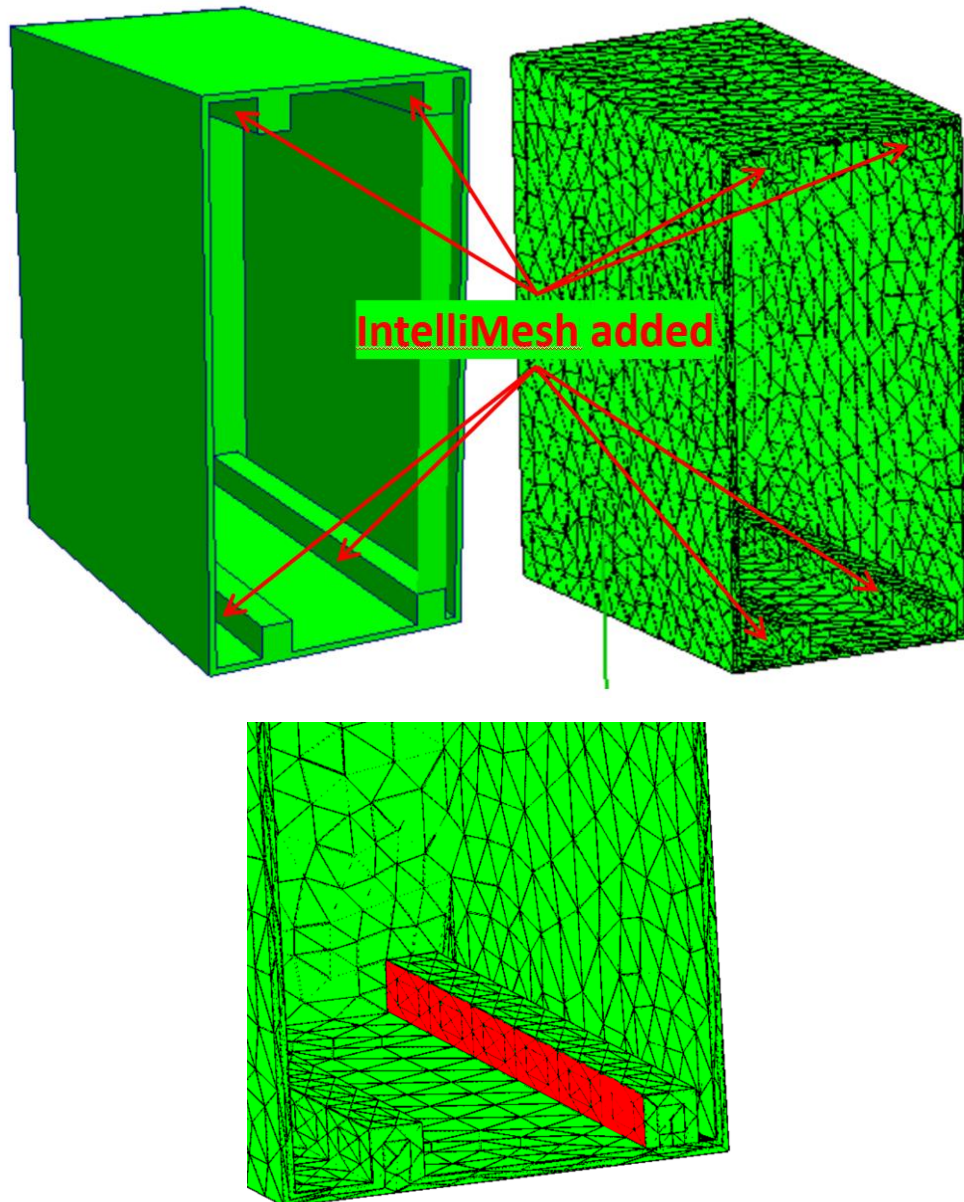
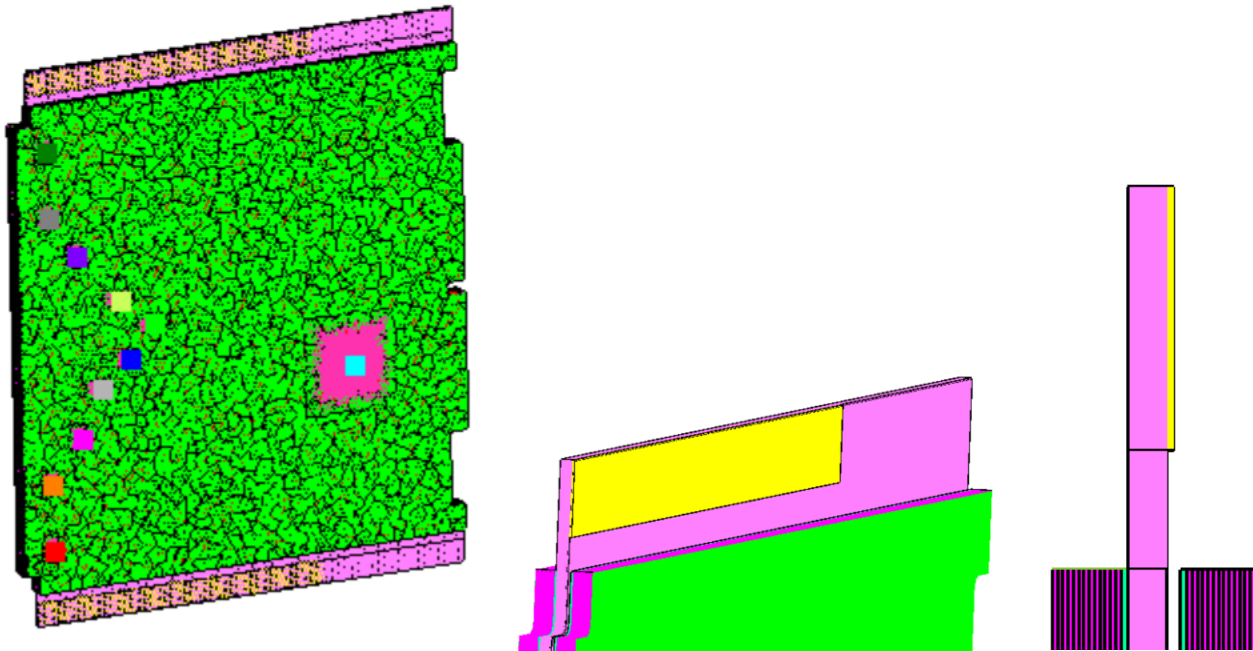


