

# **Illumen 3D Version 1.0 Help (rev1.0)**

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## **Copyright Information**

### **All Versions**

All Illumen 3D executables and help files are Copyright 1994 by High Velocity Systems. The Illumen 3D executables and help files may not be modified and/or redistributed in any way without permission. Texture Images files were retrieved from the public domain.

### **Demonstration Version**

Permission is granted for one copy per computer for the Illumen 3D Demonstration Version as packaged by High Velocity Systems at no cost to the user.

## Objects and Files

This section discusses objects and files in general and then overviews the specific objects used in Illumen 3D.

### Objects

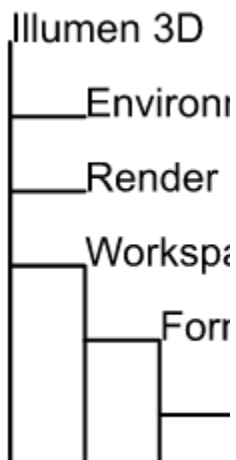
In Illumen 3D generic things are referred to as objects. Some objects span the entire scope of the program, while some objects exist only within others. The relationships between these objects and their scope is described in general in Object Relationships. Each object is discussed in detail in their own appropriate section of the manual.

### Files

When an object is placed on disk, it is then called a file. In Illumen 3D a file can hold up to 32,000 other objects within it. For instance, a form file can hold roughly 32,000 points, layers, and polygons on disk.

### Object Relationships

Objects in Illumen 3D often have relationships to other objects. Object relationships may be classified by type. Many times an object is a composition of other objects. When an object is loaded, all composed objects are loaded with it. In most object compositions, the object is made up of other objects only existing within that one particular object. The important exception is the form object which exists externally and can be in multiple workspace objects, it acts as a hybrid link/composed object. The following graph shows the object composition relationships of major objects.



Other times, objects are selected, or linked, into other objects. A link allows more than one object to use another object simultaneously. It is important to note that creating some object is not always enough, it is often necessary to select, or link that object into some other object. For instance, a material does no good on its own, it must be selected into some form objects layer to be of any use. When an object with links is loaded, the respective linked objects are not immediately loaded, although they may be requested to load by operations in the workspace, such as rendering. The following graph shows these types of relationships for major objects which have link relationships.

Illumen 3

Workspa

Envir

Renc

Forms

Points

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## What Illumen 3D Does

Illumen 3D is a three-dimensional Modeler and Renderer.

The role of the modeler is to allow the user to enter a three-dimensional description of an objects surface in the most logical way possible. The problem is that computer input and display technology are primarily focused on only two-dimensions. Illumen allows three-dimensional editing by having three parallel projection views which are two-dimensional, the top, right, and front views. The combination of these views allow the user the full range of three-dimensional motion. Actual 3D data is stored internally, however, only two-dimensional views into the three dimensional data is allowed due to the 2D representation of a computer monitor.

In Illumen 3D the 3D surface data is stored as a collection of polygons. These polygons often form only a good approximation of an actual surface; however, by increasing the number of polygons in the approximation, the stored surface can be made to look more and more like an actual surface.

The role of the renderer is to take the 3D surface description of the modeler data and to output an photo realistic shaded two dimensional picture. To achieve this, materials are applied surfaces which give the surface desired qualities, lights are placed, and the environment is described. For example, one could take a surface description of a spaceship and apply a metallic material to it, light could be placed in the distance to light the scene, stars could be placed in the environment description, then, the renderer would be able to render a metallic spaceship in the stars.

In Illumen 3D, the rendering process used is called ray-tracing. It allows a high degree of realism, including effects like translucency, reflection, refraction, and shadows. The material system allows for phong smoothing of polygons, and multiple procedural and non-procedural 2D and 3D textures.

## **Using The Manual**

All documentation for Illumen 3D is located in this Windows help file and the printed installation card. This help file may be browsed by clicking on Illumen 3D Help in the program manager, by selecting Help:Index from within Illumen 3D or by using the context sensitive help function which will automatically locate a particular portion of the help file which pertains to the context of the help call.

This manual is divided up into two main sections: Introduction, and Operational Reference.

### **Introduction**

Provides an introduction to Illumen 3D, including an introduction to multiple editors and a sample design cycle.

### **Operational Reference**

The operational reference contains program operation description by overview of logical groupings and by command.

It is recommended that you read the introduction and experiment with the program to get an idea of how Illumen 3D works. Try opening some of the example workspaces and images. Try clicking around (with both mouse buttons) in a workspace. When you have specific questions about functions, look into the operational reference section either by browsing the help file, by calling the context sensitive help in the area you have a question, or by using the search button. Whenever you use context sensitive help, you bring up information from the command section. Sometimes, it will be useful to go to the overview sections to get a broader idea of what's happening.

When working with the manual, you may want to select 'Help:Always on Top' from the help window so that the help window will always stay on top of the screen.

## **Features and Requirements**

New 3D modeler and renderer from High Velocity Systems incorporates logical polygon mesh based editing with the power of raytracing into one integrated environment. From the surreal to the real, your creativity is set free to create images from your dreams to recreation of actual scenery. Find your inspiration within Illumen 3D, your 3D toolbox.

### **Features:**

- Object oriented operation
- Powerful View System with user definable views which can work independently or cooperatively
- Point Editing of Polygon Mesh based objects
- Extrude and Lathe
- Create smooth 3D forms by deforming existing objects with linear, exponential, and bell curves
- Parameterized Primitive Creation
- Quick access to functions via button bar and accelerator keys
- Dynamic Object Cloning
- Standardized use of color
- Ray Tracing allows reflection, translucency, refraction, and shadows
- Texture mapping of color, translucency, reflection, and bumps
- Procedural textures include wood, marble, clouds, turbulent color ranges, granite.
- Environmental effects include horizon, fog, and stars
- Use of Jpeg image standard
- Context sensitive help

### **Uses:**

- Desktop publishing
- Advertising
- Simulation
- Multimedia Presentations
- Creation of Original Art Work

### **System Requirements:**

- Windows 3.1 (or better) running in enhanced mode
- Video card running in 256 or more colors at or above 640x480
- 386,486, Pentium (or better) with math co-processor.
- 4MB or More Ram
- 5MB or More Free Hard Drive Space

### **System Recommendations:**

- Windows 3.1 (or better) enabled Virtual Memory

True-color (16 or 24 bit) display at or above 800x600  
486, Pentium (or better) with math co-processor  
8MB or More Ram



## **Illumen 3D Demo**

The Illumen 3D Demo is a working demonstration of the Illumen 3D product. It includes all of the Illumen 3D package, except save is disabled in workspaces, and it only renders at 160x120.

The Illumen 3D Demo comes in the form of a zip file. To use the demo, retrieve it and place the file in its own directory and unzip it using an unzipping tool like pkunzip. You must unzip the file so that the directory structure is restored. For pkunzip, use `pkunzip /d illumend.zip`. The Illumen 3D demo will decompress into that directory. Start Illumen 3D by running `illumend.exe` from within Windows.

The Illumen 3D Demo is available from the High Velocity Systems WWW site. See [Sales, Service, and Information](#).

## **Sales, Service, and Information**

### **Sales of Illumen 3D.**

See [Order Form](#).

### **Service**

All service for the Illumen 3D product is handled through any of the following addresses of High Velocity Systems:

Internet Mail Address: [jvanabra@nyx10.cs.du.edu](mailto:jvanabra@nyx10.cs.du.edu)

Mail Address: High Velocity Systems; 6521 S. 41st Street; Lincoln, NE 68516

### **Information**

Additional information about Illumen 3D can be found on the World Wide Web at:

WWW Address: <http://nyx10.cs.du.edu:8001/~jvanabra/highvel.html>

## **Order Form for Illumen 3D V1.0 (rev 1.0)**

### **To Order:**

Print out this form by selecting File:Print Topic, fill in, and mail form and payment to address below.

