

APPENDIX 1: TECHNIQUES FOR MODIFYING THE VIEW OF THE MODEL WORKSPACE

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APPENDIX A: TECHNIQUES FOR MODIFYING THE VIEW OF THE MODEL WORKSPACE

Introduction

During the course of building and analyzing models, you will often want to focus on specific areas of the workspace and/or change the manner in which objects appear. Here we will describe the most often used commands for modifying the view (or **window**) displayed on your computer monitor.

Changing your view will usually be accomplished by employing one or more of the following fundamental procedures:

- **Zooming** in or out to change the apparent size of objects in your model.
- **Panning** to move specific parts of your model into the center of your viewing area.
- **Rotating** the orientation from which you view objects.
- **Windowing** (a combination of **Zooming** and **Panning**) to a specific view.
- **Hiding** some parts of the model when they obstruct your view of objects you wish to focus on.
- **Shading** (also called **rendering**) objects to make them appear solid.

The program commands for accomplishing each of the above procedures are contained in the **View** menu. In addition, there are several shortcuts that can be activated using your computer's keyboard and mouse, or speed buttons on program tool bars.

Use of the shortcut methods can greatly increase the speed and efficiency with which you use the program, so we will begin with descriptions of keyboard and mouse shortcuts.

Keyboard Shortcuts

In the descriptions that follow, standard computer keyboard keys will be shown enclosed in angle brackets (<>) to set them apart from the rest of the text. (For example <Home>, <Enter>, <F1>, <Ctrl>.)

In particular, note that the cursor control arrow keys are also shown according to this convention. (For example <Left Arrow>, <Down Arrow>). This is important since you will use the cursor control arrow keys for most procedures.

Combinations of keystrokes are shown with a plus sign (+) between the keys. (For example <Alt>+<Print Screen> means to hold down the <Alt> key and then press the <Print Screen> key.)

Arrow Key Shortcuts

The four arrow keys on your computer keyboard can be used to zoom, pan and rotate your model view.

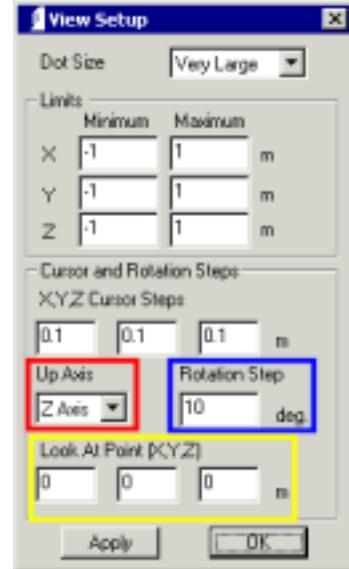
Zoom	<p><Alt>+<Up Arrow> magnifies your view (zooms in on the center of your current view).</p> <p><Alt>+<Down Arrow> zooms out.</p>
Pan	Use <Shift>+ the arrow key for the direction you wish to shift the screen view.
Rotate	<p>The <Left Arrow> and <Right Arrow> keys rotate <i>your viewpoint</i> to the left or right.</p> <p>The <Up Arrow> and <Down Arrow> keys rotate <i>your viewpoint</i> up or down.</p>

The zoom and pan commands are pretty much self-explanatory, but there are some fine points about the rotate command that you should understand. We will explain these in the next section.

Using the Rotate View Command

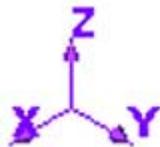
The effects of the **Rotate View** command will vary according to the settings in the **View Setup** dialog box, which is shown at right. In particular, note the settings for the **Up Axis** (shown outlined in red), the **Rotation Step** (outlined in blue) and the **Look At Point** (the group of three **X,Y,Z** fields outlined in yellow).

Imagine that your model space is enclosed within a globe. The globe is free to rotate about the **Up Axis**, and center of the globe is the **Look At Point**. The **Rotate View** command allows you to spin the globe about its axis (in this example the **Z Axis**), or tilt it to change the angle from which you view its center (in this example **0,0,0**). Each time the **Rotate View** command is activated, the view will change by a specified discrete step (in this example **10** degrees).

