
Integrated PhotoRender Tutorial

Introduction

This list of instructions will allow the user to create a photorendered image of their model that will give a significant visual improvement over the conventional **Pro/ENGINEER** shaded image. This is a "basic" tutorial to achieve **PhotoRender** quality results. Further user experimentation of the **Pro/PHOTORENDER** function, including appearance creation, light creation and their application will increase the potential for a stunning photorendered image that will prove to play a strong role in the visual representation of the model in a "real-life" setting. Once created, the photorendered image can be saved and/or printed out and used for a number of applications including marketing or brochures. You will need to install the available *Graphic Library* from the separate *Photorender Texture Library* CD to fully utilize the **Pro/PHOTORENDER** capability. This CD can be ordered from PTC if it was not received with the initial software shipment.

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Setup/Installation

Install the graphic-library from the *Pro/PHOTORENDER TEXTURE LIBRARY* CD. Load this in the same directory as you loaded **Pro/ENGINEER**.

The following config.pro options apply to Pro/PHOTORENDER (**Please note**: many of these options are also modifiable within a session of Pro/ENGINEER. The following options should only be set if standards other than the defaults are to be used regularly):

Option	Setting
PHOTORENDER_PREVIEW_SCALE	0.300000 to 0.900000 This option affects the quality of a Full Window (Preview) output (default is .50)
MAXIMUM_TEXTURE_SIZE	64X64 128X128 256X256 512X512
PHOTORENDER_DEFAULT_HEIGHT	1280
PHOTORENDER_DEFAULT_WIDTH	1024
PHOTORENDER_TIMEOUT	Minutes
PRO_TEXTURE_LIBRARY	Path to graphic-library e.g. pro_texture_library /sportsrc/spg where the /sportsrc/spg contains the directory graphic-library
TEXTURE	No, Yes
TEXTURE_SEARCH_PATH	specifies any additional directories to add to the texture search path
PHOTORENDER_MEMORY_USAGE	Integer, in Mb.
PHOTORENDER_MAX_SHARED_MEM_SIZE	Mb (Applicable only to SGI and Sun Multi-processor machines)
PHOTORENDER_SHARED_MEM_FILENAME	Filename (Applicable only to SGI and Sun Multi-processor machines)

Enabling the PhotoRender Button/System Requirements

NT Systems:

Intel and Alpha processors only

Graphics must have True-color capability. This typically means a minimum of 4 MB of memory on the graphics card. To check this, choose *Control Panel/Display*. On Alpha processors using the PowerStorm graphics cards, for maximum texture mapping performance additional texture mapping memory (available as an option) should be used.

Many high end NT cards always run in True color with resolution set at 1280 x 1024. Use the *Change Display Type* button to view info on the current card (note the memory). Select *List All Modes*, this will display all available settings. If **True Color** with at least 1024 x 756 resolution is not available, you may not be able to render. Make sure you test this setting first.

Miscellaneous:

Set the *config.pro* option, *Graphics* to *OPENGL* or do not set at all (remove any old GL settings). This

will enable the Texture selection within the "Environment" dialog box (select **Utilities, Environment**) as active and will permit textures to be displayed.

List of Topics

Appearances:

Defining Appearances

Start by activating **Shading** and **Texture** from the **Environment** menu. This will allow you to view your model in a shaded representation allowing you to see what your model will look like during the setup process.

One of the first steps for good image creation is to give the model some color. Think about how the model will be used when developing your color. One common mistake is to be too conservative. Don't be afraid to experiment with colors that *might* seem too flashy. Remember you are trying to create a photorendered image that you want to stand out in the crowd for its effective visual realization. Keep in mind that anything exciting to look at, is so because it is *visually stimulating*. You want viewers to be impressed when viewing your models.

Select **View, Model Setup, Colors & Appearances**. This will bring up the "Appearances" dialog box. Select **Add**, and the "Appearance Editor" dialog box will appear. This dialog box can also be called by selecting **View, Advanced, Photorender**, and selecting the *Modify Appearances* icon, then **Add**. Notice the sphere within the sample window. This sphere will aid you in ensuring that the color you define, along with appearance attributes, is the exact color you require.

