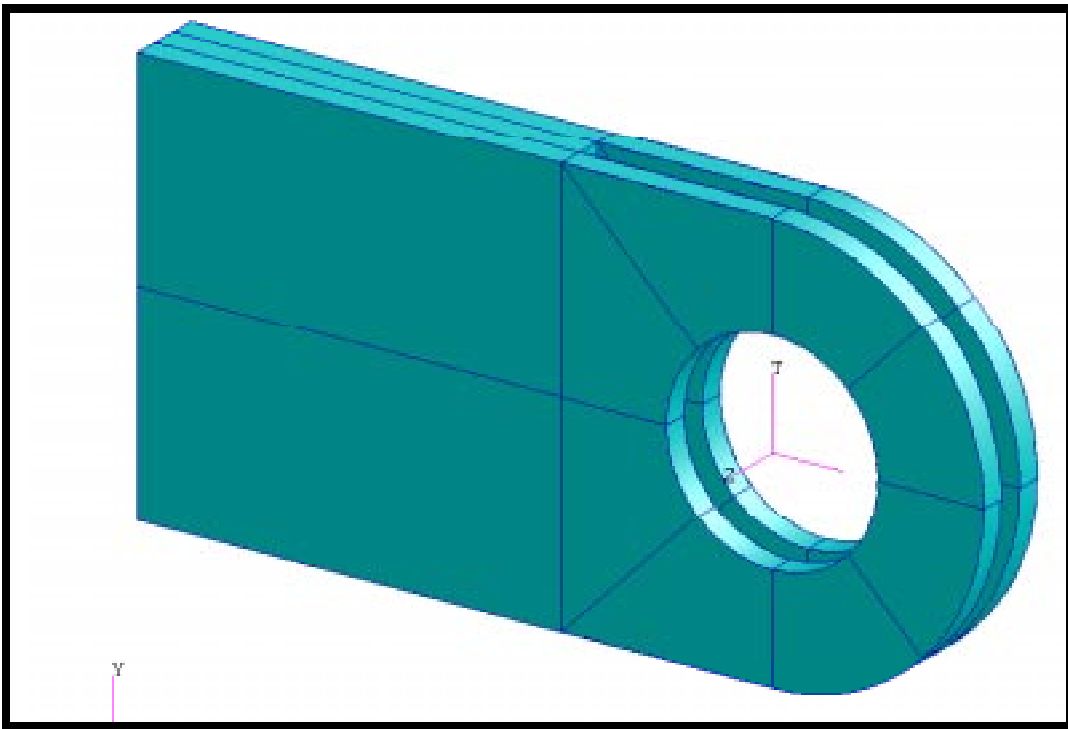

WORKSHOP 1

Geometry Model of a 3-D Clevis



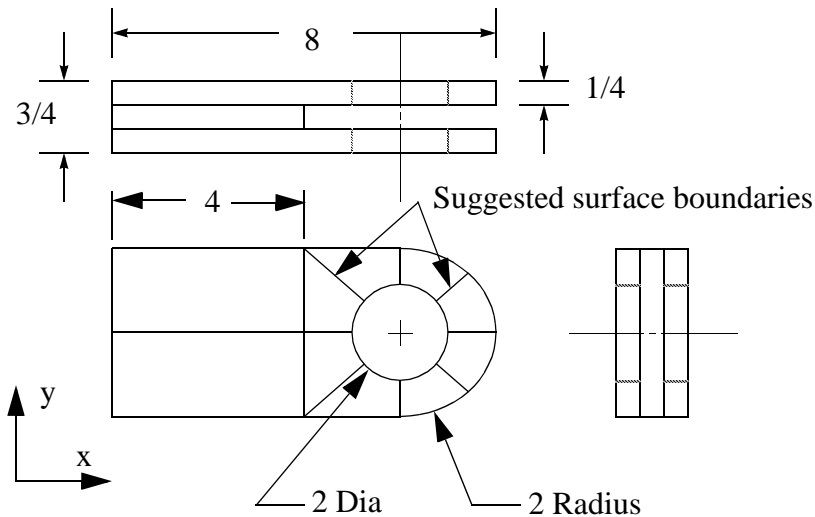
Objectives:

- Create a new database for the model.
- Create the geometry of the clevis.
- Alter the graphics display of the model.