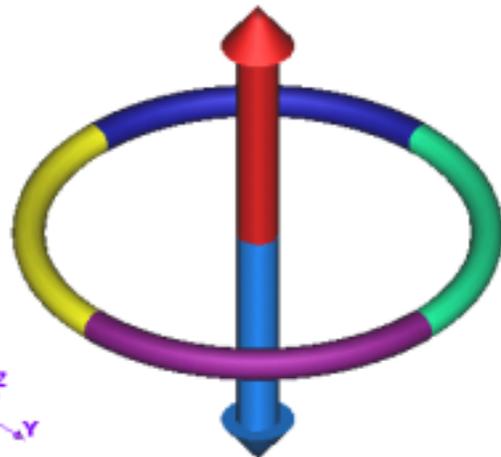


When you first set up a new model, the program defaults are for the positive **Z Axis** to be the **Up Axis**, and a **Rotation Step** of **10** degrees. The **Look At Point** will be automatically set to the center of your model space as determined by your **Minimum** and **Maximum Limits** settings. Under certain circumstances, you may need to change these settings from their defaults. This will become clearer as you study the following examples.

Consider the structure shown at right. The red arrow lies on, and points in, the direction of the positive **Z Axis**; the blue arrow lies on, and points in, the direction of the negative **Z Axis**. The multi-section torus lies in the **XY** plane.



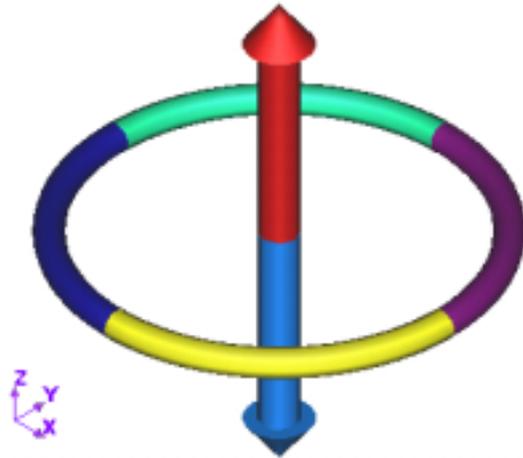
Note that in the bottom left-hand corner of the picture there is a small set of **XYZ** axes to show the view orientation.



If we now press the **<Left Arrow>** key **9** times, our viewpoint will rotate to the left by **90 degrees**. Note that our model appears to have rotated to the right.



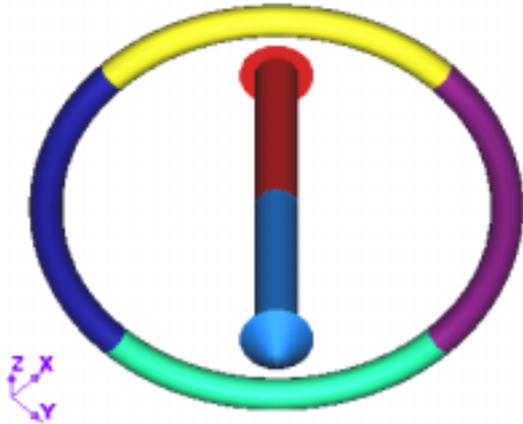
The orientation indicator also rotates 10 degrees at each step to reflect the changing view direction.



If we now press the **<Down Arrow>** key **9** times, our viewpoint will rotate downward by **90 degrees**. Note that our model appears to have rotated upward.

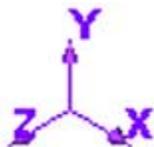


Once again, the orientation indicator changes to reflect the new view direction.

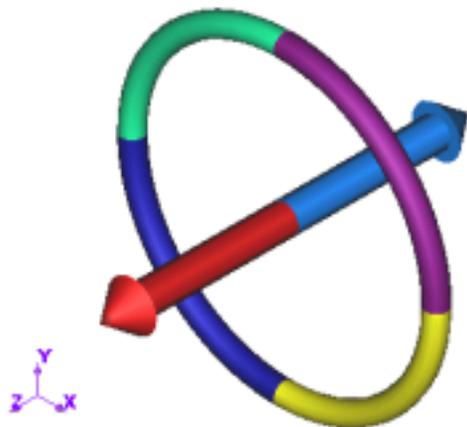


Note that in the previous examples the red and blue arrows were aligned vertically. In fact, because the **Z Axis** is set as the **Up Axis**, you cannot tilt the arrows to a diagonal or horizontal orientation. To overcome this restriction, we need to change the setting of the **Up Axis**.

