

# Hidden Line Removal (and AEC HLR) User Guide and Menu Reference

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CADDS® 5 15.0

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# Preface

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*Hidden Line Removal (and AEC HLR) User Guide and Menu Reference* provides information on how to blank the features on a solid model that is invisible or hidden from the viewer when the object is a solid.

## Related Documents

The following documents may be helpful as you use *Hidden Line Removal (and AEC HLR) User Guide and Menu Reference*:

- *Explicit Modeling User Guide and Menu Reference*
- *Design and Drafting User Guide and Menu Reference*

## Book Conventions

The following table illustrates and explains conventions used in writing about CADD 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 CADD text fields and on any command line	<code>cvaec.hd.data.param</code> <code>tar -xvf /dev/rst0</code>	Enter the text in a CADD text field or on any command line.
System output	<code>Binary transfer complete.</code>	Indicates system responses in the CADD 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.

Convention	Example	Explanation
Variable in text	tagname	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	INSERT LINE TANTO	Shows CADDs commands and modifiers as they appear in the command line interface.
Text string	"SRFGROUPA" or 'SRFGROUPA'	Shows text strings. You must enclose text string with single or double quotation marks.
Integer	n	Supply an integer for the <i>n</i> .
Real number	x	Supply a real number for the <i>x</i> .
#	# mkdir /cdrom	Indicates the root (superuser) prompt on command lines.
%	% rlogin remote_system_name -l root	Indicates the C shell prompt on command lines.
\$	\$ rlogin remote_system_name -l root	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 CADDs can change. Refer to the following table:

### Look and Feel of User Interface Elements

User Interface Element	Common Desktop Environment (CDE) on Solaris and HP	Window Manager Other Than CDE on Solaris, HP, and Windows
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 CADDs desktop or the Local Data Manager (LDM)

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

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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/ap1/cadds/data/html/htmldoc/ (UNIX)  
Drive:\usr\ap1\cadds\data\html\htmldoc\ (Windows)
2. Click `mainmenu.html`. A list of available CADDs documentation appears.
3. Click the book title you want to view.

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 DOCUMENTATION. A list of available CADDs 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/htmldoc/mainmenu.html (UNIX)  
CDROM\_Drive:\htmldoc\mainmenu.html (Windows)

## 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)

## 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 electronically to `doc-webhelp@ptc.com`.

# Hidden Line Removal

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This chapter describes how to access the Graphical User Interface (GUI) for Hidden Line Removal (HLR) for objects. It describes how to blank the features on an object that would be invisible or hidden from the viewer, if the object were solid. It also describes how to restore (unblank) hidden lines.

- Overview of Hidden Line Removal
- Accessing HLR Options
- Removing Hidden Lines
- Restoring Hidden Lines
- Mark Changes
- Update Hidden Line Removal Image
- Update Management
- Restrictions and Notes

# Overview of Hidden Line Removal

The following sections describe Hidden Line Removal.

## What is Hidden Line Removal?

Hidden Line Removal (HLR) consists of two command options that are accessible from the CADD5 desktop:

**Remove Hidden Lines:** This enables you to erase the hidden lines and generate silhouettes on objects (defined as solid or trimmed surfaces) to produce a complete three dimensional image. You can apply Hidden Line Removal, simultaneously to more than one view, and to all the objects or only those that you have selected. You can also blank the hidden lines or show them as dotted lines.

You can apply hidden line removal to objects such as primitives, swept solids, Boolean solids and on all objects supported by the Basic Shader or Image Design II.

**Restore Hidden Lines:** This command option restores the hidden lines of the object. You can choose to restore lines for all objects or only those that you select.

## How Hidden Line Removal can Help the Design Process

Hidden Line Removal has many features that can improve the design process, some of which are described in the following sections.

### Naturally Visualize Objects

Removing hidden lines enables the natural visualization of objects by blanking those features that would be invisible or hidden from the viewer if the object were solid. As a result, the visual complexity of the scene is reduced and the object appears three dimensional.

### Focus on the View you Want

You can blank the features on an object in one view. This lets you proceed with interactive construction on the part while providing three-dimensional visualization of objects. Using explicit xyz coordinates, you can select or identify all entities in a hidden line image. HLR enables you to hide any solid objects that appear against each other in a scene.

## Use Images for Illustrations

Besides aiding the design process, hidden line images may be used as illustrations for technical publications, marketing materials, and other documentation that is not design related.

## RENDER VIEW HLR Quality Statement

The quality of Hidden Line Removal (HLR) images depends on the platform, the graphics board, and the graphics driver used.

## Accessing HLR Options

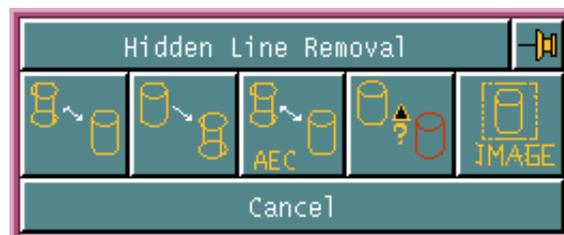
The Hidden Line Removal (HLR) options are available from the Render icon, located on the top bar of all Explicit environments.

### To Access HLR

1. Click the Render icon (paintbrush) on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the pulldown menu.



The Hidden Line Removal command palette appears.



The Hidden Line Removal command palette allows you to:

- Remove hidden lines from an object
- Restore hidden lines, previously removed from an object
- Remove hidden lines from Application Objects
- Identify changes
- Update the HLR graphics

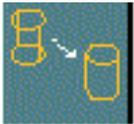
The third icon, AEC9 HLR, allows you to access the Graphical User Interface for Architecture Engineering Construction (AEC) Hidden Line Removal. These options are explained in detail in Chapter 2, “AEC Hidden Line Removal.”

## HLR Commands

You can also use the following commands:

- Remove hidden lines using the command **HIDE OBJECT**
- Restore hidden lines using the command **UNHIDE OBJECT**
- Identify changes using the command **MARK CHANGES**
- Update the HLR graphics using the command **UPDATE HLRIMAGE**

## Removing Hidden Lines



Removing hidden lines reduces the visual complexity of an object and gives it a three-dimensional appearance. This enables the natural visualization of solid models by blanking those features that would be invisible or hidden from the viewer if the object were solid.

If the HIDE OBJECT command is applied to previously HLRed entities, it preserves the associative dimensions of the Limbs or Surrogates. Similarly, if the dimensions are applied to the viewed part entities, HIDE OBJECT preserves the dimensions for those curves which are still visible after the execution of the command.

Please note: When you perform an operation for hidden line removal, a warning message appears if the selected entity is not a properly formed solid. For viewed entities, this message displays the name of the part or component, its instance name (ID Name), and its Master Index Pointer (miptr) in the original part as follows:

**In Part mode:**

```
Warning: Can't find solid for entity 328295.  
Miptr 328295 is miptr 66151 in the part NVORM, IDName  
PART.1.
```

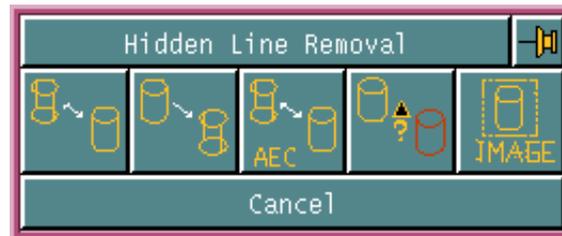
**In Assembly mode:**

```
Warning: Error in reading solid entity 324785.  
Miptr 324785 is miptr 62641 in the model VALVE, component  
valve_1.
```

If dimensions are applied to the Surrogates in HLR Image, the UNHIDE OBJECT command preserves these dimensions and they are applied to the corresponding viewed part curves. Dimensions applied to Limbs are not transferred.

Using the Remove Hidden Lines option

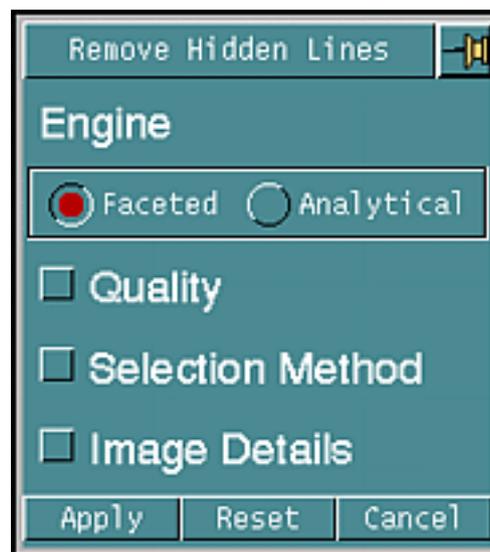
1. Click the Render icon from the top bar.
2. Choose Hidden Line removal from the menu.



3. Click the Remove Hidden Lines icon from the command palette.

The following menu appears:

**Figure 1-1 Remove Hidden Lines Menu**



The Remove Hidden Lines menu allows you to switch between the Faceted and the Analytical engine. By default, you are in the faceted mode.

Please note: While using the Faceted engine, you can interrupt the HLR operation by pressing ESC+Q while the HIDE OBJECT FACETED command is running.

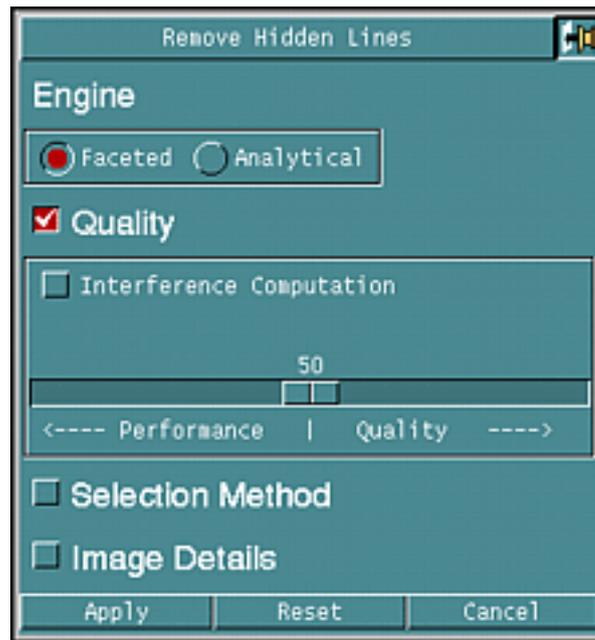
You can select any combination of the Quality, Selection Method, and Image Details options, along with their options, to further refine your HLR operation.

The Remove Hidden Lines menu expands for further data input when you choose one of these options.

You can also remove hidden lines without selecting or expanding the Quality, Selection Method, or Image Details options. The hidden line removal operation is then performed with the default values of the Quality, Selection Method, or Image Details options.

When you choose any one of these options, the related options are displayed. The Remove Hidden Line menu expands or contracts, displaying the related options. For example, if you choose the Faceted engine and choose the Quality option, the Remove Hidden Lines menu appears as shown:

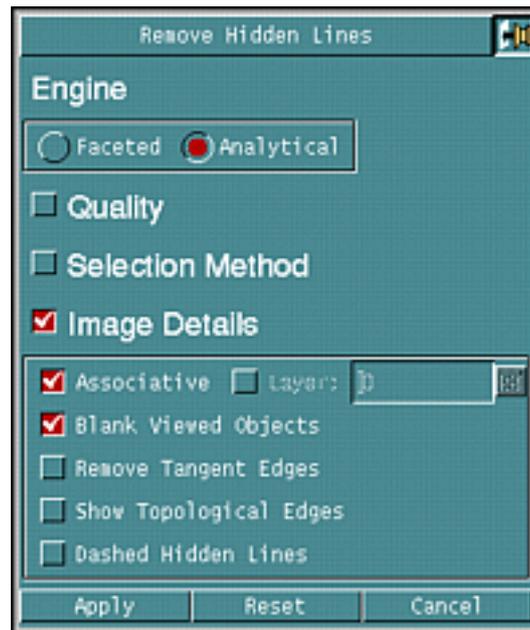
**Figure 1-2 Remove Hidden Lines menu with Faceted > Quality option selected**



Only the options related to the Quality option are displayed.

Similarly, if you choose the Analytical engine and choose the Image Details option, the Remove Hidden Lines menu appears as shown:

**Figure 1-3 Remove Hidden Lines menu with Analytical > Image Details option selected**



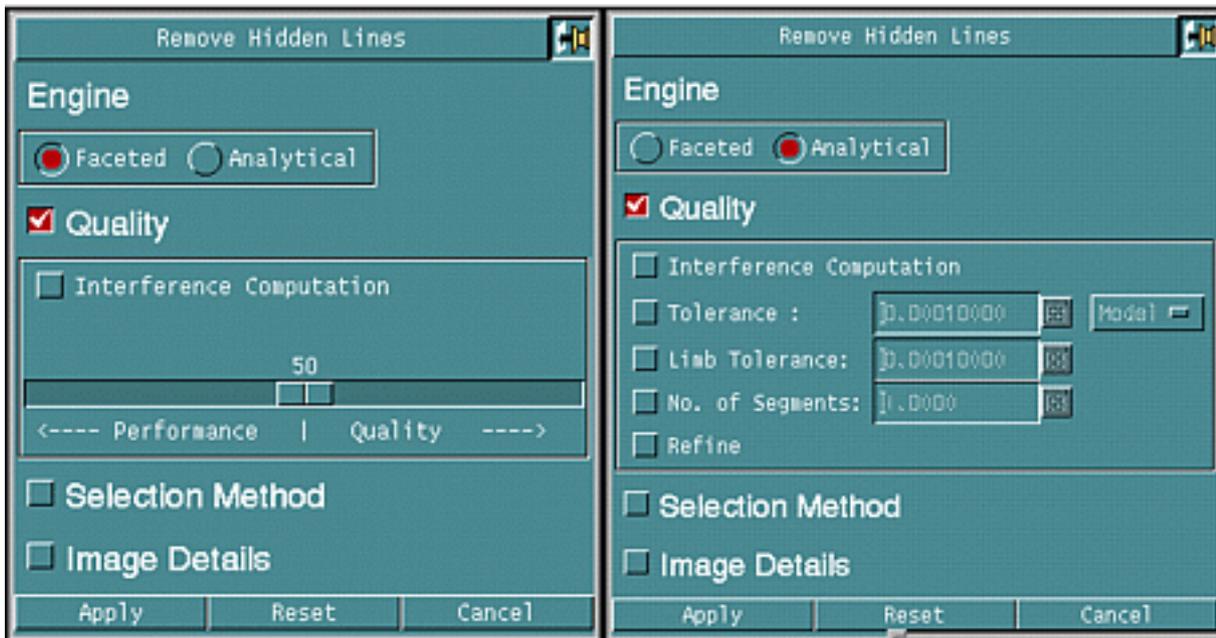
Only the options related to the Image Details option are displayed.