Model Description:

In this exercise you will create an analytic solid model of a clevis by defining MSC/PATRAN points, curves, surfaces, solids, and a user defined coordinate system. Throughout this exercise you will become more familiar with the use of the MSC/PATRAN select menu. You will also be introduced to another viewing method and shown how to change your model's render style. Shown below is a drawing of the model you will build and suggested steps for its construction.



Exercise Procedure:

1. Open up a new database named **clevis.db**.

Type **p3** in your xterm. The *Main Window* and *Command Window* will appear.

File/New ...

New Database Name:

The viewport (PATRAN's graphics window) will appear along with a *New Model Preference* form. The *New Model Preference* sets all the code specific forms and options inside MSC/PATRAN.

In the *New Model Preference* form set the *Analysis Code* to **MSC/ADVANCED_FEA**.

Tolerance: **◆ Default**

Analysis Code: **MSC/ADVANCED_FEA**

Analysis Type: **Structural**

OK

2. Change the geometric preference to PATRAN 2 convention.

The **PATRAN 2 Convention** convention represents a special class of parameterized geometry known as parametric cubic. This option allows the user to create geometry that can be exported and imported into PATRAN 3 through the PATRAN 2 neutral files and IGES files.

Preferences/Geometry...

Geometry Representation: **■ PATRAN 2 Convention**

Apply

Cancel

3. Create a point on the inner radius of the hole in the clevis.

First, make the geometry labels visible by using the following toolbar icon:



◆ Geometry

Action: **Create**

Object: **Point**

Method: **XYZ**

Point Coordinates List: **[1, 0, 0]**

Apply

4. Use the point you just created to sweep 4 curves that will define the upper half of the radius of the hole in the clevis.

Action: **Create**

<i>Object:</i>	Curve
<i>Method:</i>	Revolve
<i>Total Angle:</i>	180
<i>Curves per Point:</i>	4
<i>Point List:</i>	select the point on the screen

The function autoexecutes, and four curves can now be seen in the viewport.

- Use Curvilinear Transformation to create the outer radius of the lug by radially translating the curves that define a quarter of the hole.

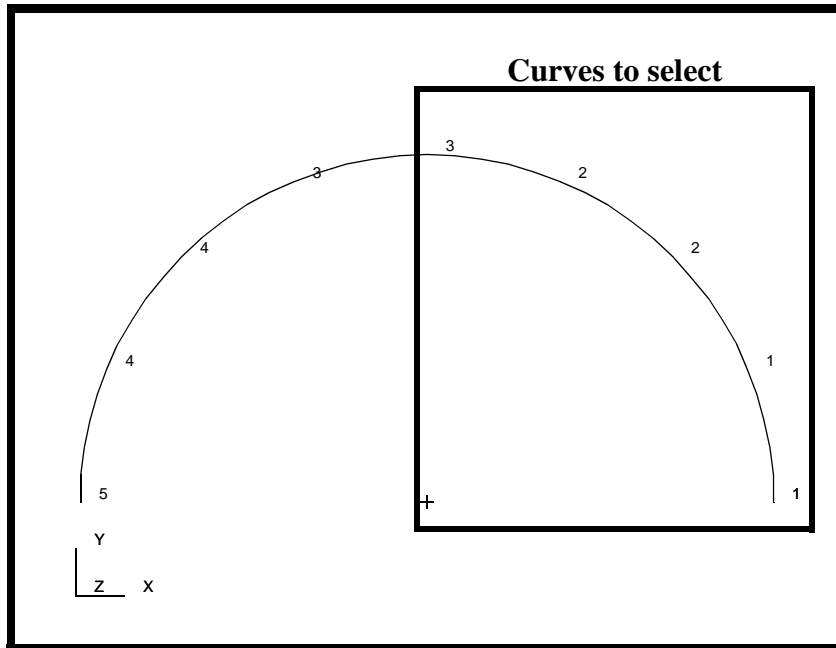
To accomplish this you will first need to create a cylindrical coordinate frame located at the center of the hole.

