

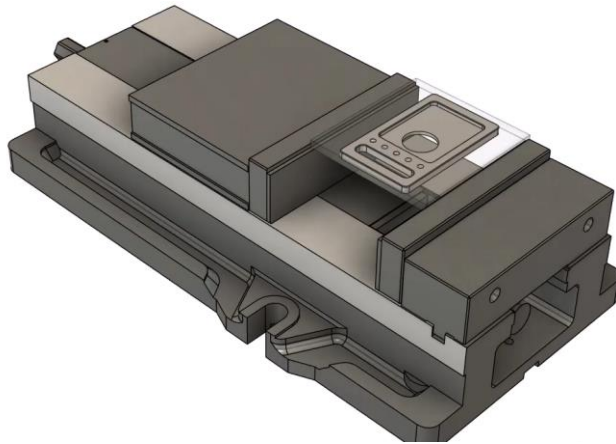
Step-by-step guide

Create a digital twin

Create a digital twin to ensure that you can cut a physical part without colliding into other objects.

Learning objectives:

- Create a stock body.
- Import and locate workholding.



The completed exercise

1. Open a new Untitled tab in Fusion.
Expand the Data Panel and use the New Folder button to create a folder structure for this course. For the purposes of this documentation, a main folder named 25 Learn Fusion CAM in 90 was created. Then an Imperial subfolder was created and a 1 - Setup subfolder was created inside that. Upload the two supplied files shown in the image on the right into your folder structure. These two supplied files will be used to help create a digital twin. This digital twin will help clarify where the tool can machine without colliding into any other objects.

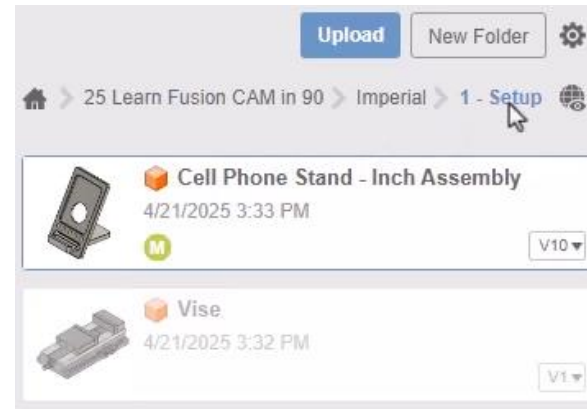


Figure 1. Create the course's folder structure and upload files

2. Inside the Data Panel, double-click the *Cell Phone Stand - Inch Assembly.f3d* file to open it in the Canvas area. This is a two-piece cell phone holder.



Figure 2. Open the supplied file

3. Click Hide Data Panel to close the Data Panel.

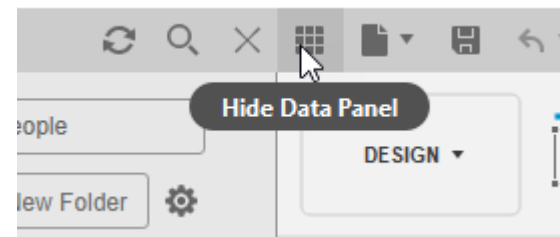


Figure 3. Hide the Data Panel

4. Sometimes it makes sense to move individual components into separate files before creating machining operations. You can use the Derive tool to make a copy that is linked back to the original file. Expand the Bodies folder and select the Main Body.

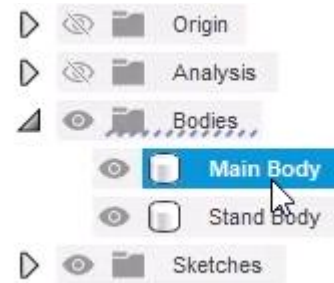


Figure 4. Select the Main Body

5. With the Main Body selected, click Create> Derive.

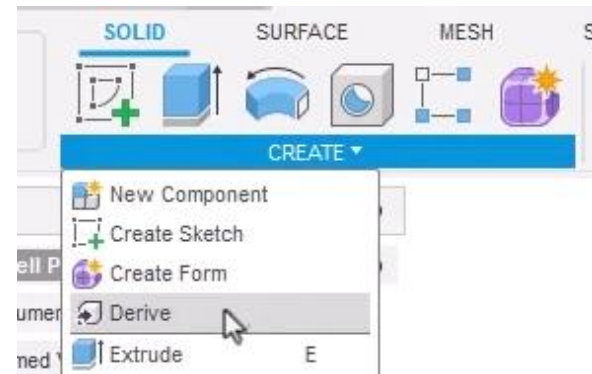


Figure 5. Open the Derive tool

6. In the Derive dialog, make sure the Place Objects at Origin option is checked, then OK the dialog.

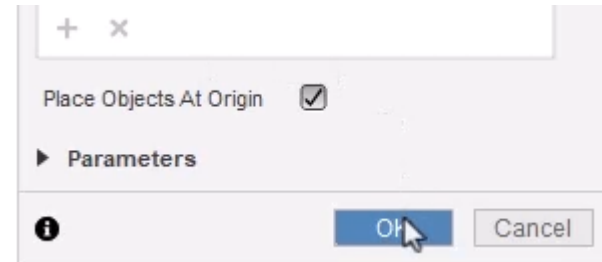


Figure 6. OK the dialog

7. The Main Body is copied into a new Untitled tab. The Browser's arrow icon indicates that this part is derived from an external file. If the original external design is modified, those changes will automatically cascade to this derived design.