Please note: All options and modifiers common to the Faceted and Analytical engine are identical in function.

## Quality

When you select the Quality option, the Faceted and Analytical modes of the Remove Hidden Lines menu appears as shown:

Figure 1-4 Quality option in Faceted and Analytical mode



Use the Quality option to set the quality of the image.

Control the quality of the image in the two modes in the following manner:

- Move the slide bar in the Faceted mode.
- Specify the Tolerance value in the Analytical mode.

**Interference Computation:** Choose this option in the Analytical engine mode to subdivide all the curves into an independent number of segments. The default number of segments is set at 10. In the Faceted engine mode, facets are created instead of segments, and their number depends on the quality factor selected. Interference Computation helps you minimize errors caused by the interfering objects but can decrease the speed of HLR output.

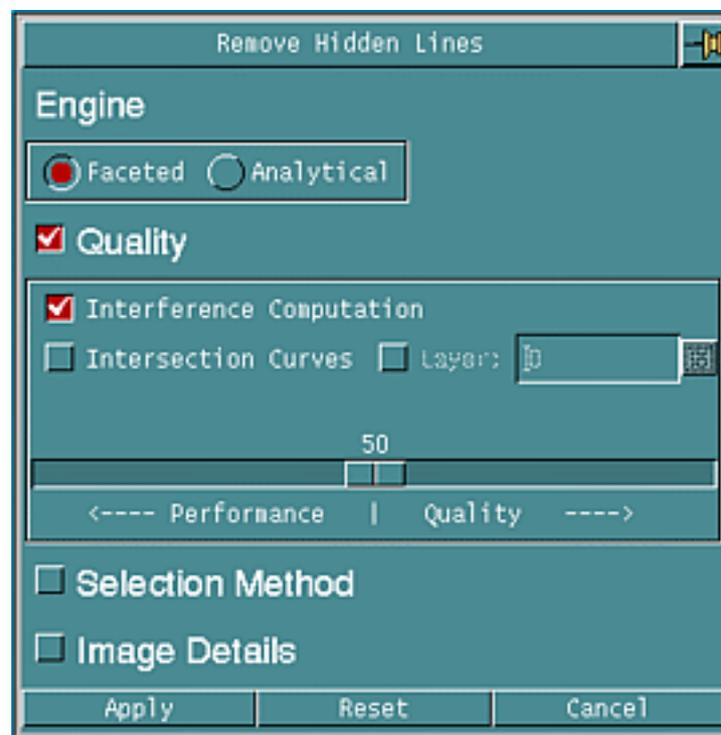
**Please note:** HIDE OBJECT does not check whether objects in a view interfere with each other. Use Interference Computation when interfering elements exist to get correct HLR results.

**Intersection Curves:** This option and its submodifiers are available only if the Interference Computation option is selected first. Use this option to display the intersection curves while using the HIDE OBJECT command. It automatically enables Interference. This option involves a Boolean operation between the interfering objects and may take a significant amount of time for very complex and large assemblies and parts.

- **lLayer:** Specifies the layer in which the HLR intersection curves are displayed. If the layer is not specified, the active layer value is used.
- **lTol:** Specifies tolerance to be used for the intersection process. If the tolerance is not specified, the default tolerance value is used. This submodifier is not available in the Faceted engine mode.

The following figure shows the Quality option and the modifiers available when the Faceted engine is selected. Move the sidebar to the right to obtain a higher quality of output for the HLR image. Moving it to the left will result in faster HLR, but the image will be less accurate.

**Figure 1-5 Remove Hidden Lines menu in the Faceted mode**



Please note: The modifiers Tolerance, Limb Tolerance, No. of Segments, and Refine are available only in the Analytical engine mode.

**Tolerance :** Use this option to determine whether two curves occupy the same place in a view. The default value is 0.0001 units.

In the field adjoining Tolerance, select the tolerance value either in Model units or in Draw units:

The tolerance value controls the following factors:

- Curves and Space: The smaller the tolerance, the more curves will be occupied in the given space.
- Limb accuracy: The smaller the tolerance, the more accurate the limbs are.

Limb Tolerance : Use this option to specify the tolerance factor in units for generating limbs. The default value is derived from the Tolerance option.

### Warning

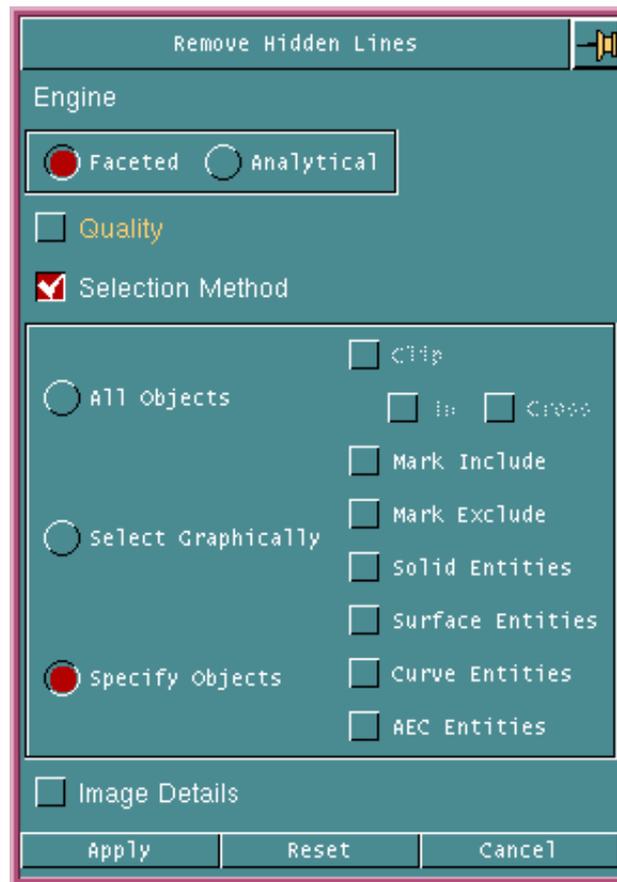
Using Limb Tolerance increases the size of the database and negatively affects the quality of the displayed object.

No. of Segments: Selects the number of segments that has to be generated. The default value is 1.000.

Refine: Use this option when the HIDE OBJECT command does not produce accurate Hidden Line Removal. This option provides better quality results of an HLR image. In the Faceted engine mode, the Quality factor may be adjusted to achieve similar results.

### Selection Method

When you select the Selection Method option, the Faceted and Analytical modes of the Remove Hidden Lines menu appear as follows:

**Figure 1-6 Selection Method Options**

Choose the Selection Method option to identify the method that you want to use to select entities for hidden line removal operation. These options are same for Faceted and Analytical modes.

1. Use the All Objects option to remove hidden lines from all the objects that are visible in the views you choose. This is the default option if you select the Selection Method option.
2. In the Faceted mode, All Objects is the default option, even if you do not select the Selection Method option. In the Analytical mode, All Objects is not the default option.

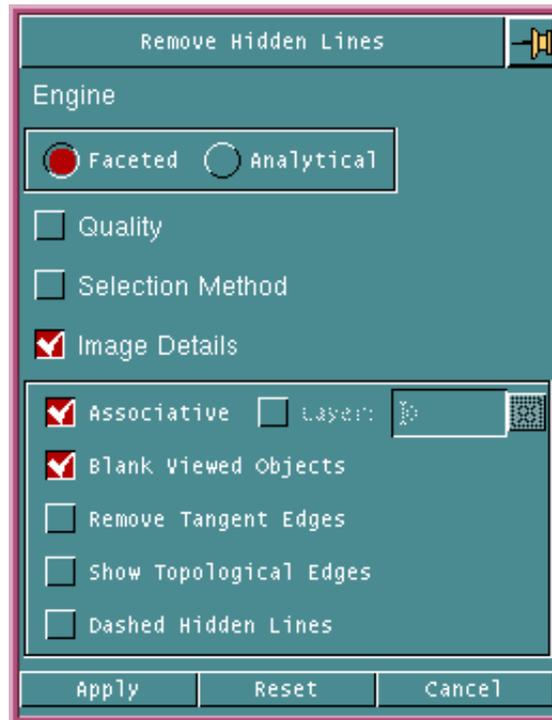
Use the Clip option to remove hidden lines only from those entities that lie within or cross the selected view boundaries.

- Use the In option to remove hidden lines from entities inside the view clip volume.
- Use the Cross option to remove hidden lines from entities that cross the view clip volume.

- Select both In and Cross options to remove hidden lines from the entities that lie within and crossing the selected view boundaries. Alternatively, you can perform the same operation by clearing the selection of In and the Cross options.
3. Choose the Select Graphically option to remove hidden lines from the objects that you have selected graphically.
  4. Choose the Specify Objects option to remove hidden lines from all the entities of a specified types as follows:
    - Solid Entities: Removes hidden lines from all visible solid entities.
    - Surface Entities: Removes hidden lines from all visible surface entities.
    - Curve Entities: Removes hidden lines from all curved entities.
    - AEC Entities: Removes hidden lines from all visible AEC entities.
  5. Choose the Mark Include option to remove hidden lines from marked entities only.
  6. Choose the Mark Exclude option to remove hidden lines from unmarked entities only.

## Image Details

When you select the Image Details option, both Faceted and Analytical modes of the Remove Hidden Lines menu show common controls and appear as shown:

**Figure 1-7 Image Details Option**

**Associative:** The HLR image that is created is associative; that is, whenever you move a viewed component, all the HLR curves and limbs corresponding to the component also move. This is the default. When you do not select this option, the NONASSOCIATIVE modifier gets selected to the command HIDE OBJECT and the image created is nonassociative. For a nonassociative image, the HLR curves and limbs do not move when the underlying component is moved. You can create a nonassociative image in the CAMU environment only.

**Layer:** This is a suboption to the modifier NONASSOCIATIVE. You can put all the nonassociative curves can be on the selected layer with this option.

**Blank Viewed Object:** Use this option to override the default which causes view parts or assemblies to be blanked during the Remove Hidden Lines process. If you select this option, you must manually blank the viewed parts in order to obtain the correct image.

**Remove Tangent Edges:** Choose this option to suppress all the tangent edges for the selected solids. On selecting this option, CADD5 identifies all the tangent edges in all the selected objects and does not display them in the final result.

Tangent Edge is defined as an edge of a solid such that for every point of the edge, the tangent planes for the surfaces sharing the edge, at the point, match with each other.

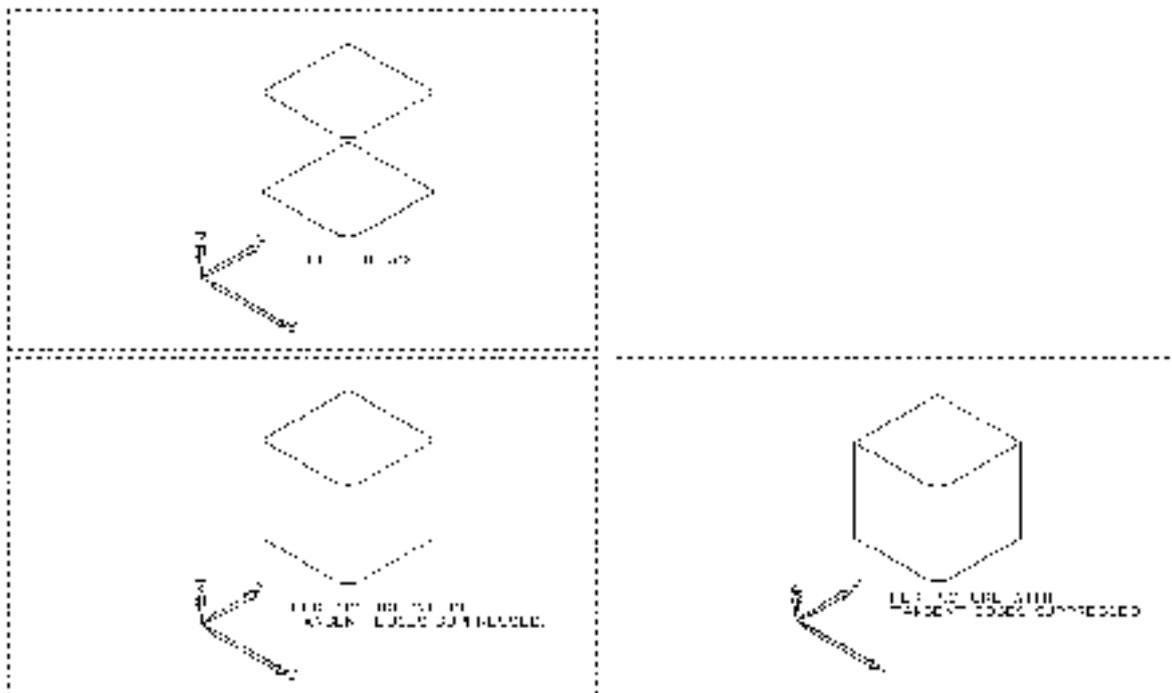
## Example of Remove Tangent Edges

Every edge of a well-defined solid is shared by two faces of the solid. A face of a solid can be thought of as a bounded region of a surface. Thus every edge of a well-defined solid is shared by two surfaces.

A surface is well behaved at a point on the surface if you can define a tangent plane to the surface at that point uniquely. If for every point on the edge, both the surfaces sharing the edge are well behaved, and the tangent planes for both the surfaces at that point match, then such an edge is called a tangent edge.

For example, in the case of a box, if you fillet one of its edges, then a cylindrical face is created between two planar faces of the box. The edge joining a planar face and the cylindrical face of the filleted box is called a tangent edge. If a model has a large number of such tangent edges, the final hidden-line-removed picture may look quite cluttered up.

If you select filleted solids to be HLRed, then every edge shared by a fillet-surface will not be visible in the final HLR picture.



**Show Topological Edges:** When the HIDE OBJECT command is applied it blanks the Topological Edges by default. Choose this option to display the omitted Topological Edges.

Topological Edge is defined as the edge of a solid which exists between two surfaces that are analytically identical.

**Dashed Hidden Lines:** Displays the Hidden Lines as dashed lines.

- **Dash Length:** Specifies the dash length in absolute drawing units. The default value is 0.0001.
- **Space Length:** Specifies the spacings between dashes in absolute drawing units. The default value is 0.0001.

