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# USING MAYA: ESSENTIALS

VERSION 3

## USING MAYA: BASICS

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# CONTENTS

## Part 1 Basic Features 29

<b>1</b>	<b>WORKING IN MAYA</b>	<b>1</b>
	<b>Starting Maya</b>	<b>2</b>
	Command line options	2
	Running prior versions of Maya	3
	Environment variables	3
	<b>Main window</b>	<b>4</b>
	Main window and floating windows	8
	<b>Maya workspace</b>	<b>9</b>
	<b>Streamlining the interface</b>	<b>12</b>
	<b>Working with objects</b>	<b>13</b>
	Object display	14
	Object attributes	15
	Attributes and nodes	16
	<b>Working with tools and actions</b>	<b>17</b>
	Using actions	17
	Using tools	18
	Manipulators and handles	19
	<b>MEL commands</b>	<b>20</b>
	<b>Using the Hotbox</b>	<b>20</b>
	Displaying recent selections	22
	Changing the appearance and contents of the Hotbox	23
	Disabling the Hotbox	25
	<b>Using marking menus</b>	<b>25</b>
	<b>Scene management</b>	<b>28</b>

## CONTENTS

	<b>Getting help</b>	29
<b>2</b>	<b>VIEWING YOUR SCENE</b>	31
	<b>Orienting the XYZ system</b>	31
	Changing the orientation/up axis	33
	World coordinates	33
	Local coordinates	33
	<b>Working with cameras</b>	34
	Creating a new camera	36
	Moving the camera	36
	Looking through a camera	37
	Changing camera settings	38
	<b>Setting a perspective view</b>	40
	Creating new perspective views	40
	<b>Setting an orthographic view</b>	41
	Creating new orthographic views	41
	<b>Lighting your scene</b>	42
	<b>Arranging views</b>	43
	Displaying the workspace only	45
	Laying out the views	45
	<b>Marking a view</b>	47
	Creating a bookmark	47
	Selecting custom bookmarks	48
	Renaming a bookmark	49
	Adding a bookmark to a shelf	49
	<b>Enabling and disabling nodes</b>	49
<b>3</b>	<b>EDITING OBJECTS</b>	51

## CONTENTS

<b>Selecting objects</b>	51
Selecting objects individually	52
Selecting all objects in a scene	52
Selecting objects by type	53
Selecting objects by name	55
Selecting all objects in a set	55
Selecting all objects in a display layer	55
<b>Deleting objects</b>	55
Deleting a single object	56
Deleting object components by type	56
Deleting all objects by type	57
<b>Duplicating and instancing objects</b>	58
Duplicating objects	58
Creating instances of objects	60
<b>Working with groups</b>	63
Grouping objects	63
Ungrouping objects	64
Creating an empty group	66
<b>Creating object hierarchies (parenting)</b>	66
Parenting objects	66
Unparenting objects	67
<b>Undoing and redoing actions</b>	68
Undoing your last action	68
Redoing and repeating actions	68
<b>Editing object attributes</b>	69
<b>4 TRANSFORMING OBJECTS</b>	71
Selecting transformation tools	72

## CONTENTS

<b>Using manipulators</b>	72
About manipulator handles	73
<b>Using axes and pivot points</b>	73
What are pivot points?	74
What is an axis?	78
<b>Moving objects</b>	79
Moving the translate pivot point	81
Choosing a coordinate system for the Move tool	82
Moving curves on surfaces	83
Moving a path animation marker	84
<b>Rotating objects</b>	85
Moving the rotate pivot point	86
Changing the rotation order	87
Animating rotation channels	89
<b>Scaling objects</b>	89
Moving the scale pivot point	90
<b>Using the Show Manipulator tool</b>	91
Selecting an item's history node	92
Changing a curve's parameter range	93
Displaying manipulators for lights and cameras	94
Using the Default Object manipulator	94
<b>Entering numeric values</b>	95
Using the Numeric Input field	95
Using the Command Line	97
<b>Combining transformations</b>	97
<b>Using proportional modification</b>	99
Specifying proportional modification falloff	101

	Using the PropMod script	105
	<b>Creating locators</b>	105
	<b>Using Measure tools</b>	107
	Using distance measures	107
	Displaying parameter values	111
	Measuring arc lengths	114
<b>5</b>	<b>DISPLAYING OBJECTS</b>	119
	<b>Displaying items in Maya</b>	119
	<b>Using a grid</b>	120
	Setting grid options	121
	<b>Displaying axes, polygon count, and frame rate</b>	122
	<b>Specifying how objects display</b>	122
	<b>Hiding and showing objects</b>	125
	Hiding geometry	126
	Hiding kinematics	127
	Hiding deformers	128
	<b>Isolating selected objects or components</b>	129
	<b>Displaying object components</b>	131
	<b>Displaying NURBS components</b>	132
	Displaying NURBS smoothness	133
	<b>Displaying polygon components</b>	135
	Setting custom polygon options	135
	<b>Displaying camera and light manipulators</b>	137
	Displaying camera manipulator controls	137
	Displaying light manipulator controls	138

## CONTENTS

<b>Working with templates</b>	139
<b>Using display layers</b>	139
Display layer tools	140
Creating and naming display layers	141
Assigning objects to display layers	141
Removing objects from display layers	142
Display Layer commands	143
Changing the color of the display layer:	144
Using the Layer Editor	145
Modifying display layer attributes	146
Merging display layers when importing files	147
<b>Using render layers</b>	147
Creating and naming render layers	148
Assigning objects to render layers	148
Removing objects from render layers	149
Render Layer commands	149
Changing the color of the render layer:	150
<b>6 MODELING AIDS</b>	151
<b>Snapping</b>	151
Snapping icons	151
Snapping hotkeys	153
Snapping along a constraint axis	154
Snapping to a curve on surface or isoparm curve	154
Snapping aligning objects	155
<b>Limiting selections</b>	157
Limiting selection by object type	157
Limiting selection by component type	159
Limiting selection to hierarchy items	166

	Limiting selection to template objects	166
	Limiting selection by task	167
	Moving selection limitations to the shelf	168
	<b>Freezing and resetting transformations</b>	169
	<b>Locking transform tools and manipulators</b>	170
	<b>Using construction history</b>	170
	<b>Making objects live</b>	171
	<b>Creating levels of detail</b>	173
	Changing the Threshold distances	174
	Re-ordering the levels	175
	Adding and editing levels	175
	Previewing more than one object at the same time	176
	Notes about orthographic cameras and level of detail	177
<b>7</b>	<b>MANAGING FILES AND PROJECTS</b>	179
	<b>Opening a scene</b>	180
	<b>Creating a new scene</b>	181
	<b>Setting Open options</b>	181
	<b>Importing files</b>	184
	Using default nodes	184
	Importing files by copying	184
	Importing move files	186
	Importing Adobe Illustrator® and EPS files	188
	Importing animation curves	188
	Importing files by reference	190
	<b>Supported file formats</b>	196
	<b>Saving files</b>	198

## CONTENTS

	Setting save options	200
	Tips for reducing file size	201
	<b>Exporting files</b>	201
	Setting export options	202
	Exporting scene elements	202
	Exporting move files	204
	<b>Using plug-ins for exporting</b>	205
	Exporting to Wavefront (OBJ)	205
	Exporting to IGES or DXF	207
	Exporting to Alias Wire	207
	Exporting to RenderMan	207
	Exporting animation curves	210
	<b>Optimizing scene size</b>	212
	<b>Managing projects</b>	213
	Where Maya stores scene information	214
	Using absolute and relative paths	214
	Multiple project directory paths	215
	Creating projects	215
	Specifying the current project	217
	Editing the current project	218
	<b>Mapping missing directories</b>	218
	Mapping from IRIX to NT	218
	Mapping from IRIX to IRIX	219
<b>8</b>	<b>SETTING ENVIRONMENT VARIABLES</b>	221
	<b>About environment variables</b>	221
	<b>Creating the Maya.env file</b>	222
	Rules for Maya.env	223

Where Maya looks for Maya.env	224
<b>Modifying standard paths</b>	225
Other path settings	225
<b>Standard Maya environment variables</b>	226
 <b>Part 2 Editors</b>	 233
 <b>9 USING MAYA EDITORS</b>	 235
<b>Using General Editors</b>	236
Using the Component Editor	237
Using the Attribute Spread Sheet	241
Specifying tool settings	248
Specifying performance settings	249
Loading and unloading plug-ins	251
<b>Using the Relationship Editor</b>	255
Setting view options	256
Displaying relationships and objects	257
Creating relationships	259
Selecting relationships, relationship members, and objects	260
Adding and removing relationship members	261
<b>Using the Attribute Editor</b>	262
Displaying the Attribute Editor	262
Loading object attributes into the Attribute Editor	266
Viewing attributes for different objects at the same time	268
Adding a custom attribute	269
Deleting or renaming custom attributes	271
Changing node behavior	272
Setting keys for attributes in the Attribute Editor	273

## CONTENTS

Linking attributes	274
Breaking connections	274
Locking attribute values	274
Launching the Expression Editor	275
Mapping a texture to an attribute value	275
<b>Using the Color Chooser</b>	276
<b>Using the Channel Box</b>	280
Displaying the Channel Box	280
Displaying object attributes	281
Adding attributes to the Channel Box	282
Displaying component attributes	283
Changing the display format	284
Entering values for attributes	285
Setting keys for attributes from the Channel Box	291
Setting breakdown keys for attributes from the Channel Box	292
Breaking connections from the Channel Box	293
Locking attribute values from the Channel Box	294
Launching the Expression Editor from the Channel Box	295
Linking attributes from the Channel Box	295
Modifying an object's history (inputs)	295
<b>Using the Outliner</b>	297
Understanding scene hierarchy terminology	299
Navigating the Outliner	300
Displaying shape nodes	302
Displaying attributes	303
Displaying specific types of nodes	306
Parenting objects	306
Selecting and renaming objects	309
Reordering nodes	309

<b>Limiting the information shown in editors</b>	311
Limiting the display	312
Showing all items not currently displayed	314
Showing all items (removing restrictions)	314
Storing your restrictions	314
Deleting stored restrictions	315
Controlling display of auxiliary nodes	316
<b>10 USING THE HYPERGRAPH</b>	319
<b>Opening the Hypergraph</b>	320
<b>Understanding scene hierarchy terminology</b>	322
<b>Using the scene hierarchy</b>	324
Expanding scene hierarchy nodes	324
Displaying special nodes and connections	326
Parenting objects	329
Rearranging scene hierarchy nodes	331
Displaying a background image with a scene hierarchy	335
<b>Understanding the dependency graph</b>	337
<b>Using a dependency graph</b>	338
Displaying render node connections	339
Displaying upstream and downstream connections	340
Dragging nodes into a dependency graph	344
Disconnecting nodes in a dependency graph	344
Connecting nodes in a dependency graph	346
Updating the layout of a dependency graph	351
Clearing the contents of a dependency graph	352
Returning to the scene hierarchy	352
<b>Editing objects</b>	352

## CONTENTS

Selecting objects	352
Adding and selecting an IK handle	353
Renaming an object	354
Hiding an object in the workspace	355
Editing an object's attributes	355
Creating a render node	356
<b>Altering the view of a graph</b>	356
Tracking the view	356
Dollying the view	356
Dollying a region	357
Fitting an entire graph in the window	358
Centering selected nodes in the window	359
Centering a hierarchy in the window	359
Centering a hierarchy branch in the window	360
Adjusting view transition speed	360
Setting graph update options	361
Undoing a view of a scene hierarchy	361
Using bookmarks for graph views	362
Displaying a graph vertically or horizontally	364
Rebuilding the graphs	365
<b>11 SETS AND PARTITIONS</b>	367
How you can use sets	368
Understanding sets	369
Sets you create	370
Sets created by Maya	371
Creating, selecting, and removing sets	375
Creating sets	375
Selecting sets	376

Removing sets	377
Creating sets for easy object selection	377
Editing set membership	378
Altering the display of sets	379
Understanding partitions	379
Partitions you create	379
Partitions created by Maya	380
Creating, displaying, and removing partitions	381
Adding sets to partitions	382
<b>Part 3 Artisan Paint Tools</b>	<b>385</b>
<b>12 USING ARTISAN PAINT TOOLS</b>	<b>387</b>
What are the Artisan paint tools	388
How Artisan paint tools work	390
Changing paint tool settings	393
Tool-specific settings	395
Common tool settings	396
Resetting tools	397
Changing brush stroke settings	397
Changing display settings	404
Changing miscellaneous tool settings	406
Creating an Artisan tool shelf	410
Defining Artisan hotkeys	410
Using Artisan marking menus	414
Snapping an Artisan paint brush to path	415

## CONTENTS

<b>Masking surfaces</b>	416
<b>Mapping attributes</b>	419
Importing attribute maps	420
Exporting attribute maps	424
<b>Working with seams</b>	426
What is a seam?	426
Selecting common edges and corners	426
Stitching surfaces	438
Painting weights and attributes, or script painting over seams	438
<b>13 SCRIPT AND ATTRIBUTE PAINT TOOLS</b>	441
<b>Painting with MEL Scripts</b>	441
Overview of MEL script painting	441
Setting Script Paint Tool options	442
Script painting	447
Script painting on masked surfaces	454
Flooding surfaces	454
<b>Painting attribute values</b>	454
Painting attributes	454
 <b>Part 4 Preferences</b>	459
<b>14 SETTING PREFERENCES</b>	461
<b>Settings/Preferences menu</b>	462
<b>Where Maya stores preferences</b>	462
<b>Saving preferences using userSetup.mel</b>	464
<b>Preferences window</b>	465
Interface	466

## CONTENTS

UI Elements	466
Misc	467
Display	467
Kinematics	469
Manipulators	469
NURBS	470
Polygons	471
Settings	472
Dynamics	473
Files/Projects	474
Keys	475
Modeling	476
Selection	476
Snapping	478
Sound	478
Timeline	479
Undo	481
Modules	481
OpenMaya	482
<b>Changing color settings</b>	<b>482</b>
Changing default colors	482
<b>Specifying tool settings</b>	<b>485</b>
<b>Specifying performance settings</b>	<b>487</b>
<b>Loading and unloading plug-ins</b>	<b>489</b>
<b>15 CUSTOMIZING SHELVES, MARKING MENUS, AND HOTKEYS</b>	<b>493</b>
<b>Creating and editing shelves</b>	<b>493</b>
Creating and deleting shelves	495
Adding shelf items	498

## CONTENTS

Removing shelf items	499
Moving and copying shelf items	500
Renaming shelves	501
Reordering the shelves	501
Changing shelf icons	502
Changing icon labels	504
Setting Shelf label options	506
Adding overlay labels	507
Changing MEL command(s) associated with an icon	507
<b>Creating and editing marking menus</b>	<b>509</b>
Creating marking menus	511
Assigning marking menus to hotkeys	515
Modifying existing marking menus	516
Adding submenus to menu items	520
Associating a MEL script with a menu item	522
Deleting marking menus	523
<b>Assigning hotkeys</b>	<b>526</b>
Assigning hotkeys to standard commands	527
Viewing hotkey lists	528
Searching for commands	529
Changing or deleting a hotkey	530
Adding commands for hotkey assignment	530
<b>16 WORKING WITH PANELS AND LAYOUTS</b>	<b>533</b>
<b>Using the Panel Editor</b>	<b>533</b>
<b>Viewing panels</b>	<b>535</b>
Modifying existing panels	535
Creating and deleting panels	537
<b>Defining layouts</b>	<b>539</b>

## CONTENTS

Selecting panel layouts	539
Creating layouts	540
Deleting layouts	544
Maintaining layout history	544

## CONTENTS

USING MAYA: ESSENTIALS

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# INTRODUCING MAYA: ESSENTIALS

Thank you for buying Maya—Alias | Wavefront’s award-winning computer animation package. The following pages describe how to approach the Maya documentation so you can learn and use your software most effectively.

## About the Essentials book

*Using Maya: Essentials* provides a guide to the Maya user interface and basic tools, and a general introduction to the Maya software. *Using Maya: Essentials* covers the following:

- Chapter 1, *Working in Maya*, describes how you do things in Maya. It shows you how to use menus, shelves, hotkeys, and windows. It also introduces the Hotbox and marking menus—two customizable tools for quickly accessing menus and action.
- Chapter 2, *Viewing Your Scene*, describes Maya’s XYZ coordinate system. It also includes information on the various tasks you can perform using Maya viewing tools.
- Chapter 3, *Editing Objects*, describes how to edit objects in Maya. It covers how to delete, select, instance, copy, group, and parent objects. It also describes Maya’s undo, redo, and repeat functions.
- Chapter 4, *Transforming Objects*, shows you how to scale, rotate, and move your objects to position them in 3D space.
- Chapter 5, *Displaying Objects*, describes the tools and actions you use to display or hide objects and attributes. You can use these tools to customize your working environment and reduce workspace complexity.
- Chapter 6, *Modeling Aids*, shows you some of the modeling features you can use to help you build and position objects.
- Chapter 7, *Managing Files and Projects*, describes how to open and save files, import and export files, how to create and edit projects, and what files formats are supported by Maya.

- Chapter 8, *Setting Environment Variables*, explains the use of the Maya.env file to set environment variables. It also lists the available Maya environment variables.
- Chapter 9, *Using Maya Editors*, describes Maya editors, including: several of the General Editors, the Relationship Editor, the Attribute Editor, the Channel Box, and the Outliner.
- Chapter 10, *Using the Hypergraph*, shows you how to use the Hypergraph to view the relationship between components of a scene graphically.
- Chapter 11, *Sets and Partitions*, explains how to use sets (collections of objects and components) and partitions (collections of related sets).
- Chapter 12, *Using Artisan Paint Tools*, introduces the paint tools included in Maya (formerly Artisan paint tools). The tools use an intuitive paint and sculpting-based interface to deliver high quality and otherwise complex results in minimal time.
- Chapter 13, *Script and Attribute Paint Tools*, describes how to use the advanced Artisan tools: Script Paint Tool and Attribute Paint Tool.
- Chapter 14, *Setting Preferences*, describes preferences you can set to customize Maya to the way you work. You can change general color definitions, the way manipulators display, and the appearance of the Shelf, menu bars, and panels.
- Chapter 15, *Customizing Shelves, Marking Menus, and Hotkeys*, describes how to tailor these tools to your own needs.
- Chapter 16, *Working with Panels and Layouts*, shows you how to customize your workspace using panels (areas in the main Maya window consisting of interface elements) and layouts (groups of panels).

## About the Maya documentation set

Whether you use Maya Unlimited, Maya Builder, or Maya Builder, you receive a full set of documentation. Since Maya ties together several different kinds of software, we've included a lot of different books to describe how to use it.

### Where do I begin?

The following paragraphs should help you decide where to start reading and learning about Maya.

- 1 **When you install Maya Complete, Maya Unlimited, or Maya Builder**, refer to one of the installation guides for guidance.

For example, see *Installing Maya 3.0 on Windows NT* if you're installing Maya Complete or Unlimited on an NT or Windows 2000 system.

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### *Important*

In response to customer requests, we've changed the licensing procedure in Maya 3.0. Please read the installation instructions from cover to cover, even if you have installed previous versions of Maya.

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- 2 **If you've used Maya before** and want an overview of new features, see *What's New in Maya 3*.

This booklet provides a summary of new features across all modules.

Next, you may want to review the *Maya 3.0 Release Notes* for brief descriptions of limitations in the software and successful ways to work around them.

- 3 **If you're a first-time Maya user**, see *Learning Maya* for a comprehensive, step-by-step tour of the Maya software before you read any other documentation.

A CD included at the back of the book contains online documentation of the tutorials as well as all required image and Maya support files. Additional copies of this book are also available from your local technical bookstore.

The remaining documentation assumes that you have at least a working familiarity with Maya, so it's important to start with *Learning Maya*.

- 4 Now, you're ready to move on to the *Using Maya* series.

## **The Using Maya series**

The *Using Maya* books describe how you can use Maya's user interface to create professional 3D graphics animations and visual effects. Each book is devoted to a different area of the software.

The *Using Maya* series includes these books:

Essentials	provides a guide to Maya's user interface and basic tools. <i>Using Maya: Essentials</i> also defines a number of concepts that are common to all of Maya. <i>Using Maya: Essentials</i> was called <i>Using Maya: Basics</i> in previous releases.
NURBS Modeling	describes Maya's spline modeling system and tells you how to get the most out of it.
Polygonal Modeling	describes how to interactively create, modify, and color polygonal models.
Subdivision Surfaces Modeling	describes the enhanced subdivision surfaces modeling tools which are available only in Maya Unlimited.
Character Setup	tells how to use Maya's deformer, skeleton, skinning, constraint, and character features.
Animation	describes Maya's basic animation software, which is based on keyframes and motion paths. This book also provides information on motion capture and introduces other Maya animation techniques, such as character setup.
Dynamics	describes how to animate using natural forces. You can use dynamics to make effects such as tumbling dice, waving flags, and exploding fireworks.
Rendering	<p>describes how to prepare for rendering, render a scene, and view your rendered images. This book also describes how to create light, shadow, and light effects, shade and texture surfaces. It also tells you how to set up cameras and views and create a background. The information in <i>Using Maya: Rendering</i> is arranged by production task.</p> <p>The online book, <i>Maya Reference: Rendering</i> describes Maya's rendering-related menu options, attributes, and windows. The information in this book is organized around the user interface</p>
Paint Effects	describes how to use Paint Effects to paint real-time rendered strokes onto or between 3D objects or onto a 2D canvas.
Cloth	describes how to create and animate realistic clothing using Maya Unlimited's Cloth software. This book includes four tutorials to get you started, as well as a complete user's guide.

Fur	describes how to use Maya Unlimited Fur to create realistic, self-shadowing fur and short hair on multi-surface models.
Live	describes how to use Live, Maya Unlimited's automated match-moving tool. You can use Live to match Maya scenes with live footage by reconstructing 3D locations and camera or object movement from a shot.

## The Maya Technical Library

When you're ready to use Maya to its fullest potential, you'll want to explore the technical library. These documents tell how to use Maya's powerful command language and expressions. They also provide information that will help you use Maya with other software packages.

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### Note

The books in the Maya Technical Library are not included in a printed document set. However, html files for all of these documents are provided on your product CD for online viewing. PDF files are also provided unless otherwise specified.

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MEL	describes how to use the Maya Embedded Language (MEL) to enter commands and write scripts.
MEL Command Reference	includes technical descriptions of the individual MEL commands. <i>MEL commands are provided in html format only, no PDF files are supplied.</i>
Expressions	describes how to use expressions to control attributes. Expressions are ideal for controlling attributes that change incrementally, randomly, or rhythmically over time. They are also useful for linking attributes between different objects—where a change to one attribute affects the behavior of the other.
DG Node Reference	is for technical users who want more information on the DG node attributes. <i>The DG Node Reference is provided in html format only, no PDF files are supplied.</i>

<b>Maya File Formats</b>	is for technical users with programming experience who want to either edit Maya files or write translators to or from the Maya file formats.
<b>Maya Developer's Tool Kit</b>	describes how to use the Maya API to load, write, and edit plug-ins. This book includes instructions for creating your own plug-ins. The <i>Maya Developer's Tool Kit</i> also features on-line links to example plug-ins.
<b>Maya Translators</b>	is for people who are bringing data into Maya or exporting data to other software packages.
<b>Maya Game Translators</b>	describes how to install and use Maya game translators. Information is provided for VRML2 and GE2, as well as the RTG file format. This book also includes information on using the MDt API.
<b>Rendering Utilities</b>	describes how to use command-line and stand-alone utilities that are part of Maya, such as fcheck, as well as the options for the command line renderer. <i>Rendering Utilities</i> was called <i>Utilities</i> in previous releases.

## Using Maya's online documentation

For your convenience, the Maya documentation is online in html format. (This help requires version 4 or higher of either Netscape Communicator or Internet Explorer.) We include the complete Maya Unlimited documentation set, no matter what version of the software you have purchased.

### Printing online books

To allow you to print copies of the documentation, we've provided PDF files of most documents. These files require the Adobe Acrobat reader.

To print the online books, insert your Maya CD, navigate to the pdf directory, and open library.pdf.

### The Glossary

For 3.0, we've provided an online glossary so you can look up meanings of words you encounter which are new or confusing.

## Search tools

Due to customer requests, we've provided an enhanced Library search tool in Maya 3.0. You can use the Library Search tool without installing the documentation files on a server. To access the Library Search tool, return to the main Maya Library page and select Library Search.

A Book Search tool is also provided in the left frame of most books. Use this tool to look for an item in the book you are viewing currently.

## Online indexes

When you are viewing a specific book, you can access that book's index. You can also use the Global Index to view entries throughout the document set (except the *MEL Command Reference* and the *DG Node Reference*.)

## Using Maya's printed documentation

A complete printed documentation set includes the following documentation:

- *Installing Maya* — describes how to install and license your software
- *Learning Maya* — provides comprehensive step-by-step tutorials
- *Maya Release Notes* — lists limitations in the software and suggests workarounds for them
- *What's New in Maya* — describes the new features we've added for this release
- *Maya Quick Reference Card* — a guide to Maya's most frequently used keyboard shortcuts. The Quick Reference Card also outlines the steps you use to create your own hotkeys.
- Troubleshooting Rendered Images — a quick reference card to help you identify problems with rendered images
- Books in the *Using Maya* series — as listed on page xxiii
- *Maya Global Index* for print — which provides page numbers for entries in the printed document set. This book is different from the online index.

## Printed documentation conventions

The printed documentation follows these conventions:

- MEL commands, program code, expressions, and error messages appear in courier font:

`This is computer code`

- Items in cascading menus are identified by an arrow. For example, “select Particles > Make Collide” means “select the Add Goal option from the Make Collide menu.”



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PART 1

## BASIC FEATURES



# 1

## WORKING IN MAYA

Throughout Maya you'll find a consistent interface and a style of working that is both fast and easily customizable. This chapter presents these methods of working so you can quickly launch into your projects.

- “Starting Maya” on page 2
- “Main window” on page 4
- “Maya workspace” on page 9
- “Streamlining the interface” on page 12
- “Working with objects” on page 13
- “Working with tools and actions” on page 17
- “MEL commands” on page 20
- “Using the Hotbox” on page 20
- “Using marking menus” on page 25
- “Scene management” on page 28
- “Getting help” on page 29

## STARTING MAYA

You can start Maya by either double-clicking the Maya desktop icon or by typing *maya* at a command prompt. On Windows NT, you can also select Start > Programs > Maya (Complete or Unlimited) 3.0 > Maya.

### Command line options

If you start Maya from the command line, there are various startup options you can specify. For example, you can open a file at startup using the *-file* flag:

```
maya -file filename
```

To see the available startup flags, type the following:

```
maya -help
```

To execute Maya commands without the interface, use either *-prompt* or *-batch*. The *-prompt* flag issues a MEL prompt for you to type commands. Type *quit* to exit the prompt mode.

Use the *-batch* flag to run commands without user input, such as in shell or batch scripts. The *-batch* flag starts Maya, executes any commands you specify, and then close Maya. For example, you could create a script to open a file from a prior version of Maya in order to update it to the current version:

```
maya -batch -file someMayaFile.ma -command "file -save"
```

---

#### Notes

The *-batch* command is not used for batch rendering. Instead, use the *Render* command. However, *-batch* does check out a render-only license instead of a full Maya license.

On Windows NT, type *mayabatch* when using the *-batch* flag. The *mayabatch* command runs within the command prompt window, whereas the *maya* command starts a separate window.

---

## Running prior versions of Maya

In some cases, you may want to run a prior version of Maya. On Windows NT, simply choose the prior version from the Start menu.

On IRIX, you need to use a symbolic link pointing to the installation directory of the prior version. To add a symbolic link, log in as root and type the following commands:

```
cd /usr/sbin  
ln -s /usr/aw/mayaX.X/bin/maya mayaXX
```

where *XX* is the version number. Now you can type *mayaXX* to run the prior version.

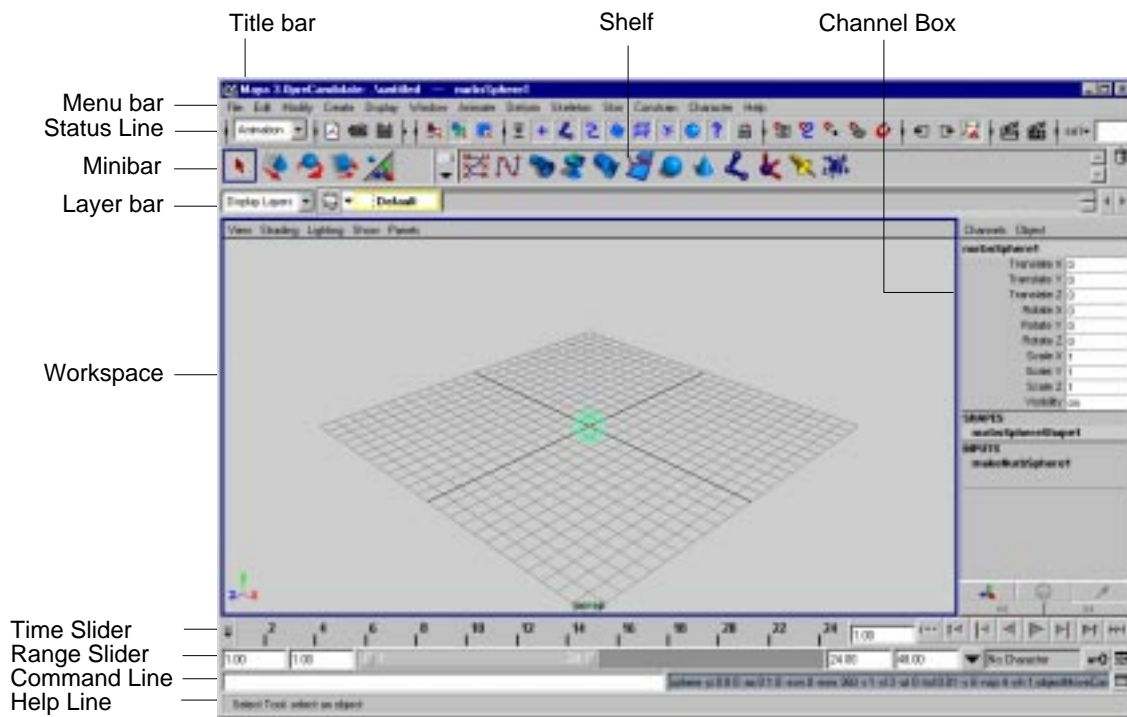
## Environment variables

At startup, Maya uses a number of environment variables to set the environment. Many of the variables are included in the Maya program and are set automatically when you start Maya. To configure Maya further, you can set additional environment variables. See Chapter 8, “Setting Environment Variables” for more information.

## MAIN WINDOW

Read this section for a brief summary of the main interface elements. As you read, keep in mind the following:

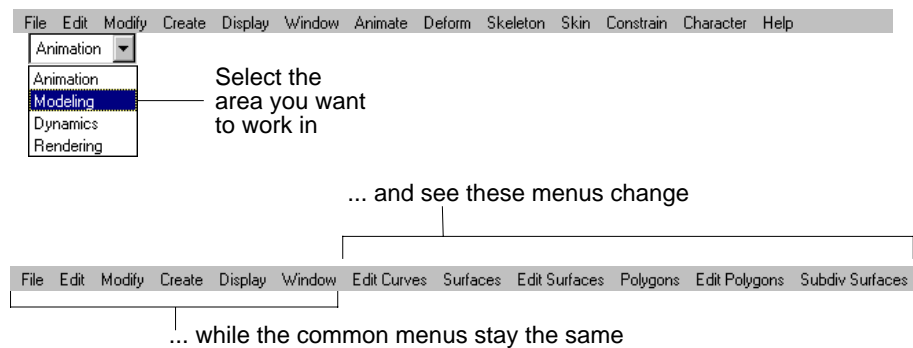
- The critical part of the interface is in the workspace panel; see the next topic, “Maya workspace” on page 9 for details.
- You can hide all the interface elements and instead use Maya’s quick command features: the Hotbox, Marking Menus, and hotkeys. For an introduction to this topic, see “Streamlining the interface” on page 12.



## Menu Bar

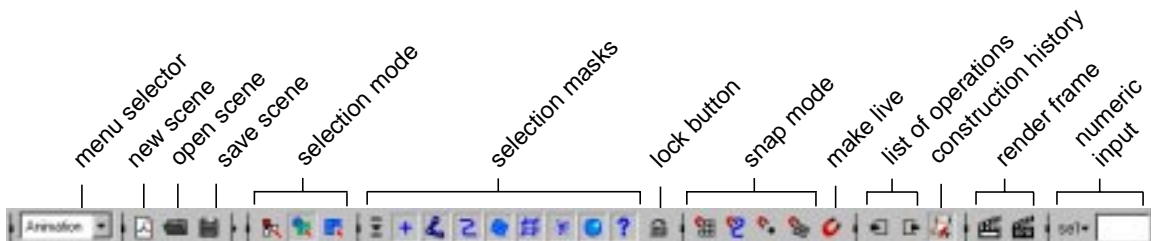
The menus in Maya are grouped into *menu sets*. Each menu set corresponds to a module of the software: Animation, Modeling, Dynamics, and Rendering. Maya Unlimited has additional modules: Cloth and Live. As you switch between menu sets, the right-hand menus change, but the leviathan menus remain the same; these are the common menus.

To switch between menu sets, use the Status Line pull-down or hotkeys. The hotkeys are: F2 (Animation), F3 (Modeling), F4 (Dynamics), and F5 (Rendering).

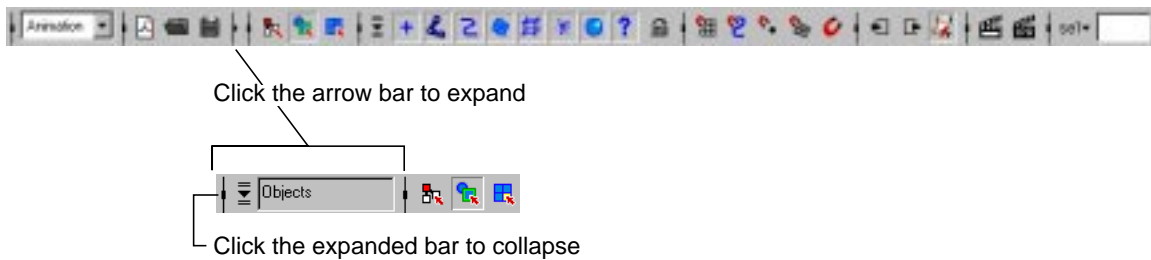


## Status Line

The Status Line has a variety of commands, mostly used for modeling. For example, the central group of buttons are used to select objects and components. See “Working with objects” on page 13 for an introduction to this topic. Also see Chapter 6, “Modeling Aids,” which describes most of the options on the Status Line.



For better organization, the buttons are broken into groups that you can expand and collapse, as shown in the following illustration.

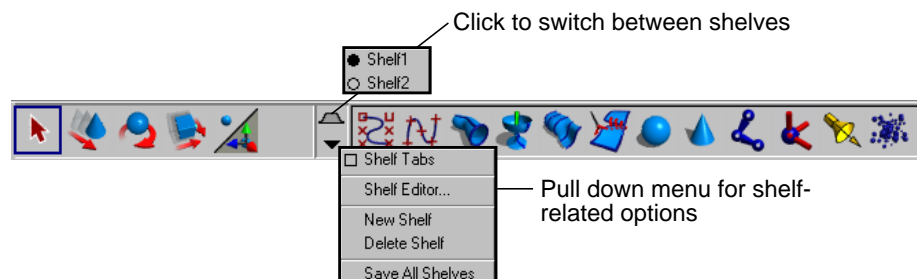


## Minibar and Shelf

The Minibar and Shelf work together. The Minibar contains common tools as well as the currently selected tool. The Shelf is a collection of tools and other commands that you can customize for your specific needs.

By creating custom shelves, you can organize commonly used actions and tools into groups. For example, you can create modeling, animating, and rendering shelves with appropriate tools and actions for each option. You can also store the same tool more than once, but with different settings. For information on creating, editing, and deleting shelves, see “Creating and editing shelves” on page 493.

To switch between shelves, click the tab icon, as shown in the following illustration.



## Layer Bar

Layering is a method of grouping objects so you can easily hide them from view, use them as a template, or render them in a separate pass. The Layer Bar provides the main controls for creating layers, adding objects to layers, and making layers visible or invisible. See “Using display layers” on page 139 for more information.

Note that the Layer Bar is hidden by default; you can display it by choosing Display > UI Elements > Layer Bar.

## Workspace

The main purpose of the workspace is to view your scene, but that’s not all. You can also display various editors and arrange the workspace panels in different layouts. For further discussion, see the next topic “Maya workspace” on page 9.

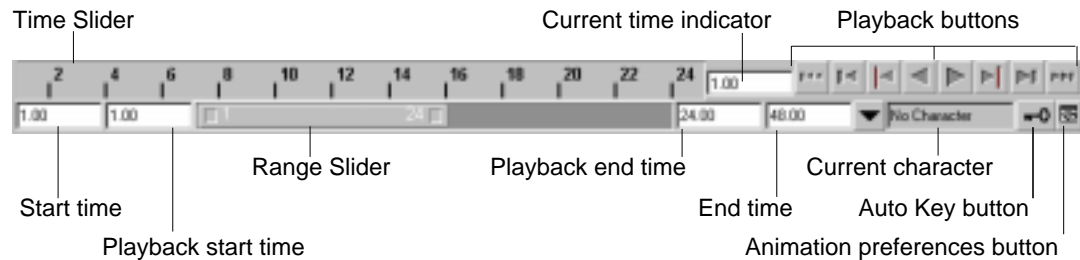
## Channel Box

Most of Maya’s interface elements are common to 3D software packages, but the Channel Box is a unique and powerful feature. It gives direct access to the building blocks of Maya: attributes and nodes. Specifically, it shows the keyable attributes, also known as *channels*. (A keyable attribute means you can set animation keyframes for it.) For further discussion, see “Object attributes” on page 15.

## Time and Range Sliders

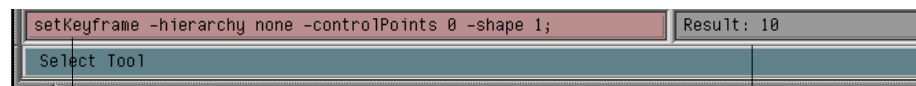
The two sliders are for controlling the frames in your animation. The Time Slider includes the playback buttons (also called transport controls) and the current time indicator. The Range Slider includes start and end times, playback start and end times, the Range Slider bar, the Auto Key button, and the Animation preferences button.

For information on using the animation controls, see *Using Maya: Animation*.



## Command Line

Another powerful feature of Maya is the MEL command language, and the Command Line is your pipeline to it. Notice that it has two halves.



Enter MEL command with required arguments

Command response

The left side is where you can type MEL commands. For example, you can type a command to quickly create a sphere with a specific name and radius.

For a longer series of commands, use the Script Editor, which you can launch from the icon on the far right.

The right half displays system responses, error messages, and warnings. It can also show echoes of all commands if you turn on Edit > Echo All Commands from the Script Editor.


## Help Line

Like several other applications, you can look at the help line for descriptions, instructions, and other useful information. For full details, see "Help Line" on page 30.

## Main window and floating windows

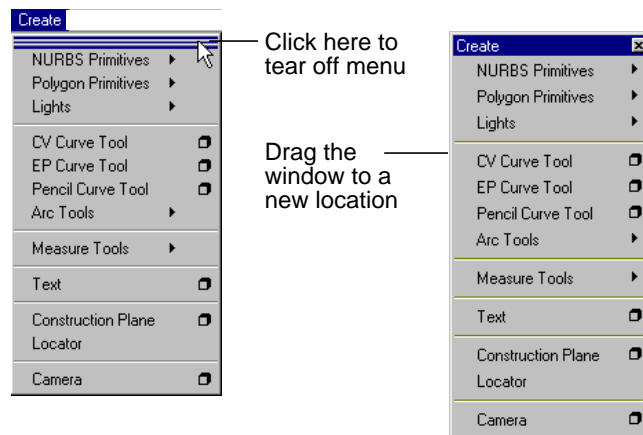
Maya has several editors that launch as floating windows separate from the main window. To manage these windows, note the following tips.

On IRIX, use Window > Raise Application Windows to display open windows hidden by the main window.

On Windows NT, floating windows stay on top of the main Maya window by default. In order to bring the main window on top, you can detach each floating window from the main window. Click the icon in the upper-left corner of the floating window () and turn off Attach to Main Window.

### Tear-off menus

You can display menus as separate windows. This is helpful when you use a menu repeatedly. Pull down the menu and click the tear-off line at the top. The tear-off menus always display on top.



## MAYA WORKSPACE

The main purpose of the workspace is to view your scene, but that's not all. You can also display various editors and arrange the workspace panels in different layouts.





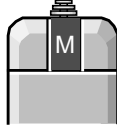
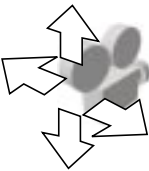

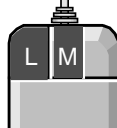
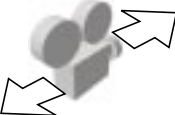
Most of the commands for using the workspace are on the menu bar at the top of the workspace panel. In particular, the Panels menu contains commands for changing views, displaying editors, and arranging panel layouts.

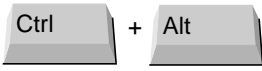

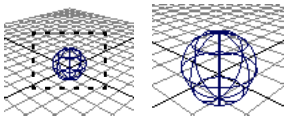


Viewing your scene

The view panel is really the view seen through a virtual camera. There are four default views: perspective, front, side, and top. Select a view from the Panels menu.

To look around the scene, you move the camera. The main commands are shown in the following table:

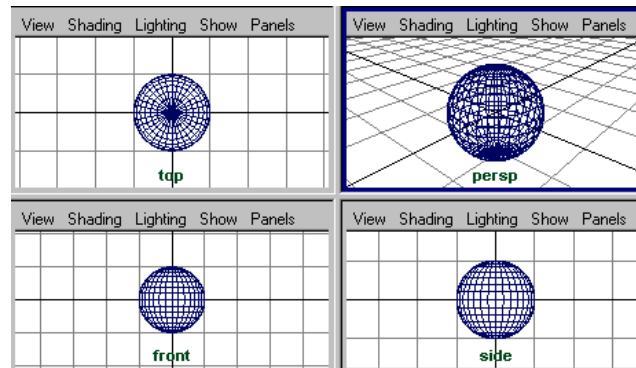
Hold	Drag	To...
		<div>Tumble</div>  <div>(Tumbling does not work in orthographic windows.)</div>
		<div>Track</div> 
		<div>Dolly</div> 

Hold	Drag	To...
		<p>Bounding Box Dolly</p>  <p>Drag right to dolly in and left to dolly out.</p>

This navigation is available in several editors too, like the Graph Editor and Hypergraph. Additional view commands are available under the View menu.

### Layout options

You can split the workspace into a multi-panel layout. For example, press and release the Spacebar to switch to the default, four-panel layout. (Press and release the Spacebar again to expand the active panel to full screen.)



In addition, you can display various editors in any panel, giving you the capability of arranging layouts to suit a specific workflow. Default layouts are listed under the Panels > Saved Layouts submenu. You can also use the Panels editor (Panels > Panel Editor) to create your own.

## STREAMLINING THE INTERFACE

You can easily customize the Maya interface to suit your work style. One of the recommended ways of streamlining the interface is to hide the interface elements like menus and tools and devote more space to your scene window.

To hide or display elements, use the Display > UI Elements submenu. You can quickly hide all UI elements except the workspace panels by choosing Display > UI Elements > Hide UI Elements. For example, you can maximize the scene view while working on detailed models.

In place of menus and toolbars, use hotkeys, the Hotbox, Marking Menus, and popup menus. The following are descriptions of each.

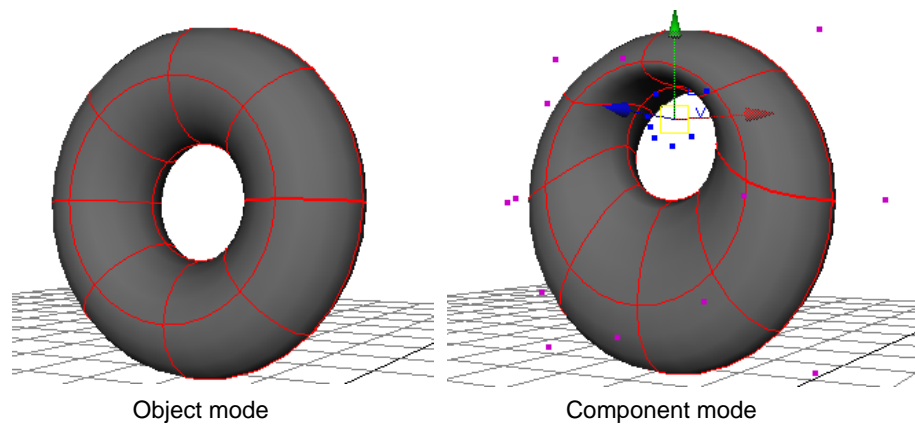
Hotkeys	Hotkeys are also known as keyboard shortcuts. There are several default hotkeys, and they appear on the menu label next to the corresponding menu command. You can change these hotkeys and assign new ones using the Hotkey Editor (Window > Settings/Preferences > Hotkeys). For information on assigning hotkeys, see “Assigning hotkeys” on page 526.
Hotbox	The Hotbox is a way to quickly navigate the Maya menus without using the menu bar. It pops up when you press and hold Spacebar. It puts all of the Maya menus in quick reach, instead of at the top of the screen. Unlike the main menu bar, you can control which menu sets display in the Hotbox. For details, see “Using the Hotbox” on page 20.
Marking Menus	Like the Hotbox, Marking Menus are a pop-up menu that puts commands in quick reach, including commands not on menus. For example, with nothing selected, you can right-click in the workspace and choose Select All. You can also modify Marking Menus to suit your workflow. For details, see “Using marking menus” on page 25.
Pop up menus	Several Maya editors display popup menus when you right click in them. Typically, they include commands from that editor’s menu. For example, the popup menu in the Outliner gives you controls for what types of information display.

## WORKING WITH OBJECTS

The scenes you create in Maya consist of *objects*, and objects consist of *components*, such as control vertices (CVs), edit points, patches, polygonal faces, and so forth.

In Maya, you work with objects in either object or component selection mode. *Object mode* is the default and is for manipulating objects as a whole. *Component mode* displays and lets you edit the object's components. You switch between object and component mode from the Status Line. You can also switch between modes with the hotkey F8.

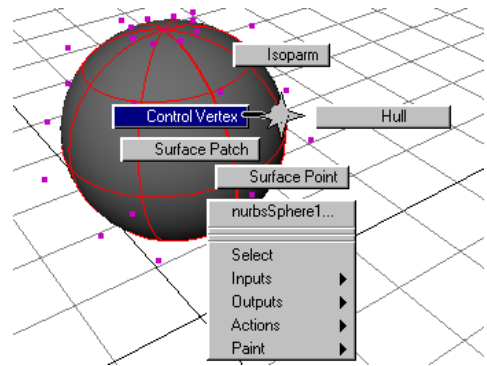
The following illustration shows a torus in object mode and the same torus modified by moving CVs in component mode.



### Selection masks

To select just the object or component types you want to edit, you use *selection masks*, also called *pick masks*. Pick masks are available on the Status Line and also as Marking Menus when you right click on an object.

For example, right click on a NURBS sphere, choose Control Vertices from the Marking Menu, and the CVs display for you to edit.



For more information, see “Limiting selections” on page 157.

Object display

By default, objects appear in wireframe display. To view objects with shaded surfaces, choose a shade mode from the Shading menu on the view panel. The hotkeys for these options are shown in the following table:

4	Wireframe
5	Smooth Shade
6	Smooth Shade with Hardware Texturing

For NURBS objects (objects created from NURBS curves), you can also control how smooth the surface appears using the commands under Display > NURBS Smoothness. (This affects display only, not how the object renders.) The hotkeys are in the following table:

1	Rough
2	Medium
3	Fine

For more information on object display, see Chapter 5, “Displaying Objects.”

## Object attributes

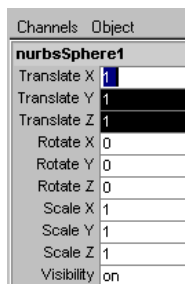
All object and component characteristics are stored as *attributes*. When you model, animate, assign materials, and do any kind of manipulation on objects, you are changing attribute values.

You can see and edit attributes directly in the Channel Box or the Attribute Editor. The Channel box contains the keyable attributes for one or more objects. The Attribute Editor contains all attributes for any *single* object.

### Entering values

A simple example of working with object attributes is to change its translation. In the Channel box, the Translate X, Y, Z attributes appear at the top. To quickly position an object at the coordinates 1, 1, 1, select all three attributes, type 1, and press Enter. (In general, typed values do not go into effect until you press Enter or exit the field.)

Using the Channel box to change translate attributes

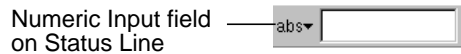


### Note

When you change values, Maya inserts characters by default. On Windows NT, you can also overwrite (replace existing characters) as you type. Press the Insert key for overwrite mode.

### Numeric Input field

An alternative way to enter values for moving, scaling, or rotating is to use the Numeric Input field in the Status Line. Enter the numbers in the order of X-axis, Y-axis, and Z-axis, with a space between each number. (Do not use any punctuation between the numbers.) You can enter positive and negative real numbers.

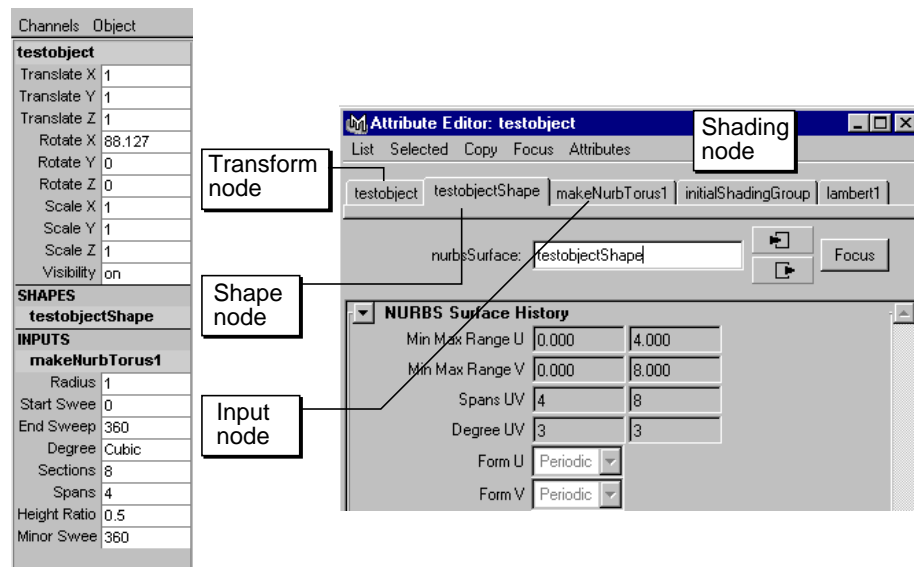


For more information on using the Numeric Input field with the transformation tools, see “Entering numeric values” on page 95. Also see “Selecting objects by name” on page 55 for information on using the Numeric Input field to select objects.

## Attributes and nodes

As you work with attributes, you need to be aware of Maya’s *node architecture*. Unlike other software packages, Maya lays bare its underlying programming structure. The building blocks are *nodes*, which are groups of related attributes. For example, the attributes describing an object’s transformation are in a transform node.

Why should you care about nodes? At a minimum, simply be aware that attributes are grouped together in this way. In general, nodes fall into one of these types: transform (object position), shape (component positions), input (object construction), and shading (object materials).



With more experience, you can take advantage of nodes to make your own connections. For example, you could link the animation of two orbiting spheres by connecting the rotation attributes of those objects' nodes.

For more information, see Chapter 10, "Using the Hypergraph." (The Hypergraph graphically depicts the objects and nodes in your scene so you can easily examine and modify connections.)

## WORKING WITH TOOLS AND ACTIONS

We've described how you can edit object attributes by typing values, but you'll do most of your object manipulation using tools and actions. An example *tool* is the Move tool, which translates objects. An example *action* is Edit > Duplicate. The distinction is not crucial, but you should know how each works.

### Using actions

An action refers to the standard software operation of picking an object, and selecting a menu item to perform an action. For example, if you want to create a revolved surface, first select the profile curve you want to use, then select Revolve from the Surfaces menu.

In Maya, many of the actions you perform have associated options. For example, you may want to set the pivot point before you revolve the curve.

To set options, first open the option box (if available). Option boxes appear as a square to the right of the menu label (□). When you have completed the option box, click the action button or Apply button at the bottom.

Most of the settings in option boxes correspond to object attributes, so you can edit them later as well.

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#### Tip

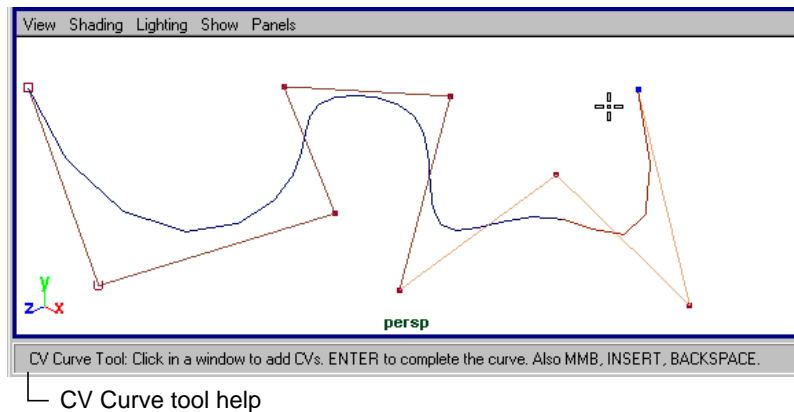
You can return to the factory option settings by choosing Edit > Reset Settings in the option box menu.

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## Using tools

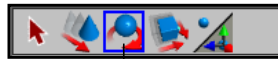
Working with tools in Maya is like working with a real artist's tool. You pick the tool and manipulate items with it until you complete the operation. There are visual cues to let you know that you have picked a tool:

- the word Tool appears on the menu label
- the tool is highlighted on the Minibar, next to the Shelf
- in most cases, the cursor changes or a manipulator appears around the object
- instructions appear on the Help Line to guide you through the operation



Tools have options you can set to control their behavior. Like actions, there is a box to right of the menu label that opens a window with all the options.

You can also double-click icons on the Maya window's Minibar to display a settings window for the tool represented by that icon. For instance, if you double-click the following icon in the Minibar, Maya displays a settings window for the Rotate tool:

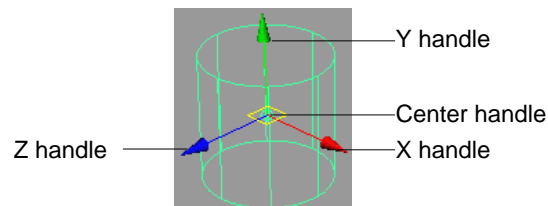


Double-click here to display a settings window for the Rotate tool.

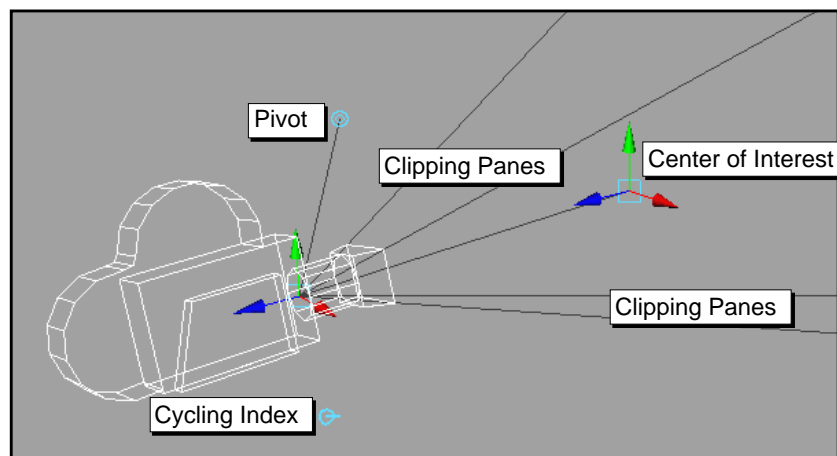
## Manipulators and handles

Many tools have manipulators for modifying objects. All of the transform tools, for example, have manipulators with three handles—one for each axis.

Manipulator handles are typically used to control the direction of transformation. For example, you can click on just one handle of the Move tool to constrain movement to that axis. This is the active handle and it is colored yellow. For more information on transform manipulators, see “Using manipulators” on page 72.



Some objects have manipulators associated with them. For example, cameras and lights have manipulators to control their center of interest and other settings. These manipulators also have a Cycling Index. You can click the Cycling Index to cycle through the available manipulator controls.



For more information on displaying camera and light manipulators, see “Displaying camera and light manipulators” on page 137. For information on using manipulators to modify an object’s construction history, see “Using the Show Manipulator tool” on page 91.

## MEL COMMANDS

MEL is Maya's scripting language. Here are some examples of things you can do with MEL:

- Use MEL commands to bypass Maya's user interface, quickly create shortcuts, and access advanced features.
- Enter exact values for attributes, bypassing any restrictions to precision imposed by the interface.
- Customize the interface for specific scenes, changing default settings to settings you prefer for a particular project.
- Create MEL procedures and scripts that carry out custom modeling, animation, dynamics, and rendering tasks.

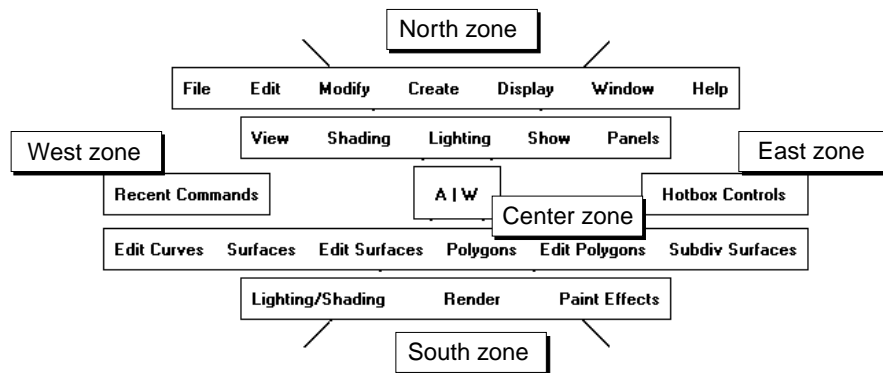
There are several ways to enter MEL commands; using the Script Editor or Command Line are the most common. You can also execute commands in script files, .ma files, shelf icons, hotkeys, and expressions.

See *Using Maya: MEL* for an introduction to using MEL commands and scripts.

## USING THE HOTBOX

The Hotbox is a customizable collection of menu sets that you can make appear by holding down the Spacebar on the keyboard. Once you customize the Hotbox, it provides quick access to the menus you use, hiding menus that are irrelevant to your work. You can customize the Hotbox at any time to accommodate changing needs.

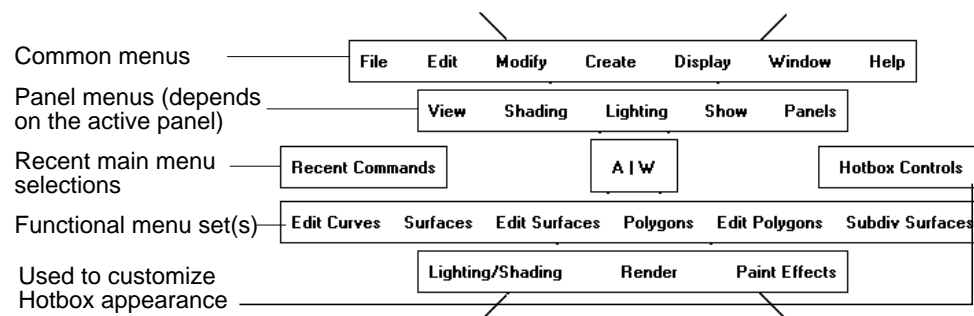
The Hotbox has five zones: North, South, East, West, and Center. They are defined by diagonal lines.



Each zone contains *marking menus*. Use these menus to change selection masks, control panel visibility, and panel types. For information on marking menus, see “Using marking menus” on page 25.

#### To display the Hotbox:

Press and hold the Spacebar. The Hotbox appears at the location of the pointer. The default Hotbox looks like the following (if you customized it, it will look different):

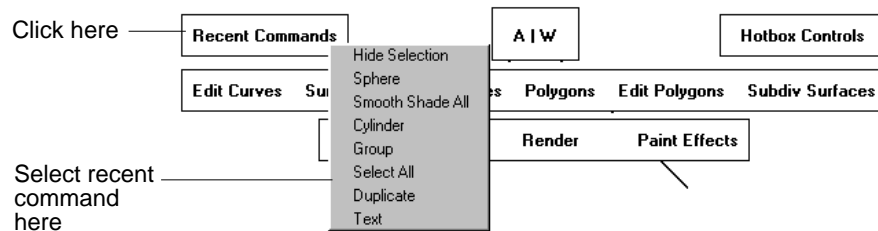


**Note**

If you press the Spacebar briefly but do not hold it down, Maya changes the number of views displayed. For example, if you are in a perspective view, then press the Spacebar, Maya displays the four basic views.

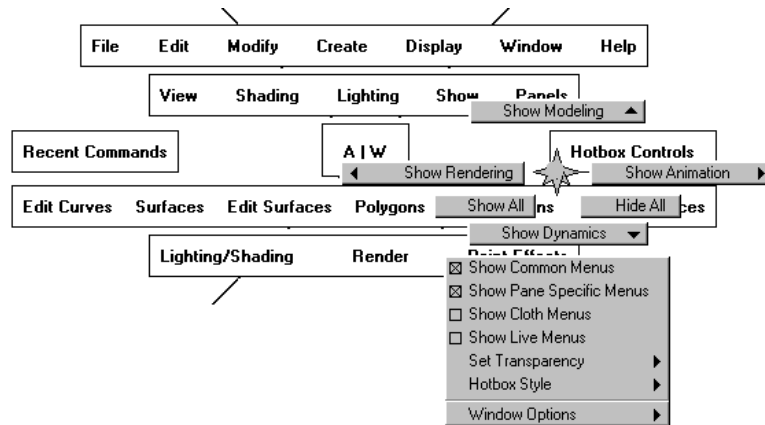
## Displaying recent selections

The Hotbox lets you display up to 16 previously selected menu items (also available from Window > Recent Commands). This saves working through hierarchial or cascading menus and lets you quickly repeat a selection. (To display more than 16 menu selections, use a MEL script. For more information, see *Using Maya: MEL*.)



## Changing the appearance and contents of the Hotbox

You can change the appearance and the contents of the Hotbox while you are working. While pressing the Spacebar, click Hotbox Controls and drag to select an option.



### Customizing which menus show in the Hotbox

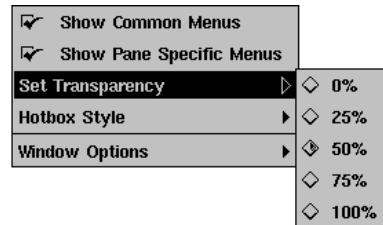
The top portion of the Hotbox Controls lets you choose which menu sets you want to appear. For example, choose Show Animation > Show/Hide Animation to turn on or off the Animation menu set display. You can also hide all menu sets except the one you want displayed; for example, choose Animation Only.



The display controls for other menus are in the bottom portion of the Hotbox Controls, including menus for Maya Cloth and Live.

### Changing the transparency

You can make the Hotbox more or less transparent. Select Hotbox Controls > Set Transparency and choose a new percentage.



### Changing the style of the Hotbox

Use the Hotbox Style option to change the display of the Hotbox. Select Hotbox Controls > Hotbox Style and drag to select one of the following styles:

#### Zones and Menu Rows

Make all of the menu rows visible.

#### Zones Only

Display just the five marking menu zones. Menu sets are not available.

#### Center Zone Only

Make only the center zone (A | W) active everywhere. North, South, East, and West Zones and menu sets will not be available.

#### Center Zone RMB Popups

Turn this option on to display menus for the selected menu set when you right-click on the workspace. The menu set appears as a pop-up instead of a row. Note that the functional menu sets do not display when this option is on, even if you have selected to show them.

### Setting window options from the Hotbox

To increase your screen space, you can hide the main and view menu bars and use the Hotbox menus instead. Select the Hotbox Controls > Window Options submenu and turn off Show Main Menubar or Show Pain Menubars.

## Disabling the Hotbox

You can disable the Hotbox so it does not appear when you press the Spacebar.

### To disable the Hotbox:

- 1 Select Window > Settings/Preferences > Hotkeys. The Hotkeys window opens.
- 2 Scroll down to the Miscellaneous section (near the bottom of the window).
- 3 Under Miscellaneous, select Pop Hotbox, then click the Unmap Key button. Maya changes (Space) to (none) and removes the word Press from the window. This turns off the hotkey functionality.
- 4 Click the Save button, then the Close button. Now when you press the Spacebar, the Hotbox does not display.

## USING MARKING MENUS

Marking menus are customizable menus that let you quickly access various tools and actions. You can use them from any part of the Maya workspace.

You can display marking menus by doing any of the following:

- Clicking in each *zone* in the Hotbox. (See “To use a marking menu in the Hotbox:” on page 25.)
- Pressing hotkeys and the left mouse button. (See “To use a marking menu with a hotkey:” on page 27.)
- Clicking in the workspace with the right mouse button. (See “To use a marking menu with the right mouse button:” on page 28.)

You can customize marking menus to run scripts you have written. For information, see “Creating and editing marking menus” on page 509.

### To use a marking menu in the Hotbox:

- 1 Press and hold the Spacebar. Maya displays the Hotbox.

The Hotbox has five zones: North, South, East, West, and Center. They are defined by diagonal lines. (For an illustration, see “Using marking menus” on page 25.)

- 2 Still holding down the Spacebar, left click in a zone then drag to select a menu item and release the Spacebar.

In each of the five zones, the Hotbox supports a different marking menu for each mouse button. This lets you create three menus per zone, for a total of fifteen marking menus and approximately 120 selections.

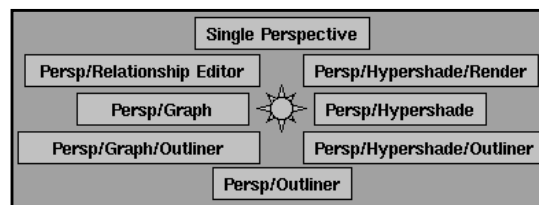
You can customize a marking menu using the Marking Menu editor. For more information, see “Creating and editing marking menus” on page 509.

### Default marking menus

The following marking menus are the default settings for each of the five zones.

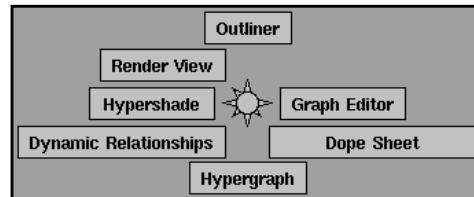
North zone

Changes to a new window layout.



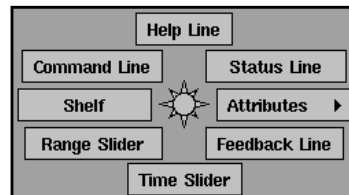
South zone

Changes a view in the current panel.



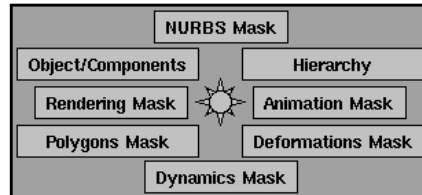
East zone

Turns parts of the interface display on and off.



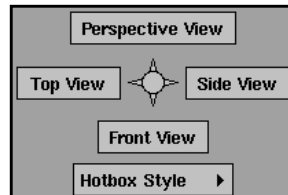
West zone

Switches between preset selection masks.



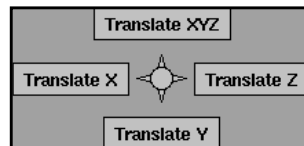
Center zone

Switches between views.

**To use a marking menu with a hotkey:**

Many hotkeys have a marking menu associated with them. For example, the default hotkey “w” is associated with the Move tool.

- 1 Select an object.
- 2 Press and hold the hotkey on the keyboard, then click the left mouse button. For example, when you press the w key, the following menu appears.



- 3 Drag to make your selection then release the hotkey.

If you choose the Translate XYZ option, the move tool’s center handle is selected. You can then move the object anywhere within the view plane. If you choose the Translate X, Translate Y, or Translate Z option, the move tool’s appropriate handle (either X, Y, or Z) is selected.

For more information on using marking menus with hotkeys, see “Assigning marking menus to hotkeys” on page 515.

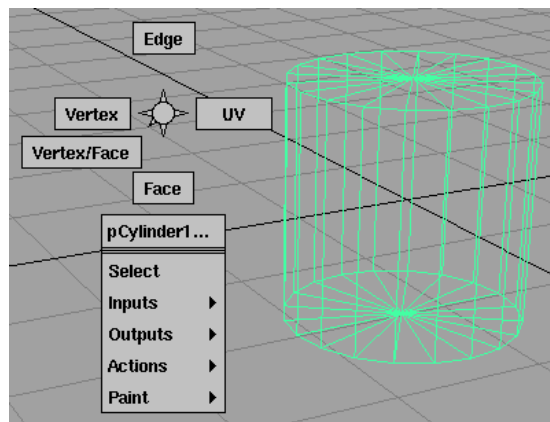
To use a marking menu with the right mouse button:

- 1 If you have not selected an object, press the right mouse button to display a pop-up menu.
- 2 Choose Select All.

or

If you have selected an object, press the right mouse button anywhere in the view.

The type of object you are working with determines which marking menu appears. For example, in the following illustration, a polygonal cylinder is selected.




## SCENE MANAGEMENT

Throughout Maya, there are various features for organizing the elements in your scene and for optimizing the scene file size. The following list summarizes some of the main scene management features.

### Groups

You can group objects for quick selection and manipulating them as a whole. See “Working with groups” on page 63.

- Sets and Partitions** Sets are like groups, but they have the advantage of working with components as well. A partition is a collection of sets. It is used primarily to prevent two sets from having overlapping members. See Chapter 11, “Sets and Partitions.” Note that other Maya features, such as the Character > Create command, utilize sets as a way of grouping objects.
- Layers** Layering is a method of grouping objects so you can easily hide them from view, use them as a template, or render them in a separate pass. The Layer Bar provides the main controls for creating layers, adding objects to layers, and making layers visible or invisible. See “Using display layers” on page 139 for more information.
- Scene optimization** Before you save, we recommend that you optimize scene size for improved performance, memory use, and reduced use of disk space (File > Optimize > Scene Size ☐). For details, see “Optimizing scene size” on page 212.
- Deleting construction history (if you have it enabled) is recommended when you finish modeling and are ready to animate. (Construction history, as the name implies, is a record of the information used in constructing an object.) To delete it, select the object and choose Edit > Delete by Type > History.
- You may want to avoid construction history altogether to optimize performance. To do this, click the Construction off in the Status Line. 

## GETTING HELP

There are various types of online help provided with Maya.

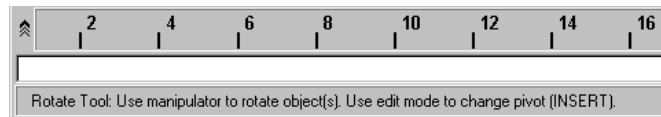
- Popup Help** When you pass your mouse over an icon or button, a description of it appears. This feature is on by default, but you are able to disable it (Help > Popup Help).



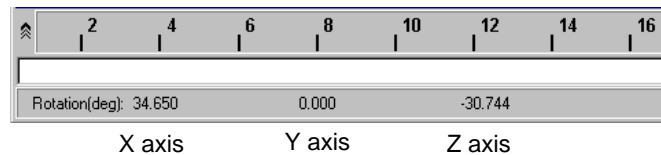
## Getting help

### Help Line

The Help Line at the bottom of Maya's window shows information about tools, menus, and objects. Like the popup help, it displays descriptions when you pass the mouse over icons, as well as menu items. It also displays instructions when you select a tool; for example:



When you transform objects, the Help Line displays the object coordinates; for example:



**Product Information** Choose Help > Product Information to see Maya's version and release date.

### Online Library

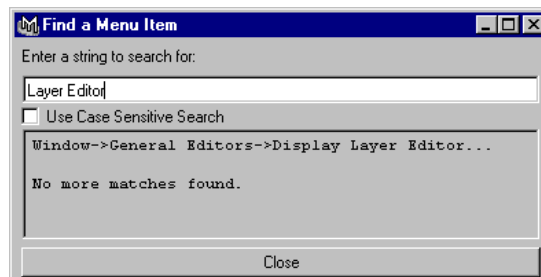
Also under the Help menu are selections for the online documentation library. This help requires version 4 or higher of either Netscape Communicator or Internet Explorer. Several of these documents are available in printable PDF format, readable from the Maya CD-ROM.

### Help on...

For some Maya editors, you can open help about the editor directly by choosing Help > Help on *EditorName*.

### Find Menu

To find the location of a main menu item, choose Help > Find Menu and type the menu item name. The search is not case-sensitive. It accepts wildcard characters (\*), but if the menu was renamed or removed, type the name in full. The search is limited to the main menu selections.



# 2

## VIEWING YOUR SCENE

This chapter describes Maya's XYZ coordinate system. It also includes information on the various tasks you can perform using Maya viewing tools. Additionally, it explains how to hide nodes to improve Maya's playback speed.

The following topics are described in this chapter:

- “Orienting the XYZ system” on page 31
- “Working with cameras” on page 34
- “Setting a perspective view” on page 40
- “Setting an orthographic view” on page 41
- “Lighting your scene” on page 42
- “Arranging views” on page 43
- “Marking a view” on page 47
- “Enabling and disabling nodes” on page 49

### ORIENTING THE XYZ SYSTEM

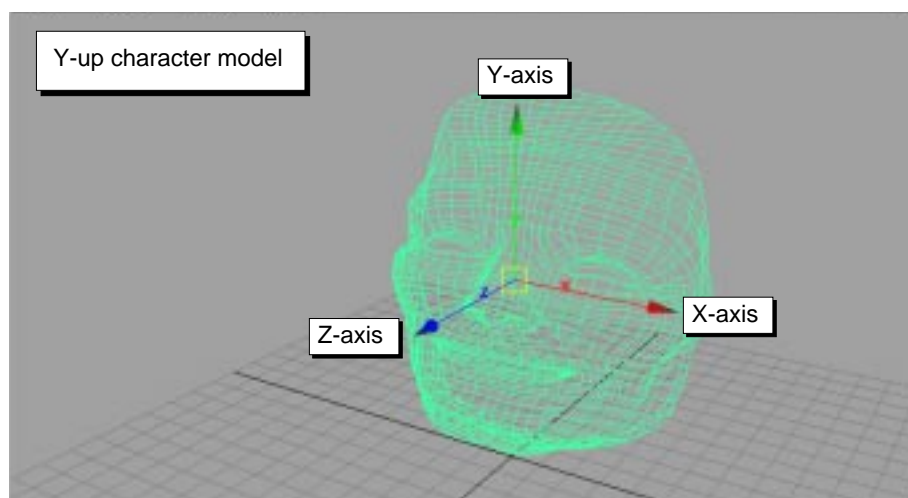
Maya's 3D coordinate system lets you create characters and scenes with dimensionally accurate values. In the XYZ coordinate system, the origin is the center with coordinates 0,0,0. All points are defined by one coordinate along the X-axis, the Y-axis, and the Z-axis. You can orient the XYZ coordinate system in either Y-up or Z-up.

#### Y-up

A Y-up world has X set up as the horizontal and Z as the depth of the scene. This orientation is often used by animators (and games developers) who have evolved from the 2D world of vertical (Y) and horizontal (X) to include movement toward or away from the camera (Z).

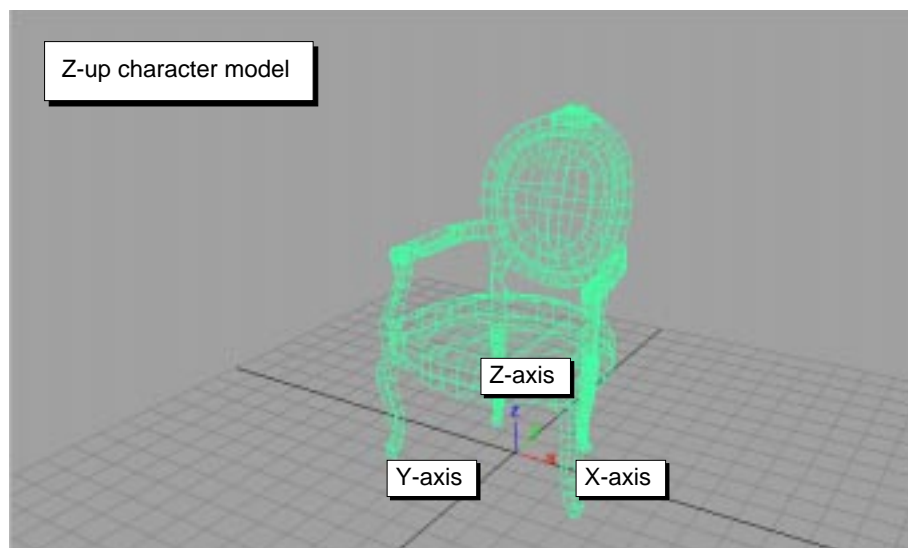
## VIEWING YOUR SCENE | 2

### Orienting the XYZ system



### Z-up

A Z-up world begins with a ground plane that represents the X and Y directions, with Z representing the up direction. This orientation is used by designers, whose main concern is the ground plane where their plans are placed.



## Changing the orientation/up axis

You can change the scene orientation in the preferences or with a MEL command. Note that, along with changing the up axis, *every* menu action or tool has an equivalent line command.

To specify the scene orientation in the preferences:

- 1 Select Window > Settings/Preferences > Preferences, Settings category.
- 2 Under World Coordinate System, select Y or Z.

To specify the scene orientation with a MEL command:

- 1 To change the orientation to Z-up, enter the following in the Command line:  
`upAxis -ax z`
- 2 To change the orientation to Y-up, enter the following in the Command line:  
`upAxis -ax y`

For more information on using MEL commands, see *Using Maya: MEL*.

## World coordinates

World coordinates represent space in the view. For example, when you move a camera you move it in terms of world coordinates. The center of the world coordinate system is located at the Origin.

World space is a coordinate system used to represent an object in terms you define. For example, a model car might be defined in terms of millimeters. World coordinates are also known as “modeling coordinates.”

## Local coordinates

Local coordinates represent the space around an entity. The origin of a local coordinate system is the center of that entity.

One way to understand local coordinates is to imagine an object sitting within a box. All of the points on the object’s surface are then given with respect to one corner of the box. If you pick up the entire box and move it around the room, the coordinates of the object—with respect to the box—do not change: the coordinates of the box with respect to the room are changing. Focus on the two different descriptions: the object with respect to the box

(the object's local coordinates), and the box with respect to the room (the position of the object's coordinate system with respect to the world coordinate system).

## WORKING WITH CAMERAS

In Maya, you are always looking through a camera for either *perspective* or *orthographic* views. Think of it as being a director on a movie set and looking through a camera lens. Your field of view is restricted to what you can see through that lens. If you wanted to view the scene from another angle, you could move the camera you are looking through, but then you would have to move it back again. Instead, you could create, orient, and look through a second camera.

It's the same in Maya. Whatever part of a scene you see depends on the camera you are looking through. You can also use the Look Through Selected option to look through a light or object. For example, if you look through a light you can display its exact area of illumination. You could also select an object such as a character's eyes and animate a scene through their view.

When setting up output resolution, aspect ratio, and image planes, you should be aware of what each setting on the camera represents and how it relates to the real world.

### Focal length

The focal length of a lens is defined as the distance from the lens to the film plane. The shorter the focal length, the closer the focal plane is to the back of the lens. Lenses are identified by their focal length. Focal length is expressed in millimeters or, on occasion, in inches (1 inch is approximately 25mm).

For every shot, you must decide how big an object is in the frame. For example, should a shot include an entire character or just its head and shoulders? There are two ways to make an object larger in the frame. You can either move the camera closer to the object or adjust the lens to a longer focal length.

Focal length is directly proportional to the object's size in the frame. If you double the focal length (keeping the distance from the camera to the object constant), the subject appears twice as large in the frame. The size of the

object in the frame is inversely proportional to the object's distance from the camera. If you double the distance, you reduce the size of the object by half in the frame.

### Angle of view

As you adjust the camera's focal length, the angle of view narrows and expands. This is what causes objects to get larger or smaller in the frame. As you extend the focal length, the angle of view gets narrower. As you shorten the focal length, the angle of view gets larger.

### Perspective

Since there are two ways to change the size of objects in the frame, what is the difference between moving the camera and changing the focal length? Why choose one over the other? The answer is that by moving the camera, you change the perspective. Objects far from the camera change in relative size at a slower rate than objects which are close to the camera. When you change the focal length, or zoom, perspective does not change. All objects in the frame change size at the same rate. Perspective could be thought of as the rate that objects change in size in the frame as their distance from the camera changes.

### Camera aperture

In a real camera, aperture is the film back's width and height in millimeters. The camera aperture relates to the focal length in that different film backs have different "normal" lenses. A normal lens has a focal length that is not telephoto or wide angle. It closely approximates normal vision. As the size of the camera aperture increases, a longer focal length is required to achieve "normal" perspective. For example, a 35mm camera uses a 50mm lens as a normal lens. On a 16mm camera, the same 50mm lens appears telephoto in nature. A 25mm lens is required to achieve "normal" perspective on a 16mm camera.

This can be demonstrated in Maya by changing to different film backs without changing the focal length. The camera appears to zoom in and out with different film backs even though you are not changing focal length.

For more information on camera tools and settings, see *Using Maya: Rendering*.

## Creating a new camera

By default, a new scene has four cameras: a perspective camera (persp), and three orthographic cameras (top, front, side). If you change a view by either tumbling, tracking, dollying, or zooming in and out, you are still looking at the scene or object through the same camera. To look at the scene or object through a second camera, first change the view, then create the camera (Panels > Perspective > New).

For more information on saving camera views, see “Marking a view” on page 47.

## Moving the camera

You can move a camera to get a different view of the object without creating a new camera. To move the current view camera, you can use the View > Camera Tools menu or the mouse with the Alt key. You can also display the camera as an object in your workspace and use the camera manipulators to move it. For more information on camera manipulators, see “Displaying camera manipulator controls” on page 137.

To display the current camera as an object, select Display > Show > Cameras. It may be easier to work with the camera as an object when you are moving through a scene and you want to see the camera’s path.

### Camera tools

<b>Tumble Tool</b>	Revolves the camera by varying the azimuth and elevation angles in the perspective window. You can also press Alt and the left mouse button.
<b>Track Tool</b>	When tracking across the display, slides the view either horizontally or vertically. You can also press Alt and the middle mouse button.
<b>Dolly Tool</b>	Moves into or away from the view. You can also press Alt and the left and middle mouse buttons together. You can use the Dolly tool in both a perspective or orthographic view.
<b>Zoom Tool</b>	Changes the focal length on a camera. Zooming in is like using a telephoto lens. Zooming out is like using a wide angle lens. You can use zoom in both a perspective or orthographic view. To move in or out without changing the viewing angle, use the Dolly tool.
<b>Roll Tool</b>	Rotates the display around its horizontal axis.

**Azimuth Elevation Tool**

Revolves the camera about the center of interest in the perspective view.

**Yaw Pitch Tool**

Changes from an orthographic view to a perspective view.

**Fly Tool**

The Fly Tool lets you navigate your scene as if you were playing a 3D first-person perspective game. The camera flies through your scene without being constrained by any geometry.

To use the Fly Tool, press-and-hold the Ctrl key, then drag with the left mouse button. Drag up to fly forward and down to fly backward. To change the camera direction, release the Ctrl key and drag the left mouse button.

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**Note**

The tumble, track, and dolly commands are available while the fly tool is active.

---

**To use a camera tool:**

- Select the tool you want to use from the View > Camera Tools menu and drag the left (or middle) mouse button.

For information on changing a tool's properties, see "Specifying tool settings" on page 248.

*or*

- Press the Alt key and drag the appropriate mouse button(s). See "Camera tools" on page 36.

---

**Note**

To select the Roll, Zoom, Azimuth Elevation, and Yaw-Pitch tools, use the View > Camera Tools menu. You cannot select these tools with the mouse and the Alt key.

---

## Looking through a camera

If you have more than one camera, you can switch which camera you view your scene through.

**To look through a camera:**

- 1 Select Panels > Perspective.
- 2 Select a camera.
- 3 Select Panels > Look Through Selected.

**Note**

You can also use the Look Through Selected command to view your scene from the point of view of a selected light or object.

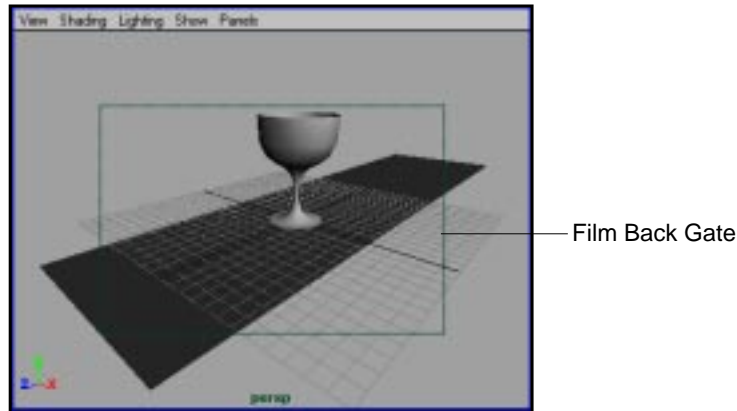
**Tip**

You can also use the Hypergraph to select a view. In the Hypergraph window, select the name of a view, then select Panel > Look Through Selected. For more information, see “Using the Hypergraph” on page 319.

## Changing camera settings

To change camera settings, select View > Camera Settings and select one of the following settings:

Perspective	Toggle Perspective on so that the camera uses a perspective view. This means that the lines converge at infinity. If toggled off, the camera uses an orthographic view.
Journal	Toggle Journal on to copy camera view actions, such as tumble, track, and zoom, to the MEL journal making the commands undoable. Normally, the camera command view actions are not copied to the MEL journal and they are not undoable. For more information on the MEL journal, see <i>Using Maya: MEL</i> .
No Gate	Displays no frustum. This is the default.
Film Gate	Displays the viewable frustum according to the film back size. The aspect ratio of the window (or rendering resolution) determines what you actually see. Also sets the camera Overscan attribute to 1.5. The following illustration shows the film gate representing the maximum viewable (or renderable) area.



**Resolution Gate** Displays the renderable frustum for the current resolution specified in Render Globals. This often specifies a more exact rendered image than the Film Gate option. Also sets the camera Overscan attribute to 2.0.

---

#### Note

If the aspect ratio between the film back and the resolution is the same, then the two resulting rendered images match.

---

<b>Field Chart</b>	Toggle Field Chart on to display a grid that represents the twelve standard cell animation field sizes. The largest field size (number 12) is identical to the rendering resolution (the resolution gate). Render Resolution must be set to NTSC dimensions for this option to have meaning.
<b>Safe Action</b>	Toggle this option on to display a box defining the region that you should keep all of your scene's action within if you plan to display the rendered images on a television screen. The safe action view guide represents 90% of the rendered resolution (the resolution gate). Render Resolution must be set to NTSC dimensions for this option to have meaning.
<b>Safe Title</b>	Toggle this option on to display a box defining region that you should keep titles (text) within if you plan to display the rendered images on a television screen. The safe title region represents 80% of the rendered resolution (the resolution gate). Render Resolution must be set to NTSC dimensions for this option to have meaning.

### Setting a perspective view

Fill	Automatically selects a horizontal or vertical fit so that the selected image fills the render frame.
Horizontal	Selects a horizontal fit for the selected image in the render frame.
Vertical	Selects a vertical fit for the selected image in the render frame.
Overscan	Selects a slightly larger fit for the selected image in the render frame.

## SETTING A PERSPECTIVE VIEW

Each workspace view is linked to a camera that “looks” at your scene. The camera’s position, orientation, and attributes determine what you see through that particular camera. This is a perspective view. Unlike an orthographic view, a perspective view shows depth.

You can switch to a perspective view and you can create new perspective views.

**To switch to a perspective view:**

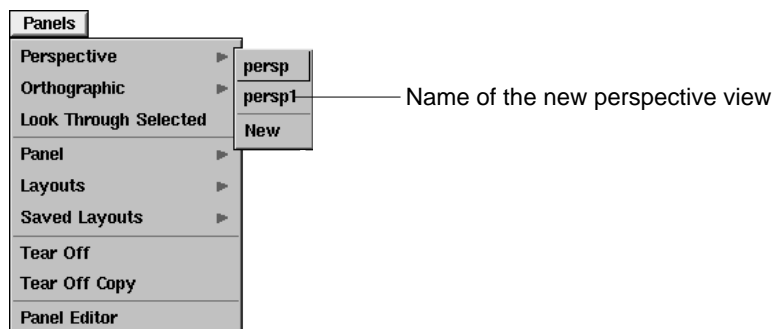
Select Panels > Perspective and select the appropriate camera view.

## Creating new perspective views

When building an object or scene, it is often useful to view the object from several different perspectives. Use the Panels > Perspective > New option to create a new perspective camera.

**To create a new perspective camera view:**

- 1 Change the view of the object.  
For example, if you want to tumble the display, press the Alt key and use the left mouse button to drag the view.
- 2 Select Panels > Perspective > New. Maya creates a new camera in the default home perspective position.
  - To view through the original perspective camera, select View > Previous View or View > Default Home.
  - To view through the new perspective camera, select Panels > Perspective. and select the new perspective view.



## SETTING AN ORTHOGRAPHIC VIEW

An orthographic camera shows the 3D workspace from the top, front, and side views. These views offer the most analytical view of the world space. However, they do not show depth.

You can switch to an orthographic view and you can create new orthographic views.

### To switch to an orthographic view:

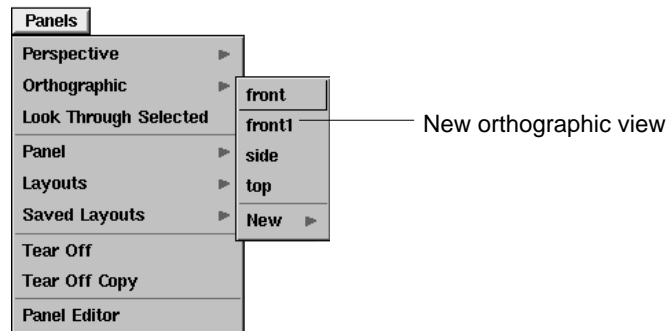
Select Panels > Orthographic and select front, side, or top as the active camera view.

## Creating new orthographic views

When building an object or scene, it is often useful to view the object from the top, front, or sides. Use the Panels > Orthographic > New option to create a new orthographic camera view. For example, you may want a zoomed in top view.

### To create a new orthographic view:

- 1 Select Panels > Orthographic > New and select a new view: Front, Side, or Top. Maya creates the view.
- 2 Select Panels > Orthographic. The view you just created appears in the Orthographic menu.



## LIGHTING YOUR SCENE

Use commands on the Lighting menu to select which lights or groups of lights to use in your scene. These options include:

### Use Default Lighting

Lights the scene using only a single point light situated at the camera.

### Use All Lights

Uses all lights in the scene, to a maximum of eight lights. This option gives you a representation of what the lights will look like when the image is rendered.

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#### Note

This option does not include the default light.

If there are no lights in the scene, the scene renders as an all black image.

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**Use Selected Lights** Uses only selected lights. If you change the light selection, the lighting also changes respectively.

### Use Previously Specified Lights

Select this option to use the lights selected with the Specify Selected Lights option. This option is grayed until you choose Specify Selected Lights. If you select a different set of lights when this option is selected, the scene will still use the previously selected lights.

*Note*

This menu item can be turned off by picking any of the items above it.

**Two Sided Lighting** Toggle this option on to illuminate both sides of an object. Note that Maya's performance may decrease on some systems.

**Specify Selected Lights**

Lets you use a preset selection of lights. Select the lights you want to use then select Specify Selected Lights. Once specified, toggle on Lighting > Use Previously Specified Lights to use this light selection. Unlike Use Selected Lights, if you change the light selection, the scene will still use the previously selected lights.

## ARRANGING VIEWS

Use the Panels menu to change a camera view or to view a scene or object through a selected camera.



**Perspective** Lets you change to a perspective view or create a new perspective view. For details, see “Creating new perspective views” on page 40.

**Orthographic** Lets you change to an orthographic view or create a new orthographic view. For details, see “Creating new orthographic views” on page 41.

**Look Through Selected**

Lets you look through a selected camera, object, or light. For details, see “Looking through a camera” on page 37.

**Panel**

Displays a menu with the following commands.

**Outliner** – Opens the Outliner, where you can view objects and their attributes hierarchically. For more information, see “Using the Outliner” on page 297.

**Graph Editor and Dope Sheet** – Opens the Graph Editor and Dope Sheet, respectively, where you can edit keys, motion tangents, and animation curves. For more information, see *Using Maya: Animation*.

**Hypergraph** – Opens the Hypergraph, which gives you an overview of your entire scene, all objects it contains, and the relationships between those objects. For more information, see “Using the Hypergraph” on page 319.

**Hypershade** – Opens the Hypershade, which you can use to create and edit rendering nodes, and to view and edit rendering (or shading) networks. For more information, see *Using Maya: Rendering*.

**Visor** – Opens the Visor, which you can use to show images of shading nodes you can create, those already in your scene, and those in online libraries, in a visual outline form. For more information, see *Using Maya: Rendering*.

**Texture View** – Opens the Texture View window, which you use to map textures to a polygonal model. For more information, see *Using Maya: Polygonal Modeling*.

**Multilister** – Opens the Multilister. For more information, see *Using Maya: Rendering*.

**Render View** – Opens the Render View window, where you can test render single frames and interactively tune rendering attributes. For more information, see *Using Maya: Rendering*.

**Blend Shape** – Lets you create character deformations. For more information, see *Using Maya: Character Setup*.

**Dynamic Relationships** – Lets you view or edit connections between dynamics elements such as particle emitters, collisions, etc. For more information, see *Using Maya: Dynamics*.

**Devices** – Lets you use external tools and plug-ins for special devices, such as Motion Capture.

**Relationship Editor** – Opens the Relationship Editor, which you can use to group and manipulate objects as sets and assign shading groups to geometry. For more information, see “Using the Relationship Editor” on page 255.

**Reference Editor** – Opens the Reference Editor, which you can use to specify settings for importing files by reference. For more information, see “Using the Reference Editor” on page 192.

Layouts	Lets you specify how different camera views are arranged spatially in the Maya window.
Saved Layouts	Lets you select a panel layout. For more information, see “Selecting panel layouts” on page 539.
Tear Off	Moves the current camera view into a separate window. The current view is replaced with the next view in the Panels list (to see this list, select Panels > Panel Editor).
Tear Off Copy	Copies the current camera view into a separate window.
Panel Editor	Opens the Panel window, where you can create new panels, re-label existing panels, rename layouts, and change layout configurations. For more information, see “Using the Panel Editor” on page 533.

## Displaying the workspace only

Select the following options on the Display > UI Elements submenu to quickly display only the workspace.

- Hide UI Elements • Temporarily hides all UI elements except the workspace panels. For example, you can maximize the scene view while working on detailed models.
- Restore UI Elements • Displays the UI elements that were hidden.

## Laying out the views

Because much of your 3D work takes place in a modeling view window, you want to be able to view an object from the top, front, side, and in perspective. In 3D, it is sometimes difficult to see exactly where an object lies. The four views enable you to confirm the positioning of objects from more than one camera angle.

## VIEWING YOUR SCENE | 2

### Arranging views

Use the Window > View Arrangement option to control how Maya displays the four basic views. The top, front, and side views are 2D orthographic views that allow you to view your work analytically. The fourth view is perspective and allows you to view the scene in 3D. You can also access the same view arrangement settings from the Panels > Layouts option.

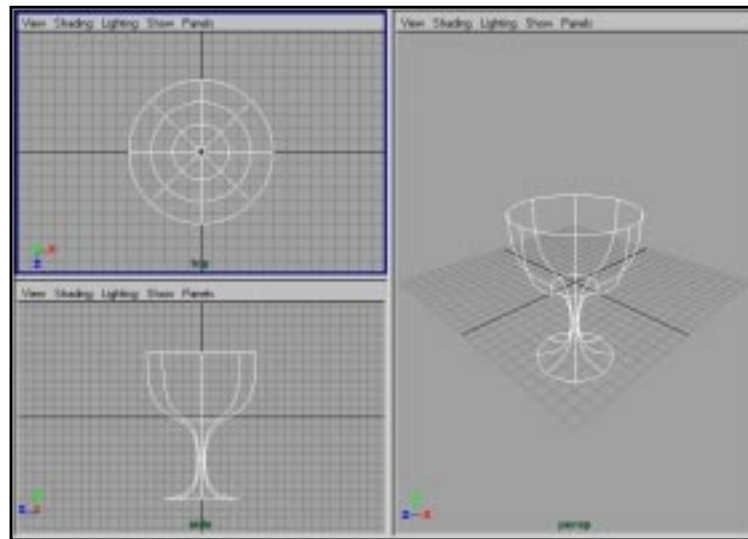
You can place any tool in a view. For more information, see “Creating layouts” on page 540.

In the following example, the display is changed to a 3 Left Split layout.

#### To set the views:

Select Panels > Layouts or select Window > View Arrangement and select the view layout you want.

For example, if you select 3 Left Split Layout, you get the following view layout.



---

### Notes

If you want one view to occupy the entire Maya window, select the view, then press the space bar quickly. (If you press the space bar for too long, Maya displays the HotBox.)

To rename and delete a camera, use the Outliner. See “Using the Outliner” on page 297.

---

## MARKING A VIEW

You can use bookmarks to mark a view for future use. This lets you maintain a variety of camera views for any scene. Maya has four predefined bookmarks: Perspective, Front, Top, and Side. You can change your view to any of these predefined bookmarks, or you can create your own bookmarks.

---

### Note

You cannot change positions for the predefined bookmarks.

---

#### Changing the view to a predefined bookmark:

Select View > Predefined Bookmarks and select the default view you want to change to.

## Creating a bookmark

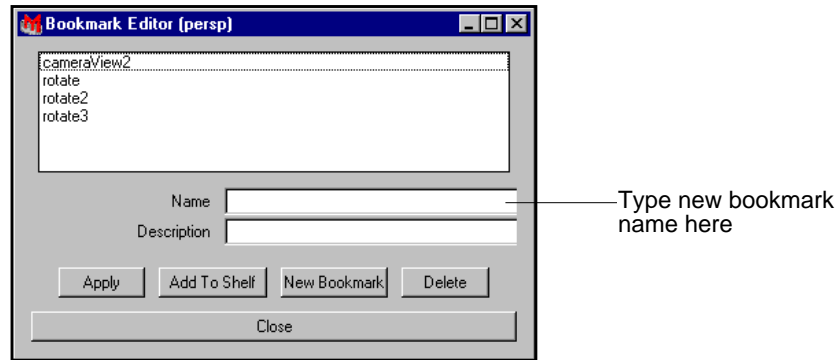
You can create your own custom bookmarks to mark views other than Perspective, Front, Top, and Side.

#### To create a new bookmark:

- 1 Select an object and change the view.
- 2 Select View > Bookmarks > Edit Bookmarks. The Bookmark Editor opens.

## VIEWING YOUR SCENE | 2

### Marking a view



- 3 In the Name box, type the new bookmark name press Enter.
- 4 Type a description of the view in the Description box.
- 5 Close the Bookmark Editor.

---

#### Tip

To create a bookmark with a system-assigned name, select View > Bookmarks > Edit Bookmarks and click New Bookmark. Maya assigns the view to the first bookmark under the name cameraView1.

---

#### To delete a bookmark:

- 1 Select View > Bookmarks > Edit Bookmarks. The Bookmark Editor opens.
- 2 Select the bookmark you want to delete and click the Delete button.

## Selecting custom bookmarks

If you have created custom view bookmarks, you can select them as follows.

#### To view custom bookmarks:

Select View > Bookmarks and select the bookmark you want to view the object through.

## Renaming a bookmark

You can rename custom bookmarks at any time.

To rename a bookmark:

- 1 Select View > Bookmarks > Edit Bookmarks. The Bookmark Editor opens.
- 2 Select the bookmark you want to change.
- 3 In the Name box, change the bookmark name then press Enter. The modified bookmark appears in the Bookmarks menu.

## Adding a bookmark to a shelf

You can add any bookmark to a shelf for easy access.

To add a bookmark to a shelf:

- 1 Select the shelf you want to add the bookmark to.
- 2 Select View > Bookmarks > Edit Bookmarks. The Bookmark Editor opens.
- 3 Select the bookmark you want to add to the shelf and click the Add To Shelf button. The bookmark is added to the shelf. It appears as a MEL command.

## ENABLING AND DISABLING NODES

You can disable animation nodes in your scene to improve playback speed while you view animations.

For example, suppose you create a scene that includes a keyframed bouncing ball in addition to several particle emitters. Because particle emission requires much processing time, your animation playback may be slow. You can disable particle nodes to temporarily disable the emitted particles. This makes the animation of the bouncing ball play faster, so the ball's motion more closely resembles the final rendered motion.

To enable or disable nodes, select Modify > Enable Nodes or Disable Nodes. You can enable or disable the following nodes:

IK solvers	See <i>Using Maya: Character Setup</i> for more information on inverse kinematic tools.
Constraints	See <i>Using Maya: Character Setup</i> for more information on basic constraints.

## VIEWING YOUR SCENE | 2

Enabling and disabling nodes

Expressions	See <i>Using Maya: Expressions</i> for more information.
Particles	See <i>Using Maya: Dynamics</i> for more information.
Rigid Bodies	See <i>Using Maya: Dynamics</i> for more information.
Snapshots	See <i>Using Maya: NURBS Modeling</i> for more information on Animation Snapshots.

# 3

## EDITING OBJECTS

Use the Edit menu to delete, select, instance copy, group, and parent objects. This chapter describes how you edit objects in Maya. It also describes Maya's undo, redo, and repeat functions.

It describes the following topics:

- “Selecting objects” on page 51
- “Deleting objects” on page 55
- “Duplicating and instancing objects” on page 58
- “Working with groups” on page 63
- “Creating object hierarchies (parenting)” on page 66
- “Undoing and redoing actions” on page 68
- “Editing object attributes” on page 69

The following Edit menu options are not described in this chapter:

**Keys** – Displays the available keys. For more information, see *Using Maya: Animation*.

**Sets** – A set is a collection of related objects or components. Examples of items that can be in a set include geometric objects, NURBS, CVs, polygonal vertices, skin points, cluster points, and polygonal faces. For more information, see “Sets and Partitions” on page 367.

### SELECTING OBJECTS

There are several ways to select objects in Maya. You can:

- select objects individually
- select all objects in the scene
- select objects of a specified type

## Selecting objects

- select objects of a specified name
- select all objects in a set
- select all objects in a display layer

When you select objects, they become highlighted. Note that you can change the highlight color. For details, see “Changing default colors” on page 482.