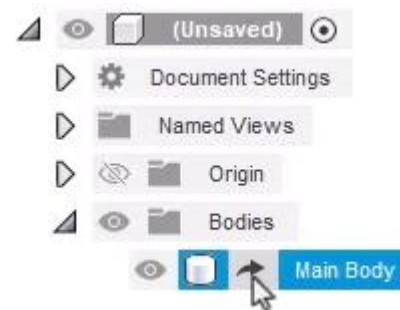


Figure 7. Note the Derive icon

8. In the Browser, click the Origin's eyeball icon to make it visible in the Canvas area.



Figure 8. Show the origin

9. Note the part is not ideally oriented for machining.

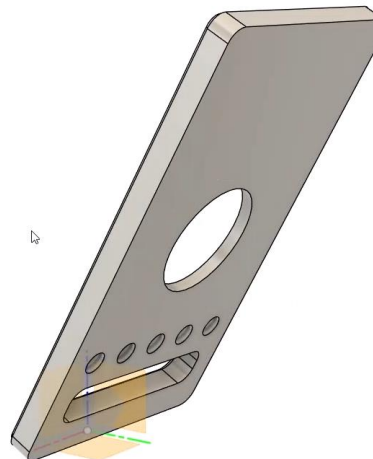


Figure 9. Note the part's orientation

10. Since the part is a body and not a component, the Align tool should be used. Click Modify> Align.

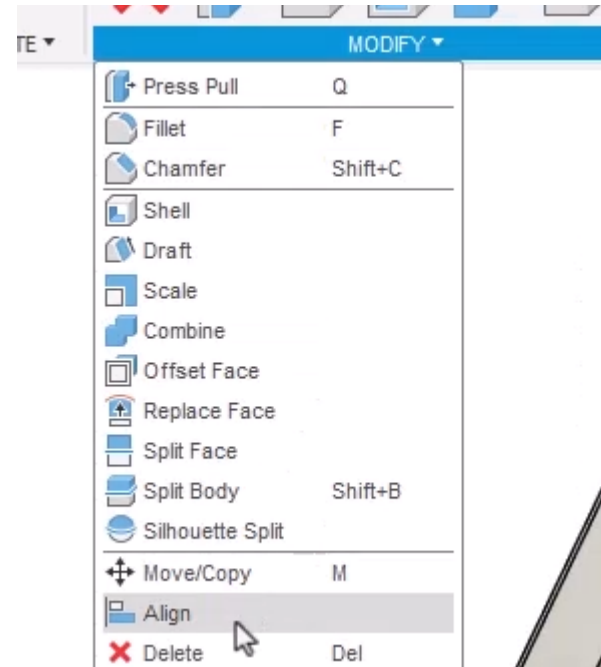


Figure 10. Open the Align tool

11. In the Align dialog, choose the Bodies option from the Object menu.

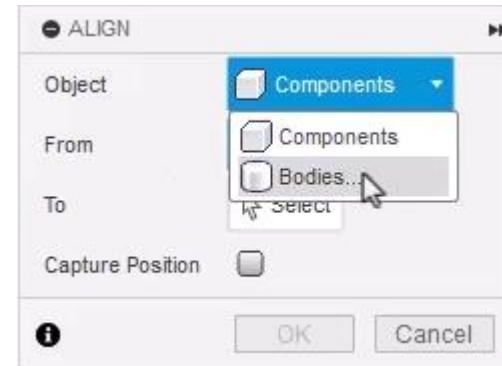


Figure 11. Choose the Bodies option

12. For the dialog's From selection, choose the large hole's center point. You can select this point by clicking the edge shown in the image on right.

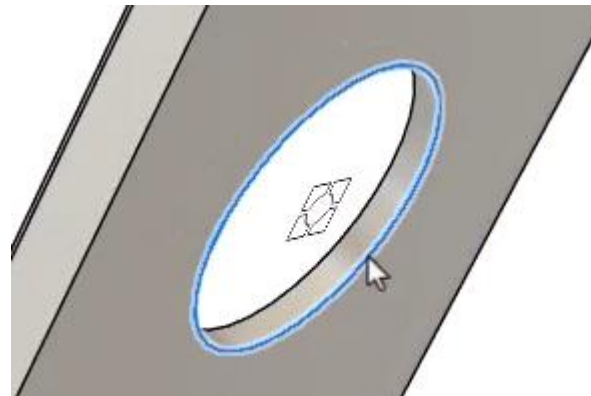


Figure 12. Select the hole's center point

- 13.** For the dialog's To selection, choose the origin's center point. Make sure the origin's small white icon lies flat on the XY plane.