### **Information:**

Price: US \$149

Shipping: Second Day Shipping Included in price (Where available)

Sales Tax: Included in price (When applicable)

Payment Method: Check or Money order in US Funds written out to High Velocity Systems

### **Mail Completed Form To:**

High Velocity Systems

6521 S. 41st Street

Lincoln, NE 68516 USA

### **Fill In These Entries, Please Print:**

Company Name (optional):

First Name:

Last Name:

Street Address (1):

Street Address (2) (optional):

City:

State:

Zip Code:

Country:

Telephone Number:

E-Mail Address (optional):

Quantity Ordered:

Total Payment Included:

### **Additional Optional Information:**

Where did you get this from?:

Any Comments?:

## **Using The Editors**

### **Using Multiple Editors**

Illumen is divided up into five distinct editors. These editors work together to produce your 3D rendering project. They are all accessed from within the Illumen 3D application main window using MDI, Window's multiple document interface. Any number of files of any type may be edited simultaneously. The job of each editor is to allow you to manipulate a specific object or set of objects.

## The Design Cycle

This section covers a general design cycle used in Illumen 3D. This design cycle is to give the new user an idea of what working in Illumen 3D is like, and how to go about creating rendering projects.

### I. Startup

1. Come up with the project idea.

One could ask: what is the theme of the project?, what is the artistic style of the project?, what will the project be composed of?, what time will this project take to complete?

2. Find existing objects which could be used in the project.

If a part of the project already exists, such as a render settings file, a form object, or an environment, then you should try to reuse that part in your current project. Doing this will greatly reduce project generation time.

3. Create a new Workspace.

Select File:New to create a new workspace.

### II. Create needed Form Objects and Materials

1. Create a Form Object in the Workspace

Using the Mouse, create a new form in the workspace. Edit the object using all the Workspace Editor tools.

2. Create Materials for the Form Object and Apply them.

Select File:New to create a new material and/or find usable materials already created. Edit materials in the Material Editor. Apply the materials to the form object layers in the Workspace Editor using Layer Properties.

3. Place a camera and light.

Using the Mouse, create a new camera and light and/or drag them into position. Select the camera into the camera view using View Properties on the selected camera view.

4. Setup a simple Render Settings file for test rendering.

Select File:New to create a new Render Settings file, or use one previously created. Select that Render Settings file into the workspace using the Workspace Properties command. The render settings file should generate a small image, so that the rendering will not take much time.

5. Setup a simple Environment for test rendering.

Select File:New to create a new Environment file, or use one previously created. Select that Environment file into the workspace using the Workspace Properties command. The environment file should not use to many environment features, so that the rendering will not take much time.

6. Test render the Form Objects.

Select the camera view and choose View:Render to render the scene.

7. Repeat until all objects are created.

### **III. Scene Organization**

1. Think of how the Form Objects, Lights, and Camera Position should work together in the scene. Using the Mouse and other Workspace Editor tools, position the object for the final scene.
2. Setup an Environment file for the final scene.  
Select File:New to create a new Environment file, or use one previously created. Select that Environment file into the workspace using the Workspace Properties command. This environment file should be setup as the environment for the final image.
3. Test Render the arranged objects in the environment using the test Render Settings.  
Select the camera view and choose View:Render to render the scene. Use the test Render Settings so that the rendering does not take too long.
4. Repeat until satisfied with appearance.

### **IV. Generate the Final Image**

1. Setup a final render settings file.  
Select File:New to create a new Render Settings file, or use one previously created. Select that Render Settings file into the workspace using the Workspace Properties command. The render settings file should generate the appropriate final image.
2. Render the final image.  
Select the camera view and choose View:Render to render the scene.

## **Main Application Window**

All operations in Illumen happen in the Illumen Main Application Window. The following important parts will be discussed here: Title Bar, Status Bar, Tool Bar, Common Editor Menus

### **Title Bar**

The title bar states the application name and the current file.

### **Status Bar**

The status bar informs the user on the state of current processes. See the menu command [Window:Status Bar](#).

### **Menus**

Most Illumen functions are accessed from standard Windows menus. When accessing a menu, a description of that menu's function is shown in the Status Bar. Certain operations are available in all editors, while other operations are only accessible from one type of editor.

All file manipulation is done with the File Menu. Windows may be manipulated by using the standard Windows operations, including those functions accessible from the Window Menu. These two menus, including the Help Menu are common menus available in all editors. They are described in the following links:

[Common File Menu](#)

[Common Window Menu](#)

[Common Help Menu](#)

### **Tool Bar**

Certain menu functions can be accessed via the tool bar. To use the Tool Bar, click on the picture representation of the function you want to invoke. When you click on a Tool Bar button, a description of the function is displayed in the Status Bar. See the menu command [Window::Tool Bar](#).

### **Accelerator Keys**

Certain menu functions can also be accessed via accelerator keys. If there exists an accelerator key for a menu item, then it is stated in that menu functions name. Functions with accelerator keys may be accessed by pressing and holding either the Alt or Ctrl keys and then pressing another key. The notation used to denote this, for example, is Alt+A or Ctrl+1.

## **Common File Menu**

### **New**

Use this command to create a new document. Select the type of new document you want to create in the File Type Dialog Box.

### **Open**

Use this command to open a new document. Select the type of document you want to open in the File Type Dialog Box. Select the name of the file to open in the File Open Dialog Box.

### **Close**

Use this command to close the active document. Illumen suggests that you save changes to your document before you close it. If you close a document without saving, you lose all changes made since the last time you saved it. You may also close the document by closing all windows representing the active document.

### **Save**

Use this command to save the active document using the current name. If a name has not yet been given, then you will be asked to choose a file name in the File Save Dialog Box.

### **Save As...**

Use this command to save the active document under a new name. You will be asked to choose a document name in the File Save Dialog Box.

### **Exit**

Use this command to quit Illumen. All active documents will be closed and Illumen will exit. If there are any unsaved documents you will be prompted to save them.

### **Most Recently Used List**

Illumen keeps track of the four most recently used documents and displays them in the most recently used list at the end of the file menu. Selecting one of these menu items will open the corresponding document.



## **Common Window Menu**

### **Placement Bar**

Selecting this command toggles the Placement Bar on and off. A check mark in front of the menu signifies that the Placement Bar is open.

### **Tool Bar**

Certain menu functions can be accessed via the tool bar. To use the Tool Bar, click on the picture representation of the function you want to invoke. When you click on a Tool Bar button, a description of the function is displayed in the Status Bar. Selecting this command toggles the Tool Bar on and off. A check mark in front of the menu signifies that the Placement Bar is open.

### **Status Bar**

The status bar informs the user on the state of current processes. Selecting this command toggles the Status Bar on and off. A check mark in front of the menu signifies that the Status Bar is open.

### **Arrange Icons**

Selecting this command organizes all icons in to an orderly pattern at the bottom of the application window.

### **Window List**

The window list is a list of all active windows currently open in Illumen 3D. Selecting one of the windows in the list will bring that window to the top and activate it.

## **Common Help Menu**

### **Contents**

Opens the contents page of the Illumen 3D help file.

### **Context Help**

Opens help, moving to the page which relates to what is currently selected. You may use the F1 key to get help on selected windows, dialog boxes, and menu items.

### **Context Help Cursor**

Starts Context Help Cursor Mode. After selecting this, the mouse cursor will change to a help pointer. You may then click upon a window, select from the toolbar, or select a menu item to get help on that particular thing.

### **Using Windows Help**

Opens the standard windows help file on using help.

### **About Illumen**

Opens the [About Illumen Dialog Box](#).

## **About Illumen Dialog Box**

The About Dialog Box Displays the following information:

- Copyright notice

- Version number

- Available Memory

- Math Co-processor Availability

- Disk space on current drive

## **File Type Dialog Box**

Allows you to select a file type to create or to open.

Select "Create A New File..." to create a new file,  
or select "Open An Existing File..." to open a file which already exists on disk.

Then, click on the button representing the file type you want:

Workspace

Render Settings

Environment

Material Settings

Image (Available for Open An Existing File Only)

Or, Select cancel to abort the operation.

## **File Open Dialog Box**

The following options allow you to specify which file to open:

### **File Name**

Type or select the filename you want to open. This box lists files with the extension you select in the List Files of Type box.

