

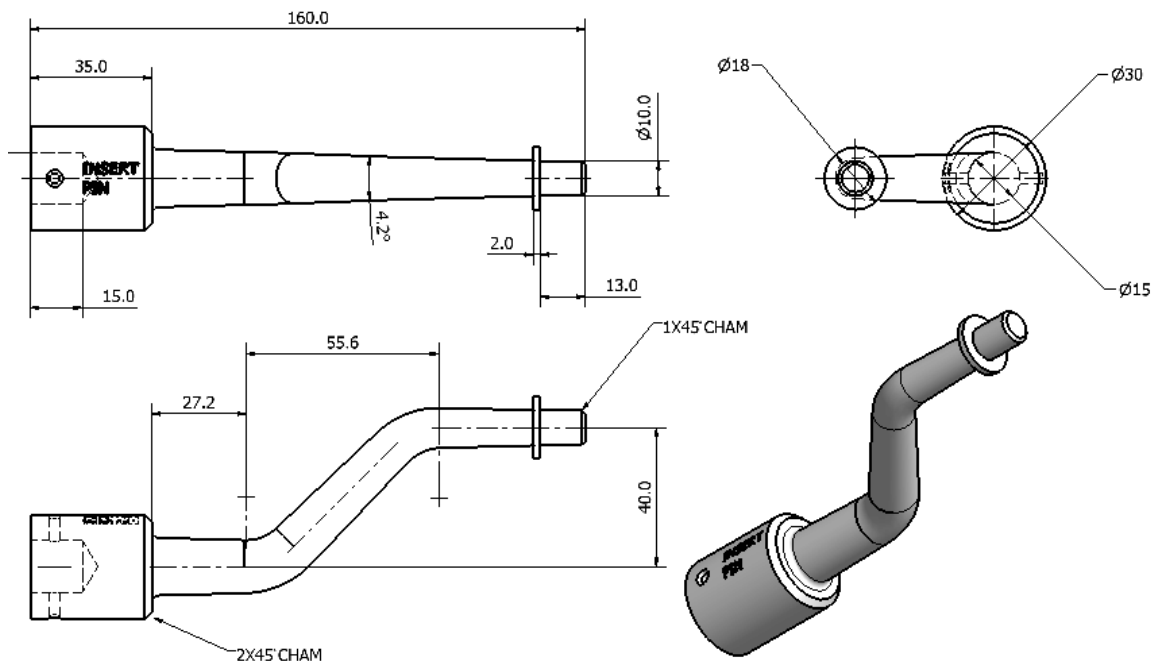
SKETCHING IN 3D

OBJECTIVES

At the completion of this Module you should be able to:

- Create a **3D Sketch**.
- Apply the **Sweep** command to a 3D sketch path.
- **Project Geometry** from one position to another plane.
- Create another working plane using the **Work Plane** command.
- Apply the **Save and Save Copy As**.
- Insert **Text** and subsequently **Emboss** onto the model.

The objective for this Module is to model an Oscillating Arm (shown below).



Install the **New** command and once again ensure the project working file is current.



Shortcut key: Ctrl+N

The *New File* dialogue box is displayed.

Pick the Metric tab.

Once again the intention in this model is to create a 3D model, pick onto Standard(mm).ipt



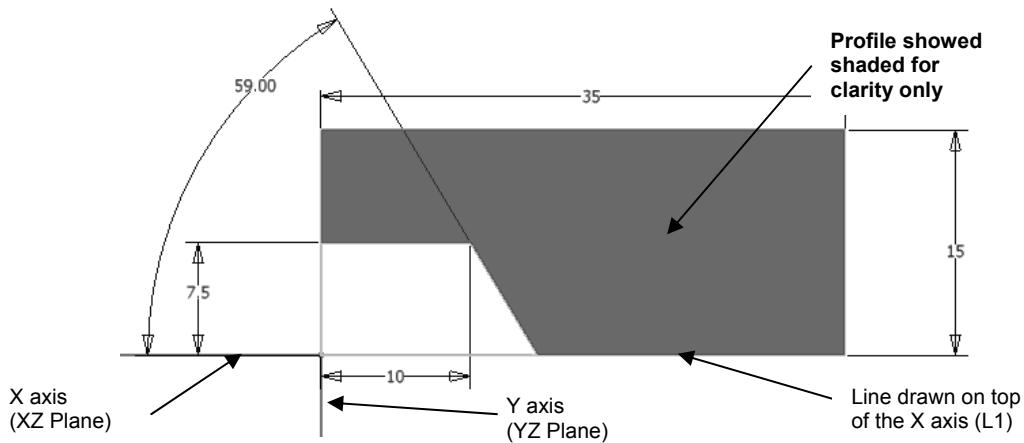
Standard (mm).ipt icon.

Pick the OK button.

The **Sketch** environment becomes active, displaying the Riobbon menu Sketch Tab, Menu Browser, etc.

Once again set the planes (YZ & XZ) on the sketch plane using the **Project Geometry** command as before.

The first objective is to sketch a cross section profile of the boss, positioned as shown on the X axis of the XY plane. Ensure all entities are drawn square and parallel to each other.



Constrain the sketch using the **General Dimension** command.

Pick mouse RH button and select 'Done' (or Esc) to complete dimensioning constraint.

