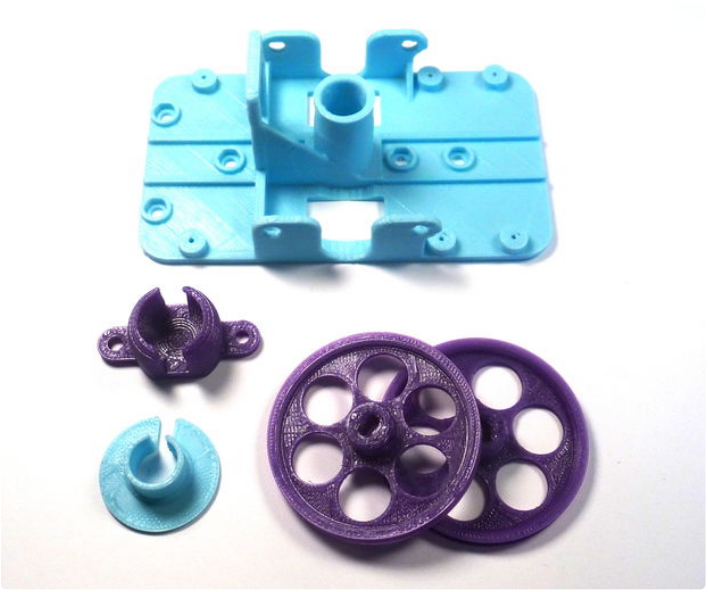
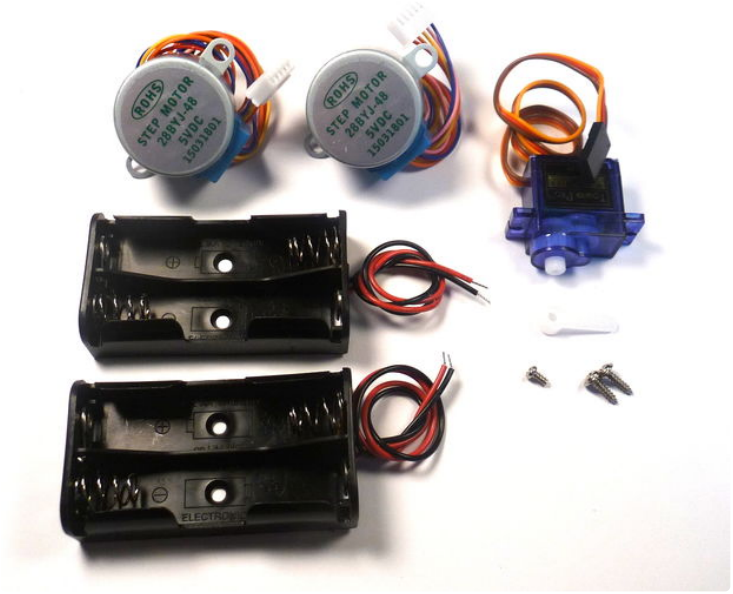



ROHS
STEP MOTOR
28BYJ-48
5VDC
15031801
ROHS
STEP MOTOR
28BYJ-48
5VDC
15031801

Step 12: ME: Chassis Prep

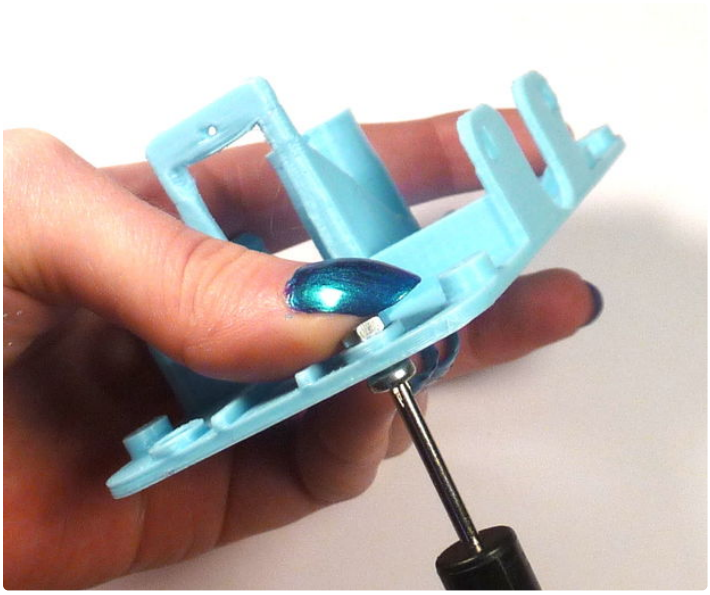
A "chassis" is the fame of a motor vehicle or other wheeled conveyance, and in this case the robot's chassis forms the platform for the electronics, motors, and servos.

