Ansys Mechanical Getting Started

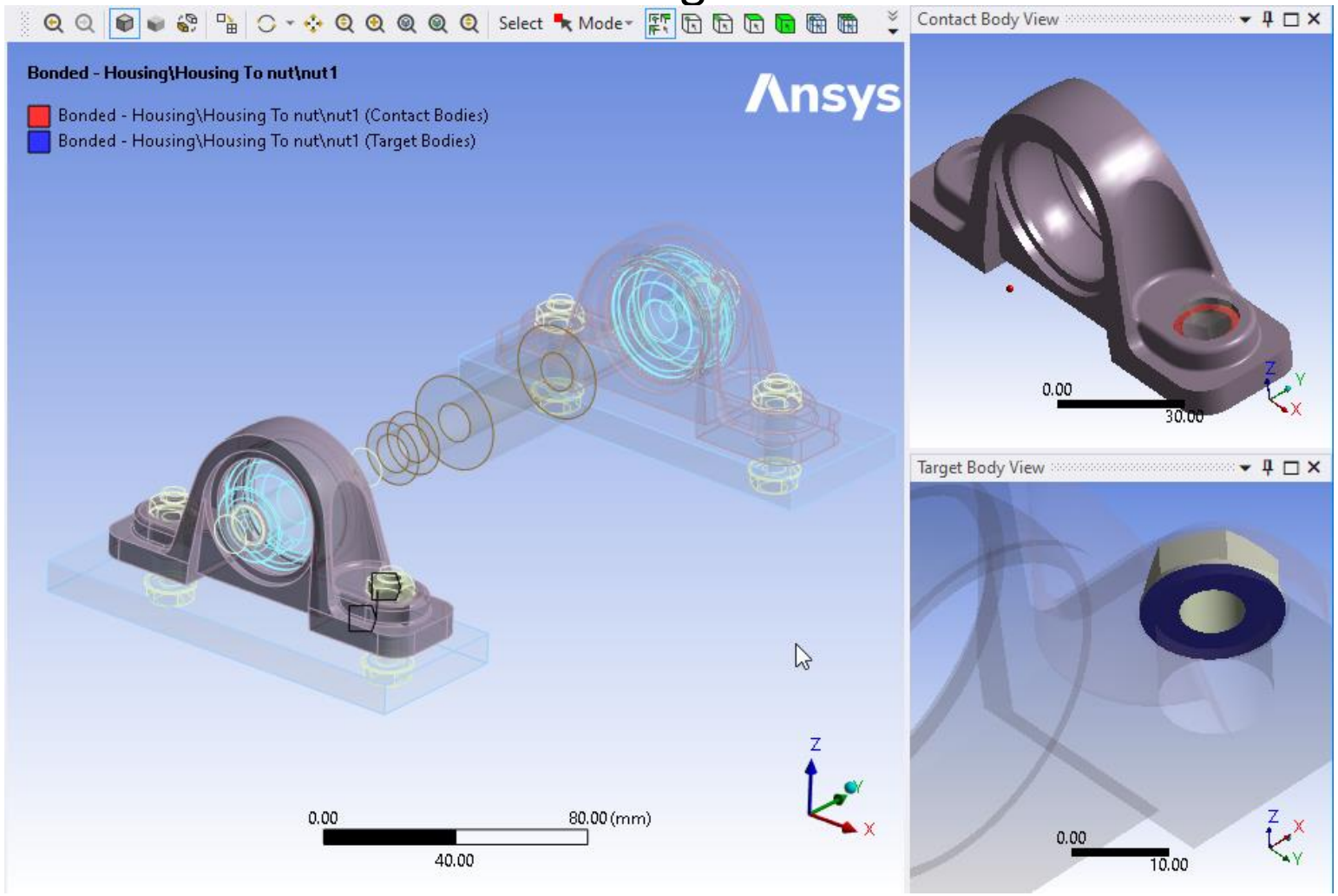
Module 05 Student Workshop: Connections

Please note:

- These training materials were developed and tested in Ansys Release 2023 R1. Although they are expected to behave similarly in later releases, this has not been tested and is not guaranteed.
- The screen images included with these training materials may vary from the visual appearance of a local software session.
- Although some workshop files may open successfully in previous releases, backward compatibility is somewhat unlikely and is not guaranteed.

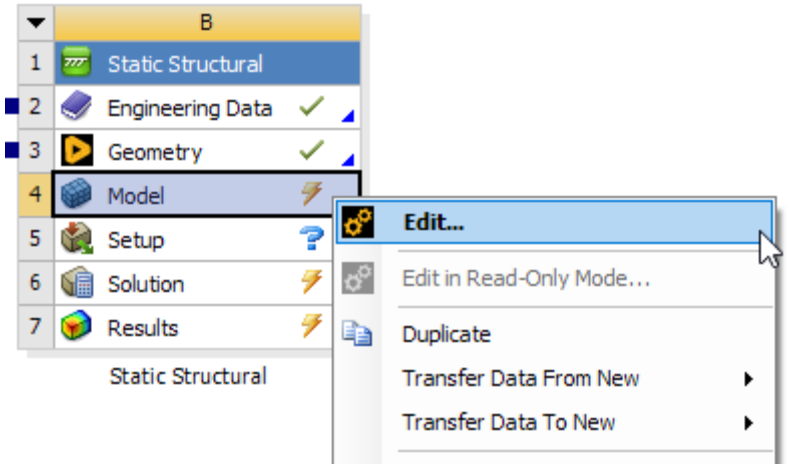
Workshop 05: Connections

- Use this guide to work on the Journal Bearing model.