Preview of the new Auto Move Object feature in Solaria

The chassis shown below was imported into NETGEN and 3D automeshed with Tetrahedron elements. It was then imported into Solaria. In Solaria, IntelliMesh Master surfaces were added along the card guides, where the PCBs make thermal contact. A thermal interface was added to the bottom of the chassis to a coldplate.



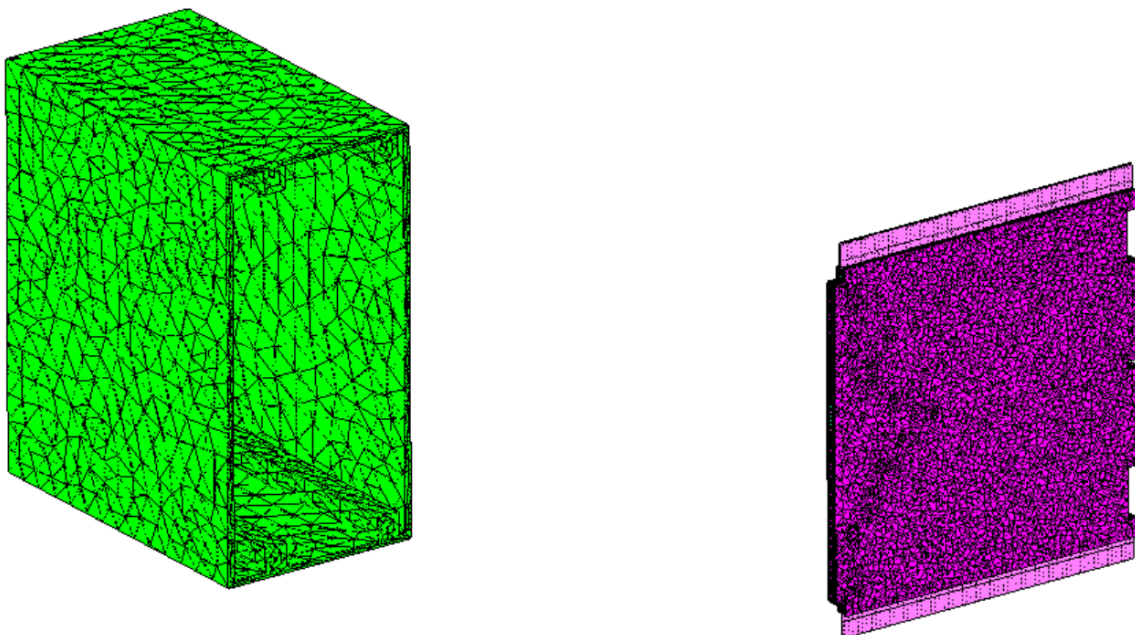
The PCB below was generated by SolariaPCB by importing an ODB++ file. In SolariaPCB Thermal Contacts were added along the top and bottom surfaces where the PCB makes contact with the chassis.



The chassis and the PCB models were merged. The chassis and PCB are put into their own Groups.

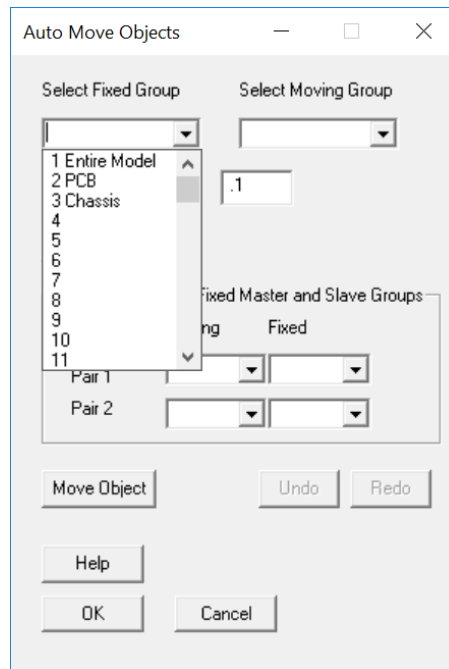
Notes:

- 1) The IntelliMesh surfaces are moved into place based on the center of the area of the IntelliMesh Slave and Master surfaces. In the above example, the red area in the chassis is the IntelliMesh area and extends the entire length of the surface. But the contact surface on the PCB does not extend the entire width. If the board is to be centered in the chassis, the contact area on the board should be extended.
- 2) If the move that was automatically performed was not as desired, then either hit the Cancel button in the dialog or hit the Undo button a couple times to undo the rotations and try it again.

