ThinkDesign Mating

ThinkDesign enables you to mate objects in an absolutely natural and smart way, based on the selection of entities from the two mating objects. The first entity belongs to the object that has to be positioned, whereas the second one acts as a reference entity. We will see how to use mating (simple or inferred) and multiple mating concepts, as we run through this task.

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1. Step 1: The first Mating

To a large extent, we will use Externally referenced components in the task. Let's begin the task by bringing in an X-ref component in the ThinkDesign window. Before that, let's customize the ThinkDesign environment. Since we are working on Assemblies, we will have a complete Assembly Tool Bar in the UI.

Open a **New Model**.

- Right Click on the default tool bar and say Assembly.
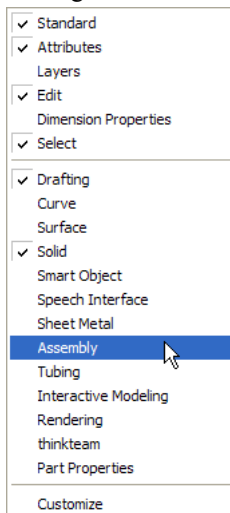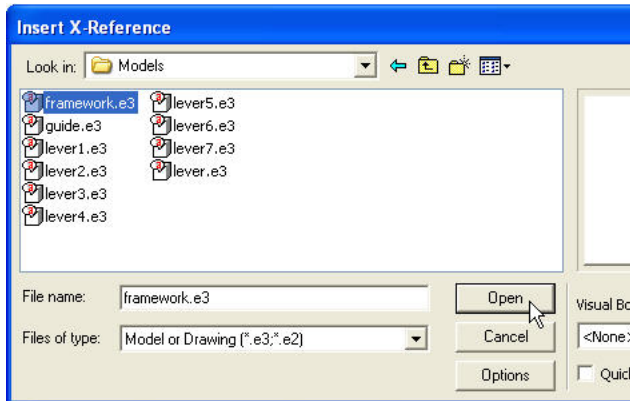

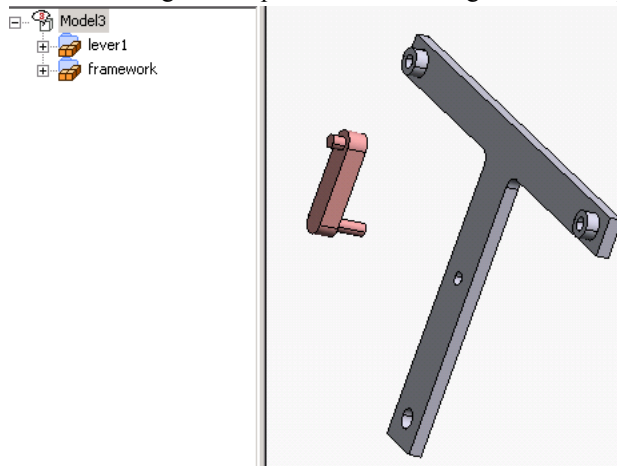A New Tool bar shows up in the graphic area.

- Move this tool bar on to the tool bar area.

Ok. We are now ready for the real action on Assemblies

- Click to insert a New **X-Reference Component**

- Browse to the task installation folder and insert framework.e3 as an Xref

Let's now bring in Component Lever1 using the same sequence of steps as described above.

Mating_Comp_01.gif

We will assemble these two components

- Start the **Solid Mating** Command.

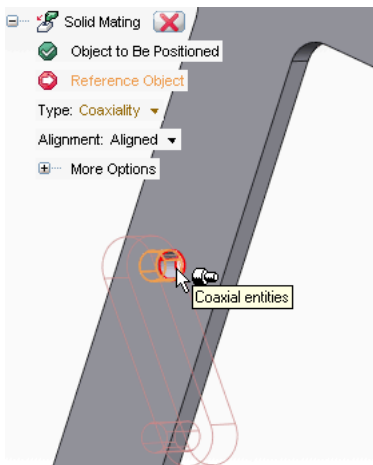- Pick Lever 1 as the ⊖Object to be positioned.

Note:

The Type appears as Coaxial .ThinkDesign automatically detects the mating constraint types which suit the entity you selected and you can view them in the selection list. Depending on the type you choose, the selection of reference entities is restricted to suitable entities only.
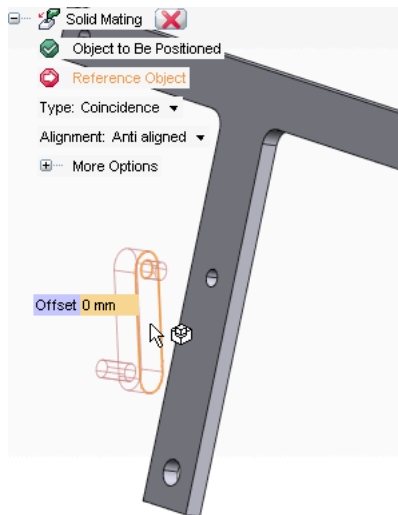
Let's continue.

- Pick the Inner surface of the hole on Component framework as the ●Reference Object.

- Click ✖ Cancel to insert the first constraint.

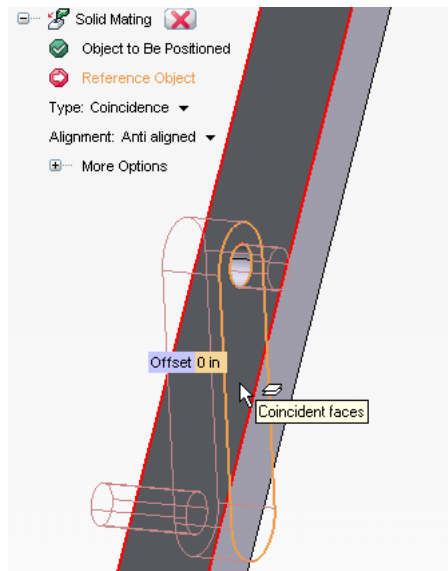- We are now in SIMPLE mode, so we can choose one constraint a time.

Let's now mate the faces and align Lever1 to the framework.

- Start the **Solid Mating** Command

- Pick the face of Lever1 as the ● Object to be positioned.
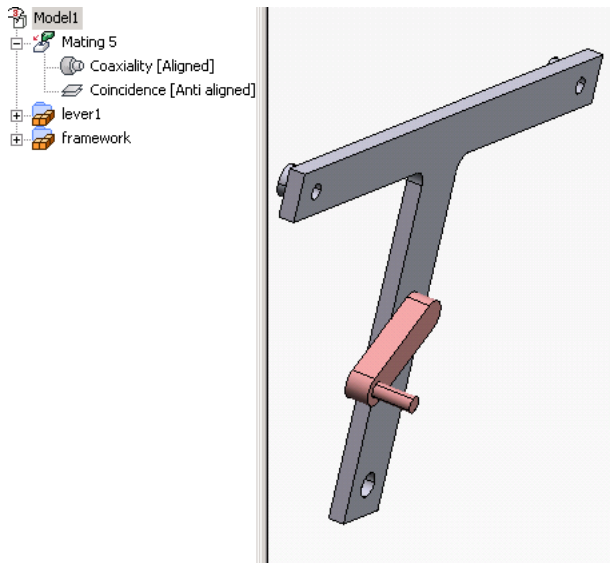
Notice that the Type Coincident appears automatically. Keep the Alignment Anti aligned and Offset as 0.

- Pick the face on framework as ⊖ Reference Object.

Click ☒ Cancel to insert the constraint.

