

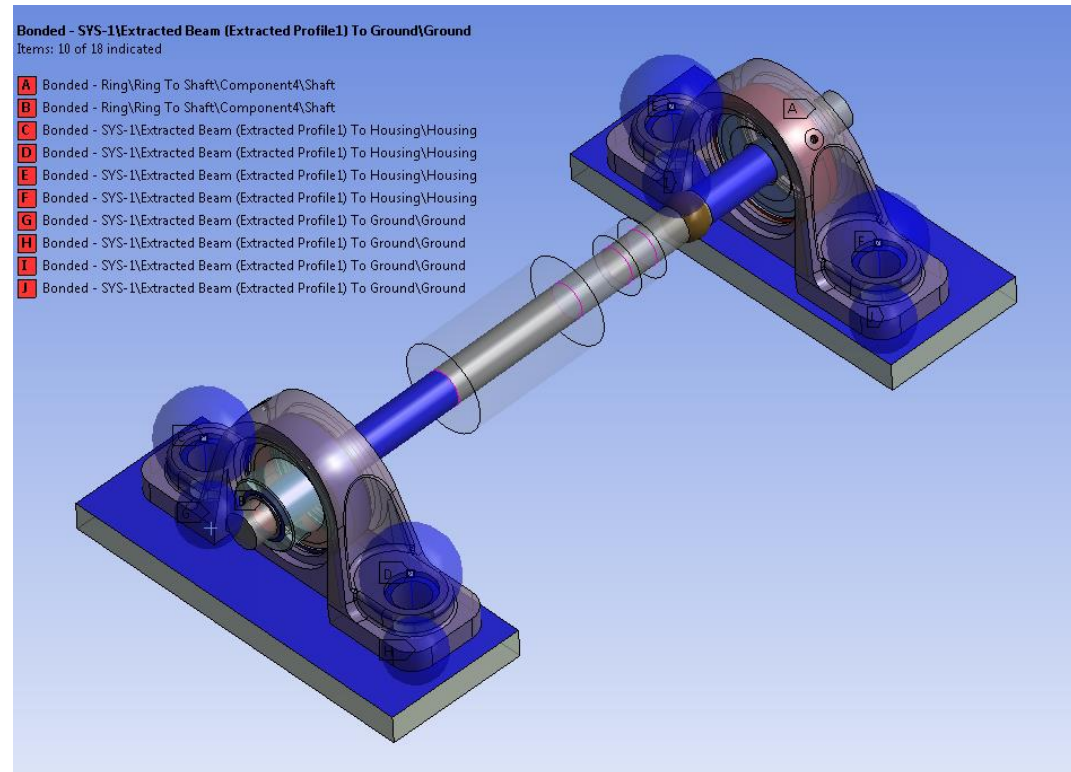
Ansys Mechanical Beyond the Basics

Module 03 Workshop: More Realistic Connections

Release 2021 R2

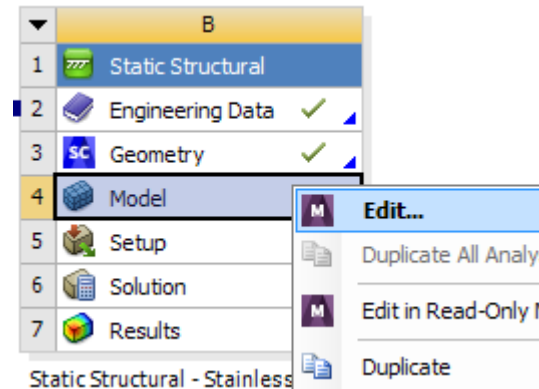
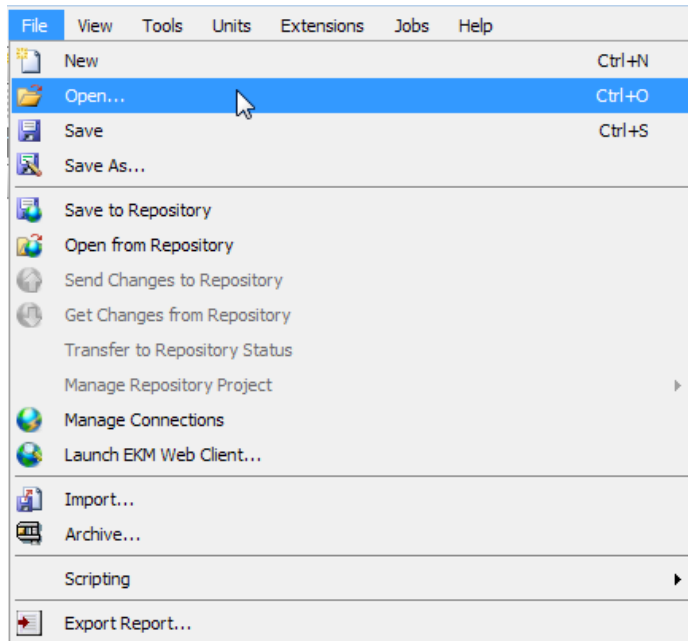
Workshop 03: More Realistic Connections

Use this guide to work on the Journal Bearing model.