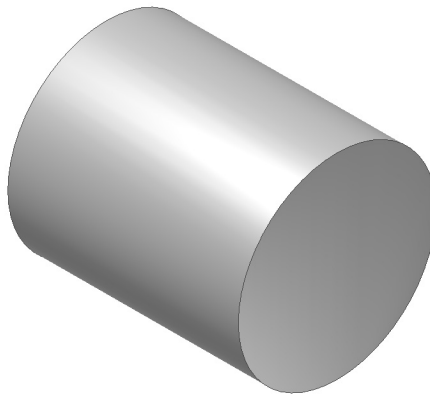
Pick mouse RH button and select 'Finish Sketch'.

Install the **Revolve** command.

Pick onto the profile just drawn and revolve around the Line L1 (X Axis) a full 360°.

Pick the mouse RH button (ensure the cursor is in the graphic window) and select 'Home View'.

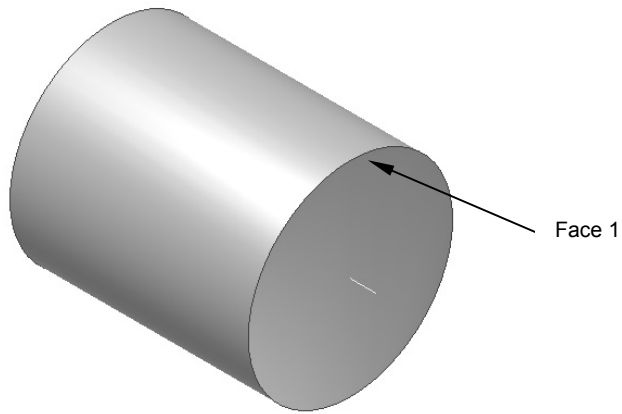
The finish boss should look like this (the hole is on the other end).



To assist with later construction, install the  **Work Axis** command.

System prompts: Define work axis by highlighting & selecting geometry

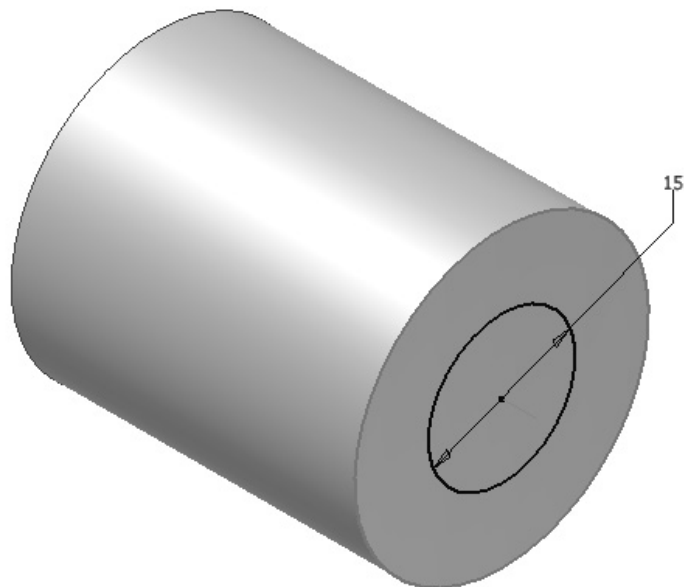
Pick onto the outside diameter. The X Axis is now shown in place.



Install the **Create 2D Sketch** (or **S**) command and pick onto 'Face 1'.

Install the **Centre Point Circle** (or **C**) command and draw a circle with its centre located on the centre of the boss. Location of that centre is made possible by the X axis already positioned.

Pick the mouse RH button and select 'Done' (or *Esc*) to complete **C** command.



Constrain the circle to '15mm' diameter using the **General Dimension** command.

Pick the mouse RH button and select 'Done' (or *Esc*).

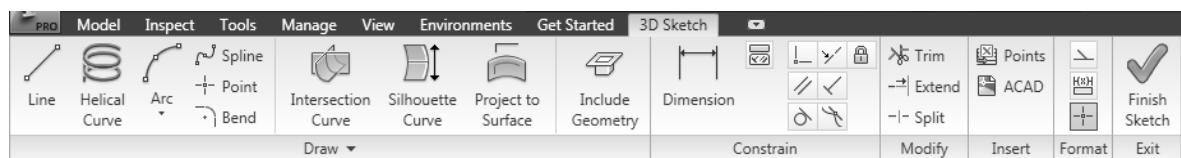
Pick the mouse RH button and select 'Finish Sketch'.

The next step is to draw the path for the tapered oscillating arm, using the **3D Sketch** command.

Install the **3D Sketch** command.



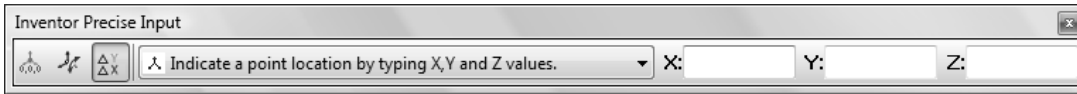
The **3D Sketch** Tab is displayed on the Ribbon menu.



Install the **Line** command.



The *Inventor Precise Input* Toolbar is automatically loaded.