## Selecting objects individually

You can select objects individually from the scene, the Outliner, the Hypergraph, and the Relationship Editor.

### To select an object:

- Click on the object, or click-drag a box around it.  
*or*
- In the Outliner or Hypergraph, click on the object name. For information about the Outliner, see “Using the Outliner” on page 297. For information about the Hypergraph, see “Using the Hypergraph” on page 319.  
*or*
- In the Relationship Editor, highlight the object and on the Edit menu, click Select Highlighted. For more information about the Relationship Editor, see “Using the Relationship Editor” on page 255.

### To select more than one object individually:

Shift-click on each object.

## Selecting all objects in a scene

Use Select All on the Edit menu to select root objects and all visible dependency nodes in a scene. You can then treat them as a virtual group without actually having grouped them.

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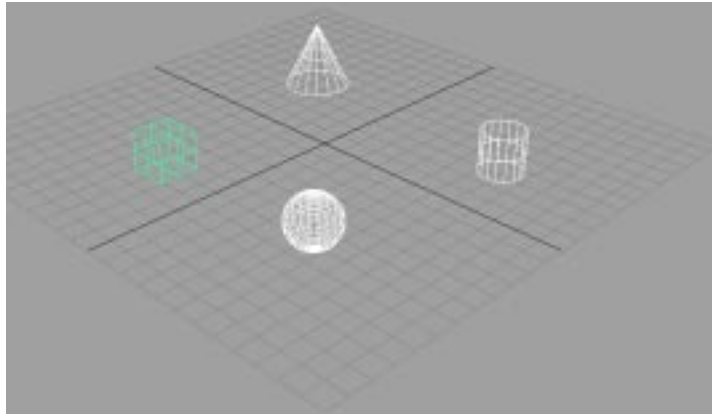
### Note

To select several objects individually, Shift-click on each object. The last selected object is highlighted with a different color than the other objects (default, green).

---

To select all displayed objects:

Select Edit > Select All. Maya selects all objects.



When you select a transformation tool, the manipulator for that tool displays on the last selected object (the one highlighted in a different color, default, green). When you transform the selection, the selected objects move as a group.

To deselect all objects, click anywhere on the view.

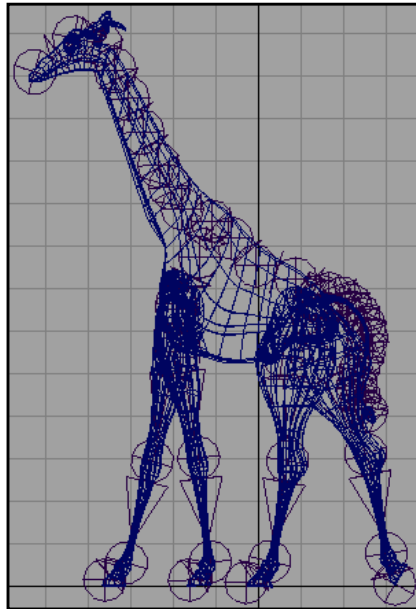
## Selecting objects by type

Use Select All By Type to select all objects of a specific type. In the following example, we select all joints associated with the giraffe.

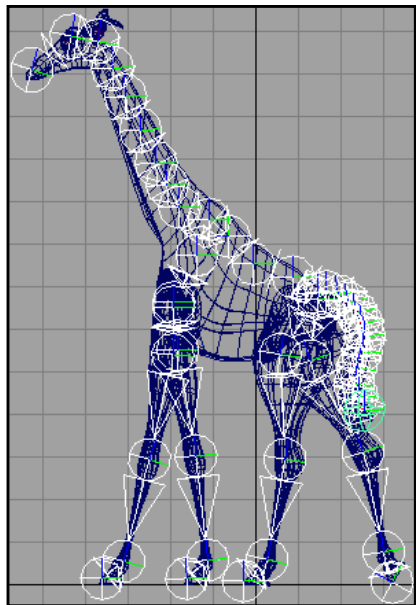
To select all objects by type:

- 1 Select the object.

Selecting objects

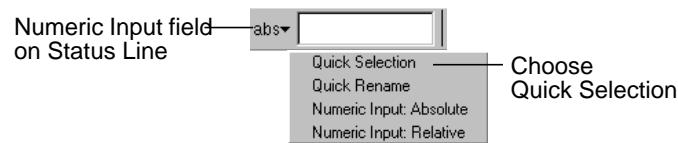


2 Select Edit > Select All by Type > Joints. Maya selects the joints on the object.



## Selecting objects by name

You can select objects and nodes by typing their name or a portion of the name. In the Numeric input field on the Status Line, choose Quick Selection from the pulldown menu and type the name. Using wildcard characters (\* and ?), you can select several items with the same string in their names.



## Selecting all objects in a set

Edit > Quick Select Set is a fast way to select all objects in a particular set without having to open the Relationship Editor.

To place an item into a quick selection set, select it, then select Edit > Sets > Create Quick Select Set. You can place items such as dependency graph nodes, CVs, or lattice points, in a set. Once you name and create the set, you can select it with Edit > Quick Select Set > *setName*.

## Selecting all objects in a display layer

To select all objects in a display layer, on the layer bar, click the ▼ Layer menu button to the left of the layer and select Select All in Layer. For information about layers, see “Using display layers” on page 139.

## DELETING OBJECTS

Use the Delete, Delete by Type, and Delete All by Type options on the Edit menu to:

- delete single objects
- delete object components by type
- delete all objects by type

## Deleting a single object

Use Edit > Delete to delete a selected object or component.

In the following example, we delete a cylinder from the scene.

### To delete an object:

- 1 Select the object(s) you want to delete.  
To delete more than one object or component, Shift-click each object you want to delete, or click-drag a box around the object(s).
- 2 Select Edit > Delete. Maya removes the object and the associated Channel Box or Attribute Editor from the display.

---

### Tip

You can also delete selected objects with the Backspace or Delete keys on the keyboard.

---

## Deleting object components by type

Delete by Type lets you delete objects of a particular type or characteristic (for example, channels). If many objects are selected and you select Delete by Type > Channels, only the Channels attached to the selected objects are deleted. Similarly, if you select Delete by Type > History, any history nodes attached to the selected objects are deleted.

You can delete the following component types:

- History
- Channels (channels that describe how the object's animation parameter changes values over time)
- Static Channels (channels that are not animated)
- Motion Paths
- Expressions
- Constraints
- Sounds
- Rigid Bodies

**To delete an object's components:**

- 1 Select the object with the component you want to delete.
- 2 Select Edit > Delete by Type > *componentType*.

For Channels, Static Channels and Expressions, the components are deleted according to the selected delete channel options.

**To specify delete options:**

- 1 Select Edit > Delete by Type > Channels ☐, Static Channels ☐, or Expressions ☐. The Delete Options window opens.
- 2 Set the following options and click Save.

Hierarchy	To delete the component from the selected object only, choose Selected. To delete the component from the selected object and all objects below it in the DAG hierarchy, choose Below.
Channels	To delete all channels attached to all the selected object's keyable attributes, select All Keyable. To delete channels attached to those attributes selected in the Channel Box, select From Channel Box.
Driven Channels	Toggle this option on to delete driven channels attached to the selected object's set driven key attributes.
Control Points	Toggle this option on to delete channels attached to lattice, polygon, and NURBS curves and surface CVs. If you select All Keyable, this is automatically toggled on. The default is off.
Shapes	Removes the object's geometry channels. If you select All Keyable, this is automatically toggled on. The default is off.

**Deleting all objects by type**

Use Delete All Objects by Type to delete all occurrences of a type of object or component in the scene (for example, joints).

**To delete all objects by type:**

Select Edit > Delete All By Type > *type*. This deletes all of the selected type of components or objects in the scene.

To undelete the component, select Edit > Undo.

## DUPLICATING AND INSTANCING OBJECTS

There are two ways to copy objects:


- With the Duplicate option—Maya actually copies the geometry or lights in a scene.
- With instances—Maya just redisplay the geometry being instanced. Copies of the selected geometry are not created. Since instances are not actual copies of the original geometry, they take up less system memory than actual copies.

### Duplicating objects

Use the Duplicate command to create copies of geometry or lights in a scene. You can duplicate more than one object at a time. You can duplicate objects as many times as you like. This means that you do not have to build a new object every time you need a copy.

---

#### Note

To create more than one copy of the object at the same time, select Duplicate . For more information, see “Setting duplicating options” on page 59.

---

#### To duplicate an object:


- 1 Select the object you want to duplicate.  
If you want to duplicate more than one object, click-drag a box around the objects or Shift-select the desired object.
- 2 Select Edit > Duplicate. Maya positions the copy of the object behind the original object. You cannot see it until you move it.
- 3 To move the duplicate object from behind the original, select the Move tool from the Minibar. The object displays four manipulators.
- 4 Drag the object to move it from behind the original object. Maya deselects the original object.

If you specified more than one copy (see “Setting duplicating options” on page 59), click on the original with the Move tool and drag the manipulators. Repeat until all copies appear in the view.

## Setting duplicating options

Use the Duplicate Options window to position, scale, and rotate objects as you make copies. You can also specify how many copies are made.

### Setting a duplicate option:

- 1 Select Edit > Duplicate . The Duplicate Options window opens.
- 2 Set the following options and click Save.

#### Translate, Rotate, Scale

Specify the offset values for X, Y, and Z. Maya applies these values to the copied geometry. You can position, scale, or rotate objects as Maya duplicates them.

#### Note

The default for Translate and Rotate is 0.0000. The default for Scale is 1.0000. With the default values, Maya places the copy on top of the original geometry. You can specify offset values (positive or negative floating point) for translation, rotation, and scaling that are then applied to the copied geometry.

**Number of Copies** Specify the number of copies to create. The range is from 1 to 1000.

**Geometry Type** Select how you want the selected object(s) duplicated.

**Copy** – Make a copy of the geometry being duplicated.

**Instance** – Create an instance of the geometry being duplicated. When you create an instance, you do not create actual copies of the selected geometry. Instead, Maya redisplay the geometry being instanced. For more information, see “Creating instances of objects” on page 60.

**Group** Toggle Group on to put the duplicates under a new group node.

### Duplicating and instancing objects

**Smart Transform** Toggle Smart Transform on so that when you duplicate and transform a single copy or instance of the object (without changing the selection), Maya applies the same transformations to all subsequent duplicates of the selected duplicate.

#### Duplicate Upstream Graph

Toggle this option on to force the duplication of all upstream nodes leading up to the selected object. Upstream nodes are defined as all nodes with connections feeding into selected nodes.

For example, if A, B, and C are the upstream nodes connecting to D...

A > B > C > D

...and you select D and use the Duplicate Upstream Graph option, the resultant graph will be as follows:

A1 > B1 > C1 > D1

(where A1, B1, C1, and D1 are duplicates of A, B, C, and D respectively).

#### Duplicate Input Connections

Toggle this option on so that in addition to duplicating the selected node, the connections feeding into the selected node are also duplicated.

For example, if A, B, and C are connections feeding into C...

A > B > C

...and you select C and use the Duplicate Input Connections option, then the resultant graph will be as follows:

A > B > C and

A > B > C1

(where C1 is a duplicate of C).

## Creating instances of objects

When you create an instance, you do not create actual copies of the selected geometry. Maya redisplay the geometry being instanced on the screen.

An instance is always identical to the original geometry, although each object can have a unique translation, scaling, and rotation factor applied to it. Therefore, individual instances can be picked as objects independent of one another.

---

*Note*

If you move a CV on the original geometry, it affects the shape of all instances of that object.

Instanced geometry does not display CVs or hull structure. The form of an instance can only be altered from the original geometry.

---

You can create several instanced copies of the original object, rather than just copying it. If you then make a change to the original object, all instanced copies automatically reflect the same change.

Since instances are not actual copies of the original geometry, they take up less system memory than actual copies. In large or complex model scenes, instancing can speed up refresh time, reduce the size of data files, and improve rendering times.

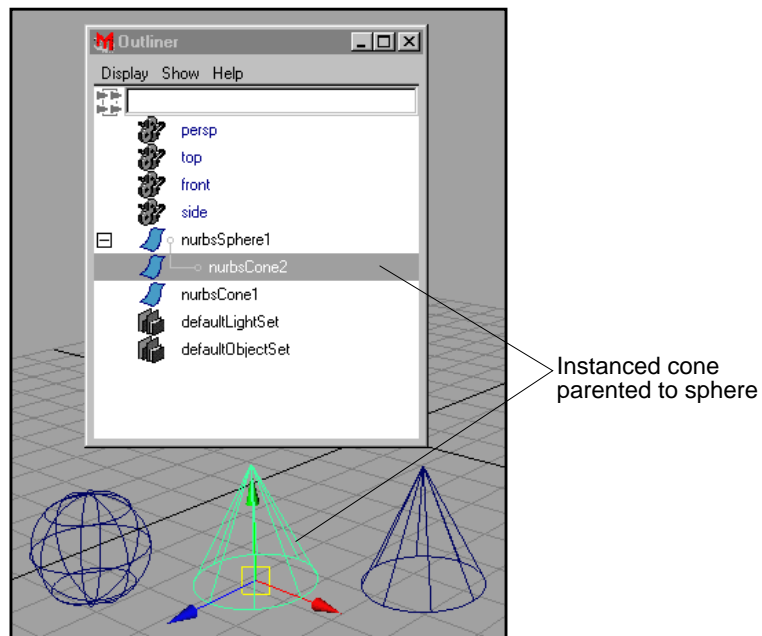
#### Limitations

There are a few limitations when using instancing:

- Instanced lights have no effect.
- Instances share the same shader as the original geometry and cannot be assigned independent shaders.
- Some functions, such as extrude and insert, cannot be used on instanced items. In these cases, you must make a true copy of the instanced geometry that you want to manipulate, then continue with the function.
- You can only apply clusters and deformation frames to the original geometry—you cannot assign them independently to instances. To use clusters and deformations on copies, you must make a true copy of the geometry.
- There is always at least one non-instanced transformation node between the instance nodes and the actual geometry nodes.
- When you create an instance of an already instanced node, Maya does not create a new level.

### DAG nodes and instancing

When Maya creates an instance, the software also creates an extra DAG node level. The top DAG node is the transformation node and the lower DAG level is the geometry node.



When Instance is toggled on in the Duplicate Options window, Maya creates an extra DAG node level to be created.

## WORKING WITH GROUPS

Grouping makes it easier for you to apply an action to multiple objects. Use the Group, Ungroup, and Create Empty Group options on the Edit menu to:

- group objects
- ungroup objects
- create empty groups (groups with null objects)

### Grouping objects

Grouping lets you group a number of objects into a more complex object so that transformations can be applied to all of them at once—in effect, treating many objects as a single object for transformation purposes.


To group objects together:

- 1 Select the objects you want to group together.
- 2 Select Edit > Group. The objects are now part of a group, according to the defined grouping options.

### Setting grouping options

Use the Group Options window to specify options for grouping objects. You can specify how the objects, as well as their pivot points, are grouped.

Setting groupings option:

- 1 Select Edit > Group . The Group Options window opens.
- 2 Set the following options and click Save.

#### Group Under

Group objects under one of the following:

**Parent** – Groups the selected objects under their lowest common parent in the hierarchy. For example, selecting a single object and grouping puts the group node immediately above the selected object in the hierarchy.

Selecting objects that are in different hierarchies puts the group under the world since they don't share a common parent.

Selecting objects in different parts of the same hierarchy puts the objects under their lowest common parent. If you go from each selected object, the new group will be placed under the first node containing all the selected objects.

**World** – Puts the new group under the world (at the top level of the hierarchy).

**Group Pivot**

Select where you want the pivot point for the group to be.

**Center** – Puts the new group’s pivot point at the center of the bounding box of the grouped objects.

**Origin** – Puts the new group’s pivot point at the origin of the new group’s coordinate system.

**Preserve Position**

Toggle this option on to modify the selected object’s matrix so that Maya preserves the overall world-space position of the object. If toggled off, the matrix of grouped objects are changed and the object’s world-space position changes when grouped.

## Ungrouping objects

Ungroup lets you separate parts of a group and remove nodes from a hierarchy. You can then work with each object on an individual basis.

To ungroup objects:

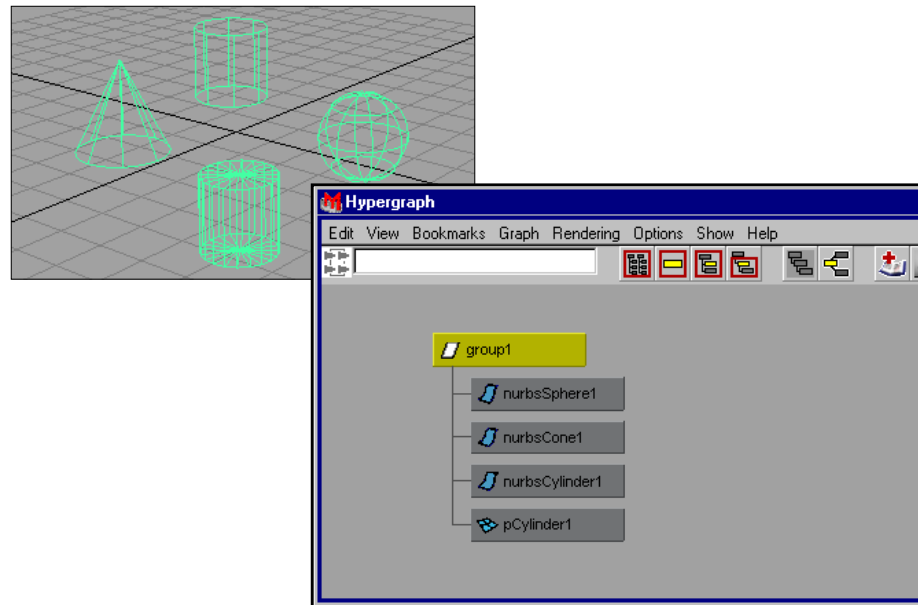
- 1 Select a group.

---

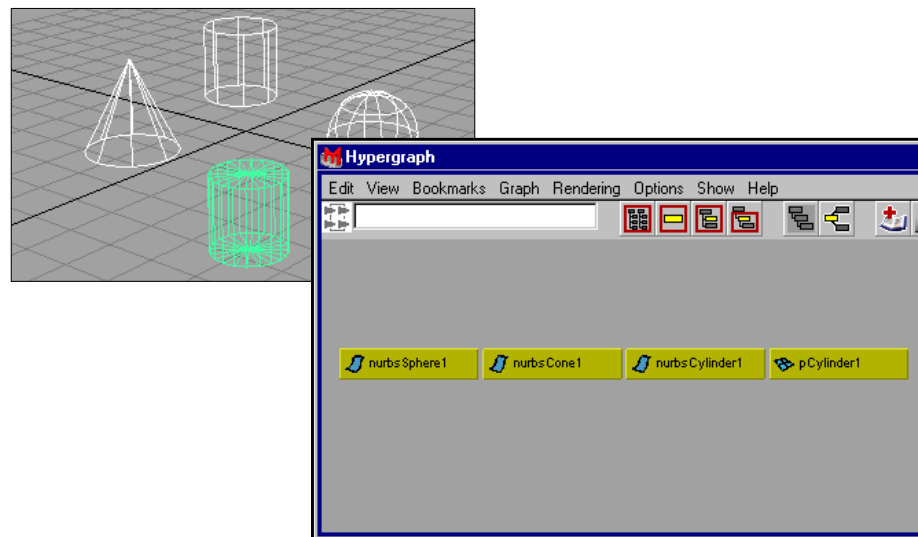
*Tip*

If your scene is comprised of many groups, use the Hypergraph to help you select a group. See “Using the Hypergraph” on page 319.

---



- 2 Select Edit > Ungroup. Maya puts all objects at world level.



- 3 Click anywhere in the display to deselect the objects.

## Creating an empty group

Select Edit > Create Empty Group to create a new group (transform node) without children. These empty or null objects are useful because they can be used to control other objects through expressions. Moving the unrendered, empty object triggers expressions that move other parts of the model. In other words, they can act as constraint nodes.

---

### Tip

You can also create an empty group by selecting Edit > Group with no objects selected.

---

## CREATING OBJECT HIERARCHIES (PARENTING)

You use parenting to establish a hierarchy in your scenes. The Edit menu provides these parenting options:

Parent	Moves objects from one hierarchy to another and creates instances.
Unparent	Returns a parented hierarchy to its original state.
	Use Parent to move objects between hierarchies and create instances.

---

### Note


In the Outliner and Hypergraph, you can drag and drop one object on top of another to parent it.

---

## Parenting objects

When you parent an object, you make it part of a hierarchy.

### To create a parent:

- 1 Select the objects you want to make up the parent/child relationship. Select the children first, and the parent last.
- 2 Select Edit > Parent . The Parent Options window opens.
- 3 Set the following options and click Parent.

Parent Method	<p>Select what you want done with the selected object:</p> <p><b>Move Objects</b> – Move the object from its current parent to the new parent (the last selected object).</p> <p><b>Add Instance</b> – Create an instance under the new group instead of moving the object.</p>
Preserve Position	<p>Toggle Preserve Position on to preserve the overall world-space position by changing the parented objects' transformation matrix.</p>

---

*Note*

If two objects are selected, the first object goes under the one selected last.

---

## Unparenting objects

When unparenting an object from a group, you can remove it from the hierarchy and put it into world space. If it is an instance, you can delete it altogether.

### To unparent an object:

- 1 Select the child object.
- 2 Select Edit > Unparent ☐. The Unparent Options window opens.
- 3 Set the following options and click Unparent.

Unparent Method	<p>Select how you want to unparent the selected object:</p> <p><b>Parent to World</b> – Remove the object from its current parent and place it under the world.</p> <p><b>Remove Instance</b> – Remove a particular instance instead of moving the object.</p>
Preserve Position	<p>Toggle Preserve Position on to preserve overall world-space position by modifying the parented objects' transformation matrix.</p>

## UNDOING AND REDOING ACTIONS

You can undo the last action you performed and redo if you change your mind. You can also repeat your last actions.

### Undoing your last action

Undo reverses the last action you performed on a selected object. It also reverses any action you performed from the Edit menu.

For example, you can transform an object to a new position, then return it to its original position using the Undo command.

**To reverse an action:**

Select Edit > Undo.

---

#### *Note*

To set how many levels of Undo you want, select Window > Settings/Preferences > Preferences, Undo category, and set the Queue Size. Note that a large Queue Size slows Maya's performance.

---

### Redoing and repeating actions

Select Edit > Redo to perform the last action that you reversed. For example, if you delete an object and then use Undo to display it, Redo deletes the object again.

Select Edit > Repeat to echo the last menu item you selected. You can only repeat selections from menus on the main Maya menu bar. You cannot repeat selections from the shelf, channel box, or any of the secondary window menus.

## EDITING OBJECT ATTRIBUTES

An attribute is a characteristic of an object in a scene. There are many ways to set attributes in Maya—with the Attribute Editor, Channel Box, Attribute Spreadsheet, menu selections, and expressions. You can set attributes to control virtually anything in your models and animation. For information on editing attributes, see:

- “Using the Attribute Editor” on page 262
- “Using the Channel Box” on page 280
- “Using the Attribute Spread Sheet” on page 241
- *Using Maya: Expressions*
- “Painting attribute values” on page 454



# 4

## TRANSFORMING OBJECTS

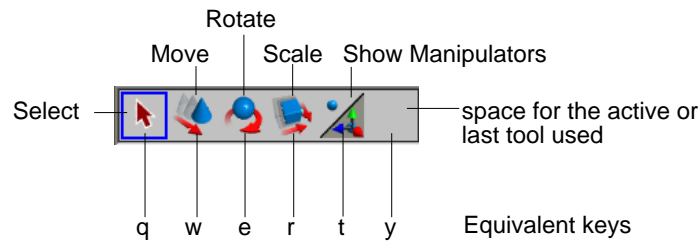
After you build your curves, surfaces, and objects, you are ready to position them in 3D space. This chapter describes how you scale, rotate, and move your objects.

It includes information on these topics:

- “Selecting transformation tools” on page 72
- “Using manipulators” on page 72
- “Using axes and pivot points” on page 73
- “Moving objects” on page 79
- “Rotating objects” on page 85
- “Scaling objects” on page 89
- “Using the Show Manipulator tool” on page 91
- “Entering numeric values” on page 95
- “Combining transformations” on page 97
- “Using proportional modification” on page 99
- “Creating locators” on page 105
- “Using Measure tools” on page 107

## SELECTING TRANSFORMATION TOOLS

The Minibar provides five basic tools: Select, Move, Rotate, Scale, and Show Manipulator. The last tool you used occupies the last position in the row.



The q, w, e, r, t, and y hotkeys correspond to the Minibar icons, as shown above.

When you press the w key and drag with the left mouse button, a marking menu appears for the Move manipulator. Similarly, you can display marking menus for using the e key (for Rotate) and r key (for Scale). The marking menu options are another way to select manipulator handles.

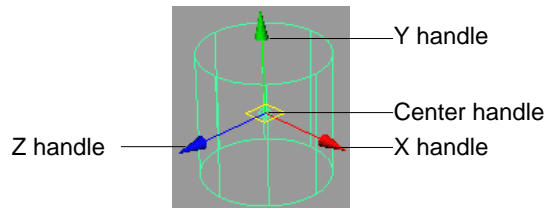
## USING MANIPULATORS

Manipulators provide a visual and interactive way to change an object's parameters. You use manipulators to directly position and scale objects in the workspace.

Many tools have manipulators. Usually, a tool creates a manipulator when you open the tool and deletes the manipulator when you exit it. (However, there are some exceptions to this.)

When you use a manipulator to change parameter values, the Help Line displays the values as they change.

You can also change parameter values by entering them in the Numeric Input field (at the top right of the window). For details, see "Entering numeric values" on page 95.




## About manipulator handles

Each manipulator has several handles. You move these handles to change parameters. For example, the Move manipulator has a center handle, plus handles you use to move it in X, Y, and Z.

If you want, you can make these handles larger or smaller using the manipulator display preferences in Window > Settings/Preferences > Preferences. For the transform manipulators, you can also use the + and - keys on the keyboard to change handle size.

### The active (current) handle

When you click-drag a manipulator handle, it becomes active. This means you can now use the middle mouse button to move the handle without having to reselect it. If you click away from the handle and drag, it still moves the manipulator. The default color of the active handle is yellow.

You can keyframe the attribute that corresponds to this active handle by setting keys on the current manipulator handle (Animation menu set, Animate > Set Key ). For more information, see *Using Maya: Animation*.

## USING AXES AND PIVOT POINTS

There are various ways you can define where your objects are transformed from. You use the location of the pivot point or axes to transform in a specific direction from a specific point in local or world space.

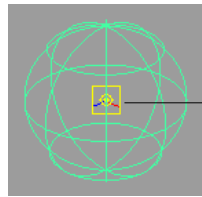
## What are pivot points?

Objects are transformed based on a specific point in 3D space known as a *pivot*. When you rotate a primitive, for example, the pivot point represents the center of the rotation axis; when you scale, the pivot point represents the fixed point around which scaling occurs.

By default, the pivot point is set so that the rotational and scale pivots are located at the point of origin for an object (0, 0, 0). The point of origin is the center of the object. You can change an object's pivot and you can also pin it to a fixed location.

### To quickly display an object's pivot point:

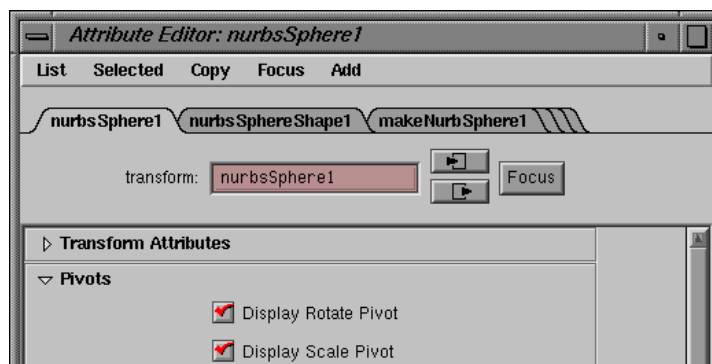
- 1 Select the object, then select the transformation tool.
- 2 Press the Insert key on the keyboard to toggle to and from an *edit* mode. Edit mode displays a manipulator for moving the pivot.



Manipulator for moving pivot

### To display an object's pivot point using the Attribute Editor:

- 1 Select the object.
- 2 Open the Attribute Editor (Window > Attribute Editor) and click the object's transform tab.
- 3 Expand Pivots, and toggle on Display Rotate Pivot or Display Scale Pivot.

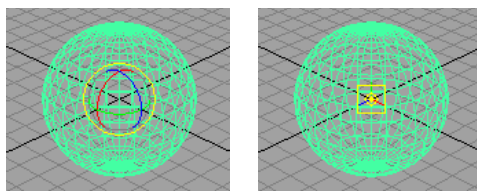


## Moving pivot points

You can move the pivot point to set the point you want to move, scale, or rotate the object from. Use the Insert key on the keyboard to display the pivot point, then use any of the transformation tools. In the following example the Rotate transformation tool is selected.

### To move pivot points:

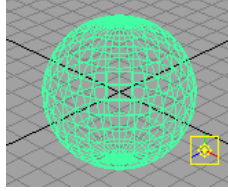
- 1 Select an object active, select a transformation tool, then press the Insert key. The manipulator appears.



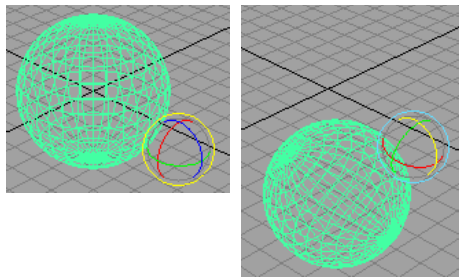
- 2 Drag the manipulator to move the pivot point.

## TRANSFORMING OBJECTS | 4

Using axes and pivot points

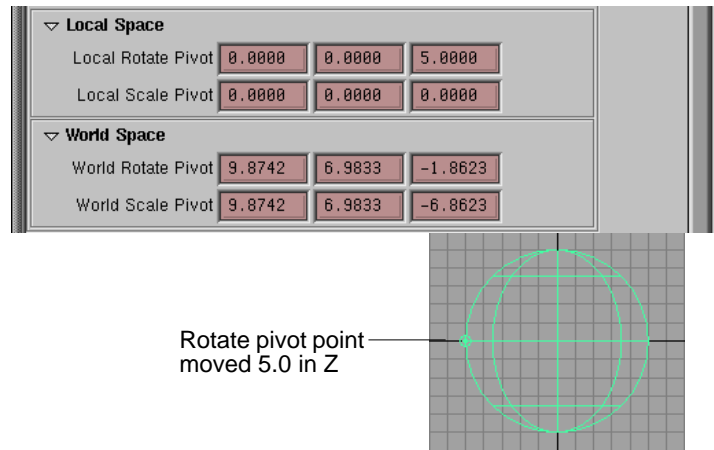


- 3 Press the Insert key again to display the rotate manipulator, drag to rotate the object.



To move the pivot point using the Attribute Editor:

- 1 Select the object, open the Attribute Editor and in the Pivots section, toggle Display Rotate Pivot or Display Scale Pivot on, depending on which pivot you want to move.
- 2 In the Local or World Space sections, enter X, Y and Z values for Rotate Pivot or Scale Pivot and press Enter. In the following example, the rotate pivot is moved 5.0 units in the Z direction in absolute local space. You can now rotate the object from that pivot point location.

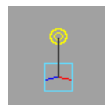


### Pinning component pivot points

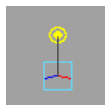
Maya creates a temporary pivot point for object components you select while in Component selection mode. The pivot point is centered with respect to the selected components. If you select additional components after moving a temporary pivot, the pivot automatically moves back to the original position. To prevent it from moving, you can “pin” the temporary pivot to a location you define in edit mode.

#### To pin a pivot point:

- 1 In component selection mode, select the components.
- 2 Press the Insert key to enter edit mode.
- 3 Drag the pivot point to move it to a new location.
- 4 Still in edit mode, click the pivot target. The pivot locks to the current position.



Unpinned  
pivot point



Pinned  
pivot point

**Note**

The component pivot remains pinned in its position until you return to edit mode (using the Insert key) and unpin it.

To “unpin” (or unlock) a pivot and return it to default auto-centering mode, click the pinned pivot manipulator.

**What is an axis?**

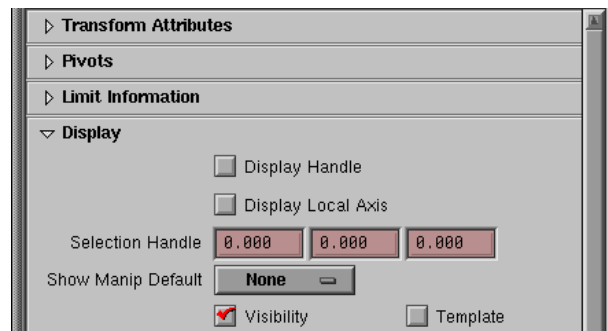
An axis is a straight line that indicates the origin and direction. For example, by using two axes, a plane is defined: the XY plane is defined by placing X and Y axes so they intersect at the origin. Three dimensions are defined by using three axes: X, Y, and Z.

**Displaying the axis indicators**

There are two types of axes: the global axes, and the local axes.

The global axes display in the view. You can display the global axes at the origin in the perspective view (Display > Heads Up Display > Origin Axis) and you can display the global axes at the bottom left of each view (Display > Axes > View Axis).

The local axes displays at the origin of the active object in all views. To display the local axis, open the Attribute Editor. Click the transform tab for the object, and in the Display section, toggle on Display Local Axis.



## Axes and rotation

When you rotate an object, the outcome is partially dependent on the rotation order of the object's axis. The default rotation order is xyz, but you can change it as needed. For more information, see "Changing the rotation order and axis orientation" on page 88.

## Toggling the axes origin from the Command Line

You can also type the following commands in the Command Line to toggle the global axis display on and off in the 3D views.

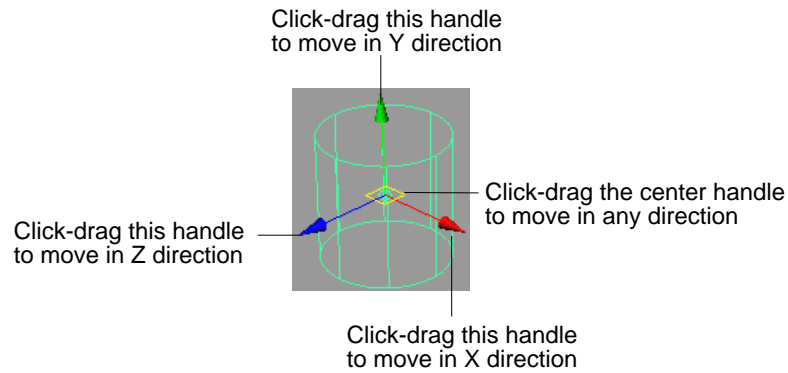
Command	Action
<code>toggleAxis -o true;</code>	displays the axis at the origin
<code>toggleAxis -o false;</code>	hides the axis at the origin
<code>toggleAxis -v true;</code>	displays the axis at the bottom left of each view
<code>toggleAxis -v false;</code>	hides the axis at the bottom left of each view

# MOVING OBJECTS

The following procedure describes how you use manipulators to move an object:

### To move an object using the Move tool:

- 1 Click the Move icon in the Minibar.
- 2 Select the object you want to move. Maya displays a manipulator with four handles—one to move along each axis and one to move anywhere within the plane.



- 3 Click-drag one of the handles, as follows. The selected handle changes color when active. The default color is yellow.
  - To move the object along a single axis, select and drag the handle for that axis.

---

*Tip*

Another way to restrict movement to one axis is to press the Shift key and drag using the middle mouse button. This is faster than clicking on the manipulator to switch between specific handles.

---

- To move the object freely along all axes, select and drag the center handle in the middle of the manipulator.

---

*Tip*

For all manipulators, the middle mouse button controls the active manipulator handle.

---

By default, the Move manipulator moves along the plane of the view. In the perspective view, you also use it to move in the XY, YZ, or XZ planes.

- To move in the XZ plane, Ctrl-click the Y handle.

The “current plane” for the center handle becomes the XZ plane. The center handle now moves the object in the XZ plane (keeping the Y translation value constant).

- To move in the YZ plane, Ctrl-click the X handle
- To move in the XY plane, Ctrl-click the Z handle.
- If the current plane is the XZ plane (or YZ or XY) and you want to move in the view plane, Ctrl-click the center handle.

When a snap mode is turned on, the manipulator center changes to a circle. This indicates that the manipulator snaps instead of moving freely in the current plane.

### Moving tips

Here are a few tips to help you move an object:

- The Selection Mask options window controls what types of items you can move. For example, if CVs are toggled on and all other components are toggled off, only CVs can be selected and moved.
- To change an object’s shape, you can move CVs independently of the objects they are in.

## Moving the translate pivot point

When you transform an object, the center of the manipulator is the center of the current selection’s bounding box. It acts as a temporary pivot. You can move an object’s pivot in edit mode.

### To move the pivot:

- 1 Select the object.
- 2 To switch to edit mode, press the Insert key. Maya displays a Translate manipulator that you can use to move the scale or rotation pivot.
- 3 Drag the manipulator to the desired area within the object.
- 4 Press Insert again to resume translating the object.

*Note*

When you are in Component selection mode, you can “pin” the pivot point to its new location. For information, see “Pinning component pivot points” on page 77.


## Choosing a coordinate system for the Move tool

Use the Tool Settings options window to specify the coordinate system for the Move tool.

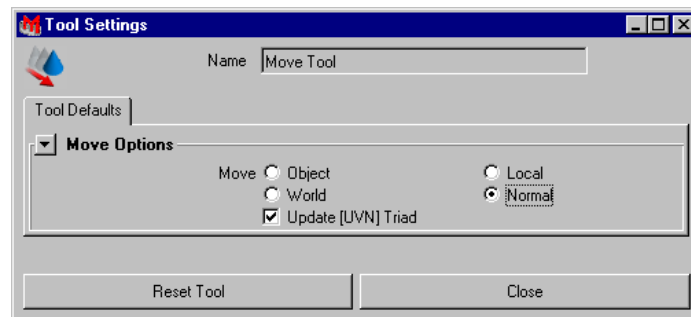
To specify an option:

- 1 Double-click the Move icon in the Minibar.

or

Select Modify > Transformation Tools > Move Tool .

The Tool Settings window opens.

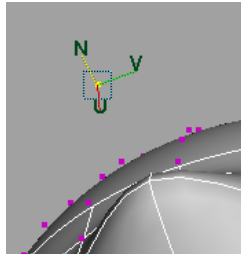


- 2 Select one of the following options and click Close.

### Object

Moves an object in object space coordinate system. Axis orientation includes rotations on the object itself. If several objects are selected, each object moves the same amount relative to its own object space coordinate system.

Local	Aligns the object to the rotation of the parent object. Movement is constrained to those axes in the local space coordinate system. The object is aligned to the rotation of the parent object and does not include the rotations on the object itself. If several objects are selected, each object moves the same amount relative to its own object space coordinate system.
World	Moves in the world space coordinate system. The object is aligned to the world space axis. This is the default.
Normal	Moves selected CVs on a NURBS surface in the U or V direction of the surface. Typically you would use this option for small sets of CVs. The manipulator indicates the surface Normal, U, and V directions.



When you select Normal, the Update [UVN] Triad option displays. Toggled on, this option causes the manipulator orientation to reflect the moved surface rather than the original surface. This is the default. Toggled off, the manipulator retains the orientation for the original surface.

---

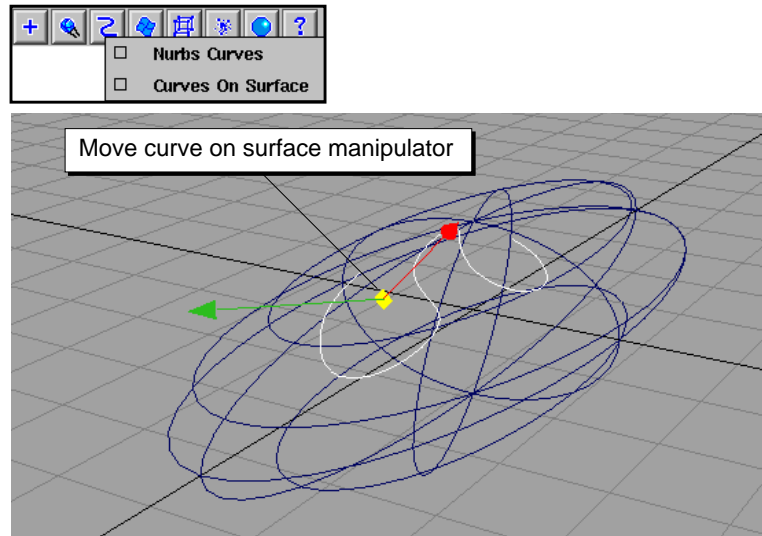
#### Note

For quick access, you can also use the Modify > Transformation Tools > Move Normal Tool. It is the same as selecting the Normal option for the Move tool.

---

## Moving curves on surfaces

Curves on surface (along with their edit points) have a special Move manipulator. When you move a curve on surface, the manipulator constrains the curve on surface to the surface and allows for movement in the UV direction separately.



You can also move a curve on surface entirely off the surface. Since it is mapped only to the UV parameter space of a surface, once the curve or any portion of the curve is moved off the surface, it is no longer displayed.

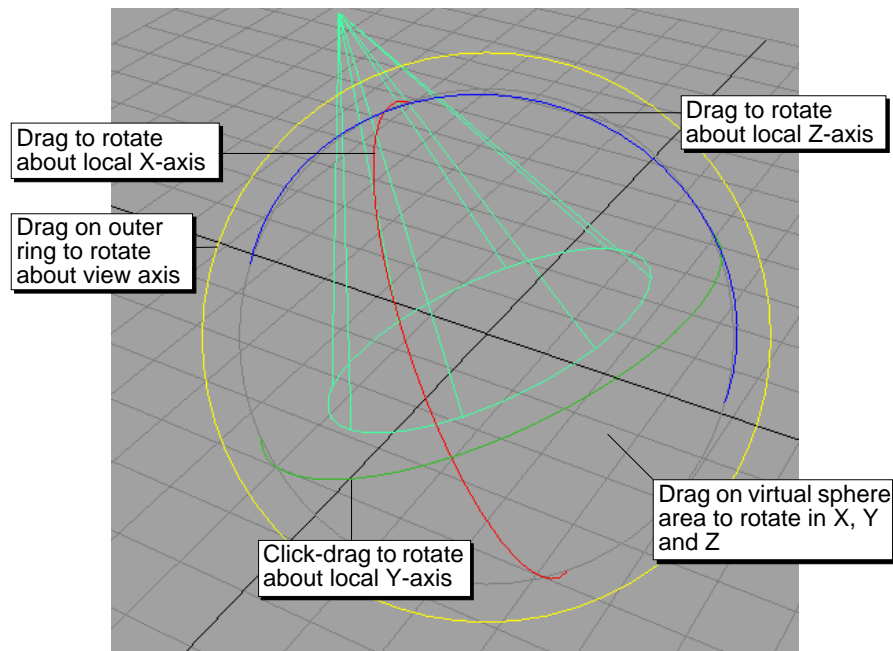
Similarly, if you move an edit point on a curve on surface element off the surface, the edit point and curve spans affected by that edit point are no longer displayed.

## Moving a path animation marker

Motion path markers also have a special manipulator. You can add a marker to a path animation to change the animation timing. If you have a position marker along a path animation, you can use the Move tool to motion the position marker to another point along the motion path. For more information, see *Using Maya: Animation*.

## ROTATING OBJECTS

Use the Rotate tool to rotate objects. The Rotate manipulator consists of four rings, plus a “virtual sphere” enclosed by the rings.



You use the X, Y, and Z rings to perform constrained rotations. You use the outer ring to rotate relative to the view.

For example, in the front view, the view ring rotates the object in the XY plane. The virtual sphere is used to rotate in X, Y, and Z.

---

### Note

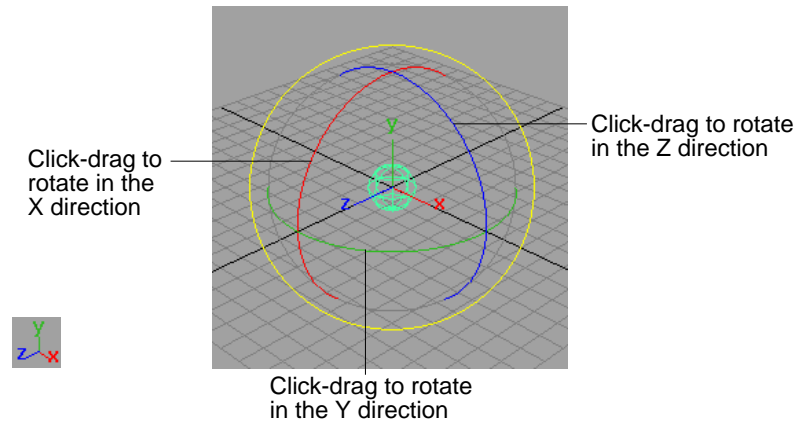
When you rotate a component, Maya rotates it about a temporary pivot which is initially set to the center of the component's bounding box. For information on moving the pivot, see “Moving the rotate pivot point” on page 86.

---

## Rotating objects

### To rotate an object:

- 1 Select the Rotate icon in the Minibar.
- 2 Select the object you want to rotate. Maya displays a rotate manipulator in the shape of a sphere (or arc ball).



- 3 Rotate the object by pressing the left mouse button and dragging.

---

### Note

The object's rotational pivot point determines the effect of a rotation.

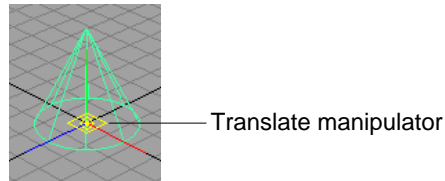
---

## Moving the rotate pivot point

Maya uses the rotate pivot to position the Rotate manipulator.

### To move the rotate pivot:

- 1 To switch to edit mode, press the Insert key. Maya displays the manipulator for moving the pivot. This temporary pivot is initially at the center of the component's bounding box.



- 2 Drag the manipulator to the desired area within the object.
- 3 Press Insert again to resume rotating the object.

---

#### Note

When you are in Component selection mode, you can “pin” the pivot point to its new location. For information, see “Pinning component pivot points” on page 77.

---

## Changing the rotation order

The Rotate manipulator respects the key object’s rotation order, that is, the order in which X, Y, and Z rotations are applied.

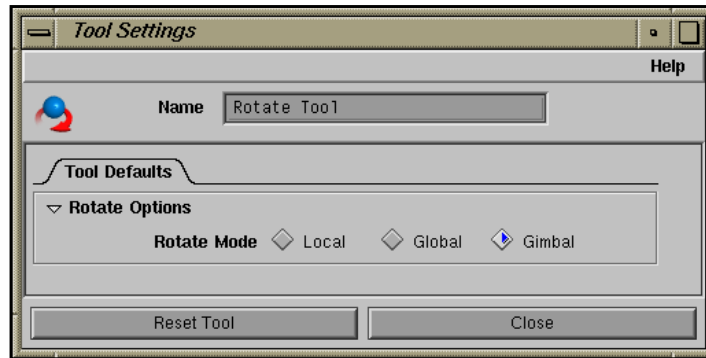
To change the rotation order of an object, open the Attribute Editor. The rotation order option is under the scale/rotate/translate attributes. This is most useful with the Gimbal manipulator. See “Animating rotation channels” on page 89.

### Choosing a rotate mode

You use the Tool Settings options window to specify the behavior for the Rotate tool.

#### To specify an option:

- 1 In the Minibar, double-click on the Rotate icon. The following window opens.

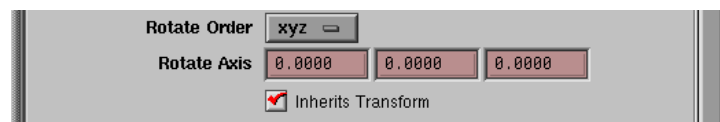


## 2 Specify a rotate mode:

- Local** Rotates the object about the object space axes.
- Global** Rotates the object about the world space XYZ axes. Notice that in this mode the rings never change.
- Gimbal** Changes only the X, Y, or Z rotation value. In the local and global modes, the XYZ constraint rings may change more than one of the rotation XYZ channels.

## Changing the rotation order and axis orientation

In the Transform Attributes section of the Attribute Editor, you can change the rotation order of the axes for an object by selecting an order from the Rotate Order pop-up menu. You can also enter values in the Rotate Axis X, Y, or Z boxes to rotate the axes in a specific direction, and to rotate the object around a different axis.



Keep in mind that these attributes have a combined effect with the Rotate Mode settings in the rotate Tool Settings.

## Animating rotation channels

With the world and object space rotation manipulator, you can change multiple rotation channels at one time, even when using one of the X, Y, or Z rings. For animation, rotations are interpolated on a *per channel* basis and the rotation channels are not independent.

The rotation channels are applied in a specific order. This ordering impacts the animation of these channels. (To change the rotation order, use the Attribute Editor.) For this reason, interpolating all three rotation channels on a single object usually does not result in a smoothly animated rotation.

Instead, use the gimbal rotation manipulator. It lets you change and control individual rotation channels without affecting the other rotation channels. It also gives more predictable results. For modeling purposes, or with animations that don't include rotation channels, use any of the rotate manipulators.

When you animate components such as CVs, you are actually animating their position. Rotating some CVs and setting keys does not produce an arc because it is the CV positions that are interpolated. In this case, it does not matter which rotate manipulator is used.

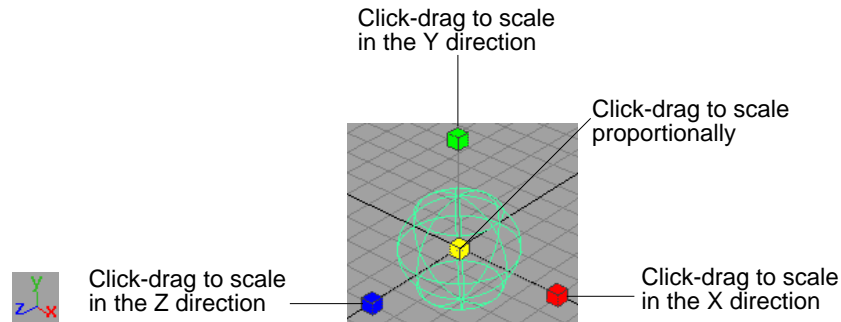
## SCALING OBJECTS

Use the Scale tool to change the size of objects by scaling proportionally in all three dimensions. You can also scale non-proportionally in one dimension at a time.

**To scale an object:**

- 1 Choose the Scale icon from the Minibar.
- 2 Select the object you want to scale. Maya displays a scaling manipulator that consists of four handles. The colors of the handles correspond to the XYZ axes.

## Scaling objects



- 3 Scale the object by click-dragging a handle.

*Tip*

A useful shortcut for non-proportional scaling in X, Y, or Z is to use the Shift key. Hold the Shift key down, then, using the middle mouse button, drag along the direction of the axis you would like to scale in. This is faster because you don't need to click directly on the specific handle to switch between scaling in X, Y, or Z.

When you scale a component, Maya scales it about a temporary pivot, which is initially set to the center of the active component's bounding box. Note that for components, it is the component position that is being changed.

By default, all geometry is assigned an initial scale factor of 1.

## Moving the scale pivot point

Maya uses the scale pivot to position the scale manipulator.

### To move the scale and rotate pivots:

- 1 To switch to edit mode, press the Insert key. Maya displays the manipulator for moving the scale pivot.
- 2 Drag the manipulator to the desired area within the object.
- 3 Press Insert again to resume scaling.

---

*Note*

When you are in Component selection mode, you can “pin” the pivot point to its new location. For information, see “Pinning component pivot points” on page 77.

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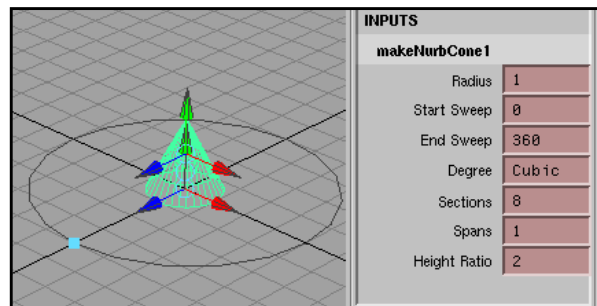
## USING THE SHOW MANIPULATOR TOOL

Some functions display special manipulators that let you tailor a surface or curve after a surface has been created. The Show Manipulator tool (Modify > Transformation Tools > Show Manipulator Tool) lets you edit the construction history of an operation or the attributes of an object itself. In other words, this tool lets you access the input node of an object.

A manipulator is a good way to access the history of a surface created with construction history (such as a beveled or revolved surface). Several manipulators can be active at one time.

When the object is deselected, the manipulators disappear. Reselect the object, and the manipulators reappear.

There are several ways to access and display manipulators using the Show Manipulator tool. Before you start, make sure construction history is on (click the Construction History icon on the status line).



## Selecting an item's history node

The Show Manipulator tool displays a manipulator for the operation's history node. To access the manipulator, you must select the history node.

After you revolve an object, the revolve history node is active and the Show Manipulator tool displays the Revolve manipulator. If you perform several other operations and then want to edit the revolved surface, the manipulators are no longer displayed. You have to select them using one of the following methods.

### To select the history node:

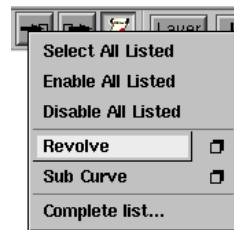
Select the surface then do one of the following:

- Press the **a** key and the left mouse button. Drag to Select All History on the marking menu that appears.



*or*

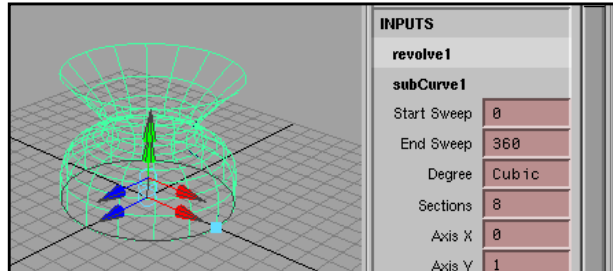
- From the History list menu in the Status Line, select the history node.



*or*

- From the Channel Box, select the history node.

In the following example, the history nodes for a revolved surface and the curve used to construct it are selected. Click **revolve1** to select the history node for the revolved surface.

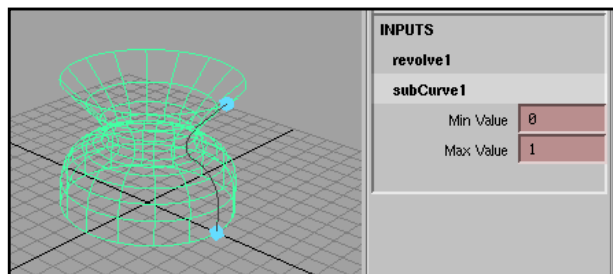


## Changing a curve's parameter range

You can use the Show Manipulator tool to change the parameter range (minimum and maximum value) on a subCurve.

A subCurve is created when you select the Partial option as the Curve Range in some options windows (for example, Revolve Options, Loft Options, Extrude Options, Boundary Options, Bevel Options, Project Curve Options). This option lets you select a minimum and maximum parameter value on the curve; only the part of the curve between those points is used to create the surface. Most surface operations that use a curve as input include this option.

A subCurve can also be the construction curve, or input curve, you use to create surfaces, such as revolved or extruded surfaces.



Once you select the history nodes and the Show Manipulator tool, manipulators display on the surface or the construction curve. To interactively edit these nodes, click-drag the manipulator handles, or change the values in the Channel Box or the Attribute Editor.

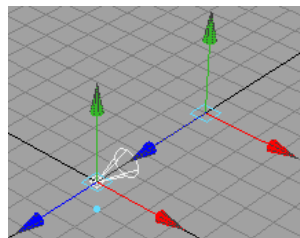
**Note**

Some options windows include a Keep Original toggle (for example, Edit Curves > Detach Curves). Toggle this on to access the manipulators.

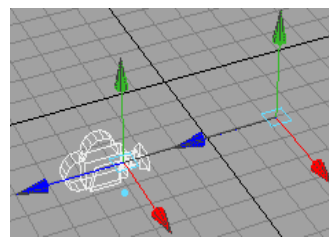
## Displaying manipulators for lights and cameras

Use the Show Manipulator tool to display manipulators for editing lights and cameras. The appropriate manipulator for the camera or light you select displays.

For example, if you select a light or a camera then click the Show Manipulator tool on the Minibar, Maya displays the following manipulators:



Spotlight manipulators



Camera manipulators

For details, see “Displaying camera and light manipulators” on page 137.

## Using the Default Object manipulator

The Default Object manipulator is the transform tool set to be used with the Show Manipulator tool for an object. It can be the Move, Rotate, or Scale tool. Even if the object has its own manipulator (for example, a light), the transform manipulator is shown instead.

### To set the default manipulator for the Show Manipulator tool:

Select **Modify > Transform Tools > Default Object Manipulator > *transformTool***. Set Default Object Manipulator to None to use the object’s own manipulator, rather than a transform manipulator. This is the default.

This information is saved with the scene. It is also shown in the Attribute Editor under the transform Display section.

## ENTERING NUMERIC VALUES

You can move, rotate, or scale an object by entering values in the Numeric Input field or the Command Line.

### Using the Numeric Input field

The Numeric Input field appears on the Status Line. You can enter absolute values or relative values in the Numeric Input field. When typing values, do not include commas to separate XYZ coordinates—use spaces. For example, type:

1 3 5

*...not*

1,3,5

You can use decimal values.

#### Entering absolute values

Click the pulldown menu next to the Numeric Input field and select Numeric Input: Absolute. The button changes to abs, to indicate that Maya will interpret the values you enter as relative.

When you enter an absolute value, Maya moves or rotates the object to the absolute world-space coordinates that you type in, or scales the object to the absolute size value specified for each of the three axes.

For example, if an object is positioned at XYZ coordinates (4, 2, 2) and you move the object by entering an absolute value of:

6 3 1

*...in the numeric input field, the new position of the object is (6, 3, 1).*

You can omit trailing zero values. For example, you can type:

2 3 0

or

2 3

*...to move an object to (2, 3, 0).*

## Entering numeric values

To move or scale an object on only one or two of the axes without affecting the other axis, you must re-enter the current values you don't want to affect. For example, to move an object from its location at (2,3,1) to (4,4,1), enter the absolute move values:

4 4 1

Similarly, if an object is scaled by a factor of 5 on all three axes and you want to change the scale on the x-axis to a factor of 6, enter the scale factors:

6 5 5

### Entering relative values

Click the pulldown menu next to the Numeric Input field and select Numeric Input: Relative. The button changes to rel, to indicate that Maya will interpret the values you enter as relative.

When you enter a relative value, Maya moves, rotates, or scales the object by the specified amount on each axis, relative to the object's current position or scale factor.

For example, to move an object from (2,3,1) to a position 2 grid positions in the positive X direction and one grid position in the positive Y direction, enter the relative values:

2 1 0

...and press Enter.

The zero value for the z-axis results in no positional adjustment on this axis. The object moves to (4,4,1).

You can omit trailing zero values. For example, you can type:

2 3 0

...or

2 3

...to move an object from (1,1,1) to (3,4,1).

### To transform an object using the Numeric Input field:

- 1 Click the Move, Rotate, or Scale tool in the Minibar.
- 2 Select the object you want to move.

**Note**

If you select more than one object, Maya displays the manipulator on only one object. However, each object scales or rotates relative to its own pivot point.

- 3 To move the object by an absolute amount (the default), type the XYZ coordinates in the Numeric Input field and press Enter, or type `-a` before the value and press Enter, for example:

```
-a 1 7 4
```

To move an object by a relative amount, click the `abs` button to toggle to `rel`, then enter the value, or type `-r` before the value and press Enter, for example:

```
-r 2 6 3
```

## Using the Command Line

The command line appears at the bottom of the Maya main window.

### To transform an object with the Command Line:

To transform objects from the Command Line, you use the *move*, *rotate*, and *scale* commands.

If you type `-r` before the numerical values on the Command Line, geometry is translated *relative* to its current location. (`-a`, for absolute world space coordinates, is the default.)



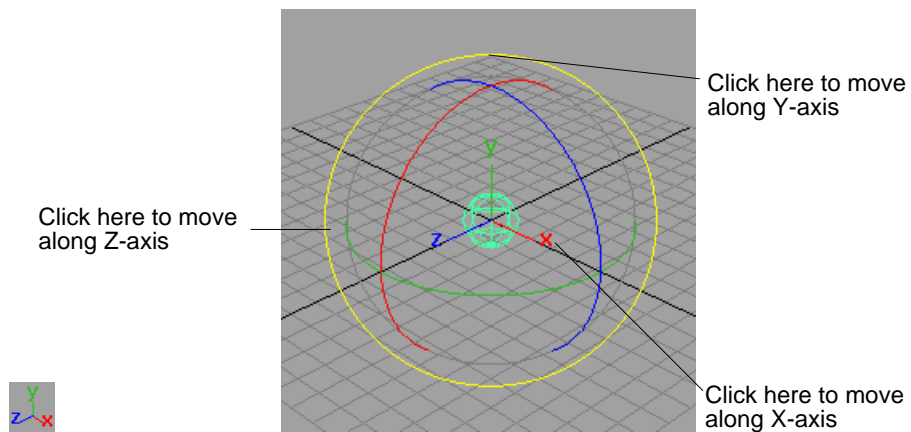
## COMBINING TRANSFORMATIONS

You can use the combined Move/Rotate/Scale manipulator to switch between moving, rotating, and scaling. When you first select this tool, only part of each manipulator is displayed. To see the complete manipulator, click on one of its handles.

### To move an object:

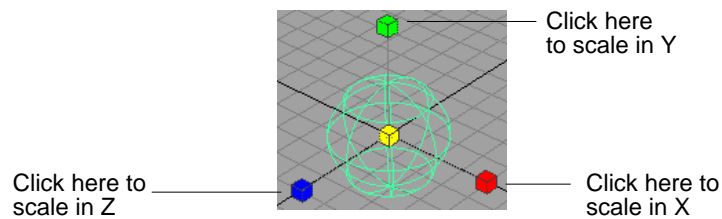
To display the full move manipulator (including the center handle), click on one of the arrow handles. Then use the handles as described in the Move tool.

- To move along a single axis, click-drag the arrows in the direction of the XYZ axes.
- To move the object freely along all axes, click one of the arrow handles to first display the center handle, then click-drag the center handle.



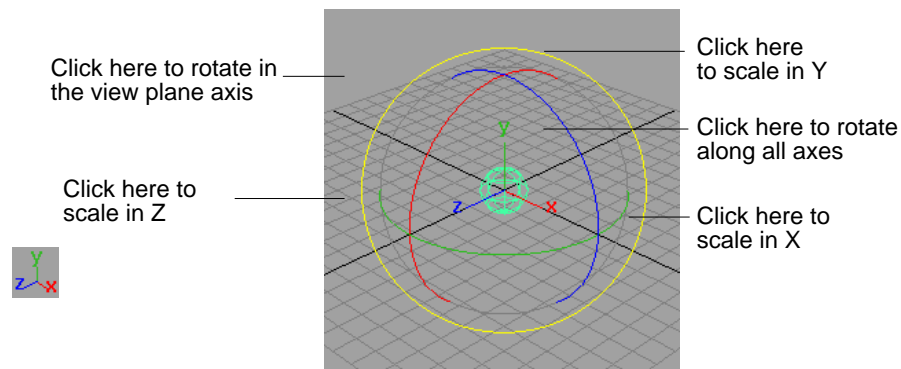
### To scale an object:

- To perform a non-proportional scale, select the box handle representing the axis and drag in that direction.
- To perform a uniform scale on the entire object, click one of the box handles to display the center handle, then click-drag the center handle.~



### To rotate an object:

- 1 When you first select this tool, the XYZ constraint rings are not displayed. To display the arc ball, select the outer constraint ring.
- 2 To rotate around a single axis, select the appropriate ring and drag in the direction of the axis.



### Note

When you use the combined transformation tool, the transformations occur with respect to object space only.

## USING PROPORTIONAL MODIFICATION

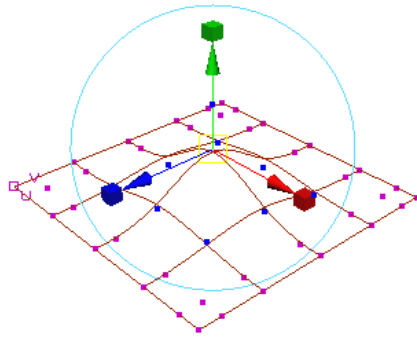
You can use the Proportional Modification (propmod) tool to transform a number of items proportionally, based on the distance from the manipulator handle. Typically, you use this tool to transform CVs.

The propmod effect is usually based on the distance of the CV, or other component, from the manipulator. The closest object exactly matches the manipulator's movement. Objects further away do not. This effect is controlled by the Distance Cutoff setting.

## TRANSFORMING OBJECTS | 4

### Using proportional modification

The manipulator for Proportional Modification is a combination of the move, rotate, and scale manipulators. Click on the appropriate part of the manipulator, depending on what type of transformation you want to perform.



You can reposition the manipulator in another part of the scene to achieve different effects on the selected objects.

#### Example of translating CVs:

- 1 Click the Select by Component Type icon and select the curves to see the CVs.



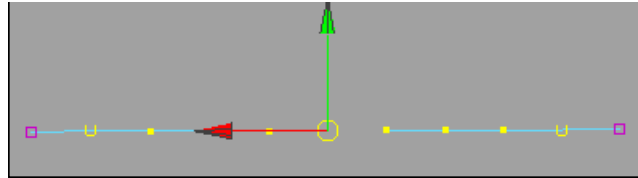
Click this icon and select the curves to see the CVs



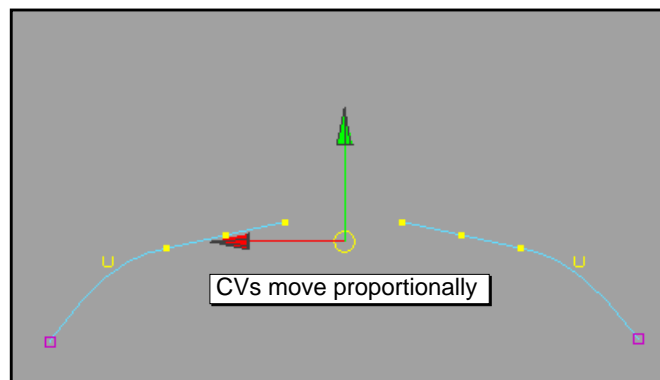
- 2 Shift-drag to select all the CVs in the center of the curves.




- 3 Select **Modify > Transformation Tools > Proportional Modification Tool**.  
Maya displays a manipulator.



- 4 Click-drag to position the manipulator, then drag the green handle to move the CVs on the curves.

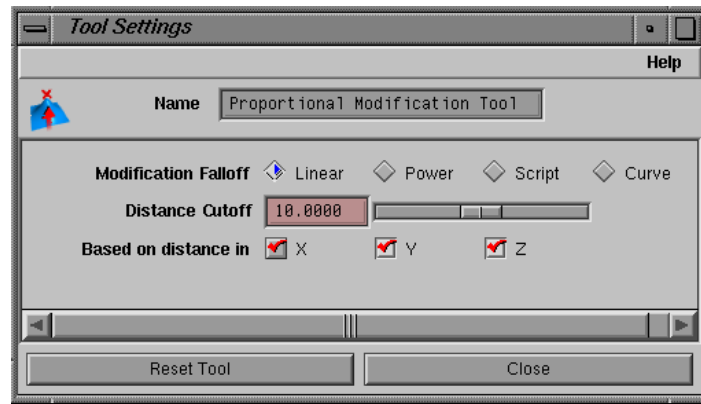


## Specifying proportional modification falloff

To set proportional modification options, either double-click on the icon, or select **Modify > Transformation Tools > Proportional Modification Tool** . The options window opens.

### Linear modification falloff

This is the default modification falloff. Maya performs the modification in a linear fashion and displays the **Distance Cutoff** option.

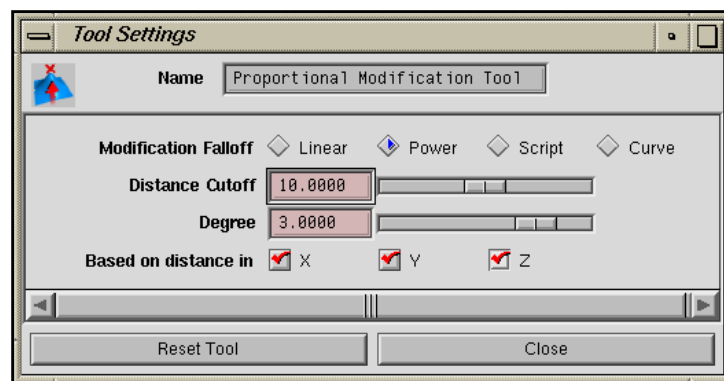


**Distance Cutoff** Objects further away than this value are ignored. The distance is measured in 3D from the manipulator handle.

**Based on distance** The distance from the manipulator handle to the object directly influences the modification factor. The distance will be computed along the selected axes only. If any of these is toggled off, the distance used in the computation of the propmod effect from the handle to the point will ignore that component.

### Power modification falloff

Using the Proportional Modification tool, you can set the degree to any value between +5 and -5 and the falloff is non-linear (it forms a logistic curve). However, if you set the degree to 1 the falloff is linear again.

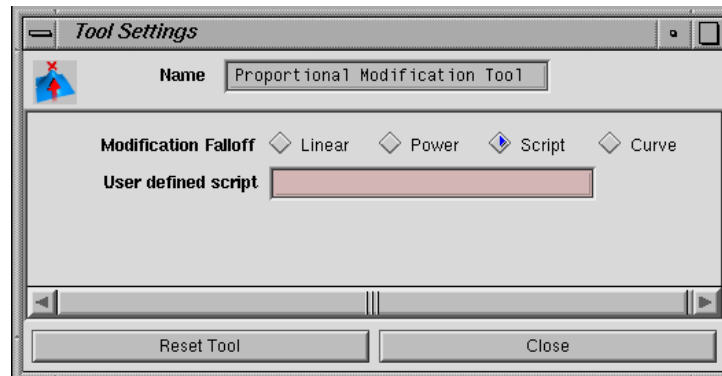


Distance Cutoff	Objects further away than this value are ignored. The distance is measured in 3D from the manipulator handle.
Degree	<p>Specifies the degree of effect in the U and V directions. A value of 0 applies the transformation equally over the entire region.</p> <p>A <i>positive</i> value decreases the effect of the transformation for objects further away from the manipulator handle; the greater the degree, the greater this dampening effect.</p> <p>If Degree is <i>negative</i>, the effect of the transformation is <i>increased</i> for objects further away from the manipulator handle.</p>
Based on distance	The distance from the manipulator handle to the object directly influences the modification factor. The distance is computed along the selected axes only.

### Script modification falloff

This method uses a MEL script to determine the falloff.

With the appropriate parameters set, you can choose the Script option and type a command for the settings in the User defined script box to save the current parameter settings without actually invoking the function. If you want to use these settings again later, you can retrieve the tool's script from the Reference Editor.



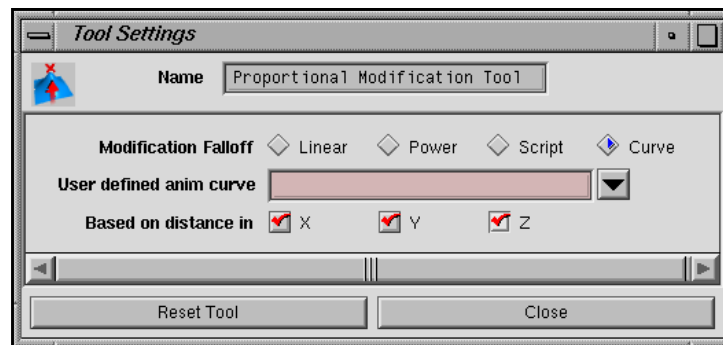
User defined script	The script should return a modification factor. The inputs to the script are “float” numbers. The first three represent the position of the manipulator handle. The second three represent the position of the point manipulated.
---------------------	---

For example, the points for which this script returns 1 will move with the manipulator handle. The points for which this script returns 0.5 will move half as fast as the manipulator handle.

For more information, see “Using the PropMod script” on page 105.

### Curve modification falloff

This option uses an animation curve to create the falloff. An animation curve profile can be used to produce a modification factor.



#### User defined anim curve

Enter the name of an existing animation curve. Its vertical direction will map into the modification factor. The distance maps to the anim curve time axis (in seconds).

You can use the pull-down menu to the right of the box to list and choose all the anim curves with names starting with *propModAnimCurve*. You can also create one of those by choosing Create New from the same pull-down menu.

**Based on distance** The distance from the manipulator handle to the object directly influences the modification factor. The distance is computed along the selected axes only.

## Using the PropMod script

The PropMod script is similar to the Move script except that it has additional settings for the move distance. Using the Script option, you can compute each object's factor individually.

The user-defined script command considers both the position of the manipulator and the object. The value returned by the script is used as a multiplying factor for a specific object.

### Example

Create myPropMove.mel file as:

```
global proc float myPropMove(float $mx, float $my,
                                float $mz, float $px,
                                float $py, float $pz)
{
    return rand (1.0)
}
```

...which produces a random value between 0 and 1.

If you select myPropMove as the script name, you get a random modification factor for all selected points.

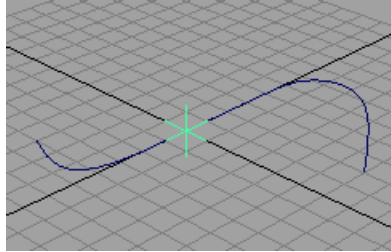
## CREATING LOCATORS

A locator marks a position in world space. A locator is displayed as a small gnomon; its lines extend in each direction along the X, Y and Z axes (like the directional rods of a sundial). You can use point snapping to snap to a locator position.

Use Create > Locator to create a space or curve locator.

To create and move a locator:

- 1 Select Create > Locator. A locator is created at the origin.

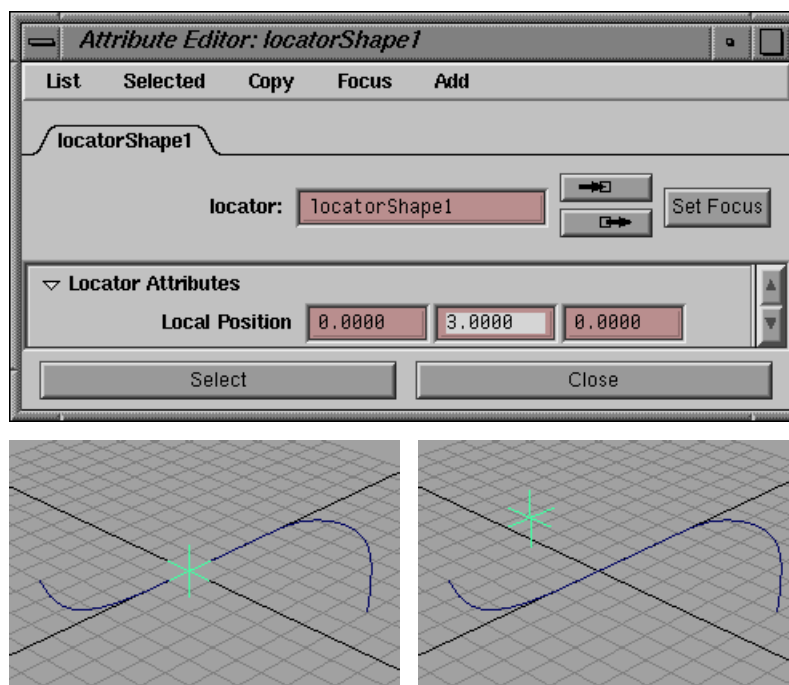


- 2 Move the locator in one of the following ways:
  - Use the transformation tools.
  - Change the transformation values in the Channel Box.
  - Click the locator# tab in the Attribute Editor and change the Transformation values in that section of the editor.

### Repositioning the locator in local space

You can reposition the locator in local space from the Attribute Editor (Window > Attribute Editor).

Click the locatorShape# tab to open that section of the editor. Enter X, Y, or Z values in the Local Position boxes.



## USING MEASURE TOOLS

The Create > Measure menu includes the Distance Tool, Parameter Tool, and Arc Length Tool.

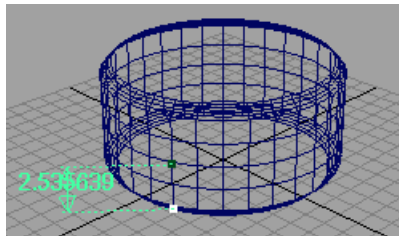
### Using distance measures

Use the Create > Measure > Distance Tool to measure and display distances between two specified points.

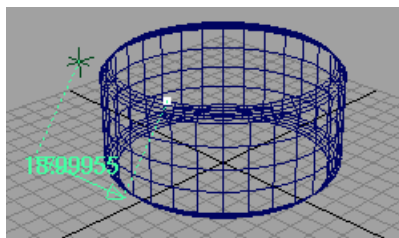
**To display a distance measure:**

- 1 Select Create > Measure > Distance Tool.
- 2 Click to select two points in space, or click on a curve or surface to display the distance measure locator.

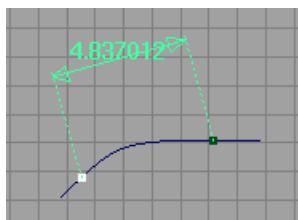
The following example shows the distance locator when two points are placed on a surface.



This shows the distance locator when one point is placed in world space and the other is placed on the surface.



The following shows the distance locator when two points are placed on a curve.

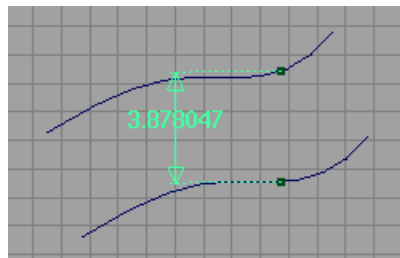
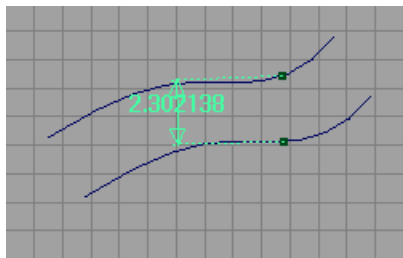


#### To snap a distance measure point:

To snap a locator to a curve or surface, use the Snap to curves icon and click on the curve or surface. When you move the item, the distance measure updates. This can be especially helpful if you want to measure the distance between two curves.

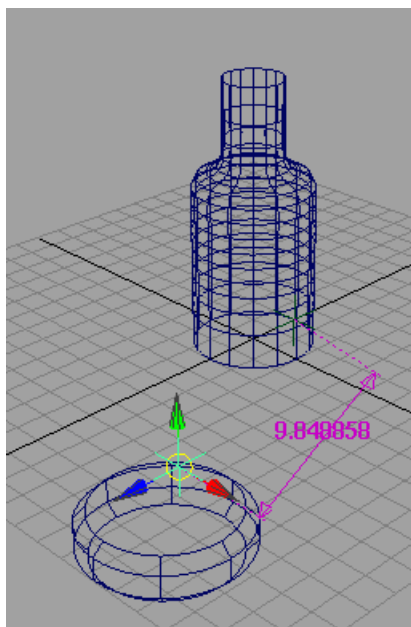
- 1 Click the Snap to curves icon from the Status Line.

- 2 Place a point on one curve and another point on the other curve.
- 3 Move one of the curves and the distance measure updates.



To move the distance locator:

Select the Move Tool, then click to select a locator and drag to where you want to measure the distance between. The distance measure updates interactively.

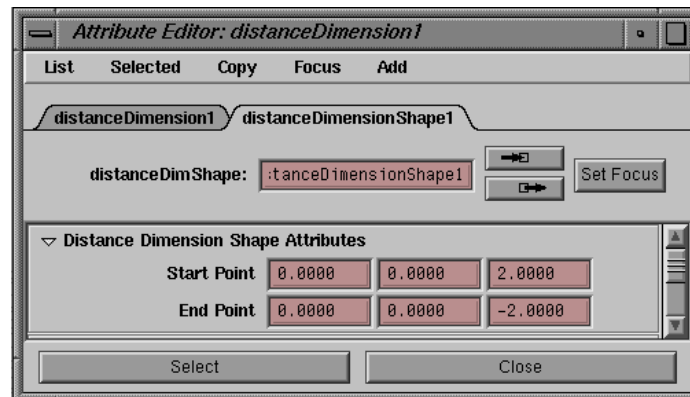


## Editing the distance locators using the Attribute Editor

You can specify the start and points of the distance measure in X, Y and Z from the Attribute Editor (Window > Attribute Editor).

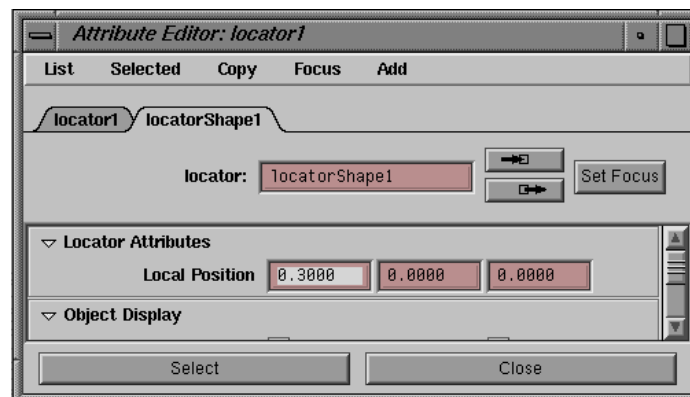
### To specify the start and end points of the distance measure:

Click the distanceDimensionShape# tab to open that section of the editor. Enter values in the Start Point and End Point boxes to specify the start and end points of the distance measure in X, Y, and Z.



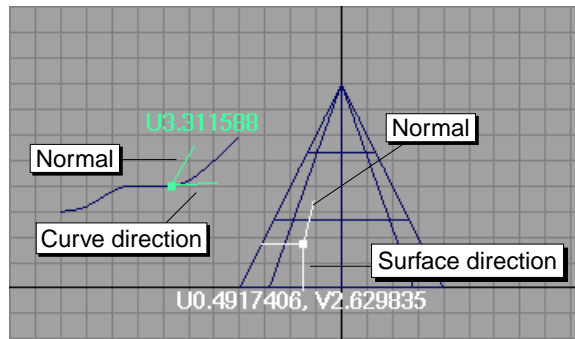
### To reposition the distance locator in local space:

Click the locatorShape# tab to open that section of the editor. Enter values in the Local Position boxes to reposition the distance measure in X, Y, or Z.



## Displaying parameter values

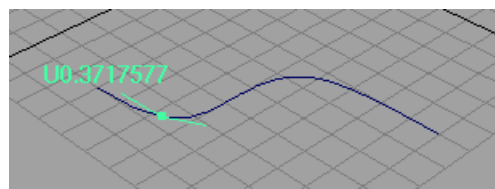
Use the Create > Measure > Parameter Tool to display parameter values on curves and surfaces at a specified point. This locator also displays the direction of the curve or surface and the normal to the curve or surface at a specified point.



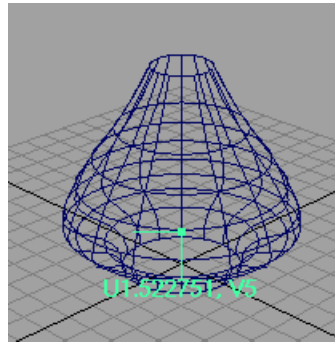
To display parameter values on a surface or curve:

- 1 Select Create > Measure > Parameter Tool.
- 2 Click-drag on a curve or surface to display the parameter values at a specified point.

For curves, the parameter value in U at the specified point on the curve displays.

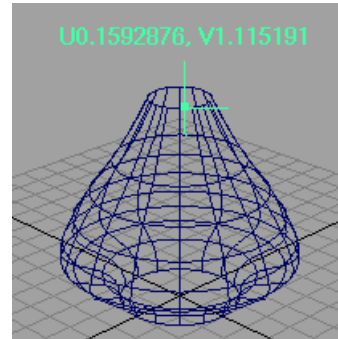
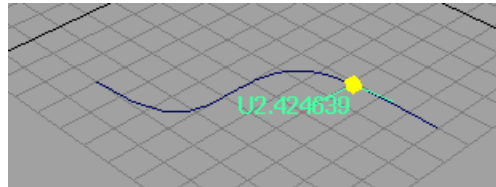


For surfaces, the parameter value in U and V at the specified point displays.

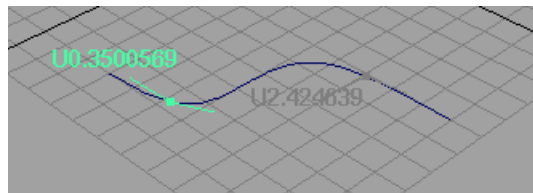


To move the parameter locator:

Select the Move Tool, then click-drag a locator over the curve or surface. The parameter values update as you drag.



If you create another locator, the previous locator is dimmed. This means that you can move it later if you need to.



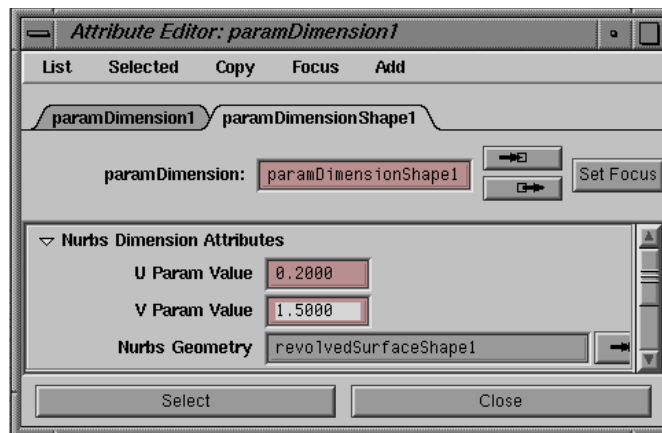
## Editing the parameter locators in the Attribute Editor

You can specify the U and V parameters values from the Attribute Editor (Window > Attribute Editor).

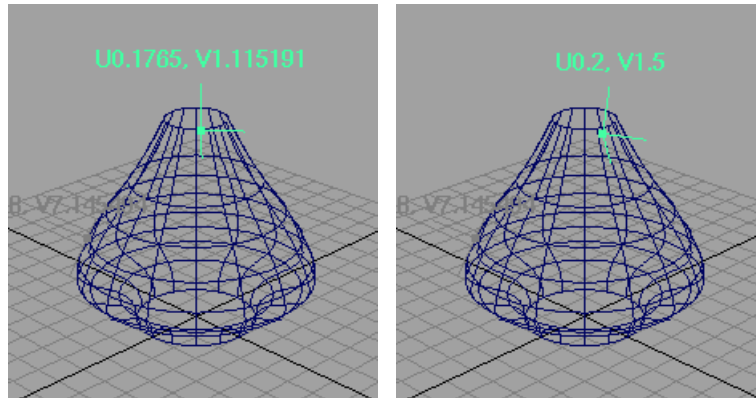
Click the arrow beside the Nurbs Geometry box to access the curve or surface whose locator you want to edit.

### To specify the U and V parameter values:

Click the paramDimensionShape# tab to open that section of the editor. Enter new U and V Param values.

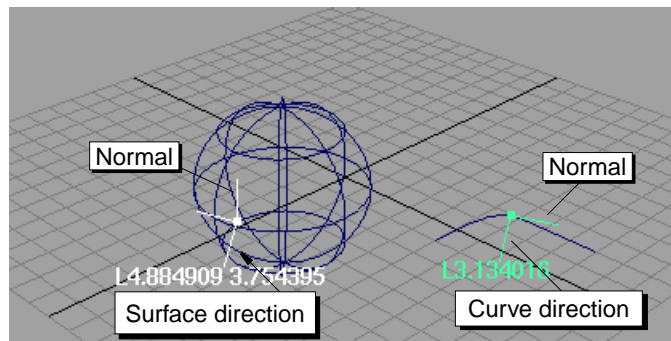


In the following example, the first figure shows the parameter locator on a surface at the position where it was created. The second figure shows how the locator is modified when you change the U and V Param values.



## Measuring arc lengths

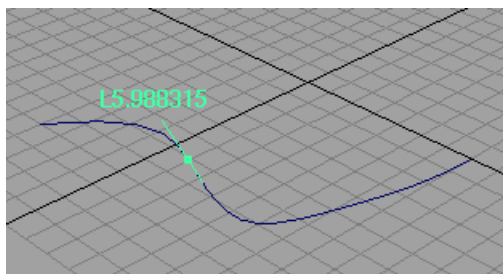
Use the Create > Measure > Arc Length Tool to measure and display arc lengths on curves and surfaces at a specified point. It also displays the direction of the curve or surface and the normal to the curve or surface at a specified point.



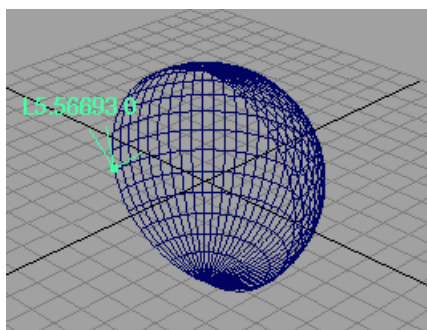
To display arc length values on a surface or curve:

- 1 Select Create > Measure > Arc Length Tool.
- 2 Click-drag over a curve or surface to display the parameter values at a specified point.

For curves, the distance of the specified point from the start point of the curve is measured.

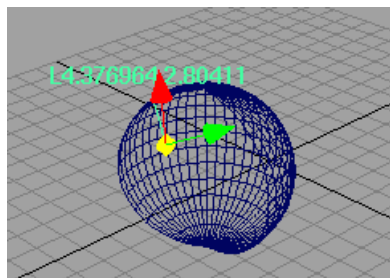
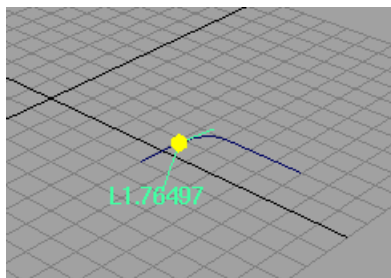


For surfaces, the specified point from the start point in both the U and V direction is measured.



To move the arc length locator:

Select the Move Tool, then click-drag over the curve or surface. The parameter values update as you drag.



If you create another locator, the previous locator dims, meaning you can select to move it later if you want.

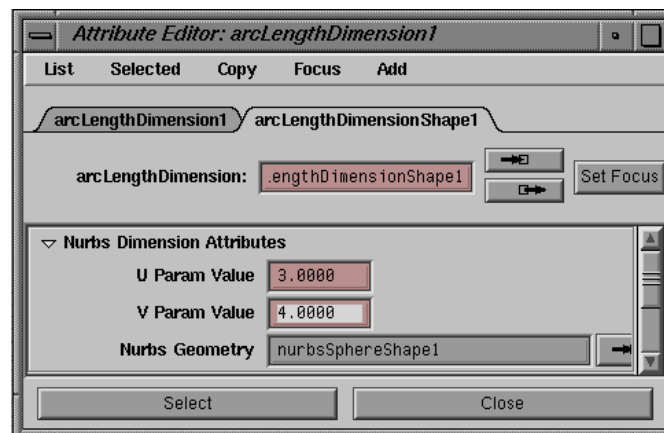
### Editing the arc length locators in the Attribute Editor

If you want, you can specify the U and V parameters values from the Attribute Editor (Window > Attribute Editor).

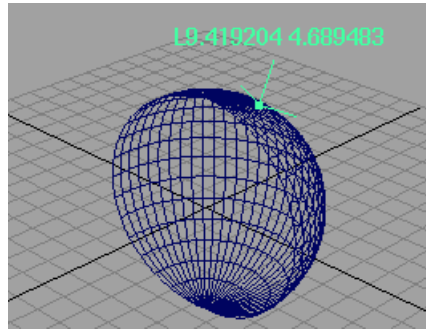
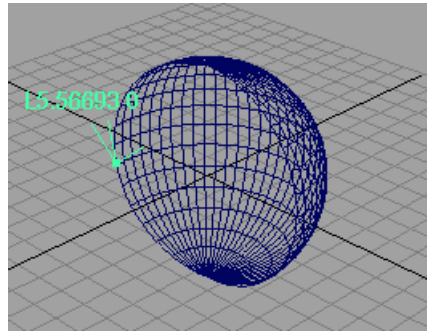
Click the arrow beside the Nurbs Geometry box to access the curve or surface for which you want to edit the locator.

#### To specify the U and V parameter values:

Click the arcLengthDimensionShape# tab to open that section of the editor and enter new U and V Param values.



In the following example, the first figure shows the arc length locator on a surface at the position where it was created. The second figure shows how the locator is modified when the U and V Param values are changed.





# 5

## DISPLAYING OBJECTS

This chapter describes the tools and actions you use to display or hide objects and attributes. You can use these tools to customize your working environment and reduce workspace complexity. Topics include:

- “Displaying items in Maya” on page 119
- “Using a grid” on page 120
- “Displaying axes, polygon count, and frame rate” on page 122
- “Specifying how objects display” on page 122
- “Hiding and showing objects” on page 125
- “Isolating selected objects or components” on page 129
- “Displaying object components” on page 131
- “Displaying NURBS components” on page 132
- “Displaying polygon components” on page 135
- “Displaying camera and light manipulators” on page 137
- “Working with templates” on page 139
- “Using display layers” on page 139
- “Using render layers” on page 147

### DISPLAYING ITEMS IN MAYA

You use the Display menu to show or hide NURBS, polygons, tools, components, and attributes. When you hide or show items, it affects the workspace globally.

If you want to hide or show these elements for just one view, use that view's Show menu. You can also use the Show menu to display specific types of objects (joints, lights, meshes, surfaces, and so on) in a 3D view. For information on Show menu options, see “Hiding and showing objects” on page 125.

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*Tip*

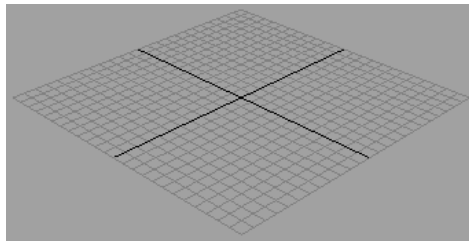
You can also control the display of many items from the Attribute Editor. See “Using the Attribute Editor” on page 262.

---

## USING A GRID

A grid is a 2D plane that represents 3D dimensions in the view. You can use grids to help animate relative to a solid surface. For example, you could use a grid to help plan the foot positions of a person walking on the ground. You can also use a grid to construct skeletons, because you can snap grid coordinates on and off to precisely position joints.

You can hide the grid when you need to reduce visual clutter. For example, if you have animated a character walking across a floor and want to view the surface texture, you can toggle off the grid when you're ready to fine-tune the placement of the character's feet.



**To turn the grid off and on:**

Select Display > Grid. To toggle the grid back on, select Grid again.

---

*Note*

The default grid is a 24 x 24 unit grid displayed in the XZ plane.

---

## Setting grid options

Use the Grid Options window to specify how the grid looks on the screen. When you change grid options, Maya changes the display immediately.


---

*Tip*

Have at least one modeling window open when changing the Grid option. This lets you view the changes interactively.

---

### To set grid options:

- 1 Select Display > Grid . The Grid Options window opens.
- 2 Set the following options and click Apply.

Grid	Specifies the size of the grid or the spacing between major grid lines. The default is 5. The smaller the number, the less space there is between major grid lines.
Subdivisions	Specifies the number of divisions between major grid lines. Setting the Subdivisions option to a value greater than 1 specifies that each main grid interval will be subdivided by the amount specified. The default is 5.
Extent	Specifies how far the grid is drawn in each direction. If the extent is 50 cm, Maya draws the grid 50 cm in the +X direction and 50 cm in the -X direction.
Style	<p>Changes the style of the grid, including:</p> <p><b>Outline</b> – Displays only the outline of the grid.</p> <p><b>Axes</b> – Displays the outline and the XZ axes.</p> <p><b>Grid</b> – Displays the outline, the XZ axes, and the major grid lines.</p> <p><b>All</b> – Displays the outline, the XZ axes, major grid lines, and subdivisions. This is the default.</p> <p>To restore the options back to their original settings, click Reset.</p>

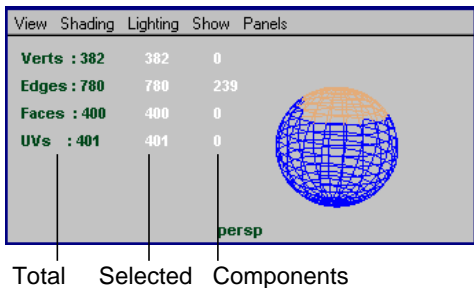
Displaying axes, polygon count, and frame rate

To change the color of the grid, select Window > Settings/Preferences > Colors. For more information, see “Where Maya stores preferences” on page 462.

## DISPLAYING AXES, POLYGON COUNT, AND FRAME RATE

Maya includes useful tools under the Display > Heads Up Display submenu.

- View Axis** Displays the global axis at the origin (0, 0, 0) within the perspective view.
- Origin Axis** Displays the global axis in the bottom left corner of all views. This is the default.
- Display Poly Count** Shows polygon statistics for the visible objects displayed in the view panel. This feature is useful for games development.



- Frame Rate** Displays the frame rate in Hertz for the current port.

## SPECIFYING HOW OBJECTS DISPLAY

The Shading menu provides a number of ways to look at your scene. The quality can range from a simple wireframe display to a smooth- shaded view.

- Wireframe** Draws edges for polygon meshes and isoparametric curves for surfaces. This is the default shading quality.
- Smooth Shade All** Displays all surfaces, meshes, and particles as smooth-shaded objects.
- Smooth Shade Selected Items** Displays selected items as smooth-shaded objects.

**Flat Shade All** Displays all surfaces and meshes as flat-shaded objects.

**Flat Shade Selected Items**

Displays selected items as flat-shaded objects.

**Bounding Box** Shows objects as boxes that represent their bounding volumes. Bounding boxes speed up Maya operations and can make a significant difference for complex models.

The bounding box encompasses the hulls as well as the actual geometry. As a result, the bounding box may have dimensions larger than those of the geometry.

---

*Note*

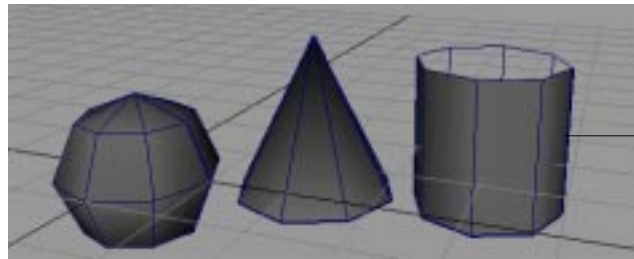
To see bounding box coordinates, open the Attribute Editor, click on the shape node tab, and open the Object Display section. It shows the read-only minimum and maximum world space boundary coordinates of a surface along the X, Y, and Z axes.

---

**Points** Shows objects as groupings of individual points.

**Shade Options** There are two display options for shaded objects.

**Wireframe on Shaded** – Superimposes a wireframe display on all shaded objects in a view.



Wireframe isoparms appear over the shaded objects

**X-Ray** – Displays all shaded objects as semi-transparent. This can be useful for seeing hidden parts of a model.

**Interactive Shading** Controls the display of objects during interactive modes (such as transformations, camera navigation, and playbacks). At the same time the normal display can be in some sort of shaded mode. For example, the normal display can be smooth-shaded while the interactive display is bounding box. There are four interactive shading options:

**Normal** – Keeps the interactive mode the same as regular display mode.

**Wireframe** – Displays objects in wireframe mode during the interactive mode.

**Bounding Box** – Displays objects as bounding boxes during the interactive mode.

**Points** – Displays objects as points during the interactive mode.

**Color Index Mode** On IRIX only, lets you manipulate a wireframe object in a complex scene more quickly (for example, if you are using a full-color image plane while working in wireframe mode).

#### Dense Wireframe Acceleration

On NT only, lets you manipulate a wireframe object in a complex scene more quickly. For example, suppose you have created a saloon scene with many objects. When you use the Move tool to move a bottle in the scene, it moves slowly as you drag the mouse. You can improve the interactive manipulation of the bottle with this menu option.

---

#### *Tip*

When you use the Dense Wireframe Acceleration option, be aware of the following:

- Results vary with the graphics card installed in your workstation.
  - Manipulation of wireframe objects in simple scenes is slower.
  - Camera tumbling is unaffected.
- 

**Back Face Culling** For objects displayed in smooth shade or flat shade mode, makes the object's back face transparent which helps speed the display or manipulation of objects.

- Hardware Texturing** Displays a hardware rendition of the texture applied to a material shading an object.
- Apply Current to All** Applies the current 3D view's shading style to all objects in the scene.

HIDING AND SHOWING OBJECTS

Use Display > Hide to hide items you aren't using and reduce visual clutter by hiding objects you are not working on. This is handy if you want to remove an object from the view, but do not want to delete it or move it.

To redisplay items, use the Display > Show submenu, which includes the same selections as Display > Hide. The Hide menu items are:

- Hide Selection** Hides selected object(s).
- Hide Unselected Objects**  
Hides all unselected objects.
- Hide Unselected CVs**  
To control the display of CVs, select the CVs that you want to remain visible, and then use Display > Hide > Hide Unselected CVs to hide all the other CVs on that surface. This will affect the display of CVs in component selection mode, as well as CVs displayed in object selection mode by the use of Display > NURBS Components > CVs.

Tip

It is possible to use selective CV display on more than one surface at a time.

The selective CV display function operates exclusively from other Maya Hide and Show commands, and therefore menu selections such as Display > Show > All and others do not effect CVs whose display has been set using selective CV display.

- All** Hides all objects, whether they are selected or not.
- Hide Geometry** Displays a menu that lets you select the type of geometry you want to hide.
- Hide Kinematics** Displays a menu that lets you select the type of kinematics you want to hide.

## Hiding and showing objects

Hide Deformers	Displays a menu that lets you select the type of deformers you want to hide.
Hide Cloth	Available only if you have Maya Unlimited and are using Maya Cloth. Hides cloth objects. For details, see <i>Using Maya: Cloth</i> .
Lights	Hides lights.
Cameras	Hides cameras.
Texture Placements	Hides texture placements.
Planes	Hides planes.
Markers	Hides markers.
Light Manipulators	Hides light manipulators.
Camera Manipulators	Hides camera manipulators.

## Hiding geometry

Geometry represents the properties and relations of points, lines, surfaces, and objects. You can hide a variety of geometry components.

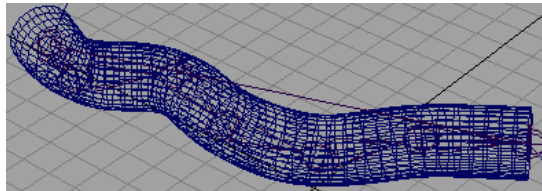
### To hide geometry:

- 1 Select an object.
- 2 Select **Display > Hide > Hide Geometry** and select the geometry components you want to hide. You can hide, NURBS Surfaces, NURBS Curves, Polygon Surfaces, Deforming Geometry, and Subdiv Surfaces. If you select **All**, all geometry is hidden, whether it is selected or not.

