

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

How to Reverse Engineer Parts in CAD

Chapter 2, Lesson 1

SendCutSend

Designing Around Real Parts

- Most designs in CAD are built around existing components like electronics or hardware.
- Reverse engineering helps you recreate enough of a physical part to design compatible features or assemblies. You can measure the part manually or download an existing CAD model.

Essential Tools for Reverse Engineering

- In this chapter, we'll design an enclosure for the Arduino Uno circuit board, which requires taking precise measurements to reverse engineer the part.
- Begin by using calipers to capture key dimensions: the overall length, width, and height, along with mounting hole diameters and port locations.
- Focus on what's functionally essential for your design, avoid spending time on minor surface details that don't impact fit or performance.

Measuring Techniques

- If a hole is positioned near an edge, measure from the edge of the hole to the nearest outer edge, then add the hole's radius to determine the exact center point of the hole (see Figure 1.1).
- If you have two holes, there are two reliable ways to measure hole centers with calipers: inside-to-inside and outside-to-outside.
- For **inside-to-inside**, measure between inner edges and add both radii (or one diameter) (see Figure 1.2).
- For **outside-to-outside**, measure outer edges and subtract the radii. These methods ensure precise spacing without estimating center points (see Figure 1.2).

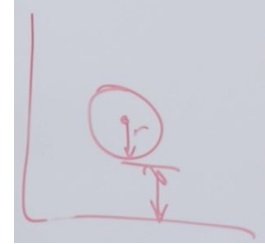


Figure 1.1

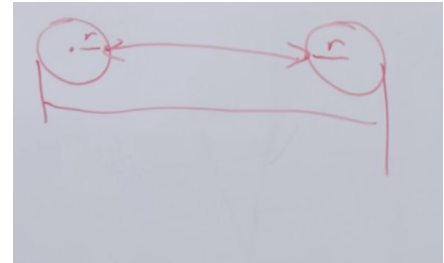


Figure 1.2

Simplifying the Model

- When recreating a component, only include what you need: the outer rectangular boundary, hole placement, and port openings. Avoid overcomplicating your model with unnecessary features, simplicity leads to faster, cleaner CAD work.
- From this lesson, you'll see the basic outline of the circuit board modeled in CAD. This serves as the foundation for building the enclosure and ensures accurate alignment as you design around it (see Figure 1.3).

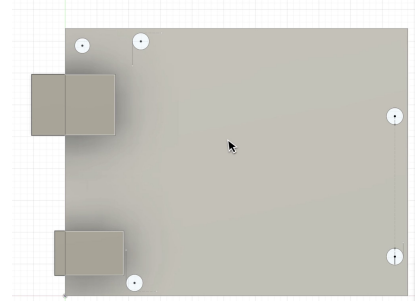


Figure 1.3

Using Online Resources

- You don't always need to build every component from scratch. For common parts, you can save time and improve efficiency by downloading pre-made CAD models.
- Recommended sites include GrabCAD and Thingiverse.
- To import, go to the Autodesk Fusion Data Panel, click Upload, and drag or select your STEP file. Once imported, you'll have a fully detailed component ready to use in your assembly. In this lesson, when we downloaded the file from GrabCAD, we were able to obtain a highly detailed base model of the circuit board to reference in our design (see Figure 1.4).

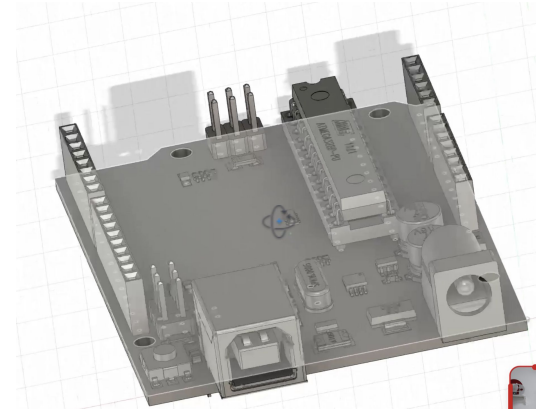


Figure 1.4

Summary

Reverse engineering is the bridge between digital design and the physical world. By measuring or importing real parts, you create a foundation for assemblies that work in reality, not just in CAD. The key is simplicity: only model what you need to meet your design intent.

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