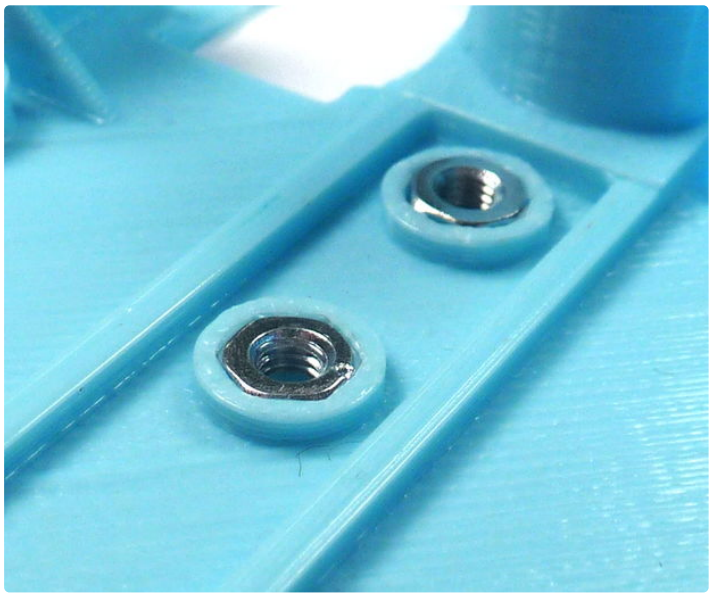
Time to get familiar with your hardware. We will be using three different types of Phillips screws you will have to be able to identify:

- Pan Head Screw (M3 x 6 mm) -> Stepper motors to Chassis
- Flat Head Screw (M3 x 6 mm) -> Battery Holders to Chassis
- Round Head Thread-Forming Screw (#2 x 1/4") -> PCB to Chassis

In order to attach parts, we are going to embed M3 nuts into the chassis.

- Use an M3 round-head screw and tighten it to pull the nut into the pocket so it is seated flush.
- Remove the screw.

