

9 Transformation Control

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General Description

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Section 9.4, Tool Transform

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Section 9.6, Look At/Look From

Section 9.7, Copy/Paste Transformation State

General Description

An essential feature of postprocessing is the reorientation of the visualized model in order to see it from a number of different vantage points. Basic transformations include *rotating* (about an axis or axis origin point), *translating* (up, down, left, right), and *zooming* (moving the model toward or away from you). When EnSight reads in a geometry file, it assigns all model parts to the same Frame of reference: Frame 0. Frame 0 corresponds to the model coordinate system (defined when the model was created).

Using the Frame Mode, it is possible to create additional frames and reassign parts to them. In fact, when you copy a part, a new Frame is automatically created and the part copy is assigned to the new Frame. (See Section 8.6 Frame Mode for further discussion).

Just after all parts of your model have been read in, EnSight centers the model in the Graphics Window by placing the geometric center of the model at the *Look At Point* which is always located in the center of the Graphics Window. Initially - before any Global translations are made -the origin for the *Global Axis* is located at the Look At Point.

There are seven Editor Functions available within the Transformation Editor, Global Transform, Frame, Tools, Z-Clip, Look At/Look From, Copy Transformation State, and Paste Transformation State. (The Transformation Editor dialog is opened by clicking the Transf Edit... button)

9.1 Global Transform

Transformations you make while in Part or View Modes (rotations, translations, zoom, scale) are performed globally. Global transformations affect the *entire* model as a unit and move all Frames, parts, and *visible* tools relative to the Global Axis. You can make the Global Axis triad (which pinpoints the Global Axis Origin) visible by selecting Axis Visibility > Axis - Global from View in the Main Menu or by clicking the Global Axis Visibility Toggle Icon in the View Mode icon bar.



Figure 9-2
Global Axis Visibility Toggle Icon and Global Axis triad

You can also show the global frame orientation by toggling it on from Desktop > Axis.

Most Global transformations you will make will be done interactively. Interactive Transformations normally affect only the single, selected viewport (the one which the mouse pointer is in when you click the left mouse button). The exception to this is if when you toggle on *Link Interactive Transforms*, causing the selected viewports in the Transformation Editor dialog to all transform together. You choose the type of transformation you wish to perform from among the Transformation Control Icons.

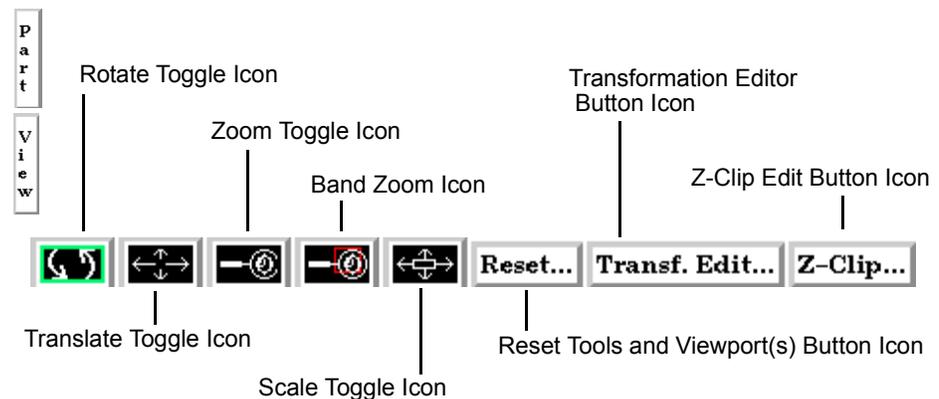


Figure 9-3
Transformation Control Area in View or Part Mode

Rotate Toggle

Interactive Rotation When this toggle is on, clicking the left mouse button and dragging horizontally will rotate the scene (including any tools that are visible) about the Global Y axis.

Clicking the left mouse button and dragging vertically will rotate the scene (including any tools that are visible) about the Global X axis.

Holding the Control Key down and then clicking the left mouse button and dragging will rotate the scene (including any tools that are visible) about the Global Z Axis.

Rotation Using Function Keys

Pressing the F1, F2, or F3 function keys will rotate the scene 45 degrees about the X, Y, or Z axis respectively. Holding the Control Key down while pressing these keys will rotate the scene by -45 degrees. The mouse must be located in the graphics window for these keys to work.

Precise Rotation

When the Transformation Editor is open under Global Transform and the Rotate toggle is selected, the dialog will be configured to permit precise Rotation.

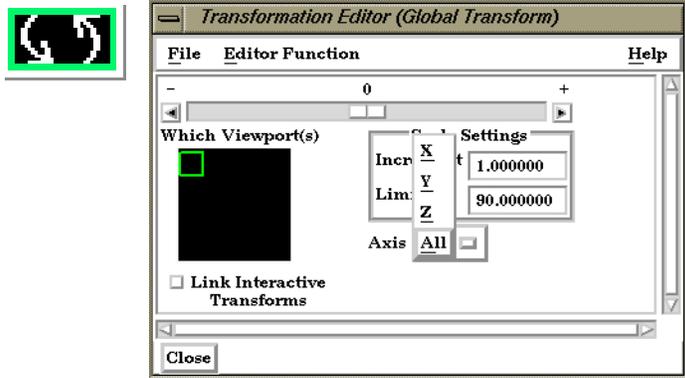


Figure 9-4 Transformation Editor for Exact Global Rotation

You may rotate the entire scene (including any tools that are visible) precisely about the X, Y, Z, or All axes by:

- entering the desired rotation in (+ or -) degrees in the Increment field and pressing Return,
- clicking the stepper buttons at each end of the slider bar (each click will rotate the model by the number of degrees specified in the Increment field), or
- dragging the slider in the positive or negative direction to the desired number of degrees you wish to rotate the model (the Limit Field specifies the maximum number of degrees of rotation performed when the slider is pulled to either end of the slider bar).

Translate Toggle

Interactive Translation

When this toggle is on, you can transform objects interactively in the Global X-Y plane (or by holding down the Control key, in Z). Clicking the left mouse button and dragging will translate the scene (including any tools that are visible) up, down, left or right (or forward or backward).

Precise Translation

When the Transformation Editor is open under Global Transform and the Translate toggle is selected, the dialog will be configured to permit precise Translation.