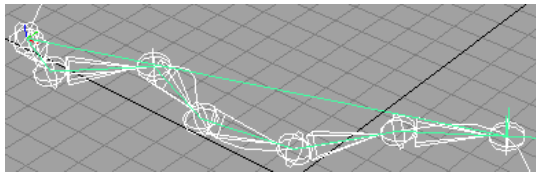
Maya displays the object with the specified component hidden.

In the following illustration, the NURBS surfaces associated with a sample object are hidden.

Before



After



## Hiding kinematics

Kinematics is the study of motion without consideration to the cause of that motion. You can hide and show kinematic components.

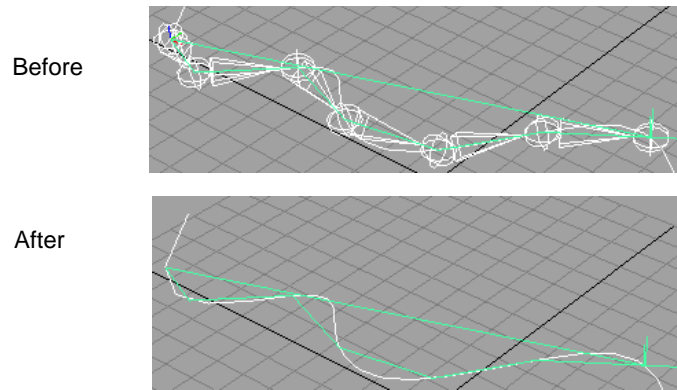
For information on kinematics, see *Using Maya: Character Setup*.

**To hide a kinematic component:**

- 1 Select an object.
- 2 Select Display > Hide > Hide Kinematics and select the components you want to hide. You can hide Joints, and IK handles. If you select All, all kinematic components are hidden, whether they are selected or not.

Maya displays the object with the specified component hidden.

In the following illustration, an object's joints are hidden.



## Hiding deformers

Deformers are operations you apply to one or more geometry objects to change their shape. You use the Hide and Show Deformers menus to control the display of the “influence objects” for some deformation types. This helps reduce clutter when you're not actively editing those parts of your scene.

For information on deformers, see *Using Maya: Character Setup*.

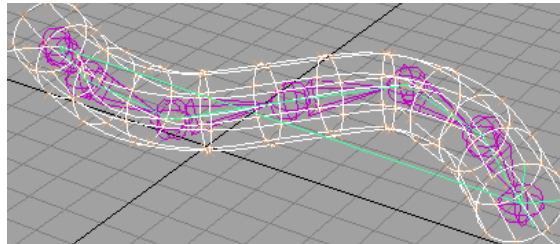
### To hide a deformer:

- 1 Select an object.
- 2 Select Display > Hide > Hide Deformers and select the components you want to hide. You can hide Lattices, Sculpt Objects, Clusters, Nonlinears, Wrap Influences, and Smooth Skin Influences. If you select All, all deformers are hidden, whether they are selected or not.

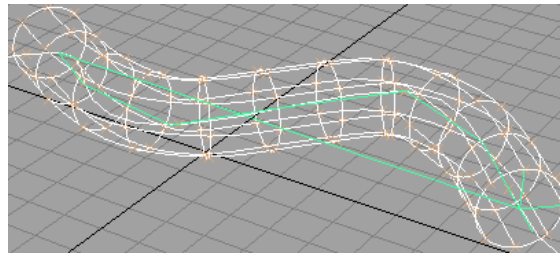
Maya displays the object with the specified deformer hidden.

In the following illustration, the object's clusters are hidden.

Before



After



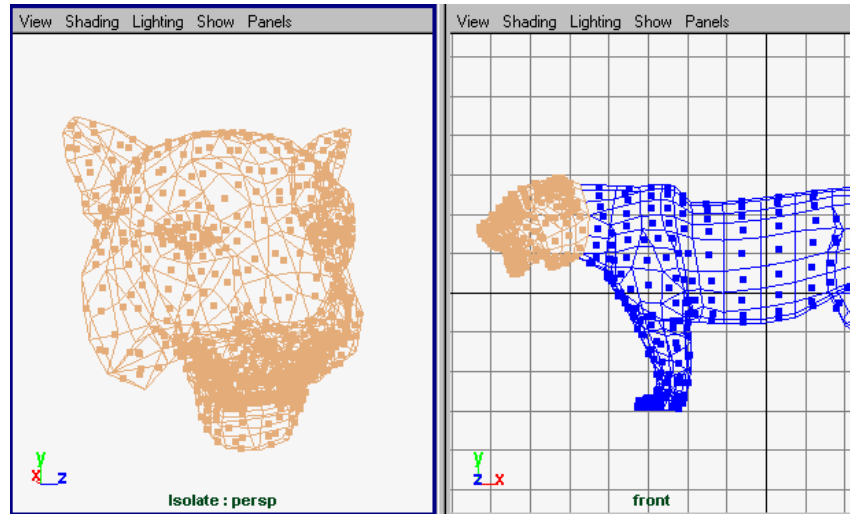
## ISOLATING SELECTED OBJECTS OR COMPONENTS

Use the Isolate Select feature (Show > Isolate Select > View Selected) to quickly isolate objects or components in a view panel. You simply select the items, choose Show > Isolate Select > View Selected, and all other objects and components in your scene become hidden.

Unlike the Display > Hide commands, which hide mostly objects, the Isolate Select feature can also isolate components. For example, by selecting polygonal faces, you could isolate the head of a model. Another difference is Isolate Select affects screen display only, while Display > Hide commands also affect rendering.

## DISPLAYING OBJECTS | 5

Isolating selected objects or components



Isolate Select works on a per-panel basis for any view panel (perspective or orthographic). The components you can select for isolation are:

- CVs of NURBS surfaces
- faces of a polygon mesh
- faces of a subdivision surface mesh

Other components cannot be selected for isolation, such as NURBS patches, curve segments, particles, or lattice points. However, you can still see and manipulate other component types within the items you have isolated.

Use the Show > Isolate Select menu to control the isolate select feature. The menu options are described below.

---

### Tip

Keep open at least one other workspace panel with isolate select turned off so you can select other items. Also, tearing off the Isolate Select submenu gives you quick access to these commands.

---

#### View Selected

Activates or deactivates the isolate select feature. When activated, the word “Isolate” appears at the bottom of the panel and the current selection becomes isolated.

#### Auto Load Selected Objects

Turn on to automatically update the isolate select panel when you change your selection. If turned off, you must use the Load, Add, or Remove Selected Objects options to update the panel.

#### Load Selected Objects

#### Add Selected Objects

#### Remove Selected Objects

If you don't have auto load on, you can use these options to control the isolate select display. Select items from the isolate panel or another panel and then load, add, or remove them as needed. Note that Load Selected Objects replaces the display with the current selection, while Add Selected Objects adds the current selection to the selections already displaying.

#### Bookmarks

Enables you to bookmark an isolated selection. To create a bookmark, choose Show > Bookmarks > Bookmark Current Objects. Choose the option box if you want to name the bookmark; otherwise, a default name is used.

To view bookmarked items, choose Show > Bookmarks > *BookmarkName*. Choose it again to turn it off and return to the previous view. You can view multiple bookmarks at the same time.

Bookmarks are saved with the scene as a set. You can manage them using the Relationship Editor. For more information on sets, see Chapter 11, "Sets and Partitions."

## DISPLAYING OBJECT COMPONENTS

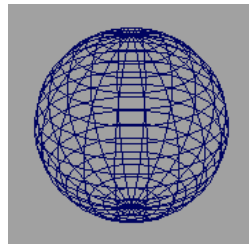
To help control screen clutter and display performance, you can toggle the display of specific object components, on an object-by-object basis.

#### To display an object's components:

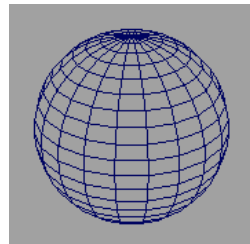
- 1 Select an object.
- 2 Select Display > Object Components and select one of the following options:

#### Backfaces

If you selected a polygonal object, toggles the display of the object's backfaces.



Backfaces



No backfaces

Lattice Points	If you selected a lattice deformer (an L icon represents a lattice deformer handle), toggles the display of the lattice points. For information on lattices, see <i>Using Maya: Character Setup</i> .
Lattice Shape	If you selected a lattice deformer, toggles the display of the object's lattice shape. The lattice deformer toggles between displaying its lattices and the L icon. For information on lattices, see <i>Using Maya: Character Setup</i> .
Local Rotation Axes	Toggles the display of the object's local rotation axes. For information on axes, see "Using axes and pivot points" on page 73.
Rotate Pivots	Toggles the display of the object's rotate pivots. For information on pivot points, see "Using axes and pivot points" on page 73.
Scale Pivots	Toggles the display of the object's scale pivots. For information on pivot points, see "Using axes and pivot points" on page 73.
Selection Handles	Toggles the display of selection handles on manipulators. For information on manipulator selection handles, see "About manipulator handles" on page 73.

## DISPLAYING NURBS COMPONENTS

Non-Uniform Rational B-Splines (NURBS) are a special type of B-spline that can have weighted control points. You can use these control points to create smooth curves that Maya can read from many CAD/CAM systems. Use the NURBS Components options to display the NURBS component for a selected object.

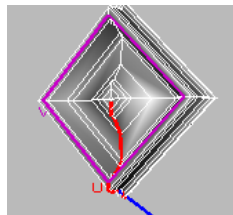
For more information on modeling with NURBS components, see *Using Maya: NURBS Modeling*.

**To display a NURBS object's components:**

- 1 Select an object.
- 2 Select Display > NURBS Components and select one of the following options: CVs, Edit Points, Hulls, Normals (Shaded Mode), Patch Centers, Surface Origins, or Custom.

**Surface origin display**

Displaying Surface Origins is helpful for alignment and placement of the surface. The command highlights the first U and V isoparms and labels them U and V. It also draws a line indicating the surface normal direction. The colors used for Surface Origins are defined in Window > Settings/Preferences > Colors > Components.



**Setting custom NURBS component options**

Select Display > NURBS Components > Custom ☐. The Display Control Options window opens.

You can specify the scope of which NURBS objects display their components using the Scope pull-down menu. The scope can be active objects, all objects, new curves, or new surfaces.

## Displaying NURBS smoothness

You can select the object's smoothness: Hull, Rough, Medium, or Fine.

**To specify a smoothness:**

- 1 Select an object.
- 2 Select Display > NURBS Smoothness and select one of the following options:  
**Hull** Shows hulls only.

## DISPLAYING OBJECTS | 5

### Displaying NURBS components

#### Rough, Medium, Fine

Displays objects at preset levels of quality. Selecting Medium or Fine slows the display and interactivity, but improves image precision.

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#### *Tip*

The hotkeys for these settings are: 1 (Rough), 2 (Medium), and 3 (Fine).

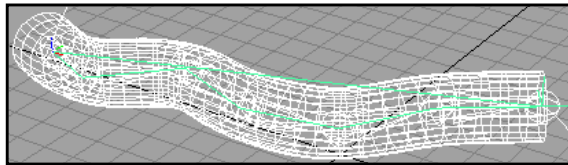
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#### Custom

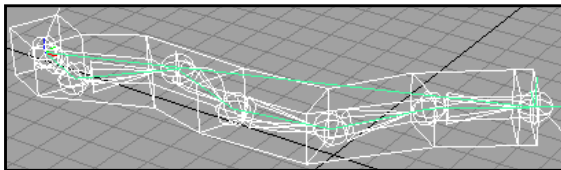
Lets you customize the display quality.

In the following figure, an object's smoothness is changed from a default medium level of quality to a custom hull quality level.

Before



After



### Setting custom NURBS smoothness options

Select Display > NURBS Components > Custom ☐. The Smoothness Options window opens.

#### Geometry

To display all geometry, select Full. To display hulls only, select Hull.

#### Surface Div per Span U

#### Surface Div per Span V

Together, these settings subdivide the NURBS patches for display purposes to give it the appearance of a finer mesh. The range is from 0 to 32.

#### Curve Div per Span

Specifies the number of curve divisions per span to give the curves a rougher or smoother appearance. The range is from 1 to 128.

**Display Render Tessellation Geometry**

Turn on to see the pattern of tessellation that the renderer will use for the surface. You must be in shade mode to see this pattern.

**Shaded Surface Div per Span**

Specifies the number of surface divisions per span in shaded mode. The range is from 0 to 32.

**Hull Simplification U****Hull Simplification V**

If you have the Geometry set to Hull, you can use these settings to control the number of hull divisions displayed.

## DISPLAYING POLYGON COMPONENTS

Polygons are shapes that consist of a sequence of line segments. You can use polygons to construct and control objects.

Polygons are based on a standard B-Rep (Boundary Representation) structure, unlike curves and surfaces which are NURBS-based.

For more information on modeling with polygon components, see *Using Maya: Polygonal Modeling*.

### To display an object's components:

- 1 Select an object.
- 2 Select Display > Polygon Components and select one of the following options: Vertices, Border Edges, Soft/All Edges, Face Centers, UVs, Normals, Long Normals, Medium Normals, Short Normals.

## Setting custom polygon options

You can customize the following polygon display options by selecting Display > Custom Polygon Display ☐. For more information, see *Using Maya: Polygonal Modeling*.

**Vertices**

Displays vertices.

**Display** – Displays vertices.

**Normals** – Displays vertex normals.

	<p><b>Backculling</b> – Backculling is used to select and only draw what is in front in the 3D view. In effect, Maya displays vertices in areas where the normal is pointing away from the camera.</p>
Edges	<p>Displays edges.</p> <p><b>Standard</b> – Displays all edges the same.</p> <p><b>Soft/Hard</b> – Displays soft edges as dotted lines, and hard edges as solid lines.</p> <p><b>Only Hard</b> – Shows hard edges only (makes soft invisible).</p>
Highlight	<p>Changes borders.</p> <p><b>Border Edges</b> – Makes outside edges thicker. This makes them more visible for certain operations.</p> <p><b>Texture Border</b> – Displays a thick border to highlight the area a texture affects per polygon or per vertex.</p>
Border Width	<p>Enter a value or use the slider to set the polygon border width. The range is from 1 to 10.</p>
Face	<p>Displays object faces.</p> <p><b>Centers</b> – Places a small square to indicate the facet center.</p> <p><b>Normals</b> – Shows the normals at the center of each polygon.</p> <p><b>Triangles</b> – Shows all polygons as triangles for display.</p>
Show Item Numbers	<p>Displays how many vertices, edges, faces, or UVs an object has. Numbers display on the object depending on which component type you select.</p>
Normals Size	<p>Enter a value or use the slider to specify the normals display size. The range is from 1 to 10.</p>
Texture Coordinates	<p>Displays the UVs on your object.</p> <p><b>UV</b> – Displays UVs.</p> <p><b>UV Topology</b> – Displays unshared UVs and enables you to select them.</p> <p>For details, see the “Displaying texture coordinates (UVs) and UV topology” section in <i>Using Maya: Polygonal Modeling</i>.</p>
Color	<p>Toggle on Color in Shaded Display to prepare for an Apply Color operation. Select a Color Material Channel from the pull-down menu to refine your application. For details, see the “Coloring Polygons” chapter in <i>Using Maya: Polygonal Modeling</i>.</p>

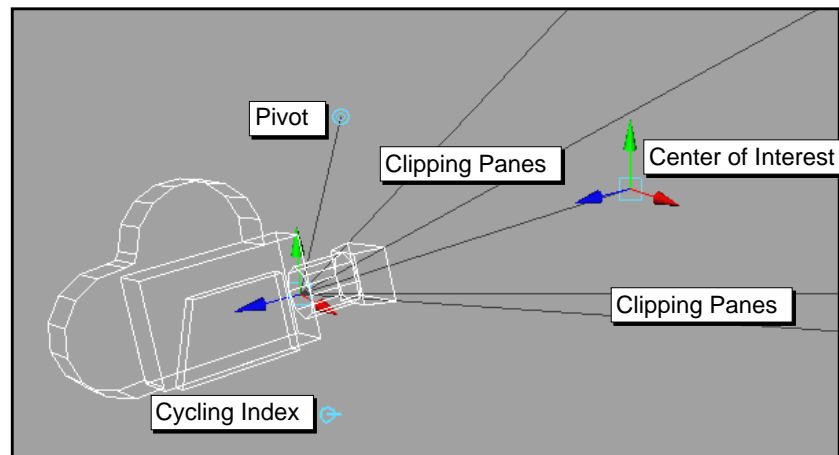
- Backface Culling** Backface culling is used to select and only draw what is in front in the 3D view. Click to select an option from the pull-down menu.
- Off** – Toggles backface culling off. This is the default.
  - On** – Displays backface culling, causing surfaces to appear invisible in areas where the normal points away from the camera. You can improve performance on some systems by toggling on Backface Culling.
  - Keep Wire** – Sets backface culling for all surfaces except wireframe outlines.
  - Keep Hard Edges** – Sets backface culling for soft edges only.

## DISPLAYING CAMERA AND LIGHT MANIPULATORS

If a camera or light is selected, you can toggle its manipulators on or off. For more information on manipulators, see “Using manipulators” on page 72.

### Displaying camera manipulator controls

Use the options on the Display > Camera/Light Manipulator menu to display manipulator components for the selected camera.



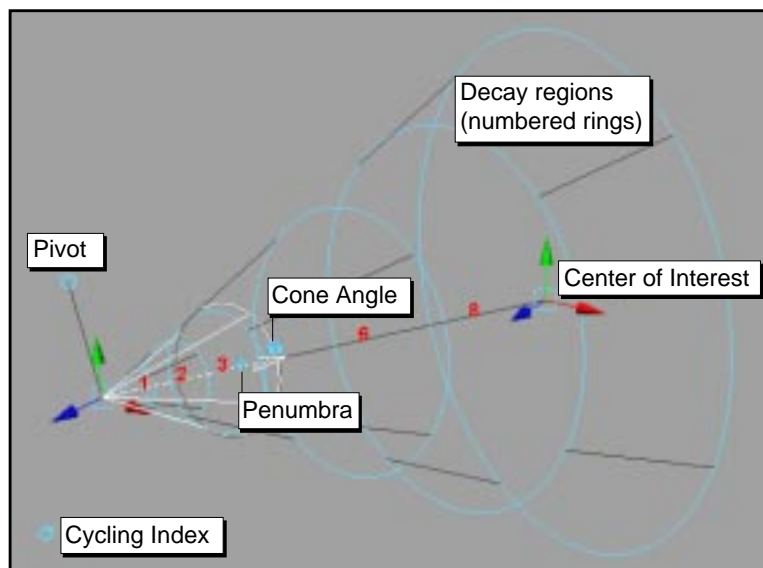
- Center of Interest** Toggles the display of the camera's center of interest manipulator.
- Pivot** Toggles the display of the camera's pivot.
- Clipping Planes** Toggles the display of the camera's clipping planes.

Displaying camera and light manipulators

**Cycling Index** Toggles the display of the camera's cycling index. By clicking on this control, you can cycle through the available manipulator controls for the selected camera one at a time.

## Displaying light manipulator controls

Use the options on the Display > Camera/Light Manipulator menu to display manipulator components for the selected light.



**Center of Interest** Toggles the display of a light's center of interest manipulator.

**Pivot** Toggles the display of a light's pivot.

**Cone Angle** Toggles the display of a light's cone angle.

**Penumbra** Toggles the display of a light's Penumbra.

**Look through Barn Doors**

Barn doors are doors or shutters fitted on the spotlight, which let you create a square spot effect. Shows the view through the spotlight's barn doors.

**Decay Regions** Toggles the display of a light's decay regions.

Cycling Index	Toggles the display of the light's cycling index. By clicking on this control, you can cycle through the available manipulator controls for the selected light one at a time.
---------------	---

## WORKING WITH TEMPLATES

Templates are objects that you can see but cannot select. If you make an object into a template, you cannot accidentally select it or modify it. You could make a background object into a template and use it as a modeling reference (the way a grid is used)..

To make an object into a template:

- 1 Select the object.
- 2 Select Display > Object Display > Template. The object appears as a lighter colored wireframe to indicate it is a template. Any shading is turned off.

To return a template to its standard display:

- 1 Select the object in the Outliner.
- 2 On the main Maya menu bar, select Display > Object Display > Untemplate.

## USING DISPLAY LAYERS

A display layer is a collection of objects that you can quickly select, hide, or template separate from other, distracting objects in the scene. For example, you can:

- add a group of trees to a *display layer* and hide them so they don't distract you from viewing another part of the scene.
- create a *template layer* for the house of some creatures you're modeling so the house is visible as a size reference, but is not selectable.

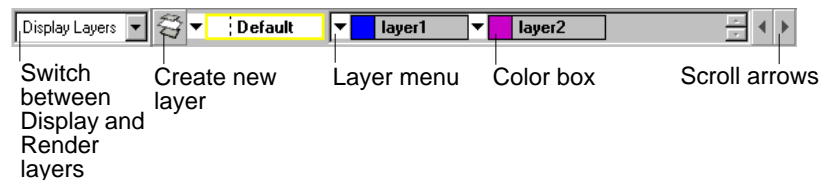
Maya also includes render layers, which work similar to display layers but apply specifically to rendering. For more information, see "Using render layers" on page 147.

### Types of display layers

- **default** – Each scene has a default layer that consists of all objects that have not been assigned to any other layer. When you remove an object from a layer, it becomes a member of the default layer.
- **standard** - When you create a new layer, it is standard, meaning objects display normally.
- **template** – Objects in a template layer are visible, but you cannot select them, nor can you snap to them.
- **reference** – Objects in a reference layer are visible and can be snapped to, but you cannot select them or modify them.

### Display layer tools

Typically, you use the Layer Bar to manage layers. If the Layer Bar is not displayed, select Display > UI Elements > Layer Bar.



As an alternative, you can choose to perform all layer management using the Layers window. For simplicity, we give instructions using the Layer Bar. If you prefer the Layers window, see “Using the Layer Editor” on page 145 for details.

Whether you use the Layer Bar or Layers window, you must also use the Relationship Editor if you need to remove objects from a layer. See “Removing objects from display layers” on page 142.

## Creating and naming display layers

Follow these instructions to create and optionally name a layer.

**To create a new layer:**

- 1 On the Layer Bar, click the New Layer button. An icon for the new layer is added to the Layer bar, with a default name, for example, *layer1*.

New Layer button —



- 2 Assign objects to the layer; see the next topic “Assigning objects to display layers.”

---

### Note

You can turn on or off the Make New Layers Current when you right-click on the Create Layer button. When this setting is on, you can add a new layer and Maya changes it to be the current layer. When this setting is off, the default layer remains the current layer, unless you choose a different current layer in the layer attributes.

---

**To name a layer:**

- 1 In the Layer Bar, double-click the layer you want to name.  
The Rename Layer window appears.
- 2 Type a new layer name and click OK.

## Assigning objects to display layers

You can add selected objects to a layer, and you can move an object from one layer to another. An object can belong to only one layer at a time.

**To assign selected objects to a layer:**

- 1 Select the objects you want to assign to a layer.
- 2 In the Layer Bar, click the ▼ Layer menu button to the left of the target layer.
- 3 Select Assign Selected.

---

*Note*

If the selected object already belongs to a layer, the object is transferred from its layer to the newly assigned layer.

---

### Assigning objects at creation time

If you want objects you create to be automatically assigned to the current layer, turn on the Use Current Layer option. (The current layer is the one shown highlighted in the Layer Bar or Layers window.) Right click the Create Layer button on the Layer Bar and choose Use Current Layer from the pulldown menu.

## Removing objects from display layers

When you remove an object from a layer, it automatically becomes part of the default layer. You cannot remove objects from the default layer.

These instructions involve using the Relationship Editor. For more information, see “Using the Relationship Editor” on page 255.

### To remove an object from a layer:

- 1 In the workspace or Outliner, select the object you want to remove.
- 2 In the Layer Bar, click the ▼ Layer menu button to the left of the layer you want to remove the object from, then select Edit Membership.

The Relationship Editor opens.

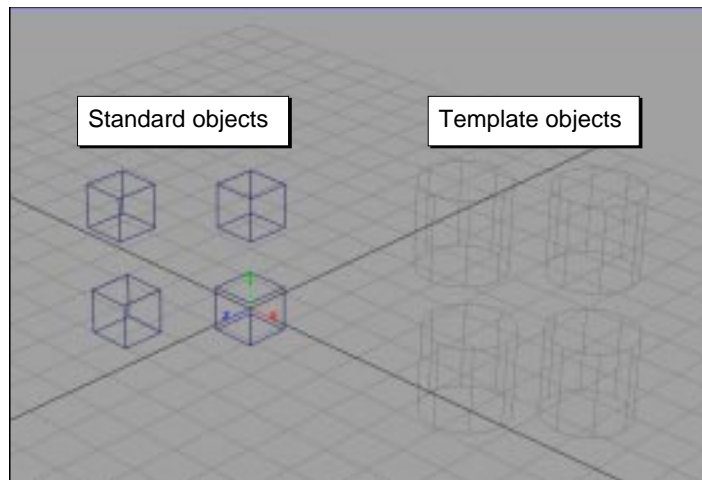
- 3 In the Layers panel, click the layer containing the object.
- 4 Select Edit > Remove Selected Items.

## Display Layer commands

Click the ▼ Layer menu button to choose from the layer commands. As a visual aid, the layer swatch is marked X if Visible is off, T if Template is on, or R if Reference is on.



Visible	Use this command to quickly hide objects in a layer so that you can concentrate on other objects in the scene.
Standard	This is the default state that allows you to select and snap to objects.
Template	Objects in a template layer are visible in the workspace, but you cannot modify, pick or snap to them. Objects in a template layer appear in a different color. For details, see “Working with templates” on page 139.



Reference	Like template layers, objects in a reference layer are visible in the workspace, but you cannot modify them. You can, however, snap to all objects in the reference layer by snapping to curve. For information, see “Snapping to a curve on surface or isoparm curve” on page 154. Vertices and edit points do not display on reference layers.
Assign Selected	Adds objects to the current layer.
Select All in Layer	Use this command as a quick selection method and to see what objects are contained in the layer.

Using display layers

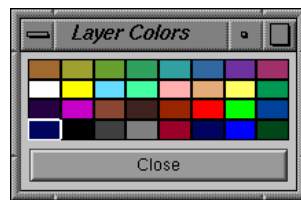
Layer Attributes	Use this selection to edit the layer attributes in the Attribute Editor . See “Modifying display layer attributes” on page 146.
Edit Membership	Opens the Relationship Editor for removing or adding objects to layers.
Delete	Deletes the layer, but not the objects in the layer.

### Changing the color of the display layer:

To help you identify the objects belonging a layer, you can assign a color to the layer. Each object in the layer will display the assigned layer color in wireframe display. You cannot change the color of objects in the default layer.

**To assign a layer color:**

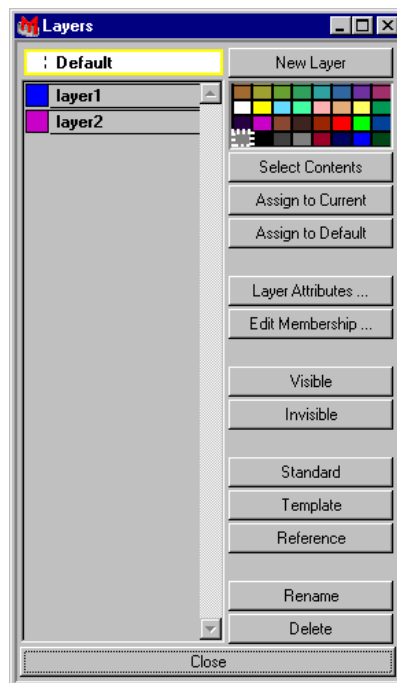
- 1 In the Layer Bar, double-click on the layer color box. The Layer Colors window opens.



- 2 Click on the color you want to make all objects in the layer.

## Using the Layer Editor

As an alternative to the Layer Bar, you can choose to perform all layer management using the Layers window. To open it, select Window > General Editors > Layer Editor.



<b>New Layer</b>	Creates a new layer with a default name, for example <i>layer1</i> .
<b>Color palette</b>	Assigns a color to all objects in the currently selected layer.
<b>Select Contents</b>	Selects all objects in the layer. Use this command as a quick selection method and to see what objects are contained in the layer.
<b>Assign to Current</b>	Adds selected objects to the currently selected layer.
<b>Assign to Default</b>	Removes all objects in the currently selected layer to the default layer. The current layer becomes empty so you can assign other objects.
<b>Layer Attributes</b>	Opens the Attribute Editor for the layer. There are some attributes in the Attribute Editor not available through the Layers editor or Layer Bar.

## Using display layers

Edit Membership	Click to remove objects from the layer. The Relationship Editor opens, where you can select the objects you want removed and choose Edit > Remove Selected Items.
Visible, Invisible	Turns the visibility of objects in the layer on or off.
Standard, Template, Reference	Standard allows normal selection of objects. Template and Reference restrict selection while keeping objects visible. See “Display Layer commands” on page 143 for more information.
Rename	Click to open the Rename Layer window and change the layer name.
Delete	Deletes the layer, but not the objects in the layer.

## Modifying display layer attributes

	To further control in layers, open the Attribute Editor by clicking the ▼ Layer menu button and choosing Layer Attributes.
Display Layer	Type the name of the layer.
Enable Overrides	Turn this option off to disable the effects of the layer. Objects in the layer will appear and behave as though they do not belong to the layer.
Display Type	Select how the layer will display.  <b>Normal</b> – Objects in the layer display normally, according the settings for the layer. Objects in the layer can be selected and snapped.  <b>Template</b> – Objects in the layer become templates. You can see template objects in the workspace, but you cannot select them, nor can you snap them.  <b>Reference</b> – Objects in the layer can be snapped to, but you cannot select them or modify them.
Level of Detail	Select the level of display detail for layer objects:  <b>Full</b> – Displays full detail for layer objects.  <b>Bounding Box</b> – Shows objects as boxes that represent their bounding volumes. Bounding boxes speed up Maya operations and can make a significant difference for complex models.
Shading	Toggle on to make layer objects appear shaded when in shaded display.
Texturing	Toggle on to show textures on layer objects when in shaded display.

Playback	Toggle on to animate layer objects during playback. If you have several characters in a scene and want to look at each character's animation separately, you can place each character in its own layer and play back the animation of each character as desired.
Visible	Toggle on to make the objects in the layer visible.
Color	Select the color of all objects belonging to the layer.
Number	This is the number assigned to the layer.

## Merging display layers when importing files

To facilitate the merging of layers when you read in files, select Window > Settings/Preferences > Preferences, click the Display category, and in the Display Layer section select one of the following options:

None	All layers read in will be put in a new layer, and renumbered and renamed, if necessary to preserve uniqueness.
By Number	All layers read in that have the same index number as an existing layer will be merged with that layer rather than creating a new layer.
By Name	All layers read in that have the same name as an existing layer will be merged with that layer rather than creating a new layer.

## USING RENDER LAYERS

A render layer is a collection of objects that you can quickly render in separate passes, giving you more flexibility when the shot is composited.

Once you have render layers set up, you can take advantage of the Render Layer/Pass Control settings in the Render Globals. For more information on these settings, see *Using Maya: Rendering*.

Maya also includes display layers, which work similar to render layers but apply specifically to how objects display in the scene view. For more information, see “Using display layers” on page 139.

## Creating and naming render layers

Follow these instructions to create and optionally name a layer.

To create a new layer:

- 1 On the Layer Bar, click the New Layer button. An icon for the new layer is added to the Layer bar, with a default name, for example, *layer1*.

New Layer button



- 2 Assign objects to the layer; see the next topic “Assigning objects to display layers.”

To name a layer:

- 1 In the Layer Bar, double-click the layer you want to name.  
The Rename Layer window appears.
- 2 Type a new layer name and click OK.

## Assigning objects to render layers

You can add selected objects to a layer, and you can move an object from one layer to another. An object can belong to only one layer at a time.

To assign selected objects to a layer:

- 1 Select the objects you want to assign to a layer.
- 2 In the Layer Bar, click the ▼ Layer menu button to the left of the target layer.
- 3 Select Assign Selected.

---

### Note

If the selected object already belongs to a layer, the object is transferred from its layer to the newly assigned layer.

---

## Removing objects from render layers

When you remove an object from a layer, it automatically becomes part of the default layer. You cannot remove objects from the default layer.

These instructions involve using the Relationship Editor. For more information, see “Using the Relationship Editor” on page 255.

To remove an object from a layer:

- 1 In the workspace or Outliner, select the object you want to remove.
- 2 In the Layer Bar, click the ▼ Layer menu button to the left of the layer you want to remove the object from, then select Edit Membership.

The Relationship Editor opens.

- 3 In the Layers panel, click the layer containing the object.
- 4 Select Edit > Remove Selected Items.

## Render Layer commands

Click the ▼ Layer menu button to choose from the layer commands.

**Renderable** Controls whether the objects in the layer render. This command can be useful for performing test renders, but the main controls for rendering layers are in the Render Layer/Pass Control settings in the Render Globals. For more information on these settings, see *Using Maya: Rendering*.

**Assign Selected** Adds objects to the current layer.

**Select All in Render Layer**

Use this command as a quick selection method and to see what objects are contained in the layer.

**Render Layer Attributes**

This selection opens the render layer attributes in the Attribute Editor. These attributes are also found in the Render Layer/Pass Control settings in the Render Globals. See *Using Maya: Rendering*.

**Edit Membership** Opens the Relationship Editor for removing or adding objects to layers.

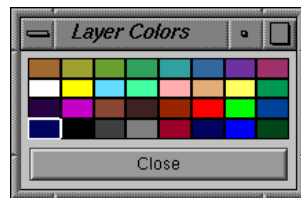
**Delete** Deletes the layer, but not the objects in the layer.

## Changing the color of the render layer:

To help you identify the objects belonging a layer, you can assign a color to the layer. Each object in the layer will display the assigned layer color in wireframe display. You cannot change the color of objects in the default layer.

To assign a layer color:

- 1 In the Layer Bar, double-click on the layer color box. The Layer Colors window opens.



- 2 Click on the color you want to make all objects in the layer.

# 6

## MODELING AIDS

Maya has many features that help you build and position objects. This section describes some of those features and tells how to use them. It includes the following information:

- “Snapping” on page 151
- “Limiting selections” on page 157
- “Freezing and resetting transformations” on page 169
- “Locking transform tools and manipulators” on page 170
- “Using construction history” on page 170
- “Making objects live” on page 171
- “Creating levels of detail” on page 173

For a comprehensive guide to modeling features, see the *Using Maya: NURBS Modeling* and *Using Maya: Polygonal Modeling*.

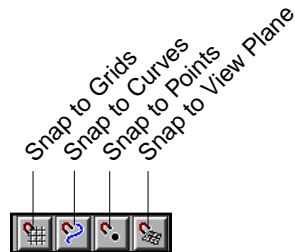
### SNAPPING

The snap options let you control an object or component’s position by attaching it to a grid, point, curve, or view plane. As you draw, rotate, resize, or drag the object, it snaps to the grid, point, curve, or view plane.

#### Snapping icons

Four icons in the Status Line control snap mode as you move or rotate objects and create curves:


## Snapping



Snap to Grids	Snaps a vertex (CV or polygonal vertex) or pivot point to a grid corner. If you select Snap to Grids before you create a curve, its vertices snap to the grid corners. For more information on CVs, see <i>Using Maya: NURBS Modeling</i> .
Snap to Curves	Snaps a vertex (CV or polygonal vertex) or pivot point to a curve or curve on surface.
Snap to Points	Snaps a vertex (CV or polygonal vertex) or pivot point to a point.
Snap to View Planes	Snaps a vertex (CV or polygonal vertex) or pivot point to a view plane.

To snap an object or object component to a grid, curve, point, or view plane:

- 1 To snap to a grid, select Display > Grid to display a grid in your workspace.  
or  
To snap to a curve, create a curve.  
or  
To snap to a point, create an object with several CVs or vertices (for example, a curve).  
or  
To snap to a view plane, select a view (perspective, top, front, or side).
- 2 Click the appropriate snap icon in the Status Line.
- 3 Select the object or object component you want to snap to the grid, curve, point, or view plane.

If you are snapping an object component (for example, a vertex, edit point, hull, or curve on surface), use the Select by Component Type icon  on the status line to select the component. For information on selecting by component, see “Limiting selection by component type” on page 159.

Note that when you select several components, each component snaps to the same point.

- 4 Select the Move tool.

When you select several components, the move manipulator is placed at the center of the selection's bounding box.

- 5 If you are snapping to a point, right-click on the object with the vertices you are snapping to and select Control Vertex or Vertex, to display the vertices.
- 6 Use the middle mouse button to click and drag anywhere on the grid, curve, points, or view plane.

The object snaps to the grid, curve, points, or view plane. You can now move the object along the grid, curve, point, or view plane.

## Snapping hotkeys

The hotkeys for snapping are:

- **x** for grid snap
- **c** for curve snap
- **v** for point snap

**To use the grid snap hotkey:**

- 1 Select the object or component you want to snap and select the Move Tool.
- 2 Press and hold down the x key while click-dragging on the grid with the middle mouse button.

**To use the curve snap hotkey:**

Select the object or component you want to snap and select the Move Tool.

Press and hold down the c key while click-dragging on the curve you want to snap to with the middle mouse button.

**To use the point snap hotkey:**

- 1 Select the object or component you want to snap and select the Move Tool.
- 2 Right-click the object with vertices (CVs or polygonal) that you want to snap to (for example, a curve), and select Control Vertex or Vertex to display the vertices.
- 3 Press and hold down the v key and click-drag the selected object with the right mouse button to the point you want to snap to.

**Snapping along a constraint axis**

You can constrain object positioning along a particular axis.

If you toggle on snapping and drag a Move Tool manipulator arrow (as opposed to dragging the pivot point), Maya uses a combination of the snap and the axis constraint.

If you are using grid snap, Maya snaps to the nearest grid line along the specified axis.

If you are using point snap and grab the end of the arrow, the manipulator has an initial jump because the center of the manipulator (not the tip) follows the mouse position.

It is useful to snap to an axis when you want to align a group of vertices to a particular Y position.

---

**Tip**

To minimize the initial jump, click closer to (but not on) the center of the manipulator. This is especially important if you are using a large arrow on the manipulator.

To change the size of the manipulator arrows, press the = and - keys.

---

**Snapping to a curve on surface or isoparm curve**

A curve on surface is a curve you have either plotted directly onto a live surface in UV parameter space, rather than a curve in world space or projected onto a surface as a result of a project or intersect function.

Curves on surfaces are often used for trimming.

You can use Snap to curves to snap to an isoparm curve or a curve on surface. This is useful if you want to snap a pivot to the edge of a surface. But if you are moving vertices on a surface (with curve snap on) you can accidentally snap to a curve on surface.

---

*Tip*

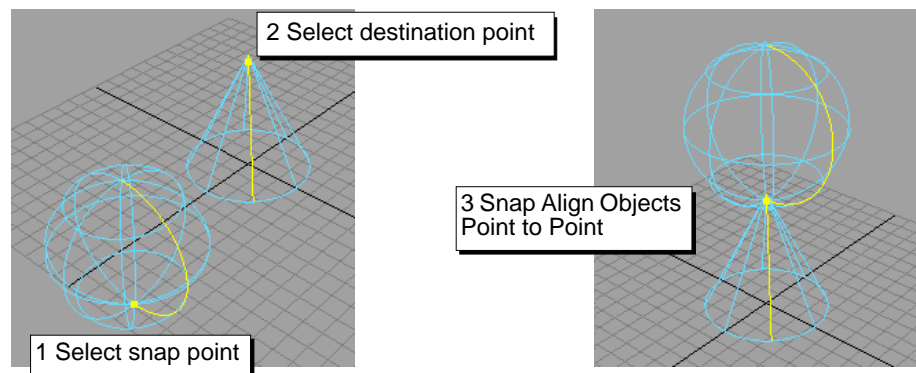
To avoid unintentional snapping, use the **c** hotkey instead of the Snap to curves icon in the Status Line. See “To use the curve snap hotkey:” on page 153.

---

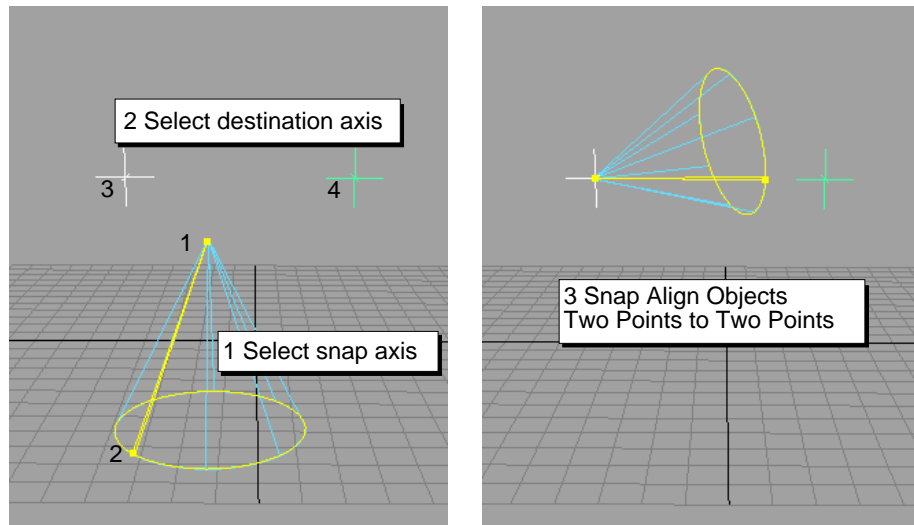
## Snapping aligning objects

Instead of using the Move and Rotate tools, you can easily move an object to a specific point by snap aligning the object.

You can snap a point directly to any other point (where a point can be a surface point, curve intersection point, vertex, locator, etc).



If you select two points on each object, the points define an axis snap, which means the object will be rotated as well as translated. This technique is useful for orienting one object with another along some arbitrary axis.



#### To snap a point to another point:

- 1 Select the point that you want to snap to another point.
- 2 Select the point you want to snap the first point to.
- 3 Select Modify > Snap Align Objects > Point to Point. The first selected point snaps to the second selected point. Note that the whole object is translated, not just the select point. For example, if you used CVs as points, the selected CV is not moved alone, but the entire surface is.

#### To snap two points to two points:

- 1 Select the first point on the snap axis.
- 2 Select the second point on the snap axis. This defines the snap axis.
- 3 Select the first point on the destination axis. The first point you selected in step number 1 will snap to this point.
- 4 Select the second point to define the destination axis. This defines the destination axis.
- 5 Select Modify > Snap Align Objects > Two Points to Two Points. The first selected point snaps to the third selected point, and the axis defined in steps 1 and 2 lines up with the axis defined in steps 3 and 4.

To snap three points to three points:

- 1 Select three points on an object.
- 2 Select three points on the destination object.

Select the points on the destination object in the order you want the snap to occur. The first point should correspond to the first point selected on other object, and so on.

- 3 Select Modify > Snap Align Objects > 3 Points to 3 Points.

## LIMITING SELECTIONS

Because Maya works on a selection-based mode, picking items is critical to modeling. If you forget what needs to be picked for a tool or an action, hold and drag the mouse button over the menu item. The Help Line displays the type of selection required for the current item.

You can limit the items you can select in the workspace to specific types of objects, components, or hierarchy elements. By limiting object selection, you can avoid unintentionally selecting a nearby object. Limiting object selection is also known as creating a *pick mask* or *selection mask*.

### Limiting selection by object type

You can limit selection to various types of objects, such as NURBS curves.

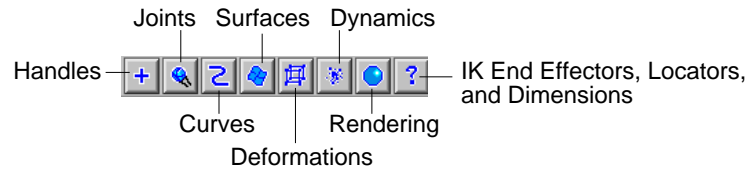
To select only a specific type of object:

- 1 Toggle on the following:



Select by object type

- 2 Click the adjacent ▼ icon to display the pull-down menu and select All Objects Off.
- 3 Toggle on one of the following icons:

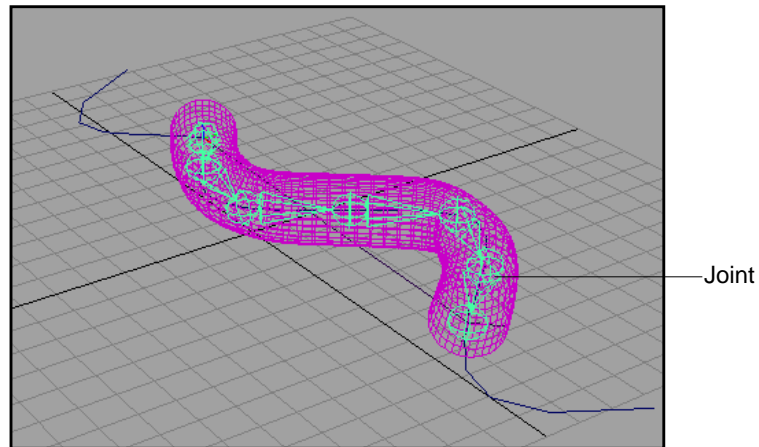


To further limit the items you can select, click the right mouse button on the icon and toggle off the appropriate check boxes.

- 4 Select the object. You can only select the type of object you have specified.
- 5 To return to the default selection mask, click the left-most ▼ icon in the Status Line and choose Initial Default.

### Example

Suppose you've created a tubular object and want to select the joint chain within the object.



- 1 Toggle on the Select by Object Type icon.
- 2 Click the adjacent ▼ icon to choose All Objects Off.
- 3 Toggle on the Joints icon.
- 4 Click the object's root joint. The root and its children become the selected objects.

- 5 To return to Maya's default selection mask, click the left-most ▼ icon in the Status Line and select Initial Default.

## Limiting selection by component type

You can limit your selection to a specific type of object component, such as polygonal vertices.

### Using the selection mask to select components

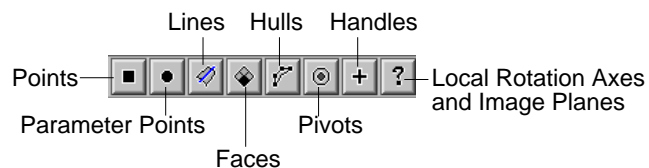
To select only a type of component:

- 1 Select the object that has the components you want to select.
- 2 Toggle on the Select by Component Type icon.



Select by Component Type

- 3 Click the adjacent ▼ icon to select All Components Off.
- 4 Toggle on one of the following icons.



To further limit the items you can select, click the right mouse button on the icon and toggle off the appropriate check boxes.

- 5 Select the component.

If you didn't previously select the object containing the component, the object's components will be displayed but not selected. Select the component again.

Maya selects only the specified type of component.

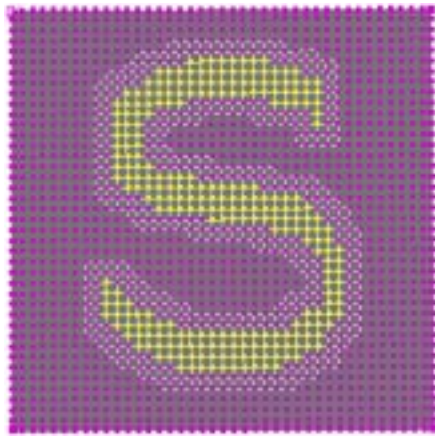
- 6 To return to Maya's default selection mask, click the left-most ▼ icon in the Status Line and choose Initial Default.

### Using the Paint Selection Tool to paint-select components

You can select, unselect, and toggle vertices (CVs and polygonal vertices) by painting over them with the Paint Selection Tool. This gives you much greater control than you have ever had over vertices and enables you to work much faster.

You can apply global selections to the entire selected surface. With the click of a button, you can select, unselect, or toggle all the vertices on a surface or along any of its edges.

The CVs in the following illustration were selected in seconds with a single brush stroke.




You can also use the Paint Selection Tool to select faces and edges on polygons.


#### To select, unselect, or toggle vertices:

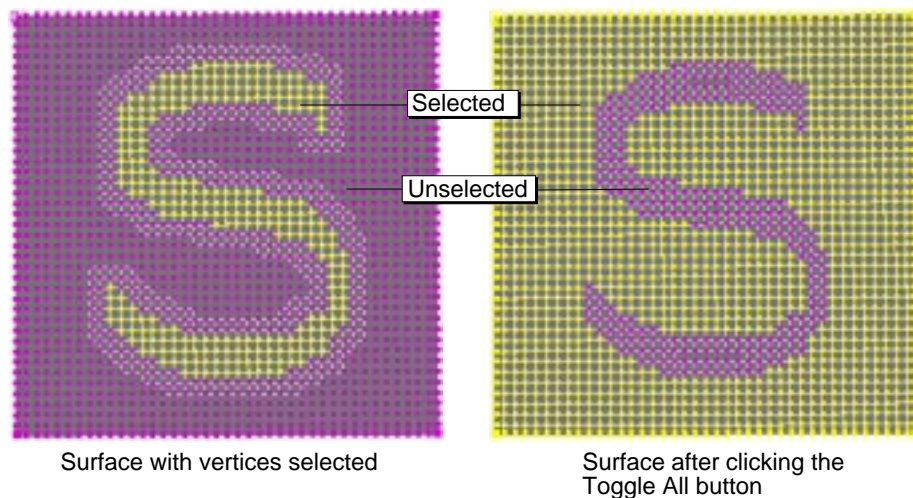
- 1 Select the surface.
- 2 Select the Paint Selection Tool (Edit > Paint Selection Tool) and define tool settings, if required. For details, see “To define Paint Selection Tool settings:” on page 162.
- 3 Click-drag the brush across the surface.

### To select CVs along an edge of a NURBS surface:


- 1 Select the NURBS surface.
- 2 Select the Paint Selection Tool and open the Tool Settings editor (Edit > Paint Selection Tool .
- 3 In the Edge Operation section, click a button to select the vertices along the left edge, top edge, or right edge of the surface. Note that the edges are relative to U/V parameterization. For information on U/V parameterization, see *Using Maya: Modeling*.



### To select, unselect, or toggle vertices globally:

- 1 Select the surface.
- 2 Select the Paint Selection Tool and open the Tool Settings editor (Edit > Paint Selection Tool .
- 3 In the Global Selection section, click a button to select, unselect, or toggle all the vertices on the selected surface.






### To select polygon faces:


- 1 Select the polygonal surface.
- 2 Toggle on the Select by component type button. 

- 3 Right-click the Faces selection mask button and toggle Faces on. 
- 4 Select the Paint Selection Tool (Edit > Paint Selection Tool) and define the tool settings (Edit > Paint Selection Tool ) , if required.
- 5 Click-drag the brush across the surface.

#### To select polygon edges:

- 1 Select the polygonal surface.
- 2 Toggle on the Select by component type button. 
- 3 Right-click the Lines selection mask button and toggle Poly Edges on. 
- 4 Select the Paint Selection Tool (Edit > Paint Selection Tool) and define the tool settings (Edit > Paint Selection Tool ) , if required.
- 5 Click-drag the brush across the surface.

#### To define Paint Selection Tool settings:

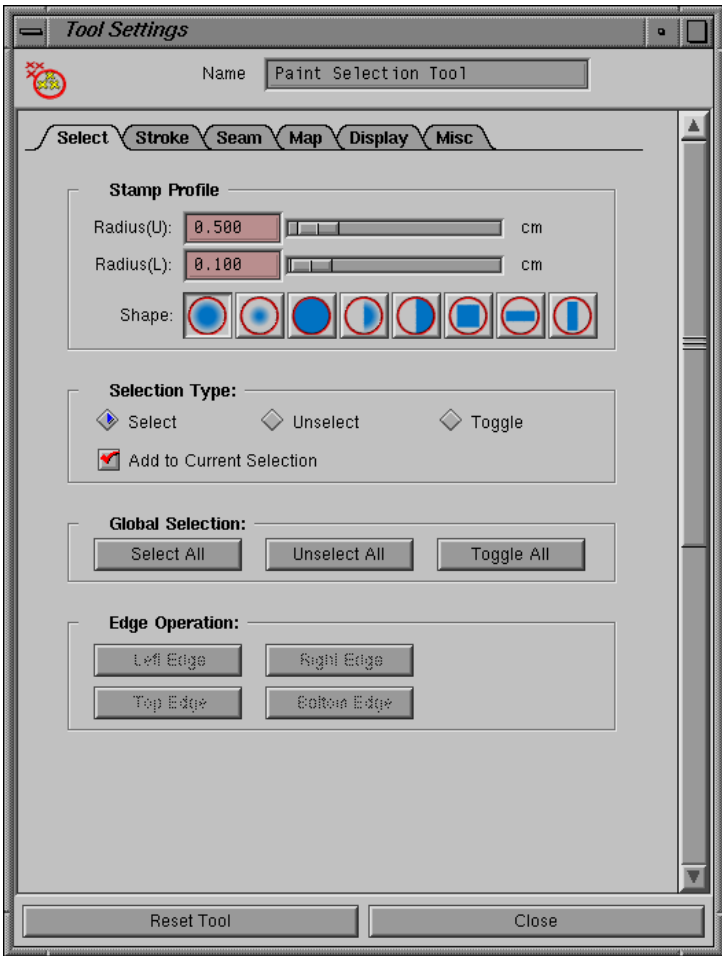
Select the Paint Selection Tool and open the Tool Settings editor (Edit > Paint Selection Tool ). Maya switches to component mode automatically.

---

#### Tip

You can define hotkey combinations to change most of the settings without opening the Tool Settings editor. For details on setting hotkey combinations, see “Defining Artisan hotkeys” on page 410.

---



### Setting the stamp profile

**Radius (U)**

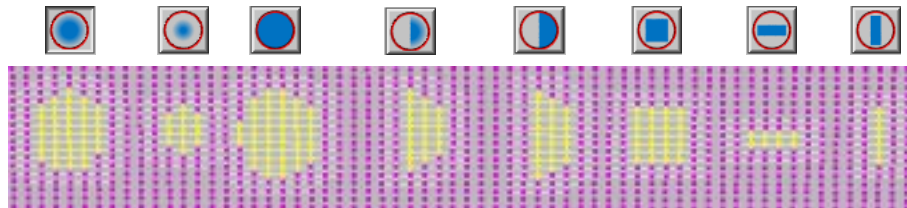
If you are using a stylus, set the upper or maximum possible radius for the brush. No matter how hard you press the stylus, the brush radius will not exceed this radius. If you are not using a stylus, this setting defines the radius for the brush.

**Radius (L)**

If you are using a stylus, set the lowest or smallest possible radius for the brush when pressure is applied to the stylus. If you are not using a stylus, this setting is not used.

### Shape

Click on the shape of the brush. This determines the shape of the area affected by the selection.



#### Note

The brush profile alignment affects how vertices are selected. For details on changing the profile alignment, see “To set the brush stamp profile alignment:” on page 402.

### Choosing the selection type

In the Selection Type section, specify what you want to do with the surface area you paint:

#### Add to Current Selection

By default, this option is toggled on so that each stroke adds to the previous selection. This means you do not have to press the Shift key when you make a brush stroke to select, unselect, or toggle more vertices. If you want each stroke to override the previous one, toggle Add to Current Selection off.

### Select

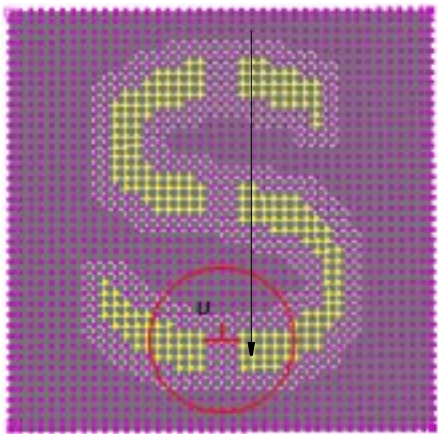
Selects vertices.

#### Tip

To unselect selected vertices while Select is chosen, press the Ctrl key and paint over them.

### Unselect

Unselects any selected vertices.

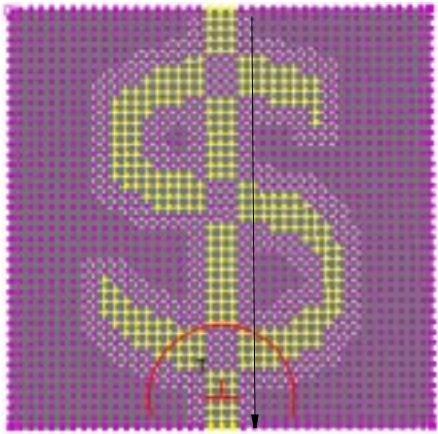


*Tip*

To select unselected vertices while Unselect is selected, press the Ctrl key and paint over them.

**Toggle**

Unselects selected vertices and selects unselected vertices.



## Limiting selection to hierarchy items

You can limit selection to the following hierarchy items:

- root – a hierarchy’s top object
- leaf – descendent object

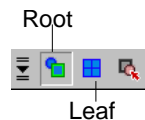
For information about hierarchies, see “Understanding scene hierarchy terminology” on page 322.

To select only a hierarchy root or leaf:

- 1 Toggle on the Select Hierarchy and Combinations icon.

Select Hierarchy and Combinations 

- 2 Toggle on the Root or Leaf icon.



or

Click the adjacent ▼ icon to select Root or Leaf.

- 3 Select the object. Notice you can select only a root or leaf object.
- 4 To return to Maya’s default selection mask, click the left-most ▼ icon and choose Initial Default.

## Limiting selection to template objects

You can limit your selections to template objects.

To select only a template object:

- 1 Toggle on the Select Hierarchy and Combinations icon.

Select Hierarchy and Combinations 

- 2 Toggle on the Template icon.



Alternatively, click the adjacent ▼ icon to select Template from a menu.

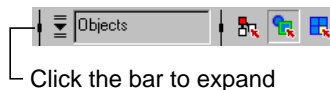
- 3 Select the object. Maya selects only a template object.
- 4 To return to Maya's default selection mask, click the left-most ▼ icon in the Status Line and choose Initial Default.

## Limiting selection by task

You can limit your selection to the objects or components that pertain to types of Maya tasks. For instance, you can limit selection to objects and components relevant to dynamics tasks.

To limit selection by Maya task:

- 1 If it isn't showing, open the Task Selection icon on the Status Line.



- 2 Click the pulldown icon and choose one of these categories:

- Animation
- Polygons
- NURBS
- Deformations
- Dynamics
- Rendering

This creates a selection mask that limits selection to the objects and components in the chosen category.

- 3 Do one of the following:
  - To select an object in the chosen category, drag a selection box around the object.
  - To select a component in the chosen category, click the component directly.

- You usually need to display components before you can click-select them. For example, to select CVs by clicking, first select Display > NURBS components > CVs to display them.
- If you display CVs on an object and the selection box surrounds any of them, you select the CVs rather than the object. Drag the selection box on the object where CVs aren't displayed.

**To use the default Maya selection limitations:**

Click the ▼ icon in the Status Line to choose Initial Default.

**To allow selection of all objects:**

Click the ▼ icon in the Status Line to choose All Objects.

---

*Tip*

You can customize the priority of object or component selection for situations where you drag a selection box around multiple objects or components.

To prioritize object selection:

- 1 Select Window > Settings/Preferences > Preferences and click the Selection category.
  - 2 Select Custom from the PreSets menu.
  - 3 Select an item in the Priority list.
  - 4 Enter a priority number for the item in the data box. Higher numbers have higher priority.
- 

## Moving selection limitations to the shelf

You can put your selection limitation choices on a shelf for future use.

**To move selection limitations to a shelf:**

- 1 Select a shelf tab.
- 2 Toggle on the object or component selection limitation icons.
- 3 Click the right mouse button on individual icons to Toggle on (or off) item check boxes.

- 4 Click the right-most ▼ icon in the Status Line to choose Save to Shelf.

An icon labeled MEL appears on the shelf. If you click this icon, the selection limitations take effect. The Status Line icons show the selection limitations.

You can change the MEL icon, as described in “Changing shelf icons” on page 502. If you want to add an icon label, see “Setting Shelf label options” on page 506.

## FREEZING AND RESETTING TRANSFORMATIONS

Before animating a model you just created, you may want to reset it's transformation, called *freezing* the transformations. Freezing sets the existing translation, rotation, or scale for selected objects to be the initial state. The result is that transform values change to zero (or one for scale), but the object itself remains in place.

You can also reset an object's transformations at any time. The reset command transforms the object back to the translation, rotation, and scale it was when created or last frozen.

You can apply these operations separately for translation, rotation, or scale.

**To freeze or reset an object:**


- 1 Select one or more objects that you have moved, rotated, or resized.
- 2 Choose Modify > Freeze (or Reset) Transformations □.
- 3 In the option window, turn on or off Translate, Rotate, or Scale, as needed.
- 4 Click OK.

## LOCKING TRANSFORM TOOLS AND MANIPULATORS

If you are going to be using a single tool on an object for a long time, you can lock the transform tools—Move, Rotate, Scale—and the Show Manipulator tools. It is also useful to lock tools when you use a stylus input device.

After you lock a tool, you can't use the left mouse button to select objects in the workspace. The left mouse button works the same way as the middle mouse button does during normal use of the Move, Rotate, Scale, or Manipulator tools. If you need to select objects after locking a tool, use the Outliner or Hypergraph.

**To lock the Move, Rotate, Scale, or Show Manipulator tool:**

- 1 Select the object.
- 2 Select the tool.
- 3 Toggle the Lock current selection icon on in the Status Line. 

To unlock the tool and return to normal mouse usage, toggle off the icon.

## USING CONSTRUCTION HISTORY

When you create an object surface using deformers or certain modeling tools, Maya keeps a *construction history* for the object. A construction history is a record of the options, geometry, and modeling actions that you used to create the object.

You can use the construction history to modify an object by making simple changes to the original elements of the history. You don't have to repeat all the steps that went into the object's creation.

Construction history adds complexity to a scene and therefore slows Maya operation. For this reason you might decide to toggle it off for some scenes.

You can toggle off the creation of construction history for all subsequent modeling activities. If you do this, you won't be able to tweak history options and geometry for object surfaces you create afterwards. Alternatively, you can delete a single object's construction history.

To toggle off construction history for all objects:

Toggle the Construction History icon off in the Status Line. 

---

*Tip*

When you attach curves or animate CVs, toggle construction history off or you may get unexpected results.

---

To delete an object's construction history:

- 1 Select the object.
- 2 Select Edit > Delete by Type > History.

---

*Tip*

If you animate CVs on an object that was created with history, do not delete the object's history. The CV animation will not be correct and unexpected results will occur.

---

## MAKING OBJECTS LIVE

When you “make an object live,” you can use its surface as a construction aid. You can make NURBS surfaces, poly meshes, and construction planes into live objects. Making a NURBS surface live is one way to create a curve on surface.


---

*Note*

Only one object can be live at a time. The live object displays in a special green color in wireframe mode to indicate its status.

---

To make an object live:

- 1 Select the object.
- 2 Select Modify > Make Live or click the Make Live icon on the Status Line. 

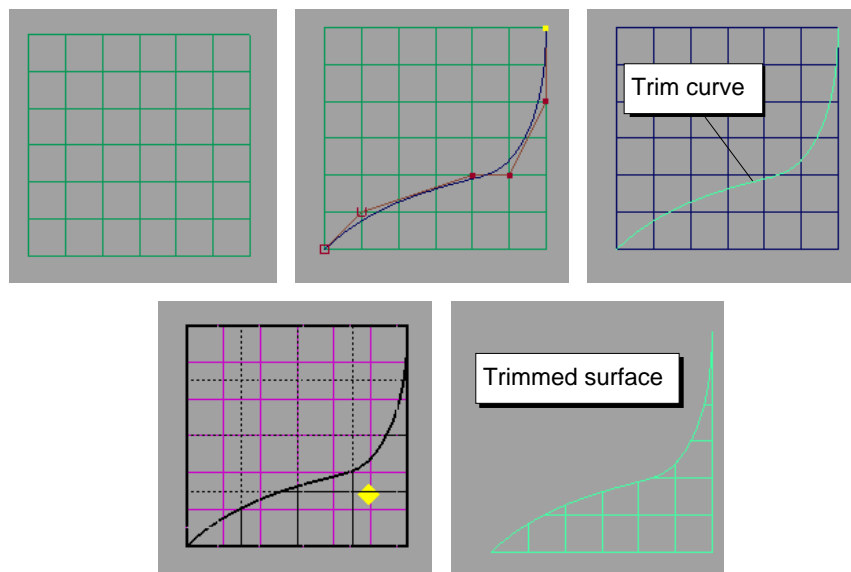
## MODELING AIDS | 6

### Making objects live

- 3 To toggle off a live object, select Make Live again.

To create a curve on surface by placing it onto a live surface:

- 1 Select the surface.
- 2 Select Modify > Make Live or click the Make Live icon on the Status Line.
- 3 Use any curve creation tool to draw the curve directly onto the surface.



All creation tools respect a live surface. Actions do not.

You can use Make Live to place particles on an object's surface or on joints and polygons.

When an object is live and the Move tool is the current tool, the active object snaps to the live object.

## CREATING LEVELS OF DETAIL

You can group geometry into a special Level of Detail group, which means that depending on how far the group is from the camera, a different child, or resolution, of the group is displayed.

An object can have any number of levels of detail, but typically 3 to 5 levels are used in the creation of a game. Level 1 is drawn when the object is closest to the camera and it typically has the most geometry. Level N is drawn when the object is far away from the camera and has the least amount of geometry. This level can be empty.

Creating levels of detail can involve one or more artists/programmers, and two tasks. The first task is to create the models for each level. The second task is to set up the order of the models (usually by complexity) and the distances at which each level is drawn.

---

### Notes

- Setting up level of detail will not work if you specify less than two levels of detail.
  - Different levels can come from different sets, layers, and can be reference objects.
  - Level of Detail only supports discrete levels of detail. For example, there is no blending between levels.
  - You can use NURBS, polygons, or subdivision surfaces to create the different levels, and each level can use a different geometry type if you want.
- 

### To create levels of detail:

- 1 Create models to represent different levels of detail, in order of geometric complexity.  
  
The models can be in different layers or sets, or they can be referenced objects.
- 2 Position the models together in a modeling view at approximately the distance that you want the middle object to appear in the level of detail.

Positioning the objects together helps you keep track of them in cases where you have multiple groups and many models in the same scene.

- 3 Look through the camera to which you want to associate the level of detail group.
- 4 Do one of the following:
  - Select the models in the order you want them to appear in the level of detail group (either lowest to highest or highest to lowest), then select Edit > Level of Detail > Group.
  - Select a camera and the models in the order you want them to appear in the level of detail group, then select Edit Level of Detail > Group. The selected camera is used in the level of detail group.

The objects are grouped under a new node, called lodGroup#, which is linked to the camera you are looking through.

- 5 Preview the levels by zooming in and out.

---

#### Note

Only one of the levels is visible at a time. The levels switch as you zoom in and out.

---

## Changing the Threshold distances

You can change the distances at which the levels are switched using the channel box.

**To change a Threshold distance:**

- 1 Select the level of detail group node in Hypergraph.  
Its level of detail attributes are displayed in the Channel Box.
- 2 Edit the Threshold value for the object whose distance you want to change, and press Enter.

## Re-ordering the levels

You can re-order the levels after you create a level of detail group.

### To re-order the levels in the Outliner:

In the Outliner, use the middle mouse button to drag the object you want to move into its new position within the group. This is the easiest way to re-order the levels.

### To re-order the levels in the Hypergraph:

- 1 In the Hypergraph, use the middle mouse button to remove the object you want to re-order from the group.  
The other objects in the group move up the group hierarchy.
- 2 Use the middle mouse button to drag the removed object onto the lodGroup node.

The object is added to the bottom of the lodGroup's hierarchy.

---

### Tip

You can also re-order a group by selecting Edit > Level of Detail > Ungroup. Re-order the objects and create a new group.

---

## Adding and editing levels

### To add a new level:

- 1 Create a new object to add to the level of detail group.
- 2 Do one of the following:
  - In the Hypergraph, use the middle mouse button drag the new object onto the lodGroup node.
  - In the Outliner, use the middle mouse button to drag the new object onto the group.

The new object is added to the bottom of the lodGroup's hierarchy.

---

*Tip*

You can also re-order a group by selecting Edit > Level of Detail > Ungroup. Re-order the objects and create a new group.

---

## Previewing more than one object at the same time

You can preview different objects at the same time to compare them.

**To view more than one object:**

- 1 In the Hypergraph, select the level of detail group node.  
The node's attributes are displayed in the Channel Box. Each Display Level has three possible settings: *uselod*, *show*, and *hide*.
- 2 Use the left mouse button to click on one of the Display Level's *uselod* text.  
A drop-down menu with the three options is displayed.
- 3 Select one of the options.  
You can show or hide any combination of objects.

---

*Tip*

Reset the Display Levels to *uselod* to return to the regular level of detail behavior.

---

## Notes about orthographic cameras and level of detail

Level of Detail displays one child of a level of detail group, depending on the group's distance to a camera. For perspective cameras, this means measuring the distance between the camera position to the center of the bounding box of the group.

For orthographic cameras, the distance is measured differently. This is because zooming, panning and dollying in an ortho view does *not* change the camera position, but instead changes the camera's *orthographic width*. So the distance is measured as:

$$\text{distance} = (\text{default camera distance}) * (\text{camera's orthographic width}) / (\text{default orthographic width})$$

Substituting Maya's default values in this equation results in the following:

$$\text{distance} = 3.333 * (\text{camera's orthographic width})$$

## MODELING AIDS | 6

Creating levels of detail

# 7

## MANAGING FILES AND PROJECTS

Maya includes many features to help you manage your files and projects. This chapter describes how to open and save files, import and export files, how to create and edit projects, and what file formats are supported by Maya.

- “Opening a scene” on page 180
- “Creating a new scene” on page 181
- “Setting Open options” on page 181
- “Importing files” on page 184
- “Supported file formats” on page 196
- “Saving files” on page 198
- “Exporting files” on page 201
- “Using plug-ins for exporting” on page 205
- “Optimizing scene size” on page 212
- “Managing projects” on page 213
- “Editing the current project” on page 218
- “Mapping missing directories” on page 218

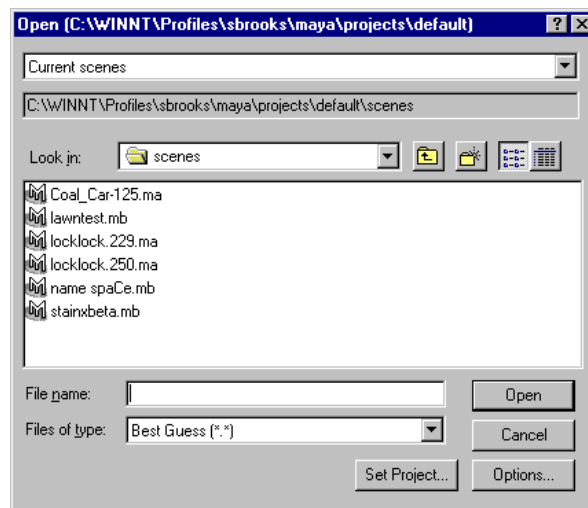
## OPENING A SCENE

When you open a scene, Maya tries to read the scene's contents through a filter based on currently supported file formats. For a list of file types you can open in Maya, see "Supported file formats" on page 196.

**To open a scene:**

- 1 Select File > Open Scene.

Maya displays a file browser. When you start up Maya, the file browser automatically goes to the scenes directory of your current project. For information on setting projects, see "Creating projects" on page 215.



- 2 To display all the file types you can open, select Best Guess from the Files of Type pull-down menu (NT only).

*or*

To display specific file types, select the file type from the Files of Type pull-down menu (NT only).

- 3 Navigate to the file you want to open and click Open or double click on the file.

---

*Note*

Maya lists the files you have opened in the current Maya session on the Recent Files sub-menu. You can open these files at any time during the session by selecting File > Recent Files > *filename*. When you close Maya, the list becomes empty.

---

## CREATING A NEW SCENE

When you create a new scene file, the current scene file is closed and the file changes to that of the newly opened file.

To create a new scene:

- 1 Select File > New Scene.


If you haven't saved the current scene, a Confirm dialog box displays.

- 2 To save the contents of the current scene file, click Yes. To discard the present scene file, click No.

## SETTING OPEN OPTIONS

The Open Scene window lets you set some general options and some options that are specific to file types.

To set Open options:

- 1 Select File > Open Scene .

*or*

- Select File > Open Scene and click the Options button in the Open window (NT).
  - Select File > Open Scene and select Options > Options in the Open window (IRIX). The options window opens.
- 2 In the Open Options window, you can set the options listed below. Click Open to open a file or click Save to save the Open options without opening a file.

## Setting Open options

**General options****File Type**

Select the file format you want to use as a default for the next time you open a file.

If you have a project set up, when you open a scene, the browser points to the directory containing files of that type. On NT, it also sets the filter to display only files of the selected type. See “Creating projects” on page 215 for information on setting up projects.

For example, if you set File Type to DXF, when you open a scene, the Open window displays the contents of *CurrentProject/DXF*. On NT, it also sets your filter type to DXF.

Depending on the File Type you select, various File Type Specific Options are displayed.

**Execute Script Nodes**

Script nodes contain Mel scripts in mayaAscii or mayaBinary files. You can designate a script node to execute its script when the node is read from a file, or before or after rendering a frame. You can create and edit the script nodes using the Expression Editor. See the chapter “Using Script Nodes” in the *Using Maya: MEL* book for information on creating and editing script nodes.

User interface configuration information is stored inside the Maya scene file as an attribute on a script node. If you disable the Execute Script Nodes option, the UI script nodes are not executed. However, we recommend disabling script node execution only if you have an error in your script.

**Load Deferred References**

Turn on Load Deferred References option to load referenced files that may have been unloaded. When you unload a reference, Maya removes the reference contents from the scene but “remembers” how the reference was connected into the scene.

If you create a scene with references, unload some of them, and then save the scene, you have created some deferred references. If you turn on the Load Deferred References option, the deferred reference are loaded when you open the scene. If you turn off Load Deferred References, the deferred references are not loaded when you open the scene.

Turn on Load Deferred References when rendering a scene in which the animators were working with only part of the scene loaded when they saved the scene.

### mayaAscii, MayaBinary, and MEL. File Type Specific Options

#### Use Verbose Names

Displays the full names of node attributes in the file.

For example, if you select the Use Verbose Names option, attribute names are listed as, *setAttr.translate 0 0 0* when you open the Maya ASCII file in a text editor. If you turn off the Use Verbose Names option, attribute names are listed as *setAttr .t 0 0 0*.

### OBJ File Type Specific Options

#### Create Multiple Objects

Specifies how shapes are created in OBJ files.

Select True to create individual shapes based on grouping information specified in the OBJ file.

Select False to create one shape for the entire file, with object sets corresponding to each of the specified groups.

You cannot have overlapping groups. If you do, Maya informs you that overlapping groups exist, and re-reads the file as if the option were set to false.

### Sound File Type Specific Options

#### Sound File Offset

Specifies the time the sound should start playing.

For example, suppose you created an animation of a bird walking a tightrope, and you wanted the sound file to play after the bird reached the end of the rope. If you knew that the bird reached the end of the tightrope at time 108, you would specify a sound file offset of 108.

### Move files

You must import move files (see “Importing move files” on page 186).

### Anim files

You must import anim files (“Importing animation curves” on page 188).

## IMPORTING FILES

Maya has built-in translators that let you import scenes and files created in other applications into Maya. See “Supported file formats” on page 196 to see the types of files you can import.

There are two ways to import a file:

- You can copy the imported file into the current scene using File > Import. See “Importing files by copying” on page 184 for details.
- You can import the file by reference using File > Create Reference. When you import by reference, Maya makes a link to the file rather than copying it. See “Importing files by reference” on page 190 for details.

### Using default nodes

Default nodes are built-in nodes that always exist in Maya. These nodes represent global elements, such as camera positions, shader colors, and current time frames.

When you import a file into an active scene, Maya uses the default nodes for the active scene.

For example, if you changed a scene’s default shader color to red, this change would be saved. However, if you imported this scene into another scene, Maya would ignore the changed shader color and use the current default shader color instead. This is to prevent default nodes from suddenly changing.

Since default nodes are always present in Maya, you don’t need to create them when you open a file. Only changes made to the defaults are saved. For more information on default nodes, see *Using Maya: Expressions*.

### Importing files by copying

Importing by copying makes it easier to transfer imported material from one scene to another. However, copying increases the file size. It also means that you must delete the imported objects and import the source scene again, if you change it.

**To import by copying:**


- 1 Select File > Import.

- 2 Navigate to the file you want to import.
  - 3 Double-click the name of the file you want to import.
- Maya copies the contents of the specified file into the current scene.

### Setting import options

Import options are values you specify, that take effect whenever you import a file into a scene. You can override the import options for a specific session.

#### To set import options:

- 1 Select File > Import . The Import Options window opens.
- 2 You can set the following options:

**Group** Specifies whether the imported objects are grouped under a single transform when you import the file. Grouping makes it easier to work on the nodes of imported objects. The default is off.

**Use Namespaces** When you import or reference a scene with the Use Namespaces option turned on, Maya creates a new namespace that contains the imported or referenced data. Turning on the Use Namespaces option ensures that all nodes are uniquely named.

A namespace is a grouping of objects under a given name. Each item in a namespace is identified by its own name along with the namespace it belongs to.

By default, the basename of the imported or referenced file is added to the beginning of the imported or referenced object names, separated by colons.

For example, if you are importing a scene named foo.ma that contains an object named ball, after it's imported the ball is named foo:ball.

You can change the prefix by selecting Resolve clashing nodes with this string and entering a prefix.

You can create, name, parent, and remove namespaces using the *namespace* command. See the online documentation for MEL Commands for information on the *namespace* command.

Namespaces do not effect selection, the DAG, the Dependency Graph, or any other aspect of Maya.

## Importing files

## Resolve Name Clashes by

When you import a scene into another scene, naming conflicts occur if the nodes share the same name and parent nodes.

To resolve these naming conflicts, you can rename only nodes with the same name and parents (clashing nodes) or you can rename all nodes. You specify whether to use the filename as the prefix (the default) or to create a prefix string.

For more information on node hierarchy, see *Using Maya: Expressions*.

---

*Tip*

We recommend you use namespaces to resolve naming conflicts instead of using the Name clash options when importing or referencing files.

---

## Type is

Choose the file type you will be importing from the pull-down menu. If you aren't sure what type of file you will be importing, you can use the Best Guess setting if you don't know what type of file will be imported.

Depending on the file type you select, various file type specific options may be displayed, see "Setting Open options" on page 181 for information on these options.

## Importing move files

When you import move files, you must list the attributes to import or export in the text list in the move file option box.


The move file format is just list of numbers. No information on how those numbers should be used is included in the move file. Instead, each row is assumed to be a frame of data, and each column represents a single channel of data.

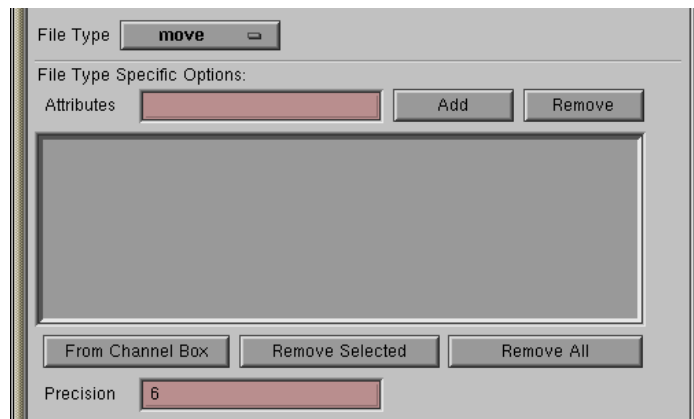
This is the same move file format used by the Wavefront PreView program, with the addition that comment characters (# or // ) at the beginning of a line are allowed.

Since time data is not stored with the file, when exporting a move file, the attribute's value is written at each frame. The units of the file are your current units in Maya. When importing a move file, the current time of the scene is used as the starting point of the import.

For both the import and export functions, all node naming clash and group options are ignored.

#### To import a move file:

- 1 Select File > Import . The Import Options window opens.
- 2 Select move from the File Type pull-down menu.



The following file type specific options apply to importing move files:

<b>Attributes</b>	Type the name of an attribute in the Attributes box and click Add to add the attribute to the list of attributes to use when importing or exporting. If the attribute is already included in the list, a duplicate is not made. To remove an attribute, type the name of the attribute and click Remove. You can add several attributes at one time by separating them with a space.
<b>From Channel Box</b>	Click From Channel Box to combine all of the selected objects in Maya, in the order of their selection, with the channels selected in the channel box and place them in the list. For example, if sphere and cone are selected, and tx, sx are selected in the channel box, sphere.tx sphere.sx cone.tx and cone.sx are added to the list of attribute to import and export.
<b>Remove Selected</b>	Click Remove Selected to remove all of the attributes selected in the list.
<b>Remove All</b>	Click Remove All to remove all of the attributes are removed from the list.
<b>Precision</b>	This is ignored in file export. For file import, this sets the precision of the file.  When you click import or export, the move file is written or read and only the attributes in the list are affected.

## Importing Adobe Illustrator® and EPS files

You can import Illustrator and encapsulated postscript (EPS) files into Maya. With this feature, you can create 3D models based on 2D graphics, such as text or logos. Maya imports them as NURBS curves, which you can then group into surfaces, convert to polygons, and so forth.

Support for Illustrator files extends from version 4 up to version 8. Any versions before 4 or after 8 are not necessarily supported.

### How curves are converted

The curves from Illustrator and EPS files are actually Bezier curve segments. During import, Maya attaches the segments into a single curve. The Curve Degree is set to 3 (cubic) and the Knot Spacing is set to Multiple End Knots.

### To import an Illustrator or EPS file:

- 1 Choose File > Import.
- 2 In the file browser, navigate to the Illustrator or EPS file.
- 3 If needed, click the Options button (NT) or choose Options > Options (IRIX) to set the following controls.
 

Scale Factor	Allows you to control the scale of the curves produced from the import. It is the same operation as using the Scale tool.
Group	Turn on this option to group the imported curves. It is the same operation as using the Edit > Group option.
- 4 Click Import.

## Importing animation curves

You can import animation curves from an anim file. To do this, you must first select the objects you want to connect to the animation curves. If nothing is selected the anim import will fail. Maya imports the animation curve into the API clipboard and pastes it into the file.

### To import animation curves from an anim file:

- 1 Select Window > Settings/Preferences > Plug-in Manager to verify that the animImportExport plug-in is loaded.


- 2 Open the file into which you want to import the animation curve.
- 3 Select the object which you want to connect to the animation curves.
- 4 Select File > Import.
- 5 Select animImport from the Read As pull-down menu (IRIX).

*or*

Select animImport from the Files of Type pull-down menu (NT).

- 6 Navigate to the file you want to import.
  - 7 Double-click the name of the file you want to import.
- Maya copies the contents of the specified file into the current scene.

#### To set anim import options:

- 1 Select File > Import . The Export Selection Options window opens.
- 2 Select animImport from the File Type pull-down menu. The Export Options window opens.

You set the following options in the Import Options window:

#### Time Range

**Start** – Imports the animation information to the selected objects so that the animation starts at the time specified in the Start Time field.

**Start/End** – Imports the animation information to the selected object or objects, scaling the animation to fit into the specified time range as entered in the Start Time and End Time fields. Animation information from the keys clipboard is either scaled or clipped depending on the setting of the Clipboard Adjustment option.

**Current** – Imports the animation information to the selected objects so that the animation starts at the current time as displayed in the Animation Controls.

**Clipboard** – Transfers the animation information to the selected object or objects, preserving the duration and timing of the animation information on the keys clipboard.

**Copies** – Specify how many copies of the anim curves you want imported. Multiple copies are appended sequentially.

#### Help Images

Turn on Help Images to display illustrations of the effects of the various anim import options.

## Importing files

## Clipboard Adjustment

**Preserve** – Pastes the contents of the clipboard into their new positions on the curve without any changes.

**Scale** – Becomes enabled when Start/End is selected. The complete contents of the clipboard curves are stretched or compressed to fit into the specified import Time Range.

**Fit** – Becomes enabled when Start/End is selected. The contents of the clipboard are preserved (that is, not stretched or compressed) and as much as will fit into the specified time range is pasted into the new area.

## Paste Method

**Insert** – Places the clipboard contents before any existing keys in the specified time range. The keys from the original curve that were after the specified time range are shifted in time by the pasted range times.

**Replace** – Becomes enabled when Start/End or Clipboard is selected. The clipboard contents overwrite any existing keys in the specified time range.

**Merge** – The clipboard contents are added to any existing keys on the curve. In the case where a clipboard key is at the same time as an existing key, the clipboard's key replaces the existing key.

## Replace Region

These buttons are enabled when Paste Method is set to Replace.

**Time Range** – Replace keys and curve segment information in the specified time range with the contents of the keys clipboard.

**Entire Curve** – Is available only when the Time Range setting is Clipboard. The Entire Curve setting replaces the animation curve(s) on the imported attributes with the contents of the keys clipboard, in effect deleting any existing animation curves on these attributes and applying the new curves from the keys clipboard.

## Connect

Adjusts the keys clipboard curves in value, so there's no discontinuity in the animation at the start of the pasted segment.

## Importing files by reference

When you import a scene by reference, Maya makes a link from the current scene to the source scene. This link points to the latest saved version of the scene. You cannot rename, delete, or ungroup objects from a referenced file.

You can develop the referenced file while you use it in other scenes. For example, say you had three scenes in an animation that all used the same props. In one scene, the chair is beside the table. In the second, the chair is on top of the table. In the third, the chair is on the floor. If you imported the files by reference, three animators could use the same props, saving file space and sharing changes made to the surface characteristics and shading of the objects.

---

#### Note

Node names from referenced files appear red in the Hypergraph. In contrast, node names from non-referenced files appear black.

---

#### To specify a referenced file:

- 1 Select File > Create Reference.
- 2 In the file browser, navigate to the file to reference and click Reference.

You can also use this window to reference files on other systems (including IRIX) on your network.

Maya loads the selected scene into the scene you are working on.

---

#### Tip

Turn on the Use Namespaces option if you referenced expressions that include statements in MEL command format that include object names.

---

Statements in conventional expression format work whether or not you include object names. The Expression Editor resolves name changes.

### Setting Reference options

You can specify file reference options. Maya uses these options the next time you import by reference. You can change the options as you work to override existing import by reference options for only the current session.

#### To set reference options:

- 1 Select File > Create Reference ☐. The Reference Options window opens.

## Importing files

- 2 Set the options. See “Setting import options” on page 185 for information on setting Group, Namespaces, Name clash, and File Type options.

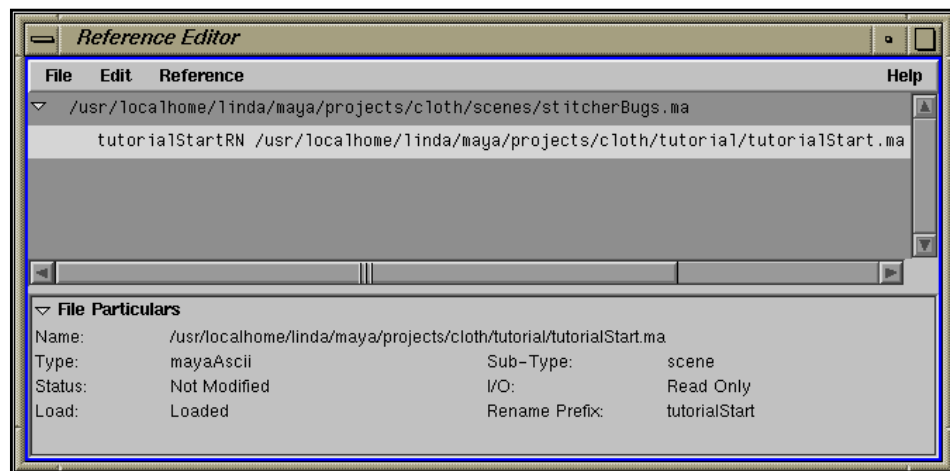
### Using the Reference Editor

You use the Reference Editor to specify settings for importing files by reference. You can:

- Create Reference (see “Importing files by reference” on page 190).
- Import Reference (see “Importing a referenced scene” on page 193).
- Export Selection As Reference (see “Exporting a selection as a reference” on page 193).
- Remove Reference (see “Removing a reference from a scene” on page 194).
- Select Reference Contents (see “Selecting the contents of a referenced scene” on page 194).
- Load Reference/Unload Reference (see “Loading and unloading reference files” on page 195).
- Replace Reference (see “Replacing reference files” on page 195).
- Clean up References (see “Cleaning up references” on page 196).

#### To use the Reference Editor:

- 1 Select File > Reference Editor. The Reference Editor opens.



**2** Select a referenced file.

When you select a referenced file using the Reference Editor, Maya displays information about the file, called File Particulars.

**File Particulars**

<b>Name</b>	Displays the name of the file.
<b>Type</b>	Displays the file format.
<b>Status</b>	Indicates if the file has been changed in some way.
<b>Load</b>	Indicates if the referenced file is loaded or unloaded. See “Loading and unloading reference files” on page 195.
<b>Sub-type</b>	Displays the sub-type of file.
<b>I/O</b>	Indicates if the file can be changed. Referenced files are always Read Only, while files you create yourself are always Writable.
<b>Rename Prefix</b>	Displays a prefix that can be applied to object names in the event of name clashes or namespaces.

**Importing a referenced scene**

You can import a scene that used to be referenced. This breaks the reference connection.

**To import a referenced file:**

- 1** Select File > Reference Editor.
- 2** Click the arrow next to the scene name and select the referenced file to be imported.
- 3** Select File > Import Reference.

**Exporting a selection as a reference**

This lets you export parts of the scene you are working on as a referenced file. Exporting a referenced file is similar to File > Export Selection. However, when exporting selections as a referenced file, the selections in the Maya window exist only as referenced objects. If you make changes to the new referenced file, the objects in the existing scene change. For more information on exporting selections, see “Exporting files” on page 201.

**To export a referenced file:**

- 1 Select objects in the scene file.
- 2 Select File > Reference Editor.
- 3 Select File > Export Selection as Reference.
- 4 Type the name of the referenced file, choose a file type from the Write As pull-down menu, then click Export Reference.

**Removing a reference from a scene**

You can remove a referenced file from a scene if you do not need it anymore. When you delete the referenced file, referenced objects disappear and all connections are broken permanently. If you want to remove a reference and keep the connections intact, see “Loading and unloading reference files” on page 195.

**To remove a referenced file:**

- 1 Select File > Reference Editor.
- 2 Select a referenced file.
- 3 Select Edit > Remove Reference. Maya displays a message warning you that this action cannot be undone.
- 4 Click Remove to remove the referenced file.

**Selecting the contents of a referenced scene**

You can select objects in your scene that come from a referenced file. This lets you identify which objects exist in a referenced file without having to open the source file.

**To select objects from a referenced file:**

- 1 Select File > Reference Editor.
- 2 Select a referenced file.
- 3 Select Edit > Select Reference Contents. The objects from the referenced file are selected and displayed in a different color.

## Loading and unloading reference files

In a scene that contains reference files, you can unload a reference file if it is not needed while you are working on a different part of the scene. This improves the interactive performance of Maya. You load it back in when you are ready for that part of the scene.

### To unload a reference file:

- 1 Select File > Reference Editor.
- 2 In the Reference Editor, expand the scene name to display the reference files.
- 3 Highlight the reference file you want to unload.
- 4 Select Reference > Unload Reference.

The reference file no longer appears in the scene.

### To load a reference file:

- 1 Select File > Reference Editor.
- 2 In the Reference Editor, expand the scene name to display the reference files.
- 3 Highlight the reference file you want to load.
- 4 Select Reference > Load Reference.

The reference file appears in the scene.

## Replacing reference files

You can replace a reference file with another reference file. This is useful for substituting high and low resolution geometry.

### To replace a reference file:

- 1 Select File > Reference Editor.
- 2 In the Reference Editor, expand the scene name to display the reference files.
- 3 Highlight the reference file you want to replace.
- 4 Select Reference > Replace Reference.
- 5 Navigate to the replacement file and click Reference.

The reference file is replaced. All connections are maintained.

Cleaning up references

When you use reference files, Maya records any changes to the reference file. If you load, unload, or replace reference files, these changes may or may not be used. When you clean up references, you remove any recorded changes that aren't being used.

For example, if you replace a high-resolution reference file with a low-resolution, Maya records the connections, dynamic attributes, changed values, and disconnected attributes, which may not apply to the low-resolution version. When you substitute the high-resolution version again, the connections and values are restored. However, if you don't substitute the high-resolution version, or you modify the high-resolution version before you substitute it, the scene may have dangling connections and unused values. When you clean up references, you eliminates this.

You should clean up reference when you are done swapping reference files.

To clean up references:

- 1 Select File > Reference Editor.
- 2 Select File > Clean Up Reference.

SUPPORTED FILE FORMATS

You can open and import the following file formats:

File extension	Filename	Description	Program used by	Platform
.ma	Maya ASCII	Native ASCII file format.	Maya	IRIX & NT
.mb	Maya Binary	Native binary file format. This is the default file format.	Maya	IRIX & NT

File extension	Filename	Description	Program used by	Platform
.mel	MEL	Maya Embedded Language, the scripting language used by Maya.	Maya	IRIX & NT
.dxf	Drawing Exchange File	Exchanges geometric and drawing information between microCAD systems.	Auto CAD	IRIX & NT
.geo	ExploreGeo	Geometry files. Can be imported only. Note that blobs, shaders, and groups are not converted	Explore	IRIX only
.obj	object file	ASCII files that define geometry and other object properties.	Advanced Visualizer	IRIX & NT
.iges	Initial Graphics Exchange Specification	Standard for exchanging geometric information.	CAD systems	IRIX & NT
.rib	RIB	RIB input/output of geometry.	Renderman	IRIX & NT
.wire	aliasWire	Wire files.	PowerAnimator	IRIX only
audio (various extensions)	audio files such as WAVE and aiff	Audio files for sampling in mono or stereo.	Various	IRIX & NT

## Saving files

File extension	Filename	Description	Program used by	Platform
image (various extensions)	Alias, BMP, CINEON, EPS, IFF, GIF, JPEG, Maya, RGB, RLA, SGI&nbsp;, SoftImage, 24- or 32-bit Targa, TIFF, and XPM	Image files for textures or image planes.	Various	IRIX & NT
.avi	AVI	Video for Windows Microsoft	Various	NT only Note that this is the only movie file type supported on NT.
.mov	move	An ASCII file that stores the channel data (such as <i>x</i> translate, <i>y</i> translate, and <i>z</i> translate) from a PreView scene file.	PreView	IRIX & NT

## SAVING FILES

You use Save and SaveAs to save the current scene, save the current scene using a new name, or convert a file to from Maya ASCII to Maya Binary and vice versa. To convert a file into formats other than Maya ASCII and Maya Binary, use the Export option (“Exporting files” on page 201).

Before you save, we recommend that you optimize scene size for improved performance, memory use, and reduced use of disk space (File > Optimize > Scene Size ☐). For details, see “Optimizing scene size” on page 212.

**To save a scene file:**

- 1 Select File > Save Scene.

If you have not specified a name for the scene, the Save As window appears:

- 2 Select mayaAscii or mayaBinary from the Write As pull-down menu (IRIX).

*or*

Select mayaAscii or mayaBinary from the Files of Type pull-down menu (NT).

This selects the format for your scene.

- Maya Binary files are usually smaller and load faster than Maya ASCII files.
- Maya ASCII files have the same information as Maya Binary files, and you can edit them using a text editor.

Both types of files work with the IRIX operating system and the Windows NT operating system.

- 3 Type the name of the new file.

See the Save Scene As option called Default File Extensions – Adds the file extension .ma to Maya ASCII filenames and .mb to Maya Binary filenames. on page 200 for information on automatically adding file extensions to your scene names.

---

**Tip**

If you plan to transfer files between IRIX and Windows NT, do not put spaces in the filenames.

---

- 4 Click Save. Maya saves the contents of the file under the specified name.

---

**Note**

If your scene includes referenced files, the Save and Save Scene As option save your current working file. The names of files you've imported by reference do not change.

---

## Saving files

**To rename a scene file:**

- 1 Select File > Save Scene As. The Save As window opens.
  - 2 Type the name of the new file, then click Save.
- Maya saves the contents of the file under the specified name.

**To convert a file:**

- 1 Open the scene file.
- 2 Select File > Save Scene As
- 3 Select mayaAscii or mayaBinary from Write As pull-down, depending on how you want to convert the scene.

*or*


Select mayaAscii or mayaBinary from the Files of Type pull-down menu (NT).

- 4 Click Save. Maya saves the scene in the specified format.

**Setting save options**

For your convenience, you can predefine some of the options that apply when you use Save Scene and Save Scene As. You can override these predefined options when you save the scene.

**To set Save Scene As options:**

- 1 Select File > Save Scene As .
- 2 You can set the following options in the Save Scene As Options window:
  - File Type** – Sets the File Type to mayaBinary or mayaAscii. The default is mayaBinary.
  - Default File Extensions** – Adds the file extension .ma to Maya ASCII filenames and .mb to Maya Binary filenames.
  - Use Verbose Names** – Displays the full names of node attributes. For more information about using full names see, “Setting Open options” on page 181.
- 3 Click Save Scene As to save the scene or click Save to save the settings only.

## Tips for reducing file size

When you save a new scene file, Maya saves the user interface information in the scene by default. The user interface file includes information about the interface like the current visible window positions.

To decrease the size of files you create, you can turn the default setting off so these user interface files are not created.

To turn user interface file creation off:

- 1 Select the Panels tab from the Window > UI Preferences window.
- 2 Set the Save File option in the Scene Configurations section to Never Save, as shown in the following figure:
- 3 Click Save to close the UI Preferences window and preserve your changes.

## EXPORTING FILES

You export files when you want to copy all of a scene's contents (including referenced files) into a single file. Export also lets you convert a file into formats other than Maya ASCII and Maya Binary.

Export copies all of a scene's contents into another file, regardless of how the scene is divided into segments and references. In essence, Export collapses the entire scene into one file. This is essential when you want to save the scene's contents to another file type, such as an IGES file, which doesn't support Maya references.

You can export scenes in several file formats depending on which export plug-ins you have installed. For more information on export plug-ins, see "Using plug-ins for exporting" on page 205.

---

*Note*

If you export selected objects to an existing scene, it will overwrite the contents of the target file. If you want to add the contents of a scene to another scene, you must use File > Import. For more information, see “Importing files by copying” on page 184.

When you export the contents of a scene, the entire contents of the scene, including referenced files, are written to a single file.

---

*To export the contents of a scene:*

- 1 Select File > Export All.
- 2 Specify the name and file type you want to export the information to.

If Maya detects an existing file with the same name, it will ask if you want to overwrite the existing file.

The options for exporting are the same as those you use to save a file, except more export file types are available through plug-ins.

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*Note*

New export file formats may be added through plug-ins. For more information, see “Using plug-ins for exporting” on page 205.

---

## Setting export options

You can set the default file format for exporting by selecting File > Export All ☐. For Maya ASCII and Maya Binary formats, the Export All options are the same as the Save Scene As options (see “Setting save options” on page 200). File formats you export to using plug-ins have different options (see “Using plug-ins for exporting” on page 205).

## Exporting scene elements

You may want to export certain elements of a scene (for example, expressions). You can specify the scene elements that are included in the export data.

**To export specific elements of a file:**

- 1 Select File > Export Selection ☐. The Export Selection Options window opens.
- 2 Set the following export preferences:

**File Type** – Sets the File Type to mayaBinary or mayaAscii. The default is mayaBinary.

**Default File Extensions** – Adds the file extension .ma to Maya ASCII filenames and .mb to Maya Binary filenames.

**Keep Only a Reference** – Turn on to keep a reference to the file and move all of the selected nodes out of the current scene. You must first select the objects in the scene.

**Use Namespaces** – When you reference a scene with the Use Namespaces option turned on, Maya creates a new namespace that contains the referenced data. Turning on the Use Namespaces option ensures that all nodes are uniquely named. For more information on Namespaces, see “Setting import options” on page 185)

**Prefix with** – Select the file name to use the filename as the namespace. Select this string and enter a name to be used for the namespace.

**Include These Inputs** – Turn on to include or off to exclude any of the following inputs:

**History** – Includes or excludes construction history of the selected nodes. See *Using Maya: Modeling* for more information on construction history.

**Channels** – Includes or extrudes attribute values. See *Using Maya: Animation* for more information on attribute values.

**Expressions** – Includes or excludes expressions. See *Using Maya: Expressions* for more information on expressions.

**Constraints** – Includes or excludes constraints. See *Using Maya: Animation* for more information on constraints.

**Including Texture Info** – Turn on to export rendering information. The default is off.

**Use Verbose Names** – Specifies whether you want to use long flag names for MEL commands and full attribute names in the ASCII text.

## Exporting move files

When you import move files, you must list the attributes to import or export in the text list in the move file option box.

The move file format is just list of numbers. No information on how those numbers should be used is included in the move file. Instead, each row is assumed to be a frame of data, and each column represents a single channel of data.

This is the same move file format used by the Wavefront PreView program, with the addition that comment characters (# or // ) at the beginning of a line are allowed.

Since time data is not stored with the file, when exporting a move file, the attribute's value is written at each frame. The units of the file are your current units in Maya. When importing a move file, the current time of the scene is used as the starting point of the import.

For both the import and export functions, all node naming clash and group options are ignored.

### To export a move file:

- 1 Select File > Export All . The Export Selection Options window opens.
- 2 Select move from the File Type pull-down menu. The Export Options window opens.

The following file type specific options apply to importing move files:

Attributes	Type the name of an attribute in the Attributes box and click Add to add the attribute to the list of attributes to use when importing or exporting. If the attribute is already included in the list, a duplicate is not made. To remove an attribute, type the name of the attribute and click Remove. You can add several attributes at one time by separating them with a space.
From Channel Box	Click From Channel Box to combine all of the selected objects in Maya, in the order of their selection, with the channels selected in the channel box and place them in the list. For example, if sphere and cone are selected, and tx, sx are selected in the channel box, sphere.tx sphere.sx cone.tx and cone.sx are added to the list of attribute to import and export.
Remove Selected	Click Remove Selected to remove all of the attributes selected in the list.
Remove All	Click Remove All to remove all of the attributes are removed from the list.

Precision	<p>This is ignored in file export. For file import, this sets the precision of the file.</p> <p>When you click import or export, the move file is written or read and only the attributes in the list are affected.</p>
-----------	---

## USING PLUG-INS FOR EXPORTING

Maya plug-ins provide translators for exporting to various file formats. For more information about file conversions and file formats in general, see the online documentation *Maya File Formats* and *Translators*.

---

### Note

Maya plug-ins work only for the system type they were designed for. Maya NT can use only NT plug-ins; Maya IRIX can use only IRIX plug-ins.

---

Before you can use a plug-in, you must load it into Maya using a MEL command or the Plug-in Manager.

#### To load a plug-in:

- 1 Select Window > Settings/Preferences > Plug-in Manager.
- 2 Locate the plug-in and click the loaded button.
- 3 After the plug-in loads, click the i button to get information on the plug-in.