<i>Action:</i>	Create
<i>Object:</i>	Coord
<i>Method:</i>	3 Point
<i>Type:</i>	Cylindrical
Apply	

Next, radially translate the curves.

<i>Action:</i>	Transform
<i>Object:</i>	Curve
<i>Method:</i>	Translate
<i>Type of Transformation:</i>	◆ Curvilinear in Refer. CF
<i>Refer. Coordinate Frame:</i>	select newly created coord frame
<i>Translation Vector:</i>	< 1, 0, 0 >

Figure 1.1 - Curves to Radially Translate



Curve List:

select the two curves on the right

Two new curves appear in the viewport.

6. Begin creating surfaces for the geometry model.

You have now created all the curves that you will need to complete your clevis model. Next, you will create the necessary surfaces for the model. You will start by creating a 4x2 surface that defines part of the upper half of the clevis body.

Action:

Create

Object:

Surface

Method:

XYZ

Vector Coordinates List:

< -4, 2, 0 >

Origin Coordinates List:

[-2, 0, 0]

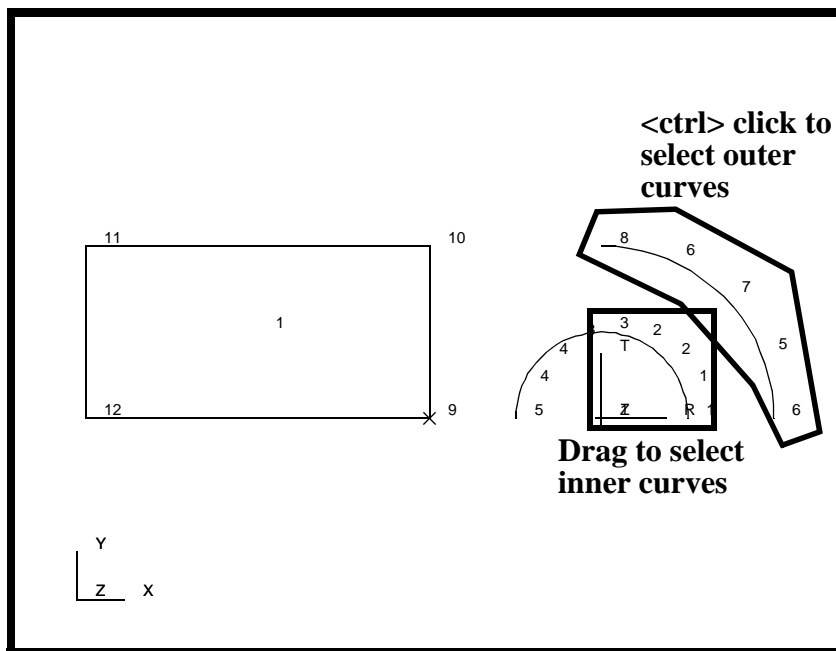
Apply

7. Finish creating the surfaces surrounding the hole of the model.

The next series of surfaces will be created using the Curve method. First, create a surface by connecting two curves.

<i>Action:</i>	Create
<i>Object:</i>	Surface
<i>Method:</i>	Curve
<i>Option:</i>	2 Curve

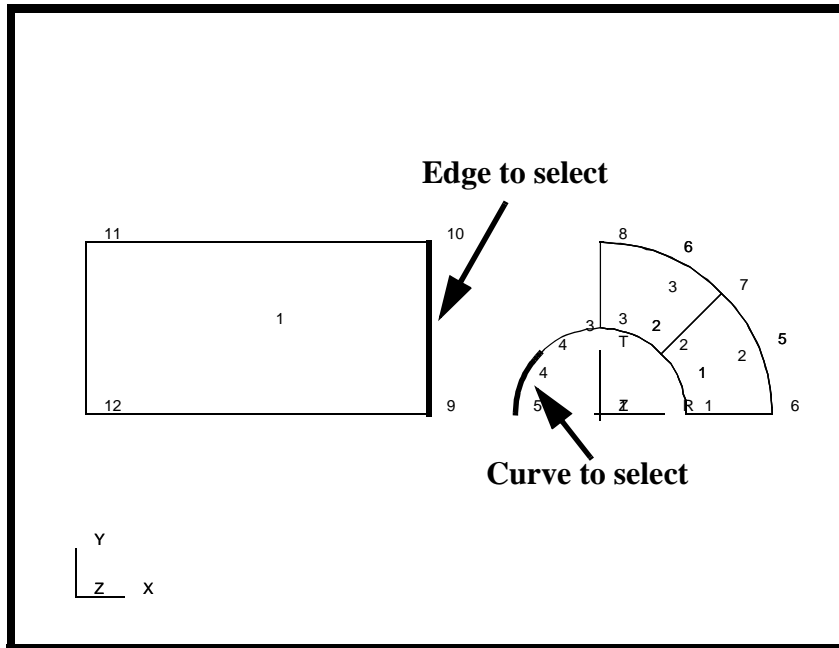
Figure 1.2 - Curves Selected to Create Lug Surface Geometry