Basic

Select the upper right box within the *Color* section of the *Basic* tab in the "Appearance Editor". This will bring up the "Color Editor". You have the option to define your color by using *RGB* (Red, Green, Blue) and *HSV* (Hue, Saturation, Value) slider bars. If you prefer, you may enter numerical values to help define your color. You will notice as you adjust the slider bars that the color updates automatically within the "Color Editor" sample window and the "Appearance Editor" sample window. Colors can also be changed using either the *Color Wheel* and/or the *Blending Palette*.

To use the *Color Wheel*, expand that part of the color editor by selecting the arrow next to "Color Wheel". Select anywhere inside the wheel to obtain a desired color. The *RGB* sliders will automatically update to the values for the color selected. Select in the gradient bar underneath the wheel to obtain a darker or lighter shade.

To use the *Blending Palette*, expand that area of the color editor. Select one of the corner boxes of the palette, then create a color for that corner, using either the *Color Wheel*, or the *RGB/HSV* sliders. Select another corner box and repeat the process. All four corner boxes can be utilized in this manner. Pro/ENGINEER will blend the colors in the middle of the palette. Selecting within the palette will update

the color in "Color Editor" sample window and "Appearance Editor" sample window.

Once you are satisfied with the look of your color, select **OK**. Your new color will be added to the palette at the top of the screen and will now occupy the color box in the upper right of the "Appearance Editor". You can now define the color of the highlight that appears on your base color. Colored highlight definition can produce similar results as colored lighting or as a slightly colored clearcoat over a base color. This is done with many *flashy* products on the market. An example product would be a Jet Ski. To accomplish a colored clearcoat, first define a base color with a high saturation value of 100.00, then define the highlight color and keep the saturation low, around 25.00. This way your highlight color will not overpower your base color.

You can view the effect on the colored sample sphere, or better yet assign that appearance to a surface then rotate the model. Depending on the orientation of your models as it spins, you will see the subtle effect of the colored highlight. You will want to experiment with different highlights until you achieve the required effects. To get a good feel for the appearance on a rendered model without actually rendering the model, place a check by **Photorender sample window**. The ball in the "Appearance Editor" will be displayed as if it were rendered, and not just shaded.

Select the lower color box to the right of the **Appearance Editor**. This will bring up the **Highlight Color Editor**. Define the highlight color the in the same manner as you defined the base color and select **OK** when satisfied.

The base color can be much more than just color. Depending on what you want, you can assign appearance attributes to your color. For more information on advanced appearance settings, see below.

Advanced

Select the *Advanced* tab. Slider bar adjustments made here will be visible in the completed photorendered image only (not in the shaded image), but can be observed if **Photorender sample window** is checked. Move the **Matte/Mirror** slider to define how shiny (or not) you want your surface (s). Basically if it is a shiny or metal part such as chrome, this setting should be set closer to mirror (i.e., the value should be closer to 100 than to 0).

The **Transparency** slider should always be set to opaque unless your model surfaces are supposed to be a transparent material such as glass, translucent plastic etc. The transparency slider could also be used to produce interesting effects in your completed photorendered image. For instance, you could make certain surfaces semi-transparent to produce a "ghost" effect that will allow certain aspects of your model to become less apparent without having to remove them for your rendering.

Normally, leave the **Threshold** set to high. By setting this lower, you can produce "clipping" effects within your final image. You will want to experiment with this when producing more advanced

renderings, as changes in the threshold will have extremely subtle effects.

Detail

This tab will be used if you want to add further detail to the visual aspects of your model. You have the capability to apply a **Texture** map, **Bump** map or **Decal** to any surface or surfaces. Keep in mind, if you specify a **Texture** map, any color that you have previously specified will be over-ridden. However, all other user defined attributes such as reflectivity will remain effective.

Be sure that **Texture** is selected in the **Environment** menu, this will allow the display of a texture if a texture map is applied to the model. If your model has flat surfaces, use the default **Planar** projection mapping option. For planar projections, you need to have the model oriented in the window as you want the texture to be applied. The texture will "map" dependent on your view. You may still rotate the model during the texture placement process, but it will lie on the surface **and** in the orientation in which it was first applied.

