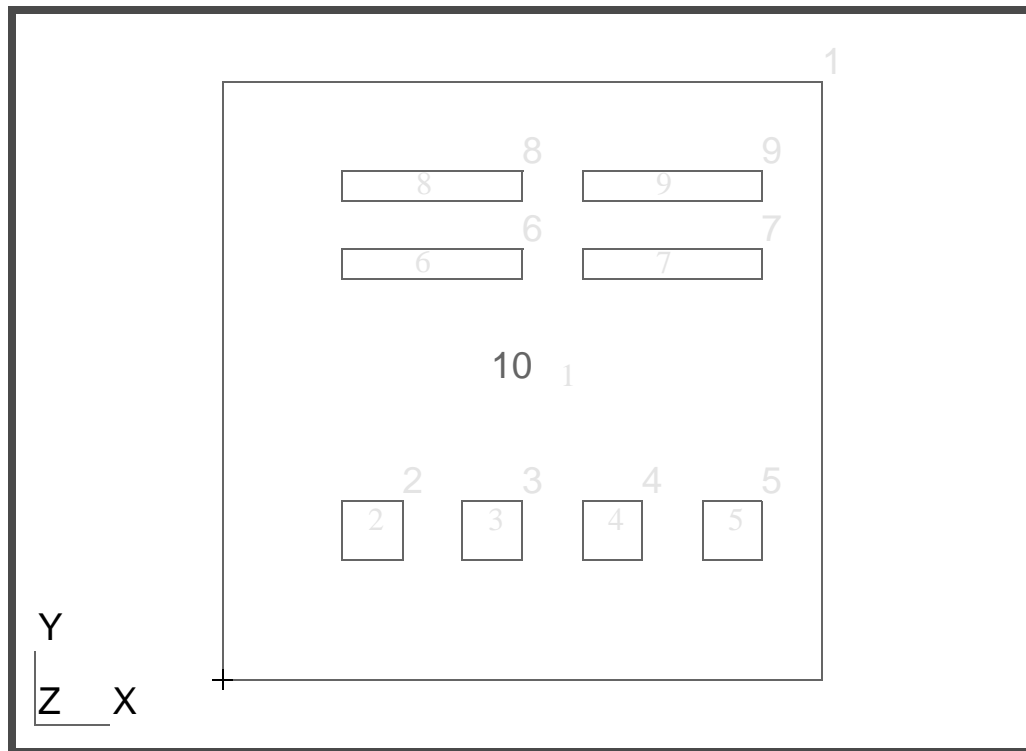


## WORKSHOP 1

# *Construct Hybrid Microcircuit Geometry*



### **Objective:**

- In this exercise you will construct a trimmed surface which will be the underlying geometry of a 3D Hybrid Microcircuit model.
- Create a trimmed surface with interior cutouts for components.
- Create regular surfaces representing component footprints.



## Model Description:

In this exercise you will create the required geometry for a 3D hybrid microcircuit model. You will first construct simple surfaces which will define the microcircuit perimeter and the locations of eight surface mounted devices. From the edges of these simple surfaces you will create chained curves which define the inner and outer edges (loops) of the microcircuit surface. From these chained curves you will create a trimmed surface, the guiding geometry of the microcircuit model.

In later exercises you will define the finite element mesh, material properties, thermal loads, and boundary conditions for the microcircuit.

## Exercise Overview:

- Create a new database named **microcircuit.db**. Set the *Tolerance* to **Based on Model**, the *Approximate Maximum Model Dimension* to **0.02**, and the *Analysis Code* to **MSC/THERMAL**.
- Create a simple surface that will form the outside edge for the microcircuit model. The dimensions are provided.
- Turn labels on using Tool Bar *Show Labels* icon.
- Create eight regular surfaces that will define the locations of the surface mounted devices. The dimensions are provided.
- Create chained curves on the edges of each surface by using **Create/Curve/Chain**.
- Unclutter the display by selectively hiding labels.
- Complete the geometry of the hybrid microcircuit by using **Create/Surface/Trimmed** with the *Option Planar*.
- **Quit** MSC.Patran.

