Missing Maps

Many times, when you open a MAX file from Autodesk VIZ, you will be presented with a *Missing External Files dialog (page 3–504)*. To locate the missing files, click Browse and then add the appropriate Autodesk VIZ directories to the *Configure External File Paths dialog (page 3–855)*.

VIZ Render (DRF) Files

DRF is the file format for VIZ Render, a rendering tool included with Autodesk Architectural Desktop 2005. The DRF file type is similar to MAX files from previous versions of Autodesk VIZ.

This file format is available only when you use the File menu > *Open (page 3–400)* command. All DRF files must be saved as MAX files in 3ds Max. Likewise, DRF files cannot be imported or merged into 3ds Max scenes.

Note: You can open DRF files using drag-and-drop functionality.

Saving DRF Files

DRF files must be saved as MAX files in 3ds Max.

Important: Once you save a DRF file in 3ds Max, it becomes a MAX file and you *can no longer open it* in VIZ Render.

Defaults

3ds Max ships with several market-specific defaults sets. If you are working on design visualization types of files, you should load the *Design VIZ*

default settings. For more information on how to do this, see *Market-Specific Defaults (page 3–834)*.

Units

In VIZ Render, you can only use meters as your system unit. However, 3ds Max lets you define your own system unit, and how units are displayed. For more information on units, see *Using Units (page 2–3)* and *Units Setup Dialog (page 3–891)*.

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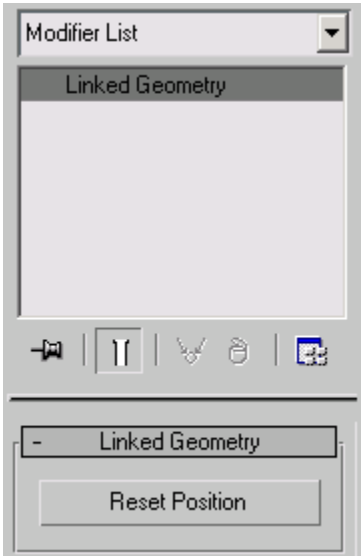
Handling Linked Geometry in 3ds Max

Linked objects show up as Linked Geometry objects on the Modify panel. These objects don't allow access to sub-object levels where minor editing can occur. If a linked geometry object is moved, rotated or scaled you do have the option to Reset Position.



Linked Geometry user interface on the Modify panel.

3ds Max recognizes Linked Geometry objects when you open a MAX file created in VIZ Render. Since linked geometry objects offer no parameters on the Modify panel, you must first add an Edit Mesh modifier to the object or collapse the linked geometry object to an Editable Mesh in order to access sub-object levels. If you add a modifier to linked geometry, the modifier is applied to all instances of that object.

Linked Geometry objects are assigned a special LinkTM controller. If a the object is converted to an Editable Mesh, Poly, NURBS or Editable Spline, the LinkTM controller is replaced with a PRS controller.

Substituted Objects

There is no substitution modifier in 3ds Max. However, if you open a DRF file with substituted objects, 3ds Max will recognize the substitutions and will add the substituted objects into the scene.

User Interface Changes

Some of the user interface elements in 3ds Max are not where you would expect them if you are coming from VIZ Render. For example, the *viewport controls (page 3–778)* are in the bottom-right corner, instead of the top-left.

For more information on the user interface, see *User Interface (page 3–717)*.

Render Presets

The Render Presets in 3ds Max are very different from the presets in VIZ Render. For more information on using them, see *Preset Rendering Options (page 3–23)*.

Working with DRF Files in 3ds Max

Saving DRF Files

DRF files must be saved as MAX files in 3ds Max.

Important: Once you save a DRF file in 3ds Max, it becomes a MAX file and you **can no longer open it** in VIZ Render.

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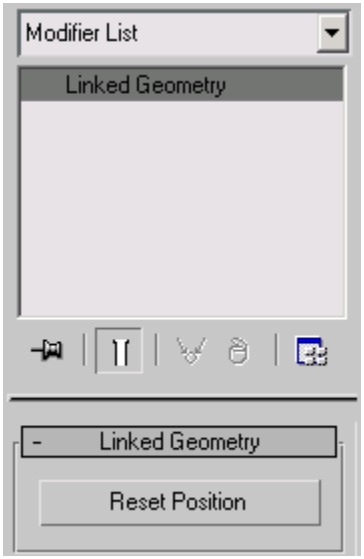

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Render Presets

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3D Studio Mesh (3DS, PRJ) Files

Importing 3DS Files

File menu > Import > Select File To Import dialog > Files Of Type > 3D Studio (*.3DS)

3DS is the 3D Studio® (DOS) mesh-file format. You can import 3DS files into 3ds Max.

When you import a 3DS file, you can merge the imported objects with the current scene or replace the current scene completely. If you choose to merge the objects with the current scene, you are asked whether you want to reset the length of the animation in the scene to the length of the imported file (if the imported file contains animation).

When you import a 3DS file, the following information is imported:

- Backgrounds (solid, gradient, and bitmap).
- Fog, Layered Fog, and Distance Cue.
- Ambient light level.
- Subtractive transparency is converted to 3ds Max "Filter" transparency and the filter color is set equal to the diffuse color.
- Transparency falloff settings.
- All map channels that are enabled. Map channels that are turned off in the 3DS file do not import into 3ds Max.
- All map parameters, including UV transforms, Negative, Mirror, and Rotation. Some Map parameters such as Blur, Luma, RGB, and Alpha work much differently in 3ds Max. These values are converted to new values that produce a similar affect.

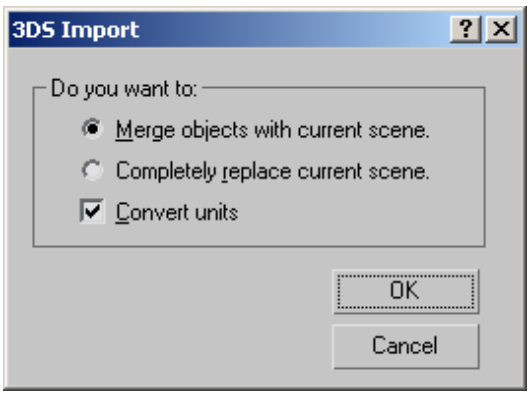
- Mask bitmaps are imported as 3ds Max mask textures.
- When materials with both Texture 1 and Texture 2 are imported, a composite texture is created and added to the Standard material's Diffuse channel.
- Reflection maps, auto-cubics, and mirrors.
- Automatic reflection map Nth frame and Map Size settings.
- SXP translation for Marble and Noise materials.
- 3DS/DOS R4 IK joint parameters.
- 3D Surfer patch data.

When you import a PRJ file, all of the above items are imported, plus shapes.

When you import a 3DS file, the following information is *not* imported:

- Morph keys.
- Keyframer instances.
- Map channels that are turned off.
- Custom *.cub*-format cubic maps.
- Decal transparency using the RGB color of the upper-left pixel of the map.

Interface



Merge objects with current scene—Merges imported data with the current scene.

Completely replace current scene—Completely replaces the current scene with the imported data.

Convert units—When turned on, the software assumes units in the imported file to be in inches, and converts them to the current system of units. When turned off, the software assumes the units in the imported file match the current scene unit and doesn't convert the units.

Importing PRJ Files

File menu > Import > Select File To Import dialog > Files Of Type > 3D Studio Project (*.3DS,*.PRJ)

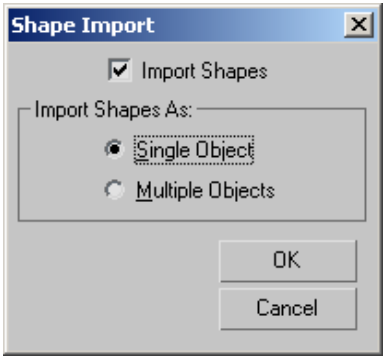
PRJ is the 3D Studio (DOS) project-file format.

When you import a PRJ file, you can merge the imported objects with the current scene or replace the current scene completely. If you choose to merge the objects with the current scene, you'll be asked whether you want to reset the length of the animation in the scene to the length of the imported file (if the imported file contains animation).

You'll also be asked how you want the software to handle *shapes (page 3–1105)* in the incoming file: to make them into a single object or multiple objects.

Interface

When you import a PRJ file, you first see a *3DS Import dialog (page 3–531)*. This is identical to the dialog you see when you import a 3DS file. When you have set the options and clicked OK in the 3DS Import dialog, you then see a Shape Import dialog.



When importing PRJ files, the software converts polygons to shape objects. You choose an option in the Shape Import dialog to set how the shape objects are created:

Import Shapes—Turn on this option if you don't want to import shapes from a *.prj* file.

Single Object—All polygons in the *.prj* file are converted to Bezier splines and placed inside a single composite shape object.

Multiple Objects—Each polygon in the *.prj* file is converted to a Bezier spline and placed inside an independent shape object.

Exporting to 3DS

File menu > Export > Select File To Export dialog > Save As Type > 3D Studio (*.3DS)

3DS is the 3D Studio (DOS) mesh file format. You can export 3ds Max files to this format.

When you export a 3DS file, the following information is exported:

- Position, Rotation and Scale animation. If the controller is a TCB controller, the TCB, Ease In, and Ease Out values are also saved. If the controller is any other type of key controller, the keys are saved but the tangent information is lost. If the controller is not a key controller, only the object's transformation at frame 0 is saved.
- Basic material color/parameters from the Standard material.
- Single maps with their amount, offsets, scales, etc.
- Auto-cubics and Mirrors.
- Target cameras, target spotlights and omni lights.
- Most "static" parameters for cameras and lights, and animation tracks for Roll, Falloff, Hotspot, and FOV.

When you export a 3DS file, the following information is *not* exported:

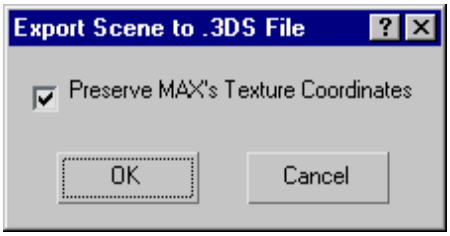
- Composite and procedural maps.
- Grouped object transformations. There's no concept of group hierarchy in the 3D Editor. Groups export to the Keyframer because the Keyframer understands hierarchies.
- Global shadow parameters.

When you export a 3DS file, the following occur:

- All non-mesh geometry, such as procedural primitives and patches, is collapsed to meshes before export.
- Objects are exported as they exist on the frame 3ds Max displays at export time.

  If you want to output morph targets, go to each frame and export the target to a different file name.
- Meshes are saved with edge display information and smoothing groups.
- 3ds Max instances are saved as Keyframe instances.
- Modifier and morph animation is frozen at the current frame, collapsed, and exported as a simple mesh.

Interface



When you choose 3DS as the export file format, enter a file name, and click Save, an Export Scene To .3DS File dialog is displayed. This dialog has a single option:

Preserve MAX's Texture Coordinates—When on, preserves mapping coordinates. When off, mapping information is discarded. Default=on.

3D Studio Shape (SHP) Files

File menu > Import > Select File To Import dialog > Files Of Type > 3D Studio Shape (*.SHP)

SHP is the 3D Studio (DOS) shape file format. You can import these files into 3ds Max.

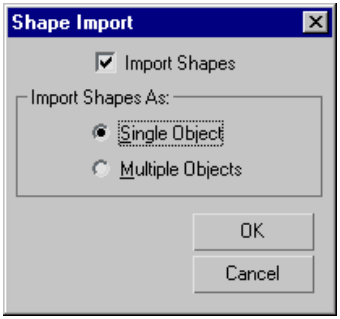
A *.shp* file contains polygons created in the 2D Shaper in 3D Studio.

When importing an SHP file that contains multiple shapes, the software gives you the option to either merge them all into one object or make multiple incoming objects.

The shape importer looks at the vectors on incoming splines, and if they're collinear within a couple of percentage points, it changes the angle to a smoothed Bezier (otherwise, it's a Bezier corner).

Interface

When you import an SHP file, you first see a *3DS Import dialog (page 3–531)*. This is identical to the dialog you see when you import a 3DS file. When you have set the options and clicked OK in the 3DS Import dialog, you then see a Shape Import dialog.



Import Shapes—When on, imports the shape objects. When off, does not import them. Default=on.

Import Shapes As group

Single Object—(The default.) When chosen, imports all shapes in the SHP file as a single *editable spline object (page 1–284)*.

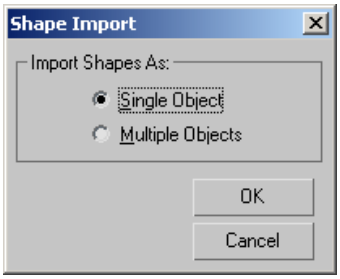
Multiple Objects—When chosen, imports each shape in the SHP file as an individual editable spline object.

Adobe Illustrator (AI) Files

File menu > Import > Select File To Import dialog > Files Of Type > Adobe Illustrator (*.AI)

You can import Adobe Illustrator (AI88) files into 3ds Max.

Interface



When importing AI88 files, the software converts polygons to shape objects. You choose an option in the Shape Import dialog to set how the shape objects are created:

Single Object—All polygons in the *.ai* file are converted to Bezier splines and placed inside a single composite shape object.

Multiple Objects—Each polygon in the *.ai* file is converted to a Bezier spline and placed inside an independent shape object.

Exporting to Adobe Illustrator

File menu > Export > Select File To Export dialog > Save As Type > Adobe Illustrator (*.AI)

You can export shapes that can be converted to *Bezier splines (page 3–1009)*. The software exports these shapes in 2D only. It uses only the X and Y coordinates of the shape's local coordinate system, discarding the Z coordinates.

Procedure

To export a file to Adobe Illustrator:

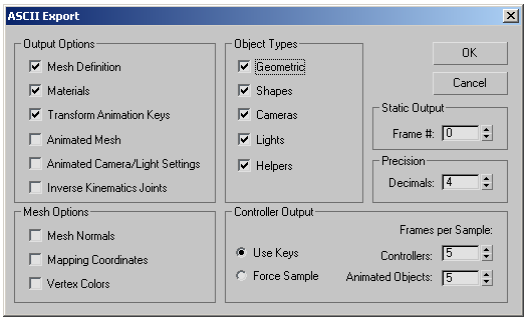
1. Select one or more shape objects.
2. Choose File menu > Export.
3. Select Adobe Illustrator (*.AI) as the file format.
4. Enter a file name, and click Save.

ASCII (ASC, ASE) Files

File menu > Export > ASCII Scene Export (*.ASE)

When you choose ASCII Scene Export (*.ase) as the Save As type, the exported file is an ASCII representation of your scene. A dialog lets you specify which scene components are included, and how they're output. This is helpful if you are writing a program that requires you to parse the ASCII file.

Interface



Output Options group

Provides check boxes to specify which general options are included in the ASCII file.

Mesh Definition—Exports the definition of each mesh, including vertex and face information for geometric objects. In addition, turning this on enables the items in the Mesh Options group box, described below.

Materials—Includes the material description. If a material is not assigned to an object, its wireframe color is exported. All levels of a material tree are included, so this can produce a lot of text.

Transform Animation Keys—Includes the transform animation data for the objects. If the object is a target camera or spotlight, this will include target animation data.

Animated Mesh—Exports a complete mesh definition of every n frames. The frequency is specified by the Controller Output spinner, described below. Each block contains the same information specified in the Mesh Options group box, described below. Turning this on can result in a huge file, even for small scenes.

Animated Camera/Light Settings—Exports the animation data for cameras and lights, such as color, intensity, falloff, map bias, etc. Outputs a block every n frames, as specified by the Controller Output spinner.

Inverse Kinematics Joints—Exports the IK joint settings in the Hierarchy branch.

Mesh Options group

These items are enabled only when Mesh Definition is turned on in the Output Options group box.

Mesh Normals—Exports the face and vertex normals. The normal of the face is listed first, followed by the normals of the three vertices supporting the face. Turning this on results in a much larger file.

Mapping Coordinates—Exports a list of mapping vertices and faces, according to the TVert and TVFace structures described in the 3ds Max Software Development Kit. If an object uses face mapping, a face map list is exported containing UVW coordinates for each face.

Vertex Colors—Exports vertex colors.

Object Types group

The items here let you specify which category of object you want included in the output. You can include geometric objects, shapes, cameras, lights, and helper objects.

Static Output group

Frame #—Lets you specify which frame of the animation will be used to export all static data, whether or not you output controller animation data.

Precision group

Decimals—Lets you specify the precision (the number of digits after the decimal) of the values exported to the ASCII file.

Controller Output group

Use Keys—Exports key values. If the controller doesn't use keys, then the Force Sample method is used. In the case of transform controllers, the Use Keys option works only if all of the transform controllers are either Linear/TCB or Bezier. If one of the transform tracks uses a different type of controller, then the Force Sample method is used for all transform tracks.

Force Sample—Samples controller values based on the frequency specified in the Frames per Sample Controller.

Frames per Sample group

Controllers—Specifies the frequency, in frames, with which to sample controller values for export.

Animated Objects—Specifies the frequency, in frames, with which to output animation settings and mesh definitions.

AutoCAD (DWG) Files

Importing AutoCAD Drawing Files

File menu > Import > AutoCAD (*.DWG, *.DXF)

Although you will usually want to use the *File Link Manager (page 3–431)* to connect to drawing files, you can also use the Import command to bind to the drawing file immediately.

When you import a drawing file, 3ds Max converts a subset of the AutoCAD or Architectural Desktop objects to corresponding 3ds Max objects.

After you select a drawing file to import, the AutoCAD DWG/DXF Import Options dialog is displayed. After an import, you are presented with editable meshes, editable splines, and PRS controllers. Nested blocks maintain their parent-child hierarchy and will be imported as "Block/Style Parent". In addition, if a single drawing object creates both mesh and spline geometry, you will find objects referred to as "Linked Geometry" in the scene. Block/Style Parent or Linked Geometry objects appear in the modifier stack on the Modify panel.

Note: You are no longer asked if you want to completely replace the current scene. If you import multiple drawings, the importer merges the drawings together.

If you are using AutoSurf or AutoCAD Designer, use the AutoCAD command 3DSOUT to export mechanical models to 3ds Max. You can also explode the mechanical models and then import the resulting file, but some data will not appear in the AutoCAD drawing file.

Important: AutoCAD 2005 and AutoCAD vertical applications, such as Architectural Desktop (ADT), have custom objects that are unique to the product. In order to view them in 3ds Max, you need the appropriate Object Enabler (OE). Object Enablers let you access, display, and manipulate these objects in AutoCAD 2005, as well as the other vertical applications, including 3ds Max. For a list of downloadable OEs, see the Autodesk Web site

Legacy DWG Importer

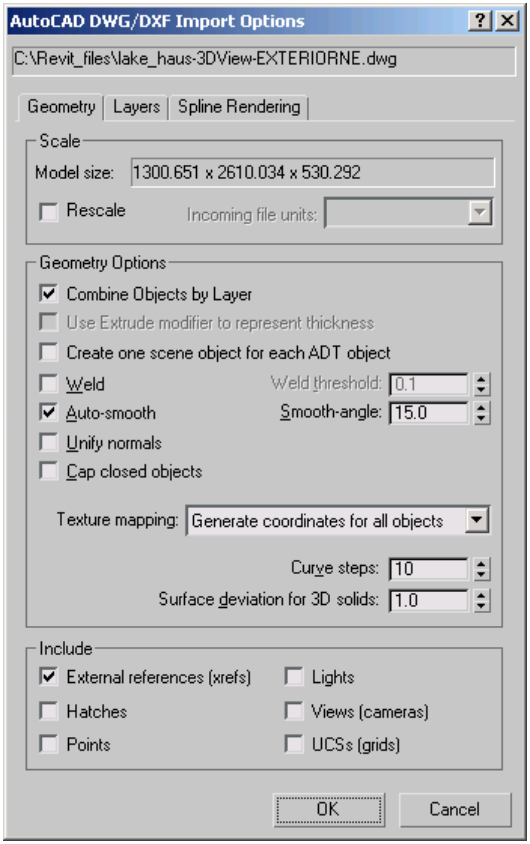
The new DWG import utility contains many improvements, including enhanced DWG compatibility and greater user control and customizability; however, some things were lost from the DWG Importer found in previous versions of the software. For this reason, 3ds Max retains the *legacy DWG Import functionality (page 3–543)*.

Procedures

To import a DWG or DXF file:

1. Choose File menu > Import.
2. Choose AutoCAD (*.DWG, *.DXF) in the Files of Type list.
3. Specify a file name to import.
4. Set options in the AutoCAD DWG/DXF Import Options dialog.

Interface



Geometry panel: Scale group

Model Size—Incoming geometry is evaluated to determine its bounding box size. This field displays the scene extents based on three factors:

- Incoming file units
- System units in 3ds Max
- Display units in 3ds Max

Note: If the size cannot be determined, the field will show (Drawing Extents Not Known).

Rescale—Allows rescaling of the incoming geometry by a factor corresponding to the most common unit type used. The importer will try to detect the units of the DWG file being imported, compare those units with the 3ds Max system units, and provide the appropriate conversion factor.

For example: if a drawing file is built in millimeters and 3ds Max has its System Units set to inches, the AutoCAD DWG/DXF Import Options dialog will automatically be set with Rescale turned on and the Incoming File Units set to millimeters.

Note: If the units are unspecified in the drawing, the drop-down list will appear blank. In this case, if the Import button is pressed and the Rescale toggle is turned on, you are prompted to select a value for Incoming File Units, and returned to the AutoCAD DWG/DXF Import Options dialog.

Incoming File Units—This drop-down shows the base units in the incoming file.

Geometry panel: Geometry Options group

Combine Objects by Layer—When this option is on, any objects on a given layer in the AutoCAD drawing will be made part of a single Editable Mesh or Editable Spline when imported into 3ds Max. The names of each imported object are based on the AutoCAD object's layer. The imported object name has a "Layer:" prefix and is followed by the layer name. For example, all AutoCAD objects residing on the layer WALLS become part of the Editable Mesh named Layer:Walls, after they are imported to 3ds Max.

Note: When this option is on, the import behavior is equivalent to choosing Layers, Blocks As Node Hierarchy in the *Advanced Settings panel (page 3–438)* of the File Link Manager. When this option is off, the behavior is equivalent to choosing Entity, Blocks As Node Hierarchy on the same panel.

Use Extrude Modifier to Represent Thickness—When on, objects with thickness receive an Extrude modifier to represent the thickness value. You can then access the parameters of this modifier and

change the height segments, capping options, and height value.

When off, objects with thickness (and closed capped objects) are converted directly to a mesh.

Create One Scene Object For Each ADT Object—Architectural Desktop (ADT) objects are imported as a single object instead of being separated into their constituent components. This means that if you import an ADT door object, the door is represented as one object instead of three. Turning on this switch make importing faster and the scene size is smaller.

Note: This switch presents several modeling concerns that you should be aware of:

- Material assignments from ADT are not translated during the import process..
- If you want to assign materials to these objects, you'll have to use Multi/Sub-Object materials.
- Depending on the Texture Mapping option you choose, UVW coordinates are translated correctly.

Weld—Sets whether coincident vertices of converted objects are welded, according to the Weld Threshold setting. Welding smoothes across seams and unifies normals of objects with coincident vertices.

Weld Threshold—Sets the distance that determines whether vertices are coincident. If the distance between two vertices is less than or equal to the Weld Threshold, the vertices are welded together.

Auto-smooth—Assigns smoothing groups according to the Smooth Angle value. Smoothing groups determine whether faces on an object render as a smooth surface or display a seam at their edges, creating a faceted appearance.

Smooth Angle—Controls whether smoothing occurs between two adjacent faces. If the angle between the two face normals is less than or equal to the smooth angle, the faces are smoothed.

Unify Normals—Analyzes the face normals of each object and flips normals where necessary, so they all point out from the center of an object. If the imported geometry is not properly welded, or if the software can't determine the object's center, normals might be oriented in the wrong direction. Use the Edit Mesh or Normal modifiers to flip normals.

When Unify Normals is turned off, normals are calculated according to the face vertex order in the drawing file. Face normals for solid objects are already unified. Turn off Unify Normals when importing drawings containing solid objects.

You should also turn off Unify Normals when working with Architectural Desktop files.

Cap Closed Objects—Applies an Extrude modifier to all closed objects, and turns on the Cap Start and Cap End options of the modifier. The Extrude modifier Amount value for a closed entity with no thickness is set to 0. Capping makes closed entities with thickness appear solid and closed entities without thickness appear flat. When Cap Closed Objects is turned off, the Extrude modifier Cap Start and Cap End options for closed entities with thickness are turned off. No modifiers are applied to closed entities without thickness, except for Circle, Trace, and Solid.

Note: If Use Extrude Modifier to Represent Thickness is turned off, an extrude modifier is *not* applied to closed objects.

Texture Mapping—The texture mapping settings affect the loading time of models that have many objects with stored UVW Coordinates for texture mapped materials.

Note: This setting only applies to geometry that is stored as a mesh in the scene. Spline shapes marked as renderable have separate controls for UVW coordinate generation on the Spline Rendering panel.

- **No Mapping Coordinates**—When No Mapping Coordinates is used, the File Link Manager will not generate texture coordinates for the mesh objects that are linked.

  When drawings are imported, objects are added to the scene as Editable Mesh objects that do not have UVW coordinate assignments. Before assigning materials to imported objects, you'll need to apply a *UVW Map modifier (page 1–905)* to add texture coordinates. When you then apply the material and the material or texture map is set to Show Map in Viewport, the texture map is displayed if the viewport is set to Smooth + Highlights. If the UVW Map modifier is not applied, the object turns gray and you'll see a *Missing Map Coordinates dialog (page 2–1433)* when you render the scene.

  This option gives you faster loading speed, but no UVW coordinate generation.

- **Generate Coordinates For All Objects**—This option forces all objects to have UVW coordinates generated when the drawing is imported.

  This option tells the DWG/DXF Importer to create UVW coordinates, but loading time is increased while the coordinate generation occurs.

Curve Steps—Adjusts how smoothly an arc or curve appears when the drawing is imported. Larger numbers result in smoother curves. Default=10.

Surface Deviation for 3D Solids—Specifies the maximum allowable distance from the 3ds Max surface mesh to the parametric 3D solid surface. Small numbers produce more accurate surfaces with a greater number of faces. Large numbers produce less accurate surfaces with fewer faces.

Geometry panel: Include group

This group allows you to toggle the inclusion of specific parts of a drawing file during the import process.

External References (xrefs)—Imports xrefs attached to the drawing file.

Hatches—Imports hatches from the drawing file.

Warning: This stores each line or dot in the hatch pattern as a separate component of the VIZBlock that defines the hatch; this can create a very large number of objects in your scene.

Points—Imports points from the drawing file.

Note: The imported point objects are represented in 3ds Max as Point Helper objects.

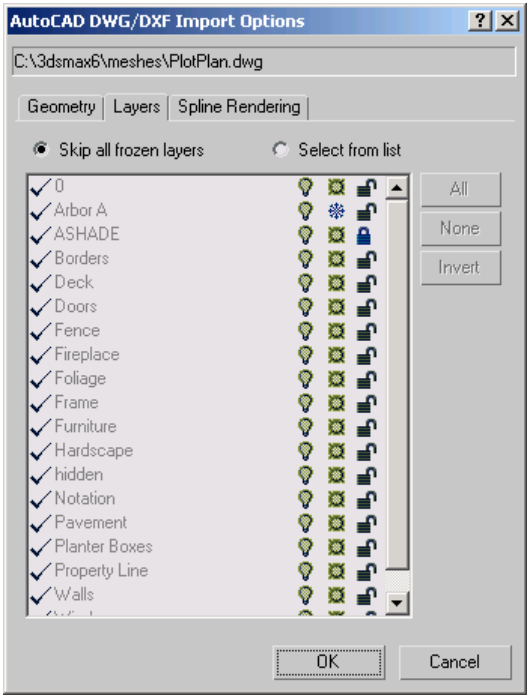
Lights—Imports lights from the drawing file.

Views (cameras)—Imports named views from the drawing file, and converts them to 3ds Max cameras.

UCSs (grids)—Imports user coordinate systems (UCS) from the drawing file and converts them to 3ds Max grid objects.

Layers panel

This interface is very similar to the *Layer Manager (page 3–706)*. Layer names remain the same as specified in the drawing file.



Skip all Frozen Layers—Excludes the import of objects on frozen layers.

Select from List—Allows you to choose specific layers to import. A check mark beside the layer name indicates the layer is selected.

All—The All button is only active when Select From List is turned on. It quickly lets you select all the layers in the list.

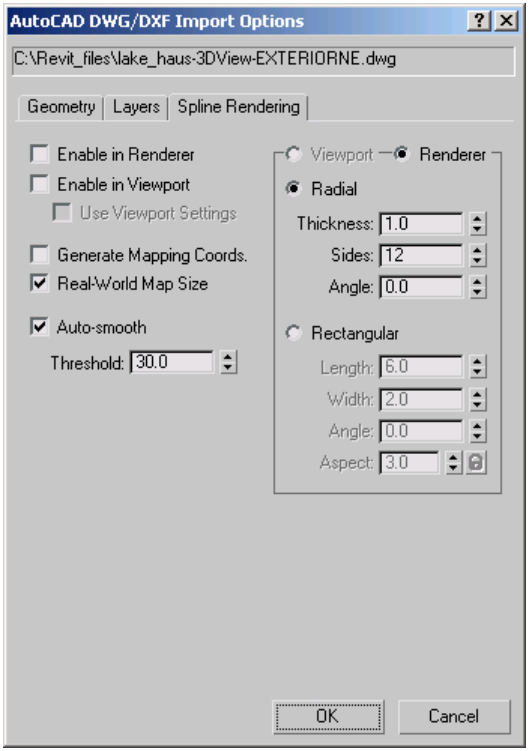
None—The None button is only active when Select From List is turned on. It deselects any layers you've selected.

Invert—The Invert button is only active when Select From List is turned on. Clicking this button reverses the selection set: currently selected layers are unselected and unselected layers are selected.

Layer List—This field displays all the layers that make up the drawing and shows their status such as hidden/displayed or frozen/unfrozen.

Spline Rendering panel

The controls on this panel are identical in name and operation to those found on the Rendering rollout of an *Editable Spline (page 1–284)*. The values of these settings are "set" for all imported shapes. Once the import is complete, you can change the settings as necessary for each object.



Enable In Renderer—When on, the shape is rendered as a 3D mesh using the Radial or Rectangular parameters set for Renderer. In previous versions of the program, the Renderable switch performed the same operation.

Enable In Viewport—When on, the shape is displayed in the viewport as a 3D mesh using the Radial or Rectangular parameters set for Renderer. In previous versions of the program, the Display Render Mesh performed the same operation.

Use Viewport settings—Lets you set different rendering parameters, and displays the mesh generated by the Viewport settings. Available only when Enable in Viewport is turned on.

Generate Mapping Coords—Turn this on to apply mapping coordinates. Default=off.

3ds Max generates the mapping coordinates in the U and V dimensions. The U coordinate wraps once around the spline; the V coordinate is mapped once along its length. Tiling is achieved using the Tiling parameters in the applied material. For more information, see *Mapping Coordinates (page 2–1249)*.

Real-World Map Size—Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's *Coordinates rollout (page 2–1434)*. Default=on.

Auto Smooth—If Auto Smooth is turned on, the spline is auto-smoothed using the threshold specified by the Threshold setting below it. Auto Smooth sets the smoothing based on the angle between spline segments. Any two adjacent segments are put in the same smoothing group if the angle between them is less than the threshold angle.

Threshold—Specifies the threshold angle in degrees. Any two adjacent spline segments are put in the same smoothing group if the angle between them is less than the threshold angle.

Viewport—Turn this on to specify Radial or Rectangular parameters for the shape as it will display in the viewport when Enable in Viewport is turned on.

Renderer—Turn this on to specify Radial or Rectangular parameters for the shape as it will display when rendered or viewed in the viewport when Enable in Viewport is turned on.

Radial—Displays the 3D mesh as a cylindrical object.

Thickness—Specifies the diameter of the viewport or rendered spline mesh. Default=1.0. Range=0.0 to 100,000,000.0.

Splines rendered at thickness of 1.0 and 5.0, respectively

Sides—Sets the number of sides (or facets) for the spline mesh n the viewport or renderer. For example, a value of 4 results in a square cross section.

Angle—Adjusts the rotational position of the cross-section in the viewport or renderer. For example, if the spline mesh has a square cross section you can use Angle to position a "flat" side down.

Rectangular—Displays the spline's mesh shape as a rectangle.

Length—Specifies the size of the cross–section along the local *Y* axis.

Width—Specifies the size of the cross–section along the local *X* axis.

Angle—Adjusts the rotational position of the cross-section in the viewport or renderer. For example, if you have a square cross-section you can use Angle to position a "flat" side down.

Aspect—Sets the aspect ratio for rectangular cross-sections. The Lock check box lets you lock the aspect ratio. When Lock is turned on, Width is

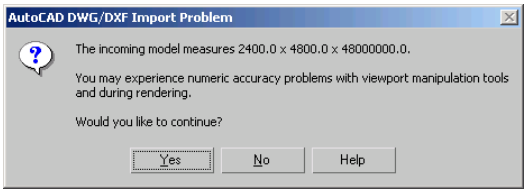
locked to Length that results in a constant ratio of Width to Length.

A Note on Large-Scale Drawings

If you attempt to import geometry that is created very far from the origin or contains a very large bounding box in tools like AutoCAD, the 3ds Max viewports and transform tools do not respond properly. When you use them, the cursor does not move smoothly.

For example, if you have a file that is a mile wide, but your system units are millimeters, you have a scene width of 1.6 million units, which is too great a value. If you change your system unit to feet, this is less taxing on the system.

If any side of the scene's bounding box measures larger than ± 1,000,000 system units, you will see the following dialog:



Legacy AutoCAD Import

File menu > Import > Legacy AutoCAD (*.DWG)

The new *AutoCAD DWG/DXF Import Options dialog (page 3–537)* contains many improvements, including enhanced DWG compatibility and greater user control and customizability; however, some things were also lost from the DWG Import found in previous versions of the software. For this reason, 3ds Max retains the legacy DWG Import functionality.

Differences Between New and Legacy DWG Import

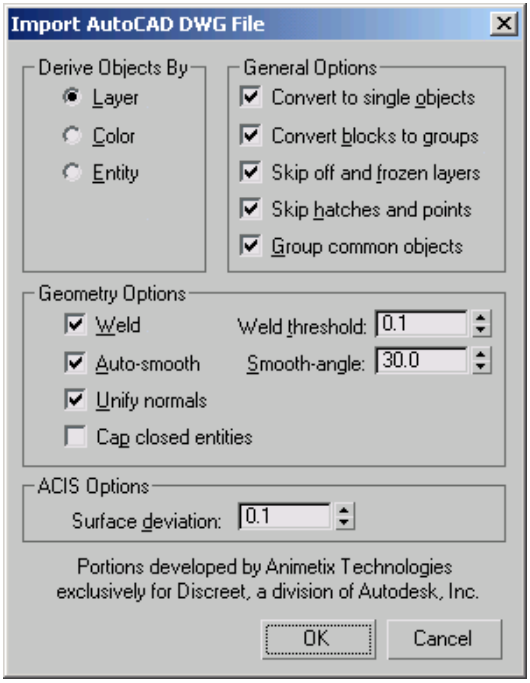
Features Unique to the new DWG Import System

- Support for all ObjectARX custom objects (ignored by the Legacy importer).
- Specialized support for Architectural Desktop and Revit objects, including style/component grouping and naming, style associations for material and modifier propagation, and material translation and assignment.
- Specialized support for AEC Civil contour objects (translated into a Terrain object).
- Support for Raster objects.
- Support for axonometric named views (translated into cameras with the Orthogonal toggle turned on). Both importers can translate perspective views.
- Support for attached drawing xrefs.
- Support for DXF files.
- Rescaling to imported drawings created with units that differ from the 3ds Max system units.
- Ability to skip frozen layers, or to select specific layers to import (or exclude) from a list.
- Ability to set shape rendering parameters before importing to 3ds Max.
- Ability to maintain layer assignments from the drawing file.

Features Unique to the Legacy DWG Import System

- AutoCAD primitives are translated into 3ds Max primitives.
- Support for Text (though not MText).
- Imported blocks are represented as groups.

Interface



Derive Objects By group

Layer—Names each 3ds Max object based on the object layers specified in the drawing file. The layer name is followed by a number for each object from that layer. For example, an object on the layer BASE becomes BASE.01. If Convert To Single Objects is turned on, objects on the same layer become a single 3ds Max object.

Color—Derives the name of each 3ds Max object based on the object's layer color in the drawing. The AutoCAD color number is followed by a number for each object using that layer color. For example, objects on a layer that is set to the color red (Color number 001) become COLOR001.01. Colors assigned by object are ignored in favor of colors assigned by layer. If Convert To Single Objects is turned on, objects assigned the same layer color become a single 3ds Max object.

Entity—Names each 3ds Max object based on the object type. The object type name is followed by a number for each object converted. For example, a Line object becomes Line.01. Drawings can contain thousands of entities, so deriving objects by entity can create many 3ds Maxobjects.

General Options group

Convert to Single Objects—Combines multiple objects in the drawing file into a single 3ds Max object. Objects are combined according to the current Derive Objects By setting and their 3ds Max object type. Explicit mesh objects are combined. Shapes with no Z axis extrusion are combined, as are shapes with the same Z axis extrusion amount. Shapes with differing amounts of Z axis extrusion are assigned an Extrude modifier and are not combined.

Convert Blocks to Groups—Places all objects in a block entity into a 3ds Max group that uses the name of the block entity and the number .01. For example, a block entity named CHAIR becomes a collection of 3ds Max objects inside a group named [CHAIR.01].

Multiple insertions of the block entity are converted to instances of the 3ds Max group. For example, a second insertion of the block, CHAIR, becomes an instance of [CHAIR.01] named [CHAIR.02].

When Convert Blocks To Groups is turned off, block definitions are ignored and block insertions are treated as separate objects, similar to exploding blocks in AutoCAD.

Skip Off and Frozen Layers—Excludes the import of objects on layers that are hidden or frozen.

Skip Hatches and Points—Excludes the import of hatch patterns and point objects.

Hatch patterns are made of many short line segments and points. Importing all the objects in hatch patterns can overload your 3ds Max scene.

Note: Hatch patterns are stored in drawings as anonymous blocks. Skip Hatches And Points skips any other anonymous blocks in the drawing file. Hatch patterns created in AutoCAD R14 are skipped regardless of this setting.

Group Common Objects—Puts imported objects into a common group, based on how they are derived. In other words, the group would include all objects on a common layer, or color, and so on.

Geometry Options group

Weld—Sets whether coincident vertices of converted objects are welded according to the Weld Threshold setting. Welding smoothes across seams and unifies normals of objects with coincident vertices. To use the Weld option, first turn on Convert To Single Objects, because welding occurs only for vertices that are part of the same object.

Weld Threshold—Sets the distance that determines whether vertices are coincident. If the distance between two vertices is less than or equal to the Weld Threshold setting, the vertices are welded together.

Auto-Smooth—Assigns smoothing groups according to the Smooth Angle setting. Smoothing groups determine whether faces on an object render as a smooth surface or display a seam at their edges, creating a faceted appearance.

Smooth Angle—Controls whether smoothing occurs between two adjacent faces. If the angle between the two face normals is less than or equal to the Smooth Angle setting, the faces are smoothed.

Unify Normals—Analyzes the face normals of each object and flips normals where necessary, so they all point out from the center of an object. If the imported geometry is not properly welded, or if the software can't determine the object's center, normals might be oriented in the wrong direction. Use the Edit Mesh or Normal modifiers to flip normals.

When Unify Normals is turned off, normals are calculated according to the face vertex order in the drawing file. Face normals for 3D Solids are already unified. Turn off Unify Normals when importing 3D Solid models.

Cap Closed Entities—Applies an Extrude modifier to all closed entities, and turns on the Cap Start and Cap End options of the modifier. The Extrude modifier Amount value for a closed entity with no thickness is set to 0. Capping makes closed entities with thickness appear solid and closed entities without thickness appear flat. When Cap Closed Entities is turned off, the Extrude modifier Cap Start and Cap End options for closed entities with thickness are turned off. No modifiers are applied to closed entities without thickness, except for Circle, Trace, and Solid.

ACIS Options group

Surface Deviation—Specifies the maximum allowable distance from the 3ds Max surface mesh to the parametric ACIS surface. Small numbers produce more accurate surfaces with a greater number of faces. Large numbers produce less accurate surfaces with fewer faces.

Exporting to AutoCAD DWG Files

File menu > Export > AutoCAD (*.DWG)

When you export to an AutoCAD 2005 or AutoCAD 2000 drawing file, you convert your 3ds Max objects into AutoCAD objects. Because AutoCAD doesn't support animation, objects export in a static state defined by the current frame set by the time slider.

If layers, instances or colors are used to organize objects in the scene, that structure is maintained when the model is exported.

Exported objects that have modifiers assigned to them are affected by the current state of the modifier. For instance, if the Taper modifier, assigned to a Box, is turned off, the exported scene will show a non-tapered box.

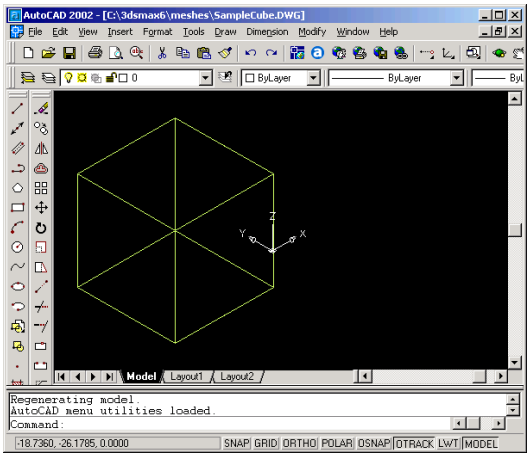
Note: Layers created in 3ds Max are not exported to AutoCAD.

Note: Exporting to an AutoCAD R14 drawing file is no longer supported. Export to a 3DS or DXF file format if you are working with AutoCAD R14.

When drawings, exported from 3ds Max, are opened in AutoCAD, you are presented with an Isometric (3/4) view looking toward the positive XY direction instead of a Front elevation view.

What to Expect When Opening the DWG File

When drawings, exported from 3ds Max, are opened in AutoCAD, Architectural Desktop or other desktops, you are presented with an Isometric (3/4) view looking toward the positive XY direction.



The isometric view of an exported model opened in AutoCAD

The exporter also sets two AutoCAD system variables. INSUNITS, Insert Units, sets the drawing-unit value for blocks or images inserted from AutoCAD Design Center. Therefore, if you have the units of a model in 3ds Max set to millimeters, INSUNITS will be set to “4”. The other system variable is MEASUREMENT which sets the drawing units as either “English” or “Metric”.

See also

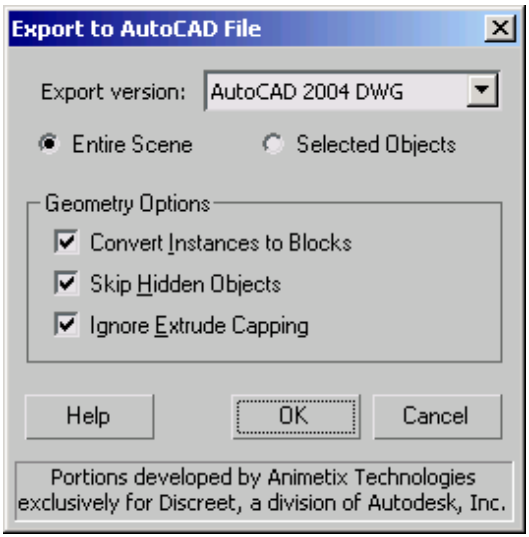
Exporting to DXF Files (page 3–552)

Procedure

To export a DWG file:

1. Choose File menu > Export.
2. Choose AutoCAD (*.DWG) in the Files Of Type list.
3. Specify a file name to export.
4. Set options in the Export to AutoCAD File dialog (described below).

Interface



Export version

Version List—3ds Max allows you to export to AutoCAD 2005 or AutoCAD 2000.

Entire Scene—All objects in the scene are exported. Default=on.

Selected Objects—When turned on, only the selected objects are exported. Turning this switch on is comparable to using File > *Export Selected (page 3–491).*

Geometry Options group

Convert Instances To Blocks—Converts instances to AutoCAD block insertions. The block definition uses the same name as the first instance converted. When turned off, each instance is converted as a separate AutoCAD object. References are always exported as separate objects.

Skip Hidden Objects—Exports hidden objects. When turned off, hidden objects are not exported.

Ignore Extrude Capping—When turned on, exports shapes with Extrude modifiers as 2D AutoCAD objects with a thickness property, and ignores the state of the Cap Start and Cap End parameters. When turned off, shapes with Extrude modifiers that also have Cap Start or Cap End turned on, are exported as polyface 3D meshes. Extruded Circles, Donuts, and Rectangles export as AutoCAD Circles, Donuts and Traces with a thickness property.

AutoCAD Interchange (DXF) Files

Importing DXF Files

File menu > Import > Select File To Import dialog > Files Of Type > AutoCAD (*.DXF)

The DXF file format is the next best method of getting design data to and from 3ds Max if using a DWG file is not an option. Most commonly, DXF files are used to import and export modeling data to and from CAD programs that have support for DXF files, but not DWG files.

Importing DXF files uses the same import plug-in that is used for *imported DWG files (page 3–537).* When you import an DXF file, the software converts a subset of AutoCAD objects to corresponding 3ds Max objects.

Note: You are no longer asked if you want to Completely Replace Current Scene. If you import multiple drawings, the importer will merge the drawings together.

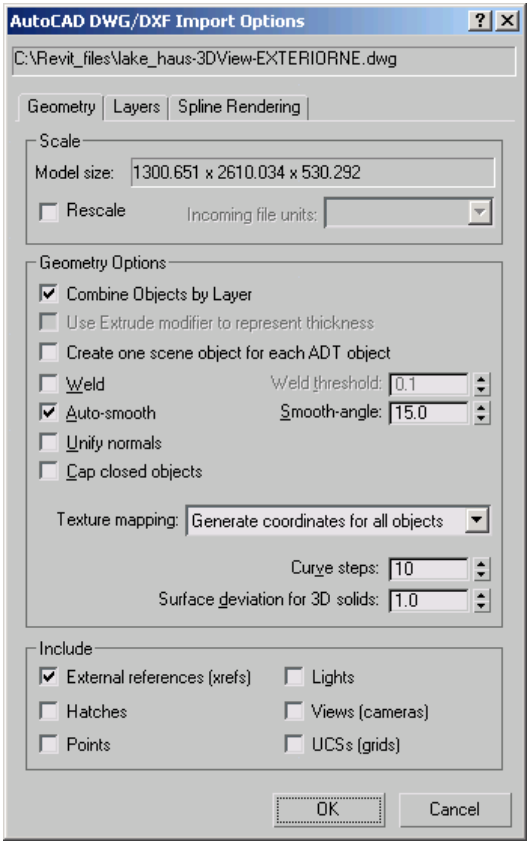
After you select a DXF file to import, the AutoCAD DWG/DXF Import Options dialog is displayed. Once imported, you are presented with Editable Meshes, Editable Splines and PRS Controllers.

Procedure

To import a DXF file:

1. Choose File menu > Import.
2. Choose AutoCAD (*.DXF) in the Files Of Type list.
3. Specify a file name to import.
4. Set options in the AutoCAD DWG/DXF Import Options dialog.
5. Click OK to begin importing the model.

Interface



Geometry panel: Scale group

Model Size—Incoming geometry is evaluated to determine its bounding box size. This field displays the scene extents based on three factors:

- Incoming File Units
- System Units in 3ds Max
- Display Units in 3ds Max

Note: If the size cannot be determined, the field will show (Drawing Extents Not Known).

Rescale—Allows rescaling of the incoming geometry by a factor corresponding to the most common unit type used. The importer will try to detect the units of the DXF file being imported, compare those units with the 3ds Max system units, and provide the appropriate conversion factor.

For example: if a DXF file is saved using millimeter units and 3ds Max has its System Units set to 1.0 inches, the AutoCAD DWG/DXF Import Options dialog will automatically be set with Rescale turned on and the Incoming File Units set to millimeters.

Note: If the units are unspecified in the drawing, the list will appear blank. In this case, if the Import button is pressed and the Rescale toggle is turned on, you are prompted to select a value for Incoming File Units, and returned to the AutoCAD DWG/DXF Import Options dialog.

Incoming File Units—A drop down menu where you can set the scene units.

Geometry panel: Geometry Options group

Combine Objects by Layer—Names each imported object based on the AutoCAD object's layer. The imported object name has a "Layer:" prefix and is followed by the layer name. For example, an AutoCAD object on the layer WALLS becomes Layer:Walls.

Create One Scene Object For Each ADT Object—Architectural Desktop (ADT) objects are imported as a single object instead of being separated into their constituent components. This means that if you import an ADT door object, the door is represented as one object instead of three. Turning on this switch make importing faster and the scene size is smaller.

Note: This switch presents several modeling concerns that you need to be aware of:

- Material assignments from ADT are not translated during the import process..
- If you want to assign materials to these objects, you'll have to use Multi/Sub-Object materials.

- Depending on the Texture Mapping option you choose, UVW coordinates are translated correctly.

Weld—Sets whether coincident vertices of converted objects are welded according the to Weld Threshold setting. Welding smoothes across seams and unifies normals of objects with coincident vertices. To use the Weld option, first turn on Convert To Single Objects, because welding occurs only for vertices that are part of the same object.

Weld Threshold—Sets the distance that determines whether vertices are coincident. If the distance between two vertices is less than or equal to the Weld Threshold, the vertices are welded together.

Auto-smooth—Assigns smoothing groups according to the Smooth Angle value. Smoothing groups determine whether faces on an object render as a smooth surface or display a seam at their edges, creating a faceted appearance.

Smooth Angle—Controls whether smoothing occurs between two adjacent faces. If the angle between the two face normals is less than or equal to the smooth angle, the faces are smoothed.

Unify Normals—Analyzes the face normals of each object and flips normals where necessary, so they all point out from the center of an object. If the imported geometry is not properly welded, or if the software can't determine the object's center, normals might be oriented in the wrong direction. Use the Edit Mesh or Normal modifiers to flip normals.

When Unify Normals is turned off, normals are calculated according to the face vertex order in the DXF file. For instance, face normals for AutoCAD ACIS solids are already unified. Turn off Unify Normals when importing ACIS solid models from AutoCAD.

Cap Closed Entities—Applies an extrude modifier to all closed entities, and turns on the Cap Start and Cap End options of the modifier. The Extrude modifier Amount value for a closed entity with no thickness is set to 0. Capping makes closed entities with thickness appear solid and closed entities without thickness appear flat. When Cap Closed Entities is turned off, the Extrude modifier Cap Start and Cap End options for closed entities with thickness are turned off. No modifiers are applied to closed entities without thickness, except for Circle, Trace, and Solid.

Texture Mapping—The texture mapping settings affect the loading time of models that have many objects with stored UVW Coordinates for texture mapped materials.

Note: This setting only applies to geometry that is stored as a mesh in the scene. Spline shapes marked as renderable have separate controls for UVW coordinate generation on the Spline Rendering panel.

- **No Mapping Coordinates**—When No Mapping Coordinates is used, the File Link Manager will not generate texture coordinates for the mesh objects that are linked.

  When DXF files are imported, objects are added to the scene as Editable Mesh objects that do not have UVW coordinate assignments. Before assigning materials to imported objects, you'll need to apply a *UVW Map modifier (page 1–905)* to add texture coordinates. When you then apply the material and the material or texture map is set to Show Map in Viewport, the texture map is displayed if the viewport is set to Smooth + Highlights. If the UVW Map modifier is not applied, the object turns gray and you'll see a *Missing Map Coordinates dialog (page 2–1433)* when you render the scene.

  This option gives you faster loading speed, but no UVW coordinate generation.

- **Generate Coordinates For All Objects**—This option forces all objects to have UVW

coordinates generated when the DXF file is imported.

This option tells the DWG/DXF Importer to create UVW coordinates, but loading time is increased while the coordinate generation occurs.

Curve Steps—Adjusts how smoothly an arc or curve appears when the drawing is imported. Larger numbers result in smoother curves. Default=10.

Surface Deviation For 3D Solids—Specifies the maximum allowable distance from the 3ds Max surface mesh to the parametric ACIS surface. Small numbers produce more accurate surfaces with a greater number of faces. Large numbers produce less accurate surfaces with fewer faces.

Geometry panel: Include group

This group allows you to toggle the inclusion of specific parts of a DWG file during the file link process.

External references—Imports xrefs attached to the DWG file.

Hatches—Imports hatches from the DWG file.

Warning: This stores each line or dot in the hatch pattern as a separate component of the VIZBlock that defines the hatch; this can create a very large number of objects in your scene.

Points—Imports points from the DWG file.

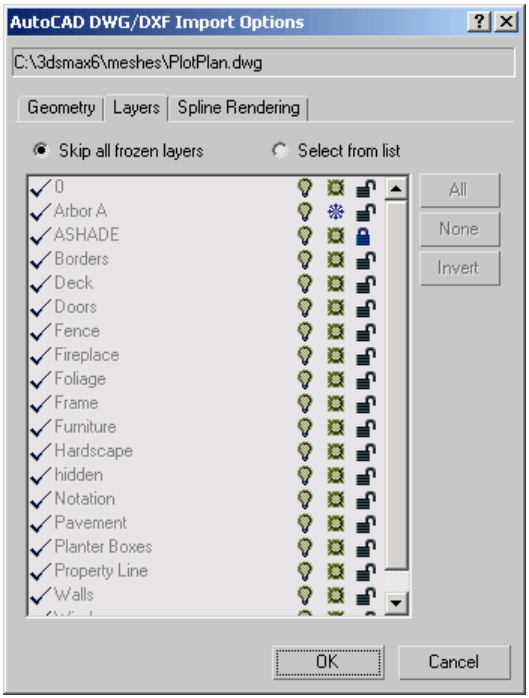
Lights—Imports lights from the DWG file.

Views (cameras)—Imports cameras from the DWG file, and converts them to 3ds Max cameras.

UCSs (grids)—Imports user coordinate systems (UCS) from the DWG file and converts them to 3ds Max grid objects.

Layers panel

This interface is very similar to the *Layer Manager (page 3–706)*. Layer names remain the same as specified in the DXF file.



Skip all Frozen Layers—Excludes the import of AutoCAD objects on layers that are Off or Frozen.

Select from List—Allows you to choose specific layer that get imported.

All—The All button is only active when Select from List is turned on. It quickly lets you select all the layer in the list.

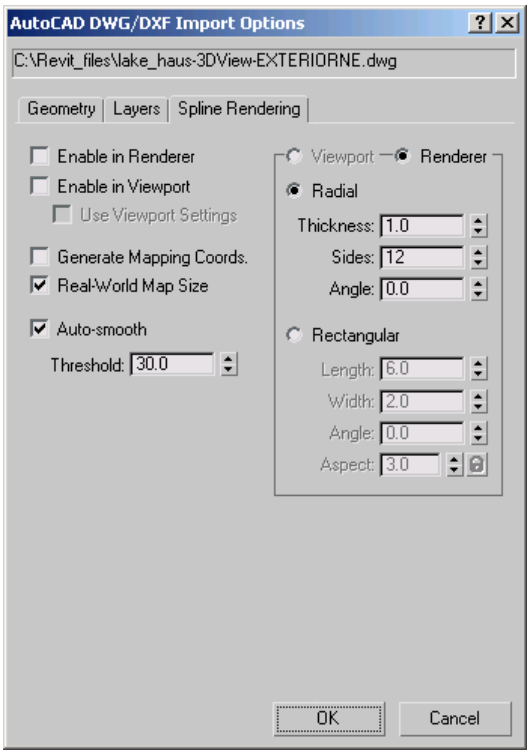
None—The None button is only active when Select from List is turned on. It deselects any layers you've selected.

Invert—The Invert button is only active when Select from List is turned on. Clicking this button reverses the selection set. Currently selected layers are unselected and unselected layers are selected.

Layer List—This field displays all the layers that make up the drawing and shows their status such as on/off, frozen/unfrozen or locked/unlocked.

Spline Rendering panel

The controls on this panel are identical in name and operation to those found on the Rendering rollout of an *Editable Spline (page 1–284)*. The values of these settings are 'set' for all imported shapes. Once the import is complete, you can change the settings as necessary for each object.



Enable In Renderer—When on, the shape is rendered as a 3D mesh using the Radial or Rectangular parameters set for Renderer. In previous versions of the program, the Renderable switch performed the same operation.

Enable In Viewport—When on, the shape is displayed in the viewport as a 3D mesh using the Radial or Rectangular parameters set for Renderer. In previous versions of the program, the Display Render Mesh performed the same operation.

Use Viewport settings—Lets you set different rendering parameters, and displays the mesh generated by the Viewport settings. Available only when Enable in Viewport is turned on.

Generate Mapping Coords—Turn this on to apply mapping coordinates. Default=off.

3ds Max generates the mapping coordinates in the U and V dimensions. The U coordinate wraps once around the spline; the V coordinate is mapped once along its length. Tiling is achieved using the Tiling parameters in the applied material. For more information, see *Mapping Coordinates (page 2–1249)*.

Real-World Map Size—Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's *Coordinates rollout (page 2–1434)*. Default=on.

Auto Smooth—If Auto Smooth is turned on, the spline is auto-smoothed using the threshold specified by the Threshold setting below it. Auto Smooth sets the smoothing based on the angle between spline segments. Any two adjacent segments are put in the same smoothing group if the angle between them is less than the threshold angle.

Threshold—Specifies the threshold angle in degrees. Any two adjacent spline segments are put in the same smoothing group if the angle between them is less than the threshold angle.

Viewport—Turn this on to specify Radial or Rectangular parameters for the shape as it will display in the viewport when Enable in Viewport is turned on.

Renderer—Turn this on to specify Radial or Rectangular parameters for the shape as it will display when rendered or viewed in the viewport when Enable in Viewport is turned on.

Radial—Displays the 3D mesh as a cylindrical object.

Thickness—Specifies the diameter of the viewport or rendered spline mesh. Default=1.0. Range=0.0 to 100,000,000.0.

Splines rendered at thickness of 1.0 and 5.0, respectively

Sides—Sets the number of sides (or facets) for the spline mesh n the viewport or renderer. For example, a value of 4 results in a square cross section.

Angle—Adjusts the rotational position of the cross-section in the viewport or renderer. For example, if the spline mesh has a square cross section you can use Angle to position a "flat" side down.

Rectangular—Displays the spline's mesh shape as a rectangle.

Length—Specifies the size of the cross–section along the local *Y* axis.

Width—Specifies the size of the cross–section along the local *X* axis.

Angle—Adjusts the rotational position of the cross-section in the viewport or renderer. For example, if you have a square cross-section you can use Angle to position a "flat" side down.

Aspect—Sets the aspect ratio for rectangular cross-sections. The Lock check box lets you lock the aspect ratio. When Lock is turned on, Width is locked to Length that results in a constant ratio of Width to Length.

Exporting to DXF Files

File menu > Export > Select File To Export dialog > Save As Type > AutoCAD (*.DXF)

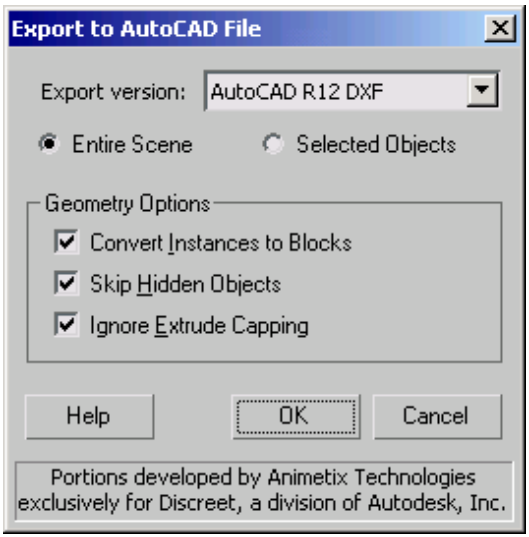
DXF files are used to import and export objects to and from AutoCAD (and other programs that support this file format).

Note: The DXF Exporter can export only mesh data. Therefore, all *shapes and splines* *(page 3–1105)* are exported as mesh objects. Consequently, any open splines (which cannot be converted to mesh objects) in your scene will not be exported.

See also

Exporting to AutoCAD DWG Files (page 3–545)

Interface



Export version

Export version list—Lets you choose the AutoCAD version to export. 3ds Max allows you to export to AutoCAD 2005, AutoCAD 2000, or AutoCAD R12 DXF formats.

- **Entire Scene—**(The default.) All objects in the scene are exported.
- **Selected Objects—**When chosen, only the selected objects are exported. Choosing this option is comparable to using File > *Export Selected (page 3–491)*.

Geometry Options group

Convert Instances To Blocks—Converts instances to AutoCAD block insertions. The block definition uses the same name as the first instance converted. When turned off, each instance is converted as a separate AutoCAD object. References are always exported as separate objects.

Skip Hidden Objects—Exports hidden objects. When turned off, hidden objects are not exported.

Ignore Extrude Capping—When turned on, exports shapes with Extrude modifiers as 2D AutoCAD objects with a thickness property, and ignores the state of the Cap Start and Cap End parameters. When turned off, shapes with Extrude modifiers that also have Cap Start or Cap End turned on, are exported as polyface 3D meshes. Extruded Circles, Donuts, and Rectangles export as AutoCAD Circles, Donuts and Traces with a thickness property.

Autodesk Inventor Files

Importing Autodesk Inventor Files

File menu > Import > Select File To Import dialog > Files Of Type > Autodesk Inventor (*.IPT, *.IAM)

IPT and IAM are the native Autodesk Inventor® file formats for *parts* (IPT) and *assemblies* (IAM). You can now import both file formats into 3ds Max without having to copy scripts from the install CD.

The components of models that you import into 3ds Max retain their object naming as assigned in Autodesk Inventor and appear as *editable meshes (page 1–984)*. Once imported, you can edit the model just as you would any other type of object that you construct. You can apply modifiers, alter materials, add lighting and cameras, create animations, etc.

Requirements and Limitations

In order to be able to import models that originate from Autodesk Inventor, Inventor 8, or later, is required to be installed along with 3ds Max on the system.

At this time, there are some limitations to the Inventor Importer. They are as follows:

- Camera animation paths are not converted to 3ds Max cameras so any animation you've set up in Inventor is lost during import.
- Any lighting from brightness and ambience settings created in the Inventor file are not imported. You will have to relight the scene once the import is complete.
- A model that is set up with constraints to limit the movement of parts will lose those constraints upon import. You will need to use

inverse kinematics (IK) (page 2–417) to restore the constraints.

- Dragging and dropping an Inventor file into 3ds Max uses the settings last set on the Inventor File Import dialog with the except for Mesh Resolution, which always resets to 0.
- 3ds Max uses the last version of Inventor that was opened to set the Import version. For instance, let's say you have both Inventor 8 and Inventor 10 on your system. If the last version of Inventor you ran was Inventor 8, you cannot import Inventor 10 files. Inventor 8 must be closed and Inventor 10 opened, at least once, in order for you to successfully import Inventor 10 files.

Material Handling

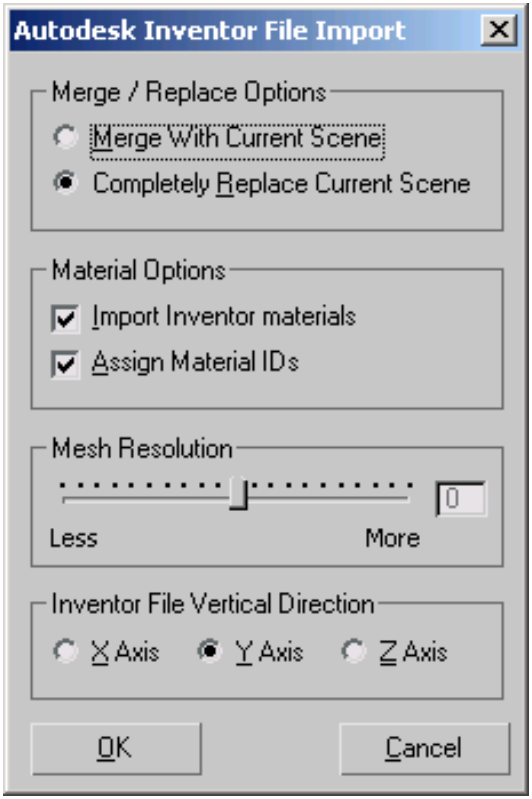
Materials and material assignments made to the original Inventor model are retained and imported along with the geometry. Materials are imported as *Architectural materials (page 2–1376)* or if a single object has several materials assigned to it, they are imported as a *Multi/Sub-Object material (page 2–1403)*.

Procedures

To import an IAM or IPT file:

1. Choose File menu > Import.
2. Choose Autodesk Inventor (*.IPT, *.IAM) in the Files of Type list.
3. Specify a file name to import.
4. Set options in the Autodesk Inventor File Import dialog.

Interface



Merge / Replace Options group

Merge With Current Scene—Incoming geometry is merged with any existing geometry that is already present in the scene. This setting is useful if you have several separate files that contains components that you want to combine into a single model.

Completely Replace Current Scene—The file you're importing will completely replace any existing geometry that is in the current scene. If your current scene has not been saved, you are given the opportunity to save your changes to the current scene before the import process continues. Default=on.

Material Options group

Import Inventor Materials—When turned on, all Inventor materials and texture maps are translated and imported into the scene. If turned off, no materials are imported with the model.

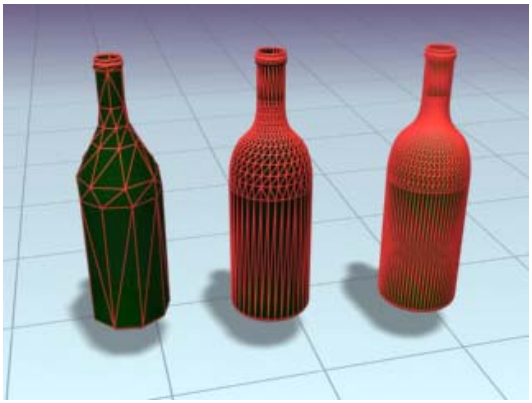
Assign Material IDs—Lets you control whether material IDs are assigned to objects that are imported from Inventor. You can assign different materials to different surfaces of the same object while working in Inventor. When these objects are imported to 3ds Max, material IDs are assigned to the faces of single objects to which multiple materials are applied.

For example, you've created a single object that represents a knob that has a threaded shaft and you've applied a black, plastic material to the knob and a silver, metal material to the threaded shaft. If Assign Material IDs is turned on when you import the model into 3ds Max, the faces of the object that have the plastic material are assigned material ID #1 and the faces that have the metal material are assigned material ID #2. If you choose to try different materials while working in 3ds Max, you can quickly make *sub-object selections (page 1–74)* based on the material IDs or apply a *Multi/Sub-Object material (page 2–1403)* that contains materials that correspond to the IDs assigned to the faces.

Mesh Resolution group

Mesh Resolution—This slider lets you determine the degree of refinement applied to mesh objects by the importation process. When set to 0 (zero), the geometry is imported as it appears in Autodesk Inventor. When set less than zero, the mesh is optimized with fewer faces thus reducing detail. If the mesh resolution is set higher than zero, the mesh is tessellated with more faces, giving you greater detail.

The mesh resolution slider is always set to 0 when you initiate an import.



Left: Mesh Resolution=–7.
Center: Mesh Resolution=0.
Right: Mesh Resolution=+7.

Note: The option to adjust mesh resolution is available only for models imported from Autodesk Inventor 10 or later.

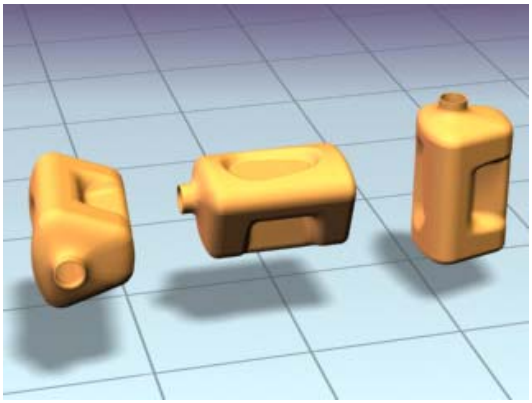
Inventor File Vertical Direction group

This option determines the model's orientation upon import. You can choose which axis of the Inventor model is vertical.

X Axis—The X axis of the model, as seen in Inventor, is rotated so it is vertical when the model is imported.

Y Axis—The model is imported with the Y axis oriented as the vertical axis.

Z Axis—The imported model is rotated so its Z axis is the vertical axis.



Left: Vertical axis set to X.
Center: Vertical axis set to Y.
Right: Vertical axis set to Z.

DWF Files

Exporting 3D DWF Files

File menu > Export > Publish to DWF

With 3D DWF publishing, you can export Design Web Format™ (.DWF™) files of your three-dimensional models with nearly the same visual fidelity as in rendered scenes. DWF files are relatively small files that can easily be shared with a team working on a project who may not have 3ds Max. It also provides a fast way for viewing models without having to spend time animating and rendering them because you can use the Orbit feature in the viewer to fly around the model.

For example, a DWF file of your scene can allow you and others to quickly view an interactive model as well as the properties of each object.

Recipients of 3D DWF files can view and print them using the Autodesk® DWF™ Viewer, which is installed with 3ds Max. For more information about using the viewer, see the Autodesk DWF Viewer help system.

Feature Support with 3D DWF Export

- 2D and 3D splines. The Enable In Viewport setting on the *Rendering rollout (page 1–262)* does not need to be enabled in order to export splines.
- 3D geometry.
- Texture mapped materials with a diffuse map channel, UV mapping channels, and material IDs are published.

  Note: Materials that have *Use Real-World Scale (page 2–1429)* enabled display more accurately in the DWF viewer.
- Procedural materials are exported, but they are only a rough approximation and will be very low resolution. Real-World Map Size should be turned off for objects that have procedural materials assigned to them.
- Materials that have transparency are correctly exported and their opacity values are recognized by the DWF Viewer. Even as you orbit the view, objects that pass behind other objects that have transparent materials assigned are still visible.

Limitations of 3D DWF Export

Materials and Environments

- Environment backgrounds are not exported; the DWF Viewer uses its own background color setting.
- Environmental effects such as fog do not export.
- Materials using reflection maps such as Flat Mirror do not produce a reflection when exported.

- Two-sided materials are not supported. However, you can get around this by turning on Force Two Sided on the Render Scene dialog.

  Note: Turning on Force Two-Sided affects the entire scene. This can slow down the performance of the DWF Viewer because it has to process the two-sided display of everything in scene.

- Materials from 3rd party suppliers and mental ray materials are not exported.

  Objects that have unsupported materials display in their diffuse color in the viewer. Architectural Desktop materials are displayed in their ambient color.

- Not all material parameters are exported, even for supported materials. Therefore, materials that are exported to the DWF Viewer may not look as they do in a rendered image.

Lights

- You cannot export scene lighting.

Cameras and Animation

- Named camera views are not exported. If the scene is set in a Camera viewport at the time of the export, it will display in the viewer as shown, however, the camera view will not be listed.
- Animations are not supported, however, the frame at the time of the export is published.

Procedure

To export a 3D DWF file:

1. Set up the scene in the active viewport as you want it displayed in the Autodesk DWF Viewer.

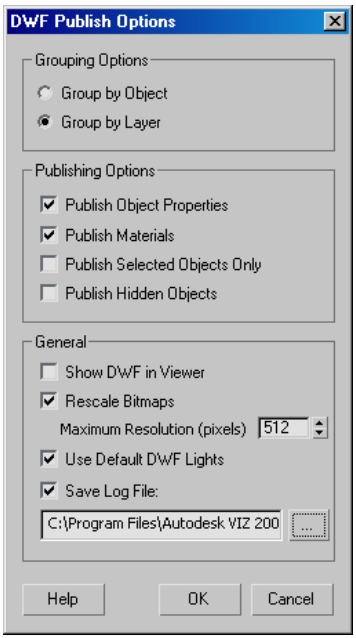
   If you want to publish particular objects or layers, make a selection set of those objects. Hide those objects or layers you do not want published.

   Note: You can also isolate objects in the viewer you want to hide or make transparent.

   Tip: If you have a camera in the scene and want that view exported, make sure the Camera viewport is active when you publish the DWF file.

2. Choose File menu > Export.
3. Choose Publish to DWF (*.DWF) from the Save as type list in the file selector dialog.
4. Specify a file name to export.
5. Click Save.
6. In the DWF Publish Options dialog, selected the desired options. Click OK.
7. If Save to Log file is enabled, enter a new name or specify a different folder if you do not want the existing log file to be overwritten.

Interface



Grouping Options group

Group by Object—When turned on, objects are listed in the Model tree pane in the Autodesk DWF Viewer by their object name or group name.

Group by Layer—When turned on, objects are grouped in the Model tree pane in the Autodesk DWF Viewer by their respective layers.

Publishing Options group

Publish Object Properties—When turned on, object property data is exported and displayed in the viewer and reported in the log file if Save Log File is enabled. Object Properties displayed are: object name, layer name, face count, vertex count, and whether the object is frozen or hidden.

Publish Materials—Displays objects with their assigned materials in the viewer. When turned off, objects are displayed in the highlight color set in the Options dialog in the viewer. Material names are not exported.

Publish Selected Objects Only—Exports only those objects that have been selected prior to exporting. All other objects are not exported when this is turned on.

Publish Hidden Objects—Hidden objects are exported and displayed in the viewer. When turned off, objects that are hidden or on layers that are hidden are not displayed. Hidden objects are listed in the log file if Save Log File is enabled.

Note: Frozen objects and frozen layers are exported.

General group

Show DWF in a Viewer—When turned on, the exported DWF file is automatically opened in the Autodesk DWF Viewer. When turned off, the viewer must be opened outside of 3ds Max.

Rescale Bitmaps—When turned on, bitmap textures are automatically rescaled in the DWF file to the size set for pixels for Maximum Resolution. Turn this on if the scene contains large texture files in order to reduce the DWF file size.

Note: This setting has no effect when Publish Materials is turned off.

Maximum Resolution (pixels)— Sets the maximum length, in pixels, of the longest edge of all the bitmap images that are used as textures.

Note: All bitmap images exported to the DWF file are compressed to *JPG (page 3–670)* format in order to create small DWF files.

Use Default DWF Lights—Lets you control whether the DWF Viewer adds its own default lighting. When turned off, the scene is displayed without lights in the viewer, which can result in the scene objects being flat shaded making them appear two dimensional. Turn Use Default DWF Lights off if the scene contains lights that are already baked into textures with *Render to Texture (page 3–139)*, otherwise it is recommended that DWF lights are used. Default=on.

Note: When exporting a scene with all the lighting baked into the texture maps after using Render to Texture, if Use Default DWF Lights is turned on the scene may actually appear darker in the DWF Viewer, and the built-in DWF lights will cause the scene lighting to change as you orbit around the objects in the scene. With it turned off, the lighting will be constant as you move through the scene.

Save Log File— When enabled, 3ds Max creates a text file with an *.log* file extension that lists objects, their layers, face and vertex counts that are exported as well as the time and date of the export. Objects that were not selected or hidden are also listed as not as not being exported. The log file is overwritten each time a DWF file is created unless the log file name or file location is changed. Default=on.

Filmbox (FBX) Files

File menu > Import > Kaydara FiLMBOX (*.FBX)

FBX is the Kaydara FiLMBOX file format. Kaydara FiLMBOX is a system used for the creation, editing, and blending of motion capture and keyframe animation. You can import files using this format.

You can also merge FBX files with your current scene, to copy new animation onto existing models. When you merge FBX files into your scene, only geometry transform data is imported; the geometry itself is ignored.

Feature Support with FBX Import

Mesh Geometry

Normals are not imported with the FBX file; they appear randomly flipped in 3ds Max.

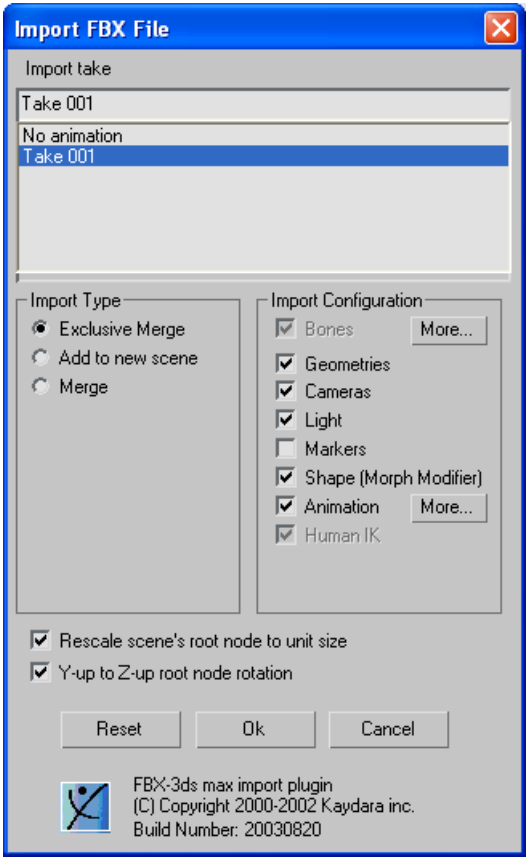
NURBS

NURBS cannot be imported from FBX; dummies must be created instead.

Patches

Patches are converted to triangle meshes.

Interface



Import take window—Some FBX files have more than one animation take for a given geometry. This window lets you choose the animation to import to 3ds Max.

If you choose No animation, only geometry will be imported.

Import Type group

Exclusive Merge—Merges the animation on elements present in both the FBX file being imported *and* in the current 3ds Max scene.

Note: Only animation is transferred in an exclusive merge. Materials are not transferred.

Note: Any object in the FBX file that does not match an object in the current 3ds Max scene is not imported to 3ds Max.

Note: Control sets, optical markers, and other FBX elements are not imported.

Add to New Scene—Imports the elements selected in the Import Configuration group to a new scene.

Merge—Merges animated elements in an FBX file onto the corresponding elements in the MAX file.

Import Configuration group

Bones—When on, any bones in your FBX file are imported.

Clicking More opens the *FBX Import Advanced Parameters dialog (page 3–560)*.

Geometries—When on, all geometry in your FBX file is imported.

Cameras—When on, all cameras in your FBX file are imported.

Light—When on, all lights in your FBX file are imported.

Markers—When on, all markers in your FBX file are imported.

Shape (Morph Modifier)—When on, all shapes and morphs in your FBX file are imported.

Animation—When on, all animation in your FBX file is imported.

Clicking More opens the *FBX Import Advanced Parameters dialog (page 3–560)*.

Human IK—When on, all IK information in your FBX file is imported.

Rescale scene's root node to unit size—Scales the scene's root node to match the unit size in your MAX file.

Y-up to Z-up root node rotation—FBX files use the Y axis as the 'UP' direction; however, 3ds Max uses the Z axis. Turning this on will convert the axis assignments accordingly.

Reset—Resets all values in the Import dialog to their defaults.

Ok—Proceeds with FBX import, using the current settings.

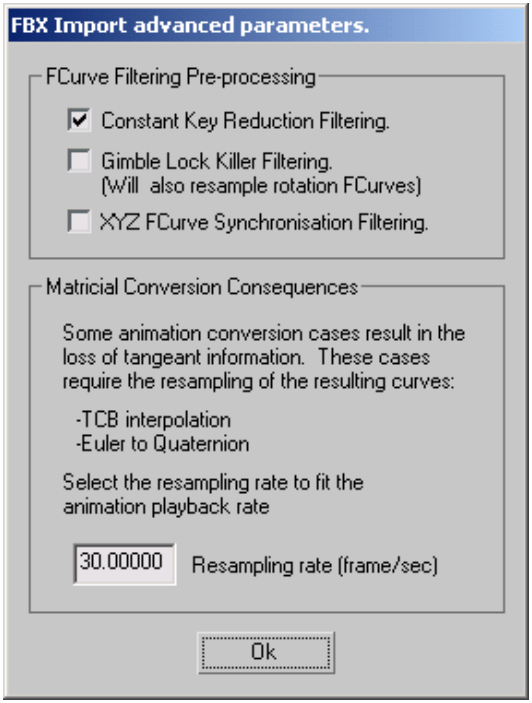
Cancel—Cancels FBX import.

FBX Import Advanced Parameters Dialog (Animation)

File menu > Import > Kaydara FiLMBOX (*.FBX) > Import FBX File dialog > Click More (next to Animation).

The FBX Import Advanced Parameters dialog for animation lets you specify how animation behavior is imported to 3ds Max.

Interface



FCurve Filtering Pre-Processing group

Constant Key Reduction Filtering—When on, any position, rotation, or scale keys which do not change during an animation are removed during the Import process to reduce file size and complexity.

Gimble Lock Killer Filtering—When turned on, the animation curve of the FBX file is *not* converted to quaternion values, but remains using Euler values.

Use this control if the animation behavior curve differs from expected results.

XYZ FCurve Synchronization Filtering—In cases where an animation key is on one axis, but not the other two, 3ds Max will create keys on the other axes when this is turned on.

Matricial Conversion Consequences group

Resampling Rate—Sets the rate at which animation will be sampled in the imported file.

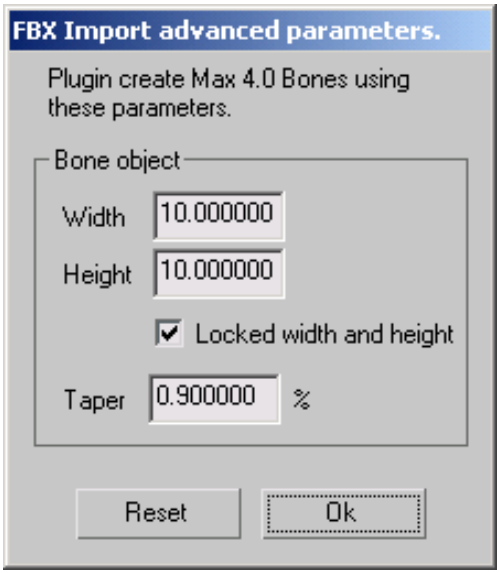
OK—Accepts all changes and closes the dialog.

FBX Import Advanced Parameters Dialog (Bones)

File menu > Import > Kaydara FiLMBOX (*.FBX) > Import FBX File dialog > Click More (next to Bones).

The FBX Import Advanced Parameters dialog for bones lets you specify how bones imported from an FBX file will look in 3ds Max.

Interface



Bone Object group

Width—Sets the Width of the bone object imported to 3ds Max.

Height—Sets the Height of the bone object imported to 3ds Max.

Locked Width and Height—When turned on, the Width and Height values are always equal.

Taper—Applies a taper to the bone objects imported to 3ds Max

Reset—Resets any changes, assigning the default values to the controls in the dialog.

OK—Saves any changes and closes the dialog.

Exporting FBX Files

File menu > Export > Kaydara FiLMBOX (*.FBX)

FBX is the Kaydara FiLMBOX file format. Kaydara FiLMBOX is a system used for the creation, editing, and blending of motion capture and keyframe animation. You can export 3ds Max files to this format.

Note: Softimage and Maya also export to the FBX format, making it a bridge between the three applications.

Feature Support with FBX Export

Mesh Geometry

- When exporting mesh geometry, polygons are exported as triangles.
- Normals are not exported by default; they are computed automatically in FiLMBOX.
- All mapping types are exported as a UVW Map.

Animated Meshes

While most of the 3ds Max modifiers successfully export static models to the Filmbox format, only the following three modifiers support mesh/vertex animation: Physique, Skin, and Morph.

Common animation modifiers (Bend, Noise, Wave, FFD, Displace, and so on) will not export animation information: to see animated meshes in Filmbox, you must use Morph targets or Skin/Physique and Bones/Biped.

NURBS

- Exporting NURBS to FBX creates different NURBS nodes for NURBS components.

  Note: NURBS geometry with several components (trims, caps, and so on) are exported as a hierarchy of nodes named after the 3ds Max NURBS node using their component name as a suffix.
- Export of morphing is supported, but the NURBS morph primitives must still exist at the time of export.

  Note: If any primitives are missing from the morph channel when exporting, a dialog appears to warn you.

Textures

- All mapping types are exported as a UV Map.
- Only the Diffuse channel of a material is exported.

Patches

Patches are converted to triangle meshes.

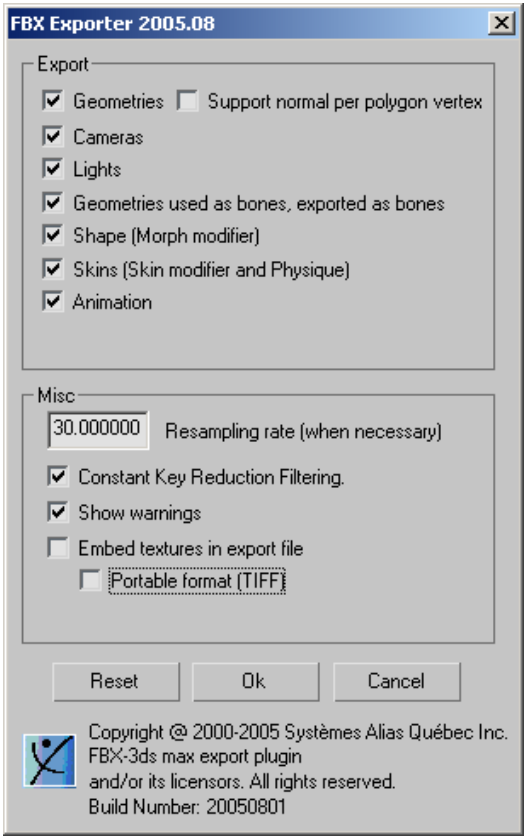
Bones

- To export bones correctly, you must reset the scaling of every bone, or they will be scaled in a non-uniform way within FiLMBOX.
- FiLMBOX does not support negative scaling on geometry or bones objects.

See also

Building a Character to Export to FBX (page 3–564)

Interface



Export group

Geometries—When on, exports all geometry in your scene.

Support normal per polygon vertex—When on, normals are exported to your FBX file on a per-polygon basis.

Cameras—When on, all cameras in your scene are exported.

Lights—When on, all lights in your scene are exported.

Geometries used as bones, exported as bones—When on, objects that are used as bones will be exported as bones.

Shape (Morph Modifier)— When on, any morphing information in your scene is exported.

Skins (Skin Modifier and Physique)—When turned on, any skin or physique information in your scene is exported.

Animation—When turned on, any animation in your scene is exported.

Misc group

Resampling Rate—Lets you specify a sampling rate for controller-based and coordinate-interpolated animation, as well as the Flip-Book output rates.

Setting the resampling rate lets you trade off between animation fidelity and file size. The default values give good results in most cases. For the greatest animation precision, use a lower number (a higher sampling rate).

Constant Key Reduction Filtering—When on, any position, rotation, or scale keys that do not change during an animation are removed during the export process to reduce file size and complexity.

Show Warnings—When on, you are alerted to any export errors.

Embed textures in export file—When on, all materials in your scene will be embedded in the exported FBX file.

Portable Format (TIFF)—When on, stores bitmaps used in materials in a baseline TIFF format, which is highly portable.

Reset—Resets all values in the Export dialog to their defaults.

Ok—Proceeds with FBX export, using the current settings.

Cancel—Cancels FBX export.

Building a Character to Export to FBX

To properly export a 3ds Max character to the FBX file type, you need to design it in a certain way. This topic describes several things to consider while assembling a character for FBX Export.

Building the Mesh

- Negative scaling on mesh objects is not supported by FBX plug-ins, especially if the mesh is used as weight on a skeleton.
- Once your mesh is completed, be sure to reset the pivot point and transform it in the Hierarchy pane.

Mapping

FBX only supports UVW Mapping, so you should only use the *UVW Map (page 1–905)* and *Unwrap UVW (page 1–867)* modifiers.

Using Morph Targets

FBX supports Morph targets, therefore when a morph is applied to a mesh, the Morph channel is preserved; you don't need to export the Morph Target geometry.

Building a Skeleton

To build a skeleton for FBX Export:

1. In the Bone Tools dialog > Object Properties rollout > Stretch group, choose None.

   FBX does not support squash and scale.

2. Create a skeleton without IK Chains (history independent).
3. Build the skeleton using a standard hierarchy, as follows (the Pelvis object is the root of the hierarchy; the rest of the list is indented as in the 3ds Max Select By Name dialog, with Display Subtree turned on):

```
Pelvis
      Right
         Right Upper Leg
            Right Leg
               Right Ankle
                  Right Foot
                     Right Toe
      Left
         Left Upper Leg
            Left Leg
               Left Ankle
                  Left Foot
                     Left Toe
      Spine 1
         Spine 2
            Spine 3
               Right Collar
                  Right Shoulder
                     Right Upper Arm
                        Right Forearm
                           Right Wrist
                              Right Hand
               Left Collar
                  Left Shoulder
                     Left Upper Arm
                        Left Forearm
                           Left Wrist
                              Left Hand
               Neck
                  Head
                     Head End
```

   Your skeleton is now ready to be exported to FBX.

4. To export, choose File menu > Export > Kaydara FiLMBOX (*.FBX).

Skinning the Character

- Skin weighting is supported only when applied to an editable mesh.
- *Skin (page 1–781)* and Physique (a **character studio** plug-in) are the only two 3ds Max weighting modifiers supported by FBX.
- Physique and Skin modifiers can be applied to two different objects in the same scene.
- Negative scaling on weighted skeleton meshes is not supported by FBX.

IGES Files

Overview of IGES in 3ds Max

The Initial Graphics Exchange Specification (IGES) is an ANSI standard that defines a neutral form for the exchange of information among dissimilar computer-aided design (CAD), computer-aided manufacturing (CAM), and computer visualization systems. The software implements the IGES standard for translating files between 3ds Max and IGES file formats used by the mechanical engineering and entertainment industries. Using the IGES import/export feature, you can read in and write out native *NURBS (page 3–1074)* data between 3ds Max and programs such as Mechanical Desktop release 3.0, Maya™, Pro/ENGINEER®, SOFTIMAGE®, CATIA®, and others. For complete details on the IGES standard, see The Initial Graphics Exchange Specification (IGES) Version 5.3.

What IGES Translates

The ideal file translation preserves the appearance and functionality of objects (called entities in IGES) contained in a file. This process has limits. You should be aware that some 3ds Max objects are not supported or not fully supported by IGES. Similarly, be aware that some IGES entities are not supported by the software. For example, you can't translate animation data and mapping coordinates, as these elements are not supported by IGES.

As with all translations, concepts that can be expressed succinctly in one language might not have exact equivalents in another language; conversely, concepts common to two languages might be expressed differently by each.

Even when the objects you translate don't have an equivalent in the target system, a one-time translation to or from IGES might not pose a serious problem. However, data loss can become a concern if you maintain objects that will be repeatedly translated in and out of different formats through IGES. By becoming familiar with the details of the systems and the IGES translators you use, you can learn to structure files to minimize information loss.

Warning: The conversion of objects during translation is not fully symmetrical. If you import an IGES file that you created by exporting to IGES, the resulting objects might not be identical to the original.

NURBS

When you import an IGES file into the software, IGES meshes are converted to *NURBS (page 1–1079)* surfaces, rather than to 3ds Max mesh objects. An IGES file with multiple meshes imports as a *single* NURBS model. Each IGES mesh is a surface sub-object within the model.

Each surface sub-object based on an IGES mesh is initially a *rigid surface (page 1–1090)*. To edit the surface and its *CVs (page 3–1020)*, you must first make the rigid surface independent. The following procedure explains how to do this.

Procedure

To make rigid imported NURBS surfaces independent:

1. Select the object.
2. Go to the Modify panel.
3. In the Modifier Stack rollout, choose Surface as the sub-object level.
4. Select the surface sub-object you want to edit.
5. In the Surface Common rollout, click Make Independent.

   Note: Making rigid imported NURBS surfaces independent can take a long time if there are complicated surfaces in the file, or if the file

is large. Avoid selecting all surfaces and then clicking Make Independent. Rather, save your file immediately after successfully importing it, and then use Make Independent with care.

Future Compatibility

The group that maintains and updates the IGES standard, the IGES/PDES (Product Data Exchange Standard) consortium, attempts to keep IGES upwardly compatible. It's likely that files generated by the software will be compatible with future versions of IGES.

History of IGES

The first version of IGES was developed in 1980 in response to demands from government and industry for a neutral file format. In 1981, IGES was approved as an ANSI standard. Since then, many enhancements have been made, including the significant additions listed in the following table.

IGES version	Date	Added features
1.0	1980	Mechanical 2D and 3D drawings
2.0	1983	Sculptured surfaces, rational B-splines, finite elements, and electrical drawings
3.0	1986	Manufacturing AEC (architecture, engineering, and construction), and piping drawings
4.0	1988	CSG (constructive solid geometry) solids
5.0	1990	Primarily consolidation and rationalization of existing formats to improve the quality and robustness of existing entities
5.1	1991	Boundary-representational (B-rep) solids
5.2	1993	European character set and several clarifications; published as an ANSI standard
5.3	1996	Unbounded Lines (110:1 and 110:2), several new Properties (406), and further clarifications. Year 2000 compliance

See also

3ds Max to IGES Export Table (page 3–570)

Exporting IGES Files (page 3–569)

IGES Log Files (page 3–566)

IGES to 3ds Max Import Table (page 3–568)

Importing IGES Files (page 3–567)

IGES Log Files

During the translation process, the software creates log files containing detailed information about the processing of the model. This information includes error messages and entity-mapping statistics. You can use this log file to understand what occurred during the translation.

The software places log files in the directory where the IGES file is either imported from or exported to. The log file name has the prefix name of the 3ds Max file name, with the extension of *.xli* (input) for import, and *.xlo* (output) for export.

The log file provides the following information:

- Name of the file processed.
- Number and severity of errors encountered, a description of them, and an explanation of what can be done, or what was done to the data in error. (The software attempts to fix many errors itself.)
- Summary of entities processed.

- List of the entity types encountered and those created.

See also

Overview of IGES in 3ds Max (page 3–565)

3ds Max to IGES Export Table (page 3–570)

Exporting IGES Files (page 3–569)

IGES to 3ds Max Import Table (page 3–568)

Importing IGES Files (page 3–567)

Importing IGES Files

File menu > Import > IGES (*.IGE, *.IGS, *.IGES)

IGES files are used to import and export NURBS objects to and from 3ds Max (and other programs that support this file format). For more information, see *Overview of IGES in 3ds Max (page 3–565)*.

In some cases, when you import an IGES file, the translation doesn't produce exact replicas. To understand what happens to each entity when it's translated, review the *IGES import table (page 3–568)*.

3ds Max imports an object containing multiple surfaces as a single NURBS object. To work with a single surface of the object, detach it in sub-object NURBS and work with only that object. This releases the rest of the object from memory. For more information, see *NURBS (page 3–565)*.

When you import IGES files, 3ds Max creates a log file containing detailed information about the processing of the model. The name of the file has the form of *filename.xli*. For more information, see *IGES Log files (page 3–566)*.

Note: 3ds Max creates and uses a few temporary files during translation. Temporary files can be large. If there has been a computer or IGES translation failure and temporary files remain on your system, they might need to be removed to free up disk space. For storage of these temporary files in Windows, 3ds Max uses the directory specified by the TEMP environment variable, or the current directory if TEMP is not set.

See also

3ds Max to IGES Export Table (page 3–570)

Exporting IGES Files (page 3–569)

IGES Log Files (page 3–566)

IGES to 3ds Max Import Table (page 3–568)

Importing IGES Files (page 3–567)

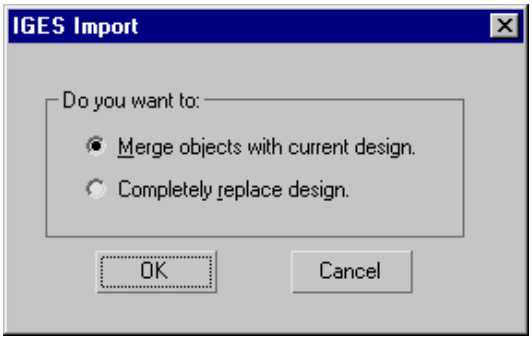
Procedure

To import an IGES file:

1. Choose File menu > Import.
2. Specify the IGES file to import from the file selector dialog.

   You can choose IGES (*.IGE, *.IGS, *.IGES) from the Files Of Type list to display only IGES files.
3. From the IGES Import dialog, select Merge Objects With Current Scene or Completely Replace Scene.
4. To review the translation process, read the *.xli* log file with your preferred text editor.

Interface



IGES Import

The IGES Import dialog has the following controls:

Merge objects with current scene—Merges imported data with the current scene.

Completely replace scene—Completely replaces the current scene with the imported data.

IGES to 3ds Max Import Table

The following table lists IGES entities and the 3ds Max objects they translate to when you import them. Any IGES entities not listed here do not import.

IGES entity number	IGES entity name	3ds Max
100	Circular Arc	Arc Shape
102	Composite Curve	Spline Shape
104	Conic Arc	Spline Shape
106	Copious Data	Spline Shape
108	Plane	NURBS Surface (unbounded converts to construction plane)
110	Line	Spline Shape
112	Parametric Spline Curve	NURBS Curve
114	Parametric Spline Surface	NURBS Surface
116	Point	Point Helper
118	Ruled Surface	NURBS Surface
120	Surface of Revolution	NURBS Surface
122	Tabulated Surface	NURBS Surface
126	Rational B-spline Curve	NURBS Curve
128	Rational B-spline Surface	NURBS Surface
130	Offset Curve	NURBS Curve
140	Offset Surface	NURBS Surface
141	Boundary Curve	NURBS Surface
142	Curve on Parametric Surface	NURBS Surface
144	Trimmed Parametric Surface	NURBS Surface
143	Bounded Surface	NURBS Surface
186	Solid	NURBS Surface
308	Subfigure Definition	Instance
402	Group	NURBS Object

Notes

The 3ds Max objects translated from IGES can have surface sub-objects.

IGES import supports name and color mappings to 3ds Max names and colors.

When you import IGES files, names are mapped by using the level name followed by a colon, and then the object name.

See also

3ds Max to IGES Export Table (page 3–570)

Exporting IGES Files (page 3–569)

IGES Log Files (page 3–566)

IGES to 3ds Max Import Table (page 3–568)

Importing IGES Files (page 3–567)

Exporting IGES Files

File menu > Export > IGES (*.IGS)

IGES files are used to import and export objects to and from 3ds Max (and other programs that support this file format). For more information, see *Overview of IGES in 3ds Max (page 3–565)*.

In some cases, when you export 3ds Max objects to an IGES file, the translation doesn't produce exact replicas. To understand what happens to each object when it's translated, review the *IGES export table (page 3–570)*.

When you export IGES files, 3ds Max creates a log file containing detailed information about the processing of the model. The name of the file has the form of *filename.xlo*. For more information, see *IGES Log files (page 3–566)*.

Note: If there are modifiers applied to surfaces in your scene, it's best to collapse the stack before exporting to IGES. When 3ds Max exports to an IGES file, it skips any surface that has any modifiers applied.

See also

3ds Max to IGES Export Table (page 3–570)

IGES Log Files (page 3–566)

IGES to 3ds Max Import Table (page 3–568)

Importing IGES Files (page 3–567)

Overview of IGES in 3ds Max (page 3–565)

Procedure

To export an IGES file:

1. Select the objects to export.
2. Choose File menu > Export.
3. Choose IGES (*.IGS) from the Save as type list in the file selector dialog.
4. Specify a file name to export.
5. Click Save.
6. From the IGES Export dialog, select Export Hidden Objects or Export Selected Objects Only.
7. To review the translation process, read the *.xlo* log file with your preferred text editor.

Interface

IGES Export

The IGES Export dialog has the following controls:

Export Hidden Objects—Exports objects that are currently hidden in the 3ds Max scene.

Export Selected Objects Only—Exports only objects that are currently selected.

3ds Max to IGES Export Table

The following table lists 3ds Max objects and the IGES ID and IGES Type they translate to when you export them. Any 3ds Max objects not listed here do not export.

Note: The convention for denoting the type of IGES entity is the numerical construction type:form. For example, 214:2 is the IGES entity number 214, form 2. Form numbers can also be signed (given a positive or negative value).

3ds Max object	IGES entity name	IGES entity number
Surface	Rational B-spline Surface	128
NURBS Surface	Bounded Surface	143
Trimmed Surface	Bounded Surface	143/144
Curve	Rational B-spline Curve	126
Point	Point	116
Group	Group	402:7
Instance	Subfigure Definition	308
Instance(s)	Subfigure Definition(s)	408

Notes

When 3ds Max exports IGES, it supports name and color mappings to IGES names and colors.

Since IGES requires unique names per element, 3ds Max will append a unique identifier to multiple objects with the same name.

See also

Exporting IGES Files (page 3–569)

IGES Log Files (page 3–566)

IGES to 3ds Max Import Table (page 3–568)

Importing IGES Files (page 3–567)

Overview of IGES in 3ds Max (page 3–565)

JSR-184 Files

Exporting JSR-184 Files

File menu > Export > JSR-184 (*.M3G)

3ds Max provides support for developing mobile games using the JSR-184 format. JSR-184 is a Java standard used to create 3D applications for mobile phones. Once you have exported your scene to JSR-184 format, you can preview the animation using the *JSR-184 Standalone Player (page 3–576)*.

Procedure

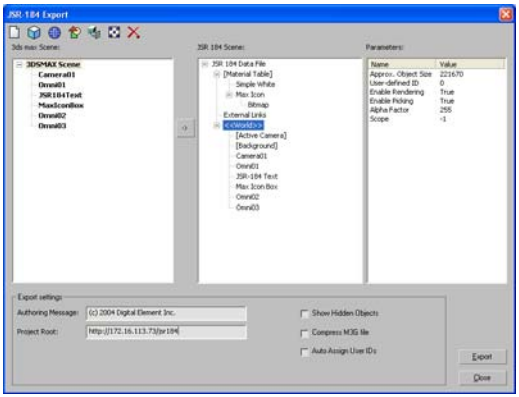
To export an M3G file:

1. Choose File menu > Export.
2. Choose JSR–184 (*.M3G) in the Files Of Type list.
3. Specify a file name to export, and then click Save. This opens the JSR-184 dialog, displaying the scene hierarchy for your 3ds Max scene. By default, all of the elements in your scene are also listed for export in the JSR-184 scene.

   Note: If you wish to export a particular object in your scene, use File > Export Selected, or delete the objects you do not wish to export by clicking . If an object is a descendant within an hierarchy, it will be exported with its hierarchy. The same applies for objects in a group.
4. Modify the parameters of objects exported to JSR–184. See *JSR-184 Object Parameters (page 3–572)* for more info.
5. Click Export.

6. Preview your exported JSR-184 scene in the *JSR-184 Standalone Player (page 3–576)*.

Interface



The 3ds Max scene hierarchy is shown on the left of the dialog, and the hierarchy of the JSR-184 scene to be exported is displayed on the right. Object parameters for the JSR–184 scene are displayed on the far right-hand side of the JSR-184 Export dialog. The exported m3g file contains all of the objects and parameters included in the JSR-184 scene. Many of the parameters for the objects in the JSR-184 scene can be modified prior to exporting the file. See *JSR-184 Object Parameters (page 3–572)* for more details.

Menu options:

New JSR-184 Scene—Creates an empty JSR-184 scene

Add 3ds Max Scene—Adds all objects that can be converted to the JSR-184 format to the JSR-184 scene.

Add World Object—Adds a World Object to the JSR-184 scene file. A World Object contains sub-object hierarchies and has two special sub-objects: Active Camera and Background.

Add Group—Adds an empty Group. Use this option to group objects in your scene without the need to create a World Object.

Convert Mesh to Sprite3D—Converts a selected 3ds Max plane object into a JSR-184 Sprite3D object. If you do not select this option, by default all plane objects are converted to JSR-184 mesh objects.

Texture Tool—All the textures of objects in your 3ds Max scene are placed in the Material Table level of JSR184 image file. Use the *JSR-184 Texture Tool (page 3–572)* to edit texture properties.

Remove Object—Removes the selected object from the JSR-184 scene.

Export Settings:

Authoring Message—This message is required by the JSR-184 file format standard and is usually reserved for entering copyright notice information. This message is stored in the header portion of the M3G file.

Project Root—Sets the location of the root of the project. If you do not enter a path in this field, all external references within the M3G file are loaded from the same location as the current file.

Show Hidden Objects—Shows all the hidden objects in the 3ds Max scene hierarchy.

Compress M3G File—Compresses all the data in the exported M3G file.

Auto Assign User IDs—Automatically assigns unique User ID values to all exported objects.

JSR-184 Texture Tool

File menu > Export > JSR-184 (*.M3G). > Name your file and click OK. > Select a texture in your scene. > Click the Texture Tool button to edit the texture properties.

You can edit the parameters that are exported for the textures in your JSR-184 scene. The Texture Tool dialog displays a preview of the texture with its current settings. When you select different options, the preview is updated to reflect the changes. You can modify the parameters described in this topic.

Note: If the image is not a texture, then you can choose any palette in the Image Format group.

Interface

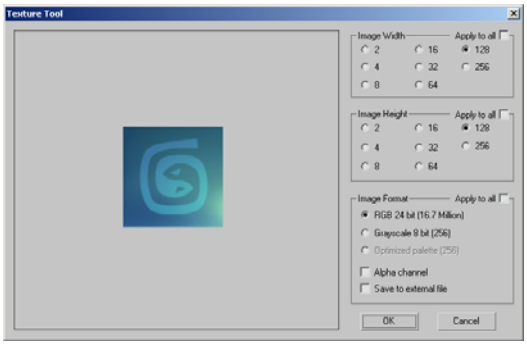


Image Width group

The JSR-184 format requires that texture sizes use the "power of two rule," and supports texture sizes less than or equal to 256^2. You can select either 2, 4, 8, 16, 32, 64, 128, or 256.

If you want to modify the image width of all of the textures in your JSR-184 scene, turn on Apply To All; otherwise, the changes affect only the selected texture.

Image Height group

These are the same options as Image Width: you can select either 2, 4, 8, 16, 32, 64, 128, or 256.

If you want to modify the image height of all of the textures in your JSR-184 scene, turn on Apply To All; otherwise, the changes affect only the selected texture.

Image Format Group

Changes the color model of all textures in your JSR-184 scene.

If you want to modify the image format of all of the textures in your JSR-184 scene, turn on Apply To All; otherwise, the changes affect only the selected texture.

- **RGB 24 bit (16.7 Million of colors)**—Changes the color model to RGB color.
- **Grayscale 8 bit (256 grayscales)**—Changes the color model to grayscale.
- **Optimized Palette (256 colors adaptive palette)**—Changes the color model to a limited 256-color palette.

  The Optimized Palette option is available only when the Save To External File option is on. This palette does not support an alpha channel.

  Save to External File—When on, saves the texture as an external file (in PNG format) in the same directory as the M3G file. If you do not select this option, the texture is saved as part of the M3G file only.

  Alpha Channel—When on, saves the alpha channel with the texture.

JSR-184 Object Parameters

File menu > Export > JSR-184 (*.M3G).

The JSR-184 data file is represented as the root object of your scene. Many of the parameters of

objects in the JSR-184 data file can be adjusted to optimize the output of your scene. You can preview your exported scene using the *JSR-184 Standalone Player (page 3–576)*.

Note: All editable parameters are displayed in *italic*.

The JSR-184 Data File

Material Table

Material Table is a special object that contains all the materials and textures used in the JSR-184 scene. The Material Table has a two-level structure: the 3ds Max material name is the first level and its associated textures comprise the second level. The Material Table is represented as [Material Table] in the JSR-184 scene tree.

The 3ds Max level displays the following parameters:

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Layers*: Sets the rendering layer for the JSR-184 Appearance Object. When rendering a World, Group, or Mesh, submeshes and sprites are rendered in the order of ascending layers.

The texture level displays the following parameters:

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Blending*: Specifies how to combine the filtered texture color with the incoming fragment color in a texturing unit. This is equivalent to the texture environment mode in OpenGL. Options are Add, Blend, Decal, Modulate, and Replace.
- *WrappingS and WrappingT*: The Repeat and Clamp texture wrapping modes define the treatment of coordinate values that are outside the [0,1] range.
- *Level Filter*: Sets the texture filtering. Options are Nearest, Linear, and Base Level.
- *Image Filter*: Sets the image filtering. Options are Nearest, Linear, and Base Level.

World

World is a special Group node that is a top-level container for scene graphs. A World Object is represented as <<World>> in the JSR-184 scene tree. Every world object has three sub-objects: [Background], [Active Camera], and [Ambient Light]. A World object has the following parameters:

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Enable Rendering*: Sets the picking enable flag of this node. The effective rendering enable status for this node is the logical AND of the enable flags on this node and all of its ancestors. This means that the World node is disabled if any of its ancestors are disabled. The status of the World node has an effect only if all its ancestors are enabled. If the effective status is set to True, this node is enabled. If it is False, it is disabled.
- *Enable Picking*: Sets the picking enable flag of this node. The effective rendering enable status for this node is the logical AND of the enable flags on this node and all of its ancestors. This means that the World node is disabled if any of its ancestors are disabled. The status of the World node has an effect only if all its ancestors are enabled. Options are True and False.
- *Alpha Factor*: Allows groups of mesh objects to fade in and out conveniently, provided that certain preconditions related to their

appearance are met. The Alpha Factor is defined for each node, and its value is between 0 and 255.

- *Scope*: Allows the scene graph nodes to form conceptual groups independent of the scene graph hierarchy. By default, all objects are visible to all cameras and lit by all light sources. The scope is an integer bitmask set to -1 by default.

Background

Every world object has two sub-objects: [Background] and [Active Camera]. The only parameter available for the Active Camera is selecting an active camera from sub-objects of the current World Object. Background parameters are listed below:

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Image Mode X and Image Mode Y*: Sets the background image repeat mode for the X and Y directions. Image mode can be set to either Border or Repeat.
- *Depth Clear Enabled*: Enables or disables depth buffer clearing. If depth buffer clearing is enabled, the portion of the depth buffer that corresponds to the viewport is cleared to the maximum depth value. Set this parameter to True to enable depth buffer clearing. Set it to False to disable.
- *Color Clear Enabled*: Enables or disables color buffer clearing. If color buffer clearing is enabled, the portion of the color buffer that corresponds to the viewport is cleared with the background image and/or the background color. Set this parameter to True to enable color buffer clearing. Set it to False to disable.

Group

Group is a scene graph node that stores an unordered set of nodes as its children. A Group object is represented as <<Group>> in the JSR-184 scene tree.

Note: Since most JSR-184 objects cannot contain any sub-objects, the JSR-184 exporter uses the Group object to represent the 3ds Max hierarchy. In this case, the Group object is assigned a name such as <<ObjectName Group>>, where ObjectName is the name of the 3ds Max object with sub-objects. Parameters available for Group objects are the same as parameters for World objects.

Camera

Camera is a scene graph node that defines the position of the viewer in the scene and the projection from 3D to 2D. A Camera object is assigned the same name as its counterpart in the original 3ds Max scene.

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Scope*: Allows scene graph nodes to form conceptual groups independent of the scene graph hierarchy. The default scope is -1, implying that all nodes are in the same scope. By default, all objects are visible to all cameras and are lit by all light sources.
- *Projection Type*: Sets the projection mode for the Camera. Options are Parallel and Perspective.

Ambient Light

Ambient light represents the ambient light color from the 3ds Max environment setting. Ambient light parameters are the same as Light parameters.

Light

Light is a scene graph node that represents different kinds of light sources. A Light object is assigned the same name as its counterpart in the original 3ds Max scene.

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Enable Rendering*: Sets the light to On or Off. Options are True and False.
- *Scope*: Allows scene graph nodes to form conceptual groups independent of the scene graph hierarchy. The default scope is -1, implying that all nodes are in the same scope. By default, all objects are visible to all cameras and are lit by all light sources.

Sprite3D

Sprite3D is a scene graph node that represents a 2–dimensional image with a 3D position. The only way to create a Sprite3D object is to convert a two-polygon 3ds Max mesh object. A Sprite3D object is named "Sprite, ObjectName," where ObjectName is the name of the corresponding 3ds Max mesh object.

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Enable Rendering*: Sets the rendering enable flag of this node. The effective rendering enable status for this node is the logical AND of the enable flags on this node and all of its ancestors. This means that this node is disabled if any of its ancestors are disabled. The status of this node has an effect only if all its ancestors are enabled. If the effective status is set to True, this node is enabled. If it is False, it is disabled.
- *Scope*: Allows scene graph nodes to form conceptual groups independent of the scene graph hierarchy. The default scope is –1, implying that all nodes are in the same scope. By default, all objects are visible to all cameras and are lit by all light sources.

Mesh

- **Approx.Object Size**: Shows the object size with sub-objects.
- *User-defined ID*: Displays the user ID for the object.
- *Scope*: Allows scene graph nodes to form conceptual groups independent of the scene graph hierarchy. The default scope is –1, implying that all nodes are in the same scope. By default, all objects are visible to all cameras and are lit by all light sources.
- *Projection Type*: Sets the projection mode for the Camera. Options are Parallel and Perspective.

Morphing Mesh

Morphing mesh is a scene graph node that represents a vertex-morphing polygon mesh. A morphing mesh object is assigned the same name as its counterpart in the original 3ds Max scene. Morphing mesh parameters are the same as mesh object parameters.

Note: Morphing animation is not supported. A Morphing mesh is exported with morph targets. If you wish to export a morphing mesh animation, set animated weights to morph targets during playback.

Skinned Mesh

Skinned Mesh is a scene graph node that represents a skeletally-animated polygon mesh. A skinned mesh object in the JSR-184 scene is assigned the same name as its counterpart in the original

3ds Max scene. Skinned mesh parameters are the same as Mesh Object parameters.

Note: Biped meshes are not supported.

JSR-184 Log Files

File menu > Export > JSR-184 (*.M3G).

When you export an M3G file, the JSR-184 Export feature creates a log file. This log file is an HTML file, saved in the same directory as the M3G file. The table contains an entry for all the objects exported to the M3G file format.

- **Object #**—Indicates the root object value. When multiple root objects exist in the M3G file, this value is used by the JSR-184 Load object to load the correct object.
  - **Object Name**—Contains the name of the corresponding 3ds Max object.
  - **Object Type**—Indicates the type of saved object.
  - **User ID**—Displays the User ID for the object.
  - **Object Size**—Shows the object size (in kilobytes) for the object.
  - **Comments**—Displays additional information such as errors and warnings.

Below is a sample of a simple log file:

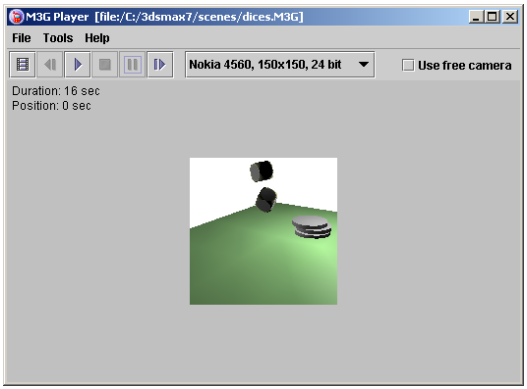
Object #	Object Name	Object Type	User ID	Object Size	Comments
		Vertex Array	0	161	
		Vertex Array	0	89	
		Vertex Buffer	0	48	
		Triangle Strip Array	0	213	
		Material	0	30	
		Appearance	0	33	
	Box01	Mesh	0	78	
		Group	0	66	
	Camera01	Camera	0	89	
	Omni01	Light	0	90	
		Group	0	26	
		Light	0	50	
		Background	0	40	
0		World	0	58	

JSR-184 Standalone Player

Start menu > Programs > Autodesk > Autodesk 3ds Max 8 > JSR184 Player

Once you have exported your 3ds Max scene to JSR-184 format, you can preview how the animation is displayed on various mobile screens.

Interface



File menu

- **Open**—Opens an M3G file for viewing in the JSR-184 player.

- **Reopen**—Displays a list of recently opened files. The list displays the most recently opened files at the top.
- **Exit**—Closes the JSR-184 viewer window.

Tools menu

- **Handsets**—Allows you to add or edit phone profiles. You can modify the vendor, model, screen width, screen height, and screen color depth.

  Note: You can also modify the handset profiles directly in the *terminals.xml* file in the *c:\Program Files\Autodesk\3dsmax8\JSR* directory.

Player controls

The player is controlled by the following buttons on the toolbar:

- Opens the Choose Objects for Rendering dialog. This dialog allows you to select the JSR-184 world object in the scene hierarchy in the event that there are multiple world objects in the JSR-184 data file.
- Steps one frame backward through the animation.
- Plays the animation.
- Stops the animation and returns to the first frame.
- Pauses the animation.
- Steps one frame forward in the animation.

Phone Profiles—Displays the phone profiles defined in the Tools > Handsets dialog.

Use Free Camera—Switches to viewing the scene from the free camera. The camera is controlled by the following keyboard shortcuts:

Left Arrow	Rotate Left
Right Arrow	Rotate Right
Up Arrow	Rotate Up
Down Arrow	Rotate Down
A	Move Left
D	Move Right
S	Move Backward
W	Move Forward
Home	Move camera to default

Lightscape Files

Exporting Lightscape Files

You can export your 3ds Max scenes to Lightscape. Lightscape is a visualization application that uses radiosity and ray tracing to create accurate lighting for 3D models.

You can export several Lightscape file formats from 3ds Max. The *Lightscape Preparation (*.lp) (page 3–591)* file is the main format Lightscape uses. Other Lightscape file formats save selected portions of the information in the LP file. These are the additional Lightscape file formats:

- *View file (*.vw) (page 3–600)*: Exports the active view, or selected camera views.
- *Block file (*.blk) (page 3–602)*: Exports materials, lights, and geometry. Blocks in

a block file can be selectively loaded into Lightscape.

- *Material file (*.atr) (page 3–607)*: Exports materials.
- *Layer file (*.lay) (page 3–607)*: Exports layers.
- *Parameter file (*.df) (page 3–608)*: Exports processing parameters.

Overall Workflow for Exporting a Lightscape Preparation (LP) File

1. *Select the object to be exported (page 3–583).*
2. Open the *Export Lightscape Preparation File dialog (page 3–591).*
3. If your scene uses *standard lights (page 3–580)*, set the units and scale, and then set the light conversion method.
4. If you are *exporting an animation (page 3–585)*, select the frames to be exported.
5. If your scene uses *daylight (page 3–582)*, set the daylight parameters.
6. Select the *cameras to be exported (page 3–583).*
7. *Export the file (page 3–578).*

See also

Creating Geometry for Lightscape (page 3–578)

Creating Materials for Lightscape (page 3–579)

Grouping Geometry for Lightscape (page 3–580)

Exporting Standard Lights (page 3–580)

Exporting Daylight to Lightscape (page 3–582)

Selecting Objects to Be Exported (page 3–583)

Exporting Camera Views (page 3–583)

Keeping Your Original 3ds Max Materials (page 3–584)

Using Relative Paths with Block and Material Files (page 3–584)

Exporting Animations (page 3–585)

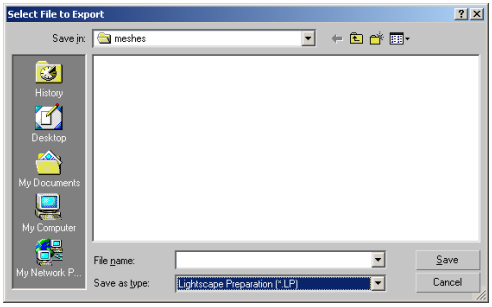
How 3ds Max Objects Are Converted to Lightscape (page 3–588)

Procedures

To export a Lightscape file:

1. Choose File > Export.

   The Select File To Export Dialog is displayed.



2. Use the Save As Type list to choose which kind of Lightscape file format you are exporting.
3. Use the Save In list to navigate to the appropriate directory.
4. In the File Name field, enter the name of the file that you want to create, and then click Save.

To get version information about the Lightscape exporter:

1. Export one of the Lightscape file types.

   A dialog with options for that file type is displayed.
2. Click About.

   An About dialog is displayed. The dialog shows the version of the Lightscape exporter.

Creating Geometry for Lightscape

These are guidelines for creating geometry that will export to Lightscape in a way that will generate a good radiosity solution:

- Avoid overlapping surfaces, and do not use double-sided materials.
- Assign mapping coordinates to geometry that will use a textured material.
- Try to keep polygon count to a minimum. Use the Optimize modifier and use smoothing groups to reduce the number of faces needed for smooth surfaces.
- Lightscape calculates radiosity only for the front side of a face. Check face normals of the geometry. Lightscape's Orientation option offers convenient methods for changing a surface's orientation.
- If you plan to use daylight in an interior scene, create surfaces for areas that will be windows or openings in Lightscape. In order to allow light to flow through them they must be placed in an opening in the geometry, not on a continuous surface. These surfaces should fill the opening in the geometry. Since the exporter uses material assignments to mark windows and openings, these surfaces can be faces within more complex geometry.
- You should model transparent objects that have a refractive index greater than 1 so that they are physically valid. For example, you should model a pane of glass as two surfaces separated by the correct distance.
- Before exporting, make sure your units are properly set. If your scene uses photometric lights, this is probably the case. If your scene uses standard lights, realistic units might differ from your viewport settings. You can choose Customize > Units Setup to find what units your model has. Make this correspond to the units in which you will export your model. Because Lightscape is a physically based lighting renderer, it is essential that you export a scene with physically accurate units to obtain accurate lighting results. See *Exporting Standard Lights (page 3–580)*.

Creating Materials for Lightscape

These are guidelines for creating materials to export to Lightscape. In general, Lightscape materials are less complex than materials in 3ds Max.

- Only the diffuse texture gets imported into Lightscape, so there is no need to set up other texture maps. Other mapping types can be applied after the solution file is imported back into 3ds Max.
- The diffuse color corresponds to the reflective color in Lightscape.
- Glossiness corresponds to the shininess of the material in Lightscape.
- Opacity corresponds to the transparency of the material in Lightscape.
- Tiling information is exported, but mirrored and clipped textures are not supported by OpenGL display in Lightscape. They can be seen only by using the ray tracer.
- The index of refraction is imported into Lightscape.
- For accurate radiosity processing, it is important to set the correct HSV Value of the material. The Value controls the maximum reflectance of the surface. If it is set too high, the solution looks washed out and processing time increases significantly. Refer to the *Lightscape User's Guide* for more information on how to set material properties.
- If you are creating surfaces for openings (See *Creating Geometry for Lightscape (page 3–578)*), then create a transparent material for these surfaces. This material should not be used for any other surfaces in the scene.
- In Lightscape, windows allow daylight to pass through. If your scene has windows, make sure that the materials you use on the windows in your scene are not used for other surfaces.

Materials assigned to windows should not be completely opaque.

- Check texture alignment and tiling by viewing your textures in the viewport.
- Material files (*.*atr)* can be exported to Lightscape. Selected materials or all the materials in a scene can be exported this way. Texture mapping alignment is not saved in Material files.

Grouping Geometry for Lightscape

These are guidelines for grouping geometry so it will export well to Lightscape:

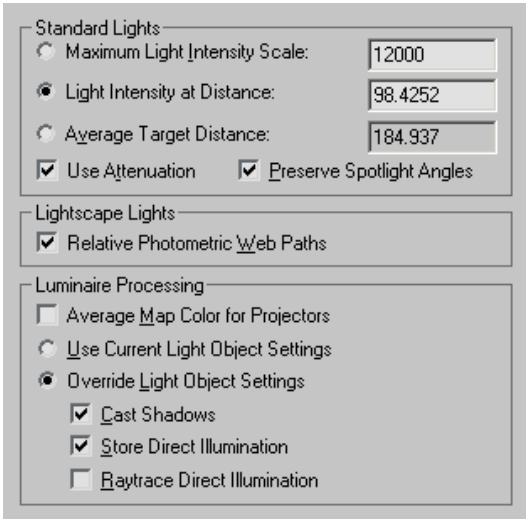
- Group or attach geometry you want to come into Lightscape as blocks. When exporting, you can create blocks for every object and group in the scene.
- If a light has a geometric fixture, group the fixture with the light. This will allow you to move the light and fixture together in Lightscape.
- You can export layers by material, group, instance, or for each object in a scene. These options are available when exporting a Lightscape Preparation file (*.*lp),* a Lightscape Block file (*.*blk),* or a Lightscape Layer file (*.*lay).*

  Tip: Exporting layers by instance makes it easier to import the solution back into 3ds Max.

Exporting Standard Lights

Lightscape lights (luminaires) are always photometric. If your 3ds Max scene uses only photometric lights, then exporting lights has few options. If your scene uses standard lights, on the other hand, you need to set options for converting their settings to realistic lighting levels.

Controls for standard light export are in the Standard Lights group of the *Lights panel (page 3–594)* on the Export Lightscape Preparation File dialog, with additional controls in the Luminaire Processing group.



Tip: Use cloning to create light instances whenever possible. Instanced and referenced lights will be exported as the same Lightscape luminaire, which makes adjusting the lights in Lightscape much easier.

The 3ds Max standard light's color corresponds to the Lightscape color filter.

The shadow parameters Cast Shadows and Use Ray-Traced Shadows correspond to the Lightscape luminaire-processing parameters Cast Shadows and Ray Trace Direct Illumination, respectively.

If the 3ds Max light is On, Lightscape will not store direct illumination for the light in the radiosity solution. This allows 3ds Max to apply the direct lighting after importing the solution back into 3ds Max.

You can choose to customize the Cast Shadows, Raytrace Direct Illumination, and Store Direct

Illumination settings by choosing Override Light Object Settings.

There are three ways to convert standard light intensities for Lightscape. Each method is useful for different types of lighting. These are described in the sections that follow.

Scenes Where Exact Light Intensities Are Important

These are scenes where you are using 3ds Max to build a model, but you don't require 3ds Max to render the lighting well.

If exact intensities are important, using photometric in your 3ds Max scene is the best solution. But if your scene contains standard lights, you can follow these steps:

1. Find the intensity, in candelas, of the brightest light you will place in your model.
2. As you create each light, set its Multiplier to the ratio of the intensity of the light and the intensity of the brightest light.
3. When you export the model, choose Maximum Light Intensity Scale and set the intensity value to the intensity of the brightest light. The lights imported into Lightscape will have the exact intensities you require.

Scenes Where You Want the Lightscape Model to Appear as Close as Possible to the Rendered Scene

These are scenes where exact light intensities are not important.

Follow this step:

- When you export the model, either choose Light Intensity At Distance and enter the average distance between lights and the surfaces they illuminate, or select Average Target Distance if your lights are mostly targeted spotlights. This will match the brightness of your lights at the selected distance, and will give an overall effect similar to 3ds Max.

Scenes with Lights Imported from Lightscape Solution (LS) Files

In scenes with lights imported from Lightscape Solution (*.*ls)* files, as well as scenes that use photometric lights, should already have physically correct lighting. This method also works in scenes where you have used standard lights with range attenuation to simulate physical lights.

Note: If you import a Lightscape Solution (LS) file but turn off Make Lightscape Lights, lights are imported as standard lights. However, the imported lights will have physically correct attenuation settings.

Follow these steps:

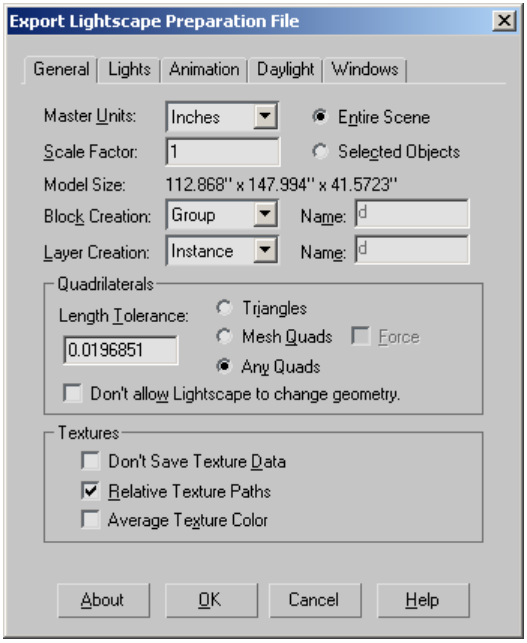
1. For lights that do not use range attenuation, use either of the methods described in the preceding sections.
2. When you export the model, make sure Use Attenuation is turned on. This will cause a different intensity estimate to be used for lights that use range attenuation.

Setting Units and Scale

If your scene was not created at a realistic scale, you need to specify scaling that Lightscape will be able to use.

Note: If your scene uses photometric lights, the scaling should already be correct, so leave Scale Factor set to 1, but be sure to choose the correct units.

The controls for setting units and scale are on the *General panel (page 3–592)* of the Export Lightscape Preparation File dialog.



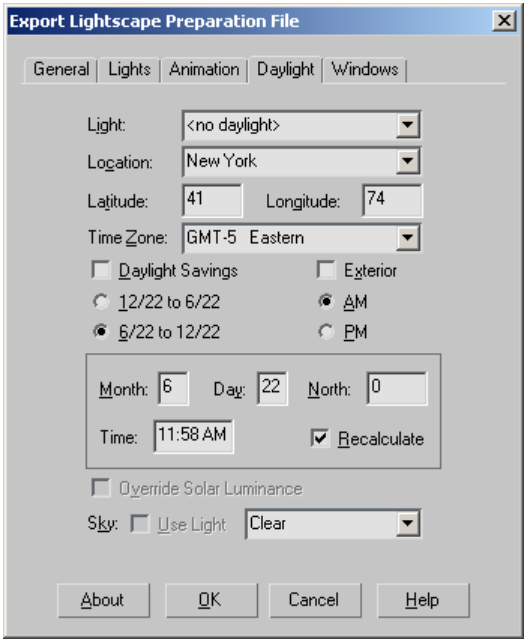
Set Master Units to the units used by 3ds Max. To find what units are current, choose Customize > Units Setup. The Units Setup dialog shows which units are used by the scene.

If your scene does not use realistic units, adjust the value of Scale Factor so the scene will be exported at the correct size.

The Model Size displayed immediately below Scale Factor can help you choose the correct scale. Model Size shows the dimensions of the scene geometry, not including cameras or lights. Increasing the scale factor makes the model larger, and decreasing it makes the model smaller. Because Lightscape is a physically based renderer, it is essential that you export the original scene with dimensional accuracy to obtain accurate lighting results.

Exporting Daylight to Lightscape

Controls for exporting daylight are in the *Daylight panel (page 3–597)* of the Export Lightscape Preparation File dialog.



To export daylight:

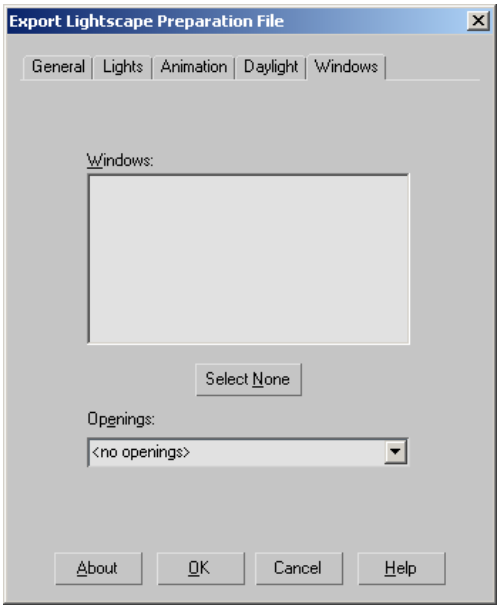
1. If you have simulated sunlight using a 3ds Max light, use the Light list to choose its name. If the light is a directional light, spotlight, skylight, or IES Sky light, Lightscape will calculate the daylight parameters that match the direction of the sun based on the direction of the chosen light.

   Note: If you want to force the sun in Lightscape to have the same brightness as the selected light in 3ds Max, check Override Solar Luminance. This will use the brightness of the light to override the calculated brightness of the sun.

2. If no light in the scene simulates sunlight, leave the Light field blank, and enter the scene's location on the earth, the date, and the time.

Lightscape will calculate the position and brightness of the sun.

3. Set the sky coverage to Clear, Partly Cloudy, or Cloudy. Turn on Use Light to use the brightness of the selected light to calculate the sky coverage.
4. If you don't indicate that the scene is Exterior, you will need to select windows and openings to allow daylight to enter the scene. Use the *Windows panel (page 3–598)* to do this.



5. Use the Windows panel to select the materials that are assigned to Windows in the scene. To work correctly in Lightscape, these materials should not be assigned to other kinds of objects. Use SHIFT+click or CTRL+click to select multiple materials if needed.
6. Use the Windows panel to select the material that is assigned to openings in the scene. To work correctly in Lightscape, this material should not be assigned to other kinds of objects.

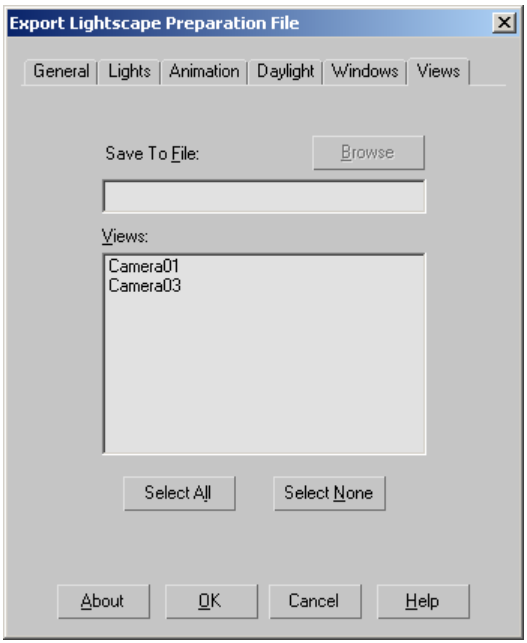
Selecting Objects to Be Exported

When you are exporting a Preparation file, Block file, Material file or Layer file to Lightscape, you can export either the entire 3ds Max scene, or just selected objects.

If you want to export only selected objects, first select the objects to export, then choose Export Selected from the File menu. You can also choose Export from the File menu, then enable Selected Objects in the Export dialog.

Exporting Camera Views

When you export to Lightscape, the active view is saved in the Lightscape Preparation (**.lp)* file or View (**.vw)* file. You can also export additional camera views. Each additional view is saved in a separate VW file.



To export additional camera views:

1. In the Export Lightscape Preparation File dialog or the Export Lightscape View File dialog, click the Views tab to go to the Views panel.
2. Select the name of a camera whose view you want to export.

   The name of the new VW file is displayed in the Save To File field. By default, this is the camera name with the *.vw* file name extension appended. You can enter a different path or file name to change the default.
3. Use SHIFT+click or CTRL+click to add or remove cameras from the selected list.

Keeping Your Original 3ds Max Materials

If you export a 3ds Max model to Lightscape and calculate a radiosity solution, you can have the importer use your original 3ds Max materials when you import the solution back into 3ds Max.

Do this when you export your scene:

- After you have exported you scene, be sure to save the 3ds Max scene. The exporter tags the exported materials. If the scene is not saved, the importer will not be able to find the materials it needs to use.

Follow these steps when you import your scene:

1. Before importing the Lightscape solution, open the 3ds Max scene that was exported to create the solution.
2. Make sure the Replace Scene Contents and Keep Original Materials options are turned on.
3. Set the other options you want to use.
4. Click OK to import the scene.

   Note: If the importer cannot find the 3ds Max material from which a Lightscape material was created, it will create a new 3ds Max material.

Using Relative Paths with Block and Material Files

The exporter will write texture file names as relative or absolute paths. When using relative paths, directories are added to the texture path list in the Preparation file so Lightscape can find the textures. Block (BLK) and Material (ATR) files do not have path information in them. Follow theses steps to get the path list from the exporter into Lightscape when you want to use relative paths with Block and Material files:

1. Open 3ds Max and load the scene you will use to export the Block or Material file.
2. Access the *Export Lightscape Block File dialog (page 3–602)* or the *Export Lightscape Material File dialog (page 3–607)*. Turn on the option Relative Texture Paths, and set the other options as desired. Click OK to save the Block or Material file.
3. Access the *Export Lightscape Parameter File dialog (page 3–608)* to export a Lightscape Parameter (DF) file. Turn on the option Texture Path From Files, set the other options as needed, and then click OK.
4. In Lightscape, open the model you want to load blocks or materials into. Select File > Parameters > Save, and save the parameters for the model. *Do not overwrite* the file you created in step 3.
5. Select File > Properties, and click the Paths tab. Delete all of the directories from the path lists.
6. Select File > Parameters > Load, and load the file you created in step 3.
7. Select File > Parameters > Load, and load the file you created in step 4.

8. Now you can load the blocks or materials from the exported file.

Exporting Animations

You can select multiple frames to be exported in multiple Lightscape Preparation (*.*lp)* files. Lightscape provides batch utilities to process and render the files to produce animations. This technique is expensive, and should be used only when you need to animate color bleeding and indirect lighting effects between moving objects. See the *Animation panel (page 3–596)* in the Lightscape Export Preparation File dialog.

Animating Multiple Frames in Lightscape

The Lightscape exporter is able to output Lightscape Preparation files for multiple frames. You can process these files through Lightscape's batch utilities to produce animations.

The process is described in these procedures:

- *To animate daylight: (page 3–585)* How to set up your scene to animate daylight in Lightscape.
- *To animate views: (page 3–585)* How to set up your scene to animate your view in Lightscape.
- *To set up lights and daylight: (page 3–585)* How to set your lights for the best results.
- *To export animated objects: (page 3–586)* The exporter exports multiple Lightscape Preparation files, one for each frame of the animated objects.
- *To export nonanimated objects: (page 3–586)* The exporter exports a single preparation file containing the objects that are not animated. This file is merged with the animated objects during Lightscape processing. This reduces the disk space requirements and speeds up the export process.
- *To export parameters: (page 3–586)* Processing parameters are saved for the scene.
- *To override parameters: (page 3–587)* Here you use a sample frame to set the processing parameters for the radiosity simulation.
- *To batch-process the LP files: (page 3–587)* This step merges the non-animated objects, the animated objects, and the parameter files from the previous steps. The merged file is processed and images for each frame are created.
- *To create the animation: (page 3–588)* The images created in the previous step are put together into an AVI or MPEG animation.

Procedures

To animate daylight:

1. To animate daylight, you must animate a light that follows the path of the sun. Use a Sunlight or Daylight system.
2. Set the light color to the color you want for the sun.
3. When you export the animated objects you will select the animated light on the Daylight tab.

To animate views:

- To animate your view, simply make sure that the active view is using an animated camera.

To set up lights and daylight:

When solving multiple Lightscape solution files for animation, the settings of lights and daylight are important for good results and performance.

1. Do a preview of your animation in 3ds Max. Lights and daylight that are moving or cast moving shadows need to be ray traced during the rendering of the animation. Other lights don't need to be ray traced, and ray tracing them will slow down processing.
2. In 3ds Max, select each light. If the light needs to be ray traced, turn the light on, turn shadows on, and choose Advanced Ray Traced as the shadow type. If the light does not need to be

ray traced, turn the light off, turn shadows on, and choose Shadow Map as the shadow type. If different instances of a light need different settings, you will need to make a copy of the light.

Note: When a light is turned off in 3ds Max, its illumination is stored in the Lightscape mesh when radiosity is solved. That way, if it is imported back into 3ds Max, the light remains off, and the illumination comes from the radiosity mesh.

To export animated objects:

1. Select the geometry in your scene that is being animated. Geometry should be selected if it is moving or one of its materials is changing.

   You don't need to select nonanimated geometry, even if it's illuminated by an animated light.

   Tip: Make a named selection set of the objects you select in this step and the following one. Then you can invert this selection to export nonanimated objects. See *the following procedure (page 3–586)*.

2. Select the lights in your scene that are being animated. Lights should be selected if they are moving, or any of their parameters, such as brightness and color, are changing.

   If you are animating daylight, you need to select the light you are using to simulate daylight.

   If you plan to use the Lightscape utility *Isray* to render the output, and you want to ray trace direct illumination, make sure your lights are turned on, and that their shadow type is set to Advanced Ray Traced.

3. Access the *Export Lightscape Preparation File dialog (page 3–591)*.
4. Choose the Selected Objects radio button.
5. Set the other parameters in the General panel as you normally would.
6. Click the Animation tab. In the *Animation panel (page 3–596)*, enter the range of frames you want to export.
7. If you are using daylight, click the Daylight tab, and in the *Daylight panel (page 3–597)* set the daylight parameters.
8. Don't forget to set up windows and openings in the *Windows panel (page 3–598)*, if your scene makes use of these.
9. Click OK. This will export the animated objects by creating a Lightscape Preparation file for each frame in the scene.

To export nonanimated objects:

1. Retrieve the selection of animated objects, then choose Edit > Select Invert. This selects all of the objects that are not animated.
2. Use CTRL+click to remove objects you don't want to export from the selection set.
3. Access the *Export Lightscape Preparation File dialog (page 3–591)*. Use the same name you used for the animated objects. (This won't overwrite the original LP file, because sequence numbers will be appended to the file name.)
4. Choose the Selected Objects radio button.
5. Set the other parameters in the General panel as you normally would.

   Important: Make sure the units are the same as when you exported the animated objects.

6. Click OK. This will export the nonanimated objects in a Lightscape Preparation file.

To export parameters:

1. If you didn't export all of the objects in your scene, select all of the animated and nonanimated objects you *did* export.
2. Access the *Lightscape Parameter File Export dialog (page 3–608)*. Use the same file name you used for the animated objects.

3. If you didn't export all of the objects in your scene, choose the Selected Objects radio button.
4. Set the other parameters as you normally would.

   Important: Make sure the units are the same as when you exported the animated objects.
5. Click OK. This exports the parameters to be used for processing in a Lightscape Parameters (DF) file.

To override parameters:

1. Start Lightscape.
2. Open the Lightscape Preparation file that contains the nonanimated objects.
3. Open one of the Lightscape Preparation files containing the animated objects. On the Open File dialog, turn on the Append check box.
4. Choose File > Parameters > Load, and load the parameter file you exported.
5. Use the Parameter Wizard or adjust the processing parameters manually. Initiate the radiosity solution. When asked, do *not* save the Lightscape Preparation file. Process the solution.
6. Continue adjusting parameters, resetting, and processing until you are satisfied. Try to get 15 percent of initial energy, or less, still unshot (at least 85 percent of the initial energy should be distributed).
7. Choose File > Parameters > Save As, and save the parameters over the DF file you exported. You do not need to save the solution file.
8. Select Process > Statistics, and make a note of the number of iterations Lightscape needed.

To batch-process the LP files:

To process the Lightscape Preparation (LP) files, you must run a batch file to process all of the frames. The name of this file is *lsanim.bat*. By default, it is installed in the *|bin* subdirectory of the directory where Lightscape is installed.

Note: If you installed Lightscape after installing 3ds Max, you can find *lsanim.bat* in the same directory where 3ds Max is installed.

1. You might want to copy and edit the beginning of *lsanim.bat*, to set parameters and give the paths to the batch utilities. The beginning of *lsanim.bat* looks like this:

   Note: See the online *User Reference* to view this code.
2. Open a command shell, and enter **lsmerge -h** to run that utility.

   If you do not see a short help message for *lsmerge*, then you will need to add the path to the *lsmerge*, *lsrad* and *lsray* utilities. The utilities are located in the *|bin* subdirectory in the directory where Lightscape was installed. For example, you might need to change the lsmerge line above to be:

   Note: See the online *User Reference* to view this code.

   You can also use the OpenGL renderer by changing *lsray* to *lsrender* and using options for *lsrender*. Look in the Lightscape help file for more information on the utilities and options.
3. Change <ITERATIONS> to the number of iterations you noted when overriding the process parameters.
4. If you want to save the solution files, change SAVELS=0 to SAVELS=1. This will require extra disk space to hold the solution files.
5. Set PREPFILES, SOLUTIONFILES, and IMAGEFILES to the directories where the preparation files exist and where solution files and image files will be created.
6. You can change IMAGETYPE to change the file type for the image files. For example IMAGETYPE=tga will output Targa files.

7. Create a batch file that calls *lsanim* for each frame being processed. The line should look like this:

   Note: See the online *User Reference* to view this code.

   Important: If a frame number has fewer than four digits, pad the number with leading zeros to make it four digits long.

8. Run the batch file.

To create the animation:

1. Create an *Image File List (IFL) file (page 3–666)* to collect the image files into an AVI or FLC animation.

   Tip: The Image File List does not need to contain path names. You can use the Configure User Paths dialog > *External Files panel (page 3–855)* to indicate the directory where your images have been saved.

2. In 3ds Max, choose Rendering > Environment.
3. In the Environment dialog, click Environment Map.
4. In the Material/Map Browser, choose Bitmap, and then click OK.
5. In the Select Bitmap Image File dialog, choose the IFL file, and then click OK.
6. Click Time Configuration, and use the Time Configuration dialog to make the animation length match the number of frames specified in the IFL file.
7. Render a viewport to a movie-format file (AVI, FLC, or MOV).

   Tip: The aspect ratio of the rendered movie should match the aspect ratio of the frames in the IFL file.

   Note: Some video compressors have been found to add banding and other artifacts to animations. The Intel Indeo video compressor tends to produce animations with fewer artifacts.

How 3ds Max Objects Are Converted to Lightscape

This topic describes how the exporter converts names, lights (including standard lights), and materials.

3ds Max and Lightscape Naming

Lightscape requires unique names for materials, blocks, and layers. These names are taken from 3ds Max material and object names, which are not necessarily unique. When we process the model for export, we change material and object names to guarantee uniqueness by adding or changing digits at the end of the name.

Converting Geometry

To convert 3ds Max geometry, each object is first converted to a mesh. Then the mesh is searched for adjacent triangles that have the same normal and the same material: these are collapsed into quadrilaterals. Triangles and quadrilaterals are then exported along with their material assignments, layer assignments, UV coordinates, and smoothing normals. The geometry is grouped into Lightscape blocks according to the method you chose in the *General panel of the export dialog (page 3–592)*.

Hidden geometry is never exported.

Converting Lights

Photometric lights are simply exported to Lightscape with the same distribution, intensity, light color, and filter color. Photometric lights with spotlight distribution maintain their beam and field angles when exported to Lightscape. For lights with web distributions, the IES file paths are also exported.

Converting Standard Lights

For standard lights, there are three methods for converting the lights when exporting them to Lightscape: scaling intensity, matching intensity, and using attenuation.

- **Scaling Intensity**—Takes a value you enter and multiplies that times the standard light's Multiplier value. The result becomes the intensity of the converted light in candelas.
- **Matching Intensity**—Calculates the brightness of a light by matching the apparent intensity of the standard light and Lightscape light at a set distance you can choose. This can give you a good estimate of the general brightness of a 3ds Max scene. The default distance is 2.5 meters (about 8 feet), which is a good estimate for typical interior models. If you are using targeted spotlights, you can also use the average distance between the lights and their targets.

  Note: The two previous methods are mutually exclusive, and you must choose one method or the other.
- **Attenuation**—Estimates the brightness of the light based on the range attenuation for lights that use range attenuation. This method simply matches the light intensity at the distance 25 percent of the way from the inner range to the outer range. If you use this option, all lights with range attenuation will be converted using this method, and all other lights will be converted using either the scale or match intensity methods. This method also properly inverts the brightness of lights imported from Lightscape solutions.

There are two methods for converting spotlight angles. When the Preserve Spotlight Angles option is *not* on, the beam angle for a converted spotlight is set to the angle where the standard spotlight illuminates at one-half intensity, which matches the illumination of a Lightscape spotlight at the beam angle. When the Preserve Spotlight Angles option *is* on, the beam angle is set to the standard light's hotspot angle.

If you want Lightscape to illuminate a scene the same as 3ds Max, you shouldn't turn on Preserve Spotlight Angles, because the converted spotlights will have significantly different intensity distributions. Turn on Preserve Spotlight Angles when you want to use 3ds Max to specify the spotlight angles that Lightscape will use.

Since hidden lights in 3ds Max can illuminate a scene, they are exported unless they aren't turned on.

Converting Materials

Lightscape doesn't have the same materials found in 3ds Max, and only a few material parameters are exported. The following material components are exported:

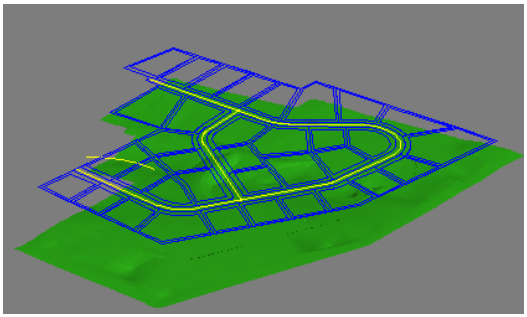
- Diffuse color
- Shininess
- Shininess strength
- Diffuse map, if one is assigned

If you use a multi/sub-object material to assign different materials to faces in an object, the exporter assigns the proper material to each face. If you use a material that isn't a standard material, the exporter performs a depth-first search of the material hierarchy until it finds a standard material, which is exported. If the object doesn't have a material, or the exporter can't find a material, it creates a standard material that using the object's wireframe color, and exports that material.

LandXML (XML, DEM) Files

Importing LandXML/DEM Models

LandXML/DEM Model Import lets you import land development data into 3ds Max. Civil engineering data, from XML, DEM (digital elevation model), or DDF files, is used to create a 3ds Max model.



The *LandXML/DEM Model Import dialog (page 3–590)* allows for interoperability with Autodesk products such as Land Development Desktop 3, Land Development Desktop 2005, Civil 3D™, and CAiCE Visual PE. Once imported, the models are ready for high-quality photorealistic rendering and animations.

LandXML File Types

There are three file types you can import with the LandXML/DEM Model Import dialog: XML, DEM, and DDF.

- **XML** is the most robust file type for LandXML import. In addition to surface elevation data, XML files can also contain Alignment (road) and Parcel data.
- The **DEM** (digital elevation model) file type is the most commonly available large area surface data type supplied by the USGS and other government and private organizations. DEM files contain only surface data.
- The **DDF** file type is an SDTS (spatial data transfer standard) format grid surface. DDF files are very similar to DEM files; however, DDF information is shared across multiple files.

  The LandXML/DEM Model Import utility searches for the key DDF file in the selected directory, which is identified by the following pattern: *xxxxCEzz*, where *xxxx* is usually numeric and *zz* typically 'L0'.

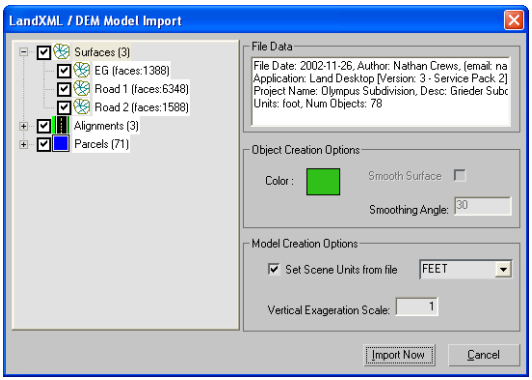
  Like DEM files, DDF files only contain surface data.

LandXML/DEM Model Import Dialog

File menu > Import > Select File to Import dialog > Files of Type > LandXML/DEM (*.DEM, *.XML, *.DDF)

In the LandXML/DEM Model Generator, you determine which parts of your land development data are imported to 3ds Max. 3ds Max then creates separate objects for each of the land features, including terrain surfaces, road alignments, and parcels.

Interface



Object List—Lists the terrain surfaces, alignment data, and parcel data in the file to be imported. You can toggle the import of individual objects

or entire groups with their corresponding check boxes.

Three types of civil engineering data stored in LandXML files are supported:

- **Surfaces**—3D TIN ground and finished surface model. Terrain surface data is imported to 3ds Max as an editable mesh.
- **Alignments**—2D road centerlines. Alignment data is imported to 3ds Max as a Shape object.

  Note: DEM and DDF files do not contain Alignment data.
- **Parcels**—2D legal parcel or lot boundaries. Parcel data is imported to 3ds Max as a Shape object.

  Note: DEM and DDF files do not contain Parcel data.

Note: 2D Alignment and Parcel shapes are created on top of the highest terrain surface.

File Data group

The File Data group displays information about the file to be imported, including date of creation, author, the application used to create the file, and the units.

Object Creation Options group

The Object Creation Options group lets you set the import properties for selected objects.

Color—The color of the object when it is imported into 3ds Max. To change this setting, click the color swatch and select a new color from the Color Selector.

Smooth Surface—Applies smoothing to the geometry, based on the Smoothing Angle setting. Edges between faces that have an angle between them that is greater than the specified smoothing angle will appear faceted in the scene. Edges between faces that are below or equal to the specified angle are smoothed.

Note: This option is only available for terrain surface objects.

Smoothing Angle—Determines the size of the smoothing angle.

Note: This option is only available for terrain surface objects.

Model Creation Options group

Set Scene Units from file—Changes the 3ds Max Scene Unit to match the units of the incoming file.

Note: This setting is only available when the 3ds Max scene is empty. If there is geometry in your scene, this setting is not available.

The units setting of the incoming file is displayed in the drop-down list.

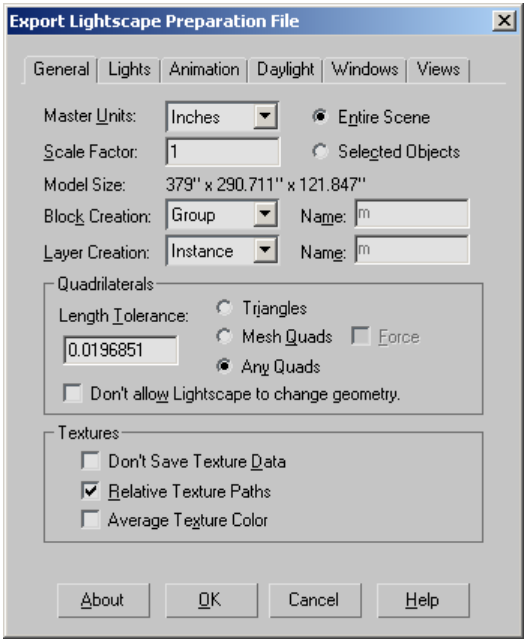
Vertical Exaggeration Scale—Artificially exaggerates the terrain surface to enhance subtle details by applying a scale factors to the vertical dimensions.

Tip: This can be useful for very flat surface models.

Lightscape Export Dialogs

Export Lightscape Preparation File Dialog

This dialog is displayed when exporting to the Lightscape Preparation (LP) file format. The dialog is organized into six panels.



- *General panel (page 3–592)*

  General parameters for exporting your 3ds Max scene.

- *Lights panel (page 3–594)*

  Controls the way in which light objects will be converted to Lightscape luminaires. (Most controls apply to exporting standard lights.)

- *Animation panel (page 3–596)*

  Lets you export multiple Lightscape Preparation files for multiple frames in your scene.

- *Daylight panel (page 3–597)*

  Sets the Lightscape daylight parameters. You can set the parameters directly, or match the daylight parameters to a light that is modeling the sun in your scene.

- *Windows panel (page 3–598)*

  Selects materials to identify windows and openings in the Lightscape Preparation file.

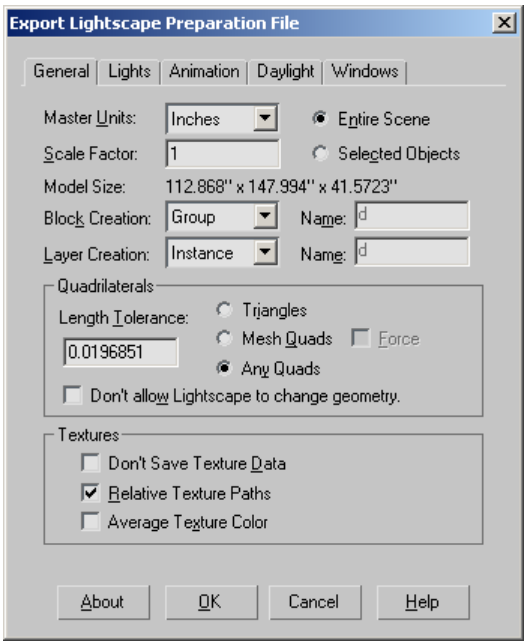
- *Views panel (page 3–599)*

  Allows additional Lightscape View (VW) files to be output for cameras in your scene.

Lightscape Preparation File General Panel

This panel sets the general parameters for exporting the 3ds Max scene to a Lightscape Preparation (LP) file.

Interface



Master Units—Specifies the units used by the scene, so Lightscape can use them as well. To see which units the scene is currently using, choose Customize > Units Setup. If Master Units doesn't match the units specified in the Units Setup dialog, Lightscape might give unrealistic results.

If your scene uses generic units, you will have to convert to real-world units for Lightscape to use. In this case, you might also have to adjust the Scale Factor. The Model Size display can help you do so.

The Master Units are also used as the display units in the exported LP file.

Scale Factor—A scaling factor that is applied to the entire model. Any positive real number is accepted. Use this setting to globally adjust the size of the exported model. Default=1.

If your scene uses realistic physical dimensions, as it probably does if you use photometric lights, then leave Scale Factor set to 1. If you didn't create your scene using realistic physical dimensions, which is often the case when using standard lights or generic units, you might have to adjust the scene's scale.

Model Size—Displays the X, Y, and Z extents of the scene's geometry using the current Master Units and Scale Factor settings. This can help you set up the exported file if you need to change either of these settings. Model Size does *not* include lights and cameras, which might be outside the extents of the renderable geometry.

Entire Scene and Selected Objects—These radio buttons select whether all objects in the scene are exported, or only selected objects.

Block Creation and Name—These settings allow you to select how blocks are created in the exported LP file. Default=Group. The four possible settings are:

- **Object**—A Lightscape block is created for each object. The name of each block is taken from the name of the first instance of the object. If different instances of a single object use different materials, a new block is created so the proper material can be applied to the instance. The blocks are then created in the LP file.
- **Group**—A block is created for each object, as with the Object option, and also for each group. The blocks are created in the LP file based on the groups in which they are contained.
- **Single**—A single block is created for the entire scene. All of the meshes of all of the objects reside within this block. One instance of this block is created for the LP file. When this setting is chosen, the Name field is enabled. You can enter the block name in this field. Default=The name of the exported file (with no file name extension).
- **None**—No blocks are created. All of the meshes of all of the objects are created directly in the LP file.

Tip: If your scene uses object instancing, creating blocks can reduce the file size of the exported LP file, because the geometry of the object is exported only once. You can also use groups to group lights with the geometry that represents their fixtures. This will make moving and changing lights easier in Lightscape.

Layer Creation and Name—These settings allow you to select how Lightscape layers are created and how surfaces and blocks are placed on the layers. Default=Instance. The five possible settings are:

- **Instance**—A layer is created for each object instance in the model, including lights. The surfaces for each instance are placed on their own layer. The name of the layer is the same as the name of the object instance. This setting is very useful if you plan to import the Lightscape solution back into 3ds Max, since the importer can reconstruct the original objects.
- **Object**—A layer is created for each object. All surfaces in all instances of the object are placed in the layer for the object. The name of the layer is the same as the name of the first instance of the object.
- **Group**—A layer is created for each object and each group. All surfaces in all instances belonging to a group are placed in the layer for the group. All other surfaces are placed in the layer for the object. The name of the layer is the same as the name of the first instance of the object.

- **Single**—A single layer is created and all surfaces are put on that layer. When this setting is used, the Name field is enabled. You can enter the name of the single layer in this field. Default=The name of the exported file (with no file name extension).
- **Material**—A layer is created for each exported material. Surfaces are assigned to layers based on the material assigned to the surface.

Quadrilaterals group

This group gives you more control over the geometry exported to Lightscape.

Length Tolerance—The tolerance between points that will be welded together when forming quadrilaterals. Points closer than this distance are welded. The distance is given in the units selected in the Master Units drop-down list. This value becomes the Length Tolerance in Lightscape.

Triangles—When chosen, no quadrilaterals are formed.

Mesh Quads—When chosen, only quadrilaterals that are in the mesh are formed, but only if they fit the criteria that Lightscape uses for quadrilaterals.

- **Force**—Enabled only when Mesh Quads is chosen. If it is on, then quadrilaterals in the mesh will be formed even if they don't fit the Lightscape criteria.

Any Quads—When chosen, triangles can be used to form quadrilaterals, as long as they are planar, convex quadrilaterals that fit the criteria that Lightscape uses for quadrilaterals.

Don't allow Lightscape to change geometry—When this is on, flags are set to prevent Lightscape from modifying the geometry when it is initialized to start the solution.

Note: This option is available only for recent patches of Lightscape. The most recent patch is available at ftp://ftp1.discreet.com/web/support/lightscape/short_sizes2.zip. When you run the patched Lightscape, you can use the new controls Preserve Polygons and Condition Polygons. These are located on the Layer Table Context menu. Turning on Preserve Polygons preserves the geometry layout in the LP file; it is the Lightscape counterpart to Don't Allow Lightscape To Change Geometry in the LP exporter. Turning on Condition Polygons restores the behavior to the default for the currently selected layers.

Textures group

Don't Save Texture Data—Prevents textures from being exported with materials.

Relative Texture Paths—Specifies whether or not texture path names will be output as relative or absolute paths. If this option is off, the exporter will output absolute texture paths. If this option is on, the exporter will output relative paths.

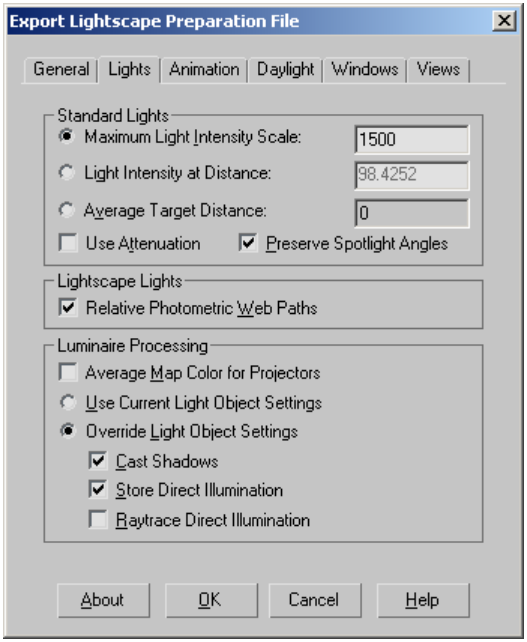
The texture path list the exporter writes always contains the directories specified on the *External Files panel (page 3–855)* of the Configure User Paths dialog. When you turn on Relative Texture Paths, additional relative paths are added to the texture path list stored by Lightscape.

Average Texture Color—Selects the material color the exporter will use for texture-mapped materials. If this option is off, the exporter sets the color of texture-mapped materials to the original diffuse color of the 3ds Max material. If this option is on, the exporter sets the color to the average color of the diffuse map of a texture-mapped material.

Lightscape Preparation File Lights Panel

This panel is used to set the parameters for converting 3ds Max lights to Lightscape luminaires.

Interface



Standard Lights group

Maximum Light Intensity Scale—Selects the scale intensity method for converting standard lights. You can enter the intensity scale in candelas in the field to the right. (Photometric lights are not scaled.)

Light Intensity at Distance—Selects the match intensity method for converting standard lights. You can enter the distance used for matching intensity in the field to the right. The units are always in those selected by Master Units.

Average Target Distance—Selects the match intensity method for converting standard lights. The distance used is the average distances between targeted spotlights and their targets, which is displayed in the edit field to the right. This button is disabled if there are no targeted spotlights in the scene.

Use Attenuation—Selects the Use Attenuation method for converting lights with range attenuation.

Preserve Spotlight Angles—Selects how spotlight angles are converted from 3ds Max to Lightscape. When this option is off, the Lightscape beam angle is set to the angle where the 3ds Max intensity is one-half of the spotlight intensity, which matches the Lightscape intensity at the beam angle. When this option is on, the Lightscape beam angle is set to the hotspot angle. The 3ds Max intensity at the hotspot angle is the full spotlight intensity, which is significantly different from the Lightscape intensity at the beam angle. You should only turn this option on if you want to enter a specific Lightscape beam angle for your spotlights in 3ds Max.

Lightscape Lights group

Relative Photometric Web Paths—Use this option if your scene contains photometric lights with web distributions. When this option is on, exported luminaire definitions contain only the relative path of the IES file and the absolute path is added to the Lightscape document path list. When this option is off, the absolute path of the IES file appears in the luminaire definition.

Luminaire Processing group

Average Map Color for Projectors—Use this option to average the texture map colors and include them in the filter color of the exported light. This is available only for bitmap textures.

Use Current Light Object Settings—Use this option to base the luminaire processing settings on the settings of the 3ds Max light objects. You might want to use this option if you plan on importing your resulting Lightscape solution back into 3ds Max. The options are determined as follows:

- **Cast Shadows** —This option will be set according to the 3ds Max light Shadow Parameters Cast Shadows setting.
- **Store Direct Illumination**—If the 3ds Max light is turned on, this option will be disabled. If the 3ds Max light is turned off, this option will be enabled.

  See the description of Store Direct Illumination below.
- **Raytrace Direct Illumination**—If Use Ray-Traced Shadows is on in 3ds Max, this option will be enabled.

  See the description of Raytrace Direct Illumination below.

Override Light Object Settings—Choose this option to use the following check boxes to set the luminaire processing options. The 3ds Max light object settings will be overridden.

- **Cast Shadows**—When on, turns on the Lightscape Cast Shadows processing option for all luminaires. If you disable this option, light energy is distributed to each surface as if there were no other surfaces blocking it.
- **Store Direct Illumination**—When on, turns on the Lightscape Store Direct Illumination toggle for all luminaires. This causes illumination to be stored in the radiosity mesh. If you disable this option, only indirect lighting will be calculated; direct illumination from the lights will not appear in the radiosity solution.
- **Raytrace Direct Illumination**—When on, turns on the Lightscape Raytrace Direct Illumination toggle for all luminaires. This causes light to be sampled when Lightscape raytraces the model for rendering. Ray-traced direct illumination can improve shadow quality.

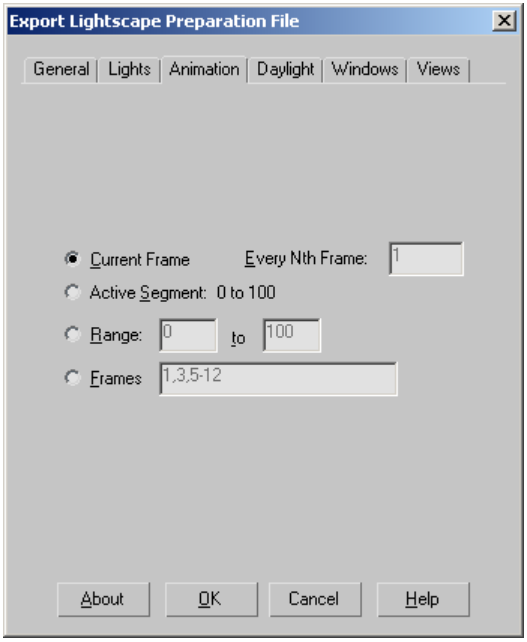
  Tip: In general, it is a good idea to give Store Direct Illumination and Raytrace Direct Illumination opposite values: turn off one when the other is on. If you ray-trace lights that are also stored, then Lightscape must perform the additional step of removing energy from the mesh before it begins ray-tracing.

Lightscape Preparation File Animation Panel

This panel is used to set the animation parameters for the 3ds Max scene. You can export a Lightscape preparation file for multiple frames in a 3ds Max model. The default behavior will export the current frame into the file you chose in the Select File To Export dialog.

If you choose one of the other options, the frame number is appended to the name you chose in the Select File To Export dialog. If the export will overwrite any preparation files, a single warning will be displayed for the first file found.

Interface



Current Frame—Exports a single file for the current frame.

Active Segment—Exports a file for each selected frame in the active animation segment.

Range—Exports a file for each selected frame in the given range. The format of values in the range depends on the current time configuration.

Frames—Exports the selected frames. Single frames or frame ranges are separated by a comma. Frame ranges are specified by two frame separated by a hyphen. These values are always in frames, and don't depend on the current time configuration. All files are exported in ascending frame order, and each file is written only once, even if it appears multiple times in the list.

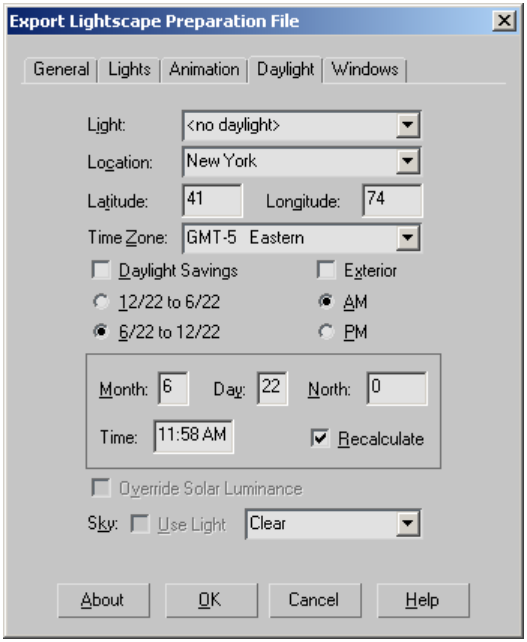
Every Nth Frame—This number gives the number of frames from each frame exported to the next frame exported. This field is enabled only when Active Segment or Range is chosen.

Lightscape Preparation File Daylight Panel

This panel is used to set the daylight parameters for the exported model. You can enter the daylight parameters directly, or choose a light that represents sunlight in your model. You can choose from spotlights, either free or targeted, and directional lights.

Note: Lightscape export does not recognize light from the Daylight system.

Interface



Light—Select the light you want to use for the sun. Select <no daylight> if you don't want daylight included in the model, or <use daylight> if you want to enter the daylight parameters directly. This list will only have spotlights and directional lights in it. You can enter the daylight parameters, even if you choose <no daylight>; the parameters will be exported and used if you change the daylight setting in Lightscape.

If you choose a light and the Recalculate check box is turned on, the exporter calculates the daylight parameters that match the direction of the sun based on the direction of the chosen light. If the parameters cannot be calculated, a label highlighted in red will indicate which value is out of range. In Lightscape, the sun's position and brightness will match the chosen light, whether or not it a realistic location for the sun.

Location—Select a city location where the model is located. You can also enter the latitude and longitude directly.

Latitude and Longitude—Enter the latitude and longitude where the model is located. When calculating the daylight parameters, latitude is displayed in red if the latitude is too close to the poles for the chosen light to give the sun direction. These are set automatically when a location is chosen.

Time Zone—The time zone where the model is located. This is set automatically when a location is chosen. The time zone is used to convert between sun time and local time.

Daylight Savings—Indicates that daylight savings is to be used for converting between sun time and local time. This is *not* automatically set when dates are changed.

Exterior—Indicates that the model is an exterior scene, or partially exterior.

12/22 to 6/22 and 6/22 to 12/22—Usually, when calculating dates, two possible dates can be chosen between the two solstices. This radio button determines which solstice the date falls within.

AM and PM—Usually, when calculating times, two times can be chosen, either in the morning or afternoon. This radio button determines which time is chosen. AM chooses the time before the sun reaches its highest point, and PM the time after the highest point. Because of local variations between sun time and local time, these times might not be in the morning or afternoon respectively.

Month and Day—Enter the month and day for the date you want daylight. If your selected light places the sun too high in the sky for a date that you enter, the date will be indicated in red to warn you that the sun position in the preparation file will be overridden. If you want to correct the date, change it to a date where the sun rises higher in the sky. You can also move the location to a place where the sun rises higher in the sky.

North—Enter the direction of north in degrees clockwise from the positive Y axis. If your selected light places the sun too high in the sky for a direction that you enter, the direction will be indicated in red to warn you that the sun position in the preparation file will be overridden. If you want to correct the direction, change it toward the light. You can also move the location to a place where the sun rises higher in the sky at that direction.

Time—Enter the time of day for the daylight calculation. This will *not* cause other parameters to be calculated.

Recalculate—When on, daylight parameters are recalculated as location, date, and north change. Turn off Recalculate if you want to enter all of the parameters directly. Turning on Recalculate *will* cause other parameters to be calculated.