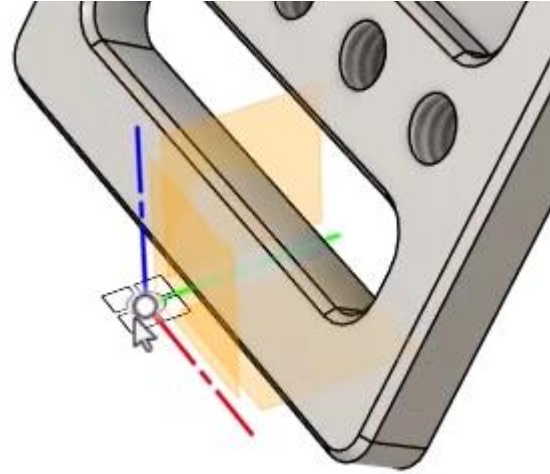


Figure 13. Select the origin

- 14.** The part will snap into place after making the dialog's To selection. OK the Align dialog after you're satisfied.

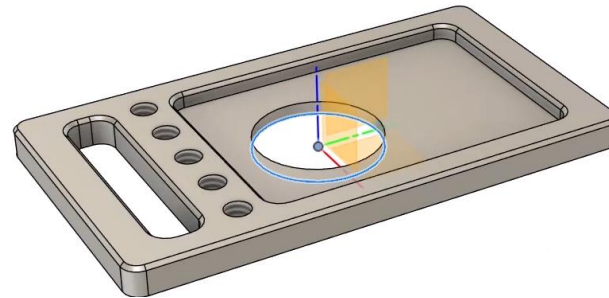


Figure 14. Inspect the result

15. Notice the Align feature is added to the timeline.

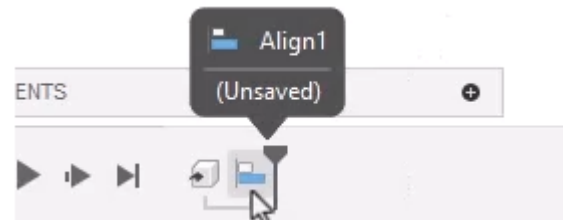


Figure 15. Note the feature added to the timeline

16. Dragging the timeline marker backwards will revert the part to its original position.



Figure 16. Note how to revert the part's position

17. You can create a custom body to represent the stock material that will be machined. Select the part's bottom face shown in the image on the right.

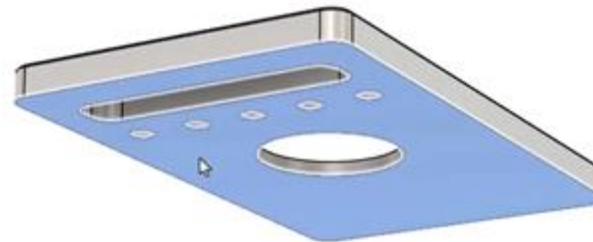


Figure 17. Select the face

18. Click Create> Create Sketch.

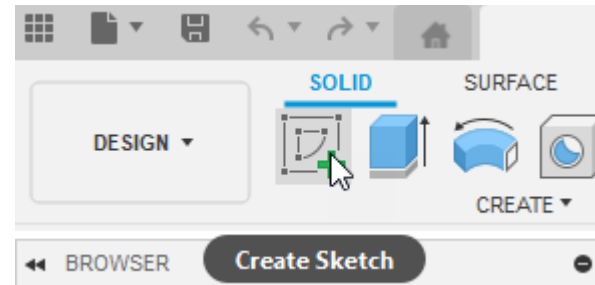


Figure 18. Create a new sketch

19. Double-click the edge shown in the image on the right to select the entire edge loop.



Figure 19. Select the edge loop

20. Convert the selected edge loop into construction geometry by choosing the dialog's Construction option. Repeat this process to convert all of the existing sketch geometry into construction geometry.

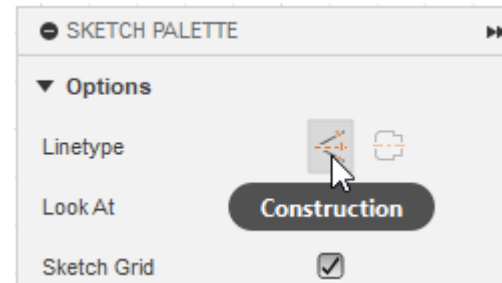


Figure 20. Convert to construction geometry

21. Open the Rectangle tool by clicking Create> 2-Point Rectangle.

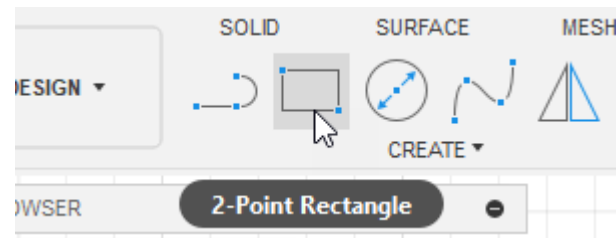


Figure 21. Open the Rectangle tool

22. Choose the dialog's Center Rectangle option.

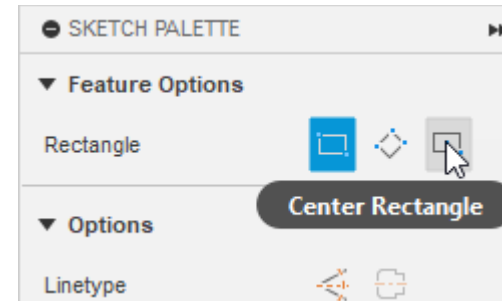


Figure 22. Choose the Center Rectangle option

23. Click the origin to place the rectangle's center point at the sketch's origin, then click again to create a rectangle larger than the part.

