

# Imagedesign II User Guide and Menu Reference

---

CADD5® 5 Revision 6.1.1

DOC38207-004

---

**Copyright © 2001 Parametric Technology Corporation. All Rights Reserved.**

User documentation from Parametric Technology Corporation (PTC) is subject to copyright laws of the United States and other countries and is provided under a license agreement, which restricts copying, disclosure, and use of such documentation. PTC hereby grants to the licensed user the right to make copies in printed form of PTC user documentation provided on software or documentation media, but only for internal, noncommercial use by the licensed user in accordance with the license agreement under which the applicable software and documentation are licensed. Any copy made hereunder shall include the Parametric Technology Corporation copyright notice and any other proprietary notice provided by PTC. User documentation may not be disclosed, transferred, or modified without the prior written consent of PTC and no authorization is granted to make copies for such purposes.

Information described in this document is furnished for general information only, is subject to change without notice, and should not be construed as a warranty or commitment by PTC. PTC assumes no responsibility or liability for any errors or inaccuracies that may appear in this document.

The software described in this document is provided under written license agreement, contains valuable trade secrets and proprietary information, and is protected by the copyright laws of the United States and other countries. UNAUTHORIZED USE OF SOFTWARE OR ITS DOCUMENTATION CAN RESULT IN CIVIL DAMAGES AND CRIMINAL PROSECUTION.

**Registered Trademarks of Parametric Technology Corporation or a Subsidiary**

Advanced Surface Design, CADD5, CADDShade, Computervision, Computervision Services, Electronic Product Definition, EPD, HARNESSDESIGN, Info\*Engine, InPart, MEDUSA, Optegra, Parametric Technology, Parametric Technology Corporation, Pro/ENGINEER, Pro/HELP, Pro/INTRALINK, Pro/MECHANICA, Pro/TOOLKIT, PTC, PT/Products, Windchill, InPart logo, and PTC logo.

**Trademarks of Parametric Technology Corporation or a Subsidiary**

3DPAINT, Associative Topology Bus, Behavioral Modeler, BOMBOT, CDRS, CounterPart, CV, CVact, CVaec, CVdesign, CV-DORS, CVMAC, CVNC, CVToolmaker, DesignSuite, DIMENSION III, DIVISION, DVSAFEWORK, DVS, e-Series, EDE, e/ENGINEER, Electrical Design Entry, Expert Machinist, Expert Toolmaker, Flexible Engineering, *i*-Series, ICEM, Import Data Doctor, Information for Innovation, ISSM, MEDEA, ModelCHECK, NC Builder, Nitidus, PARTBOT, PartSpeak, Pro/ANIMATE, Pro/ASSEMBLY, Pro/CABLING, Pro/CASTING, Pro/CDT, Pro/CMM, Pro/COMPOSITE, Pro/CONVERT, Pro/DATA for PDGS, Pro/DESIGNER, Pro/DESKTOP, Pro/DETAIL, Pro/DIAGRAM, Pro/DIEFACE, Pro/DRAW, Pro/ECAD, Pro/ENGINE, Pro/FEATURE, Pro/FEM-POST, Pro/FLY-THROUGH, Pro/HARNESS-MFG, Pro/INTERFACE for CADD5, Pro/INTERFACE for CATIA, Pro/LANGUAGE, Pro/LEGACY, Pro/LIBRARYACCESS, Pro/MESH, Pro/Model.View, Pro/MOLDESIGN, Pro/NC-ADVANCED, Pro/NC-CHECK, Pro/NC-MILL, Pro/NC-SHEETMETAL, Pro/NC-TURN, Pro/NC-WEDM, Pro/NC-Wire EDM, Pro/NCPOST, Pro/NETWORK ANIMATOR, Pro/NOTEBOOK, Pro/PDM, Pro/PHOTORENDER, Pro/PHOTORENDER TEXTURE LIBRARY, Pro/PIPING, Pro/PLASTIC ADVISOR, Pro/PLOT, Pro/POWER DESIGN, Pro/PROCESS, Pro/REPORT, Pro/REVIEW, Pro/SCAN-TOOLS, Pro/SHEETMETAL, Pro/SURFACE, Pro/VERIFY, Pro/Web.Link, Pro/Web.Publish, Pro/WELDING, Product Structure Navigator, PTC *i*-Series, Shaping Innovation, Shrinkwrap, The Product Development Company, Virtual Design Environment, Windchill e-Series, CV-Computervision logo, DIVISION logo, and ICEM logo.

**Third-Party Trademarks**

Oracle is a registered trademark of Oracle Corporation. Windows and Windows NT are registered trademarks of Microsoft Corporation. Java and all Java based marks are trademarks or registered trademarks of Sun Microsystems, Inc. CATIA is a registered trademark of Dassault Systems. PDGS is a registered trademark of Ford Motor Company. SAP and R/3 are registered trademarks of SAP AG Germany. FLEX $lm$  is a registered trademark of GLOBEtrouter Software, Inc. VisTools library is copyrighted software of Visual Kinematics, Inc. (VKI) containing confidential trade secret information belonging to VKI. HOOPS graphics system is a proprietary software product of, and copyrighted by, Tech Soft America, Inc. All other brand or product names are trademarks or registered trademarks of their respective holders.

---

---

**UNITED STATES GOVERNMENT RESTRICTED RIGHTS LEGEND**

This document and the software described herein are Commercial Computer Documentation and Software, pursuant to FAR 12.212(a)-(b) or DFARS 227.7202-1(a) and 227.7202-3(a), and are provided to the Government under a limited commercial license only. For procurements predating the above clauses, use, duplication, or disclosure by the Government is subject to the restrictions set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software Clause at DFARS 252.227-7013 or Commercial Computer Software-Restricted Rights at FAR 52.227-19, as applicable.

**Parametric Technology Corporation, 140 Kendrick Street, Needham, MA 02494-2714**  
**8 January 2001**

---



---

# Table of Contents

---

## Preface

Related Documents _____	xi
Book Conventions _____	xii
Window Managers and the User Interface _____	xiii
Online User Documentation _____	xiii
Online Command Help _____	xiv
Printing Documentation _____	xiv
Resources and Services _____	xv
Documentation Comments _____	xv

## Imagedesign II Concepts

Overview of Imagedesign II _____	1-2
Benefits of Imagedesign Shading _____	1-2
Hardware and Software _____	1-3
Hardware _____	1-3
Software _____	1-3
Setup Tasks _____	1-5
Size of a Shaded Picture _____	1-6
Window Size _____	1-6
Selecting Colors _____	1-7
Direct Color Assignment _____	1-7
Assigning Predefined Colors _____	1-7
Defining Your Own Colors _____	1-7

---

Layer Color Assignment _____	1-7
Picture Creation Techniques _____	1-9
Default Pictures _____	1-9
Realistic Pictures _____	1-9
Creating High Quality Pictures _____	1-10
Number of Displayed Colors _____	1-10
Colors _____	1-10
DITHER4 _____	1-10
Examples _____	1-11
Plotting Shaded Pictures _____	1-12
Plotting Tasks _____	1-12
Picture Management _____	1-13
Default Picture Names _____	1-13
User-specified Picture Names _____	1-13
Imagedesign as a Surface Analysis Tool _____	1-14
Displaying Contour Definition _____	1-14
Shading Curvature _____	1-14
Parametric Environment Shading _____	1-15
Parametric Shading Options _____	1-15
Imagedesign at a Glance Using the GUI _____	1-16
Establishing Surface Appearance Attributes _____	1-16
Establishing Imagedesign Options _____	1-17
Solid Model Attributes _____	1-18
Surfaced Geometry Attributes _____	1-18
Gaussian and Minimum Radius of Curvature _____	1-18
Printer and Plotter Options _____	1-19
Creating a Shaded Image _____	1-20
Manipulating an Existing Image _____	1-21
Exiting the Active Picture _____	1-24
Deleting an Image File _____	1-24

---

# Attribute Assignment and Initialization

Overview _____	2-2
Assigning Attributes _____	2-2
Specifying Picture Attributes _____	2-2
Activate a Part and Drawing _____	2-4
Activate a Part and a Drawing _____	2-4
Display the SETUP Menu _____	2-5
Selecting SURFACE ATTRIBUTES... _____	2-5
Selecting IMAGEDESIGN... _____	2-5
Assign Surface Attributes _____	2-6
Selecting a Solid or a Face _____	2-8
Selecting the Face Option _____	2-8
Assigning Reflective Attributes _____	2-10
Reinitializing Assigned Values _____	2-10
Shininess _____	2-10
Highlight Intensity _____	2-10
Transparency _____	2-11
Specifying Speckles or Tweed _____	2-12
Speckles _____	2-12
Tweed _____	2-12
Selecting Matte, Corduroy, or Brushed Metal Surfaces _____	2-13
Predefined Surface Attributes _____	2-13
Establishing Shaded Picture Display Values _____	2-14
Shading a Solid or Surface _____	2-15
Picture and Shadow Smoothness _____	2-16
Picture Smoothness _____	2-16
Shadow Smoothness _____	2-16
Color Shades and Lighting Level _____	2-17
Shades per color _____	2-17
Ambient Intensity _____	2-17
Lightsource _____	2-18
Model Lightsource _____	2-18

---

Space Lightsource_____	2-19
Background Color_____	2-19
Selecting a Background Color _____	2-20
Size of the Shaded Picture _____	2-20
Specifying Shaded Picture Size _____	2-21
Specifying Defined, Layer, or Solid Colors _____	2-22
Using Layer Colors _____	2-22
Using Solid Colors_____	2-22
Using Defined Colors_____	2-22
Shadows, Patterns, Specularity, and Transparency _____	2-23
Displaying Shadows _____	2-23
Displaying Patterns _____	2-23
Displaying Specularity _____	2-23
Displaying Transparency _____	2-24
Evaluating Contour Definition _____	2-25
Evaluating Curvature Change _____	2-25
Shade Curvature _____	2-25
Gaussian Curvature _____	2-26
Minimum Radius of Curvature _____	2-27
Gaussian Curvature _____	2-28
Ambient Intensity and Picture Size _____	2-28
Linear Gaussian Curvature _____	2-28
Quadratic Gaussian Curvature _____	2-28
Maximum Curvature _____	2-29
Minimum Curvature _____	2-29
Print scale values _____	2-29
Minimum Radius of curvature _____	2-29
Applying the Property Sheet _____	2-30
Example _____	2-30
Minimum Radius of Curvature _____	2-30
Using the -Z Tool Axis _____	2-31
User-Defined Colors _____	2-31
System-Assigned Colors _____	2-32
Assigning Plotting Attributes _____	2-33
Number of Copies _____	2-33
Selecting a Plotter _____	2-34
Specifying the Device _____	2-34



---

Picture Size_____	2-34
Modifying Extents_____	2-35
Rotating the Plot _____	2-36
Displaying Your Shaded Picture _____	2-36
Applying Your Selections_____	2-36

## Shaded Picture Generation

Entering the Shaded Picture Generation Environment _____	3-2
Imagedesign Generation Options _____	3-2
Shading a Solid or Surface _____	3-4
Naming Your Picture_____	3-5
Shading with Defined Colors _____	3-6
Shading with Custom Colors _____	3-8
Shading Curvature _____	3-10
Type of Curvature to be Displayed _____	3-10
Displaying the Curvature_____	3-10
Plotting a Picture _____	3-12

## Shaded Picture Manipulation

Manipulating and Editing Shaded Pictures_____	4-2
Available Property Sheets_____	4-2
Editing Pictures _____	4-2
Displaying a Filed Shaded Picture _____	4-4
Displaying the Picture as It Was Filed _____	4-4
Displaying the Picture With Stripes _____	4-5
Deleting a Shaded Picture _____	4-6
Editing a Shaded Picture _____	4-8
Dithering_____	4-9
Pixel Averaging _____	4-9
Modifying Colors _____	4-10

---

Filing a Picture _____	4-12
Completing Picture Edits _____	4-13
Returning to the Explicit Modeling Environment _____	4-13
Exiting a Picture _____	4-14
Listing Pictures _____	4-15
Listing Surface Attributes _____	4-16

## Rendering a Parametric View

Shading in the Parametric Environment _____	5-2
Shading Setup _____	5-2
Shading Options _____	5-2
Shade Display Type: _____	5-2
Shade Smoothness: _____	5-3
Ambient Intensity: _____	5-3
Ambient Color: _____	5-3
Light Source Options _____	5-3
Controlling Light Source Options _____	5-4
Name _____	5-4
Color _____	5-4
Intensity _____	5-4

## System Messages

Messages and Description _____	A-2
C _____	A-2
D _____	A-2
E _____	A-3
M _____	A-4
N _____	A-5
P _____	A-5
T _____	A-6
U _____	A-6

---

# Preface

---

The *Imagedesign II User Guide and Menu Reference* contains information and instruction for creating and manipulating shaded pictures. It is intended for designers with a working knowledge of CADD5 surface and solid model geometry creation and manipulation.

## Related Documents

The following documents may be helpful as you use *Imagedesign II User Guide and Menu Reference*:

- For background on CADD5 5:  
*Introduction to CADD5 5*  
*Managing CADD5 5*
- For Explicit solid modeling and design:  
*Explicit Modeling User Guide and Menu Reference*
- For Parametric modeling and design:  
*Parametric Modeling User Guide and Menu Reference*
- For advanced Explicit surface modeling using NURBS:  
*NURBS User Guide and Menu Reference*
- For assemblies of parametric and/or explicit solid and surfaced models:  
*Concurrent Assembly MockUp user Guide and Menu Reference*
- For advanced Explicit surface modeling using ASD:  
*Advanced Surface Design User Guide and Menu Reference*

## Book Conventions

The following table illustrates and explains conventions used in writing about CADDs applications.

Convention	Example	Explanation
Menu selections and options	List Section option, Specify Layer field	Indicates a selection you must make from a menu or property sheet or a text field that you must fill in.
User-selected graphic location	X, d <sub>1</sub> or P1	Marks a location or entity selection in graphic examples.
User input in CADDs text fields and on any command line	<code>cvaec.hd.data.param</code> <code>tar -xvf /dev/rst0</code>	Enter the text in a CADDs text field or on any command line.
System output	<code>Binary transfer complete.</code>	Indicates system responses in the CADDs text window or on any command line.
Variable in user input	<code>tar -cvf /dev/rst0 filename</code>	Replace the variable with an appropriate substitute; for example, replace filename with an actual file name.
Variable in text	<code>tagname</code>	Indicates a variable that requires an appropriate substitute when used in a real operation; for example, replace tagname with an actual tag name.
CADDs commands and modifiers	<code>INSERT LINE TANTO</code>	Shows CADDs commands and modifiers as they appear in the command line interface.
Text string	<code>"SRFGROUPA"</code> or <code>'SRFGROUPA'</code>	Shows text strings. You must enclose text string with single or double quotation marks.
Integer	<code>n</code>	Supply an integer for the <i>n</i> .
Real number	<code>x</code>	Supply a real number for the <i>x</i> .
#	<code># mkdir /cdrom</code>	Indicates the root (superuser) prompt on command lines.
%	<code>% rlogin remote_system_name -l root</code>	Indicates the C shell prompt on command lines.
\$	<code>\$rlogin remote_system_name -l root</code>	Indicates the Bourne shell prompt on command lines.