At right, we have changed the setting so that the **Y Axis** is now the new **Up Axis**. We can now tilt the arrows away from a strictly vertical alignment. (We could also have accomplished this by setting the **X Axis** as the **Up Axis**.)



With this new setting, the orientation indicator displays the **Y Axis** as vertical.



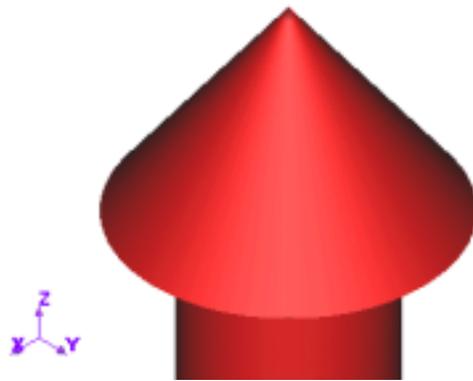
You can change the current **Up Axis** by opening the **View Setup** dialog box, but usually it is more convenient to change the setting on the **Utilities** toolbar as shown below.



Another problem can occur when you have zoomed in on a small section of your model space that is located far from the default **Look At Point**.

An example of this situation is shown at right, where we have zoomed in on the tip of the red arrow

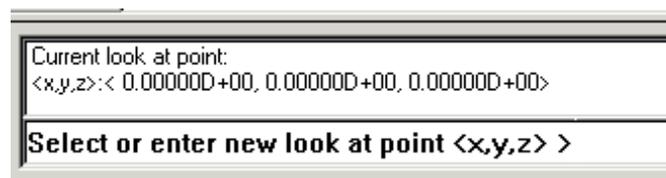
If we now attempt to rotate our view to look down on the tip from above, it will pass down out of the viewing area of our screen after a few rotation steps. We will then have to pan down until the tip is again visible.



A better solution is to move the coordinates of the **Look At Point** closer to the arrow tip. You can do this by changing the setting in the **View Setup** dialog box, but again the **Utilities** tool bar has a speed button for this as shown at right.

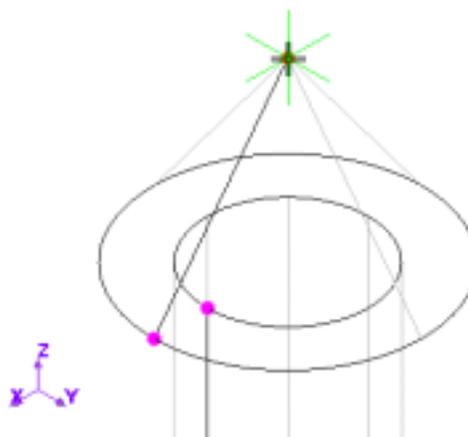


Clicking the speed button will cause the **Command Line** to show the prompt **Select or enter new look at point <x,y,z>** as shown below.



For some cases you will know the appropriate coordinates to enter, but usually it is easier just to select an existing geometry point with your mouse as shown at right (we changed the display to wire frame to make the points easier to see).

Note that the mouse pointer can only be used to select existing geometry points in 3D mode. Clicking on blank sections of the model space will not produce a selection.



<Home> and <Page Up>

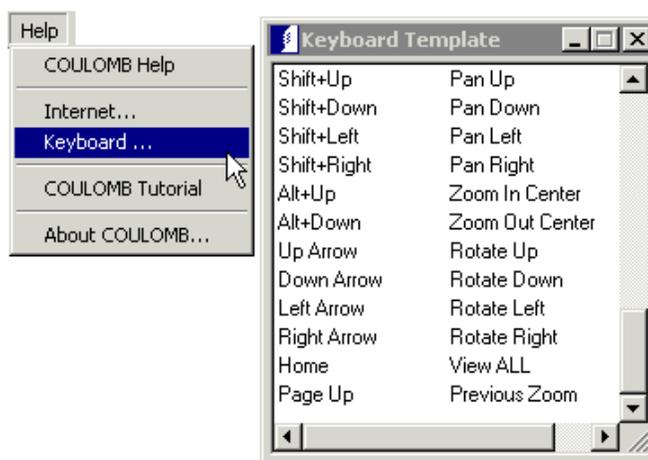
If you have zoomed in on a small detail of a model, you can quickly zoom out to view the full workspace by pressing the **<Home>** key on your computer keyboard.