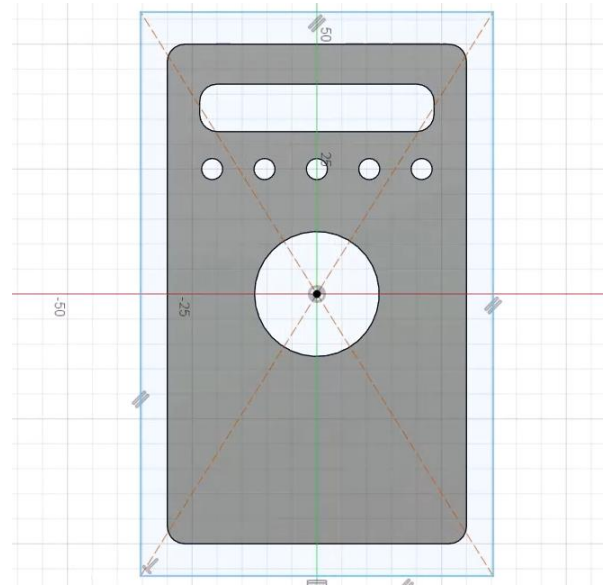


Figure 23. Draw a rectangle

24. Open the Sketch Dimension tool by clicking Create> Sketch Dimension.

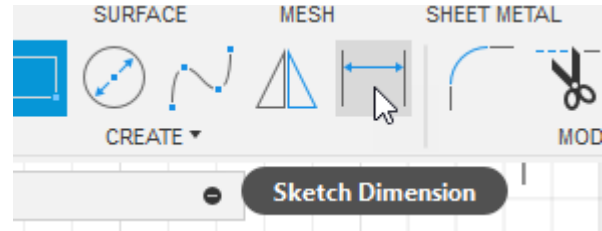


Figure 24. Open the Sketch Dimension tool

25. Click the rectangle's top edge to apply a dimension to it. Enter **4in** into the dimension box and press Enter.

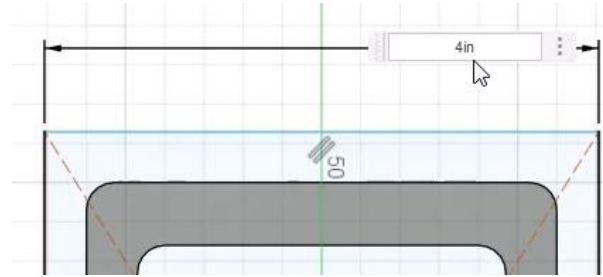


Figure 25. Dimension the top edge

26. Add a dimension of **4.125 in** to the rectangle's vertical edge.

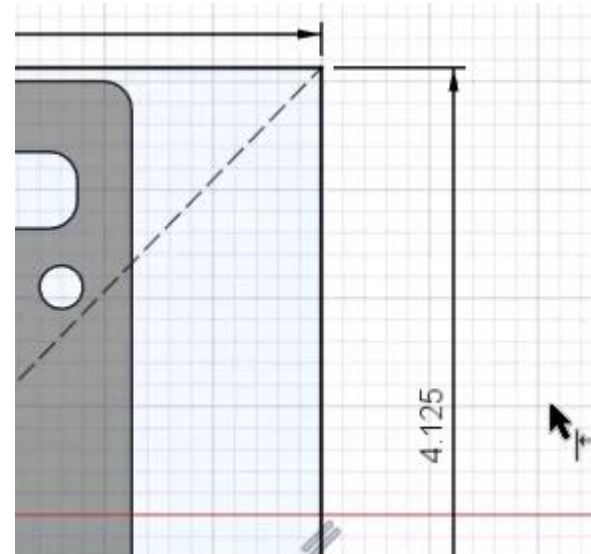


Figure 26. Dimension the vertical edge

27. Finish the current sketch by clicking Finish Sketch> Finish Sketch.

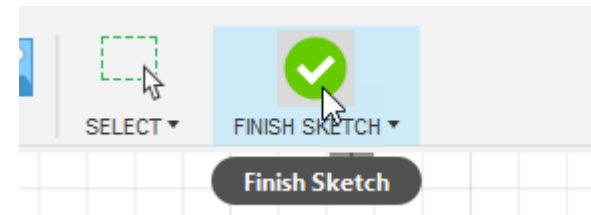


Figure 27. Finish the sketch

28. Open the Extrude tool by clicking
Create> Extrude.

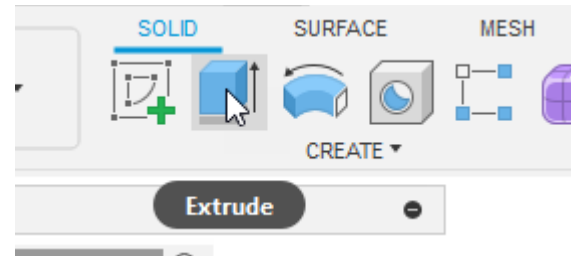


Figure 28. Open the Extrude tool

29. Select the rectangle you drew and pull
the on-screen manipulator up -0.25 in.



Figure 29. Extrude the rectangle

30. Choose the New Body option from the Operation menu. OK the dialog

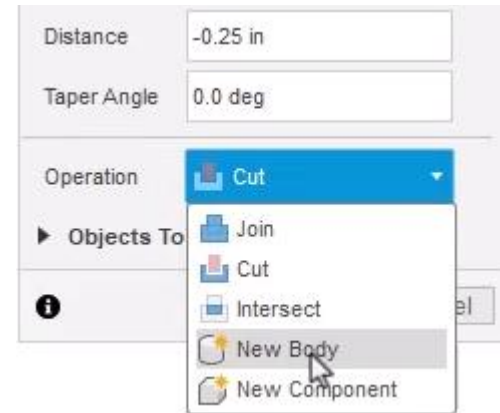


Figure 30. Change the operation type

31. You can organize your project by renaming the Browser's bodies. Click Body2 and rename it as **Stock**.



Figure 31. Rename the new body

32. You can adjust the Stock's opacity so you can see the underlying original model. In the Browser, right-click the Stock body and choose **Opacity Control** > 30%.