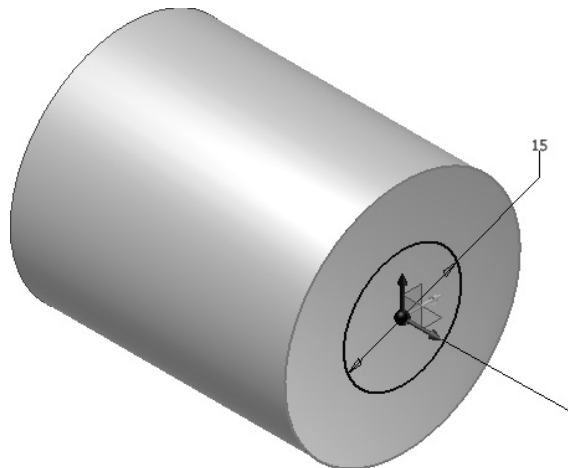
Ensure Precise Delta button  is pre-selected.



The X,Y, & Z relative datum icon is displayed but not in the position required.

Pick onto the circle centre (just constructed).

The 3D (path) line is now attached to the centre (X,Y, & Z relative datum repositioned), as well as being connected to the cursor crosshairs.

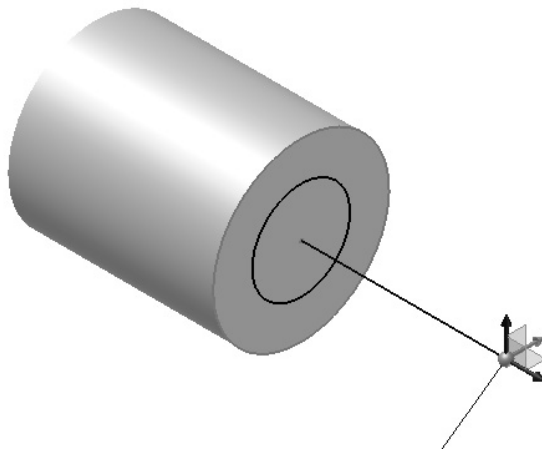


The *Inventor Precise Input* Toolbar now expects an input to the X, Y & Z coordinate box (the flashing cursor is already positioned in the X coordinate box).

- Type : '35' in the X direction (use the *Tab* key to move to each section Y & Z)
- Type : '0' in the Y direction
- Type : '0' in the Z direction

Move the cursor onto the graphic area and pick.

The first line of the path is drawn and the X,Y, & Z relative datum icon is moved to the end of the line. **Zoom All** to see the results.

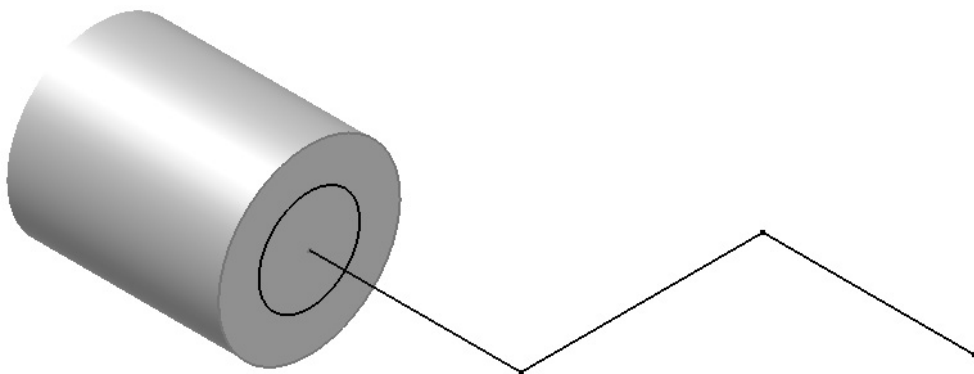


Continue to draw the path, typing in the *Inventor Precise Input* Toolbar, X: 40, Y: 0, Z: 40.

Move the cursor onto the graphic area and pick to view the path being constructed.

Finally, type in the *Inventor Precise Input* Toolbar, X: 35, Y: 0, Z: 0.

Pick mouse RH button and select 'Done' (or *Esc*) to complete the line (path). The *Inventor Precise Input* Toolbar now disappears.

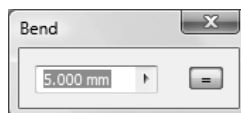


Two 20mm radii are to be added to the dog legs.

Install the **Bend** command.

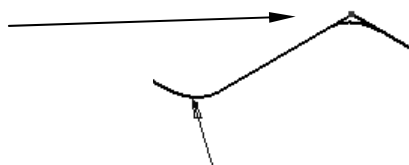


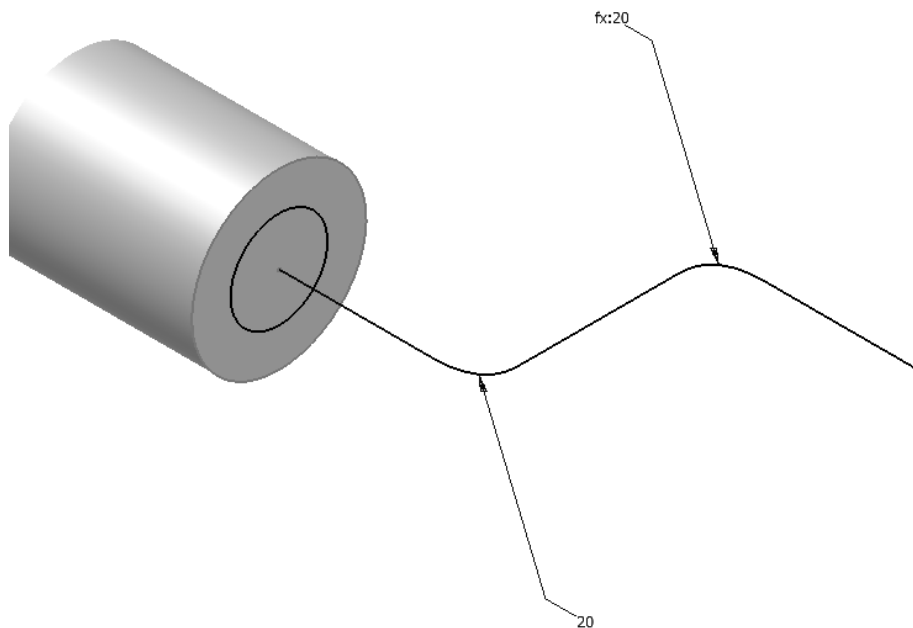
The *3D Sketch Bend* edit box is displayed.