## Window Managers and the User Interface

According to the window manager that you use, the look and feel of the user interface in CADD5 can change. Refer to the following table:

**Look and Feel of User Interface Elements**

User Interface Element	Common Desktop Environment (CDE) on Solaris, HP, DEC, and IBM	Window Manager Other Than CDE on Solaris, HP, DEC, IBM, SGI, and NT
Option button	ON — Round, filled in the center OFF — Round, empty	ON — Diamond, filled OFF — Diamond, empty
Toggle key	ON — Square with a check mark OFF — Square, empty	ON — Square, filled OFF — Square, empty

## Online User Documentation

Online documentation for each book is provided in HTML if the documentation CD-ROM is installed. You can view the online documentation in the following ways:

- From an HTML browser
- From the Information Access button on the CADD5 desktop or the Local Data Manager (LDM)

Please note: The LDM is valid only for standalone CADD5.

You can also view the online documentation directly from the CD-ROM without installing it.

From an HTML Browser:

1. Navigate to the directory where the documents are installed. For example,
  - `/usr/apl/cadds/data/html/htmldoc/` (UNIX)
  - `Drive:\usr\apl\cadds\data\html\htmldoc\` (Windows NT)
2. Click `mainmenu.html`. A list of available CADD5 documentation appears.
3. Click the book title you want to view.

From the Information Access Button on the CADD5 Desktop or LDM:

1. Start CADD5.
2. Choose Information Access, the *i* button, in the top-left corner of the CADD5 desktop or the LDM.
3. Choose DOCUMENTATION. A list of available CADD5 documentation appears.
4. Click the book title you want to view.

From the Documentation CD-ROM:

1. Mount the documentation CD-ROM.
2. Point your browser to:  
CDROM\_mount\_point/html/doc/mainmenu.html (UNIX)  
CDROM\_Drive:\html\doc\mainmenu.html (Windows NT)

## Online Command Help

You can view the online command help directly from the CADDs desktop in the following ways:

- From the Information Access button on the CADDs desktop or the LDM
- From the command line

From the Information Access Button on the CADDs Desktop or LDM:

1. Start CADDs.
2. Choose Information Access, the *i* button, in the top-left corner of the CADDs desktop or the LDM.
3. Choose COMMAND HELP. The Command Help property sheet opens displaying a list of verb-noun combinations of commands.

From the Command Line: Type the exclamation mark (!) to display online documentation before typing the verb-noun combination as follows:

```
#01#!INSERT LINE
```

## Printing Documentation

A PDF (Portable Document Format) file is included on the CD-ROM for each online book. See the first page of each online book for the document number referenced in the PDF file name. Check with your system administrator if you need more information.

You must have Acrobat Reader installed to view and print PDF files.

The default documentation directories are:

- /usr/apl/cadds/data/html/pdf/doc\_number.pdf (UNIX)
- CDROM\_Drive:\usr\apl\cadds\data\html\pdf\doc\_number.pdf (Windows NT)

## Resources and Services

For resources and services to help you with PTC (Parametric Technology Corporation) software products, see the *PTC Customer Service Guide*. It includes instructions for using the World Wide Web or fax transmissions for customer support.

## Documentation Comments

PTC welcomes your suggestions and comments. You can send feedback in the following ways:

- Send comments electronically to `doc-webhelp@ptc.com`.
- Fill out and mail the PTC Documentation Survey located in the *PTC Customer Service Guide*.





# Imagedesign II Concepts

---

The following key topics are discussed in this chapter:

- Overview of Imagedesign II
- Hardware and Software
- Setup Tasks
- Size of a Shaded Picture
- Selecting Colors
- Picture Creation Techniques
- Creating High Quality Pictures
- Plotting Shaded Pictures
- Picture Management
- Imagedesign as a Surface Analysis Tool
- Parametric Environment Shading
- Imagedesign at a Glance Using the GUI

# Overview of Imagedesign II

As your models become more complex, you may find it necessary to use Imagedesign to visualize them. Using Imagedesign, you can shade surfaces and solids to create a lifelike representation of the model.

Imagedesign (shaded picture generation) is a powerful design tool that provides a realistic simulation of a model at various levels of design.

## Benefits of Imagedesign Shading

The following are a few benefits of creating shaded pictures with Imagedesign:

- Shading a model so that different surfaces and solids have different colors. This allows you to check for visual interference and boundary alignment.
- Shading a surface or face to quickly check for irregularities in the model.
- Using various colors or shades to display the contours of a model.
- Selecting the light source and vantage points to highlight the design features.

You can create shaded pictures for technical publications, marketing brochures, and other functions.

Although you need not understand how shading works, you should have some knowledge of light, color, and geometry to achieve pleasing and predictable results.

The ability to shade surfaces and solids is integrated as a set of stand-alone tasks. Once you create a surface or solid model part, you can independently use these features to generate any number of shaded images.

Prior to the actual shading, use the **DYNAMIC VIEW**, **ZOOM DRAWING**, **CHANGE GWINDOW** and other utilities to select the desired orientation and/or image size of the part.

You cannot run any graphics tasks when a picture is displayed on the screen. To continue with graphics generation and modification, use the **Exit Picture** option to remove the picture display and reactivate the previous wireframe graphics.

# Hardware and Software

Hardware for Imagedesign requires a color graphics frame buffer. Imagedesign tasks are divided into three separate and distinct categories.

## Hardware

Hardware for shaded picture generation and display requires a color graphics frame buffer that has a minimum of 8 color selection bits. The default screen resolution for Imagedesign is the size of the Graphics Window. Smaller pictures can be made. Imagedesign requires more memory and disk storage than other graphics applications.

## Software

Imagedesign tasks fall into three categories:

- Shading Initialization
- Shading Generation
- Shading Manipulation

The shading initialization tasks assign surface attributes that control the appearance of shaded entities and list previously assigned attributes.

You also assign values to such categories as

- Picture and shadow smoothness
- Number of shades per color
- Ambient intensity
- Lightsources (in model or screen space)
- Background color
- Picture size
- Gaussian curvature
- Minimum radius of curvature
- Plotter information

The shading generation tasks shade surface and solid entities and generate representations of surface curvatures.

The shading manipulation tasks display, edit, list, and delete the pictures created by the generation tasks.

You can modify any of the categories without having to make changes to the others.

## Setup Tasks

Set up values for the many features of an Imagedesign shaded picture. These values remain as defaults until you decide to change one or all of them for a different picture.

Enter values into the different fields on the Imagedesign Setup property sheet to control the following features:

- **Picture Smoothness** - The quality and speed of picture generation. The greater the degree of smoothness, the more accurate the results.
- **Shadow smoothness** - The casting of shadows. Calculates and displays shadows relative to the light source(s) selected.
- **The number of shades per color.**
- **Ambient intensity** - The surrounding lighting level. Specify the background light (that which is all around). This determines how the system displays the dark areas of the surface that are farthest from the light source, but visible to the viewer.
- **Light sources** - Specify a strong light source from infinity so that the rays of light appear parallel. The rays pass through a specified coordinate and are aimed at the origin (0,0,0) of selected entities. They can be considered directional spotlights with no angle of diffusion.

Model light source coordinates are specified as a model space relative vector.

Screen light source coordinates are described as being in x-, y-, z- screen space.

Up to eight different light sources can be used to illuminate each shaded image.

- **Background color** - Select the background color from a range of 65 colors.
- **Surface highlights and patterns** - Display the surface attributes of a surface or solid that you specified in setup property sheets. Shininess and Specularity specify shading done with sharply defined highlights.

Translucency specifies shading of objects with a degree of transparency.

Transparent objects cast no shadows.

Pattern specifies shading done with tweed, speckles, or corduroy patterns.

- **Picture Size** - Specify the ratio of the size of the shaded picture to the graphics display window.
- **Gaussian curvature or minimum radius of curvature** - Assign colors to radii and levels to display curvature.
- **Plotters** - Select a plotter and enter information that defines the picture.

## Size of a Shaded Picture

The larger a picture, the higher its resolution. You have a choice of three sizes of shaded picture with the `SHADE` options. The `Plot Picture` option offers a fourth size.

Picture resolution refers to the size of the shaded picture. The larger the picture, the higher the resolution.

## Window Size

Picture resolution is directly related to the size of the Graphics Window. The maximum size is  $1152 \times 900$  pixels. Window size and location are initially determined by variables in your `.caddsrc` file. When in design mode you can change the window size with the `CHANGE GWINDOW` utility.

You can control the size of the shaded picture as it appears in the Graphics Window using the size choices available in the `Picture size` field on the Imagedesign Setup property sheet. The sizes available are

- **Full Size: 1:1 (default)**  
Generates a picture the same size as your current Graphics Window. The default is  $512 \times 512$  pixels if you are running without a Graphics Window.
- **Half Size: 1:2**  
Generates a picture one half the height and one half the width of the current Graphics Window (one quarter the area of a full window). The default picture is  $256 \times 256$  pixels.
- **Quarter Size: 1:4**  
Generates a picture one fourth the height and one fourth the width of the current Graphics Window (one sixteenth the area of a full window).

A fourth size is available with the `Plot Picture` option which is found on the bottom level of the Imagedesign Setup property sheet.

- **Double Size: 2:1**  
Generates a picture double the height and width of the Graphics Window. If the picture exceeds the Imagedesign limits of 1152 horizontal and 900 vertical pixels, the system clips the picture to those limits.  
You can reduce the possibility of picture clipping by positioning the objects you want to shade in the upper left corner of the Graphics Window.

## Selecting Colors

You can assign colors to entities when shading by one of three different methods.

You can assign predefined colors directly to entities; you can create your own colors and assign them directly; you can assign colors by layer.

### Direct Color Assignment

In every shaded picture generation the system asks you to select the entities to be shaded. When you pick and apply one of the shading generation options the system asks you to identify the entities to be shaded and the color with which each entity is to be shaded.

To assign more colors to more entities, pick `Select more entities`, identify the next entity, and assign a color to it. Continue assigning colors to entities until all those you want colored are assigned. Then click on `Done`.

A limit of 10000 entities can be selected in one `Location and Placement` session. However, the `Select more entities` option overrides that limitation.

### Assigning Predefined Colors

A list of 65 predefined colors is available to you when you select the `Defined Colors` option. Select the one you want by clicking on it.

### Defining Your Own Colors

Select the `Custom Colors` option and you can create your own colors by blending different percentages of red, green, and blue. These custom colors are assigned to entities in the same way that the predefined ones are.

### Layer Color Assignment

When designing you can assign colors by layer. All entities on a chosen layer are assigned a specific color. To assign a color, use the `SELECT LDISCRIMINATION` and `DISCRIMINATE LAYER` utilities. To control which layer the system shades, use the `ECHO LAYER` and `SELECT LAYER` utilities. To shade the model using the selected layer discrimination turn the `Use Layer Colors:` field on the `Imagedesign Setup` property sheet to "yes".

The `Specularity` option is the only one valid when using layer color assignment.

Please note: UNIX windows use a different color look-up table than Imagedesign. Therefore, when you go from a graphics window to a UNIX window while a shaded picture is displayed, flashing may occur.



# Picture Creation Techniques

The realism and quality of pictures created with Imagedesign vary with the number and variety of options you use.

The more options you use, the more time the system needs to generate the shaded picture. In your early design stages, you may want to restrict the number of option picks to the minimum necessary and add enhancements as your design becomes more explicit.

## Default Pictures

The system can create a default picture with default settings by using no options other than one for light source and background color.

A default picture has no special surface attributes, no shadows, a single light source, and produces a smoothly shaded image. The default pictures are usually sufficient during the initial design process.

It is not necessary to make any entries on the Setup property sheets if a default picture is to be generated. Simply open the Imagedesign generation menu under the `Render View` icon, pick the shading option and click on `Apply`.

## Realistic Pictures

As you complete your design, you can create a realistic picture by combining multiple light sources, shadows, and surface textures to achieve realistic effects.

# Creating High Quality Pictures

There are two ways to improve the quality of a picture: dithering and pixel averaging. Pixel averaging smooths jagged edges at the expense of spatial resolution. Dithering increases the number of colors by a factor of 2 or 4, while reducing the number of shades per color.

Pixel averaging can be used only once per model. Using dithering, you create a picture with more than the maximum number of shades that can be displayed, and dither it to display all the colors.

## Number of Displayed Colors

The following lists the maximum number of displayed colors:

Shades/Color - 256

Colors - 16

Colors

Displayed - 1 2 4 8 16

After

DITHER4 - 4 8 16

DITHER4

Again 16 - 16\*

Please note: \*DITHER2 is more efficient

When shading surfaces or solids with a total of 256 shades, you are not restricted to selecting only one color. You can enter any number of colors, and the system stores this information in the picture file.

When the system displays a picture, the combination of colors and their associated shades that equal 256 or less appears on the screen. The system then substitutes the first colors for those color and shade combinations that exceed the 256 limit.

## Examples

The following examples explain the method the system uses to display colors:

- If you specify eight colors for a picture and specify 64 shades for each color, the system displays the picture with the first four colors and their component 64 shades. Those entities specified to be in colors 5 to 8 instead appear in shades of the first four colors.
- If you select four different colors with 256 shades per color, the system displays only one color. See the table. To display all four colors, pick `Dither4` on the `EDIT PICTURE` option.
- If you select different values for `Dither`, it reduces the number of shades per color. Using a value of 4 (`Dither4`) reduces the shades per color by a factor of 4 (to 64), and the system displays four colors.

When using the maximum number of 16 colors, use the following steps to get the best quality picture:

1. Start out at full size resolution with shades per color of 64.
2. Use `Dither4` to shades per color of 16. The system can now display up to 16 colors.

For most images with 16 colors, this produces the best spatial smoothing and blending of the shades across a curved surface. If you need high quality images, it is best to start as far to the right and top of the table as possible and change the number of colors and shades until you reach the desired combination of colors, shades, and resolution.

## Plotting Shaded Pictures

You can display, edit, and plot any shaded picture that is newly created with the Plot Picture option or with any of the other shading commands. You can plot the shaded model in either color or monochrome provided that the appropriate plotter has been configured.

When generating a shaded picture with the Plot Picture option, you can shade all entities that can be shaded with the Shade Solid/Surface options.

The drawing does not have to be active to plot a shaded picture; only the part needs to be active.

### Plotting Tasks

Using the Plot Picture option you can perform the following tasks:

- Shade specified entities and then plot the resulting shaded model.
- Inspect a newly created model and plot it.
- Inspect a newly created shaded model and edit it.
- Inspect a newly created shaded model, edit it, and plot the result.

Plot Picture features allow you to specify the following:

- Surface attributes displayed on the shaded model
- The size of the shaded model in the Graphics Window
- The color of the shaded model
- The number of copies plotted
- The type of plotter used
- Monochrome or color plotting
- Changes in the color of a shaded model
- Changes in the number of shades in a shaded model
- Rotation of the drawing 90 degrees counterclockwise for plotting

# Picture Management

Each picture that you create and file has a picture file name. The picture file name is the part name followed by &PICT and a picture name that you specify or the system assigns.

