EXERCISE BOOK

Student Notes:

CATIA V5 Training
Exercises

Product Design Expert

Version 5 Release 19
September 2008

EDU_CAT_EN_ASM_AX_V5R19

Student Notes:

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Student Notes:

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Student Notes:

Connector Assembly

You will practice concepts learned throughout the course, by building the master exercise and following the recommended process

- Connector Assembly : Presentation
- Connector Assembly (1): Assembling Components
- Connector Assembly (2): Positioning Components
- Connector Assembly (3): Analyzing the Assembly
- Connector Assembly (4): Fixing the clash
- Connector Assembly (5): Adding Screws

Student Notes:

Connector Assembly

Exercise Presentation

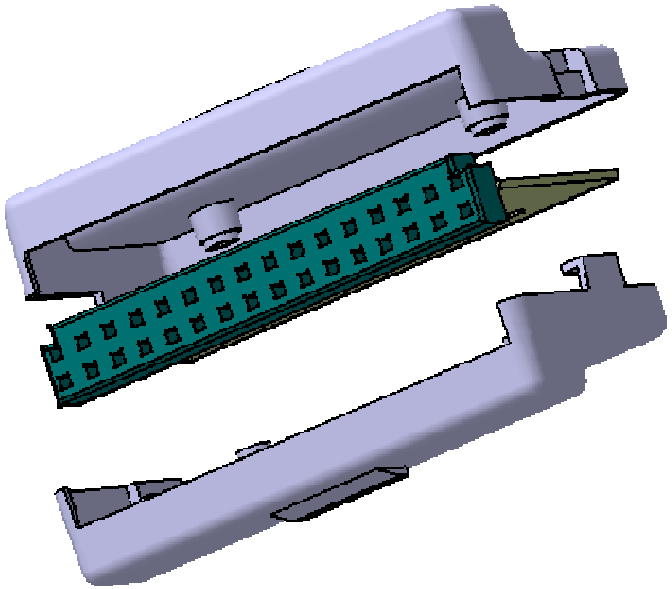
90 min

Objectives :

In this exercise you will build the Connector Assembly and modify one of its components.

In this Exercise you will use :

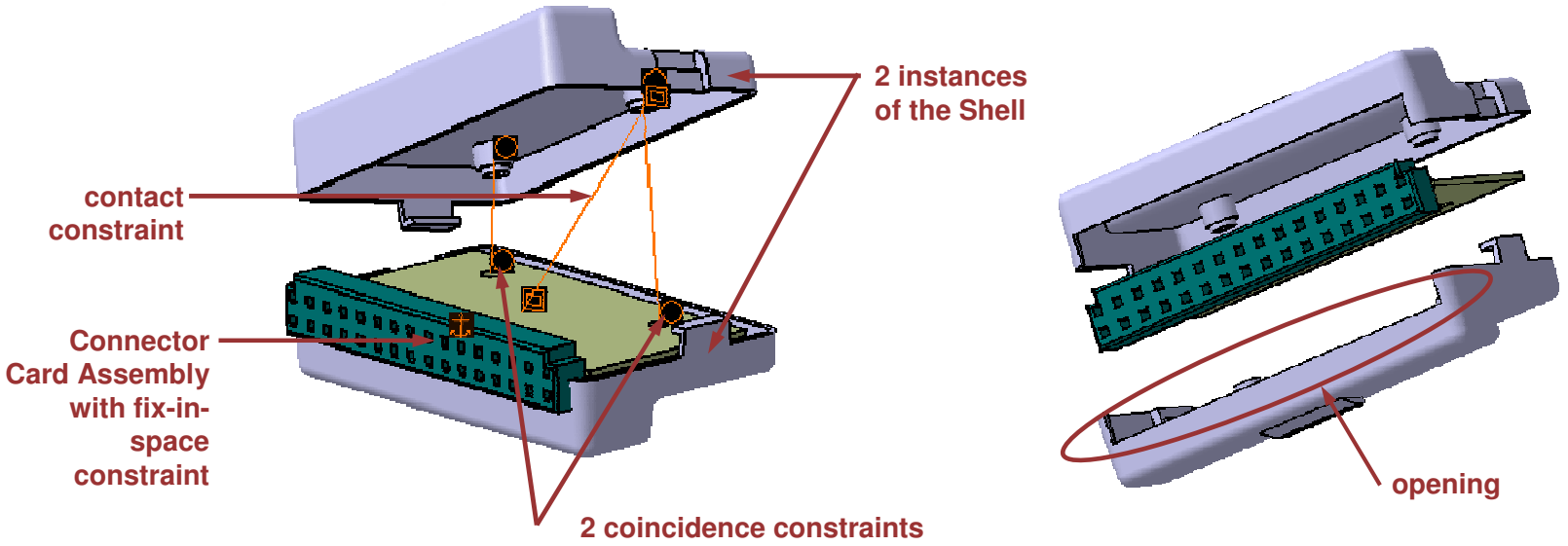
- Product Structure Tools
- Assembly Constraints
- Compass
- Clash Analysis
- Part Design in Context
- Standard Tools



Connector Assembly

Student Notes:

Design Intent: Connector Assembly

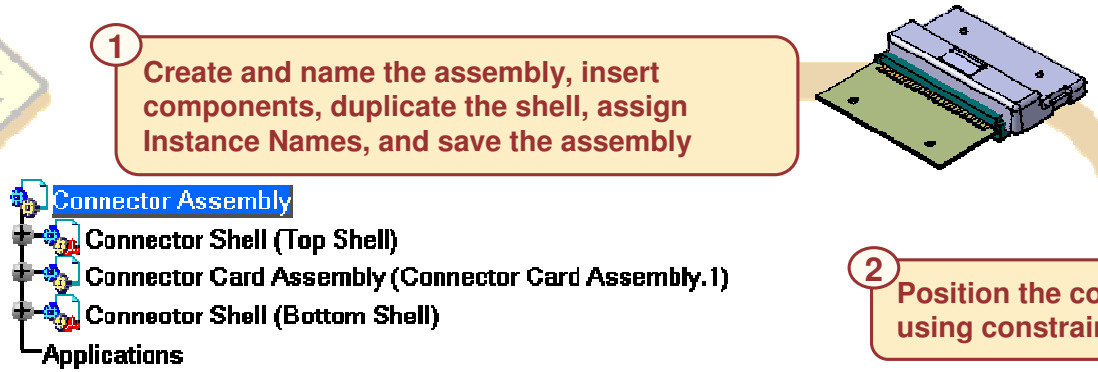


- Create and name the assembly as “Connector Assembly”.
- Add a sub-assembly “Connector Card assembly” and two instances of “Connector Shell”. Assign instance names to the two instances of “Connector Shell”.
- Position each component and create constraints between them.
- Analyze for interferences between the components and correct the interference by making an opening for the “Connector Card Assembly”.
- Add two instances of “Screw”.

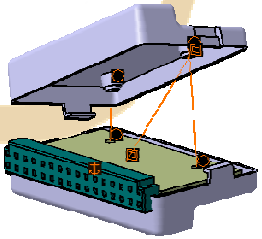
Student Notes:

Design Process: Connector Assembly

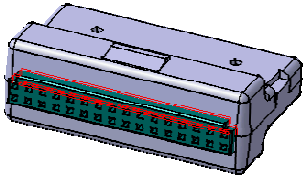
1. Create and name the assembly, insert components, duplicate the shell, assign Instance Names, and save the assembly



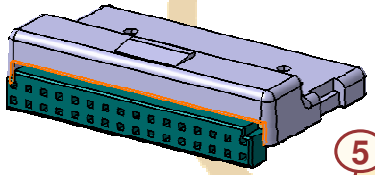
2. Position the components using constraints



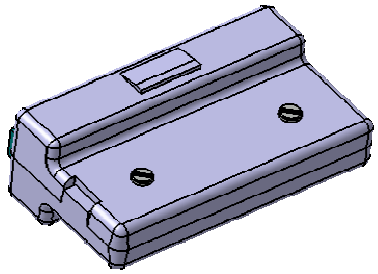
3. Check for interference



4. Fix the clash between components



5. Insert Screw and position it. Create a Pattern of the Screw



EXERCISE BOOK

Student Notes:

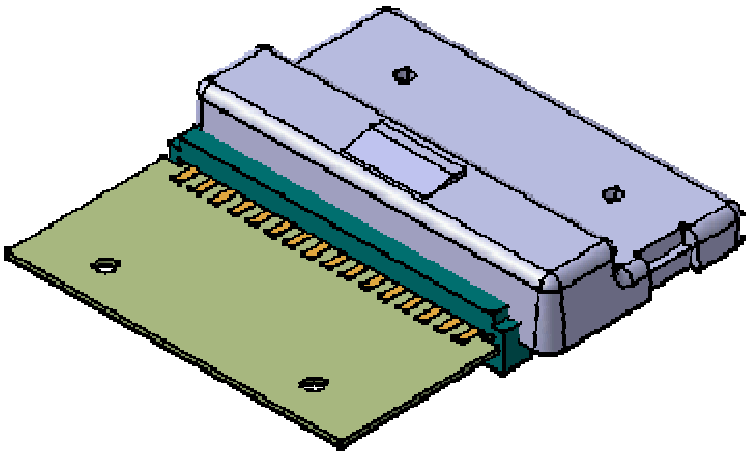
Connector Assembly

Step 1: Assembling Components

15 min

In this step you will:

- Create a new assembly and name it
- Insert existing components
- Assign instance names
- Save the assembly

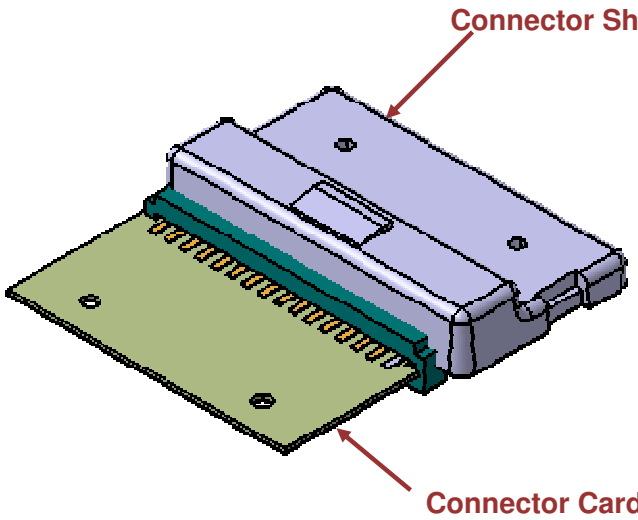


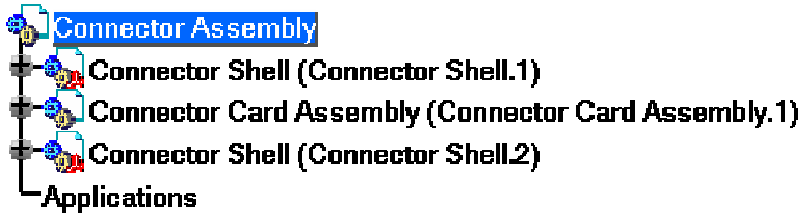
Student Notes:

Do It Yourself (1/2)

Parts used: “CATASMConnector_Shell.CATPart”, “CATASMConnector_Card_Assembly.CATProduct”

- Create a new CATProduct and name it as “Connector Assembly”
- Insert existing components “CATASMConnector_Shell.CATPart” and “CATASMConnector_Card_Assembly.CATProduct”
- Duplicate the “CATASMConnector_Shell.CATPart”
  - Copy the “Connector Shell”
  - Paste it into “Connector Assembly”



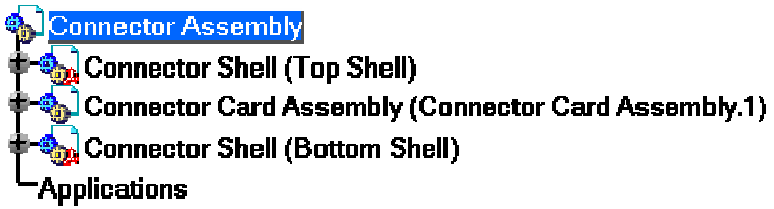


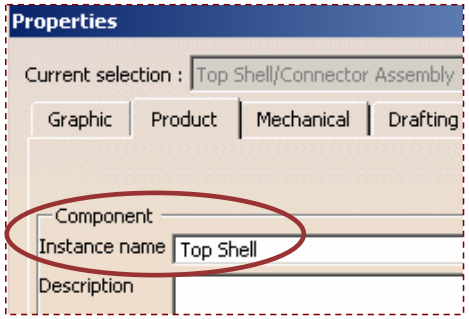
Student Notes:

Do It Yourself (2/2)

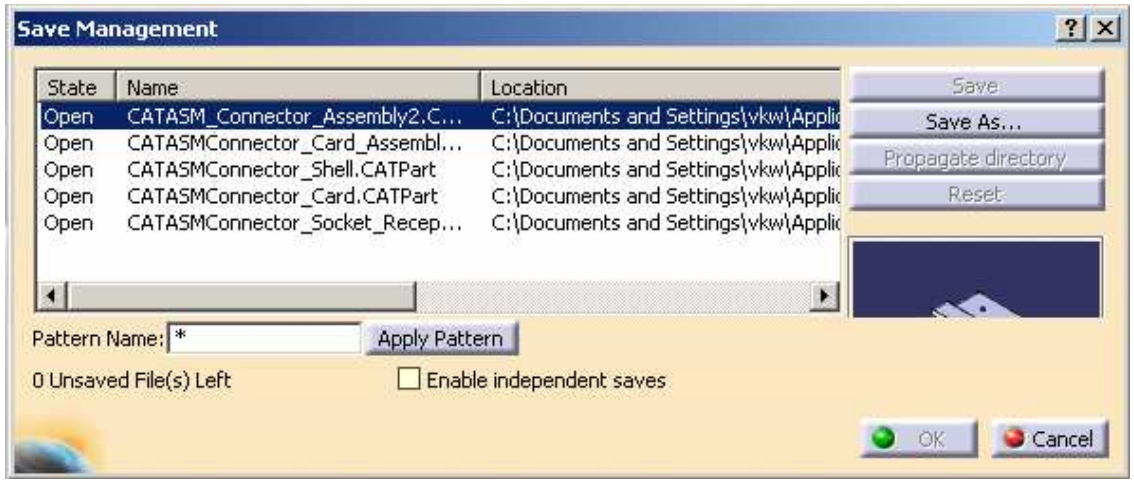
You can compare your result with the “CATASM_Connector_Assembly2.CATProduct”

- Rename the two instances of “Connector Shell” as “Top Shell” and “Bottom Shell”





- Save the assembly as “CATASM_ConnectorAssembly2.CATProduct” in a new folder “Connector_Assembly” using ‘Save Management’
  - Click on Propagate Directory to save all documents in same folder



Student Notes:

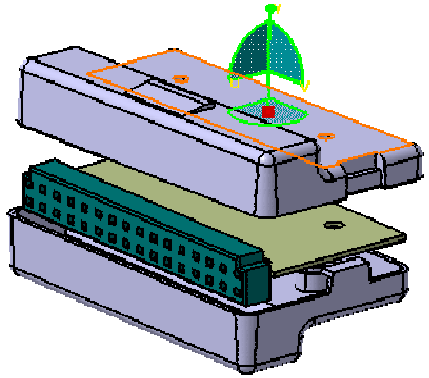
Connector Assembly

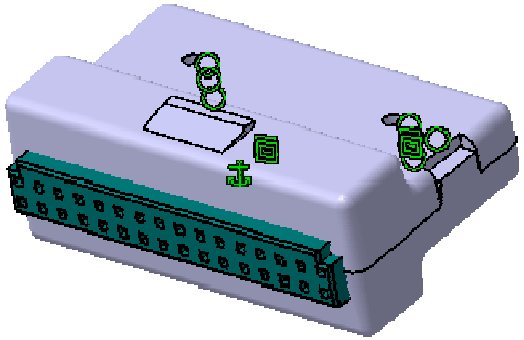
Step 2: Positioning Components

20 min

In this step you will position the components using compass and constrain them by using following constraints:

- Fix Component constraint
- Coincidence constraint
- Contact constraint



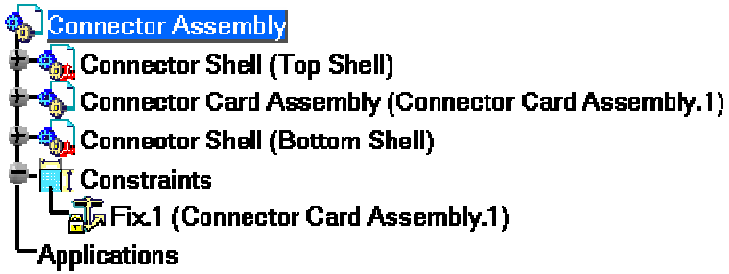


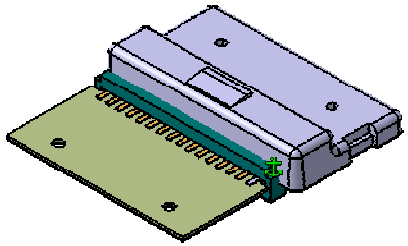
Student Notes:

Do It Yourself (1/4)

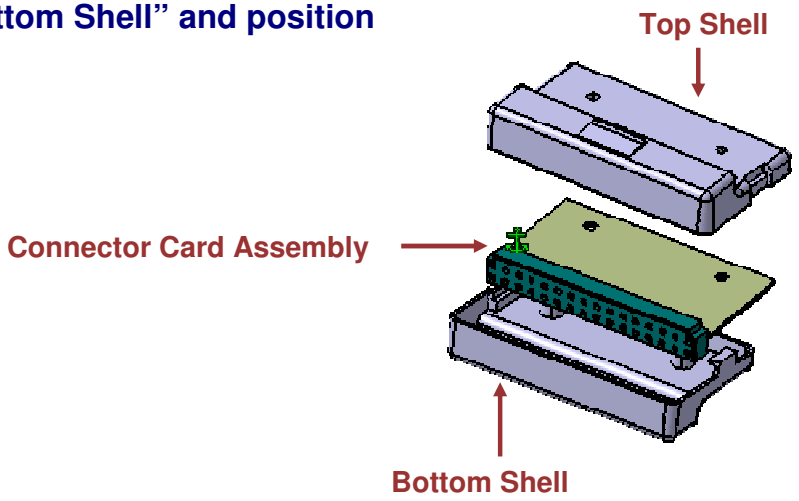
Product used: “CATASM_Connector_Assembly2.CATProduct”

- Fix “Connector Card Assembly”





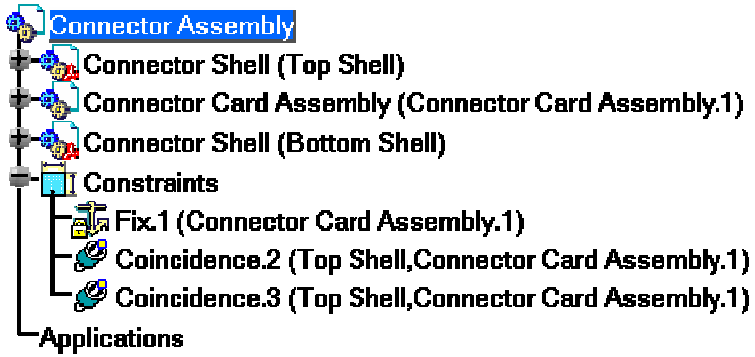
- Move the “Top Shell” and the “Bottom Shell” and position them using Compass as shown

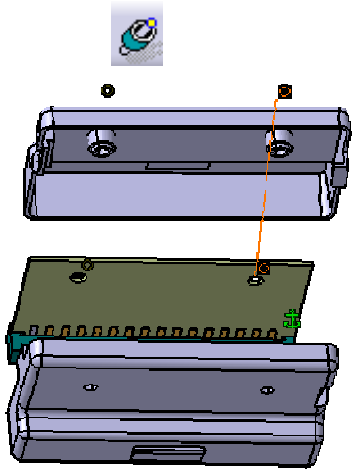


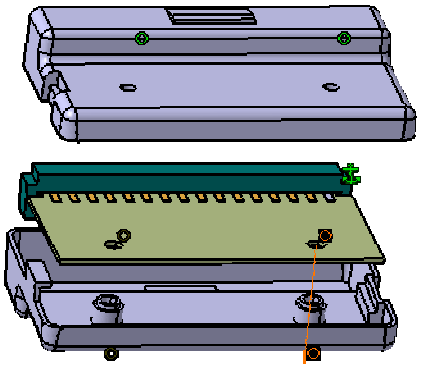
Student Notes:

Do It Yourself (2/4)

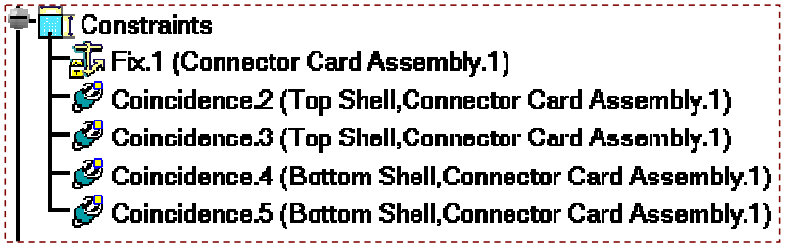
- Set an axial coincidence between corresponding holes of "Top Shell" and "Connector Card Assembly".







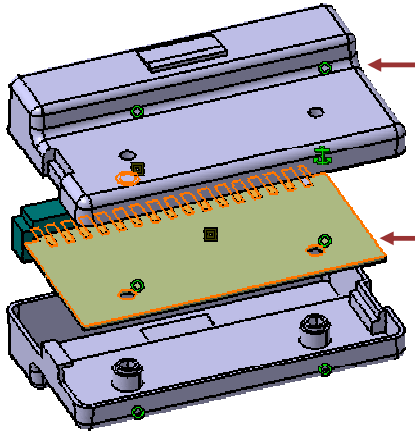
- Set an axial coincidence between corresponding holes of "Bottom Shell" and "Connector Card Assembly".

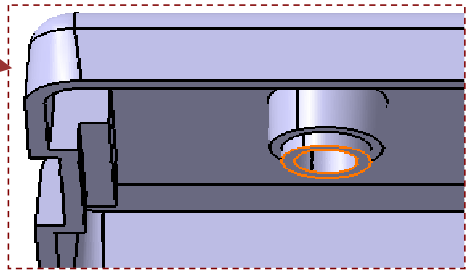


Student Notes:

Do It Yourself (3/4)

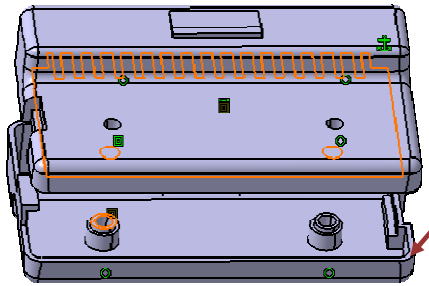
- Create a contact constraint between the inside face of the “Top Shell” and the top face of “Connector Card” as shown

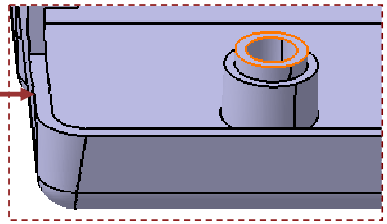


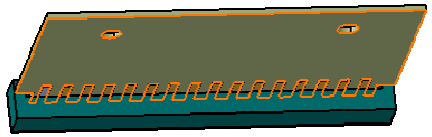


Surface contact.6 (Connector Card Assembly.1,Top Shell)

- Create a contact constraint between the inside face of the “Bottom Shell” and bottom face of “Connector Card Assembly”







Connector Card

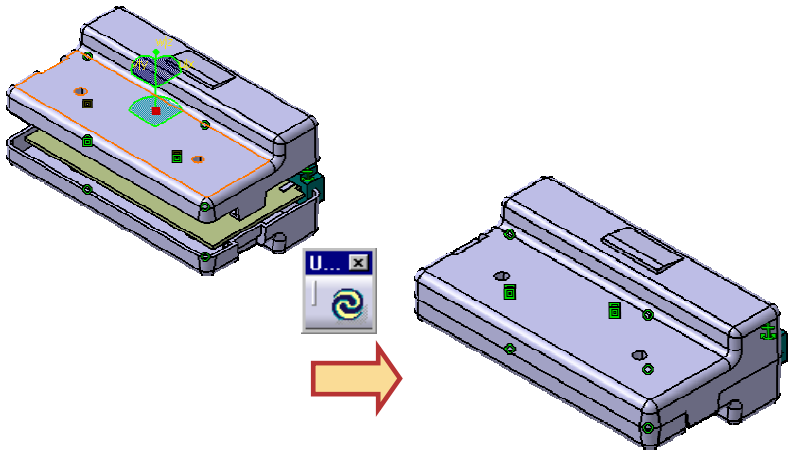
Surface contact.7 (Bottom Shell,Connector Card Assembly.1)

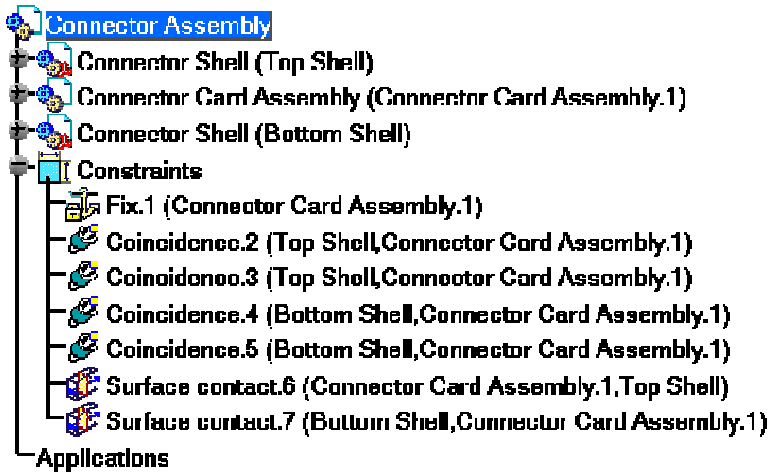
Student Notes:

Do It Yourself (4/4)

You can compare your results with attached model :
"CATASM_Connector_Assembly3.CATProduct"

- Move the "Top Shell" with the compass. The 'Update' icon is activated indicating that an assembly needs an update.
- Update the assembly by clicking on the 'Update' icon





- Save the assembly as 'CATASM_Connector_Assembly3.CATProduct' using 'Save As' command.

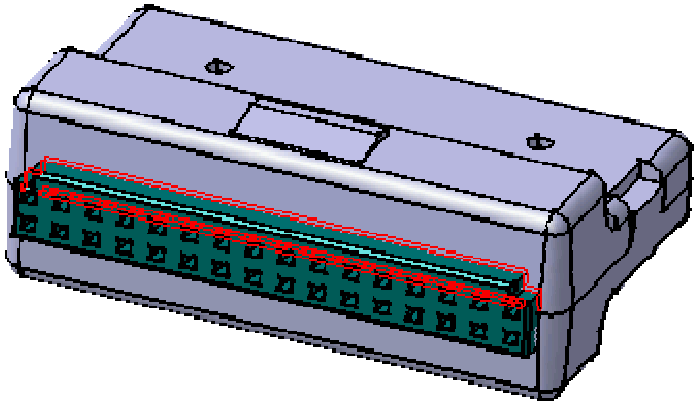
Student Notes:

Connector Housing

Step 3: Analyzing the Assembly

15 min

In this step you will perform clash analysis in the assembly using 'Compute Clash' command.

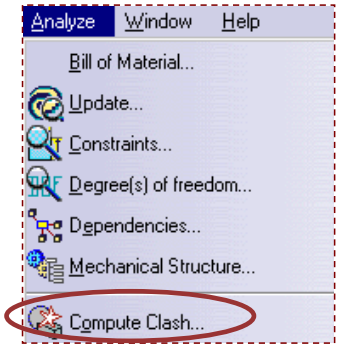


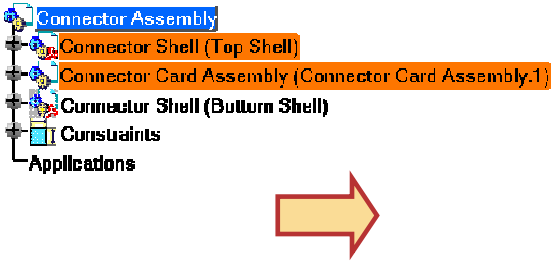
Student Notes:

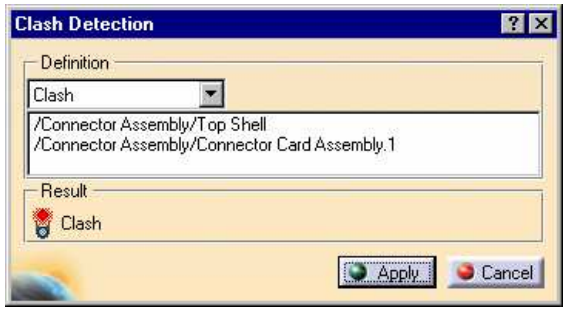
Do It Yourself (1/2)

Product used: “CATASM_Connector_Assembly3.CATProduct”

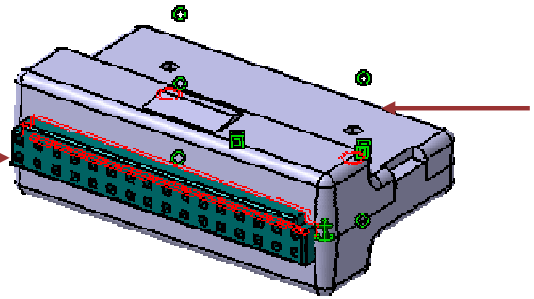
- Compute clash between following components using ‘Compute Clash’ command
  - Launch ‘Compute Clash’ command
  - Multi select “Connector Card Assembly” and “Top Shell”
  - Click ‘Apply’







‘Red Light’ in the Result section indicates clash



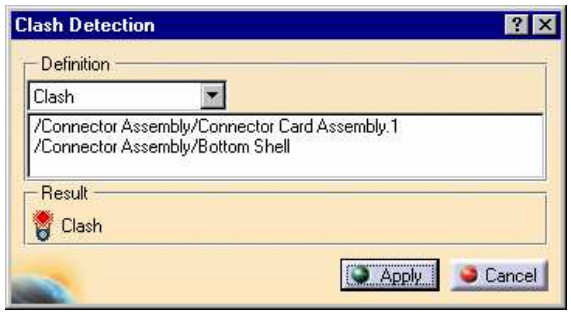
‘Red’ areas in the assembly indicate clash

Student Notes:

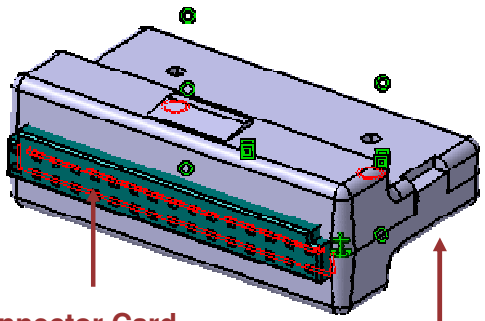
Do It Yourself (2/2)

You can compare your results with the attached model:
"CATASM_Connector_Assembly4.CATProduct"

- Compute clash between following components using 'Compute Clash' command
  - "Connector Card Assembly"
  - "Bottom Shell"



Clash exists between selected parts



Connector Card Assembly

Bottom Shell

- Save the assembly as 'CATASM_Connector_Assembly4.CATProduct' using 'Save As' command

Student Notes:

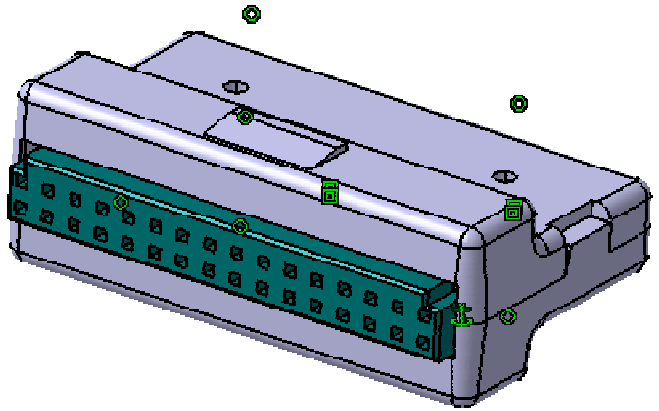
Connector Assembly

Step 4: Fixing the clash

30 min

In this step, you will eliminate the clash between the components by editing one of the components in the context of the assembly. In this process you will:

- **Hide components**
- **Edit part in 'Part Design' workbench.**
- **Show components**
- **Save the assembly**

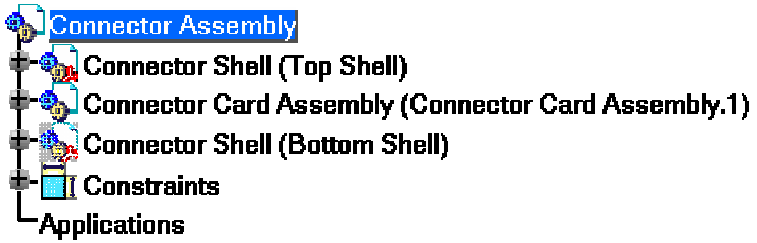


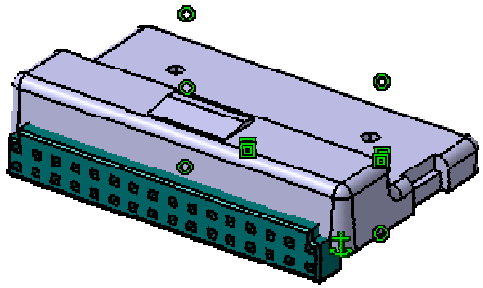
Student Notes:

Do It Yourself (1/4)

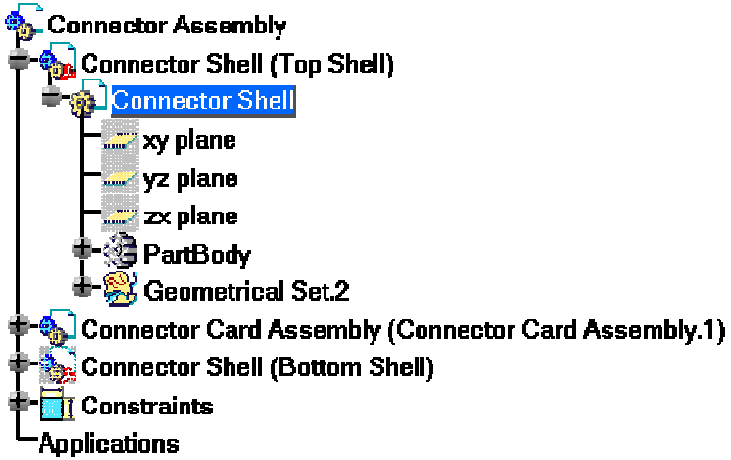
Product used: “CATASM_Connector_Assembly4.CATProduct”

- Hide “Bottom Shell”.





- Edit the part “Connector Shell” in assembly context.



Pocket sketch

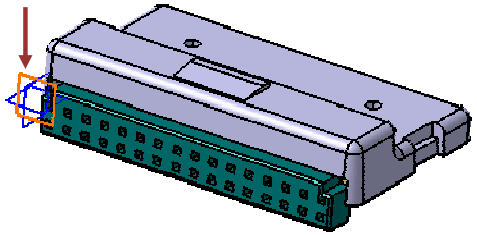
Refer to Detailed Steps to see the details on how to edit part and create a pocket using Part Design workbench

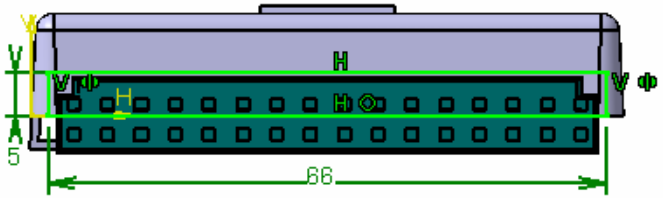
Student Notes:

Do It Yourself (2/4)

- Create a new sketch on the ‘yz plane’ of the “Connector Shell” as shown
- Exit the sketcher workbench.

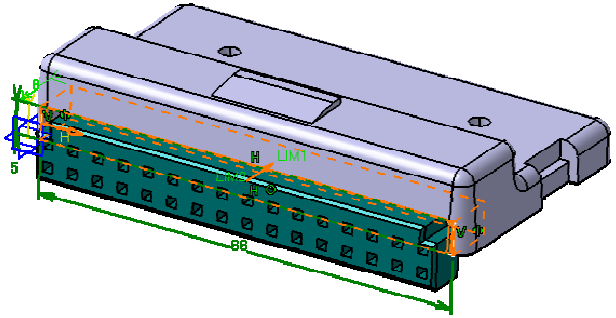
‘yz plane’

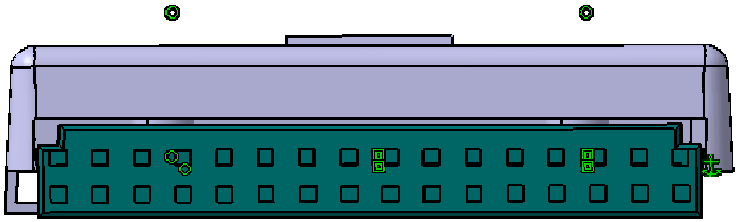




Pocket sketch

- Create a pocket using the sketch created in earlier step



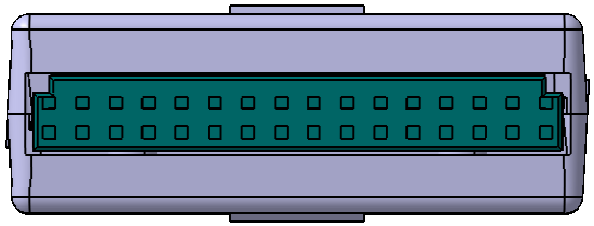


The pocket creates a clearance between “Connector Shell” and the “Connector Card”

Student Notes:

Do It Yourself (3/4)

- Unhide “Bottom Shell”



Now there is a clearance between the two
“Connector Shells” and the “Connector Card”

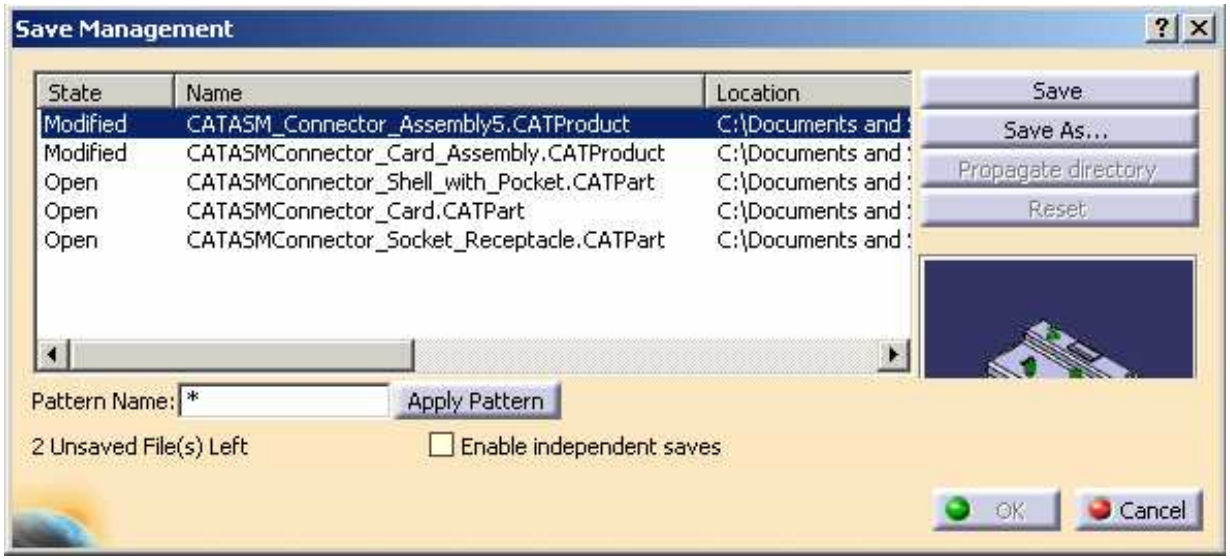
- Activate “Connector Assembly”

Student Notes:

Do It Yourself (4/4)

You can compare your results with the attached model :
"CATASM_Connector_Assembly5.CATProduct"

- Save various components using 'Save Management'.
  - Save "CATASMConnector_Shell.CATPart" as "CATASMConnector_Shell_with_Pocket.CATPart"
  - Save root assembly as "CATASM_Connector_Assembly5.CATProduct"
  - Click on Propagate directory to ensure all documents are saved in same folder



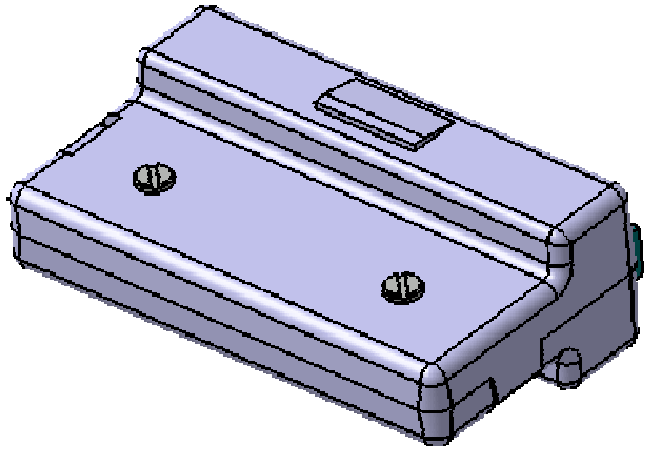
Connector Assembly

Step 5: Adding screws

10 min

In this step you will add and position the 'Connector Screw' in the "Connector Assembly".