You can see the constraints appear on the History tree.

Wow!!! we have done the first mating neatly.

You can move lever1 about these two constraints and check it out.

We will now bring in another component Lever, to assemble it to the already added components.Only this time we will use Inferred Mating.


Note:

You choose inferred, when you require ThinkDesign to identify more than one constraint a time. In inferred mode, when you click on a suitable reference entity, ThinkDesign creates the corresponding constraint, then tries to infer additional constraints, which are consistent with the shape of both objects, the one to be positioned and the referenced one.

- Click to insert a New **X-Reference Component**.

- Browse to the task installation folder and insert Lever.e3 as an Xref

- Start the **Solid Mating** command.

- Pick the Lever as the ⬤Object to be positioned.
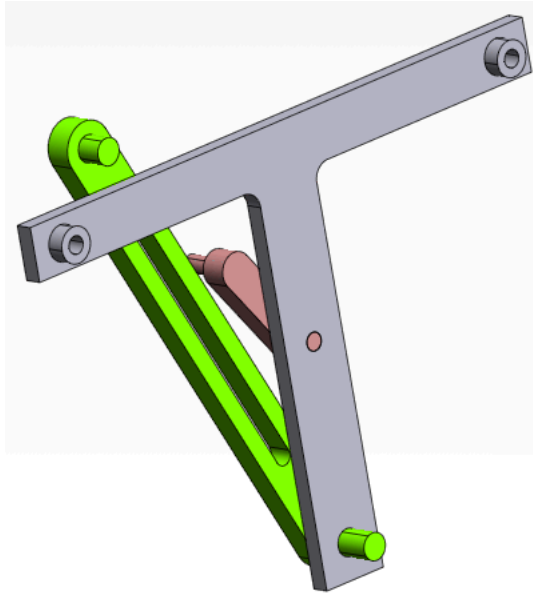
- The Type is Coaxial and Mode Inferred
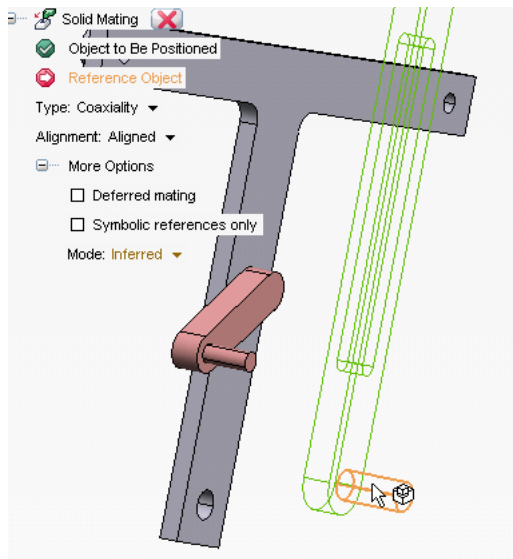
We can see how automatically ThinkDesign infers additional constraints (coincident faces, see tool tip before confirming mating)
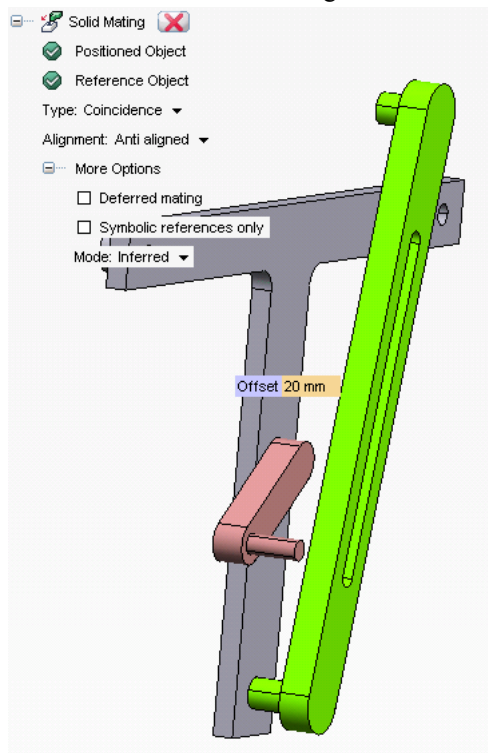
- Pick the inside surface of the hole on framework as ⊖ Reference Object.
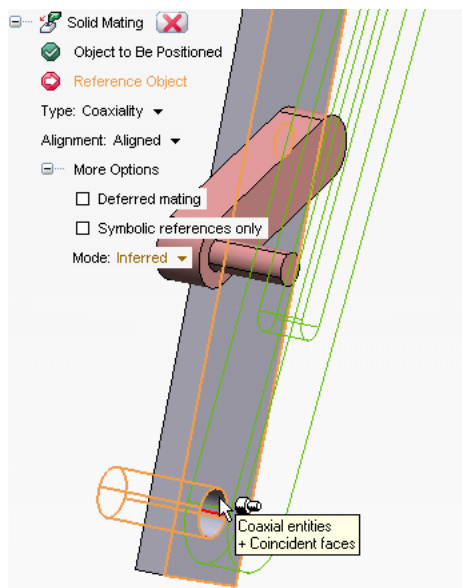
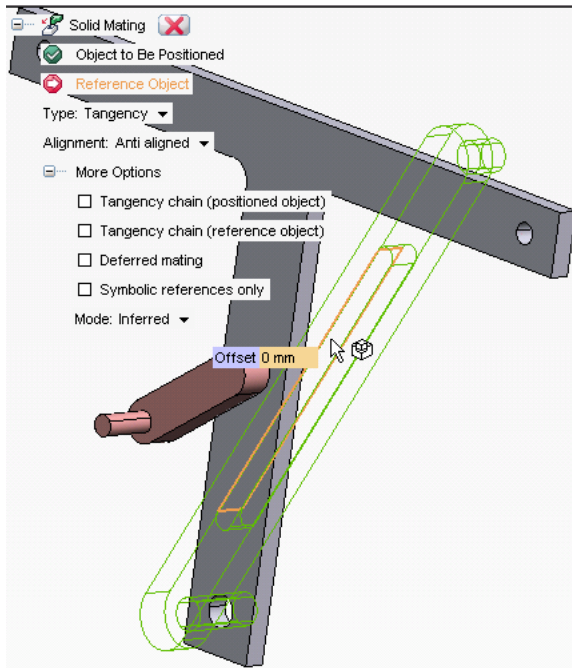- Click ✖ Cancel to insert the constraint.

Redefine Coincident - Antialigned constraint and Insert an Offset of 20 mm.
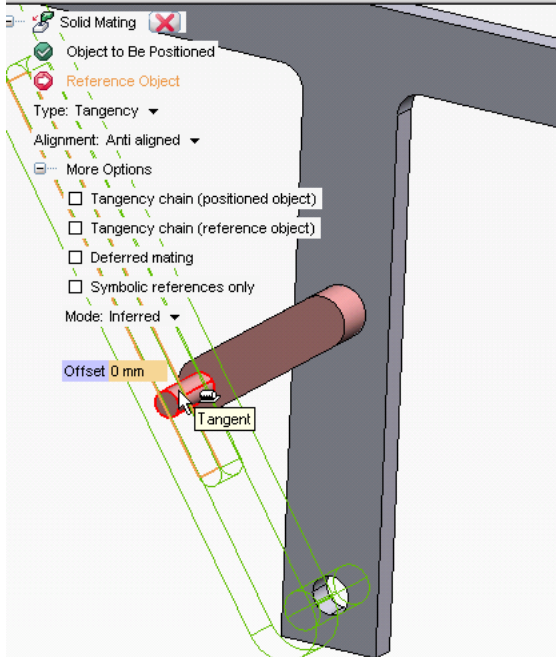

❌ Cancel

We will now mate components Lever and Lever1

- Pick and rotate Lever1 so that its Pin is on the top side.