Workshop 05: Connections

- Open ANSYS Workbench:
  - Start button → ANSYS nnnn Rn → Workbench nnnn Rn
  - File → Open…
  - Browse for archive file Shaft_Bearings_WS05_Start.wbpz → Open → Save to a convenient location. Or, continue with the model from Module 04 completed.
  - RMB—Model cell → Edit…

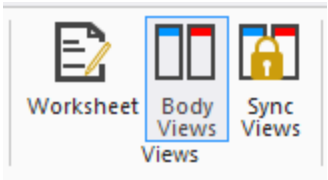


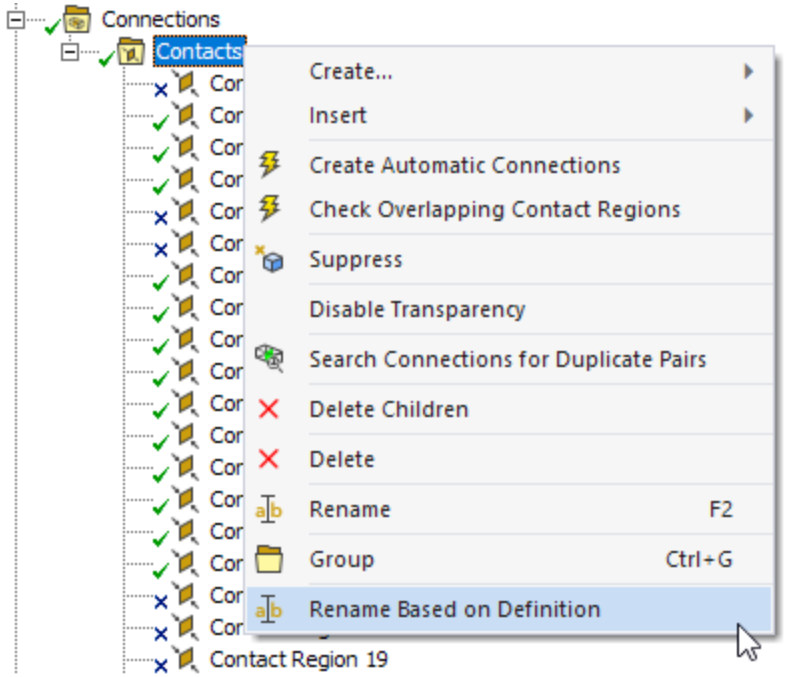
Workshop 05: Connections

- Expand the Connections branch.
- Expand the Contacts branch.
  - Some contact regions are suppressed. Why?
  - Contact detection and creation are done automatically when geometry is transferred into Mechanical. Contact Regions for the plugs, shafts and bolts were created before we suppressed these bodies from the assembly. Contact regions for these bodies were automatically suppressed at that time.
- Select Contacts branch and review details Tolerance Slider and Tolerance Value.

Workshop 05: Connections

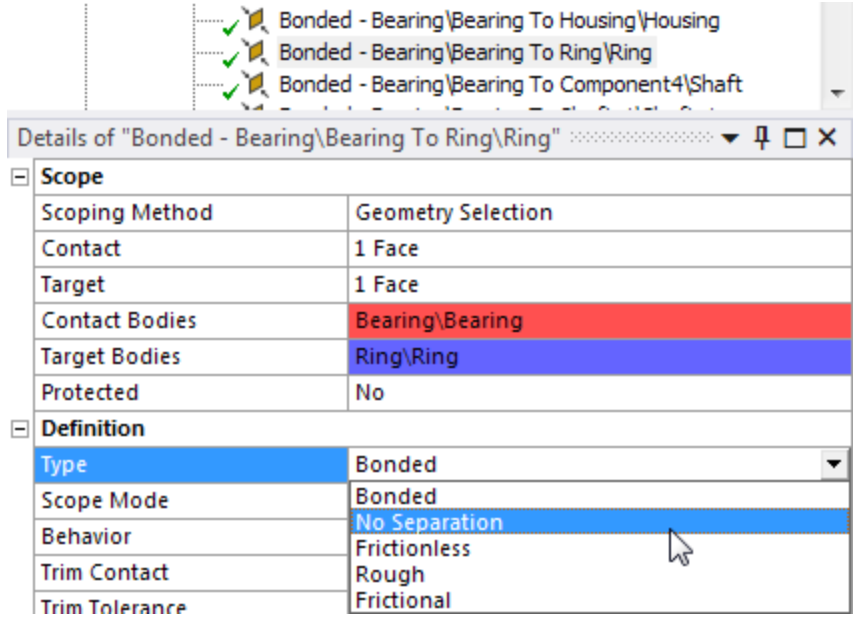
- Select the first active contact region.
- Review detail Type and the various graphics display features.
- Use Body Views and Sync Views in the Connections tab to review the contact and target geometries.
- RMB—Contacts → Rename Based on Definition





Workshop 05: Connections

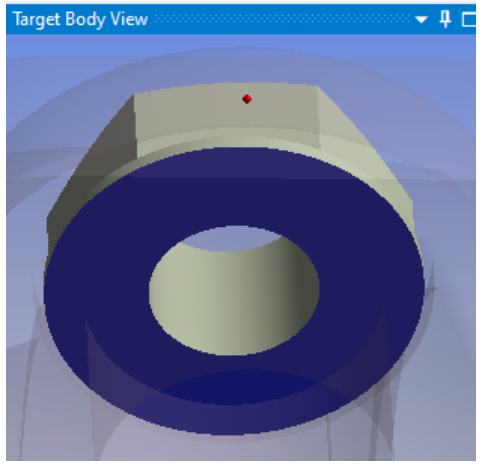
- Review each contact region for appropriateness in representing the actual physical system. Activate or Deactivate Body Views as needed during this process.
- Make the following changes:
  - Bonded - Bearing\Bearing To Ring\Ring: This contact, defined as bonded contact is not physically representative of how the system works. A suggestion is to define it as nonlinear contact, but we'll wait to do this in a later course. For this workshop, we'll define the type as No Separation.
  - Change Type to No Separation
  - Click on the other Ring body in the Graphics window.
  - RMB [on the Ring body] → Go To → Contacts for Selected Bodies.
  - Mechanical should highlight 2 contact pairs.
  - Select the contact region named Bonded - Ring\Ring To Bearing\ Bearing and change type to No Separation.