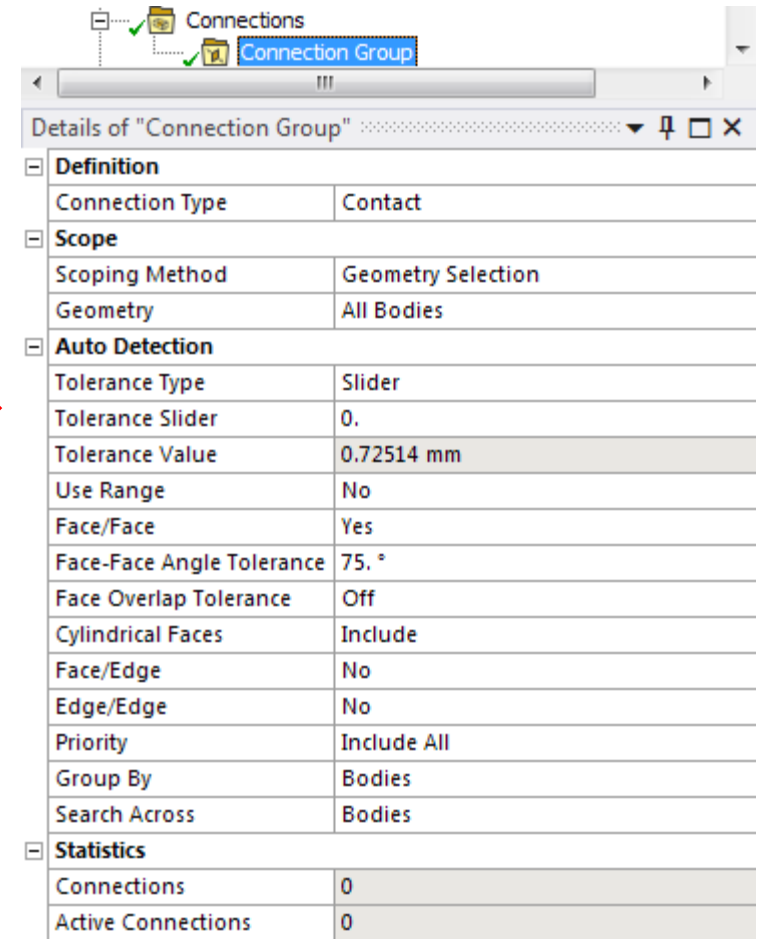
Workshop 03: More Realistic Connections

- **Open Archive** “Shaft_Bearings_WS03_Start.wbpz”
- **Open Mechanical**



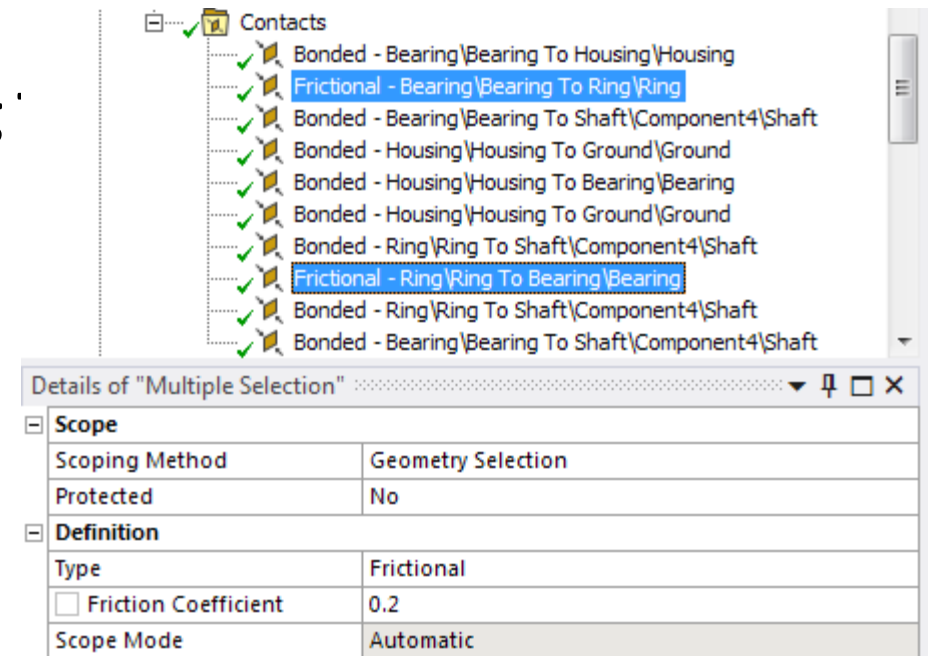
Workshop 03: More Realistic Connections

- Click on the **Connections** branch
- If there are any contact regions already defined, delete them
- Insert a **Connection Group**
- Confirm details as shown 
- **RMB—Contacts → Create Automatic Connections**
- Expand the Contacts Branch
- **RMB—Contacts → Rename Based on Definition**