You will then create a pattern of screw using an existing pattern.



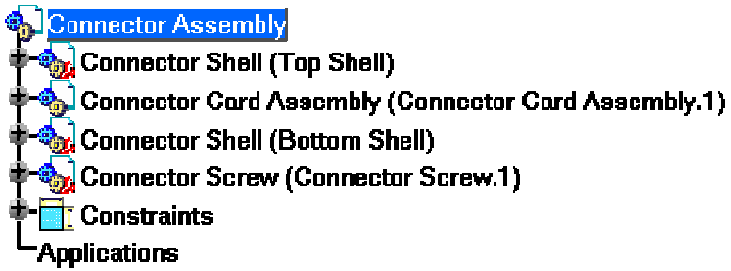
Student Notes:

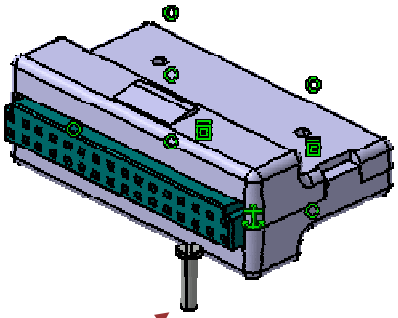
Student Notes:

Do It Yourself (1/3)

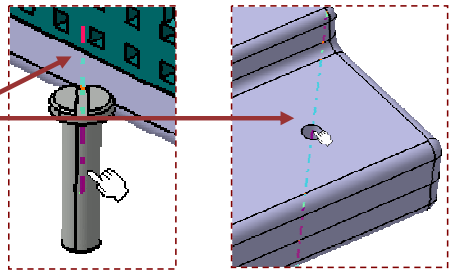
Documents used: “CATASM_Connector_Assembly5.CATProduct”, “CATASMConnector_Screw.CATPart”

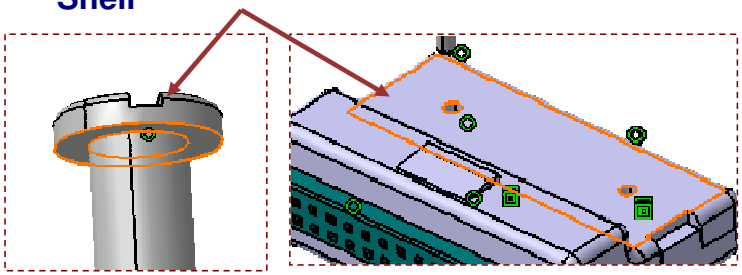
- Insert “CATASMConnector_Screw.CATPart” in “Connector Assembly” using ‘Insert Existing Component’.





- Position the “Connector Screw” by adding following assembly constraints:
  - Coincidence constraint between the axis of the “Connector Screw” and the axis of ‘Hole.1’ holes in the “Top Shell”
  - Contact constraint between the bottom face of the “Connector Screw” head and the top face of the “Top Shell”



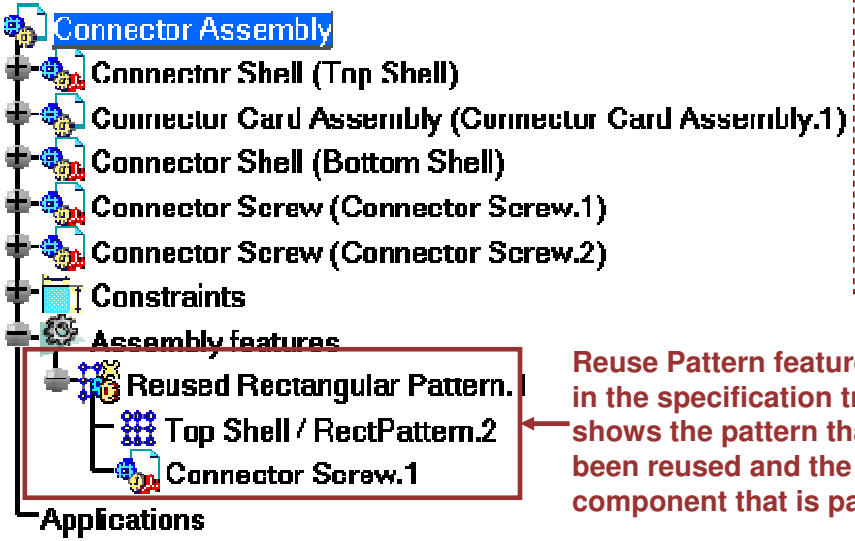


Click on Update icon to update constraints

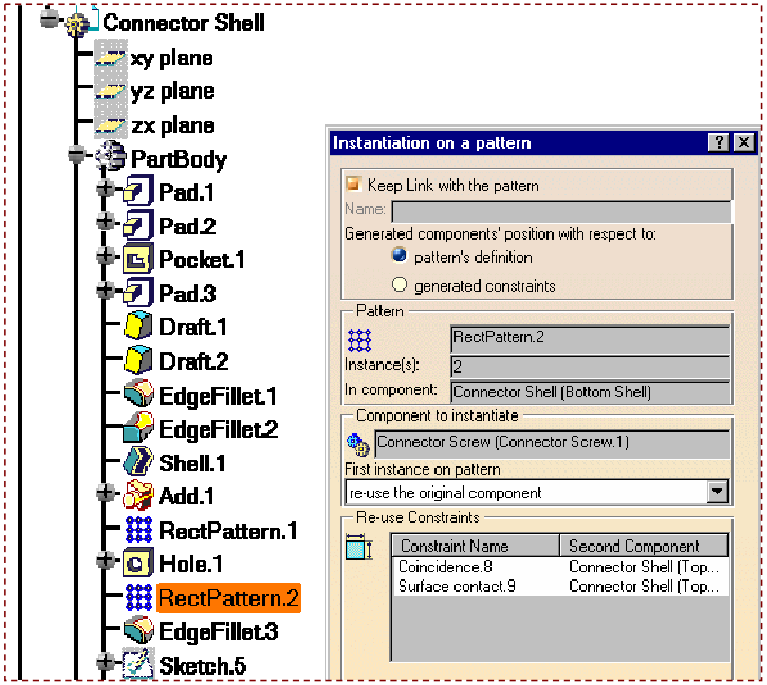
Student Notes:

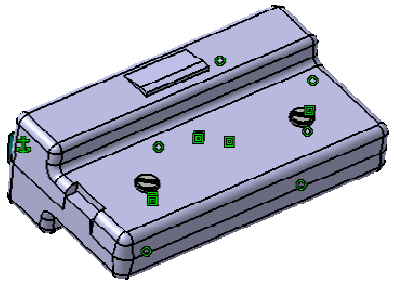
Do It Yourself (2/3)

- Duplicate the “Connector Screw” by using an existing pattern:
  - Select the “Connector Screw” (in the tree or on the geometry)
  - Click on the “Reuse Pattern” icon
  - To select the pattern, open the “Connector Shell” node and select ‘RectPattern.2’ in the tree or in the geometry.
  - Click OK to confirm the inputs



Reuse Pattern feature is added in the specification tree, which shows the pattern that has been reused and the component that is patterned.



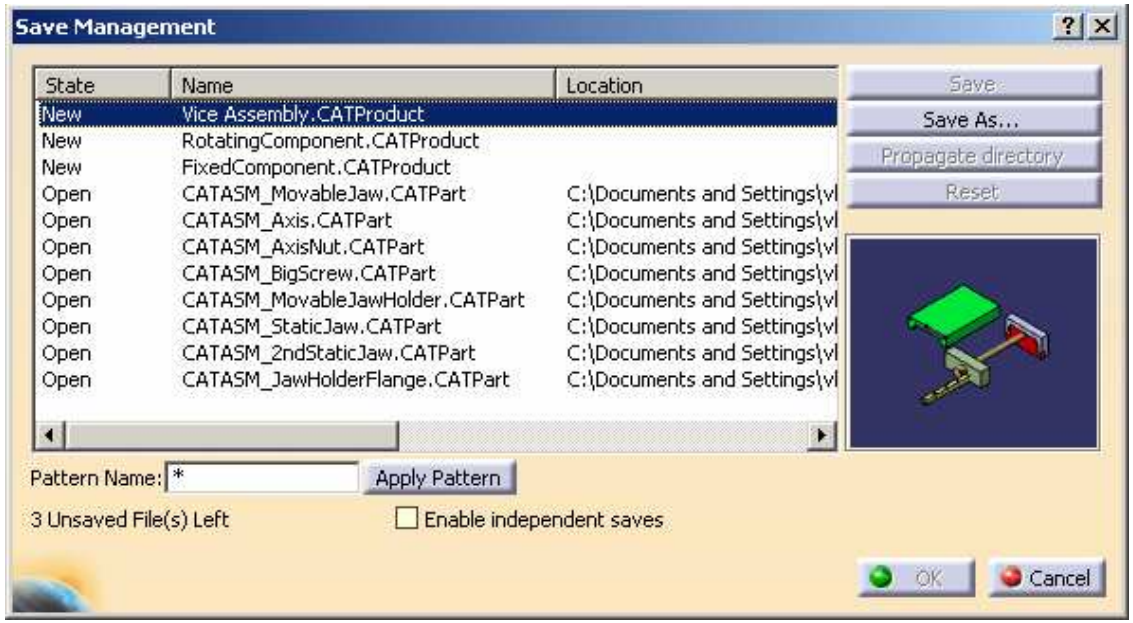


Student Notes:

Do It Yourself (3/3)

You can compare your results with the attached model:
"CATASM_Connector_Assembly5_end.CATProduct"

- Save the "Connector Assembly" as "CATASM_Connector_Assembly_5_end.CATProduct" using Save Management.
  - Use 'Propagate directory' to save all the files in same location



Student Notes:

Vice Assembly

You will practice concepts learned throughout the course, by building the master exercise and following the recommended process

- Vice Assembly : Presentation
- Vice Assembly (1): Creating the Structure
- Vice Assembly (2): Positioning Components
- Vice Assembly (3): Editing Parts
- Vice Assembly (4): Inserting Fitting Components from catalogs

Vice Assembly

Exercise Presentation

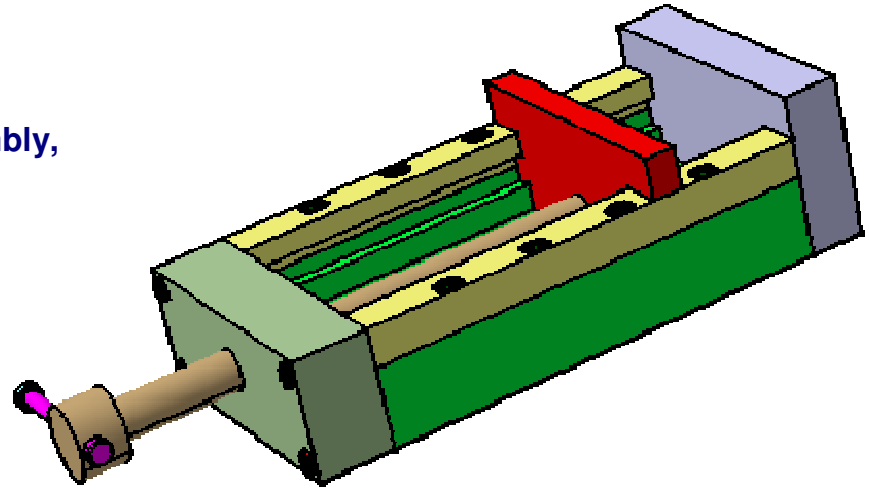
70 min

Objectives :

In this exercise you will build the Vice Assembly, modify two of its components and insert components from catalogs

In this exercise you will use :

- **Product Structure Tools**
- **Assembly Constraints**
- **Compass**
- **Catalog Browser**
- **Part Design in Context**
- **Standard Tools**

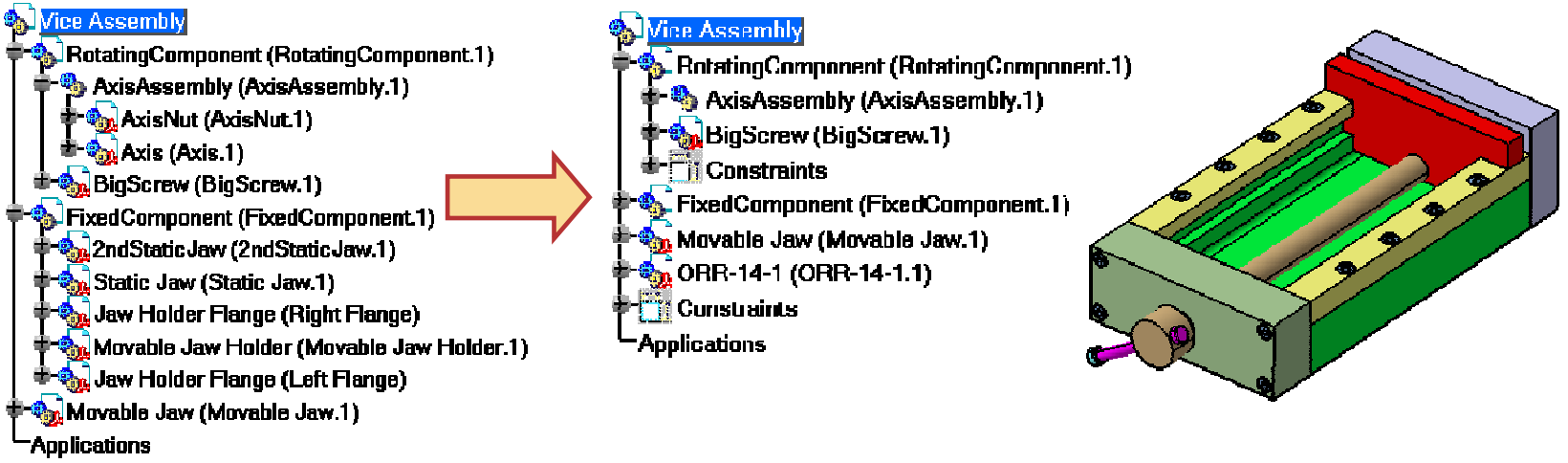


Vice Assembly

Student Notes:

Student Notes:

Design Intent: Vice Assembly

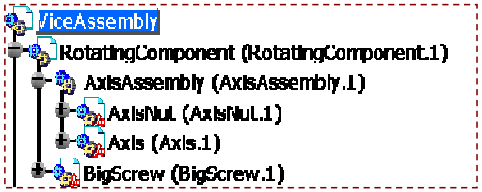


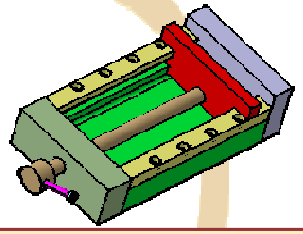
- Create a new product structure, name the root assembly (Vice Assembly) and its sub assemblies (RotatingComponent, FixedComponent and AxisAssembly)
- Add components inside appropriate assemblies
  - “Axis” and “Axis Nut” in “AxisAssembly”
  - “2ndStaticJaw”, “Static Jaw”, “Jaw Holder Flange” and “Movable Jaw Holder” in “FixedComponent”
  - “Movable Jaw” in “Vice Assembly”
- Position the Components and constrain them
- Design holes in both jaws in order to allow the assembly of fitting screws
- Using catalog,insert fitting elements (screws) in appropriate assemblies

Student Notes:

Design Process: Vice Assembly

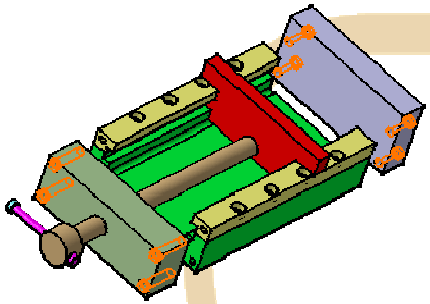
1. Create and name the assembly, insert components, assign Instance Names, and save the assembly



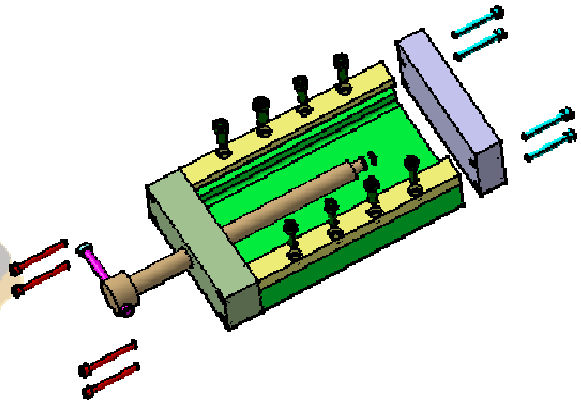


2. Position the components using constraints

3. Edit both Static Jaws by designing in context of the assembly



4. Insert fitting components from catalog and constrain them in appropriate assemblies



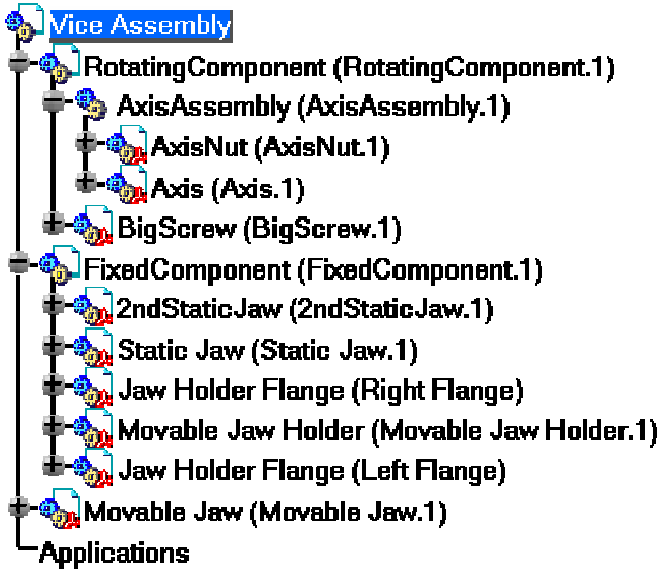
Student Notes:

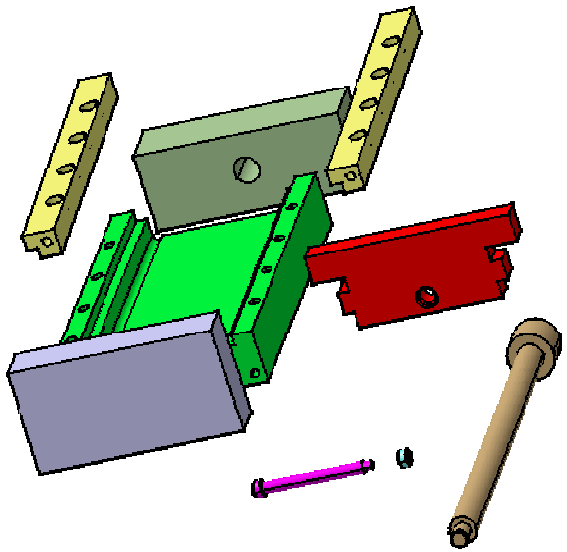
Vice Assembly

Step 1: Creating the Structure

15 min

In this step you will create and name a root assembly and its sub-assemblies, insert components, assign instance names, and save the assembly using save management.



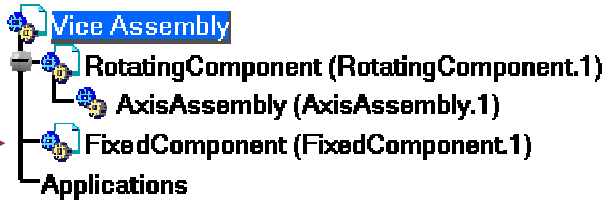


Student Notes:

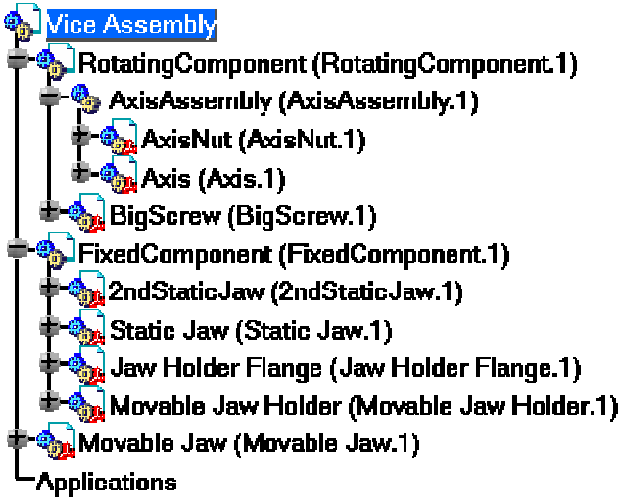
Do It Yourself (1/3)

Parts used: “CATASM_Axis.CATPart”, “CATASM_AxisNut.CATPart”, “CATASM_BigScrew.CATPart”, “CATASM_2ndStaticJaw.CATPart”, “CATASM_JawHolderFlange.CATPart”, “CATASM_MovableJawHolder.CATPart”, “CATASM_MovableJaw.CATPart” , “CATASM_StaticJaw.CATPart”

- Create a new CATProduct, name it as “Vice Assembly”
- Add new CATProducts and Components in the “Vice Assembly” to create the product structure as shown



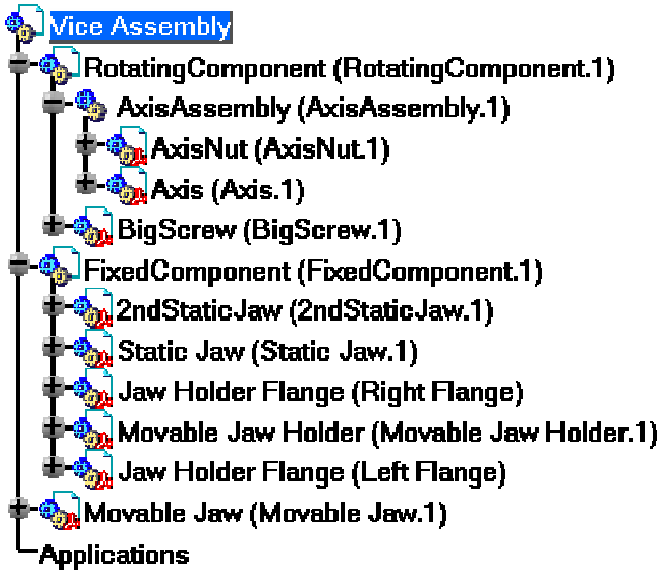
- Insert various CATParts in the assembly at locations as given below:
  - “CATASM_Axis.CATPart” and “CATASM_AxisNut.CATPart” in “AxisAssembly”
  - “CATASM_BigScrew.CATPart” in “RotatingComponent”
  - “CATASM_2ndStaticJaw.CATPart”, “CATASM_StaticJaw.CATPart”, “CATASM_JawHolderFlange.CATPart” and “CATASM_MovableJawHolder.CATPart” in “FixedComponent”
  - “CATASM_MovableJaw.CATPart” in “Vice Assembly”

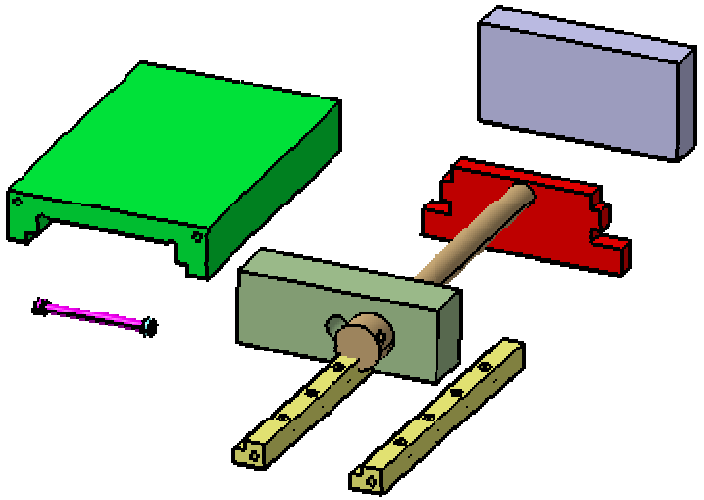


Student Notes:

Do It Yourself (2/3)

- Create a copy of “Jaw Holder Flange” in “Fixed Component”
- Set the instance names of the “Jaw Holder Flange” to “Right Flange” and “Left Flange”.

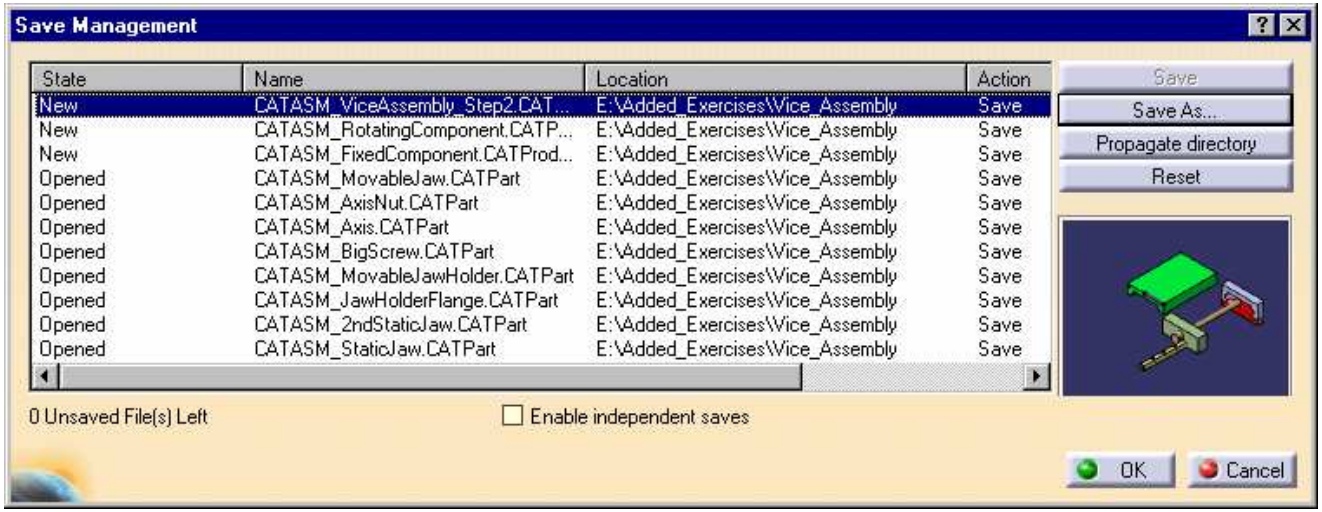




Student Notes:

Do It Yourself (3/3)

- Save the root assembly using Save Management in a new folder "Vice_Assembly". Save the new CATProducts as follows:
  - "Vice Assembly as "CATASM_ViceAssembly_Step2.CATProduct"
  - "RotatingComponent" as "CATASM_RotatingComponent.CATProduct"
  - "FixedComponent" as "CATASM_FixedComponent.CATProduct"

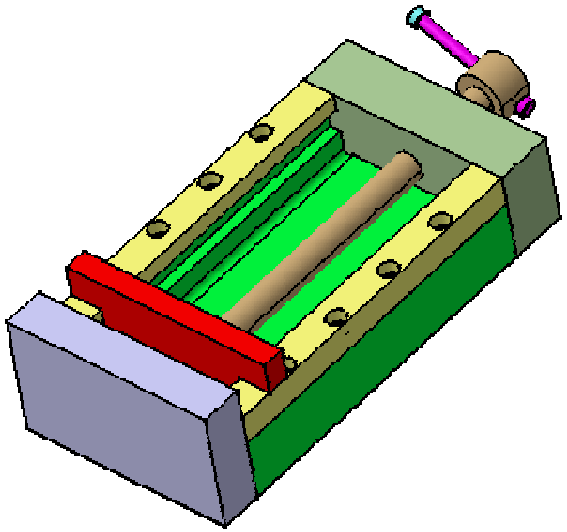


Vice Assembly

Step 2: Positioning Components

20 min

In this step you will create constraints to position components relative to each other in the correct active assemblies.



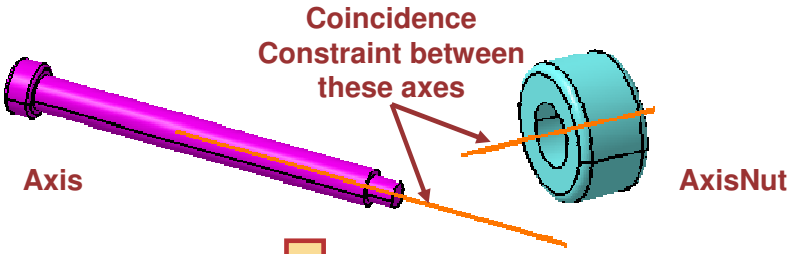
Student Notes:

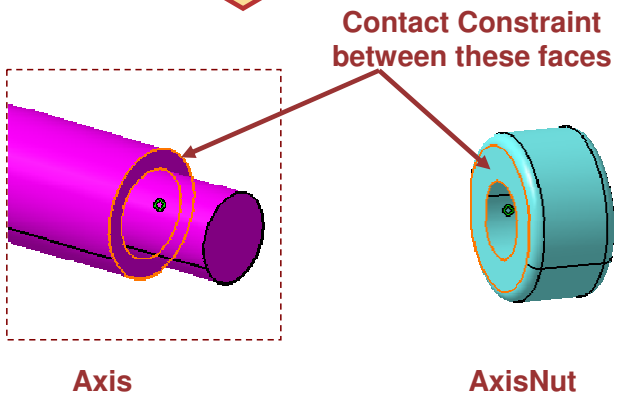
Student Notes:

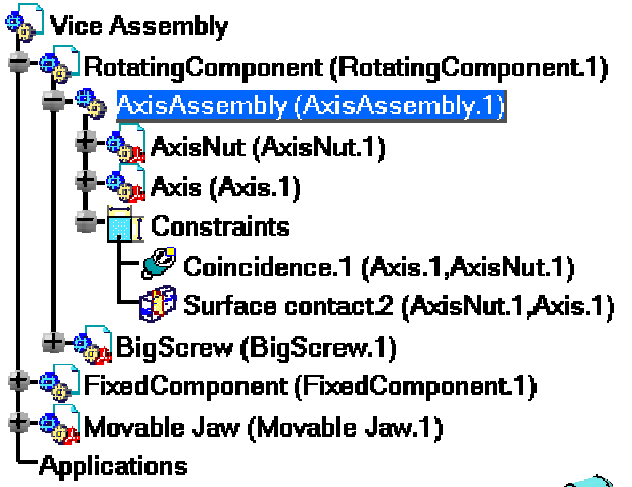
Do It Yourself (1/6)

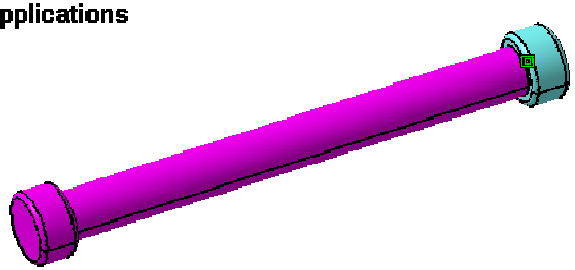
Products used: “CATASM_ViceAssembly_Step2.CATProduct

- Activate “AxisAssembly”
- Position and constrain parts in “AxisAssembly” by moving parts with compass, then add the following constraints and update the assembly:
  - Coincidence constraint between the axes of the “AxisNut” and “Axis”
  - Contact constraint between the faces of the “AxisNut” and “Axis”





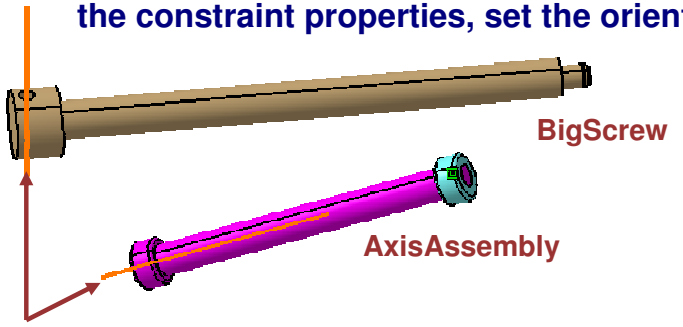


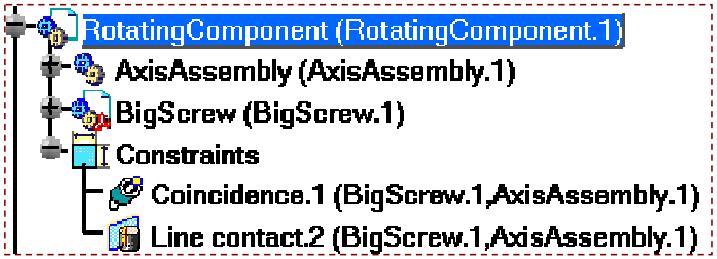


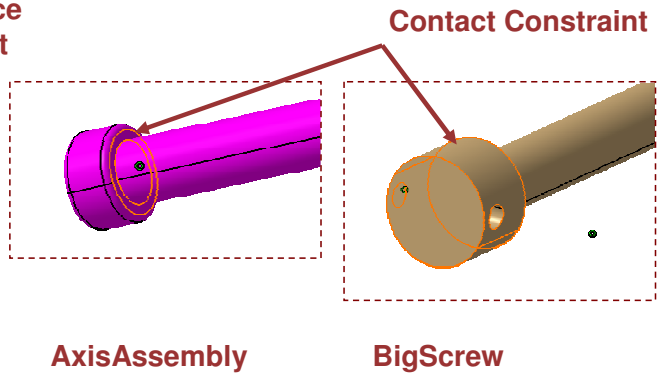
Student Notes:

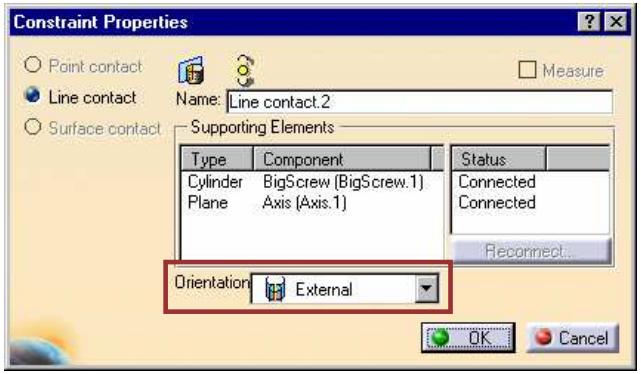
Do It Yourself (2/6)

- Hide “FixedComponent” and activate “RotatingComponent”
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axis of the hole in the “BigScrew” and the axis of the component “AxisAssembly”
  - Contact constraint between the faces of the “Axis” and the “BigScrew”. In the constraint properties, set the orientation to “External”.







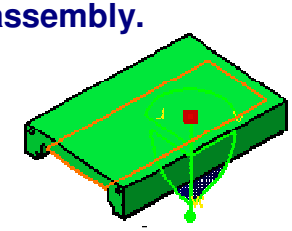


- Save the “RotatingComponent” as “CATASM_RotatingComponent_Step3.CATProduct”

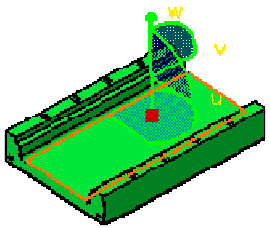
Student Notes:

Do It Yourself (3/6)

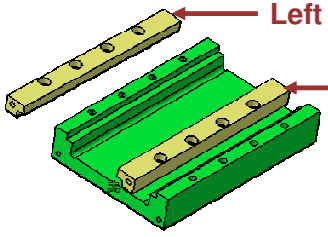
- Hide “RotatingComponent”, unhide and activate “FixedComponent”
- Rotate the “Movable Jaw Holder” using the compass to orient it as shown.
- Move and position the “Left Flange” and the “Right Flange” as shown.
- Fix in space “Movable Jaw Holder”
- Set the Multi-constraint mode to ‘Stack Mode’. Use ‘Stack Mode’ to add Offset constraints with ‘0mm’ offset between the highlighted faces and update the assembly.