- Start the **Solid Mating** command.

- Pick the Surface on the lever as the ⊖ Object to be Positioned.

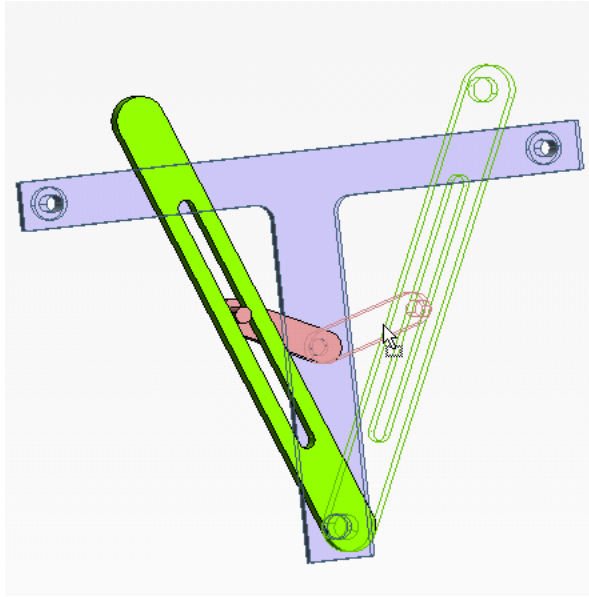- Set Type Tangent and Alignment Anti aligned

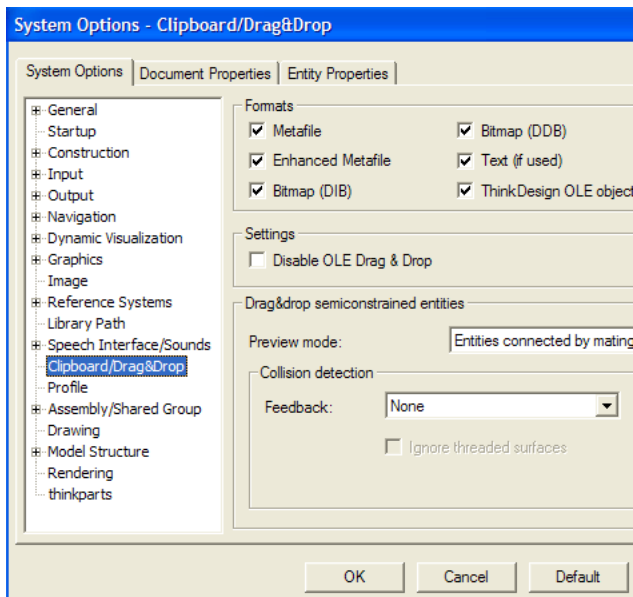- Now pick the Pin on Lever1 as ⊘Reference Object to place the Tangent mating

Click ✖ Cancel to make the placement.

- Click Lever1 and rotate it and see how Lever also moves with it.

- Uncheck the Disable OLE Drag and Drop option dialog under Clipboard/Drag and Drop tab for the settings of Preview mode.

Fine. Till now we have made our simple and inferred mating. Let's move on to the next step.
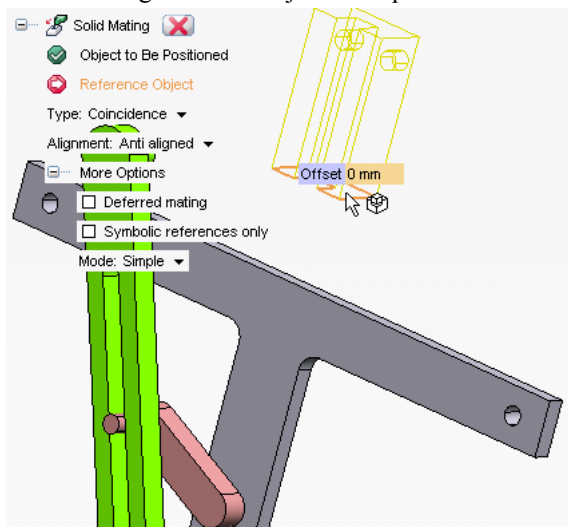
2. Step2 : Mating More Components

Let's now continue adding a few more components into this assembly.

- Click to insert a New **X-Reference Component**.

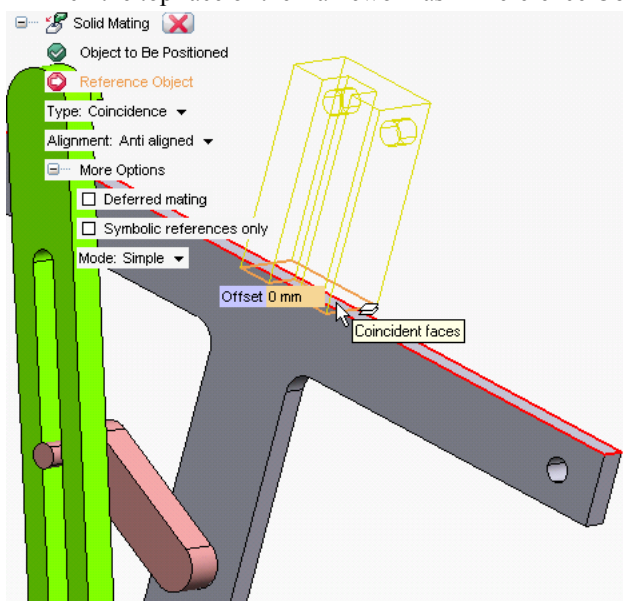- Browse to the task installation folder and insert guide.e3 as an Xref

We need to mate the guide on framework.

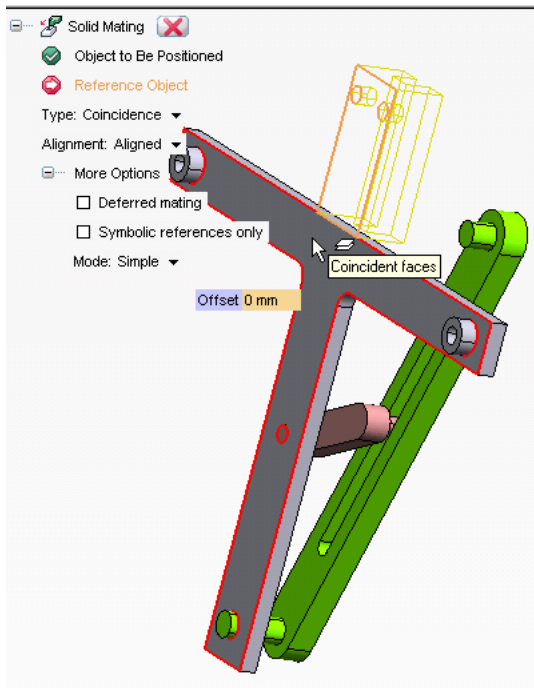- Start the **Solid Mating** Command.

- Pick the guide as ⊖Object to be positioned.