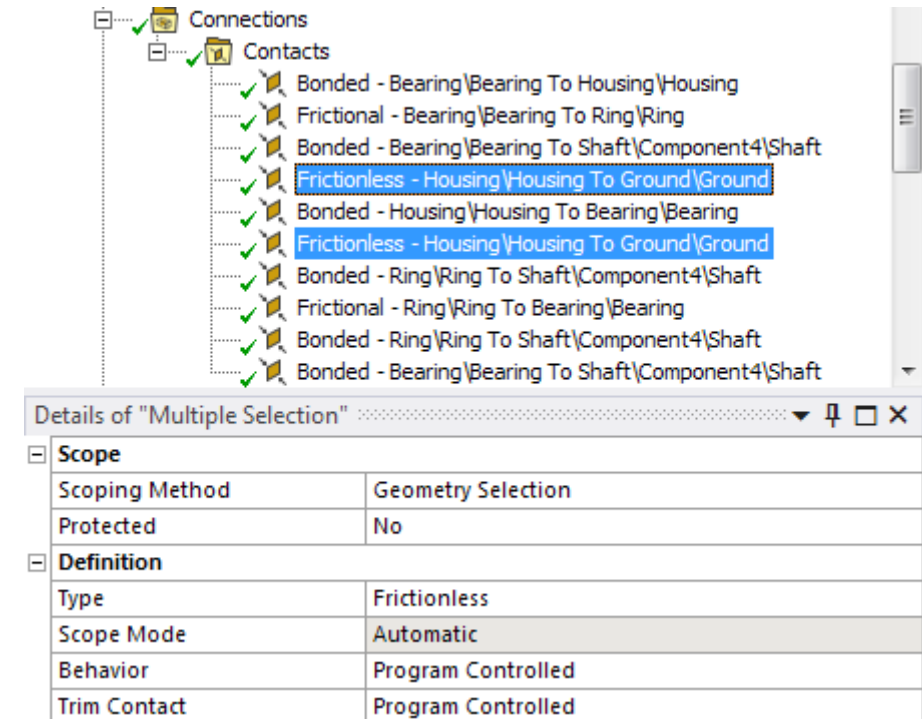
Workshop 03: More Realistic Connections

- Inspect the created contact regions
- Change contact Type to **Frictional** for Contact region **Bonded - Bearing\Bearing To Ring\Ring**. Define a **Friction Coefficient** of **0.2**.
- Do the same for contact region **Bonded - Ring\Ring** **Bearing\Bearing**



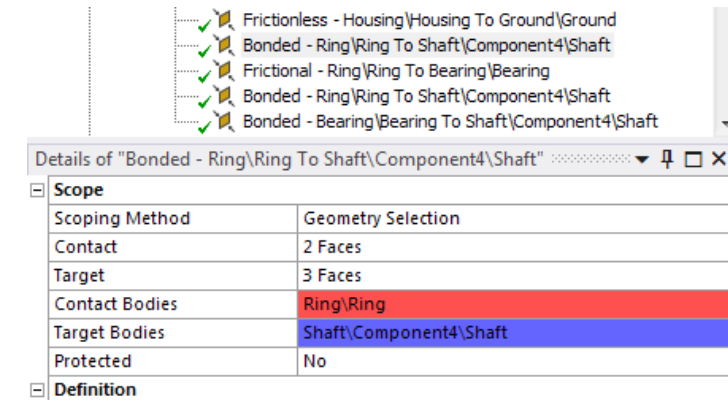
Workshop 03: More Realistic Connections

- Select the 2 contact regions named **Bonded - Housing\Housing To Ground\Ground** and set detail **Type** to **Frictionless**