## Hybrid Microcircuit Dimensions

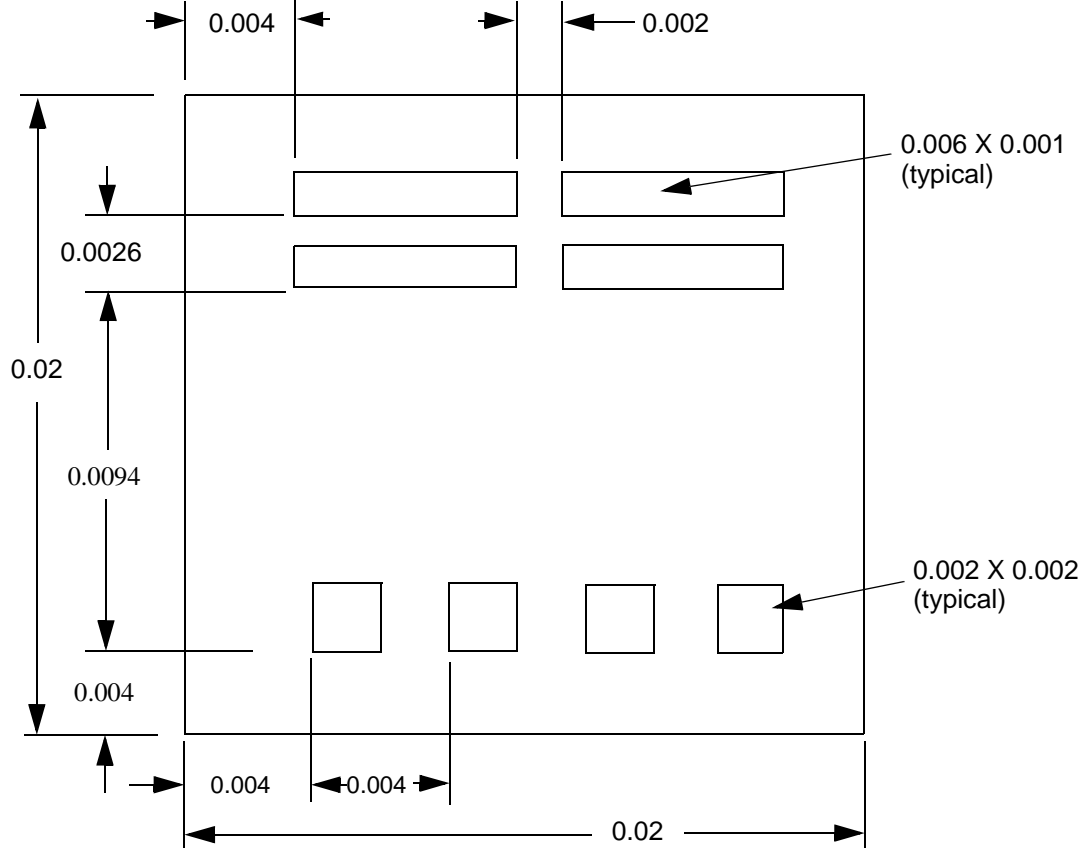


Figure 1 -Board Design

(All lengths shown in meters)

## Exercise Procedure:

### Create a new database

1. Create a new database named **microcircuit.db**. Set the *Tolerance* to **Based on Model**, the *Approximate Maximum Model Dimension* to **0.02**, and the *Analysis Code* to **MSC/THERMAL**.

Within your window environment change directories to a convenient working directory. Run MSC.Patran by typing **p3** in your xterm window.

Next, select **File** from the *Menu Bar* and select **New...** from the drop-down menu.

Assign the name **microcircuit.db** to the new database by clicking in the *New Database Name* box and entering **microcircuit** (.db will automatically be appended).

Select **OK** to create the new database.