<i>Starting Curve List:</i>	drag to select the two inner right curves
<i>Ending Curve List:</i>	<ctrl> click to select the two outer right curves

Next, create a surface using a curve and a surface edge.

Figure 1.3 - Curve and Edge for Next Surface



Starting Curve List:

select the lower left inner curve (Curve 4)

Click in the *Ending Curve List* databox and select the following entity select icon:



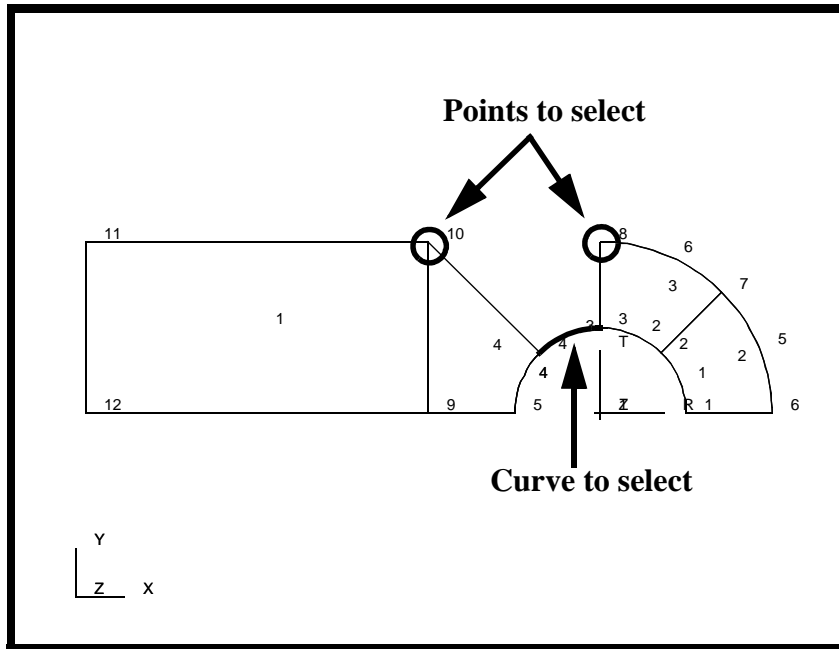
Edge

Ending Curve List:

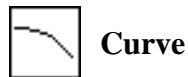
select the right edge of the rectangular surface

Finally, create a surface using a curve and two defined points.

Figure 1.4 - Curve and Points for Final Surface



When you click in the *Starting Curve* databox, you will have to select the following entity select icon:



Starting Curve List:

select the remaining inner curve (Curve 3)

Click in the *Ending Curve List* databox and select the following entity select icon:



Ending Curve List:

select the two points where the remaining curve should be located (Pts 8 and 10)

8. Create the solids of the geometry model.

You will now use the Surfaces you have just created as patterns to define solids (3-dimensional entities).