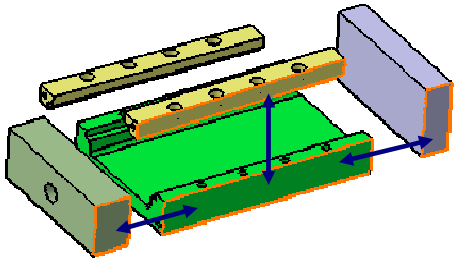
Initial “Movable Jaw Holder” Orientation

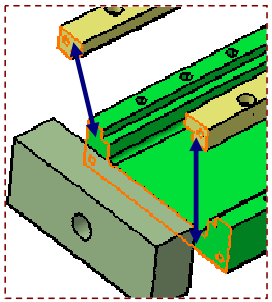


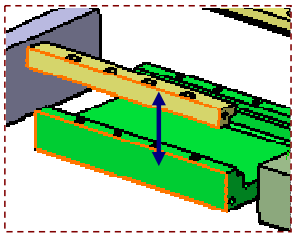
Final “Movable Jaw Holder” Orientation

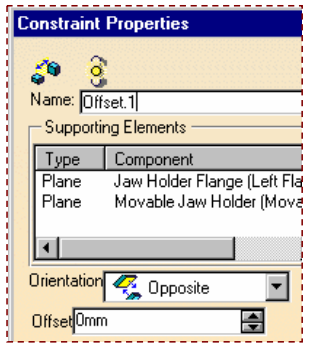


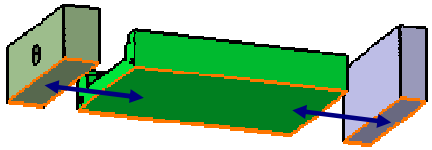
Flanges Orientation









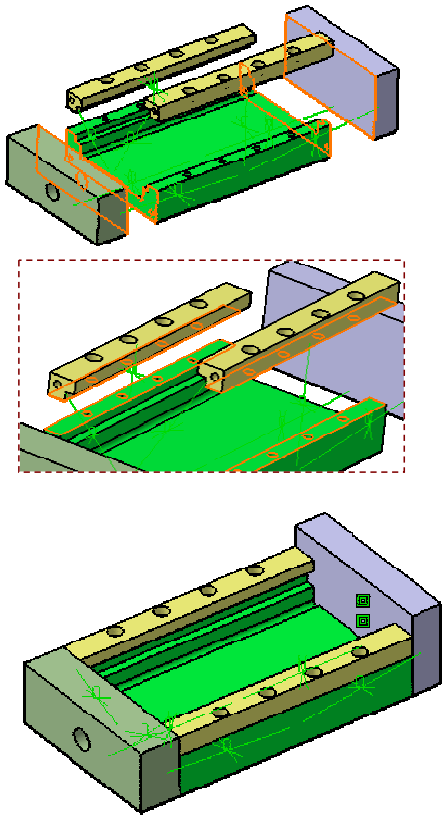


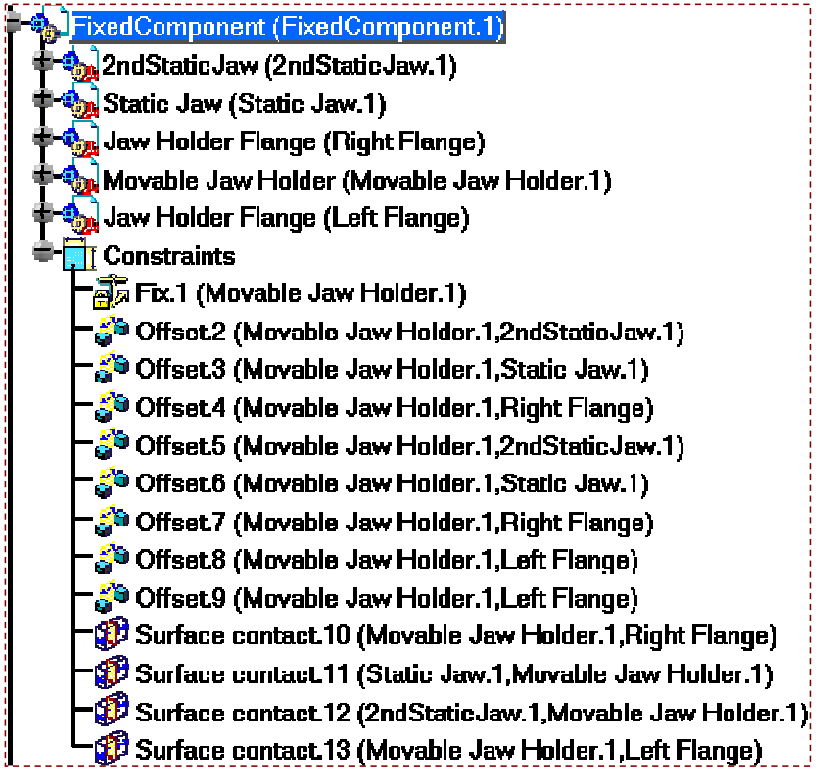
Offset Constraint

Student Notes:

Do It Yourself (4/6)

- Set the Multi-constraint mode to ‘Chain Mode’, add Contact constraints between highlighted faces and update the assembly.



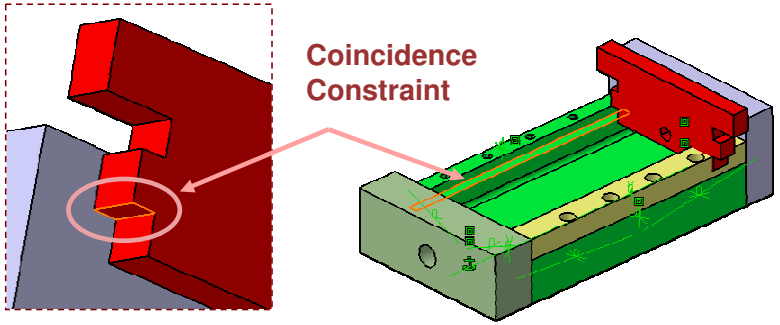


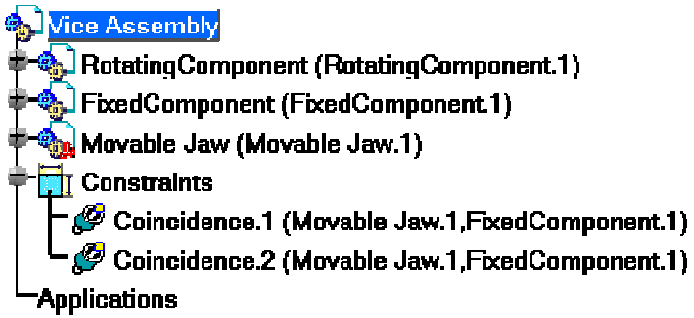
- Save the “FixedComponent” product as “CATASM_FixedComponent_Step3.CATProduct”

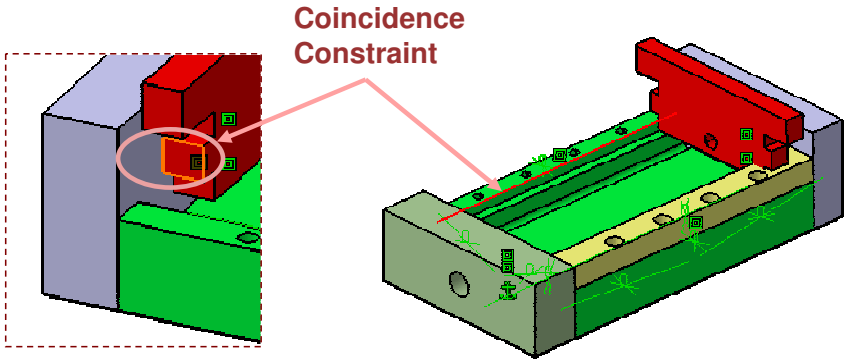
Student Notes:

Do It Yourself (5/6)

- Unhide “RotatingComponent” and activate “Vice Assembly”
- Set the Multi-constraint mode to ‘Default Mode’
- Hide “Left Flange”
- Add the following constraints and update the assembly:
  - Coincidence constraint between the faces of the “Movable Jaw” and “Movable Jaw Holder”
  - Coincidence constraint between the face of “Movable Jaw” and the edge of the “Movable Jaw Holder”



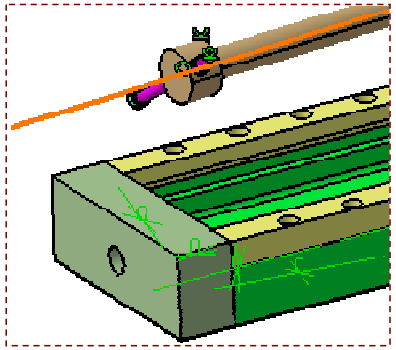


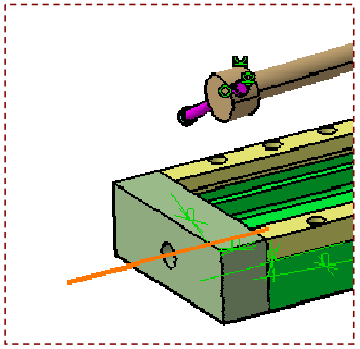


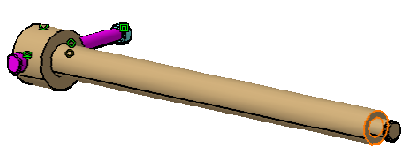
Student Notes:

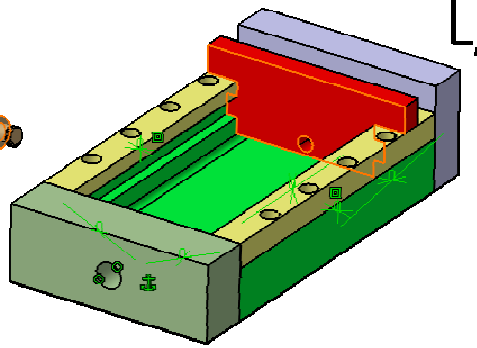
Do It Yourself (6/6)

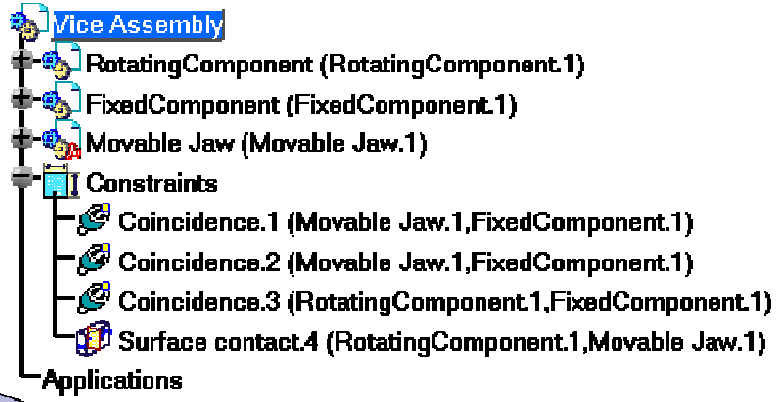
- Unhide “Left Flange”
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axis the “BigScrew” and the axis of the hole in the “2ndStaticJaw”
  - Contact constraint between the “BigScrew” and the “Movable Jaw”











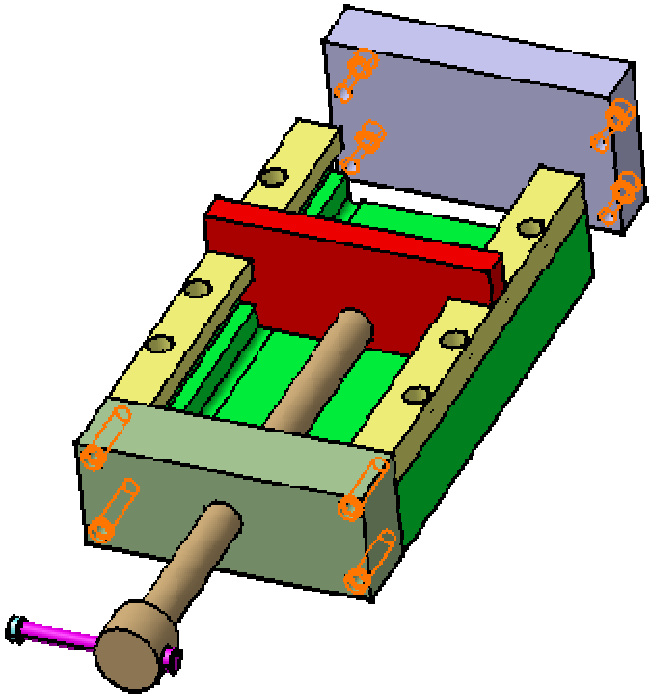
Student Notes:

Vice Assembly

Step 3: Editing parts

20 min

In this step you will design two parts in context of the assembly. You will create holes in the parts to accommodate fastening screws.

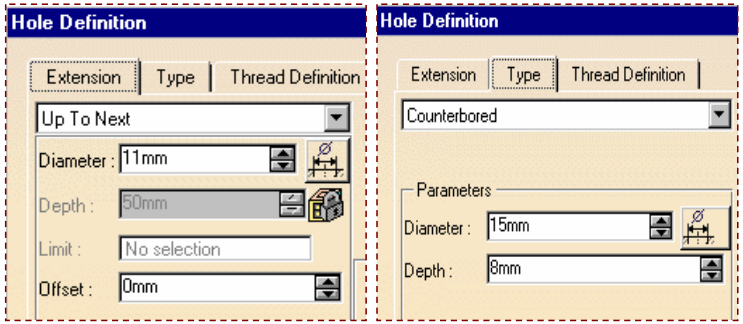


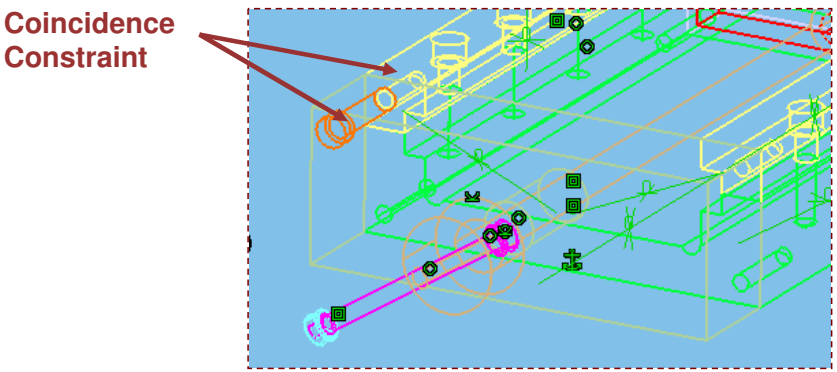
Student Notes:

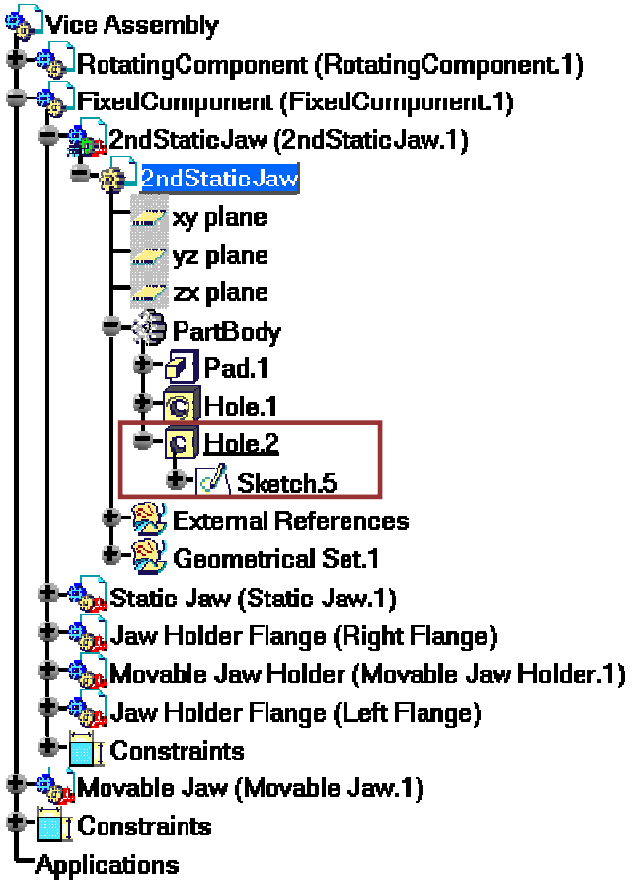
Do It Yourself (1/5)

Parts used: “CATASM_ViceAssembly_Step3.CATProduct

- Set the view mode to “Wireframe” and activate “2ndStaticJaw” CATPart
- Create a ‘Counter bored Hole’ on the front face with following dimensions and positioning:
  - Hole Diameter = 11mm
  - Counter bore Diameter =15mm and depth = 8mm
  - Hole should be concentric to the hole in “Left Flange”



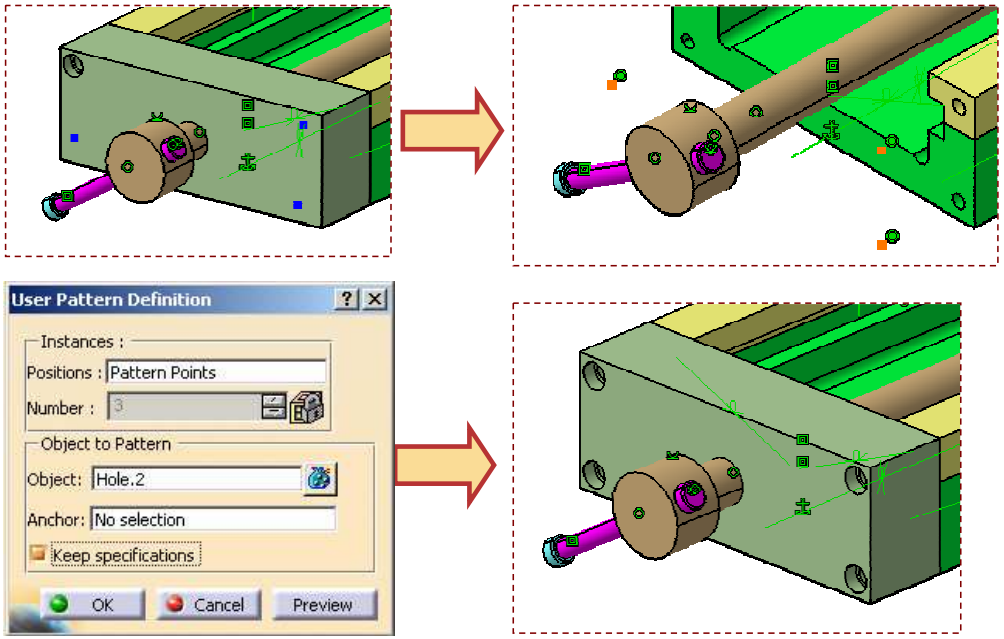


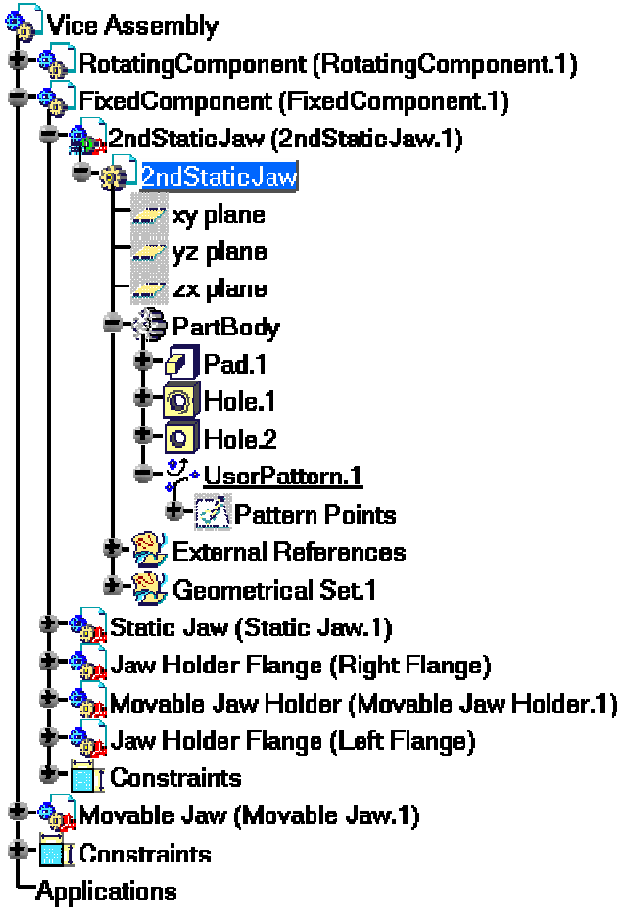


Student Notes:

Do It Yourself (2/5)

- Set the view mode to 'Shading with edges'
- Create a sketch consisting of three points on the front face of "2ndStaticJaw"
- Create 'Coincidence constraints' between each of these points and the holes in parts behind "2ndStaticJaw"
- Rename the sketch as "Pattern Points"
- Create a 'User Pattern' of the Counterbored Hole using 'Pattern Points' for positioning
- Save the "2ndStaticJaw" as "CATASM_2ndStaticJaw_Step4.CATPart"

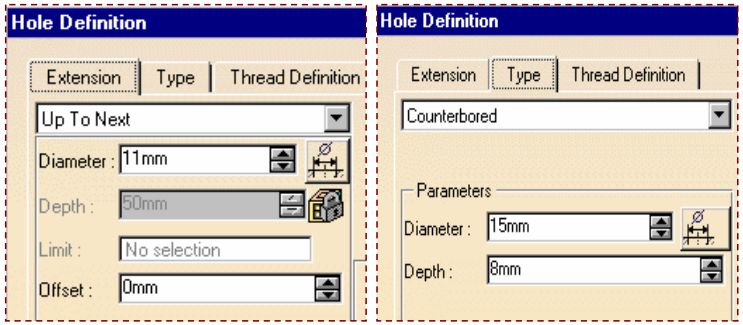


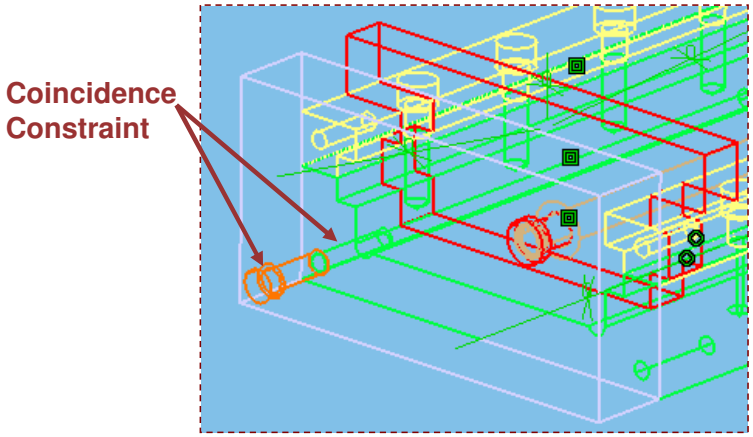


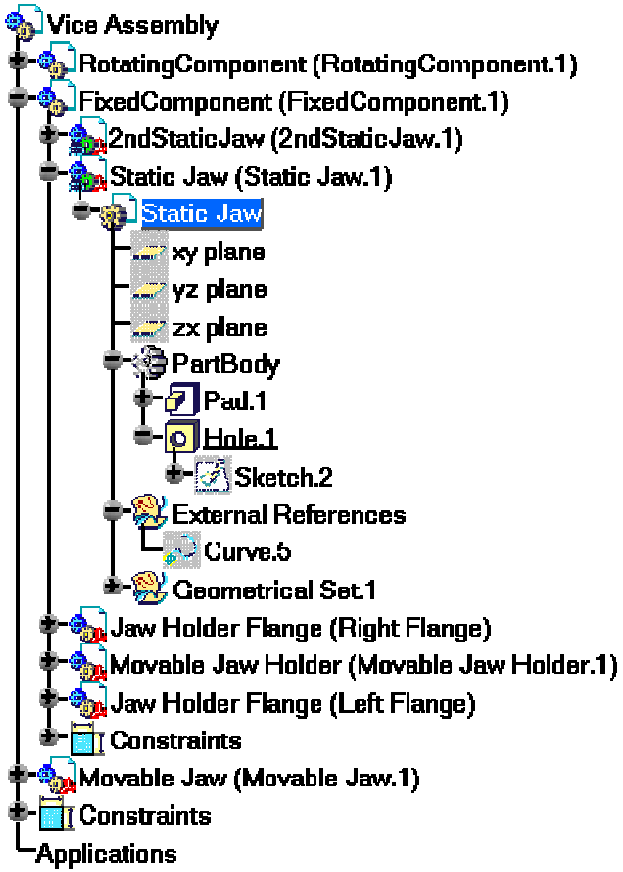
Student Notes:

Do It Yourself (3/5)

- Set the view mode to “Wireframe” and activate “Static Jaw” CATPart
- Create a ‘Counter bored Hole’ on the front face with following dimensions and positioning:
  - Hole Diameter = 11mm
  - Counter bore Diameter =15mm and depth = 8mm
  - Hole should be concentric to the hole in “Movable Jaw Holder”



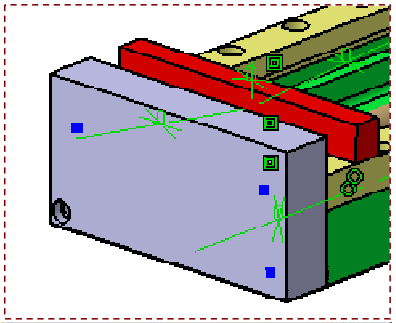


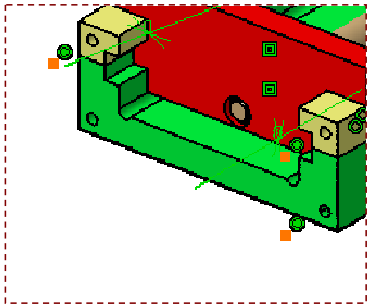


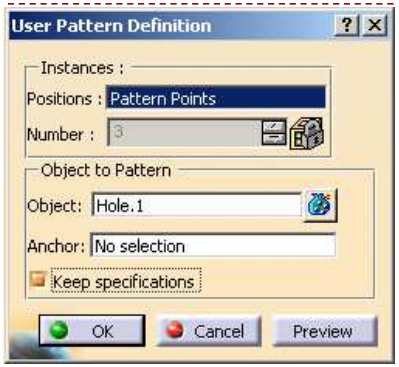
Student Notes:

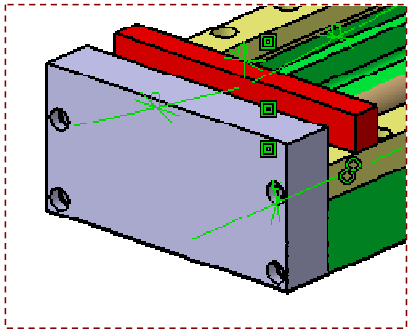
Do It Yourself (4/5)

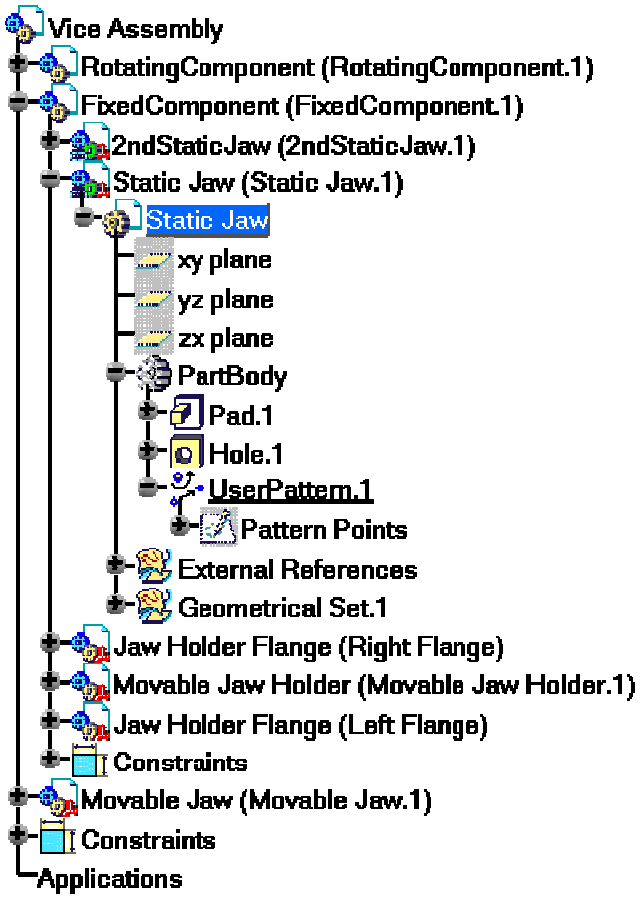
- Set the view mode to 'Shading with edges'
- Create a sketch consisting of three points on the front face of "Static Jaw"
- Create 'Coincidence constraints' between each of these points and the holes in parts behind "Static Jaw"
- Rename the sketch as "Pattern Points"
- Create a 'User Pattern' of the Counterbored Hole using 'Pattern Points' for positioning
- Save the "Static Jaw" as "CATASM_StaticJaw_Step4.CATPart"







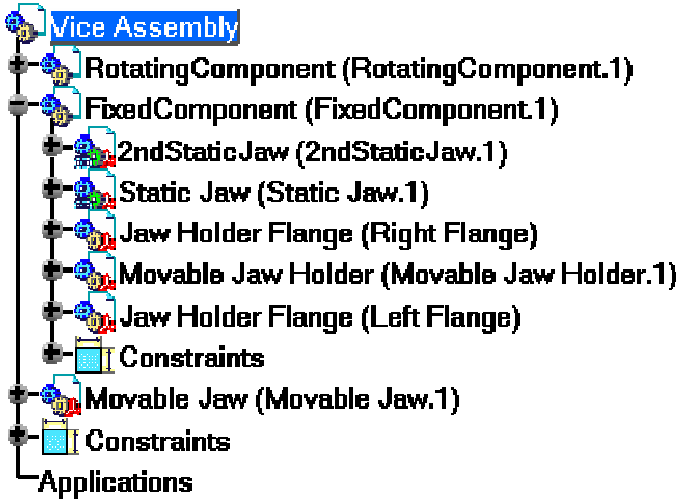


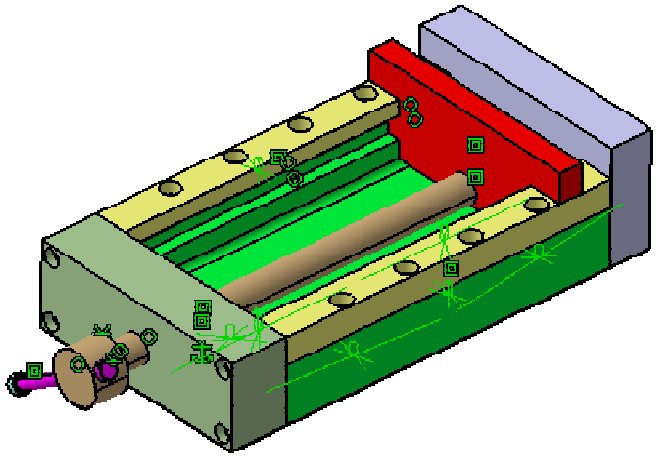


Student Notes:

Do It Yourself (5/5)

- Activate “Vice_Assembly”. Save the components as follows:
  - “FixedComponent” as “CATASM_FixedComponent_Step4.CATProduct”
  - “Vice Assembly” as “CATASM_ViceAssembly_Step4.CATProduct”





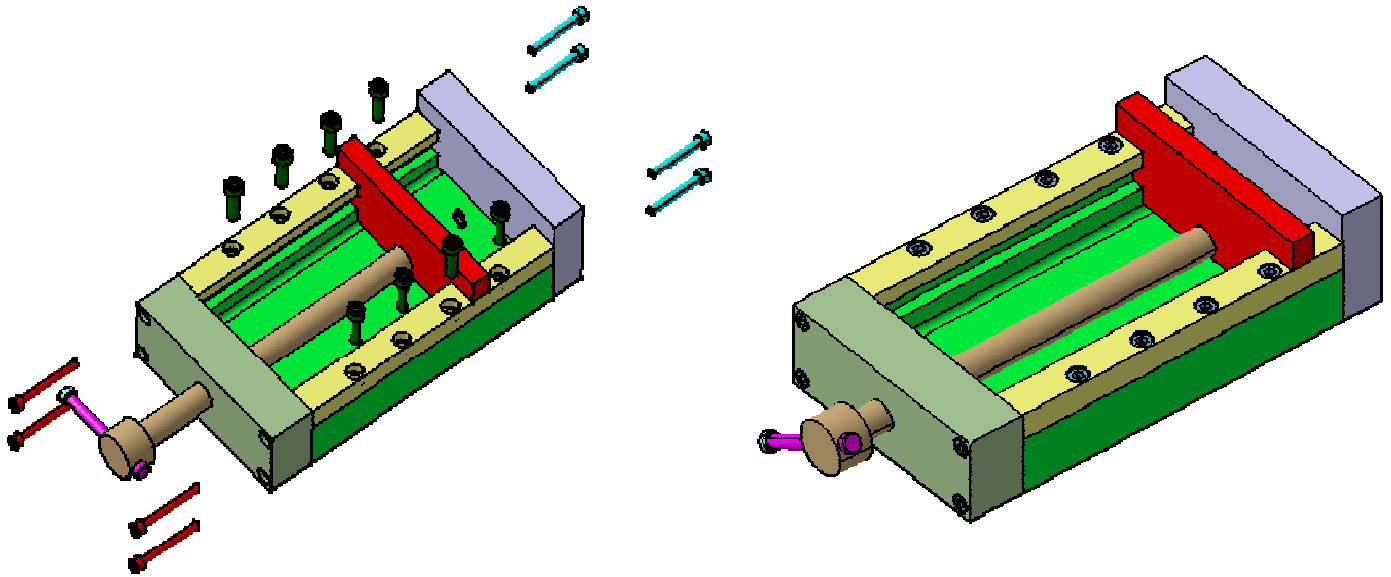
Student Notes:

Vice Assembly

Step 4: Inserting Fitting Components

15 min

In this exercise you will insert fitting elements from a catalog and constrain them in the assembly using assembly constraints.

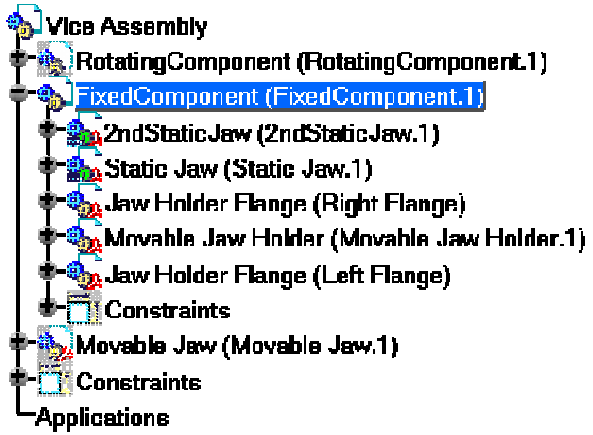


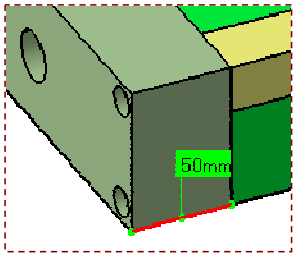
Student Notes:

Do It Yourself (1/16)

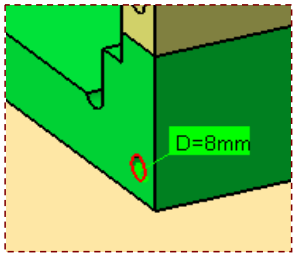
Parts used: “CATASM_ViceAssembly_Step4.CATProduct”

- Activate “FixedComponent”
- Hide “RotatingComponent” and “Movable Jaw”
- Measure following distances and diameters and keep these measures:
  - Thickness of the ‘2ndStaticJaw’ as “Thickness1”
  - Diameter of hole in ‘Movable Jaw Holder’ as “Diameter1”
  - Thickness of ‘Static Jaw’ as “Thickness2”
  - Diameter of hole in ‘Movable Jaw Holder’ as “Diameter2”
  - Thickness of ‘Right Flange’ as “Thickness3”
  - Diameter of hole in ‘Movable Jaw Holder’ as “Diameter3”

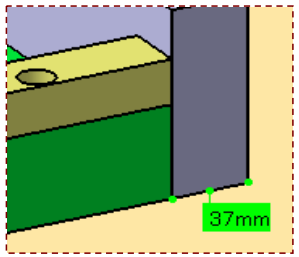




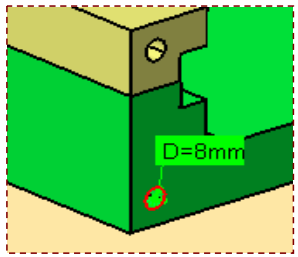
Thickness1



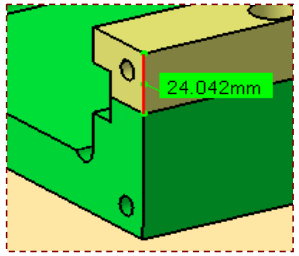
Diameter1



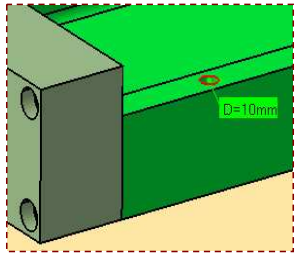
Thickness2



Diameter2



Thickness3

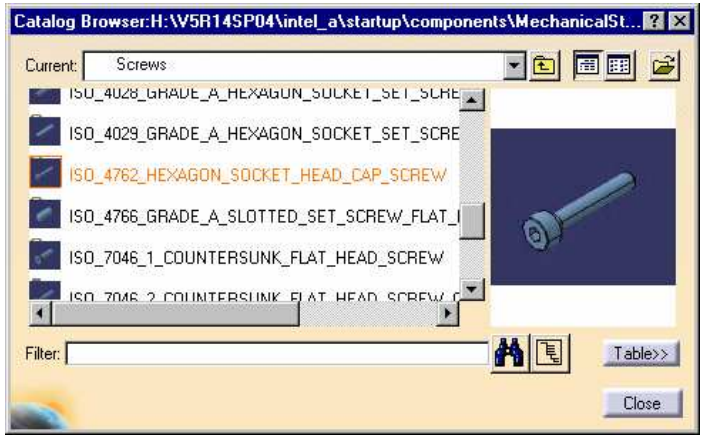


Diameter3

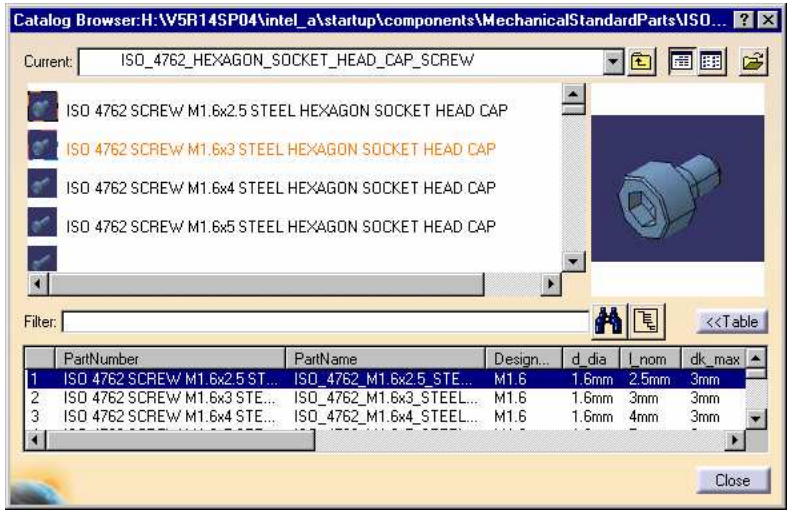
Student Notes:

Do It Yourself (2/16)

- Open the “ISO.Catalog” by clicking on the Catalog Browser
- Browse the ‘Screws’ chapter. Inside ‘Screws’, browse the “ISO_4762_HEXAGON_SOCKET_HEAD_CAP_SCREW”.