MSC.Patran will open a Viewport and change various *Control Panel* selections from a ghosted appearance to a bold format. When the New Model Preferences form appears on your screen, set the *Tolerance* to **Based on Model**, the *Approximate Maximum Model Dimension* to **0.02**, and the *Analysis Code* to **MSC/THERMAL**. Select **OK** to close the New Model Preferences form.

2. Create a simple surface that will form the outside edge for the microcircuit model.

Select the **Geometry** toggle in *Applications radio button*. You will now create a 0.02 X 0.02 surface. Use its outside edges to form the outer loop for the trimmed surface you will create in the last part of this exercise.

Set the *Action*, *Object*, and *Method* to **Create/Surface/XYZ**. Be sure to turn off Auto Execute in all forms in this exercise. Change the *Vector Coordinates List* to **<0.02 0.02 0>** and select **Apply** to create the surface. The completed form is shown below.

Create a  
simple  
surface

Geometry

Action: Create

Object: Surface

Method: XYZ

Surface ID List

1

Surface Type

PATRAN 2 Convention

Refer. Coordinate Frame

Coord 0

Vector Coordinates List

<0.02 0.02 0>

Auto Execute

Origin Coordinates List

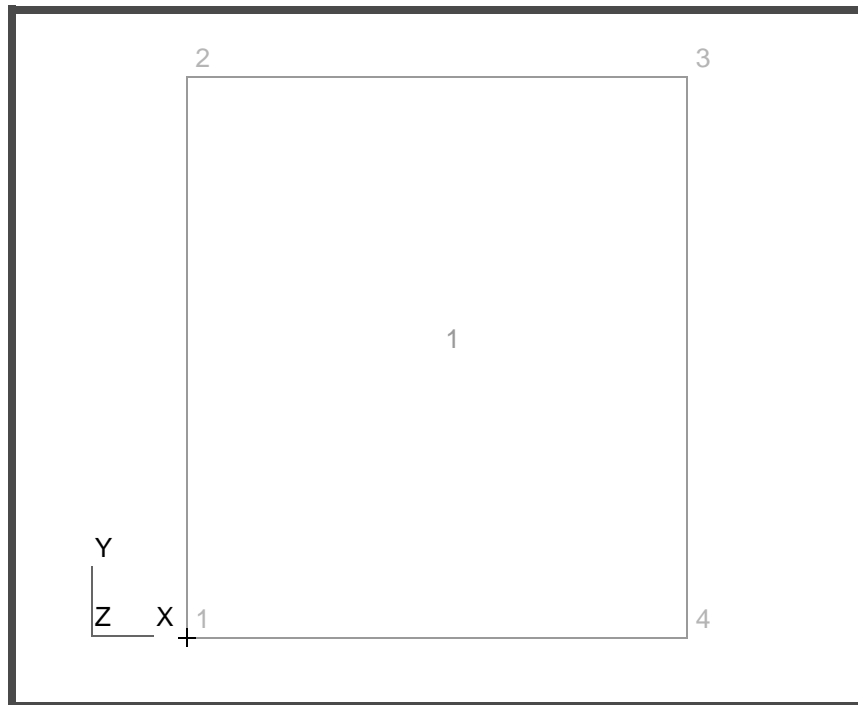
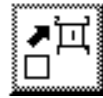
[0 0 0]

-Apply-

## Turn on labels

- Turn labels on using Tool Bar *Show Labels* icon.

Use the Tool Bar *Show Labels* icon on the menu bar to turn on labels. The correct model is shown below.



## Position the 8 devices

- Create eight regular surfaces that will define the locations of the surface mounted devices.

Position the left-most square device by changing the *Vector* and *Origin Coordinates Lists* to  $\langle 0.002 \ 0.002 \ 0 \rangle$  and  $[0.004 \ 0.004 \ 0]$ . Select **Apply** to create the surface.

Create three copies of this region by changing the *Action*, *Object*, and *Method* to **Transform/Surface/Translate**. Enter **<0.004 0 0>** for the *Translation Vector* and **3** for the *Repeat Count*. Click in the *Surface List* box. Select **Surface 2** in the viewport. Select **Apply** to create the surface. The completed Geometry form and current model should appear as shown below.