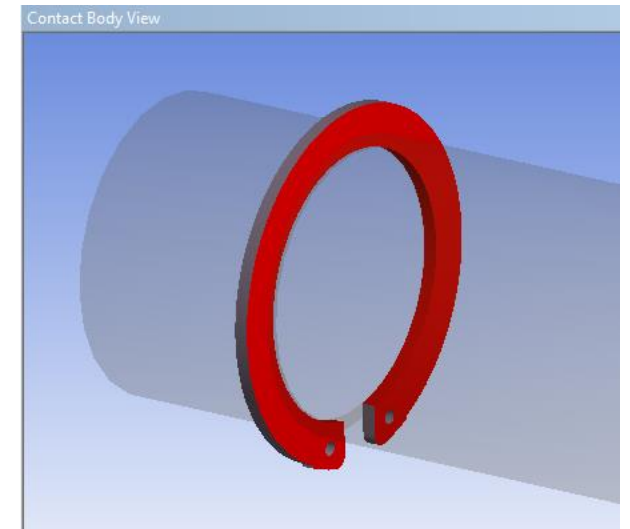
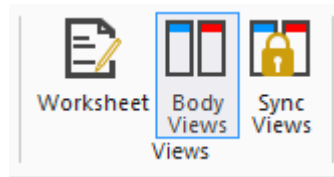


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- Select one of the contact regions named **Bonded - Ring\Ring To Shaft\Component4\Shaft**
- Edit the detail **Contact** and deselect the face on body **Ring/Ring** closest to the end of the shaft, leaving only 2 faces selected
- Repeat the steps above for the other contact region named **Bonded - Ring\Ring To Shaft\Component4\Shaft**

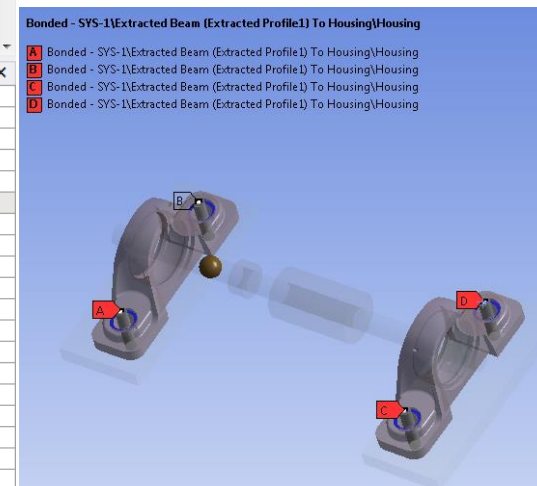
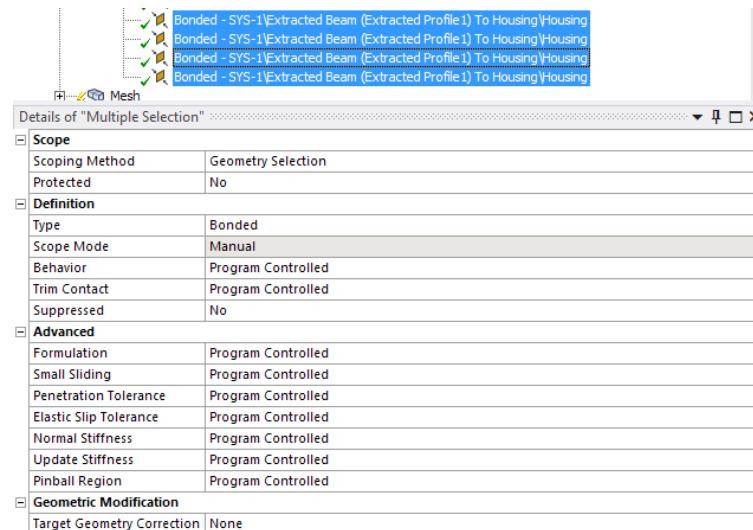
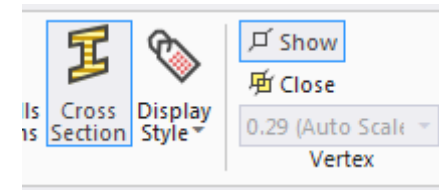
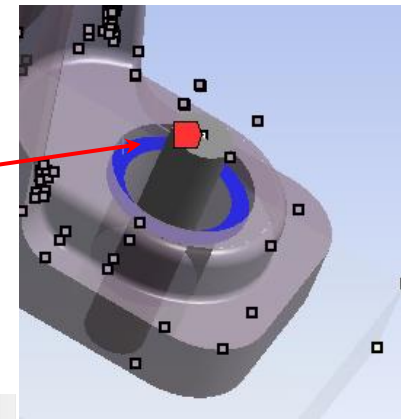
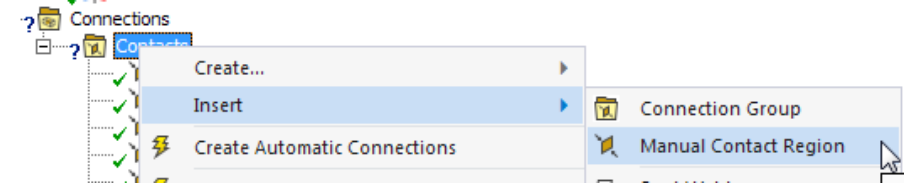