Workshop 05: Connections

- For the first contact region named Bonded - Housing\Housing To nut\nut1, follow steps below to include just the surface under the nut head for the Target side:
  - Edit Target Bodies to include just the surface under nut head. To make this process easier, we will make use of the Target Body View
  - Next, click the 2 Faces field next to detail Target to activate edit mode for the target surfaces—the Apply and Cancel buttons will appear.
  - Next, go to the Target Body View and single-click the desired surface i.e. the surface under nut head to select it, click the Apply button next to detail Target, and observe that detail Target now has the value 1 Face.
  - Review the contact region again in the Geometry view to confirm that the target geometry associations have been redefined as desired.

Details of "Bonded - Housing\Housing To nut\nut1"	
Scope	
Scoping Method	Geometry Selection
Contact	2 Faces
Target	1 Face
Contact Bodies	Housing\Housing
Target Bodies	nut\nut1
Protected	No

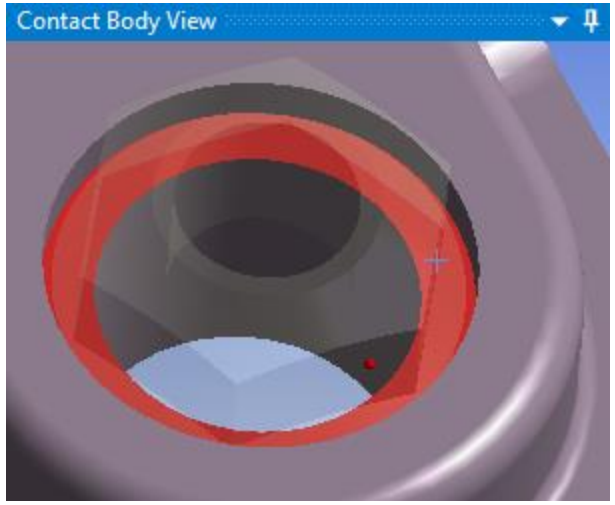


Workshop 05: Connections

- For the first contact region named Bonded - Housing\Housing To nut\nut1, follow steps below to include just the plane surface of the Housing for the Contact side:
  - Similarly, edit Contact Bodies to include just the plane surface. To make this process easier, we will make use of the Contact Body View
  - Click the 2 Faces field next to detail Contact to activate edit mode for the contact surfaces—the Apply and Cancel buttons will appear.
  - Next, go to the Contact Body View and single-click the desired surface to select it, click the Apply button next to detail Contact, and observe that detail Contact now has the value 1 Face.
  - Review the contact region again in the Geometry view to confirm that the target geometry associations have been redefined as desired.

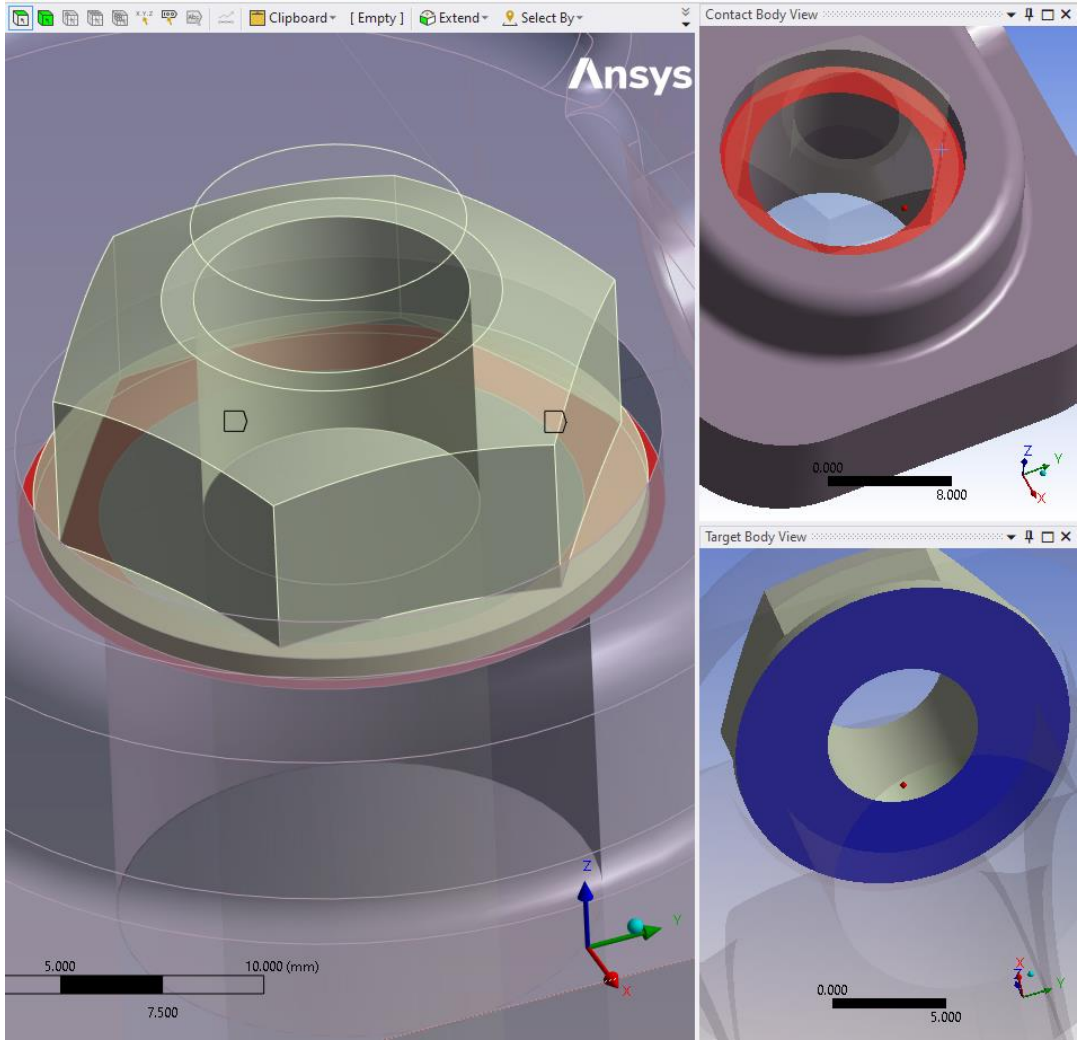
Details of "Bonded - Housing\Housing To nut\nut1"