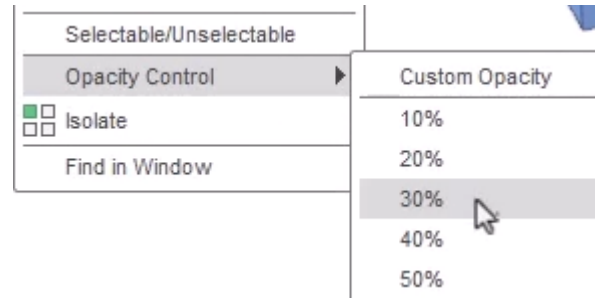


Figure 32. Adjust the stock's opacity

33. You can now see the original model through the stock body.

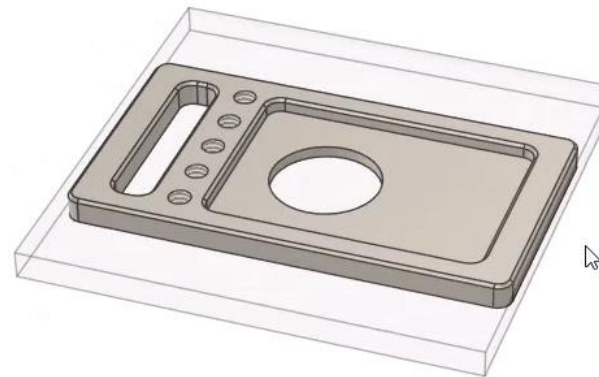


Figure 33. Inspect the result

34. Open the Data Panel and locate the supplied *Vise.f3d* project.

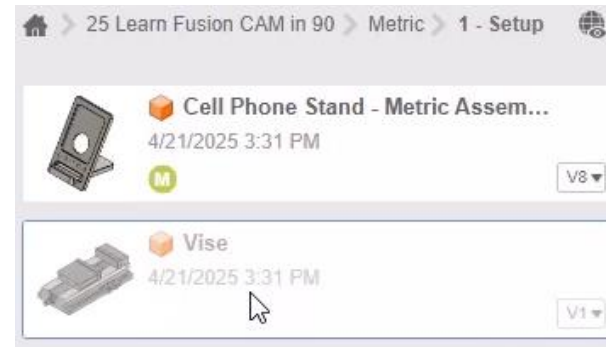


Figure 34. Locate the supplied file

35. Click and drag the *Vise.f3d* project into the Canvas area.

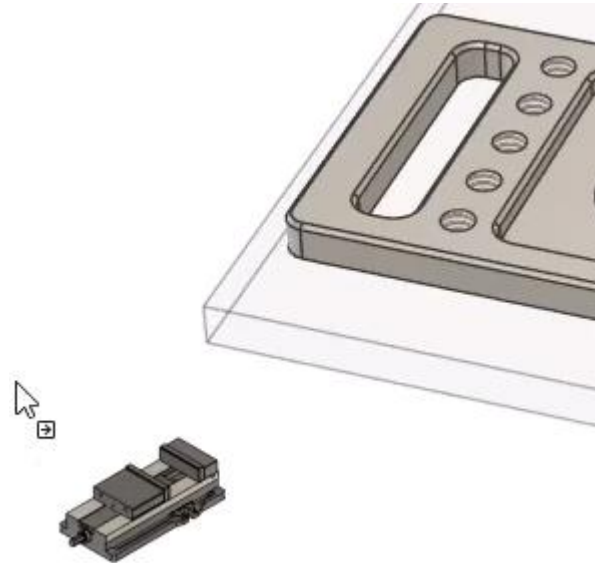


Figure 35. Click and drag the vise

36. Use the on-screen manipulator's arrow to drag the vise below the Stock body.

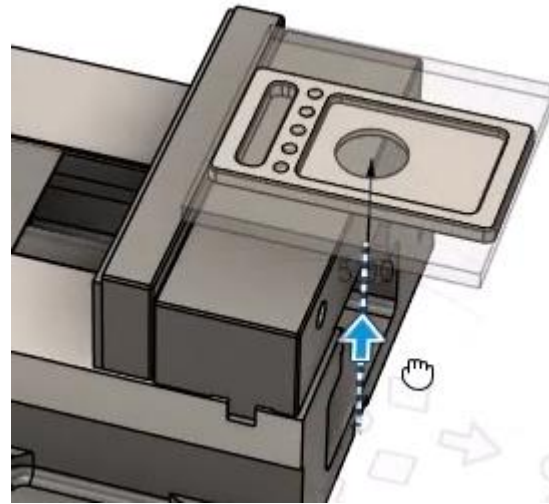


Figure 36. Move the vise

37. Use the on-screen manipulator's rotation handle to rotate the vise -90 degrees.

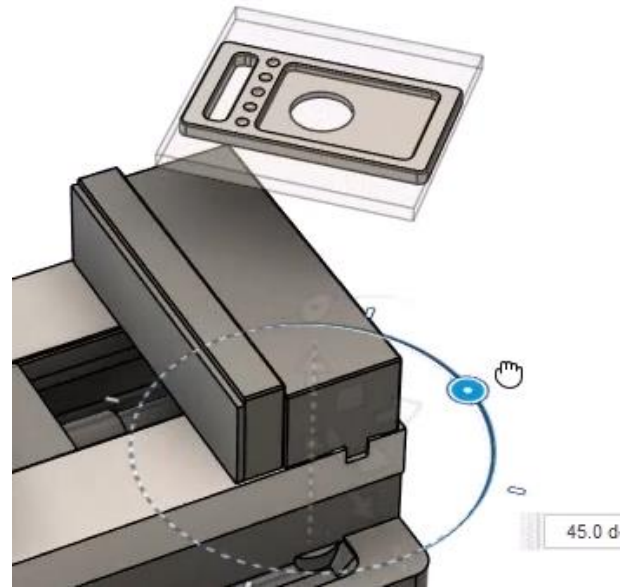