Select the **Map** button to the right of the texture box. The "Open" dialog box will appear and you must navigate to select a texture. Select the /graphic-library, /texture-library. The next list will give you many texture categories to choose from with various texture maps included in each category. You will want to experiment with this to figure out which texture will best fit your needs. Select a texture then select *Apply* within the **Appearance Editor** dialog box. The sample sphere will update to reflect the selected texture. That texture is now identified by the color that was assigned to it in the **Basic** tab and is added to your palette at the top of your screen. To verify this, move your cursor over the associated color on your color palette and you will see the name of the texture in the message line at the bottom of your screen.

The **Spherical** and **Cylindrical** projection options work similar to **Planar**. Use **Spherical** projection if your model has compound/complex surfaces similar to that of a camera. Use **Cylindrical** projection if your model has curved surfaces similar to that of a tube. Pro/ENGINEER will prompt you to select a coordinate system for both the **Spherical** and **Cylindrical** projection options. Select or create a coordinate system that is roughly in the middle of the surface or model, with the Z-axis pointing in the "up" direction. (For instance, with a cylinder, select a coordinate system in the middle of the cylinder whose Z-axis is parallel to the axis of the cylinder).

The **Texture** map, **Bump** map and **Decal** procedure are similar in selection process, however only one texture type can be set per appearance. After defining each appearance, select **Add** to see it added to your palette. When you are finished defining your appearances, select **OK**, or **Close**.

Note: The next time you define an **Appearance**, the texture will still appear on the sphere. Go to the **Detail** tab and select the corresponding **Map** button. Selecting **Cancel** in the "Open" dialog box will reset the sphere and remove any associated texture map. Also, if you want to save your defined color palette along with any associated textures assigned, select **Save** from the **Appearances** dialog box. Selecting **OK** in the "Save" dialog box will automatically create a color.map file (the name is created by

default and cannot be customized during the save process). The color.map file is automatically retrieved in future sessions by launching **Pro/ENGINEER** in the same directory in which the color.map file resides.

Only one color.map file can be created and saved. You can however temporarily rename the current color.map file within the operating window and create a new color.map file for multiple file usage.

(**Note:** The color.map file can also be referenced if stored in another directory by setting the config.pro option "pro_colormap_path" to the full path to the location of the color.map file.)

Setting Appearances

Now you are ready to apply your defined appearances to your model. For any color *without* an associated texture, bump or decal map, follow this procedure:

1. Select the tile of the appearance that is to be set.
2. Ensure that the *Set Object Appearance* field is set to the appropriate type (part, surface, etc), then select the **Set** button. Your color is now applied.
3. If you would like to check the settings of an appearance, either before or after the appearance is applied, select **Modify**, and the "Appearance Editor" will reappear. You can adjust the appearance's attributes in the same manner as when you initially defined the appearance.
4. Any changes made in the "Appearance Editor" to an appearance after it has been applied will update both in the sphere and in the model/surface in the main Pro/ENGINEER screen.

If you make any changes to either the color palette or from surface selection of the model, be sure to re-save the color palette by selecting **Save** from the "Appearances" dialog box and save the model.

***NOTE* Appearances** can be applied to either the part while in the part mode or the assembly surface while in the assembly mode. However, make it a habit to apply appearances while in the part mode. The assigned appearance will still display correctly in the assembly mode but will avoid confusion later if appearance colors need to be changed or removed, especially if the assembly has multiple levels.