Scope	
Scoping Method	Geometry Selection
Contact	1 Face
Target	1 Face
Contact Bodies	Housing\Housing
Target Bodies	nut\nut1
Protected	No



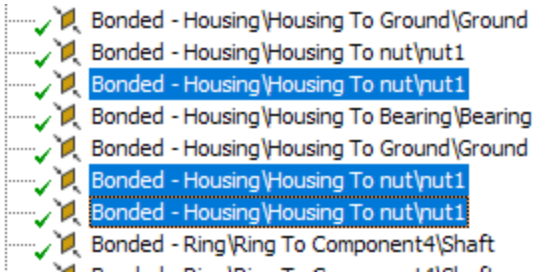
Workshop 05: Connections

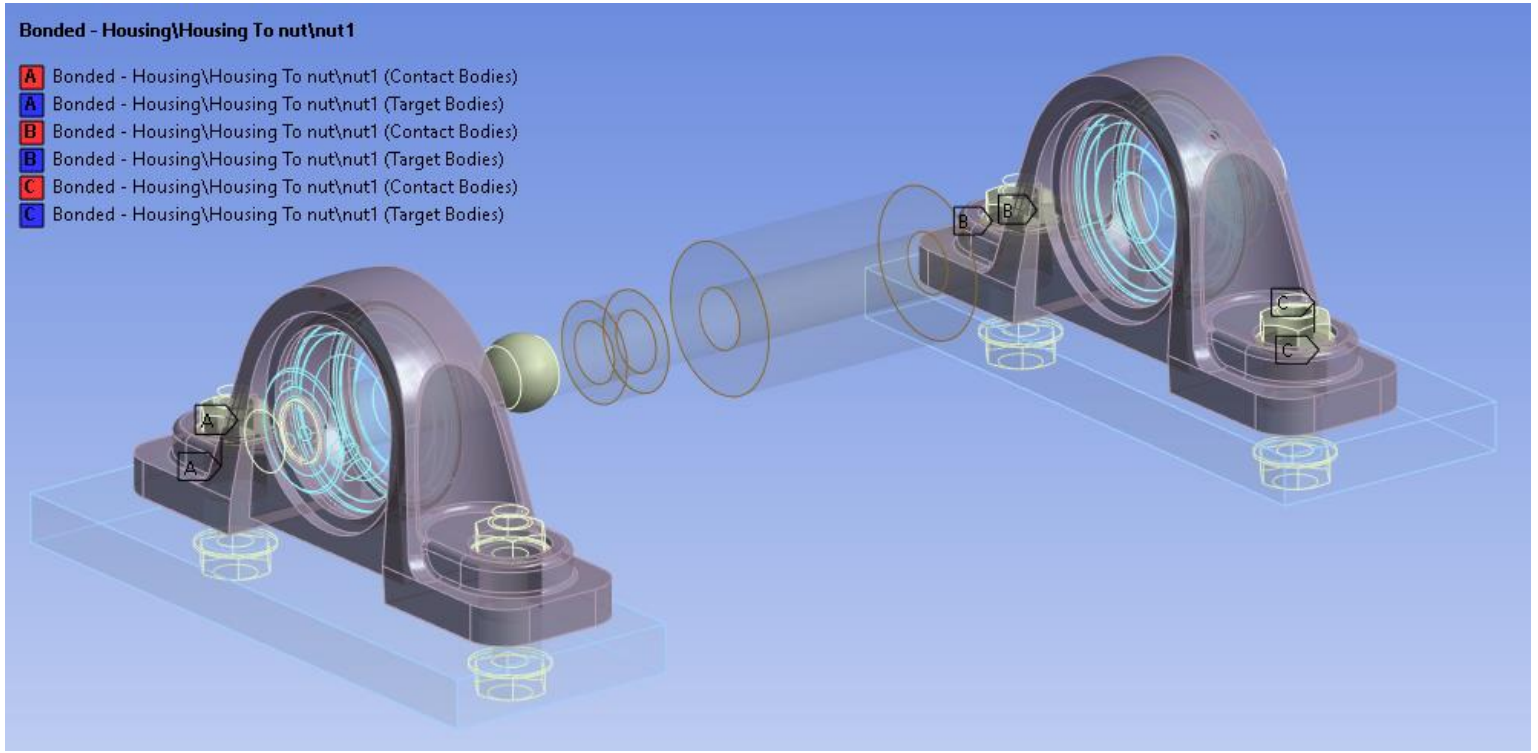
- The contact pair should look like this:



Workshop 05: Connections

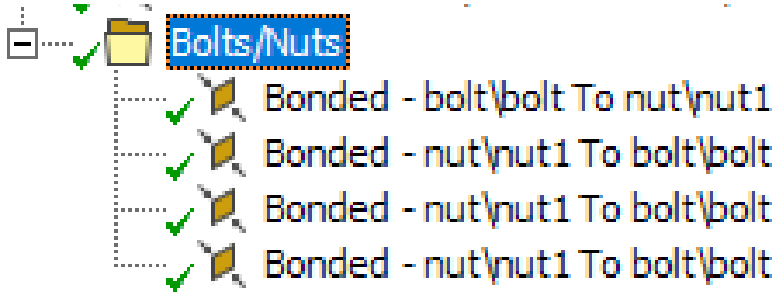
- Repeat the steps from the previous 3 slides for each of the 3 other contact regions named Bonded - Housing\Housing To nut\nut1.