### **List Files of Type**

Select file type to open. If possible Illumen presents the most logical type already selected.

### **Drives**

Select the drive in which Illumen stores the file that you want to open.

### **Directories**

Select the directory in which Illumen stores the file that you want to open.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.

## **File Save Dialog Box**

The following options allow you to specify which file to save:

### **File Name**

Type or select the filename you want to save. This box lists files with the extension you select in the List Files of Type box.

### **List Files of Type**

Select file type to save. If possible Illumen presents the most logical type already selected.

### **Drives**

Select the drive in which Illumen will store the file that you want to save.

### **Directories**

Select the directory in which Illumen will store the file that you want to save.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.

## Material Editor

A Material File describes the surface of Form Objects which the renderer will create. The Material Editor represents a Material File by dialog controls which allow the manipulation of the file.

The following menu is unique to the Material Editor:

Material Preview Menu

The texture system is described in:

Texture System

The following controls are used:

### **Name**

Use this control to edit the name of the material file. This name is for descriptive purposes only, it is not the file name.

### **Color**

Click on this color box to edit the color of the material.

### **Specular**

Click on this color box to edit the specular color of the material. The specular color is the color of the reflective spot on the object. Set this color to white for a plasticity feel. Set this color close to the color of the material for a more 'realistic' look.

### **Reflect**

Click on this color box to edit the reflectivity of the material. The higher the number of any color component, the more that color component is reflected on the surface. When set to white, the material is perfectly reflective.

### **Filter**

Click on this color box to edit the filter, or translucency, of the material. The higher the number of any color component, the more that color component is transmitted through surface. When set to white, the material is perfectly translucent.

### **Hardness**

This edit box controls the hardness of the material. Harder materials have smaller specular highlights, while softer materials have larger specular highlights.

### **Index of Refraction**

This edit box controls the index of refraction of the material. This number only affects the material if the material has some filter defined. The area around a form is assumed to be air. The index of refraction

of some common materials are defined below:

#### Index of Refraction of Some Common Materials

Air: 1.00

Water: 1.33

Salt: 1.54

Quartz: 1.55

Emerald: 1.57

Glass: 1.66

Crystal: 2.00

Diamond: 2.42

The index of refraction affects how light is bent as it passes through the surface of a material. As light enters an area of a higher index of refraction, light is bent toward the surface normal. As light enters an area of lower index of refraction, the light is bent away from the surface normal.

#### Phong

When checked, phong smoothing is enabled. When not checked, phong smoothing is disabled. Phong smoothing has the effect of smoothing out the polygons which are connected by the exact same points. This effects the appearance of the form objects surface, and not the actual polygon data. Because of this, the silhouette of the object still appears to have sharp polygon edges, while the inner area appears smooth. Phong works across the boundaries of layers.

To use phong effectively, the workspace editor must allow the joining and separation of points so that areas where there the phong smoothing stops can be defined. To join points in the exact same location into one actual point, select the points and call Edit:Join. To separate a point into two points which share the same location but are attached to different polygons, select the polygons which will form the smoothed or the non-smoothed area, then call Edit:Cut and then Edit:Paste.

#### Texture List

The texture list box lists all textures applied to the current material. Textures are described in depth in Texture System. To select the current texture, click on it. To edit the properties of the texture, you may double click on it.

#### (Texture List) Add

Click on this button to add a texture to the material. The Add Texture Dialog Box appears to allow you to select the texture. The property page of the texture then appears.

#### (Texture List) Drop

Click on this button to remove the current texture from the material.

#### (Texture List) Properties

Click on this button to edit the properties of the current texture.





## **Add Texture Dialog Box**

### **Texture List**

Select the texture you want to add to the current material by clicking on the name of the texture and clicking on OK, or by double clicking on the name of the texture.

Available Textures:

Bitmap

Checkerboard

Clouds

Color Range

Granite

Marble

Radial Wave

Roughness

Wood

## **Material Preview Menu**

The material preview menu allows you to preview the current material in a variety of ways without setting up a form object to view it on.

### **Sphere**

Select this command to render the current material on a sphere.

### **Box**

Select this command to render the current material on a box.

### **Complex**

Select this command to render the current material on a complex scene.

### **(Background) Black**

Select this command to set the background for material preview renders to black.

### **(Background) White**

Select this command to set the background for material preview renders to white.

### **(Background) Color Gradient**

Select this command to set the background for material preview renders to a red-green-blue color range.

## Texture System

This section describes the texture system.

### Texture Definition

Texture is used to vary an attribute of a material by position within a texture domain.

### Texture Modifications

Textures may vary the Color, Filter, Reflect, and Surface Normal of a surface. For example, by color modification texture can be used to define complex material patterns such as wood, or to project images upon an object. By Filter and Reflect modification, it can make the reflective and translucent spots of an ornament. By Surface Normal modification (called Bump Mapping, or Bump Normal), it can be used to simulate the bumps of a rock. Bump normal effects only modify the surface normal of the form object, and thus the edges and silhouette of the form remains the same.

### The Texture Domain

The texture domain, which is the area in which texture exists, is defined by the layer axis of the form object in which the material is selected into. The visual length of the layer axis x,y and z components is 1 unit. Positioning, Rotating, and Scaling the layer axis correspondingly affects how the texture is mapped.

### Texture Domain Mappings

Texture may be defined in the texture domain either by a two or three dimensional mapping. These mappings are defined as follows:


#### Two Dimensional Mappings

A Two Dimensional Map takes a texture which is defined in 2D and maps it to the 3D texture domain using either a plane, cylinder, or sphere mapping, such that a texture map:



Will be mapped as follows:

Plane



All points at  $(x,y)$  regardless of the Z component retrieve their color from  $x,y$

Cylinder



All points  $(x,y,z)$  retrieve their color from their angle around the Z axis and the Z component.

Sphere



All points  $(x,y,z)$  retrieve their color from their angle around the Z and Y axes.

### Three Dimensional Mapping

A Three dimensional mapping is called space filling. In a Three Dimensional map, all points in the texture domain are already defined, so no extra mapping is required.

### Combining Textures

Many textures of the same modification type may be defined at the same position. When this happens, there respective attributes at that position are added.

### Texture Types

Bitmap: see [Bitmap Properties Dialog Box](#)

Checkerboard: see [Checkerboard Properties Dialog Box](#)

Clouds: see [Clouds Properties Dialog Box](#)

Color Range: see [Color Range Properties Dialog Box](#)

Granite: see [Granite Properties Dialog Box](#)

Marble: see [Marble Properties Dialog Box](#)

Radial Wave: see [Radial Wave Properties Dialog Box](#)

Roughness: see [Roughness Properties Dialog Box](#)

Wood: see [Wood Properties Dialog Box](#)

## **Bitmap Properties Dialog Box**

See [Texture System](#) for general information on texture.

Property Modification: Color, Filter, Reflectivity, Bump Normal

Mapping Type: Plane, Cylinder, Sphere

Bitmap texture defines a JPG image file as a 2D map. Mapped Color, Filter, and Reflectivity properties are taken directly from the bitmap. The surface normal is modified by interpreting the red value of the bitmap as the height to disturb the surface of the object at any mapping point.

### **(Bitmap Image) Browse**

Click on this button to select the JPG image file to map.

### **Horizontal Repetitions**

Controls the number of times the image is tiled horizontally (y axis.)

### **Vertical Repetitions**

Controls the number of times the image is tiled vertically (x axis)

### **Bump Height**

Defines the bump height of the maximum red value for bump normal modifications.

### **Mapping**

Defines a 2D->3D map as defined in [Texture System](#).

### **Object Modification**

Click on the modification types desired, as described in [Texture System](#).

## Checkerboard Properties Box

See [Texture System](#) for general information on texture.

Property Modification: Color, Filter, Reflect

Mapping Type: 2D

The checkerboard texture defines a pattern of alternating color squares in 2D.

### First Color

Defines the color of the first set of checks.

### Second Color

Defines the color of the second set of checks.

### Horizontal Repetitions

Defines the number of horizontal tilings (y axis.)

### Vertical Repetitions

Defines the number of vertical tilings (x axis.)