A picture name is a text string with a maximum length of nine characters.

## Default Picture Names

The default picture name for the shading tasks is a two-character alphanumeric name representing the task that you are performing when the shaded picture is generated. The default name remains the same throughout the shading session.

The task is usually the number that appears as part of the design prompt. For example, the prompt #02# is task 02. When you use shading generation on task 02, the system issues the following default file name:

```
<partname>.&PICT.02
```

## User-specified Picture Names

You can specify a unique picture name as long as it does not exceed nine characters.

When you select the Imagedesign generation property sheet and pick the shade solid or shade surface icon, the name field displays the current task number. Pick the Name field and an alphanumeric keypad is displayed. Type out your unique name, click on it, and it is entered as the unique name to replace the task number.

# Imagedesign as a Surface Analysis Tool

You can use Imagedesign as a surface analysis tool as well as to create pictures for presentation purposes.

Using Imagedesign, you can check surface smoothness and see that there is a uniform, gradual change between adjacent surfaces. The visual examination of shaded pictures can often reveal the need for immediate design changes or for further engineering analysis.

Examining shaded pictures for changes in shading can reveal surface irregularities. By giving adjacent surfaces different colors, you can check for visual interference and boundary alignment.

## Displaying Contour Definition

Shading solids and surfaces all can display contour definition.

Displaying contour definition can clearly show unwanted contour changes such as bumps, creases, and dents. It is also helpful in determining tangency between adjacent surfaces. Displaying contour definition is particularly useful in showing whether curvatures change at a uniform rate (are smooth).

## Shading Curvature

Shade Curvature is the most powerful surface analysis tool.

Shade Curvature displays the relative Gaussian curvature or the minimum radius of curvature for selected surfaces. By displaying the relative Gaussian curvature, you can check surface smoothness and make sure that there is a uniform, gradual change between curvatures. Surface irregularities show up as separate colors. Values between the minimum and maximum range specified can be displayed in the CADD5 text window.

By displaying the minimum radius of curvature, you can determine the size of the spherical tool necessary to sweep out a surface without gouging it.

# Parametric Environment Shading

You can, if you have the necessary license, create shaded images within the Parametric environment.

You can display colored shaded pictures within the Parametric environment.

## Parametric Shading Options

When you select `SETUP` on the top menu bar while in the Parametric environment, and `SHADING . . .` on the menu that is displayed you can specify the characteristics of a Parametric shaded image display. The options that are available are

Shade Display Type: Toggle between flat and shiny

Shade Smoothness: Specify the degree of tessellation

Ambient Intensity: Intensity of the surrounding light

Lightsource: Color and intensity of a light from infinity

When the options are specified, pick the `RENDER VIEW` icon. Then select one or more views to be shaded.

All entities in the selected view(s) are shaded and displayed.

For more information see the *Basic Shading Reference Card*.

## Imagedesign at a Glance Using the GUI

This section provides a quick reference for accomplishing basic Imagedesign tasks using the graphical user interface (GUI).

In all cases you must first activate a CADDs part and drawing, be in the Explicit environment, and have a surfaced or solid model(s) that you wish to shade.

Please note: Imagedesign is a subenvironment of the Explicit modeling environment. When you are in Imagedesign the CADDs prompt is a double dollar sign.

### Establishing Surface Appearance Attributes

1. Select the SETUP option in the top bar.
2. Select SURFACE ATTRIBUTES from the resultant menu.

The Surface Attributes Setup property sheet appears:



3. Select desired options and apply the property sheet.



## Establishing Imagedesign Options

1. Select the SETUP option in the top bar.
2. Select IMAGEDESIGN from the resultant menu.

The Imagedesign Setup property sheet appears:



The four icons on the left side of the property sheet control the display of the rest of the property sheet.

## Solid Model Attributes

Select this icon to enable specification of solid model attributes for Imagedesign. See “Establishing Imagedesign Options” on page 1-17 for actual property sheet display.



## Surfaced Geometry Attributes

Select this icon to enable specification of surfaced model attributes for Imagedesign. See “Establishing Imagedesign Options” on page 1-17 for actual property sheet display.



## Gaussian and Minimum Radius of Curvature

Select the third icon to display options relative to Gaussian curvature display or minimum radius of curvature.



## Printer and Plotter Options

Select the fourth icon to display options relative to printing or plotting.



## Creating a Shaded Image

Use this procedure to create a shaded image and an image file.

1. Select the Render icon in the top bar.



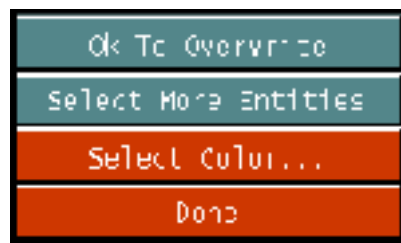
2. Select IMAGEDESIGN from the resultant menu.

The Imagedesign property sheet appears.



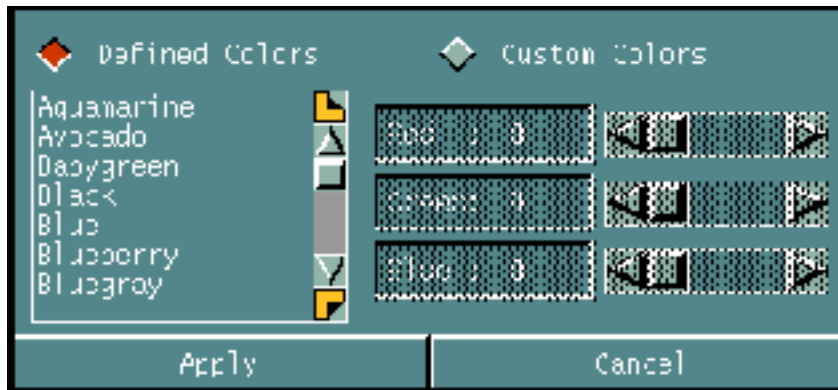
3. Click in the Name field and type in a new filename or use the resultant alphanumeric keypad to enter a new filename.
4. Enable the desired shading option and apply the property sheet.

The following menu appears and you are prompted (MODEL ent :) to select one or more entities from within the CADD graphics window:



5. Select the entity or entities that you wish to shade.
6. Select the Select Color option panel.

The following property sheet appears:



7. Specify a Defined Color or create a Custom Color and apply the property sheet.
8. Select the Done option panel when you are ready to generate the shaded image.

The selected entities are shaded and the filename specified is created.

9. Optionally manipulate the shaded image. See “Manipulating an Existing Image” on page 1-21, steps 5 through 10.

When you are ready to exit the Imagedesign shaded appearance and the Imagedesign environment, select the Render icon in the top bar.



10. Select EXIT PICTURE from the resultant menu.

## Manipulating an Existing Image

Use this procedure to edit an existing image.

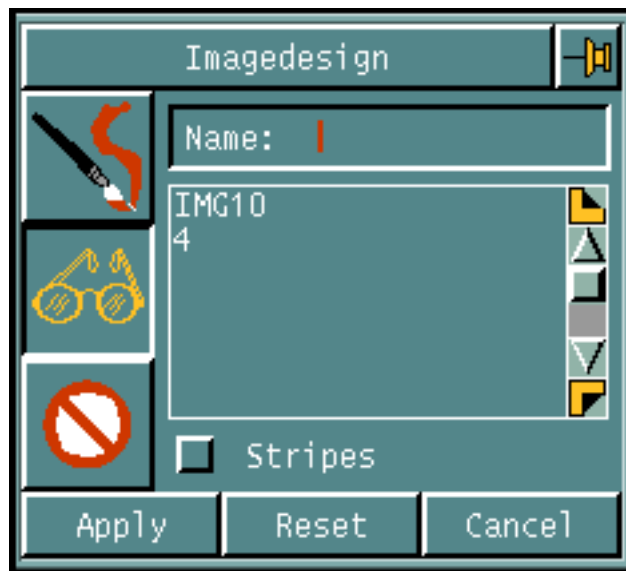
1. Select the Render icon in the top bar.



2. Select IMAGEDESIGN from the resultant menu.

The Imagedesign property sheet appears.

3. Select the second icon on the left side of the property sheet.



4. Click on the name of an existing image file that you wish to view and apply the property sheet.

The shaded image stored under that filename appears.

5. Select the Render icon in the top bar.
6. Select EDIT PICTURE from the resultant menu.

The Edit Picture property sheet appears.

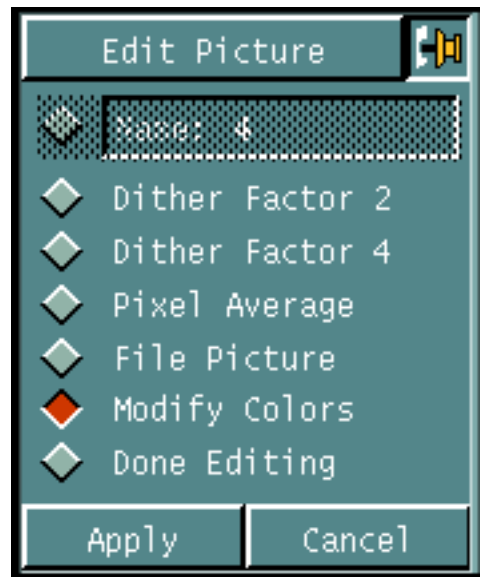


7. Enter the Name of the image file that you wish to edit.

Editing options become available.

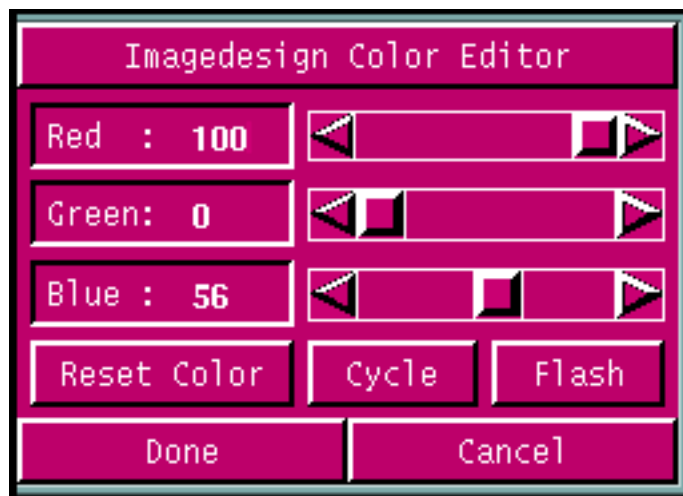
8. Select the desired editing option and apply the property sheet.

Please note: In this example, the Modify Colors option is used.



The Color Editor appears.

9. Slide the color buttons to immediately change image color.



10. Select the Done menu option when you are satisfied with the results.

## Exiting the Active Picture

Use this procedure to exit the active image file and the Imagedesign environment.

1. Select the Render icon in the top bar.



2. Select EXIT PICTURE from the resultant menu.

## Deleting an Image File

Use this procedure to delete an existing image file.

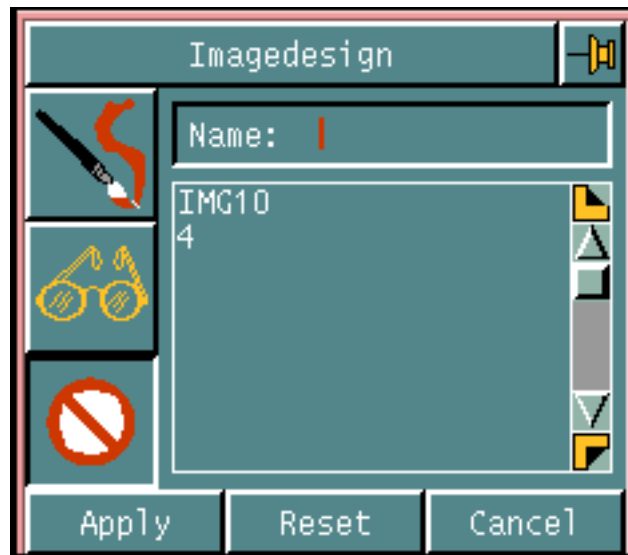
1. Select the Render icon in the top bar.



2. Select IMAGEDESIGN from the resultant menu.

The Imagedesign property sheet appears.

3. Select the third icon on the left side of the property sheet.





4. Click on the name of the existing image file that you wish to delete and apply the property sheet.

The named image file is deleted.



# Attribute Assignment and Initialization

---

The following key topics are discussed in this chapter:

- Overview
- Activate a Part and Drawing
- Display the SETUP Menu
- Assign Surface Attributes
- Selecting a Solid or a Face
- Assigning Reflective Attributes
- Specifying Speckles or Tweed
- Selecting Matte, Corduroy, or Brushed Metal Surfaces
- Establishing Shaded Picture Display Values
- Evaluating Contour Definition
- Assigning Plotting Attributes

## Overview

Before generating a shaded picture, assign attributes to the part surfaces. Then define particulars for the specific picture you intend to generate.

As described in Chapter 1, Imagedesign is divided into three phases:

- Shading Initialization
- Shading Generation
- Shading Manipulation

## Assigning Attributes

Using the Surface Attributes Setup property sheet, you specify the following attributes for the surface or face of a solid:

- Shininess
- Highlight Intensity
- Transparency
- Speckles
- Tweed
- Matte (or) Corduroy (or) Brushed Metal

## Specifying Picture Attributes

Using the Imagedesign Setup property sheet, you specify the following options that apply to the picture you are going to generate:

- Picture Smoothness
- Shadow Smoothness
- Shades per Color
- Ambient Intensity
- Lightsource Space
- Lightsource coordinates
- Background Color
- Picture Size
- Are the various assigned Surface Attributes to be displayed
- Gaussian or Minimum Radius of Curvature

- Number of copies if Plotting
- Plotter device
- Plotting scale
- Plotting options

All options listed above are explained in the following pages.

# Activate a Part and Drawing

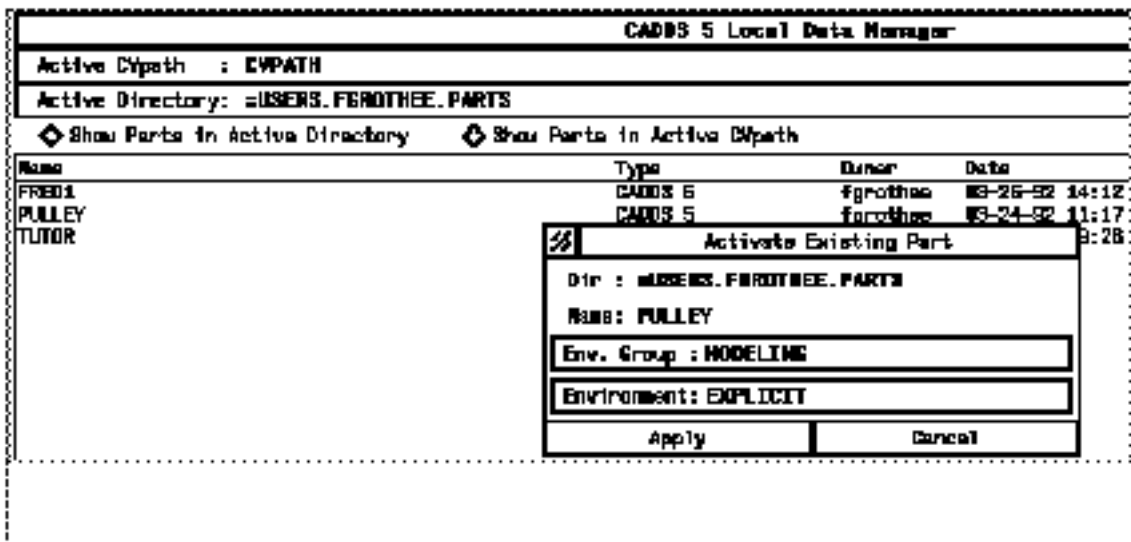
Imagedesign shaded picture initialization and generation is designed to be used with an existing part and active drawing.