Figure 37. Rotate the vise

38. Deactivate the dialog's Ground to Parent option, then OK the dialog.



Figure 38. OK the dialog

- 39.** Open the Align tool by clicking Modify> Align.

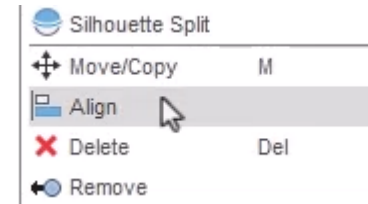


Figure 39. Open the Align tool

- 40.** Choose the dialog's Components option from the Object menu.



Figure 40. Change the object type

- 41.** Being careful to avoid any of the small white square icons, select the vise's face as shown in the image on the right. You might need to zoom in to the vise to make sure you are not selecting the parallel's face.

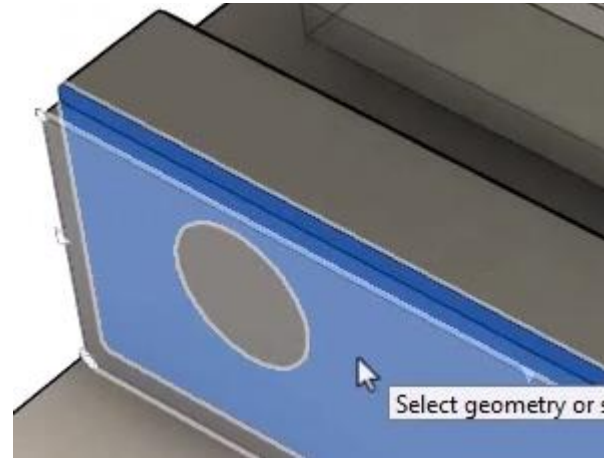


Figure 41. Select the face

42. For the dialog's To selection, choose the stock body's face that will contact the vise face you selected in the previous step.

