CAD Training Part 1 A

This training will focus on making a simple assembly. This will be an accelerated version of the Lake Effect CAD Training. That document should also be read as it includes more practice including revolves.

This lesson will work on CADing the gearboxes we use on robots.

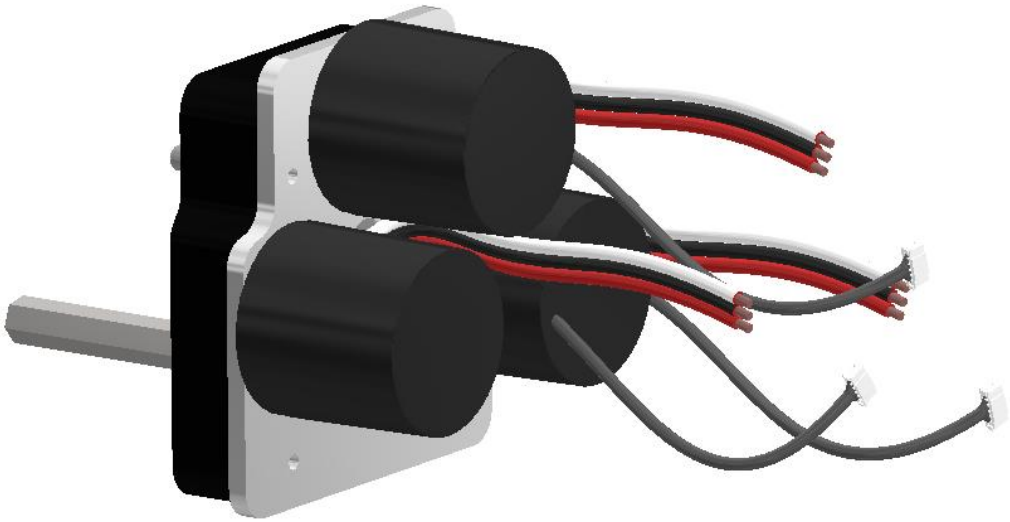


Figure 1: Gearbox assembly from turret bot CAD

Gearbox Plate

For the first part, we will be making the metal plate where the motors are mounted