- Set Type Coincident, Alignment Anti aligned and Mode Simple

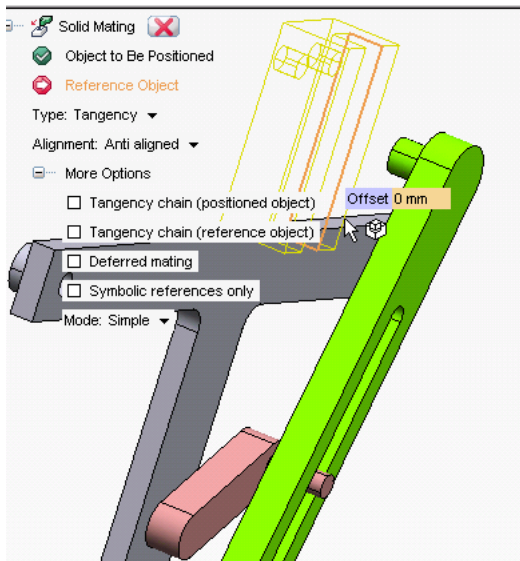- Pick the top face of the framework as ⊖ Reference Object to place the constraint

- Start the **Solid Mating** command.

- Pick the back face of the guide and mate to the back of the frame work
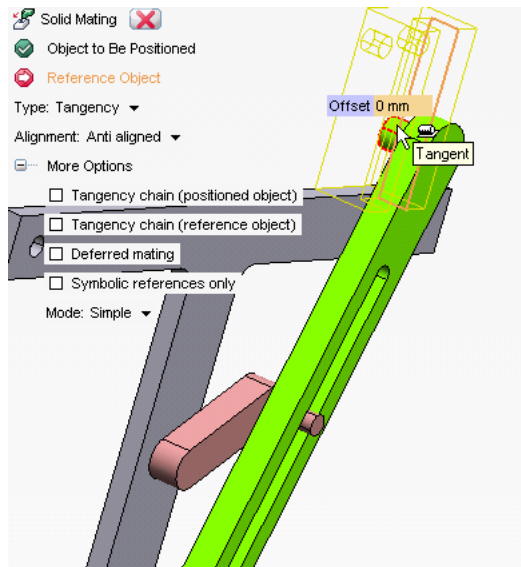
- Set Type Coincident,Alignment aligned and Mode Simple

❌ Cancel

- Start the **Solid Mating** command.

- Pick the inside slot face of the guide as ⊘ Object to Be Positioned.

- Set Type Tangent, Alignment Anti aligned and Mode Simple

- Pick the surface of the Pin of Lever as ⊘ Reference Object.

Click ❌ Cancel to place the constraints

Move Lever1 and you can see that the guide also moves

Let's now insert and mate another component Lever2.

- Click to insert a New **X-Reference Component**

- Browse to the task installation folder and insert lever2.e3 as an Xref

- Start the **Solid Mating** command

- Pick the Pin of lever2 as ◯ Object to be Positioned.
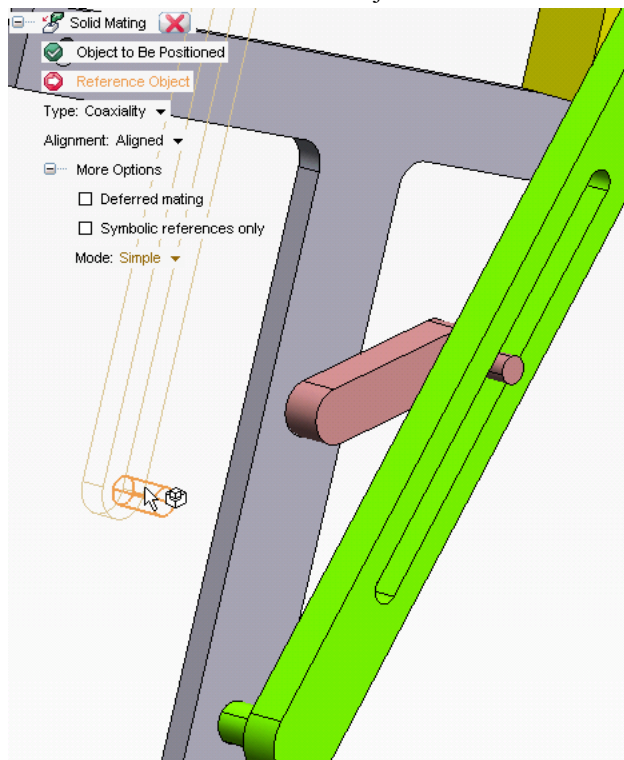
- Set Type Coaxial, Alignment - Aligned, Mode - Inferred.

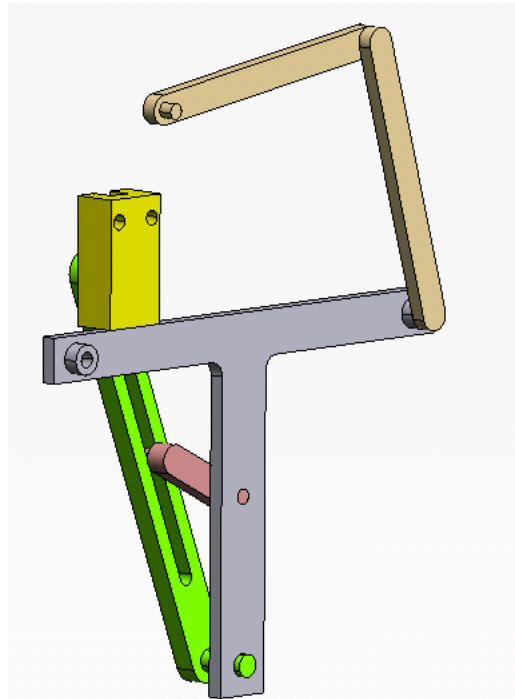- Pick the Inner hole surface on the framework as ⊖ Reference Object

The Coincident constraint is taken automatically
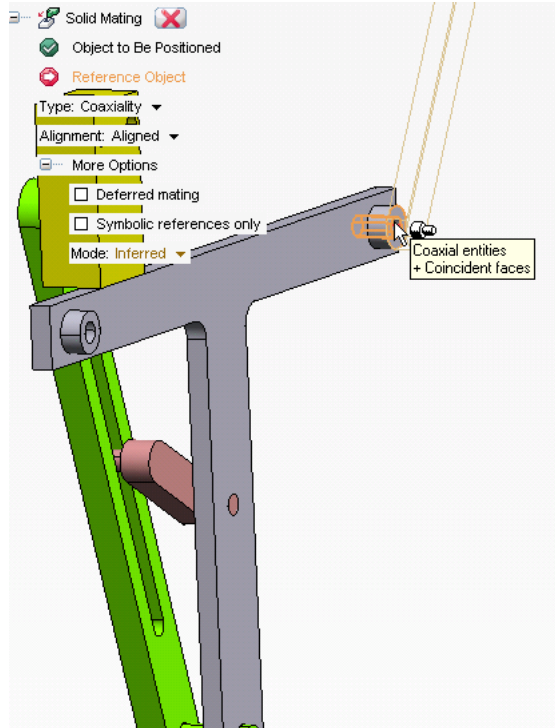
Click ✖ Cancel to complete the mating.

We will bring in lever3 also and mate it to lever2.

- Use Inferred mating as before to mate it to lever2

The assembly at this stage looks like as shown above.

3. Step3 : Multiple Mating

Now we have to mate lever3 and guide.But if we move one of the two levers, the other doesn't follow the movement.

How can we achieve this?

ThinkDesign has what is called **Multiple Mating**.