Workshop 05: Connections

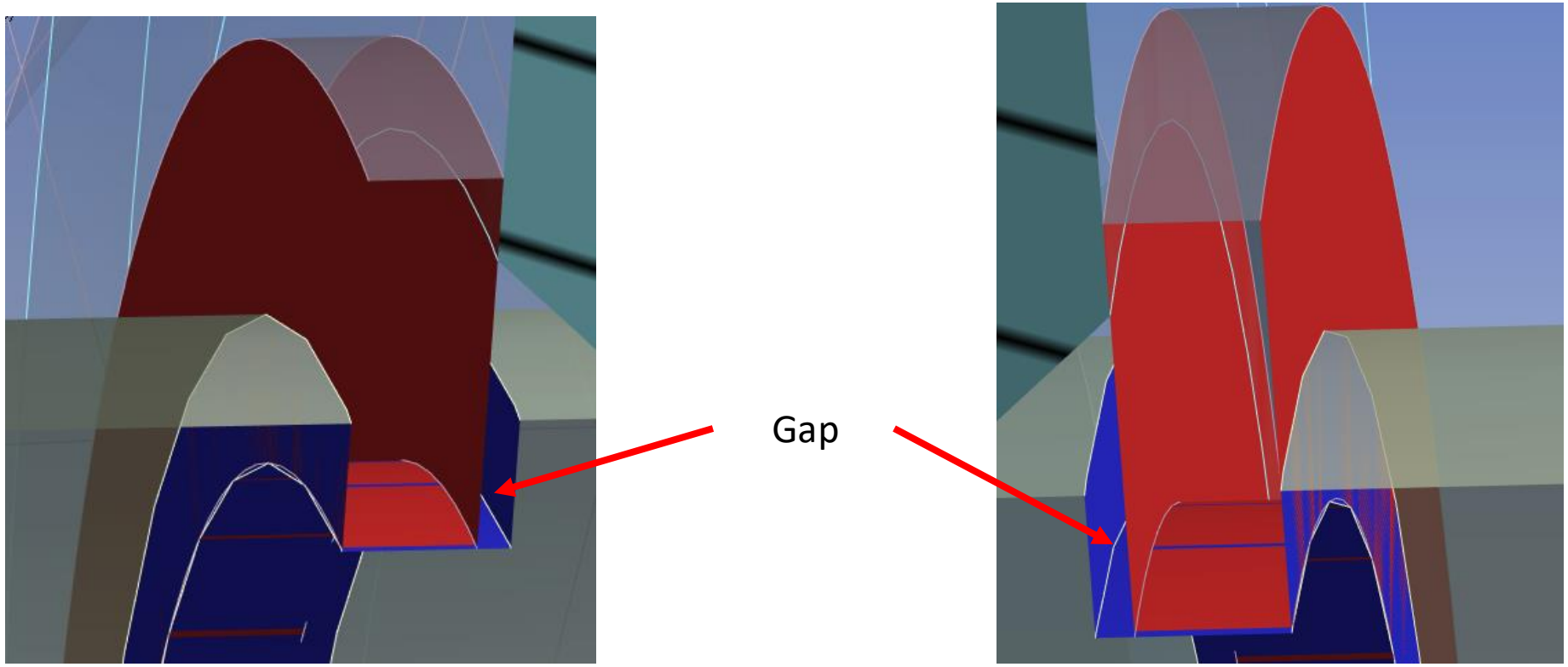
- Select the 4 contact regions named Bonded - bolt\bolt To nut\nut1 or Bonded - nut\nut1 To bolt\bolt.
- RMB → Group
- Enter a name for the new group folder. Suggestion: Bolts/Nuts



- Repeat the steps above for the 4 contact regions named Bonded - Ground\Ground To bolt\bolt

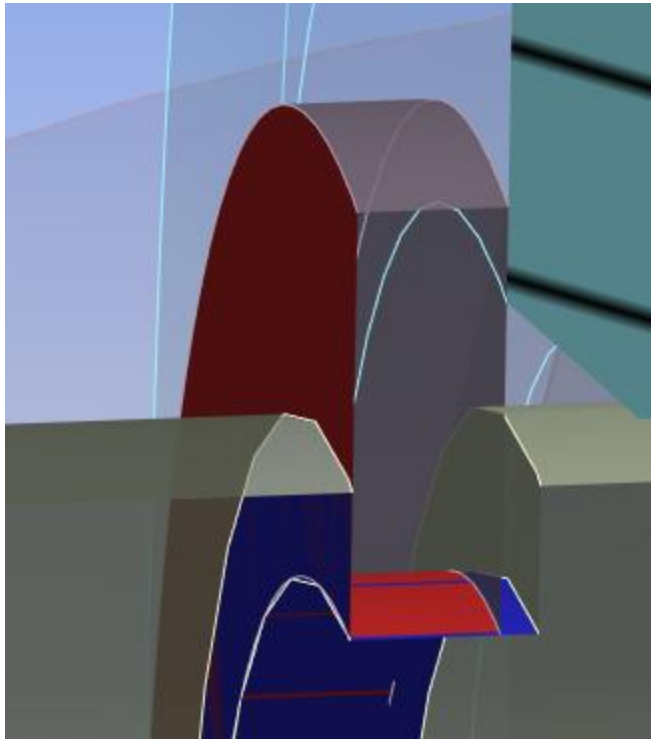
Workshop 05: Connections

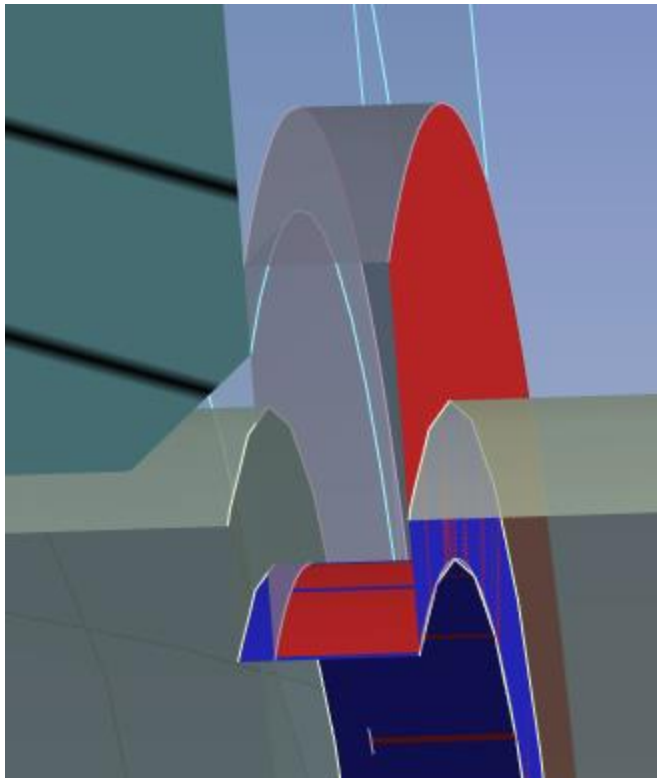
- For both contact regions named Bonded - Ring\Ring To Component4\Shaft, there is a gap between the ring and shaft on one side. So, the side surfaces of this gap need to be removed from both the contact regions
  - To better visualize this gap, take a section view that passes through the center of the shaft