<i>Action:</i>	Create
<i>Object:</i>	Solid
<i>Method:</i>	Normal
<i>Thickness:</i>	0.25
<i>Surface List:</i>	select all surfaces

Five solids have now been created. In order to get a better view of the model, use the following toolbar icon:

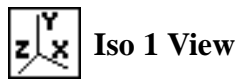
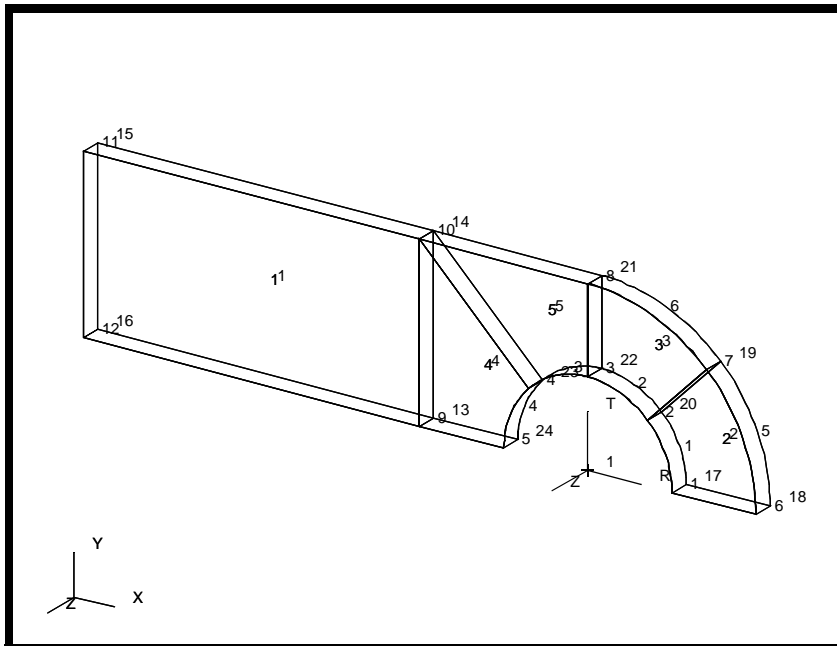


Figure 1.5 - Isometric View of Half-Lug Geometry



9. Create the lower half of the model by mirroring the solid.

<i>Action:</i>	Transform
<i>Object:</i>	Solid
<i>Method:</i>	Mirror

Click in the *Define Mirror Plane Normal* databox and pick the following entity select icon:



Frame Direction 2

Define Mirror Plane Normal:

select second direction of
original coord frame

Solid List:

select all solids

10. Create the remaining solids using the Translate method.

Action:

Transform

Object:

Solid

Method:

Translate

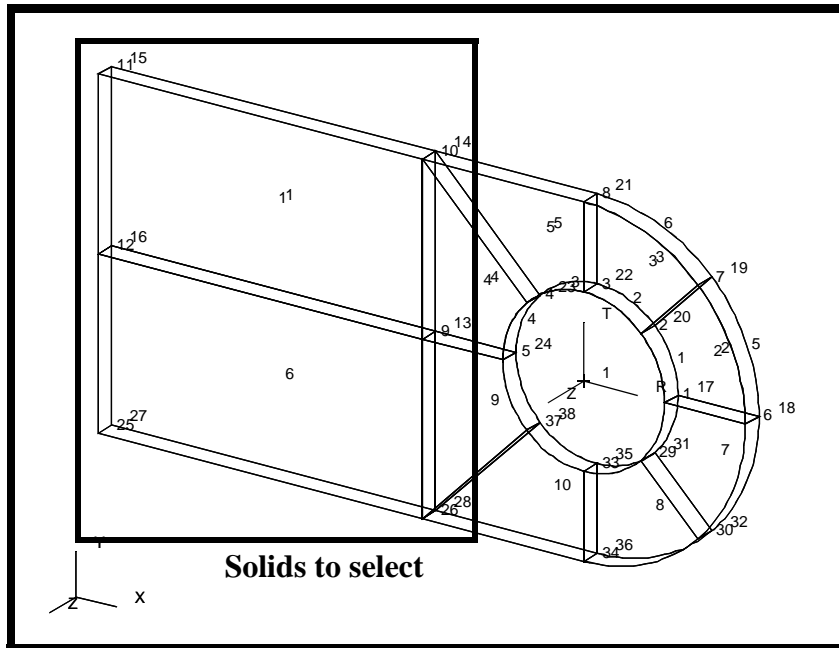
Translation Vector:

< 0, 0, -0.25 >

Repeat Count:

2

Figure 1.6 - Solids to Select for Lug Base



Solid List:

select only the two left solids (Solids 1 and 6)

The left portion of the clevis should now appear.