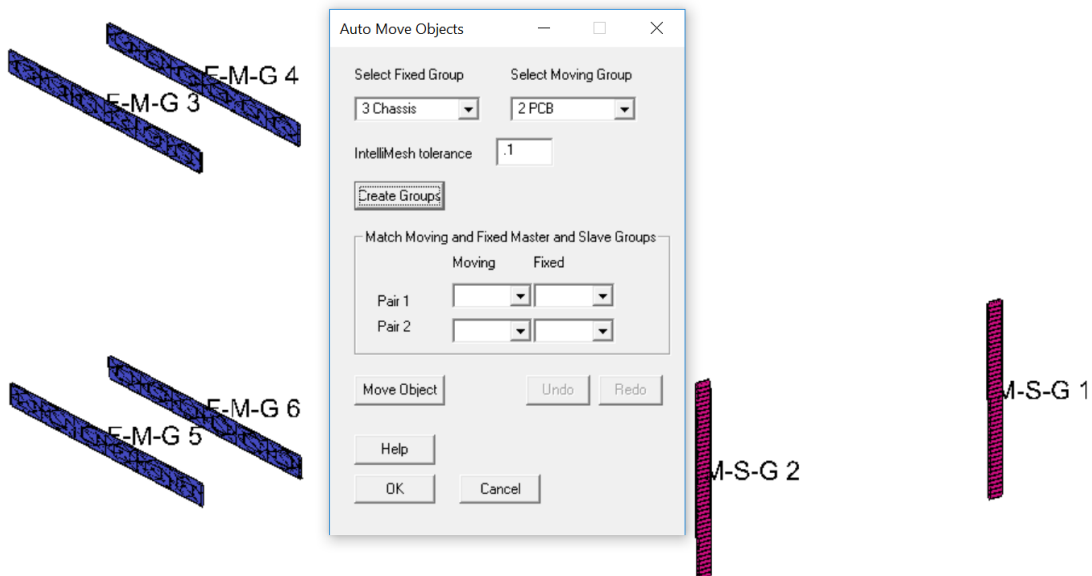


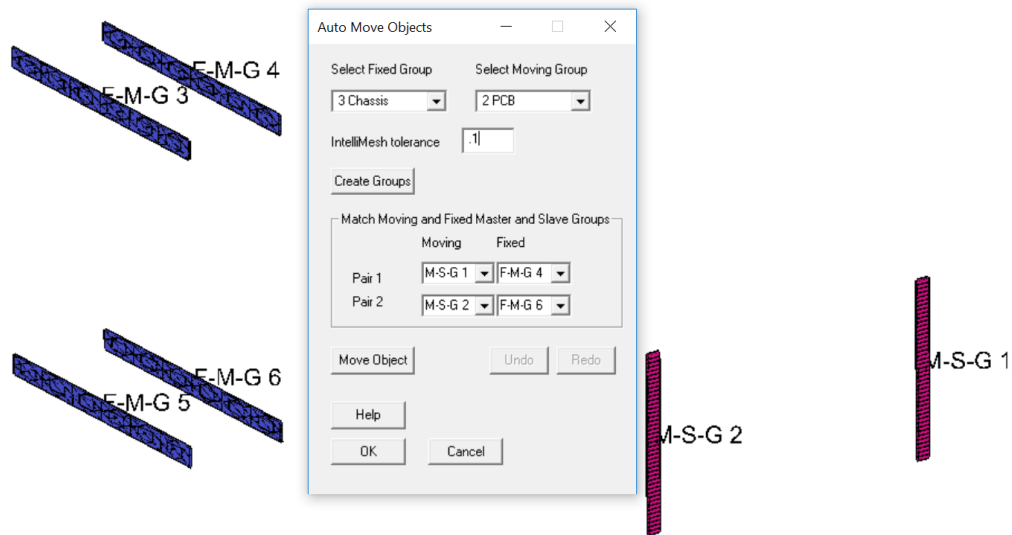
Now the PCB needs to be rotated then moved into place in the chassis. A gap is needed between the Master and Slave IntelliMesh surfaces, less than the IntelliMesh tolerance.

To access the new feature, select **Modify>Auto Move Objects**. The dialog shown below will come up. First select the Group that is fixed, in this case the chassis, then select the Group that will move, in this case the PCB. Once they are selected, hit the **Create Groups** button.