## Exporting to Wavefront (OBJ)

The objExport plug-in lets you export Maya polygon data to the Wavefront OBJ ASCII file format. It converts:

- Maya texture coordinate and vertex normal information.
- Maya renderable set information into material names.
- Maya component set information into groups.

#### To export a file in OBJ format:

- 1 Select Window > Settings/Preferences > Plug-in Manager to verify that the objExport plug-in is loaded.

Using plug-ins for exporting

- 2 Select File > Export All or File > Export Selection.
- 3 Select OBJExport from the Write As pull-down menu (IRIX).

*or*

Select OBJExport from the Files of Type pull-down menu (NT).

---

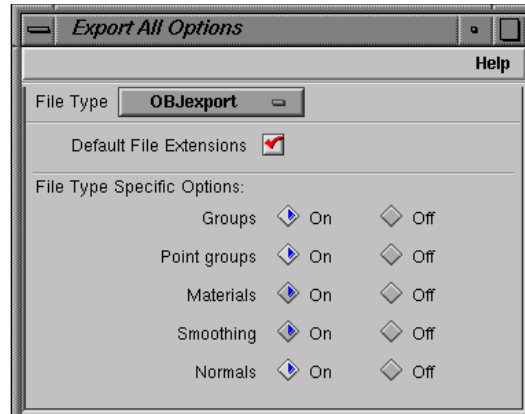
### Note

The objExport plug-in does not export OBJ formatted curves, surfaces, smoothing groups, or point group materials. It also does not support NURBS. Use the MayaToIgesDxf plug-in for scenes that contain NURBS surfaces.

---

To set OBJ export options:

- 1 Select File > Export All ☐ or File > Export Selection ☐. The Export Selection Options window opens.
- 2 Select OBJexport from the File Type pull-down menu.



- 3 Click to turn on or off exportation of Groups, Point groups, Materials, Smoothing, and Normals.
- 4 Click Export or Export All.

## Exporting to IGES or DXF

The MayaToIgesDxf (NT) and MayaToAlias (IRIX) plug-ins let you export Maya scene information to an IGES or DXF file, depending on which export file format you select. For IRIX, it also lets you export to Alias Wire format.

**To export a file in IGES or DXF format:**

- 1 Select Window > Settings/Preferences > Plug-in Manager to verify that the plug-in is loaded.
- 2 Select File > Export All or File > Export Selection.
- 3 Select IGESexport or DXFexport from the Write As pull-down menu (IRIX).

*or*

Select IGESexport or DXFexport from the Files of Type pull-down menu (NT).

## Exporting to Alias Wire

MayaToAlias is a Maya plug-in (IRIX) that exports Maya scene information to an Alias wire (version 8.1).

**To export a file in Alias wire format:**

- 1 Select Window > Settings/Preferences > Plug-in Manager to verify that the MayaToAlias plug-in is loaded.
- 2 Select File > Export All or File > Export Selection.
- 3 Select aliasWireExport from the Write As pull-down menu

## Exporting to RenderMan

The ribExport plug-in lets you export scenes created in Maya to the RIB (RenderMan) format.

The plug-in exports NURBS and polygonal geometry. All types of animation in Maya are supported, including keys, expressions, path, deformations, and motion blur.

The ribExport plug-in supports ambient, directional, point, and spot lights. It does not support plug-in lights

Simple non-textured shaders are supported, although only the shader color is exported; all other shading attributes are ignored. Phong and Blinn shaders are exported as “plastic” and Lambert shaders are exported as “matte.” Per-face shading groups are not supported; only shading groups that are assigned to objects or object instances are exported. Plug-in shaders and textures are not supported.

When exporting Maya scenes into RIB, note that the # character is a special formatting character in RenderMan image names (See the RenderMan user manual for information on its formatting capabilities). If you want to include a real # character in a RenderMan image name, you must use “##”.

The image name constructed by the ribExport plug-in includes the contents of the “imageName” attribute of the renderable cameras. If you want to include the special RenderMan formatting characters in an image, the imageName attribute is the place those characters should be placed in quotes.

---

#### Note

When you create a camera in PowerAnimator, it is automatically given a name that ends with the “#” character and a number. When the AliasToMaya translator converts these cameras into Maya cameras, the “#” is kept in the imageName attribute. If you want to render these scenes with RenderMan, the cameras will need to be edited, and the “#” characters in the imageName attributes replaced with “##”.

---

#### To export a file to RenderMan format:

- 1 Select Window > Settings/Preferences > Plug-in Manager to verify that the ribExport plug-in is loaded.
- 2 Select File > Export All or File > Export Selection.
- 3 Select RIBexport from the Write As pull-down menu (IRIX).

*or*

Select RIBexport from the Files of Type pull-down menu (NT).

**To set RenderMan export options:**

- 1 Select File > Export All ☐ or File > Export Selection ☐. The Export Selection Options window opens.
- 2 Select RIBexport from the File Type pull-down menu. The Export Options window opens.
- 3 You can set the following options.

**Default File Extensions** – Specifies whether the .rib extension will be appended to the specified file name. The .rib extension is not added if the specified filename already contains that extension.

**Single File Output** – If on, each frame is written to a single file. If off, all frames are written to one file.

**Extension Padding** – If the Single File Output option is turned off, then this option specifies whether the RIB file extensions will be padded with 0's.

**Geometry Motion Blur** – Specifies whether geometry motion blur information is written to the RIB file.

**Pixel Samples** – Specifies the number of samples taken for each pixel. This value will be used for both the X and Y directions.

## Exporting animation curves

You can export animation curves to an anim file. To do this, you must first select the objects connected to the animation curves. If nothing is selected the anim export will fail.

Maya copies the anim curve into the API clipboard and pastes it into the new file.

**To export animation curves to an anim file:**

- 1 Select Window > Settings/Preferences > Plug-in Manager to verify that the animImportExport plug-in is loaded.
- 2 Select the object whose animation curve you want to export.
- 3 Select File > Export All or File > Export Selection.
- 4 Select animExport from the Write As pull-down menu (IRIX).

*or*

Select animExport from the Files of Type pull-down menu (NT).

**To set anim export options:**

- 1 Select File > Export All ☐. The Export Selection Options window opens.
- 2 Select animExport from the File Type pull-down menu. The Export Options window opens.

You set the following options in the Export Options window:

### Precision

Sets the precision of the numbers stored in the file. The choices are:

**Float** – Eight digits of precision

**Double** – Seventeen digits of precision

**Custom** – A setting between 1 and 18.

### File Contents

**Use Node and Leaf Attribute Names** – When the Use Node and Leaf Attribute checkbox is selected, The node and leaf attribute names in the clipboard are written to the file.

When the checkbox is not selected, only the full attribute name is written to the file.

	<p><b>Verbose Units</b> – When the Verbose Units checkbox is selected, long unit names are used in the file, otherwise short unit names are used.</p>
Hierarchy	<p>The Hierarchy setting provides control over which nodes will be copied within a hierarchy. See <i>Using Maya: Basics</i> for information on hierarchy and grouping of objects and nodes in Maya</p> <p><b>Selected</b> – Only the selected object's animation copies to the keys clipboard.</p> <p><b>Below</b> – Copies the animation of the selected object and all objects below it to the clipboard</p>
Channels	<p>This setting is available when you want to copy only attributes selected in the Channel Box.</p> <p><b>All Keyable</b> – All keyable channels of the selected object's animation are copied to the clipboard</p> <p><b>From Channel Box</b> – Only those channels selected in the Channel Box are copied to the clipboard</p>
Control Points	<p>This option enables or disables the copy action for all the CVs, polygon vertices, and lattice points associated with a geometry shape (or transform node hierarchically above the geometry shape).</p> <p>Normally, when a control point is copied, only the selected control point is copied. The Control Points option enables the copying for all the control points associated with an object. This is useful when you are doing control point-intensive animation and don't want to select each control point to copy the animation.</p>
Shapes	<p>This option determines if the animation of a shape attribute of an object as well as the animation of the associated transform attribute are copied, or if only the transform node's animation is copied.</p> <p>Generally, when an object is selected in a modeling window, the transform node (above the shape hierarchically) is selected.</p> <p>For example, if a camera, NURBS object, or light is selected, the associated transform node is selected for copying.</p>
Time Range	<p><b>All</b> – Copies all the animation information of the selected object or objects to the keys clipboard.</p> <p><b>Start/End</b> – copies only the animation information in the range specified in the Start Time and End Time fields of the selected object or objects to the keys clipboard.</p>

## Optimizing scene size

Help Images	When checked, this option displays a diagram of the copy action, and in particular represents graphically the two methods of copying animation information.
Method	<p><b>Keys</b> – Copies only keys within the selected range to the keys clipboard.</p> <p><b>Segments</b> – Copies animation curve segments and any keys in the selected range to the keys clipboard. Use the Segments method when the animation information to be copied lies.</p>

**Note**

The Segments method of copying keys will create keys for the copied animation segment at the start and end times in order to preserve the shape of the animation curve, if keys do not already exist at those points. between keys.

## OPTIMIZING SCENE SIZE

You can optimize the size of your scene by removing the following.

- invalid NURBS surfaces and curves
- empty sets, partitions, and transforms
- unused animation and NURBS curves, cached data, deformers, expressions, group ID, rendering, snapshot, and unit conversion nodes, locators, point constraints, and referenced items

We recommend that you make a habit of optimizing scene size before you save. Optimizing your scene size before saving can:

- improve the overall performance of Maya (the improvement can be significant)
- improve Maya's use of memory
- reduce unnecessary waste of disk space

To optimize scene size:

- 1 Open the scene.

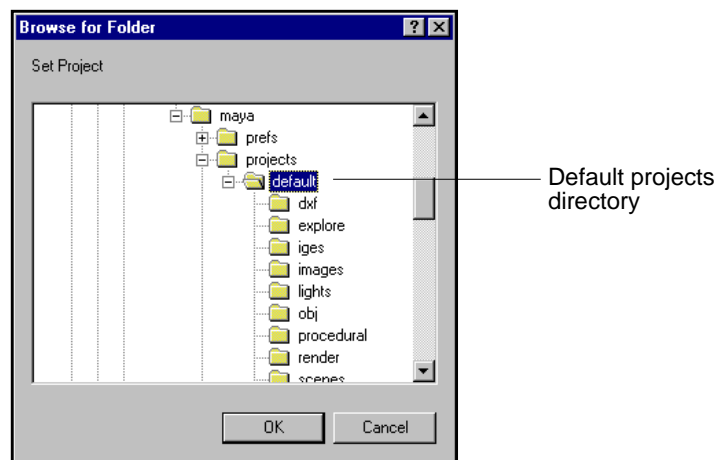
- 2 Select File > Optimize Scene Size ☐. The Optimize Scene Size Options window opens.
- 3 Select the items you want removed from the scene.
- 4 To optimize the scene using these settings, click Optimize.
- 5 To save the settings, click Save. When you select File > Optimize Scene Size, the saved settings are used.

## MANAGING PROJECTS

A *project* is a collection of one or more scene files. A project also includes files related to the scene, such as texture files for rendering or geometry files for modeling. It specifies the directories for the scene data and the search paths to use when referencing files.

For example, if you were working on a project called *Randy\_the\_Robot*, you could create a directory called *robot* to hold all the files related to that project, including scene, sound, rendering, and animation. Placing all the files in one directory makes it easier to manage the project, including referencing the files.

When you start Maya for the first time, it creates a default directory called “default.” This directory contains default settings for all the subdirectories under default.



Typically, these subdirectories contain information on all files associated with a specific project. For example, the sound subdirectory contains all sound files used by a scene. For more information on setting up projects, see “Creating projects” on page 215.

## Where Maya stores scene information

Maya stores scene information in three locations according to the type of information:

- **Scene File Locations** – Stores scene files.
- **Project File Locations** – Stores files such as textures, lights, images, source images, and rendering scenes.
- **Data Transfer File Locations** – Stores files that are in other formats such as .mel, .dxf, .obj, and plug-ins.

## Using absolute and relative paths

You can specify either an absolute or relative path to a particular directory.

### What is an absolute path?

An absolute path starts at the root of a file system and works down the directory tree to the requested file. If you move a scene to a new directory, any absolute paths you created become unusable. You must correct the paths before Maya can read the scene again.

Note that Maya also supports UNC paths, if your network supports them.

---

#### Tip

Absolute paths must always start with a drive letter (Windows NT) or slash (IRIX). For example, C:\username\maya\projects\Storm\wind.

---

### What is a relative path?

Relative paths point to a directory by describing its relationship to the current scene. For example, if you want to access all files in project *Storm*, under directory *hurricane*, then type `hurricane\Storm`.

If you change the name of the project directory, then all you have to do is change the name of the directory. You do not have to change the entire path to the associated project files.

### Example of a relative path

Here is an example of a relative path that goes up two levels to the projects directory, then down one directory to project *hurricane*\Storm.

```
..\..\projects\hurricane\Storm\Wind
```

### Tip

Normally, you should use a relative paths. Special situations require an absolute path—for example, if you want to place all lights for all projects in the same directory.

## Multiple project directory paths

If you have multiple locations for project files, including directories outside your project area, you can list them all in the New Project or Edit Project window. Separate the directories using a colon (IRIX) or semi-colon (Windows NT). For example, you may have a local sourceimages directory and one that is shared on the network, as shown in the following illustration.



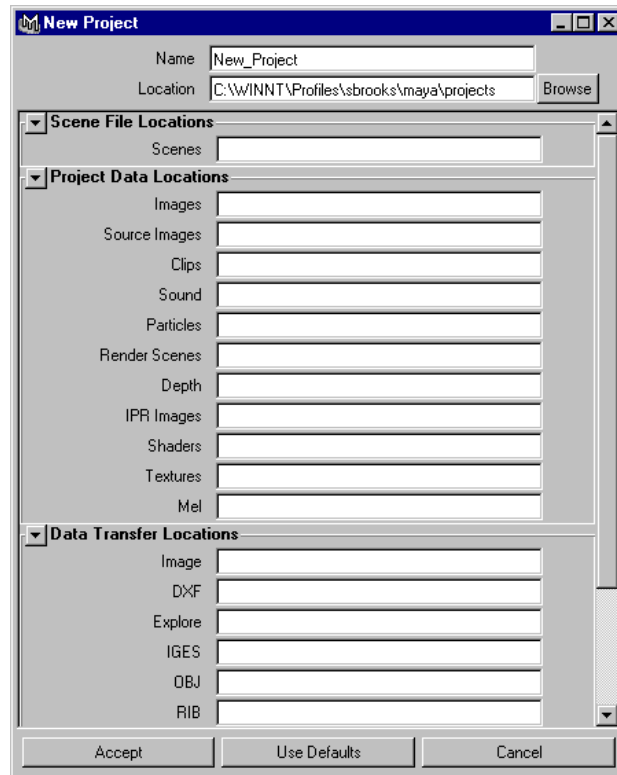
You can mix relative and absolute paths, as the above example illustrates. The entry *sourceimages* is relative to the project directory, while *g:\sharedimages* is absolute. Make sure to start absolute paths with either a slash (IRIX) or drive letter (Windows NT).

## Creating projects

You can structure a project file to suit the requirements of a particular project.

### To create a new project:

- 1 Select File > Project > New. The New Project window opens.



- 2 Enter the name of the new project in the Name box.
- 3 In the Location box., enter or browse to the directory that will contain the new project.
- 4 You can click the Use Defaults button to let Maya assign the default names for the following locations or you can set them explicitly by typing in the location:

**Scenes** – Specifies the directory used to save scene files. This directory normally contains only geometry information, unless you instruct Maya to put all of the information on the file into this subdirectory. You can also use this box to enter search criteria for scene information. For more information, see “Multiple project directory paths” on page 215.

**Project Data Locations** – Specifies the directories for files containing project textures, lights, source images, images, and render scenes.

**Data Transfer File Locations** – These locations specify the paths to the directories containing files in formats that may require conversion.

---

#### Note

The location directories can be expanded using plug-ins. Each time you add a plug-in, the New Project window displays the addition. You can then specify the path to the plug-in's directory. For more information, see "Using plug-ins for exporting" on page 205.

---

---

#### Note

If you leave a box blank, Maya does not create a subdirectory. If you create a scene using an unspecified project setting, Maya saves the information in the project location directory.

---

- 5 Click Accept.

## Specifying the current project

Use Set Project to specify the current project.

#### To specify a current project:

- 1 Select File > Project > Set. A file browser appears.
- 2 Select a project. Maya changes the path to the new project.
- 3 Click OK.

## Editing the current project

If any file location information has changed, use Edit Current to update the directories. For example, you may have relocated your sound files to a new directory and want to make sure that Maya is able to find them.

---

### Note

You cannot change the name or location of the project file.

---

#### To edit a project:

- 1 Select File > Project > Edit Current. The following window opens.
- 2 Click on a triangle to open a section of directories related to the Scene, Project, or Data Transfer file locations.
- 3 Make changes, then click Accept. Maya updates the information on the project file.

## MAPPING MISSING DIRECTORIES

The *dirmap* command lets you map a missing directory to a different non-missing directory. This is most useful when you are moving scenes from IRIX to NT.

### Mapping from IRIX to NT

You can use the *dirmap* command to map your IRIX directory to your NT directory. For example, if you enter the following commands:

```
dirmap -enable true;  
  
dirmap -m "/home/linda/maya" "C:/aw/maya/linda"
```

These commands enable *dirmap* and add a mapping from */home/linda/maya* to *C:/aw/maya/linda*. Now, if you try to open the file on an NT:

```
file -open "/home/linda/maya/projects/default/scenes/  
rose.ma";
```

Maya is not able to find the directory so it uses the *dirmap* data and tries again using:

```
file -open "C:/aw/maya/linda/projects/default/scenes/  
rose.ma";
```

## Mapping from IRIX to IRIX

You can also use the *dirmap* command to map IRIX directories to other IRIX directories.

For example, suppose you are running out of disk space and add a new disk, you can map your old directories to you new ones:

```
dirmap -enable true  
  
dirmap -m "/home/linda/maya/projects" "/bigdisk/maya/  
projects";
```

---

### Note

This works only if the original directory is missing. If the directory is there but the file is missing, you will get a normal “file not found” error.

---

See the *dirmap* command in the online MEL command documentation for more information.



# 8

## SETTING ENVIRONMENT VARIABLES

This chapter describes how to set environment variables using the `Maya.env` file and lists standard Maya environment variables that you may want to modify. It includes the following topics:

- “About environment variables” on page 221
- “Creating the `Maya.env` file” on page 222
- “Modifying standard paths” on page 225
- “Standard Maya environment variables” on page 226

### ABOUT ENVIRONMENT VARIABLES

Environment variables are a useful way to modify the standard path locations and behavior used by Maya. Typical examples include:

- Setting `MAYA_SCRIPT_PATH` to point to a directory where you keep custom scripts.
- Setting `TEMPDIR` to point to an area with more disk space so that you have enough room for temporary render cache files.
- Setting `MAYA_DISABLE_BACKSPACE_DELETE` if you prefer that the backspace key does not perform deletion.

Many of the variables used by Maya are set automatically when you start Maya. To configure Maya further, you can set additional environment variables.

There are two places you can set environment variables: in the `Maya.env` file and in the operating system (through the IRIX command line, IRIX `.cshrc` file, or NT registry). Using the `Maya.env` file is the recommended method and is the subject of this chapter.

Creating the Maya.env file

The variables set in the operating system (through the IRIX command line, IRIX .cshrc file, or NT registry) take priority over the settings in the Maya.env file. However, when Maya verifies the environment settings, it may add default settings.

CREATING THE MAYA.ENV FILE

While you can set environment variables in the operating system (such as the IRIX .cshrc file or NT registry), you should use the Maya.env file in most cases so you don't clutter the standard environment settings.

Another advantage of using Maya.env occurs when you are performing distributed rendering among several Windows NT machines. In this case, you can set up Maya.env as a roaming profile to be shared by all the machines. See your networking documentation for details on setting up roaming profiles.

To create Maya.env:

- 1 Create Maya.env in a text editor (such as jot or Notepad).

For IRIX, make sure to use capital M for Maya.env.

- 2 Set each variable on a single line in the following form:

NAME = VALUE

where NAME is the name of the environment variable, and VALUE is its value. For other formatting rules, see "Rules for Maya.env" on page 223.

- 3 Save the file to one of the following locations.

IRIX	Windows NT
~/maya/ <i>version</i>	<i>drive</i> : \WinNT\Profiles\ <i>UserName</i> \maya\ <i>version</i>
or	or
~/maya	<i>drive</i> : \WinNT\Profiles\ <i>UserName</i> \maya

---

*Note*

These directory locations are the default. You can use a different directory if you specify it in the MAYA\_APP\_DIR environment variable, which must be set outside of Maya and the Maya.env file. See “Standard Maya environment variables” on page 226.

---

## Rules for Maya.env

- You can set any variable, including ones that you define yourself. The only variables you cannot set in Maya.env are MAYA\_APP\_DIR and either HOME (for IRIX) or USERPROFILE (for NT).
- For directory paths, use backslash (\) for NT and forward slash (/) for IRIX.
- To separate several paths, use semicolon (;) for NT and colon (:) for IRIX.
- You can include blank lines or lines that begin with # (comment character).
- Extra spaces around the NAME and VALUE are ignored.
- You can use variable substitution by typing either *\$variable* (IRIX) or *%variable%* (NT). For example:

```
MAYA_PLUG_IN_PATH = $MAYA_APP_DIR/scripts/test (IRIX)
```

```
MAYA_PLUG_IN_PATH = %MAYA_APP_DIR%\scripts\test (NT)
```

This example uses \$MAYA\_APP\_DIR, one of Maya's standard environment variables. You can also use variables that you define yourself, either in the Maya.env file or in the operating system.

- If you define your own variable, make sure it does not contain these characters: Space Tab / : \* " < > |

---

*Note*

Although we recommend using different formatting for NT and IRIX (such as \ and ; for NT but / and : for IRIX), Maya does recognize both formatting styles no matter what platform you use. It's still best to keep a platform-specific format to avoid possible errors.

---

Creating the Maya.env file

IRIX example:

The following example shows how you can define your own variable (SHARED\_MAYA\_DIR) and use it to set the value of other Maya variables.

```
SHARED_MAYA_DIR = HostName:/usr/localhome/public/maya/3.0
MAYA_SCRIPT_PATH = $SHARED_MAYA_DIR/scripts:$MAYA_APP_DIR/scripts/custom
MAYA_PLUG_IN_PATH = $SHARED_MAYA_DIR/plugin-ins
TMPDIR = /disk2/temppace
```

Windows NT example:

This example is the same as IRIX, but with NT-specific formatting.

```
MAYA_SCRIPT_PATH = %MAYA_APP_DIR%\scripts\test
MAYA_PLUG_IN_PATH = %MAYA_LOCATION%\devkit\plug-ins;%MAYA_LOCATION%\devkit\test
TMPDIR = D:\temppace
```

Where Maya looks for Maya.env

Maya looks for the Maya.env file in MAYA\_APP\_DIR/*version* or MAYA\_APP\_DIR, which is an environment variable you may optionally set outside of Maya and the Maya.env file. If you did not explicitly set MAYA\_APP\_DIR, the following directories are used:

IRIX	Windows NT
~/maya/ <i>version</i>	<i>drive</i> : \WinNT\Profiles\ <i>UserName</i> \maya\ <i>version</i>
or	or
~/maya	<i>drive</i> : \WinNT\Profiles\ <i>UserName</i> \maya

## MODIFYING STANDARD PATHS

When Maya builds all the environment variable settings into its memory, it makes some verifications and adjustments. For several path environment variables, Maya adds a string of standard paths to the end of the variable setting. The standard paths contain items Maya requires to run. The affected environment variables are:

```
MAYA_PLUG_IN_PATH  
MAYA_MODULE_PATH  
MAYA_SCRIPT_PATH  
XBMLANGPATH
```

If you set these variables, the path you give comes before the standard paths. First priority is given to settings made through the operating system, followed by Maya.env settings. Standard paths are always last. For a list of the standard paths, see the specific environment variable in the section “Standard Maya environment variables” on page 226.

---

### Warning

Because your path settings take priority over standard Maya paths, a conflict may occur and Maya may fail to load. In this case, try starting Maya with only default settings by typing the following at the command line: *maya -default*.

---

## Other path settings

For the system PATH variable, Maya adds \$MAYA\_LOCATION/bin. On IRIX, it also adds /usr/aw/com/bin.

Maya checks whether the directory specified by the HOME variable (IRIX) or USERPROFILE variable (NT) exists and is writable. If not, Maya issues a prompt for you to provide a writable home directory. Note that HOME and USERPROFILE cannot be set in the Maya.env file.

## STANDARD MAYA ENVIRONMENT VARIABLES

This section lists the Maya environment variables you might typically use.

### MAYA\_APP\_DIR

This variable defines your personal Maya application directory. This directory contains your projects and other important items:

- the prefs directory
- the projects directory
- mayaRenderLog.txt
- mayaLog
- mayaJournal
- the scripts directory
- (Maya.env, if you choose to create it, can also reside in this directory)

You can only set MAYA\_APP\_DIR from the operating system; you cannot use Maya.env. If you do not set it, the default values are: *~username/maya* (IRIX) or *drive:\WINNT\Profiles\username* (NT).

### MAYA\_DEBUG\_ENABLE\_CRASH\_REPORTING

When Maya encounters a fatal error, this variable writes a crash report file (.crash) in the current working directory. This file contains a detailed description of what Maya was doing when the failure occurred.

To enable this option, set the value equal to 1. To disable it, set the value to 0 (zero) or leave it undefined.

### MAYA\_DISABLE\_BACKSPACE\_DELETE

Disables the functionality of the backspace key. To enable this option, set the value equal to 1. To disable it, set the value to 0 (zero) or leave it undefined.

### MAYA\_LOCATION

The path for the Maya installation directory. If it is not set, it defaults to */usr/aw/maya VersionNumber* (IRIX) or *drive:\AW\maya VersionNumber* (NT).

### MAYA\_MODULE\_PATH

Defines the search paths for Maya module files. A module file describes the install location for certain Maya components, such as subdivision surfaces. Generally, you don't need to set this variable. But, keep in mind that for each

path extracted from the modules files, Maya appends the suffixes “plug-ins”, “scripts” and “icons” and “icons,” and then adds the appended path to MAYA\_PLUG\_IN\_PATH, MAYA\_SCRIPT\_PATH, and XBMLANGPATH, respectively.

The following table lists the default paths, which will always follow any path that you specify.

Default for Windows NT	Default for IRIX
%MAYA_APP_DIR%\maya\3.0\modules	\$MAYA_APP_DIR/maya/3.0/modules
%MAYA_APP_DIR%\maya\modules	\$MAYA_APP_DIR/maya/modules
C:\AW\Modules\maya\3.0	/usr/aw/modules/maya/3.0
C:\AW\Modules\maya	/usr/aw/modules/maya

#### MAYA\_NO\_JITTER\_FINAL\_COLOR

If you are quantizing to 8-bit color, we apply some randomness, or jitter, to the color. Set this variable for no jittering to occur. To enable this option, set the value equal to 1. To disable it, set the value to 0 (zero) or leave it undefined.

#### MAYA\_OVERRIDE\_UI

If this environment variable is set, Maya won't load the file `initialLayout.mel`, which creates the interface. You must specify an alternate file to run (for example, `MAYA_OVERRIDE_UI = test.mel`). This variable should only be specified if you want to completely replace Maya's UI for your own, custom-programmed interface.

#### MAYA\_PLUG\_IN\_PATH

Search path for plug-ins. When a plug-in is specified by relative path name, the directories in this path will be searched for the given plug-in name. This path also determines which directories will be listed in the Plug-in Manager.

The following table lists the default paths, which will always follow any path that you specify.

Default for Windows NT	Default for IRIX
%MAYA_APP_DIR%\maya\3.0\plug-ins %MAYA_APP_DIR%\maya\plug-ins %MAYA_LOCATION%\bin\plug-ins	\$MAYA_APP_DIR/maya/3.0/plug-ins \$MAYA_APP_DIR/maya/plug-ins /usr/aw/userconfig/maya/3.0/plug-ins /usr/aw/userconfig/maya/plug-ins \$MAYA_LOCATION/bin/plug-ins

MAYA\_PROJECT

Defines the default location of your project. You can change the location at any time by choosing File > Project. This variable simply defines the default.

MAYA\_RENDERER\_RT\_BACKGROUND\_COLOR

If you set this variable to 1, Maya includes the camera background in the calculation of reflection and refraction rays. If you set this variable to 0 (zero) or leave it undefined, Maya ignores the background color for these rays.

MAYA\_SCRIPT\_PATH

Colon-separated search path for Mel scripts. If an unresolved Mel procedure is called, then this path will be searched for a script that implements it. Also, if a Mel file is sourced without giving the full path, then this path will be searched.

The following table lists the default paths, which will always follow any path that you specify.

Default for Windows NT	Default for IRIX
%MAYA_APP_DIR%\maya\3.0\scripts	\$MAYA_APP_DIR/maya/3.0/scripts
%MAYA_APP_DIR%\maya\scripts	\$MAYA_APP_DIR/maya/scripts
%MAYA_APP_DIR%\maya\3.0\prefs\shelves	/usr/aw/userconfig/maya/3.0/scripts
%MAYA_LOCATION%\scripts\startup	/usr/aw/userconfig/maya/scripts
%MAYA_LOCATION%\scripts\others	\$MAYA_APP_DIR/maya/3.0/prefs/ shelves
%MAYA_LOCATION%\scripts\AETemplates	\$MAYA_LOCATION/scripts/startup
%MAYA_LOCATION%\scripts\paintEffects	\$MAYA_LOCATION/scripts/others
%MAYA_LOCATION%\scripts\cloth	\$MAYA_LOCATION/scripts/AETemplates
%MAYA_LOCATION%\scripts\live	\$MAYA_LOCATION/scripts/paintEffects
%MAYA_LOCATION%\scripts\fur	\$MAYA_LOCATION/scripts/cloth
	\$MAYA_LOCATION/scripts/live
	\$MAYA_LOCATION/scripts/fur

**MAYA\_USE\_V1\_CAMERA**

Allows you to revert to the old (Maya 1.0/1.5) camera model behavior. Starting with Maya 2.0, we have fixed how the camera behaves when lens squeeze is not 1.0, or when the resolution's aspect ratio is not the same as the x-resolution divided by the y-resolution. If you are in the middle of a job started with Maya 1.0/1.5, you may need the old (incorrect) behavior for continuity.

To enable this option, set the value equal to 1. To disable it, set the value to 0 (zero) or leave it undefined.

**MAYA\_USE\_VERSION1\_DISPLACEMENT**

Allows you to revert to the old (Maya 1.0) displacement mapping behavior. Starting with Maya 1.5/2.0, we significantly improved displacement mapping. If you are in the middle of a job started using Maya 1.0, you may need the old behavior for continuity.

To enable this option, set the value equal to 1. To disable it, set the value to 0 (zero) or leave it undefined.

#### MAYA\_USE\_VERSION1\_POLY\_TANGENT

Allows you to revert to the old (Maya 1.0) polygon tangent calculation behavior. For Maya 1.5/2.0 we significantly improved the way we calculate tangents on polygon objects. This primarily affects bump-mapping. If you are in the middle of a job started using Maya 1.0, you may need the old behavior for continuity.

To enable this option, set the value equal to 1. To disable it, set the value to 0 (zero) or leave it undefined.

#### TMPDIR and TEMP

This variable specifies the directory location Maya uses for various temporary files, such as:

- temporary render cache files during a render
- crash files if Maya crashes

On IRIX, set TMPDIR only. On NT, set both TEMP and TMPDIR. If not set, the temporary directory is /tmp (IRIX) or C:/temp (NT).

#### XBMLANGPATH

For both IRIX and Windows NT, this variable specifies the location of icon files, such as icons used for Shelf buttons. On IRIX, the syntax is slightly different than other paths. For example:

```
XBMLANGPATH = "./icons/%B:$HOME/dev/icons/%B"
```

In this example, %B is acts as a placeholder that will be replaced by Maya with the bitmap filename.

The following table lists the default paths, which will always follow any path that you specify.

Default for Windows NT	Default for IRIX
%MAYA_APP_DIR%\maya\3.0\prefs\icons	\$MAYA_APP_DIR/maya/3.0/prefs/icons/%B
%MAYA_APP_DIR%\maya\prefs\icons	\$MAYA_APP_DIR/maya/prefs/icons/%B
%MAYA_LOCATION%\icons	/usr/aw/userconfig/maya/3.0/icons/%B
%MAYA_LOCATION%\icons\paintEffects	/usr/aw/userconfig/maya/icons/%B
%MAYA_LOCATION%\icons\cloth	\$MAYA_LOCATION/icons/%B
%MAYA_LOCATION%\icons\live	\$MAYA_LOCATION/icons/paintEffects/%B
%MAYA_LOCATION%\icons\fur	\$MAYA_LOCATION/icons/cloth/%B
	\$MAYA_LOCATION/icons/live/%B
	\$MAYA_LOCATION/icons/fur/%B

WINEDITOR

Allows you to override the Expression Editor and use your own editor. The editor must be set to run in the foreground.

## SETTING ENVIRONMENT VARIABLES | 8

Standard Maya environment variables



---

PART 2

**EDITORS**



# 9

## USING MAYA EDITORS

The chapter describes Maya editors, including: several of the General Editors, the Relationship Editor, the Attribute Editor, the Channel Box, and the Outliner.

General Editors are tools you can use in a number of diverse workflows. One of the General Editors, the Attribute Spread Sheet, lets you see and modify attributes for multiple objects simultaneously. You use it to view and edit attributes in a columnar layout, and to keyframe them.

The Relationship Editor provides a single place to work with memberships for sets, deformer sets, character sets, partitions, display layers, shading groups, and light linking. You can quickly see the relationships, and select and remove items in those relationships.

The Attribute Editor is used to examine a particular object's attributes in more detail, and with a more explanatory interface. Its advantage is that it is very detailed, and allows you to work on one object at a time. This is particularly useful for dealing with particles.

The Channel Box is the primary, fastest, and most streamlined tool for editing object attributes. It lets you quickly set keys, and lock, unlock, or create expressions on attributes.

The Outliner lists the objects, lights, cameras, and other items in a scene. This arrangement is called the scene hierarchy.

This chapter contains the following topics:

- “Using General Editors” on page 236
- “Using the Component Editor” on page 237
- “Using the Attribute Spread Sheet” on page 241
- “Specifying tool settings” on page 248
- “Specifying performance settings” on page 249
- “Loading and unloading plug-ins” on page 251

- “Using the Relationship Editor” on page 255
- “Using the Attribute Editor” on page 262
- “Using the Color Chooser” on page 276
- “Using the Channel Box” on page 280
- “Using the Outliner” on page 297
- “Limiting the information shown in editors” on page 311

Maya includes several other editors not described in this chapter. For details, refer to the following:

- Reference Editor, see “Using the Reference Editor” on page 192
- Hypergraph, see “Using the Hypergraph” on page 319
- Layer Editor, see “Using display layers” on page 139
- Rendering Editors, see *Using Maya: Rendering*.
- Animation Editors, see *Using Maya: Animation*.
- Render Globals, see *Using Maya: Rendering*
- Hypershade, see *Using Maya: Rendering*
- Visor, see *Using Maya: Rendering*
- Expression Editor, see *Using Maya: Expressions*

## USING GENERAL EDITORS

General editors are grouped together because they are useful across all functional areas of Maya (Animation, Modeling, Dynamics, Rendering).

**To select a general editor:**

Select Window > General Editors and click the appropriate menu item:

**Component Editor** Lets you edit data assigned to components. For example, you can use the Component Editor to modify the weights assigned to individual CVs by cluster deformers. See “Using the Component Editor” on page 237.

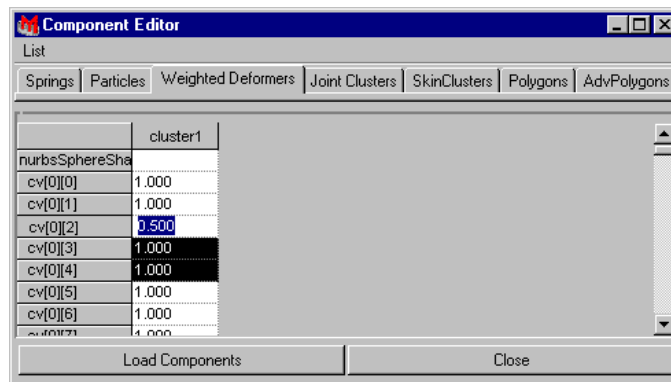
**Attribute Spread Sheet**

Lets you view and edit attributes for multiple objects at the same time. See “Using the Attribute Spread Sheet” on page 241.

- Connection Editor** Lets you explicitly connect any two attributes. For example, you could use the Connection Editor to connect a shader attribute to a texture attribute. See the book *Using Maya: Rendering*.
- Channel Control** Displays all of a node's attributes and lets you make them keyable or not keyable, editable or not editable (locked or unlocked). Since the Channel Box lists only keyable attributes, you often use Channel Control to add attributes to the items displayed in the Channel Box. For information on using Channel Control, see *Using Maya: Animation*. For information on the Channel Box, see "Using the Channel Box" on page 280.
- Script Editor** Lets you edit a script. See *Using Maya: MEL*.
- Command Shell** Lets you enter MEL commands directly through a command window. See *Using Maya: MEL*.

## Using the Component Editor

Use the Component Editor to edit data assigned to components. For example, you can use the Component Editor to modify the weights assigned to individual CVs by cluster deformers.



You can use the Component Editor to edit the component data of particles, springs, NURBS CVs, polygonal vertices, and lattice points. For example, you can edit the following component data with the Component Editor:

- the stiffness of individual springs
- the colors of individual particles
- polygonal vertex normals and colors

- the weights of CVs, vertices, or lattice points influenced by cluster deformers
- the weights assigned to CVs, vertices, or lattice points after smooth or rigid skinning

## Editing component data

With the Component Editor, you can find out what data is currently assigned to particular components, and then change that data.

To query component data:

- 1 Select the components whose data you want to edit.
- 2 Select Windows > General Editors > Component Editor. The Component Editor opens.

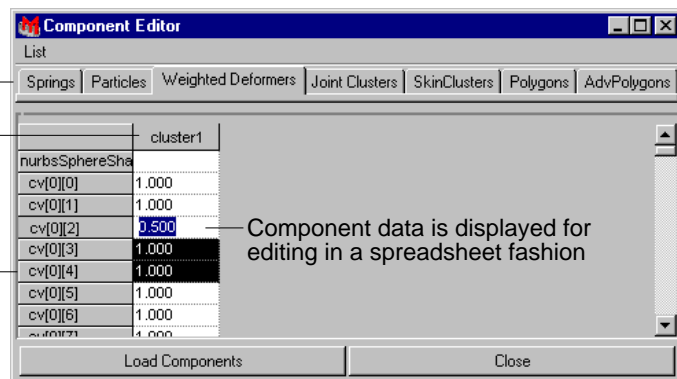
The Component Editor displays the component data for currently selected components in the workspace.

By default, the Component Editor updates dynamically as you select components in the workspace. Also, as you select components in the Component Editor, the workspace updates dynamically.

Click on tabs to select component types or influences

Objects influencing component data listed by column

Components listed by rows



- 3 Click the Springs, Particles, Polygons, AdvPolygons, Weighted Deformers, SkinClusters, and JointClusters tabs to view component data.

Springs

Lists component data for springs, including stiffness and damping data.

Particles

Lists component data for particles, including color or velocity data.

Polygons	Lists component data of polygonal vertices, including color or normal data in world space coordinates. If color or normal data are not shared at the vertex level, the column displays the word UnShared. These unshared values can be viewed and edited from the AdvPolygons tab.
AdvPolygons	Lists vertex face component data, including color and normal values for the vertex face.
Weighted Deformers	Lists component data of CVs, vertices, or lattice points influenced by cluster deformers (cluster weights).
SkinClusters	Lists component data of CVs, vertices, or lattice points bound to a skeleton's joints by smooth skinning (skin cluster weights).
JointClusters	Lists component data of CVs, vertices, or lattice points bound to a skeleton's joints by rigid skinning (joint cluster weights).

Note that if the components are organized into sets, the sets are also listed.

#### To modify component data:

- 1 In the Component Editor's spreadsheet, click the component data box you want to edit. Only the component whose box you selected is now selected in the workspace.
- 2 Enter a new value or use the slider bar.

#### To modify several boxes at once:

- 1 In the workspace, select the components whose data you want to edit.
- 2 In the Component Editor's spreadsheet, drag through the component data boxes you want to edit.
- 3 Enter the value you want all the boxes to have.

#### To modify an entire row or column (IRIX only):

- 1 In the workspace, select the components whose data you want to edit.
- 2 In the Component Editor's spreadsheet, click one of the boxes in the row or column.
- 3 Click the row or column heading.  
Now all the boxes for the row or column are selected.
- 4 Enter a value for all the boxes in the row or column.

**To modify an entire row or column (NT only):**

- 1 In the workspace, select the points whose weights you want to edit.
- 2 To change all the entries of a row or column, in the Component Editor's spreadsheet, select the row or column heading.
- 3 Shift select any of the boxes in that row or column.
- 4 Enter a new value to update the entire row or column.

**Adjusting editor updating**

By default, the Component Editor updates its display automatically to list whatever components you've just selected in the workspace. This automatic updating enables the rapid selection and editing of component data.

If you prefer, you can turn automatic updating off so that the Component Editor lists components you selected in the workspace only when you tell it to do so. In contrast to automatic updating, this approach is called manual loading.

**To use automatic updating:**

In the Component Editor, select List > Auto Update, turning Auto Update on. (This is the default.)

---

*Note*

The display does not automatically update if you undo, redo, or modify components in the workspace. For these types of changes, you must manually load components to refresh to Component Editor display.

---

**To use manual loading:**

- 1 In the Component Editor, select List > Auto Update, turning Auto Update off.
- 2 In the workspace, select the components whose data you want to edit.
- 3 To list the components in the Component Editor, select List > Load Selected Components. Alternatively, click the Load Components button located below the spreadsheet.

## Using the Attribute Spread Sheet

Attributes (also known as *channels*) are qualities or characteristics that affect the visual representation of objects (for example, position or color) or behavior of objects (for example, the damping of a joint or magnitude of a force). You can use the Attribute Spread Sheet to set various attributes for more than one object in a pane or for a particular node of an object. You can also use this tool to assign various attributes from the Attribute Editor to multiple objects or nodes.

Use the Attribute Spread Sheet to see and edit attributes for multiple objects simultaneously. It doesn't show whether attributes are connected or locked, and it does not show multi-attributes at all.

To examine the attributes of a node in more detail, and with a more explanatory interface, you can use the Attribute Editor. However, the Attribute Editor can be slower than the Attribute Spread Sheet, because you can only work on one object at a time. (The Channel Box works on all selected objects.)

### Displaying the Attribute Spread Sheet

Use the Attribute Spread Sheet to change the attributes for an object.

#### To display the Attribute Spreadsheet:

- 1 Select the node you want to change the attributes for.
- 2 Select Windows > General Editors > Attribute Spread Sheet. Maya displays the node's name in the Attribute Spread Sheet.

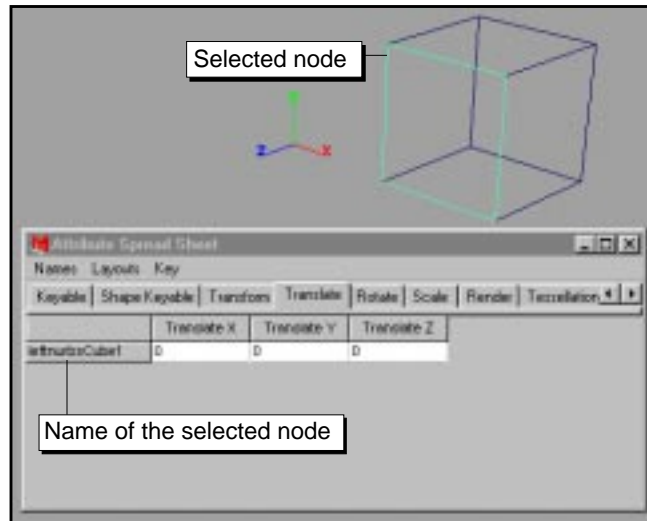
---

#### Notes

When the Attribute Spread Sheet first opens, the Keyable tab is selected. This tab displays all the keyable attributes of the selected objects. Most other tabs display useful subsets of these attributes. The All tab displays all attributes, keyable or not.

Many attributes useful in editing an object are not stored in its main node, but rather in the shape node associated with it. Some of the tabs in the Attribute Spread Sheet (such as Shape Keyable, Tessellation, and so on) show you attributes in the associated shape.

---



### Tips

If you have any problems selecting a node, select Windows > Hypergraph. For more information, see “Using the Hypergraph” on page 319.

To select all of an object’s nodes at once, drag a box around the object.

### To display shorter attribute names:

When you display the Attribute Spread Sheet, Maya shows the full attribute names. You can make the column smaller by showing the short names instead.

To show the short attribute name, select Names > Short Attribute Names in the Attribute Spread Sheet.

To show the long attribute name, select Names > Long Attribute Names.

## Entering values for attributes

With a single entry from your keyboard, you can change the value of:

- a single attribute of one or more objects
- two or more attributes of the same object
- two or more attributes of multiple objects

You can set any of these combinations with one text entry.

For example, you can enter the value 5 in one text box to change the three attributes for scaling along the X, Y, and Z axis for more than one object.

You can also change the values of several attributes by a relative amount. For example, you can add 3 to the Scale X, Scale Y, and Scale Z attributes.

### Entering an exact value for object attributes

You can give one or more attributes an exact value as follows:

#### To change the value of a single attribute:

- 1 Select the object(s). The Attribute Spreadsheet displays the attributes of the object(s).
- 2 In the Attribute Spreadsheet, click the attribute's text box.  
For example, click the Scale X text box.
- 3 Type the new entry and press Enter or the tab key.

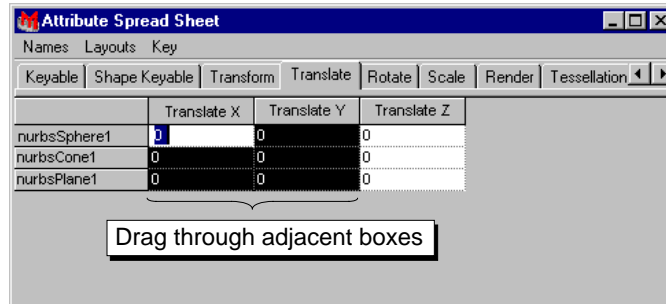
For example, type 5 and press Enter. For a Scale X entry, this sets the X axis scaling of all selected objects to 5 grid units.

#### To change the value of two or more attributes:

- 1 Select the object(s). The Attribute Spreadsheet displays the attributes of the object(s).
- 2 In the Attribute Spreadsheet, select the desired attribute text boxes.

For example, you can click the Translate X text box and drag through to the Translate Y text box for an object, then drag down to select the Translate X and Y boxes for other objects.

The first box you click is where you enter the value. The other selected text boxes turn black. This lets you know they're selected in addition to the box where you'll type the new number.



### Tip

You can select multiple text boxes:

- To select several adjacent boxes, drag through them.
- To add a non-adjacent box to a selection, Ctrl-click the additional box.
- To select a range of boxes, click the first box and Shift-click the last box.
- To select an entire row of boxes, click the node name.
- To select an entire column of boxes, click the column name.

### 3 Type the new entry and press Enter or the tab key.

For example, type 5 and press Enter. If Translate X and Translate Y are selected when you enter 5, all selected Translate X and Translate Y attributes become 5.

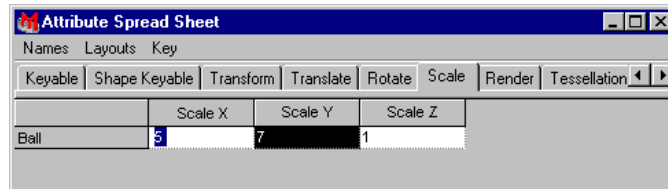
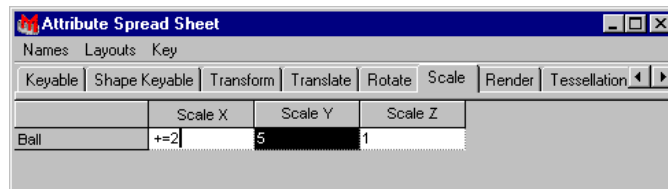
### Entering a relative value for attributes

You can change the values of several attributes by a relative amount. For example, you can add 3 to the Scale X, Scale Y, and Scale Z attributes. To do this, you must enter these arithmetic operators in the text boxes:

Arithmetic operator	Operation	Example entry
+=	Adds the entry to the existing value in each selected box	+= 3.5
-=	Subtracts the entry to the existing value in each selected box	-= 3.333
*=	Multiplies the entry to the existing value in each selected box	*= 7
/=	Divides the entry to the existing value in each selected box	/= 3

For example, suppose you've selected an object named Ball. Its Scale X and Scale Y attributes are set to 3 and 5 in the Attribute Spreadsheet.

If you select the Scale X and Scale Y text boxes, typing += 2 in the text box adds 2 to each value. So Scale X would become 5 and Scale Y would become 7.



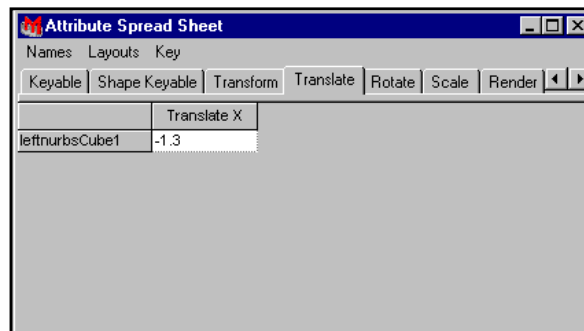
## Managing the layout of information

There are three ways to manage information in the Attribute Spread Sheet:

- Select Layouts > Show Selected Columns Only to display selected columns of information. This reduces the amount of information on your display.
- Use Layouts > Remember this Layout to save a selected layout and recall it later.
- Use Layouts > Delete Current Layout to delete a layout.

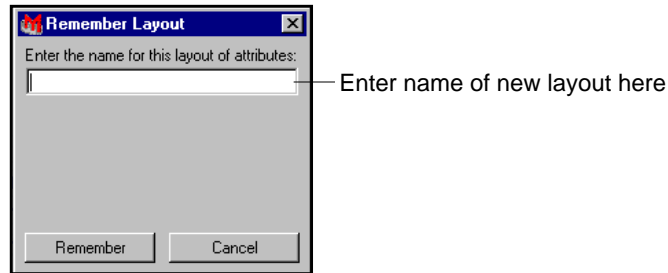
### To show selected columns:

- 1 From the Attribute Spread Sheet, select the tab that has the attributes that you want to display. Each attribute occupies a column.
- 2 Click on the title of one of the columns you want to show. Ctrl-click to select additional columns, until you have selected all the attributes you are interested in.
- 3 Select Layouts > Show Selected Columns Only. All the other columns are hidden, leaving only the ones you have selected. This layout persists until you select another tab, or close the Attribute Spread Sheet. To make the new layout permanent, follow the next set of steps.



### To remember a layout:

- 1 Select Layouts > Remember This Layout. The following window appears.



- 2 Type the name of the new layout, then click Remember. Maya adds the layout name to the existing tabs. You can now recall the layout by clicking on the tab.

### To delete a layout:

To delete a layout, select Layouts > Delete Current Layout. Maya removes the tab from the window.

---

#### Note

You can remove Maya's pre-defined tabs, but they will return the next time you open the window.

---

## Setting attribute keys in the Attribute Spread Sheet

Keys are markers that represents the value of an attribute of an object at a particular time. When the value of an attribute is different at one key from another, that attribute's value will change over time as Maya calculates the value of the attribute in the time between the keys, and that attribute is animated. The act of placing a key is called "setting a key" for that attribute at that time. For details, see *Using Maya: Animation*.

### To set attribute keys in the Attribute Spread Sheet:

- 1 Select the cells you want to set keys for.
- 2 Select Key > Key Selected.

## Specifying tool settings

Tool settings determine how a tool behaves. For example, if you are using the EP Curve Tool, you can specify whether the knot spacing is uniform or chord length.

### To change a tool's settings:

- 1 Do one of the following to open the Tool Settings window:

If the tool is represented by an icon on the Minibar, double-click on it with the left mouse button.

*or*

If the tool is in a menu, select the check box (☐) located beside the tool.

*or*

Select the tool and then select Window > General Editors > Tool Settings.

- 2 Make the desired changes and click Close.

### To return to a tool's default settings:

In the Tool Settings window, click Reset Tool.

## Duplicating a tool

Using shelves, you can have two tools with the same name but different tool settings. For example, you can have two versions of the Particle Tool.

---

### *Tips*

You cannot change the name of the tool using the Tool Settings window. If you want to change the name of the tool, see “Changing icon labels” on page 504.

To remove an icon from a shelf, drag it to the garbage can.

---

### To duplicate a tool:

- 1 Select the shelf that will contain the new version of the tool.
- 2 Select the tool that you want to duplicate.

- 3 Using the middle mouse button, drag the tool icon from the Minibar to the shelf.
- 4 Select the new version of the tool on the shelf and open the Tool Settings window (Window > General Editors > Tool Settings).
- 5 Change the tool settings.

To test whether Maya saved the settings for each tool, select the original tool and check the settings in the Tool Settings window. Leave the Tool Settings window open and select the new tool on the shelf and check the settings.

- 6 Click Close.

---

#### Note

When you drag a tool from the Minibar to the Shelf, a copy of the tool is made. If you use Ctrl-Shift to place a menu item that selects a tool on the shelf, Maya does not place a copy of a tool on the Shelf. Instead, only the action that invokes the original tool is placed on the Shelf. For more information on adding tools and actions to a shelf, see “Creating and editing shelves” on page 493.

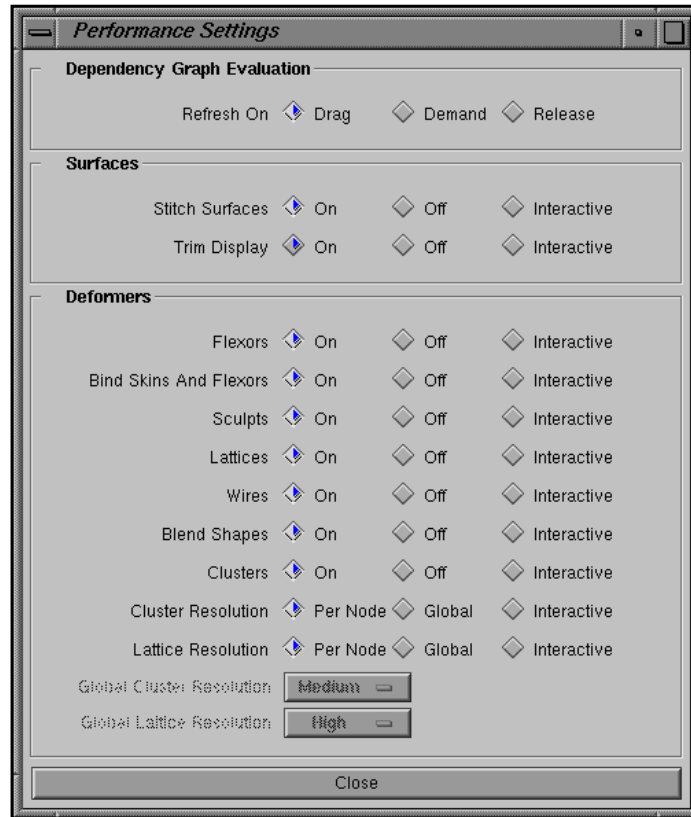
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## Specifying performance settings

You use the Performance Settings window to set when you want to refresh the screen when manipulating objects and to control complex operations, such as stitching and deformation. You can use the performance settings to suspend these complex operations during mouse interaction or to completely disable them. This improves performance by reducing the amount of evaluation necessary during interaction and playback.

#### To specify performance settings:

Select Window > Settings/Preferences > Performance Settings. The Performance Settings window opens.



### Selecting screen refresh options

To set when to refresh (or redraw the screen) when manipulating objects, in the Dependency Graph Evaluation section, select one of the following:

- Drag** Refreshes the display during the drag.
- Demand** Refreshes the display only when you release the mouse button and click the Update button that appears in the bottom right of the display window.
- Release** Refreshes the display only when you release the mouse button.

### Controlling complex operations on surfaces

To control complex operations on surfaces during mouse interaction, in the Surfaces section, select one of the following beside the surface:

On	Performs complex operations during mouse interactions.
Off	Completely disables complex operations during mouse interaction.
Interactive	Suspends complex operations during mouse interaction.

### Controlling complex operations on deformers

To control complex operations on deformers during mouse interaction, in the Deformers section, select one of the following beside the surface:

On	Performs complex operations during mouse interactions.
Off	Completely disables complex operations during mouse interaction.
Interactive	Suspends complex operations during mouse interaction.
Per Node	For Cluster Resolution and Lattice Resolution only, improves redraw performance for individual cluster or lattice deformations by setting the Use Partial Resolution attribute to partial and setting the Percent Resolution on a per node basis. For details, see <i>Using Maya: Character Setup</i> .
Global	For Cluster Resolution and Lattice Resolution only, improves the redraw performance of <i>all</i> cluster or lattice deformations. (You do not need to set the Percent Resolution for each cluster or lattice.)

Set Global Cluster Resolution and Global Lattice Resolution to Full, High, Medium, or Low. A Low setting corresponds to a low percentage, and therefore more improved performance.

For more information on surfaces, see *Using Maya: NURBS Modeling* and *Using Maya: Polygonal Modeling*. For more information on deformers, see *Using Maya: Character Setup*.

## Loading and unloading plug-ins

A plug-in is an add-on module that extends Maya's capabilities. File translators are plug-ins you use to import and export various file formats. You can create or purchase specialty plug-ins to customize Maya for a specific job.

Some features that can be added through plug-ins are:

- file translators
- tools
- objects (nodes)

- MEL commands
- device drivers

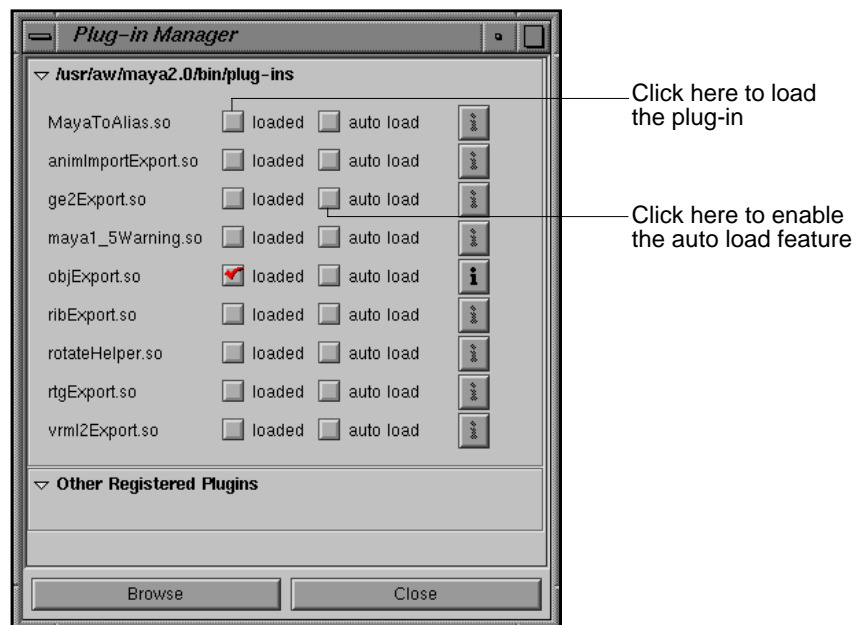
The Plug-in Manager identifies which plug-ins are loaded into Maya. If you have a plug-in that you use frequently, you can make sure it is always there. The Plug-in Manager automatically scans all the directories in the plug-in path and lists available plug-in features.

## Loading plug-ins

You can manually load plug-ins each time you run Maya, or you can have them load automatically when you start Maya.

### To load a plug-in:

Select Window > Settings/Preferences > Plug-in Manager. The Plug-In Manager window opens.



### Selecting loading options

Toggle the appropriate option beside the plug-in.

loaded

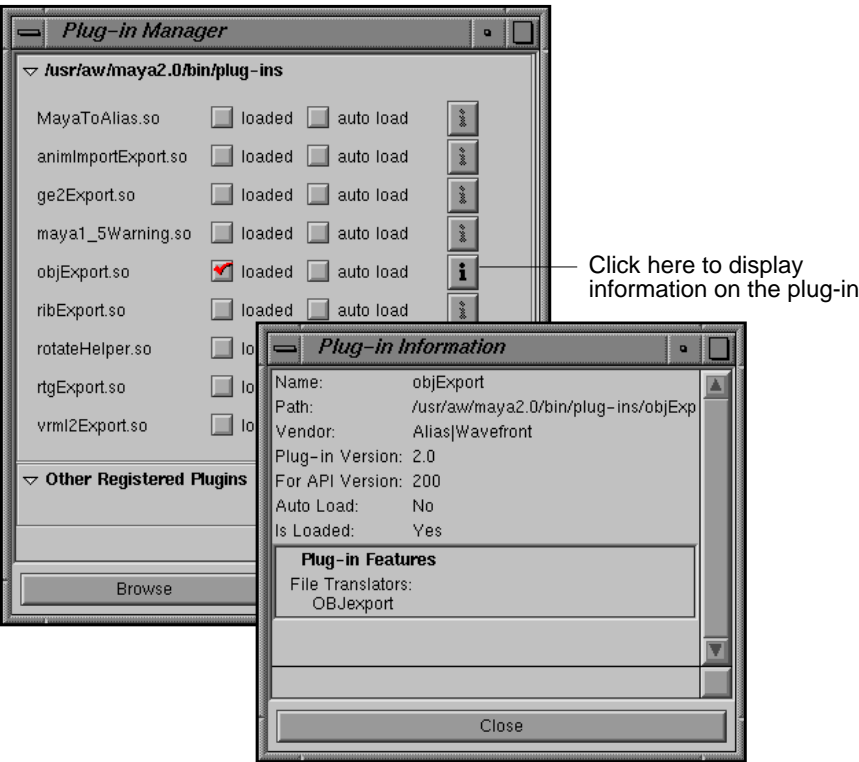
auto load

Toggle on loaded to load the plug-in for the current Maya session.

Toggle on auto load to load the plug-in so that the next time you start Maya the plug-in loads automatically.

Displaying plug-in information

To view information about a particular plug-in, you must first load it, then click the **i** button beside the plug-in.



Maya displays the following information for a selected plug-in:

Name

Path

The name of the plug-in. On IRIX, plug-ins have the extension `.so`. On NT, they have the extension `.dll`.

The location of the file. On IRIX, the default plug-in location is `/usr/aw/maya3.0/bin/plug-ins`. On NT, the default plug-in location is `drive:\aw\maya3.0\bin\plug-ins`.

Vendor	The manufacturer of the plug-in.
Plug-in Version	The version number of the plug-in.
For API Version	The version of the Maya API (Application Programmer Interface) the plug-in was compiled for.

---

*Note*

You cannot load a plug-in for any version of Maya that predates the version it was compiled for.

---

Auto Load	Indicates whether the plug-in has been marked for auto load.
Is Loaded	Indicates whether the plug-in is loaded.
Plug-in Features	Displays a list of the features added by the plug-in (for example, commands, dependency nodes, file translators).  To display additional plug-ins, click the triangle to open the Other Registered Plug-ins section.

### Unloading a plug-in

You can unload a plug-in when you finish with it. To unload a plug-in, toggle off the loaded box next to it.

If you are developing a plug-in, unload it so the source code can be changed, the plug-in recompiled, and then reloaded.

### Removing references to the plug-in

Before you can unload a plug-in, you must first remove all references to it from the Maya scene. Otherwise, Maya converts the plug-in nodes to unknown nodes. For example, if you load a shader plug-in and then unload that same shader plug-in without first removing the special shader node and all of its references in the scene, Maya will display an error message the next time you open that scene.

If you try to unload a plug-in while it is in use, a warning message will display. You can then cancel the unload or force it.

If you force the unload of a plug-in while it is in use, you cannot reload that plug-in's node. Maya converts the existing nodes to unknown nodes. When you reload plug-ins, you cannot change the type of these existing unknown nodes.

## USING THE RELATIONSHIP EDITOR

Use the Relationship Editor to edit relationships in Maya, where a relationship is a collection or grouping of objects or components. These relationships include:

- sets
- deformer sets
- character sets
- partitions
- display layers
- render layers
- shading groups
- light linking (light centric and object centric)

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### Note

The Relationship Editor is separate from the Dynamic Relationships Editor, which is used to control relationships of particle objects. See *Using Maya: Dynamics* for more information.

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For all these types of relationships, you can do the following in the Relationship Editor:

- specify view options (see “Setting view options” on page 256)
- select which relationships and objects display (“Displaying relationships and objects” on page 257)
- create and delete relationships (see “Creating relationships” on page 259)
- select members of a relationship (see “Selecting relationships, relationship members, and objects” on page 260)

- add and remove members of a relationship (see “Adding and removing relationship members” on page 261)
- filter which relationships and objects display in the Relationship Editor (see “Selecting which relationships and objects show” on page 258)

#### To open the Relationship Editor:

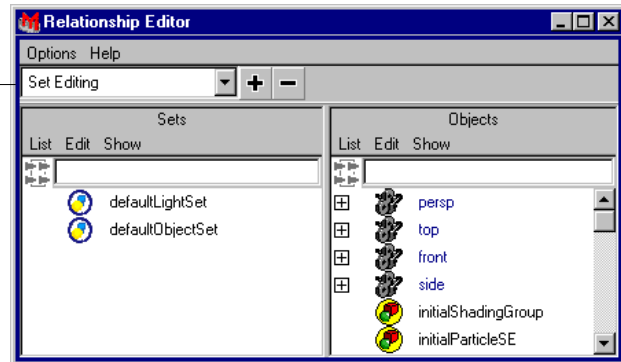
- From the main Maya window, select Window > Relationship Editors and select the relationship you want to work with. (You can change this from within the Relationship Editor.)

*or*

- From a panel, select Panels > Panel > Relationship Editor. Note that this opens the Relationship Editor in a panel rather than a separate window.

The Relationship Editor opens.

Select the type of relationship you want to work with



The left side of the editor displays relationships of the type you selected, while the right side of the editor displays objects in the scene.

## Setting view options

You can set view options for sets, partitions, characters, deformer sets, and shading groups.

You can automatically expand the relationships in the display area so you can see the members of each relationship without having to click the plus sign beside them. In the Relationship Editor, select the relationship type, then select Options > Auto Expand Frames to toggle it on.

For shading groups, you can also automatically assign a random color to new shading groups when you create them. In the Relationship Editor, select Options > Assign Color to New Groups. For details, see *Using Maya: Rendering*.

## Displaying relationships and objects

Using the List menu, you can control which relationships are loaded in the left panel of the Relationship Editor, and which objects are loaded in right panel. By default, all relationships and objects display, but you may want to limit the display so you can see what you're working on more clearly.

You can also control what displays in the Relationship Editor using the Show menu. For details, see "Selecting which relationships and objects show" on page 258.

### To display relationships:

On the left panel, select one of the following options from the List menu.

**Auto Load All** Toggle this on to automatically display *all* relationships of the selected type in the scene. This is the default.

**Manual Load** Toggle this on to display relationships by choosing one of the following options:

**Load from Selection** – Display only the relationships associated with the objects selected in the scene.

**Add from Selection** – Add to the display the relationships associated with the objects selected in the scene.

**Remove from Selection** – Remove from the display the relationships associated with the objects selected in the scene.

### To display objects:

On the right side panel, select one of the following options from the List menu.

**Auto Load All** Toggle this on to automatically display *all* objects in the scene.

**Auto Load Selection** Toggle this on to automatically display objects in the relationships associated with the objects selected in the scene.

**Manual Load** Toggle this on to display objects by choosing one of the following options:

**Load List from Selection** – Display only the selected objects.

**Add Selection to List** – Add to the display the objects selected in the scene.

**Remove Selection from List** – Remove from the display the objects selected in the scene.

### Selecting which relationships and objects show

You can display a subset of relationships and objects in the Relationship Editor using the Show menu. What you can display depends on the relationship you are editing.

For more information, see “Limiting the information shown in editors” on page 311.

#### To select which relationships show:

- In the left panel of the Relationship Editor, select Show > Objects, then select the types of relationships you want to show. Only the items you select will display in the left panel.

*or*

- Type text in the Text Filter box to limit the display to items with that text. For details, see “Limiting the display to items containing specific text” on page 312.

#### To show all relationships:

- In the left panel of the Relationship Editor, select Show > Objects, then toggle off the items you now want to show.

*or*

- To show all types of relationships, select Show > Show All.

#### To select which objects show:

- In the right panel of the Relationship Editor, select Show > Objects, then select the types of objects you want to show. Only the items you select will display in the right panel.

*or*

- Type text in the Text Filter box to limit the display to items with that text. For details, see “Limiting the display to items containing specific text” on page 312.

**To show all objects:**

- In the right panel of the Relationship Editor, select Show > Objects, then toggle off the items you now want to show.

*or*

- To show all types of objects, select Show > Show All.

## Creating relationships

From the Relationship Editor, you can create the following relationships:

- sets (see “Creating sets” on page 375)
- partitions (see “Creating, displaying, and removing partitions” on page 381)
- characters (see *Using Maya: Character Setup*)
- display layers (see “Using display layers” on page 139)
- render layers (see “Using render layers” on page 147)
- shading groups (see *Using Maya: Rendering*)
- light sets and object sets (see *Using Maya: Rendering*)

You cannot create deformer sets.

In general, use the following procedure to create a new relationship.

**To create a relationship in the Relationship Editor:**

- 1 Select the objects or items in the workspace, Outliner, or elsewhere.  
If you don’t select any objects or items, an empty set will be created. You can add to it later. See “Adding and removing relationship members” on page 261.
- 2 Open the Relationship Editor (see “To open the Relationship Editor:” on page 256).
- 3 Select the type of relationship you want to create, if it isn’t already selected.

- 4 For sets, partitions, and characters:
  - On the left panel of the editor, select Edit > Create *Relationship* □, where *Relationship* is the type of relationship you are creating (set, partition, character). An Options window opens.
  - In the Name box, type a name for the set. For example, if you are creating a set with polygonal objects, you might call the set polyObjects.
  - Click Apply.
- 5 For shading groups, light sets, or object sets, select Edit > Create *Relationship*, where *Relationship* is the type of relationship you are creating (shading group, shading group (force), partition, character, display layer).
- 6 The new set appears on the left side of the Relationship Editor.  
 If a relationship or other item in the scene already has the specified name, the new set name will be appended with a number. For example, entering top results in top1, because top is the name of a camera that exists in every scene by default.

#### To rename a relationship in the Relationship Editor:

Double-click the name of the relationship and type the new name.

#### To delete a relationship in the Relationship Editor:

In the left panel, click on the relationship you want to delete and select Edit > Delete Highlighted.

## Selecting relationships, relationship members, and objects

You can use the Relationship Editor to quickly select relationships, members of relationships, and objects in your scene.

When you select a relationship, it becomes active in the channel box, or the Attribute Editor.

#### To select a relationship:

- 1 In the left panel of the Relationship Editor, click the relationship(s) you want to select. Notice that member of the set are highlighted in the Objects panel.
- 2 Select Edit > Select Highlighted. The relationship(s) becomes active.

**To select set members:**

- 1 In the left panel of the Relationship Editor, click the relationship(s) with the members you want to select.
- 2 Select Edit > Select Set Members. The members of the highlighted set are selected in the scene.

**To select objects in your scene:**

- 1 In the right panel of the Relationship Editor, click the object(s) you want to select in your scene.
- 2 Select Edit > Select Highlighted. The highlighted objects are selected in your scene.

## Adding and removing relationship members

Use the Relationship Editor to quickly add and remove objects or items from a relationship.

**To add objects or items to a relationship:**

- 1 In the left panel of the Relationship Editor, click the relationship you want to add objects or items to.
- 2 In the right panel of the Relationship Editor, click on the objects or items you want to add to the relationship.

*or*

In the scene, select the objects or items you want to add to the relationship and select Edit > Add Selected Items or click the large plus sign beside the relationship type at the top left of the Relationship Editor.

**To remove objects or items from a relationship:**

- 1 In the left panel of the Relationship Editor, expand the relationship you want to remove objects or items from by clicking the plus sign (+) beside it, if it is not already expanded.
- 2 Still in the left panel, click on the object or item you want to remove from the expanded relationship and select Edit > Remove Highlighted from Set.

or

- 1 In the left panel of the Relationship Editor, click the relationship you want to remove objects or items from.
- 2 In the Object panel of the Relationship Editor, click on the highlighted objects or items you want to remove from the relationship.

or

In the scene, select the objects or items you want to remove from the relationship and select **Edit > Remove Selected Items** or click the large minus sign beside the relationship type at the top left of the Relationship Editor.

## USING THE ATTRIBUTE EDITOR

Use the Attribute Editor to view and set the attributes for any object or node. For example, you can use the Attribute Editor to change the rotation order of an object (that is, the rotation order under the scale/rotate/translate attributes.) You can also use the Attribute Editor to toggle many items in the Display menu on and off. The Attribute Editor provides access to *all* attributes for an object or node.

You can also use the Channel Box and the Attribute Spreadsheet to view and set attributes. The Channel Box provides access to keyable attributes only. For information on the Channel Box, see “Using the Channel Box” on page 280. The Attribute Spreadsheet provides access to all attributes, and lets you change attribute values for multiple objects at the same time. For information on the Attribute Spreadsheet, see “Using the Attribute Spreadsheet” on page 241.

### Displaying the Attribute Editor

The Attribute Editor displays in a separate window or in the main Maya window, depending on your preference settings (**Window > Settings/Preferences > Preferences**, Interface category).

**To open the Attribute Editor:**

Do one of the following:

- Select **Windows > Attribute Editor**.

- Press Ctrl-A in the view.
- Right click on the object or node and select it from the marking menu.
- Select Display > UI Elements > Attribute Editor.
- In the Hypergraph, select the object or node, then select Edit > Attributes.
- Double-click a node in the Hypershade, Visor, Multilister, or Outliner.



#### To change the default display of the Attribute Editor:

- 1 Select Window > Settings/Preferences > Preferences, Interface category.
- 2 Select one of the following options beside Open Attribute Editor:

#### In Separate Window

Opens the Attribute Editor in a separate window.


#### In Main Maya Window

Opens the Attribute Editor in the Main Maya window where the Channel box normally resides. You can switch between displaying the Attribute Editor and Channel Box from the Display > UI Elements submenu. (You cannot display both the Attribute Editor and the Channel Box in the main Maya window at the same time.)

#### Common attributes and buttons

Each tab in the Attribute Editor represents an individual node and contains all the attributes for that node. Click a tab to display and modify the attributes for that node. For details about specific attributes, refer to the appropriate *Using Maya* book.

The following attributes and buttons are common to most Attribute Editor tabs.

- the name of the node (for example, nurbsSphere1 or lambert1)
- Input Connection button 

Hold down the left mouse button on the Input Connection button to display the first input connection node for the currently displayed node. Hold down the left mouse button on the Input Connection button to display a list of all input connection nodes. You can then choose a node from this list to display in the Attribute Editor.

- Output Connection button 

Hold down the left mouse button on the Output Connection button to display the first output connection node for the currently displayed node. Hold down the right mouse button on the Output Connection button to display a list of all output connection nodes. You can then choose a node from this list to display in the Attribute Editor.

- Focus button — Click this button to set the Attribute Editor focus to this node
- a sample image or icon that represents the node (where appropriate)
- Select button — Click this button to select the node that is currently displayed in the Attribute Editor.

- **Load Attributes button** — Click this button to manually load the attributes of the selected object or node.

### Menus

The Attribute Editor has the following menus:

List	Use this menu to load attributes into the Attribute Editor and to define which items display in the Selected/Object menu. See “Loading object attributes into the Attribute Editor” on page 266.
Selected/Object	The Selected menu lists objects currently selected in the scene while the Object menu displays all the objects in the scene of a selected type. See “Loading attributes from the Selection/Object menu” on page 267.
Copy	Use this menu to display the selected tab as a separate window. See “Viewing attributes for different objects at the same time” on page 268.
Focus	This menu displays all nodes that have been selected in the scene while the Attribute Editor is open. The most recently selected node is at the top of the list. “Loading attributes from the Focus menu” on page 268.
Add	Use this menu to add extra attributes to an object or node. These appear under the Extra Attributes section. You can also add attributes by selecting Modify > Add Attribute. See “Adding a custom attribute” on page 269.

### Right-click menu options

For some attributes, a pop-up menu appears when you right-click the attribute name or text box. This pop-up menu has the following options:

#### ***output connection node***

If you set a key for the attribute or connect a texture to it, the resulting output connection node name displays as the first menu item. To load the attributes for this node into the Attribute Editor, select it.

#### **Create New Expression**

Select this option to create a new expression for the attribute. For details, see “Launching the Expression Editor” on page 275.

#### **Set Key**

Select this option to set a key for the attribute. For details, see “Setting keys for attributes in the Attribute Editor” on page 273. This options disappears from the menu if you have already connected a texture to the attribute.

- Set Driven Key**      Select this option to link the attribute values. For details, see “Linking attributes” on page 274.
- Break Connection**      Select this option to break the connection between the attribute and a key or texture. For details, see “Breaking connections” on page 274.
- Create New Texture**      Select this option to connect a texture to the attribute. For details, see “Mapping a texture to an attribute value” on page 275.
- Color Chooser**      This option displays for color attributes only. Select it to open the Color Chooser. For details, see “Using the Color Chooser” on page 276.

**Lock/Unlock Attribute**

Select the Lock option to lock an attribute value so that it cannot be changed. Use Unlock Attribute to unlock the value. For details, see “Locking attribute values” on page 274.

**Ignore/Don’t Ignore when Rendering**

This option displays only for attributes that are connected to keys or textures. Select the Ignore when Rendering option to ignore the connection when rendering. If the attribute has a map button, the button changes to indicate that the connection will be ignored.



Indicates that the attribute is connected to a key or texture



Indicates that the connection will be ignored when rendering

Select the Don’t Ignore when Rendering option to render with the set connection. For details, see *Using Maya: Rendering*.

## Loading object attributes into the Attribute Editor

Loading attributes into the Attribute Editor makes them available to view or edit. There are three ways to load object attributes into the Attribute Editor:

- automatically when you select the object
- manually
- by selecting the object from the Attribute Editor Selected/Object menu
- by selecting the object from the Focus menu

## Loading attributes automatically

When you select an object, its attributes are automatically loaded into the Attribute Editor where you can view and edit them. Each node of the selected object automatically appears as a tab. This is the default method.

### To automatically load attributes for selected objects:

In the Attribute Editor, select List > Auto Load Selected Attributes to toggle it on.

---

#### Note

If you select more than one item, Maya automatically updates the most recently selected one (that is, the most recent one in the pick list).

---

## Loading attributes manually

If Auto Load Selected Attributes is toggled off, after selecting an object, you must manually load the object's attributes into the Attribute Editor to view and edit them.

### To manually load attributes for selected objects:

- In the Attribute Editor, select List > Load Selected Attributes.
- or*
- Click the Load Attributes button at the bottom of the Attribute Editor.

## Loading attributes from the Selection/Object menu

By default, the menu that appears beside the List menu is the Selection menu. It lists all selected objects in the scene so they are readily available for loading into the Attribute Editor. To list selected objects in the Selection menu, select List > Selected Items.

Instead of listing selected objects for easy availability in the Attribute Editor, you can list objects of a specified type. If you choose to do this, the menu that appears beside the List menu becomes the Object menu. To list all objects in the scene of a specified type, select the object category from the

List menu (Dynamics, Kinematics, Deformers, Lights, Shading), then select the object. For example, to list all joints in the scene under the Object menu, select List > Kinematics > Joints.

#### To load attributes for objects in the Selected/Object menu:

In the Attribute Editor, select Selected > *objectName*, where *objectName* is the name of the object you want to load into the Attribute Editor.

#### Loading attributes from the Focus menu

The Focus menu displays all nodes that have been selected in the scene while the Attribute Editor is open. You can think of it as a history of the nodes you've viewed in the Attribute Editor. The most recently selected node is at the top of the list.

Use it to redisplay the attributes for these nodes.

#### To redisplay node attributes:

In the Attribute Editor menu bar, select Focus, then select the node you want to load. The attributes for the selected node appear in the Attribute Editor.

## Viewing attributes for different objects at the same time

You can simultaneously view attributes for multiple objects by opening multiple copies of the Attribute Editor.

#### To view attributes for different objects at the same time:

- 1 Select the first object and load the attributes into the Attribute Editor. (See “Loading object attributes into the Attribute Editor” on page 266.)
- 2 In the Attribute Editor, select Copy > Tear Off Copy to create another version of the Attribute Editor. It appears as a separate window with the attributes for the selected object loaded.
- 3 Select the next object and load the attributes into the original Attribute Editor. Note that the attributes for the first selected object remain loaded in the copy of the Attribute Editor.
- 4 Repeat steps 2 and 3 for each other object you want to view attributes for simultaneously.

## Adding a custom attribute

Custom attributes are attributes you optionally add and define from the Add Attribute window. Although custom attributes are dynamically added to an object, we refer to them as custom to distinguish them from the built-in dynamic attributes.

Custom attributes have no direct effect on any characteristic of an object in Maya. You can use them to control a combination of other attributes. You might also use a custom attribute as a variable—a place to store a value temporarily to be read by other attributes.

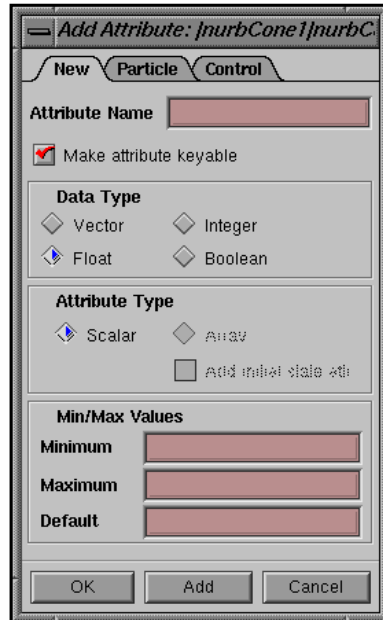
When you add a custom attribute to an object, it appears in the Extra Attributes section of the Attribute Editor (and in the Channel Box, if you make the attribute keyable).

For practical examples of when you would add extra attributes, see *Using Maya: Expressions*.

For details on deleting a custom attribute, see “Deleting or renaming custom attributes” on page 271.

To create a new attribute definition:

- 1 In the Attribute Editor, select Add > Add Attributes and click the New tab.



- 2 Set the new attribute options as follows and click the Add button.

To view the new attribute controls, expand the Extra Attributes section in the Attribute Editor.

### Setting new attribute options

**Attribute Name** Type the name of the attribute you are adding.

**Make Attribute Keyable**

Toggle this option on to make this attribute keyable. For information about keyable attributes, see *Using Maya: Animation*.

**Data Type** Select the data type for the attribute:

**Vector** – Creates a vector attribute consisting of three floating point values.

**Float** – Creates a floating point attribute.

**Integer** – Creates an integer attribute.

Attribute Type	<b>Boolean</b> – Creates an attribute consisting of an on/off toggle.
	If you select Vector or Integer, you can also set Min/Max Values.
	Select a type:
	<b>Scalar</b> – Creates a per object attribute that you can set to a single value that applies to every particle in the object. A vector scalar is considered a single value with three numbers. If you select Scalar, you can specify Minimum, Maximum, and Default values for a Float or Integer attribute.
	<b>Array</b> – Creates a per particle attribute. You can set this type of attribute to different values for each particle. If you select Array, you can also create a counterpart initial state attribute by turning on Add Initial State Attribute.
	<b>Add Initial State Attribute</b> – Toggle on to create a corresponding initial state attribute for the added attribute. Without this corresponding attribute, you can't save a particle object's current attribute values for initial state usage. You must write a creation expression if you decide to initialize the custom attribute's value upon rewinding the animation. If you know you're going to write a creation expression for a custom attribute, you can set Add Initial State Attribute to off when you add the attribute. Otherwise, set Add Initial State Attribute to on whenever you add a custom per particle attribute.
	<b>Min/Max Values</b> For scalar attributes, Minimum and Maximum set the lowest and highest values you can enter for the attribute in the Attribute Editor or Channel Box. Default sets the default value for the attribute.

## Deleting or renaming custom attributes

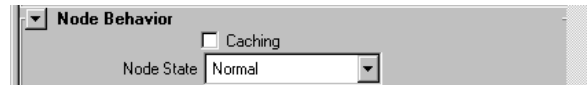
You can delete custom (or *dynamic*) attributes from either the main menu (Modify > Delete Attributes) or from the Attribute Editor (Attributes > Delete Attributes). You cannot delete built-in dynamic attributes.

To change the attribute's label, Rename Attributes from the Modify or Attributes menu.

## Changing node behavior

You can improve Maya's performance by changing node behavior settings.

To change node behavior, select the node and expand the Node Behavior section of the Attribute Editor.



### Caching

Toggle Caching on to temporarily store upstream node evaluations in the cache. When Maya needs these evaluations (as input to the node), it uses the information stored in the cache rather than re-evaluating the upstream node. If no changes have been made to the node, it redraws more quickly. The cache is destroyed when you edit an attribute. Note that caching uses more memory, which could affect Maya's performance.

### Node State

Changing the node state can improve performance. There are six possible node states:

**Normal** – Causes the node to behave normally, according to the defined settings and effects. This is the default.

**HasNoEffect** – Disables any effects on the node so that fewer calculations are necessary at the time of redraw. Note that the effect will not render until you reset the Node State back to Normal. Maya evaluates the nodes in the node's history, but not the node itself.

For example, if you translate a cluster to deform a geometry, then set the Node State of the cluster node to HasNoEffect, the geometry will appear undeformed, as though the translation had not occurred. To view the effect, change the Node State back to Normal.

**Blocking** – Temporarily hides the node and does not display the results of any input (upstream evaluations) to the node. This can speed the redraw. It is also useful when you have complex scenes and want to edit only one aspect of a node. Blocked nodes do not render.

For example, if you have a complex revolved surface and want to edit the curve, but don't want to wait while the curve redraws, select Blocking and edit the curve. To display the modified revolved surface, reset the Node State to Normal.

Note that Blocking has no effect on deformers.

**Waiting-Normal** – If the dependency graph refresh performance setting (Window > General Editors > Performance Setting) is set to Demand or Release, the node will take the Normal state when in the Hypergraph you select Update or release the mouse button.

**Waiting-HasNoEffect** – If the dependency graph refresh performance setting (Window > General Editors > Performance Setting) is set to Demand or Release, the node will take the HasNoEffect state when in the Hypergraph you select Update or release the mouse button.

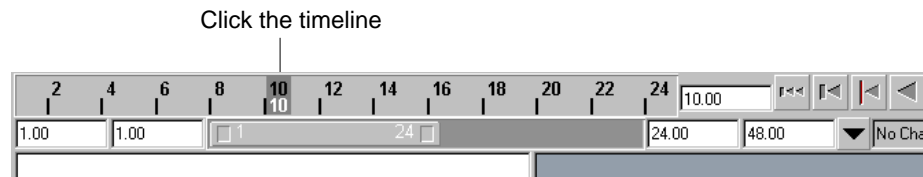
**Waiting-Blocking** – If the dependency graph refresh performance setting (Window > General Editors > Performance Setting) is set to Demand or Release, the node will take the Blocking state when in the Hypergraph you select Update or release the mouse button.

## Setting keys for attributes in the Attribute Editor

You can set a key for an object attribute in the Attribute Editor. For details about keys, see *Using Maya: Animation*.

To set a key for one attribute:

- 1 Select the object.
- 2 Click the timeline frame number where you want to set the key.



- 3 In the Attribute Editor, select the attribute value.
- 4 Type the value of the attribute and press Enter.
- 5 Right-click the attribute name or text box and select Set Key. This sets the key for the object attribute value.

---

*Tip*

To set a key for all attributes, use the Channel Box. For details, see “Setting keys for attributes from the Channel Box” on page 291.

---

## Linking attributes

Maya has a special type of key called a *driven* key that links one attribute value to another. When you create a driven key, you specify a driver attribute value and a driven attribute value. The value of the driven attribute is locked to a corresponding value of the driver attribute.

You can link attributes from the Attribute Editor by right-clicking the attribute text box or label and selecting Set Driven Key. For details, see *Using Maya: Animation*.

## Breaking connections

In the Attribute Editor, the text box for an attribute that is connected to an expression, key, or other attribute (for example texture attribute) is displayed in a different color, depending on your color settings.

**To break a connection:**

- 1 Select the object.
- 2 In the Attribute Editor, right-click the attribute name or text box and select Break Connections.

## Locking attribute values

You can lock an attribute value to avoid accidentally changing it later.

**To lock an attribute:**

- 1 Select the object.
- 2 In the Attribute Editor, set the attribute value you want to lock.
- 3 Right-click the attribute name or text box and select Lock Attribute.

This locks the value. The Attribute Editor displays locked attributes with a gray background. (This color may not be visible while the text box is selected.)

When you've locked an attribute, you cannot change its value in the Attribute Editor, Channel Box, the workspace, or elsewhere.

You must unlock the attribute to change its value.

#### To unlock an attribute

- 1 Select the object.
- 2 In the Attribute Editor, right-click the attribute name or text box and select Unlock Attribute.

## Launching the Expression Editor

You can launch the Expression Editor for the attribute selected in the Attribute Editor.

#### To start the Expression Editor:

In the Attribute Editor, right-click the attribute name or text box and select Create New Expression. The Expression Editor opens.

For details on its use, see *Using Maya: Expressions*.

## Mapping a texture to an attribute value


You can map textures to non-keyed attributes in the Attribute Editor.

#### To map a texture to an attribute value:

- In the Attribute Editor, right-click the attribute name or text box and select Create New Texture.

or

- Click the map button beside the attribute .

The button changes to indicate there is a connection.  Click this button to view the attributes for the connected node.

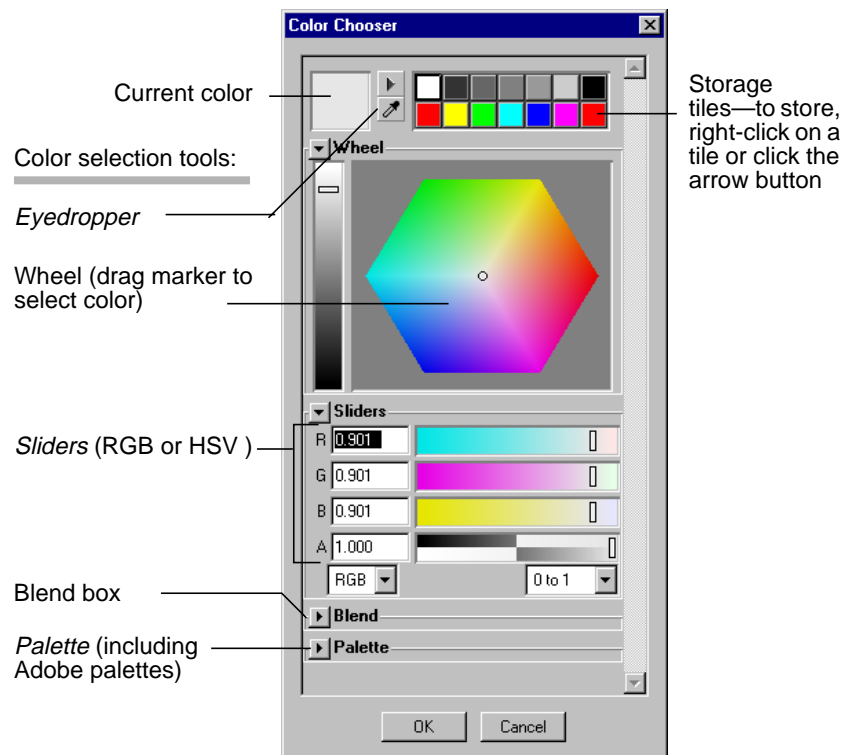
The Create Render Node window opens. For details, see *Using Maya: Rendering*.

## USING THE COLOR CHOOSER

The Color Chooser is a color selection tool that launches when you click a color attribute in the Attribute Editor. (It also opens when assigning interface colors in the Colors window; see “Changing color settings” on page 482 for more information.)

When you select a new color in the Color Chooser, it becomes the current color, shown in the top left tile of the Color Chooser and also in the color block of the Colors window or Attribute Editor. You can then close the Color Chooser.

The Color chooser has several color selection tools. Review the following illustration and topics for an explanation.



## Using the color wheel and storage tiles

The fastest way to select a color is to drag the selector in the color wheel. Once you have the color selected, you can drag the brightness control on the left.

Another quick way to select a color is to left click on one of the storage tiles at the top. To store the current color on a tile, right click a tile or click the arrow button.

## Using the eyedropper

The eyedropper tool lets you grab a color from anywhere on the computer screen, including other applications. The eyedropper operates differently on Windows NT and IRIX:

- On NT, click the eyedropper button, hold down the mouse button, and drag the eyedropper cursor to any position on your screen. Release the mouse to grab the color.
- On IRIX, click and release the eye dropper button, then position the eyedropper cursor anywhere on your screen. Click again to grab the color.

You can also type *grabColor* in the Command Line to grab the color under the eyedropper cursor. On NT, this command only works within Maya-related windows.

## Using the sliders

For precise color selection, you can use the color sliders. You can switch between RGB sliders (Red, Green, Blue) or HSV (Hue, Saturation, Value), depending on the color model you want.

### HSV

In this color model, Hue corresponds to the pure colors of the rainbow, such as yellow, blue, and green. Saturation is the amount of white mixed with the hue to set the intensity of the color. Value is the amount of black mixed with the hue to make it darker. If the Value is 0 (zero), then the color is black, regardless of the values for Hue and Saturation.

### RGB

This color model describes how red, green, and blue light combines at different intensities to produce different colors. Using RGB, you can choose which value range you want:

**0 to 1** – Each component color has a value from 0 to 1.

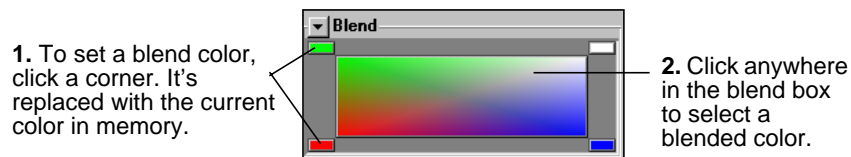
**0 to 255** – Each component color has a value from 0 (zero intensity) to 255 (full intensity). This model is useful because it relates directly to how monitors emit light to create colors. However, it is often hard for people to figure out what the RGB values are for a specific color.

#### A (alpha) slider

With the A (alpha) slider, you can control the opacity or transparency of the color you choose. Many Maya options already have an alpha or transparency control, but if it does not or you are calling the Color Chooser from the command line, you can use this slider to control the alpha channel.

### Using the Blend box

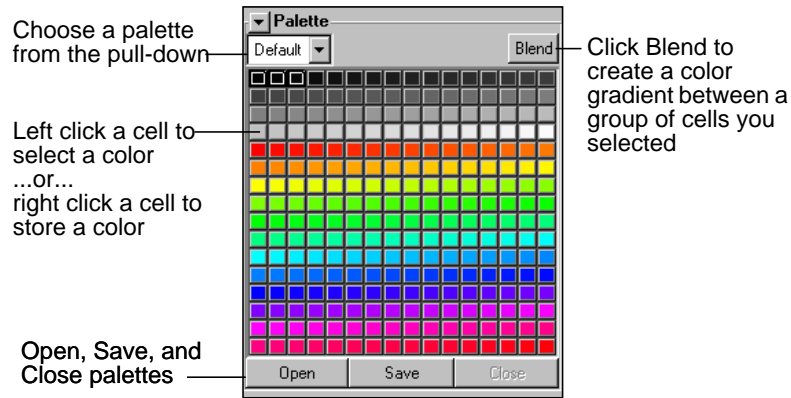
The Blend box creates a blend between colors so that you can select a new color from the blended gradient. The following illustration explains how to use it.



### Using the Palette

In the Palette section, you can create and save custom color palettes. You can also open Adobe color palettes (file extension .aco), if it is in one of the following formats: RGB, HSV, CMYK, Lab, or Inverted Lab. (Other formats, such as Pantone, are not supported.)

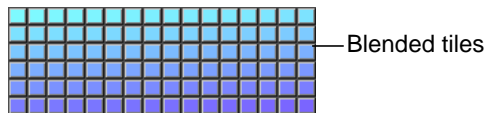
The following illustration highlights the palette components.



#### To create a custom palette

- 1 Select a color using any of the Color Chooser tools, such as the Wheel.
- 2 Right click on any tile to store the current color there.
- 3 To create a blended gradient, select several tiles by dragging the mouse, then click Blend.

A color gradient is created between the first and last tiles in your selection. For example, as shown below, you may want more color gradations than in the default palette.



- 4 When finished assigning colors, click Save and specify the filename. You can save the file in any directory. It is saved in ascii format.

## USING THE CHANNEL BOX

Like the Attribute Editor, you use the Channel Box to modify an object's attribute values. The Channel Box is different from the Attribute Editor in that:

- It displays only the keyable attributes for the selected object. (You can make an object keyable, and therefore display in the Channel box by selecting Windows > Channel Control. For information on using Channel Control, see *Using Maya: Animation*.)
- You can change multiple attribute values of multiple objects (see “Entering values for attributes” on page 285)
- It takes up much less space in the window.
- You can control construction history.

The information displayed in the Channel Box varies, depending on what kind of object or component you have selected. If you haven't selected an object, the Channel Box region is blank.

### Displaying the Channel Box

The Channel Box appears in the Maya window only if you choose to display it. It appears to the right of the workspace.

---

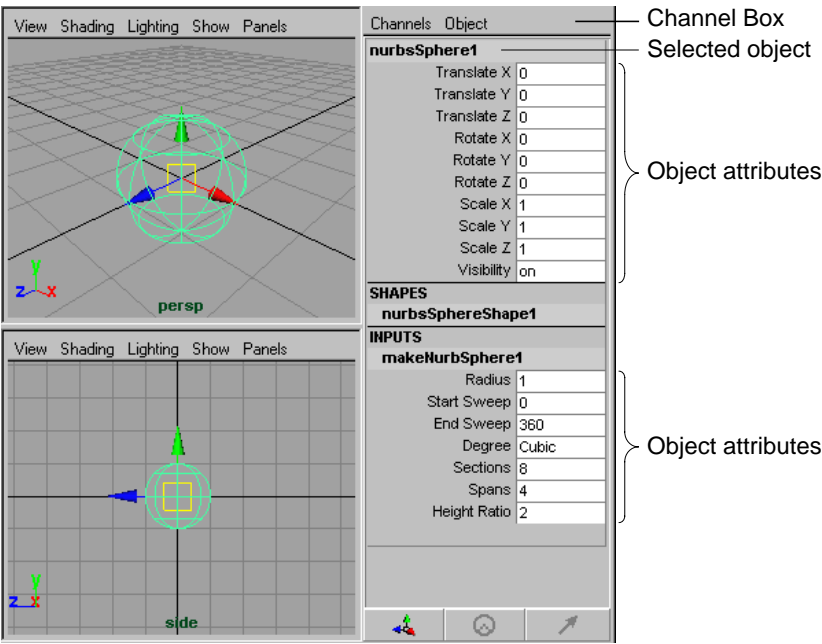
#### Note

You can display either the Channel Box or the Attribute Editor in the main Maya window, but not both.

---

#### To display the Channel Box:

- 1 Select the object (or component) that has the attributes you want to modify.
- 2 If the Channel Box is not already displayed, turn on Display > UI Elements > Channel Box. The following example shows the attributes of a selected sphere in the Channel Box.



### Displaying object attributes

When you select a geometric object, the Channel Box displays these sections:

Section	Usage
<i>objectName</i>	Lists the keyable transform attributes that translate, scale, and rotate the object's absolute position in the world space. Also shows the object's visibility attribute.
SHAPES	Lists the names of nodes that define the geometry of the object. Other nodes, such as related particle emitters may be found here.
INPUTS	Lists the names of other nodes that affect this one. Typically, these comprise the "construction history" of the node.

Section	Usage
OUTPUTS	Lists the names of the output nodes (nodes that receive data) for this node.

If you've selected two or more objects, the Channel Box displays the attributes for the last object selected only. To display the attributes in the Channel Box of another selected object, select **Object > *objectName***.

Note that edits you make in the Channel Box will affect **all selected objects** of the same type as the one displayed.

#### Note

When you set an attribute value using an expression or a Key, the attribute text box displays in a different color. (The actual color depends on which color scheme you are using.)

## Adding attributes to the Channel Box

The Channel Box includes keyable attributes only. To add an attribute to the Channel Box, you must make it keyable.

#### To make an attribute keyable:

- 1 Select the objects that have the attribute(s) you want to make keyable.
- 2 Select **Window > General Editors > Channel Control** and click the **Keyable** tab. The Channel Control window opens.
- 3 In the **Non Keyable** box, select the attributes you want to make keyable. Ctrl- or Shift-click to select more than one attribute.
- 4 If you selected more than one object, toggle on **Change all selected objects of the same type** to enable the editing of attributes common to the selected objects.
- 5 Click **Move**. The selected attributes move to the **Keyable** box.
- 6 Click **Close**. The attributes appear in the Channel Box.

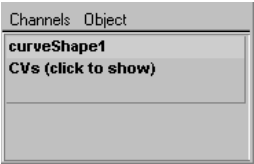
## Displaying component attributes

If you display attributes of an object component, the Channel Box displays only one section for shape attributes that pertain to the component.

For example, suppose you’ve created a NURBS curve with the following CVs:



If you turn on component selection mode (in the Main menu bar) and select the CVs, the Channel Box displays this:

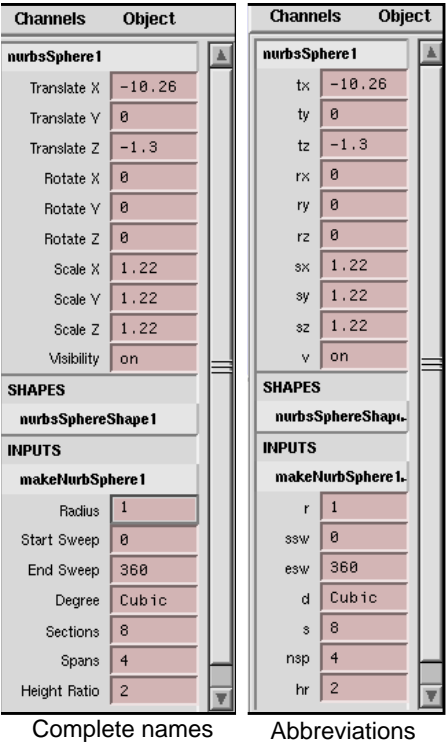


You can display the CV values in the Channel Box and enter new values. To display the values, click CVs (click to show) in the Channel Box.

	X	Y	Z
0	-5.54	0	6.29
1	-8.09	0	-1.75
2	-1.49	0	-4.43
3	-3.58	0	-14.02
4	-14.91	0	-25.49

### Changing the display format

To make more workspace available while you display the Channel Box, you can display abbreviations for the attribute names.



To display attribute name abbreviations:

In the Channel Box, select Channels > Channel Names > Short.

There are three choices for names: Long displays the full, correct channel name, Short displays the abbreviation, and Nice displays the name in the most readable form.