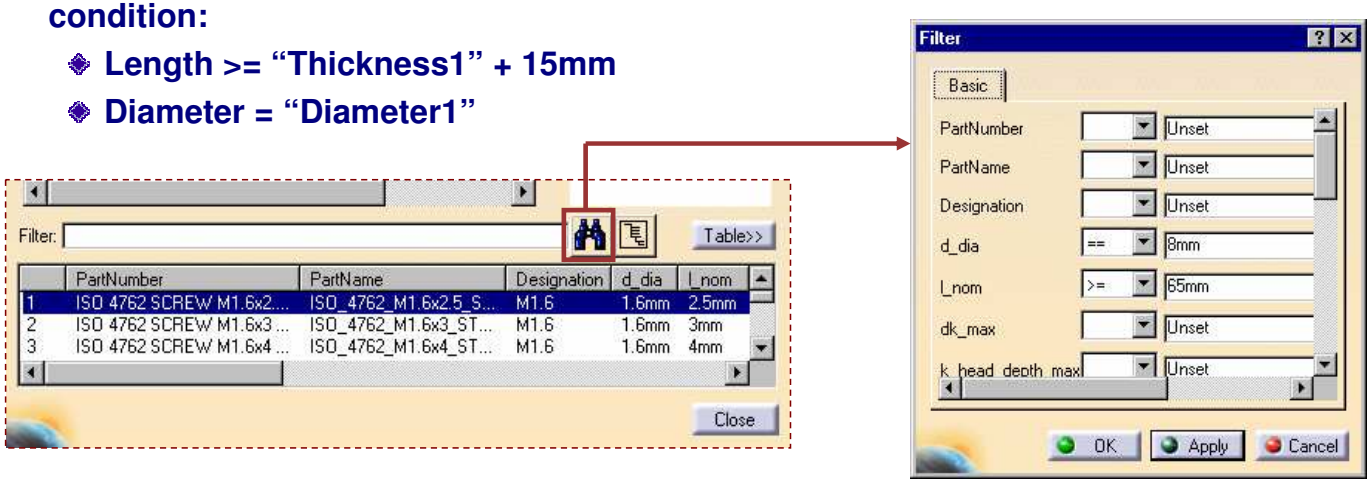
- Expand the Catalog Browser window by clicking on “Table” button



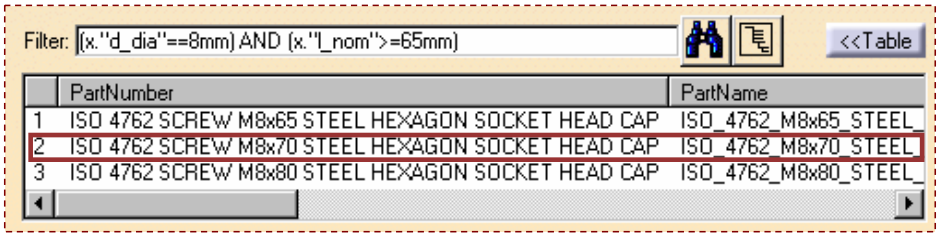
Student Notes:

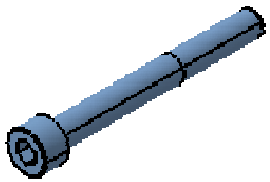
Do It Yourself (3/16)

- Apply filter on the table to select the screw which respects the following condition:
  - Length >= “Thickness1” + 15mm
  - Diameter = “Diameter1”



- Double click on “ISO 4762 SCREW M8x70 STEEL HEXAGON SOCKET HEAD CAP” to insert it inside “FixedComponent”

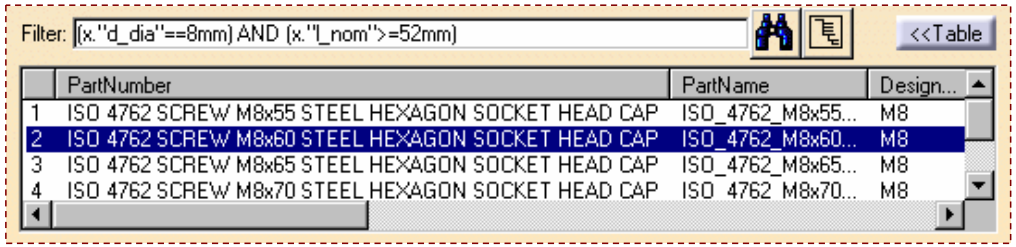


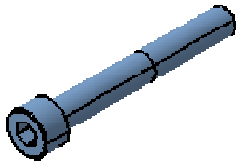


Student Notes:

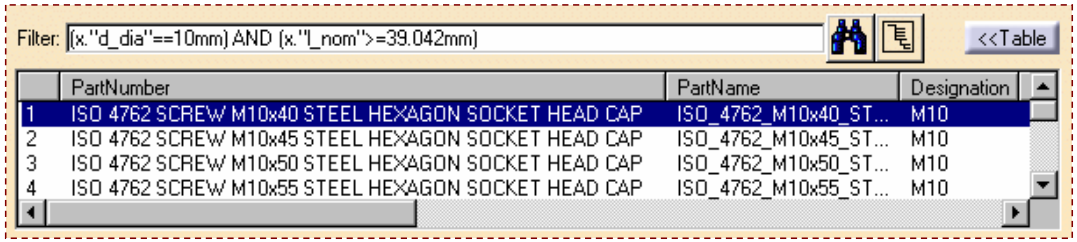
Do It Yourself (4/16)

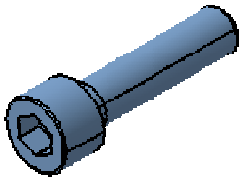
- Apply filter on the table to select the screw which respects the following condition:
  - Length >= “Thickness2” + 15mm
  - Diameter = “Diameter2”
- Double click on “ISO 4762 SCREW M8x60 STEEL HEXAGON SOCKET HEAD CAP” to insert it inside “FixedComponent”





- Apply filter on the table to select the screw which respects the following condition:
  - Length >= “Thickness3” + 15mm
  - Diameter = “Diameter3”
- Double click on “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP” to insert it inside “FixedComponent”

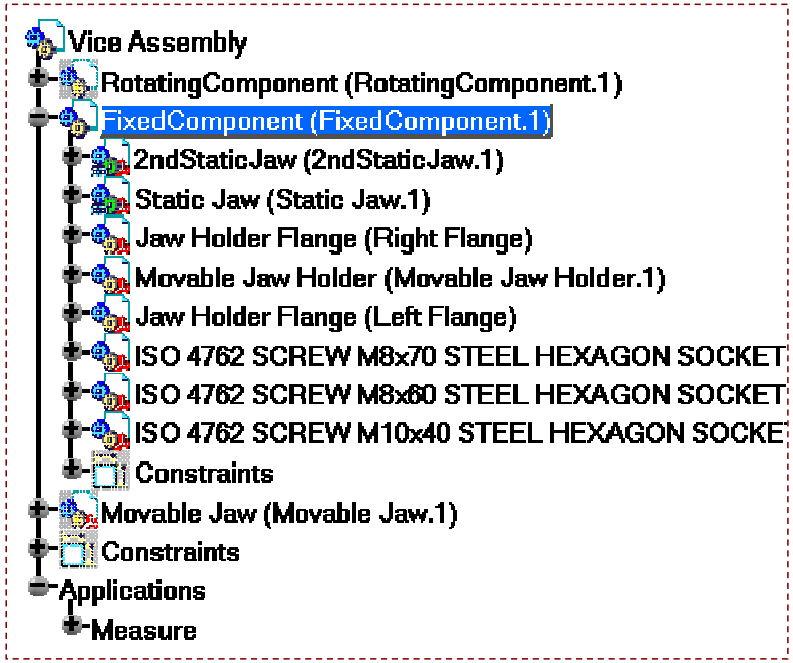


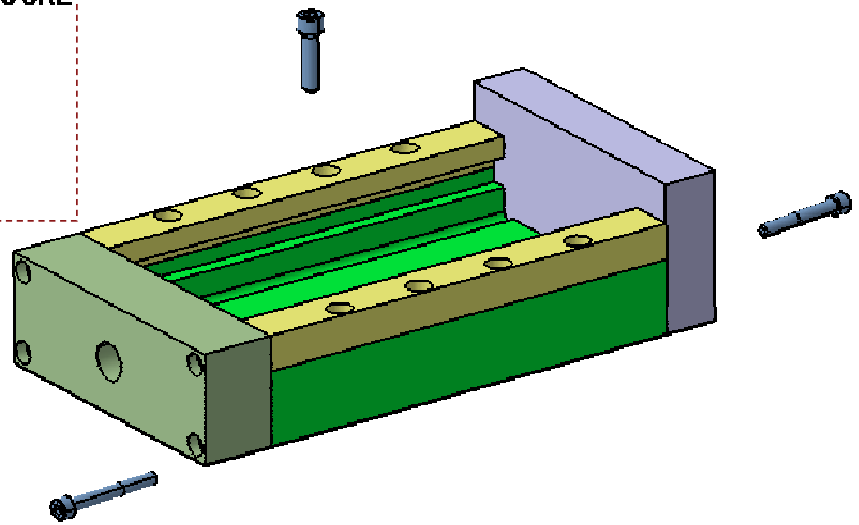


Student Notes:

Do It Yourself (5/16)

- Hide all the measures
- Move the screws and position them roughly as shown

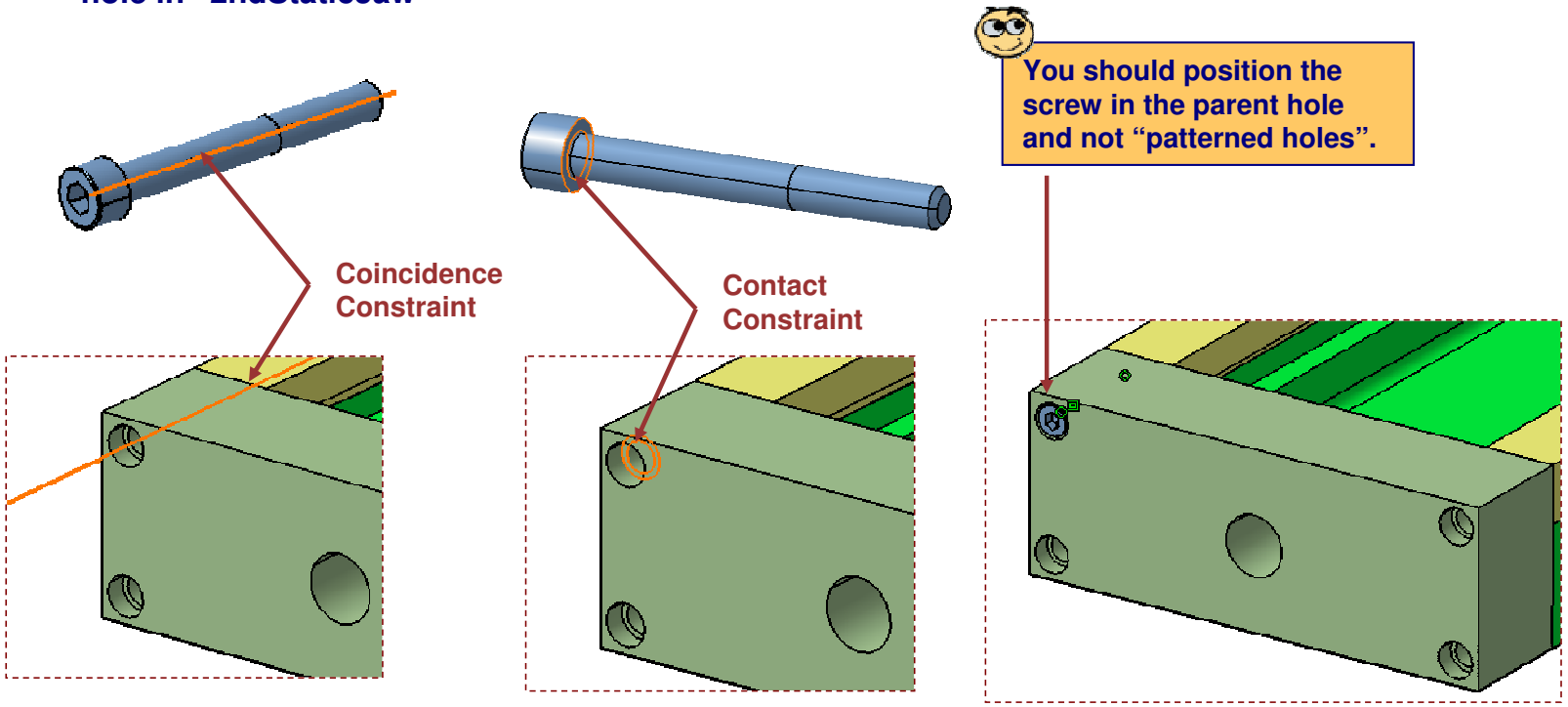




Student Notes:

Do It Yourself (6/16)

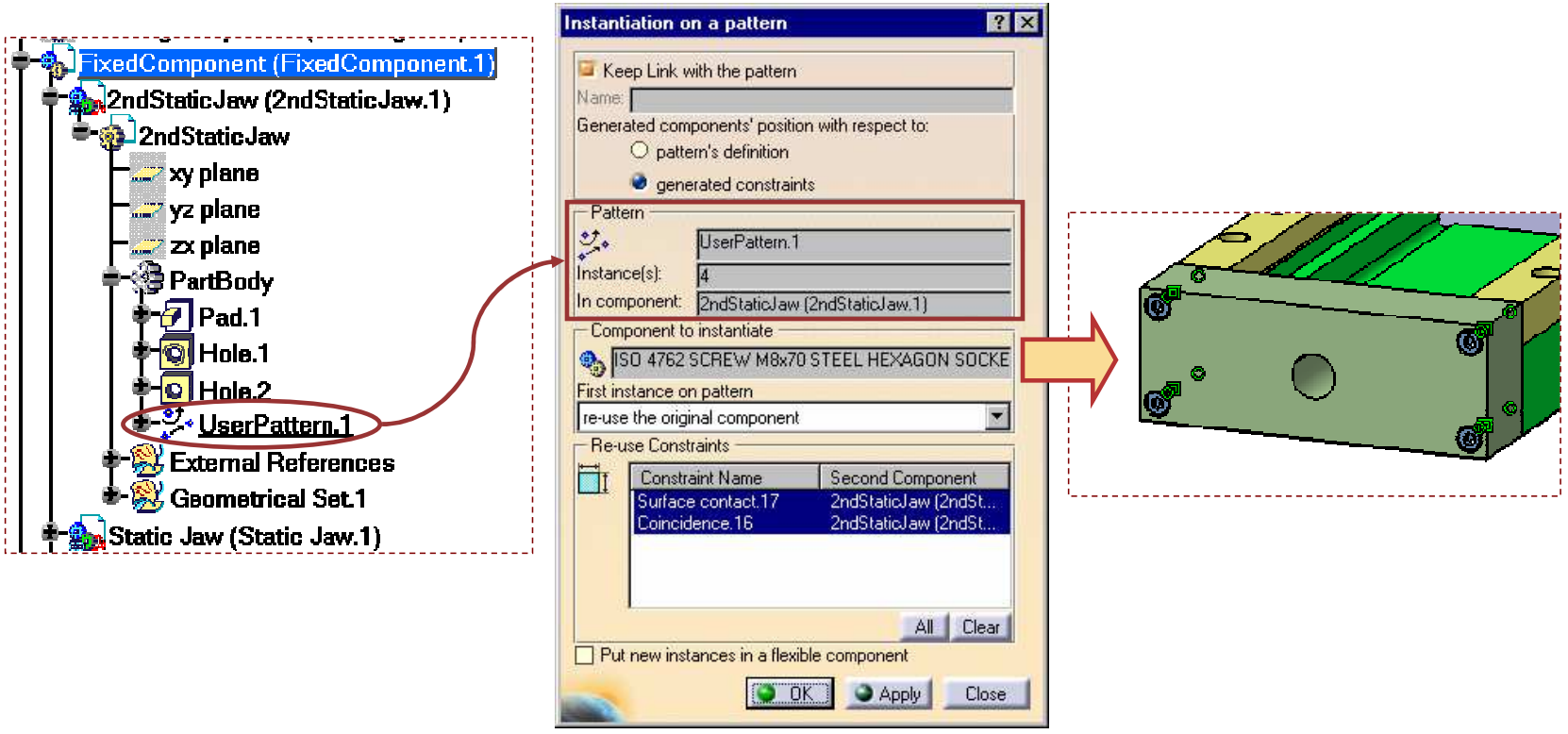
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axes of the “ISO 4762 SCREW M8x70 STEEL HEXAGON SOCKET HEAD CAP” and the hole in “2ndStaticJaw”
  - Contact constraint between the faces of “ISO 4762 SCREW M8x70 STEEL HEXAGON SOCKET HEAD CAP” and the inside face of the counter bored hole in “2ndStaticJaw”



Student Notes:

Do It Yourself (7/16)

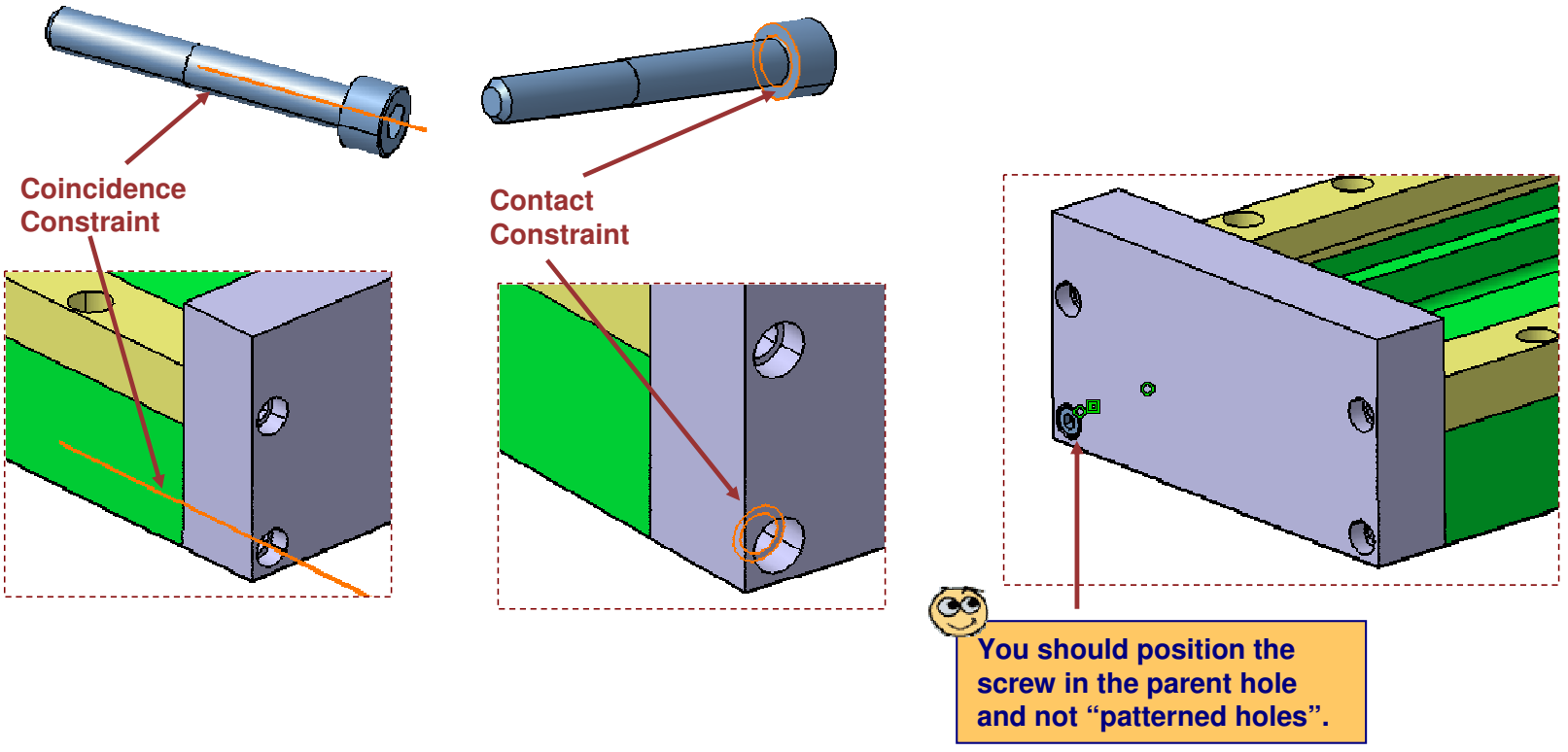
- Instantiate multiple instances of the screw “ISO 4762 SCREW M8x70 STEEL HEXAGON SOCKET HEAD CAP” in “FixedComponent” using ‘Reuse Pattern’
  - Use the ‘UserPattern.1’ in ‘2ndStaticJaw’ as pattern for instantiation
  - Reuse all detected constraints during instantiation



Student Notes:

Do It Yourself (8/16)

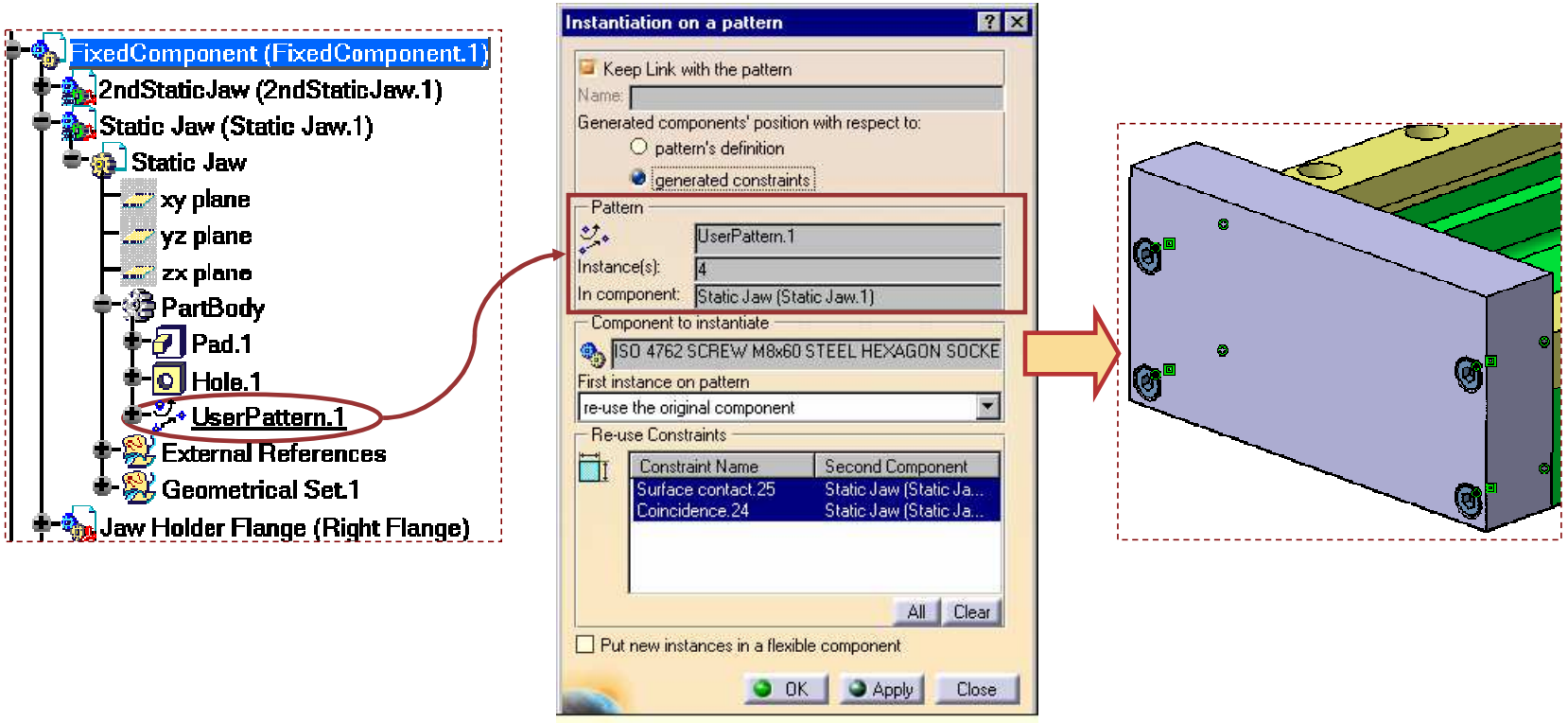
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axes of the “ISO 4762 SCREW M8x60 STEEL HEXAGON SOCKET HEAD CAP” and the hole in “Static Jaw”
  - Contact constraint between the faces of “ISO 4762 SCREW M8x60 STEEL HEXAGON SOCKET HEAD CAP” and the inside face of the counter bored hole in “Static Jaw”



Student Notes:

Do It Yourself (9/16)

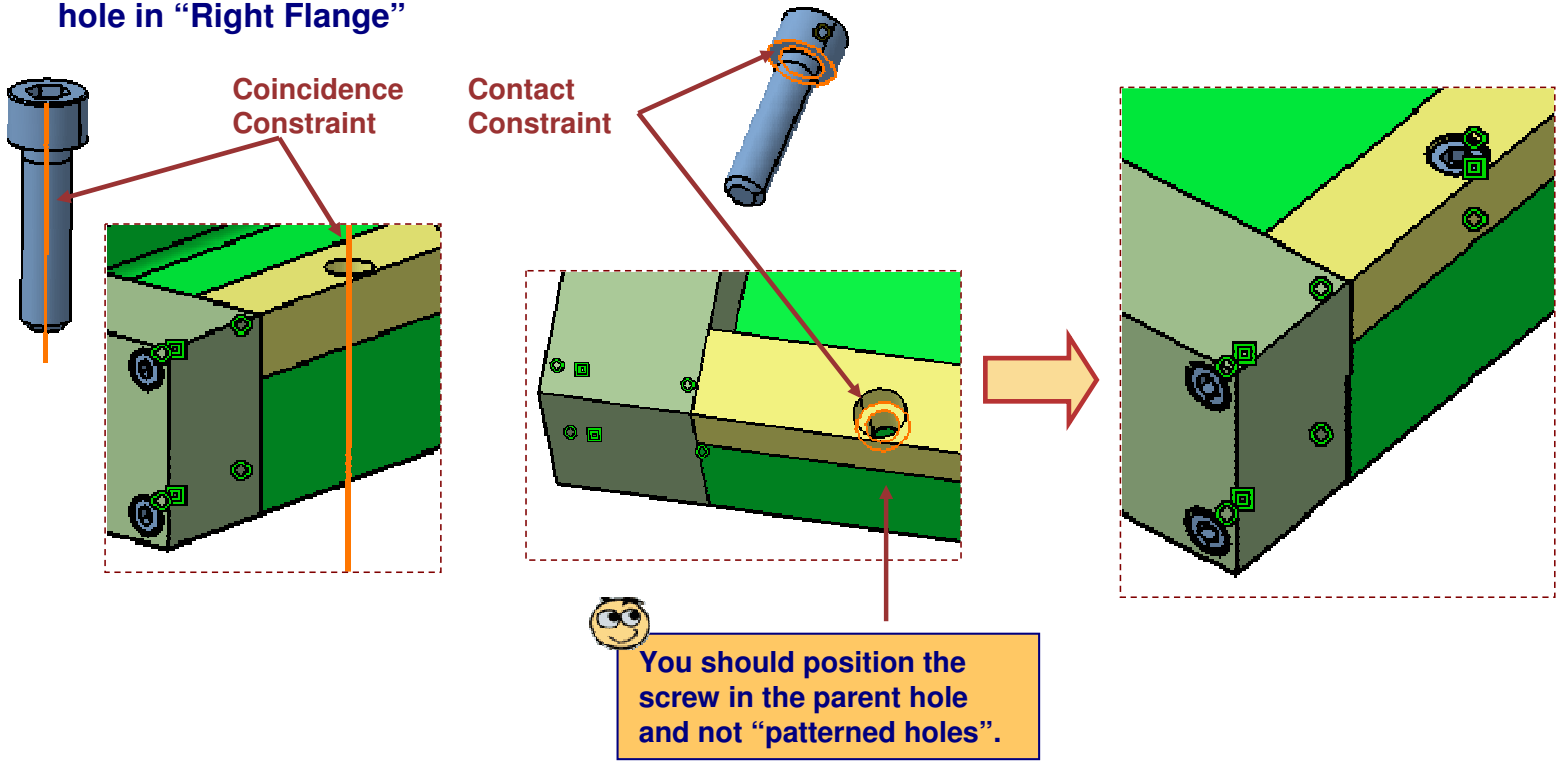
- Instantiate multiple instances of the screw “ISO 4762 SCREW M8x60 STEEL HEXAGON SOCKET HEAD CAP” in “FixedComponent” using ‘Reuse Pattern’
  - Use the ‘UserPattern.1’ in ‘Static Jaw’ as pattern for instantiation
  - Reuse all detected constraints during instantiation



Student Notes:

Do It Yourself (10/16)

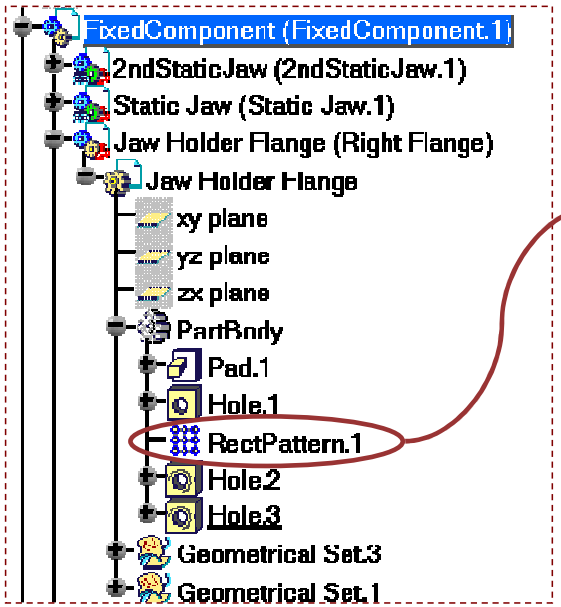
- Create another instance of “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP” in “FixedComponent” by using copy + paste and move the two instances apart using compass.
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axes of the “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP.1” and the hole in “Right Flange”
  - Contact constraint between the faces of “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP.1” and the inside face of the counter bored hole in “Right Flange”

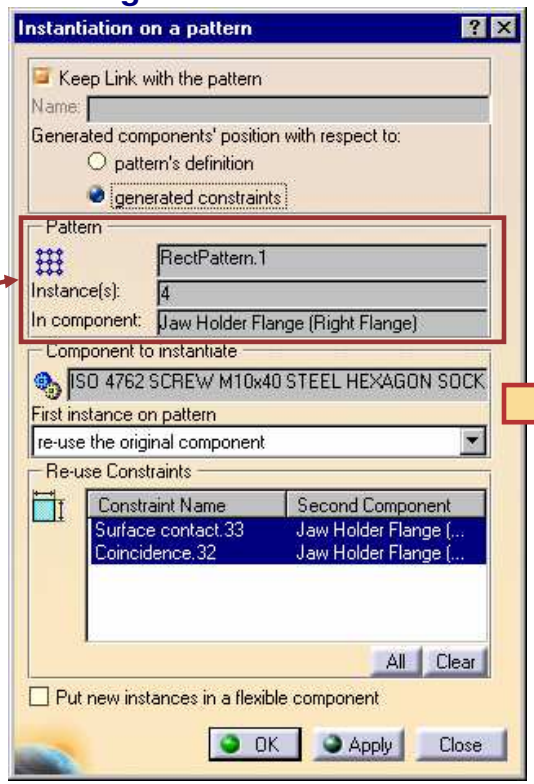


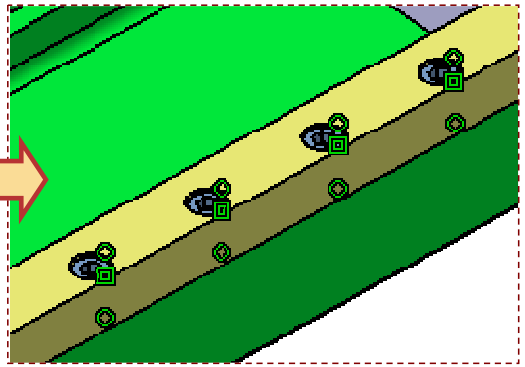
Student Notes:

Do It Yourself (11/16)

- Instantiate multiple instances of the screw “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP.1” in “FixedComponent” using ‘Reuse Pattern’
  - Use the ‘RectPattern.1’ in ‘Right Flange’ as pattern for instantiation
  - Reuse all detected constraints during instantiation



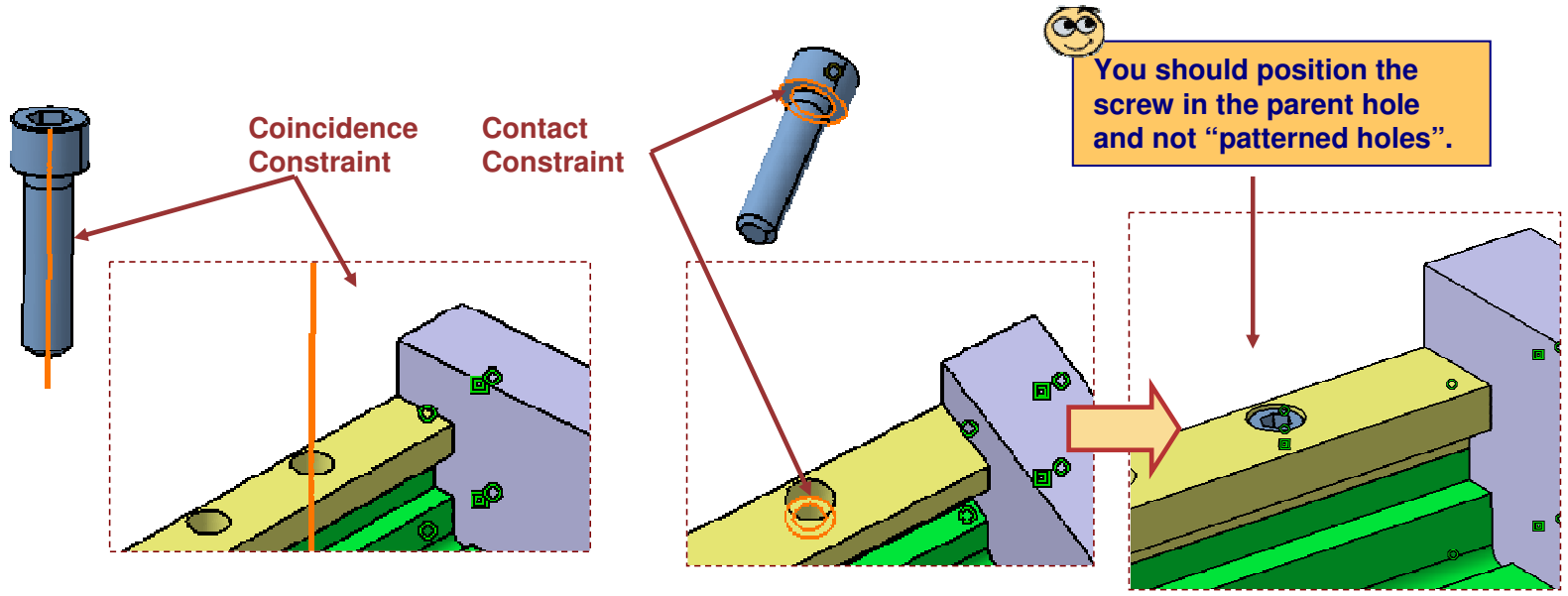




Student Notes:

Do It Yourself (12/16)

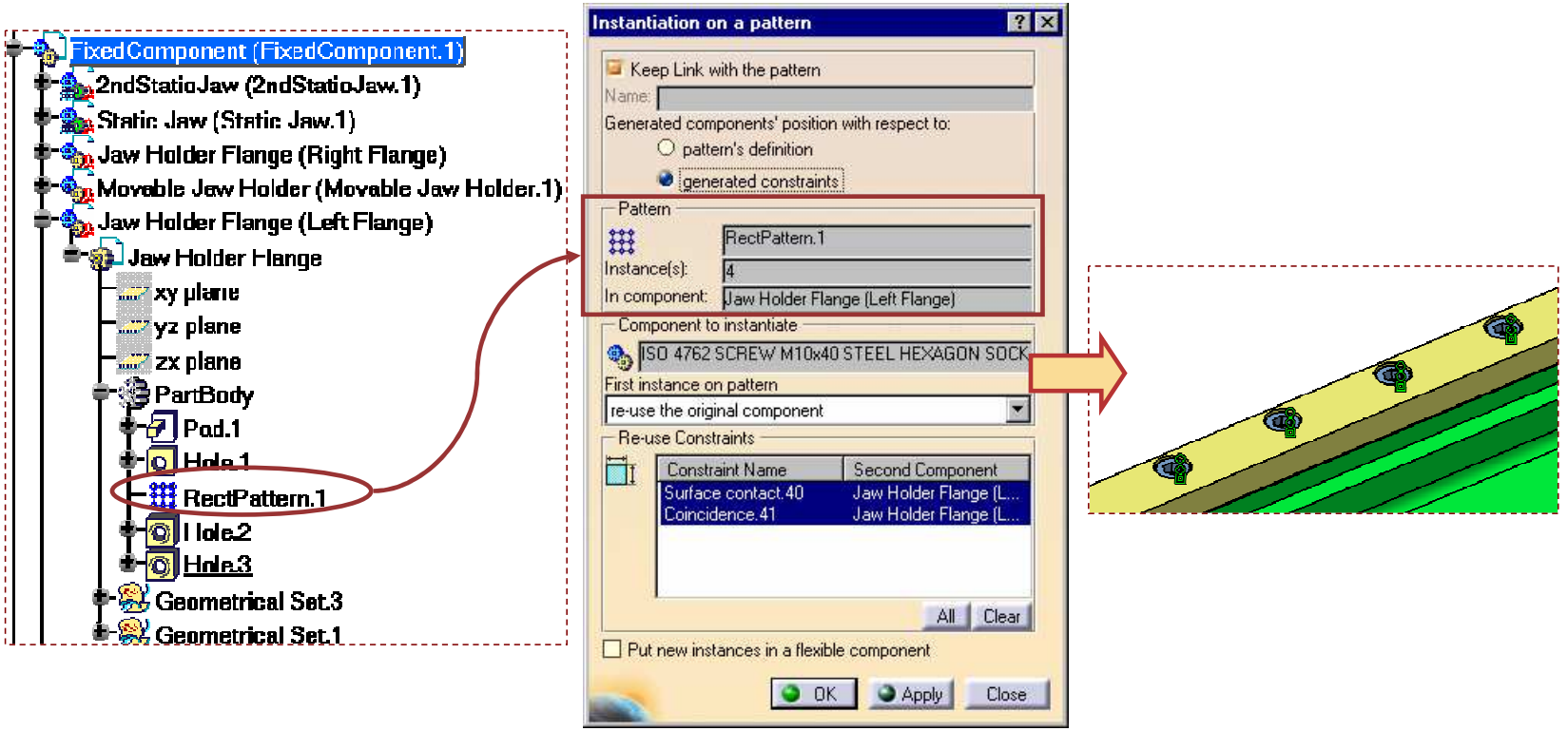
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axes of the “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP.2” and the hole in “Right Flange”
  - Contact constraint between the faces of “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP.2” and the inside face of the counter bored hole in “Right Flange”



Student Notes:

Do It Yourself (13/16)

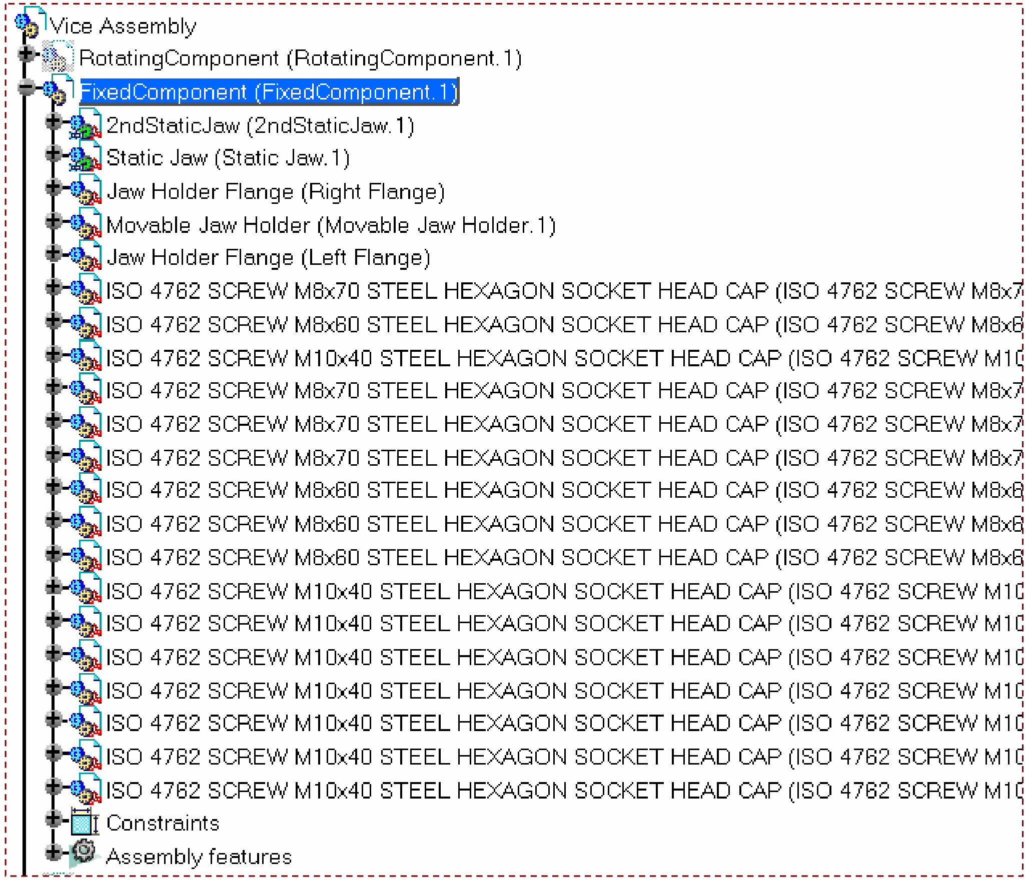
- Instantiate multiple instances of the screw “ISO 4762 SCREW M10x40 STEEL HEXAGON SOCKET HEAD CAP.2” in “FixedComponent” using ‘Reuse Pattern’
  - Use the ‘RectPattern.1’ in ‘Right Flange’ as pattern for instantiation
  - Reuse all detected constraints during instantiation

