

# Autodesk Inventor Tips & Tricks: Creating Mating Parts with the Derive Tool



Machines are made up of many parts. In some cases, two complex parts are assembled to form a left and right or a top and bottom. By their very nature it is necessary for these parts to fit together correctly. They may share a complex cavity or feature which requires continuity between parts after assembly.

Often when designing these types of mating parts it is much easier to model them as a single part. This makes it simpler to model and adjust the complex cavities or features while maintaining continuity across the part. After the common features have been modeled, it becomes necessary to split the part into its respective pieces.

## Split a Part into Two using the Derive Tool!

Autodesk® Inventor® supports this workflow through the use of its Derive Tool. A complex model can be created, and then split into individual parts. The parts remain associated with the original, providing a link which forces the parts to update as the original part evolves.

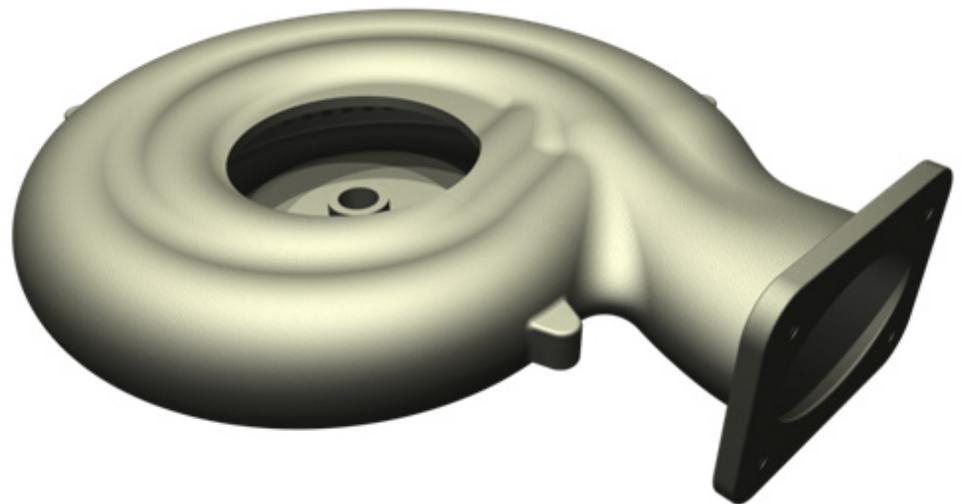
### The Setup

Imagine that you are working on the design of a small plastic pump housing. The housing makes use of an involute shaped cavity, and will be injection molded from ABS plastic. It will be assembled from two separate halves through the use of three external screws.

At this point in the design cycle the housing is partially designed. It has been modeled as a single part because of the complex geometry of the cavity. It has three lugs around the outside, which are intended to house the external screws. It is your job to make the housing manufacturable.

To prepare the housing for manufacture, it needs to be split into two parts. Screw holes need to be added to provide for assembly. In addition, the mating faces need to have an integral feature which simplifies assembly. This feature must also add strength to the mating interface. Like always, this design has the potential to change slightly before it is complete.

Let's look at how all of these design constraints can be met using Inventor's Derive Tool.



# Tips & Tricks

1. Begin by determining where the split needs to be. In the case of this housing, the best place for the split is right in the middle. Create a Work Plane at this location.

**Tip:**  
If the part was originally created centered around the Origin Work Features, one of the Origin Planes can be used.

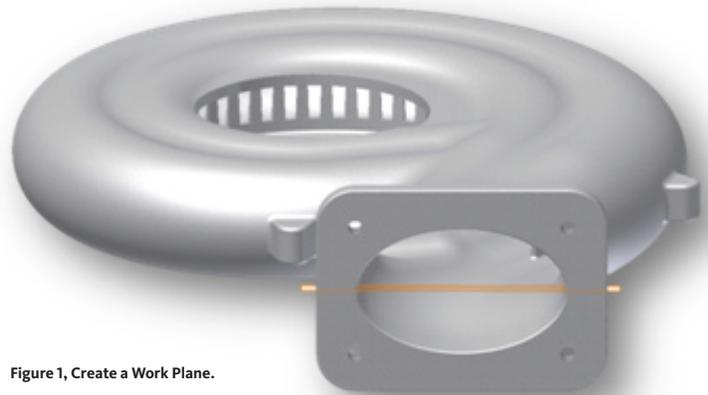


Figure 1, Create a Work Plane.