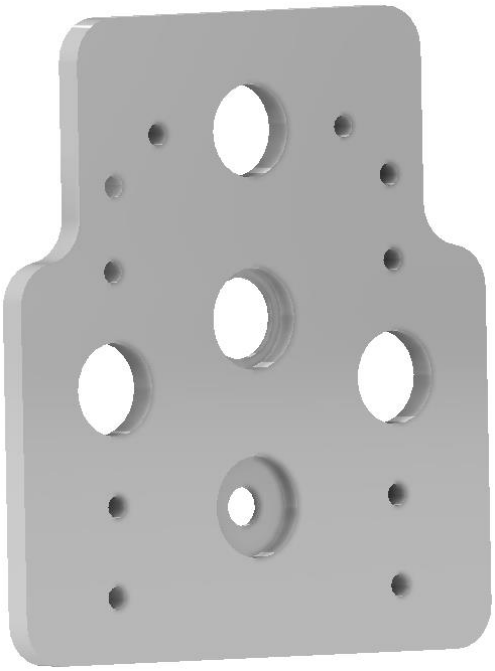


Figure 2

1: Create a Part

Select File>New>Part

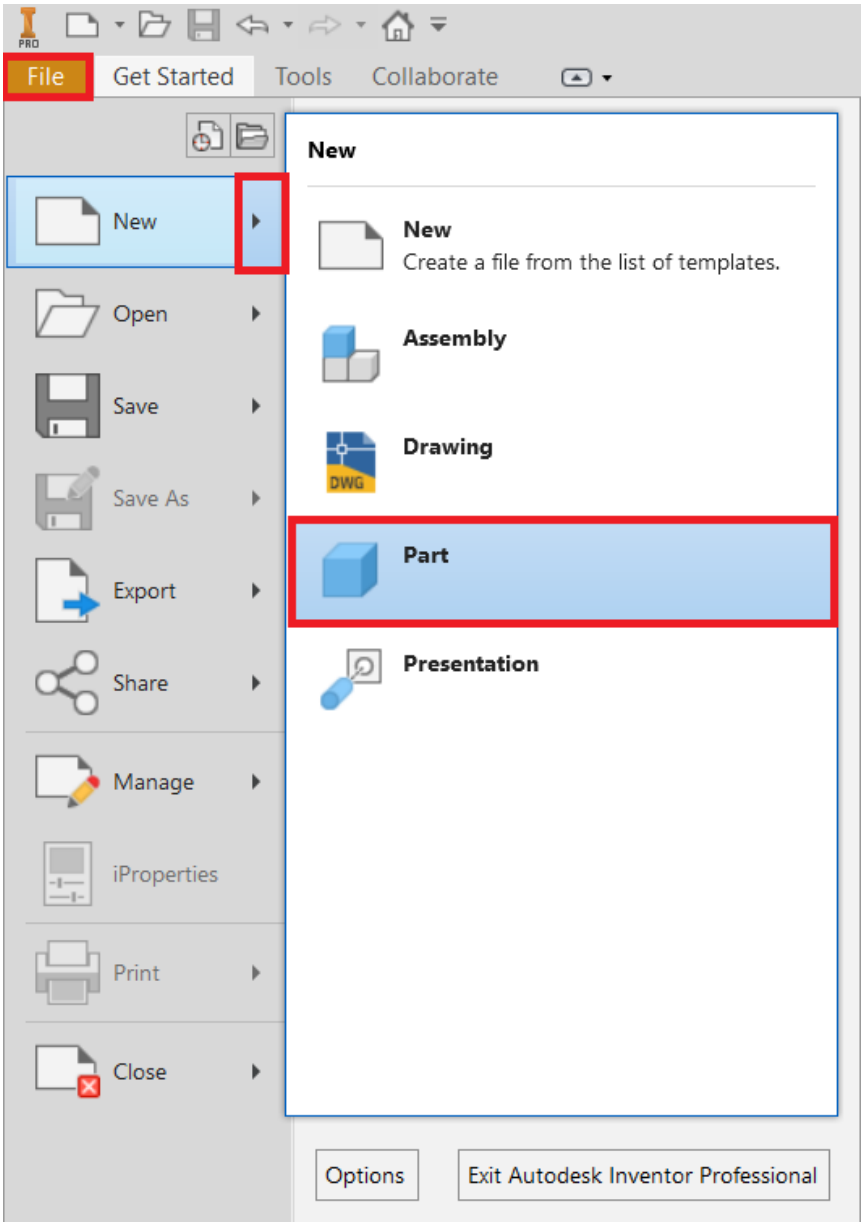


Figure 3

This will open a new blank part file

2: Create Base

Click “Start 2D Sketch” and select the XY Plane

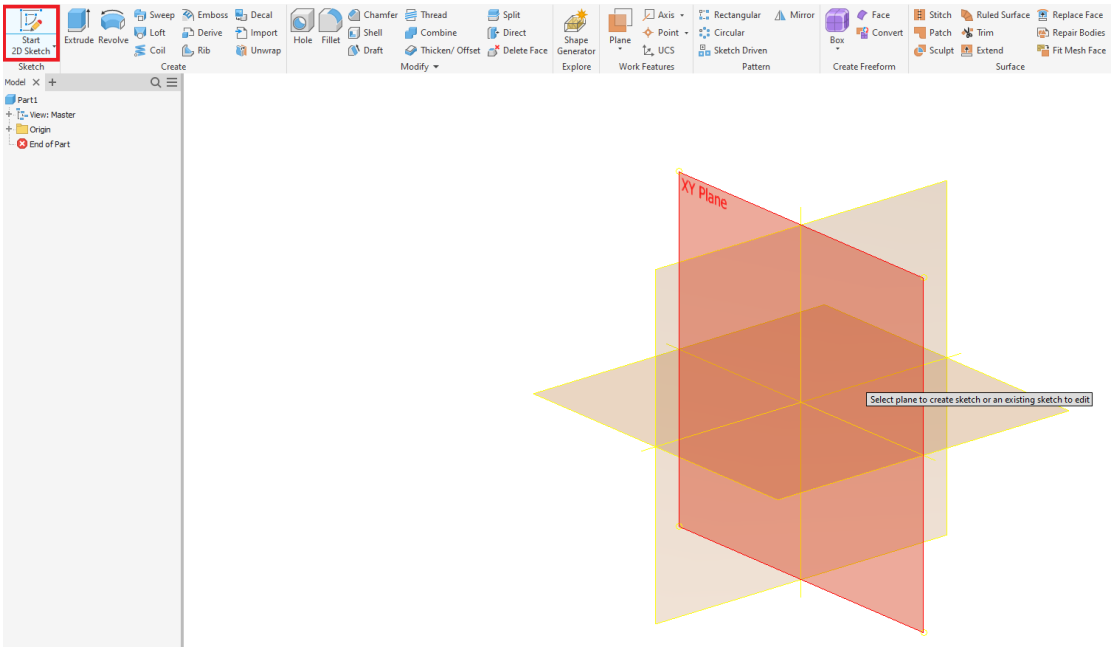


Figure 4

Once you have created the sketch, draw a 5”x5.5” rectangle. The cut-out corners will be added later relative to the hole locations.