### Twist Per Radial Unit

Defines how the checkerboard twists around the origin. When set to zero, no twisting occurs. When set to 90, the checkerboard twists 90 degrees at a distance of one from the origin.

### Mapping

Defines a 2D->3D map as defined in [Texture System](#).

### Object Modification

Click on the modification types desired, as described in [Texture System](#).



## **Clouds Properties Dialog Box**

See [Texture System](#) for general information on texture.

Property Modification: Color

Mapping Type: 3D Space Filling

This texture creates a cloud-like texture in 3D.

### **Color Map**

Click to define a color mapping.

### **Turbulence**

Controls the turbulence of the clouds. Higher numbers produce more turbulence, while lower number produce a more calm effect.

## Color Range Properties Dialog Box

See [Texture System](#) for general information on texture.

Property Modification: Color

Mapping Type: 3D

This texture creates a color range on a form object in various ways.

### Color Map

Click to define a color map for the color range.

### (Areas Of Equal Color) XY Planes

Click to make the planes corresponding to  $z=\text{constant}$  the areas of equal color.

### (Areas Of Equal Color) Cylinders around Z

Click to make cylinders with an axis at the z axis corresponding to  $\text{radius}=\text{constant}$  the areas of equal color.

### (Areas Of Equal Color) Spheres a Origin

Click to make spheres with their centers at the origin corresponding to  $\text{radius}=\text{constant}$  the areas of equal color.

### (Areas Of Equal Color) Radial Planes Around Z

Click to make planes which rotate about the z axis through the yz plane the areas of equal color.

### Turbulence

Controls the turbulence of the color range. Higher numbers produce more turbulence, while lower number produce a more calm effect. Set to zero to create a non-turbulent color range.

## **Granite Properties Dialog Box**

See [Texture System](#) for general information on texture.

Property Modification: Color

Mapping Type: 3D Space Filling

This texture creates a 3D granite like effect.

### **Color**

Click to define the color of granite.

## **Marble Properties Dialog Box**

See [Texture System](#) for general information on texture.

Property Modification: Color

Mapping Type: 3D Space Filling

This texture creates a 3D marble effect.

### **Color Map**

Click to define a color mapping.

### **Turbulence**

Controls the turbulence of the color range. Higher numbers produce more turbulence, while lower number produce a more calm effect.

## Radial Wave Properties Dialog Box

See [Texture System](#) for general information on texture.

Property Modification: Bump Normal

Mapping Type: 2D

This texture creates a radial wave effect, like a rock dropped in water.

### Height

Defines the height of the radial wave.

### Wave Length

Defines the wave length of the radial wave. The wavelength is the length of one complete wave.

### Phase

Defines the phase of the wavelength. Increasing the phase pushes the wave along its path.

### Radius at A/2

Defines the radius(distance) at which the amplitude (height) is one half of its original value. Set to a large value to create the effect of no decay.

### Mapping

Defines a 2D->3D mapping as described in [Texture System](#).

## **Roughness Properties Dialog Box**

See [Texture System](#) for general information on texture.

Property Modification: Bump Normal

Mapping Type: 3D Space Filling

This texture creates a roughness or graniness.

### **Use Noise**

Click on this to create noise base roughness.

### **Use Turbulence**

Click on this to create turbulence based roughness.

### **Roughness**

Defines the amount of roughness. Higher values produce more roughness. Lower values produce less roughness.

## **Wood Properties Dialog Box**

See [Texture System](#) for general information on texture.

Property Modification: Color

Mapping Type: 3D Space Filling

This texture creates a wood effect.

### **Base Color**

Click on this button to define the base color of the wood.

### **Grain Color**

Click on this button to define the color of the grain of the wood.

### **Radial Waves**

Defines the number of whole waves around one grain ring.

### **Length Per Twist**

Defines the length at which one whole twist of the grain occurs.

### **Percent Base**

Defines the percent of the wood effect which should be colored the Base Color.

### **Radial Ring Size**

Defines the size of one radial ring.

## **Workspace Editor**

Overview by group looks at some major function groups of the workspace. Reference By Function describes individual functions. Discussion in Overview By Group will often reference those things in the Reference By Function section.

### **Overview By Group**

[The Workspace and Objects](#)

[Coordinates](#)

[View System](#)

[Space Manipulation](#)

[Object Generation](#)

[Finding Objects](#)

[Composition and Properties](#)

[Form Generation and Deformation](#)

[Clipboard](#)

[Cloning](#)

[Rendering](#)

### **Reference By Function**

[Workspace Mouse Operations](#)

[Workspace Edit Menu](#)

[Workspace Mode Menu](#)

[Workspace View Menu](#)

[Workspace Window Menu](#)

[Placement Bar](#)



## Rendering

Rendering is started by calling [View:Render](#).

## Cloning

Cloning is a dynamic method of copying the form into another form such that changes in the master, or original form, are updated to the clone as they are made. See [Form Property Page Dialog Box](#) for more information on cloning.

## Clipboard

The clipboard is a temporary storing location for objects of any type. The functions cut, copy, paste operate on the clipboard. See [Workspace Edit Menu](#) for description of these operations.

## Form Generation and Deformation

Primitive shapes may be generated by calling Edit:Add Primitive. Lathes of polygons may be generated by calling Edit:Lathe. Extrusions of polygons may be generated by calling Edit:Extrude. To deform a set of points of a form, see Mode:Curved Drag.

## **Composition and Properties**

Contents and Properties are defined for most objects in the workspace. To determine what an object is made out of, select the object, and call Edit:Contents. To edit the properties of an object, select the object, and call Edit:Properties.

## **Finding Objects**

Objects may be found by looking up their name on the [Placement Bar](#).

## **Object Generation**

Objects are generated by using [Workspace Mouse Operations](#).

## **Space Manipulation**

Objects are manipulated by Workspace Mouse Operations and functions in the Workspace Edit Menu and the Workspace Mode Menu.



## **View System**

Since a scene is defined in 3D and monitors are only 2D there is a need to define a viewing system into 3D. A view into this 3-space can be of three different types, either top, front, right, or camera. There may be any number of any types of views. These views are enclosed by a window frame in the workspace. Views are manipulated using normal Windows window operations and those functions in the Workspace View Menu and the Workspace Window Menu.

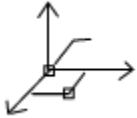
## Coordinates

### 3D Space and Coordinates

In Illumen 3D, a 3d space system is defined. All spots in this space can be addressed by an ordered triple, or coordinate. A coordinate consists of three real component values, 'x', 'y', and 'z' which may be written  $(x,y,z)$ . These component values denote the distance in one direction in the space.

### Axis

An axis is used to represent the position, rotation, and scale of space. Its origin is the origin of the space, which is the coordinate  $(0,0,0)$ . Three rays are drawn from the origin in the direction of each component part of the space to define rotation. The length of the ray is relative to the scale of the space in that direction. The axis of a form is drawn to a length of 40. The axis of a layer is drawn to a length of 1.



## The Workspace and Objects

This section overview the workspace and describes the purpose of objects in the workspace.

### The Workspace

The workspace is the area in which a scene is setup. The workspace defines a standard 3d coordinate space called the world space. The idea of a coordinate space is discussed in [coordinates](#). Within the workspace many objects may exist. Objects in the workspace are manipulated through a [view system](#). Existing objects are manipulated through their hotspot. The hotspot is a small clickable box. To affect an object, it must be selected. Discussion of selection and many manipulations is in [space manipulation](#). Discussion of object generation is in [object generation](#). The workspace edits cameras, lights, and forms.

When an object consists of many different editable part types, then in order to edit all the types, different levels of the object are defined. In order to edit at different levels, one must change the editing level to the appropriate level for that part. This is done by selecting the object at the current level, and then changing the level one step closer to the one you wish to step to by using the [Workspace Mode Menu](#). Move back to the Root Level to operate on object axes, lights, and cameras.

### Forms

Forms are the objects which describe the surfaces of things in the scene, such as a ball, or a table. A form is a complex object consisting of many parts types. A form consists of an axis, points, layers, and polygons.