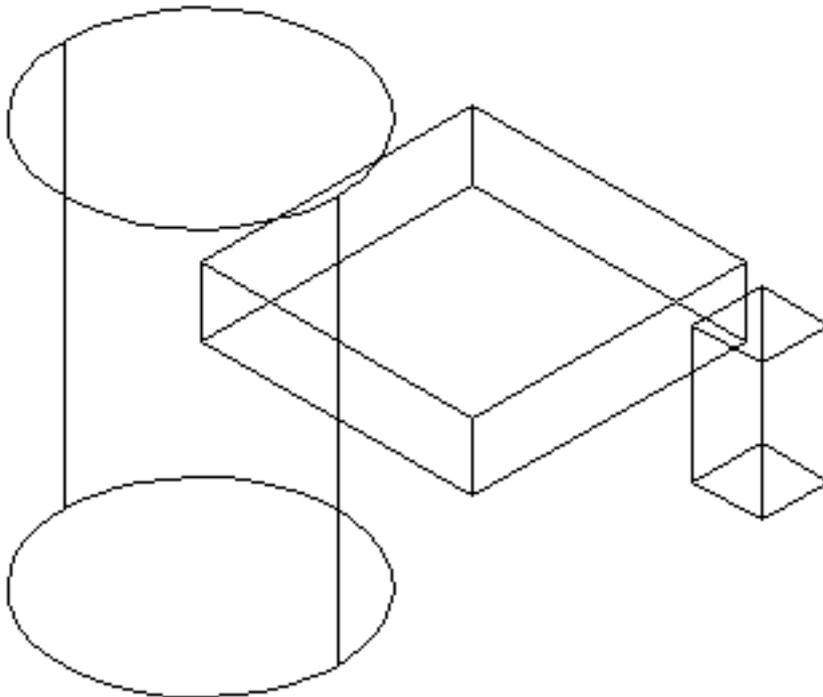
## Restriction

The intersection curves displayed by this option are nonassociative.

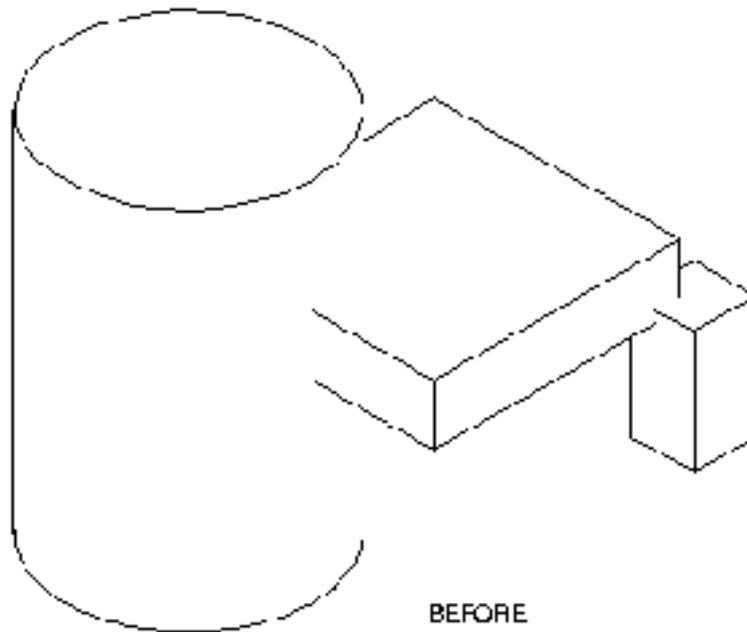
## Example of Image Before and After Intersect

The example below shows how the intersection curves are processed and displayed.

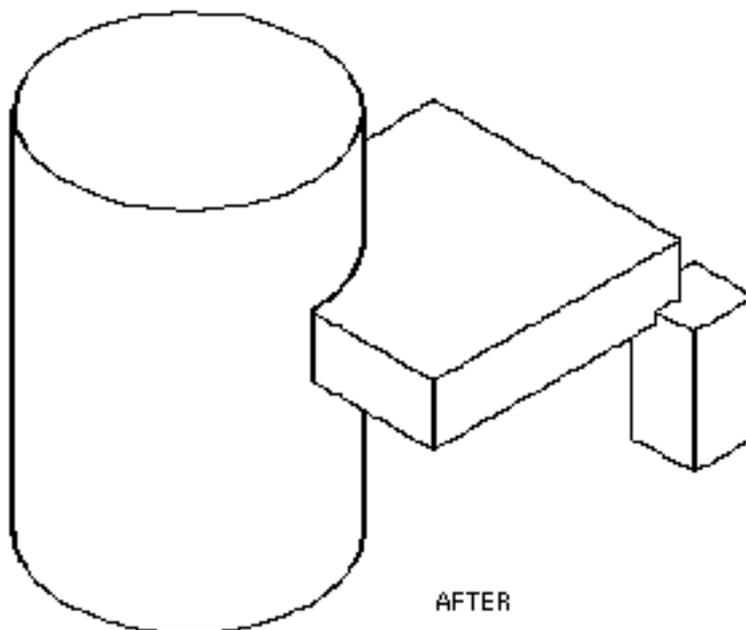
**Figure 1-8** The objects to be HLRed



**Figure 1-9** The output using option Interference



**Figure 1-10** The output using option Intersect

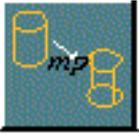


## How Curves Appear in HLR

During the Remove Hidden Lines process, the system generates a silhouette of a curved object by inserting limbs onto object surfaces. A limb is the visual edge of a curved surface in a given view and is sometimes referred to as a silhouette edge or a virtual edge. Below is how HLR defines and displays curves:

- **Visible Curve:** A curve that is always visible in the HLR image, regardless of whether the removed lines are blanked or dashed.
- **Weakly Invisible Curve:** A curve that is hidden behind a face of an object. These areas will appear dashed in a dashed hidden line picture, and blanked in a blanked hidden line picture.
- **Strongly Invisible Curve:** A curve that is hidden by other curves in the hidden line picture. These curves are always blanked in either type of hidden line picture.

## Restoring Hidden Lines



The Restore Hidden Lines option restores (unblanks) all hidden lines of all objects or selected objects in the views you specify. The view is determined by the first object you select.

When restoring hidden lines from an object, you can choose the following options:

- Restore the hidden lines of all the objects in a view
- Restore the hidden lines of selected objects in a view
- Restore the hidden lines if objects in specified views, including the objects that are completely hidden.

### Using the Restore Hidden Lines Option

1. Click the Render icon (paintbrush) from the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Click the Restore Hidden Lines icon on the Hidden Line Removal command palette.



You can select the following options from the Restore Hidden Lines property sheet:

For all Objects: : Specifies that objects in the specified view, including the objects that are completely hidden, are to be restored.

1. Select the views in which you want to perform Restore Hidden Lines.
2. Click Apply.

For selected Object: Specifies the Hidden Lines will be restored for selected objects only. To do this,

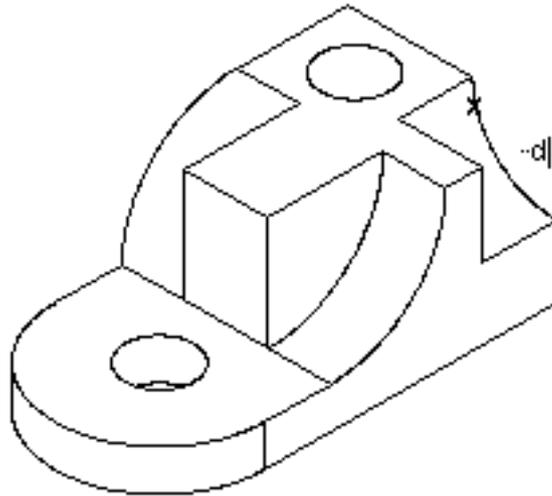
1. Select the views in which you want to perform Restore Hidden Lines.
2. Click the Objects button from the menu.
3. Select the objects to which you want to apply Restore Hidden Lines.
4. Choose Apply.

Unblank Viewed Objects: Unblanks the view parts or assemblies that are blanked as a part of the HLR process.

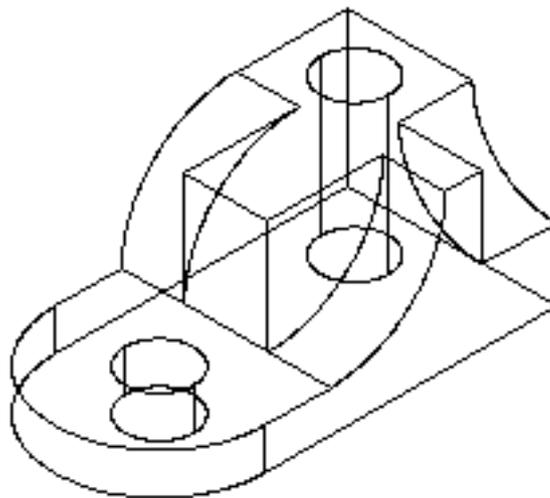
Please note: The Restore Hidden Lines property sheet is an immediate action property sheet. After you have chosen Apply, you cannot abort the command unless you choose Abort from the Utilities command palette.

## Example of Image Before and After Restored Hidden Lines

The example below shows an image of a solid model before and after the hidden lines have been restored:



**BEFORE**



**AFTER**

# Mark Changes



The MARK CHANGES option marks or highlights the changes in the HLR image that are out of sync with the viewed part entities from which they have originated.

This option recognizes the differences due to modeling changes in the remote part, loss of association to the viewed part, and the discrepancies, if any, between the instance transformation and the positions of the surrogates.

To unhighlight the marked entities use the MARK ENTITY CLEAR ALL option.

## Using the Mark Change Option

1. Click the Render icon (paintbrush) on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Click the Mark Changes icon on the Hidden Line Removal command palette.

# Update Hidden Line Removal Image



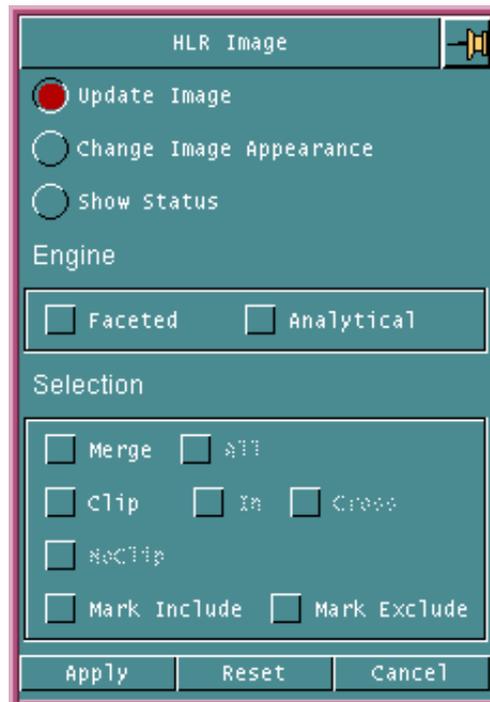
The Update Hidden Line Removal Image (UPDATE HLRIMAGE) option re-executes the Remove Hidden Lines option for all objects in a selected view. Entities not visible in an earlier view will also be updated.

UPDATE HLRIMAGE can also change selective attributes for an HLRed view without repeating the entire HLR calculation for a faster updated output.

## Using the Update HLR Image Option

1. Click the Render icon (paintbrush) on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Click the Update HLR Image icon on the Hidden Line Removal command palette.

The HLR Image menu appears:



This menu allows you update an HLR image, change the appearance of an HLR image or view the current status of an HLR Image. The default option is UPDATE HLRIMAGE.

You can select either the Faceted or the Analytical engine to update HLR image. Not selecting either will update the image using the previous engine used for HLR.

The Merge option can be used to update image as well as change the image appearance and allows you to select objects in an HLRed view (See “Selection” on page 26.).

## Update Image

This option enables you to bring back the picture in sync with the model. You can use the Faceted and the Analytical engine available for this operation to update an HLRed image created using either of these engines.

Please note: In CAMU, you must run the UPDATE HLRIMAGE command on an HLRed image in the same mode in which the image was created, that is, either in standard mode or exploded mode. Otherwise, the command is aborted and the following warning message is displayed:

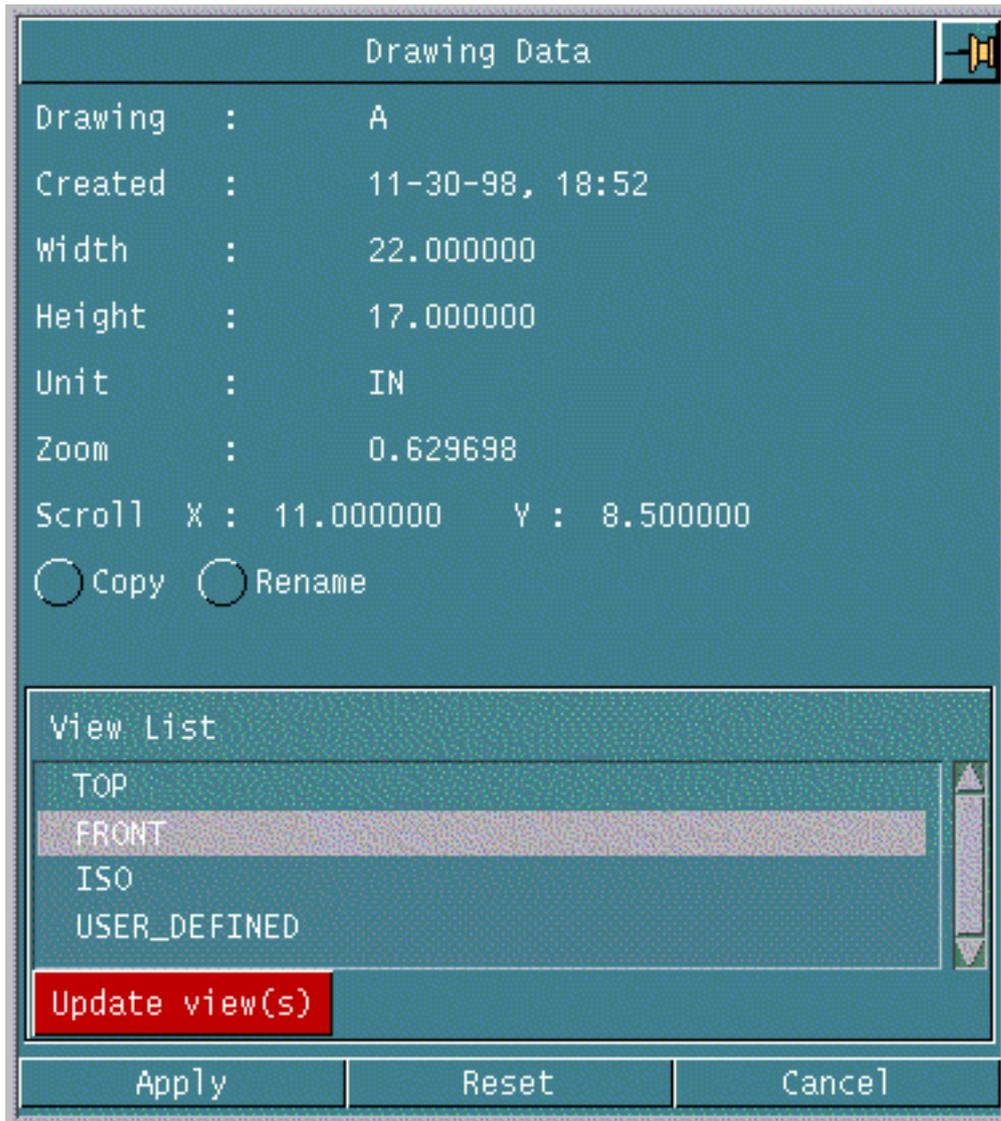
```
Update HLRimage command is not valid in this mode.  
Please change the current adrawing orientation using  
TOGGLE EXPLODED command and re-issue the UPDATE HLRimage  
command.
```

When an entity in the PART environment undergoes a parametric change or in CAMU a remote part corresponding to a component is modified, this option places the previously created dimensions wherever possible. Any associative dimensions that have been applied to the Limbs or Surrogates are carried forward and reapplied to the updated HLR image. These dimensions are automatically updated according to the changes you make in the entity. In cases where reattachment of a dimension is not possible, the particular dimensions are marked and they become nonassociative.