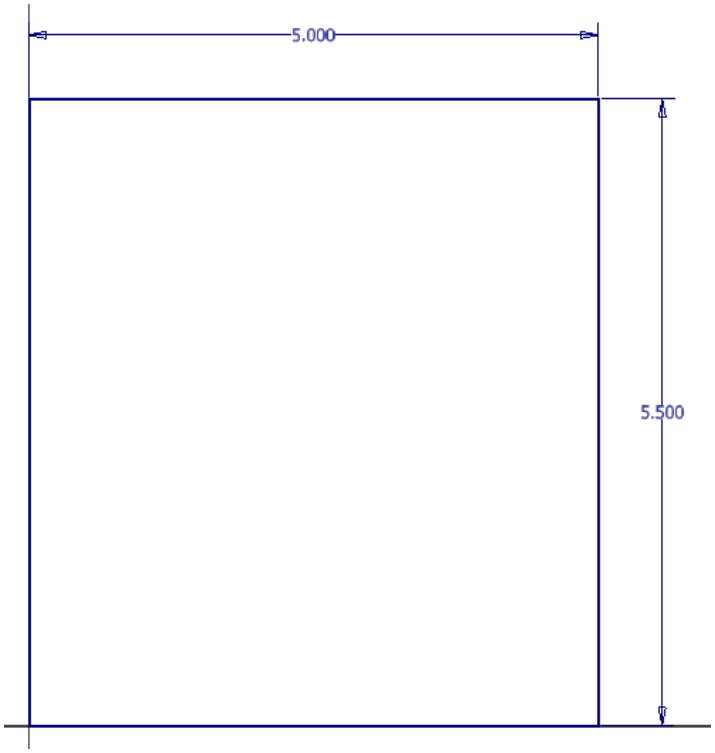


Figure 5

Exit the sketch and extrude the shape ¼”. This will complete the base shape for the faceplate.

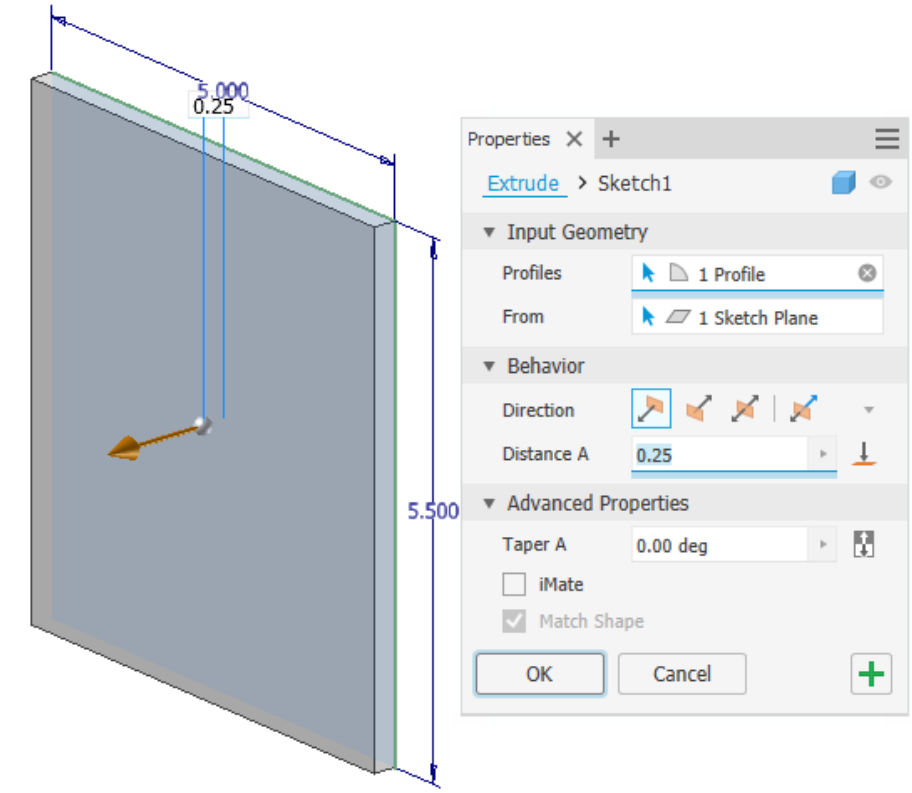


Figure 6

3: Add Major Holes

There are 4 major holes on the faceplate.

Making Holes

To make a hole, create a sketch on the target face and use the point tool to pick the location. When you have marked the points, exit the sketch, and use the hole tool. This method can create as many holes as you want, so long as they have the same properties.

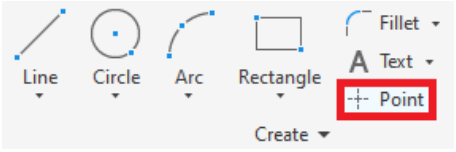


Figure 7: The point tool, in the Sketch tab

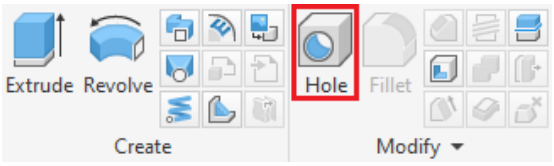


Figure 8: The hole tool, in the 3D Model tab

Central Hole

Create a sketch on the front face and add a point which is horizontally centered and 2.886” up from the bottom. Then exit the sketch and create a simple 0.7” through hole.