The axis defines a local coordinate space which is independently oriented from the world space. Everything within the form exists within this local coordinate space. The idea of coordinate spaces and axis is defined in [coordinates](#). This axis may be rotated, scaled, moved, and dragged thereby rotating, scaling, moving, and dragging everything within it from the view of the world space.

Points define a place in 3D space. The points of a form are edited by selecting the axis of that form and then changing to the point editing level by using the [Workspace Mode Menu](#).

Layers define a collection of polygons which share a material. The axis of the layer defines a texture domain as described in [Texture System](#). The layers of a form are edited by selecting the axis of that form and then changing to the layer editing level by using the [Workspace Mode Menu](#).

Polygons define a portion of the surface of a form. Polygons may consist of any number of connected points existing in a plane. Polygons are considered 'oriented' according to the direction in which the points are ordered. When creating polygons by hand, it is important that you orient all polygons clockwise when viewed from the outside surface of the polygon. Currently, only convex polygons are supported by the renderer, this means that polygons can not have segments which cave into the polygon. The polygons of a form are edited by selecting a layer of that form and then changing to the polygon editing level by using the [Workspace Mode Menu](#).

### Camera

A Camera is used to look into the scene much like a movie camera looks at a scene. A camera consists

of three distinct parts: the Camera, noted by a 'C'; the target, noted by a '\*'; and the up direction of the camera; noted by a 'U'. By moving these three parts, any view possible into the scene is possible.

### **Light**

Lights are used to make the scene visible. They are moved around the scene to create different lighting effects.

## **Placement Bar**

The placement bar displays current coordinates for accurate positioning and a list of objects in the workspace. To open or close the placement bar, use the menu command Window::Placement Bar.

### **X, Y, Z**

Displays the current X, Y, and Z position, rotation, or scale according to the context of the operation. When in Rotate mode, the rotation of the selected object is displayed. When in Scale mode, the scale of the selected object is displayed. When in move mode, while dragging, or while just moving the pointer in the view, the current position of the object is displayed.

### **Relative**

When checked everything tracked by the X,Y,Z display is displayed relative to the last position. When not checked, all operations are tracked in an absolute coordinates.

### **Object List**

Displays a list of all objects in the current workspace by name. The object list is especially useful for selecting objects by name, for finding objects, and for determining which objects exist in a workspace.

Selected objects have a darkened background, while objects which are not selected have bright backgrounds. You may select an object by clicking on it with the primary mouse button. You may select multiple objects by clicking on an object with the primary mouse button and dragging, or by holding down the Control (Ctrl) Key and selecting multiple objects individually. To deselect an object, hold down the Control (Ctrl) Key and click on it with the primary mouse button.

## Workspace Mouse Operations

This section describes mouse operations within the workspace in a view under normal circumstances. When a command alters the way the mouse functions, it is detailed within that command's description. Mouse functionality is presented by operation.

### Object Creation

To create an object, click on the secondary mouse button. An object will be created at the mouse position according to which editing level you're in. If more than one type of object can be created at a given level, then a menu will popup to allow you to choose which type of object to create.

When creating polygons, click on the secondary mouse button for every point to add to the polygon. If you click on an existing point, then that point will be incorporated into the polygon. If you click in an area with no points, then a point will be created there. To finish the polygon, click the primary mouse button. See [The Workspace and Objects](#) for information on polygon orientation.

### Object Selection

To select an object click on the primary mouse button on the object hotspot. The hotspot is a small box which when deselected is black, and when selected is red.

### Object Selection Box

To select all objects within a certain rectangular area, click and hold the primary mouse button in an area without any hotspots; this spot will define one corner of the rectangle. Now, drag the mouse to another position to define the second corner. The selection box will be drawn as you drag the mouse. When you are satisfied with the area, release the primary mouse button. All the objects which have hotspots within the drawn box will be selected.

### Multiple Object Selection

To select more than one object at once, hold down the control (ctrl) key and individually select the objects either by individual selection of object selection box.

### Object Deselection

To deselect an object click on the primary mouse button on the object hotspot. The hotspot is a small box which when deselected is black, and when selected is red.

### Deselecting All

To deselect all objects at the current editing level, click the primary mouse button in an area with no hotspots.

### Zooming

To zoom a view, hold down the shift key and click and hold down the primary mouse button. To zoom in, drag the mouse up. To zoom out, drag the mouse down. The display updates as you move the mouse.

When satisfied with the zoom level, release the mouse button and the shift key.

### **Panning**

To pan a view, use the two sliders at the left and bottom of the views. To pan up and down, move the slider at the left. To pan left and right, move the slider at the bottom.

### **Dragging**

To drag an object, click and hold the objects hotspot with the primary mouse button. Move the mouse and the object will drag with it. To drag multiple objects, hold down the Control (ctrl) key, and click and hold on any of the objects hotspots with the primary mouse button. Release the buttons when finished.

### **Handling Mouse Operations in Parallel Projections**

The problem is that objects in flat projections often wind up with points in the same visual spot. This makes selection of those points difficult. The solution is that Illumen 3D stores all points in a list and when the mouse is clicked, the list is searched from head to tail for the first point at the mouse location. When a point is selected, it is moved to the front of the list. When deselected, it moves to the back of the list. So, in effect, you can set the priority of points for the selection search by:

- 1) Selecting/deselecting points in a view where the points do not overlap to set the search priority.
- 2) Moving to the view where the overlap problem existed and clicking. The first point in the list that is clicked upon will be selected.

## **Workspace Window Menu**

### **New**

Select this command to add a new window to the current workspace. The new windows properties will be copied from the current window.

### **Arrange Windows: 1 Custom**

Select this command to arrange the windows of the current workspace into positions stored in Custom Arrangement 1.

### **Arrange Windows: 2 Custom**

Select this command to arrange the windows of the current workspace into positions stored in Custom Arrangement 2.

### **Arrange Windows: 3 Quad View**

Select this command to arrange windows of the current workspace into a quad view. All top windows are placed in the upper left quadrant. All front windows are placed in the bottom left quadrant. All camera windows are placed in the upper right quadrant. All right windows are placed in the bottom right quadrant.

### **Arrange Windows: 4 Restore**

Select this command to restore all iconized windows of the current workspace into their last positions.

### **Arrange Windows: 5 Minimize**

Select this command to minimize all windows of the current workspace into icons.

### **Arrange Windows: Snapshot 1**

Select this command to store the current windows position of the workspace into Custom Arrangement 1.

### **Arrange Windows: Snapshot 2**

Select this command to store the current windows position of the workspace into Custom Arrangement 2.



## Workspace View Menu

### Type

Opens the [View Type Dialog Box](#) to allow you to set the type of view projection to use in the current view.

### Properties

Opens the [Camera View Properties](#) for camera views, or the [Parallel View Properties](#) for non-camera views to allow you to modify the properties of the view.

### Center

Centers the current view on the selected objects in the workspace. This function does not operate on camera views.

### Center All

Centers the all non-camera views on the selected objects in the workspace.

### Center & Zoom

Centers and Zooms the current view on the selected objects in the workspace so that the objects fill the view. This function does not operate on camera views.

### Center & Zoom All

Centers and Zooms all non-camera views on the selected objects in the workspace so that the objects fill the views.

### Redraw

Redraws the current view. Illumen 3D normally keeps the views in step with the actual object data, however, sometimes the display may become corrupted. In this case, use this command to fix the view display.

### Redraw All

Redraws all views. Illumen 3D normally keeps the views in step with the actual object data, however, sometimes the display may become corrupted. In this case, use this command to fix the view display.

### Notify All

All views store their properties individually. This allows all the views to work in completely different ways. Many times, however, you will want to synchronize the view properties. Chose Notify All to update all views of the same projection type such that their property page data will be the same as the current view.

### Render

Select this command to render the workspace from the current camera view. The [Rendering Dialog Box](#)

will display the status of the rendering.

## Rendering Dialog Box

### Phase

Describes the current phase in the rendering process. It is one of the following 5 steps.