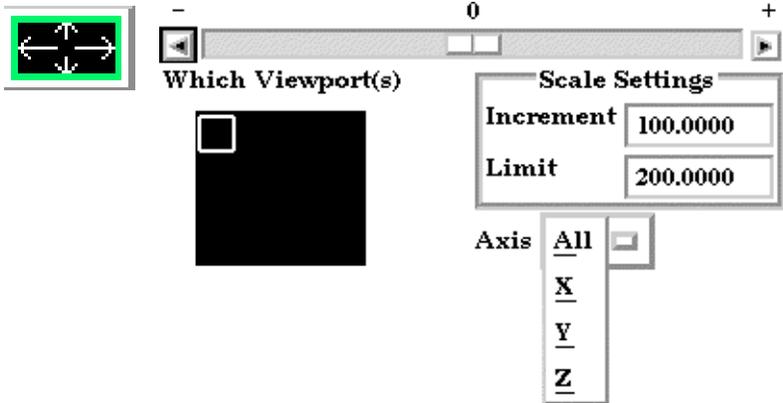


Figure 9-5 Transformation Editor for Exact Global Translation

You may translate the entire scene (including any tools that are visible) precisely along the X, Y, Z, or All axes by:

- entering the desired translation in (+ or -) model coordinate units in the Increment field and pressing Return,
- clicking the stepper buttons at each end of the slider bar (each click will translate the model by the number of model coordinate units specified in the Increment field), or
- dragging the slider in the positive or negative direction to the desired number of model coordinate units you wish to translate the model and then releasing the slider (the Limit Field specifies the maximum number of model coordinate units that the model is translated when the slider is pulled to either end of the slider bar).

Zoom Toggle

Interactive Zooming

A Zoom transform is really an adjustment of the Look From Point, which you might also think of as the Camera Position. When this toggle is on, clicking and dragging to the left or down will zoom-in, that is it will move the Look From Point closer to the Look At Point. Clicking and dragging to the right or up will zoom-out, that is it will move the Look From Point farther away from the Look At Point. If you hold down the Control key while interactively zooming, you will “pan”, i.e. move both the Look At and Look From Points in the direction of the mouse movement.

(see Section 9.6, Look At/Look From)

As you Zoom in or out, be aware that you may clip the model with the Front or Back Z-Clip planes since they move in relationship to the Look From Point, always maintaining the distance from the Look From Point specified in the Transformation Editor dialog: Editor Function > Z-Clip.

(see Section 9.5, Z-Clip)

Precise Zooming

When the Transformation Editor is open under Global Transform and the Zoom toggle is selected, the dialog will be configured to permit precise Zoom.

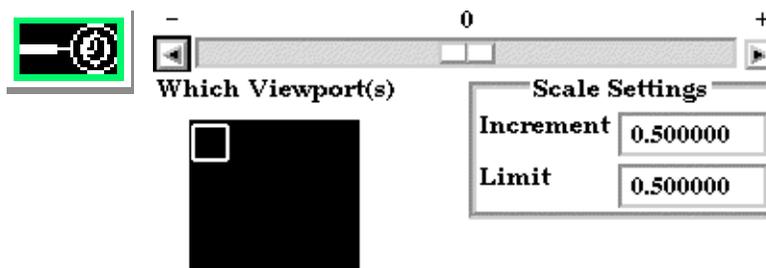


Figure 9-6
Transformation Editor for Exact Global Zoom

You may precisely adjust the position of the Look From Point (with respect to the Look At Point) by:

- entering in the Increment Field the desired modification (+ or -) in the distance between the two Points (a value of .5 will increase the distance to be equal to 1.5 the current distance, a value of 1.0 will double the current distance),
- clicking the stepper buttons at each end of the slider bar (each click will increase or decrease the distance between the two Points by the factor specified in the Increment field), or
- dragging the slider in the positive or negative direction to the desired modification factor and then releasing the slider (the Limit Field specifies the maximum modification factor for the distance between the two Points when the slider is pulled to either end of the slider bar).

Band Zoom Button

You specify the area of interest by clicking and dragging the white rectangle (rubber band) around the area you wish to zoom in on. Immediately after you perform the Band Zoom operation however, EnSight will switch to the regular Zoom Transformation. So, each time you click on the Band Zoom button, EnSight allows you to perform one Band Zoom operation and subsequent clicking/dragging actions you make in the Graphics Window perform regular Zoom transformations.

Band Zoom combines the functionality of a zoom-in transform as described above with a panning operation. The effect of performing a Band Zoom is that the area of interest that you specify will be centered in and will fill the selected viewport. EnSight adjusts the transformation center to be in the center of the area you specified.

The Transformation Editor is inactive for the Band Zoom Operation.

Scale Toggle

Interactive modifications to scale are not permitted. When the Transformation Editor is open under Global Transform and the Scale toggle is selected, the dialog will be configured to permit precise adjustments to the scale of the scene.

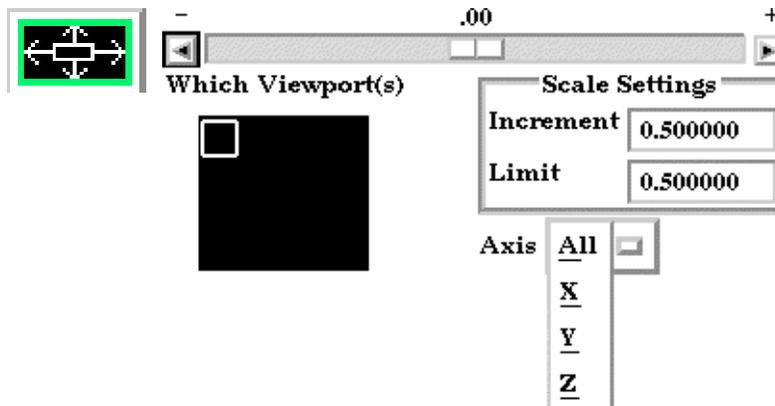


Figure 9-7
Transformation Editor for Exact Global Scaling

You may precisely rescale the scene in the X, Y, Z, or All axes by:

entering in the Increment Field the desired rescale factor and pressing Return (A value of .5 will reduce the scale of the scene in the chosen axis by half. A value of 2 will double the scale in the chosen axis. *Be aware that entering a negative number will invert the model coordinates in the chosen axis.*),

clicking the stepper buttons at each end of the slider bar (Clicking the left stepper button will apply 1/Increment value to the scale. Clicking the right stepper button will apply the entire Increment value to the scale), or

dragging the slider in the positive or negative direction to the desired scale factor and then releasing the slider. (Dragging the slider to the leftmost position will apply 1/Limit value to the scale. Dragging the slider to the rightmost position will apply the entire Limit value to the scale.)