Please note: In the Faceted engine mode, you can interrupt the update HLR operation by pressing ESC+Q while the UPDATE HLRIMAGE FACETED command is running.

The following figure shows the HLR Image menu with the Analytical engine selected.

**Figure 1-11 HLR Image menu in the Analytical mode**



## Selection

**Merge:** This option enables you to select objects in HLRed view. This results in a view where the new objects selected using the Merge modifier have their hidden lines removed and previously HLRed objects are updated.

Individual objects can be selected for merging, or groups of objects can be selected by defining a window around them using the selection filters in the top menu bar.



Select either the Faceted or the Analytical engine option for this operation. If you select neither of these options, the engine chosen for the last HLR operation will be used.

Please note: For better UPDATE HLRIMAGE results using Merge, you should select all objects that interfere with the new object to be HLRed.

**ALL:** This option will select all objects in the part while using UPDATE HLRIMAGE with Merge. You cannot select ALL without selecting the Merge option.

**Clip:** This option removes hidden lines only from those entities that lie within or crossing the selected view boundaries. This option has the following modifiers:

- **In:** Removes hidden lines from entities inside the view clip volume.
- **Cross:** Removes hidden lines from entities that cross the view clip volume.
- **In and Cross:** Enables both the options to remove hidden lines from the entities that lie within and cross the selected view boundaries. Alternatively, you can perform the same operation by clearing the selection of the In and Cross options.

**NoClip:** This option overrides the Clip modifier. This modifier removes hidden lines for objects that were previously processed using UPDATE HLRIMAGE. NoClip removes the clipping from database and updates the entities that were earlier HLRed. Clip and NoClip are mutually exclusive.

**Mark Include:** This option updates HLR image for marked entities only.

**Mark Exclude:** This option updates HLR image for unmarked entities only.

## Quality

**Interference Computation:** Choose this option in the Analytical engine mode to subdivide all the curves into independent number of segments. The default number of segments is set to 10. In the Faceted engine mode facets are created instead of segments and their number will depend on the quality factor selected. Interference Computation helps you to minimize errors caused by the interfering objects but can decrease the speed of HLR output.

**Please note:** HIDE OBJECT does not check whether objects in a view interfere with each other. Use Interference Computation when interfering elements exist to get correct HLR results.

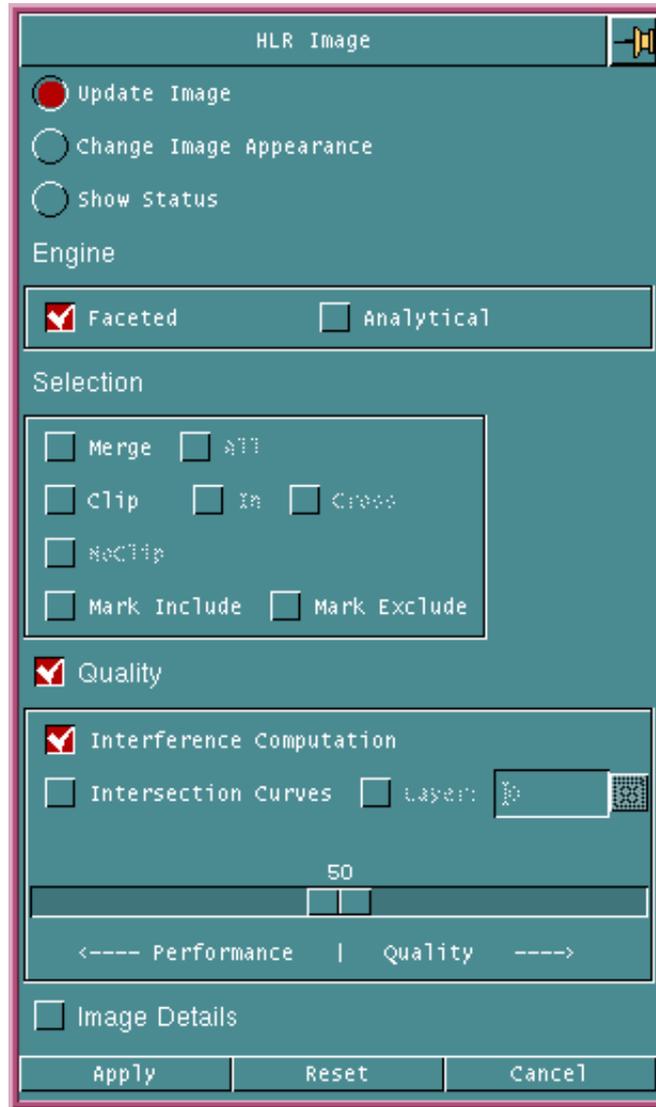
**Intersection Curves:** This option and its submodifiers are available only if you first select the Interference Computation option. Use this option to display the intersection curves while using the HIDE OBJECT command. CADDSS automatically enables Interference. When the Analytical engine is selected, this option involves a Boolean operation between the interfering objects and may take significant time for very complex and large assemblies and parts.

- **lLayer:** Specifies the layer in which the HLR intersection curves are displayed. If the layer is not specified, the active layer value is used.
- **lTol:** Specifies tolerance to be used for the intersection process. If the tolerance is not specified, the default tolerance value is used. This submodifier is not available in the Faceted engine mode

**Refine:** Use this option when the HIDE OBJECT command does not produce accurate Hidden Line Removal. This option provides better quality results of an HLR image. Refine is not available in the Faceted engine mode but the Qualityfactor modifier available when using the Faceted engine may be adjusted to achieve similar results.

The following figure shows the Quality option and the modifiers available when the Faceted engine is selected. Move the sliderbar to the right to obtain a higher quality of output for the HLR image. Moving it to the left will result in faster HLR but the image will be less accurate.

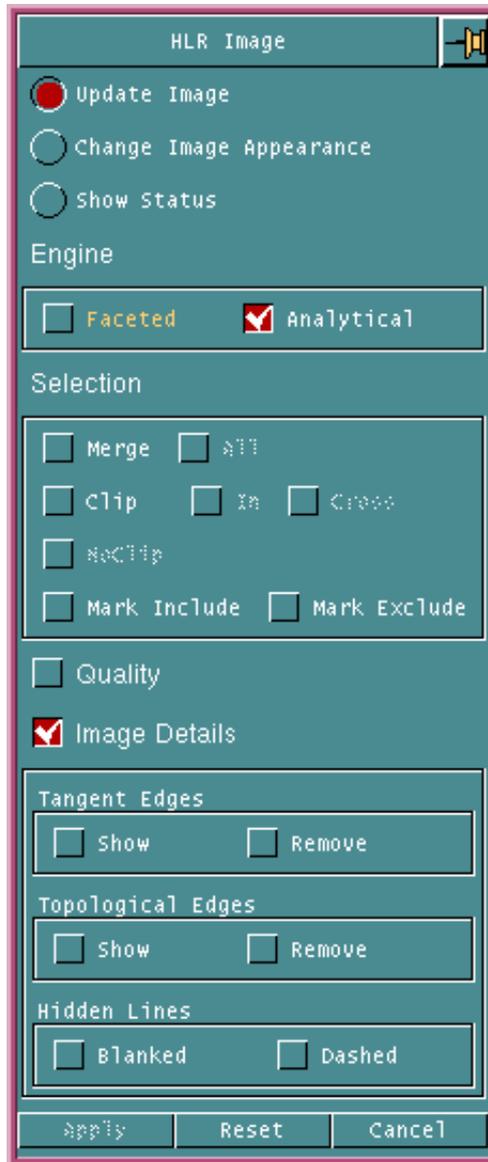
Figure 1-12 HLR Image Menu in Faceted Mode



## Image Details

This option is identical in both the Faceted and Analytical mode. Selecting Image Details will update the HLRed image using one or a combination of the submodifiers.

Please note: On selecting this option, you are required to select at least one of the submodifier of Image Details.



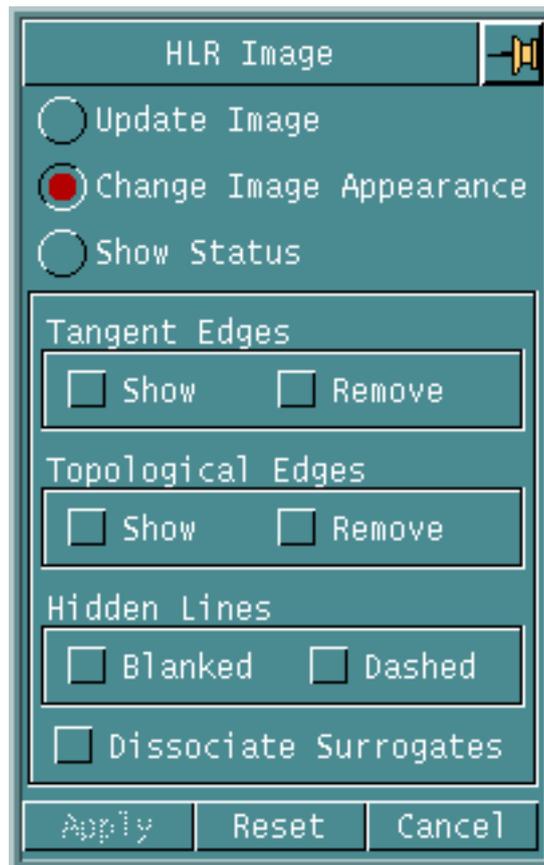
- Tangent Edges: Choose Show to display all the tangent edges in the final result. Remove identifies all the tangent edges in the view and suppresses them in the final result.
- Topological Edges: Choose Show to display all the Topological edges in the final result. Remove identifies all the Topological edges in the view and suppress them in the final result.

- Hidden Lines: Choose Blanked to blank all the Hidden Lines in the view. Dashed will display the Hidden Lines as dashed lines and one or both of the following submodifiers should be used.
  - Dash Length: Specifies the dash length in absolute drawing units. The default value is 0.0001.
  - Space Length: Specifies the spacings between dashes in absolute drawing units. The default value is 0.0001.

## Change Image Appearance

This option allows you to update the HLRed image using the following modifiers.

Please note: At least one of the options must be selected in order to apply this menu.



- Tangent Edges: Choose Show to display the tangent edges in the final result. Remove will identify all the tangent edges in the view and suppress them in the final result.

- Topological Edges: Choose Show to display all the Topological edges in the final result. Remove will identify all the Topological edges in the view and suppress them in the final result.
- Hidden Lines: Choose Blanked to blank all the Hidden Lines in the view. Dashed will displays the Hidden Lines as dashed lines and one or both of the following submodifiers should be used.
  - Dash Length: Specifies the dash length in absolute drawing units. The default value is 0.0001.
  - Space Length: Specifies the spacings between dashes in absolute drawing units. The default value is 0.0001.
- Dissociate Surrogates: This option converts an associative HLR Image to a nonassociative image.

Please note: The Change Image Appearance operation does not involve an HLR operation using either of the two engines. The image is changed using only the modifiers selected.

## Show Status

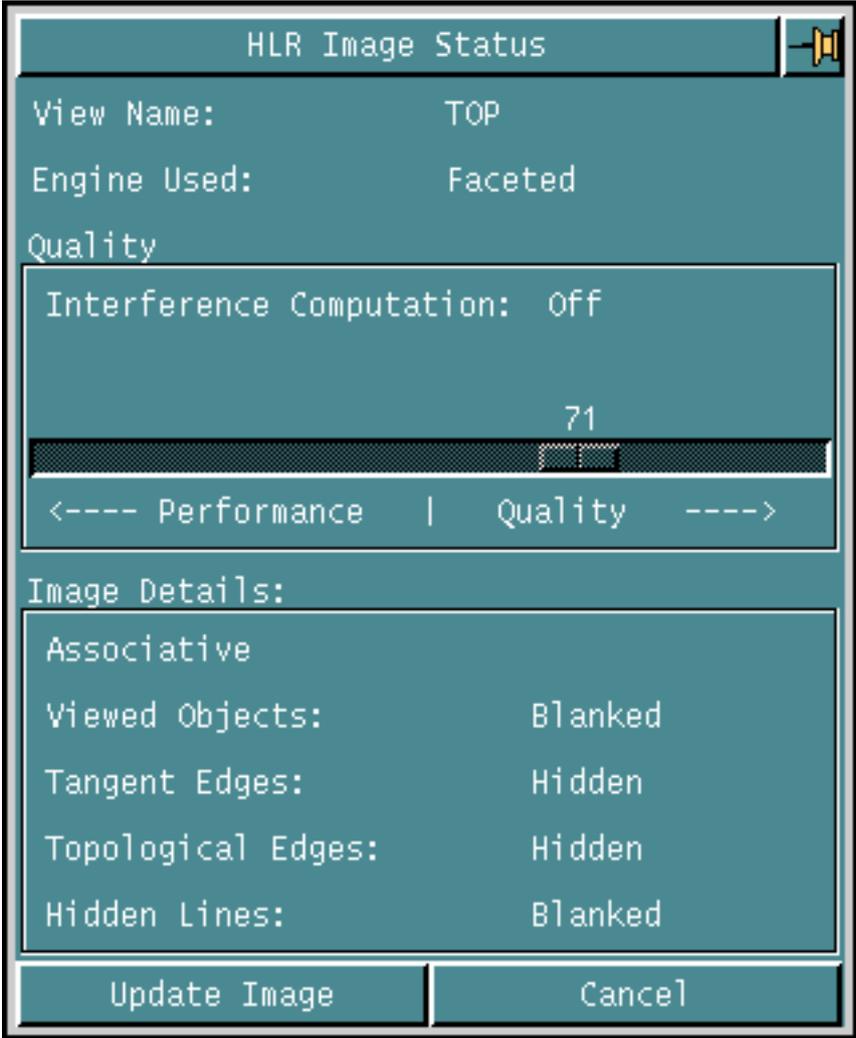
This option allows you to view the options that were selected during the last HLR operation on a particular view.