Tip

The Channel Box is set to only show two decimal places of precision. You can increase this precision up to fifteen places by entering the *channelBox* command from the Command Line. For example, to increase the precision to 4, use this command:

```
channelBox -edit -precision 4 mainChannelBox;
```

Entering values for attributes

With a single entry from your keyboard, you can change the value of:

- a single attribute of one or more objects
- two or more attributes of the same object
- two or more attributes of multiple objects

Object 1	Object 2	Object 3	Object 4
Scale Y	Scale X Scale Y Scale Z	Scale X Scale Y	Scale X Scale Y

You can set any of these combinations with one text entry.

For example, you can enter the value 5 in one text box to change the three attributes for scaling along the X, Y, and Z axis.

You can also change the values of several attributes by a relative amount. For example, you can add 3 to the Scale X, Scale Y, and Scale Z attributes.

Tip

When you enter a value in the Channel Box, you can press the tab key or one of the Enter (or Return) keys. If you press the Enter key on the numeric keypad, the keyboard focus will stay in the Channel Box. If you press the other Enter key, the keyboard focus will go back to the last selected panel.

Entering an exact value for object attributes

You can give one or more attributes an exact value as follows:

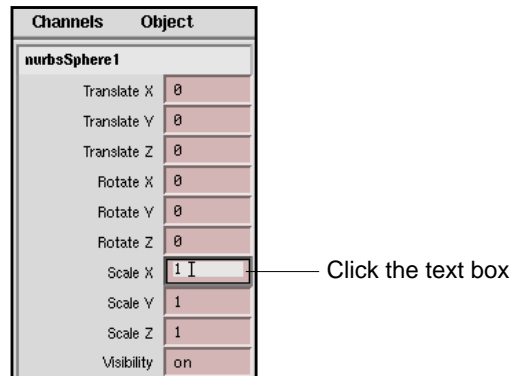
To change the value of a single attribute of one or more objects:

- 1 Select the object or objects.

For example, select the object from the Outliner or in the workspace. If you select two or more objects, the Channel Box displays only the attributes of the object you selected last.

- 2 In the Channel Box, click the attribute's text box.

For example, click the Scale X text box.



- 3 Type the new entry and press Enter.

For example, type 5 and press Enter. For a Scale X entry, this sets the X axis scaling of all selected objects to 5 grid units.

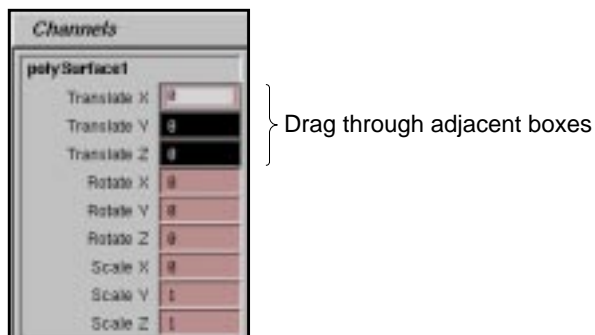
To change the value of two or more attributes of the same object:

- 1 Select the object.

- 2 In the Channel Box, select the desired attribute text boxes.

For example, you can click the Translate X text box and drag through to the Translate Z text box.

The first box you click is where you enter the value. The other selected text boxes turn black. This lets you know they're selected in addition to the box where you'll type the new number.



### Tip

You can select multiple text boxes:

- To select several adjacent boxes, drag through them.
- To add a non-adjacent box to a selection, Ctrl-click the additional box.
- To select a range of boxes, click the first box and Shift-click the last box.

### 3 Type the new entry and press Enter.

For example, type 5 and press Enter. If X translate, Y translate, and Z translate are selected when you enter 5, all three attributes become 5.

**To change the value of two or more attributes of multiple objects:**

- 1 Select the objects.
- 2 In the Channel Box, select the attribute's text boxes.
- 3 Type the entry and press Enter.

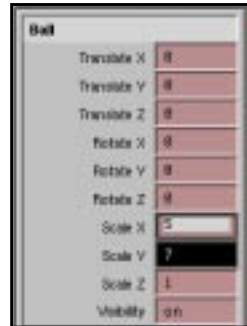
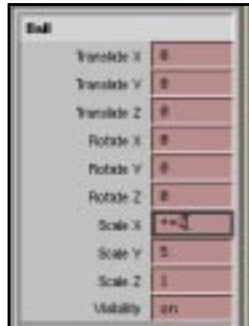
### Entering a relative value for attributes

You can change the values of several attributes by a relative amount. For example, you can add 3 to the Scale X, Scale Y, and Scale Z attributes. To do this, you must enter these arithmetic operators in the text boxes:

Arithmetic operator	Operation	Example entry
+=	Adds the entry to the existing value in each selected box	+= 3.5
-=	Subtracts the entry to the existing value in each selected box	-= 3.333
*=	Multiplies the entry to the existing value in each selected box	*= 7
/=	Divides the entry to the existing value in each selected box	/= 3

For example, suppose you've selected an object named Ball. Its Scale X and Scale Y attributes are set to 3 and 5 in the Channel Box.

If you select the Scale X and Scale Y text boxes, typing += 2 in the text box adds 2 to each value. So Scale X would become 5 and Scale Y would become 7.



## Entering values using manipulators

By default, when you click an object's translate, rotate, or scale attribute name (such as Translate X), manipulators appear on the object in the workspace.

The manipulators are the same ones displayed with the Move, Rotate, and Scale tools. You can drag the manipulators directly using the left mouse button.

If you do not want to display these manipulators, select Channels > Settings, then select either No Manips or Invisible Manips. If you select No Manips, you can only perform these operations from the Channel Box by entering values in the text boxes. If you select Invisible Manips, you perform these operations using the mouse (see “Entering values with the mouse (channel slider)” on page 289) or by entering values in the text boxes.

You can also switch between using manipulators, no manipulators, and the mouse (channel slider) using the buttons at the bottom of the Channel Box.



Standard  
Manips



Invisible  
Manips



No  
Manips

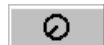
### Entering values with the mouse (channel slider)

For most attributes in the Channel Box, you can click the attribute name or text box then drag the middle mouse button in the workspace to change its value. Dragging to the right decreases the value, dragging to the left increases the value. You can also press the Ctrl key while dragging for fine control.

To use this interactive channel slider, you must set the channel box to use standard or invisible manipulators (Channels > Settings then select Standard Manips or Invisible Manips). If you select Channels > Settings > No Manips, you cannot enter attribute values with the mouse. You must enter the values for these attributes in the text boxes.

When you select Channels > Settings > Invisible Manips, the cursor changes to a left and right pointing arrow when you press the middle mouse button, indicating that you are using the channel slider to change values.

You can set how quickly the channel slider responds when you drag. Select Channels > Settings, then select Slow, Medium, or Fast or switch these settings using the buttons at the bottom of the Channel Box.



Slow



Medium



Fast

## Using the Channel Box

You can also specify whether the attribute values change linearly as you drag (values increase steadily as you drag), or hyperbolically (values increase more sharply as you drag). Toggle off Channels > Settings > Hyperbolic to change the values linearly, and on to change values hyperbolically, or switch the settings using the buttons at the bottom of the Channel Box.



Linear



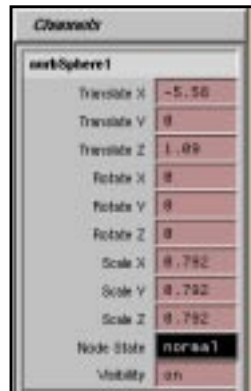
Hyperbolic

## Entering values for attributes with a pop-up menu

For some attributes, a pop-up menu appears when you click the mouse in its text box. You can choose from the selections displayed by dragging the mouse over the desired choice.

### Example

Suppose you add the predefined Node State attribute to a NURBS sphere's keyable attributes. (You can do this with Windows > General Editors > Channel Control.) Node State appears in the list of attributes below the transform attributes.



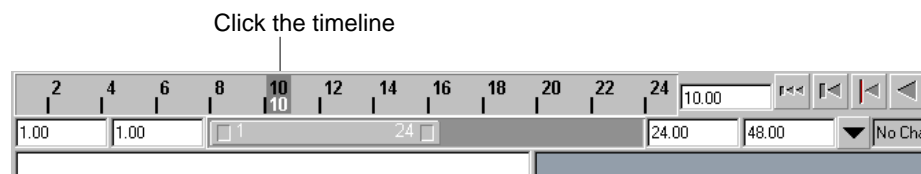
If you click in the Node State text box, a pop-up menu appears with six choices: Normal, HasNoEffect, Blocking, Waiting-Normal, Waiting-HasNoEffect, Waiting-Blocking. Drag the mouse over the desired selection. For information on these states, see “Changing node behavior” on page 272.

## Setting keys for attributes from the Channel Box

You can set a key for one or more object attributes in the Channel Box. For details about keys, see *Using Maya: Animation*.

To set a key for one attribute:

- 1 Select the object.
- 2 Click the timeline frame number where you want to set the key.



- 3 Click the attribute name to select it.  
For example, click Translate X.
- 4 Type the value of the attribute and press Enter.  
For example, enter 10 and press Enter.
- 5 In the Channel Box, choose Channels > Key Selected.

or

Right-click the attribute name or text box and select Key Selected.  
This sets the key for the object attribute value you specified.

### Setting a key for all attributes

- 1 Click the timeline frame number where you want to set the key.
- 2 Enter values for the desired attributes in the Channel Box. Press Enter after entering the attributes.
- 3 In the Channel Box, select Channels > Key All.

or

Right-click the attribute name or text box and select Key All.

This sets the key for all the object attribute values displayed in the Channel Box.

---

*Note*

You can key the same attribute value for two or more objects. Select the objects, click the frame, enter the value in the text box, then select Channels > Key Selected.

You can also key multiple attribute values for multiple objects. Follow the instructions in the previous paragraph, only select several attribute text boxes using Ctrl- or Shift-click before typing the numerical entry.

---

**To copy keyed attribute values:**

- 1 Select the object.
- 2 In the Channel Box, select the desired attributes. (You can select either the attribute name, or the attribute text boxes.)
- 3 Select Channels > Copy Selected.

*or*

Right-click the attribute name or text box and select Copy Selected.

- 4 Select the attributes you want to paste the keyframed values to.
- 5 Select Channels > Paste Selected.

*or*

Right-click the attribute name or text box and select Paste Selected.

## Setting breakdown keys for attributes from the Channel Box

Breakdowns are a type of key that maintains a proportional relationship with adjacent keys. You can set a breakdown key for an attribute from the Channel Box. For information about breakdowns, see *Using Maya: Animation*.

**To set a breakdown for selected attributes:**

- 1 Select the object.
- 2 Click the timeline frame number where you want to set the breakdown.

- 3 Select the attributes you want to set breakdowns for.
- 4 Enter the values of the attributes.
- 5 Select Channels > Breakdown Selected.

*or*

Right-click the attribute name or text box and select Breakdown Selected.

To set breakdowns for all attributes:

- 1 Select the object.
- 2 Click the timeline frame number where you want to set the breakdowns.
- 3 Enter the values of the attributes.
- 4 In the Channel Box, select Channels > Breakdown All.

*or*

Right-click the attribute name or text box and select Breakdown All.

## Breaking connections from the Channel Box

In the Channel Box, the text box for an attribute that is connected to an expression, key, or other attribute (for example texture attribute) is displayed in a different color, depending on your color settings.

To break a connection:

- 1 Select the object.
- 2 In the Channel Box, select the connected attribute (click the attribute name or text box).
- 3 Select Channels > Break Connections.

*or*

Right-click the attribute name or text box and select Break Connections.

## Locking attribute values from the Channel Box

You can lock an attribute value to avoid accidentally changing it later.

### To lock an attribute:

- 1 Select the object.
- 2 In the Channel Box, click the attribute name.
- 3 If you need to set the attribute value before locking it, type a value and press Enter.
- 4 In the Channel Box, select Channels > Lock Selected.

*or*

Right-click the attribute name or text box and select Lock Selected.

This locks the value. The Channel Box displays locked attributes with a gray background. (This color may not be visible while the text box is selected.)

When you've locked an attribute, you cannot change its value in the Channel Box, the workspace, or elsewhere.

You must unlock the attribute to change its value.

---

### *Tip*

You can lock two or more attributes at the same time. Ctrl- or Shift-click the attribute names to select them, then select Channel > Lock Selected (or right-click the attribute names and select Lock Selected).

---

### To unlock an attribute

- 1 Select the object.
- 2 In the Channel Box, click the attribute name.
- 3 In the Channel Box, select Channels > Unlock Selected.

*or*

Right-click the attribute name or text box and select Unlock Selected.

## Launching the Expression Editor from the Channel Box

You can launch the Expression Editor for the attribute selected in the Channel Box.

To start the Expression Editor:

- In the Channel Box, select Channels > Expressions.  
*or*
- Right-click the attribute name or text box and select Expressions.

The Expression Editor appears. See *Using Maya: Expressions* for details on its use.

## Linking attributes from the Channel Box

Maya has a special type of key called a *driven* key that links one attribute value to another. When you create a driven key, you specify a driver attribute value and a driven attribute value. The value of the driven attribute is locked to a corresponding value of the driver attribute.

You can link attributes from the Channel Box by selecting the attribute and then selecting Channels > Set Driven Key (or by right-clicking the attribute name or text box and selecting Set Driven Key). For details, see *Using Maya: Animation*.

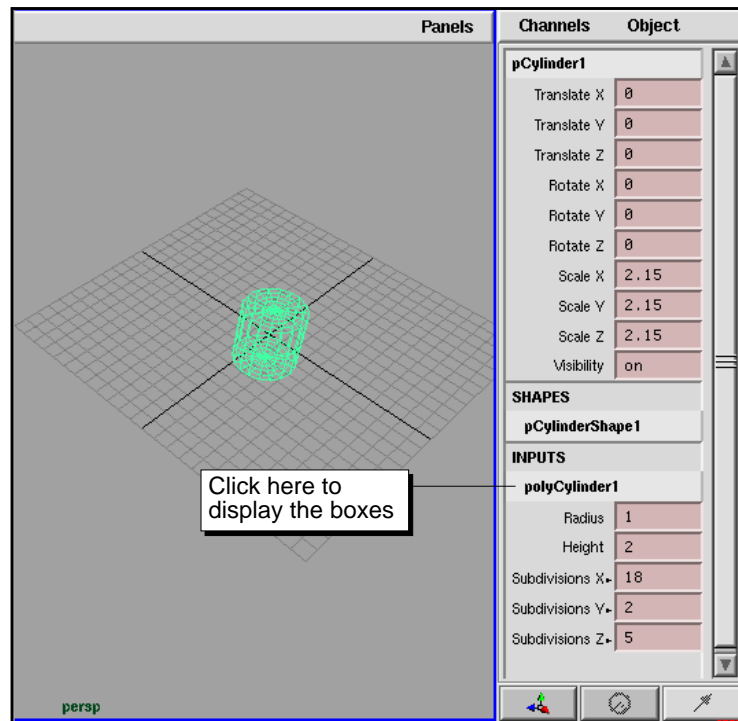
## Modifying an object's history (inputs)

Use the INPUTS component of the Channel Box to modify an object's construction history. Since all objects in Maya can be created with "History On," you can change initial parameters after the fact.

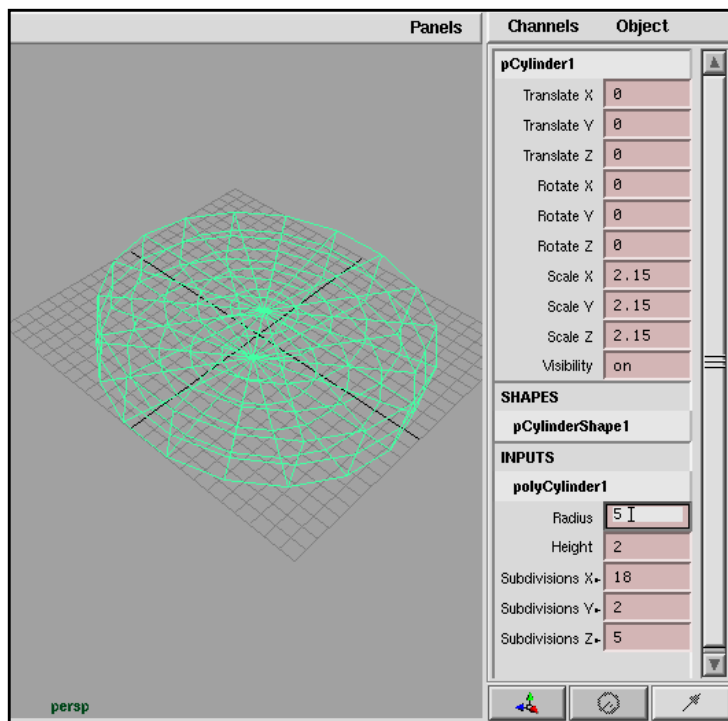
In the following example, we change the object's radius from 0.5 to 0.8, its height from 1 to 2, and its X, Y, and Z subdivisions from 20, 1, and 8 to 18, 2, and 5, respectively.

To modify an object's history:

- 1 Select the object you want to modify.



- 2 Type the new information in the respective boxes and press Enter. Each time you change part of the object's history, Maya changes the object.



- 3 To return to the original setting for Subdivision Z, select Edit > Undo or press Ctrl-Z. The object returns to its original scale for Subdivision Z.
- 4 Repeat for the other boxes.

## USING THE OUTLINER

You can use the Outliner to do these tasks:

- Examine the structure and components of the scene. See “Navigating the Outliner” on page 300.
- Display shape nodes, connections, and attributes. See “Displaying shape nodes” on page 302.
- Make an object the child of a parent object. A child adopts attribute changes made to the parent. See “Parenting objects” on page 306.

- Select and rename an object. See “Selecting and renaming objects” on page 309.
- Reorder nodes. Reordering a node’s position in the Outliner affects Maya’s evaluation order for the object. See “Reordering nodes” on page 309.

---

*Tip*

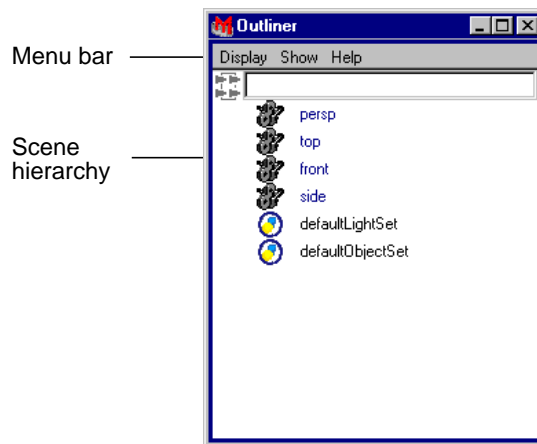
If your scene has many objects or it contains character skeletons, consider using the Hypergraph instead of the Outliner. The Hypergraph displays the scene hierarchy in a graphical format that’s more convenient for complex scenes.

---

You can open the Outliner in its own window or in a workspace panel. If you display it in a workspace panel, you see the Maya user interface and the Outliner at the same time without having to reposition the windows.

**To open the Outliner in its own window:**

From the menu bar or Hotbox, select Window > Outliner. The Outliner opens.



Scale and move the window as needed.

To open the Outliner in a workspace panel:

From a workspace panel, select Panels > Panel > Outliner.

### Outliner panel items

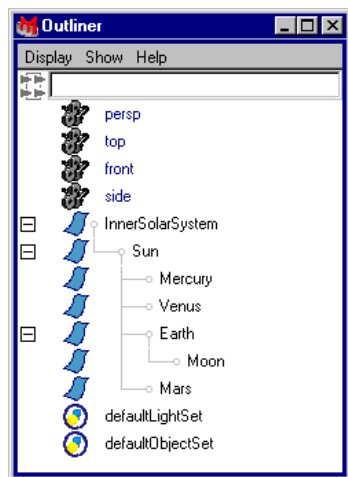
The Outliner's *menu bar* selections control what types of objects and other items are displayed in the scene hierarchy. A scene hierarchy is sometimes referred to as a DAG (for *Directed Acyclic Graph*).

The Outliner lists invisible objects, such as the perspective, top, front, and side cameras, in blue text. In a new, empty scene, the Outliner lists only these objects and the default light and object sets. As you add objects to the scene, they appear in the Outliner.

## Understanding scene hierarchy terminology

A common technique in modeling, rendering, and animating is to work with objects in a hierarchical relationship. To work with a hierarchy you must understand the terminology for describing the relationship of objects.

We use the following figure to define common hierarchy terminology:



Parent

An object or other item that controls attributes of one or more children. A parent can also be the child of another parent.

	<p>In the figure, InnerSolarSystem is a parent of Sun. Sun is a parent of Mercury, Venus, Earth, and Mars. Earth is a parent of Moon.</p>
Child	<p>An object whose attributes are controlled by its parent. A child can be the parent of other children. A child is connected to its parent by an indented right angle line.</p> <p>Sun is a child of InnerSolarSystem. Mercury, Venus, Earth, and Mars are children of Sun. Moon is a child of Earth.</p>
Node	<p>A parent, child, or independent object or item.</p> <p>InnerSolarSystem, Sun, Moon, persp, top, and all other entries in the example are nodes.</p>
Hierarchy	<p>The arrangement of all connected nodes that make up a scene or object.</p> <p>The scene hierarchy is made of all nodes in the figure. The Earth hierarchy consists of Earth and Moon.</p>
Transform node	<p>A node that contains an object's transformation attributes—values for its translation, rotation, and scale. It also holds information on any parent-child relationships it has with other nodes. Transform nodes are also called DAG objects.</p> <p>InnerSolarSystem, Sun, Moon, and all other entries in the example are transform nodes.</p>
Shape node	<p>A node that holds an object's geometry attributes or attributes other than the object's transform node attributes. A shape node is always a child of a transform node.</p> <p>Shape nodes do not appear in the Outliner by default. To display shape nodes, see "Displaying shape nodes" on page 302.</p>

## Navigating the Outliner

As you examine a scene with many objects, you must scroll or expand the Outliner panel. You'll also need to expand or collapse the display of nodes. You expand a node to see the child node below it. You collapse a node to simplify your view of the hierarchy.

### To expand a node:

Click the plus sign (⊕) to its left.

The plus sign (⊕) changes to a minus sign (⊖).

As a quick way of expanding several collapsed hierarchies, you can select them, expand one of them, and they all expand.

#### To collapse a node:

Click minus sign (⊖) to its left.

The minus sign (⊖) changes to a plus sign (⊕). Note that Hierarchies become highlighted if they are collapsed but contain an item that is selected.

#### To expand a node's entire hierarchy:

Shift-click the plus sign (⊕) to its left.

The plus sign (⊕) changes to a minus sign (⊖).

If your scene has many objects in a complex hierarchy, you might need to expand many nodes to find a child. To find the node quickly, you can select the object in the workspace and choose a menu entry to expand all nodes necessary to list the object.

#### To display a child not currently listed in the Outliner:

- 1 Select the object in the workspace.
- 2 In the Outliner, select Display > Selected.

---

#### Tip

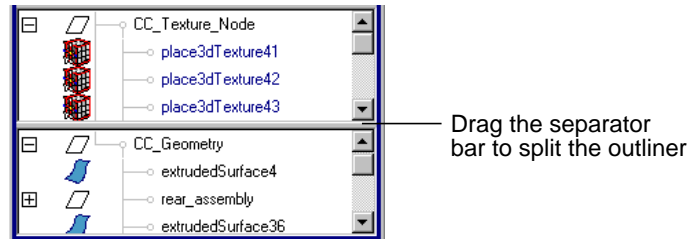
To select Outliner menus more conveniently from a pop-up menu, click the right mouse button in the Outliner window.

---

#### To split the Outliner window:

You can split the Outliner window in order to see either end of a long list. To split the window, click the separator at the bottom of the window and drag it up. Restore full display by dragging the separator back to the bottom. As visual cue, moving your cursor over the separator bar changes it to:

↕ (IRIX) or ⇄ (Windows NT).



## Displaying shape nodes

By default, the Outliner displays only DAG objects in the scene. DAG objects are transform nodes. You can also display shape nodes, the nodes that hold an object's geometry attributes or attributes other than the object's transform node attributes.

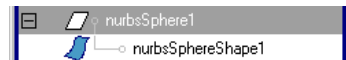
### To display shape nodes:

In the Outliner, toggle on Display > Shapes.

### Example

Suppose you select Create > NURBS Primitives > Sphere to create a sphere. Maya creates a transform node and a shape node.

If you toggle on Display > Shapes and expand the nurbsSphere1 node, the shape node appears underneath.



Maya gives the nodes the default names shown in the figure. The nurbsSphere1 is the transform node; nurbsSphereShape1 is the shape node. If you rename the transform node, for example, as Bubble, Maya renames the shape node BubbleShape.

If you rename the shape node, Maya does not rename the transform node. Maya doesn't transmit a child's attribute changes up to its parent.

---

*Note*

The Display and Show menu settings are saved with a scene file. The menu settings are not saved when you open a new or different scene.

---

## Displaying attributes

You can display attributes of the nodes shown in the Outliner. To simplify the Outliner's appearance, you can also limit the display of attributes to the following categories:

- keyable attributes
- translate, scale, and rotate attributes
- attributes connected to an animation curve or expression
- attributes connected to any controlling node

### To display all attributes:

- 1 Select Display > Attributes (Channels) to toggle it on. (Make sure you are not showing only selected items by selecting Show > Show All.)

A plus symbol (⊕) appears to the left of each node.

- 2 Click (⊕) to display the node's attributes.

The (⊕) changes to a minus symbol (⊖) when the node's attributes are expanded. You can click the minus symbol to collapse the attributes.

Some attributes also appear with (⊕) to the left. These are compound attributes consisting of two or more attributes. Click (⊕) for a compound attribute to see its component attributes. For example, the compound Translate attribute is made of Translate X, Translate Y, and Translate Z attributes.

You can't use the Outliner to change attributes' values. You can set them in the Channel Box, Attribute Editor, or Attribute Spreadsheet. Note also that you use those tools to set the value of noncompound attributes only. You can set compound attributes (to set the component attributes) only with MEL commands.

### Tips

To open the Attribute Editor for a node, double-click the icon beside the node name.

You can double-click a noncompound attribute to start the Expression Editor with the attribute automatically selected.

#### To display only keyable attributes:

- 1 Select Display > Attributes (Channels) to toggle it on.
- 2 Select Show > Attributes > Keyable to toggle it on.

#### To display only translate, scale, and rotate attributes:

- 1 Select Display > Attributes (Channels) to toggle it on.
- 2 Select Show > Attributes and toggle on one of these:

Rotate                      Displays only Rotate attributes.

Scale                        Displays only Scale attributes.

Scale Rotate Translate                      Displays only Scale, Rotate, and Translate attributes.

Translate                      Displays only Translate attributes.

- 3 Click (⊕) to expand the compound Translate, Rotate, or Scale attributes into the component attributes.

For example, if you expand the compound Translate attribute, the Outliner displays Translate X, Translate Y, and Translate Z attributes.

#### To display only attributes connected to a controlling node:

- 1 Select Display > Attributes (Channels) to toggle it on.
- 2 Click (⊕) to display the node's attributes.
- 3 Select Display > Connections to toggle it on.

This displays only the attributes whose value is connected to the following types of controlling nodes:

- keys
- set driven key
- constraint
- motion path
- expression
- any other direct connection

### Example

Suppose you create a NURBS sphere named Ball and a NURBS cone named Cone. You write an expression to assign the value of Ball's translateY attribute to Cone's translateY attribute.

If you select Cone, toggle on Display > Attributes (Channels) and Display > Connections, then expand Cone and the Translate attribute, the Outliner displays the following:



### To display only attributes connected to anim curves or expressions:

Select Show > Attributes and toggle on one of these:

#### Driven by Anim Curve

Displays only attributes with an animation curve. This includes attributes animated with keys, set driven keys, constraints, and motion paths.

#### Driven by Expression

Displays only attributes controlled by expressions.

### To display all attributes again:

Select Show > Attributes > Clear Below.

## Displaying specific types of nodes

To simplify the Outliner's appearance, you can limit node display to various categories.

**To display only specific types of nodes:**

- 1 Toggle on Display > Shapes or Display > Dag Objects Only, as appropriate.
- 2 Select Show > Objects > and the type of node.

**To display all nodes again:**

Select Show > Objects > Clear Below.

## Parenting objects

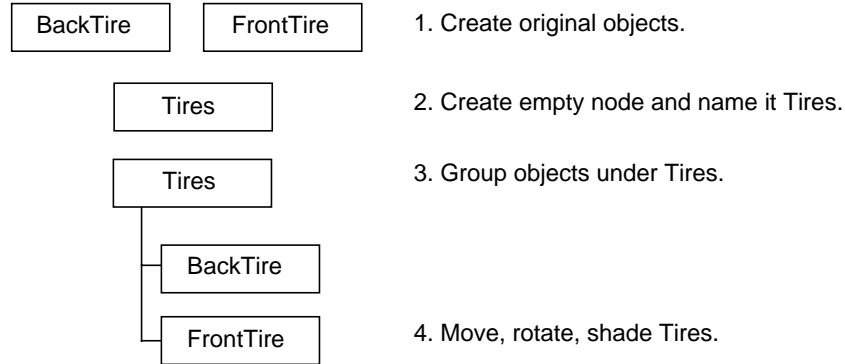
You can make an object the child of a parent object. The child adopts some or all attribute changes made to the parent.

For example, suppose you animate a planet to orbit the center of the workspace. If you make a moon the child of the planet, it follows the motion of the planet.

Though the moon is the child of the planet, you can also give the moon motion that's independent of the planet. For example, you can make it orbit the planet. If you later change the orbiting motion of the planet, the moon continues to follow the planet's motion, but still retains its original orbiting motion.

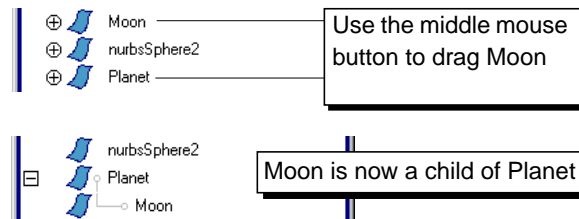
To control multiple objects with one node, you can also create an empty group and make several objects its children. By grouping objects under one node, you can move, shade, apply texture, and do many other actions to all the objects by working with the group node.

### Example



### To parent an object in the Outliner:

- 1 Make sure both objects are visible in the Outliner.  
If you can't see both nodes at the same time even after maximizing and scrolling the Outliner, use Edit > Parent in Maya's main menu bar. In the Outliner, Ctrl-click the children first, then Ctrl-click the parent, then select Edit > Parent.
- 2 In the Outliner, use the middle mouse button to drag the child node onto the parent node.

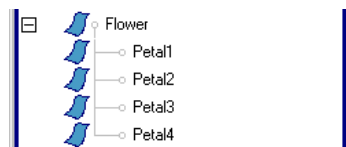


### To parent several objects to a new group node:

- 1 From the main menu bar, choose Edit > Create Empty Group. A new group node appears in the Outliner named *null1*. This node is an invisible, empty object.

- 2 Use the middle mouse button to drag an object node onto the null1 node. The object becomes a child of the null1 node.
- 3 Repeat this step for other objects to be children of the group.
- 4 Rename the null1 node to something more meaningful.

For example, you might rename a group with four flower petals as flower. The Outliner displays the objects parented to the group node.



If you modify the group node attributes, its corresponding member's attributes are also modified. For example, if you decrease the Y scale attribute for a flower group node, the Y scale attributes of the four petals decrease also.

#### To break the relationship between parent and child:

- 1 Select the child.
- 2 From the Maya main menu bar, select Edit > Unparent.

### Prefixing hierarchy names

You can give the same prefix to all objects within a hierarchy. For example, if you select a parent object and give it a prefix, all objects under that parent will now have the same prefix name.

#### To assign prefix hierarchy names:

- 1 Select the parent.
- 2 From the Maya main menu bar, select Modify > Prefix Hierarchy Names.
- 3 Enter a prefix name in the Prefix Hierarchy window and click OK.

## Selecting and renaming objects

You can select and rename objects and other nodes in the Outliner. Selecting an object in the Outliner is useful when the workspace is crowded with objects.

You can give two nodes the same name, but only if each has a different parent (as in the following example).



### To select an object:

- 1 Scroll to find the node that represents the object or component.
- 2 Click the node to select it. The node is highlighted in the scene to indicate it is selected.

### To deselect an object:

Click an empty spot in the Maya workspace. (You can also click below the last item in the Outliner.)

When you deselect a node, its highlighting turns off.

### To rename an object:

- 1 Double-click the name of the object in the Outliner.
- 2 Enter the name in the text box.

## Reordering nodes

You can reorder the position of nodes in the Outliner, for example, to make the node's Outliner position correspond to its spatial position in the workspace.

Be aware that reordering an object's position in the Outliner might affect its behavior or appearance in your scene. Reordering a node's position in the Outliner affects Maya's evaluation order for the object. Maya evaluates objects as listed from top to bottom in the Outliner.

For example, Maya typically renders nodes in the order they appear in the Outliner. Changing this order changes their rendering order. However, if a node has transparency, Maya puts the node in a delayed render queue. Maya renders objects in the queue after all opaque objects.

#### To reorder a node in the Outliner:

Use the middle mouse button to drag the node to another position.

As you drag, a horizontal line appears in the Outliner that indicates where the dragged node will be positioned. Release the mouse button at the desired position.

#### Example

Suppose you created a scene containing several of the solar system's planets, including earth. As you add each planet, the Outliner adds a node representing the planet.

Maya puts each new node in the Outliner below existing nodes. The location of the planet nodes in the Outliner might not represent the spatial relationship of the planets in the workspace as in this example:



Here, earth sits further from mercury than mars. In the actual solar system, and in your workspace, this is not true.

To make the Outliner reflect the positioning of the earth in the workspace, use the middle mouse button to drag the earth above mars.

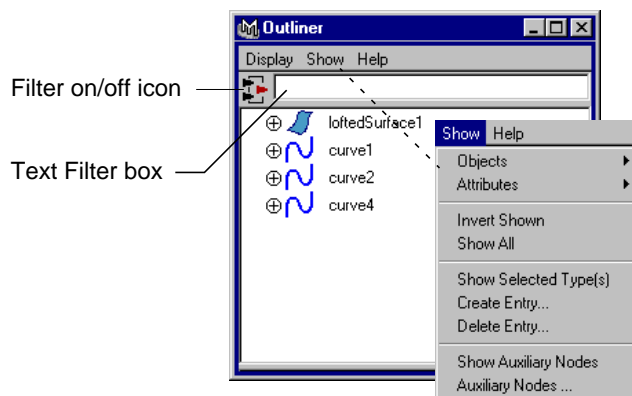
Maya positions earth below venus and above mars.



## LIMITING THE INFORMATION SHOWN IN EDITORS

You can limit which information shows in the Outliner, Hypergraph, Graph Editor, Dope Sheet, and Relationship Editor. Each of these editors has a Text Filter box and Show menu (except the Dope Sheet, which has only the Show menu). With these controls, you can limit the display to the following:

- items containing specified text (for example, type *spot\** to show items beginning with *spot*)
- object types (Geometry, NURBS Objects, Polygon Objects, Cameras, Joints, IKHandles, Sets, Lights, Materials, Textures, Renderable Objects, Shading Groups, Partitions)
- attribute types (Hidden, Driven by Anim Curve, Driven by Expression, Keyable, Rotate, Scale, Translate, Scale Rotate Translate)



For details, see the next topic, “Limiting the display” on page 312. Also, using the Show menu, you can also do the following:

- “Showing all items not currently displayed” on page 314
- “Storing your restrictions” on page 314
- “Controlling display of auxiliary nodes” on page 316

## Limiting the display


You can limit the amount of information shown in the Outliner, Hypergraph, Graph Editor, and Relationship Editor by selecting the object types and attribute types you want shown. You can show items containing specified strings. You can also store your selections for later use. When you limit the display in the editor, the icon beside the Text Filter box changes.



All objects and attributes show



Filtered display (only objects and attributes of selected types or containing specified text show)

When you have a filter active, you can revert to showing all objects by clicking the filtered display icon (  ).

### Limiting the display to items containing specific text

Use the Text Filter box to limit the display to all objects and attributes with names containing the text string you type. Type the string in the box and click Enter. This box is case sensitive. For example, typing *nurbs* will yield different results than typing *NURBS*.

Use the asterisk (\*) wildcard to match any number of characters in the string. For example, to show all items with names starting with *nurbs*, type *nurbs\** in the text filter box and press Enter.

Use the question mark (?) wildcard to match a single character. For example, to show items *bodyFur* and *bodyfur* (remember, the box is case sensitive), type *body?ur* and press Enter.

### Limiting the display to selected objects

You can limit the display to any combination of the following objects: Geometry, NURBS Objects, Polygon Objects, Cameras, Joints, IKHandles, Sets, Lights, Materials, Textures, Renderable Objects, Shading Groups, and Partitions.

#### To limit the display to objects of a specified type:

Select Show > Objects, then select the items you want to display (toggle them on). Only the items you select will display. If you do not want an object type to show, toggle it off.

To clear the list so that no restrictions are placed on what displays (in effect, you are removing the object filter), select Show > Clear Below.

### Limiting the display to selected attributes

You can limit the display to any combination of the following attributes: Hidden, Driven by Anim Curve, Driven by Expression, Keyable, Scale, Rotate, Translate, and Scale Rotate Translate.

In the Relationship Editor you can limit the display of attributes of a specific type when character editing only.

In the Outliner, you can limit the display of attributes of a specific type only if Display > Attributes (Channels) is toggled on.

You cannot limit the attribute display in the Hypergraph.

#### To limit the display of attributes of a specified type:

Select Show > Attributes, then select the items you want to display (toggle them on). Only the items you select will show. If you do not want an attribute type to show, toggle it off.

To clear the list so that all attributes display (in effect, you are removing the attribute filter), select Show > Clear Below.

### Limiting the display of object or attribute types based on the selected items

Instead of limiting the display using the Objects and Attributes menus, you can limit the display to all objects or attributes of the same type as the selected (highlighted) objects or attributes by selecting Show > Show Selected Type(s). You must first select objects or attributes (in the Outliner or workspace) to make this command available.


### Applying custom display restrictions

If you saved your display restrictions (see “Storing your restrictions” on page 314), it appears on the Show > Objects menu or Show > Attributes menu, (depending on the type of items selected). To apply it, simply select it from the appropriate menu (toggle it on).

## Showing all items not currently displayed

You can quickly toggle the display to show all items that are *not* currently displayed. To do this, select Show > Invert Shown to toggle it on.

## Showing all items (removing restrictions)

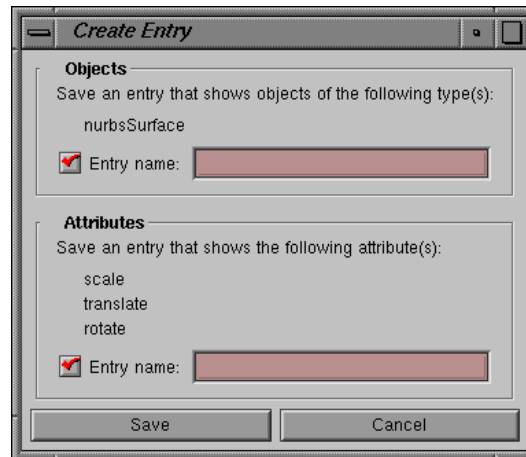
To quickly remove all restrictions so that all objects and attributes show, click the filtered display icon (  ) or select Show > Show All.

## Storing your restrictions

You can store your display restrictions for later use. Restrictions that you store in one editor are available for use in the other editors.

To store your restrictions:

- 1 In the Outliner or workspace, select the objects and attributes that are the type you want to show.
- 2 Select Show > Show Selected Type(s). The editor shows all objects and attributes that are the same type as the selected objects.
- 3 Select Show > Create Entry. The Create Entry window opens.



If you selected only objects in step #1, only the Objects section appears on the Create Entry window. Similarly, if you selected only attributes in step #1, only the Attributes section appears.

- 4 In the Objects section (if there is one), toggle Entry name on and type a name for the selection list in the adjacent box. This name will appear on the Show > Objects menu.
- 5 In the Attributes section (if there is one), toggle Entry name on and type a name for the selection list in the adjacent box. This name will appear on the Show > Attributes menu.
- 6 Click Save.

## Deleting stored restrictions

Deleting a stored restriction removes it from the Show > Objects or Show > Attributes menu.

To delete a stored restriction:

- 1 Select Show > Delete Entry. The Delete Entry window opens.



- 2 To delete Object selection list, click the Objects tab, then click the entries you want to delete.

To delete Attributes selection list, click the Attributes tab, then click the entries you want to delete.

- 3 Click Delete.

## Controlling display of auxiliary nodes

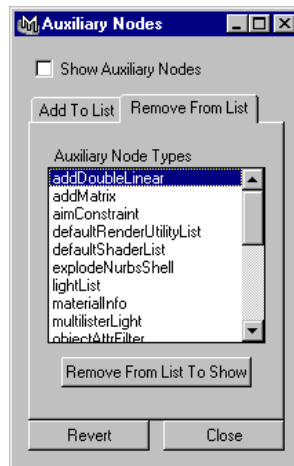
By default, there are several auxiliary nodes, such as `unitConversion`, that do not show in the Outliner and other editors. These nodes are hidden to reduce clutter. If you need them to show or you want to hide additional nodes, you can use the Show menu selections: Show Auxiliary Nodes and Auxiliary Nodes.

Your Auxiliary Node settings are saved immediately in your preferences, so they affect all editors. They are loaded whenever you start Maya.

### To show a hidden auxiliary node:

- To see all auxiliary nodes, choose Show > Show Auxiliary Nodes.
- or*
- To selectively show an auxiliary node, choose Show > Auxiliary Nodes to open the Auxiliary Nodes window. From the list of auxiliary nodes, select the ones you want to show and click Remove From List To Show.

Auxiliary Nodes window



### To hide a node:

- 1 Choose Show > Auxiliary Nodes to open the Auxiliary Nodes window.
- 2 Click the Add To List tab.
- 3 Either turn on All Node Types or turn on Selected Node Types.

Limiting the information shown in editors

The Selected Node Types option lets you select the node in the Outliner, Hypergraph, or other panel.

- 4 Click Add To List To Hide.

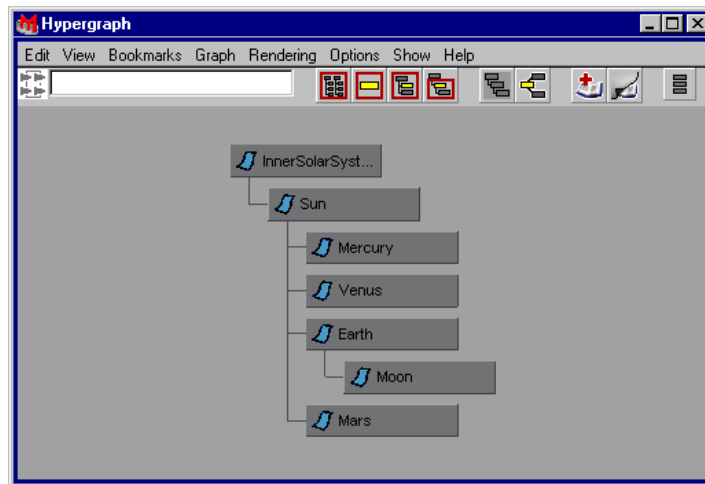


# 10 USING THE HYPERGRAPH

The Hypergraph shows a graphical relationship between components of a scene. You can display two kinds of graphs in the Hypergraph: the scene hierarchy or dependency graph.

The *scene hierarchy* shows the ordered arrangement of objects, lights, cameras, and other items that make up a scene. It's similar to the Outliner but has more features and visual aids for working with the hierarchy of scene components.

Here's an example scene hierarchy:



A *dependency graph* shows the architectural connections between Maya entities that input and output data. For example, it shows connections between shading group elements that create an object's material appearance.

This chapter describes the following topics:

- “Opening the Hypergraph” on page 320

## Opening the Hypergraph

- “Understanding scene hierarchy terminology” on page 322
- “Using the scene hierarchy” on page 324
- “Understanding the dependency graph” on page 337
- “Using a dependency graph” on page 338
- “Editing objects” on page 352
- “Altering the view of a graph” on page 356

## OPENING THE HYPERGRAPH

You can open the Hypergraph in its own window or in a workspace panel. Displaying it in a workspace panel has the advantage of letting you see the Maya user interface and the Hypergraph without having to reposition the windows.

To open the Hypergraph in its own window:

From the menu bar or Hotbox, select Window > Hypergraph. The Hypergraph opens.



Scale and move the window as needed.

**To open the Hypergraph in a workspace panel:**

From a workspace panel, select Panels > Panel > Hypergraph.

When you display the Hypergraph the first time, the scene hierarchy displays. In subsequent displays of the Hypergraph, the scene hierarchy *or* dependency graph appears, depending on which was displayed the previous time you closed the window. Note that a scene hierarchy is also referred to as a DAG (directed acyclic graph).

If you display the scene hierarchy for a new, empty scene, you'll see no graph.

If you display the scene hierarchy, invisible objects such as the perspective, top, front, and side cameras do not appear in the graph by default. In contrast, the Outliner shows the default cameras unless you choose not to display them.

---

**Note**

Unless instructions in this chapter state otherwise, make all menu choices from the Hypergraph menu bar.

---

**Hypergraph menu bar**

The Hypergraph *menu bar* has entries for working with the scene hierarchy or dependency graph.

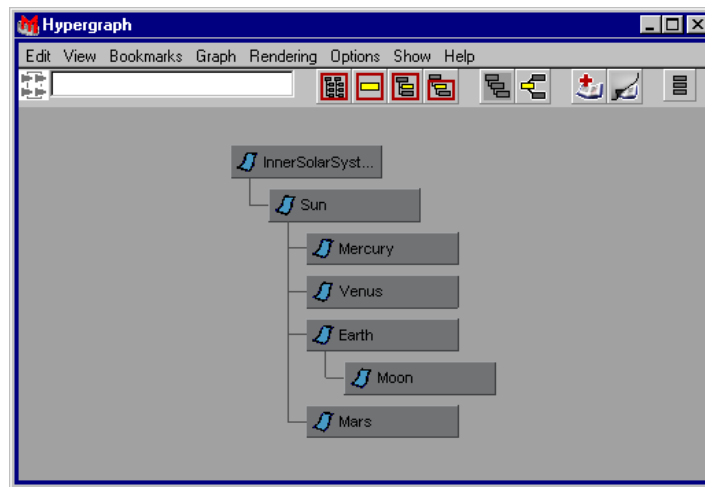
**Hypergraph toolbar**

The *tool bar* has icons for commonly used Hypergraph menu bar selections. To see the selection that an icon represents, move the mouse pointer over the icon. If popup help is toggled on (Help > Popup Help), the name of the selection appears in a yellow popup. Otherwise, look in the help line at the bottom of the Maya window.

## UNDERSTANDING SCENE HIERARCHY TERMINOLOGY

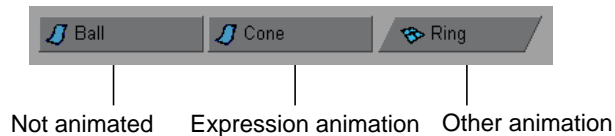
A common technique in modeling, rendering, and animation is to work with objects in a hierarchical relationship. To work with a hierarchy you must understand the terminology for describing the relationship of objects.

The following figure illustrates a scene hierarchy.



Parent	<p>An object or other item that controls attributes of one or more children. A parent can also be the child of another parent.</p> <p>In the figure, InnerSolarSystem is a parent of Sun. Sun is a parent of Mercury, Venus, Earth, and Mars. Earth is a parent of Moon.</p>
Child	<p>An object having attributes controlled by its parent. A child can be the parent of other children. A child in the graph is connected to its parent by an indented right angle line.</p> <p>Sun is a child of InnerSolarSystem. Mercury, Venus, Earth, and Mars are children of Sun. Moon is a child of Earth.</p>
Node	<p>A parent, child, or independent item. This refers generally to any box in the graph.</p> <p>InnerSolarSystem, Sun, Moon, and all other boxes in the graph are nodes.</p>
Subnode	<p>Any node below another node in the hierarchy.</p>

	<p>The subnodes of InnerSolarSystem are Sun, Mercury, Venus, Earth, Moon, and Mars. The subnodes of Sun are Mercury, Venus, Earth, Moon, and Mars. The subnode of Earth is Moon. Moon and Mars have no subnode.</p>
Branch	<p>All nodes along a path from a parent to child. A branch from Sun to Moon includes Sun, Earth, and Moon.</p>
Hierarchy	<p>The arrangement of all connected nodes that make up a scene or object.</p> <p>The scene hierarchy is made of all nodes in the figure. The Earth hierarchy consists of Earth and Moon.</p>
Transform node	<p>A node that contains an object's transformation attributes—values for its translate, rotation, scale, and so on. It also holds information on parent-child relationships it has with other nodes.</p> <p>InnerSolarSystem, Sun, Moon, and all other boxes shown in the example are transform nodes.</p>
Shape node	<p>A shape node holds an object's geometry attributes or attributes other than the object's transform node attributes. Shape nodes do not appear in the scene hierarchy by default. To display shape nodes, see "Displaying special nodes and connections" on page 326.</p> <p>The scene hierarchy and the dependency graph display animated nodes as slanted boxes. If you animate a node with an expression, it displays a regular rectangle rather than a slanted box. All other animation techniques display a slanted box. Specifically, a slanted box indicates that the node has a param curve connected to it.</p>



## USING THE SCENE HIERARCHY

You can use the scene hierarchy to:

- display special nodes and connections

You can display shape, invisible, and underworld nodes. You can also show expression, constraint, and deformer connections that link nodes. See “Displaying special nodes and connections” on page 326.

- make an object the child of a parent object (known as *parenting*)

A child adopts attribute changes made to the parent. See “Parenting objects” on page 329.

- reorder the position of nodes (see “Rearranging scene hierarchy nodes” on page 331)
- create a free-form graph of the hierarchy that suits your visual preference (see “Creating a free-form hierarchy” on page 333)
- select, rename, and hide objects, and edit attributes of an object (see “Editing objects” on page 352)
- examine the structure of the scene

The Outliner lists the components of a scene as an indented list. The Hypergraph shows the relationship of the objects of the scene graphically. See “Altering the view of a graph” on page 356 for details on navigating the view of the graph.

### Expanding scene hierarchy nodes

As you examine a scene hierarchy, you can expand or collapse the display of nodes. Collapsing nodes is helpful for lessening clutter in a hierarchy. You expand a node to see nodes below it.

For a selected node, you can display:

- subnodes one level below the node
- all subnodes below a node

When you know where a node is in the workspace but you’re not sure of its graph position, you can select the node in the workspace and expand all nodes necessary to display and highlight it.

A selected node is yellow in the scene hierarchy.

*Note*

A node name followed by “...” is abbreviated in the graph. See “Dollying the view” on page 356 to learn how to view the full name. For other graph viewing techniques, see “Altering the view of a graph” on page 356.

**To expand a node:**

- 1 Select the node.

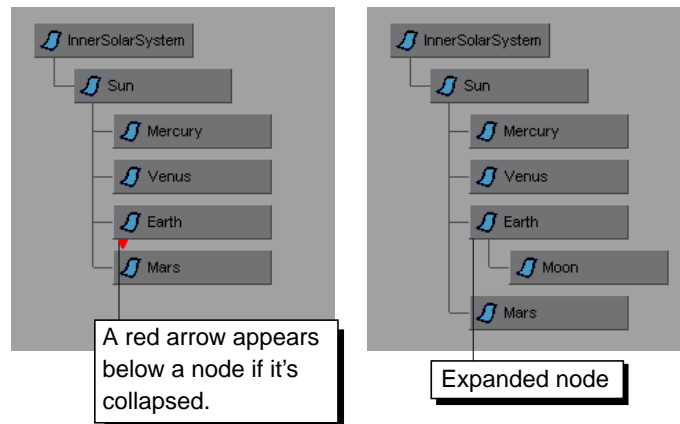
If the node is not visible in the scene hierarchy, select it in the workspace or Outliner.

- 2 Select:

Edit > Expand to expand a node to one level below.

Edit > Expand All to expand all subnodes below a node.

Edit > Show Selected to display and expand a node not visible in the graph.



**To collapse a node:**

- 1 Select the node.
- 2 Select Edit > Collapse.

---

*Tips*

- To expand or collapse a node, double-click it.
  - To quickly select Hypergraph menus, click the right mouse button in an empty part of the Hypergraph window.
  - To display context-sensitive Hypergraph menus, move the mouse over a node and click the right mouse button. These menus are also available from the main Hypergraph menus, but they apply only to the selected node.
  - For details on navigating the view of the graph, see “Altering the view of a graph” on page 356.
- 

## Displaying special nodes and connections

You can display shape, invisible, and underworld nodes in the scene hierarchy. You can also display expression, constraint, and deformer connections that link different nodes.

### Shape, invisible, and underworld nodes

By default, the scene hierarchy does not display shape nodes, invisible nodes, or underworld nodes. It displays only transform nodes—nodes that hold attributes and other information on an object’s transformation and parent-child relationships.

A *shape node* holds an object’s geometry attributes or attributes other than the object’s transform node attributes. A shape node is a child of a transform node. A transform node has only one shape node.

An *invisible node* is any object you have hidden using Display > Hide from Maya’s menu bar. The default cameras top, front, side, and persp are also invisible nodes.

An *underworld node* is a pair of nodes below a shape node. When you create a curve on a NURBS surface, Maya generates an underworld transform node and shape node below the shape node of the surface. The CV positions of underworld nodes have UV coordinates on the surface rather than coordinates in world or local space.

To display invisible nodes, object shape nodes, or underworld nodes:

Toggle on these options:

- Options > Display > Shape Nodes
- Options > Display > Invisible Nodes
- Options > Display > Underworld Nodes

Invisible nodes display with the text grayed.

Underworld nodes appear only if you also display shape nodes in the graph.

A dotted line in the scene hierarchy indicates a connection to an underworld node. Connections to instanced objects are also indicated by dotted lines.

---

#### Note

Hypergraph option settings are saved with a scene file. The options are not saved for Maya globally.

---

#### Example

Suppose you select Create > NURBS Primitives > Sphere to create a sphere. Maya creates a transform node and a shape node.

The sphere's shape node holds the mathematical description of the sphere's shape. The sphere's transform node holds the sphere's position, scaling, rotation, and so on. The shape node is the child of the transform node.

If you select Options > Display > Shape Nodes in the Hypergraph, the scene hierarchy shows these nodes for the sphere:



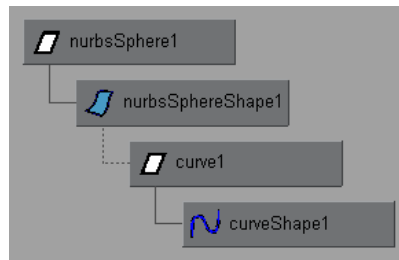
Maya gives the nodes the default names shown in the preceding figure. The transform node is `nurbsSphere1`, the shape node is `nurbsSphereShape1`. If you rename the transform node, for example, to `Bubble`, Maya renames the shape node to `BubbleShape`.

If you rename the shape node, Maya does not rename the transform node. Maya doesn't transmit a child's attribute changes up to its parent.

### Example

Suppose you select Create > NURBS Primitives > Sphere to create a sphere. Maya creates a transform node and a sphere node. Suppose you then select Modify > Make Live, then use the Create > CV Curve Tool to draw a curve on the surface of the sphere.

If you turn on the display of shape nodes and underworld nodes, the scene hierarchy appears as follows:



Maya gives the nodes the default names shown. The transform node is `nurbsSphere1`, the shape node is `nurbsSphereShape1`. The `curve1` and `curveShape1` nodes are underworld nodes for the curve created on the sphere's surface.

When a curve-on-surface is hard to select in the workspace because of crowding or complex geometry, you can select it easily in the scene hierarchy with underworld nodes displayed.

### Expression, constraint, and deformer connections

You can display color-coded lines in the scene hierarchy that illustrate nodes connected by an expression, constraint, or deformer.

To display nodes connected by an expression, constraint, or deformer:

Toggle on any or all of these options:

- Options > Display > Expression Connections
- Options > Display > Constraint Connections
- Options > Display > Deformer Connections

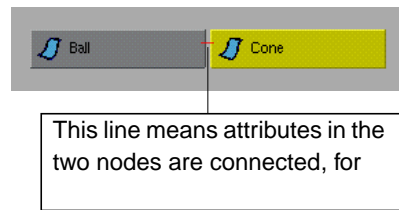
To hide these connections, toggle off the appropriate options.

### Example

Suppose you create a NURBS sphere named Ball and a NURBS cone named Cone. You write an expression to assign the value of Ball's translateY attribute to Cone's translateY attribute.

The expression links the two values. When you move Ball up or down in the workspace (in a Y-axis direction), Cone moves up or down the same amount.

If you select Options > Display > Expression Connections, the scene hierarchy displays this:



### Tip

You can change the color-coding of the connection lines and other important entities by selecting Window > Settings/Preferences > Colors from Maya's main menu bar and expanding Hypergraph/Hypershade.

## Parenting objects

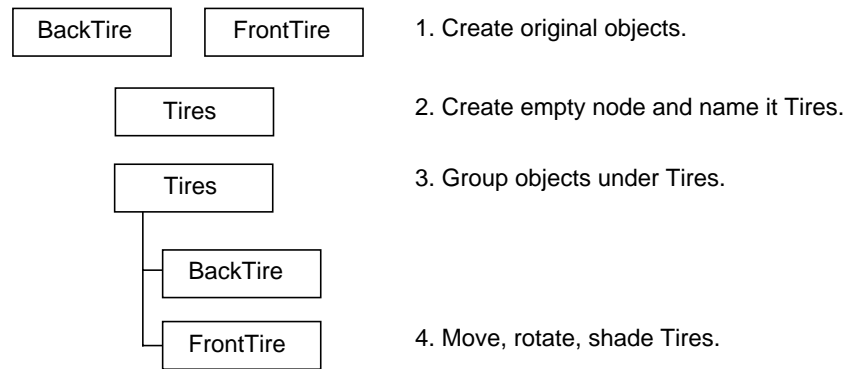
You can make an object the child of a parent object. The child adopts some or all attribute changes made to the parent.

For example, suppose you animate a planet to orbit the center of the workspace. If you make a moon the child of the planet, it follows the motion of the planet.

Though the moon is the child of the planet, you can also give the moon motion that's independent of the planet. For example, you can make it orbit the planet. If you later change the orbiting motion of the planet, the moon continues to follow the planet's motion, but still retains its original orbiting motion.

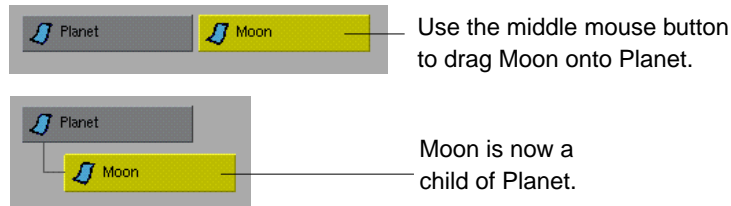
To control multiple objects with one node, you can also create an empty group and make several objects its children. By grouping objects under one node, you can move, shade, apply texture, and do many other actions to all the objects by working with the group node.

### Example



### To parent an object:

In the scene hierarchy, use the middle mouse button to drag the child node on the parent node.



If the parent node is not visible in the window, drag the child toward in the direction of the parent. The graph view scrolls as you drag into the Hypergraph's window border.

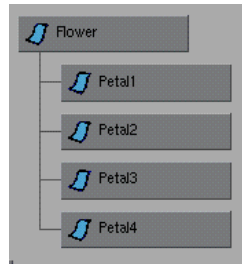
### To parent several objects to a new node:

- 1 From the Maya main menu bar, select Edit > Create Empty Group. A new node appears in the scene hierarchy named null1. This node is an invisible, empty object.

- 2 Use the middle mouse button to drag an object node onto the null1 node. The object becomes a child of the null1 node.
- 3 Repeat this step for other objects to be children of the group.
- 4 Rename the null1 node to something more meaningful.

For example, you might rename a group containing four flower petals as flower. See “Renaming an object” on page 354.

The scene hierarchy displays the objects parented to the group node:



If you modify the group node attributes, its corresponding member's attributes also are modified. For example, if you scale down a flower group node, the four petals scale down also.

#### To break the relationship between parent and child:

With the middle mouse button, drag the child node to an empty spot in the workspace.

## Rearranging scene hierarchy nodes

You can rearrange the position of nodes in a scene hierarchy to suit your preferences as follows:

- Move a node's relative position.
- Create a free-form scene hierarchy.
- Display the graph vertically or horizontally. See “Displaying a graph vertically or horizontally” on page 364.

Note that Maya updates the scene hierarchy as you modify a scene.

## Changing a node's relative position

You can move a node's relative position vertically or horizontally in a scene hierarchy. You might want to do this, for example, to make the node's graph position correspond to its spatial position in the workspace.

Be aware that rearranging an object's position in the Hypergraph might alter its behavior or appearance in your scene. Reordering a node's position in the graph affects Maya's evaluation order for the object. The evaluation order occurs from left to right and top to bottom for a scene hierarchy displayed in automatic layout.

For example, Maya typically renders nodes in the order they appear in the scene hierarchy. Changing this order changes their rendering order. If a node has transparency, however, Maya puts the node in a delayed render queue. Maya renders this queue after all opaque objects.

To see the evaluation order for a graph currently in free-form layout, select Options > Layout > Automatic Layout. To return to the free-form layout, select Options > Layout > Freeform Layout.

### To move a node in the graph:

Use Ctrl-middle mouse button to drag the node on top of another node.

In a horizontal graph, the dragged node replaces the other node's position. The other node's position gets pushed to the right.

In a vertical graph, the dragged node replaces the other node's position. The other node's position gets pushed downward.

### Example

Suppose you created a scene containing several of the solar system's planets, including earth. As you add each planet, the scene hierarchy puts a node representing the planet in the graph.

Maya puts each new node in the graph to the right of existing nodes. The location of the planet nodes in the graph might not represent the spatial relationship of the planets in the workspace, as in this example:



Here, Earth sits further from mercury than mars. In the actual solar system and in your workspace, this is not true.

To make the graph reflect the positioning of the earth in the workspace, use Ctrl-middle mouse button to drag the Earth on top of Mars.

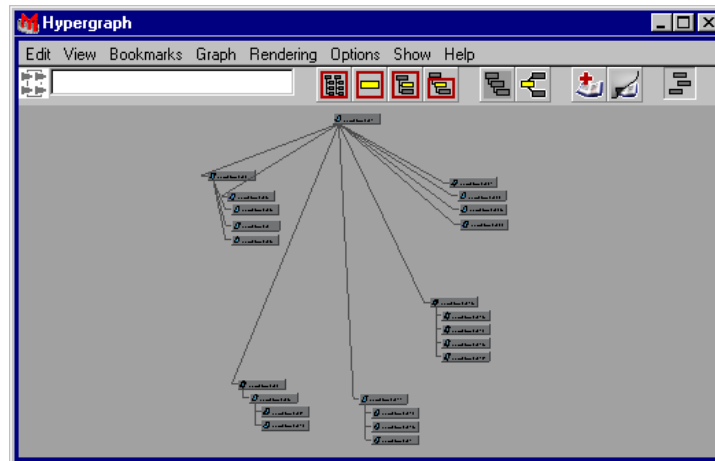
Maya positions the node to the right of Venus and to the left of Mars. Thereafter, you'll know where to look for Earth in the scene hierarchy.



## Creating a free-form hierarchy

Maya lets you select a free-form layout for the scene hierarchy to suit your node position preferences. By doing so, you can make the graph's appearance resemble the appearance of characters or other complex objects in your scene. This helps you find and select components from the hierarchy more quickly.

For example, suppose you modeled a human hand. You can customize the graph so the location of its nodes resembles the arrangement of the joints that represent the fingers and palm:



---

*Important*

Move as few nodes as necessary. When you drag a node to a new position in the graph, you increase the scene's file size and the Maya processing time needed to work with the scene.

When you move a parent node, Maya automatically moves its children with it. Automatically moved children do not increase the file size and processing time.

---

**To make a free-form graph:**

- 1 Select Options > Layout > Freeform Layout.
- 2 Drag nodes to the desired positions in the graph.

If the spot where you want to put a node is not visible in the window, drag the node past the edge of the window. The window scrolls in the direction you drag.

To drag two or more nodes to another position, click the first node, Shift-click the second node and any other nodes, then drag to the desired position.

To drag a parent but not its children, Ctrl-Shift-click the node and drag to the desired position.

**To return to the automatically generated layout:**

Select Options > Layout > Automatic Layout.

You can return to your previous free-form graph arrangement by selecting Options > Layout > Freeform Layout.

**To reset the free-form graph:**

If you create a free-form graph and you decide you no longer like its appearance, you can reset the graph to the automatic layout.

- 1 Select Edit > Reset Freeform Layout.
- 2 Click Yes when asked to confirm your selection.

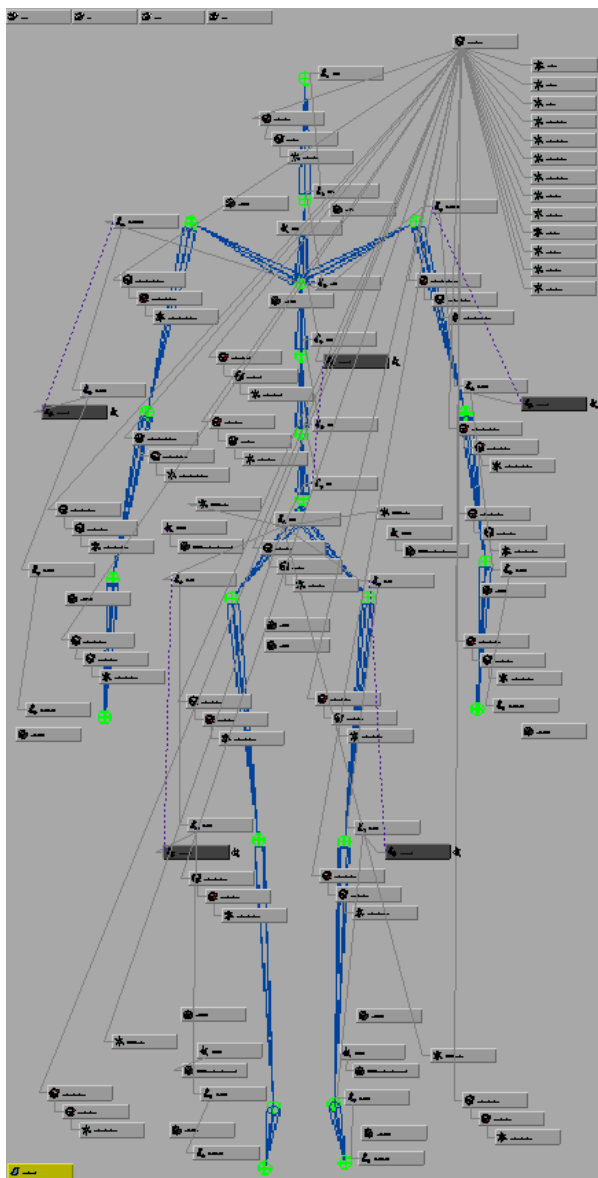
## Displaying a background image with a scene hierarchy

You can display a single image of your choice as the background for a scene hierarchy. This is helpful if you want to create a free-form hierarchy that lets you identify and select a character's joints and nodes more easily.

For example, suppose you modeled a human character. Suppose further you rendered an image of the character or used a snapshot utility to capture an image of the character's skeleton in the workspace.

You can display the image in the background of a free-form hierarchy, then position nodes and joints to match the character skeleton. This helps you identify scene hierarchy components more quickly.

Using the scene hierarchy



The character skeleton exists behind the scene hierarchy. With this arrangement, you can quickly find nodes, for example, that represents the character's feet and ankles.

### To import the background image:

- 1 Switch to freeform layout, if you are not already in it (Options > Layout > Freeform Layout).
- Note that you can import an image for the free-form layout only. Having a background image for the automatic layout has no practical purpose. The node positions for the automatic layout are fixed.
- 2 Select View > Load Background Image. A file browser appears.
- 3 Select and load the image. The image appears in the scene hierarchy.
- 4 Dolly or track to bring the image into view.
- 5 Move nodes to positions on top of the image.

Whenever you display the scene hierarchy in the Hypergraph (in freeform layout), the image appears behind the nodes.

### To turn the display of the background image off or on:

Toggle Options > Display > Background Image (in free-form) on or off.

You can display the image in the background of a free-form hierarchy.

## UNDERSTANDING THE DEPENDENCY GRAPH

The dependency graph displays connections between nodes in Maya that input and output data. A dependency graph node can represent an object's geometry, for example, a NURBS sphere. A node can also represent a Maya operation such as a deformer. Inputs and outputs are the connections between nodes, including direction of influence.

A dependency graph has no parent-child relationships, only data flow. You can display a dependency graph, for example, to see the data flow between nodes that make up an object's construction history or shading.

All nodes in a scene hierarchy also can be displayed in a dependency graph. However, not all nodes in a dependency can be displayed in a scene graph.

For example, a NURBS sphere's transform and shape nodes appear in a scene graph and therefore can be displayed in a dependency graph. A shading group node or deformer operation node that appears in a dependency graph never appears in a scene hierarchy.

A dependency graph node takes input data from one or more other nodes and uses the input to create output data. When you create models, deform objects, animate, process audio, and so on, dependency graph nodes work with the data involved.

Although we refer to a dependency graph as a singular graph, be aware you can display two or more independent graphs of connected nodes in the same window. We refer to each independent graph also as a dependency graph. Maya updates the dependency graph as you modify a scene.

## USING A DEPENDENCY GRAPH

The dependency graph is a tool for programmers who extend Maya capabilities. If you're an advanced Maya user, you'll also find it useful to:

- examine render node connections (see “Displaying render node connections” on page 339)
- examine other node connections (see “Displaying upstream and downstream connections” on page 340)
- disconnect rendering nodes and other nodes (see “Disconnecting nodes in a dependency graph” on page 344)
- connect rendering nodes and other nodes (see “Connecting nodes in a dependency graph” on page 346)

Avoid disconnecting and connecting nodes unless you have an understanding of Maya's architecture. You'll spare yourself frustration tracking down resulting problems.

See “Editing objects” on page 352 and “Altering the view of a graph” on page 356 for additional details on working with a dependency graph.

---

### Tip

As a new user of the Hypergraph, you might be unsure whether you're looking at the scene hierarchy or a dependency graph. If you see arrows between nodes, you're looking at a dependency graph. If Scene Hierarchy under the Graph menu is grayed, you're looking at the scene hierarchy.

---

## Displaying render node connections

You can show connections to shading groups, materials, textures, and lights. See *Using Maya: Rendering* for details.

### To display render node connections:

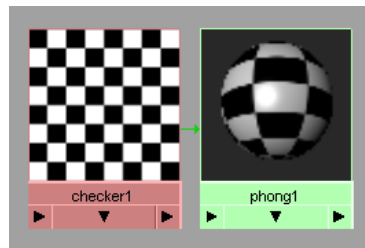
Select one of these options:

- Rendering > Show Shading Groups
- Rendering > Show Materials
- Rendering > Show Textures
- Rendering > Show Lights

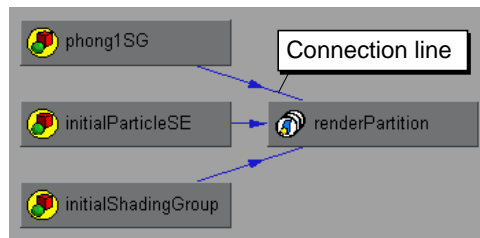
### Example

Suppose you create a NURBS sphere, then use the Hypershade to create and assign a Phong shading group to it. Next you use the Hypershade to create a 2D checker texture and assign it to the Phong node.

The Hypershade displays the following contents:



The following dependency graph appears when you select Rendering > Show Shading Groups in the Hypergraph.

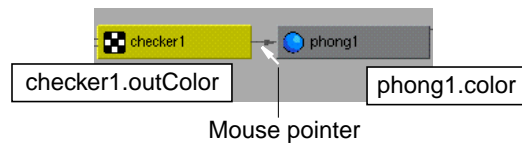


The connection lines between nodes show connection direction. The connection line originates at a node that outputs data, and the line points to a node receiving the data as input.

The preceding figure shows that the flow of output goes from the phong1SG shading group to the renderPartition.

Although you can see most of the same nodes in the Hypershade, the dependency graph shows the nodes in a flow diagram. This makes it easy to see the connections between the nodes that make up a shading group.

If you move your mouse pointer over a connection line, small white boxes appear next to the input node and output node. The white box next to an input node shows the node's name and attribute that receives the input.



The white box next to an output node shows the node's name and attribute that provides the output. Each node name and attribute is separated by a period, for example, checker1.outColor and phong1.color. In the preceding figure, the outColor attribute of checker1 is output to the color attribute of phong1.

In many cases, you must be familiar with Maya internal operation details to understand the node and attribute names you see in the white boxes.

## Displaying upstream and downstream connections

You can show upstream and downstream connections to a selected node. An upstream connection is a node that provides input to the selected node. A downstream connection is a node that receives input from the selected node.

To see connections to most objects, you must select the shape node of the object rather than the transform node.

**To select a node and display its connections:**

- 1 Select the node.

To select a shape node from the scene hierarchy, make sure Options > Display > Shape Nodes is toggled on.

---

*Tip*

You can select an object's shape node in the scene hierarchy without showing shape nodes. Select the object's transform node, put the mouse pointer in the Maya or Hypergraph window, then press your keyboard's down arrow key.

Selecting a shape node with this technique is useful for scenes having many nodes, where displaying all shape nodes in the scene hierarchy takes up much panel space.

Press the up arrow key to return to the transform node.

---

2 Select one of the following:

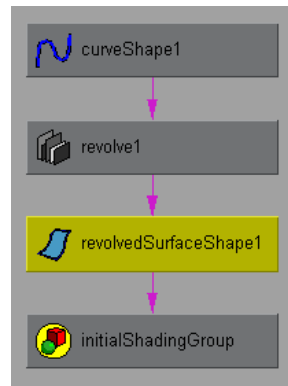
- Graph > Up and Downstream Connections
- Graph > Upstream Connections
- Graph > Downstream Connections

When you display upstream connections for a node, you see the chain of nodes that provide input to each other all the way to the selected node.

When you display downstream connections for a node, you see the chain of nodes that output to each other, all the way through to the end receiving node.

### Example

Suppose you create a wine glass surface by revolving a NURBS curve. The following dependency graph appears when you select the revolved surface's shape node and select Graph > Up and Downstream Connections:



Note that the graph is shown with a vertical orientation to make the illustration fit on this page. By default, a dependency graph has a horizontal orientation. See “Displaying a graph vertically or horizontally” on page 364.

The connection lines between nodes show connection direction. The connection line originates at a node that outputs data, and the line points to a node receiving the data as input. For information on the connection line colors, see “Connection line colors” on page 343.

The example graph shows that a curve provides input to the revolve operation node. The revolve operation generates a revolved shape—the wine glass. The revolved shape is connected to initialShadingGroup, which sets the default color of all geometric shapes created in Maya.

If you move your mouse pointer over a connection line, small white boxes appear next to the input node and output node. The white box next to an input node shows the node’s name and attribute that receives the input.

The white box next to an output node shows the node’s name and attribute that provides the output. Each node name and attribute is separated by a period.

In many cases, you must be familiar with Maya internal operation details to understand the node and attribute names you see in the white boxes.

Note that the dependency graph and scene hierarchy display animated nodes as slanted boxes. If you animate a node with an expression, it displays a regular rectangle rather than a slanted box. All other animation techniques display a slanted box. Specifically, a slanted box indicates Ball has a param curve connected to it.

### Example

Suppose you keyframe the `translateX` attribute of a NURBS sphere named `Ball`. If you select `Ball`'s transform node and display all upstream and downstream connections, this graph appears:



The slanted box indicates `Ball`'s transform node has been animated. The graph doesn't indicate which type of animation technique controls the attribute.

### Connection line colors

The connection lines are color-coded to indicate the type of attribute that is connecting the nodes. In this case, attribute types are single, double, triple, data, and array. See the following table for an explanation.

Default Color	Attribute Type	Example Attributes
Blue	Single	<code>transform.translateX</code> , <code>makeNurbsSphere.radius</code>
Cyan	Double	<code>file.repeatUV</code> , <code>cameraShape.cameraAperature</code>
Green	Triple	<code>transform.translate</code> , <code>lamBERT.color</code>
Magenta	Data	<code>nurbsSurface.create</code> , <code>makeNurbsSphere.outputSurface</code>
Red	Array	<code>particleShape.position</code> , <code>particleShape.velocity</code>

These colors are the default. You can change them in the Colors window (Window > Settings/Preferences > Colors).

Also note that a dotted line in the scene hierarchy indicates a connection to an underworld node or an instanced object.

## Dragging nodes into a dependency graph

You can drag one or more nodes from the Outliner or Hypershade into the dependency graph to display the dependency graph of the node or nodes. This is ideal for keeping irrelevant nodes out of view when you're creating and assigning rendering nodes.

Any dependency graphs previously in the display remain there.

- 1 To clear out all graphs from the display, select Edit > Clear View.
- 2 Click Yes to confirm.

Note that you can also drag a node into the dependency graph from any part of Maya that lets you drag icons.

### To drag the node into the dependency graph:

Use the middle mouse button to drag the node or nodes into the Hypergraph panel.

## Disconnecting nodes in a dependency graph

You can use the dependency graph to disconnect nodes.

### To disconnect nodes:

- 1 Click the connection line representing the connection in the dependency graph. The connection line turns yellow to indicate it's selected.
- 2 Press your keyboard's Backspace key. The connection line disappears, indicating you disconnected the connection.

To update the graph's layout to display the disconnected nodes more appropriately, select Graph > Layout.

### Example

Suppose you create a NURBS sphere named Ball. You then use the Hypershade to create a Phong E material with red color and assign the resulting phongE1SG shading group node to Ball.

The Hypershade displays the following contents.



The following dependency graph appears when you select **Rendering > Show Shading Groups**, then select the **phongE1SG** node and select **Graph > Up and Downstream Connections**.



The graph shows that an attribute of the **BallShape** node (that represents Ball's geometry) is input to the **phongE1SG** shading group node. Ball gets its color from the **phongE1SG** node.

To stop the **phongE1SG** node from setting Ball's color, do the following:

- 1 Click the connection line leading from **BallShape** to **phongE1SG**. The connection line turns yellow to indicate it's selected.
- 2 Press the Backspace key on your keyboard.

The connection line disappears, indicating you disconnected the nodes. The **phongE1SG** no longer controls Ball's color.

Ball keeps its previous shading group attribute values. In other words, it stays red and doesn't become the default gray. If you alter attributes of **phongE1SG**, though, the changes are not passed to Ball.

You can reconnect **BallShape** to another shading group node to make it control Ball's shading. For example, you can use the middle mouse button to drag **BallShape** from the Outliner onto **initialShadingGroup**.

Ball's color becomes the default gray color set in the **initialShadingGroup** node. Note that each geometric object you create is connected to the **initialShadingGroup** node, by default, until you connect it to another shading group.

## Connecting nodes in a dependency graph

The dependency graph offers convenient ways to connect nodes while you examine the graph. In the dependency graph, you can:

- launch the Connection Editor
- launch a window that displays input or output attributes you can connect to
- connect a node's default output attribute to a node's default input attribute

### To launch the Connection Editor:

Use Shift-middle mouse button to drag from an output node to an input node.

The Connection Editor appears. The Outputs side of the Connection Editor displays the dragged node and its attributes. The Inputs side displays the attributes of the destination node. See *Using Maya: Rendering* for details on the Connection Editor.

### To create a default connection:

Use the middle mouse button to drag the output node onto the input node.

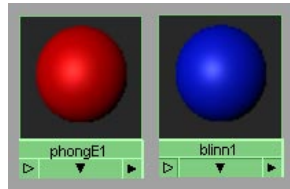
Maya connects the default output attribute from the output node to the default input attribute of the input node. Usually, the default input and output attributes are the attributes you would most likely want to connect.

If the attributes aren't compatible, no connection occurs and the Connection Editor appears instead.

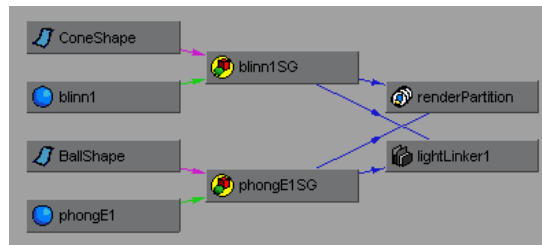
### Example

Suppose you create a NURBS sphere and cone named Ball and Cone. You use the Hypershade to create a Phong E material with red color, and a Blinn material with blue color. You assign the resulting phongE1SG shading group node to Ball, and the blinn1SG shading group to the Cone.

The Hypershade displays the following contents:



The following dependency graph appears when you select **Rendering > Show Shading Groups**, select the **phongE1SG** and **blinn1SG** shading groups and select **Graph > Up and Downstream Connections**.



The graph shows **ConeShape** connected to the **blinn1SG** shading group, and **BallShape** connected to the **phongE1SG** shading group.

You can swap the colors of **Ball** and **Cone** by reversing their connections to the shading groups.

**To reverse connections:**

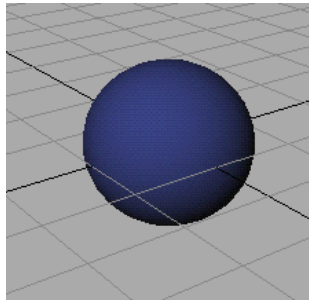
- 1 Use the middle mouse button to drag **ConeShape** onto **phongE1SG**. This reconnects the default output attribute of the **ConeShape** node to the default input attribute of the **phongE1SG** node. **Cone** becomes red.
- 2 Use the middle mouse button to drag **BallShape** onto **blinn1SG**. This reconnects the default output attribute of the **ConeShape** node to the default input attribute of the **phongE1SG** node. **Ball** becomes blue.

### Tip

Select **Rendering > Create Render Node** to create a new material, texture, or light. You can then connect to the new node using the dependency graph.

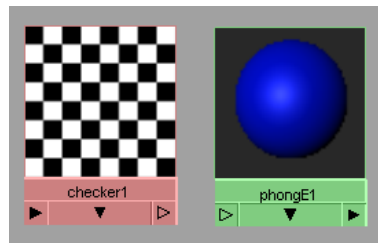
### Example

Suppose you create a NURBS sphere named Ball. You then use the Hypershade to create a Phong E material with blue color and assign the corresponding phongE1SG shading group node to Ball to color it blue.



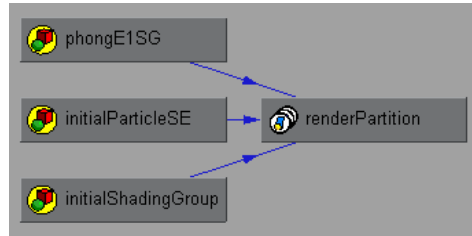
You then create a black and white 2D checker texture, but you haven't assigned it to an object.

The Hypershade displays the following contents.

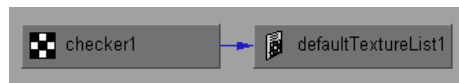


To replace Ball's blue color with the checker texture, you must use the middle mouse button to drag the texture node onto the shading group.

If you select Rendering > Show Shading Groups, you'll see the shading groups in the scene, but not the textures.



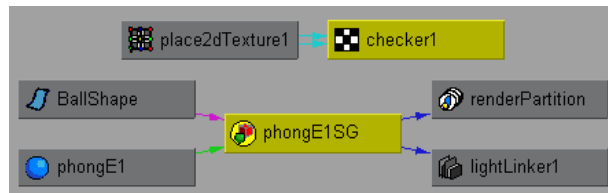
If you select **Rendering > Show Textures**, you'll see the textures created in the scene, but not the shading groups.



To drag the checker1 texture onto the phongE1SG shading group, you need to display them in the graph at the same time. Do the following steps:

- 1 While the checker1 node is displayed in the dependency graph, use the middle mouse button to drag the phongE1SG shading group node from the Hypershade into the Hypergraph window.
- 2 Select the checker1 and phongE1SG nodes and select **Graph > Upstream and Downstream Connections**.

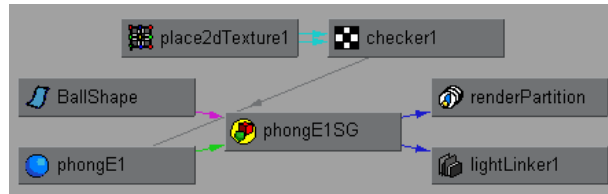
The dependency graph for the phongE1SG node appears as follows.



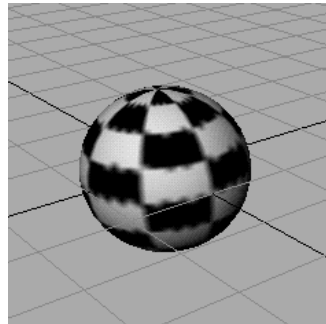
- 3 Use the middle mouse button to drag the checker1 node onto the phongE1SG or PhongE1 node. Maya makes a connection from checker1 to phongE1 and draws a connection line representing the connection:

## USING THE HYPERGRAPH | 10

Using a dependency graph



Ball shows a black and white checkerboard texture, rather than blue color. Turn on Shading > Smooth Shade All and Shading > Hardware Texturing to display shading and textures of objects in your workspace.



- 4 To redraw the graph with better organization of connection lines, select Graph > Layout.
- 5 Dolly and track to bring the reorganized graph into view:



- 6 Move the mouse pointer over the connection line between checker1 and phongE1.  
White boxes appear next to the nodes. They show that the default output outColor attribute of checker1 connects to the default input color attribute of phongE1.

Because of this connection, the black and white checker1 texture provides the material color for the phongE1 node and therefore the phongE1SG shading group. An object connected to the phongE1SG shading group receives the black and white checker1 texture.

**To launch the display of input or output attributes:**

- 1 Drag a connection line to a node.  
  
If you drag the side of the line closer to the original output node, you display output attributes of the destination node. If you drag the side of the line closer to the original input node, you display input attributes of the destination node.  
  
After you drag a connection line to a node, a pop-up menu displays listing either of the appropriate attributes you can connect to, either input or output. The part of the connection line you drag determines whether you display the node's input or output attributes.
- 2 Click the attribute you want to connect to.

## Updating the layout of a dependency graph

When you add or connect nodes in a scene, the dependency graph might place the nodes in a position that isn't easy to read. If you don't like the positioning of the added node, you can update the graph's layout to a default reorganized layout.

**To update the dependency graph's layout:**

- 1 Select Graph > Layout. A window opens and asks you to confirm your choice.
- 2 Click Yes.

**To return to the scene hierarchy from the dependency graph:**

Select Graph > Scene Hierarchy.

## Clearing the contents of a dependency graph

You can clear the display of the dependency graph from the Hypergraph window. This is helpful when you're looking at connections for one or more nodes, but want to look at unrelated nodes without the clutter of the existing nodes.

To clear the contents of the dependency graph:

- 1 Select Edit > Clear View. A window requesting confirmation appears.
- 2 Click Yes.

## Returning to the scene hierarchy

While examining a dependency graph, you can return to the view of the scene hierarchy.

To return to the view of the scene hierarchy:

Select Graph > Scene Hierarchy.

## EDITING OBJECTS

There are several ways to edit objects as you're examining the scene hierarchy or dependency graph. You can:

- select objects
- add and select an IK handle
- rename objects
- hide objects
- edit a selected node's attributes
- add a render node

## Selecting objects

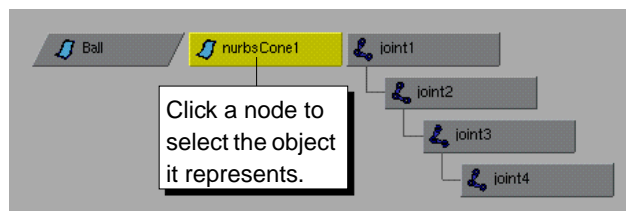
The scene hierarchy and dependency graph offer a convenient way to select objects or other items in a scene. This is useful when items in the workspace are crowded and overlapping.

### To select an object:

- 1 Track and dolly the view to find the node that represents the object or component.

For example, if your scene has an object named Ball, bring the node representing Ball into view in the scene hierarchy.

- 2 Click the node to select it. The node changes to yellow.



### To deselect an object:

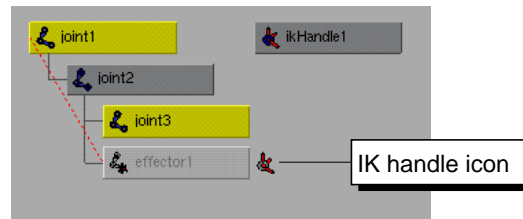
Click an empty spot in the window. When you deselect a node, it becomes gray again.

## Adding and selecting an IK handle

In a scene having an IK character with a complex, crowded skeleton, you can use the scene hierarchy to easily add an IK handle to a joint chain. This lets you select the handle easily.

### To add an IK handle:

- 1 In the Animation menu set, select Skeleton > IK Handle Tool.
- 2 In the scene hierarchy, select the top node of the joint chain.
- 3 Shift-select the bottom node of the joint chain. Maya creates an end effector and IK handle for the joint chain.



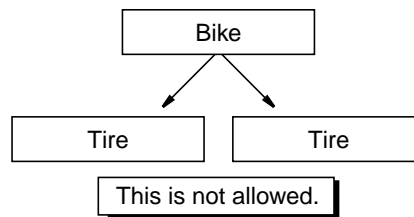
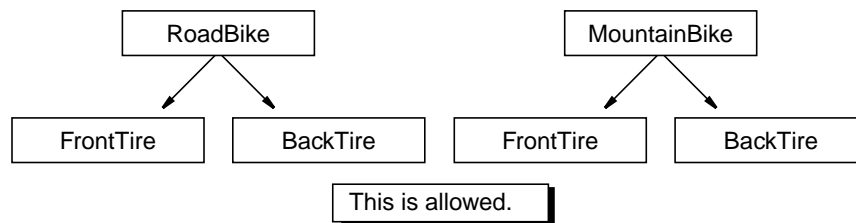
#### To select an IK handle:

Click the IK handle icon to the right of the end effector node. The IK handle node and icon turn yellow to indicate you selected it.

If you make the IK handle node the child of another node, its location might be hard to find in the graph. The IK handle icon to the right of the end effector at the bottom of the joint chain makes it easy to find.

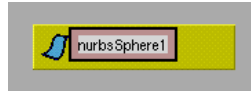
## Renaming an object

You can rename an object or other item in the scene hierarchy or dependency graph. You can give two nodes the same name, but only if each has a different parent.



**To rename an object:**

- 1 Right-click on the node representing the object and select Rename from the pop-up menu. A small text box appears in the node:



- 2 Enter the new name.

**Hiding an object in the workspace**

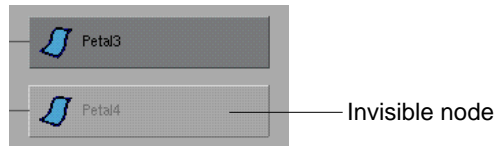
You can use the scene hierarchy or dependency graph to make an object or other item invisible in the workspace.

**To hide an object:**

Right-click on the node representing the object and select Hide from the pop-up menu. The object disappears from the workspace and the text on the node becomes grayed in the scene hierarchy.

**To display a hidden object:**

- 1 Select Options > Display > Invisible Nodes. The text on a node representing a hidden object is grayed to indicate it's invisible in the workspace.



- 2 Right-click on the node representing the object and select Show from the pop-up menu. The object reappears in the workspace.

**Editing an object's attributes**

After you select a node in the scene hierarchy or dependency graph, you can edit its attributes:

Altering the view of a graph

To edit a node's attributes:

- 1 Select the node in the graph.
- 2 Select Edit > Attributes. The attributes for the selected node load into the Attribute Editor.

## Creating a render node

You can launch the Create Render Node window to create a new material, texture, and light. This is convenient when you're examining the dependency graph for a rendering node.

The Create Render Node window is the same window that appears when you select Create > Create Render Node from the Hypershade.

To create a render node:

Select Rendering > Create Render Node. The Create Render Node window opens. For details, see *Using Maya: Rendering*.

## ALTERING THE VIEW OF A GRAPH

A scene hierarchy or dependency graph covers lots of screen space for complex scenes. For example, you might create a detailed kinematic character that results in thousands of nodes.

The following pages describe general navigation techniques for examining a graph. You can use the techniques with a scene hierarchy or dependency graph, unless otherwise noted.

### Tracking the view

You can move the view of the graph up, down, or sideways.

To track the view:

In the graph view, use Alt-middle mouse button to drag in the desired direction.

### Dollying the view

You can enlarge or shrink the view of the graph.

### To dolly the view:

In the graph view, hold down the Alt key and drag the left and middle mouse buttons left to shrink the view; drag to the right to enlarge the view.

### Note

If you dolly away from a graph, the text in node boxes becomes abbreviated. An ellipses (...) appears to the right of the abbreviation.

To read the text, move the mouse pointer over the box. The node's name appears in a pop-up box. The type of node appears in parenthesis next to the node name.

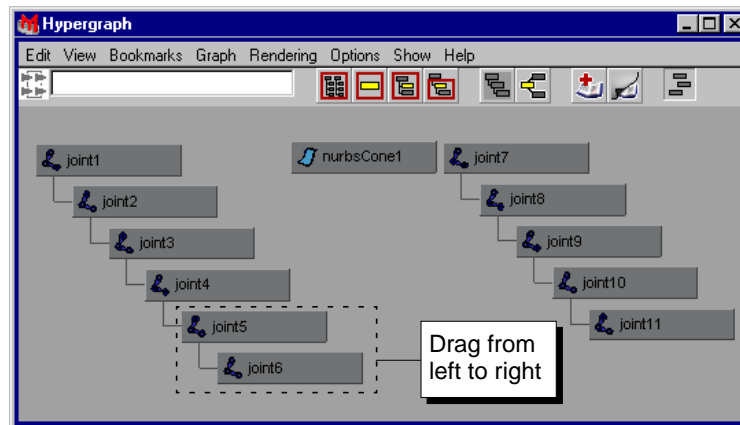
For example, if you see Ball (transform) in a box, it means the box represents the node named Ball, which is a transform node.

## Dollying a region

You can dolly the view of a selected region by dragging a selection box.

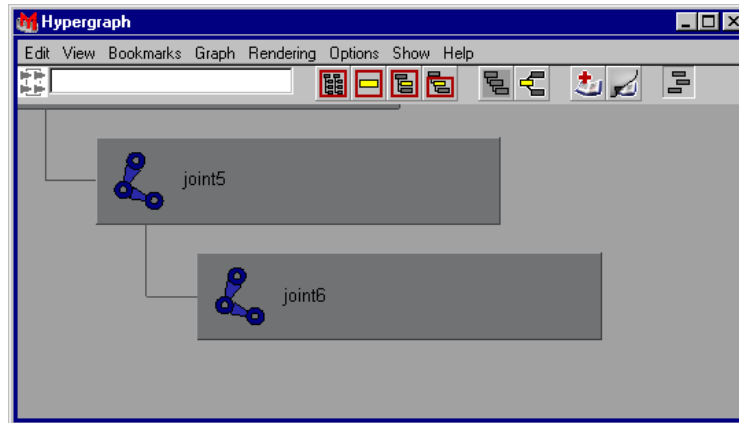
### To dolly a region:

Ctrl-Alt-drag a selection box from left to right around the region.



The region in the selection box expands to the center of the Hypergraph window.

Altering the view of a graph



To dolly away from a selection:

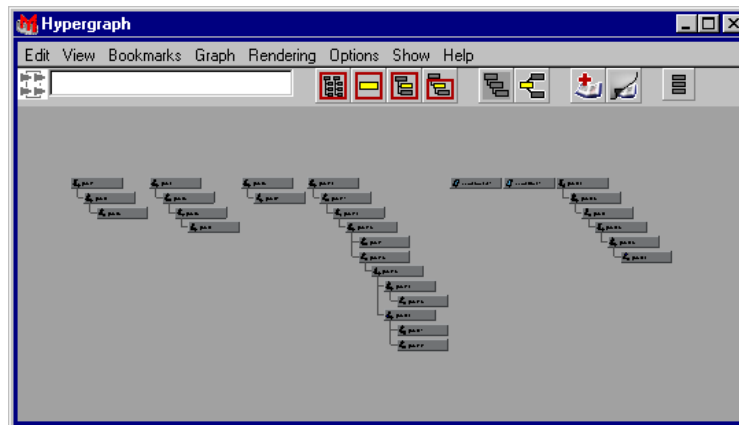
Ctrl-Alt-drag a selection box from right to left around the region.

## Fitting an entire graph in the window

You can fit an entire graph in the Hypergraph window. This is helpful if you want to see the general organization of nodes.

To fit the entire scene graph in the window:

Select View > Frame All.



In a large graph, the node names will be too small to read. You'll need to dolly and track this view to read the names.

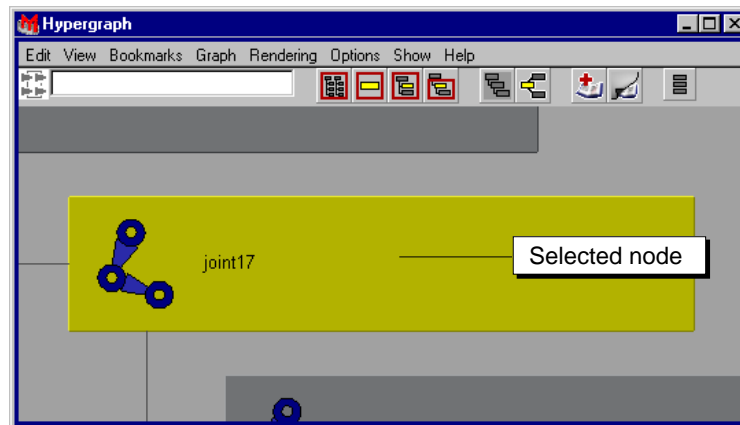
## Centering selected nodes in the window

You can center and expand the view of selected nodes in the Hypergraph window. You might want to do this, for example, when you're looking at distant, unreadable view of the graph, and you want to read the name of the currently selected object.

To center selected nodes in the window:

- 1 Click the node or nodes in the graph. You can also select a node in the Maya workspace or from the Outliner.
- 2 Select View > Frame Selection.

Here's an example display.



## Centering a hierarchy in the window

You can center a selected node's hierarchy in the Hypergraph window. This is useful when you want to focus on a group of related nodes above and below the selected node. This option works only in the scene hierarchy, not in the dependency graph.

Altering the view of a graph

To center a hierarchy in the window:

- 1 Click the node in the graph. You can also select a node in the Maya workspace or from the Outliner.
- 2 Select View > Frame Hierarchy.

## Centering a hierarchy branch in the window

You can center the branch descending from a node in the Hypergraph window. This is useful when you want to focus on the related nodes below a selected node. This option works only in the scene hierarchy, not in the dependency graph.

To center a branch in the window:

- 1 Click the node in the graph. You can also select a node in the Maya workspace or from the Outliner.
- 2 Select View > Frame Branch.

## Adjusting view transition speed

When you change the panel view of a graph, for example, by selecting View > Previous View, Maya dollies from one view to another instantaneously, by default. You can slow Maya's transition speed between views to make the view change action easier to see.

To adjust the transition speed between views:

- 1 Toggle on Options > Transitions > Animate Transitions.
- 2 Select Options > Transitions > and select one of these speeds:
  - 5 Frames
  - 10 Frames
  - 15 Frames
  - 20 Frames

20 Frames dollies slowest, 5 Frames dollies fastest.

To return to the default transition speed between views:

Toggle off Options > Transitions > Animate Transitions.

## Setting graph update options

Whenever you add or delete an object, rendering node, or other item in the scene, the Hypergraph updates the scene hierarchy and dependency graph, by default.

When you select an object in the scene hierarchy or dependency graph, the object is also selected in the workspace, Outliner, and elsewhere in Maya. Also, when you select an object in the workspace, Outliner, and elsewhere in Maya, the object becomes selected in the scene hierarchy or dependency graph.

These updates slow Maya operation when you work with a complex scene or when you're examining nodes or dragging nodes to new positions in a free-form hierarchy. You can toggle off updating to improve operation speed.

**To turn off graph updates for created nodes:**

Toggle off Options > Update > On Nodes Creation.

If you toggle this option on later, the graph displays all previously added and deleted nodes.

**To turn off Hypergraph selection updates:**

Toggle off Options > Update > On Selection.

## Undoing a view of a scene hierarchy

As you track, dolly, and make other changes to the view of a scene hierarchy, you may want to return to a previous view. Maya keeps the history of your view changes and lets you return to one or more previous views.

After you display a previous view, you can move forward again to other view.

**To change to a previous view:**

Select View > Previous View.

To see the view before this one, select View > Previous View again.

**To see the view ahead:**

Select View > Next View.

This works only after you use View > Previous View. To see another view ahead, select View > Next View again.

## Using bookmarks for graph views

You can bookmark the view of a graph to return to it later. For instance, suppose you dolly the view to see a group of nodes, then bookmark the view. If you dolly to a different view of the scene, you can select the bookmarked view to return to it.

Note that the layout of the nodes in a previously bookmarked view changes when you modify a scene as follows:

- add or delete objects.
- reposition nodes in a free-form hierarchy
- expand or collapse nodes
- display invisible, shape, or underworld nodes

If a node was selected and entirely visible in the view at the time of bookmarking, when you return to the bookmarked view, the node appears in the same position regardless of how you altered the graph.

If no node was selected or if a selected node was only partly visible in the view, returning to the bookmarked view shows the previously displayed region in the graph.

Depending on how you altered the graph, the previously displayed nodes might not appear in the bookmarked region anymore. You'll likely need to create a new bookmark.

As you add or delete nodes in a scene, Maya updates the layout of the scene hierarchy and dependency graph. Don't be alarmed if you notice a node disappears from a previously bookmarked view of the dependency graph. This is usually the result of Maya conforming with its default graph layout.

---

*Tip*

You can ensure that a bookmarked view displays a node even after you reposition, add, or delete nodes in the scene. To do so, select the node and make sure its entire outline is visible in the view before creating the bookmark.

If you select two or more nodes, the bookmarked view displays the first node selected.

---

**To bookmark a view:**

- 1 Track and dolly the view as desired.
- 2 Select Bookmarks > Create Bookmark. The bookmarked view gets a default name, for example, hyperView1. The name appears at the bottom of the Bookmarks menu.

**To name a view before bookmarking it:**

- 1 Track and dolly the view as desired.
- 2 Select Bookmarks > Create Bookmark ☐. A window opens and prompts for the bookmark name.
- 3 Enter a bookmark name.

**To return to a bookmarked view:**

Select Bookmarks and the name of the bookmark at the bottom of the menu. For example, select Bookmarks > MonsterHead.

**To delete a bookmarked view:**

- 1 Select Bookmarks > Bookmark Editor. The Bookmarks window opens, showing all bookmarks you added.
- 2 Click the name of the bookmark.
- 3 Select Edit > Delete Bookmark. The name of the bookmark is deleted.