Note:

This command enables you to mate different objects, whose positions are interdependent. By selecting this command, you specify that, during the history evaluation, all the constraints concerning a specific set of objects must be solved at the same time
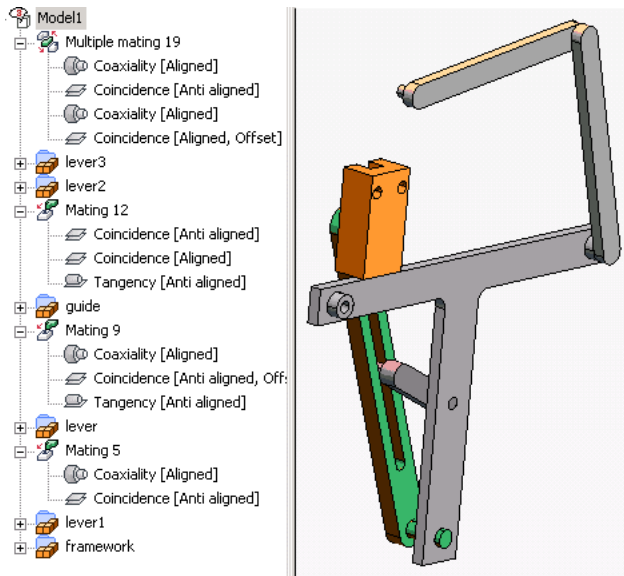

Let's check it out.

- Start the **Multiple Mating** command

- Pick components Lever2 and Lever3
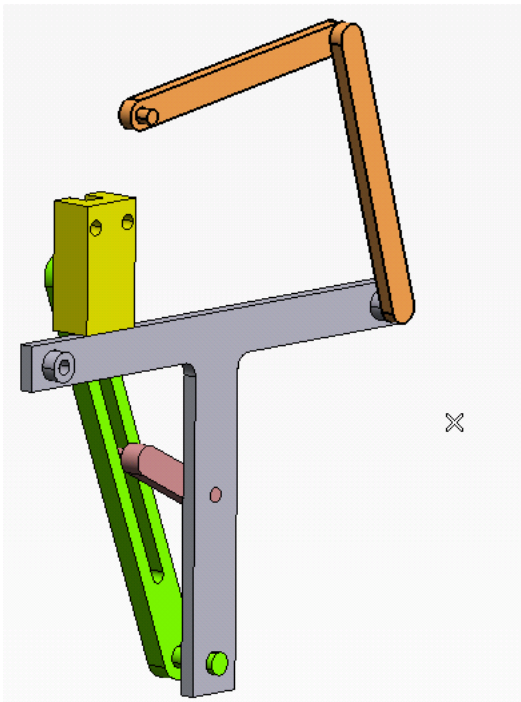
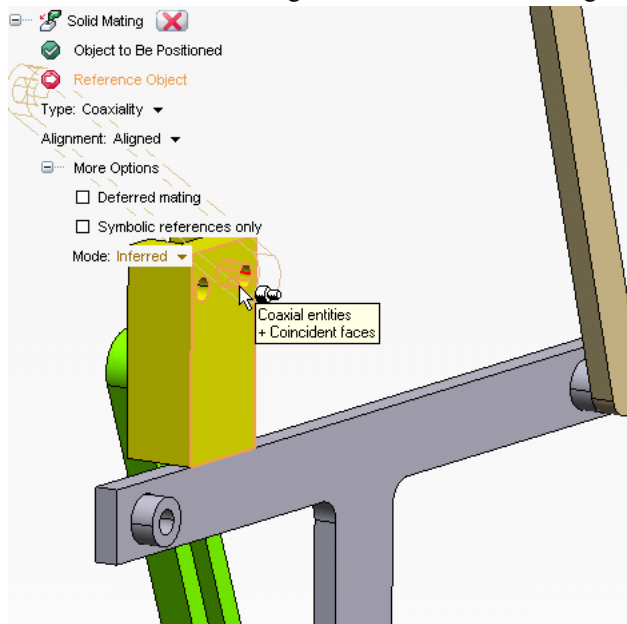

- Right click to end the Multiple Mating Command.ThinkDesign will show a warning message as shown in the Image below. Say OK.
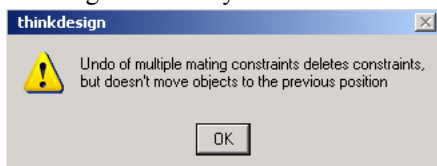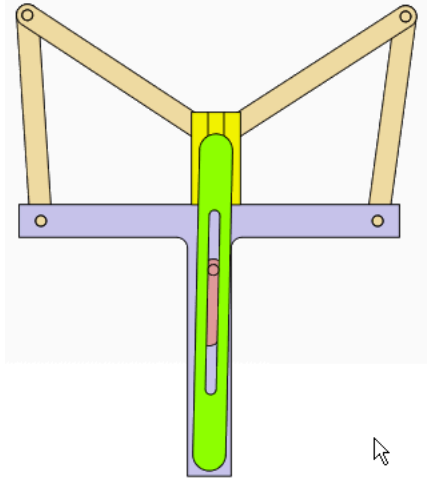
Check out the History of this mating.

Now mate Lever3 and the guide in Inferred mode using similar steps shown before.

Cancel

Fantastic you now know how useful **Multiple Mating** is.

At this stage your assembly is as shown below.

We need Lever2 and Lever3 on the right side also.

First we will make copies of the two components.

- Select Lever2

- Press Ctrl and Shift Key.

- Drag and drop a copy of the component.

- Repeat the same for Lever3

Repeat previous four steps(mating lever2-framework, mating lever2-lever3, multiple mating between lever2 and lever3 and finally mating lever3-guide) to complete the right side portion of the assembly
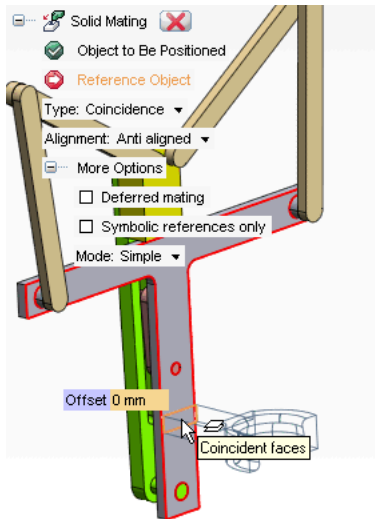
This looks pretty good. Keep going.

Next in queue is component Lever4.Let's assemble it.

- Click to insert a New **X-Reference Component**.

- Browse to the task installation folder and insert lever4.e3 as an Xref

- Start the **Solid Mating** command

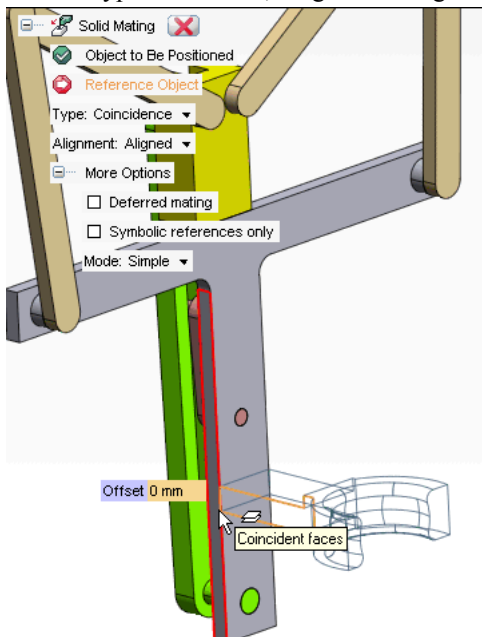- Pick the bottom face of Lever4 as ⬡ Object to be positioned.
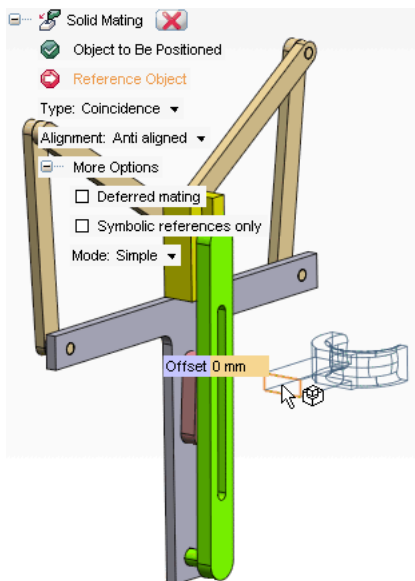
- Set Type Coincident, Alignment Anti aligned and Mode Simple

- Pick the face of framework as ⬡ Reference Object.