Use **Body Views** in the **Connections** tab to facilitate selection



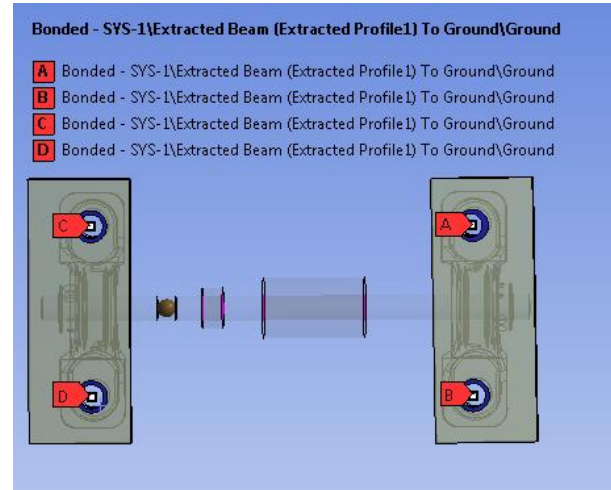
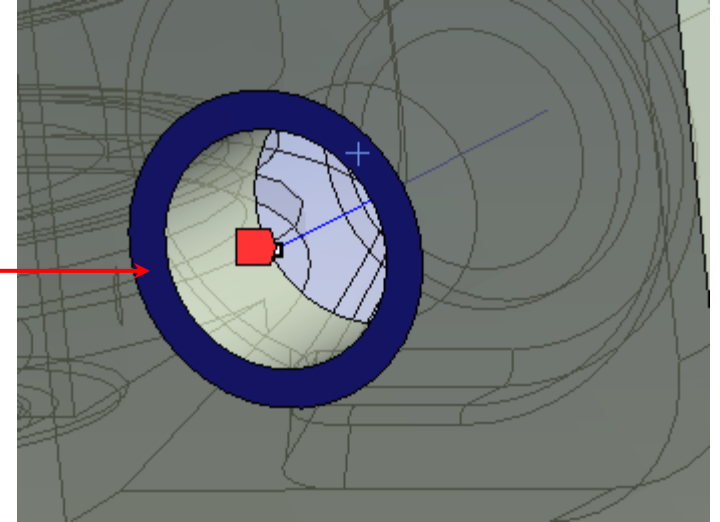
Workshop 03: More Realistic Connections

- Insert a new **Manual Contact Region** (RMB—**Contacts**)
- Scope the **Contact Side** to the top vertex of one of the beam bodies
- Scope the **Target Side** to the face shown
- **Repeat** the steps above for the 3 remaining beam bodies, creating a total of 4 manual contact regions



Workshop 03: More Realistic Connections

- Insert a new **Manual Contact Region**
- Scope the **Contact Side** to the bottom vertex of one of the beam bodies
- Scope the **Target Side** to the face shown
- **Repeat** the steps above for the 3 remaining beam bodies, creating a total of 4 additional manual contact regions



Workshop 03: More Realistic Connections

- RMB—Connections → Insert → Contact Tool
- RMB—Contact Tool → Generate Initial Contact Results
- Expand the **Contact Tool** branch
- Select the **Initial Information** branch and review the **Initial Information Worksheet**

Worksheet

Initial Information

For additional options, please visit the context menu for this table (right mouse button)