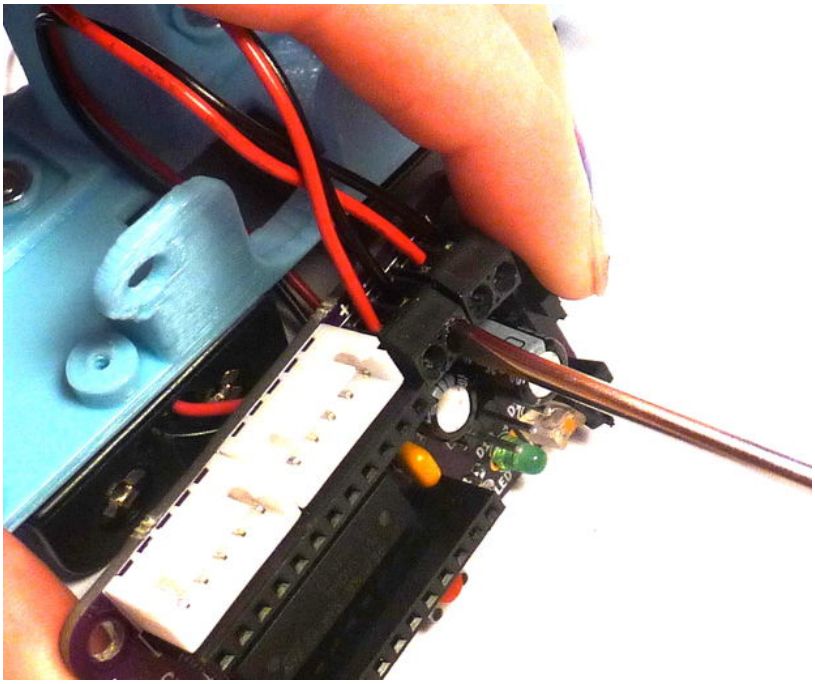


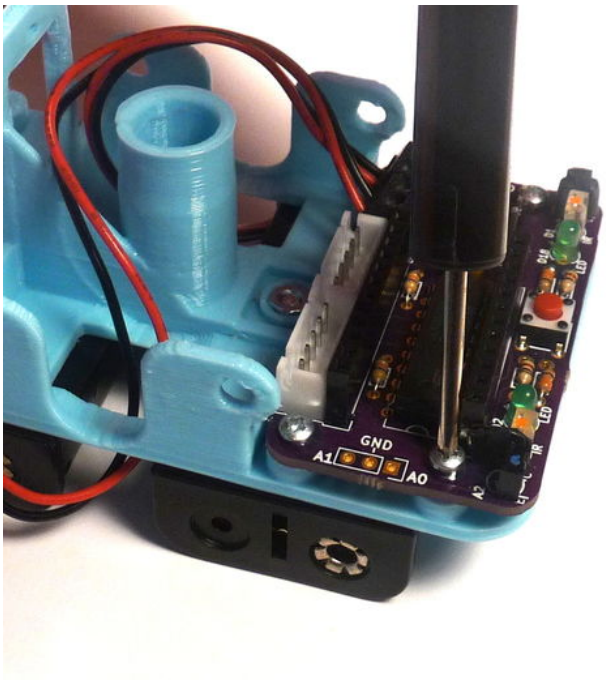


Step 13: ME: Batteries

Integrating the electrical components like motors and batteries with the chassis will fall into the ME's domain.

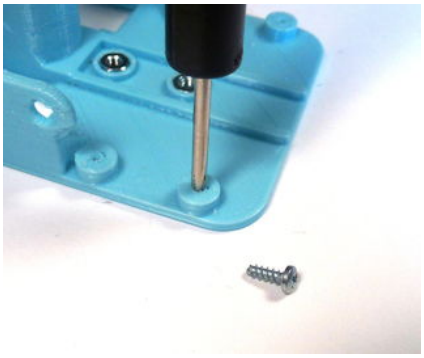
- Attach the battery holders using two M3 flat-head screws and thread the wires through the openings under the motor mounts.

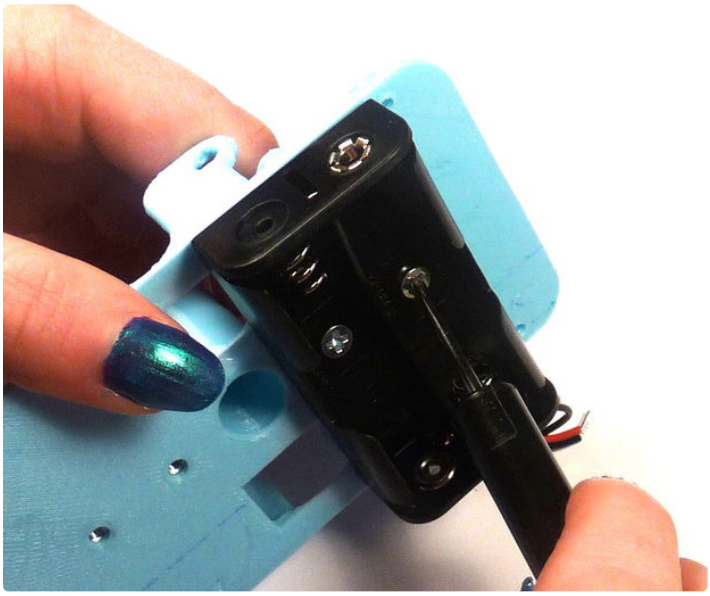


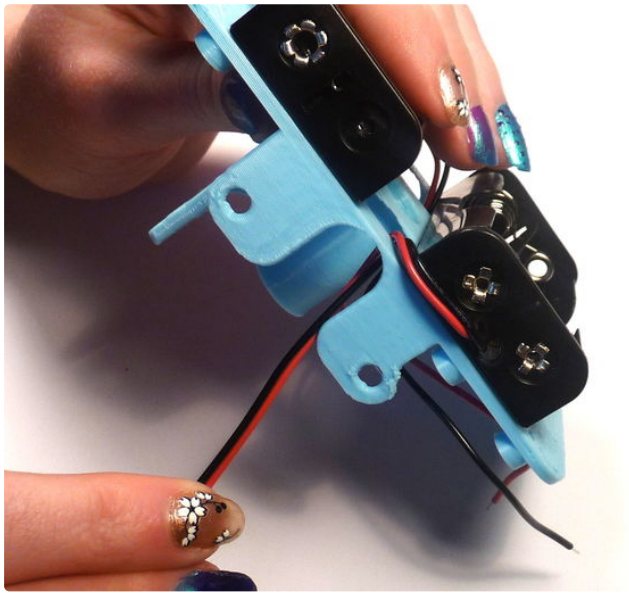


- Put on your "EE" hat and attach the positive and negative wires to the terminals marked "+" and "-", one set of batteries for each terminal.