Reset Tools & Viewports Button

Clicking the Reset Tools and Viewport(s) button in the Transformation Control Area will open the Reset Tools and Viewport(s) dialog

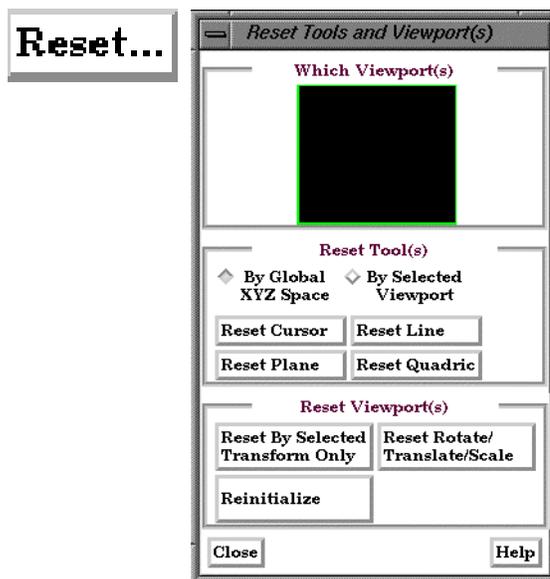


Figure 9-8
Reset Tools and Viewport(s) dialog

By Global XYZ Space Toggle	When enabled, clicking a Reset button will cause the Cursor, Line, Plane, or Quadric Tool to reset to its initial default position.
By Selected Viewport Toggle	When enabled, clicking a Reset button will cause the Cursor, Line, Plane, or Quadric Tool to be repositioned in the center of the geometry for the selected viewport.
Reset Cursor	Clicking this button will cause the Cursor Tool to reset according to the “By” toggle.
Reset Line	Clicking this button will cause the Line Tool to reset according to the “By” toggle.
Reset Plane	Clicking this button will cause the Plane Tool to reset according to the “By” toggle.
Reset Quadric	Clicking this button will cause the currently selected Quadric Tool to reset according to the “By” toggle.
Reset By Selected Transform Only	Clicking this button will cause the transformation selected in the Transformation Control Area to reset for the viewports selected in the dialog’s Viewport(s) area.
Reset Rotate/Translate/Scale	Clicking this button will cause the rotate, translate, and scale transformations to reset for the viewports selected in the dialog’s Viewport(s) area.
Reinitialize	Clicking this button will cause the viewports selected in the dialog’s Viewport(s) area to reset and recenter on the Parts which are visible in the Viewport(s).
Reset using Function Keys	Pressing the F5 button will change the scene in the current viewport to the standard “right side” view. Similarly, pressing F6 will show a “top” view and F7 a “front” view. Pressing F8 will restore the view to the one which existed before F5, F6, or F7 were pressed. If the Control Key is pressed at the same time as F5, F6, or F7, then the current view will be stored to the selected button.
Z-Clip Edit Button	Clicking this button will open the Transformation Editor dialog for precise Z-Clip editing. For further discussion: (see Section 9.5, Z-Clip)

9.2 Frame Transform

When Frame Transform has been chosen from the Transform/Definition button Pulldown menu or from the Editor Function menu in the Transformation Editor dialog, transformations you make will affect the selected Frame(s) and the Parts assigned to them.



Figure 9-9
Two ways to choose Frame Transform

Note: Before any transformations are performed on a Frame, its definition should be modified (if necessary) as described later in this section. Transformations always occur about a Frame's origin and orientation. Failure to define the proper position and orientation of the Frame will result in unexpected transform behavior.

You choose the type of transformation you wish to perform from among the Transformation Control Icons. Note that under Frame Transform, you cannot perform the zoom operation.