![X] Cancel

- Start the **Solid Mating** command.

- Pick the side face of Lever4 as ⬭Object to be positioned.

- Pick the face of framework as ⬤ Reference Object.

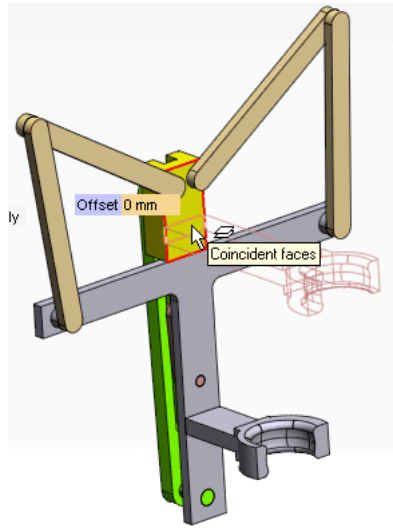- Set Type Coincident, Alignment Aligned and Mode Simple

Click ![X] Cancel to complete the mating.

4. Step4 : Continue building

We will now insert another component lever7 into this assembly.

- Click to insert a New **X-Reference Component**.

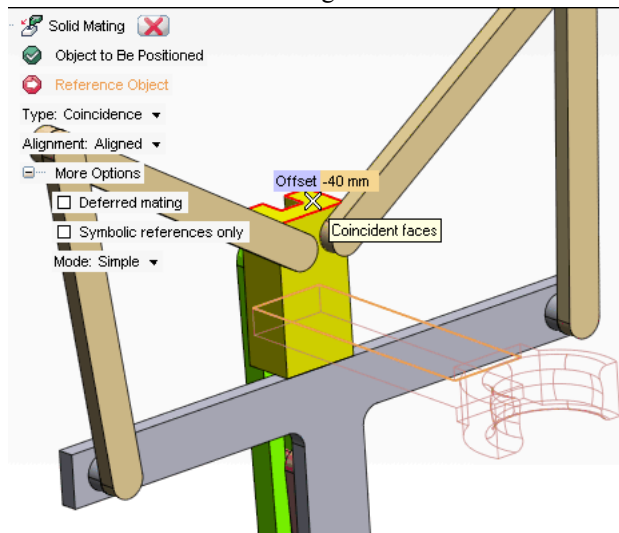- Browse to the task installation folder and insert lever7.e3 as an Xref

- Start the **Solid Mating** command.

- Set Coincident, Anti aligned and Simple mating settings and select the faces for mating as shown.

❌ Cancel.

- Start the **Solid Mating** command.

- Set Coincident, Aligned and Simple mating settings and select the ⊖faces for mating as shown

- Pick top face of Lever7 and guide to mate with an offset of -40 as shown.

This offset can act as a driving dimension to move the component

- Start the **Solid Mating** command.

- Set Coincident, Aligned and Simple mating settings and select the ⊖faces for mating as shown

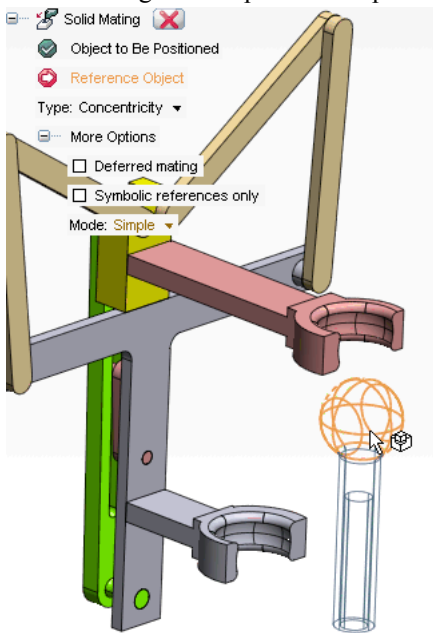- Pick one of the side faces of Lever7 and guide to mate.
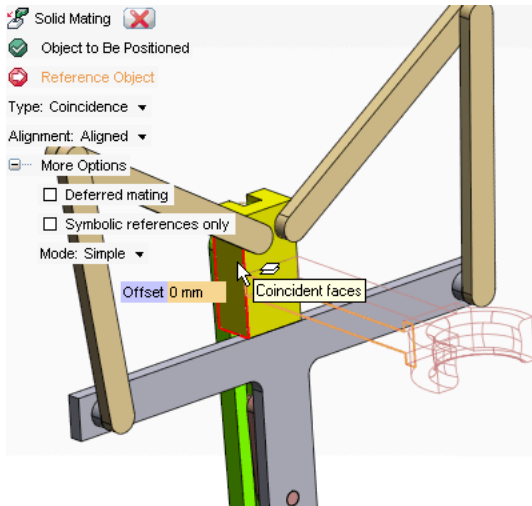
Another component to be added is lever5
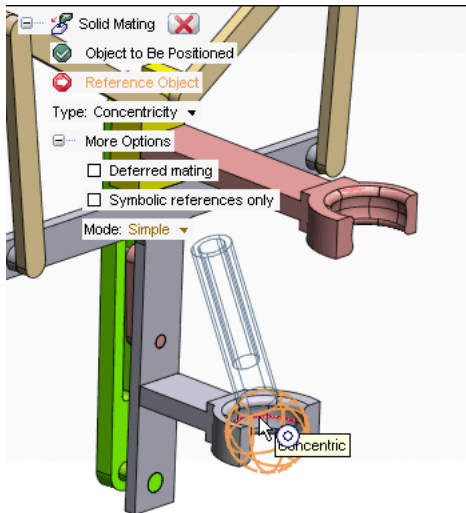
Bring it in as an Xref.

To mate this with lever4, We use concentric mating.

- Switch to **Wireframe View** for better visibility.

- Start the **Solid Mating** command.
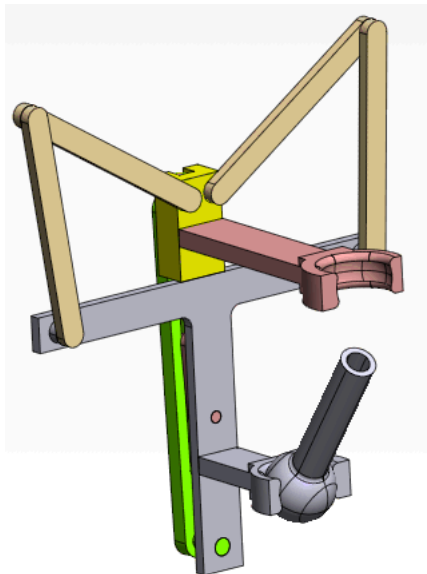
- Pick the globe or spherical shape of Lever7.