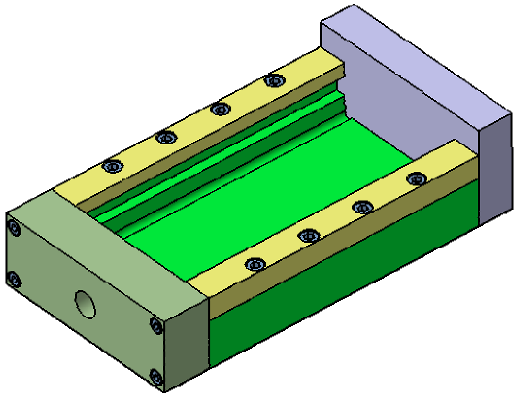


Student Notes:

Do It Yourself (14/16)

- **Save assembly 'FixedComponent'**



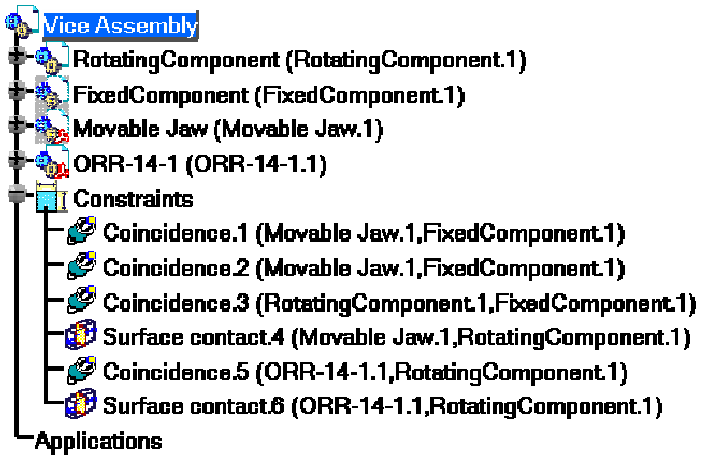


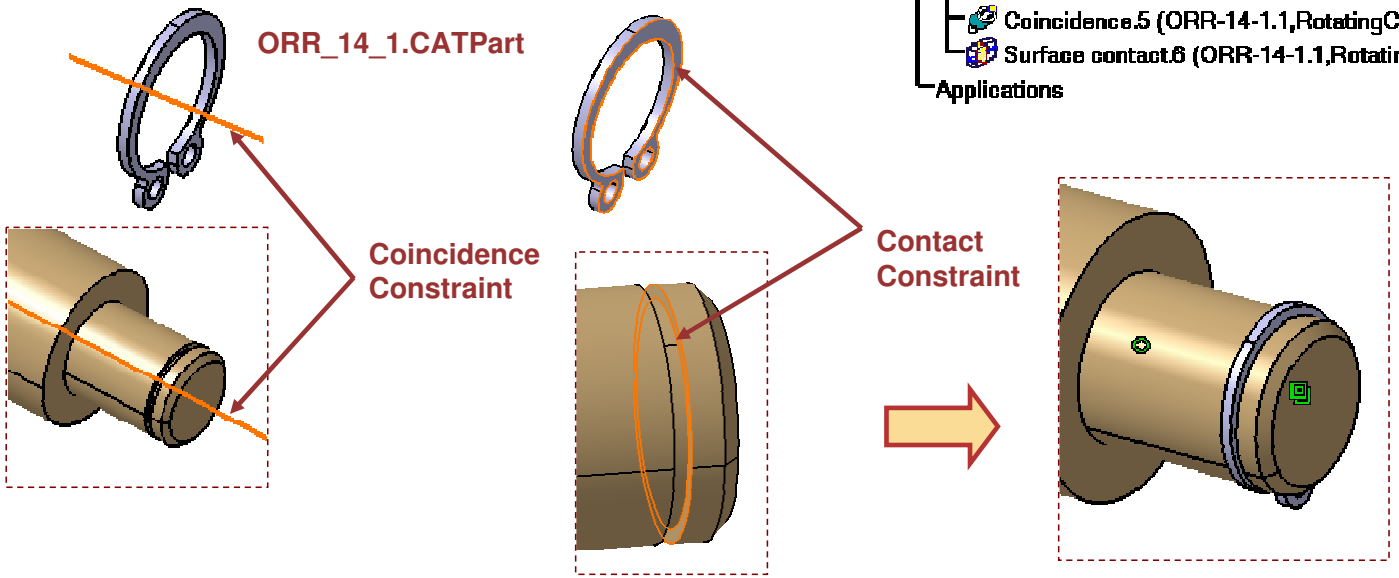
Student Notes:

Do It Yourself (15/16)

Parts used: “ORR_14_1.CATPart”

- Activate root assembly and hide “FixedComponent”
- Unhide “RotatingComponent”
- Insert existing part “ORR_14_1.CATPart”
- Add the following constraints and update the assembly:
  - Coincidence constraint between the axes of the “ORR-14-1” and the “BigScrew”
  - Contact constraint between the faces of “ORR-14-1” and the one of the faces of the groove in “BigScrew”

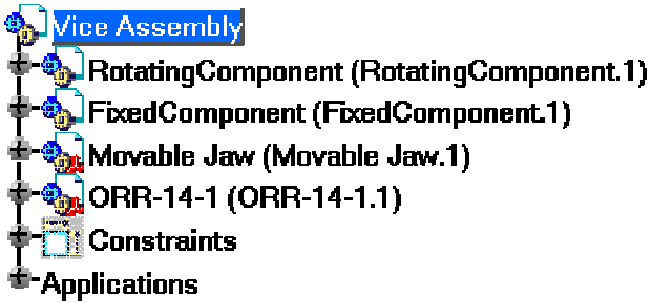


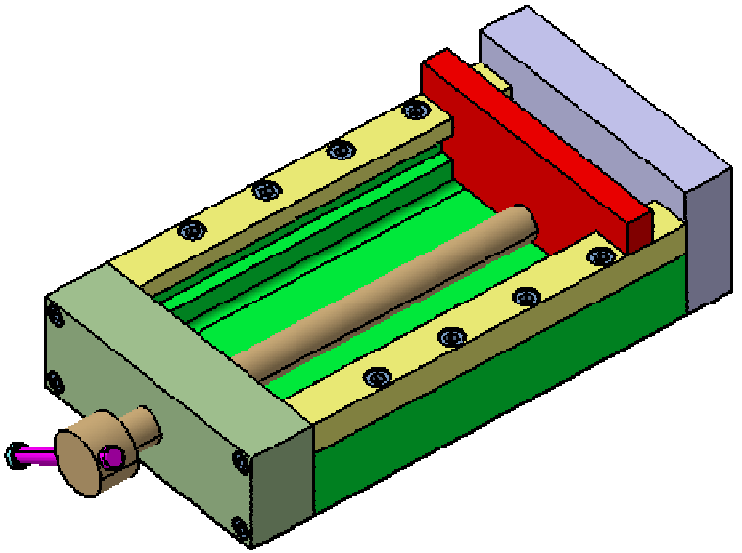


Student Notes:

Do It Yourself (16/16)

- Unhide “FixedComponent” and “Movable Jaw”
- Hide all constraints
- Save the final assembly as “CATASM_ViceAssembly_Step4_end.CATProduct” and “ORR-14-1”





Student Notes:

Flexible Assemblies

You will practice concepts learned throughout the course, by building the master exercise and following the recommended process

- Flexible Assemblies : Presentation
- Flexible Assemblies (1): Assembling Components
- Flexible Assemblies (2): Constrain Full Assembly
- Flexible Assemblies (3): Change Configuration

Student Notes:

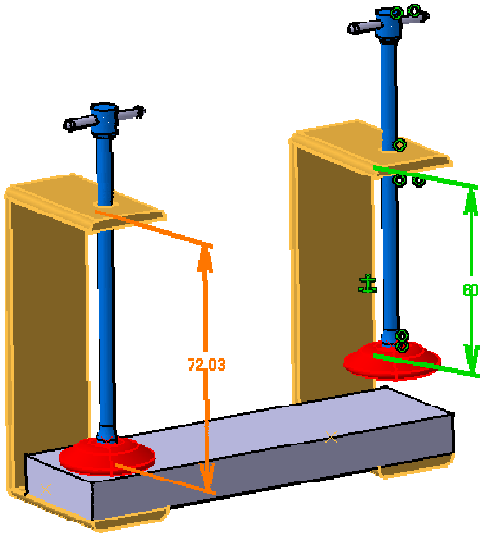
Flexible Assemblies

Exercise Presentation

25 min

Objectives :

In this exercise you will build the Full Assembly and use Flexible / Rigid sub-assemblies.



In this exercise you will use :

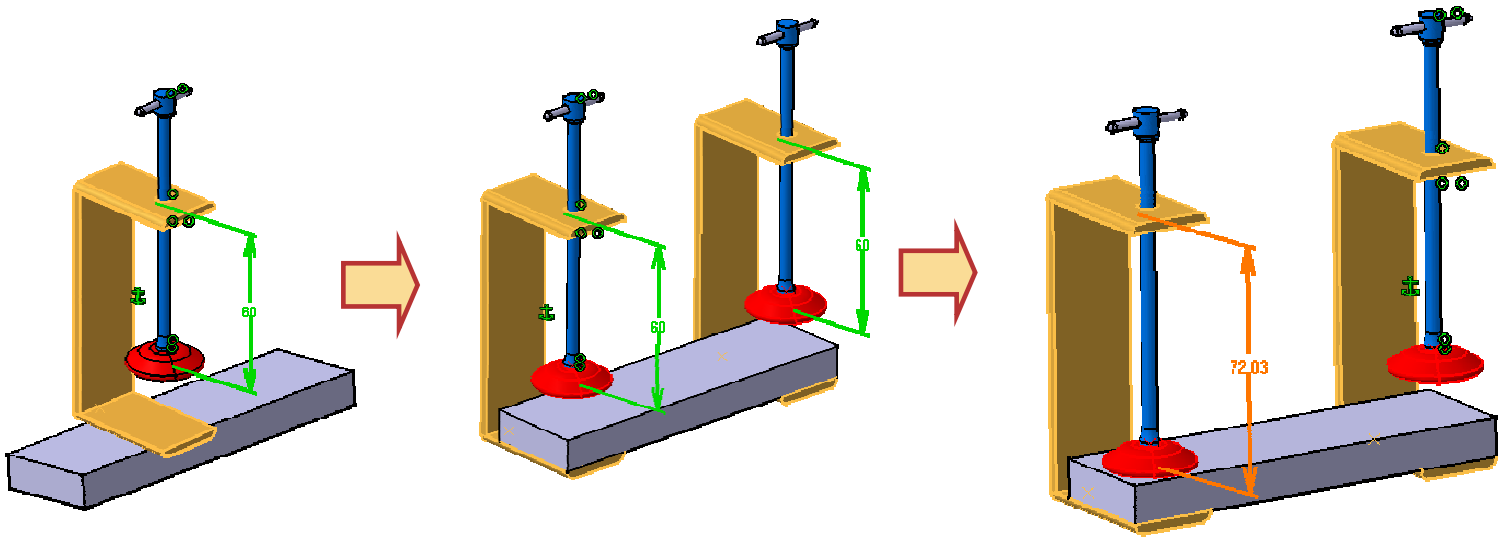
- **Product Structure Tools**
- **Assembly Constraints**
- **Flexible / Rigid sub assemblies command**

Student Notes:

Design Intent: Flexible Assemblies

In this exercise you will:

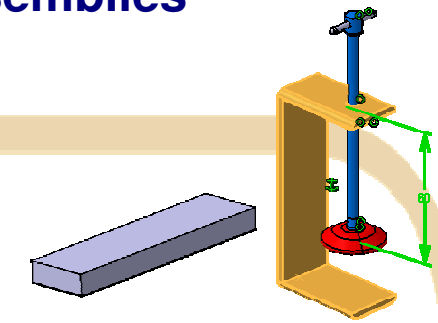
- Insert following parts to create an assembly
  - "CATASM_Sub_clamp.CATProduct"
  - "CATASM_Clamp_Pad.CATPart"
- Duplicate sub-assembly 'sub-clamp'
- Constrain inserted sub assemblies and parts
- Use 'Flexible/Rigid' function to have different configurations of the sub-assembly



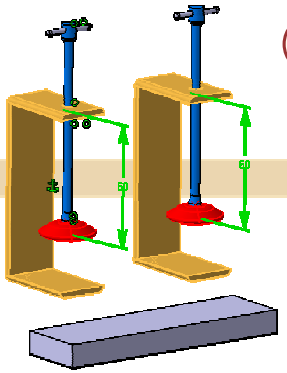
Student Notes:

Design Process: Flexible Assemblies

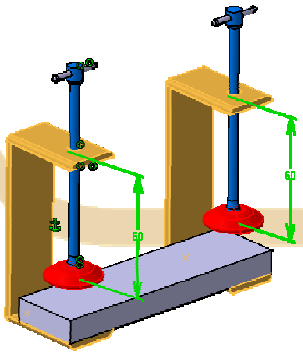
1 Create and name the assembly, insert components from sub-clamp.CATProduct and clamp-pad

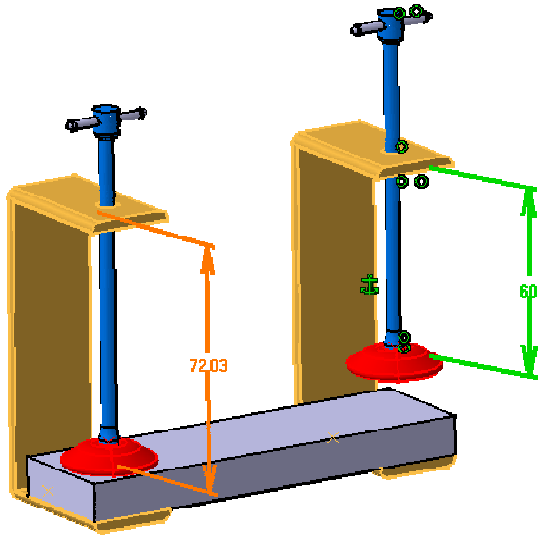


2 Constrain the assembly



3 Change configuration of one sub-assembly





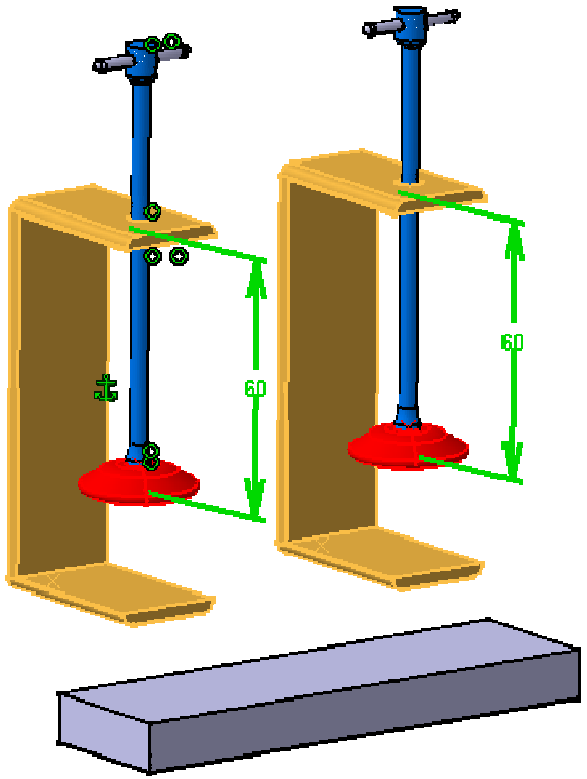
Student Notes:

Flexible Assemblies

Step 1: Assembling Components

3 min

In this step you will create and name an assembly, insert components, duplicate sub assembly and save the full assembly.

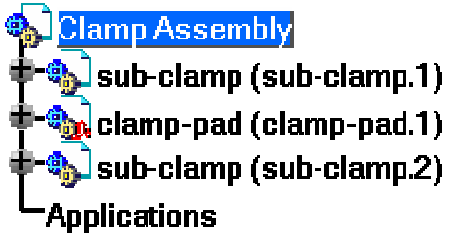


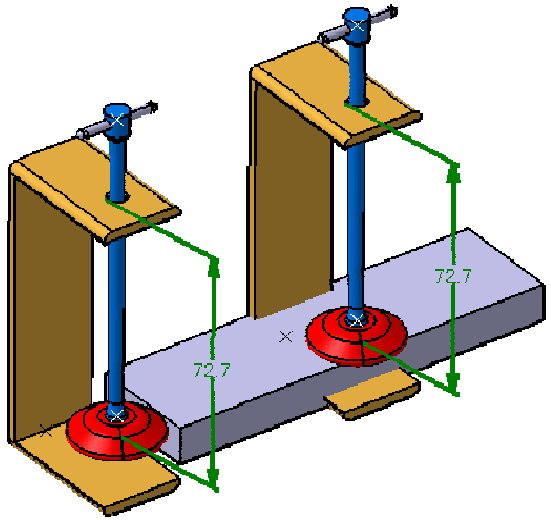
Student Notes:

Do It Yourself

Documents used: “CATASM_Sub_Clamp.CATProduct”, “CATASM_Clamp_Pad.CATPart”

- Create a new product and name it as “Clamp Assembly”
- Insert following components in “Clamp Assembly”:
  - “CATASM_Sub_Clamp.CATProduct”
  - “CATASM_Clamp_Pad.CATPart”
- Duplicate the “sub-clamp” in “Clamp Assembly” by using Copy / Paste commands
- Using ‘Save Management’, save the root assembly as “CATASM_Clamp_Assembly_Step2.CATProduct” in your working folder and use ‘Propagate directory’ to save all documents in same location





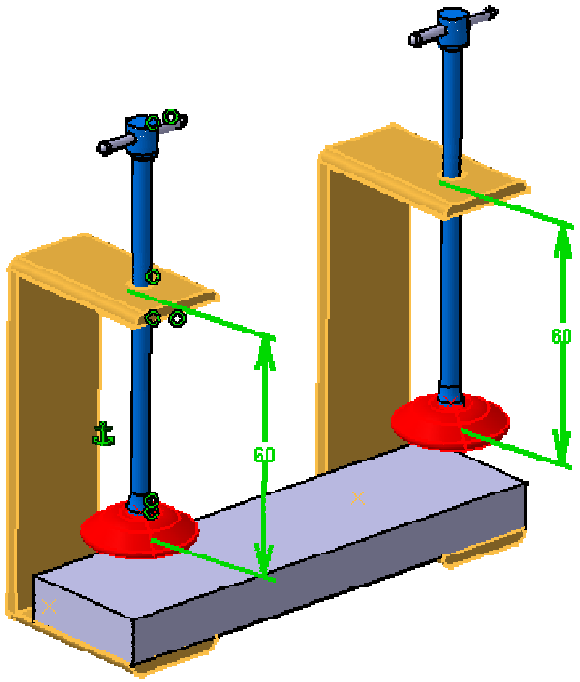
Student Notes:

Flexible Assemblies

Step 2: Constrain Clamp Assembly

15 min

In this step you will constrain the Clamp assembly using assembly constraints.

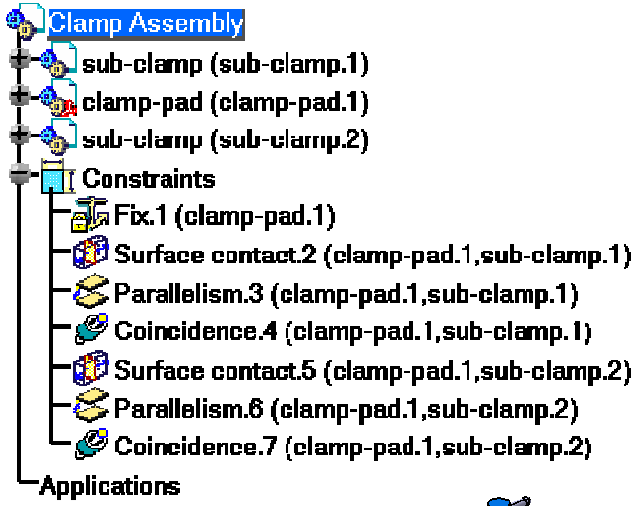


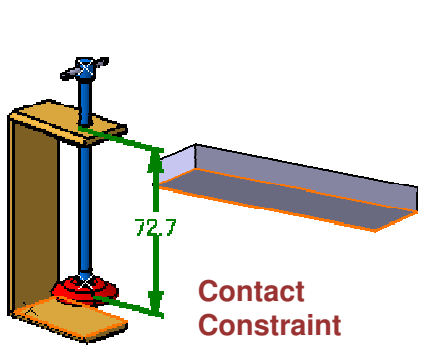
Student Notes:

Do It Yourself

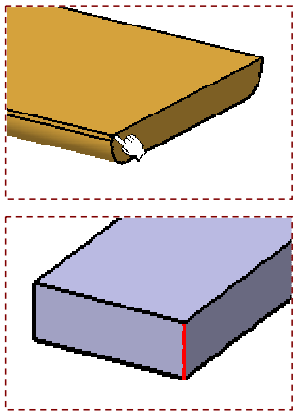
Parts used: “CATASM_Clamp_Assembly_Step2.CATProduct

- Fix the ‘clamp-pad’
- Add following constraints and update the assembly:
  - Contact constraint between the faces of the ‘clamp-pad’ and the ‘sub-clamp1’
  - Parallelism constraint between the edges of the ‘clamp-pad’ and the ‘sub-clamp1’
  - Coincidence constraint between highlighted edge of the clamp-pad and point in the sub-clamp assembly
- Similarly constrain the other sub assembly ‘sub-clamp2’
- Save the Clamp assembly as “CATASM_Clamp_Assembly_Step3.CATProduct”

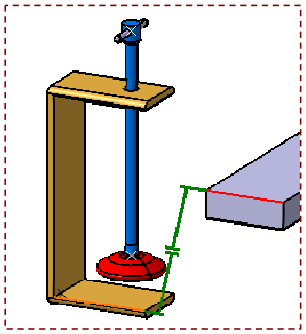




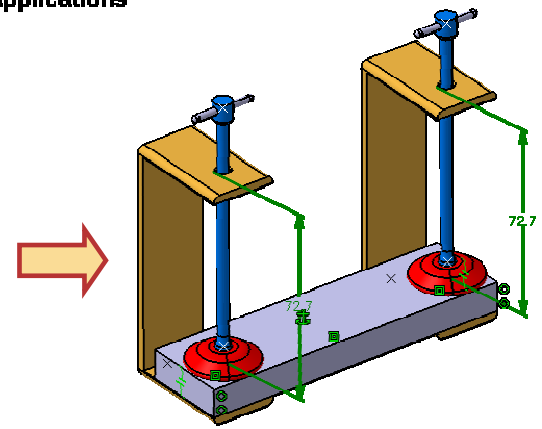
Contact Constraint



Coincidence Constraint



Parallelism Constraint



Student Notes:

Flexible Assemblies

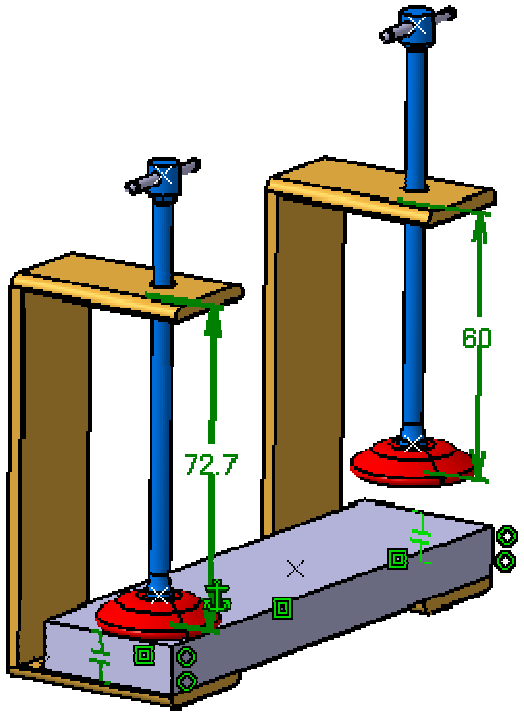
Step 3: Change configuration

7 min

In this step with 'Flexible/Rigid' command, you will simulate two configurations for the sub-clamp assembly.

First configuration:'Open' (value=60 mm)

Second configuration:'Close' (value=72.7 mm)

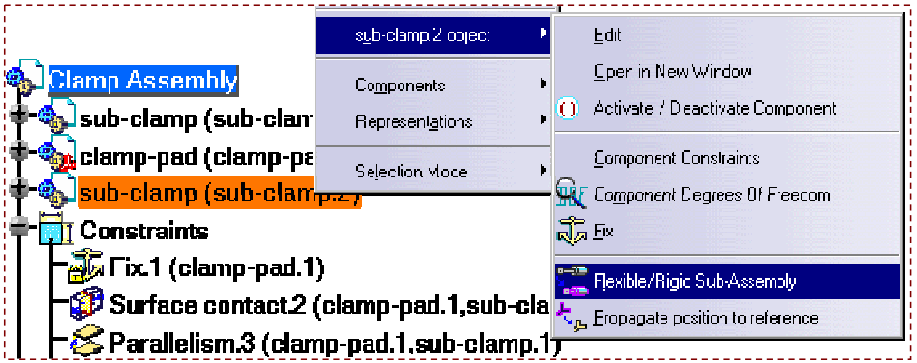


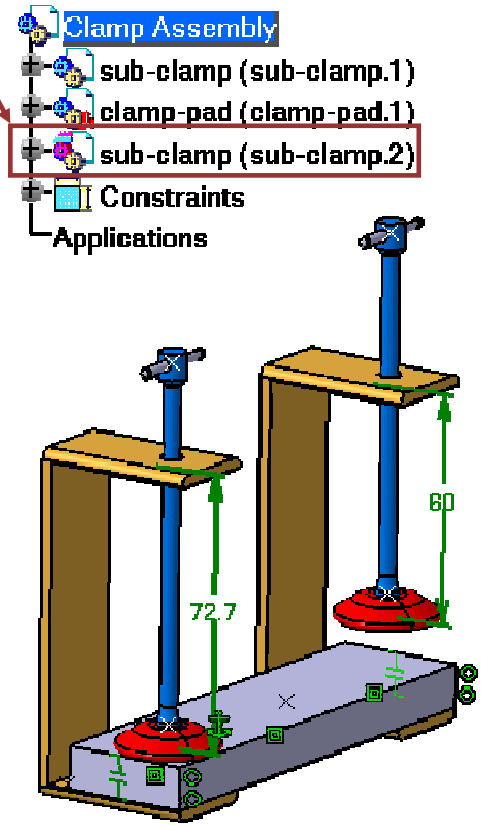
Student Notes:

Do It Yourself

Parts used: “CATASM_Clamp_Assembly_Step3.CATProduct”

- Make ‘sub-clamp.2’ flexible by using ‘Flexible/Rigid Sub Assembly’ command
- Notice the changes in the icon representing sub-clamp.2 A purple gear appears in this icon which indicates that the sub assembly is flexible.





- Change the value of ‘Offset.10.1’ under ‘sub-clamp.2’ to 60 mm. Now, the two instances of same sub-assembly are different configurations in the same assembly.
- Save the assembly as “CATASM_Clamp_Assembly_Step3_end.CATProduct”

You can compare your result with the attached model : “CATASM_Clamp_Assembly_Step3_end.CATProduct”

Student Notes:

PC Speaker Assembly Exercise

Now let us practice creating a PC Speaker assembly.

- PC Speaker Assembly Presentation
- Step 1: Preparing the Session
- Step 2: Creating the Product Structure
- Step 3: Positioning the Components
- Step 4: Analyzing Assembly
- Step 5: Design in Context
- Step 6: Replacing Components
- Step 7: Managing Structure

Student Notes:

PC Speaker Assembly

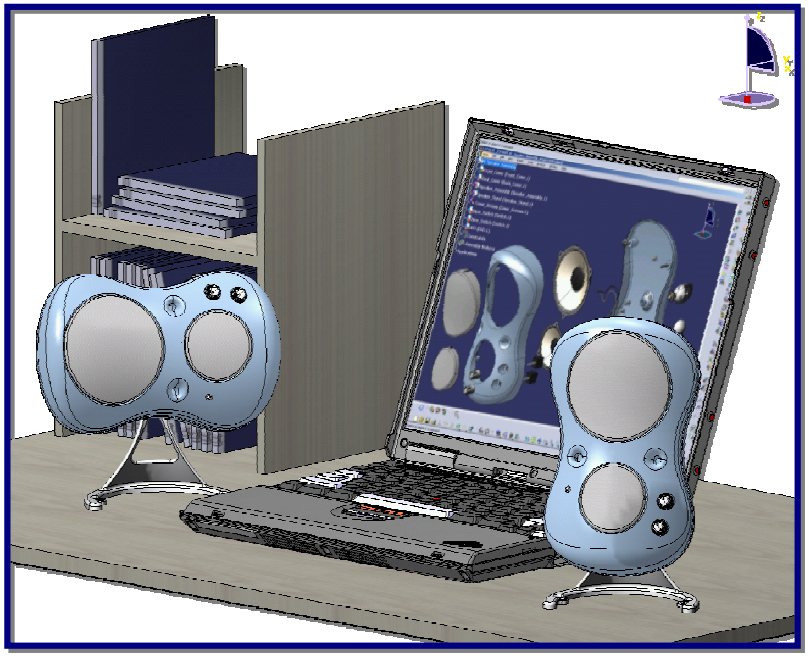
Exercise Presentation

90 min

In this exercise, you will create an assembly of a Desktop Personal Computer Speaker.

This Assembly Design process will cover the following topics:

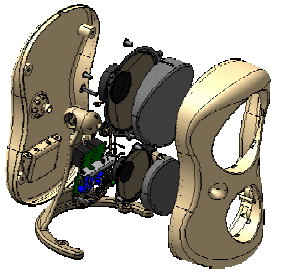
- Inserting and positioning components
- Assembly constraints
- Assembly Analysis
- Design in context
- Reordering product structure
- Generate CATPart from CATProduct

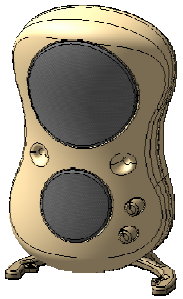


Student Notes:

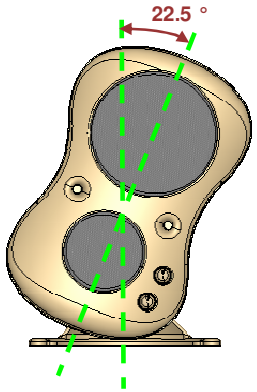
Design Intent – PC Speaker (1/2)

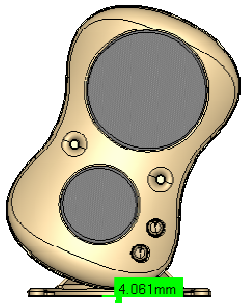
Your first step will be to create the PC Speaker assembly progressively by using various assembly design tools. Then, with the help of different analysis tools, you will check your final assembly for minimum distance and components' clearance.





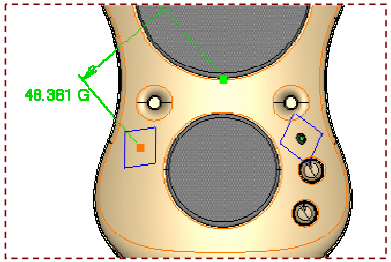
In the next step, you will modify a component that does not respect the specified clearance.

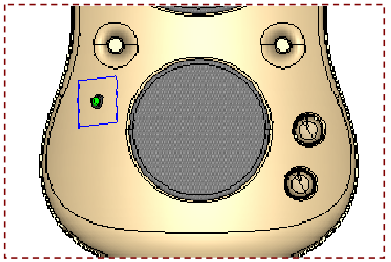




In the next step of the process, you will deal with a product enhancement request by inserting a Power LED Indicator and designing the Front Cover in the context of this part.

A design constraint will force you to change the location of the newly inserted component.



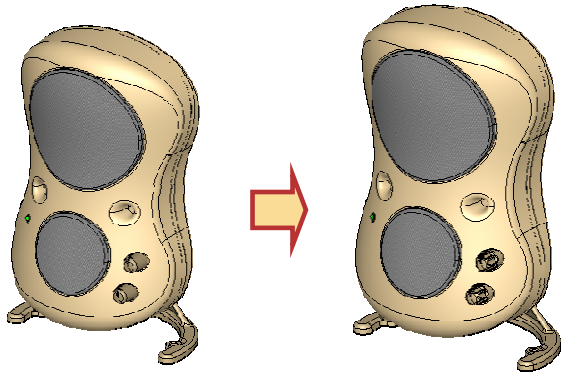


Student Notes:

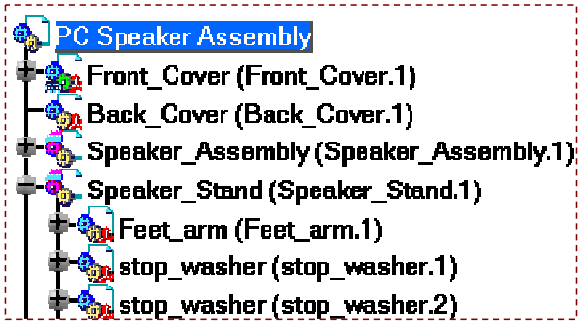
Design Intent – PC Speaker (2/2)

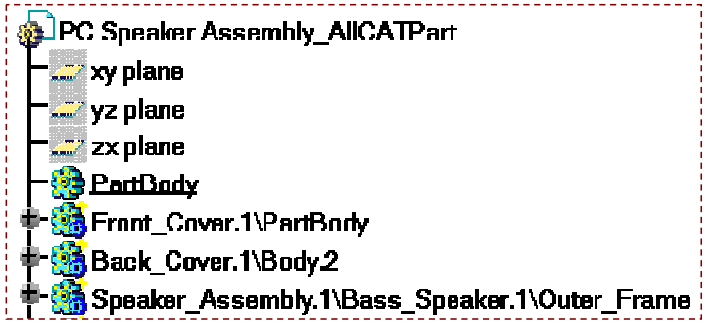
Next, you will deal with the versioning aspect of Product Lifecycle Management:

A new component version has been created and needs to replace its older representation in the assembly. At this stage, you will have to manage the impact on the different component constraint links.



In the final step, you will use Assembly Design Tools to manage your product in terms of Visualization and Release.



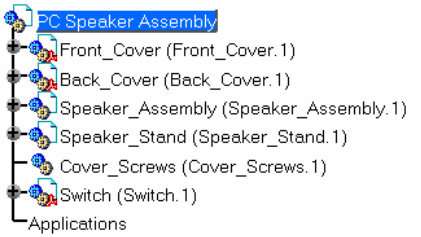


Student Notes:

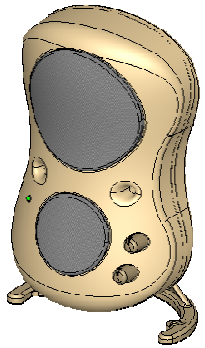
PC Speaker Assembly - Design Process

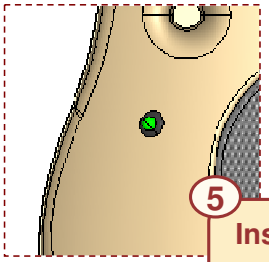
1 Preparing the session

2 Creating the product structure



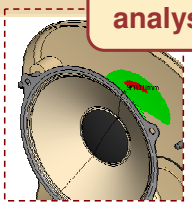
3 Position the components

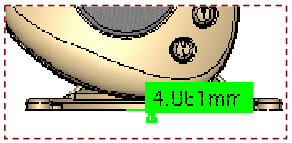




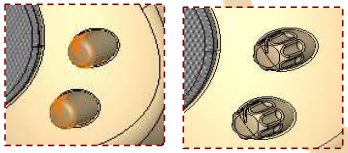
5 Insert an existing part with positioning and design a part in context

4 Perform assembly analysis

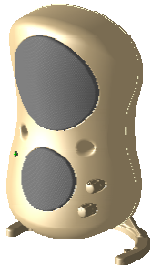


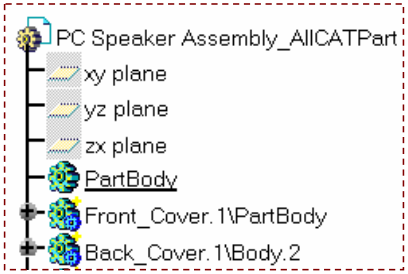


6 Replace component and reconnect constraints



7 Manage the product structure and visualization of components





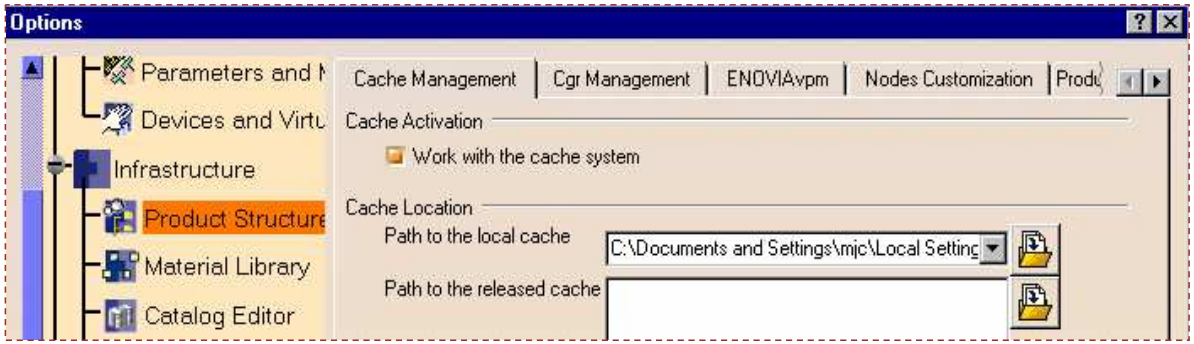
Student Notes:

PC Speaker Assembly

Step 1: Preparing the Session

5 min

In this step, you will prepare the CATIA session for the PC Speaker Assembly Exercise.