**Geometry**

Action:

Object:

Method:

---

Surface ID List

Type of Transformation  
 Cartesian in Refer. CF  
 Curvilinear in Refer. CF

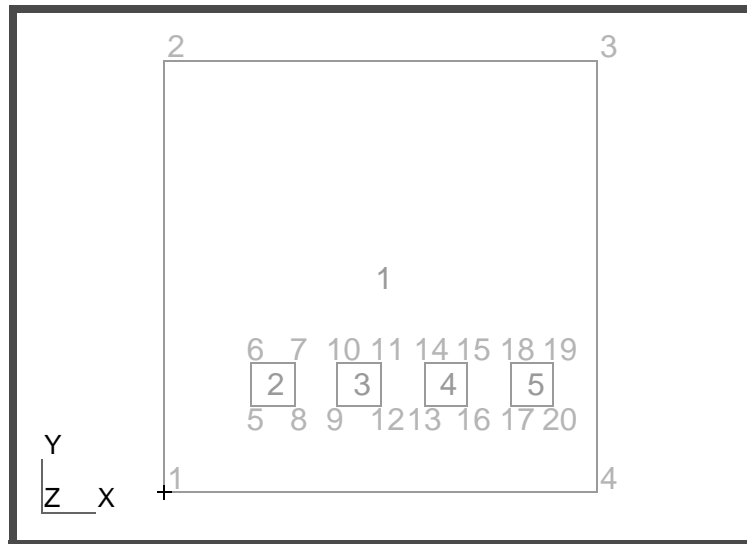
Refer. Coordinate Frame

Translation Vector

Translation Parameters  
Repeat Count

Delete Original Surfaces  
 Auto Execute

Surface List



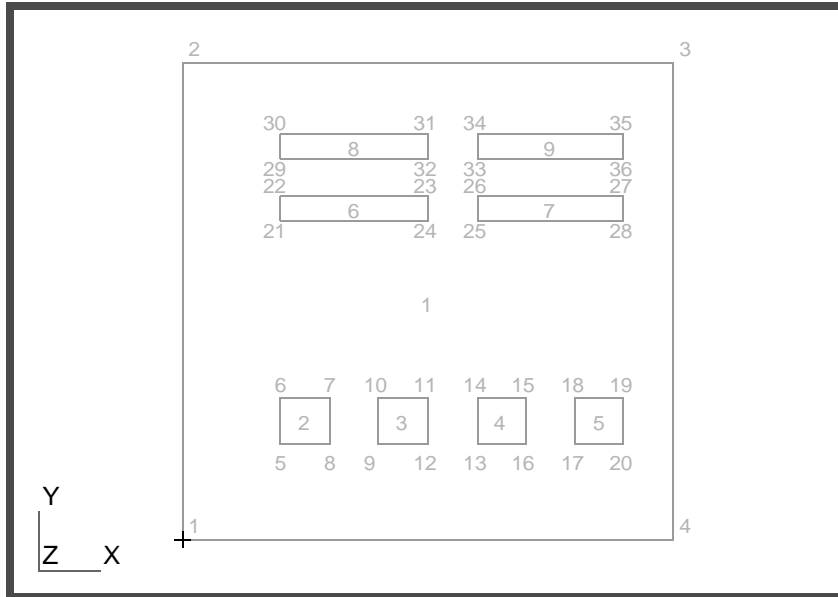
Leaving the *Action* as **Transform** change the *Object* and *Method* to **Point/Translate**. Edit the *Translation Vector* to read **<0 0.0094 0>** and the *Repeat Count* to **1**. Click in the *Point List* box and select **Point 5** from the viewport, the lower left corner point of Surface 2. Select **Apply** to create the surface. Point 21 should appear to guide layout of the remaining four devices.