- Attach the circuit board to the chassis using #2x1/4 thread-forming screws.
    - If the screws wont start, remove the PCB and use the tip of the screw driver to open them up a bit.



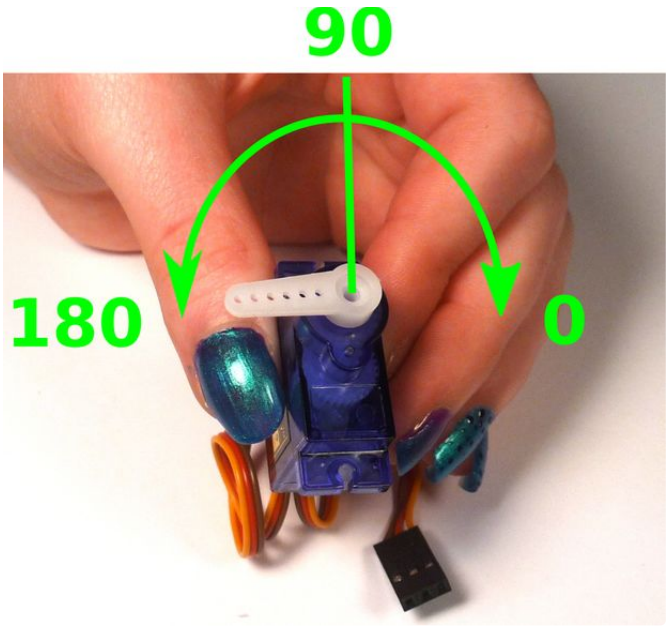


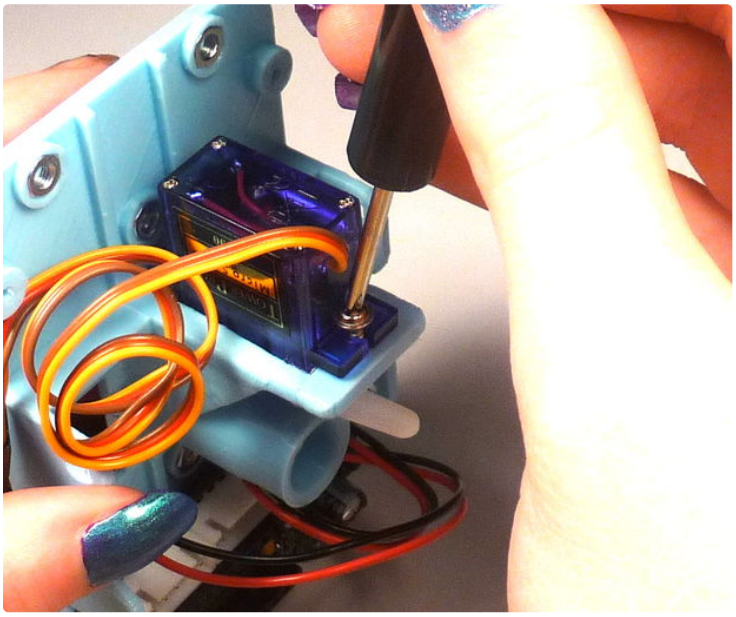


Step 14: ME: Servo

The servo is used to raise and lower the pen for drawing.

- Place the arm on the hub and gently rotate the stepper counter-clockwise looking down on it until it reaches the stop.
- Remove the arm and position it facing left (this will be the down position).
- Insert the small thread-forming screw and tighten.
- Insert the servo in the mount with the hub end upward and attach using two larger thread-forming screws.