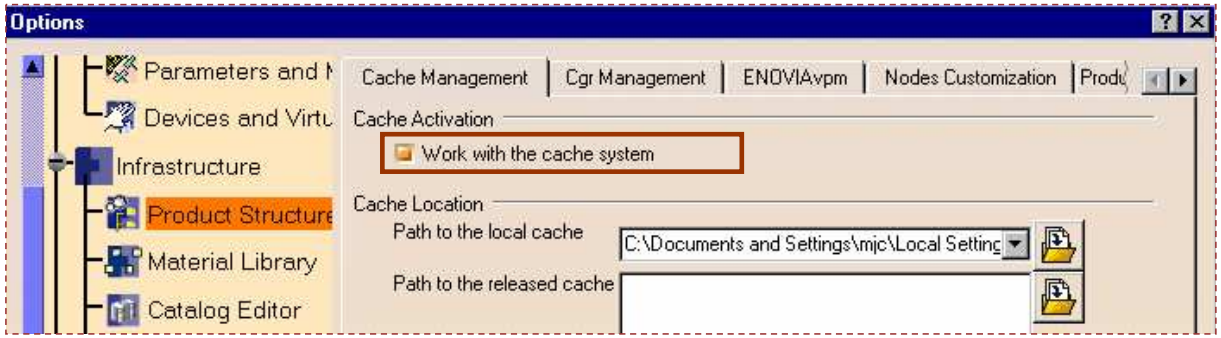


Student Notes:

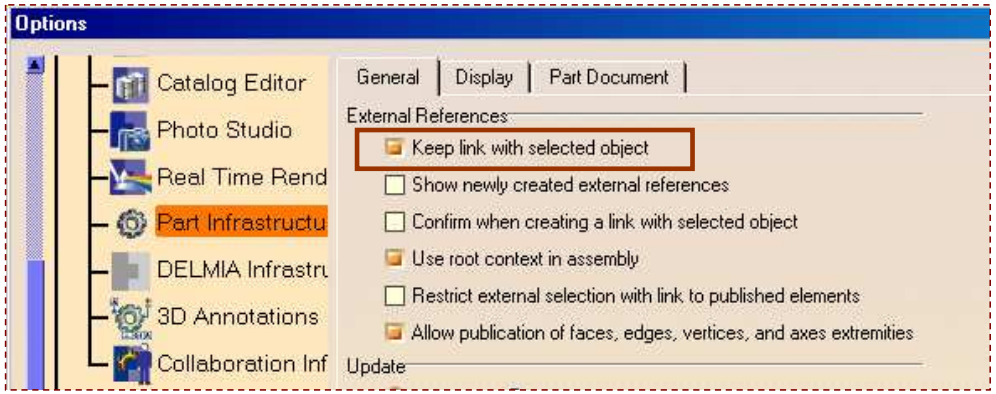
Do It Yourself (1/3)

In this step, you will prepare the CATIA session necessary for replaying the entire exercise.

- **Cache Management : Activate “Work with the cache system”**



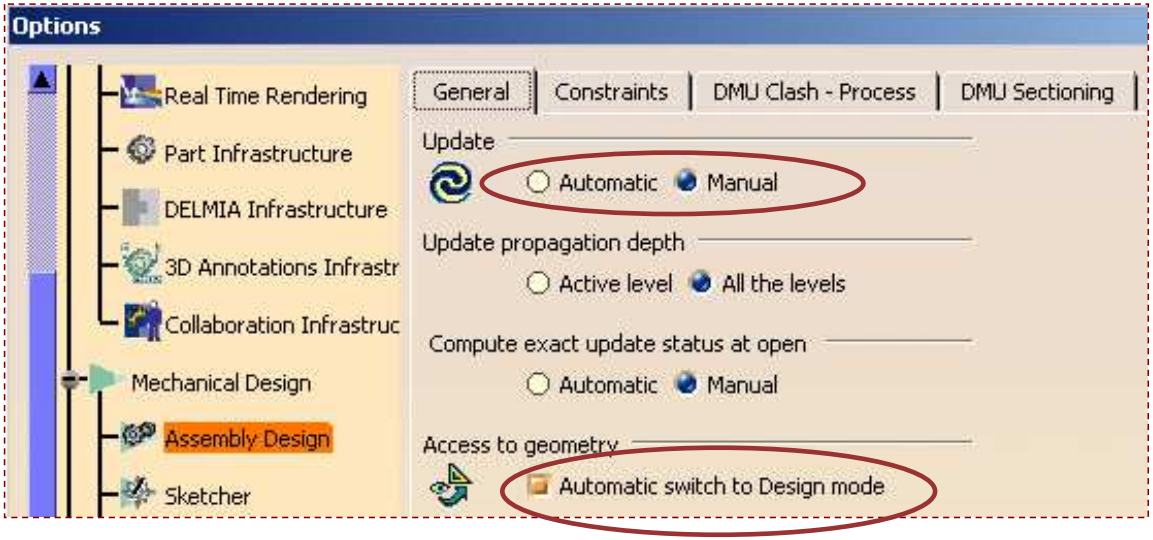
- **Activate the “Keep link with selected object” option**



Student Notes:

Do It Yourself (2/3)

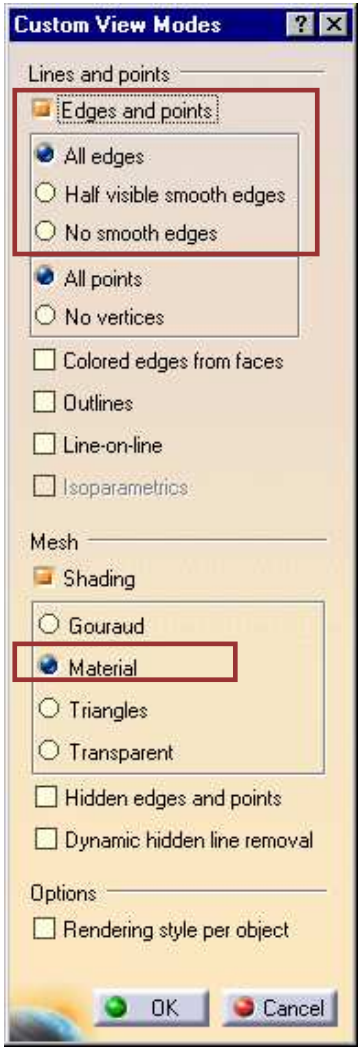
- For Assembly Design, activate the options “Manual Update” and “Automatic switch to Design mode”



Student Notes:

Do It Yourself (3/3)

- **Customize Visualization settings as shown:**



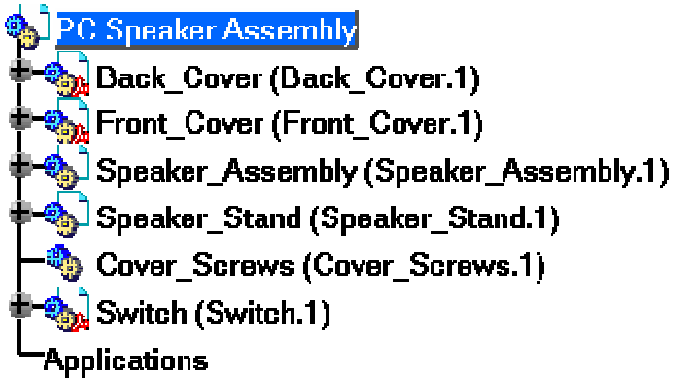
Student Notes:

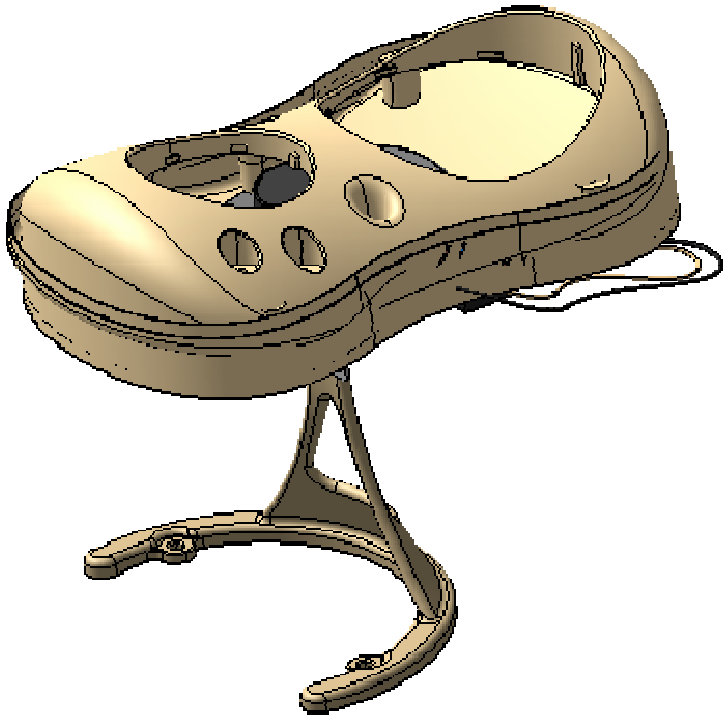
PC Speaker Assembly

Step 2: Creating the Product Structure

15 min

In this step, you will create the product structure of the PC Speaker Assembly by inserting existing components.





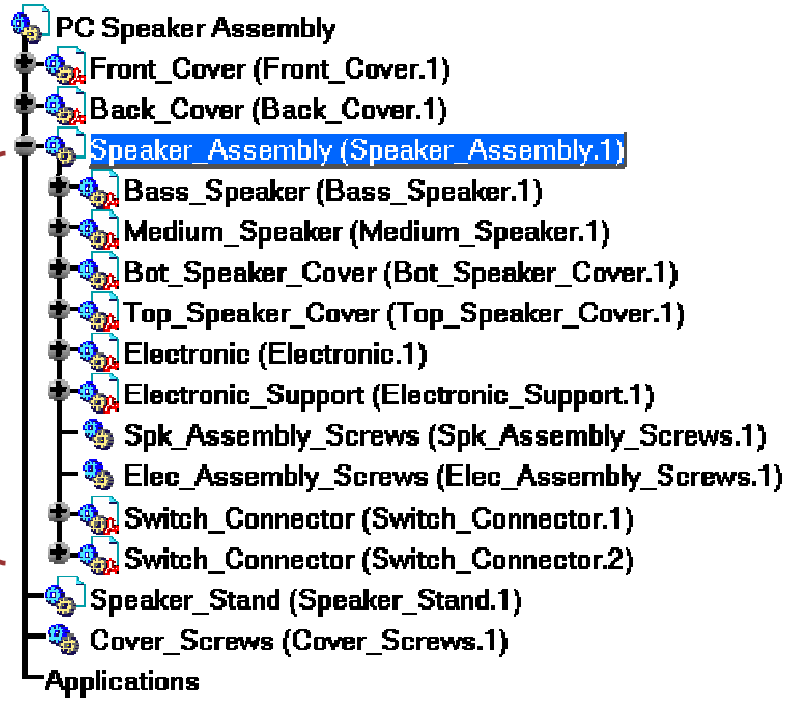
Student Notes:

Do It Yourself (1/3)

Load document “CATASM_PC_Speaker_Assembly_CATParts.CATProduct”.

- Create a new CATProduct “PC Speaker Assembly”
- Save this CATProduct as “CATASM_PC_Speaker_Assembly_Step1.CATProduct”
- Insert existing components from “CATASM_PC_Speaker_Assembly_CATParts.CATProduct”: “Front_Cover.CATPart”  and “Back_Cover.CATPart”
- Insert new products ‘Speaker_Assembly’ and ‘Speaker_Stand’ 
- Insert new Component ‘Cover_Screws’ 

- Activate the sub-assembly ‘Speaker_Assembly’ and create the product structure as shown by inserting existing parts and creating new components

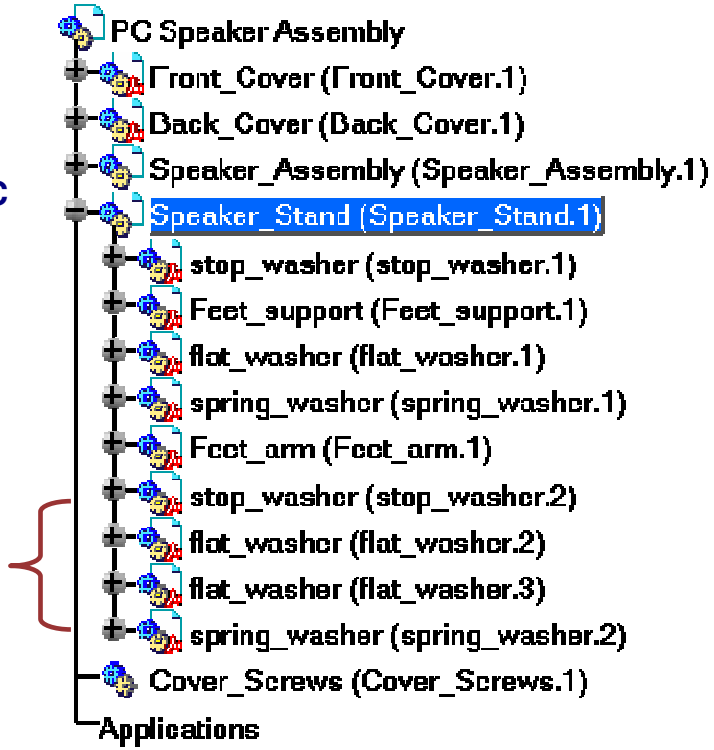


Student Notes:

Do It Yourself (2/3)

- Activate the sub-assembly 'Speaker_Stand' and create the product structure as shown by inserting existing parts from "CATASM_PC_Speaker_Assembly_CATParts.CATProduct".

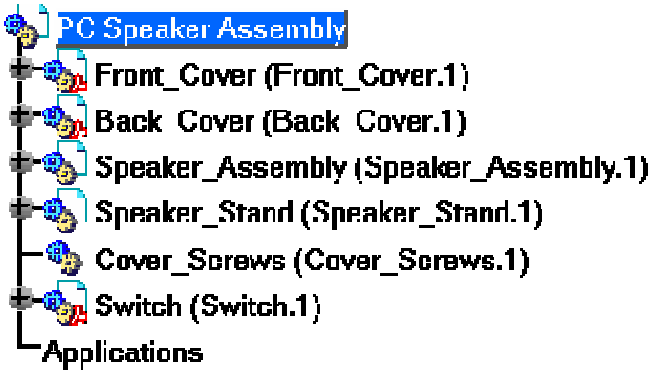
- Instantiate multiple instances of the washers in the 'Speaker_Stand' by using copy/paste

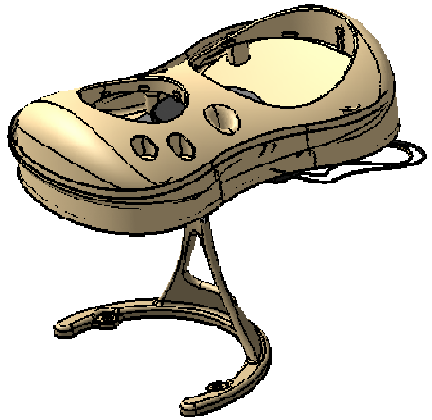


Student Notes:

Do It Yourself (3/3)

- Activate root assembly and insert “Switch.CATPart” from “CATASM_PC_Speaker_Assembly_CATParts.CATProduct” in the root product.





- Save the following CATProducts using Save Management (use propagate directory)
  - Save “CATASM_PC_Speaker_Assembly_Step1.CATProduct” as “CATASM_PC_Speaker_Assembly_Step2.CATProduct
  - Save new product ‘Speaker_Assembly’ as “CATASM_Speaker_Assembly_Step2.CATProduct”
  - Save new product ‘Speaker_Stand’ as “CATASM_Speaker_Stand_Step2.CATProduct”

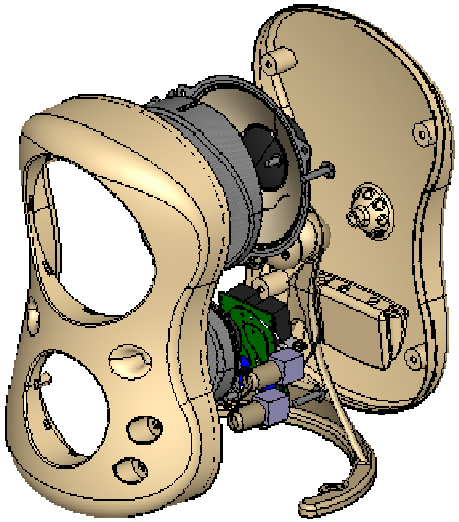
Student Notes:

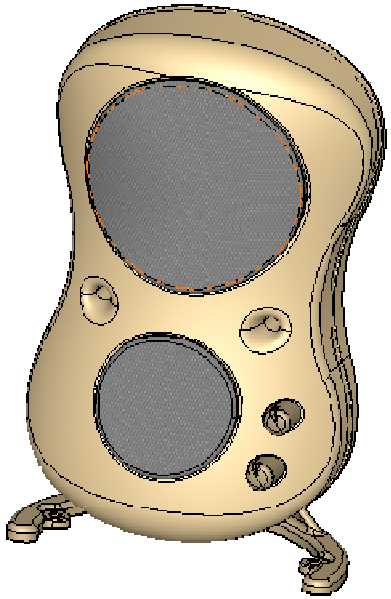
PC Speaker Assembly

Step 3: Positioning the components

60 min

In this step, you will roughly position components using positioning tools. You will then position the components permanently by applying various assembly constraints.



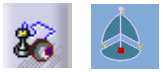


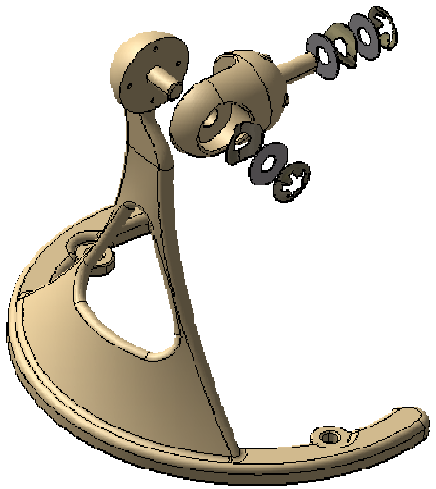
Student Notes:

Do It Yourself (1/22)

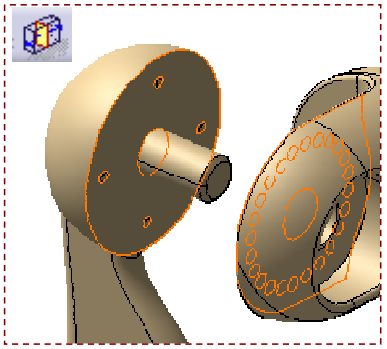
Product used: CATASM_PC_Speaker_Assembly_Step2.CATPart

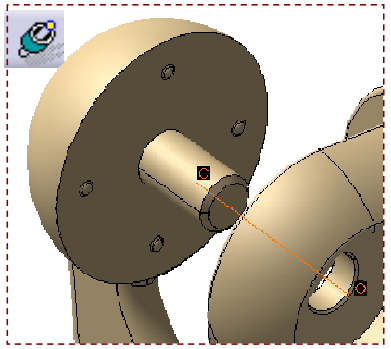
- Hide the following components:
  - 'Front_Cover.1' and 'Back_Cover.1'
  - 'Speaker_Assembly.1' and 'Switch.1'
- Activate 'Speaker_Stand' product and fix 'Feet_support.1'
- Position various components in the 'Speaker_Stand' sub assembly using 'Snap' and 'Compass'





- Position the 'Feet_arm.1' using following assembly constraints:
  - Surface contact constraint between the two faces
  - Coincidence constraint between the axes of two cylindrical faces

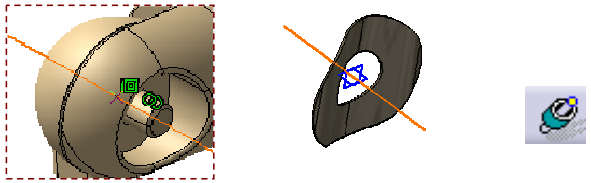


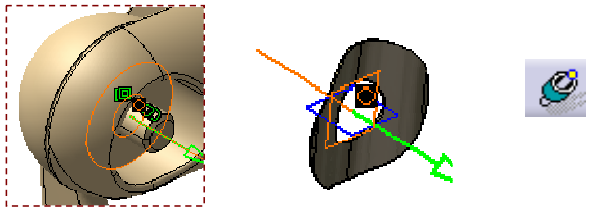


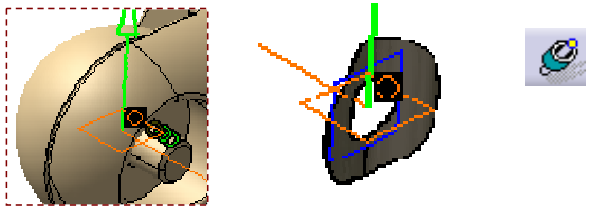
Student Notes:

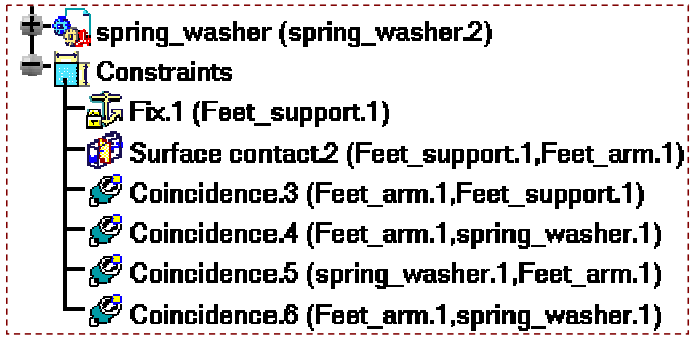
Do It Yourself (2/22)

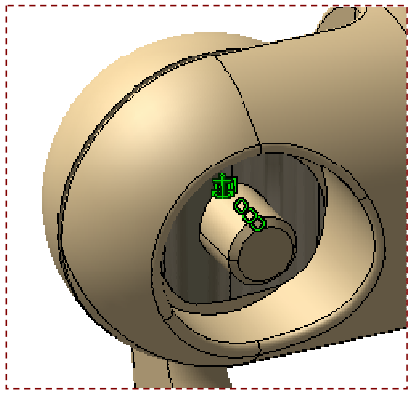
- Position ‘spring_washer.1’ using following constraints:
  - Coincidence constraint between the axes of the ‘spring_washer.1’ and the ‘Feet_support.1’
  - Coincidence constraint between the xy plane of the ‘spring_washer.1’ and highlighted face of the ‘Feet_arm.1’
  - Coincidence constraint between the yz plane of the ‘spring_washer.1’ and ‘Plane.1’ of ‘Feet_arm.1’







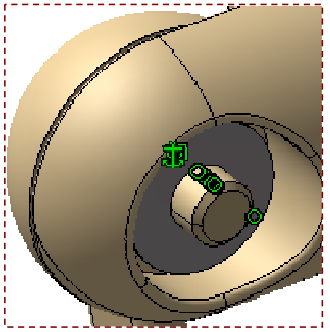




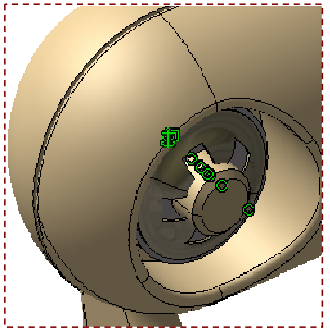
Student Notes:

Do It Yourself (3/22)

- Position ‘flat_washer.1’ using following constraints:
  - Coincidence constraint between the axes of the ‘flat_washer.1’ and the ‘Feet_support.1’
  - Coincidence constraint between the face of the ‘flat_washer.1’ and ‘Plane.1’ of the ‘spring_washer.1’



- Position ‘stop_washer.1’ using following constraints:
  - Coincidence constraint between the axes of the ‘stop_washer.1’ and the ‘Feet_support.1’
  - Coincidence constraint between the xy plane of the ‘stop_washer.1’and the face of the ‘flat_washer.1’

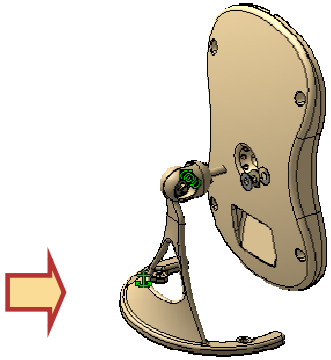


Student Notes:

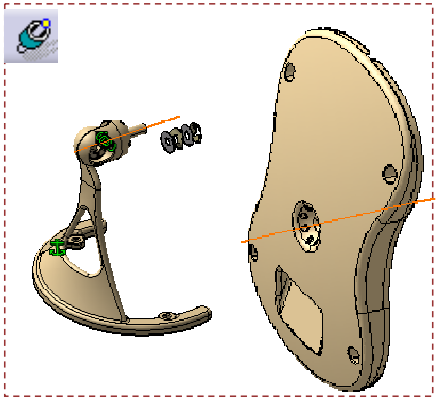
Do It Yourself (4/22)

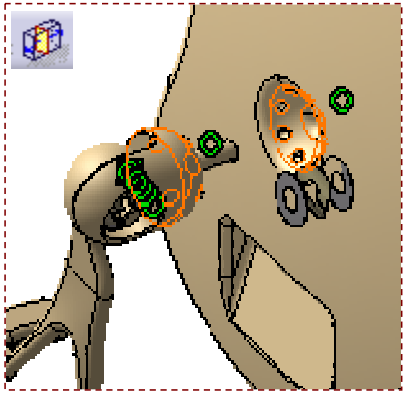
- Activate root product, and make the sub assembly ‘Speaker_Stand.1’ flexible

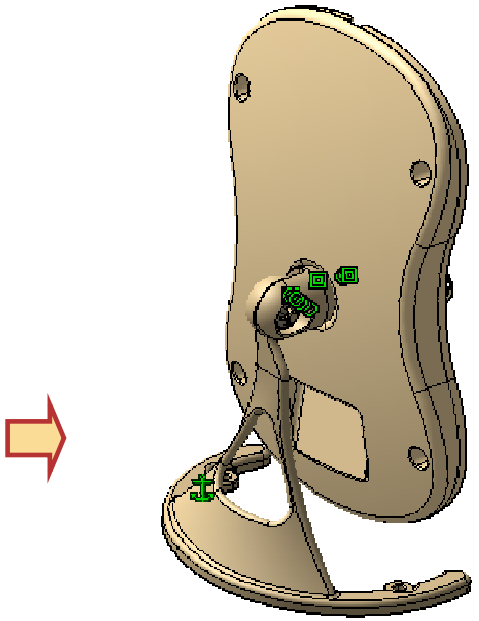
- Unhide and position ‘Back_Cover.1’ roughly as shown



- Position ‘Back_Cover.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the ‘Back_Cover.1’ and the ‘feet_arm.1’
  - Surface contact constraint between the spherical surfaces of the ‘Back_Cover.1’ and the ‘feet_arm.1’



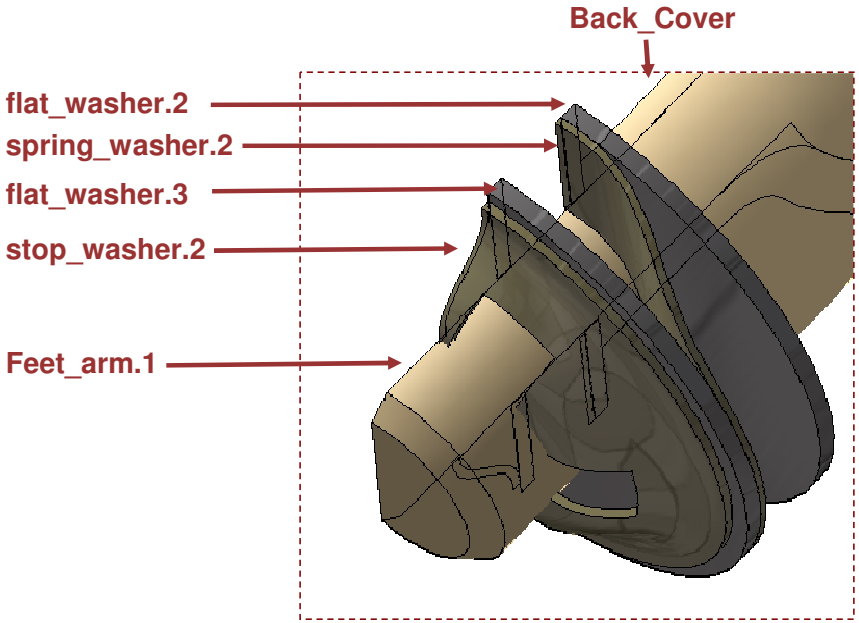




Student Notes:

Do It Yourself (5/22)

- Activate ‘Speaker_Stand’ product and position ‘flat_washer.2’ using following constraints:
  - Coincidence constraint between the axes of the ‘flat_washer.2’ and the ‘Feet_arm.1’
  - Surface contact constraint between the faces of the ‘flat_washer.2’ and ‘Back_Cover.1’



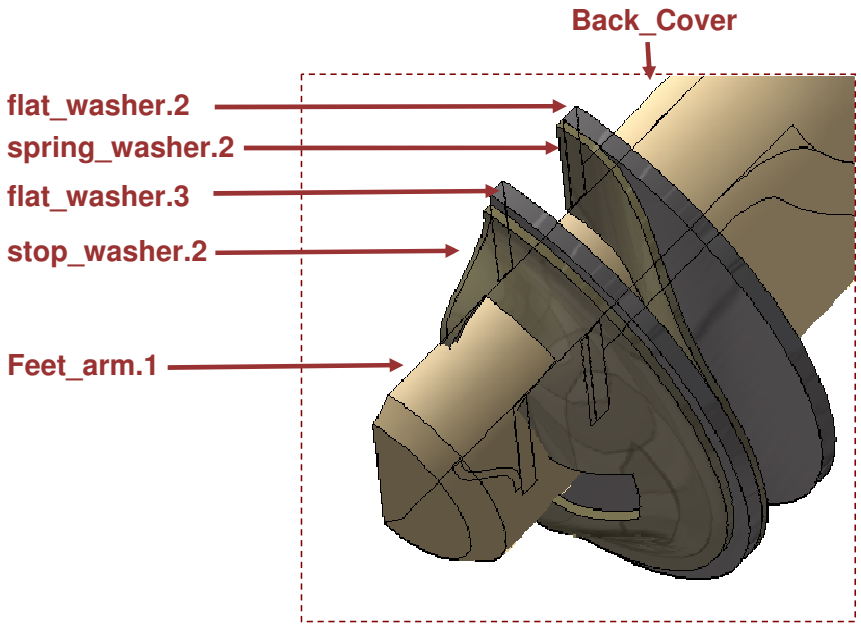
- Position ‘spring_washer.2’ using following constraints:
  - Coincidence constraint between the axes of the ‘spring_washer.2’ and the ‘flat_washer.2’
  - Coincidence constraint between the xy plane of the ‘spring_washer.2’ and the face of ‘flat_washer.2’

Student Notes:

Do It Yourself (6/22)

- Position ‘flat_washer.3’ using following constraints:
  - Coincidence constraint between the axes of the ‘flat_washer.3’ and the ‘Feet_arm.1’
  - Coincidence constraint between the face of the ‘flat_washer.3’ and the ‘Plane.1’ of the ‘spring_washer.2’

- Position ‘stop_washer.2’ using following constraints:
  - Coincidence constraint between the axes of the ‘stop_washer.2’ and the ‘Feet_arm.1’
  - Coincidence constraint between the xy plane of the ‘stop_washer.2’ and the face of ‘flat_washer.3’

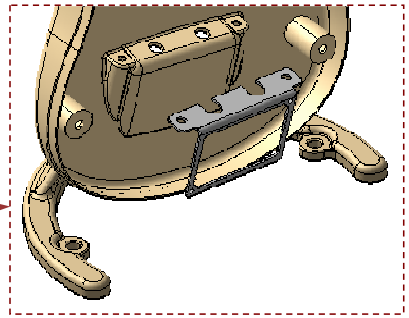


Student Notes:

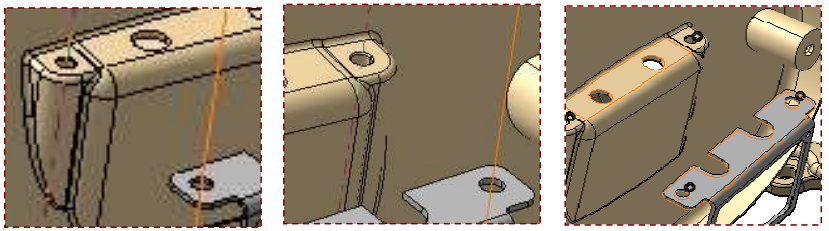
Do It Yourself (7/22)

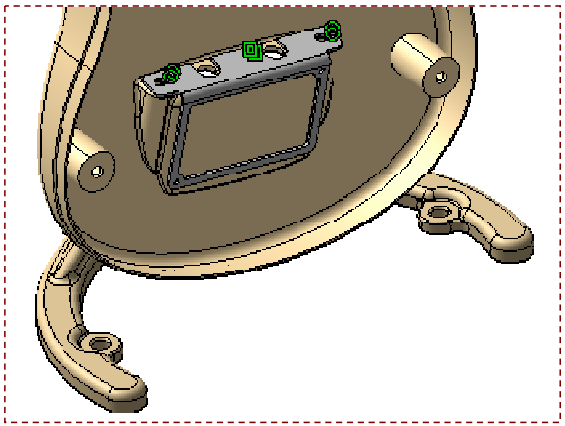
- Activate root product, unhide and make the sub assembly ‘Speaker_Assembly.1’ flexible

- Position ‘Electronic_Support.1’ roughly as shown



- Position Electronic_Support.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the first screw hole of the ‘Electronic_Support.1’ and the corresponding hole in the ‘Back_Cover.1’
  - Coincidence constraint between the axes of the second screw hole of the ‘Electronic_Support.1’ and the corresponding hole in the ‘Back_Cover.1’
  - Surface Contact constraint between the faces of the ‘Electronic_Support.1’ and the ‘Back_Cover.1’

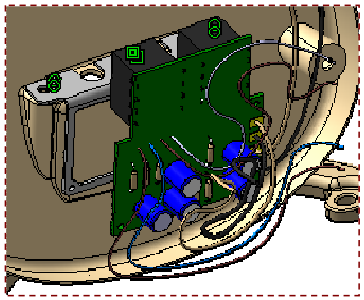


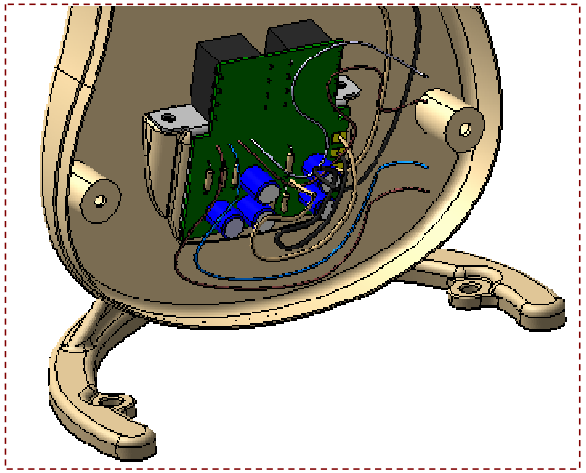


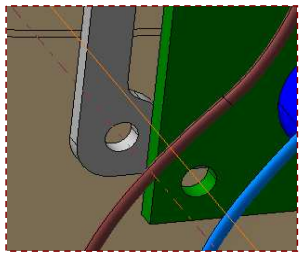
Student Notes:

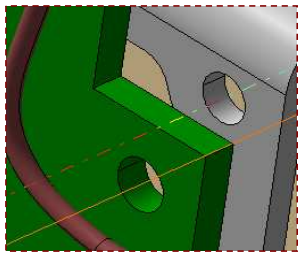
Do It Yourself (8/22)

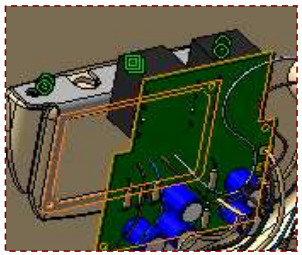
- Activate ‘Speaker_Assembly.1’ and position ‘Electronic.1’ roughly as shown
- Position ‘Electronic.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the first screw hole of the ‘Electronic_Support.1’ and the corresponding hole in the ‘Back_Cover.1’
  - Coincidence constraint between the axes of the second screw hole of the ‘Electronic_Support.1’ and the corresponding hole in the ‘Back_Cover.1’
  - Surface Contact constraint between the faces of the ‘Electronic_Support.1’ and the ‘Back_Cover.1’







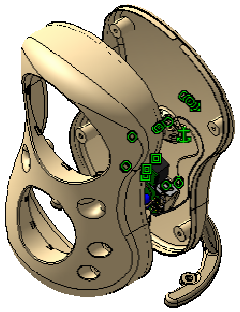




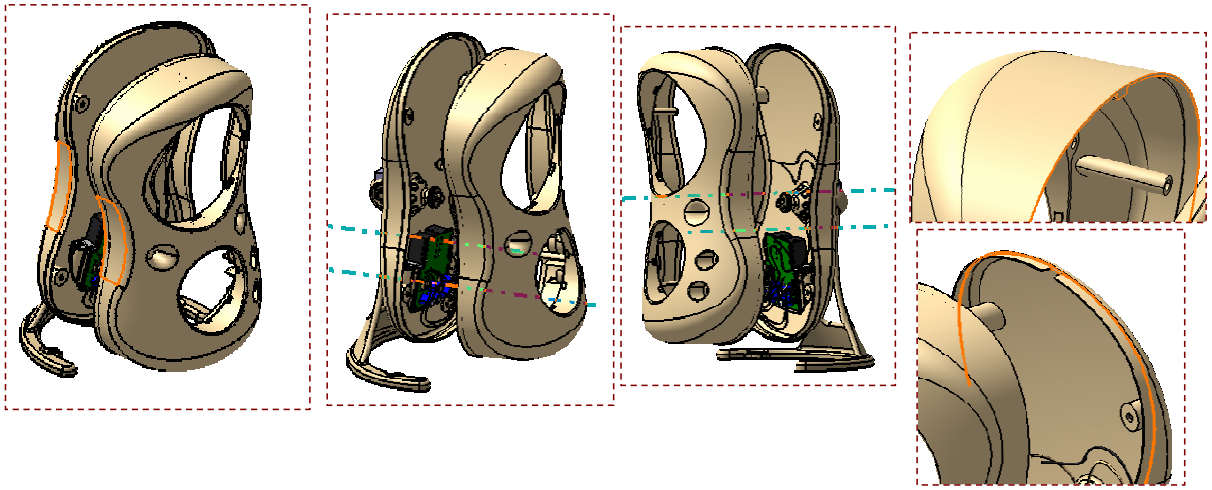
Student Notes:

Do It Yourself (9/22)

- Activate the root assembly, unhide ‘Front_Cover.1’ and position it approximately as shown



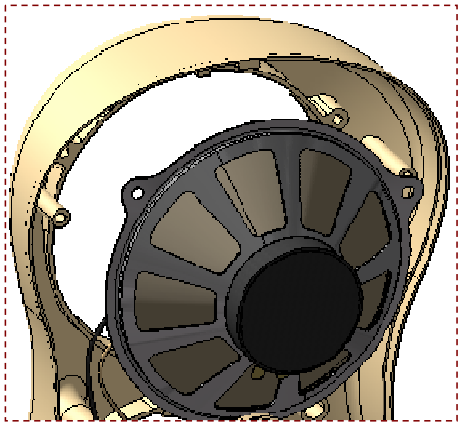
- Position ‘Front_Cover.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the adjacent curvilinear surfaces of ‘Front_Cover.1’ and ‘Back_Cover.1’
  - Coincidence constraint between the axes of another set of adjacent curvilinear surfaces of ‘Front_Cover.1’ and ‘Back_Cover.1’
  - Surface Contact constraint between the faces of the ‘Front_Cover.1’ and the ‘Back_Cover.1’