1. Initialization: At this point, linked files are loaded and basic rendering initialization is performed.
2. Computing Octree: At this point the octree is being built. If this process takes too long, or you hear the hard drive being accessed repeatedly, then try lowering the Octree Limit in the [Render Settings Editor](#) for the workspace.
3. Rendering: At this point, the actual rendering image is being generated.
4. Clean Up: At this point, all rendering process memory is freed and all linked files are closed.
5. Writing Image File: At this point, the rendering image is being translated into the JPeg file format.

### Complete

Describes, in a fractional quantity, the amount completed in the current phase.

### Start Time

Displays the time at which the rendering was started.

### Elapsed Time

Displays the time spent so far in the rendering process.

### Primary Rays

Displays the number of primary rays shot directly from the camera into the workspace.

### Reflected Rays

Displays the number of rays reflected off of a reflective surface.

### Transmitted Rays

Displays the number of rays transmitted, which is the number of rays which pass through a translucent surface.

### Shadow Rays

Displays the number of times a ray was shot to determine if a point is in a shadow.

### Polygon I-sect Tests

Displays the number of times all rays were tested to see if they hit a polygon in the workspace.

### Polygon Intersections

Displays the number of times all rays actually hit any polygon.

**Octree Intersections**

Display the number of times all rays have hit any octree partition.

**Octree Size**

Displays the number of boxes in the octree generated for this render.

## **View Type Dialog Box**

This dialog box allows the user to set the type of the current view.

### **Parallel Projections**

Parallel projections do not show perspective and allow editing.

Top: Views from the top down. Looking in the xy plane toward the negative z axis.

Front: Views from the front toward the back. Looking in the yz plane toward the negative x axis.

Right: Views from to right to the left. Looking in the xz plane toward the negative y axis.

Properties of the view are defined in the [Parallel View Properties](#) dialog.

### **Perspective Projection**

Perspective projection types are used for displaying the workspace in 3D.

Camera: Views from a camera position defined in the [Camera View Properties](#) dialog.

## **Parallel View Properties**

### **View Width**

Sets the width the current view will display. To dynamically change view width, see [Workspace Mouse Operations](#) about zooming.

### **World Width**

Sets the width of the world according to the current view. The sliders along side the view will only be allowed to pan inside the world width. See [Workspace Mouse Operations](#) for information on panning.

### **Grid Size**

Sets the size of the grid in the current view. Set Grid Size to 0 to turn the grid off.

### **Grid Snap**

If checked, then all drag operations in the current view will be snapped to the closest grid intersection.

## **Camera View Properties**

### **Camera**

Use this list box to select the camera from the current workspace to be the camera for the current view. Once a new camera is selected into the view, the view will redraw according to that camera's perspective.

### **Display Editing Objects**

When not checked, then objects such as cameras, lights, and form object axis will not be displayed in the view.

## **Workspace Mode Menu**

### **Root**

Changes to the root editing mode. At this level, you may edit root objects such as form axis, cameras, and lights. This item is checked when in the root edit mode.

### **Point**

Changes to the point editing mode of the selected form. At this level, you may edit the points of the selected form. This item is checked when in the point edit mode.

### **Layer**

Changes to the layer editing mode of the selected form. At this level, you may edit the layer axes of the selected form. This item is checked when in the layer edit mode.

### **Polygon**

Changes to the polygon editing mode of the selected layer. At this level, you may edit the polygons of the selected layer. This item is checked when in the layer edit mode.

### **Select**

Changes to the select and drag mode. In this mode all normal mouse operations are available. This item is checked when in select mode.

### **Rotate**

If the selected object supports rotation, then selecting this will change into rotate mode. All normal mouse operation will be suspended. This item is checked when in rotate mode.

To rotate the object, drag the mouse in the direction you want the object to rotate.

- Dragging in the positive x direction rotates positively around the local y axis.

- Dragging in the positive y direction rotates positively around the local z axis.

- Dragging in the positive z direction rotates positively around the local x axis.

### **Scale**

If the selected object supports scaling, then selecting this will change into scale mode. All normal mouse operation will be suspended. This item is checked when in scale mode.

To scale the object, drag the mouse in the direction you want the object to scale.

- Dragging in the positive x direction scales the local x axis positively.

- Dragging in the positive y direction scales the local y axis positively.

- Dragging in the positive z direction scales the local z axis positively.



**Move**

If the selected object supports moving, then selecting this will change into move mode. All normal mouse operation will be suspended. To move the object, drag the mouse in the direction of translation. This item is checked when in move mode.

**Curved Drag**

Selecting this item opens the Curved Drag Dialog Box which allows you to set up curved dragging groups of points.

## Curved Drag Dialog Box



This dialog sets up curved dragging of points. When the user selects a group of points and starts to drag them when curved drag is enabled, then the points are affected according to the distance of the points from the cursor point such that the point directly under the cursor is most affected while points which are further away are affected less and less according to either a linear, exponential, or bell function.

Curved drag only operates on the points of a form.

### Disable

Selecting this radio button disables curved drag.

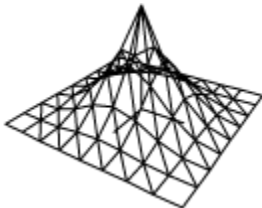
### Linear



Selecting this radio button enables linear curved drag. This forms a pyramid type shape.

### Exponential

Selecting this radio button enables exponential curved drag.



Exponents greater than 1 form pointy shapes.



Exponents less than 1 form steep hills.

## **Bell**



Selecting this radio button enables bell curved drag. This forms a bell hill type shape.

## **Radius Of Influence**

This edit box sets the maximum distance at which points will be affected in a curved drag.

## **Exponent**

This edit box sets the exponent for exponential curved drag.

## **Workspace Edit Menu**

### **Cut**

Use this command to copy the selection into the clipboard and to delete the selection.

### **Copy**

Use this command to copy the selection into the clipboard.

### **Paste**

Use this command to paste the selection from the clipboard into the current workspace. Note that the data contained in the clipboard must match the current editing level.

### **Join**

Use this command to join all selected points which share the exact same position into one point.

### **Delete**

Use this command to delete the selection.

### **Select All**

Use this command to select all hotspots at the current editing level.

### **Select All Components**

Use this command to select all component parts of the selection. This currently works only on polygons to select the points within the selected polygons.

### **Add Primitive**

Use this command to add a primitive layer to a selected form axis. The add primitive dialog pops up to ask you for the type of primitive to create. You may select: Sphere, Cylinder, Cone, Disk, Plane, or you may cancel the operation. After determining the type of primitive to add another dialog pops up to ask you what parameters to use for primitive generation.

Primitive Parameter Dialogs:

[Sphere Definition Dialog Box](#)

[Cylinder Definition Dialog Box](#)

[Cone Definition Dialog Box](#)

[Disk Definition Dialog Box](#)

[Plane Definition Dialog Box](#)

### **Extrude**

Use this command on selected polygons to extrude them. This creates a 3D effect from planar objects like pushing dough through a form. The [Extrude Dialog Box](#) pops up for you to enter the extrude parameters.

### **Lathe**

Use this command on selected polygons to lathe them. This creates a 3D effect from a planar set of polygons by spinning them around their forms' z-axis. The [Lathe Dialog Box](#) pops up for you to enter the lathe parameters.

### **Update Clones**

Use this command to instantly update all clones. Clones are normally updated periodically by Illumen 3D, however, sometimes it is necessary to update them manually.

### **Properties**

Use this command to bring up the properties page of the selection. A Property page is a unique set of editable properties available for most objects. The property page format is different for every different object type. To bring up the property page for the workspace, go to the root level and deselect everything and then call this command.

Property Page Dialog Box Description by Object Type:

[Workspace Property Page Dialog Box](#)

[Form Property Page Dialog Box](#)

[Light Property Page Dialog Box](#)

[Camera Property Page Dialog Box](#)

[Layer Property Page Dialog Box](#)

### **Contents**

Use this command to bring up the contents page of the selection. A contents page is a unique set of description available for most objects. To bring up the contents page for the workspace, go to the root level and deselect everything and then call this command.