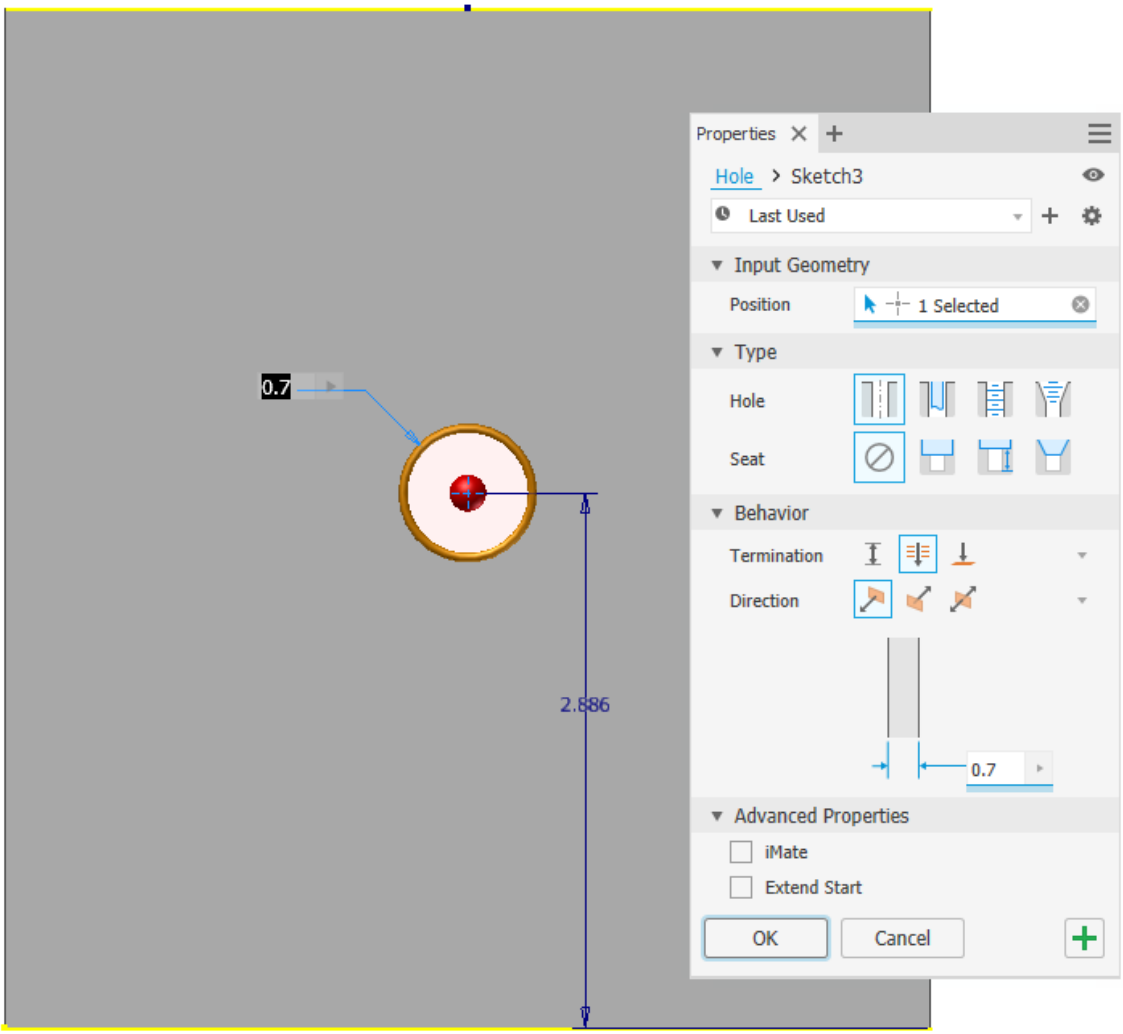


Figure 9

Motor Holes

There are 3 holes for motors, to create them a new sketch on the front face and place 3 points. All points are at a radial distance of 1.602”. In the real CAD this is tied to the gear diameter, but for us it will be hardcoded. The upper hole is horizontally centered, while the lower 2 are 0.55” below. To do this you will need diagonal dimensions, which can be created by right-clicking after selecting the points and choosing “aligned”. There is also a 4th hole directly below the central, but it will need its own sketch as its smaller.

Once the points are placed, exit the sketch and create 0.8” through holes.

