EDU[**CAD**]TION **STUDY GUIDE**

How to Design a CAD Lid with Joints, Ventilation & Access Features

Chapter 2, Lesson 6

SendCutSend

Creating the Lid Component

• Start by creating a sketch directly on the top face of the bottom box. Selecting this surface automatically projects the box's outer and inner profiles into your sketch.

• Use '**Extrude**' on both the inner and outer profiles to create a wall thickness of 0.125 inches, matching the box's walls.

• In the extrude window, select '**New Component**' (not New Body) to ensure the lid is treated as its own part within the assembly (see Figure 1.1).

• When you display your analysis, the purple area will appear, representing the lid (see Figure 1.2).

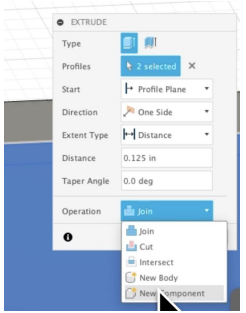

Figure 1.1

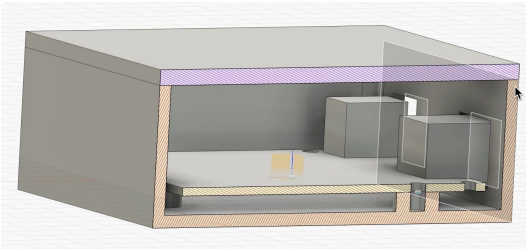

Figure 1.2

Locating the Lid

- The lid initially floats above the box with no fixed position.

- To align and seat it correctly, reveal your previous sketch and Extrude downward by 0.050 inches to create a locator lip that fits into the top of the bottom box.

- Make sure that before extruding, hide the bottom box to avoid accidentally joining both components. Once you've hidden you'll only see the analysis of the lid (see Figure 1.3).

- Once complete, turn the box back on you'll see a small lip fitting neatly into the box's cavity see (Figure 1.4).

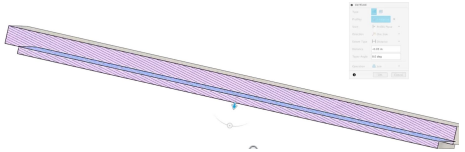

Figure 1.3

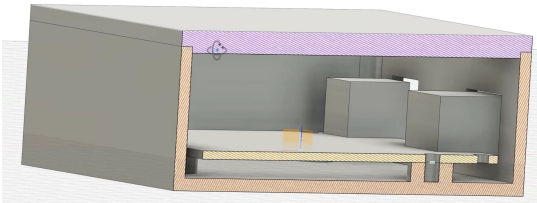

Figure 1.4

Locking Components with a Joint

• If you select the lid, you'll notice you can move it freely because it isn't physically connected. This occurs when two components are created within the same file, they exist separately and aren't joined together.

• In order to connect them you will go to **Assemble** > **Joint**.

• Select the bottom corner point of the lid and the midpoint of the box's top edge as your reference points.
Note: *If the lid flips upside down, select Flip in the dialog box. Once confirmed, the lid, box, and Arduino are all rigidly connected in the assembly space.*

Adjusting for Fit, Slip Clearance

- Another modification we want to do is to the ledge thats sticking down. Right now it's the same size as the opening (see Figure 1.5).

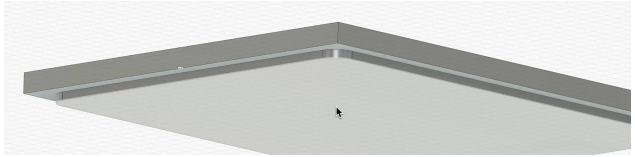

Figure 1.5

- To ensure the lid fits snugly but not too tight, use **Modify** > **Press Pull** (see Figure 1.6).

- Select all the locator faces on the lid and enter -0.020 inches. This creates a small clearance for a slip fit between components, ideal for 3D printed parts that may have slight tolerances.

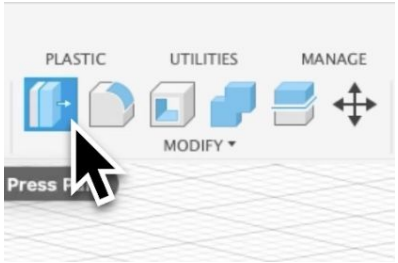

Figure 1.6

Adding Ventilation

- This is where design considerations come into play. Since PCBs generate heat, the enclosure must allow for proper airflow to prevent overheating.

- Create a sketch on the lid's top face and use **Create** > **Slot** > **Center-Point Slot** to draw a vent centered at the origin. Radius: 0.125 inches; Length: 1.75 inches (see Figure 1.7).

- Select the slot profile and use **Extrude** > **Cut** to open it through the lid. Turn on your analysis to confirm the cut affects only the lid and doesn't remove material from any other parts of the design.

- To add multiple vents, go to **Pattern** > **Rectangular Pattern**. Under Objects, select the extrude feature, not the sketch. This saves time by patterning a single operation instead of creating multiple sketches.

- Next, select your extrude cut, choose your axis, and drag to create multiple copies. Adjust the distance or choose Symmetric to evenly distribute the pattern (see Figure 1.8).

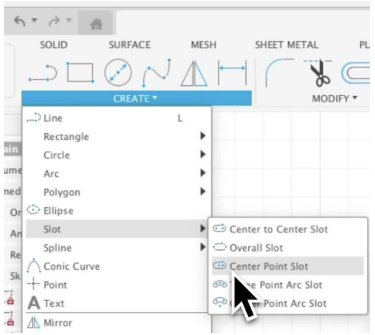

Figure 1.7

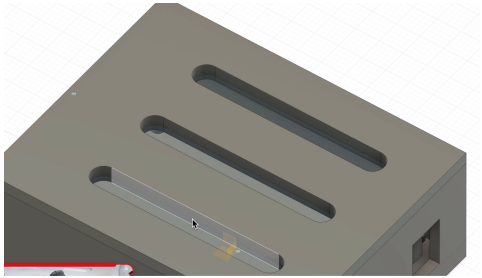

Figure 1.8

Creating the Reset Button Hole

- For the reset button access, hide the lid, reveal the Arduino, and project the reset hole from the board onto the lid plane using **Create** > **Project**.

- Re-show the lid, then **Extrude** > **Cut** through it. This ensures an accurately placed hole aligned with the board's reset switch.

Adding the Wire Slot

- For cable routing, create a sketch on the back face of the assembly.

- Use a Center Slot with radius 0.125 inches and 1 inch in length. We're going to add a 'Midpoint Constraint' to make it center.

- Now you can **Extrude** > **Cut** through both the lid and bottom box.
Note: *In the Objects to Cut dropdown, you can deselect or hide parts to prevent unwanted cuts.*

- Reminder, this slot is not machinable, it's meant for 3D printing, demonstrating a Design for Manufacturing (DFM) consideration.

Summary

This lesson introduced how to create and manage multiple components within a single assembly, reference one part to another, and integrate mechanical design features. You now have a fully enclosed Arduino housing that's ready for manufacturing and practical use.

Learn more at https://sendcutsend.com/education/