Type: 20mm (*bend*)

Pick the two intersection locations (red dot) in turn to create the two bends.





Pick the mouse RH button and select 'Done' (or *Esc*).

Continue to constrain the 3D path by using the  **General dimension** command.

Pick the mouse RH button and select 'Done' (or *Esc*) to complete dimensioning constrain.

Pick the mouse RH button and select 'Finish 3D Sketch'.

The **Parts** environment returns.

Install the **Sweep** command and the *Sweep* dialogue box is displayed, with the Profile button pre selected.

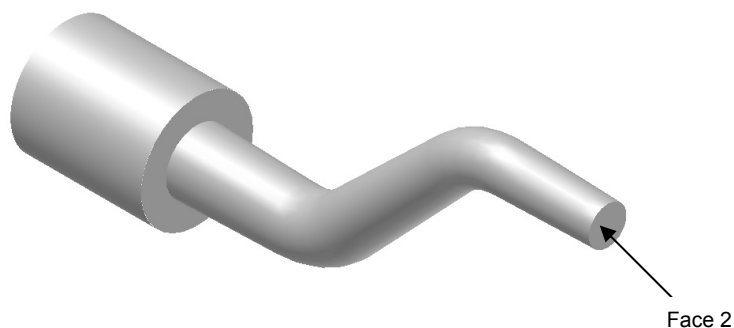
Pick onto the boss face, circle profile (turns blue).

Go to the Type sector and type in '-1.5' taper.

Pick the Path button.

System prompts: Select continuous Path segments.

Pick onto the path, followed by the OK button. The oscillating arm should look like this.



It now requires the roller follower to be added to the arm.

Install the **Create 2D Sketch** (or **S**) command and pick onto 'Face 2'.

Install the **Centre Point Circle** (or **C**) command and draw two circles (18 & 10mm diameters) with their centre located on the centre of the boss.

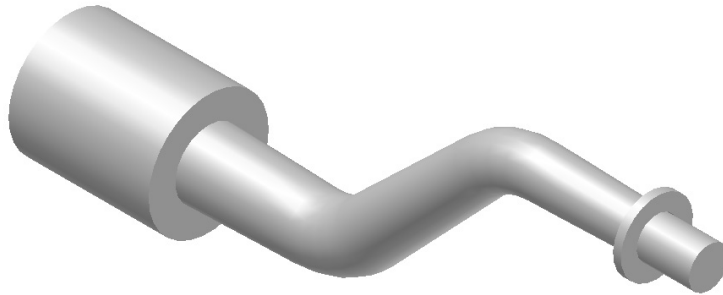
Constrain the diameters by using the **General Dimension** command.

Pick the mouse RH button and select 'Done' (or *Esc*) to complete dimensioning constrain.

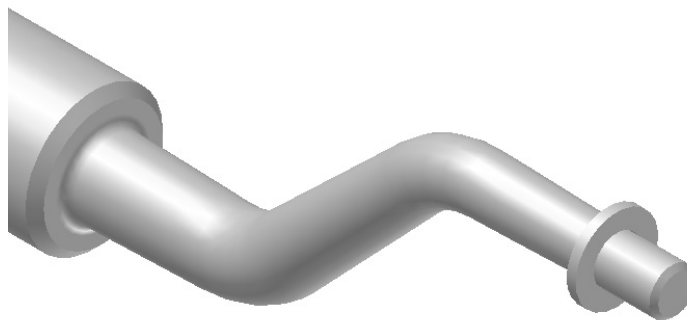
Pick the mouse RH button and select 'Finish Sketch'.

Install the **Extrude** (or **E**) command and extrude the inner circle '15 mm' deep and then repeat with the outer '2 mm' deep (selection of the outer will have to be achieved by the **Share sketch** command).

The model should be at this stage of construction.