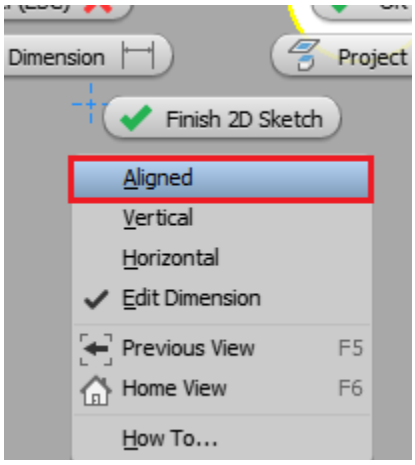


Figure 10

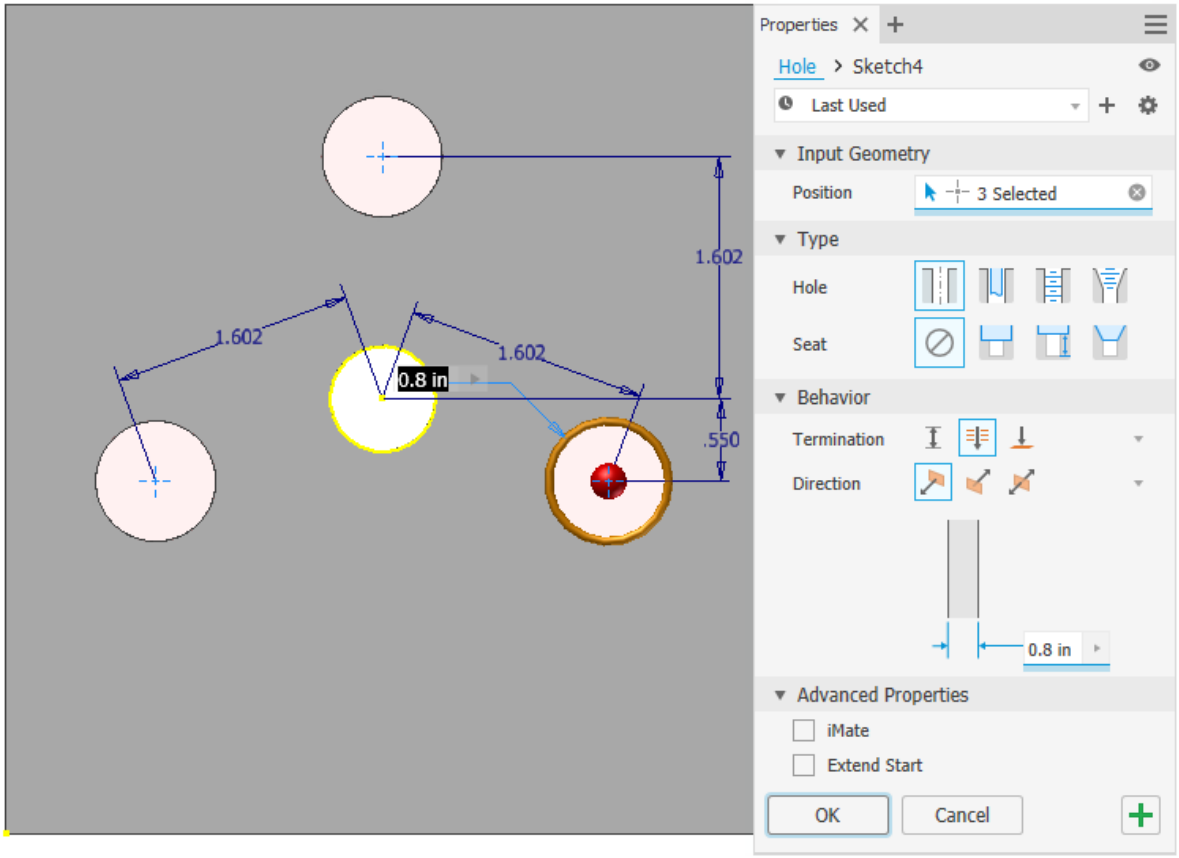


Figure 11

Once you have created the 3 larger holes, create the 4th in a new sketch, this time with a diameter of 0.339”.

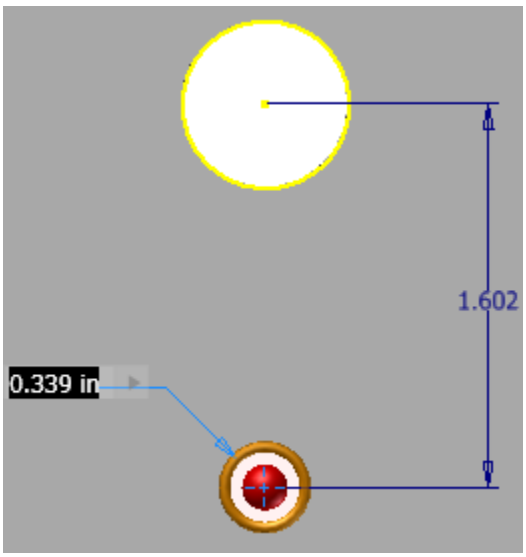


Figure 12

Hole Sink

The central and lower holes are sunk. To add this feature, create a new sketch with 0.875” circles around the holes and extrude them by the following equation: $0.25\text{in} - 0.0625\text{in}$. This equation implies that the cut will leave $^1/_{16}$” of material from the original $^1/_4$”.