If you have used several different view windows since starting the program, you can backtrack through them one at a time by pressing the **<Page Up>** key. You can back up through a maximum of 32 previous view windows.

Keyboard Template

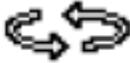
As a reference and reminder for the functions of the keyboard shortcuts, you can open a template window.

Select **Help>Keyboard** as shown at right.



Mouse Shortcuts

Mouse shortcuts also allow you to zoom, pan and rotate your model view. The mouse shortcuts are more flexible than the arrow key shortcuts since they provide continuous (or **real-time**) view modifications (as opposed to the discrete steps that occur each time you press an arrow key).

<p>Zoom</p>	<p>With your mouse pointer over the workspace, press <Alt>+Left Mouse Button. The pointer will change to a magnifying glass.</p>  <p>When this occurs, move your mouse up (or down) to zoom in (or out).</p> <p>(Also, if you have a scrolling mouse you can rotate the center wheel to zoom by discrete steps in the same manner as you would by using the cursor arrow keys.)</p>
<p>Pan</p>	<p>With your mouse pointer over the workspace, press <Shift>+Left Mouse Button. The pointer will change to an omni directional indicator.</p>  <p>When this occurs, move your mouse in the direction you wish to pan.</p> <p>(You can of course also pan by using your mouse to drag the horizontal or vertical scroll bars at the bottom and right sides of the workspace.)</p>
<p>Rotate</p>	<p>With your mouse pointer over the workspace, press <Alt>+Right Mouse Button. The pointer will change to rotational arrows.</p>  <p>When this occurs, move your mouse in the direction you wish to rotate.</p>

Using Window Commands

The four **Window** commands combine zooming and panning in one operation. They are called window commands because you define your next view window by using the mouse to draw a “rubber” box outline to select the desired part of your workspace.

The **Window** commands can be accessed through the **View** menu, or using the speed buttons on the **View** tool bar shown below.



The four **Window** commands fall into one of two categories: they are either **Window All** or **Window Current**. The distinction between the two types is explained as follows:

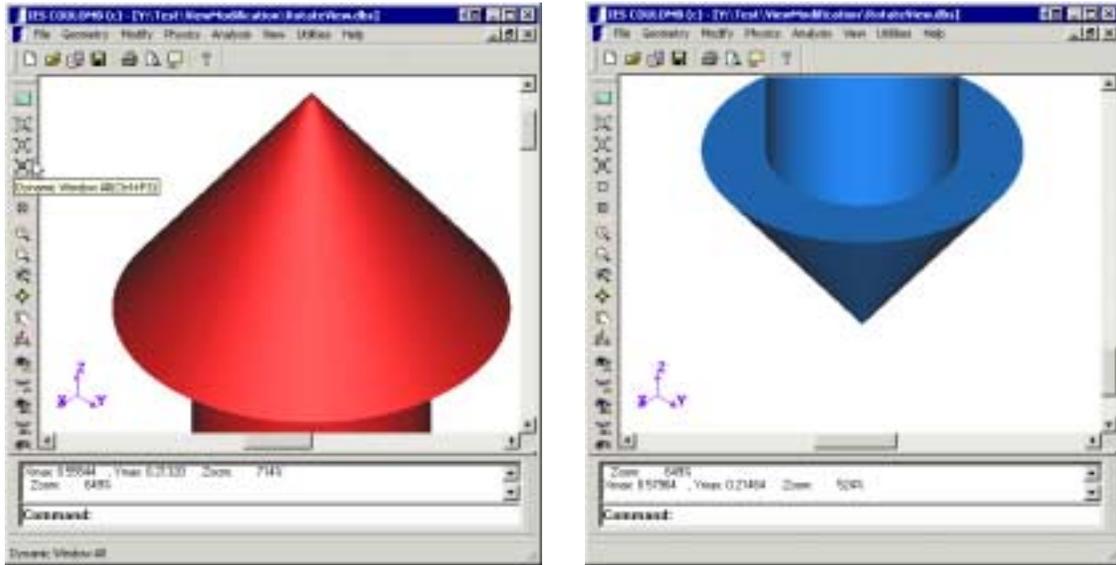
- **Window Current** commands allow you to select a subsection of the currently displayed view to be your next view window. They can only be used to zoom in (not out) for your next view.
- **Window All** commands allow you to select any portion of your entire model space to be your next view window. If you have zoomed in on a small region, activating a **Window All** command will cause the display to immediately zoom out to the full extent of the view limits. You then draw your selection box for your next view. (Essentially, the **Window All** commands save you the step of using the **View All** command to display your full model before defining your new window.)