For any color *with* an associated texture, bump or decal map, follow this procedure:

1. Select the tile of the appearance that is to be set. (Remember, the name of the texture/bumpmap/decal will appear in the message window if you move the cursor over the tile.)
2. Ensure that the *Set Object Appearance* field is set to the appropriate type (part, surface, etc), and ensure that the part is oriented so that the texture can be projected from the computer screen onto the part surface. Select **Set**.
3. As soon as you select **Set** the "Material Placement" dialog box appears and the texture appears on the corresponding surface(s). Again, if your model has flat surfaces to which you will be assigning a texture, the texture is applied *view dependent* so you will want to make sure your

- model is oriented appropriately before you begin this procedure.
4. As with any appearance application, the texture placement can always be changed at a later time. You can toggle between **Planar**, **Spherical** and **Cylindrical** for texture mapping projection as you are placing the texture depending on the shape of your model. The texture will not be locked to the surface until you select **OK** from the "Material Placement" dialog box.
 5. Finish adjusting placement and scale parameters within the "Material Placement" dialog box to get the look you are trying to achieve. You may use the thumbwheels or adjust by numerical input for placement constraints.
 6. Once you are satisfied with the texture placement, select **OK**. Your texture is now applied.

List of Topics

Lights:

Defining Lights

One of the most important variables in a stunning photorendered image is the effective use of lights. Lighting is used to create dramatic effects in the computer the same way a photographer uses lights to set up a photo shoot. Lights can be used to highlight portions of a model, as back lighting, or to make surface appearances more realistic.

Light creation is similar to that of appearances. Select **View, Model Setup, Lights**, which will open up the "Lights" dialog box. This dialog can also be accessed by selecting **View, Advanced, Photorender** and then the *Modify lights* icon. (For more information on using the lights dialog, please refer to the [Suggested Technique for Defining and Setting Lights on a Model.](#))

There are three types of lights that can be defined in a model: Directional, Point, and Spot.

Direction: Directional light closely simulates light from the sun. A directional light will strike the model with several parallel rays of light. This type of lighting is good when used for outdoor settings with brilliant sunlight.

For sunlight, start with **HSV** values set to:

H: 10.00

S: 15.00

V: 100.00

For moonlight, start with **HSV** values set to:

H: 200.00

S: 39.00

V: 57.00

Point: A Point light is a light that emits beams in all directions, similar to a lightbulb. This type of lighting is good for indoor settings with traditional light sources.

For a comfortable indoor room-type setting, start with **HSV** values set to:

H: 57.00

S: 21.00

V: 100.00

Spot: A Spot light is a light that emits a beam shaped like a cone. Therefore, it will only effect surfaces which lie within the angle of the cone spread. This type of light is good for emphasizing portions of a model by creating specific highlights or "hotspots".

For object highlighting, start with **HSV** values set to:

H: 200.00

S: 20.00

V: 100.00

Depending on the general color and size of your object, you will want to experiment with the color and spread angle of your spot light.

You will notice during light creation that certain slider bar controls are "active". These controls are *light specific* and will become active depending on the light chosen for definition.

Keep in mind that these lights are not and should not be limited in use to this general explanation. HSV values are listed as a starting reference only. The descriptions for each light should be used as a guide while "composing" your model during setup to be used for the rendered image.

Depending on your model and its complexity, a combination of lights can be very effective in creating a striking photorendered image. Also, a "pure white" light is seldom present in everyday life. You will notice in the light around you even the slightest amount of color. Use this awareness during light creation and don't be afraid to add color to your lights. They don't have to be strong in color saturation, and shouldn't be unless you are out to produce a specific visual effect with your image.

Position your lights to most effectively display your model. The dynamic update of the light movement is very helpful in displaying the light on the shaded model. You should probably not use light emitting from only one side because your model will appear too harsh (the same effect as objects in outer space illuminated by the sun). On the other hand, you may want this visual effect, depending on what you are trying to accomplish with your final image. Be wary of "drowning" your model with light, as this can result in a glaring image. You will want to play with your defined lights by turning them on or off in different combinations. To turn a light on or off, highlight the light in the "Lights" dialog box, then select the *Toggle light on/off* icon to switch the light on or off.

If you want your final photorendered image to fully utilize the lights you have defined, be sure to leave the option for *Lights Default* in the "Render Configuration" dialog box unselected. Normally this option

is not selected. If you do not want to define your own lights. Select this option to make the default lights active.