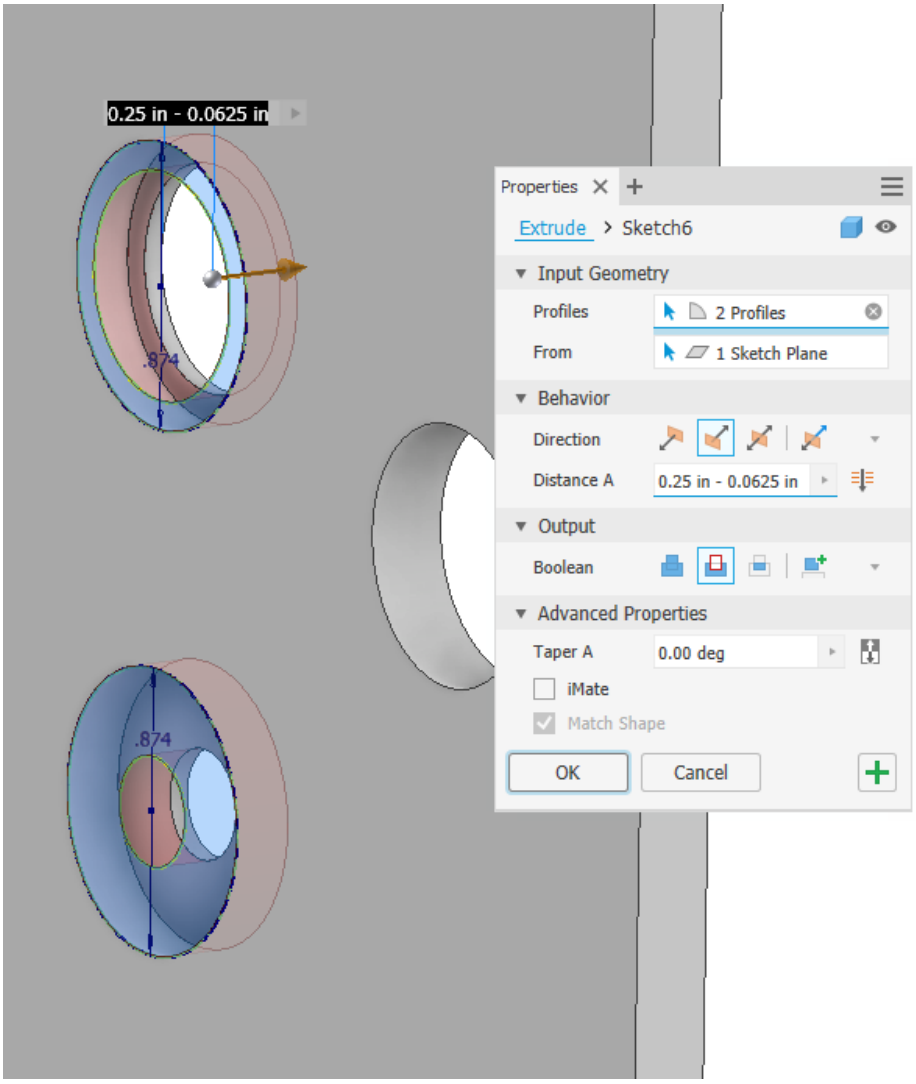
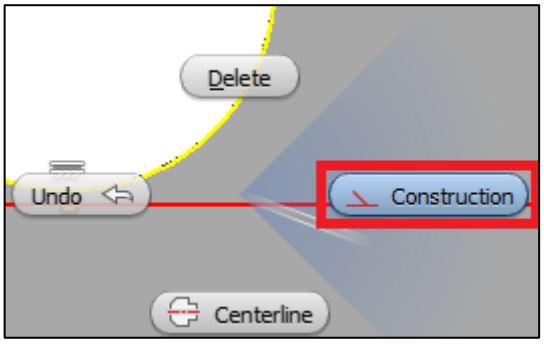


Figure 13

4: Add Minor Holes

There are a variety of minor holes included for mounting screws. Each of the motor holes has 2 holes for mounting screws at 1” on either side. There are also 4 holes used for mounting the 3D printed housing. These dimensions are shown in Figure 14. The dashed lines are Construction Geometry, which means that they will not have any effect outside of the sketch view. A line can be made into construction geometry by right-clicking and selecting “Construction Geometry”. There are a few other holes which will be omitted from this tutorial as they are not used.