The final geometry model construction step is to translate copies of the solids which surround the hole.

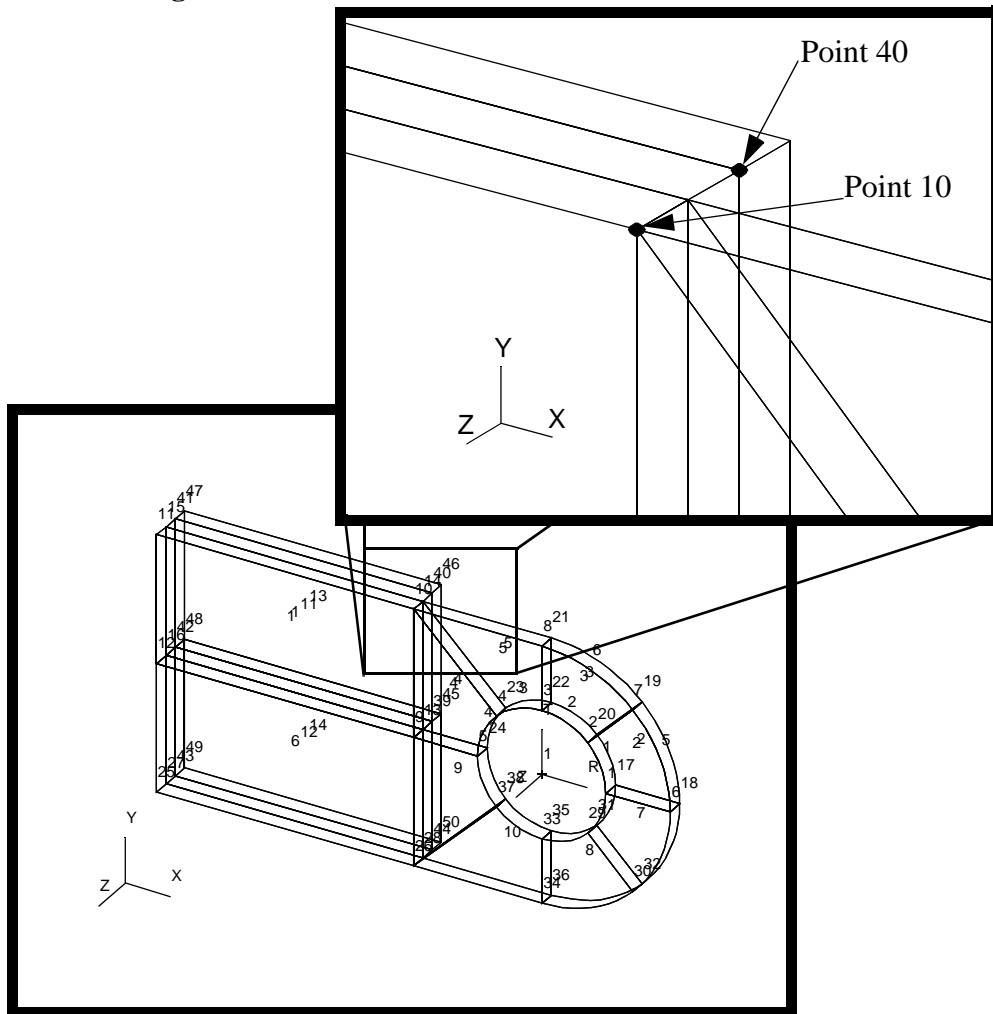
Click in the *Translation Vector* databox and pick the following entity select icon:



Tip and Base Points

To define the translation vector, pick **Point 10** then **Point 40** as shown below. Use the **View Corners** toolbar icon to zoom in. After selecting the points use **Fit View** toolbar icon to zoom out.