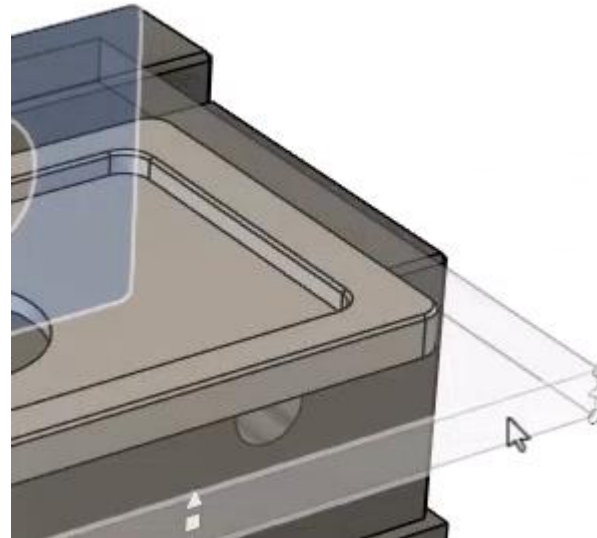


Figure 42. Select the stock's face

43. Notice the vise moves into the correct position. OK the dialog.

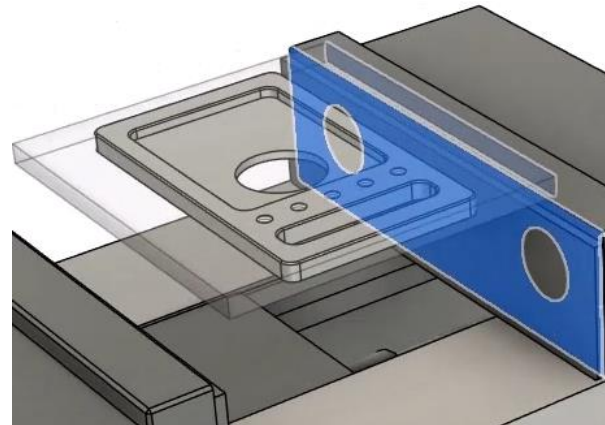


Figure 43. Inspect the progress

44. Right-click in an open area of the canvas and choose the Repeat Align option from the right-click menu.

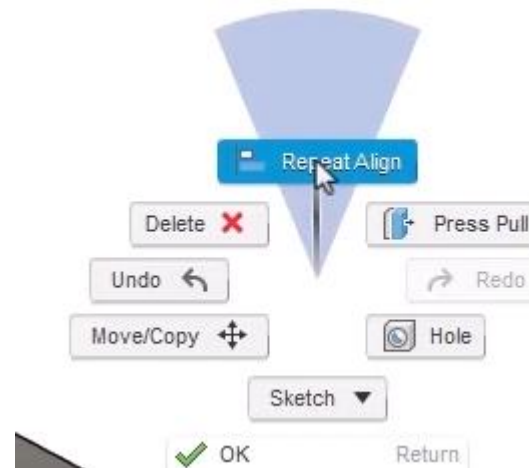


Figure 44. Reopen the Align tool

- 45.** Use the Align tool to make sure the stock body's bottom face is aligned with the parallel's top face. OK the dialog.

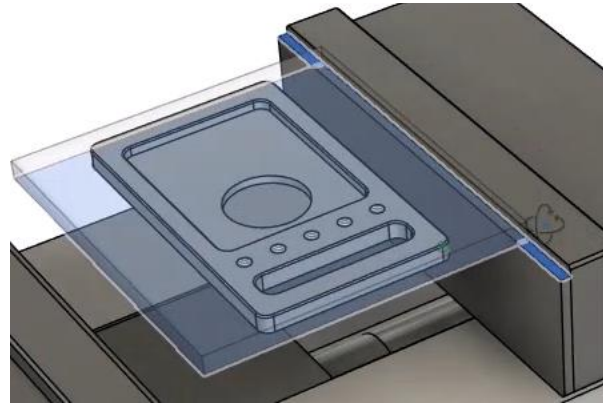


Figure 45. Continue to align the vise to the stock

- 46.** Repeat the Align tool to align the stock's left face with the vise's left face. OK the dialog.

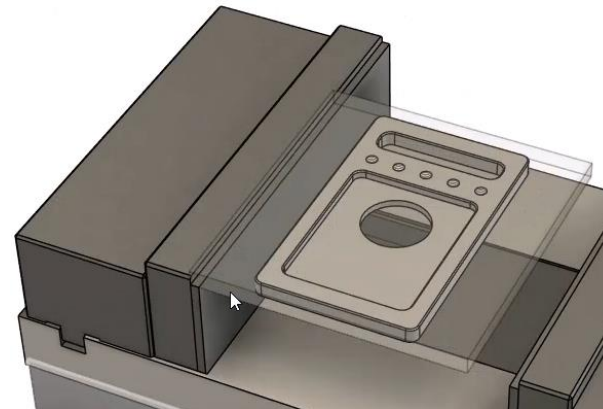


Figure 46. Align the stock to the left

- 47.** Select the vise jaw's top face shown in the image on right.

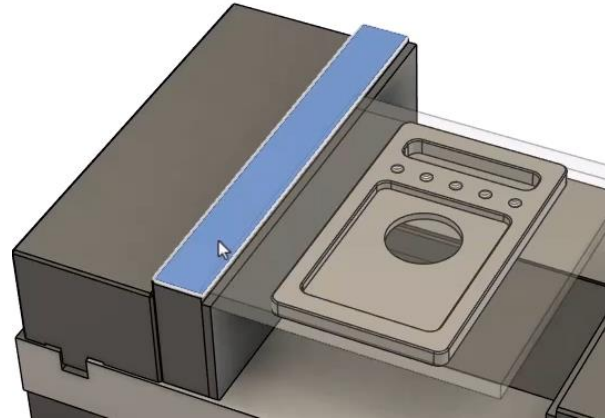


Figure 47. Select the jaw's face

- 48.** In the Browser, expand the Vise component and notice that one of the components is highlighted with a dashed underline.



Figure 48. Inspect the Browser

- 49.** Right-click the highlighted component and choose the menu's Pin option.