You will be asked to select a view, and a menu similar to the one shown in the following figure will display the information for the last view selected.

Selecting the Update Image button which will open the HLR Image menu with the Update Image option as default.

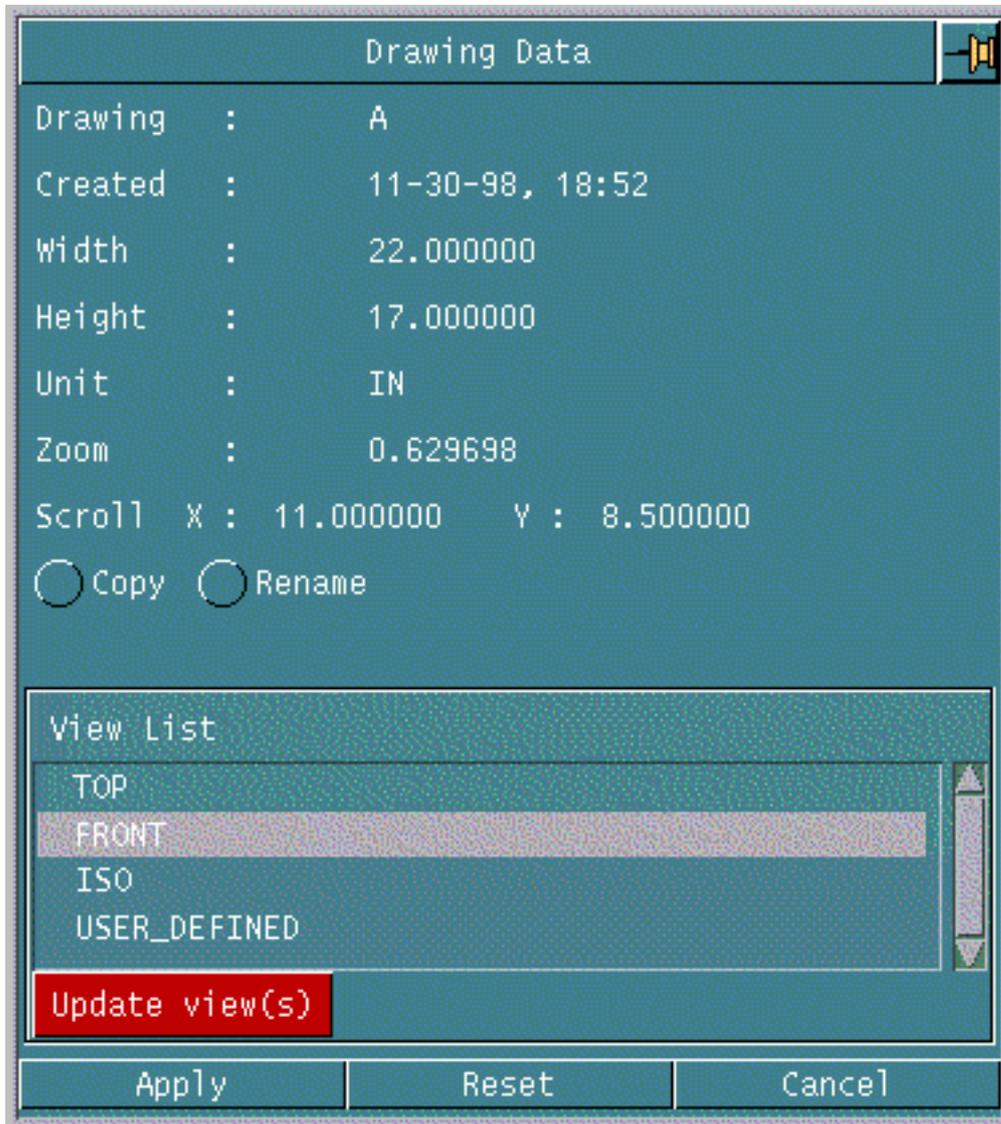
Figure 1-13 HLR Image Status Menu.



# Update Management

You are alerted automatically if an update is required on an activated view. The view is highlighted in magenta, the default color. The Drawing Data menu shown in the following figure is also activated the first time a drawing with a view requiring an update is activated.

**Figure 1-14 Drawing Data Menu**



This menu, along with information about the drawing, highlights in the View List the view(s) requiring to be updated. Choosing the Update view(s) option and applying the menu will automatically update these views.

The Drawing Data menu can also be launched using the query pulldown window in the top menu bar of CADD5 or by issuing the LIST DRAWING command on the command line.

Copy and Rename the drawing choosing the Copy or Rename menu option. A separate menu is launched for these operations.

Please note: To reset the default upgrade alert color of magenta to one of your choice, reset the UPDATE\_DUE\_VIEW\_COLOR variable in the `caddsrc` file. Colors ranging from 0 to 255 and the strings red, blue, normal, gray, cyan, green, magenta, yellow, white, pink, brown and violet are accepted. The strings may be uppercase or lowercase as shown in the following examples.

```
Setenv UPDATE_DUE_VIEW_COLOR 3
Setenv UPDATE_DUE_VIEW_COLOR Yellow
Setenv UPDATE_DUE_VIEW_COLOR YELLOW
```

If an update is required, HLR Update Management will highlight the relevant view requiring update in each of the following cases.

- In CAMU, when a component is transformed and removed, or during drawing activation if the remote part corresponding to the component has changed.
- In piece parts or in CAMU, when there is an Explicit modeling change or when a new solid is created as a result of Boolean or replace solid operation.
- In CAMU and parts, immediately after any Explicit transformation on operands.
- After every activate drawing or at the time of context switch if a view is due for update.
- Change in the orientation of view. Exceptions to this case are:
  - If the view aligned to the line of sight has not changed. e.g., When the line of sight is along the Z axis and the view has rotated along this axis
  - If the view aligned to the line of sight is changed using Dynamic Manipulation Menu, update requirement is initiated only on quitting the menu.
  - If the view aligned to the line of sight is changed using mouse dynamics, update requirement is not initiated unless SET VIEW is executed on the view.

## Warning

Failure to update a view requiring updation will result in the update color highlight persisting and could lead to errors in your visualization of the part.

You can disable the Update Management process for the HLR/Section views using the `HLR_SECTION_UPDATE_MANAGEMENT` environment variable defined in the `.caddsrc-local` file. By default, the `HLR_SECTION_UPDATE_MANAGEMENT` variable is set to `on`. To disable the Update Management process, set the `HLR_SECTION_UPDATE_MANAGEMENT` variable as follows:

```
setenv HLR_SECTION_UPDATE_MANAGEMENT off
```

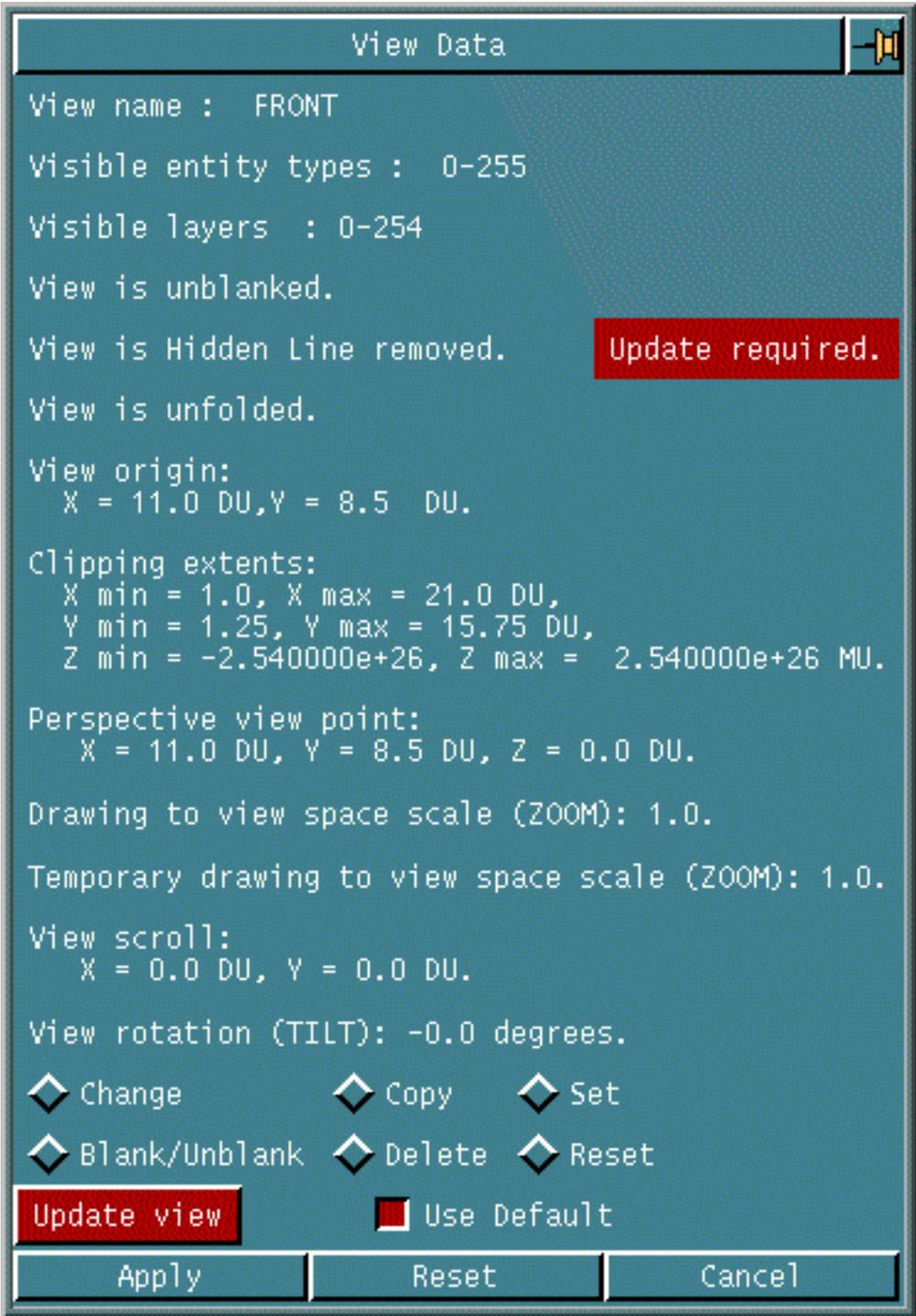
## View Data Menu

To launch the View Data menu:

1. Click on a specific view in the View List of the Drawing Data menu.  
or
2. Use the query pulldown window from the top bar menu  
or
3. Issue the `LIST VIEW STATUS` command at the command line.

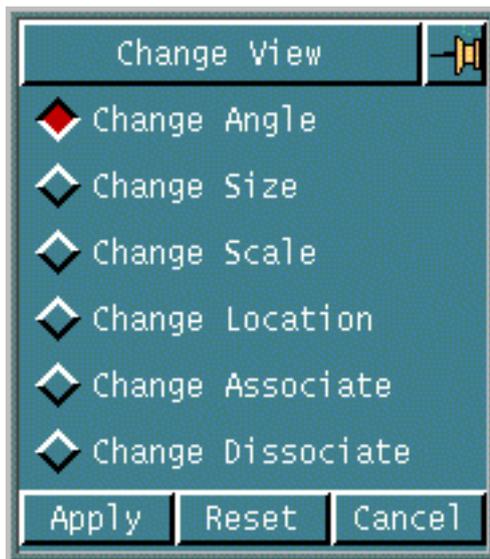
The following figure shows the VIEW DATA menu.

**Figure 1-15 View Data Menu.**



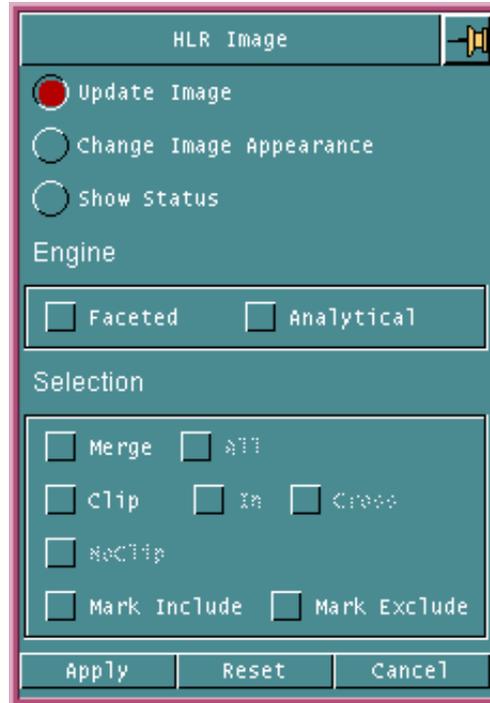
The View Data menu lists information about a selected view and also allows you to perform the following operations on it. These options are similar to those discussed earlier in the book with the difference that a view is not required to be specified as the current active view is taken to be the default.

1. Change view using the Change View menu.



2. Copy view.
3. Set View on current selected view.\*
4. Blank/Unblank toggle depending on the current state of view.
5. Delete the current view.
6. Reset the current view.

Choose the Use Default button can be selected if you want the update to be made using default modifiers. Not choosing this option allows you to choose options for the update from the following menu.



## Legacy Parts in Update Management

When a legacy part is opened in CADD5 5i Release 10 onwards for a part that has been filed prior to this revision, Update Management will fail in the following cases:

- If the view orientation is not set using the SET VIEW command and the part has been filed after HLR has been performed on a temporary view.
- If a modeling update or change has taken place on a part.

## Restrictions and Notes

There are certain restrictions and other information you should be aware of.

### User-Created Fonts are Removed

The system removes any previous user-created image data associated to an object in the view being used for HLR. To enhance the accuracy of the image appearance, Remove/Restore Hidden Lines eliminates any pre existing image data and creates new view specific font data on many of the curves and limbs associated with an object. If you use REECHO ENTITY after ERASE ENTITY on any fonted entity, then the font for the entity will not be preserved by HLR commands. The types of data that are removed by HLR are:

- View specific blanking or fonting of entities
- Incremental blanking or fonting of entities

### Preservation of User-Created Fonts by HLR

HIDE OBJECT and UPDATE HLRIMAGE preserve manually applied fonts in CAMU as well as in viewed part environment.