Workshop 05: Connections

- For both contact regions named Bonded - Ring\Ring To Component4\Shaft, remove the side surfaces from Contact and Target.
  - Make use of the Contact Body View and Target Body view for selecting/deselecting the surfaces

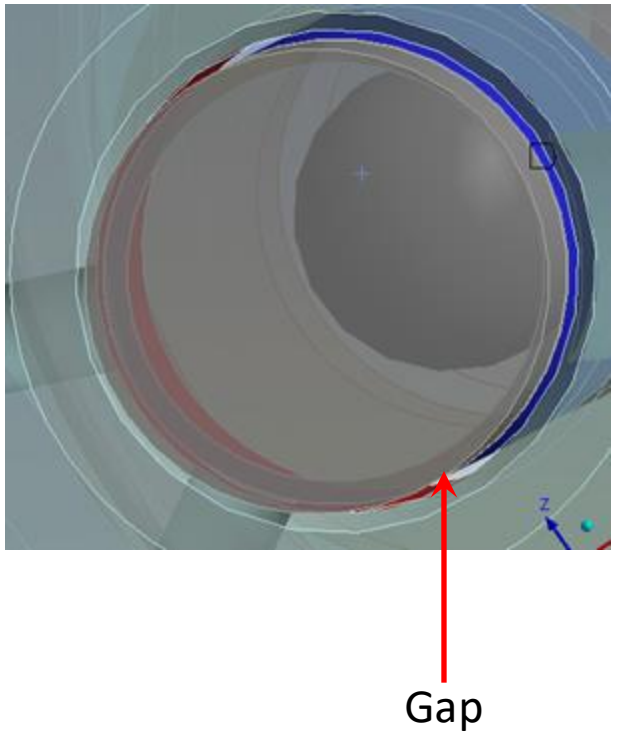




Workshop 05: Connections

- Activate the Body filter.

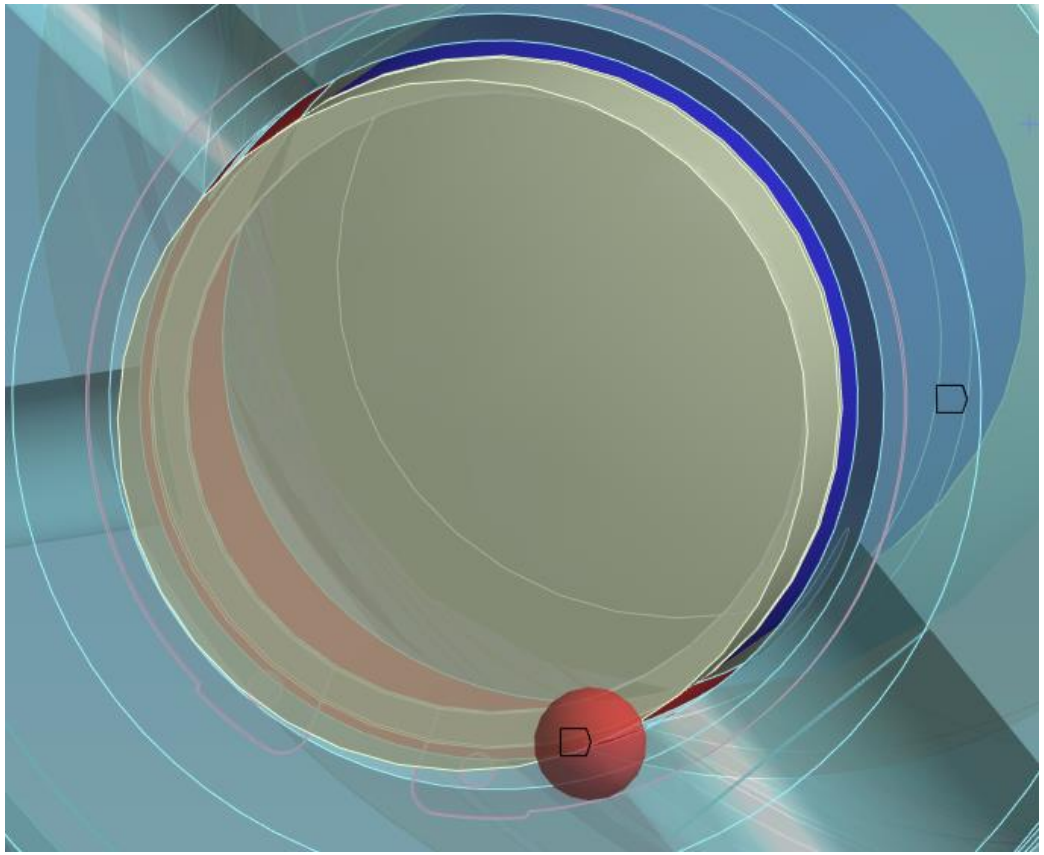
- Select either part named Bearing\Bearing (chose one side of the assembly) and Component4\Shaft in the Geometry view.
- In any background area of the Geometry view, RMB → Go To → Contacts common for Selected Bodies.
- Observe selected contacted geometry to see the small gap between the shaft and the bearing
- Define a pinball radius in the Contacts details for the contact region named Bonded - Bearing\Bearing To Component4\Shaft (see next slide)



