



PISTON ASSEMBLY

Advanced CAD — Rohawks 3419 — Lili and Chris

Today, we're going to learn the process for CADing a piston. We use pistons frequently on our robots, and because they have two states (extended and retracted), modeling them is an especially important skill to have! We need to make sure that everything works within a mechanism regardless of the state a piston is in, so we have to learn how to create a piston part that can have its state changed.

Let's start by getting measurements for the piston we want to use. We don't machine our pistons and usually buy them from McMaster-Carr, so it's important to take dimensions directly from their products. Today we're going to use this piston: <https://www.mcmaster.com/6498K527/>.

Scroll to the bottom and download the part as a 3-D STEP file, then open it in Inventor. If you've forgotten how to do that, check out our **video**.

What's the problem with this file as it is? The shaft can't move in and out of the piston. We need to replicate this piston—we don't need to be nearly as fancy, but our piston will need to have the same dimensions.

We'll be making three files:

- 1) pistonbore.ipt - the main part of the piston
- 2) pistonshaft.ipt - the part of the piston that moves in and out
- 3) pistonassembly.asm - the entire piston, with the shaft constrained to the bore using a moving constraint

To create pistonbore.ipt: Take measurements of the length and radius using the measuring tool (click the "M" key) on the STEP file. You can cross check your measurements with those listed on the McMaster website. Make a cylinder.

To create pistonshaft.ipt: Take measurements of the shaft the same way that you did the bore. Make another cylinder.

To create pistonassembly.asm: Open a new assembly, place both the bore and the shaft down. Use an **insert** constraint to place the shaft in the bore, and click the ">>" button at the bottom right of the insert window. Play around with the Min and Max settings until you get a shaft that slides in and out of the bore, with a range of motion that is not too big and not too small (the piston can be retracted, but also fully extended).