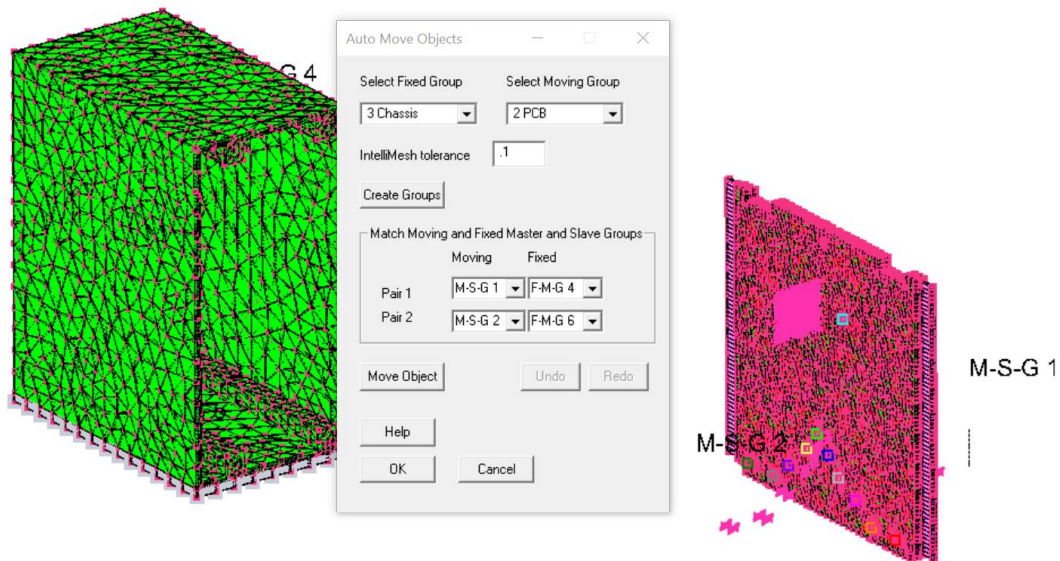


Each group of IntelliMesh surfaces will automatically be shown with their given names. If the name starts with F, then it is a Fixed IntelliMesh group. If the name starts with M, then it is a Moving IntelliMesh group. Next, from the Moving and Fixed drop down, select which Moving IntelliMesh surface should match up with the Fixed IntelliMesh surface. In this example we are selecting two pairs.





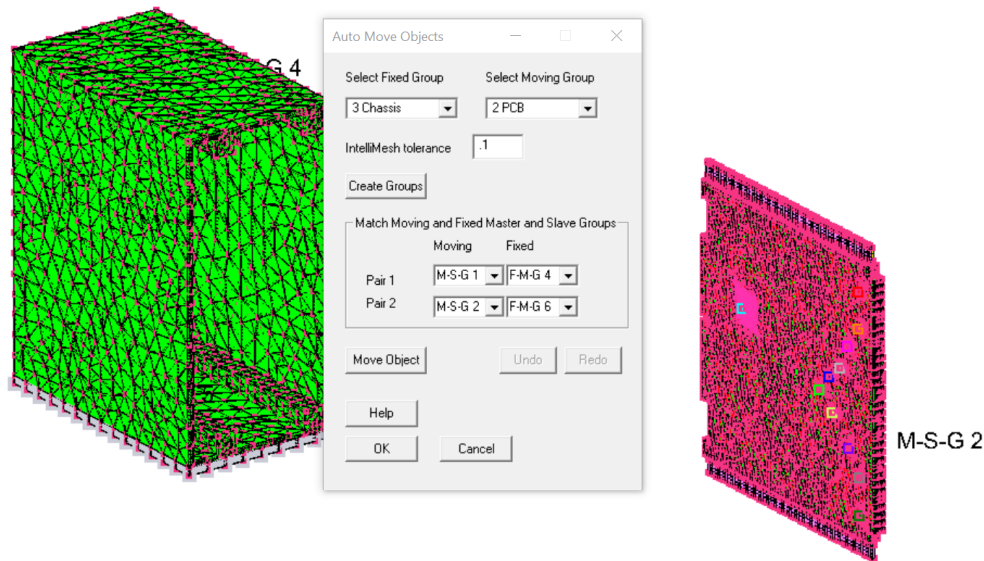
Next hit the **Move Object** button. First the moving object, in this case the PCB, is rotated so it is on the same plane as the chassis IntelliMesh surfaces. I've stopped the process at this step to show the PCB first rotation.



It does this by:

- 1) The centers and overall dimensions of the IntelliMesh Groups are calculated.
- 2) It determines what planes the Fixed and Moving IntelliMesh surfaces are on by determining what dimension is zero. For instance, if it is on the XY plane then the Z dimension or thickness of the nodes defining the IntelliMesh surfaces must be zero.
- 3) Next, the normal direction is determined for each IntelliMesh Group. This is based on the element face the IntelliMesh surfaces lies on. When the Master and Slave surfaces are aligned, the normal must be pointing towards each other. This therefore goes into determining the rotation, positive or negative.
- 4) The geometric center of the moving object is calculated
- 5) The Moving Group is then rotated onto the correct plane.

Next, if necessary, the PCB is rotated on plane to align the Master and Slave surfaces. Again, I have stopped the process to show the PCB second rotation.