Workshop 05: Connections

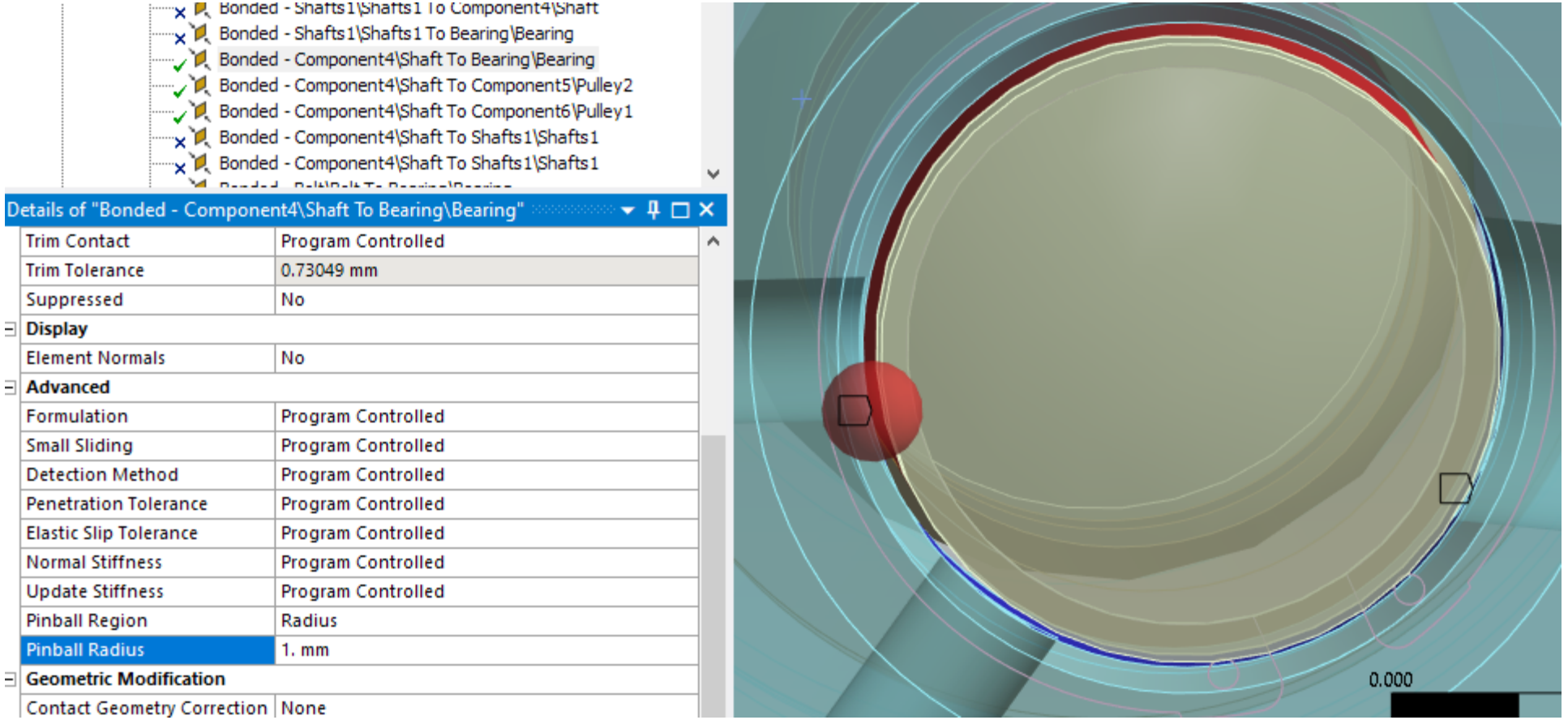
- Select the Pinball Region as Radius
- Specify Pinball Radius of 1 mm

Details of "Bonded - Bearing\Bearing To Component4\Shaft"	
Behavior	Program Controlled
Trim Contact	Program Controlled
Trim Tolerance	0.73049 mm
Suppressed	No
Display	
Element Normals	No
Advanced	
Formulation	Program Controlled
Small Sliding	Program Controlled
Detection Method	Program Controlled
Penetration Tolerance	Program Controlled
Elastic Slip Tolerance	Program Controlled
Normal Stiffness	Program Controlled
Update Stiffness	Program Controlled
Pinball Region	Radius
Pinball Radius	1. mm
Geometric Modification	
Contact Geometry Correction	None



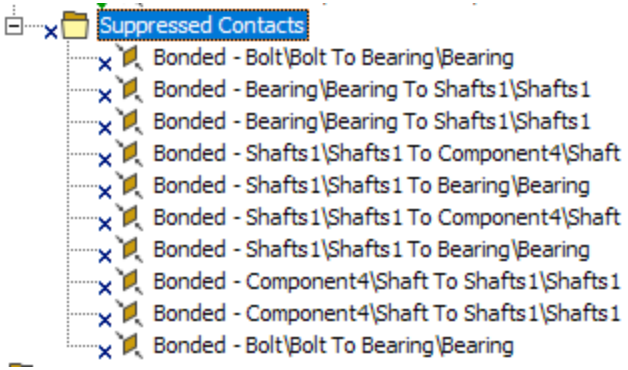
Workshop 05: Connections

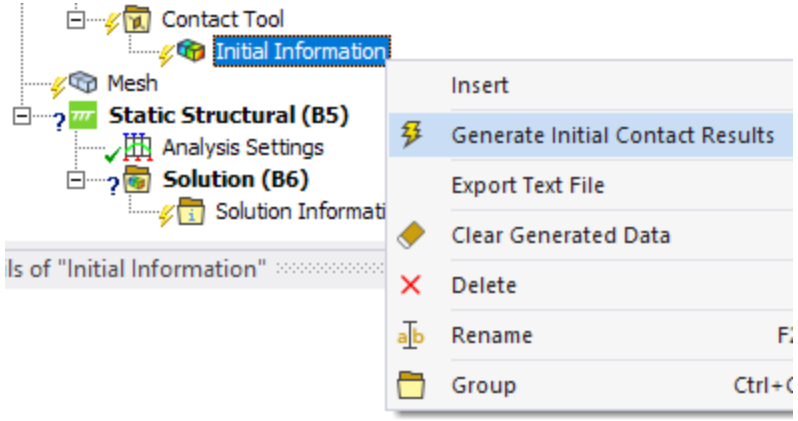
- Repeat the steps from previous 2 slides for the other contact region named Bonded - Component4\Shaft To Bearing\Bearing (bearing on the other side of the assembly)