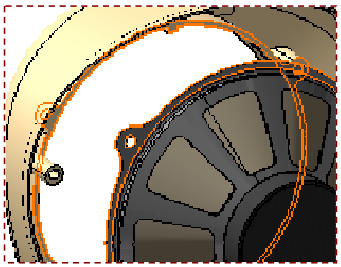


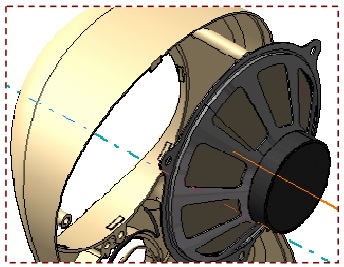
Student Notes:

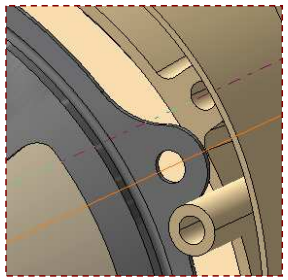
Do It Yourself (10/22)

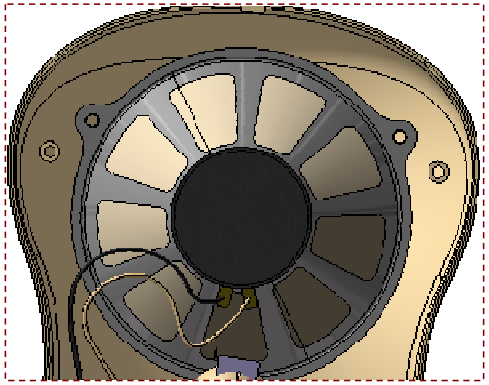
- Hide ‘Back_Cover.1’and position ‘Bass_Speaker.1’ approximately as shown
- Position ‘Bass_Speaker.1’ permanently using following constraints:
  - Surface Contact constraint between the faces of the ‘Bass_Speaker.1’ and the ‘Front_Cover.1’
  - Coincidence constraint between the axes of the ‘Bass_Speaker.1’ and the circular opening in ‘Front_Cover.1’
  - Coincidence constraint between the axes of screw holes in the ‘Bass_Speaker.1’ and ‘Front_Cover.1’







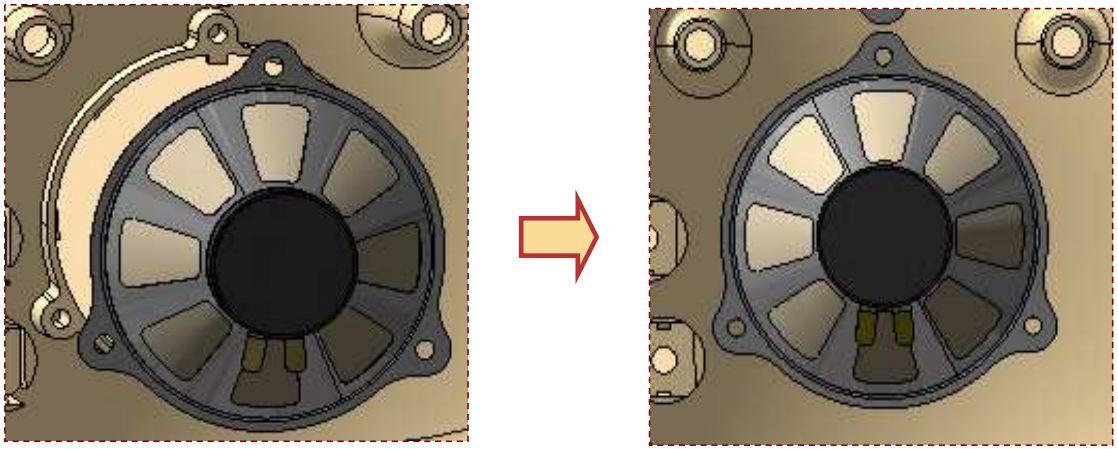




Student Notes:

Do It Yourself (11/22)

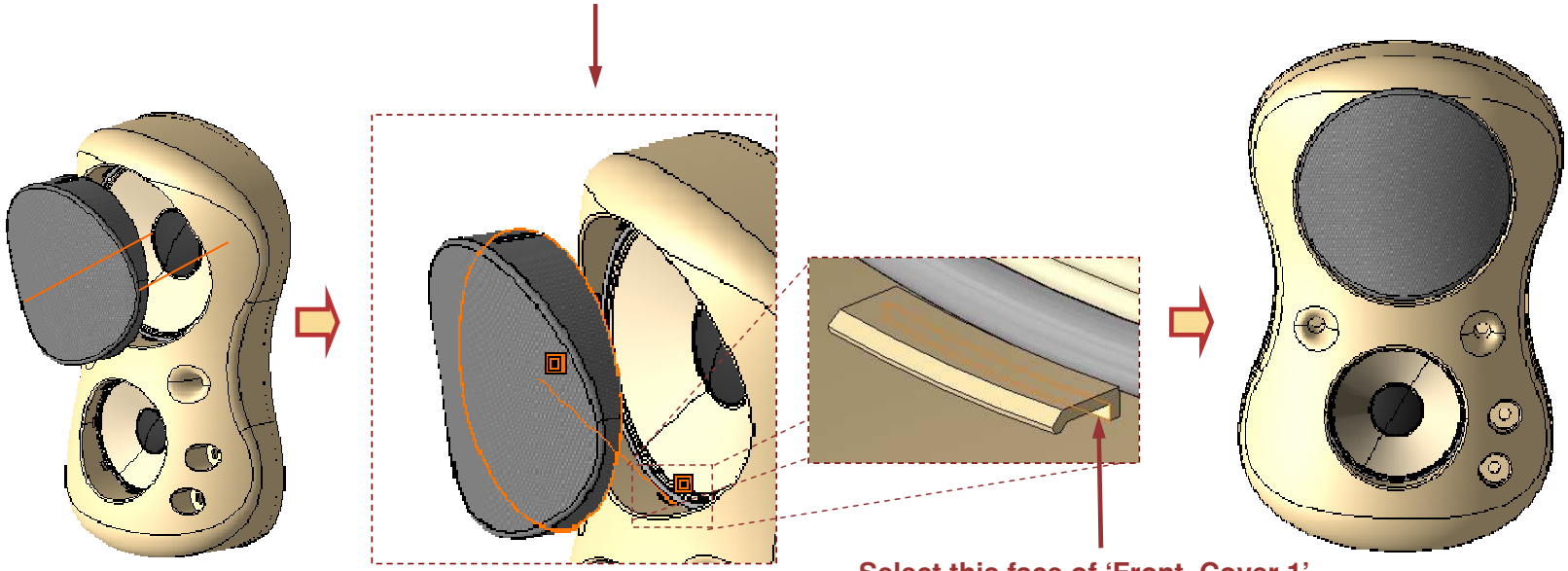
- Hide ‘Speaker_Stand.1’, ‘Electronic.1’ and ‘Electric_Support.1’
- Position ‘Medium_Speaker.1’ permanently using following constraints:
  - Surface Contact constraint between the faces of the ‘Medium_Speaker.1’ and the ‘Front_Cover.1’
  - Coincidence constraint between the axes of the ‘Medium_Speaker.1’ and the circular opening in ‘Front_Cover.1’
  - Coincidence constraint between the axes of screw holes in the ‘Medium_Speaker.1’ and ‘Front_Cover.1’



Student Notes:

Do It Yourself (12/22)

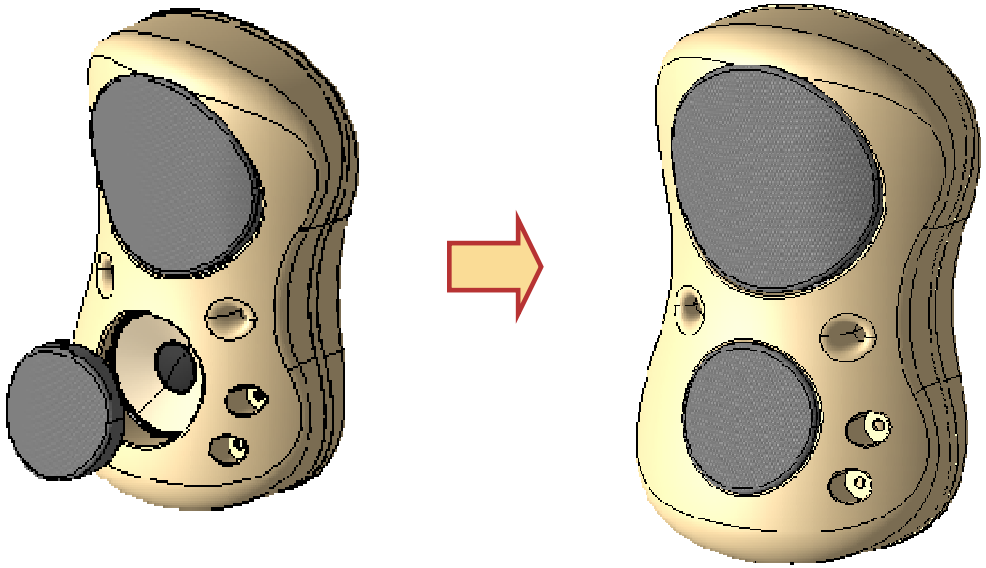
- Position ‘Top_Speaker_Cover.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the ‘Top_Speaker_Cover.1’ and the ‘Front_Cover.1’
  - Coincidence constraint between the yz planes of the ‘Top_Speaker_Cover.1’ and the ‘Front_Cover.1’
  - Surface Contact constraint between the the faces of the ‘Top_Speaker_Cover.1’ and the ‘Front_Cover.1’



Student Notes:

Do It Yourself (13/22)

- Position ‘Bot_Speaker_Cover.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the ‘Bot_Speaker_Cover.1’ and the ‘Front_Cover.1’
  - Coincidence constraint between the yz planes of the ‘Bot_Speaker_Cover.1’ and the ‘Front_Cover.1’
  - Surface Contact constraint between the faces of the ‘Bot_Speaker_Cover.1’ and the ‘Front_Cover.1’

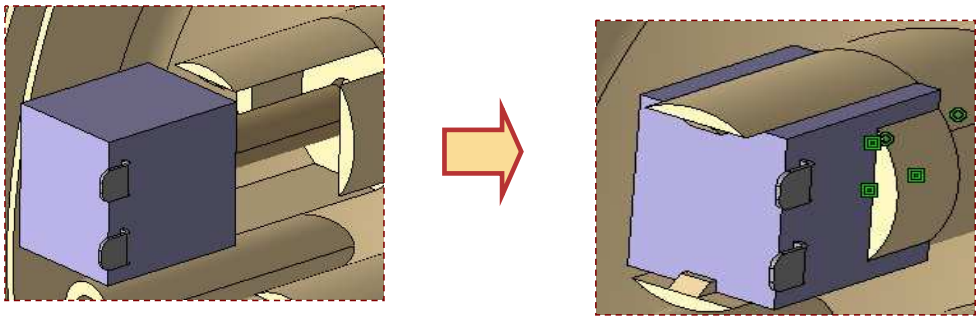


- Unhide ‘Electronic.1’ and ‘Electric_Support.1’

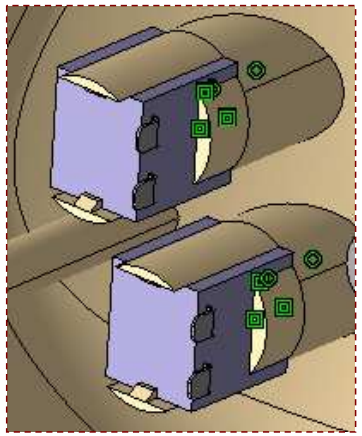
Student Notes:

Do It Yourself (14/22)

- Position ‘Switch_Connector.1’ permanently using following constraints:
  - Coincidence constraint between the axes of the ‘Switch_Connector.1’ and the circular cutout in the ‘Front_Cover.1’
  - Surface Contact constraint between the side faces of the ‘Switch_Connector.1’ and the ‘Front_Cover.1’
  - Surface Contact constraint between the bottom face of the ‘Switch_Connector.1’ and the inner face of the ‘Front_Cover.1’



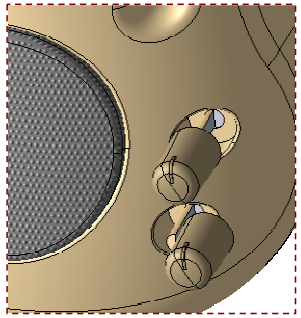
- Similarly position ‘Switch_Connector.2’ permanently using following constraints:
  - Coincidence constraint between the axes of the ‘Switch_Connector.2’ and the circular cutout in the ‘Front_Cover.1’
  - Surface Contact constraint between the side faces of the ‘Switch_Connector.2’ and the ‘Front_Cover.1’
  - Surface Contact constraint between the bottom face of the ‘Switch_Connector.2’ and the inner face of the ‘Front_Cover.1’



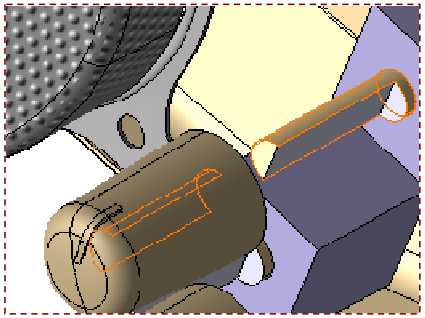
Student Notes:

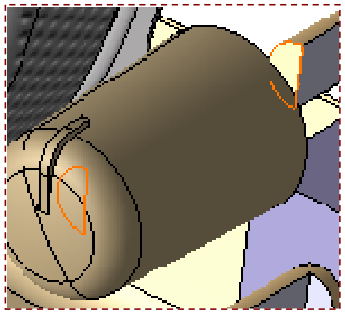
Do It Yourself (15/22)

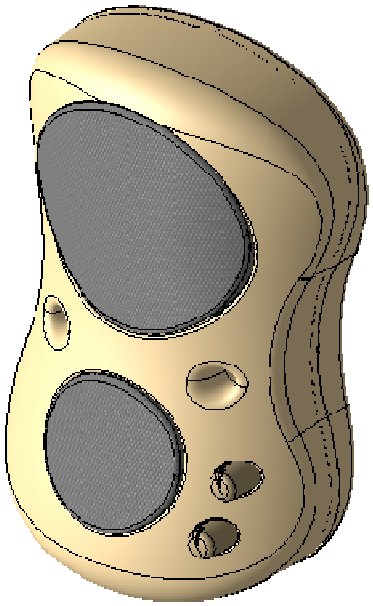
- Unhide ‘Switch.1’ and add its another instance
- Position approximately the two instances as shown



- Position ‘Switch.1’ and ‘Switch.2’ permanently using following constraints:
  - Surface Contact constraint between the inner semi-circular groove of the ‘Switch’ and the shaft of the ‘Switch_Connector’
  - Surface Contact constraint between the inner face of the ‘Switch’ and the top face of the shaft of ‘Switch_Connector’





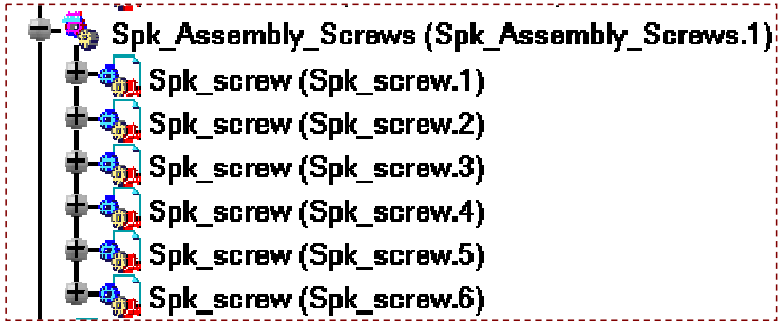


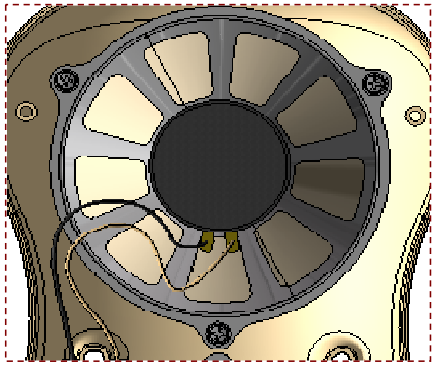
Student Notes:

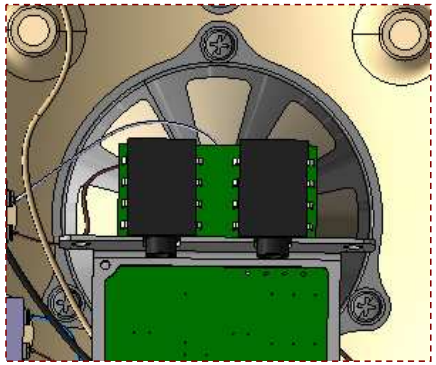
Do It Yourself (16/22)

Part used: “Spk_screw.CATPart”

- Activate ‘Speaker_Assembly.1’ and insert ‘Spk_screw.CATPart’ in the component ‘Spk_Assembly_Screws.1’
- Instantiate ‘Spk_screw’ to create total 6 instances of this screw
- Make the sub assembly ‘Spk_Assembly_Screws.1’ flexible
- Using multi-constraints mode, position all instances of the ‘Spk_screw’ with the following constraints:
  - Coincidence constraint between the axes of the ‘Spk_Screw’ and the screw hole in the ‘Bass_Speaker.1’
  - Contact constraint between the faces of the ‘Spk_Screw’ and the ‘Bass_Speaker.1’
  - Coincidence constraint between the axes of the ‘Spk_Screw’ and the screw hole in the ‘Medium_Speaker.1’
  - Contact constraint between the faces of the ‘Spk_Screw’ and the ‘Medium_Speaker.1’





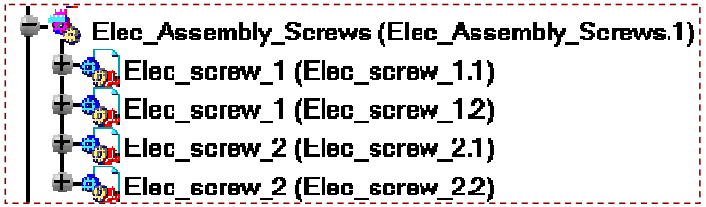


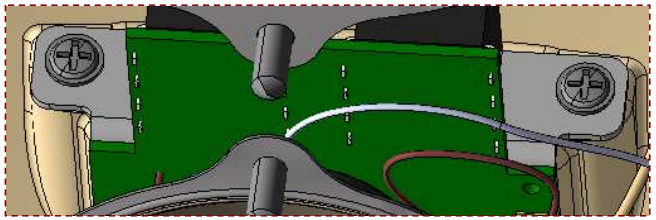
Student Notes:

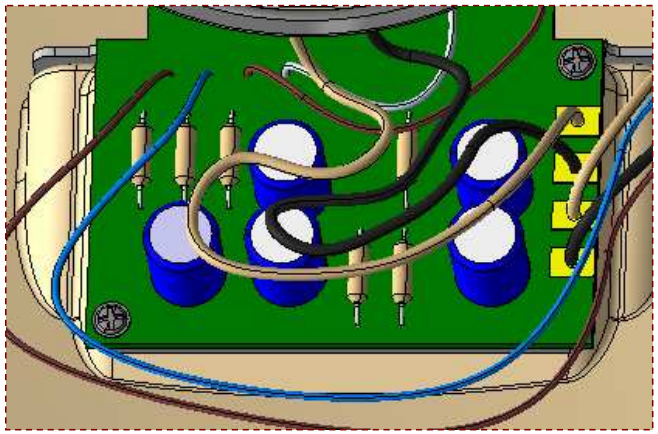
Do It Yourself (17/22)

Parts used: “Elec_screw_1.CATPart”, “Elec_screw_2.CATPart”

- Activate ‘Speaker_Assembly.1’ and insert ‘Elec_screw_1.CATPart’ and ‘Elec_screw_2.CATPart’ in the component ‘Elec_Assembly_Screws.1’
- Instantiate ‘Elec_screw_1’ and ‘Elec_screw_2’ to create two instances of each of screws
- Make the sub-assembly ‘Elec_Assembly_Screws.1’ flexible
- Hide ‘Front_Cover.1’ and unhide ‘Back_Cover.1’
- Position the two instances of the ‘Elec_screw_1’ with the following constraints:
  - Coincidence constraint between the axes of the ‘Elec_screw_1’ and the screw hole in the ‘Electronic_Support.1’
  - Contact constraint between the faces of the ‘Elec_screw_1’ and the ‘Electronic_Support.1’
- Position the two instances of the ‘Elec_screw_2’ with the following constraints:
  - Coincidence constraint between the axes of the ‘Elec_screw_2’ and the screw hole in the ‘Electronic.1’
  - Contact constraint between the faces of the ‘Elec_screw_2’ and the ‘Electronic.1’





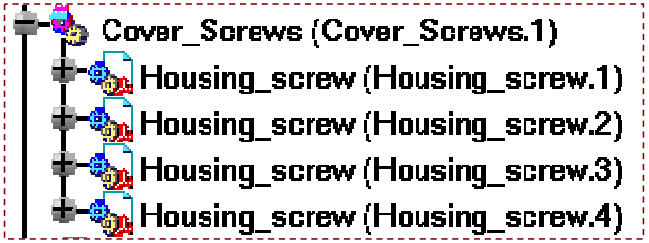


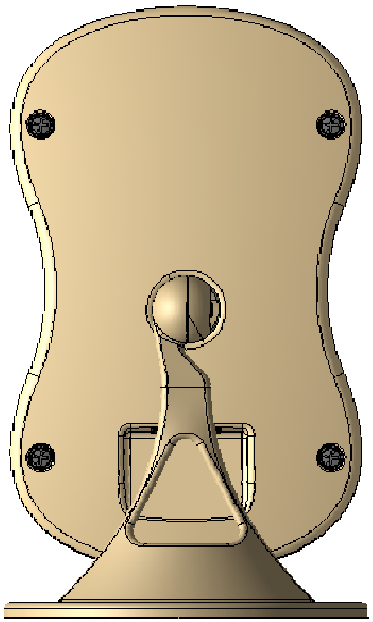
Student Notes:

Do It Yourself (18/22)

Part used: “Housing_screw.CATPart”

- Activate root assembly and unhide ‘Front_Cover.1’
- Insert ‘Housing_screw.CATPart’ in ‘Cover_Screws’ and instantiate multiple instances to create total four instances
- Make the sub-assembly ‘Cover_Screws.1’ flexible
- Position the four instances of the ‘Housing_screw’ with the following constraints:
  - Coincidence constraint between the axes of the ‘Housing_screw’ and the screw hole in the ‘Back_Cover.1’
  - Surface Contact constraint between the faces of the ‘Housing_screw’ and the in the ‘Back_Cover.1’
- Unhide ‘Speaker_Stand.1’



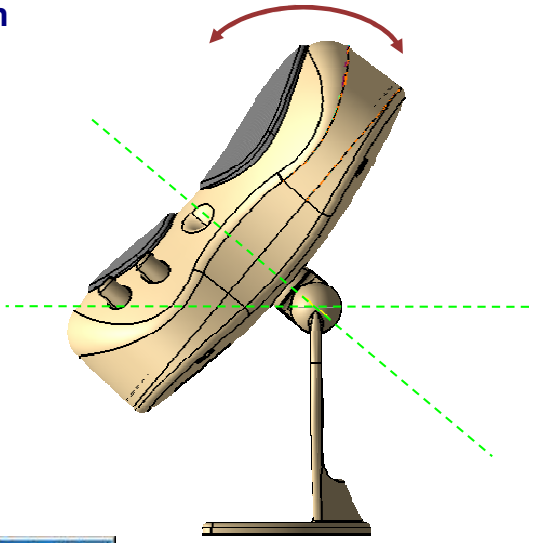


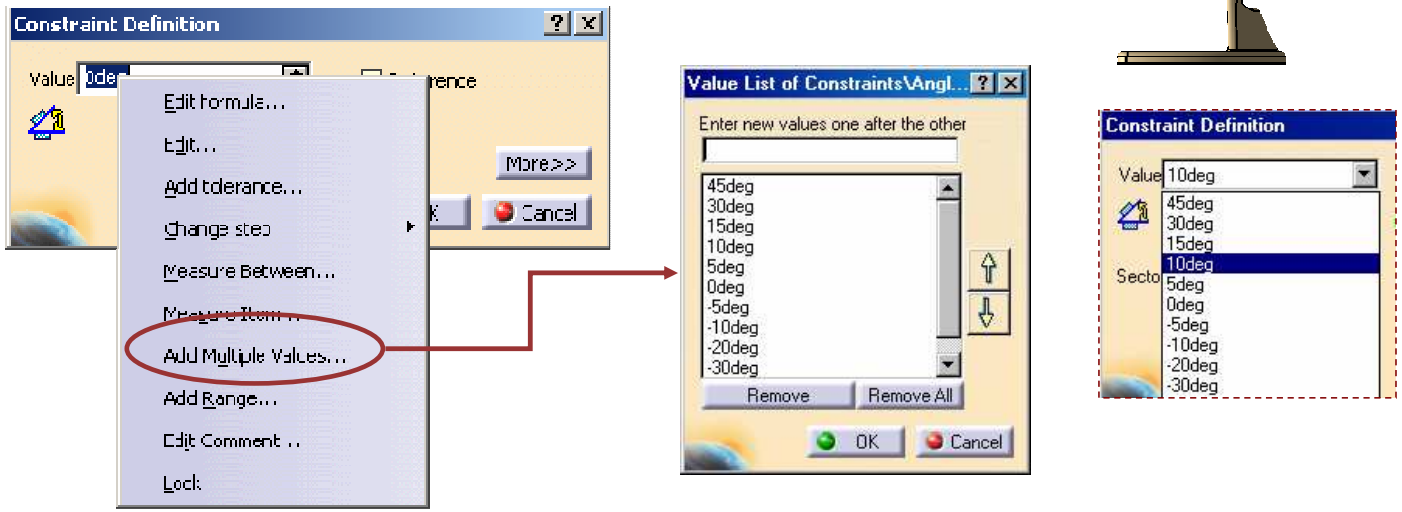
Student Notes:

Do It Yourself (19/22)

You will now demonstrate the PC Speaker can be rotated in the yz and zx plane

- **Activate 'Speaker_Stand.1', create an angular constraint between the 'Plane.1' of 'Feet_arm.1' and xy plane of 'Feet_support.1' with angle between the two planes set as '0 deg', re-activate root assembly and update the assembly.**
- **Change the value of this angular constraint to '-45deg' and update the assembly**
- **Observe the new orientation of the PC Speaker assembly and restore the angle to '0deg'**



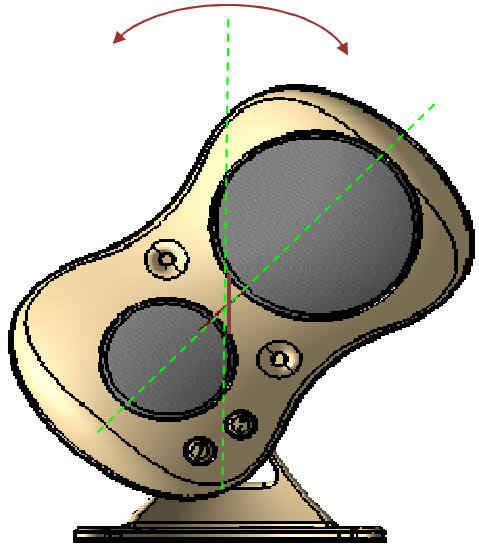


You can add preset values for the rotation angle by using contextual menu "Add Multiple Values" and specify the values in the list.

Student Notes:

Do It Yourself (20/22)

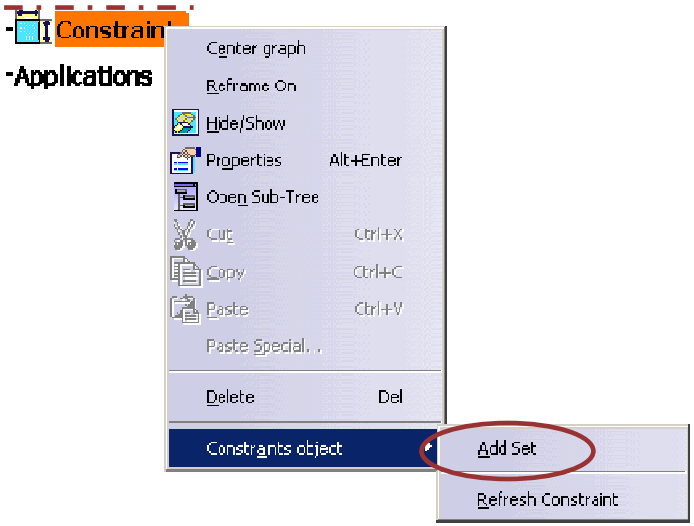
- Activate the root assembly, create an angular constraint between the yz planes of the ‘Feet_arm.1’ and ‘Back_Cover.1’ with angle between the planes set to ‘0deg’
- Update the assembly
- Change the angle value for the newly created angle constraint to ’45deg’ and update the assembly
- Observe the new orientation of the PC Speaker assembly and restore the angle value to ‘0deg’

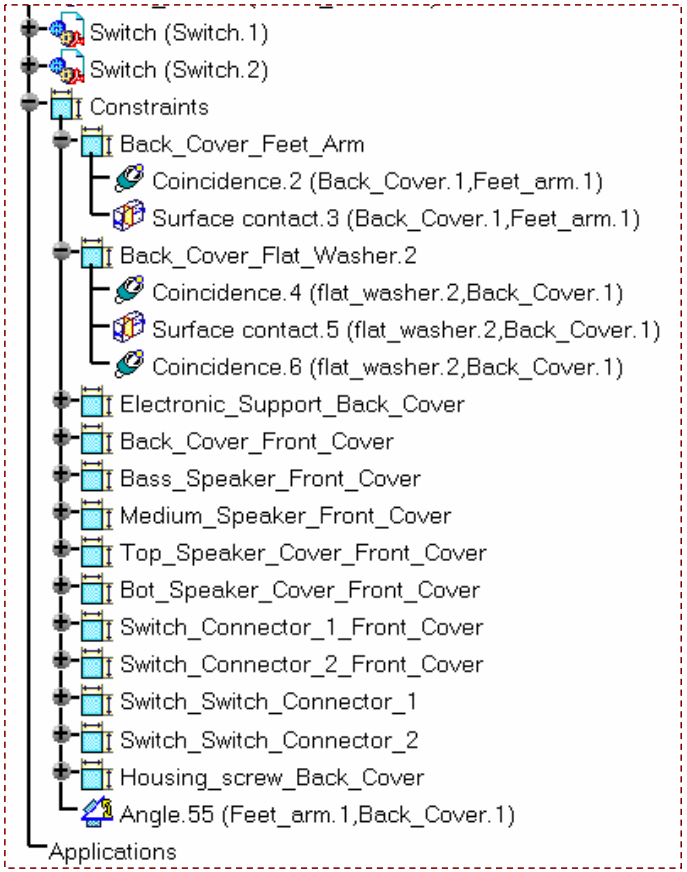


Student Notes:

Do It Yourself (21/22)

- Activate root assembly and group several constraints into sets as shown
- Create a set for each group of constraints between the pair of components
- Hide all constraints

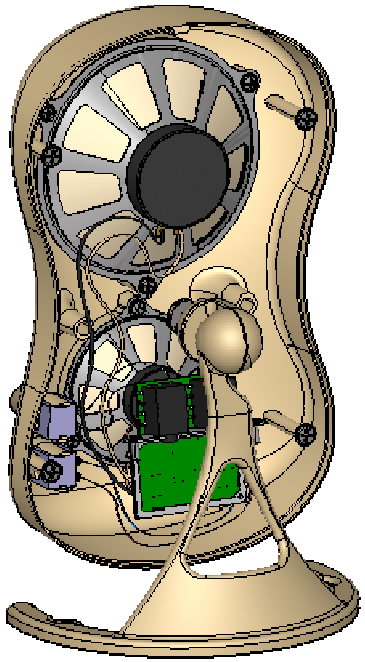


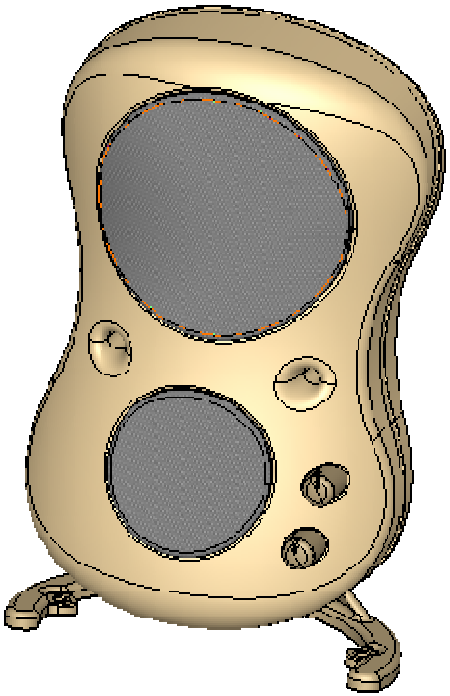


Student Notes:

Do It Yourself (22/22)

- Save the root assembly as “CATASM_PC_Speaker_Assembly_Step3.CATProduct” using propagate directory





Student Notes:

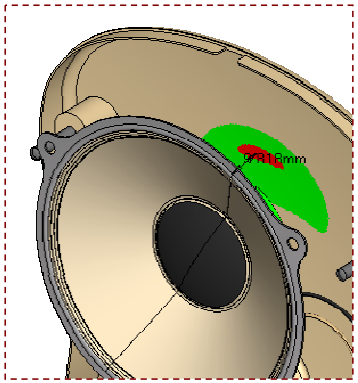
PC Speaker Assembly

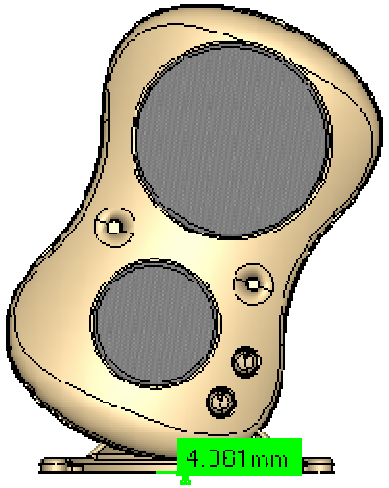
Step 4: Analyzing Assembly

15 min

In this step, you will analyze the design of the speaker assembly for minimum ground clearance and minimum distance between cover and speaker.

You will verify the rotational degree of freedom for volume control and bass control switches. You will extract a Bill of Material for PC Speaker Assembly





Student Notes:

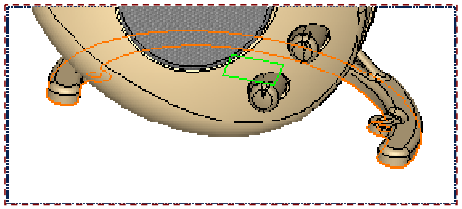
Do It Yourself (1/5)

Product used: CATASM_PC_Speaker_Assembly_Step3.CATProduct

You will analyze the minimum ground clearance for a particular orientation of the speaker assembly and modify to design to maintain the minimum ground clearance above 10 mm.

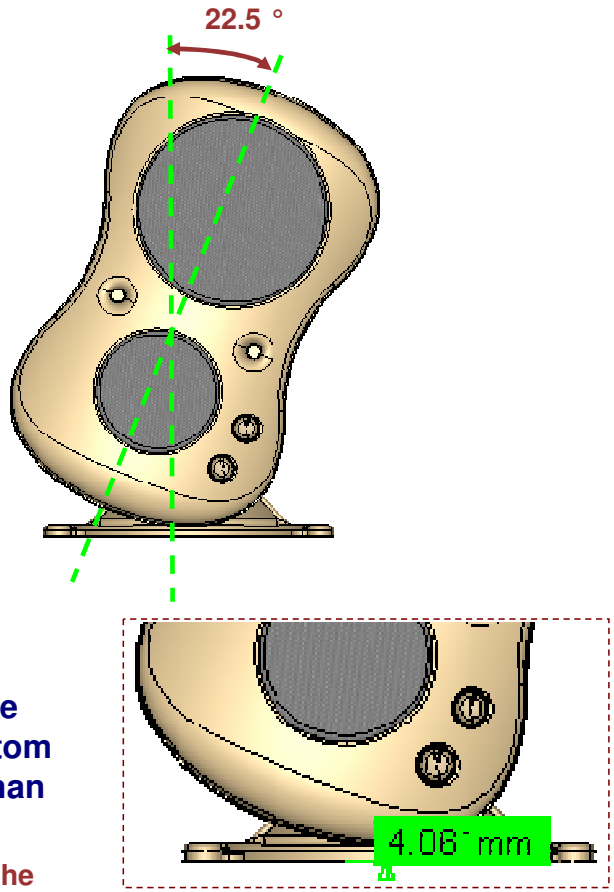
- **Edit the angle constraint between 'Feet_arm.1' and 'Back_Cover.1' and change it to '22.5deg'**

- **Edit 'Feet_support.1' and create a plane on the bottom surface as shown.**



- **Measure 'Minimum' distance between the lower surface of the 'Back_Cover.1' and the newly created plane bottom surface of the 'Feet_support.1'. This distance is less than the design clearance of 10mm.**

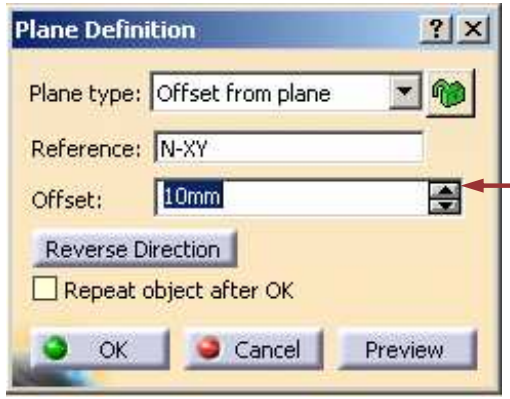
Note: Measured values are representative and not necessarily the exact values that will be seen by the user.