Override Solar Luminance—When on, allows the brightness of the selected light to override the calculated brightness of the sun. When off, the brightness of the selected light is not exported, but it might be used to calculate sky coverage.

Sky—Sets the sky coverage. The sky can be set to Clear, Partly Cloudy, or Cloudy. This affects the brightness of the sun. If you turn on Use Light, the brightness of the selected light will be used to calculate the sky coverage by choosing the coverage that makes the calculated sun's brightness closest to the light.

Lightscape Preparation File Windows Panel

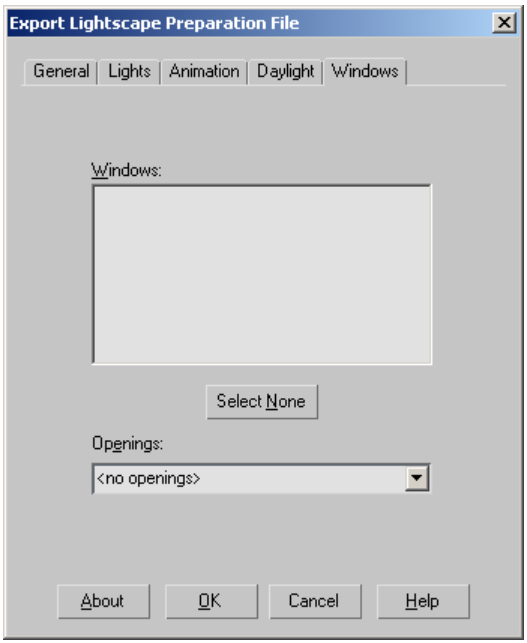
This panel is used to mark windows and openings for Lightscape. When daylight is used for an interior scene, Lightscape allows daylight to enter the scene only through two types of special surfaces: windows and openings. Openings are just placeholder surfaces that mark openings for

Lightscape. Windows also allow light to enter, but other material attributes are used for filtering the light as it passes through the window.

When you create your scene, you need to make sure that there are surfaces for all of your windows and openings.

The exported LP file uses the a material to mark whether a surface is a window or opening. Create a material that you assign only to openings. Make sure that materials assigned to windows are only used by surfaces that are windows. Light might shine through surfaces that incorrectly have a material used to marked a window or opening.

Interface



Windows—Select all of the materials you used for your windows. When exporting a face, it will be marked as a window if any of the selected materials is assigned to the face.

Select None—Removes selection from all materials in the Windows list box.

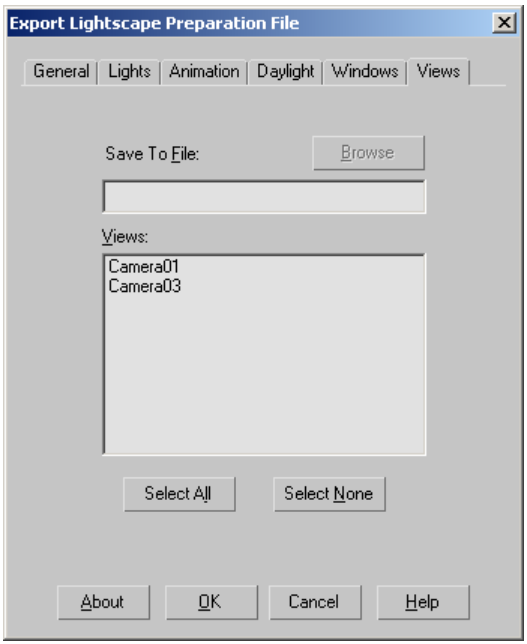
Openings—Select the material you used for your openings. Faces that use this material will be marked as openings.

Lightscape Preparation File Views Panel

The active view is always stored in the preparation file. This panel allows you to choose additional views that are saved in Lightscape view files. Normally, the additional views are saved in the same directory as the preparation file and are named for their cameras.

This panel is unavailable if no cameras are in the scene.

Interface



Save to File—Displays the file name that will be used to save the view for the last camera selected. You can enter a file name if you don't want to use the default.

Browse—Click to open a File Save dialog and choose the name and location of the file.

Views—Lists the cameras in the scene. You can select any or all of the cameras. A view file will be created for each selected camera. By default, the file name is the same as the camera name, and the files are put in the directory with the preparation file. If you are exporting preparation files for multiple frames, a view is exported for each camera in each frame. The frame number is appended to the end of the file name for each camera. If any of the view files to be exported would overwrite another file, a single message will be displayed, and you can choose to abort or continue the export.

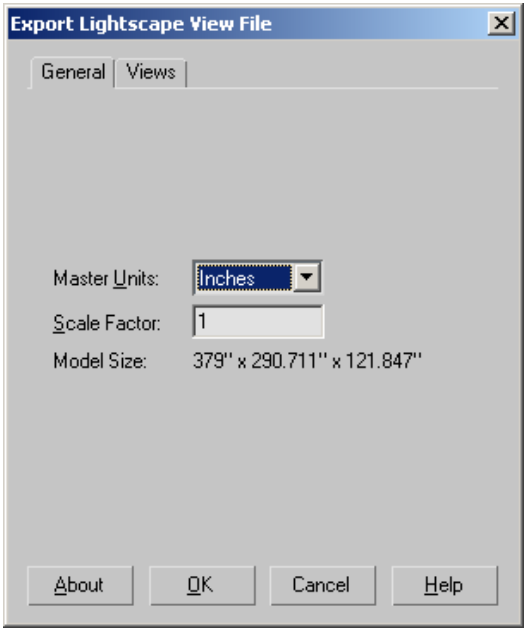
Select All—Selects all cameras in the Views list.

Select None—Removes selection from all cameras in the Views list.

Export Lightscape View File Dialog

This dialog is displayed when exporting a Lightscape view (VW) file. The active view is placed in the file given in the Select File To Export dialog, but additional views can be exported to other files.

Interface



- *General panel (page 3–601)*

  General parameters for exporting your 3ds Max views.

- *Views panel (page 3–601)*

  Allows additional Lightscape views to be output for cameras in your scene.

About—Displays a dialog that contains the copyright and version of the exporter you are using.

OK—Begins writing the 3ds Max objects into the view file.

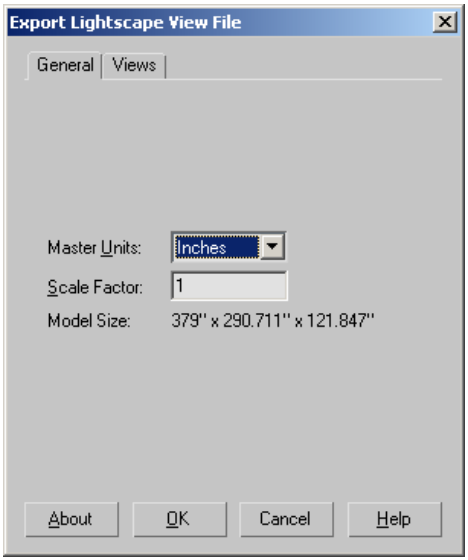
Cancel—Cancels the export operation. No file is created when you cancel.

Help—Opens help for the active tab in the dialog.

Lightscape View File General Panel

This panel is used to establish the units and scaling for the exported model. These should match the original values used when exporting the preparation file.

Interface



Master Units—Specifies the units used by the scene, so Lightscape can use them as well. To see which units the scene is currently using, choose Customize > Units Setup. If Master Units doesn't match the units specified in the Units Setup dialog, Lightscape might give unrealistic results.

If your scene uses generic units, you will have to convert to real-world units for Lightscape to use. In this case, you might also have to adjust the Scale Factor. The Model Size display can help you do so.

Scale Factor—Gives a scaling factor applied to the entire model. Any positive real number is accepted. You can use this setting to globally adjust the size of the exported model.

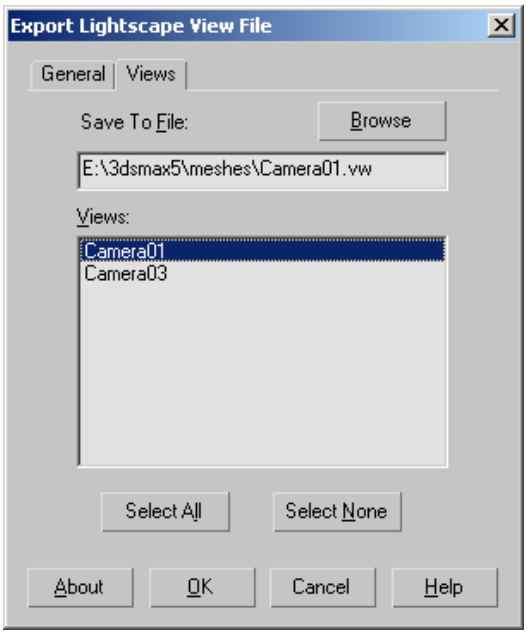
Model Size—The X, Y, and Z extents of the model are displayed in here.

Lightscape View File Views Panel

The active view is always stored in the view file. This panel allows you to choose additional views that are saved in Lightscape view files. Normally, the additional views are saved in the same directory as the preparation file and are named for their cameras.

This panel is unavailable if no cameras are in the scene.

Interface



Save to File—Displays the file name that will be used to save the view for the last camera selected. You can enter a file name if you don't want to use the default.

Browse—Click to open a File Save dialog and choose the name and location of the file.

Views—Lists the cameras in the scene. You can select any or all of the cameras. A view file will be created for each selected camera. By default,

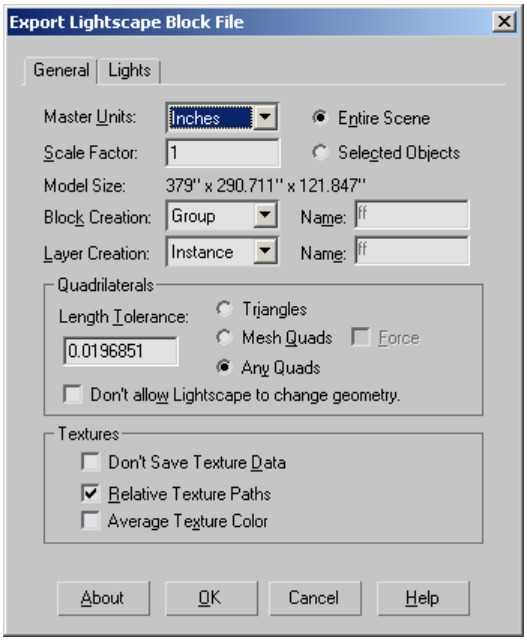
the file name is the same as the camera name, and the files are put in the directory with the preparation file. If you are exporting preparation files for multiple frames, a view is exported for each camera in each frame. The frame number is appended to the end of the file name for each camera. If any of the view files to be exported would overwrite another file, a single message will be displayed, and you can choose to abort or continue the export.

Select All—Selects all cameras in the Views list.

Select None—Removes selection from all cameras in the Views list.

Export Lightscape Block File Dialog

This dialog is displayed when exporting a Lightscape block (BLK) file. Block files contain only the layer, material, block, and luminaire definitions in the model. You can load blocks and luminaires from a Lightscape block file into an existing model, and create instances of the blocks or luminaires.



- *General panel (page 3–602)*

  General parameters for exporting blocks.

- *Lights panel (page 3–605)*

  Controls the way in which 3ds Max light objects will be converted to Lightscape luminaires.

About—Displays a dialog that contains the copyright and version of the exporter you are using.

OK—Begins writing the 3ds Max objects into the block file.

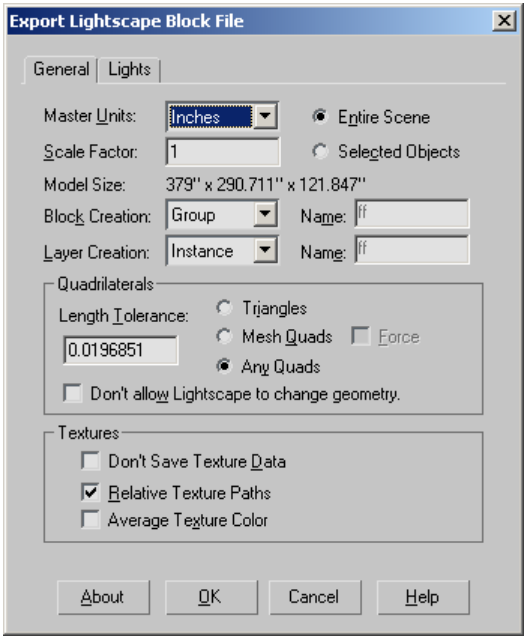
Cancel—Cancel the export operation. No file is created when you cancel.

Help—Opens help for the active tab in the dialog.

Lightscape Block File General Panel

This panel is used to set the general parameters for exporting a 3ds Max model to a block file.

Interface



Master Units—Specifies the units used by the scene, so Lightscape can use them as well. To see which units the scene is currently using, choose Customize > Units Setup. If Master Units doesn't match the units specified in the Units Setup dialog, Lightscape might give unrealistic results.

If your scene uses generic units, you will have to convert to real-world units for Lightscape to use. In this case, you might also have to adjust the Scale Factor. The Model Size display can help you do so.

The Master Units are also used as the display units in the exported BLK file.

Scale Factor—A scaling factor that is applied to the entire model. Any positive real number is accepted. Use this setting to globally adjust the size of the exported model. Default=1.

If your scene uses realistic physical dimensions, as it probably does if you use photometric lights, then leave Scale Factor set to 1. If you didn't create your scene using realistic physical dimensions, which is often the case when using standard lights or generic units, you might have to adjust the scene's scale.

Model Size—Displays the X, Y, and Z extents of the scene's geometry using the current Master Units and Scale Factor settings. This can help you set up the exported file if you need to change either of these settings. Model Size does *not* include lights and cameras, which might be outside the extents of the renderable geometry.

Entire Scene and Selected Objects—These radio buttons select whether blocks are exported for all objects in the scene, or only selected objects.

Block Creation and Name—These settings allow you to select how blocks are created in the exported model. Default=Group. The four possible settings are:

- **Object**—A block is created for each object. The name of each block is taken from the name of the first 3ds Max object that uses the 3ds Max object. If different instances of a single 3ds Max object use different materials, a new block is created so the proper material can be applied to the instance. The blocks are then created in the model.
- **Group**—A block is created for each object as with the Object setting and also for each group. The blocks are created in the model based on the groups in which they are contained.
- **Single**—A single block is created for the entire model. All of the meshes of all of the objects are created within this block. One instance of this block is created for the model. When this setting is chosen, Name is enabled. You can enter the name of the single block in this field. The default name is the base name of the exported file.
- **None**—No blocks are created. All of the meshes of all of the objects are created directly in the model.

Tip: If you are using object instancing in 3ds Max, creating blocks can reduce the file size of the exported file, because the geometry of the object is only output once in the exported file. You can also use groups to group lights with the geometry that represents their fixtures. This will make moving and changing lights easier in Lightscape.

Layer Creation and Name—These settings allow you to select how layers are created and how surfaces and blocks are placed on the layers. Default=Instance. The five possible settings are:

- **Instance**—A layer is created for each object instance in the model, including lights. The surfaces for each instance are placed on their own layer. The name of the layer is the same as the name of the 3ds Max object instance. This setting is very useful if you plan to import the Lightscape solution back into 3ds Max, since the importer can reconstruct the original objects.
- **Object**—A layer is created for each 3ds Max object. All surfaces in all instances of the object are placed in the layer for the object. The name of the layer is the same as the name of the first instance of the object.
- **Group**—A layer is created for each 3ds Max object and each group. All surfaces in all instances belonging to a group are placed in the layer for the group. All other surfaces are placed in the layer for the object. The name of the layer is the same as the name of the group, or the first instance of the object.
- **Single**—A single layer is created and all surfaces are put on that layer. When this setting is used, Name is enabled. You can enter the name of the single layer in this field. The default name is the base name of the exported file.
- **Material**—A layer is created for each exported material. Surfaces are assigned to layers based on the material assigned to the surface.

Quadrilaterals group

This group gives you more control over the geometry exported to Lightscape.

Length Tolerance—The tolerance between points that will be welded together when forming quadrilaterals. Points closer than this distance are welded. The distance is given in the units selected in the Master Units drop-down list. This value becomes the Length Tolerance in Lightscape.

Triangles—When chosen, no quadrilaterals are formed.

Mesh Quads—When chosen, only quadrilaterals that are in the mesh are formed, but only if they fit the criteria that Lightscape uses for quadrilaterals.

- **Force**—Enabled only when Mesh Quads is chosen. If it is on, then quadrilaterals in the mesh will be formed even if they don't fit the Lightscape criteria.

Any Quads—When chosen, triangles can be used to form quadrilaterals, as long as they are planar, convex quadrilaterals that fit the criteria that Lightscape uses for quadrilaterals.

Don't allow Lightscape to change geometry—When this is on, flags are set to prevent Lightscape from modifying the geometry when it is initialized to start the solution.

Note: This option is available only for recent patches of Lightscape. The most recent patch is available at ftp://ftp1.discreet.com/web/support/lightscape/short_sizes2.zip. When you run the patched Lightscape, you can use the new controls Preserve Polygons and Condition Polygons. These are located on the Layer Table Context menu. Turning on Preserve Polygons preserves the geometry layout in the LP file; it is the Lightscape counterpart to Don't Allow Lightscape To Change Geometry in the LP exporter. Turning on Condition Polygons restores the behavior to the default for the currently selected layers.

Textures group

Don't Save Texture Data—Prevents textures from being exported with materials.

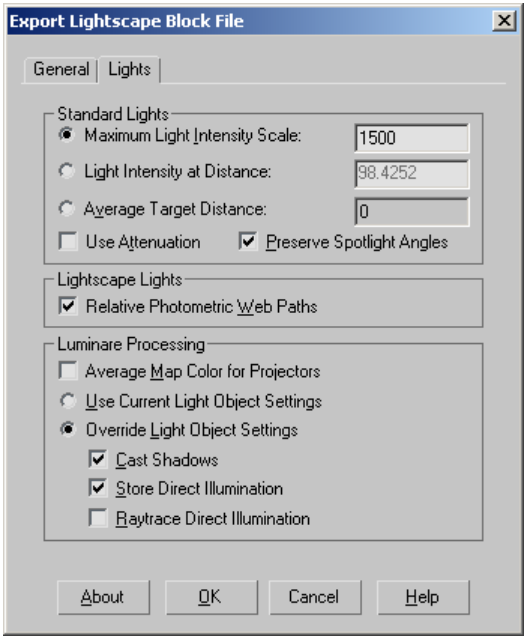
Relative Texture Paths—Selects whether or not texture path names will be output as relative or absolute paths. If this option is off, the exporter will output absolute texture path names. If this option is on, the exporter will output relative path names. See *Using Relative Paths with Block and Material Files (page 3–584)* for more information.

Average Texture Color—Selects the material color the exporter will use for texture-mapped materials. If this option is off, the exporter will set the color of texture-mapped materials to the diffuse color of the 3ds Max material. If this option is on, the exporter will set the color to the average color of the diffuse map of a texture-mapped material.

Lightscape Block File Lights Panel

This panel is used to set the parameters for converting 3ds Max lights to Lightscape luminaires.

Interface



Standard Lights group

Maximum Light Intensity Scale—Selects the scale intensity method for converting standard lights. You can enter the intensity scale in candelas in the field to the right. (Photometric lights are not scaled.)

Light Intensity at Distance—Selects the match intensity method for converting standard lights. You can enter the distance used for matching intensity in the field to the right. The units are always in those selected by Master Units.

Average Target Distance—Selects the match intensity method for converting standard lights. The distance used is the average distances between targeted spotlights and their targets, which is displayed in the edit field to the right. This button is disabled if there are no targeted spotlights in the scene.

Use Attenuation—Selects the Use Attenuation method for converting lights with range attenuation.

Preserve Spotlight Angles—Selects how spotlight angles are converted from 3ds Max to Lightscape. When this option is off, the Lightscape beam angle is set to the angle where the 3ds Max intensity is one-half of the spotlight intensity, which matches the Lightscape intensity at the beam angle. When this option is on, the Lightscape beam angle is set to the hotspot angle. The 3ds Max intensity at the hotspot angle is the full spotlight intensity, which is significantly different from the Lightscape intensity at the beam angle. You should only turn this option on if you want to enter a specific Lightscape beam angle for your spotlights in 3ds Max.

Lightscape Lights group

Relative Photometric Web Paths—Use this option if your scene contains photometric lights with web distributions. When this option is on, exported luminaire definitions contain only the relative path of the IES file and the absolute path is added to the Lightscape document path list. When this option is off, the absolute path of the IES file appears in the luminaire definition.

Luminaire Processing group

Average Map Color for Projectors—Use this option to average the texture map colors and include them in the filter color of the exported light. This is available only for bitmap textures.

Use Current Light Object Settings—Use this option to base the luminaire processing settings on the settings of the 3ds Max light objects. You might want to use this option if you plan on importing your resulting Lightscape solution back into 3ds Max. The options are determined as follows:

- **Cast Shadows** —This option will be set according to the 3ds Max light Shadow Parameters Cast Shadows setting.
- **Store Direct Illumination**—If the 3ds Max light is turned on, this option will be disabled. If the 3ds Max light is turned off, this option will be enabled.

  See the description of Store Direct Illumination below.
- **Raytrace Direct Illumination**—If Use Ray-Traced Shadows is on in 3ds Max, this option will be enabled.

  See the description of Raytrace Direct Illumination below.

Override Light Object Settings—Choose this option to use the following check boxes to set the luminaire processing options. The 3ds Max light object settings will be overridden.

- **Cast Shadows**—When on, turns on the Lightscape Cast Shadows processing option for all luminaires. If you disable this option, light energy is distributed to each surface as if there were no other surfaces blocking it.
- **Store Direct Illumination**—When on, turns on the Lightscape Store Direct Illumination toggle for all luminaires. This causes illumination to be stored in the radiosity mesh. If you disable this option, only indirect lighting will be calculated; direct illumination from the lights will not appear in the radiosity solution.
- **Raytrace Direct Illumination**—When on, turns on the Lightscape Raytrace Direct Illumination toggle for all luminaires. This causes light to be sampled when Lightscape raytraces the model for rendering. Ray-traced direct illumination can improve shadow quality.

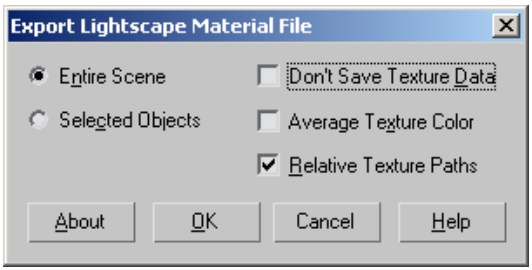
  Tip: In general, it is a good idea to give Store Direct Illumination and Raytrace Direct Illumination opposite values: turn off one when the other is on. If you ray-trace lights that are

also stored, then Lightscape must perform the additional step of removing energy from the mesh before it begins ray-tracing.

Export Lightscape Material File Dialog

This dialog is displayed when exporting a Lightscape material (ATR) file. Material files contain only the material definitions in the model. You can load materials from a Lightscape material file into an existing Lightscape model.

Interface



Entire Scene and Selected Objects—These radio buttons choose whether all materials in the scene are exported, or only those materials used by the selected objects. Default=Entire Scene.

Don't Save Texture Data—Prevents textures from being exported with materials.

Average Texture Color—Selects the material color the exporter will use for texture-mapped materials. If this option is off, the exporter will set the color of texture-mapped materials to the diffuse color of the 3ds Max material. If this option is on, the exporter will set the color to the average color of the diffuse map of a texture-mapped material.

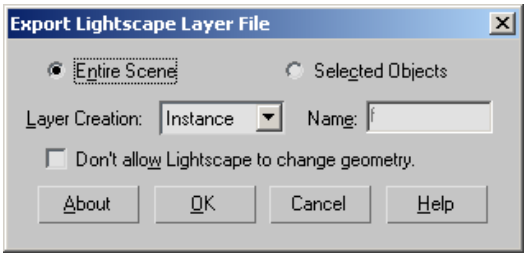
Relative Texture Paths—Selects whether or not texture path names will be output as relative or absolute paths. If this option is off, the exporter will output absolute texture path names. If this option is on, the exporter will output relative path names. See *Using Relative Paths with Block and Material Files (page 3–584)* for more information.

Export Lightscape Layer File Dialog

This dialog is displayed when exporting a Lightscape layer (LAY) file. Layer files contain only the layer definitions in the model. You can load layers from a Lightscape layer file into an existing Lightscape model.

Note: The Lightscape exporter does not recognize 3ds Max scene layers, because it was written before that feature was implemented.

Interface



Entire Scene and Selected Objects—These radio buttons select whether all layers in the scene are exported, or only those layers used by the selected objects. Default=Entire Scene.

Layer Creation and Name—These settings allow you to select how layers are created and how surfaces and blocks are placed on the layers. Default=Instance. The five possible settings are:

- **Instance**—A layer is created for each object instance in the model, including lights. The surfaces for each instance are placed on their own layer. The name of the layer is the same as the name of the 3ds Max instance of the object. This setting is very useful if you plan to import the Lightscape solution back into 3ds Max, since the importer can reconstruct the original objects.

- **Object**—A layer is created for each 3ds Max object. All surfaces in all instances of the object are placed in the layer for the object. The name of the layer is the same as the name of the first instance of the object.
- **Group**—A layer is created for each 3ds Max object and each group. All surfaces in all instances belonging to a group are placed in the layer for the group. All other surfaces are placed in the layer for the object. The name of the layer is the same as the name of the first instance of the object.
- **Single**—A single layer is created and all surfaces are put on that layer. When this setting is used, Name is enabled. You can enter the name of the single layer in this field. The default name is the base name of the exported file.
- **Material**—A layer is created for each exported material. Surfaces are assigned to layers based on the material assigned to the surface.

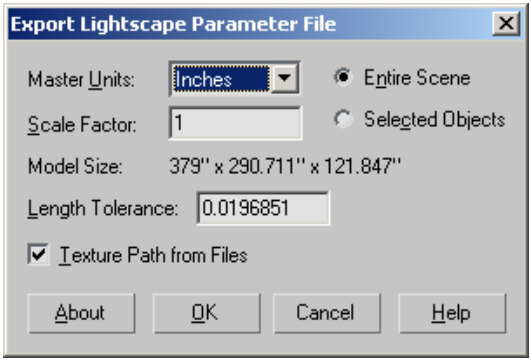
Don't allow Lightscape to change geometry—When this is on, flags are set to prevent Lightscape from modifying the geometry when it is initialized to start the solution.

Note: This option is available only for recent patches of Lightscape. The most recent patch is available at ftp://ftp1.discreet.com/web/support/lightscape/short_sizes2.zip. When you run the patched Lightscape, you can use the new controls Preserve Polygons and Condition Polygons. These are located on the Layer Table Context menu. Turning on Preserve Polygons preserves the geometry layout in the LP file; it is the Lightscape counterpart to Don't Allow Lightscape To Change Geometry in the LP exporter. Turning on Condition Polygons restores the behavior to the default for the currently selected layers.

Export Lightscape Parameter File Dialog

This dialog is displayed when exporting a Lightscape parameter (DF) file. Parameter files contain the units and processing parameters for the model. You can load parameters from a Lightscape Parameter file into an existing Lightscape model.

Interface



Master Units—Specifies the units used by the scene, so Lightscape can use them as well. To see which units the scene is currently using, choose Customize > Units Setup. If Master Units doesn't match the units specified in the Units Setup dialog, Lightscape might give unrealistic results.

If your scene uses generic units, you will have to convert to real-world units for Lightscape to use. In this case, you might also have to adjust the Scale Factor. The Model Size display can help you do so.

The Master Units are also used as the display units in the exported DF file.

Scale Factor—Gives a scaling factor applied to the entire model. Any positive real number is accepted and the default is 1.0. You can use this setting to globally adjust the size of the exported model.

Model Size—Displays the X, Y, and Z extents of the scene's geometry using the current Master Units

and Scale Factor settings. This can help you set up the exported file if you need to change either of these settings. Model Size does *not* include lights and cameras, which might be outside the extents of the renderable geometry.

Entire Scene and Selected Objects—These radio buttons select whether all objects in the scene are exported, or only selected objects.

Length Tolerance—The tolerance between points that will be welded together when forming quadrilaterals. Points closer than this distance are welded. The distance is given in the units selected in the Master Units drop-down list. This value becomes the Length Tolerance in Lightscape.

Texture Path from Files—Specifies whether the texture path list the exporter outputs will contain directories generated from the textures in a scene. The texture path list the exporter writes will always contain the directories specified on the *External Files panel (page 3–855)* of the Configure User Paths dialog. When you turn this option on, additional directories containing textures are added to the path list. See *Using Relative Paths with Block and Material Files (page 3–584)* for more information.

Importing Lightscape Files

Just as you can export a Lightscape Preparation (LP) file, you can also import one into 3ds Max. You can also import Lightscape Solution (LS) and Lightscape View (VW) files.

The steps to import a Lightscape file include:

- Accessing the *import dialog (page 3–609)*.
- Choosing to *replace the current scene (page 3–609)*.
- Choosing how to *group the imported objects (page 3–610)*.
- (LS files.) *Specifying a prefix (page 3–612)* for imported Lightscape objects.
- (LS files.) Choosing *which Lightscape objects to import (page 3–612)*.
- (LS files.) Choosing the conditions for *importing Lightscape lights (page 3–611)*.
- (LS files.) Choosing the *radiosity mapping settings (page 3–612)*.

Note: The Lightscape importer does not convert Lightscape layers into 3ds Max scene layers, because it was written before that feature was implemented.

Procedures

To import a Lightscape (LS, VW, or LP) file:

1. Choose File > Import.

   The Select File To Import dialog is displayed.

2. Choose Lightscape (*.LS, *.VW, *.LP) from the Files Of Type drop-down list.

3. Use the dialog's controls to browse to the directory that contains the file you want to use. Highlight the name of that file, and then click Open.

   Depending on the type of file you chose, an *Import Lightscape Preparation dialog (page 3–619)* or an *Import Lightscape Solution dialog (page 3–620)* is displayed.

   No dialog is displayed when you import a Lightscape view (VW) file.

To replace the current scene:

When you import a Lightscape Solution or Preparation file, you can choose to add the imported objects to the current scene, or to replace entire scene.

- In the Import Lightscape Preparation dialog, turn on Replace Current Scene.

- In the Import Lightscape Solution dialog, turn on Replace Scene Contents.

To group imported objects:

- In the Import Lightscape Preparation or the Import Lightscape Solution dialog, use the controls in the Entity Grouping group to choose how imported Lightscape objects are grouped.

  See each dialog's description for details about these options.

To get version information about the Lightscape file importer:

1. Access the Import Lightscape Solution dialog.
2. Click About.

   An About Lightscape LS File Import dialog is displayed. This shows the version of the importer that is currently installed.

Importing Lightscape View Files

File menu > Import > Lightscape (*.LS, *.VW, *.LP) > Choose a VW file.

When you import a Lightscape VW file, the importer creates a target camera in your scene. The camera has the name of the Lightscape view file, and is oriented to reproduce the original Lightscape view.

No additional dialog appears when you import a VW file.

You can have a viewport show the view by right-clicking the viewport's label, then choosing Views followed by the name of the camera and view file.

Importing Lightscape Preparation Files

File menu > Import > Lightscape (*.LS, *.VW, *.LP) > Choose an LP file. > Import Lightscape Preparation dialog

A Lightscape Preparation file contains lights and geometry, but does not contain radiosity data. When you import a Lightscape Preparation file, Lightscape data appears in your scene as follows:

- Lightscape geometry becomes editable mesh objects.
- Lightscape luminaires become photometric lights.
- Lightscape views become target cameras.

The dialog that is displayed when you import an LP file gives you a few options for how to import the Lightscape data, but not as many as when you import an LS file.

See also

Import Lightscape Preparation Dialog (page 3–619)

Importing Lightscape Solution Files

File menu > Import > Lightscape (*.LS, *.VW, *.LP) > Choose an LS file. > Import Lightscape Solution dialog

A Lightscape Solution file contains lights, geometry, and a radiosity mesh. When you import a Lightscape Solution file, you have a wide range of options about which data to import, and how.

See also

Import Lightscape Solution Dialog (page 3–620)

Importing Lights

There are two sets of options for how you import lights from the LS file. These are in the Lights group of the Import Lightscape Solution dialog.

- The first set lets you choose the on/off status of lights: all on, all off, or on or off as they were set in Lightscape.
- The second set begins with the toggle, Make Lightscape Lights. When this is on, Lightscape lights (luminaires) are imported as photometric lights; there are no further options to set.

  Make Lightscape Lights is on by default. When you turn off Make Lightscape Lights, other options become available: these have to do with how luminaires are converted to standard lights. See the *Lights group description (page 3–622)* for details.

Luminaires and Photometric Lights

When you import luminaires as Photometric lights, they have the following settings:

- Intensity is equal to the luminaire Intensity in Lightscape.
- Color and Filter Color are the same as the luminaire Color and Color Filter in Lightscape.
- The light's distribution (isotropic, spot, or web) is the same as the luminaire's distribution in Lightscape.
- Point lights are converted to Free Point lights.
- Area and Linear lights are imported as Area and Linear lights.
- Triangular Area lights are converted to rectangular Area lights.
- Shadows are on if Cast Shadows was on in the Luminaire Processing parameters in Lightscape.
- Shadows are set to Raytrace Shadows, if Raytrace direct illumination was on in the Luminaire Processing parameters in Lightscape.

Lightscape Radiance Map parameters correspond to the following:

- Contrast and Brightness are equal to the Contrast and Brightness in the Display panel of the Lightscape File Properties.
- Daylight corresponds to Daylight in the Lightscape Process Parameters.
- Exterior is the opposite of Daylight Through Windows And Openings Only in the Lightscape Process Parameters.

Determining Whether or Not to Have Lightscape Store Direct Illumination

When importing lights from a Lightscape solution file, you can run into the following situation:

- If a light is turned on in 3ds Max and the direct illumination was stored in Lightscape, the effect of the light on the Lightscape objects in 3ds Max is doubled. Similarly, if the light is off in 3ds Max and the direct illumination was not stored in Lightscape, the surface does not have any direct light and is too dark.

There are several issues to consider when deciding whether or not to have Lightscape store the direct illumination or have 3ds Max calculate the direct illumination:

- Does a 3ds Max object that is not part of the Lightscape model, need to be illuminated by light?

  If the answer is yes, then 3ds Max needs to do the lighting calculations for those lights.
- Are you using a material effect that needs to be illuminated by a light?

  The Lightscape radiosity mapping is applied only to the ambient or diffuse map or color in a material.

Material effects that need 3ds Max light may include specular mapping, opacity mapping, and so on.

To turn off direct illumination storage, use Lightscape. Select the lights that need to be on in the 3ds Max scene. Right-click and choose Luminaire Processing, then turn off the parameter Store Direct Illumination.

Keeping Your Scene's Original Materials

If you export a 3ds Max scene to Lightscape and calculate a radiosity solution, you can have the importer use your original 3ds Max materials when you import the solution back into 3ds Max.

Do this when you export your model:

- After you have exported your scene, be sure to save the MAX file. The exporter tags the exported materials. If the scene is not saved, the importer will not be able to find the materials it needs to use.

Follow these steps when you import your model:

1. Before importing the Lightscape solution, open the MAX scene that was exported to create the solution.
2. Import the LS file. In the Import Lightscape Solution dialog, make sure the options Replace Scene Contents and Keep Original Materials are both turned on.
3. Set the other import options you want to use, then click OK to import the model.

   Note: If the importer cannot find the 3ds Max material from which a Lightscape material was created, it will create a new 3ds Max material.

Radiosity Settings

You can control the brightness and contrast of the image displayed on your monitor. You can also specify the type of radiosity mapping required for your scene (daylight, exterior, or daylight exterior).

For details, see the *Radiosity Mapping group description (page 3–621)*.

Procedures

To specify a prefix for Lightscape objects:

When you import a Lightscape solution (LS) file, you can specify a prefix to the name of each imported object. This lets you easily identify and group the Lightscape objects in your 3ds Max scene.

- In the *Import Lightscape Solution dialog (page 3–620)*, enter the prefix in the Object Name Prefix field.

  The importer places this prefix at the beginning of every Lightscape entity name that you import.

To import selected Lightscape objects:

When you import a Lightscape Solution file, you can choose which Lightscape objects to import.

- In the Import Lightscape Solution dialog, use the controls in the Import group to choose which types of Lightscape objects to import.

To replace the radiosity solution in an existing 3ds Max scene:

This procedure assumes you have already established an existing scene, with radiosity.

1. Make backup copies of your existing 3ds Max scene and your current Lightscape solution (LS) file.
2. In your Lightscape solution, make your lighting revisions and run the solution until you obtain the desired result. Save the LS file.
3. In 3ds Max, import the LS file.

   The Import Lightscape Solution dialog is displayed.

4. In the Import group, turn off all Import options except for Radiosity and Lights.
5. Click OK.

   The importer replaces the scene's radiosity solution with the one obtained from the LS file.

To import sunlight into an existing 3ds Max scene:

This procedure assumes you have already established an existing 3ds Max scene based on the geometry of an LS file.

1. Process your Lightscape solution file with the desired daylight settings until you have achieved the desired result. Save the LS file.
2. In 3ds Max, import the LS file.

   The Import Lightscape Solution dialog is displayed.
3. In the Import group, turn off all options except for Radiosity, Sunlight, and Materials.

   (Materials is an optional choice. If you didn't change materials in Lightscape, you can leave it off as well.)
4. Click OK.

   The importer creates a directional light that models the sunlight created in Lightscape.

To make a 3ds Max material for use with imported meshes:

1. In 3ds Max, open the Material Editor.
2. Click an unused sample slot to make it active.
3. Click the material type button (by default, it is labeled "Standard").

   The Material/Map Browser is displayed.
4. In the Browser, double-click Multi/Sub-Object.

   Respond to the dialog that asks if you want to keep the original material.
5. On the Multi/Sub-Object Basic Parameters rollout, click Set Number and change the number of sub-materials to the number you want to use with the imported meshes.

   You can set the color and mapping of each sub-material as you would for top-level materials.
6. Apply the new multi-sub-object material to the *Lightscape Mesh objects (page 3–613)* in the scene.
7. Select a Lightscape mesh object.
8. On the Modify panel, go to the Face sub-object level.
9. Set the material ID of each Face sub-object to correspond to the ID of the sub-material you want to apply to that face.

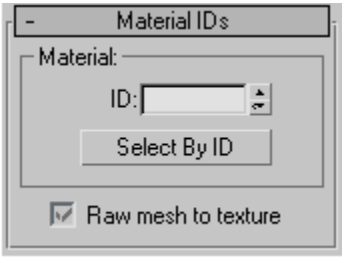
   Note: When the mesh stores textures (the Mesh To Texture procedure was used in Lightscape), faces that have textures are displayed and rendered with no further lighting calculations. If you want to assign a material to a face, then at the Face sub-object level, make sure you turn off Raw Mesh To Texture.
10. Repeat steps 7 through 9 for each Lightscape mesh object in the scene.

Lightscape Mesh Objects

When you import a Lightscape Solution (LS) file, the Lightscape geometry, which can contain radiosity data, is imported as an object type named Lightscape Mesh. At the object level, Lightscape meshes have no parameters. Lightscape meshes have a single sub-object level, Faces. At the Faces sub-object level, you can change the material ID value of faces for controlling sub-material assignment.

Interface

The Faces sub-object level for Lightscape mesh objects has a rollout in the Modify panel titled Material IDs.



Material group

ID—Assigns a material ID to the selected faces.

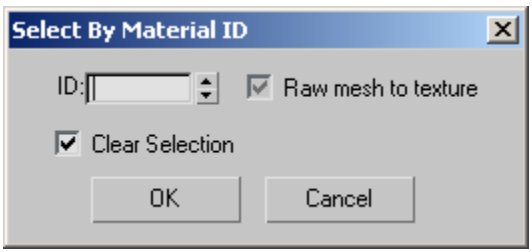
Select By ID—Click to display a *Select By Material ID dialog (page 3–614)*, where you can select faces based on their material ID, and whether their material was generated by Mesh To Texture.

Raw Mesh to Texture—This check box is turned on the material on the face selection was generated using the Lightscape Mesh To Texture feature. These materials are displayed *without* lighting calculations.

If you assign a new material to a face, you should turn off Raw Mesh To Texture.

Select by Material ID Dialog

You can select faces in the mesh based on their material ID, or on their Raw Mesh To Texture flag.



ID—The material ID you want to use to select faces. If this field is blank, all material IDs will be selected when you click OK.

Raw Mesh to Texture—The state of the Raw Mesh To Texture flag you want to select. This check box has three states: on, off, and indeterminate (a gray check mark). If Raw Mesh To Texture is indeterminate, a face's state of this flag is disregarded when making the selection. Default=indeterminate.

Clear Selection—When this check box is on, the previous selection is cleared before making the new selection. When it is off, the new selection is added to the previous selection. Default=on.

Using Illumination Maps

You can import illumination maps and assign them to one of the 3ds Max material components. This is a three-step process: you need to import the model without the illumination maps, use Lightscape to create the illumination maps, and then import the illumination maps.

For details of the import options, see the *Illumination Maps group description (page 3–622)*.

For instructions on creating illumination maps, see *To build illumination maps (page 3–615)*.

When to Use Illumination Maps

Illumination maps work best for textured faces. If the face is not textured, a standard mesh-to-texture map that includes the color of the face will give you better results. It is difficult to adjust the brightness and contrast for illumination maps that are not applied to textured surfaces.

Checking Your Model

This process will work with most models, but there are areas where you might have trouble.

You should not have more than 65,536 faces in any of the objects that you want to use with mesh-to-texture or illumination maps. Each face might create a unique texture, and each texture requires a unique material ID. 3ds Max imposes a limit of 65,536 on the material ID value.

If your game engine can apply only a single UV coordinate map on a face, you need to be careful about the mappings on the faces.

- Don't face-map coplanar connected faces. When the coordinate system is built for the illumination map, 3ds Max tries to use the coordinate system on the faces. If the face UVs overlap, then 3ds Max cannot use them. A coordinate system will be created for the illumination map, but you will not be able to use the same map for the diffuse and the illumination maps.
- Watch out for degenerate maps. These maps appear as streaks in 3ds Max viewports, or when rendered. Watch out for the top and bottom of a cylinder and cone. If you want to clean up the UV map, apply a UVW map modifier and then collapse the stack.

3ds Max will warn you when it cannot match up the illumination and diffuse maps. 3ds Max also places the correct coordinates for the illumination map in the second UVW mapping channel, so your game exporter can use it.

Game-Engine Export

Illumination maps can be useful with game engines. Once the illumination maps are imported into 3ds Max, your game engine exporter will be able to export them to your game engine. A few things to be aware of:

- Maps are generated for coplanar clusters of faces. You can have the game exporter extract the pixels for a face from maps, or you can put coplanar faces on different layers to prevent them from being clustered. Each face that requires a different illumination map, UV offset, or UV scale also needs a different material for the face. is handled using a multi/sub-object material. You might find thousands of materials assigned to a single object.
- The illumination map and diffuse map might use different UV offsets and scales.
- If you want multiple illumination maps packed into a single texture, you will need to write the tool to do this. You should take care about using the Fill Color for this purpose. The fill color might be drawn along the edges of a face. Increasing the antialiasing will reduce the regions where the fill color is drawn, but might not completely eliminate it.

Procedures

To build illumination maps:

1. In Lightscape, export your model to a LP file.
2. In Lightscape, create a radiosity solution.
3. In Lightscape, convert faces that are not textured to textures by using Mesh To Texture.

   Turn on Pad Texture Edge in the Mesh To Texture wizard to ensure that textures mesh well at face boundaries. Replace the maps on the surfaces, and reset the mesh.

   Tip: You might want to use a single-pixel texture when you want to use an illumination map with faces that are not textured. This will help you correctly adjust the brightness and contrast for the model.
4. Turn on textures.
5. Increase the contrast and reduce the brightness until you are satisfied with the dynamic range of the illumination on the textured faces. At first the model will look dark, but in the next step you will use the texture scale to compensate.

6. Adjust the texture scale to compensate for the reduced contrast and brightness. Adjusting the texture scale can compensate. Try to get the model to look as good as it can.

   This step assumes that your game engine will multiply the illumination map by the diffuse texture. This method loses contrast. If your game engine applies illumination differently, to get a good-looking result you might need to use different values in steps 5 and 6.

   Illumination maps have an inherent problem. They cannot brighten a texture value beyond the HSV Value of the texture itself. This limits the dynamic range produced by the textured surfaces. You can see this in the Lightscape OpenGL renderer. You can improve the look by increasing the contrast, reducing the brightness, and increasing the texture scale of textures.

7. Save the LS file.

8. Turn off textures and convert the textured surfaces to illumination maps.

   Turn on Pad Texture Edge in the Mesh To Texture wizard to ensure that textures mesh well at face boundaries.

9. Replace the maps on the surfaces and reset the mesh. Use a different name for these textures than the name you used in step 3.

10. Save the LS file using a name different from the name you used in step 7.

To import illumination maps:

1. In 3ds Max, import the LS file you created in step 7 of the previous procedure, *To build illumination maps (page 3–615)*.

   Note: If the scene was originally a 3ds Max scene and you want to keep your old materials, follow the steps described in *Keeping Your Scene's Original Materials (page 3–612)*. The materials created by Mesh To Texture will replace the original 3ds Max materials.

2. Import the LS file you created in step 10 of the previous procedure, *To build illumination maps (page 3–615)*.

   The Import Lightscape Solution dialog is displayed.

3. Turn off *all options* in the Import group.

   In the Illumination Maps group, turn on Import Illumination Maps, and choose the material component you want to use for the illumination maps.

   Tip: If you use material maps with the Self-Illumination component, 3ds Max will be able to render the illumination map along with your other material settings.

   Also in the Illumination Maps group, use the default settings for unconvertable maps: leave Don't Assign turned off, and Use Second UVW turned on.

4. Clean up errors reported by the importer. Look at the *Error dialog (page 3–623)* for details on the errors.

   The importer will identify each illumination map that couldn't be properly mapped using the UVW 1 coordinates in 3ds Max. If you have coplanar face-mapped surfaces or UV coordinates that are degenerate, the illumination maps will fail. If you left Don't Assign and Use Second UVW in their default settings, the importer will use the UVW 2 coordinates for these maps, and if your game engine can map the illumination and diffuse maps independently, the maps will be correct. If your game engine requires the illumination and diffuse maps to use common coordinates, you will need to adjust the coordinates to make them match.

Helpful Hints and Troubleshooting

This topic provides hints and troubleshooting tips on importing Lightscape Solution (LS) files.

Material Effects and Animated Shadows Don't Appear in Renderings

Processing direct illumination in Lightscape contributes to the reduction of the time it takes to render the scene in 3ds Max. However, because the light was already cast in Lightscape, you will not be able to use material effects such as opacity or specular mapping, or cast shadows from animated objects.

Solution

Use the luminaire processing functions in Lightscape to:

- Store direct and indirect illumination (the default setting) if you don't plan to do opacity or specular mapping or use volumetric lights in 3ds Max.
- Process only the indirect illumination in the cases where you want to use material mapping such as opacity or specular mapping, or to cast shadows from animated objects.

  Warning: Don't apply an edit mesh modifier to a Lightscape mesh that has radiosity. Any geometric changes destroy the mesh's radiosity mapping.

Lightscape Meshes Appear Black in Shaded Viewports

Shaded viewports might not have Default Lighting turned on.

Solution

Turn on default lighting, as follows:

1. Right-click the viewport's label, and choose Configure.
2. On the Viewport Configuration dialog, click the Rendering Method tab to go to the Rendering Method panel.
3. In the Rendering Options group, turn on Default Lighting.

Unusual Patterns Appear on Surfaces

This can happen when you import a double-sided surface from Lightscape. Lightscape explodes a double-sided surface into two back-to-back surfaces at the same location. Small errors in precision can prevent 3ds Max from consistently selecting the correct surface, so the surfaces appear to intersect one another.

Solution

Don't use double-sided surfaces in Lightscape. Instead, hide mesh faces that are facing away from the view. In Lightscape, you can make all surfaces single sided before you initiate your model:

1. Select all surfaces in the model.
2. Right-click and choose Orientation from the menu.
3. Click the One-Sided button.

   Refer to the *Lightscape User's Guide* for more information.

The Imported Camera View Doesn't Match Lightscape

This can happen when you import a view that has been scrolled in Lightscape. Scrolling positions the focus point of the view away from the center of the window. 3ds Max cameras are not able to display a view in this manner.

Solution

Avoid scrolling views in Lightscape. In Lightscape, you can remove any scroll by:

1. Choose View > Setup.

2. Click OK. If the view was scrolled, the focus point now moves to the center of the window.

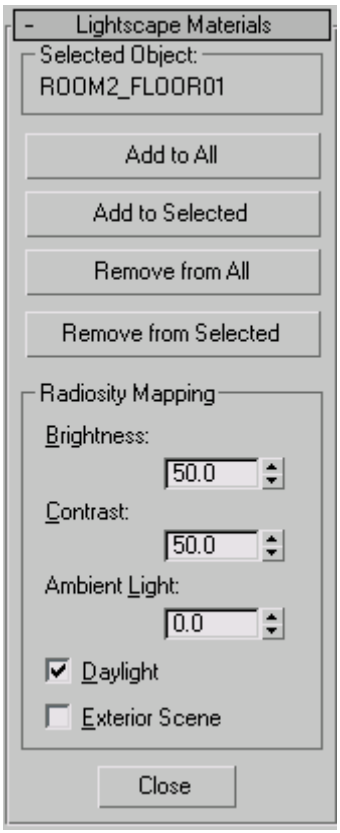
   Refer to the *Lightscape User's Guide* for more information.

Lightscape Materials Utility

Utilities panel > Click More. > Utilities dialog > Choose Lightscape Materials. > Lightscape Materials rollout

With the Lightscape Materials utility, you can add the *Lightscape material (page 2–1413)* to multiple objects, and remove the Lightscape radiosity material from multiple objects.

Interface



Selected Object group

Displays the name of the currently selected object. If no objects are selected, displays None Selected. If more than one object is selected, displays Multiple Selected.

Add to All—Click to add a Lightscape material to all materials used by all objects in the scene.

An object's previous material, if any, becomes the Lightscape material's base material. If a material is already using a Lightscape material, it remains unchanged.

You set the new Lightscape material's values in the Radiosity Mapping group, described below.

Add to Selected—Clicking to add a Lightscape material to all materials used by the current selection.

An object's previous material, if any, becomes the Lightscape material's base material. If a material is already using a Lightscape material, it remains unchanged.

You set the new Lightscape material's values in the Radiosity Mapping group, described below.

Remove from All—Click to remove the Lightscape material from all materials used by all objects in the scene.

Each material's base material becomes the top-level material. If a material is not using a Lightscape material, it remains unchanged.

Remove from Selected—Click to remove the Lightscape material from all materials used by the current selection.

Each material's base material becomes the top-level material. If a material is not using a Lightscape material, it remains unchanged.

These parameters are used only when you add the Lightscape materials. They set the initial values of the new Lightscape material.

Radiosity Mapping group

Brightness—Controls the brightness of the displayed image on your monitor. The setting of this control does not affect the actual lighting levels in the model. Default=50.0.

Contrast—Controls the contrast between light and dark regions in the model. Default=50.0.

Ambient Light—Controls the amount of 3ds Max ambient light that will be mixed in with the radiosity calculations. If the value is 0.0, none of the 3ds Max ambient light is used. If the value is 1.0, the full 3ds Max ambient light is added into the radiosity calculations. Default=0.0.

Daylight—Determines whether you want natural daylight to be used in the calculation. Default=on.

Exterior Scene—Used for exterior daylight simulations. Default=off.

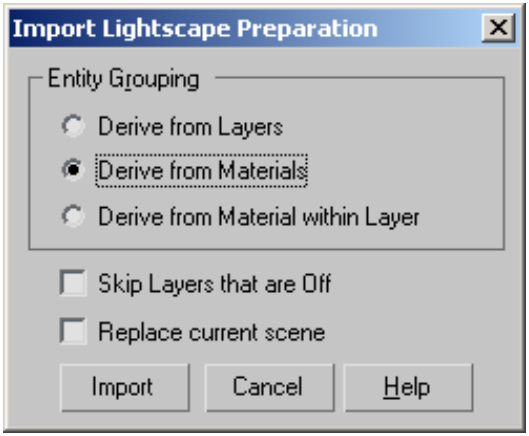
Lightscape Import Dialogs

Import Lightscape Preparation Dialog

File menu > Import > Lightscape (*.LS, *.VW, *.LP) > Choose an LP file. > Import Lightscape Preparation dialog

This dialog is displayed when importing the Lightscape Preparation (LP) file format.

Interface



Entity Grouping group

Use these options to combine the imported Lightscape geometry in various ways.

Derive from Layers—Imports each surface as an object, and objects on the same layer are placed in the same 3ds Max group.

Derive from Materials—Imports all Lightscape geometry assigned the same material as a single object. The name of the object is the same as the material name, along with the unique number appended to the name.

Derive from Material within Layer—All surfaces that have the same material and are on the same layer are imported in a single group.

Skip Layers that are Off—When on, skips layers that are off in Lightscape. When off, imports objects on Lightscape layers that are off. The objects are imported as hidden objects. Default=off.

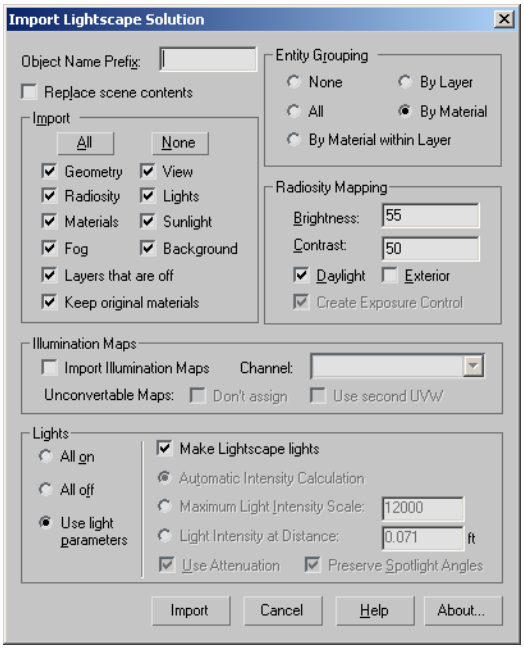
Replace current scene—When on, the imported model replaces the current 3ds Max scene. When off, the imported Lightscape objects are added to the current scene. Default=off.

Import Lightscape Solution Dialog

File menu > Import > Lightscape (*.LS, *.VW, *.LP) > Choose an LS file. > Import Lightscape Solution dialog

This dialog is displayed when importing the Lightscape Solution (LS) file format.

Interface



In addition to a couple of "independent" controls at the top, the Import Lightscape Solution dialog has five groups: Import, Entity Grouping, Radiosity Mapping, Illumination Maps, and Lights.

Note: The settings in this dialog are "sticky": if you import more than one LS file, the next time the dialog is displayed, it shows the changes you previously made to the import parameters.

Object Name Prefix—Enter a prefix to the name of each imported Lightscape object. A prefix lets you easily identify and select the Lightscape objects in your 3ds Max scene. Default=no prefix.

Replace scene contents—When on, the imported model replaces the current 3ds Max scene. When off, the imported Lightscape objects are added to the current scene. Default=off.

Import group

You can determine which Lightscape entities you import.

Geometry—Imports the Lightscape solution mesh surfaces. Default=on.

Radiosity—Imports the radiosity-mapping component of the Lightscape solution (you must import geometry at the same time, or have previously imported geometry). Default=on.

Because radiosity is part of the geometry in Lightscape, you can't import radiosity alone unless you have previously imported the mesh geometry.

This option is useful if you need to change the radiosity solution without changing the geometry. The importer looks for the geometry in 3ds Max and simply re-attaches the recomputed solution (colors and sub-mesh).

Materials—Imports Lightscape material definitions. Default=on.

Fog—Imports linear fog. If the Lightscape solution file contains both linear and exponential fog, the importer turns the exponential fog into linear. Default=on.

Note: If the fog is not turned on in Lightscape, then you cannot import it. If you want to import fog, make sure that you turn the fog on in Lightscape.

View—Imports a camera that duplicates the Original view in Lightscape (Perspective view only). Default=on.

Lights—Imports Lightscape luminaires. (The Sunlight option imports the sun.) Default=on.

Options in the Lights group of this dialog, described below, specify how the importer imports lights.

Sunlight—Imports a directional light that duplicates the color and direction of the sun. Default=on.

Background—Imports the current background color in Lightscape. Default=on.

The default background color in both Lightscape and 3ds Max is black.

Layers that are off—When on, imports objects on Lightscape layers that are off. The objects are imported as hidden objects. Default=off.

Note: Layers that are on are always imported.

Keep original Materials—When on, finds and keeps the original 3ds Max materials that were exported to create the Lightscape materials in the solution. When off, the importer creates a new 3ds Max material for each Lightscape material. See *Keeping Your Original 3ds Max Materials (page 3–584)*. Default=on.

Entity Grouping group

Use these options to combine the imported Lightscape geometry in various ways.

- **None**—Imports each surface (flat area in Lightscape that you can select) as a distinct object.
- **All**—Imports the Lightscape model as a single, combined object.
- **By Layer**—Imports each surface as an object, and objects on the same layer are placed in the same 3ds Max group.
- **By Material**—Imports all Lightscape geometry assigned the same material as a single object. The name of the object is the same as the material name, along with the unique number appended to the name.
- **By Material Within Layer**—All surfaces that have the same material and are on the same layer are imported in a single group.

Radiosity Mapping group

Controls the brightness and contrast of the image displayed on your monitor and in renderings. These controls also let you specify the type of radiosity mapping required for your scene (daylight, exterior, or daylight and exterior).

Brightness—Controls the brightness of the displayed image on your monitor. The setting of this control does not affect the actual lighting levels in the model. Typically, values range between 30 and 60. Default=the Brightness value in the Lightscape model (you set this on the Lightscape Document Properties dialog: File > Properties > Display tab).

Contrast—Controls the contrast between light and dark regions in the model. Typically, values range between 30 and 50. Default=the Contrast value in the Lightscape model (you set this on the Lightscape Document Properties dialog: File > Properties > Display tab).

Daylight—When on, uses natural daylight when calculating radiosity. Default=the Daylight (Sunlight + Sky Light) setting in the Lightscape model (you set this on the Lightscape Process Parameters dialog: Process > Parameters).

Exterior—When on, uses exterior daylight when calculating radiosity. Default=the *opposite* of the Daylight Through Windows And Openings Only setting in the Lightscape model (you set this on the Lightscape Process Parameters dialog: Process > Parameters).

Create Exposure Control—When on, creates a *logarithmic exposure control (page 3–293)* for the scene. Default=off.

When Make Lightscape Lights is turned on (in the Lights group), this control is disabled and

turned on, because photometric lights require the exposure control.

Illumination Maps group

You can import Lightscape illumination maps as 3ds Max material maps.

Import Illumination Maps—When on, imports illumination maps from the LS file. Default=off.

When you import the illumination maps, you *must* import into an existing scene that was imported from Lightscape previously. You cannot import materials or geometry at the same time, and you must import radiosity data. You can import lights, sunlight, and so on, but you don't have to import these.

Channels—Chooses the material component that will be used for the illumination maps.

In order to help this function work with normal mesh-to-texture maps, the importer will not import a texture map that is already assigned to a different material component. This keeps the importer from importing mesh-to-texture maps already assigned to the diffuse component into a different component. The importer determines whether a map is assigned to a different component by comparing the path names of the maps.

This is unavailable when Import Illumination Maps is off.

Unconvertable maps—Selects the error action for maps that cannot be correctly rendered using explicit UVW1 mapping coordinates.

These toggles are unavailable when Import Illumination Maps is off.

- **Don't assign**—When on, maps that can't be rendered are not assigned to the material applied to the faces in question. When off, the maps are assigned to the material and Use Second UVW is used to determine which mapping coordinates are used. Default=off.
- **Use second UVW**—When on, selects the mapping coordinates used for maps that cannot be correctly rendered using explicit UVW1 mapping coordinates. The correct coordinates are placed in explicit UVW2 mapping coordinates, and the map uses the UVW2 coordinates. When off, the mapping depends on the state of Don't Assign. Default=on.

Lights group

In the box on the left, you can choose whether the imported Lightscape lights are turned on or off in the 3ds Max scene.

- **All on**—All lights come into the scene turned on.
- **All off**—All lights come into the scene turned off.
- **Use light parameters**—Uses the Lightscape settings to determine whether a light is on or off (see the list that follows). As a general rule of thumb, you should leave this option chosen: let the importer decide when to turn on lights. This option is the one that is chosen by default.

  If Store Direct Illumination is on in Lightscape, then lights are off when imported. If Store Direct Illumination is off in Lightscape, then lights are on when imported.

Note: If Store Direct Illumination is on in Lightscape, and the importer turns a light on in 3ds Max, then the effect of the light on the imported Lightscape objects is doubled. In a similar way, if the direct illumination was not stored in Lightscape, and the importer turns the light off in 3ds Max, the imported surface will not have any direct light and will appear too dark.

Make Lightscape Lights—When on, converts imported lights into photometric lights with settings as described in the list that follows. When off, converts imported lights into standard lights, with settings determined by the other controls in this part of the Lights group. Default=on.

See *Luminaires and Photometric Lights (page 3–611)* for details of how luminaires are converted.

The remaining options in the Lights group are for converting imported lights into standard lights. They are unavailable unless you turn off Make Lightscape Lights.

- **Automatic Intensity Calculation**—The intensity of each standard light is based on the intensity of each Lightscape light. This option is chosen by default.
- **Maximum Light Intensity Scale**—The intensity of each standard light is based on the intensity of the Lightscape light divided by the specified value. When this option is chosen, you can enter the constant value in the field to the right of the radio button. The value is in candles. Default constant=12000.

  This option is useful when you import a solution generated from a 3ds Max scene with standard lights. If you used the Maximum Light Intensity Scale option when you exported the scene, this option will create lights with the same intensity as the original 3ds Max scene.
- **Light Intensity at Distance**—The intensity of each standard light is calculated by matching the brightness of the standard light and the brightness of the Lightscape light at a given distance from the light. When this option is chosen, you can enter the distance in the field to the right of the radio button. The value is in feet unless you specify meters (m). Default=0.208m.

  This option is useful when you import a solution generated from a 3ds Max scene. If you used the Light Intensity At Distance option when you exported the scene, this option will create lights with the same intensity as the original 3ds Max scene.

Use Attenuation—When on, the standard lights use range attenuation. When off, the standard lights are not attenuated. Default=on.

Note: The range attenuation limits are always calculated, regardless of this option's setting.

Preserve Spotlight Angles—When on, the hotspot angle is set to the Lightscape beam angle. When off, the hotspot angle is set so the standard spotlight distribution is closer to the Lightscape light's distribution. Default=on.

Leave this option on if you are using 3ds Max for modeling only, and Lightscape for rendering. Turn this option off if you want Lightscape and 3ds Max rendering to be similar visually.

Error Dialog (Lightscape Import)

The Lightscape importer will display an error dialog when errors are found while merging radiosity or illumination maps into an existing scene.

The errors that can be displayed in the dialog are:

- **Radiosity data for [*object*] could not be merged.**

  The radiosity data for the specified object couldn't be merged. This can happen if the object has been deleted, or if the faces of the object have changed. The importer will not try to import illumination maps if the radiosity data cannot be merged.
- **[*Face-material*]: [*object-material*] ([*sub-material*]): Could not be cloned.**

  The material named *face-material* couldn't be cloned to add the illumination map. This error is not expected, and usually indicates that the system doesn't have enough memory to make a copy of the material. *Face-material* is assigned as a sub-material of the material

named *object-material*. *Sub-material* is the sub-material ID number.

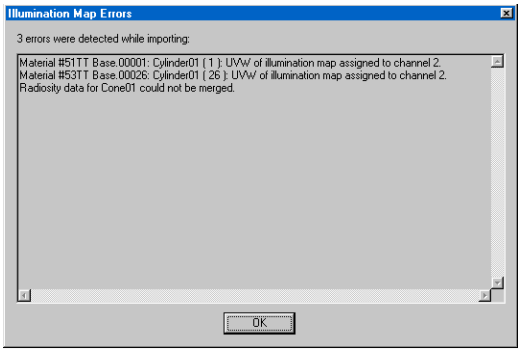
- **[*Face-material*]: [*object-material*] ([*sub-material*]): UVW of illumination map does not match.**

  The UVW mapping for the illumination map being used with the material named *face-material* did not match the coordinates in the explicit UVW 1 mapping coordinates. *Face-material* is assigned as a sub-material of the material named *object-material*. *Sub-material* is the sub-material ID number. *Face-material* will have the illumination map assigned depending on the Don't Assign setting in the *Import Lightscape Solution dialog (page 3–620)*.

- **[*Face-material*]: [*object-material*] ([*sub-material*]): UVW of illumination map assigned to channel 2.**

  The UVW mapping for the illumination map being used with the material named *face-material* did not match the coordinates in the explicit UVW 1 texture coordinates. The correct coordinates are stored in UVW 2 mapping coordinates, and the illumination map is assigned to *face-material* using these coordinates. *Face-material* is assigned as a sub-material of the material named *object-material*. *Sub-material* is the sub-material ID number.

Interface



Motion Analysis Files (HTR/HTR2, TRC)

Importing HTR/HTR2 Files

File menu > Import > Motion Analysis HTR File (*.HTR)

The Motion Analysis HTR (Hierarchical Translation-Rotation) motion capture file format is an alternative to the *BVH (page 3–1009)* format because it provides flexibility in data types and ordering. It also has a complete base pose specification, which consists of indicating the starting point for both rotations and translations.

The stored data is grouped by segments; all motions from the first segment are read, then those from the next segment, and so on.

The HTR format contains four sections: Header, Segment Names & Hierarchy, Base Position, and the motion data section.

Note: All section titles are displayed between square brackets ([]).

Note: Comments within the HTR file are denoted by a hash mark (#).

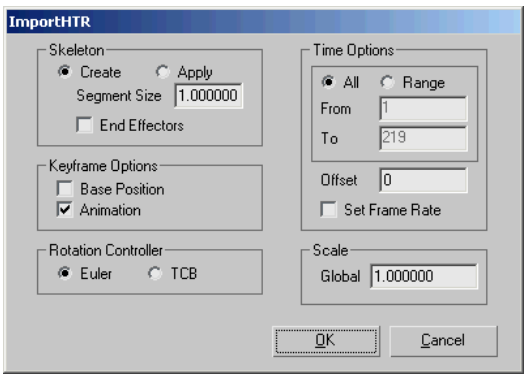
The header section contains global parameter information:

- file type
- data type
- file version
- number of segments
- number of frames
- data frame rate
- Euler rotation order
- calibration units
- rotation units
- global axis of gravity
- bone length axis
- scale factor

HTR2 is nearly identical to HTR, except that the data from the motion section is organized differently in order to better suit a streaming data input (a sample-major ordering is used to present the motion information).

On import, 3ds Max constructs a FK hierarchy rig from the incoming data. The resulting bone skeleton is linked to a dummy object named after the HTR file.

Interface



Skeleton group

Create—Choose this option to build a new bone skeleton from the incoming data. Default=on.

Segment Size—Set this value to modify the scale factor for the weight and height of all bones from the motion capture data. Only available if Create is active.

Note: This does not change the skeleton's scale.

End Effectors—Toggle this option to import *end effectors (page 3–1027)* from the incoming data, if they exist. Only available if Create is active.

Apply—Choose this option to map the incoming data onto the children of the selected skeleton root in your scene.

Keyframe Options group

Base Position— When on, imports only the keys of the base pose.

Animation—When on, imports all animation keys. Default=on.

Rotation Controller group

Euler/TCB—Choose one of the two *rotation controllers (page 2–312)* to apply to the imported data.

Time Options group

These options (except Set Frame Rate) are only functional if the Animation option in the Keyframe Options group is enabled.

All/Range—Choose between using the entire animation range from the motion capture file, or a defined portion.

From/To—These values represent the start and end frames of the defined range. Only available if Range is active.

Offset—Sets the number of inserted empty frames before the imported animation starts.

Note: This does not affect the Base Position setting (in the Keyframe Options group), which sets a key at frame 0.

Set Frame Rate—When on, the *frame rate (page 3–1038)* from the HTR file overwrites the current one in the *Time Configuration dialog (page 3–768)*.

Scale group

Global—Sets the size of the resulting skeleton.

Note: The scale value within 3ds Max remains 100.

Ok—Proceeds with HTR/HTR2 import, using the current settings.

Cancel—Cancels HTR/HTR2 import.

Importing TRC Files

File menu > Import > Motion Analysis TRC File (*.TRC)

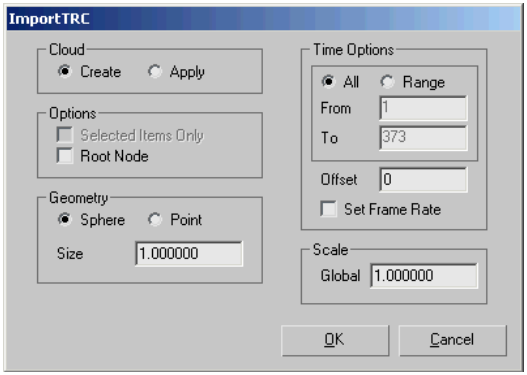
The Motion Analysis TRC motion capture file format represents the raw form (in ASCII) of tracking output. It contains a header section and a motion section.

All tracking markers stored in a TRC file contain global positioning data and do not share parent-child relationships among themselves.

On import, 3ds Max converts the incoming data as either spheres or points, which are named according to the markers names.

You can *convert an imported TRC motion into CSM format* using the *MACUtilities utility (page 2–642)* in order to map it onto a biped.

Interface



Cloud group

Create—Choose this option to build a new set of marker objects. Default=on.

Apply—Choose this option to map the incoming data onto the marker children of the selected root in your scene.

Note: The marker objects must be named to match the imported data.

Options group

Selected Items Only—Imports the motion data only relative to the selected objects in your scene. Available only if the Apply option (in the Cloud group) is active.

Root Node—Includes a root dummy on file import. Available only if the Create option (in the Cloud group) is active.

Geometry group

These settings are available only if the Create option (in the Cloud group) is active.

Sphere/Point—Choose between creating spheres or point helpers to illustrate markers.

Size—Sets the sphere diameter or point size, based on your choice above.

Time Options group

All/Range—Choose between using the entire animation range from the motion capture file, or a defined portion.

To/From—These values represent the start and end frames of the defined range. Only available if Range is active.

Offset—Sets the number of inserted empty frames before the imported animation starts.

Set Frame Rate—When on, the *frame rate (page 3–1038)* from the TRC file overwrites the current one in the *Time Configuration dialog (page 3–768)*.

Scale group

Global—Sets the size of the resulting skeleton.

Note: The scale value within 3ds Max remains 100.

Ok—Proceeds with TRC import, using the current settings.

Cancel—Cancels TRC import.

Exporting HTR/HTR2 Files

File menu > Export > Motion Analysis HTR File (*.HTR)

The Motion Analysis HTR (Hierarchical Translation-Rotation) motion capture file format is an alternative to the *BVH (page 3–1009)* format because it provides flexibility in data types and ordering. It also has a complete base pose specification, which consists of indicating the starting point for both rotations and translations.

The stored data is grouped by segments; all motions from the first segment are read, then those from the next segment, and so on.

The HTR format contains four sections: Header, Segment Names & Hierarchy, Base Position, and the motion data section.

Note: All section titles are displayed between square brackets ([]).

Note: Comments within the HTR file are denoted by a hash mark (#).

The header section contains global parameter information:

- file type
- data type
- file version
- number of segments
- number of frames
- data frame rate
- Euler rotation order
- calibration units
- rotation units
- global axis of gravity
- bone length axis
- scale factor

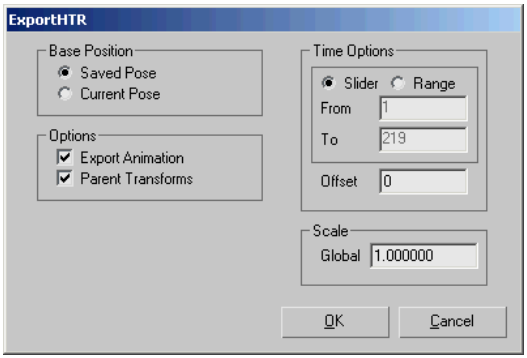
HTR2 is nearly identical to HTR, except that the data from the motion section is organized differently in order to better suit a streaming data input (a sample-major ordering is used to present the motion information).

On export, the root object is named after your file name.

Note: To have a successful export, you have to select the root of the desired skeleton.

Note: You can only export one bone hierarchy at a time.

Interface



Base Position group

Saved Pose—Choose this option to use the skeleton's pose at frame 0 as base position data. Default=on.

Current Pose—Choose this option to use the skeleton's pose at the current frame as base position data.

Options group

Export Animation—Enable to export all animation keys. Otherwise, only the base position is exported.

Parent Transforms—Enable to include the root object's animation data in the export file.

Time Options group

These options are only functional if the Export Animation option in the Options group is enabled.

Slider/Range—Choose between using your scene's *time slider (page 3–748)* range or a defined portion.

From/To—These values represent the start and end frames of the defined range.

Offset—The exported animation starts after the number of frames set by this value.

Scale group

Global—Sets the bone length scale factor in the export file.

Ok—Proceeds with HTR/HTR2 export, using the current settings.

Cancel—Cancels HTR/HTR2 export.

Shockwave Files (W3D)

You can set up 3D scenes and animations in 3ds Max, and then export them in Shockwave 3D (W3D) format for use in interactive presentations in Macromedia Director. To start this process, choose File menu > Export, and choose Shockwave 3D Scene Export (*.W3D) as the file type. Choosing this format opens the *Shockwave 3D Scene Export Options dialog (page 3–629)*.

The Shockwave exporter in 3ds Max offers significant differences from the 3ds Max exporter previously available from Macromedia. When you prepare a scene for exporting to Director, please be aware of the following:

- Bones require special consideration when being exported to Shockwave 3D format. See "Exporting Bones" below.
- Hidden objects are not exported. However, bones are exported whether hidden or not.
- The exporter supports specular lighting for light sources with Specular turned on in the General Parameters rollout > Affect Surfaces group.
- Some types of mapping distort or disappear on export. Whenever possible, use Multi/Sub-Object materials rather than maps.

Exporting Bones

The exporter supports character animation using bones and the Skin modifier, or a **character studio®** biped with the Physique® modifier. Bones are exported not as geometry, but as Shockwave 3D bones.

If the bones deform a mesh with the Skin modifier, the scene must be arranged in a specific manner to cause the bones and mesh to export properly:

- All bones for each mesh object must be linked, and linked contiguously. In other words, each bone must link to another bone, with one bone acting as the root for the entire hierarchy.
- You'll get the best results if all bones are created in the same viewport, and bones are created individually (not copied or mirrored).
- All vertices in the skinned mesh must be assigned to at least one bone, even if they constitute a part of the mesh that isn't animated. Otherwise, the mesh will distort on export.
- You must group the bones and the skinned mesh with the Group menu > Group command prior to export. If you have more than one set of bones with skinned meshes, create a separate group for each.
- You can also export animation on IK chains and dummy objects. These objects must be grouped with the skin and bones to export correctly.

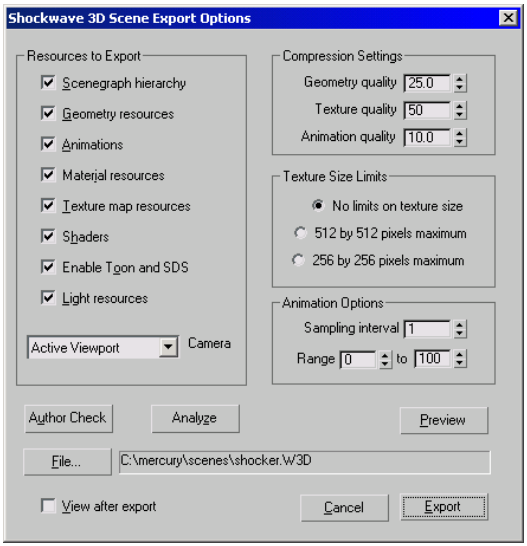
For more tips on working with bones animation and the Shockwave 3D Exporter, visit the Macromedia Web site. Also, search the Macromedia site for "bones shockwave export" (without the quotes).

Shockwave 3D Scene Export Options Dialog

File menu > Export > Select File To Export dialog > Save As Type > Shockwave 3D Scene Export (*.W3D)

This dialog appears when you choose the Shockwave 3D format as the export format for your scene.

Interface



Resources to Export group

Scenegraph hierarchy—Controls whether or not the parent-child hierarchy between all geometry, light, group, and camera resources is written to the Shockwave 3D file. This option should always be selected when exporting an entire scene from 3ds Max. The Shockwave 3D scenegraph contains:

- Information on parent-child relationships.
- Information about what resources each scene element uses (for example, the model resource used by a model in the scenegraph).
- Controls for any modifiers associated with the geometry resources.

- Information about any cameras, lights, and groups in the scene. Shockwave 3D treats cameras, lights, and groups as less important resources, and stores information about them only in the scenegraph.

The scenegraph hierarchy is the glue that binds most of the scene assets in the Shockwave 3D file. If this option is turned off, only shader, texture, model, and motion resources will be written to the W3D file, and all the other information that specifies how objects exist in the scene, how the scene is laid out, how the scene is lit, and how the scene is viewed will be missing. For this reason, turn this option off only when exporting libraries of animations or texture maps.

Note: The exporter will remember this setting from one export to the next. Be sure to turn on this option again before trying to export an entire scene. If you do not, the result will be unusable (except as an object and texture library).

Geometry resources—Exports all meshes and their associated bones to the Shockwave 3D file. If this option is turned off, the preview window will be completely black. All other designated resources will be written to the W3D file.

Animations—Writes out the animation on all objects supported by the exporter to the Shockwave 3D file. The preview window is useful in quickly showing which animations the exporter is capturing.

By default, the Shockwave 3D Exporter captures the animation of all objects in the scene in every frame. This data is compressed into a streaming format as the file is written. There may be times, however, when you only want to capture part of an animation, or sample it more coarsely than once a frame. If this option is cleared, the full scene will be displayed in the preview window without any animations.

Note: 3ds Max supports direct animation of cameras and lights. If you animate a camera or light, that animation will be exported, but an extra geometry node will be inserted into the scene during the export process. This geometry node has the animation of the camera or light applied to it, and the camera or light is made a child of this extra node.

The exporter does this because the Shockwave 3D runtime engine supports keyframes only on geometric nodes. The extra node that the exporter creates is named "Dummy Animation Node xyz", where xyz is the name of the animated camera or light. This dummy geometry node also has a dummy material applied to it named Dummy Material, and the geometry is invisible.

Lingo™ programmers should note that the camera or lights transform is now relative to the dummy geometry node, that is, its parent.

Important: Animation export compression collapses non-bone-based hierarchies (simple linked hierarchies in 3ds Max), so only animation assigned to the root exports properly. For example, in a simple head animation where the eyes and eyelids are linked to the skull, the skull movements export but the eye and eyelid animations do not. Because 3ds Max groups do not collapse on export, you should link each element of your chain, and then group each element with its parent starting from the bottom of the chain and working to the top. Arrange each group's pivot point, and then animate only the group objects, and not their contained elements.

Material resources—Exports all basic materials associated with all objects supported by the exporter to the Shockwave 3D file. Materials represent the most basic properties that can be assigned to a surface, such as diffuse color, opacity, and specular color.

We strongly recommend that you leave this option on when exporting any geometry, shader, or texture map resources. Turn this option off only

when exporting just the animation in a scene; otherwise, the W3D file will not work correctly with Director.

Texture map resources—Exports all texture maps associated with all objects supported by the exporter to the Shockwave 3D file. Texture maps in Shockwave 3D are bitmap images or 2D procedural maps, such as Tile and Gradient Ramp. All bitmap images used in 3ds Max are transformed by Shockwave 3D into streaming JPEG images.

Note: The terms "Texture," "Map," and "Texture Map" are used interchangeably. If this option is turned off, models will be untextured when first loaded into Director, because they will have no texture information (despite their being visible and fully shaded in the preview window). Once textures are assigned to the proper shaders with Lingo, the models will look properly textured.

Shaders—Exports all shaders in the Shockwave 3D file. Shaders are the highest-level entities that describe surface properties. They bear no relationship to the shaders used in 3ds Max. Shockwave 3D does not distinguish among Blinn, Phong, Anisotropic, or any other shader algorithm that determines the rendered look of materials and maps. Only Gouraud shading, which is most closely emulated by the standard shaders in 3ds Max, is supported. Shockwave 3D shaders are primarily pointers to *texture map resources* and *material resources*.

Note: The Shaders option should be used in conjunction with the Texture Map Resources and Material Resources options. If this option is turned off, models will be invisible when first loaded into Director, because they will have no shading information (despite their being visible and fully shaded in the preview window). Once shaders are assigned to the models with Lingo (Director's scripting language), the models will become visible and look properly shaded.

Enable Toon and SDS—When turned off, this option prevents the writing of geometry data used by some of the more advanced Shockwave 3D technologies, and thus reduces the overall file size.

If turned off, Toon and Subdivision Surfaces (SDS) data is not included in the export file, which means that the Toon and Subdivision Surfaces modifiers cannot be applied to the model in Director. A model missing this geometry data can be used with all other Shockwave 3D technologies, however. Leave this option turned on unless it is expedient to reduce the size of the W3D file.

Note: There is no way to tell if a W3D file was exported with this option enabled or disabled until you try to apply the Toon or SDS modifiers in Director. For this reason, if you turn off this option, use a special naming convention to indicate that a model doesn't have the Toon or SDS data in it.

Light resources—Exports all lights in the scene to the Shockwave 3D file.

Turning this option off doesn't do anything unless the scenegraph hierarchy option is also turned off. The only time you should turn this option off is when exporting just the animation, geometry, or texture data in a scene.

Camera—Determines the viewpoint used for the scene in Director. This option defaults to Active Viewport, but if any cameras exist in the scene, you can choose one from the drop-down list.

Note: In order to preview or export an animated camera, you must select that camera from the list. Selecting Active Viewport with an animated camera will not export that camera's animation.

Compression Settings group

The Shockwave 3D file contains all scene assets in a proprietary compressed and streaming format. You can control the order in which data streams with the user properties. The amount

of compression of the scene assets is set by three controls: Geometry Quality, Texture Quality, and Animation Quality. The controls have values that range from 0.1 to 100.0, with higher values giving less compression and better quality (a more faithful representation of the original model).

A value of 100 means that the scene assets will be represented at the best quality possible, but with some degree of compression still present. It does not represent the value at which compression does not occur. Also, the compression controls do not have a linear scale, so a setting of 20.0 doesn't necessarily mean that the quality level of the resulting data is twice as good as that produced with a setting of 10.0.

Geometry quality—Controls how much the scene geometry data (such as vertex positions and normals and texture coordinates) is compressed. The default of 25.0 generally produces a good compromise between data accuracy and space savings.

Texture quality—Controls the compression of textures (images) in the scene.

Animation quality—Controls the compression of animation data in the scene. Higher compression levels (lower quality) tend to remove the finer motions authored in the scene, especially motion-capture data, while occasionally introducing small noise artifacts.

Note: You might need to use larger values of the *Animation Sampling Interval control* (below) along with greater values of this setting to minimize the file space consumed by animation while still maintaining acceptable motions.

Texture Size Limits group

The Texture Size Limits setting lets you reduce the size of the W3D file by limiting the size of the texture maps in the export.

The reduced size of the texture maps will usually look fine on the model, because the model's UVW texture coordinates will have already taken into account the non-square dimensions of the image. Use the smaller settings if, after tuning the compression settings and simplifying the scene in 3ds Max, the W3D file is still too large. If the scene contains no textures, or only small textures, limiting the texture size will not help to reduce the size of the W3D file.

No limits on texture size—Exports all texture maps in the scene at the full resolution of the image as used in 3ds Max. For example, a 2048 X 4096-pixel image will be written to the W3D file at these dimensions (compressed, of course).

512 by 512 pixels maximum—Exports the texture maps so that no image exceeds 512 X 512 pixels. A 2048 X 4096-pixel image will be scaled to a 512 X 512-pixel image; a 128 X 1024-pixel image will be scaled to a 128 X 512-pixel image.

256 by 256 pixels maximum—Exports the texture maps so that no image exceeds 256 X 256 pixels. A 2048 X 4096-pixel image will be scaled to 256 X 256 pixels; a 128 X 1024-pixel image will be scaled to 128 X 256 pixels.

Animation Options group

The Animation Options group contains the controls to change how an animation is captured.

Sampling interval—This setting is used to capture object animation once every specified number of frames.

Range—These Start and End controls indicate which frames of the scene animations are to be captured. By default, these values are set to capture the entire animation interval specified in 3ds Max, sampling all animations in the scene every frame.

Export Controls

Author Check—Opens a window displaying warning messages about possible problems found converting the scene to the W3D file format. If no errors are found, the window is blank.

These messages, which do not necessarily indicate problems with the scene, can be useful in debugging problems such as why the scene looks different in the preview window than it does in 3ds Max. If the scene uses any 3ds Max features that are not supported by the exporter, they will be listed here.

Analyze—Opens the *Shockwave 3D File Analysis window (page 3–634)*, displaying a graphic breakdown of the data in the W3D file.

Preview—Opens the *Shockwave 3D Export Preview window (page 3–633)*, showing the scene as it will be exported.

File—Opens the Choose Export File dialog, which lets you specify the name and location of the file to be exported. When you click Save, you're returned to the Export Options dialog; the file name and path you specified appear in the field next to the File button.

Note: Clicking the Save button does not save the W3D file; you must click the Export button to create the file.

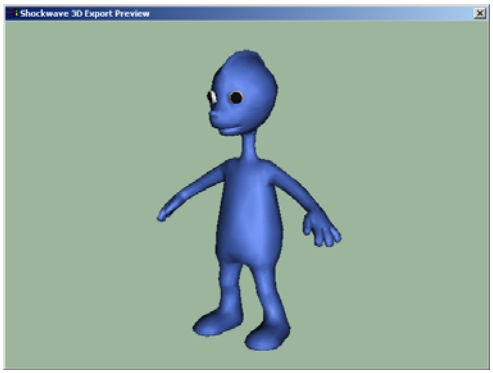
Export—Exports the Shockwave 3D file, using the path and name specified next to the File button.

View after export—After you export a file, this option lets you view it in the *Preview window (page 3–633)*.

Shockwave 3D Export Preview

File menu > Export > Select File To Export dialog > Save As Type > Shockwave 3D Scene Export (*.W3D) > Preview

This window displays the scene as it has been captured by the Shockwave 3D Exporter. This view lets you quickly identify scene elements that are not supported by the Shockwave 3D Exporter.



In many cases the export preview window will display scene resources you had decided not to export. Remember that this window displays the scene as captured by the exporter and not necessarily how it is written to the W3D format. Only those scene assets indicated under the export options and supported by the exporter will be written to the W3D file.

Export with a User, Top, Front, or Right viewport active in 3ds Max, and the scene will be viewed through an orthographic camera. Export with a Perspective or Camera viewport active in 3ds Max, and the scene will be viewed through a perspective camera.

Note: When navigating a scene, keep in mind that only the parts of models that are in front of the camera will be rendered. Parts of models that penetrate the camera plane and are behind the camera will not render, resulting in visual artifacts ("black holes" or "tearing") in the model. This is particularly noticeable when you dolly an

orthographic camera forward, because the lack of perspective effects does not hide models as the camera passes them. Dolly the camera back, and any visual artifacts should disappear.

You can navigate the export preview window using the following controls.

Rotation

- Left-click=orbit
- Left-click+Y=rotating the camera with "Y-up" (particularly useful if scene was created in the "Y-up" environment)
- Left-click+SHIFT=roll; vertical movement is ignored

Dolly

- Left-click+CTRL=dolly
- Left-click+CTRL+SHIFT=dolly faster

Pan

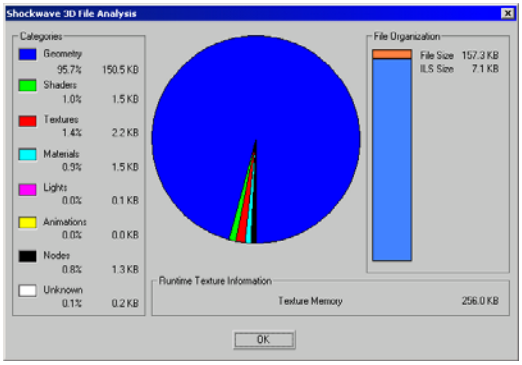
- Left-click+SPACEBAR=pan
- Left-click+SHIFT+SPACEBAR=constrain the movement to be either horizontal or vertical, depending on the initial direction when first dragging

Shockwave 3D File Analysis Window

File menu > Export > Select File To Export dialog > Save As Type > Shockwave 3D Scene Export (*.W3D) > Analyze

This window provides a graphic breakdown of the data in the W3D file. Click OK to close the window.

Interface



Pie Chart—Graphic display of the proportion of the file used by all of the W3D file data types. Refer to the color-coded Categories list, which gives a percentage and an absolute size in kilobytes of each asset:

- **Geometry**—(in the initial load segment, if a model has a zero priority in the sw3d_stream_priority user property, or in the streamable portion of the file, if a model has a non-zero streaming priority)
- **Shaders**—(only in the initial load segment)
- **Textures**—(in the initial load segment, if the model that uses the texture has a zero priority in the sw3d_texture_stream_priority user property, or in the streamable portion of the file, if a model has a non-zero streaming priority)
- **Materials**—(only in the initial load segment)
- **Lights**—(only in the initial load segment)
- **Animations**— (only in the initial load segment)

  Note: Large animations can greatly lengthen the time it takes to see the start of a Shockwave 3D animation, because they must fully download before any of the scene can becomes visible.
- **Nodes**—or scenegraph hierarchy data (only in the initial load segment)

- **Unknown**—includes, for example, streaming priorities, names, and block sizes.

File Organization—Graphic display of the size of the entire file and its initial load segment (ILS) portion. The ILS, in orange, consists of all the data that must be loaded before Shockwave will display the scene (scenegraph data, animations, shaders, and any textures or geometry with a streaming priority of zero). The rest of the file, in light blue, represents all of the streamable data with a non-zero streaming priority. This data will continue to load and fill out the detail of the scene as the download proceeds.

Runtime Texture Information—Approximate texture memory that will be required at run time to display the textures in the scene. Scenes requiring more than a few megabytes of texture memory will require accelerated graphics cards to display textures at their full resolution.

Stereolithography (STL) Files

Importing STL Files

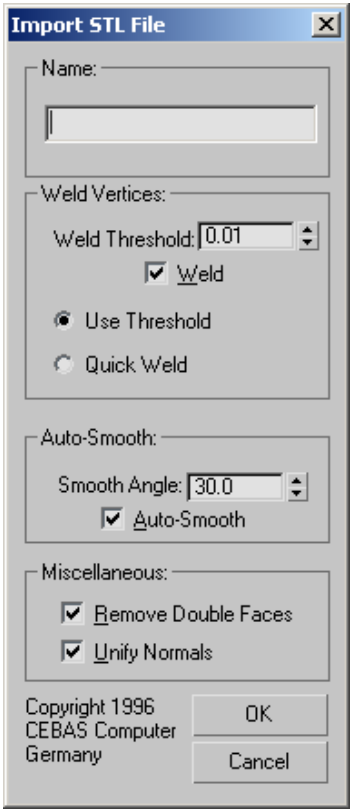
File menu > Import > StereoLitho (*.STL)

An STL file saves object data in a format used for stereolithography. STL files have a filename extension of *.stl*. There is an ASCII STL format as well as a binary STL format. You can choose which to create when you export a 3ds Max scene.

STL files are generally used for purposes of rapid prototyping. A variety of methods use the STL format to construct prototypes. For example, many STL machines use a liquid polymer and harden it in small slices, creating a solid plastic model. Other STL machines use metal powder to create a model in steel. Still other machines use a special wax.

You can import and export STL files. See *Exporting to STL (page 3–636)*.

Interface



Name—Enter a name for the 3D Studio object created from the STL file. Default is the file name (without extension) or the name saved internally in the STL file.

Weld Vertices group

Welds coincident vertices in the STL file into single vertices in the 3D Studio mesh.

Weld Threshold—Determines the size of the area which vertices must occupy to be welded. Vertices with distances equal to or less than this value are welded into a single vertex.

Weld—Turns on the Weld Vertices function. In most cases, you should leave this box turned on because unwelded objects can't be unified or smoothed.

Use Threshold—If on, STL import uses the standard 3D Studio welding method. This can be a very slow process.

Quick Weld—If on, STL import uses a welding algorithm optimized for the STL format. This is up to thirty times faster than standard 3D Studio welding, and is highly recommended.

Auto-Smooth group

Auto-Smooth—Applies *smoothing groups (page 3–1107)* to the geometry based on the smoothing angle set by the smooth angle spinner. Edges between faces that have an angle between them that is greater than the specified smoothing angle will appear faceted in the rendered image. Edges between faces that are below the specified angle are smoothed

Smooth Angle—Determines the size of the smoothing angle.

Auto-Smooth—Turns on the Auto-Smooth function.

Miscellaneous group

Remove Double Faces—Removes one of the pair wherever two faces are occupying the same location. Recommended.

Unify Normals—Forces the *normals (page 3–1074)* of all faces on each object to face the same way (usually out). If, when you render your scene, the face normals are pointing in the wrong direction, use the Normal modifier to flip them. For best results, leave this box turned on.

Exporting to STL

File menu > Export > StereoLitho (*.STL)

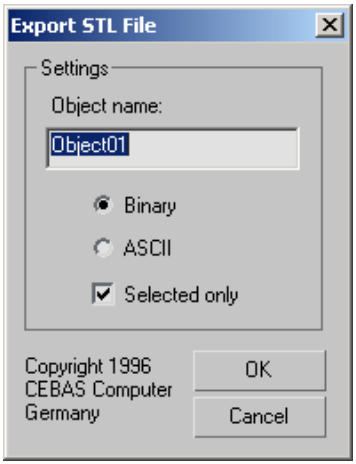
An STL file saves object data in a format used for stereolithography. STL files have a file-name extension of *.stl*. There is an ASCII STL format as well as a binary STL format. You can choose which to create when you export a 3ds Max scene.

STL files are generally used for purposes of rapid prototyping. A variety of methods use the STL format to construct prototypes. For example, many STL machines use a liquid polymer and harden it in small slices, creating a solid plastic model. Other STL machines use metal powder to create a model in steel. Still other machines use a special wax.

An STL object must define a complete and closed surface. You can check whether the geometry you want to export satisfies this criterion by using the *STL Check modifier (page 1–825)*.

You can also import STL files. See *Importing STL Files (page 3–635)*.

Interface



Object Name—Enter a name for the object you want to save in STL format.

Binary/ASCII—Choose whether the STL output file will be binary or ASCII (character) data. ASCII STL files are much larger than binary STL files.

Selected Only—Exports only objects that you selected in the scene.

Wavefront (OBJ, MTL) Files

Importing Wavefront (OBJ, MTL) Files

3ds Max can import the text-based (ASCII) Wavefront formats OBJ and MTL. An OBJ file contains geometry descriptions. A MTL file is also text based, and contains material descriptions that supplement the OBJ file.

Exporting Wavefront Object (OBJ) Files

File menu > Export > Wavefront Object (*.OBJ)

The ASCII-based OBJ format makes it possible to exchange graphical data between many applications. Both polygons and freeform geometries such as curves are supported with these format. You can export 3ds Max files to this format.

Feature Support with OBJ Export

Mesh Geometry

- When exporting mesh geometry, you can export triangles, polygons, or quadrilaterals.
- Normals are exported by default.

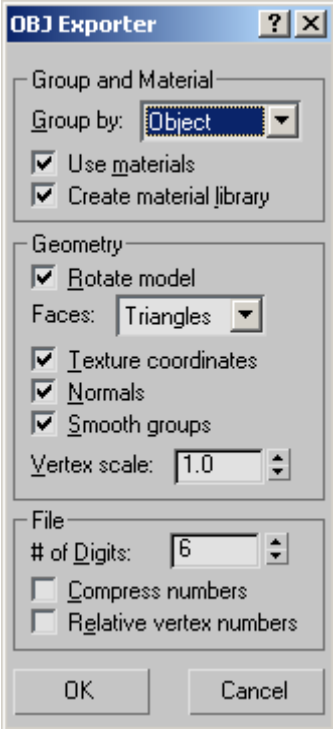
Groups

- If you choose to group by object, then the exported information will be organized by object. This information will be available when you import the file so that you can choose certain objects to import rather than the entire file.
- If you select to group by material, then the exported information will be organized by materials. When importing, you can select to only important elements that are associated with a particular material.

See also

Importing Wavefront (OBJ, MTL) Files (page 3–637)

Interface



Group and Material group

Group by—Lets you group the information in the OBJ file by object, material, or by using defaults. The choice you make will be important when you want to import the file. For example, it may be useful to group by material if you have several objects that use the same material.

Use materials—Determines whether the materials that are associated with the object are also exported to the OBJ file.

Create material library—Determines whether a separate library is created to store the information about the materials. This creates a MTL library in the same directory as the OBJ file, first prompting for information with the *MTL Export dialog (page 3–639)*.

Geometry group

Rotate model—Exports the geometry to match its orientation in 3ds Max.

Faces—Choose whether the mesh faces are stored as triangles, quadrangles, or polygons.

Texture coordinates—When on, the texture coordinates are stored with the exported file. When you import the file in another application you will be able to use this information if it is supported.

Normals—When on, the *normal information (page 3–1074)* for the mesh is stored.

Smooth groups—When on, the information about color transition between groups is stored. See *Viewing and Changing Smoothing (page 1–162)*.

Vertex scale—Determines the scaling for the contents of the OBJ file. The default value of 1.0 means the exported file will have the same scaling as the source file.

File group

# of Digits—The precision of the exported vertex data, as expressed by the number of decimal places.

Compress numbers—When on, trailing zeroes are eliminated from decimal fractions. This makes the exported file smaller without sacrificing any precision, but can cause compatibility issues when importing with certain programs. If you're unable to import an OBJ file, make sure this option is off and export again.

Relative vertex numbers—Causes face vertex indices in exported files to be expressed as relative (i.e., negative) numbers. This can cause compatibility issues when importing with certain programs. If you're unable to import an OBJ file, make sure this option is off and export again.

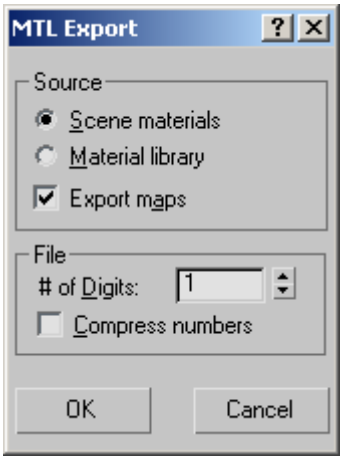
Cancel—Cancels the OBJ export.

Exporting Wavefront Material (MTL) Files

File menu > Export > Wavefront Material (*.MTL)

The ASCII-based MTL format makes it possible to exchange graphical data between many applications. The MTL format uses floating-point numbers to define each material's ambient, diffuse, and specular colors, as well as alpha and shininess values. Optionally, the MTL files can also specify texture-map filenames.

Interface



Source—Choose whether to export only materials used in the current scene, or the entire material library.

Export maps—When on, any map files used in exported materials are referred to in the exported MTL file. File paths are not included, so map files must be available upon subsequent importing.

File group

# of Digits—Specifies the number of decimal places for exporting color values such as ambient and diffuse in floating-point format.

Compress numbers—When on, trailing zeroes are eliminated from decimal fractions. This makes the exported file smaller without sacrificing any precision, but can cause compatibility issues when importing with certain programs. If you're unable to import a MTL file, make sure this option is off and export again.

VRML Files

Importing VRML Files

File menu > Import > Select File To Import dialog > Files Of Type > VRML (*.WRL, *.WRZ)

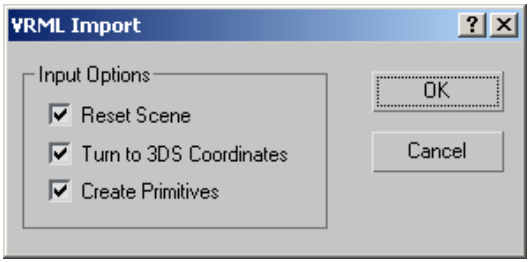
You can import VRML 1.0, VRBL, and VRML 2.0/VRML 97 files into 3ds Max. 3ds Max imports geometry, materials (including diffuse texture maps), lights, perspective cameras and viewpoints, transformations, and grouping nodes created by other VRML tools. Once they are in the scene file, you can edit, modify, and animate these objects.

3ds Max also imports basic transform animations, such as position, rotation, and scale. Also included are animated color and light. These correspond to the basic animation that is exported by the VRML 1.0/VRBL and VRML97 exporters. Helper objects are not created upon import. Lighting effects are somewhat simplified from the full VRML lighting model.

- VRML97 files don't indicate the duration of an animation. If you import animation from a VRML97 file, you might want to set the animation length in 3ds Max manually.
- More elaborate forms of animation and simulation, including Script nodes, MovieTexture nodes, and sensor nodes, are not supported.

- The VRML 1.0 WWW Inline works only if the URL refers to a local file residing in the same folder as the .WRL file. Internet URLs are not supported.

Interface



Reset Scene—Deletes any existing scene upon import. If you turn off this option, the imported VRML world is merged into the 3ds Max scene.

Turn to 3DS Coordinates—Rotates the imported VRML world from Y, which is "up" in VRML, to Z, which is "up" in 3ds Max. If you turn off this option, VRML X, Y, and Z coordinates are imported without change.

Create Primitives—Converts the VRML Box/Cube, Cone, Cylinder, and Sphere nodes to corresponding 3ds Max primitives, if possible. If the VRML object has a texture on it, or if only part of the VRML object is to be created, a general triangular mesh object will be created instead. If you turn off this option, 3ds Max will convert these objects to triangular mesh objects.

Exporting to VRML97

File menu > Export > Select File To Export dialog > Save As Type > VRML97 (*.WRL)

3ds Max scenes can be exported to VRML97 file format.

See also

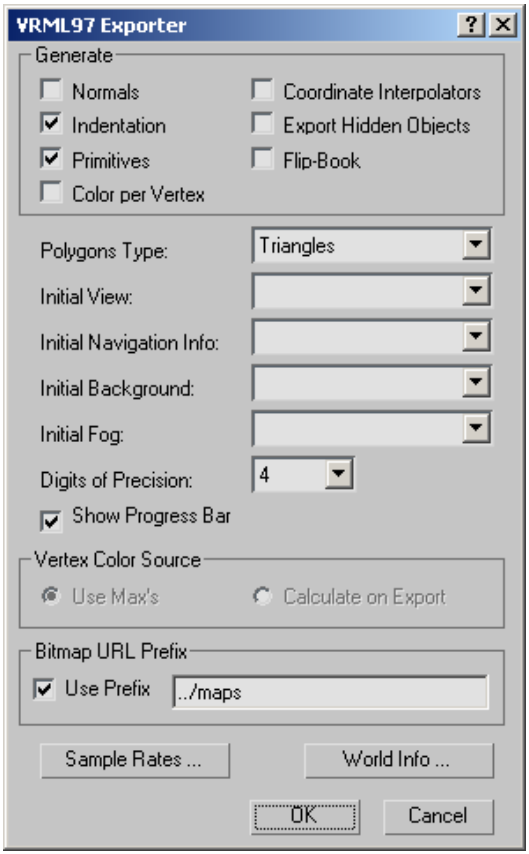
VRML97 Export (page 3–643)

Procedure

To export a file to VRML97:

1. Choose File menu > Export.
2. Choose VRML97 (.WRL) as the file format.
3. Enter a file name, and click Save.
4. In the VRML97 Exporter dialog, set options as described below.

Interface



Generate group

Turning on any of these options increases the size of the VRML97 file generated by the export process.

Normals—Generates real normals for objects. Some browsers need normals to do smoothing properly. Check this box if you are exporting geometry that uses smoothing groups in 3ds Max, to see the correct shading. Default=off.

Coordinate Interpolators—Exports animation effects that involve actual modifications of the mesh objects, and not just move, rotate, and scale. Examples include the Taper, Bend, and Twist modifiers, and space warps. This option can generate large files, because the exporter has to calculate the position of every vertex for this kind of animation.

If your animations aren't exporting correctly, try exporting with this option chosen. An example of animation motion requiring Coordinate Interpolators is a stick figure made up of simple rectangular boxes that have bones Linked to the boxes as a skeleton. Even though these boxes move through space without any noticeable shape morphing, their motion will not be exported without the use of Coordinate Interpolators, because their motion isn't derived from simple transforms. Any animation achieved using the modifier stack or object parameters needs Coordinate Interpolators. This includes animated XForm modifiers.

Certain types of animations are not possible with Coordinate Interpolators; for example, when the mesh being animated changes size between frames. An example of this is animating the number of segments in a sphere. 3ds Max warns you if it detects this type of animation on export.

Indentation—Indents the VRML97 source code so it is easy to read. Default=on.

Export Hidden Objects—Exports hidden objects. Default=off.

Primitives—Exports VRML97 primitives, which reduces the file size because these primitives are described very simply (for example, a sphere is described by its radius). To see how many polygons are in the scene, turn off this box to export 3ds Max primitives, which have an indexed face set for each object. Default=on.

Flip-Book—Exports the scene to multiple files. The sample rate is set in the in the Flip-Book section of the Sample Rates dialog. The file name you specify becomes the base for the sequence of files. For example, if you specify the file name *test.wrl*, choose one file per animation frame, and have five frames, 3ds Max exports the following:

test.txt contains general info, start/stop times, and number of frames.

test0.wrl through *test4.wrl* are snapshots of the animation in frames 0 through 4.

Color Per Vertex—Exports the vertex colors of geometry. If this is turned on, the Color Per Vertex Source lets you choose the source of the vertex color.

Polygons Type

Determines how geometric faces are written out as VRML97 IndexedFaceSet nodes.

Ngons—Writes faces with as many edges as possible.

Quads—Writes quadrilateral faces where possible (otherwise triangles).

Triangles—Writes only triangular faces.

Visible Edges—Breaks faces at internal edges that are marked as being visible.

Initial View

Sets the entry camera for the scene and controls what first appears in the browser. If there are no cameras in the scene, the scene appears with a default viewpoint (which may give only a partial view).

All scenes should have at least one camera, so you can control how the scene initially renders. Add more cameras to the scene than you might ordinarily use, so the viewer can switch between cameras if his VRML97 browser allows it. This lets you set up your scene with pre-installed vantage points. Otherwise, if the world is very large, it can overpower the viewer's system and make navigation difficult. Some browsers animate camera moves, so the extra cameras can make viewing the scene more pleasant.

Initial Navigation Info

Specifies the *Navigation Info helper object (page 3–648)* to use when the world loads in the browser.

Initial Background

Specifies the *Background helper object (page 3–654)* to use when the world loads in the browser.

Initial Fog

Specifies the *Fog helper object (page 3–649)* to use when the world loads in the browser.

Digits of Precision

Sets the number of decimal points used for calculating dimensions. The default of 4 is usually sufficient. Set this number greater than 4 if parts of your world were created 100,000 units away from the center of the scene. Setting the value to 3 reduces the file size.

Show Progress Bar

Gives you the option to view a progress bar as the scene is exported.

Vertex Color Source group

Lets you choose the source for the vertex color when Color Per Vertex is turned on.

Use Max's—Exports the current vertex color of the object defined in the scene.

Calculate on Export—Calculates the diffuse color at the vertices during export, based on the current lighting and the objects' materials.

Bitmap URL Prefix group

Lets you specify a URL prefix for bitmaps assigned to objects in the scene. You must keep all your texture bitmaps in either the same directory as the *.wrl* file or in one other location, which you specify here. If your maps are stored in other locations, you will have to manually search for the map in the *.wrl* and change its location. Not all browsers will display error messages if the maps aren't found on the WWW server.

Use Prefix—Enables the prefix mechanism. If this box is turned off, image maps must be in the same location as the *.wrl* file.

Prefix—Adds the prefix you enter here to the names of all assigned bitmaps. The name can be a full URL (beginning with HTTP), or it can be a relative path (a subdirectory of the location of the VRML97 file). For example, if you enter "Maps" for the prefix, when the browser opens a VRML97 file that has a texture map assigned to it, it will look for the subdirectory "Maps." "Maps" must be a directory that is directly under the directory where the VRML97 file resides.

Use forward slashes (not backslashes) to enter longer paths. For example, *3dsMAX/maps*.

Sample Rate

Displays a dialog that lets you specify sample rates for controller-based and coordinate-interpolated animation, as well as the Flip-Book output rates. Setting sample rates lets you trade off between animation fidelity and file size. The default values give good results in most cases. For the greatest

animation precision, use a lower number (a higher sampling rate).

World Info

Lets you enter information about the world. This has no effect on the visual appearance or behavior of the world. Some browsers can display what you enter in the Title field, for example, in the browser window's title bar. You can use the Info field to provide author, version, and copyright information.

VRML97 Export

Vrmlexp.dle is for creating and exporting scenes in the VRML97 format. VRMLEXP exports *.wrl* files, which can be viewed in any VRML97 browser.

Make sure that you have the most current version of your VRML browser and check its documentation to insure that it supports VRML97.

This documentation covers:

VRML97 Helper Objects (page 3–646)

Exporting to VRML97 (page 3–640)

VRML97 Tips (page 3–643)

Using the Polygon Counter Utility (page 3–645)

VRML97 Specification (page 3–645)

Procedures

To create VRML97 files:

1. Create the objects that make up the scene.
2. In the Create panel, choose Helpers .
3. Use the tools in the *VRML97 Helpers (page 3–646)* to add actions and triggers and prepare the scene.
4. Choose File > Export and export the scene in the VRML97 format.
5. Open the VRML97 file in the browser and test it.

Interface

The VRML97 exporter supports the following:

Lights—All VRML97 light types: direct, omni, and spot.

Cameras—Free and targeted cameras.

Primitives—Sphere, cone, box, and cylinder primitive objects. These objects export as VRML97 primitive objects. This helps reduce the size of VRML97 files.

Animation—All position, rotation, and scale animation on objects, as well as animated hierarchies, inverse kinematics, and all controller types. Select *Coordinate Interpolators (page 3–640)* in the Export dialog to export animated meshes, such as an animated Bend modifier or **character studio** Physique animations.

VRML97 Tips

The following tips will help you make your work look as good as possible and display and move as fast as possible.

Geometry

Use small texture maps, and use them sparingly. Keep the polygon count of your objects down to achieve good performance. A complete scene with a maximum of 5,000 to 10,000 polygons is manageable for most computers. The *Level of Detail (page 3–651)* helper lets you manage the polygon count of objects in the scene. You can also use the software's Optimize modifier to simplify objects before exporting them to VRML97.

Use primitives whenever possible. For example, a scene containing only a sphere exports to a VRML97 file of about 400 bytes, but if you apply an edit mesh modifier and move one vertex on the sphere, the VRML97 file is about 7,400 bytes.

Use the *Polygon Counter (page 3–645)* to keep track of the number of faces in your scene.

Call your VRML97 *.wrl* files from a standard HTML page and constrain the viewer to a limited window on the screen using the embed command. This decreases the number of pixels that must be rendered on every frame and makes the VRML97 environment more responsive. Many users use high resolution (800x600 or more), so the number of pixels during rendering and navigation can be large and the video display may slow down. Frames may be dropped as the browser attempts to keep up its real-time rendering, and navigating the scene will become "chunky." Use the embed command to avoid this, for example, <embed SRC=myworld.wrl WIDTH=300 HEIGHT=200>

Hide faces on an object in the software, then export the object. The hidden faces appear as a hole in the object. While the VRML97 plug-in can export hidden objects, it does not export hidden faces. Hide faces that you know will never be visible in the scene, such as the backs of objects or the bottom faces of objects resting on a surface.

Use instances to reduce file size for objects that have the same geometry.

Whenever you use a Mirror transform, use the Reset Transform utility immediately afterward. You can also use a Normal modifier immediately followed by Unify Normals. VRML97 does not allow mirror transforms (negative scales). The Reset Transform utility modifies the data in the actual mesh object to create the mirroring effect.

Don't change units when modeling for VRML97. To model in meters, keep the units set to the default and use one world unit as one meter.

Animation

Beware of large file sizes when you use transform animation and coordinate-interpolated animation. The VRML97 plug-in exports transform animation (move, rotate, and scale), and coordinate-interpolated animation. For example, you can animate modifiers such as Taper and Bend and you can animate changing parameters, such as increasing or decreasing the radius of a sphere.

When scenes using the Inherit Links function are exported to VRML97, child objects always inherit their parents' transforms. Inverse kinematics export correctly to VRML97 with the exception of the Inherit Links function, which determines whether child objects inherit the transforms of parent objects.

Always use TCB controllers for VRBL animations. These controllers provide precise control and generate the smallest possible file size. Other kinds of controllers, such as the default Bezier controller, create larger VRML97 files that do not perform as well.

Make sure your animations never change the face or vertex count over time. VRML97 can not add or delete faces or vertices over time. CoordinateInterpolators support morphing a mesh only, not changing the number of vertices or faces.

To trigger an animation that is not on an object at the top-level of the software's linking hierarchy, use a TimeSensor helper object. If you trigger an animation directly from a TouchSensor or ProximitySensor, without a TimeSensor, you can animate only top-level objects. Animating from TimeSensors does not have this limitation.

Turn off the Generate Primitives toggle in the Export dialog if you animate the parameters of primitives (like the radius of a sphere), and want the animation exported with

CoordinateInterpolators. This applies to box, sphere, cylinder and cone primitives only.

Materials

You can export only standard and multi/sub-object materials, and only the following components of the material:

- Diffuse, ambient, and specular color
- One texture map, which must be in the Diffuse channel

  Use JPEG or PNG format for your maps, because they are recognized by all VRML97-compliant browsers and generally create the smallest files. (Some older browsers may recognize GIF format and not PNG.) Multi/sub-object materials export colors and textures. If an object has a multi/sub-object material with textures, it exports as separate objects in VRML97, since VRML97 does not support more than one texture map per object. Texture maps slow down the browser and increase download time. Use them sparingly.
- Shininess (but not shininess strength)
- Opacity
- Wire frame

Make sure that all large flat surfaces have enough vertices in them that a few vertices can be seen from all reasonable vantage points in your scene. Some browsers cannot display textures on an object where all of its vertices are outside the current viewport.

If you have several lights in you scene, lower the default multiplier value on all the lights in the scene. Lights can oversaturate the scene and make all your geometry wash out toward white. Always add at least one camera and one light to a scene exported to VRML97.

Helper Objects

Insert VRML helper objects into your scene in the top viewport. You can insert VRML helper objects in any view, but if you insert them in the top viewport, they appear properly oriented in the front viewport.

Using the Polygon Counter Utility

When producing worlds with a small number of faces, use the *Polygon Counter utility (page 1–1254)*. The counter displays a dialog that shows the number of polygons in the current scene, as well as the number of polygons in the current selection set. Use the spinners on this dialog to set a budget for both of these values. A bar graph changes from green to yellow to red as you approach and exceed the allocated budget.

Procedure

To display the Polygon Counter utility:

- From the Utilities panel, click More and then select Polygon Counter from the Utilities dialog.

  This opens the Polygon Count dialog for setting your budget polygon count for selected and all objects in the scene.

VRML97 Specification

You can find the complete VRML97 specification at http://www.web3d.org/x3d/vrml/index.html.

This document describes the entire VRML97 language and provides technical details on the behavior of exported VRML97 worlds.

VRML97 Helper Objects

The VRML97 Helpers appear when you click Helpers in the Create panel and choose one of the VRML97 Helpers from the Object Type rollout. Insert a VRML 97 Helper into the scene by clicking and dragging at the desired location.

Note: Some helper objects (for example, Billboard and Level Of Detail) are position-sensitive, so be careful how and where you insert them. Usually, you have the most control by creating the helper object in the Top viewport.

Anchor VRML97 Helper (page 3–646)

ProxSensor VRML97 Helper (page 3–647)

NavInfo VRML97 Helper (page 3–648)

Fog VRML97 Helper (page 3–649)

Sound VRML97 Helper (page 3–649)

LOD VRML97 Helper (page 3–651)

TouchSensor VRML97 Helper (page 3–652)

TimeSensor VRML97 Helper (page 3–653)

Background VRML97 Helper (page 3–654)

AudioClip VRML97 Helper (page 3–655)

Billboard VRML97 Helper (page 3–656)

Inline VRML97 Helper (page 3–657)

Anchor VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > Anchor

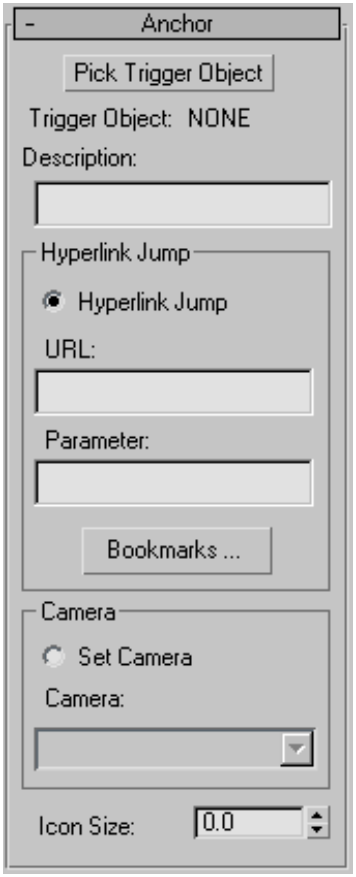
The Anchor rollout lets you specify a click-to-play trigger in the scene. This trigger will be linked to a currently existing object in the scene. This allows you to add links to other HTML pages, VRML97 worlds, or alternate cameras in your VRML97 world.

Procedure

To set up an Anchor to jump to another VRML world:

1. Add an Anchor helper object by pressing the Anchor button and then click-dragging in the Top viewport to create its icon.
2. Pick a Trigger Object in the scene that will be the object the viewer clicks while browsing.
3. Choose Hyperlink Jump and designate a URL to jump to.
4. When the user clicks the Trigger Object geometry, the browser will replace the current scene with the designated URL.

Interface



The Anchor rollout contains the following options:

Pick Trigger Object—Specifies the geometry that will be the trigger for this anchor. Click this button, then select the geometry.

Description—Lets you enter a text description or message that will appear in the browser's status bar when the mouse is over an object that has an Anchor action defined for it.

Hyperlink Jump—Creates an Anchor that jumps to a URL.

URL—Specifies the location for Hyperlink Jump. Use your Bookmarks list, or enter a location manually. If the URL points to another VRML97 world (a *.wrl* file) you can append "#CameraName" to the end of the URL to have the browser use the viewpoint named "CameraName" as the initial view.

Bookmarks—Lets you select a URL location from a list of bookmarks. Click Import List to import the list of bookmarks defined in your browser, or manually enter new URLs into the list.

Parameter—Lets you specify additional browser parameters for the hyperlink jump. See the *VRML97 specification (page 3–645)* for the uses of this field.

Set Camera—Creates an Anchor that jumps to a given camera in the current VRML97 world.

Camera—Specifies the name of the camera for Set Camera.

Icon Size—Determines the size of the helper in the scene.

ProxSensor VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > ProxSensor

The ProxSensor helper creates a VRML97 ProximitySensor node. This lets you set up a rectangular region in space, so that entering the region in a VRML97 browser starts a set of objects animating.

Procedure

To create a Proximity Sensor object:

1. Add a Proximity Sensor object by pressing the ProxSensor button and then click-dragging in the Top viewport to create its icon.
2. Select the geometry, camera, or sound to control.

   When the user navigates inside the box, the specified objects animate or the sound plays.

Interface

The Prox Sensor rollout contains the following options:

Length/Width/Height—Specifies the dimensions of the bounding box that triggers the action.

Enable—Activates the Proximity Sensor. When this check box is turned off, the sensor has no effect, even if objects have been selected.

Pick Action Objects—Specifies the objects in the scene to control with this helper. The objects can be animated geometry, cameras, lights, or AudioClips. Click this button then click the objects in the viewports.

Delete—Deletes an object from the list of picked objects.

NavInfo VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > NavInfo

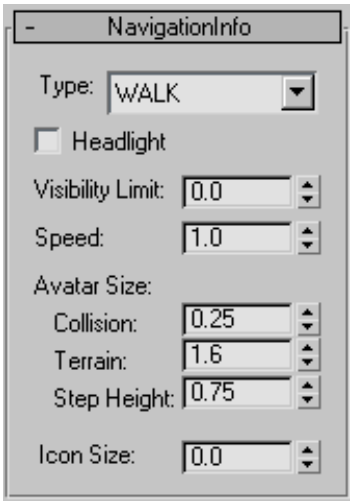
The NavInfo helper lets you create a VRML97 NavigationInfo node. This tells the browser how to navigate around the VRML97 world.

Procedures

To create a NavInfo helper:

1. Add a NavInfo helper by pressing the NavInfo button and then click-dragging in the Top viewport to create its icon.
2. Use the controls to adjust the behavior of the helper.

Interface



The NavigationInfo rollout contains the following options:

Type—Specifies the type of movement (Walk, Examine, Fly, and None) for navigating the world. Implementation of these movement types may vary from browser to browser.

Headlight—Places a directional light at the viewpoint. The light always points in the direction the user is looking.

Tip: Don't use this option if you have lights in the scene.

Visibility Limit—Sets the far clipping plane. Any geometry beyond this point is invisible. The smaller this value is, the closer the clipping plane is to the camera. The larger this value is, the more of your scene is visible to the camera. A value of 0 turns off the effect, making everything in the scene visible. Use this option to show just part of large scenes.

Speed—Determines the speed of navigation in units per second. Use this option to allow the user to travel faster, if you're building a large world (like a cityscape), and slower, if you're building a small world (like a room).

Avatar Size—Specifies the user's physical dimensions in the world, to detect collision distance and follow terrain.

Collision—Specifies the allowable distance between the user's position and any collision geometry before a collision is detected. For example, you can set this so that a collision is detected one unit in front of a wall.

Terrain—Specifies the height above the surface to maintain when following terrain.

Step Height—Specifies the highest object that can be "stepped over." If an object like a staircase has steps that are lower than this value, the user can go up.

Icon Size—Adjusts the size of the helper object in the viewports.

Fog VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > Fog

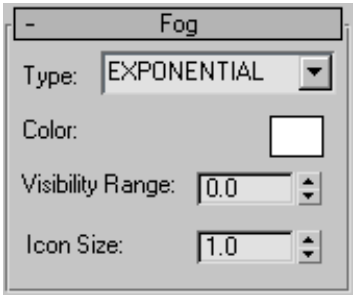
The Fog helper lets you specify the color and range of fog in your VRML97 world. You can simulate atmospheric effects by blending objects with a color based on the objects' distances from the viewer. For the best visual results, the background (which is unaffected by the fog) should be the same color as the fog.

Procedures

To create a VRML 97 Fog helper:

1. Add a Fog helper by pressing the Fog button, then click-drag in the Top viewport to create its icon.
2. Use the controls to adjust the type of fog in your VRML environment.

Interface



The Fog rollout contains the following options:

Type—Specifies the fog type (linear or exponential). Linear means that the amount of blending is a linear function of the distance, resulting in a depth-cueing effect. Exponential uses an exponential increase in blending, resulting in a more natural fog appearance.

Color—Lets you select the fog color from the Color Selector dialog.

Visibility Range—Specifies the distance from the viewer at which objects are totally obscured by the fog. The smaller this value is, the closer the fog is to the camera, and the less your scene is visible. The larger this value is, the more of your scene is visible to the camera. A value of 0 turns off the effect, making everything in the scene visible. A value of 0 means that there is no fog effect.

Icon Size—Adjusts the size of the helper object in the viewports.

Sound VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > Sound

The Sound helper lets you place 3D (spatial) or ambient sounds in a scene. The sound may be located at a point and emit sound in a spherical or ellipsoid pattern. The ellipsoid is pointed in a particular direction and may be shaped to provide

more or less directional focus from the location of the sound. The sound node may also be used to describe an ambient sound that tapers off at a specified distance from the sound node.

The red ellipsoid of the helper represents the outermost range for which the sound can be heard. The blue ellipsoid represents the range of the maximum strength of the sound. The area between the red and blue ellipsoids represents a falloff area in which the volume varies in intensity. The helper's arrow points in the direction toward which the sound is emanating.

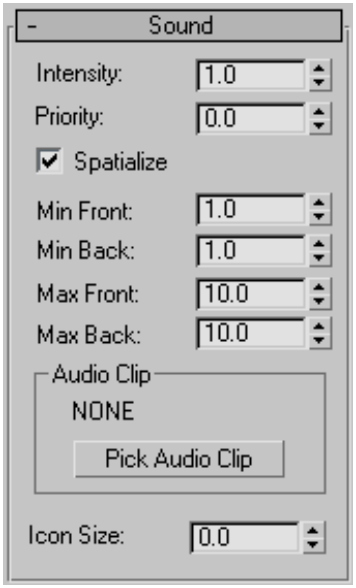
Note: The Sound helper object must be linked to an existing audio clip in the scene. Therefore, you must have an *AudioClip (page 3–655)* helper object in the scene in order for the Sound helper to play.

Procedures

To create a Sound helper object:

1. Add a Sound helper by pressing the Sound button, then click-drag in the Top viewport to create its icon.
2. Press Pick Audio Clip and select an AudioClip helper object in the scene.
3. Rotate the icon to determine the direction in which the sound is emanated.
4. Use the controls to adjust the range and strength of the playback sound.

Interface



The Sound rollout contains the following options:

Intensity—Sets the loudness of the sound. 1.0 is full volume.

Priority—Sets the relative importance of the sound, if you have more than one sound in the scene and the browser cannot play all of them. 0 is least important. 1 is most important.

Spatialize—Makes the sound 3D. A spatial sound has a particular source location in the scene. If this box is turned off, the sound is ambient.

Min Back/Front, Max Back/Front—Displays red and blue ellipsoids that allow you to set the area of the sound effect. Inside the blue ellipsoid, the sound is at full volume. Outside the red ellipsoid, the sound is inaudible. Between the blue and red ellipsoids is a falloff area in which the volume varies in intensity.

Pick Audio Clip—Lets you choose an audio clip. Click this button, then click an AudioClip helper object. The audio clip must already be in the scene and have a sound file associated with it.

Icon Size—Determines the size of the helper in the scene.

LOD VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > LOD

The Level of Detail (LOD) helper lets you specify objects with varying face counts that are appropriate for different viewing distances. Browsers display the less detailed objects when the viewer is far away from them and substitute the more detailed objects at closer ranges.

Use LOD objects to speed up rendering of scenes in which highly detailed objects are often far away from the viewer.

Objects used for LOD do not have to be of the same type or size, so you can accomplish a crude form of morphing by using different objects as the LOD components. For example, a tree might seem to grow if taller trees with more limbs are substituted as the viewer gets closer.

Procedures

To create a Level of Detail helper object:

1. Create the objects to which you want to add level of detail.
2. Click the LOD button.
3. Click and drag in the scene to create a helper object.
4. Add the objects to the list with Pick Objects.
5. Use the Hide and Unhide commands, or the **H** key, to help pick the objects and add them to the LOD list.
6. Select the objects in the list and use the Distance spinner to set the distance.

To create all the objects and the LOD helper object at exactly the same coordinates:

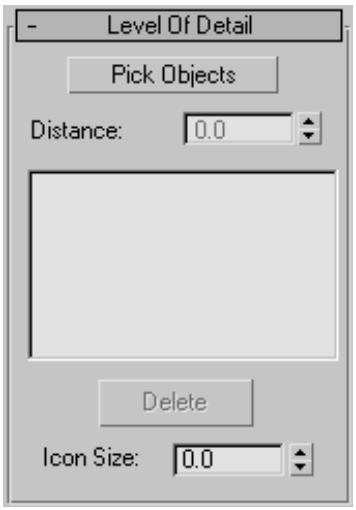
1. Create the LOD helper object.
2. You can use Snap and create the helper object at the origin (0,0,0 coordinates), or use the Keyboard Entry rollout for a Standard Primitive to specify an exact object origin.
3. Create the object with the most detail at the same coordinates. Name it (for example, hicapsule).
4. Choose Edit/Clone.

   In the Clone Options dialog, choose Copy and name the new object (for example, medcapsule).
5. Repeat step 3 to create the other objects (for example, locapsule).

   For the medium and low resolution objects, apply an Optimize modifier to reduce the face count.

   For primitives, you can reduce the face count by changing the creation parameters in the modifier stack.

Interface



The Level of Detail rollout contains the following options:

Pick Objects—Selects objects of different face counts to substitute for the LOD helper object. Create all the objects and the LOD helper object at exactly the same coordinates.

Distance—Sets the distance from the camera at which the user sees the selected object. The distance specified for the object appears next to the object name. For example:

hicapsule - 100 medcapsule - 300 locapsule – 500

Hicapsule is displayed when the distance between it and the camera is within 100 units. The lower resolution object (medcapsule) is displayed when the camera is between 100 and 300 units. The lowest resolution object (locapsule) is displayed when the camera is beyond 300 units. The greatest distance (500 in this case) is not actually used, but must be supplied.

Delete—Deletes the selected object from the list.

Icon Size—Sets the size of the LOD helper object.

TouchSensor VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > TouchSensor

The TouchSensor helper lets you set up an object so that selecting it in a VRML97 browser starts a set of objects animating.

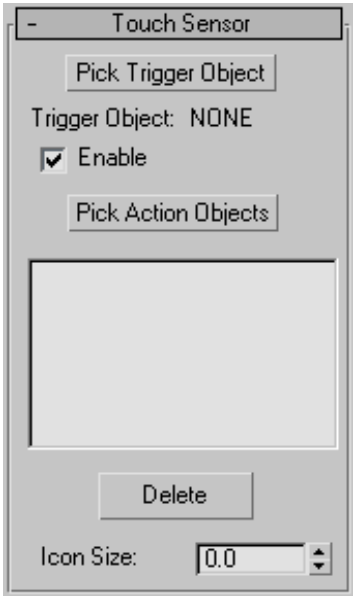
Procedure

To set up an object as a TouchSensor trigger:

1. Add a Touch Sensor object by pressing the Touch Sensor button and then click-dragging in the Top viewport to create its icon.
2. Select the geometry to control.

When the user clicks the trigger geometry, the geometry, camera or light animates, or the sound plays.

Interface



The Touch Sensor rollout contains the following options:

Pick Trigger Object—Specifies the geometry that will be the trigger for this TouchSensor. Click this button, then select the geometry.

Enable—Activates the Touch Sensor. When this box is turned off, the sensor has no effect, even if objects have been selected.

Pick Action Objects—Specifies the objects in the scene to control with this helper.

Delete—Deletes an object from the list of picked objects.

Icon Size—Determines the size of the Touch Sensor helper in the scene.

TimeSensor VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > TimeSensor

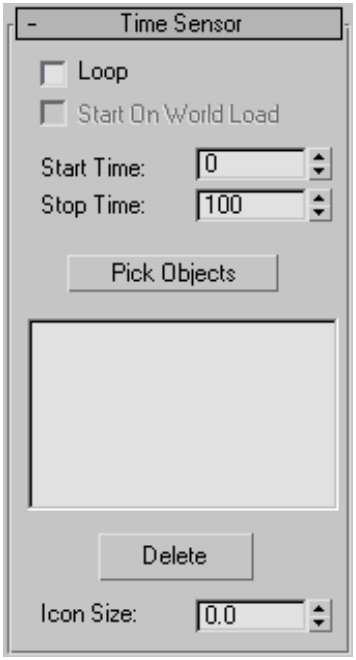
The TimeSensor helper lets you add time-based animation controls, such as the start and end frames for a particular object's animation, and looping. Use this helper to split up an object's animation keys over several triggers, to automatically start an animation upon loading the *.wrl* file, or to make animation endlessly loop.

Procedure

To assign an object to a TimeSensor helper:

1. Add a Time Sensor object by pressing the Time Sensor button and then click-dragging in the Top viewport to create its icon.
2. Press Pick Objects and select the (animated) geometry to control.
3. Use the controls to adjust the start and end times of the animation, and to loop the animation.

Interface



The Time Sensor rollout contains the following options:

Loop—Repeats the animation from the start-time frame to the stop-time frame.

Start on World Load—Starts the animation so that it will be running when the file is loaded into the browser.

Note: This option is only available when Loop is turned on. Otherwise, the animation will start and stop at the specified times.

Start Time/Stop Time—Specifies the range of frames to play.

Note: If the start time is after the end time, the animation will play from the earliest frame to the last frame. It will not play the animation backward.

Pick Objects—Lets you select the objects to control with this TimeSensor.

Delete—Deletes an object from the list of picked objects.

Icon Size—Adjusts the size of the helper object in the viewports.

Background VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > Background

The Background button displays the Sky Color, Ground Color, and Images rollouts. Use these rollouts to specify colors and images for the sky and ground in your VRML97 world.

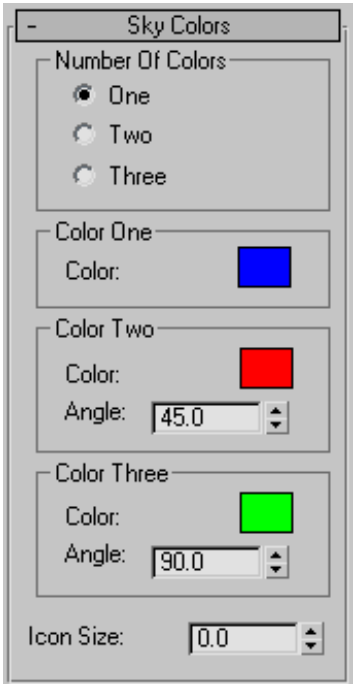
Procedure

To create a Background helper object:

1. Add a Background helper object by pressing the Background button, then click-drag in the Top viewport.
2. Use the controls to adjust the colors and layout of the background.

Interface

Sky Colors rollout



Lets you provide a colored background to the world's sky using a gradient of up to three colors. The sky is an infinite sphere that encloses the objects of the scene.

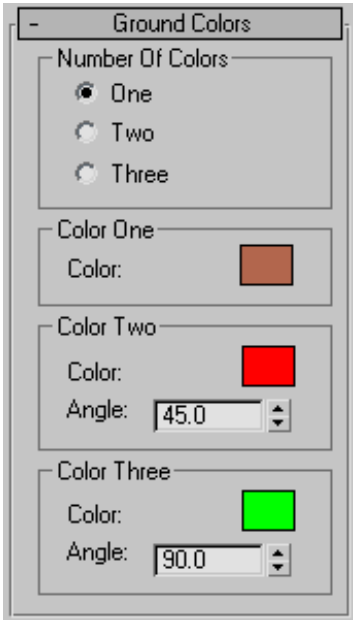
Number of Colors—Specifies whether the sky is one solid color or a gradient of two or three colors.

Color One/Two/Three—Lets you select the colors from the Color Selector. Color One is the base color.

Angle—Specifies the angle at which Color Two and Color Three merge with the base color, in degrees from the North pole of the sky (straight up from the viewer).

Icon Size—Adjusts the size of the helper object in the viewports.

Ground Colors rollout



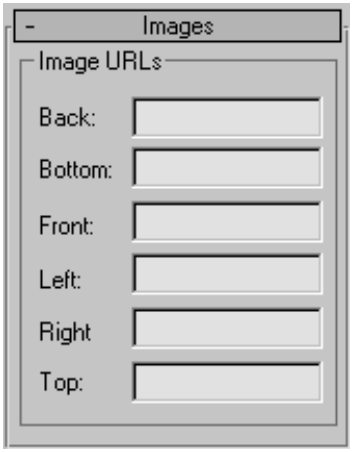
Lets you provide a colored background to the world's ground plane using a gradient of up to three colors. The ground appears inside the sky sphere and below the objects of the scene.

Number of Colors—Specifies whether the ground is one solid color or a gradient of two or three colors.

Color One/Two/Three—Lets you select the colors from the Color Selector. Color One is the base color.

Angle—Specifies the angle at which Color Two and Color Three merge with the base color, in degrees from the South pole of the sky (straight down from the viewer).

Images rollout



Lets you specify a set of images that define a background panorama between the ground/sky backdrop and the objects in the scene. The panorama consists of six images, each of which is mapped onto a face of an infinitely large cube centered in the local coordinate system.

Image URLs—Specifies the location/file names of the images to use. The images can be JPEG files or PNG files with or without transparency. Some browsers also support GIF files.

See the *VRML97 specification (page 3–645)* for diagrams of the typical image configuration.

AudioClip VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > AudioClip

The AudioClip rollout lets you specify the name and characteristics of an audio file that can be used by the Sound helper.

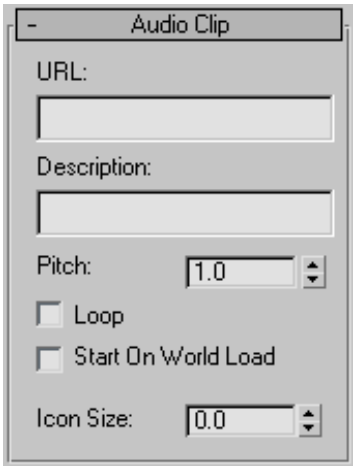
Procedures

To create an AudioClip helper:

1. Press the AudioClip button, and click-drag in the Top viewport to create the helper.

2. Enter the location of the sound file (*.wav* or *.mid*) you want to use in the URL text box.

Interface



The rollout contains the following options:

URL—Specifies the location/file name of the sound to use. Either *.wav* (waveform) or *.mid* (MIDI) files can be used, but MIDI sound files may not be spatialized. Some browsers do not support MIDI.

Description—Lets you enter a text description of the sound, which is displayed by some browsers.

Pitch—Sets the relative pitch of the sound. 1.0 is normal pitch, and 0.5 is one octave lower than normal.

Loop—Repeats the sound.

Start on World Load—Starts playing the sound as soon as the world is loaded into the browser.

Icon Size—Determines the size of the AudioClip helper in the scene.

Billboard VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > Billboard

The Billboard helper lets you create geometry that is camera-aligned in the VRML97 browser. The objects always align to the viewpoint in the VRML97 browser.

Any geometry linked to the Billboard helper will rotate about the local Z axis of the helper object to face the viewer. Since it rotates about the location of the Billboard, it is best to center the Billboard on the object that you will link to it.

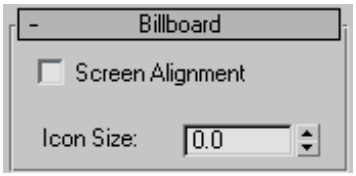
The direction of the negative Y axis of the object, which will be its front, is aligned with the negative Y axis of the helper, and will be the Billboard surface that always faces the viewer. This is the side usually seen from the default camera position.

Procedures

To create a Billboard helper object:

1. Press the Billboard button and click-drag in the Top viewport to create the helper.
2. Link object(s) to the billboard to keep them aligned with the camera.

Interface



The Billboard rollout contains the following option:

Screen Alignment—Keeps the geometry linked to the Billboard helper aligned, even when the viewer elevates, pitches, and rolls.

Icon Size—Determines the size of the Billboard helper in the scene.

Inline VRML97 Helper

Create panel > Helpers > VRML97 > Object Type rollout > Inline

The Inline helper lets you reference another VRML97 file that is included in your world when you load it into your VRML97 browser. These inline objects are like instance objects, but they function at the browser level.

Procedure

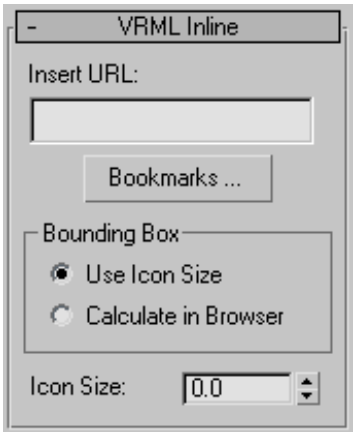
To create an Inline helper object:

1. Click the Inline button.
2. Click and drag in one of the viewports.

   You can modify the helper object with the tools in the VRML Inline rollout.

Interface

If you create the objects in the scene to be inserted off-center (away from the origin), they will appear in the browser off-center as well. Align the original scene and the scene to be inserted correctly, in relation to the origin.



The VRML Inline rollout contains the following options:

Insert URL—Specifies the URL of the *.wrl* files to insert in place of the helper object. The URL must be another VRML97 file.

Bookmarks—Displays a dialog that lets you select a location from a list of bookmarks. Click Import List to import the list of bookmarks defined in your browser. Most browsers store bookmarks in a file called *bookmark.htm*.

Bounding Box—Specifies whether an explicit bounding box size will be exported. If you select "Use Icon Size," the diameter of the icon will be written into the VRML97 file for the width, length, and height of the bounding box; the actual contents of the inline file should fit within that bounding box. If you select "Calculate in Browser," no bounding box size is exported and the VRML browser will determine the size of the inline geometry.

Icon Size—Sets the size of the helper object. You can transform this object like any other object in the software. The scene that replaces the helper object will be moved, rotated, or scaled in the same manner. The size shown is the radius of the icon.

Image File Formats

Image files, also known as bitmaps, have a variety of uses in 3ds Max scenes. You can use bitmaps as textures for materials, as backgrounds to viewports, as environment maps, as Image Input events in Video Post, or as images projected from a light.

An image file can be a single still image, or a sequence of images that form a video sequence or animation. When you assign an animation for

use as a bitmap, then the image changes over time when you render the 3ds Max scene.

Note: Bitmaps are reloaded automatically after they have been changed and resaved by a graphic editing program. See the Reload Textures On Change toggle in *File Preferences (page 3–870)*.

When you render a scene, you can render a still image or an animation. You can render to most of the formats listed below. Some of the formats support various options. If there are output options, these appear in a dialog that is described along with the image file's format.

These are the image file formats supported by 3ds Max:

AVI Files (page 3–658)

BMP Files (page 3–659)

CIN (Kodak Cineon) Files (page 3–659)

CWS (Combustion Workspace) Files (page 3–660)

DDS Files (page 3–660)

EPS and PS (Encapsulated PostScript) Files (page 3–661)

FLC Files (page 3–662)

GIF Files (page 3–662)

HDRI Files (page 3–663)

IFL Files (page 3–666)

IMSQ Files (page 3–669)

JPEG Files (page 3–670)

MOV (QuickTime Movie) Files (page 3–670)

MPEG Files (page 3–671)

PIC Files (page 3–677)

PNG Files (page 3–678)

PSD Files (page 3–678)

RLA Files (page 3–680)

RPF Files (page 3–681)

RGB (SGI Image) Files (page 3–683)

TGA (Targa) Files (page 3–683)

TIFF Files (page 3–684)

YUV Files (page 3–685)

Note: To save loading time, if a map with the same name is in two different locations (in two different paths), it is loaded only once. This poses a problem only if your scene includes two maps that have different content but the same name. In this case, only the first map encountered will appear in the scene.

AVI Files

The AVI (Audio-Video Interleaved) format is the Windows standard for movie files. The *.avi* file-name extension indicates a Windows AVI movie file.

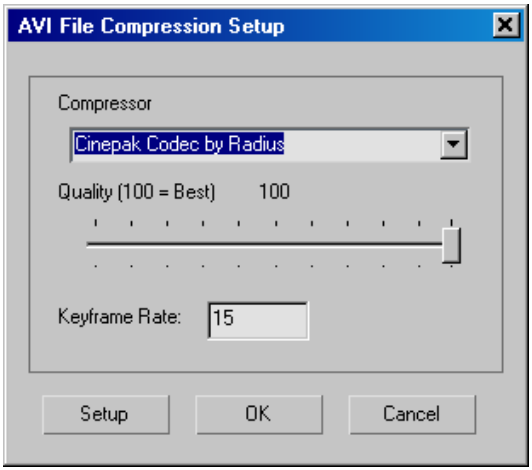
3ds Max creates an AVI created when you *make a preview animation (page 3–163)*. You can also render your final output to an AVI file. Although 3ds Max produces its highest-quality output by rendering single-frame TGA files or rendering directly to a digital disk recorder, you can still get good results rendering AVI files.

AVI files can be used as input to 3ds Max in several ways, for example:

- As animated materials in the Material Editor
- As viewport backgrounds for rotoscoping
- As input images for compositing in Video Post

Interface

When AVI is the chosen output format, clicking Render or Setup on the *Render Output File dialog (page 3–8)* displays the Video Compression dialog.



Compressor—Use the drop-down list to choose the *codec (page 3–1015)* (compressor/decompressor) you want to use to compress the file. You can use any codec that's installed on your system.

Alternatively, you can render uncompressed frames and then use an external application to compress the animation. Video-file compression is a complex subject, with many aspects to consider.

Compression Quality—Available only for certain codecs. When available, use the slider to specify the quality you want. The higher you set the quality, the larger the file size will be.

Keyframe Rate—Available only for certain codecs. When available, use this setting to specify the interval between the delta keyframes used to compare one frame with another and generate in-between frames. Too large an interval will create loss of quality in the AVI file as a whole.

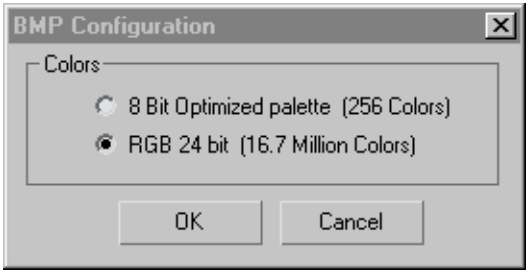
Setup—Available only for certain codecs. Click this button to see any additional options that are specific to the codec. These are vendor specific and vary from codec to codec.

BMP Files

BMP files are still-image bitmap files in the Windows bitmap (*.bmp*) format.

Interface

When BMP is chosen as the output format, clicking Render or Setup on the *Render Output File dialog (page 3–8)* displays the BMP Compression dialog.



8 Bit Optimized palette (256 Colors)—Choose to render a smaller, 8-bit color file.

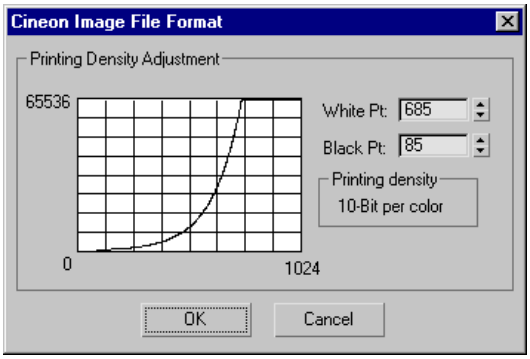
RGB 24 bit (16.7 Million Colors)—Choose to render a larger, true color (24-bit) file.

CIN (Kodak Cineon) Files

A file format that stores a single frame of a motion picture or video data stream. Each frame is saved as cineon version 4.5 with a CIN file-name extension. The file contains no user-defined data such as a thumbnail, and supports 10-bit log, and three colors per pixel. Alpha channels are not supported.

Interface

When CIN is chosen as the output format, clicking Render or Setup on the *Render Output File dialog (page 3–8)* displays the Cineon Image File Format dialog.



Printing Density Adjustment—Represents the transfer function from printing density (10-bit log) to 16-bit linear with the white point mapped to a maximum code value of 65535.

Conversion of logarithmic printing density to a linear representation requires both a scaling and an anti-log operation. With 16-bits linear, it is possible to maintain the full printing density range. The 90% white card at code value 685 is mapped to maximum code value of 65535.

The **White Pt** and **Black Pt** spinners let you adjust the 90% white code and the 2% black code.

CWS (Combustion Workspace) Files

The file format for the Combustion™ software from Autodesk. CWS is a resolution-independent, vector/raster file format.

You can use CWS files in conjunction with the *Combustion map (page 2–1448)*. You can't use a CWS file as a general-purpose bitmap. You can also generate a CWS file by using the *Render Elements option (page 3–126)* when you render a scene.

Important: Only Combustion 2.1 and later formats are supported. Maps in the Combustion 1 format are not supported in 3ds Max.

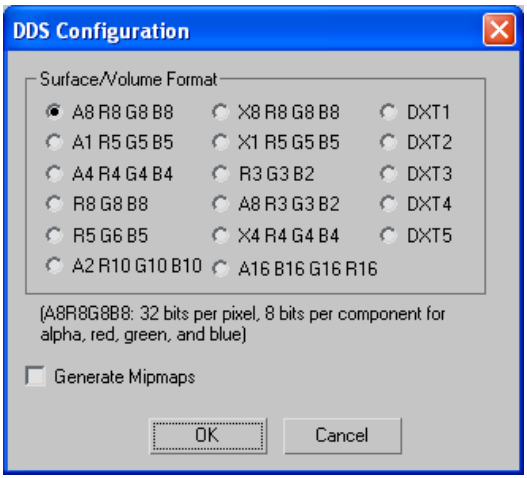
DDS Files

The DirectDraw® Surface (DDS) file format is used to store textures and cubic environment maps, both with and without mipmap levels. This format can store uncompressed and compressed pixel formats, and is the preferred file format for storing DXTn compressed data. Microsoft® is the developer of this file format.

You can use DDS files as texture maps.

With Direct3D 9, you can render to the DDS format. (With DX8 or DX9, DDS files can be rendered using the *Metal Bump shader (page 2–1424)*, as well.) If your system does not support DX9, you can use DDS files as textures, but you can't render them.

Interface



Surface/Volume Format group

DDS supports a variety of output formats, which vary in the number of pixels allocated to the red, green, and blue (RGB) channels, to the optional alpha channel (transparency), and to possible unused bits. There is also a set of compressed formats.

- **A8 R8 G8 B8**—32 bits per pixel: 8 bits each for the RGB and alpha channels.
- **A1 R5 G5 B5**—16 bits per pixel: 5 bits each for the RGB channels, and one bit for the alpha channel.
- **A4 R4 G4 B4**—16 bits per pixel: 4 bits each for the RGB and alpha channels.
- **R8 G8 B8**—24 bits per pixel: 8 bits each for the RGB channels; no alpha.
- **R5 G6 B5**—16 bits per pixel: 5 bits each for the R and B channels, 6 bits for the G channel; no alpha.
- **A2 R10 G10 B10**—32 bits per pixel: 10 bits each for the RGB channels; 2 bits for the alpha channel.
- **X8 R8 G8 B8**—32 bits per pixel: 8 bits each for the RGB channels; 8 bits unused; no alpha.
- **X1 R5 G5 B5**—16 bits per pixel: 5 bits each for the RGB channels; 1 bit unused; no alpha.
- **R3 G3 B2**—8 bits per pixel: 3 each for the R and G channels, 2 bits for the B channel; no alpha.
- **A8 R3 G3 B2**—16 bits per pixel: 3 each for the R and G channels, 2 bits for the B channel; 8 bits for the alpha channel
- **X4 R4 G4 B4**—16 bits per pixel: 4 each for the RGB channels and 4 unused bits.
- **A16 B16 G16 R16**—64 bits per pixel: 16 bits each for the RGB and alpha channels.
- **DXT1**—Compressed format with 1-bit alpha.
- **DXT2**—Compressed format with 4-bit *premultiplied alpha (page 3–1091)*.
- **DXT3**—Compressed format with 4-bit alpha, no premultiplication.
- **DXT4**—Compressed format with interpolated premultiplied alpha.
- **DXT5**—Compressed format with interpolated alpha but no premultiplication.

Generate Mipmaps—When on, mipmaps are generated for the image. Default=off.

Mipmaps are a set of lower-detail bitmaps. The first is half the size of the original image, the next is half the size of that, and so on down to a single pixel. (You can think of them as being arranged like a pyramid.) They are used to optimize display time and reduce *aliasing (page 3–1001)* when the texture is to be displayed at less than full size. For example, if your original DDS image is 512 x 512 pixels, but the area in which it would be displayed is only 100 pixels square, the display device would interpolate between the 128 x 128 mipmap and the 64 x 64 mipmap.

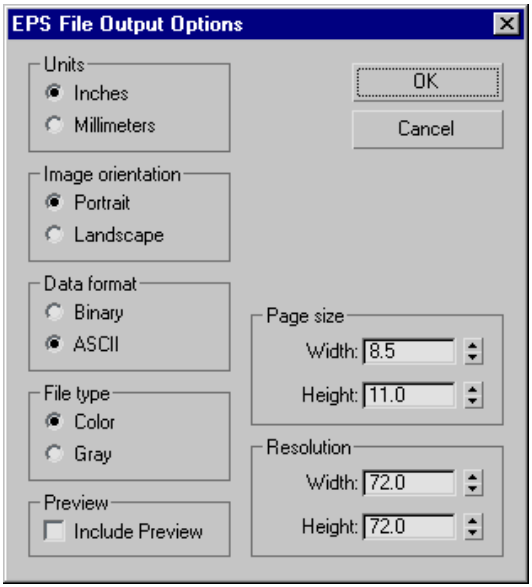
EPS and PS (Encapsulated PostScript) Files

3ds Max can render images to Encapsulated PostScript format files, which have the *.eps* or *.ps* extension.

PostScript is an Adobe page-description language for encoding graphics images. It is supported by many printing devices and is widely used in desktop publishing and graphic design as a means of porting images from one platform to another. You can not view PostScript files with 3ds Max or use them as bitmaps in materials or environments.

Interface

When PostScript is the chosen output format, clicking Render or Setup on the *Render Output File dialog (page 3–8)* displays the EPS File Output Options dialog.



Units—Select inches or millimeters.

Image Orientation—Select portrait (tall) or landscape (wide).

Data Format—Select binary or ASCII.

File Type—Select color or grayscale.

Preview—Check to generate a thumbnail image so that file browsers can preview the contents of the PostScript file.

Page Size—Set width and height measurements.

Resolution—Set width and height resolution in dots per inch (dpi).

FLC Files

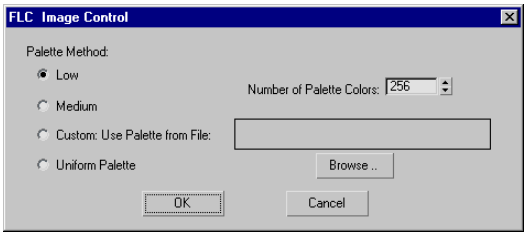
The FLC (flic) file format is an Autodesk format for digital animations.

There are two slight variations of this format. Animations created by the earlier Autodesk Animator® program have the *.fli* file name extension; the later Animator Pro® and 3D Studio® R4 products create animation files with a *.flc* file-name extension. Flic files can also have a *.cel* file name extension.

Flic files are restricted to a maximum of 256 colors (8-bit).

Interface

When a flic file is the chosen output format, clicking Render or Setup in the *Render Output File dialog (page 3–8)* displays the FLC Image Control dialog.



Palette Method—Select the method to use to create the 256-color palette for the file. Low builds the palette based on the first frame. Medium builds a 256-color palette for every frame and then optimizes them into a single palette. Custom uses the palette of another file that you specify. Uniform uses a generic set of colors for cases in which you want to use a set of flic files to all have the same standard colors.

Number of Palette Colors—Set the number of colors up to 256. If you specify a number less than 256, the remaining slots in the palette are filled with black.

GIF Files

GIF is an 8-bit (256-color) format developed by Informix for the CompuServe® information service. It was originally designed to minimize file transfer times over telephone lines.

GIF is supported only as an input file format. You can use GIF files as general-purpose bitmaps, but you can't render to a GIF file.

HDRI Files

HDRI is a file format used for high-dynamic-range images. Most cameras don't have the capability to capture the dynamic range (the gamut of luminances between dark and bright regions) that is present in the real world. However, the range can be recovered by taking a series of pictures of the same subject with different exposure settings, and combining them into one image file.

This type of image is called a *high dynamic range image* (HDRI) or *radiance map*. HDRI files have an *.hdr* extension and radiance maps have a *.pic* extension. The file actually contains all the data from all the pictures, so a wide luminance range is present, from bright, white highlights to the darkest black.

HDR files are particularly useful as backgrounds for compositing, and as reflection maps on composited objects. When using a HDR image as a skylight, use the parameters in the Exposure group to control the brightness of the scene.

Procedure

To use a HDR image as a background, or as a diffuse or reflection map:

1. In the Material Editor, choose Bitmap as the map type.
2. On the Select Bitmap Image File dialog, under Files Of Type, choose Radiance Image File (HDRI). Open the HDR file you would want to use.

   The HDRI Load Settings dialog appears, with the image displayed in its preview window.
3. On the HDRI Load Settings dialog, look at the Measured Min/Max values to see the luminance range for the image.
4. Turn on Black Point.
5. Adjust the Black Point and White Point values until the red lines on the histogram encompass the majority of the graph, and the preview image is satisfactory.

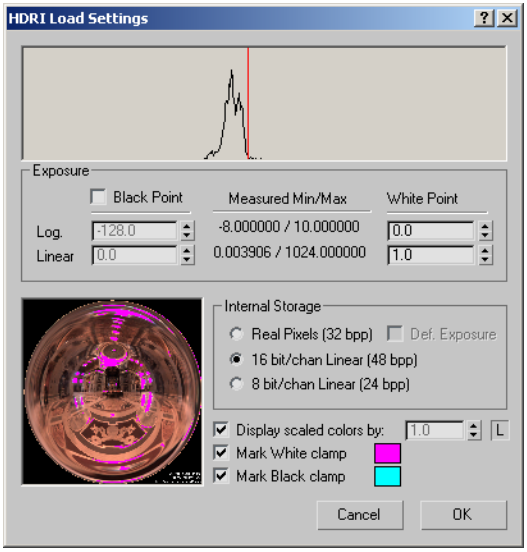
   Tip: For the Internal Storage option, use the default choice of 16 bit/chan Linear (48bpp) unless you have a specific reason for doing otherwise.
6. When you have finished adjusting values, note the Linear White Point value, and click OK to accept the settings.
7. In the Material Editor, expand the Output rollout. Set the RGB Level to the same value as the Linear White Point value on the HDRI Load Settings dialog.

   The result is a map with a wide range of deep blacks and very white highlights. If such an image is used as both a background in the rendering and a reflection map on an object, the object will appear to be extremely shiny and reflective.

Interface

HDR Load Settings dialog

When you open a HDR file as a bitmap, the HDR Load Settings dialog appears. This dialog allows you to specify the luminance range to use from the image, and the method for storing the data.



Histogram—This graph shows the image's luminance values in a logarithmic scale. The red lines indicate the current Black Point and White Point values.

The graph is visible only for luminance levels with substantial representation in the image. In other words, if a luminance level only applies to one or two pixels in the image, there will be no corresponding graph line on the histogram. Compare with Measured Min/Max, which gives the entire range of luminance levels in the image.

In general, the resulting image will have the most dramatic effect when the histogram is used to set the Black Point and White Point range values, rather than using the full range expressed by Measured Min/Max.

Exposure group

Black Point—When this option is turned on, you can set the luminance value that you would like to be treated as the darkest color, or "black". The value can be set as a logarithm (Log) or as a linear value (Linear). All values below this value will be clamped to black. When this option is turned off, the lowest possible value is used as the Black Point.

Measured Min/Max—Displays the actual minimum and maximum luminance values in the image, expressed as both the logarithmic and linear values. Using these values for the Black Point and White Point will result in the image's full luminance range being used. However, the histogram might show that the majority of the luminance levels fall into a much smaller range.

White Point—Sets the luminance value that you would like to be considered the brightest color, or "white", either as a logarithm (Log) or linear value (Linear). All luminance values in the image that are above this value will be clamped to white. White pixel values inside HDR files can be much larger than a Linear value of 1.

The image's extended luminance range is used only when the White Point's Linear value is set above 1.0. In other words, setting White Point at or below a Linear value of 1.0 will not use any of the HDR image's special luminance properties, and will give results similar to other bitmap formats such as TIF and JPG.

Log—Sets the Black Point or White Point as a logarithmic value ranging from –128 to 127. Changing this value changes the Linear parameter to the corresponding value.

Linear—Sets the Black Point or White Point as a linear value ranging from 0 to over 1 trillion. Changing this value changes the Log parameter to the corresponding value.

Preview window—Displays the selected HDR image.

Internal Storage group

Real Pixels (32 bpp)—Compresses the luminance selections into a color space with 32 bits per pixel. Premultiplied Alpha and Motion Blur do not work with this option.

Def Exposure—When on, the image will load as is without applying any changes to the colors. When off, you can use the parameters in the Exposure group to remap colors. Available only with the Real Pixels option.

16 bit/chan Linear (48 bpp)—Compresses the luminance selections into 16–bit color space, at 48 bits per pixel. This is the recommended setting. To decompress the luminance for use in the scene, set the RGB Level on the image's *Output rollout (page 2–1430)* to the same value as the linear white value on this dialog.

8 bit/chan Linear (24 bpp)—Compresses the luminance selections into 8–bit color space, at 24 bits per pixel. This compression method uses less memory than other methods, but it is generally not adequate to display the range of luminance in a HDR image, and can result in banding or other artifacts.

Display scaled colors by—When on, this value scales the preview image's luminance value by the specified amount.

L—Locks the preview luminance scale to the white linear value. When off, you can change the value manually. Default=on.

Mark White clamp—Masks the white-clamped values in the preview window with the color indicated by the color swatch. Click the color swatch to change this color.

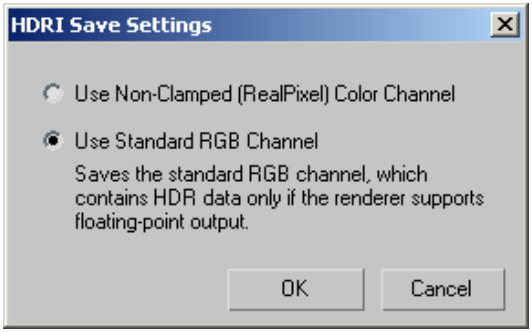
Mark Black clamp—When Black Point is on, this option masks the black-clamped values in the preview window with the color indicated by the color swatch. Click the color swatch to change this color.

HDRI Save Settings dialog

As of version 8, 3ds Max can render and save images with 32-bit floating-point channels. Among the useful applications for this type of imagery are:

- Compositing: using 16–bit images in a compositing pipeline can quickly become a problem as colors are manipulated. For example, banding may appear.
- HDR images are not bound to a specific range (e.g., 0-255 or 0-65535); they have a dynamic range. As such, high-contrast and physically accurate values can be stored in 32-bit floating-point pixels.
- Because of their large range of values, HDR images can easily be modified, and effects can be reapplied long after rendering, without affecting the quality of the image. For example, changing the contrast/brightness/exposure of a 16-bit image could cause banding, which would require re-rendering the image. However, the same operation on an HDR image should not affect its quality.

Clicking Save or Setup in the *Render Output File dialog (page 3–8)* displays the HDR Save Settings dialog.



The dialog lets you choose the source of the values used for output:

- **Use Non-Clamped (RealPixel) Color Channel**—Outputs the image by means of the unclamped color channel. This channel does not contain atmospherics or render effects.
- **Use Standard RGB Channel**—Saves the standard RGB channel, which contains

high-dynamic-range data only if the renderer supports floating-point output. Currently the mental-ray renderer supports floating-point output, while the default scanline renderer does not.

If you're rendering with mental ray (be sure to set *Frame Buffer Type* to Floating-Point (32 bits per channel)) or another renderer that supports floating-point output, using this option ensures the highest-quality HDR data in the saved image file.

IFL File Format

IFL Files

An IFL (Image File List) file is an ASCII file that constructs an animation by listing single-frame bitmap files to be used for each rendered frame. When you assign an IFL file as a bitmap, rendering steps through each specified frame, resulting in an animated map.

(In a similar way, if you assign an AVI file, FLC file, or MOV file as a bitmap, rendering steps through each frame of the animation.)

For example, if you assign a 10-frame FLC of a blinking red "Danger" sign to a material's diffuse component, apply the material to a cube, and then render a 30-frame animation, the cube displays the blinking red Danger animation three times.

The *.ifl* file lists the bitmap files to be used with each frame. You can append an optional numeric argument to each file name to specify the number of frames of rendered animation on which it is used. For example:

```
; Anything after a semicolon is a comment, and is ignored.
sand.tga 20
pebble.tga 40
stone.tif 20
boulder.tif 20
```

The IFL file listed above specifies *sand.tga* to be used for the first 20 frames, *pebble.tga* to be used for the next 40 frames, *stone.tif* to be used for 20 frames, and *boulder.tif* to be used for 20 frames.

Tip: Specify only the file names in your IFL files. The file paths can be derived from the map paths established in your preferences. See *External Path Configuration (page 3–855)*. IFL files with path names can be used only on the system on which you create them.

See also

Image File List Control Dialog (page 3–668)

IFL Manager Utility (page 3–668)

Sequentially Numbered Files

You can use incrementally numbered bitmap files (for example, *frame001.bmp, frame002.bmp,* and so on) to construct an IFL file. Either use the *IFL Manager Utility (page 3–668)*, or use the Sequence check box in a file selector dialog, as described in the following procedures.

Procedures

To construct an IFL file from sequentially numbered files:

1. In the file selector dialog, navigate to a directory that has a sequence of incrementally numbered bitmaps.
2. Choose the name of one of the sequential files (for example, *image01.bmp*).

   The Sequence check box becomes available.
3. Turn on the Sequence check box.

   The Setup button becomes available.
4. Click Setup to display the *Image File List Control dialog (page 3–668)*.

5. In the Image File List Control dialog, choose the options you want, and then click OK.

   Tip: Use the Browse button to set the Target Path to a directory on your hard disk. Do not set this path to a CD-ROM drive, because you cannot save the file there.

   The Image File List (IFL) file is saved to the target directory.

6. In the file selector dialog, click OK.

   This assigns the newly created IFL file as the bitmap.

Example: To select a set of still images as a viewport background:

1. Activate the viewport where you want the animated background.
2. Choose Views menu > Viewport Background.
3. In the Background Source group, click Files.

   A Viewport Background dialog is displayed.

4. On Select Background Image dialog, use the Look In field to navigate to the directory containing the files you want to use for the sequence.

   If necessary, change the file type to match the file name extension of the sequence, or choose All Formats.

   Note: The Select Background Image File dialog uses the last location where a bitmap was chosen, rather than the default bitmap path defined in Customize menu > Configure User Paths.

5. Construct an IFL file as described in the previous procedure.
6. On the Select Background Image dialog, click OK.

   The IFL file now provides the background for the viewport.

   Tip: The viewport background does not render. To render the IFL file's animation, assign the IFL file as a rendering environment. (See the following procedure.)

To render the frames in an IFL file as a movie (AVI, FLC, or MOV format):

1. Choose Rendering > Environment.
2. On the Environment dialog, click Environment Map.
3. On the Material/Map Browser, choose Bitmap, and then click OK.
4. On the Select Bitmap Image File dialog, choose the IFL file, and then click OK.
5. Click Time Configuration, and use the Time Configuration dialog to make the animation length match the number of frames specified in the IFL file.
6. Render a viewport to a movie-format file.

   Tip: The aspect ratio of the rendered movie should match the aspect ratio of the frames in the IFL file.

Notes

- If the IFL generator has a name conflict with an existing IFL file, it will increment the new file's name to avoid overwriting the existing file.
- If the IFL generator has any problems with write access while trying to create the IFL file, the process will fail and the IFL file won't be created. Therefore, automatic IFL generation won't work when reading bitmaps from a CD-ROM. You need to copy them to a directory on your hard disk first. Likewise, automatic IFL generation won't work on network drives to which you don't have write access.

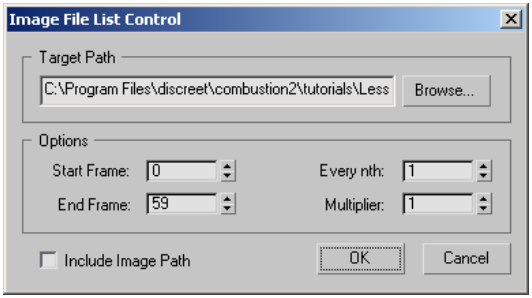
Image File List Control Dialog

Views menu > Viewport Background > Select Background Image dialog > Choose a directory with sequentially numbered files. > Sequence > Setup > Image File List Control dialog

The Image File List Control dialog provides controls for creating an *Image File List (IFL file) (page 3–666)*, which lists sequential still image files for rendering into backgrounds or materials. It is particularly useful if you are choosing a sequence of files that are on a CD-ROM, because you can redirect the IFL file to a different directory on your hard disk.

This dialog duplicates the functionality found in the *IFL Manager utility (page 3–668)*.

Interface



Target Path—Sets the directory where the IFL file is saved.

Browse—Use this to navigate to the correct directory.

Options—Sets additional options for creating the IFL file.

Start Frame—Determines which file in the sequence will be the first frame. Use this when you have a sequence but you don't want to start with the first image in the sequence.

End Frame—Determines which file will be the last frame listed in the IFL list.

Nth Frame—Skips frames in the image file list. Use this to match the length of the sequence to the length of the animation.

Multiplier—Increases the frames in the image file list. Each frame in the file list can be repeated by this value to stretch out the length of the sequence.

Include Image Path—Includes the path in the image file list.

IFL Manager Utility

Utilities panel > Utilities rollout > More button > Utilities dialog > IFL Manager

The IFL Manager utility generates an *image file list (IFL) file (page 3–666)* from an image file you choose from a numbered file sequence.

Note: You can also generate an IFL file in a file selector dialog by selecting a numbered bitmap, turning on Sequence, and then clicking Setup to display an *Image File List Control dialog (page 3–668)*.

See also

Image File List Control Dialog (page 3–668)

Procedure

To use the IFL Manager utility:

1. Open the IFL Manager.
2. Click the Select button to display a file selector.
3. Select any of the sequentially numbered image files that you want included in the list, and click Open.

   The prefix name of the file appears in the Working File Prefix group box, and the spinners in the IFL Manager panel become enabled.
4. Set the Start spinner to specify the first numbered file in the sequence. For example, set this to 5 to begin with file *tree0005.jpg*.

5. Set the End spinner to specify the last numbered file in the sequence. The Start and End spinners default to the first and last number in the existing numbered files.

   Note: You can invert the Start and End values (setting the greater value in Start and the lesser in End) to create a reversed list in the *.ifl* file.

6. Click Create to display a file dialog where you can name and then save your IFL file.
7. Click the Edit button to display a file dialog where you can choose an IFL file, which then appears in the Windows Notepad.

Interface

Working File Prefix group

After you use the Select button to select a sequentially numbered file, the prefix name of the file appears here. For example, if the files are *tree0000.jpg*, *tree0001.jpg*, *tree0002.jpg*, and so on, the title in this group box would be **tree**.

Spinners group

Start—Displays the number of the first image file in the selected sequence. Increase to specify a different starting image for the IFL file.

End—Displays the number of the last image file in the selected sequence. Decrease to specify a lower ending image for the IFL file.

Every nth—Set to a number greater than 1 to skip a specified number of images in the list.

Multiplier—Adds a multiplier after each file in the IFL list. If you set to 3, each image is used three times before the next image in the list is used.

Button set

Select—Displays a file dialog that lets you select a file in a sequential list. The number appended to the file doesn't matter, as long as the prefix and file name extension are the same. After selecting the file, the spinners in the IFL Manager are enabled.

Create—Displays a file dialog where you can name and save your IFL file.

Edit—Displays a file dialog where you can select an IFL file. The selected file is then displayed in the Windows Notepad editor.

Close—Closes the utility.

IMSQ Files

The Autodesk ME Image Sequence (IMSQ) format is an XML file used by the Autodesk products Cleaner and Toxik. You generate IMSQ files by turning on Put Image File List(s) In Output Path(s) and then clicking Create Now in the Render Output group of the Render Scene Dialog's *Common Parameters rollout (page 3–27)*. The IMSQ file stores information about the rendering, including:

- The name of the rendering file

- The format of the rendering file
- The range of frames

  (Nonsequential frame sequences, such as 1, 7, 12–19, are not supported.)
- The frame rate
- The pixel aspect ratio
- The output type, aperture width, and resolution (width x height)
- The render element type and name
- The camera name (when rendering a Camera view)

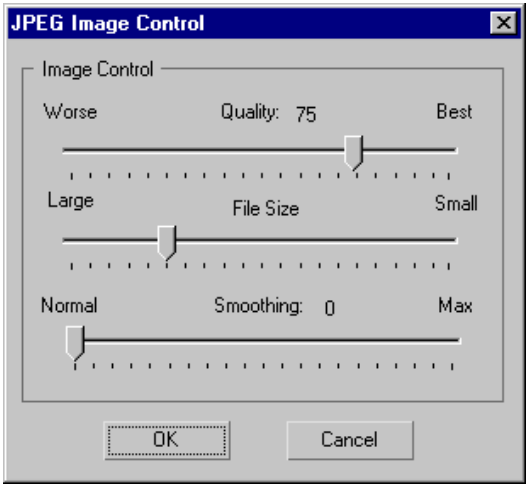
3ds Max generates a separate IMSQ file for each render element.