Contents Page Dialog Box Description by Object Type:

[Workspace Contents Page Dialog Box](#)

[Form Contents Page Dialog Box](#)

[Layer Contents Page Dialog Box](#)

[Point Contents Page Dialog Box](#)

[Polygon Contents Page Dialog Box](#)

## **Workspace Contents Page Dialog Box**

Displays information on the contents of the workspace.

### **Cameras**

Number of cameras in the workspace.

### **Forms**

Number of forms in the workspace.

### **Layers**

Sum of the number of layers of each form.

### **Lights**

Number of lights in the workspace.

### **Objects**

Number of root objects in the workspace (cameras+forms+lights)

### **Points**

Sum of the number of points in each form.

### **Polygons**

Sum of the number of polygons in each form.

## **Form Contents Page Dialog Box**

Displays information on the contents of the form.

### **Cloning**

Clone state of the form. If 'Is Clone,' then the form is a clone. If 'Is Master,' then the form is cloned. If 'None,' then the form is neither a master or a clone.

### **Layers**

Number of layers in the form.

### **Points**

Number of points in the form.

### **Polygons**

Number of polygons in the form.

## **Layer Contents Page Dialog Box**

Displays information on the contents of the layer.

### **Polygons**

Number of polygons in the layer.



## **Point Contents Page Dialog Box**

Displays information on the contents of the point.

### **Layers In**

Number of layers which have polygons which reference the point.

### **Polygons In**

Number of polygons which reference the point.

## **Polygon Contents Page Dialog Box**

Displays information on the contents of the point.

### **Points**

Number of points in the polygon.

## **Workspace Property Page Dialog Box**

Controls general editable properties of a workspace.

### **Name**

Edit box which is used to name the workspace. This name is not the filename, it is used only for description purposes.

### **Description**

Edit box which is used to store a description of the workspace.

### **Render Settings File Name**

Displays the file name of the current render settings to be used for rendering the workspace.

#### **(Render Settings File Name) Browse**

Clicking on this button brings up a browse file requester so that you may search for a render settings file to be used for rendering the workspace.

#### **(Render Settings File Name) Edit**

Clicking on this button opens the render settings file defined in Render Settings File Name for editing.

### **Environment Settings File Name**

Displays the file name current environment settings to be used for rendering the environment of the workspace.

#### **(Environment Settings File Name) Browse**

Clicking on this button brings up a browse file requester so that you may search for a environment settings file to be used for rendering the environment of the workspace.

#### **(Environment Settings File Name) Edit**

Clicking on this button opens the environment settings file defined in Environment Settings File Name for editing.

## **Form Property Page Dialog Box**

Controls general editable properties of a form.

### **Name**

Edit box which is used to name the form. This name is not the filename, it is used only for description purposes within the workspace. Whenever this form object is referenced by name in the workspace, it will be referenced by this name. This name is independent of the external form name.

### **Is Clone Of**

If checked then the form loses its own definition and becomes a clone of another form. A clone of a form gets its points, layers, and polygons from its master; however, its root level is still unique, which means that it may be positioned, rotated, and scaled independent of its master. A clone exists only within a workspace, it has no external file characteristics. A clone is dynamically updated from its master as needed. To select the clone master, choose from the listbox. Only valid form possibilities are listed. Any form which is already a clone may not also be a master.

### **Quick Draw**

If checked, then the form is drawn only as its bounding box; the underlying form remains intact. Use this feature if your video card is slow, and/or the form is very large to speed up drawing time.

### **(External) File Name**

This is the name of the file in which the forms points, polygons, and layers are stored. The axis of the form is stored in the workspace. This storage method allows the same form to be used in different workspaces in different places. The form is stored on disk in this file whenever the workspace file is saved.

### **(External) (File Name) Browse**

Click on this button to open a file browse requester to select the file name of the form. If the file already exists then it will be loaded. If the file is new, then the file will be created.

### **(External) Name**

Edit box which is used to name the form. This name is not the filename, it is used only for description purposes within the form file. When a new form is loaded this name is copied into the workspace form name. This name is independent of the workspace form name.

### **(External) Description**

Edit box used to describe the form. This is stored externally in the form file.

## **Light Property Page Dialog Box**

Controls general editable properties of a light.

### **Name**

Edit box which is used to name the light. This name is not a filename, it is used only for description purposes within the workspace. Whenever this light object is referenced by name in the workspace, it will be referenced by this name.

### **Color**

Defines the color of the light for use in rendering.

## **Layer Property Page Dialog Box**

Controls general editable properties of a layer.

### **Name**

Edit box which is used to name the layer. This name is not a filename, it is used only for description purposes within the workspace. Whenever this layer object is referenced by name in the workspace, it will be referenced by this name.

### **Material File Name**

This is the file name of the material to be applied to the layers polygons during rendering.

### **(Material File Name) Browse**

Click on this button to open a browse file requester to select the file name of the material to apply to this layer. The file must be a valid material.

### **(Material File Name) Edit**

Click on this button to open the material file named in Material File Name for editing.

## **Camera Property Page Dialog Box**

Controls general editable properties of a camera.

### **Name**

Edit box which is used to name the camera. This name is not a filename, it is used only for description purposes within the workspace. Whenever this camera object is referenced by name in the workspace, it will be referenced by this name.

## Sphere Definition Dialog Box



Defines a procedurally created sphere with center at the origin.

### **Radius**

Defines the radius of the sphere, that is, the distance from the center to any point on the sphere.

### **Horizontal Divisions**

Defines the number of polygon divisions to divide the sphere up in to in the horizontal direction (around the z axis). Higher numbers produce a more realistic, better curved sphere, but require more memory and time to operate upon.

### **Vertical Divisions**

Defines the number of polygon divisions to divide the sphere up in to in the vertical direction. Higher numbers produce a more realistic, better curved sphere, but require more memory and time to operate upon.



## Cylinder Definition Dialog Box



Defines a procedurally created cylinder with bottom in the plane  $z=0$  and center at the  $z$  axis.

### Top Radius

Defines the radius at the top of the cylinder, that is, the distance from the center to any point on the cylinder at the top.

### Bottom Radius

Defines the radius at the bottom of the cylinder, that is, the distance from the center to any point on the cylinder at the bottom.

### Height

Defines the distance from the top to the bottom of the cylinder.

### Number Of Divisions

Defines the number of polygon divisions around the center of the cylinder. Higher numbers produce a more realistic, better curved cylinder, but require more memory and time to operate upon.

### Close Top

If checked, the cylinder will have a closed top.

### Close Bottom

If checked, the cylinder will have a closed bottom.

## Cone Definition Dialog Box



Defines a procedurally created cone with base at  $z=0$ , and center along the  $z$ -axis.

### Radius

Defines the radius at the bottom of the cone, that is, the distance from the center of the cone to any point at the bottom of the cone.

### Height

Defines the height of the cone, that is the distance from the base to the tip.

### Number Of Divisions

Defines the number of polygon divisions around the center of the cone. Higher numbers produce a more realistic, better curved cone, but require more memory and time to operate upon.

### Close Bottom

If checked, the bottom of the cone is closed.

## Plane Definition Dialog Box



Defines a procedurally created plane located in the plane  $z=0$  with center at the origin.

### **Width**

Defines the width of the plane, that is the distance from left to right along the y axis.

### **Height**

Defines the height of the plane, that is the distance from the top to the bottom along the x axis.

### **Horizontal Divisions**

Defines the number of polygon divisions along the y axis.

### **Vertical Divisions**

Defines the number of polygon divisions along the x axis.

## **Disk Definition Dialog Box**

Defines a procedurally created disk in the plane  $z=0$  with center at the origin.

### **Radius**

Defines the radius of the disk, that is the distance from the center to any point on the disk.

### **Number Of Divisions**

Defines the number of segment divisions around the center of the disk.

### **Make Center Point**

If checked, the disk will have a center point connected radially to all other points on the disk.

## Extrude Dialog Box

Defines how selected polygons should be extruded. An extrusion forms a 3D object out of a 2D one. For example, a box is an extrusion of a square polygon.

Example:



Starting Form



Extruded Form

### Number Of Divisions

Defines the number of polygon layer divisions along the extrusion.