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The Room:

The Right Room

Your model will be best displayed in a "room" setting that is specifically appropriate. Get to the "Room Editor" dialog box by selecting the *Modify room configuration* icon from the "PhotoRender" icon bar. The "Room Editor" dialog box will appear with default texture patterns for all walls including the ceiling and floor.

The display for the wall patterns will display a miniaturized version of the 512x512 textures that make up the room. This room, as with other available complete rooms can be found in the graphic-library under /rooms. If you wish to load a different room, from the "Room Editor" select **File, Open**, and navigate through the graphic-library until you select the required room (this fill will have a .drm extension). After the room loads, the wall thumbnails will update to the new group of textures. You can also create your own rooms by loading individual textures using a couple of different methods. Within the "Room Editor" dialog box you can select by clicking within the specific wall box. Navigate in the "Open" dialog box until you find the required texture (this file will have a .tx3 extension).

You can also select the down-arrow next to the text at mid-point of the "Room Editor" dialog box to specify which wall you wish to define. Once you select a wall, select **Load Texture** to the right of the dialog box and search for your texture using the conventional file search method.

Room and Model Orientation

Once you are pleased with the room wall pattern selection, and still have the "Room Editor" dialog box open, you will want to orientate your room to best show off your model. Start by zooming back on your model until you see a red wireframe. This is the room and can better be visualized by selecting the *Rotate* tab. You will first want to lock the room to the model. Orient the part until its bottom is normal to the screen, facing downward. Next adjust the **Floor** thumbwheel until the floor comes up flush against the bottom of the model. Select the *Rotate* tab, and check mark **Lock Room To Model Rotation**. Do not rotate the room after this point. As you dynamically spin the model, you will see the red wireframe room spin with it.

You will probably need to open the room. This is done by moving the walls away from the model and can be accomplished by either the thumbwheels or numerical input. This is something with which you will need to experiment because the room size will of course be relative to the size of your object and the room environment you have selected. Start with a large room, open up the walls and raise the ceiling by what appears in wireframe to be pretty big. Once you have rendered the image, you will want to re-adjust certain parameters and re-render.

To better visualize the room, you can change the red wireframe to a surface by selecting the *Display*

tab, then the **Shaded** button. Pro/ENGINEER will display the walls behind the part with the actual textures that have been assigned to them. These textures will be slightly transparent, but the degree of transparency can be modified on the *Display* tab. To go back to the red wireframe, select **Wireframe**.

For a slightly more realistic image, you may want to put your model in a perspective view. Select the *Modify perspective view* icon from the "PhotoRender" menu bar. The model will transform into a perspective view and the "Perspective" dialog box will appear. Adjust the *Eye Dist* slider to move the model closer to or farther away from your viewpoint. The other sliders in this dialog box can be manipulated to obtain a desired orientation. Please refer to the [Suggested Technique for Rendering a Basic Perspective View of a Model](#) for more information on the different sliders in this dialog box.

At this point, your model should be in its final position for rendering and with a few more steps, you will be ready to render. Select **OK** from the "Perspective" dialog box. If you want to reset your model view to a non-perspective one, you will need to select **View, Default** from the main menu.

List of Topics

Photorender:

Setup Options Tab

The "Render Configuration" dialog box is the place where you define final specifications in preparation for the photorendered image. This dialog can be accessed by selecting the *Modify Rendering configuration options* icon from the "PhotoRender" menu bar. The *Options* tab which appears first has certain settings set as default. These settings are useful with creating a "first-off" rendered image. You will want to experiment with these attributes to see what is best for your final photorendered image. If you want your model to appear very realistic, you will ultimately want to set the following as active:

- **Transparency:** Check this to show models with transparency assigned.
- **Textures:** Check this if you have placed textures on the model.
- **SelfShadows:** Unless the model is well lit from every direction, there should always be self shadows.
- **Reflections:** Use this if you want the model to reflect the walls of the room.
- **Render Room:** This is *On* as default to place the model in a room environment. You can turn this *Off* if desired. If the room is not active, it will not be displayed but all other user assigned attributes will remain in effect. The model will be rendered with a featureless black background.
- **Reflect In Floor:** Use this if you want the floor to appear shiny and reflect the model which may be resting on the floor surface.
- **Shadows On Floor:** If your model "sits" on the floor, you should have this as active. If your model is "floating" in an environment (or in space) where the floor is not visible, there is no need to have this active.
- **Geometric Texture Sharpen:** This is useful if you have a geometric type texture such as grids or stripes that are not displaying clear in a trial photorendered image. This option will also enhance

the appearance of decals and bump maps.