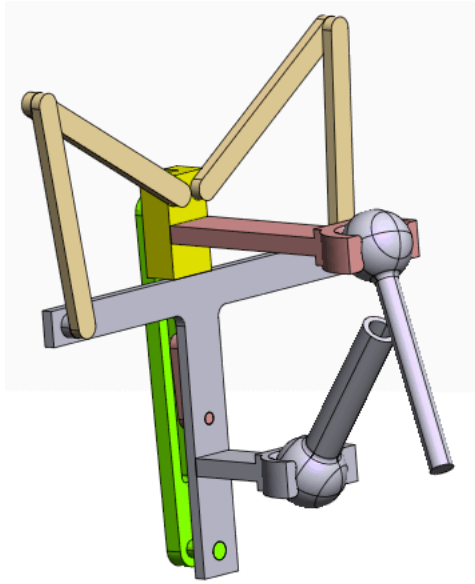Pick again the spherical surface of lever4 as shown below.

❌ Cancel

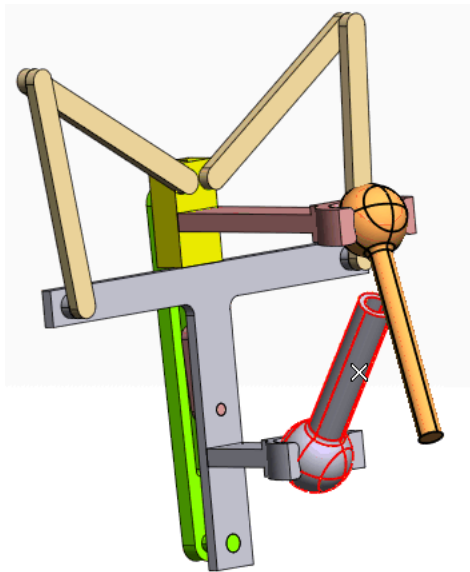- Switch back to **Shaded View** to check out the mating.

5. Step5 : Animate and See

Bring in Component lever6 and mate it to lever7 just as we did with lever5

Let's now add **Multiple Mating** between these two levers.

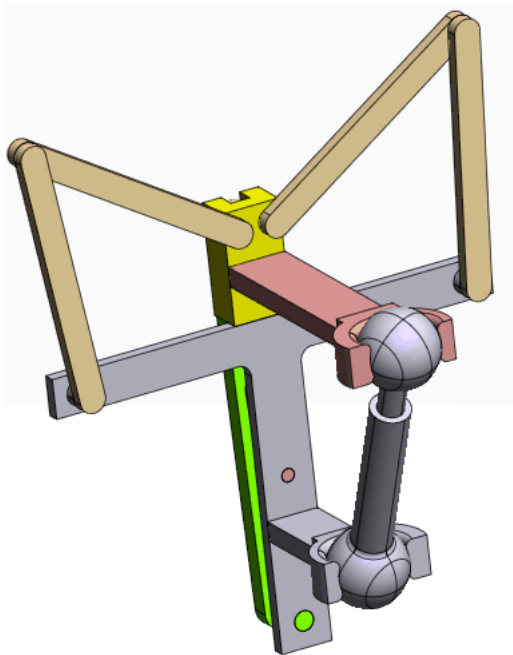- Start the **Multiple Mating** command

- Pick lever5 and lever6

Add another Concentricity constraint between these two components.

- Start the **Solid Mating** command

- Pick the face of lever6 as ⊙ Object to be positioned and insert surface of lever 5 as ⊕Reference Object as shown.
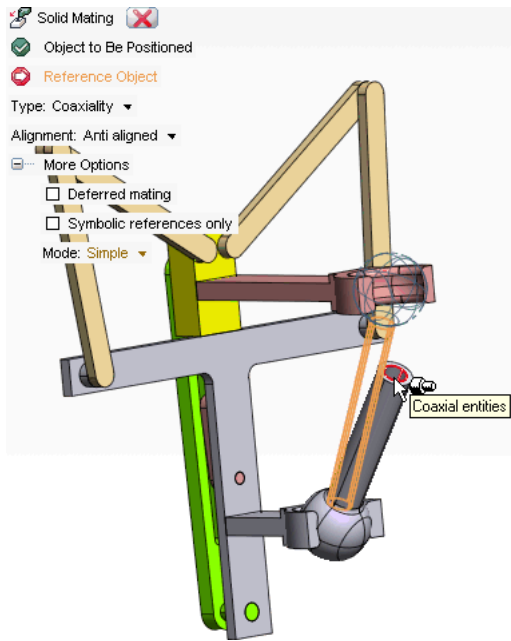
Click ❌ Cancel to freeze the mating.

Our Assembly is ready now.

- Select component lever1 and see how all the components move relative to it.

Let's animate this motion.

Before animation let's see the new Isolate command in version 9 .

The Isolate command enables you to view the entities involved in the selected constraint in isolation with the other entities that make up for the assembly.

- Right click on any of the mating constraint and say Isolate.
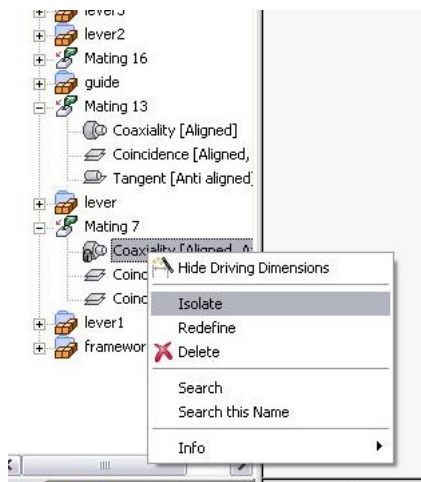
When you perform the command on a mating constraint at the top level of the assembly:

- The constraints are shown with highlighted faces and arrows.

- A zoom is applied on the involved components.
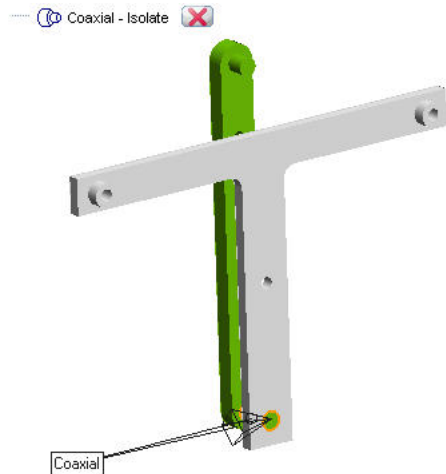
- And also all entities are hidden showing only those which involve the constraints.

Try this useful exercise : Isolating a mating constraint.

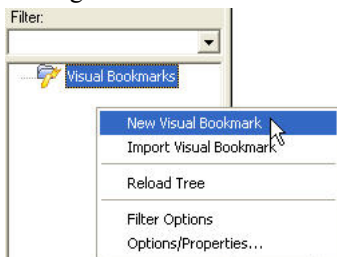What is Create Visual Bookmark in mating properties?

The Create Visual Bookmark command in the mating properties dialog captures a Visual Bookmark highlighting the entities involved in the mating/Multiple mating. It is important to note that you can use this command at any level of the assembly hierarchy. This visual bookmark enables you to get back to the initial view.

**How to Unhide the hidden entities?**

When you Activate the bookmark, the entities are hidden to the level of the Profile. In large assemblies this can be a problem when you need to Unhide all the entities. Before activating the created bookmark, its better to create another new bookmark with all the entities visible and keeping the Hide/Unhide and Recursive Capture options checked.