JPEG Files

JPEG (*.jpeg* or *.jpg)* files follow the standards set by the Joint Photography Experts Group. These files use a variable compression method that is called lossy compression because of the loss of image quality as you increase the compression. However, the JPEG compression scheme is extremely good and you can sometimes compress the file up to 200:1 without severe loss of image quality. JPEG is consequently a popular format for posting image files on the Internet for minimum file size and minimum download time.

Interface

When JPEG is the chosen output format, clicking Render or Setup in the *Render Output File dialog (page 3–8)* displays the JPEG Image Control dialog.



Quality—Move the slider to the level of quality you want: the higher the quality, the larger the file size. In general, files compressed with the slider set to Best have compression ratios between 5:1 and 15:1.

File Size—Move the slider to the size of file you want: the larger the file, the higher the quality.

Smoothing—Move the slider to the level of smoothing you want: the higher the level of smoothing, the larger the file size.

MOV (QuickTime Movie) Files

QuickTime® is a standard file format created by Apple® for storing common digital media types such as audio and video. When you choose QuickTime (**.mov*) as the Save as Type, your animation is saved as a *.mov* file.

You can export animations to *.mov* for both rendering and previews. You can also export audio if an audio track is present in Track View. To preview an existing *.mov* file, you must have *movieplayer.exe* included in your environment path. You can download the QuickTime movie player from www.apple.com/quicktime/download.

Note: The plug-in does not allow for the direct import of audio from a QuickTime file.

Interface

When you create a new QuickTime file or choose Setup for an existing one, you see a dialog that is typically titled Compression Settings. This dialog is provided by the QuickTime *codec (page 3–1015)* installed with your system, and can change depending on the version of QuickTime you've installed.

MPEG Files

The MPEG format is a standard for movie files. MPEG stands for Moving Picture Experts Group. MPEG files can have a *.mpg* or *.mpeg* file name extension.

MPEG is supported only as an input file format. You can use MPEG files as texture maps.

OpenEXR Files

3ds Max can both *read (page 3–675)* and *write (page 3–672)* image files in the OpenEXR format. OpenEXR is both an image file format and a general open-source API for reading and writing such files.

The best place to look for information on OpenEXR itself is the official Website. The following is taken directly from the OpenEXR home page:

> OpenEXR is a high dynamic-range (HDR) image file format developed by Industrial Light & Magic for use in computer imaging applications.
>
> OpenEXR has already been used by ILM on 4 major motion pictures -- Harry Potter and the Sorcerer's Stone, Men in Black II, Gangs of New York, and Signs -- and is also being used on several other movies currently in production.
>
> OpenEXR's features include:
>
> - Higher dynamic range and color precision than existing 8- and 10-bit image file formats.
> - Support for 16-bit floating-point pixels. The pixel format, called "half," is compatible with the half data type in NVIDIA's Cg graphics language and is supported natively on their new GeForce FX and Quadro FX 3D graphics solutions.
> - Multiple lossless image compression algorithms. Some of the included codecs can achieve 2:1 lossless compression ratios on images with film grain.
> - Extensibility. New compression codecs and image types can easily be added by extending the C++ classes included in the OpenEXR software distribution. New image attributes (strings, vectors, integers, etc.) can be added to OpenEXR image headers without affecting backward compatibility with existing OpenEXR applications.

The OpenEXR Bitmap I/O software goes beyond the "standard" OpenEXR format, taking advantage of the flexibility of the format itself. It can write channels and attributes as well as general RGBA data in formats that many OpenEXR file importers cannot understand, due to implementation limits as well as limits to the current set of standards. The full-latitude 32-bit floating point RGBA files that the output function can write is one example. While the OpenEXR API itself fully supports this capability, and these files are written using the standard set of OpenEXR libraries, most software

only reads the 16-bit "half" floating point RGBA files that are considered standard EXR files.

Configuration File Usage

Most bitmap I/O plug-ins, including those integrated into 3ds Max, store their configuration information in a binary CFG file that cannot be edited. To allow external scripting support as well as ordinary preferences, the OpenEXR software uses a standard INI file format to store its configuration data. The file is named *openexr.ini* and is found in the *plugcfg* folder in the program directory. The file is generated automatically the first time you edit the OpenEXR configuration settings, and is updated each time you modify an EXR loader. It is a standard text file and can be modified with any text editor.

When the INI file is written, it automatically generates a companion "help" text file named *openexr_ini_help.txt*. This file contains the valid ranges for various INI settings, as well as the various text strings used to specify compression type and bit depth. This file is just a guide; editing it has no effect, and it is overwritten whenever the INI file is updated.

To restore the default settings after editing the INI file, simply delete the *openexr.ini* file and a new one with the original defaults will be generated the next time you edit the configuration settings.

See also

Saving OpenEXR Files (page 3–672)

Opening OpenEXR Files (page 3–675)

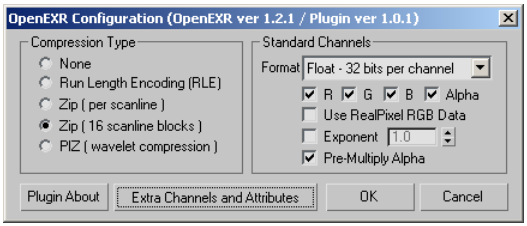
Saving OpenEXR Files

Render Scene dialog > Common panel > Common Parameters rollout > Render Output group > Click Files. > Enter file name and set type to OpenEXR Image File > Click Save. > OpenEXR Configuration dialog

Rendered Frame Window > Click Save Bitmap. > Enter file name and set type to OpenEXR Image File > Click Save. > OpenEXR Configuration dialog

Use the OpenEXR Configuration dialog dialog to set output parameters for OpenEXR files. You can specify the format for saving the RGBA data as well as which of the four standard channels should be saved. An option is available to use RealPixel unclamped color information for Render Output saving. Also available are color transforms to be applied, file compression type, and additional attributes.

Interface



Compression Type—Lets you choose the method of file compression. The OpenEXR API provides for three general types of lossless compression, including two different methods of Zip compression. For most images without a lot of grain, the two Zip compression methods seem to work best, while the PIZ compression algorithm is better suited to grainy images. The following options are available:

- **None**—Disables all compression.
- **Run Length Encoding (RLE)**—A basic form of compression comparable to that used by standard Targa files.

- **Zip (per scanline)**—Zip-style compression applied to individual scanlines.
- **Zip (16 scanline blocks)**—Zip-style compression applied to blocks of 16 scanlines at time. This tends to be the most effective style of compression to use with rendered images that do not have film grain applied.
- **PIZ (wavelet compression)**—Uses a combined wavelet/Huffman compression. This form of compression is best for grainy images.

Standard Channels group

The standard channels in an image are: red, green, blue, and alpha (transparency). This group lets you choose the general type of OpenEXR file to save, as well as which of the four channels to save with the file. The most widely supported format is Half Float - 64 bpp format. This stores each channel of the image in a separate slice in the file using half-type 16-bit floating-point data. The OpenEXR distribution has features that allow easy implementation of reading and writing this type of file, and it is considered a standard OpenEXR file.

Format—Choose one of the following from the drop-down list:

- **Integer - 32 bpp**—This non-standard OpenEXR format contains only a single 32–bit integer channel. It uses a packedIntRGBA image type in order to support old-style bit depths, such as 32–bit Targa files. Only this plug-in can read this format.
- **Half Float - 64 bpp**—This 16-bit-per-channel "half-float" format is standard OpenEXR. Any software that supports OpenEXR can use this format.
- **Float - 128 bpp**—The 32-bit-per-channel "full-float" format is encoded using standard OpenEXR channel tags. Most OpenEXR implementations will have no problems reading this format.

R/G/B/Alpha—Let you specify the channels to save: red, green, blue, and alpha.

Use RealPixel RGB Data—When on, compresses the essential data of floating-point color into 32 bits. For technical information, see Structure RealPixel.

Note: Image motion blur is not applied to the RealPixel RGBA data by the renderer. If you are using Image motion blur, you will not be able to save RealPixel unclamped color data.

Exponent—Enables and sets the power function exponent to use. This is effectively a gamma curve, but the exponent is presented in an inverse manner from typical gamma. The default value is what exrdisplay expects for input.

Pre-Multiply Alpha—When on, the software uses *premultiplied alpha (page 3–1091)* when saving the file. Pre-multiplying saves computation time if you later use this image in compositing.

Plugin About—Opens a dialog that shows information about the OpenEXR plug-in.

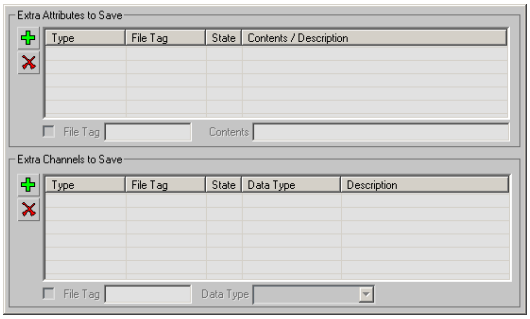
Extra Channels and Attributes—Opens a *sub-dialog (page 3–673)* that lets you specify additional information to save with the OpenEXR image file.

OK—Accepts any changes and closes the dialog.

Cancel—Discards any changes and closes the dialog.

Extra Channels and Attributes

To specify an extra attribute or channel to be included in the saved OpenEXR file, click the corresponding + button and then choose the attribute or channel from the list. To delete an attribute or channel, highlight it in the list and then click the corresponding X button.



General Notes on Extended Attributes and Channels

Please note the following:

- You can view the extended information via the *File Info button* on the input dialog.
- A default File Tag string is provided when you add an attribute/channel. You can change the file tag by highlighting the entry in the list and then editing the File Tag field immediately below the list. You can also enable and disable the attribute/channel with the check box to the left of the File Tag field.

  Note: Each saved attribute or channel must have a unique file tag. If you specify multiple instances of a file tag, only the first attribute or channel with that file tag is used.
- All the current attributes are String type attributes that are stored in the header for the file, and can be read in plain text via the *exrheader.exe* utility (available from the official Website > Downloads page).
- Attributes and channels are stored in the file in alphabetical order according to the ASCII file tag.
- While this plug-in can write most of the 3ds Max *G-Buffer (page 3–1040)* channels, there is no software that can utilize them yet.
- Attributes and channels are identified by plain-text (ASCII) strings. There can be only one instance of a string tag in any file. Attributes are data that is stored per frame, not per pixel, and they are embedded in the file's header. Channels are data that is stored per pixel. In order to maximize flexibility with other software, this plug-in lets you edit the file tags. You should only do this if you know the tag required by some other software; otherwise it is best to leave the file tags at their default values.
- Channels that create multiple "slices" in the EXR file require multiple file tags. In this case, the file tag in the user interface comprises several sub-tags denoted by square brackets. For example, the Normal channel generates three slices in the EXR file: one for the Normal vector x data, 1 for y, and 1 for z. In this instance, the tag string in the user interface would read [NX][NY][NZ], and generate slices with the file tags "NX", "NY", and "NZ". The file tag is used by software that is reading the EXR file to identify the intended use of the channel data. Even standard image channels are encoded this way, with the tags "R", "G", "B", and "A" used to denote red, green, blue, and alpha channels respectively.

Extended Attributes

Comment—A general-purpose comment string defined by the user. To define the comment, highlight the Comment entry in the list and then edit the Comments field immediately below the list.

Computer Name—The name of the computer the image was saved from. In the case of standard render output during a net render, this is the machine that rendered the frame.

System Time—The UTC (GMT) system time and date when the file was written.

Local Time—The local time and date (corrected for the time zone) when the file was written.

Version OpenExr —The plug-in version, OpenEXR API version, and ZLib version in plain text form.

Version 3dsMax—The release version of 3ds Max itself, the API number, and the SDK revision used when the build of 3ds Max was compiled. This also reports whether the file was generated using 3ds Max or Autodesk VIZ.

Extended Channels

Z-Buffer—The standard buffer depth channel. (16-bit or 32-bit floating point)

Object ID—The object ID from the *Object Properties dialog (page 1–112)*. (32-bit unsigned integer)

Material ID—The *material effects channel number (page 2–1287)*. (32-bit unsigned integer)

Node Render ID—A unique object ID set by the renderer. All objects in the scene have a unique Render ID, though the value stored varies from renderer to renderer. (32-bit unsigned integer)

UV Coords—The UV coordinates for the object. Only one UV channel is stored. (two slices, 16-bit or 32-bit floating point)

Velocity—The 2D velocity vector for the pixel in screen space. (two slices, 16-bit or 32-bit floating point)

Normal—The surface normal. (three slices, 16-bit or 32-bit floating point)

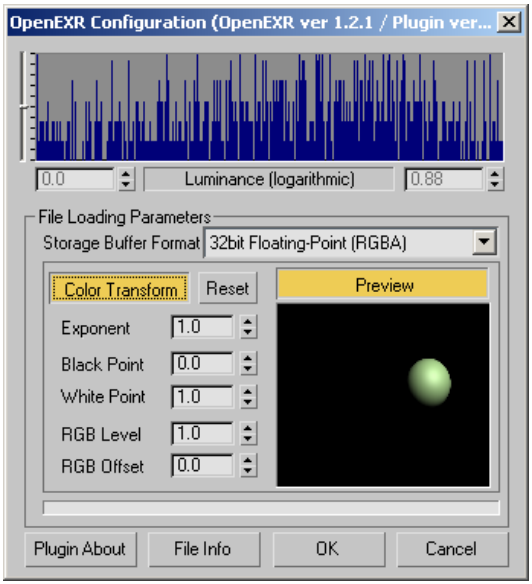
Coverage—The pixel coverage of the foremost object in the pixel. (32-bit unsigned integer, 16-bit floating point, or 32-bit floating point)

Opening OpenEXR Files

Any command that opens an image file, such as View Image File > Specify an EXR file. > Click Open. > OpenEXR Configuration dialog

This version of the OpenEXR Configuration dialog appears whenever you open an EXR file. It lets you specify various color transformations to be applied to the loaded image, designate the internal storage format to use, and preview the loaded image with the color transforms applied. There is also a histogram for viewing the brightness distribution in the image and adjusting the white and black points interactively.

Interface



Histogram

To view the histogram, click the Preview button. The histogram displays a detailed bar graph of the distribution of brightness throughout the image. The horizontal axis of the histogram defines the luminance value, and the vertical axis indicates the

percentage of the image covered by pixels of that brightness. Histogram features are:

- The histogram supports several display modes, which you can choose by right-clicking the histogram display window. The menu lets you choose between linear and logarithmic display, automatic or manual x-axis scaling, y-axis scale options, and which channel is graphed: luminance, red, green, or blue. The menu entries X-Axis Scale and Y-Axis Scale are simply labels, and are thus unavailable for choosing.
- The vertical scale slider on the left side of the histogram lets you adjust the automatically computed vertical scale.
- To modify the luminance "window," set X-Axis Scale to Manual and adjust the minimum and maximum values in the numeric fields below either end of the graph.
- The background coloration indicates several pieces of information:
  - The area between the black and white points is shaded gray.
  - The area below 1.0 (low dynamic range) is a lighter shade of gray than the area with luminance greater than 1.0, the high dynamic range region.
  - The background of the region outside the currently selected blackpoint/whitepoint region is tinted pink.
  - The vertical dotted lines indicate integer spacing (for example, 1...2...3...4). To see these, the maximum luminance value must be greater than 1.0.
- You can drag whitepoint/blackpoint markers in the histogram to place them visually. The hot-spot is two pixels to either side of the marker line. White point selection is tested first, so if the two lines are right next to each other, the white point will be selected.
- You can set the display itself to linear or logarithmic mode. Logarithmic display remaps all values greater than 1.0 to a logarithmic curve. The dotted spacing indicators are supplemented by heavier dotted lines that indicate when the scale has changed by a factor of 10. This is useful for most HDR images, as the HDR data is usually spread out over a wide range.
- Setting X-Axis Scale to Auto mode causes the histogram to encompass the entire spectrum of the image. If you switch back and forth, previous manually set values are preserved and restored.

File Loading Parameters group

Storage Buffer Format—Specifies the format in which the image data is stored within 3ds Max. The base types are variations on 8-bits-per-channel and 16-bits-per-channel integer formats. There are two forms of each: one with alpha (RGBA) and one without alpha (RGB). If you are loading an image with an alpha channel but don't require the alpha data, choose the RGB version to save some memory. If you choose a storage type that supports alpha, but load an image without alpha, no memory is allocated for the alpha channel; the loader detects the situation and reverts to the alpha channel-free storage option with equivalent RGB bit depth.

The options supports the HDR bitmap storage options. This allows storage of the high-dynamic-range data within 3ds Max in three different HDR formats: 24- and 32-bit LogLUV formats and 32-bit RealPixel format.

EXR files loaded using these storage modes are suitable for use as environment maps for reflections and skylight.

Color Transform—Because EXR images often contain values brighter than "white," it is often desirable to change the luminance range in the

source image over which black to white occurs; that is, to remap the color data. When Color Transform is on, you can adjust these luminance and general brightness controls:

Exponent—The exponent to apply when loading the file

Black Point—Where black should be in the luminance range of the image

White Point—The white point

RGB Level—A standard multiplier for the RGB data

RGB Offset—An additive offset for the RGB data

Preview—The Preview window provides for interactive previewing of color-transform options for loading EXR files. After choosing an EXR file to open, click Preview to enable the preview window. The image file is loaded into the preview window, and from then on any changes to the Color Transform options update the thumbnail in real time.

The preview window ignores the aspect ratio of the image to make the most of the small screen space available.

Plugin About—Opens a dialog that shows information about the OpenEXR plug-in.

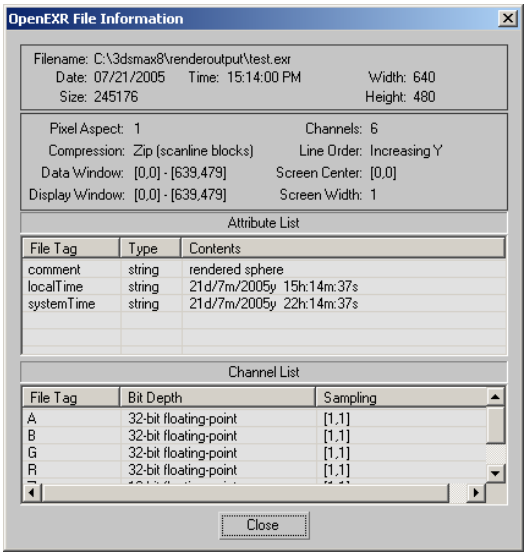
File Info—Opens the *File Information dialog (page 3–677)*, which lets you view file statistics plus any attributes and channels stored in the file.

OK—Accepts any changes, closes the dialog, and opens the image file.

Cancel—Discards any changes and closes the dialog without loading the image file.

File Information dialog

This read-only dialog displays basic file statistics including date, time, size, and resolution, plus any attributes and channel information stored with the file. See *Extra Channels and Attributes (page 3–673)*.



PIC Files

3ds Max can import and export Radiance Picture (PIC) files. The PIC file is a lighting-analysis format used for the same purpose as LogLUV *TIFF files (page 3–684)*. The PIC format differs from the LogLUV TIFF format by creating separate files for *luminance (page 3–1058)* and *illuminance (page 3–1049)* channel data (the LogLUV TIFF format creates one file containing *both* channels).

One way to create PIC files is with the *Lighting Data Exporter utility (page 3–299)*. You specify a file name by clicking the File Name button. When you click Export, the Lighting Data Exporter renders two files. The string "_Illuminance" is appended to the name of one file, and "_luminance" is appended to the other. For example, if you type **house** as the file name, the exporter renders to *house_illuminance.pic* and *house_luminance.pic*.

You can also open and save high-dynamic-range images in the PIC format using the Radiance

Image File format in input and output file browsers in 3ds Max. For further information, see *HDRI Files (page 3–663)*.

See also

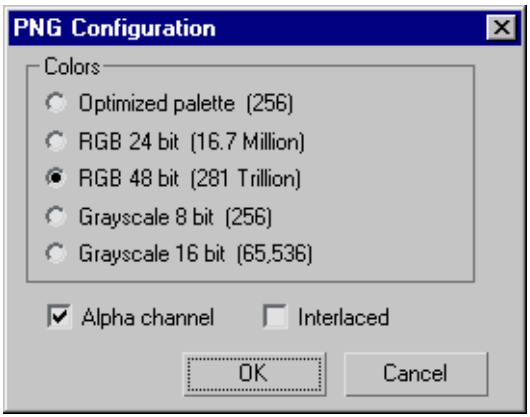
Radiosity Workflows (page 3–56)

PNG Files

PNG (Portable Network Graphics) is a still-image file format developed for use with the Internet and World Wide Web.

Interface

Clicking Render or Setup in the *Render Output File dialog (page 3–8)* displays the PNG Configuration dialog.



Optimized palette (256)—Choose to render a smaller, 8-bit color file.

RGB 24 bit (16.7 Million)—Choose to render a true color (24-bit) file.

RGB 48 bit (281 Trillion)—Choose to render a 48-bit color file.

Grayscale 8 bit (256)—Choose to render a grayscale image with 256 shades.

Grayscale 16 bit (65,536)—Choose to render a grayscale image with 65,536 shades.

Alpha Channel—Turn on to save the alpha channel with the file.

Interlaced—Turn on to make the file interlaced for faster display in Web browsers.

PSD Files

PSD is the file-name extension for graphics files native to Adobe Photoshop. This image format supports multiple layers of images superimposed to get the final image. Each layer can have any number of channels (R, G, B, Mask, and so on). It is a powerful file format because multiple layers can contribute to a variety of special effects.

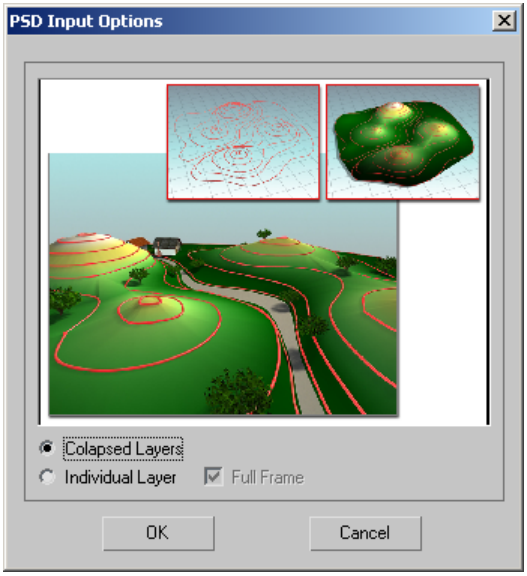
Adobe provides many different modes of superimposing layers, including normal, darken, lighten, difference, multiply, screen, dissolve, hard light, hue, saturation, color, luminosity, overlay, and soft light.

You can use PSD files as bitmaps, viewport backgrounds, and so on. You can't render to a PSD file.

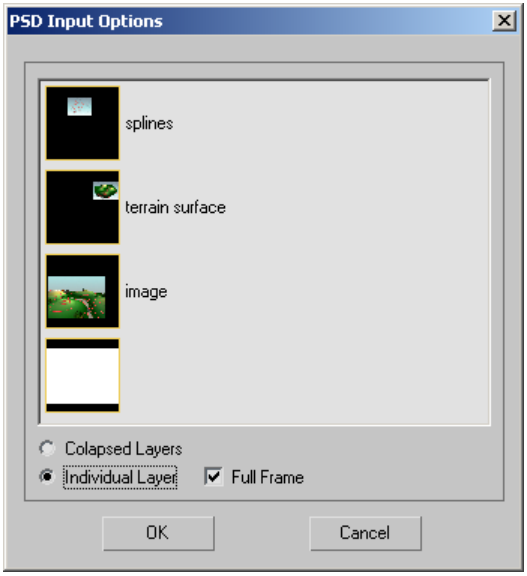
3ds Max supports Photoshop 6.0 format, and allows you to use image layers as bitmaps, as well as the entire composited graphic.

Interface

When you open a PSD file as a bitmap, a dialog appears that lets you choose how to use the image.



Collapsed Layers displays the entire image.



Individual Layer displays list of layers to choose from.

Collapsed Layers—(The default.) Uses the entire composited image.

Individual Layer—Uses a single layer of the image. When you choose this, the dialog shows a list of the layers, with a thumbnail of each, and the layer names. Click a layer to choose it, then click OK.

Full Frame—When on, uses the entire layer as the bitmap. When off, uses only that portion of the layer occupied by image data. Default=on.

Limitations

Bits Per Channel—Photoshop supports images with 1, 8, and 16 bits per channel (1-, 24-, and 48-bit RGB images, respectively). 3ds Max supports PSD images with 8 or 16 bits per channel. (In practice, there are very few images with 1 bit per channel.) While Photoshop can load images with 16 bits per channel, layers are always 8 bits per channel.

Modes—3ds Max supports *.psd* files saved in the following modes:

- RGB
- Grayscale

3ds Max doesn't support the following Photoshop modes:

- Indexed Color
- Bitmap
- Duotone

- CMYK Color
- Lab Color
- Multichannel

Non-Image Layers—Layers other than image layers (for example, text layers) are not supported. In Photoshop, you can "rasterize" a non-image layer to make it an image.

Compositing Options—Compositing options between image layers, which require processing by Photoshop, are not supported.

RLA Files

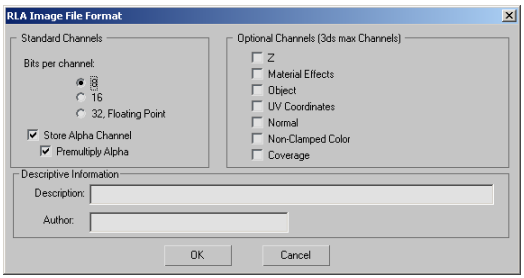
The RLA format is a popular SGI format that supports the ability to include arbitrary image channels. While setting up a file for output, if you select RLA Image File from the list and click the Setup button, you'll go to the RLA setup dialog. Once there, you can specify what channels (and what format) you want to write out to the file.

See also

RPF Files (page 3–681)

Interface

When RLA is the chosen output format, clicking Render or Setup on the *Render Output File dialog (page 3–8)* displays the RLA Image File Format dialog.



Standard Channels group

The standard channels are RGB color and the alpha (transparency) channel.

Bits per Channel—Choose 8, 16, or 32 Floating Point as the number of bits per channel. Default=8.

Store Alpha Channel—Choose whether to save the alpha channel. Default=on.

Premultiply Alpha—When on, premultiplies the alpha channel. Default=on.

Premultiplying saves computation time if you later use this image in compositing. For more information, see *Premultiplied Alpha (page 3–1091)*.

Optional Channels group

For output RLA files, there are eight additional channels that you can generate (and view in the rendered frame window):

Z Depth—Displays Z-Buffer information in repeating gradients from white to black. The gradients indicate relative depth of the object in the scene.

Material Effects—Displays the Effects Channel used by materials assigned to objects in the scene. The Effects Channel is a material property set in the Material Editor and used during Video Post compositing. Each Effects Channel ID is displayed using a different random color.

Object—Displays the *G-Buffer (page 3–1040)* Object Channel ID assigned to objects using the Object Properties dialog. The G-Buffer ID is used during Video Post compositing. Each G-Buffer ID is displayed using a different random color.

UV Coordinates—Displays the range of UV mapping coordinates as a color gradient. This channel shows where mapping seams might occur.

Note: UV Coordinates will not be displayed on objects that have the UVW Map Modifier applied

unless a map has been applied that uses the coordinates.

Normal—Displays the orientation of normal vectors as a grayscale gradient. Light gray surfaces have normals pointing toward the view. Dark gray surfaces have normals pointing away from the view.

Non Clamped Color—Displays areas in the image where colors exceeded the valid color range and were corrected. The areas appear as bright saturated colors usually around specular highlights.

Coverage—This saves the coverage of the surface fragment from which other G-buffer values (Z Depth, Normal, and so on) are obtained. Z-Coverage values range from 0 to 255. To see Z Coverage, render to an RLA file after first checking Z Coverage in the Setup subdialog, then choose Z-Coverage in the rendered frame window's Viewing Channel drop-down list.

The Z-Coverage feature is provided primarily for developers, and should aid in the antialiasing of Z-buffers.

Descriptive Information group

This information is saved with the file.

Description—You can enter descriptive text here.

Author—You can enter your name here.

RPF Files

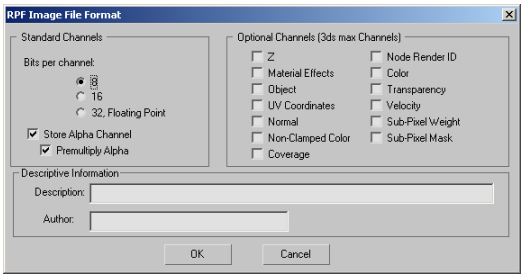
RPF (Rich Pixel Format) is the format that supports the ability to include arbitrary image channels. While setting up a file for output, if you select RPF Image File from the list, you'll go to the RPF setup dialog. Once there, you can specify what channels you want to write out to the file.

RPF files replace RLA files as the format of choice for rendering animations requiring further post-production or effects work. Many channels available in RPF files are exclusive to this format.

Tip: When you create a scene you plan to render as an RPF file for use with the Autodesk Combustion™ product, turn on Render Occlude Objects (on the *Object Properties dialog (page 1–111)*) for objects in the scene. This is important if you want to use the Combustion G-Buffer Extract feature. When Render Occluded Objects is enabled and you extract an object in Combustion, the objects behind it are drawn correctly. If Render Occluded Objects is disabled (the default), objects behind the extracted object appear with black holes where they were occluded.

Interface

When RPF is the chosen output format, clicking Render or Setup on the *Render Output File dialog (page 3–8)* displays the RPF Image File Format dialog.



Standard Channels group

The standard channels are RGB color and the alpha (transparency) channel.

Bits per Channel—Choose 8, 16, or 32 Floating Point as the number of bits per channel. Default=8.

Store Alpha Channel—Choose whether to save the alpha channel. Default=on.

Premultiply Alpha—When on, premultiplies the alpha channel. Default=on.

Premultiplying saves computation time if you later use this image in compositing. See *Premultiplied Alpha (page 3–1091)* for more information.

Optional Channels group

For output RPF files, there are additional channels that you can generate (and view in the rendered frame window):

Z—Saves Z-Buffer information in repeating gradients from white to black. The gradients indicate relative depth of the object in the scene.

Material Effects—Saves the Effects Channel used by materials assigned to objects in the scene. The Effects Channel is a material property set in the Material Editor and used during Video Post compositing. Each Effects Channel ID is displayed using a different random color.

Object—Saves the G-Buffer Object Channel ID assigned to objects using the Object Properties dialog. The G-Buffer ID is used during Video Post compositing. Each G-Buffer ID is displayed using a different random color.

UV Coordinates—Saves the range of UV mapping coordinates as a color gradient. This channel shows where mapping seams might occur.

Note: UV Coordinates will not be displayed on objects that have the UVW Map Modifier applied unless a map has been applied that uses the coordinates.

Normal—Saves the orientation of normal vectors as a grayscale gradient. Light gray surfaces have normals pointing toward the view. Dark gray surfaces have normals pointing away from the view.

Non Clamped Color—Saves areas in the image where colors exceeded the valid color range and were corrected. The areas appear as bright saturated colors usually around specular highlights.

Coverage—Saves the coverage of the surface fragment from which other G-buffer values (Z Depth, Normal, and so on) are obtained. Z-Coverage values range from 0 to 255. To see Z Coverage, render to an RLA file after first checking Z Coverage in the Setup subdialog, then choose Z-Coverage in the rendered frame window's Viewing Channel drop-down list.

The Z-Coverage feature is provided primarily for developers, and should aid in the antialiasing of Z-buffers.

Node Render ID—Saves each object as a solid color according to its G-Buffer Object channel (found under Object Properties).

Color—Saves the color returned by the material shader for the fragment. This channel displays any transparent fragment as a solid color.

Transparency—Saves transparency returned by the material shader for the fragment. Any fragment with any degree of transparency will be rendered as a solid gray object.

Velocity—Saves the velocity vector of the fragment relative to the screen in screen coordinates.

Sub-Pixel weight—Saves the sub-pixel weight of a fragment. The channel contains the fractions of the total pixel color contributed by the fragment. The sum of all the fragments gives the final pixel color. The weight for a given fragment takes into account the coverage of the fragment and the transparency of any fragments that are in front of a given fragment.

Sub-Pixel Mask—Saves the sub-pixel alpha mask. This channel provides a mask of 16 bits (4x4) per pixel, used in antialiased alpha compositing. This mask is especially useful with the Combustion compositing product.

Descriptive Information group

This information is saved with the file.

Description—You can enter descriptive text here.

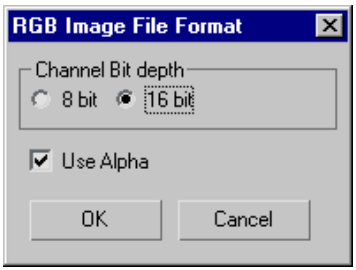
Author—You can enter your name here.

RGB (SGI Image) Files

The SGI™ Image File format is a bitmap file type created by Silicon Graphics®. SGI Image File support in 3ds Max lets you load and save files in both 8- and 16-bit color depth, with alpha channels, and RLE Compression.

Interface

Clicking Render or Setup in the *Render Output File dialog (page 3–8)* displays the RGB Image File Format dialog.



Channel Bit Depth group

8 Bit—Saves the RGB file as 8-bit color.

16 Bit—Saves the RGB file as 16-bit color.

Use Alpha toggle

Use Alpha—Saves Alpha channels with the RGB file.

TGA (Targa) Files

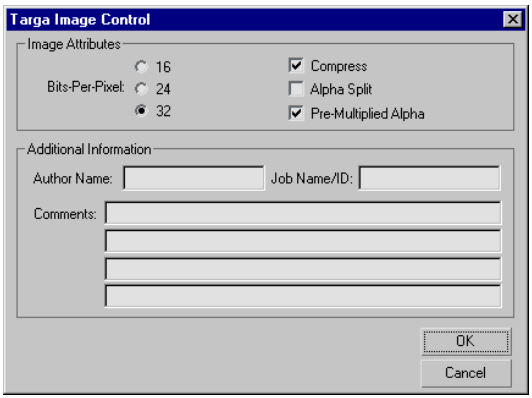
The Targa (TGA) format was developed by Truevision for their video boards. The format supports 32-bit true color; that is, 24-bit color plus an alpha channel, and is typically used as a true color format.

Targa files are widely used to render still images and to render sequences of still images to video tape.

Some Targa files created by other applications have different file-name extensions. 3ds Max can render the *.vda*, *.icb*, and *.vst* variants as well as *.tga*.

Interface

Clicking Render or Setup in the *Render Output File dialog (page 3–8)* displays the Targa Image Control dialog.



When you render to a Targa file, you have the following options:

Image Attributes group

Bits-Per-Pixel—Choose the color depth: 16-bit, 24-bit, or 32-bit.

Compress—Applies lossless compression to the file.

Alpha Split—Creates a separate file for the alpha channel. The file name created for the alpha-channel file starts with a_ and then appends the full file name. For example, if you check this box and render the file *greek004.tga*, 3ds Max creates the file *a_greek004.tga* for the alpha channel. (Sometimes the name will be longer than 8 characters.)

Pre-Multiplied Alpha—When on, pre-multiplies the alpha channel. Pre-multiplying saves computation time if you later use this image in compositing. See *Premultiplied Alpha (page 3–1091)*.

Additional Information group

Author Name, Job Name/ID, Comments—These fields are available for you to add information about the file.

Note: To control whether or not the renderer uses the environment map's alpha channel in creating the alpha for the rendered image, choose Customize > Preferences > Rendering, and then turn on Use Environment Alpha in the Background Antialiasing group.

If Use Environment Alpha is turned off (the default) the background receives an alpha of 0 (completely transparent). If Use Environment Alpha is turned on, the alpha of the resulting image is a combination of the scene and background image's alpha. Also, when writing TGA files with Pre-Multiplied Alpha set to off, turning on Use Environment Alpha prevents incorrect results. Note that only background images with alpha channels or black backgrounds are supported when compositing in other programs such as Photoshop.

TIFF Files

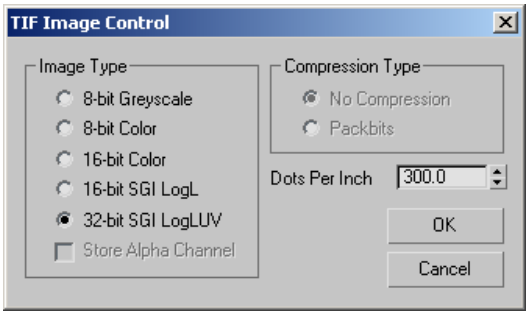
TIFF (Tagged Image File Format) is a multiplatform *bitmap (page 3–1011)* format originating on the Macintosh® and in desktop-publishing applications. TIFF is a common choice if you plan to send your output to a print service bureau or import the image into a page-layout program.

There are several classes of TIFF files, each varying in the color depth and color palette that they support.

You can render TIFF files with alpha, *luminance (page 3–1058)*, and UV color coordinate information, which describes *illuminance (page 3–1049)*. You also have the option to render a compressed image. Luminance and illuminance data are rendered by the *Lighting Data Exporter utility (page 3–299)*.

Interface

To open the TIF Image Control dialog, click Save or Setup on the *Render Output File dialog (page 3–8)*.



When you render to a TIFF file, you have the following options:

Monochrome—Creates an 8-bit grayscale image.

Color—Creates a 24-bit color image (no alpha channel).

Image Type group

Lets you select which image information to save.

8-bit Greyscale—Creates an 8-bit grayscale image.

8-bit Color—Creates an 8-bit color image.

16-bit Color—Creates an 16-bit color image.

16-bit SGI LogL—Creates a color image that also includes a logarithmic encoding of the luminance channel.

32-bit SGI LogLUV—Creates a color image that includes a logarithmic encoding of the luminance channel and UV color coordinate information.

Store Alpha Channel—When on, stores the alpha channel along with other image data. Alpha data adds 8 bits per pixel to the image type you selected.

Compression Type group

Lets you render a compressed TIFF file. Default=No Compression.

No Compression—Does not compress the rendered image.

Packbits—Uses the TIFF Packbits algorithm to compress the file.

Dots Per Inch—Sets the dots per inch (dpi) for the saved image. This setting does not change the resolution of the final image, but can affect the way it prints in documents.

YUV Files

YUV files are still-image graphics files in the Abekas Digital Disk format.

YUV is supported only as an input file format. You can use YUV files as general-purpose bitmaps, but you can't render to a YUV file.

RAM Player

Rendering menu > RAM Player

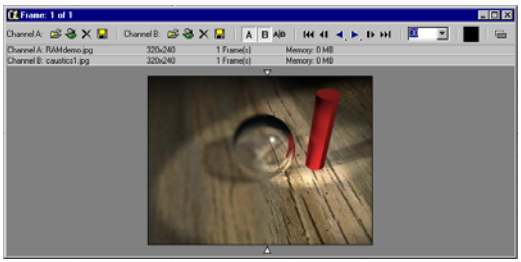
The RAM Player loads a frame sequence into RAM and plays it back at selected frame rates.

The RAM Player has a channel A and a channel B. Two different sequences can be loaded into the channels to play back together, giving you the ability to compare them.

Clicking and dragging in the channel display window allows you to set the A/B divider between the two channels. The right mouse button "scrubs" the animation through all of its frames. Hold the right mouse button and move the mouse left to move the animation back to the first frame. Move the mouse right to advance the animation to its end.

For best RAM Player performance, Gamma should not be enabled in Customize > Preferences > Gamma.

Interface



Channel A/B

Open Channel—Displays an Open File dialog that lets you select a file to load into the channel. After you have selected a file, the *RAM Player Configuration dialog (page 3–687)* appears that allows you to set height, width, and memory usage for that channel.

Open Last Rendered Image—Loads the last rendered image into the channel. Nothing is displayed if there is no last rendered image available.

Close Channel—Unloads the image in the channel and frees up your memory.

Save Channel—Displays a Save File dialog that lets you save the animation or image from the respective channel. You can save the animation as a *.avi* file or a numbered sequence of images.

Note: The RAM Players converts everything it loads into 24-bit RGB which means that some information may be lost when it is loaded. This may affect a file saved in the RAM Player.

Channel A—When selected, this button will show the file loaded into channel A. Split screen markers are displayed if both channels are enabled. The split screen markers are represented by two triangles. These markers indicate where channel A ends and channel B begins. You can move the divider using the left mouse button.

Channel B—When selected, this button will show the file loaded into channel B. Split screen markers are displayed if both channels are enabled. The split screen markers are represented by two triangles. These markers indicate where channel A ends and channel B begins. You can move the divider using the left mouse button.

Horizontal/Vertical Split Screen—Toggles between the view of the two channels side-by-side or one on top of the other.

Frame Controls

First Frame—Automatically returns the RAM Player to the first frame of the animation. If the RAM Player is at the first frame, First Frame returns the animation to the last frame.

Previous Frame—Backs up the RAM Player to the previous frame in the animation. If the RAM Player is at the last frame, Previous Frame returns the animation to the first frame.

Playback Reverse—Plays the frames in the animation in reverse order. The flyout contains an option to play the animation once and then stop.

Playback Forward—Plays the frames in the animation in rendered order. The flyout contains an option to play the animation once and then stop.

Next Frame—Advances the RAM Player to the next frame in the animation.

Last Frame—Automatically places the RAM Player at the last frame of the animation.

Frame Rate Control—Sets the desired frame rate in frames per second. When playing back a movie, you see the frame rate displayed in the title bar of the RAM Player. You can select a predefined frame rate or type in your own frame rate value.

Color Selector—CTRL+right-clicking the mouse in the display window displays the color of the pixel in the color selector swatch. Stop the animation to get a correct pixel reading. The RGB of the pixel is also displayed in the title bar of the RAM player.

Double Buffer—Selecting Double Buffer ensures that the two frames in channels A and B are synchronized. Enabling this function has a substantial impact on the maximum frame rate.

RAM Player Keyboard Shortcuts

The following keyboard shortcuts are available for the RAM Player.

RAM Player Function	Keyboard Shortcut
Go To Start Frame	HOME
Go To End Frame	END
Go To Previous Frame	LEFT ARROW
Go To Next Frame	RIGHT ARROW
Playback Reverse	UP ARROW
Playback Forward	DOWN ARROW
Stop Playback	ESC or CTRL+C
Toggle Playback or Stop	SPACEBAR
Toggle Channel A On/Off	A
Toggle Channel B On/Off	B

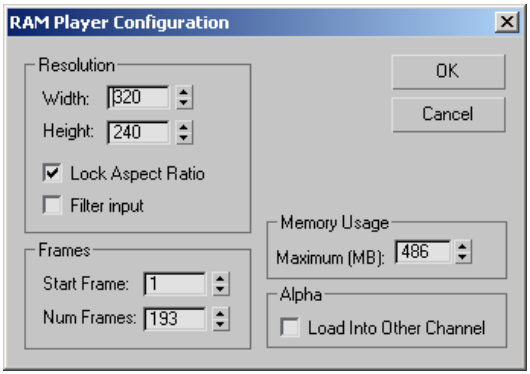
RAM Player Function	Keyboard Shortcut
Open File in Channel A	CTRL+A
Open File in Channel B	CTRL+B
Open Last Rendered Image in Channel A	ALT+A
Open Last Rendered Image in Channel B	ALT+B
Scrub Animation	CTRL+left mouse button or right mouse button

RAM Player Configuration Dialog

Rendering menu > RAM Player > Load a file into either channel. > RAM Player Configuration dialog

The RAM Player Configuration dialog contains controls for resolution, frames, memory usage, and alpha channel for playing back animations.

Interface



Resolution group

Width—Defines the width at which the file is loaded.

Height—Defines the height at which the file is loaded.

Lock Aspect Ratio—When turned on, Lock Aspect Ratio forces the file to load at the same aspect ratio, regardless of the Width and Height values you enter.

If you change the Width of the file, the Height adjusts according to the file's original aspect ratio. Adjusting the Height does the same to the Width value.

Filter Input—When turned on, Filter Input filters the image or animation so that it best maintains the quality of the original file. When turned off, filtering does not occur, and the image or animation could be distorted.

Frames group

Start Frame—Specifies a certain frame in an animation where you want the RAM Player to begin loading. A value of 1 would start the animation at its rendered beginning. A value of 5 would start the animation on frame five and any frame before that would not be loaded.

Num Frames—Specifies the total number of frames to be loaded into the RAM Player.

Memory Usage group

Maximum—Lets you configure the maximum amount of memory to use for the RAM player. This value includes both channels.

Alpha group

Load Into Other Channels—When turned on, this option loads a grayscale alpha channel into the other channel. This allows you to wipe between an RGB channel of the animation and the alpha channel of the animation.

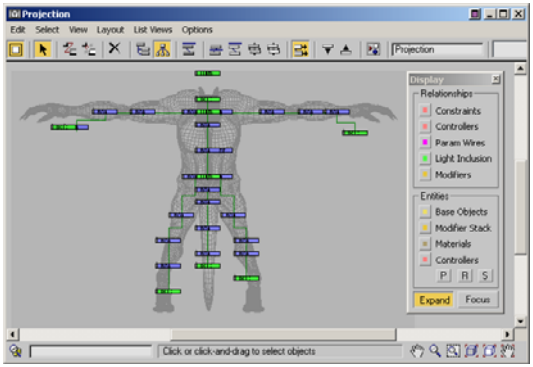
Schematic View

Schematic View Window

Menu bar > Graph Editors > New Schematic View
Menu bar > Graph Editors > Saved Schematic Views > Choose a saved schematic view.
Main toolbar > Schematic View button

The Schematic View is a node-based scene graph that gives you access to object properties, materials, controllers, modifiers, hierarchy, and non-visible scene relationships such as wired parameters and instancing.

Here, you can view, create, and edit relationships between objects. You can create hierarchies, assign controllers, materials, modifiers, or constraints.



You can use the Schematic View Display floater to control what entities and relationships you want to see and work with. Use Schematic View to navigate complex hierarchies or scenes with large numbers of objects. Use Schematic View to understand and explore the structure of files you didn't create yourself.

One powerful feature is the list view. You can see the nodes in a text list which you can sort by criteria. The list views can be used to navigate extremely complex scenes quickly. You can use the relationship or instance viewer within Schematic View to see light inclusions or parameter wirings within the scene. You can control the display of instances or see a list of object occurrences.

Schematic View also allows for background image or grid, and automatic arrangement of nodes based on physical scene placement. This makes arranging nodes for character rigs easier.

Choose between a variety of arrangement selections so you can auto-arrange, or work in a free mode. The layout of the nodes is saved with the named Schematic View window. You can load a background image as a template for laying out the nodes in the window.

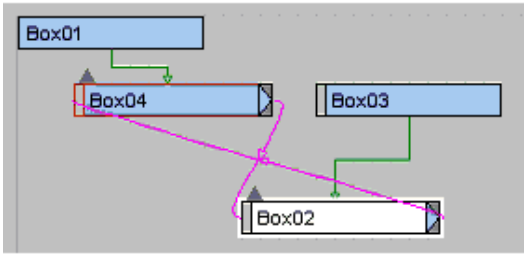
Schematic View Features

Here are some of the notable features of Schematic View:

- Layouts are saved with the named Schematic View file.
- Text remains readable during window navigation.
- Schematic View includes new tools for displaying and arranging nodes including a new free mode.
- You can use a background image or grid in the Schematic View window.
- You can see and edit wired parameters.
- A new modeless display floater lets you turn on and off node display by category.
- A new Relationship List Viewer has been added, for quick navigation and selection of nodes. Relationships displayed includes Lights inclusion/exclusion, all parameter wires, constraints, controllers, and modifier relationships such as path deform paths and morph targets
- You can now copy and instance controllers.

- You can assign new controller types.
- Schematic View offers extensive MAXScript exposure.
- Performance has been substantially improved.
- Ability to drill down to more properties (such as static values and custom attributes).

How the Components of Schematic View Behave



Everything displayed in the Schematic View window is shown as a box with a name. There are various conventions to indicate different states regarding these objects.

Solid End—Signifies that the entity is arranged.

Open end—Signifies that the entity is free.

Red Border—Signifies that the entity is animated.

End Arrow—Signifies that the entity shares a relationship with another entity.

White Fill—Signifies that the entity is selected in the Schematic View window.

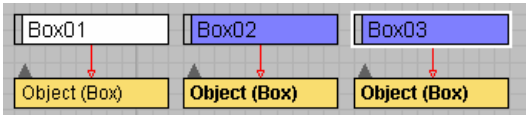
White Border— Signifies that the entity is selected in the viewport.

Up Arrow—Collapses the entity it springs from and all child entities thereof up into the parent entity

Down Arrow—Expands the next child entity down from the entity that the arrow springs from.

Overlap—Schematic View will prevent newly visible nodes from overlapping with existing nodes. This applies to free mode: make an object, free it, make another object and it will fall on top but to the right of the original object so both can be accessed and moved.

Instances—Schematic View will bold the text of instanced entities, for nodes this will show up on the base object entity. In the example illustrated, *Box02* and *Box03* are instances.



Procedures

See *Using Schematic View (page 3–690)*

Interface

See the following topics describing the Schematic View user interface.

Schematic View Menus (page 3–692)

Schematic View List Views (page 3–694)

Schematic View Preferences Dialog (page 3–695)

Schematic View Toolbars (page 3–699)

Schematic View Display Floater (page 3–701)

See also

New Schematic View (page 3–702)

Delete Schematic View (page 3–702)

Delete Schematic View Dialog (page 3–702)

Saved Schematic Views (page 3–702)

Schematic View Selection Right-Click Menu (page 3–702)

Using Schematic View

This topics includes procedures for using functionality in the *Schematic View window (page 3–688)*.

To create hierarchies with Schematic View:

1. Select the objects you want to work with in the viewport.
2. Use Zoom Extents Selected to display these objects in the Schematic View window.
3. On the Schematic View toolbar, click the Connect button.
4. In the Schematic View window, drag from the child object to the parent. A dotted line follows your cursor. Click to set the linkage.

   If you are in Hierarchy mode, the children will arrange themselves into an indented list under the parent as you create linkages.

To assign controllers with Schematic View:

1. On the Schematic View toolbar, click Display.

   The Display floater appears. It lets you control what you see in the Schematic View window.
2. On the Display floater, in the Relationships group, click Controllers. In the Entities group, click Controllers as well.

   The buttons indent to show they are active. The Transforms now appear in the Schematic View window.
3. In the Schematic View window, select the transform of the object you want to assign a controller to.
4. Right-click the transform, from on the Tools quad, choose Assign Controller.
5. Choose the controller you want to apply from the list, then click OK.

To wire parameters with Schematic View:

1. Using the Display Floater, turn on Param Wires in the Relationships group.
2. In the Schematic View window, select one of the objects you want to wire.
3. Right-click the selected object and choose Wire Parameters.
4. In the pop up that appears select the component you want to wire, either a Transform or an Object parameter, for instance.
5. Drag to the other object you want to wire to.
6. Again in the pop up that appears, select the component you need to wire to.
7. The Wire Parameters dialog appears. Make the necessary selections and connect the wires.
8. Once the wiring is established you can edit the wiring by double-clicking *the wire* in Schematic View.

To save a Schematic View layout:

1. When you have a layout you like, name the layout using the Schematic View name field in the toolbar, just to the right of the Preferences button.
2. Close the Schematic View window.
3. To load the saved view, go to Graph Editors > Saved Schematic View and choose the schematic view from the history list.

To add a background image:

1. On the Schematic View Options menu, choose Preferences.
2. In the Background Image group, click the File: button to launch the File Browser.
3. In the Browse Images for Input dialog, find and highlight the bitmap you want to use, then click Open.
4. On the Schematic View Preferences dialog, in the Background group, turn on Show Image.

   The Background bitmap show up in the Schematic View window.

   Tip: Turn on Lock Zoom Pan, if you want to zoom in or pan the background image.

To navigate complex scenes:

Complex scenes can be navigated quickly by using the list viewer combined with the pan or zoom to selected option. For example suppose you need to locate all the bones within a certain character.

1. Open Schematic View
2. Press **H** on the keyboard and enter the name of the object you're looking for in the Select Objects field. Press Enter to select the object by name.
3. On the window navigation tools press Zoom Selected.

   The Schematic View window now clearly shows the object node.
4. On the List Views menu, choose Show Occurrences.

   The List viewer displays the Object Occurrences dialog.

   This is a sortable list. You can click the header title to sort by it.

   Note: Object Occurrence is being used as an example here. You can use any of the List View menu choices to display a list of objects based on a certain relationship.
5. On the Options menu choose Pan to Selected. Now click through the nodes in the list.

   The Schematic View window updates to display each node as you click.

   This method makes navigation of very complex scenes much more convenient. Also when working with lists such as relationships or instances you have the additional ability to detach the relationship or make the instance unique.

To arrange the nodes in Schematic View to match the viewport:

It can be useful sometimes to arrange the nodes in the Schematic View the same as in the viewport. There is a script that can do this for you. In this example we'll use the bones of a character rig.

1. Using Windows Explorer, copy *|3dsmax|scripts|maxscripttools|macro_schematicviewtools.mcr* into *|3dsmax|ui|macroscripts*.
2. Restart 3ds Max.
3. On the Customize menu, choose Customize User Interface.
4. Click the Quads tab, then choose the Schematic View category from the drop-down list on the right
5. Drag the action named Project into Schematic View in the Schematic View quad menu (any quad you like).
6. Drag the Spacing Tool item into Schematic View's quad menu.
7. On the Graph Editors menu, choose New Schematic View.

8. In any viewport (other than Perspective or User), select the bones of the rig that you want to arrange.
9. In the Schematic View window, right-click and choose Project Into Schematic View from the quad menu.

   A new Schematic View named Projection shows the selected bones arranged as in the viewport.

   Tip: If the components appear on top of one another, right-click again and choose Spacing Tool from the quad menu. Drag the spacing slider to the right to add space between the objects. If necessary manually reposition components as needed.

Schematic View Menus

Menu bar > Graph Editors > New Schematic View > Menu bar
Menu bar > Graph Editors > Saved Schematic Views > Choose a saved schematic view. > Menu bar
Main toolbar > Schematic View button > Menu bar

Edit Menu

Connect—Activates the connect tool. The connect tool in Schematic View can be used to create any relationship or constraint, are can be used to assign modifiers.

Unlink—Disconnects the selected entities.

Delete—Removes entities from Schematic View and from the scene. Disconnects selected relationships.

Assign Controllers—Let's you assign controllers to transform nodes. Only available when controller entities are selected. Opens the standard assign controller dialog.

Wire Parameters—Let's you wire parameters using Schematic View. This is active only when entities are selected. This launches the standard Wire Parameters dialog.

Edit Object Properties—Displays the Object Properties dialog for selected nodes. This is unavailable when no nodes are selected.

Select Menu

Select tool—Activates the Select tool when in Always Arrange mode and Select and Move tool when not.

Select all—Selects all entities in the current Schematic View.

Select none—Deselects all entities in the current Schematic View.

Select invert—Deselects selected entities and selects unselected entities in the current Schematic View.

Select children—Selects all children of currently selected entities.

Deselect children—Deselects children of all selected entities. Parent and child must be selected for child to become unselected.

Select to scene—Selects in viewport all nodes that are selected in Schematic View. This is unavailable when Sync Selection is active

Select from scene—Selects in Schematic View all nodes that are selected in viewport. This is unavailable when Sync Selection is active.

Sync Selection—Creates a mode that lets you select objects in the Schematic View and have them instantly selected in the viewport, as well as select them in the viewport and have them instantly selected in the Schematic View. This menu selection toggles Sync Selection on and off.

View Menu

Pan Tool—Activates the pan tool. Lets you move horizontally or vertically in the window.

Zoom Tool—Activates the zoom tool. Lets you move closer to or further from the Schematic display.

Zoom Region Tool—Lets you draw a zoom window on the area of the Schematic view you want to see up close.

Zoom Extents—Zooms the window back so all the nodes in the Schematic View are visible.

Zoom Extents Selected —Zooms the window back so that all the selected nodes are visible in the display.

Show Grid—Displays a grid in the background of the Schematic View window.

Show Background—Displays an image in the background of the Schematic View window.

Refresh View—Redraws the contents of the Schematic View window with all changes made to it or with changes made in the scene.

Layout Menu

Display Floater—Displays or hides the Display Floater which controls what is displayed in the Schematic View window.

Align—Lets you define the following alignment options:

- **Left**—Aligns selected entities to the left edge of the selection, leaving vertical positioning intact.
- **Right**—Aligns selected entities to the right edge of the selection, leaving vertical positioning intact.
- **Top**—Aligns selected entities to the top edge of the selection, leaving horizontal positioning intact.
- **Bottom**—Aligns selected entities to the bottom edge of the selection, leaving horizontal positioning intact.
- **Center Horizontal**—Aligns selected entities to the horizontal center of the selection, leaving vertical positioning intact.
- **Center Vertical**—Aligns selected entities to the vertical center of the selection, leaving horizontal positioning intact.

Expand Selected—Reveals the display of all child entities of selected entity.

Collapse Selected—Hides the display of all children of selected entity, leaving the selected entity visible.

Hide Selected—Performs the action of hiding whatever is selected in the Schematic View window.

Show All—Displays everything in the scene in the Schematic View window.

Arrange Children—Arranges the display of children based on set arrangement rules (align options) below the selected parent.

Arrange Selected—Arranges the display of children based on set arrangement rules (align options) below the selected parent.

Free Selected—Frees all selected entities from arrangement rules, tags them with a hole icon on their left end and leaves them in place. Use this to freely arrange selected objects.

Free All—Frees all entities from arrangement rules, tags them with a hole icon on their left end and leaves them in place. Use this to freely arrange all objects.

Shrink Selected—Hides all selected entities' boxes, keeps arrangement and relationships visible.

Unshrink Selected—Makes all selected shrunk entities visible.

Unshrink All—Makes all shrunk entities visible.

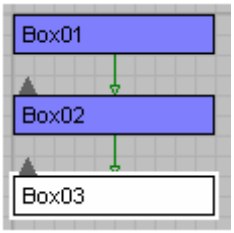
Toggle Shrink—Changes the state of entity shrinkage. Shrunk entities become unshrunk, and the other way around.

Options Menu

Always Arrange—Sets Schematic View to always arrange all entities based on the chosen arrangement preference. Displays a pop-up warning before doing so. Choosing this activates the toolbar button.

Hierarchy Mode—Sets Schematic View to display entities as a hierarchy instead of reference graph. Children appear indented below the parent. Switching between Hierarchy and Reference mode is nondestructive.

Reference Mode—Sets Schematic View to display entities as a reference graph instead of hierarchy. Switching between Hierarchy and Reference mode is nondestructive.



Move Children—Sets Schematic View to move all children of parent being moved. When this mode is on, the toolbar button is activated.

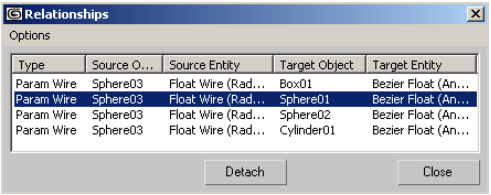
Preferences—Opens the *Schematic View Preferences Dialog (page 3–695)*. Here you control what displays in the window by filtering for categories and setting display options.

Schematic View List Views

Menu bar > Graph Editors > New Schematic View > Menu bar
Menu bar > Graph Editors > Saved Schematic Views > Choose a saved schematic view. > Menu bar
Main toolbar > Schematic View button > Menu bar

Schematic View supports several list views that display objects and their relationships in a list. These include list views for instances, object occurrences, and relationships. Use these lists to quickly edit your parameter wiring, detach relationships, or make instances unique. Use the List options to synchronize the list with the viewport or the node display in the Schematic View window.

Interface



List view displaying relationships

All Relationships—Opens or redraws List View with all relationships of currently displayed Schematic View entities.

Selected Relationships—Opens or redraws List View with all relationships of currently selected Schematic View entities.

All Instances—Opens or redraws List View with all instances of currently displayed Schematic View entities.

Selected Instances—Opens or redraws List View with all instances of currently selected Schematic View entities.

Show Occurrences— Opens or redraws List View with all entities that share a property or relationship type with currently selected entities

All Animated Controllers—Opens or redraws List View with all entities that have or share animated controllers.

Make Unique—In the All Instances and Selected Instances views, this makes the selected entity a copy and takes it out of the list.

Detach—In the All Relationships and Selected Relationships views, eliminates the selected relationship and takes it out of the list.

Options Menu in the List View Dialogs

Options for list view let you synchronize the list selection with the viewport and the Schematic View window.

Sync selection—When this is turned on, Schematic View selection corresponds to selections made in the list.

Pan to Selected—When this is turned on, Schematic View pans to put the entity selected in the list into the center of the Schematic View within the existing zoom factor. For Instances and Occurrences this will be single entities, for Relationships it will be two entities.

Zoom to Selected—When this is turned on, Schematic View zooms extents around the entity selected in the list. For Instances and Occurrences this will be single entities, for Relationships it will be two entities

Respect display—When this is turned on, the List View will only show entities turned on for display by the Display Floater.

Schematic View Preferences Dialog

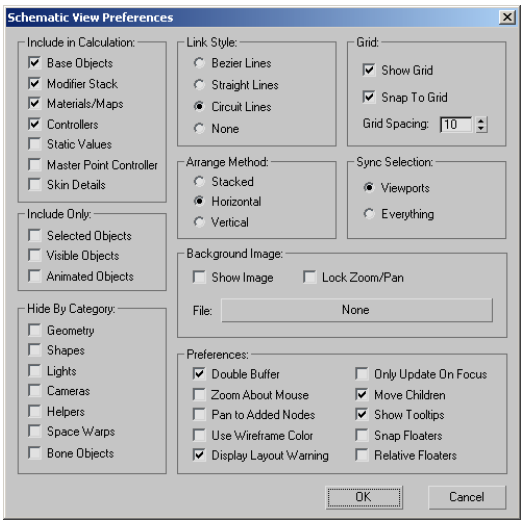
Menu bar > Graph Editors > New Schematic View > Display > Filters

Menu bar > Graph Editors > Saved Schematic View > Open any existing Schematic View > toolbar > Preferences button.

The Schematic View Preferences dialog controls what is shown and what is hidden based on categories. You can filter the objects appearing in the Schematic View window, so you only see what you need to.

You can add a grid or background image into your Schematic View window. Here you can also choose the arrangement method and determine the synchronization between viewport selection and Schematic view window selection. You can also set the style for the node connections. By selecting the appropriate filters in this dialog you can make working with Schematic View more controllable.

Interface



Include in Calculation group

Schematic View can traverse the entire scene, including materials, maps, controllers, and so on. The Include In Calculation settings control which scene components Schematic View will know about. The Display Floater then controls what is displayed. So, if you don't Include Materials, you can't display materials. If you don't include controllers, you can't display controllers, constraints, or parameter-wiring relationships.

If you have a huge scene and are interested only in using Schematic View for selection, you can turn everything off except Base Objects. If you are interested only in materials, you can turn off controllers, modifiers, and so on.

Base Objects—Turns on and off the display of the base objects. Use this to remove clutter in the Schematic View window.

Modifier Stack—Turns on and off the display of modifier nodes.

Materials/Maps—Turns on and off the display of material nodes in the Schematic View window. Hide the materials when you are animating and don't need to see them, display them when you want to select materials or make changes to the material of various objects.

Note: Schematic View does not support the ability to manipulate maps. You can not paste a map from one material to another.

Controllers—When this is turned on, controller data is included in the display. When this is turned off Controllers, Constraints and Param Wires relationship and entity buttons are unavailable in the Display floater. When this is on, you can assign controllers or wire parameters using the tools quad of the Schematic View right-click menu.

Static Values—When this is turned on, unanimated scene parameters are included in the Schematic View display. Turn this off to prevent the window from filling up with everything seen in Track View.

Master Point Controller— When this is on, sub-object animation controllers are included in the Schematic View display. This button prevents the window from filling up with too many controllers in cases in which sub–object animation is present.

Skin Details—When this is turned on four controllers for each bone in the Skin modifier are included in the Schematic View display (when Modifiers and Controllers are also included). This button prevents the window from stretching out around too many Skin controllers with normal use of the Skin modifier.

Include Only group

Selected Objects—Filters the display of selected objects. Check this box if you have a lot of objects and only want Schematic View to display the viewport selection.

Visible Objects—Limits the display in Schematic View to the visible objects. Hide objects you don't need to display, then check this box to contain clutter in Schematic View.

Animated Objects— When this is turned on, then only objects that have keys and their parents will be included in the Schematic View display.

Hide By Category group

These toggles control the display of objects and their children, by category. The categories are:

- **Geometry**—Hides or displays geometric objects and their children.
- **Shapes**—Hides or displays shape objects and their children.
- **Lights**—Hides or displays lights and their children.

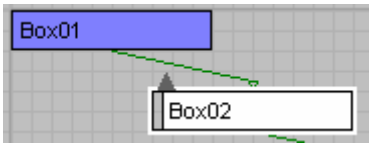
- **Cameras**—Hides or displays cameras and their children.
- **Helpers**—Hides or displays helper objects and their children.
- **Space Warps**—Hides or displays space warp objects and their children.
- **Bone Objects**—Hides or displays bone objects and their children.

Be aware that if you have a hierarchy linked to a helper such as a dummy, and you hide the dummy, you'll also hide the children.

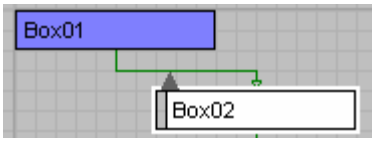
Link Style group

Bezier Lines—Displays the reference lines with arrowheads as Bezier curves.

Straight Lines— Displays the reference lines as straight lines instead of Bezier curves.



Circuit Lines—Displays the reference lines as orthogonal lines instead of curves.



None— When this is chosen, link relationships will not appear in the Schematic View display.

Grid group

This group controls the display and use of a grid in the Schematic View.

Show Grid—Displays a grid in the background of the Schematic View window.

Snap to Grid—When this is on, all moved entities and children of those entities will snap their upper left corners to the nearest grid point. Entities not snapped to a grid point when snap is enabled will not snap until they are subsequently moved.

Grid Spacing:—Sets the spacing units of the Schematic View grid. This uses the standard that entities are 20 grid units high and 100 grid units long.

Arrange Method group

Arranging always takes place within the confines of the positive X and negative Y space which is delineated by the darker grid lines.

Stacked—When this is turned on, arranging via Always Arrange, Arrange Children or Arrange Selected will result in the hierarchies being stacked below a width that is determined by the extents of the highest entities in the view.

Horizontal—When this is turned on arranging using Always Arrange, Arrange Children or Arrange Selected will result in the hierarchies being distributed along and below the y=0 line. Arranging always takes place within the confines of the positive X and negative Y space.

Vertical—When this is turned on arranging using Always Arrange, Arrange Children or Arrange Selected will result in the hierarchies being distributed along and to the right of the x=0 line. Arranging always takes place within the confines of the positive X and negative Y space.

Sync Selection group

Viewports—When this is chosen, node entities selected in Schematic View will have their corresponding nodes selected in the viewports.

Likewise, nodes selected in the viewports will have their corresponding entities selected in Schematic View.

Everything—When this is chosen, all entities selected in Schematic View will have their corresponding entities selected in the appropriate places in the interface, given that those places are open. For instance, selecting a material in Schematic View will select it in the material editor if it is open and the material is present, selecting a modifier in Schematic View will select it in the stack is the Modify panel is open. Likewise, entities selected in the scene will have their corresponding entities selected in Schematic View.

None—When this is chosen, changes in the viewport selection do not affect the Schematic View display, and selection changes in the Schematic View display do not affect the viewport selection.

Background Image group

Show Image—When on, the background bitmap (if one is chosen) is displayed. When off, it is not displayed.

By default, the background image displays at screen resolution at the current zoom factor of Schematic View.

Lock Zoom/Pan—When this is turned on, zooming and panning resizes the background image accordingly. When turned off, the bitmap will remain or revert to actual pixels at screen resolution.

File button—Click to choose an image file for the background of Schematic View.

When no background image has been chosen, this button displays "None." If an image has been chosen, it shows the name of the bitmap file.

Preferences group

Double Buffer—Allows for double buffer display to control viewport performance.

Zoom About Mouse Pointer—When this is turned on you can zoom into wherever you place your cursor. You can also zoom with the zoom wheel, or hold CTRL and press the middle mouse button.

Pan to Added Nodes—When this is turned on the Schematic View window will alter itself to accommodate new objects or nodes as they are added to the scene. When this is turned off the view is unchanged. Leave this off and turn off Auto arrange, and Schematic view will not disturb the layout of the nodes.

Use Wireframe Color—Uses the wireframe color to shade the node in the Schematic View window.

Display Layout Warning—When this is on, Schematic View will show a layout warning when Always Arrange is first turned on.

Only Update On Focus—When this is turned on, Schematic View only updates with additions or changes to the scene when it is given focus. This lets you avoid constant redraws when making changes in the viewport to the scene objects.

Move Children—When this is turned off you can move the parent without affecting the children. When this is turned on, moving a parent also moves the children.

Show Tooltips—Toggles the display of tooltips when the cursor is over the node in the Schematic View window.

Snap Floaters—Enables floating dialogs (Display and List) to snap to the edges of the Schematic View window.

Relative Floaters—Enables floating dialogs to move and resize as the Schematic View window is moved and resized.

Schematic View Toolbars

Menu bar > Graph Editors > New Schematic View > Top and bottom toolbars
Menu bar > Graph Editors > Saved Schematic Views > Choose a saved schematic view. > Top and bottom toolbars
Main toolbar > Schematic View button > Top and bottom toolbars

The Schematic View toolbar at the top of the window contains the following buttons:

Display Floater—Displays or hides the Display Floater. Active button means floater is open, inactive button means it's hidden.

Select—Lets you select objects in the Schematic View window and in the viewport. Selecting objects in the Schematic View window turns the node yellow. Selecting the objects in the viewport, outlines their Schematic View representation box in white, but doesn't select it in the Schematic view window. If you want to the selection in Schematic view passed into the viewport use the Sync Selection button. Whatever is selected in Schematic view will become selected in the viewport as well.

Connect—Lets you create hierarchies. Just as you link objects in the viewports, you can create linkages in Schematic View. Click the child and connect to the parent. You also use this to add modifiers to objects, and to wire parameters.

Unlink Selected—Unlinks whatever is selected in the Schematic View window.

Delete Objects—Deletes whatever is selected in Schematic View. The deleted selection disappears in the viewport and the Schematic View window.

Hierarchy Mode—Shows the parent/child relationships in a cascading display. The parents are to the left and up, the children are indented toward the right and down.

References Mode—Shows relationships based on instances and references rather than hierarchy. Use this to view materials and modifiers.

Always Arrange—Sets Schematic View to always arrange all entities based on arrangement preference (alignment options). Displays a pop-up warning before doing so. When this mode is on it activates the toolbar button.

Arrange Children—Arranges the display of children based on set arrangement rules (align options) below the selected parent.

Arrange Selected—Arranges the display of children based on set arrangement rules (align options) below the selected parent.

Free All—Frees all entities from arrangement rules, tags them with a hole icon on their left end and leaves them in place. Use this to freely arrange all objects.

Free Selected—Frees all selected entities from arrangement rules, tags them with a hole icon on their left end and leaves them in place. Use this to freely arrange selected objects.

Move Children—Sets Schematic View to move all children of parent being moved. When this mode is on, the toolbar button is activated.

Expand Selected—Reveals the display of all child entities of selected entity.

Collapse Selected—Hides the display of all children of selected entity, leaving the selected entity visible.

Preferences —Displays the Schematic View Preferences dialog. This lets you control what is displayed and hidden in the Schematic View window by category. Various options are here to filter and control the display within the Schematic View window. See *Schematic View Preferences Dialog (page 3–695).*

Schematic View Name field—Use this field to give the particular configuration of Schematic View a name. Simply typing the name and hitting enter will add the named view to the list of Saved Schematic View windows available from the Graph Editors menu.

Bookmark Name field—Let's you define a selection of entities in the Schematic View window as a bookmark, so you can easier return to them in a complex scene with many objects.

Go to Bookmark—Zooms and pans the Schematic View window so the bookmarked selection is displayed.

Delete Bookmark—Removes the bookmark name that is displayed in the Bookmark name field.

Buttons on the Lower Toolbar

Zoom Selected Viewport Object—Zooms in on whatever is selected in the viewport. You can also type in the name in the text field next to this button.

Selected Object text entry window—Lets you type in the name of the object you are looking for. Then click the Zoom Selected Viewport Objects button and that object will appear in the Schematic View window selected.

Prompt Area—Provides a one-line instruction to tell you how to use the highlighted tool or button or provides you with details such as how many objects are currently selected.

Pan—Lets you move horizontally or vertically in the window. You can also achieve the same effect by using the scroll bars at the right and bottom of the Schematic View window, or by using the middle mouse button.

Zoom—Lets you move closer to or further from the Schematic display. When you first open your Schematic View window you will spend a moment zooming and panning to gain the appropriate view of the objects in the display. The display of the nodes changes as you move in or out.

You can also zoom by holding CTRL and pressing the middle mouse button. To zoom at the cursor, turn on Zoom About Mouse Point in the Schematic View Settings dialog, accessed by click the Preferences button.

Zoom Region—Lets you draw a zoom window on the area of the Schematic view you want to see up close.

Zoom Extents—Zooms the window back so all the nodes in the Schematic View are visible.

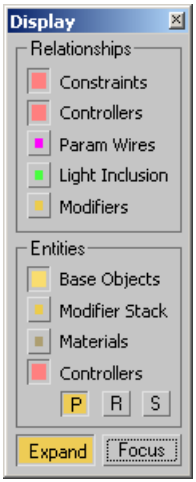
Zoom Extents Selected—Zooms the window back so that all the selected nodes are visible in the display.

Pan to Selected—Pans the window to include the selected objects, within the same zoom factor, so that all selected entities are visible within current extents of the window.

Schematic View Display Floater

The Display Floater controls by category what is displayed in the Schematic View window. The Schematic View Preferences dialog also filters that display of the window. Use these to manage the clutter of the window, and the performance speed. Note that unless you display the correct entity and relationship, you will not be able to perform certain operations. If you want to wire parameters, for instance, you must have Param Wires turned on. If you want to wire the parameters of a material, you must also have Materials chosen.

Interface



Relationships group

Lets you choose which of the following relationships you want to display or create: Constraints, Controllers, Parameter wiring, Light inclusion and Modifiers.

Entities group

Selects which types of entities are displayed or edited:

Base Objects—When active, all base object entities will display as children of the node entities. When Sync Selection is on and the Modifier stack is open, clicking on a base object will activate that level of the object's stack.

Modifier Stack—When active, all modifiers in the object's stack will display as children, beginning with the Modified Object base entity. Modifiers can be copied, instanced or moved between objects by using the Connect tool. For example, connecting *XForm* to *Box01*, will display the Attach Modifier dialog where you can choose between Copy, Move or Instance. Deleting the modifier from the Schematic View will also remove it from the object's stack in the Modify panel.

Materials—When active, all materials and maps assigned to the objects will display as children of the objects. Materials can be instanced between objects by using the Connect tool on the Schematic View toolbar. For example, drag material *Default1* to *Box01* . Double clicking on a material will bring up the Material editor if the Material is already in an sample material slot.

Controllers—When this is active, all controllers other than position, rotation and scale will display as children of the objects' transform controller, which also displays. Controllers can be added to objects only when this is active. Controllers can be copied or instanced between objects by using the Connect tool. For example dragging *PositionXYZ* from *Box01* to *Position List* for *Box02*, for instance, will open the Attach Controller dialog, where you can choose to Copy, Move or Instance this controller.

PRS—Lets you choose to display any combination of the three transform types (position, rotation or scale).

Expand—When turned on, entities that are activated will be displayed in Schematic View. When turned off, only the triangle child indicator on the bottom of the nodes will display. This toggle

only applies at activation time, it will not expand or contract entities that are already displayed.

Focus—When this is turned on, only those entities that are related to others and have their relationships displayed will be filled with their color, all others will be displayed unshaded.

Schematic View Commands

New Schematic View

Menu bar > Graph Editors > New Schematic View

New Schematic View creates a new *Schematic View window (page 3–688)*. You might want to create multiple Schematic view windows filtered in different ways that you recall for quick access to multiple objects. Name the new schematic view using the Schematic View name field.

Delete Schematic View

Menu bar > Graph Editors > Delete Schematic View

Delete Schematic View opens the *Delete Schematic View dialog (page 3–702)*. This will allow you to delete a schematic view.

Delete Schematic View Dialog

Select a schematic view. > Menu bar > Graph Editors > Schematic View > Delete Schematic View

This dialog displays all the saved schematic views. Choose the view to be deleted from the list, then press the delete button.

For information on the Schematic View buttons and controls, see *Schematic View Window (page 3–688)*.

Saved Schematic Views

Graph Editors menu > Saved Schematic Views > Schematic views by name

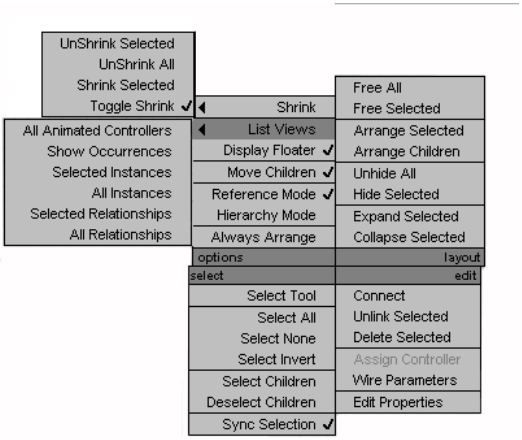
Saved Schematic Views displays a list of schematic views by name that were previously created by *New Schematic View (page 3–702)*.

Schematic View Selection Right-Click Menu

Schematic View (page 3–688) > Select any node. > Right-click.

The Schematic View right-click menu contains controls for selecting, displaying, and manipulating selections of nodes. It gives you quick access to List Views, Display Floater and lets you switch between Reference and Hierarchy Mode quickly.

Interface



Select quadrant

Select Tool— Activates the Select tool when Always Arrange is turned on. Activates the Select and Move tool when Always Arrange is off.

Select All—Choose Select All to select everything in the window.

Tip: Hold down the CTRL key to add to selections, and the ALT key to subtract from them.

Select None— Choose Select None to deselect everything.

Select Invert—Deselects selected entities and selects all other entities in the current Schematic View.

Select Children—Selects all children of the current selection.

Deselect Children—Deselects children of all selected entities. Parent and child must be selected for child to become unselected.

Sync Selection—Synchronizes the selection in the Schematic View window with the viewport. Whatever you have selected in the Schematic View window becomes selected in the viewport. Whatever you select in the viewport becomes selected in Schematic View. It's a two-way street.

Layout quadrant

Free All—Frees all entities from arrangement rules, tags them with a hole icon on their left end and leaves them in place. Use this to freely arrange all objects.

Free Selected—Frees all selected entities from arrangement rules, tags them with a hole icon on their left end and leaves them in place. Use this to freely arrange selected objects.

Arrange Selected— Arranges the display of the selection based on the arrangement preferences.

Arrange Children—Arranges the display of children based on set arrangement rules (align options) below the selected parent.

Unhide All—Displays all the nodes in the scene. If the resulting Schematic View is too cluttered to work with, try using Preferences to remove what you don't need to see. Or make individual selections and hide upstream or downstream to unclutter the display.

Hide Selected—Hides the selection in the Schematic View window.

Expand Selected—Reveals the display of all child entities of selected entity.

Contract Selected—Hides the display of all children of selected entity, leaving the selected entity visible.

Edit quadrant

Connect Tool—Activates the connect tool. This tool in Schematic View can be used to create many Schematic View relationships such as parent, constraint, copy modifier, copy controller, or copy material.

Unlink Selected— Disconnects the selected entities

Delete Selected—Deletes entities from Schematic View and from the scene. This also can be used to disconnect selected relationships.

Assign Controller—Displays the Assign controller dialog. This is available only when controller entities are selected.

Wire Parameters—Let's you wire parameters using Schematic View. This is active only when entities are selected. This launches the standard Wire Parameters dialog.

Edit Properties—Displays the Object Properties dialog for the selected objects.

Options quadrant

Shrink—Hides all selected entities' boxes, keeps arrangement and relationships visible.

Toggle Shrink—Changes the state of entity shrinkage. Shrunken entities become unshrunken, and the other way around.

Unshrink All—Makes all shrunken entities visible.

Unshrink Selected—Makes all selected shrunken entities visible.

Shrink Selected— Hides all selected entities' boxes, keeps arrangement and relationships visible.

List Views

Selected Occurrences— Opens or redraws List View with all entities that share a property or relationship type with currently selected entities

Selected Instances—Opens or redraws List View with all instances of currently selected Schematic View entities.

All Instances—Opens or redraws List View with all instances of currently displayed Schematic View entities.

Selected Relationships—Opens or redraws List View with all relationships of currently selected Schematic Vie entities.

All Relationships—Opens or redraws List View with all relationships of currently displayed Schematic View entities.

Display Floater—Opens the Display floater and activates the corresponding toolbar button.

Move Children— Sets Schematic View to move all children of parent being moved. When this mode is on, the toolbar button is activated.

Reference Mode— Sets Schematic View to display entities as a reference graph instead of hierarchy. Switching between Hierarchy and Reference mode is nondestructive.

Hierarchy Mode— Sets Schematic View to display entities as a hierarchy instead of reference graph. Children appear indented below the parent. Switching between Hierarchy and Reference mode is nondestructive.

Always Arrange— Sets Schematic View to always arrange all entities based on the chosen arrangement preference. Displays a pop-up warning before doing so. Choosing this activates the toolbar button.

Layers

Using Layers to Organize a Scene

Layers are like transparent overlays on which you organize and group different kinds of scene information. The objects you create have common properties including color, renderability, and display. An object can assume these properties from the layer on which you create it. Using layers makes it easier to manage the information in your scenes. Layers are used primarily to control the visibility of objects in your scene, however they also controls the color of objects' wireframe and the *frozen (page 1–70)* and hidden state of objects, as well as their radiosity properties.

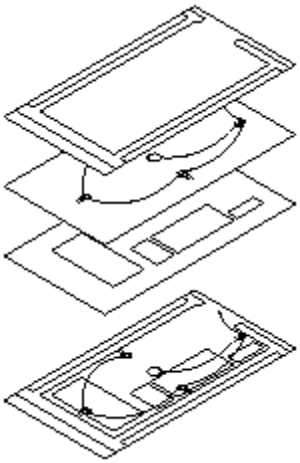
For example, you might want to set up a layer that will contain detailed, custom furniture. To do this, you create a layer and set Viewport Display to Bounding Box. Then you set the object's display properties to ByLayer (in the *Object Properties dialog (page 1–111)*). This will keep the viewport display quick. Then, whenever you want to import new furniture, switch to this layer. You don't need to set up your viewport display every time you import new furniture. Also, if you don't want to

render the furniture, you can turn off that layer's Renderable property.

Note: When you link an AutoCAD file into 3ds Max, any layers that are frozen (and all objects that reside on these layers) are not imported.

Note: Objects can be hidden and frozen on a per-object basis; however, an object residing on a hidden or frozen layer will *always* adopt the hide/freeze state of its layer.

Tip: If you set lights' render control to ByLayer (in the General panel of the Preferences dialog), you can use the Render column in the Layer Manager to quickly turn lights on or off in your scene.



Layers can help organize the contents of a scene.

Layer-Object Relationships

The *Layer Manager (page 3–706)* displays layers, as well as their associated objects. This makes it very easy to organize, and make changes to objects in a scene. With the Layer Manager, you can adjust property settings at either the layer level, or individually for each object. Each property can be toggled between various states, including the *ByLayer state (page 3–1014)*. When an object's property is set to ByLayer, the object inherits that setting from the layer it is associated with.

Note: The Hide and Freeze states of an object cannot be set to ByObject. Objects *can* be hidden or frozen on a per-object basis; however, they will *always* follow the behavior of their layer when it is hidden or frozen.

Special Layer 0

When you begin a new scene, 3ds Max creates a special layer named *0 (default)*. By default, objects on layer 0 have their visibility settings on, renderability is on, and viewport display is set. You can't delete or rename layer 0.

If you haven't created any layers, 3ds Max places objects you create on layer 0 by default. After you create objects, you can reassign them to different layers, including those residing on layer 0.

Display Properties

In the *Layer Properties dialog (page 3–711)*, you can specify layer visibility individually for each viewport. If you don't want to display a certain layer, you can hide that layer. 3ds Max hides the layer in the viewport, but not in any output rendered image of the scene.

Note: For hidden geometry to render, Render Hidden Geometry must be turned on in the *Render Scene dialog > Common Parameters rollout (page 3–27)*.

You can specify layers to display objects *shaded (page 3–774)*, in *wireframe mode (page 3–1128)*, as a *bounding box (page 3–1013)*, or as whatever is set on the *Viewport Properties menu (page 3–774)*. Using this method, you can have different objects displayed differently in the same scene.

You can display layers in *See-Through mode*. See-Through mode temporarily displays selected objects in translucent form so you can see through them without applying special materials. You can toggle See-Through mode for all objects per layer.

Note: You can control whether newly created objects adopt the default layer settings on a per-object basis by using Default To By Layer For New Nodes in the *General Preferences panel (page 3–859)*.

You can also Freeze, Hide, or Isolate the layer of a selected object using the corresponding command in the display quadrant of the quad menu.

Layer Names

You can create and name a layer for each conceptual grouping (such as walls or terrain) and assign common properties to those layers. By grouping objects into layers, you can control their display and make changes quickly and efficiently. When you name layers, you can use names of variable length up to 255 characters. These names can contain letters, digits, blank spaces, and the special characters dollar sign ($), hyphen (-), and underscore (_).

Note: Any layers from a linked AutoCAD file are automatically imported to 3ds Max. 3ds Max names the converted layers based on the layer names from the AutoCAD drawing.

See also

Layer List (page 3–715)

Layer Manager (page 3–706)

Layer Properties Dialog (page 3–711)

Layer Manager

Main toolbar > Layer Manager
Layers toolbar > Layer Manager
Tools menu > Layer Manager

The Layer Manager, available from the main toolbar, is a modeless dialog where you can create and delete layers. You can also view and edit the settings for all of the layers in your scene, as well as the objects associated with them. You can specify the name, visibility, renderability, color, and objects' and layers' inclusion in the radiosity solution from this dialog.

Objects are organized by layer in the dialog, in an expandable list. By clicking '+' or '-', you can expand or collapse (respectively) the object list for each layer. You can also sort the layers by clicking any of the column heads.

Another useful tool is the ability to open the Object Properties dialog or Layer Properties dialog for one or more highlighted objects or layers directly from the Layer Manager by clicking the corresponding icons.

Note: You can change the property settings for each layer or object by clicking the corresponding icon in the dialog. With each click, the icons cycle through the various states of the property, including Off ( ) and *By Layer (page 3–1014)* ( ), and, in the Render, Color, and Radiosity columns, By Object. When a property is set to By Layer, the object inherits the property setting from its associated layer.

Procedures

To create a new layer:

When you create new layers, 3ds Max names them sequentially by default: Layer01, Layer02, and so on. After creating a layer, you can rename it. 3ds Max assigns a random color to all new layers. You can accept the default settings or specify other colors.

1. On the main toolbar, click Layer Manager.
2. In the Layer Manager, click Create New Layer.

3ds Max displays a new layer in the list with the temporary name Layer01.

3. Click the Layer to enter a new name.
4. To create more than one layer, click New again and enter the new layer name.

   Tip: If an existing layer is highlighted when you create a new layer, the new layer inherits the properties of the highlighted layer. You can modify the properties of the new layer, if necessary, as illustrated in the following procedures.

To make a layer current:

1. On the main toolbar, click Layer Manager.
2. In the Layer Properties dialog, click the second column next to the layer name.

   A check box appears indicating that the layer is current.

   Note: The current layer is also displayed in the title bar of the Layer Manager.

To make a layer current (alternate method):

- On the Layers toolbar > Layer List, select a layer.

  The highlighted layer becomes the current layer.

To hide a layer:

1. On the Layers toolbar, click Layer Manager.
2. In the Layer Manager, select the layers you want to hide.
3. In the Hide column, click Off to turn Hide on for the highlighted layer(s).

   The hide icon displays.

   Tip: You can hide *all* layers by clicking Hide/Unhide All Layers on the Layer Manager toolbar.

To freeze a layer:

Freezing layers is useful when you want to edit objects associated with particular layers but also want to view, without editing, objects on other layers. You can't edit or select objects on a frozen layer; however, the objects are still visible if the layer is on. You can make a frozen layer current, and you can add new objects to the frozen layer.

1. On the main toolbar, click Layer Manager.
2. In the Layer Manager, select the layers you want to freeze.
3. In the Freeze column, click Off to turn Freeze on for the highlighted layer(s).

   The Freeze icon displays.

   Tip: You can freeze *all* layers by clicking Freeze/Unfreeze All Layers on the Layer Manager toolbar.

To assign a color to a layer:

You can assign a color to a layer using the Layer Properties dialog. For example, you can assign the color red to a layer named HVAC to help you identify the mechanical equipment in your scene.

1. On the main toolbar, click Layer Manager.
2. In the Layer Manager, select a layer and click the Color icon.
3. In the Layer Color dialog, select a color, and then click OK.

To rename a layer:

You might want to rename a layer to better define how it's used in your scene. You can rename a layer at any time during a 3ds Max session. However, you can't rename Layer 0.

1. On the main toolbar, click Layer Manager.
2. In the Layer Manager, select a layer to rename.
3. Click the layer's name again and enter a new name.

To delete a layer:

You can delete an empty layer at any time during a 3ds Max session. However, you can't delete the current layer, Layer 0, or a layer that contains objects.

1. On the main toolbar, click Layer Manager.
2. In the Layer Manager, select one or more layers, and then click Delete Empty Layer.

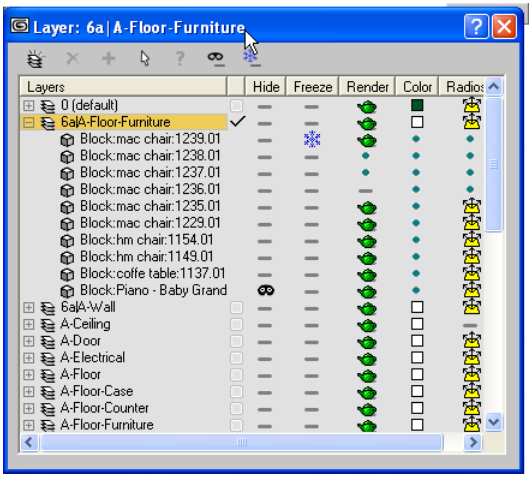
To open the Object Properties dialog for an object selection:

1. On the main toolbar, click Layer Manager.
2. Select one or more objects in the Layer Manager.
3. Click the Object Properties icon to open the *Object Properties dialog (page 1–111)* for the highlighted objects.

To open the Layer Properties dialog for a layer selection:

1. On the main toolbar, click Layer Manager.
2. Select one or more layers in the Layer Manager.
3. Click the Layer Properties icon to open the *Layer Properties dialog (page 3–711)* for the highlighted layers.

Interface



Title Bar

The title bar displays the word 'Layer', followed by the name of the current Layer. For example, if *Layer02* is the current layer, the title bar will read *Layer: Layer02*.

Layer Manager toolbar

Create New Layer—Creates a new layer containing the currently highlighted objects (if any).

The new layer's name is automatically generated ("Layer01", "Layer02", etc.) but may be changed by clicking on the label.

Note: The new layer becomes the current layer.

Delete Highlighted Empty Layers—Deletes highlighted layers if they are empty.

Note: This button is not available if any of the following items are in your selection set: nothing, the current layer, objects, Layer 0, or non-empty layers.

Add Selected Objects to Highlighted Layer—Moves currently selected objects into the highlighted layer.

Note: This button is not available if nothing is selected or if more than one layer is highlighted.

Select Highlighted Objects and Layers—Selects all of highlighted objects, as well as all objects contained in any highlighted layers.

Note: This button is not available if nothing is highlighted.

Highlight Selected Objects' Layers—Highlights layers containing the currently selected objects and automatically scrolls so that highlighted layers are visible in the layer manager.

Note: This button is not available if nothing is highlighted.

Hide/Unhide All Layers—Toggles the display of all layers.

Tip: This is most useful if you hide all layers and then display only the layers you want to work on.

Freeze/Unfreeze All Layers—Toggles the frozen state of all layers.

Tip: This is most useful if you freeze all layers and then unfreeze only the layers you want to work on.

List of layers

Displays layers, their associated objects, and their properties. To expand or collapse the object list for each layer, click '+' or '-', respectively. To modify a property, click its icon. To select all layers quickly, right-click and choose Highlight All. To open the Object/Layer Properties dialog, click on the icon next to the layer or object.

Each property has a unique icon to indicate that it is turned on, while all properties share the same icon for the off ( ) and By Layer ( ) states.

Note: By Layer is available only at the object level, in the Render, Color, and Radiosity columns.

Tip: You can sort the layers by any of their properties by clicking the column name.

Layers—Displays the names of the layers/objects. Click a name to select the layer, or to rename the layer.

Note: Clicking the layer icon opens the Layer Properties dialog for all highlighted layers.

Clicking the object icon opens the Object Properties dialog for all highlighted objects.

Current Layer Toggle—The unlabeled column to the right of the layer name indicates the current layer and lets you make a different layer current.

A check mark appears next to the current layer. Click the check box next to another layer name to make it current.

Hide—Hides and unhides layers. When a layer is hidden, it's invisible. You might want to hide layers that contain construction or reference information.

Freeze—Freezes layers. You can't select or edit objects on a frozen layer. Freezing a layer is useful if you want to view information on a layer for reference but don't want to edit objects on that layer.

Render—When on, objects appear in the rendered scene. Non-rendering objects don't cast shadows or affect the visual component of the rendered scene. Like dummy objects, non-rendering objects can manipulate other objects in the scene.

Shape objects (page 1–257) have the Render option turned on by default. In addition, they have a Renderable check box in their creation parameters. When both check boxes are on, the shape is renderable. If either check boxes are off, the shape isn't renderable. If you apply a modifier that converts the shape into a mesh object, such as a *Lathe (page 1–699)* or *Extrude (page 1–671)* modifier, the shape automatically becomes renderable regardless of the state of its local Renderable check box.

For shapes, the Renderable toggle in the *Object Properties dialog (page 1–111)* affects the main object, so it also affects all instances of and references to the shape.

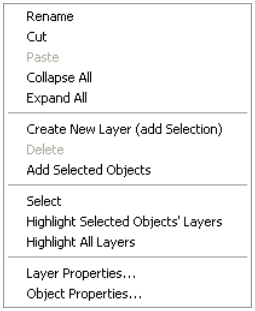
Color—Changes the color associated with the highlighted layers. You can select another color by clicking the color swatch to display either the *Object Color dialog (page 1–155)* (for objects), or the Layer Color dialog (for layers).

You can set an object's color independently, or turn on ByLayer in the Object Color dialog to use the associated layer's color.

Radiosity—When on, objects are included in the *radiosity solution (page 3–50)*. Objects *not* included in the radiosity solution do not contribute to indirect illumination. If these objects are lights, only their direct contribution will be used for rendering.

Note: Removing objects from the radiosity solution can significantly decrease radiosity processing and rendering time, however it does sacrifice some accuracy in the solution. It can be useful for creating quick test renders.

Layer Manager Right-Click Menu



A standard popup menu is displayed over the Layer Manager by right-clicking anywhere in the Layer Manager dialog. The menu contains a variety of layer management and focus operations.

Some of the operations involve highlighted items or selected objects in your scene. If the right-click is on a non-highlighted row, the highlight switches to that row and the subsequent operation applies to the newly highlighted item. If the right-click is on a highlighted row (or a group of highlighted rows), all of the highlights are preserved and the subsequent operation applies to all of the highlighted items.

Note: To apply an operation to a group of objects or layers, you must hold CTRL when you right-click. If you have highlighted a group of objects and right-click on one of them (without holding CTRL), the selection group is cleared and only that object will be highlighted.

Rename—Initiates text editing mode for the highlighted layer's name. Unique names are enforced. If a non-unique name is typed in, a modal dialog pops up, stating "Invalid Layer Name. Layer names must be unique."

Note: Rename is available only for layers; objects cannot be renamed in the Layer Manager. Likewise, Rename is only available when a single layer is highlighted.

Cut—Stores references to highlighted objects in memory so they can be pasted into another layer.

Cut is only available when objects are highlighted; if there are no objects highlighted or if a layer is part of a multiple selection, it is not available.

Note: Objects are not actually cut from their assigned layer until they are pasted to another one.

Tip: If you cut a layer, 3ds Max cuts all objects in the layer.

Paste—Moves cut objects into the highlighted layer.

Paste is available only when a single layer is highlighted and one or more objects have been cut.

Collapse All—Closes all expanded layers, hiding the object lists.

Expand All—Expands all layers, displaying the objects within each.

Create New Layer—Creates a new layer containing any currently selected objects.

The new layer becomes the current layer. Its name is generated automatically ("Layer01", "Layer02", etc.) but can be changed by clicking its label.

Delete—Deletes any empty highlighted layer.

Note: This does not delete objects. Likewise, this command is not available when your selection includes Layer0, any objects, or any layer containing objects.

Add Selected Objects—Places objects currently selected in your scene into the highlighted layer.

Note: This command is available only when a single layer is highlighted.

Select—Selects all of the currently highlighted objects or layers in the Layer Manager.

Note: If you use this command on a layer, all objects in that layer are selected.

Highlight Selected Objects' Layers—Highlights all layers that contain objects in the current scene selection.

Highlight All Layers—Highlights all of the layers in your scene.

Note: This command does not highlight any objects.

Layer Properties—Opens the *Layer Properties dialog (page 3–711)* for the currently highlighted layers.

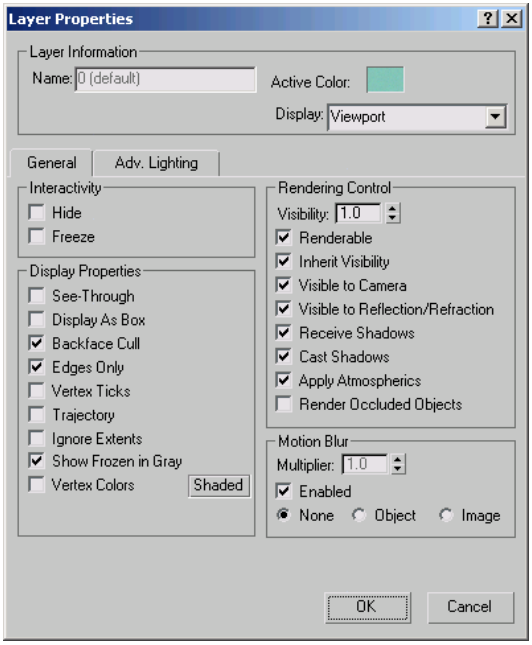
Object Properties—Opens the *Object Properties dialog (page 1–111)* for the currently highlighted objects.

Layer Properties Dialog

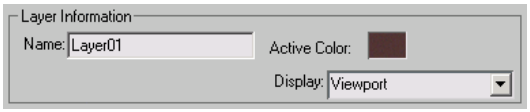
Main toolbar > Layer Manager > Select one or more layers. > Click Layer icon.

The Layer Properties dialog is similar to the *Object Properties dialog (page 1–111)*. Here, you can change the rendering, motion blur, and display settings of one or more selected layers. In addition, you can also change the advanced lighting settings or hide/freeze one or more selected layers.

Interface



Layer Information group



Controls layer information for objects on the selected layer.

Name—Displays the selected layer name. You can edit the name. The name can have up to 255 characters, containing letters, digits, blank spaces, and the special characters dollar sign ($), hyphen (-), and underscore (_).

Active Color—Displays the color of the selected layer. You can select another color by clicking the color to display the Layer Color dialog, which is identical to the *Object Color dialog (page 1–155)*, except that it doesn't have the By Layer/By Object toggle.

Display—Controls the display of the objects on the selected layer.

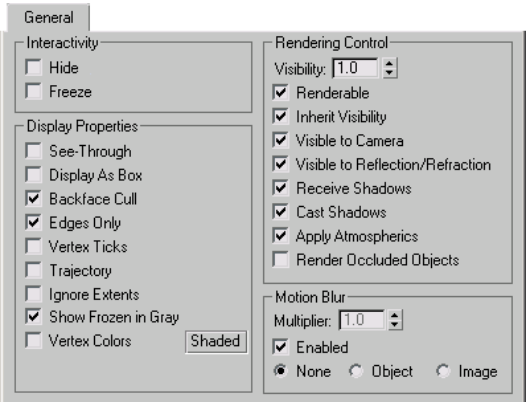
Viewport—Displays the objects on the selected layer using the current settings under Views on the *viewport right-click menu (page 3–774)*.

Bounding Box—Displays the objects on the selected layer as a *bounding box (page 3–1013)*.

Wireframe—Displays the objects on the selected layer in *wireframe mode (page 3–1128)*.

Shaded—Displays the objects on the selected layer in *Smooth+Highlight mode (page 3–774)*.

General panel



Interactivity group

Hide—Hides the selected layer.

Freeze—Freezes the selected layer.

Display Properties group

Provides controls that alter the display of objects on the selected layer.

See-Through—Makes objects on the selected layer translucent in viewports. This setting has no effect on rendering, it simply lets you see what's behind an object in a crowded scene, and especially to adjust the position of objects behind or inside the See-Through object.

Display As Box—Toggles the display of objects on the selected layers, including 3D objects and

2D shapes as *bounding boxes (page 3–1013)*. Produces minimum geometric complexity.

Backface Cull—For objects on the selected layer, toggles the display of faces with *normals (page 3–1074)* pointing away from view. When on, you see through the wireframe to the back faces. Applies only to Wireframe viewport display.

Edges Only—For objects on the selected layer, toggles the display of face edges. When set, only faces appear. When off, all mesh geometry appears. Applies only to Wireframe viewport display.

Vertex Ticks—Displays the vertices in objects on the selected layer as tick marks.

If the current selection has no displayed tick marks, the check box is clear. If *some* of the vertices in the current selection display tick marks, the check box contains a gray X. If all vertices in the current selection display tick marks, the check box contains a black X.

Trajectory—Toggles *trajectory (page 3–1119)* display for objects on the selected layer. You can display an object's trajectory wherever you are in 3ds Max.

Ignore Extents—When turned on, objects on the selected layer are ignored when you use the display control *Zoom Extents (page 3–783)*.

Show Frozen in Gray—When on, the object turns gray in viewports when you freeze it. When off, viewports display the object with its usual color or texture even when it is frozen.

Vertex Colors—Affects *editable mesh objects (page 1–984)* on the selected layer. Displays the assigned *vertex colors (page 1–111)* in the viewport. You assign vertex colors at the vertex or face sub-object levels.

Shaded—Affects *editable mesh objects (page 1–984)* on the selected layer. When on, if the editable mesh has vertex colors, shaded viewports use vertex colors to shade the mesh. When off, colors are unshaded.

Rendering Control group

Controls rendering settings for objects on the selected layer.

Visibility—Controls the rendered visibility of the object. At 1.0, the object is fully visible. At 0.0, the object is completely invisible when rendered. Default=1.0.

Renderable—Makes objects on the selected layer appear or disappear from the rendered scene. For more information, see *Renderable*.

Note: This has the same functionality as the Render toggle in the *layer list (page 3–715)*.

Inherit Visibility—Causes objects on the selected layer to inherit the visibility of their parents (as determined by the parent's Visibility track in Track View). When a group parent is assigned a visibility track, Inherit Visibility is automatically turned on for all children in the group. Transparent materials and hidden objects have no effect on this function.

Visible to Camera—When on, the object is visible to cameras in the scene. When off, cameras do not view this object.

Visible to Reflection/Refraction—When on, the object is used in calculating reflections and refractions. When off, the object does not appear in reflections or refractions.

Receive Shadows—When on, objects on the selected layer can receive shadows.

Cast Shadows—When on, objects on the selected layer can cast shadows.

Apply Atmospherics—When on, atmospheric effects are applied to the object. When off atmospheric effects do not change the rendered appearance of this object.

Render Occluded Objects—Allows special effects to affect objects in the scene that are occluded by this object. The special effects, typically applied by *plug-ins (page 3–1089)* such as *Glow (page 3–222)*, use *G-Buffer (page 3–1040)* layers to access occluded objects. Turning on this control makes the object transparent for the purposes of special effects. This makes no difference when you render to most image files. When you render to either the *RLA (page 3–680)* or *RPF (page 3–681)* file format, however, occluded objects appear with the effect applied on their designated G-buffer layer.

Motion Blur group

Controls motion blur for objects on the selected layer.

Multiplier—Affects the length of the motion blur streak.

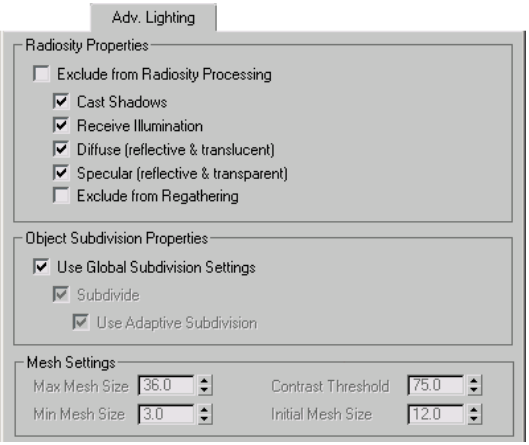
Enabled—When on, enables motion blur for this object. When off, motion blur is disabled regardless of the other blur settings. Default=on.

None—Turns off the state of motion blur for objects on the selected layer.

Object—*Object motion blur (page 3–1075)* provides a time-slice blur effect for objects on the selected layer.

Image—*Image motion blur (page 3–1049)* blurs the image of each object on the selected layer, based on the velocity of each pixel.

Adv. Lighting panel



Radiosity Properties group

Exclude from Radiosity Processing—When on, objects on a selected layer are included in the radiosity solution. Objects *not* included in the radiosity solution do not contribute to indirect illumination. If these objects are lights, their direct contribution will only be used for rendering.

Note: This has the same functionality as the Radiosity toggle in the Layer List.

Cast Shadows—Determines whether objects on the selected layer will cast shadows.

Receive Illumination—Determines whether objects on the selected layer will receive illumination.

Diffuse (reflective & translucent)—When on, objects on the selected layer are treated as diffuse (rough) in the radiosity process.

Specular (reflective & transparent)—When on, objects on a selected layer are treated as specular (smooth) in the radiosity process.

Exclude from Regathering—When on, objects on a selected layer are excluded from the regathering process of the radiosity solution.

For more information on the Radiosity Properties group, see *Radiosity Control Panel (page 3–60)*.

Object Subdivision Properties group

Use Global Subdivision Settings—When on, the object's meshing settings correspond to the global subdivision settings on the Radiosity Control Panel. When off, you can change the meshing settings for each object. Default=on.

- **Subdivide—**When on, a radiosity mesh is created for the objects regardless of the global meshing state. The subdivision that is performed is determined by the Use Adaptive Subdivision switch. When off, the settings in the Mesh Settings group are unavailable. Default=on.
- **Use Adaptive Subdivision—**Turns adaptive subdivision on and off. Default=on.

  Note: The Mesh Settings group parameters Contrast Threshold, Min Mesh Size, and Initial Mesh Size are available only when Use Adaptive Subdivision is turned on.

Mesh Settings group

Max Mesh Size—The size of the largest faces after adaptive subdivision. Default=36" for imperial units and 100cm for metric units.

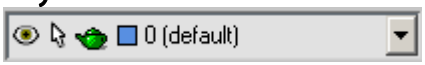
When Use Adaptive Subdivision is turned off, Max Mesh Size sets the size of the radiosity mesh in world units.

Min Mesh Size—Faces are not divided smaller than the minimum mesh size. Default=3" for imperial units and 10cm for metric units.

Contrast Threshold—Faces that have vertex illuminations that differ by more than the Contrast Threshold settings are subdivided. Default=75.0.

Initial Mesh Size—When improving the face shape, faces that are smaller than the Initial Mesh Size are not subdivided. The threshold for deciding whether a face is poorly shaped also gets larger as the face size is closer to the Initial Mesh Size. Default=12" for imperial units and 30cm for metric units.

Layer List



Layers toolbar > Layer List

The Layer List, available from the *Layers toolbar (page 3–735)*, displays layer names and their properties. You can control the properties of layers by clicking the property icons. You can make a layer current by simply selecting it from the list.

The controls available in the Layer List are a subset of the controls available in the Layer Manager. For more information, see *Layer Manager (page 3–706)*.

Tip: The Layer List is most useful in conjunction with the other tools available on the *Layers toolbar (page 3–735)*.

See also

Using Layers to Organize a Scene (page 3–704)

Procedures

To make a layer current:

1. Click Layers toolbar > Layer List to display the list.
2. Select the layer you want to make current from the list.

   It is now the current layer.

To change the layer of a selected object:

1. Click Layers toolbar > Layer List to display the list.
2. Select the desired destination layer to make it current.

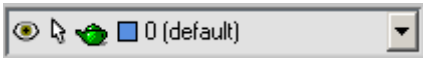
3. On the Layers toolbar, click Add Selected Objects to Current Layer.

To change a layer's properties:

1. Click Layers toolbar > Layer List to display the list.
2. Click the layer property icon that you want to set.

   You can change the following properties from the layer list: hide/unhide, freeze/unfreeze, renderable/non-renderable, and color.
3. Click the Layer List again to collapse it.

Interface



You can change the following properties from the layer list: hide/unhide, freeze/unfreeze, renderable/non-renderable, and color.

Unlike the Layer Manager, where one icon is used for all Off states, the 'Off' icons for each property on the Layer List are unique.

The following are the On and Off icons for each toggled property in the Layer List:

Property	On	Off
Hide/Unhide	(Hidden)	(Visible)
Freeze/Unfreeze	(Frozen)	(Editable)
Renderable/Non-Renderable	(Renderable)	(Non-renderable)

Create New Layer

Layers toolbar > Create New Layer

Layers toolbar > Layer Manager > Create New Layer

Create New Layer creates a new layer the layer containing the currently selected objects. The new layer's name is automatically generated ("Layer01", "Layer02", etc.) but may be changed in the *Layer Manager (page 3–706)*.

Add Selection to Current Layer

Layers toolbar > Add Selection to Current Layer

Add Selection to Current Layer moves the current object selection to the current layer.

Select Objects in Current Layer

Layers toolbar > Select Objects in Current Layer

Select Objects in Current Layer selects all of the objects contained in the current layer.

Set Current Layer to Selection's Layer

Layers toolbar > Set Current Layer to Selection's Layer

Set Current Layer to Selection's Layer changes the current layer to the layer which contains the currently selected objects.

Note: This button is not available if your selection includes objects that reside on different layers.

21 User Interface

User Interface

The 3ds Max user interface provides multiple ways to achieve the same goals. You can hide, *float (page 3–1024)* or *dock (page 3–1024)*, resize and rearrange the user interface elements into your own personal design. For more information, see *Customizing the User Interface (page 3–829)*.

See the topics referenced below for detailed information on all of the elements of the user interface.

See also

Menu Bar (page 3–720)

3ds Max Toolbars (page 3–732)

Customize Display Right-Click Menu (page 3–831)

Quad Menu (page 3–741)

Status Bar Controls (page 3–746)

Animation and Time Controls (page 3–759)

Viewports (page 3–772)

Viewport Controls (page 3–778)

Command Panel (page 3–799)

Track View (page 2–483)

MAXScript Menu (page 3–823)

Additional Keyboard Commands

This topic describes some commands that are provided only as customizable actions. You can assign them to a keyboard shortcut, a menu, or a button by using the *Customize User Interface dialog (page 3–836)*.

See also

Default Keyboard Shortcuts (page 3–911)

Unwrap UVW Shortcuts (page 3–954)

Keyable Property

Keyable Property Toggle

Default key: None

In Track View, if you select any track or group of tracks, this command turns the *keyable property (page 2–505)* on or off. If a selected track is not keyable, its children (sub-animations), if any, are toggled. For example, if you select a transform controller track, this command toggles the keyable property of all position, rotation, and scale tracks. If you select an object's track, its transform, parameter, and material tracks are all toggled. If

the object is part of a hierarchy, all its child objects' tracks are also toggled.

This action can be undone.

Set Key

Clear Set Key Mode Buffer

Default key: None

While in Set Key mode, if you transform an object but haven't yet clicked Set Key, this shortcut undoes the transformation and restores the viewport to show the animation that existed before the change.

Another way to accomplish this is to move the time slider or to turn on Play.

Transforms

Create Position Lock Key and Create Rotation Lock Key

Default keys: None

A lock key is a key with Linear interpolation. If you create the lock key while an existing key is selected, it changes that key's interpolation from Smooth to Linear. (Different types of interpolation are described in *Bezier Controllers (page 2–305)*.) You can create a lock key for position or for rotation.

Lock keys are useful when you want an object to be stationary, but smooth interpolation is causing it to "wobble" on its stationary spot.

Position to Zero

Default key: None

Like its counterparts on the *Animation quad menu (page 3–745)*, this shortcut restores the object's position to the initial "frozen" pose (0,0,0).

Note: Position To Zero works only if you have previously invoked Freeze Transform or Freeze Rotation from the Animation quad menu.

Viewport Navigation

Pan Viewport

Default key: I (the letter "i")

Pans the active viewport, centering it on the current location of the cursor.

You can use this shortcut while another command, such as Move, is active.

This action can be undone, using **SHIFT+Z**.

Toggling Dialogs

In most cases, you can close a dialog with the same command used to open it. This applies to any combination of input methods, including menu, toolbar button, and keyboard shortcuts. For example, you can open the Render Scene dialog by choosing Rendering > Render, and then close it by pressing **F10** (default keyboard shortcut). If a dialog is available from a menu, a check mark appears next to the respective command while it's open.

If a dialog is minimized, invoking its command opens the dialog, and invoking it a second time closes the dialog.

In addition, the keyboard shortcut **CTRL+~** (tilde) toggles display of the active dialog.

The dialogs affected by this functionality are:

- Asset Browser
- Bone Tools
- Channel Info Editor
- Clone and Align dialog
- Display Floater
- Environment and Effects dialog
- Grid and Snap Settings dialog
- Layer Manager
- Light Lister

- Material Editor
- Material/Map Browser (modeless version)
- mental ray Messages Window
- Parameter Collector
- Parameter Editor
- Rename Objects
- Render dialog
- Render to Texture
- Rigid Body Property editor
- Selection Floater
- Spacing Tool
- Transform Type-In
- Video Post

The one exception is Particle View, which has always been toggled by its keyboard shortcut (**6**), but is not toggled by the Modify panel > Particle View button.

Starting 3ds Max from the Command Line

You can start the program from the command line in a Command Prompt window, or include the command line in a batch file. There are a number of switches that you can use on the command line.

To start 3ds Max from the command line:

1. Open a Command Prompt window.
2. Change directory to the 3ds Max root directory, if this directory is not in your PATH statement.
3. Type **3dsmax** to start the program. Optionally, add a command-line switch (see below).

Command-Line Switches

You can use the following switches after **3dsmax** on the command line.

Switch	Effect
-c othercui	Starts program using *othercui.cui* instead of *maxstart.cui*.
-d	Causes Track View to use a double-buffered display, which is smoother than the single-buffered display but uses more system resources.
-g	Makes background white (instead of gray) in the following dialogs: Track View, RAM Player, Video Post, Loft, and Falloff Curve. Useful for screen captures when using a display mode less than 24 bits deep, for avoiding background patterns.
-h	Allows choice of graphics drivers: Software, Open GL, Direct3D, and Custom.
-i otherfile	Starts program using *otherfile.ini* instead of *3dsmax.ini*.
-l	Loads the last *.max* file automatically.
-ma	Open maximized.
-mi	Open minimized.
-n	Disables network mode.
-p otherfile	Starts program using *otherfile.ini* instead of *plugin.ini*.
-q	Starts program "quietly," without the splash screen.
-s	Starts program in server mode.
-u	Opens utility.
-v	Loads a display driver. See details following, under "Using the –V Option." Note: It is not possible to select which version of Direct3D you will use with this switch.
-z	Writes version number to file. See details following, under "Using the –Z Option."
anyscene	Starts the program and opens a file called *anyscene.max*.

A space must separate the program executable name and the command-line switch.

Examples:

3dsmax –l

3dsmax –i otherfile

3dsmax anyscene

3dsmax –c MaxCustom

See also

Startup Files and Defaults (page 1–17)

Saving and Loading Custom User Interfaces (page 3–848)

Graphics Driver Setup Dialog (page 3–881)

Running Scripts from the Command Line (page 3–826)

Using the -V Option

You use the -V option to load a different display driver at startup. This option overrides the setting in *3dsmax.ini*.

Follow the -V with one of these letters for the driver you want to use:

s: Loads the software driver.

o: Loads the OpenGL driver.

d: Loads the Direct3D driver.

n: Loads a null driver.

For example, if you ordinarily run OpenGL and want to switch to the software driver for a session, you would type: **3dsmax –vs**

Using the -Z Option

If you call product support, the representative might ask you to run this option to determine the exact version of your software. This option only writes to a file; it does not start 3ds Max.

Follow the -Z with a file name:

3dsmax –z id.txt

The file (in this example, *id.txt*) is written to the 3ds Max root directory.

Menu Bar

The menu bar is located directly under the main window's title bar. The title of each menu indicates the purpose of the commands on the menu. Each menu uses standard Microsoft Windows conventions.

File Menu (page 3–721)

Edit Menu (page 3–721)

Tools Menu (page 3–722)

Group Menu (page 3–722)

Views Menu (page 3–722)

Create Menu (page 3–723)

Modifiers Menu (page 3–726)

Character Menu (page 3–729)

Reactor Menu (page 3–729)

Animation Menu (page 3–729)

Graph Editors Menu (page 3–730)

Rendering Menu (page 3–731)

Customize Menu (page 3–731)

MAXScript Menu (page 3–823)

Help Menu (page 3–732)

Interface

When you click a menu name, a number of commands are listed below it.

As an alternative to using your mouse (or other pointing device), each menu name includes an underlined character. Pressing that character key while holding down the ALT key opens the menu. Commands in the open menu usually have an underlined character as well. While the menu

is open, pressing that character key invokes the command.

An ellipsis (…) after a command name indicates a dialog will appear.

A right-pointing triangle after a command name indicates that a submenu will appear.

If a command has a keyboard shortcut, the menu displays it to the right of the command name.

Menu commands that are on/off toggles use a check mark to indicate their status. If a check mark is present, the command is active.

File Menu

Menu bar > File

The File menu contains commands for managing files.

New (page 3–399)

Reset (page 3–399)

Open (page 3–400)

Open from Vault (page 3–401)

Open Recent (page 3–402)

Save (page 3–402)

Save As (page 3–403)

Save Copy As (page 3–404)

Save Selected (page 3–404)

XRef Objects (page 3–406)

XRef Scene (page 3–416)

File Link Manager Utility (page 3–431)

Merge (page 3–469)

Merge Animation (page 3–471)

Replace (page 3–476)

Load Animation (page 3–479)

Save Animation (page 3–481)

Import (page 3–490)

Export (page 3–491)

Export Selected (page 3–491)

Asset Tracking (page 3–492)

Archive (page 3–500)

Summary Info (page 3–500)

File Properties (page 3–501)

View Image File (page 3–503)

Exit (page 3–504)

File dialogs (such as Open, Save, Save As) uniformly remember the previous path you used, and default to that location.

Edit Menu

Menu bar > Edit

The Edit menu contains commands for selecting and editing objects in a scene.

Undo/Redo (page 1–93)

Hold (page 1–94)

Fetch (page 1–95)

Delete (page 1–95)

Clone (page 1–461)

Select All (page 1–86)

Select None (page 1–86)

Select Invert (page 1–86)

Select By (page 1–86)

Region (page 1–87)

Edit Named Selection Sets (page 1–91)

Object Properties (page 1–111)

Tools Menu

Menu bar > Tools

The Tools menu displays dialogs that help you change or manage objects, especially collections of objects, in your 3ds Max scene.

Transform Type-In (page 1–412)

Selection Floater (page 1–79)

Display Floater (page 3–818)

Layer Manager (page 3–706)

Light Lister (page 2–1139)

Managing Scene States (page 3–519)

Mirror (page 1–433)

Array (page 1–435)

Align (page 1–447)

Quick Align (page 1–450)

Snapshot (page 1–438)

Spacing Tool (page 1–440)

Clone and Align (page 1–444)

Normal Align (page 1–450)

Align Camera (page 1–453)

Align to View (page 1–453)

Place Highlight (page 1–452)

Isolate Selection (page 1–73)

Rename Objects (page 1–123)

Assign Vertex Colors (page 2–1544)

Color Clipboard (page 1–159)

Camera Match (page 2–1232)

Grab Viewport (page 1–35)

Measure Distance (page 2–15)

Channel Info (page 2–1549)

Group Menu

Menu bar > Group

The Group menu contains functions for grouping and ungrouping objects in the scene.

Group (page 1–102)

Ungroup (page 1–103)

Open Group (page 1–102)

Close Group (page 1–102)

Attach Group (page 1–104)

Detach Group (page 1–103)

Explode Group (page 1–103)

Assembly (page 1–104)

See also

Using Groups (page 1–95)

Using Assemblies (page 1–97)

Views Menu

Menu bar > Views

This menu contains commands for setting up and controlling viewports. Some of the commands found on this menu can also be accessed when you right-click a viewport label.

Undo View Change / Redo View Change (page 1–36)

Save Active View (page 1–37)

Restore Active View (page 1–37)

Grids Submenu (page 2–33)

Viewport Background (page 1–38)

Update Background Image (page 1–44)

Reset Background Transform (page 1–45)

Show Transform Gizmo (page 1–45)

Show Ghosting (page 1–46)

Show Key Times (page 1–46)

Shade Selected (page 1–47)

Show Dependencies (page 1–47)

Create Camera From View (page 1–48)

Add Default Lights to Scene (page 1–49)

Redraw All Views (page 1–50)

Activate All Maps (page 1–50)

Deactivate All Maps (page 1–51)

Update During Spinner Drag (page 1–51)

Adaptive Degradation Toggle (page 1–34)

Smart Object Culling (page 1–59)

Object Display Culling (page 1–59)

Expert Mode (page 1–51)

Note: The following commands, also influencing viewport behavior, are accessed from a different menu:

Viewport Configuration (page 3–896)

Units Setup Dialog (page 3–891)

Grid and Snap Settings (page 2–38)

Create Menu

Menu bar > Create

The Create menu provides a way to create some kinds of geometry, lights, cameras, and *helper objects (page 2–15).* It is organized into various submenus.

See also

Create Panel (page 3–800)

Interface

Standard Primitives

Plane (page 1–180)

Box (page 1–166)

Cone (page 1–167)

Sphere (page 1–169)

GeoSphere (page 1–171)

Cylinder (page 1–172)

Tube (page 1–174)

Torus (page 1–175)

Pyramid (page 1–177)

Teapot (page 1–178)

Extended Primitives

Hedra (page 1–182)

Torus Knot (page 1–184)

Chamfer Box (page 1–186)

Chamfer Cylinder (page 1–187)

Oil Tank (page 1–189)

Capsule (page 1–190)

Spindle (page 1–191)

L-Extrusion (page 1–193)

C-Extrusion (page 1–195)

RingWave (page 1–197)

Hose (page 1–201)

Prism (page 1–200)

AEC Objects

Foliage (page 1–209)

Railing (page 1–212)

Wall (page 1–218)

Terrain (page 1–342)

Pivot Door (page 1–246)

Sliding Door (page 1–246)

BiFold Door (page 1–247)

Straight Stair (page 1–234)

L-Type Stair (page 1–227)

U-Type Stair (page 1–238)

Spiral Stair (page 1–230)

Awning Window (page 1–251)

Casement Window (page 1–252)

Fixed Window (page 1–253)

Pivoted Window (page 1–254)

Sliding Window (page 1–256)

Projected Window (page 1–255)

Compound

Morph (page 1–309)

Scatter (page 1–313)

Conform (page 1–319)

Connect (page 1–323)

BlobMesh (page 1–326)

ShapeMerge (page 1–331)

Boolean (page 1–333)

Terrain (page 1–342)

Loft (page 1–347)

Mesher (page 1–369)

Particles

Particle Flow Source (page 2–131)

Spray (page 2–240)

Snow (page 2–242)

Blizzard (page 2–247)

PArray (page 2–252)

PCloud (page 2–249)

Super Spray (page 2–245)

Patch Grids

Quad Patch (page 1–981)

Tri Patch (page 1–983)

NURBS

CV Surface (page 1–1105)

Point Surface (page 1–1103)

CV Curve (page 1–1112)

Point Curve (page 1–1108)

Dynamics

Damper (page 1–372)

Spring (page 1–376)

Shapes

Line (page 1–265)

Rectangle (page 1–267)

Section (page 1–277)

Arc (page 1–269)

Circle (page 1–268)

Donut (page 1–271)

Ellipse (page 1–269)

Helix (page 1–276)

NGon (page 1–272)

Star (page 1–272)

Text (page 1–273)

WRectangle (page 1–279)

Channel (page 1–279)

Angle (page 1–281)

Tee (page 1–282)

Wide Flange (page 1–283)

Lights

Standard Lights >

Target Spotlight (page 2–1143)

Free Spotlight (page 2–1144)

Target Direct Light (page 2–1145)

Free Direct Light (page 2–1147)

Omni (page 2–1148)

Skylight (page 2–1149)

mr Area Spot (page 2–1153)

mr Area Omni (page 2–1152)

Photometric Lights >

Target Point (page 2–1157)

Free Point (page 2–1158)

Target Linear (page 2–1159)

Free Linear (page 2–1160)

Target Area (page 2–1161)

Free Area (page 2–1162)

IES Sun Light (Photometric) (page 2–1163)

IES Sky Light (Photometric) (page 2–1165)

Presets (page 2–1156)

Daylight System (page 1–394)

Sunlight System (page 1–394)

Cameras

Free Camera (page 2–1215)

Target Camera (page 2–1216)

Create Camera From View (page 1–48)

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Dummy (page 2–15)

Point (page 2–22)

Grid (page 2–19)

Tape Measure (page 2–23)

Protractor (page 2–25)

Compass (page 2–26)

Camera Point (page 2–1236)

Atmospherics >

Box Gizmo (page 3–300)

Cylinder Gizmo (page 3–302)

Sphere Gizmo (page 3–303)

Manipulators >

Slider (page 2–30)

Plane Angle (page 2–29)

Cone Angle (page 2–27)

Particle Flow >

Speed by Icon (page 2–158)

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VRML 97 >

Anchor (page 3–646)

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Billboard (page 3–656)

Fog (page 3–649)

Inline (page 3–657)

LOD (page 3–651)

NavInfo (page 3–648)

ProxSensor (page 3–647)

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TouchSensor (page 3–652)

Space Warps

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Motor (page 2–57)

Push (page 2–55)

Drag (page 2–62)

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Path Follow (page 2–67)

PBomb (page 2–64)

Displace (page 2–72)

Gravity (page 2–69)

Wind (page 2–71)

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PDynaFlect (page 2–77)

POmniFlect (page 2–74)

SDynaFlect (page 2–81)

SOmniFlect (page 2–80)

SDeflector (page 2–83)

UDynaFlect (page 2–82)

UOmniFlect (page 2–81)

UDeflector (page 2–85)

Deflector (page 2–86)

Geometric/Deformable >

FFD (Box) (page 2–87)

FFD (Cyl) (page 2–91)

Wave (page 2–96)

Ripple (page 2–98)

Displace (page 2–72)

Conform (page 2–99)

Bomb (page 2–101)

Modifier-Based >

Bend (page 2–103)

Noise (page 2–103)

Skew (page 2–103)

Taper (page 2–103)

Twist (page 2–103)

Stretch (page 2–103)

Systems

Bones IK Chain (page 1–381)

Daylight System (page 1–394)

Sunlight System (page 1–394)

Modifiers Menu

Menu bar > Modifiers

The Modifiers menu provides a way to apply frequently used modifiers quickly. It is organized into submenus. The availability of items on this menu depends on the current selection. If a modifier doesn't apply to currently selected objects, it is unavailable in the menu.

See also

Modify Panel (page 3–801)

Modifier Stack Controls (page 3–802)

List of Available Modifiers (page 1–483)

Interface

Selection Modifiers

Mesh Select (page 1–710)

Poly Select (page 1–752)

Patch Select (page 1–743)

Spline Select (page 1–822)

Volume Select (page 1–935)

FFD Select (page 1–680)

Select by Channel (page 1–775)

Patch/Spline Editing

Edit Patch (page 1–617)

Edit Spline (page 1–671)

Cross Section (page 1–602)

Surface (page 1–833)

Delete Patch (page 1–606)

Delete Spline (page 1–606)

Lathe (page 1–699)

Normalize Spline (page 1–739)

Fillet/Chamfer (page 1–681)

Trim/Extend (page 1–856)

Renderable Spline (page 1–771)

Sweep (page 1–839)

Mesh Editing

Cap Holes (page 1–550)

Delete Mesh (page 1–605)

Edit Mesh (page 1–613)

Edit Normals (page 1–613)

Extrude (page 1–671)

Face Extrude (page 1–673)

MultiRes (page 1–731)

Normal Modifier (page 1–738)

Optimize (page 1–741)

Smooth (page 1–818)

STL Check (page 1–825)

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Tessellate (page 1–854)

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Vertex Weld (page 1–917)

Conversion

Turn to Mesh (page 1–860)

Turn to Patch (page 1–862)

Turn to Poly (page 1–863)

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Skin (page 1–781)

Morpher (page 1–721)

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Melt (page 1–709)

Linked XForm (page 1–703)

PatchDeform (page 1–746)

PatchDeform (WSM) (page 1–533)

PathDeform (page 1–748)

PathDeform (WSM) (page 1–533)

SurfDeform (page 1–838)

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SplineIK Control (page 1–820)

UV Coordinates

UVW Map (page 1–905)

UVW Mapping Add (page 1–916)

UVW Mapping Clear (page 1–916)

UVW XForm (page 1–916)

Map Scaler (WSM) (page 1–532)

Unwrap UVW (page 1–867)

Camera Map (WSM) (page 1–498)

Camera Map (page 1–547)

Cache Tools

Point Cache (page 1–750)

Point Cache (WSM) (page 1–536)

Subdivision Surfaces

TurboSmooth (page 1–857)

MeshSmooth (page 1–714)

HSDS Modifier (page 1–693)

Free Form Deformers

FFD 2x2x2 (page 1–674)

FFD 3x3x3 (page 1–674)

FFD 4x4x4 (page 1–674)

FFD Box (page 1–677)

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Parametric Deformers

Bend (page 1–541)

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Twist (page 1–865)

Noise (page 1–735)

Stretch (page 1–826)

Squeeze (page 1–823)

Push (page 1–769)

Relax (page 1–769)

Ripple (page 1–773)

Wave (page 1–940)

Skew (page 1–780)

Slice (page 1–815)

Shell (page 1–775)

Spherify (page 1–819)

Affect Region (page 1–538)

Lattice (page 1–701)

Mirror (page 1–720)

Displace (page 1–608)

XForm (page 1–942)

Preserve (page 1–757)

Surface

Material (page 1–706)

Material by Element (page 1–707)

Disp Approx (page 1–607)

Displace Mesh (WSM) (page 1–499)

NURBS Editing

Surface Select (page 1–740)

SurfDeform (page 1–838)

DispApprox (page 1–607)

Radiosity Modifiers

Subdivide (WSM) (page 1–536)

Subdivide (page 1–829)

Cameras

Camera Correction (page 2–1237)

Character Menu

Menu bar > Character

The Character menu contains commands for managing character assemblies and bones.

Create Character (page 2–683)

Destroy Character (page 2–685)

Lock / Unlock Character (page 2–685)

Insert Character (page 2–686)

Save Character (page 2–686)

Bone Tools (page 1–388)

Skin Pose Commands (page 2–686): Set Skin Pose, Assume Skin Pose, and Skin Pose Mode

Reactor Menu

Menu bar > Reactor

The reactor menu provides a set of commands related to the reactor dynamics product, which is build into 3ds Max.

For more info on reactor, see the reactor user reference.

Animation Menu

Menu bar > Animation

The Animation menu provides a set of commands related to animation, constraints and controllers, and inverse-kinematics solvers.

Also present here are controls for custom attributes and parameter wiring, as well as for creating, viewing, and renaming animation previews.

Interface

IK Solvers

HI Solver (page 2–427)

HD Solver (page 2–442)

IK Limb Solver (page 2–454)

Spline IK Solver (page 2–455)

Constraints

Attachment Constraint (page 2–376)

Surface Constraint (page 2–379)

Path Constraint (page 2–380)

Position Constraint (page 2–384)

Link Constraint (page 2–386)

LookAt Constraint (page 2–388)

Orientation Constraint (page 2–391)

Transform Controllers

Link Constraint (page 2–386)

Position/Rotation/Scale (page 2–341)

Script (page 2–364)

Position Controllers

Audio (page 2–303)

Bezier (page 2–305)

Expression (page 2–315)

Linear (page 2–325)

Motion Capture (page 2–331)

Noise (page 1–735)

Quaternion (TCB) (page 2–361)

Reaction (page 2–342)

Spring (page 2–359)

Script (page 2–356)

XYZ (page 2–340)

Attachment Constraint (page 2–376)

Path Constraint (page 2–380)

Position Constraint (page 2–384)

Surface Constraint (page 2–379)

Rotation Controllers

Audio (page 2–303)

Euler XYZ (page 2–312)

Linear (page 2–325)

Motion Capture (page 2–331)

Noise (page 2–337)

Quaterion (TCB) (page 2–361)

Reaction (page 2–342)

Script (page 2–356)

Smooth (page 2–359)

LookAt Constraint (page 2–388)

Orientation Constraint (page 2–391)

Scale Controllers

Audio (page 2–303)

Bezier (page 2–305)

Expression (page 2–315)

Linear (page 2–325)

Motion Capture (page 2–331)

Noise (page 2–337)

Quaternion (TCB) (page 2–361)

Reaction (page 2–342)

Script (page 2–356)

XYZ (page 2–355)

Parameter Editor (page 1–124)

Parameter Collector (page 1–133)

Wire Parameters

Wire Parameters (page 2–393)

Parameter Wire Dialog (page 2–395)

Reaction Manager (page 2–345)

Toggle Limits—Toggles all *Limit controllers (page 2–319)* in the current scene. If all Limit controllers are off, Toggle Limits turns them on, and if all are on, it turns them off. If some are on and the rest are off, Toggle Limits turns them all on.

Make Preview (page 3–163)

View Preview (page 3–165)

Rename Preview (page 3–165)

Delete Selected Animation

Graph Editors Menu

Menu bar > Graph Editors

The Graph Editors menu gives you access to graphic sub-windows for managing a scene and its hierarchies and animation.

Interface

Track View – Curve Editor (page 2–489)

Track View – Dope Sheet (page 2–489)

New Track View (page 2–574)

Delete Track View (page 2–574)

Saved Track Views (page 2–575)

New Schematic View (page 3–702)

Delete Schematic View (page 3–702)

Saved Schematic Views (page 3–702)

Particle View (page 2–121)

Motion Mixer... (page 2–581)

Rendering Menu

Menu bar > Rendering

The Rendering menu contains commands for rendering scenes, setting up environmental and render effects, compositing scenes with Video Post, and accessing the RAM Player.

Render (page 3–2)

Environment (page 3–267)

Effects (page 3–215)

Advanced Lighting >

- *Light Tracer (page 3–43)*
- *Radiosity (page 3–60)*
- *Exposure Control (page 3–289)*
- *Lighting Analysis (page 3–75)*

Render to Texture (page 3–139)

Batch Render (page 3–200)

Raytracer Settings (page 2–1369)

Raytrace Global Include/Exclude (page 2–1372)

mental ray Message Window (page 3–86)

ActiveShade Floater (page 3–20)

ActiveShade Viewport (page 3–20)

Material Editor (page 2–1253)

Material/Map Browser (page 2–1256)

Video Post (page 3–307)

Show Last Rendering (page 3–24)

Panorama Exporter (page 3–166)

Print Size Wizard (page 3–24)

RAM Player (page 3–685)

Customize Menu

Menu bar > Customize

The Customize menu contains commands for customizing the 3ds Max user interface (UI).

Customize User Interface (page 3–836)

Load Custom UI Scheme (page 3–849)

Save Custom UI Scheme (page 3–850)

Revert to Startup Layout (page 3–851)

Custom UI and Defaults Switcher (page 3–833)

Show UI (page 3–832)

Lock UI Layout (page 3–832)

Configure Paths (page 3–852)

Units Setup (page 3–891)

Grid and Snap Settings (page 2–38)

Viewport Configuration (page 3–896)

Plug-In Manager (page 3–832)

Preferences (page 3–859)

You can create a custom user interface layout, including custom keyboard shortcuts, colors, menus, and quad menus. You can load or save all of these things individually in the Customize User Interface dialog, or you can load or save all of them at once, using *schemes*. Schemes allow you to load all customized features of the UI at one time.

You can hide, *float or dock (page 3–1024)*, resize, and rearrange some UI elements into your own personal design. You can also lock the UI once you've got it set. Tools are provided in the

Customize menu to load and save these custom UI files, or to revert to the startup user interface.

System preferences such as keyboard shortcuts, viewport configuration, units setup, grid and snap settings, and many important default settings, are also on the Customize menu.

Tip: You can access many of these commands with keyboard shortcuts or right-click options. For example, you can display the Grid and Snap Settings dialog by right-clicking the Snaps buttons on the main toolbar; you can display the Viewport Configuration dialog by right-clicking the viewport label, and then choosing Configure.

MAXScript Menu

Menu bar > MAXScript

Utilities panel > MAXScript

This menu contains commands for working with scripts you create with the software's built-in scripting language, *MAXScript (page 1–xx)*.

New Script (page 3–824)

Open Script (page 3–824)

Run Script (page 3–824)

MAXScript Listener (page 3–824)

Macro Recorder (page 3–825)

Visual MAXScript Editor (page 3–826)

MAXScript Debugger Dialog (page 3–826)

There is also a *MAXScript Mini Listener (page 3–746)* on the *status bar (page 3–746)*.

For detailed information about the MAXScript utility, open the MAXScript Reference, available from Help menu > MAXScript Reference.

Help Menu

Menu bar > Help

The Help menu provides access to the 3ds Max online reference systems.

New Features Guide (page 3–973)

User Reference (page 3–973)

MAXScript Reference (page 3–973)

Tutorials (page 3–974)

Hotkey Map (page 3–974)

Additional Help (page 3–974)

3ds Max on the Web (page 3–974)

Activate 3ds Max (page 3–975)

License Borrowing—If you're running 3ds Max under a network license, you can use this submenu to borrow or return a license. For details, see the Autodesk License Borrowing Utility help, which is available as the file *adsk_brw.chm*, installed in the *\program files\common files\autodesk shared\enu* folder on your local drive (typically, drive C:).

About 3ds Max (page 3–975)

Toolbars

Many of the commands in 3ds Max are available as buttons on a toolbar. By default, two toolbars are displayed: the *main toolbar (page 3–733)* and the *reactor (page 3–736)* toolbar. By default, the main toolbar is docked at the top of the interface and the reactor toolbar is docked on the left side of the interface. You can, however, place them wherever you want. See *Customizing the User Interface (page 3–829)* for more information.

Several additional toolbars are hidden by default: *Axis Constraints (page 3–735)*, *Layers (page 3–735)*, *Extras (page 3–736)*, *Render Shortcuts (page 3–736)*, *Snaps (page 3–737)*, and *Brush Presets (page 3–737)*. To turn any of them on, right-click a blank area of the main toolbar and choose the toolbar's name from the list. You can use this method to turn any toolbar on or off.

See *Customize Display Right-Click Menu (page 3–831)* for more information.

See also

Main Toolbar (page 3–733)

Axis Constraints Toolbar (page 3–735)

Layers Toolbar (page 3–735)

reactor Toolbar (page 3–736)

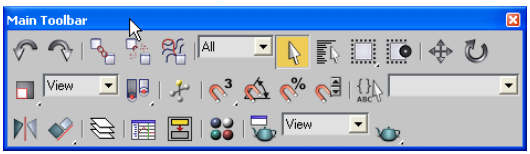
Extras Toolbar (page 3–736)

Render Shortcuts Toolbar (page 3–736)

Snaps Toolbar (page 3–737)

Brush Presets Toolbar (page 3–737)

Main Toolbar



The main toolbar in its "floating" form.

The main toolbar provides quick access to tools and dialogs for many of the most common tasks in 3ds Max.

Note: Right-clicking the move, rotate, or scale buttons opens the *Transform Type-In dialog (page 1–412)*.

Undo (page 1–93)

Redo (page 1–94)

Select and Link (page 2–404)

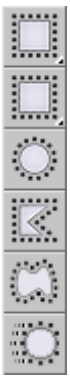
Unlink Selection (page 2–405)

Bind to Space Warp (page 2–54)

Selection Filter List (page 1–83)

Select Object (page 1–77)

Select By Name Button (page 1–77)

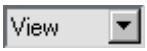
 *Selection Region Flyout (page 1–80)*

Window/Crossing Selection Toggle (page 1–88)

Select and Move (page 1–419)

Select and Rotate (page 1–420)

Select and Scale Flyout (page 1–421)



Reference Coordinate System (page 1–423)

Use Center Flyout (page 1–426)

Select And Manipulate (page 2–26)

2D Snap, 2.5D Snap, 3D Snap (page 2–35)

Angle Snap Toggle (page 2–36)

Percent Snap Toggle (page 2–37)

Spinner Snap Toggle (page 2–37)

Edit Named Selection Sets (page 1–91)

Named Selection Sets (page 1–85)

Mirror (page 1–433)

Align Flyout (page 1–446)

Layer Manager (page 3–706)

Curve Editor (Open) (page 2–489)

Schematic View (Open) (page 3–688)

Material Editor (page 2–1253)

Render Scene Dialog (page 3–2)

Render Type (page 3–13)

Quick Render flyout:

- *Quick Render (Production) (page 3–16)*

- *Quick Render (ActiveShade) (page 3–17)*

Quick Render (page 3–16)

Axis Constraints Toolbar

Right-click unused area of any toolbar > Axis Constraints

The axis constraint buttons and flyouts appear on the Axis Constraints toolbar.

Note: The default UI does not display this toolbar: to see it, right-click an empty portion of any toolbar, and choose Axis Constraints from the menu.

Restrict To X (page 1–428)

Restrict To Y (page 1–429)

Restrict To Z (page 1–429)

Restrict to Plane flyout: (page 1–430)

Restrict To XY Plane (page 1–430)

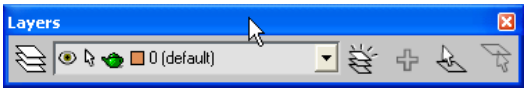
Restrict To YZ Plane (page 1–431)

Restrict To ZX Plane (page 1–431)

Snaps Use Axis Constraints Toggle (page 2–46)

Layers Toolbar

Right-click any toolbar > Layers



The Layers toolbar simplifies interaction with the layer system in 3ds Max, allowing you to easily organize the layers in your scene. Most of these operations are available from the *Layer Manager (page 3–706)*, however the Layers toolbar provides shortcuts to several common actions, as well as the advantage of being able to work directly in the viewports.

Note: The default UI does not display this toolbar; to see it, right-click an empty portion of any toolbar, and choose Layers from the menu.

The Layers toolbar provides the following controls:

Layer Manager (page 3–706)

Layer List (page 3–715)

Create New Layer (page 3–716)

Add Selection to Current Layer (page 3–716)

Select Objects in Current Layer (page 3–716)

Set Current Layer to Selection's Layer (page 3–716)

See also

Using Layers to Organize a Scene (page 3–704)

reactor Toolbar

The reactor toolbar provides quick access to many of the objects and commands for the reactor dynamics feature. For more information, see the reactor User Reference.

Note: The reactor toolbar is docked on the left side of your interface by default. You can toggle its display by right-clicking any toolbar and choosing reactor.

For more information, see *Customize Display Right-Click Menu (page 3–831)* and *Customizing the User Interface (page 3–829)*.

Extras Toolbar

The Extras toolbar contains several miscellaneous tools for working with your 3ds Max scene.

Note: The default UI does not display this toolbar; to see it, right-click an empty portion of any toolbar, and choose Extras from the menu.

Keyboard Shortcut Override Toggle (page 3–912)

AutoGrid (page 2–7)

Array Flyout (page 1–432)

Preset Rendering Options (page 3–23)

Render Shortcuts Toolbar

Right-click the unused (gray) portion of the main toolbar or another toolbar. > Render Shortcuts

The Render Shortcuts toolbar lets you assign settings to three custom preset buttons. You can then use these buttons to switch among various render presets.

Procedures

To define the presets for a button:

1. Choose one of the default shortcuts from the Presets drop-down list, or use Load to load the presets from an RPS file.

   The Select Preset Categories dialog appears. See *Preset Rendering Options (page 3–23)*.

2. Choose the categories you want, and then click Save.

   The preset render settings are now active.

3. SHIFT+click the button you want to define.

   3ds Max assigns the presets to the file that corresponds to the button: *a.rps, b.rps,* or *c.rps*.

To use a saved preset:

1. Click one of the buttons you defined.

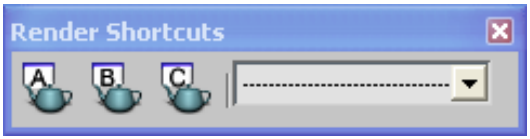
   The button's name appears in the field above the drop-down list: "a," "b," or "c."

   If the button has not yet been defined, clicking it has no effect, and no name appears in the preset field.

2. On the main toolbar, click Quick Render.

   The scene is rendered using the presets you chose.

Interface



Render Preset Slot A, B, and C—Click a button to make its presets active.

If you haven't assigned presets to a button, clicking it has no effect. If presets are assigned, then after you click the button, its name appears in the field above the drop-down list: "a," "b," or "c."

After assignment, each button has its own render preset (RPS) file: *a.rps, b.rps,* and *c.rps*. These are saved in the *\renderpresets* folder below the 3ds Max root directory. The active preset status is not saved with the MAX scene, but it is saved in the *3dsmax.ini* file.

Render Presets drop-down list—Lets you choose from among a set of preset rendering parameters, or load or save rendering parameter settings. See *Preset Rendering Options (page 3–23)*.

This list is the same as the one that appears at the bottom of the *Render Scene dialog (page 3–2)*.

Snaps Toolbar

Right-click unused area of any toolbar. > Snaps

The Snaps toolbar provides access to the most common Snaps settings.

To toggle display of the Snaps toolbar, right-click an empty area of the main toolbar, such as the section under the Reference Coordinate System drop-down, and choose Snaps. For details on the button functions, see *Standard Snaps (page 2–40)* and *Snap Options (page 2–43)*.

Brush Presets Toolbar

Right-click unused area of any toolbar. > Brush Presets

The Brush Presets toolbar gives you quick access to up to 50 different brush settings for use with the following paint-oriented tools:

- *Paint Deformation (page 1–1065)* (Edit/Editable Poly)
- *Paint Soft Selection (page 1–948)* (Edit/Editable Poly)
- *VertexPaint modifier (page 1–918)*
- *Skin modifier (page 1–781)*

You can also use the toolbar to create new presets and to open the *Brush Preset Manager (page 3–739)*, which lets you edit presets, and save and load groups of presets. The current group of presets is saved when you quit 3ds Max and is restored the next time you start the program.

Note: Only one set of presets is available at a time. The Brush Presets feature stores context-specific features, such as the VertexPaint color, but a given preset has the same size (or size range) in *every* context. Other context-independent settings are Strength and Mirror options (set via the *Painter Options dialog (page 1–801)*.

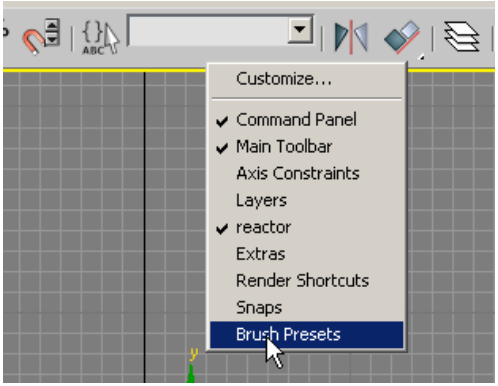
Procedure

To use the Brush Presets toolbar:

1. Access any of the brush tools listed above.

   The tool starts with a default brush.

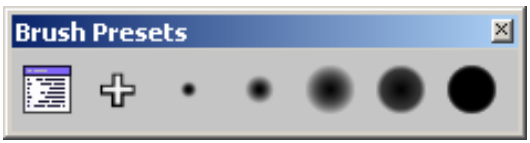
2. Right-click an empty area on a toolbar, such as the main toolbar below the Named Selection Sets drop-down list, and choose Brush Presets.



This opens the Brush Presets toolbar.

3. Do either of the following:
   - Click any of the presets to use it instead of the default brush.
   - Change brush settings and click Add New Preset to add a new button with the current settings.
4. Paint with the brush.
5. If you change brush settings with a preset brush active, the preset will remember the changes between sessions. Common setting changes such as Size will apply to use of the brush with any tool.
6. To change a preset's name, copy it, delete it from the toolbar, or save or load all brush presets, click *Brush Preset Manager (page 3–739)*.

Interface



The Brush Preset toolbar controls are available only when a brush tool such as *Paint Deformation (page 1–1065)* is active.

Brush Preset Manager—Opens the *Brush Preset Manager (page 3–739)* dialog, which lets you add, duplicate, rename, delete, save, and load brush presets.

Add New Preset—Adds a new preset with the current brush settings to the toolbar, first prompting you for a name for the brush. If you attempt to exceed the maximum number of brush presets (50), a dialog alerts you.

[brush presets]—Each preset is available on a button with a grayscale bitmap showing its shape and relative size. Click a preset to activate it and use its settings. Each preset contains all settings pertinent to the current tool, such as Mode for Paint Deformation brushes. You can see a preset name by hovering the mouse cursor over it; the tooltip that appears shows its name.

To deactivate a preset, click its preset again on the toolbar. Its settings remain active, but changing the settings no longer modify the preset.

By default, the toolbar contains five brush presets, but you can add up to a total of 50. To activate and use a preset, click its button on the toolbar. The program remembers any changes you make to the brush settings while a preset is active and automatically restores these at the start of the following session.

The button image updates automatically to reflect changes to the size (by default, up to 40.0) and the falloff, which is depicted as a gradient on the button image. Set the falloff with the *Painter Options dialog (page 1–801)*.

Note: Changing a value for a setting the preset has in common with other contexts, such as Size,

changes it for all contexts. For example, if you set a preset brush's size to 11.6, the brush will be that size when used with any other tool.

Brush Preset Manager

Brush Presets toolbar (page 3–737) > Activate a brush tool. > Brush Preset Manager

The Brush Preset Manager lists all brush presets, showing the context-specific settings and lets you change contexts. It also lets you rename, add, copy, and delete presets, and set the range for the depiction of brush sizes on the toolbar. Lastly, it lets you save and load custom collections of brush presets using the BPR file format.

The Brush Presets feature recognizes four contexts:

- *VertexPaint modifier (page 1–918)*
- *Paint Deformation (page 1–1065)* (Edit/Editable Poly)
- *Paint Soft Selection (page 1–948)* (Edit/Editable Poly)
- *Skin modifier (page 1–781)*

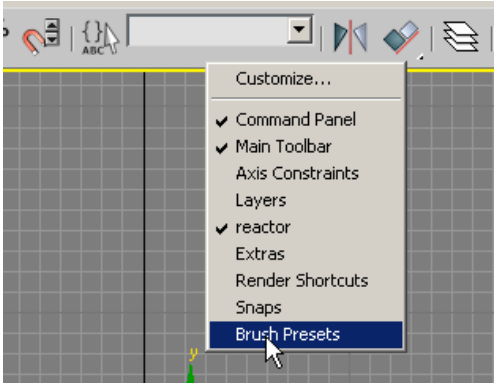
Procedure

To use the Brush Preset Manager:

1. Access any of the brush tools listed above.

   The tool starts with a default brush.

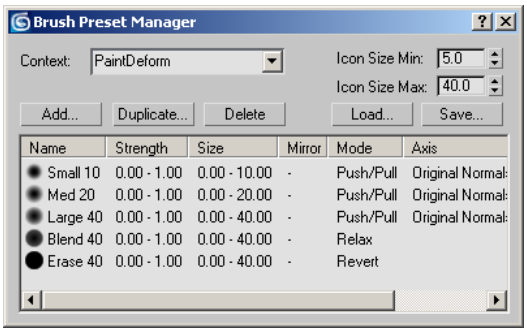
2. Right-click an empty area on a toolbar, such as the main toolbar below the Named Selection Sets drop-down list, and choose Brush Presets.



This opens the Brush Presets toolbar.

3. On the toolbar, click Brush Preset Manager.

Interface



Context—Choose the context for the settings in the list window. The Brush Presets feature recognizes four contexts and shows the current context as active:

- *VertexPaint (modifier) (page 1–918)*
- *PaintDeform (Paint Deformation; Edit/Editable Poly) (page 1–1065)*
- *PaintSoftSel (Paint Soft Selection; Edit/Editable Poly) (page 1–948)*
- *Paint Skin Weights (Skin modifier) (page 1–781)*

Icon Size Min/Max—Sets the range of the brush size depicted on the toolbar. Changing the actual brush size between the minimum and maximum settings changes the image of the brush as depicted on its button to show its size relative to the other presets. Changes to the brush size outside these limits are not reflected on the toolbar buttons.

Add—Adds a new preset to the list, using the current brush settings. When you click Add, you're prompted to enter a name for the new preset. Edit the name and then click OK to create the new preset. The new preset appears highlighted at the end of the list and the toolbar.

Note: If 50 presets already exist, you won't be able to add any new ones.

Duplicate—Adds a copy of the highlighted preset to the list. When you click Duplicate, you're prompted to enter a name for the new preset. Edit the name and then click OK to create the new, duplicate preset. The preset appears highlighted at the end of the list and the toolbar.

Note: If 50 presets already exist, you won't be able to add any new ones via duplication.

Delete—Deletes the brush preset highlighted in the list from both the list and the toolbar.

Load—Lets you load a saved Preset (BPR) file. Click Load to open the Load Brush Preset File dialog, click a BPR file to load, and then click Open. The loaded Preset file replaces the current presets.

Save—Lets you save a custom Preset (BPR) file, containing all current brush presets. Click Save to open the Save Brush Preset File dialog, specify a BPR file to save, and then click Save. You can then load the Preset file into 3ds Max at any time.

[presets list]—Shows all presets in a scrollable list. Each list entry shows a small version of the button image, the preset name, ranges for Strength and Size, Mirror and Mode settings, and other settings depending on the context.

To rename a button preset, double-click its name and then edit or enter a new one. Other settings are available from the applicable rollout and the *Painter Options dialog (page 1–801)*. For example, you can set the brush strength and size on the applicable rollout, but to set the range, which is used by a pressure-sensitive input device such as a pen and tablet, you must use the Painter Options dialog. Mirror options are also available only from this dialog.

The list shows the following general and contextual information:

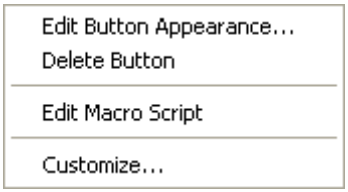
- General (all contexts):
  - **Strength** (with range)
  - **Size** (with range)
  - **Mirror** on/off (with axis and offset, if on)
  - **Falloff** values (set via the Painter Options graph, displayed as a gradient in the button image)
- *VertexPaint (page 1–918)*
  - **Mode** (brush state: Paint, Erase, Blur Brush)
  - **Color**
  - **Opacity**
  - **BlurStrength** (if Mode=Blur Brush)
- *PaintDeform (page 1–1065)*
  - **Mode** (brush state: Push/Pull, Relax, Revert)
  - **Axis** (if brush is Push/Pull)
  - **Push/Pull Value** (if brush is Push/Pull)
- *PaintSoftSel (page 1–948)*
  - **Mode** (brush state: Paint, Blur, Revert)
  - **Selection Value**
- *Paint Skin Weights (Skin modifier) (page 1–781)*

- **Mode** (Paint, Blend [Paint Blend Weights=on])

Right-Click Menu for Scripted Toolbar Buttons

Any toolbar > Right-click a button that is implemented by a script. > Pop-up button menu

When you right-click a toolbar button that is implemented by a macro script, a pop-up menu appears.



Edit Button Appearance—Displays the Edit Macro Button dialog, which lets you change the button's appearance and its tooltip. This is documented in the *MAXScript Reference:* see Customizing MacroScript Buttons.

Delete Button—Deletes the button from the toolbar.

Note: There is no Undo for Delete Button, although Customize > Revert To Startup Layout will restore the toolbar to its original appearance.

Edit Macro Script—Opens a MAXScript Editor window, which lets you edit the button's script.

Customize—Opens the *Toolbars panel (page 3–838)* of the Customize User Interface dialog, which lets you customize the contents of the current toolbar (or any other toolbar).

Quad Menu

When you click the right mouse button anywhere in an active viewport, except on the viewport label (see *Viewport Right-Click Menu (page 3–774)*), a *quad menu* is displayed at the location of the mouse cursor. The quad menu can display up to four quadrant areas with various commands. These commands can be customized on the *Quads panel (page 3–839)* of the *Customize User Interface dialog (page 3–836)*.

The quad menu allows you to find and activate most commands without having to travel back and forth between the viewport and rollouts on the command panel.

The two right quadrants of the default quad menu display generic commands, which are shared between all objects. The two left quadrants contain context-specific commands, such as mesh tools and light commands. Each of these menus provides convenient access to functions found in the command panel. You can also repeat your last quad menu command by clicking the title of the quadrant.

The quad menu contents depend on what is selected, as well as any customization options you may have selected in the Quads panel of the Customize UI dialog. The menus are set up to display only the commands that are available for the current selection; therefore, selecting different types of objects displays different commands in the quadrants. Consequently, if no object is selected, all of the object-specific commands will be hidden. If all of the commands for one quadrant are hidden, the quadrant will not be displayed.

Cascading menus display submenus in the same manner as a right-click menu. The menu item that contains submenus is highlighted when expanded. The submenus are highlighted when you move the mouse cursor over them.

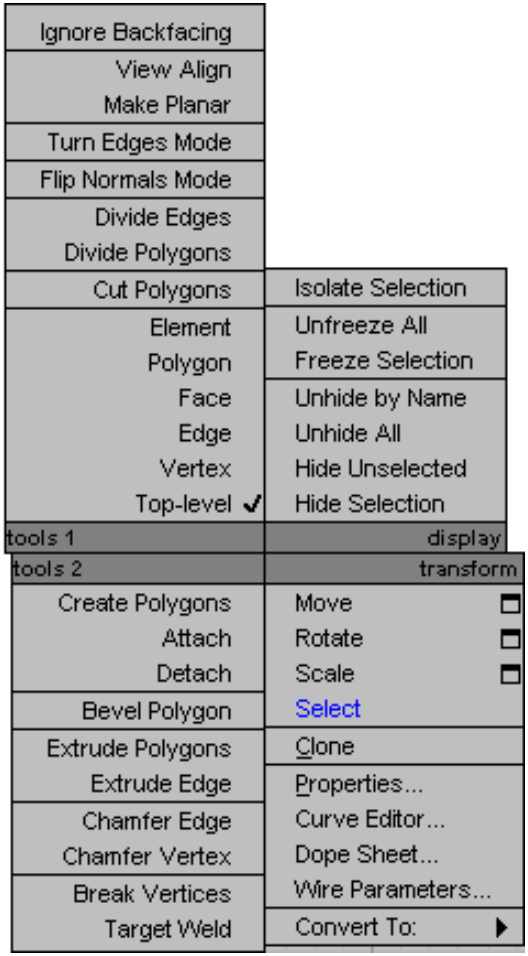
Some of the selections in the quad menu have a small icon next to them in the quad menu. Clicking this icon opens a dialog where you can set parameters for the command.

To close the menu, right-click anywhere on the screen or move the mouse cursor away from the menu and click the left mouse button. To reselect the last selected command, click in the title of the quadrant of the last menu item. The last menu item selected is highlighted when the quadrant is displayed.

Additional, specialized quad menus become available when you are working in *ActiveShade (page 3–17)*, the *Edit UVWs dialog (page 1–878)*, or when you press any combination of SHIFT, CTRL, or ALT while right-clicking in any standard viewport. For more information, see *Additional Quad Menus (page 3–744)*.

Interface

The following are the default commands for the right-click menu. You can add, edit, or remove any of these commands in the *Quads panel (page 3–839)* of the Customize User Interface dialog.



Default quad menu for an editable mesh object at the Vertex sub-object level

Transform quadrant

These options are available from the Transform quadrant:

Move—Lets you move objects. This is the same as clicking *Select And Move (page 1–419)* on the main toolbar.

You can open the *Transform Type-In (page 1–412)* by clicking the icon to the right of Move on this menu.

Rotate—Lets you rotate objects. This is the same as clicking *Select And Rotate (page 1–420)* on the main toolbar.

You can open the *Transform Type-In (page 1–412)* by clicking the icon to the right of Rotate on this menu.

Scale—Lets you scale objects. This is the same as clicking *Select And Scale (page 1–421)* on the main toolbar. If one of the other *Select And Scale flyout (page 1–421)* buttons is active on the main toolbar, that tool becomes active when you click Scale on the quad menu.

You can open the *Transform Type-In (page 1–412)* by clicking the icon to the right of Scale on this menu.

Select—Lets you select objects.

Clone—Lets you clone objects. This is the same as choosing *Clone (page 1–461)* from the Edit menu.

Properties—Opens the *Object Properties dialog (page 1–111)* for a selected object. This command is available only if an object is selected when you open the quad menu.

Curve Editor—Opens and displays the selected object at the top of the Track View Hierarchy. This command is visible only if an object is selected when you open the quad menu.

Dope Sheet—Opens and displays the *Dope Sheet (page 2–489)*.

Wire Parameters—Starts a *wire parameter (page 2–393)* from the selected object. This command is available only if an object is selected when you open the quad menu.

Convert To—This submenu lets you convert the selected object to an *editable mesh (page 1–984)*, an *editable patch (page 1–950)*, an *editable spline (page 1–284)*, a *NURBS surface (page 1–1102)*, or an *editable poly (page 1–1012)*. This command is available only if an object is selected when you open the quad menu.

Display quadrant

These options are available from the Display quadrant:

Isolate Selection—The *Isolate Selection tool (page 1–73)* lets you edit your selection while hiding the rest of the scene.

Tip: You can use this successively to dig into a large selection set.

Isolate Selection's Layer—Isolates the layer of the selected object.

Unfreeze All—Unfreezes all frozen objects.

Freeze Selection—Freezes the selected objects. Frozen objects are visible in the viewports, but cannot be manipulated.

Freeze Selection's Layer—Freezes the layer of the selected object.

Unhide by Name—Displays a dialog you use to hide objects you choose from a list. See *Select Objects Dialog (page 1–78)*, which describes nearly identical controls.

Note: You cannot unhide an object on a hidden layer. If you select and object on a hidden layer, a dialog will prompt you to unhide the layer first.

Unhide All—Unhides all hidden objects.

Hide Unselected—Hides all visible objects that are not selected. Hidden objects still exist in the scene, but do not appear in the viewports or in rendered images.

Hide Selection—Hides the selected objects.

Hide Selection's Layer—Hides the layer of the selected object.

Context Hide/Unhide Tools—The hide and unhide commands are context-specific for editable meshes, polys, patches, and splines. They are

visible only if there is a corresponding geometry selected when the quad menu is opened.

Tools quadrants

The two quadrants on the left side of the default quad menu are called Tools 1 and Tools 2. These quadrants contain commands specific to various geometries and modifiers such as: lights, editable geometries, and cameras. These quadrants are not displayed unless one of the corresponding geometries or modifiers are selected when the quad menu is opened.

Additional Quad Menus

Several specialized quad menus are available when you are working in certain modes, such as *ActiveShade (page 3–17)*, *Edit UVWs (page 1–878)*, *Track View (page 2–483)*, or when you press any combination of SHIFT, CTRL, or ALT while right-clicking any standard viewport.

The ActiveShade quad menu provides many useful commands such as Render, Draw Region, Update, as well as access to the *Material Editor (page 2–1253)*. Similarly, the Unwrap UVW quad menu contains many common UVW commands.

More quad menus are available if you hold down any combination of SHIFT, CTRL, or ALT when you right-click a viewport. Some of these menus have default commands, and some of them are empty.

You can create or edit any of these menus from the quad set list in the *Quads panel (page 3–839)*, on the Customize User Interface dialog; however, they cannot be deleted.

These are the additional quad menus and their default settings:

ActiveShade—Appears when you right-click an *ActiveShade viewport or window (page 3–17)*. This menu provides quick access to many of the commonly used actions in ActiveShade, including Draw Region, Initialize, and Update, as well as access to the Material Editor.

Unwrap UVW—Appears when you right-click an Edit UVWs dialog. This menu provides quick access to many of the commonly used UVW actions.

Track View Key—Appears when you right-click any Track View dialog. This menu provides quick access to common key actions, such as Move, Add, Scale, and Reduce Keys.

SHIFT+right-click—Provides access to snap options and settings. See *Grid and Snap Settings dialog (page 2–38)*.

ALT+right-click—Provides several animation tools, letting you set the coordinate system, set and assume skin poses, and set key frames.

CTRL+right-click—Provides several modeling tools that let you create and edit many geometries, including standard primitives and editable geometries.

SHIFT+ALT+right-click—Contains many reactor commands. For more information, see the **reactor** User Reference.

SHIFT+CTRL+right-click—Available for assignment. Use the Quads panel to customize it.

CTRL+ALT+right-click—Provides several lighting and rendering commands. The default actions let you create and edit lights, render your scene, access the Material Editor, render effects, and environmental effects.

SHIFT+CTRL+ALT+right-click—Available for assignment. Use the Customize menu > Customize User Interface > Quads panel to customize this menu.

There is also a *Track View quad menu (page 2–512)* that appears only while you are using Track View.

Animation Quad Menu

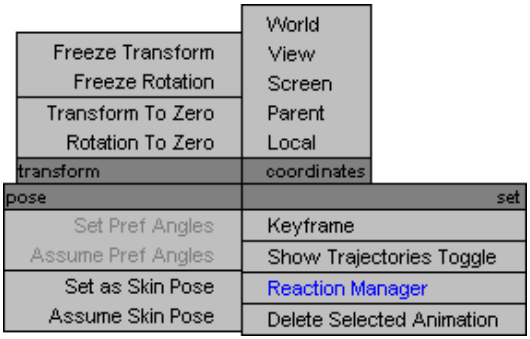
ALT+right-click a viewport. > Animation quad menu

The ALT+right-click quad menu has commands to assist in animation.

See also

Additional Keyboard Commands (page 3–717)

Interface



Coordinates quadrant

Lets you change the active *reference coordinate system (page 1–423)*.

Set quadrant

Keyframe—Sets a key at the current frame. Set Key or Auto Key do not need to be on.

Show Trajectories Toggle—Toggles the display of *trajectories (page 2–296)*.

Reaction Manager—Opens the *Reaction Manager dialog (page 2–345)*.

Delete Selected Animation—Deletes any existing animation keys for all selected objects, as well as any sub-object animation. Each object remains in its state at the frame in which you use this command.

Pose quadrant

Set Pref Angles—For a hierarchy with history-independent (HI) IK applied to it, sets the preferred angle for each bone in the chain.

Assume Pref Angles—For a hierarchy with history-independent (HI) IK applied to it, copies the X, Y, and Z preferred angle channels of each bone and places them into its FK rotation subcontroller.

Set as Skin Pose—Stores the selected objects' current position, rotation, and scale as the skin pose. See *Skin Pose Commands (page 2–686)*.

Assume Skin Pose—Causes the selected objects to take on the stored skin pose. See *Skin Pose Commands (page 2–686)*.

Transform quadrant

Commands in this quadrant are meant primarily as aids to character animation. Use the Freeze commands to set the character's initial pose. Then you can later use the "to Zero" options to return to that initial pose.

Freeze Transform—Sets the object's transform values to zero without actually moving the object.

Freeze Rotation—Sets the object's rotation value to zero without actually moving the object.

Transform to Zero—Transforms the object back to the zero pose established by Freeze Transform.

Transform To Zero works only if you have previously invoked Freeze Transform or Freeze Rotation.

Note: There is also a Position To Zero command, which returns the object to the zero position only (no rotation). You can use Position To Zero by creating a keyboard shortcut for it. See *Additional Keyboard Commands (page 3–717)*.

Rotation to Zero—Transforms the object back to the zero rotation established by Freeze Rotation.

Rotation To Zero works only if you have previously invoked Freeze Transform or Freeze Rotation.

Status Bar Controls

The 3ds Max window contains an area at the bottom for prompt and status information about your scene and the active command. There is a coordinate display area in which you can type transform values, and on the left, a two-line interface to the MAXScript Listener.

See also

Animation and Time Controls (page 3–759)

Viewport Controls (page 3–778)

Time Slider and Track Bar

Time Slider (page 3–748)

Show Curves —Click to display a version of the *Track View Curve Editor (page 2–489)* in place of the time slider and track bar.

When curves are displayed, you can click the Close button at upper left to return to a view of the time slider and track bar.

Track Bar (page 3–750)

Status Bar

MAXScript Mini Listener (page 3–746)

Status Line (page 3–748)

Selection Lock Toggle (page 3–754)

Relative/Absolute Transform Type-In (page 1–412)

Coordinate Display (page 3–755)

Grid Setting Display (page 3–757)

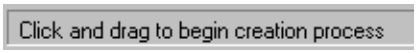
Prompt Line (page 3–746)

Time Tag (page 3–757)

Prompt Line

Status bar > Prompt line

The prompt line, located at the bottom of the window under the status line, provides ongoing feedback, based on the current cursor position and the current program activity. When you don't know what to do next, look down here for instructions.



Depending on what you are doing, the prompt line displays instructions that tell you what the program expects or what you can do next. For example, when you click the Move button, the prompt line reads "Click and drag to select and move objects."

Tooltips are also displayed on the prompt line as your cursor passes over icons in any toolbar and the status bar.

MAXScript Mini Listener

Click the tag bar, to the left of the status and prompt lines, and drag it to the right to display the MAXScript Mini Listener.

The MAXScript Mini Listener is a single-line view of the contents of the *MAXScript Listener window (page 3–824)*.

The MAXScript Listener window is divided into two panes: one pink, and one white. The pink pane is the MacroRecorder pane. When the MacroRecorder is enabled, everything that is recorded is displayed in the pink pane. The pink line in the Mini Listener shows the latest entry into the MacroRecorder pane.

The white pane is the Scripter window where you can create scripts. The last line you type in the white area of the Listener will appear in the white are of the Mini Listener. Use the arrow keys to scroll the display in the Mini Listener.

You can type directly into the white area of the Mini Listener, and the command executes in the viewports.

Right-click either of the Mini Listener lines to open the floating MAXScript Listener window. It will also display a list of the last 20 commands recorded. You can choose any of these commands and press ENTER to execute them.

For more information about the MAXScript Listener window, as well as about creating scripts, see the MAXScript Reference: choose Help > MAXScript Reference.

Procedures

Example: To create a sphere using the Mini Listener:

1. Click the tag bar at the left end of the status bar, and drag it to the right to expand the Mini Listener.
2. In the Scripter (white, lower) line, type **sphere radius: 50** and press ENTER.