## Activate a Part and a Drawing

Activate the part and the drawing to be used as the basis for the shaded picture.

Illustrated below is an existing part being activated by using Local Data Manager.

Your system manager may have configured your system to activate parts in some other fashion.



## Display the SETUP Menu

Pick `SETUP` on the top menu bar to display a menu that allows you to

- Assign surface attributes to an entity or entities
- Specify Imagedesign setup options

### Selecting SURFACE ATTRIBUTES...

You assign surface attributes to a surface, a solid, or an nfigure. An attribute gives them a special appearance or texture.

When you pick `SURFACE ATTRIBUTES...` on the `SETUP` menu, the property sheet illustrated on the following page is displayed.

### Selecting IMAGEDESIGN...

Use the selections on the Imagedesign Setup property sheet to

- Assign options to the picture you want to generate
- Specify representations of surface curvatures using Gaussian curvature or minimum radius of curvature
- Configure your Plotter setup

These selections are applied after the surface attributes have been assigned.

Please note: Surface attributes do not apply to the surface curvature options.

The Imagedesign specifications remain as defaults until some or all are changed.





The system does not make the attributes assigned until a specific request is made using the appropriate fields on the Imagedesign Setup property sheet. For example, Surface Attribute Setup may assign the Speckles and Tweed attributes to a shaded model. However, the surface appears without one of these patterns unless you specify “yes” to the `Display preset patterns:` field in the Imagedesign Setup property sheet.

You can reassign surface attributes more than once and specify different options. Options specified during the last execution overwrite and reinitialize any previously assigned surface attributes. To change the attributes of a shaded model, reexecute the Surface Attribute Setup assignments.

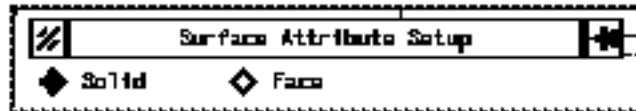
When you have made your selection, click on `Apply`. In the Text Window you are prompted to identify the entities to which the attributes apply. Select the entities and click on `Done selecting entities` under the `Apply` panel.

## Selecting a Solid or a Face

The Surface Attribute Setup property sheet allows you to assign attributes to

- An entire solid by picking Solid
- Specific faces of a solid by picking Face.

Please note: You cannot use Solid and Face together.



BETUP	LTJLJ Y	QJG
MODEL COLOR		...
DRWY GRID		...
VISIBILITY		...
ACTIVATE LAYER NAMES		
BET LAYER COLORS		...
DISPLAY BY LAYER COLORS		
DISPLAY BY ENTITY COLORS		
CHANGE INPUT UNITS		...
CADSHADE		...
SURFACE ATTRIBUTES		...
DWGBORDER		...
TABLET		...

### Selecting the Face Option

When using the Face option, indicate a face by selecting two edges of that face.

You can indicate pairs of faces with a common edge by entering a string of selections. The system interprets each consecutive pair of selections as one face. The final choice indicates the closing edge of the last face.

Use a semicolon to indicate the end of any string including a pair of selections indicating only one face.

The system can interpret a string of selections to indicate a series of faces with common edges. For example, if two faces have a common edge, the system interprets a string of three selections to indicate two faces.

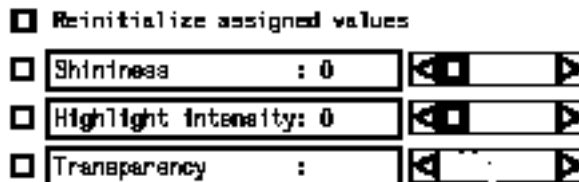
It defines the first face by the first two choices and the second face by the second and third choices.

In the same manner it interprets a string of five selections to indicate four faces with common edges. It defines the first face by the first two choices, the second face by the second and third choices, the third face by the third and fourth choices, and the fourth face by the fourth and fifth choices.

Please note: Do not use windows as a means of selecting geometry when using the Face option; the system may select the wrong face of a solid. Specifically digitize the geometry you want.

## Assigning Reflective Attributes

You can assign a variety of reflective attributes. These options are found on the Surface Attribute Setup property sheet.



### Reinitializing Assigned Values

When you select this option the system reinitializes all previously assigned surface attributes from a surface, solid, or face to its default value.

### Shininess

This attribute specifies how polished the shaded model is. The values range from 0 to 100. A highly polished surface has small, sharply defined highlights. A dull surface has more diffuse highlights that blend gradually into the surface. The default is 0, indicating a very dull surface. Slide the pointer next to the field back and forth to assign the value you want.

### Highlight Intensity

This attribute specifies the intensity of the highlights on a surface. The values for intensity range from 0 to 100. The greater the value of <n>, the more intense the highlights. The default value is 0 and indicates no highlights. Slide the pointer next to the field back and forth to assign the value you want.

A polished and /or highlighted surface will not be displayed until you set “yes” to the `Display preset specularity:` field on the `Imagedesign Setup` property sheet.

## Transparency

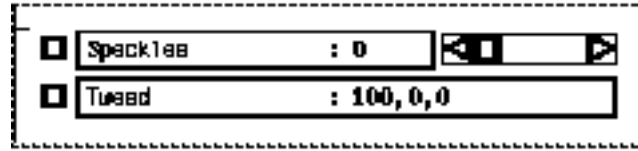
Specifies that the shaded model is not opaque. You specify transparency in percentages by sliding the pointer next to the field back and forth. The settings are

- 0% - Transparency is not in effect. This is the default.
- 25% - Partial (quarter) shading.
- 50% - Partial (half) shading.
- 75% - Partial (three-quarter) shading.
- 100% - The entity is not shaded.

Transparent surfaces cast no shadows, regardless of the level of transparency. This option has no visible effect unless you set “yes” to the `Display preset transparency:` field on the `Imagedesign Setup` property sheet.

## Specifying Speckles or Tweed

You can use a speckled or tweed appearance when shading. These options are found on the Surface Attribute Setup property sheet.



SETUP	UTILITY	OBJ
MODEL DRESS	...	
DRAW GRID	...	
VISIBILITY	...	
ACTIVATE LAYER NAMES		
SET LAYER COLORS	...	
DISPLAY BY LAYER COLORS		
DISPLAY BY ENTITY COLORS		
CHANGE INPUT UNITS	...	
CAD SHADE	...	
SURFACE ATTRIBUTES	...	
IMAGEDESIGN	...	
TABLET	...	

### Speckles

Specifies the percentage of speckles on the surface. Values range from 0 (no speckles) to 100. The default is 0. Speckles are not displayed until you set "yes" to the Display preset patterns files on the Imagedesign Setup property sheet.

Please note: Speckles and Corduroy cannot be selected at the same time.

### Tweed

Specifies a tweed pattern with percentages of color on the surface. Each of color 1, 2, and 3 range from 0 to 100. The proportion of color to the sum of all colors defines its percentage of color.

You can set the values for 1, 2, and 3 by using the calculator or by sliding the pointer next to the field back and forth.

A Tweed surface is not displayed until you set "yes" to the Display preset patterns field on the Imagedesign Setup property sheet.

## Selecting Matte, Corduroy, or Brushed Metal Surfaces

You can apply a matte, corduroy, or brushed metal appearance to your shaded objects. These options are found at the bottom of the Surface Attribute Setup property sheet.



### Predefined Surface Attributes

Specify that you want to use one of the predefined attributes, Matte, Brushed Metal, or Corduroy. You cannot change or add to the predefined attributes, and you cannot specify more than one predefined attribute at a time.

Matte specifies that the shaded model has a matte finish. A matte finish has no shiny highlights. This is the default.

Corduroy specifies that the shaded model has a corduroy finish.

Brushed Metal specifies that the shaded model has a brushed metal finish. A brushed metal finish has both specular and highlights.

A predefined attribute surface is not displayed until you set “yes” to the `Display preset patterns:` field on the Imagedesign Setup property sheet.

## Establishing Shaded Picture Display Values

Use the Imagedesign Setup property sheet to specify values that affect the appearance of the shaded picture.

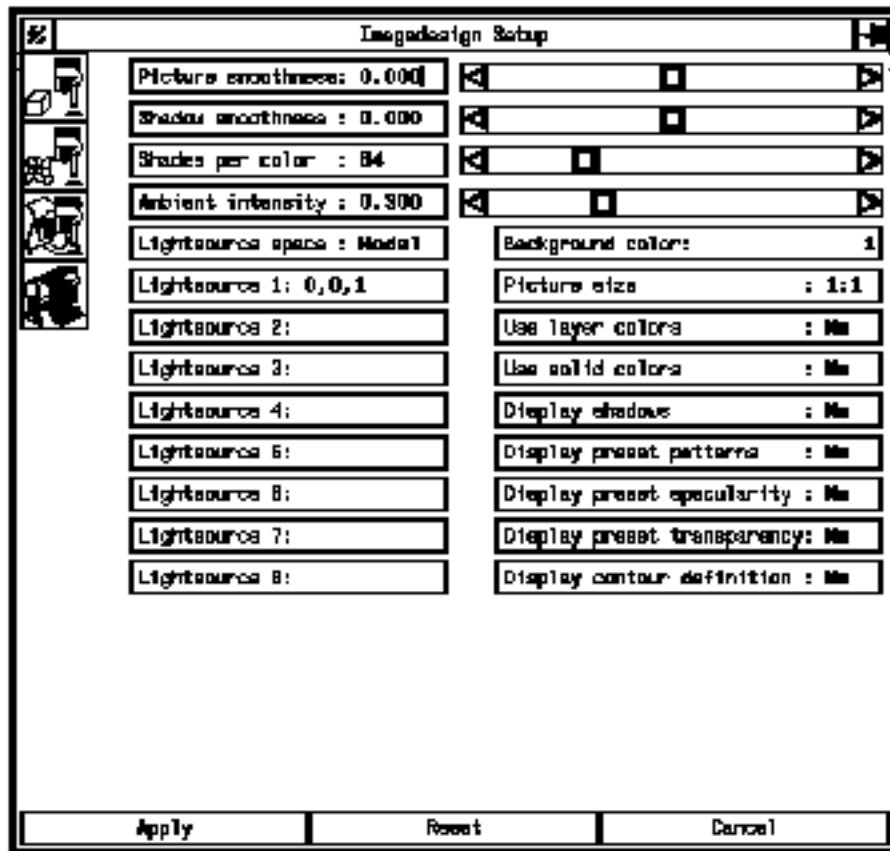


Pick `IMAGEDESIGN...` under `SETUP` on the top menu bar. The Imagedesign Setup property sheet illustrated below is displayed.

- Click on the top option to declare values for solids.
- Click on the second option to declare values for surfaces.
- Click on the third option to declare values for the display of Gaussian curvature or minimum radius of curvature.



- Click on the bottom option to initialize plotting attributes.



## Shading a Solid or Surface

The SHADE SOLID or SHADE SURFACE icon displays the Setup property sheet illustrated above. You can use SHADE SOLID and SHADE SURFACE with all solids, surfaces, trimmed surfaces, and nfigures.

The fields on the property sheet are used to specify the surface attributes that will be used with the shaded model, the size of the picture in the Graphics Window, and various appearance and lighting attributes of the shaded picture.

## Picture and Shadow Smoothness

Values for Picture smoothness and Shadow smoothness are specified in the top two fields on the Setup property sheet.



SETUP	PROPERTY SHEET
MODEL GRID	...
DRAW GRID	...
VISIBILITY	...
ACTIVATE LAYER NAMES	
SET LAYER COLORS	...
DISPLAY BY LAYER COLORS	
DISPLAY BY ENTITY COLORS	
CHANGE INPUT UNITS	...
SHADOWS	...
SURFACE ATTRIBUTES	...
IMPRESSION	...
TABLET	...

The default values for both Picture and Shadow smoothness are zero. They are changed by moving the sliding pointer on the Setup property sheet.

### Picture Smoothness

Picture smoothness defines the quality and speed for picture generation.

Quality refers to the degree of surface evaluation. The greater the degree, the more accurate the resulting picture.

Allowable values for Picture smoothness are real numbers between -1 and +1. A -1 is fast but has less quality. A +1 requires more computer time but has more quality. The default is 0.

### Shadow Smoothness

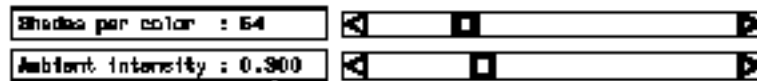
Shadow smoothness specifies quality and speed for shadow generation.

Allowable values are from -1 to +1. A -1 indicates faster shadow generation, though it has less quality or sparser resolution. A+1 indicates slower generation, but greater quality or denser resolution. The default is 0.

## Color Shades and Lighting Level



You can change the default values on the Setup property sheet by either clicking on the field and displaying the calculator or by sliding the pointer back and forth.



### Shades per color

The `Shades per color:` field is set to a default value of 64 shades per color. The maximum number is 256.

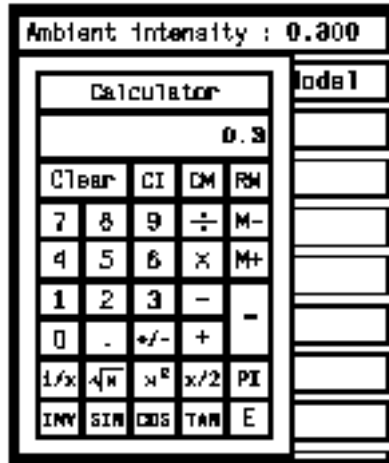
Review the module *Creating High Quality Pictures* in Chapter One for more information about shades per color.

### Ambient Intensity

Ambient intensity specifies the surrounding lighting level. It must be a real number between 0 and 1.

This option is used to clarify surface edges. The value 0 specifies the least amount of surrounding light. A value of 1.0 produces a picture of uniform shade.

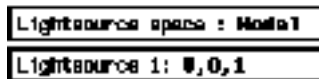
The default is 0.3. The remainder of the lighting equation is determined by the other Lightsource options, including space coordinates and numbers of lightsources specified.



## Lightsource



Lightsource can be specified in either model or screen space. Click on the Lightsource field and the option toggles between Model and Screen.



## Model Lightsource

Lightsource specifies a three-dimensional direction for the light source emanating from infinity so that the rays are parallel (no angle of diffusion). The light passes through a coordinate specified by you, and is aimed at the point of origin of the entity. The coordinates must be three real numbers and can be measured in model space. The default is (0,0,1) from the top of the model.