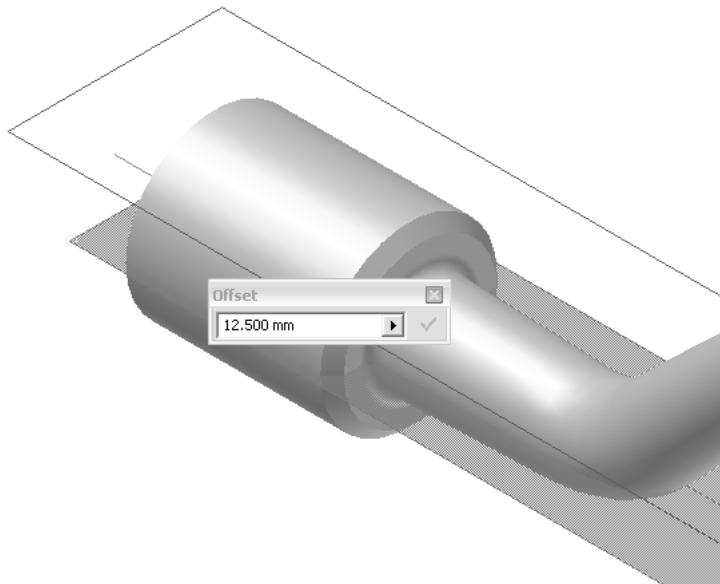
Apply two chamfers (2mm and 1mm, respectively) to the boss and the end of the arm and a fillet 2mm to where they join.



It now leaves just the embossed text and the locking pin hole to be added.

Use the Model Browser to ensure the 'XY Plane' and 'Work Axis' are displayed.

Install the **Work Plane** command and pick and hold on to the XY plane and drag upward (Z direction). Release the pick button and in the *Offset* edit box, which has just appeared, type '16mm', followed by checking the green tick to confirm.



This positions the new Work Plane 1mm above the boss diameter. This Work Plane can now be used for both the locking pin and the embossed text.

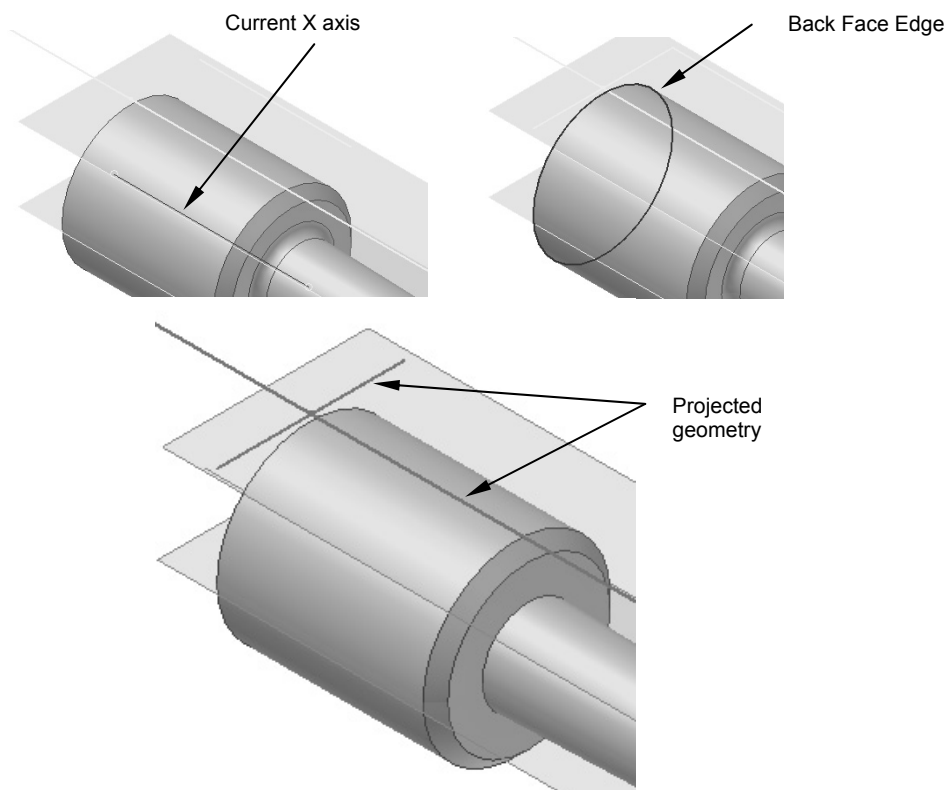
Time Out !

Inventor is not happy with the working plane touching the surface, which is to be embossed. Hence, the reason for placing the working plane 1mm above.


Returning to the plot.

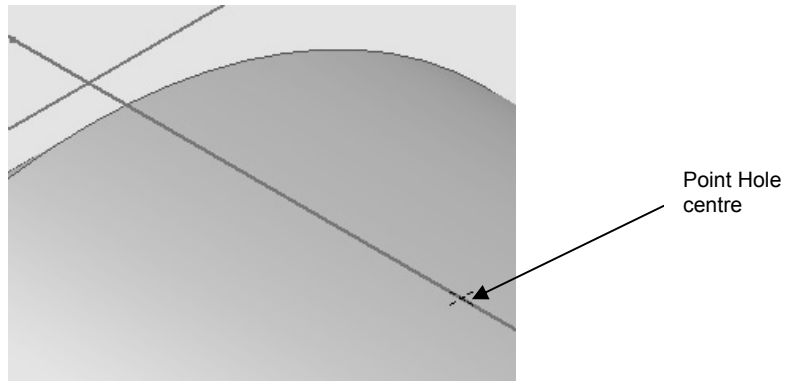
Install the **Create 2D Sketch** command and apply a new sketch plane to the 'Work Plane 1'.

Install the **Project Geometry** command and elevate the X axis onto the new 'Work Plane 1' by picking on the current X axis.