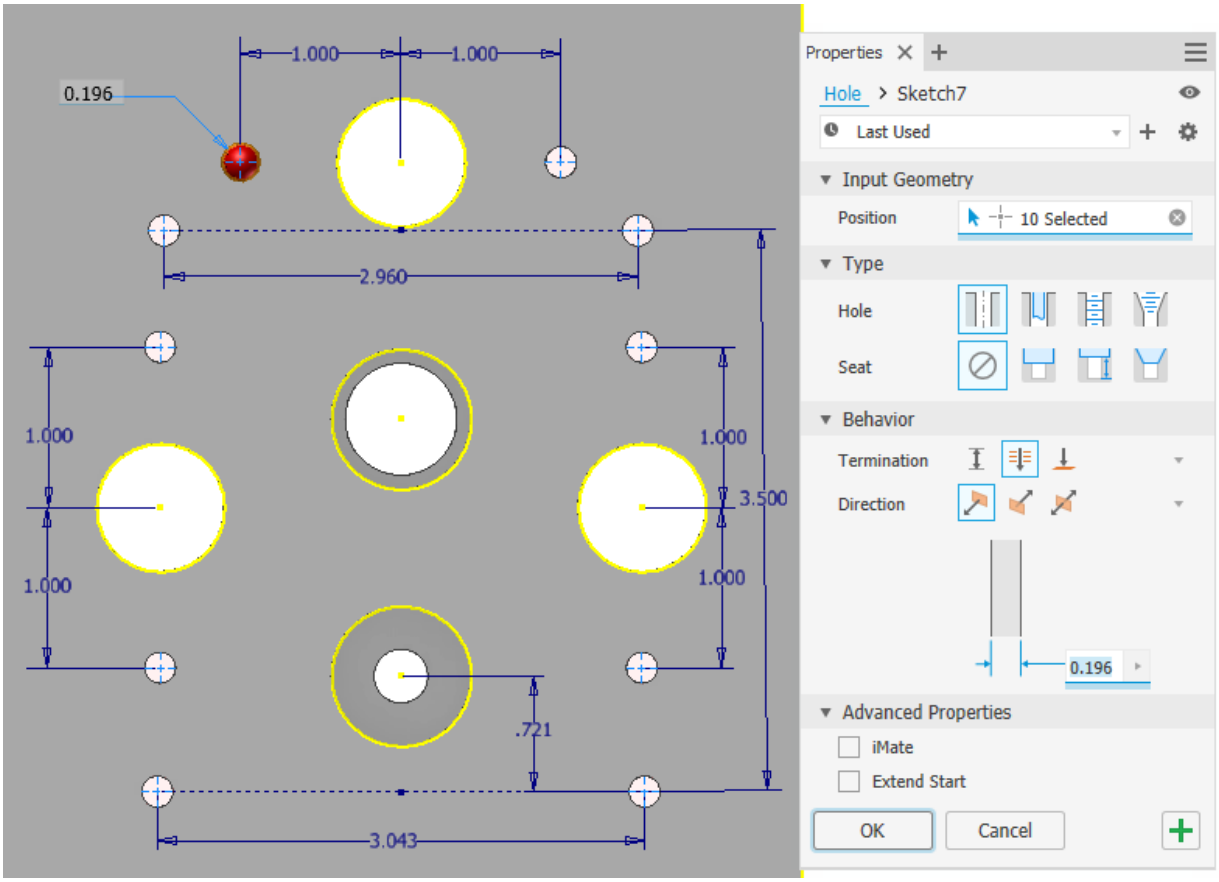


Figure 14

5: Corner Cutouts

Now that the holes have been created, the corner cutouts can be added. The dimensions are based on the size of motors and bolts, however for this tutorial we well simply use the dimensions from the robot.

The first step is to extrude 2 equal-width rectangles 3.7” apart and 0.55” above the central hole.

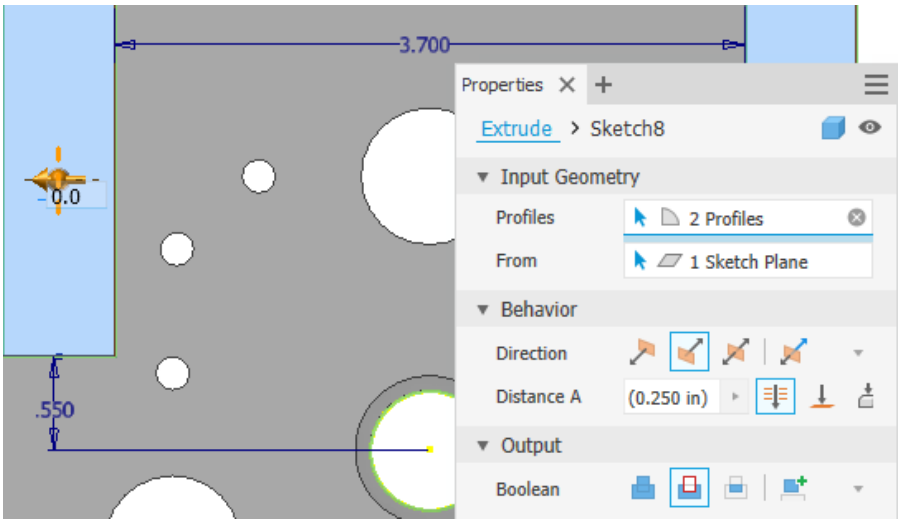


Figure 15

Once the rectangles have been cut, use the Fillet (*Fill-it* not *Fill-ae*) tool to create rounded edges for the part. Select all the corners and set the radius to 0.375”.