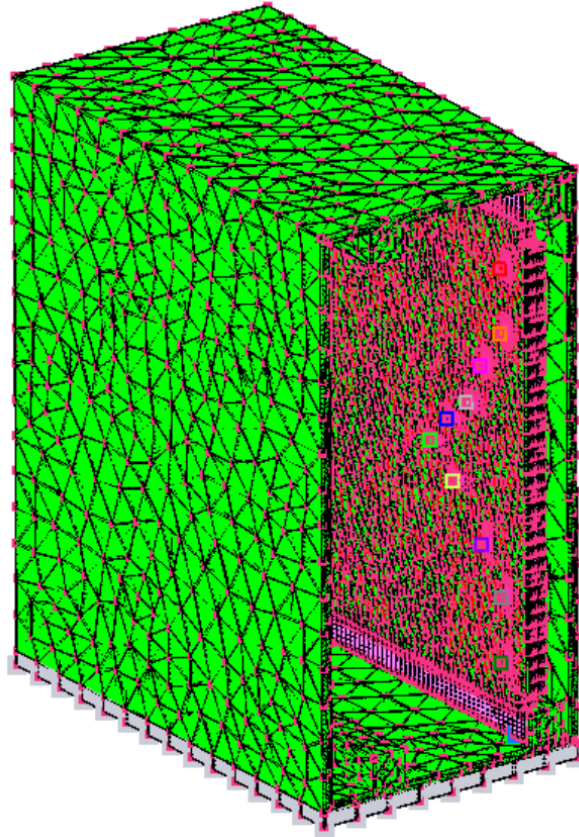
This is done by:

- 1) The centers and overall dimensions of the IntelliMesh Groups are recalculated because they have changed because of the first rotation.
- 2) The geometric center of the moving object is recalculated
- 3) If two pairs of IntelliMesh Groups were selected, then:
 - a. A line connecting the centers of the Fixed pair is compared to a line connecting the centers of the Moving pair. If they are both horizontal or both vertical then which end the first pair is on is used to determine if the Moving Group needs to be rotated 180 degrees.
 - b. If the lines are normal to each other, the Moving Group is rotated 90 degrees. Which end the first pair is on is used to determine if the rotation is positive or negative.
- 4) If one pair of IntelliMesh Groups were selected, then:
 - a. A check is made to see if the long and short dimensions of the Fixed and Moving IntelliMesh groups are aligned. If they are not, then the Moving group is rotated 90 degrees.
 - b. If a 90 degree rotation is needed, then the distance between the center and left and right edges of the Moving and Fixed IntelliMesh groups are compared to determine if the rotation should be negative or positive. Note that if there is symmetry in the IntelliMesh groups and there is not symmetry in the Moving object then it may be necessary to rotate the Moving object manually.
- 5) The Moving Group is rotated on the plane to the correct orientation.

The Moving Group is next moved into place. This is done by:

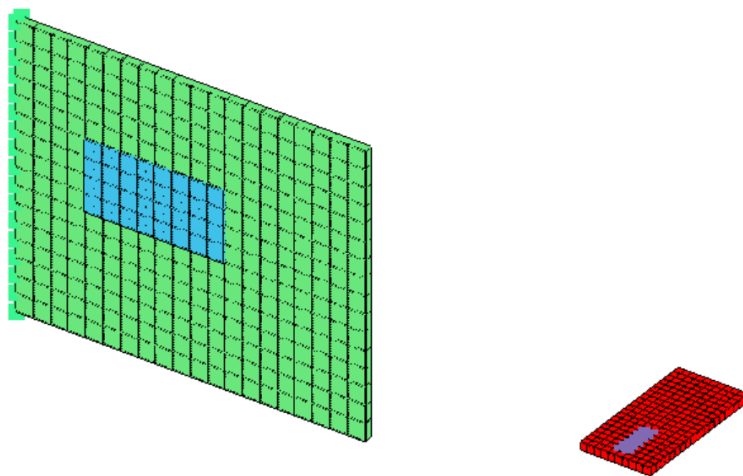
1. The centers and overall dimensions of the IntelliMesh Groups are recalculated because they have changed because of the first rotation.
2. The geometric center of the moving object is recalculated
3. The centers of the first pair are used to get the X, Y and Z displacement.
4. The direction normal to the plane is adjusted to create a gap of half the IntelliMesh tolerance defined in the dialog.
5. The Moving Group nodes are then moved.

The PCB is then automatically moved into place. All you have to do now is solve for temperatures.