   A sphere appears in the viewports.

Example: To redo a command using the Mini Listener:

1. Click the tag bar at the left side of the status bar, and drag it to the right to expand the Mini Listener.
2. Right-click the Mini Listener and choose Open Listener Window.
3. From the MacroRecorder menu, choose Enable.
4. Using the command panel, create a sphere in the perspective viewport.
5. Convert the sphere to an Editable Mesh.
6. Delete the sphere.
7. Make a box.
8. Right-click the MacroRecorder (pink, upper) line and choose *macros.run "Modifier Stack" "Convert_to_Mesh"* from the list. The box has been collapsed to an editable mesh.

Example: To make a script and add it to a toolbar:

For this very simple example, you'll make a script that collapses an object to an editable mesh, and then create a toolbar icon to run the script.

1. Right-click the Mini Listener, and choose Open Listener Window.
2. From the MacroRecorder menu, choose Enable. Close the listener window.
3. Create a box in the Perspective viewport.
4. Right-click the box and choose Convert to: > Editable Mesh from the quad menu.
5. Left-click in the MacroRecorder line.

   The MacroRecorder line goes blank because the cursor goes to the last line.
6. Press the upper-arrow key on the keyboard to move up the list of recorded command scripts.
7. Click and highlight the *macros.run "Modifier Stack" "Convert_to_Mesh"* line.

   Highlight the command script as you would highlight a line of text in a text editor by clicking at the start of the line and dragging along the entire length.
8. Click and drag the highlighted script from the Mini Listener to a toolbar.

Interface

MacroRecorder Line—The pink, upper line displays the last thing recorded by the MacroRecorder. If the MacroRecorder is not enabled, nothing will appear in this line.

Scripter Line—The white, lower line displays the last entry typed into the Scripter window. You can type directly into this line and execute the commands in the viewports

History List—Right-clicking either of the Mini Listener lines displays a history of the last twenty commands recorded by the Macro Recorder (provided it has been enabled). Click any of these commands to execute them in the viewports.

Open Listener Window—Right-clicking either of the Mini Listener lines displays a dialog that allows you to open the MAXScript Listener window. You can also open the Listener using the Utilities panel > MAXScript rollout. You can display the Listener window in a viewport by right-clicking the viewport label, then choosing Views > Extended > MAXScript Listener.

Status Line

Status bar > Status line

The status line displays the number and type of object or objects selected. The status line is located at the bottom of the screen, just above the *prompt line (page 3–746)*.

If multiple objects are selected and all are of the same type, the number and type of the objects are displayed: "2 cameras, 3 lights" for example.

If multiple objects of different types are selected, the status line displays the number plus the word "objects": "6 objects" for example.

Time Slider

Status line > Time Slider

The time slider shows the current frame and lets you move to any frame in the *active time segment (page 3–998)*. Right-clicking the slider bar opens the *Create Key dialog (page 2–279)*, which lets you create position, rotation, or scale keys without using the Auto Key button.

When you are in *Auto Key (page 3–760)* mode, you can right-click and drag the time slider to create a key that has the source at the initial time slider position, and the destination at the subsequent time slider position.

In *Set Key mode (page 3–761)*, holding down the right mouse button and dragging the time slider allows you to move a pose in time without losing it in the viewport.

To move one frame back or forward, click the arrow on the left or right side of the time slider, respectively. Or simply place your cursor anywhere on the time line, click and the time slider will jump to your cursor position. In *Key Mode (page 3–767)*, clicking an arrow jumps to the adjacent key.

The Track View Key window displays a time slider as well. The movement of the two time slider is synchronized. Moving the time slider in the Track View window will move the time slider below the viewports, and visa versa.

Procedures

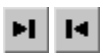
To move to a specific frame in the animation, do one of the following:

- Drag (scrub) the time slider right or left until the frame number is displayed on the time slider.
-

Type the frame number into the current frame field in the time controls, and then press ENTER.

To move ahead or back a frame or a key at a time, do one of the following:

By default, *Key Mode (page 3–767)* is off, and these controls move a frame at a time. To move by keys, click the Key Mode Toggle button; this turns on Key Mode. When Key Mode is on, the button looks like this:

- Click the < or > button at either end of the time slider.
- Press the **<** or **>** key on the keyboard.
- When Key Mode is off, click the Next Frame or Previous Frame button in the time controls.
-  When Key Mode is on, click the Next Key or Previous Key button in the time controls.

To move ahead or back many frames at a time:

- Click in the empty track to either side of the time slider. The time slider will jump to your cursor position. This is a faster way of moving in time than dragging the time slider.

To move to the first or last frame of the active time segment:

- Use the time control buttons Go To Start or Go To End.

To display SMPTE time code on the time slider:

- Click Time Configuration in the time controls, and then under Time Display, choose SMPTE.

To display subframes on the time slider:

- Click Time Configuration in the time controls, and then under Time Display choose Frames:TICKS or MM:SS:TICKS.

  Each frame is divided into subframes.

To use the time slider to adjust animation, do one of the following:

- To copy a pose from one frame to another, with Auto Key on or off, and Set Key off, right-click the time slider and drag to a new location.

  The Create Key dialog appears with Source Time set to the frame you were on when you right-clicked, and Destination Time set to the frame to which you moved the time slider. Toggle the Position, Rotation, and Scale check boxes as necessary and then click OK to create a key at the destination frame for the pose at the source frame.
- In Set Key mode, if you have posed your character on the wrong frame, right-click and drag the time slider. The pose is moved in time to the new time slider position. Click the Set Key button to set the keys.

To scrub the animation with the mouse but without dragging:

1. Go to Customize > Customize User Interface. On the Keyboard panel, click in the Action list and then press the **T** key to jump to the T section. Scroll down to find Time Slider Capture Toggle and click it.
2. Click the Hotkey field and then press a keyboard combination to assign as a keyboard

shortcut; for instance, **CTRL+T**. Click the Assign button.

3. Close the Customize User Interface dialog and then press your hotkey for Time Slider Capture Toggle.
4. Move the mouse left and right without pressing any buttons.

   The time slider moves in tandem with the mouse.
5. To exit this mode, press the hotkey again or click any mouse button.

Interface

By default, the active time segment is from frame 0 to frame 100. The slider displays time in frames, *SMPTE numbers (page 3–1107)*, or other measurements, depending on the current setting in the *Time Configuration dialog (page 3–768)*.

The slider bar displays the current frame, followed by a slash (/), followed by the total frames in the active time segment. For example 25/100 means frame 25 of 100 frames. The current frame also appears in the current frame field. If *animation (page 3–1003)* exists in the scene, it's played back as you drag the time slider.

The buttons on either side of the time slider bar move one frame to the left and one frame to the right, like the Previous Frame and Next Frame buttons in the time controls. If *Key Mode (page 3–767)* is on, these buttons duplicate the Previous Key and Next Key buttons.

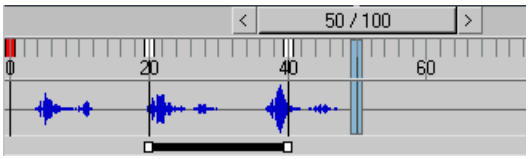
Key Mode can jump to all the keys or only the transform keys, depending on the Key steps setting in the Time Configuration dialog.

Tip: Right-click the slider bar to open the Create Key dialog. This lets you create Position, Rotation, or Scale keys without using the Auto Key button. It also lets you copy keys easily from one frame to another.

Track Bar

The track bar is located below the viewports, between the time slider and the status bar.

The track bar provides a timeline showing the frame numbers (or appropriate display units). It provides a quick alternative to Track View for moving, copying, and deleting keys, and changing key properties. Select an object to view its animation keys on the track bar. The track bar also displays keys for multiple selected objects.



The displayed keys use color coding, so you can easily determine what kind of key exists at that frame. Position, rotation and scale keys are red, green, and blue, respectively, and non-transformational keys such as modifier parameters are gray. You can customize the colors in the *Customize User Interface dialog (page 3–836)*, and depends on the selected/unselected state of the key. The frame indicator is a similar bar displayed in blue.

A key on the track bar can represent any number of animated parameters for the selected objects. Transformations, modifiers, and animated material parameters can all have keys at a particular frame.

To display a list of all keyed values for a key on the track bar, right-click the key. Choose a key type from the right-click menu to display its key properties dialog. Delete keys and filter the track bar display using options on the right-click menu.

The track bar right-click menu contains a submenu that lists any procedural controllers (list controllers, expression, reactors, springs, noise, and so on) assigned to the current object selection.

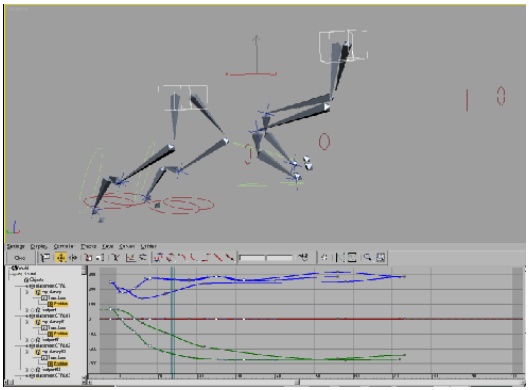
If you select one of the controllers from the submenu, the properties dialog for that controller displays in a modeless dialog.

The track bar can display a waveform (*.wav* file) that has already been assigned to the sound object in Track View. To display this feature, right-click the track bar and choose Configure > Show Sound Track. If no waveform is currently assigned to the sound object or if you are using a third-party sound object plug-in that is not compatible with the waveform display, this part of the track bar is unavailable.

You can modify the *active time segment (page 3–998)* by pressing CTRL and ALT while dragging the track bar. Hold the left mouse button to slide the start of the range, the right mouse button to slide the end of the range, and the middle mouse button to change both the start and end frames together. A tooltip at the cursor and a status bar message will indicate the range you are setting.

Note: While the Auto Key button is depressed, the time slider background is highlighted red, to indicate that 3ds Max is in automatic keyframing mode.

You can expand the track bar to show curves. Click the Open Mini-Curve Editor button at the left corner of the track bar. The time slider and track bar are replaced with the controller and key windows, and Track View toolbars. You can resize the track bar window by pressing and dragging the border between the menu bar and the toolbars.



Track bar displaying curves

Procedures

To select keys on the track bar:

1. Click a key to select it.
2. Drag a window around a selection of keys to region-select multiple keys.

   If the track bar right-click menu > Configure > Show Selection Range option is on, when you select multiple keys, the range of the selected keys is shown in the selection range bar at the bottom of the track bar. You can then scale the selected keys proportionally by dragging either end of the selection range bar, or move the keys by dragging the center of the bar.

To move or clone keys on the track bar:

While keys are moved or cloned, small lines on the track bar mark the original position of the keys. All keys at a particular frame are moved simultaneously using the following procedures.

1. Drag a key selection to move it in time.
2. Hold down SHIFT, then drag a key(s) to clone keys.
3. Right-click to abort a move or clone operation.

To move a single key from a frame with multiple keys:

If, for example, a frame has both a transform key and a material key for the selected object, and

only the transform key must move, display the Transform Properties dialog and use the Time parameter to move the transform key.

1. Right-click a key on the track bar and choose a key on the pop-up window key list.

   A Key Properties dialog is displayed.

2. Change the Time parameter in the Key Properties dialog.

   The key slides along the track bar to a new location.

To delete keys on the track bar:

1. Make a key selection on the track bar and press DELETE.

   All selected keys are deleted.

2. Make a key selection on the track bar, right-click anywhere on the track bar to display the track bar menu, and then choose Delete Selected Keys on the pop-up window.

   All selected keys are deleted.

To delete a single key type on a frame with multiple keys:

An object can have many keys for different animated parameters at a particular frame. Use this procedure to delete a key for a single parameter.

1. Right-click over a selected or unselected key on the track bar.

   A pop-up window displays.

2. Move the mouse over Delete Key, then choose a key to delete in the submenu.

To change the length of the active time segment:

You can change the animation length using track bar.

- Hold CTRL+ALT and drag on the track bar:
  - *With the left mouse button* to change the active time segment's start frame.
  - *With the right mouse button* to change the active time segment end frame.
  - *With the center mouse button* to change the active time segment start and end frames simultaneously.

To hide or show the track bar:

- Choose Customize > Show UI > Show Track Bar.

  This menu item is a toggle: a check mark shows that the track bar is currently displayed.

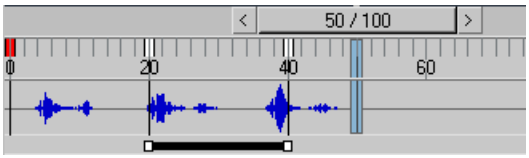
To show curves on the track bar:

- Click the Open Mini Curve Editor button at the left hand side of the track bar.

  The track bar keys are replaced with a menu bar, toolbars and the controller and key windows.

Interface

Track Bar



- Make an object selection in the viewports to display the object's keys on the track bar.
- Selected transformation keys are white; unselected keys are other colors.
- Drag from an empty area of the track bar to region-select keys.
- Drag a key to move it in time.
- Hold SHIFT and drag a key to clone it.
- Hold CTRL+ALT and drag the track bar to change the active time segment, that is, the animation range displayed on the track bar.

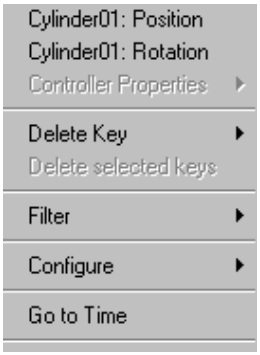
  Dragging with the left mouse button will change the start of the range, dragging with the

right mouse button will change the end of the range, and dragging with the middle mouse button will change both the start and the end of the range.

- Right-click to abort a move or clone operation.
- During a move or clone operation, short, vertical, gray lines represent the original key locations.
- The cursor changes to a cross when over unselected keys.
- The cursor changes to a two-sided arrow over selected keys, signifying a move operation is possible.
- Right-click anywhere on the track bar to display the track bar right-click menu. Right-click over a key to access its keyed values from the right-click menu, as well as other track bar-related commands.
- Click the Open Mini Curve Editor button to expand the track bar. When the track bar is expanded it displays the Track View menu, toolbars, controller and key windows. You can hide or unhide UI Elements such as scroll bars as well when this is expanded.

Track bar menu

Right-click a key on the track bar to display the track bar menu.



List—Displays the object name and key type for all keys at the current position. Choose any of the keys in the list at the top of the track bar menu to display a key properties dialog. For more information on this dialog, see *Key Info (Basic) (page 2–299)* and *Key Info (Advanced) (page 2–301)*.

- A key with a check next to the name indicates the key is shared with other instances in the list. Two selected objects might share the same Twist modifier, for example.
- The list displays keys for all selected objects. If there are more than 10 keys, then the list turns to a submenu under Key Properties in the track bar menu.
- If there is no key properties dialog for a key type, the key is unavailable.

Controller Properties—Displays a submenu that contains a list of all of the procedural controllers (list controllers, expression controllers, reactors, springs, noise, and so on) assigned to the object selection.

If you choose one of the controllers from the submenu, the properties dialog for that controller displays in a modeless dialog.

Delete Key—Displays a submenu identical to the key properties list at the top of the track bar menu. Choose a key type or choose All to delete one or all of the keys.

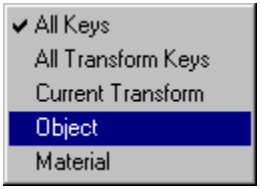
All—Deletes all keys at the current position.

Keys do *not* need to be selected on the track bar in order to use Delete Key. Keys are deleted from the track bar key over which you right-clicked.

Delete selected keys—Deletes the keys selected on the track bar. If no keys are selected, this option is unavailable.

Filter—Displays a Filter submenu. Choose a filter to filter the track bar display; showing only transformation keys, for example.

Right-click anywhere on the track bar, place the cursor over Filter in the track bar menu to display the Filter submenu, then choose a filter. According to the filters set, keys will disappear on the track bar.



All Keys—Displays all keys.

All Transform Keys—Displays only keys for position, rotation and scale.

Current Transform—Displays only keys that use the currently selected transform-position, rotation or scale.

Object—Displays object modifier keys. Excludes transformation and material keys.

Material—Displays material keys for the material assigned to the selected objects.

Keyable Tracks Only—Controls the display of keyable tracks on the track bar.

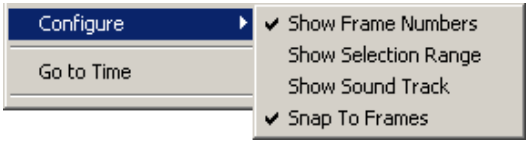
Parameter Collector Keys—

List Controller – Active Only—This filter lets you see only the keys on the active control in a List Controller. Otherwise, you see all the keys on all the controls.

List Controller – Hide Weights—This filter hides the weight parameter keys of a List Controller from the track bar.

Configure—Displays a submenu that lets you change the track bar display and behavior. The options are:

- Show Frame Numbers
- Show Selection Range
- Show Sound Track
- Snap To Frames



- **Show Frame Numbers**—Displays frame numbers in the track bar.
- **Show Selection Range**—Displays a selection range bar below the track bar, whenever multiple keys are selected.

  You can scale all selected keys by dragging either end of the selection range. This lets you change the length of an animation segment while maintaining the relative distance between animation keys. You can also move the selected keys in time by dragging the selection range bar.
- **Show Sound Track**—Displays the waveform (*.wav* file) that is assigned to the sound object in Track View.
- **Snap to Frames**—Keys snap to frame numbers when moved. If turned off, you can place keys between frames.

Go to Time—Moves the time slider to the cursor position.

Right-click anywhere on the track bar, then click Go To Time.

Selection Lock Toggle

Status bar > Selection Lock Toggle

Keyboard > **SPACEBAR**

Selection Lock Toggle toggles selection locking on and off. Lock selections so you don't inadvertently select something else in a complex scene.

When your selection is locked, you can drag the mouse anywhere on screen without losing your

selection. The cursor displays the current selection icon. When you want to deselect or alter your selection, click Lock Selection again to turn off locked selection mode.

When you want to select something and you can't, it's frequently because you have locked your selection.

This button is off by default.

Click to turn it on (it turns yellow). When Lock Selection is on, you can click anywhere in a viewport and the program interprets it as clicking the selected object(s). This is useful when you want to keep objects selected while you make a different viewport active or when the selection is tiny, or crowded and difficult to select.

Procedures

To transform an object without touching it:

1. Use the Selection Floater from the Tools menu, the Select By Name button on the main toolbar or press the **H** key to select the object by name.
2. Click the transform button (move, rotate, or scale) from the main toolbar.
3. On the status bar, turn on the Selection Lock toggle or press the SPACEBAR to lock the selection set.
4. Press and drag anywhere in the viewport.

   The object transforms even though you are not touching it.

To avoid accidentally canceling a selection:

1. Make your object selection.
2. Click the Selection Lock toggle on the status line, or press SPACEBAR to turn on Locked Selection mode.

To exit sub-object selection mode, do one of the following:

- In the Modifier Stack display, choose the object level.
- Open another command panel. This turns off Sub-Object selection.

  If you've turned off Sub-Object selection and object selection is still not restored, one of the following may be true:
- Your selection is locked. Turn off the Selection Lock toggle on the status line.
- You've set the Selection Filter in the toolbar to a specific category of object, so you can't select any of the other categories. To fix this, choose All in the Selection Filter list.

Coordinate Display

Status bar > Coordinate Display area

The Coordinate Display area shows the position of the cursor or the status of a transform, and allows entry of new transform values.

The information in these fields varies, depending on what you are doing:

- When you are simply moving the mouse in a viewport, these fields show the current cursor location in absolute *world coordinates (page 3–1129)*.
- While you are creating an object, these fields also show the current cursor location in absolute world coordinates.
- While you are transforming an object by dragging in a viewport, these fields always show coordinates relative to the object's coordinates before the transformation was started.

While you are transforming an object, these fields change to *spinners (page 1–13)*, and you can type values directly in them, as described below in "Using the Coordinate Display for Transform Type-In." This is an easy alternative to using the *Transform Type-In dialog (page 1–412)*.

- While a transform button is active and a single object is selected, but you are not dragging the object, these fields show the absolute coordinates for the current transform. See "Interface," below.
- While a transform button is active and multiple objects are selected, these fields are blank.
- When no object is selected and the cursor is not over the active viewport, these fields are blank.

Procedures

To display the position of the mouse in feet or metric units:

1. Choose Customize > Units Setup.
2. Turn on one of the main categories (Metric, US Standard, Custom, or Generic Units) and choose from the drop-down list.

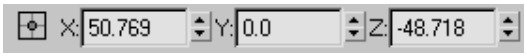
   The coordinate display is now in labeled units.

Example: To move the position of an object to the center of the world:

1. Select an object in the viewport.
2. Right-click and choose Move from the quad menu
3. Select the value in the x coordinate field, then enter **0**. Press TAB.
4. Type **0** in the Y coordinate field, and press TAB.
5. Type **0** in the Z coordinate field.

   Tip: Right-clicking the spinner arrows for a coordinate sets the value to zero.

Interface



When you are transforming an object, you can type coordinates directly in the Coordinate Display fields. You can do this in two modes, Absolute or Offset.

- Absolute sets the exact coordinates of the object in world space.
- Offset transforms the object relative to its existing coordinates.

Click the Absolute or Offset button to toggle between the modes:

While you are typing in the Coordinate Display fields (X,Y,Z), you can use the TAB key to move from one coordinate field to another.

When you transform an object, the information shown by these fields depends on the type of transform:

- **Move** displays the offset XYZ coordinates based on the current coordinate system. For example, if you're moving an object and you're constrained to the X axis, only the X readout will change, displaying the offset of the move along the local X axis.
- **Rotate** displays the offset angle in degrees about the axis or axes the rotation is performed around. This is dependent on both the axis coordinate system, and the local/center toggle button.
- **Scale** displays the offset XYZ scale in percentages.

You can get the absolute as well as offset information through the *Transform Type-In dialog (page 1–412)* available from the Tools menu or by right-clicking a transform button that has been selected on the toolbar.

See also

Units Setup Dialog (page 3–891)

Grid Setting Display

Status bar > Grid Setting Display

The grid setting display shows the size of one grid square.

This value is constant in the active viewport. It does not change if you zoom in very close or zoom out very far.

Procedure

To change the size of one grid square:

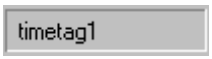
- Right-click the Snap Toggle on the main toolbar to display the Grid and Snap Settings dialog. Alternately, you can choose Customize menu > Grid and Snap Settings.
- On the Home Grid tab, in the Grid Dimensions group, change the Grid Spacing value.

  The new value is displayed in the grid setting display.
- Close the dialog by clicking the X at the upper right corner of the Grid and Snap Setting dialog.

Time Tag

Status bar > Add Time Tag

Time tags are text labels that you can assign to any point in time in your animation.



They let you easily jump to any point in your animation by selecting its tag name. The tags can be locked to be relative to other time tags so that the movement of one time tag will update the time position of another.

The time tags are not attached to keyframes. They are simply a way to name events that occur in your animation and navigate to them. If you move your keyframes, you will need to update your time tags accordingly.

Interface

Left-click or right-click the Time Tag box to display a menu with the following items:

Add Tag—Displays the *Add Time Tag dialog (page 3–757)* that lets you define a tag name for the current location in time.

Edit Tag—Displays the *Edit Time Tag dialog (page 3–758)* that lets you rename, delete, or edit any defined tag.

The remainder of the menu displays frame numbers and their tag names. Choose a tag name to jump to the spot in time defined by the tag.

Add Time Tag Dialog

Status bar > Click in the Time Tag box. > Add Tag

Use the Add Time Tag dialog to define a *time tag (page 3–757)* for the current spot in time.

Procedure

To use time tags:

1. Move to the spot in time where you want to add a tag.
2. Click in the Time Tag box, and choose Add Tag from the menu.

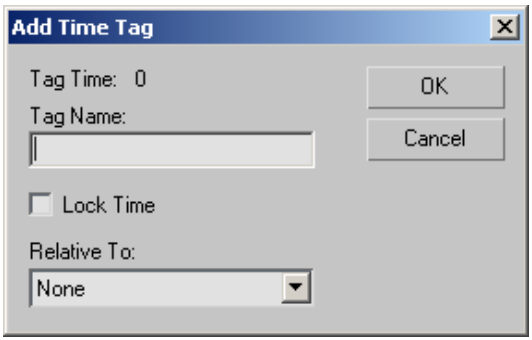
3. In the Add Time Tag dialog, enter the name of the tag. Choose whether to lock it to time and whether to make it relative to another tag, and click OK.

   The name of the tag appears in the tag slot, and will reappear whenever you go to that spot in time.

   To jump to a defined tag, click the Time Tag slot and choose the tag name from the list.

   To rename, delete, or change the properties of a tag, click the Time Tag field and choose *Edit Tag (page 3–758)*.

Interface



Tag Time—Displays the current frame, to which the tag will be assigned.

Tag Name—Enter the name of the tag. You can create a long tag name in this field, but the tag slot will display only 15 characters.

Lock Time—Locks the tag to the current frame, regardless of subsequent scaling of time.

For example, with Lock Time off, if you have a tag named "Forty" at frame 40, and you scale time up 200 percent, the Forty tag will be at frame 80. If Lock Time is on, the Forty tag remains at frame 40.

Relative To—Lets you assign another tag to which the current tag will maintain a relative offset.

For example, if you have a tag at frame 10 called First and you create a second tag at frame 30 called Second, if you move the position of First to frame 25, Second will move to frame 45 to maintain the 20-frame offset between the two tags.

This is a one-way offset. If you change the time position of the second tag in the example, the first tag is not affected. Circular dependencies are not allowed: you can't have First relative to Second and Second relative to First.

Edit Time Tag Dialog

Status bar > Click in the Time Tag box > Edit Tag

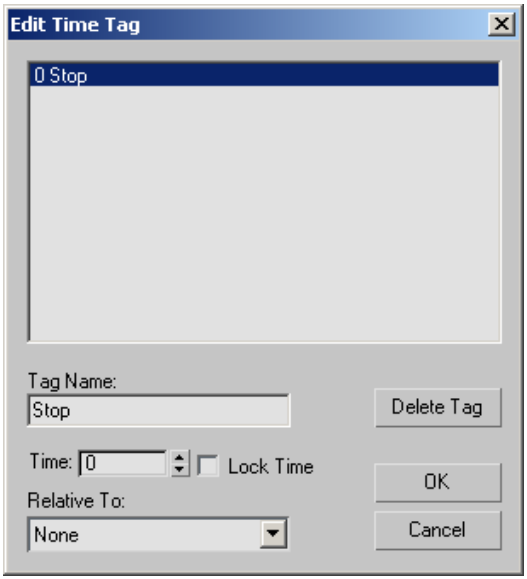
Use the Edit Time Tag dialog to alter the properties of any of the defined *time tags (page 3–757)*.

Procedure

To edit a time tag:

1. Click in the Time Tag box and choose Edit Tag from the menu.
2. Choose the time tag you want to edit from the list.
3. Use controls in the Edit Time Tag dialog to rename it, or move it in time relative to another time tag.

Interface



All of the current tags, along with their associated frame numbers, appear in the window at the top of the Edit Time dialog. Select the tag to edit, then adjust the controls below the window.

Tag Name—Use this field to rename the selected tag. You can create a long tag name in this field, but the tag slot will display only 15 characters.

Time—Lets you change the time where the tag is assigned.

Lock Time—Locks the tag to the current frame, regardless of subsequent scaling of time. For example, with Lock Time off, if you have a tag named Forty at frame 40, and you scale time up 200 percent, the Forty tag will be at frame 80. If Lock Time is on, the Forty tag remains at frame 40.

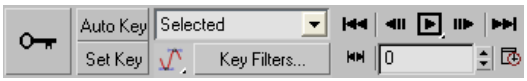
Relative To—Lets you assign another tag to which the current tag will maintain a relative offset. For example, if you have a tag at frame 10 called First and you create a second tag at frame 30 called Second, if you move the position of First to frame 25, Second will be moved to frame 45 to maintain the 20-frame offset between the two tags.

This is a one-way offset. If you changed the time position of the second tag in the previous example, the first tag is not affected. In addition, circular dependencies are not allowed. You can't have First relative to Second and Second relative to First.

Delete Tag—Deletes the selected tag.

Animation and Time Controls

Between the status bar and the viewport navigation controls are the animation controls, along with the time controls for animation playback within viewports.



Animation Controls

Auto Key Animation Mode (page 3–760) and *Set Key Animation Mode (page 3–761)*

Default In/Out Tangents For New Keys (page 3–764)

Go To Start (page 3–765)

Previous Frame/Key (page 3–766)

Play/Stop (page 3–766)

Next Frame/Key (page 3–767)

Go To End (page 3–767)

Current Frame (Go To Frame) (page 3–767)

Time Controls

Key Mode (page 3–767)

Time Configuration (page 3–768)

Auto Key Animation Mode

Status bar > Time controls > Auto Key (Toggle Auto Key Mode)

Keyboard > **N**

The Auto Key button turns the *keyframing mode (page 3–1054)* called Auto Key on or off. All movement, rotation, and scale changes are keyframed while the Auto key button is on. When it's off, these changes are applied to frame 0.

You can also keyframe by using *Set Key mode (page 3–761)*, which allows you to selectively add keyframes using the Set Keys button.

The Auto Key button is red when it's on. The active viewport is also outlined in red when the Auto Key mode is on; the time slider turns red as well. This serves to remind you that you are in Animate mode, and that you are setting keyframes with your actions.

Warning: Be sure to turn off Auto Key after keyframing, or you will inadvertently create unwanted animation. Use Undo to remove the unwanted animation. Be careful; it's easy to forget.

Within an existing animation, you can create keyframes for transforms without the use of the Auto Key button by right-clicking the time slider and then setting the source and destination time. For example, you can use this function to copy an existing Move key to a later frame, so an object pauses its motion momentarily (to keep the object still, you must use linear or step interpolation). You can also set keyframes for other animatable parameters in Track View and the Motion panel without using Auto Key.

See also

Using Auto Key Mode (page 2–274)

Set Key Animation (page 3–761)

Using Set Key Mode (page 2–275)

Procedures

To animate an object using Auto Key:

1.

Turn on the Auto Key button.

   The Auto Key button, the time slider, and the highlight border around the active viewport all turn red.

2. Drag the time slider to a time other than 0.
3. Do one of the following:
   - Move, scale, or rotate an object.
   - Change an animatable parameter.

   For example, assume you start with a cylinder that has not been animated yet and therefore has no keys. You then turn on the Auto Key button, and on frame 20 you rotate the cylinder 90 degrees about its Y axis. This action creates Rotation keys at frames 0 and 20. The key at frame 0 stores the original orientation of the cylinder, while the key at frame 20 stores the animated rotation of 90 degrees. When you play the animation in the viewport, the cylinder rotates 90 degrees about its Y axis over 20 frames.
4.

Turn off the Auto Key button when you are done.

Example: To animate an object between three points using Auto Key:

1. Auto Key Turn on the Auto Key button.
2. Drag the time slider (to frame 25, for example).
3. Move the object from point A to point B.

   A Move key is created at frames 0 and 25. The establishing key at frame 0 describes the object's position at point A. The key at frame 25 describes the object's position at point B.
4. Drag the time slider (to frame 50, for example).
5. Move the object from point B to point C.

   A Move key is created at frame 50 that describes the object's position at point C.
6. Click the Playback button.

   The object moves from point A to point B over frames 0 to 25, then proceeds to point C over frames 26 to 50.
7. The Playback button turns into a Stop button. Click it to stop playback.

   The position of the object in between the keyframes is determined by the interpolation type used by the controller. Right-click the keys in the track bar and select the transform key to see the controls for adjusting the timing of the in-betweens.
8. Auto Key Turn off the Auto Key button.

To remove the animation from a scene and start again:

1. Choose File menu > New.

   If the scene has been modified, you are asked if you want to save it. After you make that decision, a New Scene dialog is displayed.
2. In the New Scene dialog, turn on Keep Objects And Hierarchy and click OK.

   All the objects remain in the scene but all keyframes have been removed.
3. To remove the animation from just certain objects, delete their keys in Track View.

Example: To animate a deformation curve of a loft object:

1. Auto Key Turn on the Auto Key button.
2. Set a current frame with the time slider.
3. Select one or more control points in the deformation curve of a loft object.
4. Use the Move Control Point or Scale Control Point buttons to transform the control points.

To animate a hierarchy with IK interactively:

1. Select any hierarchy that does not already have an IK Solver applied.
2. Click IK on the Hierarchy panel.
3. Auto Key Turn on the Auto Key button.
4. On the Inverse Kinematics rollout, turn on Interactive IK.
5. Select and move objects in the IK structure on different frames.

   Note: This will work on linked hierarchies and bones that do not already have an HI, HD, or Limb Solver applied. This technique allows you to animate hierarchies using *IK methods (page 2–417)* without applying any *IK solver (page 2–421)*.

Set Key Animation Mode

Set Key Animation Mode allows you to create keys for selected objects individual tracks using a combination of the Set Keys button and Key Filters. Unlike the traditional method of 3ds Max animation, Set Key mode gives you control over what you key and when. It allows you to pose a

character (or transform any object) and then if you like it, use that pose to create keys. If you move to another point in time without keying, your pose is discarded. It also works with object parameters.

You can try out different values and then when you have what you like use it to create keys. Combine this with keyable tracks in the Curve Editor to create keys on just the object parameters you want to key.

Set Key Workflow

To animate something using Set Key mode, you first turn on Set Key Mode. You can then select the object you want to animate and use the Key Filters button to set which tracks you want to keyframe. You can also use Show Keyable icons in Track View edit windows to make individual tracks keyable or not. With all this setup work completed you can create keys by clicking the Set Key button (the large button with the key) or using Keyboard shortcut (K). Move ahead in time, then make changes to your character (transforms or parameter changes) and click Set Keys to use those changes to create keys.

If you do not click the Set Keys button and move to another frame the object changes will be lost, as if you had never made them. This is fundamentally different behavior from Auto Key mode, where you would need to use undo to lose the changes you made. Use the right mouse button on the time slider to press and drag a pose to a different point in time.

For faster workflow you can define keyboard shortcuts for the Key Filters and Show Keyable tools by going to Customize menu > Customize User Interface and assigning keystroke combinations in the Main UI group.

Procedures

To animate using Set Key mode:

1. Set Key Turn on Set Key mode.
2. Select the objects you want to keyframe, and then right-click and choose Curve Editor.
3. On the Track View toolbar, click Show Keyable Icons, then use the keyable icons in the controller window to define which tracks will be keyed.

   A red key means the track will be keyed. Click a key to toggle keyable status.
4. Key Filters... Click Key Filters and then turn on the tracks you want to keyframe. By default, Position Rotation, Scale, and IK Parameters are on. For this example, turn off Rotation and Scale.
5. go to a frame at which you want to set a key.
6. Move an object.
7. Click the Set Keys button.

   The Set Key button flashes red to show that it has set a key, and a key appears on the track bar.

   Repeat this process, moving the time slider and setting keys.

To keyframe all parameters using Set Key mode

1. Set Key Turn on Set Key mode.
2. In the viewport, select the objects to which you want to add keyframes.
3. Key Filters... Click Key Filters and then turn on the Key All.

4. Move the time slider to the frame where you wish to set keys
5. Click the Set Keys button.

   Keys will be added to all keyable parameters.

To move a pose in time without update:

1. Turn on Set Key.
2. Move to a particular frame (let's say frame 20).
3. Pose your character.
4. Move your cursor over the time slider, then press the right mouse button down and drag.

   The time slider moves, but the pose does not jump. The pose is maintained and transferred to the new point in time.
5. When you are at the appropriate frame, press Set Keys to set the pose keys.

Interface

Set Key—Turns on Set Key Mode.

Set Keys—Click this to set a key. This button will create a key on tracks for the selection set. It checks that the tracks are keyable, and that Key filters allow the tracks to be keyed. If both these are satisfied, a key is set. Set Keys also sets keys in Auto Key mode, and in Layout mode (the mode when neither Auto Key nor Set Key is turned on). Keyboard shortcut default for this command is **K**.

Key Filters—Displays the Set Key Filters dialog where you can define which type of tracks will be allowed or disallowed keys.

Selection List—Gives quick access to *named selection sets (page 1–85)* and *track sets (page 2–567)* while working with Set Key. Lets you easily swap between different selection sets and track sets.

Note: Choosing a selection set from the list does not select objects in the viewports. To accomplish this, use the *Named Selection Sets (page 1–85)*.

Note: Selection set names appear between braces (example: {Biped Arms}) while track set names appear between square brackets (example: [Throw Baseball]).

Set Key Filters dialog—Turn on the tracks you want to key. Default=Position, Rotation, Scale and IK Parameters.

The following options are available:

- **All**— allows for a quick way to key all tracks. When All is turned on, the other toggles are unavailable. Clicking Set Keys with the All filter turned on will result in a key placed on all keyable tracks.
- **Position**— allows for position keys to be created.
- **Rotation**— allows for rotation keys to be created.
- **Scale**— allows scale keys to be created.
- **IK Parameters**— allows inverse kinematic parameters to be keyframed.
- **Object Parameters**— allows object parameters to be keyframed.
- **Custom Attributes**— allows custom attributes to be keyframed.

- **Modifiers—** allows modifiers to be keyframed. Note that you should turn on Object parameters when you turn on modifiers, so you can keyframe gizmos.
- **Materials—** allows material properties to be keyframed.
- **Other—**allows for other parameters that don't fall in the above categories to be keyframed using the Set Key technique. This includes such things as helper properties and look-at controller tracks for target cameras and lights.

Warning: If you turn on Object Parameters, all the object parameters of an object will then receive keys, unless you have turned off the tracks using Keyable on the Controller menu of Track View – Curve Editor. The same advice applies to Materials.

Tip: You can also set keys on spinners by holding down the SHIFT key and right-clicking a spinner.

Default In/Out Tangents For New Keys

Status bar > Animation controls > Default In/Out Tangents For New Keys flyout

This flyout provides a quick way to set a *default tangent type (page 2–300)* for new animation keys created with *Set Key Mode (page 3–761)* or *Auto Key Mode (page 3–760)*. You can also access the *tangent types (page 2–300)* from the *Key Info (Basic) rollout (page 2–299)* and the Curve Editor's *Key Tangency toolbar (page 2–513)*.

Note: Changing tangent types does not affect existing keyframes, only new ones.

On each new set keyframe, the Key Tangent flyouts on the Key Info (Basic) rollout updates with the current default tangent type.

When you set a default tangent type, both the in and out tangents are set to match that type. If you set different in and out tangents via the Controller Defaults group of the *Animation Preferences panel (page 3–868)*, the current flyout icon changes to a question mark.

Note: Setting a default tangent type stores it in the *3dsmax.ini* file, from which it is restored after a scene reset or session change.

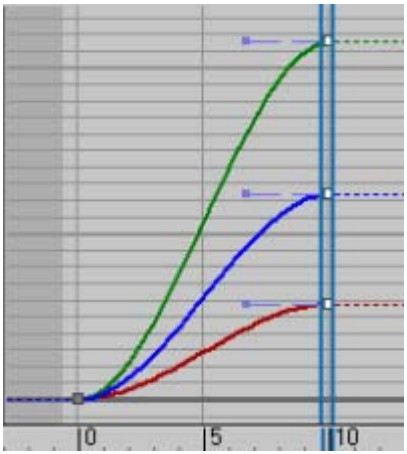
See also

Specifying Default Controllers (page 2–289)

Procedures

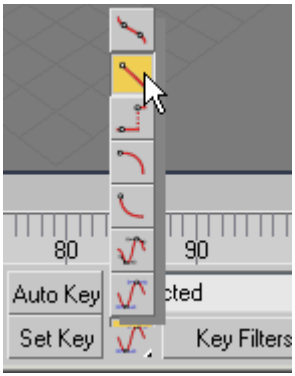
Example: To set a default tangent type:

1. Create a sphere.
2. Auto Key Turn on Auto Key, go to frame 10, and move the sphere in all three axes.
3. Right-click the sphere. From the quad menu, choose Curve Editor.



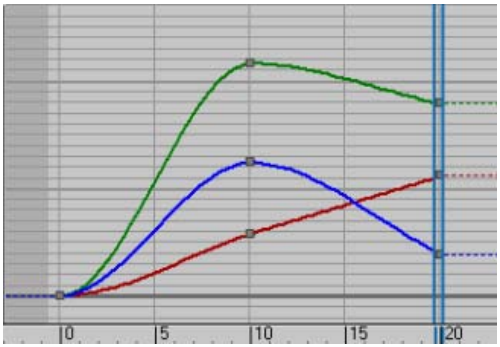
The position curve with Flat tangent.

4. Choose the Linear tangent type (second icon from the top) from the Default In/Out Tangents For New Keys flyout.



5. Go to frame 20 and move the sphere elsewhere in your scene.

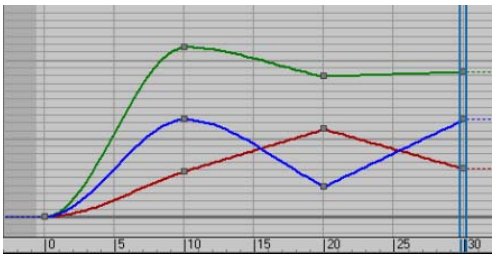
   The curve starts curvy at frame 10 but straightens out near frame 20. Its interpolation transitions from an Flat out tangent to a Linear in tangent.



The position curve going from Flat to Linear tangents.

6. Go to frame 30 and move the sphere again.

   The curve interpolation from frame 20 to 30 is straight as both keys have tangents set to Linear.



The position curve going from Flat to Linear to Linear tangents.

Go To Start

Status bar > Time controls > Go To Start
Keyboard > **HOME**

Go To Start moves the time slider to the first frame of the *active time segment (page 3–998)*. The active time segment is set in the Start Time and End Time fields of the *Time Configuration dialog (page 3–768)*.

Previous Frame/Key

Status bar > Time controls > Previous Frame
Keyboard > , (comma)

Previous Frame moves the *time slider (page 3–748)* back one frame.

If *Key Mode (page 3–767)* is on, the time slider moves to the previous *keyframe (page 3–1054)*. Keyframe options are set in the Key Steps group of the *Time Configuration dialog (page 3–768)*.

If Time Configuration dialog > Use TrackBar is on, Previous Key jumps to the previous key of any kind. If Use TrackBar is off, Previous Key jumps to the previous transform key, ignoring any other type of keys.

Play/Stop

Status bar > Time controls > Play
Status bar > Time controls > Stop
Keyboard > **/** (to play); **ESC** (to stop)

The Play button plays the animation in the active viewport. If you click another viewport to make it active, the animation continues playing in that viewport. When the animation is playing, the Play button becomes a Stop button. The Play button is a flyout for playing only the animation of selected objects.

Tip: You can play the animation in all the viewports simultaneously by turning off Active Viewport Only in the *Time Configuration dialog (page 3–768)*.

Procedures

To play the animation in the viewport:

1. Activate the viewport where you want to play the animation.
2. Click the Play button.

   The animation plays in the viewport. The Play button becomes a Stop button.
3. Click Stop to end the playback.

   The speed of the animation playback is determined by the settings in the Time Configuration dialog, the complexity of the scene and the speed of the graphics card and processor.

To play the animation looped backward:

1. Click the Time Configuration button on the status bar.
2. In Time Configuration dialog > Playback group, turn off Real Time.

   The Direction buttons are now available.
3. Turn on Reverse and click OK.
4. Click the Play button.

   The animation plays backward.
5. To play the animation front-to-back and then back-to-front in a continuous loop, turn on Ping-Pong as the Direction.

To play the animation of a selected object only:

1. In a viewport, select a single animated object or a set of animated objects.
2. Click Play Selected on the Play/Stop flyout.

   Only the selection is animated in the viewport.
3. Click the Stop button or press ESC to end playback.

Interface

The Play/Stop flyout contains two buttons. Both buttons become a Stop button when in use.

Play—Plays the animation in the currently active viewport.

Play Selected—Plays the animation for selected objects only in the currently active viewport.

Stop Animation—Replaces the Play button when an animation is playing. Click to stop the playback.

Stop Animation (Selected)—Replaces the Play Selected button when an animation is playing. Click to stop the playback.

Next Frame/Key

Status bar > Time controls > Next Frame

Keyboard > . (period)

Next Frame moves the *time slider (page 3–748)* ahead one frame.

If *Key Mode (page 3–767)* is on, the time slider moves to the next *keyframe (page 3–1054)*. Keyframe options are set in the Key Steps group of the *Time Configuration dialog (page 3–768)*.

If Time Configuration dialog > Use TrackBar is on, Next Key jumps to the next key of any kind. If Use TrackBar is off, Next Key jumps to the next transform key, ignoring any other type of keys.

Go To End

Status bar > Time controls > Go To End

Keyboard > **END**

Go To End moves the *time slider (page 3–748)* to the last frame of the *active time segment (page 3–998)*. The active time segment is set in the Start Time and End Time fields of the *Time Configuration dialog (page 3–768)*.

Current Frame (Go To Frame)

Status bar > Time controls > Current Frame (and Go To Frame)

Current Frame displays the current frame number, indicating the position of the *time slider (page 3–748)*. You can also enter a frame number in this field to go to that frame.

Procedure

To move to a particular frame, do one of the following:

- Type the frame number and press ENTER to go to the specified frame.
- Move the time slider and observe the frame number updating on the time slider.
- Click or drag the spinner to change the value in the frame number field.

Key Mode

Status bar > Time controls > Key Mode

Key Mode lets you jump directly between *keyframes (page 3–1054)* in your animation. By default, Key Mode uses the keys visible in the

track bar below the time slider. Other options are available on the *Time Configuration dialog (page 3–768)* in the Key Steps group.

When the Auto Key button on and you change an object's creation parameters or performed a *transform (page 3–1120)*, or change a material or modifier applied to that object, the software automatically creates a keyframe.

Key Mode can respect all keyframes, or you can restrict it to move only to transform keys via the Key Steps options on the Time Configuration dialog. When Key Steps > Use TrackBar is on, Key Mode jumps to keyframes of any type. When Use TrackBar is off, Key Mode respects only transform keys.

Procedures

To use Key Mode:

1. Turn on Key Mode.

   The button turns blue when key mode is active.
2. Use the *Previous Key (page 3–766)* and *Next Key (page 3–767)* buttons to move from one keyframe to the next.

   If you are not jumping to the keys, be sure the object is selected in the viewport.

   If you are still not jumping to the keys, configure Key Mode to Use TrackBar, as described in the following procedure.

To configure Key Mode:

1. Click Time Configuration, or right-click any animation-control button, including Key Mode.

   The Time Configuration dialog opens.
2. Choose options in the Key Steps group.

   If you turn on Use TrackBar and turn Key Mode on, then clicking Next Key advances to the next key for the selected object. This will respect every type of key that appears in the track bar. If you turn Use TrackBar off, only transform keys are used by key mode.

Time Configuration

Status bar > Time controls > Time Configuration > Time Configuration dialog

The Time Configuration dialog provides settings for frame rate, time display, playback, and *animation (page 3–1003)*. You use this dialog to change the length of your animation, or stretch or rescale it. You also use it to set the start and end frames of the *active time segment (page 3–998)* and your animation.

See also

Setting Time Segments (page 2–282)

Procedures

To define the active time segment:

1. Click Time Configuration.
2. In the Time Configuration dialog > Animation group, set Start Time to specify the beginning of your active time segment.
3. Do one of the following:
   - Set End Time to specify the end of your active time segment.
   - Set Length to specify the amount of time in the active time segment and automatically set the correct End Time.

     You can enter positive or negative values in any spinner, but you must use the same format used by the time display.

You can change the active time segment without affecting the keys you've created. For example, if you have keys scattered over a range of 1000 frames, you can narrow your active time segment to work on only frames 150 to 300. You can only work on the 150 frames in the active segment, but the remainder of the animation stays intact. Returning the active segment from 0 to 1000 restores access and playback of all the keys.

Changing the active time segment has the following effects: it restricts the range of time you can use with the time slider, and it restricts the range of time displayed when using the animation playback buttons.

The default setting for the active time segment runs from frames 0 to 100, but you can set it to any range.

To stretch out your existing animation over a longer time:

1. In the Time Configuration dialog > Animation group, click Re-scale Time.
2. Change the value in Length to be the number of frames you want the action to fill.
3. Click OK.

   The animation is rescaled to the new number of frames.

   This also works to compress animations into a shorter space of time. To avoid losing frames during the rescaling, see "To use sub-frame animation" in this set of procedures.

To add frames onto your existing animation:

This procedure adds new frames to the end of your animation, without affecting your existing work.

1. In the Time Configuration dialog > Animation group > End Time field, enter the number of the last frame of the animation.

   For example, if your existing animation is 100 frames long and you want to add 50 frames, enter **150**.
2. Click OK.

   The number you entered is now the new length of the animation, shown on the time slider.

To move to an exact time in your animation:

- In the Time Configuration dialog > Animation group, enter the frame number in the Current Time field, and press ENTER.

  The viewport updates to this frame.

To set the frame rate of your animation:

In the Time Configuration dialog > Frame Rate group, do one of the following:

- Choose one of the standard frame rates such as PAL or NTSC.
- Choose Custom, and specify a frame rate in the FPS (frames-per-second) field.

To configure viewport playback:

- In the Time Configuration > Playback group, turn on or off the Real Time and Active Viewport Only boxes.

To play your animation in reverse or back and forth:

1. In the Time Configuration > Playback group, turn off the Real Time.
2. Choose the direction of the animation playback by selecting Forward, Reverse, or Ping-Pong.
3. Play the animation in the viewport using the Play button or the **/** key.

To play your animation only once:

1. In the Time Configuration > Playback group, turn off Loop.
2. Choose the direction of the animation playback by selecting Forward, Reverse or Ping-Pong.

3. Play the animation in the viewport using the Play button or the **/** key.

   The animation will play once and stop.

To play your animation in multiple viewports:

1. In the Time Configuration > Playback group, turn off Active Viewport Only. Click OK.
2. Play your animation.

   The animation now plays in all four viewports.

To use sub-frame animation:

1. In the Time Configuration > Time Display group, turn on FRAME:TICKS or MM:SS:TICKS. Click OK.
2. Move the time slider to set keyframes in between keys.

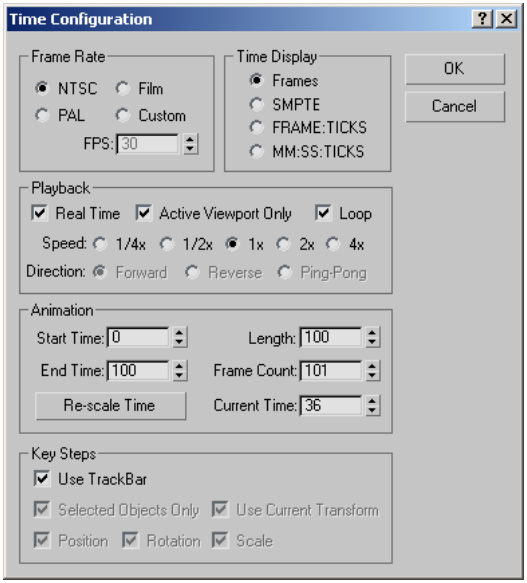
   Tip: Use this when you scale an animation down from a longer length to insure that you won't lose any keys. You can then move the keys to frames and revert to frames without ticks.

To play an animation with sound:

- In the Time Configuration > Playback group, be sure you have Real Time turned on. If Real Time is not on, the sound will not play back during the animation.

Interface

These are the controls for the Time Configuration dialog. You can display this dialog by right-clicking any of the time control buttons to the right of the Auto Key button.



Frame Rate group

These four option buttons, labeled *NTSC (page 3–1074)*, Film, *PAL (page 3–1082)*, and Custom let you set the *frame rate (page 3–1038)* in frames-per-second (FPS). The first three buttons force the standard FPS for that choice. The Custom button lets you specify your own FPS by adjusting the spinner.

FPS (Frames Per Second)—Sets the frame rate of your animation in Frames per Second. Use frame rates of 30 fps for video, 24 for film, and lower rates for web and media animations.

Time Display group

Specifies the method for displaying time in the time slider and throughout the program. Choices are Frames or in minutes, seconds and ticks.

Specifies the method for displaying time in the time slider and throughout the program (in frames, in SMPTE, in frames and *ticks (page 3–1115)*, or in minutes, seconds, and ticks).

For example, if the time slider is at frame 35, and the Frame Rate is set to 30 fps, the time slider would display the following numbers for the different Time Display settings:

- Frames: 35
- SMPTE: 0:1:5
- FRAME: TICKS: 35:0
- MM:SS: TICKS: 0:1:800

SMPTE is the *Society of Motion Picture Technical Engineers* standard used to measure time for video and television production.

Playback group

Real Time—*Real Time (page 3–1095)* causes viewport playback to skip frames to keep up with the current Frame Rate setting. A choice of five playback speeds is available: 1x is normal speed, 1/2x is half speed, and so on. The speed settings affect only the playback in the viewports.

These speed settings can also be used with the *Motion Capture utility (page 2–632)*.

When Real Time is off, viewport playback occurs as rapidly as possible and displays all frames.

Active Viewport Only—Causes playback to occur only in the active viewport. When off, all viewports display animation.

Loop—Controls whether the animation playback occurs only once, or repeatedly. When on, playback repeats until you stop it by clicking an animation control button or the time slider channel. When off, the animation plays once and then stops. Clicking Play rewinds to the first frame and plays again.

Direction—Set the animation to play forward, reverse, or ping-pong (forward and then reverse, repeating). This affects only the playback in the interactive renderer. It does not apply when rendering to any image output file. These options are available only when Real Time is off.

These settings can be recalled by saving to a *maxstart.max* file.

Animation group

Start Time/End Time—Sets the *active time segment (page 3–998)* displayed in the time slider. Choose any time segment before or after frame 0. For example, you can set an active time segment from -50 to 250.

Length—Displays the number of frames in the active time segment. If you make this greater than the total frames in the active segment, the End Time field increases accordingly.

Frame Count—The number of frames that will render. Always the length plus one.

Current Time—Specifies the current frame for the time slider. As you adjust this, the time slider moves accordingly and the viewport updates.

Re-scale Time—Stretches or shrinks the animation for the active time segment to fit into the new time segment you specify. Relocates the position of all *keys (page 3–1054)* in all tracks. As a result, the animation plays over a greater or lesser number of frames, making it faster or slower.

Key Steps group

Controls in this group let you configure the method used when you turn on *Key Mode (page 3–767)*.

Use TrackBar—Allows key mode to honor all keys in the track bar. This includes any parameter animation in addition to transform keys.

To make the following controls available, turn off Use TrackBar.

Selected Objects Only—Considers only the *transforms (page 3–1120)* of selected objects when

you use Key Steps mode. If you turn this off, the transforms of all (unhidden) objects in the scene are considered. Default=on.

Use Current Transform—Disables Position, Rotation, and Scale and uses the current transform in Key Mode. For example, if the Rotate button is selected in the toolbar, you stop at each rotation key. If none of the three transform buttons are on, Key Mode considers all transforms.

To make the following control available, turn off Use Current Transform.

Position, Rotation, Scale—Specifies which transforms are used by Key Mode.

Clear Use Current Transform to make the Position, Rotation, and Scale check boxes available.

Viewports and Viewport Controls

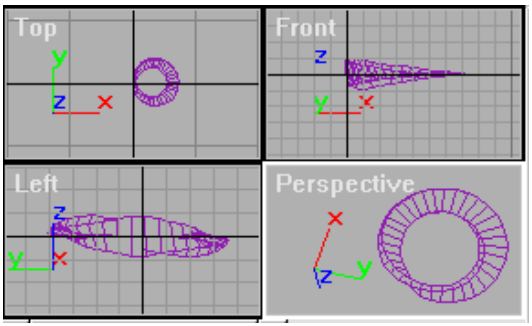
Viewports

When you start 3ds Max, the main screen contains four equal-sized viewports. The one in the lower right is a perspective view, and the others correspond to the three views: top, front, left. By default, the perspective view is Smooth and Highlights.

You can choose different views to display in these four viewports as well as different layouts from the *viewport right-click menu (page 3–774)*.

Viewport Layouts

You can choose from other layouts different from the default configuration. To choose a different layout, right-click the viewport label, and click Configure. Choose the layout tab of the Viewport Configuration dialog to see and select the alternative layouts.



Typical viewport layout

Note: The viewport layout is saved with your MAX file.

Tip: You can change the default viewport layout by saving a *maxstart.max* file with the desired viewport configuration and placing it in the *|defaults folder (page 3–834)*.

Active Viewport Borders

When four viewports are visible, one viewport, marked with a highlighted border, is always active. This is where commands and other actions take effect. Only one viewport at a time can be active. Other viewports are set for observation only; unless disabled, they simultaneously track actions taken in the active viewport. When the Auto Key button is on, the active viewport border changes from yellow to red.

In general, a viewport becomes active as you work in it. You can move an object in one viewport, then drag the same object in another viewport to continue the move. Right-click viewport to activate it without changing the selection. If you left-click a viewport, the viewport is activated and whatever you click is selected. The previous selection is discarded.

Viewport Labels

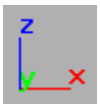
Viewports are labeled in the upper-left corner. You can control many aspects of a viewport by right-clicking the viewport label to display the *viewport right-click menu (page 3–774)*.

Dynamic Resizing of Viewports

You can resize the four viewports so they are not of equal proportions. To resize the viewports, press and drag in the center of the four viewports on the splitter bars. Move the center to change the proportions. To return to the original layout, right-click the intersection of the dividing lines and click Reset Layout from the right-click menu.

The new viewport proportions are saved in the scene. However, they always reset when you change the *viewport layout (page 3–899)*.

World-Space Tripod



The three-color world-space tripod is visible in the lower-left corner of each viewport. The colors correspond to the three axes of world space: red=X, green=Y, and blue=Z. The axes are labeled in these same colors. The tripod always refers to world space, regardless of the current reference coordinate system.

The world-space tripod is on by default. To turn off this feature, see "To turn off the world-space tripod in all viewports" in the following procedures.

Viewport Tooltips for Object Names

When you're working with objects in a viewport and pause the cursor over any unselected object, a tooltip appears with the name of that object. If you need to select something or link to something, wait until you see the tooltip to be sure you have selected the object you want. These tooltips are disabled when you work in sub-object mode.

Tooltips (page 3–859) are on by default. To turn off this feature, see *To turn off object name tooltips (page 3–774)*, below.

See also

Viewport Controls (page 3–778)

Procedures

To make a viewport active, do one of the following:

- Click any viewport.

  If you click an object in the viewport, it is selected. If you click a space where there are no objects, any selected objects are deselected.
- Right-click any viewport.

  Right-click activates a viewport without changing the selection state of objects. (You can also do this by left-clicking the viewport label.)

To switch between single and multiple viewports:

Activate the viewport you want to minimize or maximize, and do one of the following:

- On the keyboard, press **ALT+W**.
- Click the Maximize Viewport Toggle button in the lower-right corner of the 3ds Max window.

To resize the viewports:

1. Press and drag at the center of the four viewports on the intersection of the horizontal and vertical splitter bars.
2. Move the center to any new location.
3. To reset the viewports, right-click the same point again and choose Reset Layout from the right-click menu.

To change the number of viewports and their arrangement:

1. Right-click any viewport label. Select Configure from the right-click menu.
2. In the Viewport Configuration dialog, click the Layout tab.
3. Select a layout from the 14 choices at the top of the dialog.
4. Assign what each viewport will display in the lower window of the dialog.
5. Click OK to make the change.

To turn off the world-space tripod in all viewports:

1. Choose Customize menu > Preferences to display the Preferences dialog.
2. Click the Viewports tab.
3. In the Viewport Parameters group, turn off Display World Axis.
4. Click OK to make the change.

To turn off object-name tooltips:

1. Choose Customize menu > Preferences to display the Preferences dialog.
2. Click the General tab.
3. In the UI Display group, turn off Enable Viewport Tooltips.
4. Click OK to make the change.

Viewport Right-Click Menu

Right-click any viewport label. > Viewport right-click menu

The viewport right-click menu, also referred to as the Viewport Properties menu, contains commands that let you change what is shown in the active viewport. This is a shortcut menu. Some of the options are also available on the *Configuration dialog (page 3–896)*.

You can do the following from this menu:

- Change the view to any available viewport type (for example, Perspective, Top, Bottom, User, Light, Camera, Grid, or Shape).

  When your scene contains cameras or lights with targets, the viewport right-click menu gives you selection options for the components. For example, when you right-click the label of a target camera viewport, you see two new commands, Select Camera and Select Camera Target, that let you select the camera or target used by that view.
- Set the type of shading displayed in the viewport (for example, Wireframe, Smooth, or Edged Faces).
- Set how transparency is displayed in the viewport.
- Undo or redo a view change.
- Turn on texture correction if your display is not configured for OpenGL or Direct3D.
- Disable a viewport so it doesn't update when you work in other viewports.
- Toggle the display of the grids, safe frame, and viewport background.

  Note: A grid object must be active before you can select it from its viewport.
- Display the Asset Browser, Schematic View or MAXScript Listener in a viewport.
- Turn on Viewport Clipping. This interactively sets a near and far range for the viewport. Geometry within the viewport clipping range is displayed. Faces outside the range are not displayed.

Tip: If the viewport right-click menu becomes disabled, you can restore it by refreshing the UI scheme. Use Customize menu > *Load Custom UI Scheme (page 3–849)* to load a different *.cui* file, then reload the original *.cui* file again. The right-click viewport menu will become available

after either the new or original UI scheme is loaded.

Procedures

To hide or show the home grid, do one of the following:

- Choose Views menu > Grids, and click Show Home Grid.
- Right-click a viewport label.

  Click Show Grid to reverse the current display of the home grid in that viewport.
- Keyboard > **G** (for single viewport);

To change a viewport to Camera view:

Note: This procedure requires at least one camera object in your scene.

1. Right-click a viewport label.
2. Click Views.
3. Choose one of the cameras in the Views list.

   This assigns the camera to the viewport and changes the label to the camera name.

   A camera viewport tracks the view through the perspective of that camera. As you move the camera (or target) in another viewport, you see the scene swing accordingly. If you alter the camera's *field of view (page 3–784)*, you see the changes as they are applied.

   Tip: You can also press **C** on the keyboard as a shortcut to change any active viewport to an existing camera view.

To change a viewport to a shape view:

This procedure requires at least one shape object in your scene.

1. Right-click a viewport label.
2. Choose Views > Shape from the menu.

To use viewport clipping:

1. Right-click a viewport label.
2. Choose *Viewport Clipping (page 3–896)*.

   The viewport displays the viewport clipping controls.
3. Move the lower slider up until the geometry is clipped in the viewport by the near clipping plane.
4. Adjust the upper slider to clip the geometry with the far clipping plane.

To display Schematic View in a viewport:

1. Right-click a viewport label to access the Viewport Properties menu.
2. Click Views > Schematic > New, or choose the name of the Schematic View you want to display.

To display the Asset Browser or MAXScript Listener in a viewport:

1. Right-click any viewport label to access the Viewport Properties Views flyout menu.
2. Click Extended > Asset Browser or MAXScript Listener.

   The tool is displayed in a dedicated viewport.

To access the Layout panel, do one of the following:

- Choose Customize menu > Viewport Configuration, then click the Layout tab.
- Right-click a viewport label, and choose Configure, then click the Layout tab.

To turn on safe frame display, do one of the following:

- Right-click a viewport label, and then choose Show Safe Frame.
- Keyboard > **SHIFT+F**
- Choose Customize menu > Viewport Configuration > Safe Frames panel, and turn on Show Safe Frames In Active View.

See *Safe Frames (page 3–899)*.

To fix texture display problems in a viewport:

- Right-click a viewport label, and then choose Texture Correction. This applies only to the software display driver; OpenGL and Direct3D displays automatically correct texture display.

  Tip: If you have materials with texture maps that are not displaying in the viewport, you need to turn on Show Map In Viewport in the Material Editor for each material that has this problem.

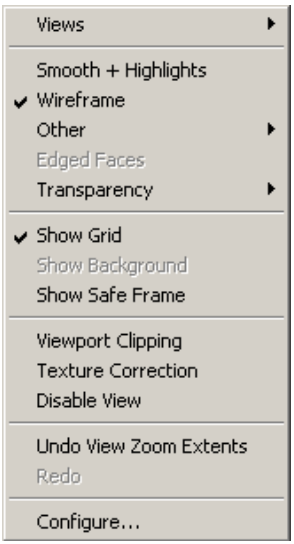
To change quickly between snap options:

1. With nothing selected, hold SHIFT and right-click anywhere in the viewport.

   The Snaps shortcut menu is displayed.

2. Choose any of the Standard or NURBS snap options. You can also toggle whether snaps use transform constraints.

Interface



Views—Displays a secondary menu that allows you to choose another view to display in the viewport (Front, Top, Back, etc.).

Available views included are:

- *Camera views (page 3–788)* (if the scene contains cameras)
- *Light views (page 3–792)* (if the scene contains spotlights or directional lights)
- *Perspective (page 3–781)*
- User
- Front
- Back
- Top
- Bottom
- Left
- Right
- *ActiveShade (page 3–17)*
- Schematic: Choose an existing *Schematic view (page 3–688)*, if any, from the sub-menu, or choose New to create a new one. To change a viewport when it contains a Schematic view, right-click the menu bar and choose a different view.
- *Grid (page 2–19)*: Choose Front, Back, Top, Bottom, Right, Left, or Display Planes. For details, see *Viewing Grid Objects (page 2–6)*.
- Extended
  - *Asset Browser (page 3–505)*
  - *Biped Animation Workbench (page 2–864)*
  - *Motion Mixer (page 2–581)*
  - *MAXScript Listener (page 3–824)*
  - HW Standard Material
- Shape: Automatically aligns view to the extents of a selected shape and its local XY axes

The fastest way to change the viewport display is with keyboard shortcuts. Press **V** to open the Viewports quad menu. You can then choose from this menu or use the first letter of the viewport

label as the keyboard shortcut (**F** for Front, for example. The exception is **K** for back).

Note: This menu appears at the mouse cursor, but it controls the view for the active viewport, even if the mouse cursor is over a different viewport.

Smooth+Highlights—Displays the smoothness and lighting of objects. You can also display maps on the surface of objects. See *Show Map in Viewport (page 2–1289)*. This happens on a map-by-map basis, but you can display as many maps as you want simultaneously in the viewport. Maps only display on objects that have mapping coordinates. Also Show Map In Viewport must be turned on for each map individually in the Material Editor.

Note: This and other shaded viewport options support self-illuminated materials and 32 lights (depending on display mode and graphics card).

Wireframe—Displays objects as edges only, as if they were made from wire. Wire color is determined by object color (default).

Other—Displays a cascading menu of other shading modes. These include:

- **Smooth**—Displays smoothing, but doesn't show highlights.
- **Facets+Highlights**—Displays highlights, but doesn't show smoothing.
- **Facets**—Shades faces, but doesn't display smoothing or highlights.
- **Flat**—Renders each polygon in its raw, unshaded diffuse color, disregarding any contribution from ambient lighting or light sources. This rendering method is useful when it's more important to see each polygon than to see its shading. It's also a good way to check the results of bitmaps created with *Render to Texture (page 3–139)*.
- **Lit Wireframe**—Displays edges as wireframe, but shows lighting.
- **Bounding Box**—Displays objects as a *bounding box (page 3–1013)* only.

Edged Faces—Available only when the current viewport is in a shaded mode. Displays the wireframe edges of objects along with the shaded surfaces. This is helpful for when you want to edit meshes in a shaded display.

Edges are displayed using the object wireframe color, while surfaces use material colors (if assigned). This lets you create contrasting colors between the shaded surfaces and the wireframe edges. You can switch these assignments in the *Display Color rollout (page 1–52)*.

Transparency—Sets the quality of transparency display in the selected viewport:

- **Best**—Highest quality transparency display; longer redraw time.
- **Simple**—Less accurate transparency display, however viewport redraw is considerably faster with Simple.
- **None**—Transparency is not displayed in the viewport.

Note: The Transparency setting only affects viewport display, and does not affect renderings.

Show Grid—Turns on and off the display of the home grid. Does not affect other grid display.

Keyboard > **G**

Show Background—Turns on and off the display of any viewport background image (or animation). To specify an image, choose Views menu > Viewport Background.

Tip: The keyboard shortcut for the Viewport Background dialog is **ALT+B**.

Show Safe Frame—Turns on and off the display of *safe frames (page 3–1124)*. You define the safe frames in the Viewport Configuration dialog (see Configure, below). The safe frame proportions

conform to the Width and Height of the output size of your rendering image output.

Viewport Clipping—Interactively sets a near and far range for the viewport. Geometry within the viewport clipping range is displayed. Faces outside the range are not displayed. This is useful in complex scenes where you want to work on details that are obscured from view. Turning on viewport clipping displays two yellow slider arrows on the edge of the viewport. Adjusting the lower arrow sets the near range, and the upper arrow sets the far range. Tick marks indicate the extents of the viewport. Viewport Clipping can also be turned on and off in the *Viewport Configuration dialog (page 3–896)*.

Texture Correction—Redraws the viewport using pixel-interpolation (perspective corrected).

Note: This is for the software display driver only. If you are using the OpenGL or Direct3D display mode, texture correction is automatic.

Disable View—Disables the active viewport. A disabled viewport behaves like any other viewport while it is active. However, when you change the scene in another viewport, the view in the disabled viewport does not change until you activate it. Use this function to speed up screen redraws when you are working on complex geometry.

Keyboard > **D**

Undo—Undoes the last viewport change.

Redo—Cancels the last viewport undo.

Configure—Displays the *Viewport Configuration dialog (page 3–896)*, which contains many options for further control of the viewports.

Viewport Controls

At the right end of the status bar are the buttons that control the display and navigation of the viewport.

Some of the buttons change for camera and light viewports. The Field Of View button changes for Perspective viewports.

The state of the navigation-button flyouts for all viewport types is saved in the **[Performance]** section of the *3dsmax.ini* file.

Viewport Navigation Controls

The navigation controls depend on the active viewport. Perspective, orthographic, camera, and light viewports all have specialized controls. Orthographic includes User viewports as well as viewports like Top, Front, and so on. The Zoom Extents All flyout and Maximize Viewport Toggle, available in all viewports, are included with the perspective and orthographic viewport controls.

Many of these controls are *modal (page 3–1067)*, meaning they stay on for repeated use. The buttons highlights when on. To turn them off, press ESC, right-click in a viewport, or choose another tool.

Controls Available in All Viewports

Zoom Extents All, Zoom Extents All Selected (page 3–780)

Maximize Viewport Toggle (page 3–780)

Perspective and Orthographic Viewport Controls

Perspective and Orthographic Viewport Controls (page 3–781)

Zoom Viewport (page 3–782)

Zoom All (page 3–782)

Zoom Extents / Zoom Extents Selected (page 3–783)

Field-of-View Button (page 3–784) (Perspective) or *Zoom Region (page 3–785)*

Pan View (page 3–786)

Walk Through (page 1–30)

Arc Rotate, Arc Rotate Selected, Arc Rotate Sub-Object (page 3–787)

Camera Viewport Controls

Camera Viewport Controls (page 3–788)

Dolly Camera, Target, or Both (page 3–788)

Perspective (page 3–789)

Roll Camera (page 3–790)

Field-of-View Button (page 3–784)

Truck Camera (page 3–791)

Walk Through (page 1–30)

Orbit/Pan Camera (page 3–791)

Light Viewport Controls

Light Viewport Controls (page 3–792)

Dolly Light, Target, or Both (page 3–793)

Light Hotspot (page 3–794)

Roll Light (page 3–796)

Light Falloff (page 3–796)

Truck Light (page 3–797)

Orbit/Pan Light (page 3–798)

Controls Available in All Viewports

Zoom Extents All, Zoom Extents All Selected

Activate any viewport. > Viewport Navigation controls > Zoom Extents All flyout

Keyboard > **SHIFT+CTRL+Z**

The Zoom Extents All flyout is available in all viewports. The flyout has two options:

- **Zoom Extents All** centers all visible objects in all viewports. This control is useful when you want to see every object in a scene in every available viewport.
- **Zoom Extents All Selected** centers a selected object, or set of objects, in all viewports. This control is useful when you want to navigate to small objects lost in a complex scene.

Procedures

To zoom all objects in a scene:

1. Activate any viewport.
2. Click Zoom Extents All.

   The viewports display all objects in the scene.

To zoom on a specific object:

1. In any viewport, select the object by clicking it, or press **H** to select it by name.
2. Click Zoom Extents All Selected.

   The viewports display the selected object.

Interface

Zoom Extents All—Centers and magnifies views so all the visible objects in the scene are shown in all viewports.

Zoom Extents All Selected—Centers and magnifies views so just the selected objects or sub-object selections in the scene are shown in all viewports. If no objects are selected, the effect is the same as Zoom Extents All.

Maximize Viewport Toggle

Activate any viewport. > Viewport navigation controls> Maximize Viewport Toggle

Keyboard > **ALT+W**

Maximize Viewport Toggle switches any active viewport between its normal size and full-screen size.

Tip: The keyboard shortcut **ALT+W** is especially useful for quick toggles.

Walkthrough Controls for Perspective and Camera Viewports

Pan/Truck and Walkthrough Flyout

In Perspective and Camera viewports, this flyout offers two separate buttons:

- Walk Through
- Pan or Truck

The *Walk Through button (page 3–781)* is one way to turn on *walkthrough navigation (page 1–30)*.

The use of the Pan or Truck button depends on which kind of viewport you are in:

- *Perspective viewports (Pan) (page 3–786)*
- *Camera viewports (Truck Camera) (page 3–791)*

This flyout doesn't appear for orthographic viewports or spotlight viewports. These viewports don't provide walkthrough navigation.

Walk Through Button

The Walk Through button is one way to begin *walkthrough navigation (page 1–30)*. (The other is to press UP ARROW.) It is available on the *Pan/Truck And Walkthrough flyout (page 3–780)*.

The flyout and button don't appear for orthographic viewports or for spotlight viewports. These don't provide walkthrough navigation.

Perspective and Orthographic Viewport Controls

Right-click any viewport label. > Views > Choose a perspective or orthographic view.
Right-click any viewport label. > Views > Grid > Choose any grid view.
Select a shape. > Right-click any viewport label. > Views > Shape
Keyboard > **V** (to open the Viewports quad menu), then **P** (Perspective), **U** (User), **F** (Front), **K** (Back), **T** (Top), **B** (Bottom), **L** (Left)

Perspective, orthographic, user, grid, and shape viewports all share the same viewport controls.

Perspective and orthographic viewport controls include the following. Two of these controls are available in all viewports.

Zoom Viewport (page 3–782)

Zoom All (page 3–782)

Zoom Extents / Zoom Extents Selected (page 3–783) (available in all viewports)

Field-of-View Button (page 3–784)

Zoom Region (page 3–785)

Pan View (page 3–786)

Arc Rotate, Arc Rotate Selected, Arc Rotate Sub-Object (page 3–787)

Maximize Viewport Toggle (page 3–780) (available in all viewports)

Procedure

To undo changes to a perspective or orthographic viewport, do one of the following:

- Right-click the viewport label and choose Undo. The type of Undo is specifically named on the menu (for example, Undo Zoom Extents).
- Press **SHIFT+Z**.

  Note: This is different from camera and light viewports, which require the use of Undo on the main toolbar, or **CTRL+Z**.

Zoom Viewport

Activate a Perspective or Orthographic viewport. > Viewport Navigation controls > Zoom
Keyboard > **Z** turns on Zoom ; **[** zooms in; **]** zooms out
Keyboard > **CTRL+ALT+middle mouse button**
Roll your mouse scroll wheel.

Zoom adjusts view magnification when you drag in a Perspective or Orthographic viewport. By default, the zoom is in and out of from the pointer of your mouse.

Tip: If you use the Microsoft IntelliMouse or a compatible pointing device, you can roll the wheel to zoom in and out in the active viewport. The zoom center is the current cursor position.

Zoom moves incrementally, based on the distance between the Perspective view and its "virtual target," an inaccessible hidden target used for calculation purposes only. Use the CTRL and ALT keys to increase or decrease the increments. You can move the virtual target by holding down the SHIFT key during a zoom operation. Otherwise you will zoom increasingly closer to the target, which will not move.

Procedures

To zoom a view:

1. Activate a Perspective or Orthographic viewport.
2. Click Zoom.

   The button highlights when it is on.
3. Drag in a viewport to change magnification.
   - Drag up to increase magnification.
   - Drag down to decrease magnification.
4. Press ESC or right-click to turn off the button.

To increase zoom speed:

- Hold down CTRL while you drag in a viewport.

To decrease zoom speed:

- Hold down ALT while you drag in a viewport.

To turn on an automatic zoom mode:

- On the keyboard, hold down CTRL+ALT, then hold down the middle mouse button and drag in a viewport. This does not activate the Zoom button.

To zoom to the cursor position:

- On the keyboard, press **[** (left bracket) to zoom in, and **]** (right bracket) to zoom out.

Zoom All

Activate a Perspective or Orthographic viewport. > Viewport Navigation controls > Zoom All

Zoom All lets you adjust view magnification in all Perspective and Orthographic viewports at the same time.

By default, Zoom All zooms in and out of the center of the viewports.

Procedures

To zoom all views:

1. Activate a Perspective or Orthographic viewport.
2. Click Zoom All.

   The button highlights when it is on.
3. Drag in a viewport to change magnification in all viewports.
   - Drag up to increase magnification.
   - Drag down to decrease magnification.
4. Press ESC or right-click to turn off the button.

To zoom all viewports except the Perspective viewport:

1. Hold down the SHIFT key and click Zoom All.
2. Drag in a viewport to zoom all the viewports except the Perspective.

   Note: You can drag in a Perspective viewport, but you only see the zoom in Orthographic viewports.

Zoom Extents / Zoom Extents Selected

Activate a Perspective or Orthographic viewport. > Viewport Navigation controls > Zoom Extents flyout

The Zoom Extents flyout displays the Zoom Extents button and the Zoom Extents Selected button.

Zoom Extents centers all visible objects in an active Perspective or Orthographic viewport. This control is useful when you want to see every object in a scene in a single viewport.

Zoom Extents Selected centers a selected object, or set of objects, in an active Perspective and Orthographic viewport. This control is useful when you want to navigate to small objects lost in a complex scene.

Procedures

To zoom all objects in one viewport:

1. Activate the Perspective or Orthographic viewport you want to zoom.
2. Click Zoom Extents.

   The viewport displays all objects in the scene.

To zoom on a specific object:

1. Activate the Perspective or Orthographic viewport you want to zoom.
2. Select the object by clicking it, or press **H** to select it by name.
3. Click Zoom Extents Selected.

   The viewport displays the selected object.

To exclude an object from Zoom Extents:

Use this procedure, for example, to ignore lights that are far away from the other objects in the scene.

1. Click an object to select it.
2. Right-click the object and choose Properties.
3. In the Display Properties group, make sure properties are set to By Object.
4. Turn on Ignore Extents.

   The object will now be excluded by Zoom Extents and Zoom Extents Selected.

Interface

Zoom Extents—Centers and magnifies views so all the visible objects in the scene are shown in a single viewport.

Objects can be excluded from zoom extents all if the Ignore Extents box is turned on under Object Properties.

Zoom Extents Selected—Centers and magnifies views so just the selected objects or sub-object selections in the scene are shown in a single viewport. If no objects are selected, the effect is the same as Zoom Extents.

Field of View Flyout

Activate Perspective viewport. > Status bar > Viewport controls > Field of View flyout

The Field of View flyout is available only for Perspective viewports. The flyout has two options:

- *Field of View (FOV) (page 3–784)*: Adjusts the amount of the scene that is visible in a viewport and the amount of perspective flare.
- *Zoom Region (page 3–785)*: Magnifies a rectangular area you drag within a viewport.

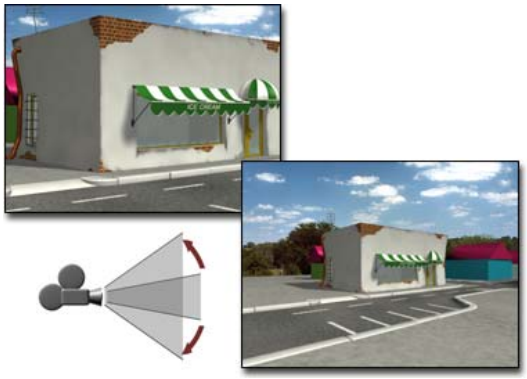
Field-of-View Button

Activate a Camera viewport. > Viewport controls > Field-of-View

Activate a Perspective viewport. > Viewport controls > Field-of-View (on Field-of-View flyout)

Field-of-View (FOV) adjusts the amount of the scene that is visible in a viewport and the amount of perspective flare. The effect of changing FOV is similar to changing the lens on a camera:

- As the FOV gets larger, you see more of your scene and the perspective becomes distorted, similar to using a wide-angle lens.
- As the FOV gets smaller, you see less of your scene and the perspective flattens, similar to using a telephoto lens.



Above: Narrow field of view

Below: Wide field of view

Although the effect of Field-of-View appears similar to a zoom, the perspective is actually changing, resulting in increased or decreased distortion in the viewport.

In a Perspective viewport, Field-of-View defines the width of your view as an angle with its apex at your viewpoint and the ends at the sides of the view.

In a Camera viewport, Field-of-View controls the width of the area a camera views, and represents the arc of the camera's horizon in degrees. For a selected camera, you can adjust its *FOV and Lens parameters (page 2–1218)* directly to fine-tune the FOV you set in the viewport. See "To use FOV with Camera parameters" in the following procedures.

Procedures

To adjust the field of view in a viewport:

1. Activate a Perspective or Camera viewport.
2. Click Field-of-View.

The button highlights in gold when it is on.

3. Drag in the viewport to adjust the FOV angle.
   - Dragging down widens (increases) the FOV angle, reduces lens length, displays more of your scene, and exaggerates perspective.
   - Dragging up narrows (decreases) the FOV angle, increases lens length, displays less of your scene, and flattens perspective.
4. Press ESC or right-click to turn off the button.

To enter an FOV value in a Perspective view:

1. Activate a Perspective viewport.
2. Right-click Field-of-View to display the Viewport Configuration dialog.
3. Click the Rendering Method tab.
4. In the Perspective User View group, enter an angle in the FOV field.
5. Click OK to make the change.

To use FOV with Camera parameters:

1. Activate a Camera viewport.
2. Press **H** and select the viewport's camera in the Select Objects dialog.
3. Open the Modify panel to view the camera's Parameters rollout.
4. As you drag Field-of-View in the viewport, the FOV and Lens parameters update interactively.
5. Set the FOV and Lens parameters directly, or click a button in the Stock Lenses group.

   Note: Only the FOV value is saved with the camera. The Lens value (focal length) is another way to express and select the FOV.

   See *Common Camera Parameters (page 2–1218)*.

   Note: Using the *Perspective button (page 3–789)* in a Camera viewport also changes the FOV in concert with dollying the camera.

Zoom Region

Activate an Orthographic viewport. > Viewport navigation controls > Zoom Region
Activate a Perspective viewport. > Viewport navigation controls > Zoom Region (from Field of View flyout)
Keyboard > **CTRL+W**

Zoom Region magnifies a rectangular area you drag within a viewport. This control is available only when the active viewport is an *Orthographic (page 3–1080)*, *Perspective (page 3–1086)* or *User-Axonometric view (page 3–1007)*. It is not available for Camera viewports.

Zoom Region stays active until you right-click or select another command.

Procedures

To zoom a region:

1. Activate an Orthographic or Perspective viewport.
2. Click Zoom Region or press **CTRL+W**.

   When you zoom a region in a perspective viewport, select Zoom Region from the Field of View flyout.
3. Drag a rectangular region in any viewport displaying a non-camera view.

   When you release, the region is magnified to fill the viewport.

   Note: When using the Zoom Region in Perspective view, the zoom rectangle is at a fixed distance from the camera. For this reason, if you draw the rectangle large enough, you can zoom out from the scene.

Pan View

Activate a Perspective or Orthographic viewport. > Viewport Navigation controls > Pan View
Keyboard > **CTRL+P**; **I** pans so the cursor location becomes the center of the viewport.
Middle mouse button > Drag in the viewport with the middle mouse button for instant access to pan the viewport.

Pan moves the view parallel to the current viewport plane.

Pan is *modal (page 3–1067)*: it stays active until you right-click or select another command.

To constrain panning of any viewport to a single axis, hold down the SHIFT key. The pan is constrained to the axis you first move while the SHIFT key is down.

To accelerate panning, hold down the CTRL key.

You can also pan by dragging in a viewport while pressing the middle button of a three-button mouse. This lets you pan without turning on the Pan button.

Procedures

To pan a viewport:

1. Activate a Perspective or Orthographic viewport, and then click Pan View.
2. Drag in the viewport in the direction you want to move.
3. Press ESC or right-click to turn off the button.

To pan a non-Camera viewport:

1. Activate a Perspective or Orthographic viewport.
2. Do one of the following:
   - Click Pan View.
   - Press **CTRL+P**.
   - Press the middle mouse button.
3. Drag in the viewport in the direction you want to move, or use the arrow keys.

To accelerate panning:

- Hold down the CTRL key as you pan.

To constrain panning to a single axis:

- Hold down the SHIFT key as you pan.

  The pan is constrained to the first axis you use.

  If you drag vertically at first, the pan or orbit is constrained to be vertical; if you drag horizontally at first, the constraint is horizontal.

Arc Rotate Flyout

Activate a Perspective or Orthographic viewport. > Viewport Navigation controls > Arc Rotate flyout
Keyboard > ALT+middle mouse button

The Arc Rotate flyout displays the Arc Rotate button, the Arc Rotate Selected button, and the Arc Rotate Sub-Object button. Use these to rotate your viewpoint around the view.

For more information on these tools, see *Arc Rotate, Arc Rotate Selected, Arc Rotate Sub-Object (page 3–787)*.

Arc Rotate, Arc Rotate Selected, Arc Rotate Sub-Object

Activate a Perspective or Orthographic viewport. > Viewport Navigation controls > Arc Rotate flyout

Keyboard > **ALT+middle mouse button**

The Arc Rotate buttons, on the *Arc Rotate flyout (page 3–786)*, spin the viewpoint freely around a center.

Three Arc Rotate variants are available: Arc Rotate, Arc Rotate Selected, and Arc Rotate Sub-Object.

Arc Rotate is *modal (page 3–1067)*: it remains active until you right-click or choose another command.

Arc Rotate respects *Angle Snap (page 2–36)*. If you turn on Angle Snap, the Arc Rotate mouse pointer displays a magnet, and the rotation snaps by the *Viewport Arc Rotate Snap Angle setting*.

Arc Rotation used a hidden "virtual target" as the point which is used for the center of rotation. Holding the CTRL key down in Arc Rotate mode has a special behavior: It does a rotation of the scene around the screen's X and Y axis (at the position of the virtual target). Move the mouse horizontally yields rotation around *world* coordinates referential **Z**-axis. User moves the mouse vertically yields rotation around screen coordinates referential **X**-axis. This differs from standard Arc Rotate, when horizontal mouse movement rotates around *screen* coordinates referential **Y**-axis.

Procedures

To use Arc Rotate:

1. Activate a Perspective or Orthographic viewport.
2. Click any of the three Arc Rotate buttons.

   A view rotation "trackball" is displayed as a yellow circle with handles placed at the quadrant points.
3. Drag the mouse on and around the trackball to produce different types of view rotations. The cursor changes to indicate what type of rotation you are about to perform.
   - Drag the handles to keep the rotation either horizontal or vertical. Drag horizontally on the side handles, or vertically on the top or bottom handle.
   - Drag inside the trackball to rotate the view freely within the viewport. The free rotation continues while dragging even if the cursor crosses outside the trackball.
   - Drag outside the trackball to rotate the view about the depth axis that is perpendicular to the screen. When the cursor crosses inside the trackball during dragging, free rotation occurs. When the cursor crosses back outside the trackball, spinning rotation is again in effect.
4. Press ESC or right-click to end Arc Rotate.

To constrain rotation to a single axis:

- Hold down the SHIFT key as you rotate.

  The rotation is constrained to the first axis you use.

To rotate with keyboard and mouse:

- Hold down the SHIFT key as you rotate.

  The rotation is constrained to the first axis you use.

Interface

Arc Rotate—Uses the view center as the center of rotation. If objects are near the edges of the viewport, they may rotate out of view.

Arc Rotate Selected—Uses the center of the current selection as the center of rotation. The selected object remains at the same position in the viewport while the view rotates around their center.

Arc Rotate SubObject—Uses the center of the current sub-object selection as the center of rotation. The selection remains at the same position in the viewport while the view rotates around its center.

Camera Viewport Controls

Right-click any viewport label. > Views > Choose a camera.
Keyboard > **C**

A Camera viewport shows the view from a camera, looking in the direction it's aimed.

Camera viewport controls include the following. Two of these controls are available in all viewports.

Dolly Camera, Target, or Both (page 3–788)

Perspective (page 3–789)

Roll Camera (page 3–790)

Zoom Extents All, Zoom Extents All Selected (page 3–780) (available in all viewports)

Field-of-View Button (page 3–784)

Truck Camera (page 3–791)

Orbit/Pan Camera (page 3–791)

Maximize Viewport Toggle (page 3–780) (available in all viewports)

Activate a Camera view from the viewport right-click menu, under Views. If the scene contains more than 10 cameras, the last entry in the list is "More Cameras." Choose this to display the Choose A View dialog, which shows the complete list.

If a single camera is selected and you press **C**, the active viewport switches to the view from that camera. If, when you press **C**, the scene contains more than one camera and no camera or multiple cameras are selected, the Select Camera dialog appears; choose a camera from the list.

Procedure

To undo changes to a Camera viewport, do one of the following:

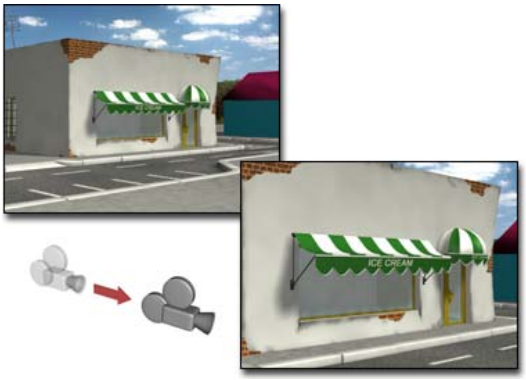
- Click Undo on the main toolbar.
- Press **CTRL+Z**.

  Note: This is different behavior from orthographic viewports, which require the use of Views menu > Undo, or **SHIFT+Z**.

Dolly Camera, Target, or Both

Activate a Camera viewport. > Viewport navigation controls > Dolly Camera or Dolly Target or Dolly Camera + Target

The buttons on this flyout replace the Zoom button when a Camera viewport is active. Use them to move the camera and/or its target along the camera's main axis, toward or away from what the camera is pointing at.



Dollying a camera

A free camera moves along its depth axis in the direction its lens is pointing. Unlike a target camera, its target distance remains fixed, no matter how far you dolly.

Note: The three buttons of the Dolly Camera flyout are available when a target camera viewport is active. When a free camera viewport is active, the button appears as a flyout, but only Dolly Camera is available for this type of camera. If you activate a target camera viewport, the three buttons are again available.

See also

Dolly Light, Target, or Both (page 3–793)

Procedure

To dolly a camera:

1. Activate a Camera viewport.
2. Click one of the buttons on the Dolly Camera flyout.
3. Drag to move the camera.
   - Drag up to move the camera forward along its line of sight.
   - Drag down to move the camera backward along its line of sight.
4. Press ESC or right-click to turn off the button.

Interface

The Dolly Camera flyout consists of the following individual buttons:

Dolly Camera—Moves only the camera to and from its target. If you go past the target, the camera flips 180 degrees and moves away from its target.

Dolly Target—Moves only the target to and from the camera. You see no visual change in the camera viewport, unless you dolly the target to where it passes through the camera to the other side, at which point the camera view is reversed. However, changing the relative position of the target to the camera affects other adjustments, such as Orbit Camera, which uses the target as its rotational pivot.

This option is available only if the viewport's camera is a target camera.

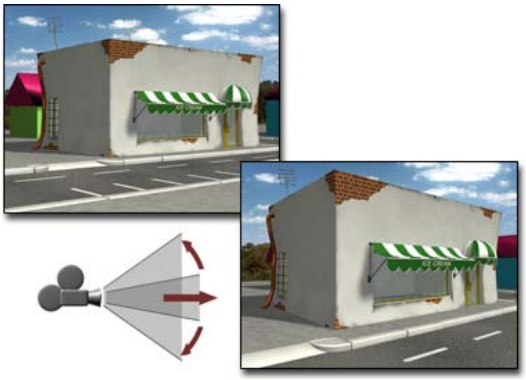
Dolly Camera + Target—Moves both the target and the camera to and from the camera.

This option is available only if the viewport's camera is a target camera.

Perspective

Activate a Camera viewport. > Viewport navigation controls > Perspective

Perspective performs a combination of *FOV (page 3–1031)* and *Dolly (page 3–788)* for target cameras and free cameras. It increases the amount of perspective flare, while maintaining the composition of the scene.



Adjusting perspective

Note: This button replaces the Zoom All button when a Camera viewport is active.

Tip: Hold down the CTRL key to magnify the effect of the mouse on perspective adjustment.

A target camera can pass through its target object while you are using Perspective. When this happens, the FOV reaches its maximum angle of 180 degrees at the target location and cursor motion is reversed until you release the drag.

A free camera continues moving along an infinite path but uses an implied target position to control the FOV change rate. This implied target is defined as a point specified by the Target Distance field in the Parameters rollout for the free camera.

Procedure

To change perspective for a camera:

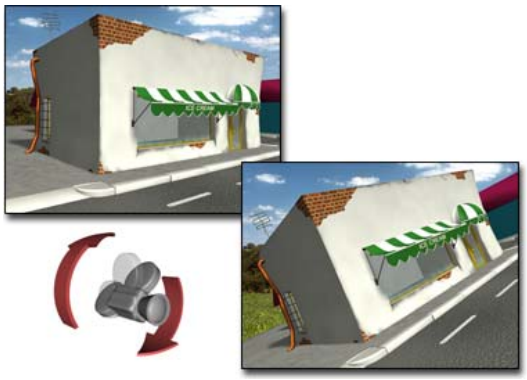
1. Activate a Camera viewport.
2. Click Perspective.

   The button turns yellow when it is on.
3. Drag to change FOV and dolly simultaneously.
   - Drag up to move the camera closer to its target, widen the FOV, and increase perspective flare.
   - Drag down to move the camera away from its target, narrow the FOV, and decrease perspective flare.
4. Press ESC or right-click to turn off the button.

Roll Camera

Activate a Camera viewport. > Viewport navigation controls > Roll Camera

Roll Camera rotates a target camera about its line of sight, and rotates a free camera about its local Z axis.



Rolling a camera

Note: This button replaces the Zoom Extents button when a Camera viewport is active.

Procedure

To roll a camera:

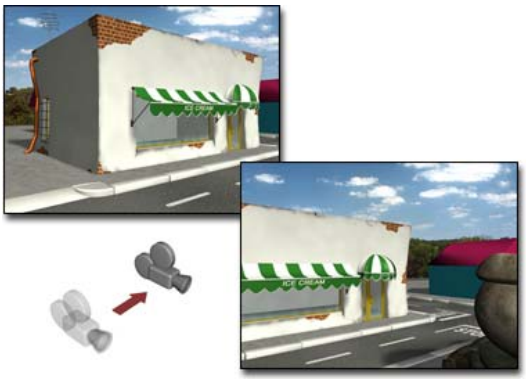
1. Activate a Camera viewport.
2. Click Roll Camera.

   The button highlights when it is on.
3. Drag horizontally to roll the view.
4. Press ESC or right-click to turn off the button.

Truck Camera

Activate a Camera viewport. > Viewport navigation controls > Truck Camera

Truck Camera moves the camera parallel to the view plane.



Trucking a camera

For a target camera, dragging the mouse moves both the camera and its target parallel to the Camera view.

This button replaces the Pan button when a Camera viewport is active.

Procedure

To truck a camera:

1. Activate a Camera viewport.
2. Click Truck Camera.

   The button highlights when it is on.
3. Drag to move the camera and its target.

   The camera and its target move parallel to the view plane, which is perpendicular to the camera's line of sight.
4. Press ESC or right-click to turn off the button.

To constrain trucking to a single axis:

- Hold down the SHIFT key.

  The truck is constrained to the first axis you move while the SHIFT key is down.

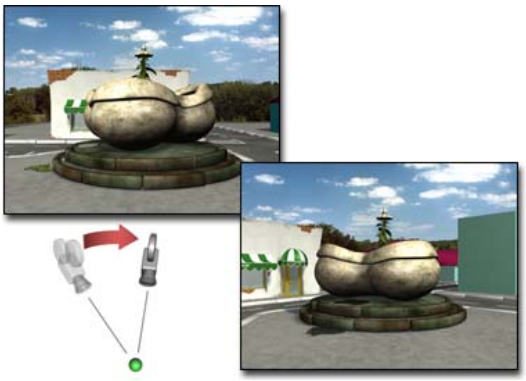
To accelerate trucking:

- Hold down the CTRL key.

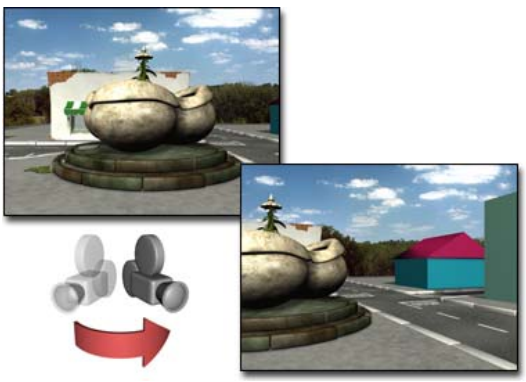
Orbit/Pan Camera

Activate a Camera viewport. > Viewport navigation controls > Orbit Camera

Orbit Camera rotates a camera about the target. Pan Camera rotates the target about the camera.



Orbiting a camera



Panning a camera

Note: This button replaces the Arc Rotate button when a Camera viewport is active.

You can constrain the rotation to a single axis by first pressing SHIFT before beginning the rotation. The rotation is constrained to the axis you begin rotating about.

To accelerate panning, hold down the CTRL key before you pan.

Procedures

To pan a camera:

1. Activate a Camera viewport.
2. Click Pan Camera.

   The button highlights when it is on.
3. Drag to rotate the view about the camera.
   - Dragging rotates the view freely using the world X and Y axes.
   - Press SHIFT and drag horizontally to lock view rotation about the world Y axis. This produces a horizontal pan.
   - Press SHIFT and drag vertically to lock rotation about the world X axis. This produces a vertical pan.
4. Press ESC or right-click to turn off the button.

To pan with the middle mouse button:

- Hold down the middle mouse button and drag.

  Pan mode is automatically switched on.

To orbit a camera:

1. Activate a Camera viewport.
2. Click Orbit Camera.
3. Drag to rotate the view around the target.
   - Dragging rotates the view freely using the world X and Y axes.
   - Press SHIFT and drag horizontally to lock view rotation about the world Y axis. This produces a horizontal orbit.
   - Press SHIFT and drag vertically to lock rotation about the world X axis. This produces a vertical orbit.
4. Press ESC or right-click to turn off the button.

Interface

Orbit Camera—Rotates a target camera about its target. Free cameras use the invisible target, set to the target distance specified in the camera Parameters rollout.

Pan Camera—Rotates the target about a target camera. For a free camera, rotates the camera about its local axes.

Light Viewport Controls

Right-click any viewport label. > Views > Choose a light.
Keyboard > **$**

A Light viewport shows the view from a spotlight or directional light, looking at its target.

Light viewport controls include the following. Two of these controls are available in all viewports.

Dolly Light, Target, or Both (page 3–793)

Light Hotspot (page 3–794)

Roll Light (page 3–796)

Zoom Extents All, Zoom Extents All Selected (page 3–780) (available in all viewports)

Light Falloff (page 3–796)

Truck Light (page 3–797)

Orbit/Pan Light (page 3–798)

Maximize Viewport Toggle (page 3–780) (available in all viewports)

For *photometric lights (page 2–1155)*, the Light Hotspot control actually adjusts the beam angle. At the beam angle, the light is 50 per cent of the maximum intensity.

Targeted photometric lights can be used as views only when the light's distribution is set to spotlight.

Warning: Switching to or from a light view clears the Undo/Redo lists.

Procedures

To set a Light viewport:

1. Activate the viewport you want to show the view from a spotlight or directional light in the scene.
2. Do one of the following:
   - Press the keyboard shortcut **$**.
   - Right-click the Viewport label. Choose Views and then choose the light from the Views submenu.
3. If you have more than one spotlight or directional light in the scene (and none is selected), the Select Light dialog is displayed: choose the light you want.
4. If there are more than 10 lights listed, the last entry is "More Lights." Choose this to display the Choose a View dialog, which shows the complete list.

To undo changes to a Light viewport, do one of the following:

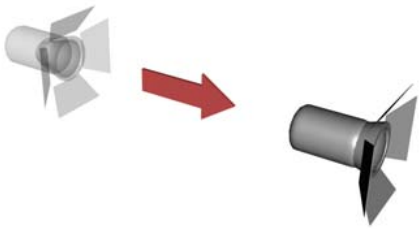
1. Click Undo on the main toolbar.
2. Press **CTRL+Z**.

Note: This is different from orthographic viewports, which require the use of Views menu > Undo, or **SHIFT+Z**.

Dolly Light, Target, or Both

Activate a Light viewport. > Viewport navigation controls > Dolly Light

Dolly Light, on the Dolly Light flyout (see below) moves the light or its target or both along the light's main axis, toward or away from what the light is pointing at. A free light moves along its depth axis in the direction its lens is pointing. On a target light, the target distance remains fixed, no matter how far you dolly.



Dollying a light

When you dolly a light, the light source moves closer to and away from its target. Because spotlights have conical beams, dollying a spotlight closer to its target shrinks the area illuminated at the target. Similarly, dollying a spotlight away from its target expands the area illuminated at the target.

The three buttons of the Dolly Light flyout are available when a target light viewport is active. When a free light viewport is active, the button appears as a flyout, but only Dolly Light is available for this type of light. If you activate a target light viewport, the three buttons are again available.

The buttons on this flyout replace the Zoom button when a Light viewport is active.

See also

Dolly Camera, Target, or Both (page 3–788)

Procedure

To dolly a light:

1. Activate a Light viewport.
2. Click Dolly Light.

   The button highlights when it is on.
3. Drag to move the light.
   - Drag up to move the light forward along its line of sight.
   - Drag down to move the light backward along its line of sight.
4. Press ESC or right-click to turn off the button.

Interface

The Dolly Light flyout consists of the following buttons:

Dolly Light—Moves only the light to and from its target. If you go past the target, the light flips 180 degrees and moves away from its target.

Dolly Target—Moves only the target to and from the light. You see no visual change in the light viewport, unless you dolly the target to where it passes through the light to the other side, at which point the light view is reversed. However, changing the relative position of the target to the light affects other adjustments, such as Orbit Light, which uses the target as its rotational pivot.

This option is available only if the viewport's light is a target light.

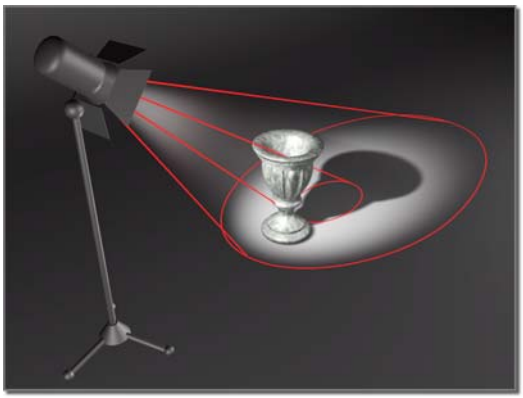
Dolly Light + Target—Moves both the target and the light to and from the light.

This option is available only if the viewport's light is a target light.

Light Hotspot

Activate a Light viewport. > Viewport navigation controls > Light Hotspot

Light Hotspot lets you adjust the angle of a light's *hotspot (page 3–1048)*. This button replaces the Zoom All button when a light viewport is active.



The floodlight has a narrow hotspot but a wide falloff area.

Widening the hotspot creates a brighter light.

Click this button, then move the mouse in the light viewport to make the cone of the hotspot narrower or wider (the hotspot cone is shown in blue, the *falloff (page 3–1048)* cone is in gray).

Hold down the CTRL key while moving the mouse to lock the initial angle separation of the hotspot and falloff cones.

You can't adjust the hotspot larger than the falloff, because that would change the falloff value. Likewise, when you reduce the falloff, it stops at the hotspot size (in both cases, separated by the *Angle Separation (page 3–863)*, specified on the Rendering page of the Preferences dialog).

To override the separation of the hotspot and falloff parameters and cause the parameters to affect each other, hold down the SHIFT key.

For more information on the hotspot and falloff parameters, see *Spotlight Parameters (page 2–1183)* and *Directional Parameters (page 2–1193)*.

Note: If the light is a *photometric light (page 2–1155)* with spotlight distribution, this button controls the light's beam angle. At the beam angle, the light's intensity has fallen to 50 per cent (rather than 100 per cent at the hotspot angle for a standard light).

Procedure

To change a light's hotspot:

1. Set up a Perspective viewport so you can see the light in 3D space.
2. Activate a Light viewport.
3. Press H to display the Select Objects dialog. Select the light.

   The light and its cones should be visible in the Perspective viewport.
4. Click Light Hotspot.

   The button highlights when it is on.
5. Drag in the Light viewport to change the hotspot angle.

   The blue hotspot cone expands and contracts as you drag.

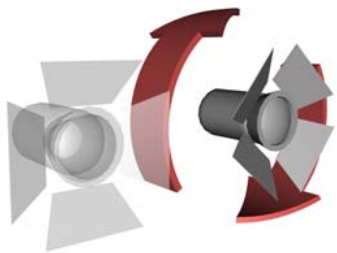
   - Drag down to widen (increase) the hotspot angle and illuminate more of the scene. The hotspot grows inside the falloff as its angle increases. By default, the hotspot can be no larger than the falloff cone.
   - Hold down SHIFT as you drag to override the default. This lets the falloff cone increase in size as you increase the size of the hotspot cone.
   - Drag up to narrow (decrease) the hotspot angle and illuminate less of the scene.
   - Hold down CTRL as you drag to lock the initial angle separation of the hotspot and falloff cones.
6. Press ESC or right-click to turn off the button.

Roll Light

Activate a light viewport. > Viewport navigation controls > Roll Light

Roll Light rotates the light about its own line of sight (the light's local Z axis).

Although Roll does change the light view, it affects the light object only if the light casts a rectangular beam or is a *projector (page 3–1092)*.



Rolling a light

Drag the mouse horizontally to roll a target light or rotate a free light about its local Z axis.

This button replaces the Zoom Extents button when a light viewport is active.

Procedure

To roll a light:

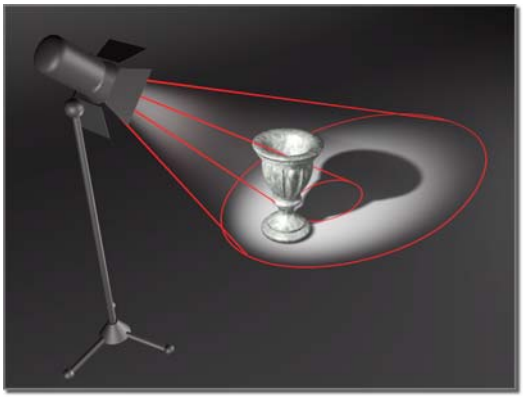
1. Activate a Light viewport.
2. Click Roll Light.

   The button highlights when it is on.
3. Drag horizontally to roll the view.
4. Press ESC or right-click to turn off the button.

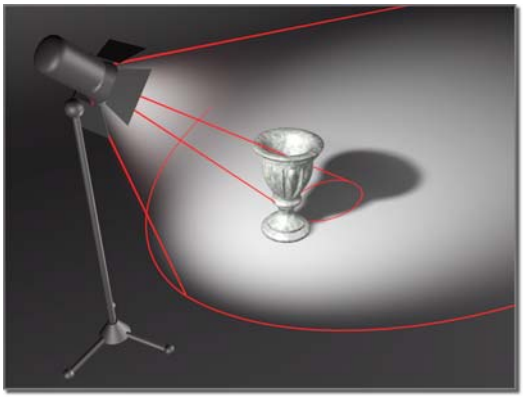
Light Falloff

Activate a Light viewport. > Viewport navigation controls > Light Falloff

Light Falloff adjusts the angle of a light's *falloff (page 3–1048)*. This button replaces the Zoom Region button when a light viewport is active.



The light has a narrow hotspot but a wide falloff area.



Making the falloff even wider illuminates a larger area.

Click Light Falloff, then move the mouse in the light viewport to make the falloff narrower or wider (the falloff extents are shown in gray, the *hotspot (page 3–1048)* is in blue).

Hold down the CTRL key while moving the mouse to lock the initial angle separation of the hotspot and falloff cones.

You can't adjust the hotspot larger than the falloff, because that would change the falloff value. Likewise, when you reduce the falloff, it stops at the hotspot size (in both cases, separated by the *angle separation (page 3–863)*, specified on the Rendering page of the Preferences dialog).

To override the separation of the hotspot and falloff parameters and cause the parameters to affect each other, hold down the SHIFT key.

For more information on the hotspot and falloff parameters, see *Spotlight Parameters (page 2–1183)* and *Directional Parameters (page 2–1193)*.

Procedure

To change a light's falloff:

1. Set up a Perspective viewport so you can see the light in 3D space.
2. Activate a Light viewport.
3. Press H to display the Select Object dialog. Select the light.

   The light and its cones should be visible in the Perspective viewport.
4. Click Light Falloff.

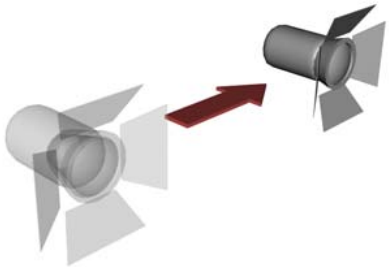
   The button highlights when it is on.
5. Drag in the Light viewport to change the falloff angle.

   The gray falloff cone expands and contracts as you drag.
   - Drag down to widen (increase) the falloff angle and illuminate more of the scene.
   - Drag up to narrow (decrease) the falloff angle and illuminate less of the scene. As its angle decreases, the falloff shrinks around the hotspot. By default, the falloff cone can be no smaller than the hotspot cone.
   - Hold down SHIFT as you drag to override the default. This lets the hotspot cone decrease in size as you decrease the size of the falloff cone.
   - Hold down CTRL as you drag to lock the initial angle separation of the hotspot and falloff cones.
6. Press ESC or right-click to turn off the button.

Truck Light

Activate a light viewport. > Viewport navigation controls > Truck Light

Truck Light moves a target light and its target parallel to the light view, and moves a free light along its XY axis.



Trucking a light

To constrain trucking of any viewport to a single axis, hold down the SHIFT key. The truck is constrained to the first axis you move while the SHIFT key is down.

To accelerate trucking, hold down the CTRL key.

Note: This button replaces the Pan button when a light viewport is active.

Procedures

To truck a light:

1. Activate a Light viewport.

2. Click Truck Light.

   The button highlights when it is on.

3. Drag to move the light and its target.

   The camera and its target move parallel to the view plane, which is perpendicular to the camera's line of sight.

4. Press ESC or right-click to turn off the button.

To constrain trucking to a single axis:

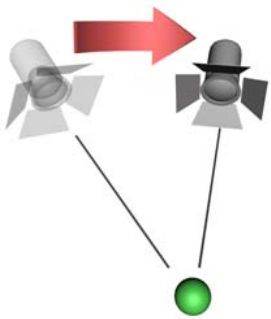
- Hold down the SHIFT key.

  The truck is constrained to the first axis you use.

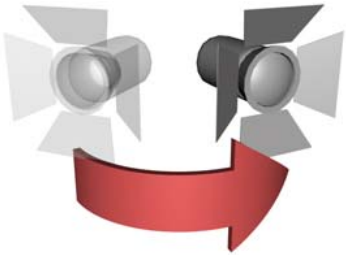
Orbit/Pan Light

Activate a light viewport. > Viewport navigation controls > Orbit/Pan Light flyout

Orbit rotates a light about the target. Pan rotates the target about the light.



Orbiting a light



Panning a light

To constrain panning or orbiting to a single axis, hold down the SHIFT key. The pan or orbit is constrained to the axis you first move while the SHIFT key is down.

To accelerate panning or orbiting, hold down the CTRL key before you pan or orbit.

Note: This button replaces the Arc Rotate button when a light viewport is active.

Procedures

To orbit a light:

1. Activate a Light viewport.
2. Click Orbit Light.

   The button highlights when it is on.

3. Drag to rotate the view around the target.
   - Dragging rotates the view freely using the world X and Y axes.
   - Press SHIFT and drag horizontally to lock view rotation about the world Y axis. This produces a horizontal orbit.
   - Press SHIFT and drag vertically to lock rotation about the world X axis. This produces a vertical orbit.
4. Press ESC or right-click to turn off the button.

To pan a light:

1. Activate a Camera or Light viewport.
2. Click Pan Light.

   The button highlights when it is on.
3. Drag to rotate the view about the camera or light.
   - Dragging rotates the view freely using the world X and Y axes.
   - Press SHIFT and drag horizontally to lock view rotation about the world Y axis. This produces a horizontal pan.
   - Press SHIFT and drag vertically to lock rotation about the world X axis. This produces a vertical pan.
4. Press ESC or right-click to turn off the button.

To pan with the middle mouse button:

- Hold down the middle mouse button and drag.

  Pan mode is automatically switched on.

Interface

Orbit Light—Rotates the light about its target. Free lights use the invisible target, set to the target distance specified in the Modify panel > Spotlight Parameters or Directional Parameters rollout.

Pan Light—For a target light, rotates the target about the light. For a free light, rotates the light about its local axes.

Command Panels

The command panel comprises six user-interface panels that give you access to most of the modeling features of 3ds Max, as well as some animation features, display choices, and miscellaneous utilities. Only one panel is visible at a time. To display a different panel, you click its tab at the top of the command panel.

These are the six panels:

- *Create panel (page 3–800)*

  Contains controls for creating objects: geometry, cameras, lights, and so on.
- *Modify panel (page 3–801)*

  Contains controls for applying *modifiers (page 3–1068)* to objects and editing editable objects such as meshes and patches.
- *Hierarchy panel (page 3–816)*

  Contains controls for managing links in a hierarchy, joints, and inverse kinematics.
- *Motion panel (page 3–817)*

  Contains controls for animation controllers and trajectories.
- *Display panel (page 3–818)*

  Contains controls that let you hide and unhide objects, along with other display options
- *Utilities panel (page 3–821)*

  Contains miscellaneous utility programs, most of which are plug-ins to 3ds Max.

By default, the command panel appears at the right of the 3ds Max window. You can "dock" it along other edges of the program window, or make it a floating panel. See *Customizing the User Interface (page 3–829)*.

Object Name and Wireframe Color

Create panel > Any object category > Name And Color rollout

Modify, Hierarchy, Motion, Display, or Utilities panel > Name field and color swatch

The name and color fields appear at the top of all command panels other than the Create panel. On the Create panel, the fields are contained in a rollout. You can change an object's name or color from any of these locations.

Interface

Name (text field)—Displays the name of the selected object and lets you enter a new name from the keyboard. Available only when a single object is selected.

Color (swatch)—Displays the selected object's wireframe color and lets you select a new one. The wireframe color is the one used to display the object in viewports. Click the color swatch to display the *Object Color dialog (page 1–155)*.

Create Panel

Create Panel

Command panels > Create panel

The Create panel provides the controls for creating objects. This is the first step in building a new scene in 3ds Max. Most likely, you will continue to add objects throughout an entire project. For example, when it is time to render a scene you might need to add more lights.

The Create panel groups the kinds of objects you create into seven categories. Each category has its own button. Within each category there can be several different subcategories of objects. A drop-down list lets you choose among object subcategories, and each kind of object has its own button, which you click to begin creation.

These are the categories of objects that the Create panel provides:

- *Geometry (page 1–149)*

  Geometry is the renderable geometry of the scene. There are geometry primitives such as Box, Sphere, Pyramid, and more advanced geometry such as Booleans, Lofts, and particle systems.

- *Shapes (page 1–257)*

  Shapes are splines or NURBS curves. They have only one local dimension, although they can exist in 2D space, such as a Rectangle shape, or 3D space, such as a Helix.

  You can give shapes a thickness so they will render, but primarily you use them for constructing other objects such as Lofts, or for motion trajectories.

- *Lights (page 2–1126)*

  Lights illuminate the scene and improve its realism. There are several kinds of lights, each of which models different types of lighting in the real world.

- *Cameras (page 2–1210)*

  Camera objects provide a view of the scene. The advantages of cameras over the views in the standard viewports are that cameras have controls similar to real-world cameras, and that you can animate a camera's position.

- *Helpers (page 2–2)*

Helper objects are aids to constructing a scene. They help you position, measure, and animate the scene's renderable geometry.

- *Space Warps (page 2–51)*

  Space warps produce various kinds of distortions in the space surrounding other objects. Some space warps are meant especially for use with particle systems.

- *Systems (page 1–380)*

  Systems combine objects, controllers, and hierarchies to provide geometry associated with some kind of behavior. Also contains Sunlight and Daylight systems that simulate sunlight in your scenes.

Modify Panel

Modify Panel

Command panels > Modify panel

From the Create panel of 3ds Max, you place basic objects in your scene, including 3D geometry, 2D shapes, lights and cameras, space warps, and helpers. As you do this, you give each object its own set of creation parameters, which define its geometry and other characteristics depending on the type of object. Once placed in a scene, objects carry their creation parameters with them. You can change these parameters on the Modify panel.

You also use the Modify panel to assign *modifiers (page 3–1068)*. Modifiers are tools for reshaping an object. While they mold the final appearance of the object, modifiers do not change its underlying creation parameters. See the *list of available modifiers (page 1–483)*.

You use the Modify panel to:

- Change the creation parameters for existing objects.
- Apply modifiers to adjust the geometry of an object or a set of objects.
- Change the parameters of modifiers and select their components.
- Delete modifiers.
- Convert a parametric object to an editable object; see *Modifier Stack Controls (page 3–802)*.

  Note: Some space warps can be created as modifiers. See *World Space Modifiers (WSMs) (page 1–498)*.

The Modify panel stays in view until you dismiss it by clicking the tab of another command panel. The contents of the panel with its options and controls update when you select an object, giving you access only to what you can modify about that object.

What you can modify depends on whether an object is classed as a geometric primitive like a sphere, or as another kind of object, such as a light or a space warp. Each category has its own range of possibilities. The contents of the Modify panel are always specific to the category as well as to the selected object. When you make a change from the Modify panel, you immediately see the results transferred to the object.

You can change or delete modifiers by using the *Modifier Stack Controls (page 3–802)*.

See also

List of Available Modifiers (page 1–483)

Procedure

To use the Modify panel:

1. Select an object.
2. On the Command panel, click the Modify tab to display the Modify panel.

   The name of the object appears at the top of the Modify panel, and the remainder of the panel displays settings for the object or the modifier at the top of its stack.
3. You can now do any of the following:
   - Change the parameters for the object. As you change these parameters, the object updates in the viewports.
   - Apply a modifier to the object.
   - Change the parameters for a modifier. As you change these parameters, the object updates into the viewports.
   - Collapse the stack to create an editable surface such as an *editable mesh (page 1–984)*.

To apply a modifier from the Modify panel:

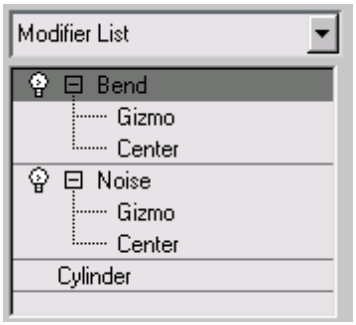
1. Select an object.
2. On the Command panel, click the Modify tab to display the Modify panel. On the Modify panel, click the Modifier List items to open the drop-down list of modifiers.
3. Scroll the list to find the modifier you want. You can use any standard method to scroll the list:
   - From the keyboard, press the up or down arrow key to scroll one item at a time, or press the Page Up or Page Down to scroll in screen-height increments, or use Home or End to jump to the top or bottom of the list. The name of the chosen modifier is highlighted, and the name appears at the top of the list.

     Tip: If you know the modifier name, you can jump to its section by pressing the keyboard key corresponding to first letter of the name. To cycle through all modifiers starting with that letter, press the key repeatedly.
   - With the mouse, slide the scroll bar on the right side of the list, or turn the mouse wheel.
4. Apply the modifier. If using the keyboard, press ENTER to apply the highlighted modifier. If using the mouse, simply click the modifier name to apply it.

Modifier Stack Controls

Make selection. > Modify panel

The modifier stack controls appear near the top of the Modify panel, just below the name and color fields. The modifier stack ("stack" for short) contains the accumulated history of an object, including its creation parameters and the modifiers applied to it. At the bottom of the stack is the original object. Above the object are the modifiers, in order from bottom to top. This is the order in which modifiers are applied to the object's geometry.



Object with two modifiers applied to it in the stack

See also

Applying Modifiers (page 1–486)

Using the Modify Panel (page 1–485)

Using the Modifier Stack (page 1–487)

List of Available Modifiers (page 1–483)

World-Space Modifiers (WSMs) (page 1–498)

Object-Space Modifiers (page 1–537)

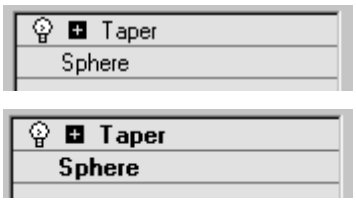
Instances and References in the Modifier Stack Display

In the modifier stack display, objects and modifiers appear in normal type unless they are an instance or a reference. Here is how instances and references appear in the stack display:

- The name of an instanced object appears in boldface.
- The name of a modifier appears in boldface if it is part of an instanced pipeline.

Top: Plain object displayed in plain text

Bottom: Object instance displayed in boldface



Top: Pipeline displayed in plain text

Bottom: Pipeline instance displayed in boldface

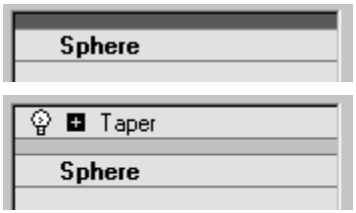
- If a modifier is applied to two or more pipelines, it is called an instanced modifier. Its name appears in italic.
- If a modifier is instanced *and* part of an instanced pipeline, its name appears in boldface and italic.

Top: Instanced modifier displayed in italic (modifier applied to two objects)

Bottom: Instanced modifier in an instanced pipeline displayed in italic and boldface

- A referenced object appears with a dark bar above it. Modifiers below the bar are part of the current pipeline. Modifiers above the bar are unique to the reference object.

  Note: You can also create instances of a reference. In this case, the modifier above the reference bar apply to the reference and to its instances.
- A modifier above the reference object bar can itself be an instance and appear in other pipelines, in which case its name would be italic (either plain or boldface).



Top: Object reference shows a bar in the pipe

Bottom: Modifier applied to reference is not bold, as it is unique to this reference

The *Make Unique button (page 3–812)* makes a pipeline or a modifier instance unique. When you highlight the base object and then click Make Unique, the whole pipeline becomes unique. When you highlight a bold modifier and then click Make Unique, this also makes the pipeline unique. If the modifier is an instanced modifier that belongs to an instanced pipeline (it appears in boldface *and* italic), clicking Make Unique makes

the modifier unique but not the entire pipeline (the modifier's name is no longer italic, but it is still bold).

See also

How Instanced Modifiers Work (page 1–496)

Transforms, Modifiers, and Object Data Flow (page 1–480)

Most-Recently-Used Modifiers

3ds Max caches the results of evaluating most-recently-used modifiers. This means that in general, you can see results more quickly as you move among modifiers on the stack.

To conserve memory use, the list of most-recently-used modifiers has a fixed length. Once the list is full, adding a new modifier removes the oldest modifier in the list. By default, the list length is 1. You can increase it by adding an MRUModSize entry to the [Performance] section of the *3dsmax.ini* file. For example:

```
MRUModSize=10
```

A good rule of thumb for this value is 10, but results will vary depending on how much main memory your system has.

Procedures

To adjust an object's creation parameters:

1. Choose the object by clicking its name in the stack.

   Primitive objects have a Parameters rollout. Other kinds of objects (such as meshes or NURBS) have a variety of rollouts.

2. Use the controls in the rollouts to adjust the object.

To apply a modifier to an object:

1. Select the object.
2. Do one of the following:
   - Choose the name of the modifier from the drop-down modifier list.
   - Drag the name of the modifier from the stack display or the drop-down modifier list to the object in a viewport. SHIFT+drag from the stack display moves the modifier, removing it from the original object and applying it to the new one. CTRL+drag from the stack display copies the modifier, creating an instanced modifier applied to both the original object and the new one.
   - If the modifier buttons are visible and the modifier you want is one of them, click the button.
   - Choose the modifier from the Modifiers menu.

To remove a modifier:

1. Choose the modifier by clicking its name in the stack.

   The modifier's name is highlighted, and its control rollouts appear below the modifier stack.

2. Do one of the following:
   - Click Remove Modifier From The Stack. This button is one of the tools beneath the display of the modifier stack.
   - Right-click the modifier's name in the stack, and choose Delete.

To turn the effect of a modifier off, do one of the following:

- Click to turn off the light-bulb icon to the left of the modifier's name in the stack.

  When you apply a modifier, the light-bulb icon is on by default.

- Right-click the modifier in the stack display, and choose Off.

To turn the effect of a modifier back on, do one of the following:

- Click to turn on the dark light-bulb icon to the left of the modifier's name in the stack.
- Right-click the modifier in the stack display, and choose On.

To change the size of the modifier stack display:

1. Move the cursor over the shaded bar below the tool buttons beneath the stack list.

   The cursor changes to an up-and-down resize arrow (as it does on the borders of a resizable window).

2. Drag the bar up or down to change the size of the stack display in the Modify panel.

To change a modifier's position in the stack:

1. Right-click the modifier's name in the stack, and choose Cut.
2. Right-click the name of the modifier you want the modifier to appear *after* (that is, *above),* and choose Paste.

   You can also drag-and-drop the modifier to a different location in the stack.

   Note: The original object is always at the bottom of the stack, and world-space modifiers are always at the top.

To use the modifier buttons:

- Click Configure Modifier Sets, and choose Show Buttons.

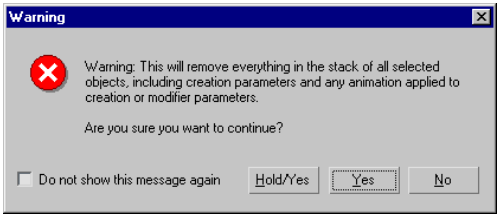
  This menu item is a toggle. It is either on or off. When you turn on Show Buttons, the current button set appears between the drop-down modifier list and the stack display.

  See *Configure Modifier Sets Dialog (page 3–815)* for more information.

To turn the modified object into an editable mesh, do one of the following:

- Right-click the modifier stack, and choose Collapse All.

  A warning dialog is displayed that reminds you that the collapse operation cannot be undone, and gives you the option of performing a *hold (page 1–94)* before creating the mesh.



- Right-click the object in a viewport, and choose Convert To > Convert to Editable Mesh in the quad menu.

  Tip: You can also turn a modified object into an editable patch or editable polygon surface. Use the quad menu to do this.

To adjust a modifier's component such as its gizmo or center point:

1. Click the plus-sign icon to display the modifier's hierarchy.
2. Choose the component you want to adjust, such as the Gizmo.

   The component highlights to show it is active.

3. Adjust the component.

   For example, you might use transforms to move a gizmo or a center point.

4. When done, you can click the minus-sign icon to hide the hierarchy display. The modifier itself is highlighted again.

   Tip: You can also right-click the stack and use Show All Subtrees to view the entire hierarchy, and Hide All Subtrees to view only objects and modifiers.

To go to a sub-object level for complex objects:

1. Click the plus-sign icon to display the object's hierarchy.
2. Choose the sub-object level you want to adjust.

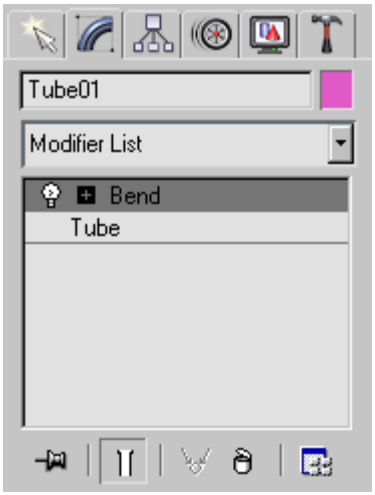
   The sub-object level highlights to show it is active.

   Keyboard shortcut: **INS** cycles through the different sub-object levels.
3. Adjust sub-objects.

   When you add a new sub-object type, the modifier stack updates to show the new sub-object levels. For example, when you add a point curve sub-object to a NURBS surface, the Point and Curve sub-object levels appear in the stack.
4. To leave the sub-object level, click to select the name of the top-level object or a different top-level object.

   Tip: You can also right-click the stack and use Show All Subtrees to view the entire hierarchy, and Hide All Subtrees to view only objects and modifiers.

Interface



The Modifier Stack

Modifier List

The modifier list is a drop-down list that lets you choose a modifier to add to the stack. When you choose an *object-space modifier (page 1–537)* from this list, it appears above the object, or above the modifier that was currently selected in the stack. When you choose a *world-space modifier (page 1–498)* from this list, it appears at the top of the stack.

Use Pivot Points—The first item in the modifier list is the Use Pivot Points toggle. It is unavailable unless multiple objects are selected.

When Use Pivot Points is turned on, 3ds Max uses the pivot point of each object as the center of a modifier's operation. For example, if you bend a line of trees around the Z axis, they all bend along their trunks.

When Use Pivot Points is turned off, 3ds Max calculates a central pivot point for the entire selection set and modifies the selection as a whole. For example, if you bend a line of trees around the Z axis, trees at the end of the line deform more than those at the center where the pivot is located.

Note: You must turn on Use Pivot Points before you apply the modifier to multiple objects. You can't change the setting afterward, although you can delete the modifier and start over without deselecting the selection set.

Modifier Buttons

Between the modifier list and the stack display, you can display up to 32 buttons. The buttons are a shortcut way to add modifiers to the stack.

To display the modifier buttons, click Configure Modifier Sets (below the stack display) and choose Show Buttons.

To customize the button set, click Configure Modifier Sets (below the stack display) and choose *Configure Modifier Sets (page 3–815)*.

When a modifier's button is visible, clicking the button adds the modifier to the stack. Object modifiers are applied immediately above the currently selected object or modifier. World space modifiers are applied at the top of the stack.

Stack Display

The modifier stack is organized as follows:

- At the bottom of the stack, the first entry always lists the object type. Click this entry to display the object's creation parameters so you can adjust them.

  When you click to choose an entry in the modifier stack, its background highlights to show that the entry is current, and that the object's or modifier's parameters are available for adjusting, in rollouts that appear beneath the stack display.

- Above the object itself are entries for object modifiers. Click a modifier entry to display the modifier's parameters so you can adjust them.

  This section lets you go back to any modifier you've applied and rework its effect on the object. You can also delete the modifier from the stack, canceling its effect.

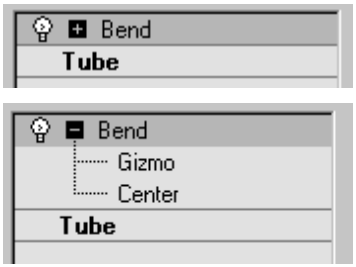
  Reminder:3ds Max applies transforms *after* it applies object modifiers but *before* it applies space warps or world-space modifiers.

- The top of the stack shows which space warps and world-space modifiers the object uses. For example, if the object were bound to a Ripple space warp, an entry in the top section would read Ripple Binding.

To the left of each modifier in the stack is a light-bulb icon. When the bulb appears white, the modifier is applied to the stack below it. When the bulb appears gray, the modifier is turned off. Click to toggle the on/off state of the modifier.

Note: You can also turn off the effect of modifiers in viewports but not in renderings, or vice versa. The light-bulb icon changes to show these states as well. See *Modifier Stack Right-Click Menu (page 3–809)*.

If the modifier has sub-controls such as a center or a gizmo, the stack also shows a small plus/minus icon. Click this icon to open or close the hierarchy.



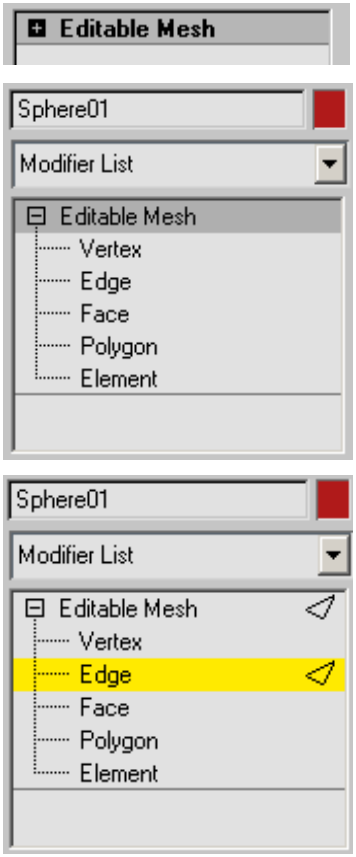
Opening a modifier's hierarchy to access sub-controls

When the hierarchy is open, you can select a sub-control, such as a gizmo, and then adjust it. The available sub-controls vary from modifier to modifier.

Objects that have a sub-object hierarchy, such as *editable meshes (page 1–984)* and *NURBS (page 1–1079)*, also show a collapsible hierarchy in the modifier stack.

To work at a sub-object level, click to open the hierarchy, then click to select the sub-object level. Controls for that particular level or type of sub-object appear in rollouts below the stack display.

(Certain types of sub-objects display an icon at the right of the stack, to help you see which sub-object type you are adjusting.)



Opening an object's hierarchy to access sub-object levels

Tool Buttons

Below the stack display is a row of buttons for managing the stack.

Pin Stack—Locks the stack to the currently selected object so it remains with that object regardless of subsequent changes in selection. The entire Modify panel is locked to the current object as well.

Pin Stack is useful for transforming another object while keeping your place in the modified object's stack.

Show End Result—Shows the selected object as it will appear after all modifications in the stack have taken place, regardless of your current position in the stack. When this toggle is turned off, the object appears as modified up to the current modifier in the stack.

Make Unique—Converts an instanced modifier to a copy that's unique to the current object. See *Make Unique (page 3–812)*.

Remove Modifier—Deletes the current modifier or unbinds the current space warp.

Configure Modifier Sets—Click to display the pop-up *Modifier Sets menu (page 3–814)*.

Modifier Stack Right-Click Menu

Modify panel > Modifier stack display > Right-click a modifier or object.

Some commands for managing modifiers are available by right-clicking the modifier stack display. Some options are unavailable if they don't apply to the current modifier. For example, Make Unique is available only if you select an instanced modifier.

The main uses of the right-click menu for the modifier stack are:

- Renaming modifiers
- Rearranging modifiers with the cut, copy, and paste functions

You can cut, copy, and paste multiple modifiers at one time. You can also cut and copy discontiguous selections of modifiers.

- Creating instances of modifiers
- Collapsing the stack into a surface object such as an editable mesh
- Controlling whether modifiers are on or off, off in viewports, or off in renderings

Collapsing the Stack

Collapsing the stack removes modifiers from the object. Collapsing a stack typically converts an object into an editable version of the original object (unless the object was editable to begin with, such as a NURBS model). Collapse To is unavailable unless you select one or more modifiers in the stack. Using Collapse To removes all stack items from the creation parameters to and including the uppermost selected stack item.

Note: You can *preserve custom attributes* when collapsing the stack.

Following are suitable reasons to collapse a stack:

- To simplify the scene geometry.
- To discard applied modifiers, and convert the object to an editable object while retaining the results of any applied modifiers.
- To conserve memory.

After you collapse an object's stack, you can no longer parametrically adjust either its creation parameters or its individual modifiers. Animation tracks that were assigned to such parameters also disappear.

Procedures

To move one or more modifiers:

1. Select one or more modifiers in the modifier stack display.

   To select multiple modifiers, click to select one modifier, then hold down CTRL and click to select the others. Holding down SHIFT selects the two modifiers you click and all modifiers in between them.

2. Right-click and choose Cut.

3. Select a modifier above which to paste the cut modifiers. (This can also be the object at the bottom of the stack.)
4. Right-click and choose Paste. The modifiers are pasted above the current selection.

To copy one or more modifiers:

1. Select one or more modifiers in the modifier stack display.

   To select multiple modifiers, click to select one modifier, then hold down CTRL and click to select the others. Holding down SHIFT selects the two modifiers you click and all modifiers in between them.
2. Right-click and choose Copy.
3. Select an item above which to paste the cut modifiers.
4. Right-click and choose Paste. The copied modifiers are pasted above the current selection. Choose Paste Instanced to make the pasted modifiers instances of those you copied.

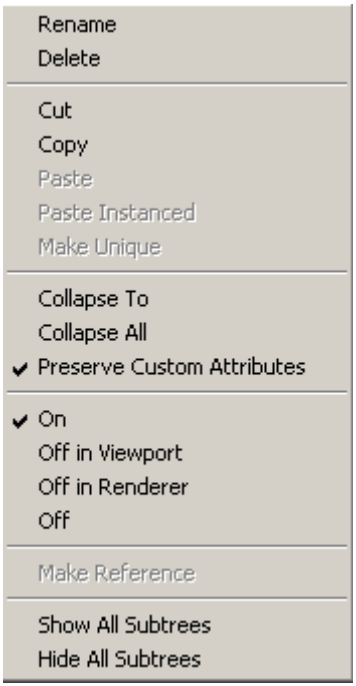
To copy modifiers from one object to another:

1. Select one or more modifiers in the modifier stack display of the first object.

   To select multiple modifiers, click to select one modifier, then hold down CTRL and click to select the others. Holding down SHIFT selects the two modifiers you click and all modifiers in between them.
2. Right-click and choose Copy.
3. Select the second object.
4. In the second object's modifier stack display, select an item above which to paste the copied modifiers.
5. Right-click and choose Paste.

   The modifiers from the first object are pasted above the current selection in the second object. Choose Paste Instanced to make the pasted modifiers instances of those you copied.

Interface



Rename—Lets you change the name of the modifier. For example, you might change the name Bend to the more specific "First 45-degree bend." After choosing Rename, enter the new name in the stack display, and then press ENTER. Pressing ESC cancels the name change.

Delete—Deletes the modifier from the stack. The modifier is not available for pasting.

Cut—Cuts the modifier from the stack. The modifier is removed, but is available for pasting.

Copy—Makes a copy of the modifier that is available for pasting.

Paste—Pastes the modifier into the stack. The modifier appears above the currently selected object or modifier, unless it is a world space

modifier, in which case it is pasted at the top of the stack.

You can paste a modifier from one object into the stack of a different object.

Paste is unavailable when more than one modifier is selected in the stack.

Paste Instanced—Pastes an instance of the modifier into the stack. The modifier instance appears above the currently selected object or modifier, unless it is a world space modifier, in which case it is pasted at the top of the stack.

You can paste a modifier instance from one object into the stack of a different object.

Paste Instanced is unavailable when more than one modifier is selected in the stack.

Make Unique—Converts an instanced modifier to a copy that's unique to the current object. This button is unavailable unless the modifier you right-clicked is instanced. See *Make Unique (page 3–812)*.

Collapse To—Collapses a portion of the stack. Collapse To is unavailable unless you select one or more modifiers in the stack. Using Collapse To collapses all stack items from the object itself, up to and including the uppermost selected stack item. If there are modifiers above the uppermost selection, they are not changed.

The resultant object type depends on the uppermost modifier that outputs a specific geometry type, if any. If the stack contains no such modifier, the result is an *editable mesh (page 1–984)*. If the collapsed portion of the stack contains a modifier that outputs a specific geometry type, and no other such modifier is above it, the result is that type of object. For example, if the topmost such collapsed modifier is Edit Poly, the resultant object is Editable Poly.

Collapse All—Collapses the entire stack.

The resulting stack list shows a single entry: Editable Mesh, unless any modifiers on the stack output a different type of geometry. For example, if the topmost such modifier is Edit Poly, the resultant object is Editable Poly.

Note: *World-space modifiers (page 1–498)* don't collapse along with the rest of the stack.

Convert To—This menu item appears if no modifiers are applied to the object. Choose one of the Convert To options:

- Editable Mesh
- Editable Spline
- Editable Patch
- Editable Poly
- NURBS

Note: Depending on the object type, not all Convert To options might be available.

Preserve Custom Attributes—When on, collapsing an object's modifier stack or converting it a different format such as Editable Poly preserves any *custom attributes (page 1–124)* present in the stack.

On—Turns on the effect of modifiers in both viewports and the renderer.

The light-bulb icon to the left of the modifier name shows "on."

Off in Viewport—Turns off the currently selected modifiers in viewports only. Allows you to work in the viewport without the effects of the modifiers. You see the effects when you render.

The light-bulb icon to the left of the modifier name shows "off in viewports."

Off in Renderer—Turns off the currently selected modifiers in renderings only. The effect of the modifiers is visible in viewports but not in renderings.

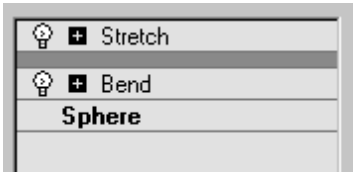
The light-bulb icon to the left of the modifier name shows "off in Renderer."

Off—Turns off the currently selected modifiers without deleting them. This can help you see the object without the effect of its modifiers.

The light-bulb icon to the left of the modifier name shows "off."

Make Reference—If the object is an instance, converts it to a reference. This option is available only when the base object is selected, and only when the base object is a reference.

When you make an instanced object into a reference, a heavy, "derived object" bar appears at the top of the stack. You can select this bar and apply modifiers above it. Modifiers applied above the bar affect the reference object only, and not its parent object.



Gray bar denotes a reference object at the base of the stack

Show All Subtrees—Expands the display of every hierarchical item in the stack display, so that all items in the stack are visible, including sub-objects.

Hide All Subtrees—Hides the subtree of every hierarchical item in the stack display, so that only objects, modifiers, and space warp bindings are visible.

Make Unique

Modify panel > Tool buttons > Make Unique
Modify panel > Right-click an instanced modifier in the stack display. > Make Unique
Right–click an instanced object. > Make Unique

Make Unique lets you convert an instanced object to a copy that's unique. A object is instanced when it is cloned (SHIFT+Move or SHIFT+Rotate). If you make changes to an instanced object the changes are also reflected in the other instances in your scene. Making objects unique lets you adjust or change those objects independently without affecting any other objects in the scene.

Tip: If you drag a material to a unique object and see the other instanced object updating as well, turn off Automatic Material Propagation. Go to Customize menu > Customize UI and choose Category: Instance Manager, then drag Automatic Material Propagation to a toolbar or assign a keyboard shortcut to it. Using this tool will allow the unique object to act uniquely.

Procedures

Example: To use the Make Unique options with an instanced modifier:

1. Create a cylinder with some height segments, and then use SHIFT+Move to create three copies, resulting in four identical cylinders.
2. Select all four cylinders, apply the Bend modifier, and adjust the Angle setting just enough to see the results of the bend.

   You now have four cylinders with a single instance of a Bend modifier applied to them.
3. Choose Edit menu > Hold.

   This lets you return to the current state of the scene at any time without using Undo.

4. Select two of the cylinders and click Make Unique.
5. Choose Yes in the resulting dialog.

   At this point, the two selected cylinders each have unique Bend modifiers, while the remaining two cylinders share the original Bend. You can see this by selecting each cylinder and changing the Bend Angle setting.
6. Choose Edit menu > Fetch, and answer Yes.
7. Select two cylinders again, and click Make Unique.
8. Choose No in the resulting dialog.

   The two selected cylinders now share an instance of a Bend modifier, but it's a different instance than that shared by the other two cylinders. Again, you can see this by selecting each of the cylinders and changing the Bend Angle spinner. You can also turn on *Show Dependencies (page 1–47)* in the Views menu to see the relationship between the four cylinders and the Bend modifier.

Example: To use Make Unique with an instanced object/modifier combination:

1. Create a cylinder with some height segments.
2. Apply a Bend modifier and adjust the Angle just enough to see the results of the bend.
3. Use SHIFT+Move with the Instance option to create an instanced object/modifier combination.
4. Change the Bend Angle setting on one of the instances to demonstrate that the cylinders and modifiers are truly instanced.

   Both cylinders bend.
5. Select one of the instances, and then, in the modifier stack choose either the Bend modifier or the cylinder itself.
6. Click Make Unique.

   When you change the Bend Angle setting or cylinder base parameters for one of the objects, the other doesn't change.

   Note: When you instance an object/modifier combination, all duplicates are instances of a *single* master node containing the original object and modifier. In such cases, you cannot selectively make the object or its modifier unique. Clicking Make Unique for one or the other, makes both unique.

Interface

Make Unique—Detaches objects and modifiers (and combinations) logically from the master node of which they're instances or references.

Go to the object or modifier level in the stack for an instanced or referenced object or modifier (respectively), and click Make Unique.

For instanced object/modifier combinations, in the modifier stack, choose either the modifier or the object itself.

Make Unique is unavailable when a selected object is not an instance or reference, when it doesn't contain an instanced modifier, or when all objects in the selection don't have an instanced modifier in common.

Making New Instances

When you click Make Unique for a selection of two or more objects, a dialog appears that asks: Do you want to make the selected items unique with respect to each other? This gives you a choice of how you want to make the objects unique.

- **Yes**—Makes the instanced modifiers assigned to the objects in the selection unique for each object in the selection.
- **No**—All instanced modifiers assigned to the objects in the selection remain instanced across

the selected objects, but become unique from other objects not in the selection.

Modifier Sets Menu

Modify panel > Configure Modifier Sets button

The button sets menu gives you options for managing and customizing shortcut buttons for applying modifiers.

Procedures

To display the current button set on the Modify panel:

- Click Configure Modifier Sets, and then choose Show Buttons to turn on this item.

  This item is a toggle. Choosing Show Buttons a second time turns off the button display, and so on.

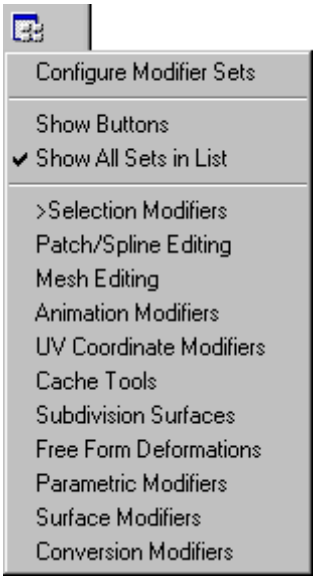
To configure a new modifier set:

- Click Configure Modifier Sets, and then choose *Configure Modifier Sets (page 3–815)*.

To change from one button set to another:

- Click Configure Modifier Sets, and then choose the modifier set name from the lower part of the menu.

Interface



Configure Modifier Sets—Displays the *Configure Modifier Sets dialog (page 3–815)* to let you create a new, customized button set.

Show Buttons—When on, buttons for the current modifier set are displayed between the modifier list and the stack display. Default=off.

Show All Sets in List—When on, the Modifier List is organized by sets. When off, the Modifier List is organized simply into World-Space Modifiers and Object-Space Modifiers, and is otherwise alphabetical except that the current set appears at the top of the list. Default=off.

Saved button sets—The bottom part of the Button Sets menu lists the names of saved button sets. Choose one of these sets to make it the current button set. The current set is displayed as buttons when Show Buttons is on. The Modifier List drop-down is organized by sets when Show All Sets In List is on.

Configure Modifier Sets Dialog

Modify panel > Configure Modifier Sets button > Configure Modifier Sets

This dialog lets you create custom modifier and button sets for the Modify panel.

Procedures

To choose a modifier and button set to edit:

- Choose a button set from the Sets drop-down list.

To create a new modifier and button set:

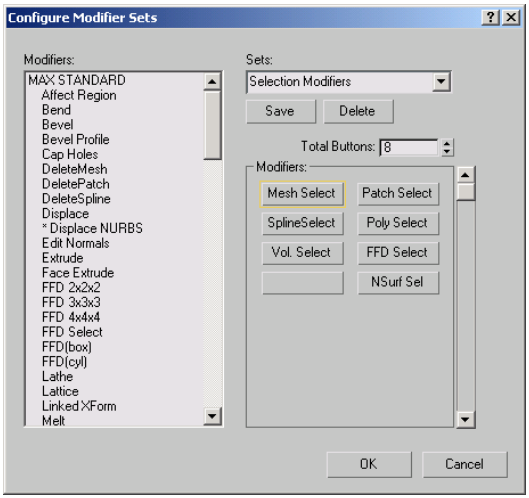
1. Create a custom button set in the Modifiers group box. You use these controls:
   - Use Total Buttons to change the number of buttons.
   - Drag a modifier from the Modifiers list to a button.
   - Highlight a button, and then double-click a modifier in the Modifiers list. (When you assign a button by double-clicking, the highlight moves to the next button in the Modifiers group.)
2. Enter the new set's name in the Sets edit field.
3. Click Save.
4. Click OK to leave the Configure Modifier Sets dialog.

To customize the current modifier and button set:

1. Use Total Buttons to choose the number of buttons in the set.
2. Assign buttons by dragging the names of modifiers in the dialog's Modifiers list to buttons in the Modifiers group box.
3. Click OK.

   3ds Max updates the Modifiers list. You can customize the set without saving it, but if you save a new set under a new name, you can use it later.

Interface



Modifiers—Lists all modifiers currently available. It's organized into these categories: Channel Info, Max Edit, Max Standard, Deformations, Max Surface, Surface Tools, Modifiers, Radiosity, LIGHT, Max Additional, Shell, Spline Edits, World Space Modifiers, and others. To add a modifier to the current button set, drag the modifier's name from this list onto a button in the Modifiers group box.

Sets—This edit field and drop-down list lets you choose the modifier set to edit. To create a new button set, enter the name in the edit field, and then click Save.

Save—Saves the current button set.

Delete—Deletes the current button set.

Important: You can't undo deleting a button set.

Total Buttons—Sets the number of buttons in the button set. A button set can have up to 32 buttons.

Modifiers group

Previews how the button set will appear on the Modify panel. Because the box shows only 16 buttons at a time, a scroll bar on the right lets you see any remaining buttons.

To change a button, drag the name of a modifier from the Modifiers list to a button in this group box, or click the button (its border highlights) and then double-click the modifier name.

Hierarchy Panel

Hierarchy Panel

Command panels > Hierarchy panel

The Hierarchy panel provides access to tools to adjust the hierarchical linkage between objects.

By linking one object to another, you create a parent-child relationship. Transformations applied to the parent are also transmitted to the child. By linking more objects to both parent and child objects you can create complex hierarchies.

Gyroscope assembled as a hierarchy.
The parent is the outer ring with handle.
The flywheel is the lowest child.

Common uses of linking are:

- Creating complex motions.
- Simulating jointed structures.
- Providing the basis for inverse kinematics.
- Setting rotational and sliding parameters for Bones.

The Hierarchy panel is divided into three areas:

Pivot (page 2–470)

IK (page 2–473)

Link Info (page 2–481)

Note: For important background information on hierarchies and kinematics, see *Animating with Forward Kinematics (page 2–408)* and *Inverse Kinematics (IK) (page 2–417)*.

Motion Panel

Motion Panel

Select an object. > Command panels > Motion panel

The Motion panel provides tools to adjust the motion of the selected object. Key timing and easing in and out of a key are parameters that you can adjust with tools on the Motion panel, for example. The Motion panel also provides an alternative to Track View for assigning animation controllers.

Additional rollouts display in the Motion panel if an assigned animation controller has parameters. If a Path constraint is assigned to the position track of an object, then a Path Parameters rollout is added to the Motion panel. A Link constraint displays a Link Parameters rollout, a Position XYZ controller displays a Position XYZ Parameters rollout, and so on.

Trajectories

Click Trajectories to chart a path that an object will travel along in the viewports. Yellow dots along the path represent frames, giving you an idea of velocity and easing. By turning on Sub-Object Keys, keys can be moved in space, key properties can be changed, the trajectories will reflect all the adjustments you make. You can also convert to and from splines and collapse transforms using trajectories.

Interface

Parameters

Provides an alternative to *Track View (page 2–483)* for adjusting transform controllers and key information.

Assign Controller Rollout (page 3–817)

PRS Parameters Rollout (page 2–298)

Key Info (Basic) Rollout/Dialog (page 2–299)

Key Info (Advanced) Rollout/Dialog (page 2–301)

Trajectories

Provides tools for working with objects' trajectories.

Trajectories (page 2–296)

Assign Controller Rollout

Select an object. > Motion panel > Parameters > Assign Controller rollout

The Assign Controller rollout assigns and appends different transform controllers to individual objects. You can also assign controllers in Track View.

Animation controllers (page 2–302) are plug-ins that handle all of the animation tasks in 3ds Max. For a complete list of available Animation controllers, see *Assign Controller (Track View) (page 2–523)*.

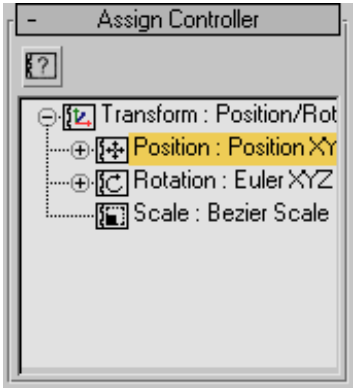
Procedure

To assign a TCB Rotation controller:

1. Select an object.
2. On the Motion panel, click Parameters, and open the Assign Controller rollout.
3. Select the rotation track in the Assign Controller list.
4. Click the Assign Controller button, and then select TCB Rotation from the Assign Controller dialog.

   The default Euler XYZ Rotation controller is replaced with the TCB Rotation controller.

Interface



Assign Controller—Displays the Assign Controller dialog. If no track is selected, the Assign Controller button is unavailable.

Assign Controller dialog—Select a controller from a list of available controllers in this dialog.

Depending on the type of track you've selected, the Choose Controller dialog displays a subset of the different types of controllers. Rotation controllers, for example, are available only for rotation tracks.

Display Panel

Display Panel

Command panels > Display panel

The Display panel provides access to tools that control the display of objects in the scene.

Use the Display panel to *hide and unhide (page 3–1045)*, *freeze and unfreeze (page 3–1039)* objects, alter their display characteristics, speed up viewport displays, and simplify your modeling procedures.

Note: A target is considered part of its light or camera for purposes of hiding and unhiding.

Display Panel Rollouts

Display Color Rollout (page 1–52)

Hide By Category Rollout (page 1–52)

Hide Rollout (page 1–53)

Freeze Rollout (page 1–54)

Display Properties Rollout (page 1–55)

Link Display Rollout (page 1–58)

Display Floater

Tools menu > Display Floater

This modeless dialog contains most of the functions on the Display panel. You can leave the Display floater up while you work in your scene, making it easier to change viewport displays without changing the current command panel.

Interface

The Display floater has two panels: Hide/Freeze and Object Level.

Hide/Freeze panel

Hide group

Selected—Hides the selected object(s).

Unselected—Hides all visible objects except the selected ones. Use this to hide all the objects except the one you are working on.

By Name—Lets you select the objects to hide by name.

By Hit—Causes any object you click in the viewport to be hidden. If you hold the CTRL key while selecting an object, that object and all of its children are hidden. To exit Hide by Hit mode, right-click, press ESCAPE, or select a different function. This mode is automatically turned off if you hide all objects in the scene.

Unhide group

All—Unhides all hidden objects. The unhide buttons are only available when you have specifically hidden one or more objects. They won't unhide objects hidden by category.

By Name—Displays a dialog in which you can unhide objects you select from a list.

Note: You cannot unhide objects on a hidden layer. If you select an object on a hidden layer, you will be prompted to unhide the object's layer.

Freeze group

Selected—Freezes the selected object(s) so they cannot move in the viewport.

Unselected—Freezes all visible objects except the selected ones. Use this to quickly freeze all the objects except the one you're working on.

By Name—Lets you select the objects to freeze by name.

By Hit—Causes any object you click in the viewport to be frozen. If you hold the CTRL key while selecting an object, that object and all of its children are frozen. To exit Freeze by Hit mode, right-click, press Escape, or select a different function. This mode is automatically turned off if you freeze all objects in the scene.

Unfreeze group

All—Unfreezes all frozen objects.

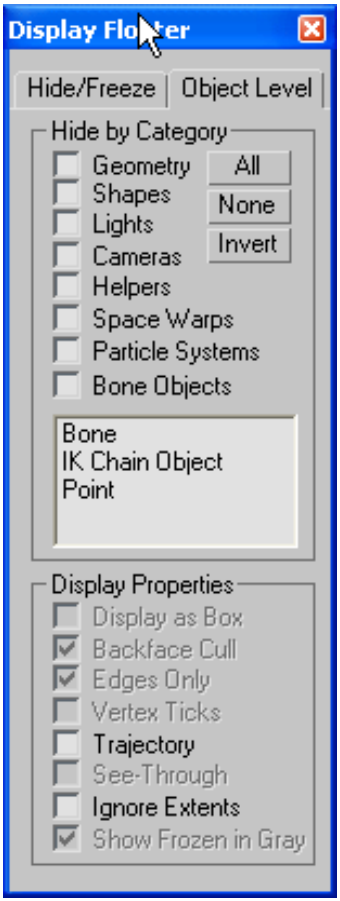
By Name—Displays a dialog in which you can unfreeze objects you select from a list.

By Hit—Causes any object you click in the viewport to be unfrozen. If you hold the CTRL key while selecting an object, that object and all of its children are unfrozen.

Note: You cannot unfreeze objects on a frozen layer. If you select an object on a frozen layer, you will be prompted to unfreeze the object's layer.

Hide Frozen Objects—Toggles display of frozen objects on and off. You don't have to unfreeze objects to hide them; you can use Hide Frozen Objects instead to hide or unhide frozen objects in a single step.

Object Level panel



Hide by Category group

Toggles the display of objects by their category (objects, cameras, lights, and so on). Choose the check boxes to hide objects of that category. Use the **All**, **None**, and **Invert** buttons to change the settings of the check boxes.

Display Properties group

Provides controls that alter the display of selected objects.

Display as Box—Toggles the display of selected objects, including 3D objects, 2D shapes, and particle systems, as *bounding boxes (page 3–1013)*. Produces minimum geometric complexity.

Particle systems appear as bounding boxes when adaptive degradation takes effect. Since particle systems naturally exist in world space, their bounding box is always oriented parallel to the world planes.

Backface Cull—Toggles the display of faces with *normals (page 3–1074)* pointing away from view. When selected, you see through the wireframe to the back faces.

Edges Only—Toggles the display of hidden edges and polygon *diagonals (page 3–1022)*. When on, only outside edges appear. When off, all mesh geometry appears. Applies to Wireframe viewport display mode, as well as other modes with Edged Faces turned on.

Vertex Ticks—Displays the vertices in the selected geometry as tick marks.

If the current selection has no displayed tick marks, the check box is clear. If *some* of the vertices in the current selection display tick marks, the check box contains a gray X. If all vertices in the current selection display tick marks, the check box contains a black X.

Trajectory—Toggles *trajectory display (page 3–1119)* for the selected object so you can display its trajectory wherever you are in the software.

See-Through—When turned on, this toggle makes the object or selection translucent in viewports. This setting has no effect on rendering: it simply

lets you see what's behind or inside an object in a crowded scene, and especially to adjust the position of objects behind or inside the see-through object. Use this when you need to see inside an object, such as a character with bones inside. Default=off.

This option is also available from the *Display panel (page 3–818)* and the *Object Properties dialog (page 1–111)*.

You can customize the color of see-through objects by using the *Colors panel (page 3–843)* of the Customize > *Customize User Interface dialog (page 3–836)*. Choose Geometry from the Elements list, and then choose See-Through.

Keyboard shortcut (default): **ALT+X**

Ignore Extents—Allows an object to be excluded from a zoom extents operation. Choose this when you have lights or other distant objects that you don't want to use when you do a *Zoom Extents (page 3–783)*.

Show Frozen in Gray—When on, the object turns gray in viewports when you freeze it. When off, viewports display the object with its usual color or texture even when it is frozen. Default=on.

Utilities Panel

Utilities Panel

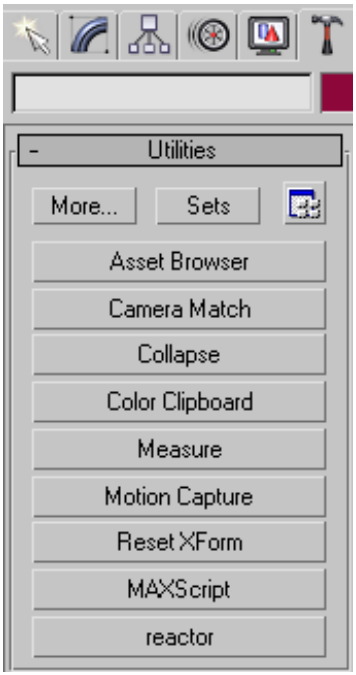
Command panels > Utilities panel

The Utilities panel gives you access to a variety of utility programs. 3ds Max utilities are provided as *plug-ins (page 3–1089)*. 3ds Max ships with the utilities listed below. Some utilities are available from third-party developers, so your setup of 3ds Max might include utilities not described here. Look for documentation describing these additional plug-ins by choosing *Help > Additional Help (page 3–974)*.

Note: Documentation for MAXScript and Visual MAXScript is provided in a separate help system. To access the MAXScript Reference, choose *Help > MAXScript Reference (page 3–973)*. See *About MAXScript (page 1–xx)*.

See also

Interface



The Utilities panel contains one rollout for managing and invoking utilities. While a utility is running, additional rollouts can appear. Some utilities use a dialog rather than rollouts.

The Utilities rollout contains the following controls at the top:

More—Displays a Utilities dialog that lists all utilities not already displayed in buttons on the

Utilities panel. Highlight a utility in the list and then click OK to display its controls in the Utilities panel. (You can also double-click the utility's name.)

Sets—Displays a list of button sets to choose from. By default, there is only one button set, called MAX Default. You can create custom button sets by clicking Configure Button Sets.

Configure Button Sets—Displays the *Configure Button Sets dialog (page 3–822)*, where you can create custom button sets of up to 32 buttons.

Named utility buttons—These buttons show a selection of utilities. Click one of these buttons to run a utility. The utility's parameters can appear in rollouts below the Utilities rollout. Some utilities use a dialog rather than rollouts.

While a utility is running, its button remains active until you click it again to turn it off and close the utility, or when you click a different utility's button.

Many utilities have a Close button that appears at the bottom of their rollout. This is another way to close a utility. If the utility controls appear in a dialog rather than a rollout, closing the dialog closes the utility.

Utilities Dialog

Utilities panel > Utilities rollout > More... button

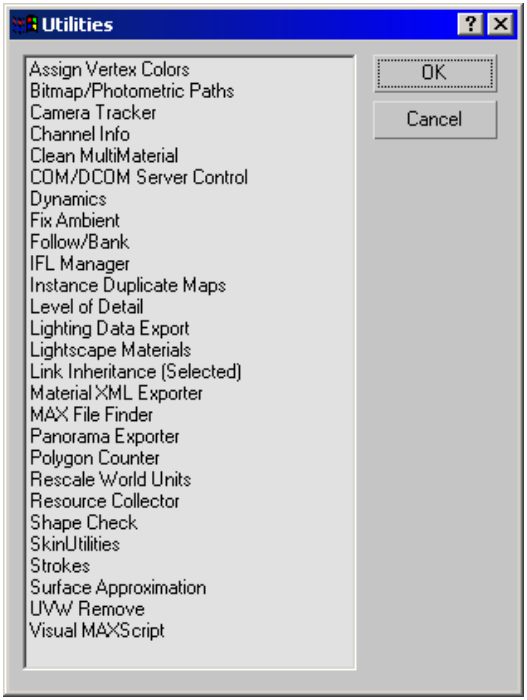
This dialog lists all utilities that are not already displayed in current button set of the Utility rollout.

Procedure

To run a utility shown in the Utilities dialog, do one of the following:

- Choose a utility in the list and then click OK.
- Double-click the utility's name.

Interface



Configure Button Sets Dialog

Utilities panel > Utilities rollout > Configure Button Sets button

This dialog lets you create custom button sets for the Utilities panel. Once created, these utility sets are available from the Sets button on the Utilities panel.

Procedures

To customize the current button set:

1. Use Total Buttons to choose the number of buttons in the set.
2. Assign buttons by dragging the names of utilities in the Utilities list to buttons in the Utilities group box.

3. Clear buttons by dragging them to the Utilities list on the left.
4. Click OK.

   3ds Max updates the Utilities rollout. You can customize the button set without saving it, but if you save a new button set under a new name, you will be able to use it later.

   Tip: Don't alter the Default button set. Create a new one instead.

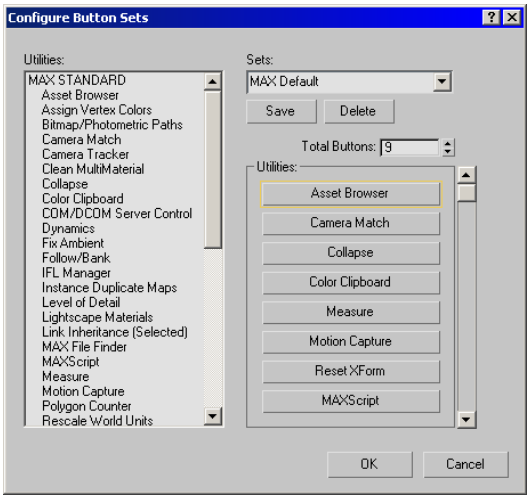
To create a new button set:

1. Create a custom button set as described in the previous procedure.
2. Enter a new button set name in the Sets edit field.
3. Click Save.

To choose a button set to modify:

- Choose a button set from the Sets drop-down list.

Interface



Utilities List—This lists all the utilities currently available to 3ds Max. It is organized into a number of categories, including MAX STANDARD, Channel Info, NURBS, Radiosity, Skin Tools, Strokes, MAXScript Tools, Internet Extensions, Realviz Products, and reactor. To add a utility to the current button set, drag the utility's name from this list to the Utilities group box.

Sets edit field and drop-down list—Lets you choose the button set to modify. By default, there is a single button set called MAX Default.

Tip: Don't alter the Default button set. Create new sets as the need arises.

Save—Saves the current button set.

Delete—Deletes the current button set.

Warning: You can't undo the deletion of a button set.

Total Buttons—Sets the number of buttons in the button set. A button set can have up to 32 buttons.

Utilities group

This group previews how the button set will appear in the Utilities rollout. A scroll bar on the right lets you see other buttons when the set has more than eight.

To change a button, drag the name of a utility from the Utilities list to a button in this group.

MAXScript Interface

MAXScript Menu

Menu bar > MAXScript
Utilities panel > MAXScript

This menu contains commands for working with scripts you create with the software's built-in scripting language, *MAXScript (page 1–xx)*.

New Script (page 3–824)

Open Script (page 3–824)

Run Script (page 3–824)

MAXScript Listener (page 3–824)

Macro Recorder (page 3–825)

Visual MAXScript Editor (page 3–826)

MAXScript Debugger Dialog (page 3–826)

There is also a *MAXScript Mini Listener (page 3–746)* on the *status bar (page 3–746)*.

For detailed information about the MAXScript utility, open the MAXScript Reference, available from Help menu > MAXScript Reference.

New Script

MAXScript menu > New Script

New Script opens a new MAXScript Editor window. Use this window for writing a new script.

For detailed information about the MAXScript utility, open the *MAXScript Reference*, available from Help menu > MAXScript Reference.

Open Script

MAXScript menu > Open Script

Open Script opens a common file open dialog for choosing an existing script. A new MAXScript Editor window then displays the selected script.

For detailed information about the MAXScript utility, open the *MAXScript Reference*, available from Help menu > MAXScript Reference.

Run Script

MAXScript menu > Run Script

Run Script opens a common file open dialog for choosing an existing script. MAXScript then reads and executes the selected script. Any output is printed to the Listener window.

For detailed information about the MAXScript utility, open the *MAXScript Reference*, available from Help menu > MAXScript Reference.

MAXScript Listener

MAXScript menu > MAXScript Listener

Mini Listener > Right-click menu > Open Listener Window

Keyboard > **F11**

The MAXScript Listener window is an interactive interpreter for the MAXScript language and works similar to a DOS command prompt window. You enter MAXScript commands in this window, and when you press ENTER they are executed immediately.

The Listener window is appropriate for performing interactive work and developing small code fragments. Each command you execute in the Listener is actually an expression with a result which the Listener prints out after each execution. You can enter any MAXScript expression or sub-expression in the Listener for evaluation, and the Listener prints out its result.

The Listener is divided into two panes. The top (pink) pane is the Macro Recorder pane, and the bottom (white) pane is the output pane. When the Macro Recorder is enabled, everything recorded is displayed in the Macro Recorder pane. The output of results from scripts are displayed in the output pane. The output of code executed in the Macro Recorder pane is always directed to the output

pane so as not to clutter the recordings. Both panes allow you to cut-and-paste, drag-and-drop, edit, select, and execute code. You can resize the panes by dragging on the split bar between them.

The left-end of the status bar contains a resizable Mini Listener. If the Mini Listener is not visible, drag on the vertical split bar at the left edge of the status bar to reveal the Mini Listener. The Mini Listener panes act as single-line sliding windows for the current line in the corresponding Listener panes. The Mini Listener panes always show what you are typing or where the edit cursor is placed in the Listener panes. Conversely, anything you type into a Mini Listener pane is entered into the corresponding Listener pane at the current edit cursor position.

The MAXScript Mini Listener on the Status Bar.

You can install the Listener into any viewport by right-clicking the viewport label, choose Views > Extended, and then MAXScript Listener.

For detailed information about the MAXScript utility, open the *MAXScript Reference*, available from Help menu > MAXScript Reference.

Macro Recorder

MAXScript menu > Macro Recorder

The MAXScript Macro Recorder captures many of the actions performed by the user, and generates the MAXScript commands that correspond to those actions. Output from Macro Recorder is displayed in the Macro Recorder pane of the MAXScript Listener window. Several filtering options are available that control what types of user actions are recorded, whether the generated MAXScript commands contain explicit object references or are selection-relative, and whether the generated MAXScript commands contain absolute or relative transforms and coordinates. These options are set using the MacroRecorder menu in the Listener window. The default option settings are specified in the MAXScript page of the 3ds Max Preferences dialog, as described in *MAXScript Preferences Settings (page 3–879)*. These settings can also be changed or set by editing the [MAXScript] section of the *3dsmax.ini* file.

While many areas in the software generate Macro Recorder output, there are also many areas that do not. In general, most of the buttons on the software's menu bar, toolbars, status bar, Create panel, and Modify panel will generate Macro Recorder output. If the button invokes a secondary dialog, changing settings or performing actions in the secondary dialog typically do not generate Macro Recorder output. In the Create and Modify panels, Macro Recorder output will typically be generated if the object or modifier can be created by MAXScript. In some cases, the plug-ins implementing an object or modifier has not been updated to support Macro Recorder, so that object or modifier will not generate Macro Recorder output.

MAXScript supports text drag-and-drop onto toolbars to create Macro Script buttons. You can select and drag text from any text window, such as the Listener window panes or Editor windows, onto any visible toolbar. The cursor changes to an arrow with a + sign when it is OK to drop the text. If you drop it, a Macro Script button is added to the toolbar with the dropped text as the body of the Macro Script. The classic case here would be to drag text from the Macro Recorder pane onto a toolbar to make a button that does the sequence of events just recorded.

For detailed information about the MAXScript utility, open the *MAXScript Reference*, available from Help menu > MAXScript Reference.

Visual MAXScript Utility (See MAXScript Reference)

Utilities panel > Utilities rollout > More button > Visual MAXScript

Visual MAXScript is a powerful interface to the 3ds Max scripting language, making the MAXScript feature easier to learn and use. With Visual MAXScript, you can quickly create UI elements and layouts for scripting.