Set the *Action*, *Object*, and *Method* to **Create/Surface/XYZ**. Position the first rectangular device by changing the *Vector Coordinates List* to **<0.006 0.001 0>**, clicking in the *Origin Coordinates List* box, and selecting **Point 21** from the viewport. Select **Apply** to create the surface.

**After constructing Surface 6 use the Transform/Surface/Translate operations twice to complete the remaining three device locations.** Forms are shown below.

Geometry	Geometry	Geometry
Action: <input type="text" value="Create"/>	Action: <input type="text" value="Transform"/>	Action: <input type="text" value="Transform"/>
Object: <input type="text" value="Surface"/>	Object: <input type="text" value="Surface"/>	Object: <input type="text" value="Surface"/>
Method: <input type="text" value="XYZ"/>	Method: <input type="text" value="Translate"/>	Method: <input type="text" value="Translate"/>
Surface ID List <input type="text" value="6"/>	Surface ID List <input type="text" value="7"/>	Surface ID List <input type="text" value="8"/>
Surface Type <input checked="" type="checkbox"/> PATRAN 2 Convention	Type of Transformation <input checked="" type="checkbox"/> Cartesian in Refer. CF <input type="checkbox"/> Curvilinear in Refer. CF	Type of Transformation <input checked="" type="checkbox"/> Cartesian in Refer. CF <input type="checkbox"/> Curvilinear in Refer. CF
Refer. Coordinate Frame <input type="text" value="Coord 0"/>	Refer. Coordinate Frame <input type="text" value="Coord 0"/>	Refer. Coordinate Frame <input type="text" value="Coord 0"/>
Vector Coordinates List <input type="text" value="&lt;0.006 0.001 0&gt;"/>	Translation Vector <input type="text" value="&lt;0.008 0 0&gt;"/>	Translation Vector <input type="text" value="&lt;0 0.0026 0&gt;"/>
<input type="checkbox"/> Auto Execute	Translation Parameters Repeat Count <input type="text" value="1"/>	Translation Parameters Repeat Count <input type="text" value="1"/>
Origin Coordinates List <input type="text" value="Point 21"/>	<input type="checkbox"/> Delete Original Surfaces <input type="checkbox"/> Auto Execute	<input type="checkbox"/> Delete Original Surfaces <input type="checkbox"/> Auto Execute
<input type="text" value="-Apply-"/>	Surface List <input type="text" value="surface 6"/>	Surface List <input type="text" value="surface 6 7"/>
	<input type="text" value="-Apply-"/>	<input type="text" value="-Apply-"/>

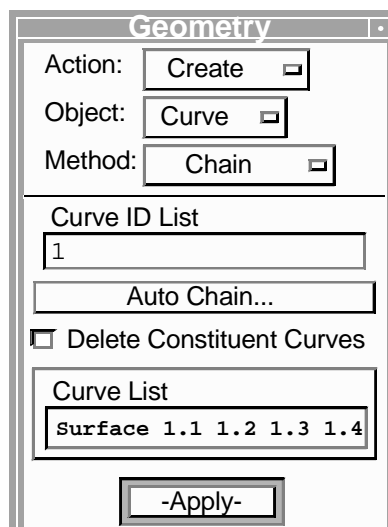
Your model should now appear as shown below.



5. Create chained curves on the edges of each surface.

In order to facilitate picking, use **Preferences/Picking...** and set *Rectangle/Polygon Picking* to **Enclose entire entity**. Select **Close**. Next, Change the *Action*, *Object*, and *Method* to **Create/Curve/Chain**. Turn off the *Delete Constituent Curves* option. To create the perimeter chain click in the *Curve List* box and then click in the *Edge* selection icon (third from the top) in the *Select Menu*. While holding the *<shift>* key down select the four outer edges of Surface 1. The completed form should now look like the one shown below.

**Create chained curves**



Select **Apply** to complete the function.