### Rotated Images are not Updated

If you rotate the image (using Rotate View, Dynamic View) on a view after using Remove Hidden Lines, you may rotate hidden lines to positions where they would no longer be hidden. The system does not automatically update the image with respect to the new viewing angle. If you rotate a view with hidden lines, you can restore the image with one of the following methods:

- Execute Restore Hidden Lines to restore the original objects.
- Execute Remove Hidden Lines again.
- Reset the view to its original orientation.

### Surface Meshes are not Modified

Remove Hidden Lines does not modify surface meshes. You must change a mesh to 1 x 1 or blank any mesh that interferes with visualization of the hidden line image.

#### Warning

Before removing hidden lines, use Detect Interference to ensure that none of the objects penetrate each other. If the

objects share common volume, the image created by Remove Hidden Lines could contain significant errors.

## Using Remove Hidden Lines with Viewed Parts and Assemblies

Using Remove Hidden Lines on viewed parts (either from CAMU or Explicit View Part) creates surrogate copies of all visible edge curves. The command also blanks all viewed parts. At the end of the process, you have an HLR image in the views you designated. The surrogate curves are visible only in the views in which HLR is performed.

In addition, these surrogate curves are grouped together, each group representing a single viewed object. This grouping prevents you from deleting an HLR curve by mistake. You should modify the appearance of the curve if it is not satisfactory.

To return the part to the original state, use the Restore Hidden Lines option and select the For all Objects button (digitize all HLR views). This will delete all the HLR groups in the active part and restore the viewed parts.

## Using Remove Hidden Lines in Multiple Views

Performance is much better if you perform Remove Hidden Lines on all views at one time, particularly when working with viewed parts or assemblies. Doing so will reduce the number of entities created. Each execution of Remove Hidden Lines creates a new set of local curves; pre-existing HLR pictures will not be updated to reflect the creation of these curves.

## Using Remove Hidden Line on Objects Created in the Parametric Environment

You can use Remove Hidden Lines on objects created in the Parametric environment and viewed in the Explicit environment. However, if you reenter the Parametric environment, change the object, and return to the Explicit environment, the hidden line graphics will be incorrect. You must re-execute Remove Hidden Lines.

## Using Nonassociative HLR Image

Simultaneous display of exploded and unexploded views on one drawing sheet is achievable. When the view parts are unblanked, the nonassociative surrogates may be out of sync with the viewed (unhidden) wireframe.

Partial unhides are not permitted in nonassociative HLR Images. HLR picking and MARK CHANGE do not work for nonassociative HLR images.

Features that are supported through curve associativity, such as preservation of dimensions during updates, are not supported. The nonassociative HLR image is not deleted when deleting the corresponding component from the assembly tree structure. Picking the tree node does not highlight the corresponding nonassociative HLR image. nonassociative HLR images increase the database size.

## Using Associative HLR Image

In order to assure that associativity is properly mapped between the parametric and explicit environments, the following line should be in the user's `.caddsrc` file:

```
setenv CADDSSASSOC_UID yes
```

If a particular surface has more than one limb then all the dimensions become non associative and they are marked.

Please note: HIDE OBJECT can only maintain associativity to a viewed part when specific internal data exists in the viewed part. All CADDs design parts, except older CADDs parts, automatically contain this information. Such older parts have to be activated and filed as design parts in order to ensure subsequent associativity with respect to HLR.

## Associating Viewed Components to Centerline, Label, or Hatch

- It will not be possible to associate an existing nonassociative centerline, label, or hatch with a viewed entity using CHANGE DIMENSION ASSOCITIVE command.
- If a part corresponding to a component is renamed or deleted, then the centerline, label, or hatch associated with the viewed component will be lost.

# AEC Hidden Line Removal

---

This chapter describes how to access the Graphical User Interface for AEC Hidden Line Removal functions and briefly describes the options available from it. AEC HLR functions are available from all Explicit environments.

- Introduction to AEC Hidden Line Removal
- Accessing Hidden Line Removal Options
- Hidden Line Removal Setup
- AEC Hidden Line Removal Preparation
- Creating Visual Edges
- Projecting an Outline
- Editing an Outline
- Creating a Text Version of a Compiled Procedure File
- Checking a Procedure File
- AEC Hidden Line Removal
- Creating a Visual Edge (with Options)
- Hidden Line Removal Editing Option

# Introduction to AEC Hidden Line Removal

This chapter describes how to access the Graphical User Interface for Architecture Engineering Construction (AEC) Hidden Line Removal. AEC HLR performs the following functions:

- Sets up environment parameters for removing hidden lines
- Prepares a group of objects for hidden line removal
- Removes hidden lines
- Edits the resulting drawing

These functions encompass the

- Traditional Architecture Engineering Construction commands
- AEC procedure file commands

The AEC Products HLR functions and the solids HLR functions provide parallel capabilities.

Setup options for AEC HLR functions are accessible from one part of the GUI, and the preparation, removal and editing options from another.

# Accessing Hidden Line Removal Options

AEC Hidden Line Removal can be accessed from:

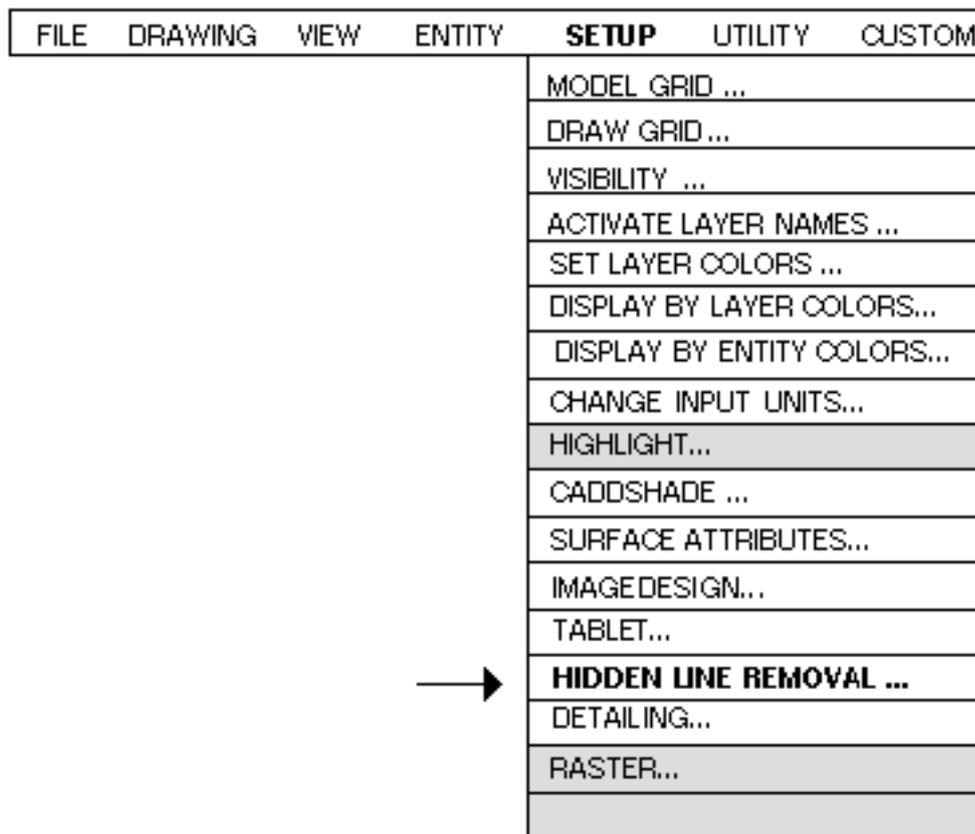
The Setup menu: AEC HLR Setup options are accessible from the Setup menu.

The Render option: AEC HLR preparation, actual hidden line removal, and HLR editing options are accessible from the Hidden Line Removal and Rendering pulldown menu.

From the Setup Menu

To access Hidden Line Removal Setup functions, do the following:

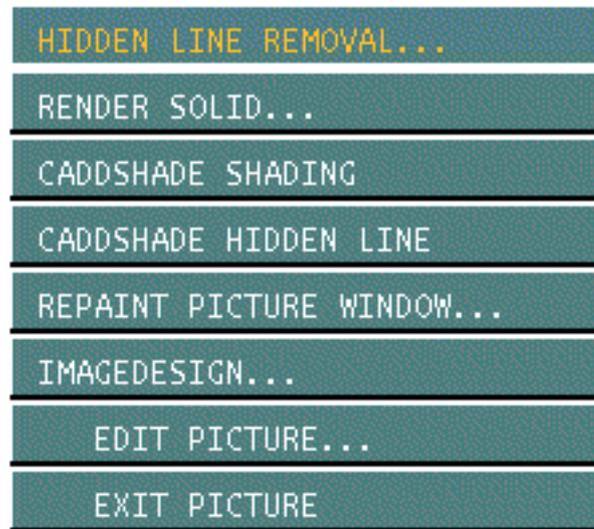
1. Choose Setup from the Environment Management menu area on the top bar. The Setup Menu appears.



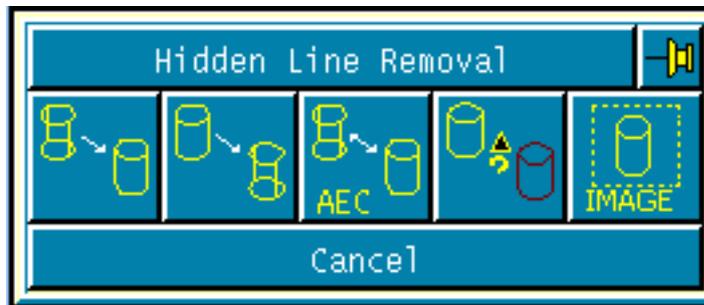
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal Setup property sheet is displayed.

## From the Render option

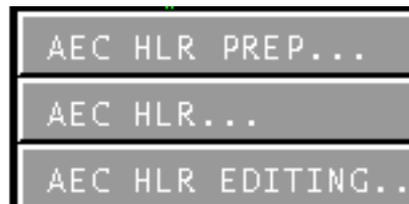
1. Click the Render icon (paintbrush) on the Environment Global area of the top bar. The following pulldown menu appears.



2. Choose Hidden Line Removal from the menu. The Hidden Line Removal command palette, as shown below, is displayed.



3. Choose AEC HLR from the Hidden Line Removal palette. The following pulldown menu appears. This menu can be used to access HLR commands for Hidden Line Preparation, Hidden Line Removal and Hidden Line Editing.



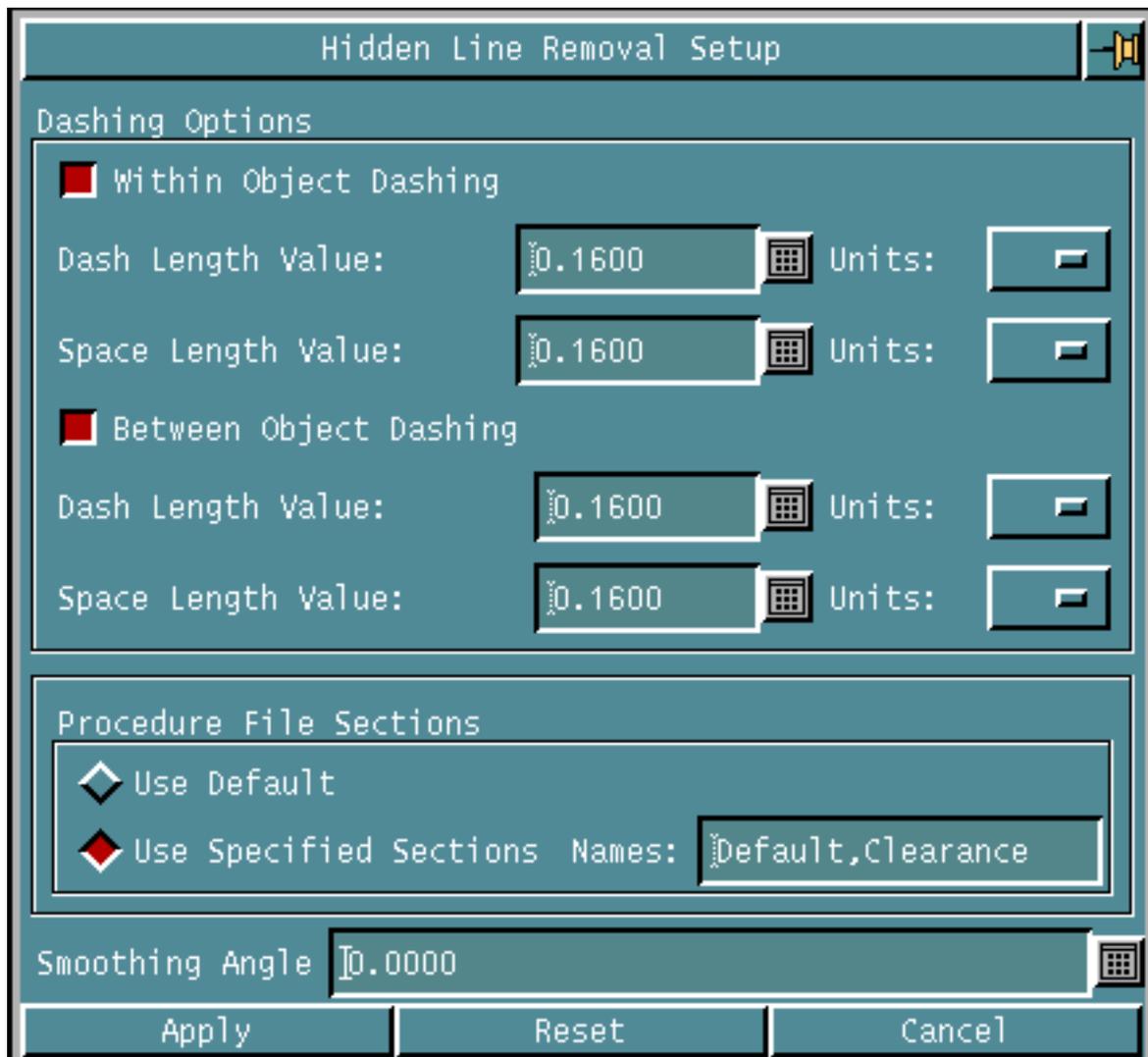
# Hidden Line Removal Setup

The Setup option enables you to set up or change options that you want active during your Hidden Line Removal session.

## Getting to the Setup Option

To access Hidden Line Removal Setup functions, do the following:

1. Choose Setup from the Environment Management menu area on the top bar. The Setup Menu appears.
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal Setup property sheet is displayed.