For detailed information about Visual MAXScript, open the *MAXScript Reference*, available from Help menu > MAXScript Reference.

MAXScript Debugger Dialog

MAXScript menu > Debugger Dialog

MAXScript Listener > Debugger menu > Debugger Dialog

MAXScript Editor > Debugger menu > Debugger Dialog

The MAXScript debugger implements the first half of a script development and debugging environment. It allows the main thread of 3ds Max to be suspended, the values of global and local variables to be examined and altered while the thread is not running, MAXScript commands to be executed from a command line, and the execution to be suspended using method calls from inside the MAXScript code. The debugger also lets you stop or continue the execution of the suspended code.

For detailed information about the MAXScript debugger, consult the MAXScript Reference, available from Help menu > MAXScript Reference.

Running Scripts from the Command Line

3ds Max allows you to enter MAXScript commands directly on the command line. When you launch 3ds Max from a DOS command line, you can have it run a specified launch script. This can be useful for tasks such as unattended batch-rendering. This capability uses the existing -U command line switch that names a utility to be run when 3ds Max is started. The -U switch allows an optional extra argument which, for MAXScript, is taken to be the name of the launch script to run. The case (capitalization) of MAXScript must be as shown in the following example (entered after you CD to the program directory):

See the online *User Reference* to view this code sample.

This example command line would launch the 3ds Max executable in *c:|Program Files|Autodesk|3dsmax8|*, start MAXScript, and then have it run the launch script *rendercams.ms*.

The following example launch script loads two scenes, renders frames from each of the cameras in them, and then quits 3ds Max:

See the online *User Reference* to view this code sample.

This example makes use of the quitMax() method to exit 3ds Max when the script is finished. Launch scripts need not be batch scripts as in this example, but may be used to condition 3ds Max for interactive use, for example by loading a scene file and setting some user-interface options.

The normal startup scripts, *startup.ms* and those in the *|scripts|startup* directory, are run before the launch script. It is also possible to install scripts into individual scene files that run automatically when that scene is open or closed or at certain other events.

Note: Command line -U MAXScript startup scripts are run *after* 3ds Max has completely booted and the standard scripts and startup scripts have been run.

MAXScript Command-Line Switches

The following switches work specifically with MAXScript files and functions.

Switch	Effect
-mip	Starts 3ds Max in a minimized mode – but never allows you to open the window for interactive usage.
-mxs	This switch is essentially the same as *-U MAXScript file.ms*, but avoids the need for the .ms file. You can follow the switch with MAXScript commands.
-silent	Comparable to the MAXScript command, *setSilentMode*, this switch suppresses all MAXScript and 3ds Max UI dialogs so that batch scripts specified by the –U command do not get interrupted.
-u MAXScript *<filename>*	Opens a specified MAXScript file.

Examples of desired syntax usage:

See the online *User Reference* to view these code samples

22 Customizing the User Interface

Customizing the User Interface

You can rearrange the components of the 3ds Max user interface, including the menu bar, toolbars, and command panel. You can also dynamically resize the viewport windows. You can specify which toolbars should appear and which should be hidden, and create your own keyboard shortcuts, custom toolbars, and quad menus. You can also customize the colors used in the User Interface.

The procedures in this topic tell how to rearrange and resize UI components. Various other customization options are available from the *Customize menu (page 3–731)*.

See also

Customize Display Right-Click Menu (page 3–831)

Customize User Interface Dialog (page 3–836)

Saving and Loading Custom User Interfaces (page 3–848)

Revert to Startup Layout (page 3–851)

Configure Paths (page 3–852)

Preferences (page 3–859)

Procedures

To switch between a single-viewport and multi-viewport layout:

- By default, 3ds Max starts with a multi-viewport. To switch to a single-viewport layout, activate a viewport and click the *Min/Max Toggle (page 3–780)*.

To resize the windows in a multi-viewport layout:

- With your cursor, click the splitter bar between any two viewports, or at the intersection of all four viewports, and drag to a new location. When you release the mouse, the new viewport layout is defined.

  The dividers are saved in the scene, but are reset when you change the layout. This feature does not allow you to define new layouts, only to adjust the proportions of the currently existing ones.

To reset the viewport windows to the default layout:

1. Right-click the splitter bar between the viewports.

   The Reset Layout button is displayed.

2. Click this button to restore the viewports to the default multi-viewport layout.

To rearrange the order of rollouts in the command panel:

- Click the rollout title bar, and drag to another location on the command panel. A thick line indicates where the rollout will be placed. When you release the mouse button, the rollout is moved to the indicated location, and the other rollouts are shifted appropriately.

  The order of rollouts is saved in the text file *rolluporder.cfg*, which is located in the *|ui* subdirectory.

To float a toolbar, do one of the following:

- Click a docked toolbar's tag bar (a narrow line displayed when the toolbar is docked) and drag it away from its location. The toolbar is now floating; you can reposition, resize, or dock it.
- Right-click a docked toolbar's tag bar (a narrow line displayed when the toolbar is docked), and then choose Float.

To float the command panel, do one of the following:

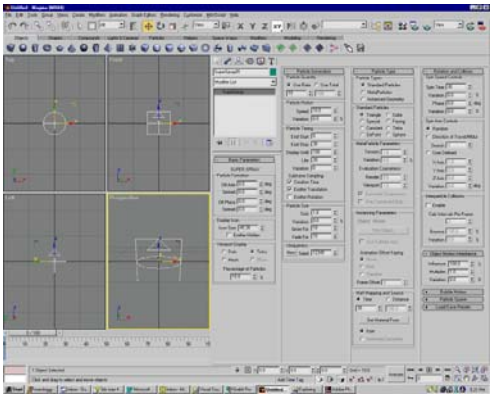
- Right-click the blank area at the upper-right corner of the command panel, and then choose Float.
- Click a corner of the upper portion of the command panel and drag it into the viewport.

  Tip: Use *Lock UI Layout (page 3–832)* if you find you tend to float the command panel accidentally.

To resize the docked command panel horizontally:

- Move the cursor over the edge of the docked command panel that is nearest the viewports. The cursor changes to a double arrow. Drag the cursor to increase or decrease the width of the command panel.

  The command panel grows or shrinks in column increments. Unless the command panel is hidden, there is always at least one column. When the command panel is docked, the columns must fit within the main 3ds Max window.



Multiple command panels are useful when working with objects such as particle systems, which have many controls.

To resize the floating command panel horizontally:

- Move the cursor over the left or right edge of the floating command panel. The cursor changes to a double arrow. Drag the cursor to increase or decrease the width of the command panel.

  The command panel grows or shrinks in column increments. Unless the command panel is hidden, there is always at least one column. When the command panel is floating, you can display as many columns as you want.

To resize the floating command panel vertically:

- Move the cursor over the top or bottom edge of the floating command panel. The cursor changes to a double arrow. Drag the cursor to increase or decrease the height of the command panel as you do for other windows on the desktop.

To dock a floating UI element, do one of the following:

- Drag the panel by its title bar to the top, bottom, left, or right edge of the program window. The

mouse cursor and the panel outline change shape at a docking location. Release the mouse.

- Right-click the title bar, choose Dock from the pop-up menu, and then choose Top, Bottom, Left, or Right.
- Double-click the handle or title bar.

  A UI element docks automatically when it approaches a "dockable" location. The toolbars and menu bar can dock at the top or bottom, left or right of the viewports. They can also dock on either side of the Command panel.

To hide a panel or toolbar, do one of the following:

- When a panel or toolbar is floating, you can hide it by clicking the X control in the upper-right corner.

Customize Display Right-Click Menu

The Customize Display right-click menu displays when you right-click over a blank area of a toolbar (not when the cursor is over a button). It is also available when the cursor is immediately above, below, or to the right of the command panel tabs: in these locations, the cursor changes to look like a stack of two sheets of paper. In addition, the menu displays when you right-click at the right edge of the command panel when docked, or, when floating, at the right or left edge.

Use this menu to turn on and off the display of various user interface elements, customize the display of toolbars, and dock or float items such as the command panel.

Interface

The following options are displayed in all cases:

Customize—Displays the *Customize User Interface dialog (page 3–836)*, which lets add commands and macro scripts to new and existing toolbars.

Command Panel—Toggles the command panel display. By default, this is displayed.

Main Toolbar—Toggles the *main toolbar (page 3–733)*. By default, this is displayed.

Axis Constraints—Toggles the *Axis Constraints toolbar (page 3–735)*. By default, this toolbar is not displayed.

Layers—Toggles the *Layers toolbar (page 3–735)*. By default, this is not displayed.

Reactor—Toggles the *reactor toolbar (page 3–736)*. By default, this is displayed.

Extras—Toggles the *Extras toolbar (page 3–736)*. By default, this is not displayed.

Render Shortcuts—Toggles the *Render Shortcuts toolbar (page 3–736)*. By default, this is not displayed.

Snaps—Toggles the *Snaps toolbar (page 3–737)*. By default, this is not displayed.

Additional Options: Docking and Floating

Depending on the cursor location when you right-click, the menu can also display these options:

Dock—Docks the active item to the specified location: Top, Bottom, Left, or Right.

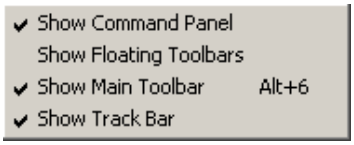
Note: For more information on docking toolbars, see *Customizing the User Interface (page 3–829)*.

Float—Floats the active item.

Note: This is available only for docked items.

Show UI

Customize menu > Show UI



The Show UI submenu lets you add or remove UI (user interface) elements from the workspace, so that you can customize your screen as you work. You can turn these elements on and off as you need by selecting them from the menu, maximizing the efficiency of your workspace. The settings are stored in the *maxstart.cui* file, so they will remain after you shut down and restart 3ds Max.

When you choose a UI element from the Show UI submenu, it will be displayed or hidden, depending on its previous state. If it was hidden when you selected it from the menu, it will be displayed. If it was displayed when you selected it from the menu, it will be hidden. The Show UI menu displays a check mark next to the UI element when it is currently being displayed.

Keyboard shortcuts for turning on and off UI elements are displayed next to their corresponding UI elements in the Show UI menu.

You can use the Show UI menu to hide or display the following UI elements:

Command Panel (page 3–799)

Floating Toolbars (displays *Axis Constraints Toolbar (page 3–735)*, *Layers Toolbar (page 3–735)*, and *Extras Toolbar (page 3–736)*)

Main Toolbar (page 3–733)

Track Bar (page 3–750)

Lock UI Layout

Customize menu > Lock UI Layout

When the Lock UI Layout toggle is active, you cannot modify the user interface layout by dragging interface elements. (You can still use the right-click menu to do so, however.) Use this command to prevent user interface changes or inadvertent actions, such as floating toolbars, from happening due to mouse clicks.

Tip: Use this command if you find you are inadvertently selecting and *floating (page 3–1024)* UI elements such as the Command panel.

Procedure

To lock the UI layout:

- Choose Lock UI Layout from the Customize menu.

  You can no longer move or resize the UI elements. Use this command to prevent user interface changes or if you find yourself accidentally floating toolbars or the command panels on mouse clicks.

Plug-In Manager

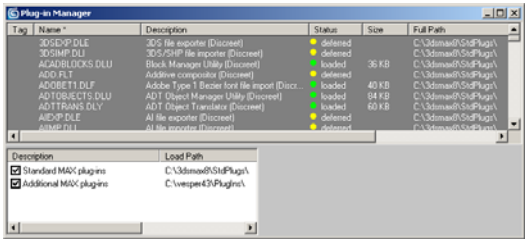
Customize menu > Plug-in Manager

The Plug-in Manager lets you manage plug-ins dynamically without any initialization required. The Plug-in Manager provides a list of all plug-ins found in the 3ds Max plug-in directories, including the plug-in description, type (object, helper, modifier, and so on), status (loaded or deferred), size, and path. The Plug-in Manager provides options to load any plug-in, regardless where it resides on disk. The Plug-in Manager is similar to *Summary Info (page 3–500)*, but with more options.

See also

Plug-Ins Path Configuration (page 3–857)

Interface



When you start the Plug-in Manager, it scans through all the plug-in paths specified in the *plugin.ini* file and lists them in the Plug-in Manager dialog. The information is divided up into columns as described below.

Tag—Use the right-click menu and select Tag Selected to add a check mark for selected plug-ins. Tagging plug-ins lets you perform right-click menu actions on them. Thus you can tag multiple plug-ins and perform a single operation on all of them.

Name—The filename of the plug-in.

Description—A description of the plug-in.

Status—Indicates whether the plug-in is loaded (green) or deferred (yellow).

Size—File size of the plug-in.

Full Path—The disk location of the plug-in file.

Plug-in Directories

These are the plug-in directories listed in *plugin.ini*. You can also configure these paths via the *3rd Party Plug-Ins panel (page 3–857)* of the Configure User Paths dialog. You can display or hide all the plug-ins in a directory by toggling the check box.

Description—Shows directory description from *plugin.ini* file.

Load Path—The path of the plug-in directory.

Right-Click Menu

The right-click menu for the Plug-in Manager works in the list of plug-ins, and in the blank area beneath the list. It does not work in the list of plug-in directories. The commands apply to two possible states for the listed plug-ins: selected (that is, highlighted) and tagged (a check mark appears to the left of the plug-in's name).

Selected Plug-ins—To load plug-ins, highlight one or more plug-ins, choose this item, and then choose Load.

Clear Selection—Removes highlighting from all items in the list.

Tagged Plug-ins—To load tagged plug-ins, choose this item, and then choose Load.

Tag Selected—Tags all highlighted plug-ins.

Clear Tags—Clears all tags.

Load New Plug-in—Loads a plug-in from the hard drive. Use the file dialog to locate the plug-in, and then click Open.

Refresh View—Refreshes the list of plug-ins.

Custom UI and Defaults Switcher

Customize menu > Custom UI and Defaults Switcher

Artists and designers in different industries use 3ds Max in different ways. The Custom UI and Defaults Switcher lets you quickly change your program defaults and UI scheme to more closely match the type of work you are doing.

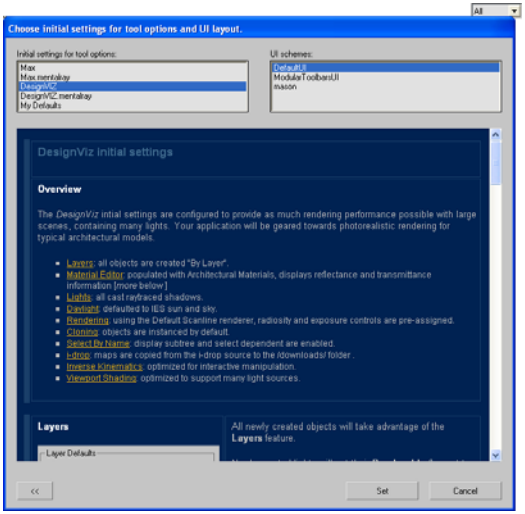
The *Initial settings for tool options* control the default settings for various features in 3ds Max, while the UI Schemes control how the 3ds Max interface will look.

The dialog displays a detailed explanation for each of the four default sets and two UI Schemes that ship with 3ds Max. If you create your own defaults or UI Scheme, they will also appear in the list, however you cannot edit the general description of custom default sets or UI schemes.

See also

Market-Specific Defaults (page 3–834)

Interface



Initial settings for tool options—This list contains different sets of default settings for various tools in 3ds Max. Highlight the set that corresponds to the tools you are using.

3ds Max ships with four default sets:

- **Max** contains the set of default settings for general animation use without the *mental ray renderer (page 3–77)*.
- **Max.mentalray** contains the set for general animation use with the mental ray renderer.
- **DesignVIZ** contains the set for design visualization use without the mental ray renderer.
- **DesignVIZ.mentalray** contains the set for design visualization use with the mental ray renderer.

Highlight any of these sets to see detailed explanations of the affected settings.

For information on creating or editing defaults sets, see *Market-Specific Defaults (page 3–834)*.

Note: You must restart 3ds Max before new defaults are applied.

UI Schemes—This list contains all of the UI schemes defined in the *|UI* folder. 3ds Max ships with two UI schemes: *DefaultUI*, and *ModularToolbarsUI*, which has the *main toolbar (page 3–733)* broken up into smaller toolbars. Highlight the name of the UI scheme in the list to see a description (and image) of the interface.

This list also contains any UI schemes you have saved with the *Save Custom UI Scheme dialog (page 3–850)*. However, no description or image is displayed for these schemes.

Set—Applies the selected default settings and UI scheme to 3ds Max.

Note: You must restart 3ds Max before your defaults are applied.

Cancel—Closes the dialog without applying any changes.

Market-Specific Defaults

3ds Max is used in many different professional markets, including film, design visualization, and games. The workflow and performance requirements for users from these markets vary tremendously. As a result, different default settings are ideal for different types of scenes.

For example, a typical animation scene has a small number of lights; *shadow maps (page 3–1104)* provide a fast, accurate solution to generating

shadows. On the other hand, a typical design visualization scene can contain hundreds of lights, in which case shadow maps will cause memory issues. For this type of scene, *ray-traced shadows (page 3–1094)* are much more appropriate.

In order to provide an efficient working environment for both project types, 3ds Max offers four sets of market-specific defaults, tailored specifically for general animation scenes and for design visualization projects (both with and without the use of the *mental ray renderer (page 3–77)*). The sets are each located in their own sub-directories of the *|defaults* directory. These sub-directories each contain an INI file (*currentdefaults.ini*), which contains the global parameter defaults, a default material library (*medit.mat*), which populates the Material Editor at startup, and a startup file (*maxstart.max*), which is the file that opens when 3ds Max is started or when you reset. You can edit any of these files, and you can also create your own sets, however each set must be in a separate sub-directory of *|defaults*. in addition, each file in the directory should have the same names (*currentdefaults.ini*, *medit.mat*, and *maxstart.max*). If one of these files is not present in a custom defaults directory that you have created, 3ds Max uses the corresponding file from the *|defaults|max* directory in its place.

Note: For your protection, both of the preset default directories have a sub-directory named *|factorydefaults*, which contains the original files for each set. These can be used in the event that you have changed your defaults and are unhappy with the results. They are also a useful starting point for creating your own set; copy them to a new directory and edit them. It is highly recommended that you *do not edit* the files in the *|factorydefaults* directories.

Default sets are assigned through the *Custom UI and Defaults Switcher (page 3–833)*.

Procedure

To change the current set of defaults:

1. Choose Customize menu > Customize UI And Defaults Switcher.
2. Select one of the default sets from the *Initial settings for tool options* list and click Set.
3. Restart 3ds Max to load the new default parameters.

Interface

The following files should be included in your default directory. If one or more of these files is not present in the current Default directory, 3ds Max will use the corresponding file from *|defaults|max* in its place.

currentdefaults.ini

The following table describes all of the sections that can be set in a default INI file. Any parameter with a blank or invalid value will use the hard coded default.

Note: See the online *User Reference* to view this table.

medit.mat

medit.mat is the default material library in your scene.

maxstart.max

The *maxstart.max* file is loaded when you start or reset 3ds Max.

COM/DCOM Server Control Utility

Utilities panel > Utilities rollout > More button > COM/DCOM Server Control

The COM/DCOM Server Control utility supports plug-ins and third-party programs that use the COM (Component Object Model). The idea

behind the COM is to expose the core of 3ds Max so applications can invoke 3ds Max to generate images.

The COM facility is intended for application developers. For more information about applications development with 3ds Max, see the description of the COM object interface in the help file *(sdk.chm)* for the 3ds Max Plug-In Software Development Kit (SDK).

Procedure

To register 3ds Max as a DCOM server:

1. Start 3ds Max and go the Utilities panel. Click More, choose COM/DCOM Server Control, and then click OK.
2. If the button in the COM/DCOM Server Control rollout says Register, then click it. If it says Unregister, then do nothing, as 3ds Max is already registered.

   Now 3ds Max is registered as a DCOM server and an instance of it can be created from any COM client.

   Note: Not all products include this utility. You can build it from the source located in *|maxsdk|samples|utility|comsrv|*. Copy the resulting *comsrvui.dlu* to the 3ds Max *|plugins* directory.

It is also possible to register and unregister from the command line. There are two command-line options that can be passed to 3ds Max:

3DSMAX -RegisterMAXRenderer

3DSMAX -UnregisterMAXRenderer

Customize User Interface Dialog

Customize menu > Customize User Interface

The Customize User Interface dialog lets you create an entirely customized user interface, including shortcuts, quad menus, menus, toolbars, and colors. You can also add commands and macro scripts by selecting either a text or icon button to represent the command or script on the toolbar.

Most commands in the 3ds Max user interface appear in this dialog as *action items*. An action item is simply a command that you can assign to a keyboard shortcut, toolbar, quad menu, or menu. The Keyboard, Toolbars, Quads, and Menus panels of this dialog show tables of action items that you can assign. (Tables in the Colors panel list UI elements, instead.)

Note: A few action items don't correspond to any elements in the default user interface. See *Additional Keyboard Commands (page 3–717)*.

Keyboard Panel (page 3–837)

Toolbars Panel (page 3–838)

Quads Panel (page 3–839)

Menus Panel (page 3–842)

Colors Panel (page 3–843)

See also

Customizing the User Interface (page 3–829)

Saving and Loading Custom User Interfaces (page 3–848)

Keyboard Panel

Customize menu > Customize User Interface > Keyboard tab

The Keyboard panel lets you create your own keyboard shortcuts. You can assign shortcuts to most commands available in the software.

The same shortcuts can be assigned to multiple commands, as long as they occur in different contexts. For example, in Video Post, CTRL+S is assigned to Add Scene Event; however, in the Main UI, it is assigned to Save File.

When you use a keyboard shortcut, the software looks for a context-specific shortcut first, and if none is found it looks for the appropriate command in the Main UI shortcuts.

The *Keyboard Shortcut Override toggle (page 3–912)* must be turned on (the default) for the context-specific shortcuts to work properly. If it is turned off, only the Main UI keyboard shortcuts will be available.

See also

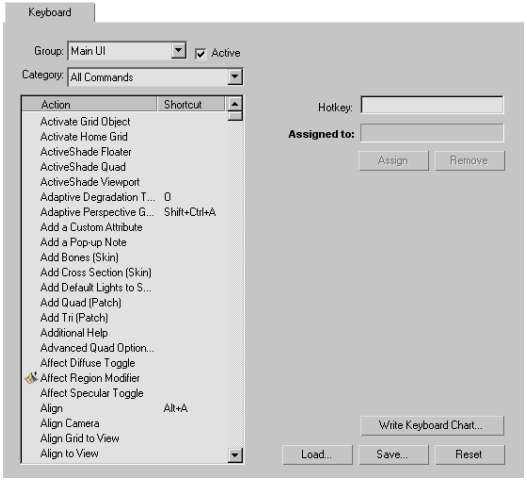
Default Keyboard Shortcuts (page 3–911)

Procedure

To create a keyboard shortcut:

1. Choose Customize menu > Customize User Interface > Keyboard panel.
2. Use the Group and Category lists to find the action for which you want to create a shortcut.
3. Click action in the Action list to highlight it.
4. In the Hotkey field, enter the keyboard shortcut you want to assign to the action.
5. Click Assign.

Interface



Group—Displays a drop-down list that lets you select the context you want to customize, such as Main UI, Track View, Material Editor, and so on.

Active—Toggles availability of context-specific keyboard shortcuts. When this is turned on, you can use duplicate shortcut keys between contexts within the overall user interface. For example, A can be the shortcut for Angle Snap toggle within the Main UI, and also a shortcut for Assign Material to Selection when you are working in the Material Editor. When this is turned off, the shortcuts defined for the appropriate context will not be available. Default=on.

Category—Displays a drop-down list of all the available categories of user interface actions for the selected context.

Action list—Displays all the available actions and shortcuts, if defined, for the selected group (context) and category.

Hotkey—Allows you to enter a keyboard shortcut. Once the shortcut is entered, the Assign Button is active.

Assigned To—Displays the action a shortcut is assigned to if the shortcut you've entered is already assigned.

Assign—Activates when you enter a keyboard shortcut in the Hotkey field. When you click Assign, it transfers the shortcut information to the Action list on the left side of the dialog.

Remove—Removes all shortcuts for the selected action in the Action list on the left side of the dialog.

Write Keyboard Chart—Displays the Save File As dialog. Allows you to save any changes you've made to keyboard shortcuts to a TXT file that you can print.

Load—Displays the Load Shortcut File dialog. Allows you to load custom shortcuts, from a KBD file into your scene.

Save—Displays the Save Shortcut File As dialog. Allows you to save any changes you've made to the shortcuts to a KBD file.

Reset—Resets any changes you've made to the shortcuts to the default setup (*defaultui.kbd*).

Toolbars Panel

Customize menu > Customize User Interface > Toolbars tab

The Toolbars panel lets you edit existing toolbars and create your own custom toolbars. You can add, remove, and edit buttons on existing toolbars, or you can delete the toolbars entirely. You can also create custom toolbars with both 3ds Max commands and scripts.

Procedures

To create your own toolbar:

1. Choose Customize menu > Customize User Interface > Toolbars tab.
2. Click New.

   The New Toolbar dialog appears.
3. Enter the name of the toolbar and click OK.

   The new toolbar appears as a small floater.

To add a command to the toolbar:

1. Choose Customize menu > Customize User Interface > Toolbars tab.

   You can also right-click the label of the toolbar you just created, and then choose Customize.
2. Choose the toolbar you want to edit from the drop-down list.
3. There are three ways to add commands to the toolbar:
   - In the Customize User Interface dialog, drag the command from the action list. If the action has a default icon assigned to it (it will be next to the command in the action list), the icon will appear as a button on your toolbar. If no icon is assigned to the command, the name of the command will appear as a button on the toolbar.
   - CTRL+drag buttons from any toolbar onto your toolbar. This creates a copy of the button on your toolbar.
   - ALT+drag buttons from any toolbar onto your toolbar. This moves the button from the original toolbar onto your toolbar.

To record a script and add it to a toolbar:

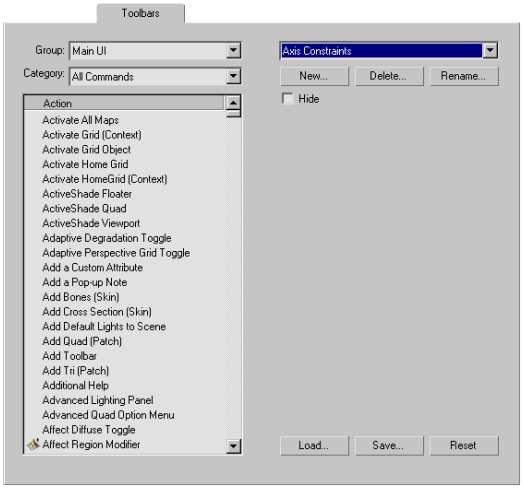
1. Open a MAXScript Listener window, by doing one of the following:
   - Choose Utilities panel > MAXScript > MAXScript rollout > Open Listener.
   - Right-click a viewport label, and then choose Views > Extended > MAXScript Listener.
2. Choose MAXScript menu > Macro Recorder.

3. Perform the actions you want to record.
4. Select the lines in the script that you want. Drag those lines directly onto the toolbar.

   Note that your macro might require some minor editing to remove extraneous steps or to refine the procedure.

You can edit the appearance of the text or icons on your toolbars with the *Edit Button Appearance (page 3–847)* command, which is available when you right click the toolbar button.

Interface



Group—Displays a drop-down list that lets you select the context you want to customize, such as Main UI, Track View, Material Editor, and so on.

Category—Displays a drop-down list of all the available categories of user interface actions for the selected context.

Action Window—Displays all the available actions for the selected group and category.

Toolbars List—Displays the Axis Constraints, Extras, Layers, and Reactor toolbars, and any additional toolbars you've created using the New button.

New—Displays the New Toolbar dialog. Enter the name of the toolbar you want to create and click OK. The new toolbar appears as a small floater.

Once you've created a new toolbar, there are three ways to add commands:

- Drag actions from the Action Window in the Toolbars panel of the Customize User Interface dialog onto your toolbar.
- CTRL+drag buttons from any toolbar onto your toolbar. This creates a copy of the button on your toolbar.
- ALT+drag buttons from any toolbar onto your toolbar. This moves the button from the original toolbar onto your toolbar.

Delete—Deletes the toolbar item displayed in the Toolbars list.

Rename—Displays the Rename Toolbar dialog. Select a toolbar from the Toolbars list to activate the Rename button. Click Rename, change the name of the toolbar, and click OK. The toolbar name changes in the toolbar floater.

Hide—Toggles the displays of the active toolbar in the toolbars list.

Load—Displays the Load UI File dialog. Allows you to load custom user interface files into your scene.

Save—Displays the Save UI File As dialog. Allows you to save any changes you've made to the user interface to a *.cui* file.

Reset—Resets any changes you've made to the user interface to the default setup (*defaultUI.cui*).

Quads Panel

Customize menu > Customize User Interface > Quads tab

The Quads panel lets you customize the *quad menus (page 3–741)*. You can create your own

quad menu sets, or you can edit existing sets. In the Quads panel, you can customize menu labels, functionality, layout, and shortcuts. The *advanced quad menu options (page 3–845)* let you modify the color and behavior of the quad menu system. You can also save and load custom menu sets.

See also

Additional Quad Menus (page 3–744)

Procedures

To create a new quad set:

1. Choose Customize menu > Customize User Interface > Quads tab.
2. Click New.

   The New Quad Set dialog appears.
3. Enter the name of the quad set and click OK.

   The new set appears in the Quad set list.

To add a command to a quad set:

1. Choose Customize menu > Customize User Interface > Quads tab.
2. Choose the quad set you want to edit from the upper-right drop-down list.

   If you want to change the name of the quad set, click Rename and enter a new name in the Rename Quad Set dialog.
3. Select the quadrant where you want to place the command.

   You can edit the name of the quadrant by changing the text in the Label area.
4. Choose the appropriate Group and Category from the respective drop-down lists.
5. Choose a command from the action list and drag it into the Quad Menu window.

   Use the same procedure to add menus and separators to your quad set.

To delete a quad set:

Note: You cannot delete any of the default quad sets.

1. Choose Customize menu > Customize User Interface > Quads tab.
2. Choose the quad set you want to delete from the upper-right drop-down list.
3. Click Delete.

To remove a command from a quad set:

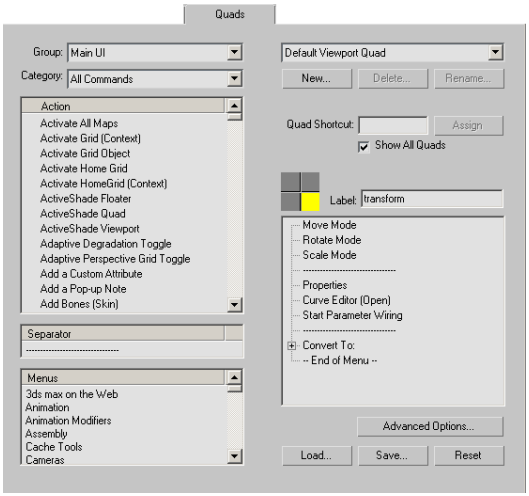
1. Choose Customize menu > Customize User Interface > Quads tab.
2. Choose the quad set you want to edit from the upper-right drop-down list.
3. Choose the command you want to remove.
4. Press the Delete button.

   Use the same procedure to remove menus and separators from your quad set.

To move a command in a quad set:

- Choose the command in the quad set list and drag it to a new position in the list.

Interface



Group—Displays a drop-down list that lets you select the context you want to customize, such as Main UI, Track View, Material Editor, and so on.

Category—Displays a drop-down list of the available categories of user interface actions for the selected context.

Action Window—Displays all the available actions for the selected group and category. To add an action to a specific quad set, select it and drag it to the quad menu window on the right side of this dialog. Right-click an action in this window to edit the macro script that defines the action (if there is one).

Separator Window—Displays a separator line that can be used to separate groups of menu items in a quadrant. To add a separator line to a specific quad set, select it and drag it to the quad menu window on the right side of this dialog.

Menus Window—Displays the names of all 3ds Max menus. To add a menu to a specific quad set, select it and drag it to the quad menu window on the right side of this dialog. Right-click a menu in this window to delete the menu, rename it, or create a new, empty menu.

Quad Set List—Displays the available quad sets.

Additional quad menus (page 3–744) appear in this list. They can be edited, renamed, and reorganized; however, they cannot be deleted.

New—Displays the New Quad Set dialog. Enter the name of the quad set you want to create and click OK. The new quad set appears in the Quad Set list.

Delete—Deletes the item displayed in the Quad Set list.

Rename—Displays the Rename Quad Set dialog. Select a quad set from the Quad Set list to activate the Rename button. Click Rename, change the name of the quad set, and click OK to change the name.

Quad Shortcut—Allows you to define a keyboard shortcut for displaying the quad set. Enter the shortcut and click Assign to make the change.

Show All Quads—When on, a viewport right-click shows all four quad menus. When off, a viewport right-click shows only one quad at a time.

Label—Displays the label for the highlighted quadrant (shown in yellow to the left of the Label).

Quad Menu Window—Displays the menu options for the currently selected quad menu and quad set. To add menus and commands, drag options from the Action and Menus windows to this window.

Items included in the quad menu are displayed only when they are available. For example, if your quad menu contains Track View Selected, the command will display only if you have an object selected when you open the quad menu. The quadrant will not be displayed if none of the commands are available when you open the quad menu.

There are several actions available when you right-click any item in the quad menu window:

Delete Menu Item—Removes the selected action, separator, or menu from the quad menu.

Edit Menu Item Name—Opens the Edit Menu Item Name dialog. The Customize Name check box must be on to edit the name. Enter the desired name in the name text field and click OK. The item's name is changed in the quad menu, but not in the quad menu window.

Flatten Sub-Menu—Displays contents of selected submenu on top level of quad. When this is selected, the menu name will be followed by the string: [FLAT].

Edit MacroScript—Opens the macro script for the selected action in a MAXScript editor window.

Advanced Options—Opens the *Advanced Quad Menu Options dialog (page 3–845)*.

Load—Displays the Load Menu File dialog. Allows you to load custom menu files into your scene.

Save—Displays the Save Menu File As dialog. Allows you to save any changes you've made to the quad menus to a MNU file.

Reset—Resets any changes you've made to the quad menus to the default setup (*defaultui.mnu*).

Menus Panel

Customize menu > Customize User Interface > Menus tab

The Menus panel lets you customize the menus in the software. You can edit existing menus or create your own. You can customize menu labels, functionality, and layout.

Procedures

To create a new menu:

1. Choose Customize menu > Customize User Interface > Menus tab.
2. Click New.

   The New Menu dialog appears.
3. Enter the name of the menu, and click OK.

   The new menu appears in the menu list.

To add a command to a menu:

1. Choose Customize menu > Customize User Interface > Menus tab.
2. Choose the menu you want to edit from the drop-down list.

   If you want to change the name of the menu, click Rename, and enter a new name in the Rename Menu dialog.
3. Choose the appropriate Group and Category from the respective drop-down lists.
4. Choose a command from the action list and drag it into the Menu window.

   Use the same procedure to add menus and separators to your menu.

To delete a menu:

1. Choose Customize menu > Customize User Interface > Menus tab
2. Choose the menu you want to delete from the drop-down list.
3. Click Delete.

To remove a command from a menu:

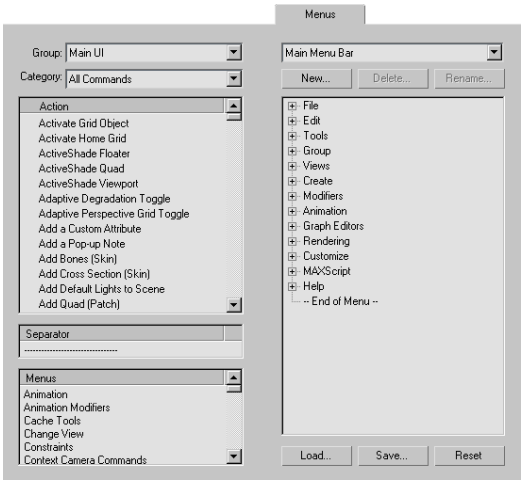
1. Choose Customize menu > Customize User Interface > Menus tab.
2. Choose the menu you want to edit from the drop-down list.
3. Choose the command you want to remove.
4. Press the Delete key.

   Use the same procedure to remove menus and separators from your menus.

To move a command in a menu:

- Choose the command in the menu window and drag it to a new position in the window.

Interface



Group—Displays a drop-down list that lets you select the context you want to customize, such as: Main UI, Track View, Material Editor, and so on.

Category—Displays a drop-down list of the available categories of user interface actions for the selected context.

Action Window—Displays all the available actions for the selected group and category. To add an action to a specific menu, select it and drag it to the menu window on the right side of this dialog. Right-click an action in this window to edit the macro script that defines this action (if there is one).

Separator Window—Displays a separator line that can be used to separate groups of menu items. To add a separator to a specific menu, select it and drag it to the menu window on the right side of this dialog.

Menu Window—Displays the names of all menus. To add a menu to another menu (shown in the Menu List), select and drag it to the menu window on the right side of this dialog. Right-click a menu in this window to delete the menu, rename it, or create a new, empty menu.

Menu List—Displays the default menus as well as any new ones you create or load.

New—Displays the New Menu dialog. Enter the name of the menu you want to create and click OK. The new menu appears in the menu window on the left side of the dialog as well as in the Menu List.

Delete—Deletes the item displayed in the menu list window.

Rename—Displays the Edit Menu Item Name dialog. Select a command in the menu list window and click Rename. This dialog lets you specify a custom name that will be displayed in the menu. If you precede a letter in the custom name with the "&" (ampersand) character, that letter will be used as a menu accelerator.

Menu Window—Displays the menu options for the menu currently selected in the menu list. To add menus and commands (actions), simply select and drag the options from the Action and Menus windows to this window.

There are several actions available when you right-click any item in the menu window:

Delete Menu Item—Removes the selected action, separator, or menu from the menu.

Edit Menu Item Name—Opens the Edit Menu Item Name dialog. The Customize Name check box must be on to edit the name. Enter the desired name in the name text field and press OK. The item's name is changed in the menu, but not in the menu window. If you precede a letter in the custom name with the "&" (ampersand) character, that letter will be used as a menu accelerator.

Edit MacroScript—Opens the script for the selected action in a MAXScript editor window.

Load—Displays the Load Menu File dialog. Allows you to load custom menu files into your scene.

Save—Displays the Save Menu File As dialog. Allows you to save any changes you've made to the menus to a *.mnu* file.

Reset—Resets any changes you've made to the menus to the default setup (*defaultui.mnu*).

Colors Panel

Customize menu > Customize User Interface > Colors tab

The Colors panel allows you to customize the look of the software interface. You can adjust the colors for almost every element in the interface, giving you the freedom to design your own unique style.

The quad menu colors cannot be customized from the Color panel. To customize quad menu colors,

use the *Advanced Quad Menu Options dialog (page 3–845)*.

Interface

Elements—Displays a drop-down list that lets you select from the following high-level groupings: Track bar, Geometry, Viewports, Gizmos, Objects, Schematic View, Rollouts, Track View, Manipulators, and Grids.

UI Elements List—Displays a list of the available elements for the selected user interface category.

Color—Displays the color for the selected category and element. Click to display the Color Selector where you can change the color. After selecting a new color, click Apply Colors Now to make the change in the interface.

Reset—Resets the color to the default value.

Intensity—Sets a grayscale value for the display of the grid lines. 0 is black and 255 is white.

This control is available only when you select the Set By Intensity element from the Grids element. This affects the intensity of the grid lines in the viewports.

Invert—Inverts the grayscale value for the display of grid lines. Dark gray becomes light gray and vice versa.

This control is available only when you select the Set By Intensity element from the Grids element.

Scheme—Allows you to select whether the main UI colors are set to the default Windows colors or whether they can be customized. If Use Standard Windows Colors is selected, all of the elements in the UI Appearance list are disabled, and you are unable to customize the UI colors.

UI Appearance List—Displays all the elements in the user interface that can be changed.

Color—Displays the color for the selected UI appearance item. Click to display the Color Selector where you can change the color. After selecting a new color, click Apply to make the change in the interface.

Reset—Resets the selected UI appearance item.

Saturation—Sets a saturation scale of enabled or disabled icons in the UI. The higher the saturation, the less gray the color. See *Red, Green, Blue / Hue, Saturation, Value (page 3–1095)*.

This control is only available when Icons: Enabled or Icons: Disabled is selected in the UI Appearance list.

Value—Sets the value scale of enabled or disabled icons in the UI. The higher the value, the brighter the color. See *Red, Green, Blue / Hue, Saturation, Value (page 3–1095)*.

This control is only available when Icons: Enabled or Icons: Disabled is selected in the UI Appearance list.

Transparency—Sets the transparency value scale of enabled or disabled icons in the UI. The higher the value, the more opaque the icon will be.

This control is only available when Icons: Enabled or Icons: Disabled is selected in the UI Appearance list.

Invert—Inverts the RGB value for the display of enabled or disabled icons in the UI.

This control is only available when Icons: Enabled or Icons: Disabled is selected in the UI Appearance list.

Apply Colors Now—Makes any change you have entered using this dialog active in the user interface.

Load—Displays the Load Color File dialog. Allows you to load custom color files into your scene.

Save—Displays the Save Color File As dialog. Allows you to save any changes you've made to the user interface colors to a CLR file.

Reset—Resets any changes you've made to the colors to the default setup (*defaultui.clr*).

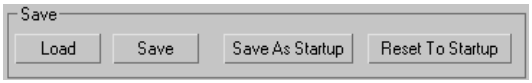
Advanced Quad Menu Options

Customize menu > Customize User Interface > Quads panel > Advanced Options

The Advanced Quad Menu Options dialog lets you customize the size and colors of your quad menus. You can also customize other quad menu behaviors such as repositioning, type font, and cursor behavior.

Interface

Save group



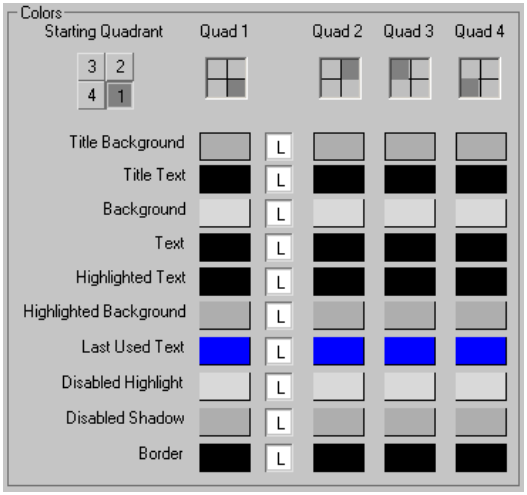
Load—Lets you load a quad options (*.qop*) file.

Save—Saves your settings to a *.qop* file.

Save as Startup—Saves your current settings as the startup settings.

Reset to Startup—Resets options to default settings (*defaultui.qop*).

Colors group



The colors group allows you to customize the colors of your quad menus.

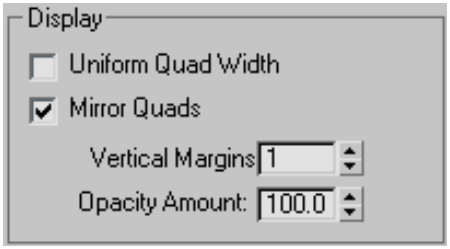
Starting Quadrant—Lets you select which quadrant your cursor starts in when you open the quad menu.

Color list—The customizable elements of the quad menu are listed and separated by quadrant. Click the color swatch to open a color selection dialog.

If the colors for a quad menu element are locked (indicated by a pressed "L" button), each of the separate quadrants will share the same color; when you change the color in one quadrant, it will change all of the quadrants' colors.

You can customize each quadrant separately by turning off the lock button for the selected quad menu element.

Display group



Uniform Quad Width—When turned on, all displayed quadrants will be the same width. The width is determined by the widest quadrant.

Mirror Quads—When turned on, text in the quad menus is justified to the inside edge of the menu; the text in the right quadrants is left-justified, and text in the left-quadrants is right-justified.

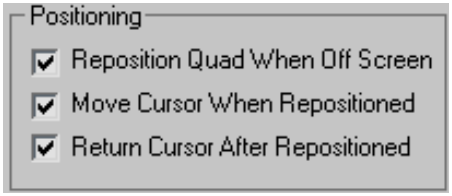
When turned off, all text in the quad menu is left-justified.

Vertical Margins—Sets the vertical spacing between commands in the quad menu.

Opacity Amount—Sets the opacity of the quad menu.

Opacity is not available in systems running on Windows NT.

Positioning group



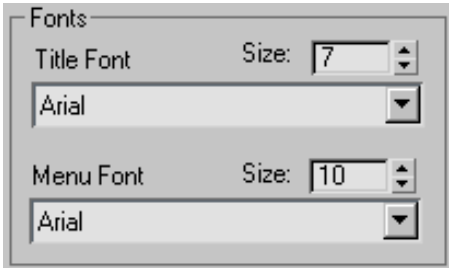
Reposition Quad When Off Screen—Automatically repositions the quad menu when you open it with part of the menu off the edge of the screen. The menu is moved so that the entire menu is displayed on the screen.

Move Cursor When Repositioned—Moves your cursor to the new location of the quad menu when it is repositioned.

When this is turned off, you must hold down the mouse button when you right-click to display the quad menu. Once you move the cursor over the menu, you can release the mouse button.

Return Cursor After Repositioned—After you have selected an action from the quad menu, the cursor is returned to the location on the screen where the original right-click was made.

Fonts group



Title Font—Sets the font of the quadrant titles.

Size—Sets the font size of the quadrant titles.

Menu Font—Sets the font of the text inside the quadrants.

Size—Sets the font size of the text inside the quadrants.

Animation group

Type—Sets the animation type for the quad menu from the following options:

- **None**—Quad menus display immediately upon right-clicking.

- **Stretch**—Quad menus open by expanding one quadrant at a time, in a clockwise manner. They close similarly; contracting one quadrant at a time, in a counterclockwise manner.
- **Fade**—Quad menus open by fading in from transparent to opaque, and close by fading out from opaque to transparent.

Steps—The number of frames used to complete the animated display of the quad menu.

As this value becomes larger, the transition (small to large, transparent to opaque, etc.) becomes more gradual.

Pause—The time between frames during the animated display of the quad menu.

As this value becomes larger, the animated display of the quad menu slows down.

Edit Button Appearance Dialog

Right-click any button on a custom toolbar. > Edit Button Appearance

Use this dialog to change the appearance of the selected button. You can substitute a different icon for the button, or change to a text button instead. You can also customize the tooltip.

Custom Icons

To make a custom icons, you need a series of four files, each beginning with the same prefix which designates the icon group. You can create these images in any paint program.

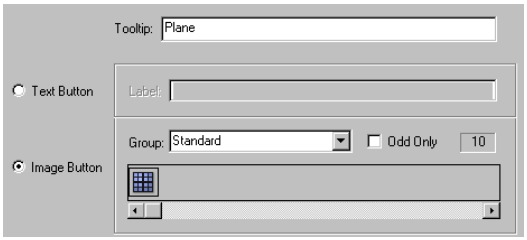
- A 24x24 image for use when large icons are displayed. Suffix: *_24i.bmp*.
- A 24x24 grayscale image showing the transparency of the 24x24 image, with black pixels indicating see-through areas where the gray button background will show through. Suffix: *_24a.bmp*.
- A 16x15 image for use when small icons are displayed. Suffix: *_16i.bmp*.
- A 16x15 grayscale image showing transparency of the 16x16 image. Suffix: *_16a.bmp*

Each file can contain more than one icon, but if so, the icons must be arranged in series one after the other. For example, if you want three icons to appear, the file that ends in *_24i.bmp* would be 72 pixels wide and 24 pixels high, and contain the three icons in series with no space between them.

After you create the icon files, copy them to the *UI/icons* folder and restart 3ds Max. This will enable the software to find and display the group when you access the Edit Button Appearance dialog.

Tip: Look at some of the existing *.bmp* files in the *UI/icons* folder as a guide to arranging custom icons in your *.bmp* files.

Interface



Tooltip—You can add your own tooltips to the buttons. This is the tooltip that displays when the mouse is over the tool button. You can edit this to describe the tool.

Text Button—Lets you assign text to the button. You can enter whatever text you like for the button.

Image Button—Lets you assign an image (icon) to the button. You can use any predefined icon that you want by selecting it from the display on the right.

Group—Displays a list of button categories. The groups of icons change with each category selection.

Odd Only—Certain icon sets, like Internal, Classic, Main toolbar and others, are designed in pairs that show what the tool looks like when the button is enabled, and what it looks like when disabled. When Odd Only is turned on, only the odd numbered icons (enabled) are displayed, when Odd Only is turned off, all of the icons, enabled and disabled, are displayed.

Saving and Loading Custom User Interfaces

You can customize your workspace by saving and loading custom user interface (UI) schemes.

A custom UI scheme is saved as a set of six files:

- ***.cui:*** Stores toolbar and panel layouts.
- ***.clr:*** Stores all color settings (except quad menu colors).
- ***.mnu:*** Stores menu bar and quad menu contents.
- ***.qop:*** Stores quad menu colors, layout, and behavior.
- ***.kbd:*** Stores keyboard shortcut assignments.
- ***.ui:*** Stores the icon scheme (Classic or 2D Black and White).

You can load and save each of these files individually from their respective panels in the *Customize User Interface dialog (page 3–836)*. You can also load an entire set of UI scheme files at once with the *Load Custom UI Scheme dialog (page 3–849)*, and you can save the current UI scheme as a complete set with the *Save Custom UI Scheme dialog (page 3–850)*.

By default, two sets of UI schemes are present in the *3dsmax|UI|* folder: *maxstart* and *defaultUI*. Upon startup, 3ds Max uses the *maxstart* file series if it exists; if not, it uses the *defaultui* series.

Warning: Do not save over any files that begin with *defaultUI*, as doing so will permanently overwrite the default UI scheme.

Procedures

To load a custom UI scheme:

1. Set up the custom UI scheme within 3ds Max using the options on the Customize menu > *Customize User Interface dialog (page 3–836)*.
2. Save the custom UI scheme with Customize menu > Save Custom UI Scheme.
3. During your current 3ds Max session or any later session, choose Customize menu > Load Custom UI Scheme.
4. In the Load Custom UI Scheme dialog, select a type of customization file (*.cui*, *.mnu*, *.clr*, *.kbd*, *.qmo*, or *.ui*) from the Files of Type drop-down list.
5. Choose any file with the appropriate extension. The software will search for (and load) any other type of UI scheme file with the same base file name.

   If you choose a UI scheme for which one of the six file types is not present, the part of the user interface for which there is no file will not be changed.

To return to the default UI scheme:

If you start 3ds Max and its user interface has an unfamiliar layout, you can always return to the default UI scheme.

1. Choose Customize > Load Custom UI Scheme.
2. From the Load UI File dialog that displays, choose *defaultui.cui*, and click Open.

All the default UI files begin with the base file name *defaultui*. When you choose *defaultui.cui*, all default UI scheme files will load.

To start the software with a custom user interface:

1. Arrange the user interface as you would like it to appear when you start 3ds Max.
2. Choose Customize menu > Save Custom UI Scheme, and save your custom UI scheme with the base file name *maxstart*.

   The next time you start 3ds Max, the software will start with the current UI scheme.

   Note: If the Save UI Configuration On Exit option on the Customize menu > Preferences > *General tab (page 3–859)* is turned on (which it is by default), the state of the user interface when you close the program will overwrite the *maxstart* UI scheme files.

To start the software with a custom user interface from the command line:

1. Save your custom UI scheme with a descriptive base file name with the *Save Custom UI Scheme dialog (page 3–850)*.
2. Right-click the 3ds Max icon on the Windows desktop, and choose Properties.
3. In the Target field, change **3dsmax.exe** to **3dsmax.exe -c**, followed by the name of your *.cui* file.

   Example: **3dsmax.exe -c myfile.cui**. Be sure to leave a space both before and after the **-c**.

If you want to move the UI scheme to a different computer, copy all the files in the *3dsmax|UI|* folder that start with the custom UI scheme base name to the new *3dsmax|UI|* folder. Alternately, you can add the path name to the command line.

To save a single UI scheme file:

1. Choose Customize menu > *Customize User Interface (page 3–836)*.
2. Access the panel for the type of user interface item you want to save.
3. On the panel, click Save.

To change the icon display from Classic to 2D Black and White:

1. Choose Customize menu > Save Custom UI Scheme, enter a filename, and click Save.
2. On the Custom Scheme dialog, next to Icon Type, choose the type of icon you want to display.
3. Click OK to close the dialog and save the scheme.
4. Choose Customize menu > Load Custom UI Scheme and then open the UI scheme you just saved.

Load Custom UI Scheme

Customize menu > Load Custom UI Scheme

On the Load Custom UI Scheme dialog, you specify the base file name of the custom UI scheme you want to load. You can select any type of UI scheme file from the dialog, and the software will load any other type of UI scheme files with the same base file name.

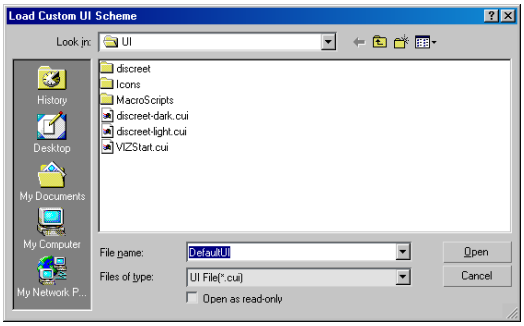
To save a custom UI scheme, use the *Save Custom UI Scheme dialog (page 3–850)*.

For more information on saving and loading custom user interfaces, see *Saving and Loading Custom User Interfaces (page 3–848)*.

You can also load a custom UI scheme with the *Custom UI and Defaults Switcher (page 3–833)*.

Interface

Tip: You can resize the dialog by dragging an edge or a corner.



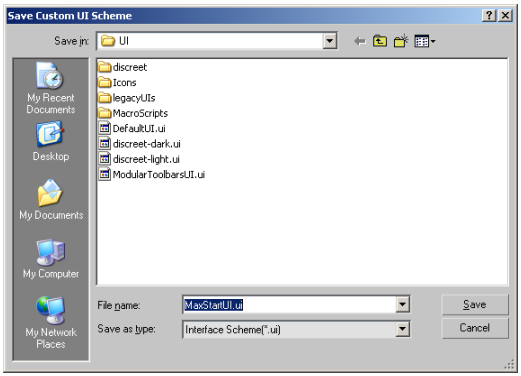
Use the Look In field to navigate to other directories. Click the folder to choose it. The files display in the window. Display or hide the details using List or Details buttons. If Details is turned on, you can sort by clicking the column labels in the window.

Use the Files of type drop-down menu to search for other types of customization files. The default is *.cui*, but you can also search for *.clr, .mnu, .kbd, .qop*, and *.ui* files. When you choose a filename, all files with that base file name will be loaded.

Save Custom UI Scheme

Customize menu > Save Custom UI Scheme

This standard Windows file save dialog lets you save your customized UI scheme.



This dialog works differently from other dialogs that save files. In this dialog, after you enter a base file name and click Save, the Custom Scheme dialog appears. On the Custom Scheme dialog, you set the types of user interface schemes to save. A file is saved for each type of scheme you select, each with a specific extension for that type of scheme. When you load any one of the custom UI scheme files with the *Load Custom UI Scheme dialog (page 3–849)*, the entire set of files with the same base file name will be loaded.

On the Save Custom UI Scheme dialog, the base name of the current UI scheme is filled in by default. You can enter the name of the base file name in the File Name field, or click in the list to choose an existing base file name. You can click a file with any UI scheme extension to save to the base file name from that file.

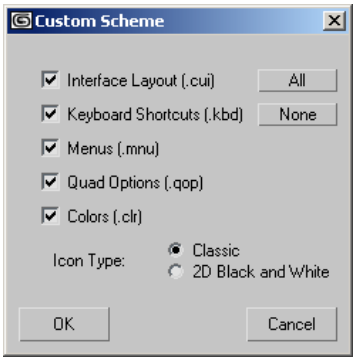
If you want the current UI to load automatically every time you load 3ds Max, you can save to the base file name *maxstart*. Alternately, you can turn on the Save UI Configuration On Exit option on the Customize menu > Preferences > *General tab (page 3–859)*. This will cause the UI scheme that is current at the time you close 3ds Max to be saved to the base file name *maxstart*. This option is on by default.

Warning: Do not save over the base file name *defaultUI*, as doing so will permanently overwrite the default UI scheme files.

For more information on saving and loading custom user interfaces, see *Saving and Loading Custom User Interfaces (page 3–848)*.

Interface

After you enter a file name and click Save, the Custom Scheme dialog opens, letting you define which parts of the UI scheme will be saved.



Tip: You can resize the dialog by dragging an edge or a corner.

Interface Layout (.cui)—When on, saves the current toolbar and panel layout to a *.cui* file with the UI Scheme base file name.

Keyboard Shortcuts (.kbd)—When on, saves the current keyboard shortcuts to a *.kbd* file with the UI Scheme base file name.

Menus (.mnu)—When on, saves the menu layout to a *.mnu* file with the UI Scheme base file name.

Quad Options (.qop)—When on, saves the quad menus to a *.qop* file with the UI Scheme base file name.

Colors (.clr)—When on, saves the current color definitions to a *.clr* file with the UI Scheme base file name.

Icon Type—Selects the icon scheme for all toolbars, and saves this information in a file with the extension *.ui* after the UI Scheme base file name.

Note: The icon scheme you choose will be saved as part of the file set, regardless of whether the chosen icon scheme matches the current scheme displayed on your screen.

All—Turns on all of the above controls.

None—Turns off all of the above controls.

OK—Closes the dialog, and saves all of the selected UI Scheme files.

Cancel—Closes the dialog without saving any UI Scheme files.

Revert to Startup Layout

Customize menu > Revert to Startup Layout

Revert to Startup layout automatically loads *_startup.ui*, which returns the user interface to its startup settings. This temporary system file is created automatically when you start the program. Use this option to return the UI to startup settings.

See *Load Custom UI Scheme (page 3–849)* for information on how to load different UI schemes on startup.

If you have Save UI Configuration On Exit turned on in the *General panel (page 3–859)* of the Preferences dialog, the current UI file is overwritten when you exit the program.

Procedure

To revert to the startup UI:

- Choose Customize > Revert To Startup UI Layout. UI elements are rearranged to look as they did when you started the program.

Configure Paths

Configure Paths

Customize menu > Configure User Paths

Customize menu > Configure System Paths

Configure Paths functionality is available in two dialogs:

- Paths that *you* use to specify locations for bitmaps, scenes, etc. are found on the *Configure User Paths dialog (page 3–852)*. In addition, the latter dialog now lets you save, load, and merge path-configuration files, which makes it easier for content-creation teams to set up the same folders for all team members to use.
- Paths used by 3ds Max, such as for loading fonts and defaults, are accessible via the *Configure System Paths dialog (page 3–854)*.

See also

Asset Tracking dialog > Paths menu (page 3–495)

Configure User Paths

Customize menu > Configure User Paths

3ds Max uses stored paths to locate different kinds of user files, including scenes, images, DX9 effects (FX), photometric, and MAXScript files. You use the Configure User Paths command to display the Configure User Paths dialog and customize these paths. This command is useful when you add new folders to help you organize your scenes, images, plug-ins, backups, and so on.

You can save, load, and merge the paths that the Configure User Paths dialog manages in MXP (max path) files. This makes it easy for all members of content-creation teams to keep projects organized and work efficiently by using the same paths.

See also

Configure System Paths (page 3–854)

Procedures

In general, these procedures are common to all panels on the Configure User Paths dialog. When you change a setting, it's written to the *3dsmax.ini* file, and is effective immediately.

To modify a path:

1. Click a path entry to highlight it.
2. Click Modify.
3. Use the Choose Directory dialog to do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
4. Optional step (3rd Party Plug-Ins panel only): Edit the description of the path in the Label field.

   This description subsequently appears in the path list.
5. Click Use Path.

   The new path takes effect immediately.

To add a path:

This procedure is not available on the File I/O panel.

1. Click Add.
2. On the dialog that opens, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.

3. Optional step (3rd Party Plug-Ins panel only): Edit the description of the path in the Label field.

   This description subsequently appears in the path list.

4. If you want to include subdirectories in this path, turn on Add Subpaths.

5. Click Use Path.

   The new path takes effect immediately.

To delete a path:

This procedure is not available on the File I/O panel. In addition, it's not available on the 3rd Party Plug-ins panel if only one plug-ins path exists. In other words, you can't delete the last plug-ins path.

1. On the External Files panel, choose a path entry.

2. Click Delete.

   The path location is removed.

3. If you want to restore the path, click Cancel.

   This closes the Configure User Paths dialog without saving any path changes.

To share User paths with team members:

1. Use the Configure User Paths dialog to set up all necessary user paths.

2. Click the Save As button and then use the Save Paths To File dialog to save the path configuration as an *.mxp* file.

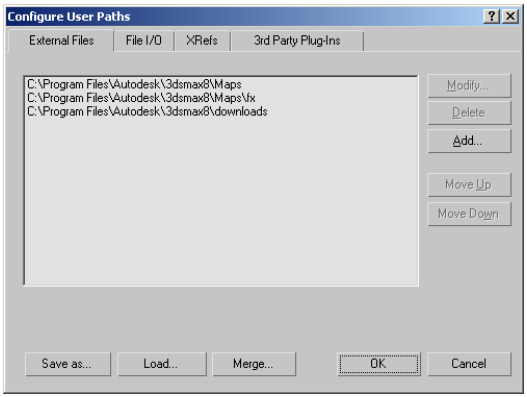
3. Make the path configuration file available to other team members.

4. Each team member then opens the Configure User Paths dialog and uses Load or Merge to open the path configuration file.

   The new path configuration is now the same on each team member's machine.

   Note: Using Load eliminates the existing path configuration; using Merge overwrites only paths that exist in both the current configuration and the new one.

Interface



The Configure User Paths dialog comprises four panels:

- *External Files (page 3–855)*
- *File I/O (page 3–856)*
- *XRefs (page 3–857)*
- *3rd Party Plug-Ins (page 3–857)*

In addition, the dialog provides command buttons on the right side and across the bottom:

Modify—Lets you change the highlighted path.

Delete—Lets you delete the highlighted path.

Add—Lets you add a new path. Not available on the File I/O panel.

Move Up/Down—Lets you change the highlighted path's position in the list to alter its search priority. Available only on the External Files and XRefs panels.

Save as—Lets you save the path configuration as an MXP file for sharing with team members.

Load—Loads a path configuration from an MXP file. The loaded configuration completely replaces the existing one.

Merge—Merges a path configuration from an MXP file. The merged configuration adds paths that exist only in the new file and replaces any existing paths.

For example, if your File I/O panel > Scenes path is set to *c:|3dsmax8|scenes* and you merge a path configuration file in which the Scenes path is set to the UNC path *||scene_server|max|scenes*, the former path is replaced by the latter one.

OK—Exits the dialog and saves any changes.

Cancel—Exits the dialog without saving changes.

Configure System Paths

Customize menu > Configure System Paths

The 3ds Max system uses paths to locate different kinds of files, including defaults, fonts, and startup MAXScript files. You use the Configure System Paths command to open the Configure System Paths dialog and customize these paths.

3ds Max saves the paths that the Configure System Paths command manages in the *3dsmax.ini* file.

See also

Configure User Paths (page 3–852)

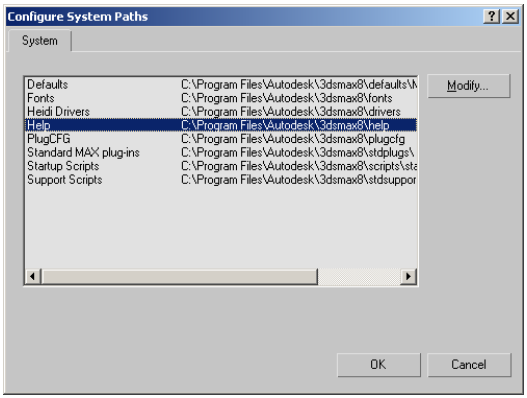
Procedure

To modify a path:

1. Click a path entry to highlight it.
2. Click Modify.
3. Use the Choose Directory dialog to do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
4. Click Use Path.

   The new path takes effect immediately.

Interface



The dialog specifies paths for the standard support files. You can specify one path for each of the following file types:

File Type	Function
Defaults	Path for market-specific defaults
Fonts	Path for font files
Heidi Drivers	Path for display drivers for the software
Help	Path for online help files
PlugCFG	Path for plug-in configuration files
Standard MAX plug-ins	Path for plug-ins included with 3ds Max
Startup Scripts	Path for MAXScript scripts automatically loaded when 3ds Max first runs
Support Scripts	Path for scripts that are used by other scripts

Changing Font Paths

If you change your font paths, you will need to restart 3ds Max before the change can occur. Since fonts are loaded only at first use, changing the font path later in the program has no effect, if the font manager has been used by the program.

External Path Configuration

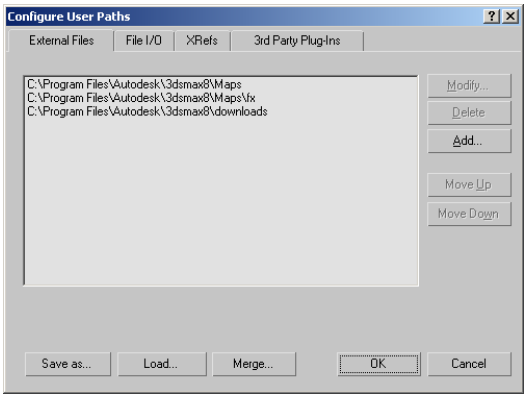
Customize menu > Configure User Paths > Configure User Paths dialog > External Files panel

On the External Files panel of the Configure Paths dialog, you can add or modify path directories for *bitmaps (page 3–1011)*, *DX9 effects (FX) files (page 3–1040)*, and downloads; that is, files transferred from the Internet via *i-drop (page 3–524)*. Bitmaps are used for background images and *mapped materials (page 3–1062)* (textures, bump maps, displacement maps, and so on). FX files are used by the *DirectX 9 Shader material (page 2–1422)*.

3ds Max stores the path of any file you load. When the file is reloaded, the search order is as follows:

1. The path saved with the file.
2. The directory of the current scene.
3. The paths listed in the External Files panel, starting at the top of the list.

   Note: To save loading time, if a map with the same name is in two different locations (paths), it is loaded only once. This poses a problem only if your scene includes two different maps with the same name. In this case, only the first map encountered will appear in the scene.



For descriptions of the general dialog controls, see *Configure User Paths (page 3–852)*.

Procedures

To modify a file path:

1. On the External Files panel, choose a path entry.
2. Click Modify.
3. In the Choose Directory dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
4. Click Use Path.

   The new path takes effect immediately.

To add a file's path:

1. On the External Files panel, click Add.
2. On the Choose New Bitmap Path dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
3. If you want to include subdirectories in this path, turn on Add Subpaths.
4. Click Use Path.

   The new path takes effect immediately.

To delete a file's path:

1. On the External Files panel, choose a path entry.
2. Click Delete.

   The path location is removed.
3. Click Cancel to restore the path.

   This closes the Configure Path dialog without saving any path changes.

To move a path up or down in the list:

1. On the External Files panel, choose a path entry.
2. Do one of the following:

- Click Move Up to move the entry closer to the top of the list, giving it a higher priority in the search process.
- Click Move Down to move the entry closer to the bottom of the list, giving it a lower priority in the search process.

File I/O Path Configuration

Customize menu > Configure User Paths > Configure User Paths dialog > File I/O panel

The File I/O panel of the Configure User Paths dialog contains most of the file directories in which users store files.

For descriptions of the general dialog controls, see *Configure User Paths (page 3–852)*.

Procedure

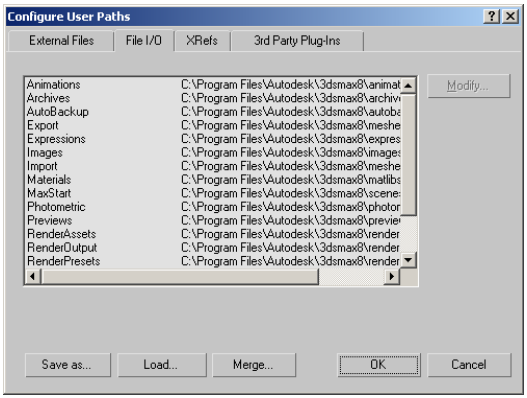
To modify a file path:

1. On the Configure User Paths dialog, click File I/O, and then choose a path entry.
2. Click Modify.
3. In the Choose Directory dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
4. Optional step: Enter a description of the path in the Label field.

   This description subsequently appears in the path list.
5. Click Use Path.

   The new path takes effect immediately.

Interface



Animations—Path for animation (ANM) files.

Archives—Path for archive files.

AutoBackup—Sets the default path for automatic backup files. If you use the *Auto Backup feature (page 3–870)*, use either the *|autoback* directory, which is specific to each running version of the software, or a directory that's not shared by any other machine.

Export—Path for exported files.

Expressions—Path for text files used by expression controllers.

Images—Path for image files.

Import—Path for imported files.

Materials—Path for material library (MAT) files.

MaxStart—Path for *maxstart.max*, which provides initial 3ds Max scene settings.

Photometric—Path for photometric files, which define various characteristics of *Photometric lights (page 2–1155)*

Previews—Path for preview renders.

RenderAssets—Path for mental ray and other rendering asset files, including shadow maps, photon maps, final gather maps, MI files, and render passes.

RenderOutput—Path for rendered output.

RenderPresets—Path for Render Preset files.

Scenes—Path for MAX scene files.

Scripts—Loads and saves MAXScripts.

Sounds—Loads sound files.

VideoPost—Loads and saves Video Post queues.

XRefs Path Configuration

Customize menu > Configure User Paths > Configure User Paths dialog > XRefs panel

On the XRefs panel of the Configure User Paths dialog, you can add to or modify the directory locations in which 3ds Max searches for XRef objects and XRef scenes.

You expand the default locations of XRef files by adding paths to this panel. Use this technique to identify the directories most often used in your scenes.

3ds Max stores the path of any XRef file you load. When the XRef is re-loaded, the search order is as follows:

1. The path saved with the XRef file.
2. The directory of the current scene.
3. The paths listed in the Configure Paths dialog > XRefs panel, starting at the top of the list.

For descriptions of the general dialog controls, see *Configure User Paths (page 3–852)*.

Procedures

To modify an XRef file path:

1. On the XRefs panel, choose a path entry.
2. Click Modify.
3. On the Choose Directory dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path, and click Use Path.

To add an XRef path:

1. On the XRefs panel, click Add.
2. On the Choose Directory dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
3. If you want to include subdirectories in this path, turn on Add Subpaths.
4. Click Use Path.

   The new path takes effect immediately.

To delete an XRef path:

1. On the XRefs panel, choose a path entry.
2. Click Delete.

   The path location is removed.
3. Click Cancel to restore the path.

   This closes the Configure Path dialog without saving any path changes.

To move a path up or down in the list:

1. On the XRefs panel, choose a path entry.
2. Do one of the following:
   - Click Move Up to move the entry closer to the top of the list.
   - Click Move Down to move the entry closer to the bottom of the list.

Plug-Ins Path Configuration

Customize menu > Configure User Paths > Configure User Paths dialog > 3rd Party Plug-Ins panel

On the 3rd Party Plug-Ins panel of the Configure User Paths dialog, you can add or modify the directory paths of Standard and *plug-ins (page*

3–1089) supplied by third parties and independent software developers. You can also store plug-ins in separate directories and use this panel to add the paths of those directories. Changing the list order specifies the search order. Put the most frequently used plug-ins at the top.

Path information is stored in the *plugin.ini* file.

Note: To change the path for standard plug-ins included with 3ds Max, use the *Configure System Paths (page 3–854)* function.

For descriptions of the general dialog controls, see *Configure User Paths (page 3–852)*.

Procedures

To modify a plug-in path:

1. On the 3rd Party Plug-Ins panel, choose a path entry.
2. Click Modify.
3. On the Choose Directory dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
4. Click Use Path.

   The new path takes effect immediately.

To add a plug-in path:

1. On the 3rd Party Plug-Ins panel, click Add.
2. On the Choose Directory dialog, do one of the following:
   - Enter a path in the Path field.
   - Navigate to locate a path.
3. Type a description in the Label field.
4. If you want to include subdirectories in this path, turn on Add Subpaths.
5. Click Use Path.

   The new path takes effect immediately.

To delete a path:

1. On the 3rd Party Plug-Ins panel, choose a path entry.
2. Click Delete.

   The path location is removed.

Network Plug-In Configuration

You can include path annotations to additional INI files within the local *plugin.ini* and the software will process the files as if they were part of the original *plugin.ini*. This can be very helpful in settings where several systems on a network are using the same plug-ins. The network administrator need only maintain a single remote INI file, rather than having to update each machine individually.

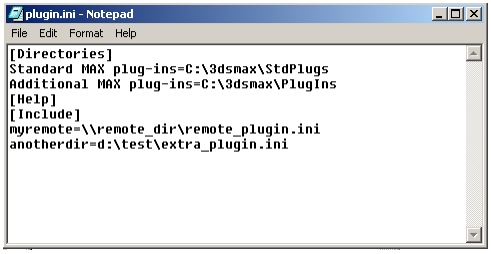
Procedure

Example: To add remote INI files to your local *plugin.ini*:

1. Open your local copy of *plugin.ini* with your preferred text editor.
2. At the bottom of the file, type **[Include]** and press ENTER.
3. Below [Include], type these *two* lines:

   myremote=\\remote_dir\remote_plugin.ini

   anotherdir=d:\test\extra_plugin.ini



Note: You can give any title to the directory (*myremote* or *anotherdir*, in this case) and the

directory can be any local or remote directory. In addition, the INI file can have any name.

4. Save *plugin.ini* and exit the text editor.

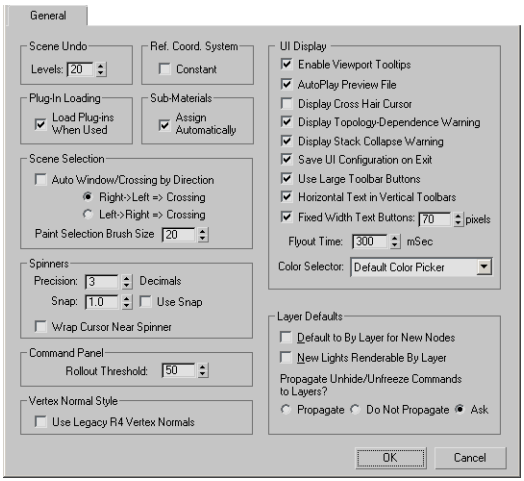
   The next time you start the software, it will load plug-ins from the directories defined in *plugin.ini*, as well as those in any remote INI file that has been included in *plugin.ini*.

   You can add as many remote INI files as you need, making it easy to organize groups of plug-ins.

Preferences

Customize menu > Preferences

3ds Max offers many options for its display and operation. These options are available on the Preference Settings dialog in a series of tabbed panels.



The Preference Settings dialog contains the following panels:

General Preferences (page 3–859)

File Preferences (page 3–870)

Viewport Preferences (page 3–874)

Gamma and LUT Preferences (page 3–873)

Rendering Preferences (page 3–863)

Animation Preferences (page 3–868)

Inverse Kinematics Preferences (page 3–865)

Gizmos Preferences (page 3–877)

MAXScript Preferences (page 3–879)

Radiosity Preferences (page 3–866)

mental ray Preferences (page 3–867)

General Preferences

Customize menu > Preferences > Preferences dialog > General tab

On the General panel of the Preference Settings dialog, you set options for the user interface and for interactivity.

Interface (page 3–860)

Procedures

To set and toggle spinner snap:

1. Do one of the following:
   - Choose Customize menu > Preferences > Preference Settings dialog > General tab.
   - Right-click the Spinner Snap button on the main toolbar.

   Either method brings up the General tab. The two controls for spinner snap are in the Spinners area of this panel.
2. Enter a value in the Spinner Snap field.
3. Turn on Use Spinner Snap.

   When you exit the dialog, Spinner Snap is on.

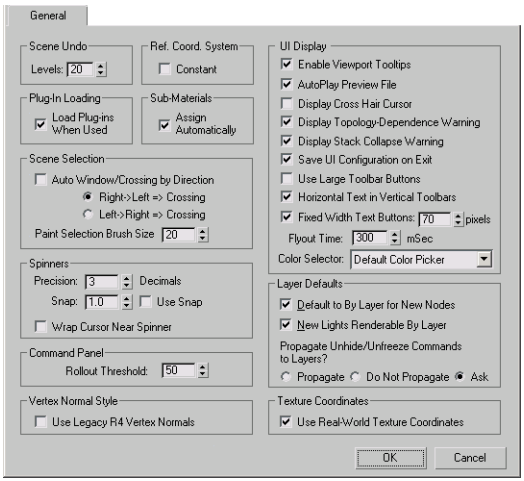
4. As you work, use the Spinner Snap button to toggle the use of this setting.

To set the Undo level:

1. Choose Customize menu > Preferences > Preference Settings dialog > General panel.
2. Change the value of Scene Undo Levels.

   The higher the value of Undo Levels, the more system resources are required. The default value is 20.

Interface



Scene Undo group

Levels—Sets the number of operations you can undo. You can see the operation that will be undone by looking at Undo on the Edit menu.

Reference Coordinate System group

Constant—Sets one coordinate system and transform center for Move, Rotate, and Scale on the Main toolbar. The coordinate system displayed in the *coordinate dropdown list (page 1–423)*, and the transform center selected from the *Use Center flyout (page 1–426)*, are used for all transforms.

Normally, each transform switches to the coordinate system and transform center used the last time the transform was active.

UI Display group

Enable Viewport Tooltips—Displays a tooltip when the cursor pauses over a non-selected object in the viewports if you are not in sub-object mode. Tooltips show the names of objects.

AutoPlay Preview File—Starts the Media Player automatically at the end of a *Make Preview (page 3–163)*.

Display Cross Hair Cursor—Displays the mouse cursor as full-viewport cross hairs, vertical and horizontal lines extending the full extent of the active viewport.

Each movement of the mouse is redrawn, so the cross hairs are relatively slow. If you want to create a keyboard shortcut, find *Cross Hair Cursor toggle* in Customize menu > Customize User Interface > Keyboard panel and specify the keys to use for the shortcut. If you want to change the color of the cross-hairs cursor, Customize menu > Customize User Interface > Colors panel > Viewports > Cross Hair Cursor and use the color selector to change the cursor color.

Display Topology Dependence Warning—Turns of the topology dependence warning. A warning is displayed if an object has modifiers and sub-object selections, and you choose to edit a modifier or the base object at the bottom of the modifier stack, which can adversely affect the object's topology. You can also turn off the warning in the warning dialog. Default=on.

Display Stack Collapse Warning—Turns off the stack collapse warning. A warning is displayed if an object has modifiers and sub-object selections, and you choose to delete a modifier, which can adversely affect the object's topology. You can

also turn off the warning in the warning dialog. Default=on.

Save UI Configuration on Exit—Restores panels and toolbars to the positions they were in the last time you used the software. Turn this off to restore panels to the state they were in prior to turning on this option.

Use Large Toolbar Buttons—Toggles between large and small toolbar buttons.

Horizontal Text in Vertical Toolbar—Ensures text buttons are displayed horizontally.

If you create a custom toolbar positioned vertically, and you're using text rather than image buttons, you can choose to display either horizontal or vertical text with this option.

Fixed Width Text Button—Specifies the maximum width of text buttons.

You must turn on the Horizontal Text in Vertical Toolbar option, turn this option on, and then set a maximum display size for the text button in pixels. For custom vertical toolbars with text buttons, this option will limit the size of the text display.

Flyout Time—Sets the pause, in milliseconds, between the mouse click and the flyout popping up from the button. Increase this setting only if you need an extra-long delay. Don't decrease the setting much or you may not be able to execute button commands before the flyout takes over.

Color Selector—Choose the default *color selector (page 1–157)*, or a third-party plug-in color selector in the list. The color selector you choose here is used throughout 3ds Max whenever you specify a color.

Plug-In Loading group

Load Plug-Ins When Used—When turned on, loads plug-ins on demand, when they are needed.

Sub-Materials group

Assign Automatically—Enables the automatic creation of a Multi/Sub-Object material when you assign a material to a selection of face sub-objects in an editable object. Default=on.

When on, the assigned material becomes part of the new Multi/Sub-Object material, and is assigned to the face selection. When off, the assigned material is assigned to the entire object.

Note: If the face selection comprises faces with different material IDs, assigned a material to the selection with Assign Automatically turned on results in the software assigning the first unused material ID to all selected faces, thus changing their IDs.

See also *Drag and Drop Sub-Object Material Assignment (page 2–1268)*.

Scene Selection group

Auto Window/Crossing by Direction—When this is enabled, the direction that you drag a selection area determines whether it is a *window or crossing selection (page 1–88)*. This works for any selection area (rectangle, circle, fence, or lasso).

You can select which direction causes a window selection and which causes a crossing selection in the Scene Selection group. When you drag a window selection, the selection region is displayed with a solid line, however when you drag a crossing selection, the selection region is displayed with dashed lines.

Right-> Left => Crossing—When you drag a selection region from right to left, it is a crossing selection. Conversely, when you drag left to right, it is a window selection.

Left-> Right => Crossing—When you drag a selection region from left to right, it is a crossing selection. Conversely, when you drag right to left, it is a window selection.

Paint Selection Brush Size—Sets the size of the brush used by *Paint Selection Region (page 1–82)*.

Spinners group

Precision—Sets the number of decimal places displayed in a spinner's edit field. Range=0 to 10 (where 0 is no decimal places).

Snap—Sets the click increment and decrement values for all of the spinners in 3ds Max.

Use Snap—Toggles spinner snap on and off.

Wrap Cursor Near Spinner—Limits cursor wrapping to an area close to the spinner when you drag to adjust spinner value.

Command Panel group

Rollout Threshold—Determines the number of pixels in a rollout that should be scrollable in the command panel before the rollout is shifted into a separate command panel column.

This option is applicable only when the command panel displays multiple columns.

Layer Defaults group

Default to By Layer for New Nodes—When on, all new objects will have their rendering, motion blur, display, and advanced lighting properties set to *By Layer (page 3–1014)*.

New Lights Renderable By Layer—When on, the Renderable setting (found on the *Object Properties dialog (page 1–112)*) of new lights is determined by the setting of the layer they are created on.

Propagate Unhide/Unfreeze Commands to Layers?—When a layer is hidden or frozen, and you unhide or unfreeze an object in that layer, this choice determines whether the command affects the object or its layer.

- **Propagate**—Unhiding or unfreezing an object in a layer unhides or unfreezes the layer.
- **Do Not Propagate**—Unhiding or unfreezing an object in a hidden or frozen layer affects only the object.
- **Ask**—When this option is active and you unhide or unfreeze objects, a dialog appears asking if you want to apply the operation to the associated layers. If you do, the associated layers are unhidden or unfrozen. Otherwise the operation is applied only to the specified objects.

Vertex Normal Style group

Use Legacy R4 Vertex Normals—By default, 3ds Max uses a new, more accurate method for computing vertex normals from smoothing groups, which improves the way geometry displays in viewports and in rendered output. To use the method from older versions of the software, for compatibility, turn on this check box.

Texture Coordinates group

Use Real-World Texture Coordinates—Controls whether real-world texture coordinates are active or if the old style of texture coordinates are in use. If turned off, the texture coordinate behavior reverts to the old style and texture tile values have a default value of 1, and *Real-World Map Size* for primitives is off. Default=on.

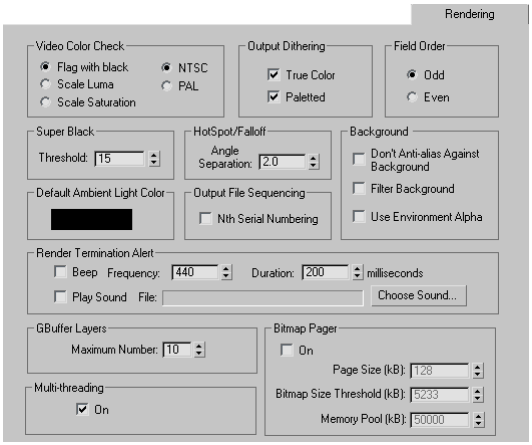
Whenever Use Real-World Texture Coordinates is enabled, the Real-World Scale or Real-World Map Size options will always be on. For example, in the Coordinates rollout for 2D maps, objects such as primitives, modifiers like UVW map, and other objects and modifiers that have the control.

Rendering Preferences

Customize menu > Preferences > Preference Settings dialog > Rendering tab

On the Rendering panel of the Preference Settings dialog, you set options for rendering, such as the default color of ambient light in rendered scenes. The many choices available enable you to reassign the renderers used for production and draft rendering.

Interface



Video Color Check group

Some pixel colors are beyond the safe *NTSC (page 3–1074)* or *PAL (page 3–1082)* threshold. You can choose to flag or modify them to acceptable values.

Flag with Black—Flags all illegal pixels with black to show you the illegality of your image. This mode teaches you how to make correct colors, instead of depending on Scale options. Scale options force a natural discontinuity in the color values. In some cases, that discontinuity can cause visible *aliasing (page 3–1001)*.

Scale Luma—Scales the luminance to bring the color into range, and maintains saturation. This generally makes the illegal areas appear darker than they should be.

Scale Saturation—Scales the chroma to bring the color into range, and maintains saturation. Because this option keeps the brightness levels of the pixels fairly equal to the unscaled ones, this is the more useful of the two scale methods.

NTSC/PAL—Determines the standard for the video color check. See *NTSC (Glossary) (page 3–1074)* and *PAL (Glossary) (page 3–1082)*.

Output Dithering group

Sets output *dithering (page 3–1023)* for all file types.

True Color—Turns dithering on or off for any true color output device. For 24-bit work, you should turn True Color on. For paletted work, you can turn it off.

Paletted—Turns dithering on or off for any 8-bit paletted device.

Field Order group

Odd/Even—Selects the field order of rendered images when the Render to Fields option is turned on in the render dialog. Some video devices require that the even field be first, other video devices require that the odd field be first. Determine the correct field order for your video device. If the video output of your device is strobing or appears jittery, it may be due to incorrect *field (page 3–1032)* order, try changing this parameter and re-rendering your animation.

Super Black group

Threshold—Keeps the *super black (page 3–1112)* threshold above a certain level primarily for luminance keying.

HotSpot/Falloff group

Angle Separation—Locks the spotlight *hotspot (page 3–1048)* and *falloff (page 3–1048)* cones at the angle separation defined by the spinner (degrees). This option constrains the hotspot angle so that it can't equal the falloff and cause aliasing artifacts.

Background group

Don't Antialias Against Background—Ensures that the edges of rendered geometry aren't antialiased against the background. The inside of the geometry is still antialiased. Keep this control off unless you're creating sprites for game development, or require special compositing techniques because the background will not be rendered. In these cases, turning on this option helps avoid generating alpha antialiasing on the outlines of the geometry. Default=off.

Note: You must be rendering against a black background if Don't Antialias Against Background is turned on.

Filter Background—Controls whether or not a background image is affected by the Renderer's antialiasing Filter. See Plate Match /MAX R2.5/VIZ R2 Filter Types in *Default Scanline Renderer Rollout (page 3–37)* for detailed information of filtering background and antialiasing.

Use Environment Alpha—Controls whether or not the renderer uses the environment map's alpha channel in created the alpha for the rendered image. If Use Environment Alpha is turned off, the background is completely transparent. If it is turned on, the alpha of the resulting image is a combination of the scene and image's alpha. Note that only background images with alpha channels or black backgrounds are supported when compositing in other programs such as Photoshop.

Default Ambient Light Color group

Click the color swatch to change the default *ambient light (page 3–1002)* color for renderings. This color will be the darkest color for rendered shadows in the scene.

Output File Sequencing group

Nth Serial Numbering—Specifies whether output frame files generated using a frame-step value other than 1 are numbered sequentially (on) or according to their true frame numbers (off).

Render Termination Alert group

Beep—Beeps when the rendering has finished. You can set the frequency and the duration.

Play Sound—Plays a sound file when the rendering has finished.

Choose Sound—Opens the Open Sound browser dialog, select a sound file using the browser. You can test sound files with the Play button in the Open Sound dialog. Press ESC to turn off the sound.

GBuffer Layers group

Maximum Number—Limits the number of layers that are stored in the G-buffer during rendering. Default=10; Range=1 to 1000.

Memory requirements may dictate that you limit the number of G-buffer layers. The RLA and RLF image formats, used for compositing, can store many G-buffers for object Z buffer information, material ID, transparency and so on.

Multi-threading group

On—Causes the software to treat the rendering task as separate threads. This option works with multiprocessor systems. Each processor in your computer handles a different thread, which makes full use of available processing power and speeds up rendering to its maximum level. When

off, 3ds Max treats a rendering task as a single processing task and won't divide it up.

Bitmap Pager group

The Bitmap Pager can help with the rendering of scenes that have very large textures, a large number of textures, or when rendering a high-resolution image.

Tip: You can access a *Bitmap Pager Statistics dialog (page 3–515)* with useful pager information such as memory usage: Go to Customize menu > Customize User Interface, find the Bitmap Pager Statistics item in the Main UI list, and then assign it as a keyboard shortcut or other UI element.

On—When turned on, the software creates a series of temporary "page" files on the drive where it is installed for use in rendering bitmaps.

Page Size (kB)—Sets the size of the bitmap page. If textures are smaller than the page size, the system allocates only the memory required.

Bitmap Size Threshold (kB)—Sets the minimum size (in kilobytes) that a bitmap must be in order to be paged.

Memory Pool (kB)—Controls the amount of memory used by the pager. All pages remain in memory until this limit is reached. When the limit is reached, the pager begins saving pages to disk. Pages that are not frequently used are paged out; more frequently used pages are kept in memory.

Inverse Kinematics Preferences

Customize menu > Preferences > Preference Settings dialog > Inverse Kinematics tab

On the Inverse Kinematics panel of the Preference Settings dialog, you set options for both applied and interactive *inverse kinematics (page 3–1052)*.

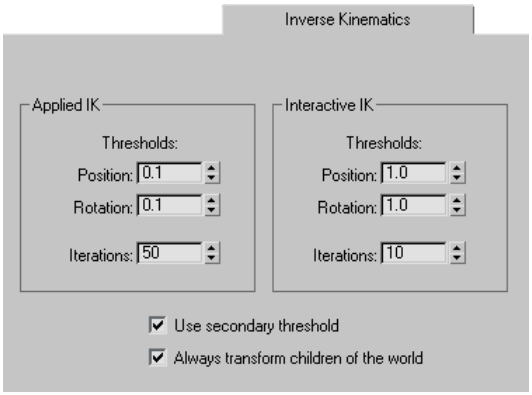
Procedure

To prevent transforming unlinked objects while working in IK mode:

1. Choose Customize menu > Preferences > Preference Settings dialog > Inverse Kinematics tab.
2. On the Inverse Kinematics panel, turn off the option labeled Always Transform Children Of The World.

   Single, unlinked objects are hierarchies of one object. An unlinked object is its own root and also a child of the world, so turning off Always Transform Children Of The World prevents you from transforming single objects in IK mode.

Interface



Applied IK/Interactive IK group

The threshold and iterations settings are a trade-off between accuracy and speed. With the two groups of settings you can individually tune the behavior of Interactive IK and Applied IK. Interactive IK provides fast, real-time response, so you should set Interactive IK preferences for speed. Applied IK provides the *IK solution (page 3–1049)* to match the *follow objects (page 3–1037)* very closely. You should set applied IK preferences for accuracy.

Position—Sets how close the end effector has to get to the follow object or cursor position for the

object to be considered a valid solution. The value represents a distance in the current display unit system. Small values increase accuracy but take longer to solve.

Rotation—Sets how accurately the end effector has to match the orientation of the follow object to be considered a valid solution. The value represents a rotation angle in degrees. Small values increase accuracy but take longer to solve.

Iterations—Sets the maximum number of times 3ds Max repeats the IK calculations to find a valid solution. A high iterations value increases the chance that 3ds Max can calculate a valid IK solution, but the calculation takes longer to complete.

Ungrouped controls

Use Secondary Threshold—Compares the second derivative of the *end effector (page 3–1027)* to a very small threshold. If the derivative is within the threshold, IK is terminated.

Always Transform Children Of The World—Applies when IK is turned on in both move and rotate mode. It affects only an object that's a direct child of the world when the object is selected.

For example, if the root of an IK chain is a child of the world, and you're manipulating an object at the end of the chain (the root object itself isn't selected), any constraints set for the root object will be observed. However, if you select the root object and try to move it, its constraints will be ignored.

Radiosity Preferences

Customize menu > Preferences > Preference Settings dialog > Radiosity tab

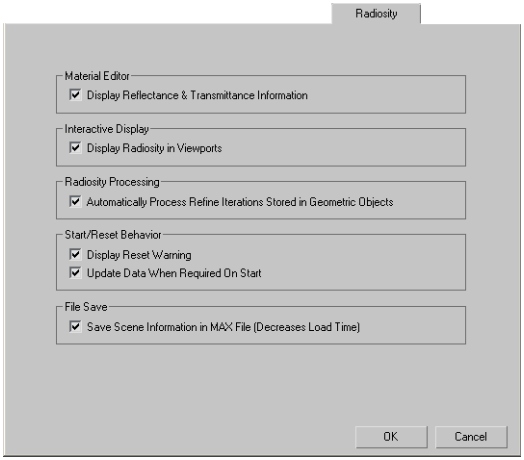
On the Radiosity panel of the Preference Settings dialog, you set options for the *radiosity solution (page 3–50)*.

See also

Modeling Global Illumination with Radiosity (page 3–50)

Radiosity Controls (page 3–60)

Interface



Material Editor group

Display Reflectance & Transmittance Information—When on, *reflectance and transmittance values (page 2–1274)* are displayed in the Material Editor.

Note: In order to make this change effective, you need to close and restart the Material Editor.

Interactive Display group

Display Radiosity in Viewports—When on, radiosity effects are displayed in the viewports.

Radiosity Processing group

Automatically Process Refine Iterations Stored in Geometric Objects—When on, all refine iterations stored in geometric objects are automatically processed.

Start/Reset Behavior

Display Reset Warning—When on, a warning message is displayed whenever you reset the radiosity solution in your scene.

Update Data When Required on Start—When on, the radiosity engine must be reset and then recalculated if the solution is invalidated. In this case, the Start button changes to read Update & Start. When this is pressed, the radiosity solution is reset and the calculation starts over again.

When this toggle is off, the radiosity solution does *not* need to be reset if it is invalidated. You can continue processing your scene with the invalid solution.

Note: The radiosity solution is invalidated any time an object or light is added, removed, moved, or altered in any way.

File Save group

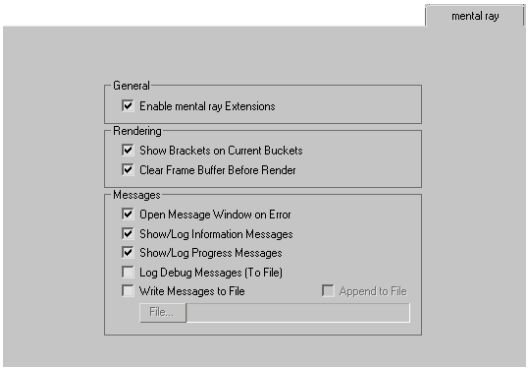
Save Scene Information in MAX file (Decreases Load Time)—The light levels from the radiosity solution are always saved with the file, however when this is on, some additional radiosity information is saved with your scene.

Note: Having this on decreases file load time, but increases the file size.

mental ray Preferences

Customize menu > Preferences > mental ray panel

Interface



General group

Enable mental ray Extensions—When on, enables certain features that provide additional support for the mental ray renderer. When off, these features do not appear in the interface. Default=off.

These are the features enabled as mental ray extensions to 3ds Max:

- *mental ray Connection rollout (page 2–1305)* for materials (Material Editor)
- *mental ray Light Shader rollout (page 2–1189)* (Modify panel for lights)

Warning: If you have assigned shaders and adjusted their settings using the mental ray Connection rollout, turning off Enable mental ray Extensions will *lose all these assignments and settings*. The same applies to light shader assignments.

Rendering group

Show Brackets on Current Buckets—Displays white selection brackets at the corners of the bucket currently being rendered. Default=on.

Clear Frame Window Before Render—When on, before rendering the *rendered frame window (page 3–5)* turns to a gray shade by clearing every other scanline. This makes it easier to see the progress of rendering. On the other hand, it can make it harder to see the effect of small changes to the model or the view. Default=on.

Messages group

Open Message Window on Error—Whenever the mental ray renderer detects an error, it generates an error message. When this option is on, the Messages Window is displayed and the error message appears in it. Default=off.

Show/Log Information Messages—When on, displays informational messages in the Messages Window. Default=off.

Show/Log Progress Messages—When on, displays progress messages in the Messages Window. Default=off.

Log Debug Messages (to file)—When on, writes debug messages to the log file, if one has been specified. Default=off.

Debug messages are never displayed in the Messages Window. The mental ray renderer generates a large number of them, which would make the window hard to read.

Write Messages to File—When on, generates a mental ray *log file (page 3–1058)*. Default=off.

The other log file options are unavailable unless you turn on Write Messages To File:

- **Append to File—**When on, appends messages to the existing file. When off (or if the named file is not found), only new messages are written to the file. Default=off.
- **File—**Click to display a file dialog that lets you choose the name and location of the *.log* file.
- **File name field—**When you have specified a *.log* file, this field shows its name and its path.

Animation Preferences

Customize menu > Preferences > Preference Settings dialog > Animation tab

On the Animation panel of the Preference Settings dialog, you set options relating to *animation (page 3–1003)*. Options include displaying animated objects in wireframe viewports, the assignment of sound plug-ins, and controller defaults.

Procedures

To change the default transform center:

1. Choose Customize menu > Preferences > Preference Settings dialog > Animation tab.
2. Turn off Local Center During Animate in the Animate group.

   This changes the default and activates all the transform center buttons. You can now move about the selection, coordinate center, or local pivot.

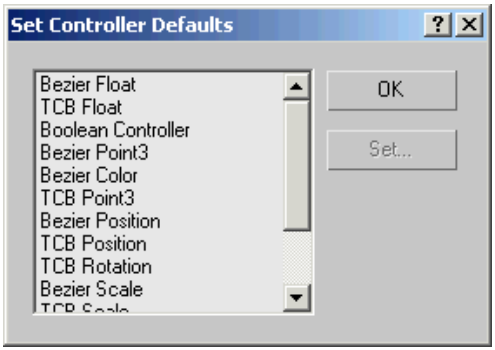
To set the key bracket display:

1. Choose Customize menu > Preferences > Preference Settings dialog > Animation tab.
2. Use the controls in the Key Bracket Display group to specify how you want key brackets displayed in wireframe viewports.

To specify default controller settings:

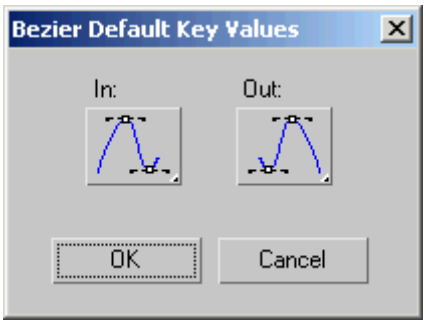
1. Choose Customize menu > Preferences > Preference Settings dialog > Animation tab.
2. Click Set Defaults in the Controller Defaults group.

   The Set Controller Defaults dialog appears.



3. Choose a controller type from the list of available controllers and click the Set button.

   A dialog containing the default settings supported by the selected controller type appears in, for example, the In and Out tangents for a Bezier controller.



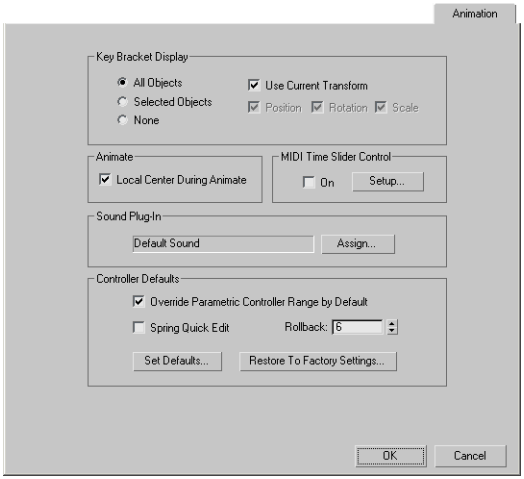
4. Make changes to the controller settings.

   Once you click OK in the Set Controller Defaults dialog, the controller defaults are changed.

   Changes to the controller default settings are written to your *3dsmax.ini* file and become the defaults for all newly assigned controllers and all new scenes.

   If you decide that you want to revert to the original 3ds Max defaults for all controllers, you can click Restore To Factory Settings.

Interface



Key Bracket Display group

When you move to a frame, the software displays white brackets around objects that have transform *keys (page 3–1054)* at that frame, including cameras and lights. These key brackets only appear in wireframe viewport displays.

All Objects/Selected Objects/None—Specifies which objects will display key brackets.

Use Current Transform—Displays brackets only on those frames containing a key for the *transform button (page 3–1120)* (Move, Rotate, or Scale) currently active in the toolbar.

If no transform button is active, a bracket appears when you're on a frame containing any of the three transforms.

Position/Rotation/Scale—Specifies which type of transform displays a bracket. If only Rotation is turned on, brackets appear only on those frames containing Rotation keys. These check boxes become active when Use Current Transform is turned off.

Animate group

Local Center During Animate—Locks the center method to *local (page 3–1057)*. Turn off if you want to animate around a non-local center such as world or selection.

MIDI Time Slider Control group

Enables use of a MIDI device to control the time slider. Choose On to use the MIDI device specified in the *MIDI Time Slider Control Setup dialog (page 3–890)*, which is displayed with the Setup button.

Sound Plug-In group

Assign—Displays a dialog listing all sound plug-ins installed in the system. Select a new plug-in to replace the current one.

Controller Defaults group

Sets the default values for animation controllers capable of supporting default settings. For example, set the default values for tension, continuity and bias in the TCB float controller.

Override Parametric Controller Range By Default—When on, new parametric controllers are active throughout the timeline, independent of their animation range. Otherwise, they respect it and are only active within their range. Refer to *Ignore Animation Range (page 2–526)* and *Respect Animation Range (page 2–527)* for more details. Default=on.

Spring Quick Edit—Toggle to increase the accuracy of all spring controllers in the scene. To be used with the Rollback input field. Default=off.

Note: This option is saved in the *3dsmax.ini* file as *SpringsQuickEdit*.

Note: Turning on this option may impact scene performance.

Rollback—Sets the number the frames a spring controller goes back before becoming invalid. Default=6.

Note: This option is saved in the *3dsmax.ini* file as *SpringsRollingStart*.

Note: Setting a high number may impact scene performance.

Set Defaults—Displays a dialog listing all controllers that can have their default values changed. The Set button becomes available when you choose a controller class from the list.

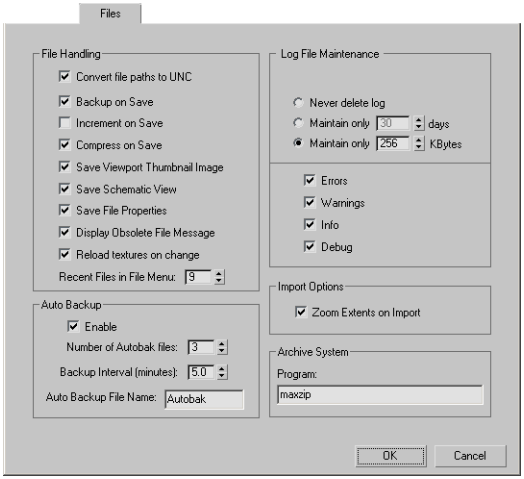
Restore To Factory Settings—Prompts you to verify if you want to reset all controllers to the program's default settings. If you choose Yes, the defaults are reset for all controllers currently in the system.

File Preferences

Customize menu > Preferences > Preference Settings dialog > Files tab

On the Files panel of the Preference Settings dialog, you set options relating to file handling. You also select the program used for archiving. This is where you control the options for log file maintenance. You can enable Auto Backup in this dialog to save your work automatically at defined intervals.

Interface



File Handling group

Convert file paths to UNC—When on, paths shown in the user interface for any files present on a mapped drive use *Universal Naming Convention (UNC) format (page 3–1122)*. When off, each path starts with the mapped drive letter (e.g., *w:*).

This check box is linked to the *Convert file paths to UNC* switch on the Asset Tracking dialog > Paths menu. Toggling either one toggles both.

Note: This switch affects only newly added paths. Toggling it has no effect on existing paths. For example, if you load an image file into a *Bitmap map (page 2–1441)* from a mapped drive with the switch on, turning it off does not change the file path to the mapped version.

Backup on Save—Creates a backup file if a file of the same name already exists. The existing file is renamed *maxback.bak* and placed in the *autoback* directory before the save occurs. You can edit the automatic backup settings in the *Auto Backup group (page 3–872)*. Default=on.

Increment on Save—Creates a new copy of the file in the same directory whenever you save the file. The name of the new file is incremented by 1 (*filename01.max, filename02.max,* and so on). Default=off.

Compress on Save—Saves the 3ds Max file in a compressed format. Depending on the details of the file, the compressed file can be as small as one-fifth the size of its uncompressed equivalent. Default=off.

You can determine whether a 3ds Max file is compressed or not by bringing up Properties for the file in Windows Explorer. On the Contents panel, under General, you'll see whether the file is compressed or uncompressed.

Save Viewport Thumbnail Image—Saves a 64-pixel thumbnail of the active viewport when you save each MAX file. The Asset Browser reads thumbnails. Saving thumbnails adds about 9K to each MAX file. Default=on.

Save Schematic View—When on, the active schematic view is saved with the MAX file. Default=on.

Save File Properties—When on, any data entered in the *File Properties dialog (page 3–501)* is saved with the scene file and can be accessed with Windows Explorer and *File Finder (page 3–511)*. When off, the file properties information is not stored with the file. Default=on.

Display Obsolete File Message—Turns off the "Obsolete data format found - Please resave file" alert that is displayed when you load a MAX file created in an earlier version of 3ds Max. Default=on.

There is a matching "Do not display this message" check box in the alert itself, and you can also turn off the alert from there.

Reload textures on change—When on, reloads bitmapped textures if the date of the bitmap file has been updated. Default=on.

Recent Files in File Menu—Sets the maximum number of recently edited MAX files to display

in the list File > Open Recent. Range=0 to 50. Default=9.

Auto Backup group

Auto Backup saves your work periodically. In the event of a power failure, if you have not saved your work, you can load in an auto backup (autoback) file from the *autoback* subdirectory in the program directory and continue working with little lost work.

Auto Backup creates auto backup files based on a time interval. The name of an auto backup file is *autobakn.max,* where *autobak* is the main part of the name (*autobak* is the default), and *n* is an integer from 1 to 9.

For example, if you've set Auto Backup to create three auto backup files at one-minute intervals, Auto Backup will create *autobak1.max*, and then a minute later *autobak2.max*, and then *autobak3.max.* At the fourth minute, the system overwrites *autobak1.max*, and so on.

Enable—Enables Auto Backup.

Number of Autobak Files—Determines how many backup files to write before overwriting the first one. Range=1 to 9.

Backup Interval (minutes)—Determines the number of minutes between backup file generation.

Auto Backup File Name—Lets you enter an alternative name for the auto backup file. Auto backup files with a different name still have the filename extension *.max*. Default="Autobak".

Log File Maintenance group

The following controls affect the *max.log* file.

Never Delete Log—Determines how long the log file is maintained. When you choose Never Delete, the *max.log* file remains on the hard disk and continues to grow.

Maintain Only...Days—Resets the file to zero bytes after it reaches the number of days specified in this field.

Maintain Only... Kbytes—Resets the file to zero bytes after it reaches the number of kilobytes specified in this field.

Errors—Writes fatal errors to the *max.log* file instead of generating Alert dialogs. Alerts halt network rendering for one or more servers.

Warnings—Writes warning messages to the *max.log* file instead of generating Alert dialogs.

Info—Writes general information to the *max.log* file instead of generating Alert dialogs.

Debug—Writes debug messages to the *max.log* file instead of generating Alert dialogs.

The type of errors covered by these four categories include maps that can't be found, missing UV coordinates, missing output directories, full disks, missing DLLs, disks to which you don't have access, invalid meshes, and obsolete MAX files

Import Options group

Zoom Extents on Import—Zooms all viewports to scene extents after importing a file. If this is turned off, zoom extents isn't performed.

Archive System group

Program—Specifies the name and location of the program to use for archiving. The program must be independently installed on your system. You can add command-line arguments to follow the executable file name. For example, for the PKZIP program, the arguments might be:

project1.zip c:proj0?.max -o

Gamma and LUT Preferences

Customize menu > Preferences > Preference Settings dialog > Gamma tab

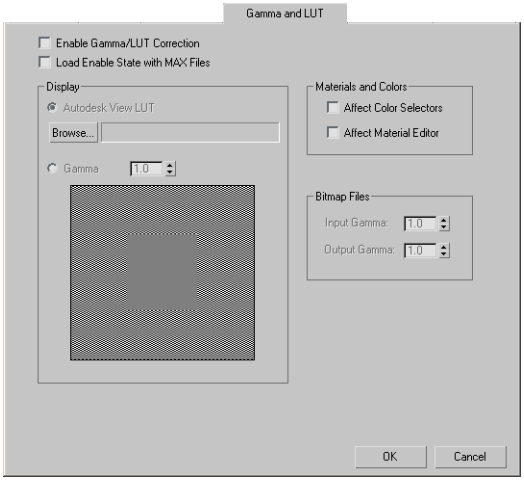
On the Gamma and LUT panel of the Preference Settings dialog, you set options to adjust the *Gamma (page 3–1042)* and lookup-table (LUT) values for input and output images and for the monitor display.

The LUT functionality provides support for the same-named feature in other Autodesk Media and Entertainment software such as Combustion and the systems suite: Inferno, Flint, Smoke, etc. This feature allows studios to implement a consistent way of displaying colors, assuming that their monitors are calibrated to the same reference. Thus 3D artists can produce results that are closer to what the compositor expects by eliminating a variable in the equation: the way colors are displayed on screen.

Note: The lookup table controls available here do not affect exposure control or lighting of the scene. While they do affect the colors of the final image, this is with regard to the display only. By having a reference across a studio (with calibrated monitors), using standardized lookup tables minimizes variability in rendered output.

Also, please note that the LUT system of the systems suite is complex and offers a variety of controls and flavors of lookup tables. This feature integrates the View LUTs only, such as that found in Combustion, where only the displayed images are modified.

Interface



Enable Gamma/LUT Correction—Makes available the controls for adjusting gamma and LUT adjustments you make and applies the adjustments. Turn off to disable gamma/LUT correction.

Load Enable State with MAX Files—Loads the state of Enable Gamma/LUT Correction with each 3ds Max file.

When you choose Load Enable State, and load an 3ds Max file whose Enable Gamma/LUT Correction state differs from the current state, you can make the correction correspond with the setting in the current file or leave the setting as is.

If you have a *maxstart.max* file and you choose this option, new sessions of 3ds Max use the Enable Gamma/LUT Correction state in the file. If you turn this option, off, the file doesn't affect the state of Enable Gamma/LUT Correction.

Display group

You use display gamma or lookup tables for the Material Editor spheres, the color selector, color swatches, and the *rendered frame window (page 3–5)* (Scanline Renderer). Take note of the default

value before you start making adjustments in case you need to restore it.

You can use these controls to load an Autodesk View LUT or adjust gamma numerically; choose either option.

Autodesk View LUT—Click the Browse button and then use the Load LUT File dialog to find and open a LUT file. Thereafter the LUT file name appears in the text field to the right of the button.

Note: 3ds Max does not support generation of LUT files at this time, and no LUT files are included with the software. To create a LUT file, use a program such as Combustion.

Gamma—Adjusts the gamma display for 3ds Max. The field increases or decreases the value (lightness or darkness) of the solid gray center square. Adjust the value until the center square is as close as possible in value to the surrounding checkered square.

If you're creating imagery that will be sent to someone, turn on the Gamma options to assure yourself that the image will look correct at the destination site.

You can also display these gamma settings from the Gamma button in the File Browser dialog, for example, when you are rendering a scene to an image file.

Materials and Colors group

By default, the Gamma setting affects the viewport display, but not the color selectors or the Material Editor. Use these switches to enable gamma control of either or both of these.

Affect Color Selectors—When on, the Gamma setting affects the display of colors on the standard 3ds Max Color Selector dialog. This has no impact on the Object Color dialog, however.

Affect Material Editor—When on, the Gamma setting affects the display of colors on the Material Editor dialog.

Bitmap Files group

Input Gamma—The system input gamma that the software uses to process bitmaps if that bitmap type doesn't override the gamma with its own gamma value. In the case of Targa files, the file's inherent gamma will override the system input gamma. You use the Input Gamma to invert the gamma of bitmaps coming into 3ds Max (for example, texture maps) so that when they are processed by the renderer and re-output, the bitmaps aren't gamma corrected twice.

Tip: If you have gamma enabled when loading texture maps, set your input gamma to the same value as your display gamma, or your maps will be too bright.

Output Gamma—The system output gamma that the software uses to process bitmaps if that bitmap type doesn't override the gamma with its own gamma value.

Viewport Preferences

Customize menu > Preferences > Preference Settings dialog > Viewports tab

On the Viewports panel of the Preference Settings dialog, you set options for viewport display and behavior.

You can also set the current Display Driver.

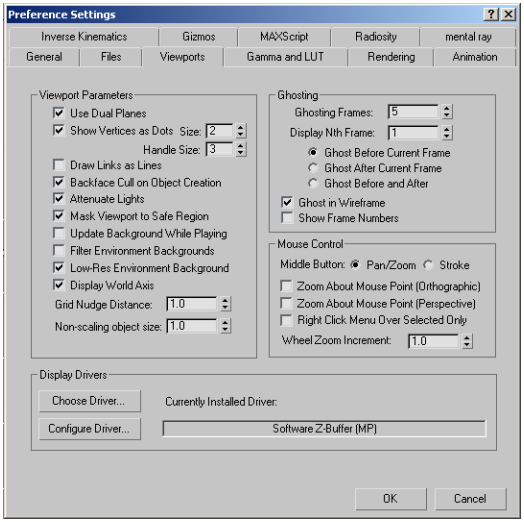
See also

Strokes (page 3–903)

Graphics Driver Setup Dialog (page 3–881)

Configure Driver (page 3–883)

Interface



Viewport Parameters group

Use Dual Planes—Uses the front/back plane system when redrawing the viewport. The selected object is manipulated in the front plane and is redrawn, while other objects remain on the back plane and are not redrawn. This default setting provides the fastest redraws under normal circumstances. If your assigned display driver doesn't support dual planes, this option is not available.

Turn off this setting to improve redraw speed if you are rotating the whole scene or moving a camera through the scene (usually situations in which the whole viewport needs to be redrawn anyway).

Show Vertices As Dots—When on, the software displays vertices in mesh and patch objects as small, solid-color squares, whose size you can set with the Size parameter. When off, the vertex display is a tick mark.

Size—Lets you specify the vertex size displayed in the viewports. Range=2 to 7. Default=2.

Handle Size—Lets you specify the display size for handles attached to patch vertices and spline vertices. Range=2 to 7. Default=3.

Draw Links as Lines—Displays the *hierarchical links (page 3–1045)* between parent and child objects as plain lines, rather than shapes when Display panel > Link Display rollout > Display Link is turned on.Show Links is enabled in the Object Properties dialog.

Backface Cull on Object Creation—Determines whether to display faces with *normals (page 3–1074)* pointing away from view. When turned on, you see through the wireframe to the backfaces. This option applies to wireframe viewport displays only. In most cases, you'll want this item turned on. However, if you're modeling with NURBS surfaces, which consist of single-sided planes, it's easier to view them from all angles when backface culling is turned off.

- This control affects only the created objects, and you can reverse the effect on each object by changing the Backface Cull setting in the Object Properties dialog for that object.You might turn off Backface Cull On Object Creation before creating your NURBS, and then turn it on again when your finished.
- You can globally change the display of backface culling in the viewports by turning on *Force 2-Sided (page 3–896)* on the Rendering Method panel of the Viewport Configuration dialog.

Attenuate Lights—Turns the display of *attenuation effects (page 3–1006)* on or off from start to end in the interactive viewport renderer. When turned off, attenuated lights behave as though there was no attenuation. Default=off.

Mask Viewport to Safe Region—By default, the viewport area outside the outermost safe frame displays the contents of the viewport. When this box is turned on, that area is left blank.

Update Background While Playing—Turns on the updating of bitmaps in the viewport background when you play an animation. You need this capability to check your action against a 2D

rotoscoped (page 3–1097) background, even if your animation plays at 1 frame per second. When turned on, an *IFL, (page 3–666) FLC or, (page 3–662) AVI (page 3–658)* file updates on each frame when you click the Play button. Turn off the *real-time (page 3–1095)* switch in the *Time Configuration dialog (page 3–768)* to use this feature.

In 3ds Max, the viewport updates not only when you click Play, but also when you drag the time slider.

Filter Environment Backgrounds—Affects the background displayed in the viewport only when the *Viewport Background parameter (page 1–38)* is turned on in the Viewport Background dialog.

When you turn on Filter Environment Backgrounds, the environment background is filtered in the viewport, resulting in an antialiased image. When you turn it off, the background image is not filtered, resulting in an aliased, pixelated image.

- Filtering slows down the recalculation of the viewport background image about 30 to 40 percent. Unless you really need that smooth display, it's best to leave the option turned off.
- This option doesn't affect the rendered background image, and doesn't effect the viewport backgrounds when you turn on Use Environment Background.

Low Res Environment Background—Reduces the size of the environment background map by half, and then magnifies it to the size needed for the viewport. This results in a chunkier, pixelated appearance, but speeds the rendering in the viewport by four times (because it halves the width and the height of the original image).

Tip: Unless you need fine detail in your environment background, it's best to leave this item turned on.

Display World Axis—Displays a world axis in the lower-left corner of all viewports when turned on. Default=on.

Grid Nudge Distance—Sets the nudge distance for the Nudge Grid Down and Nudge Grid Up keys, which you can use to move selected objects into position.

Non Scaling Object Size—Sets the display size of cameras, lights, and other nonscaling objects. Default=1.

Display Drivers group

Currently Installed Driver—Displays the name of the currently installed driver.

Choose Driver—Displays the *Display Driver Setup dialog (page 3–881)*. Use this dialog to select a different software display driver, or to switch drivers if you installed a hardware accelerator card.

Configure Driver—Displays the *Configure Driver dialog (page 3–883)*, where you can change the driver options for your currently selected driver.

Ghosting group

Ghosting Frames—Specifies the number of ghost images that appear before and after the current frame when you choose Show Ghosting from the Views menu. If you display ghosts both before and after the current frame, the total number of ghosts is twice this number.

Display Nth Frame—Specifies the number of frames between the appearance of each ghost. The smaller this number, the closer the ghost images appear to each other.

Ghost Before Current Frame—Displays only ghost images that occur before the current frame. This makes the ghosts trail the object.

Ghost After Current Frame—Displays only ghost images that occur after the current frame.

Ghost Before and After—Displays ghosts both before and after the current frame.

Ghost in Wireframe—Displays ghosts in black wireframe in shaded viewports. When turned off, the ghosts appear as shaded objects, using the same colors as the wireframe ghosts.

Show Frame Numbers—Displays a frame number in the upper-left corner of each frame.

Mouse Control group

Middle Button Pan/Zoom—Sets the middle mouse button to pan in the viewport if you have a three-button mouse. If you have a Microsoft Intellimouse, you can also roll the middle wheel to zoom the viewport.

To Zoom with a three button mouse, press CTRL+ALT and drag the center button.

Note: By default, the Intellimouse slows the speed of the mouse when you hold down the wheel button. You can increase the mouse speed in the Mouse Properties dialog in the Windows Control Panel. Choose the Wheel tab, click the Settings button in the Wheel Button group, and turn the slider up to Fast.

Stroke—Assigns command shortcuts to stroke patterns applied by dragging with the middle mouse button. See *Strokes (page 3–903)*.

Zoom About Mouse Point (Orthographic)—When this control is turned on, viewports zoom about the point where you click the mouse. With it turned off, viewports zoom about the center of the view. This applies to orthographic viewports only.

Zoom About Mouse Point (Perspective)—When this control is turned on, viewports zoom about the point where you click the mouse. With it turned off, viewports zoom about the center of the view. This applies to perspective viewports only.

Right Click Menu Over Selected Only—Limits the right-click menu display over a selected object. Default=off.

When this option is turned off; you can right-click anywhere in the viewports to display a menu.

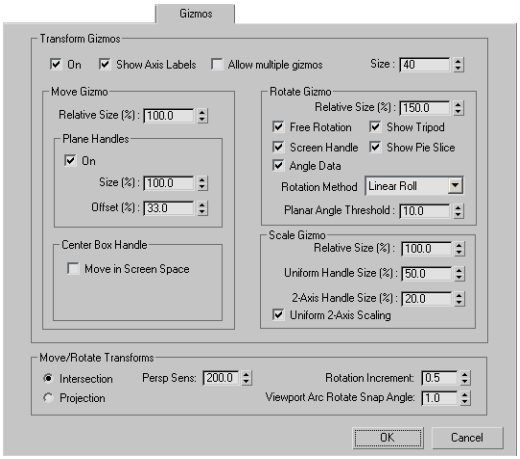
Wheel Zoom Increment—Determines the sensitivity of the zoom when you use the wheel on the mouse. Increase sensitivity up to a maximum value of 100 or reduce it to a minimum of 0.01. Default=1.0.

Gizmos Preferences

Customize menu > Preferences > Preference Settings dialog > Gizmos tab

You set the display and behavior of the *Transform gizmos (page 1–408)* on the Gizmos panel of the Preference Settings dialog.

Interface



Transform Gizmos group

On—When on, 3ds Max uses the Transform gizmo to enable more powerful move, rotate, and scale options. When turned off, a basic tripod is displayed, with no axis specificity.

Show Axis Labels—Toggles the display of the axis labels on the Transform gizmo.

Note: Functionality is maintained when axis labels are turned off.

Allow Multiple Gizmos—Toggles the display of more than one gizmo at a time.

When turned off, a Transform gizmo will only be displayed for one object at a time in a selection set.

When turned on and when Use Pivot Point Center in the Use Center flyout is active, each object in a selection set will have its own transform gizmo.

Size—Sets the size of the Transform gizmo as a percentage of the viewport size. Range=1 to 100.

Move Gizmo group

Relative Size (%)—Sets the size of the Move gizmo, relative to the Size value of the Transform gizmo. Range= 0.0 to 500.0.

Plane Handles group

The plane handles let you constrain object movement along combinations of any two axes.

On—Toggles the use of plane handles on the Transform gizmo.

Size—Sets the size of the plane handles, as a percent of the distance from the Offset to the tripod axis. Range=0.0 to 100.0.

Offset—The percentage of the distance from the gizmo's tripod axis to the outer extent of the Primary axis handles.

For example, 0 = no plane handles; 100 = plane handles extend as far as the Primary axis handles.

Center Box Handle group

The center box can be used as a handle for translations constrained parallel to a viewport.

Move in Screen Space—Toggles the use of the center box handle.

Rotate Gizmo group

Relative Size (%)—Sets the size of the Rotate gizmo, relative to the Size value of the Transform gizmo. Range= 0.0 to 500.0.

Free Rotation—Toggles the use of free rotation.

Note: When this is turned off, you can only rotate an object along an axis, or parallel to the screen (if Screen Handle is on).

Show Tripod—Toggles display of an axis tripod at the pivot point. This tripod also highlights the selected axis while rotating.

Screen Handle—Toggles display of the screen orbit, which lets you rotate an object parallel to a viewport.

Show Pie Slice—When on, a shaded pie slice acts as a visual indicator of the direction and amount of rotation.

Note: If you rotate more than 360°, the slice overlaps and the shading becomes more and more intense.

Angle Data—When on, numerical feedback appears during rotation, indicating rotation values along the X, Y, and Z axes.

Rotation Method—Sets the rotation method for the gizmo:

- **Linear Roll:** Rotate the virtual trackball by dragging in a single direction, tangent to the Rotate gizmo.

  Note: A tangent handle will appear to show the best direction to drag the mouse.
- **Circular Crank:** Rotate the virtual trackball by dragging around the Rotate gizmo, in a circular manner.
- **Legacy R4:** Turns off virtual trackball behavior, and uses the rotation method from 3ds Max **4**.

Planar Angle Threshold—Determines when the Circular Crank rotation method will automatically

switch to Linear Roll to prevent loss of control over the gizmo.

This occurs when a Primary axis is nearly 90 degrees to the view plane, making it different to circle around. Any angle to the view plane that is higher than this setting will use Crank mode, but any angle equal to or less than this setting will always function as a Linear Roll.

Scale Gizmo group

Relative Size (%)—Sets the size of the Move gizmo, relative to the Size value of the Transform gizmo. Range= 0.0 to 500.0.

Uniform Handle Size (%)—Sets the size of the handle for uniform scaling (the distance from the transform center to the edge of the uniform handle), as a percentage of the scale gizmo size.

2–Axis Handle Size (%)—Sets the size of the handle for non-uniform scaling along 2–axes (the distance from the edge of the uniform handle to the edge of the 2–axis handle), as a percentage of the scale gizmo size.

Uniform 2–Axis Scaling—Forces scaling using a 2–axis plane handle to be uniform.

Move/Rotate Transforms group

Controls the way you can move selected objects with the mouse in a non-*orthographic (page 3–1080)* view such as *Perspective (page 3–1086)*.

Intersection—Shoots a ray from the mouse point into the screen. This makes moving objects easier, but as you move toward the *horizon (page 3–1047)*, the object moves great distances.

Projection—Projects the motion of the mouse onto the plane. This ensures that there are no singularities at the horizon, and that motion is always smooth and stable. However, it can become difficult to move objects when the plane is not parallel to the screen.

Persp Sens—Sets mouse sensitivity for projection transforms.

Rotation Increment—Specifies the amount of rotation generated by moving the mouse 1 pixel. Lower this value for angular rotations smaller than the default .5 degrees. The lower this value, the more mouse movement is needed to rotate objects.

Viewport Arc Rotate Snap Angle—Sets the amount of rotation in degrees.

Turn on Angle Snap on the main toolbar, and then use *Arc Rotate (page 3–787)* to rotate a viewport. The viewport rotation snaps by the value set here. The Arc Rotate cursor displays a small magnet in the upper left to indicate that Angle Snap is turned on.

MAXScript Preferences

Customize menu > Preferences > Preference Settings dialog > MAXScript tab

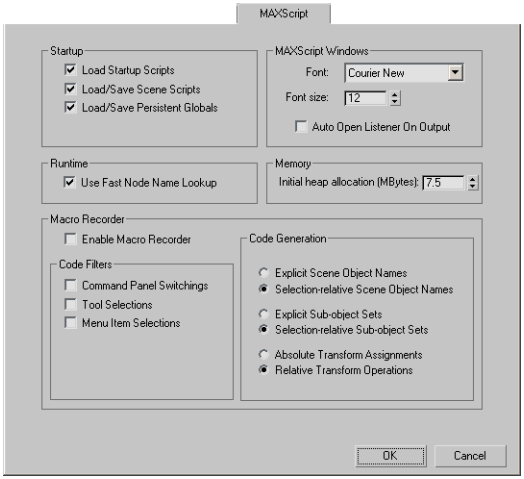
On the MAXScript panel of the Preference Settings dialog, you set MAXScript and Macro Recorder preferences, enable or disable auto-loading of scripts, set the initial heap size, change font style and size used in the MAXScript editor, and manage all the settings for the Macro Recorder.

You can also change these settings by editing the [MAXScript] section of the *3dsmax.ini* file.

Note: Two paths to support auto-startup scripts are on the *Configure User Paths dialog (page 3–852)* and *Configure System Paths dialog (page 3–854)*: *..\scripts* and *..\scripts\startup*. If you prefer to start scripts from a different directory, you can change these default directories with the corresponding Customize menu commands.

Choose Help > MAXScript Reference for details on MAXScript.

Interface



Startup group

You can start scripts automatically in two ways. You can create a file named *startup.ms* that contains your startup code. MAXScript searches for this file in the scripts directory first, then the 3ds Max root directory, and finally the directories specified in the Windows PATH environment variable. MAXScript stops searching after it finds the first occurrence of *startup.ms*.

You can also place the script files you want auto-loaded into the *|startup* directory inside the *|scripts* directory. MAXScript loads any script file with the file name extension *.ms* or any encrypted script file with file name extension *.mse*.

If you have both a *startup.ms* file and auto-load files in the *|startup* directory, MAXScript always loads *startup.ms* first.

Load Startup Scripts—Loads scripts automatically when 3ds Max starts.

Load/Save Scene Scripts—Enables Scene Script loading and saving.

Load/Save Persistent Globals—Enables load and save Persistent Globals.

MAXScript supports a limited form of variables. You declare that a particular global is persistent and the value it contains is always saved to and restored from scene files as they are opened and closed. In this way you can, for example, keep direct references to objects in the scene in variables. Those references will move across scene save and reload.

MAXScript Windows group

Font—Choose a font for the MAXScript editor

Font size—Choose a font size for the MAXScript editor.

Auto Open Listener On Output—Opens the Listener if a script sends output to a WindowStream value with no associated window. This would require a MAXScript extension.

Runtime group

Use Fast Node Name Lookup —When on, MAXScript indexes scene node names in a cache, resulting in significantly faster resolution of non-wildcard pathname values (for example, $box01) to node values. When off, the scene nodes are enumerated as MAXScript looks for a scene node name that matches the pathname, resulting in slower lookups.

Turn this off if you encounter an incompatibility with an existing script.

Memory group

Initial Heap Allocation (Mbytes)—Sets the initial heap allocation.

MAXScript carves its own working memory (called a heap) out of the memory that the software allocates. You can add to the heap at any time by increasing the value here.

Macro Recorder Group

Enable Macro Recorder—Enables the Macro Recorder.

3ds Max starts with the macro recorder disabled and a minimized Macro-Recorder pane in the MAXScript listener window.

You can also enable the Macro Recorder by turning on MAXScript > Macro Recorder or by turning on Enable in the Macro Recorder menu on the MAXScript Listener toolbar.

This state is stored in the *3dsmax.ini* file. Turning it on once keeps it enabled across restarts of the program.

Code Filters group

Command Panel Switchings—Displays command panel switchings in the code.

Tool Selections—Displays tool selection in the code.

Menu Item Selections—Displays menu selection in the code.

Code Generation group

The Code Generation parameters refer to whether or not the script emitted is made selection-relative, if possible, or if it contains object references. By making the script selection-relative, you can apply the recorded script to a different selection, thereby making it more general. Absolute mode always works on the same objects regardless of the current selection.

Explicit Scene Object Names—Uses scene object names in the code.

Selection-relative Scene Object Names—Makes Scene Object Names relative in the code. Default=on.

Explicit Sub-object Sets—Uses explicit sub-object sets in the code.

Selection-relative Sub-object Sets—Uses selection relative sub-object sets in the code. Default=on.

Absolute Transform Assignments—Uses absolute transforms in the code.

Relative Transform Operations—Uses selection relative transform operations in the code.

Graphics Driver Setup

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Choose Driver button

(With Direct3D active) Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Choose Driver button > Direct3D Driver Setup dialog > Revert From Direct3D button

You choose and configure graphic display drivers on the Viewports panel of the Preference Settings dialog. This topic explains driver options available on the Display Driver Setup dialog and analyzes trade-offs in performance.

See also

Configure Driver (page 3–883)

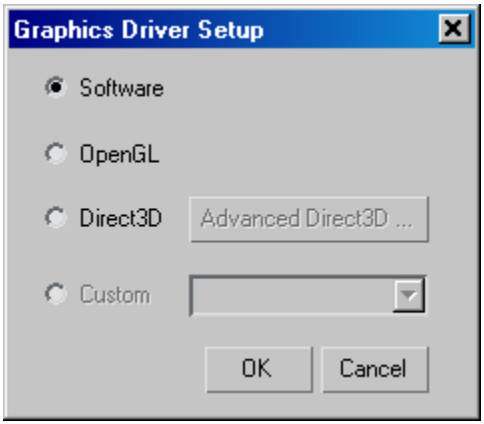
Configure Software Display Driver Dialog (page 3–884)

Configure OpenGL Dialog (page 3–884)

Configure Direct3D Dialog (page 3–888)

Direct3D Driver Setup Dialog (page 3–887)

Interface



On the Display Driver Setup dialog, some options are unavailable if the corresponding driver is not installed in the system. The currently installed driver is listed in the Display Driver group.

Software Display Driver

Choose this if you're using software rather than hardware acceleration. This choice is always available.

OpenGL

Choose this option if you're using any form of hardware acceleration. The software will use whatever driver has been installed in your operating system.

The OpenGL driver supports geometry acceleration as well as rasterization acceleration. It offers the optimum display performance for animated deforming meshes. It's tightly integrated into Windows NT and Windows 2000, and many 3D display cards were specifically designed to accelerate OpenGL operations. OpenGL implementations have all of the scene data necessary to optimize the entire 3D display process.

Because OpenGL is most efficient when run on systems with at least rasterization acceleration, the software display driver/SZB option may work best on systems with an ordinary 2D display card. However, with a 3D-enabled card, you may see dramatic acceleration using the OpenGL driver.

The disadvantages of the Open GL driver are as follows:

- All potentially visible scene data must be transferred to the driver, and this can cause a communication bottleneck across the system bus. In particular, this slows down the display of individual primitives (as opposed to strips or polylines, like wireframe displays).
- Because the OpenGL design supports a wide variety of display systems, there is no guarantee that either incremental scene update methods (partial window *blits* (Block Image Transfers) or dual planes) will work with a particular implementation of OpenGL.
- Because lighting and texturing are restricted to OpenGL-specified semantics, mismatches between 3ds Max scene lighting and texturing and what appears in an OpenGL viewport can occur. This applies especially to attenuated lights and non-tiled texture display.)

Direct 3D

Choose this if you have a Direct3D (D3D) driver installed on your system. If you don't have DirectX 8.1 or above installed, this option is unavailable.

To configure the Direct3D driver, click the Advanced Direct3D button. This button, which is available only when Direct3D is the active option, opens the *Configure Direct3D dialog (page 3–888)*.

To switch to a different display driver when Direct3D is the active driver, click the Choose Driver button on the Viewports tab of the Preference Settings dialog to open the *Direct3D Driver Setup dialog (page 3–887)*, click Revert

From Direct3D, and then choose the new driver from the Graphics Driver Setup dialog.

The Microsoft Direct3D API supports both rasterization and 3D scene-level calls. It offers the optimum display performance for large modeling tasks, and pixel and vertex shading. (3ds Max supports only D3D Version 8 or above, which is included in DirectX 8.1.) D3D calls are accelerated if the display hardware supports this.

Many inexpensive 3D display cards can use this driver efficiently. This driver supports scene data culling efficiently, accelerates texture display (depending on the specific display card), and performs perspective correction.

The driver works with high-color displays, which provide a good trade-off between display quality and memory overhead. Incremental display update works efficiently.

The disadvantages of the Direct3D driver are as follows:

- The driver currently runs only under Windows 98, Windows Millennium, Windows 2000, and Windows XP. (There is no multi-processor Windows NT support.)
- Dual-plane operations are slow (if available), and there can be some additional overhead in minimizing/maximizing viewports due to the way D3D allocates video memory.

You can download D3D drivers from this location: www.microsoft.com/windows/directx/.

Custom

Choose this if you have a custom driver installed on your system. Such custom drivers don't use the software display driver (Heidi), OpenGL, or Direct3D. If you don't have such a driver installed, this option is not available.

Configure Driver

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Configure Driver button

You configure the current display driver using the Viewports panel of the Preference Settings dialog.

Changes to a driver's configuration take effect immediately, and the configuration persists between sessions. However, data downloaded to the graphics card is not regenerated. For example, if you change the texture resolution, the hardware continues to use the previous resolution until you use the Material Editor to reload the texture.

The options in the driver configuration dialog vary, depending on which driver is in use. This reference describes the options for the *software display driver (page 3–884)*, *Direct3D driver (page 3–888)*, and *Open GL driver (page 3–884)*.

If you use a custom driver, the options depend on what the driver's manufacturer provides. See the manufacturer's documentation for further information.

See also

Graphics Driver Setup Dialog (page 3–881)

Configure Software Display Driver Dialog (page 3–884)

Configure OpenGL Dialog (page 3–884)

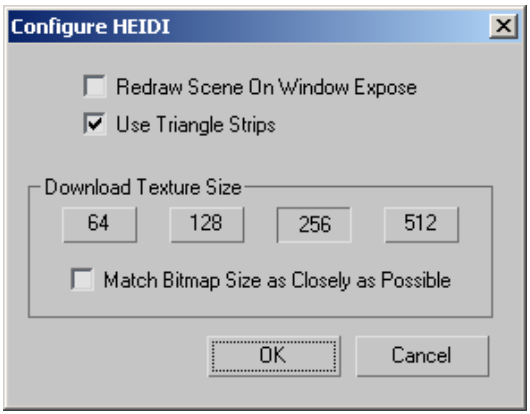
Configure Direct3D Dialog (page 3–888)

Configure Software Display Driver Dialog

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Configure Driver button (when Software Display Driver is the current driver)

The software display driver does not require hardware acceleration.

Interface



Redraw Scene On Window Expose—Redraws the whole scene when a dialog over the viewports is moved, resulting in smoother dragging of dialogs such as the Material Editor or Track View.

If your 3ds Max display easily becomes messy or "corrupted," turn this option on and then redraw viewports by choosing Views > Redraw All Views (the default keyboard shortcut for this is the ‘ (accent grave) key, on the left side of the “1” key).

Use Triangle Strips—Strips the geometry, which can more than double the display speed. In some cases, such as when topology is constantly changed, the time taken to strip the geometry can cause a slowdown instead. In such cases, turn off this option. Otherwise, leave it on for speed.

Download Texture Size group

64, 128, 256, 512—These buttons specify the size of the bitmaps used to map surfaces in the viewports. The larger the size, the better the resolution but the slower the speed. High speed produces jagged maps and slower speeds produce smooth maps.

Note: When Match Bitmap Size As Closely as Possible is on, these buttons are overridden, however they are still available. The value is still used when procedural textures are converted to bitmaps for viewport texture display.

Match Bitmap Size as Closely as Possible—To allow the viewport to show actual texture resolutions, bitmaps are individually resized in the display. This means that small bitmaps don’t get overexpanded and large bitmaps retain their resolution (but potentially use a lot more video RAM).

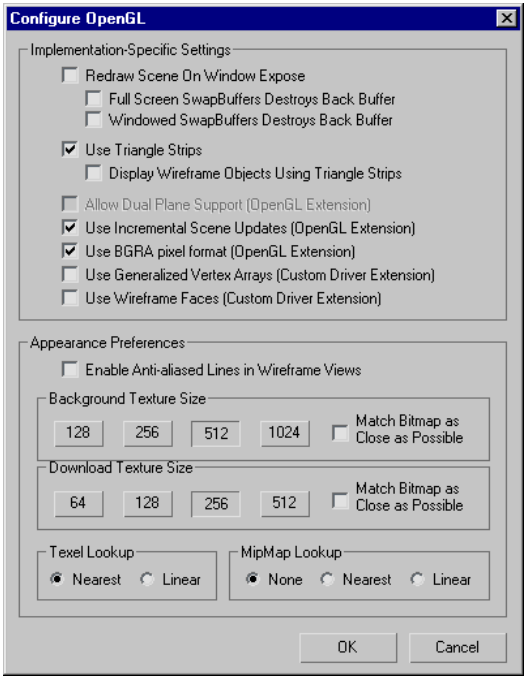
Note: Bitmaps can be no larger than 4000 x 4000 pixels (or they will be scaled down to this size) and no smaller than 32 x 32 (or they will be scaled up to this size). Default=off.

Configure OpenGL Dialog

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Configure Driver button (when OpenGL is the current driver)

The OpenGL display driver provides options that support hardware acceleration.

Interface



Implementation-Specific Settings group

Redraw Scene On Window Expose—Redraws the whole scene when a dialog over the viewports is moved, resulting in smoother dragging of dialogs such as the Material Editor or Track View. However, redrawing takes some time. Default=on.

If your 3ds Max display easily becomes messy or "corrupted," turn this option on and then redraw viewports by choosing Views > Redraw All Views (the default keyboard shortcut for this is the "1" key).

This option has two subordinate options. How you should set them depends on how the display card handles its back buffer, which is used for refreshing the screen. Turn on one or the other, as appropriate.

Full Screen SwapBuffers Destroys Back Buffer—If, after updating the screen, the display card destroys the back buffer *only* when there's a single viewport, turn on this sub-option. The OpenGL driver redraws the scene when a single viewport is visible, but doesn't have to redraw when multiple viewports are visible. Default=off.

Windowed SwapBuffers Destroys Back Buffer—If, after updating the screen, the display card destroys the back buffer when multiple viewports are visible, turn on this sub-option. Default=off.

Use Triangle Strips—Strips all geometric data before sending it to the driver. In some cases, such as when topology is constantly changed, the time taken to strip the geometry can cause a slowdown instead. In such cases, turn off this option. Otherwise, leave it on for speed. Default=on.

This option has one subordinate option:

Display Wireframe Objects Using Triangle Strips—Default=off.

Allow Dual Plane Support—Uses the front/back plane system when redrawing the viewport. The selected object is manipulated in the front plane and is redrawn, while other objects remain on the back plane and are not redrawn. This default setting provides the fastest redraws under normal circumstances. If your assigned display driver doesn't support dual planes, this option is not available.

Turn off this setting to improve redraw speed if you are rotating the whole scene or moving a camera through the scene (usually situations in which the whole viewport needs to be redrawn anyway).

Use Incremental Scene Updates—Redraws only those scene objects that have changed, or that intersect a region changed by another moving object. When turned off, the entire scene is redrawn for each new frame. Default=on.

If your 3ds Max display becomes messy or "corrupted" as a result of incremental updates, turn this option off and then redraw viewports by

choosing Views > Redraw All Views (the default keyboard shortcut for this is the ‘ [accent grave] key).

Use BGRA Pixel Format—When on, sends bitmaps using BGRA (blue-green-red-alpha) ordering for pixels. This is the default order for Windows. By default, OpenGL expects RGBA ordering. Because of this, under default conditions, loading textures or backgrounds requires the pixels to be reordered. OpenGL supports an extension that allows it to receive pixels in BGRA order. This means that bitmaps can be displayed directly, without reordering each pixel. Thus, assuming the OpenGL driver has efficient hardware support for BGRA pixels, turning on this option makes loading textures and background images much faster. Default=on.

Use Generalized Vertex Arrays—When on, enables 3ds Max to use custom driver code to render smoothly shaded objects. Typically this is much faster than using standard OpenGL code, but has an effect only when the driver has hardware-specific custom code. Default=on.

Use Wireframe Faces—When on, makes wireframe display accessible to hardware acceleration. Default=on.

This option is intended to allow display-card manufacturers to accelerate 3ds Max wireframe displays in a way that is specific to the underlying display hardware. Check with your display-card manufacturer to see if enabling this option will yield faster wireframe rendering with your display card.

Appearance Preferences group

Enable Anti-Aliased Lines in Wireframe Views—Draws lines slightly thicker and much smoother. This is best used for wireframe-only views, and especially if you're making a preview of wireframe objects.

Background Texture Size—Unlike the Software Display driver, which uses bitmaps to display viewport backgrounds directly, the OpenGL driver uses a texture-mapped background rectangle. This allows for smoother zooms and pans in orthographic views and can take less memory than the direct bitmap method. However, background bitmap resolution may be lost. Increase the resolution if you're using a maximized viewport to digitize.

Download Texture Size—Lets you choose the size of the texture map that's downloaded to the driver for texture-mapped scene objects. Larger maps look better, but use more display card memory.

Note: When Match Bitmap Size As Closely as Possible is on, these buttons are overridden, however they are still available. The value is still used when procedural textures are converted to bitmaps for viewport texture display.

Match Bitmap Size as Closely as Possible—To allow the viewport to show actual texture resolutions, bitmaps are individually resized before they are downloaded to the driver. This means that small bitmaps don't get overexpanded and large bitmaps retain their resolution (but potentially use a lot more video RAM).

Note: Bitmaps can be no larger than 4000 x 4000 pixels (or they will be scaled down to this size) and no smaller than 32 x 32 (or they will be scaled up to this size). Default=off.

Texel Lookup—Specifies whether to use the nearest *pixel (page 3–1089)* or to linearly interpolate the pixel value from the four closest *texels (page 3–1115)*. Using the nearest pixel is faster, but using texels produces a higher-quality display. Default=Nearest.

MipMap Lookup—Specifies whether to use one version of the texture map (None) or to interpolate between a pyramid of progressively smaller maps. With Nearest chosen, the texel lookup is done

on the map level nearest the ideal one, and with Linear, the texel values from the two closest map levels are interpolated. Default=None.

Note: When both Texel and MipMap lookup are set to Linear, a true trilinear weighting of 8 texel values is used for a single pixel display. This is very accurate and helps eliminate aliasing, but it is time consuming if the texture-mapping hardware is not accelerated.

Direct3D Driver Setup Dialog

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Choose Driver button (if Direct3D is the active driver)

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Choose Driver button > Graphics Driver Setup dialog > Choose Direct3D. > Advanced Direct3D button

When using the Direct3D display driver with 3ds Max, this dialog lets you make some basic choices for setting up the driver. Further Direct3D configuration options are available from the *Configure Direct3D dialog (page 3–888)*.

To switch to a different display driver when Direct3D is the active driver, click the Choose Driver button on the Viewports tab of the Preference Settings dialog, click Revert From Direct3D, and then choose the new driver from the Graphics Driver Setup dialog.

Interface

Direct3D Version—The available option is whichever version is currently active in your system: DirectX 8.1 or DirectX 9.0.

Direct3D Device—The default option is Hardware (HAL). The Software (RefRast) option is for use by software developers, and is unavailable unless the debug version of DirectX is installed in your system.

Direct3D Use Flags—The default option is Release. The Debug option is for use by software developers, and is unavailable unless the debug version of DirectX is installed in your system.

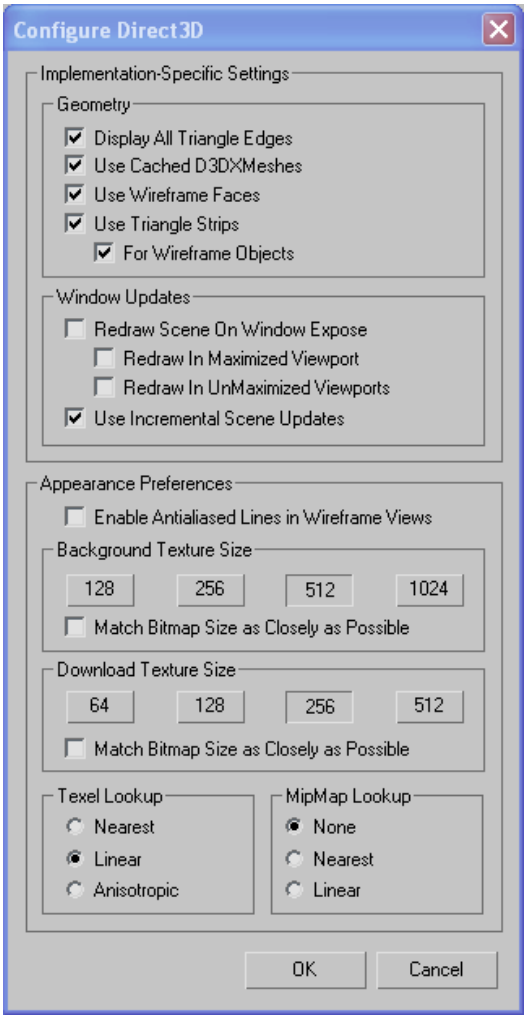
Revert from Direct3D—Click this button to display the *Graphics Driver Setup dialog (page 3–881)*, which lets you choose a different driver.

Configure Direct3D Dialog

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Display Drivers group > Configure Driver button (when Direct3D is the current driver)

The Direct3D display driver provides options that support DirectX 8 drivers. You can download D3D drivers from this location: www.microsoft.com/windows/directx/.

Interface



Implementation-Specific Settings: Geometry group

Display All Triangle Edges—When on, all triangle edges are displayed in shaded viewports. When off, triangle edges are not displayed. Default=on.

Turning off this option can improve viewport appearance, but at a cost of display performance.

Use Cached D3DXMeshes—When on, enables 3ds Max to use custom driver code to render smoothly shaded objects. Typically this is much faster than using standard Direct3D code, but has an effect only when the driver has hardware-specific custom code. Default=on.

Use Wireframe Faces—When on, makes wireframe display accessible to hardware acceleration. Default=on.

This option is intended to allow display-card manufacturers to accelerate 3ds Max wireframe displays in a way that is specific to the underlying display hardware. Check with your display-card manufacturer to see if enabling this option will yield faster wireframe rendering with your display card.

Use Triangle Strips—Strips all geometric data out before sending it to the driver. In some cases, such as when topology is constantly changed, the time taken to strip the geometry can cause a slowdown instead. In such cases, turn off this option. Otherwise, leave it on for speed. Default=on.

This option has one subordinate option:

- **For Wireframe Objects**—When on, uses triangle strips for wireframe objects. Default=off.

Implementation-Specific Settings: Window Updates group

Redraw Scene On Window Expose—Redraws the whole scene when a dialog over the viewports is moved, resulting in smoother dragging of

dialogs such as the Material Editor or Track View. However, redrawing takes some time. Default=on.

If your 3ds Max display easily becomes messy or "corrupted," turn this option on and then redraw viewports by choosing Views > Redraw All Views (the default keyboard shortcut for this is the 1 key on the numeric keypad).

This option has two subordinate options. How you should set them depends on how the display card handles its back buffer, which is used for refreshing the screen. Turn on one or the other, as appropriate.

- **Redraw In Maximized Viewport—**If, after updating the screen, the display card destroys the back buffer *only* when there's a single viewport, turn on this sub-option. The Direct3D driver redraws the scene when a single viewport is visible, but doesn't have to redraw when multiple viewports are visible. Default=off.
- **Redraw In UnMaximized Viewports—**If, after updating the screen, the display card destroys the back buffer when multiple viewports are visible, turn on this sub-option. Default=off.

Allow Dual Plane Support—Uses the front/back plane system when redrawing the viewport. The selected object is manipulated in the front plane and is redrawn, while other objects remain on the back plane and are not redrawn. This default setting provides the fastest redraws under normal circumstances. If your assigned display driver doesn't support dual planes, this option is not available.

Turn off this setting to improve redraw speed if you are rotating the whole scene or moving a camera through the scene (usually situations in which the whole viewport needs to be redrawn anyway).

Use Incremental Scene Updates—Redraws only those scene objects that have changed, or that intersect a region changed by another moving object. When turned off, the entire scene is redrawn for each new frame. Default=on.

If your 3ds Max display becomes messy or "corrupted" as a result of incremental updates, turn this option off and then redraw viewports by choosing Views > Redraw All Views (the default keyboard shortcut for this is 1 on the numeric keypad).

Appearance Preferences group

Enable Antialiased Lines in Wireframe Views—Draws lines slightly thicker and much smoother. This is best used for wireframe-only views, especially if you're making a preview of wireframe objects.

Background Texture Size—Unlike the software display driver, which uses bitmaps to display viewport backgrounds directly, the Direct3D driver uses a texture-mapped background rectangle. This allows for smoother zooms and pans in orthographic views and can take less memory than the direct bitmap method. However, background bitmap resolution may be lost. Increase the resolution if you're using a maximized viewport to digitize.

Match Bitmap Size as Closely as Possible—Displays background at full resolution. This allows the viewport to behave like the *rendered frame window (page 3–5)*, in regards to zoom and pan. Default=off.

Download Texture Size—Lets you choose the size of the texture map that's downloaded to the driver for texture-mapped scene objects. Larger maps look better, but use more display card memory.

Note: When Match Bitmap Size As Closely as Possible is on, these buttons are overridden, however they are still available. The value is still used when procedural textures are converted to bitmaps for viewport texture display.

Match Bitmap Size as Closely as Possible—To allow the viewport to show actual texture resolutions,

bitmaps are individually resized before they are downloaded to the driver. This means that small bitmaps don't get overexpanded and large bitmaps retain their resolution (but potentially use a lot more video RAM).

Note: Bitmaps can be no larger than 4000 x 4000 pixels (or they will be scaled down to this size) and no smaller than 32 x 32 (or they will be scaled up to this size). Default=off.

Texel Lookup—Specifies whether to use the nearest *pixel (page 3–1089)*, to linearly interpolate the pixel value from the four closest *texels (page 3–1115)*, or to use anisotropic filtering. Using the nearest pixel is faster, but using texels produces a higher-quality display. The Anisotropic filter compensates for the distortion caused by the difference in angle between the texture polygon and the plane of the screen. Default=Nearest.

MipMap Lookup—Specifies whether to use one version of the texture map (None) or to interpolate between a pyramid of progressively smaller maps. With Nearest chosen, the texel lookup is done on the map level nearest the ideal one, and with Linear, the texel values from the two closest map levels are interpolated. Default=None.

Note: When both Texel and MipMap lookup are set to Linear, a true trilinear weighting of 8 texel values is used for a single pixel display. This is very accurate and helps eliminate aliasing, but it is time consuming if the texture-mapping hardware is not accelerated.

MIDI Time Slider Control Setup

Customize menu > Preferences > Preference Settings dialog > Animation tab > MIDI Time Slider Control group > Setup button

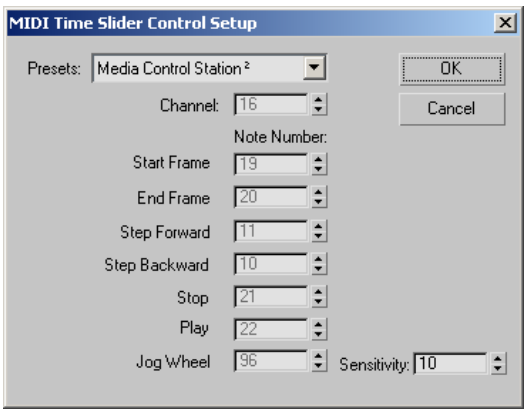
With the MIDI Time Slider Control Setup dialog you can specify and set up a MIDI device to control animation playback.

Procedure

To use a MIDI device to control the animation time slider:

1. Choose Customize menu > Preferences > Preference Settings dialog > Animation tab.
2. In the MIDI Time Slider Control group, choose On.
3. Click Setup.
4. Set the MIDI device options and click OK.

Interface



Presets—Specifies the type of MIDI device used. You can choose the Media Control Station 2, which is a MIDI device containing standard VCR-style playback buttons along with a jog wheel, or you can choose Custom, which specifies note events in the spinners. You can also use Custom to

customize the buttons used by the Media Control Station.

Channel—Specifies the channel to which your MIDI device is assigned.

Note Number group

With the controls in this group you can specify which note event triggers which function.

Start Frame—Goes to the start frame (the Rewind button in the Media Control Station).

End Frame—Goes to the end frame (the Fast-Forward button in the Media Control Station).

Step Forward—Moves one frame forward (the Fast-Forward button and Option button in the Media Control Station).

Step Backward—Moves one frame back (the Rewind button and Option button in the Media Control Station).

Stop—Stops playback (the square button).

Play—Plays the animation (the arrow button).

Jog Wheel—Controls the time slider with the jog wheel.

Sensitivity—Controls the number of ticks that the time slider moves in response to one unit of movement from the jog wheel. A lower value provides more precise positioning of the time slider, while a higher value makes the time slider move faster. If you set your time display to show ticks and set the sensitivity to 1, you can move one tick at a time with the jog wheel.

Units Setup

Customize menu > Units Setup > Units Setup dialog

The Units Setup dialog establishes the unit display method, giving you the choice between generic units and standard units (feet and inches, or metric). You can also create custom units, which are used whenever you create an object.

The units that you set up are used to measure geometry in your scene. In addition to these units, the software also uses system units as an internal mechanism. System units should only be changed *before* you create your scene or import a unitless file. Do not change the system unit in an existing scene.

You can also set the lighting units using this dialog.

System vs. Display Units

It is important to note the distinction between System and Display units. Display units only affect how geometry is displayed in the viewports. System units determine the actual scale of geometry. For example, if you import a DXF file (unitless) containing a 1 x 1 x 1 Box, 3ds Max may import the box's dimensions in inches or miles, depending on the System unit. This can have a significant impact on your scene, which is why you should always set up the system unit *before* you import or create geometry.

Procedures

To change units to feet and inches:

1. In Units Setup, choose US Standard.
2. For Default Units, choose Feet or Inches.
3. Select from among the choices on the drop-down list.
   - If you want feet, choose how the inches will appear, as fractions or decimal.

- If you choose Fractional Feet or Feet w/ Fractional Inches, choose the fraction on the drop-down list to the right.

To enter fractions in numeric fields:

- When you enter fractions in numeric fields, they are converted to the correct units. For example, if units are set to Feet w/ Decimal Inches, and Default Units is set to Feet, type **37/45** and press ENTER for the result 0'9.867", or 37/45'.

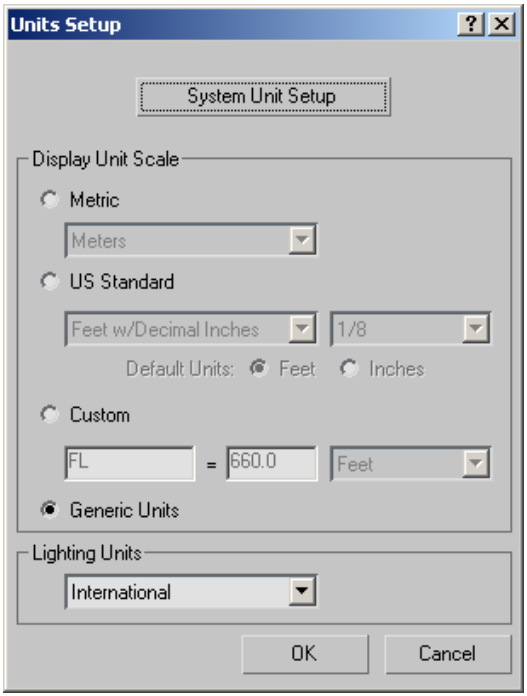
To enter a fraction and a units specifier, place the specifier after the divisor. For example, type **17/5'**, but not **17'/5**.

To convert between unit types:

- You can convert between unit types by entering any valid unit specifier, along with the number, and then pressing ENTER.

  The number is converted to the current unit display type. For example, if units are set to Meters, type **1/2** to get the result 0.5M. However, if you type **1/2'** or **6"** the result is 0.152M.

Interface



System Unit Setup—Click to display the *System Unit Setup dialog (page 3–893)* and change the system unit scale.

Warning: You should only change the system unit value *before* importing or creating geometry. Do not change the system unit in an existing scene.

Display Unit Scale group

Click one of the option buttons (Metric, US Standard, Custom, or Generic) to activate its settings.

Metric—Click the list and choose a metric unit: Millimeters, Centimeters, Meters, Kilometers

US Standard—Click the list and choose a US Standard unit. If you choose a fractional unit, the adjoining list activates to let you select the fractional component. The decimal units require no additional specification.

The US Standards are as follows:

- Fractional Inches
- Decimal Inches
- Fractional Feet
- Decimal Feet
- Feet w/ Fractional Inches
- Feet w/ Decimal Inches

For the last two items, you can specify which unit is assumed when you enter a value in a numeric field and press ENTER without including a units specifier, such as ’ for feet or " for inches.

For example, if Feet is the default, typing **5** followed by ENTER results in 5 feet. Typing **5"** followed by ENTER results in 0’5". If Inches is the default, typing **5** followed by ENTER results in 0’5". Typing **5’** followed by ENTER results in 5 feet.

Custom—Fill in the fields to define a custom unit of measurement.

Generic—This is the default option (one inch) and is equal to the system unit used by the software.

Lighting Units group

The Lighting Units group lets you choose whether light values are displayed in American or International units.

System Unit Setup Dialog

Customize > Units Setup > Click System Unit Setup.

This dialog appears when you click System Unit Setup in the *Units Setup dialog (page 3–891)*.

Warning: You should only change the system unit value *before* importing or creating geometry. Do not change the system unit in an existing scene.

Because of the nature of digital floating-point calculations, distances that are extremely large or extremely small can cause round-off error. Symptoms of round-off error include trouble navigating (zooming and panning become too fast or too slow), unwanted viewport clipping, and unexpected flipping of normals. Here are some general guidelines to avoid these problems:

- Make sure your scene is roughly centered around the origin (0,0,0).

  Round-off error increases at large distances from the origin.

- Make sure no significant detail in the scene is smaller than one generic 3ds Max unit.

Note: The *Rescale World Units utility (page 2–49)* alters the scale of world units throughout the entire scene, or selected objects.

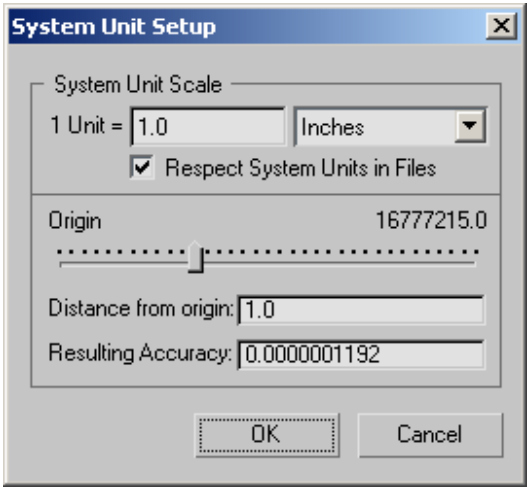
Procedure

To change the system unit:

1. Choose Customize menu > Units Setup.
2. Click System Unit Setup.
3. Change the System Unit Scale value, and click OK.

   The system unit is immediately reset. This setting remains in effect until you change it.

Interface



Unit and Measurement fields—Change the scale of the 3ds Max unit. The system unit is the standard measurement throughout 3ds Max. You should only change the system unit value *before* importing or creating geometry.

Respect System Units in Files—When on, if you open, merge, XRef, or drag and drop geometry from file that has different system unit settings, a *File Load: Units Mismatch dialog (page 3–895)* is displayed. This dialog gives you the choice of rescaling the geometry to match the current system units, or adopting the units used in the file. When off, the dialog is not displayed, and the file is assumed to have the same units as the current 3ds Max session. Default=on.

Origin Slider, Distance from Origin, Accuracy

These controls provide a system unit calculator to help you determine the unit scale for your project. The resolution of measurement diminishes as the distance to the origin of space increases, so you need to consider space granularity when you choose a scale for your project. If you're modeling an island, for example, this calculator can help you determine the smallest object you should model on the island. In other words, don't use a unit scale of millimeters if you plan on modeling an island that's many miles across.

When you use the slider or the text field to enter a distance from the origin, the Resulting Accuracy changes to show what the round-off error will be at that distance.

These controls don't change the unit settings in 3ds Max. They don't reflect the extents of the current scene, either.

Origin Slider—Move the slider for interactive feedback of distance and accuracy. Right-click the scale to reset the slider to 0. Dragging the slider displays the last slider position as a small square on the scale markings.

The slider covers distances from 0 to the maximum distance that's accurate to one system unit.

Distance from Origin—Enter the maximum distance you want to use in your project to determine the maximum accuracy, which is displayed in the Accuracy field. Values consider current settings for system scale and unit.

Note: When you type a distance, you must press ENTER to update the Resulting Accuracy field. Pressing TAB simply moves focus to Resulting Accuracy, without doing the calculation.

Resulting Accuracy—Enter the minimum resolution you will use to determine the maximum size or distance that is most practical. Values consider current settings for system scale and unit.

For example, if units are in feet and decimal inches in Customize menu > Units Setup, and you type (**1'**, **1 foot**) in the Accuracy field, a value of 22369620'0.0" is displayed in the Distance From Origin field. If you move an object that's one foot across, at this distance away from the origin of space, a round-off error will occur, and the shape of the object will be compromised.

File Load: Units Mismatch Dialog

Change the system unit scale. > Open, Merge, XRef, or drag geometry from a file with a different unit scale.

This dialog appears when you open or merge a file that has been saved with *system unit settings* that are different from those of your current 3ds Max session. The default system unit setting is Inches.

If you open a file with the system unit set to meters, for example, you will see this dialog.

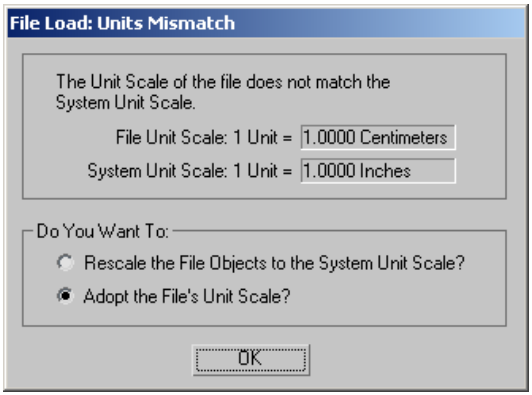
When this happens, you have two options:

- **Rescale the File Objects to the System Unit Scale:** You can choose to rescale the objects from the incoming file to match the current system unit. This changes the size of the incoming geometry
- **Adopt the File's Unit Scale:** This changes the system unit in your 3ds Max installation to match that of the incoming file. This setting will persist between the current and future 3ds Max sessions until you *reset your system unit (page 3–893)*. This is the default option.

  Choosing File > Reset will not reset your system unit. You must either change it using Customize > Units Setup > System Unit Setup, or manually edit your *3dsmax.ini* file.

Note: This dialog appears only if Respect System Units In Files is turned on in the *System Unit Setup dialog (page 3–893)*.

Interface



Rescale the File Objects to the System Unit Scale— Objects from the file are rescaled to the current session's system unit scale.

Note: Many features depend on the scale of the scene, so choosing to rescale the file objects can have unpredictable results, particularly in scenes using radiosity. Reset and recalculate radiosity if you have rescaled the file objects.

Tip: Use the Zoom Extents All button if the geometry is no longer visible in the viewport after rescaling.

Adopt the File's Unit Scale—The system unit scale is changed to match that of the other file. This is the default option.

Choosing Adopt The File's Unit Scale adds two settings to your *3dsmax.ini* file: UnitType= and UnitScale=. For this reason, this change is persistent between sessions until you reset it manually.

To get back the default System Unit Scale, you can edit your *3dsmax.ini* file and remove those settings; or go to Customize > Units Setup > System Unit Setup and change the units back to the default scale, Inches.

Tip: Objects with a UVW Unwrap may lose their texture coordinate information when you choose

this option. If this occurs, choose the Rescale option rather than the Adopt option.

Viewport Configuration

Customize menu > Viewport Configuration

Right-click any viewport label. > Configure

The Viewport Configuration command displays the *Viewport Configuration dialog (page 3–896)*. You use controls on this dialog to set options for viewport control.

All the configuration options are saved with the *.max* file. To configure startup settings for your file, you can save a *maxstart.max* file. If this file exists, 3ds Max uses it to determine the viewport configuration and settings when the software is loaded or reset.

Viewport Configuration Dialog

Customize menu > Viewport Configuration

Right-click any viewport label. > Configure

Viewport configuration options are available in a series of tabbed panels on the Viewport Configuration dialog:

Rendering Method (page 3–896)

Viewport Layout (page 3–899)

Safe Frames (page 3–899)

Adaptive Degradation Options (page 3–901)

Regions (page 3–902)

Rendering Method

Customize menu > Viewport Configuration > Viewport Configuration dialog > Rendering Method tab

Right-click a viewport label. > Configure > Viewport Configuration dialog > Rendering Method tab

You set the rendering method for either the current viewport or all viewports on the Rendering Method panel of the Viewport Configuration dialog.

Procedures

To set the viewport rendering method:

1. Choose Customize menu > Configure > Viewport Configuration dialog > Rendering Method tab.
2. Click to choose the desired rendering level and any options available for that level.
3. Choose how the rendering level is to be applied to viewports:
   - Active Viewport Only applies the rendering method to the active viewport. This choice is the default.
   - All Viewports applies the rendering method to all configured viewports.
   - All But Active applies the rendering method to all viewports except the active one.

     Tip: This option lets you work in full detail in the current view and easily set other views to Wireframe or Bounding Box for quicker interactive display.

To enter an FOV value in a perspective view:

1. Activate a viewport with a Perspective view.
2. Right-click the viewport label and choose Configure to display the Viewport Configuration dialog > Rendering Method tab.
3. Enter an angle in the Field Of View field.

Interface

When you open this dialog, the settings reflect the current viewport settings.

Rendering Level group

Determines how the software displays objects.

Smooth+Highlights—Renders objects with smooth shading and displays specular highlights.

Smooth—Renders objects with smooth shading only.

Facets+Highlights—Renders objects with flat shading and displays specular highlights.

Facets—Renders polygons as flat surfaces, shaded but with no smoothing or highlights.

Flat—Renders each polygon in its raw, unshaded diffuse color, disregarding any contribution from ambient lighting or light sources. This rendering method is useful when it's more important to see each polygon than to see its shading. It's also a good way to check the results of bitmaps created with *Render to Texture (page 3–139)*.

Lit Wireframes—Renders objects as wireframes with flat shading.

Wireframe—Draws objects as wireframes with no shading applied.

Bounding Box—Draws objects as bounding boxes with no shading applied. A *bounding box (page 3–1013)* is defined as the smallest box that completely encloses an object.

Edged Faces—Available only when the current viewport is in a shaded mode, such as Smooth, Smooth+Highlights, Facets+Highlights, or Facets. When Edged Faces is on in these modes, the wireframe edges of objects appear along with the shaded surfaces. This is helpful for editing meshes in a shaded display.

Edges are displayed using the object wireframe color, while surfaces use material colors (if a material is assigned). This lets you create contrasting colors between the shaded surfaces and the wireframe edges. You can switch these around in the *Display Color rollout (page 1–52)* in the Display panel.

Transparency group

None—Objects with transparency assigned appear completely opaque, regardless of the transparency settings.

Simple—Objects with transparency assigned are displayed with a "screen door" transparency effect.

Best—Objects with transparency assigned are displayed with a two-pass transparency effect.

This option is smoother and closer to rendered transparency effects.

Apply To group

Applies the current settings to the active viewport only, to all viewports, or to all the viewports except the active one.

Rendering Options group

These check boxes modify either the shading modes or the wireframe modes. They refer to the *viewport renderer (page 3–1124)* only, not to the *scanline renderer (page 3–1100)*.

Disable View—Disables the Apply To viewport selection. A disabled viewport behaves like any other viewport while active. However, when you change the scene in another viewport, the view in the disabled viewport does not change until you next activate it. Use this function to speed up screen redraws when you are working on complex geometry.

Disable Textures—Select to turn off display of texture *maps (page 3–1062)* assigned to objects. Turn off to show the maps assigned to objects.

Texture Correction—Redraws the viewport using pixel interpolation (perspective-corrected). The redrawn image remains until you force the viewport to redraw for any reason. This command has an effect only when the viewport is shaded and at least one object's map is displayed.

Z-Buffer Wireframe Objects—Draws the wires ordered according to depth in the scene. Otherwise wires may be drawn out of order to speed the viewport display. This option is generally needed only when sub-object selections are "hidden" by lines drawn out of order. For example, you select the front edges of a box, but they don't appear highlighted in red, because the white lines from the rear may get drawn last. Activate this only if you find that selections are obscured or if you need the viewport redrawn from back to front.

Force 2-Sided—Set to render both sides of faces. See *2-Sided (page 3–995)*. Turn off to render only faces with *normals (page 3–1074)* toward the viewer. Usually, you'll want to keep this option off to speed redraw time. You might want to turn it on if you need to see the inside as well as the outside of objects, or if you've imported complex geometry in which the face normals are not properly unified.

Default Lighting—Turn on to use default lighting. Turn off to use the lights created in the scene. If no lights exist in the scene, the default lighting is used automatically, even when this check box is off. Default=on.