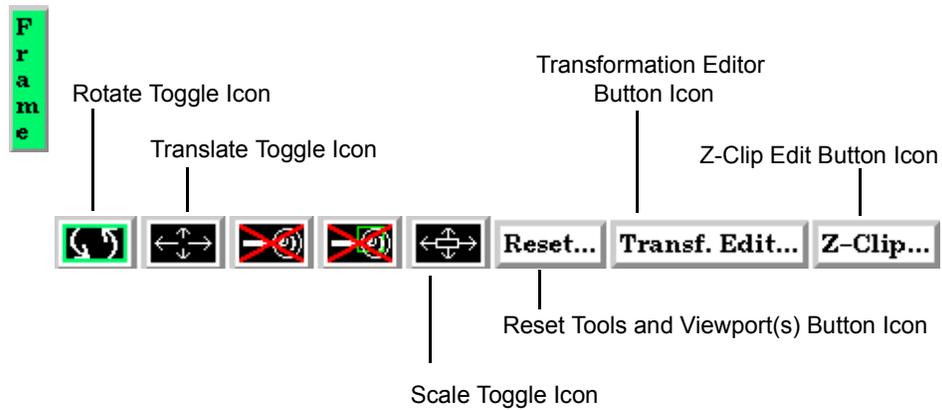


Figure 9-10
Transformation Control Area in Frame Mode under Frame Transform

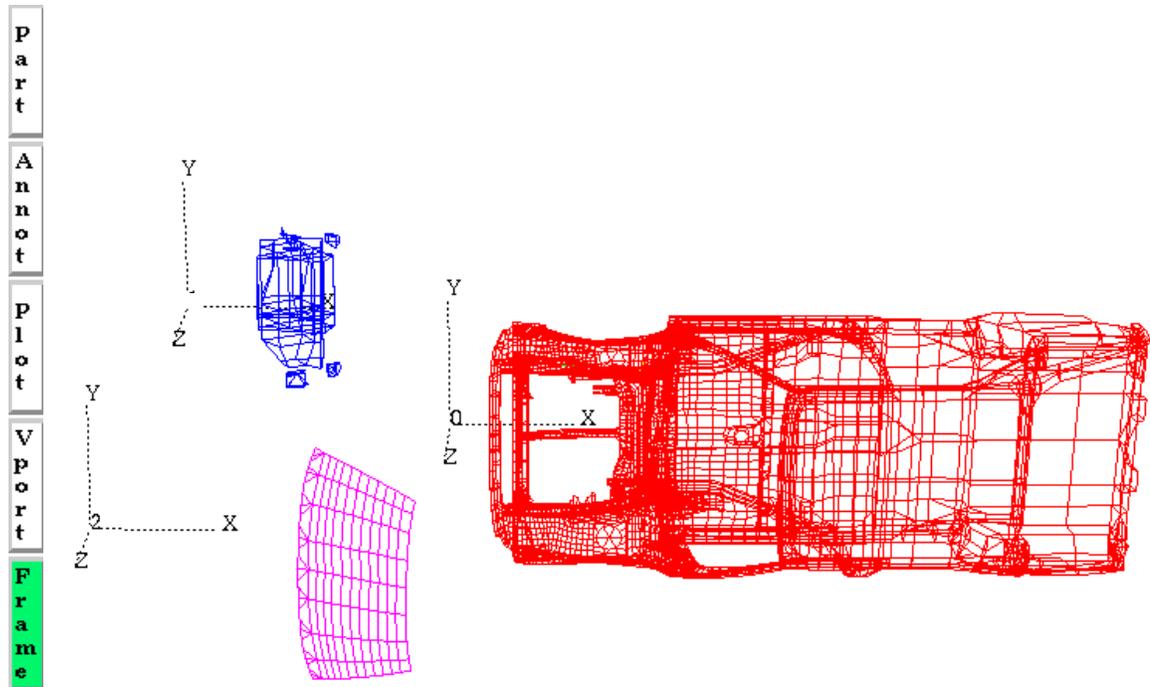


Figure 9-11
Frame axis triads for Frame 0, Frame 1, and Frame 2

Rotate Toggle

Interactive Rotation When this toggle is on, clicking the left mouse button and dragging causes the selected Frame(s) and all Parts assigned to the Frame(s) to rotate about the Origins of each Frame Axis. Holding down the Control key while dragging will rotate the selected Frame(s) and all assigned Parts about a Z axis perpendicular to the screen.

Precise Rotation When the Transformation Editor is open under Frame Transform and the Rotate toggle is selected, the dialog will be configured to permit precise Rotation.

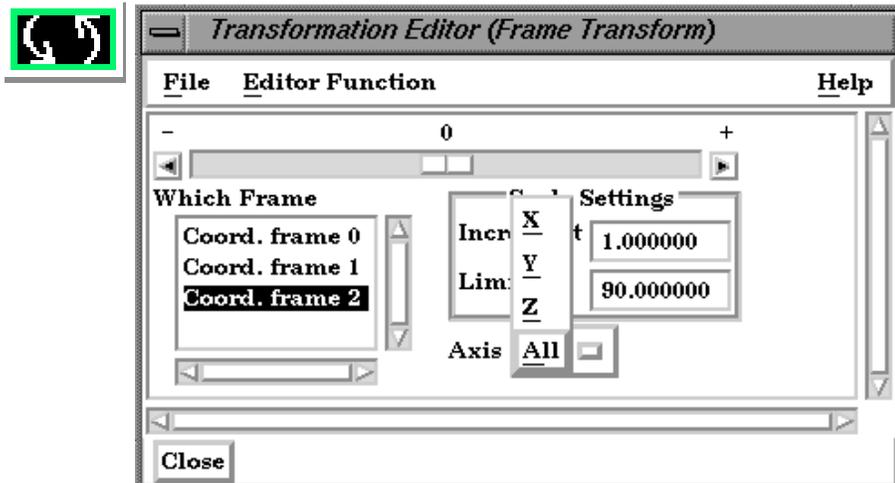


Figure 9-12
Transformation Editor for Precise Rotation under Frame Transform

You may rotate the selected Frame(s) and assigned Part(s) precisely about the X, Y, Z, or All axes, as the orientation of the axes were defined when the Frame was first created by:

entering the desired rotation in (+ or -) degrees in the Increment field and pressing Return,

clicking the stepper buttons at each end of the slider bar (each click will rotate the selected Frame(s) and assigned Part(s) by the number of degrees specified in the Increment field), or

dragging the slider in the positive or negative direction to the desired number of degrees you wish to rotate the selected Frame(s) and assigned Part(s) (the Limit Field specifies the maximum number of degrees of rotation performed when the slider is pulled to either end of the slider bar).

Translate Toggle

Interactive Translation

When this toggle is on, you can transform objects interactively in the X-Y plane (or by holding down the Control key, in Z). Clicking the left mouse button and dragging will translate the selected Frame(s) and all assigned Part(s) up, down, left or right (or forward or backward) within the selected viewport.

Precise Translation

When the Transformation Editor is open under Frame Transform and the Translate toggle is selected, the dialog will be configured to permit precise Translation.

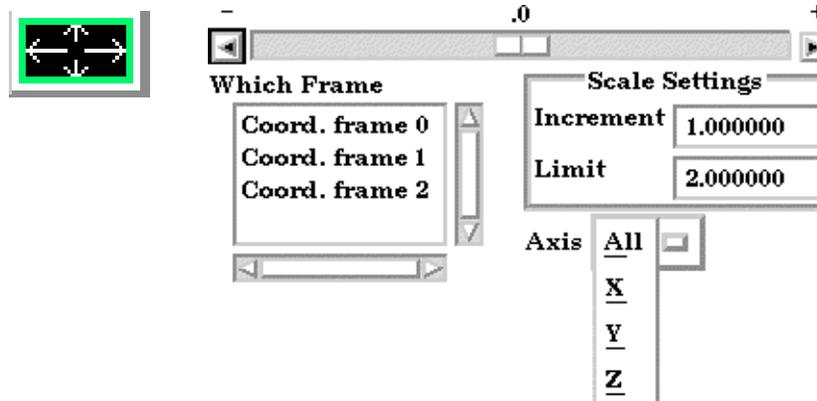


Figure 9-13

Transformation Editor for Precise Translation under Frame Transform

You may translate the selected Frame(s) and all Parts assigned to them precisely along the X, Y, Z, or All axes by:

entering the desired translation in (+ or -) model coordinate units in the Increment field and pressing Return,

clicking the stepper buttons at each end of the slider bar (each click will translate the selected Frame(s) and assigned Part(s) by the number of model coordinate units specified in the Increment field), or

dragging the slider in the positive or negative direction to the desired number of model coordinate units you wish to translate the selected Frame(s) and assigned Part(s) and then releasing the slider (the Limit Field specifies the maximum number of model coordinate units that the model is translated when the slider is pulled to either end of the slider bar).