### Translation

Defines the ending position of the extrusion relative to the starting position.

### Scale

Defines how the scale of the polygons at the end of the extrusion relative to their starting size.

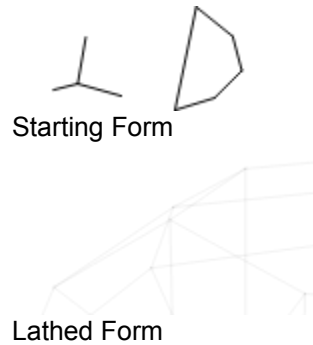
### Rotation

Defines how to polygons are rotated at the end of the extrusion relative to their starting rotation.

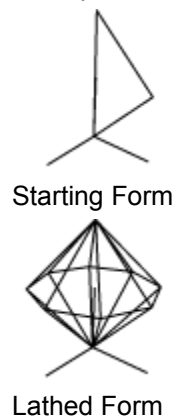
## Lathe Dialog Box

Defines how selected polygons should be lathed. A lathe spins a 2D polygon to form a 3D object. For example, a lathe of a circle positioned away from the axis is a donut shape called a torus.

Example Lathe no Sealed Center:



Example Lathe with Sealed Center:



## Number of Divisions

Defines the number of polygon divisions of the lathe around the z axis.

## Sealed Center

If checked the lathe is sealed off. This means that the top and bottom points are unique and the last polygon segment is removed. If sealed center is not checked, then the all parts of the polygon are used and the top and bottom points of the lathe will not be unique.

## Render Settings Editor

A Render Settings file describes the image file which renderer will create and some parameters of how the rendering should be done. The Render Settings Editor represents a Render Settings File by dialog controls which allow the manipulation of the file. The following controls are used:

### Name

Use this control to edit the name of the render settings file. This name is for descriptive purposes only, it is not the file name.

### Width

Use this control to edit the width of the image, in pixels, to be output by the renderer.

### Height

Use this control to edit the height of the image, in pixels, to be output by the renderer.

### Pixel Ratio

Use this control to edit the pixel ratio of the image to be output by the renderer. The pixel ratio is the ratio of the width of a pixel over its height. For instance, if a pixel on the output device is twice as wide as tall, then enter 2 here to create an image with the correct aspect for display. Most display devices use square pixels, so the pixel ratio should be 1.

### JPEG Quality

Use this control to edit the quality of the JPEG file created by the renderer. The quality range is 25 to 100, where 100 produces the best images but the worst compression, and 25 produces the worst quality images but the highest compression.

### Octree Limit

An octree is a device used to speed up rendering. A large octree limit uses more memory and takes longer to build, but, on average, the overall render will take less time. A small octree limit will use little memory and take less time to build, but, on average, the overall render will take longer. The default, 6, will work well most of the time. However, if you are low on memory, you may want to try 4 or 5. If you have a lot of memory (>8Mb), are working on a fast machine, and are working on large workspaces, then you may want to raise this number to 7 or 8.

### Depth Limit

The rendering process used in Illumen 3D is ray tracing. In ray tracing, light rays are reflected and transmitted. Every time a new reflection or transmission occurs, a new ray is created, and the depth limit for that ray increases by one. If you don't want any reflections or transmissions to occur, then set the depth limit to one. To enable reflections and transmissions to occur, set this number greater than one. In highly reflective scenes, you will get better results by raising this number, however, as you increase this number, the rendering may take longer.

**Auto Display Render**

If Checked, then once a rendering is complete, the resulting image will be loaded into the Image Viewer.



## **Image Viewer**

The image viewer is used to display JPG type images created by Illumen 3D and other programs. Only image viewing is supported, therefore, you may only open images, not save them. These images are displayed in a window. It's recommended that you be in a graphics mode that can produce 256 or more simultaneous colors.

For users of 256 color graphics modes, an optimal palette will be computed for display. The displayed image will not perfectly represent the actual picture due to the lack of display colors. In these palette based modes, only one image can be displayed an optimal palette, therefore, when more than one image is opened only the image with the active display will be displayed optimally.

For users of true color graphics modes (16, or 24 bit) no palette is computed. Pictures displayed on true color graphics mode will more accurately represent the actual image than those produced on 256 color displays. Since there is no palette, many pictures may be opened simultaneously, all with optimal displays.

## Color System

Whenever there is an editable color it is represented by a color button. This color button is roughly square and displays the current color inside the button. To edit the color, click on the color button. The Select Color Dialog Box then pops up for editing.

Sometimes, it is necessary to define a range of colors. Whenever there is an editable color range, it is represented by a color map button. This color map button is much longer than it is tall and it displays the current color map inside the button. To edit the color map, click on the color map button. The Color Map Dialog Box then pops up for editing.

## **Select Color Dialog Box**

The select color dialog box edits a color. In Illumen 3D colors are defined by three components, Red, Green, and Blue. The three color components are mixed together to form any possible color. Each component ranges in value from 0 to 255 where 0 corresponds to none of that component, and 255 corresponds to the maximal amount of that component.

The current color composed in the Select Color Dialog Box is displayed top and center.

### **Red,Green,Blue**

The red, green, and blue components are edited either by typing in the value in the corresponding edit box, or by using the sliding the corresponding slider to the left or the right.

## **Color Map Dialog Box**

The Color Map Dialog Box edits a color map. A color map is a range of colors. The range of colors is specified by setting the color of any of 21 distinct color boxes located evenly throughout the map and by specifying how that particular color box affects the color map.

### **Color Boxes**

The color boxes start in the top left corner of the dialog and continue to the right. To set the current color box, click on it. The properties of the color box are displayed at the bottom of the dialog box. The color of it is displayed in a color button, and one of the radio buttons are selected to show its type.

### **Color Button**

Click on this button to edit the color of the current color box.

### **Color Box Types**

Click on a color box type to edit the type of the current color box. A Color Box may be either Solid, Linear, or Empty. A Color Box defined as empty does not affect the color map. A Color Box defined as Solid colors the portion of the color map from the last defined color box to the current Color Box the color defined in the color button. A Color Box defined as Linear colors the portion of the color map from the last defined color box to the current a range of colors varying linearly from the previously defined color to the color of the current color box.

## Environment Editor

The environment editor is used to setup the background effects of a rendering. The Environment Editor represents a Environment File by dialog controls which allow the manipulation of the file. The following controls are used:

### Name

Use this control to edit the name of the environment file. This name is for descriptive purposes only, it is not the file name.

### Horizon

Click on this color box to edit the background color at the horizon (the color at the xy plane).

### Enable Poles

Check this box to have the background color change as the camera is pointed from the Positive Pole to the Horizon to the Negative Pole. If not checked, then the entire background color is the horizon color.

### Pole Tension

This edit box controls the Pole Tension. The pole tension is a number greater than zero. As the number goes from one toward zero more and more of the pole colors are pushed toward the horizon. As the number goes from one up, more and more of the horizon color is pushed away from toward the poles.

### Positive Pole

Click on this color box to edit the background color at the positive pole (the color at the +z axis).

### Negative Pole

Click on this color box to edit the background color at the negative pole (the color at the -z axis).

### Shell Size

This edit box controls the radius of the background environment shell. The background environment shell is a large sphere centered at the world origin in which all background environmental effects are projected upon. The default value is normally sufficient. However, this value should always be large enough to encompass all objects within the workspace the environment is used in.

### Stars

When greater than 0, stars are placed on the environment shell in front of the background color. The higher the number, the more stars are placed on the shell. A number of 0.1 produces just a few stars.

### Fog Occluded/Unit

When set greater than 0, fog is placed in the environment. This value determines the percent of

'haziness' per world unit of distance from the view position. To set up for your scene, determine the maximum distance you want to be able to see from the camera, and set this value equal to  $100/(\text{Max Distance})$ .

### **Fog Color**

Click on this color box to edit the color of the fog.

### **Ambient Light**

Click on this color to edit the color of ambient light in the environment. Ambient light comes from every direction onto every object in the scene. A value of 40,40,40 is normally a good value. When set much higher, the scene becomes washed-out.

### **Shadows**

If checked, then shadows will be rendered in the environment.