Sometimes the lighting you create in the scene makes the objects difficult to see in the viewport. The default lighting displays the objects under an even illumination. You can select either 1 or 2 lights (default).

- **1 Light**—Provides an over-the-shoulder light with 20% faster redraws at the expense of less natural illumination.
- **2 Light**—Provides more natural illumination, but slower viewport performance.

Shade Selected Faces—Faces selected in the viewport are displayed in a red semitransparent state when this is turned on, letting you see the faces you've selected when the Shading Mode is Smooth+Highlighted.

Use Selection Brackets—Toggles the display of white selection brackets in the viewport display. Turn this off in complex scenes when the display of multiple selection brackets obscures the required view of selected objects.

Display Selected with Edged Faces—Toggles the display of highlighted edges for selected objects when the viewport is in a shaded mode, such as Smooth, Smooth+Highlights, Facets+Highlights, or Facets. When on in these modes, the wireframe edges of selected objects appear along with the shaded surfaces. This is helpful when selecting multiple objects or small objects.

Viewport Clipping—When turned on, interactively sets a near and far range for viewport display. Two arrows at the edge of the viewport allow you to determine where the clipping will occur. Tick marks correspond to the extents of the viewport, the lower tick is the near clipping plane, and the upper tick sets the far clipping plane. This does not affect the rendering to output, only the viewport display.

Fast View Nth Faces—When turned on, speeds screen redraw by displaying fewer faces. The Nth Faces spinner sets the number of faces that are displayed when the Fast View mode is active. For example, a setting of 3 displays every third face.

Perspective User View group

Field Of View—Sets the field of view angle for a Perspective viewport. This spinner is not available when any other viewport type is active. You can change the Camera field of view in the Modify panel.

Viewport Layout

Customize menu > Viewport Configuration > Viewport Configuration dialog > Layout tab

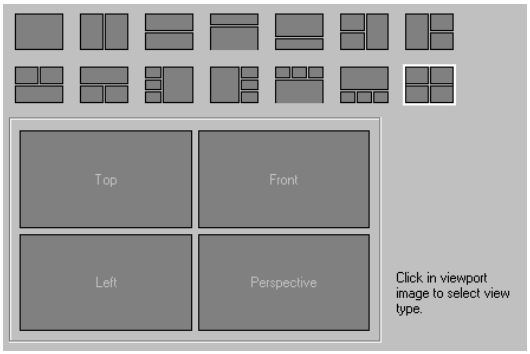
Right-click a viewport label. > Configure > Viewport Configuration dialog > Layout tab

You specify the division method of viewports, and assign specific types of views to each viewport on the Layout panel of the Viewport Configuration dialog.

The layout is saved with the *.max* file, so you can store different layouts in separate scene files. Load the file you want, then merge in the contents of other files to maintain the layout.

Tip: Through MAXScript, there are commands to set the current layout to any of the 14 available setups. You can also activate any viewport and set the view type. This enables you to create macros and custom user interface buttons to set any layout you choose.

Interface



The Layout panel is arranged in two general areas. At the top are icons representing the possible division methods. Below these is a screen representation of the currently selected layout. Click an icon to select the division method, which appears in the larger screen representation.

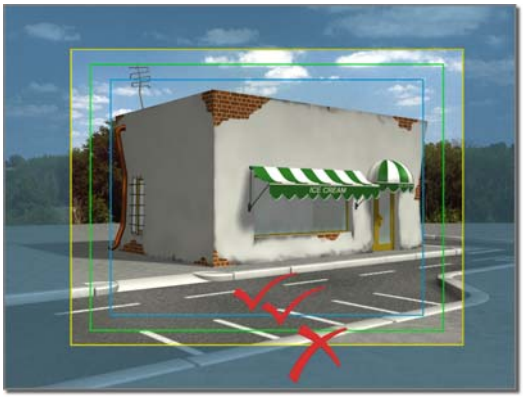
To assign specific views, click the viewport in the screen representation. Choose a viewport type from the menu that appears.

Safe Frames

Customize menu > Viewport Configuration > Viewport Configuration dialog > Safe Frames tab

Right-click a viewport label. > Configure > Viewport Configuration dialog > Safe Frames tab

Keyboard > **SHIFT+F**



Safe frame borders show which portions of a viewport will be visible when rendered to video.

You toggle the status of the *video safe frame (page 3–1124)* for the current viewport and adjust its parameters on the Safe Frames panel of the Viewport Configuration dialog.

Video Safe Frame displays a series of concentric rectangular frames in the viewport. Use Safe Frame to see the proportions of your rendered output within the viewport. This is particularly useful when you are rendering to output that doesn't match the viewport's aspect ratio.

The primary purpose of Safe Frames is to suggest safe areas for work intended for display on TV monitors. It is likely that the bezel will cover about 10% of the image so you don't want important objects or action to fall outside the Action Safe

area. High contrast titles falling outside the Title Safe area are likely to bleed or be obstructed by the bezel of the TV screen.

When Safe Frames are displayed in the viewport and a bitmap image is assigned as a viewport background using either the *Match Viewport or Match Rendering Output (page 1–38)* options, the image is confined to the Live area of the safe frames and matches the rendered background. This assumes that the same bitmap is assigned to the Environment background using Environment/Screen coordinates.

You can toggle the status of *safe frames (page 3–1124)* on or off for the current viewport, and use the Safe Frames panel of the Viewport Configuration dialog to adjust the parameters.

When Safe Frame is displayed in the viewport and a bitmap image is assigned as a background, and Show Background is turned on, the image is confined to the Live area of the safe frame. If you are using a background image in your rendering, make sure your rendering output size matches the background image size. This will avoid distortion.

Interface

Setup group

The Safe Frames panel contains settings for the following frame types:

Live Area(yellow)—The area that will actually be rendered, regardless of the size or aspect ratio of the viewport.

Action Safe(green)—The area in which it's safe to include your rendered action. The Lock check box lets you lock the aspect ratio of the Action frame. When Lock is turned on, use the Both spinner to set the percentage of the live area that's trimmed within the safe frame. When Lock is off, you can use the Horizontal and Vertical spinners to set these parameters independently. Default=10%.

Title Safe(cyan)—The area where it's safe to include titles or other information. When used correctly, this is smaller than the Action frame. The Lock check box lets you lock the aspect ratio of the Title frame. When Lock is turned on, use the Both spinner to set the percentage size of the title frame relative to the action area. When Lock is turned off, you can use the Horizontal and Vertical spinners to set these parameters independently. Default=20% of Live Area.

User Safe—Displays an additional safe frame that you can use for any custom requirements. The Lock check box lets you lock the aspect ratio of the User frame. When Lock is turned on, use the Both spinner to set the percentage size of the user frame relative to the action area. When Lock is turned off, you can use the Horizontal and Vertical spinners to set these parameters independently. Default=20% of Live Area.

12-Field Grid—Displays a grid of cells (or fields) in the viewport. In this case, "fields" are cells in the grid, and not scanline fields.

The "12-field grid" is a method used by video directors to refer to specific areas of the screen. A director might ask you to move an object two

fields to the left and four fields down. The 12-field grid is a reference for this type of placement.

4 x 3/12 x 9—Lets you choose between two matrices of either 12 or 108 cells.

Application group

Show Safe Frames in Active View—Toggles the frame displays on or off for the current viewport. This option is duplicated by the Show Safe Frame item in the viewport right-click menu.

Ungrouped

Default Settings—Resets all values to the default values.

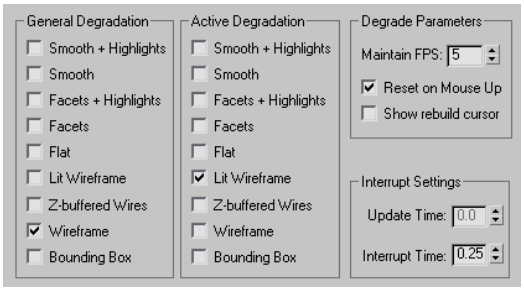
Adaptive Degradation Options

Customize menu > Viewport Configuration > Viewport Configuration dialog > Adaptive Degradation tab

Right-click a viewport label. > Configure > Viewport Configuration dialog > Adaptive Degradation tab

You adjust the adaptive viewport redraw methods on the Adaptive Degradation panel of the Viewport Configuration dialog. The *adaptive degradation (page 3–999)* settings are saved with your *.max* file.

Interface



General Degradation and Active Degradation groups

Select the boxes in each column to indicate the rendering modes to step through during necessary degradation. Those selected in the General Degradation column affect all inactive viewports, while those selected in the Active Degradation column affect only the active viewport.

Degrade Parameters group

Maintain FPS—Lets you set the *frame rate (page 3–1038)* in frames per second that adaptive display will attempt to maintain.

Reset on Mouse Up—Resets the rendering level as the mouse is released. If turned on, the program tries rendering levels, selected in the degradation settings, to achieve optimal quality while still maintaining the playback rate. If turned off, the rendering level immediately drops to the previous minimum.

Show rebuild cursor—Displays a cursor to show when the viewport rendering level is being recalculated.

Interrupt Settings group

Update Time—Sets the interval between updates during viewport rendering. At each interval, a new section of the rendering is drawn on screen. If set to 0, nothing is drawn until the rendering is complete.

Interrupt Time—Sets the interval between times when the program checks for a mouse-down event during viewport rendering. Small values free the mouse more quickly, so you can use the mouse elsewhere without waiting for it to "wake up."

To override adaptive degradation, turn off the Degradation Override button on the prompt line. Press **O** (letter "o") to turn off adaptive degradation, and press **O** (letter "o") again to turn it back on.

This is handy when you're adjusting lights and want to see their effect, real time, in a shaded viewport. Or you might be adjusting the camera and need to see complex geometry exactly as it is.

Regions

Customize menu > Viewport Configuration > Viewport Configuration dialog > Regions tab

Right-click a viewport label. > Configure > Viewport Configuration dialog > Regions tab

On the Regions panel of the Viewport Configuration dialog, you specify default selection rectangle sizes for the Blowup Region and the Sub Region, and the parameters for setting up a virtual viewport.

The rectangular selection region appears when you render with either Blowup or Region selected in the *Render Type List (page 3–13)*. You can change the size of the region by dragging its handles.

The Virtual Viewport options let you zoom in on a sub-region of the current viewport, creating a "virtual viewport" where you can perform any standard navigation, but in a zoomed-in area. This function works only when you're using an OpenGL driver. If you're using the software driver, these controls are disabled.

You can use the virtual viewport on any type of viewport, but it's primarily designed for zooming in on camera views. This lets you perform close-up work, such as tracing, without distorting the relationship between the geometry and a bitmap background. (See Lock Zoom/Pan in *Viewport Background (page 1–38)* for similar functionality in orthographic views.)

Because you're actually zooming the viewport image itself, the viewport label might be hidden from display, but you can still right-click in the upper-left area of the viewport to display the menu. This takes advantage of zooming features in the Open GL driver so that the software does not compute the display change internally.

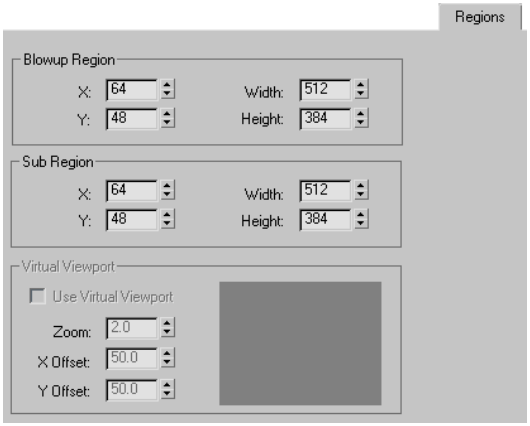
Procedure

To use the virtual viewport:

1. Make sure you're using an *OpenGL driver (page 3–881)* for your display.
2. Activate the viewport to convert to a virtual viewport (typically a camera viewport that is displaying a bitmap background).
3. Choose Customize menu > Viewport Configuration and click the Regions tab.
4. Click Use Virtual Viewport. A reduced image of the viewport displays in the dialog, along with a white zoom rectangle representing the virtual viewport.
5. Use the Zoom, X Offset, and Y Offset spinners to adjust the size and position of the virtual window, or drag the white window anywhere within the image.
6. Click OK.

   The viewport is converted to a virtual viewport and displays the area of viewport represented by the white rectangle. All viewport navigation methods work the same, except that you're seeing only the zoomed portion of the viewport.
7. To close the virtual viewport, go to Viewport Configuration > Region Tab and turn off virtual viewport. You can get to the Viewport configuration menu by right-clicking any of the viewport navigation tools or by going to Customize menu > Viewport Configuration.

Interface



The Regions panel contains spinners for setting the four corners of the region (in pixels), and the following options.

Virtual Viewport

Use Virtual Viewport—Enables the virtual viewport. A reduced image of the viewport appears in the dialog, along with a white zoom rectangle representing the virtual viewport.

Zoom, X Offset, and Y Offset—Adjusts the size and position of the virtual window. You can also drag the white window anywhere within the image.

Entering Commands by Using Mouse Strokes

Strokes

Customize menu > Preferences > Preference Settings dialog > Viewports tab > Mouse Control group > Stroke

Strokes are a way to assign command shortcuts to mouse or tablet drag patterns. For many operations, strokes are more convenient than keyboard shortcuts because they can select an object and apply a command to it.

For example, you can assign Arc Rotate to a downward stroke. When you draw this stroke, the software changes to Arc Rotate mode. You can assign a circular stroke to the Hide Selected command so that it both selects the objects and then hides all the objects in the bounding extents of the stroke pattern.

You can use strokes in two ways:

- If you have a middle mouse button, you can define and use strokes by specifying the Stroke option for the middle mouse button in the *Viewports tab (page 3–874)* of the Customize menu > Preferences dialog.
- To define and use strokes with the left mouse button, use the *Strokes utility (page 3–909)* and turn on Draw Strokes.

Using the Keyboard with Strokes

The same stroke pattern can perform four different functions by holding the SHIFT, ALT, or SHIFT+ALT keys when drawing the stroke:

- Drawing a vertical line is one type of stroke.
- Holding SHIFT while drawing the same line is another type.
- Holding ALT while drawing it is a third type.
- Holding both SHIFT and ALT while drawing the line is a fourth type.

  Holding CTRL while drawing a stroke indicates that you want to define a new stroke, rather than use an existing stroke.

  Note: Changes you make to the set of strokes are saved with 3ds Max and persist from session to session.

See also

Defining Strokes (page 3–905)

Reviewing and Editing Strokes (page 3–907)

Stroke Preferences Dialog (page 3–908)

Strokes Utility (page 3–909)

Procedures

To define and use strokes with the middle mouse button:

1. Choose Customize menu > Preferences > Preference Settings dialog > Viewports tab.
2. In the Mouse Control group, turn on Stroke.

   You must turn on this option for all Stroke functions to work with the middle mouse button.
3. Hold the middle mouse button and drag in a viewport to make a stroke. If the stroke hasn't been defined, a dialog appears where you can click Define to define the stroke. If the stroke has already been defined, the corresponding function is executed.

   See *Defining Strokes (page 3–905)* for information on defining and editing strokes.

To define and use strokes with the left mouse button:

1. Choose Utilities panel > Utilities rollout > More button > Utilities dialog > Strokes.
2. Turn on Draw Strokes.
3. Hold the left mouse button and drag in a viewport to make a stroke. If the stroke hasn't been defined, a dialog appears where you can click Define to define the stroke. If the stroke has already been defined, the corresponding function is executed.

   See *Defining Strokes (page 3–905)* for information on defining and editing strokes.

Example: To assign Object Properties to a stroke:

1. Use one of the first two procedures to activate strokes.
2. Hold down CTRL, and drag from top to bottom and then back up to the starting point.
3. The Define Stroke dialog appears, and the name of the stroke is "HKKH."

   Note: Depending on how you drew your stroke sequence, it might be defined by different letters. This is fine, as long as you use the same sequence to enact the stroke after you have finished defining it.

   If an alert appears, you've either drawn the stroke incorrectly, or this stroke has already been assigned. Continue with the following steps to replace the defined stroke.
4. Choose the Properties command from the Command To Execute list.
5. The option enabled is Single Object At Start Of Stroke, because that's the logical choice for the Object Properties command.
6. Click OK.
7. Drag vertically down and back up over any object in the scene to display the Object Properties dialog for that object.

Example: To assign Hide Selection to a stroke:

1. Use one of the first two procedures to activate strokes.
2. Hold down CTRL, and drag vertically from top to bottom.
3. In the alert that appears, click Yes to redefine the stroke and display the Define Stroke dialog.

   The name of this stroke is HK.

   Note: Depending on how you drew your stroke sequence, it might be defined by different letters. This is fine, as long as you use the same sequence to enact the stroke after you have finished defining it.
4. Choose Hide Selection from the list.
5. Choose All Objects in the Selection Set.

6. Click OK.
7. Load a scene containing several objects, and select two or more objects.
8. Drag vertically from top to bottom in the viewport.

   The selected objects are all hidden.

Defining Strokes

Hold down CTRL and the middle mouse button and drag in a viewport to create the shape of an unused stroke. > Define Strokes dialog
Hold down the middle mouse button alone or with SHIFT, ALT, or both, and drag in a viewport to create the shape of an unused stroke. > Define > Define Strokes dialog
Utilities panel > Utilities rollout > More button > Utilities dialog > Strokes > Draw Strokes > Hold down the left mouse button alone or with SHIFT, ALT, or both, and drag in a viewport to create the shape of an unused stroke. > Define > Define Strokes dialog

You define a stroke by creating the stroke in a viewport, then choosing the command that the stroke defines. The next time you perform the stroke, the command will be executed. You can define strokes to work in conjunction with the SHIFT key, the ALT key, or both SHIFT and ALT.

You can define strokes with either the left or middle mouse button. If you want to use your middle mouse button to define and use strokes, you must first turn on Customize menu > Preferences > Preference Settings dialog > *Viewports tab (page 3–874)* > Mouse Control group > Stroke. To define and use strokes with the left mouse button, choose Utilities panel > Utilities rollout > More button > Utilities dialog > *Strokes (page 3–909)* > Draw Strokes, then draw the strokes.

In the Define Stroke dialog, you can see how the strokes are analyzed by examining the grid under Stroke to Define. When you complete the drawing of a stroke, a nine-square grid is centered around the stroke and fit to its extents. The inner segments of the grid are assigned unique letters. Where the stroke crosses a segment, the letter associated with that segment is added to the stroke name. Thus, the direction and the shape of the stroke matter, but the size of the stroke has no effect.

The stroke is always centered within the grid. If you draw a stroke vertically from top to bottom, the stroke is named HK because it crossed the segments labeled H and K, in that order. Had you drawn the stroke from bottom to top, it would have been named KH.

Tip: You can define more than one stroke for the same command. For example, you might assign a U-shape stroke to Undo, but find that you sometimes draw a J shape when attempting the U. By assigning both the U and the J strokes to Undo, you don't have to worry about missing that stroke.

The Command Should Operate On group of options is important. If the command applies to selections, leave this option set to Single Object at Start of Stroke, or change it to All Objects in the Selection Set. However, if the command doesn't apply to selections, such as Arc Rotate or Activate Grid Object, change it to No Objects Just Execute the Command.

See also

Reviewing and Editing Strokes (page 3–907)

Stroke Preferences Dialog (page 3–908)

Viewport Preferences (page 3–874)

Strokes Utility (page 3–909)

Procedures

To define a stroke using the CTRL key:

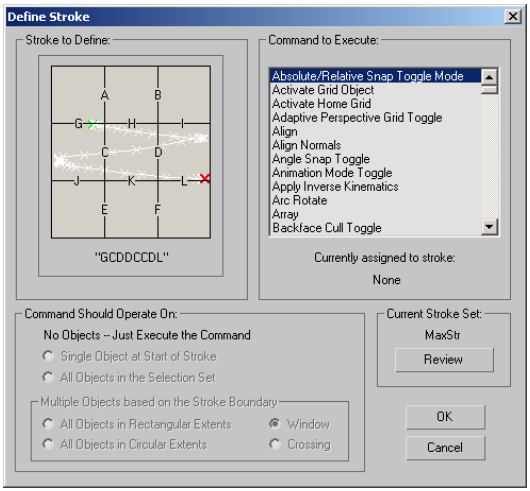
1. Hold down the CTRL key while drawing a stroke.
2. If the stroke already exists, a message asks you if you want to replace the old stroke. Click Yes.

3. In the Define Stroke dialog that appears, assign the stroke.

To define a stroke by example:

1. Draw a stroke that doesn't exist.
2. A Stroke Not Found message appears. Click Define.
3. In the Define Stroke dialog that appears, assign the stroke.

Interface



Stroke to Define group

Displays the name of the stroke and displays the stroke you just drew as a series of white Xs connected by white lines. A green X represents the start of the stroke and a red X represents the end. The labeled grid shows you how it recognizes the stroke. Where the stroke crosses the labeled segments in the grid, a letter is added to the name of the stroke.

Command to Execute group

Lists all commands to which you can assign a stroke. Select a command and click OK to assign the stroke displayed in the grid to the selected command. Depending on the type of command you choose in this list, various options become available in the Command Should Operate On group.

Currently assigned to stroke—Displays the name of the stroke currently assigned to the selected command. If you pressed SHIFT or ALT when the stroke was drawn, they're added to the name. For example: "SHIFT + HK" or "ALT + HK."

Command Should Operate On group

Provides a number of options that specify which objects (if any) are affected by the command. These options are enabled or disabled depending on the type of command you've selected in the list window.

No Objects Just Execute the Command—This text is displayed when you choose a command that's not specific to selected objects (such as Arc Rotate). When you select a command that can be applied to selected objects, the following options become enabled:

Single Object at Start of Stroke—Causes the command to act on the object beneath the first stroke point in the active viewport.

All Objects in the Selection Set—Causes the command to act on all objects in the current selection set.

Multiple Objects Based On The Stroke Boundary group

Choosing one of the options in this group lets you use the stroke itself to select multiple objects and then apply the command.

All Objects in Rectangle Extents—Selects all objects defined by the rectangular bounding of the stroke.

All Objects in Circular Extents—Selects all objects defined by the largest circle that fits within the rectangular bounding of the stroke.

Window/Crossing—When you choose either of the previous two options, these two options become available. Window selects only those objects entirely within the rectangular or circular region. Crossing selects all objects within or crossing the region.

Current Stroke Set group—Displays the name of the current stroke set, so you can review the strokes defined in that set. You can create and save a number of different stroke sets. See *Stroke Preferences (page 3–908)*.

Review—Click to display the *Review Strokes dialog (page 3–907)*, in which you can choose from a list of defined strokes and then see the stroke itself. You cannot edit strokes this way. To view, change, and delete strokes, draw the Review Strokes stroke (by default, a horizontal line from left to right).

Reviewing and Editing Strokes

Define Strokes dialog > Click Review.

Draw the Review Strokes stroke. By default, this is a horizontal line from left to right.

You can view defined strokes in the Review Strokes dialog. Depending on how you display this dialog, you can also change or delete defined strokes:

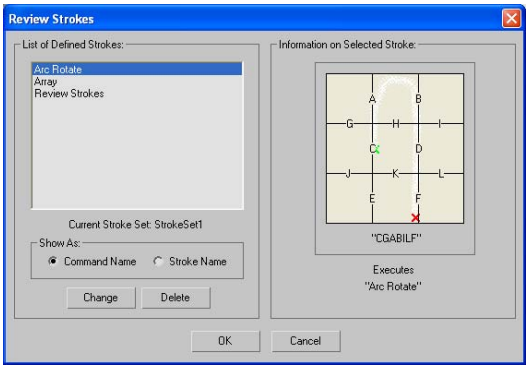
- Click the Review button in the *Define Strokes dialog (page 3–905)* to view strokes, but not change or delete them.
- Draw the Review Strokes stroke (by default, a horizontal line from left to right) to view, change, and delete strokes. You can redefine the Review Strokes stroke in the Review Strokes dialog.

Procedure

To change the command assigned to a stroke (or vice versa):

1. Select a command (or stroke) from the list.
2. Click Change. The Define Strokes dialog appears.
3. Select the new stroke to assign.
4. Click OK in the Define Strokes dialog to assign the selected stroke to the command currently highlighted in the Review Strokes dialog.

Interface



Defined Strokes

Displays a list of commands that currently have strokes assigned to them and the name of the current stroke set.

Make Camera Active—Point at a single camera (not the target), draw the stroke, and that camera becomes active in the viewport in which you draw the stroke.

Change Light Color—You can stroke this command over one or more lights. The color selector appears, so you can change the color of the selected lights.

Light On/Off Toggle—Stroke over a light to toggle it on and off. If you stroke over two or more lights, all the lights are set to a common state, either all on or all off.

Set Constraints—Displays a small dialog with the available axis constraints. Double-click to change the axis constraints for the current transform mode.

Move Mode (Set Constraints)—Switches to Move transform mode and displays a small dialog with the available axis constraints. Double-click to change the axis constraints for the current transform mode.

Rotate Mode (Set Constraints)—Switches to Select and Rotate mode and displays a small dialog with the available axis constraints. Double-click to change the axis constraints for the current transform mode.

Scale Mode (Set Constraints)—Switches to Select and Scale mode and displays a small dialog with the available axis constraints. Double-click to change the axis constraints for the current transform mode.

Review Strokes—Displays the Review Strokes dialog.

Stroke Preferences—Displays the *Stroke Preferences dialog (page 3–908)*.

Show As

Provides two options that specify how commands are displayed in the list.

Command Name—Displays the assigned strokes by command name (for example, Play Animation).

Stroke Name—Displays the assigned strokes by their stroke name (for example, HK).

Change—Assigns a different stroke to the command, or vice versa, depending on whether commands or strokes are displayed in the list.

Note: This command is only available when the dialog is accessed by drawing the Review Strokes stroke.

Delete—Removes the selected command (or stroke) from the list, and the command is no longer assigned to the stroke.

Note: This command is only available when the dialog is accessed by drawing the Review Strokes stroke.

Information on Selected Stroke

Displays the name and shape of the stroke selected in the list window.

Stroke Preferences Dialog

Draw the Stroke Preferences stroke. By default, this is an inverse L, drawn vertically from bottom to top, and then horizontally from left to right.

Set up a stroke to access the Stroke Preferences dialog > Use the stroke

With the Stroke Preferences dialog you can save sets of strokes and set other stroke properties.

Note: This dialog is available only by drawing its stroke (by default, an inverse L, drawn vertically from bottom to top, and then horizontally from left to right). You can redefine the Stroke Preferences stroke in the *Review Strokes dialog (page 3–907)*.

Note: By default, the Strokes Preferences dialog is available only if you assign a stroke to it, then use the stroke to access the dialog. See the following procedure.

Procedure

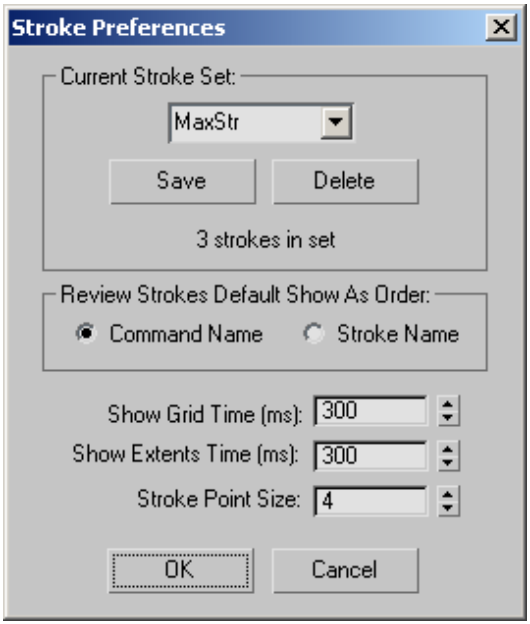
To access the Strokes Preferences dialog:

1. Set up strokes for your left or middle mouse button. See *Strokes (page 3–903)* for information how to do this.
2. To define the stroke, hold down CTRL and drag an inverted L shape (drag vertically from bottom to top, and continue from left to right).

   The name of this stroke is JGAB.
3. On the Define Strokes dialog, choose Stroke Preferences from the list.
4. Click OK to close the dialog.

5. Drag an inverted L shape to access the Strokes Preferences dialog.

Interface



Current Stroke Set group

Displays the name and number of strokes in the current set.

- To create a new set, enter a new name in the field and click Save.
- To choose a different set, choose it from the list and click OK.

Save—Saves the set displayed in the list.

Delete—Deletes the set displayed in the list.

Review Strokes Default Show As Order group

Specifies whether commands or strokes are initially listed in the Review Strokes dialog.

Show Grid Time (ms)

The time it takes, in milliseconds, for the stroke analysis grid to appear in the viewports when you complete a stroke. Set it to 0 to hide the grid. Default=300 (about 1/3 of a second); Range=0 to 2000.

Show Extents Time (ms)

The time it takes, in milliseconds, for the extents of the stroke to appear in the viewports. Range=0 to 2000. Set it to 0 to disable this feature. Default=300 (about 1/3 of a second).

Strokes that operate on the First Point display a small X. Strokes that operate on items in the bounding box of the stroke display the bounding box. Strokes that operate on the circular extents display a circle that fits inside the square bounding box of the stroke. Window selections appear solid. Crossing selections appear dotted.

Stroke Point Size

The size, in pixels, of Xs drawn in the viewports that allow you to visualize the stroke shape. Default=4; Range=3 to 20.

Strokes Utility

Utilities panel > Utilities rollout > More button > Utilities dialog > Strokes

The Strokes utility lets you launch commands by dragging left-button mouse patterns in a viewport. When you launch the Strokes utility, a modeless dialog appears containing a single Draw Strokes button. When the Draw Strokes button is active, you can define and use strokes with the left mouse button.

The Strokes system is also available as an option for the middle mouse button that doesn't require the utility or the modeless dialog. This option can be found on the *Viewports tab (page 3–874)* of the Preferences dialog. For details, see *Strokes (page 3–903)*.

Procedures

Example: To define a stroke pattern for Arc Rotate:

1. On the Utilities panel, click the More button, and choose Strokes from the list.
2. On the modeless dialog, click Draw Strokes.
3. Hold down the left mouse button and drag the mouse straight down from top to bottom, then release the mouse button. The length of the stroke doesn't matter, but the direction does.

   A dialog appears asking you to define the pattern or continue.
4. Click Define to display the Define Stroke dialog.
5. Choose Arc Rotate from the Command To Execute list and then click OK.

   The pattern is now defined for Arc Rotate.

Example: To turn on Arc Rotate using the Strokes utility:

1. Turn on Draw Strokes in the modeless dialog.
2. In any viewport, hold down the left mouse button and drag the mouse straight down from top to bottom. The length of the stroke doesn't matter, but the direction does.

   As you drag the mouse, small X's appear, displaying your stroke. When you release the mouse, a 3x3 grid appears briefly, and then the program switches to Arc Rotate mode.

   If a Stroke Not Found message appears, click Continue, and then repeat step 2.

23 Default Keyboard Shortcuts

Default Keyboard Shortcuts

Keyboard shortcuts are keyboard alternatives you can use to initiate actions (commands or tools) normally accessed with the mouse. For example, to open the Select Objects dialog, you can press the **H** key, or you can change the active viewport to a view from the Bottom, by pressing **B**. Keyboard shortcuts offer a means to let you work faster and more efficiently.

Many keyboard shortcuts are already set for most commonly used actions. If you want to modify or add new shortcuts, you can do this from the *Keyboard panel (page 3–837)* of the *Customize User Interface dialog (page 3–836)*. Keyboard shortcuts are separated by *Groups* or *Categories* of groups and they organize *Actions*.

Groups—organize the Actions for which you can set shortcuts. Default=Main UI.

Categories—offer a further breakdown of the Actions in a Group to specific categories. This lets you quickly find an Action so you can assign or adjust a shortcut.

Actions—are commands or tools.

The tables in these topics show the default keyboard shortcuts. Only shortcuts which are defined by default are listed in these tables; however, you can create a shortcut for almost every command available in the software.

As the tables show, the keyboard shortcut system has been expanded in the latest version of 3ds Max.

In most cases you can close a dialog with the same command used to open it. In general this applies to any combination of input methods, including menu, toolbar button, and keyboard shortcuts. For more information, see *Toggling Dialogs (page 3–718)*.

Note: You can create a text (TXT) file of all the actions and their shortcuts by clicking Write Keyboard Chart on the *Keyboard panel (page 3–837)* of the *Customize User Interface dialog (page 3–836)*. All actions that can have a shortcut assigned to them are listed. For actions with no default shortcut assigned, the Shortcut column entry is blank.

You can assign and change default keyboard shortcuts in these feature areas:

ActiveShade Shortcuts (page 3–913)

Biped Shortcuts (page 3–913)

Biped Curve Editing Shortcuts (page 3–915)

Cloth Shortcuts (page 3–915)

Crowd Shortcuts (page 3–916)

Edit Normals Shortcuts (page 3–916)

Edit/Editable Mesh Shortcuts (page 3–918)

Edit/Editable Patch Shortcuts (page 3–919)

Edit/Editable Spline Shortcuts (page 3–920)

Editable Poly Shortcuts (page 3–920)

Free-Form Deformation (FFD) Shortcuts (page 3–921)

Garment Maker Shortcuts (page 3–922)

Main User Interface Shortcuts (page 3–922)

Material Editor Shortcuts (page 3–946)

NURBS Shortcuts (page 3–947)

Object Display Culling Shortcuts (page 3–949)

Particle Flow Shortcuts (page 3–949)

Physique Shortcuts (page 3–950)

Reaction Manager Shortcuts (page 3–950)

Schematic View Shortcuts (page 3–951)

Track View Shortcuts (page 3–952)

Unwrap UVW Shortcuts (page 3–954)

Video Post Shortcuts (page 3–961)

Weight Table Shortcuts (page 3–962)

Procedure

To create a keyboard shortcut:

1. Choose Customize menu > Customize User Interface > Keyboard panel.
2. Use the Group and Category lists to find the action for which you want to create a shortcut.
3. Click an action in the Action list to highlight it.
4. In the Hotkey field, enter the keyboard shortcut you want to assign to the selected action.

   Note: If the keyboard shortcut you enter is already assigned to an action, that action's name will appear in the Assigned To field.
5. Click Assign.

Note: To use keyboard shortcuts other than the Main User Interface shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

Keyboard Shortcut Override Toggle

Extras Toolbar (hidden by default) > Keyboard Shortcut Override Toggle

The Keyboard Shortcut Override Toggle lets you toggle between using only the "Main User Interface" shortcut keys and using both the main shortcuts and shortcut keys for functional areas such as Editable Meshes, Track View, NURBS, and so on.

When the Override toggle is off, only the *Main User Interface shortcuts (page 3–922)* are recognized. When Override is on, both Main UI and functional area shortcuts are recognized; however, if there is a conflict between a shortcut assigned to a feature and one assigned to the Main UI, when Override is on, the feature's shortcut takes precedence.

You can customize keyboard shortcuts on the *Keyboard panel (page 3–837)* of the *Customize User Interface dialog (page 3–836)*. The lists in the keyboard panel show which shortcuts have been assigned to which command or feature.

See also

Default Keyboard Shortcuts (page 3–911)

ActiveShade Shortcuts

To use ActiveShade keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

ActiveShade (page 3–17)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

ActiveShade Function	Default Keyboard Shortcut
Act Only on Mouse Up	
Close	Q
Draw Region	D
Render	R
Select Object	S
Toggle Toolbar (Docked)	SPACEBAR

Biped Shortcuts

The table in this topic shows the default keyboard shortcuts for **character studio**. To customize your shortcuts, use the path specified above.

Use the Keyboard Shortcut Override toggle on the 3ds Maxextras toolbar to enable the **character studio** keyboard shortcuts.

Note: The default UI does not display this toolbar; to see it, right-click an empty portion of any toolbar, and choose Extras from the menu.

All **character studio** keyboard shortcuts activate when the Motion panel is active and the Keyboard Shortcut Override button is active.

See Also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Action	Shortcut	Description
Activate Layer (Toggle)		
Bend Links Mode		
Body Horizontal		Selects the center of mass to edit horizontal biped motion
Body Rotation		Selects the center of mass to edit biped rotational motion
Body Vertical		Selects the center of mass to edit vertical biped motion
Buffer Mode		
Change Leg State	ALT+CTRL+S	Toggles foot states of the selected leg at the current frame. View the state change in the leg states displayed on the Biped rollout.
Clear All Animation		
Clear Selected Tracks		
Collapse Layer		
Collapse Move All Mode Changes	ALT+M	
Copy Posture	ALT+C	Copies the posture of the selected biped objects to the clipboard.
Create Layer		
Delete Layer		
Display Biped Trajectory		
Display Bones		
Display Footstep Number		

Action	Shortcut	Description
Display Footsteps		
Enable Subanims		
Figure Mode		
Fix Graphs	ALT+CTRL+F	Searches for any problem in the motion and prompts you whether or not to fix problems it encounters. Problems it looks for include overlapping keys, keys past the end of the footstep range, keys at negative frames, or illegal footstep timing. Click OK when prompted to fix these problems automatically.
Footstep Mode		
Free Mode		
In Place Mode		
In Place X Mode		
In Place Y Mode		
Load .bip File		
Lock Selected Keys (toggle)	ALT+CTRL+L	Toggles locked keys (red) on and off for the selected leg or vertical track key at the current frame. In Track View, you can watch the key turn from red to gray, and back again, as you lock and unlock it.
Manipulate Subanims		
Mirror		
Mixer Mode		
Motion Flow Mode		
Move All Mode		
Next Layer		

Action	Shortcut	Description
Paste Posture	ALT+V	Pastes the posture from the clipboard onto the currently selected biped.
Paste Posture Opposite	ALT+B	Pastes Posture Opposite for the currently selected biped.
Play Biped	V	Toggles Biped playback.
Previous Layer		
Reset all limb keys	ALT+K	
Rubber Band Mode		
Save .bip File		
Scale In Transform (toggle)	ALT+CTRL+E	This toggle strips the scale from the biped. Developers should use this when exporting biped objects as regular 3ds Max links through the 3ds Max SDK. Animators should not use this shortcut.
Scale Stride Mode		
Set Free Key		
Set Key	0	Sets a biped key.
Set Layer Snap Key		
Set Multiple Keys		
Set Planted Key		
Set Range	ALT+R	Resets the total animation length to the length of the current biped footstep range.
Set Sliding Key		
Smooth Twist Mode		
Toggle Biped Keys in Track Bar	ALT+T	
TV Select end of footstep	ALT+D	Selects all right edges of the selected footsteps in Track View.

Action	Shortcut	Description
TV Select entire footstep	ALT+S	Selects both edges of the selected footsteps in Track View.
TV Select start of footstep	ALT+A	Selects all left edges of the selected footsteps in Track View.
Twist Links Mode		

* Not available for customization in the Customize User Interface dialog.

Biped Curve Editing Shortcuts

These keyboard shortcuts are for working with the *Animation Workbench (page 2–864)*.

Use the Keyboard Shortcut Override toggle on the 3ds Max Extras toolbar to enable the **character studio** keyboard shortcuts.

Note: The default UI does not display the Extras toolbar; to see it, right-click an empty portion of any toolbar, and choose Extras from the menu.

All **character studio** keyboard shortcuts activate when the Motion panel is active and the Keyboard Shortcut Override button is active.

See Also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Action	Keyboard Shortcut
Pos Curve Relative To Bip Root	
Pos Curve Relative To World	
Show Pos Accel Curve	
Show Pos Curve	
Show Pos Jerk Curve	
Show Pos Speed Curve	
Show Rot Accel Curve	
Show Rot Curve	
Show Rot Jerk Curve	
Show Rot Speed Curve	
Toggle Draw Every Frame	
Toggle Layered Edit	
Toggle Limit Quat Curve to 180	
Toggle Manipulate Subanims	
Toggle Show Z	
Toggle Show X	
Toggle Show Y	
Toggle Subanims	

Cloth Shortcuts

Note: By default, no keyboard shortcuts are set in the Cloth group.

See also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Cloth Function	Keyboard Shortcut
Add Objects	
Change Group	
Check Intersections	
Cloth Constraint	
Copy Forces	
Copy Group	
Create Keys	
Delete Group	

Cloth Function	Keyboard Shortcut
Delete Object Cache	
Delete Constraint	
Drag Constraint	
Erase Simulation	
Forcefield Constraint	
Get Group	
Grab State	
Group Constraint	
Initialize Constraint	
Live Drag	
Live Rotate	
Make Group	
NoCollide Constraint	
Node Constraint	
Object Properties	
Paste Group	
Preserve Constraint	
Rename Group	
Reset State	
Self Collision	
Set Initial State	
Show Current State	
Show Sewing Springs	
Sim on Mouse Down	
SimNode Constraint	
Simulate	
Simulate Local	
Simulate Local Damped	
Solid Collision	
Surface Constraint	
Truncate Simulation	
Use End Frame	
Use Gravity	

Crowd Shortcuts

Use the Keyboard Shortcut Override toggle on the 3ds Maxextras toolbar to enable the **character studio** keyboard shortcuts.

Note: The default UI does not display this toolbar; to see it, right-click an empty portion of any toolbar, and choose Extras from the menu.

All **character studio** keyboard shortcuts activate when the Motion panel is active and the Keyboard Shortcut Override button is active.

See Also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Action	Shortcut	Description
Solve	S	Solves crowd simulation.
Step Solve		Step-solves crowd simulation.

Edit Normals Shortcuts

To use keyboard shortcuts for Edit Normals, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Edit Normals Modifier (page 1–613)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Edit Normals Function	Keyboard Shortcut
Average Mode	
Average Normals	
Break Normals	B
Copy Normal	CTRL+C
Edge Level	CTRL+3
Face Level	CTRL+4
Make Explicit	E
Normal Level	CTRL+1
Object Level	CTRL+0 (zero)
Paste Normal	CTRL+V
Reset Normals	R
Specify Normals	S
Unify Normals	U
Vertex Level	CTRL+2

Edit Poly Shortcuts

These are the keyboard shortcuts for Edit Poly objects; that is, objects to which the *Edit Poly modifier (page 1–619)* is applied and active. The table shows only the default keyboard shortcuts for commands and menu entries.

To use keyboard shortcuts for Edit Poly objects, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Edit Poly Modifier (page 1–619)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Edit Poly Function	Default Keyboard Shortcut
Affect Backfacing	
Align to Grid	
Align to View	
Attach	
Attach List	
Auto Smooth	
Bevel Mode	Shift+Ctrl+B
Bevel Settings	
Border Level	3
Break	
Bridge	
Bridge Settings	
Cap	
Chamfer Mode	Shift+Ctrl+C
Chamfer Settings	
Collapse	
Connect	Shift+Ctrl+E
Connect Edge Settings	
Constrain to Edges	Shift+X
Constrain to Faces	
Create	
Create Shape from Edges	
Cut	ALT+C
Detach	
Edge Level	2
Edit Triangulation Mode	
Element Level	5
Extrude along Spline Mode	
Extrude along Spline Settings	
Extrude Mode	Shift+E
Extrude Settings	
Flip Normals	

Edit Poly Function	Default Keyboard Shortcut
Grow Selection	Ctrl+PageUp
Hide	Alt+H
Hide Unselected	Alt+I (letter "i")
Hinge from Edge Mode	
Hinge from Edge Settings	
Ignore Backfacing in Selections	
Insert Vertex Mode	
Inset Mode	
Inset Settings	
Make Planar	
MeshSmooth	
MeshSmooth Settings	
Object Level	6
Outline Mode	
Outline Settings	
Polygon Level	4
Quickslice Mode	Shift+Ctrl+Q
Remove	
Remove Isolated Vertices	
Remove Unused Map Vertices	
Repeat Last Operation	; (semi-colon)
Reset Slice Plane	
Retriangulate	
Select By Vertex	
Select Edge Loop	ALT+L
Select Edge Loop Down	
Select Edge Loop Down Add	
Select Edge Loop Down Substract	
Select Edge Loop Up	
Select Edge Loop Up Add	
Select Edge Loop Up Subtract	
Select Edge Ring	ALT+R

Edit Poly Function	Default Keyboard Shortcut
Select Edge Ring Down	
Select Edge Ring Down Add	
Select Edge Ring Down Subtract	
Select Edge Ring Up	
Select Edge Ring Up Add	
Select Edge Ring Up Subtract	
Shaded Face Toggle	
Shrink Selection	Ctrl+PageDown
Slice	
Slice Plane Mode	
Split Edges	
Tessellate	
Tessellate Settings	
Unhide All	Alt+U
Use Soft Selection	
Vertex Level	1
Weld Mode	Shift+Ctrl+W
Weld Settings	

Edit/Editable Mesh Shortcuts

Edit Mesh and Editable Mesh actions that are assigned default keyboard shortcuts are listed in the table below.

To use keyboard shortcuts for Edit Mesh and Editable Mesh objects, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Edit Mesh Modifier (page 1–613)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Edit/Editable Mesh Function	Default Keyboard Shortcut
Attach List	
Attach Mode	
Auto Edge	
Auto Smooth	
Bevel Mode	CTRL+V, CTRL+B
Break Vertices	
Chamfer Mode	CTRL+C
Collapse	
Copy Named Selection	
Create Mode	
Cut Mode	ALT+C
Delete Isolated Vertices	
Detach	CTRL+D
Divide Mode	
Edge Invisible	CTRL+I (letter "i")
Edge Level	2
Edge Turn	CTRL+T
Edge Visible	
Element Level	5
Explode	
Extrude Mode	CTRL+E
Face Level	3
Flip Normal Mode	
Flip Normals	
Grid Align	
Hide Selected	
Ignore Backfacing in Selections	
Ignore Visible Edges (for Polygons)	
Make Planar	
Next Sub-object Level	
Object Level	
Paste Named Selection	
Polygon Level	4
Previous Sub-object Level	
Refine Cut Ends	
Select by Vertex Toggle	
Select Open Edges	
Set Vertex Color	
Set Vertex Illumination	
Show Normals	
Slice	
Slice Plane	
Soft Selection	
Soft Selection Affect Backfacing	
Split	
Unhide All	
Unify Normals	
Vertex Level	1
View Align	
Weld Selected	CTRL+W
Weld Target Mode	ALT+W

Edit/Editable Patch Shortcuts

To use keyboard shortcuts for Edit Patch and Editable Patch objects, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

Note: By default, no keyboard shortcuts are set in the Edit/Editable Patch group.

See also

Editable Patch Surface (page 1–950)

Edit Patch Modifier (page 1–617)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Edit/Editable Patch Function	Default Keyboard Shortcut
Edit/Editable Patch Menu	

Edit/Editable Spline Shortcuts

To use keyboard shortcuts for Edit Spline and Editable Spline objects, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

Note: By default, no keyboard shortcuts are set in the Edit/Editable Spline group.

See also

Editable Spline (page 1–284)

Edit Spline Modifier (page 1–671)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Edit/Editable Spline Function	Default Keyboard Shortcut
Edit/Editable Spline Menu	

Editable Poly Shortcuts

These are the keyboard shortcuts for Editable Poly objects. The table shows only the default keyboard shortcuts for commands and menu entries.

To use keyboard shortcuts for Editable Poly objects, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Editable Poly Surface (page 1–1012)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Editable Poly Function	Default Keyboard Shortcut
Affect Backfacing	
Align to Grid	
Align to View	
Attach	
Attach List	
Auto Smooth	
Bevel Mode	SHIFT+CTRL+B
Bevel Settings	
Border Level	3
Break	
Bridge	
Bridge Settings	
Cap	
Chamfer Mode	SHIFT+CTRL+C
Chamfer Settings	
Collapse	
Connect	SHIFT+CTRL+E
Connect Edge Settings	
Constrain to Edges	SHIFT+X
Constrain to Faces	
Create	
Create Shape from Edges	
Cut	ALT+C
Detach	

Editable Poly Function	Default Keyboard Shortcut
Edge Level	2
Edit Triangulation Mode	
Element Level	5
Extrude along Spline Mode	
Extrude along Spline Settings	
Extrude Mode	SHIFT+E
Extrude Settings	
Face Level	4
Flip Normals	
Grow Selection	CTRL+PageUp
Hide	ALT+H
Hide Unselected	ALT+I (letter "i")
Hinge from Edge Mode	
Hinge from Edge Settings	
Ignore Backfacing in Selections	
Insert Vertex Mode	
Inset Mode	
Inset Settings	
Make Planar	
MeshSmooth	
MeshSmooth Settings	
Object Level	6
Outline Mode	
Outline Settings	
Quickslice Mode	SHIFT+CTRL+Q
Remove	
Remove Isolated Vertices	
Remove Unused Map Vertices	
Repeat Last Operation	; (semicolon)
Reset Slice Plane	
Retriangulate	
Select By Vertex	

Editable Poly Function	Default Keyboard Shortcut
Select Edge Loop	ALT+L
Select Edge Loop Down	
Select Edge Loop Down Add	
Select Edge Loop Down Substract	
Select Edge Loop Up	
Select Edge Loop Up Add	
Select Edge Loop Up Subtract	
Select Edge Ring	ALT+R
Select Edge Ring Down	
Select Edge Ring Down Add	
Select Edge Ring Down Substract	
Select Edge Ring Up	
Select Edge Ring Up Add	
Select Edge Ring Up Subtract	
Shaded Face Toggle	
Shrink Selection	CTRL+PageDown
Slice	
Slice Plane Mode	
Split Edges	
Tessellate	
Tessellate Settings	
Unhide All	ALT+U
Use Soft Selection	
Vertex Level	1
Weld Mode	SHIFT+CTRL+W
Weld Settings	

Free-Form Deformation (FFD) Shortcuts

To use keyboard shortcuts for Free-Form Deformation (FFD) modifiers, the *Keyboard*

Shortcut Override Toggle (page 3–912) on the Extras toolbar must be turned on.

FFD Function	Keyboard Shortcut
Switch To Control Point Level	ALT+SHIFT+C
Switch To Lattice Level	ALT+SHIFT+L
Switch To Set Volume Level	ALT+SHIFT+S
Switch To Top Level	ALT+SHIFT+T

See also

FFD (Free-Form Deformation) Modifiers (page 1–674)

FFD (Box/Cylinder) Modifiers (page 1–677)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Garment Maker Shortcuts

Note: By default, no keyboard shortcuts are set in the Garment Maker group.

See also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Garment Maker Function	Keyboard Shortcut
Arranged Panels	
Auto Mesh	
Break Multisegment	
Create Seam	
Delete All Seams	
Delete Seam	
Enable Seam	
Flat Panels	
Make Multisegment	
Mesh It	
Mesh It Preserve	
Panel Curved	
Panel Preserved	
Panel Preserved	
Preserve	
Preserved Surface	
Reset All Panels Deformation	
Reset All Panels Position	
Reset Panel Deformation	
Reset Panel Position	
Reverse Seam	
Seam Cut	
Show Mesh	
Show Seams	
Stretch Map Coords	
X Axis	
Y Axis	

Main User Interface Shortcuts

You can quickly access a majority of the user interface functionality via a combination of keystrokes and mouse button clicks. The table below shows the functions for which you can create a shortcut. Where a function has a default keyboard shortcut, the shortcut is listed in the second column.

See also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Note: In the table below, "RMB" stands for "right mouse button": in other words, a right-click.

User Interface Function	Keyboard Shortcut
Numeric Expression Evaluator	CTRL+N while the cursor is in a numeric field

The following list shows all action items for which you can create a keyboard shortcut. For those action items with a default keyboard shortcut, the shortcut is shown in the right column.

User Interface Function	Default Keyboard Shortcut
100W Bulb	
100W Halogen Bulb	
21W Halogen Bulb	
35W Halogen Bulb	
40W Bulb	
4ft Cove Fluorescent (web)	
4ft Pendant Fluorescent (web)	
50W Halogen Bulb	
60W Bulb	
75W Bulb	
80W Halogen Bulb	
About Reactor	
Absolute	
Activate 3ds Max	
Activate All Maps	
Activate Grid (Context)	
Activate Grid Object	
Activate Home Grid	
Activate Home Grid (Context)	
ActiveShade Floater	
ActiveShade Quad	
ActiveShade Viewport	
Adaptive Degradation Toggle	O (letter "o")
Adaptive Perspective Grid Toggle	
Add	
Add a Pop-up Note	
Add Bones (Skin)	
Add Brush Preset	
Add Cross Section (Skin)	
Add Default Lights to Scene	
Add Files...	
Add Hair Effect	
Add Hair Modifier	
Add hair properties	
Add Quad (Patch)	
Add Selection to Current Layer	
Add to Selected	
Add Toolbar	
Add Tri (Patch)	
Add Weight (Skin)	
Add/Edit Parameters (SV)	
Add/Edit Parameters (TV)	Ctrl+1
Additional Help	
Advanced Lighting Panel	9
Advanced Quad Option Menu	
Affect Diffuse Toggle	
Affect Pivot Only Mode Toggle	
Affect Region Modifier	
Affect Specular Toggle	

User Interface Function	Default Keyboard Shortcut
Align	ALT+A
Align Bottom	
Align Camera	
Align Grid to View	
Align Horizontal Center	
Align Left	
Align Right	
Align to View	
Align Top	
Align Vertical Center	
Always Arrange	
Ambient Only Toggle	
Analyze World	
Angle Shape	
Angle Snap Toggle	A
Animation	ALT+RMB
Apply Camera Correction Modifier (Context)	
Apply Cloth Modifier	
Apply Inverse Kinematics	
Apply Rope Modifier	
Apply Soft Body Modifier	
Arc Rotate View Mode	CTRL+R
Arc Shape	
Archive	
Arrange Selected	
Array	
Assemble Objects	
Assembly Attach	
Assembly Close	
Assembly Detach	
Assembly Explode	
Assembly Open	

User Interface Function	Default Keyboard Shortcut
Asset Browser	
Asset Tracking Quad	
Asset Tracking...	Shift+T
Assign Controller	
Assign Vertex Colors	
Assume Pref Angles	
Assume Skin Pose	
Attach (Mesh)	
Attach (Patch)	
Attach (Poly)	
Attach (Spline)	
Attach Multiple (Spline)	
Attachment Constraint	
Attribute Holder Modifier	
Audio Position Controller	
Audio Rotation Controller	
Audio Scale Controller	
Auto Expand Base Objects	
Auto Expand Children	
Auto Expand Materials	
Auto Expand Modifiers	
Auto Expand Selected Only	
Auto Expand Transforms	
Auto Expand XYZ Components	
Auto Key Mode Toggle	N
Auto Login	
Auto Scroll to Root	
Auto Scroll to Selected	
Auto Select Animated	
Auto Select Position	
Auto Select Rotation	

User Interface Function	Default Keyboard Shortcut
Auto Select Scale	
Auto Select XYZ Components	
Auto Smooth (Poly)	
AutoGrid	
Awning Window	
Back View	
Backface Cull Toggle	
Backface Cull Vertices (Skin)	
Background Lock Toggle	ALT+CTRL+B
Backup Time One Unit	, (comma)
Batch Render Dialog Toggle	
Bend Modifier	
Bend Space Warp	
Bevel (Poly)	
Bevel Element (Patch)	
Bevel Face (Mesh)	
Bevel Face (Poly)	
Bevel Modifier	
Bevel Patch (Patch)	
Bevel Polygon (Mesh)	
Bevel Profile Modifier	
Bezier Position Controller	
Bezier Scale Controller	
BiFold Door	
Bind (Patch)	
Bind (Spline)	
Bind Space Warp Mode	
Biped	
Bitmap Pager Statistics Toggle	
Blend Weights (Skin)	

User Interface Function	Default Keyboard Shortcut
Blizzard Particle System	
BlobMesh Compound Object	
Blur Brush Mode (VertexPaint)	
Bomb Space Warp	
Bone Options	
Bone Tools	
Bones IK Chain	
Boolean Compound Object	
Borrow license	
Bottom View	B
Box	
Box Gizmo (Atmospheres)	
Box Mode Selected Toggle	
Break (Poly)	
Break Vertex (Patch)	
Break Vertex (Poly)	
Break Vertices (Mesh)	
Break Vertices (Spline)	
Browse...	
Brush Opacity Down (VertexPaint)	
Brush Opacity Up (VertexPaint)	
Brush Size Down (VertexPaint)	
Brush Size Up (VertexPaint)	
By Layer Properties for Selected Objects	
Camera Correction Modifier	
Camera Map (WSM)	
Camera Map Modifier	
Camera Match	
Camera Point	

User Interface Function	Default Keyboard Shortcut
Camera View	C
Cap (Poly)	ALT+P
Cap Border (Poly)	
Cap Holes Modifier	
Capsule	
Casement Window	
Center Point Cycle	
C-Extrusion	
Chamfer (Poly)	
Chamfer Cylinder	
Chamfer Edge (Mesh)	
Chamfer Edge (Poly)	
Chamfer Vertex (Mesh)	
Chamfer Vertex (Poly)	
Chamfer Vertex (Spline)	
ChamferBox	
Change Photometric File...	
Channel Info Editor...	
Channel Shape	
Check Network Paths	
Checkin...	
Checkout...	
Circle Shape	
Circular Selection Region	
Clear All Smoothing Groups (Patch)	
Clear All Smoothing Groups (Poly)	
Clear Hair InstanceMesh	
Clear Set Key Mode Buffer	
Clone	CTRL+V
Clone and Align Tool	
Close (Spline)	

User Interface Function	Default Keyboard Shortcut
CloseUnwrapUI	
Cloth Modifier	
Collapse (Mesh)	
Collapse (Poly)	ALT+CTRL+C
Collapse Controller...	
Collapse Stack	
Collect Parameters SV	Alt+3
Collect Parameters TV	Alt+4
Color Clipboard	
Compass	
Condense Materials Editor Slots	
Cone	
Configure System Paths	
Configure User Paths	
Conform Compound Object	
Conform Space Warp	
Connect (no dialog) (Poly)	
Connect (Spline)	
Connect (with dialog) (Poly)	
Connect Compound Object	
Connect Edge (Poly)	
Connect Vertex (Poly)	
Controller Defaults Dialog	
Controller Range Editor (Open)	
Controller Ranges (Switch to)	
Convert file paths to UNC	
Convert Guides To Splines	
Convert Hairs To Mesh	
Convert Hairs To Splines	

User Interface Function	Default Keyboard Shortcut
Convert to Area Light	
Convert to Edge (Poly)	
Convert to Editable Mesh	
Convert to Editable Patch	
Convert to Editable Polygon	
Convert to Editable Spline	
Convert to Face (Poly)	
Convert to NURBS Surface	
Convert to Patch Modifier	
Convert to Vertex (Poly)	
Convexity Test	
Copy Envelope (Skin)	
Copy Hairdo	
Copy Weights (Skin)	
Create (Patch)	
Create (Poly)	
Create a Character	
Create Angular Dashpot	
Create Animation	
Create Camera From View	Ctrl+C
Create Car-Wheel Constraint	
Create Cloth Collection	
Create Command Mode	
Create Constraint Solver	
Create Deforming Mesh Collection	
Create Edge (Poly)	
Create Faces (Mesh)	
Create Fracture	
Create Hinge Constraint	
Create Key	
Create Line (Spline)	

User Interface Function	Default Keyboard Shortcut
Create Linear Dashpot	
Create Mode	
Create Motor	
Create New Layer	
Create Plane	
Create Point-Path Constraint	
Creat Point-Point Constraint	
Create Polygon (Poly)	
Create Polygons (Mesh)	
Create Position Lock Key	
Create Prismatic Constraint	
Create Rag Doll Constraint	
Create Rigid Body Collection	
Create Rope Collection	
Create Rotation Lock Key	
Create Shape (Poly)	
Create Shape from Edges (Mesh)	
Create Shape from Edges	
Create Shape from Edges (Patch)	
Create Shape from Edges (Poly)	
Create Soft Body Collection	
Create Spring	
Create Toy Car	
Create Vertex (Poly)	
Create Vertices (Mesh)	
Create Water	
Create Wind	
Cross Hair Cursor Toggle	
Cross Insert (Spline)	
Cross Section Modifier	
Crowd	

User Interface Function	Default Keyboard Shortcut
Curve Editor (Open)	
Curve Editor (Switch to)	
Custom [Shift+Ctrl+Alt+ RMB]	
Custom [Shift+Ctrl+RMB]	
Custom Dependencies...	
Custom UI and Default Switcher	
Customize Tool Palettes	
Customize Toolbars	
Customize User Interface	
Cut (Poly)	ALT+C
Cut Edge (Mesh)	
Cut Faces (Mesh)	
Cut Polygons (Mesh)	
CV Curve	
CV Surface	
Cycle Active Snap Type	ALT+S
Cycle Selection Method	CTRL+F
Cycle Snap Hit	ALT+SHIFT+S
Cycle Vertices (Spline)	
Cylinder	
Cylinder Gizmo (Atmospheres)	
Damper	
Daylight System	
Deactivate All Maps	
Debugger Dialog	
Default Lighting Toggle	CTRL+L
Default Viewport Quad	
Deflector Space Warp	
Delegate	
Delete All	

User Interface Function	Default Keyboard Shortcut
Delete Collection	
Delete Keys (All)	
Delete Keys (Selection)	
Delete Mesh Modifier	
Delete Objects	. (Decimal Point)
Delete Patch (Patch)	
Delete Patch Edge (Patch)	
Delete Patch Element (Patch)	
Delete Patch Modifier	
Delete Patch Vertex (Patch)	
Delete Rollout	
Delete Rollout Move Down	
Delete Rollout Move Up	
Delete Schematic View	
Delete Segment (Spline)	
Delete Selected [in Schematic View]	
Delete Selected [in Parameter Collector]	
Delete Selected Animation	
Delete Spline (Spline)	
Delete Spline Modifier	
Delete the Pop-up Note	
Delete Toolbar	
Delete Track View	
Delete Vertex (Spline)	
Destroy Character	
Detach (Mesh)	
Detach (Patch)	
Detach (Poly)	
Detach Element (Patch)	
Detach Segment (Spline)	
Detach Spline (Spline)	

User Interface Function	Default Keyboard Shortcut
Disable Asset Tracking	
Disable Scene Redraw Toggle	
Disable Viewport	D
Disassemble Objects	
Disp Approx Modifier	
Disp Approx Modifier (WSM)	
Displace Modifier	
Displace Space Warp	
Display As See-Through Toggle	ALT+X
Display Channel Down (VertexPaint)	
Display Channel Up (VertexPaint)	
Display Command Mode	
Display Edges Only Toggle	
Display Excluded Files	
Display First Tab	
Display Floater	
Display Selected Edges with Edged Faces	
Display Toggle Enable	
Display Toggle Mode	
Display Vertex Ticks Toggle	
Divide (Spline)	
Divide Edges (Mesh)	
Divide Faces (Mesh)	
Divide Polygons (Mesh)	
Dolly Mode	
Donut Shape	
Dope Sheet (Switch To)	
Dope Sheet (Open)	
Drag Space Warp	

User Interface Function	Default Keyboard Shortcut
Draw CrossSections on Top (Skin)	
Draw Envelope on Top (Skin)	
Dual Planes Toggle	
Dummy	
Duplicate Collection	
DX Effect Toggle Display	
DX Effect Toggle Display Selected	
Edge Constraint Toggle (Poly)	
Edit Mesh Modifier	
Edit Modifier Stack	
Edit Named Selection Sets...	
Edit Named Selections	
Edit Normals Modifier	
Edit Notes	
Edit Patch Modifier	
Edit Spline Modifier	
Edit Triangulation (Poly)	
Ellipse Shape	
Environment Dialog Toggle	8
Erase Mode (VertexPaint)	
Euler XYZ Controller	
Exclude Output Files	
Exclude Verts (Skin)	
Exit 3ds Max	
Expert Mode Toggle	CTRL+X
Explode (Spline)	
Export File	
Export Selected	
Expose Transform	
Exposure Control	
Extend (Spline)	

User Interface Function	Default Keyboard Shortcut
Extrude (Poly)	
Extrude along Spline (Poly)	
Extrude Edge (Mesh)	
Extrude Edge (Patch)	
Extrude Edge (Poly)	
Extrude Element (Patch)	
Extrude Face (Mesh)	
Extrude Face (Poly)	ALT+E
Extrude Face along Spline (Poly)	
Extrude Modifier	
Extrude Patch (Patch)	
Extrude Polygons (Mesh)	
Extrude Vertex (Poly)	
Face Constraint Toggle (Poly)	
Face Extrude Modifier	
Fence Selection Region	
Fetch	ALT+CTRL+F
FFD 2x2x2 Modifier	
FFD 3x3x3 Modifier	
FFD 4x4x4 Modifier	
FFD Box Modifier	
FFD Cylinder Modifier	
FFD Select Modifier	
FFD(Box) Space Warp	
FFD(Cyl) Space Warp	
Field-of-View Mode	
File Properties	
File Replace	
Fillet (Spline)	
Fillet/Chamfer Modifier	
Filter Cross Sections (Skin)	

User Interface Function	Default Keyboard Shortcut
Filter Envelopes (Skin)	
Filter Vertices (Skin)	
Fixed Window	
Flex Modifier	
Flip Face Normals (Poly)	
Flip Faces (Mesh)	
Flip Normals (Poly)	
Flip Normals Mode (Patch)	
Flip Normals Selected (Mesh)	
Flip Normals Selected (Patch)	
Flip Polygon (Mesh)	
Foliage	
Forward Time One Unit	. (period)
Free Area Photometric	
Free Camera	
Free Directional	
Free Linear Photometric	
Free Point Photometric	
Free Camera	
Free Directional	
Free Linear Photometric	
Free Point Photometric	
Free Rotate	
Free Spotlight	
Freeze by Hit	
Freeze by Name	
Freeze Nonselected Curves	
Freeze Position	
Freeze Rotation	
Freeze Selection	

User Interface Function	Default Keyboard Shortcut
Freeze Selection's Layer	
Freeze Transform	
Freeze Unselected	
Front View	F
Fuse Vertices (Spline)	
Gengon	
Geometry Selection Visibility Toggle	Alt+G
GeoSphere	
Get from Object	
Get from Provider	
Get Latest	
Gimbal Coordinate System	
Gizmo Reset Reset Rotation Plane (Skin)	
Global Raytracing exclude list	
Global Raytracing Parameters	
Go to End Frame	END
Go to Start Frame	HOME
Grab Viewport...	
Gravity Space Warp	
Grid	
Grid Align (Mesh)	
Grid Align (Poly)	
Grid and Snap Settings Toggle	
Grid Coordinate System	
Grid View	
Group	
Group Attach	
Group Close	
Group Detach	

User Interface Function	Default Keyboard Shortcut
Group Explode	
Group Open	
Grow Selection (Poly)	
Grow Selection (Skin)	
Hair and Fur (WSM) Modifier	
Halogen Spotlight	
Hedra	
Helix Shape	
Help Menu About Box	
Hide (Mesh)	
Hide (Patch)	
Hide (Poly)	
Hide (Spline)	
Hide All Toolbars	
Hide by Hit	
Hide by Name	
Hide Cameras Toggle	SHIFT+C
Hide Frozen Objects Toggle	
Hide Geometry Toggle	SHIFT+G
Hide Grids Toggle	G
Hide Helpers Toggle	SHIFT+H
Hide Lights Toggle	SHIFT+L
Hide Nonselected Curves	
Hide Particle Systems Toggle	SHIFT+P
Hide Selection	
Hide Selection's Layer	
Hide Shapes Toggle	SHIFT+S
Hide Space Warps Toggle	SHIFT+W
Hide Tangents	
Hide Unselected	
Hide Unselected (Poly)	
Hierarchy Command Mode	

User Interface Function	Default Keyboard Shortcut
Highlight Editable Assets	
Hinge Face from Edge (Poly)	
Hinge from Edge (Poly)	
History...	
History-Dependent IK Solver	
History-Independent IK Solver	
Hold	ALT+CTRL+H
Hose	
Hotkey Flash Movie	
HSDS Modifier	
Ignore Backfacing (VertexPaint)	
Ignore Backfacing Toggle (Poly)	
Ignore Extents Toggle	
IK Chain FK Snap	
IK Chain IK Snap	
IK Chain Snap Action	
IK Limb Solver	
IK Solver Toggle	
IK Terminator Toggle	
Import File	
Include Verts (Skin)	
Insert a Character	
Insert Selection (Spline)	
Insert Vertex (Poly)	
Insert Vertex in Edge (Poly)	
Insert Vertex in Face (Poly)	
Inset (Poly)	
Inset Face (Poly)	
Inset Selection (Mesh)	
Interactive Update	

User Interface Function	Default Keyboard Shortcut
Introduction and New Features Guide	
Inverse Kinematics Mode Toggle	
Invisible Edge (Mesh)	
Isolate Keys in Track Bar	
Isolate Selected Keys in Track Bar	
Isolate Selection	ALT+Q
Isolate Selection's Layer	
Isolate Unselected...	
Isometric User View	U
Key All	
Key Position	
Key Position X	
Key Position Y	
Key Position Z	
Key Position, Rotation, Scale	
Key Rotation	
Key Rotation X	
Key Rotation Y	
Key Rotation Z	
Key Scale	
Key Scale X	
Key Scale Y	
Key Scale Z	
Key Selected	
Keyboard Shortcut Override Toggle	
Lasso Selection Region	
Last File 1	
Last File 2	
Last File 3	
Last File 4	

User Interface Function	Default Keyboard Shortcut
Last File 5... (Goes up to Last File 50)	
Lathe Modifier	
Lattice Modifier	
Launch Provider...	
Layer Manager	
Layer Opacity Down (VertexPaint)	
Layer Opacity Up (VertexPaint)	
Left View	L
L-Extrusion	
Light Include/Exclude Tool	
Light Lister...	
Light On/Off Toggle	
Light Tracer...	
Lighting | Render	CTRL+ALT+RMB
Lighting Analysis	
Line Shape	
Linear Position Controller	
Linear Rotation Controller	
Linear Scale Controller	
Link Constraint	
Link to Object	
Linked XForm Modifier	
List View – Animated Controllers	
Load Animation	
Load Controller Quad Menu	
Load Custom UI	
Load Custom UI Scheme	
Load Key Quad Menu	
Load Layout	
Load Menu Bar	

User Interface Function	Default Keyboard Shortcut
Load Menu File	
Local Coordinate System	
Lock a Character	
Lock Display Channel (VertexPaint)	
Lock User Interface Toggle	ALT+0 (zero)
Loft Compound Object	
Log in...	
Log out	
LookAt Constraint	
Loop Selection (Skin)	
L-Type Stair	
Macro Recorder Toggle	
Maintain Custom Attributes on Stack Collapse	
Make First (Spline)	
Make Planar (Mesh)	
Make Planar (Poly)	
Make Preview	
Manipulator Cone Angle	
Manipulator Plane Angle	
Manipulator Slider	
Manual Navigation	
Map Scaler Modifier	
Map/Photometric Path Editor	
MapScaler Modifier (WSM)	
Match Camera to View	
Material By Element Modifier	
Material Editor	M
Material Modifier	
Material/Map Browser Toggle	
Maximize Viewport Toggle	ALT+W

User Interface Function	Default Keyboard Shortcut
MAXScript Listener	F11
MAXScript Reference	
Measure Distance...	
Melt Modifier	
mental ray Area Omni	
mental ray Area Spot	
mental ray Message Window Toggle	
Merge Animation	
Merge File	
Mesh Select Modifier	
Mesher Compound Object	
MeshSmooth (Poly)	CTRL+M
MeshSmooth Modifier	
Middle Mouse Button Toggle	
Mirror	
Mirror Both H&V (Spline)	
Mirror Horizontally (Spline)	
Mirror Mode (VertexPaint)	
Mirror Modifier	
Mirror Vertically (Spline)	
Mirror Mode Axis (VertexPaint)	
Modeling	CTRL+RMB
Modify Child Keys	
Modify Command Mode	
Modify Mode	
Morph Compound Object	
Morpher Modifier	
Motion Command Mode	
Motion Mixer	
Motion Mixer (Close)	
Motion Mixer (Open)	

User Interface Function	Default Keyboard Shortcut
Motor Space Warp	
Move	
Move Parameters Down	
Move Parameters Down by Rollout	
Move Parameters Up	
Move Parameters Up by Rollout	
MoveUnwrapUI	
Multiple Edits	
MultiRes Modifier	
New Collection	
New Features Guide	
New Rollout	
New Rollout Selected Parameters	
New Scene	CTRL+N
New Schematic View	
New Script	
New Track View	
Next Modifier	
Next/Previous Key Mode Toggle	
NGon Shape	
Noise Modifier	
Noise Position Controller	
Noise Rotation Controller	
Noise Scale Controller	
Noise Space Warp	
Non-uniform Scale	
Normal Align	ALT+N
Normal Modifier	
Normalize Spline Modifier	
Nudge Grid Down	

User Interface Function	Default Keyboard Shortcut
Nudge Grid Up	
NURBS Shaded Lattice Toggle	
NURBS Tessellation Preset 1	
NURBS Tessellation Preset 2	
NURBS Tessellation Preset 3	
NURMS Toggle (Poly)	
Oil Tank	
Omni Light	
On/Off Apply Atmospherics	
On/Off Cast Shadows	
On/Off Inherit Visibility	
On/Off Motion Blur	
On/Off Receive Shadows	
On/Off Render Occluded	
On/Off Renderable	
On/Off Visible to Camera	
On/Off Visible to Reflection	
Online Partners	
Online Resources	
Online Support	
Online Updates	
Open Brush Preset Manager	
Open File	CTRL+O (letter “o”)
Open from Vault...	
Open Property Editor	
Open Script	
OpenUnwrapUI	
Optimize Modifier	
Options...	
Orientation Constraint	

User Interface Function	Default Keyboard Shortcut
Ortho Snapping Mode	
Outline (Poly)	
Outline (Spline)	
Outline Face (Poly)	
Paint Channel Down (VertexPaint)	
Paint Channel Up (VertexPaint)	
Paint Mode (VertexPaint)	
Paint Selection Region	
Paint Selection Size Up	
Paint Selection Size Down	
Pan Camera Mode	
Pan Non-Camera View Mode	
Pan View	CTRL+P
Pan Viewport	I (letter "i")
Panorama Exporter	
Parameter Collector	ALT+2
Parameter Editor	ALT+1
Parameter Wiring Dialog	ALT+5
Parent Coordinate System	
PArray Particle System	
Particle Flow Find Target	
Particle Flow Source Particle System	
Particle Flow Speed by Icon	
Paste Envelope (Skin)	
Paste Hairdo	
Paste to All Envelopes (Skin)	
Paste Weights (Skin)	
Paste Weights By Pos (Skin)	
Patch Deform Modifier	
Patch Deform Modifier (WSM)	

User Interface Function	Default Keyboard Shortcut
Patch Select Modifier	
Path Constraint	
Path Deform Modifier	
Path Deform Modifier (WSM)	
Path Follow Space Warp	
PBomb Space Warp	
PCloud Particle System	
PDynaFlect Space Warp	
Percent Snap Toggle	SHIFT+CTRL+P
Perspective Mode	
Perspective User View	P
Physique Modifier	
Pick Mode (VertexPaint)	
Pitch Viewport Down Big	
Pitch Viewport Down Small	
Pitch Viewport Up Big	
Pitch Viewport Up Small	
Pivot Door	
Pivoted Window	
Place Highlight	CTRL+H
Plane	
Play Animation	/ (forward slash)
Plug-in Manager	
Point	
Point Cache Modifier	
Point Cache Modifier (WSM)	
Point Curve	
Point Surface	
Poly Select Modifier	
Polygon Counter	7
POmniFlect Space Warp	
Position Constraint	

User Interface Function	Default Keyboard Shortcut
Position Expression Controller	
Position Motion Capture Controller	
Position To Zero	
Preferences	
Preserve Modifier	
Preview Animation	
Preview Depth of Field in Viewport	
Previous Modifier	
Print Size Wizard	
Prism	
Projected Window	
Projection Modefier	
Prompts Dialog...	
Properties	
Protractor	
PRS Controller	
Purge	
Push Modifier	
Push Space Warp	
Put to Object	
Pyramid	
Quad Patch	
Quad Swap to Animation	
Quad Swap to Default	
Quad Swap to Modeling	
Quad Swap to Rendering	
Quick Align	Shift+A
Quick Render	Shift+Q
Quickslice (Poly)	
Radiosity...	
Railing	

User Interface Function	Default Keyboard Shortcut
RAM Player	
Reaction Manager	
Reaction Position Controller	
Reactor Rotation Controller	
Reaction Scale Controller	
Reactor	SHIFT+ALT+RMB
Reads the Pop-up Note	
Recessed 250W Wallwash (web)	
Recessed 75W Lamp (web)	
Recessed 75W Wallwash (web)	
Rectangle Shape	
Rectangular Selection Region	
Redo Scene Operation	CTRL+Y
Redo Viewport Operation	SHIFT+Y
Redraw All Views	‘ (lowercase ~)
Reduce Keys (All)	
Reduce Keys (Selection)	
Refine (Spline)	
Refine Connect (Spline)	
Refresh	
Refresh View	
Regrow Hair	
Relationship Viewer All	
Relationship Viewer Selected	
Relative	
Relax Modifier	
Remove (Poly)	
Remove Cross Section (Skin)	
Remove Edge (Poly)	
Remove from Object	

User Interface Function	Default Keyboard Shortcut
Remove Isolated Vertices (Mesh)	
Remove Isolated Vertices (Poly)	
Remove Link to Object	
Remove Multiple Bones (Skin)	
Remove Unused Map Vertices (Poly)	
Remove Vertex (Poly)	
Remove Zero Weights (Skin)	
Rename Objects...	
Rename Preview	
Rename Rollout	
Render Effects	
Render Last	F9
Render Preset Slot A (shift+click to save)	
Render Preset Slot B (shift+click to save)	
Render Preset Slot C (shift+click to save)	
Render Scene Dialog	F10
Render Selected	
Render To Texture Dialog Toggle	0 (zero)
Renderable Spline Modifier	
RenderElements to combustion(tm)	
Repeat Last (Poly)	
Replace Rest	
Reset All	
Reset Background Transform	
Reset File	
Reset Material Editor Slots	
Reset Plane (Poly)	

User Interface Function	Default Keyboard Shortcut
Reset Raytrace globals	
Reset Selected	
Resolve Path to UNC Location	
Resource Collector...	
Restore Active View	
Restore Material Editor Slots	
Restore Scene State	
Restrict Direction Cycle	
Restrict Plane Cycle	F8
Restrict to X	F5
Restrict to Y	F6
Restrict to Z	F7
Retarget Common Root...	
Retriangulate (Poly)	
Retriangulate Face (Poly)	
Return license	
Reveal in Explorer...	
Reverse (Spline)	
Revert to Startup Menu	
Revert to Startup UI	
Right View	
Ring Array	
Ring Selection (Skin)	
RingWave	
Ripple Modifier	
Ripple Space Warp	
Roll Angle Manipulator Toggle	
Roll Mode	
Roll Viewport CCW Big	
Roll Viewport CCW Small	
Roll Viewport CW Big	

User Interface Function	Default Keyboard Shortcut
Roll Viewport CW Small	
Rotation Motion Capture Controller	
Rotation To Zero	
Run Script	
Save a Character	
Save Active View	
Save Animation	
Save Custom UI	
Save Custom UI As	
Save Custom UI Scheme	
Save File	CTRL+S
Save File As	
Save File As Copy	
Save Incremental (+)	
Save Layout	
Save Menu File	
Save Menu File As	
Save Scene State	
Save Selected	
Saved Schematic View 1	
Saved Schematic View 10	
Saved Schematic View 11	
Saved Schematic View 12	
Saved Schematic View 13	
Saved Schematic View 2	
Saved Schematic View 3	
Saved Schematic View 4	
Saved Schematic View 5	
Saved Schematic View 6	
Saved Schematic View 7	
Saved Schematic View 8	
Saved Schematic View 9	

User Interface Function	Default Keyboard Shortcut
Save Track View 1	
Save Track View 10	
Save Track View 11	
Save Track View 12	
Save Track View 13	
Save Track View 2	
Save Track View 3	
Save Track View 4	
Save Track View 5	
Save Track View 6	
Save Track View 7	
Save Track View 8	
Save Track View 9	
Scale	
Scale Cycle	CTRL+E
Scale Expression Controller	
Scale Motion Capture Controller	
Scale Weight Custom (Skin)	
Scale Weight Down (Skin)	
Scale Weight Up (Skin)	
Scatter Compound Object	
Scene State Manager Dialog Toggle	
Schematic View (Open)	
Schematic View Quad	
Screen Coordinate System	
Script Position Controller	
Script Rotation Controller	
Script Scale Controller	
SDeflector Space Warp	
SDynaFlect Space Warp	
Section Shape	

User Interface Function	Default Keyboard Shortcut
Select All	CTRL+A
Select All Rollout	
Select Ancestor	PAGE UP
Select and Link	
Select and Manipulate	
Select and Move	W
Select and Rotate	E
Select and Scale	
Select By Channel Modifier	
Select By Color	
Select by Crossing	
Select By Layer	
Select by Material ID (Patch)	
Select By Name	H
Select by Window	
Select Camera	
Select Child	PAGE DOWN
Select Child Bone (Skin)	
Select Children	CTRL+PAGE DOWN
Select End Point (Skin)	
Select Excluded Verts (Skin)	
Select Invert	CTRL+I (letter “i”)
Select Light	
Select Loop (Poly)	
Select Luminaire Target	
Select Next Bone (Skin)	
Select Next Sibling Bone (Skin)	
Select None	CTRL+D
Select Object	
Select Object From Target	
Select Objects in Current Layer	

User Interface Function	Default Keyboard Shortcut
Select Open Edges (Mesh)	
Select Open Edges (Patch)	
Select Previous Bone (Skin)	
Select Previous Sibling Bone (Skin)	
Select Ring (Poly)	
Select Start Point (Skin)	
Select Target (Cameras)	
Select Target (Lights)	
Select Vertices By Bone (Skin)	
Selected by Smoothing Group (Patch)	
Selection Floater	
Selection Lock Toggle	SPACEBAR
Separator	
Set Current Layer to Selection's Layer	
Set Default Tangent As Auto	
Set Default Tangent As Custom	
Set Default Tangent As Fast	
Set Default Tangent As Linear	
Set Default Tangent As Slow	
Set Default Tangent As Smooth	
Set Default Tangent As Step	
Set Key All Filter	
Set Key Custom Attributes Filter	
Set Key IK Parameters Filter	
Set Key Materials Filter	
Set Key Mode	'
Set Key Modifiers Filter	
Set Key Object Params Filter	

User Interface Function	Default Keyboard Shortcut
Set Key Other Filter	
Set Key Position Filter	
Set Key Rotation Filter	
Set Key Scale Filter	
Set Key Selected	
Set Keys	K
Set Path...	
Set Pref Angles	
Set Skin Pose	
Set View to Selected Camera	
Set View to Selected Light	
Set View to Selected Luminaire	
Set Weight Custom (Skin)	
Set Weight To 0.0 (Skin)	
Set Weight To 0.10 (Skin)	
Set Weight To 0.25 (Skin)	
Set Weight To 0.5 (Skin)	
Set Weight To 0.75 (Skin)	
Set Weight To 0.9 (Skin)	
Set Weight To 1.0 (Skin)	
Shade Selected Faces Toggle	F2
Shade Selected Toggle	
Shaded Face Toggle (Poly)	
Shadows On/Off Toggle	
Shape Viewport	
ShapeMerge Compound Object	
Shell Modifier	
Show All Grids Toggle	
Show All Tangents	
Show All Toolbars	
Show Background Toggle	

User Interface Function	Default Keyboard Shortcut
Show Command Panel Toggle	
Show Custom Icons	
Show Dependencies	
Show End Result	
Show Floating Dialogs	Ctrl+‘
Show Floating Toolbars Toggle	
Show Frozen Keys	
Show Ghosting Toggle	
Show Home Grid	
Show Key Times Toggle	
Show Keys in Track Bar	
Show Last Rendering	
Show Main Toolbar Toggle	ALT+6
Show Nonselected Curves	
Show Safeframes Toggle	SHIFT+F
Show Selected Keys in Track Bar	
Show Selected Tangent	
Show Selection Bracket Toggle	J
Show Tab Panel Toggle	
Show Time Slider	
Show Track Bar Toggle	
Show Trajectories Toggle	
Show Transform Gizmo	
Show Viewport Tooltips Toggle	
Show/Hide Controller Window	
Show/Hide Key Window	
Show/Hide Menu Bar	
Show/Hide Name Toolbar	
Show/Hide Scroll Bars	

User Interface Function	Default Keyboard Shortcut
Show/Hide Time Ruler	
Shrink Selected	
Shrink Selection (Poly)	
Shrink Selection (Skin)	
Skew Modifier	
Skew Space Warp	
Skin Modifier	
Skin Morph Modifier	
Skin Pose Mode On/Off Toggle	
Skin Wrap Modifier	
Skin Wrap Patch Modifier	
Skylight	
Slave Position Controller	
Slave Rotation Controller	
Slave Scale Controller	
Slice (Poly)	
Slice Modifier	
Slice Plane (Mesh)	
Slice Plane (Poly)	
Sliding Door	
Sliding Window	
Smart Scale	R
Smart Select	Q
Smooth Modifier	
Smooth Rotation Controller	
SMPTE / Frames Toggle	
Snap (quad menu)	SHIFT+Right-click
Snap Menu	
Snap To Bounding Box Toggle	
Snap To Center Face Toggle	
Snap To Curve Center Toggle	

User Interface Function	Default Keyboard Shortcut
Snap To Curve Edge Toggle	
Snap To Curve End Toggle	
Snap To Curve Normal Toggle	
Snap To Curve Tangent Toggle	
Snap To CV Toggle	
Snap To Edge/Segment Toggle	ALT+F10
Snap To Endpoint Toggle	ALT+F8
Snap To Face Toggle	ALT+F11
Snap To Frozen Objects Toggle	ALT+F2
Snap To Grid Lines Toggle	
Snap To Grid Points Toggle	ALT+F5
Snap To Midpoint Toggle	ALT+F9
Snap To Perpendicular Toggle	
Snap To Pivot Toggle	ALT+F6
Snap To Point Toggle	
Snap To Surf Center Toggle	
Snap To Surf Edge Toggle	
Snap To Surf Normal Toggle	
Snap To Tangent Toggle	
Snap To Vertex Toggle	ALT+F7
Snaps Toggle	S
Snaps Use Axis Constraint Toggle	ALT+D, ALT+F3
Snapshot	
Snow Particle System	
Soft Select Settings	
Soft Selection Toggle (Poly)	
SOmniFlect Space Warp	
Sound Toggle	\ (backslash)

User Interface Function	Default Keyboard Shortcut
Spacing Tool	SHIFT+I (letter "i")
Sphere	
Sphere Gizmo (Atmospheres)	
Spherify Modifier	
Spindle	
Spinner Drag Update Toggle	
Spinner Snap Toggle	
Spiral Stair	
Spline IK Solver	
Spline Select Modifier	
SplineIK Control Modifier	
Split (Poly)	
Split Edges (Poly)	
Spot/Directional Light View	SHIFT+4
Spray Particle System	
Spring	
Spring Position Controller	
Squeeze Modifier	
Stadium 1000W Lamp (web)	
Star Shape	
Start New Shape	
Start New Shape Lock	
Start Parameter Wiring...	Ctrl+5
STL Check Modifier	
Store Direct Illumination: Sky	
Store Direct Illumination: Sun	
Straight Stair	
Street 400W Lamp (web)	
Stretch Modifier	
Stretch Space Warp	

User Interface Function	Default Keyboard Shortcut
Strip Path	
Style Hair	
Subdivide Edge (Patch)	
Subdivide Element (Patch)	
Subdivide Modifier	
Subdivide Modifier (WSM)	
Subdivide Patch (Patch)	
Sub-Object Level 1	1
Sub-Object Level 2	2
Sub-Object Level 3	3
Sub-Object Level 4	4
Sub-Object Level 5	5
Sub-object Level Cycle	INSERT
Sub-object Menu	
Sub-object Selection Toggle	CTRL+B
Substitute Modifier	
Subtract (Spline)	
Summary Info	
Sunlight System	
Super Spray Particle System	
Suppress a persistent Pop-up Note	
Surf Deform Modifier	
Surface Constraint	
Surface Modifier	
Surface Selection Modifier	
SurfDeform (WSM)	
Sweep Modifier	
Symmetry Modifier	
Sync Cursor Time	
Sync Selection	
Table View	
Tape Measure	

User Interface Function	Default Keyboard Shortcut
Taper Modifier	
Taper Space Warp	
Target Area Photometric	
Target Camera	
Target Directional	
Target Linear Photometric	
Target Point Photometric	
Target Spotlight	
Target Weld (Mesh)	
Target Weld (Patch)	
Target Weld (Poly)	
Target Weld Edge (Poly)	
Target Weld Vertex (Poly)	
TCB Position Controller	
TCB Rotation Controller	
TCB Scale Controller	
Teapot	
Tee Shape	
Terrain Compound Object	
Tessellate (Poly)	
Tessellate Modifier	
Text Shape	
Texture Correction	
Time Configuration	
Time Slider Capture Toggle	
Toggle Display of the File Link Manager	
Toggle Limits	
Toggle Track bar	
Top View	T
Torus	
Torus Knot	
Track View Floater	

User Interface Function	Default Keyboard Shortcut
Track View Key Quad	
Track View Quad	
Track bar Quad	
Training	
Transform Gizmo Center Toggle	
Transform Gizmo Labels Toggle	
Transform Gizmo Planes Toggle	
Transform Gizmo Size Down	- (minus)
Transform Gizmo Size Up	=
Transform Gizmo Toggle	X
Transform Script	
Transform To Zero	
Transform Type-In Dialog	F12
Tree View	
Tri Patch	
Triangle Counter	
Trim (Spline)	
Trim/Extend Modifier	
Truck Mode	
Tube	
TurboSmooth Modifier	
Turn Edges (Mesh)	
Turn To Mesh Modifier	
Turn To Patch Modifier	
Turn To Poly Modifier	
Tutorials	
Twist Modifier	
Twist Space Warp	
UDeflector Space Warp	
UDynaFlect Space Warp	
Unbind (Patch)	

User Interface Function	Default Keyboard Shortcut
Unbind (Spline)	
Undo Checkout...	
Undo Scene Operation	CTRL+Z
Undo Viewport Operation	SHIFT+Z
Unfreeze All	
Unfreeze by Hit	
Unfreeze by Name	
Ungroup	
Unhide All	
Unhide All (Mesh)	
Unhide All (Patch)	
Unhide All (Poly)	
Unhide All (Splines)	
Unhide by Name	
Uniform Planar Scale	
Unify Normals (Mesh)	
Unify Normals (Patch)	
Unit Setup	
Unlink Selection	
Unlock a Character	
UnShrink All	
UnShrink Selected	
Unwrap UVW Modifier	
Unwrap UVW Quad	
UOmniFlect Space Warp	
Update Background Image	ALT+SHIFT+CTRL+B
Use Soft Select	
User Reference	
Utility Command Mode	
U-Type Stair	
UVW Map Modifier	
UVW Mapping Add Modifier	

User Interface Function	Default Keyboard Shortcut
UVW Mapping Clear Modifier	
UVW XForm Modifier	
Vector Field Space Warp	
Vertex Paint Modifier	
Vertex Weld Modifier	
Video Post Dialog Toggle	
View Align (Mesh)	
View Align (Poly)	
View Attribute Dialog... (SV)	
View Attribute Dialog... (TV)	
View Coordinate System	
View Edged Faces Toggle	F4
View File	
View Image File...	
View Preview	
View Selected Curves	
View Stored Collisions	
Viewport Background	ALT+B
Viewport Box Mode Toggle	
Viewport Clipping	
Viewport Configuration	
Viewport Render Level Bounding Box	
Viewport Render Level Edged Faces Toggle	
Viewport Render Level Facets	
Viewport Render Level Facets + Highlights	
Viewport Render Level Flats	
Viewport Render Level Lit Wireframes	
Viewport Render Level Smooth	

User Interface Function	Default Keyboard Shortcut
Viewport Render Level Smooth + Highlights	
Viewport Render Level Wireframe	
Viewport Transparency Best	
Viewport Transparency None	
Viewport Transparency Simple	
Viewport	
Viewports	V
Virtual Viewport Pan Down	2 (numeric keypad)
Virtual Viewport Pan Left	4 (numeric keypad)
Virtual Viewport Pan Right	6 (numeric keypad)
Virtual Viewport Pan Up	8 (numeric keypad)
Virtual Viewport Toggle	/ (numeric keypad - backslash)
Virtual Viewport Zoom In	+ (numeric keypad)
Virtual Viewport Zoom Out	- (numeric keypad - minus)
Visible Edge (Mesh)	
Visual MAXScript Editor	
Volume Select Modifier	
Vortex Space Warp	
VRML Anchor	
VRML Audio Clip	
VRML Background	
VRML Billboard	
VRML Fog	
VRML Inline	
VRML LOD	
VRML NavInfo	
VRML ProxSensor	
VRML Sound	
VRML TimeSensor	
VRML TouchSensor	

User Interface Function	Default Keyboard Shortcut
Walk Through View Mode	Up Arrow
Wall	
Wave Modifier	
Wave Space Warp	
Weight Table Dialog (Skin)	
Weight Tool Dialog (Skin)	
Weld (Poly)	
Weld Edge (Poly)	
Weld Vertex (Poly)	
Weld Vertices (Mesh)	
Weld Vertices (Patch)	
Weld Vertices (Spline)	
Wide Flange Shape	
Wid Space Warp	
Window / Crossing Toggle	
Wire Parameters	
Wireframe / Facet All Toggle	
Wireframe / Facet Shading Toggle	
Wireframe / Smooth Shading Toggle	
Wireframe / Smooth+ Highlights All Toggle	
Wireframe / Smooth+ Highlights Toggle	F3
Working Comment...	
World Coordinate System	
WRectangle Shape	
XForm Modifier	
XRef Objects	
XRef Scenes	
XYZ Position Controller	
XYZ Scale Controller	
Yaw Viewport CCW Big	

User Interface Function	Default Keyboard Shortcut
Yaw Viewport CCW Small	
Yaw Viewport CW Big	
Yaw Viewport CW Small	
Zoom All Mode	
Zoom Extents	ALT+CTRL+Z
Zoom Extents All	SHIFT+CTRL+Z
Zoom Extents Selected	
Zoom Extents All Selected	Z
Zoom In 2X	ALT+SHIFT+CTRL+Z
Zoom In 2X All	
Zoom Mode	ALT+Z
Zoom Out 2X	ALT+SHIFT+Z
Zoom Out 2X All	
Zoom Region Mode	CTRL+W
Zoom To Selected Bone (Skin)	
Zoom To Selected Gizmo (Skin)	
Zoom Viewport In	[(open square bracket)
Zoom Viewport Out	] (closed square bracket)

Material Editor Shortcuts

Material Editor features for which keyboard shortcuts have been set are listed below.

To use Material Editor keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Material Editor (page 2–1253)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Material Editor Function	Default Keyboard Shortcut
Access Editable Name Field	
Assign Material to Selection	
Background	B
Backlight	L
Change Material/Map Type	
Clean MultiMaterial	
Copy/Rotate Drag Mode Toggle	
Custom Background Toggle	
Cycle 3X2, 5X3, 6X4 Sample Slots	X
DX Display	
Fix Ambient All	
Fix Ambient Selected	
Get Material	G
Go Backward to Sibling	LEFT ARROW
Go Forward to Sibling	RIGHT ARROW
Go to Parent	UP ARROW
Instance Duplicate Map	
Launch Magnify Window	
Make Material Copy	
Make Preview	P
Manual Update Toggle	
Options	O
Pick Material from Object	
Propagate Materials to Instances	
Put Material to Scene	
Put to Library	
Render Map	
Reset Sample Slot Rotation	
Save as .FX File	
Save Preview	
Select by Material	

Material Editor Function	Default Keyboard Shortcut
Show End Result	
Show Map in Viewport	
Update Active Material	
Video Color Check	
View Preview	

NURBS Shortcuts

To use NURBS keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

A couple of NURBS shortcuts cannot be customized.

See also

Working with NURBS Models (page 1–1081)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Noncustomizable Keyboard Shortcut Function for NURBS	Keyboard Shortcut
Cycle Sub-Object Level	INSERT
Delete Sub-Object	DELETE

Customizable Keyboard Shortcut Function for NURBS	Keyboard Shortcut
Break Both	
Break Column	
Break Curve	
Break Row	
Create 1–Rail Sweep	
Create 2–Rail Sweep	

Customizable Keyboard Shortcut Function for NURBS	Keyboard Shortcut
Create a Multicurve Trimmed Surface	
Create a Multisided Blend Surface	
Create Blend Curve	
Create Blend Surface	
Create Cap Surface	
Create Chamfer Curve	
Create Curve Point	
Create Curve-Curve Point	
Create CV Curve	
Create CV Curve on Surface	
Create CV Surface	
Create Extrude Surface	
Create Fillet Curve	
Create Fillet Surface	
Create Fit Curve	
Create Lathe Surface	
Create Mirror Curve	
Create Mirror Surface	
Create Normal Projected Curve	
Create Offset Curve	
Create Offset Point	
Create Offset Surface	
Create Point	
Create Point Curve	
Create Point Curve on Surface	
Create Point Surface	
Create Ruled Surface	
Create Surf Point	
Create Surface Edge Curve	
Create Surface Offset Curve	

Customizable Keyboard Shortcut Function for NURBS	Keyboard Shortcut
Create Surface-Curve Point	
Create Surface-Surface Intersection Curve	
Create Transform Curve	
Create Transform Surface	
Create U Iso Curve	
Create U Loft Surface	
Create UV Loft Surface	
Create V Iso Curve	
Create Vector Projected Curve	
CV Constrained Normal Move	ALT+N
CV Constrained U Move	ALT+U
CV Constrained V Move	ALT+V
Display Curves	SHIFT+CTRL+C
Display Dependents	CTRL+D
Display Lattices	CTRL+L
Display Shaded Lattice	ALT+L
Display Surfaces	SHIFT+CTRL+S
Display Toolbox	CTRL+T
Display Trims	SHIFT+CTRL+T
Extend CV Curve	
Extend Point Curve	
Extend Surface	
Fuse Curve CVs	
Fuse Points	
Fuse Surface CVs	
Insert CV Both	
Insert CV Column	
Insert CV In Curve	
Insert CV Row	
Join Curves	

Customizable Keyboard Shortcut Function for NURBS	Keyboard Shortcut
Join Surfaces	
Local Select Sub-Object by Name (beneath mouse)	CTRL+H
Lock 2D Selection	SPACEBAR
Make First	
Refine CV Both	
Refine CV Column	
Refine CV Curve	
Refine CV Row	
Refine Point Both	
Refine Point Column	
Refine Point Curve	
Refine Point Row	
Select Next in U	CTRL+RIGHT ARROW
Select Next in V	CTRL+UP ARROW
Select Previous in U	CTRL+LEFT ARROW
Select Previous in V	CTRL+DOWN ARROW
Select Sub-Object by Name	H
Set Tessellation Preset 1	ALT+1
Set Tessellation Preset 2	ALT+2
Set Tessellation Preset 3	ALT+3
Soft Selection	CTRL+S
Switch to Curve CV Level	ALT+SHIFT+Z
Switch to Curve Level	ALT+SHIFT+C
Switch to Imports Level	ALT+SHIFT+I (letter "i")
Switch to Point Level	ALT+SHIFT+P
Switch to Surface CV Level	ALT+SHIFT+V
Switch to Surface Level	ALT+SHIFT+S
Switch to Top (Object) Level	ALT+SHIFT+T
Transform Degrade	CTRL+X

Object Display Culling Shortcuts

To use Object Display Culling keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Object Display Culling Utility (page 1–59)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Object Display Culling Function	Default Keyboard Shortcut
Object Display Culling	ALT+O
Object Display Culling Dialog	

Particle Flow Shortcuts

To use keyboard shortcuts for Particle Flow, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Particle Flow (page 2–105)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Particle Flow Function	Keyboard Shortcut
Copy Selected In Particle View*	CTRL+C
Particle Emission Toggle	;

Particle Flow Function	Keyboard Shortcut
Particle View Toggle	6
Paste In Particle View*	CTRL+V
Select All In Particle View*	CTRL+A
Selected Particle Emission Toggle	SHIFT+;

* These functions are specific to Particle View. It is recommended that you use Customize User Interface to change their keyboard shortcuts only, and not assign them to toolbars, quads, or menus.

Physique Shortcuts

Use the Keyboard Shortcut Override toggle on the 3ds Maxextras toolbar to enable the **character studio** keyboard shortcuts.

Note: The default UI does not display this toolbar; to see it, right-click an empty portion of any toolbar, and choose Extras from the menu.

All **character studio** keyboard shortcuts activate when the Motion panel is active and the Keyboard Shortcut Override button is active.

See Also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Action	Shortcut	Description
Copy Envelope	Ctrl+C	
Delete	Ctrl+D	
Next	PageDown	
Next Selection Level	I	
Paste Envelope	Ctrl+V	
Previous	PageUp	
Previous Selection Level	Shift+I	
Reset Envelopes	Ctrl+E	Resets envelopes for selected links to their default values.

* Not available for customization in the Customize User Interface dialog.

Reaction Manager Shortcuts

To use keyboard shortcuts for the Reaction Manager dialog, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Reaction Manager Dialog (page 2–345)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Reaction Manager Function	Keyboard Shortcut
Add Master	
Add Selected	
Add Slave	
Append Selected	
Create State	
Create States Mode	
Delete Selected	
Delete State	
Edit Slave State Mode	
Replace Master	
Set Max Influence	CTRL+I (letter "i")

Reaction Manager Function	Keyboard Shortcut
Set Min Influence	ALT+I (letter "i")
Set State	

Schematic View Shortcuts

To use Schematic View keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Using Schematic View (page 3–690)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Schematic View Function	Keyboard Shortcut
Access Schematic View Name Field	
Access Select Name Field	
Add Bookmark	B
All Relationships	
Arrange Children	
Bring Selection In	
Deselect Children	
Display Floater	D
Display Floater Base Objects	
Display Floater Controllers	
Display Floater Controllers Pos	
Display Floater Controllers Rot	
Display Floater Controllers Scale	
Display Floater Expand	
Display Floater Focus	
Display Floater Materials	
Display Floater Modifiers	
Display Floater Rel Constraints	
Display Floater Rel Controllers	
Display Floater Rel Lights	
Display Floater Rel Modifiers	
Display Floater Rel Param Wires	
Edit Properties	
Filters	P
Free All	ALT+F
Free Selected	ALT+S
Hide Downstream	
Hide Selected	
Hierarchy Mode	
Invert Selected Nodes	CTRL+I
List Viewer Pan to Selected	
List Viewer Respect Display	
List Viewer Shade Selected	
List Viewer Sync Selection	
List Viewer Zoom to Selected	
Move Children	ALT+C
Move Selection Out	
Next Bookmark	right arrow
Pan to Selected	
Previous Bookmark:	left arrow
Reference Mode	
Refresh View	
Rename Object	R
Right Justify Labels	
Select All	CTRL+A
Select children	CTRL+C

Schematic View Function	Keyboard Shortcut
Select None	CTRL+D
Selected Relationships	
Show All	
Show Background Image	
Show Downstream	
Show Grid	G
Show Instances All	
Show Instances Selected	
Show Like Objects	
Show Tooltips	
Sync Selection	
Toggle Shrink	CTRL+S
Unlink Selected	
Use Connect Tool	C
Use Pan Tool	
Use Select Tool	S
Use Zoom Region Tool	
Use Zoom Tool	
Zoom Extends	
Zoom Extents Selected	Z
Zoom Selected Viewport Objects	

Track View Shortcuts

Track View functions for which keyboard shortcuts can be set are listed below. Where there is no default keyboard listed and no button shown in the action list, a short description appears in the right column.

To use Track View keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Track View (page 2–483)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Track View Function	Default Keyboard Shortcut	Description
Access Hierarchy Select Name Field		Accesses the track selection field at the lower left of Track View window
Access Time Field		Accesses the time field at the lower left of Track View window
Access Track Name Field		Accesses the name of the Track View window at upper right
Access Value Field		Accesses the value field at the lower left of Track View window
Add Keys	A	
Add Note Track		
Add Visibility Track		
Align Keys		
Apply Ease Curve	CTRL+E	
Apply Multiplier Curve	CTRL+M	
Assign Controller	C	
Auto Expand Animated		
Auto Expand Keyable		
Auto Expand Limits		
Collapse All		
Collapse Objects		
Collapse Tracks		

Track View Function	Default Keyboard Shortcut	Description
Copy Controller	CTRL+C	
Copy Time		
Cut Time		
Delete Controller		
Delete Ease/ Multiplier Curve		
Delete Note Track		
Delete Visibility Track		
Draw Curves		
Ease Curve Out-of-Range Types		
Ease/Multiplier Curve Enable Toggle		
Edit Keys Mode		
Edit Ranges Mode		
Edit Time Mode		
Edit Track Set		
Exclude Left End Point Toggle		
Exclude Right End PointToggle		
Expand Object Toggle	O (letter "o")	
Expand Objects		
Expand Track Toggle	ENTER, T	
Expand Tracks		
Filters	Q	
Freeze Nonselected Curves		
Function Curves Mode		
Ignore Animation Range		

Track View Function	Default Keyboard Shortcut	Description
Insert Time		
Keyable Properties Toggle		
Lock Selection	SPACEBAR	
Lock Tangents Toggle	L	
Make Controller Unique	U	
Modify Subtree Toggle		
Move Highlight Down	DOWN ARROW	
Move Highlight Up	UP ARROW	
Move Keys	M	
Move Keys Horizontal		
Move Keys Vertical		
Move Object Down		Moves an object down in the hierarchy display
Move Object Up		Moves an object up in the hierarchy display
Multiplier Curve Out-of-Range Types		
Nudge Keys Left	LEFT ARROW	
Nudge Keys Right	RIGHT ARROW	
Pan	P	
Parameter Curve Out-of-Range Types		
Paste Controller	CTRL+V	
Paste Limit Only		
Paste Time		
Position Ranges Mode		
Properties		

Track View Function	Default Keyboard Shortcut	Description
Reduce Keys		
Remove Limit		
Respect Animation Range		
Reverse Time		
Scale Keys		
Scale Time		
Scale Values		
Scroll Down	CTRL+DOWN ARROW	
Scroll Up	CTRL+UP ARROW	
Select All		
Select Children		
Select Invert		
Select None		
Select Time		
Select Lower Limit		
Set Tangents to Auto		
Set Tangents to Custom		
Set Tangents to Fast		
Set Tangents to Linear		
Set Tangents to Slow		
Set Tangents to Smooth		
Set Tangents to Step		
Set Upper Limit		
Show All Tangents		
Show Keys on Frozen Curves		
Show Selected Key Stats		
Show Tangents Toggle		
Slide Keys		
Snap Frames	S	
Toggle Limit		
Track View Utilities		
Zoom	Z	
Zoom Horizontal Extents		
Zoom Horizontal Extents	ALT+X	
Zoom Region		
Zoom Selected Object		
Zoom Time		
Zoom Value Extents		
Zoom Values		

Unwrap UVW Shortcuts

To use keyboard shortcuts for the Unwrap UVW modifier, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Unwrap UVW Modifier (page 1–867)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

In general, this table includes only functions that have default keyboard shortcuts and functions with descriptions that are not documented in the Unwrap UVW reference topics.

Unwrap UVW Function	Keyboard Shortcut	Description
Allow Selections Inside Transform Gizmo		Lets you select vertices inside the gizmo by CTRL+clicking or ALT+clicking a vertex. When turned on, you can move only by dragging over empty space.
Always Bring Up The Edit Window		When on, the Edit UVWs dialog automatically opens when you access the Unwrap UVW modifier.
Blend Tiles To Background		Lets you blend the image in the Edit UVWs dialog with the background color. At 0 the image will be hidden while at 1 it will be at full intensity.
Box Map		
Break Selected Vertices	CTRL+B	Breaks selected vertices so no face shares them; the same as breaking a vertex in Edit Mesh.
Brightness Affects Center Tile		The brightness control for the tile of image at 0,0 of the Edit UVWs dialog.
Contract Geom. Faces		Shrinks the face selection in the viewport.
Copy		Copies the current face selection texture data into the paste buffer.
Cylindrical Map		
Detach Edge Vertices	D, CTRL+D	Detaches the selected vertices into a separate element.

Unwrap UVW Function	Keyboard Shortcut	Description
Display Seams		Highlights edges that are seams in texture space in the Edit UVWs dialog. A seam is an edge that has only one face attached to it.
Edge Sel to Pelt Seam (Add)		Converts the edge selection to pelt seams, adding to the current pelt seams.
Edge Sel to Pelt Seam (Replace)		Converts the edge selection to pelt seams, replacing the current pelt seams.
Edge Snap		
Edge to Face Select		Converts an edge selection into a face selection.
Edge to Vertex Select		Converts an edge selection into a vertex selection.
Edit UVWs	CTRL+E	Opens the Edit UVWs dialog.
Expand Geom. Faces		Grows the face selection in the viewport.
Face to Edge Select		Converts a face selection into an edge selection.
Face to Vertex Select		Converts a face selection into a vertex selection.
Filter Selected Faces	ALT+F	When on, only faces that are selected in the viewport will be displayed in the Edit UVWs dialog.
Flatten Map		Lays out the UV space so that no texture faces overlap.

Unwrap UVW Function	Keyboard Shortcut	Description
Flatten Map Dialog		Opens the dialog for Flatten Mapping settings.
Flip Horizontal		Detaches the current selection and then mirrors it in the U direction.
Flip Vertical		Detaches the current selection and then mirrors it in the V direction.
Freeform Mode		Toggles freeform editing tool in the Edit UVWs dialog.
Freeze Selected	CTRL+F	Locks the current selection so you cannot select it anymore.
Geom. Edge Loop Selection		
Geom. Edge Ring Selection		
Geom. Element Select Mode		Puts you in an element-select mode for selecting faces in the viewport.
Get Face Selection From Stack	ALT+SHIFT+ CTRL+F	Copies the face selection from the modifier stack into the face selection that Unwrap UVW uses.
Get Selection From Faces	ALT+SHIFT+ CTRL+P	Transfers the face selection in the viewport to the selection in the Edit UVWs dialog.
Grid Snap		Turns on grid snapping.
Grid Visible		Toggles grid visibility.
Hide Selected	CTRL+H	Hides the current selection in the Edit UVWs dialog.

Unwrap UVW Function	Keyboard Shortcut	Description
Ignore Back Faces		When on you can select only faces in the viewport that are facing you.
Load Defaults		Loads the UI defaults from an *.ini* file.
Load UVW	ALT+SHIFT+ CTRL+L	Lets you load a *.uvw* file onto a mesh. The mesh must have similar topology as the source.
Lock Selected Vertices	SPACEBAR	Locks the selection so you cannot add to or remove from it.
Mapping Align Normals		
Mapping Align To View		
Mapping Align X		Aligns the mapping gizmo to the X axis of the object's local coordinate system.
Mapping Align Y		Aligns the mapping gizmo to the Y axis of the object's local coordinate system.
Mapping Align Z		Aligns the mapping gizmo to the Z axis of the object's local coordinate system.
Mapping Center		Moves the mapping gizmo so that its pivot coincides with the center of the selection.
Mapping Fit		Scales the gizmo to the extents of the selection and centers it on the selection. Does not change the orientation.

Unwrap UVW Function	Keyboard Shortcut	Description
Mapping Reset		Scales the gizmo to fit the selection and aligns it with the object's local space.
Mirror Horizontal	ALT+SHIFT+ CTRL+N	Mirrors the current selection along the U axis.
Mirror Vertical	ALT+SHIFT+ CTRL+M	Mirrors the current selection along the V axis.
Move Horizontal	ALT+SHIFT+ CTRL+J	
Move Vertical	ALT+SHIFT+ CTRL+K	
Normal Map		This creates a mapping based on the face normals.
Normal Map Dialog		Opens a dialog for making Normal Mapping settings.
Open Edge Mode		When turned on, selecting an open edge selects all attached open edges.
Open Edge Select		Selects all open edges connected to the current selection.
Pack		Lays out all selected elements so they don't overlap.
Pack Dialog		Opens the Pack dialog.
Paint Select Decrement Cursor Size		Applies to the Sketch tool.
Paint Select Increment Cursor Size		Applies to the Sketch tool.
Paint Select Mode		Applies to the Sketch tool.
Pan	CTRL+P	

Unwrap UVW Function	Keyboard Shortcut	Description
Paste		Pastes the contents of the paste buffer onto the selection. For best results the source and target should have similar topology.
Paste Instance		The pasted and source UVs will share the same vertices.
Pelt Always Show Seams		Toggles display of the pelt seams in the viewports.
Pelt Dialog		Opens the Pelt Map Parameters dialog
Pelt Dialog Mirror Stretcher		Mirrors the stretcher points from one side of the mirror axis to the other.
Pelt Dialog Relax Simulation Heavy		Causes a relatively strong normalization of the distances between mapping vertices.

Unwrap UVW Function	Keyboard Shortcut	Description
Pelt Dialog Relax Simulation Light		Causes a relatively weak normalization of the distances between mapping vertices.
Pelt Dialog Reset Stretcher		Returns the stretcher and the pelt UVs to their default shape and orientation.
Pelt Dialog Run Simulation		Runs the simulation, pulling the pelt seam vertices towards the stretcher points.
Pelt Dialog Select Pelt UVs		Selects all pelt UVs.
Pelt Dialog Select Stretcher		Selects all stretcher UVs.
Pelt Dialog Snap Seams		Aligns all the stretcher points to the edge seams on the pelt UVs.

Unwrap UVW Function	Keyboard Shortcut	Description
Pelt Dialog Straighten Stretcher		Lets you specify a polygonal outline for the stretcher by moving points.
Pelt Edit Seams		Lets you specify a pelt seam by selecting edges with the mouse in the viewports.
Pelt Expand Selection To Seams		Expands the current face selection to meet the pelt seam border(s).
Pelt Map		Activates pelt-mapping mode.
Pelt Seam to Edge Sel (Add)		Converts the pelt seam to an edge selection, adding to the current edge selection.
Pelt Seam to Edge Sel (Replace)		Converts the pelt seam to an edge selection, replacing the current edge selection.

Unwrap UVW Function	Keyboard Shortcut	Description
Pivot Snap ... (nine shortcuts)		Snaps the Freeform gizmo pivot to the specified gizmo edge.
Planar Map Faces/Patches	ENTER	Applies a planar map to the current selection.
Planar Threshold		Turns on the Modify panel > Planar Angle check box.
Point to Point Edge Selection		Lets you specify pelt seams by selecting vertices with the mouse in the viewports.
Polygon Mode		Applies only to triangle meshes. When turned on (the default), if you select a triangular face, the software will select all faces that belong to the poly that owns that face.
Polygon Select		Expands the current face selection to the poly.
Prevent Reflattening		When on, keeps Render To Texture from reflattening the mapping.
Relax		Applies the default Relax Tool settings to the current texture vertex selection.
Relax Dialog		Opens the Relax Tool dialog.
Render UVW Template		Renders the UVW coordinates to a bitmap.

Unwrap UVW Function	Keyboard Shortcut	Description
Reset Pivot On Selection		When turned on (the default), the Freeform gizmo pivot is reset to the center every time the selection changes, otherwise the pivot maintains its offset.
Reset UVWs		Sets texture coordinates to the original values before Unwrap was applied.
Save Current Settings As Default		Saves current UI values to the default *.ini* file.
Save UVW		Lets you save the UVW data to disk as a *.uvw* file, which can be read in later or onto another mesh if they have similar topology.
Scale Horizontal		Scales the selection along the U axis.
Scale Vertical		Scales the selection along the V axis.
Select Inverted Faces		Selects any faces in the Edit UVWs dialog that are not facing you.
Select Overlapped Faces		Selects overlapping faces in the Edit UVWs dialog.
Show Edge Distortion		Uses a green-to-red color range to depict distortion.
Show Hidden Edges		Toggles display of all edges.
Show Map		Toggles display of the image map.

Unwrap UVW Function	Keyboard Shortcut	Description
Show Seams in Viewport	ALT+E	Toggles display of cluster seams in the viewport. Works only when Edit UVWs dialog has focus.
Show Shared Sub-objects		Shows sub-objects that share edges/vertices.
Show Subobject Counter		Displays the number of selected objects in the editor window.
Show Vertex Connections		Tags all texture vertices that share the same geometry vertex with a unique ID.
Sketch		Activates Sketch Vertices.
Sketch Dialog		
Sketch Reverse Vertex Order		Reverses the order of the selected vertices for Sketch mode. Applies to the Use Current Selection option for Sketch.
Snap	CTRL+S	Toggles snapping.
Snap to Grid/ Vertex/Edge		Sets the snap type.
Soft Selection Edge Distance		Equivalent to turning on Edge Distance.
Soft Selection Edge Distance Range 1		Set Edge Distance to the specified value.
Soft Selection Edge Distance Range 2		Set Edge Distance to the specified value.
Soft Selection Edge Distance Range 3		Set Edge Distance to the specified value.
Soft Selection Edge Distance Range 4		Set Edge Distance to the specified value.

Unwrap UVW Function	Keyboard Shortcut	Description
Soft Selection Edge Distance Range 5		Set Edge Distance to the specified value.
Soft Selection Edge Distance Range 6		Set Edge Distance to the specified value.
Soft Selection Edge Distance Range 7		Set Edge Distance to the specified value.
Soft Selection Edge Distance Range 8		Set Edge Distance to the specified value.
Spherical Map		Applies spherical mapping.
Stitch		Stitches together shared edges of a polygon.
Stitch Dialog		Opens the properties for the Stitch command.
Sync Selection Mode		Same as Sync to Viewport
Sync Texture Selection to Viewport		Synchronizes the selection in the Edit UVWs dialog to the selection in the viewport.
Sync Viewport Selection to Texture		Synchronizes the selection in the viewport to the selection in the Edit UVWs dialog.
Texture Vertex Contract Selection	- (minus sign), NumPad -	Shrinks the selection in the Edit UVWs dialog.
Texture Vertex Expand Selection	= (equal sign), NumPad +	Grows the selection in the Edit UVWs dialog.
Texture Vertex Move Mode	Q	Lets you move vertices in editor.
Texture Vertex Rotate Mode	CTRL+R	Lets you rotate vertices in editor.
Texture Vertex Scale Mode		Lets you scale vertices in editor.

Unwrap UVW Function	Keyboard Shortcut	Description
Texture Vertex Weld Selected	CTRL+W	Welds selected vertices in editor.
Texture Vertex Target Weld	CTRL+T	Lets you target-weld selected vertices in editor.
TV Edge Sub-object Mode		TV=Texture Vertex
TV Element Mode		TV=Texture Vertex
TV Face Sub-object Mode		TV=Texture Vertex
TV Vertex Sub-object Mode		TV=Texture Vertex
Unfold Map		
Unfold Map Dialog		
Unfreeze All		Unfreezes all frozen elements.
Unhide All		Unhides all hidden elements.
Unwrap Options	CTRL+O (letter "o")	
Update Map	CTRL+U	Updates map in editor.
UV Edge Mode		When on, selecting an edge expands the selection to include all edges in its loop. See *Edge Loop*.
UV Edge Select		Expands an existing edge selection to include all edges in its loop. See *Edge Loop*.
Vertex Snap		
Vertex To Edge Select		Converts vertex selection to an edge selection and puts you in Edge mode.
Vertex To Face Select		Converts vertex selection to a face selection and puts you in Face mode.
Zoom	Z	
Zoom Extents	X	
Zoom Extents Selected	ALT+CTRL+Z	
Zoom Region	CTRL+X	
Zoom Selected Element		
Zoom to Gizmo	SHIFT+SPACEBAR	

Video Post Shortcuts

To use Video Post keyboard shortcuts, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Video Post (page 3–307)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Video Post Function	Keyboard Shortcut
Abut Selected	
Add External Event	
Add Image Filter Event	CTRL+F
Add Image Input Event	CTRL+I (letter “i”)
Add Image Layer Event	CTRL+L
Add Image Output Event	CTRL+O (letter "o")
Add Loop Event	
Add New Event	CTRL+A
Add Scene Event	CTRL+S
Align Selected Left	

Video Post Function	Keyboard Shortcut
Align Selected Right	
Edit Current Event	CTRL+E
Edit Range Bar	
Execute Sequence	CTRL+R
Make Selected Same Size	
New Sequence	CTRL+N
Open Sequence	
Pan	
Save Sequence	
Swap Event	
Zoom Extents	
Zoom Region	
Zoom Time	

Walkthrough Navigation Shortcuts

These are the keyboard shortcuts for use with Walkthrough Navigation. The table shows all the valid keyboard shortcuts for commands and menu entries.

To use keyboard shortcuts for Walkthrough Navigation, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Using Walkthrough Navigation (page 1–30)

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Command	Shortcut
Accelerate Toggle	Q
Back	S, DOWN ARROW
Decelerate Toggle	Z
Decrease Rotation Sensitivity	
Decrease Step Size	[
Down	C, SHIFT+DOWN-ARROW
Forward	W, UP ARROW
Increase Rotation Sensitivity	
Increase Step Size	]
Invert Vertical Rotation Toggle	
Left	A, LEFT ARROW
Level	SHIFT+SPACE
Lock Horizontal Rotation	
Lock Vertical Rotation	SPACE
Reset Step Size	ALT+[
Right	D, RIGHT ARROW
Up	E, SHIFT+UP-ARROW

Weight Table Shortcuts

These are the keyboard shortcuts for use with the Weight Table. The table shows all the valid keyboard shortcuts for commands and menu entries.

To use keyboard shortcuts for Weight Tables, the *Keyboard Shortcut Override Toggle (page 3–912)* on the Extras toolbar must be turned on.

See also

Default Keyboard Shortcuts (page 3–911)

Keyboard Panel (page 3–837)

Customize User Interface Dialog (page 3–836)

Command	Shortcut
Affect All Vertices	
Alternate Global Method	
Copy	
Create Vertex Set	
DebugMode	
Delete Vertex Set	
Drag Left/Right Mode	
Flip UI	
Paste	
Remove Zero Weights	
Right Justify Bone Names	
Select All	Ctrl+A
Select Invert	Ctrl+I (letter i)
Select None	Ctrl+D
Shorten Labels	
Show Affected Bones	
Show Attributes	
Show Copy and Paste UI	
Show Exclusions	
Show Global	
Show Menu	
Show Options UI	
Show Set Sets UI	
Show Weight Table Marker	
Update On Mouse Up	

appendix a

Using the Reference Online

The 3ds Max **User Reference** gives you information about every aspect of the software. Each topic contains an overview discussion, typically preceded by a path annotation showing how to access the feature in the program, and followed by a "Procedures" section with steps for using a command or feature, and an “Interface” section detailing controls and parameters for the user interface.

- **Path Annotation:** Gives one or more sequences of steps indicating how to access the feature in the user interface.
- **Topic Overview:** Tells you the name of the feature, command, user-interface control, or concept, and gives you a description.
- **Procedures:** Contains steps for tasks that illustrate the typical use of the feature.
- **Interface:** Describes the controls for this feature as they appear in the user interface, with a description of their behaviors and settings.

Important Notes

New features are indicated in this reference by the "New" icon shown at the beginning of this paragraph. This makes it easy to see what’s new in the software as you use the reference. You can also identify topics containing information on new features in the program using the Index. Double-click the "new feature" entry to display a list of topics describing new program features. Double-click the entry "changed feature" to see which existing features have changed.

The screen shots in this reference show the default user interface colors. Other color sets for the user interface are available. You can choose them, or create your own, using the *Colors tab (page 3–843)* in the *Customize User Interface dialog (page 3–836)*.

The 3ds Max **User Reference** assumes that Windows is set to the default Small Fonts (96 dpi) display. If your computer is set to use Large Fonts or any option other than Small Fonts, change it to Small Fonts; otherwise you might experience display problems, or unpredictable system behaviors.

When you open the User Reference from the Help menu, you are actually opening an *umbrella* reference, which contains references for 3ds Max and reactor. You can access each of these references individually in the *\help* directory of your 3ds Max installation.

See also

Finding Information Fast (page 3–966)

Using the HTML Help Viewer (page 3–966)

Searching for Help Topics (page 3–968)

Finding Information Fast

Use the Navigation pane in the Help Window to get to information quickly. It contains tabs that let you use Contents, Index, or Search techniques to get to topics you need.

Contents Tab

The Contents tab displays the main sections of this online system as book icons. When you click a book, it expands to show the list of topics contained within it, like chapters in hardcopy books.

To go to a topic from the Contents tab:

1. Click the Contents tab to display the Table of Contents view.
2. Click the book icon representing the area for which you want information.

   The page icons for the book expand below representing all the topics for the book's feature area.
3. Click the page icon for the topic you want.

Index Tab

The Index is an alphabetical listing of keywords found in each topic. A single keyword may be linked to more than one topic. You may type the first few letters of a subject to jump to an index entry that matches what you are looking for.

To go to a topic from the Index tab:

1. Click the Index tab to display the Help Index.
2. In the form at the top of the Index, type the subject you want to find, or scroll through the alphabetical list to find the term for which you need information.
3. Click the term, then click Display to see the topic for that term, or double-click the term to see its topic.

   The topic displays in the right pane and may show links to related topics.

Search Tab

The Search tab summons a full-text search engine that operates on a database of every word in the help system, created when the HTML Help system was compiled. You can use tools on the Search tab to *find the help topics (page 3–968)* containing any word or phrase.

Favorites Tab

Use tools on the Favorites tab to create and store a set of topics you use often; you can name them as you choose.

Using the HTML Help Viewer

This online information system is a compiled HTML help (*.chm*) file; you view it using Microsoft's HTML Help Viewer, powered by Internet Explorer. The HTML Help Viewer is a three-pane window:

- The *Navigation pane (page 3–966)* is on the left side of the window. It contains five navigational tabs, for *Contents (page 3–966)*, *Index (page 3–966)*, *Search (page 3–968)*, and *Favorites (page 3–970)*.
- The Topic pane is on the right side of the window. It displays the selected help topic, or the default help topic. It's the window you're reading from right now.
- The *toolbar (page 3–970)* is the third pane, located below the help window title bar.

  Here are some tips on how to find more information when using the HTML Help Viewer:

- To link to another topic or a list of other topics, click the colored, underlined words in the Topic pane.
- If you use a particular help topic often, you can add it to your *favorites list (page 3–970)*.
- Right-click the Contents or Favorites tab or the Topic pane for shortcut menu commands.

Comments

Each topic in the User Reference online ends with a **Comments** link. When you click Comments, the Help Viewer displays a dialog you can use to send us comments or requests about that topic. We'll use that information when we revise the documentation set for a future release.

Tip: Frequently check the downloads section on the 3ds Max support site for updated releases of our online references. Access it from Help menu > 3ds Max on the Web > Online Support.

For more information, refer to *3ds Max on the Web (page 3–974)*.

See also

Finding Information Fast (page 3–966)

Searching for Help Topics (page 3–968)

Note: Most of information about using the HTML Help Viewer has been supplied directly by Microsoft. It has been made freely available for inclusion in HTML help projects such as this one. This information has been edited and reformatted to match that of the other online information systems shipping with the software.

Procedures

To find a help topic:

1. In the Navigation pane, click one of the following tabs:
   - To browse through a table of contents, click the Contents tab. The table of contents is an expandable list of important topics.
   - To see a list of index entries, click the Index tab, and then type a word or scroll through the list. Topics are often indexed under more than one entry.
   - To locate every occurrence of a word or phrase that may be contained in a help file, click the Search tab, and then type the word.
2. Click the contents entry, index entry, or search results entry to display the corresponding topic.

To copy a help topic:

1. In the Topic pane, right-click the topic you want to copy, and then click Select All.
2. Right-click again, and then click Copy. This copies the topic to the Clipboard.
3. Open the document you want to copy the topic to.
4. Position your cursor where you want the information to appear.
5. On the Edit menu, click Paste.

To copy only part of a topic:

- Select the text you want to copy, right-click, and then click Copy.

To print the current help topic:

- Right-click a topic, and then click Print.

  If you print from the Contents tab (by right-clicking an entry, and then clicking Print) you will see options to print only the current topic, or the current topic and all subtopics.

To hide or show the Navigation pane:

- On the toolbar, click Hide or Show to close or display the Navigation pane, which contains the Contents, Index, Search, and Favorites tabs.

If you close the Help Viewer with the Navigation pane hidden, it will appear that way when you open the Help Viewer again.

To see where the current topic fits in the information hierarchy (contents):

- Press ALT+C.

  The Contents pane displays, with the current topic highlighted.

Searching for Help Topics

A basic search consists of the word or phrase you want to find. You can use Boolean, wildcard, and nested expressions. You can also limit the search to previous results, match similar words, or search topic titles only to further define your search.

The basic rules for formulating queries are as follows:

- Searches are not case-sensitive, so you can type your search in uppercase or lowercase characters.
- You may search for any combination of letters (a through z) and numbers (0 through 9).
- Punctuation marks such as the period, colon, semicolon, comma, and hyphen are ignored during a search.
- Group the elements of your search using *double quotes (page 3–xii)* or *parentheses (page 3–xii)* to set apart each element. You cannot search for quotation marks.

  Note: If you are searching for a file name with an extension, you should group the entire string in double quotes, ("filename.ext"). Otherwise, the period will break the file name into two separate terms. The default operation between terms is AND, so you will create the logical equivalent to "filename AND ext."

Searching for Words or Phrases: Using Wildcards

You can search for words or phrases and use wildcard expressions. Wildcard expressions allow you to search for one or more characters using a question mark or asterisk. The table below describes the results of these different kinds of searches.

Search for	Example	Results
A single word	select	Topics that contain the word "select." (You will also find its grammatical variations, such as "selector" and "selection.")
A phrase	"new operator" or new operator	Topics that contain the literal phrase "new operator" and all its grammatical variations.Without the quotation marks, the query is equivalent to specifying "new AND operator," which will find topics containing both of the individual words, instead of the phrase.
Wildcard expressions	esc* or 80?86	Topics that contain the terms "ESC," "escape," "escalation," and so on. The asterisk cannot be the only character in the term.Topics that contain the terms "80186," "80286," "80386," and so on. The question mark cannot be the only character in the term.

Turn on Match Similar Words to include minor grammatical variations for the phrase you search.

Defining Search Terms: Using Boolean Expressions

The AND, OR, NOT, and NEAR operators enable you to precisely define your search by creating a relationship between search terms. The

following table shows how you can use each of these operators. If no operator is specified, AND is used. For example, the query "spacing border printing" is equivalent to "spacing AND border AND printing."

Search for	Example	Results
Both terms in the same topic.	dib AND palette	Topics containing both the words "dib" and "palette."
Either term in a topic.	raster OR vector	Topics containing either the word "raster" or the word "vector" or both.
The first term without the second term.	ole NOT dde	Topics containing the word "OLE," but not the word "DDE."
Both terms in the same topic, close together.	user NEAR kernel	Topics containing the word "user" within eight words of the word "kernel."

Note: The |, &, and ! characters don't work as Boolean operators (you must use OR, AND, and NOT).

Using Nested Expressions When Searching

Nested expressions allow you to create complex searches for information. For example, "control AND ((active OR dde) NEAR window)" finds topics containing the word "control" along with the words "active" and "window" close together, or containing "control" along with the words "dde" and "window" close together.

The basic rules for searching help topics using nested expressions are as follows:

- You can use parentheses to nest expressions within a query. The expressions in parentheses are evaluated before the rest of the query.
- If a query does not contain a nested expression, it is evaluated from left to right. For example: "Control NOT active OR dde" finds topics containing the word "control" without the word "active," or topics containing the word "dde." On the other hand, "control NOT (active OR dde)" finds topics containing the word "control" without either of the words "active" or "dde."
- You cannot nest expressions more than five levels deep.

Procedures

To go to a topic from the Search tab:

1. Click the Search tab, and then type the word or phrase you want to find.
2. Click the Boolean button to the right of the text field, and then one of the operator names to add Boolean operators to your search.
3. Click List Topics, choose the topic you want, and then click Display.
4. To sort the topic list alphabetically, click the Title column heading.

You can precisely define a search by using wildcard expressions, nested expressions, and Boolean operators.

You can request similar word matches, search only the topic titles, or search the results of a previous search.

You can set the Help Viewer to highlight all instances of search terms that are found in topic files. Click the Options button, and then click Search Highlight On.

To highlight words in searched topics:

When searching for words in help topics, you can have each occurrence of the word or phrase highlighted in the topics that are found.

- To highlight all instances of a search word or phrase, click Options on the toolbar, and then click Search Highlight On.

  To turn off this option, click Options on the toolbar, and then click Search Highlight Off.

If you are viewing a long topic, only the first 500 instances of a search word or phrase will be highlighted.

To search for words in the titles of HTML files:

1. Click the Search tab, type the word or phrase you want to find, and then turn on Search Titles Only.
2. Click List Topics, choose the topic you want, and then click Display.

   If you use this option, all HTML topic files will be searched, including any that are not listed in the table of contents.

To find words similar to your search term:

This feature enables you to include minor grammatical variations for the phrase you search. For example, a search on the word "add" will find "add," "adds," and "added."

1. Click the Search tab, type the word or phrase you want to find, and then turn on Match Similar Words.
2. Click List Topics, choose the topic you want, and then click Display.

   This feature only locates variations of the word with common suffixes. For example, a search on the word "add" will find "added," but it will not find "additive."

To search only the last group of topics you searched:

This feature enables you to narrow a search that results in too many topics found. You can search through your results list from previous search by using this option.

1. On the Search tab, turn on Search Previous Results.
2. Click List Topics, choose the topic you want, and then click Display.

   If you want to search through all of the files in a help system, this check box must be off.

   If you previously used this feature, the Search tab opens with this check box turned on.

To repeat an earlier search:

- Click the down arrow on the text-entry field and choose a previously used search string, and then click List Topics.

Favorites Tab

Use tools on the Favorites tab to create a set of topics you use often; you can name them as you choose.

Procedures

To create a list of favorite help topics:

1. Locate the help topic you want to make a favorite topic.
2. Click the Favorites tab, and then click Add.

To return to a favorite topic:

1. Click the Favorites tab.
2. Choose the topic, and then click Display.

To rename a topic in the Favorites list:

- Choose the topic, and then enter a new name in the Current topic box.

To remove a favorite topic:

- Choose the topic, and then click Remove.

HTML Help Viewer Toolbar

The Help Viewer toolbar contains the following features.

Hide/Show—Click this toggle to hide the Navigation pane when it is displaying, or show it when it's hidden.

Back/Forward—Click to move to the previously viewed topic, or forward to the following previously viewed topic.

Print—Prints the current topic (if the Topic pane is active). If the table of contents is active on the Navigation pane, you can choose to print the current topic, or the topic and its subtopics. This is a way of printing a collection of topics.

Options—Displays the options menu:

Hide/Show Tabs—Same as Hide/Show buttons, described above.

Back/Forward—Same as Back/Forward buttons, described above.

Home—Displays the main topic of this online system.

Stop—Halts display of a topic.

Refresh—Redraws the Help Viewer display.

Internet Options—Displays a dialog to change Internet Explorer (IE) settings. Changes you make here *do not affect* the online reference or tutorials, but *do affect* your IE browser settings. We do not recommend you use this option.

Print—Same as the Print button, described above.

Search Highlight On/Off—Toggles highlighting on and off for each occurance of a word or phrase found with a search.

HTML Help Viewer Right-Click Menus

There are several commands on the shortcut menu that you can use to display information.

Command	Description
Right-click in the table of contents, and then click Open All.	Opens all books or folders in the table of contents. This command only works if the Contents tab is displayed.
Right-click in the table of contents, and then click Close All.	Closes all books or folders. This command only works if the Contents tab is displayed.
Right-click in the Topic pane, or an entry in the table of contents, and then click Print.	Prints the topic.
Right-click an entry in the Favorites tab.	Choose to display, add, remove, or rename a topic.

Keyboard Shortcuts in the Help Viewer

The following keyboard shortcuts can be used for navigation in the HTML Help Viewer, or the *Contents (page 3–xii)*, *Index (page 3–xii)*, *Search (page 3–xii)*, or *Favorites (page 3–xii)* tabs on the Navigation pane.

Help Viewer

To	Press
Close the Help Viewer.	ALT+F4
Switch between the Help Viewer and other open windows.	ALT+TAB

To	Press
Display the Options menu.	ALT+O
Hide or show the Navigation pane.	ALT+O, and then press T
Print a topic.	ALT+O, and then press P, or right-click in the Topic pane and choose Print.
Move back to the previous topic.	ALT+LEFT ARROW, or ALT+O, and then press B
Move forward to the next topic (provided you have viewed it just previously).	ALT+RIGHT ARROW, or ALT+O, and then press F
Turn on or off search highlighting.	ALT+O, and then press O
Return to the home page (help authors can specify a home page for a help system).	ALT+O, and then press H
Switch between the Navigation and Topic panes.	F6
Scroll through a topic.	UP ARROW and DOWN ARROW, or PAGE UP and PAGE DOWN
Scroll through all the links in a topic.	TAB

Contents Tab

To	Press
Display the Contents tab. Tip: Use this shortcut to see where a topic fits in the information hierarchy.	ALT+C
Open and close a book or folder.	PLUS SIGN and MINUS SIGN, or LEFT ARROW and RIGHT ARROW
Choose a topic.	DOWN ARROW and UP ARROW
Display the selected topic.	ENTER

Index Tab

To	Press
Display the Index tab.	ALT+N
Type a keyword to search for.	ALT+W, and then type the word
Choose a keyword in the list.	UP ARROW and DOWN ARROW
Display the associated topic.	ALT+D

Search Tab

To	Press
Display the Search tab.	ALT+S
Type a keyword to search for.	ALT+W, and then type the word
Start a search.	ALT+L
Choose a topic in the results list.	ALT+T, and then UP ARROW and DOWN ARROW
Display the selected topic.	ALT+D
Search for a keyword in the result list of a prior search.	ALT+U and press ENTER
Search for words similar to the keyword. For example, to find words like "running" and "runs" for the keyword "run."	ALT+M and press ENTER
Search through topic titles only.	ALT+R and press ENTER

Favorites Tab

To	Press
Display the Favorites tab.	ALT+I
Add the currently displayed topic to the Favorites list.	ALT+A
Choose a topic in the Favorites list.	ALT+P, and then UP ARROW and DOWN ARROW
Display the selected topic.	ALT+D
Remove the selected topic from the list.	ALT+R

Notes

- There are also *shortcut menu commands* *(page 3–971)* that can be accessed through the keyboard.
- The Match Similar Words check box, on the Search tab, will be turned on if you used it for your last search.

Help Commands

New Features Guide

Help menu > New Features Guide

The *New Features Guide* is a PDF document that provides an introduction to the new features in 3ds Max **7**.

User Reference

Help menu > User Reference

Click User Reference to display the 3ds Max User Reference online. This reference provides navigation and search methods to help you to find the information you want.

Contents—Starting from the topmost topic, you click to select different levels of topics, proceeding from more general to more specific. Click a book icon to see the topics in that book. Click the page icon for the topic you want to display.

Index—Lists keywords for topics alphabetically in index format.

Search—All words in all topics are indexed when the reference was compiled. When you enter the words you want to search for, the Search engine gives you a list of all topics containing those words.

Note: When you open the User Reference from the Help menu, you are actually opening an *umbrella* reference, which contains references for 3ds Maxand reactor. You can access each of these references individually in the *|help* directory of your 3ds Max installation.

See also

Using the Reference Online (page 3–965)

Finding Information Fast (page 3–966)

MAXScript Reference

Help menu > MAXScript Reference

Click MAXScript Reference to display the MAXScript Reference online. This separate online reference system provides navigation and search methods to help you to find the MAXScript information you want.

Contents—Starting from the topmost topic, you click to select different levels of topics, proceeding from more general to more specific. Click a book icon to see the topics in that book. Click the page icon for the topic you want to display.

Index—Lists keywords for topics alphabetically in index format.

Search—All words in all topics are indexed when the reference was compiled. When you enter the words you want to search for, the Search engine gives you a list of all topics containing those words.

See also

About MAXScript (page 1–xx)

Tutorials

Help menu > Tutorials

Click Tutorials to display the online tutorials for 3ds Max. These display as a separate online help syste; a tutorials manual accompanies this software package.

Hotkey Map

Help menu > Hotkey Map

The Hotkey Map is similar to the dialog displayed during startup. It lets you view the current keyboard shortcuts setup on your system interactively. When you open the dialog, you can move your cursor over the parts of the keyboard image to highlight different areas, showing the shortcuts assigned to the various keys. You can also page through all of the assigned shortcuts by clicking the arrow in the bottom-right corner of the dialog.

Clicking the icon at the upper-right corner of the map refreshes the window.

Note: The splash screen and Hotkey Map are based on Macromedia® Flash®. If Flash is not installed on your system, these windows will not be available.

Additional Help

Help menu > Additional Help

Click Additional Help to display help files for installed third-party plug-ins and for add-on products from Autodesk.

This command is set by default to look for third-party help files installed to the *\help* subdirectory, though that location may have changed if you've edited *plug-in path settings* *(page 3–857)*. Plug-in path information is stored in the *plugin.ini* file.

To view help for the plug-ins:

1. Choose Help > Additional Help.
2. Choose the plug-in for which you want help.
3. Click Display Help.

3ds Max on the Web

Help menu > 3ds Max on the Web

The 3ds Max on the Web submenu gives you five options:

- **Online Support**—Uses your Web browser to connect to the Autodesk 3ds Max Support site.

  Tip: To access technical documents, choose *knowledgebase* from the menu on the left side of the Web page.
- **Updates**—Uses your Web browser to connect to the 3ds Max Downloads section of the Support and Services site.
- **Resources**—Uses your Web browser to connect to the Autodesk 3ds Max Resources page.
- **Partners**—Uses your Web browser to connect to the Autodesk 3ds Max Partners page.

- **Training**—Uses your Web browser to connect to the Autodesk Media and Entertainment Training page.

Activate 3ds Max

Help menu > Authorize 3ds Max

Choose this command to restart Register Today in order to enter a new license authorization code. You'd need to reauthorize 3ds Max, for example, if you're changing from a trial license to a permanent license.

If you bypassed the initial registration after installing 3ds Max, you can also use this command to register your copy.

About 3ds Max

Help menu > About 3ds Max

Click About 3ds Max to display copyright and license information about your copy of 3ds Max. The About box also records release and serial numbers, as well as the current graphic display driver.

appendix b

Troubleshooting 3ds Max

Troubleshooting 3ds Max

This section describes a collection of problematic situations and what you can do to diagnose and fix them. These include many common problems that are reported to Autodesk Product Support, and the things you can try in order to resolve the problems yourself.

When starting to diagnose a problem, by yourself or with the intent of contacting Product Support, you should take stock of the situation by answering the following questions.

- What's changed since the last time I ran 3ds Max?
- Has the 3ds Max display configuration been changed?
- Was an updated video driver or new operating system service pack installed recently?
- Has 3ds Max been running successfully without lock-ups or crashes?

Handling File Corruptions

Nothing is more frightening or aggravating than attempting to open a scene and you encounter an Assertion Failed error, File Open Failed error, or perhaps no error at all. The file just does not load. You have encountered a corrupt file. A number of things can cause a file corruption, including the following:

- Some component built in another program has been imported or referenced with an XRef.
- The scene failed to save properly due to a power failure or system crash.
- A poorly coded plug-in was used that corrupted an object in the scene.

Problems and Resolutions

Assertion Failed Errors

The assertion failed error occurs commonly when you try to load a corrupt file. The error gives you a line number and file name where the corruption occurred. You are then left with the options to retry or cancel.

Unfortunately, the line number and file often don't help because that isn't necessarily where the error is actually occurring. Most people click the Retry option a couple of times then give up, fearing they've lost many hours of work. Don't panic yet. There are a number of things you can try before you have to start rebuilding.

The first thing to try is keep clicking the Retry button. If there is a corruption to the vertices of an object, you might have to parse through each

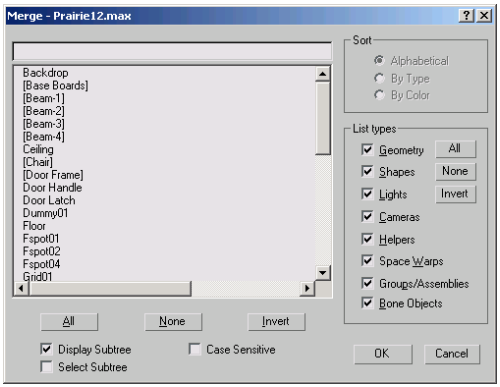
vertex until you bypass the object completely. For example, Autodesk Product Support once received a file that returned an Assertion Failed error referencing a *tab.h* file. The scene recently had an AutoCAD component imported that 3ds Max couldn't understand. However, after the support technician clicked the Retry button 88 times, the scene finally opened. After resaving the scene, it opened without incident.

Merging Corrupt Files

If normal attempts to open a scene fail, another thing you can try is merging the scene. If the file is not too corrupted, you would be able to access the Merge dialog which shows a list of the components in the scene. This is a good sign because, with a little effort, you can fix the file yourself. You now need to narrow down which object, or objects, are causing the load failure.

1. Start 3ds Max.
2. Choose File menu > Merge.
3. Browse to the folder containing the model, select the model and click the Open button.

   The Merge dialog is displayed, showing all the components in the scene.



   You'll start by seeing if any of the objects or shapes in the scene are corrupt.

4. In the List Types group, on the right, turn off everything except Geometry, Shapes, and Groups/Assemblies.
5. Click the All button at the lower left, and then click OK.

   If the objects appear in the viewports, you know the scene components are fine and you'll have to repeat these steps with other List Types turned on.

If the objects merge successfully, and you have to try merging in other objects, be sure to first save what you've just merged as a basis for rebuilding the scene.

If you receive an error message, you know one of the objects is the offending item. Then, do as follows.

1. Reset 3ds Max.

   You now have to narrow down exactly which object in the previous list is corrupt.
2. Once again, choose File > Merge and turn off everything except Geometry, Shapes, and Groups/Assemblies.
3. Select the first ten objects in the list of components and click OK.

   If those ten objects merge successfully, save the scene and repeat the Merge operation with the next set of ten objects. Eventually, one of the sets of objects you try to merge will report the error message.
4. Keep refining the number of objects you are merging until you have singled out the object that reports the error.
5. Once you've found the corrupt object, reset 3ds Max and merge all the objects and components except for the object you've singled out.
6. After everything is merged, save the scene and rebuild the object that was corrupt.

Granted, this can be a long process, but it's well worth it if you can salvage a majority of the model.

Remember Backup Files

By default, the 3ds Max automatic backup feature is turned on. It is set to store three backup files that are saved every five minutes. The files are stored in the *|Program Files|Autodesk|3dsmax8|autoback* folder. Using backup files is especially good if your file became corrupt due to a system crash or power outage.

1. Start 3ds Max and verify that you cannot load the scene.
2. Open Windows Explorer and browse to the *|Program Files|Autodesk|3dsmax8|autoback* folder.
3. Start by selecting *autobak1.max* and make a copy of it.
4. Browse to the *|Program Files|Autodesk|3dsmax8|scenes* folder and paste the file.

   If you want, you can rename it.
5. In 3ds Max, choose File > Open and try loading the file you just copied from the *|autoback* folder.

   If it opens, save the scene and rebuild what you lost in the last five minutes.

You can adjust the Auto Backup settings, located on the *File Preferences (page 3–870)* tab of the Preferences Settings dialog found on the Customize menu.

Fixing Boolean Problems

Boolean operations are a powerful addition to your modeling toolbox; however, they can sometimes give strange or unexpected results. The Boolean button is found on the Create panel in the Compound Objects list; it allows you to join, subtract, intersect, and cut objects. Following is a list of problem scenarios and steps you can follow to fix them.

Tip: Before performing a Boolean operation, you should save your scene or use Edit > Hold. That way, you can quickly recover should anything not appear as expected.

Problems and Resolutions

Boolean Objects Disappear

If you mistakenly perform an Intersection Boolean operation on two objects that look like they intersect, but actually don't, you can end up in a situation where the object completely disappears. In the Operands group, you see both your objects listed but nothing on-screen.

1. Click the Undo button to retract the Operand B selection.
2. Right-click to exit the Boolean operation.
3. Verify that the objects intersect by checking them in two viewports, like the Top and Left.
4. Click Boolean to turn on the operation, and click Pick Operand B.
5. Click the intersecting object.

Creases or Ridges Show in Boolean Objects

Creases or ridges might be caused by a Boolean operation between an object that has very few faces and an object that has considerably more faces, for example, when you subtract a complex freeform object from a simple box.

3ds Max tessellates the surface of the box so there are additional faces for the subtraction. Unfortunately, the faces are usually generated as long, slivered faces that sometimes overlap and form creases or ridges in the resulting scene, when rendered.

Before attempting the Boolean operation, try these steps.

1. Select the object that has the lower face count.

In this example, it would be the box.

2. Change the Length, Width or Height Segments of the surfaces where the subtraction will occur.
3. From the Compound Objects buttons, click Boolean.
4. Perform the subtraction as you originally wanted.

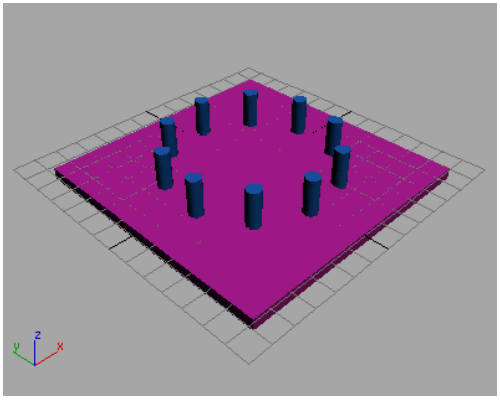
By subdividing the surface with more faces, the Boolean operation has more faces and edges to work with. This results in fewer long, sliver-like faces that can produce creases or ridges.

Consecutive Booleans Results in Disappearing Components

Booleans are programmed to work with two operands, Operand A and Operand B. If you plan to join or subtract many objects from the object that you've selected as Operand A, you must click the Boolean button after each Operand B selection. If you don't, and simply click the Pick Operand B button and pick the next object, the previous operation is negated and the previous Operand B disappears.

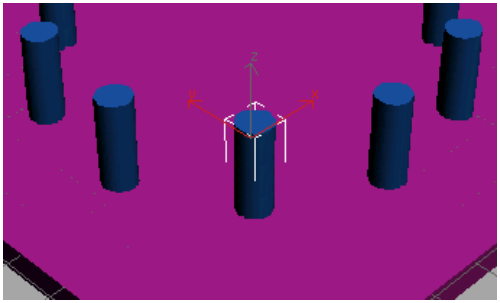
The most efficient means to use when joining or subtracting a large number of objects to or from a single object is to attach all the objects before attempting the Boolean operation.

As an example, let's say you're building a metal plate that has a circle of bolt holes. So far, you have a flat box, Operand A, and ten cylinders, Operand B, passing through it.



The future metal plate with circle of bolts

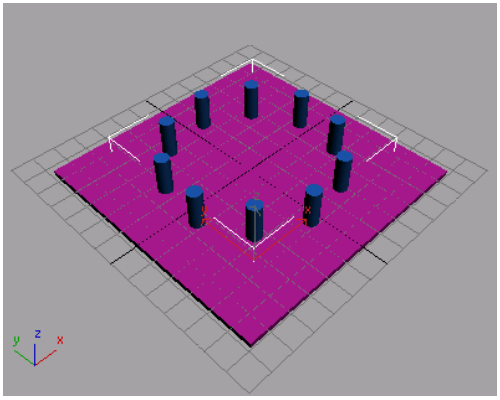
1. Select one of the cylinders.



2. Right-click and convert it to an Editable Poly.

   This automatically opens the Modify panel.
3. From the Edit Geometry rollout, click Attach List.

   This is the little button next to Attach.
4. From the Attach List dialog, select all the other Cylinders and click the Attach button.

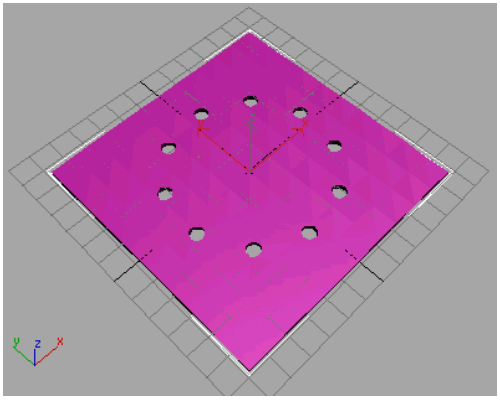


All the cylinders are a single object.

5. Select the Box and make sure it has Length, Width, or Height Segs values that are greater than 1.

   See *Creases or ridges show in Boolean objects (page 3–xii)*.

6. Open the Create panel and from the drop-down menu that shows Standard Primitives, choose Compound Objects.
7. Click the Boolean button and in the Parameters rollout > Operations group, make sure Subtraction (A-B) is turned on.
8. On the Pick Boolean rollout, click Pick Operand B, and select the Cylinders.



The cylinders are subtracted to form holes in the box.

You only have to perform Boolean operations once instead of several times. This method is far more efficient and less prone to errors. It is also very useful for cutting rough openings for doors and windows into a wall if you're already working with 3D geometry. Next, you'll find an example for working with 2D spline objects.

Splines and Boolean Operations

Performing Boolean operations on splines made from the Create panel > Shapes menu can be confusing. 2D spline shapes do not use the Boolean operation you'd use for 3D geometry. Shapes, converted to Editable Splines, offer Boolean functionality from the Modify panel > Geometry rollout. Unlike Boolean operations performed on two separate pieces of 3D geometry, Boolean operations can only be performed on single splines.

Therefore, one of two things must be done before you can perform Boolean operations to spline shapes.

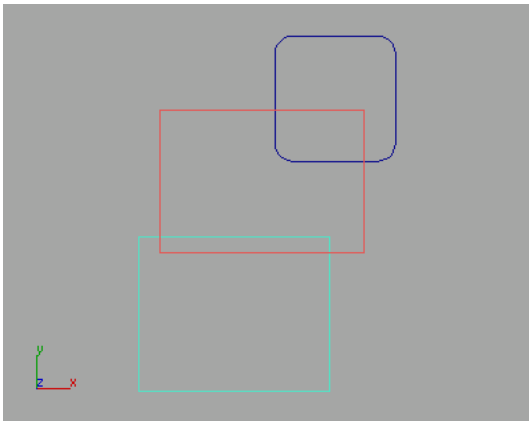
- When originally creating the shapes, make sure Start New Shape is turned off on the Create panel > Shapes > Object Type rollout. When turned off, you can create several overlapping shapes that are treated as a single shape made up of several splines.

Start New Shape in the OFF state (it is on, by default.)

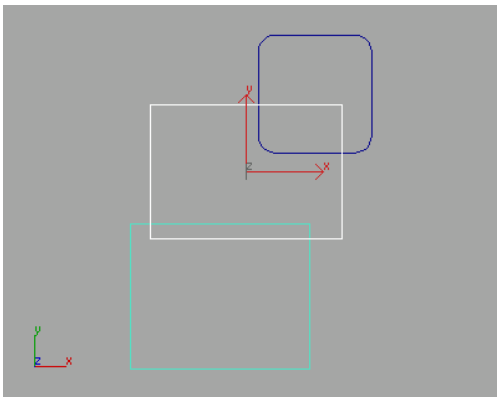
- If you didn't turn off Start New Shape, you'll have to attach all the spline shapes to create a single shape comprised of multiple splines.

To illustrate the most common situation, let's say you've got three overlapping rectangles and you

want to subtract the two outer rectangles from the central rectangle. You also forgot to turn off Start New Shape.



1. Start by selecting the central rectangle.

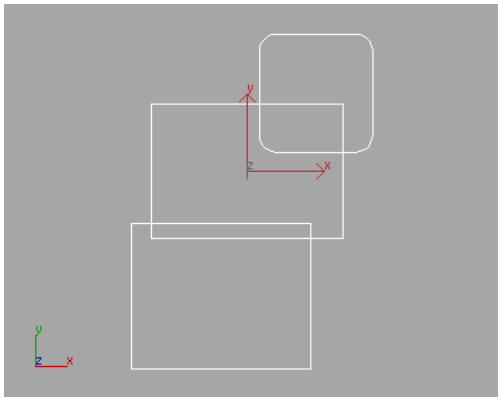


2. Right-click and choose Convert To > Convert to Editable Spline from the quad menu.

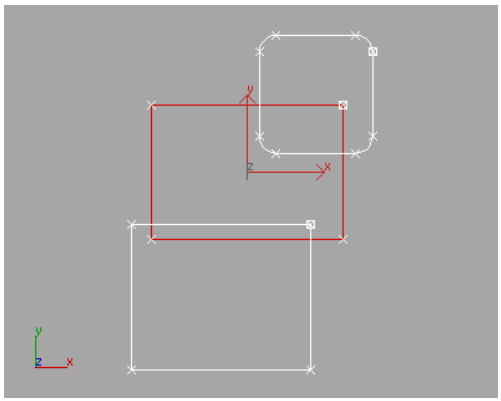
   The Modify panel automatically opens.

3. In the Geometry rollout, click the Attach button and pick the two outer rectangles.

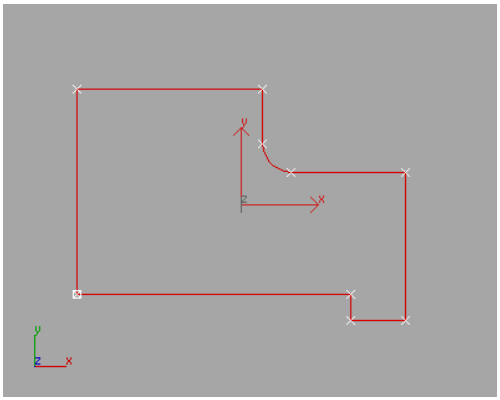
   Now, you've got a single shape made up of three sub-object splines.



4. Turn off Attach and scroll up to the Selection rollout.
5. Turn on the sub-object Spline mode, and select the central rectangle.



6. Scroll down the Geometry rollout and click the Boolean button. Also click the Subtraction button to the right.
7. Pick the two outer rectangles.



The final shape after subtracting the two outer rectangles

Tips for Successful Boolean Operations

Here, you'll find some general tips that will ensure that you're Boolean operations work the first time.

- Add a modifier and collapse the stack.

  If a set of operands never seems to produce desired results, try adding a modifier and collapsing the stack to create an Editable Mesh or Editable Poly. You can also collapse objects to editable meshes and polys without first applying modifiers. If you do this, use Edit > Hold or File > Save As on the scene; you will not be able to adjust the parameters of the existing modifiers in the stack.

- Create objects with more faces.

  In general, create objects that have more faces than you might normally use. For instance, increase the Height, Width, and Length segments of a Box, especially if the other object is more complex. Try to make the face count of both operands similar in number. With a larger number of faces, the edges created by the Boolean operation tend to be smoother and more refined. Once the Boolean operation gives you the results you want, apply the Optimize modifier to reduce the number of faces on the object.

- Apply the STL-Check modifier.

  One way to check the validity of objects that you intend to use as operands is by applying the STL-Check modifier. This modifier is primarily used to verify that an object is a complete and closed surface in preparation for exporting to STL files. Because Boolean operations work best with objects that meet the same criteria, use STL-Check on your operands. After applying the STL-Check to an object, turn on Check. The Status group tells you if errors are present.

Performance Issues While Running 3ds Max

Slow or sluggish performance while running 3ds Max can usually be attributed to either a video configuration conflict or a memory allocation problem. The hard thing about performance problems is narrowing down the culprit. Here are some common situations that can hamper operation of 3ds Max and steps to take to rectify them.

Problems and Resolutions

3ds Max Doesn't Start Quickly

Autodesk Product Support often encounters an increase of this situation around the time a new version or upgrade of the software is released. The question usually posed by the customer is, "Why does the new version take longer to start than the last version?" There are several reasons.

- The size of the executable that starts 3ds Max and the additional overhead needed to load the new features of a new release can cause a slowdown. Code in a new executable may use the system processors in a different way than the last version so a slowdown may be noticed. The important thing is how 3ds Max performs once it is running.

- Each version of 3ds Max is programmed and optimized to use newer video technology than what was previously available. If you haven't upgraded your video card in the last year, or at least updated video drivers, there is a very good chance 3ds Max will not start as quickly as in previous versions. You can also try a different 3ds Max video configuration.
- If you have not defragmented your system recently, 3ds Max could exhibit a slower start time. Defragmenting the system can also streamline the loading of large files that tend to swap to virtual memory.

Files Take a Long Time to Open

The size of a file often defines how quickly it loads into 3ds Max. However, if you notice an increase in load time from one design session to another, it could be an indication that 3ds Max is not finding enough memory to operate efficiently or that the file needs to be optimized.

The first thing to check is your system memory allocation. Per the 3ds Max system requirements, you should have a minimum of 256 MB of physical memory (RAM) and 300 MB of swap space. Recommended RAM is 1 GB with a 2 GB swap file. Here's how to check your memory and swap-file allocations.

To check RAM and swap-file allocation on Windows 2000:

1. Right-click the My Computer icon on your desktop and choose Properties from the menu.

   This opens the System Properties dialog.

   On the General panel, you should see information about your computer. The amount of RAM should be listed on this panel.

   Note: The RAM may be displayed in kilobytes (KB) instead of megabytes (MB).

2. Open the Advanced panel, and click the Performance Options button.

   The Performance Options dialog is displayed.

3. Check the "Total Paging File Size For All Drives" setting in the Virtual Memory group.

   If you have 256 MB of RAM, you should set the Virtual Memory to approximately three times the RAM, or 768 MB.

To check RAM and swap-file allocation on Windows XP:

1. Right-click the My Computer icon on your desktop and choose Properties from the menu.

   This opens the System Properties dialog.

   On the General tab, you should see information about your computer. The amount of RAM should be listed on this panel.

2. Open the Advanced tab and click the Performance Settings button.

   The Performance Options dialog is displayed.

3. Click the Advanced tab, and check the "Total Paging File Size For All Drives" setting in the Virtual Memory group.

If the physical and virtual memory are set appropriately, then you'll have to check the model. If the model does eventually open, do the following:

- From the File menu, choose Save As and save the scene under a different name. Then try opening the new file to see if it loads faster.
- Review some of the objects you know have large modifier stacks. Performance can be improved if you collapse the stacks of objects that you've completed.
- If the model uses XRefs, make sure the XRefs are locally accessible. If they're located on a network server, the long load time could be due to high network traffic.

Slow Response to Open or Drag Dialogs

This situation is exhibited when you click a command that opens a dialog, like the Material Editor or graph window, like Track View. After you click, you notice an appreciable time lag until the dialog or window opens. If you then attempt to drag it to a new location, the dialog or window does not smoothly follow your cursor.

The usual cause for this is a video driver conflict or display configuration issue because opening or dragging a dialog causes your graphic card to refresh the screen. Try these steps to diagnose the problem.

1. Start 3ds Max.
2. From the Customize menu, choose Preferences.
3. Open the Viewports panel and check the Current Installed Driver.

   Most likely, it will be set to OpenGL or Direct3D.
4. If set to OpenGL or Direct3D, click the Choose Driver button and choose Software.

   The Software setting is a generic driver that works for all video cards. It doesn't have any video enhancements but it's a good place to begin diagnostics.

   Note: If you're switching from Direct3D, you first have to use Revert From Direct3D before choosing the Software configuration.
5. Click OK to close the Graphic Driver Setup dialog.

   You will be informed that you have to restart 3ds Max for the change to take affect.
6. Close the Preferences dialog and exit 3ds Max.
7. Restart 3ds Max.

Try opening or dragging dialogs around to see if performance has improved. If it has, do the following:

- If the software was originally configured for OpenGL, try configuring 3ds Max for Direct3D and see if performance is improved. Or vice-versa.
- Verify that your graphic card supports your preferred display configuration choice. Some cards do not fully support OpenGL or Direct3D.
- Visit the Web site of your graphic card manufacturer and see if they have any newer video drivers that you can download and install.

Sluggish Command Response

Sluggish command response is closely related to the previous situation. If you create an object such as a Box, you might notice that the cursor suddenly slows down when you drag it into a viewport. Clicking the corners to set the length, width and height is equally time-consuming. Once again, the likely cause is video-related.

1. Start 3ds Max.
2. From the Customize menu, choose Preferences.
3. Open the Viewports panel and check the Current Installed Driver.
4. Make sure you have 3ds Max configured for the software display driver.
5. Click OK to close the Graphic Driver Setup dialog.

   You will be informed that you have to restart 3ds Max for the change to take effect.
6. Close the Preferences dialog and exit 3ds Max.
7. Restart 3ds Max.

Try using the command that was giving you trouble and see if it works correctly now.

Problems Caused by Unit Settings

The unit settings of a model can often get you into trouble. Understanding some of the common problems can help you avoid them.

This section addresses the two most common problems that modelers encounter.

Problems and Resolutions

Objects Disappear When the Camera Gets Close

This situation can happen when you model things on a very tiny scale and then have to get very close to them in a Camera or Perspective viewport. Architectural walkthrough animations are notorious for this kind of behavior. You've got a camera moving along a path and at some point it gets too close to a wall and you're suddenly able to see through to a room on the other side.

Note: This problem is quite common for designers working with the metric system when you want to use real world metric units and you change the System Unit Scale to 1 unit=1 meter. You don't have to change the System Unit Scale to metric to work in Metric units; just change the units.

There are two solutions that often fix this problem.

Turn on the manual viewport clipping:

You can turn on the manual viewport clipping and adjust it to see the entire object. Viewport clipping has a Near and Far range setting, if a camera gets closer to an object than the Near Clip value, you will see through that object. Likewise, objects that are located beyond the Far Clip value, will be invisible to the camera.

1. Open the problematic scene and select the camera.
2. In the Parameters rollout > Clipping Planes group, turn on Clip Manually.
3. Adjust the Near or Far Clip value, or both.

   When you can see the object again, your clipping plane is set properly.

Scale the entire scene:

If it doesn't matter what units you work in, scale the entire scene so objects are not affected by viewport clipping.

1. Open the problematic scene and select everything.
2. On the toolbar, click Select And Uniform Scale.
3. Enlarge the entire scene.

   Not only do the objects in the scene get larger but the distance between objects increases. So, the larger you scale the scene, the further your camera is located from the surrounding objects.

If you need to work in real world units, such as inches or meters, you should set the scale of the scene before you begin modeling by changing the System Unit Scale value from the default of 1 unit=1 inch to something like 1 unit=0.1 inch or even 0.01 inch.

If you change the System Unit Scale after you have begun modeling, you will need to use the Rescale World Units utility to rescale the scene.

Zooming and Panning Are Too Fast or Slow

If zooming and panning are too fast or too slow, the most likely cause is the System Unit Scale. 3ds Max can exhibit round-off errors when dealing with extremely large or small distances. These round-off errors can also cause normals to be flipped or strange viewport clipping. 3ds Max does not have the numerical resolution to zoom infinitely from the some remote corner of the solar system down to an ant on your doorstep.

If you're going to change the System Unit Scale, you should change it before beginning any modeling. If you do have to set it later, it's best to rescale

the entire scene with Rescale World Units. For example, if working on a tiny scale, like modeling coins, you might change the System Unit Scale from the default of 1 unit=1 inch to something like 1 unit=0.1 or 0.01 inch. For larger scaled scenes, like an airport, increase the System Unit Scale.

As a rule of thumb, keep the scale such that the smallest detail is not less than one generic unit. If this makes the scene too big to work with comfortably and efficiently, you can create separate scenes for models that include cameras for "close" and "far" shots.

User Interface Problems and Recovery

It's very aggravating when you can't find something on the user interface, especially when you saw it a few minutes ago and now it's gone missing. Of course, you're so engrossed in your modeling that you forget what you may have done that caused the button, element or dialog to disappear.

This section addresses several of the most common user interface situations and how you can fix them.

Problems and Resolutions

Large Fonts and 3ds Max

While some users like to configure their systems to use large fonts, this setting is not recommended with 3ds Max. The 3ds Max user interface was designed to operate with your system set to small fonts. Small fonts are the default setting for both Windows 2000 and Windows XP.

If you have your system set to use large fonts, some of the most common anomalies you can expect while running 3ds Max are as follows:

- Buttons may be missing from the command panels.
- Some text-entry fields may not allow you to type in them.
- Garbled text appears in some dialogs.
- Text labels in dialogs and rollouts might be cut off or overlap other fields.
- Dialogs show cascading text fields and spinners.

To remedy these problems, set your system font back to small fonts.

1. Exit 3ds Max.
2. Go to Start > Settings > Control Panel, and click Display.

   You can also right-click anywhere in the open desktop and choose Properties.
3. Open the Settings panel and click the Advanced button.
4. In the Display group, click the arrow to open the Font Size list and choose:
   - Small Fonts, if running Windows 2000
   - Normal Size, if running Windows XP
5. Click Close to exit the Display Properties dialog.

   You will most likely have to reboot the system for these changes to take effect.

Lost Dialogs and Windows

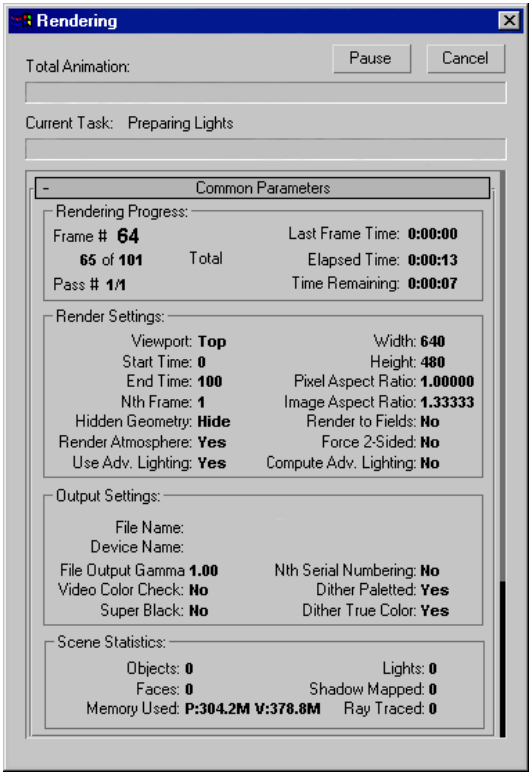
3ds Max has many dialogs or windows that float when you open them. This feature allows you to drag them anywhere on your desktop. You can greatly improve your design efficiency by positioning dialogs out of the way of the main 3ds Max interface, such as on a second monitor if you have dual-monitor functionality.

However, there are times when a dialog gets lost. Either you drag it someplace and inadvertently let go of it, or some data is written incorrectly to an initialization file and you end up with a lost dialog.

There are a couple of ways to recover a lost dialog; both entail working with the *3dsmax.ini*, found in the *|Program Files|Autodesk|3dsmax8|* folder.

Thorough Method

In this example, let's say you've got a single monitor that's configured for 1280x1024 resolution and you've lost your Rendering Progress dialog.



It was visible the last time you rendered, but that was awhile ago and someone else has been using the system.

1. Make sure 3ds Max is not running.

   The *3dsmax.ini* file is constantly being updated while 3ds Max is running.

2. Open a text editor and load *3dsmax.ini*.
3. Scroll down the list of entries until you find the data block:

```
[RenderProgressDialogPosition]
  Dimension=-425 152 379 866
```

   A dialog's position is based off the location of the upper-left corner, anchored by the first pair of digits. Therefore, in this example, the upper-left corner of the dialog is -425 pixels from the left edge of the screen and 152 pixels from the top. The second pair of digits describe the horizontal and vertical size of the dialog, so this dialog is 379 pixels wide and 866 pixels tall.

   Since this example assumes a single monitor, configured for 1280x1024 resolution, this dialog is off-screen to the left. If the first number were greater than 1280, the dialog would be off-screen to the right.

4. Place your cursor on the "Dimension" line and scroll over to the problem number.

   The problem number is usually the first or second, since the last two set the width and height of the dialog.

5. Change the problem number to a value that is positive and within 1280x1024.
6. Save the *3dsmax.ini* file and start 3ds Max.

The next time you render, the Rendering Progress dialog appears appear on-screen.

This is the preferred method, because it causes no loss to other custom configuration settings that are stored in the *3dsmax.ini* file.