Altering the view of a graph

To rename a bookmarked view:

- 1 Select Bookmarks > Bookmark Editor. The Bookmarks window opens, showing all bookmarks you added.
- 2 Click the name of the bookmark.
- 3 Select Edit > Rename Bookmark. A window opens and prompts for the bookmark name.
- 4 Enter the new name.

You can also rename a bookmark by selecting Bookmarks > *name* □, where *name* is the name of the bookmark. A prompt window opens and lets you enter the new name.

## Displaying a graph vertically or horizontally

The scene hierarchy and dependency graph have a horizontal layout by default.



If you prefer to look at a graph upright, you can change to a vertical layout.



To display the graph vertically:

Select Options > Orientation > Vertical.

To display the graph horizontally:

Select Options > Orientation > Horizontal.

## Rebuilding the graphs

If your scene hierarchy or dependency graph doesn't seem up to date, you can rebuild the graphs. For example, if you add an object to a scene and it doesn't appear in the scene hierarchy, rebuild the graphs to make the scene hierarchy aware of the object's presence.

To rebuild the graph:

Select Graph > Rebuild.

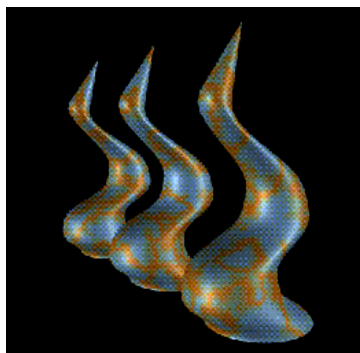


# 11 SETS AND PARTITIONS

A *set* is a collection of objects or components. For example, a set might include geometric objects, NURBS CVs, polygonal vertices, lattice points, polygonal facets, or other items. Any item you can select can be in a set.

In some instances, Maya creates sets for you as you work with objects. For example, when you add a cluster to several CVs of a NURBS cone, Maya makes a set of the CVs. You can edit and tune such sets to control the area affected by deformation.

You can also create a custom set so you can work on its items with a single action. For instance, you can create a set of NURBS objects, then hide or display them as a single entity.



You can edit and tune sets to control deformation of one or more objects.

This chapter has the following topics:

- “How you can use sets” on page 368
- “Understanding sets” on page 369
- “Creating, selecting, and removing sets” on page 375
- “Editing set membership” on page 378
- “Editing set membership” on page 378

How you can use sets

- “Altering the display of sets” on page 379
- “Understanding partitions” on page 379
- “Creating, displaying, and removing partitions” on page 381
- “Adding sets to partitions” on page 382

## HOW YOU CAN USE SETS

Here are the ways you can use sets:

- adjusting deformer, skin, and flexor deformation
- adjusting the weight of cluster, cluster flexor, and skin points
- simplifying selection of objects or components that you regularly select or have difficulty selecting in the workspace.
- assigning objects to shading groups for rendering
- moving objects from one layer to another

If you apply a deformer or skin to a geometric object, Maya creates a set for the geometry’s CVs, vertices, or points. You can add or remove set members to alter the effect of the deformer or skin. See *Using Maya: Character Setup* for details on deformers and skins.

For clusters and cluster flexors, you can apply different weights to the set members to increase or decrease deformations at specified points.

For skin, you can apply different weights to the set members to increase or decrease skin deformation around the joints.

You can create your own set of objects or components for easier selection and transformation. For instance, suppose you need to repeatedly select the same few CVs around the eye of a cyclops to animate the eye. Rather than struggle to select the CVs with a selection box, you might create a set named `cyclops_eye` for the CVs, then select the set by clicking the set name in a convenient set editing tool named the Relationship Editor.

When you create a shading group with the Hypershade, Maya creates a set that represents the shading group. You can work with such sets rather than the Hypershade to conveniently assign shading groups to objects. See *Using Maya: Rendering* for details on shading groups.

When you create a layer, Maya creates a set that represents it. You can work with sets rather than layer menu entries to quickly move members from one layer to another.

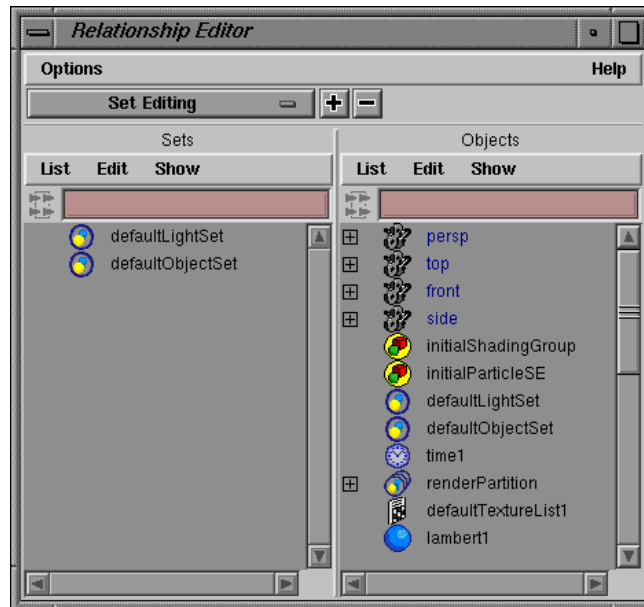
When you add a field to vertices, CVs, or edit points, Maya creates a set named after the field, for instance, `uniformFieldShape1Set`. The set members are the vertices, CVs, or edit points to which you added the field. You can add or remove the set members to alter the effect of the field. See *Using Maya: Dynamics* for details on fields.

## UNDERSTANDING SETS

It's easiest to learn about sets by examining the display of the Relationship Editor, the main tool for working with sets. You can launch the Relationship Editor by selecting it from the main menu or with other common techniques such as the Hotbox. For more information about the Relationship Editor, see "Using the Relationship Editor" on page 255.

### To open the Relationship Editor:

From the main Maya menu, choose Window > Relationship Editors > Sets. The Relationship Editor opens.



Scale and move the window as needed.

You can also display the Relationship Editor in a workspace panel by choosing **Panels > Panel > Relationship Editor**. This lets you see the Maya user interface and the Relationship Editor without having to reposition the windows.

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### Note

Unless instructions in this chapter state otherwise, make all menu choices from the Relationship Editor's menu bar.

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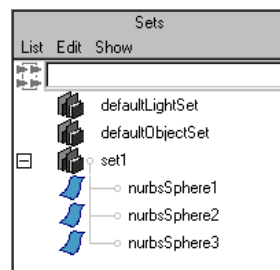
## Sets you create

When you create a set, the Relationship Editor displays the set's name and contents. You can apply an operation to a set to affect all its members.

### Example

Suppose you create three NURBS spheres. You can put the spheres in a set as follows:

- 1 Select the spheres in the workspace, Outliner, or elsewhere.
- 2 In the Sets panel of the Relationship Editor, select Edit > Create Set. The Relationship Editor displays the newly created set.  
By default, Maya gives the set the name set1 or something similar. To use your own name rather than the default, choose Edit > Create Set ☐.
- 3 Click the plus sign (+) next to the set to expand its contents.



The set contains nurbsSphere1, nurbsSphere2, and nurbsSphere3. Items indented below a set name are its members. You can select the set to do operations on each of its members.

- 4 To select the objects in the set, click the set name and select Edit > Select Set Members.

This selects the three spheres that are members of the set. With the sphere members selected, you can do operations such as:

- hide them from the workspace view
- translate, rotate, and scale
- start the Attribute Editor, so all three spheres are available for editing there

Subsequent topics provide more details on working with sets.

## Sets created by Maya

A new empty scene has the following default sets:

- defaultLightSet
- defaultObjectSet (not used)
- defaultLayer

- Shading group sets (initialShadingGroup, initialParticleSE)

In addition to the default sets, Maya creates sets automatically when you create shaders. It also creates sets automatically when you create deformers, flexors, or when you bind skin (Deformer and skin point sets).

### defaultLightSet

When you add a light to the scene, the light becomes a member of the defaultLight set by default. Maya keeps all lights in these set, even when you assign a light to another set.

### defaultLayer

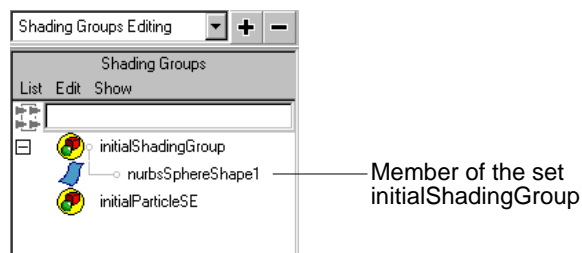
Each scene has a default display layer that consists of all objects that have not been assigned to any other layer. When you remove an object from a layer, it becomes a member of the default layer.

### Shading group sets

A new, empty scene has two shading group sets by default: initialShadingGroup and initialParticleSE. These sets control the default shading of objects added to the scene.

When you add a geometric object to the scene, the object becomes a member of the initialShadingGroup set by default. The shading group colors its members a dull gray. (You can see the default gray color of such objects in the workspace by choosing Shading > Smooth Shade All.)

If you create a sphere, for instance, Maya adds the sphere to the initialShadingGroup set. (To see these sets, you must select Shading Groups Editing from the drop-down list in the Relationship Editor.)

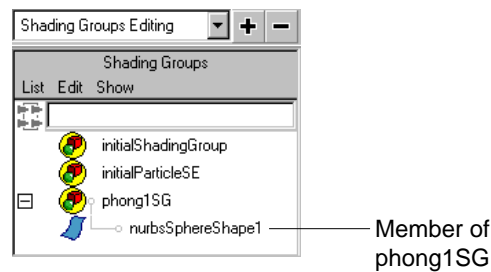


Maya keeps a newly added geometric object in the `initialShadingGroup` set until you create and assign a different shader to the object. Maya then relocates the object to a set it creates for the shading group you created. You typically won't do anything directly with the `initialShadingGroup` set. It's for Maya's internal use as you make shading choices.

### Example

Suppose you use the Hypershade to create a Phong material. When you create the node, Maya creates a set named `phong1SG`. This set represents the Phong shading group.

Suppose further you use the Hypershade to assign `phong1SG` to a geometric object named `nurbsSphere1`. Maya moves the object from the `initialShadingGroup` to the `phong1SG` set.



The object receives its surface shading from the options you set in the Attribute Editor for the `phong1SG` node.

If you were to add a particle object to a scene, it would become part of the `initialParticleSE` shading group set. This set has the same purpose as `initialShadingGroup`, only it controls the default shading characteristics of particles rather than geometry.

An object can be part of only one shading group set—whether `initialShadingGroup`, the `initialParticleSE`, or one you create.

By looking at the members of the shading group sets, you can see which objects are shaded by the shading groups you've added to your scene. To try out various shaders on different objects, use the middle-mouse button to drag objects from one shading group set to another.

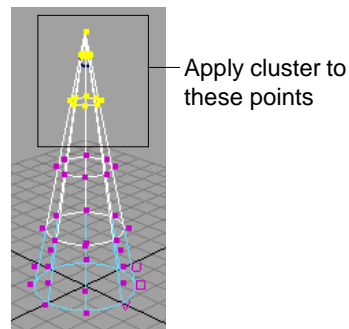
For more details on working with shading groups, see *Using Maya: Rendering*.

## Deformer and skin point sets

When you attach a deformer to an object, Maya creates a set from the object's points. When you bind skin to a skeleton, Maya creates two or more sets for the skin points attached to the joints. (To see these sets, you must select Deformer Set Editing from the drop-down list in the Relationship Editor.) See *Using Maya: Character Setup* for details on deformers and skin points.

### Example

Suppose you create a NURBS cone, select several CVs, then choose Deform > Create Cluster from the Animation menu to apply a cluster.



Maya creates a set named cluster1Set or something similar by default.



The set contains the points in the cone controlled by the cluster. In such sets, you can alter deformations by adding and removing points or by editing point weights of existing members.

For example, you can add corresponding points from a newly added cone in the scene. The added points deform with the existing points as you translate, rotate, or scale the cluster handle.

## CREATING, SELECTING, AND REMOVING SETS

The following topics describe how to create, select, and remove a set. Note that binding skin or adding a deformer or flexor to an object automatically creates one or more sets. You need not create a set for such objects. See “Sets created by Maya” on page 371 for details.

### Creating sets

You can create a set of geometric objects, CVs, vertices, polygonal faces, or other items.

**To create a set with a default name:**

- 1 Select the objects or items in the workspace, Outliner, or elsewhere.  
For example, use the Artisan Paint Selection Tool (Modify > Paint Selection Tool) to select CVs.  
If you don't select any objects, an empty set will be created in the next step. You can add to an empty set later.

- 2 From Maya's main menu, choose Edit > Sets > Create Set.

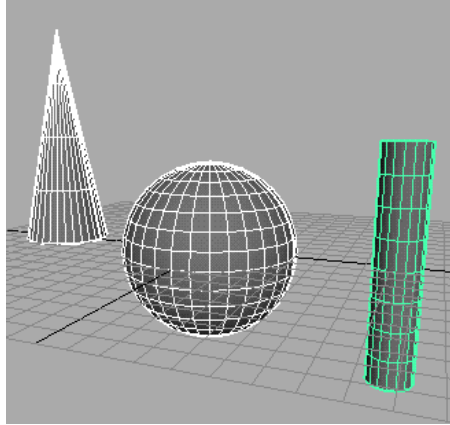
*or*


From the Relationship Editor, select Set Editing from the drop-down list and select Edit > Create Set in the Sets panel.

The set appears with a default name in the Relationship Editor.


**To create a set and name it:**

- 1 Select the objects or items in the workspace, Outliner, or elsewhere.



- 2 From Maya's main menu, choose Edit > Sets > Create Set .

*or*

From the Relationship Editor, select Set Editing from the drop-down list and select Edit > Create Set  from the Sets panel.

The Create Set Options menu opens.

- 3 Enter the name of the set in the Name text box.

For example, enter nurbsObjects.

Other options in the window let you add the set to a partition. See “Adding sets to partitions” on page 382 for details.

- 4 Click Apply. The set appears with the chosen name in the Relationship Editor.

If a set or other item in the scene already has the specified name, the new set name will be appended with a number. For example, entering top results in top1, because top is the name of a camera that exists in every scene by default.

## Selecting sets

You can select a set or the contents of a set. You must select a set to remove or rename the set. You must select the contents of the set to apply an action to each member of the set.

**To select a set:**

- 1 In the left panel of the Relationship Editor, click the name of the set and choose **Select > Highlighted**.

You can also select the set in the Outliner or Hypergraph's dependency graph view.

To display set members in the Outliner so you can select them, toggle on **Display > Set members**.

To display sets in the Hypergraph's dependency graph view, select the object shape node associated with the set and choose **Graph > Up and Downstream Connections**.

**To select a set's contents only:**

- 1 In the left panel of the Relationship Editor, click the name of the set.
- 2 Select **Edit > Select Set Members**. This selects the contents of the set, but not the set.

## Removing sets

If you are no longer using a set, you can remove it without removing its members.

**To remove a set, but not its members:**

- 1 In the Relationship Editor, select **Set Editing** from the drop-down list.
- 2 Click the name of the set in the left panel.
- 3 Select **Edit > Delete Highlighted**.

## Creating sets for easy object selection

You can create a set of joints, geometry, CVs, materials, or other items for quick selection in the main menu. You might want to do this, for instance, so you can select different animation characters quickly without having to start the Relationship Editor. This is also useful for selecting items not visible in the workspace, for instance, invisible objects.

**To create a quick set:**

- 1 Select the objects or items.

- 2 From the main Maya menu bar, select Edit > Sets > Create Quick Select Set. A window prompts for a set name.
- 3 Enter the set name for the items and click OK. This creates the set and puts its name in the cascading menu to the right of Edit > Quick Select Set in the main Maya window.

#### To select items in the quick set:

From the main Maya menu bar, select Edit > Quick Select Set and the name of the set.

This selects the items in the set, not the set itself.

## EDITING SET MEMBERSHIP

You can add or remove members of a set with the Relationship Editor, the Paint Set Membership Tool, or the Edit Membership Tool.

The advantage of the Relationship Editor is that it:

- includes a formatted list of set members and associated objects
- displays U and V parameters of NURBS curve and surface CVs
- lets you edit the weight of cluster, cluster flexor, and skin points

For information on using the Relationship Editor to add and remove set members, see “Adding and removing relationship members” on page 261.

The advantage of the Paint Set Membership Tool is that you can modify which of a deformable object’s points (for example, CVs or vertices) belong to multiple deformer sets by painting the points you want added to, transferred to, or removed from the set, directly on the object. Color feedback makes sets easy to identify. See *Using Maya: Character Setup* for details.

The advantage of the Edit Membership Tool is that you can add and remove set members in the workspace without using another window or panel. This is ideal for quickly altering membership of sets Maya creates for deformers and skin. See *Using Maya: Character Setup* for details.

## ALTERING THE DISPLAY OF SETS

You can display all sets in your scene (including character sets, deformer sets, shading groups, and layers) in the Relationship Editor. For information on the options for narrowing or broadening which sets display, so you spend less time scrolling and expanding sets, see the following:

- “Displaying relationships and objects” on page 257
- “Setting view options” on page 256
- “Selecting which relationships and objects show” on page 258

## UNDERSTANDING PARTITIONS

A partition is a collection of related sets. The sets in a partition can have no overlapping members.

As you create shading groups, bind skin, and do a few other tasks, Maya creates partitions. It does this to keep the sets separate where an operation would be hindered by overlapping members. You can also create custom partitions to keep your own sets separate.

### Partitions you create

When you use the Create Set menu item to create a set, its members can, by default, exist in any other set you’ve created. In some instances, you might want to prevent two sets from having overlapping members. You can do this by creating a partition and putting the sets in it.

#### Example

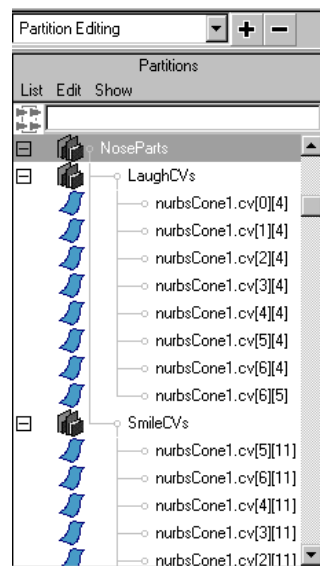
Suppose you’re animating a cartoon character’s nose as he smiles and laughs. You added a cluster to several CVs for adjusting the nose as he smiles and another cluster to different CVs for adjusting the nose as he laughs.

Creating the two clusters creates a set for each group of CVs. Occasionally you want to move CVs from one set to the other, to alter the deformations that occur as you transform the clusters.

When you move the CVs from one set to the other set, they remain in the first set. You might not want the CVs in the first set because they add undesirable deformations as you transform the cluster.

To avoid this problem, you can create a partition and put both sets in it. The partition prevents one set from having members of another set. When you move the CVs from the first set to the second set, they're automatically removed from the first set.

You can also add a partition to prevent clusters from having overlapping members when you add the cluster with Deform > Create Cluster ☐. See *Using Maya: Character Setup* for details.



The LaughCVs and SmileCVs sets in the NoseParts partition cannot have overlapping members.

## Partitions created by Maya

Maya creates partitions in cases where objects or items must be kept separate for correct operation. A new scene has two partitions by default:

- characterPartition
- renderPartition

The `characterPartition` contains the character sets for each character you create. With all the character sets in the same partition, you can be sure that the attributes in one character set will not be in some other character set.

The `renderPartition` contains the shading group sets explained in “Shading group sets” on page 372.

Because you can apply only one shading group per object or per polygonal facet, the rendering partition ensures you can’t accidentally render a single object or polygonal facet with two shading groups.

If you rigid bind skin to a skeleton, Maya also creates a partition. The partition has the name `joint1skinPartition` or something similar. It contains all the skin point sets in your scene. The partition prevents you from assigning skin points to two different joints, which would result in undesirable skin deformations when you manipulate a skeleton.

If create a deformer with the Exclusive option, Maya creates a partition named `deformPartition` by default. The partition contains all deformer point sets in your scene. It prevents you from assigning points to two different sets, which might result in undesirable deformations when you manipulate the deformers.

Because Maya creates partitions for you when it makes sense to do so, you’ll rarely need to create your own partitions. Still, if you find a situation where you need create one, you can do so as described in the next topic.

## CREATING, DISPLAYING, AND REMOVING PARTITIONS

The following procedures describe how to create, display, and remove partitions.

**To create a partition with a default name:**

- 1 Make sure no objects or other items are selected.
- 2 Select any sets you want to put in the partition. See “Selecting sets” on page 376 for details.
- 3 To create a partition with a default name, select **Edit > Sets > Create Partition** on the main Maya menu bar. (This completes the procedure.)



*or*

In the Relationship Editor, select Partition Editing from the drop-down list and select Edit > Create Partition in the Partitions panel.

---

#### Note

To name the partition when you create it, replace step #3 with:

Select Edit > Sets > Create Partition  in the main Maya menu bar or in the Relationship Editor, select Edit > Create Partition .

Enter the name of the partition in the Name text box of the Partition Options menu and click Apply.

---

#### To display partitions:

In the Relationship Editor, select Partition Editing from the drop-down list. The partitions appear in the left panel.

To see the sets a partition contains, click the plus sign (+) beside the partition name.

#### To remove a partition, but not its sets:

- 1 In the Relationship Editor, select Partition Editing from the drop-down list and click the name of the partition in the left panel.
- 2 Select Edit > Delete Highlighted.

This removes the partition, but not the sets within the partition.


#### To remove a set from a partition:

- 1 In the Relationship Editor, select Partition Editing from the drop-down list.
- 2 In the Partitions panel, expand the partition to see the set.
- 3 Click the set you want to remove and select Edit > Remove Highlighted from Partition.


## ADDING SETS TO PARTITIONS

The following procedures describe how to add and move sets to partitions:

**To add a set to an existing partition when you create the set:**

- 1 Select the objects or items to be put in the set.
- 2 From Maya's main menu, choose Edit > Sets > Create Set .

*or*

In the Relationship Editor, select Set Editing from the drop-down list and select Edit > Create Set  in the left panel.

The Create Set Options window opens.

- 3 Enter the name of the set in the Name text box.
- 4 To add the set to a partition toggle on Try to Add or Force to Add.

If the partition already has a set containing elements of the selected object, when you select Try to Add, Maya doesn't add the member and instead displays a warning message to the Script Editor.

If you select Force to Add, Maya adds the member to the set after removing the member from the set it's already part of.

- 5 After you toggle on either option in the prior step, select the name of the partition from the Partition menu.
- 6 Click the Apply button.

Maya puts the set in the selected partition.

**To add a set to a partition:**

- 1 In the Relationship Editor, select Partition Editing from the drop-down list.
- 2 In the Partitions panel, click the partition you want to add to.
- 3 In the Objects panel, click the set to be added into the partition.

*or*

Select the set in the Outliner and select Edit > Add Selected Items in the Relationship Editor.





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PART 3

## ARTISAN PAINT TOOLS



# 12 USING ARTISAN PAINT TOOLS

Artisan was previously an add-on module to Maya that provided tools for detailing surfaces. These tools are now part of Maya. The tools use an intuitive paint and sculpting-based interface to deliver high quality and otherwise complex results in minimal time.

This chapter provides an overview of the Artisan tools. It includes the following topics:

- “What are the Artisan paint tools” on page 388
- “Changing paint tool settings” on page 393
- “Creating an Artisan tool shelf” on page 410
- “Defining Artisan hotkeys” on page 410
- “Using Artisan marking menus” on page 414
- “Snapping an Artisan paint brush to path” on page 415
- “Masking surfaces” on page 416
- “Mapping attributes” on page 419
- “Working with seams” on page 426

What are the Artisan paint tools

## WHAT ARE THE ARTISAN PAINT TOOLS

There are nine Artisan paint tools that all work like a paint brush. You can use your graphics tablet and stylus for greater control when you paint using these tools.



### Sculpt Surfaces Tool (for NURBS surfaces)

Use the Sculpt Surfaces Tool (Modeling menu set, Edit Surfaces > Sculpt Surfaces Tool) to push and pull CVs on a NURBS surface. The effect is like sculpting clay—push and the surface depresses, pull and the surface raises. For details, see *Using Maya: NURBS Modeling*.



### Sculpt Polygons Tool

Use the Sculpt Polygons Tool (Modeling menu set, Edit Polygons > Sculpt Polygons Tool) to push and pull vertices on a polygonal surface. The effect is similar to sculpting clay. For details, see *Using Maya: Polygonal Modeling*.



### Paint Selection Tool

Use the Paint Selection Tool (Edit > Paint Selection Tool) to select vertices on a NURBS or polygonal surface by painting on the surface with the tool. This control quickly provides results that previously required painstaking manipulation of individual vertices. You can also use the Paint Selection Tool to select faces and edges on polygons. For details, see “Using the Paint Selection Tool to paint-select components” on page 160.



### Paint Weights Tool

Use the Paint Weights Tool (Animation menu set, Deform > Paint Weights Tool) to paint weights on vertex clusters. For details, see *Using Maya: Character Setup*.



### Script Paint Tool

Use the Script Paint Tool (Modify > Script Paint Tool) to paint a surface with a texture or attribute defined in a Maya MEL script. For example, you can paint soft body goal weights or particle emitters on your surfaces like you would paint a color or texture in a painting program. Maya includes sample MEL paint scripts to apply to your surfaces. For details, see “Painting with MEL Scripts” on page 441.



### Attribute Paint Tool

Use the Attribute Paint Tool (Modify > Attribute Paint Tool) to paint any registered attributes on any object. For details, see “Painting attribute values” on page 454.



### Paint Set Membership Tool

Use the Paint Set Membership Tool (Animation menu set, Deform > Paint Set Membership Tool) to paint the set membership of vertices instead of having to individually select them. For details, see *Using Maya: Character Setup*.



### Paint Skin Weights Tool

By smooth binding skin to an object, you can create reasonable skin-like deformations. In effect, all the vertices belong to all the joint clusters. Use the Paint Skin Weights Tool (Animation menu set, Skin > Edit Smooth Skin > Paint Skin Weights Tool) to modify the weights of these clusters at the joints. For details, see *Using Maya: Character Setup*.



### Paint Vertex Color Tool (for polygons only)

Use the Paint Color Per Vertex Tool (Modeling menu set, Edit Polygons > Colors > Paint Vertex Color Tool) to paint a specified color value and alpha onto polygon vertices. For details, see *Using Maya: Polygonal Modeling*.



### Paint Textures

Use the Paint Textures tool (Rendering menu set, Lighting/Shading > Paint Textures Tool) to paint the following texture attributes: color, transparency, incandescence, bump, specular color, and reflectivity. This tool operates similar to other Artisan paint tools; however, some tool settings are unique, such as Blend Mode. For details, see *Using Maya: Rendering*.

Typically, you create your model in Maya, then use these tools to detail and modify it. By changing the settings for Artisan tools, you can also do the following:

- sculpt and paint over seams (see “Working with seams” on page 426)

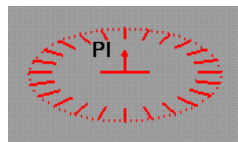
What are the Artisan paint tools

- mask selected vertices and selectively apply Artisan effects to the masked surface (see “Masking surfaces” on page 416)
- import and export attribute maps (see “Mapping attributes” on page 419)

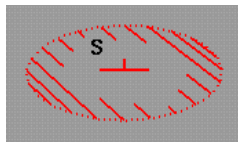
## How Artisan paint tools work

The Artisan paint tools work like paint brushes with attributes that you can modify to customize their effect.

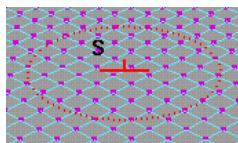
When you select an Artisan tool, the Maya pointer changes to a paint brush. When you move the pointer over a surface, Artisan displays a brush outline. The brush outline defines the area you “paint” with the tool. The appearance of the brush outline changes depending on the tool selected and the tool settings. The following examples illustrate some Artisan tool brush outlines.



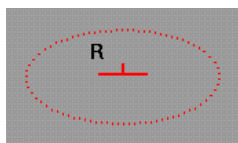
Sculpt Surfaces Tool  
Pull operation



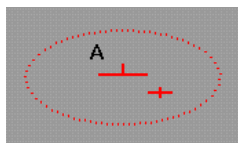
Sculpt Surfaces Tool  
Smooth operation



Paint Selection Tool  
Select selection type



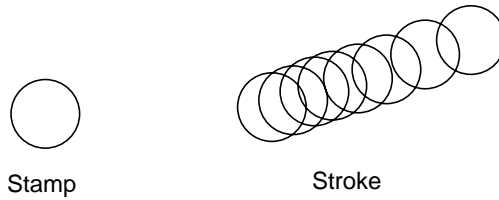
Script Paint and Paint Weights Tools  
Replace operation



Script Paint and Paint Weights Tools  
Add operation

What are the Artisan paint tools

Clicking the brush on a surface creates a stamp. A stroke is made up of many overlapping stamps.



Each brush has a stamp profile that you can modify. The stamp profile includes:

- brush radius
- brush opacity (for the Script Paint Tool, Attribute Paint Tool, Sculpt Surfaces Tool, Sculpt Polygons Tool, Paint Weights Tool, and Paint Skin Weights Tool)
- brush value (for the Script Paint, Attribute Paint Tool, Paint Weights Tool, Paint Skin Weights Tool only)
- brush shape

What are the Artisan paint tools

## Brush radius

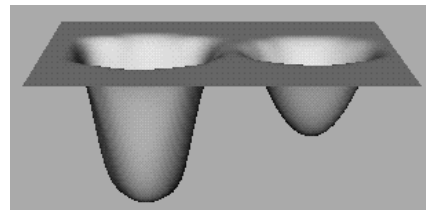
By increasing or decreasing the radius of a brush stamp, you increase or decrease its area of influence. If the brush stamp compensation mode is set to None, the radius is expressed as a percentage of the surface. Otherwise, the brush radius is measured in the working units set for Maya. For details on selecting the stamp compensation mode, see “Selecting the stamp compensation mode” on page 408. For details on setting units, see “Linear” on page 472.

If you use a graphics tablet and stylus, you can set an upper and lower range for the radius. No matter how much or how little pressure you apply to the stylus, the brush radius will not be larger or smaller than the set limits.

## Brush opacity

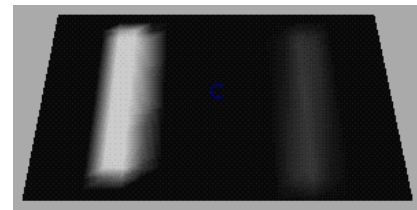
Brush opacity refers to the fraction of the maximum displacement or brush value (depending on the selected tool) to apply to each brush stamp within a stroke.

Fraction of maximum displacement  
(Sculpt Surfaces Tool)



High opacity      Low opacity

Fraction of value  
(Paint Weights Tool)



High opacity      Low opacity

Only the following tools have an opacity setting: Script Paint Tool, Attribute Paint Tool, Sculpt Surfaces Tool, Sculpt Polygons Tool, Paint Weights Tool, and Paint Skin Weights Tool.

## Brush value

Brush value refers to something different for each Artisan tool.

**Paint Weights Tool**      Brush value refers to the cluster weights.

**Paint Skin Weights Tool**

Brush value refers to joint cluster weights.

Script Paint Tool	<p>Depends on the script.</p> <p>For the emitterPaint script, brush value refers to the operation set for the script (for example, speed).</p> <p>For the geometryPaint script, brush value refers to the size of the geometric objects</p> <p>For the softBodyPaint script, brush value refers to the goal weight.</p>
Attribute Paint Tool	Brush value refers to the value of the attribute you are painting.

### Brush shape

You can choose from several brush shapes to provide flexibility as you paint. The area affected by the stamp corresponds with the selected shape. Note that the shape of the brush outline does not change to reflect your selection.

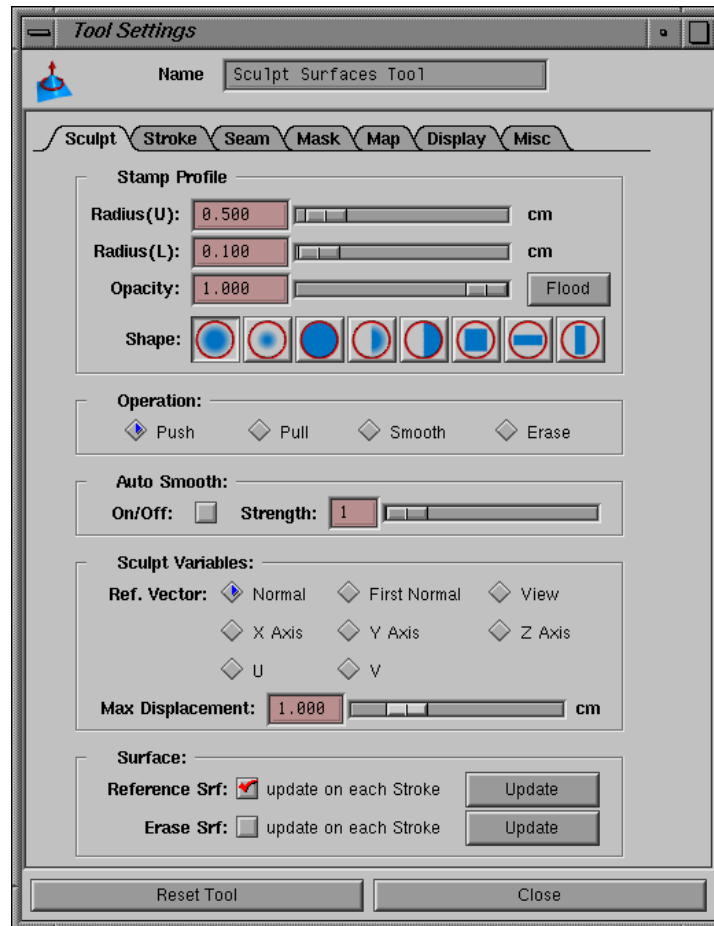


## CHANGING PAINT TOOL SETTINGS

Artisan uses the Maya Tool Settings editor to set tool properties. The most common ways to open the Tool Settings editor are:

- Click the ☐ beside the tool on its menu (for example, Edit > Paint Selection Tool ☐.
- Double-click the selected tool on the Minibar.











## Changing paint tool settings



Each tab contains settings that you change to affect the way the tool works. There are tool-specific settings and settings that are common to all tools.

## Tool-specific settings

For information on changing tool-specific settings, refer to the following table.

Tool	Tab	See
 Sculpt Surfaces Tool	Sculpt tab	<i>Using Maya: NURBS Modeling</i>
 Sculpt Polygons Tool	Sculpt tab	<i>Using Maya: Polygonal Modeling</i>
 Paint Selection Tool	Select tab	“Using the Paint Selection Tool to paint-select components” on page 160
 Script Paint Tool	Script Paint and Setup tabs	“Painting with MEL Scripts” on page 441
 Attribute Paint Tool	Attr. Paint tab	“Painting attribute values” on page 454
 Paint Weights Tool	Weight tab	<i>Using Maya: Character Setup</i>
 Paint Skin Weights	Weight tab	<i>Using Maya: Character Setup</i>
 Paint Set Membership	SetMembership tab	<i>Using Maya: Character Setup</i>
 Paint Vertex Color	Vertices Paint tab	<i>Using Maya: Polygonal Modeling</i>
 Paint Textures Tool	Paint tab	<i>Using Maya: Rendering</i>

## Common tool settings

For information on changing common tool settings, refer to the following table.

Tab	Description of Settings	See
Stroke	Define how the brush moves across the selected surface	“Changing brush stroke settings” on page 397
Seam	Define how you want surfaces to join	“Working with seams” on page 426
Mask	Define which vertices, if any, you want masked when you use an Artisan paint tool on a surface	“Masking surfaces” on page 416
Map	Import or export attribute (texture) maps	“Mapping attributes” on page 419
Display	Define how the brush and screen displays	“Changing display settings” on page 404
Misc	Define less frequently used tool settings	“Changing miscellaneous tool settings” on page 406

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*Tips*

Leave the Tool Settings editor open as you work in Artisan. When you switch tools, the settings change to reflect the selected tool.

If you do not want to leave the Tool Settings editor open, define hotkeys or use the Artisan marking menus to change commonly used settings for each of the tools. For details, see “Defining Artisan hotkeys” on page 410 and “Using Artisan marking menus” on page 414.

Tailor the settings for your tools and save them to a shelf for easy access. For details, see “Creating an Artisan tool shelf” on page 410.

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## Resetting tools

If you do not want to keep the changes you made to the settings in the Tool Settings editor, click the Reset Tool button. This returns the settings on all the tabs for the selected tool to their default values.

Note that the default settings for tools on a shelf are the settings that were saved with the shelf.

## Changing brush stroke settings

Brush stroke settings define how the selected Artisan brush moves across the surface. They are defined on the Stroke tab of the Tool Settings editor.

You can change the following brush stroke settings for all Artisan tools:

- reflect paint
- stylus pressure (if you are using a graphics tablet and pen)
- stroke profile alignment

---

*Tip*

You can make more accurate brush strokes on a surface, or have an effect on the same surface’s area again and again by snapping the cursor to the curve or a curve on the surface. For details, see “Freezing and resetting transformations” on page 169.

---

## Reflected painting

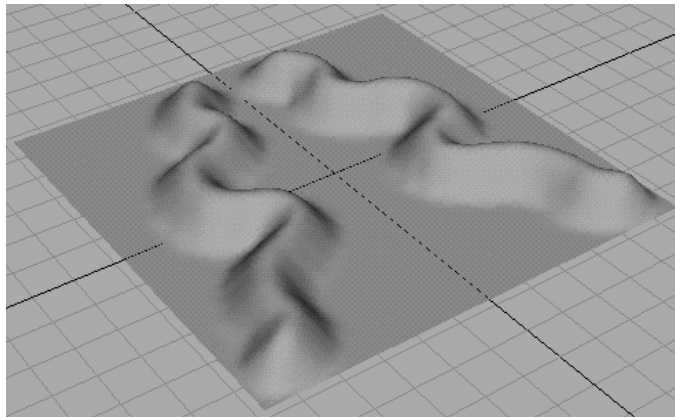
You can set Artisan tools so that your brush strokes are mirrored or reflected in the axis of your choice as you paint. This is useful when you want to create a symmetrical effect.

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### Note

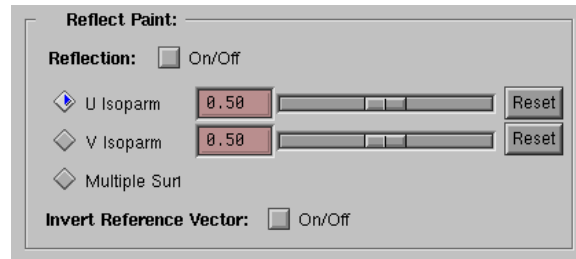
If you are painting on polygonal surfaces in projective paint mode, you cannot reflect paint. To reflect paint, you must be in UV texture paint mode and the UVs on the polygon must be evenly distributed, symmetrical, and not overlapping. For information on setting the paint mode, see “Projective Paint” and “UV Texture Paint” on page 409.

---



### To reflect your brush stroke:

- 1 Select the surface you are painting.
- 2 Select the Artisan tool you want to use and open the Tool Settings editor.
- 3 Click on the Stroke tab.
- 4 In the Reflect Paint section, modify the settings as follows:



Reflection

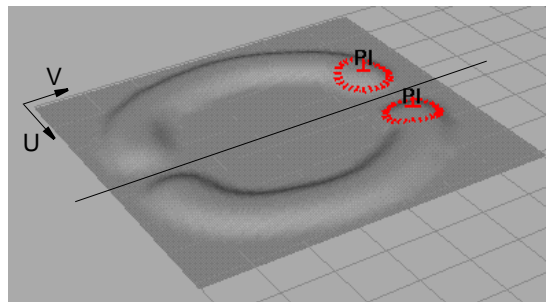
To reflect paint, toggle Reflection on.

### Selecting the axis for reflection

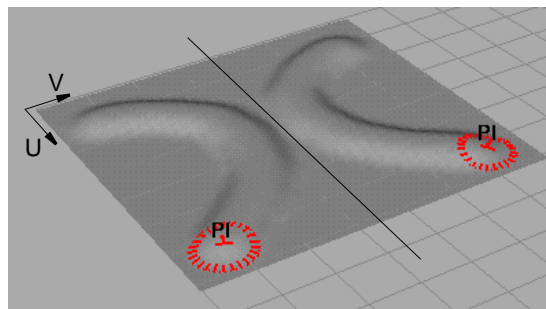
U Dir, V Dir

You can restrict the reflection along the U or V direction of a single surface.

The following examples show the Sculpt Surfaces brush stamp reflected along the U and V directions (or isoparms).



Reflection along  
U direction (or isoparm)



Reflection along  
V direction (or isoparm)

## Changing paint tool settings

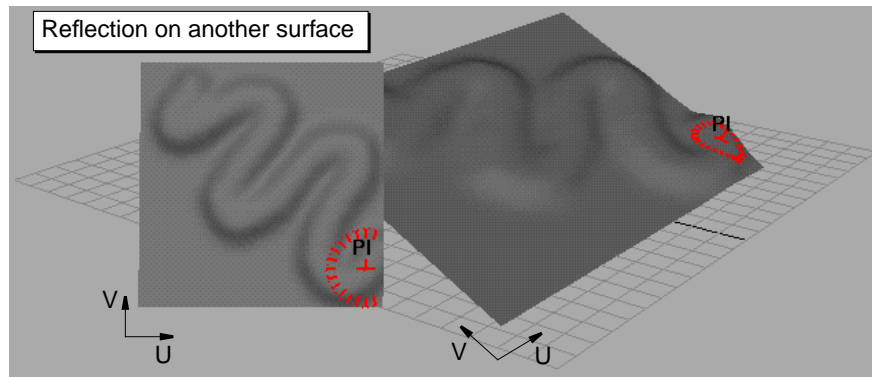
In the adjacent box, type the relative position of the axis along the surface. By default, reflections along the U or V direction (or isoparm) occur at 0.5, the midpoint of the surface.

To reset the axis to the midpoint, click the Reset button.

### Multiple Surf

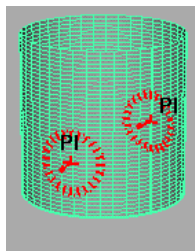
When you reflect on multiple surfaces, the reflected brush stamp moves to the same U/V position on the other surfaces.

To reflect your stroke on multiple surfaces, follow the instructions on page 398, making sure you select all the surfaces in step 1. For NURBS surfaces, the number of U patches and V patches, or sections and spans must be identical on each surface. For polygonal surfaces, the number of subdivisions must be identical on each surface.

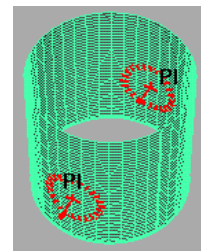


### Note

When you reflect paint on a surface, it may appear as though the reflection is not symmetrical...

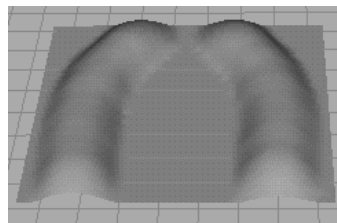


... but in fact, the brush is reflected on the other side of the object.

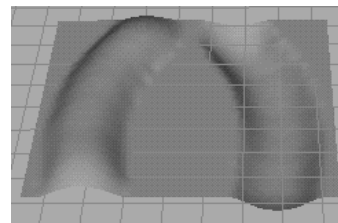


### Invert Reference Vector

This option is available for the Sculpt Surfaces and Sculpt Polygons Tools only. Toggle Invert Reference Vector on to invert the direction of the reference vector of the reflected brush. For details on setting reference vectors, refer to the sculpting information in *Using Maya: NURBS Modeling* and *Using Maya: Polygonal Modeling*. The following examples show the effect of reflect painting using the Sculpt Surfaces Tool along the V direction, and then with the reference vector inverted.



Reflection along V isoparm



Reflection along V isoparm with reference vector inverted

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### Tip

You can create a hotkey to modify the reflection isoparm without opening the Tool Settings editor. For details, see “Defining Artisan hotkeys” on page 410.

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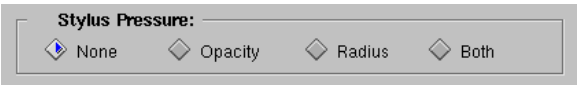
### Setting stylus pressure

With a real paint brush, pressing harder makes the brush wider and applies the paint more thickly. You can achieve a similar effect with a stylus in Artisan by specifying the effect of pressure on the Artisan tool.

To set stylus pressure:

- 1 Select the Artisan tool you want to define the stylus pressure for.
- 2 Open the Tool Settings editor and click on the Stroke tab.
- 3 In the Stylus Pressure section, select the pressure option you want to use.

Changing paint tool settings



None	No effect on the stylus pressure.
Opacity	Increases the opacity of the brush stamp as you add pressure to the stylus.
Radius	Increases the radius of the brush stamp as you add pressure to the stylus.
Both	Increases both the opacity and radius of the brush stamp as you add pressure to the stylus.

Note

If you set the stylus pressure to Opacity or Both, you will not be able to paint with your mouse, although you will be able to click with it.

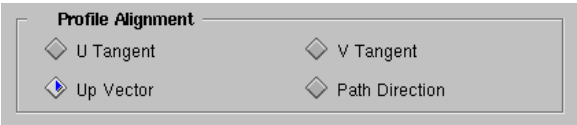
Setting the brush stamp profile alignment

The profile alignment of the brush determines the alignment of the brush shapes that are not uniformly round:

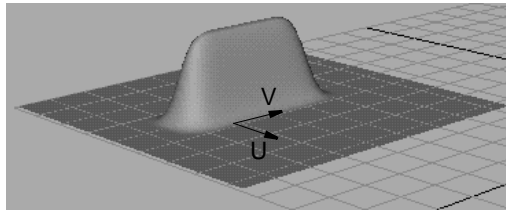


To set the brush stamp profile alignment:

- 1 Select the Artisan tool you want to define the profile for.
- 2 Open the Tool Settings editor and click the Stroke tab.
- 3 In the Profile Alignment section, select the alignment you want for the brush stamp. Note that you select the brush stamp on the first tab (Sculpt, Select, Script Paint, Weight, Attr. Paint, Vertices Paint, SetMembership, Skin Paint).

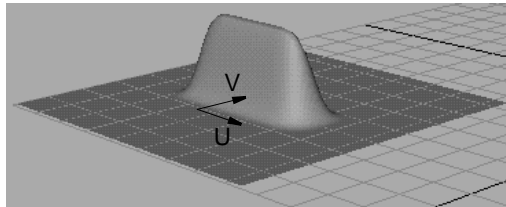


U Tangent	Aligns the stamp shape along the U tangent (V direction).
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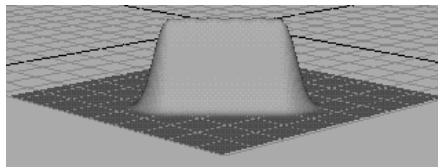
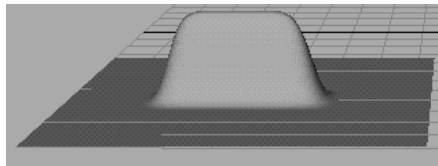
**V Tangent**

Aligns the stamp shape along the V tangent (U direction).



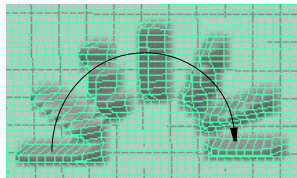
**Up Vector**

Aligns the stamp shape relative to the up vector. The stamp shape retains its orientation when you change the view.



**Path Direction**

Aligns the stamp shape relative to the direction you move the brush.



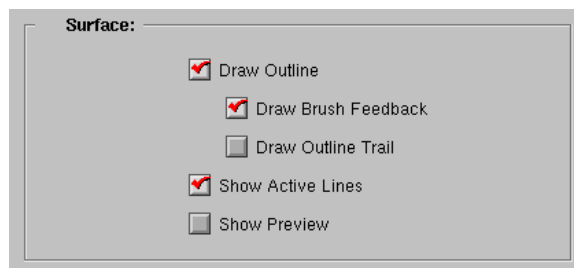
## Changing display settings

You can specify the display settings for the objects you are painting and the Artisan tool brush stamps. For the Paint Weights, Attribute Paint, Paint Set Membership, Paint Skin Weights Tool, and Script Paint Tools, you can also select to display color feedback.

To customize display settings:

- 1 Select an Artisan tool and open the Tool Settings editor.
- 2 Click the Display tab and modify the settings as follows:

### Toggling surface settings

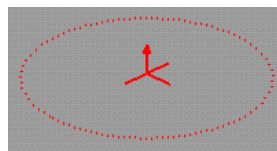


#### Draw Outline

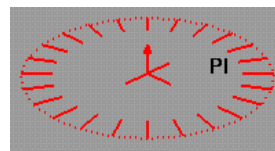
Displays the brush stroke outline when you move the pointer on the selected surface. If you do not toggle this option on, you only see the brush pointer and you will not be able to draw brush feedback or outline trails.

#### Draw Brush Feedback

Displays additional information on the brush outline indicating the operation the brush is set to perform.



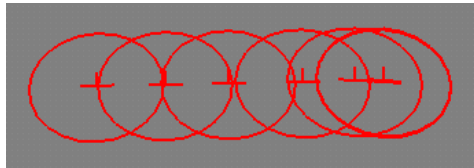
No brush feedback



Brush feedback  
(Sculpt Surfaces Tool –  
Pull operation)

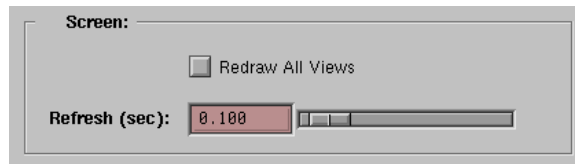
#### Draw Outline Trail

Displays a trail of brush outlines as you paint.



- Show Active Lines** Displays the isoparms on the selected surfaces.
- Show Preview** Displays the effect of the selected tool operation as you move the brush over the surface, without actually applying it.

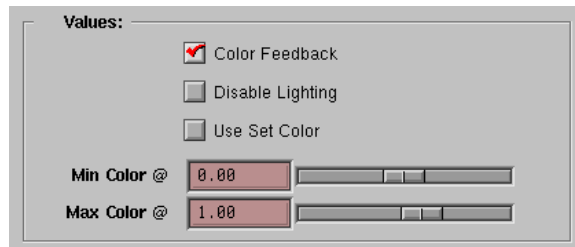
### Setting screen display options



- Redraw All Views** Toggle this option on to redraw all open views (panel windows) for the scene while you paint your stroke. If you do not toggle this option on, the active view will redraw as you paint, but the other open views will not update until the stroke is complete.
- Refresh (sec)** Type the number of seconds between screen refreshes. The maximum number is 2 seconds. The shorter the interval you select, the slower the performance.

### Setting value options

These options affect the display when you work with the Paint Weights, Attribute Paint, Paint Set Membership, Paint Skin Weights, and Script Paint Tools.



## Changing paint tool settings

<b>Color Feedback</b>	Toggle this option on to display surface attributes, for example, cluster weights, as grayscale values. This helps you see the area as you paint and helps identify what the values are (smaller values are darker, larger values are lighter). To display color feedback, you must turn on smooth shading in Maya.
<b>Display Active Vertices</b>	For the Paint Set Membership Tool only, toggle this option on to display the active vertices of a selected set. If this option is toggled off, when you select a set on the SetMembership tab, the vertices for that set will be active, but you will not be able to see that they are.
<b>Disable Lighting</b>	For the Paint Weights, Attribute Paint, Paint Skin Weights, or Script Paint Tools only, toggle this on to remove lighting from the scene. Disabling lighting provides you with a truer representation of the grayscales, making it easier to identify the values.
<b>Use Set Color</b>	For the Paint Weights and Paint Skin Weights Tools only, toggle this option on to use the color associated with the cluster set. This is particularly useful when you are working with skeletons.
<b>Min Color @</b>	For the Paint Weights, Attribute Paint, Paint Skin Weights, or Script Paint Tools only, use the slider to set the value at which the minimum color displays. This is useful if your paint values are very close to each other, making the color feedback display too subtle to detect.
<b>Max Color @</b>	For the Paint Weights, Attribute Paint, Paint Skin Weights, or Script Paint Tools only, use the slider to set the value at which the maximum color displays. This is useful if your paint values are very close to each other, making the color feedback display too subtle to detect.

## Changing miscellaneous tool settings

There are some Artisan tool settings you will find useful, although you may rarely change them. You can find these settings on the Misc tab in the Tool Settings editor. These settings include:

- **Multiple surface detection**  
Artisan detects layered and intersecting surfaces and projects the effects of the brush stroke to each surface relative to the camera view.
- **Stamp compensation**

Artisan uses a *paint on surface* technique to ensure a consistent brush shape while tracking the curvature of the surface. You can specify which method you want Artisan to use to draw the brush stamp on the surface.

- Paint mode

When you paint, Artisan uses a map of the surface UV points to produce the desired results. On NURBS surfaces, maps are created by unwrapping the surface into a rectangle, and positioning the UV points appropriately. On polygons, the maps are created by projecting the UV points onto a rectangular area. Because the mapping is created differently for NURBS surfaces and polygonal surfaces, two paint modes exist to ensure you get the desired results when you paint: projective paint (for polygons only) and UV texture paint (for NURBS or polygons). You only use the UV texture paint mode on polygons if you want to reflect paint (the UVs on the polygon must be evenly distributed, symmetrical, and not overlapping).

- Stroke smoothing

These options affect how Artisan smooths your strokes as you sculpt.

- MEL stroke callbacks

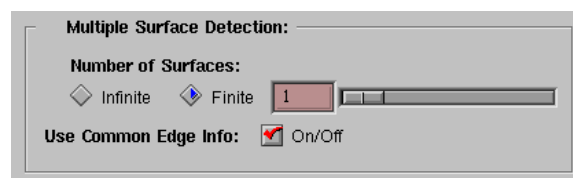
You can specify MEL commands to run before and after a stroke.

### To change miscellaneous tool settings:

- 1 Select an Artisan tool and open the Tool Settings editor.
- 2 Click the Misc tab and modify the settings as follows:

### Setting multiple surface detection

Set the maximum number of layered or intersecting surfaces affected by the same brush stamp when you perform sculpting operations.



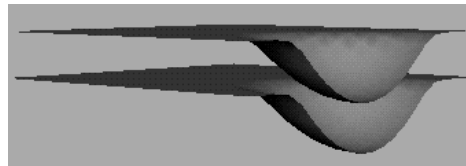
#### Infinite

The brush stamp applies the effect on an unlimited number of layered or intersecting surfaces.

## Changing paint tool settings

### Finite

The brush stamp applies the effect only on the number of layered or intersecting surfaces you specify.

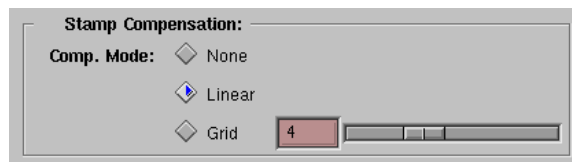


Maya detects two surfaces and applies brush settings to both

### Use Common Edge Info

Toggle Use Common Edge Info on to treat surfaces with common edges as one surface.

### Selecting the stamp compensation mode



### None

No stamp compensation. Without stamp compensation, the brush tends to stretch into odd shapes on complicated surfaces.

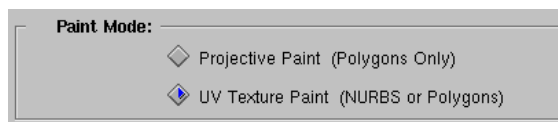
### Linear

This is an efficient (computationally) form of compensation adequate for smoothly curved surfaces.

### Grid

This is the most sophisticated form of compensation and also requires the most computations. Increasing the grid size increases the density of the grid, and thus the number of compensation calculations. Grid compensation mode provides the most consistent brush shape, but also slows Artisan's performance. You may find it useful when painting areas with uneven parameterization (for example, at the poles of a sphere).

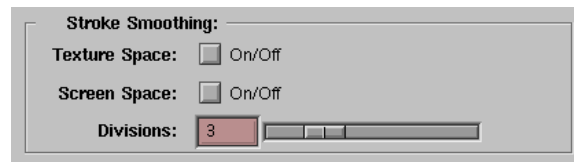
### Setting the paint mode



- |                  |   |
|------------------|---|
| Projective Paint | Select Project Paint if you are painting polygonal surfaces. You cannot reflect paint in this paint mode. To reflect paint on polygons, see UV Texture Paint, next.   |
| UV Texture Paint | Select this paint mode if you are painting NURBS surfaces or if you are painting polygonal surfaces and want to reflect paint. To use UV Texture Paint mode on a polygon, the surface must have UVs that are evenly distributed, symmetrical, and do not overlap. You can check the surface using the Texture View (Edit Polygons > Textures > Texture View). |

### Setting stroke smoothing options

These options affect the sculpting operations you perform.



- |               |  |
|---------------|--|
| Texture Space | Reads the points from the tablet or mouse, transforms them to parameter space, then smooths the resulting path. This is the fastest stroke smoothing option.   |
| Screen Space  | Smooths the path before determining where the points are in parameter space. Although this method provides more accurate smoothing and doubles the rate of the tablet, the amount of surface operations are also doubled, therefore slowing Artisan's performance. |
| Divisions     | Indicate the number of divisions used to smooth a stroke. By increasing the number of divisions, you can draw straighter, smoother lines, but you also slow the performance.   |


### Setting MEL stroke callback

- |                   |   |
|-------------------|---|
| Before Stroke Cmd | Type the MEL command and parameters you want to run when you begin a stroke, before the stroke actually starts. For example, for the Sculpt Surfaces Tool, you can specify a command that changes the display smoothness for the selected object to fine: |
|-------------------|---|

*displaySmoothness -full -du 2 -dv 2 -pw 16 -ps 4*

## Creating an Artisan tool shelf

**After Stroke Cmd** Type the MEL command and parameters you want to run immediately after completing a stroke. For example, for the Paint Selection Tool, you can specify a command that subdivides faces after you select them, as follows:

- 1 Select a polygon.
- 2 Select Edit > Paint Selection Tool .
- 3 On the Select tab, toggle off Add to Current Selection.
- 4 Change the pick mask to Poly Faces.
- 5 Click the Misc tab.
- 6 In the After Stroke Cmd box, enter:  
*polySubdivideFacet -dv 1 -m 0 -ch 1*
- 7 Paint the faces you want to subdivide. Each painted face subdivides automatically into four faces when you release the mouse button.

## CREATING AN ARTISAN TOOL SHELF

To make your Artisan tools more convenient to access, you can create an Artisan shelf and put the Artisan tools on it. Another advantage is that tools on the shelf are saved with your specific tool settings. For details on shelves, see “Creating and editing shelves” on page 493.

## DEFINING ARTISAN HOTKEYS

You can use hotkeys to change some Artisan tool settings without opening the Tool Settings editor.

You can set three types of Artisan hotkeys:

- hotkeys that display marking menus
- hotkeys that toggle or select options or actions
- interactive hotkeys that change option settings when you click-drag or use the arrow keys (for example the brush stamp radius or displacement)

### Hotkeys that display marking menus

By default, the hotkey combination *u + left mouse button* displays the operation marking menu for the selected Artisan tool. For details, see “Using Artisan marking menus” on page 414.

If you are running out of available keys, or you have created too many hotkeys to remember, you can consolidate your Artisan hotkeys into a single marking menu. Create a hotkey for Set Modify Target, with Marking Menu and another for Activate/Deactivate Modify Target, with Marking Menu.

When you press the hotkey for Set Modify Target, with Marking Menu, a marking menu appears for the selected tool. For details, see “Using Artisan marking menus” on page 414. Select the option you want to modify. Then hold down the hotkey for Activate Modify Target, and click-drag to modify the settings.

You can also define hotkeys for marking menus you define yourself. For details on defining marking menus, see “Creating marking menus” on page 511.

### Hotkeys that toggle or select options or actions

These hotkeys are straightforward—press the key to toggle an option on or off or to select an option or action. You can set hotkeys for the following options or actions:

Option or Action	Default Hotkey
Flood with the current value	Press Alt f
Toggle Reflection ON/OFF	Press Alt r
Toggle Active Lines ON/OFF	Press Alt a
Toggle Show Preview ON/OFF	none
Toggle Masking CVs ON/OFF	none
Toggle Common Edges Display Mode	none
Toggle Common Corners Display	none

Option or Action	Default Hotkey
Stitch Surfaces	none
Update Erase Surface	none
Update Reference Surface	none
Toggle Color Feedback ON/OFF	Press Alt c
~Increase Brush Radius	none
Decrease Brush Radius	none
Increase Maximum Displacement	none
Decrease Maximum Displacement	none

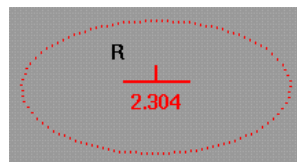
### Interactive hotkeys

You can define interactive hotkeys for Artisan operations using the activate/deactivate pairs listed in the Hotkeys editor.

These interactive hotkeys work by pressing the hotkey and doing one of the following:

- click-dragging left or right, or up and down

The setting appears as part of the brush outline and changes as you drag. For example, the following brush outline appears when you use an interactive hotkey to modify the brush stamp radius.



The following hotkeys work this way:

Activate/Deactivate	Default Hotkey
Modify Lower Brush Radius	none
Modify Upper Brush Radius	Press/Release b
Modify Max Displacement	Press/Release m
Modify Opacity	none
Modify Value	Press/Release n
Modify Reflection Isoparm	none
Modify Target	none

*or*

- selecting an item from a marking menu

A marking menu appears when press the hotkey and left mouse button. Select the menu item and release the left mouse button.

The following hotkeys work this way:

Activate/Deactivate	Default Hotkey
Maya Artisan Operation, with Marking Menu	Press u
Set Modify Target, with Marking Menu (works in conjunction with Modify Target)	none
Modify Sculpt Reference Vector	Press 0

or

- clicking a cluster, set, or surface area using the arrow pointer

You can set interactive hotkeys for the following options or actions:

Activate/Deactivate	Default Hotkey
Pick Color Mode (Use with the Paint Set Membership, Paint Weights, Attribute Paint, and Paint Color Per Vertex Tools.)	Press/Release /
Select Cluster Mode (Use with the Paint Weights Tool.)	Press/Release ’

For information on defining hotkeys, see “Assigning hotkeys” on page 526.

## USING ARTISAN MARKING MENUS

Artisan marking menus give you quick access to tools and actions normally accessed from the Tool Settings editor. You can use three types of marking menus in Artisan:

- tool operation marking menus
- target operation marking menus
- user-defined marking menus

### Tool operation marking menus

By default, the hotkey combination *u + left mouse button* displays the operation and brush stroke marking menu for the selected Artisan tool.

### Target operation marking menus

When you hold down the hotkey for Set Modify Target, with Marking Menu, and press the left mouse button, a marking menu appears for the selected tool. For details on defining hotkeys, see “Defining Artisan hotkeys” on page 410. Select the option you want to modify. You can now hold down the hotkey for Activate Modify Target, and click-drag to modify the settings.

### User-defined marking menus

You can define your own marking menus. For example, you could define a marking menu with each of the Artisan tools on it. For details on defining marking menus, see “Creating marking menus” on page 511.

#### To use a marking menu:

- 1 Select the tool.
- 2 Press and hold the hotkey for the marking menu.
- 3 Click-drag the left mouse button to select the marking menu option.


## SNAPPING AN ARTISAN PAINT BRUSH TO PATH

You can make more accurate brush strokes on a surface, or have an effect on the same surface’s area again and again by snapping the cursor to the curve or a curve on the surface.

#### To snap the brush to an isoparm:

- 1 Select the surface you want to paint.
- 2 Select the Artisan paint tool.
- 3 Press and hold down the c key on your keyboard while you do the following:
  - Move the center of the brush outline directly over the path you want the brush to snap to.
  - Click-drag the brush in the direction you want to paint.

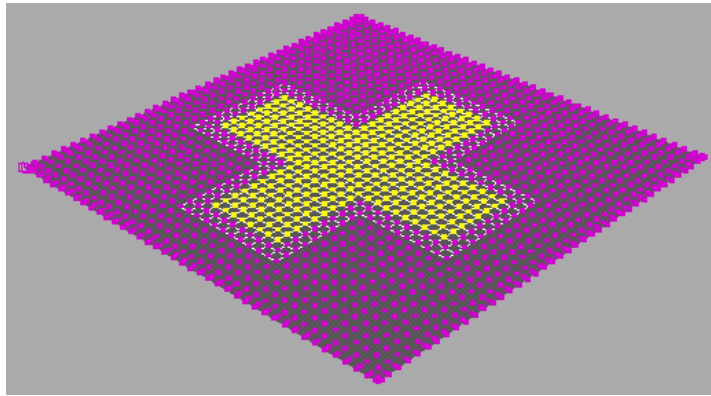
**To snap the brush to a curve:**

- 1 Create the curve on the surface as follows:
  - Select the surface you want to paint with an Artisan paint tool.
  - Click the Make Live button on the Status Line to make the surface live. 
  - Select the appropriate curve tool (for example, CV Curve Tool) and create the curve on the surface.
  - Click the Make Live button on the Status Line again.
- 2 Select the surface.
- 3 Select the appropriate Artisan paint tool.
- 4 Press and hold down the c key on your keyboard while you do the following:
  - Move the center of the brush outline directly over the path you want the brush to snap to.
  - Click-drag the brush in the direction you want to paint.

## MASKING SURFACES

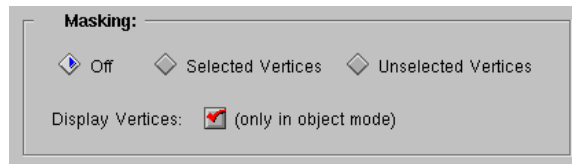
Masking blocks off an area on a surface so it is not affected by the Artisan operations you apply to it. In Artisan, you can use selected or unselected vertices (NURBS or polygonal) on your surface as a mask.

In the following example, if you masked the X, the positions, weights, or scripted attributes would not be affected when you painted over them with the Sculpt Surfaces, Sculpt Polygons, Script Paint, Attribute Paint, Paint Vertex Color, Paint Weights, or Paint Skin Weights Tools. The areas outside the X would be affected.



To mask a surface:

- 1 Select the vertices on the surface. For details, see “Using the Paint Selection Tool to paint-select components” on page 160.
- 2 Select one of the Sculpt Surfaces, Sculpt Polygons, Script Paint, Attribute Paint, Paint Vertex Color, Paint Weights, or Paint Skin Weights Tools, and open the Tool Settings editor.
- 3 Click the Mask tab.



- 4 Select a masking mode:

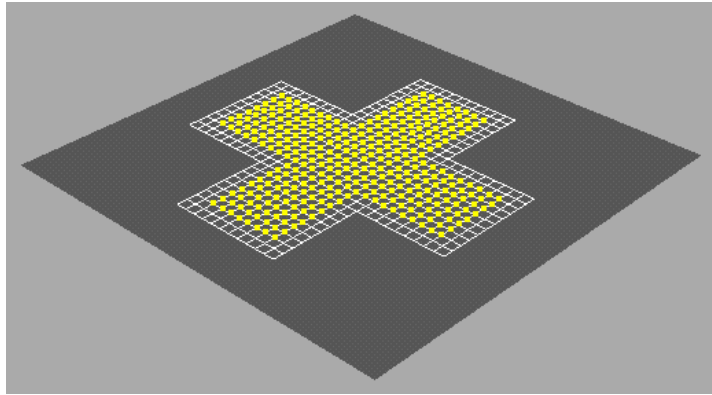
**Off** – No masking takes place.

**Selected Vertices** – Selected vertices act as a mask. The selected vertices will not change position, weight, or attribute when you apply Artisan brush strokes to them.

**Unselected Vertices** – Unselected vertices act as a mask. The unselected vertices will not change position, weight, or attribute when you apply Artisan brush strokes to them.

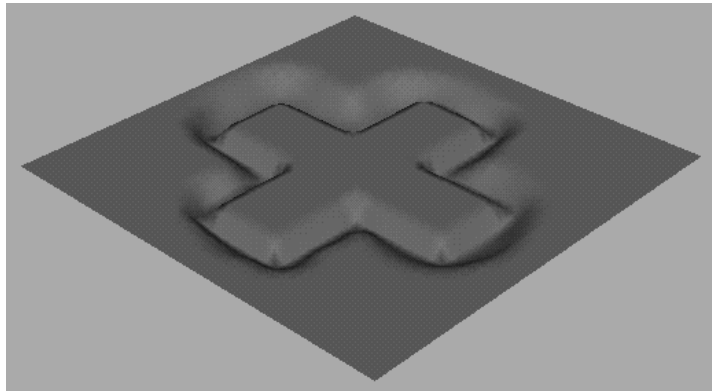
Masking surfaces

- 5 By default, Artisan displays masked vertices while your surface is in object mode. To hide masked vertices, toggle Display Vertices off.



- 6 Paint the surface with the selected Artisan tool. Any brush strokes you make over the mask will have no effect on the masked vertices.

In the following example, the masked surface was sculpted using the Sculpt Surfaces Tool.



## MAPPING ATTRIBUTES

An attribute map is a two-dimensional image with values that correspond, or map, to attributes of points on a three-dimensional surface. This mapping is relative to the U/V parameterization of the surface.

You can import image files created in other programs and use their alpha channel values or luminance values as attribute maps. The *alpha channel* is the channel in an image that contains the opacity information. Not all images have an alpha channel. *Luminance* refers to the intensity or brightness of the image.

Attribute map values are represented by grayscales, with black representing a value of 0 and white representing a value of 1.



Alpha channel



Luminance

You can also export the values on your Artisan surfaces into image files.

You can import and export attribute maps in file format supported by Maya. For a list of these file formats, see “Supported file formats” on page 196.

## Importing attribute maps

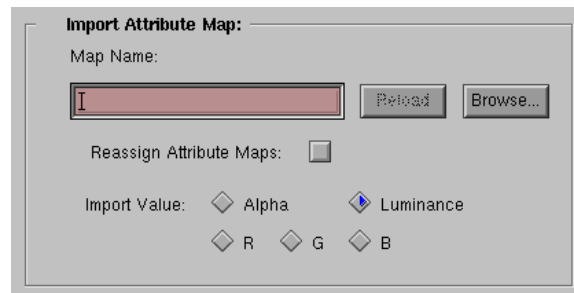
The Artisan paint tool you select, and its settings, determine the result you get when you import an attribute map to a surface. Artisan maps the attribute values onto the surface vertices relative to the U/V surface direction and applies the Artisan tool settings to the vertices using the mapped values.

To import an attribute map:

- 1 Select the surface or surfaces you want to apply the map to.
- 2 Select the Artisan paint tool and open the Tool Settings editor.
- 3 Make any changes to the tool settings.

For the Script Paint Tool, note the following:

- The Replace operation replaces surface values with imported values.
  - The Add operation adds the imported values to the surface values.
  - The Scale operation scales the surface values by factors equivalent to the imported values.
  - The Smooth operation smooths.
- 4 Click the Map tab.



- 5 Select the Import Value:

**Alpha** – Use the alpha channel values of the map you are importing.

**Luminance** – Use the luminance values of the map you are importing.

**R, G, B** – Use only the Red, Green, or Blue values of the map you are importing.

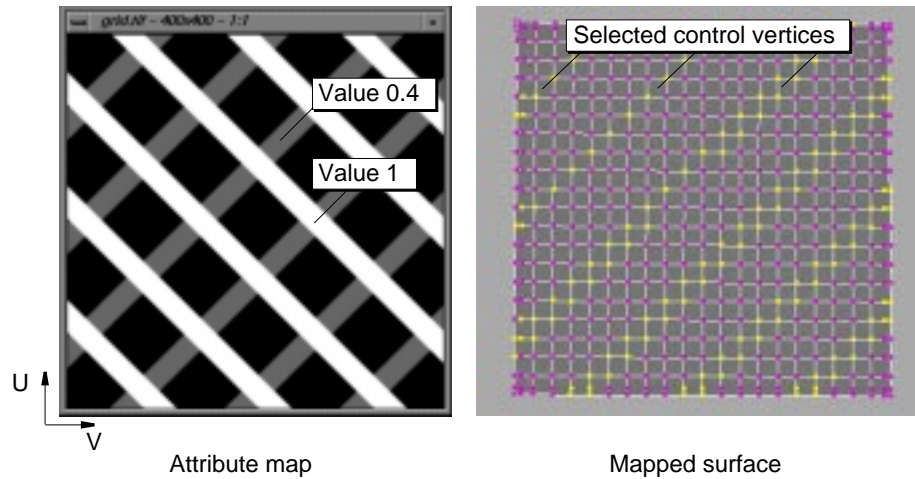
**RGB** – For the Paint Vertex Color Tool only, use each of the RGB channel values of the map you are importing.

**RGBA** – For the Paint Vertex Color Tool only, use the RGB and alpha channel values of the map you are importing.

- 6 If you selected the Paint Selection Tool, enter a value for the Threshold. This threshold defines the minimum value to be affected by the tool selection type. For example, if you set the selection type to be Select and the Threshold to be 0.5, Artisan selects vertices that are mapped with an imported value equal to or greater than 0.5.
- 7 If you are importing a map that was created in Artisan from multiple surfaces, toggle on Reassign Attribute Maps. For details, see “Importing Artisan attribute maps to multiple surfaces” on page 422.
- 8 Click in the Map Name box, then click the Browse button to select the file. The Import window opens.  
  
(Alternatively, you can type the directory location and file name in the Map Name box and press Enter to import an image, skipping the last two steps.)
- 9 On IRIX only, to preview the image before importing it, select it, then click the See Image button. The grayscales represent the values, where white represents a value of 1 and black represents a value of 0.
- 10 Select the image and click the Import button. Artisan applies the values to the selected surface(s) using the selected tool settings.

In the following example, the Paint Selection Tool is set to select control vertices and the Threshold is set to 0.5.

## Mapping attributes



### To reload the image:

Click the Reload button on the Map tab.

### Importing attribute maps to stitched surfaces

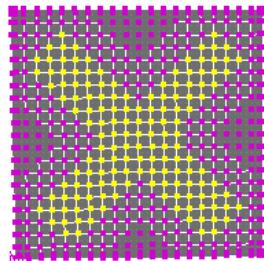
When you import attribute maps to stitched surfaces or surfaces with common edges, the attributes map to each surface separately, rather than across the entire stitched surface.

If you import a map onto stitched surfaces or surfaces with common edges using the Sculpt Surfaces Tool, the stitching may come undone. To fix this, click the Stitch Now button on the Seam tab after importing the map.

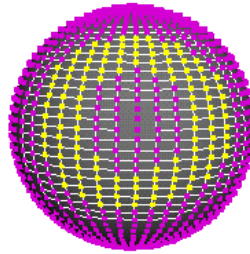
### Importing Artisan attribute maps to multiple surfaces

If the attribute map was created from multiple surfaces in Artisan (see page 425) and you want to import the map for these surfaces back to the same surfaces, the file names of the attribute map must match the surface file names. Also, you must toggle Reassign Attribute Maps on when you import.

For example, suppose you create the following two surfaces and export the attribute map, calling it *xando*.



nurbsPlaneShape1



nurbsSphereShape1

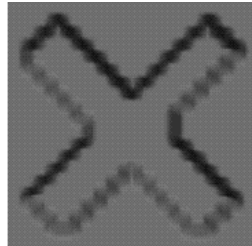
Artisan creates two files, *xando\_nurbsPlane1\_nurbsPlaneShape1* and *xando\_nurbsSphere1\_nurbsSphereShape1*. It saves the attribute maps separately for each surface in these files.

To import these maps back to the same surfaces, follow steps 1 through 6 under “To import an attribute map:” on page 420. For step 7, import either the base file (*xando*) or one of the files associated with the surface (*xando\_nurbsPlane1\_nurbsPlaneShape1* or *xando\_nurbsSphere1\_nurbsSphereShape1*). Artisan automatically maps each file to the appropriate surface.

In the following example, the attribute was imported with the Sculpt Surfaces Tool selected and set to Push.



nurbsSphereShape1



nurbsPlaneShape1

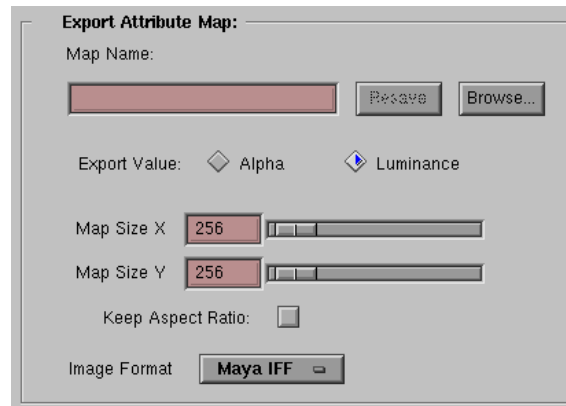
If you do not toggle Reassign Attribute Maps on, the imported file maps to each selected surface.

## Exporting attribute maps

You can export attribute maps created with the Paint Selection, Script Paint, Attribute Paint, Paint Vertex Color, Paint Weights, and Paint Skin Weights Tools. The values you paint with these tools become the either the luminance values or alpha values in the attribute map (except for the Paint Vertex Color Tool, from which you can export RGB and RGBA values).

To export an attribute map:

- 1 Create surface values using one of the Artisan tools (Paint Selection, Script Paint, Attribute Paint, Paint Weights, Paint Vertex Color, Paint Skin Weights).
- 2 Select the surface or surfaces with values you want to export, then open the Tool Settings editor.
- 3 Click the Map tab.



- 4 Select the Export Value.

**Alpha** – Export the alpha channel values.

**Luminance** – Export the luminance values.

**RGB** – For the Paint Vertex Color Tool only, export each of the RGB channel values.

**RGBA** – For the Paint Vertex Color Tool only, export the RGB and alpha channel values.

- 5 Set the Map Size in the X and Y direction. The default is 256 pixels.
- 6 Toggle Keep Aspect Ratio on to maintain the height to width ratio of the attribute map when you export it.
- 7 Select the format you want to save the image in.
- 8 Click in the Map Name box, then click the Browse button to select the directory location. The Export window opens.  
  
(Alternatively, you can type the directory location and file name in the Map Name box and press Enter, skipping the next steps.)
- 9 In the Export window, select the directory location, type the file name, then click the Export button.

If you select more than one surface in step 2, Artisan concatenates the name you type with each surface name and creates a file for each surface.

For example, suppose you select two surfaces called *nurbsSphereShape1* and *nurbsSphereShape2*, and type *checker* for the map name. Artisan saves the attributes of *nurbsSphereShape1* in the file *checker\_nurbsSphere1\_nurbsSphereShape1* and the attributes of *nurbsSphereShape2* in the file *checker\_nurbsSphere2\_nurbsSphereShape2*. If you include the file name extension (for example, *checker.rgb*) Artisan appends the extension to the concatenated names (for example, *checker\_nurbsSphereShape1.rgb* and *checker\_nurbsSphereShape2.rgb*).

To import these attribute files, the surfaces you import them to must have the same name as the surfaces with the original attributes.

For more information on importing attribute maps, see “Importing Artisan attribute maps to multiple surfaces” on page 422.

#### To resave a surface:

Click the Resave button on the Map tab.

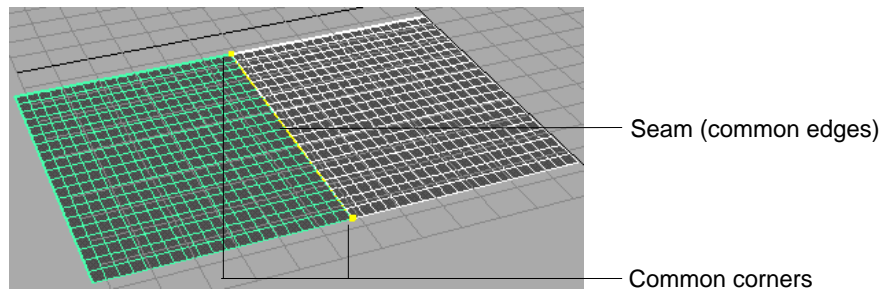
## WORKING WITH SEAMS

This section describes how to use Artisan tools on the seams of NURBS surfaces that are stitched together. It includes the following topics:

- “What is a seam?” on page 426
- “Selecting common edges and corners” on page 426
- “Stitching surfaces” on page 438
- “Painting weights and attributes, or script painting over seams” on page 438

### What is a seam?

In Maya, you can stitch two surfaces together so that they join along their common edges to become one surface. The seam is defined by the common edges and the corners of the common edges.



If you want Artisan to treat two surfaces joined by a seam as one surface, you need to select the common edges before using the Artisan tool on the seam. This prevents the seam from unstitching.

You can also use Artisan to stitch your own seams.

You can paint with the following Artisan tools: Paint Selection Tool, Script Paint Tool, Attribute Paint Tool, Sculpt Surfaces Tool, Paint Weights Tool, Paint Skin Weights Tool. You can stitch seams with the Sculpt Surfaces Tool.

### Selecting common edges and corners

Artisan tools will treat two surfaces as one at the seam as long as you identify the common edges. There are two ways to do this:

- let Artisan automatically select common edges
- select your own common edges using common edge manipulators

Selecting common edges before you use Artisan tools on a seamed surface prevents the seam stitching from coming undone.

Common edges display as highlighted lines. Common corners display as highlighted dots. You can change the highlighted color by changing the Component color in the Colors editor (select Window >Settings/Preferences > Colors, click the Active tab and expand Components).

### Selecting common edges and corners automatically

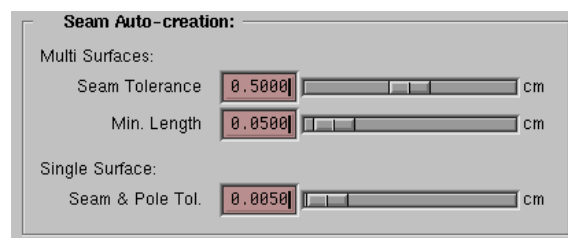
By default, Artisan selects common edges and corners that are within 0.5 cm of each other and edges that are at least 0.05 cm long (or whatever unit you have Maya set to use). You can modify these settings.

#### Note

Maya detects common edges and corners very precisely. To ensure that the common seam is detected, try increasing the Seam Tolerance (for example, to 0.7).

#### To modify automatic common edge and corner selection:

- 1 Select the Artisan tool you intend to use on your stitched surface and open the Tool Settings editor. (Paint Selection Tool, Script Paint Tool, Attribute Paint Tool, Sculpt Surfaces Tool, Paint Weights Tool, Paint Skin Weights Tool.)
- 2 Click the Seam tab and adjust the settings in the Seam Auto-creation section.



### Multi Surfaces

- |                       |   |
|-----------------------|---|
| <b>Seam Tolerance</b> | Set how close the edges and corners must be before Artisan detects them as common. If edges and corners do not appear to join, try increasing this value. |
| <b>Min. Length</b>    | Set the minimum length the edges must be before they are detected as common edges.  |

### Single Surface

- |                             |  |
|-----------------------------|--|
| <b>Seam &amp; Pole Tol.</b> | Set how close the vertices must be along an edge, and how close the edges on the same surface must be to each other before they are detected as common. This is most commonly used to detect poles on surfaces like spheres. |
|-----------------------------|--|

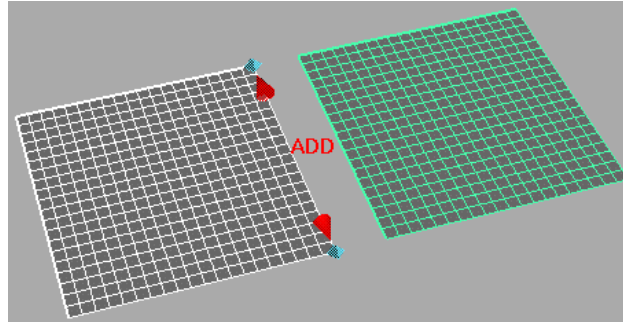
## Selecting common edges using manipulators

If you want greater control over common edges, you can use manipulators to select them. Using manipulators, you can make your common edge a segment of the surface edge.

When you select common edges using manipulators, the common corners are not automatically selected. This means the corners will not stitch together when you stitch seams. For details on selected common corners, see “Selecting common corners using manipulators” on page 434.

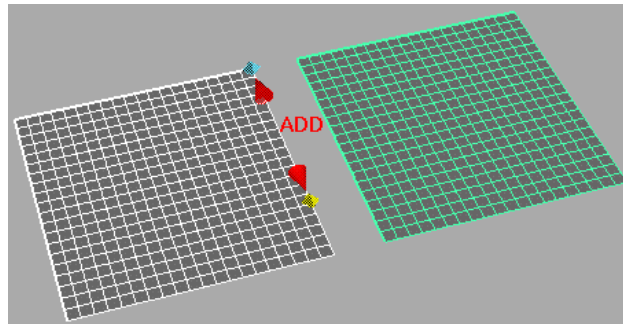
### To select common edges using manipulators:

- 1 Select the surfaces you want to have common edges.
- 2 Select the Artisan tool you intend to use on your stitched surface and open the Tool Settings editor.
- 3 Click the Seam tab.
- 4 In the Brush Mode section select Select Edges, then follow the prompts on the Help Line, as follows.
- 5 Click-drag across a surface to the edge you want to make common. When you select the edge successfully, it becomes highlighted.
- 6 Press Enter to confirm the selection. The reference manipulator appears along the selected edge.

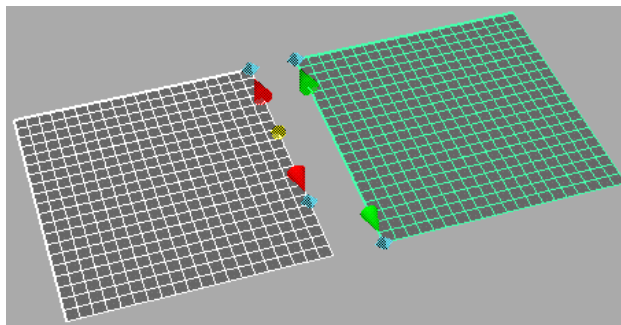


Notice that the operation handle is ADD, because the selected edge does not yet have a common edge.

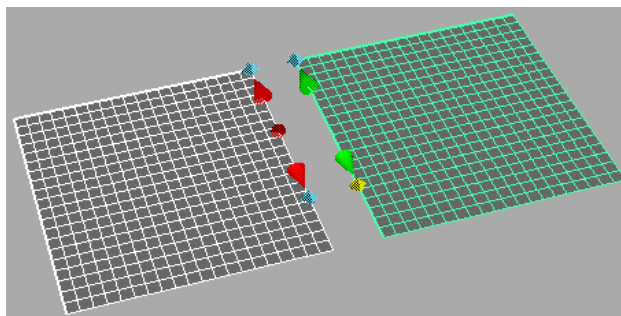
- 7 If you want the common edge to be a segment of the surface edge, slide the blue dots to increase or decrease the length of the common edge.



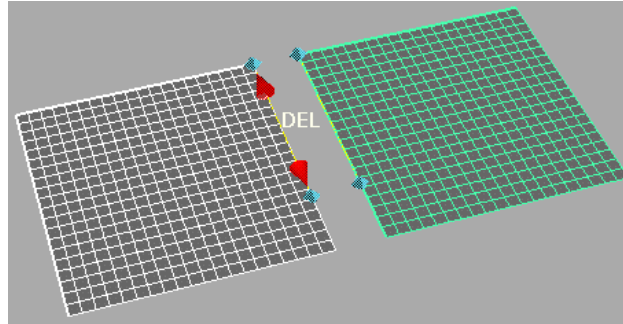
- 8 Click ADD and click-drag to select another common edge. When you select the edge successfully, it becomes highlighted.
- 9 Press Enter. Another reference manipulator appears on the second selected edge.



- 10 Slide the blue dots to increase or decrease the length of the common edge. Typically, you want common edges to be the same length, or close to the same length. If you are stitching the common edges, huge discrepancies in length will produce “puckered” seams, which you probably do not want.



- 11 To confirm the addition of the common edge, click the dot between the red arrows.



Notice that the operation handle is DEL, because the selected edge now has a common edge. You can delete the common edge by clicking DEL.

- 12 Press Enter to confirm the common edge.
- 13 Change the Brush Mode to Paint Surfaces. You can now stitch the edges together to create a seam.

---

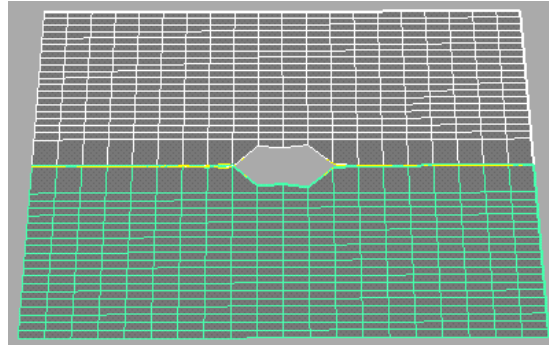
### Notes

You can exit this procedure at any time by pressing Enter.  
To deselect common edges, select another tool.

---

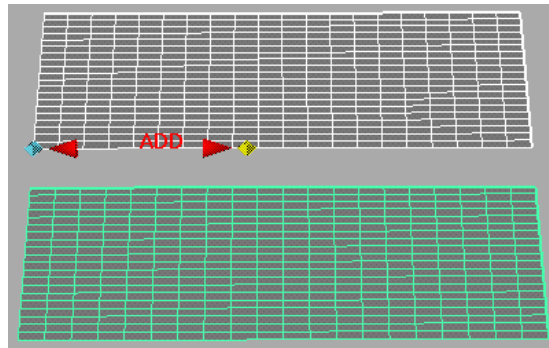
### Selecting multiple common edge segments – an example

The following example shows how you can select common edge segments on two surface edges. It describes how to stitch two segments of the surface edges together, leaving the middle segment unstitched. The end result looks as follows:

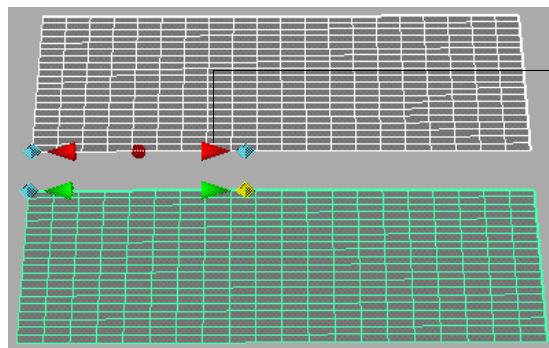


As you follow the example, notice that you use the arrows on the reference manipulator to navigate between segments.

- 1 Create two NURBS planes and position them side-by-side, leaving a gap between the surfaces.
- 2 Select the planes.
- 3 Select the Sculpt Surfaces Tool and open the Tool Settings editor.
- 4 Click the Seam tab.
- 5 In the Brush Mode section select Select Edges, then follow the prompts on the Help Line, as follows.
- 6 Click-drag across a surface to the edge you want to make common. When you select the edge successfully, it becomes highlighted.
- 7 Press Enter to confirm the selection. The reference manipulator appears along the selected edge.
- 8 Decrease the length of the common edge by sliding the blue dots.

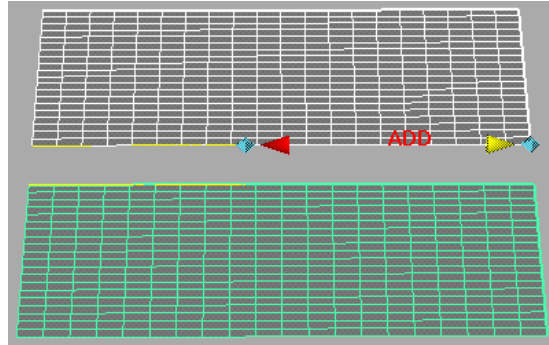


- 9 Click ADD and click-drag to select another common edge. When you select the edge successfully, it becomes highlighted.
- 10 Press Enter to confirm the selection.
- 11 Decrease the length of the common edge by sliding the blue dots.

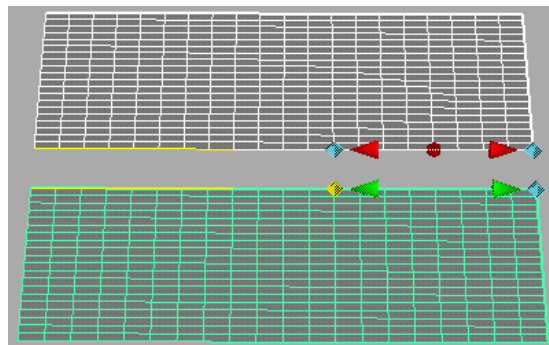


Click to add another segment

- 12 To select the common edge segment and add another segment, click the right red arrow.



- 13 Click ADD and click-drag to select another common edge segment. When you select the edge successfully, it becomes highlighted.
- 14 Press Enter to confirm the selection.
- 15 Resize the common edge segments by sliding the blue dots to the right.



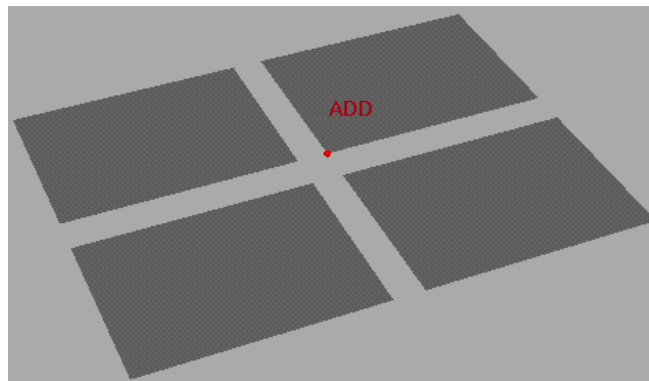
- 16 Press Enter to confirm the selection. You now have two common edge segments selected along the two surface edges.
- 17 In the Stitching Mode section of the Seam tab, click Stitch Now.

### Selecting common corners using manipulators

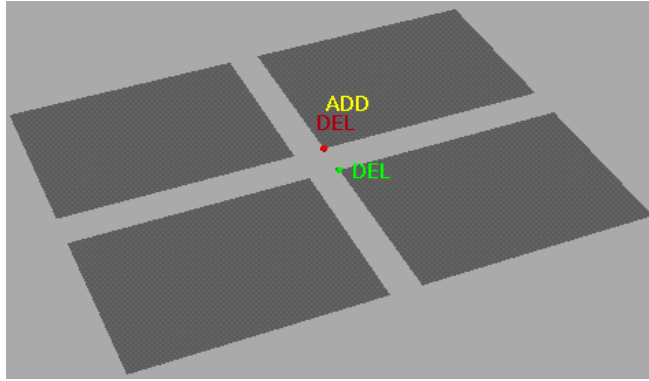
If you want greater control over common corners, you can use manipulators to select them.

To select common corners using manipulators:

- 1 Select the surfaces you want to have common corners.
- 2 Select the Artisan tool you intend to use on your stitched surface and open the Tool Settings editor.
- 3 Click the Seam tab.
- 4 In the Brush Mode section select Select Corners, then follow the prompts on the Help line, as follows.
- 5 Click-drag across a surface to a corner you want to make common. When you select the corner successfully, the edges become highlighted and a highlighted dot displays on the corner.
- 6 Press Enter to confirm the selection. Notice that the operation handle displays ADD. This is the master handle that you use to add all common corners.

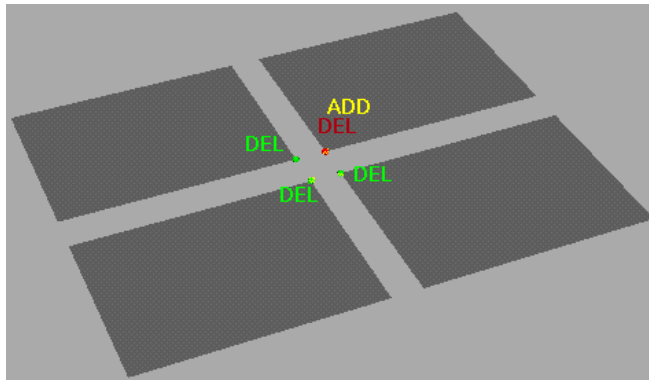


- 7 Click ADD and click-drag to select another common corner. When you select the corner successfully, it becomes highlighted.
- 8 Press Enter. Another reference manipulator appears on the second selected edge.



Notice that the operation handle on the new common corner displays DEL. To delete this corner, click DEL.

- 9 Repeat steps 7 and 8 above until you have added all the common corners you want.




---

*Tip*

After adding the first common corner, you do not need to click ADD to add other common corners. Simply click-drag across the surface to the corner, then press Enter.

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- 10 Press Enter to confirm the common corners.
- 11 Change the Brush Mode to Paint Surfaces. You can now stitch the corners together to join them.

### Notes

You can exit this procedure at any time by pressing Enter.

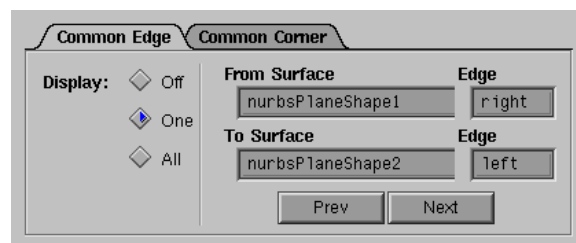
To deselect common corners, select another tool.

## Displaying common edges

By default, Artisan displays all common edges. They display as highlighted lines. If your model has more than one pair of common edges, you may want to display them one pair at a time, or hide them. (You must display all common edges when you set the brush mode to Select Edges or Select Corners.)

To display common edges one pair at a time:

- 1 Select the surfaces with common edges.
- 2 Select the Artisan tool you intend use on your stitched surface and open the Tool Settings editor.
- 3 Click the Seam tab.
- 4 Click the Common Edge tab and select One.



The From Surface and To Surface boxes display the names of the surfaces the displayed common edges belong to. The Edge boxes display which edge of the surface each common edge belongs to (left, right, top, bottom).

- 5 To display the next common edge pair, click the Next button. To display the previous common edge pair, click the Prev button.

---

*Note*

To hide all common edges, select Off on the Common Edge tab.

To display all common edges, select All.

---

### Displaying common corners

By default, Artisan displays all common corners. They display as yellow dots. You can turn off the display of common corners. (You must display all common corners when you set the brush mode to Select Edges or Select Corners.)

To turn off the display of common corners:

- 1 Select the surfaces with common corners.
- 2 Select the Artisan tool you intend use on your stitched surface and open the Tool Settings editor.
- 3 Click the Seam tab.
- 4 Click the Common Corner tab and select Off.

## Stitching surfaces

You can stitch surfaces together using the Sculpt Surfaces Tool. There are two ways to do this:

- Sculpt across the common edges and common corners. The edges and corners stitch together automatically to create a seam.
- Use the Stitch Now button in the Stitching Mode section of the Seam tab.

For details, see *Using Maya: NURBS Modeling*.

## Painting weights and attributes, or script painting over seams

You can paint weights and skin weights over seams using the Paint Weights Tool and Paint Skin Weights Tool respectively, script paint over them using the Script Paint Tool, and paint attributes over them using the Attribute Paint Tool. To ensure that the values you specify when painting across a

seam remain the same at the seam, toggle Averaging Seam on in the Common Edge Value Averaging section of the Seam tab. To ensure that the values you specify when painting across a pole remain the same, toggle on Averaging Pole CVs.

## USING ARTISAN PAINT TOOLS | 12

Working with seams

# 13

## SCRIPT AND ATTRIBUTE PAINT TOOLS

This chapter describes the advanced Artisan tools: Script Paint Tool and Attribute Paint Tool. It includes the following topics:

- “Painting with MEL Scripts” on page 441
- “Painting attribute values” on page 454

These tools involve setting up custom MEL scripts. For information on setting up the MEL scripts for these tools, see *Using Maya: MEL*.

### PAINTING WITH MEL SCRIPTS

This section describes how to paint with MEL scripts using the Script Paint Tool. It includes the following topics:

- “Overview of MEL script painting” on page 441
- “Setting Script Paint Tool options” on page 442
- “Script painting” on page 447
- “Script painting on masked surfaces” on page 454
- “Flooding surfaces” on page 454

#### Overview of MEL script painting

A MEL script is a file that contains MEL commands, MEL procedures, or both. Typically, you use a MEL script to create custom effects. Using Artisan paint tools, you can paint these effects on your surfaces the same way you paint weights. There are four sample scripts for you to try:

- **geometryPaint** – Use this script to select predefined objects in your scene and then paint them on a selected surface. For example, if the object is a cone, you can paint cones on the surface using the geometryPaint script. The Script Paint Tool settings determine the size, position, angle, and density of the cones.
- **spherePaint** – Use this script to paint spheres on a selected NURBS surface. This is a customized version of the geometryPaint script.
- **emitterPaint** – Use the emitterPaint script to paint emitters on surfaces. Emitters generate particles. The attributes of the emitter control the position, direction, quantity, and initial velocity of the emitted particles when they are born. After the particle is born, the attributes of the particle object that the emitter is connected to control the particle's appearance. For more details about emitters, see *Using Maya: Dynamics*.
- **softBodyPaint** – Use this script to set the goal weights on a soft body by painting on the soft body surface. For details about soft bodies, see *Using Maya: Dynamics*.

These scripts are stored on the /usr/aw/maya3.0/scripts/others directory (IRIX), or *drive:\aw\Maya3.0\scripts\others* directory (NT).

You might find these examples helpful when you are writing your own MEL scripts. Note that these scripts have not been thoroughly tested and therefore are *not* supported. For details on creating your own scripts, see the *Using Maya: MEL* online documentation.


## Setting Script Paint Tool options

Before you script paint, set options for the Script Paint Tool. The settings determine the effect you will achieve when you paint with the tool. You can define the following tool settings:

- brush stamp profile
- script paint operation
- value range
- clamping options

You can save your tool settings by adding the tool to a shelf. For details, see “Creating an Artisan tool shelf” on page 410.

**To define Script Paint Tool settings:**

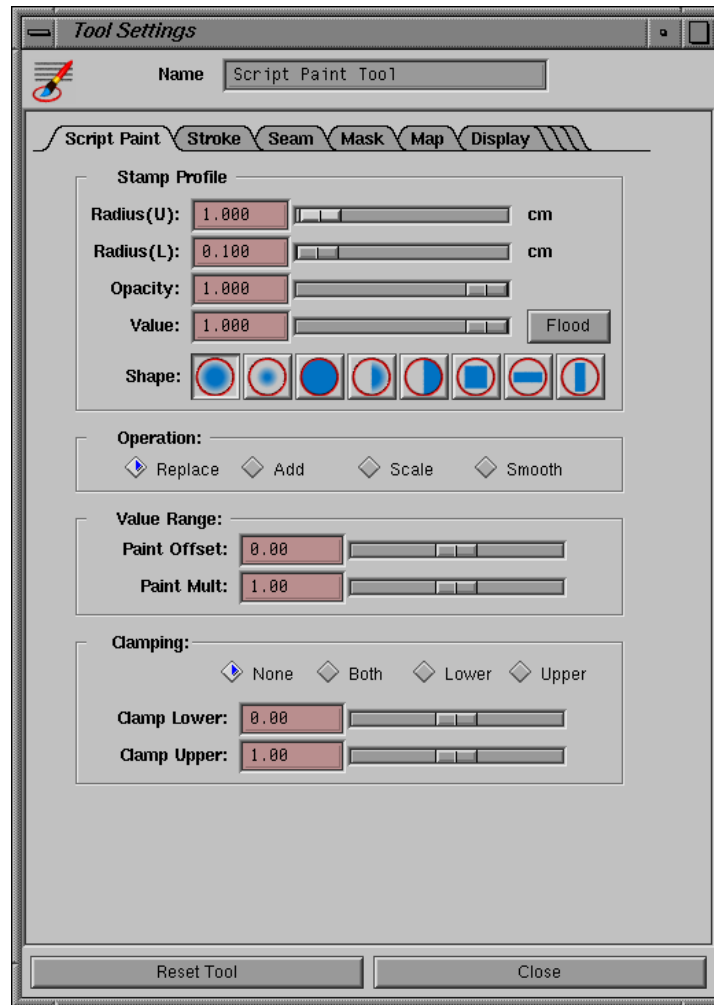
Select the Script Paint Tool and open the Tool Settings editor (Modify > Script Paint Tool )

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*Tip*

You can define hotkey combinations to change most of the settings without opening the Tool Settings editor. For details on setting hotkey combinations, see “Defining Artisan hotkeys” on page 410.