The Hidden Line Removal Setup property sheet allows you to access the following functions:

- Dashing parameters (interobject and intraobject dashing)
- Procedure file section selection
- Smoothing of facets for projected outlines

## Options on the Hidden Line Removal Setup Property Sheet

The following sections describe the options on the Hidden Line Removal Setup property sheet.

### Within Object Dashing

Displays hidden lines inside objects as dashed lines. There are two variables that can be entered for this option. They are:

#### Dash Length

**Value:** Use this field to specify the length of the dash that is used to represent hidden lines inside objects. The default value is 0.16. Selecting the field activates a real number calculator. Enter the required value using the calculator.

**Units:** Use this field to specify the units in which the length of the dash is represented. The default value is in inches. Select the Units field to display an option list of unit values: IN, FT, MI, MM, CM, M, or KM.

#### Space Length

**Value:** Use this field to specify the length of the spaces between the dashed lines. The default value is 0.16. Selecting the field activates a real number calculator. Enter the required value using the calculator.

**Units:** Use this field to specify the units in which the length of the spaces in the dashed lines is represented. The default value is in inches. Select the units field to display an option list of unit values: IN, FT, MI, MM, CM, M, or KM.

## Between Object Dashing

Displays hidden lines between objects as dashed lines. There are two variables that can be entered for this option. They are:

- Dash Length

Value: Use this field to specify the length of the dash that is used to represent the hidden lines between objects. The default value is 0.16. Selecting the field activates a real number calculator. Enter the required value using the calculator.

Units: Use this field to specify the units in which the length of the dash is represented. The default value is in inches. Select the Units field to display an option list of unit values: IN, FT, MI, MM, CM, M, or KM.

- Space Length

Value: Use this field to specify the length of the spaces between the dashed lines that is used to represent hidden lines between objects. The default value is 0.16. Select the field to activate a real number calculator.

Units: Use this field to specify the units in which the length of the spaces in the dashed lines is represented. The default value is in inches. Select the Units field to display an option list of unit values: IN, FT, MI, MM, CM, M, or KM.

## Procedure File Sections

Use Default: Use this field to specify that the default procedure file sections will be used to create detailing and remove hidden lines. This is the default selection.

Use Specified Sections: Use this field to specify that non-default procedure file sections will be used to create detailing and remove hidden lines. If you want to specify more than one section name, separate the section names with a comma.

## Smoothing Angle

Use this field to specify the minimum angle of one face to another face, at which a line is inserted between the faces. The default angle is 0.000. Select the field to activate a real number calculator.

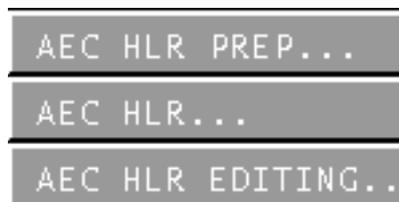
# AEC Hidden Line Removal Preparation

Selecting the Hidden Line Removal Preparation option displays a command palette. Each command Palette option either executes a direct action or displays a property sheet.

HLR commands for Hidden Line Preparation, Hidden Line Removal and Hidden Line Editing Functions are accessible from the Render option.

## Getting to the AEC Hidden Line Removal Preparation Option

1. Click the Render icon from the Environment Global.
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal command palette is displayed.
3. Choose AEC HLR from the palette. The following menu appears.



4. Choose AEC HLR PREP from the menu. The AEC HLR Preparation command palette appears.



This gives you access to the following options.



**Creating Visual Edges:** This option lets you create a three-dimensional representation on a selected object without performing Hidden Line Removal.



**Project an Outline:** This option displays a property sheet that lets you create representative three dimensional components from planar strings (outlines).



**Edit an Outline:** This option displays a menu from which you can choose one of the following options:

- **Relate Outline**

This direct action option lets you establish a relationship between an outline and the strings located inside it.

- **Unrelate Outline**

This direct action option lets you remove the relationship between outlines and holes.

- **Verify Outline**

This direct action option lets you highlight the strings that have been related using the Relate Outline option.



**Creating a Text Version of a Compiled Procedure File:** This direct action option lets you convert a compiled (binary) file into a text file of the same name.



**Check a Procedure File:** This direct action option ensures that all elements of a procedure file are valid. It verifies the syntax and lists the contents of a procedure file.

## Creating Visual Edges



This menu option allows you to insert visual edges on selected AEC objects without performing hidden line removal. Creates a three—dimensional representation for a procedure file derivative object with no hiding being done.

### Getting to the Create Visual Edges Option

1. Choose the Render icon (paintbrush) on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal command palette is displayed.
3. Choose AEC HLR from the palette.
4. Select AEC HLR PREP from the menu. The HLR Preparation command palette, as shown below, appears.



5. Choose the Create Visual Edges option from the AEC HLR Preparation command palette.

This is a direct action menu selection. After you select this option, a three dimensional representation of the procedure file derivative object is created.

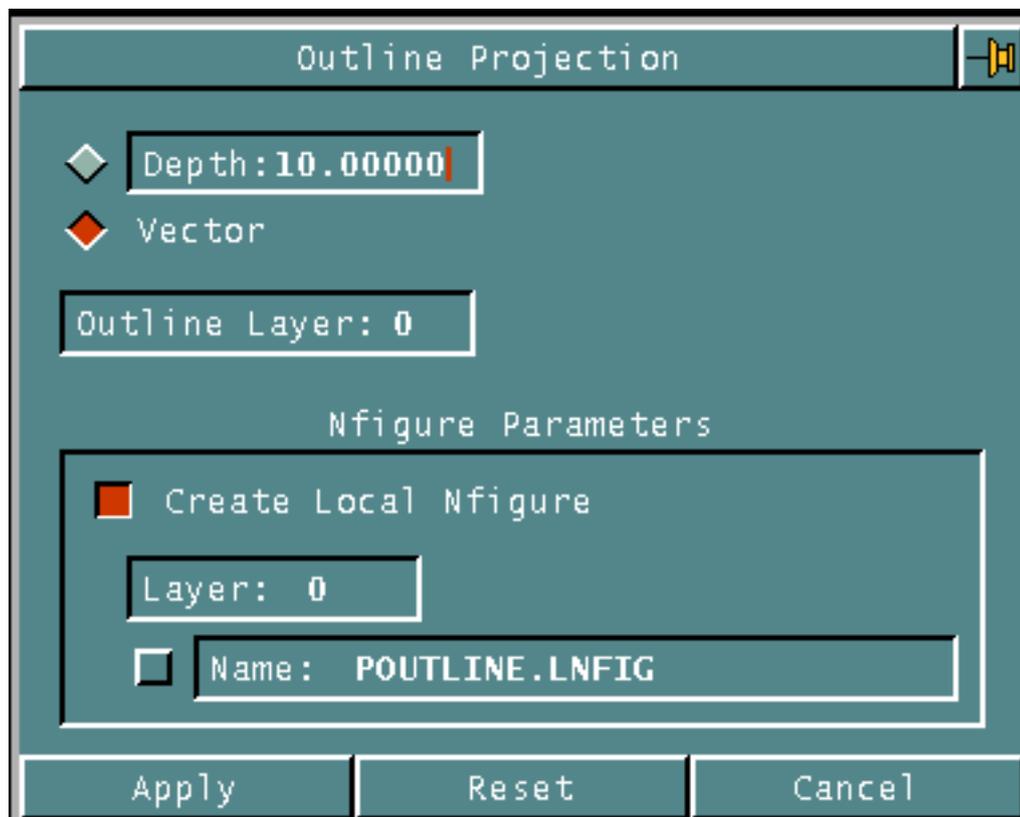
# Projecting an Outline



This option enables you to create representative three dimensional components from planar strings (outlines).

## Getting to the Project an Outline Option

1. Click the Render icon from the Environment Global area.
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal command palette appears.
3. Choose AEC HLR from the palette.
4. Choose AEC HLR PREP from the menu. The AEC HLR Preparation command palette appears.
5. Choose the Project an Outline option from the AEC HLR Preparation palette. The Outline Projection property sheet appears.



The Outline Projection property sheet gives you access to the following options:

## Depth

Specifies the displacement along the z axis of the active construction plane. Enter the depth by which the outline should be projected. It can be either a positive or negative real number.

## Vector

Specifies the distance and the direction of the projection. It can be entered either as two selections or as coordinates while selecting. This is the default selection. Note that when projecting an outline along a vector, you must have selected the CPL TOP view.

If you select the Vector option, the Project pulldown menu is displayed. The Project pulldown menu provides the following options:

Vector Locs: Choose this option to indicate the vector direction, specified by selecting two points, along which you want the selected outlines to be projected.

Done: Choose this option to project the outlines of the selected entities.

## Outline Layer

Specifies the layer where the projected outline is placed. The default outline layer is the active construction layer.

## Create Local Nfigure

Specifies that local nodal figures are to be created.

Layer Specifies the layer on which the nodal figure instance is to be located. The default is the active construction layer. The default name is POUTLINE.LNFIG.

Name: Specifies the name for the local nodal figure that is created.

Each consecutive pair of vertices of the outline is projected as a closed, planar string. The outline may be projected by a specified depth or along a specified vector. With the execution of this command, a local nodal figure is optionally attached to the original string at its beginning location.

All the strings can be translated, rotated, or deleted individually or as a group by identifying the appearance symbol of the local nodal figure. You can select a maximum of 3000 string entities. Each string of the outline to be projected is limited to 99 vertices.

## Editing an Outline



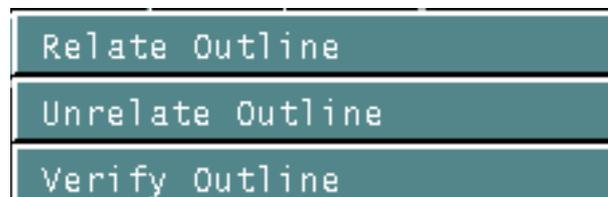
This option displays a pulldown menu that allows you to edit an outline. Each pulldown entry executes a direct action.

### Getting to the Editing an Outline Option

1. Click the Render icon on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal command palette is displayed.
3. Choose AEC HLR from the palette.
4. Choose AEC HLR PREP from the menu. The AEC HLR Preparation command palette appears.



5. Click the Edit an Outline option.



The Edit Outline menu gives you access to the following options:

### Relate Outline

This option establishes a relationship between:

- An outline and the strings located inside it.
- The outline and any string laying entirely within the outline.

## Unrelate Outline

Use this option to remove the relationship between outlines and holes. This option undoes the Relate Outline option.

If you select an outline, all holes are unrelated. If you select an outline, all holes are unrelated. If you select a hole, only that hole is unrelated from its outline.

## Verify Outline

This option highlights the strings that are related after using the Relate Outline option. In a series of selections, only one group of relationships can be highlighted at a time.

# Creating a Text Version of a Compiled Procedure File



This option creates a text version of a compiled procedure file and lists the contents. It converts a binary file into a text file of the same name. It also prints each line of the procedure file while processing.

Visualization commands do not use compiled (binary) procedure files. If a procedure file is compiled, this option converts (uncompiles) it into text before checking it. The binary file will be deleted. An uncompiled procedure file is equivalent to the original text file, except:

- It does not include original comment lines.
- It only uses standard keywords. These may not match the original keywords, but they work the same.

## Getting to the Create a Text Version of a Compiled Procedure File Option

1. Click the Render icon on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Choose AEC HLR from the command palette.
4. Choose AEC HLR PREP from the menu. The AEC HLR Preparation command palette is displayed.
5. Select the Create a Text Version of a Compiled Procedure File from the property sheet. A procedure file Name field appears.



6. Enter the file name in the field that appears.

## Checking a Procedure File



This option verifies the syntax and lists the contents of a procedure file. It ensures that all elements of a procedure file are valid.

### Getting to the Check a Procedure File Option

1. Click the Render icon on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Choose AEC HLR from the command palette.
4. Choose AEC HLR PREP from the menu. The AEC HLR Preparation command palette is displayed.
5. Choose the Check Procedure option from the AEC HLR preparation palette. A Procedure File Name field appears.



6. Enter the file name in the field.

This is a direct action menu selection. When you choose this option, a text file of the same name is created from the active compiled file.

An error message is displayed if:

- The file does not exist.
- The file contains incorrect syntax.
- Supplied keywords are incorrect for the specified shape.
- Supplied keywords are insufficient to define the specified shape; not all mandatory keywords are provided.
- The file does not specify units with a Units statement as the first noncomment line.

## AEC Hidden Line Removal

This option lets you generate a rendered representation of an object or set of objects. You can:

- Perform hidden line removal on AEC objects
- Perform hidden line removal on AEC objects with the creation of interference lines
- Provide additional options to perform hidden line removal on AEC objects

### Getting to the AEC Hidden Line Removal Option

1. Click the Render icon from the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Choose AEC HLR from the command palette.
4. Choose AEC HLR from the menu. The AEC Hidden Line Removal command palette is displayed.



The Hidden Line Removal property sheet gives you access to the following options:



**Create a Visual Edge and Performing HLR:** This option allows you to perform hidden line removal on AEC objects. It inserts visual edges on selected applications and performs HLR. The setup parameters specified in the Hidden Line Removal Setup option are used with this option.



**Create a Visual Edge with Interference Lines:** This option allows you to create interference lines among components, and within individual components. This option inserts edges, removes hidden lines and inserts dashed lines for selected AEC objects. The setup parameters specified in the Hidden Line Removal Setup option are used with this option.