Quick Method

There are really only two reasons you'd use this method:

- You've just installed 3ds Max and haven't made any customized settings that get stored in the *3dsmax.ini* file.
- You're in a hurry and don't care about the customized settings that you have stored in the *3dsmax.ini* file.

1. Make sure 3ds Max is not running.

2. Open Windows Explorer and browse to the *|Program Files|Autodesk|3dsmax8|* folder.
3. Choose the *3dsmax.ini* file and delete it.
4. Restart 3ds Max.

   A new *3dsmax.ini* file is automatically created using default settings.

You need to be careful when using this method, because you don't necessarily know what custom settings are saved in the *3dsmax.ini* file. Perhaps you have 3ds Max set to display the command panel on the left and you've changed the viewport background color. Furthermore, if you have third-party plug-ins installed, they sometimes write information to the *3dsmax.ini* file. If you delete the file, you will losing all those settings.

If you're not sure about customized settings that are stored in the *3dsmax.ini* file, you can rename the file to something like *old3ds.ini*. When you restart 3ds Max, you can continue working and, at a later time, compare the two files and copy the data you need from the old one to the new one.

Material Editor Defaults to Architectural Materials

When you open the Material Editor, you encounter Architectural Materials instead of original Autodesk VIZ Standard materials.

Autodesk VIZ now allows you to set default user interfaces. If you build architectural models or require photorealistic rendering, you can set the user interface to default to features more relevant to the way you work. This is a new feature that is set from the Customize menu > *Custom UI and Defaults Switcher dialog (page 3–833)*

This setting gets saved to the *3dsmax.ini* file and you have to restart 3ds Max after using the Defaults Switcher.

Missing Command Panel

The command panel normally appears along the right side on the user interface. If you start 3ds Max and notice that the command panel is missing, there are usually three causes.

- The command panel is turned off.
- You floated the command panel to another monitor and attempted to drag it to a new location. When you released the mouse button, the command panel disappeared.
- A custom user interface is active that places the command panel off-screen.

All of these situations can be quickly fixed by using the following steps.

1. Start 3ds Max.
2. From the main menu, choose Customize > Revert To Startup Layout.

   You'll be warned that all UI settings you've made during the current session of 3ds Max will be reset.

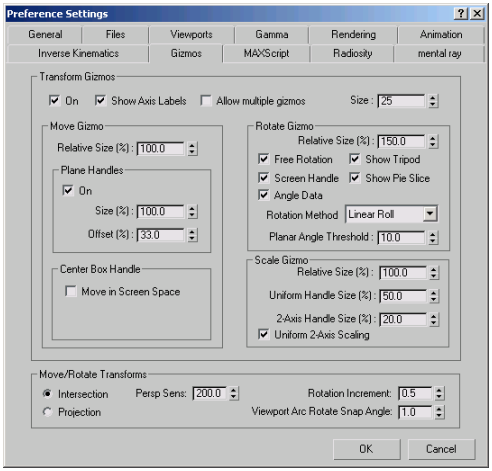
Missing Transform Gizmos

Whenever you move, rotate or scale an object, the standard, red axis tripod is replaced by a special purpose transform gizmo. It's quite easy to lose the transform gizmo, but it's also easy to get it back. If you find you've lost your transform gizmo, try these steps.

1. Start 3ds Max.
2. Press the **X** key.

   This is the keyboard shortcut that toggles the transform gizmo on and off.
3. Press the **=** key.

   This keyboard shortcut increases the size of the transform gizmo. The **–** sign reduces the size.
4. Open the Customize > Preferences > Gizmos panel, and match your setting to the default settings shown in the following image.



Multiple or Missing Buttons on the Toolbars

This is another tricky situation. You open a toolbar and find that there are duplicate buttons present or the button you expect to find is no longer there.

Note: This problem is caused by holding the CTRL key and dragging a button on the toolbar.

Three Select And Move buttons.

This is clearly a user-interface problem, so reverting to the startup layout will fix this problem.

1. Start 3ds Max.
2. From the Customize menu, choose Revert To Startup Layout.

If you have multiple buttons and don't want to reset the entire UI, you can manually remove duplicate buttons by doing the following:

- Hold down the ALT key and drag the duplicate button out of the toolbar.

  Click Yes when asked to confirm the deletion of the button.

If buttons are missing, you must use Revert To Startup Layout.

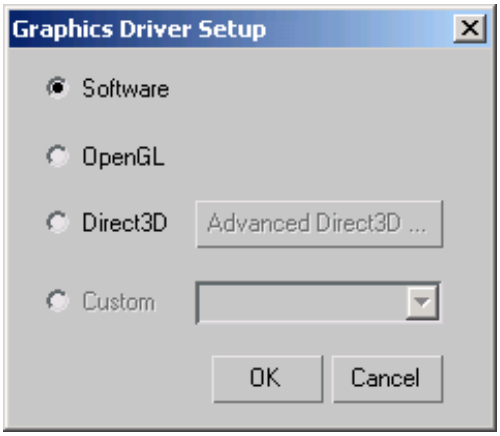
Video Driver and Display Problems

Because 3ds Max heavily relies upon the graphics card in your system, many problems that you may encounter while using the program can be attributed to the video. Such problems could be slow performance, refresh delays, user interface discrepancies, and so forth.

Problems and Resolutions

Basic Troubleshooting Start Point

As a rule of thumb, before attempting to diagnose any problem with 3ds Max, you can be more efficient in your diagnostics by resetting the display configuration to its default value. After you first install and start 3ds Max, you're presented with the Graphics Driver Setup dialog.



If you're configured for OpenGL, Direct3D, or Custom, choose the Software driver. By configuring for the Software driver, you can disqualify the video card or drivers if the problem you're encountering persists while running 3ds Max.

- Resetting the configuration from within 3ds Max.

  1. Choose Customize menu > Preferences.

2. Open the Viewport panel and check your currently installed driver.

   If it's not the Software driver, proceed. Otherwise, you can cancel and begin the diagnostics elsewhere.

3. If set to OpenGL, Direct3D, or a custom driver, click the Choose Driver button.

   The Graphics Driver Setup dialog is displayed.

4. Choose Software and click OK.

   You'll see a message that the changes will take effect the next time you start 3ds Max.

5. Exit 3ds Max and restart the program.

6. Try performing the task that was giving you problems.

- Resetting the configuration before starting 3ds Max.

  1. Start 3ds Max from the command line. Choose Start > Run.

  2. Click the Browse button, browse to the *|Program Files|Autodesk|3dsmax8|* folder and select *3dsmax.exe*.

  3. Click Open on the Browse dialog but do not click OK on the Run dialog.

  4. On the Run dialog, place your cursor at the end of the command line and add **-h** to the string.

     It should read something like; *"C:|Program Files|Autodesk|3dsmax8|3dsmax.exe" -h*

  5. Click OK on the Run dialog.

     3ds Max will start and display the Graphics Driver Setup dialog, just as it did the first time you started 3ds Max after installing.

  6. Choose the Software driver and try performing the task that was giving you problems once the program opens.

  If the problem does not persist, you know that you've encountered a display problem. If this is the case, check the following with regards to your video card:

  - Verify that the video card supports the driver you attempted to use.

    Some cards don't fully support OpenGL or Direct3D.

  - You might not have the latest video drivers for the card.

    Contact the board manufacturer for updated drivers.

  - If you were originally configured for OpenGL, try Direct3D, or vice versa.

    The driver for the graphics card may have better support for one driver than other.

Direct3D Failed to Initialize Message

3ds Max supports both DirectX 8.1 and DirectX 9. When configuring the display settings, you choose DirectX 9 and start 3ds Max only to receive a message telling you that "Direct3D failed to initialize. Please make sure you have the latest version of DirectX installed."

This usually means your card doesn't support DirectX 9 or you don't have DirectX 9 installed. Revert the Direct3D version back to DirectX 8.1 and confirm that you are running the latest version of DirectX.

1. Choose Start > Run.

2. In the Open field, type **dxdiag** and click OK.

3. On the System tab, check the DirectX version.

   If it shows DirectX 8.1, you need to download the newer version from Microsoft.

Direct3D Reports a Memory Warning

You may encounter a memory warning when starting 3ds Max if you've configured the program to use the Direct3D driver.

This warning dialog usually appears if you have several programs, that heavily impact the video memory of your graphics card, running and you have the 3ds Max interface maximized or stretched to cover most of the display.

Your quickest options for bypassing this warning are as follows:

- Shut down some of the other programs that are concurrently running with 3ds Max.
- Reduce the size of the 3ds Max interface.
- Reconfigure 3ds Max to use a different display driver.

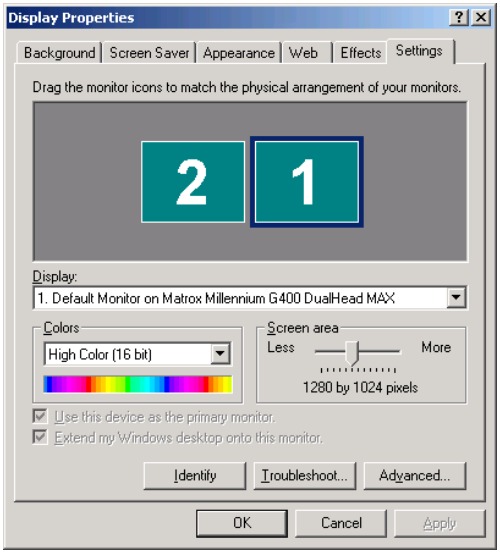
Dual-Monitor Configuration

Many board manufacturers are building graphic cards that support multi-monitor configurations. The cards might advertise hardware features like “Dual Head” or “Multi-Head” that have two monitor ports built into them. Other manufacturers choose to handle dual configuration through video drivers that let you configure your system display in “Wide” mode. Here are the details of what you need to watch out for when configuring a multi-monitor system.

- Hardware “Dual Head” Solution

  Many newer video cards offer this hardware solution for setting up a dual-monitor system. These graphic cards are usually AGP cards and have two monitor ports. Since these boards have two ports and your system has only one AGP slot, you can only drive dual monitors.

  After installing the card and drivers, you want to follow the manufacturer’s instructions for configuring your system. Configuration is done through your system’s Display Properties dialog > Settings panel.



  You are presented with a diagram for each monitor and you can set the resolutions independently by selecting a monitor and adjusting the screen Area slider. You will also often find utilities included with the drivers that enable special features for the graphics card.

  The disadvantage to this configuration is that one monitor is a primary while the other secondary, so performing some tasks can only be done on applications positioned on the primary monitor. For instance, if you use screen-capture software, you can have that program open on the secondary monitor, but if you want to capture an image, you can only capture images of applications that are located on the primary monitor.

- Software Driver Solution

The software solution to multi-monitor configuration is often found in older graphic cards that fit into your PCI slots. Each board has a single port to accept a monitor and the video drivers give you the option to configure a single display in "Wide" mode to encompass multiple displays. Also, because you have four PCI slots in your system, you could theoretically drive four monitors. However, in order for these cards to operate at the best resolutions, each card needs to have the same amount of video RAM (vRAM) installed. So, if your had two cards and one had 32 MB of vRAM and the other only had 8 MB, you can only configure to the highest resolution supported by the 8 MB card.

Display configuration is normally done through the video drivers so you have the option to configure wider screen areas. For example, instead of configuring each display individually to 1280x1024, as described above, you would treat both monitors as a single display and configure the screen area to 2560x1024 pixels.

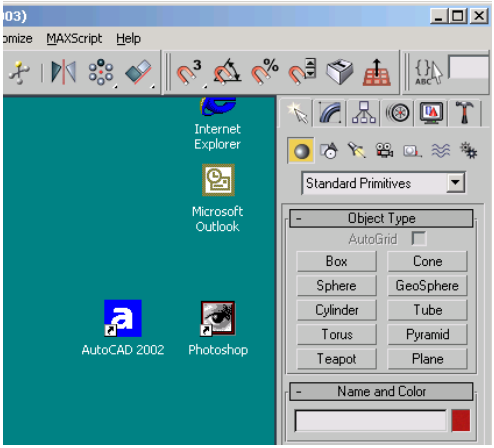
Spanning Across Monitors

Whenever, you start 3ds Max, the user interface spans across both monitors. You find yourself constantly resizing the program to fit on one screen so you can see the programs located on the other screen.

This is usually a problem on systems that let you configure both monitors as one, in "Wide" mode. The utility software that loads with the graphic card manufacturer's drivers probably has a feature that forces programs to open across the entire expanse of the display. You can turn off this feature and programs will open in the last position and size you gave them.

Viewport Transparency

After starting 3ds Max, the user interface appears but you can see the system desktop through each of the viewports. This problem normally occurs if you have the display configuration set to either OpenGL or Direct3D and your graphics card does not completely support OpenGL or Direct3D.



If configured for Direct3D, you might also see this problem coupled with the "Direct3D initialization failed" message.

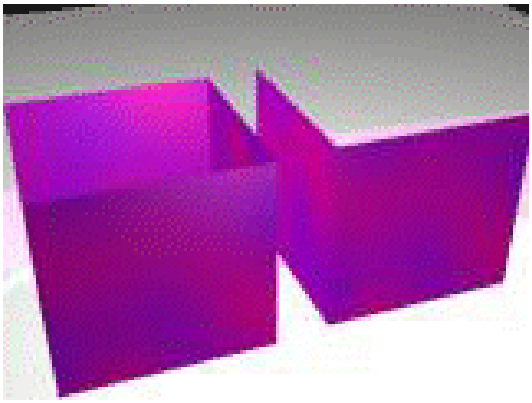
To remedy this problem, follow the steps outlined in *Basic troubleshooting start point (page 3–xii)* and configure for Software. If 3ds Max opens correctly in this mode, check the video card manufacturers for updated drivers for the display mode you'd prefer to use.

Glossary

Glossary

This section of the Help system contains explanations of concepts and terms used in the reference, arranged alphabetically.

2-Sided (Double Sided)



Rendering of a box with a double-sided material, and same box with a single-sided material

In 3ds Max, faces are one-sided. The front is the side with the surface *normal (page 3–1074)*. The back side of the face is invisible to the Renderer; meaning the face appears to be missing when viewed from the back. Objects are usually created with the surface normals facing outward, but it is possible to create objects with the faces flipped or to import complex geometry in which the face normals are not properly unified.

There are two ways to render both sides of a face. Either turn on the Force Two Sided option in the Render dialog, or apply a two-sided material to the geometry.

Usually, you want two sided rendering turned off since it slows rendering time. However, if you want to render the inside as well as the outside of objects, or if you've imported complex geometry (for example, from AutoCAD) in which the face normals are not properly unified, you can use one of the methods above to render each face regardless of its normal's orientation. You can also unify normals explicitly by using the *Normal modifier (page 1–738)*.

2D Map

A two-dimensional image or pattern. A 2D map requires mapping coordinates to render and appear in viewports. See *2D Maps (page 2–1434)*.

3D DWF

From *Design Web Format*. A highly compressed file format that is created from a MAX file. DWF

files are easy to publish and view on the Web using the Autodesk DWF Viewer.

3D Map

A pattern generated procedurally in three dimensions. A 3D map does not require mapping coordinates in order to render. However, a 3D map will appear in viewports only if the object to which it is applied has mapping coordinates. See *3D Maps (page 2–1472)*

3DS and PRJ Files

3DS is the 3D Studio R4 mesh-file format and PRJ is the 3D Studio R4 (for DOS) project-file format. You can import both these types of files into the software, as well as DXF and SHP files. You can export 3DS files and DXF files.

See also

Importing 3DS Files (page 3–531)

Importing PRJ Files (page 3–532)

Exporting to 3DS (page 3–533)

Importing PRJ and 3DS Files

When you import a 3DS file, you get the following:

- Backgrounds (solid, gradient, and bitmap).
- Fog, Layered Fog, and Distance Cue.
- Ambient light level.
- Subtractive transparency is converted to "Filter" transparency, and the filter color is set equal to the diffuse color.
- Transparency falloff settings.
- All map channels that are enabled. Map channels that are turned off in the *.3ds* file do not import.
- All map parameters, including UV transforms, Negative, Mirror, and Rotation. Some Map Parameters such as Blur, Luma, and RGB and Alpha work much differently. These values are converted to new values that produce a similar effect.
- Mask bitmaps are imported as a mask texture.
- When materials with both Texture 1 and Texture 2 are imported, a composite texture is created and added to the Standard material's Diffuse channel.
- Reflection maps, auto-cubics and mirrors.
- Automatic reflection map Nth frame and Map Size settings.
- SXP translation for Marble and Noise materials.
- 3DS/DOS IK joint parameters.
- 3DSurfer patch data.

The following information is ***not*** imported from a 3DS file:

- Morph keys
- Keyframer instances
- Map channels that are turned off
- Custom .CUB-format cubic maps
- Decal transparency using the RGB color of the upper-left pixel of the map

  When you import a PRJ file, you get all of the above, plus Shapes.

Exporting to 3DS Files

The following rules determine what is exported to the 3DS format:

- Position, Rotation, and Scale animation. If the controller is a TCB controller, the TCB, Ease In, and Ease Out values are also saved. If the controller is any other type of key controller, the keys are saved but the tangent information is lost. If the controller is not a key controller, only the object's transformation at frame 0 is saved.

- Basic material color/parameters from the Standard material.
- Single maps with their amount, offsets, scales, etc.
- Composite and procedural maps don't export.
- Auto-cubics and Mirrors export.
- UV mapping coordinates can be exported.

  UV mapping coordinates are exported if the toggle Preserve MAX's Texture Coordinates is turned on in the Export Scene to .3DS File dialog. See *Exporting to 3DS (page 3–533)*.

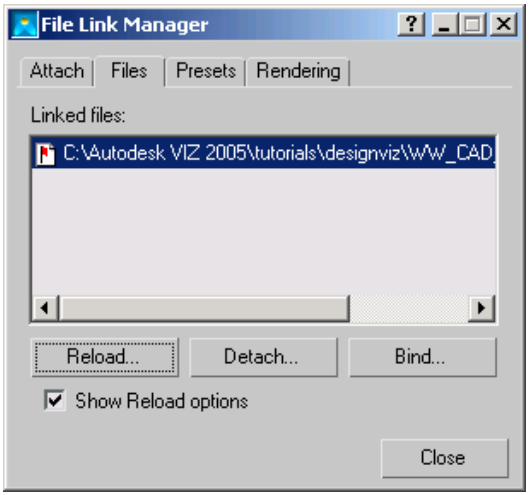
  A vertex in a 3DS file can have only one texture coordinate. If a vertex in the 3ds Max file has multiple mapping coordinates, it is split into multiple 3DS vertices on export, to preserve the mapping.
- Grouped object transformations don't export to the 3D Editor because there's no concept of group hierarchy in the 3D Editor. Groups do export to the Keyframer because the Keyframer understands hierarchies.
- Target cameras, target spotlights and omni lights.
- Most "static" parameters for cameras and lights, and animation tracks for Roll, Falloff, Hotspot, and FOV are exported. Global shadow parameters are not exported.
- All non-mesh geometry, such as procedural primitives and patches, are collapsed to meshes before export.
- Objects are exported as they exist on the frame that displays at export time. If you want to output morph targets, go to each frame and export the target to a different file name.
- Meshes are saved with edge display information and smoothing groups.
- Instances are saved as Keyframer instances.

Modifier and morph animation is frozen at the current frame, collapsed, and exported as a simple mesh.

Action

Operators (page 3–1079) and *tests (page 3–1115)* in Particle Flow are known collectively as *actions*.

Active Link



File Link Manager showing an actively linked drawing.

When you use the File Link utility to link a drawing to 3ds Max, the objects have an active link with the original drawing in AutoCAD or Autodesk Architectural Desktop. This means that any edit made to the drawing in AutoCAD or Architectural Desktop can be immediately updated in 3ds Max by reloading the link.

The red flag in the file list means the drawing has been changed in AutoCAD or Architectural Desktop and you should click the Reload button to update the scene in 3ds Max.

The Detach button will cause the drawing file that is linked to 3ds Max to be removed from the scene and removed from the File Link Manager.

Clicking the Bind button will bind the drawing to 3ds Max and sever the active link with AutoCAD or Architectural Desktop.

Active Time Segment

The active time segment is the total range of frames that you can access using the *time slider (page 3–748)*.

By default, the active time segment runs from frames 0 to 100, but you can set it to any range from the *Time Configuration dialog (page 3–768)*. In addition, the active time segment can include negative frame numbers, so you can create keys before frame 0 and work in negative time.

You can change the active time segment whenever you want without affecting the keys you've already created. You might think of it as a window in time, specifying only that portion of your animation in which you want to work. Thus, if you have keys scattered over a range of 1000 frames, you can narrow your active time segment to work on only frames 200–300 without affecting the keys outside of the segment.

Active/Inactive Footsteps

When you first create footsteps for a biped in *Footstep mode (page 2–840)*, they are inactive. You must activate these footsteps using the Create Keys For Inactive Footsteps button. Active footsteps have keys to animate the biped. Inactive footsteps have not been given keys by **character studio**.

You can make active footsteps inactive by clicking Deactivate Footsteps.

Both these buttons are on the *Footstep Operations rollout (page 2–842)*.

In the Track View – Dope Sheet editor, inactive footsteps are displayed with a distinctive color to indicate they are inactive.

If you have upper body animation added to a biped, and you deactivate the footsteps, then re-activate you will lose the existing upper body keys. Use Adapt Locks on the Dynamics and Adaptation rollout to control which tracks are affected by the create keys process.

ActiveShade Initialize and Update

ActiveShade rendering (page 3–17) is a two-step process:

- Initialize
- Update shading

The Initialize Pass

Rendering can be slow. The initialize pass is meant to take care of the most time-consuming portions of rendering, to allow the update pass to take place as quickly as possible. Initialization includes the following steps:

- Evaluate the scene geometry into meshes.
- Apply space warps.
- Do transformations and clipping.
- Evaluate textures and shade materials.
- Perform optimizations to speed later processing, such as merging fragments from the same surface that are in the same pixel.

The result of initialization is a buffer. This is a compressed rendering that, like a *G-Buffer (page 3–1040)*, contains the rendering plus additional information used by the second step, updating.

During the initialize pass, progress is indicated by a row of pixels (white by default) that traverses the top edge of the ActiveShade window.

The Update Shading Pass

Updating shading takes the buffer created by the first pass, initialization, and uses information in that buffer to change the color of pixels when you make changes to lights and materials in the scene.

During the update pass, progress is indicated by a row of pixels (white by default) that descends the right edge of the ActiveShade window.

Adapt Locks

By default, **character studio** will automatically adapt biped keys when you edit footsteps in a *footstep animation (page 2–714)*. You can avoid this adaptation by using the Adapt Locks toggles on the *Dynamics & Adaptation rollout (page 2–833)*. Each toggle locks a specific track so that **character studio** doesn't adapt it when you edit footsteps.

Adapt Locks applies only to footstep animation, not to freeform animation.

Adaptation

In the *Motion Mixer (page 3–1070)*, when the same clip is used more than once on tracks, the clip versions are either *instances (page 3–1052)* or adaptations of one another.

The same clip used more than once for one biped, or for different bipeds of the same size, is an instance. The same clip used for different-sized bipeds is an adaptation.

These terms are used because the Mixer adapts each loaded clip to the biped's size. The first time a clip is loaded, the Mixer adapts the clip as needed. When the clip is cloned or loaded again, the Mixer adapts the new clip to the biped as needed, then compares the change to previously loaded versions to see if it's the same. If so, the new clip and its previous versions are instances of one another. If not, the new clip and previous versions are adaptations of one another.

In footstep animation, the term *adaptation* refers to keys generated for a footstep sequence. When you edit active footsteps, body and leg keys are adapted automatically. By analogy, the footsteps become a kind of "gizmo" for manipulating the keyframes of your character's animation. In most cases, edits you make to footsteps will act upon your keys in an intuitive fashion. See *Working with Footstep Animation (page 2–714)*.

Adaptive Degradation

Adaptive degradation changes the display in shaded viewports so the display can keep up with the current operation. For example, while you are zooming a viewport, the display might change from shaded to boxes during the zoom operation, then change back to a shaded display when you have finished zooming.

The *Adaptive Degradation Toggle (page 1–34)*, when turned on, causes viewport display to degrade according to settings on the *Adaptive Degradation panel (page 3–901)* of the Viewport Configuration dialog. When the Adaptive Degradation toggle is turned off, viewports retain their display settings at all times, but operations such as zooming or animation playback cause a slow screen refresh rate. In this state, animation playback might have to drop frames to keep up with real-time playback.

You can set the parameters that control the trade-off between display quality and display speed. The selected levels determine which rendering levels the software falls back to when it cannot maintain the desired display speed. You can choose as many levels as you want, but you are advised to choose only one or two levels for each type of degradation.

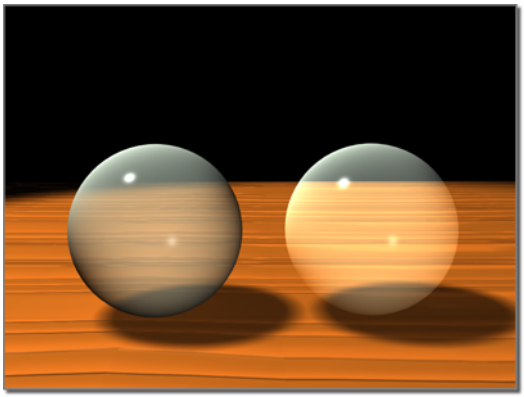
Note: When you use *Arc Rotate (page 3–787)* in a shaded viewport while Adaptive Degradation Override is off, objects degrade to bounding boxes regardless of the adaptive degradation settings.

The Adaptive Degradation Toggle is accessed from the Views menu; you can also use the **O** (letter 'o') keyboard shortcut to toggle it on and off.

Additive Opacity

An additive process adds two values together, such as two colors. When you add colors in 3ds Max, the result is brighter than either of the two original colors.

Additive Opacity



Sphere on the right uses additive opacity.

Additive opacity brightens the colors behind the material by adding the material's colors to the background colors. Additive opacity is good for special effects such as light beams or smoke. You specify the use of additive opacity on the *Extended Parameters rollout (page 2–1312)*.

Additive Opacity and the Alpha Channel

By default, additive opacity does not generate an alpha value. In other words, the alpha value is zero, indicating no transparency. This gives correct results with backgrounds in renderings, but if you want to composite objects with additive opacity using video post or a compositing program, you might want to have additive opacity render with transparency. To do so, add the following line to the [Renderer] section of the *3dsmax.ini* file, and then restart 3ds Max:

```
AlphaOutOnAdditive=1
```

To revert to the default method of rendering additive opacity, in the *3dsmax.ini* file, change the value of AlphaOutOnAdditive back to 0 (zero), and then restart 3ds Max.

See also

Subtractive Opacity (page 3–1111)

Adjust Talent Pose

When you animate a biped with *motion capture (page 2–910)*, after you load a *marker file (page 3–1063)*, you can use Adjust Talent Pose to correct the biped's position relative to the motion-capture markers. Align the biped limbs to the markers, then click Adjust Talent Pose to compute this offset for all the loaded marker data. This button is on the *Motion Capture rollout (page 2–916)*.

Affine Transformation

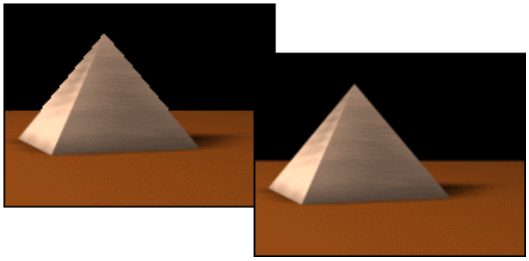
A geometric transformation such as move, rotation, or scale, that can alter distances between points or angles between lines, but preserves straight lines and the parallel relation between parallel lines. Transform operations are affine transformations. *NURBS (page 1–1093)* are invariant under affine transformations.

Airborne Period

In *footstep animation (page 2–714)*, a "ballistic gait" is defined as any footstep pattern in which

there are periods with no feet on the ground, causing the biped to become airborne, or ballistic. For example, running, hopping, and jumping are ballistic gaits with airborne periods.

Aliasing/Antialiasing



Pyramid is aliased on left, antialiased on right.

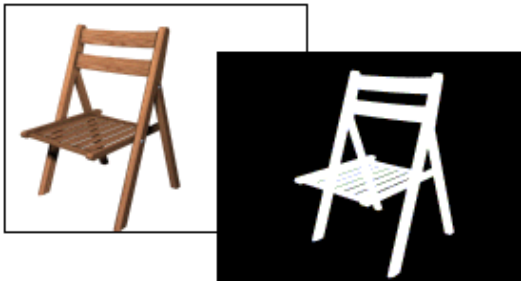
Aliasing is the staircase effect at the edge of a line or area of color when it's displayed by an array of discrete pixels.

Antialiasing smoothes the staircase effect that occurs when diagonal or curved lines or borders are drawn on raster displays consisting of square or rectangular pixels. Antialiasing can be either on or off. Turn this off only when you're rendering test images and want greater speed. Leave it on at all other times.

You can also turn antialiasing off for the Material Editor sample slots to speed up redraw of the sample objects. Click the Options button in the Material Editor and turn on the Antialias toggle on the Material Editor Options dialog. Default=off.

Note: To control whether or not a background image is affected by the renderer's antialiasing filter, choose Customize > Preferences > Rendering and then turn on Filter Background in the Background group. Default=off.

Alpha Channel



Alpha channel shown in black, on the right

Alpha is a type of data, found in 32-bit bitmap files, that assigns transparency to the pixels in the image.

A 24-bit truecolor file contains three channels of color information: red, green, and blue, or *RGB (page 3–1095)*. Each channel has a particular intensity or value at each pixel. The intensity of each channel determines the color of the pixel in the image.

By adding a fourth, alpha channel, the file can specify the transparency, or opacity, of each of the pixels. An alpha value of 0 is transparent, an alpha value of 255 is opaque, and values in between are semi-transparent. Transparency is important for *compositing (page 3–1016)* operations, such as those in Video Post, where several images are blended together in layers.

An alpha channel is particularly useful for the partly transparent pixels around the *aliased (page 3–1001)* edge of an object in a rendered image. These pixels are used for compositing. An image such as the one shown above can be composited smoothly onto a different background if an alpha channel is produced and saved with the image.

Each channel of a truecolor bitmap file is defined by 8 bits, providing 256 levels of intensity. Thus, an RGB file is 24-bit with 256 levels each of red, green, and blue. An RGBA file (red, green, blue, alpha)

is 32-bit, with the extra 8 bits of alpha providing 256 levels of transparency.

3ds Max creates the alpha channel automatically when you render. Any background pixels in the rendered image are fully transparent, and the alpha channel also accounts for any other transparency that you create via materials, etc. You can see this in the *rendered frame window (page 3–5)* by clicking the Display Alpha Channel button on the toolbar: In the resulting display, black pixels are fully transparent, white pixels are opaque, and gray pixels show degrees of transparency. To return to the regular display, click Display Alpha Channel again.

To output a rendered image with alpha, save in an alpha-compatible format such as TIFF or Targa. With Targa, the default settings include saving alpha; with TIFF, be sure to turn on the Store Alpha Channel check box.

Ambient Color

Ambient color is the color of an object where it is in shadow. This color is what the object reflects when illuminated by ambient light rather than direct light.

Ambient color areas in the scene will not appear any darker than the *ambient light setting (page 3–1002)*.

You can lock a material's ambient color to its diffuse color so that changing one automatically changes the other.

Ambient Light

Left: No ambient light

Middle: Low ambient light

Right: User-adjusted ambient light

Ambient light is the general light that illuminates the entire scene. It has a uniform intensity and is uniformly diffuse. It has no discernible source and no discernible direction.

By default, there's no ambient light in a scene. If you examine the darkest shadows on your model with the default ambient light setting, you cannot make out the surface because it's unlit by any light. Shadows in your scene will not appear any darker than the ambient light color, which is why you usually keep ambient light set to black (or a very dark color).

If you use photometric lights and a *radiosity solution (page 3–50)*, ambient light is accurately calculated. The other advanced lighting option, *light tracing (page 3–43)*, also generates ambient lighting.

If you use standard lights, a good lighting test is to set your ambient lighting to black (the default), set up all your lights, and then decide at the end if you need to increase the ambient light.

Animated Texture

An animated texture is a material whose properties change over time. One example of this is assigning a multi-frame bitmap (for example, an AVI file or an IFL image-file sequence) as a map.

Animated textures can also be materials with keyframed parameters. In addition, in the context of particle systems, a material that uses the *Particle Age map (page 2–1485)* or the *Particle MBlur map (page 2–1486)* is considered to be animated.

In general, when applying an animated texture to particles in Particle Flow, be sure incorporate it in a *Material Dynamic operator (page 2–187)*.

Animation

Animation is based on a principle of human vision. If you view a series of related still images in quick succession, your brain perceives them as continuous motion. Each image is called a *frame*.

Historically, the major difficulty in creating animations has been that the animator must produce a large number of frames. Depending on the quality you want, one minute of animation might require between 720 and 1800 separate still images. Creating images by hand is a big job. That's where keyframing comes in.

Most of the frames in an animation are routine, incremental changes from the previous frame directed toward some predefined goal. Early animation studios quickly realized they could increase the productivity of their master artists by having them draw only the important frames, called keyframes. Assistants could then figure out the frames that were required in between the keyframes. These frames were (and still are) called *tweens*.

Use the software as your animation assistant. As the master animator, you create the keyframes that record the beginning and end of each transformation. The values at these keyframes are called *keys*. The software calculates the interpolated values between each key value, resulting in tweened animation.

3ds Max is not limited to animating transformations (such as position, rotation, and scale). It can animate just about any parameter you can access. Thus, you can animate modifier parameters, such as a Bend or a Taper angle, material parameters, such as the color or transparency of an object, and much more.

Early animation studios also had to employ artists to add the ink and color to each frame. Even today, production of a cartoon usually requires hundreds of crafts people and artists to generate the thousands of images. With 3ds Max, the renderer takes over the job of shading and rendering each frame and storing it as you direct. The end result is a high-quality finished animation.

The quickest way to animate is to turn on *Auto-Key (page 2–274)* and start transforming objects at different frames. Each time you transform an object, you set a key. Then you can *play the animation onscreen (page 3–766)*, or *render it to a file (page 3–8)*.

Animation Controllers / Transform Controllers

All animation in the software is performed through animation controllers. The most common animation controllers, those for move (position), rotate, and scale, are also referred to as transform controllers.

Each animation track has its own controller, and each controller can be different.

In the hierarchy list, the controller tracks are represented by controller icons. The icons can appear differently depending on the controller that is assigned, for instance a Noise Float icon differs from a Bezier Float icon. You can also see which specific controllers are assigned to each track by turning on the controllers display in the Track View (right-click Filters in the Track View toolbar,

and choose Controller Types from the list). The controller names appear beside the tracks to which they're assigned.

You can assign different controllers to the tracks, affecting the way they respond. The Bezier Controller, assigned by default to all the Position tracks, lets you move objects using the Select and Move transform tool, and converts those movements into Bezier splines. You can adjust the splines in Function Curve editing mode.

Animation Layers

When you animate a biped, you can add layers of animation above the original biped animation. This is a powerful way of making global changes to your character animation. For example, when you add a layer and rotate the spine forward at any frame, a run cycle becomes a crouched run. The original biped motion is kept intact and can be viewed by switching back to the original layer.

Layers can be viewed individually or as a composite of all the animation in all the layers. Layers behave like a freeform animation; the biped can adopt any position.

Layers allow you to easily adjust raw motion-capture data, which contains keys at every frame. You do this by adding a layer and keyframing the biped.

Layer controls are on the *Layers rollout (page 2–827)*.

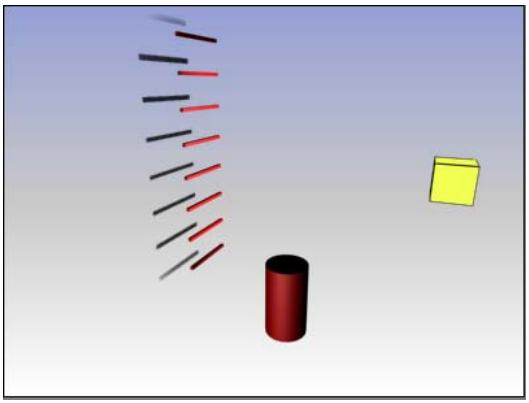
Applied IK

A type of inverse kinematics where one or more parts of the IK structure follows another animated object exactly. After the scene is set up, Applied IK generates transform keys for every object in the IK chain.

See *Animating with Applied IK (page 2–464)*.

Area Lights (mental ray Renderer)

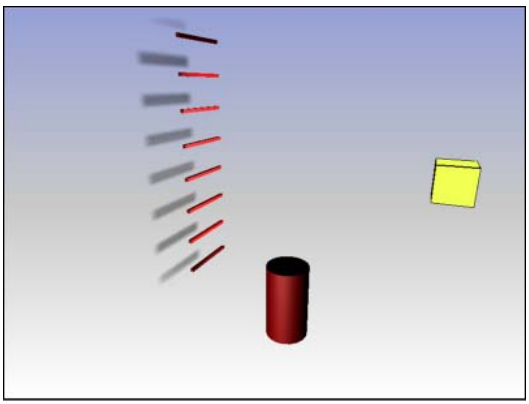
Area lights are a feature of the mental ray renderer. Instead of emitting light from a point source, they emit light from a broader area around the source. Area lights create soft-edged shadows. This can help improve the realism of your rendering.



Scene rendered with area light turned off

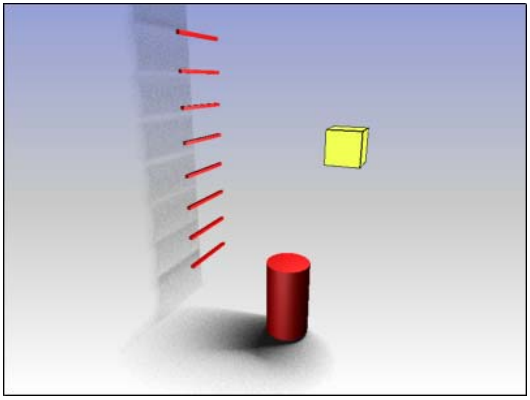
Shadows are ray-traced.

The yellow cube indicates the light's location.



Scene rendered with area light turned on, showing soft shadows

The light in this rendering is a 2D (spot) area light.



Scene rendered with a 3D (omni) area light

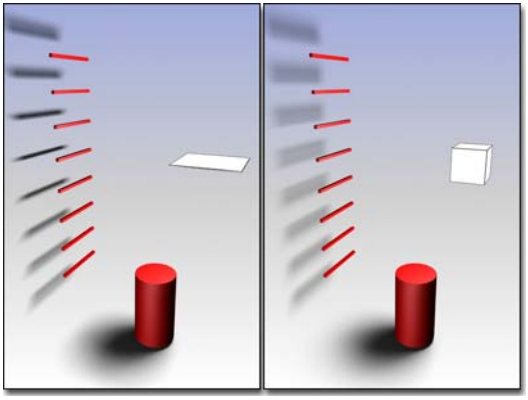
The light uses the default radius of 20.0.

Note: To render soft-edged shadows, shadows must be ray-traced, not shadow-mapped. See the Render Scene Dialog > Renderer panel > *Shadows & Displacement rollout (page 3–111)*.

Area lights support global illumination, caustics, and other features of the mental ray renderer.

Tip: Area lights take longer to render than point lights. If you are interested in creating a quick test (or draft) rendering, you can use the Area Lights/Shadows As Points toggle to speed up your rendering. This toggle is on the Render Scene dialog > Common panel > *Common Parameters rollout (page 3–27)*.

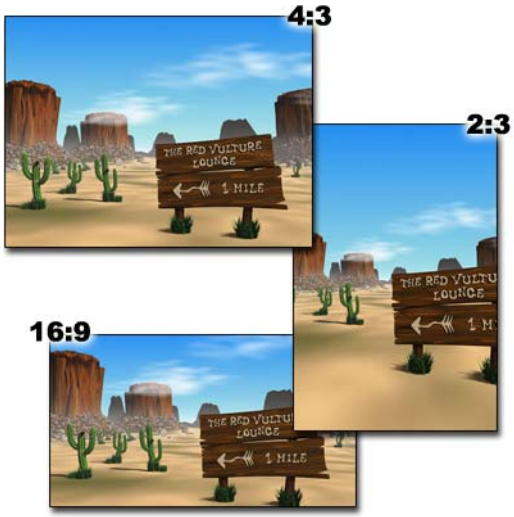
Area Shadows



The shape of the shadow-casting region changes the shape of area shadows.

Area shadows simulate shadows generated by a light with area or volume.

Aspect Ratio



Various aspect ratios

Aspect ratio describes the proportions of a still image or the frames in a movie, expressed as the

ratio of width to height, regardless of the image's *resolution (page 3–1097)*.

Aspect ratio is usually expressed either as a ratio of width over height (for example, 4:3) or as a real value relative to 1 (for example, 1.333). For example, pre-1950s movies and 35 mm slides have an aspect ratio of 4:3.

Aspect ratios are used anywhere a bitmap is created or used. For example:

- When preparing to render, you can specify an aspect ratio for your rendered images with the Image Aspect parameter on the *Render Scene dialog (page 3–2)*.
- When setting up a *viewport background (page 1–38)*, you can specify whether to use the viewport, bitmap or rendering output aspect ratio to display the bitmap.
- When you *make a spotlight a projector (page 2–1185)*, you can use the Bitmap Fit option to match the spotlight's aspect ratio to the bitmap's, and thus prevent the bitmap from distorting.

Attachments (IK)

In biped animation, the biped hands and feet can be linked to the world, another object in the scene, or to the biped's own body. This linking is also called IK attachment. Attachment can be blended: this lets you start with one attachment and end with another. For example, if the biped is catching a ball, you can start with the hand in body space and end with the hand in the coordinate space of the ball.

Attenuation

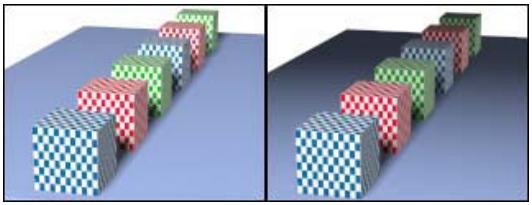


Image on right rendered with attenuation

In the real world, the intensity of light diminishes over distance. Objects far from the light source appear darker than objects near the source. This effect is known as attenuation.

In nature, light attenuates at an inverse square rate; that is, its intensity diminishes in proportion to the square of the distance from the light source. It is common for attenuation to be even greater when light is occluded by small particles in the atmosphere, especially when there are clouds or fog present.

Attenuation and Photometric Lights

Photometric lights *always* attenuate at the inverse square rate. This is one of the reasons it is important for scenes with a radiosity solution to use real-world dimensions and units.

Attenuation and Standard Lights

By default, standard lights don't attenuate. Consequently, an object's distance from the light doesn't matter, and only the angle of light to the surface has any effect on illumination unless you turn on attenuation. You can manually control the rate of attenuation for standard lights. You can also use attenuation with the Raytrace map. If your scene uses standard lights, you should consider adding attenuation whenever possible, for two reasons:

- Attenuation provides greater subtlety and realism in your lighting.

- You can reduce rendering time, since attenuated lights don't have to be calculated for surfaces that are beyond the attenuation range.

For standard lights, you can explicitly set where attenuation begins and ends. This is partly so you don't have to worry about setting up strictly realistic distances between light objects and the objects they illuminate. More importantly, this feature lets you fine-tune the effect of attenuation. In outdoor scenes, attenuation can enhance the effect of distance. In an indoor setting, attenuation is useful for low-intensity light sources such as candles.

For standard lights, you set attenuation parameters on the light's *Intensity/Color/Attenuation rollout (page 2–1190)*. For the Raytrace map, you set the parameters on the map's *Attenuation rollout (page 2–1516)*.

AutoGrid

AutoGrid is an option on the 3ds Max Create panel. It lets you create an object on the surface of another object. You can turn on AutoGrid when you create a biped, in order to position the biped on another object.

AutoGrid can also be used when creating footsteps manually, to place footsteps on an uneven terrain.

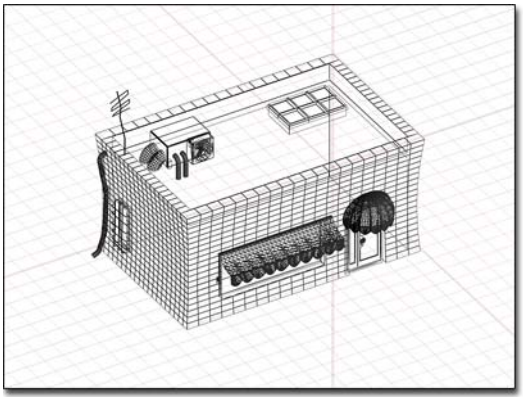
Avoid Behavior

In *crowd animation (page 2–1006)*, the Avoid behavior lets you specify any object or objects that delegates must keep away from. As delegates approach designated objects during the crowd simulation, they steer clear of them while turning or braking as necessary. This behavior uses three different methods to let delegates avoid each other and other objects: Steer To Avoid (the preferred method), Repel, and Vector Field. See *Obstacle Avoidance (page 2–1016)*.

Avoidance Behavior

In *crowd animation (page 2–1006)*, avoidance behavior consists of any combination of slowing down, turning, and stopping. See *Obstacle Avoidance (page 2–1016)*.

Axonometric View



Axonometric view of model

A projected view of 3-dimensional space that displays from one to three sides of an object. The lines in an axonometric view do not converge to vanishing points as they do in a perspective view, so lines that are parallel in 3D space are parallel in the view. For this reason, diagonal and curved lines can appear to be distorted.

Isometric (page 3–1054) and *orthographic (page 3–1080)* views are special cases of axonometric views.

B-Spline

B-spline (basis spline) is a kind of spline generated by so-called basis functions. The advantage of B-splines over *Bezier curves (page 3–1009)* is that

the control vertices (CVs) of a B-spline affect only their local region of the curve or surface. B-splines also compute faster than Bezier curves.

Balance Factor

Balance Factor positions the biped's weight anywhere along a line that extends from the center of mass to the biped's head, affecting the degree to which the hips or head (or both) swing away from their original vertical alignment when the biped is bent over.

See *Shifting the Biped's Balance (page 2–734)*.

Balance Track

Each biped added to the *Motion Mixer (page 2–581)* is automatically assigned a balance track. You don't place clips on this type of track as you do with *transition tracks (page 3–1121)* and *layer tracks (page 3–1055)*. The *weight curve (page 3–1127)* on the balance track is the only adjustable parameter.

By default, the Motion Mixer compensates for differences in upper and lower body motion that might cause the biped to go off balance over the course of the animation. It accomplishes this by changing the COM, pelvis and spine animation.

When the weight curve across the balance track is set to 1.0 (the default), balance compensation is enabled for the entire animation. You can adjust nodes on the weight curve to disable balance compensation over all or part of the animation. See *Adjusting Biped Balance in the Mixer (page 2–599)*.

Ballistic Gait

A "ballistic gait" is defined as any footstep pattern in which there are airborne periods (periods with no feet on the ground) such as a jumping or running pattern.

Ballistic Tension

Controls the amount of spring or tension when the biped lands or takes off from a jump or run step. See *Adjusting Vertical Motion (page 2–736)*.

Barycentric Coordinates

Given a triangle between points A, B, and C, each point X on the surface of the triangle can be represented by a weighted sum of the corners:

X = a*A + b*B + c*C

where a, b, and c are numbers between 0 and 1 and a+b+c = 1.

These numbers are called the *barycentric coordinates* of the point X. There is one unique set of barycentric coordinates for each point on the triangle.

Examples

The center of gravity of the triangle is given by the barycentric coordinates (1/3, 1/3, 1/3): X = 1/3 A + 1/3 B + 1/3 C = (A+B+C)/3.

If one of the barycentric coordinates is zero, the point X must lie on the opposite edge. For instance:

if a=0, X = b*B + c*C

where b+c=1

This means that X is on the line segment BC.

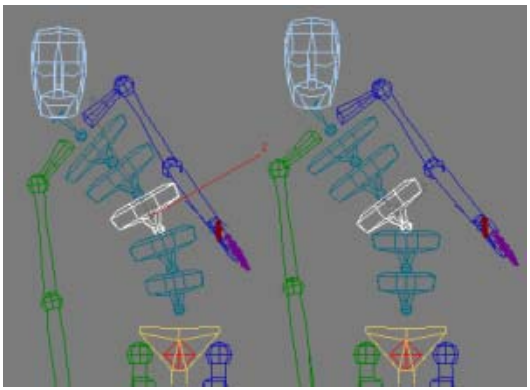
If a=1, on the other hand, then b=c=0, and X must be exactly the point A.

Behaviors

In *crowd animation (page 2–1006)*, behaviors simulate a range of activities. Seek, avoid, path follow, surface follow, repel, orientation, scripted, space warp, surface arrive, wall repel, wall seek, and wander are all behaviors available in a crowd simulation.

Behaviors let you assign procedural activity types to delegates and objects linked to delegates. You can associate any number of behaviors with each Crowd object, and then link delegates and teams of delegates to each behavior. A specific behavior assigned to a Crowd object belongs only to that crowd; it cannot be assigned to any other crowds.

Bend Links

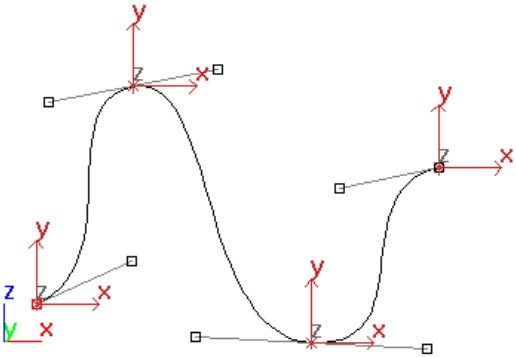


Bend Links Mode active (left) and Bend Links Mode inactive (right)

When you turn on Bend Links Mode (on the *Bend Links rollout (page 2–807)*), rotating a single chain link causes the other links to bend following a natural curvature. When Bend Links Mode is off, rotating one link rotates all its children links by the same amount.

Tip: Bend Links works well on the biped spine, neck, tail and ponytail links.

Bezier Curve



Bezier curve and the control points and tangent vectors about each vertex

A curve modeled using a parametric polynomial technique. Bezier curves can be defined by many vertices. Each vertex is controlled by two other points that control the endpoint tangent vectors. Bezier curves were developed by P. Bezier for computer modeling in automobile design.

A vertex on a Bezier Curve affects the entire curve in that area. Compare with *B-splines (page 3–1007)*, where the control vertices (CVs) affect only their local region of the curve or surface.

A segment on an *editable spline (page 1–292)* that has its vertices set to Bezier or Bezier Corner is considered a Bezier Curve.

BioVision Files

The BioVision™ file format stores motion-capture information. A BVH file contains the "actor's" skeletal and limb/joint rotation data, and uses the *.bvh* file name extension.

Note: For the BVH file specification, see the *BVH.rtf* document on the program disc.

BIP Files

BIP files contain skeletal size and limb rotation data for bipeds. This is the native **character studio** motion file format.

Biped

Biped is a 3ds Max system provided with the **character studio** product. It provides the armature used to pose a character, and facilities to animate it using either footsteps or freeform animation.

Biped Dynamics

Biped dynamics calculate a biped's airborne trajectory, the bending of its knee or knees on landing, and the biped position so it maintains balance when the spine is rotated. When the position or animation of the biped change, dynamics cause the biped to adapt.

There are six parameters that affect biped dynamics. Three are in the Body section of the *Key Info rollout (page 2–809)*:

- *Balance Factor (page 3–1008)*
- *Dynamics Blend (page 3–1025)*
- *Ballistic Tension (page 3–1008)*

The other three are on the *Dynamics & Adaptation rollout (page 2–833)*:

- *GravAccel (page 3–1044)*
- Biped Dynamics
- *Spline Dynamics (page 3–1109)*

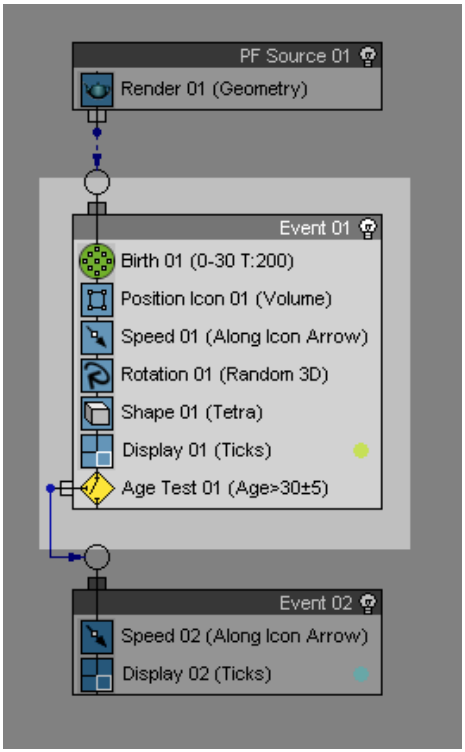
Biped Playback

Biped Playback on the *Biped rollout (page 2–791)* plays the animation for all bipeds in a scene (unless you use the Display Preferences dialog to exclude them). This playback mode usually gives real-time playback, which you might not get if you use the 3ds Max viewport animation Play button.

In Biped Playback mode, the biped is displayed as bones only, with no other scene objects visible.

Birth Event

A birth event is a special type of *local event (page 3–1057)* that always comes at the start of a *particle flow (page 3–1036)*, immediately after the *global event (page 3–1043)*. Its first *action (page 3–997)* is a *Birth operator (page 2–139)* or *Birth Script operator (page 2–141)*. The birth event can contain any number of additional actions, and can be succeeded by any number of additional events.



Birth event (highlighted)

Bitmap

A bitmap is a still image produced by a fixed matrix of colored *pixels (page 3–1089)*, like a mosaic. You can use bitmaps as textures for materials, as backgrounds to viewports, and as rendered environments.

You can use an animation or video file as a bitmap, in which case the material or background changes over time.

Bitmaps can be reloaded automatically after they have been changed and resaved by a graphic editing program. See the Reload Textures On Change toggle in *Preferences Settings > Files panel (page 3–870)*.

3ds Max can use the following image file formats as bitmaps:

avi (page 3–658)

bmp (page 3–659)

cin (page 3–659)

cws (page 3–660)

Autodesk Flic Image File: (*flc (page 3–662)*, fli, cel)

dds (page 3–660)

gif (page 3–662)

Radiance Image File: (*hdr (page 3–663)*, pic)

ifl (page 3–666)

jpg (page 3–670)

mov (page 3–670)

mpg (page 3–671)

png (page 3–678)

psd (page 3–678)

rgb (page 3–683)

rla (page 3–680)

rpf (page 3–681)

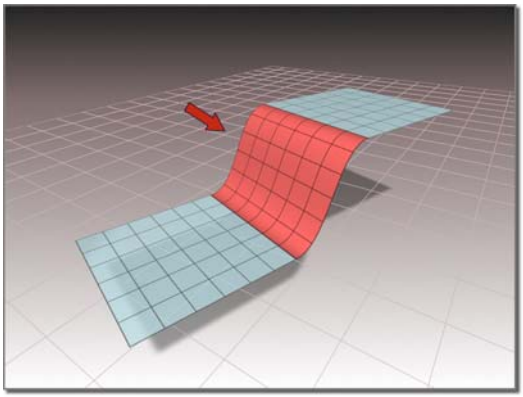
tga (page 3–683)

tif (page 3–684)

yuv (page 3–685)

Note: 3ds Max can also render to some of these formats, but not to all of them. See the topic for the individual image format for details.

Blend Object



NURBS blend surface

A dependent NURBS object that connects two curves or two surfaces. The curvature of the blend is controlled by the objects it connects, and by two tension parameters that control the "length" of effect of the tangent for each of the "parent" objects.

Block Reference

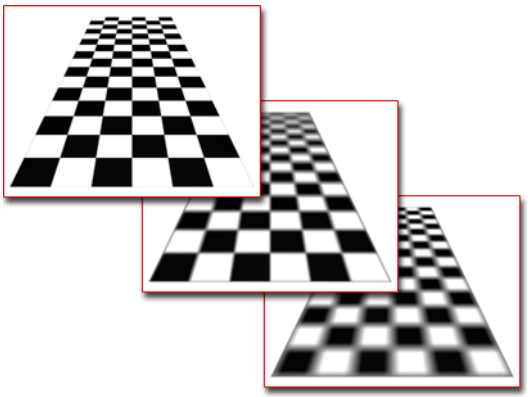
In AutoCAD, a compound object that is inserted into a drawing and displays the data stored in a block definition. A block reference is also sometimes referred to as a *Block Instance*. Refer to the AutoCAD, Autodesk Architectural Desktop, or Autodesk Mechanical Desktop help files for further information regarding Blocks, Block Instances, and Block References.

Block/Style Parent

A Block/Style Parent is closely related to a *VIZBlock (page 3–1125)* in that it is a compound object similar to a nested AutoCAD block. Just like the VIZBlock, it is used for organizing linked data from DWG files. When linking DWG data to 3ds Max, you need to decide how the incoming entities are to be organized in the scene. Objects in DWG files are commonly organized by layers, blocks, and entities, while 3ds Max scenes are organized by parent/child hierarchies of objects.

The main difference between a Block/Style Parent and a VIZBlock is that a Block/Style Parent allows for a parent/child hierarchy of "components," but does not display any of its own geometry. A VIZBlock displays its own geometry and lists a set of "components," or sub-objects.

Blur / Blur Offset



Top: Blur = 1, Blur Offset = 0

Middle: Blur = 10, Blur Offset = 0

Bottom: Blur = 0.01, Blur Offset = 0.2

The Blur and Blur Offset controls determine how a 2D map is blurred, or how it is softened in the rendering. You can't see their effect in the viewport renderer, only in the production renderer.

The Blur setting blurs the map based on its distance from the view. The farther away the map is, the greater the blurring. You should always use some blurring on your maps to avoid the type of scintillation, or aliasing that can occur when pixel details are reduced off in the distance. This effect typically occurs when you use detailed bitmaps viewed at a distance, and is particularly apparent during animations. The Blur default is 1.0, which is a good setting for most purposes.

Blur Offset blurs the map without regard to depth. That is, all the pixels in the map are blurred equally, regardless of how close or how far they are from the camera.

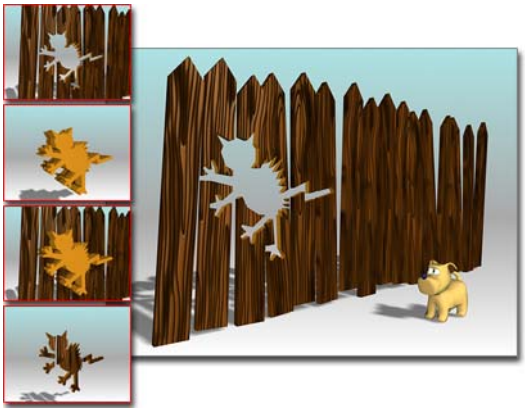
Whereas the Blur value is primarily used to avoid aliasing, Blur Offset is useful when you want to soften, or defocus the details in a map. It's the equivalent of blurring the bitmap in an image-processing program before applying it as a material map.

Note: For *bump mapping (page 2–1347)*, lower Blur and higher Blur Offset values give better results.

Body Space

A biped limb can be put into the coordinate space of the world or an object in the scene as well as body space. Body space moves the biped limbs when the biped moves; if you rotate the biped's hips, the feet, in body space, move as well.

Boolean Operation



The fence is operand A, and the cat is operand B.
Upper left and right: A minus B
Second to upper left: B minus A
Second to lower left: Union
Lower left: Intersection

A Boolean object combines two objects by performing a Boolean operation on them. In the software, a Boolean object is made from two overlapping objects. The original two objects are the operands (A and B) and the Boolean object itself is the result of the operation.

For geometry, the Boolean operations are:

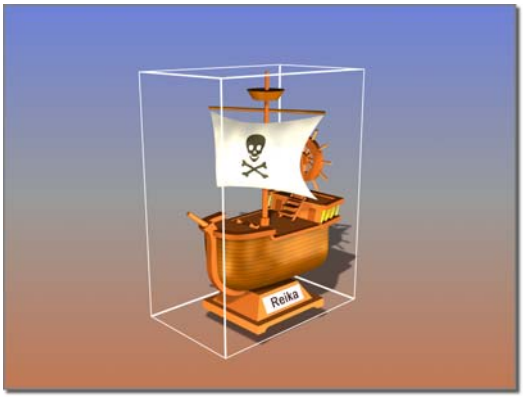
- **Union:** The Boolean object contains the volume of both original objects. The intersecting or overlapping portion of the geometry is removed.
- **Intersection:** The Boolean object contains only the volume that was common to both original objects (in other words, where they overlapped).
- **Subtraction (or difference):** The Boolean object contains the volume of one original object with the intersection volume subtracted from it.

Bound Vertex

Binding spline vertices via the Refine and Bind functions in *Editable Spline (Vertex) (page 1–292)* is useful for connecting splines when building a spline network for use with the *Surface Modifier (page 1–833)*.

Bound vertices are black, allowing them to be easily distinguished from standard vertices. You cannot move a bound vertex directly. However, changing the segment length by scaling it or by moving a connected vertex causes the bound vertex to shift its position in order to remain at the segment's midpoint. You can change a bound vertex's type (right-click the vertex, and then choose the type from the bottom of the right-click menu), and if you convert it to a Bezier or Bezier corner, you can manipulate its handles.

Bounding Box



Bounding box shows the extents of the model boat.

The bounding box is the smallest box that encloses the maximum dimensions or *extents (page 3–1030)* of an object.

You can display selected objects in the scene as bounding boxes to speed up screen redraw. Use the *Object Properties dialog (page 1–111)*.

The *Align command (page 1–447)* uses the maximum and minimum extents of the object's bounding box to align objects.

Bulge

Physique allows you to "bulge" a mesh based on the orientation of a limb. Bulging the mesh is used to simulate muscle contraction.

Bulge Angle

In Physique, a bulge angle is a control that sets the limb angle where the bulge will occur. Typically you first orient the limb, and then set the bulge angle. After setting the bulge angle, you then deform the mesh to make it bulge.

BVH Files

BVH is the file name extension for the BioVision™ motion-capture file format. A BVH file contains the "actor's" skeletal and limb/joint rotation data.

Note: For the BVH file specification, see the *BVH.rtf* document on the program disc.

By Layer

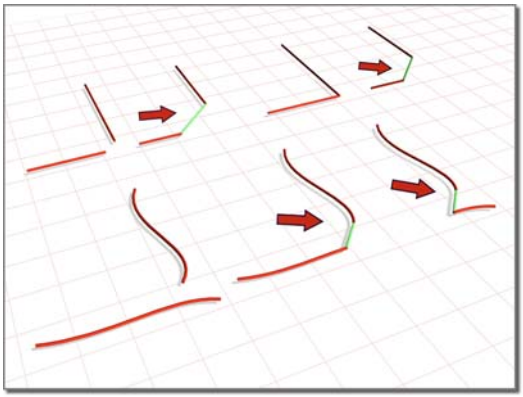
By Layer icon in the Layer Manager dialog

ByLayer is a property setting available to objects listed in the *Layer Manager (page 3–706)*, as well as from the *Object Properties dialog (page 1–111)*. When By Layer is set, the object inherits settings for the selected property from its associated layer.

Center of Mass (COM)

The root object of a biped. Transforming the center of mass moves the entire biped. The center of mass can move outside of the biped body; for example, moving the center of mass forward can help simulate lifting a heavy object. The center of mass uses three animation tracks to animate the biped. Two of these tracks, Body Vertical and Body Horizontal, contain *biped dynamics (page 3–1010)* parameters.

Chamfer



NURBS chamfer curves

A dependent NURBS object that is a line segment connecting two curves. It is controlled by the curves it connects, and by two length parameters that control the distance back from the point of apparent intersection of the "parent" curves.

character studio Marker Files

The **character studio** marker (CSM) file format stores motion-capture data in ASCII (text) format. It uses positional markers rather than limb rotation data. When you import a raw marker file, only marker position data is stored in the motion-capture buffer. **character studio** uses the marker data to extract limb rotation data to position the biped.

Note: For the CSM file specification, see the *CSM.rtf* document on the program disc.

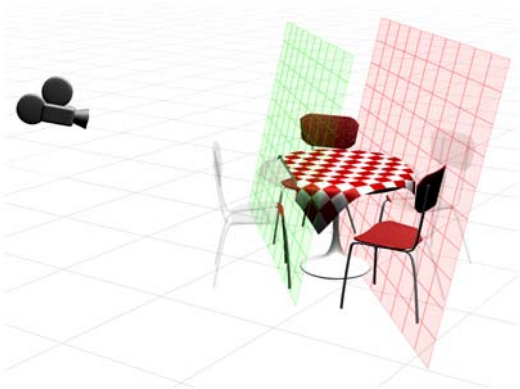
CIBSE Files

The CIBSE file type is the file format for photometric data adopted by the Chartered Institution of Building Services Engineers. It is used primarily in Great Britain.

Clip Controller

In *crowd animation (page 2–1006)*, the GlobalMotionClip and MasterMotionClip controllers are used to create animation for multiple objects. Birds, butterflies, schools of fish, and bugs can be animated using these tools. Clip controllers can be created either as block controllers in Track View, or more directly in the *Crowd helper (page 2–1038)* controls on the *Global Clip Controllers rollout (page 2–1093)*. Use clip controllers to animate non-biped creatures in crowds.

Clipping Planes



Clipping planes let you exclude some of a scene's geometry to view or render only certain portions of the scene. Each camera has a near and a far clipping plane. Objects closer than the near clipping plane or farther than the far clipping plane are invisible to the camera.

Clipping planes are useful for rendering selected portions of a scene that have a lot of complex geometry. They can also help you create cutaway views.

Clipping plane settings are part of the camera's creation parameters. The location of each clipping plane is measured along the camera's line of sight (its local Z axis) in the current units for the scene.

Clipping planes are part of a camera's *general parameters (page 2–1218)*.

Viewports can also have clipping planes. You set a viewport's clipping planes via the *viewport right-click label (page 3–774)*.

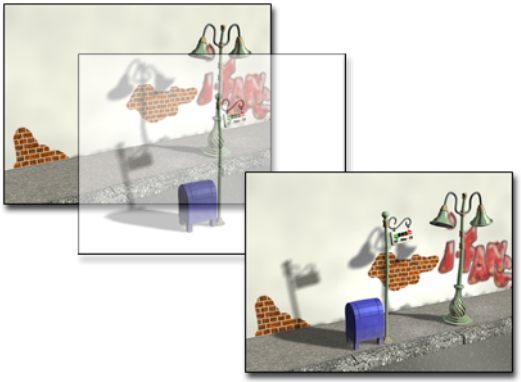
Codec

Short for *compressor/decompressor*. An algorithm for compressing and decompressing digital video data, and the software that implements that algorithm.

Cognitive Controller

In *crowd animation (page 2–1006)*, the *Cognitive Controller editor (page 2–1057)* lets you sequence different behaviors using state diagrams, where conditionals written in MAXScript impose changes in behavior. For example, you can specify that a character or object is to wander aimlessly until it comes within a certain distance of another object, whereupon it heads straight for that object. Or you can specify that one character is to avoid another only when the second character is avoiding the first.

Composite



The mailbox with its shadow is composited with the wall and sidewalk to make the finished scene.

(noun) A still image or a motion picture created by overlaying one image or motion picture with another.

(verb) To combine still images or motion pictures by laying one over the other.

Compositing often makes use of an image's *alpha channel (page 3–1001)*.

Compound Materials

House on right uses a compound material.
(House on left uses the default standard material).

Compound (or complex) materials let you create a material consisting of two or more sub-materials.

The real power in using compound materials is that each sub-material can be as complex as any standard material.

The Multi/Sub-Object compound material lets you assign different materials to different sub-objects, at the sub-object level of your geometry.

You load or create compound materials using the Material/Map Browser.

For more information about the types of compound materials you can create, refer to *Kinds of Compound Materials (page 2–1396)*.

Constrained Point

A NURBS Point that is dependent on either another Point, Curve, or Surface, and whose position is either on the parent object or relative to it. The relative cases are XYZ-relative, along a normal, or along a tangent (or set of tangents for a surface-dependent constrained point).

Contact Object

In *Particle Flow (page 2–105)*, in the context of the *Shape Mark operator (page 2–179)*, a contact object is the object that will receive the marks created by the operator.

Containers

Containers are Track View items with multiple branches that provide a complete definition of something in your scene.

Container items that appear in Track View include:

- Materials definitions with all parameters, maps, and sub-materials.

- Maps containers with all map types and map parameters.
- Single Map containers with a single map type and its associated parameters.
- Object containers directly below a named object item defining the creation parameters of an unmodified object.
- Modified Object containers holding all of the modifiers applied to an object as well as the creation parameters.

Continuity

A property of curves, including NURBS curves. A curve is continuous if it is unbroken.

Continuity Level

Levels of curve continuity:

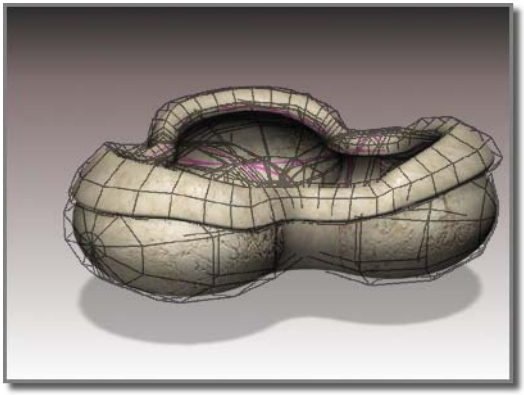
Left: C^0, because of the angle at the top

Middle: C^1, at the top a semicircle joins a semicircle of smaller radius

Right: C^2, the difference is subtle but the right side is not semicircular and blends with the left

The level of continuity is a way to describe curvature. A curve with an angular cusp is C^0 continuous. The curve is continuous but its derivative is not. A curve whose curvature changes has C^1 continuity. The curve and its derivative are both continuous but its second derivative is not. A curve with uninterrupted, unchanging curvature has C^2 continuity. NURBS curves must have at least C^0 continuity; a continuity level greater than C^2 is unnecessary for most 3D computer modeling.

Control Lattice



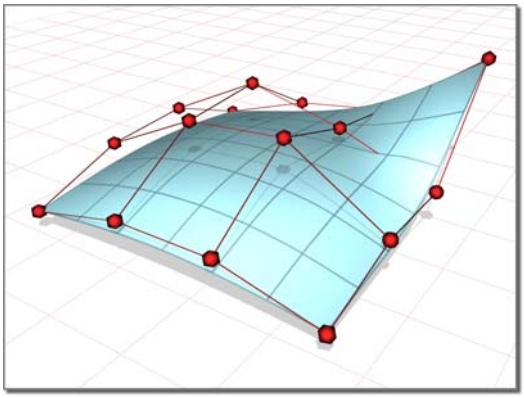
Control lattice surrounding the NURBS model of the fountain basin

In NURBS modeling, the lattice described by the CVs that specify a CV Curve or CV Surface. In viewports, this appears as a dotted yellow framework when you edit the curve or surface at the CV sub-object level. You can also choose to display the control lattice in viewports at all times.

Control Point

In Physique, a vertex used to control the cross sections of envelopes, bulges, and tendons.

Control Vertex (CV)



Control vertices in the lattice surrounding a NURBS surface

In NURBS modeling, a vertex that controls a CV Curve or CV Surface. The 3D location of each CV affects the shape of the curve or surface. CVs aren't constrained to lie on the curve or surface. Each CV has a rational weight that can be used to adjust the influence of the CV on the curve's or surface's shape.

Controller

Software that controls animation. Controllers handle the following functions:

- Storing animation key values
- Storing procedural animation settings
- Interpolating between animation key values

Convex Hull Property

The property of NURBS curves and surfaces whereby the control lattice described by CVs forms a convex hull surrounding the curve or surface.

Cool

It's useful to be able to edit a material in the Material Editor and have it immediately updated in the scene. Sometimes you want to work on a material without affecting the scene. You want to adjust a material until you're sure that it's what you want, and then reassign it. In other words, you want to *cool* a *hot material (page 3–1047)*.

You cool a material by copying it in the Material Editor sample slots. You can copy a material in two ways:

- Use the Copy Material button.
- Drag and drop to copy the material.

When you drag to copy a sample, you end up with two materials with the same name, but one is cool while the other is hot. In the Material Editor, you can have up to 24 materials with the same name, but every material in your scene must have a unique name.

You can now adjust the cool material, and compare it with the hot material. If you like the changes you've made, you can update the scene.

Coordinate Space

In **character studio** biped animation, the three most-used coordinate spaces are world, object, and body space. These are often used to control the biped's hands and feet.

Another coordinate system is used for the footstep gizmos themselves: a foot on a footstep is in that footstep's coordinate space. If the footstep is moved, the foot moves also. (A sliding footstep is a footstep that moves relative to the coordinate system of the corresponding footstep gizmo.)

CPY Files

CPY files contain postures, poses and tracks you have copied and saved on the *Copy/Paste rollout (page 2–818)*. You can load a CPY created with one biped to another biped. See *Copying and Pasting Postures and Poses (page 2–768)* and *Copying and Pasting Tracks (page 2–781)*.

Creation Parameters

An object's creation parameters are settings, typically available on its Parameters rollout, that you make when you first add the object to the scene. You can later adjust these settings by accessing the object at the bottom of its modifier stack. For example, a Box primitive's creation parameters are its size and number of segments in each of the three dimensions. You can usually adjust an object's size without scaling it by changing its creation parameters.

If you *collapse (page 1–948)* an object, its creation parameters are lost, and can no longer be adjusted.

Cross Section

In Physique, *envelopes (page 3–1027)*, *bulges (page 3–1014)*, and *tendons (page 3–1114)* all have cross sections. Envelope cross sections can be moved and scaled to encompass more or less of the character's skeleton. In bulges, shaping the cross sections controls the amount of bulging and the appearance of the bulge. In tendons, cross sections provide connections between links and the mesh skin.

Crowd

The *Crowd helper object (page 2–1038)*, available from Create panel > Helpers, serves as the command center for setting up and solving *crowd simulations (page 2–1006)*. The Crowd helper object also lets you add behaviors to the scene, choose the current behavior from a list, and modify that behavior.

Crowd System

In *crowd animation (page 2–1006)*, a crowd system comprises the *Crowd helper (page 2–1038)*, one or more *Delegate helpers*, a *Vector Field space warp*, and *Motion Flow mode (page 2–894)*. These are used in combination to animate characters or other objects.

CSM Files

The CSM (**character studio** marker) file format stores motion-capture data. It is an ASCII (text) file that uses positional markers rather than limb rotation data. When you import a raw marker file, only marker position data is stored in the motion-capture buffer. 3ds Max uses the marker data to extract limb rotation data to position a biped.

Note: For the CSM file specification, see the *CSM.rtf* document on the program disc.

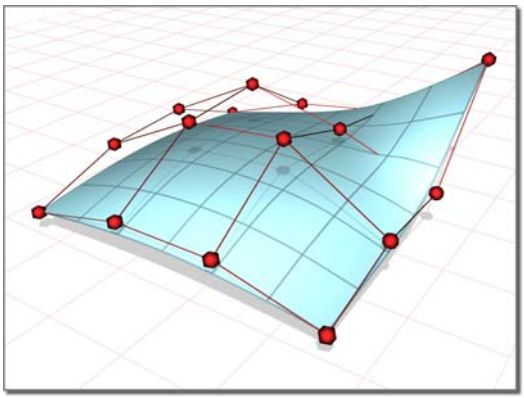
Curve View

Curve View is the area of the Animation Workbench that displays function curves for the parts of the biped. Curve View is quite similar to the Key Window in the Track View – Curve Editor. The same navigation and key manipulation toolbars are used in both Curve View and the Key Window. Both Curve View and the Key Window let you add or delete, move or scale keys selected on the curves.

Curve View differs from the Key Window in that it also displays errors found by the Analyzer panel, functionality which is not available in the standard

Track View. Curve View doesn't use soft-selection like the Key Window, instead it has a specialized Show Layered Edit command for the equivalent of soft selection on biped keys.

CV

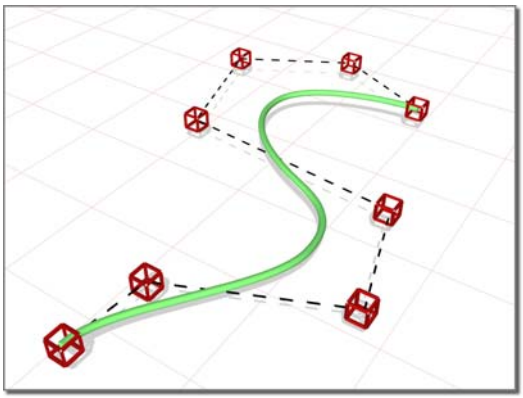


CVs (control vertices) in the lattice surrounding a NURBS surface

Short for *control vertex*.

In NURBS modeling, a vertex that controls a CV Curve or CV Surface. The 3D location of each CV affects the shape of the curve or surface. CVs aren't constrained to lie on the curve or surface. Each CV has a rational weight that can be used to adjust the influence of the CV on the curve's or surface's shape.

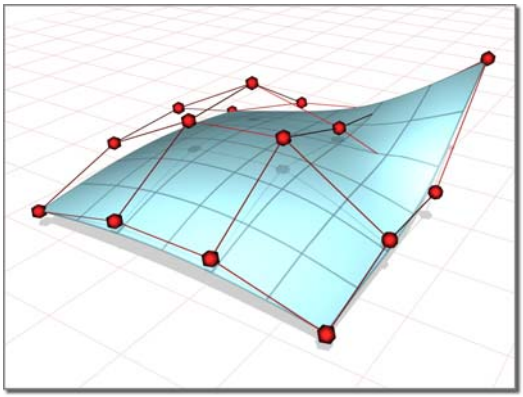
CV Curve



NURBS CV curve

A NURBS curve defined by CVs. The CVs don't necessarily lie on the curve. Instead, they form a control lattice that affects the curvature of the curve.

CV Surface



NURBS CV surface

A NURBS surface defined by CVs. The CVs don't necessarily lie on the surface. Instead, they form a control lattice that affects the curvature of the surface.

Deformable Envelope

In *Physique (page 2–927)*, *envelopes (page 3–1027)* follow the Physique *deformation spline (page 3–1021)* that runs through the joints in the skeleton's hierarchy. A deformable (as opposed to rigid) envelope is one that moves the mesh vertices it encloses as the skeleton moves.

A link can have both a deformable and a rigid envelope. When it has both, the effect of the two is averaged, creating a less flexible skin.

In character animation, you typically use deformable envelopes; however, some portions of the body, such as the head, might look best if they are rigid.

Note: Because of game-engine restrictions, if you are developing for certain engines, you might want to use rigid envelopes exclusively.

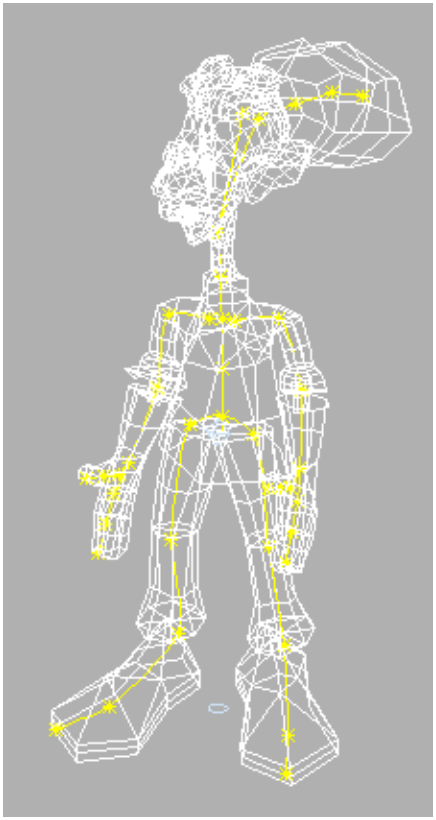
Tip: If your model consists of articulated rigid segments, such as a marionette, you might not need to use Physique at all. Simply link each part to the corresponding biped object.

Deformation

The effect caused by *Physique (page 2–927)* on a mesh. Envelopes, bulges, link parameters, and tendons all affect how a mesh deforms.

Deformation Spline

The deformation spline is created when you initialize *Physique (page 2–927)*. It is a continuous curve through several points. The deformation spline is a smooth curve that runs from joint to joint.



The deformation spline displays as a yellow curve that runs through the mesh.

The Bend, Bias, and Tension spinners can change the shape of the deformation spline.

The deformation spline also takes into consideration twisting and scaling of the skeleton's links. At the *Link sub-object level (page 2–986)*, you take control of the behavior of the deformation spline, and subsequently gain full control of the skin's behavior relative to the skeleton's movement.

Degree

The degree of a curve is the highest exponent in the equation used to represent it. A linear equation is degree 1, a quadratic equation degree 2. NURBS

curves typically are represented by cubic equations and have a degree of 3.

Delegates

In *crowd animation (page 2–1006)*, the Delegate helper serves as an agent for the motion created by a *Crowd object (page 2–1038)* and its behaviors. The Crowd object controls a delegate or delegates, whose motion can then be imparted to a biped or other object.

In viewports, the delegate object takes the shape of a pyramid. By default, the point of the pyramid indicates the delegate's forward direction. Delegates cannot be rendered.

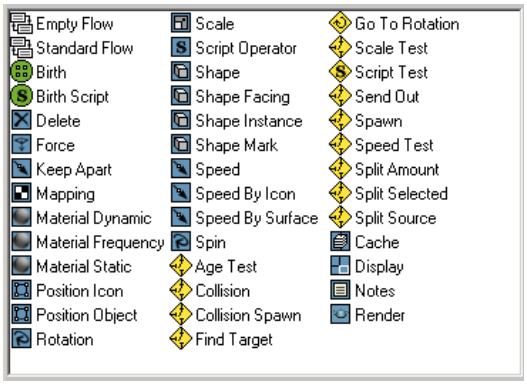
Dependent

Describes a NURBS sub-object whose definition depends on other NURBS sub-objects. For example, a Blend Curve depends on the two curves that you select when you create it.

Depot

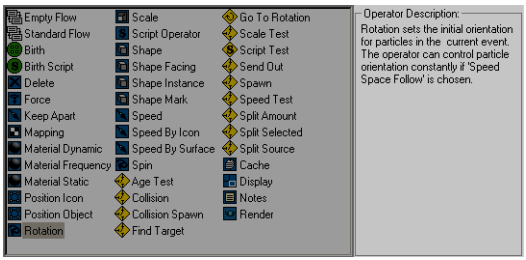
The depot is the section of the *Particle View dialog (page 2–121)* that holds the Particle Flow *actions (page 2–137)*. In effect, it serves as a library of Particle Flow functionality. Display of the depot can be toggled with the Particle View menu command Display > Depot.

To add an action to the particle system, drag it from the depot to the *event display (page 2–127)*. To view a description of an action in the *description panel (page 3–1022)*, click its entry in the depot.



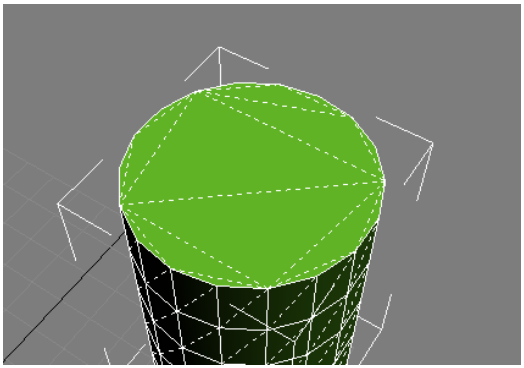
Description Panel

The description panel, found to the right of the *depot (page 3–1022)* in *Particle View (page 2–121)*, displays a text description of any action whose name you click in the depot. Display of the depot can be toggled with the Particle View menu command Display > Description.



Diagonal

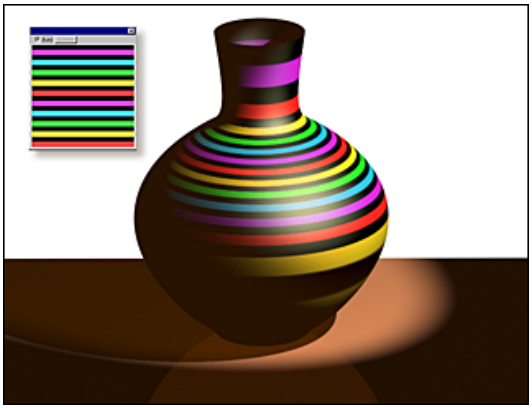
A diagonal is a line that connects polygon vertices in editable poly and Edit Poly objects. Its function is primarily to resolve the polygon into triangles at render time, especially if the polygon becomes non-planar via transformation of its vertices. Such transformation and certain other operations can, incidentally, cause automatic rearrangement of a polygon's diagonals.



Diagonals on the default Cylinder primitive

Diagonals are normally invisible, but in 3ds Max they appear as dashed lines when you use the Turn or Edit Triangulation tool. Unlike edges, diagonals cannot be transformed, or acted upon with tools like Chamfer. This is different from the hidden edges in editable mesh/Edit Mesh objects, which are actual edges and can be made visible, transformed, and manipulated with any editing tool.

Diffuse Color



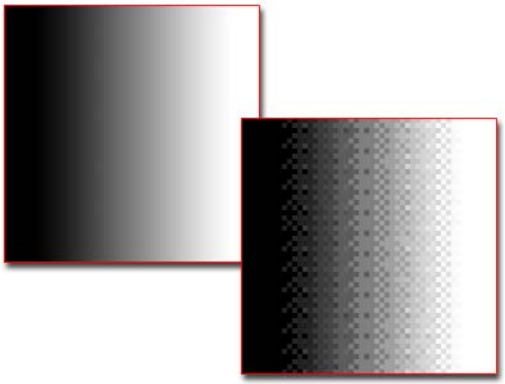
Vase has a mapped diffuse color.

The diffuse color is the color that an object reflects when illuminated by "good lighting," that is, by direct daylight or artificial light that makes the object easy to see.

When we describe an object's color in conversation, we usually mean its diffuse color.

The choice of an ambient color depends on the kind of lighting: for moderate indoor lighting it can be a darker shade of the diffuse color, but for bright indoor lighting and for daylight, it should be the complement of the primary (key) light source. The specular color should be either the same color as the key light source, or a high-value low-saturation version of the diffuse color.

Dithering



Square on the right shows dithering.

When converting an image with a palette of a greater number of colors to an image with a palette of fewer colors, dithering is a means of simulating colors not in the more limited palette, by mixing different-colored pixels together.

Dithering is also a method of smoothing the edges between two color regions by mixing their pixels so the edges appear to blend together.

If you are rendering for the limited colors of an 8-bit display (256 colors), you have the option of turning on dithering. Dithering can help prevent a banding effect in color gradients. Dithering does increase the size of 8-bit files and can slow the playback speed of animations. You might want to

try applying maps to the flat areas in the scene to see if that eliminates banding before you turn on dithering.

By default, 3ds Max renders 64-bit color output. Consequently, you also have the option of setting dithering for *truecolor (24 or 32-bit color) (page 3–1121)*. The Dither True Color option ensures that you get the best quality on truecolor displays.

You turn dithering on and off in the *Rendering panel (page 3–863)* of the Preferences dialog. You can also set dithering for scene motion blur in Video Post. Here, dithering provides a smoothing effect between the separate images making up the "blur." Video Post dither is set as a percentage of total dither.

Dock and Float

These terms describe manipulations to user-interface elements, such as toolbars.

You *dock* a toolbar, for example, when you align it with the edge of another interface element, typically a window or panel.

You *float* a toolbar when you detach it from a stationary position, and reposition it elsewhere on the desktop.

Double Support Period

In *footstep animation (page 3–1037)*, a period where both of the biped's feet are on the ground.

Dummy Object

A dummy object is a non-rendering object that you use as an animation helper. The primary use of the dummy helper object is to assist you in creating complex motions and building complex hierarchies. Because dummies are invisible in the rendered scene, they are an excellent choice for offset joints, connectors between objects, and handles for manipulating complex hierarchies.

Breaking complex motions into simple components often makes it easier to go back and edit your animations. For example, consider animating a bouncing ball moving around your scene. You could animate the ball by properly positioning it throughout the scene on many frames. The drawback is that it would be very difficult for you to go back and adjust the height of the bounce or the path the ball takes through the scene. You would have to edit the motion of the ball on many frames to make even a simple change.

Using a dummy object easily solves this problem by breaking the motion into two simple components. One component is the bounce of the ball. The other is the path through the scene.

DWG Files

The DWG file is the primary, native file format of drawing files created by AutoCAD, Autodesk Architectural Desktop, and Autodesk Mechanical Desktop®. It is a binary format used for importing and *exporting (page 3–545)* AutoCAD drawing files.

You can also use the *File Link Manager (page 3–431)* to create a live link between a drawing file that can be open in AutoCAD and 3ds Max. Changes that are made to the drawing can automatically be updated in 3ds Max without having to reload scenes or re-import drawings.

DXF Files

DXF files are used to import and export objects to and from AutoCAD (and other programs that support this file format).

Keep the following in mind when you are creating your DXF geometry, and when you are deciding whether to convert by layer, color, or entity:

- With AutoCAD Release 12, if you are using the AutoCAD Advanced Modeling Extension (AME), use the SOLMESH command on your AME models prior to saving the *.dxf* file.
- After importing a DXF file, you might want to divide the resulting 3ds Max file into smaller objects.

Entities that are frozen or turned off are ignored.

The successful unification of face normals depends on the welding of coincident vertices. Sometimes, depending upon the precision of the model as it was created in AutoCAD, the vertices may not be close enough to be considered "coincident." They will not be welded, and the faces will not be properly unified. In this case, increase the Weld Threshold value in the Import DXF File dialog.

Converting by layer can result in objects consisting of many *elements (page 3–1027)*. In certain cases, some of these elements may have all of their face normals flipped the wrong way. You can detect this in the software by turning off Backface Cull in the Display panel, or by rendering the objects. Use the *Normal modifier (page 1–738)* to correct this.

If you do not want to flip normals, you can either use 2-sided materials, or turn on the Force 2-Sided option in the Render Scene dialog.

If you are loading a large scene containing thousands of entities (such as 3D faces) and have chosen to load an object by entity, the conversion can take a long time. It also produces a huge number of objects to handle in the software. To avoid this, organize your DXF file so that these kinds of entities are grouped by layer, then make the conversion by layer rather than by entity.

Dynaflector

A *space warp (page 3–1108)* that lets particles affect objects in a dynamics situation.

Three kinds of space warps are in the dynaflector category:

PDynaFlect Space Warp (page 2–77)

SDynaFlect Space Warp (page 2–81)

UDynaFlect Space Warp (page 2–82)

See also

Omniflector (page 3–1078)

Dynamics

Biped Dynamics (page 3–1010) calculate a biped's airborne trajectory, the bending of its knee or knees on landing, and the biped position so it maintains balance when the spine is rotated. When parameters change, dynamics cause the biped to adapt.

Dynamics Blend

A parameter in the Body section of the *Key Info rollout (page 2–809)*, used with *freeform animation (page 3–1039)*. Blends between biped and spline dynamics. Select the Body Vertical track (the vertical track of the biped's center of mass), and use Dynamics Blend to control the amount of gravity in an airborne period, such as in a running or jumping gait. Dynamics Blend has no effect on a walking motion where footsteps overlap.

Ease Curve

Ease curves vary the timing of a function curve. An unaltered function curve charts the value of

an animated parameter over time. An ease curve charts changes to the timing of the function curve. Changing ease curve values shifts the time of the original track left or right.

The horizontal scale of an ease curve represents normal time, just as it does for all function curves. The vertical scale of an ease curve represents the time scale of the function curve the ease curve is applied to. Changing the shape of an ease curve changes the way time is interpreted by the affected function curve.

The value of the ease curve at a particular frame is a frame value from the original track. For example, if the ease curve is 0 at frame 0 and 10 at frame 10, the original track plays at its original speed. If the ease curve value at frame 10 increases to 20, the original track plays to frame 20 by frame 10: it has been sped up by a factor of two.

An Ease Curve Example

Imagine you have animated a bird flying around the sky. After viewing the animation you decide that you want to change the position of the bird so it moves quickly at the beginning of the animation and then slows to a leisurely pace toward the end.

You could accomplish this change by editing position keys, ranges, and function curves but it would require more work than using an Ease curve. Applying an Ease curve to the Position track provides a quick and easy solution.

Dragging the Ease curve causes time to compress near the beginning of the animation and stretch out near the end. You can tell that the bird's motion starts out fast and then slows down by looking at the effect the Ease curve has on the Position function curves.

See also

Multiplier Curve (page 3–1072)

Editable Mesh

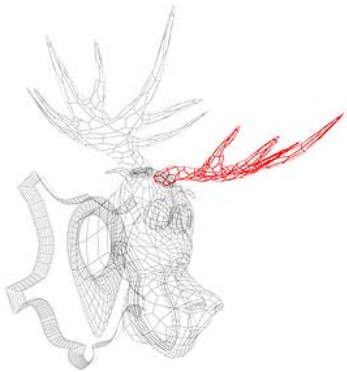
An *editable mesh (page 1–984)* is a type of deformable object. An editable mesh is a trimesh: that is, it uses triangular polygons. Editable meshes are useful for creating simple, low-polygonal objects or control meshes for MeshSmooth and HSDS modelling. You can convert a NURBS or patch surface to an editable mesh. Editable meshes require little memory, and are a natural method of modeling with polygonal objects.

An actively linked object cannot be collapsed to an editable mesh. Using the *File Link Manager (page 3–431)*, you have to Bind the object first.

Editable Poly

An *editable poly (page 1–1012)* is a type of deformable object. An editable poly is a polygonal mesh; that is, unlike an editable mesh, it uses more than three-sided polygons. Editable polys are useful in that they avoid invisible edges. For example, if you use a cut-and-slice operation with editable polys, the program doesn't insert extra vertices along any invisible edge. You can convert NURBS surfaces, editable meshes, splines, primitives, and patch surfaces to editable polys.

Element



The antler is one element of the moose head.

An element is one of two or more individual mesh objects (that is, groups of contiguous faces) grouped together into one larger object. For example, if you attach one box to another, you create one mesh object from the two boxes. Each box is now an *element* of the object. Any function you perform on that object affects all its elements. However, you can manipulate the elements independently at the Element sub-object level.

Emitter

An emitter is an object that emits particles; particles are born, or first enter the scene, at the emitter's location. By default, Particle Flow uses the *source icon (page 2–131)* as an emitter, but alternatively any other object in the scene can emit particles using the *Position Object operator (page 2–144)*.

End Effector

In *history-dependent inverse kinematics (HD IK) (page 2–442)*, the end effector is the pivot point of the selected child object at the end of a kinematic chain.

The kinematic chain is a single branch of a hierarchy used for animation with *inverse kinematics (IK) (page 3–1052)*. The chain starts with the selected child object and travels up through ancestors until it reaches the start of the chain. When you move the end effector, the HD IK solver then uses IK calculations to move and rotate all other objects in the kinematic chain to react to the object you moved.

The end effector has two transforms: one that connects it to its parent, and another that connects it to the End Effector Parent. By default, the End Effector Parent is none (equivalent to World); you can assign this in the Motion panel.

Note: You can move the end effector away from the child object, which causes the IK chain to straighten out. When you move the end effector back toward the child object, joints in the IK chain will bend again.

See also

IK Goal (page 3–1048)

Envelopes

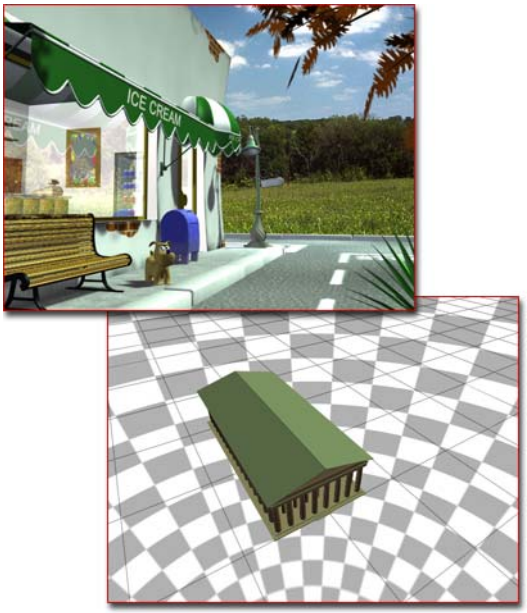
In *Physique (page 2–927)*, the envelope is the primary tool for controlling skin deformation. An envelope defines an area of influence about a single link in the hierarchy. If the envelope is *deformable (page 3–1021)*, mesh vertices within that envelope follow the movement of the Physique *deformation spline (page 3–1021)*. An envelope has a pair of inner and outer bounds; the envelope's influence is strongest at the inner bound, and falls off toward the outer bound. By default, each envelope has four cross sections. You can reshape the cross sections, or add new ones, to change the envelope's geometry.

In the *Skin modifier (page 1–781)*, the envelope plays a similar role with respect to bones. Each bone has its own envelope with two or more

cross-sections that allow you to shape the envelope to fit the surrounding mesh.

Typically, the envelopes of adjacent links or bones overlap each other. Vertices that fall in the overlap area are weighted to produce smooth blending at joint intersections.

Environment Map



Above: Image uses a picture in screen coordinates as a background.

Below: Image shows spherical mapping coordinates applied using a checker map.

Texture coordinates lock a map to geometry. Environment coordinates, on the other hand, lock a map to the world. If you move the object, the map remains in place. If you move the view (or camera), the map changes. This type of mapping system is used with reflection, refraction, and environment maps.

There are four types of environment coordinates:

- Spherical
- Cylindrical
- Shrink-Wrap
- Screen

The first three are the same as those used by the *UVW Map modifier (page 1–905)*. If you imagine a sphere, infinite in size, surrounding your scene and mapped with spherical mapping coordinates, you can visualize the effect you get with spherical environment mapping. Shrink-wrap wraps the map around a giant sphere, leaving only one singularity. Cylindrical is like a giant cylinder.

The Screen system maps the image directly to the view, with no distortion. It's similar to planar, in that it's like a giant backdrop hung in the scene. Unlike the other environment mapping methods, Screen is locked to the view. When you move the camera, the map moves with it. Therefore, you can only use it for still renderings, or animations in which the camera doesn't move.

To use a bitmap with any environmental mapping system other than Screen, you need a high-resolution map because of the size of the virtual sphere, or cylinder.

An environment map is not assigned in the Material Editor, because it's not applied to the geometry of an object, but rather to the scene itself. Environment maps appear in the background, as seen from the camera or perspective view.

When you assign a map to the environment, it's the same as if you'd assigned a mapped material to an object in your scene. To edit or adjust the assigned map, you need to place it in one of the sample slots in the Material Editor. You can do that in one of two ways:

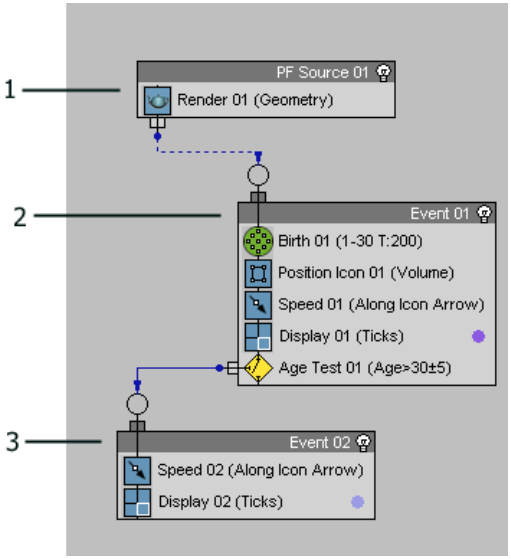
- Click the Get Material button in the Material Editor, and then get the map from the scene.
- Put the map from the Environment dialog to one of the sample slots in the Material Editor. You can do this by dragging and dropping from

the Environment dialog map button to the sample slot.

Note: To control whether or not the renderer uses the environment map's alpha channel in creating the alpha for the rendered image, choose Customize > Preferences > Rendering, and then turn on Use Environment Alpha in the Background Antialiasing group. If Use Environment Alpha is turned off (the default) the background receives an alpha of 0 (completely transparent). If Use Environment Alpha is turned on, the alpha of the resulting image is a combination of the scene and background image's alpha. Also, when writing TGA files with Pre-Multiplied Alpha set to off, turning on Use Environment Alpha prevents incorrect results. Note that only background images with alpha channels or black backgrounds are supported when compositing in other programs such as Photoshop.

Event

The event is the basic unit of organization in a Particle Flow *particle diagram (page 3–1083)*. There are two types of events: *global (page 3–1043)* and *local (page 3–1057)*. A *birth event (page 3–1010)* is a specialized type of local event.

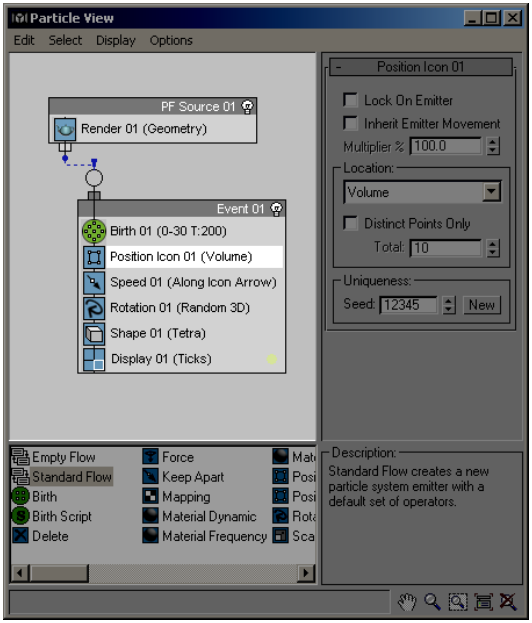


1. Global event
2. Birth event
3. Local event

Each event contains one or more *actions (page 3–997)*, which can affect particle behavior or appearance. You can use *tests (page 3–1115)* to send particles to other events if the particles meet certain qualifications. A single chain of linked events as shown in *Particle View (page 2–121)* is known as a *flow (page 3–1036)*.

Event Display

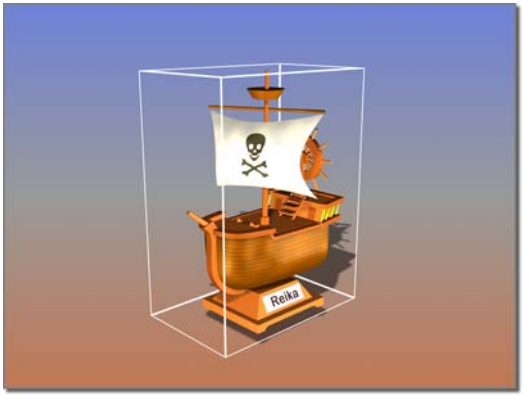
The event display, the main window in the *Particle View (page 2–121)* dialog, contains the *particle diagram (page 3–1083)*. This is where you build and edit the particle system.



Event Level

In Particle Flow, you can select particles at the Event level or at the *Particle level (page 3–1084)*, using controls on the Modify panel > *Selection rollout (page 2–134)*. An Event-level selection can be passed to the Particle level for processing by the particle system by means of the Selection rollout > Get From Event Level command.

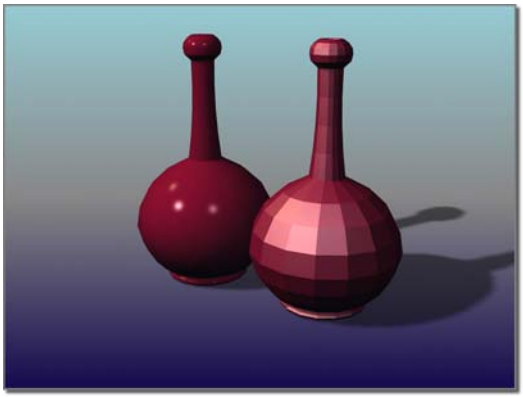
Extents



Bounding box shows the extents of the model boat.

An object's extents are its maximum dimensions in X, Y, and Z. These are the dimensions of the rectangular *bounding box (page 3–1013)* that surrounds the object.

Faceted



Vase on the right uses a faceted material.

Faceted shading provides a constant shading across each facet, or co-planar surface of the object. The result has the appearance of so-called "flat" shading, except that it provides specular highlights.

Turn on Faceted to provide a faceted look to your geometry without having to explicitly change the smoothing groups in the object with the Edit Mesh modifier.

Both *Standard (page 2–1309)* and *Raytrace (page 2–1353)* materials provide a Faceted toggle.

Note: This feature was known as "constant shading" in versions of 3ds Max prior to v5.

FFD

FFD stands for *free-form deformation*. It is used in computer animation for effects like dancing cars and gas tanks. You can use it as well for modeling rounded shapes such as chairs and sculpture.

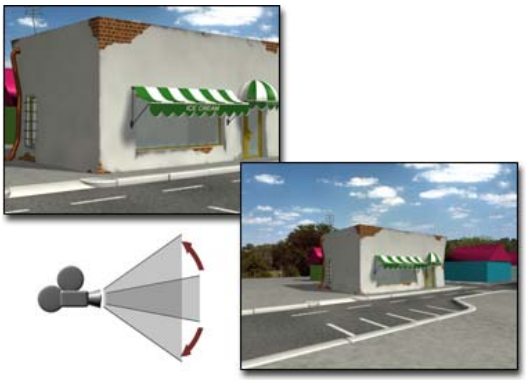
An *FFD modifier (page 1–674)* surrounds the selected geometry with a lattice box or cylinder. By adjusting the control points of the lattice, you deform the enclosed geometry.

Note: You can use *Physique (page 2–927)* to control an FFD space warp. Physique actually deforms the space warp's control points, which in turn deform the model.

FGM File

An FGM file (*.fgm*) is a final gather map file. It is used by the *mental ray renderer (page 3–77)* to save the results of a final gathering pass. Generating and saving an FGM file can speed up subsequent renderings.

Field of View



Above: Narrow field of view

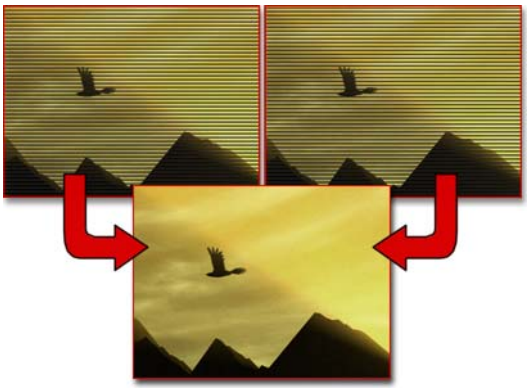
Below: Wide field of view

Field of View defines the width of your view as an angle with its apex at your viewpoint and the ends at the sides of the view. The effect of changing FOV is similar to changing the lens on a camera. As the FOV gets larger you see more of your scene and the perspective becomes distorted, similar to using a wide-angle lens. As the FOV gets smaller you see less of your scene and the perspective flattens, similar to using a telephoto lens.

A Perspective view uses an imaginary camera with only one setting, FOV. The FOV angle for the active Perspective view is displayed in the Rendering Methods panel of the Viewport Configuration dialog. You can type a value in the FOV field of the dialog to precisely set FOV for the active Perspective view.

Use Field of View (FOV) to change the amount of the scene visible and the amount of perspective flare applied to a Perspective or Camera view. The Field of View button appears in the viewport navigation control panel when a Perspective or Camera view is active.

Fields



Two fields combine to make a single frame.

Your animations might ultimately be viewed on television monitors. Standard video signals display animation by breaking it down within time segments (frames). The image for each frame is split into horizontal lines (scan lines). A special method for conveying frame information on a video signal has been developed. This method is called field interlacing. Television monitors display a video signal by separately scanning two portions of each frame called fields. One field contains the odd scan lines of a frame, the other field contains the even scan lines. Television monitors scan and display the fields of each frame separately. The fields are alternately cycled through every other horizontal line on the screen so that they "layer" together to form a single interlaced image.

Render to Fields

On the Render Scene dialog, in the *Common Parameters rollout (page 3–27)* > Options group, the Render To Fields check box sets whether the renderer renders full frames at the specified frame rate, or renders fields at twice that rate. When Render To Fields is on, the renderer renders an extra sub-frame image between every two frames, and composites each frame and the following sub-frame into a single image with two fields. The result is a 60 fields-per-second animation suitable for play on an *NTSC (page 3–1074)* television monitor.

Field Order

When you render to fields, you also specify a field order to identify which field comes first. The Field Order configuration setting is found in Preferences, on the Rendering page. A frame's scan lines are numbered and each field contains either the odd or even scan lines. The video source (for example, broadcast transmitter, video tape recorder, or digital video recorder) determines which group of scan lines is in each field and which group is delivered to the display first. The fields are referred to as Field 1 (F1) and Field 2 (F2); either could contain the odd numbered (1st, 3rd, 5th, and so on) scan lines or the even numbered (2nd, 4th, 6th, and so on) scan lines in the frame.

Using the default setting of Odd as your Field Order preference, the software renders the first field image (F1) to the odd scan lines. If the field order preference is set to Even, then the first field image is rendered to the even scan lines. For an image to display properly, the field order and the video device field order must match.

Some video systems require odd lines to be rendered first, and others require the even lines to be recorded first. The Field Order parameter is set to Odd by default. If you observe incorrect strobing in your video output, change the parameter to Even.

Figure Mode

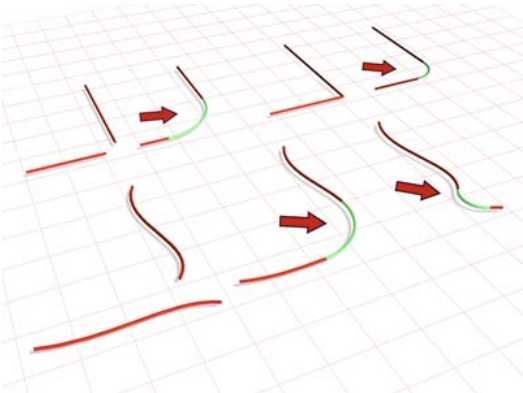
When you work with a *biped (page 2–701)*, you use *Figure mode (page 2–835)* to fit the biped to the *mesh or mesh objects (page 3–1066)* that represent your character. You should have Figure mode turned on when you attach the mesh to the biped with *Physique (page 2–927)*. Figure

mode is also used to scale a biped that has a mesh attached to it, to make biped "fit" adjustments after Physique is applied, and to correct posture for motion files that need a global posture change.

When Figure mode is turned on, the biped jumps from its animated position to its Figure mode pose. Animation is preserved when you exit Figure mode.

The parameters on the *Structure rollout (page 2–837)* are active only in Figure mode, and at creation time.

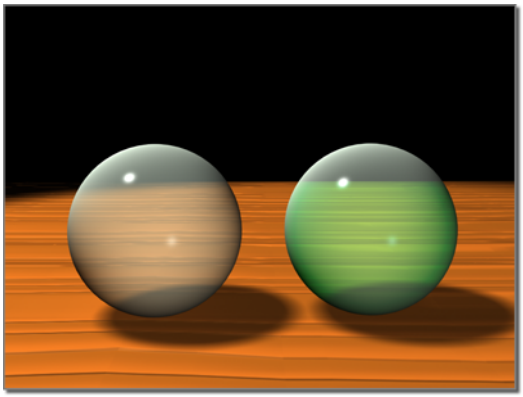
Fillet



NURBS fillet curves

A dependent NURBS object that is an arc connecting two curves. It is controlled by the objects it connects, and by a radius parameter.

Filter Color / Filter Opacity



Sphere on the right has a light green opacity filter color.

Filter opacity tints the colors behind the material using a specified transmission color.

Filter opacity is the default system, because it provides a more realistic transparency effect. When the Filter option is set in the Extended Parameters rollout, the color used by the Filter Color swatch tints the transparency of the material.

In life, a transparent material, such as colored glass, affects the colors behind it not by the diffuse or ambient colors (which are reflected colors), but by the transmission color.

The transmission color is that property of a substance that filters certain colors, and allows others to pass. For example, a sheet of red cellophane is a filter that blocks all light not in the red wavelength of the spectrum. By using filter opacity, you can specify a transmission color and achieve strong, saturated colors, no matter how transparent the material.

Filtering (Antialiasing)

Filtering is a technique of antialiasing the bitmaps in mapped materials by averaging pixels. The Pyramidal and Summed Area options provide

two methods of pixel averaging. Only one can be active at a time.

Both methods require approximately the same rendering time. Summed-area filtering generally yields superior results but requires much more memory. Pyramidal filtering requires the program to allocate memory equal to approximately 133% of the size of the bitmap. By comparison, summed-area filtering requires the program to allocate approximately 400% of the size of the bitmap.

Use summed-area filtering only for smaller bitmaps, and avoid using any more such bitmaps in a scene than necessary.

Pyramidal filtering is quite adequate for most purposes. However, because it applies filtering as a function of distance, irregular antialiasing might occur on detailed texture maps that are applied to a plane receding into the distance. The effect of pyramidal filtering on extreme perspectives such as this is even more noticeable in animations, where portions of the texture map appear to "swim." If this occurs, turn on summed-area filtering for the material.

Note: To control whether or not a background image is affected by the renderer's antialiasing filter, choose Customize > Preferences > *Rendering (page 3–863)* and then turn on Filter Background in the Background Antialiasing group.

Filtering (Character Animation)

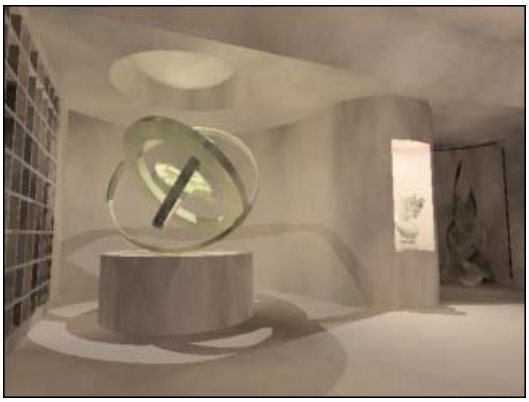
Filtering is the action of using selected data, rather than all data.

In the *Motion Mixer (page 2–581)*, you use the *trackgroup (page 3–1118)* filter to select the biped parts that will be affected by motion clips and transitions on tracks within the trackgroup. See *Filtering Mixer Tracks (page 2–589)*.

Filtering is also a *motion-capture technique (page 2–910)*. Motion-capture and marker data typically have keys at every frame. Filtering motion-capture data reduces the number of keys, making the job of altering or personalizing the motion data simpler. Other filtering options include footstep extraction, applying the skeletal structure stored in the motion-capture file to the biped, looping the data, importing a portion of the motion capture file, and selecting tracks to load. See *Filtering Motion-Capture and Marker Data (page 2–912)*.

Final Gathering (mental ray Renderer)

Final gathering is an optional, additional step to calculating *global illumination (page 3–92)*. Using a photon map to calculate global illumination can cause rendering artifacts such as dark corners and low-frequency variations in the lighting. You can reduce or eliminate these artifacts by turning on final gathering, which increases the number of rays used to calculate global illumination.



Scene rendered with global illumination but no final gather

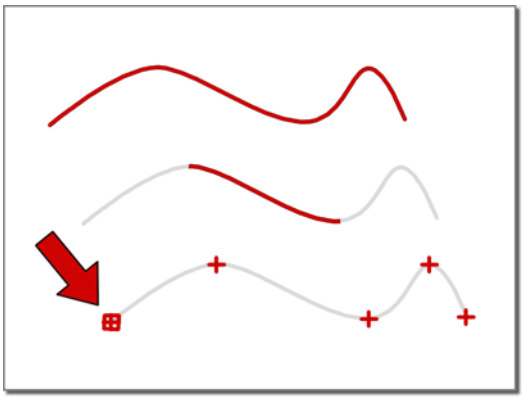
Same scene with final gather used to smooth the global illumination

Same scene with final gather but no global illumination, for comparison

Final gathering can greatly increase rendering time. It is most useful for scenes with overall diffuse lighting, less useful for scenes with bright spots of indirect illumination such as focused caustics.

You turn on final gathering on the Render Scene dialog > Indirect Illumination panel > *Final Gather rollout (page 3–109).*

First Vertex



First vertex of a spline

When you create a spline object, the software numbers the vertices from 1 to the total number of vertices in the spline, according to the order of creation. When the spline is displayed in viewports, the first vertex has a box around it.

The first vertex is commonly used as an alignment marker when you place two or more shapes on different path levels when lofting. If you place different shapes on different path levels and you don't align their first vertices, the resulting mesh object is twisted.

To avoid twisting, you can align the first vertices by rotating the splines as necessary. Alternatively, you can change the position of a spline's first vertex by using the Make First button in the Edit Spline modifier (at the Vertex sub-object level).

Flat Mirror

Flat mirror map reflects the ice-cream shop's interior.

If you want to create a flat, mirrored surface in a scene, such as a highly polished floor, you must use a flat mirror reflection map.

Flat mirror reflection maps must be assigned to your geometry in a specific way, and work only on flat surfaces.

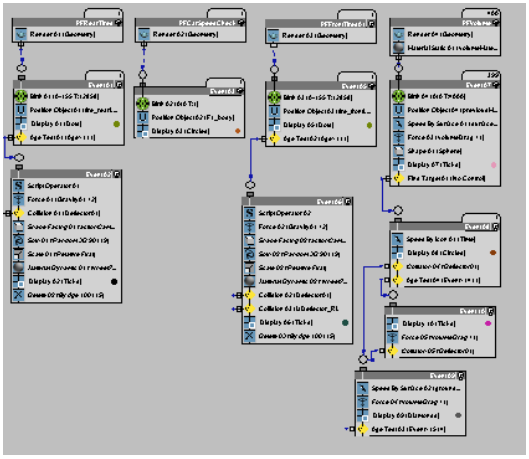
When you use flat-mirror reflection maps, keep the following in mind:

The flat-mirror material must be assigned to connected, coplanar faces on a flat surface of the object. If your flat-mirror reflection doesn't work, it's probably because non-coplanar faces have been assigned the flat-mirror material. This can happen during the selection process, if one or more non-coplanar faces are included in the selection set. It can also happen if you've already assigned the same material elsewhere on the object (coplanar faces are two or more adjacent faces that are on the same two-dimensional plane, such as the surface of a floor).

If you want to reflect in multiple planes of the same object, detach each plane into a separate object before you assign the material.

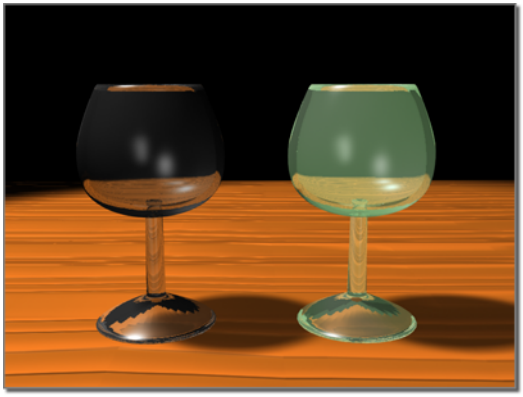
Flow

A *particle system (page 3–1084)* can contain any number of separate particle flows. Each flow consists of an isolated chain or sequence of *events (page 3–1029)*, as depicted in *Particle View (page 2–121)*. A flow typically contains a *global event (page 3–1043)* and a *birth event (page 3–1010)*, and any number of additional *local events (page 3–1057)*.



A particle system containing four separate flows

Fluorescence



Glass on the right has a light green fluorescence.

Fluorescence is light emitted from an object when it absorbs radiation (for example, ultraviolet light) from another source.

Raytrace materials have the ability to simulate fluorescence.

Flyout

Example: Align flyout (main toolbar)

A flyout is an icon-based menu available from any button that has a small black triangle in the lower-right corner. To access the flyout, click the button and hold or drag a short distance. Then, to activate a flyout menu item, drag to the item and release. As you drag, you can see each item's name on the prompt line of the *status bar (page 3–746)*.

Follow Object

You can bind an object in your hierarchy to any other object (often an object not in the same hierarchy). This other object is called the follow object.

The bound object tries to match the position and orientation of its pivot point to the position and orientation of the follow object's pivot point.

For example, you might want to animate a figure that always points to another object. Bind the hand of the figure to the other object. Turn IK on and as you move the object the hand and arm of the figure move to point at it.

Foot States

The biped feet can be in one of four states: plant, lift, move, and touch:

- **Plant**—The biped foot state in full contact with the footstep.
- **Lift**—The biped foot state just before leaving a footstep.
- **Move**—The biped foot state between footsteps; an airborne period.
- **Touch**—The biped foot state at which a biped foot first contacts a footstep.

Footstep Animation

Biped's patented footstep-driven keyframe animation feature allows animators to use footsteps to create broad, global brush strokes for character movement. Once footsteps are in place, keyframes are generated automatically to produce an initial sketch of the 3D character's motion. Throughout edits and revisions, the original nuances of the character are preserved; Biped remembers everything about how a character moves, and it makes all of the appropriate adjustments if the footsteps are changed.

Footsteps Method

Footsteps provide a way to animate a *biped (page 2–701)*. In viewports, footsteps represent support periods in space for the biped's feet. Moving or rotating footsteps in space is done in the

viewports. The footstep position and orientation in the viewport controls where the biped will step.

In Track View — Dope Sheet, each footstep appears as a block that represents a support period in time for each of the biped's feet. Moving footsteps in time is done in Track View — Dope Sheet.

Tip: To see the footsteps, you must turn on Edit Keys in the Dope Sheet.

There are three ways to create footsteps for the biped. The first way is to place footsteps individually, one at a time. The second way is to invoke Biped's multiple footstep creation tools to create a walk, run, or jump animation. The third way is to extract footsteps from raw motion-capture data.

A big advantage of the footstep method is the natural adaptation of the biped that occurs when the footsteps are edited in time and space. Also, you can reposition all of the footsteps to move the entire animation.

Forward Kinematics

The default method of manipulating a hierarchy uses a technique called "forward kinematics". The basic principles employed by this technique are:

- Hierarchical linking from parent to child
- Placement of pivot points to define the connecting joint between linked objects
- Inheritance of position, rotation, and scale transforms from parent to child

In forward kinematics, when a parent object moves, its children must follow. If the child wants to go off on its own, the parent remains behind. For example, in a hierarchical linkage of a human figure, when the torso (the parent) bends over, the head (the child) moves along with it, but you can turn the head without affecting the torso.

Forward Kinematics (Bipeds)

Using an arm to move a hand is an example of forward kinematics. Using the hand to move the arm is an example of *inverse kinematics (page 3–1052)*. When you use *freeform animation (page 3–1039)* to animate a *biped (page 2–701)*, you can use both kinds of kinematics.

By planting a hand or foot, you use another object (object space) or the world (world space) to control IK motion. In this method, the IK Blend parameter in the *Key Info rollout (page 2–809)* determines how forward kinematics and inverse kinematics are blended to interpolate intermediate positions.

Frame Rate

The frame rate of an animation is generally expressed in frames per second (fps). This is the number of frames displayed for every second of real time.

Different recording devices output different frame rates, but the standard rates are as follows:

NTSC video—30 frames per second

PAL video—25 frames per second

Film—24 frames per second

You can change the frame rate for your output at any time, outputting the correct number of frames to maintain the correct playback speed for your animation.

For example, if you create a 90-frame animation for video, using an NTSC frame rate of 30 frames per second, the result will be three seconds of animation.

If you later discover you need to output to PAL video (at 25 frames per second), you can switch to the PAL frame rate. The 90 frames are automatically converted to 75, producing the same total animation time with a different number of frames. You can later switch back to NTSC frame rate to restore the original 90 frames of animation.

You can switch back and forth between frame rates at any time without losing animation data.

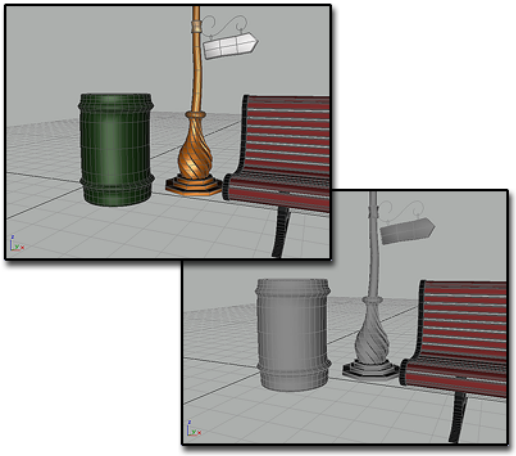
Freeform Animation

character studio gives you the option to animate *biped (page 2–701)* poses both with and without the aid of footsteps. Freeform animation does not use footsteps. In freeform animation, you set all the keys yourself.

Freeform Method

In freeform mode (without footsteps), you can pose every joint of your *biped (page 2–701)* exactly as you like using traditional keyframe methods. You can even blend dynamically between forward kinematics and *inverse kinematics (page 3–1052)* to introduce higher-level control in just the cases you need it to simulate your character's particular motion.

Freeze/Unfreeze



On the right, the trash can and streetlight are frozen.

You can freeze any selection of objects in your scene. By default, frozen objects, whether wireframe or rendered, turn a dark gray. They remain on screen, but can't be selected, and therefore can't be directly transformed or modified. Freezing lets you protect objects from accidental editing and speeds up redraws.

Frozen objects are similar to hidden objects. Linked, instanced, and referenced objects behave when frozen just as they would if unfrozen. Frozen lights and cameras and any associated viewports continue to work as they normally do.

You can choose to have frozen objects retain their usual color or texture in viewports. Use the Show Frozen In Gray toggle in the *Object Properties dialog (page 1–111)*.

Function Curve

Function curves are editable splines that represent animation values in a line-graph format. They provide a valuable way of both visualizing and editing your animation tracks.

Function curves appear in the Track View, and provide the best method of viewing and editing animation tracks. With the function curve display, you can actually see the characteristics of the animation as they change over time. The steepness of the curve indicates the velocity of an object in the scene. If the curve steepens, the object is accelerating. If the curve flattens out, the object is slowing.

You can display key dots in function curves, as well as in the key editing displays. In function curves, the key dots appear as small, black squares. The two ways to turn on their display are to click the green icon beside the track label, or to click the function curve itself.

There are two basic ways to edit function curves. You can either change the position of the key dots, thereby altering the curve, or you can edit the tangents and the values of the keys themselves.

Fusing

In NURBS curves and surfaces, fusing connects a point to a point or a CV to a CV. (You can't fuse a CV to a point, or vice versa.) This is one way to connect two curves or surfaces. It is also a way to change the shape of curves and surfaces.

Fused points behave as a single point or CV until you unfuse them. Fusing points does not combine the two point objects or CV sub-objects. They are connected but remain distinct sub-objects that you can unfuse later.

Fused CVs behave much like a single point, but the property of multiplicity for coincident CVs also applies. The fused CVs have proportionally more influence on the curve, which can become more sharply curved in the fused CVs' vicinity, or even angular if more than two CVs are fused together.

FX File

An FX file defines a DirectX 9 (DX9) shader. It is a text file created using the Higher-Level Shading Language (HLSL) standard. The *DirectX 9 Shader material (page 2–1422)* can apply DX9 shaders to objects, and display them with DX9 shading in viewports.

By default, DX9 shaders are saved in the *|3dsmax8|maps|fx* directory (the name of the 3ds Max root directory might be different on your installation).

Important: For a DX9 shader's parameter to be visible in the DirectX 9 Shader material's interface, the FX file must contain code to label the parameter, define its type, and (optionally) limit its range. (A few other UI settings are also provided.) You can find examples of files that contain this code in the above directory.

Note: The following Web page provides a specification for the DirectX 9 Shader material 3ds Max: http://sparks.discreet.com/knowledgebase/techdocs/searchable/techdoc_DXMaterialFormat/DxMaterial_Effect_format.htm.

G-Buffer

G-Buffer (graphics buffer) is a type of rendering channel. Two file formats output by 3ds Max, *RLA (page 3–680)* and *RPF (page 3–681)*, can incorporate masks that are based on graphics buffer (G-Buffer) channels instead of the more widely used RGB and alpha channels. In addition, some kinds of Filter and Layer events as well as certain *rendering effects (page 3–214)* can post-process objects or materials designated by the G-Buffer.

Main image: G-buffer used to apply a glow to lighting in a scene

Upper left: The same scene with no glow applied

Middle left: Objects selected using the G-buffer

Lower left: Glow applied to the G-buffer objects

You can set two kinds of these channels in the scene to identify and group objects or materials for a particular post-processing effect.

- You set an object's G-Buffer Object Channel value (see *Object Properties Dialog (page 1–111)*) to identify that object to receive a particular post-processing effect.
- You set a material's *Material Effects Channel (page 2–1287)* value to identify that material to receive a particular post-processing effect.

You create object-specific or material-specific post-processing by following this general procedure:

1. Assign a particular Object Channel ID or Material Effects Channel ID to the objects or the materials you want to be post-processed or affected by rendering effects.
2. In the Image Filter or Image Layer event or in each rendering effect's Options tab, choose the channel ID that associates the event with the ID value you assigned in the scene.
3. When you render the scene or execute the Video Post queue, 3ds Max singles out objects or materials that have the designated ID, and performs its post-processing only on those objects or materials.

Warning: The *mental ray renderer (page 3–77)* does not recognize Z-depth with G-buffers. G-buffer data is saved on a single layer. Also, the mental ray renderer does not support the following effects:

- *Glow lens effect (page 3–222)* (rendering effect)
- *Ring lens effect (page 3–226)* (rendering effect)
- *Lens effects Focus filter (page 3–377)* (Video Post)

Gait Pattern

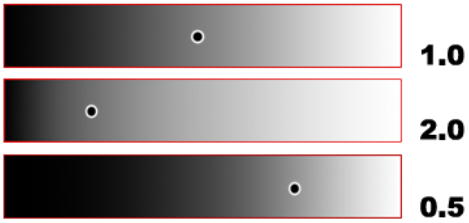
In *footstep animation (page 3–1037)*, the pattern created by a gait: walk, run, or jump. When you create new footsteps, the timing for the footsteps is determined by the gait you have chosen and the parameters for that gait. Gait parameters are on the Motion panel in the *Footstep Creation rollout (page 2–841)*.

Gait Type

In *footstep animation (page 3–1037)*, **character studio** can create three types of gaits; walk, run, or jump.

- In a walk, at least one foot is always in contact with the ground. The periods when one or both feet are in contact with the ground are known as *support periods*.
- In running, there is a period between each support period in which the body is airborne.
- Jumping is a special case of running. Both feet are in contact with the ground at the same time, or airborne at the same time.

Gamma Correction



Changing gamma value to match a monitor's middle gray

Gamma correction compensates for the differences in color display on different output devices so that images look the same when viewed on different monitors.

A gamma value of 1 corresponds to an "ideal" monitor; that is, one that has a perfectly linear progression from white through gray to black. However, the ideal display device doesn't exist. Computer monitors are "nonlinear" devices. The higher the gamma value is set, the greater the degree of nonlinearity. The standard gamma value for NTSC video is 2.2. For computer monitors, gamma values in the range of 1.5 to 2.0 are common.

When you create an image on your computer, you base your color values and intensities on what you see on your monitor. Thus, when you save an image that looks perfect on your own monitor, you're compensating for the variance caused by the monitor gamma. The same image displayed on another monitor (or recorded to another media affected by gamma) will look different, depending on that media's gamma values.

Two basic procedures are required to compensate for changes in gamma:

- Calibrate your output display devices so that the mid-tones generated by the software are accurately duplicated on your display device. You do this in the *Gamma panel (page 3–873)* of the Preferences dialog (Display Gamma).
- Determine the gamma value to be applied to files output by the renderer and files input into the software, such as texture maps. This control is also in the Gamma panel of the Preferences dialog (Files Gamma).

The most important rule about gamma correction is to do it only once. If you do it twice, the image quality is overly bright and loses color resolution.

With regard to output file gamma, video devices such as video tape recorders have their own hardware gamma-correction circuitry. Therefore, you need to decide whether to let the software do the output gamma correction or to let the output device handle it.

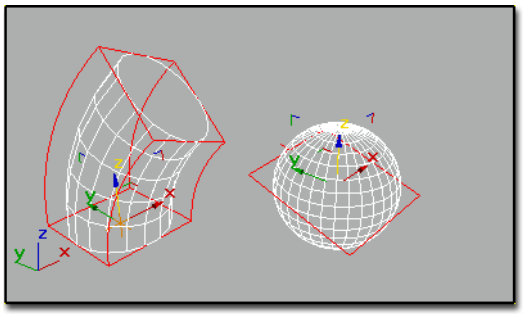
Gamma correction is not required for hardcopy print media.

Files coming into the software from programs such as Adobe Photoshop will have been gamma-corrected already. If you've been viewing the files on the same monitor and they look good, you won't need to set input file gamma.

Geometric Primitives

Simple primitive objects such as, spheres, boxes, cylinders, and so on.

Gizmo/Center



Examples of gizmos:
Left: Gizmo for a Bend modifier
Right: Gizmo for UVW mapping

A *gizmo* is geometry that appears in viewports, but not in the scene. You manipulate a gizmo to modify the scene geometry or other effects. There are gizmos for transforms, modifiers, atmospheric apparatus, and some directly modifiable geometry such as spotlight cones.

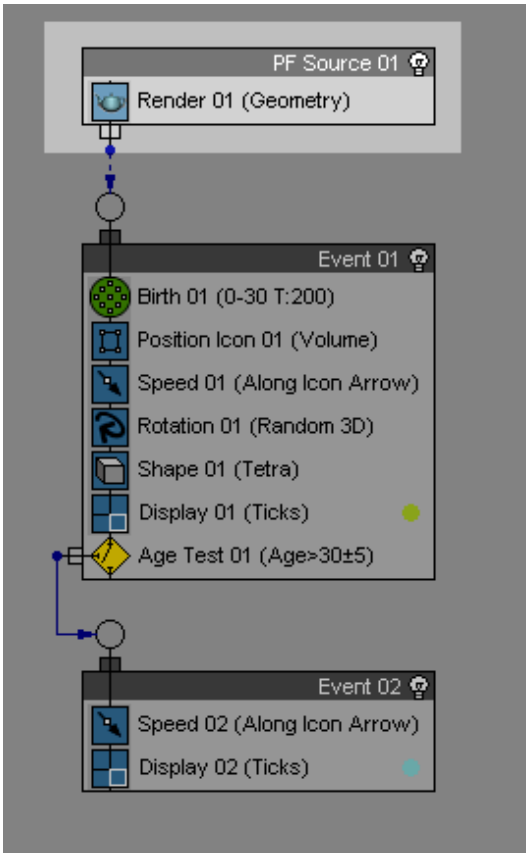
For modifiers, a gizmo acts like a kind of container that transfers the modification to the object to which it's attached. You can move, scale, and rotate the gizmo as you would any object, altering the effect of the modifier on the object.

With *bipeds (page 2–691)*, the footsteps in *footstep animation (page 3–1037)* are gizmos that let you edit the position of the biped's feet over time. *Physique (page 2–927)* uses gizmos to visually identify bulge angles.

Some modifiers with gizmos also have a center sub-object, which can be manipulated independently of the gizmo to specify the point about which the deformation, etc., takes place. For example, moving the Bend modifier center parallel to the plane of the bend effect changes the size of the bend circle and the location of the modified object within the bend circle.

Global Event

The first *event (page 3–1029)* in a *particle flow (page 3–1036)* is always a global event, whose contents affect all particles in the flow; the rest are *local events (page 3–1057)*. Although a global event has the same name as the Particle Flow source icon, selecting the source icon in a viewport doesn't highlight the global event, nor does highlighting a global event select the corresponding source icon.



Global event (highlighted)

By default, the global event contains a single *Render operator (page 2–202)* that specifies rendering properties for all particles in the flow.

You can add other operators here to have them act globally, such as Material, Display, and Speed.

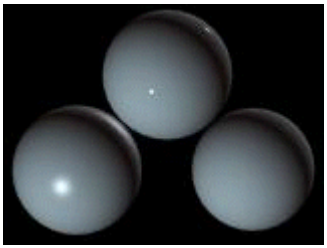
Note: A global event is the only event that can be wired to another event without using a *test (page 3–1115)*. It's almost always wired directly to a *birth event (page 3–1010)*.

Important: When you use an operator globally, be sure not to use the same operator locally (that is, in any other events in the system) to avoid potential conflicts.

Global Motion Clip Controller

In *crowd animation (page 2–1006)*, a controller that contains the animation necessary to animate a non-bipedal crowd of objects. It consists of a list of motion clips and the logic needed to instance and blend these motion clips for a crowd animation. The Global Motion Clip Controller is accessed via the *Crowd helper object (page 2–1038)*.

Glossiness and Specular Level Settings



Extremes of the Glossiness and Specular Level settings (Phong shader):

Top sphere: Glossiness=100; Specular Level=100

Left sphere: Glossiness=50; Specular Level=50

Right sphere: Glossiness=0; Specular Level=0

A material's glossiness (or dullness) depends on the size and intensity of its specular highlight. In the Material Editor, the Glossiness spinner affects the size of the specular area, and the Specular Level spinner affects the intensity of the glossiness.

When the Specular Level is too high, and Glossiness is too low, you can get harsh backlights on your surfaces. The Soften option mitigates this.

GravAccel

In *footstep animation (page 3–1037)*, the GravAccel (for gravitational acceleration) parameter lets you scale the height of airborne periods. The greater this value, the greater the height. If the biped appears to be going too high, reduce this value; if the biped goes too low, increase it. Each biped has its own Gravitational Acceleration value. The default is based on the height of the biped.

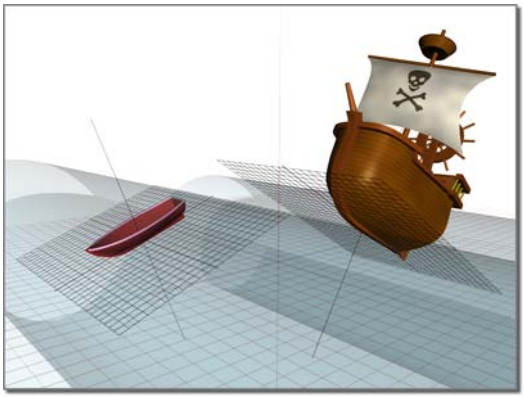
For example, if the active *unit (page 3–891)* is feet and the biped is 5 feet 10 inches tall, then Gravitational Acceleration equals 32, for 32 ft. per second per second. For other biped heights, 3ds Max scales this value to fit the scene. The Gravitational Acceleration value also changes to agree with other unit systems, such as metric.

GravAccel is located on the *Dynamics & Adaptation rollout (page 2–833)*.

Gravity

In *footstep animation (page 3–1037)*, **character studio** calculates the effect of gravity for those periods when a *biped (page 2–701)* is airborne (a biped becomes airborne when it moves with a running or jumping gait). You can use the *GravAccel (page 3–1044)* setting to scale the effect of gravity.

Grid Object



One grid establishes the pitch of the boat, another the pitch of the ship.

A grid object is a type of helper object you can create whenever you need a local reference grid or construction plane somewhere other than the home grid.

You can have any number of grid objects in your scene, but only one can be active at a time. When active, a grid object replaces the home grid in all viewports.

You can freely move and rotate grid objects, placing them at any angle in space, or attach them to objects and surfaces. You can also change viewports to display a plan or top view of any active grid object.

Grid objects can be named and saved like other objects, or used once and deleted.

Head Object

A head object is a component of a Target Camera, Sunlight or Daylight system, or a Tape helper. These objects comprise two components: the target that the camera, sun, or tape points at, and the head that represents the camera, sun, or tape.

The head object always points at the center of the target.

Helper Object

3ds Max helper objects are used to help you set up an animation, but do not render. **character studio** *crowd animation (page 2–1006)* uses two kinds of specialized helper objects: the *crowd helper (page 2–1038)* and *delegate helpers*.

Hide/Unhide

You can hide any objects in your scene and you have the option to hide any selection of objects or to hide anything except your current selection of objects. Hidden objects differ from *frozen (page 3–1039)* objects in that they disappear from the viewport instead of turning dark gray. If you are working on a scene that includes many objects or you have many objects in a very tight area, hiding some of them gives you more access to the unhidden objects and speeds up redraws.

You can hide an object that includes a target (such as target cameras, tape helpers, or suns) by choosing either the *head (page 3–1045)* or the target object and then selecting hide.

Hide and Unhide are accessible from the Display panel or from the Display quadrant of the Quad Menus.

Hierarchical Linkage

3ds Max uses a family-tree analogy to describe the relationship between objects linked together in a hierarchy.

Parent—An object that controls one or more children. A parent object is often controlled by another superior parent object.

Child—An object controlled by its parent. A child object can also be a parent to other children. An object that doesn't have any parent is by default a child of the world. (The "world" is an imaginary object that acts as the root of all other objects in the scene.)

Ancestors—The parent and all of the parent's parents of a child object.

Descendents—The children and all of the children's children of a parent object.

Hierarchy—The collection of all parents and children linked together in a single structure.

Root—The single parent object that is superior to all other objects in the hierarchy. All other objects are descendents of the root object.

Subtree—All of the descendents of a selected parent.

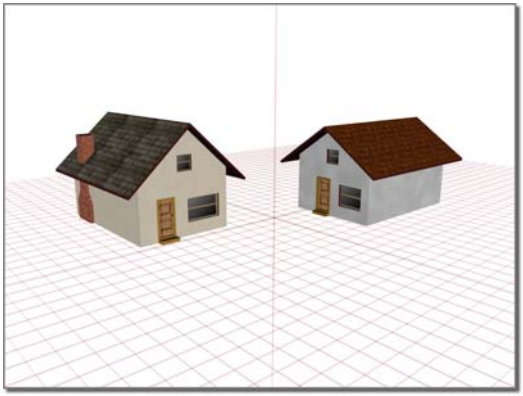
Branch—A path through the hierarchy from a parent to a single descendent.

Leaf—A child object that has no children of its own. The lowest object in a branch.

Link—The invisible connection between a parent and its child. The link is a conduit for transmitting position, rotation, and scale information from parent to child.

Pivot—Defines the local center and coordinate system for each object. You can think of links as connecting the pivot of a child object to the pivot of its parent.

Home Grid



Using the home grid to position houses

Grids are two-dimensional arrays of lines similar to graph paper, except that you can adjust the spacing and other features of the grid to the needs of your work.

Grids have these primary uses:

- As an aid in visualizing space, scale, and distance
- As a construction plane where you create and align objects in your scene
- As a reference system for using snap

The home grid is the basic reference system, defined by three fixed planes on the world coordinate axes. The home grid is visible by default when you start the software, but can be turned off with an option in the right-click viewport menu. You can use any view of the home grid as a construction plane or you can create a *grid object (page 3–1045)* and use that as a construction plane instead.

Horizon

Horizon in the distance of a scene

The horizon of a scene is the edge of vision at the height of the camera, parallel with the world coordinate plane. You can view the horizon in camera viewports.

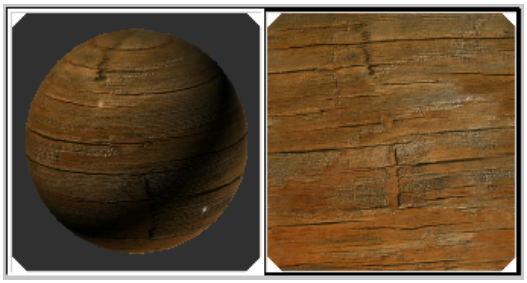
A camera is level when it and its target are the same height from the world coordinate plane. In other words, the camera's local Z axis is parallel to the world plane. When the camera is level, the horizon line is centered in the viewport. As the camera tilts up, the horizon line lowers; as it tilts down, the horizon line raises.

The horizon line can help you match the perspective of your scene to the perspective of a still image. In general, matching perspective involves the following steps:

- Display the horizon line. Use it to help you adjust the camera and target so they are level.
- Display the image in the camera viewport. Use Views menu > Background Image.
- Orbit the camera until the perspective of the scene roughly matches that of the still image.
- Adjust the camera's perspective to fine-tune the perspective match.
- Move the camera or target to position the scene against the background.

If you raise or lower the camera, raise or lower the target by an equal amount, in order to keep them level and maintain the horizon.

Hot



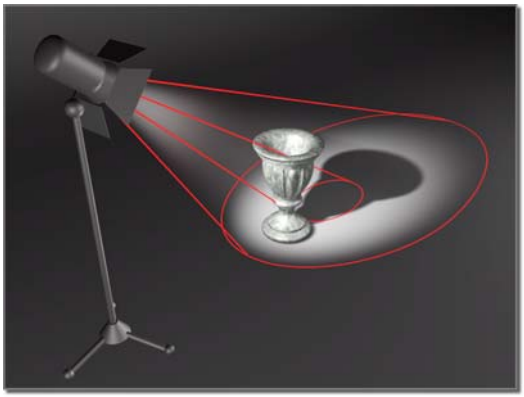
A *hot* material is one that is instanced in both the scene and the Material Editor. When you get a material from an object, that material is hot. Any changes you make to the hot material are reflected in the scene wherever that material is applied.

To edit a material without changing the scene, you can get the hot material from an object, then make a copy of it. The term for the copied material is *cool (page 3–1018)*.

White triangular tabs in each corner of the Material Editor *sample slots (page 2–1264)* show that the materials in those slots are hot.

In the Material Editor, the only time you need to select an object is when you're assigning a material to an object. When you're adjusting a material, object selection doesn't matter.

Hotspot/Falloff



Hotspot and falloff cones, highlighted in red.

You've seen how a flashlight or a theater follow spot casts a circle of light. Depending on the quality of the flashlight, or the adjustment of the follow spot, the edge of the cast pool of light is either blurred or sharp.

In the case of a blurred pool of light, the bright circle in the center is the hotspot, which has an even intensity. The outer extremity of the light, where it meets the darkness, is the falloff. The difference in circumference between the hotspot and the falloff determines the relative sharpness of the pool of light. For example, if the hotspot and falloff are nearly the same size, the pool of light has a sharp edge.

The hotspot angle of a spotlight must always be smaller than the falloff angle. Put another way, the hotspot must always be inside the falloff.

You can hold down the SHIFT key to have the hotspot and falloff values affect each other. If you increase the hotspot to be larger than the falloff, the falloff is increased as well. Likewise, if you reduce the falloff to be smaller than the hotspot, the hotspot is also reduced.

IGES (Initial Graphics Exchange Specification)

The Initial Graphics Exchange Specification (IGES) is an ANSI standard that defines a neutral form for the exchange of information among dissimilar computer-aided design (CAD), computer-aided manufacturing (CAM) systems, and computer visualization systems.

3ds Max implements the IGES standard for translating files to the software from IGES file formats used by the mechanical engineering and entertainment industries. Using the IGES import feature, you can read in native *NURBS (page 3–1074)* data between 3ds Max and other programs such as Autodesk Mechanical Desktop® (release 3.0 or later), Maya®, Pro/ENGINEER®, SOFTIMAGE®, CATIA®, and others. For complete details on the IGES standard, see The Initial Graphics Exchange Specification (IGES) Version 5.3.

IK Blend

In biped *freeform animation (page 3–1039)*, the IK Blend parameter determines how *forward kinematics (page 3–1038)* and *inverse kinematics (page 3–1052)* are blended to interpolate an intermediate position. Using an arm to move a hand is an example of forward kinematics. Using the hand to move the arm is an example of inverse kinematics.

This parameter is located in the IK section of the *Key Info rollout (page 2–809)*.

IK Goal

In *history-independent inverse kinematics (HI IK) (page 2–427)* and the *IK Limb Solver (page 2–454)*, the IK goal is the object associated with

the end joint of a kinematic chain. By default, its name is *IK Chain01*.

The kinematic chain is a single branch of a hierarchy used for animation with *inverse kinematics (IK) (page 3–1052)*. The chain starts with the end joint and travels up through ancestors until it reaches the start joint. When you move the IK goal, the IK solver then uses IK calculations to move and rotate all other objects in the kinematic chain to react to the object you moved.

Note: You can move the IK goal away from the end joint, which causes the IK chain to straighten out. When you move the goal back toward the end joint, joints in the IK chain will bend again.

See also

End Effector (page 3–1027)

IK Solution

Inverse kinematics (IK) uses a goal-directed method where the animator positions a child object and the program calculates the position and orientation of the parent objects. The final position of the hierarchy after all of the calculations have been solved is referred to as the IK solution.

Applied IK requires that one or more parts of your IK structure be pinned to animated follow objects. Once pinned, you select any object in your kinematic chain and click the Apply IK button. The software then calculates the IK solution for each frame of the animation and places transform keys for every object in the IK chain.

Illuminance

Illuminance is the *luminous flux (page 3–1059)* incident on a surface of unit area. It measures how much energy has fallen on a surface.

This quantity is useful for describing the level of illumination incident on a surface without making the measurement dependent on the size of the surface itself. The *lux* (lx) is the International System (SI) unit of illuminance. The American System (AS) unit for illuminance is the footcandle (fc), equivalent to 1 lumen per square foot. Illuminance is a function of the distance from the light source. To specify the illuminance of a light, you must enter a value in lx, and the distance at which that illuminance is measured.

Image Motion Blur

Image motion blur has been applied to the falling coin on the right.

Motion blur can enhance the realism of a rendered animation by simulating the way a real-world camera works. A camera has a shutter speed, and if significant movement occurs during the time the shutter is open, the image on film is blurred.

3ds Max provides a couple of ways to generate motion blur. Image motion blur is one. *Scene motion blur (page 3–1101)*, a Video Post *Scene Event (page 3–325)* effect, is another. For most purposes, image motion blur gives better results than scene motion blur. Scene motion blur is a more exaggerated effect. You can use both image and scene motion blur in the same rendering.

You can also apply image motion blur as a *render effect (page 3–265)*.

(Another option, *object motion blur (page 3–1075)*, is not meant to simulate a camera, but to improve the rendered appearance of fast-moving objects.)

Applying image motion blur is a two-step process:

1. Turn on image motion blur for the object you want to blur, using the *Object Properties dialog (page 1–111)*.

   You cannot apply both image motion blur and object motion blur to the same object in the same rendering.

2. Before you render, turn on image motion blur in the *Default Scanline Renderer rollout (page 3–37)* of the Render Scene dialog.

Tips and Limitations

Image motion blur smudges the object by creating a smearing effect, instead of superimposing multiple images the way object motion blur does. It considers camera movement. Image motion blur is applied after scanline rendering is complete.

- Because image motion blur is applied after rendering, it can't account for object overlap. When blurred objects overlap, blurring doesn't work correctly and there are gaps in the rendering. To fix this problem, render each blurred object separately, to a different layer, and then composite the two layers using the Alpha Compositor in Video Post (or another compositing tool.

  The overlap problem also applies to objects behind an object rendered with raytrace refraction.

- Image motion blur doesn't work with objects that change topology. This includes NURBS objects that are animated so their tessellation (*surface approximation (page 1–1241)*) changes. Regular tessellation doesn't change in this way. This also includes Displacement mapping and Optimization.
- Image motion blur can yield strange results with objects that have a *MeshSmooth modifier (page 1–714)* applied to them. If you see this happening, turn of the MeshSmooth modifier's Keep Faces Convex toggle (in the Settings rollout). This will fix the problem.
- Image motion blur is not applied to reflections of objects. It is applied only to actual geometry.

In Place Mode

When you play an animation of a *biped character (page 2–701)* that travels, you can use In Place mode to keep the biped visible in the viewports. Use this for biped key editing, or adjusting envelopes with *Physique (page 2–927)*. In Place mode prevents XY movement of the biped's center of mass during playback; motion along the Z-axis is preserved.

This control is a three-button flyout: you can also restrict X movement without restricting Y movement, or vice versa.

The state of In Place Mode is saved with the MAX file.

The In Place flyout is located on the expanded *Biped rollout (page 2–791)*.

Independent

Describes a NURBS object or sub-object that is not dependent on any other object in a NURBS model. For example, a NURBS curve created using the Create command panel does not depend on other objects.

Initial Pose

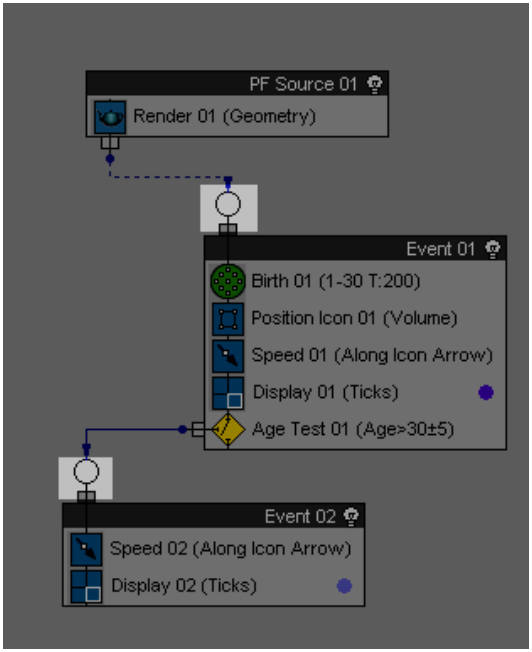
When you apply *Physique (page 2–927)* to a skeleton, the initial pose is the original position of the mesh relative to the skeleton. Some of the *Physique sub-object levels (page 2–980)* have an Initial Skeleton Pose control that temporarily puts the mesh into its initial pose.

Initialize

In *Physique (page 2–927)*, when you attach a *mesh (page 3–1066)* to a skeleton such as a biped, the modifier is initialized. This process creates the links of the *deformation spline (page 3–1021)*, the *envelopes (page 3–1027)* around the links to control the mesh, and so on.

Inputs: Event

In Particle Flow, you create a *particle diagram (page 3–1083)* by connecting *events (page 3–1029)* using *wires (page 3–1127)*. Each wire links an *output (page 3–1081)* with an event input, which is the connector sticking up from the top of an event.



Event inputs

Instance

An instance is an interchangeable clone of the original. Modifying an instanced object is the same as modifying the original.

Instances are not only alike in geometry, but also share modifiers, materials and maps, and animation controllers. When you change one instance by applying a modifier, for example, all the other instances change with it.

Each instance has its own set of transforms, object properties and space warp bindings; these are not shared among instances.

Within the program, instances derive from the same master object. What you're doing is applying a single modifier to a single master object. In the viewport, what you see as multiple objects are multiple instances of the same definition.

If you wanted to create a school of swimming fish, you might begin by making many instanced copies of a single fish. You could then animate the swimming motion by applying a ripple modifier to any fish in the school. The whole school would swim with exactly the same motions.

Instance (Motion Mixer)

The term *instance* has two meanings in 3ds Max. One is the *standard definition (page 3–1051)*; the other is specific to clips in the Motion Mixer.

In general, an instance is a completely interchangeable clone of the original object. Modifying an instanced object is the same as modifying the original.

In the *Motion Mixer (page 3–1070)*, when the same clip is used more than once on tracks, the clip versions are either instances or *adaptations (page 3–999)* of each other.

The same clip used more than once for one biped, or for different bipeds of the same size, is an instance. The same clip used for different-sized bipeds is an adaptation.

For example, suppose you scene contains two bipeds that are exactly the same size, and you use the same clip in both bipeds' mixes. The clips within one biped's mix are instances of one another, and clips within the mixes of the two same-sized bipeds are also instances of one another. Instances have the same number appended to the ends of their clip names in the Mixer.

Suppose you then add a third biped of a different size, and use the same clip in that biped's mix. The new version of the clip is an adaptation of the clip used on the first two bipeds. An incremental number is added to the end of the clip name in the Mixer.

These terms are used because the Mixer adapts each loaded clip to the biped's size. The first time a clip is loaded, the Mixer adapts the clip as needed, but no distinction is made between instances and adaptations at that point because the clip appears only once .

When the clip is cloned or loaded again, the Mixer adapts the new clip to the biped as needed, then compares the change to previously loaded versions. If the change is the same, the new clip and its previous versions are instances of one another. If not, the new clip and previous versions are adaptations of one another.

Interactive Renderer

Another term for the *Viewport Interactive Renderer (page 3–1124)*.

Interpolation

Interpolation is the calculation of intermediate values. For example, when you set two keyframes for a moving object, the object's position on intermediate frames is determined by interpolation.

Inverse Kinematics

Inverse kinematics (IK) is a positioning and animation method that is built on top of the concepts of hierarchical linking. To understand how IK works you must first understand the principles of hierarchical linking and forward kinematics.

Inverse kinematics starts with linking and pivot placement as its foundation and then adds the following principles:

- Joints are constrained with specific positional and rotational properties.

- Position and orientation of parent objects is determined by the position and orientation of child objects.

Because of these added constraints, IK requires greater thought about how you link your objects and place pivots. Where many different solutions for linking objects might be suitable for forward kinematics, there are usually just a few good solutions for any given IK approach. The best solution depends on consideration of both the nature of the hierarchy, and how that hierarchy will be animated.

Inverse kinematics is often easier to use than forward kinematics and you can quickly create complex motions. However, you sacrifice some of your control to the automation of the IK functions.

Inverse Kinematics (Biped)

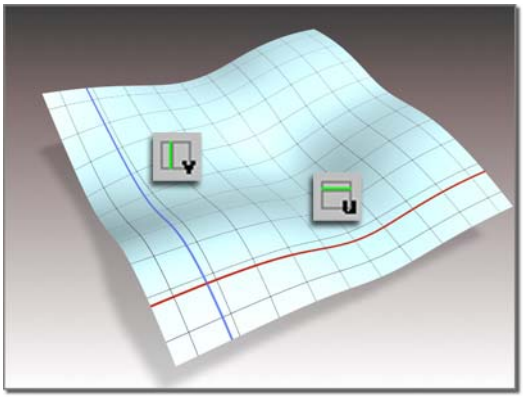
When you work with a *biped (page 2–701)*, you can use inverse kinematics (IK) by moving the hands or feet in *freeform animation (page 3–1039)*. For example, you can position an arm by moving the hand.

A biped has three inverse kinematics parameters that you can vary during the limb's motion by setting them at each key of the arm and leg tracks. As the limb moves through each key:

- **IK Blend**—Sets the motion interpolation to be a blend of forward and inverse kinematics. This will allow you to blend swinging motions with directed hand or foot motions. The default is 0.0, or full forward kinematics.
- **Body or Object**—Determines the *reference coordinate space (page 3–1018)* of the IK path. This allows you to move the IK path with your character's body, or temporarily attach a hand or foot to follow another object or be attached to world space. The default is Body.
- **Join to Previous IK Key**—Determines if the key should be part of the previous key (with the same reference position as the previous key).

These controls are in the IK section of the *Key Info rollout (page 2–809)*.

Iso Line

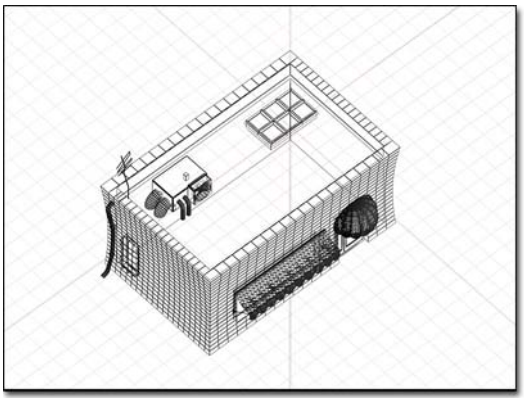


Iso lines on a NURBS surface

Iso is short for isoparametric.

In NURBS modeling, a line of constant parameter value, similar to a contour line. You can use iso lines to display a NURBS surface. You can also create dependent NURBS curves based on a surface's U-dimension or V-dimension iso lines.

Isometric View



Isometric view of a scene

A special type of *axonometric view (page 3–1007)*, where the sides of the object are equally inclined to the screen, producing equal foreshortening along the edges. You can create an isometric view by rotating a User view.

Keyframe Mode

Keyframe mode is active while the *Auto Key button (page 3–760)* is turned on. While you are in Keyframe mode, transforming an object or sub-object, or changing the value of an animatable parameter, creates an animation key.

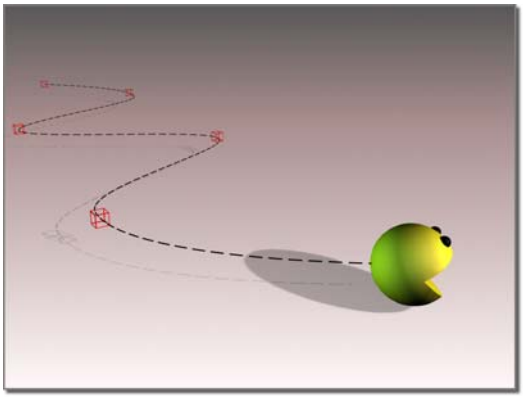
Warning: When you use *freeform animation (page 3–1039)* to animate a biped, don't use the Set Key control (the button next to Auto Key in the animation controls). Always use the biped-specific Set Key button and other key controls on the *Key Info rollout (page 2–809)*.

See also

Layout Mode (page 3–1055)

Keyframes/Keys (page 3–1054)

Keyframes/Keys



The red boxes indicate keyframes, the dotted line shows the interpolated trajectory.

Keyframes record the beginning and end of each transformation of an object or element in the scene. The values at these keyframes are called *keys*.

For example, if you have a box that has not been animated, no keyframes (or keys) exist for it. If you turn on the Auto Key button, move to frame 20, and rotate the box 90 degrees, Rotate keys are created at frames 0 and 20. The key at frame 0 represents the orientation of the box before it was rotated, while the key at frame 20 represents the orientation of the box after it was rotated 90 degrees. When you play the animation, the box rotates from 0 to 90 degrees over 20 frames.

Kinematic Chain

Inverse kinematics calculates the position and orientation of objects in a kinematic chain.

The kinematic chain is defined as a single branch of the hierarchy that starts with a selected child object and continues up through its ancestors until it reaches the base of the chain. The base of the chain is either the root of the entire hierarchy or

an object that you specify as a terminator for the chain.

3ds Max automatically determines the kinematic chain when you select and transform an object with the IK button turned on.

Knot

A value in an array or "knot vector" associated with a NURBS curve. The knots specify the region of influence of the CVs on the curve. You can't see or directly alter knots.

Launch Script

A launch script is a MAXScript script that you run from the command line with the -U switch, instead of from the Utilities command panel.

You use a launch script to run batch operations in the software. For example, you might have a batch rendering in which the script opens a sequence of files, sets up shots in each, and renders them, all without using the user interface.

Layer Track

A Motion Mixer track for a series of motions that do not require transitions between them. Compare with a *Transition track (page 3–1121)*, which allows you to stack clips on top of one another and to create automatic transitions between them. When a biped is added to the Motion Mixer, it is automatically assigned a Layer track. See *Adding Tracks to the Mixer (page 2–583)*.

Layers

Layers are like transparent overlays, and allow you to organize and group different types of scene information. The objects you create have common properties including color, visibility, renderability, and display. An object can assume these properties from the layer on which you create it.

You can adjust layer properties from the *Layers toolbar (page 3–735)* and the Layer Manager.

See also

Using Layers to Organize a Scene (page 3–704)

Layer Manager (page 3–706)

Layer Properties Dialog (page 3–711)

Layers (Biped)

The *Layers (page 2–827)* feature lets you add layers of animation above the original biped animation. This is a powerful way to make global changes to your character animation. For example, by adding a layer and rotating the spine forward at any frame, a run cycle becomes a crouched run. The original biped motion is kept intact and can be viewed by switching back to the original layer. You can view layers individually or as a composite of the animation in all layers. Layers behave like a freeform animation; the biped can adopt any position.

Layers allow you to easily adjust raw motion capture data, which contains keys at every frame. You add a layer and keyframe the biped.

Layout Mode

Layout mode is active while the *Auto Key button (page 3–760)* and *Set Key button (page 3–761)* are both turned off. While you are in Layout mode, you can transform objects and sub-objects, and change the values of animatable parameters, without generating animation keys.

See also

Keyframe Mode (page 3–1054)

Keyframes/Keys (page 3–1054)

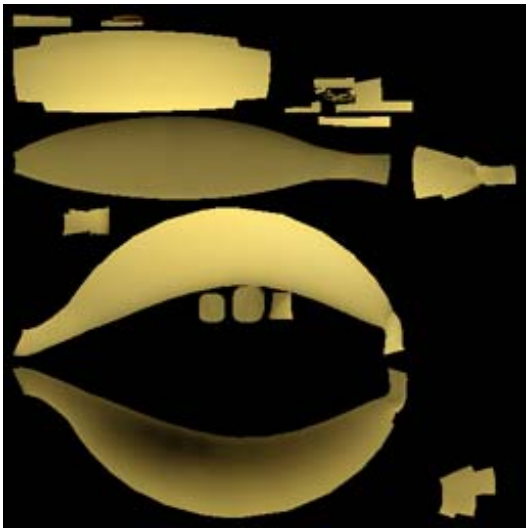
Lift

In *footstep animation (page 3–1037)*, the state of a foot at the frame when it is about to lift away from a footstep.

Light Map

A light map or lighting map is a *bitmap (page 3–1011)* that stores the lighting levels (intensity and color) falling on an object in the scene. Typically, you create a light map by *rendering to a texture (texture baking) (page 3–139)*. Light maps are primarily for use in game engines, but you can also use them to speed up renderings.

Banana object in a lighted room



Light map of the banana

If you use the *DirectX Manager (page 2–1308)*, you can display light maps interactively in viewports, using either the *LightMap shader (page 2–1423)* or the *Metal Bump shader (page 2–1424)*.

See also

DirectX Manager Rollout (page 2–1308)

Linked Geometry

Linked geometry is a by-product of importing or linking a drawing file to 3ds Max. It is a child object, or subcomponent, associated with VIZBlocks or Block/Style Parents.

When you select a linked geometry object, it offers no parameters on the Modify panel. You must first add an Edit Mesh modifier to the object or collapse the linked geometry object to an editable mesh in order to access sub-object levels. If you add a modifier to linked geometry, the modifier is applied to all instances of that object.

The only direct control you have over linked geometry objects is the Reset Position option that

is used to negate and basic move, rotate or scale transforms.

Links

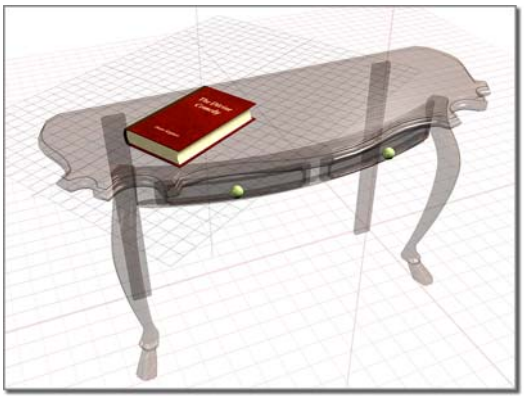
Links are the segments of the *Physique deformation spline (page 3–1021)*. Links follow the hierarchy of the skeleton, such as a biped, that has been attached to the *mesh (page 3–1066)*. Link parameters in Physique allow you to bend, twist, change sliding behavior, and radially scale the mesh.

Listener Window

In MAXScript, the Listener Window is a command-line window that lets you type in and execute MAXScript commands interactively. In other words, you run the script as you go along, rather than running a pre-saved text file.

You open the listener window using the MAXScript Listener command on the MAXScript menu or from the Utilities > MAXScript > MAXScript rollout > Open Listener command.

Local Coordinate System



A book in object space rests on a table in world space. The book has its own local coordinate system.

The local coordinate system is the coordinate system that relates specifically to the selected object.

Each object has its own local center and coordinate system as defined by the location and orientation of the object's pivot point. The local center and coordinate system of an object combine to define its object space.

The direction of the object's X, Y, and Z axes depend on the current transforms of the object. Contrast with the world coordinate system.

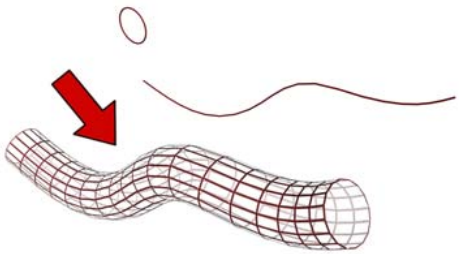
You can see the difference between the two coordinate systems when you unintentionally rotate an object, such as a wheel on a car model, around the world axis instead of the object's local axis. The wheel immediately flies off in a large arc because the center of the rotation is at the origin of the world coordinates.

To rotate the wheel correctly, first change the coordinate system to Local, using the pop-up list on the toolbar. The wheel then rotates around its own hub, which is the origin of its local coordinates.

Local Event

Particle Flow uses two types of *events (page 3–1029)*: *global (page 3–1043)* and local. All events in a *flow (page 3–1036)* except the first are called local events, because the *actions (page 3–997)* they contain take effect only while particles are in that event. The *birth event (page 3–1010)* is a special type of local event that always comes immediately after a global event.

Lofting



A circle is lofted along a path to construct a tubular shape.

Lofting is an important method for 3D object creation. You create shape objects to serve as a path and any number of cross-sectional shapes. The path becomes the framework that holds the cross-sections forming your loft object.

Once you create a loft object you can change and animate its parameters and sub-objects:

- Add and replace cross-section shapes or replace the path.
- Change or animate the parameters of the path and shapes.
- Change or animate the surface parameters of the loft object.

The lofting process first requires that you create shape objects to serve as the path and cross-sections of your loft object.

The term lofting comes from early shipbuilding. A large framework called a loft was built to hold the hull of a ship while it was assembled. The process of hoisting the ribs (cross-sections) of the hull into the loft became known as lofting.

A traditional method for building three-dimensional models of a modern vehicle design is to draw cross-sections at a number of key points. These cross-sections are cut out to form two-dimensional templates that are then placed on a rail. The model builders fill in the space between the templates to generate the surface of the model.

You create loft objects using a similar process. You first create two or more spline objects. One of these splines will be the rail, which is referred to as the path. The rest of the splines are the cross-sections of your object, which are called shapes. As you arrange your shapes along the path, the software generates a surface between the shapes.

Log File (mental ray Renderer)

The log file (*.log)* is an ASCII text file that contains messages generated by the mental ray renderer. You specify a name and location for the log file, and the "verbosity" level of the messages it contains, in the *mental ray preferences (page 3–867)*.

Look At Object

In the context of the *Shape Facing operator (page 2–172)*, a Look At object is the camera or object toward which particles face.

LTLI Files

The LTLI file type is the file format for photometric data created by the Danish Illuminating Laboratory. It is used primarily in Scandinavian countries.

Luminance

Luminance is the value of light reflected off a surface. It is a measure of how bright or dark we perceive the surface.

Luminous Flux

Luminous flux is the quantity of light energy per unit time arriving, leaving, or going through a surface. The lumen (lm) is the unit of luminous flux in both the International System (SI) of units and in the American System (AS) of units. If you think of light as particles (photons) moving through space, then the luminous flux of a light beam arriving at a surface is proportional to the number of particles hitting the surface during a time interval of 1 second.

Luminous Intensity

Luminous intensity is the light energy per unit time emitted by a point source in a particular direction. Luminous intensity is used to describe the directional distribution of a light source, that is, to specify how the luminous intensity of a light source varies as a function of the outgoing direction. The Candela (cd) is the unit of luminous intensity.

LZF Files

LZF (Lens Effects Flare) files allow you to store all of the settings for a Flare effect in one file. The settings are also saved with the MAX file; however, saving them to a separate file allows you to use the same Lens Effects settings in different scenes, and also allows you to share settings with other 3ds Max users.

LZG Files

LZG (Lens Effects Glow) files allow you to store all of the settings for a Glow effect in one file. The settings are also saved with the MAX file; however, saving them to a separate file allows you to use the same Lens Effects settings in different scenes, and also allows you to share settings with other 3ds Max users.

LZH Files

LZH (Lens Effects Highlight) files allow you to store all of the settings for a Highlight effect in one file. The settings are also saved with the MAX file; however, saving them to a separate file allows you to use the same Lens Effects settings in different scenes, and also allows you to share settings with other 3ds Max users.

LZO Files

LZO (Lens Effects Focus) files allow you to store all of the settings for a Focus effect in one file. The settings are also saved with the MAX file; however, saving them to a separate file allows you to use the same Lens Effects settings in different scenes, and also allows you to share settings with other 3ds Max users.