Window commands can also be **Dynamic**. **Dynamic Window** commands allow you to first draw the selection box to the size you want, and then position the box to enclose the portion of your model space that will be the next view window.

The procedure for using **Window** commands will be illustrated by an example in the next section.

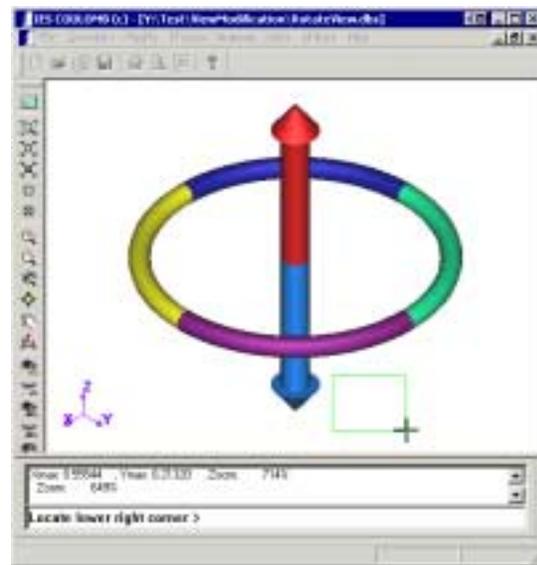
Dynamic Window All Example

We will use our previous model to demonstrate the **Dynamic Window All** command. Specifically, we will begin with a view that is zoomed in on the top arrow (shown below at left) and end zoomed in on the bottom arrow (below right).

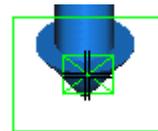
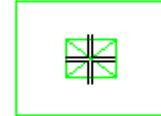


NOTE: The terms **Left-click** and **Right-click** refer to pressing the left and right buttons of your mouse when your mouse pointer is located in the workspace of your program window.

- 1) On the **View** tool bar, click the **[Dynamic Window All]** speed button bar to start the command.
- 2) Your view will zoom out to display the entire workspace and the **Command Line** will show the prompt **Locate lower left corner** (of the selection box).
- 3) **Left-click** anywhere in the workspace to begin the box.
- 4) The **Command Line** will show the prompt **Locate lower right corner**.

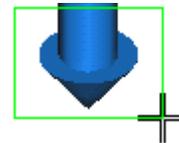


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- 5) Move your mouse pointer horizontally. Note that the outline of a box is drawn as you move the mouse, and that the box maintains a fixed aspect ratio (which is the same aspect ratio as your program window).
- 6) When the box is big enough to contain the arrow tip, **Left-click** to fix its size.
- 7) The selection box will snap to the cross hairs of the mouse pointer, and the **Command Line** will show the prompt **Locate Window Center**.
- 8) Move the selection box onto the bottom arrow tip and **Left-click** to complete the command.



We could have also used the **Window All** command to shift our view. The main difference is that the **Window All** command would have executed as soon as the lower right corner of the box had been located.

When using **Window All** you must take extra care in locating the corners since you do not get an opportunity to center the box.



The first few times you use the **Window** commands, you should pay special attention to the **Message Area** prompts to ensure you follow the proper sequence of operations.