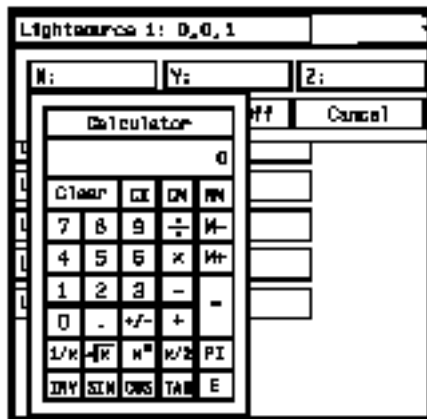
## Space Lightsource

Space lightsource specifies that the direction for the light source be in screen space. The numbers must be three real numbers and must correspond with the positive x-, y-, and z-axes of the active construction plane.

You can specify up to eight light sources. You cannot mix lightsources when using more than one.

When you use more than one light source, the system may not correctly calculate the highlights of the shaded model in the following cases:

- The model has brushed-metal surfaces and shadows.
- The model is in the isometric view and has both shadows and specularity.

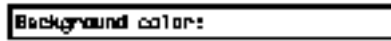


Click on the Lightsource <n> field. A coordinates menu is displayed. Use the calculator to enter values for x-, y-, and z-. Pick Apply and the entries are made in the Lightsource field. An empty coordinate field is assumed to be 0 (zero).

## Background Color



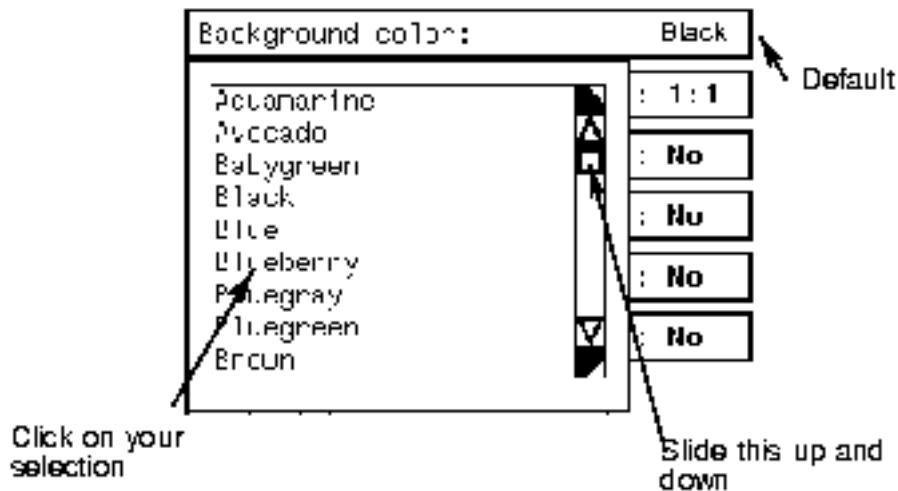
Use the `Background color:` field to specify the background color from a list of available colors. The default color is black which is the normal screen background color. You can choose any color listed in the color list.



### Selecting a Background Color

Click on the `Background color:` field. A list of available colors is displayed, as illustrated below.

Place your cursor on the pointer and slide it up and down, displaying a list of the available colors. Click on your choice when it is displayed. The name will appear in the `Background color:` field.



### Size of the Shaded Picture



You can specify that the shaded picture be only a fraction in size of the Graphics Window.

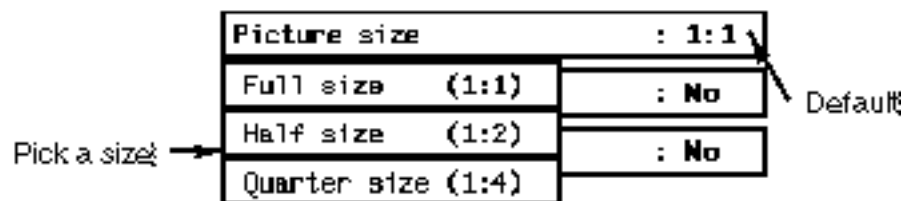


## Specifying Shaded Picture Size

There are three sizes available:

- Full size  
 (1:1) which specifies that you want a full size shaded picture generated. This generates a picture the same size as the Graphics Window. This is the default.
- Half size  
 (1:2) which specifies that you want half resolution for the shaded picture generation. Each dimension of the window is halved, generating a picture one-quarter the Graphics Window area. The system left justifies the model at the top of the Graphics Window. The rest of the Graphics Window not in the shaded picture is the background color.
- Quarter size  
 (1:4) which specifies that you want quarter resolution for the shaded picture generation. Each dimension of the window is quartered, generating a picture one-sixteenth the Graphics Window area. The system left justifies the model at the top of the Graphics Window. The rest of the Graphics Window not in the shaded picture is the background color.

To specify a picture size other than the default, click on the `Picture size:` field. A list of three selections is displayed. Click on the size you want, and that figure is entered into the field. Illustrated below is the menu of size options available with the Shade selections.

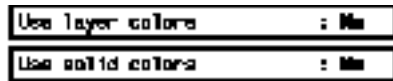


A fourth size (Double) is only available with the `Plot Picture` option and is described in that module.

## Specifying Defined, Layer, or Solid Colors



You can specify user-defined or system-defined colors for the entities you are shading, or specify that they be displayed in layer colors or solid colors. The default is to display in defined colors.



### Using Layer Colors

Pick the `Use layer colors :` field to toggle the selection from the default “no” to “yes”. This specifies that selected layer discrimination colors, using echoed layers, are the colors for the entities selected.

Layer discrimination must have been set up by picking `SETUP` on the top menu bar and `SET LAYER COLORS` on the menu that is displayed.

You cannot use defined or solid colors if layer colors are turned on.

### Using Solid Colors

Pick the `Use solid colors :` field to toggle the selection from the default “no” to “yes”. This specifies that the surface will be a solid color regardless of illumination factors.

You cannot use solid colors with surfaces that have patterns.

### Using Defined Colors

User-defined and system-defined colors are specified with the generation of the shaded picture. They are discussed in the next chapter.



## Shadows, Patterns, Specularity, and Transparency



You can specify that the display of shadows, patterns, specularity, and transparency be turned on or off.

Display shadows	: No
Display preset patterns	: No
Display preset specularity	: No
Display preset transparency	: No

### Displaying Shadows

Pick the `Display shadows:` field to toggle the selection from the default “no” to “yes”. This specifies that shadows be calculated and displayed based upon the light source(s).

Generating a picture with shadows takes approximately three times longer than generating a picture without shadows. If you use more than one light source, it takes even more time.

### Displaying Patterns

Pick the `Display preset patterns:` field to toggle the selection from the default “no” to “yes”. This specifies that the system shade the entities with tweed, speckles, and corduroy.

Before setting this field to “yes” specify the types of pattern that are to be displayed by setting their values on the Surface Attribute Setup property sheet. If you do not set any surface attribute values and specify “yes”, the picture will generate with default settings for the patterns.

### Displaying Specularity

Pick the `Display preset specularity:` field to toggle the selection from the default “no” to “yes”. This specifies that the system shade the entities with shiny highlights. If this field is set to “no”, shading is done in flat colors.

You must first enter values for `Shininess` and `Highlight intensity` on the `Surface Attributes Setup` property sheet. The system limits shading with specularly to 128 shade/color combinations.

## Displaying Transparency

Pick the `Display preset transparency:` field to toggle the selection from the default “no” to “yes”. Assign a level of transparency on the `Assign Surface Attributes Setup` property sheet before turning this field to “yes”. Transparent surfaces cast no shadows, regardless of the level of transparency.

## Evaluating Contour Definition



You can use color to show whether curvatures change at a uniform rate (are smooth).

**Display contour definition : No**

## Evaluating Curvature Change

Pick the `Display contour definition:` field to toggle the selection from the default “no” to “yes”.

This evaluates color depending on depth. The system evaluates the color relative to the screen, and the colors are not user-definable. The default is no contour definition.

You cannot turn on contour definition with solid colors or user-defined colors.

The result is similar to a topographical contour map with different colors between contour lines. Sixteen color ranges result from the default 64 shades.

You can use the `EDIT PICTURE` option and the `Dither4` feature to display more colors.

## Shade Curvature

You can check surfaces for relative smoothness using this set of options. You can also determine the appropriate tool to use when machining a surface.

`SHADE CURVATURE` creates a picture that, for selected surfaces, represents either

- Relative Gaussian curvature, or
- Minimum radius of curvature

Valid entities for this procedure are

- Tabulated cylinders
- Surfaces of revolution
- Ruled surfaces
- B-spline surfaces up to the third degree
- Spoles
- Nsurfaces
- Tsurfaces
- Solids

You cannot select more than 10000 surfaces per locations request. If it is necessary to select more than 10000 surfaces, select the `Select more entities` option on the Imagedesign generation menu.

## Gaussian Curvature

Displaying Gaussian curvature ensures a uniform, gradual change between curvatures. Surface irregularities show up as separate colors.

The Gaussian curvature of a surface is determined by the product of the two principal curvatures at a given point (P) on a surface.

The two principal curvatures are the maximum and minimum curvatures (the inverse of the local radius) at (P) of curves cut out of the surface by planes intersecting the surface normally (perpendicularly) at (P).

Maximum curvature must be a positive number; minimum must be a negative number.

System-defined Colors: Colors used in Gaussian curvature can only be specified by the system; you cannot specify them. You can, however, define the limits of the Gaussian curvature to be displayed (a negative and a positive value).

Colors for Negative Values: Six colors, ranging from red-orange to green are assigned to negative values (saddle shaped areas). Negative values that are smaller than the limit defined by you are displayed in red.

Color for Zero Curvature: Dark green is assigned to near-zero Gaussian curvature. This curvature corresponds to pieces of developable surface. A developable surface is one that can be mapped to a plane without twisting the surface.

Colors for Positive Values: Six colors, ranging from green to magenta, are assigned to positive curvatures. Magenta defines the most convex curved local area. Positive values that are greater than the upper limit defined by you are displayed in white.

A color bar is displayed across the top of the picture to serve as a guide.

## Minimum Radius of Curvature

Displaying the minimum radius of curvature allows you to determine the size of a spherical tool able to sweep out a surface without gouging it.

Convex and flat surfaces accept any tool radius. Only concave surfaces can be gouged.

By convention, the `SHADE CURVATURE` option assumes that the tool is along the z-axis of the active Cplane. You can change the tool axis from z to -z by selecting the appropriate field on the property sheet.

Define Colors or Use Preset Colors: You can define up to 14 radii values with 14 associated colors. The radii values and colors are sorted in increasing order.

Areas with a minimum radius *smaller* than the first specified color are displayed in red. In areas where the minimum radius occurs between two specified values, the color associated with the lower user-defined value is used. Convex shapes are displayed in green.

Sort Surfaces on Different Layers: You can assign surfaces to different layers according to their minimum radius of curvature, using layer discrimination options.

Please note: When working with solids and Tsurfaces, only the base surface of each face is placed on a new layer; layer modification appears only if the Tsurface or solid is striped.

Please note: For more information see the `SHADE CURVATURE` command in online command help.

## Gaussian Curvature

Assign values for either Linear or Quadratic Gaussian curvature.



Select `IMAGEDESIGN...` under `SETUP` on the top menu bar. Pick the `Shade Curvature` option on the Setup property sheet to open the `Imagedesign Setup` property sheet. The `Gaussian Curvature Linear` options are selected by default.



### Ambient Intensity and Picture Size

The ambient intensity and picture size of the shaded picture are determined in the same manner as for `Shade Solid`, described previously.

### Linear Gaussian Curvature

Displays the color change of uniform curvature by linear color scaling. This is the default.

### Quadratic Gaussian Curvature

Pick this selection if you want quadratic color scaling instead of linear. The color changes at quadratic increments (that is,  $Y = X^2$  along the total scale).

## Maximum Curvature

This option specifies the maximum (positive) Gaussian curvature for the color display. It displays curvatures greater than this value as white. The value specified should be positive. The default in a mm part is 5.0E-05 or 0.00005. The default in an inch based part is 0.1.

Six colors (ranging from green to magenta) are assigned to positive Gaussian curvature. Magenta indicates the most convex curved local area. Values larger than the limit defined by you appear as white.

## Minimum Curvature

This option specifies the minimum (negative) Gaussian curvature for the color display. It displays curvatures smaller than this value as red. The value specified should be negative. The default in a mm database is -5.0E-05 or -0.00005. The default in an inch based part is -0.1.

Six colors (ranging from red-orange to green) are assigned to negative values (saddle shaped areas). Values smaller than the limit defined by you appear as red.

Note: Near-zero Gaussian curvature is identified in dark green. This Gaussian curvature pertains to surface areas that can be mapped to a plane without twisting the surface.

## Print scale values

This option enables you to see the intermediate Gaussian curvature values that exist between the maximum and minimum values specified. This display, which includes the minimum and maximum values specified, appears in the CADDS text window. The values displayed reflect the lower limit corresponding to each curvature color displayed in the Imagedesign window.

There are a maximum of 13 intermediate values which correspond to the Gaussian curvature values that separate adjacent colors. These reflect the Gaussian curvature values that occur along a surface between two adjacent colors.

## Minimum Radius of curvature

See “Minimum Radius of Curvature” on page 2-30

## Applying the Property Sheet

When you are satisfied with your selections, click on **Apply**. The curvature is displayed in colors calculated by the system.

### Example

If you enabled the **Print scale values** option and specified a **Minimum** value of -1.5 and a **Maximum** value of 0.5, your text window would display the following:

```
SHADE CURVATURE PRINTSCALE MINVAL -1.5 MAXVAL 0.5:
Begin Shaded Image Generation
GAUSSIAN CURVATURE
Color White for any values above +1.0000E00
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:+x.xxxxE-01
Lower limit for next color:-x.xxxxE-01
Lower limit for next color:-x.xxxxE-01
Lower limit for next color:-x.xxxxE-01
Lower limit for next color:-x.xxxxE-01
Lower limit for next color:-x.xxxxE-01
Lower limit for next color:-x.xxxxE-01
Color Red for any values below -2.001E00
Minimum Gaussian curvature value: -2.000074
Maximum Gaussian curvature value: 1.000037
XSIZE=1023, Y SIZE=702, NSHADE=16, NDCOLOR=16, NSCOLOR= 0
Entering Environment: DATA.VNTAB.IMAGEDESIGN!
```

## Minimum Radius of Curvature

You can display minimum radius of curvature by defining up to 14 radii in 14 colors. These colors can be defined by you or automatically assigned by **Imagedesign**.



Select **IMAGEDESIGN . . .** under **SETUP** on the top menu bar. Select the **Shade Curvature** option.





## System-Assigned Colors

You assign colors to your model layers at the beginning of your modeling session. If you want to use these colors to display minimum radius of curvature, pick the field as shown below.

You must place a mesh on the faces of trimmed surfaces or solids before shading curvature. Only the meshed faces appear on new layers.

