

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

How to Reference Bodies for Clearance in CAD

Chapter 2, Lesson 5

SendCutSend

Creating Mounting Pads

- To begin, hide the Arduino component and create a new sketch on the bottom face of the box.
- Then, re-show the Arduino and switch Line Type to '**Construction**' so that reference lines don't affect your extrusion.
- Use **Create** > **Project** to project the Arduino's hole geometry onto the bottom surface. This transfers the hole positions from the Arduino to the box for precise alignment.

Offsetting and Defining Pads

- Once the holes are projected, apply an Offset of 0.125 inches around each of the 4 holes to define the mounting pad area (see Figure 1.1).
- Convert these construction lines back to solid lines by 'holding shift' and selecting them and changing their Line Type. These outlines will serve as the profiles for the pads that will support the Arduino board.
- Once the line type has been changed, you can select the profiles and create the extrusions.

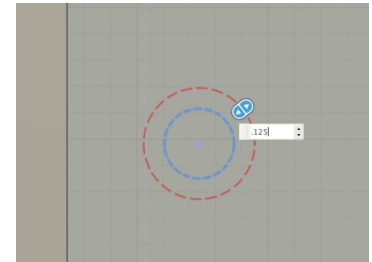


Figure 1.1

Extruding Pads to the Arduino

- With the profiles selected, use the '**Extrude**' tool to create the pads. In the Extrude dialog box, instead of entering a specific distance, set '**Extend Type**' to '**To Object**', and select the bottom face of the Arduino as the reference (see Figure 1.2).
- This approach makes the pads adaptive, if the Arduino's position changes, the pads will automatically adjust. A reference is created to the bottom of the Arduino, so you may notice the holes don't align until you select '**Join**' (see Figure 1.3).
- Set the Operation to '**Join**' to merge the pads with the bottom box. This keeps them as part of the same body while maintaining their reference to the Arduino's position (see Figure 1.4).

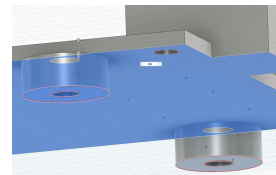


Figure 1.2

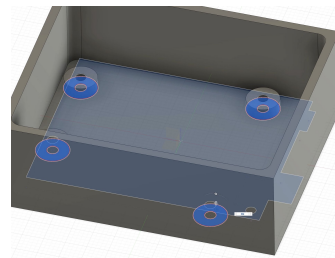


Figure 1.3

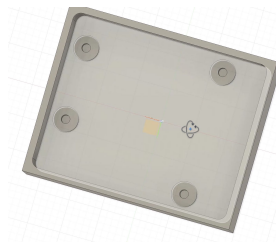


Figure 1.4

Adding Port Cutouts (USB & Charge)

- Begin a new sketch on the side face of the box where the ports will pass through. Temporarily hide the box, then project the Arduino's port outlines onto the sketch plane.
- Re-show the box, change the projected lines back to solid, and apply an Offset of 0.020 inches (20 thousandths) to provide manufacturing clearance. This ensures proper cable fit and avoids tight tolerances during production.
- Select both offset profiles and use '**Extrude**', setting the direction to '**Cut**' through the wall. Confirm that the Operation is set to '**Cut**', then click OK to create the openings (see Figure 1.5).

Note: *If multiple bodies are visible, you may accidentally cut into another part. To prevent this, either hide unrelated bodies or manually select the intended target body before confirming.*

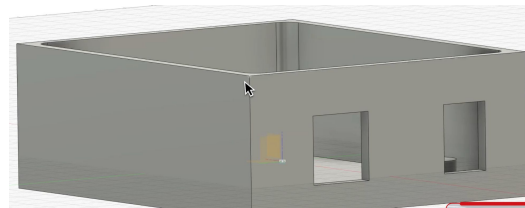


Figure 1.5

Verifying Fit with Analysis

- After cutting, re-show the Arduino and check the fit using Section Analysis. This lets you verify that the USB and charge ports align correctly and that there's adequate clearance for insertion and assembly.
- You should see that the ports fit cleanly through the box and that the Arduino mounts securely on the pads below.

Summary

By referencing and projecting geometry between bodies, you can create designs that adapt automatically and maintain alignment across components. These techniques ensure proper fit, clearance, and functionality, critical for assemblies with multiple parts like electronic enclosures.

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