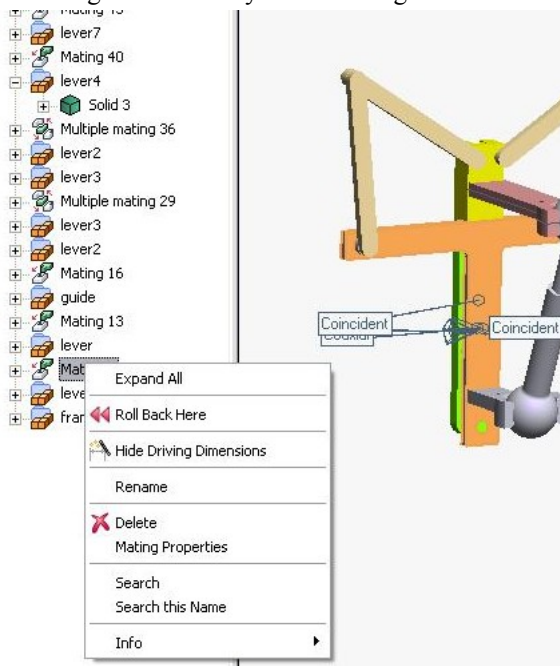So let's create a Bookmark with all the entities visible.

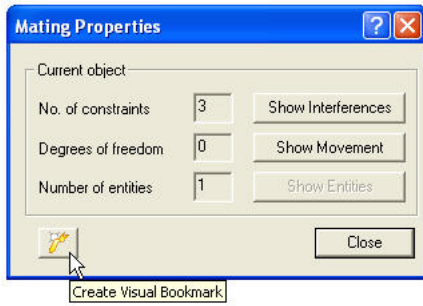• Right click on Visual Bookmark and select New Visual Bookmark.

• Check for Hide/Unhide and Recursive Capture options.

• Say ☑ OK.
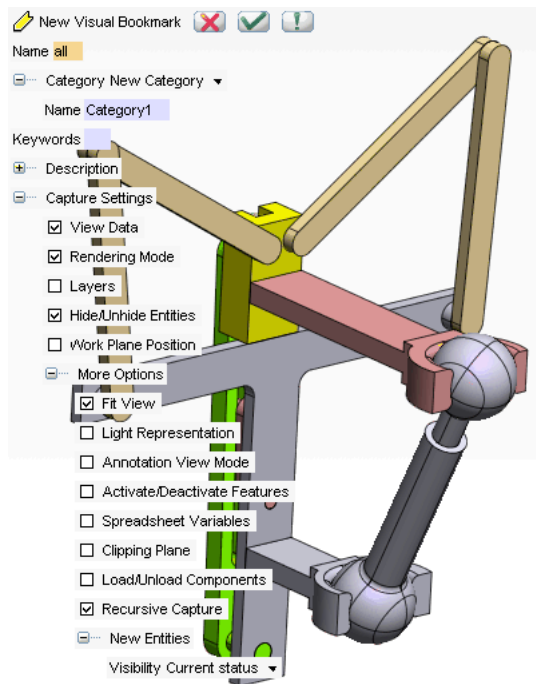
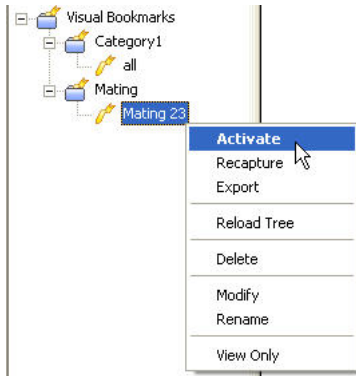- Now right click on any of the mating constraints and say Properties.

- Hit Create Visual Bookmark icon as shown.

- Hit OK for the message.

- Close the dialog box.

The bookmark is created under a Mating folder in the VB tree and also provides information whether the bookmark is created from a Solid mating or Multiple mating.

- Activate the new Visual Bookmark Mating.

- When you Activate the bookmark, all the entities that are not part of the mating/Multiple mating are hidden.

- A zoom to fit is applied on the mating entities to give you a clear view.
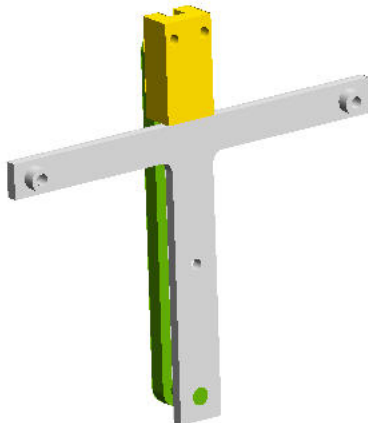
Activate the very first bookmark to unhide all the entities or to get back to the initial view.

Okay, now its time for animation.

First we need to give a angular variable to lever 1. Let's redefine it.

- Right click on coaxial constraint under mating5 in history tree and say Redefine

- Expand More Options to set Axial Angle

- Select the highlighted line on lever1 as ⊙ Moving Object direction line.

- Select highlighted line on framework as ⊙Reference direction line.

- Set angle to 270
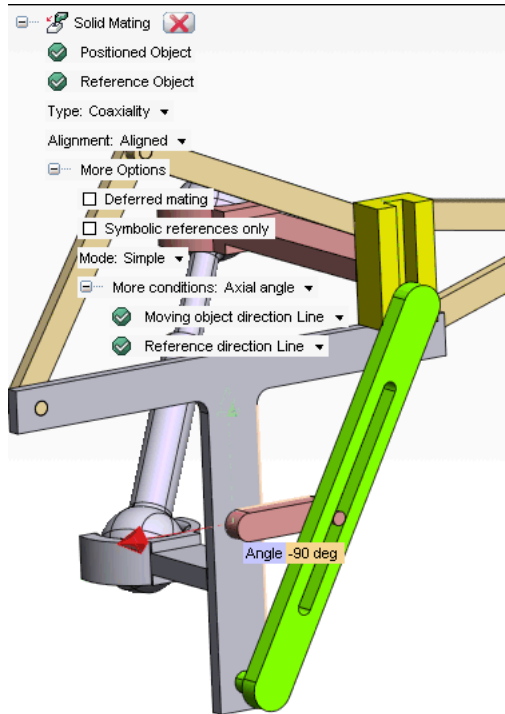
Click ✖ Cancel to make the changes.

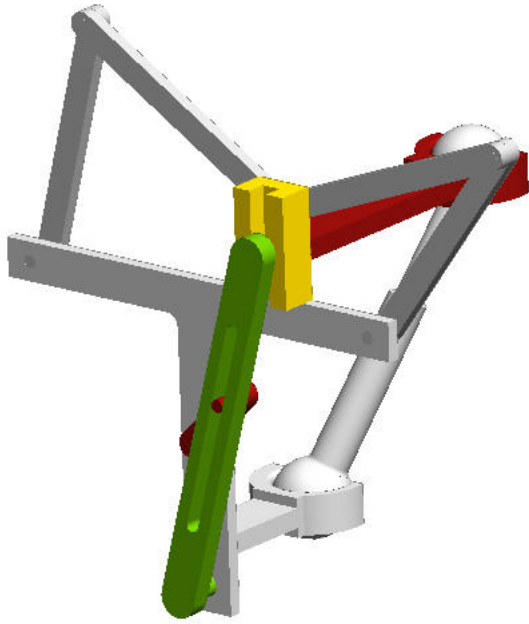- Double click on the angle dimension and add a variable Angle as shown.

- Start the **Spreadsheet** command

- Set the Expression to 360 and hit OK

Congratulations!!! We are done with the ThinkDesign mating task..