LZV Files

LZV files allow you to store the settings for several Lens Effects in one file. You can save all of your settings for Glow, Ring, Ray, Auto-Secondary, Manual Secondary, Star, and Streak effects in one file. The settings are also saved with the MAX file; however, saving them to a separate file allows you to use the same Lens Effects settings in different scenes, and also allows you to share settings with other 3ds Max users.

Map Bias

On the right, increased map bias makes the dog appear to float.

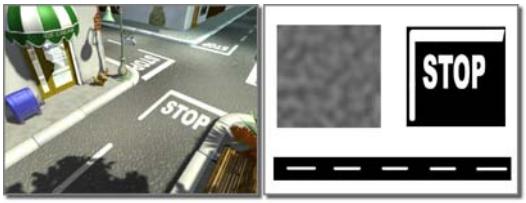
Map bias moves the shadow toward or away from the shadow-casting object (or objects).

By default, this value is 1.0 world coordinate unit. Increasing the bias moves the shadow away from the object, and decreasing the bias moves the shadow closer to the object. The Map Bias value can be any positive floating-point number.

For example, if a shadow-casting object intersects another object but its shadow doesn't meet properly at the intersection, the bias is too high. This effect varies with the angle of the spotlight to the object. Extremely shallow spotlight angles usually require higher bias values.

Another purpose of bias is to avoid problems with objects that cast shadows onto themselves. If you see streaks or moiré patterns on the surface of the object, the bias value is too low. If you increase the bias so much that the shadow becomes disconnected from the object, reduce the bias and increase the shadow map Size value instead.

Map Channel



Left: Scene uses different map channels to place different copies of the same maps in different locations.

Right: The three maps used to create the streets and the traffic markers painted on them

When you turn on Generate Mapping Coordinates for an object, the coordinates use map channel 1. You can assign new map channels with new mapping coordinates by applying a *UVW Map modifier (page 1–905)* to the object. Map channel values can range from 1 to 99.

A map channel associates a map with an object's mapping coordinates. *Texture-baked maps (page 3–139)* also use map channels.

For *NURBS (page 1–1079)* surface sub-objects, you can assign a map channel without applying UVW Map. The surface sub-object has a different set of mapping coordinates for each map channel you use.

A map's map channel value identifies which of an object's mapping coordinates to use. Different map channels allow maps for the same object to use different coordinates. For example, you might use one channel for *diffuse mapping (page 2–1339)* and a different one for *bump mapping (page 2–1347)*. Map channels also let different maps use different coordinates within a *compound material (page 2–1396)*, a *compositor map (page 2–1497)*, or a *multi/sub-object (page 2–1403)* material.

Different map channels can have different U and V tiling values, different U and V offsets, and so on. In the UVW Map modifier, you can also set

different map channels to have different mapping types (planar, cylindrical, spherical, and so on).

If you apply a map that uses a certain map channel to an object that has no mapping coordinates for that channel, the map doesn't appear on the object. When you render, a *Missing Map Coordinates (page 2–1433)* dialog appears to warn you of the problem. The dialog lists the map channel and the object name.

See also

Coordinates Rollout (2D) (page 2–1434)

Coordinates Rollout (3D) (page 2–1472)

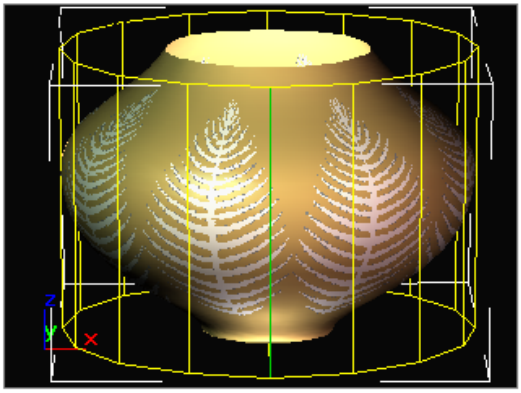
Mapped Material

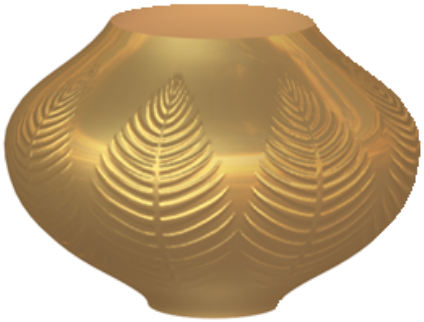
A mapped material is a *material (page 3–1065)* that contains one or more *maps (page 2–1426)*. Typically, it contains a *bitmap (page 3–1011)* as a Diffuse map, but having any map or maps applied qualifies a material as mapped.

In order for a mapped material containing a *2D map (page 3–995)* to appear properly in the viewports and in the rendered image, any object to which it's applied generally needs mapping coordinates. By default, most parametric objects in 3ds Max already have mapping coordinates applied; you can also use the *UVW Map modifier (page 1–905)* (link) or *Unwrap UVW modifier (page 1–867)* (link) to provide mapping coordinates.

Note: Objects with materials that contain only *3D maps (page 3–996)* do not need mapping coordinates.

Mapping Coordinates





Decoration on the vase is a map positioned by rotating the UVW Map Modifier gizmo.

Mapping coordinates specify the placement, orientation, and scale of a map on the geometry. Coordinates are often specified in terms of U, V, and W, where U is the horizontal dimension, V is the vertical dimension, and W is the optional third dimension, representing depth.

If you apply a mapped material to an object that has no mapping coordinates, the Renderer assigns default mapping coordinates. The built-in mapping coordinates are designed for each object type. The box mapping coordinates place a duplicate map on each of its six sides. For the cylinder, the image is wrapped once around its sides, and duplicates of the image are distorted at the end caps. A sphere has the image wrapped

once around the sphere, and then gathered at the top and bottom. Shrink-wrap mapping is also spherical, but truncates the corners of the map and joins them all at a single pole, creating only one singularity.

3ds Max provides a number of ways to apply mapping coordinates:

- Use the Generate Mapping Coords option in the creation parameters rollout of any standard primitive. This option, which is on by default for most objects, provides mapping coordinates specifically designed for each primitive. They require additional memory, so turn the option off if you don't need them.
- Apply a *UVW Map modifier (page 1–905)*. You choose from several types of mapping coordinate systems and customize the placement of the mapping coordinates on the object by positioning a mapping icon. In addition, you can animate the transformations of the mapping coordinates.
- Use special mapping coordinate controls for special objects. For example, Loft objects provide built-in mapping options that let you apply mapping coordinates along their length and around their perimeter.
- Apply a Surface Mapper modifier. This world-space modifier takes a map assigned to a *NURBS (page 1–1079)* surface and projects it onto the modified object or objects. Surface Mapper is especially useful for seamlessly applying a single map to a group of surface sub-objects within the same NURBS model. You can also use it for other kinds of geometry.

There are three cases where you don't need mapping coordinates:

- Reflection/refraction maps and environment maps

  These use an environmental mapping system, in which the placement of the map is based on the rendered view, and fixed to the world coordinates in the scene.
- 3D procedural maps (such as Noise or Marble)

  These are procedurally generated, based on the local axis of the object.
- Face-mapped materials

  The maps are placed based on the facets in the geometry.

Maps

Front left sphere: Marble bitmap
Front right sphere: Clouds bitmap
Back left sphere: Noise procedural map
Back right sphere: Marble procedural map

The images you assign to materials are called maps. The software provides several different map types. They include standard bitmaps (such as *.bmp*, *.jpg*, or *.tga* files), procedural maps, such as Checker or Marble, and image-processing systems such as compositors and masking systems.

You can assign maps to most of the components that make up a material. Materials that contain one or more images are called mapped materials. By assigning maps to different attributes of the materials, you can affect the color, the opacity, the smoothness of the surface, and much more.

Maps offer the level of realism you look for in materials. The different types of maps you can use range from the common bitmap, to the flexible procedural map.

For many map types, the renderer needs instructions telling it where the map should appear on the geometry. These instructions are called *mapping coordinates (page 3–1061)*.

Marker Data

Data from a *motion-capture device (page 2–910)*. Rather than limb rotational data, marker data uses marker positions to specify limb position.

Marker Files

A file from a motion-capture device. **character studio** can read two marker file formats:

- *CSM (**character studio** marker) (page 3–1014)*

  This is the native marker file format of **character studio**.
- *BVH (BioVision) (page 3–1009)*

Markers

In a motion-capture session, markers are reflective objects placed on the "actor" or "talent." The markers enable motion-capture hardware to record the position of various parts of the talent's body while performing motions.

Master Motion Clip Controller

In *crowd animation (page 2–1006)*, a controller (similar to the Block controller) that consists of a list of motion clips. When instanced, these motion clips can blend from one animation to another. The Master Motion Clip controller is accessed via the *Crowd helper (page 2–1038)*.

Match Frame

For the purposes of combining *inverse kinematic (IK) (page 3–1052)* and *forward kinematic (FK) (page 3–1038)* animation, this is a collection of keyframes that allow a seamless blend between IK and FK control, or vice versa. On the *IK goal (page 3–1048)*, this includes IK keys for:

- Position
- Enabled state
- Swivel angle

On the IK bones, a match frame includes FK keys for:

- Rotation
- Preferred angles
- Scale (less frequently)

Material ID

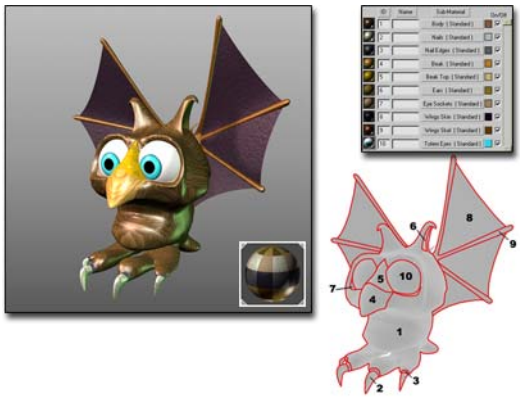


Figure mapped using a multi/sub-object material: material IDs identify the component sub-materials.

A surface's material ID is the value that determines which sub-material the surface will use when you apply a *Multi/Sub-Object material (page 2–1403)* to the object to which the surface belongs.

Geometric primitives have default material identification number assignments, just as they

have default smoothing groups. The default material ID assignment depends on the type of geometry. Most curved objects such as spheres have a single material ID. Boxes have six IDs, one for each side. Cylinders have three: ID number 1 and 2 for the two caps, and ID number 3 for the sides. Hedra have three: one for each of their P, Q, and R axes.

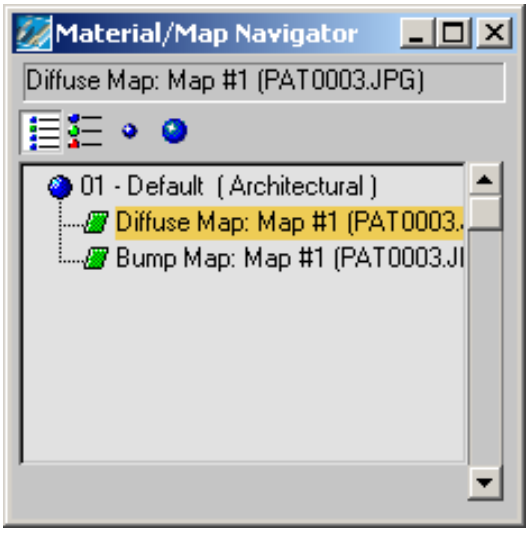
When you apply a Multi/Sub-Object material, the materials will match the Multi/Sub-Object material ID numbers to the material ID numbers on the faces of the object. Faces keep a record of the ID number, and not of the material name. If the material is anything but Multi/Sub-Object, the material is assigned to the object's entire surface.

Assigning some defining material ID number to each object before they become compound object operands can be a useful technique for being able to select the separate pieces after they're combined.

You can use material IDs for continuous surfaces that require separate paints or finishes. For example, a car constructed from different types of materials, such as a colored metal body, chrome parts, glass windows, and so on.

You can use the *Material modifier (page 1–706)* to assign material ID numbers. Also you can reassign material IDs using the Editable Mesh > Surface Properties rollout, or Edit Mesh modifier > Edit Surface rollout.

Material/Map Hierarchy



Material/map hierarchy shown in the Material/Map Navigator

The Material Editor could be called the Material and Map Editor, because you can use it to design both materials and maps, and any combination of the two. In addition, you can create material or map hierarchies.

A material hierarchy is a material that consists of other materials (or maps). Similarly, a map hierarchy is a map consisting of other maps. Materials that consist of other materials are called *compound materials (page 3–1016)*. Maps consisting of maps are compound maps.

Materials

Spheres with variations of the standard material type (no maps used):

Green sphere: High Glossiness

Red sphere: Constant shading

Blue sphere: 60% opacity

Yellow sphere: Wireframe mode, slight self-illumination

A material is data that you assign to the surface or faces of an object so that it appears a certain way when rendered. Materials affect the color of objects, their glossiness, their opacity, and so on.

A standard material consists of ambient, diffuse, and specular components. You can assign maps to the various components of astandard material.

The standard material is the default material in the six sample slots of the Material Editor. However, you can change the type of material you're working on by clicking the button labeled Type below the sample slots. This displays the Material/Map Browser, and lets you select from a list of alternative material types.

You can also change the type of material you're working on by clicking the Get Material button below the sample slots. This displays the Material/Map Browser, and lets you select from a list of alternative material types.

Matte Object

Matte object reveals part of the background, making the hamburger geometry appear to be inside the oven.

A matte object is invisible but blocks any geometry behind it. However, it does not block the background.

For example, you might make a complex scene for the background of your animation, render it once, then assign the resulting bitmap as a background using only a few animated objects during the rendering of the animation. If you then needed one of your objects to appear from behind some portion of the background, such as a building, you would create a matte object that matches the building. You then place the animated object behind it. The bitmap image of the building appears, but the animated object is blocked until it moves from behind the matte object.

Matte objects, though invisible, can cast shadows.

Matte objects can also receive shadows. When the Matte/Shadow material's Affect Alpha check box is set, shadows cast on the matte object are applied to the alpha channel. This lets you render maps with alpha shadows that you can composite later. To properly generate shadows on a matte object, turn off the Opaque Alpha check box and then set the Affect Alpha check box.

MAXScript

MAXScript is the general-purpose scripting language for 3ds Max and related products. While it works the same for all products, some functions are specific to each. You can use MAXScript to automate many tasks, including modeling, animation, material construction, and rendering. You can also use MAXScript to add custom command-panel rollouts to the user interface.

The interface to MAXScript is on both the *MAXScript menu (page 3–823)* and the *Utilities panel (page 3–821)*.

Meshes

A mesh is the "skin" geometry that *Physique (page 2–927)* deforms. Physique will work on any point-based object, including geometric primitives, editable meshes, patch-based objects, NURBS, and *FFD space warps (page 3–1031)*. For NURBS and FFDs, Physique deforms the control points (control vertices), which in turn deform the model.

Metaballs

A type of object that joins itself to other objects with a connecting surface. When one metaball object moves within a certain distance of another, a connecting surface is formed between the two. Metaballs are ideal for simulating liquids and thick, viscous substances such as mud, soft foods, or molten metal.

You can create metaballs with the *BlobMesh compound object (page 1–326)*.

MFE Files

A MFE file contains a *motion flow graph (page 2–897)* and any scripts created for the graph. See *Saving, Loading, and Appending Motion Flow Graphs (page 2–883)*.

MI Files

The MI file (*.mi)* contains a mental ray scene description that a mental ray renderer can use to render your 3ds Max scene. When you render with the mental ray renderer, you can export to a text (ASCII) *.mi* file. (There is a binary *.mi* format as well. The mental ray renderer in 3ds Max does not generate this format.) The exporter always generates mi3 (mental ray version 3) format. It does not support mental ray version 1 (mi1).

You specify a name and location for the *.mi* file on the Render Scene dialog > Processing panel > *Translator Options rollout (page 3–115)*.

See the mental ray manual, *Programming mental ray,* for a complete description of the mental ray scene description language.

Mirroring

When working with a *biped (page 2–701)*, the Mirror control in the *Keyframing Tools rollout (page 2–816)* allows you to mirror the entire biped animation.

Mix

Data in the *Motion Mixer (page 2–581)* for a single biped. The term *mix* refers to the arrangement of elements in Motion Mixer (*clips (page 3–1069)*, *transitions (page 3–1121)*, *balance information (page 3–1008)*) as well as the result of the

arrangement. A mix is sometimes called a *raw mix* to distinguish it from a *mixdown (page 3–1067)*.

You can save a mix to a *MIX file (page 3–1067)*.

MIX Files

A MIX file contains data from the Motion Mixer, including information on *trackgroups (page 3–1118)*, *tracks (page 3–1117)*, *clips (page 3–1069)*, *transitions (page 3–1121)* and *balance information (page 3–1008)*. Compare with a *mixdown (page 3–1067)*, which contains the same data, but in a collapsed format; the data is no longer separated into tracks and clips.

You can save a MIX file in the Motion Mixer by choosing Mix menu > Save Mix File, or by clicking Save File on the Mixer rollout.

Mixdown

A mixdown is a collapsed version of data in the Motion Mixer. In general, a mixdown contains the same data as the *raw mix (page 3–1066)*, with one difference. During the process of computing a mixdown, any transitions involving planted feet are corrected to prevent the feet from sliding.

After a mixdown is computed, it is placed on its own track in the Mixer. You can turn the mixdown on and off by clicking it. When the mixdown is turned on, the biped performs the motions in the mixdown; when it is turned off, the biped does the motions in the raw mix. See *Exporting Animation to the Biped (page 2–601)*.

MNM Files

An MNM file (Marker Name file) is a **character studio** file format that matches custom names in a motion-capture *marker file (page 3–1063)* with the preset list of known, supported marker names that are recognized by bipeds. See *BVH Files (page 3–1014)* and *CSM Files (page 3–1019)* for descriptions of how thesse two motion-capture file formats work with MNM files.

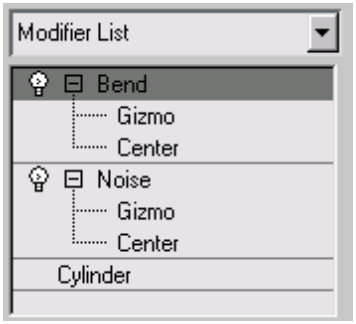
Modal/Modeless

Modal is a command state or dialog that affects all operations. You must change the mode or dismiss the dialog before doing any operations that don't pertain to that mode.

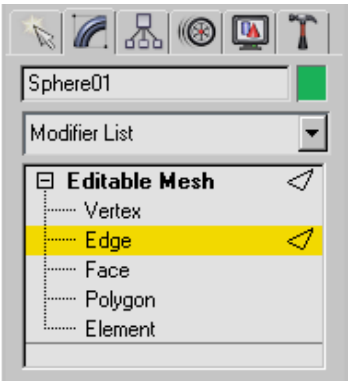
Modeless means a nonexclusive command state or dialog. You can do other operations and commands without changing the mode or dismissing the dialog.

For example, the Track View and Material Editor dialogs are modeless, while the Open File dialog is modal.

Modifier Stack



Example: Modifier stack display of cylinder with two modifiers applied to it



Example: Stack display of mesh showing its sub-object hierarchy, and Edge sub-object level chosen

The *modifier stack (page 3–802)* is the key to managing all aspects of object modification. You use the stack to:

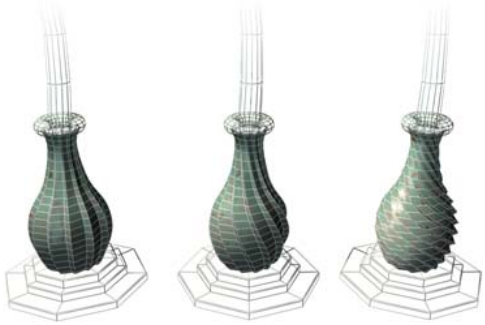
- View and manipulate the sequence of modifiers
- Find a particular modifier
- Adjust a modifier's parameters
- Select a modifier's gizmo or center
- Activate or deactivate a modifier
- Delete or disable a modifier

The effect of modifiers is directly related to their sequence, or order, in the stack.

Where you put a modifier in the stack is critical, because the program applies modifiers in their stack order, beginning at the bottom, and carries the cumulative change upward.

By clicking any entry in the stack, you go back to the point where you made that modification. You can then rework your decisions or discard the modification entirely by deleting it. You can also insert a new modifier in the stack at that point.

Modifiers



Example: effects of the twist modifier on an object

Modifiers (page 1–479), as the name implies, modify an object's geometrical structure, deforming it in some way. When you apply a *taper modifier (page 1–853)* to the end of a cylinder, for example, the vertices near the end move closer together. Modifiers make changes in the geometry that stay in effect until you adjust or delete the modifier.

Morphing

Morphing makes the clock appear to melt.

Morphing is a term derived from *metamorphosis,* which means to change physical shape or form.

The purpose of the morph object in 3ds Max is to create an animated object that changes shape by morphing between two or more objects. Although it appears that a single object is changing form, in reality the morphing process translates the position of the vertices from their arrangement in one object to the arrangement in another, relative to their local coordinate system.

Consequently, all objects chosen to make up a morph object must have the same number of vertices. Typically, you achieve this by cloning an object, and then altering the geometry of the clones without changing their vertex count.

Motion Blending

When working with *motion flow (page 2–878)*, transitions are used to blend clips together. By default, a transition is calculated with a method known as "minimum motion loss." If optimized transitions are used, then a sophisticated algorithm that minimizes foot sliding is used. This alternative method is computationally expensive.

Motion Blur

Motion blur enhances the movement of the sword.

Motion blur can enhance the realism of a rendered animation by simulating the way a real-world camera works. A camera has a shutter speed, and if significant movement occurs during the time the shutter is open, the image on film is blurred.

3ds Max provides a variety of ways to apply motion blur:

- *Image Motion Blur (page 3–1049)* applies motion blur to entire frames of an animation.
- *Motion Blur Rendering Effect (page 3–265)* lets you apply image motion blur as a *rendering effect (page 3–214)*.
- *Multi-Pass Rendering Effect (page 2–1227)* applies motion blur to frames by offsetting the camera in multiple rendering passes. You can preview multi-pass rendering effects in camera viewports.
- *Particle Motion Blur (page 2–236)* uses a material map to blur moving particles in a particle system.
- *Scene Motion Blur (page 3–1101)* lets you apply motion blur as a *Video Post (page 3–307)* effect.
- *Object Motion Blur (page 3–1075)* applies motion blur to specified moving objects in a scene. Object motion blur is best for making fast-moving objects appear to move more smoothly.

Motion Capture

The process of digitizing the movements of a live "actor" or "talent." This requires a motion-capture device.

Motion Clip

A motion clip is a sequence of motion on a biped or other objects. A motion clip can be a BIP file, or a portion of a 3ds Max animation used in a crowd sequence.

BIP files used in *Motion Flow (page 3–1070)* and the *Motion Mixer (page 3–1070)* are called *motion clips*. You can use these tools to combine several motion clips and make a longer or different animation. A BIP motion clip can be created by *saving animation (page 2–774)* you have made on the biped, or by *importing motion-capture data (page 2–912)*.

When you create a *crowd animation (page 2–1006)* that uses *motion synthesis (page 3–1071)* on non-biped objects, a *motion clip* is a portion of a 3ds Max animation used by the synthesis. You specify that a range of frames in the animation is to be used when the delegate meets certain criteria, such as turning upward to exceed a certain pitch.

One animation sequence can contain all the motion clips necessary to animate the crowd. For example, a bird animation might have three motion clips: flap, glide, and land. You could specify that when the delegate is pitched upward, the range of frames that animate the flap motion are used in the simulation. Motion clips are used by the *Global Motion Clip Controller (page 3–1044)* and the *Master Motion Clip Controller (page 3–1063)*.

Motion Files

character studio can load these types of motion files:

- *BIP files (page 3–1010)*
- *BVH files (page 3–1014)*
- *CSM files (page 3–1019)*

Motion Flow

In *Motion Flow mode (page 2–878)*, you combine *BIP files (page 3–1010)* to create longer character animation. You also use motion flow along with *crowd animation (page 2–1006)* to automatically generate crowd behavior.

One motion can transition into another. To generate a transition, **character studio** uses either velocity-interpolated transitions ("minimum motion loss"), or an algorithm to minimize sliding feet.

Motion Flow Editor

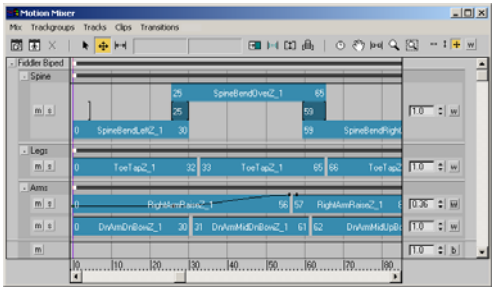
In *Motion Flow mode (page 2–878)*, the Motion Flow Editor allows you to manually create a transition between two clips. You set the start frame and transition duration for both clips, and the orientation of the destination clip.

Motion Flow Scripts

When using *motion flow (page 2–878)*, a script is a sequence of motion files that are played to create a character's motion. Scripts are created either manually or automatically.

Motion Mixer

The Motion Mixer is a window where you can mix motion clips (BIP files) on a biped. The clips are placed on various *tracks (page 3–1117)* within the mixer.



In the Motion Mixer, you can use *trackgroups (page 3–1118)* to affect different body parts with

different clips. Each trackgroup can contain *transition tracks (page 3–1121)* and *layer tracks (page 3–1055)*, which hold the motion clips.

Each biped in the Motion Mixer is assigned a *balance track (page 3–1008)*, which automatically compensates for differences in balance between upper and lower body motion.

To make the motion in the Mixer affect the biped in the scene, you must turn on Mixer Mode in the *Biped rollout (page 2–791)*.

See *Working with the Motion Mixer (page 2–581)*.

Motion Synthesis

In *crowd animation (page 2–1006)*, motion synthesis is the process of animating bipeds by combining motions (clips) automatically. Clips are added to the Motion Flow Graph, and transitions are created between appropriate clips. In the Crowd system, delegates are animated. During synthesis (solving the motion), the delegates' speed and direction are analyzed by **character studio**. Based on the analysis, clips are selected to animate the bipeds.

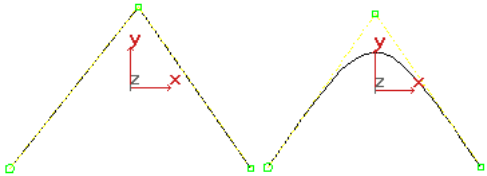
MSP (MAXScript Package) Files

A MAXScript Package (MSP) combines the set of files that make up a scripted tool into a single file. An MSP file can contain bitmaps, script sources, icons, and so on.

For more information about MSP files, see the MAXScript Reference: Help menu > MAXScript Reference

Multiplicity

In NURBS modeling, multiplicity is the property of coincident or nearly coincident CVs that reduces the continuity level of the curve or surface. Two coincident CVs locally increase curvature. Three coincident CVs (or more) create an angular cusp. Fusing CVs shows the effect of multiplicity.

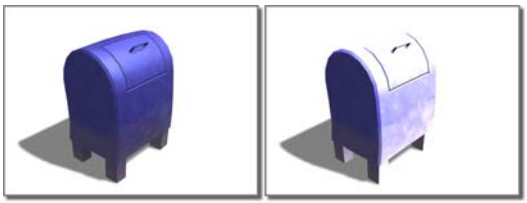


Effects of multiplicity:

On the left, three coincident CVs create a sharp angle.

On the right, only two coincident CVs in the same location create a gentler curve.

Multiplier

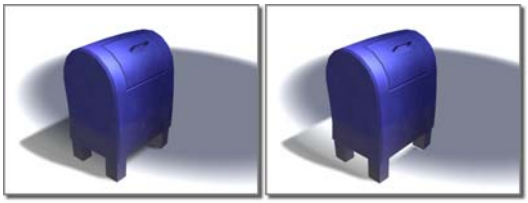


Left: Default light multiplier of 1.0

Right: Multiplier of 5.0 causes burned colors

The Multiplier value in every light lets you increase the intensity, or brightness of the light beyond its standard range.

Since increased Multiplier values tend to wash out, or "burn" portions of the image, you're better off adding lights, or reducing the intensity of other lights when you need to adjust the brightness of areas in your scene. Remember that you can adjust the intensity of a light using its V(alue) spinner. In most cases, it's better to adjust the V spinner than to alter the default Multiplier value.



Left: Spotlight with negative multiplier subtracts light from the scene.

Right: Multiplier of 0 and a negative density on a shadow whose color is white creates the effect of a negative shadow.

An unusual characteristic of the Multiplier is that you can use negative values to create negative light. You can use negative lights to further control the lighting in your scene. For example, you might want a darker area in the corner of a room.

A negative Multiplier value reverses the color of the light, so a red light would become cyan (the complementary color). In addition, the map image in a projector light becomes a negative image.

Multiplier Curve

Multiplier curves are special function curves that you use to apply animated value displacements to other function curves.

When you edit keys and function curves, you apply localized changes to your animation at specific times. By applying a multiplier curve to the original track, you affect the entire range of the original animation.

A multiplier curve shifts the value of the original track up or down. At a given frame, the value of a multiplier curve is a scale factor applied to the value of the original function curve.

- The default value of a Multiplier curve is a horizontal line with a value of 1.0.
- Values greater than 1.0 increase the value of the function curve.
- Values below 1.0 decrease the value of the function curve.
- Values less than 0.0 negatively scale the value of the function curve.

See also

Ease Curve (page 3–1025)

N Links

In *Physique (page 2–927)*, by default, any number of overlapping envelopes can influence vertices. This is specified by the N Links option on the *Vertex-Link Assignment rollout (page 2–974)* of the Physique Initialization dialog, or at the *Vertex sub-object level (page 2–1001)*.

Typically, N Links is the preferred choice. For special purposes, such as developing for a game engine that has limited support of overlap, you can limit the number of links (with their envelopes) that can affect a vertex.

Network Manager

The Network Manager service (Network Manager) is a service that must be installed on at least one computer in each group of computers that will participate in network rendering.

The Network Manager communicates with a specified group of Network Rendering Servers to assign jobs and monitor rendering progress. The Network Manager also handles the scheduling of jobs and the configuration of servers through the Queue Monitor client.

It's often best to place the Network Manager on a computer that isn't in use as a workstation and isn't shut down regularly. The Manager Service can impact CPU and network performance when network rendering is taking place, and the Network Manager must be present at all times for network rendering to work.

The ideal place to install the Network Manager is on a file server. If you have a PC already set up as a texture-map file server, this would be an ideal place for it.

You specify which PC is to be the Network Manager in the Network Job Assignment dialog, a subdialog of the Render Scene and Video Post Execute Sequence dialogs.

Network Rendering

Network Rendering is the rendering of animations using more than one computer connected by a network.

Large and complex animations take many hours to render, even on the fastest PCs. Network rendering allows you to use the power of other computers to speed up the process. Any network-connected PCs that have the software installed can participate. You can even render using computers connected only by the Internet.

Setting up network rendering involves installing three kinds of programs:

- The Network Manager, which should be installed on a central file-server PC.
- The Network Rendering Server, which must be installed on all participating PCs.
- The Queue Monitor client provides a user-interface to monitor and control network rendering. It can be installed on any of the participating PCs.

Network Rendering Server

The Network Rendering Server must be running on any computer dedicated to rendering a job remotely.

The Server communicates with the Network Manager and starts the program on that computer to render network processes. The Server has no user interface itself, but you can set various options for it from the Queue Monitor client. For example, you can specify the times of day that the Server is available to do network rendering.

You specify which PCs are to be servers in the *Job Assignment dialog (page 3–184)*, a subdialog of Render Scene.

Newton

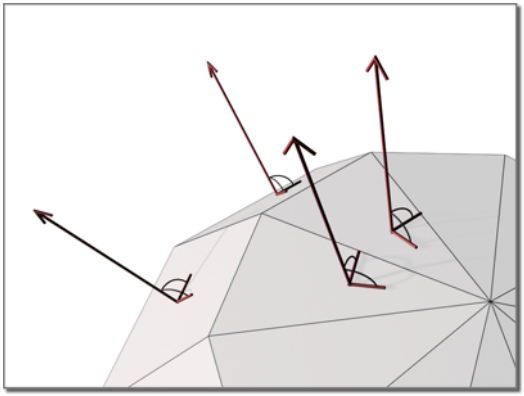
In the metric system, the newton is the unit of force required to accelerate a mass of one kilogram one meter per second. In 3ds Max, you can use the newton in dynamic simulations with objects such as the *spring (page 1–376)* and *damper (page 1–372)*.

Node

Every entity in a 3ds Max scene is represented in Track View and Schematic View as a node. The node track acts as a container for the object's geometry, its transforms, assigned materials and modifiers, and so on. The node track in Track View can be collapsed, so all the associated components are hidden. This speeds the navigation of the Track View hierarchy list. Nodes also provide the building blocks for hierarchies. Parent/child relationships are created by linking objects node-to-node.

"Node" is distinct from the term "object," because the "object" refers more narrowly to geometry: the mesh, or NURBS surface, spline, or patch, and so on. The same instance of an object (mesh) can be shared by multiple nodes, but each node in the scene is unique.

Normal



The normal of each face can point in a different direction.

A normal is a vector that defines which way a face or vertex is pointing. The direction of the normal indicates the front, or outer surface of the face or vertex.

You can manually flip or unify face normals to fix surface errors caused by modeling operations or by importing meshes from other programs.

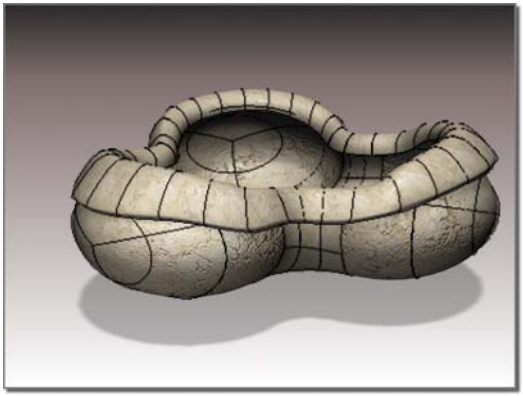
See also

Normal modifier (page 1–738)

NTSC

NTSC (National Television Standards Committee) is the name of the video standard used in North America, most of Central and South America, and Japan. The frame rate is 30 frames per second (fps) or 60 *fields (page 3–1032)* per second, with each field accounting for half the interleaved scan lines on a television screen.

NURBS



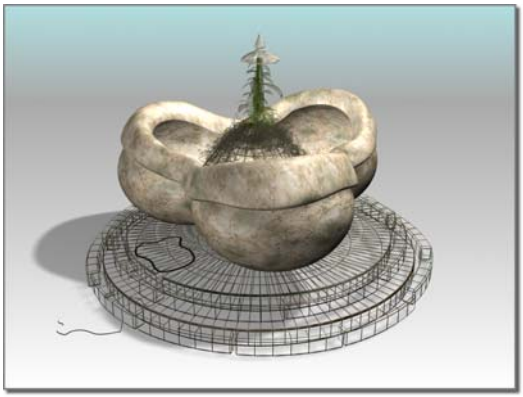
Fountain basin modeled as a NURBS surface

NURBS (Non-Uniform Rational B-Splines) are a technique for interactively modeling 3D curves and surfaces.

NURBS Curve

A curve object created by *NURBS modeling (page 3–1074)*. NURBS Curves can be either Point Curves or CV Curves. You can use them as you do spline curves in Shape objects.

NURBS Model



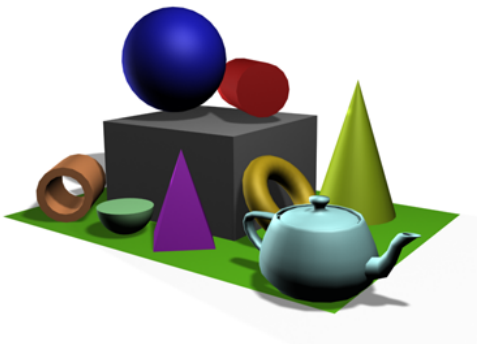
Fountain modeled using NURBS surfaces

A *NURBS object (page 3–1074)* consisting of one or more sub-objects. The 3ds Max documentation uses "NURBS model" to emphasize the final result of NURBS modeling using a variety of sub-objects and techniques.

NURBS Surface

A surface object created by *NURBS modeling (page 3–1074)*. NURBS Surfaces can be either Point surfaces or CV Surfaces.

Object



An assortment of geometric primitive objects

"Object" means an object in the scene, such as primitive geometry like boxes and spheres, more complex geometry such as Booleans, and so on. Geometric objects are renderable. A scene can also contain non-renderable objects such as lights, cameras, helpers, and space warps.

You add objects to a scene by selecting the Create menu or from the Create panel.

Object Instance

In 3ds Max, an instance is a completely interchangeable clone of the original object. Modifying an instanced object is the same as modifying the original.

Instances are not only alike in geometry, but also share modifiers and materials. When you change one instance by applying a modifier, for example, all the other instances change with it.

Each instance has its own set of transforms, object properties, and space warp bindings. These are not shared among instances.

Within 3ds Max, instances derive from the same master object. What you're doing is applying a single modifier to a single master object. In the viewport, what you see as multiple objects are multiple instances of the same definition.

For example, if you wanted to create a school of swimming fish, you might begin by making many instanced copies of a single fish. You could then animate the swimming motion by applying a Ripple modifier to any fish in the school. The whole school would swim with exactly the same motions.

Object Motion Blur

Object motion blur applies a blur effect to make fast-moving objects appear to move more smoothly in animations. It is a form of "temporal antialiasing."

Left: Object motion blur. Right: Object motion blur with dithering.

Tip: Don't use object motion blur to simulate the blur created by a camera. For this purpose, use *image motion blur (page 3–1049)* or *scene motion blur (page 3–1101)*.

Applying object motion blur is a two-step process:

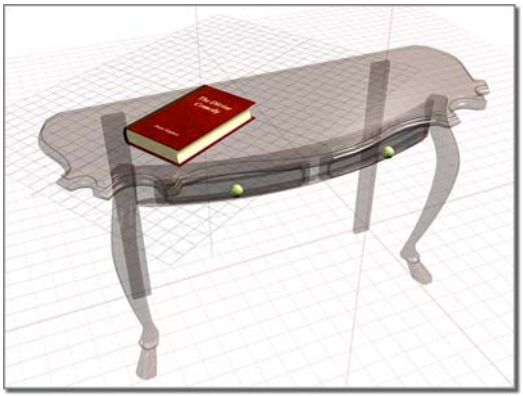
1. Turn on object motion blur for the object you want to blur, using the *Object Properties dialog (page 1–111)*.

   You cannot apply both image motion blur and object motion blur to the same object in the same rendering.

2. Before you render, turn on object motion blur in the *Default Scanline Renderer rollout (page 3–37)* of the Render Scene dialog.

Object motion blur works by rendering multiple copies of the object in between frames and then rendering them together. It is not affected by camera movement.

Object Space



A book in object space rests on a table in world space.

Object space is the coordinate system unique to each object in your scene. It tracks the location of everything applied to an object. The location of object vertices, the placement of modifiers, mapping coordinates, and materials are all defined in object space. By convention, especially in discussions of texture mapping, object-space coordinates are expressed as UVW coordinates, as opposed to the XYZ coordinates of *world space (page 3–1130)*.

Each object has its own local center and coordinate system as defined by the location and orientation of the object's pivot point. The local center and coordinate system of an object combine to define its object space.

When you choose Use Pivot Point Centers from the toolbar or Use Pivot Points from the Modifier List, you are telling the program to use the Object Space origin of one or more selected objects as the center of a transform or modifier effect.

When you choose Local from the *Reference Coordinate System list (page 1–423)* (on the main toolbar), you tell the program to use a selected object's object space for the orientation of the active coordinate axes.

Most *modifiers (page 3–1068)* operate in object space. See *Object-Space Modifiers (page 1–537)*.

Object Space (Biped)

When you use *freeform animation (page 3–1039)* to animate a biped, you can place a biped limb into the space of another object, or into world space. For example, if the biped's hands are in the space of a ball, then wherever the ball moves the hands move with it. If the biped's feet are in world space, then when you move the center of mass, the feet stay planted in the same location.

Obstacle-Avoidance Behavior

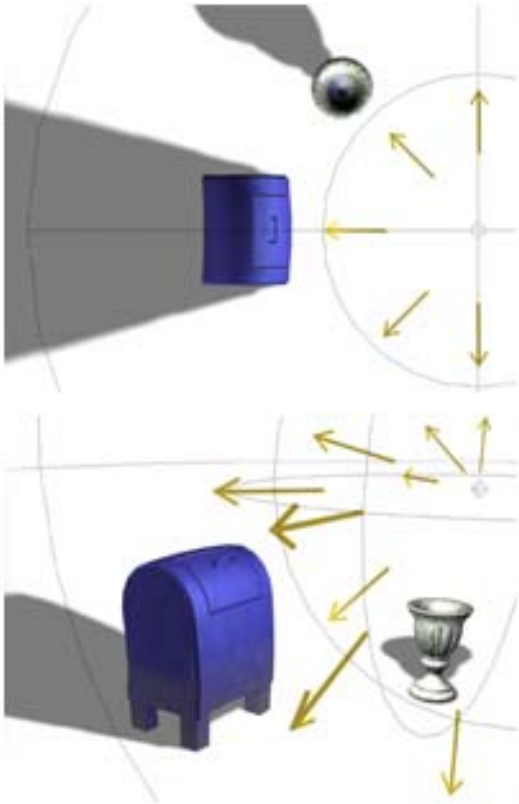
In *crowd animation (page 2–1006)*, an important part of crowd behavior is avoidance of obstacles. Think of an obstacle as anything that impedes a crowd member's progress. Examples of obstacles include walls, telephone poles, and fences, as well as other crowd members. Encountering such objects can cause avoidance behavior, which consists of any combination of slowing down, turning, and stopping.

Object-Space Modifiers

Object space is the coordinate system unique to each object in your scene. An object-space modifier, as opposed to a *world-space modifier (page 3–1130)*, directly affects an object using the object's local coordinates.

Object-space modifiers appear directly above the object in the *modifier stack (page 3–1067)*, and their effect can depend on the order they appear in the stack.

Omnidirectional Light



Above: Top view of an omni light

Below: Perspective view of the same light

Omnidirectional (omni) lights are *standard light objects (page 2–1142)* that provide a point source of illumination that shoots out in all directions. They're easy to set up, but you can't restrict the focus of their beam. You can, however restrict which objects are illuminated by an omni light.

When no lights exist in your scene, two invisible omni lights are turned on by default to provide overall illumination in the scene. However, as soon as you create your own light in the scene, the two default lights are turned off.

You can apply attenuation to omni lights.

Omniflector

A *space warp (page 3–1108)* that deflects particles. Omniflectors are also capable of refracting particles and generating spawned particles.

Three kinds of space warps are in the omniflector category:

POmniFlect Space Warp (page 2–74)

SOmniFlect Space Warp (page 2–80)

UOmniFlect Space Warp (page 2–81)

See also

Dynaflector (page 3–1025)

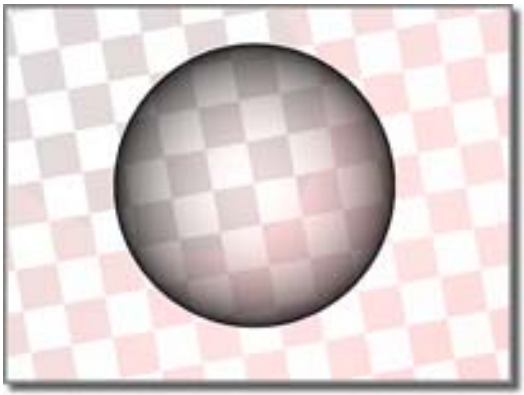
Opacity Falloff

Real transparent surfaces vary their opacity, depending on the angle of the material to your point of view. For example, a bottle appears more transparent at its center than at its edge because you're looking through more glass at its edge.

In the Extended Parameters rollout, you can specify the falloff of the transparency, based on the angle of the face normals to the view. If a face is perpendicular to the viewer, the angle of its normal is 0 degrees. If the face is edge-on to the viewer, its normal angle is 90 degrees.

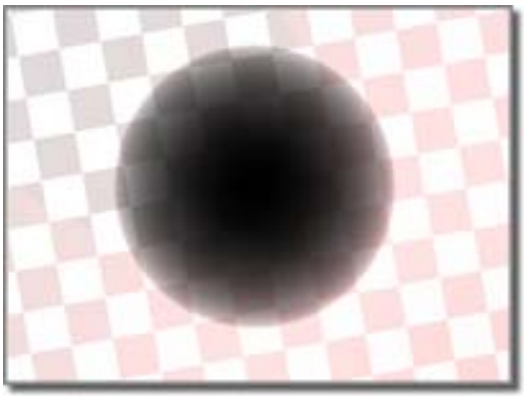
Falloff is either inward or outward:

In—Transparency increases as the normal angle approaches 0 degrees and decreases as the angle approaches 90 degrees. This gives the appearance of a hollow object such as a glass ball or bottle.



Inward opacity falloff
Top: None
Bottom: 100%

Out—Transparency increases as the normal angle approaches 90 degrees and decreases as the angle approaches 0 degrees. This gives the appearance of a solid object such as a cloudy glass marble.



Outward opacity falloff
Top: None
Bottom: 100%

The falloff amount never makes the object less opaque than the value of the Opacity spinner. For example, if Opacity were set to 50, and Falloff set to In, the inner portions would remain at 50 percent opacity, and the Amt. spinner would change the outer edges, until they became opaque at 100.

Operand

An operand is one of a set of objects upon which an operation such as *Boolean (page 1–333)* is to be done. The Boolean operation takes two operands: the first operand is called operand A, and the second operand is called operand B.

Operator

In *Particle Flow (page 2–105)*, the operator is the basic element of the particle system; you combine operators into *events (page 3–1029)* to specify the particles' characteristics over a given period of time. Operators let you describe particle speed and direction, shape, surface properties, and more.

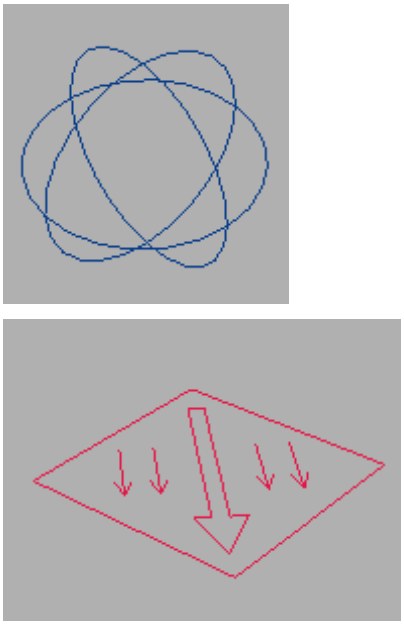
A list of all operators in Particle Flow is available in the *Operators topic (page 2–138)*.

See also

Test (page 3–1115)

Operator Icon

In *Particle Flow (page 2–105)*, adding a *Find Target test (page 2–214)* or a *Speed By Icon operator (page 2–158)* to a particle system creates a special viewport icon used by the action. This icon is known as an operator icon. In the 3ds Max scene, an operator icon functions as a Helper object, and, in fact, you can also add these two actions from the Create panel by choosing Helpers > Particle Flow.



Find Target icon (top); Speed By Icon icon (bottom)

Optical Markers

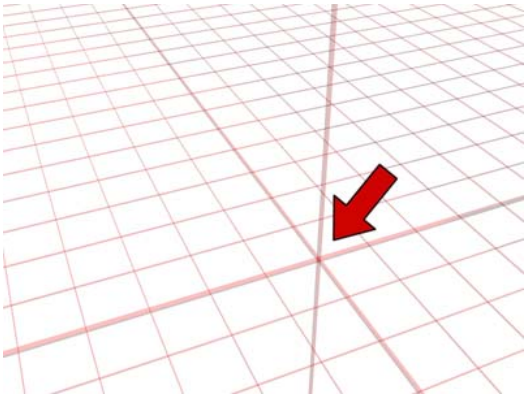
Reflective markers used by certain motion-capture equipment. In a motion-capture session, markers are reflective objects placed on the "actor" or "talent." The markers enable motion-capture hardware to record the position of various parts of the talent's body while performing motions.

Orientation Behavior

In *crowd animation (page 2–1006)*, the Orientation behavior lets you control whether and how delegates rotate, independent of their direction of motion. Normally, a delegate always faces in the direction it's moving. You can use the Orientation behavior to specify limits to the delegate's rotational activity without affecting its path, which is generated by other behaviors. Use these settings, for example, to keep delegates facing in one direction while moving in another.

Note: These settings do not affect the path a delegate takes, which is produced by other behaviors such as Seek and Avoid. Orientation influences only the direction the delegate faces as it traverses the path.

Origin



Origin is the 0,0,0 point where the X, Y, and Z axes intersect.

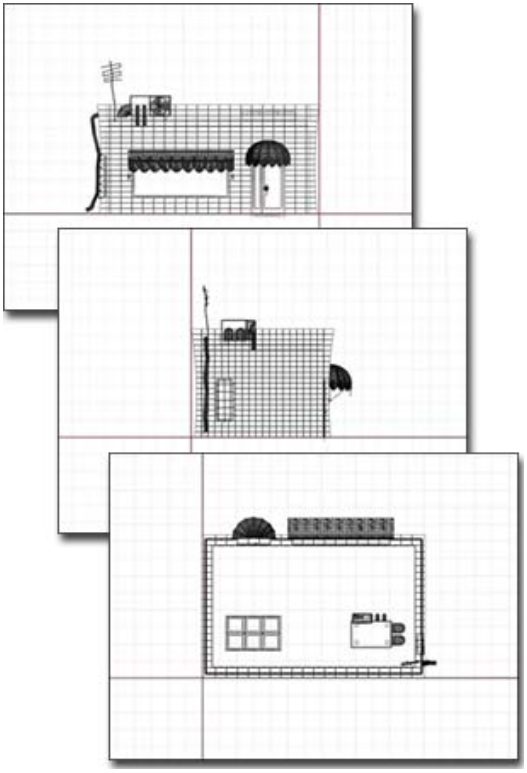
A coordinate system assigns an arbitrary point in space as the origin, and sets each axis at that point to zero.

In the *world coordinate system (page 3–1129)*, numbers increase from the origin to the right along the X axis, upward along the Y axis, and away from you on the Z axis. Numbers decrease (–1, –2, –3, and so on) to the left along the X axis, downward along the Y axis, and toward you along the Z axis. The distance between each whole number is called a unit of measurement (a 3ds Max unit).

You can combine the measurements of all three axes to mark specific locations in 3D space. The combined measurements are called coordinates. Thus, at the origin, the coordinates are X=0, Y=0, Z=0, which can be expressed more simply as the vector (0,0,0).

From the origin, the coordinates at a location 100 units to the right, 150 units up, and 60 units away are X=100, Y=150, Z=60, or (100,150,60).

Orthographic View



Orthographic views of a model

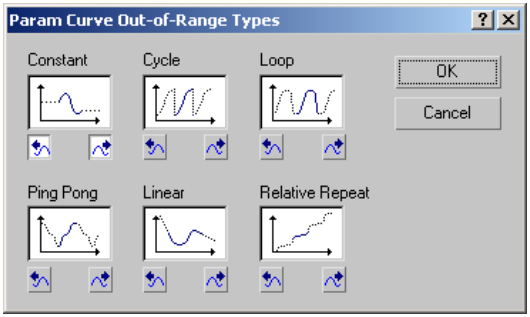
Whether produced on computer or paper, most 3D design relies on 2D representations for accurate description of objects and their positioning. Maps, plans, cross-sections, and elevations are all examples of 2D representations. Each of these views represents an *orthographic view*. In familiar terms, you might think of these views as "flat" or "straight-on," or as "looking at right angles."

Orthographic views are two-dimensional, each defined by two world coordinate axes. Combinations of these axes produce three pairs

of orthographic views: top and bottom; front and back; left and right.

Orthographic views are a special case of *axonometric views (page 3–1007)*. You can set viewports to the various orthographic views using the *viewport right-click menu (page 3–774)* or *keyboard shortcuts (page 3–911)*.

Out-of-Range Types



When you specify values and keys for a controller, you are defining animation over a range of time. You choose Out-of-Range Types to determine how the animation continues outside a specified range. Out-of-Range choices include holding a constant value, and various ways of repeating the animated range.

The easiest way to work with Out-of-Range Types is in the Track View Function Curve mode.

You use the Parameter Out-of-Range dialog to project the pattern of the key dots in the selected track. These patterns are applied to the animation outside the range of all keys in the track. This is why they're called out-of-range types.

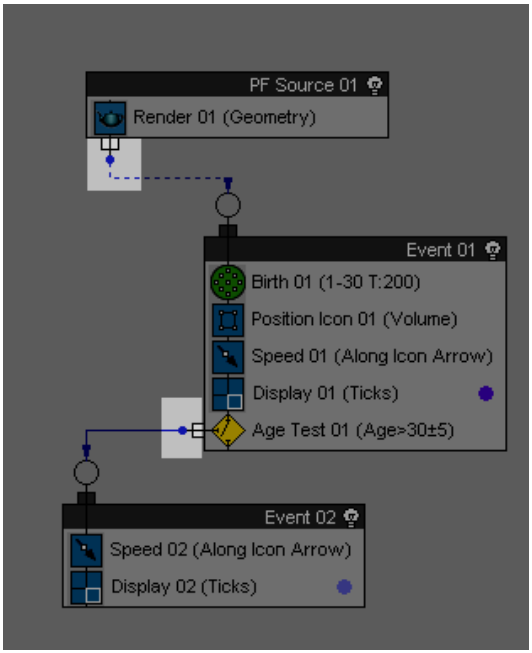
By default, tracks use a constant out-of-range type. This means that the track values before and after the range of keys remain constant. For example, in a 100-frame animation with keys up to frame 20, the X, Y, and Z values after frame 20 remain the same for the rest of the animation. The objects in this example do not move from frame 20 to frame 100.

Applying the Cycle out-of-range type will make the key pattern in frames 0–20 repeat cyclically for the remaining 80 frames.

Outputs: Source / Test

In Particle Flow, you create a *particle diagram (page 3–1083)* by connecting *events (page 3–1029)* using *wires (page 3–1127)*. Each wire links an output with an *event input (page 3–1051)*. There are two different types of outputs: ;

- The connector sticking down from the bottom of a *global event (page 3–1043)* is a source output.
- The connector sticking out from the side of a *test (page 3–1115)* is a test output.



Source output (above); test output (below)

Overshoot

Above: No overshoot

Below: Overshoot turned on

The Overshoot option causes a spotlight to flood beyond its falloff area, and cast light in all directions. With Overshoot turned on, the spotlight casts light in all directions but casts shadows only within its falloff cone.

The Overshoot control effectively turns the spotlight into a hybrid between an Omni light and a spotlight. With Overshoot set, the spotlight casts light in all directions as an Omni light does but still casts shadows or projections as other spotlights do. The shadows and projections are limited to the falloff region: outside the cone of the spotlight, Overshoot casts light but does not cast shadows or projections.

Overshoot is useful when you want to light a large area but need to cast shadows in only a small part of that area. Set the falloff to include the area where shadows must appear, and then turn on Overshoot to light the rest of the scene. This technique can reduce the size of shadow maps and thereby improve rendering speed.

PAL

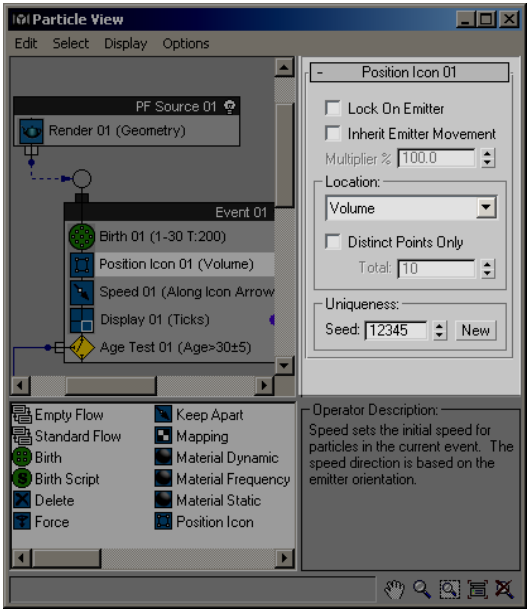
PAL (Phase Alternate Line) is the video standard used in most European countries. The frame rate is 25 frames per second (fps) or 50 *fields (page 3–1032)* per second, with each field accounting for half the interleaved scan lines on a television screen.

Parameter Space

In addition to their existence in 3D space, NURBS objects have a parameter space that includes the array of knot values. NURBS curves have a single U dimension in parameter space. NURBS surfaces have two dimensions, UV, in parameter space.

Parameters Panel

The parameters panel, found to the right of the *event display (page 3–1029)* in *Particle View (page 2–121)*, displays the parameters of any action whose name you click in the depot. The panel uses the same format and editing methods as the command panel in 3ds Max. Display of the parameters panel can be toggled with the Particle View menu command Display > Parameters.



Parameter/Parametric

A tube is one example of a parametric object. Varying its parameters creates varying geometry.

A *parameter* is a setting or value that you can change. Many objects in 3ds Max have parameters that you can change to alter the size or shape of the object. This type of object can be described as *parametric*.

Unlike physical building blocks, which have a fixed shape and size, the geometric primitives (box, sphere, torus, and so on) are parametric; you can change their dimensions, segment settings, and other features after you create them. Parametric objects respond to changes in their parameters by dynamically updating their properties.

Changing a parameter can dramatically alter the structure and appearance of an object. For example, you can turn a cylinder into a prism by reducing the number of sides and turning the Smooth option off. Alternately, you can turn a cone into a four-sided pyramid using the same technique.

Objects that you merge from other scenes or from Autodesk VIZ allow you to access parametric values. Objects in drawings that you link from Autodesk Architectural Desktop should be edited in Architectural Desktop, then relinked to 3ds Max with the *File Link Manager (page 3–431)*.

You can animate almost all creation parameters for geometric primitives, and interactively change their settings during animation playback.

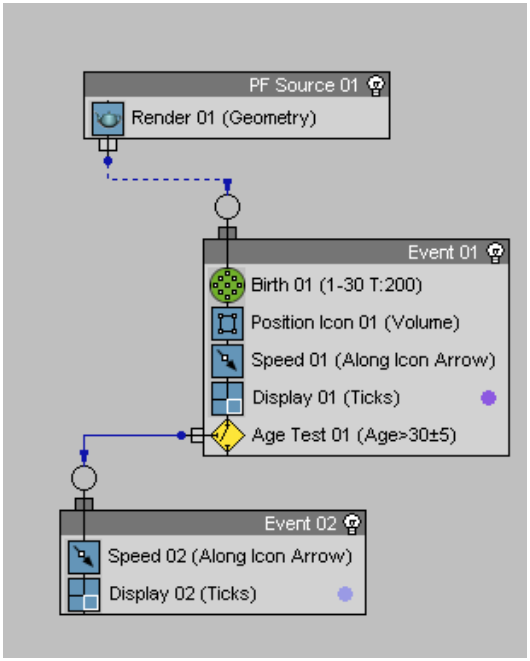
Parent Particle

A parent particle is an existing particle from which the particle system generates *spawn particles (page 3–1108)*. You can use the *Spawn test (page 2–226)* to create spawn particles arbitrarily, or the *Collision Spawn test (page 2–211)* to create spawn particles as the result of physical interaction between a parent particle and a deflector.

Particle Diagram

The particle diagram is the graphical depiction of the *particle system (page 3–1084)* in *Particle View (page 2–121)*. It uses *events (page 3–1029)* and *wires (page 3–1127)* to represent the system's

elements and logic. You edit the system by clicking *actions (page 3–997)* and events in the diagram and changing their values, by adding new actions and events, and by creating wires between events.



Particle Level

In Particle Flow, you can select particles at the *Event level (page 3–1030)* or at the Particle level, using controls on the Modify panel > *Selection rollout (page 2–134)*. At the Particle level, you select particles using standard 3ds Max methods, such as clicking or dragging a region. A Particle-level selection can be acted upon by the *Delete operator (page 2–142)* and the *Split Selected test (page 2–231)*.

Particle System

Particle systems are objects that generate non-editable sub-objects, called *particles,* for the purpose of simulating snow, rain, dust, and so on.

The particle system object generates the particles over time. You use particle systems primarily in animations.

3ds Max provides several built-in particle systems, including Spray and Snow. Your configuration might have other plug-in particle systems installed.

The Deflector, Gravity, and Wind space warps are for use with particle systems. (Gravity and Wind also work with Dynamics.)

3ds Max also offers an event-driven particle system called *Particle Flow (page 2–105)*.

Particle System (Particle Flow)

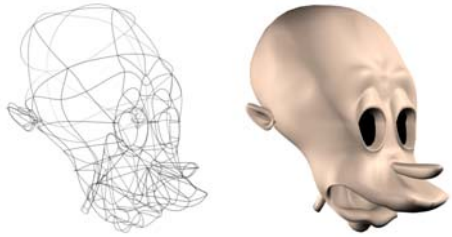
A particle system in Particle Flow consists of all *flows (page 3–1036)* defined in Particle View, as well as parameters defined for all *Particle Flow sources (page 2–131)*. In effect, it's the totality of settings in Particle Flow.

PASS File

A PASS (*.pass*) file saves the result of a single *mental ray rendering (page 3–77)* pass. You can create a final rendering by merging multiple passes. The PASS file format includes Z-buffer information to aid in merging passes.

Controls for creating and merging PASS files are on the Render Scene dialog > Processing Panel > *Translator Options rollout (page 3–115)*.

Patch



Example of a patch model

A patch is a type of deformable object. A patch object is useful for creating gently curved surfaces, and provides very detailed control for manipulating complex geometry.

When you apply an *Edit Patch modifier (page 1–617)* to an object or convert it to an *editable patch (page 1–950)* object, the software converts the object's geometry into a collection of separate Bezier patches. Each patch is made up of three or four vertices connected by edges, defining a surface. Patches also have interior vertices that you can control, or let the software control for you.

You control a patch surface's shape by manipulating the vertices and edges. The surface is the renderable geometry of the object.

Patch-Based Objects

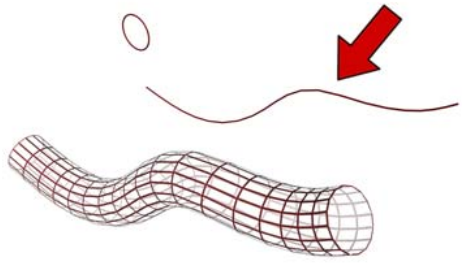
Objects made from patches. *Physique (page 2–927)* can work with meshes, patches, NURBS, splines, and FFD space warps.

Path

A path is the line (or other shape) along which shapes are lofted to create 3D *Loft objects (page 1–347)*.

The *Path constraint (page 2–380)* also lets you assign a line or other shape as a *motion path*. A motion path is a form of *trajectory (page 3–1119)*.

Get Path (Lofting)



A circle is lofted along a path to construct a tubular shape. Get Path chooses the path spline

You use Get Path as a loft creation method when you want the path to move to the location of the selected shape. For example, you use this method if you have created a shape at the exact location where you want the base of your loft object to be. You use Get Path to create a loft at that location.

Get Path causes the path shape to move and rotate to align itself with the first shape on the path:

- The first vertex on the path is located at the first shape's pivot point.
- The tangent to the first vertex on the path is aligned with the positive Z axis of the first shape.
- The local Z axis of the path is aligned with the local Y axis of the first shape.
- The local coordinate system of the resulting loft object equals the local coordinate system of the path after it has been aligned with the first shape.

Sometimes, aligning the tangent of the path with the positive Z axis of the first shape does not

produce the result you want. You can flip the orientation of the path by pressing CTRL while getting the path. Pressing CTRL aligns the path so that the tangent to the first vertex of the path is aligned with the negative Z axis of the shape.

Path Follow Behavior

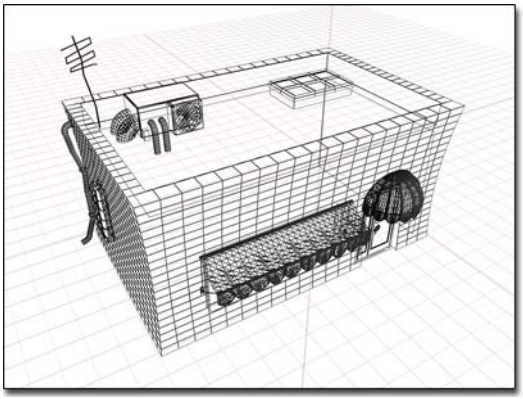
In *crowd animation (page 2–1006)*, the Path Follow behavior lets you direct delegates to traverse a specified path during a crowd simulation. Delegates can move forward or backward along paths, and when they reach the end, they can loop back to the start or reverse direction, or even continue in the same general direction.

If the delegate's start position isn't on the path at the start of the simulation, it moves to the path before following the path. During the solution, **character studio** intermittently displays an optional *target* icon to show the delegate's immediate goal; this changes as the simulation proceeds.

Period

When you animate a biped, a freeform period is a period between footsteps where you can animate the biped any way you want. *Biped dynamics (page 3–1010)* are suspended during this period. See *Freeform Animation Between Footsteps (page 2–741)*.

Perspective View



Perspective view of the ice-cream shop

Perspective views most closely resemble human vision. Objects appear to recede into the distance, creating a sense of depth and space. For most 3D computer graphics, this is the view used in the final output that the client sees onscreen or on the page.

There are three ways to create a perspective view in a viewport: perspective view, camera view, and light view.

A perspective viewport, labeled Perspective, is one of the default viewports. You can change any active viewport to this eye-like point of view by pressing the keyboard shortcut **P**.

A camera view requires that you first create a camera object in your scene. The camera viewport tracks the view through the perspective of that camera. As you move the camera (or target) in another viewport, you see the scene swing accordingly. If you alter the camera's field of view on the Modify command panel, you see the changes as they are applied.

The light view works much like a targeted camera view. You first create the spotlight or directional light and then set the viewport to that light. What you see in the viewport is the view from the light looking into the scene. This is very useful for

adjusting the correct distances of hotspot and falloff for the light.

Phases of Leg Motion

A leg's motion has four phases, beginning with the foot on the ground. Then the foot lifts, moves through the air, and returns to the ground again. Biped divides this motion into four phases, as follows:

- **Touch**—Occurs at the leg keyframe where the leg's foot first touches the ground and always corresponds with the start frame of a footstep in Track View — Dope Sheet.
- **Plant**—Occurs after touching, and before lifting. It is always in between the start and end frames of a footstep in Track View — Dope Sheet.
- **Lift**—Occurs at the keyframe where the leg's foot lifts off the ground, and always corresponds to the end frame of each footstep in Track View — Dope Sheet.
- **Move**—Occurs while the foot is in the air and is always in the intervals in between steps in Track View — Dope Sheet. In walking, while one foot moves, the body is supported by the other leg. In running or jumping, while a foot moves there is a period where the body is not supported, and moves in midair.

Photometry

When you use *photometric lights (page 2–1155)*, 3ds Max provides physically based simulation of the propagation of light through an environment. The results are not only highly realistic renderings, but also accurate measurements of the distribution of light within the scene. The measurement of light is known as *photometry*. This topic introduces the quantities used for defining and measuring light.

There are several theories that describe the nature of light. For this discussion, we define light as radiant energy capable of producing a visual sensation in a human observer. When we design a lighting system, we're interested in evaluating its effect on the human visual response system. Thus photometry was developed to measure light, taking into account the psychophysical aspects of the human eye/brain system. Four photometric quantities are used in the lighting simulation system:

- Luminous flux
- Illuminance
- Luminance
- Luminous intensity

Luminous flux is the quantity of light energy per unit time arriving, leaving, or going through a surface. The unit of luminous flux is the lumen (lm), which is used in both the International System (SI) of Units and in the American System (AS) of Units. If we think of light as particles (photons) moving through space, then the luminous flux of a light beam arriving at a surface is proportional to the number of particles hitting the surface during a time interval of 1 second.

Illuminance is the luminous flux incident on a surface of unit area. This quantity is useful for describing the level of illumination incident on a surface without making the measurement dependent on the size of the surface itself. The SI unit of illuminance is the lux (lx), which is equal to 1 lumen per square meter. The corresponding AS unit is the footcandle (fc), equivalent to 1 lumen per square foot.

Part of the light incident on a surface is reflected back into the environment. The light reflected off a surface in a particular direction is called luminance, the quantity that is converted to display colors to generate a realistic rendering of the scene. Luminance is measured in candelas per

square meter or candelas per square inch. The candela was originally defined as the luminous intensity emitted by a single wax candle.

Finally, luminous intensity is the light energy per unit time emitted by a point source in a particular direction. The unit of measure of luminous intensity is the candela. Luminous intensity is used to describe the directional distribution of a light source, that is, to specify how the luminous intensity of a light source varies as a function of the outgoing direction.

Because 3ds Max works with these physically based photometric values, it can accurately simulate real-world lighting and materials.

Photon Map

A photon map™ is a technique to generate the indirect illumination effects of *caustics (page 3–91)* and *global illumination (page 3–92)* when you render with the *mental ray renderer (page 3–77)*. When it calculates indirect illumination, the mental ray renderer traces photons emitted from a light. The photon is traced through the scene, being reflected or transmitted by objects, until it strikes a diffuse surface. When it strikes a surface, the photon is stored in the photon map.

Generating photon maps is time-consuming. To improve performance, you must explicitly specify:

- Which lights emit photons for indirect illumination.
- Which objects can generate caustics or global illumination.
- Which objects can receive caustics or global illumination.

The settings for generating and receiving caustics are on the Object Properties dialog > *mental ray Panel (page 1–121)*.

The photon map stores photons only for objects that can receive caustics, global illumination, or both.

To further reduce the time required to generate a photon map, photons are limited by trace depth controls. Trace depth limits the number of times a photon can be reflected, refracted, or both.

In animations, another way to save time is to reuse the photon-map file. If lighting doesn't change over the course of an animation, calculate and save the photon-map file for the first frame, then choose the Use Existing option for rendering subsequent frames.

The mental ray renderer saves photon maps as *PMAP files (page 3–1089)*. Photon map controls are on the Render Scene Dialog > Indirect Illumination panel > *Caustics And Global Illumination rollout (page 3–104)*.

PHY Files

You can save *Physique (page 2–927)* data to a Physique (PHY) file. This saves data common to all objects that share a given Physique modifier.

Later, you can reload the PHY file, either to restore the data that belongs to a particular skin or portion of skin, or to transfer the Physique of one skin (or portion of it) to a different one.

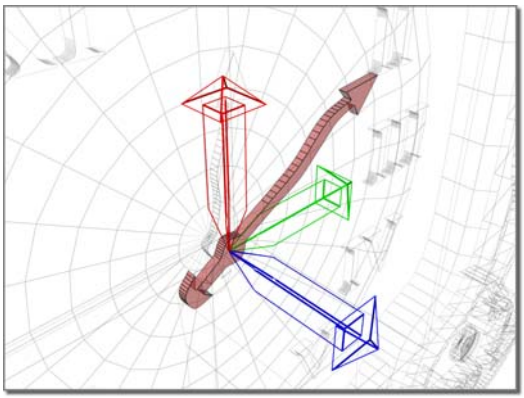
Physique

Physique (page 2–927) is a modifier that, when applied to a mesh, allows the movements of an underlying skeleton to seamlessly move the mesh like bones and muscle under a human skin. Physique will work on any point-based object, including geometric primitives, editable meshes, patch-based objects, NURBS, and FFD space warps. It will attach to any skeleton structure,

including a *biped (page 2–701)*, bones, splines, or any hierarchy.

Note: For NURBS and FFDs, physique deforms the control points (control vertices), which, in turn deform the model.

Pivot Point



Pivot point sets hand to the center of the clock face.

The transform center, or pivot point, is the spot about which a rotation takes place, or to and from which a scale occurs.

All objects have a pivot point. You can think of the pivot point as representing an object's local center and local coordinate system.

The pivot point of an object is used for a number of purposes:

- As the center for rotation and scaling when the Pivot Point transform center is selected.
- As the default location of a modifier center.
- As the transform origin for linked children.
- As the joint location for IK.

You can display and adjust the position and orientation of an object's pivot point at any time using the Pivot functions in the Hierarchy command panel. Adjusting an object's pivot has no effect on any children linked to that object.

Pixel

A pixel (short for ***Pic**ture **El**ement)* is a single point in a graphic image. Graphics monitors display pictures by dividing the screen into thousands (or millions) of pixels, arranged in rows and columns.

Plant

In *footstep animation (page 3–1037)*, the state of the biped foot when it is flat on a footstep.

Plug-Ins

A plug-in is a feature or functionality supplied by an independent program or component. Plug-ins can be supplied by third-party vendors or independent software developers.

For example, several Video Post filter and layering plug-ins ship with 3ds Max.

The open architecture provides an API (application programming interface) designed to make it easy for other companies to write plug-ins that extend the core functionality of 3ds Max.

PMAP File

A PMAP (*.pmap)* file is a mental ray *photon-map (page 3–1088)* file. This is a binary file that the *mental ray renderer (page 3–77)* uses to generate the effects of *caustics (page 3–91)* and *global illumination (page 3–92)*. You specify a name and location for the PMAP file on the Render Scene dialog > Indirect Illumination panel > *Caustics And Global Illumination rollout (page 3–104)*.

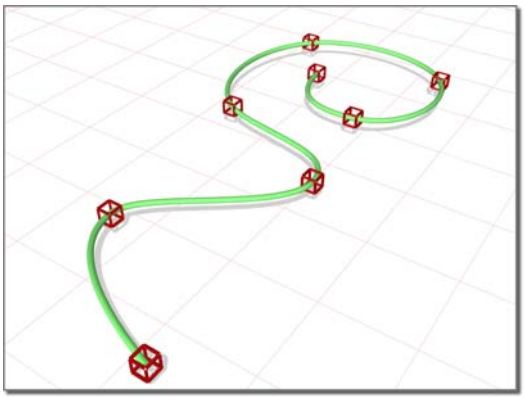
Point

A point in three-space, created when you use NURBS modeling to create a Point Curve or Point

Surface, or when you create an individual point sub-object. Points that are part of a Point Curve or Point Surface are constrained to lie on the curve or surface.

Points behave somewhat like vertices for *spline objects (page 1–261)*, but their behavior is not identical and they are a distinct object type. *Helper object points (page 2–22)* are also a distinct object type. You can't use spline vertices or helper points as NURBS points (though you can convert a spline to a NURBS curve).

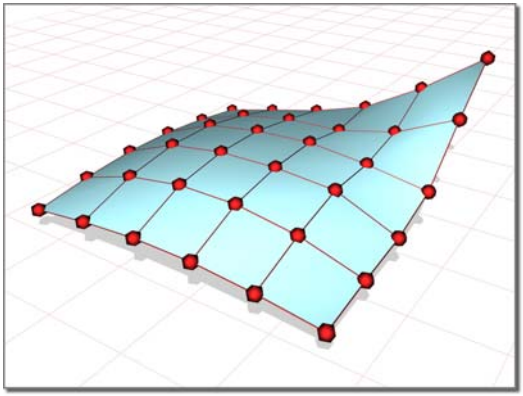
Point Curve



NURBS point curve

A curve defined by points. The points are constrained to lie on the curve. (Or you can think of the curve as being dependent on its point locations.) More than one NURBS solution is possible for a Point Curve; occasionally this can cause unexpected results.

Point Surface



NURBS point surface

A surface defined by points. The points are constrained to lie on the surface. (Or you can think of the surface as being dependent on its point locations.) More than one NURBS solution is possible for a Point Surface; occasionally this can cause unexpected results.

Poses

When you work with a *biped (page 2–701)*, the pose is the stance of the entire biped. You can copy and paste poses. See *Copy/Paste Rollout (page 2–818)*.

Positional Markers

In a motion-capture session, positional markers are reflective objects placed on the "actor" or "talent." The markers enable motion-capture hardware to record the position of various parts of the talent's body while performing motions.

Posture

When you work with a *biped (page 2–701)*, the posture refers to the position of selected

biped parts, as opposed to the overall *pose (page 3–1090)*. You can copy and paste postures. See *Copy/Paste Rollout (page 2–818)*.

Precedence

You control an *IK solution (page 3–1049)* by setting joint precedence to determine which joints contribute the most to the IK solution and which joints contribute the least.

Joints with high precedence values are calculated first, and, therefore, contribute more motion to the IK solution. Joints with low precedence values are calculated last, and, therefore, contribute the least motion to the IK solution.

Joints with equal precedence values are calculated by their order in the hierarchy. Joints deeper in the hierarchy (closer to the end effector) are calculated first and joints closer to the root are calculated last.

Premultiplied Alpha

There are two methods of storing alpha in a bitmap: premultiplied and nonpremultiplied.

To composite an image that is in nonpremultiplied format, the alpha must be multiplied by each of the R, G, and B channels before adding it to the color of the background image. This provides the correct transparency effect, but it must be done each time you composite. With premultiplied alpha, you store the R, G, and B components with the alpha already multiplied in, so compositing is more efficient.

This is not the only reason that 3ds Max stores images in the premultiplied format. When you render an image, you typically want the edges of the objects to be antialiased. This effect is achieved by determining the fractional coverage of pixels on the edge of the object, and then adjusting the alpha of the pixel to reflect this. For example, a pixel that is 30% covered by the object will have an alpha of 0.30.

To antialias the edges, the alpha must be premultiplied to darken these edge pixels. (This is equivalent to compositing the image over a black image). So it is natural, in a sense, for rendered images to have premultiplied alpha. If you do not premultiply the alpha of a rendered image, then just looking at the RGB you will see jaggies on the edges of objects. You would need to composite it against black using the alpha channel whenever you wanted to display it.

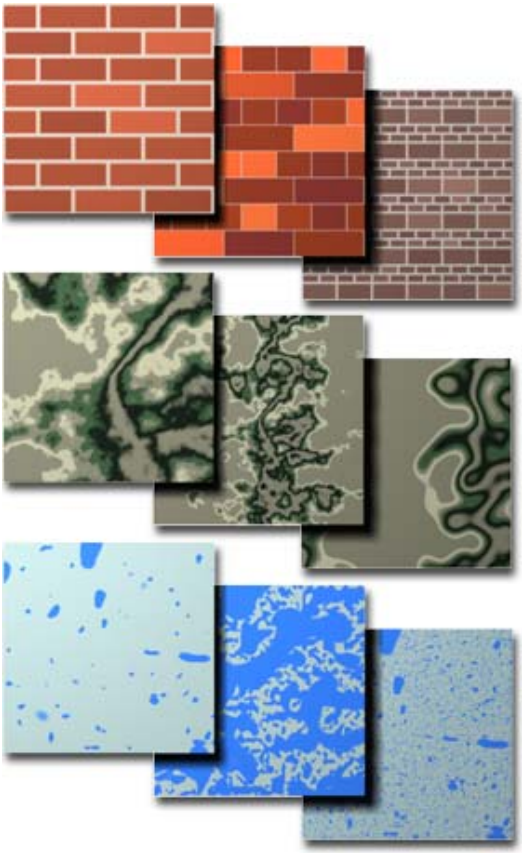
Note: To control whether or not the renderer uses the environment map's alpha channel in creating the alpha for the rendered image, choose Customize > Preferences > Rendering, and then turn on Use Environment Alpha in the Background Antialiasing group.

If Use Environment Alpha is turned off (the default), the background receives an alpha value of 0 (completely transparent). If Use Environment Alpha is turned on, the alpha of the resulting image is a combination of the scene and background image's alpha channel. Also, when you render to *TGA files (page 3–683)* with Pre-Multiplied Alpha set to off, turning on Use Environment Alpha prevents incorrect results.

Tip: If you plan to composite objects in another program such as Combustion or Photoshop, render the objects against a black background. Otherwise, a fringe of environment or background color can appear around the objects.

Procedural Maps

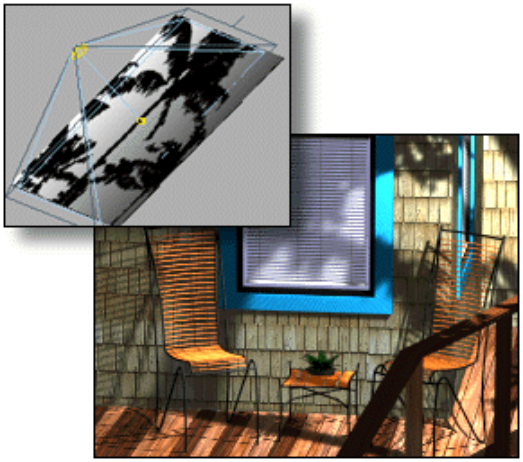
Unlike a bitmap, which is an image produced by a fixed matrix of colored pixels like a mosaic, a procedural map is generated by a mathematical algorithm. Consequently, the types of controls you might find for a procedural map will vary depending on the capabilities of the procedure.



Three procedural maps (bricks, Perlin marble, and splat), with variations

A procedural map can be generated in two dimensions, or in three. For example, Wood has a grain that goes through the assigned geometry. If you cut away part of an object with wood assigned as its texture, the grain in the cutaway portion matches the grain on the object's exterior: it is all generated by the same procedure.

Projector Light



Shadows created by projecting image of palm trees

By adding a map to a light, you turn it into a projector. You can assign a single image, or you can assign an animation to create the effect of either a slide projector or a movie projector.

You can also use projector maps to project black and white bitmaps to simulate shadows seen through leaves or window frames, in the same way that gobos are used in theater lighting.

You're not limited to circular projectors. Since you're usually projecting a rectangular image, you can use a rectangular light to project it. You can use the Bitmap Fit option to adjust the aspect ratio of the light beam to match that of the projected image.

When you use projection lights, it's often helpful to adjust their roll angle. You can do this with the navigation controls or with the *roll angle manipulator (page 2–1179)*.

Prop Bone

The *CSM marker file format (page 3–1019)* supports a prop bone in either or both hands.

There are six additional markers for the top, bottom, and middle of the two props. If these tracks are detected, **character studio** creates a 3ds Max dummy object.

The length of the prop is the average distance between the top and bottom prop marker during animation. The prop will be oriented in the plane of the three prop markers, and its origin will be at the bottom prop marker.

Quadtree

A quadtree is a data structure used to calculate *ray-traced shadows (page 3–1094)*.

The quadtree represents the scene from the point of view of the light. The root node of the quadtree lists all objects that are visible in that view. If too many objects are visible, the node generates four other nodes, each representing a quarter of the view, each with a list of objects in that portion. This process continues adaptively, until each node has only a small number of objects, or the quadtree's depth limit (which can be set for each light) is reached.

Each shadow-casting light ray needs to test intersection with the objects in only one of the leaf nodes of the quadtree. This helps speed up the ray-tracing process. In general, increasing the maximum quadtree depth can speed up ray-tracing at a cost of memory.

The maximum size of a quadtree is the square of two to the power of the maximum quadtree depth. At a depth of 7, the largest quadtree has 128 x 128 leaf nodes; at a depth of 10, the largest quadtree has a size of 1028 x 1028 leaf nodes, and so on. (On the other hand, because each successive node contains fewer objects, the size of a node's record decreases the deeper it is in the tree.)

Note: An omni light can generate up to ten quadtrees, so omni lights that cast ray-traced shadows use more memory at render time than spotlights do.

Queue Monitor

The Queue Monitor is a standalone network-administration tool that provides a user interface to monitor and control network rendering.

The Queue Monitor can connect to any computer to which you have network access with the appropriate security permissions, and a Network Manager running on it. You can install the Queue Monitor separately. It will function correctly on any Intel-based computer running Windows NT with appropriate TCP/IP networking services, including over the Internet. In other words, you can monitor and control network rendering services from any computer connected to the Internet, in addition to using the Internet as a wide-area backbone for a network rendering farm.

Radiosity

A technique to calculate indirect light to illuminate a scene. Radiosity calculates the interreflections of diffuse light among all the surfaces in your scene. The result is the *radiosity solution (page 3–1093)*. See *Modeling Global Illumination with Radiosity (page 3–50)*.

Radiosity Solution

The calculation of the *radiosity (page 3–1093)* effect in a scene. You compute the radiosity solution as a separate step from rendering. Once the solution is computed, it can be used for multiple renderings. See *Modeling Global Illumination with Radiosity (page 3–50)*.

Ray-Trace Acceleration (mental ray Renderer)

The *mental ray renderer (page 3–77)* provides three different ray-tracing methods of accelerating the process of ray tracing. The methods are:

- BSP (Binary Space Partitioning). This method (the default) performs best for most purposes.
- Grid. This method can perform better on multiprocessor systems.
- Large BSP. This method can perform better with large scenes and with distributed bucket rendering.

You set the raytrace acceleration method on the Render Scene Dialog > Renderer panel > *Rendering Algorithms rollout (page 3–113)*.

Ray-Trace Bias

On the right, increased map bias makes the dog appear to float.

A single parameter, Ray-Trace Bias, affects the generation of *ray-traced shadows (page 3–1094)*. You set this parameter in the Shadow Parameters rollout.

The Ray-Traced bias control in the Shadow Parameters rollout moves the shadow toward or away from the shadow-casting object (or objects). By default, this value is 1 unit.

Increasing the bias moves the shadow away from the object, and decreasing the bias moves the shadow closer to the object. The Ray-Trace Bias value can be any positive floating-point number.

For example, if a shadow-casting object intersects another object but its shadow doesn't meet properly at the intersection, the bias is too high. This effect varies with the angle of the spotlight to the object. Extremely shallow spotlight angles usually require higher bias values.

Another purpose of bias is to avoid problems with objects that cast shadows onto themselves. If you see streaks or moiré patterns on the surface of the object, the bias value is too low.

Ray-Traced Shadows

Example of ray-traced shadows

Ray-traced shadows are generated by tracing the path of rays sampled from a light source. Ray-traced shadows are more accurate than *shadow-mapped shadows (page 3–1104)*. They always produce a hard edge.

Ray-traced shadows are more realistic for transparent and translucent objects. Also, only ray-tracing can generate shadows for wireframe objects.

Because ray-traced shadows are calculated without a map, you don't have to adjust resolution as you do for shadow-mapped shadows. The parameters for ray-traced shadows adjust the shadow's position (known as *ray-trace bias (page 3–1094)*)

and the depth of the *quadtree (page 3–1093)* used to calculate ray tracing.

Advanced ray-traced shadows are the same as ray-traced shadows, however they provide *antialiasing (page 3–1001)* control, letting you fine-tune how ray-traced shadows are generated.

RAYHOSTS File

The RAYHOSTS file is a text (ASCII) file that lists the name of host systems capable of *mental ray rendering (page 3–77)* in a distributed network. You turn on distributed rendering on the Render Scene dialog > Processing panel > *Distributed Bucket Rendering rollout (page 3–121)*.

Each line in the RAYHOSTS file contains the name of a host system. The host name can be followed by a semicolon and a port number of the service to connect to. The host name with or without the port number can also be followed by whitespace and a list of mental ray command-line parameters.

See the manual, *Rendering with mental ray,* for descriptions of the mental ray command-line options.

When you click Add on the Distributed Bucket Rendering rollout and use the *Add/Edit DBR Hosts dialog (page 3–124)* to add a host or satellite processor, this updates the RAYHOSTS file. So does clicking Remove to remove a processor.

The RAYHOSTS file is named *max.rayhosts*. By default, it is located in the mental ray directory (*|3dsmax|mentalray|*). You can change the default location by creating an environment variable named MAX<*X*>_MI_ROOT, where <*X*> is the 3ds Max version number, and setting the variable's value to the path of the *max.rayhosts* file you want to use.

Real Time

By default, viewport animations play in real time, skipping frames where necessary.

You can turn this off by clicking Time Configuration in the time controls, and then turning off Real Time in the Playback group box of the *Time Configuration dialog (page 3–768)*.

When Real Time is turned off, all frames are displayed during playback. The playback may appear slow, but you'll know that you're seeing every frame.

You can also speed viewport animation by minimizing your viewports to quarter size.

Red, Green, Blue / Hue, Saturation, Value

There are two sets of color sliders in the *Color Selector (page 1–157)*: the red/green/blue (RGB) set and the hue/saturation/value (HSV) set. You can use either set or both to mix a particular color. As you adjust the color sliders, their RGB and HSV numeric values appear in the spinners.

There are separate RGB and HSV spinners as *light parameters (page 2–1126)*.

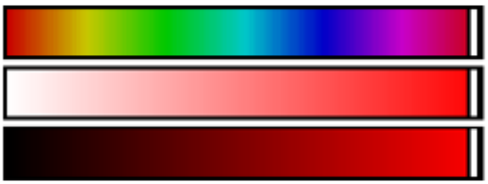
RGB Sliders

Each of the RGB sliders is a band of red, green, or blue (the primary light colors) shaded from black to the full intensity of the color. When you move

any slider, it mixes with the values of the other two, and the result appears in the swatch beneath the sliders.

For example, if you move the Red slider all the way to the right (value 255) and leave the other two at the left (0), the active swatch turns red. If you then move the Green slider all the way to the right, the swatch turns yellow. If you move all three sliders to 0, the result is black; if all three are at 255, the result is white; and all three at any point of equal value produce shades of gray.

HSV Sliders



If you prefer the hue/saturation/value color system, you can use the HSV sliders to mix color. First move the Hue slider to the color band you want (if the Value and Saturation sliders are set to low values, you don't see an immediate result in the swatch). Move the Value slider to set the brightness, or intensity of the color. Move the Saturation slider to determine the purity of the color. The higher the saturation, the less gray the color.

Reference

References are like "one-way" instances. Referenced objects are based on the original object, as are instances, and can have their own unique modifiers. Any modification made to the original object is passed on to its references, but any modification made to a reference is not passed back to the original.

The one-way effect is useful, since you can maintain an original that will affect all its references, while the references themselves can take on individual characteristics.

If you are modeling heads, for example, you might want to keep a family resemblance in your characters. You could model basic features on the original, then model specifics on each reference.

In the modifier stack, a solid line separates the reference from its parent object, so you can see that the effect of modifiers on the reference will not affect the parent object or other references to it.

Reference Object

In *Particle Flow (page 2–105)*, a reference object is a geometry object or collection of objects used as particles by the *Shape Instance operator (page 2–174)*. It can be a single object, a group, a hierarchy, or even a compound object consisting of several elements.

Refine

In NURBS modeling, refining means to increase the number of CVs on a curve or surface. Refining does not change the curvature of the curve or surface.

Reinitialize

In *Physique (page 2–927)*, when you need to reset vertex, envelope, and other skin parameters, click Reinitialize to display the *Physique Initialization dialog (page 2–964)*. Using controls in this dialog, you select which category to update, and apply the new global settings you specify.

For example, if you've added a new bone to the hierarchy and want it included and influenced by

the Physique modifier, you'd use reinitialization. Or maybe you've repositioned the biped structure relative to the mesh, or scaled both; you'd need to reinitialize Physique settings to recognize those changes.

Repel Behavior

In *crowd animation (page 2–1006)*, the Repel behavior lets you specify any object or objects (sources) that will force delegates to move away from them. This is basically the opposite of the Seek behavior. If you want delegates to back away from an object, as opposed to turning to face the direction they're moving, use Repel in conjunction with the Orientation behavior.

Reservoir

The Reservoir is a storage area for clips (*BIP files (page 3–1010)*) used by the *Motion Mixer (page 3–1070)*. The Reservoir contains a single entry for each clip *adaptation (page 3–999)* used in the Mixer. You can use the Reservoir to load previously used clips, save adaptations to new BIP files, or view a clip's adaptation data. See *Using the Reservoir (page 2–603)*.

The purpose of the Reservoir is to save memory. Instead of storing the animation and adaptation data for each clip inside the clip, it is stored in the Reservoir. When a clip is used more than once in the Mixer, the clip occurrences can share the data from the Reservoir, saving memory.

Resolution

The horizontal and vertical number of pixels in a 2D image. For example, a 640x480 resolution describes an image that is 640 pixels across by 480 pixels down. Resolution can also refer to an image's bit depth, such as 24-bit or 32-bit.

You set the resolution of the image you are going to render on the *Render Scene dialog (page 3–2)*.

Rotoscoping

Boat is an object composited over video of breaking wave.

Rotoscoping is the process of bringing video frames into a scene to use as the background for matching objects.

The way to use rotoscoping is to specify a digital disk recorder or movie file and read the frames into the viewport using the Animation Synchronization controls in the Viewport Background dialog. Once you've specified your source device or file in the Viewport Background dialog, one frame of the video displays for each scene frame by default. Remember to tun on Animate Background as well as Show Background to have your video frames appear in sequence in the viewport.

To produce the composited, rendered image, use Video Post or a compositing application to composite the background image and the rendered scene together.

Rubber-Band Mode

When you work with a *biped (page 2–701)*, Rubber-Band mode provides a way to proportion

the arm and leg links simultaneously, by moving the link with the Move transform, instead of using scale. Rubber-Band mode scales both the link and its child in a single step.

This is particularly useful when fitting a biped to a skin prior to applying the *Physique modifier (page 2–927)*. For example, rubber-banding the upper arm rescales the upper and lower arm objects and moves the elbow link without affecting the position of the shoulder or the wrist. If you've spent a lot of time getting the fingers in the right place, you can reposition the elbow by rubber-banding, without affecting the hands.

RVT Link

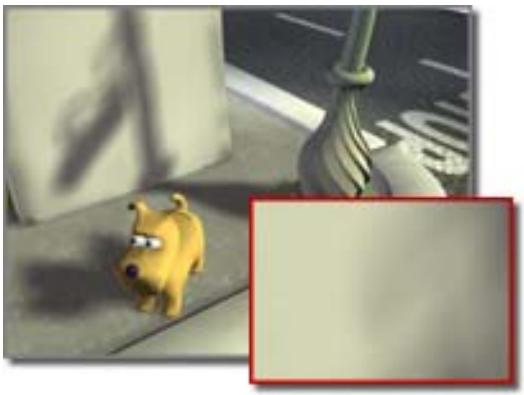
When working on Revit projects, you can import/link DWG, DXF, DGN, RVT and image files. These files can contain 2D and 3D geometry to help in the construction of your projects. Raster images can be imported as background images into your Autodesk Revit project or as visual aids needed during the creation of a model.

When you've exported the project to a DWG file, RVT links are comparable to xrefs in an AutoCAD drawing.

For more information about the Import/Link features of Revit, refer to the *Autodesk Revit Help* file.

Sample Range

Low sample range can cause jagged-edged shadows.



Higher sample range causes soft-edged shadows.

Sample Range affects the softness of the edge of *shadow-mapped shadows (page 3–1104)*. The sample range determines how much area within the shadow is averaged.

Small values reduce the area that is averaged, effectively bringing the edge of the shadow inward, producing sharper-edged shadows. Sharper edges can cause aliasing.

Large values extend the area that is averaged, effectively bringing the edge of the shadow outward, producing softer-edged shadows. Soft-edged shadows have more antialiasing. The

effect is somewhat like the falloff of a soft-edged spotlight.

The default Sample Range value is 4. The Sample Range value can be any floating-point number from 0 to 20. Values of 2 to 5 are recommended. Values below 3 can produce coarse-edged shadows. You can reduce this effect by increasing the map size.

Values greater than 5 can produce streaking and moiré patterns. You can reduce this effect by increasing the map size or the Bias value.

Rendering time increases exponentially as the Sample Range value increases.

Sampling (mental ray Renderer)

Sampling is an antialiasing technique. It provides a "best guess" color for each rendered pixel. The *mental ray renderer (page 3–77)* first samples the scene color at locations within the pixel or along the pixel's edge, then uses a filter to combine the samples into a single pixel color.

(In 3ds Max, this technique is called "supersampling." Because the mental ray renderer performs sampling on a scene basis, in the Material Editor, you *don't* need to turn on supersampling for materials rendered using mental ray.)

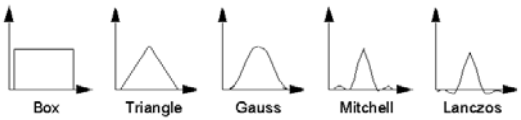
Scene rendered with low sampling is jagged and inaccurate.

Sampling range: 1/64 to 1/4

Same scene rendered with higher sampling shows smooth edges.

Sampling range: 1 to 16

The mental ray renderer provides five filter methods: Box, Gauss, Triangle, Mitchell, or Lanczos. Box, the default, is also the quickest. Mitchell is often the most accurate. The Box filter combines samples evenly, without weighting them. Each of the other filters uses a particular curve to weight samples before combining them.



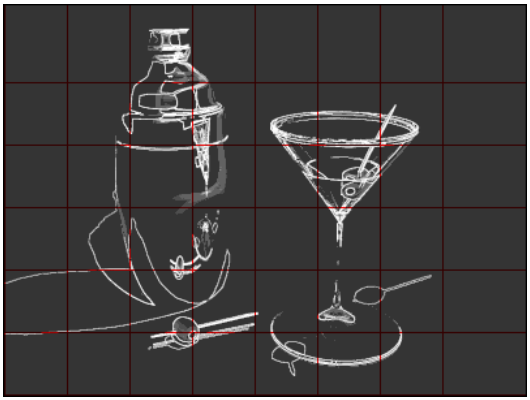
Curves used to weight samples (these are approximate)

You choose the sampling filter and set other sampling options on the Render Scene dialog > Renderer panel > *Sampling Quality rollout (page 3–97)*.

Note: Area lights (*Area Omni Light (page 2–1152)* and *Area Spot Light (page 2–1153)*) have their own sampling controls. These affect only shadows cast by the area light. They are independent of the sampling used to render the scene as a whole.

Rendering the Sampling Rate

To help you choose a sampling filter, you can render a scene with diagnostics enabled and Sampling Rate chosen on the Render Scene dialog > Processing panel > *Diagnostics rollout (page 3–120)*. The Sampling Rate diagnostic tool gives a schematic rendering that shows how the sampling method behaves with your scene.



Rendering with diagnostic display of the sampling rate turned on

Sampling range: 1 to 16

The intensity of each pixel indicates the number of samples collected within it and on its lower and left edges. The brighter the pixel, the greater the number of samples. Overall, the View Sample rendering is normalized so the brightest pixels have the maximum number of samples. Also, red boundaries indicate the boundaries of sampling tasks.

Lock Samples and Animation

By default, the mental ray renderer introduces a pseudo-random (quasi Monte Carlo) variation in the sampling pattern from frame to frame. This reduces rendering artifacts in animations.

You can turn off the sampling variation by turning on Lock Samples on the *mental ray: Sampling Quality rollout (page 3–97)*.

Jittering

"Jitters" samples by introducing a variation into sample locations. Turning on Jitter can help reduce aliasing. Default=off.

The Jitter control is also on the *Sampling Quality rollout (page 3–97)*.

Scale Stride

In *footstep animation (page 3–1037)*, the Scale parameter lets you change the length or width of a footstep selection (or both at once). This setting is on the *Footstep Operations rollout (page 2–842)*.

The selected footsteps are scaled around the first footstep in the selection.

Scanline Renderer

The *scanline renderer (page 3–37)* is the default renderer. By default, you use the scanline renderer when you render a scene from the *Render Scene dialog (page 3–2)* or from Video Post. The Material Editor also uses the scanline renderer to display materials and maps.

The image produced by the scanline renderer displays in the *rendered frame window (page 3–5)*, a separate window with its own controls.

As the name implies, the scanline renderer renders the scene as a series of horizontal lines. 3ds Max additionally provides the interactive viewport

renderer to provide a quick and simple rendered view of your scene as you work on it. You might also have other plug-in or third-party renderers that you've installed to work with 3ds Max.

Scene Extents

Just as an object's *extents (page 3–1030)* are its maximum dimensions in X, Y, and Z, the extents of a scene are its maximum dimensions in these three axes, and define a box that encloses the entire scene.

Scene Motion Blur

Motion blur can enhance the realism of a rendered animation by simulating the way a real-world camera works. A camera has a shutter speed, and if significant movement occurs during the time the shutter is open, the image on film is blurred.

Above: Scene motion blur creates an effect of movement. (The background is blurred because of slow camera panning.)

Below: The same scene with no blurring

3ds Max provides several ways to generate motion blur. Scene motion blur is one. Image motion blur is another. For most purposes, *image motion blur (page 3–1049)*or *multi-pass motion blur (page 2–1230)* give better results than scene motion blur. Use scene motion blur whenever you want to strongly emphasize rapid motion. You can use both image and scene motion blur in the same rendering.

(Another option, *object motion blur (page 3–1075)*, is not meant to simulate a camera, but to improve the rendered appearance of fast-moving objects.)

You apply scene motion blur in *Video Post (page 3–307)*. It is one of the options for a *Scene Event (page 3–325)*. In the Add or Edit Scene Event dialog, turn on Scene Motion Blur in the Scene Options group, and then adjust the parameters.

Scene motion blur creates trails behind all moving objects by rendering the entire scene at multiple time increments within each frame, and then creating the frame by compositing the multiple images together.

Schematic View

Schematic View (page 3–690) is a window that lets you see everything in your scene as a node on a graph. The *nodes (page 3–1073)* are repositionable to create custom configurations.

Use Schematic View to see and select all nodes that share a relationship, such as a material or instanced modifier. You can perform basic operations on the nodes such as rename, cut and paste modifiers or materials, or create hierarchical linkages. You can use Schematic View to see and edit other relationships such as wired parameters and constraints.

Script

A sequence of instructions used to automate a task. Scripts are typically text files containing coded instructions for a particular application.

In 3ds Max, the MAXScript utility supports a scripting language.

MAXScript scripts have the file name extension *.ms*. By default, they are saved in the *scripts* folder.

Script Editor Window

A text editing window provided with the MAXScript scripting system. A script editor window can edit any kind of ASCII text file, but is particularly suited to building and modifying MAXScript script files.

You open a script editor using the Open Script or New Script commands from the MAXScript menu.

Scripted Behavior

A behavior defined by MAXScript. When you use the *cognitive controller (page 2–1057)* with *crowd animation (page 2–1006)*, you can add conditional expressions written in MAXScript that impose changes in behavior.

Scripted Utility Panel

A scripted utility panel is a custom command-panel rollout created using the MAXScript scripting language. They let you create a graphical user interface to a MAXScript script.

Scripted utility panels are available through the Utilities drop-down menu in the MAXScript rollout of the Utilities panel.

Scripts (Motion Flow)

In *motion flow mode (page 2–878)*, a script is a list of clips (BIP files) that are executed sequentially to animate a character. You can create scripts either manually or automatically using *crowd animation (page 2–1006)*.

Scripting

A scripting language is a programming language embedded in a host application, and used to automate tasks within the application. 3ds Max provides MAXScript as its scripting language.

MAXScript controls are located on the Utilities panel.

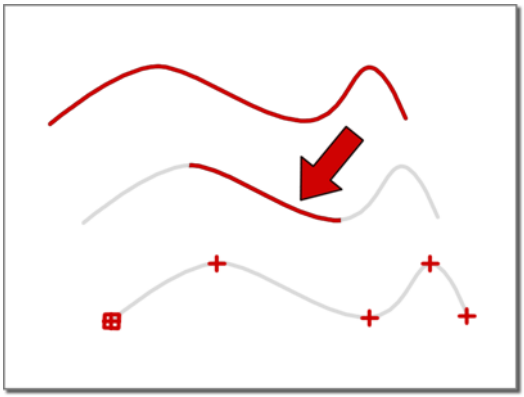
Seed Value

In NURBS sub-objects, a location in parameter space that is used to resolve ambiguities in some kinds of sub-object creation. The seed value is a location on a parent object, and the location nearest to the seed value that satisfies the creation condition is the one that the software chooses. For a curve, the seed value is a U location in the curve's parameter space. For a surface, the seed location is a pair of UV coordinates in the surface's parameter space.

Seek Behavior

In *crowd animation (page 2–1006)*, the Seek behavior lets you specify any object or objects as a stationary or moving target for delegates. Delegates move toward the target during the crowd simulation while turning as necessary.

Segment



The arrow and highlight indicate a single segment in a spline.

The portion of a NURBS point curve between two of its control points, or the portion of a spline between two vertices. (NURBS CV curves don't have segments, as their control vertices don't lie on the curve.)

Self-Illumination

The lamp on the right uses self-illumination to brighten the bulb and the glass panes.

Self-Illumination creates the illusion of incandescence by replacing any shadows on the surface with the diffuse color. At 100 percent, the shadows are completely replaced by the diffuse color, creating the illusion of self-illumination.

Unless you use environmental effects, only lights illuminate your scene; they don't appear in the rendering. You can use self-illuminated materials on objects that represent lights to provide things like car headlights, and so on.

A self-illumination map lets you use a map to affect the intensity in different areas of the self-illuminated surface. Like many other map types, only the intensity of the map values affects self-illumination. White provides the most, while black blocks the illumination completely.

It's often a good idea to design a self-illumination map to match your diffuse map. For example, the diffuse map might have small, yellow rectangles to represent windows, while the self-illumination map consists of matching white rectangles against black to illuminate the yellow windows.

Tip: To have an object behave as an actual light source (for example, a spline that models a neon light), use the *scanline renderer (page 3–37)*, *photometric lights (page 2–1155)* with a *radiosity solution (page 3–50)*, and assign an *Advanced Lighting Override material (page 2–1410)* to make the object luminous.

Shaders (mental ray Renderer)

In mental ray, a shader is a function that calculates light effects. There can be shaders for lights, cameras (lens shaders), materials, shadows, and so on.

In 3ds Max, the mental ray translator provides the functionality of light and camera shaders. Material shaders correspond to 3ds Max materials.

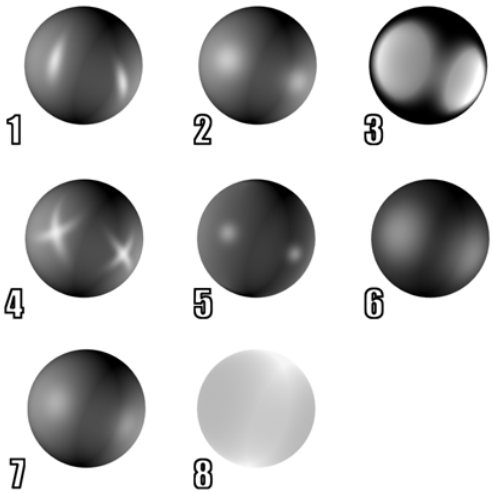
A number of shaders are provided with 3ds Max. See *mental ray Shaders (page 2–1520)*, *mental ray Connection Rollout (page 2–1305)*, and *Materials*

for Use with the mental ray Renderer (page 2–1384).

The mental ray manual, *Programming mental ray,* describes how to write custom shaders.

Shaders (Standard Materials)

For a *standard material (page 2–1309)*, the shader is the algorithm that controls how the material responds to light. Shaders especially control how highlights appear. They also provide a material's color components, and control its opacity, self-illumination, and other settings. Shaders are often named for their inventors; they can also be named for the effect they provide. See *Shading Type (page 2–1242).*



Samples of different shading for a standard material

1. *Anisotropic*
2. *Blinn*
3. *Metal*
4. *Multi-layer*
5. *Oren-Nayar-Blinn*
6. *Phong*
7. *Strauss*
8. *Translucent*

For each material, one of the available shaders is always active. You choose the shader on the material's *Shader Basic Parameters rollout (page 2–1310).*

The *raytrace material (page 2–1353)* uses a subset of the standard material shaders: Anisotropic, Blinn, Metal, Oren-Nayar-Blinn, and Phong. You choose the raytrace material's shader on the material's *Raytrace Basic Parameters rollout (page 2–1355).*

The other types of materials in 3ds Max don't give you a choice of shader.

Materials (and lights and cameras) used with the *mental ray renderer (page 3–77)* can use mental ray shaders, which are not the same as the standard material shaders. See *Shaders (mental ray Renderer) (page 3–1103).*

Shadow Maps (Light Objects)

Example of shadow-mapped shadows

A shadow map is a bitmap that the renderer generates during a pre-rendering pass of the scene. Shadow maps don't show the color cast by transparent or translucent objects. On the other hand, shadow maps can have soft-edged shadows, which ray-traced shadows cannot.

A shadow-map is projected from the direction of the spotlight. This method provides a softer edge and can require less calculation time than ray-traced shadows, but it's less accurate.

You can adjust the shadow map settings to achieve a sharper shadow. This involves changing the resolution and the pixel sampling of the shadow's bitmap. Because shadow-map shadows are only bitmaps, you need to keep in mind their resolution in relation to your distance from the shadow, and the detail required by the shadow. If the resolution is too low, and the camera too close, the shadow might look more like sooty smudges.

If shadows appear too coarse when you render them, increase the map size. The size can range from 0 to 10,000. However, be aware that greater size requires more memory and can take longer to generate. A 4096-line shadow map occupies 64 MB of memory (4096 x 4096 x 4).

If you have enough RAM to hold the entire scene including shadow maps, shadows don't affect performance, but if the renderer has to use a virtual memory swap file, rendering time can slow considerably.

The default shadow map size is 256.

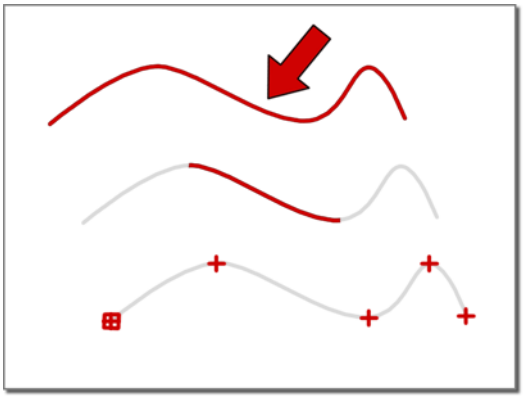
The bitmap used by shadow maps must fill the area covered by the falloff of the spotlight. The wider the falloff, the coarser the shadow appears. Keep the falloff as tight as possible given the requirements of your scene.

Shadow Map (mental ray Renderer)

A shadow map is a bitmap that the mental ray renderer generates during a pre-rendering pass of the scene. Shadow maps can require less calculation time than ray-traced shadows, but the shadows they generate can be less accurate.

The mental ray renderer saves shadow maps as *ZT files (page 3–1131)*. Shadow map controls are on the Render Scene dialog > Renderer panel > *Shadows & Displacement rollout (page 3–111)*.

Shapes and Splines



Spline

A shape is an object made up of one or more splines. A spline is a collection of vertices and connecting segments that form a line or curve. By adjusting values in the vertices, you can make portions of the line curved or straight.

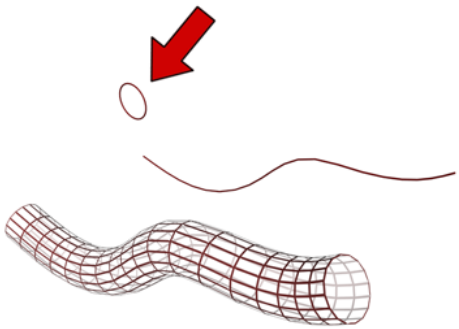
Shapes don't usually appear in the rendered scene. They're used for the following purposes:

- As the foundation for extruded objects, by applying an Extrude modifier to the shape.
- As the foundation for a spun object, by applying a Lathe modifier to a shape.
- As the components that make up a Loft object, by combining a shape as a path, and one or more shapes as cross-sections along the path.
- As an animation path for an object by assigning a path constraint to the object, and then picking a shape as the path.
- As one method of linkage for inverse kinematic chains.

You can make shapes renderable to create tubular forms in the rendering. Renderable shapes don't appear any different in viewports.

Shapes can also be *NURBS curves (page 1–1079)*. You can use NURBS curves in exactly the way you use spline-based shapes. You can also use a NURBS curve as the basis for a NURBS model that includes multiple curve and surface sub-objects.

Get Shape (Lofting)



A circle is lofted along a path to construct a tubular shape. Get Shape chooses the contour spline.

You use Get Shape as a loft creation method when you want the shape to move to the location of the selected path. For example, you use this method if you have created a path at the exact location where you want your loft object to be. You use Get Shape to create a loft at that location.

Get Shape causes the shape to move and rotate to align itself with the current level of the path. The exact orientation of the shape is controlled by two other loft settings named Contour and Banking.

The following describes the orientation of the first shape at level 0:

- The pivot point of the shape is located on the path at the current path level.
- The positive Z axis of the shape is aligned with the tangent to the path at the current path level.
- The local Y axis of the shape is aligned with the local Z axis of the path.

Sometimes, aligning the positive Z axis of the shape with tangent of the path does not produce the result you want. You can flip the orientation of the shape by pressing CTRL while getting the shape. Pressing CTRL aligns the shape so that the negative Z axis of the shape is aligned with the tangent to the path.

SHP Files

SHP is the 3D Studio R4 (DOS) shape-file format. You can import these files into 3ds Max.

The *.shp* file contains polygons created in the 2D Shaper in 3D Studio.

When importing an SHP file that contains multiple shapes, the software gives you the option to either merge them all into one object or make multiple incoming objects.

The shape importer looks at the vectors on incoming splines, and if they're collinear within a couple of percentage points, it changes the angle to a smoothed Bezier (otherwise, it's a Bezier corner).

Skylight

In the real world, daylight does not just come from direct sunlight; it also comes from skylight that is scattered through the atmosphere. 3ds Max offers great realism and accuracy by calculating not only sunlight, but calculating this scattered light as well.

In 3ds Max, the sky is modeled as a dome of infinite radius placed around the scene. Daylight computes the illumination of a point in the scene with reference to all directions around the point where the sky is visible. The sky brightness is not constant over the sky dome, but rather it changes depending upon the position of the sun.

See also

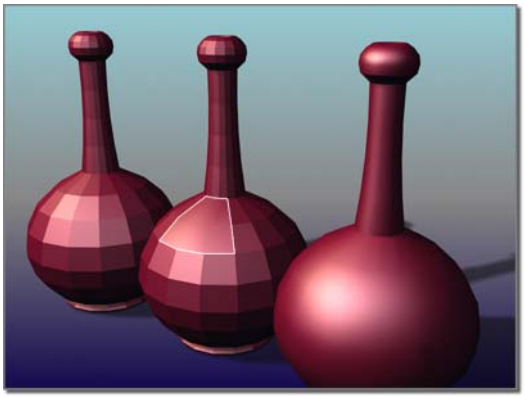
Sunlight (page 3–1112)

Sunlight and Daylight Systems (page 1–394)

Sliding Footstep

In *footstep animation (page 3–1037)*, changing biped foot key parameters enables the biped feet to move or slide during a footstep period. This feature is also available for motion-capture file import to allow the biped feet to slide or pivot. In the viewports, a sliding footstep is displayed as a footstep with a line through the middle.

Smoothing Groups



Left: The bottle has no smoothing.

Middle: Smoothing is assigned only to the highlighted group of faces.

Right: The bottle is smoothed using three different smoothing groups: on the body, the neck, and the top edge.

Smoothing groups define whether a surface is rendered with sharp edges or smooth surfaces.

Smoothing groups are numbers assigned to the faces or patches of an object. Each face or patch can carry any number of smoothing groups up to the maximum of 32. If two faces or patches share an edge and share the same smoothing group, they will render as a smooth surface. If they don't share the same smoothing group, the edge between them will render as a corner.

You can manually change or animate the threshold values for smoothing group assignments using such tools as *Editable Poly (Polygon/Element) (page 1–1054)* and the *Edit Mesh modifier (page 1–613)*.

SMPTE

SMPTE (Society of Motion Picture and Television Engineers) is the standard time display format for most professional animation work.

From left to right, the SMPTE format displays minutes, seconds, and frames, delineated by colons. For example:2:16:14

represents 2 minutes, 16 seconds, and 14 frames.

As you move through time in a SMPTE display, when the seconds field increments, the frames field recycles to 0 and starts over. For example, given an NTSC frame rate of 30 frames per second, as you move through time, the frames field counts from 0 to 29, at which point the seconds field increments by 1, and the frames field begins again at 0.

As with the Frames display format, the SMPTE format lets the time slider move at single-frame increments.

Space Warp Behavior

In *crowd animation (page 2–1006)*, the Space Warp behavior lets you assign a space warp, such as Wind or Gravity, to one or more delegates. The Space Warp behavior can use any space warp in the Forces category. These space warps treat *delegates (page 3–1022)* as if they were particles.

You can also use the Space Warp behavior to bind delegates to the *Vector Field space warp* provided

with **character studio**. This space warp causes delegates to avoid an object while following its contours.

Space Warps

Space warps (page 2–51) are objects that provide a variety of "force field" effects on other objects in the scene.

Space warps themselves are not renderable. You use them to affect the appearance of other objects, sometimes a large number of objects at the same time. Some space warps deform object geometry by generating ripples, waves, or explosions. Other space warps are meant specifically for use with particle systems, and simulate natural effects such as wind blowing snow or rain about, or a rock in the path of a waterfall.

Space warps behave somewhat like modifiers, except that a space warp influences world space, rather than object space as geometric modifiers do.

When you create a space warp object, viewports show a representation of it. You can transform the space warp as you do other 3ds Max objects. The position, rotation, and scale of the space warp affect its operation.

To have an object or selection set be affected by a space warp, you bind the object to the space warp. A space warp has no effect on objects unless the objects are bound to it. When an object is bound to a space warp, the warp binding appears at the top of the object's modifier stack. A space warp is always applied after any transforms or modifiers.

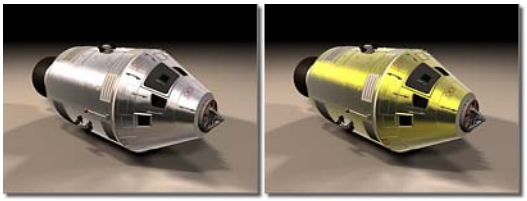
When you bind a space warp to multiple objects, the space warp's set of parameters affects all the objects equally. However, each object's distance from the space warp or spatial orientation to the warp can change the warp's effect. Because of this spatial effect, simply moving an object through warped space can change the warp's effect.

You can also use multiple space warps on a single object or objects. Multiple space warps appear in an object's stack in the order you apply them.

Spawn Particles

In *Particle Flow (page 2–105)*, spawn particles are new particles that are generated from existing particles (*parent particles (page 3–1083)*) in a process called *spawning*. You can use the *Spawn test (page 2–226)* to create spawn particles arbitrarily, or the *Collision Spawn test (page 2–211)* to create spawn particles as the result of physical interaction between a parent particle and a deflector.

Specular Color



Changing specular color tints highlights on the shiny surface of the spacecraft.

Specular color is the color of highlights on a shiny surface. The highlights are reflections of the lights that illuminate the surface. For a naturalistic effect, set the specular color to the same color as the key light source, or make it a high-value, low-saturation version of the diffuse color.

In 3ds Max, you can set the specular color to match the diffuse color. This gives a matte effect, making the material appear less shiny.

Matching specular color to the diffuse color makes the surface less shiny.

Speed Vary Behavior

In *crowd animation (page 2–1006)*, the Speed Vary behavior is useful for objects whose velocity changes as they move, such as strolling tourists who might occasionally slow down to do some sightseeing.

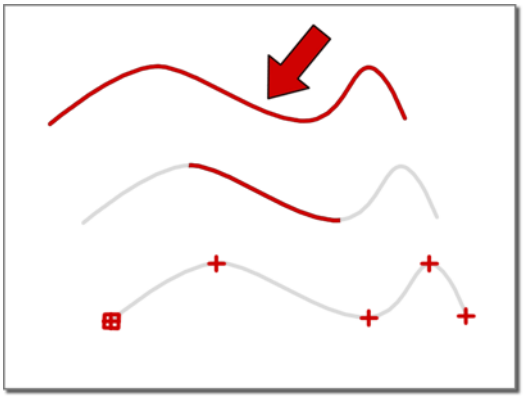
Splice

The term *splice* means to cut a sequence, insert a segment and join the cut ends to the segment. It can also mean a simple joining of ends to a segment.

In **character studio**, you can splice a footstep sequence. You do this by copying a footstep sequence, then moving it to the middle or end of another footstep sequence and placing it there. The ends of the segments are joined automatically to make a smooth footstep sequence.

You can use splicing to extend your footstep animation or build a cyclic sequence.

Spline



Top: Spline

Middle: A segment of the spline

Bottom: Vertices of the spline

A type of curve that is interpolated between two endpoints and two or more tangent vectors. The term dates from 1756, and derives from a thin wood or metal strip used for drafting curves in architecture and ship design.

Spline Dynamics

Spline Dynamics is a *biped dynamics (page 3–1010)* option located on the *Dynamics & Adaptation rollout (page 2–833)*. Choosing Spline Dynamics creates keys for the biped's center of mass without calculating gravity or balance (Dynamics Blend=0.0 and Balance Factor=0.0).

Startup Script

When 3ds Max first starts, MAXScript searches for any startup script files, which it then automatically loads and runs. This feature is useful if you have function libraries you always use and want preloaded, or if you want to establish custom UI settings, define scripted plug-ins, or load scripted utility rollouts.

MAXScript first searches for *.mcr* (macroScript definition files) in the *ui|macroscripts* directory. These macroScript definitions are not compiled at this time; rather they are just scanned to identify the macroScripts that have been defined.

MAXScript next searches for *.ms*, *.mse*, and *.mzp* files in the plug-in path directories (defined on the *Configure System Paths dialog (page 3–854)* and *Configure User Paths dialog (page 3–852)*) and their subdirectories, and compiles these files. The base scene and user interface have not been created at this point, so no viewport or scene commands should be executed in these files. These files should primarily define scripted plug-ins and utility functions.

Any utility functions used by the macroScripts defined when reading the *ui|macroscripts* directory should be defined in a *.ms* or *.mse* file in one of these directories. You can prevent a nested directory from being scanned by placing its name in parentheses, for example "(old-versions)", allowing you to enable and disable scripts in handy directory-based groupings.

At this point, 3ds Max creates the base scene and user interface. Any macro scripts used by buttons in the user interface are compiled at this time.

The automatic loading of the following startup script files can be deactivated by turning off the Auto Start MAXScript option in the MAXScript page of the Preferences dialog, as described in *MAXScript Preferences (page 3–879)*.

MAXScript first searches for a file named *startup.ms* in the following directories, in this order:

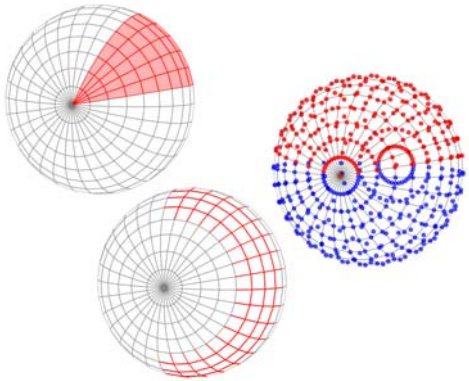
1. The Scripts directory (defined on the Configure User Paths dialog > File I/O panel)
2. The Startup Scripts directory (defined on the Configure System Paths dialog)
3. The 3ds Max executable main directory
4. The Windows NT 32-bit system directory (*system32*)
5. The Windows 16-bit system directory (*system*)
6. The *Windows* directory
7. The directories that are listed in the PATH environment variable

MAXScript stops searching when it finds the first occurrence of *startup.ms*.

MAXScript then recursively scans the Startup Scripts directory (defined on the Configure System Paths dialog) and any nested directories for *.ms*, *.mse*, and *.mzp* script files and loads them. In this pass, any script files with the name *startup.ms* are ignored. You can prevent a nested directory from being scanned by placing its name in parentheses, for example "(old-versions)", allowing you to enable and disable scripts in handy directory-based groupings.

If you specify a script to run in the command line (**-U MAXScript script_name**), the script is executed at this point. (See the MAXScript Reference topic “Running Scripts from the Command Line”).

Sub-Object



Left: A selection of face sub-objects

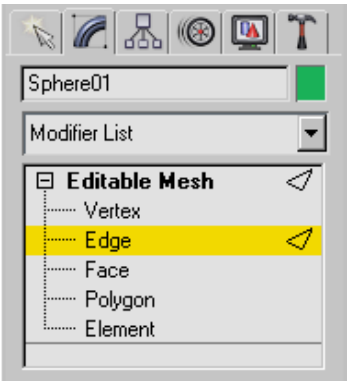
Middle: A selection of edge sub-objects

Right: A selection of vertex sub-objects

A sub-object s a subset of an object's geometry. Many objects have various types of sub-objects that you can work with independently. For example, an *editable mesh object's (page 1–984)* sub-objects are vertices, edges, faces, polygons, and elements. To access sub-objects, go to the Modifier panel. In the modifier stack display, click the plus-sign button to display an object's hierarchy, and then choose the sub-objects level from the hierarchy. At the sub-objects level you can select sub-objects, transform the selections, apply modifiers, and so on.

Many topics in the online reference deal with sub-objects. To see a list of sub-object-related topics, search on the term "sub-object" (include the quote marks in the keyword).

Sub-Object Level

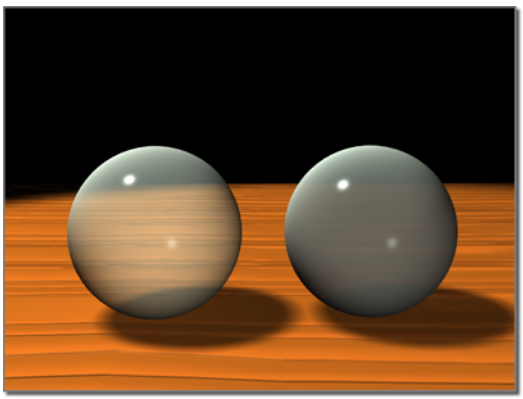


Edge sub-objects level chosen while editing a mesh.

Some types of objects let you change to a sub-object level to edit their component parts. For example, *editable meshes (page 1–984)* have Vertex, Edge, Face, Polygon, and Element sub-object levels. *NURBS models (page 1–1079)* can have Surface, Curve, Point, Surface CV, Curve CV, and Import sub-object levels.

You change the active sub-object level using the *Modifier Stack display (page 3–802)* on the Modify panel.

Subtractive Opacity



Sphere on the right uses subtractive opacity.

Subtractive opacity darkens colors behind the material by subtracting the material's colors from the background colors.

If you simply want to reduce the apparent opacity of a material, while maintaining the color values of its diffuse (or mapped) properties, use subtractive opacity.

See also

Additive Opacity (page 3–1000)

Sunlight

The Sun is modeled as a parallel light source, which makes the incident direction of sunlight constant over all surfaces in the scene. You can specify the direction and intensity of the sun directly. Alternatively, the direction and intensity of the sun can be calculated based on geographical location, time, and sky condition settings.

See also

Skylight (page 3–1106)

Sunlight and Daylight Systems (page 1–394)

Super Black

Super Black limits the darkness of rendered geometry. This option is used for video compositing. When compositing, you need pure black for the background, but overlaying objects need to be less than pure black so that you can still see exactly where they are. Also, some video systems have problems with black that has RGB values of 0,0,0, and consider it an "illegal" color.

Unless you're sure you need it, leave Super Black tuned off in the Render Scene dialog.

The scanline renderer uses the value of the Super Black preference as a threshold for the darkness of the rendered scene. For example, if you're rendering a heavily shadowed object against a black background, although the background will be rendered as pure black, the deepest shadows on the object will be no darker than the intensity level specified by the Threshold spinner (default is 15).

Note: If the threshold spinner is set too high, it will artificially raise low-blended values. This can ruin antialiasing effects in the renderer.

Supersampling

Supersampling is one of several antialiasing techniques that the software performs. Textures, shadows, highlights, and raytraced reflections and refractions all have their own preliminary antialiasing strategies. Supersampling is an optional additional step that provides a "best guess" color for each rendered pixel. The supersampler's output is then passed on to the renderer, which performs a final antialiasing pass.

See also

SuperSampling Rollout (page 2–1302)

Support Period

In *footstep animation (page 3–1037)*, the period where one or both of the biped feet are on the ground.

Surface Arrive Behavior

In *crowd animation (page 2–1006)*, the Surface Arrive behavior is similar to the Seek behavior: it lets you specify one or morer objects as a stationary or moving target for delegates. The principal difference is that you can use the Approach settings to specify an intermediate target. After reaching this location, the delegates will then make their final approach to the ultimate target surface.

An example would be birds flying over a row of telephone poles, and then each one dropping to land on top of a different pole.

Surface Follow Behavior

In *crowd animation (page 2–1006)*, the Surface Follow behavior moves delegates with respect to object surfaces. Target objects can be animated. For example, you can apply an animated Noise modifier to a patch grid to simulate a choppy water surface, and objects guided by Surface Follow will stay on top.

Synthesis, Synthesize

Synthesizing is the process of computing (solving) motions for *crowd simulations (page 2–1006)*. The resulting simulation is a synthesis.

Talent Figure Mode

When you work with *motion capture (page 2–910)*, after you load a raw *marker file (page 3–1063)*, you can turn on Talent Figure mode to scale the biped relative to the markers. Calibration for the entire marker file takes place when you exit Talent Figure mode.

Tangents

The tangent of a function curve affects the interpolated values between the keys of an animation. Most animation controllers use fixed tangents to define the function curve at a key location.

By default, 3ds Max assigns smooth tangents to the keys in a Position function curve. This is the reason that an animated object moves in smooth curves through the key frames. 3ds Max assigns smooth tangents because they usually provide the most natural motion.

Of course, you also need a way to add some corners and abrupt turns when you need them. The *Linear controller (page 2–325)* uses a discontinuous tangent that points at the preceding and following keys, producing an abrupt change in motion at that key.

The two large flyout buttons at the bottom of the Key Info dialog provide five different types of *predefined tangent types (page 2–300)*, plus a sixth type that lets you create your own custom tangents.

If you look at a single key dot and the line running through it, the line on the left side of the key dot is the incoming tangent, and the line on the right is the outgoing tangent. Using the tangent flyout buttons, you can assign a different tangent type to the incoming and the outgoing lines for each key dot.

The button on the left assigns the incoming tangent at the left side of the selected key dot, and the button on the right assigns the outgoing tangent on the right side of the selected key dot.

TCB (Biped)

TCB is short for Tension, Continuity, and Bias. These parameters quantify the traditional animation technique of ease in and ease out (also known as “slow in and slow out”). In *freeform animation (page 3–1039)* of a biped, you can use them to change the timing of a limb’s movement from key to key.

The TCB controls are in the TCB section of the *Key Info rollout (page 2–809)*.

TCB (Tension, Continuity, Bias)

The TCB Position controller provides Tension, Continuity, and Bias controls of the splines of a function curve.

TCB Controllers (page 2–361) also produce curve-based animation much like the *Bezier controllers (page 2–305)*. However, TCB controllers do not use tangent types or adjustable tangent handles. They use numeric values to adjust the Tension, Continuity, and Bias of the animation.

Tension—Controls the amount of curvature in the animation curve.

High Tension produces a linear curve. It also has a slight Ease To and Ease From effect.

Low Tension produces a very wide, rounded curve. It also has a slight negative Ease To and Ease From effect.

The default value of 25 produces an even amount of curvature through the key.

Continuity—Controls the tangential property of the curve at the key. The default setting is the only value that produces a smooth animation curve through the key. All other values produce a discontinuity in the animation curve causing an abrupt change in the animation.

High Continuity values create curved overshoot on both sides of the key. Low Continuity values create a linear animation curve.

Low continuity creates a linear curve similar to high tension except without the Ease To and Ease From side effect.

The default value of 25 creates a smooth continuous curve at the key.

Bias—Controls where the animation curve occurs with respect to the key.

High Bias pushes the curve beyond the key. This produces a linear curve coming into the key and an exaggerated curve leaving the key.

Low Bias pulls the curve before the key. This produces an exaggerated curve coming into the key and a linear curve leaving the key.

The default value of 25 distributes the curve evenly to both sides of the key.

Tendons

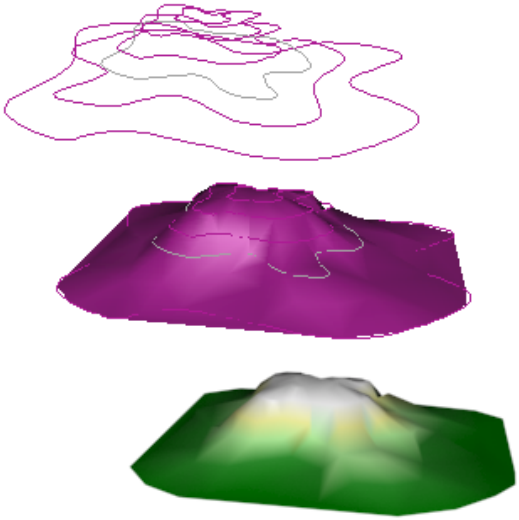
When you use *Physique (page 2–927)*, after you adjust envelope parameters for good mesh deformation, you can use *tendons (page 2–998)* to control the amount of skin stretching across multiple links. While envelopes provide smooth skin deformations, tendons provide additional stretching in much the same way that actual human tendons might create pulling in the wrist (several joints away) when the fingers are moved.

Tension, Continuity, Bias (Biped)

Tension, Continuity, and Bias (TCB) are parameters that quantify the traditional animation technique of ease in and ease out (also known as "slow in and slow out"). In *freeform animation (page 3–1039)* of a biped, you can use them to change the timing of a limb's movement from key to key.

The TCB controls are in the TCB section of the *Key Info rollout (page 2–809)*.

Terrain



Using contours to build a terrain

Creates *terrain objects (page 1–342)* from contour line data. You select editable splines representing elevation contours and 3ds Max creates a mesh surface over the contours. You can also create a "terraced" representation of the terrain object so that each level of contour data is a step, resembling traditional study models of land forms.

When you import an AutoCAD drawing file to use as contour data, 3ds Max names each object based on the AutoCAD object's layer, color, or object type. 3ds Max appends a number after each name. For example, an AutoCAD object on the layer BASE becomes BASE.01.

After importing the contour data, selecting the objects and clicking the Terrain button, 3ds Max moves all the selected objects out of the scene and into the terrain object. Other splines in the selection are treated in the same way as by the Move copy method. You can only use these splines as operands of the terrain object. This is appropriate if you create splines in order to create a terrain object and have no further use for them.

Test

The basic function of a test in Particle Flow is to determine whether particles satisfy one or more conditions, and if so, make them available for sending to another event. When a particle passes a test, it is said to "test True." To send eligible particles to another event, you must *wire (page 3–1127)* the test to that event. Particles that don't pass the test ("test False") remain in the event and are repeatedly subjected to its operators and tests. Or, if the test isn't wired to another event, all particles remain in the event.

A list of all tests in Particle Flow is available in the *Tests topic (page 2–206)*.

See also

Operator (page 3–1079)

Texel

A texel (short for ***Tex**ture **El**ement*) is the base unit of a textured graphic, which defines the surface of a three-dimensional object. The base unit of the surface of a 3D object would be a texel, while a 2D object would consist of *pixels (page 3–1089)*.

Ticks

Ticks are the way 3ds Max views increments of time. There are 4800 ticks in a second, so you can actually access time down to 1/4800th of a second.

Given a standard, NTSC video frame rate, there are 30 frames in a second, and therefore 160 ticks in each frame.

When you use the FRAME:TICKS display format, time is shown in frames and ticks, delineated by a colon. This format lets you adjust the time slider in sub-frame increments of 1/160th of a frame. As you move through time, the ticks field counts from

0 to 159, at which point the frames field increments by one, and the ticks field returns to 0.

You can step forward or backward at single increments by clicking the single-frame buttons among the playback buttons.

When you use the MM:SS:TICKS Display format, you see minutes (MM), seconds (SS), and ticks, each separated by colons.

As you move through time in this display format, the ticks field counts from 0 to 4799, at which point the seconds field increments and the ticks field returns to 0.

You can step forward or backward at single increments by clicking the single-frame buttons on either side of the playback button.

Tile/Mirror

Left: A bitmap

Middle: Tiling the bitmap

Right: Tiling and mirroring the bitmap

Tiling and mirroring are useful for creating patterns based on a simple image. Use them when you need wallpaper and other repetitive designs.

The Tile option in the Material Editor is on by default, repeating the image along the U and V directions. You can use the Tiling values to scale the map image. Setting negative Tiling values increases the size of the image.

You can also set tiling values in the UVW Map modifier. These settings are in addition to the tiling values you set for the map in the Material Editor. If the map's base tiling parameter has a value of 2.0 and the UVW Map modifier has a tiling value of 3.0 for the same axis, the net result is 2.0 x 3.0 = 6.0. To avoid confusion about where the tiling is coming from, you may want to set the map's tiling in its base parameters or with the UVW Map modifier, but not in both locations.

The Mirror option is a variation on the Tile option. Tile repeats the image side-by-side, while Mirror flips the image repeatedly.

Topology

When objects and shapes are created, each vertex and/or face is assigned a number. These numbers are used internally to determine which vertices or faces are selected at any given time. This numerical arrangement is called *topology*.

When you select vertices or faces and apply a modifier to the selection, the modifier stack keeps track of which faces/vertices the modifier affects. If you later return to the selection level of the stack and change the selection, you change the topology to which the modifier is applied.

The term *topology* refers to the structure of faces and vertices as well as their numbers.

For example, by carefully setting various parameters, you could make a box and a cylinder with the same number of vertices. You might then think you could use the box as a morph target for the cylinder. However, because the two objects are created with such different methods, the vertex numbers on these objects would be ordered very differently. Morphing causes each numbered vertex to go to its corresponding place on the morph target. In a case such as this, with two objects with such different topology, morphing

from one to the other would cause the object to crumple or turn inside out as it morphs.

Topology-Dependent Modifier

Topology-dependent modifiers perform operations on explicit, topological sub-object selections. The Edit Mesh and Mesh Select modifiers are examples of modifiers that perform operations or selections on explicit vertex or face numbers. When these modifiers are present in the stack, you can adversely affect their results if you visit previous stack operations and change the topology (the number and order of faces and vertices) being passed to them. When you do this, a topology-dependence warning alerts you to the situation.

Touch

In *footstep animation (page 3–1037)*, the state of the biped foot on the first frame of a footstep.

Track

A track is a linear representation of animation occurring over time. You can think of a track as a long, straight railroad track, with the animation start time at one end, and the finish time at the other. Keys are placed on the track at intervals that correspond to the time along the track.

The term *track* is used in several areas of **character studio**, including the following:

- Each animatable object and parameter in 3ds Max and **character studio** has its own animation track, which you can view and edit in *Track View (page 2–746)*.
- Tools are available especially for working with biped tracks. The center of mass is unique in that it has separate tracks for horizontal and vertical animation, which you can select on the Motion panel > *Track Selection rollout (page 2–800)*. You can *copy and paste tracks (page 2–781)* on biped objects to other bipeds with the *Copy/Paste rollout (page 2–818)*.
- In the *Keyframing Tools rollout (page 2–816)*, you can clear all animation or just selected tracks.
- In the *Motion Mixer (page 2–581)*, the linear areas that hold motion clips are called *tracks*. Several tracks can be stacked on top of one another to use animation from all tracks at the same time.

Track View

Track View provides a visual representation of animation keys, allowing you to view, edit, copy and adjust one or several keys at a time. This is where you control the timing of your animation, through the manipulation of keys, curves and ranges. You can also assign animation controllers to interpolate or control all the keys and parameters for the objects in your scene.

Track View has two windows, a Controller window and a Key window. The Controller window shows the hierarchy of linked objects, as well as the modifier stack and transform tracks. The Key window displays keys, curves and ranges. Keys are color coded to show what is animated.

Track View uses two different modes. *Curve Editor mode (page 2–489)* displays key interpolation as curves, and allows you to edit the curves. *Dope Sheet mode (page 2–489)* displays the animation as a spreadsheet of keys and ranges. Dope Sheet has two modes, Edit Key and Edit Ranges.

Trackgroup

In the Motion Mixer, motions are placed on tracks, and the tracks are organized into *trackgroups*. In other words, each trackgroup is a holder for one or more tracks. Each trackgroup can be filtered so the tracks within it affect only certain parts of the biped, such as its arms or legs. Every biped in the Motion Mixer can have multiple trackgroups, each with its own selection of biped parts. See *Adding Tracks to the Mixer (page 2–583)* and *Filtering Mixer Tracks (page 2–589)*.

Track View Hierarchy Icons

The Track View hierarchy, as displayed in the Controller window, follows the traditional example of organizational headings in an outline. The highest levels of the hierarchy represent the main groupings in 3ds Max of Sound, Environment, Materials, Render Effects, and Objects. Lower levels of the hierarchy progress through the details of your scene, such as individual materials, material maps, and map parameters.

Each type of item in the Track View Hierarchy List is represented by an icon. You can use these icons to quickly identify what each item represents.

Sound—Indicate sound parameters. 3ds Max provides only one sound source in Track View.

Material—Indicates material definitions. All branches below a material definition are part of that material. Because a material can be composed of multiple materials it is possible to have nested material definitions in Track View. Icons also appear in an object's modifier branch when a material is assigned to an object.

Map—Indicates map definitions. All branches below a map definition are part of that map. This includes values used by parametric maps and other map definition that are part of a map tree.

Object—Indicates objects in the scene. Branches below the square icon contain linked descendents of the object. Branches below the circle icon beside a yellow cube contain transforms and modifications applied to the object.

Modifier—Indicate modified objects and Space Warp bindings. Branches below a modifier contain the modifier's sub-objects and parameters.

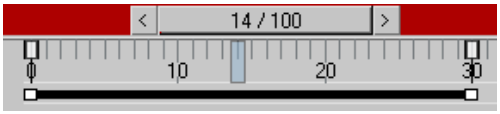
Controller—Indicate animation controllers. Controllers are the animation workhorses of Track View. They contain the animated values for all parameters and are the only item in the Hierarchy list that can have a track containing keys. Every controller has its own individual icon. Some examples:

- Position controller
- Rotation controller
- Scale controller

Certain types of controllers can contain other controllers. Examples of these are Transform Controllers and List Controllers.

Tracks

Every item in the Track View hierarchy has a track that displays what happens to the item over time.



Animation track displayed in track bar below time slider

There are two types of tracks:

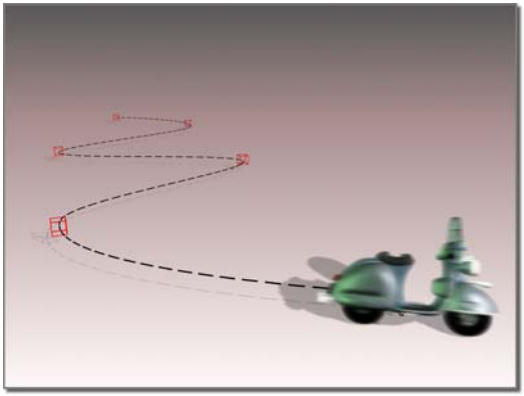
- Range tracks indicate when items below the track are animated. A range bar in the track displays the range of time over which the animation occurs.

- Animation tracks contain the actual animated values for an item. Only controller items have an animation track.

The values in an animation track are usually displayed as keys. Some controllers don't use keys and instead display their values as a range bar or some other graphic symbol. For example, the Wave Form item displays a sound file as a two-channel sound wave.

Animation tracks are also the only track type that can be displayed as a function curve.

Trajectory



Scooter following a trajectory

Whenever an object moves through world space, you can view its trajectory. A trajectory is the visible path the object makes because of its movement. You can think of a trajectory as a three-dimensional function curve for the Position track of an object.

Object trajectories appear with the following properties:

- The trajectory curve is drawn in blue.
- Frame increments are displayed as yellow dots on the curve.
- Position keys are displayed as white boxes surrounding the appropriate frame dot on the curve.
- Selected keys are displayed in gray.

In 3ds Max trajectories are created from animated objects. You must animate the object first in order to create the trajectory.

The *Path constraint (page 2–380)* lets you picks a spline in the scene to use as a motion path for an object. The spline becomes the object's explicit trajectory.

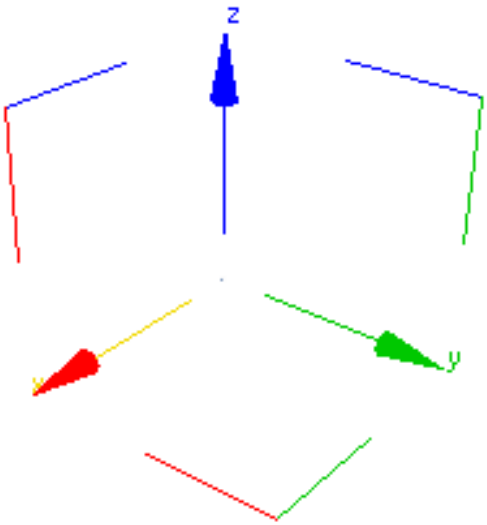
Trajectory (Biped)

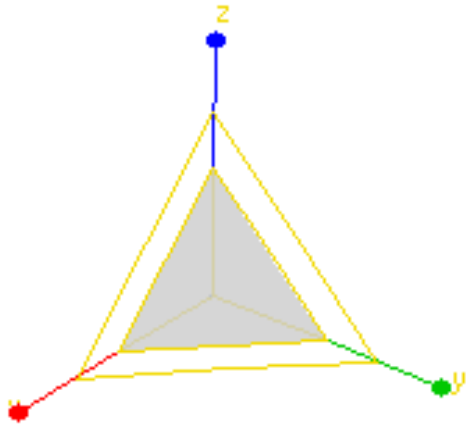
The path an object follows as it moves through space. In 3ds Max, you can think of a trajectory as a three-dimensional function curve for the Position track of an object.

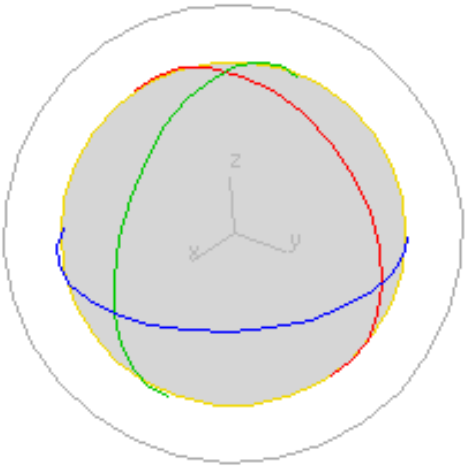
When you animate a *biped (page 2–701)*, you can turn on the display of its trajectory. See *Trajectory Display (page 2–786)*.

Transform Gizmo

A *gizmo (page 3–1043)* that is displayed in viewports and provides a visual aid when you transform objects.

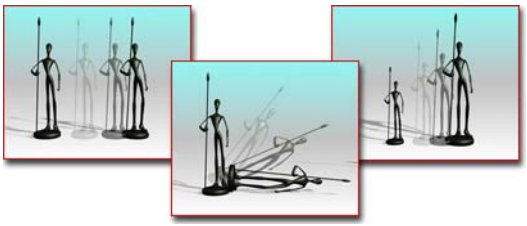






Top: Move gizmo
Middle: Rotate gizmo
Bottom: Scale gizmo

Transforms



Moving, rotating, and scaling a figure

When you create any object, 3ds Max records its position, rotation, and scale information in an internal table called a transformation matrix. Subsequent position, rotation, and scale adjustments are called transforms.

An object's actual position within the world coordinate system is always calculated in relation to its internal, or local coordinate system, which is based on the object's transformation matrix. The origin of the local coordinate system is the center of the object's *bounding box (page 3–1013)*.

An object can carry any number of modifiers, but only one set of transforms. Although you can

change transform values from frame to frame, each object always has only one position, one rotation, and one scale transform.

You can animate your transforms by turning on the Auto Key button and then performing the transform at any frame other than frame 0. This creates a key for that transform at the current frame.

Transition

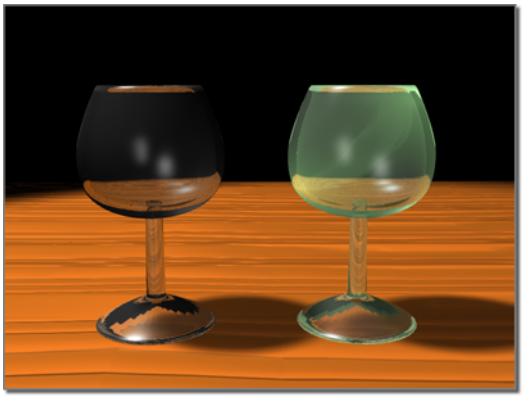
In the Motion Mixer and in Motion Flow, a transition is a gradual change between two motion clips. You can set the frames at which the transition starts and ends in each clip.

To find out how to use transitions in the Motion Mixer, see *Working with Transitions (page 2–592)*. For information on transitions in Motion Flow, see *Customizing Transitions (page 2–885)*.

Transition Track

A Motion Mixer track that allows you to stack clips on top of one another, and to create automatic transitions between them. Transitions on these tracks are similar to those in a Motion Flow network. Compare with a *Layer track (page 3–1055)*, which allows cuts only between clips. See *Adding Tracks to the Mixer (page 2–583)*.

Translucency



Glass on the right has a light green translucency.

A translucent material transmits light, but unlike a transparent material, it also scatters the light so those objects behind the material cannot be seen clearly.

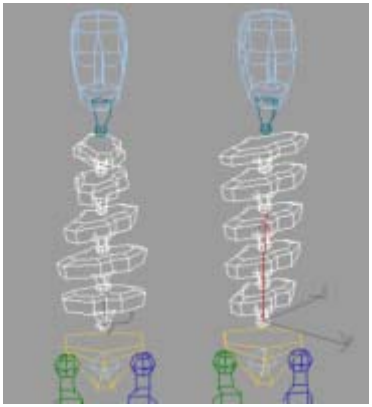
Raytrace materials (page 2–1353) can simulate translucency. A Raytrace material's Translucency color component ignores surface normal directions, giving the effect of light scattering.

You can also obtain translucency effects using the *Standard material's (page 2–1309) Translucent shader (page 2–1326)*.

Truecolor

Describes hardware and software that can support up to 16 million color values. Also known as 24-bit color, or 32-bit color when saved with *alpha channel data (page 3–1001)*.

Twist Links



Twist Links Mode active (left) and Twist Links Mode inactive (right)

When you turn on Twist Links Mode (on the *Bend Links rollout (page 2–807)*), a rotation in local X applied to a single chain link is incremented equally throughout the rest of the chain. The remaining two axes (Y and Z) are not affected by this rotation.

Universal Naming Convention (UNC)

The 3ds Max network rendering system uses the Universal Naming Convention (UNC) to identify directories and files. UNC names begin with a double backslash and do *not* include a drive letter. This is the convention:

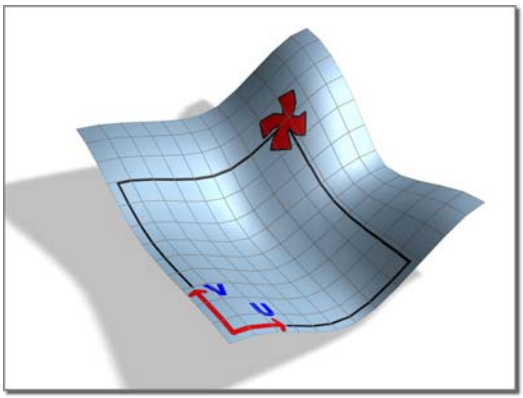
\\machine_name\directory\subdirectory\filename

To simplify network rendering, use UNC names whenever possible within a 3ds Max scene, even if the directory is on the local machine.

Tip: When entering UNC names, leave off the \\ before the file name until you've entered the entire path and file name. This eliminates search delays when entering UNC path names into file selection dialogs.

Some networks require drive letters instead of UNC names. Directories on such networks can be mounted as drive letters and shared over the network. See *Mounting a Directory (page 3–182)*.

UVW Coordinates



Local UV coordinates shown on a surface

Most material maps are a 2D plane assigned to a 3D surface. Consequently, the coordinate system used to describe the placement and transformation of maps is different from the X, Y, and Z axis coordinates used in 3D space. Specifically, mapping coordinates use the letters U, V, and W; the three letters preceding X, Y, and Z in the alphabet.

The U, V, and W coordinates parallel the relative directions of X, Y, and Z coordinates. If you look at a 2D map image, U is the equivalent of X, and represents the horizontal direction of the map. V is the equivalent of Y, and represents the vertical direction of the map. W is the equivalent of Z and represents a direction perpendicular to the UV plane of the map.

You might question why you need a depth coordinate like W for a 2D plane. One reason is because it's sometimes useful to be able to flip the

orientation of a map, relative to its geometry. To do this, you need the third coordinate. The W coordinate also has a meaning for 3-dimensional procedural materials.

Vector Field

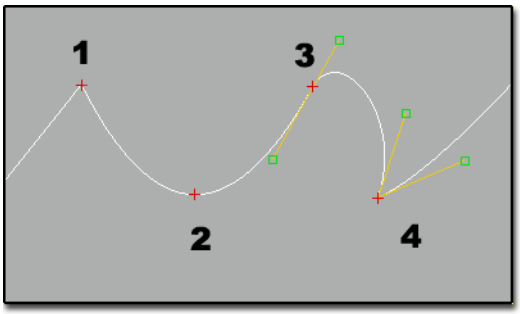
In *crowd animation (page 2–1006)*, a vector field is a special type of space warp that crowd members can use to move around irregular objects such as a curved, concave surface. The vector field gizmo, a box-shaped lattice, is placed and sized so that it surrounds the object to be avoided. The vectors are generated from the lattice intersections. These vectors are, by default, perpendicular to the surface of the object to which the field is applied; if necessary, you can smooth them out with a blending function. The crowd members move around the object by traveling perpendicular to the vectors.

Vector Field Space Warp

In *crowd animation (page 2–1006)*, you can use the *Vector Field space warp* as a space warp behavior. A vector field allows crowd members to move automatically around *obstacle objects* of any shape, following the object contours. It also lets crowd members move within the confines of an enclosed space, such as a room, while avoiding the walls. You can also use Vector Field space warps to control particle motion.

The Vector Field space warp works by generating a number of vectors that surround an object and are perpendicular to its surface. Crowd animation then uses these vectors to guide delegates around the object by moving them perpendicular to the vectors.

Vectors and Vector Handles



Kinds of vector handles:

1. *Corner*
2. *Smooth*
3. *Bezier*
4. *Bezier corner*

Vectors are secondary control points connected to vertices on a spline or patch object. They are also referred to as handles or vector handles.

Vector handles are visible as small green squares when you select a vertex. However, if the Vectors filter is checked (for a patch object), handles can be selected and transformed without selecting a vertex first. A transform cursor appears when you move onto a vector.

Each vertex in a shape can be one of four types:

Smooth—Forces the segments into a smooth curve tangent to the vertex.

Corner—Allows the segments on either side of the vertex to be at any angle.

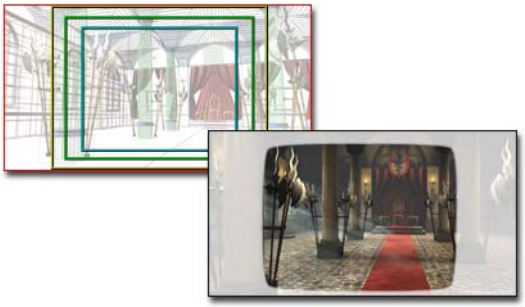
Bezier—Provide handles, but forces the segments into a tangent through the vertex.

Bezier Corner—Provides handles, and allows the segments on either side of the vertex to be any angle.

Velocity Interpolation

One method of interpolation used in *motion flow editing (page 2–878)*. By default, in a transition between two motion clips, velocity is interpolated to blend smoothly between clips. If transitions are optimized, then a sophisticated algorithm is used that minimizes sliding feet.

Video Safe Frame



Safe frame borders show which portions of a viewport will be visible when rendered to video.

The Video Safe Frame provides a guide to help avoid rendering portions of your image that might be blocked in the final output.

For example, to ensure that no unintentional black areas are visible on a television screen, broadcasters intentionally "overscan" the video image. The result is that portions of an image around the edges are not visible on a typical set. In addition, portions of images on 35mm slides can be partially covered by the slide mounts.

You can adjust the size of the safe frame as a percentage of the outer display rectangle with the Safe-Frame controls in the Viewport Configuration dialog. Depending upon its size, the safe frame can be used as the equivalent of a "title safe frame" (the area inside which it is safe to display titles), or an "action safe frame" (the area inside which action may occur without significant loss of information).

To view the frames, choose Show Safe Frame from the viewport right-click menu (displayed when you right-click the viewport label). Three rectangles, one yellow, one green, and one pale blue, appear in the camera viewport. The outer, yellow video rectangle is the area and aspect ratio of your current display. The middle, green rectangle is the action safe zone. The inner, pale blue rectangle is the title safe zone.

Choose Show Safe Frame again to turn off the display.

Viewport (Interactive) Renderer

The interactive renderer, used for the viewports, is designed for speed so you can easily manipulate your objects in a shaded environment. It's not the same as the production renderer, which is used for your final images. Therefore, a number of effects that are available to the production renderer will not show up in the viewports.

When you design your materials, for example, you have four levels of visual feedback. The lowest level is the shaded viewport. The next level is an ActiveShade viewport (or floater). The next level is the sample slot, which uses the production renderer to display the sample sphere. The highest level is the rendered scene, which uses the production renderer to display the scene.

A single material can contain any number of maps.

Because viewing mapped materials slows the viewport display, it's up to you to decide which map (if any) you want to display. To display a specific map, you go to that map's level in the Material Editor, and then turn on its display. (If you later go to a different map in the same material, and turn its display on, the other map is automatically turned off.)

VIZBlock

A VIZBlock is a compound object similar to a nested AutoCAD block. It is used for organizing linked data from DWG files. When AutoCAD data is linked to 3ds Max, you need to decide how the AutoCAD entities are to be organized in the scene. AutoCAD drawings are commonly organized by layers, blocks, and entities, and 3ds Max scenes are organized by hierarchies of objects.

VPX Files

VPX (Video Post sequence) files contain all the information relating to the queue and all associated settings and references. They have the file extension *.vpx* and are stored by default in the 3ds Max *|vpost* folder.

All of the Video Post configuration data, queue events, and queue event external data is saved with the MAX file also, however saving it to a separate file allows you to use the same Video Post settings in different scenes, and also allows you to share sequences with other 3ds Max users.

VUE File

A VUE (*.vue*) file is an editable ASCII file. You create a VUE file using the VUE file renderer instead of the default scanline renderer.

A VUE file contains a sequence of frames to render. Each frame is described by a sequence of commands, beginning with a "frame" command, which specifies the frame number, and ending with a viewport command, which specifies the view to render (such as "top" or "camera"). Between these two commands, there can be any number of "transform", "light", and "spotlight" commands.

Note: VUE files created with 3DS DOS could also contain "morph" commands. This is not supported in 3ds Max because the 3ds Max exporter doesn't export morph targets.

The VUE file commands are as follows:

frame <n>

transform <object name> <transform matrix>

light <light name> <x> <y> <z> <r> <g> <b>

spotlight <light name> <x> <y> <z> <tox> <toy> <toz> <r> <g> <b> <hot angle> <falloff angle> <shadow flag>

top <x> <y> <z> <width>

bottom <x> <y> <z> <width>

left <x> <y> <z> <width>

right <x> <y> <z> <width>

front <x> <y> <z> <width>

back <x> <y> <z> <width>

user <x> <y> <z> <horiz> <vert> <roll> <width>

camera <x> <y> <z> <tox> <toy> <toz> <roll> <focal>

Frame Command

Begins each frame description. Has a single parameter: the frame number.

Transform Command

Transforms the specified object.

The first parameter is the name of the object. This is the name as it appears when you use 3ds Max, but enclosed in double quotes.

The second parameter is a transform matrix. This consists of 12 real numbers:

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12

The VUE file treats these as if they were arranged in a 4 x 4 matrix (M):

T1 T2 T3 0

T4 T5 T6 0

T7 T8 T9 0

T10 T11 T12 1

The first nine values, T1–T9, describe rotation and scaling. The last three, T10–T12, describe a move, in world coordinates.

The VUE file renderer transforms the points of the object by post-multiplication:| X' Y' Z' 1| = | X Y Z 1 | * M

Omni Light Command

Controls the location and color of an Omni light.

The first parameter is the name of the light. This is the name as it appears when you use 3ds Max, but enclosed in double quotes.

The next three parameters, <x>, <y>, <z>, are the light's location.

The next three parameters, <r>, <g>, <b>, are the light's color. The color values are normalized to range between 0.0 and 1.0.

The last parameter, <shadow flag>, parameter is 1 if the light casts shadows, 0 otherwise.

Spotlight Command

Controls the location, color, and other characteristics of a target spotlight.

The first parameter is the name of the light. This is the name as it appears when you use 3ds Max, but enclosed in double quotes.

The next three parameters, <x>, <y>, <z>, are the light's location.

The next three parameters, <tox>, <toy>, <toz>, are the location of the light's target.

The next three parameters, <r>, <g>, <b>, are the light's color. The color values are normalized to range between 0.0 and 1.0.

The <hot angle> parameter is the angle of the light's hot spot, in degrees.

The <falloff angle> parameter is the falloff angle, in degrees

The <shadow flag> parameter is 1 if the light casts shadows, 0 otherwise.

Orthogonal Viewport Commands

These commands render a particular view—top, bottom, left, right, front, or back.

The <x>, <y>, <z> parameters are the coordinates of the center of the view.

The <width> parameter is the width of the rendered image, in world units.

User Viewport Command

Renders the user view.

The <x>, <y>, <z> parameters are the coordinates of the center of the view.

The <horiz> parameter is the horizontal angle, in degrees.

The <vert> parameter is the vertical angle, in degrees.

The <roll> parameter is a placeholder for the roll angle—but this is an "empty," unused parameter that must always be zero. To use roll in a VUE file, use a camera view instead of a user view.

The <width> parameter is the width of the rendered image, in world units.

Camera View Command

Renders a camera view.

The <x>, <y>, <z> parameters are the camera's location.

The <tox>, <toy>, <toz> parameters are the location of the camera's target.

The <roll> parameter is the camera roll angle, in degrees.

The <focal> parameter is the camera's focal length, in millimeters.

Walking Gait

One of the predefined biped gaits available in *footstep animation (page 3–1037)* (the others are running and jumping). In a walking gait, at least one foot is always in contact with the ground.

Wall Repel Behavior

In *crowd animation (page 2–1006)*, the Wall Repel behavior uses a grid object to repel delegates. When influenced by the Wall Repel force, delegates turn until they're heading away from the grid. This behavior is useful for keeping objects inside an enclosed, straight-sided enclosure, such as a room in a building.

Wall Seek Behavior

In *crowd animation (page 2–1006)*, the Wall Seek behavior uses a grid object to attract delegates. When influenced by the Wall Seek force, delegates turn until they're heading toward the grid. This behavior is useful for moving objects toward a rectangular area, such as a doorway.

You can set the grid to attract from either side or both sides, and optionally specify a maximum distance for attraction. You can also set the behavior to act as though the grid extends infinitely along its plane.

Wander Behavior

In *crowd animation (page 2–1006)*, the Wander behavior imparts a random motion to delegates, letting you simulate meandering activity in which delegates move and turn in a haphazard manner. The behavior works by randomly picking a new direction, and then turning and moving in that direction. You can specify how often to pick a new direction, how far to turn, and how fast or slow to turn while moving.

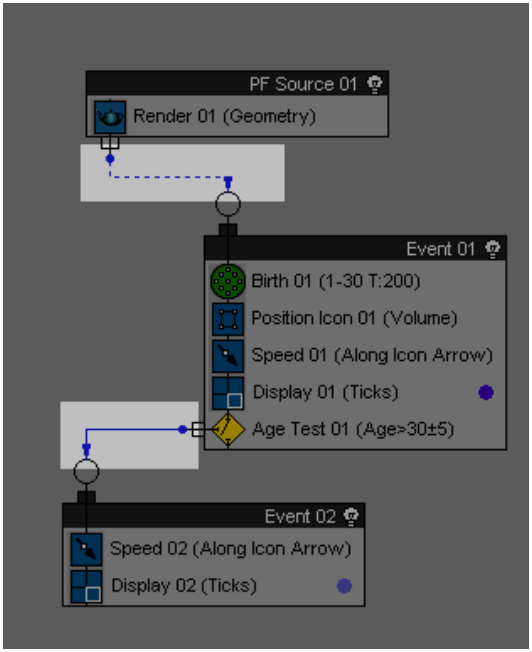
Weight Curve

In the *Motion Mixer (page 3–1070)*, weight curves define the amount of influence a *clip (page 3–1069)* or *track (page 3–1117)* has on the mixed animation.

On a *layer track (page 3–1055)*, each clip has its own weight curve. On a *transition track (page 3–1121)*, one curve defines the influence for the entire track. On a *balance track (page 3–1008)*, the weight curve determines the degree of automatic balance compensation applied to the biped motion.

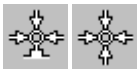
Wire

Particle Flow uses wires to show connections between events in *Particle View (page 2–121)*. There are two types of wires: one that connects a *global event (page 3–1043)* to a *birth event (page 3–1010)*, represented by a dashed blue line; and one that connects a *test (page 3–1115)* to a *local event (page 3–1057)*, represented by a solid blue line.



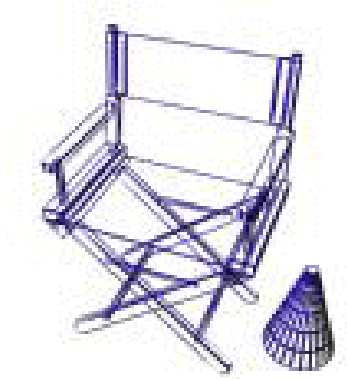
Wire from global event to birth event (above); wire from test to local event (below)

To wire a test to an event, drag from its *test output*, the blue dot that by default sticks out to the left of the test, to the event's *event input*, which sticks out from the top, or vice-versa. Similarly, you can wire a global event to a birth event by dragging between the *source output* on the bottom of the global event and the event input.

 The mouse cursor resembles the first image when you can begin this operation: the bottom portion is the top of a small square. The cursor resembles the second image when you can complete the operation: the square at the bottom has become an arrow.

To delete a wire, right-click it and choose Delete Wire, or click it (it highlights in yellow) and then press the DELETE key. Or, with a wire between a test and an event, drag from either connector to a blank area of the *event display (page 3–1029)*.

Wireframe Mode



Wireframe mode display of a director's chair and megaphone

Wireframe is a viewport setting that lets you view objects in a given viewport as a wire mesh. This is the default setting for non-Perspective viewports. You change this setting from the *viewport right-click menu (page 3–774)*.

In addition, you can set the Standard and Raytrace materials to render as wires. Use the Extended Parameters rollout to set the size of the wire, and specify its measurement in either pixels or units.

When you use pixels, the thickness of the wire is based on the screen pixels. Therefore, it's absolute, and remains the same, regardless of its distance from the camera. If you use units, the thickness is based on world units, and varies depending on the distance from the camera. It's easier to compare the effect of pixels and units if you first adjust the camera view to give a greater sense of distance. You can most easily do this with the Perspective viewport navigation tool, which dollies the camera in one direction while changing the field of view in the other.

Workbench

The Animation Workbench is a customized version of the Track View function curve editor designed to be used with bipeds. It contains a Curve View that displays keys on function curves which you can edit similar to the way you work in Track View. It also contains a set of four panels for selecting bipeds, analyzing their motion tracks for error conditions, and fixing those tracks individually or in groups.

The Workbench can be used to assign SubAnim controllers to multiple biped body parts at once through the display of the Controllers window.

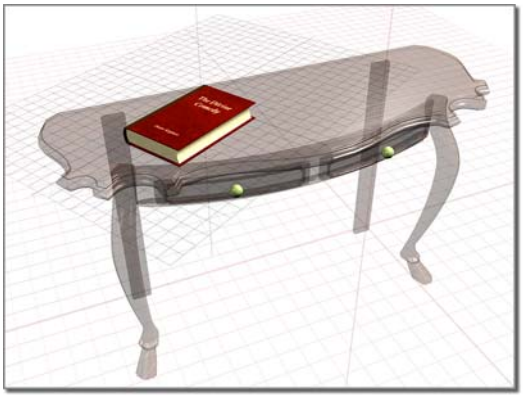
Workbench filters can be used to smooth, blur or boost position and rotation curves, and can also be used to apply controllers or remove keys.

The Workbench uses many of the same toolbars found in Track View for key manipulation and track navigation. It uses manual navigation as the default behavior. When multiple biped body parts are selected it does not display all curves as a default, so you can perform error analysis and correction on many tracks without displaying all the curves simulatneously.

Workflow

A series of steps to perform a task.

World Coordinate System



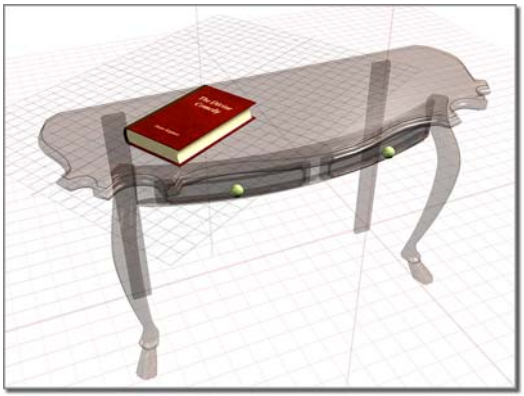
A book in object space rests on a table in world space. The table uses the world coordinate system.

The coordinate system for world space or the model space as a whole.

World space is the universal coordinate system for all objects in the scene. When you look at the home grid in the viewports, you see the World Space coordinate system. World space is constant and immovable.

In the world coordinate system seen from the front, the X axis runs in a positive direction to the right, the Z axis runs in a positive direction upward, and the Y axis runs in a positive direction away from you.

World Space



A book in object space rests on a table in world space.

World space is the universal coordinate system used to track objects in the scene. When you look at the home grid in the viewports, you see the world-space coordinate system. World space is constant and immovable. By convention, world-space coordinates are always expressed as XYZ coordinates, as opposed to the UVW coordinates of *object space (page 3–1076)*.

All objects in your scene are located in world space by their position, rotation, and scale (their transforms).

Some *modifiers (page 3–1068)* operate in world space. See *World-Space Modifiers (WSMs) (page 1–498)*.

Space warps also operate in world space. A space warp defines an area in world space that is affected by the space warp's parameters. Any object that is bound to the space warp is affected as it moves through the space warp's area of world space.

World Space (Biped)

When you use *freeform animation (page 3–1039)* to animate a biped, you can place a biped limb into the space of another object, or into world space. For example, if the biped's feet are in world space, then when you move the center of mass, the feet stay planted in the same location.

World-Space Modifiers (WSM)

World space is the universal coordinate system that applies to the entire scene. A world-space modifier, as opposed to an *object-space modifier (page 3–1077)*, affects an object but uses world coordinates.

A world-space modifier always appears at the top of the *modifier stack (page 1–487)*. Its effect is independent of its order in the stack.

See also

World-Space Modifiers (WSMs) (page 1–498)

xref (AutoCAD External Reference)

An AutoCAD external reference. An xref is a variation on a block. A block is a collection of geometry that is identified by a unique name, is stored in the AutoCAD symbol table, and essentially behaves as if it is a single object. Xrefs share block characteristics, and they are similarly defined in the symbol table. However, unlike blocks, the geometry associated with an xref definition is not stored in the current AutoCAD drawing; it is stored in another AutoCAD drawing file. Like a block, there can be many instances of an xref in a AutoCAD drawing, but only one definition.

Typically, xrefs are used to display the geometry of a common base drawing in the current AutoCAD drawing without expanding its size. This allows changes to the reference drawing to be reflected in any host AutoCAD drawings that refer to it.

See also

XRef (3ds Max Externally Referenced File) (page 3–1131)

XRef (3ds Max Externally Referenced File)

An XRef in 3ds Max is an externally referenced file or object. XRefs allow multiple animators and modelers to work on one scene at the same time without interfering with each other's work.

There are two ways to XRef another scene:

- *XRef Scene (page 3–416)*

  The File > XRef Scene command XRefs an entire scene. For example, a classic use of this command is to bring in a scene that appears as a "set" for an animation you create.

- *XRef Objects (page 3–406)*

  The File > XRef Objects command XRefs individual objects or materials. For example, you might be working on the model of a building, and fill it with furniture created by other artists.

  You can also XRef the manipulators and modifiers associated with the objects you XRef.

ZT File

A ZT (*.zt)* file is a mental ray *shadow map file (page 3–1105)*. This is a binary file that the mental ray renderer uses to accelerate the generation of shadows. You specify a name and location for the *.zt* file on the Render Scene dialog > Renderer panel > *Shadows & Displacement rollout (page 3–111)*.

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