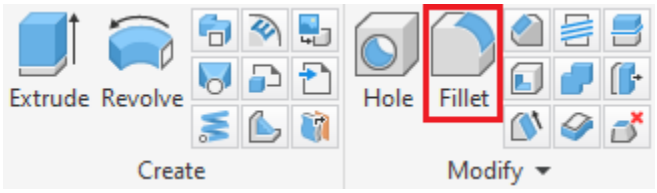


Figure 16

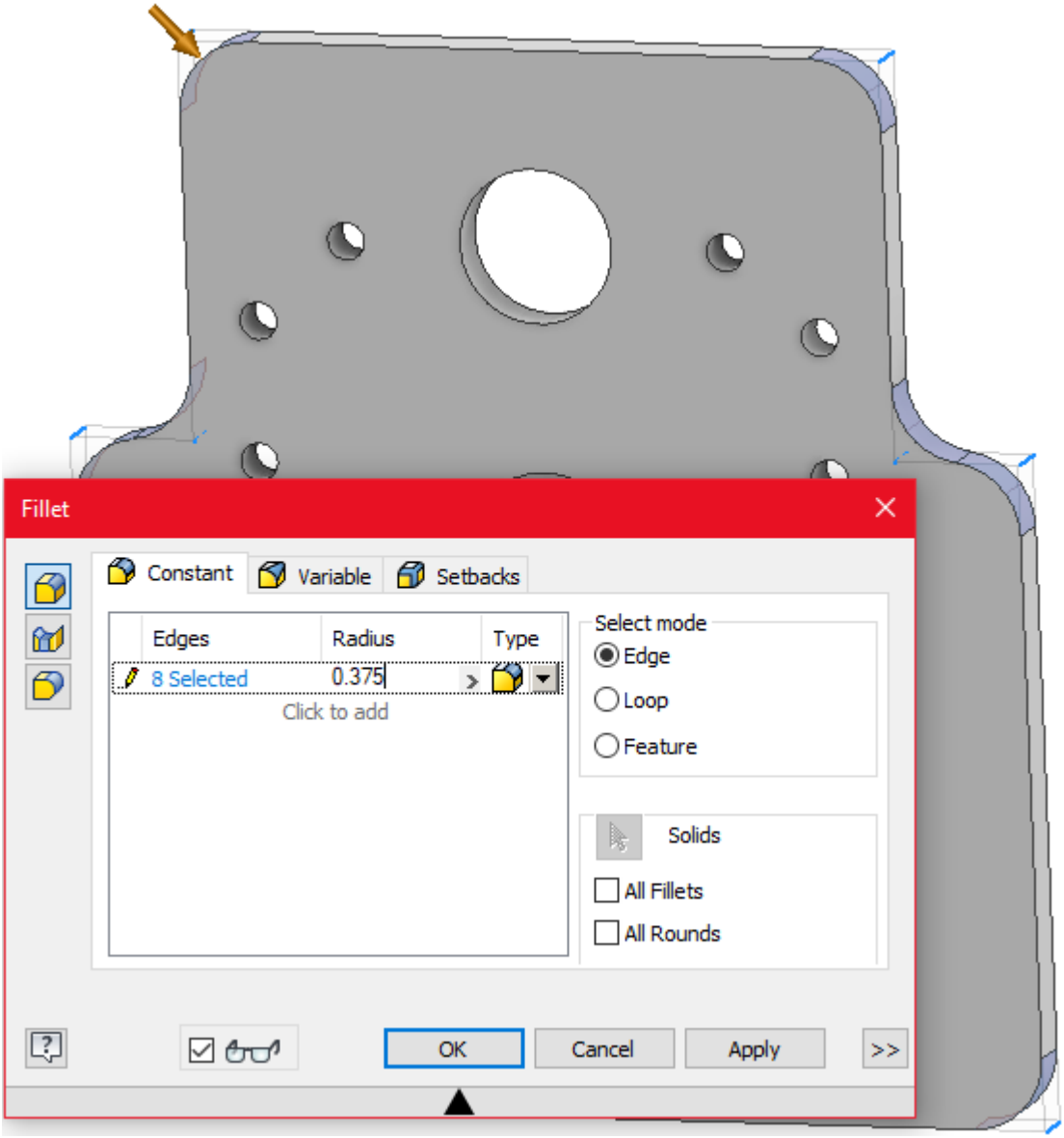


Figure 17

5: Set the material

Now that the part is designed, we can set the material. This both affects the appearance and allows us to get information about weight and strength. The material can be selected from the dropdown on the left, while the appearance that on the right. For this part, we want to use Aluminum as the material. This will also set the appearance to Aluminum – Flat, however we can override that with polished as it looks nicer.

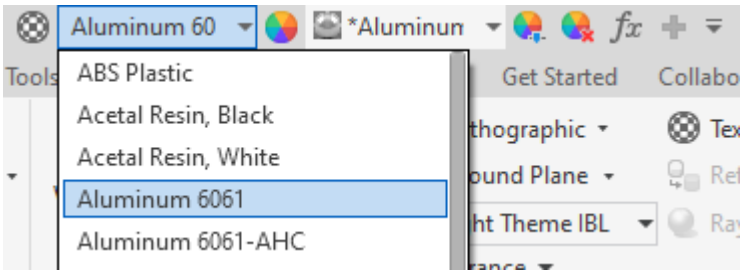


Figure 18

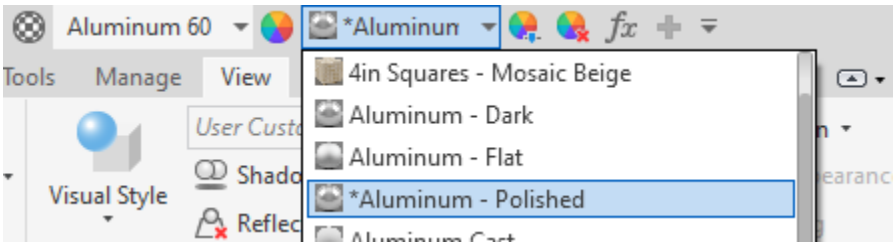


Figure 19