- **Lights, Default:** If you have not defined your own lights, make this selection active. The completed photorendered image will not look as customized but it will still produce an image that can be used for evaluation or presentation purposes.

Please note: Each of these settings will enhance the final rendered image. They will require Pro/ENGINEER to perform additional calculations however, and a longer rendering time may result. Therefore, it is not recommended that you set many of these until you are prepared to create the final rendering.

Setup Tab

The choices for rendering output have been expanded for **Pro/PHOTORENDER** within **Pro/ENGINEER**. Depending on the output choice selected, image size can be customized to fit your needs. The default output option is "Full Window (Preview)" which will enable a quick, low quality rendering. Use this option while setting up the room. To send an image directly to the Image Editor, set the output to "New Window". When the rendering is complete, select the **Display** button to show the image. Greyed out areas will activate if applicable.

Config Tab

Settings within the *Config* tab affect your overall rendering performance.

Photorender Tile Size determines how much of your system's resources PhotoRender will use. With the option **Computer Tile Size** enabled, you can specify the maximum amount of RAM your machine will use. Set this to your machine's RAM for the fastest rendering. If you want to run a complex rendering in the background while conducting other work on your system, set this to a lower value. With the option **Override tile size** enabled, you can specify the height and width of each tile Photorender will compute. The larger the tile size, the fewer tiles Photorender needs to create, but each tile will take longer to compute. If the tiles are smaller, Photorender will create more of them, but they will not take as long to create. Experiment with these settings to optimize your performance.

The *Rendering Time Out* setting controls the number of minutes Pro/ENGINEER will spend attempting to render an image. If the rendering has not completed before the allotted time, Pro/ENGINEER will abort the image and allow other operations to be performed.

The *Display Preview Scale* controls the quality of the image produced then the output type is set to "Full Window (Preview)". As the value is increased, the quality (and rendering time) is also increased. This option affects no other output type. This setting will most often be reduced when a quick rendering of a large assembly is required.

Once you have finished defining the attributes within the "Render Configuration" dialog box, select **OK**. You are now ready to render.

Render

The **PhotoRender** icon bar should still be present. At this time you have set almost everything necessary to get a first look rendering. Select the *Render model* icon, and the rendering process will start. Rendering time will be based on model complexity and photorender parameters discussed above. Once your model is rendered, and if the visual results are satisfactory, return to the "Render Configuration" dialog box *Options* tab and set the *Render Quality* to **High** or **Maximum**. This will increase model rendering time, but the final results will be worth it. Once the rendering is complete, you can save Photorendered images by selecting the *Save the currently displayed image to file* icon. You may also set the output type to "New Window". When the rendering is complete, select **Display** from the "PhotoRender Abort" dialog box. This will place the image into the Image Editor, where it can be resized, saved as another image type, etc. (**Please Note:** When rendering, selecting the **Abort** button will cancel the rendering process, allowing you to set or reset something you may have wanted.)

List of Topics

Important Note to the Creator...

The **PhotoRender** process is a very subjective one. What looks good to one person might not look good to the next. You are "playing" the role of a *photographer* who creates compositions within the computer screen. Just as a photographer creates photo shoots using objects and lights within self-defined environments, you are creating a "photo shoot" on a computer.

A photographer never gets every aspect of the photo shoot right the first time, so don't be disappointed if the first few renderings don't meet your expectations.

DO NOT BECOME FRUSTRATED. You will need to practice and experiment with every one of the settings described until you become familiar enough with the complete **PhotoRender** process.

This **PhotoRender** tutorial is to be used as a guide by explaining the fundamental process along with supplying suggested starting point guidelines for photorender image creation.