Scale Toggle

When the Transformation Editor is open under Frame Transform and the Scale toggle is selected, the dialog will be configured to permit precise scale.

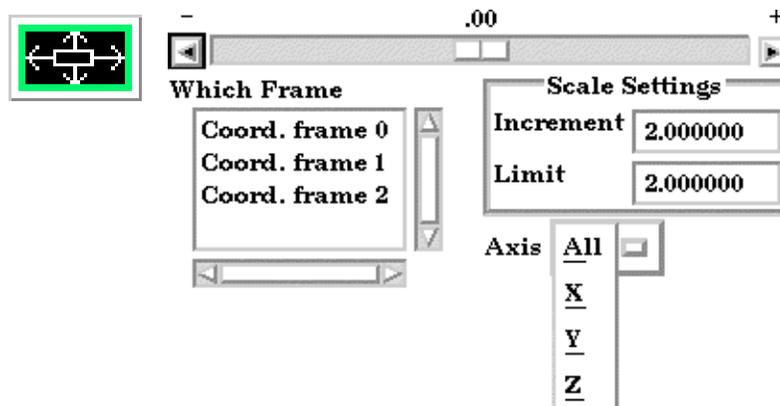


Figure 9-14
Transformation Editor for Exact Scaling under Frame Transform

You may precisely rescale the selected Frame(s) and assigned Part(s) in the X, Y, Z, or All axes by:

- entering in the Increment Field the desired rescale factor and pressing Return (A value of .5 will reduce the scale of the selected Frame(s) and assigned Part(s) in the chosen axis by half. A value of 2 will double the scale in the chosen axis. *Be aware that entering a negative number will invert the model coordinates in the chosen axis.*),
- clicking the stepper buttons at each end of the slider bar (Clicking the left stepper button will apply 1/Increment value to the scale. Clicking the right stepper button will apply the entire Increment value to the scale), or
- dragging the slider in the positive or negative direction to the desired scale factor and then releasing the slider. (Dragging the slider to the leftmost position will apply 1/Limit value to the scale. Dragging the slider to the rightmost position will apply the entire Limit value to the scale.)

Reset Tools & Viewports Button

Clicking the Reset Tools and Viewport(s) button in the Transformation Control Area will open the Reset Tools and Viewport(s) dialog

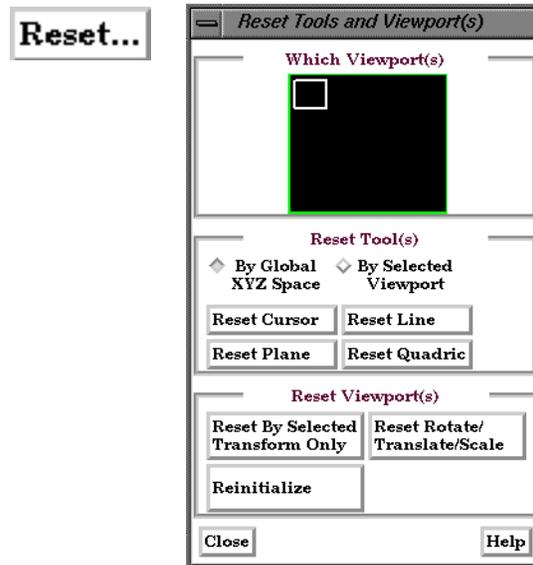


Figure 9-15
Reset Tools and Viewport(s) dialog

- | | |
|----------------------------------|--|
| Reset Cursor | Clicking this button will cause the Cursor Tool to reset to its default position |
| Reset Line | Clicking this button will cause the Line Tool to reset to its default position |
| Reset Plane | Clicking this button will cause the Plane Tool to reset to its default position |
| Reset Quadric | Clicking this button will cause the currently selected Quadric Tool to reset to its default position |
| Reset By Selected Transform Only | Clicking this button will cause the transformation selected in the Transformation Control Area to reset for the viewports selected in the dialog's Viewport(s) area. Under Frame Transform, will reset the transformation associated with the selected Frame(s). |
| Reset Rotate/Translate/Scale | Clicking this button will cause the rotate, translate, and scale transformations to reset for the viewports selected in the dialog's Viewport(s) area. Under Frame Transform, will reset the transformation associated with the selected Frame(s). |
| Reinitialize | Clicking this button will cause the viewports selected in the dialog's Viewport(s) area to reset and recenter on the Parts which are visible in the Viewport(s). |
-
- | | |
|---------------------------|---|
| <i>Z-Clip Edit Button</i> | Clicking this button will open the Transformation Editor dialog for Z-Clip editing. If the Transformation Editor is already open, it will be reconfigured for Z-Clip editing. For further discussion: |
|---------------------------|---|

(see Section 9.5, Z-Clip)

9.3 Frame Definition

When Frame Definition has been chosen from the Transform/Definition button Pulldown menu or from the Editor Function menu in the Transformation Editor dialog, then actions you make will affect only the definition (origin and orientation) of the selected Frame(s). Frame 0's definition however, can not be changed.

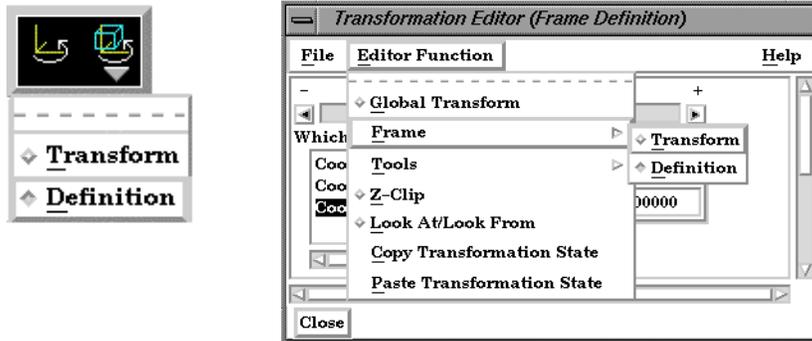


Figure 9-16
Two ways to choose Frame Definition

A Frame's definition should be adjusted before it is transformed under Frame Transform (as described in the previous pages). Transformations under Frame Transform are always about the Frame's origin and orientation. Failure to define the proper origin position and orientation of a Frame will result in unexpected transformation behavior.