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### Setting the brush stamp profile

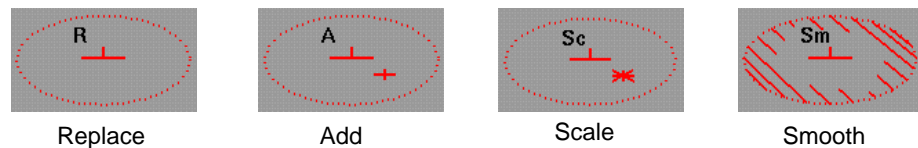
#### Radius (U)

If you are using a stylus, set the upper or maximum possible radius for the brush. No matter how hard you press the stylus, the brush radius will not exceed this radius. If you are not using a stylus, this setting defines the radius for the brush.

Radius (L)	If you are using a stylus, set the lowest or smallest possible radius for the brush when you apply pressure to the stylus. If you are not using a stylus, this setting is not used.
Opacity	Set the fraction of the Value to apply to each brush stamp within a stroke. Vertex values build up when stamps overlap. Stamps overlap when you paint over the same area.  Using the Opacity setting, you can produce more gradual changes to achieve more subtle effects.  Note that when you set Opacity to 0, your brush stroke has no effect.
Value	Set the value to apply when you perform any of the script painting operations. The value has a different meaning depending on the script. For example:  For the geometryPaint script, Value refers to the size of the geometry. The size of the original geometry has a value of 1.  For the emitterPaint script, Value refers to the percentage of the selected script operation.  For the softBodyPaint script, value refers to the goal weight on the soft body. The soft body should be set to have an initial goal weight value of 1.
Shape	Click on the shape of the brush. This determines the shape of the area affected by the brush action.  For brush shapes that are not uniformly round, you can change the profile alignment. For details, see “To set the brush stamp profile alignment:” on page 402.

### Selecting the operation

Notice that the brush stamp changes to reflect the operation.



To remove the letters and gradient marking from the brush stamp, open the Tool Settings editor, click on the Display tab and toggle Draw Brush Feedback off.

Replace	<p>For the geometryPaint script, replaces the vertex values you paint over with the specified Value and Opacity.</p> <p>For the emitterPaint script, replaces the characteristics of the painted emitter by the Value and Opacity settings and replaces the painted emitters with emitters that have these new characteristics. For example, if the selected operation is Speed, the emitter speed is factored by the Value and Opacity settings.</p> <p>For the softBodyPaint script, replaces goal weights by a factor of the original goal weight.</p>
Add	<p>For the softBodyPaint script, adds the specified Value and Opacity to the current vertex values you paint over. If the Paint Offset is negative, the value actually decreases.</p> <p>For the emitterPaint script, adds to the defined characteristics of painted emitters by the Value and Opacity factors.</p> <p>For the softBodyPaint script, adds to the goal weight.</p>
Scale	<p>For the softBodyPaint script, scales the current vertex values you paint over by the Value and Opacity factors.</p> <p>For the emitterPaint script, scales the defined characteristics of painted emitters by the Value and Opacity factors.</p> <p>For the softBodyPaint script, scales the goal weight.</p>
Smooth	<p>For the softBodyPaint script, changes the vertex values to be the average values of the surrounding vertices.</p> <p>For the emitterPaint script, changes the values of the painted emitters to the averages of the characteristics.</p> <p>For the softBodyPaint script, changes the goal weights to the averages of the adjacent goal weights.</p>
Paint Offset	<p><b>Setting the value range</b></p> <p>Set the factor you want to offset the Value by. This setting is most useful when you want to change the range of paint values from the default, 0-1. For example, if you want to paint objects with values between 4 and 5 using the geometryPaint script, set Paint Offset to 4.</p> <p>The default Paint Offset is 0, which has no effect on script painting operations.</p>

**Paint Mult.** Set the factor you want Value multiplied by.

---

*Tip*

To help you differentiate paint values when you script paint (for example, with the `softBodyPaint` script), set `Min Color @` and `Max Color @` to correspond with the `Paint Offset` and `Paint Mult` values, respectively. For details, see “Changing display settings” on page 404.

---

**Setting clamping options**

In the Clamping section, select whether you want to clamp the values within a specified range, regardless of the Value set when you paint. You can set clamping to Lower, Upper, Both, or None.

For example, if you clamp Lower and set `Clamp Lower` to 0.5, the values you paint will never be less than 0.5, even if you set `Value` to 0.25. Similarly, if you clamp Upper and set `Clamp Upper` to 0.75, the values you paint will never be greater than 0.75, even if you set `Value` to 1.

---

*Tip*

To maximize the range of values that display when you script paint (for example, with the `softBodyPaint` script), set `Min Color @` and `Max Color @` to correspond with the `Clamp Lower` and `Clamp Upper` values, respectively. For details, see “Changing display settings” on page 404.

---

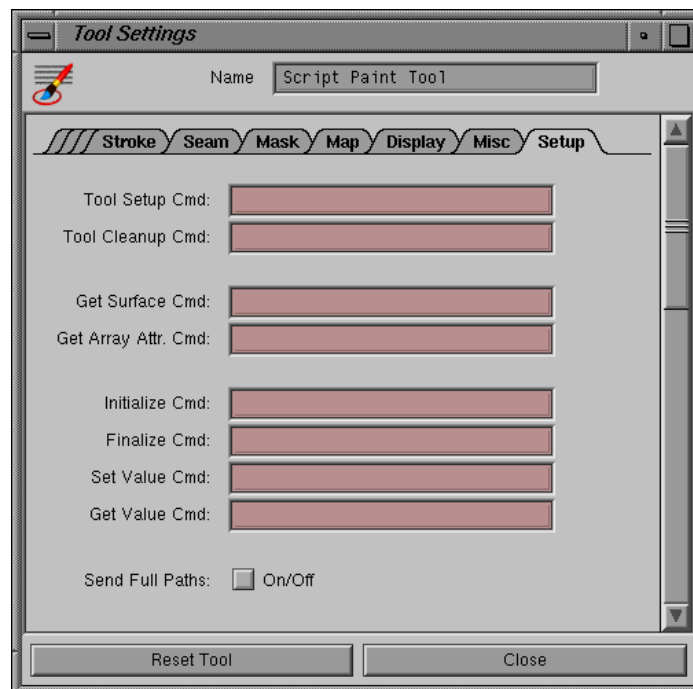
## Script painting

You script paint by selecting a script and applying brush strokes to the surface with the Script Paint Tool.

**To script paint:**

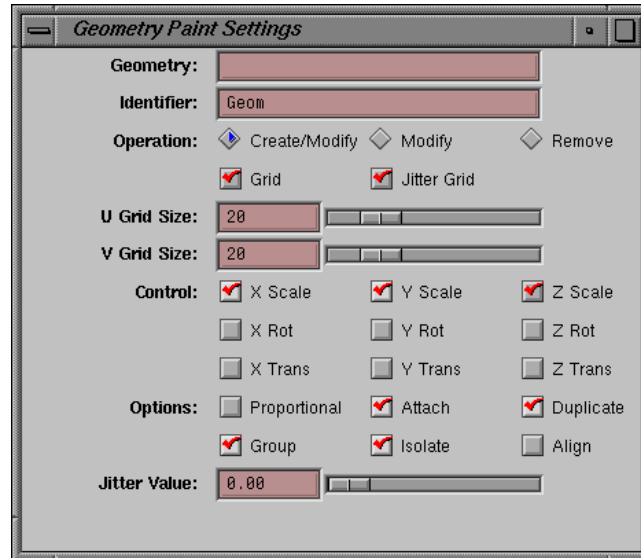
- 1 Make sure that the script you want to paint with is in the script directory:  
`~username/maya/3.0/scripts` (IRIX)  
`drive:\WINNT\Profiles\username\maya\3.0\scripts` (NT)  
`drive:\Documents and Settings\username\maya\3.0\scripts` (Windows 2000)
- 2 Select the surface you want to script paint on.

- 3 Select the Script Paint Tool (Modify > Script Paint Tool) and define tool settings, if required. For details on defining tool settings, see “Setting Script Paint Tool options” on page 442.
- 4 Click the Setup tab.



- 5 In the Tool Setup Cmd box, type the name of the MEL script (without the .mel extension) and any required parameters, and then press Enter.  
This box is case sensitive. For example, for the sample scripts type geometryPaint, emitterPaint, softBodyPaint goalPP.  
A script window may open, depending on the script.
- 6 Change any settings in the script window then click-drag the brush across the surface.

## geometryPaint settings



### Geometry

Type the names of the objects you want to paint, separating each with a space. The objects must be in your scene. If you type more than one object name, Maya paints them randomly.

### Identifier

Type a name to identify the layer the painted objects belong to. By painting on different layers, you can modify the objects on one layer without affecting the objects on a different layer. For example, if you type Layer1 in this box, then paint cones, then type Layer2 in the box and paint spheres, when you go back to Layer1 and paint, the spheres in Layer2 will be unaffected.

If you cannot remember a layer name, or identifier, open the Outliner and select an object belonging to the layer. The identifier name is part of the object name.

### Selecting an operation

#### Create/Modify

Creates new objects, and modifies the objects you paint over using the settings in this window and on the Script Paint tab.

#### Modify

Modifies the objects you paint over using the settings in this window and on the Script Paint tab.

#### Remove

Removes the objects you paint over.

### Setting grid options

**Grid**

Turn Grid on to use the grid you set in the U Grid Size and V Grid Size boxes to place the geometries. If you do not turn Grid on, Maya uses the vertex position to place geometries.

For each surface you paint, do not change the grid size. Changing the grid size while you paint produces undesirable results.

Also, keep in mind that your grid settings are interpreted in part by the UV mapping technique used on the surface. Make sure the UVs are correctly projected on the surface.

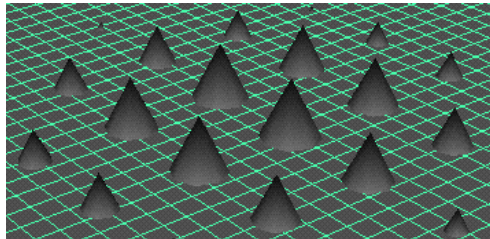
**Jitter Grid**

Toggle Jitter Grid on to randomize the position of the painted objects on the grid.

**U Grid Size V Grid Size**

Select the desired U and V Grid Size. Artisan paints the geometry on the grid point of the U and V grid you specify here, regardless of the isoparm density you set for the surface. The larger the grid size, the denser the geometries.

In the following example, the isoparm density of the surface is 40, but the U and V Grid Size are both set to 10 in the Geometry Paint Settings window.



### Selecting controls

These controls define how painted objects are transformed. Do not select both scale and rotation controls at the same time.

**X, Y and Z Scale**

Reduces object values by the factor set in the Value box of the Script Paint tab.

**X, Y and Z Rot**

Rotates objects based on the Value set in the Script Paint tab. A Value of 1 rotates objects 360 degrees.

**X, Y and Z Trans** Moves objects along the surface in the X, Y, and/or Z direction based on the Value set in the Script Paint tab. A Value of 1 moves objects 1 grid position.

### Selecting paint options

**Proportional** Distributes changes proportionally across all painted attributes rather than replacing them all with the new value.

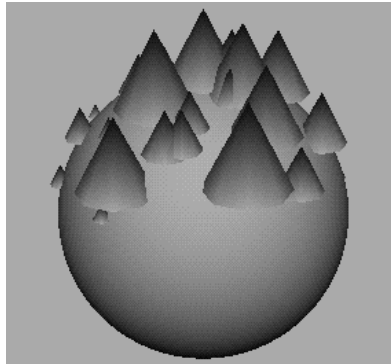
**Attach** Attaches the objects to their position so they move with the surface when you modify the surface (for example, when you sculpt or translate it).

**Duplicate** Creates copies rather than instances of the original objects.

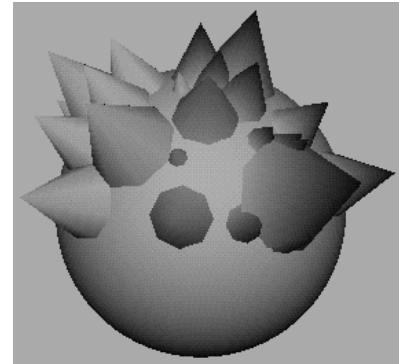
**Group** Groups the painted objects together on one identifier, or layer.

**Isolate** Isolates scale, rotate, and translate transformations, so they remain independent of each other. With Isolate toggled on, you can return objects to a base position by selecting the control and flooding with a Value of 0 for rotation and translation, or 1 for scale.

**Align** Aligns objects along the surface normal.



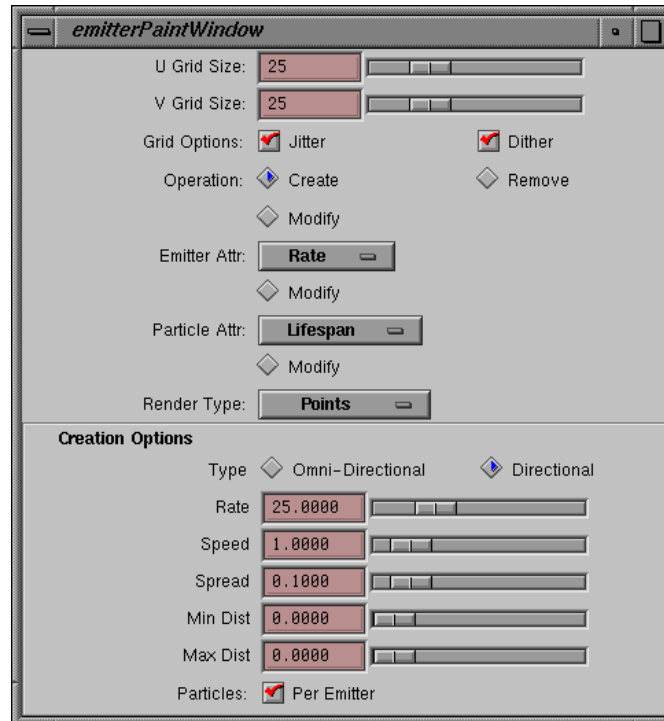
Align toggled off



Align toggled on

### Assigning a jitter value

Enter a jitter value to apply to the selected controls when Jitter Grid is toggled on, where 0 results in no jitter, and 1 results in maximum jitter.

**emitterPaint settings****U Grid Size V Grid Size**

Select the desired U and V Grid Size. Artisan paints the emitters on the grid points of the U and V grid you specify, regardless of the isoparm density you set for the surface. The larger the grid size, the denser the emitters.

**Selecting grid options****Jitter**

Randomizes the position of the painted emitters.

**Dither**

Concentrates emitters at the center of the brush stamp, with few emitters at the edge. If you do not toggle this option on, the emitters concentrate uniformly on the stamp.

**Selecting an operation****Create**

Creates emitters.

<b>Remove</b>	Removes emitters.
<b>Modify Emitter Attr.</b>	Changes the value of the selected attribute (Rate, Spread, Speed, Min Dist, or Max Dist) to the value set under Creation Options.
<b>Modify Particle Attr.</b>	Changes the value of the selected attribute (Lifespan, Opacity, Point Size, Line Width, Tail Fade, Tail Size, Radius, Multi Count, Multi Radius) to the value set under Stamp Profile on the Script Paint tab.
<b>Modify Render Type</b>	Changes the particle render type to the selected type (Multi-Point, Multi-Streak, Numeric, Points, Spheres, Sprites, Streak, or Blobby (s/w)).

### Selecting a type

<b>Omni-directional</b>	Sets the type of emitter to be an omnidirectional point emitter. This emits particles in all directions.
<b>Directional</b>	Sets the type of emitter to be a directional point emitter.

### Setting creation options

<b>Rate</b>	Set the rate at which particles are emitted. The rate is particles per unit of time.
<b>Speed</b>	Set the speed multiple of the emission. The velocity of the emitted particles is multiplied by this amount.  You can enter a value of 0 or greater.
<b>Spread</b>	Set the spread angle for the emitted particles, along the specified emission direction. Particles are randomly distributed within the spread angle and around the base of a cone between 0 and 360 degrees. This option is valid for directional emitters only.  You can enter a value between 0 and 1. A value of 1 means 180 degrees.
<b>Min Dist</b>	Set the minimum distance from the emitter at which emission starts. You can enter a value of 0 or greater.  Particles get emitted at a random distance uniformly distributed between the Min Distance and Max Distance.
<b>Max Distance</b>	Set the maximum distance from the emitter at which emission ends. You can enter a value of 0 or greater.
<b>Particles</b>	Toggle on Per Emitter to create a separate particle shape for each emitter. Toggle this option off to share one particle shape between all emitters. Per Emitter must be toggled on to paint Particle Attr. or Render Type.

## Script painting on masked surfaces

You can create a mask on your surface that is unaffected by any script painting you do. When you apply brush strokes over the mask, the vertices on the masked area remain unchanged, regardless of the script paint operation.

For details on masking surfaces, see “Masking surfaces” on page 416.

## Flooding surfaces

Flooding a surface is like taking a huge brush and applying its settings to the entire surface. The result depends entirely on the brush settings defined when you perform the flood.

## PAINTING ATTRIBUTE VALUES

The Attribute Paint Tool allows advanced users to create new paint tools. You can use the Attribute Paint Tool to paint any *paintable* attribute value on a surface. A paintable attribute is one that has been registered in Maya. Cluster weights and soft body particle attributes (goal weights, opacity, RGB and velocity) are already registered as paintable. For information on making an attribute paintable, see *Using Maya: MEL*.

The Paint Vertex Color Tool and the Paint Skin Weights Tools are actually customized Attribute Paint Tools.

## Painting attributes

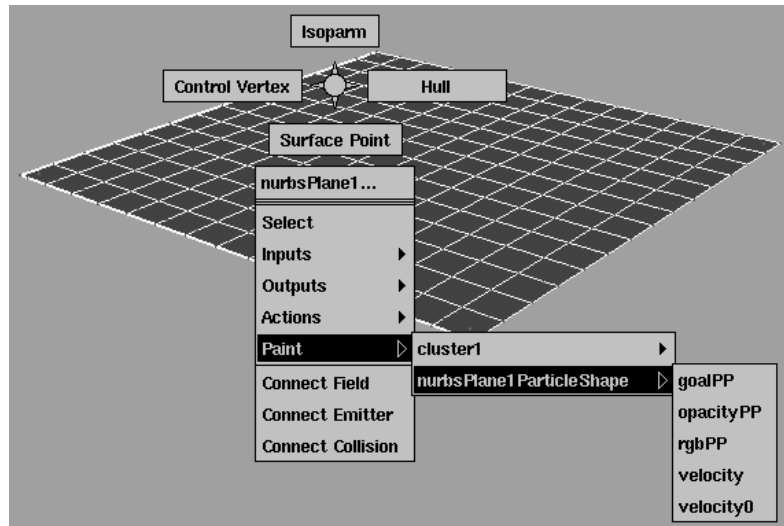
You paint attributes by selecting surfaces with paintable attributes that are registered in Maya, selecting which paintable object(s) you want to paint, and then applying brush strokes to the surface with the Attribute Paint Tool.

### To paint attributes:

- 1 Make sure that the attributes you want to paint are registered.
- 2 Select the surface you want to paint attribute values on.

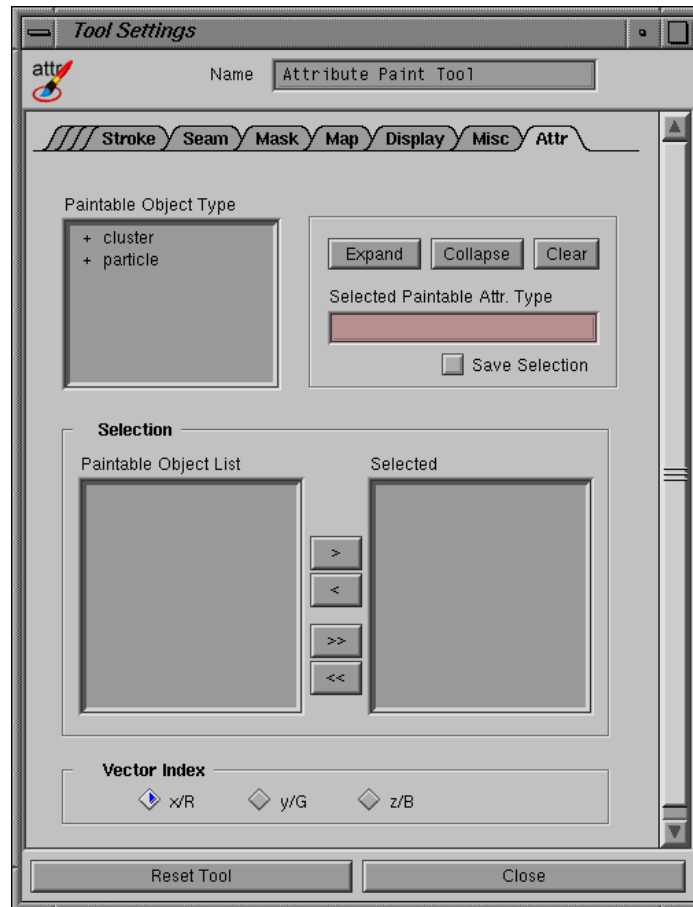
- 3 Select the Attribute Paint Tool (Modify > Attribute Paint Tool) and define tool settings, if required. (For details on defining tool settings, see “Setting Script Paint Tool options” on page 442. The settings on the Attr. Paint tab are the same as the settings on the Script Paint tab.)
- 4 Do one of the following:
  - Right-click on the surface and select Paint > *objectType* > *paintableAttribute*. The Attribute Paint Tool automatically detects paintable attributes on the surface and displays them.

In the following example, the Attribute Paint Tool detects that the surface is a soft body with a cluster (both attribute types are paintable).



or

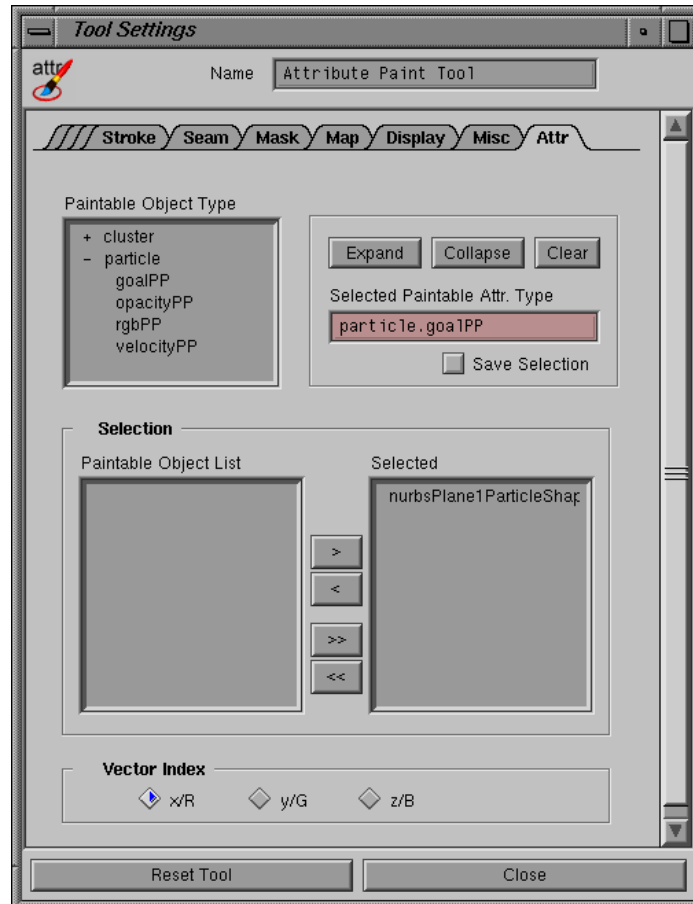
- In the Tool Settings window, click the Attr tab. The Attribute Paint Tool automatically detects paintable attributes on the surface and displays them in the Paintable Object Type box.



- Click the plus sign (+) or Expand button to expand the object type and see what attributes are paintable.
- Click the paintable attribute. All selected objects that are paintable appear under the Selection section in the Paintable Object List.

The name of the paintable attribute appears in the Selected Paintable Attr. Type box. This is the attribute you will be painting.

- 5 In the Paintable Object List, select the objects you want to paint and click the arrow button (>) to add them to the Selected list. Click the double arrow button (>>) to add them all.



- 6 If you are painting a three channel attribute (RGB or XYZ), under Vector Index, select the channel you want to paint.
- 7 Click-drag the brush across the surface.





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PART 4

## PREFERENCES



# 14

## SETTING PREFERENCES

You can use preferences to customize Maya to the way you work. You can change general color definitions, the way manipulators display, and the appearance of the Shelf, menu bars, and panels.

This chapter describes how to set preferences in Maya. It includes:

- “Settings/Preferences menu” on page 462
- “Where Maya stores preferences” on page 462
- “Saving preferences using `userSetup.mel`” on page 464
- “Preferences window” on page 465
- “Changing color settings” on page 482
- “Specifying tool settings” on page 485
- “Specifying performance settings” on page 487
- “Loading and unloading plug-ins” on page 489

## SETTINGS/PREFERENCES MENU

The Window > Settings/Preferences menu gives you access to the various Maya preferences windows, including:

Preferences	See “Preferences window” on page 465 in this chapter.
Tool Settings	Opens the settings for the current tool. See “Specifying tool settings” on page 485 in this chapter. Also see information on the specific tool.
Performance Settings	See “Specifying performance settings” on page 487 in this chapter.
Hotkeys	Displays the Hotkey Editor to let you create and edit your own hotkey combinations. See “Assigning hotkeys” on page 526.
Colors	Displays the Colors window to let you specify the color of various components of Maya, including the Hypergraph and the Multilister. See “Changing color settings” on page 482 in this chapter.
Marking Menus	Displays the Marking Menu Editor to let you edit the marking menus. See “Creating and editing marking menus” on page 509.
Shelves	Displays the Shelves window to let you create and edit shelves. See “Creating and editing shelves” on page 493.
Panels	Displays the Panels window to let you create and edit your own panels. See “Working with Panels and Layouts” on page 533.
Plug-in Manager	Opens the Plug-in Manager to let you load and unload plug-in software and Maya modules. See “Loading and unloading plug-ins” on page 489.

## WHERE MAYA STORES PREFERENCES

Many of the settings that define the Maya user interface are stored in .mel files in the the following directory:

*~username/maya/3.0/prefs* (IRIX)

*drive:\WINNT\Profiles\username\maya\3.0\prefs* (NT)

*drive:\Documents and Settings\username\maya\3.0\prefs* (Windows 2000)

Shelves are stored in the shelves subdirectory and icons are stored in the icons subdirectory.

When you customize Maya, your new settings are stored in user preference files, so that each time you open Maya, your settings are used instead of the Maya default settings. If you delete a preference file, Maya uses the default settings.

### Color and hotkey files

The following .mel files store settings you have customized using the Colors window and Hotkey Editor.

- `userColors.mel` – Contains preferences defined on the Active and Inactive tabs of the Colors window.
- `userRGBColors.mel` – Contains preferences defined on the General tab of the Colors window.
- `paletteColors.mel` – Defines the colors (RGB) making up the index palette in the Active and Inactive tabs of the Colors window.
- `userHotkeys.mel` – Contains any hotkeys you have assigned in the Hotkeys window.
- `userNamedCommands.mel` – Contains all the commands that have hotkeys assigned to them.

### Default hotbox marking menus

The following files define the default Hotbox marking menus.

- `menu_ChangePanelLayout.mel` – North
- `menu_ChangePanelType.mel` – South
- `menu_ChangeSelectionMask.mel` – West
- `menu_CommonModelingPanels.mel` – Center
- `menu_ControlPaneVisibility.mel` – East

### User preferences

The following files define user preferences.

- `userPrefs.mel` – Contains preferences defined in the General Preferences window (Window > Settings/Preferences > Preferences).
- `windowPrefs.mel` – Defines the default size and position of Maya windows.

## SAVING PREFERENCES USING USERSETUP.MEL

While you save most Maya user preferences through the user interface, you can also store preferences not stored through the user interface by creating the file `userSetup.mel` in the following directory:

`~username/maya/3.0/scripts` (IRIX)

`drive:\WINNT\Profiles\username\maya\3.0\scripts` (NT)

`drive:\Documents and Settings\username\maya\3.0\scripts` (Windows 2000)

Whenever you launch Maya, the MEL commands in this file run. For example, you could put the following command in the `userSetup.mel` file:

```
alias djs jointDisplayScale;
```

This creates an alias named `djs`, that lets you set the joint size without using the Display > Joint Size menu or typing `jointDisplayScale`. You can enter the `djs` alias with a joint size in the Command Line or Script Editor:

```
djs 1.5;
```

In this example, the joint size is set to 1.5.

---

### *Important*

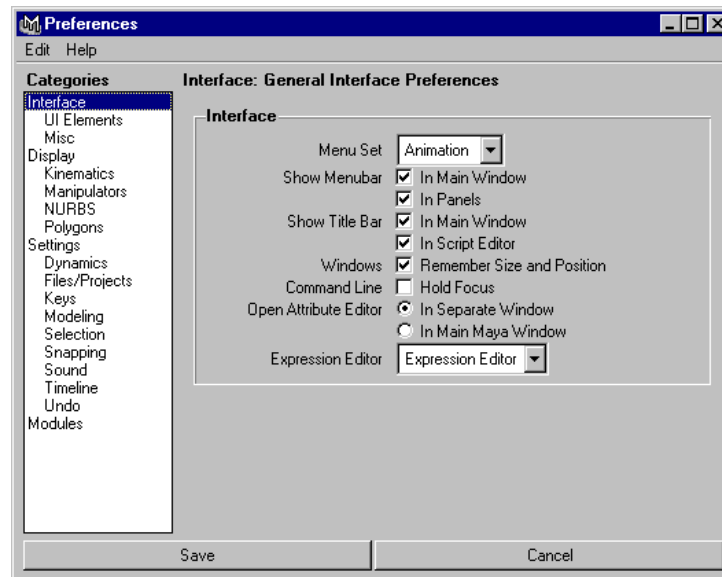
The scene is cleared of all objects after the commands in the `userSetup.mel` file are run. Therefore, any scene elements created using the `userSetup.mel` file will have been removed when Maya comes up.

---

For details about writing MEL scripts, see *Using Maya: MEL*.

## PREFERENCES WINDOW

You can set a variety of preferences in the Preferences window (Window > Settings/Preferences > Preferences). Select a category on the left and set the related preferences on the right.



### Saving and reverting changes

Your changes to the preferences are saved automatically when you quit Maya or when you click the Save button in the Preferences window. If you need to revert to previous settings, you can use the options under the Edit menu: Revert to Saved and Restore Factory Settings.

Revert to Saved returns all preferences to the settings when you last saved. Restore Factory Settings returns all preferences to the default settings.

---

#### Tip

For your preference changes to take effect, make sure you click Save.

---

## Interface

Menu Set	This determines which menu set displays in the main Maya menu bar on start-up. The default is Animation.
Show Menubar	Hides or displays the menu bar.
Show Title Bar	Hides or displays the title bar. The title bar includes window control buttons for expanding and collapsing the application.
Windows	Turn on Remember Size and Position so that Maya restores the size and position of all windows when closed and re-opened. If toggled off, Maya windows always display in the center of the screen upon opening.
Command Line	Toggle on Hold Focus if you want the cursor to stay in the Command Line after you press Enter. Otherwise, the cursor returns to the current window.
Open Attribute Editor	Use this option to specify how the Attribute Editor displays when you open it (such as pressing Ctrl+A). To open the Attribute Editor in a separate window, select In Separate Window. To open the Attribute Editor in the main Maya window, select In Main Maya Window. Note that the Attribute Editor always displays in the main Maya window when you choose Display > UI Elements > Attribute Editor.
Expression Editor	Select an Expression Editor for editing text.

## UI Elements

Visible UI Elements	Hides or displays UI elements. You can also control this display from the Display > UI Elements menu.  Toggle on any components you want displayed in the Maya main window.
---------------------	---

---

### Note

You cannot display both the Channel Box and the Attribute Editor in the main Maya window at the same time. If you toggle Attribute Editor off, when you open the Attribute Editor, it will display according to the option selected on the Windows tab. See “Open Attribute Editor” on page 466.

---

## Misc

Window Selection	Select whether Maya uses the existing help browser window (Use an Existing Help Browser Window) or creates a new one (Create a New Help Browser Window for Maya Help) when you select a Help menu item.
Window Visibility	Select whether an html browser appears when you select Help > Library, Global Index, Search, Maya Basics, or MEL. The default is on.
New Scene Config	Select the view configuration to use the next time you open a new scene.
New File	Select whether the current panel configuration (Use Existing) or a specified panel configuration (Use Specified) is used when creating a new file.
Open File	Select whether the saved panel configuration (Use Saved) or a specified panel configuration (Ignore Saved) is used when opening a file.
Save File	Select whether to save the panel configuration automatically when you save the scene file (Always Save), or never (Never Save).

## Display

Fast Interaction	Toggle Fast Interaction on to improve performance by displaying fewer geometric entities (such as polygons). Off is the default setting.
Axes	<p>Displays one or both of the XYZ coordinates (view and origin axes). If you disable both choices, no XYZ coordinates appear.</p> <p><b>View Axis</b> – Displays the XYZ coordinates in the bottom left corner of the view. This is the default.</p> <p><b>Origin Axis</b> – Displays the XYZ coordinates at coordinates 0, 0, 0.</p>
Grid Plane	<p>Displays or hides the grid plane. The grid is a 2D plane that represents 3D dimensions in the view. It is useful when you want to animate motion relative to a solid surface. Select Hide to hide the grid.</p> <p>This setting overrides the Display &gt; Grid setting described in “Using a grid” on page 120.</p>
Active Object Pivots	Specify whether to display pivot points.
Affected Highlighting	Turns highlighting display on or off. An object associated with or affected by a selected object is highlighted in a different color.

*Note*

You can edit this highlight color by selecting Window > Settings/Preferences > Colors, clicking the Active tab, expanding General, and modifying Active Affected.

**Wireframe on Shaded**

Select how you want to display the wireframe on shaded objects.

**Full** – Displays normal resolution wireframes on shaded objects. This is the default.

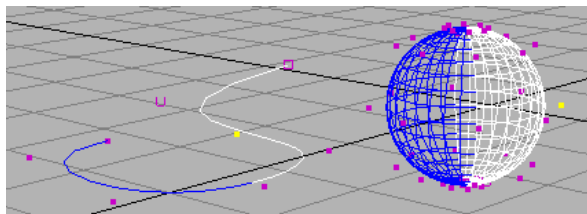
**Reduced** – Displays fewer wires on shaded objects.

**None** – Displays no wires on shaded objects. Performance is enhanced if you select None.

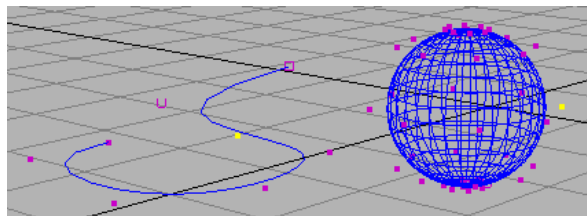
**Region of Effect**

This option lets you turn on or off the region of effect display. Region of effect is the part of an object that will potentially change as a result of moving selected CVs. Note that curves show the region of effect as well as surfaces.

Region of  
Effect on



Region of  
Effect off

**Shade Templates**

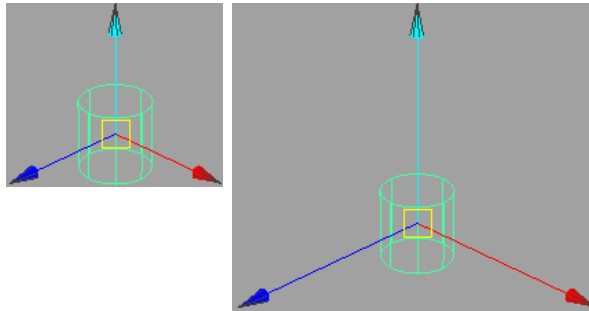
If on, templated objects appear shaded in shaded view. If off, the templated objects appear as wireframes while all other objects appear shaded.

## Kinematics

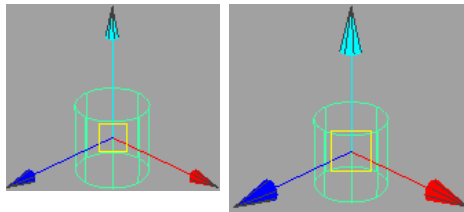
- Joint Size** Changes the display size of skeleton joint sizes. The range is from 0.01 to 5.0.
- IK Handle Size** Changes the display size of IK handles. The range is from 0.01 to 5.0.

## Manipulators

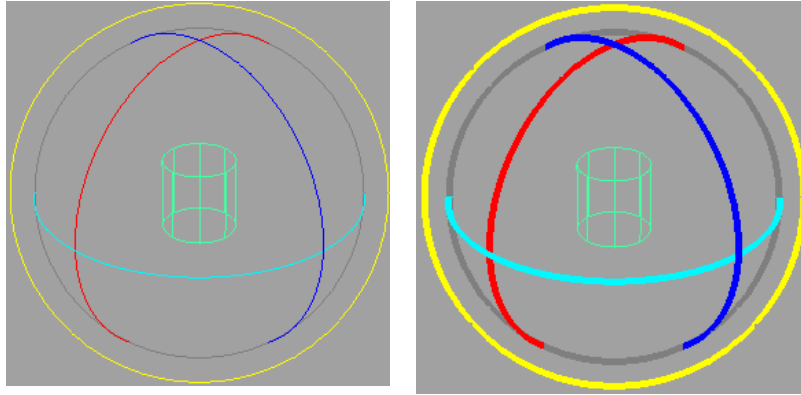
- Global Scale** Specifies the size of the manipulators. The range is from 0.10 to 10.00. The default is 10.00.



- Handle Size** Specifies the size of the handle. The range is from 4 to 100.



- Line Size** Specifies the line thickness size of the rotate manipulator's rings.



- Line Pick Size** Determines the line thickness used when *picking* the rotate manipulator rings. The pick size should be the same as line size, so you can identify which handle will be picked by the size of the ring.
- Previous State Size** Controls the size of the points drawn for a previous feedback. For example, for the Move Tool, an axis is drawn to indicate the previous position, with square points at the end of the axes. This controls the size of the squares.
- Rotate and scale manipulators also have previous state feedback. This type of feedback is shown only when you drag; it disappears as soon as you release the mouse.

## NURBS

### New Curves, New Surfaces

Select whether you want Edit Points, Hulls, and/or CVs on new curves or new surfaces:

---

#### Note

These options work only on new curves or surfaces, not existing items.

---

- Surface Divisions** Controls the smoothness of an object in a view. It also affects the rendering of newly created surfaces. Enter a value or use the slider. The range is from 0 to 64. The higher the value, the smoother the surface.

- Curve Divisions** Controls the smoothness of a curve in a view. Enter a value or use the slider. The range is from 1 to 128. The higher the value, the smoother the curve.
- Shaded Divisions** Controls how smooth your smooth-shaded object looks. The greater the number, the smoother the smooth-shaded object. Enter a value or use the slider. The range is from 1 to 64.

## Polygons

- Vertices** Specify how you want vertices to display:
- Display** – Toggles the display of vertices on or off.
  - Normals** – Displays vertex normals on or off.
  - Backculling** – Makes vertices invisible in areas where the normal is pointing away from the camera.
- Edges** Specify how you want edges to display:
- Standard** – Displays all edges the same (hard or soft).
  - Soft/Hard** – Displays soft edges as dotted lines and hard edges as solid lines.
  - Only Hard** – Displays hard edges only (makes soft invisible).
- Highlight** Specify how you want highlight polygons:
- Border Edges** – Displays thicker outside edges to make them more visible for certain operations.
  - Texture Border** – Displays a thick border to highlight the area a texture affects per polygon or per vertex.
- Border Width** Specify the width of the polygon border. The range is from 1 to 10.
- Faces** Specify how you want faces to display:
- Centers** – Displays a small square to indicate the face center.
  - Normals** – Shows the normals at the center of each polygon.
  - Triangles** – Displays all polygons as triangles for display.
- Show Item Numbers** Specify where you want item numbers displayed: at each vertex (Vertices), at each edge (Edges), or on each face (Faces).
- Normals Size** Specifies the display size of the normals. The range is from 1 to 10.

## Preferences window

Color	Toggle Colored Shading on to use the Apply Color operation (Edit Polygons > Colors > Apply Color). For details, see “Coloring polygons”, in <i>Using Maya: Polygonal Modeling</i> .
Color Material	<p>These menu options override any existing material channels and replace them with the vertex colors you assign. For all options other than None, lighting affects the object’s shading.</p> <p><b>None</b> – None of the material properties of the shader(s) assigned to the object are used. In this case lighting is also disabled.</p> <p><b>Ambient</b> – The ambient material channel of the assigned shader(s) is overridden by the vertex color.</p> <p><b>Ambient+Diffuse</b> – The ambient and diffuse material channels of the assigned shader(s) are overridden by the vertex color.</p> <p><b>Diffuse</b> – The diffuse material channel of the assigned shader(s) is overridden by the vertex color.</p> <p><b>Specular</b> – The specular material channel of the assigned shader(s) is overridden by the vertex color.</p> <p><b>Emission</b> – The emission material channel of the assigned shader(s) is overridden by the vertex color.</p>
Backface Culling	<p>Specify the display for backface culling:</p> <p><b>Off</b> – No backface culling occurs. This is the default.</p> <p><b>On</b> – Surfaces become invisible in areas where the normal is pointing away from the camera.</p> <p><b>Keep Wire</b> – Displays wireframe outlines, but any areas where the normal is pointing away from the camera are hidden.</p> <p><b>Keep Hard Edges</b> – Sets backface culling for soft edges only. See <i>Using Maya: Polygonal Modeling</i> for more information on polygonal modeling.</p>

## Settings

Up Axis	Sets the up axis to Y or Z. The default is Y. See “Orienting the XYZ system” on page 31.
Linear	Sets the unit of measure for operations that use linear values, for example, moving and scaling. The default unit for measuring linear values is centimeters.

Angular	Sets the unit of measure for operations that use an angular value, for example, rotation. The default unit for measuring angular values is degrees.
Time	<p>Sets Maya's internal representation of what one "second" is. For example, in a dynamics simulation, which relies on real world timings, the resulting simulation will produce keys which represent one second as 24 frames (Maya's default value).</p> <p>It also allows you to compensate for intermediate output devices (for example, Abekas, etc.) which may have different frame rates to your final output (for example, Film). When changed, your animation keys will move in time to match that range. This is only while your time units are on that alternate setting. Returning the time units to your creation setting will return your keys to their original location.</p> <p>The default for measuring time is Film 24fps (24 frames per second).</p>

---

#### Note

Be sure you set your preferred time unit for a particular session, **before** creating any animation. This will ensure correct timing of your keyframes, for the final output and final fps setting.

---

#### Tolerance

The Tolerance value determines the degree of accuracy that is maintained between the original and fit (or interpolated) curves. This setting applies globally to Maya. You can change it on a case-by-case basis. Set the following tolerance options:

Positional	Set the degree of accuracy between the actual positions of the original and interpolated curves.
Tangential	Set the degree of accuracy required to determine if two NURBS objects are to be made tangent across a shared edge or point.

## Dynamics

### Auto Create Rigid Body

Toggle this option on to automatically create active rigid bodies when you connect an object to a field (apply a field's influence to geometry).

**Run Up To Current Time**

If you click a frame in the Time Slider, the correct state of all dynamic objects in the scene is displayed only if Maya performs run-up to calculate each frame prior to that frame. Toggle this option on if you want to click frames in the Time Slider. Note that run-up also occurs for hidden objects.

Leave run-up toggled off if you want to prevent Maya from calculating dynamics when you click in the Time Slider. This is useful in a scene that has both nondynamic objects and complex dynamic objects, where you want the state of nondynamic objects to appear promptly after you click the Time Slider. If you are keying dynamic objects, it's also useful leave run-up toggled off to avoid waiting for run-up calculations that are irrelevant to your keying activities.

**Run Up From**

Select one of the following options:

**Previous Time** – If you click a frame higher than the current frame, run-up starts from the prior current time and ends at the frame you click. Select this option if you won't be changing any attributes of a dynamic object in the scene. This setting lessens the time you'll spend waiting for run-up. If you click a frame lower than the current frame, run-up starts from the beginning of the animation.

**Start Time** – Run-up starts from the start frame regardless of where you click in the Time Slider. Select this option if you plan to change any attributes of a dynamic object in the scene. This ensures that you see the correct object states when you click in the Time Slider after modifying an object's dynamics.

**Save Startup Cache for Particles**

When this option is turned on (the default), Maya automatically saves the start-up cache for all your particles every time you save the file. Unlike particle disk caches, you don't have to create the start-up cache explicitly every time. See *Using Maya: Dynamics* for more information.

**Files/Projects****Default Projects Directory,  
Always Start in This Project**

Use these settings to set up a default projects directory when you create new projects and on startup.

- On File Save** Specify the compression mode you want to use when saving an ASCII file:
- Compressed** — Saves files in compressed mode. File compression reduces the sizes of large files so they do not occupy as much space on your hard drive.
  - Uncompressed** — Saves files in uncompressed mode.
  - As Is** — Keeps files in their original compression mode rather than compressing or uncompressing them. As Is is the default.
- File Import Merge** Specify how you want the Display Layer merged when you import a file.
- None** – All layers read in are put in a new layer, renumbered, and renamed, if necessary to preserve uniqueness.
  - By Number** – Rather than creating a new layer, all layers read in that have the same index number as an existing layer are merged with that layer.
  - By Name** – Rather than creating a new layer, all layers read in that have the same name as an existing layer are merged with that layer.

## Keys

- Auto Key** Toggle Auto Key on to automatically set keys on any keyable attributes of an animated object (including lights, shaders, textures, cameras, and so on).
- Weighted Tangents** Toggle Weighted Tangents on to give animation curve tangents weight. The default is toggled off, which means the tangents are non-weighted.
- Default In Tangent, Default Out Tangent**
- Set the default In and Out Tangents to:
- Spline** – Creates an animation curve that is smooth between the key before and the key after the selected key.
  - Linear** – Creates an animation curve as a straight line joining two keys.
  - Clamped** – Creates an animation curve which has the characteristics of linear and spline curves.
  - Flat** – Sets the in and out tangents of the key to be horizontal (with a slope of 0 degrees).
  - Stepped** – Creates an animation curve whose out tangent is a flat curve.

## Modeling

**Output Geometry As** These settings determine the type of geometry created from modeling actions such as Revolve, Loft, Extrude, Fillet Blend, and so forth. Setting it here affects all applicable modeling actions. Otherwise, select Mixed to use the individual settings of each modeling action.

**Interaction Mode** Specify whether you want certain NURBS modeling commands to behave like actions or tools. An action performs a discreet function on selected objects. A tool lets you manipulate objects until you complete the operation. You may want to change actions to tools as you become proficient at Maya's NURBS modeling, or if you are accustomed to Power Animator tools.

To globally change the applicable modeling tools, choose Everything is a Tool or Everything is an Action. To individually set each command, choose Mixed.

## Selection

### Modifiers

Modifiers control Maya selection operations. They work with masks to control what is displayed when you select items. You can toggle on one or more of the following:

#### Single Marquee Select

Selects the first object in a hierarchy.

**Click Drag Select** Lets you perform one-step click-dragging with the transformation tools. You can move one object using the Move tool, then click on a second object and the Move tool displays. This means you do not have to select the object and the Move tool again—you can keep using the Move tool on any subsequent selected object.

**Affects Active** If you change from object to component selection mode, the selected object is not affected. This option lets you select objects and components at the same time. This is toggled on by default.

#### Allow Highlight Select

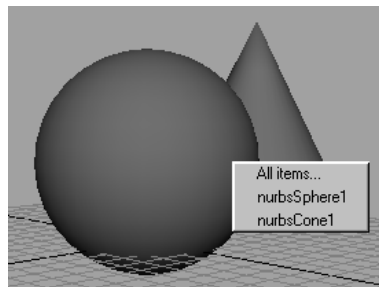
Highlights components when you switch from object to component selection mode. This is toggled on by default.

**Ignore Selection Priority**

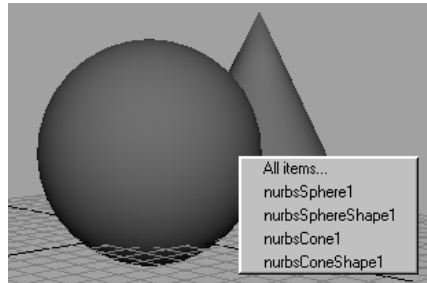
Treats all objects with the same priority. The selection order does not matter. This is toggled on by default.

**Popup Menu Selection**

When objects overlap in the view, lets you display a pop list of the objects so you can select them. Left-click on the overlap area to display the menu.



**Expand Popup List** If you toggled on Expand Popup List, displays all the pop list of objects and everything underneath it in the hierarchy.



**Click Box Size** This option controls the size of the selection area around the mouse pointer, or *click box*. If you are having problems with selecting objects or components, try adjusting this option. For example, a higher click box size might make it easier to select curves. Increasing the click box size is also useful if you have a high resolution screen display.

**Polygon Selection**

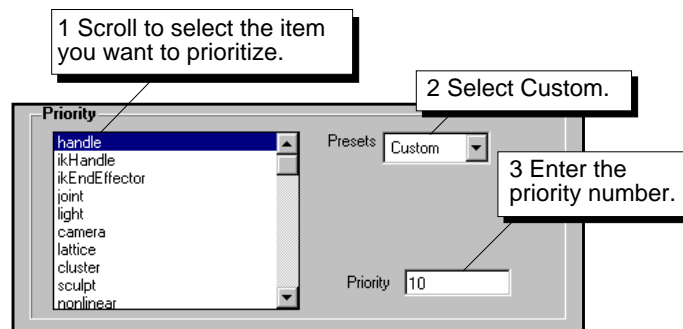
**Select Faces with** Specify how you want to select polygonal faces:

**Center** — Select polygonal faces at their center. In other words, you must click the box at the center of the face to select the entire face.

**Whole Face** — Select the entire face. You can click anywhere on the face, even any face edge, to select it.

### Priority

You can specify a selection priority for objects and components. By default, NURBS curves have a higher selection priority than surfaces. This means that Maya will select the NURBS curve before the surface when you select geometry that contains both NURBS curves and surfaces.



## Snapping

With these options, you can control the size region around the mouse pointer that is used for the snap operation.

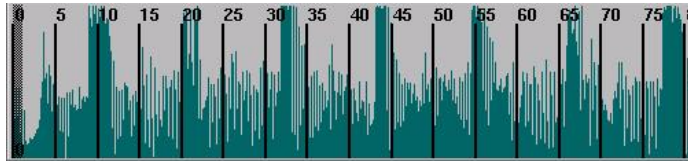
**Use Snap Tolerance** When on, the snap region is restricted to a square area around the cursor, defined by the Snap Tolerance option. When off, the snap region is unlimited; you can snap to anything viewable.

**Snap Tolerance** Controls the size of the snapping area around the cursor when Use Snap Tolerance is on. For example, if you have two curves close together and you try snapping to one of the curves, the object may snap to the wrong curve. To avoid this, try using a small Snap Tolerance value.

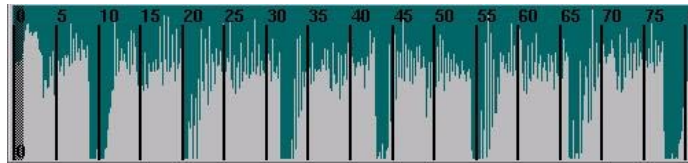
## Sound

**Waveform Display** The Waveform Display option allows you to control how much of the sound's waveform is displayed.

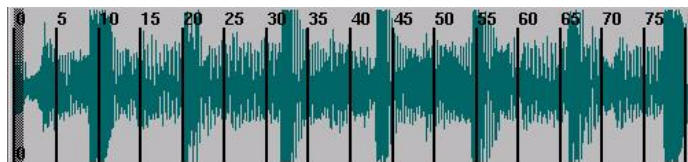
**Top** – Displays only the top half of the sound.



**Bottom** – Displays only the bottom half of the sound.



**All** – Displays the full waveform.



- |                       |  |
|-----------------------|--|
| <b>Repeat on Hold</b> | Repeats a sound at the current time. You must hold the mouse button down in the Time Slider. For more information on using sound with Maya, see <i>Using Maya: Animation</i> . |
| <b>Repeat Size</b>    | Controls how much sound (in the current time unit) is repeated when you toggle on Repeat on Hold.  |

## Timeline

- |                            |  |
|----------------------------|--|
| <b>Playback Start/End</b>  | Specifies the range of time to use as your time playback range.  |
| <b>Animation Start/End</b> | Displays the entire range of times available.  |
| <b>Height</b>              | Adjusts the height of the time slider. This helps with sound syncing (as a soundtrack can be displayed in the time slider.) Select 1x for the default size, 2x to double the size of the slider, and 4x to increase the size four times. |

Key Ticks	Keyframe ticks show the location of keys along the time slider. Select None to turn the key tick display off, Active to display only active keys, or Channel Box to display only those keys in the Channel Box.
Options	<p>Toggle the following options on or off:</p> <p><b>Timecode</b> – Changes the default display of time to video standard timecode. Enables the Timecode Offset box so you can supply timecodes to match the timing from videotape.</p> <p><b>Snapping</b> – Toggles key snapping on or off. When on, the time indicator shows integer values only.</p>
Timecode Offset	The Timecode Offset lets you specify how time 0 on the Time Slider appears when displaying in Timecode mode. For example, if the Timecode Offset is set to three hours (a value of 03:00:00:00), the Timecode Display would read 03:00:00:00 at time 0.
Update View	Specifies whether Maya plays back an animation in All modeling views or only in the active view. The default is Active.
Looping	Specifies how you want Maya to play back an animation. Select Once to play an animation once, then stop. Select Oscillate to play an animation forwards and backwards continuously. Select Continuous to play an animation continuously. This is the default setting.
Playback Speed	<p>Specifies the frame rate for playback.</p> <p><b>Free</b> – Displays all the frames of your animation. Each frame is updated completely before proceeding to the next one. Specify the exact rate in the Playback by box. This rate reflects your system's ability to draw your animation on screen and is not necessarily a real-time playback mode. This is the default setting.</p> <p><b>Normal (24 fps)</b> – Plays your animation in real-time. Some frames may be dropped (not displayed) to execute this in real-time. This depends on your system's capabilities, the complexity of your scenes, and the display mode for the playback.</p> <p><b>Half (12 fps)</b> – Plays back at exactly half the speed of real time.</p> <p><b>Twice (48 fps)</b> – Plays back at twice real-time speed.</p> <p><b>Other</b> – Enables the Other box so you can enter an exact ratio of playback rate to real-time.</p>

**Playback by** If you select Free for the Playback Speed, specify the exact rate in this box. This rate reflects your system's ability to draw you animation on screen and is not necessarily a real-time playback mode. The default setting is 1.0.

## Undo

**Undo** Select On if you want to be able to undo operations. This is the default. See "Selecting objects" on page 51.

**Queue** Select Infinite to perform an unlimited number of undo operations. This option uses a lot of memory. Select Finite to limit the number of times you can perform undo operations (specified in the Queue Size box). The default is Finite.

**Queue Size** If Finite is the selected Queue setting, specify how many times you can perform an undo operation here. The higher the number, the more memory is needed. The default is 10.

## Modules

Maya includes a number of different software modules. Each time you start Maya, the software loads all the available licensed modules.

### Disabling packages to free up RAM

Loading several modules can use a lot of RAM and thus increase the start-up time. To avoid this, you can disable one or more of the modules. You can still load a disabled module by selecting it from the main menu bar.

### Disabling modules based on tasks

You can also disable various modules based on the specific tasks you are performing. For example, if you are only rendering, you can improve system response time by disabling Dynamics.

---

#### Note

If you enable or disable a module, you must exit Maya and restart the software for the changes to take effect.

---

## OpenMaya

- Loading** Controls how plug-ins are loaded. In Lazy Binding mode, references to functions that cannot be resolved at load time will not be considered an error. In Bind Now mode, unresolved references do issue an error.
- Old Plugin Warning** Determines whether or not Maya issues a warning when you load a plug-in that was compiled against an older, and possibly incompatible, Maya release.

## CHANGING COLOR SETTINGS

You may want to make certain components stand out from a scene or object.

---

### *Tips*

Use lighter colors for active components and darker colors for inactive components.

If you have made changes to the color settings for a tool and want to restore the original settings, select Edit > Reset to Factory in the Colors window.

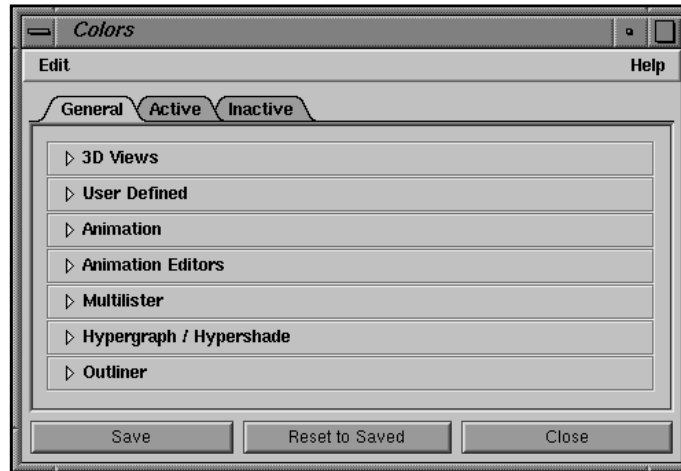
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## Changing default colors

You can change the default colors used by Maya in the Colors window

**To open the Colors window:**

Select Window > Settings/Preferences > Colors. The Colors window opens.



The Colors window has three tabs. Each tab allows you to change the default colors for a different set of components.

#### General tab

Use the General tab to change the default colors for components in these areas: 3D Views, User Defined, Animation, Animation Editors, Multilister, Hypergraph / Hypershade, and Outliner.

#### Active tab

Use the Active tab to change the default colors for components in these areas: General, Objects, Components, Deformers, Manipulators, and Animation.

#### Inactive tab

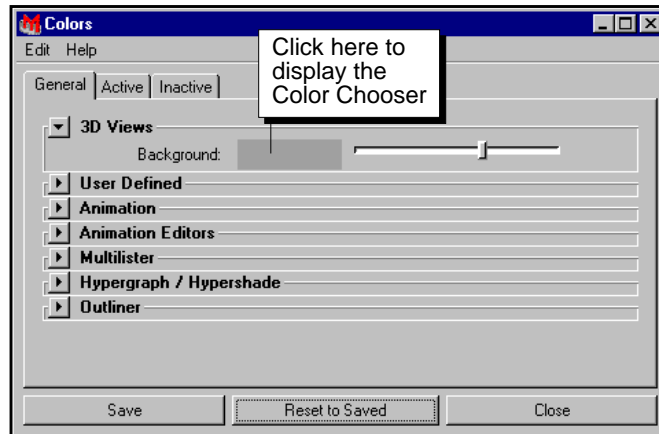
Use the Inactive tab to set the colors for objects that are not selected. The Inactive tab lets you change the default colors in the following areas or tools: General, Modeling, Objects, Components, Deformers, and Animation.

#### To change a default color:

- 1 Open the Color window (Window > Settings/Preferences > Colors) and click the appropriate tab (General, Active, or Inactive).
- 2 Expand the component type for the item you want to change.
- 3 Click on a component's color to open the Color Chooser.

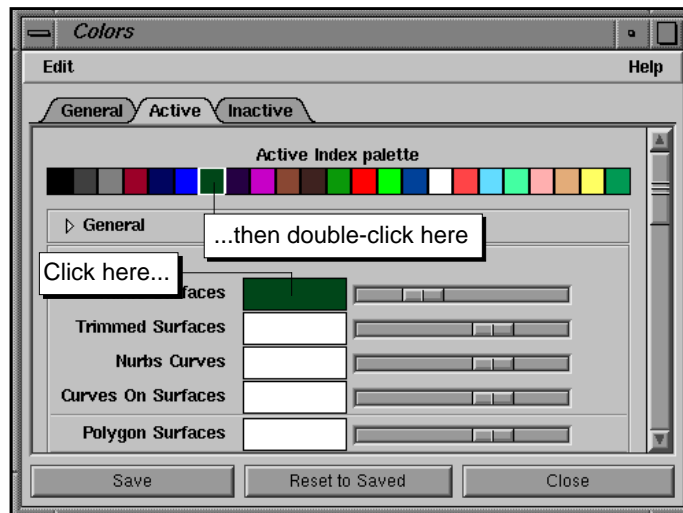
## SETTING PREFERENCES | 14

Changing color settings



or

In the Active or Inactive tab, click on a component to select it. Maya matches the existing color to one that most closely resembles it on the Index Palette. Double-click the corresponding color on the Index Palette to open the Color Chooser.



- 4 Select the color in the Color Chooser. See “Using the Color Chooser” on page 276.

---

#### Note

You can change the color value in the Colors window by dragging the slider beside the component color.

---

## SPECIFYING TOOL SETTINGS

Tool settings determine how a tool behaves. For example, if you are using the EP Curve Tool, you can specify whether the knot spacing is uniform or chord length.

### To change a tool's settings:

- 1 Do one of the following to open the Tool Settings window:  
 If the tool is represented by an icon on the Minibar, double-click on it with the left mouse button.  
*or*  
 If the tool is in a menu, select the check box (☐) located beside the tool.  
*or*  
 Select the tool and then select Window > Settings/Preferences > Tool Settings.
- 2 Make the desired changes and click Close.

### To return to a tool's default settings:

In the Tool Settings window, click Reset Tool.

## Duplicating a tool

Using shelves, you can have two tools with the same name but different tool settings. For example, you can have two versions of the Particle Tool.

---

*Tips*

You cannot change the name of the tool using the Tool Settings window. If you want to change the name of the tool, see “Changing icon labels” on page 504.

To remove an icon from a shelf, drag it to the garbage can.

---

*To duplicate a tool:*

- 1 Select the shelf that will contain the new version of the tool.
- 2 Select the tool that you want to duplicate.
- 3 Using the middle mouse button, drag the tool icon from the Minibar to the shelf.
- 4 Select the new version of the tool on the shelf and open the Tool Settings window (Window > Settings/Preferences > Tool Settings).
- 5 Change the tool settings.

To test whether Maya saved the settings for each tool, select the original tool and check the settings in the Tool Settings window. Leave the Tool Settings window open and select the new tool on the shelf and check the settings.

- 6 Click Close.

---

*Note*

When you drag a tool from the Minibar to the Shelf, a copy of the tool is made. If you use Ctrl-Shift to place a menu item that selects a tool on the shelf, Maya does not place a copy of a tool on the Shelf. Instead, only the action that invokes the original tool is placed on the Shelf. For more information on adding tools and actions to a shelf, see “Creating and editing shelves” on page 493.

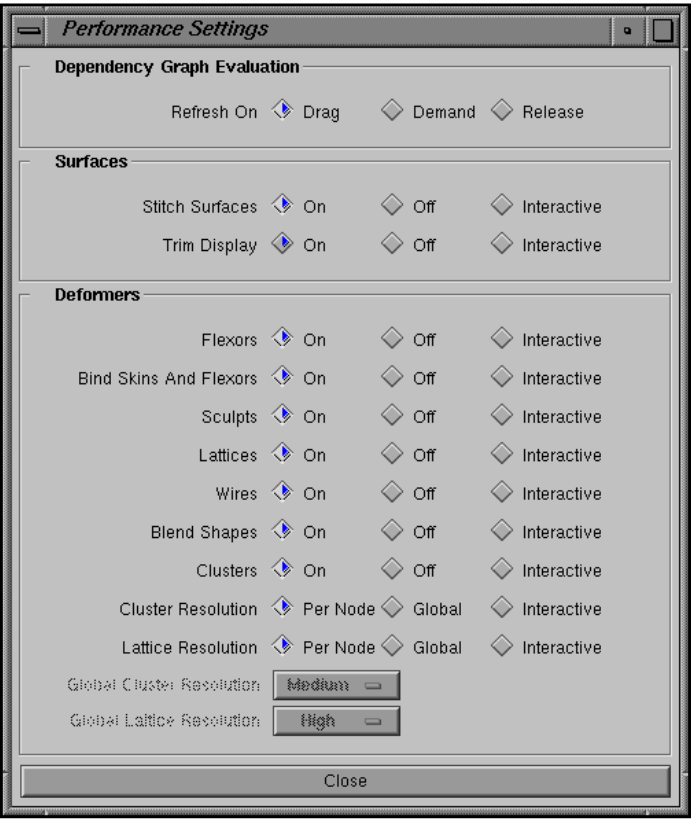
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# SPECIFYING PERFORMANCE SETTINGS

You use the Performance Settings window to set when you want to refresh the screen when manipulating objects and to control complex operations, such as stitching and deformation. You can use the performance settings to suspend these complex operations during mouse interaction or to completely disable them. This improves performance by reducing the amount of evaluation necessary during interaction and playback.

To specify performance settings:

Select Window > Settings/Preferences > Performance Settings. The Performance Settings window opens.



**Selecting screen refresh options**

To set when to refresh (or redraw the screen) when manipulating objects, in the Dependency Graph Evaluation section, select one of the following:

Drag	Refreshes the display during the drag.
Demand	Refreshes the display only when you release the mouse button and click the Refresh button that appears in the bottom right of the display window.
Release	Refreshes the display only when you release the mouse button.

**Controlling complex operations on surfaces**

To control complex operations on surfaces during mouse interaction, in the Surfaces section, select one of the following beside the surface:

On	Performs complex operations during mouse interactions.
Off	Completely disables complex operations during mouse interaction.
Interactive	Suspends complex operations during mouse interaction.

**Controlling complex operations on deformers**

To control complex operations on deformers during mouse interaction, in the Deformers section, select one of the following beside the surface:

On	Performs complex operations during mouse interactions.
Off	Completely disables complex operations during mouse interaction.
Interactive	Suspends complex operations during mouse interaction.
Per Node	For Cluster Resolution and Lattice Resolution only, improves redraw performance for individual cluster or lattice deformations by setting the Use Partial Resolution attribute to partial and setting the Percent Resolution on a per node basis. For details, see <i>Using Maya: Character Setup</i> .
Global	For Cluster Resolution and Lattice Resolution only, improves the redraw performance of <i>all</i> cluster or lattice deformations. (You do not need to set the Percent Resolution for each cluster or lattice.)  Set Global Cluster Resolution and Global Lattice Resolution to Full, High, Medium, or Low. A Low setting corresponds to a low percentage, and therefore more improved performance.

For more information on surfaces, see *Using Maya: NURBS Modeling* and *Using Maya: Polygonal Modeling*. For more information on deformers, see *Using Maya: Character Setup*.

## LOADING AND UNLOADING PLUG-INS

A plug-in is an add-on module that extends Maya's capabilities. File translators are plug-ins you use to import and export various file formats. You can create or purchase specialty plug-ins to customize Maya for a specific job.

Some features that can be added through plug-ins are:

- file translators
- tools
- objects (nodes)
- MEL commands
- device drivers

The Plug-in Manager identifies which plug-ins are loaded into Maya. If you have a plug-in that you use frequently, you can make sure it is always there. The Plug-in Manager automatically scans all the directories in the plug-in path and lists available plug-in features.

### Loading plug-ins

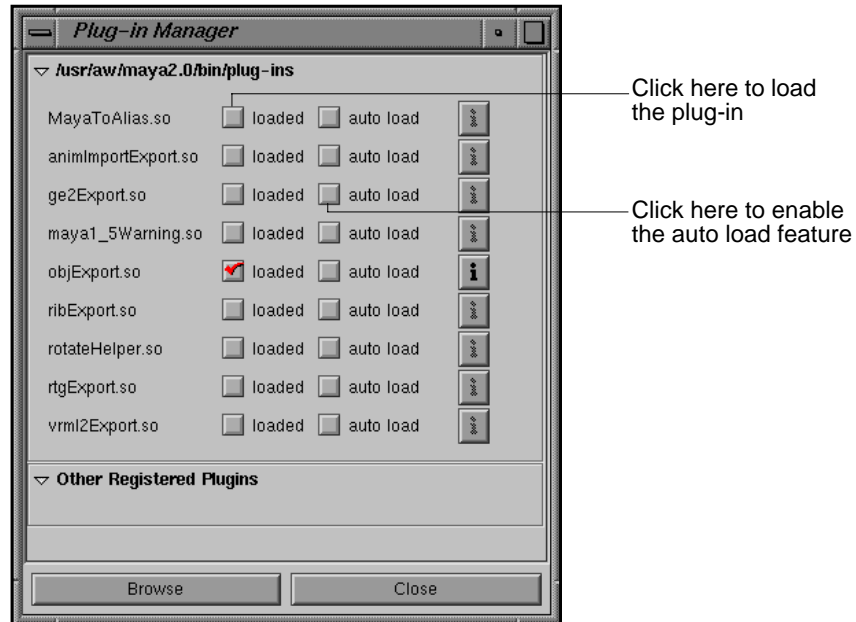
You can manually load plug-ins each time you run Maya, or you can have them load automatically when you start Maya.

#### To load a plug-in:

Select Window > Settings/Preferences > Plug-in Manager. The Plug-In Manager window opens.

## SETTING PREFERENCES | 14

### Loading and unloading plug-ins



### Selecting loading options

Toggle the appropriate option beside the plug-in.

loaded

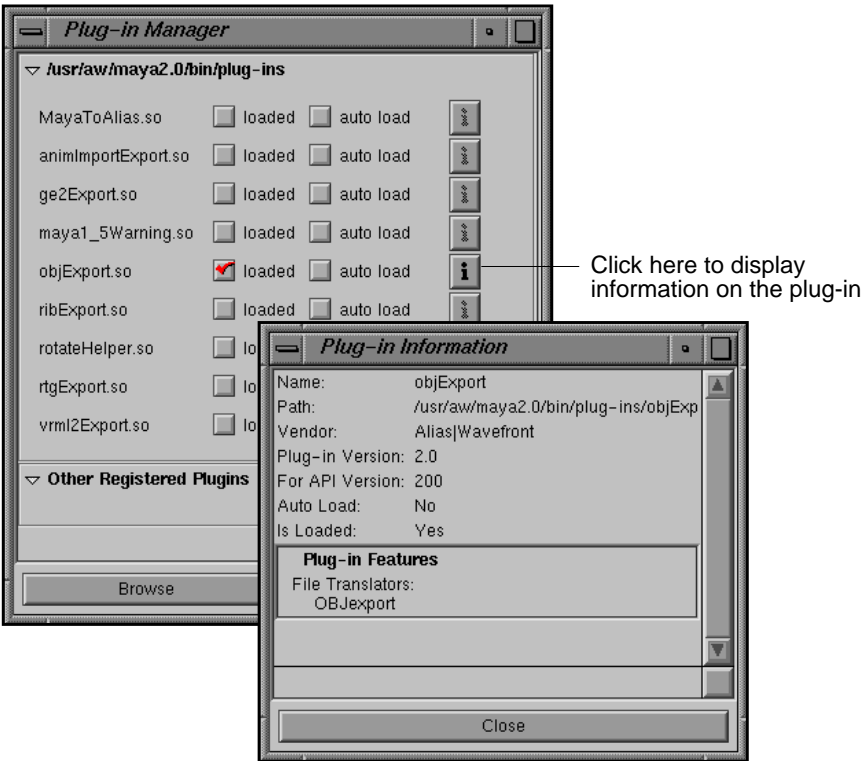
Toggle on loaded to load the plug-in for the current Maya session.

auto load

Toggle on auto load to load the plug-in so that the next time you start Maya the plug-in loads automatically.

### Displaying plug-in information

To view information about a particular plug-in, you must first load it, then click the **i** button beside the plug-in.



Maya displays the following information for a selected plug-in:

Name	The name of the plug-in. On IRIX, plug-ins have the extension <i>.so</i> . On NT, they have the extension <i>.dll</i> .
Path	The location of the file. On IRIX, the default plug-in location is <i>/usr/aw/maya3.0/bin/plug-ins</i> . On NT, the default plug-in location is <i>drive:\aw\maya3.0\bin\plug-ins</i> .
Vendor	The manufacturer of the plug-in.
Plug-in Version	The version number of the plug-in.
For API Version	The version of the Maya API (Application Programmer Interface) the plug-in was compiled for.

---

*Note*

You cannot load a plug-in for any version of Maya that predates the version it was compiled for.

---

Auto Load	Indicates whether the plug-in has been marked for auto load.
Is Loaded	Indicates whether the plug-in is loaded.
Plug-in Features	Displays a list of the features added by the plug-in (for example, commands, dependency nodes, file translators).  To display additional plug-ins, click the triangle to open the Other Registered Plug-ins section.

### Unloading a plug-in

You can unload a plug-in when you finish with it. To unload a plug-in, toggle off the loaded box next to it.

If you are developing a plug-in, unload it so the source code can be changed, the plug-in recompiled, and then reloaded.

### Removing references to the plug-in

Before you can unload a plug-in, you must first remove all references to it from the Maya scene. Otherwise, Maya converts the plug-in nodes to unknown nodes. For example, if you load a shader plug-in and then unload that same shader plug-in without first removing the special shader node and all of its references in the scene, Maya will display an error message the next time you open that scene.

If you try to unload a plug-in while it is in use, a warning message will display. You can then cancel the unload or force it.

If you force the unload of a plug-in while it is in use, you cannot reload that plug-in's node. Maya converts the existing nodes to unknown nodes. When you reload plug-ins, you cannot change the type of these existing unknown nodes.

# 15 CUSTOMIZING SHELVES, MARKING MENUS, AND HOTKEYS

This chapter provides detailed information about Maya's shelves, marking menus, and hotkeys. This information is for advanced users.

Shelves are user-customizable areas to hold the actions and tools you use most often. Marking menus are an innovative way of selecting various menu items with the right mouse button. Hotkeys are keyboard shortcuts for commands.

This chapter describes the following topics:

- “Creating and editing shelves” on page 493
- “Creating and editing marking menus” on page 509
- “Assigning hotkeys” on page 526

## CREATING AND EDITING SHELVES

You use shelves to put all the tools or action icons you use in one place. You can drag tools, options, and actions onto a shelf from the Minibar, a menu, or the Script Editor.

From the Maya main window, you can perform the following tasks:

- add shelf items (see “Adding shelf items” on page 498)
- remove shelf items (see “Removing shelf items” on page 499)
- move and copy shelf items (see “Moving and copying shelf items” on page 500)

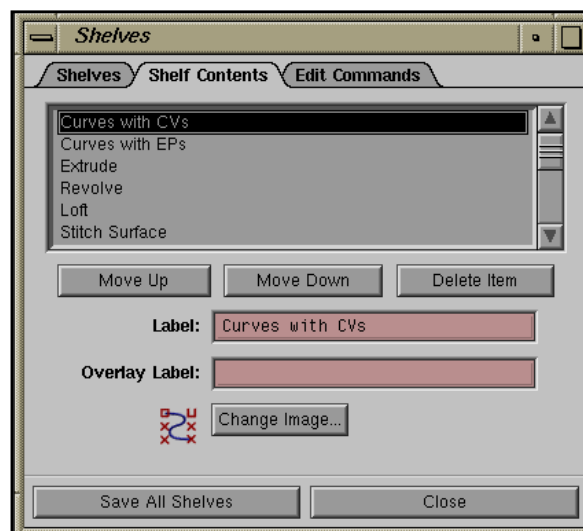
## Creating and editing shelves

You can use the Shelves window to:

- create and delete shelves (see “Creating and deleting shelves” on page 495 and “Reordering the shelves” on page 501)
- change shelf icons (see “Changing shelf icons” on page 502)
- change icon labels (see “Changing icon labels” on page 504)
- add overlay labels (see “Setting Shelf label options” on page 506)
- change MEL commands associated with an icon (see “Changing MEL command(s) associated with an icon” on page 507)

To open the Shelves window:

Select Window > Settings/Preferences > Shelves.



## Shelves

Click the Shelves tab to display existing shelves. From here you can create and delete shelves and change their order. For details, see “Creating and deleting shelves” on page 495 and “Reordering the shelves” on page 501.

## Shelf Contents

Click the Shelf Contents tab to display the contents of a specific shelf. From here you can move and delete shelf items, change an item’s label and change its icon. For details, see “Changing shelf icons” on page 502, “Changing icon labels” on page 504, “Setting Shelf label options” on page 506, “Changing shelf icons” on page 502.

Edit Commands	Click the Edit Commands tab to view and edit the MEL code associated with a tool or action. For details, see “Changing MEL command(s) associated with an icon” on page 507.
Label	Specify a brief description of the tool. This description appears with the icon in the icon or text modes. For details, see “Changing icon labels” on page 504. (Where it appears is determined by Options menu settings. For details, see “Setting Shelf label options” on page 506).
Overlay Label	Type a label for the icon. This text appears on top of the icon to distinguish it from other items that use the same icon. For details, see “Setting Shelf label options” on page 506.
Save All Shelves	Click Save All Shelves to save all changes immediately and write the information to the user shelves directory. The file name for a shelf file has the prefix <i>shelf_</i> .
Close	Click Close to accept your changes but not write them to the disk immediately. If your UI preference is to save shelf changes only when explicitly requested, the changes will stay in effect only for the current session. Otherwise your changes will be saved the next time you save a file or quit the application. For information on changing this preference, see “Setting Shelf label options” on page 506.

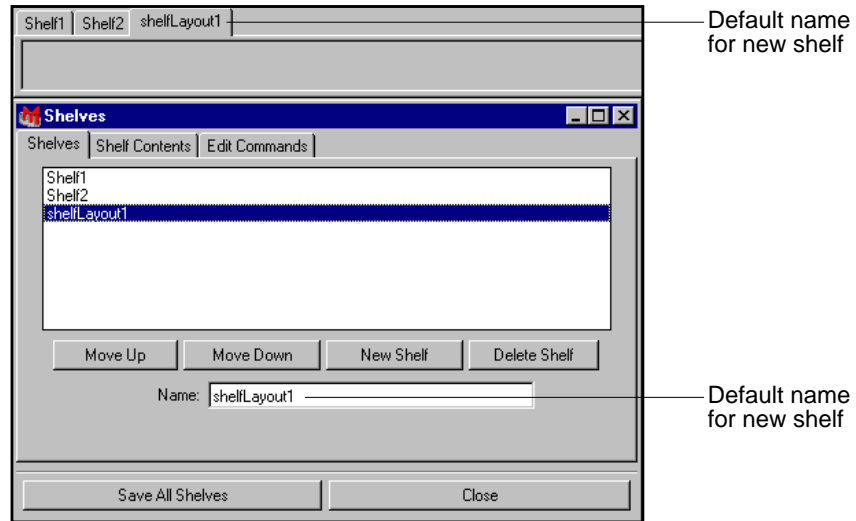
## Creating and deleting shelves

In addition to using the default shelves, you can create custom shelves. Use custom shelves to group common or frequently used tools, menu commands, or MEL commands for easy access.

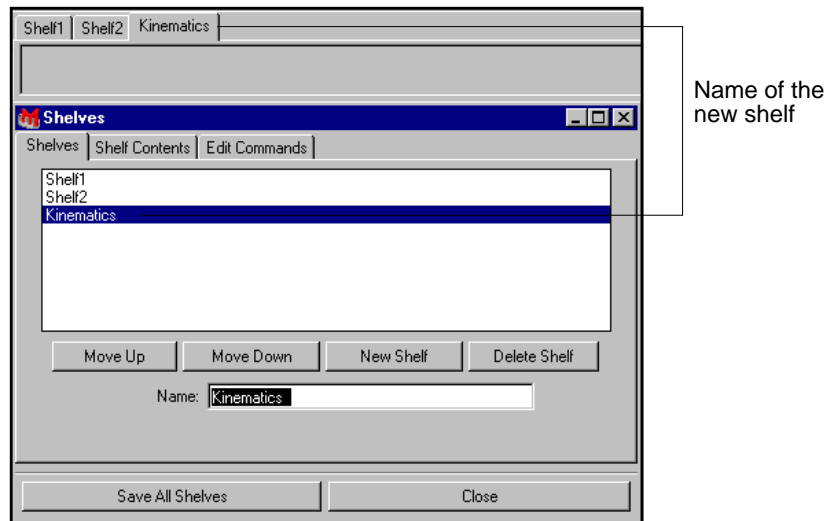
### To create a shelf:

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab. Maya displays the names of all existing shelves.
- 2 Click New Shelf. Maya displays a default name for the new shelf in the Name box and adds a new shelf tab in the main Maya window.

## Creating and editing shelves



- 3 Double-click in the Name box or press the Tab key to select the text in the Name box.
- 4 Type the new shelf name (for example, *Kinematics*), then press Enter. Maya adds the name of the new shelf to the Shelves window and the Maya window.



- 5 Click Save All Shelves or Close.

#### To delete a shelf:

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab. Maya displays all existing shelves.
- 2 Select the shelf you want to delete, then click the Delete Shelf button. (You do not have to delete any of the associated icons before deleting the shelf.)  
You are prompted to confirm the deletion.
- 3 Click OK. Maya removes the shelf from the list of existing shelves and from the Maya window.

**Note**

You cannot undo a delete command. However, Maya retains the shelf information in the file `shelf_NAME.mel.deleted` in the user shelves directory:

`~username/maya/3.0/prefs/shelves (IRIX)`

`drive:\WINNT\Profiles\username\maya\3.0\prefs\shelves (NT)`

`drive:\Documents and Settings\username\maya\3.0\shelves (2000)`

So if you want to restore a deleted shelf, rename the file to `shelf_NAME.mel`, then restart Maya.

## Adding shelf items

You can add menu commands, MEL commands, and tools to shelves from the Minibar, a menu, or the Script Editor.

You can also save multiple versions of the same tool to the shelf with different settings. For example, add a Sculpt Surfaces Tool with the Push option selected and another Sculpt Surfaces Tool with the Pull operation selected.

### To add a tool from the Minibar:

Using the middle mouse button, drag the tool to the shelf.



This creates an editable tool on the shelf. If you select this tool from the shelf and change any settings in the Tool Settings window, the settings for the shelf item also change. These new settings become the default for the shelf tool.

**To add a menu item to a shelf:**

Press Ctrl-Shift-Alt (IRIX), Ctrl-Shift (NT), then select the item from the appropriate menu. Maya places the item on the shelf. This adds the base tool to the shelf. Any changes you make to the tool settings will be reflected in the shelf tool also.

**To add a MEL command to a shelf from the Script Editor:**

- 1 In the Script Editor (Windows > General Editors > Script Editor), highlight the MEL command text that you want to add to a shelf.
- 2 Using the middle mouse button, drag the selected text to the shelf and release. This places a MEL icon on the shelf. When you click the icon, Maya runs the command(s).

**For example:**

- 1 Open the Script Editor window (Windows > General Editors > Script Editor).
- 2 In the Modeling menu set, select Create > NURBS Primitives > Sphere. A sphere appears at the origin.
- 3 Select the Move tool and drag a manipulator arrow to move the sphere.  
The MEL command `move -r 5.315 0 0;` (with your own coordinates), appears in the upper pane of the Script Editor.
- 4 Highlight the MEL command text in the upper pane of the Script Editor.
- 5 Using the middle mouse button, drag the selected text to the shelf and release. This places a MEL icon on the shelf. When clicked, the icon executes the `move -r 5.315 0 0;` command again.

## Removing shelf items

There are two ways you can delete a shelf item. You can use the middle mouse button to drag items to the garbage can directly on the shelf or you can use the Shelves window.

**To remove a shelf item directly from a shelf.**

Use the middle mouse button to drag the icon to the garbage can.



Maya removes the tool or action icon from the shelf tab.

**To remove a shelf item using the Shelves window:**

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves).
- 2 Click the Shelves tab, then select the shelf containing the tool or action you want to delete. The selected shelf becomes active in the main Maya window.
- 3 Click the Shelf Contents tab.
- 4 Select the description of the icon you want to delete, then click Delete Item. Maya removes the icon from the shelf.
- 5 Click Save All Shelves or Close.

## Moving and copying shelf items

You can move shelf items to change the order they appear and you can move shelf items between shelf tabs.

You can also copy shelf items. For example, you can add the same tool to a shelf more than once, but with different settings. The original tool must have been added to the shelf from the Minibar (see “To add a tool from the Minibar:” on page 498).

**To change the order of shelf items:**

- On the shelf, use the middle mouse button to drag the icon to the desired position.
- or*
- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelf Contents tab.
  - 2 Select the item you want to move and click the Move Up or Move Down button until the item appears where you want it to appear.
  - 3 Click Save All Shelves or Close.

#### To move an item between shelf tabs.

- 1 Use the middle mouse button to drag the icon onto the other shelf tab. The icon is removed from the current shelf.
- 2 Click the shelf tab on which you dropped the icon. The icon is visible on the new shelf.

#### To copy an existing item on the shelf.

Press the Ctrl key and use the middle mouse button to drag the icon to its new position. A copy of the icon appears on the shelf.

## Renaming shelves

You can change the name of a shelf at any time to something more meaningful (for example from ShelfLayout1 to Dynamics).

#### To rename a shelf:

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab.
- 2 Select the shelf you want to rename. Maya displays the name of the selected shelf in the Name box.
- 3 In the Name box, double-click on the name of the shelf.
- 4 Change the name, then press Enter. Maya displays the new name in the list of existing shelves and in the Maya window.

You cannot use spaces or special characters (for example, !, @, #, \$, %) in shelf names.

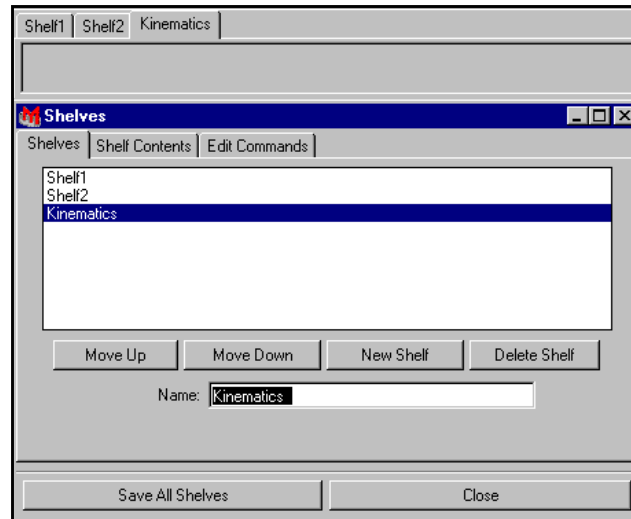
- 5 Click Save All Shelves or Close.

## Reordering the shelves

You can reorder the shelves that you use frequently. This is especially helpful if you have more shelves than Maya can display at once.

#### To reorder the shelves:

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab. Maya displays all available shelves in the order they appear in the Maya window.



- 2 Select the shelf you want to move, then click the Move Up or Move Down button until the selected shelf appears where you want it to appear.
- 3 Click Save All Shelves or Close.

## Changing shelf icons

On IRIX, Maya uses xpm (IRIX) images for the shelf button icons. Maya NT uses bitmap (bmp) images and xpm images. You can assign a new image to a shelf button to more accurately reflect the button's function. If you want to use an icon design other than a Maya default images, you must create your own image file. You cannot modify Maya's default shelf button icons.

### To create a new icon image

Use any available 2D image program to create new image files. The image file size must be 32 x 32 pixels to fit within the shelf button. Typically, you place the image in your user icons directory:

`~username/maya/3.0/prefs/icons` (IRIX)

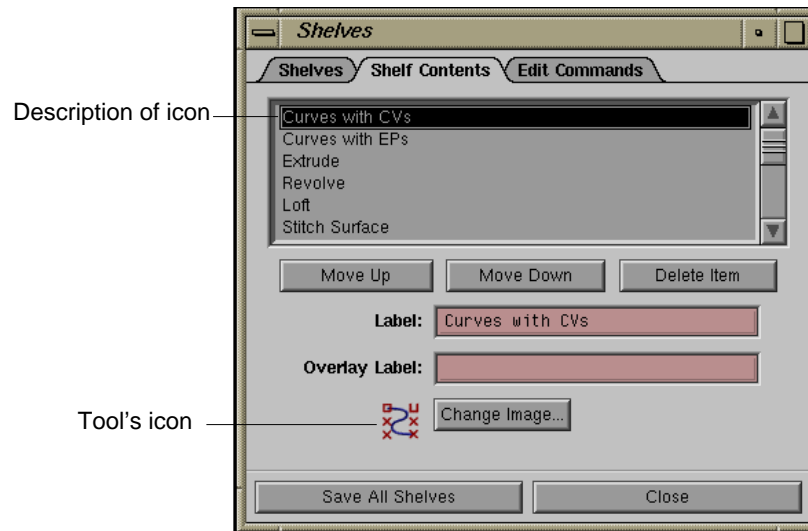
`drive:\WINNT\Profiles\username\maya\3.0\prefs\icons` (NT)

`drive:\Documents and Settings\username\maya\3.0\prefs\icons` (2000)

If you use a different directory, you should specify it in the `XBMLANGPATH` environment variable. See Chapter 8, “Setting Environment Variables.”

#### To change an icon's image:

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab.
- 2 Select the shelf containing the tool you want to change.
- 3 Click the Shelf Contents tab.



- 4 Select the description of the shelf item you want to change, then click the Change Image button. A file browser window opens with the images directory selected.

On IRIX, the browser is called the Pixmap Selector. The browser defaults to `/usr/aw/maya3.0/icons`, the location of Maya's default icons.

On NT, the default icons are stored in `drive:\AW\Maya3.0\extras\icons`.

- 5 Select a Maya default image or navigate to a new user-created image (it must have the file extension `.xpm` or `.bmp`).

---

*Note*

Maya stores the image as a reference file. If you move it, you must specify the new location by using the Shelves editor or by setting the `XBMLANGPATH` variable.

---

- 6 On IRIX, click Apply to see your change in the main Maya window without closing the Pixmap Selector. Click Done to apply your change and close the Pixmap Selector.  
On NT, click Open.
- 7 Click Save All Shelves or Close.

---

*Note*

On IRIX, you can modify existing images and create new ones from the Pixmap Selector.

To modify an existing image (but not a Maya default shelf button icon), select it and click the Modify button to launch the xpaint application. Make your changes and save them.

To create a new image, click the New button, type a name for the new file, then click OK to create a blank image in the icons directory. Select the new image and modify it.

---

## Changing icon labels

You can change the label of a tool or action icon if you:

- Want to make it more indicative of the function it performs.
- Have changed the options and want to change the name to reflect changes.

For example, if you modify a copy of the sphere action so that it now creates a hemisphere, you can change both the label and icon to reflect this change.

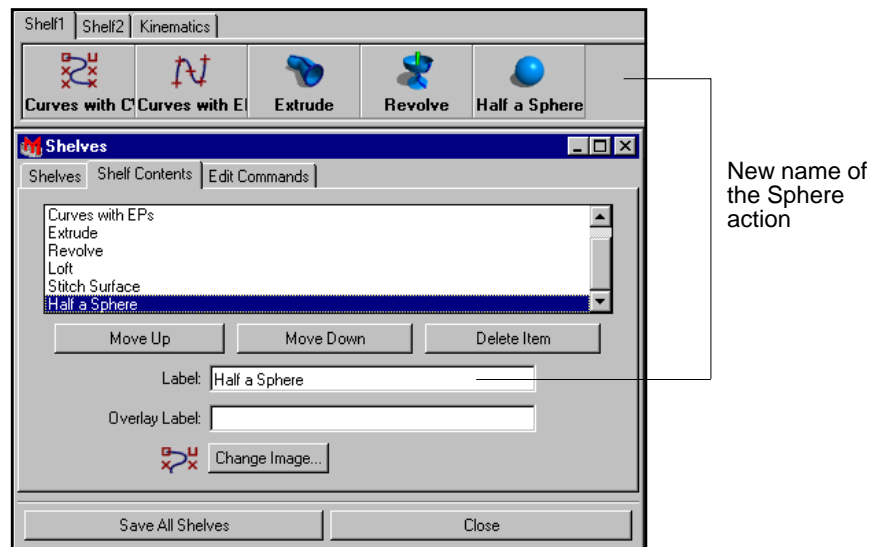
*Note*

Before you start, select Window > UI Preferences and click the Shelf tab. Click Icon/Text Below. This displays descriptive text below the icon.

**To change an icon's label:**

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab
- 2 Select the shelf that contains the icon you want to rename. The selected shelf becomes active in the main Maya window.
- 3 Click the Shelf Contents tab, then click the name of the icon you want to relabel.
- 4 Enter the new name of the icon in the Label box, then press Enter.

Maya changes the tool name in the Shelves window and on the shelf in the main Maya window.



**Note**

To change the overlay label of the tool, see “Setting Shelf label options” on page 506.

**5 Click Save All Shelves.**

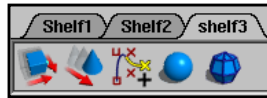
When you move the cursor over the renamed icon, Maya displays the new name on the Help Line and in the popup help.

**Setting Shelf label options**

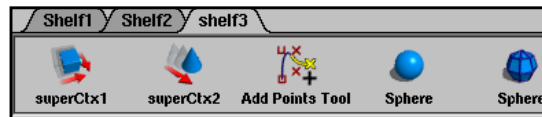
Use the Options menu in the Shelves window to specify the appearance of the Shelf labels options.

**Icon Only**

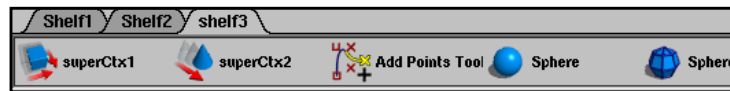
Displays only the icon.

**Icon/Text Below**

Displays descriptive text below the icon.

**Icon/Text Beside**

Displays descriptive text beside the icon.



## Adding overlay labels

Maya uses families of icons to represent related tools and actions.

You can create an overlay label to distinguish individual icons. For example, if you have several MEL command icons on your shelf, they all look the same because they all use the same default icon. You can use overlay labels to distinguish between these MEL buttons as shown in this illustration.



Overlay label on a  
MEL command icon

You use the Shelves window to assign an overlay label to a tool or action.

### To assign an overlay label to an icon:

- 1 Select Option > Settings/Preferences > Shelves and click the Shelves tab.
- 2 Select the shelf containing the tool you want to rename. The selected shelf becomes active in the main Maya window.
- 3 Click the Shelf Contents tab, then select a tool or action.
- 4 Enter the label in the Overlay Label box, then press Enter. Maya adds an overlay label in the shelf.
- 5 Click Save All Shelves.

## Changing MEL command(s) associated with an icon

All actions on the shelf consist of a single or series of MEL commands. You can change these commands to change the behavior of the action.

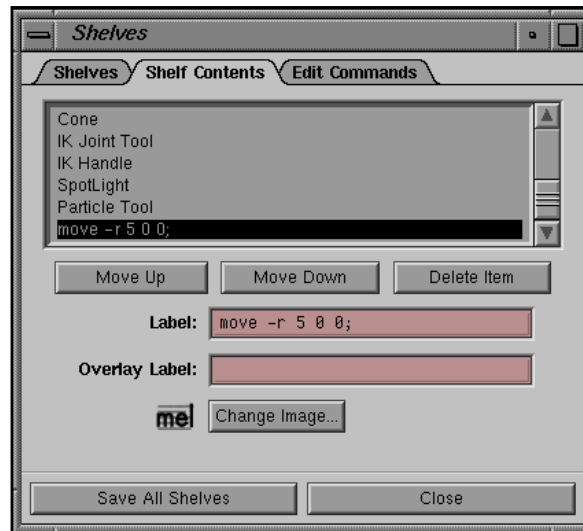
In the following example, we modify the MEL code for a move command to change the action's behavior.

### To modify an action's MEL code:

- 1 Open the Shelves window (Window > Settings/Preferences > Shelves) and click the Shelves tab.

## Creating and editing shelves

- 2 Select the shelf containing the item you want to edit. The selected shelf becomes active in the main Maya window.
- 3 Click the Shelf Contents tab and select the item you want to edit.



- 4 Click the Edit Commands tab. The commands for the shelf item appear in the text area.



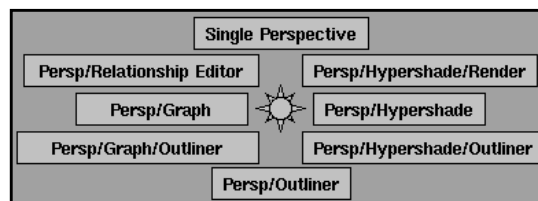
- 5 Make any necessary changes to the commands.
- 6 Press Enter on the keyboard. When you click the icon for this action, the new commands will run.
- 7 Click Save All Shelves or Close.

## CREATING AND EDITING MARKING MENUS

Marking menus let you quickly access various tools and actions. You can customize a marking menu's format and content.

A marking menu has a radial portion and an overflow portion.

The radial portion consists of one to eight menu items arranged in a circle.



Each menu item represents a command you have added to that marking menu. You can use the Marking Menus window to add, change, or delete a menu item or command. For more information on using the Marking Menus window, see “Modifying existing marking menus” on page 516.

The overflow portion (or linear portion) has one or more menu items. The overflow items are arranged in a column below the radial items.

Marking menus can be hierarchical. In other words, any menu item can have a submenu.

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#### Note

Each menu and submenu can contain a maximum of 38 menu items.

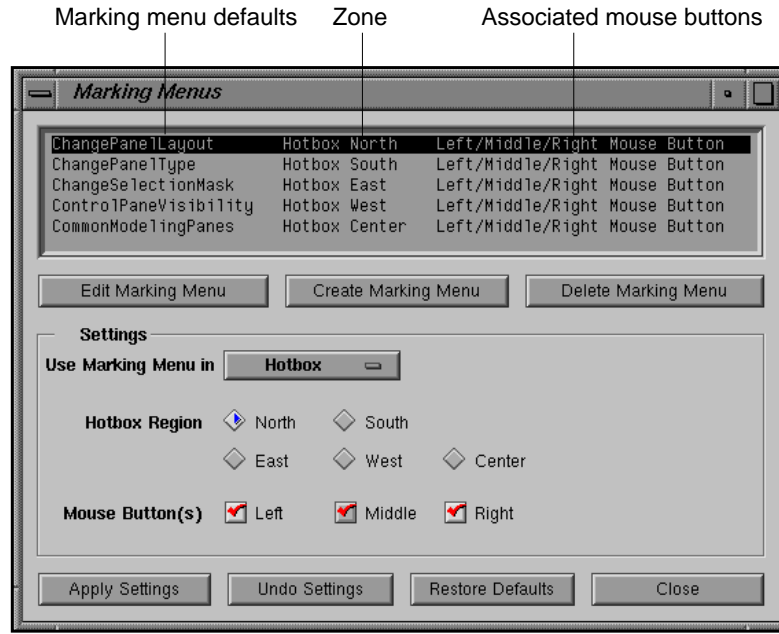
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You can use the Marking Menus window to:

- create marking menus (see “Creating marking menus” on page 511)
- attach a marking menu to a hotkey (see “Assigning marking menus to hotkeys” on page 515)
- modify existing marking menus (see “Modifying existing marking menus” on page 516)
- add submenus to marking menu items (see “Adding submenus to menu items” on page 520)
- add MEL scripts to marking menus (see “Associating a MEL script with a menu item” on page 522)
- delete marking menus (see “Deleting marking menus” on page 523)

**To display the Marking Menus window:**

Select Window > Settings/Preferences > Marking Menus.



## Creating marking menus

You can modify the default marking menus or use the Marking Menus window to create new marking menus.

You can add the following items to marking menus:

- text from the Script Editor
- tool icons and action icons from a shelf
- the Select, Translate, Rotate, Scale, and Show Manipulator icons in the Minibar

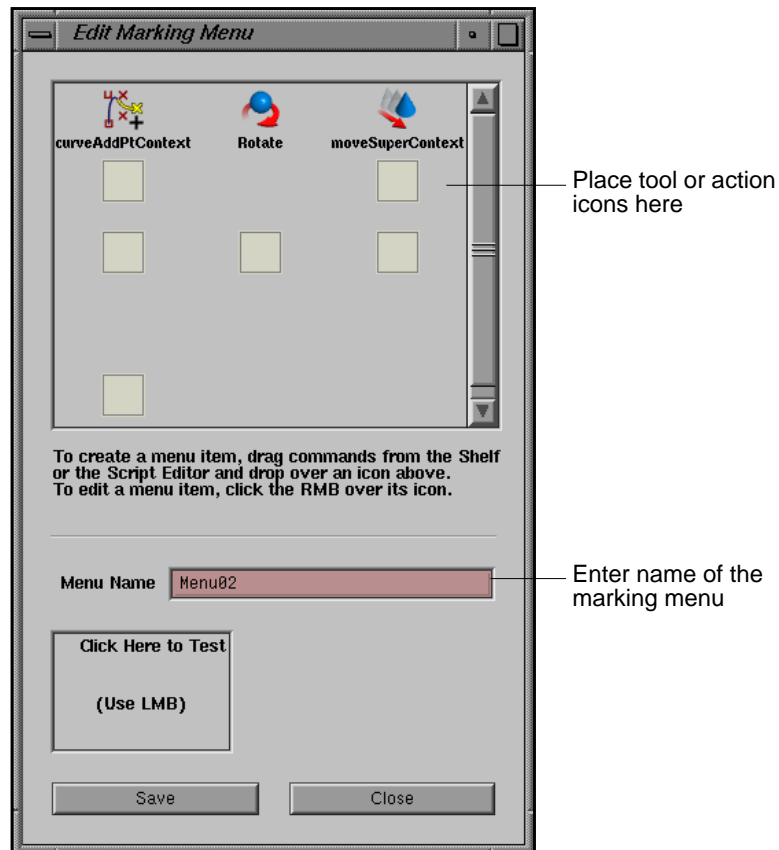
You can associate your marking menu with a zone or mouse button in the Hotbox, or a specific hotkey to the marking menu.

The Hotbox can support a different menu for each mouse button in each of the Hotbox's five zones. You can create three menus per zone, for a total of 15 marking menus (3 menus x 5 zones) with eight commands per marking menu. This gives you approximately 120 total commands (3 menus x 5 zones x 8 commands).