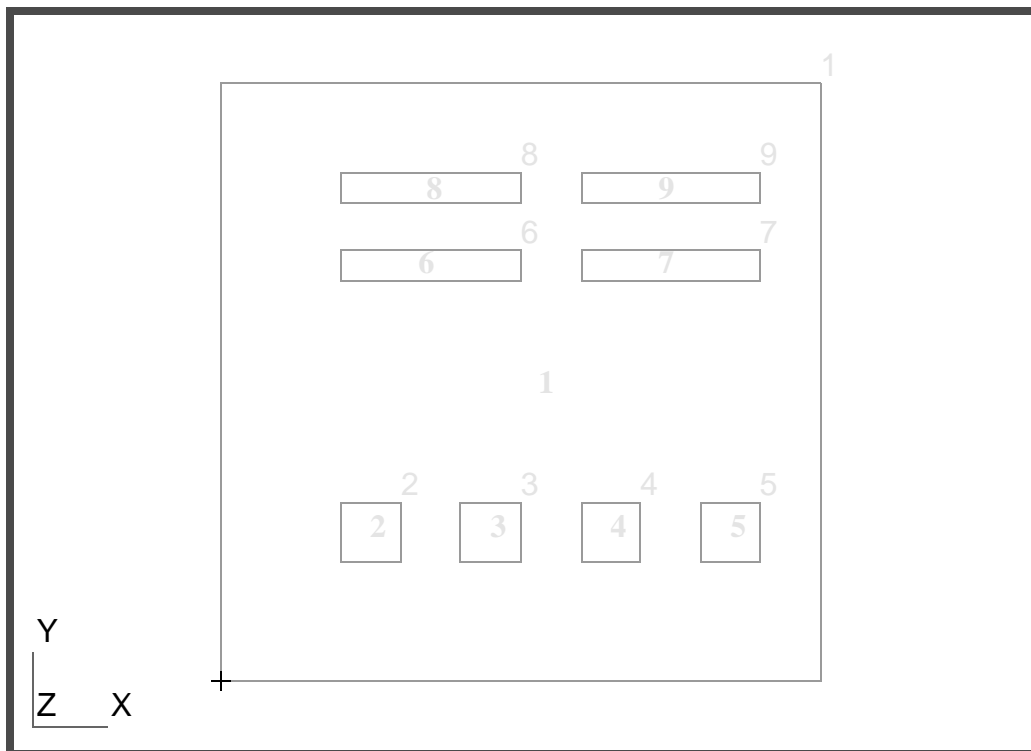
To create the 8 interior chained curves click in the *Curve List* box and drag a rectangle around Surface 2 (the lower left-most device location). The 4 edge identifiers for Surface 2 should replace the previous *Curve List* box entry. Select **Apply** to complete the function. **Repeat this step for the remaining seven device surfaces.**

## Unclutter the display

6. Unclutter the display by hiding some labels.

To simplify the displayed image of your model select **Display** from the *Menu Bar* and select **Entity Color/Label/Render...** from the drop-down menu. When the *Entity Color/Label/Render Display* form appears select **Hide All Entity Labels** and turn on only **Curve**, **Surface**, and **TSurf** labels. Select **Apply** then **Cancel** to complete the function.

Your model should now appear as shown below.



## Create a trimmed surface

7. Complete the geometry of the hybrid microcircuit.

Create the trimmed surface that surrounds the microcircuits devices. Set *Action*, *Object*, and *Method* to **Create/Surface/Trimmed**. Select *Option* as **Planar**. Turn **off** the *Delete Outer* and *Inner Loops* switches. Click in the *Outer Loop List* databox, click in the *Curve* selection icon (second from the top) in the *Select Menu* and select

Curve 1. Next, click in the *Inner Loop List* databox and drag a rectangle around Curves 2 through 9. The completed Geometry form is shown below for your reference.



Select **Apply** to complete the function.

Your model should now appear as shown on the front panel of this exercise.

If it does not, select **Viewing** from the *Menu Bar* and select **Fit View** from the drop-down menu.

8. **Quit** MSC.Patran.

To stop MSC.Patran select **File** on the *Menu Bar* and select **Quit** from the drop-down menu.

**Quit**  
**MSC.Patran**