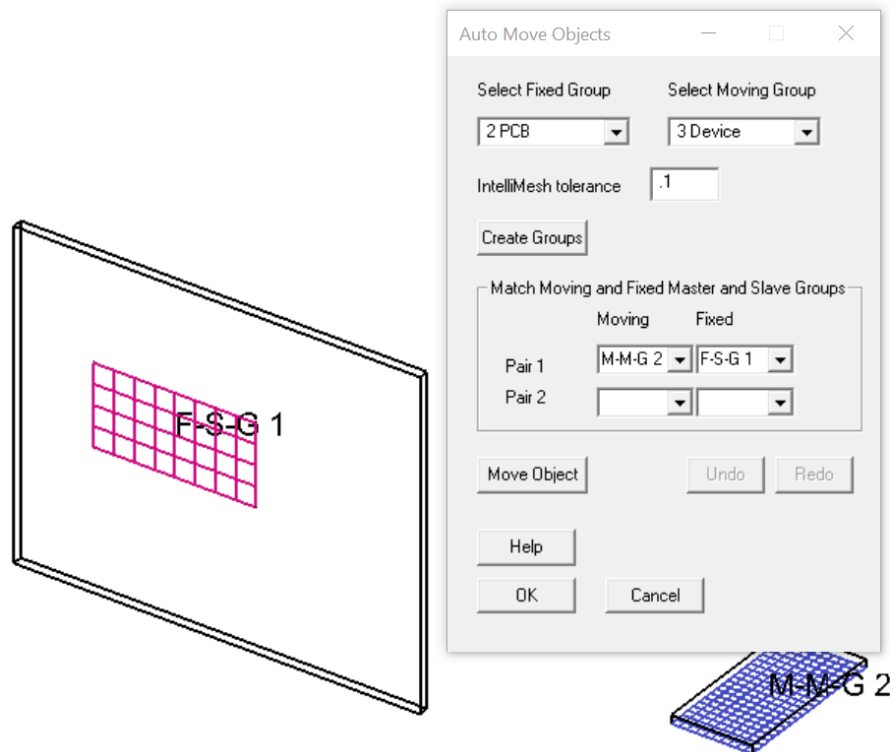


Example 2 – Simple single pair

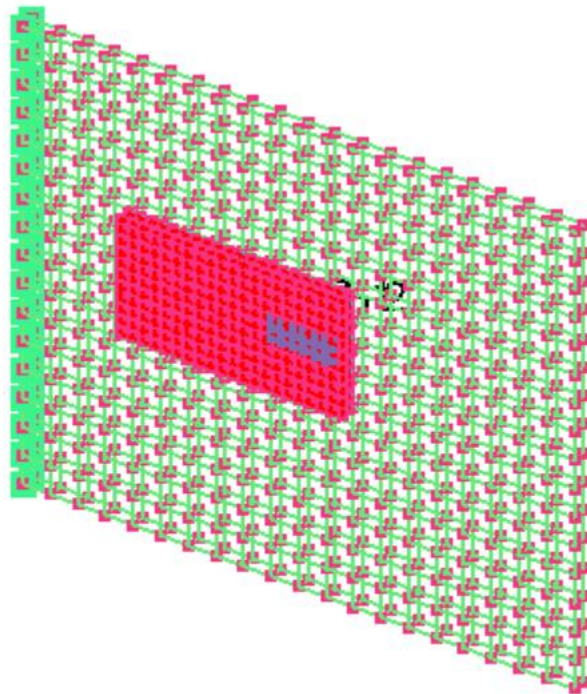
Below is a simple example of a PCB, green, and a device, red. The blue area on the PCB are Interface elements with Slave IntelliMesh on their surface. The bottom side of the red area has Master IntelliMesh on the underside surface.



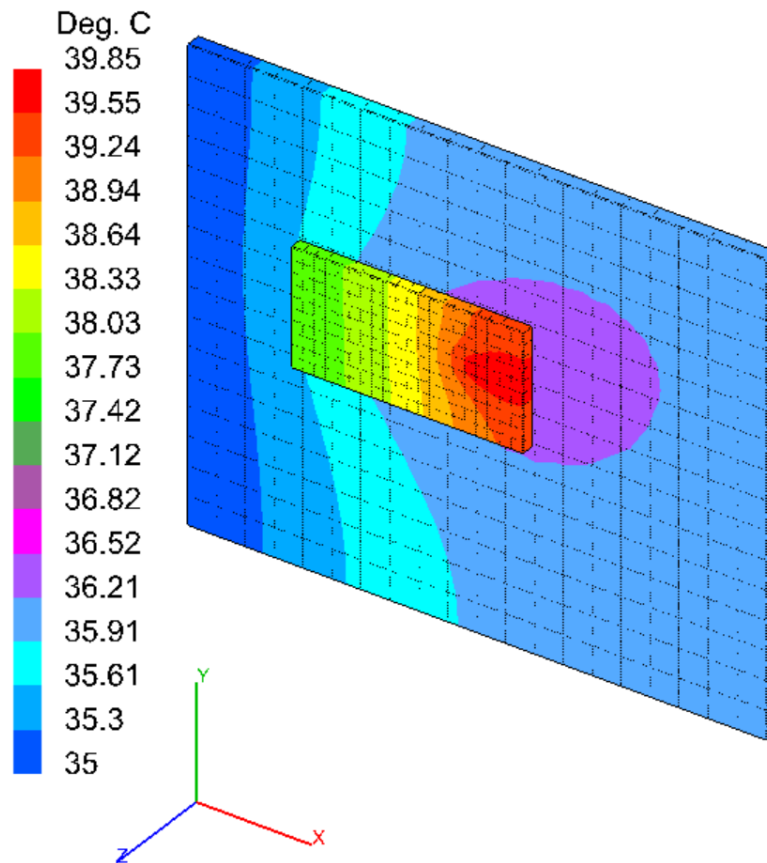
Select **Modify>Auto Move** Objects then select the Fixed Group, the PCB, then select the Moving Group, the Device then hit the **Create Groups** button. Notice that the Moving and Fixed groups are automatically selected correctly since there is only one of each.



Hit the **Move Object** button.