You choose the type of transformation you wish to perform (rotate or translate) from the Transformation Control Icons. Note that you cannot perform zoom, scale, or reset operations under Frame Definition.



Figure 9-17
Transformation Control Area in Frame Mode under Frame Definition

Rotate Toggle

Interactive
Modification of
Orientation

When this toggle is on, clicking the left mouse button and dragging modifies the orientation of the selected Frame(s). Clicking on the end of the X axis will limit the rotation to be about the Y axis. Similarly, clicking on the end of the Y axis will limit the rotation to be about the X axis.

Precise Modification
of Orientation

When the Transformation Editor is opened under Frame Definition and the Rotate toggle is selected, the dialog will be configured to permit precise rotation (modification of the orientation) of the selected Frame(s).

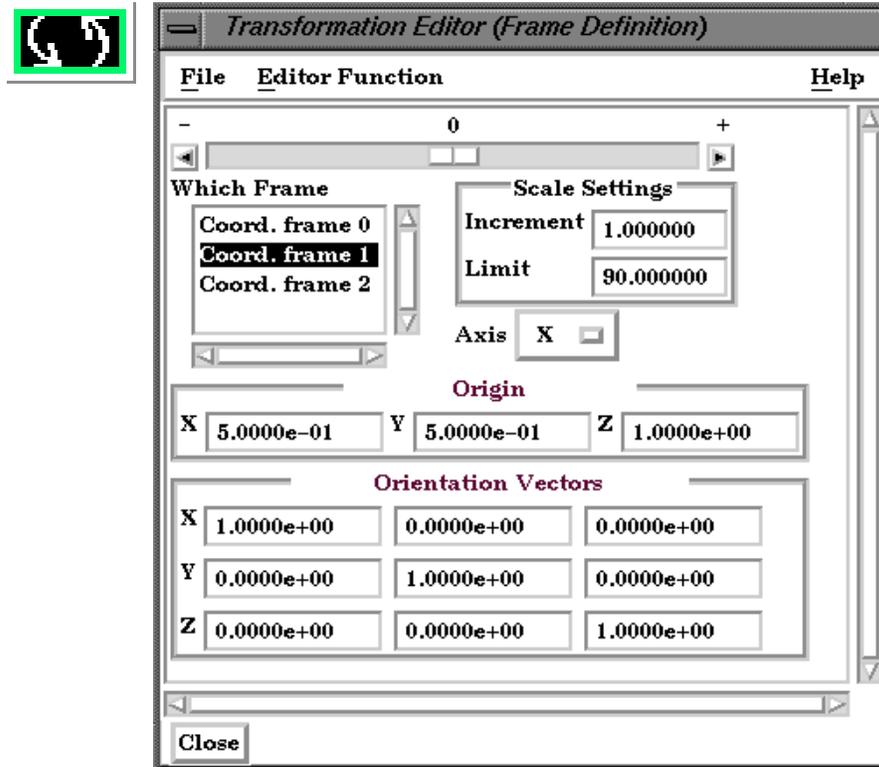


Figure 9-18
Transformation Editor for Exact Rotation for Selected Frame(s) Only

You may rotate the selected Frame(s) precisely about their X, Y, Z, or All axes by:
 entering the desired rotation in (+ or -) degrees in the Increment field and pressing Return,
 clicking the stepper buttons at each end of the slider bar (each click will rotate the selected Frame(s) by the number of degrees specified in the Increment field), or
 dragging the slider in the positive or negative direction to the desired number of degrees you wish to rotate the selected Frame(s) (the Limit Field specifies the maximum number of degrees of rotation performed when the slider is pulled to either end of the slider bar).

Origin XYZ
Orientation XYZ

You may precisely position both the origin and the axis of a selected Frame by entering in the desired coordinates in the Origin and Orientation Vector X Y Z fields and then pressing Return. These fields can be used regardless of whether the Rotate or the Translate toggle is selected.

Translate Toggle

Interactive
Translation of
Origin Position

When this toggle is on, clicking the left mouse button and dragging will translate the selected Frame(s) (other than Frame 0) up, down, left, or right within the viewport. Holding down the Control key while dragging will translate the selected Frame(s) forward or backward.

Precise Translation
of Origin Position

When the Transformation Editor is open under Frame Definition and the Translate toggle is selected, the dialog will be configured to permit precise Translation (modification of the origin position) of the selected Frame(s).

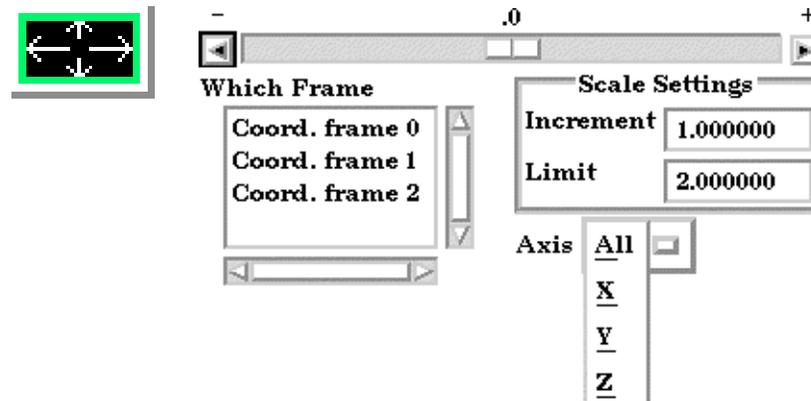


Figure 9-19
Transformation Editor for

You may translate the selected Frame(s) precisely along the X, Y, Z, or All axes by:

- entering the desired translation in (+ or -) model coordinate units in the Increment field and pressing Return,
- clicking the stepper buttons at each end of the slider bar (each click will translate the selected Frame(s) by the number of model coordinate units specified in the Increment field), or
- dragging the slider in the positive or negative direction to the desired number of model coordinate units you wish to translate the selected Frame(s) and then releasing the slider (the Limit Field specifies the maximum number of model coordinate units that the Frame is translated when the slider is pulled to either end of the slider bar).