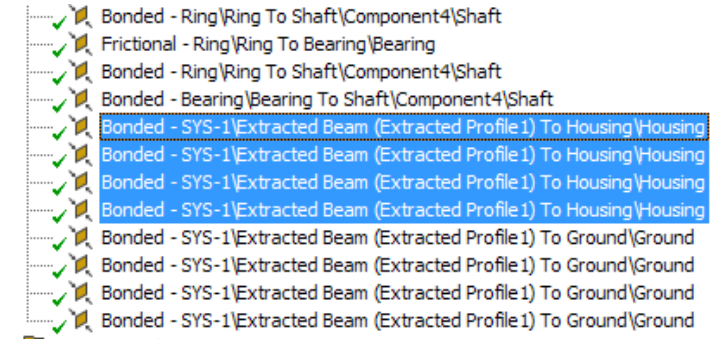
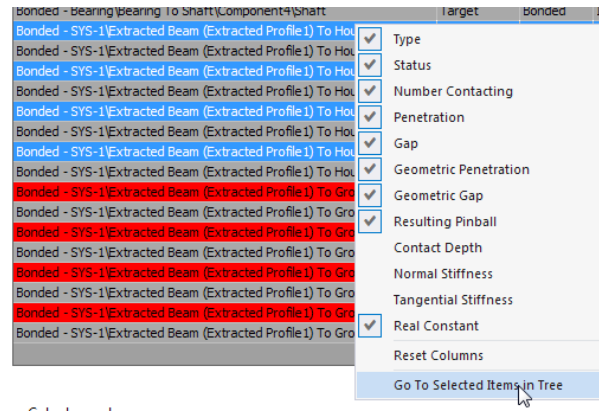
Name	Contact Side	Type	Status	Number Contacting	Penetration (mm)	Gap (mm)	Geometric Penetration (mm)	Geometric Gap (mm)	Resulting Pinball (mm)	Real Constant
Bonded - Bearing\Bearing To Housing\Housing	Contact	Bonded	Closed	1797.	4.0017e-014	0.	1.0872e-003	1.2832e-003	0.28298	17.
Bonded - Bearing\Bearing To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	18.
Frictional - Bearing\Bearing To Ring\Ring	Contact	Frictional	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	19.
Frictional - Bearing\Bearing To Ring\Ring	Target	Frictional	Closed	57.	3.5527e-015	0.	3.5527e-015	6.2535e-031	0.56	20.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Contact	Bonded	Closed	774.	5.248e-015	0.	0.	0.27123	0.27157	21.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	22.
Frictionless - Housing\Housing To Ground\Ground	Contact	Frictionless	Closed	448.	1.4211e-014	0.	1.4211e-014	2.6846e-030	2.2738	23.
Frictionless - Housing\Housing To Ground\Ground	Target	Frictionless	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	24.
Bonded - Housing\Housing To Bearing\Bearing	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	25.
Bonded - Housing\Housing To Bearing\Bearing	Target	Bonded	Closed	1437.	5.3088e-014	0.	0.27128	0.13543	0.2807	26.
Frictionless - Housing\Housing To Ground\Ground	Contact	Frictionless	Closed	448.	1.4211e-014	0.	1.4211e-014	9.2831e-029	2.2787	27.
Frictionless - Housing\Housing To Ground\Ground	Target	Frictionless	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	28.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Contact	Bonded	Closed	73.	1.2495e-015	0.	8.7864e-006	0.14	0.14741	29.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	30.
Frictional - Ring\Ring To Bearing\Bearing	Contact	Frictional	Closed	55.	5.6843e-014	0.	5.6843e-014	1.7653e-028	0.56	31.
Frictional - Ring\Ring To Bearing\Bearing	Target	Frictional	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	32.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Contact	Bonded	Closed	75.	2.8422e-014	0.	9.4392e-006	0.14	0.14741	33.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	34.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Contact	Bonded	Closed	781.	1.2066e-014	0.	0.	0.27412	0.27434	35.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	36.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	37.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	39.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	41.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	43.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	45.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	47.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	49.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Far Open	0.	0.	0.	0.	0.	0.53676	51.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.

Workshop 03: More Realistic Connections

- Pay particular attention to the contact regions highlighted in red
- What is their status?
- Is this acceptable?
- What needs to be changed?