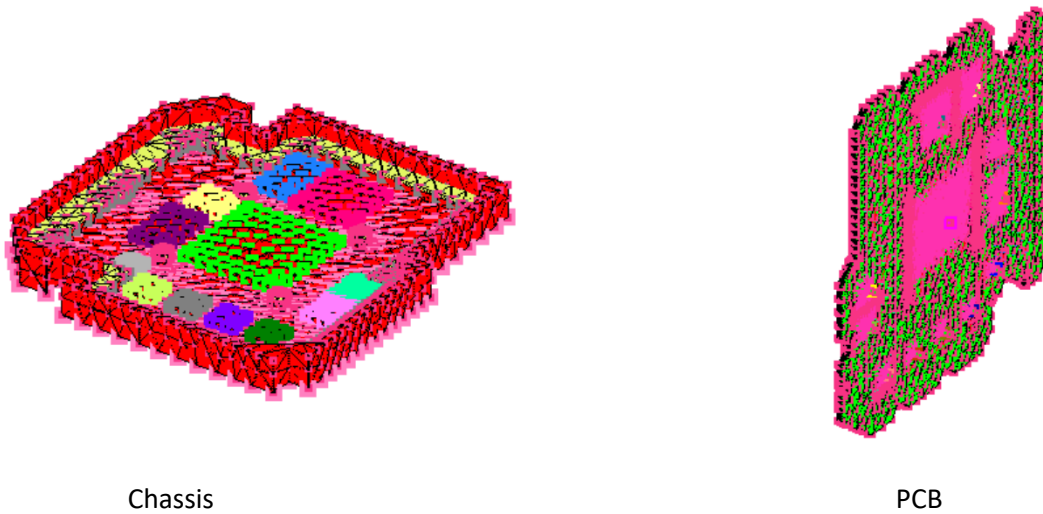


All you have to do now is solve for temperatures.

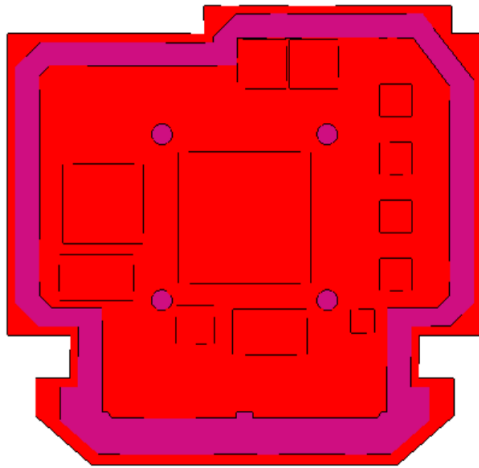


Example 3 – Complex shapes

Below shows a tetrahedron meshed chassis and a PCB that was created by SolariaPCB.



The left picture below shows the chassis, red, with IntelliMesh surfaces, purple. On the underside of the PCB on the right are IntelliMesh surfaces.