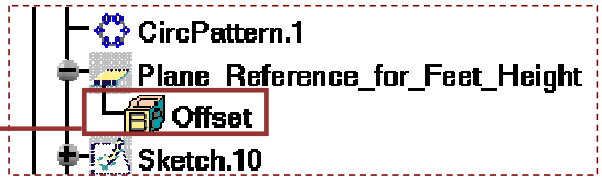


Student Notes:

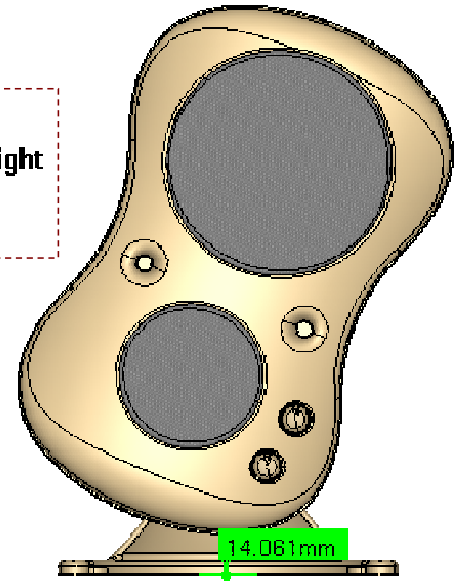
Do It Yourself (2/5)

- To increase the ground clearance, edit the part ‘Feet_Support.1’
- Edit the offset distance of the ‘Plane_Reference_for_Feet_Height’ and modify the offset value to ‘20mm’





- Update the assembly and the measure
- Hide the plane used in this measure
- Edit the angle constraint between ‘Feet_arm.1’ and ‘Back_Cover.1’ and change it back to ‘0deg’

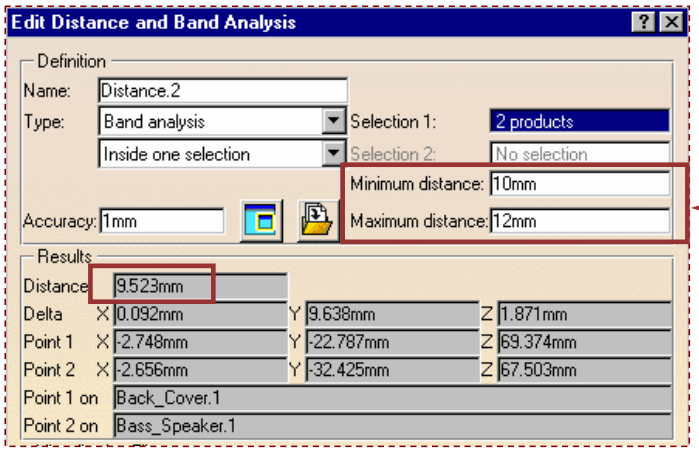


The new ground clearance is 14.061 mm

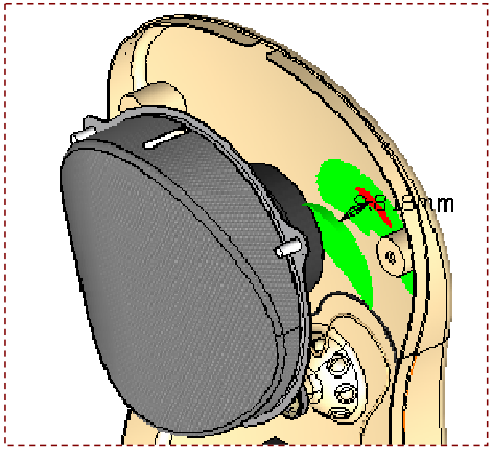
Student Notes:

Do It Yourself (3/5)

- Hide ‘Front_Cover.1’ and compute the band analysis between the ‘Back_Cover.1’ and ‘Bass_Speaker.1’ for designed clearance of 10 mm



Designed clearance band



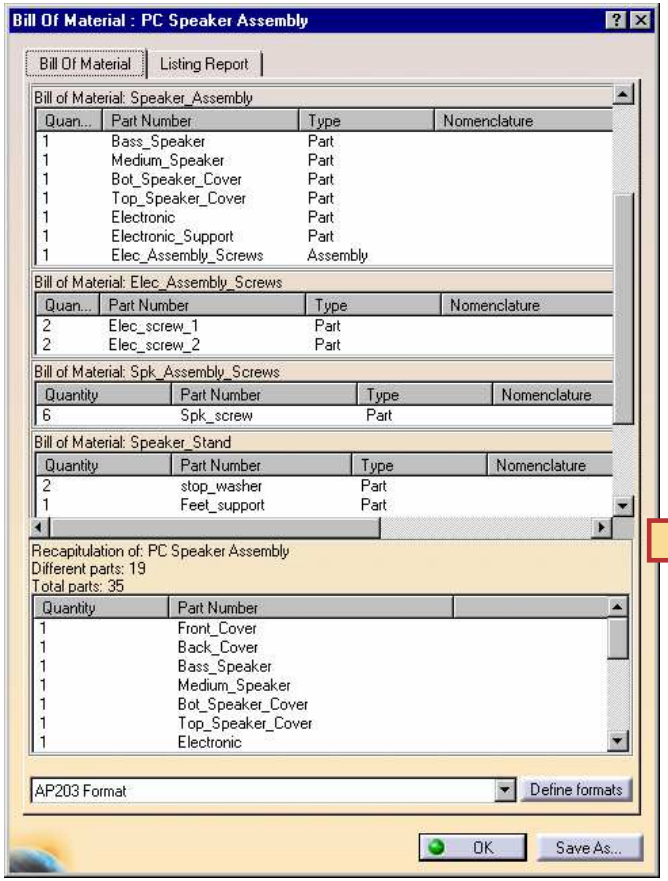
Note: Measured values are representative and not necessarily the exact values that will be seen by the user.
The clearance between the ‘Bass_Speaker.1’ and ‘Back_Cover.1’ is below the designed clearance band (10mm to 12 mm). In reality the assembly have to be modified.

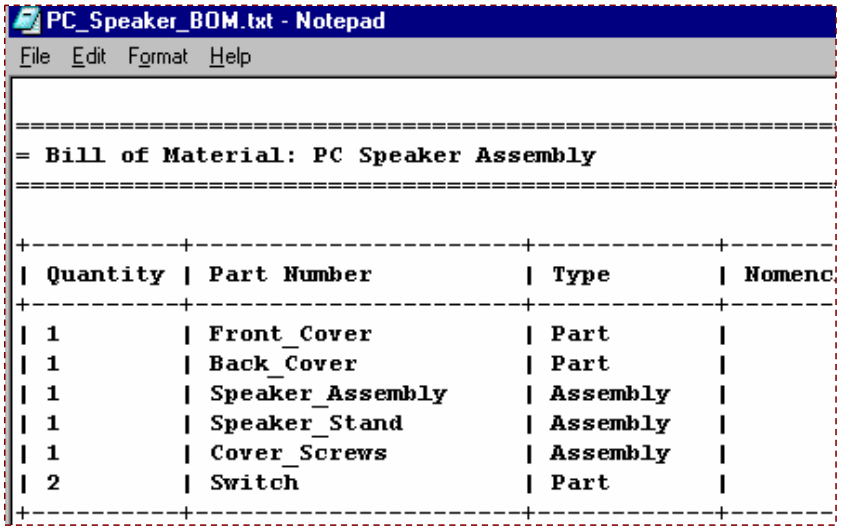
- Hide the Measure and Distance nodes
- Unhide ‘Front_Cover.1’

Student Notes:

Do It Yourself (4/5)

- **Generate the Bill of Material for the PC_Speaker assemblies and save the Bill of Material as “PC_Speaker_BOM.txt”**

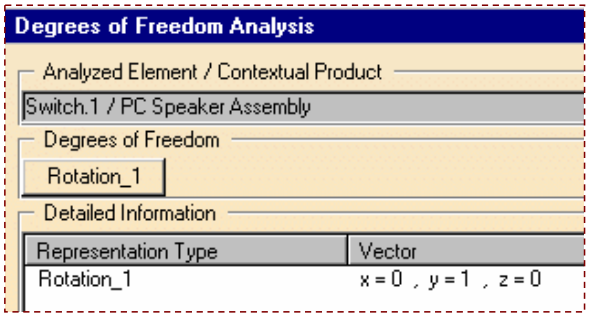


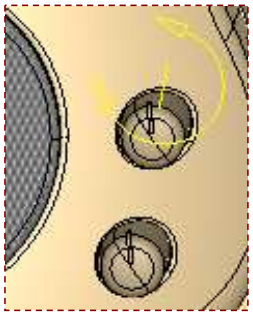


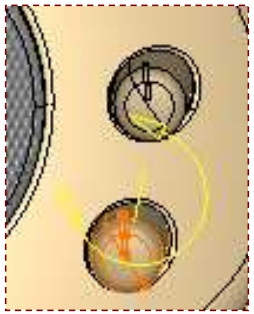
Student Notes:

Do It Yourself (5/5)

- Verify the rotational degree of freedom of the Volume control and Bass control switches.







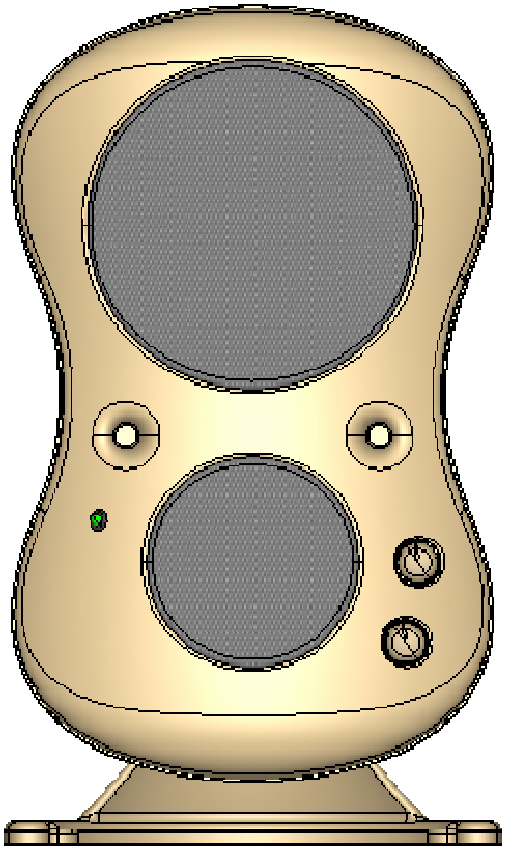
- Save the assembly as 'CATASM_PC_Speaker_Assembly_Step4.CATProduct using save management

PC Speaker Assembly

Step 5: Designing in Context

15 min

In this step, you will insert an existing CATPart with positioning. You will design the Front_Cover in context of the another part.



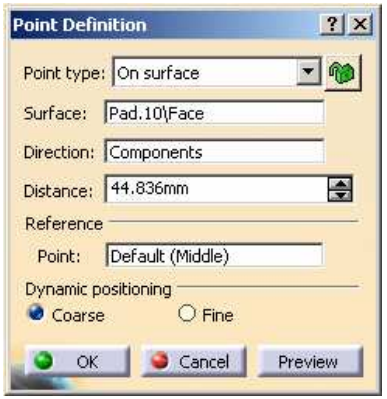
Student Notes:

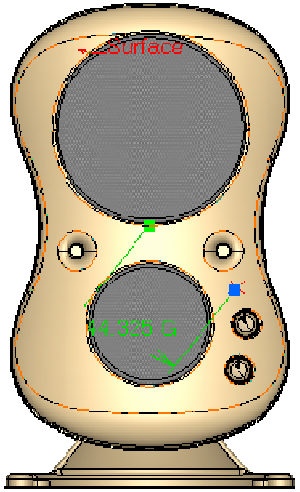
Student Notes:

Do It Yourself (1/4)

Product used: CATASM_PC_Speaker_Assembly_Step4.CATProduct

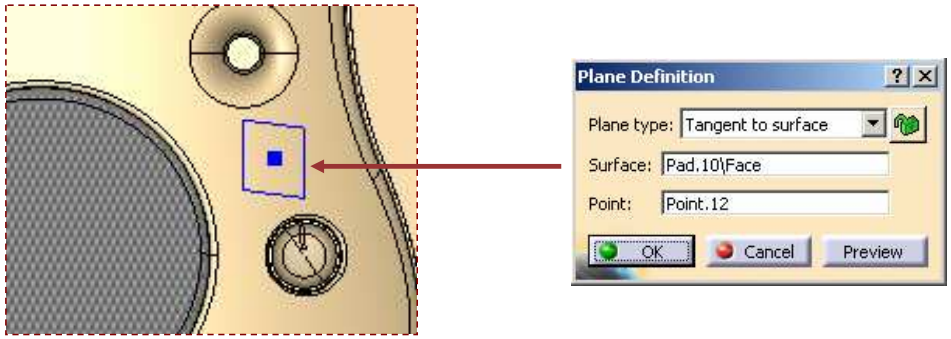
- Switch 'PC Speaker Assembly' to design mode
- Edit 'Front_Cover' and create a point on surface of the 'Front_Cover.1' as shown





The positioning of the point is approximate between the switch and circular opening in the cover

- Create a plane tangent to the front face and passing through the point just created

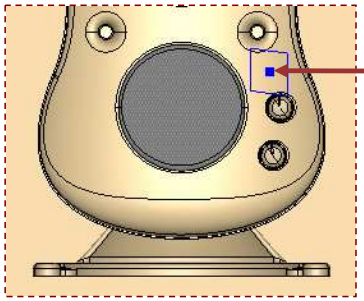


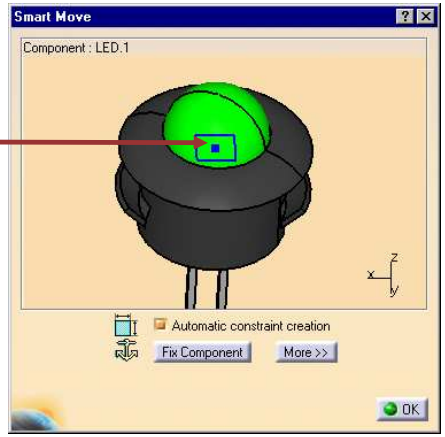
Student Notes:

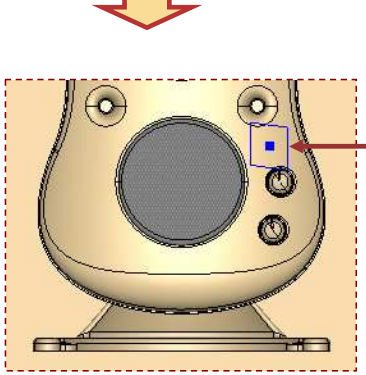
Do It Yourself (2/4)

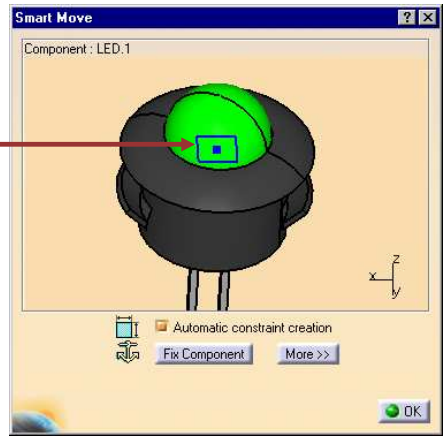
Part used: LED.CATPart

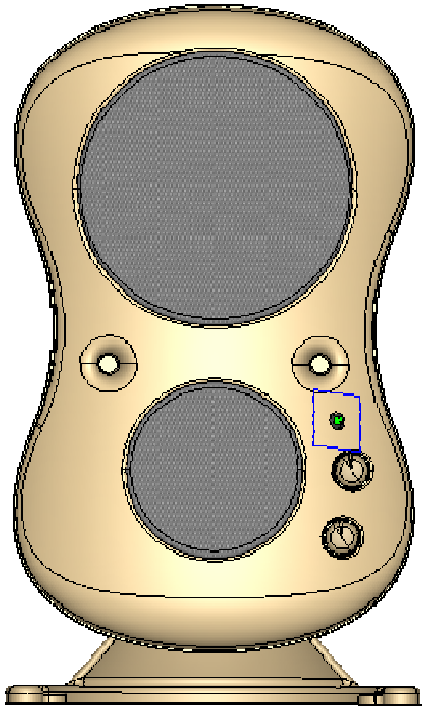
- Launch the CATPart “CATASM_LED.CATPart” and save it in a temporary location (for example : C:\temp)
- Insert existing part “CATASM_LED.CATPart” with positioning
- Position the LED using points and planes as shown









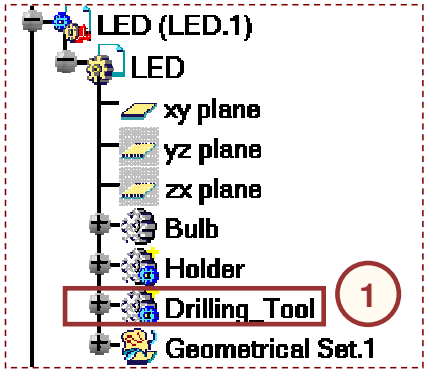


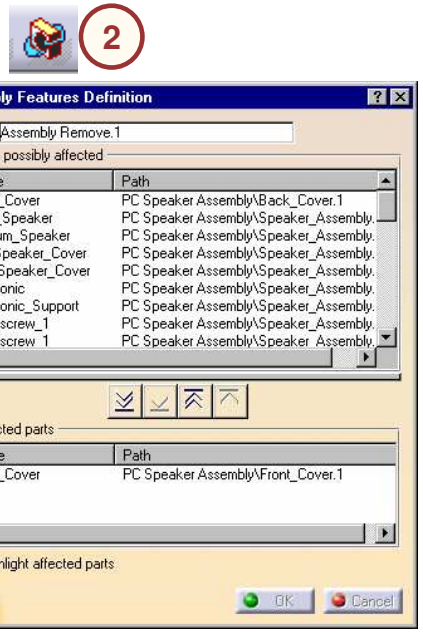
LED positioned in PC Speaker Assembly

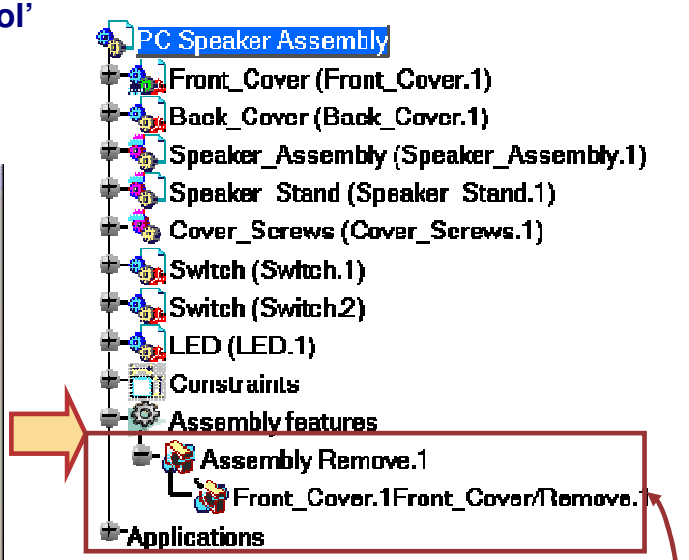
Student Notes:

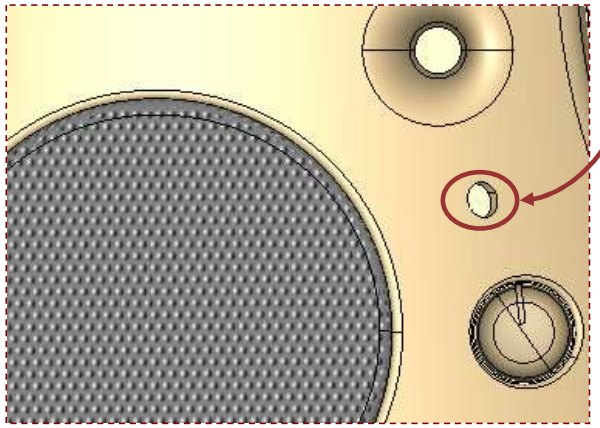
Do It Yourself (3/4)

- Create an 'Assembly Remove' feature using 'Drilling_Tool' body inside LED with part affected as 'Front_Cover'







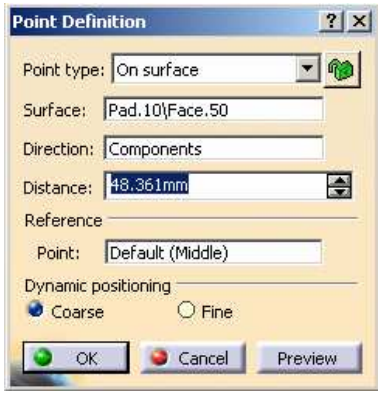


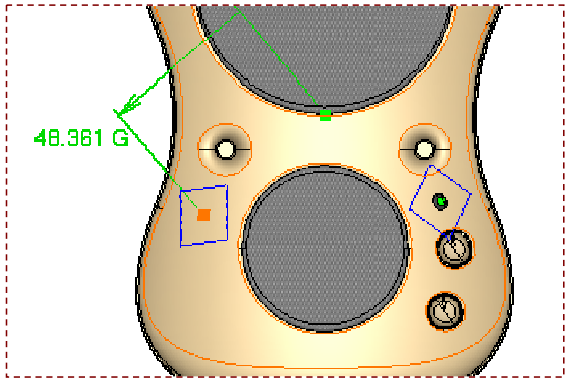
Hide LED to see the assembly remove feature

Student Notes:

Do It Yourself (4/4)

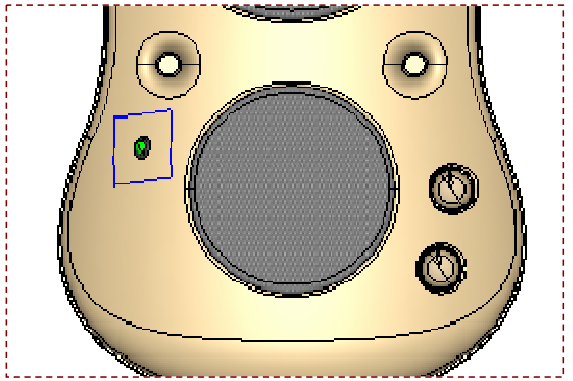
- Modify the position of LED by editing the point of positioning plane in 'Front_Cover.1'





New position of plane in Front Cover

The positioning of point is approximate and you can position it as shown above



LED Position updated after assembly update

- Activate the root product and update the assembly. The Assembly Remove feature is automatically repositioned
- Save the assembly as 'CATASM_PC_Speaker_Assembly_Step5.CATProduct using save management

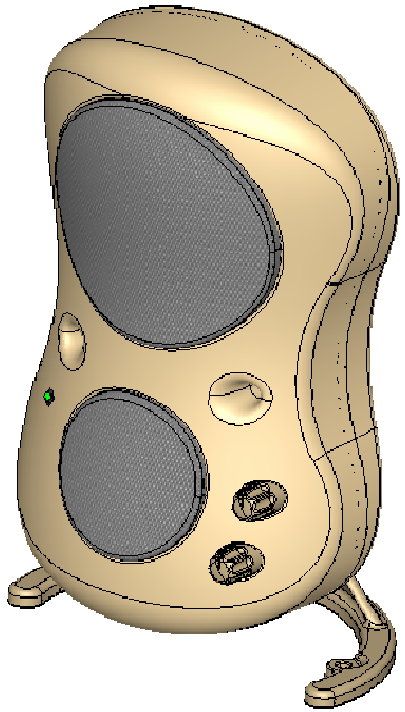
Student Notes:

PC Speaker Assembly

Step 6: Replacing Components

10 min

In this step, you will replace an existing component in an assembly with another similar component and reconnect the broken constraints

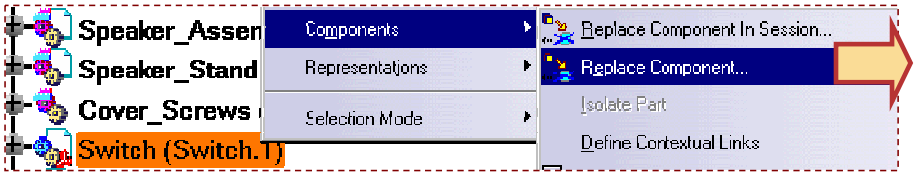


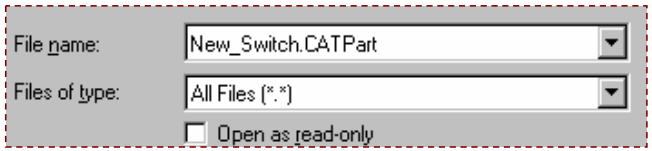
Student Notes:

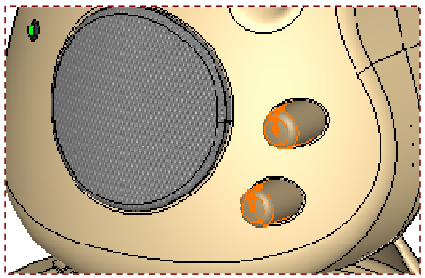
Do It Yourself (1/3)

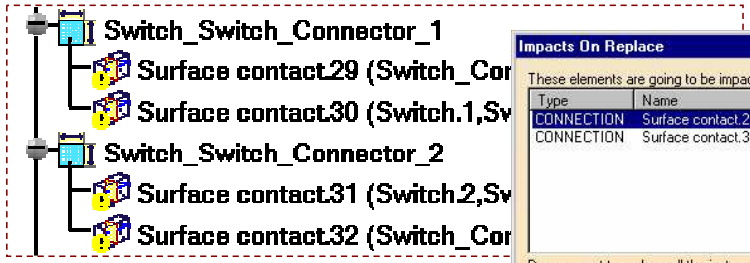
Product used: “CATASM_PC_Speaker_Assembly_Step5.CATProduct”
Part used: “New_Switch.CATPart”

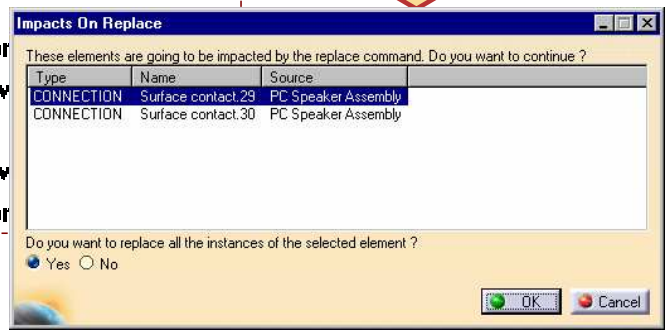
- Replace ‘Switch’ with ‘New_Switch’ component. Use the attached “New_Switch.CATPart”. Replace all instances of the component









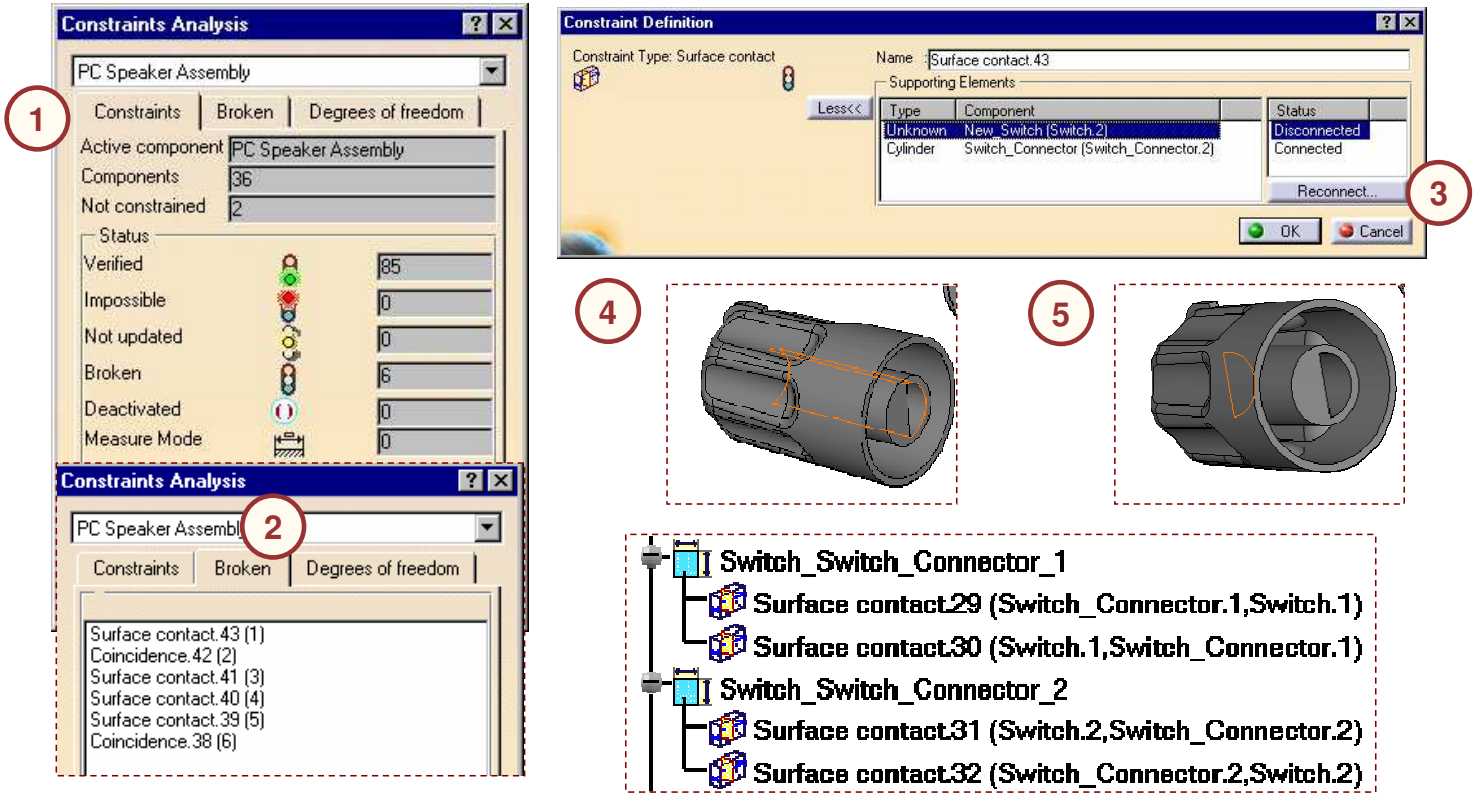


The two constraints are impacted due to the replacement of the ‘Switch’

Student Notes:

Do It Yourself (2/3)

- **Analyze and reconnect broken constraints for the two instances of replaced ‘Switch’.**

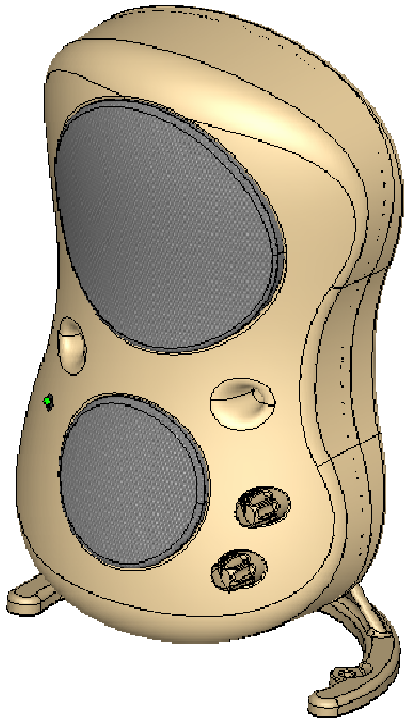


Reconnecting broken constraints by using the “Reconnect” command

Student Notes:

Do It Yourself (3/3)

- Update the assembly
- Save the root assembly using 'Save Management' as "CATASM_PC_Speaker_Assembly_Step6.CATProduct"



Student Notes:

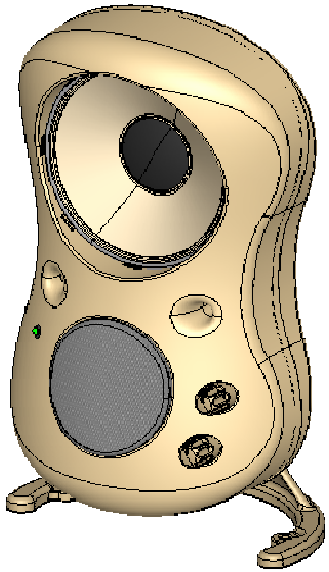
PC Speaker Assembly

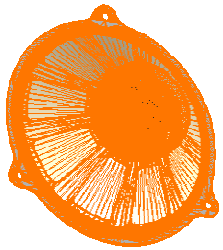
Step 7: Managing Product Structure

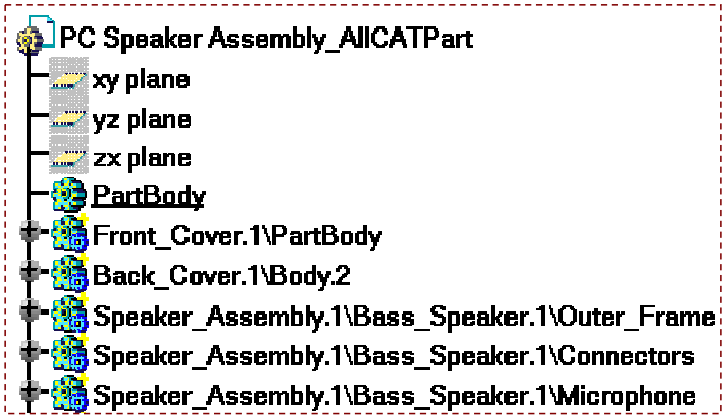
10 min

In this step, you will reorder existing product structure and propose a lighter representation of bought out parts (for example speakers) in order to reduce the size of the assembly.

Finally you will share the assembly model for review while protecting the design intent by generating a CATPart of the assembly





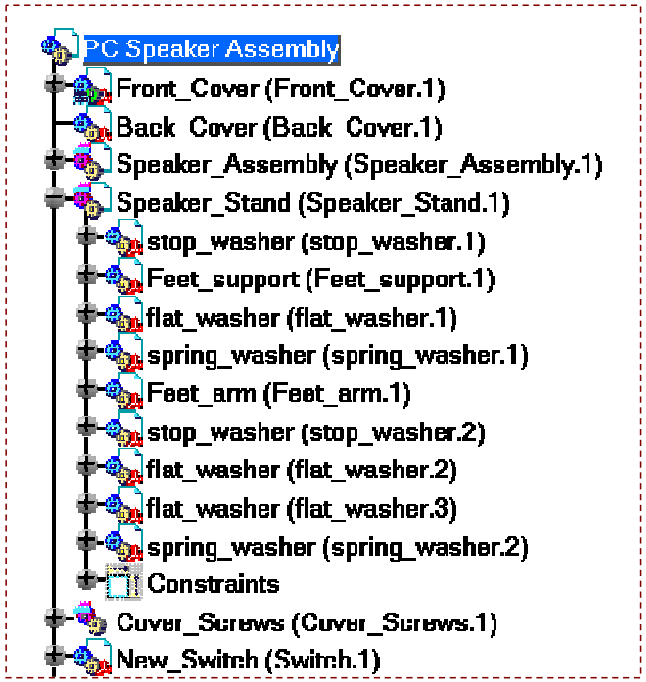


Student Notes:

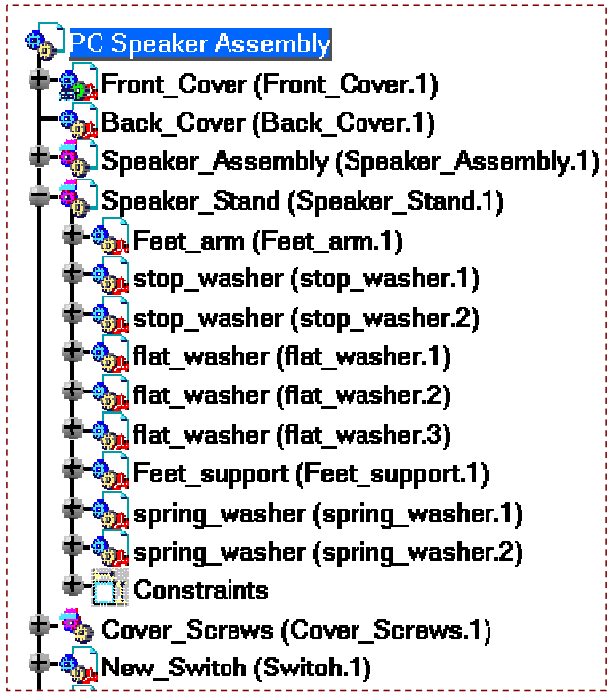
Do It Yourself (1/3)

Product used: CATASM_PC_Speaker_Assembly_Step6.CATProduct

- Reorder the product structure for better visualization of group of components in the specification tree as shown



Original specification tree

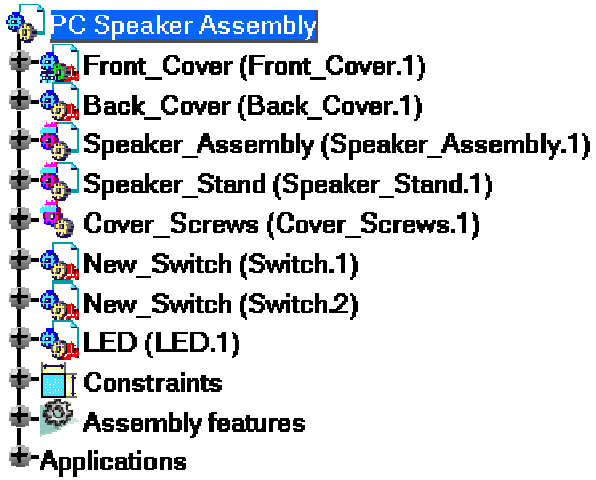


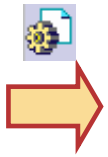
Specification Tree after reordering the structure

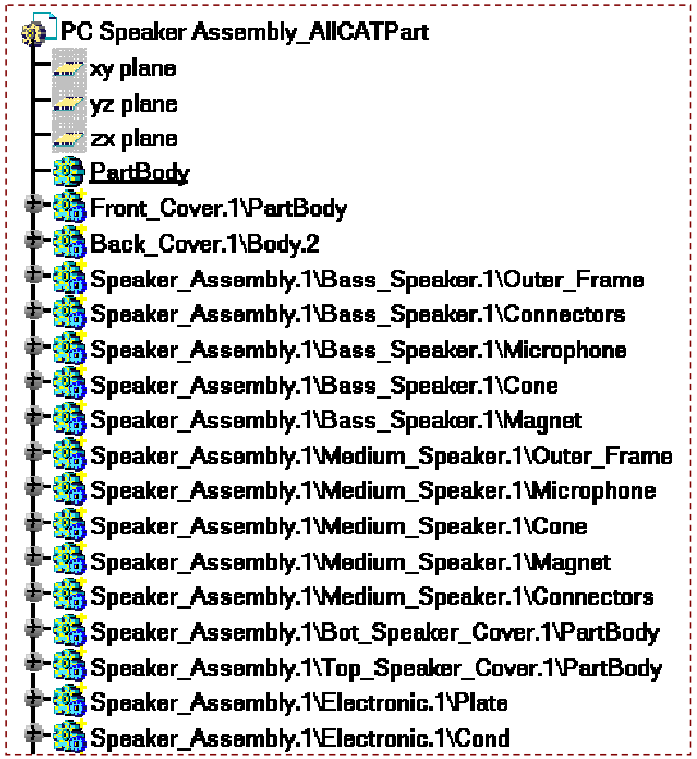
Student Notes:

Do It Yourself (2/3)

- Generate a CATPart from a CATProduct without the merge option as shown.
- Save the generated CATPart as “CATASM_PC_Speaker_for_review.CATPart”







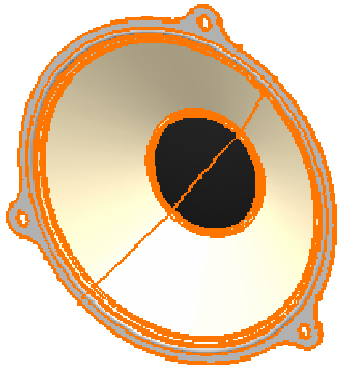
Design of assembly is visible and changes in the design can be made in the assembly

Design of assembly is invisible and only assembly review (sectioning, measurement) can be done. No design changes are done here

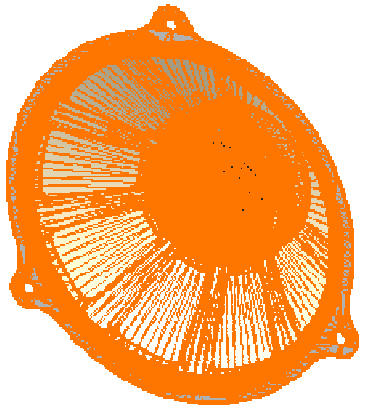
Student Notes:

Do It Yourself (3/3)

- Save as “Bass_Speaker.CATPart” as “Bass_Speaker.cgr”
- Also save “Medium_Speaker.CATPart” as “Medium_Speaker.cgr”



Bass Speaker CATPart representation (Design mode representation)
File size : 2519 Kb



Bass Speaker cgr representation (Simplified representation)
File size : ~1340 Kb

The file size of the simplified representation depends upon the CATIA settings for ‘Cgr Management’.

You can replace these bought out components in session with their ‘cgr representations’ to reduce the total assembly size.

If a cgr replacement is done then the ‘product to part’ will only partially work’.