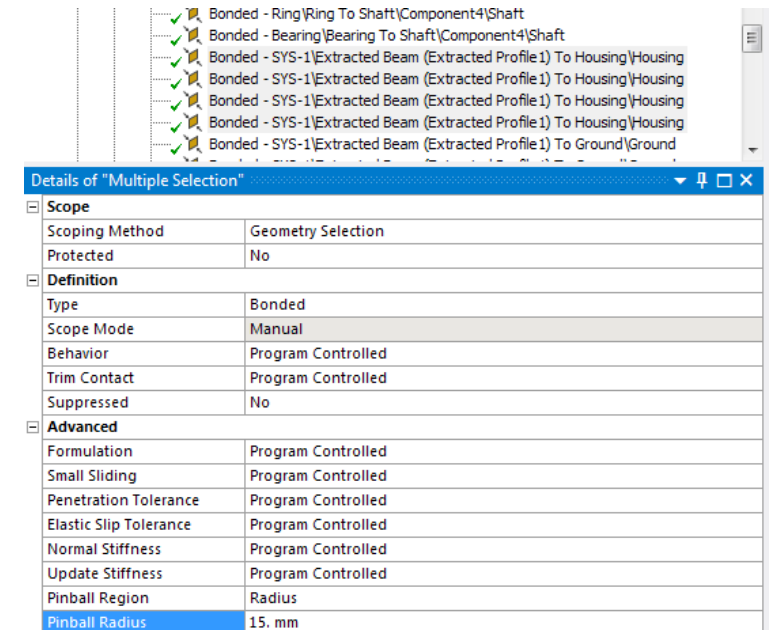
Workshop 03: More Realistic Connections

- The bonded contacts in red are detected as **Far Open**. This status will not change during solution—these contact regions will remain open during the entire solve.
- This status is not what is expected here. We would like the contact regions to be closed to represent attachment of the bolts to the housing bodies.
- We need to define a pinball radius manually, because the one which is automatically detected appears to be too small.
- Select the first 4 red lines (**Bonded - SYS-1\Extracted Beam (Extracted Profile1) To Housing\Housing**) in the **Initial Information** table
- **RMB → Go To Selected Items in Tree**



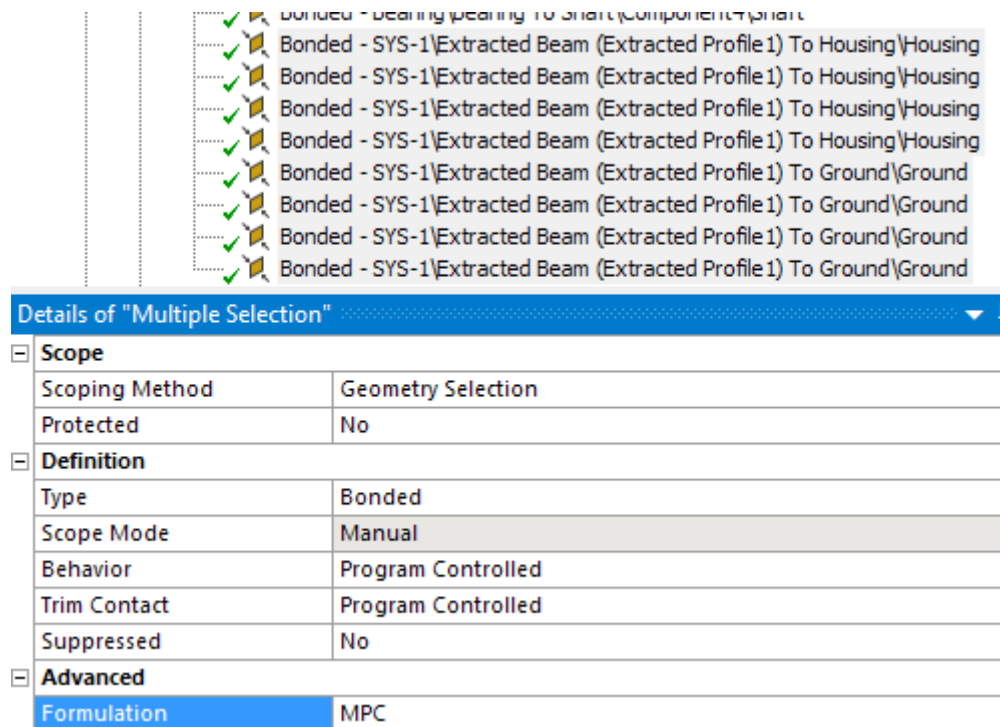
Workshop 03: More Realistic Connections

- With the 4 contact regions selected, set **Pinball Region** to **Radius** and **Pinball Radius** to **15 mm**
- Check in the graphics window to see if the pinball radius is big enough to allow contact detection
- Return to the **Initial Information** branch and select the last 4 red lines (**Bonded - SYS-1\Extracted Beam (Extracted Profile1) To Ground\Ground**)
- **RMB → Go To Selected Items in Tree**
- Set **Pinball Region** to **Radius** and **Pinball Radius** to **10 mm**
- Check in the graphics window
- **RMB—Contact Tool → Generate Initial Contact Results**
- Are all the contact regions detected as closed?