Workshop 05: Connections

- Select all suppressed contact regions
- Group them into a folder and give a name to this folder
- RMB on Connections Branch → Insert→ Contact Tool
- RMB on Initial Information → Generate Initial Contact Results





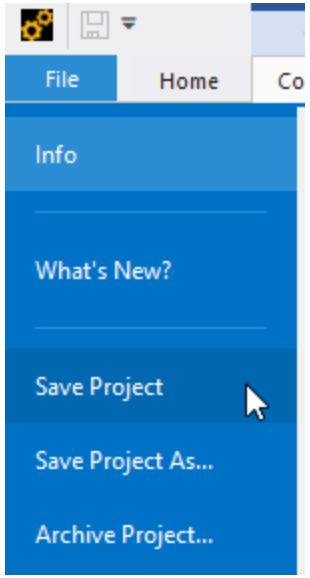
Workshop 05: Connections

- Review the results and check that all contact pairs have Status = Closed and Type defined appropriately.

Name	Contact Side	Type	Status	Number Contacting	Penetration (mm)	Gap (mm)	Geometric Penetration (mm)	Geometric Gap (mm)	Resulting Pinball (mm)	Real Constant
Bonded - Bearing\Bearing To Housing\Housing	Contact	Bonded	Closed	423.	0.36088	0.	0.36088	5.9765e-003	0.36731	20.
Bonded - Bearing\Bearing To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	21.
No Separation - Bearing\Bearing To Ring\Ring	Contact	No Separation	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	22.
No Separation - Bearing\Bearing To Ring\Ring	Target	No Separation	Closed	39.	3.5527e-015	0.	3.5527e-015	3.5527e-015	0.14441	23.
Bonded - Bearing\Bearing To Component4\Shaft	Contact	Bonded	Closed	120.	0.22392	0.	0.22392	0.31462	1.	24.
Bonded - Bearing\Bearing To Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	25.
Bonded - Housing\Housing To Ground\Ground	Contact	Bonded	Closed	48.	1.0658e-014	0.	1.0658e-014	3.5527e-015	1.0486	26.
Bonded - Housing\Housing To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	27.
Bonded - Housing\Housing To nut\nut1	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	28.
Bonded - Housing\Housing To nut\nut1	Target	Bonded	Closed	34.	7.1054e-015	0.	7.1054e-015	8.0466e-029	0.28429	29.
Bonded - Housing\Housing To nut\nut1	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	30.
Bonded - Housing\Housing To nut\nut1	Target	Bonded	Closed	34.	3.5527e-015	0.	3.5527e-015	1.572e-028	0.2868	31.
Bonded - Housing\Housing To Bearing\Bearing	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	32.
Bonded - Housing\Housing To Bearing\Bearing	Target	Bonded	Closed	433.	0.37089	0.	0.37089	1.8875e-002	0.37666	33.
Bonded - Housing\Housing To Ground\Ground	Contact	Bonded	Closed	48.	1.0658e-014	0.	1.0658e-014	3.5527e-015	1.0469	34.
Bonded - Housing\Housing To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	35.
Bonded - Housing\Housing To nut\nut1	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	36.
Bonded - Housing\Housing To nut\nut1	Target	Bonded	Closed	34.	3.5527e-015	0.	3.5527e-015	9.3218e-029	0.28429	37.
Bonded - Housing\Housing To nut\nut1	Contact	Bonded	Closed	18.	3.5527e-015	0.	3.5527e-015	7.1054e-015	0.75473	38.
Bonded - Housing\Housing To nut\nut1	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	39.
Bonded - Ring\Ring To Component4\Shaft	Contact	Bonded	Closed	47.	4.0431e-004	0.	4.0431e-004	1.3189e-004	0.16718	40.
Bonded - Ring\Ring To Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	41.
Bonded - Ring\Ring To Component4\Shaft	Contact	Bonded	Closed	51.	4.0431e-004	0.	4.0431e-004	1.3189e-004	0.16229	42.
Bonded - Ring\Ring To Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	43.
Bonded - Ring\Ring To Bearing\Bearing	Contact	Bonded	Closed	44.	5.6843e-014	0.	5.6843e-014	5.6843e-014	0.14405	44.
Bonded - Ring\Ring To Bearing\Bearing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	45.
Bonded - Component4\Shaft To Bearing\Bearing	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	46.
Bonded - Component4\Shaft To Bearing\Bearing	Target	Bonded	Closed	123.	0.	0.24129	0.	0.99859	1.	47.
Bonded - Component4\Shaft To Component5\Pulley2	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	48.
Bonded - Component4\Shaft To Component5\Pulley2	Target	Bonded	Closed	48.	0.76584	0.	0.76584	0.60083	1.8905	49.
Bonded - Component4\Shaft To Component6\Pulley1	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	50.
Bonded - Component4\Shaft To Component6\Pulley1	Target	Bonded	Closed	33.	1.0985e-003	0.	1.0985e-003	0.86006	0.86543	51.
Bonded - Ground\Ground To bolt\bolt	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	52.
Bonded - Ground\Ground To bolt\bolt	Target	Bonded	Closed	37.	4.8228e-029	0.	4.8228e-029	1.4211e-014	0.29845	53.
Bonded - Ground\Ground To bolt\bolt	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	54.
Bonded - Ground\Ground To bolt\bolt	Target	Bonded	Closed	37.	1.7145e-029	0.	1.7145e-029	1.4211e-014	0.29846	55.

Workshop 05: Connections

- Save Project for later use if desired.



End of presentation