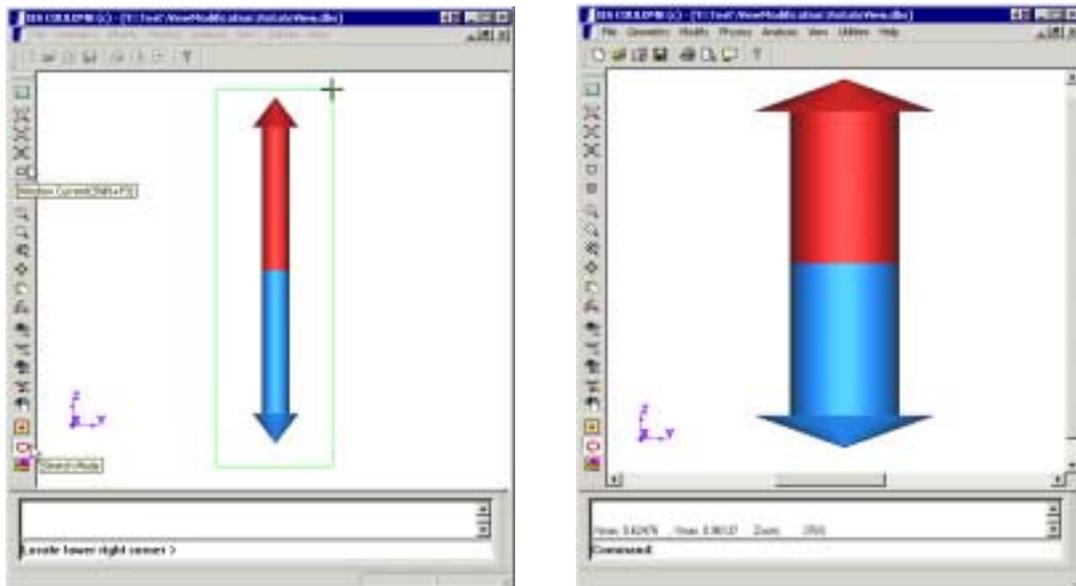
Stretch Mode

In the previous example, we could vary the size and location of the selection box, but we could not change its aspect ratio. This was fixed to the same aspect ratio as the program window in order to give an undistorted view of objects in the model space. However, there are occasions when physical structures to be modeled have extreme aspect ratios, and in these cases distorting the view by compressing or stretching dimensions can be helpful.

To accommodate these situations, the program can be set to display the model space in **Stretch Mode View**. This can be set in the **View** menu, or by the speed button on the **View** tool bar as shown below.



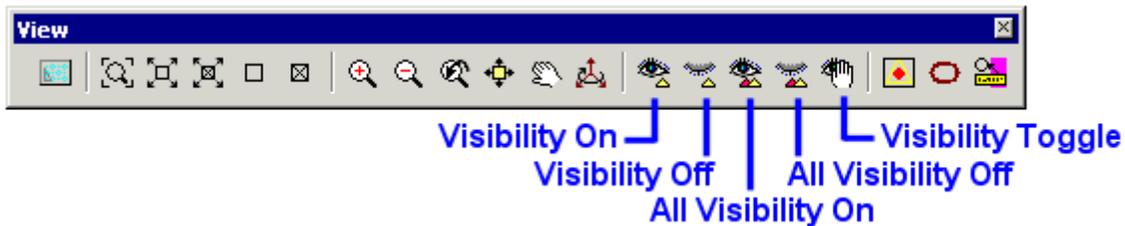
When the program is in **Stretch Mode View**, selection boxes for the **Window** commands are free of aspect ratio restrictions. In the view shown below at left, we first enabled **Stretch Mode View** and then activated the **Window Current** command. A narrow selection box has been drawn that is just large enough to enclose the red and blue arrows. As a result, the arrows appear wider when the new view is displayed (shown below at right).