Workshop 03: More Realistic Connections

- For vertex-to-surface contact regions, the recommended **Formulation** is **MPC**, which is based on a network of constraint equations
- Select all the contact regions scoped to a beam vertex and set **Formulation** to **MPC**



Workshop 03: More Realistic Connections

- Regenerate initial contact results. Are the contact status acceptable now?

Initial Information

For additional options, please visit the context menu for this table (right mouse button)

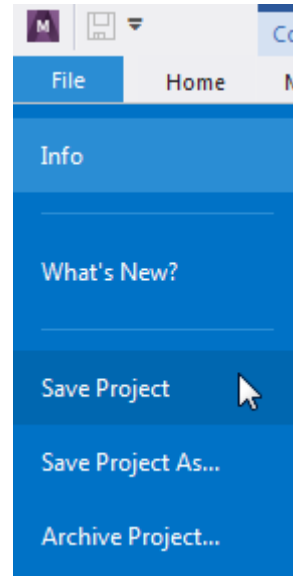
Name	Contact Side	Type	Status	Number Contacting	Penetration (mm)	Gap (mm)	Geometric Penetration (mm)	Geometric Gap (mm)	Resulting Pinball (mm)	Real Constant
Bonded - Bearing\Bearing To Housing\Housing	Contact	Bonded	Closed	1797.	4.0017e-014	0.	1.0872e-003	1.2832e-003	0.28298	17.
Bonded - Bearing\Bearing To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	18.
Frictional - Bearing\Bearing To Ring\Ring	Contact	Frictional	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	19.
Frictional - Bearing\Bearing To Ring\Ring	Target	Frictional	Closed	57.	3.5527e-015	0.	3.5527e-015	6.2535e-031	0.56	20.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Contact	Bonded	Closed	774.	5.248e-015	0.	0.	0.27123	0.27157	21.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	22.
Frictionless - Housing\Housing To Ground\Ground	Contact	Frictionless	Closed	448.	1.4211e-014	0.	1.4211e-014	2.6846e-030	2.2738	23.
Frictionless - Housing\Housing To Ground\Ground	Target	Frictionless	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	24.
Bonded - Housing\Housing To Bearing\Bearing	Contact	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	25.
Bonded - Housing\Housing To Bearing\Bearing	Target	Bonded	Closed	1437.	5.3106e-014	0.	0.27126	0.13543	0.2807	26.
Frictionless - Housing\Housing To Ground\Ground	Contact	Frictionless	Closed	448.	1.4211e-014	0.	1.4211e-014	1.1445e-028	2.2787	27.
Frictionless - Housing\Housing To Ground\Ground	Target	Frictionless	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	28.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Contact	Bonded	Closed	73.	1.2495e-015	0.	8.7864e-006	0.14	0.14741	29.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	30.
Frictional - Ring\Ring To Bearing\Bearing	Contact	Frictional	Closed	55.	5.6843e-014	0.	5.6843e-014	1.7653e-028	0.56	31.
Frictional - Ring\Ring To Bearing\Bearing	Target	Frictional	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	32.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Contact	Bonded	Closed	75.	2.8422e-014	0.	9.4392e-006	0.14	0.14741	33.
Bonded - Ring\Ring To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	34.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Contact	Bonded	Closed	795.	1.2066e-014	0.	0.	0.30149	1.	35.
Bonded - Bearing\Bearing To Shaft\Component4\Shaft	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	36.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Closed	1.	0.	10.346	0.	0.	15.	37.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Closed	1.	0.	10.346	0.	0.	15.	39.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Closed	1.	0.	10.346	0.	0.	15.	41.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Contact	Bonded	Closed	1.	0.	10.346	0.	0.	15.	43.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Housing\Housing	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Closed	1.	0.	5.8599	0.	0.	10.	45.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Closed	1.	0.	5.8599	0.	0.	10.	47.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Closed	1.	0.	5.8599	0.	0.	10.	49.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Contact	Bonded	Closed	1.	0.	5.9144	0.	0.	10.	51.
Bonded - SYS-1\Extracted Beam (Extracted Profile 1) To Ground\Ground	Target	Bonded	Inactive	N/A	N/A	N/A	N/A	N/A	N/A	0.

Orange

The contact status is closed but has a large amount of gap or penetration. Check penetration and gap compared to pinball and depth.

Workshop 03: More Realistic Connections

Save Project for use later if desired.



 **Ansys**