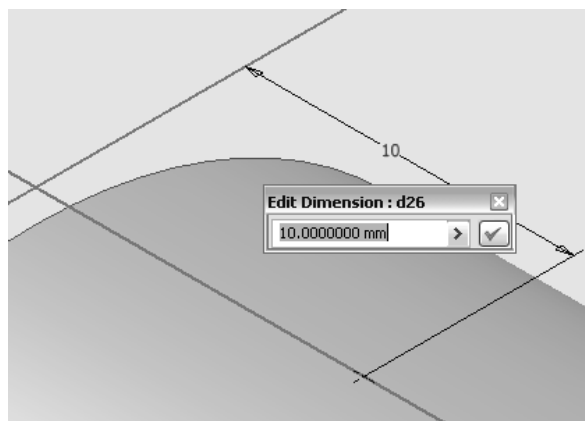
The elevated X axis is shown on the new plane as yellow. Repeat the same procedure to lift the back face edge, again it will be shown yellow.

Install the **Point, Centre Point** command and locate on top of the X Axis (ensure the  is displayed) by picking (position not important).



Pick mouse RH button and select 'Done' (or *Esc*).

Constrain the position of the centre of the hole by applying a **General Dimension** from the back face.

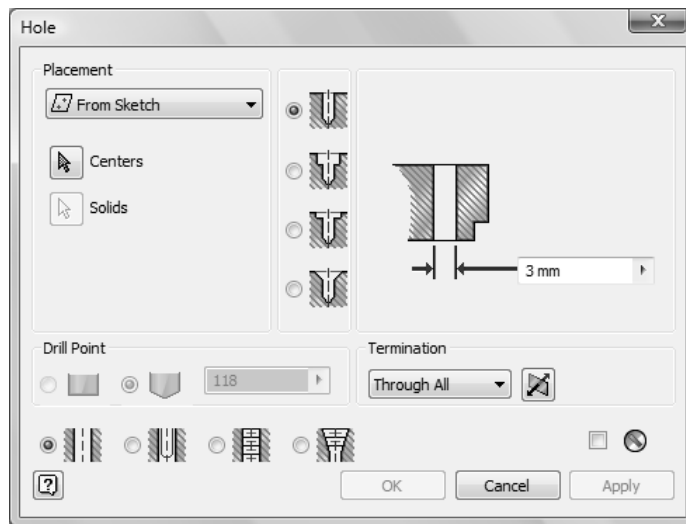



Type in, a value of '7mm' followed by checking the green tick to confirm.

Pick mouse RH button and select 'Done' (or *Esc*).

Pick mouse RH button and select 'Finish Sketch'.

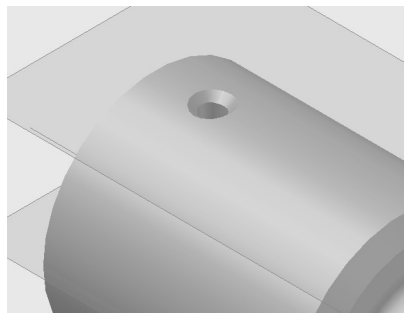
Install the **Hole** command and ensure the *Hole* dialogue box is set as below.



Pick onto the  Centers button and then select the Point Hole Center on the object.

Pick onto Apply button followed by the OK button to complete the hole.

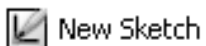
Install the **Chamfer** command and apply a 1mm chamfer to the top and bottom of the hole.



It now leaves the embossed text to be added to the boss.

As the text is to be placed on the same 'Work Plane 1' as the last sketch you would think the **Edit Sketch** command could be used. This is not so. The text requires a new 'Sketch 5' of its own.

Pick onto the 'Work Plane 1' in the Model Browser, followed by the mouse RH button and select



The new 2D 'Sketch Plane 5' is again displayed on 'Work plane 1'.

Install the **Project Geometry** command and elevate the X axis and the back face edge of the boss (again it will be shown green) onto the new 'Sketch Plane 5' by picking onto each item. Select 'Done' when finished.

As the text is to be positioned central on top of the boss the **View Face** zoom position would be preferable.

Install the **View Face** command.

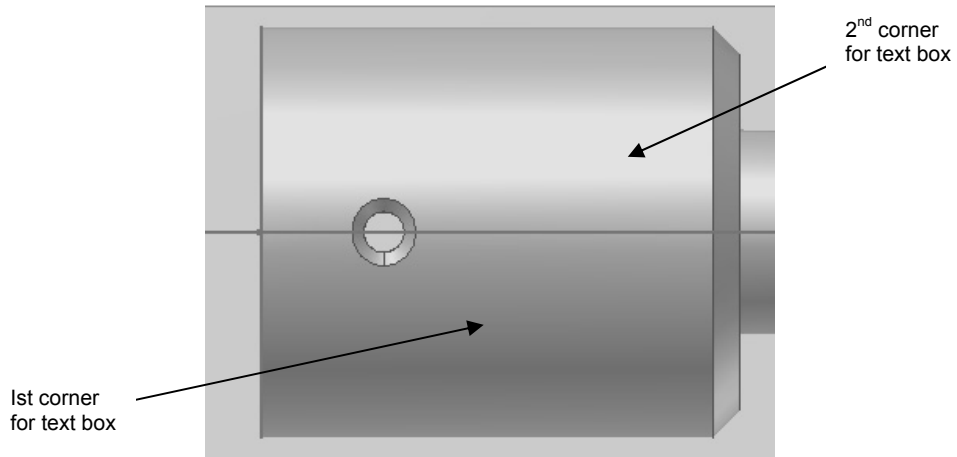
 **View** ⇒ **Navigate** ⇒ **View Face** OR Navigation *TB*



System prompts: Select entity to Look At

Pick onto the X axis which has just been projected.