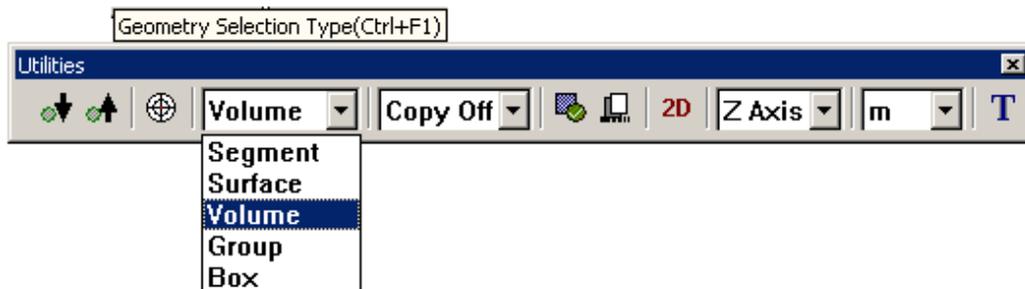
Using Visibility Commands

Quite often, you will want to focus on parts of a model that are either partially or completely surrounded by other objects. In these situations you will need to temporarily hide the surrounding objects by using **Visibility** commands.

The **Visibility** commands can be accessed through the **View** menu, or using the speed buttons on the **View** tool bar shown below.



The **All Visibility On**, **All Visibility Off** and **Visibility Toggle** commands execute in one step since they operate on all objects in your model space and as such do not require selection of specific model parts. However, you should keep in mind that the results of the **Visibility Toggle** command will vary according to the settings for the *Geometry Selection Type* in the **Utilities** tool bar.



The **Visibility On** and **Visibility Off** commands require that you first build a selection set of objects that will be subject to the commands. In the case of **Visibility On**, the visibility of objects in your model space will first toggle (all currently visible objects will become hidden and all currently invisible objects will reappear) to allow you to build your selection set.

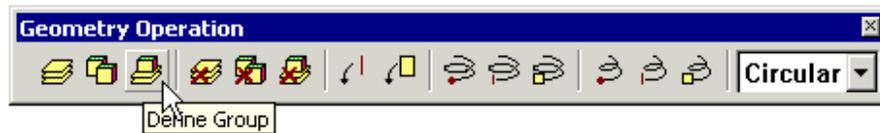
After a **Visibility** command has been executed, the **Message Area** will display a summary of the number of segments that are currently invisible as shown at right.





If you need to make most of your model invisible, first execute the **All Visibility Off** command, then use the **Visibility On** command to turn on the objects you need to see.

Also, you may find it helpful to use the **[Define Group]** speed button on the **Geometry Operation** tool bar to assign objects of your model to different **Groups**. This will enable you to hide or display large numbers of related items with a single selection operation.

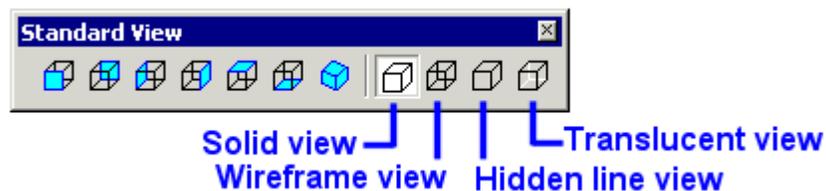


Using the Standard View Tool Bar

We will complete our discussion of the techniques for modifying your view by describing the functions of the **Standard View** tool bar.

Options for Displaying Objects

Objects in your model space are displayed as **Wireframe** structures by default, but they can also be shown in **Solid**, **Hidden line**, or **Translucent view** by clicking the appropriate speed button on the **Standard View** tool bar shown below.



The following are general guidelines for using each display mode.

- **Solid view** produces a very real life visualization of your model. It is helpful in displaying boundary condition and material assignments. It also provides the best indication when you are in the process of selecting surfaces or volumes.
- **Wireframe view** is useful for selecting individual geometry points and segments. It can however, lead to confusion when you are rotating your model view.
- **Hidden line** and **Translucent view** provide good 3D visualization, and are especially useful for viewing element meshes on surfaces.



The **View>Shading** submenu contains four options that allow you to control the quality of rendered views.



Use the **Coarse** setting when saving models (the database will then load faster the next time you open it), and to produce faster rotation of complex models.

Options for Rapid View Alignment

The **Standard View** tool bar contains speed buttons that permit you to rapidly change your model orientation (without have to use the **Rotate View** command) as shown below.