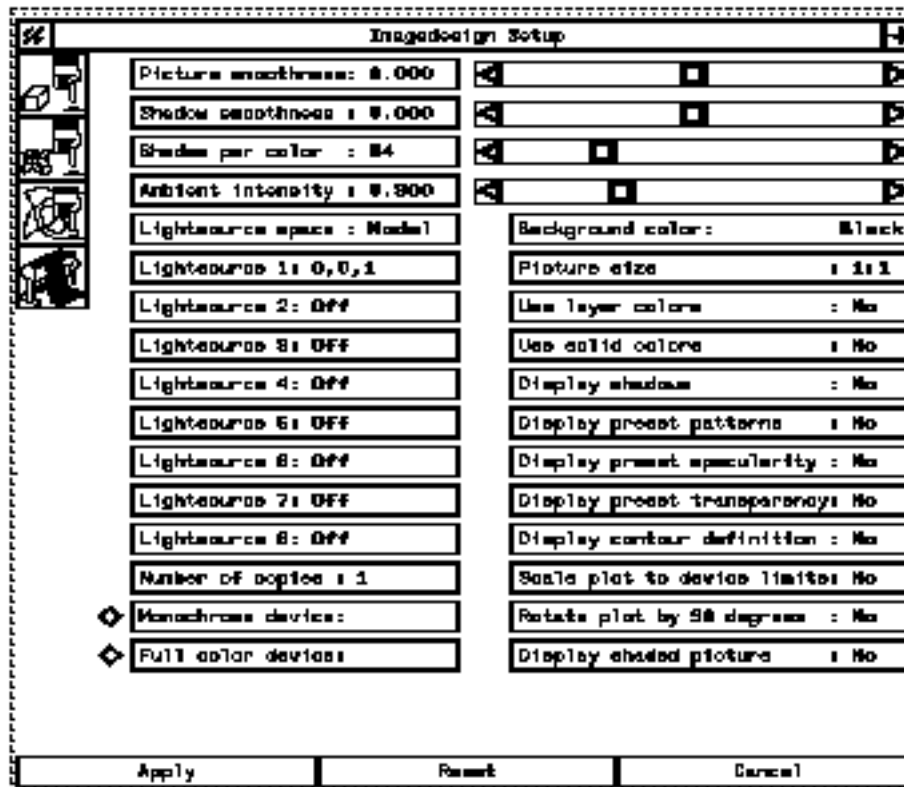
## Assigning Plotting Attributes

The Plot Picture option allows you to perform all the functions of the Shade Solid and Shade Surface options. It also enables you to rotate the drawing for plotting and specify plotter attributes.



Select `IMAGEDESIGN...` under `SETUP` on the top menu bar.

Select the Plotter option to open the following property sheet.



### Number of Copies

In the `Number of copies:` field, specify the number of copies to be plotted. The default entry is 1.

## Selecting a Plotter

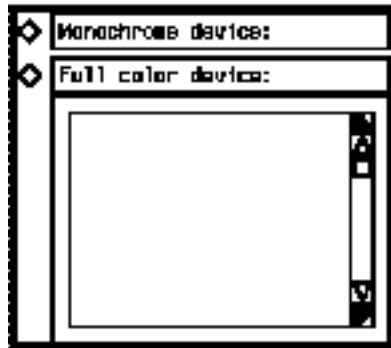
Select a plotting device with a valid device name from your `/etc/printcap` file. If you do not specify a device name the system searches the `/etc/printcap` file for the device type CHCP.

If the system does not find CHCP, it searches for the type DTMX. The format data for the plotting device must exist as a text file or a link to a text file under the `sysgf` directory. For example, if you use CHCP as your selected device, the system searches for `sysgf/chcp/plot/_bcd/bch`.

When you plot a shaded model, you do not have to display it on the screen before plotting.

## Specifying the Device

You can select either `Monochrome device:` or `Full color device:`. A list of valid plotters is displayed. Pick the plotter to be used, and the name is entered into the device field.



## Picture Size

The definitions of Full, Half and Quarter size pictures are the same for the Plot Picture option as for Shade Solid/Surface. The Plot Picture option also has a Double size available.

Picture size	
Full size	(1:1)
Half size	(1:2)
Quarter size	(1:4)
Double size	(2:1)

Double size specifies a picture twice as large as the Graphics Window. If the horizontal scale exceeds the Imagedesign limit of 1152 pixels, the system clips the picture to 1152. If the vertical scale exceeds the limit of 900 pixels, the system clips the picture to 900. This may cause the picture file to have different clipping bounds than the Graphics Window.

You can inspect the resulting picture in the existing Graphics Window by selecting Pixel Average on the Edit Picture menu. Pixel averaging reduces the resolution of the picture by a factor of two in each direction. Exit the editing mode by selecting Done Editing rather than File Picture to preserve a picture created in double size.



When you create a double size picture, the system takes about four times as long to generate the shaded picture.

When creating a double size picture, you can prevent the system from clipping the shaded picture by positioning the objects you want to shade in the upper left corner of the Graphics Window. You can also avoid clipping problems by using a Graphics Window no larger than 576 pixels by 450 pixels.

## Modifying Extents

You can plot the shaded model to full size even if you specified half or quarter size. In cases where the shaded model is larger than the plotter boundaries, the system scales the plot so that the entire picture fits within the plotter boundaries.

To specify this option, change the default “no” in the Scale plot to device limits: field to “yes” by clicking on it.

## Rotating the Plot

You can rotate the drawing 90 degrees counterclockwise before generating a shaded image for plotting. You can use this modifier for new pictures only.

To specify this option, change the default “no” in the `Rotate plot by 90 degrees :` field to “yes” by clicking on it.

## Displaying Your Shaded Picture

You can display the shaded model on the screen. After you have viewed it, you can use the `Edit Picture` option to modify or file it, or the `Imagedesign` generation option to plot the picture. You can also return to the command processor and specify additional options.

To specify this option, change the default “no” in the `Display shaded picture :` field to “yes” by clicking on it.

## Applying Your Selections

When you have made all the entries to the `Plotter Setup` menu that you desire, click on `Apply`. These entries are the default settings when you select the `Plot Picture` option on the `Imagedesign` picture generation menu.

# Shaded Picture Generation

---

The following key topics are discussed in this chapter:

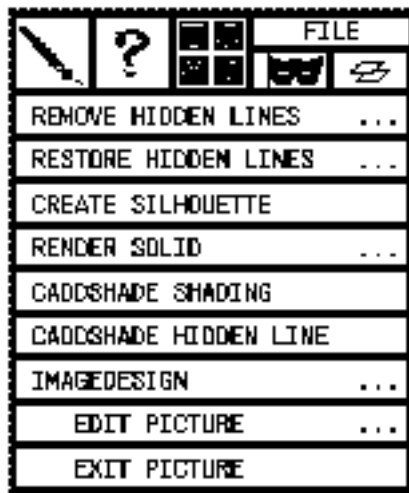
- Entering the Shaded Picture Generation Environment
- Shading a Solid or Surface
- Shading with Defined Colors
- Shading with Custom Colors
- Shading Curvature
- Plotting a Picture

# Entering the Shaded Picture Generation Environment

The Imagedesign shaded picture options are located under the Render icon in the top bar.



To enter the shaded picture generation environment click on the `RENDER VIEW` icon on the top menu bar. The following menu list is displayed:



The following menu items are used with Imagedesign:

- `IMAGEDESIGN` - Associated with shaded picture generation
- `EDIT PICTURE` - Associated with picture modification and manipulation
- `EXIT PICTURE` - Associated with picture display and modification

Please note: `EDIT` and `EXIT PICTURE` are described in the next chapter.

## Imagedesign Generation Options

Select the `IMAGEDESIGN` option on the menu and a property sheet is displayed, as illustrated on the next page. Use this sheet to accomplish the following tasks associated with shaded picture generation:



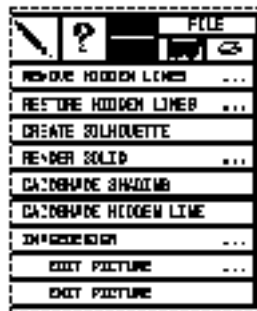
- Shade a solid
- Shade a surface
- Display Gaussian curvature
- Display minimum radius of curvature
- Display a filed picture
- Display a filed picture with stripes
- Delete a picture
- Plot a picture

## Shading a Solid or Surface

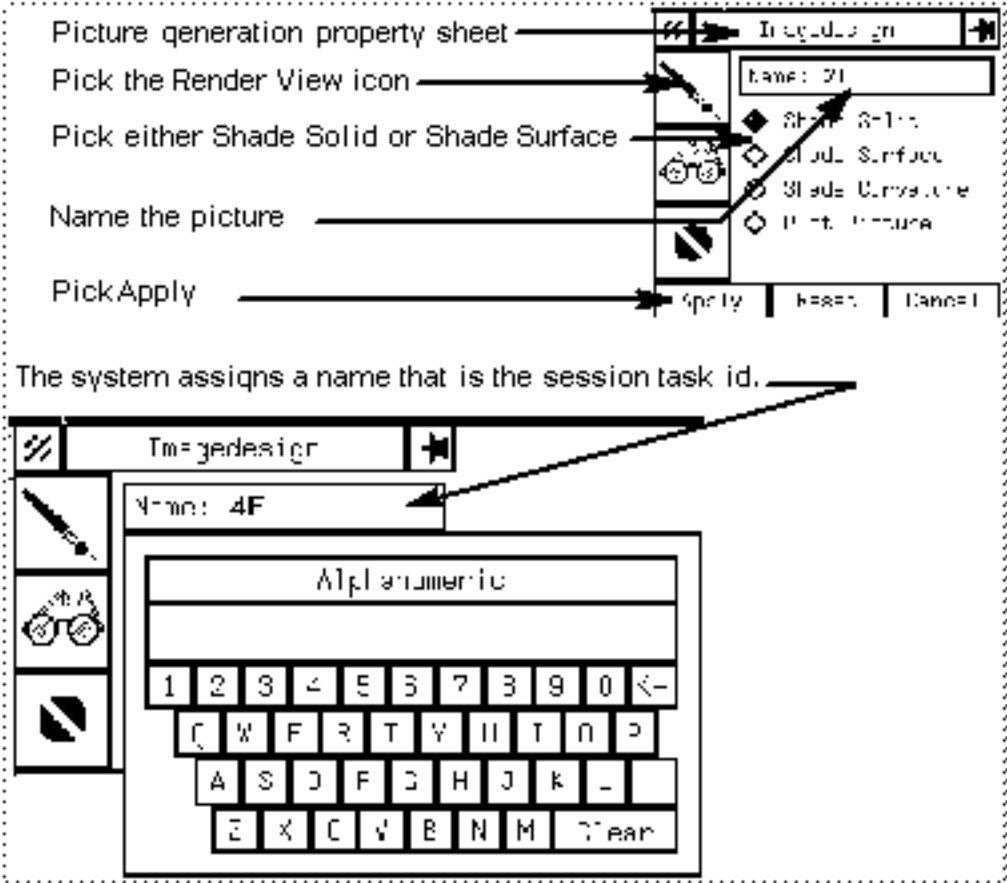
To generate a shaded picture of a solid or surface, open the Imagedesign picture generation menu and select the Render icon.



Select the RENDER VIEW icon. Select IMAGEDESIGN on the menu.



The Imagedesign generation property sheet appears.



### Naming Your Picture

When you select SHADE SOLID or SHADE SURFACE you are generating a *new* picture. This picture is named by the system. You can assign your own name by clicking on the name field and displaying an alphanumeric keypad. Enter your picture name, click on the top field and the name is entered into the Name field on the menu.

The name of the picture becomes the last level of the picture file name. The text string can have multiple levels but must not exceed nine characters.

If the name already exists, the following prompt appears:

OK To Overwrite.

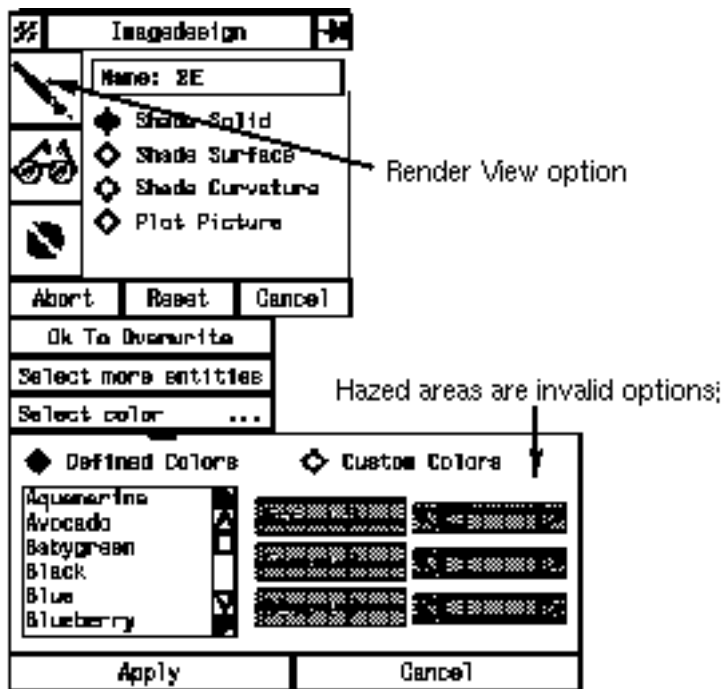
Any response other than OK terminates the command.

# Shading with Defined Colors

You can assign system-defined colors to the entities in the shaded picture. There are 65 colors available.



When you have picked the RENDER VIEW icon, selected SHADE SOLID (or SURFACE), assigned a name to the picture and picked Apply, the system displays the additional options illustrated below.



In the text window, you are asked to select an entity to which to assign color. Select the entity, then select the Select Color option. The list of system-defined colors appears. The prompt **Input Appearance Modifiers** appears in the text window. Select the desired color and select Apply on the property sheet.

If you want to assign another color to another entity, repeat the procedure. Continue in this manner until you have assigned a color to all desired entities. Select the Done menu option. The system message `BEGIN SHADED IMAGE GENERATION` is displayed in the Text Window and the shaded picture appears in the Graphics Window.

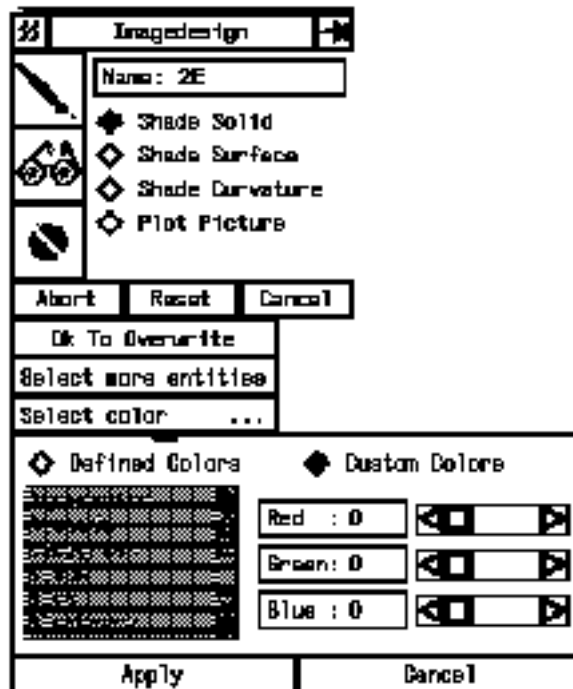
Please note: The shaded picture view that is displayed is the same view in which you selected the entity to be shaded. The default color, if you do not specify one, is white.