The view should display the following.



Install the **Text** command.

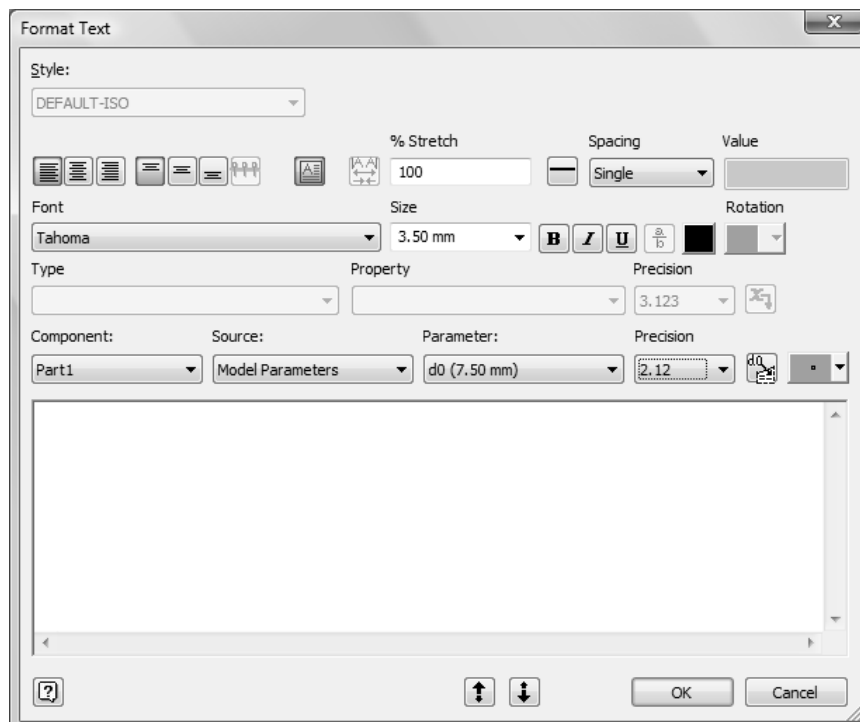


Shortcut Key: T

System prompts: Pick on a location or two corners.

Pick at approximate 1st corner position, hold the button down and drag out to 2nd corner and release to confirm the text box size.

The *Format Text* dialogue text box is displayed. Ensure the settings are as shown.

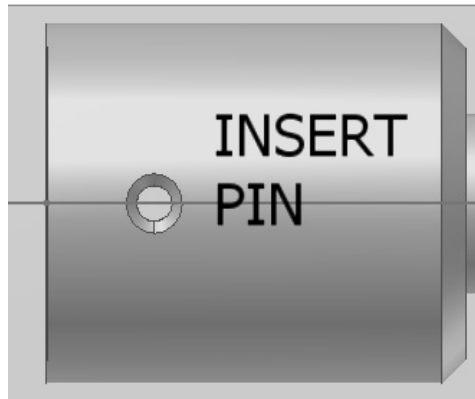


Type (Upper case): INSERT PIN.

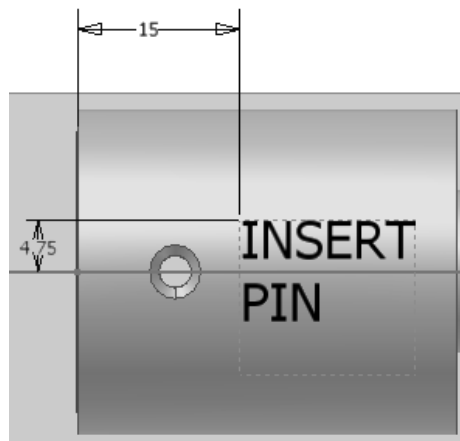
Pick on the OK button to confirm.

The text is now displayed on the plane.

Pick mouse RH button and select 'Done' (or Esc).



Install the **General Dimension** command to constrain the text central about the boss centre line.



System prompts: Select profile.

Pick mouse RH button and select 'Done' (or Esc).

Pick mouse RH button and select 'Finish Sketch'.

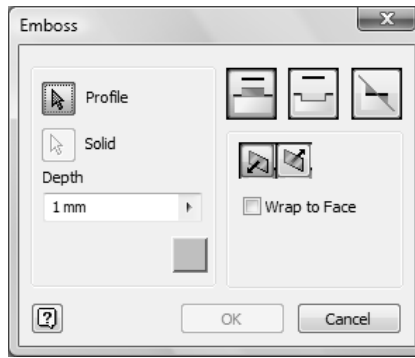
Revert to the 'Home View'.

The **Part** environment is loaded. If the text is not visible return to the browser and pick onto the 'Sketch 5' once again and select 'Visibility'. The text is now displayed.

Install the **Emboss** command.



The *Emboss* dialogue box is displayed.




The Profile button is pre-selected. Pick onto the text (turns red) to confirm. A green arrow is displayed in the middle of the text pointing upwards.

Set the depth to '2mm' (1mm depth into the boss).

Pick onto the  Engrave on Face button (the green direction button turns to red).