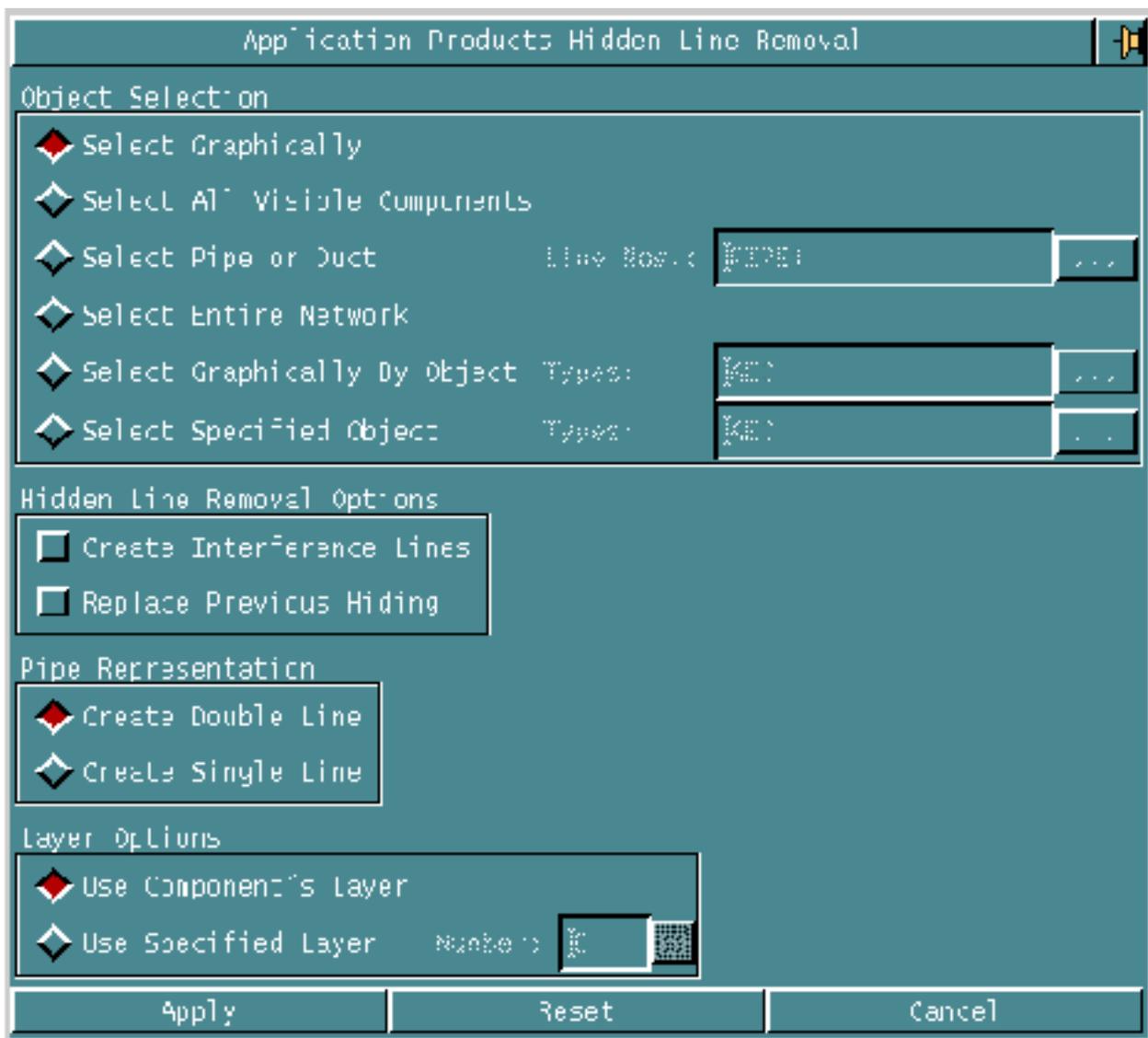


**Create a Visual Edge (With Options):** This option displays a property sheet for removing hidden lines from AEC objects. It also provides additional options for performing hidden line removal on AEC objects.

## Creating a Visual Edge (with Options)



1. Click the Render icon (paintbrush) on the Environment Global area of the top bar. A menu is displayed.
2. Choose Hidden Line Removal from the menu. The Hidden Line Removal command palette is displayed.
3. Choose AEC HLR from the palette.
4. Select AEC HLR from the pulldown menu that appears. The Hidden Line Removal Property Sheet is displayed.
5. Select Create a Visual Edge from the property sheet.



6. Specify the object selection method.
7. Click Apply.

## Suboptions of Create a Visual Edge (with Options)

Specifies the method for selecting objects.

**Select Graphically:** Specifies the objects on which you want hidden line removal performed. This is the default selection.

**Select All Visible Components:** Specifies hidden line removal for all components in the part, or in any part accessed by Multipart Access.

**Select Pipe or Duct:** Specifies up to 10 labels (including names) for each pipe or duct. Multiple labels must be separated by commas. Click the editor button to display a Line Number editor. The Line Number editor displays a scrollable list of all numbered pipe and duct runs in the active and viewed parts.

**Select Entire Network:** Specifies all entities in the network of the digitized pipe, duct, or wall, even though only one entity is digitized.

**Select Graphically by Object.** Specifies that only entities of the specified object type can be selected. Click the editor button to display an Application Object Selection property sheet. The ARCH, HVAC, PIPE, SITE, SMS and SSM buttons on the Application Object Selection Method property sheet allow you to quickly select all the types of objects in those applications.

**Select Specified Object :** Specifies that all entities of the specified object type will be selected. Click the editor button to display an Application Object Selection property sheet.

## Hidden Line Removal Options

Specifies the options that can be used along with hidden line removal.

**Create Interference Lines :** Specifies that the entities will be created at the intersection of objects. Creates interference lines among components, and within individual components.

**Replace Previous Hiding:** Specifies that new representations will replace previous hiding. Regenerates and replaces existing detailed graphics with new detailed graphics.

## Pipe Representation

Specifies the type of line graphics that will be used for pipe representation.

**Create Double Line:** This option creates double line graphics for all disciplines. This is the default selection.

**Create Single Line:** This option creates single line graphics for piping equal to or less than the diameter specified in the Change Pipeline Parameters option on the Piping Setup command palette.

## Layer Options

Specifies the layer on which the detail graphics will be placed.

**Use Component's Layer:** Places all newly created detail graphics on the same layer as the corresponding model entity.

**Use Specified Layer:** Specifies the layer where replaced graphics are saved and copied. The default value is 0.

## Editor Button

AEC Hidden Line Removal property sheets have a unique feature called the editor button. For more information about using CADDs property sheets refer to the *Explicit Modeling User Guide and Menu Reference*.

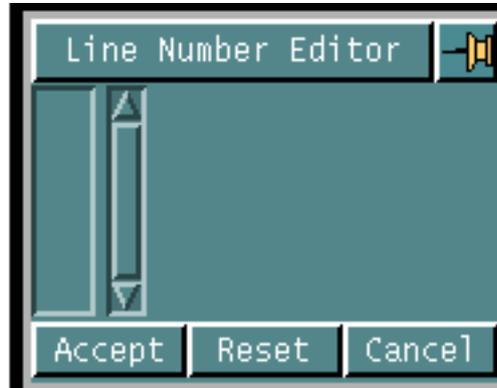
Some fields on the property sheet display scrolling lists of valid selections for that field. To access such a list, an editor button is provided next to the field. Editor button is the field with the 3 dots.



Click the Editor button to display a scrollable list of all numbered pipe and duct runs in the active and viewed parts.

## Line Number Editor Property Sheet

Select the Editor button and the Line Number Editor property sheet is displayed.



### Using the Property Sheet

The Line Number Editor property sheet displays a scrollable list of all numbered pipe and duct runs in the active and viewed parts. Select a pipe or duct run and it is displayed in the corresponding field.

You can choose multiple labels, select another pipe or duct run, and it is displayed them in the corresponding field, separated from the first label by a comma. You can specify up to 10 label names in this manner. When all required labels have been entered, click Accept.

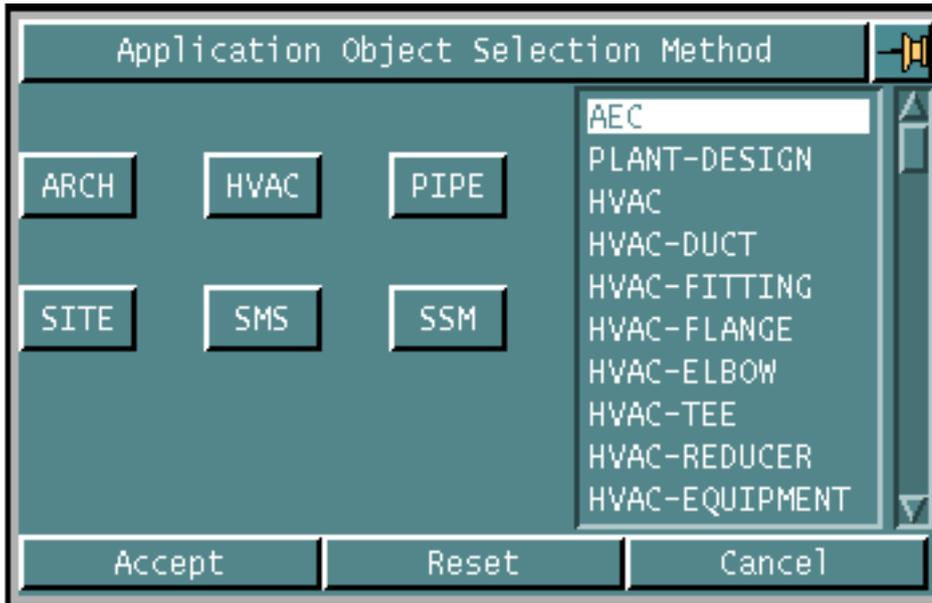
## Application Object Selection Method Property Sheet

1. Select the Select Graphically by Object or the Select Specified Object the following field gets highlighted.



2. Select the editor button.

3. The Application Object Selection Method property sheet is displayed

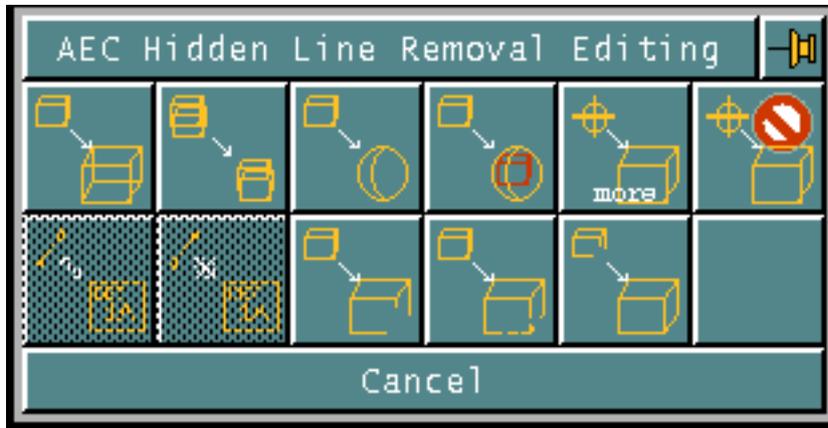


### Using the Property Sheet

The ARCH, HVAC, PIPE, SITE, SMS, and SSM buttons on the Application Object Selection Method property sheet allow you to quickly select all the types of objects in those applications. Using the Shift key on the keyboard along with the mouse button to select the specified objects.

# Hidden Line Removal Editing Option

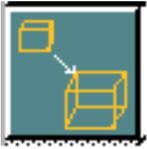
1. Click the Render icon on the Environment Global area of the top bar.
2. Choose Hidden Line Removal from the menu.
3. Choose AEC HLR from the command palette.
4. Choose AEC HLR Editing from the menu. The Hidden Line Removal Editing command palette is displayed.



The Hidden Line Removal Editing command palette includes options for the following tasks:

- Unhide previously detailed objects
- Merge previously hidden details
- Replace previously created details
- Compare new details to old
- Customize access to the AEC hidden line removal functions
- Remove detail graphics from selected AEC objects.
- Create a parent-child relationship between an Nline or Nfigure and detail graphics
- Remove any parent-child relationships between an Nline or Nfigure and detail graphics
- Blank previously created detail graphics
- Dash previously created detail graphics
- Restore blanked or dashed detail graphics

## Options on the Hidden Line Removal Editing Command Palette



**Unhiding Detailed Objects:** This option enables you to remove hiding from selected application objects while leaving visual edges. It unblanks the previously detailed objects for the identified entities. This option uses the value of the smoothing angle specified in the hidden line removal Setup option.

To change the value of the smoothing angle, access the hidden line removal Setup option. Hiding is removed from the selected application objects, while the visual edges are left as they are.



**Merging Hidden Objects:** This option enables you to merge the results of different hidden line removal executions for selected application objects.



**Replacing Detailed Objects:** This option enables you to replace visual edges and hiding for selected application objects by detailed graphics.



**Comparing Details:** This option enables you to compare new details to old by replacing visual edges and hiding for selected application objects while saving the old details.



**Editing a VisualEdge (With Options):** Displays a property sheet that provides you with more customized access to the AEC HLR functions. For more details refer to “Creating Visual Edges” .

## Hidden Line Removal Editing Options

Specifies the options that can be used along with hidden line removal.

**Create Interference Lines :** Creates interference lines among components, and within individual components. If both intersecting components are projected outlines, interference lines are not generated.

**Merge With Existing Detail:** Specifies that detail graphics for the identified components should be merged. When multiple sets of components are specified, each set is hidden against each other set. Individual components within sets are not hidden against each other. If only one set is entered, every entity in the set is hidden against every other entity in the set.

**Update Changed Detail Graphics:** Specifies that existing detail graphics should be replaced by new graphics only if there has been a change in the detailing. Replaced graphics are saved and copied to the appropriate layer, as specified in the Layer Option.

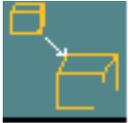


**Deleting Detailed Objects:** This enables you to delete detailed graphics from a model or portion of a model, returning it to its predefined state. If a detailed entity is digitized, the command deletes all Draw View mode detail graphics associated with Nfigure or Nline, and fonts on all strings related to a projected outline.

**Relating Details:** Creates a parent child relationship between a model entity (an Nline or Nfigure) and detail graphics. Child detail graphics can consist of simple arcs, strings, lines, and text created in Draw mode with a view selected.

This option provides flexibility in enhancing drawings. For example, you can superimpose symbols you design (such as the pipe end symbol) over an Nline or Nfigure and then relate these details to the model entity. The model entity is then erased in the given view. If you later delete or move the model entity, its detail graphics go with it.

**Unrelating Details:** Removes the parent child relationship between detail graphics and a model entity. The command works through selection of the entities of detail graphics in the view where the relationship was made. When this relationship has been removed, the original Nline/Nfigure is displayed again.



**Blanking Detail Graphics:** This option blanks selected portions of the visual edge of an application object. A pulldown menu is displayed. It provides the following options:

- **Polygon Window:** Select this option to blank previously created detail graphics from a polygonal window. Select the points that will define the boundaries of the polygonal window.
- **Window:** Select this option to blank previously created detail graphics from a rectangular window. Select the top left corner and the bottom right corner to define the boundaries of the rectangular window.
- **Line Interval:** Select this option to blank previously created detail graphics on a specified portion of a line segment. Select the start and end points of the line to define the line interval.

Select Done from the Utilities menu. Selected portions of the visual edge of an application object are blanked.



**Dashing Detail Graphics:** This option dashes the selected portions of the visual edge of an application object. A pulldown menu is displayed which provides the following options:

- Polygon Window
- Window
- Line Interval

Select Done from the Utilities menu. Selected portions of the visual edge of an application object are dashed.



**Restoring Detail Graphics:** This menu restores the blanked or dashed portions of the visual edge of an application object. A pulldown menu is displayed which provides the following options:

- Polygon Window
- Window
- Line Interval

Select Done from the Utilities menu. The blanked or the dashed portions of the visual edge of an application object are restored.

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