Z-Clip Edit Button

Clicking this button will open the Transformation Editor dialog for Z-Clip editing. If the Transformation Editor is already open, it will be reconfigured for Z-Clip editing. For further discussion:

(see Section 9.5, Z-Clip)

9.4 Tool Transform

Transformation of the Cursor, Line, Plane, and Quadric (cylinder, sphere, cone, and revolution) Tools is covered in depth in Chapter 6.

(see *Tool Positions* in [Section 6.5](#), [Tools Menu Functions](#))

9.5 Z-Clip

EnSight displays the scene in a three-dimensional, rectangular workspace that has finite boundaries on all sides. Even if you rotate the model, you are always looking into the workspace from the front side. The top-to-bottom and side-to-side boundaries of the workspace are analogous to looking out a real window—the window frame limits your view. In addition, since the memory of your computer is finite, your workspace also has limits in the front-and-back direction.

The front boundary is the *Front Clipping Plane* (or the *Near Plane*) and the rear boundary is the *Back Clipping Plane* (or the *Far Plane*). Only the portion of the scene *between* these two planes is visible—the rest of the model (if any) is *clipped* and therefore invisible. By convention, the front-to-back direction of the workspace is the Z direction. Hence, the front and back clipping planes are together called the *Z-Clip Planes*. Note that the Z-direction in the workspace is always in-and-out of the screen and is completely independent of the Z-direction of the model Frame (Frame 0).

Z-Clip Positions

The position of the Z-Clip planes is specified in terms of their *distance from the Look From Point* in the distance units implied by the model-geometry data. By default, the planes automatically move as the model moves.

Initially, EnSight positions the Z-Clip Planes based on the dimensions of the model parts read to the Client, with some extra space for you to perform transformations. You can reposition the planes when doing so becomes necessary or desirable.

Each viewport has its own independently adjustable set of Z-Clip Planes.

Using Z-Clip Planes

You can use Z-Clip planes to *deliberately* clip-away portions of the model you are not interested in, or which are getting in the way of what is of interest. For example, you can clip-away both a front-portion and a back-portion of a model to reduce the number of node and element labels displayed. *Z-Clip Planes and* EnSight uses your workstation's graphics hardware to perform all graphics

Hidden Surfaces

manipulations, including the display of solid surfaces. The appearance of a solid model is created by *not* displaying *hidden surfaces*—surfaces hidden behind nearer surfaces. The algorithm used by the graphics hardware to do this task—*Z-buffering*—is a simple algorithm which compares Z-values to calculate which surfaces are closest to you and thus visible. Z-buffering is normally performed in integer arithmetic, and on most graphics systems is confined to 24 bits of resolution. Hence, the coordinates in Z must be mapped into this 24-bit space. To achieve the maximum resolution possible in the 24 bits available, the graphics hardware maps the Z-distance between the Front and Back Clipping Planes into the 24 bits available. Hence, the larger the distance between the Z-Clip Planes, the lower the Z resolution, which can affect image quality for solid images. If you see problems with your solid images, move the front and back clipping planes in as close as possible.

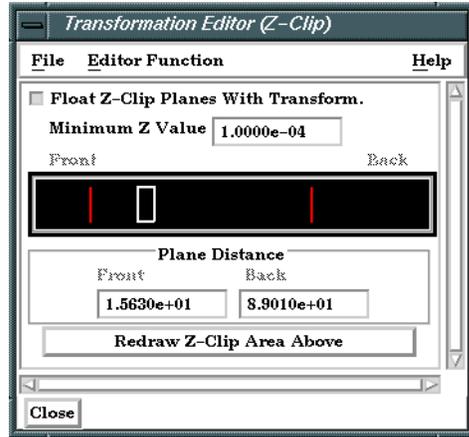


Figure 9-20
Transformation Editor for Z-Clip Plane Positions

The Transformation Editor (Z-Clip) is used to adjust the distances of the Front and Back Clipping Planes from the Look-From Point.

<i>Float Z Clip Planes With Transform</i>	When on, will automatically adjust the front and back Z-Clip planes away from the model.
Minimum Z Value	Minimum distance the Front Clipping Plane is allowed to float to from the Look From Point (model coordinates). Used only if Float Z Clip Planes with Transform toggle is on.
<i>Z-Clip Area Display</i>	Displays position of Z-Clip planes relative to model-part Z-range (shown as a rectangle) and allows interactive positioning (by clicking and dragging) of the Z-Clip planes. If lines are inside model rectangle, that part of model is clipped from the display. Values update in data fields as you move sliders. Active viewports of the Main View update automatically as you move sliders.
<i>Plane Distance</i>	
Front	Distance of the Front Clipping Plane from Look From Point in model coordinates. Precisely specify by typing in desired distance and pressing Return. Not used if the Float Z Clip Planes With Transform toggle is on.
Back	Distance of the Back Clipping Plane from the Look From Point in model coordinates. Precisely specify by typing in desired distance and pressing Return. Not used if the Float Z Clip Planes With Transform toggle is on.
<i>Redraw</i>	The Plane Position Display does not automatically update if you perform transformations in the active viewport. Click this button to update the Plane Position Display.

Troubleshooting Z-Clip Planes

Problem	Probable Causes	Solutions
Main View is empty	No parts located between Front and Back Z-Clip Planes.	Adjust Z-Clip plane locations
Model degenerates to irregular polygons or the front Z-Clip line is locked in the model extent box	You have moved the front Z-Clip plane too close to (or on) the Look From Point.	Move the front Z-Clip plane away from the Look From Point.

9.6 Look At/Look From

Using the Transformation Editor with Editor Function > Look At/Look From chosen, you can reposition the point from which you are observing the model (the Look From Point) and the point at which you are looking (the Look At Point). Both the Look-From and Look-At points are specified in the coordinates of the Model Frame (Frame 0).

Initially, the Look At Point is at the geometric center of the initial model parts read by the EnSight Client. The Look From Point is on the positive Z-axis at a distance appropriate to display the model in the Main View window.

If you increased only the X position of the Look From Point, in the Graphics Window (or selected Viewport), it would appear that the model had rotated about the Global Y axis. In fact, the model has not rotated at all, which is shown by the visible Global Axis triad in the figure below. What has happened is that you are now viewing the model from a position farther to the right than previously.