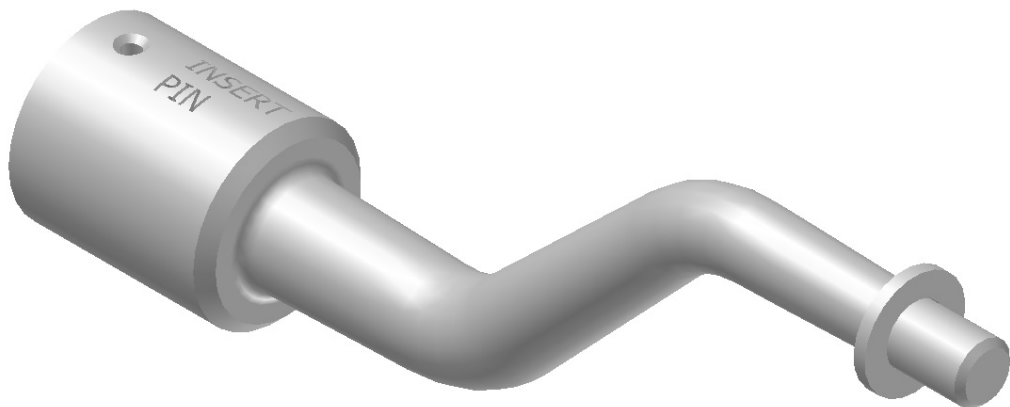
As the engrave text will be on a cylindrical surface, pick on the 'Wrap to Face' option. The Face button is displayed pre-selected. Pick on to the outside perimeter of the boss.

Finally, pick onto the direction arrow  to reverse the red arrow, so its direction is going down into the boss.

Pick onto the OK button to view the boss engraved.



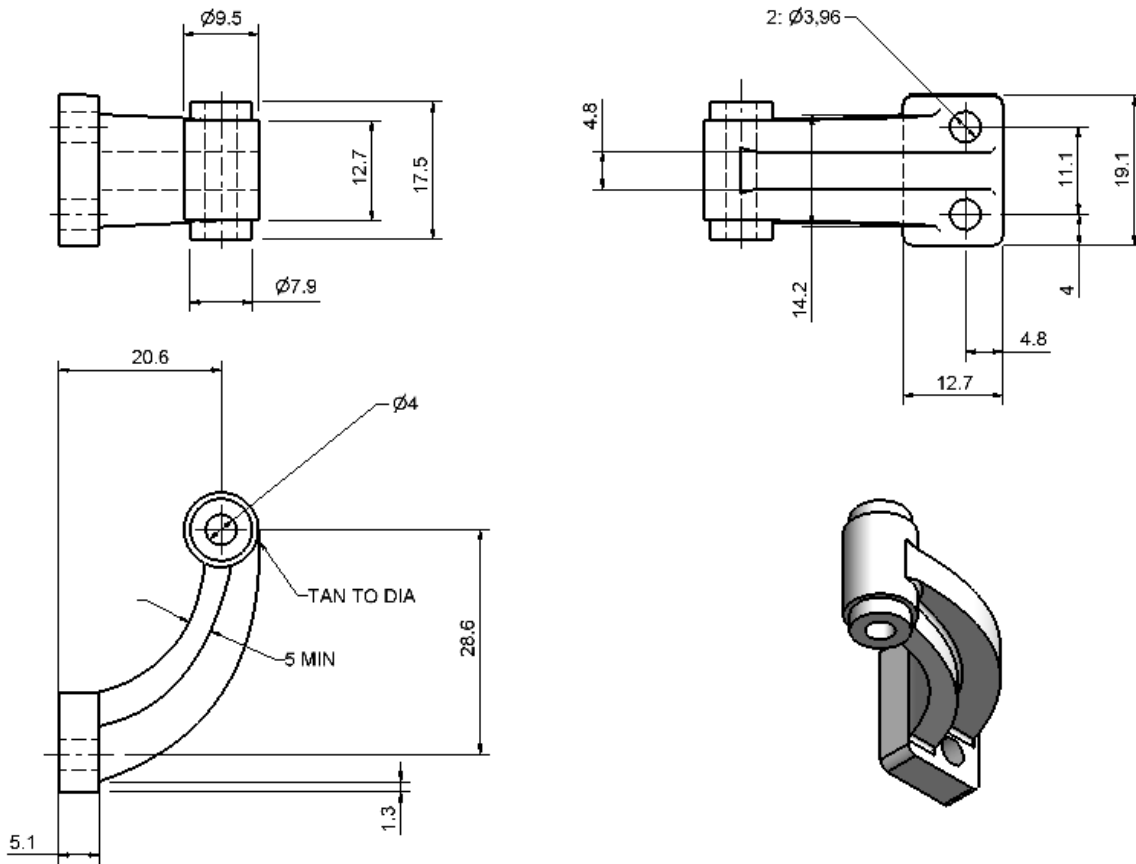
The finished product should be as shown below.



Save As the 3D model as **xx1mod9** (where xx are your initials).

TASKS

Using the newly acquired skills, model the Valve Guide shown below.



When completed, render the model using the **Material** command , which is positioned on the Inventor Quick Access Toolbar at the top of the graphic screen.

Try a number of different rendered images until you achieve the one to you like.

The list of materials may be limited, but any bitmap texture can be captured and used as a material. *The Autodesk Inventor Tutor 2* will cover this challenge.

Save the rendered model as **xx1m9 task** (where xx are your initials) and ensure its placed in the preset project.