# Shading with Custom Colors

Create your own color by blending red, green, and blue.



You can create your own color by blending red, green, and blue. The amount of each color ranges from 0% to 100%. 0% specifies no amount of that color. 100% specifies the maximum amount of that color.



Proceed in the same manner as when using system-defined colors but instead of applying a defined color to an entity, apply a color that you create.

To create your own color, select the Custom Colors option. Slide the pointers by each color back and forth to specify the desired percentage of that particular color. When you are satisfied with the new color press the Apply option. Select the desired entity. Repeat this process until you have assigned user-defined colors to each desired entity.

When you have finished associating colors, select Done and the shaded picture is generated. Exit the picture by using the Exit Picture option. The picture is automatically filed.

Please note: When you use more than one lightsource, the system may not correctly calculate the highlights of the shaded model in the following cases:

- The model has brushed-metal surfaces and shadows.
- The model is in the isometric view and has both shadows and specularities.

# Shading Curvature

Display the Gaussian curvature of a selected surface or the minimum radius of curvature of that surface.



Pick the `RENDER VIEW` icon on the generation property sheet. Pick the `Render (paintbrush)` option on the imagedesign property sheet. Pick `Shade Curvature`. Pick `Apply`. The property sheet is illustrated below.



## Type of Curvature to be Displayed

The type of curvature that will be displayed is the one that is specified on the `Imagedesign Setup` property sheet, see `Gaussian Curvature` section in `Chapter 2`. The options are:

- Gaussian Linear
- Gaussian Quadratic
- Minimum Radius of Curvature

## Displaying the Curvature

Enter a name in the `Name` field. If the name already exists, a prompt appears in the `Text Window`. Pick the `OK to Overwrite` field and you are asked to identify the entity involved.



Select the entity and click on Done . The shaded picture is generated.

Exit the picture with the EXIT PICTURE option and the picture is automatically filed.

Please note: The Shade Curvature option does not work on an entity displayed in the isometric view when the entity crosses the view clipping.

## Plotting a Picture

You can generate and plot a shaded picture in accordance with the attributes specified in the Plotter section of the Imagedesign Setup property sheet.



1. Pick the `RENDER VIEW` icon on the generation property sheet.
2. Pick the `Name` field. An alphanumeric keypad is displayed.
3. Enter the name of the picture to be generated.
4. Apply the property sheet.



If the picture already exists you are prompted `Ok to Overwrite`. Type `ok` into the Text Window or pick it on the generation menu. Any other action cancels the plot.

When you specify `ok` you are asked to supply a new name for the picture. Rename it and press the `RETURN` key.

You are prompted to identify the surfaces that are to be displayed and plotted. Select the entities and then the colors.

When you have selected all the entities and colors you want, pick `Done`.

The picture is displayed in the Graphics Window and the drawing is sent to the plotter.

# Shaded Picture Manipulation

---

This chapter discusses the following key topics:

- Manipulating and Editing Shaded Pictures
- Displaying a Filed Shaded Picture
- Deleting a Shaded Picture
- Editing a Shaded Picture
- Exiting a Picture
- Listing Pictures
- Listing Surface Attributes

# Manipulating and Editing Shaded Pictures

Manipulative and editorial menus and property sheets are located under the render and Query icons in the top bar.



Menus and property sheets that affect the appearance and attributes of a shaded picture are located beneath the `RENDER VIEW` icon and the `?` on the top menu bar.

## Available Property Sheets

Property sheets that are available under the `RENDER VIEW` icon are:

- `IMAGEDESIGN` - For viewing and deleting pictures
- `EDIT PICTURE` - For Modifying pictures
- `EXIT PICTURE` - For filing and exiting a displayed shaded picture

Property sheets that are available under the `?` icon are:

- `PICTURES` - For listing your parts and pictures
- `SURFACE ATTRIBUTES` - For listing surface attributes of solids and faces

## Editing Pictures

The options that are part of the `EDIT PICTURE` set are:

- Dithering - For greater shaded picture clarity
- Pixel Averaging - For viewing a picture before plotting

- **Picture Filing** - For saving an edited picture
- **Color Modification** - For changing the colors of solids, surfaces, or entities
- **Done Editing** - For quitting the picture without filing the changes

## Displaying a Filed Shaded Picture

Display a filed, shaded picture using this option.

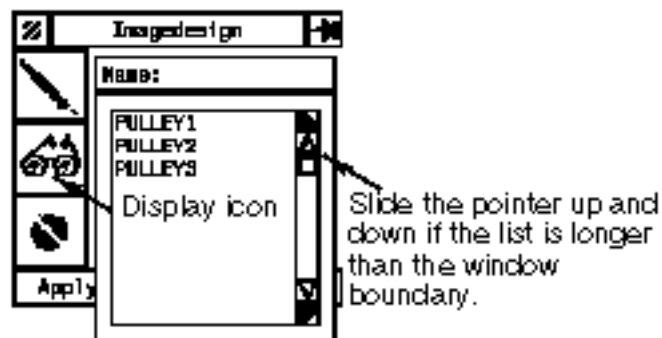


### Displaying the Picture as It Was Filed

Click on the `RENDER VIEW` icon on the top bar menu. Click on `IMAGEDESIGN...`



The `Imagedesign` generation box is displayed. Pick the `Display` icon. Click on the `Name` field and a list of filed pictures is displayed.



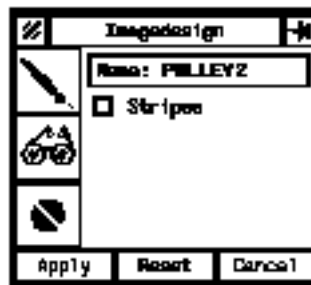
Pick the name of the picture you want. Click on `Apply` and the picture is displayed. The following information is supplied in the `Text Window`:

- Size of the picture in numbers of pixels in the x- and y- directions
- Number of shades in the picture
- Number of dynamic colors in the picture

- Number of static colors in the picture

## Displaying the Picture With Stripes

You can elect to display the filed picture with stripes, in order to more clearly mark the curvature of the surface. The changes in color and shades are for display only and cannot be filed. After you have picked the name of the picture you want, click on the `Stripes` option in the `Imagedesign` generation box. Click on `Apply`, and the picture is displayed with color bands showing the curvature of the surface.



## Deleting a Shaded Picture

You can delete a shaded picture while you are in an active part and drawing.



1. Click on the `RENDER VIEW` icon on the top bar menu.
2. Click on `IMAGEDSIGN...`



The Imagedesign generation property sheet appears.

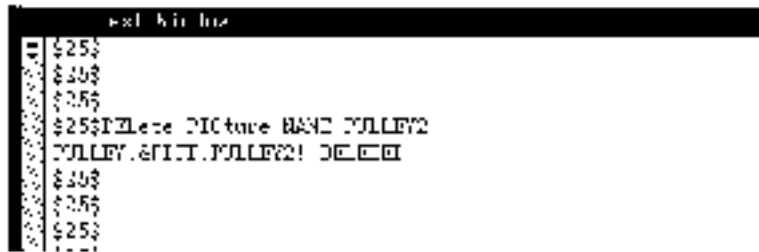
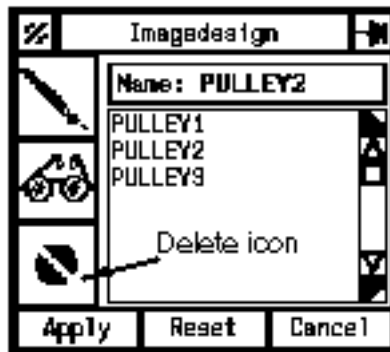
3. Click on the `Delete` icon.

A list of filed shaded pictures is displayed.

4. Click on the name of the picture you want to delete.
5. Click on `Apply` and the picture is removed from the picture file.



The Imagedesign generation property sheet and the message that appears in the Text Window when the picture is deleted are illustrated below.



## Editing a Shaded Picture

You can change or blend the colors in a shaded picture, dither the picture to increase the number of colors displayed, or pixel-average the display to reduce resolution.



1. Click on the `RENDER VIEW` icon on the top bar menu.
2. Click on `EDIT PICTURE...`



The Edit Picture property sheet with the options hazed out, together with a list of pictures that have been filed with this part, is displayed.

3. Pick the picture name and click on `Apply`.

The picture is displayed and the editing options are cleared.

The list and property sheet are illustrated below.



To exit the Edit Picture feature you must Apply the Done Editing option. Selecting Cancel will only close the property sheet but leave the process active. If you want to save your edits before exiting, Apply the File Picture option.

## Dithering

You can select Dither Factor 2 or Dither Factor 4 and Apply. Dither2 reduces the number of shades and increases the number of colors in the picture by a factor of two, Dither4 by a factor of four. Dithering is discussed in detail in Chapter 1.

You cannot dither the picture if you have specified either specularly or a brushed metal surface.

## Pixel Averaging

Pixel averaging generates a display of the active picture that has the resolution of the picture reduced by a factor of two in each direction.

This feature is used when viewing a picture that is to be plotted.

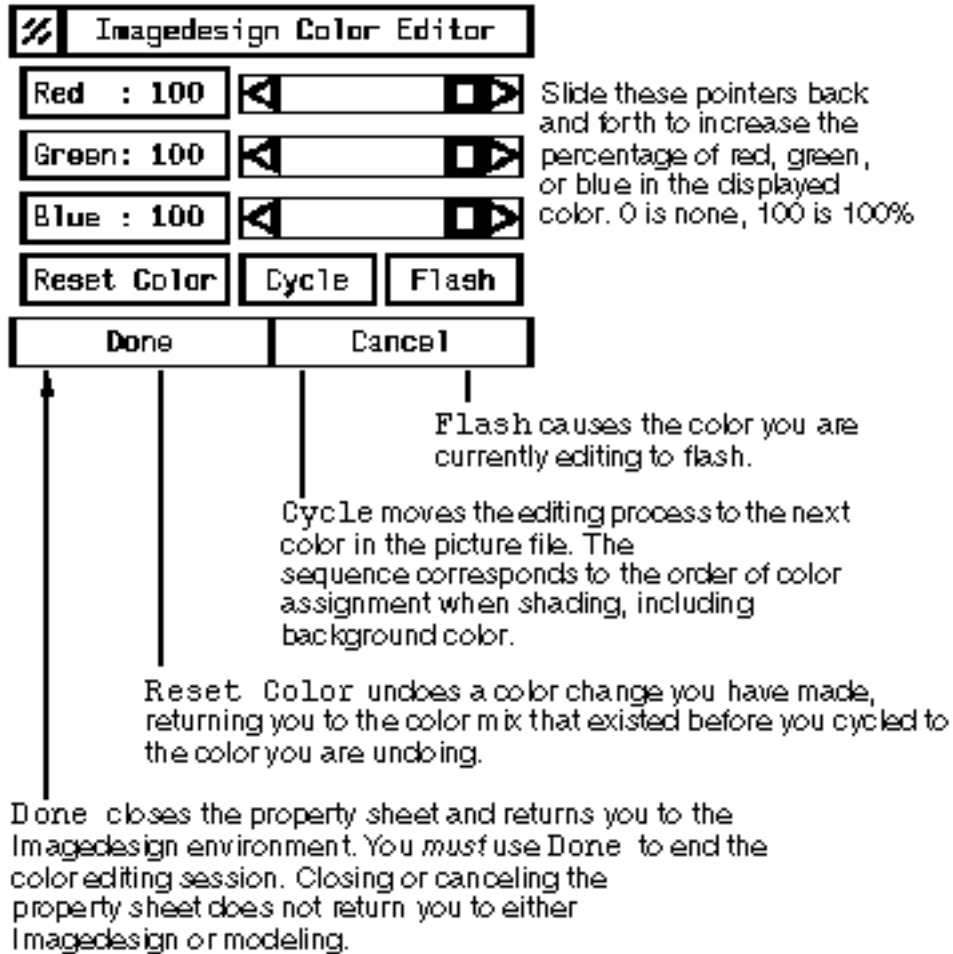
## Modifying Colors

You can modify the colors in the shaded picture by use of the Imagedesign Color Editor.



1. Click on Modify Colors on the Edit Picture menu.
2. Click on Apply.

The Imagedesign Color Editor appears.



To save your edits, file the picture.

## Filing a Picture

Save edits made to an existing picture using the following procedure:

1. Select the desired option from the Edit Picture property sheet.



2. Edit the picture.
3. Select File Picture from the menu list.
4. Apply the property sheet.

The system will ask Ok to Overwrite.

If you respond “no”, the system prompts for a new name to be entered into the Text Window and the picture is filed with the new name.

If you respond “yes”, the new picture file overwrites the old.

The following sequence occurs:

1. The picture is filed.
2. The menu is exited.
3. You remain in the Imagedesign environment.

## Completing Picture Edits

When you have finished your edits and filed any changes that you want to save, click on the `Done Editing` option and apply the property sheet.



The following sequence occurs:

1. The current picture is not filed.
2. The menu is exited.
3. You remain in the Imagedesign environment.

## Returning to the Explicit Modeling Environment

If you picked `Done Editing` and subsequently want to return to the explicit modeling environment

- Pick the `RENDER VIEW` icon on the top menu bar.
- Pick `EXIT PICTURE` on the menu.

You return to the explicit modeling environment.

## Exiting a Picture

Exit from a displayed picture using the Exit Picture option.



1. Select the `RENDER VIEW` icon on the top bar menu.



2. Select `EXIT PICTURE`.

The active picture is removed from the screen, the screen is repainted, and you are returned to your explicit modeling session.

When you exit a picture, the shaded picture is automatically saved.

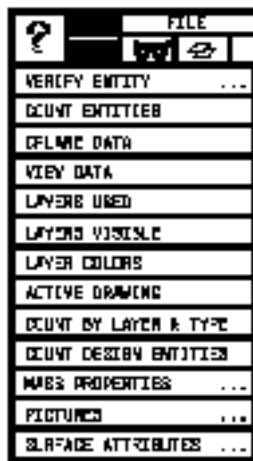


## Listing Pictures

You can list the names of pictures resident within a part.



1. Select the ? on the top bar menu.
2. Select PICTURES . . .



The List Pictures property sheet illustrated below is displayed. The name in the Part: field is the name of the active part by default.

3. Select the Part field to display a list of other parts.
4. Select the name of the part whose pictures you want listed.
5. Apply the property sheet.

A list of the pictures associated with that part is displayed in the Text Window. Included with the names of the pictures is information concerning the date and time that the pictures were created and the date they were last accessed.

Please note: A part must be active; a drawing need not be.

## Listing Surface Attributes

You can list the surface attributes of an entity within the active part.



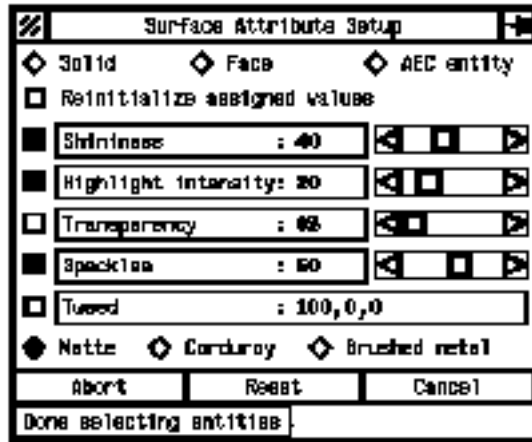
1. Select ? on the top bar.
2. Select SURFACE ATTRIBUTES . . . .