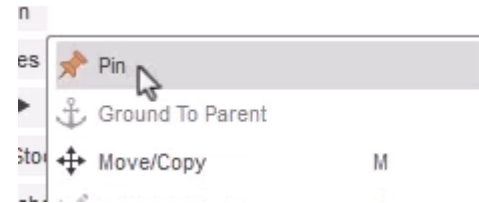


Figure 49. Pin the selected component

- 50.** Click the dialog's Capture Position option.



Figure 50. Capture the component's position

- 51.** The vise will stay stationary but the component's joints are allowed to move. Click and drag the sliding vise jaw and notice that it can move.

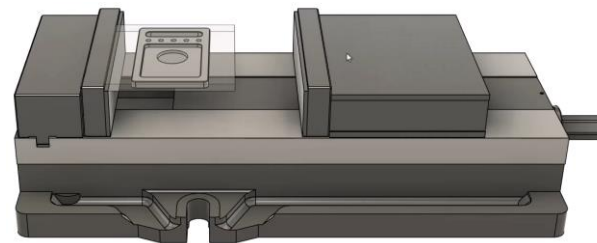


Figure 51. Move the vise jaw

52. Click Position > Revert.

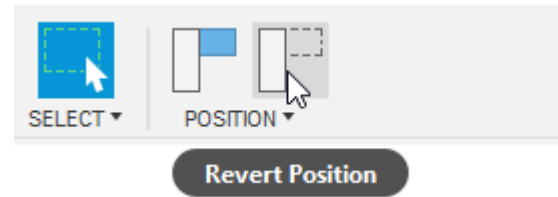


Figure 52. Revert the component's position

53. Open the Align tool and align the sliding jaw's face to the stock.

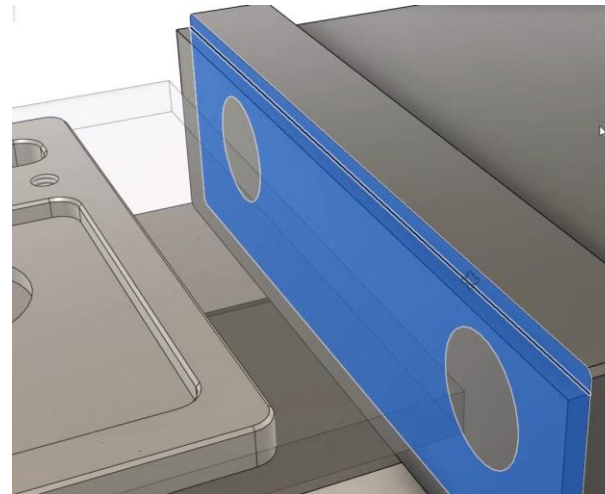


Figure 53. Align the sliding jaw

54. Activate the Align dialog's Capture Position option, then OK the dialog.

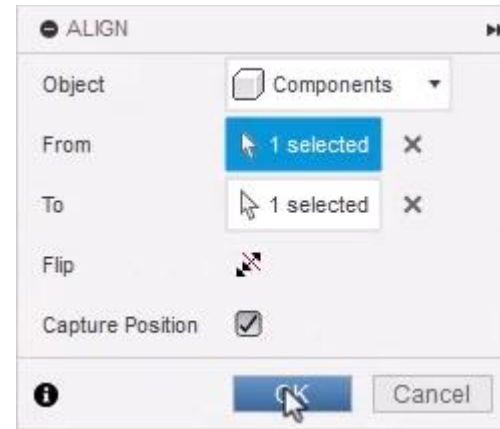


Figure 54. OK the dialog

55. Now that the digital twin is complete, you can ensure that tools will not collide with other objects during the machining process.

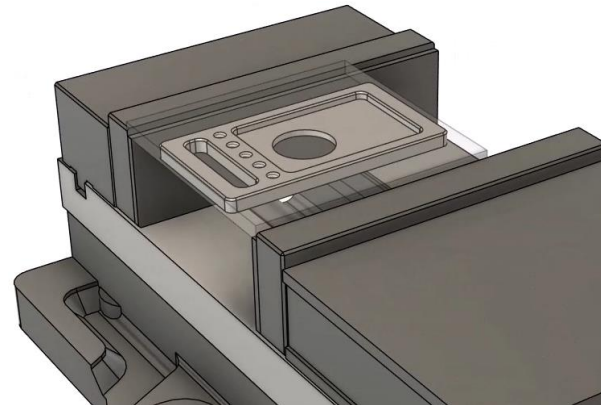


Figure 55. Inspect the result

56. Save the design by clicking Save in the Application Bar.

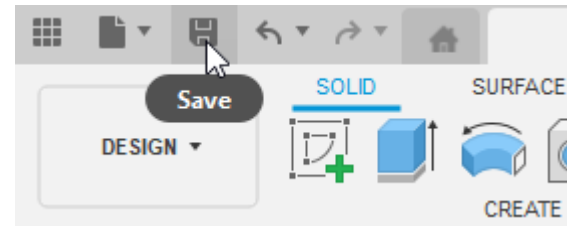


Figure 56. Click Save