2. The next step is to create a sketch on the split plane. With your sketch type set to Construction, use the Project Cut Edges tool to project the edges of the cavity.

**Tip:**  
Hitting the F7 key sections the part through the sketch plane for viewing.

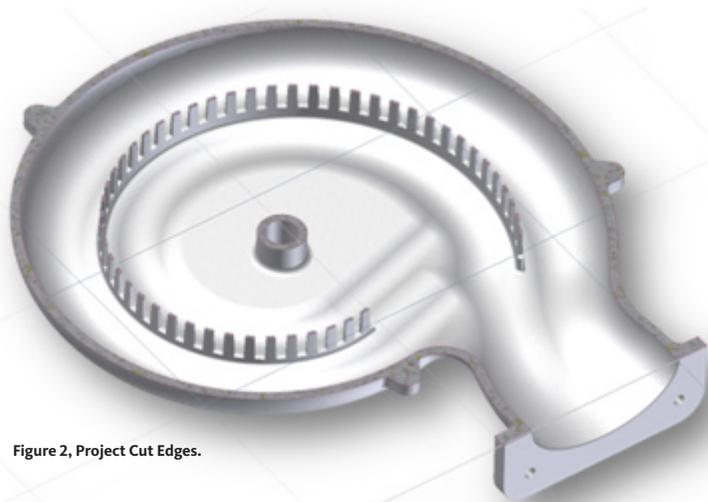


Figure 2, Project Cut Edges.

3. Select the sketch items that are projected from the inner cavity edge and change them to the Solid sketch geometry type.

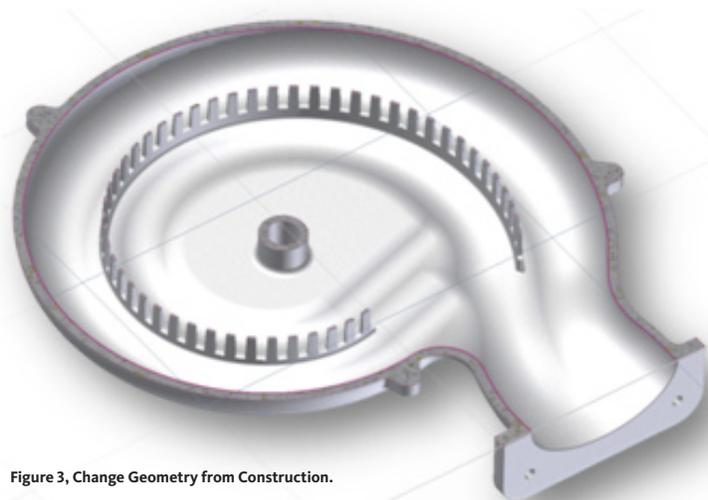


Figure 3, Change Geometry from Construction.

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- Next, create a sketch at the end of the split. In this case, the sketch lies on the inlet gasket surface. This sketch defines the profile of the lip feature that will help facilitate assembly while adding strength to the interface. Here, we have created a gap between the lip and groove that is equal to 5 thousandths of an inch.

**Tip:**  
These sketches are created in the master part to facilitate future changes.

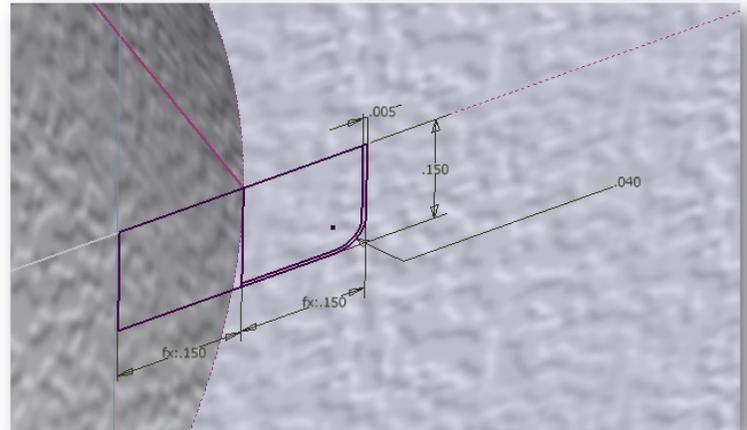


Figure 4, Create a Profile Sketch.