Figure 1.7 - Points to Select for Solid Translation Vector



View Corners

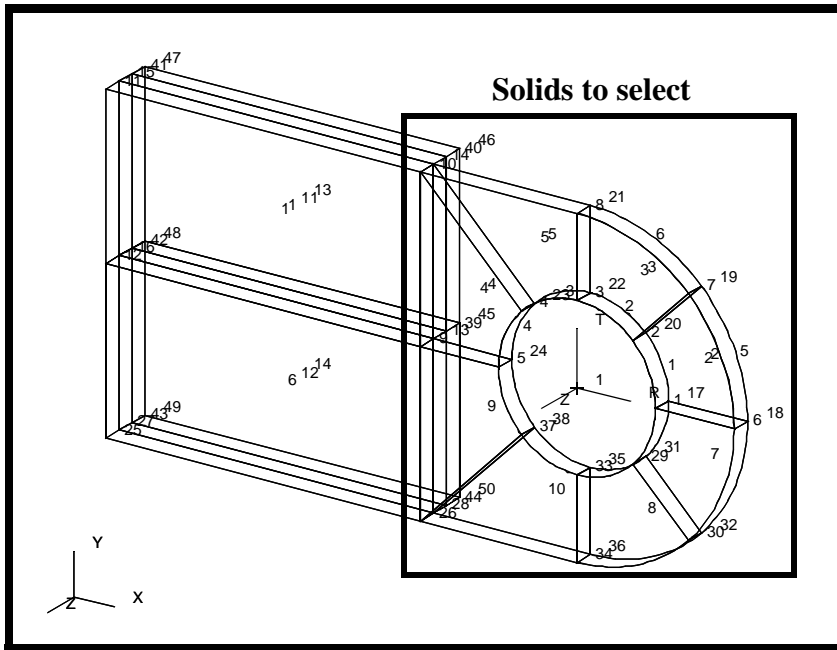


Fit View

Repeat Count:

1

Figure 1.8 - Solids to Translate to Complete Lug Geometry



Solid List:

select all solids which surround the hole

11. Change the display to see the model without labels and without the wireframe view.

First, turn off the entity labels using the following toolbar icon:

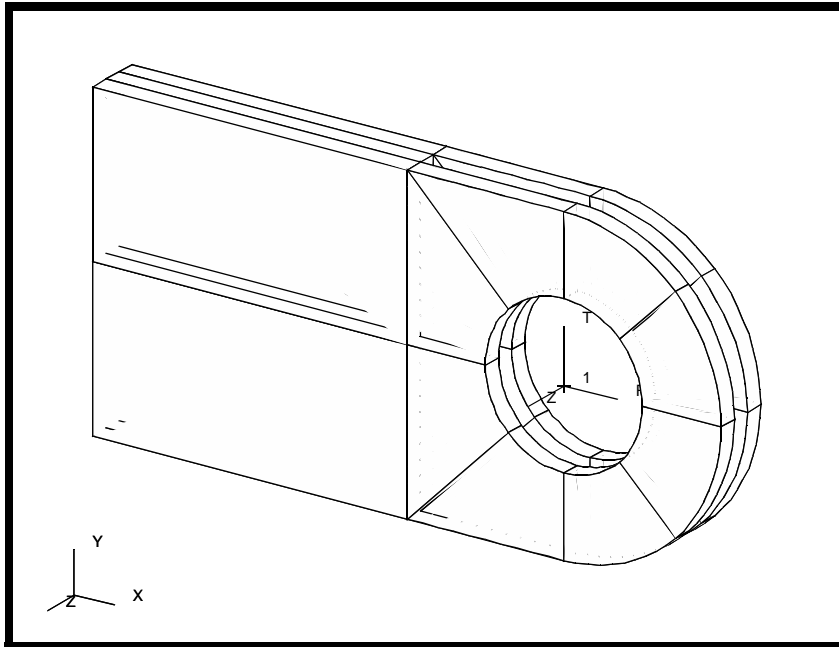


Hide Labels

Next, display the model in hidden line rendering style by selecting the following toolbar icon:



Hidden Line

Figure 1.9 - Hidden Line view of Lug Geometry

When done viewing, change the rendering style back to wireframe.



Wireframe

Close the database.

File/Close

This concludes this exercise.