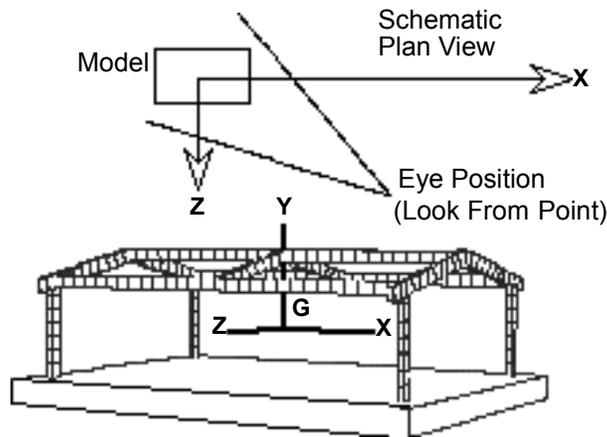


Figure 9-21
Image showing view of model from negative X axis towards positive X axis

If the Y and Z coordinates of the Look From point were made to be the same as those of the Look At point, but the X coordinate of Look From point was specified as a much smaller value than that of the Look At point, it would appear in the Graphics Window (or selected Viewport) that the model had rotated 90 degrees about the Global Y axis. As before, the model has actually not rotated at all, which is shown by the visible Global Axis triad in the figure below. What has happened is that you are now viewing the model from a position on the negative Global X axis looking in the positive X direction.

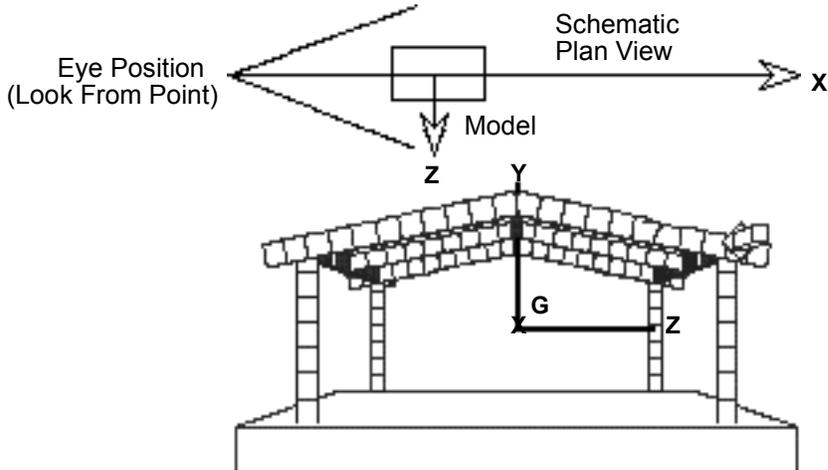


Figure 9-22

Image showing view of model from negative X axis towards positive X axis

The position of the Look-At and Look-From points can be interactively or precisely specified using the Transformation Editor dialog with Editor Function > Look At/Look From.

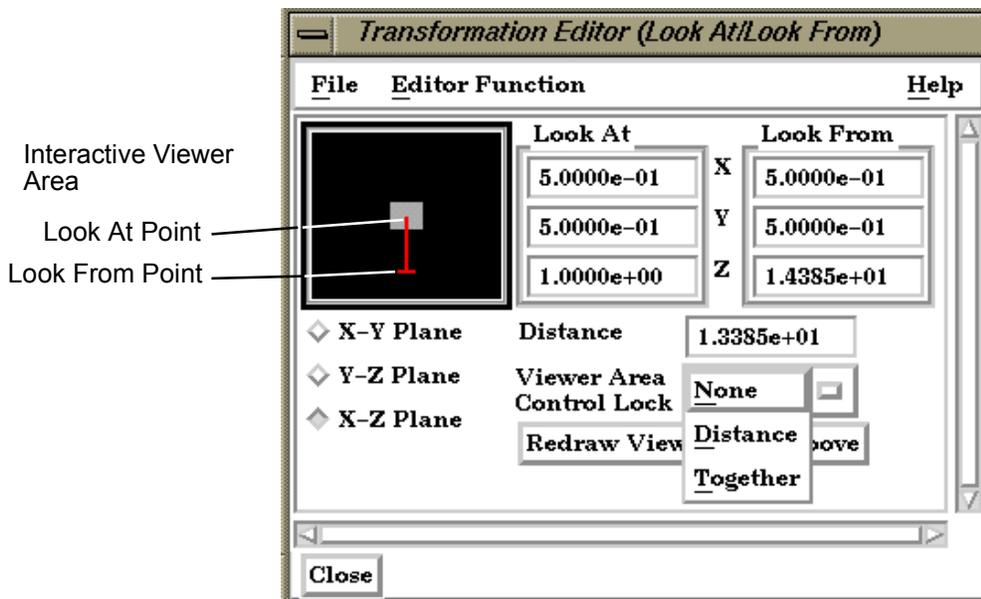


Figure 9-23
Transformation Editor for Look At/Look From

<i>Interactive</i>	The position of the Look At and Look From Points may be positioned interactively in the Interactive Viewer Area by grabbing the Look At or Look From Point and dragging it to the desired location. These interactive modifications can be made in the X-Z Plane, the X-Y Plane, or the Y-Z Plane, depending upon which of the three toggles are selected. The Graphics Window as well as the Look At and Look From coordinate fields updates as you drag either Point to a new location.
<i>Precise</i>	The position of the Look At and Look From Points may be positioned precisely by specifying the desired coordinate values in the X Y Z fields and pressing Return.
Distance	The distance in model coordinates may be precisely specified by entering the desired value in this field and pressing Return.
Viewer Area Control Lock	Opens a pop-up menu for the selection of how interactive actions taken in the Viewer Area will be limited. Choices are: <i>None</i> No locks are applied <i>Distance</i> The distance between the two Points is locked <i>Together</i> The distance and direction vector between the two Points is locked
Redraw Viewer Area Above	This button redraws the Viewer Area. This button should be clicked after a transformation is performed in the selected viewport while this dialog is active.

9.7 Copy/Paste Transformation State

This transformation option can be used to apply the transformation state of one viewport to other viewports. Useful if you want multiple viewports to have the model oriented the same, and you did not link the viewports for transformations before applying any transformations.

The use of this option consists of:

1. Selecting the viewport (one only) containing the transformation state desired.
2. Selecting *Copy Transformation State* in the Transformation Editor dialog.
3. Selecting the one or more viewports to receive this transformation state.
4. Selecting *Paste Transformation State* in the Transformation Editor dialog.