- Before we are done in the master part, rename the newly created work plane and sketches. This will ensure these features are easy to locate downstream.

**Tip:**  
Ensure that the features you wish to derive are visible in the master part.

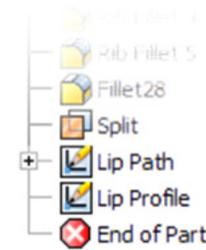


Figure 5, Rename Browser Nodes.

- Using the Derive tool, create a derived part, selecting the solid body, the two sketches, and the work plane. Repeat this operation to create the second half.

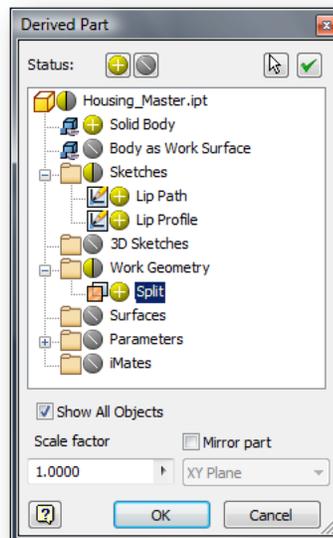


Figure 6, Derive Tool.

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7. Back in the first derived part; use the Split tool with the Remove option to remove the top half of the housing. Repeat this procedure in the second derived part, and remove the lower half of the housing.

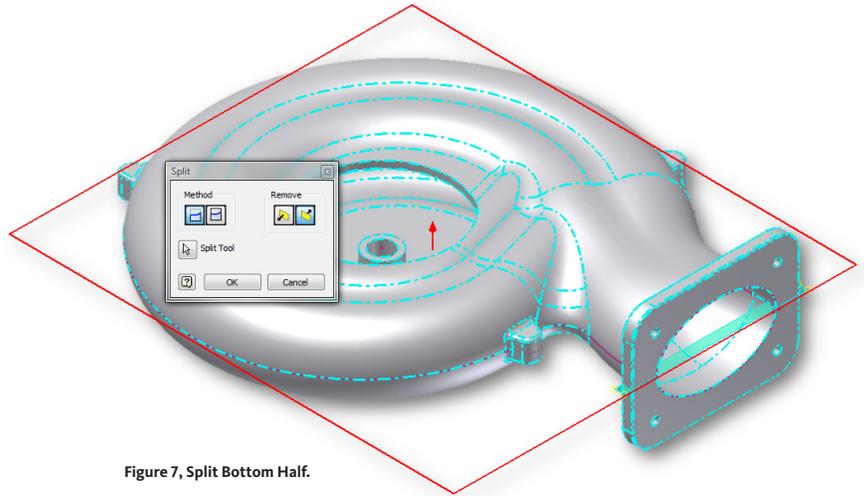


Figure 7, Split Bottom Half.

8. With the Inventor Sweep tool set to Subtract, use the two Lip sketches to create the groove for the Lip interface in the lower half of the housing.

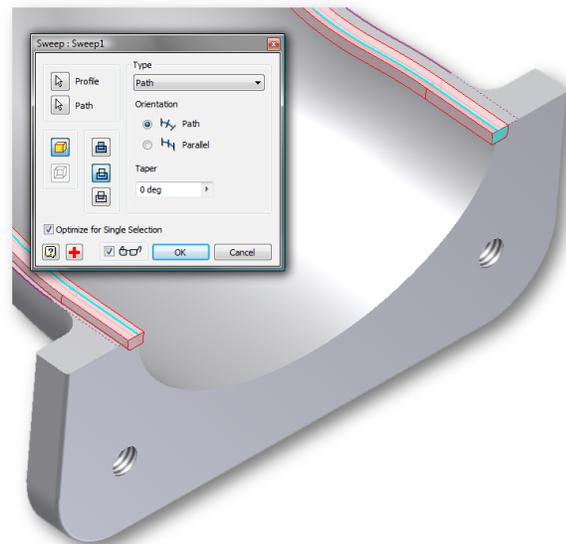


Figure 8, Groove Creation.