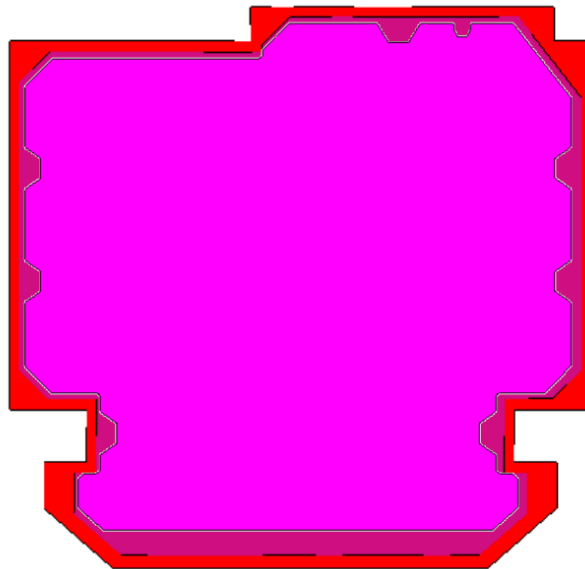


Chassis



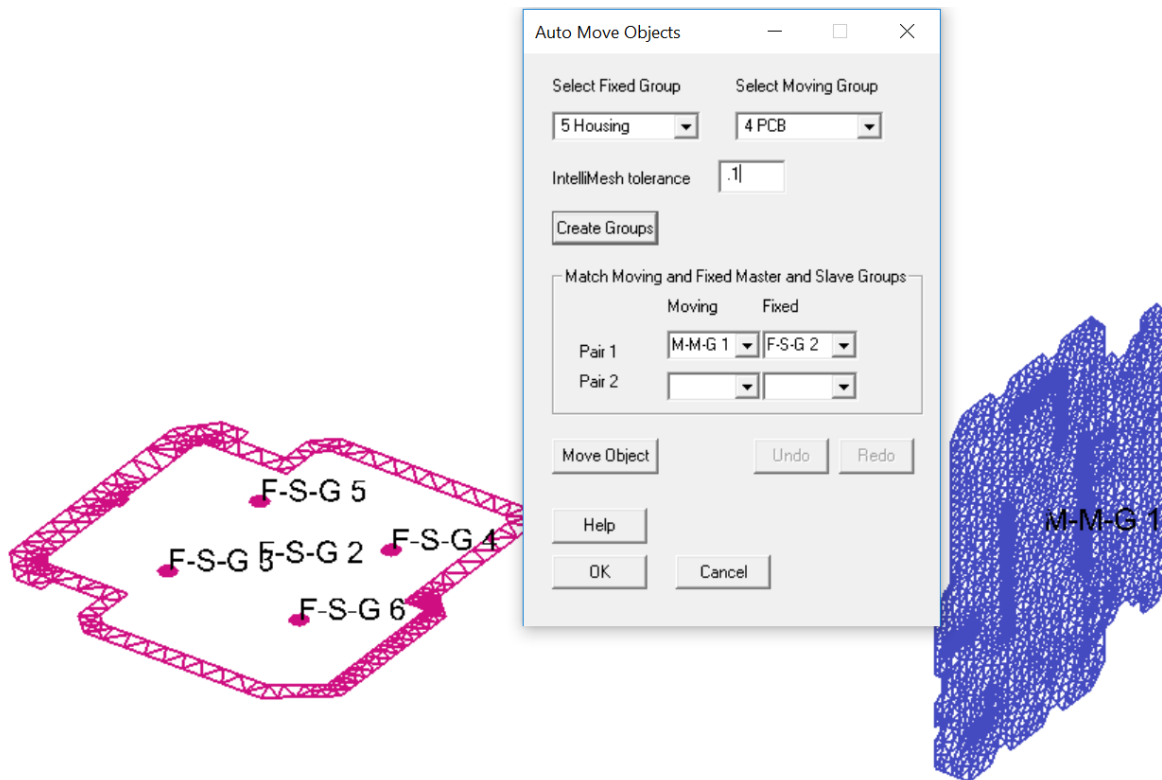
PCB

The goal is to rotate and move the PCB into the correct place within the chassis.

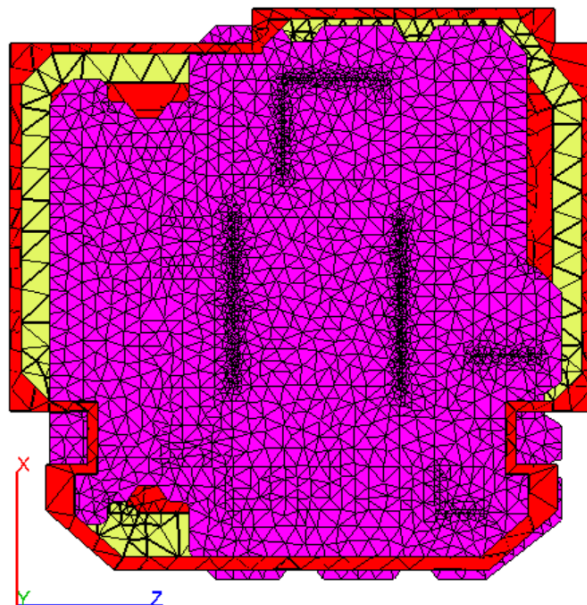


Chassis and PCB merged

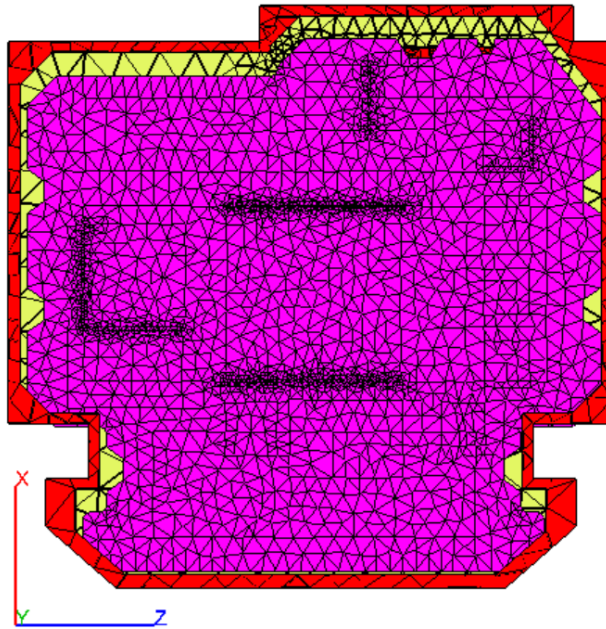
In the Auto Move Objects dialog, the Housing and PCB Groups were selected then the **Create Groups** button was hit. Since there is only one Move IntelliMesh group, it was automatically selected. IntelliMesh group F-S-G-2 was selected for the Fixed group. The IntelliMesh group name is located at the geometrical center of the IntelliMesh, therefore at the center of the PCB. The **Move Object** button was next hit.



It is obvious from the picture below that the in-plane rotation based on the logic given earlier was incorrect. But the IntelliMesh are facing each other correctly and they are the correct distance apart. The PCB just needs to be rotated about the Y axis positive 90 degrees. This is easily done manually.



Display only the PCB Group. Now select **Edit>Copy and Rotate**. Select **Rotate about the Y axis** and enter 90 degrees for the rotation. Be sure to check **Rotate Nodes**. Now check **Select Rotation Axis** and then click on a node at the center of the PCB. Hit the **Select** button the box in the entire PCB. When you view the entire model, you will probably see something like that below. It will be rotated differently depending on the node selected.



Now the PCB needs to be moved very slightly. There is a little known feature in Solaria called **Edit>Grab and Pull**. It is used to select Nodes and manually, using the mouse, move the nodes selected. Since we can visually see where the PCB needs to be, it is perfect for this operation.

Put into a Group just the PCB. Select **Edit>Grab and Pull**. Hit the **Select** button and box in the PCB. Now view the entire model by selecting **Group>Echo All**, while leaving the **Grab & Pull** dialog up. Hold the left mouse button down and slowly and carefully drag the PCB into place, resulting in yellow around the PCB as shown below.