3. Select either SOLID OR FACE.

In the Text Window, you are prompted to select the entity(s) whose surface attributes you want listed. Enter a RETURN, and a list of previously assigned attributes is displayed in the Text Window.

In the illustration below, attributes were assigned on the Surface Attribute Setup property sheet. Below the illustration is shown a portion of the Text Window listing the surface attributes of the part.



```

TAGNAME =
Surface or Solid type = FACE
PREFNAME = MATTE          SHINING = 20.0 SHININESS = 40.0
TRANSLUCENCY = NOT SET   SPECULARS = 60.0 TWEED = 0.0, 0.0,
0
TAGNAME =
Surface or Solid type = FACE
PREFNAME = MATTE          SHINING = 20.0 SHININESS = 40.0
TRANSLUCENCY = NOT SET   SPECULARS = 60.0 TWEED = 0.0, 0.0,
0
TAGNAME =
Surface or Solid type = FACE
PREFNAME = MATTE          SHINING = 20.0 SHININESS = 40.0
TRANSLUCENCY = NOT SET   SPECULARS = 60.0 TWEED = 0.0, 0.0,
0
TAGNAME =
Surface or Solid type = FACE
PREFNAME = MATTE          SHINING = 20.0 SHININESS = 40.0
TRANSLUCENCY = NOT SET   SPECULARS = 60.0 TWEED = 0.0, 0.0,
0
    
```



# Rendering a Parametric View

---

The following key topic is discussed in this chapter:

- Shading in the Parametric Environment

# Shading in the Parametric Environment

You can create some shaded images within the parametric environment.



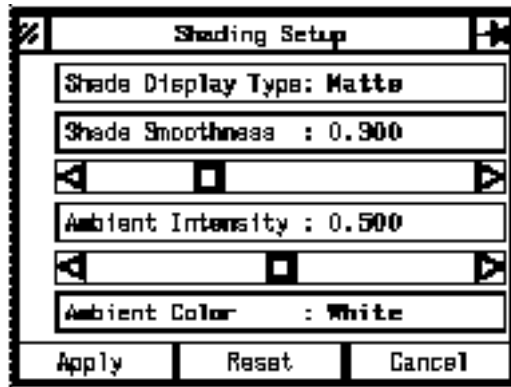
## Shading Setup

In the parametric environment, select the `RENDER VIEW` icon and click on the `SHADE` option. Select the view(s) to be shaded and the shaded image is displayed.

## Shading Options

You can change the characteristics of the shaded image display as follows:

Select `SETUP` on the top menu bar and `SHADING` on the menu. The Shading Setup property sheet appears.



The options on the property sheet are

Shade Display Type:

Toggle the shading finish between `Matte` (flat) and `Specular` (shiny).

### Shade Smoothness:

Select a tessellation value between 0.0 and 1.0. The greater the value, the more accurate the representation. (However, the greater the value, the larger the generated data set and the longer the time needed to display the data set.)

### Ambient Intensity:

Select a value between 0.0 and 1.0 to set the intensity of the ambient light surrounding the shaded model.

### Ambient Color:

Select a color from the color list for the ambient light surrounding the model.

## Light Source Options

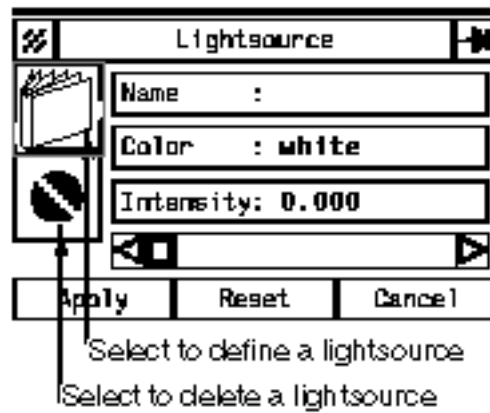
In addition to the surrounding ambient light, a single directional light source is focused on the model. You can define three other light sources besides the default.

The illustration shows how the light comes from the model extent (infinity) through the specified location (★) and to the model origin (0,0,0).



## Controlling Light Source Options

To control light source options, Select **UTILITY** on the top menu bar and **LIGHTSOURCE...** on the menu. The following property sheet is displayed:



The options on the property sheet are:

### Name

Select to specify a light source name.

### Color

Select to specify a color.

### Intensity

Enter a value between 0.0 and 1.0.

Enter a light source location  $[x,y,z]$  for the newly defined light source. The location defines a light source direction from infinity through the specified location and to the model origin (0,0,0).



# System Messages

---

This appendix describes the various messages that appear in the CADD5 5 text window.

# Messages and Description

This appendix lists system messages in alphabetical order according to the first letter in each message. Following each message is an explanation (if necessary) and a list of the options (CADD commands) to which that message applies.

## C

Cannot edit colors if display device does not have a color controller.

This message is displayed when you specify colors and the terminal is not a color terminal. When this message appears, the system aborts the command.

- EDIT PICTURE

CONVERSION of <entity name> is not supported.

The system cannot shade the surface or entity identified. The actual text of this message differs according to the entity. The system ignores the illegal surface and processes the others normally.

- SHADE SURFACE
- SHADE SOLID
- SHADE CURVATURE

## D

Dev <n> not available for plotting

This message appears when there is no dot matrix printer configured on the system, or the plotter is performing another task.

- PLOT PICTURE

Dev <n> not available for plotter

This message appears when the plotter on your system is not a dot matrix plotter.

- PLOT PICTURE

Different number of SEGMENTS in curves of <entity name>.

The system cannot shade the surface or entity identified, because it is not a legal surface or entity. The actual text of this message differs according to the entity. The system ignores the illegal surface and processes the others normally.

- SHADE SURFACE
- SHADE SOLID
- SHADE CURVATURE

Display device does not have a color controller. There will be no picture display.

This message is displayed when you execute the option on a display device that is not a color terminal. The option is executed but no graphics are displayed. You can edit or display the picture at another time.

- DISPLAY PICTURE
- EDIT PICTURE
- SHADE SOLID
- SHADE SURFACE
- SHADE CURVATURE

## E

Error in creating Spool File, Check disk space.

This message appears when there is not enough room on the disk to create the new file. Check with your system manager to see if the disk is full (more than 90%). If the disk is not full, report it to the Software Support Center.

- PLOT PICTURE

Error in displaying picture

If this message appears, report it to the Software Support Center.

- EDIT PICTURE
- SHADE SURFACE
- SHADE CURVATURE
- SHADE SOLID

Error in dithering module

If this message appears, report it to the Software Support Center.

- EDIT PICTURE
- SHADE SURFACE
- SHADE CURVATURE
- SHADE SOLID

Error in picture filing

If this message appears, report it to the Software Support Center.

- EDIT PICTURE
- SHADE SURFACE
- SHADE CURVATURE
- SHADE SOLID

Error in opening Spool File

If this message appears, report it to the Software Support Center.

- PLOT PICTURE

Error in pixel averaging module

If this message appears, report it to the Software Support Center.

- EDIT PICTURE
- SHADE SURFACE
- SHADE CURVATURE
- SHADE SOLID

## M

Modifier processing problems

If this message appears, report it to the Software Support Center.

- PLOT PICTURE

## N

New picture name ?

This message appears when you enter no or a RETURN in response to the message: `Picture exists; type Ok to overwrite. Enter a new picture name and press RETURN.`

- EDIT PICTURE

No color plotter available. Proceeding with monochrome plotter.

This message appears when you specify a Full Color Device on the PLOT PICTURE Setup property sheet and no color plotter is available.

- PLOT PICTURE

## P

`<parameter name>` has a value out of range. Input again.

This message displays when any parameter with a numerical value out of range is entered.

- ASSIGN SURFACE ATTRIBUTES

Picture not filed

This message appears when you pick Done Editing. The system also displays it when you press RETURN as an answer to the `NEW PICTURE NAME ?` message without entering a new name.

- EDIT PICTURE

`<picturename> FILE EXISTS; TYPE OK TO OVERWRITE.`

The system displays this message when you use a name that already exists. The message appears after you pick Apply. If you enter a RETURN or NO, the system aborts the option and returns to CADDs. If you click on OK to overwrite, the system proceeds and overwrites the file.

- SHADE CURVATURE
- SHADE SOLID
- SHADE SURFACE

<picturename> DOES NOT EXIST; COMMAND ABORTED

The system displays this message when the name you entered does not exist. You should check your spelling first and then use the LIST PICTURE option to list the pictures available with the active part.

- EDIT PICTURE

<picturename> Picture exists; type ok to overwrite

This message appears when you pick File Picture, Apply, and the picture name already exists. To overwrite the existing picture click on Ok to overwrite. If you don't want to overwrite it, type no or press RETURN. When you enter no or press RETURN, the following system prompt appears: New picture name?

- EDIT PICTURE

## T

The BSPLINE is NOT a 3rd DEGREE BSPLINE.

The system cannot shade the surface or entity identified, because it is not a legal surface or entity. The actual text of this message differs according to the entity. The system ignores the illegal surface or entity and processes the others normally.

- SHADE SURFACE
- SHADE SOLID
- SHADE CURVATURE

There is no dot matrix plotter in configuration.

This message appears when there is no dot matrix printer configured with your system. Check with your system manager.

- PLOT PICTURE

## U

Unable to attach plotter

This message appears when the system cannot attach a plotter. Another person may be using the plotter.

- PLOT PICTURE

USER MUST INPUT AN INITIAL PICTURE NAME.COMMAND ABORTED

This message is displayed if you do not enter a picture name in the Name field on the property sheet.

- EDIT PICTURE





---

# Index

---

## A

Ambient intensity  
  Imagedesign setup 2-17  
Attributes  
  assigning 2-2

## B

Background color  
  Imagedesign setup 2-19  
Benefits of Shading 1-2  
Brushed metal finish 2-13

## C

Color editor, Imagedesign 4-10  
Color shades  
  Imagedesign setup 2-17  
Colors, modifying 4-10  
Contour definition  
  Imagedesign setup 2-25  
Corduroy finish 2-13

## D

Deleting a picture 4-6  
Displaying  
  a filed picture 4-4  
  a filed picture with stripes 4-5  
  patterns 2-23

  shadows 2-23  
  specularity 2-23  
  transparency 2-24  
Dithering 1-10, 4-9  
Documentation, printing from Portable  
  Document Format (PDF) file xiv  
Done editing  
  picture manipulation 4-13

## E

Editing a picture 4-8  
Editing shaded pictures 4-2  
Exiting a picture 4-14  
Extents, modifying  
  Imagedesign setup 2-35

## F

Filing a picture 4-12

## G

Gaussian Curvature  
  color for zero curvature 2-26  
  colors for negative values 2-26  
  colors for positive values 2-27  
  Imagedesign Setup 2-26  
  system-defined colors 2-26  
Gaussian curvature  
  linear 2-28

- maximum 2-29
- minimum 2-29
- quadratic 2-28

## H

- Hardware for shading 1-3
- Highlight intensity 2-10

## I

Icons

- Gaussian Curvature 2-28
- paintbrush 3-2
- Plotting 2-33
- Shade Solid 2-16
- Imagedesign Color Editor 4-10
- Imagedesign Setup
  - ambient intensity 2-17
  - background color 2-19
  - color shades 2-17
  - colors
    - defining your own 2-22
    - using layer colors 2-22
    - using system-defined 2-22
  - contour definition 2-25
  - displaying patterns 2-23
  - displaying shadows 2-23
  - displaying specularly 2-23
  - displaying transparency 2-24
  - Gaussian Curvature 2-26
  - lightsource 2-18
  - minimum radius of curvature 2-27, 2-30
  - modifying extents 2-35
  - picture size 2-20
  - picture smoothness 2-16
  - plotting
    - number of copies 2-33
    - picture size 2-34
    - rotating the plot 2-36
    - selecting a plotter 2-34
    - specifying the plotter 2-34
  - plotting attributes 2-33
  - shading curvature 2-25
  - Shadow smoothness 2-16
  - Z tool axis 2-31

## L

- Lightsource
  - Imagedesign setup 2-18
  - in model space 2-18
  - in screen space 2-19
- Listing
  - parts 4-15
  - pictures 4-15
  - surface attributes 4-16

## M

- Matte finish 2-13
- Menus
  - IMAGEDESIGN... 2-14, 3-2
  - Setup 2-5
  - SURFACE ATTRIBUTES... 2-6
- Minimum radius of curvature
  - colors 2-27
  - Imagedesign setup 2-27, 2-30

## O

- Overview
  - of attribute assignment 2-2
  - of color selection 1-7
    - by layer assignment 1-7
    - defining your own 1-7
    - predefined colors 1-7
  - of high quality picture creation 1-10
  - of Imagedesign 1-2
  - of picture creation techniques 1-9
  - of picture management 1-13
  - of picture plotting 1-12
  - of setup tasks 1-5

## P

- Parametric shading 5-2
  - lightsource 5-3
  - options 5-2
  - setup 5-2
- Picture filling 4-12
- Picture Generation

- entity colors
  - user-defined 3-8
- picture plotting 3-12
- shading a solid or surface 3-4
- shading curvature 3-10
- Picture generation
  - entering the environment 3-2
  - entity colors
    - system-defined 3-6
  - naming the picture 3-5
- Picture Manipulation 4-2
  - deleting a picture 4-6
  - displaying a filed picture 4-4
  - dithering 4-9
  - done editing 4-13
  - exiting a picture 4-14
  - modifying colors 4-10
  - picture filing 4-12
  - pixel averaging 4-9
- Picture name
  - picture generation 3-5
- Picture size
  - full size 2-21
  - half size 2-21
  - Imagedesign setup 2-20
  - plotting
    - double size 2-34
    - quarter size 2-21
- Picture smoothness 2-16
- Pixel Averaging 4-9
- Pixel averaging 1-10
- Plot Picture
  - picture generation 3-12
- Plotting attributes
  - Imagedesign setup 2-33
- Printing documentation from Portable Document Format (PDF) file xiv
- Property Sheets
  - Imagedesign Setup 2-14
- Property sheets
  - Surface Attribute Setup 2-6

## R

- Reinitializing values 2-10

## S

- Shade Curvature
  - Imagedesign Setup 2-25
  - picture generation 3-10
- Shade Solid icon 2-16
- Shaded picture size 1-6
- Shading a solid or surface
  - picture generation 3-4
- Shadow smoothness 2-16
- Shininess 2-10
- Speckles 2-12
- Surface Attributes
  - highlight intensity 2-10
  - overview 2-7
  - predefined
    - matte, corduroy, brushed metal 2-13
  - reinitializing values 2-10
  - selecting a Face or Solid 2-8
  - shininess 2-10
  - speckles 2-12
  - transparency 2-11
  - Tweed 2-12
- System Messages A-1

## T

- Transparency 2-11
- Tweed 2-12

## Z

- Z tool axis
  - Imagedesign Setup 2-31