9. In the upper half, use the Sweep tool set to Add, and the two Lip sketches to create the lip for the top half of the Lip interface in the upper half of the housing.

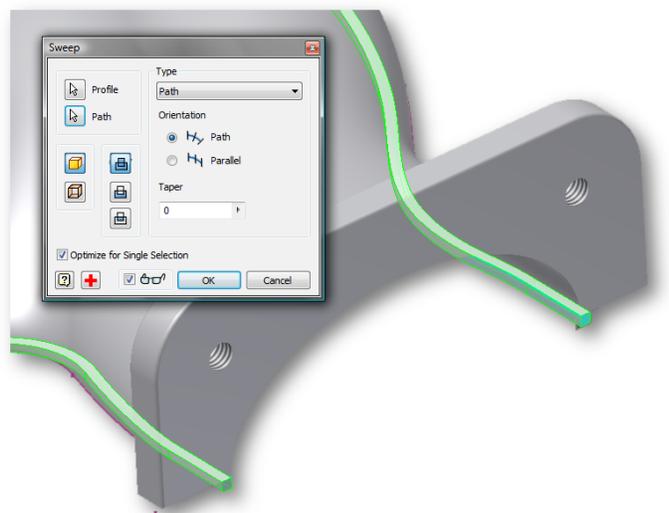


Figure 9, Lip Creation.

# Tips & Tricks

- The next step is to assemble the upper and lower halves of the housing. Since the two halves are derived from the same master part, they can be assembled by creating three Flush Constraints between the origin planes of the two parts.

**Tip:**

These constraints can be deleted, and the part can be grounded.

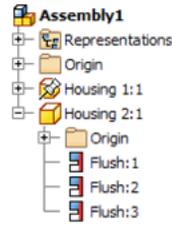


Figure 10, Constrain Parts Together.

- In the context of the assembly, edit the top half of the housing. Create counter bore features in each of the three lobes.

**Tip:**

Using the Through All option will ensure the holes penetrate the housing half.

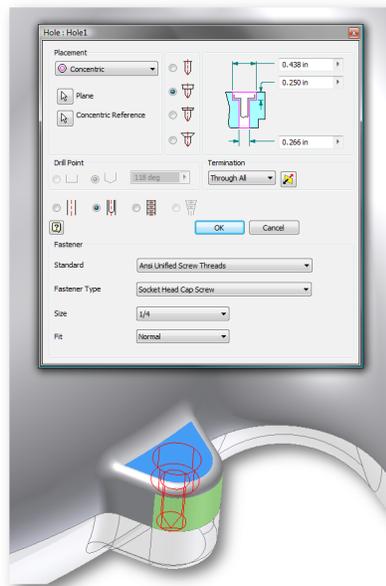


Figure 11, Create Holes in Upper Half of Housing.

- Repeat the procedure in the lower half of the housing to add threaded holes. This completes the housing.

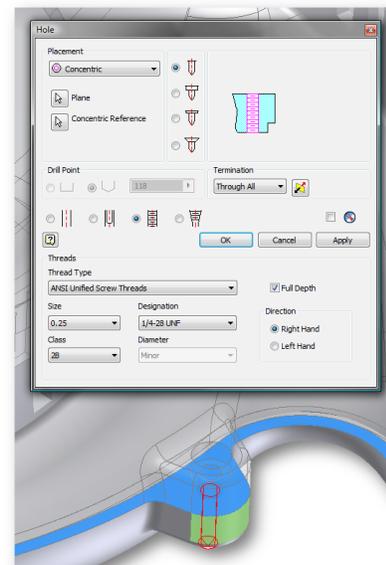


Figure 12, Create Holes in Lower Half of Housing.

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## Conclusion

Using this workflow, it is very easy to create mating features between different parts of an assembly. Everything is linked to and driven by the master part. Feature sketches and work features are created in the master part and derived into each of the mating parts, ensuring that everything fits the first time, every time.

Mating parts can be created quickly and easily leveraging this technique. This procedure makes it very simple for you and your designers to maintain mating part relationships that update as the design evolves. Your organization can experience a reduction in fitment errors between mating parts, allowing you and your team to save time and money when creating mating part relationships.