## Creating and editing marking menus

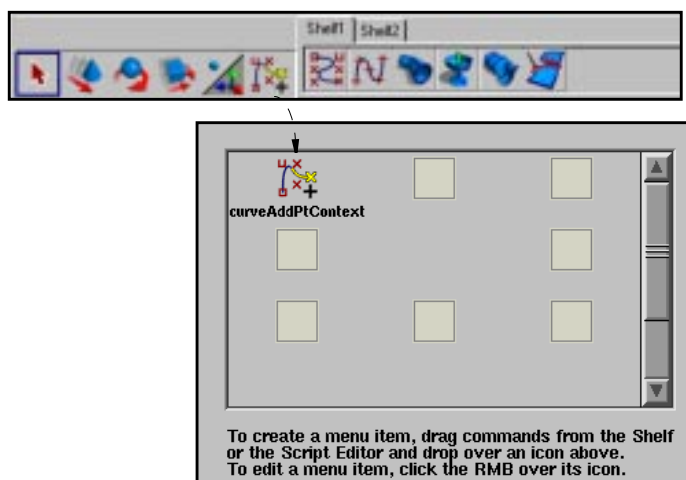
**To create a marking menu:**

- 1 Select Window > Settings/Preferences > Marking Menus. The Marking Menus window opens.
- 2 Click Create Marking Menu. The Create Marking Menu window opens.



- 3 Use the middle mouse button to drag tools or actions to the Create Marking Menu window.

For example, to add the Add Points tool, select (from the Modeling menu set) Edit Curves > Add Points Tool. The tool displays in the minibar. Using the middle mouse button, drag the Add Points tool from the minibar to the Create Marking Menu window.




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### Note

You can also add MEL commands to the Marking Menus window. For details, see “Associating a MEL script with a menu item” on page 522.

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- 4 Repeat step 3 for any additional tools.

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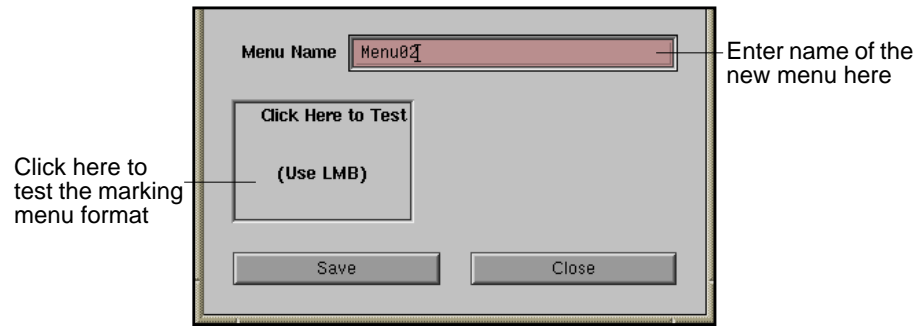
### Tips

To delete an icon, place the pointer on the icon, press the right mouse button, and select Delete Menu Item.

To create a submenu, see “Adding submenus to menu items” on page 520. This is useful if you want to increase the number of menu items you can access from a marking menu.

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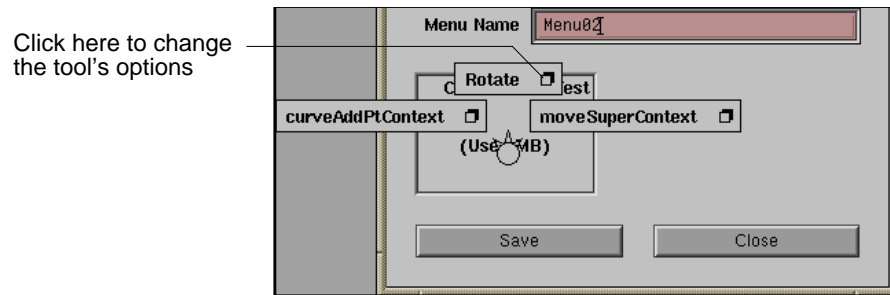
- 5 Enter the name of the new menu in the Menu Name box.



- 6 To move a tool's position, use the middle mouse button to drag the icon to a new position within the Create Marking Menu window.

*Tip*

If a tool has an option box, you can make changes to the options.



- 7 When you are satisfied with the position of every tool in the marking menu, click Save and close the Create Marking Menu window.
- 8 Set the following options and click Apply Settings, then Close.

Use Marking Menu in

Specify whether the marking menu is linked to the Hotbox or a hotkey. For information on linking a marking menu to a hotkey, see “Assigning marking menus to hotkeys” on page 515.

Hotbox region

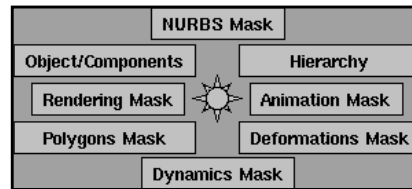
If you selected Hotbox for Use Marking Menu in, select the Hotbox zone the marking menu occupies: North, South, East, West, or Center.

Mouse button(s)

Select the left, middle, or right mouse button used to display the marking menu. You can select one, two, or three mouse buttons.

## Assigning marking menus to hotkeys

In addition to adding or customizing marking menus in the Hotbox, you can assign a marking menu to a specific hotkey. Each time you press the hotkey and the left mouse button, the associated marking menu appears. For example, the q key is associated with the Select marking menu.



*Note*

A marking menu/hotkey combination will not work in a tear-off window.

You display marking menus by pressing the left mouse button and the appropriate hotkey. The following hotkeys bring up marking menus.

Hotkey	Action on Marking Menu
a	Select All History, Disable All Future, Select All Future, and Enable All Future
d	High, Medium, and Low Quality Display
e	Rotate X, Y, and Z

Hotkey	Action on Marking Menu
h	Modeling, Animation, Dynamics, Rendering
q	Select Mask (see previous illustration)
r	Scale X, Y, Z and Scale XYZ
w	Translate X, Y, Z and Translate XYZ

For more information on setting hotkeys, see “Assigning hotkeys” on page 526.

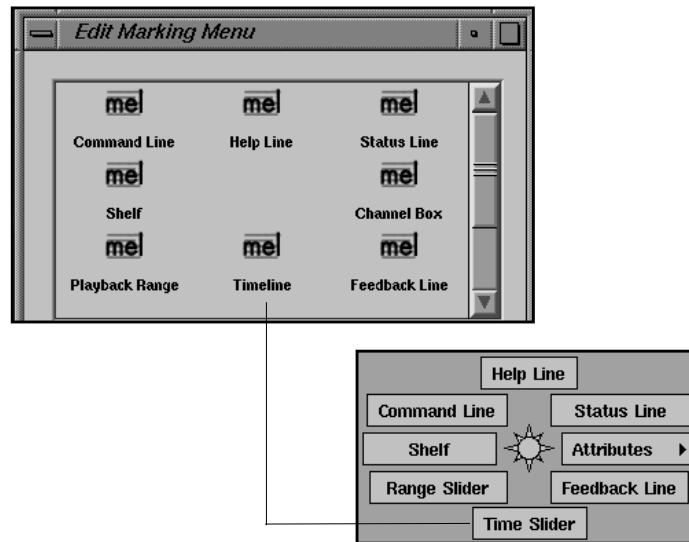
## Modifying existing marking menus

Use the Edit Marking Menu button in the Marking Menus window to modify existing marking menus. You can add, edit, or delete individual menu items in a marking menu.

You can also add submenus to add more tools and actions to a marking menu. For details, see “Adding submenus to menu items” on page 520.

Each icon in the Edit Marking Menu window corresponds to a menu item in a marking menu.

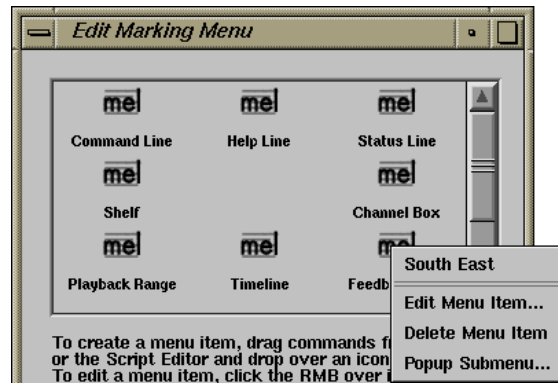
For information on adding menu items to an existing marking menu, see “Creating marking menus” on page 511.



#### To delete a menu item:

- 1 Open the Marking Menus window (Window > Settings/Preferences > Marking Menus).
- 2 Select an existing marking menu.
- 3 Click Edit Marking Menu. The Edit Marking Menu appears with each icon corresponding to a menu item.
- 4 Right-click on the menu icon you want to delete and select Delete Menu Item from the pop-up menu.

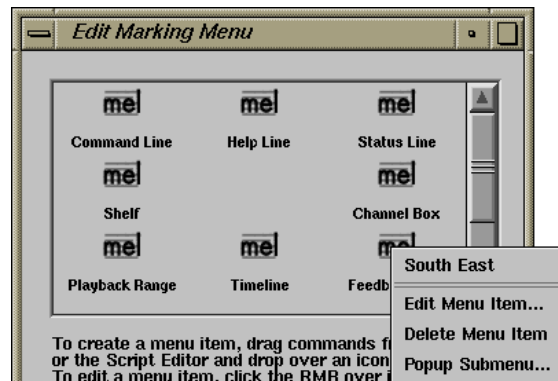
## Creating and editing marking menus



- 5 Select Save or Close.

### To edit a menu item:

- 1 Open the Edit Marking Menu window.
- 2 Right click on the menu icon you want to edit and select Edit Menu Item from the pop-up menu.



The Edit window appears according to the position of the icon (for example, Edit North, Edit North East, Edit East, Edit South East, Edit South, etc.).



- 3 Set the following options, Click Save and Close or Close, then close the Edit Marking Menu window.

Label	Enter the name of the marking menu item.
Icon Filename	Enter the name of the icon file. For more information, see <i>Using Maya: MEL</i> .
Command(s)	Enter the MEL script used as the command for the menu item. You can drag the MEL script from the Script Editor's bottom panel with the middle mouse button.
Check Box	Displays a check box beside the marking menu item.
Radio Button	Displays a toggle box beside the marking menu item.
Neither	Displays nothing beside the marking menu item.
Option Box	Toggle Option Box on to display the option box <input type="checkbox"/> beside the menu item so you can change a tool's options from the marking menu. For more information, see "Specifying tool settings" on page 248.

**Note**

If the tool or action does not have an options window, you must use MEL code to create the box. Once the box is created, you must write MEL code to invoke the option window. For more information on MEL commands, see *Using Maya: MEL*.

**Option Box Command(s)**

Enter the MEL script to use as the command for the menu item's option box.

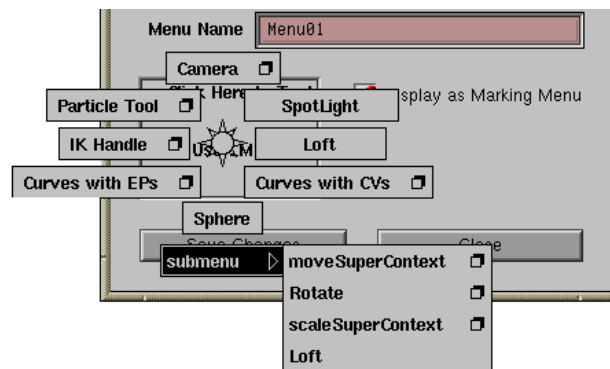
**Adding submenus to menu items**

Like the main pull-down menus, menu items in a marking menu can have submenus. These submenus let you add extra tools and actions to a marking menu.

**Note**

If you create submenus under an overflow menu item, the submenus cannot contain any radial items.

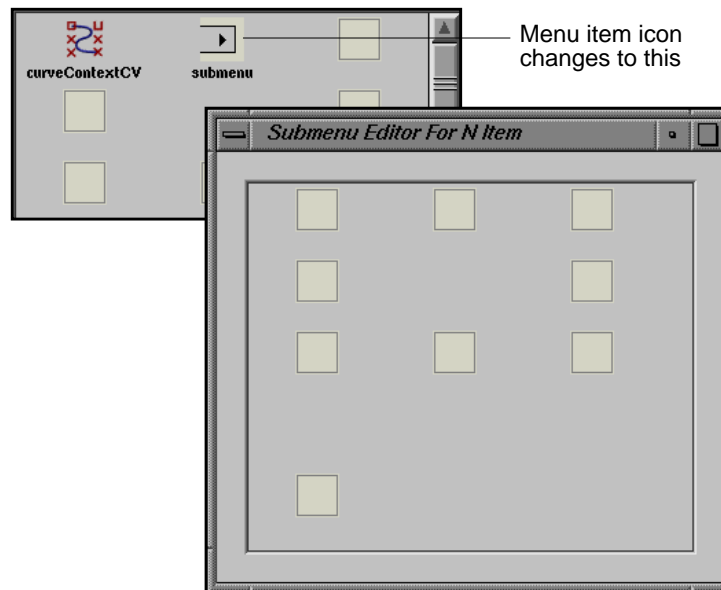
In the following example, there are four menu items associated with one submenu.



**Adding a submenu:**

In the following example, a submenu is associated with an icon.

- 1 Open the Marking Menus window (Window > Settings/Preferences > Marking Menus).
- 2 Select the marking menu that has the menu item you want to add a submenu to.
- 3 Click Edit Marking Menu.
- 4 Position the cursor on the icon you want to add a submenu to.
- 5 Press the right mouse button and select Popup Submenu from the pop-up menu. The icon changes shape indicating that a submenu is associated with it and the Submenu Editor dialog opens.



- 6 Using the middle mouse button, drag tools or actions to the Submenu Editor.
- 7 Close the Submenu Editor window.
- 8 To test the submenu, click in the Click Here to Test box.

- 9 Click Save or Close.

## Associating a MEL script with a menu item

If you have written a script to perform a particular task, you can associate it with a menu item in a marking menu. In the following example a MEL script is added to an existing marking menu.

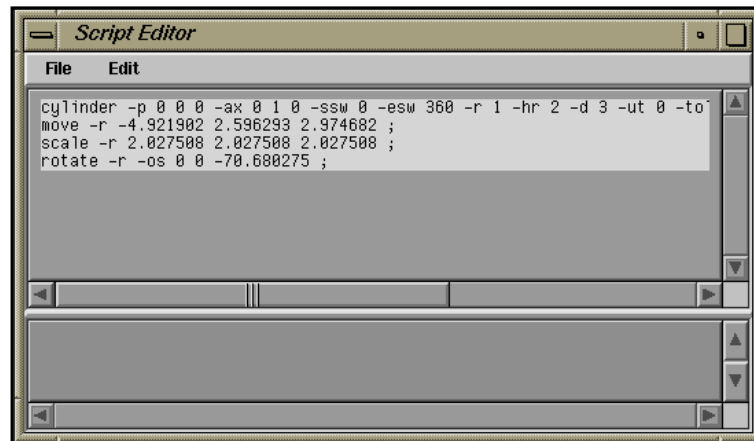
To associate a script with an menu item:

- 1 Open the Marking Menus window (Window > Settings/Preferences > Marking Menus).
- 2 Select the marking menu that has the menu item you want to add a submenu to and click Edit Marking Menu.

or

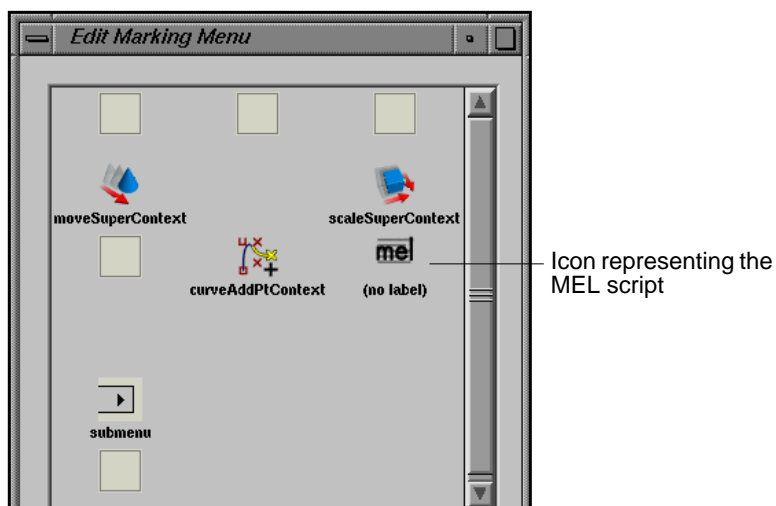
Click Create Marking Menu to create a new marking menu. For more information, see “Creating marking menus” on page 511.

- 3 Open the Script Editor (Window > General Editors > Script Editor).
- 4 With the left mouse button, highlight the MEL script you want to associate with a marking menu.



- 5 Press and hold the middle mouse button over the highlighted text. An icon appears.

- 6 Using the middle mouse button, drag the icon to the marking menu's menu item in the Edit or Create Marking Menu window.



- 7 Place the cursor over the new MEL icon and use the right mouse button to select Edit Menu Item.
- 8 Assign a label for the menu item.

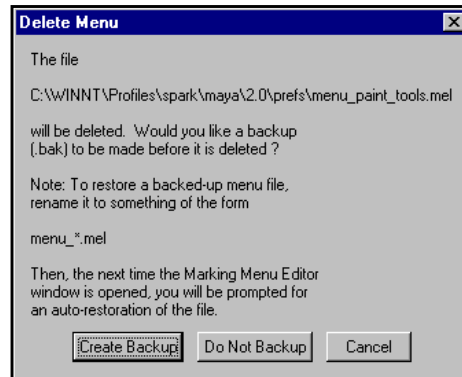
For more information, see “Modifying existing marking menus” on page 516.

## Deleting marking menus

You can use the Marking Menus window to delete marking menus. When you delete a marking menu you can create a backup file which allows you to restore the menu.

### To delete a marking menu:

- 1 Open the Marking Menus window (Window > Settings/Preferences > Marking Menus).
- 2 Select the marking menu, then click Delete Marking Menu. The following dialog appears.



- 3 If you want to delete the marking menu but keep a backup copy of it, select **Create Backup**.

Maya stores the backup file in the user prefs directory with a file extension of .bak. For information on how to recover the marking menu, see “To restore a marking menu backup:” on page 524.

*or*

If you want to delete the marking menu without creating a backup file, click **Do Not Backup**.

---

#### *Note*

You cannot recover a marking menu after you select **Do Not Backup**.

---

Maya removes the marking menu from the Marking Menus window.

- 4 Click **Close**.

**To restore a marking menu backup:**

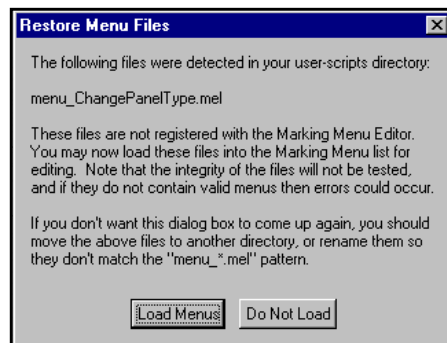
---

#### *Note*

You must exit Maya before restoring a deleted marking menu.

---

- 1 Rename the marking menu backup file `menu_MenuName.mel.bak` to `menu_MenuName.mel`.
- 2 Restart your system.
- 3 Select Window > Settings/Preferences > Marking Menus. The following message appears.



- 4 Click Load Menus. The recovered marking menu appears in the Marking Menu window.

---

#### Note

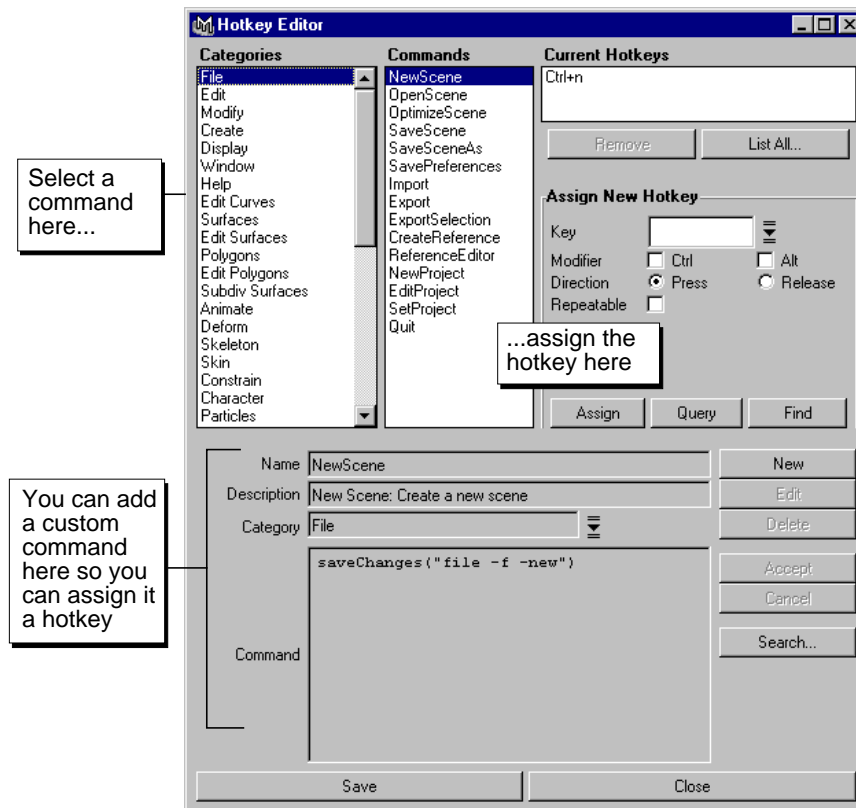
Because Maya does not recover the mouse button assignment, you will have to re-assign a mouse button to the recovered marking menu.

---

## ASSIGNING HOTKEYS

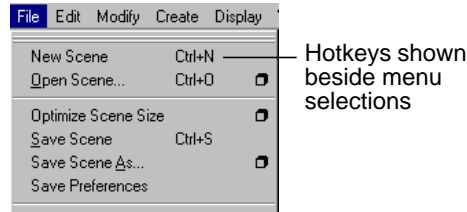
If you use a selection frequently, you may want to assign it to a hotkey. For example, if you select File > Import frequently, you can assign a hotkey to it. This decreases your reliance on the main menu.

You assign hotkeys in the Hotkey Editor (Window > Settings/Preferences > Hotkeys) window. It lists most menu items in the main menus, as well as commonly-used operations, such as Display Wireframe (hotkey 4). Also, you can assign hotkeys to your own MEL scripts or to commands that accompany plug-in software.



## Hotkeys on menu labels

When you assign a hotkey to a menu item, the change appears on the main menu label. (This feature does not apply to menu labels in the hotbox.)



## How hotkeys are saved

Maya saves your custom hotkey preferences so that they do not interfere with the default Maya hotkey settings. Your preferences will not be overwritten when you upgrade to the next Maya version.

The file names containing hotkey preferences are `userHotkeys.mel` and `userNamedCommands.mel` under user prefs directory:

`~username/maya/3.0/prefs` (IRIX)

`drive:\WINNT\Profiles\username\maya\3.0\prefs` (NT)

`drive:\Documents and Settings\username\maya\3.0\prefs` (Windows 2000)

## Assigning hotkeys to standard commands

Use the top half of the Hotkey Editor to assign hotkeys to a menu selection or standard command. To help you choose hotkeys, you can also view a list of mapped and unmapped keys.

### To assign a hotkey:

- 1 Choose Window > Settings/Preferences > Hotkeys.
- 2 Select the category and command.

There are categories for all of the main menus and for several other commands. Menu commands for plug-ins, including Live and Fur, are under the User category. If you have trouble finding a command, click Search (see “Example—creating a hotkey for a view menu option:” on page 530).

- 3 In the Assign New Hotkey area, specify the key combination and other settings. You can see a list of which keys are unmapped by clicking List All.

## Assigning hotkeys

Key	Enter the key you want to assign to the selected command. Enter a letter from A to Z (upper and lower case are different keys) or a number from 0 to 9. You cannot use more than one letter or number.  Or, choose a special key from the pull-down list. For example, if you want the right arrow key to act as the trigger, assign it here.
Modifier	Select either Alt or Ctrl for the hotkey modifier.
Direction	Use Press or Release to associate a command with the press or a release of a key. For example, you can create a hotkey to instruct Maya to snap to a curve when you press a key, then turn off the snapping when you release it.  If you added a key to an operation ending with (Press) or (Release), add the same key to the corresponding (Release) or (Press) operation.
Repeatable	Turn on so that this hotkey is repeatable using the Edit > Repeat command. Turn off to prevent repeating the hotkey using Edit > Repeat.
Query	Click Query to determine whether the specified key settings have already been assigned to a command.
Find	Clicking Find highlights the category and command for the key you enter in the Key field.

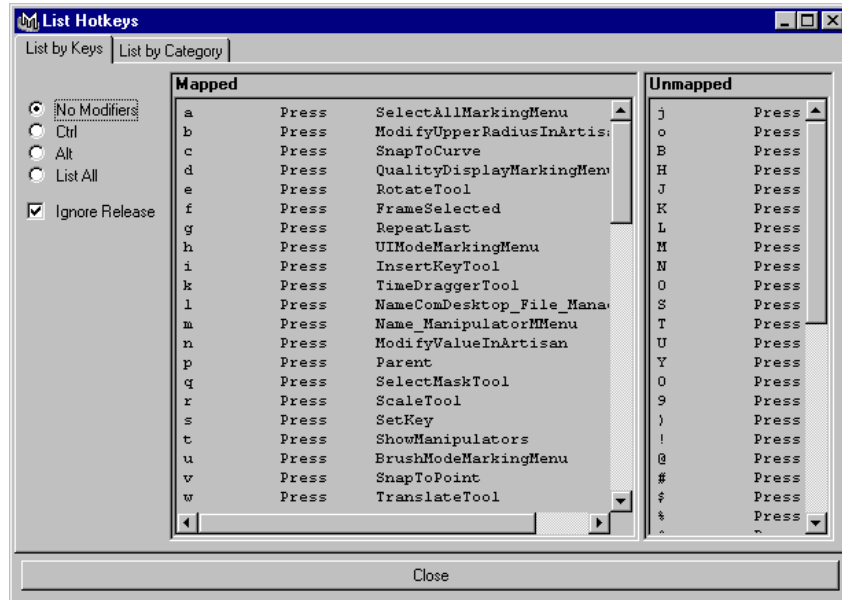
## 4 Click Assign.

The new hotkey should appear in the Current Hotkeys list.

## Viewing hotkey lists

Click List All to view a list of mapped and unmapped keys. This opens a window that allows you to sort the keys in various ways.

To print the hotkeys list to a file, click Save to File button and specify a destination directory.



- No Modifiers** Lists only single hotkeys, without Ctrl or Alt.
- Ctrl** Lists only hotkeys with a Ctrl + key combination.
- Alt** Lists only hotkeys with an Alt + key combination.
- List All** Lists all hotkeys.
- Ignore Release** Turn on to ignore the hotkeys that activate when you release the key, versus when you press the key. Turn off to see all hotkeys, including the ones activated when you release the key.

## Searching for commands

Click the Search button at the bottom of the Hotkey Editor to perform a search through all existing commands. For example, you may want to perform a search if you know part of a command name, but not the category. Or, if you are adding a new command, you can first search for commands that are related.

## Assigning hotkeys

In the Search for Command window, you type a case-sensitive string. The program searches for that string in the command names and command syntax. You can use \* to represent any character or characters. You can also use brackets to enclose both capital and lower-case letters, such as: [aA].

## Changing or deleting a hotkey

If you want to alter or delete an existing hotkey, select it from the Current Hotkeys list and click Remove. You can then assign a different hotkey as needed. You cannot restore a hotkey after you have deleted it; you must reassign it.

## Adding commands for hotkey assignment

If there is a MEL command or script you want to enact with a hotkey, you can add that command and then assign it a hotkey. This capability is also useful for assigning hotkeys to the selections on the panel menu bar: View, Shading, Lighting, Show, and Panels (see “Example—creating a hotkey for a view menu option:” on page 530).

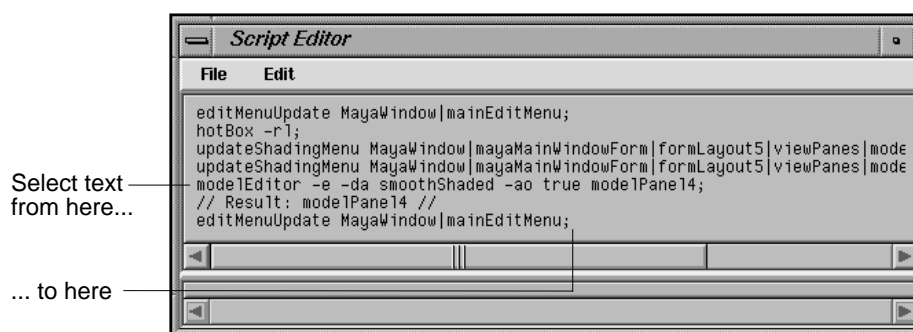
### To add a new command for hotkey assignment:

- 1 Click New.
- 2 Complete the Name and Description.  
These fields are for future reference. They only appear in the Hotkey Editor.
- 3 Select a category from the Category pop-up menu.
- 4 Enter the MEL command into the Command box.
- 5 Click Accept.  
The command should appear under the chosen category. You can now assign a hotkey to this command.

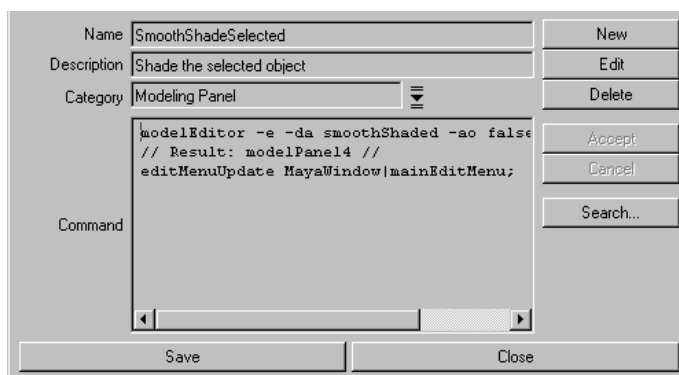
### Example—creating a hotkey for a view menu option:

- 1 In the Hotkey Editor, click New.
- 2 Complete the Name, Description, and Category.  
For the Command, you will cut and paste from the Script Editor.
- 3 Open the Script Editor (Window > General Editors > Script Editor).

- 4 In the Script Editor, select Edit > Echo All Commands.  
This instructs Maya to display all MEL commands used to execute any menu options.
- 5 In the view menu bar, select the menu item you want to create a hotkey for (for example, Shading > Smooth Shade Selected Items).
- 6 Select the echoed MEL command from the Script Editor window.



- 7 Copy and paste the command into the Command box in the Hotkeys window. On IRIX, use the middle mouse. On Windows NT, use Ctrl+C (copy) and Ctrl+V (paste).



- 8 Click Accept in the Hotkeys window.

## Assigning hotkeys

The command should appear under the chosen category. You can now assign a hotkey to this command.

# 16 WORKING WITH PANELS AND LAYOUTS

You can use panels and layouts to customize your workspace.

Panels consist of interface elements, such as graphs, camera views, editors, and Outliners, that you can view within the main window. Layouts are groups of panels.

This chapter describes how you work with panels and layouts:

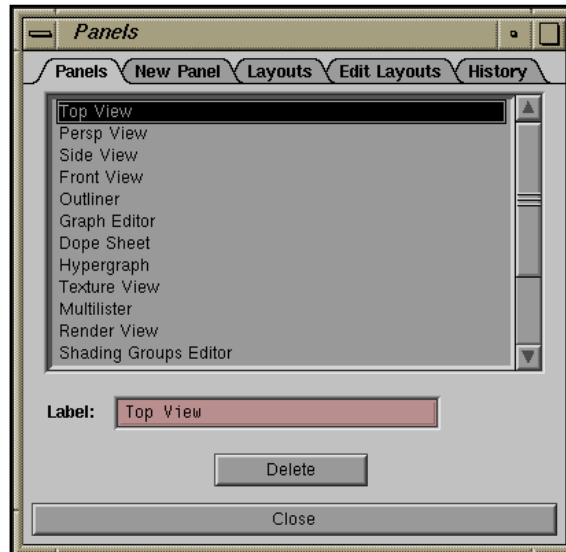
- “Using the Panel Editor” on page 533
- “Viewing panels” on page 535
- “Defining layouts” on page 539

## USING THE PANEL EDITOR

You use the Panel Editor to assign panels and layouts to your workspace. The Panel Editor also lists the existing layouts and panels.

**To display the Panel Editor:**

- On the Maya menu bar, select Window > Settings/Preferences > Panels.  
*or*
- On the view menu bar, select Panels > Panel Editor.



You can select the following Panel Editor tabs:

<b>Panels</b>	Displays existing panels you can rename or delete. See “Modifying existing panels” on page 535.
<b>New Panel</b>	Displays the types of panels that you can create. See “Creating and deleting panels” on page 537.
<b>Layouts</b>	Displays existing panel layouts. See “Creating layouts” on page 540.
<b>Edit Layouts</b>	Displays the current panel layout. See “Defining layouts” on page 539.
<b>History</b>	Displays the history of the panels you used. See “Maintaining layout history” on page 544.

## VIEWING PANELS

A panel is a collection of interface display elements. You can view panels within the main window or tear them off so they exist in a separate window. Panels can consist of a single element, such as a camera view in a Modeling panel, or multiple elements, such as the Multilister with its many buttons and tabs. Panels have their own menu bars for their specific options.

### Modifying existing panels

You rename or delete existing panels using the Panel Editor.

**To rename a panel:**

- 1 Select Panels > Panel Editor.
- 2 Select the panel you want to rename.

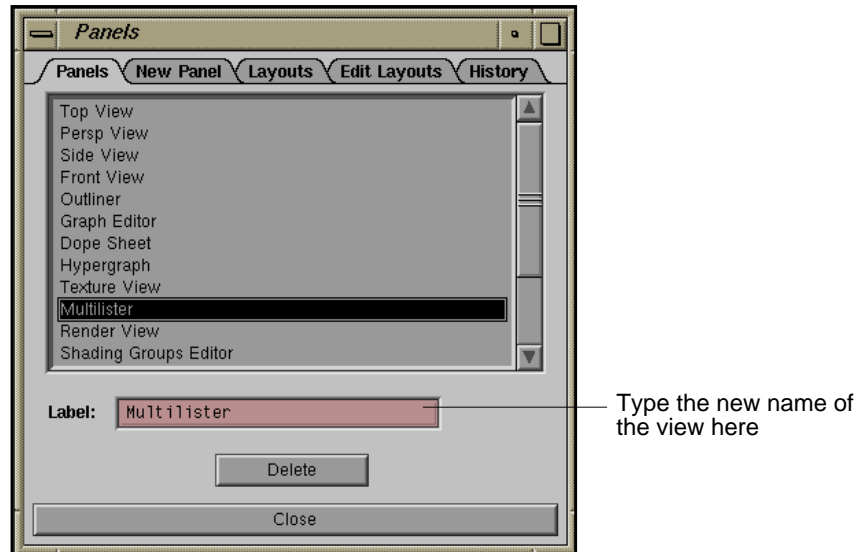
---

#### *Note*

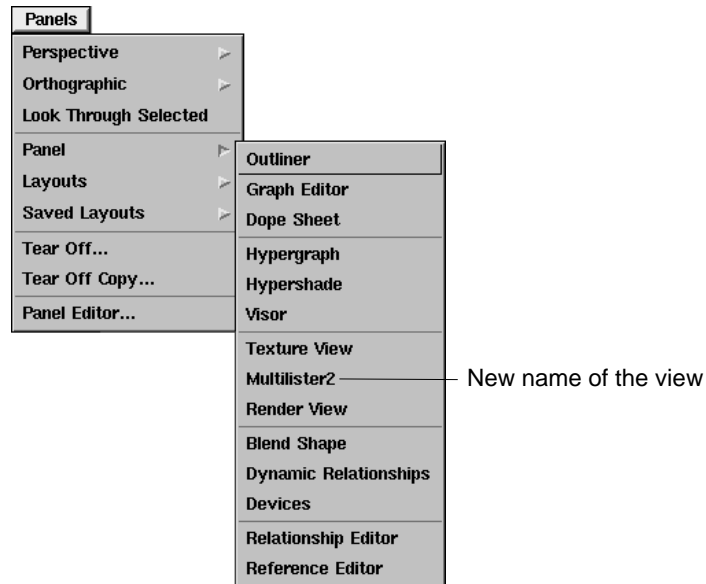
You cannot rename the Top, Side, Front, or Persp view panels.

---

## Viewing panels



- 3 Type the new name in the Label box, then press Enter. Maya changes the name of the panel in the list of existing panels.
- 4 To make sure that the renamed panel appears in the list of available panels, select Panels > Panel.



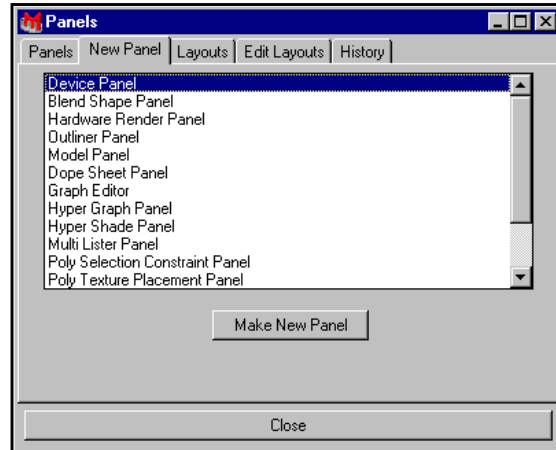
## Creating and deleting panels

Sometimes an object or scene is too big to fit in a window. When this happens, you may want to create a second panel.

For example, if you created a skeleton and wanted to use the Outliner to look at two different parts of the object at the same time, you could create a second Outliner. Since the Outliner cannot display all of the nodes of the skeleton, you could use the second Outliner to view different parts of the object.

To create a new panel:

- 1 Select Panels > Panel Editor and click the New Panel tab.



- 2 If you have more than one view open, select the view where you want the new panel to appear.
- 3 Select a panel (such as the Outliner), then click Make New Panel. Maya creates a new panel and lists it before the selected view. The name of the new panel appears in the Panels tab.

---

#### Note

Not all panels can be duplicated. For example, only one Hypergraph panel is allowed. If you try to display multiple Hypergraph panels, Maya displays an alert message.

---

- 4 To view a second Outliner, select Windows > Outliner. Both Outliner windows now appear in the view.

You can now make changes to the Outliners so they display different information about the scene.

**To delete a panel:**

Once you have deleted a panel, you cannot restore it.

- 1 Select Panels > Panel Editor.
- 2 On the Panels tab, select the panel you want to delete, then select Delete. A confirmation dialog appears.
- 3 To confirm the deletion, click OK. Maya removes the panel from the display.

## DEFINING LAYOUTS

You often work with the same combinations of panels, depending on the task you are working on. When you render, you might want to work with the Multilister, RenderView and a perspective view. When you edit models, you might use the Outliner and a perspective view. Panel layouts provide these kinds of configurations.

A number of predefined layouts are provided in Maya, but you can also create your own.

### Selecting panel layouts

There are three ways to select panel layouts:

- from the main Maya window
- from a view panel
- from the Panel Editor

**To select a panel layout from the main Maya window:**

On the main Maya menu bar, select Window > Saved Layouts, then select the layout you want to use.

**To select a panel layout from a view panel:**

On the view menu bar, select Panels > Saved Layouts, then select the layout you want to use.

**To select a panel layout from the Panel Editor.**

- 1 Select Panels > Panel Editor and click the Layouts tab.

## Defining layouts

- 2 Select one of the layouts.

Selecting any item from the list applies that panel layout to the main window. Try a few of them. Some panels take a moment to load the first time you use them.

- 3 To return to the original panel layout, select Current Layout from the list.

**To add a layout to a shelf:**

- 1 Select a shelf by clicking the shelf tab.
- 2 Select Panels > Panel Editor and click the Layouts tab.
- 3 Select the layout, then click Add to Shelf.



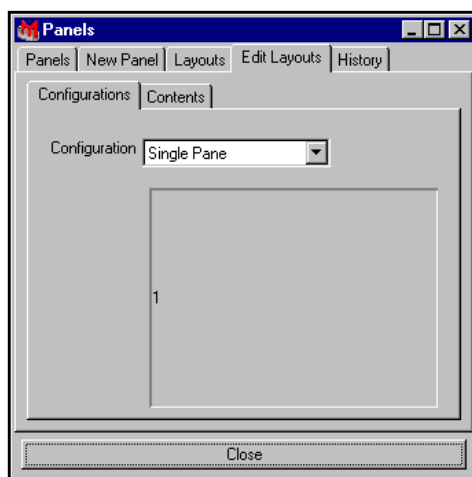
To add a name to the layout shelf button (it displays as a MEL icon), see “Setting Shelf label options” on page 506.

## Creating layouts

By default, any new panel layouts you create are saved with your preference file. This allows you to use them with any of your scene files. You can also create and save panel layouts that are only available with a specific scene.

**To create a layout:**

- 1 Select Panels > Panel Editor and click the Layouts tab.
- 2 Select a layout such as the Single Perspective View then click the New Layout button.
- 3 Tab to the Name box and rename the layout.
- 4 Click the Edit Layouts tab.



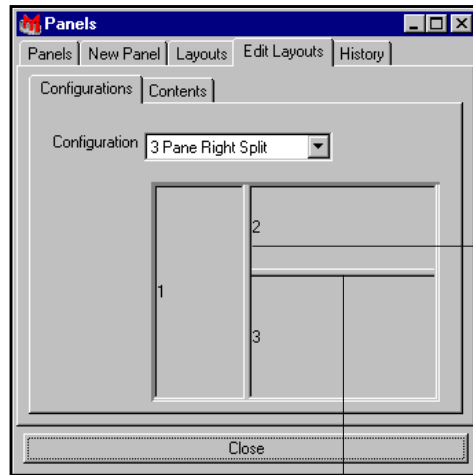
Maya displays two additional sub-tabs:

**Configurations** – Use this tab to change the configuration and proportions of the views in your window.

**Contents** – Use this tab to change which panels appear in which views.

- 5 From the Configuration pull-down menu, select the panel configuration required (in this example, 3 Pane Right Split).
- 6 Resize the panes by dragging the borders in the thumbnail view of the layout. The main window changes to reflect your changes.

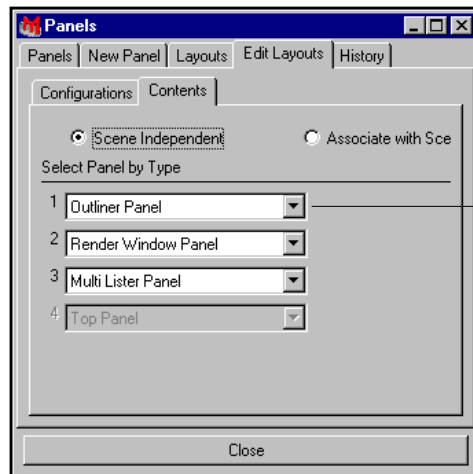
## Defining layouts



Click-drag here to change the width of the display.

Click-drag here to change the height of the display

- 7 Click the Contents tab.



Click here to display available panel types

- 8 Select whether you want layout to be scene independent or associated with the scene.

**Scene Independent** – Scene independent layouts are available for all scenes. Their contents are defined by panel types.

If you have multiple panels of the same type in a scene, it is not certain which panels show up when you select your layout. This is not a problem in most cases; however, if you are working in a particular scene a great deal, we recommend developing layouts that you can save specifically with that scene.

**Associated with scene** – These layouts are only usable with the current scene. You can specify a particular panel if you have more than one of the same type.

---

#### Note

If you want to look through cameras other than the built-in persp, top, front, or side cameras, create another model panel for use in your panel layout. The Top View, Front View, Side View, and Persp View layouts use their respective built-in cameras as defaults.

---

- 9 From the Select Panel by Type menus, select layouts for your panes.  
For example, select the Outliner, Render Window, and Hypershade panels for panes 1, 2, and 3, respectively.
- 10 Click the Layouts tab.
- 11 Select another layout. The main window changes to show the selected layout.
- 12 Select the layout you just created.  
Your new panel layout displays in the main window. Your layout also appears in the Panels > Saved Layouts menu and the Windows > Saved Layouts menu.

#### To save the current layout:

- 1 Select Window > Save Current Layout. The Save Panel Arrangement window opens.
- 2 Enter a name for the new layout and click OK. The layout appears in the Panels > Saved Layouts menu and the Windows > Saved Layouts menu.

## Deleting layouts

At some point, you may no longer need layouts you created.

**To delete a layout:**

- 1 Select Window > Settings/Preferences > Panels.
- 2 Click the Layouts tab, select the layout you want to delete, then click Delete. A confirmation dialog appears.
- 3 Click OK to remove the layout.

**To remove a layout icon from the shelf:**

Use the middle mouse button to drag the icon to the garbage can.

---

### *Note*

When you delete a layout, you only delete the named panel configuration, not the constituent panels.

---

## Maintaining layout history

Maya keeps a record of panel layout changes. This lets you step forward or back through each view. This is helpful if you are moving between two layouts and cannot remember their names.

**To display panel history:**

Select Panel > Panel Editor and click the History tab.



History Depth	Specify the number of configurations you want stored in the history.
Wrap History	Toggle this on to return you to the first view or the most recent view configuration when you reach the end of recorded history.
Clear History	Click this button to delete the record of all the panels you have used.
Previous Layout	Click this button to browse back through the panel layouts.
Next Layout	Click this button to browse forward through the panel layouts.



# INDEX

## A

- absolute
  - path 214
  - values 95, 97
- actions
  - defined 17
  - redoing 68
  - undoing 68
- active lines, showing 405
- Add Attributes option, Attribute Editor 269
- Add Instance option 66
- Add to Current Selection brush option 164
- Advanced Visualizer file format 197
- Affects Active modifier option 476
- After Stroke Cmd 409
- aiff file format 197
- aliasWire format 197
- aligning
  - brush profile 402
  - objects, snapping 155
  - vertices 154
- All Components Off option 159
- Allow Highlight Select modifier option 476
- alpha channel 419, 420
- Angle of view 35
- Angular units option 472
- anim file
  - exporting 210
  - importing 188
- animated nodes 323, 342
- animating
  - rotation channels 89
  - transitions (of view) 360
- animation
  - continuous play option 480
  - controls 479
  - curves
    - exporting 210
    - importing 188
    - using to create falloff 104
  - key options 475
  - menus 5
  - nodes 49
  - oscillating 480
  - playback options 480
  - preferences button 7
- Animation Start/End option 479
- animImportExport plug-in 188, 210
- aperture 35
- API, version for plug-ins 253, 490
- applications, importing files from 184
- Apply Current to All option 125
- Arc Length Tool 114
- arc lengths
  - locators 115, 116
  - measuring 114
- Array Cloning. *See* Duplicate Options window 59
- Artisan
  - attribute maps 422
  - paint tools 387, 388
- ASCII file 199
  - format 196, 197, 198
- Assign Selection option 141, 148
- Attribute Editor 235, 262
  - arc length locator 116
  - axis display 78
  - breaking connections 274
  - compared to Attribute Spread Sheet 241
  - custom attributes, adding 269
  - displaying 262
  - distance locators 110
  - linking attributes 274
  - loading attributes into 266
  - locators 106
  - locking attribute values 274
  - mapping textures to attributes 275
  - node behavior 272
  - opening multiple copies 268
  - parameter locators 113
  - pivot points 74, 76
  - right-click menu options 265
  - rotation order 87
  - setting keys 273
- attribute maps 420
- Attribute Paint Tool 454
- Attribute Spread Sheet 235, 241
  - layout 246
  - names, shortening 242
  - option 236, 241

## INDEX

- attributes
    - adding to Channel Box 282
    - Attribute Editor 266
    - Attribute Spread Sheet 241
    - breakdown keys, setting 292
    - changing multiple values 243, 286
    - Channel Box 281
    - components, displaying in Channel Box 283
    - compound 303
    - connections, breaking 274, 293
    - custom 269
    - default input and output 350
    - defined 241
    - deleting custom 271
    - displaying 303
    - editing 69, 241, 355
    - editing multiple 236, 241
    - exporting maps 424
    - handles 73
    - ignoring when rendering 266
    - importing maps (paint tools) 420
    - keying 247, 273, 291
    - linking 274, 295
    - locking values 274, 294
    - mapping textures to 275, 419
    - painting 454
    - relative values, entering 245, 287
    - showing for just one view 119
    - unlocking 275, 294
    - values 203, 243, 285
  - audio file format 197
  - Auto Key
    - animation option 475
    - button 7
  - auto load plug-in option 252, 490
  - Autodesk file format 197
  - Autom Create Rigid Body dynamics option 473
  - automatic graph layout 334
  - automatically created sets 367
  - auxiliary nodes 316
  - Averaging option 438
  - avi file format 198
  - axes
    - changing from command line 79
    - constraint, snapping 154
    - description 78
    - displaying 78
    - global 78
    - grid 121
    - local 78
    - orientation 88
    - outline 121
    - reflected painting 398
    - restricting object movement to 80
    - rotation order 88
    - snap 155
  - Axes option 78
  - Azimuth Elevation Tool 37
- B**
- backculling 135
  - Backculling display option 471
  - Backface Culling option 124, 137, 472
  - backfaces
    - culling, display 472
    - displaying and hiding 131
  - background image
    - importing to scene hierarchy 335
  - Backspace key 56
  - backup copies of marking menus 523, 524
  - Based on distance option 101, 102, 104
  - Before Stroke Cmd 409
  - binary file format 196
  - bitmap images for shelf icons 502
  - Blend box 278
  - Bookmark Editor 47
  - bookmarks 47
    - adding to shelf 49
    - automatic view change 362
    - creating 47, 363
    - deleting 48, 363
    - predefined 47
    - renaming 49, 364
    - returning to 363
    - selecting custom 48
  - Boommarks option 48
  - Border Edges option 136, 471
  - Border Width option 136, 471
  - borders
    - changing 136
    - displaying 136
    - edges 471
  - Bounding Box option 123
  - branches 323
    - centering in view 360
  - breakdown keys, setting 292
  - breaking parent-child relationship 308, 331

brush  
 feedback 404  
 opacity 392  
 outline trail 404  
 outline, drawing 404  
 outlines 390  
 radius 392  
 shape 393  
 stamp profile 402  
 stroke settings 397  
 value 392

## C

caching 272  
 CAD system file format 197  
 Camera Settings option, View  
 menu 38  
 Camera Tools option, View  
 menu 36, 37  
 Camera/Light Manipulator  
 option 137, 138

cameras 40  
 aperture 35  
 center of interest 37, 137  
 changing settings 38  
 clipping planes 137  
 creating 36  
 cycling index 138  
 default display of 299, 321  
 displaying 36  
 dolly 36  
 field chart 39  
 fill 40  
 film gate 38  
 frustrum 38  
 gate 38  
 hiding 126  
 horizontal 40  
 journal 38  
 looking through 37  
 manipulators 94, 126, 137  
 moving 36  
 orthographic 41  
 overscan 40  
 overview 34  
 perspective 38  
 resolution gate 39  
 revolving 36, 37  
 rolling 36  
 safe action 39  
 safe title 39  
 tools 36  
 tracking 36  
 tumbling (NT) 124  
 yaw pitch 37  
 zooming 36  
 categories  
 of projects 214  
 Center of Interest option 137,  
 138  
 Center polygon selection  
 option 477  
 Center zone marking menu 27

centering nodes in view 359  
 Channel Box 235, 280  
 adding attributes to 282  
 attribute components 283  
 attribute values,  
 entering 285  
 attributes 281  
 breakdown keys, setting 292  
 breaking connections 293  
 custom attributes,  
 deleting 271  
 displaying 280  
 Expression Editor,  
 launching 295  
 format, changing 284  
 history 295  
 history node, selecting 92  
 keys, setting 291  
 linking attributes 295  
 locking attribute values 294  
 manipulators 288  
 name abbreviations 284  
 pop-up menus in 290  
 precision 285  
 values, entering with  
 mouse 289  
 Channel Control  
 option 237, 280  
 channel slider 289  
 channelBox command 285  
 channels  
 data file format 198  
 defined 241  
 deleting 57  
 material, overriding 472  
 Channels delete option 57  
 Channels option 203  
 characterPartition 380  
 Check Box option 519  
 check boxes in marking  
 menus 519

## INDEX

- children 300, 306, 322, 329
  - breaking relationship 308
  - displaying 301
- Clamped animation option 475
- clamping options, Script Paint Tool 447
- cleaning up referenced files 196
- clearing graph display 352
- Click Box Size 477
- Click Drag Select modifier
  - option 476
- Click Here to Test box 521
- Clipping Planes option 137
- Clone. See Duplicate option 58
- clusters 368
  - sets 374
- collapsing
  - nodes 300, 324
  - sets 371
- Color Chooser window 276
- Color Feedback option 406
- Color in Shaded display
  - option 136
- Color Index Mode option (IRIX) 124
- Color Material option 472
- Color Shading option 472
- color wheel 277
- colors
  - changing 482
  - default, changing 482
  - feedback (paint tools) 406
  - layer 144
  - min and max (paint tools) 406
  - render layer 150
  - selection 276
  - swapping object 347
  - value 277
- Colors customize UI option 482
- Colors window 482
- combined transformations 97
  - rotating 99
  - scaling 98
- command line
  - absolute values 97
  - axis origin, changing 79
  - focus, default 466
  - moving, rotating, or scaling from 97
  - relative values 97
- Command Shell option 237
- Command(s) option 519
- commands
  - adding to shelf from Script Editor 499
  - adding to shelves 498
- common edges, detecting 408
- complex
  - models, displaying 123
  - scenes, display performance 124
- Component Editor 237
  - modifying data 239
  - option 236
  - querying data 238
  - updating data 240
- Component selection mode
  - pivot points, pinning 77
- components
  - deleting by type 56
  - editing 237
  - limiting selection 157, 159
  - paint-selecting 160
  - querying data 238
  - selecting using selection mask 159
  - selection mode 476
- compound attributes 303
- Compressed option 475
- compression mode 475
- Cone Angle option 138
- configuring workspace 539
- connecting
  - default output to input 346
  - nodes 346
- Connection Editor
  - launching from dependency graph 346
  - option 237
- connection lines
  - in dependency graph 340
  - in scene hierarchy 328
- connections
  - breaking 274, 293
  - creating default 346
  - direction of 340
  - displaying 328
- constraining rotations 85
- constraint
  - axis, snapping along 154
- constraints 203
  - connections, displaying 328
- Constraints option 203
- construction curve 93
- construction history 203
  - deleting 171
  - effect on speed 170
  - manipulators 91
  - turning off 170
  - tweaking 170
- continuous play option 480
- controlling node, attributes
  - connected to 304
- coordinates
  - local 33
  - system 31, 33
  - world 33

- copying
  - files 184, 190
  - objects 58
  - shelf items 500
- corners
  - displaying common 438
  - selecting common 426
  - selecting common using manipulators 434
- Create Display Layer window 141, 148
- Create Empty Group option 66
- Create Layer option 141, 148
- Create Marking Menu option 512
- Create Multiple Objects option 183
- Create Partition option 381
- Create Quick Select Set 377
- Create Reference option 184, 191, 192
- Create Render Node window launching 356
- Create Set option 375
- Create Set Options window 383
- creating
  - new materials, textures, or lights 356
  - new projects 215
  - projects 213
  - scene file 181
- culling, backface 472
- current
  - layer 139
  - project, editing 218
- Curve Div per Span option 134
- Curve Divisions option 470
- curve on surface
  - creating 172
  - snapping to 154

- curves
  - arc lengths, measuring 114
  - constraining on surface 83
  - construction 93
  - divisions per span 134
  - input 93
  - interpolated, setting tolerance 473
  - isoparm, snapping to 154
  - modification falloff 104
  - new, display options 470
  - on surface, moving 83
  - on surface, snapping to 152, 154
  - parameter range 93
  - parameter values, displaying 111
  - smoothness, controlling 470
  - snapping to 152
- custom attributes, deleting 271
- Custom Polygon Display Options window 135
- CVs
  - displaying and hiding 133
  - displaying on new curves or surfaces 470
  - modifying
    - proportionally 100
  - moving 81
  - paint-selecting 160
  - selecting 160, 164
  - selection type 164
  - transforming
    - proportionally 99
  - unselecting 160, 164
- CVs, hiding 125
- Cycling Index option 138, 139

## D

- DAG nodes, instancing 62

- Data Transfer File Locations 214
- Decay Regions option 138
- default
  - input and output attributes 350
  - layer 139
  - nodes, importing 184
- Default File Extensions option 203, 209
- Default Home option 40
- Default In/Out Tangent animation options 475
- Default Object manipulator 94
- Default Object Manipulator option 94
- defaultLayer 371
- defaultLightSet 371
- defaultObjectSet 371
- Deferred References 182
- deformers
  - adjusting operation of 368
  - complex operations, controlling 251, 488
  - connections, displaying 328
  - geometry, hiding 126
  - hiding 126, 128
  - sets 368, 374
  - skin 368
- deformPartition 381
- Degree option 102
- Delete All Objects by Type option 57
- Delete by Type option 56
- Delete Current Layout option 246
- Delete key 56
- Delete Marking Menu option 523
- Delete Shelf option 497

## INDEX

- deleting
  - by type 56
  - channels 57
  - hotkeys 530
  - icons 513
  - marking menu items 517
  - marking menus 523
  - objects 55
  - objects by type 57
  - options, setting 57
  - plug-ins 254, 492
  - referenced files 194
  - shelves 497
- Dense Wireframe Acceleration option (NT) 124
- dependency graph 319
- displaying lights 339
- displaying textures 339
- how to use 338
- materials 339
- rebuilding 350
- shading groups 339
- types of nodes 337
- understanding the 337
- device drivers, plug-ins 251, 489
- directories, mapping
  - missing 218
- Disable Lighting option 406
- Disable Nodes command 49
- disabling
  - Hotbox 25
  - modules 481
- display
  - quality 133
- Display Active Vertices option 406
- Display Control Options window 133
- Display Layer Options window 141, 148
- display layers 139
  - assigning objects to 141, 148
  - attributes 146
  - color, changing 144
  - creating 141, 148
  - default 372
  - import options 475
  - index number 475
  - merge options 147, 475
  - object appearance 146
  - options 141, 148
  - removing objects from 142, 149
  - renaming 141, 148
  - selecting all objects in 55
- Display Level attribute 176
- Display Local Axis option 78
- Display menu 119
- display performance 124
  - improving 123, 131
- Display Polygon Count 122
- Display Render Tessellation Geometry option 135
- Display Rotate Pivot option 74
- Display Scale Pivot option 74
- displaying
  - edges 136
  - entire graph in view 358
  - grid 120
  - hard edges only 136
  - hidden objects 355
  - horizontal graph 364
  - NURBS components 132
  - objects 119, 122
  - objects as semi-transparent 123
  - up and downstream connections 340
  - vertical graph 364
  - vertices 135
- distance
  - locators 107, 109, 110
  - measuring 107
  - point, snapping 108
  - start and end points, specifying 110
- Distance Cutoff option 101, 102
- Distance Tool 107
- Divisions option 409
- divisions per span, curve 134
- divisions stroke smoothing 409
- Dolly Tool 36
- dollying
  - cameras 36
  - graph view 356
  - selected region 357
- Don't Ignore when Rendering option 266
- downstream connections 340
- dragging
  - node from Outliner or Multilister 344
  - to reconnect nodes 349
- Draw Brush Feedback option 404
- Draw Outline option 404
- Draw Outline Trail option 404
- Drawing Exchange File file format 197
- Driven by Anim Curve show option 305
- Driven by Expression show option 305
- driven keys 274, 295
- Duplicate Input Connections option 59
- Duplicate option 58
- Duplicate Options window 59
- Duplicate Upstream Graph option 59

- duplicating
  - objects 58
  - options 59
  - tools 248, 485

- DXF
  - exporting 207
  - file format 197
  - file format, exporting file in 207
- dynamics
  - menus 5

## E

- East zone marking menu 26
- echoing last action 68
- edges
  - common info, using 408
  - common, selecting 426
  - common, selecting using manipulators 428
  - displaying 136
  - displaying common 437
  - hard 136
  - hard, displaying 471
  - numbering 136, 471
  - paint-selecting 160, 162
  - selecting 162
  - selecting CVs along 161
  - soft 136, 471
- Edges display option 471
- Edit Bookmarks option 47
- Edit Commands tab 494
- Edit Marking Menu button 516
- Edit Membership option 142, 149
- Edit Membership Tool 378
- Edit menu 51
- Edit Menu Item option 518
- edit mode 74, 75, 77, 81, 86, 90

- edit points
  - displaying and hiding 133
  - displaying on new curves or surfaces 470

- editing objects 352
- editors 235
  - Attribute 235
  - Attribute Spread Sheet 241
  - Channel Box 280
  - Color Chooser 276
  - Component 237
  - Connection 237
  - Expression 275, 295
  - general 235
  - limiting information displayed in 311
  - Outliner 297
  - Performance Settings 249, 487
  - Plug-in Manager 251, 489
  - Relationship 235
  - Tool Settings 393

- ellipses (...) in graph 357
- emitterPaint script 441
- empty groups 66
  - nodes 307, 330
- Enable Nodes command 49
- environment variables
  - setting 221
- EPS file import 188
- evaluation order, position in Outliner 309
- Execute Script Nodes option 182
- Expand Popup List modifier option 477
- expanding
  - nodes 300, 324
  - set contents 371
- Explore file format 197
- ExploreGeo file format 197

- Export All option 202, 207
- Export Selected As Reference option 192
- Export Selection option 193, 202, 207
- exporting
  - animation curves 210
  - attribute maps (paint tools) 424
  - DXF 207
  - files 207
  - IGES 207
  - move files 204
  - obj file format 205
  - plug-ins 205
  - referenced files 193
  - rendering information 203
  - RenderMan 207
  - scene contents 202
  - wire 207
- Expression Editor 236
  - default, selecting 466
  - opening from Attribute Editor 275
  - opening from Channel Box 295
- expressions 203
  - connections, displaying 328
  - delete options 57
- Expressions option 203
- Extension Padding option 209
- Extent option 121
- eyedropper tool 277

## INDEX

### F

#### faces

- centers, displaying 471
- display options 471
- displaying 136
- normals, displaying 471
- numbering 136, 471
- paint-selecting 160, 161
- subdividing automatically after selection 410

#### falloff

- curve modification 104
- linear modification 101
- power modification 102
- Proportional Modification tool 101
- script modification 103

#### Fast Interaction option 467

#### feedback

- brush 404
- color (paint tools) 406

#### Field Chart option 39

#### file formats

- avi 198
- movie 198

#### File Type option 182, 200, 203

#### files

- absolute paths 214
- exporting in IGES or DXF 207
- for shelf button icons 504
- formats 184, 197, 198
- importing 184, 190
- management 179
- naming 199
- Particulars 193
- reference options 191
- referenced 191, 193, 194, 195
- relative paths 214
- saving 198
- searching for 215
- size, reducing 201
- transferring 199
- translators, plug-ins 251, 489

#### Fill option 40

#### Film Gate option 38

#### filters 311

- moving to shelf 168

#### Fine option 134

#### Finite option 408

#### Flat animation option 475

#### Flat Shade options 123

#### flooding, Script Painting Tool 454

#### Fly Tool 37

#### focal length 34

#### focus, command line 466

#### Force to Add option 383

#### Frame Rate 122

#### frame rate, playback 480

#### Free playback option 480

#### free-form hierarchy 335, 337

- creating 333

#### Freeze Transformations

- option 169

#### Freeze. See Templates

- option 139

#### freezing transformations 169

#### frustrum 38

- renderable 39

### G

#### garbage can 499

#### gate 38

#### General

- Preferences option 73

#### General Editors 235

- Attribute Spreadsheet 241
- option 236

- Performance Settings 249, 487

- Plug-in Manager 251, 489
- selecting 236

- tools settings 248, 485

#### geo file format 197

#### geometry

- file format 197
- hiding 125, 126

#### Geometry Motion Blur

- option 209

#### geometryPaint script 441

#### Gimbal manipulator 87

#### Gimbal rotate mode 87

#### Gimbal rotation manipulator 89

#### global axis 78

- changing from command line 79

#### global rotate mode 87

#### Global Scale manipulator

- option 469

#### grabColor command 277

- Graph Editor, limiting
  - information displayed in 311
- graphics card, Dense Wireframe
  - Acceleration option 124
- graphs
  - clearing display 352
  - dolly view 356
  - navigation techniques 356
  - rebuilding 365
  - tracking 356
  - turning off updates 361
  - viewing 356
- grid
  - corners, snapping to 152
  - default 121
  - displaying 120
  - extent 121
  - hiding 120
  - options 121
  - size 121
  - snapping to 152
  - specifying appearance 121
  - stamp compensation 408
  - style 121
  - subdivisions 121
- Grid option 120, 121, 408
- Grid Options window 121
- ground plane 32
- Group option 185
- Group option. Hierarchies (3D Studio Max). See Group option 63
- Group Options window 63
- Group Pivot option 63
- Group Under option 63

- groups
  - editing 255
  - empty 66
  - imported objects 185
  - nodes 306, 329
  - objects 63
  - options 63

## H

- Half (12 fps) playback
  - option 480
- Handle Size manipulator
  - option 469
- handles
  - active 80
  - active or current 73
  - attributes 73
  - color 73
  - keyframing active 73
  - manipulator 73
  - scale manipulator 89
  - selecting common corners with 434
  - selecting common edges with 428
  - size, specifying 469
  - sizing 73
- hard edges
  - backface culling option 472
  - displaying 471
  - displaying as solid lines 136
- Hardware Texturing option 125
- Height animation option 479
- help 29
  - browser options 467
  - popup 29
- hidden objects 355
- Hide Cloth option 126
- Hide Deformers option 126, 128

- Hide Geometry option 125, 126
- Hide Kinematics option 125, 127
- Hide menu 125
- Hide Selection option 125
- Hide Unselected CVs 125
- Hide Unselected Objects 125
- hiding
  - camera manipulators 126
  - light manipulators 126
  - markers 126
  - objects 125
  - texture placements 126
- Hierarchies (3D Studio Max). See Ungroup option 64
- hierarchy 235
  - centering node in view 359
  - creating 66
  - limiting selection to 166
  - names, prefixing 308
  - removing objects from 67
  - terminology 299
- Hierarchy List. See Outliner 235
- Highlight option 136
- highlighting
  - colors, changing 482
  - polygons 471
- history
  - accessing 91
  - construction 203
  - modifying 295
  - node, selecting 92
- History option 203
- Hold Focus command line
  - option 466
- horizontal layout of graph 342, 364
- Horizontal option 40

## INDEX

Hotbox 512  
    appearance, changing 23  
    disabling 25  
    displaying 21  
    hiding menubars 24  
    making transparent 24  
    marking menus 511  
    menus, changing 23  
    region option 512  
    Style option 24  
    style, changing 24  
    turning off 25  
    using 20  
    using marking menu in 25  
    zones 21, 25, 26  
hotkeys  
    assigning 526  
    customizing 493  
    deleting 530  
    marking menus 27, 512, 515  
    paint tools 410  
    snapping 153  
    transformations 72  
Hotkeys option 25  
Hotkeys window 25, 526  
    categories 530  
HSV color model 277  
html browser 467  
Hull Simplification options 135  
hulls  
    displaying and hiding 133  
    displaying on new curves or  
    surfaces 470  
Hypergraph 319  
    layout, updating 351  
    limiting information  
    displayed in 311  
    menu bar 321  
    opening 320  
    tool bar 321  
    using to select a view 38

Icon Filename option 519  
icons  
    bitmap images 502  
    changing on shelves 502  
    deleting from marking  
    menu 513  
    images on shelves 502  
    xpm images 502  
IGES  
    exporting 207  
    exporting file in 207  
    file format 197  
Ignore  
    Selection Priority modifier  
    option 477  
    when Rendering option 266  
IK Handle Size kinematics  
    option 469  
IK handles  
    adding 353  
    display size, setting 469  
    hiding 127  
    selecting 353  
Illustrator file import 188  
image  
    displaying as  
    background 335  
    file format 198  
    icon 502  
Import option 184, 185  
Import Reference option 192

importing 420  
    animation curves 188  
    attribute maps 422  
    files 184  
        by copying 190  
        by reference 192  
        merging layers 147  
    move files 186  
    plug-in 205  
improving speed,  
    Hypergraph 361  
In Main Maya Window  
    option 264  
In Separate Window option 264  
In Tangents, default 475  
Include These Inputs option 203  
Including Texture Info  
    option 203  
Infinite option 407  
information, plug-ins 253, 490  
Initial Default option 158  
Initial Graphics Exchange  
    Specification format 197  
initialParticleSE 371  
initialShadingGroup 371, 372  
input  
    curve 93  
    nodes 340  
INPUTS 281  
instance 60  
    DAG nodes 62  
    deleting from hierarchy 67  
    limitations 61  
interactive  
    display 124  
    hotkeys (paint tools) 412  
Interactive Shading option 124  
interface  
    panels 535  
    turning parts off or on 26

- interpolated curves
  - tolerance, setting 473
- intersecting surfaces 407
- intialParticleSE 372
- Invert Reference Vector
  - option 401
- invisible
  - nodes 326
  - objects 355
- Invisible Manips option 288
- isoparms
  - curve, snapping to 154
  - displaying 405

## J

- Joint Size
  - kinematics option 469
- joint1skinPartition 381
- joints
  - display size, setting 469
  - hiding 127
- Journal option 38

## K

- Keep Hard Edges option 472
- Keep Only a Reference
  - option 203
- Keep Original option 93
- Keep Wire option 472
- Key Selected option 247
- Key Ticks option 480
- Keyable tab, Attribute
  - Spreadsheet 241

- keys
  - attribute, setting 273, 291
  - creating 247
  - options 475
  - snapping option 480
- kinematics
  - hiding 125, 127

## L

- Label option 519
- Label tab 494
- labels
  - icon 504
  - overlay 507
- lattices
  - hiding 128
  - points, displaying and
    - hiding 132
  - shape, displaying and
    - hiding 132
- Layer Attributes option 146
- Layer Bar, displaying 140
- Layer Editor, displaying 145
- layered surfaces 407
- layers 139, 146
  - assigning objects to 141, 148
  - attributes 146
  - color, changing 144
  - creating 141, 148
  - import options 475
  - index number 475
  - merge options 147, 475
  - moving sets to 369
  - removing objects from 142, 149
  - renaming 141, 148
  - selecting all objects in 55

- layouts 539
  - adding to shelf 540
  - associated with scene 540
  - Attribute Spread Sheet 246
  - changes to 544
  - configuring 540
  - creating 540
  - deleting 544
  - history, maintaining 544
  - Scene Independent 540
  - selecting 539
  - updating graph 351
- Layouts option 45
- Layouts option, Panels menu 45
- leaf, selecting only 166
- lens 34
- level of detail 173
  - adding a level 175
  - changing threshold
    - distances 174
  - creating 173
  - Display Level attribute 176
  - orthographic cameras 177
  - previewing several
    - objects 176
  - re-ordering levels 175
  - Threshold attribute 174
- lighting 42
  - disabling (paint tools) 406
- Lighting menu 42

## INDEX

### lights

- barn doors 138
- center of interest 138
- cone angle 138
- cycling index 139
- decay regions 138
- dependency graph 339
- hiding 126
- manipulators 94, 137, 138
- manipulators, hiding and showing 126
- penumbra 138
- pivot 138

### limiting selection

- by object type 157
- by task 167
- object and component 157
- to hierarchy items 166
- to template objects 166

### Line Pick Size manipulator

- option 469

### Line Size manipulator

- option 469

### linear

- modification falloff 101
- stamp compensation 408

### Linear animation option 475

### Linear units option 472

### lines

- dotted 136
- solid 136
- thickness, manipulators 469

### live, making objects 171

### Load Deferred References, option 182

### Load Menus option 524

### Loaded

- plug-in option 252, 490

### loading

- plug-ins 205
- referenced files 195

### local

- axis 78
- coordinates 33
- rotate mode 87
- rotation axes, displaying and hiding 132
- space, distance locator 110
- space, Move tool 82

### Local Space option, pivot points 76

### location

- of projects 214

### locators

- arc length 114
- creating 105
- distance 107, 110
- distance, moving 109
- moving 105
- parameter values 111
- parameter, moving 112
- repositioning from Attribute Editor 106
- transforming 106

### Lock current selection icon 170

### locking

- attribute values 274, 294
- pivot points 77
- transform tool or manipulator 170

### LOD 173

### lod 173

### Long Attribute Names option, Attribute Spreadsheet 242

### Look through Barn Doors option 138

### Look Through Selected option, Panels menu 37

### Looping animation option 480

### luminance 419, 420

## M

### ma file format 196

### Make Live option 171

### Make New Layers Current 141

### managing files 179

### manipulators 72

- active 80
- camera 94
  - displaying 137
  - hiding 126
- Channel Box 288
- color 73
- combined Move/Rotate/Scale 97
- default object 94
- displaying 137
- Gimbal 87, 89
- handles 73
  - displaying and hiding 132

### light 94

- displaying 137
- hiding 126

### locking 170

### Move curve on surface 83

### Move tool 83

### pivot point 74

### rotate 86

### Rotate tool 85

### scale tool 89

### selecting

- common corners with 434
- common edges with 428

### Show Manipulator tool 91

### sizing handles 73

### snapping 154

### thickness 469

### mapping attributes 419

- Mapping missing
  - directories 218
- marker
  - animation path 84
  - hiding 126
- marking menus
  - backup files for 523
  - creating 511
  - customizing 493, 509
  - default 26
  - deleting 523
  - deleting icons from 513
  - Hotbox 25, 463
  - hotkeys 27, 515
  - MEL scripts on 522
  - modifying 516
  - paint tools 414
  - restoring backups of 524
  - right mouse button 28
  - submenus, adding 520
  - using 25
  - zones 512
- Marking Menus window 510
- marking views 47
- masked surfaces, script
  - painting 454
- material channels,
  - overriding 472
- materials dependency
  - graph 339
- Maya
  - ASCII file format 196
  - Binary file format 196
  - Embedded Language file
    - format 197
  - projects 213
  - scene information 214
  - version and release date 30
- MayaToAlias 207
- MayaToIgesDxf plug-in 206, 207
- Measure menu 107
- measure tools 107
- measuring arc lengths 114
- Medium option 134
- MEL 103
  - file format 197
  - plug-ins 251, 489
  - Script Paint Tool 441
  - script painting 447
- MEL commands 237
  - adding to marking
    - menu 519, 522
  - adding to shelf 499
  - customizing on shelf 507
  - scene orientation 33
- MEL scripts
  - adding to marking
    - menu 519, 522
  - adding to shelf 499
  - customizing on shelf 507
  - painting 441
  - propMod script 103, 105
  - stroke callback 409
- membership editing 235
- memory, improving use of 212
- menu bars
  - hiding 24
  - Hypergraph 321
  - Outliner 299
- menu options
  - adding to shelves 498
  - option boxes 17
- Menu Set preference 466
- menu sets 5
  - Hotbox 20
- menu\_ChangePanelLayout.mel 463
- menu\_ChangePanelType.mel 463
- menu\_ChangeSelectionMask.mel 463
- menu\_CommonModelingPanels.mel 463
- menu\_ControlPaneVisibility.mel 463
- menus
  - context sensitive 326
  - Hotbox 23
  - option boxes 17
  - quick access 20
  - selecting 5
- merging display layers 147, 475
- microCAD systems file
  - format 197
- min and max color (paint
  - tools) 406
- Min Color @ option 406
- Min. Length option 428
- Minibar 18, 72, 79, 87, 89
  - adding tool to shelf 498
- mirrored painting 398
- mirroring brush strokes 398
- modeling
  - aids 151
  - menus 5
- models, complex 123
- Modifier Stack. See construction
  - history 203
- Modifiers (3D Studio Max). See
  - deformers 126
- modules
  - disabling 481
  - options 481
  - selecting 5
- motion path markers 84

## INDEX

- mouse
  - entering values in Channel Box 289
  - marking menu buttons 28, 512
  - suspending complex operations during interaction 249, 487
- Mouse button(s) option 512
- move command 97
- move files 198
  - exporting 204
  - importing 186
- Move manipulator 83
- Move tool 72, 79, 82, 170
  - coordinate system 82
  - motion path markers 84
  - restricting movement 80
  - tips 81
- Move Up and Down shelf buttons 501
- Move/Rotate/Scale tool 97
- movement, restricting to one axis 80
- moving
  - numeric values 95, 97
  - selection limitations to shelf 168
- Multiple Surf option 400
- multiple surface detection 406, 407

## N

- namespaces 185
- native
  - ASCII file format 196
  - binary file format 196
- Never Save option 201
- New Curves option 470

- New File panel option 467
- New Layer button 141, 148
- New Scene Config panels option 467
- New Surfaces option 470
- next view 362
- No Gate option 38
- No Manips option 288
- node state 272

- nodes 300, 322
  - animated 323, 342
  - attribute names in dependency graph 340, 342
  - behavior, changing 272
  - child 300, 306, 322, 329
  - collapsing 300, 324
  - connecting 346
  - containing param curves 323, 342
  - controlling 304
  - DAG 62
  - default 184
  - displaying underworld 326
  - dragging from Outliner or Multilister 344
  - dragging to reconnect 349
  - empty group 307, 330
  - enabling and disabling 49
  - expanding 300, 324
  - framing in Hypergraph view 359
  - group 306, 329
  - history, selecting 92
  - input 340
  - invisible 325, 326
  - moving relative position 332
  - output 340
  - parent 299, 306, 322, 329
  - plug-ins 251, 489
  - renaming 309, 354
  - reordering in outliner 309
  - selecting 309, 352
  - shape 300, 302, 323, 326
  - slanted boxes 323, 342
  - subnodes 322, 324
  - transform 300, 323
  - types 306
- nonlinears, hiding 128
- Normal (24 fps) playback option 480

normals  
   displaying and hiding 133  
   size 136  
   size on polygons 471  
   vertex 135  
 Normals Size option 136  
 North zone, marking menu 26  
 numbering  
   edges 471  
   faces 471  
   vertices 471  
 numeric input field 15  
   moving, rotating, or scaling from 95  
 numeric values  
   absolute and relative 95  
 NURBS  
   components, displaying and hiding 132  
   curves, hiding 126  
   display options 470  
   display quality 133  
   smoothness 133  
   surfaces, hiding 126  
 NURBS Components option 132  
 NURBS Smoothness option 133  
 NURBS Smoothness Options window 134

## O

obj file format 197  
   exporting to 199, 200, 205  
 Object Components option 131  
 objectName 281

objects  
   assigning to layers 141, 148  
   attributes 69, 355  
   components, displaying and hiding 131  
   deleting 55  
   displaying 119, 122  
   duplicating 58  
   editing 51, 352  
   editing attributes of 355  
   file format 197  
   grouping 63, 185  
   hiding 125, 355  
   invisible 355  
   layer appearance 146  
   limiting selection 157  
   live 171  
   moving 79, 97  
   parenting 66, 306  
   plug-ins 251, 489  
   removing from hierarchy 67  
   removing from layers 142, 149  
   rotating 85  
   scaling 89  
   selecting 51, 352  
   selection  
     mode 476  
     priorities 168  
   shape, changing 81  
   showing for just one view 119  
   smoothness, controlling 470  
   snapping to grid, curve, point, or view plane 152  
   space coordinate system, Move tool 82  
   templates 139, 166  
   transforming 72  
   ungrouping 64  
   unparenting 67  
   untemplating 139

objExport plug-in 206  
 On File Save compression option 475  
 Only Hard option 136  
 opacity  
   brush 392  
   Script Paint Tool 445  
   stylus pressure 402  
 Opacity option 445  
 Open File panel option 467  
 Open Scene option 181  
 opening  
   Expression Editor 275, 295  
   scene file 180  
   scene files 181  
 operations, complex, suspending 249, 487  
 Optimize Scene Size option 212  
 Optimize Scene Size Options window 212  
 optimizing scene size 212  
 Option Box Command(s) option 520  
 option boxes 17  
 options 101  
 Orbit Camera. See Tumble Tool 36  
 order  
   rotation 87  
   rotation channels 89  
 orientation, changing 33  
 origin  
   setting transformations to 169  
 Origin Axis 122  
 Origin option 78  
 Orthographic option, Panels menu 41

## INDEX

- orthographic view 34
  - creating 41
- Oscillate animation option 480
- Out Tangents, default 475
- Outliner 235, 297
  - attributes, displaying in 303
  - children, displaying 301
  - limiting information displayed in 311
  - menu bar 299
  - navigating 300
  - nodes
    - displaying in 306
    - renaming 309
    - reordering 309
    - selecting 309
  - opening 298
  - panel 298
- output nodes 340
- OUTPUTS 281
- overlapping set members, preventing 379
- Overlay Label tab 494
- overlay labels 507
- Overscan camera attribute 39
- Overscan option 40

## P

- packages
  - disabling 481
  - options 481
- paint mode 406, 408
- Paint Mult option 447
- paint offset
  - Script Paint Tool 446
- Paint Offset option 446
- paint preview, showing 405
- Paint Selection Tool 160
  - options 162
  - radius, brush 163
  - selection type 164
  - settings 162
  - shape, brush 164
- Paint Set Membership Tool, editing sets 378
- paint tools 387
  - Artisan, customizing 393
  - brush
    - outlines 390
    - stroke settings 397
  - display, customizing 404
  - multiple surface detection 406
  - paint mode 406
  - profile alignment 402
  - reflected painting 398
  - resetting 397
  - settings, common 396
  - stamp compensation 406
  - stylus pressure 401
  - value options 405
- paint-selecting components 160
- palette in Color Chooser 278
- paletteColors.mel 463
- Panel Editor 533
- Panel option 44
- Panel tab 201
- panels 535
  - arrangements, saving 539
  - arranging 540
  - configuration options 467
  - creating 537
  - deleting 539
  - layouts, selecting 539
  - renaming 535
  - viewing 535
- Panels menu 43, 44
- panes, resizing 540
- param curves 323, 342
- parameter
  - locators, editing 113
  - range, changing 93
  - values, displaying 111
- Parameter Tool 111
- Parent option 66
- Parent Options window 66
- Parent to World option 67
- parents 299, 306, 322, 329
  - breaking relationship 308, 331
  - creating 307, 330
  - object hierarchies 307
  - object hierarchies 66
  - removing object from 67
- Partial curve range option 93
- partitions 379
  - adding sets to 383
  - created by Maya 380
  - created by you 379
  - creating 381
  - default 380
  - defined 379
  - displaying 382
  - removing 382
  - sets, removing from 382
- path
  - absolute 214
  - animation marker, moving 84
  - direction, aligning brush stamp profile 403
  - plug-ins 253, 490
- Path Direction option 403
- Penumbra option 138
- performance improvements 212
- Performance Settings 249, 487
  - window 249, 487

- performance, improving 124, 131, 249, 272, 467, 487
- perspective 35, 40
  - creating view 40
  - view 40
- Perspective option 37, 38, 40
- perspective view 34
- pick mask 157
- pinning pivot points 77
- Pivot camera option 137
- Pivot light option 138
- pivot points 76, 81
  - defined 74
  - displaying 74, 132
  - displaying and hiding 132
  - manipulator 74
  - moving 75, 86
  - pinning 77
  - scale, moving 90
  - temporary 77
  - translate tool 81
  - unpinning or unlocking 78
  - World Space 76
- Pixel Samples option 209
- placements, texture 126
- planes
  - hiding 126
  - view 152
- playback
  - buttons 7
  - frame rate, setting 480
  - range, setting 479
- Playback Speed option 480
- Playback Start/End options 479
- plug-ins
  - API version 253, 490
  - auto loading 252, 490
  - features 253, 490
  - importing 205
  - information about 253, 490
  - loading 252, 489
  - manager 251, 489
  - MayaToIges 206
  - MayaToIges 207
  - objExport 206
  - path 253, 490
  - references, removing 254, 492
  - unloading 254, 492
  - version 253, 490
- point snap hotkey 153
- Point to Point option 155
- points
  - cluster 374
  - measuring distance between 107
  - snapping 152, 155
  - snapping to 152
- Points option 123
- Pole Tolerance option 428
- Polygon Components
  - option 135
- polygon count 122
- polygons
  - border width 471
  - components, displaying 135
  - display options 471
  - displaying as triangles 471
  - faces, displaying 471
  - normal size, specifying 471
  - numbering faces, edges, or vertices 471
  - paint mode 408
  - painting on using Artisan 407
  - surfaces, hiding 126
  - texture border, thickening display 471
- Pop HotBox hotkey 25
- popup help 29
- popup menu
  - Channel Box 290
- Popup Menu Selection modifier option 477
- Popup Submenu option 521
- Positional tolerance option 473
- power modification falloff 102
- PowerAnimator file format 197
- Predefined Bookmarks
  - option 47
- pre-defined tabs, Attribute Spreadsheet 247
- preferences
  - files 462, 463
  - saving using userSetup.mel 464
  - setting 461
  - stored location 462
  - user interface 201
- Prefix with option 203
- Preserve Position option 63, 66, 67
- pressure, stylus 401

## INDEX

PreView file format 198  
Previous State Size manipulator  
  option 469  
Previous View option 40  
previous view, returning to 361  
priority  
  for object selection 168  
priority preference 478  
profile  
  alignment 402  
projective paint 407  
Projective Paint option 408  
projects  
  categories and locations 214  
  creating new 215  
  definition of 213  
  directories 213  
  editing 218  
  setting 217  
propmod 99  
propMod script 103, 105  
Proportional Modification  
  tool 99, 101  
proportional scaling 89  
proportional transformations 99  
  falloff 101

## Q

quality  
  display 133  
  shading 122  
querying component data 238  
Queue option 481  
Queue Size option 68, 481  
Quick Select Set option 55, 377

## R

Radio Button option 519  
radio buttons in marking  
  menus 519  
radius  
  brush (paint tools) 392  
  Paint Selection Tool 163  
  Script Paint Tool 444  
  stylus pressure 402  
Radius option 444  
RAM, freeing 481  
Range Slider 7  
  options 479  
range, parameter 93  
rebuilding graph 350, 365  
Recent Commands  
  option 22  
Recent Files 181  
Redo option 68  
redoing actions 68  
Redraw All Views option 405  
redraw options 250, 488  
reference  
  layers 139  
  vector, inverting 401  
Reference Editor 192, 194  
Reference option 191  
referenced files 191  
  cleaning up 196  
  exporting 193, 201  
  importing 193, 201  
  loading/unloading 195  
  removing 194  
  replacing 195  
  selecting objects from 194  
references  
  deferred 182  
  plug-in 254, 492  
reflected painting 398  
  non-symmetrical 400  
  polygons 409  
Reflection option 399  
Refresh option 405  
refresh options 250, 488  
Region of Affect 468  
region, dollyling 357  
Relationship Editor 235, 255  
  creating relationships 259  
  editing sets 378  
  limiting display 258  
  limiting information  
    displayed in 311  
  objects, displaying 257  
  opening 256, 369  
  relationships, displaying 257  
  sets 375  
  view options, setting 256  
Relationship Editors option 369  
relationships 260  
  adding members 261  
  creating 259  
  displaying 257  
  editing 255  
  removing members 261  
  selecting members 260  
relative paths of files 214  
relative values  
  command line 97  
  entering 96, 245, 287  
release date 30  
Remember this Layout  
  option 246  
Remove Instance option 67  
Remove Reference option 192  
removing referenced files 194  
Rename Layer window 141, 148

- renaming
  - layers 141, 148
  - nodes 309, 354
- Render File Locations 214
- rendering
  - exporting information 203
  - menus 5
  - resolution 38
- RenderMan
  - exporting 207
  - format 197
- renderPartition 380
- reordering
  - nodes in Outliner 309
  - shelves 501
- Repeat on Hold sound
  - option 478
- Repeat Size sound option 478
- repeating actions 68
- replacing referenced files 195
- resetting transformations 169
- Resolution Gate option 39
- resolution, wireframe 468
- Resolve Name Clashes by
  - option 186
- restoring backup marking
  - menus 524
- reversing actions 68
- revolve history node 92
- revolving cameras 36
- RGB color model 277
- RGB, RGBA options 420
- RIB file format 197
- ribExport plug-in 207
- right mouse button, marking
  - menus 28
- Roll Tool 36
- rolling cameras 36
- root, selecting only 166

- rotate
  - axis 88
  - channels, animating 89
  - combined
    - transformations 99
  - command 97
  - modes 87
  - numeric values 95, 97
  - objects 85
  - order 87, 88
  - pivot point, moving 86
  - pivot points, displaying 132
- Rotate tool 72, 85, 170
  - manipulators 86
- Rough option 134
- Run Up From dynamics
  - option 473
- Run Up To Current Time
  - dynamics option 473

## S

- Safe Action option 39
- Safe Title option 39
- Save All Shelves button 494
- Save All Shelves option 501
- Save File option 201
- Save File panel option 467
- saving
  - Attribute Spread Sheet
    - layouts 246
  - files 198
  - scene information 214

- scale
  - combined transformation 98
  - command 97
  - numeric values 95, 97
  - objects 89
  - pivot point 90
  - pivot points 132
  - proportionally 89
- Scale tool 72, 89
  - manipulator 89
  - Show Manipulator tool 170
- Scene Configurations 201
- scene file
  - creating 181
  - opening 180
- Scene File Locations 214
- scene hierarchy 324
  - automatic layout 334
  - creating free-form 333
  - defined 319
  - displaying background
    - image 335
  - displaying special nodes and
    - connections 326
  - parenting 329
  - rearranging nodes 331
  - terminology 299, 322
- Scene Independent layouts 540
- scenes
  - display performance 124
  - exporting 202
  - hierarchy 235
  - importing 184
  - lighting 42
  - opening 181
  - optimizing size 212
  - panel configuration options,
    - setting 467
  - referencing 190
  - saved information 214
  - too big to fit window 537

## INDEX

- Schematic window. See Hypergraph 319
- screen
  - refresh options 250, 488
  - refreshing (paint tools) 405
  - space stroke smoothing 409
- Screen Space option 409
- Script Editor option 237
- Script Editor, adding command to shelf 499
- Script Nodes 182
- Script Paint Tool 441, 447
  - add operation 446
  - flooding 454
  - opacity 445
  - options 442
  - paint offset 446
  - radius 444
  - replace operation 446
  - scale operation 446
  - shape 445
  - smooth operation 446
  - value 445
- script painting 447
  - masked surfaces 454
  - seams 438
- scripts 237
  - customizing on shelf 507
  - modification falloff 103
  - on marking menus 519, 522
  - propMod 103, 105
- sculpt objects, hiding 128
- Seam & Pole Tol. option 428
- Seam Tolerance option 428
- seams (paint tools) 426
  - attribute painting 438
  - defined 426
  - script painting 438
  - tolerance 428
  - weight painting 438
- searching for files 215
- Select All by Type option 53
- Select All History option 92
- Select All option 52
- Select brush option 164
- Select Corners option 435
- Select Edges option 428
- Select Hierarchy and Combinations icon 166
- Select Reference Contents option 192
- Select tool 72
- selecting 260
  - components 159, 160
  - CVs 160, 161, 164
  - IK handles 353
  - multiple text boxes 244, 287
  - nodes in Outliner 309
  - objects 51, 53, 352, 368
  - template objects 166
  - vertices 160, 164
- selection
  - handles, displaying 132
  - limiting by object type 157
  - limiting by component 159
  - limiting by task 167
  - masks 27, 157
  - priority 168, 478
  - type 164
- Selection Mask options
  - window 81
- set color, using (paint tools) 406
- Set Driven Key option 274, 295
- Set Named Selection. See Quick Select Set option 55
- Set Project option 217

- sets
  - adding to partitions 383
  - adding members 378
  - automatically created 367
  - cluster 368
  - collapsing 371
  - created
    - by Maya 371
    - by you 370
  - creating 375
  - creating for easy object selection 377
  - default naming of 371
  - defaultLayer 371
  - defaultLightSet 371
  - defaultObjectSet 371
  - defined 367
  - deformer 368, 374
  - displaying in Relationship Editor 379
  - editing 255
  - expanding a set's contents 371
  - explained 369
  - indentation 371
  - initialShadingGroup 372
  - intialParticleSE 372
  - member weights 368
  - membership, editing 378
  - overlapping members, preventing 379
  - quick select 377
  - removing 377
    - from partition 382
    - members 378
  - selecting 376
    - all objects in 55
    - contents only 371
    - quickly 377
  - shading group 371, 372
  - simplifying selection with 368
  - skin point 368, 374
  - user-created 367, 368
  - uses 368
- setting
  - key attributes 273
  - performance 249, 487
  - project 217
- Shade options 123
- Shaded Divisions option 470
- shaded objects
  - smoothness, controlling 470
  - wireframe on 468
- Shaded Surface Div per Span option 135
- shading
  - applying to all objects 125
  - interactive 124
  - quality 122
- shading groups
  - changing selected 348
  - display example 339
  - displaying in dependency graph 339
  - sets 371, 372
  - sets Maya creates 372
- Shading menu 122
- shape
  - brush 393
  - Paint SelectionTool 164
  - Script Paint Tool 445
- shape nodes 300, 323
  - displaying 326
  - displaying in Outliner 302
- Shape option 445
- SHAPES section 281
- Shelf Contents tab 494
- shelves
  - bookmarks, adding 49
  - commands, adding to 499
  - copying items 500
  - creating 493, 495
  - customizing 493
  - deleting 497
  - duplicating tools 248, 485
  - editing 493
  - icons, changing 502
  - items, adding to 498
  - layouts adding to 540
  - MEL commands, customizing 507
  - moving filters to 168
  - moving items between 500
  - removing items from 499
  - renaming 501
  - reordering 501
  - reordering items on 500
  - using 6
- Shelves tab 494
- Shelves window, opening 494
- Short Attribute Names option, Attribute Spreadsheet 242
- Show Active Lines option 405
- Show All Panes option 45
- Show Auxiliary Nodes 316
- Show Item Numbers option 136
- Show Manipulator tool 72, 91
  - default manipulator 94
  - history node 92
  - lights and cameras 94
- Show menu 119, 311
- Show Only Viewing Panes option 45
- Show Preview option 405
- Show Selected Columns Only option 246
- Show Text box 311

## INDEX

- shutters on spotlight 138
- simplification, hull 135
- Single File Output option 209
- Single Marquee Select modifier option 476
- size
  - handles 469
  - IK handle 469
  - joints 469
  - manipulators 469
  - scene, optimizing 212
- skin points
  - sets 368, 374
- slanted boxes 323, 342
- Smart Transform option 59
- Smooth Shade options 122
- smooth skin influences
  - hiding 128
- smoothing stroke options 409
- smoothness
  - NURBS 133
  - setting 470
- Snap
  - to Curves option 152
  - to Grids option 152
  - to Points option 152
  - to View Planes option 152
- Snap Align Objects option 155
- snap axis 155
- Snap to curves icon
  - for distance measure 108
- Snap Tolerance 478
- snapping 151
  - aligning objects 155
  - along a constraint axis 154
  - animation option 480
  - distance measure point 108
  - hotkeys 153
  - icons 151
  - to a curve on surface 154
  - to a curve or curve on surface 152
  - to a point 152
  - to a view plane 152
  - to an isoparm curve 154
  - to grid corners 152
- soft edges
  - backface culling 472
  - displaying 471
  - displaying as dotted lines 136
- softBodyPaint script 441
- sound 183
  - animation options 478
  - File Offset option 183
  - repeating on hold 478
- sound synching 479
- South zone
  - marking menu 26
- space bar 20
- Specify Selected Lights option 43
- speed of Hypergraph, improving 361
- spherePaint script 441
- Spline animation option 475
- spread sheet, attribute 235
- Spreadsheet window. See Attribute Spread Sheet 241
- stamp 391
  - compensation 406
  - compensation mode 408
  - profile 163, 444
  - profile alignment 402
- Standard Manips option 288
- Static Channels, delete options 57
- Stepped animaton option 475
- stitching
  - importing attribute maps 422
  - surfaces 438
- stroke 391
  - callback 409
  - outline trail 404
  - outlines 404
  - reflecting 398
  - settings, paint tools 397
  - smoothing 406
  - smoothing options 409
- Style option 121
- stylus pressure 401
- subCurve 93
- subdivisions
  - faces, automatically after selection 410
  - grid 121
  - option 121
- Submenu Editor 521
- submenus, adding to marking menus 520
- subnodes 322, 324
- Sudivision surfaces, hiding 126
- Surface Div per Span options 134
- Surface Divisions option 470
- surface history 91

surfaces  
 arc lengths, measuring 114  
 complex operations,  
   controlling 250, 488  
 detection 407  
 flooding 454  
 intersecting 407  
 making live 171  
 moving curves on 83  
 new, display options 470  
 parameter values,  
   displaying 111  
 smoothness, controlling 470  
 stitching 438  
 suspending complex  
   operations 249, 487  
 symmetrical painting 398

## T

tabs  
   pre-defined, Attribute  
     Spreadsheet 247  
 Tangential tolerance option 473  
 tangents, weighted 475  
 Tape. See Measure menu 107  
 task, limiting selection to 167  
 Tear Off Copy option, Panels  
   menu 45  
 Tear Off option, Panels menu 45  
 template objects  
   creating 139  
   limiting selection to 166  
   returning to standard  
     display 139  
   untemplating 139  
 templates  
   layer 139  
 Templates option 139

text boxes  
   selecting multiple 244, 287  
 texture border  
   thickening display 471  
 Texture Border option 136, 471  
 Texture Coordinates option  
   UV topology 136  
 texture paint 407, 409  
 Texture Placements option 126  
 Texture Space option 409  
 textures  
   displaying in dependency  
     graph 339  
   graph display example 349  
   mapping to attributes 275  
 Threshold attribute 174  
 TIFF file format 198  
 time ranges, setting 479  
 Time Slider 7  
 time slider  
   height, adjusting 479  
   key ticks option 480  
   options 479  
 time to video standard timecode,  
   default 480  
 Time units option 472  
 Timecode animation option 480  
 Timecode Offset option 480  
 timecodes  
   matching timing from  
     videotape 480  
 Toggle brush option 165  
 toggling CV selection 165  
 toggling vertice selection 165  
 tolerances  
   pole 428  
   seam 428  
 tool bar, Hypergraph 321  
 tool settings 248, 485

Tool Settings option 248, 485  
 Tool Settings window 82, 393  
 tools 72  
   adding to shelf 498  
   adding to shelves 498  
   Artisan 388  
   camera 36  
   defined 18  
   dragging to shelf 493  
   duplicating 248, 485  
   duplicating on shelf 500  
   Minibar 72  
   paint 388  
   plug-ins 251, 489  
   setting options 248, 485  
 tooltips 29  
 Track Tool 36  
 tracking  
   cameras 36  
   graph view 356  
 transferring objects to  
   layers 141, 148  
 transformations  
   combining 97  
   freezing and resetting 169  
   Move/Rotate/Scale tool 97  
   nodes 300, 323  
   pivot points 74  
   rotate attributes 88  
   tools, locking 170  
   using Numeric Input field 96  
 transforming objects  
   from command line 97  
   Move tool 79  
   moving tips 81  
   restricting movement 80  
   rotation 85  
 transition speed, changing 360  
 translate pivot point 81  
 triad option 83

## INDEX

- triangles, displaying polygons
  - as 471
- Truck Camera. See Track Tool 36
- Try to Add option 383
- Tumble Tool 36
- tweaking construction
  - history 170
- Twice (48 fps) playback
  - option 480
- Two Points to To Points
  - option 155
- Two Sided Lighting option 43
- type
  - deleting object components
    - by 56
  - deleting objects by 57
  - selecting by 53
- Type Is option 186

## U

- U Dir or V Dir option 399
- U Tangent option 402
- U tangent, aligning brush stamp
  - profile 402
- UI Preferences
  - window 201
- Uncompressed option 475
- underworld nodes,
  - displaying 326
- undo
  - actions 68
  - setting number of 481
- Undo option 68, 481
- Ungroup option 64
- ungrouping
  - objects 64
- Units options 472
- units preferences 472

- unloading
  - plug-ins 254, 492
  - referenced files 195
- unlocking
  - attributes 275, 294
  - pivot points 78
  - tools 170
- Unmap Key button 25
- unparenting objects 67
- unpinning pivot points 78
- Unselect brush option 164
- unselected objects, hiding 125
- unselecting
  - CVs 160, 164
  - vertices 160, 164
- untemplate 139
- Up Axis coordinate system
  - option 472
- up axis, changing 33
- Up Vector option 403
- up vector, aligning brush stamp
  - profile 403
- update options,
  - Hypergraph 361
- Update View animation
  - option 480
- upstream and downstream
  - connections 340
- Use All Lights option 42
- Use Common Edge Info
  - option 408
- Use Current Layer option 142
- Use Default Lighting option 42
- Use Marking Menu in
  - option 512
- Use Namespaces option 185,
  - 203
- Use Previously Specified Lights
  - option 42

- Use Selected Lights option 42
- Use Set Color option 406
- Use Verbose Names option 183,
  - 200
- Use Verbose Names options 203
- User defined anim curve
  - option 104
- User defined script option 103
- user interface
  - file, turning off creation 201
  - preferences files 463
- userColors.mel 463
- user-created sets 367, 368
- userHotkeys.mel 463
- userNamedCommands.mel 463
- userPrefs.mel 463
- userRGBColors.mel 463
- userSetup.mel 464
- UV Texture Paint option 408
- Update 83
- UVs, numbering 136

## V

- V Tangent option 403
- V tangent, aligning brush stamp
  - profile 403
- Value option 445
- values
  - absolute 97
  - brush 392
  - numeric, entering 95
  - range 446
  - relative 97
  - Script Paint Tool 445
- version
  - and release date 30
- vertex normals, displaying 135,
  - 471

- vertical layout of graph 342, 364
- Vertical option 40
- vertices 164
  - aligning 154
  - display options 471
  - displaying 135
  - numbering 136, 471
  - paint-selecting 160
  - selecting 160, 164
  - unselecting 160, 164
- Vertices option 471
- view
  - centering branch 360
  - centering node
    - hierarchy 359
  - centering nodes 359
  - changing transistion speed 360
  - dollyng graph 356
  - history 361
  - next 362
  - returning to prior 361
  - tracking graph 356
- View Arrangement option, Window menu 45
- View Axis 122
- view menu bars, hiding 24
- view planes, snapping to 152
- views
  - arranging 43
  - changing in current panel 26
  - displaying 45
  - laying out 45
  - marking 47
  - saving in layouts 540
  - selecting with Hypergraph 38
  - switching between 27

## W

- walk throughs 37
- WAVE file format 197
- Waveform Display sound option 478
- waveform, displaying 478
- Wavefront, exporting to 205
- weight painting seams 438
- Weighted Tangents key option 475
- weights, set member 368
- West zone marking menu 27
- white boxes in dependency graph 340, 342
- Whole Face polygon selection option 477
- Window Options option, Hotbox 24
- Window Selection help browser option 467
- Window Visibility help browser option 467
- windowPrefs.mel 463
- windows
  - changing layout 26
- wire
  - exporting 207
  - file format 197
- wireframe
  - backface culling 137, 472
  - displaying 123
  - displaying on shaded objects 468
  - option 122
  - resolution 468
  - shade option 123
- Wireframe on Shaded option 468
- working units options 472

- World Coordinate System option 33
- world space 33
  - Move tool 82
- World Space option 76
- wrap influences, hiding 128

## X

- xpm images for shelf icons 502
- X-ray shade option 123
- XYZ coordinate system 31

## Y

- Yaw Pitch Tool 37
- yellow nodes 353
- Y-up orientation 31

## Z

- zones
  - Hotbox 21
  - marking menu 512
  - marking menu defaults 26
- Zoom Tool 36
- zooming cameras 36
- Z-up orientation 32

## INDEX

USING MAYA: ESSENTIALS  
572