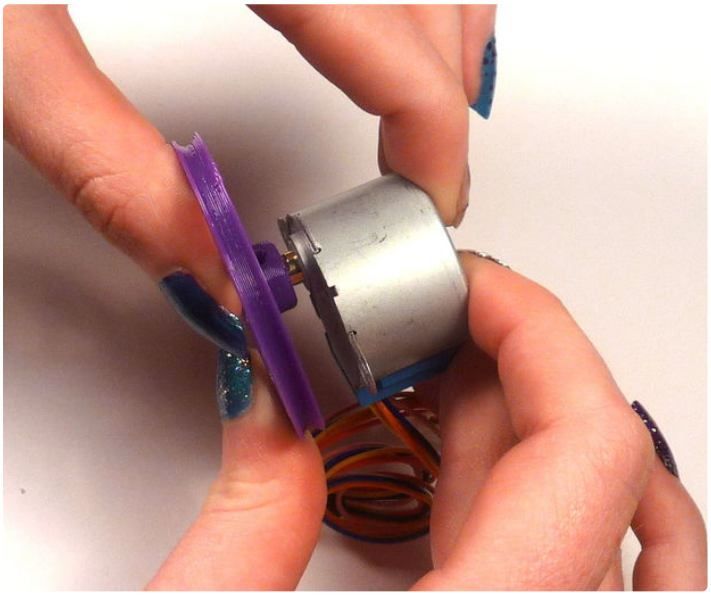
Step 15: ME: Stepper Motors

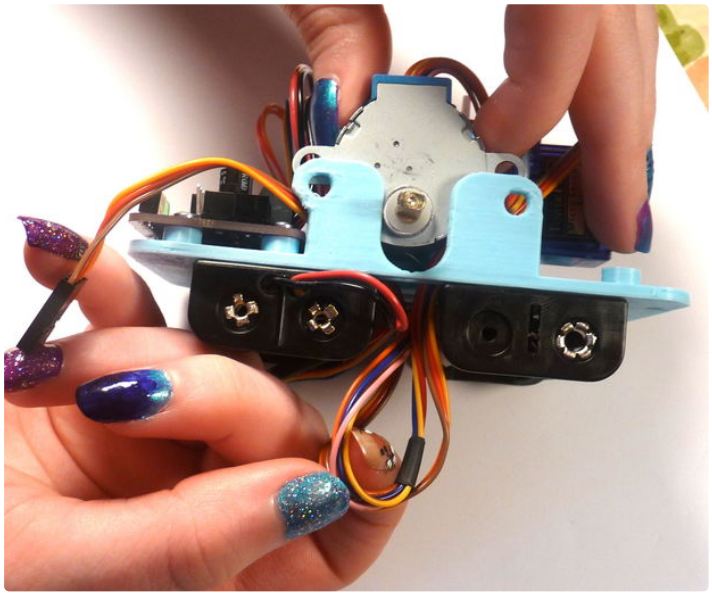
Before we mount the stepper motors, check the fit of the wheels on the shaft. These should slid on fairly tightly if your printer is calibrated correctly.

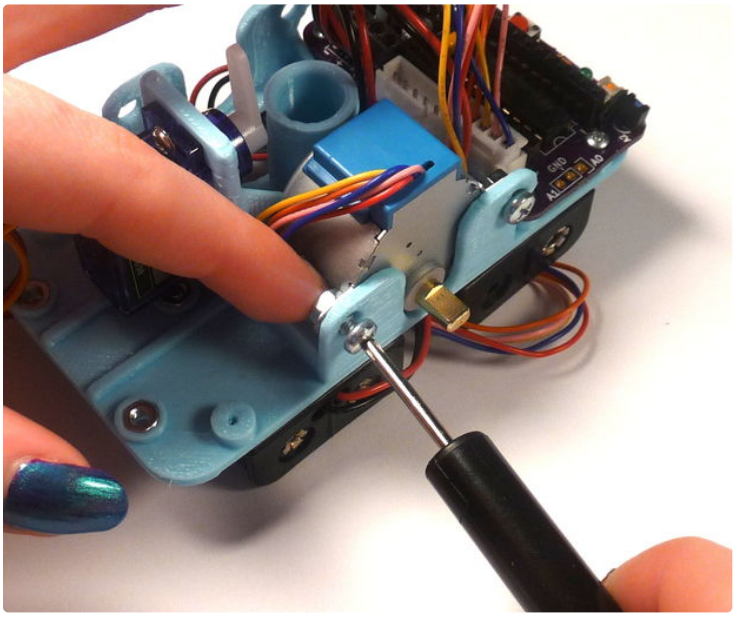
- If they are too tight, use a jewelers file to open up clearance. You can also heat the hub with a hair drier, but do so sparingly to avoid warping the rim.
- If they are too loose, you can use an M3 round-head screw to hold the wheel to the shaft (after the motor is mounted).

We are going to pass the wires of the stepper (and servo) under the body to help with wire management.

- Start with the left side and thread the wires for the stepper (and servo) through the opening with wires coming from the stepper following down the back side.
- Insert the motor into the mount and attach with two M3 round-head screws and nuts.
- Gently pull the wires through.





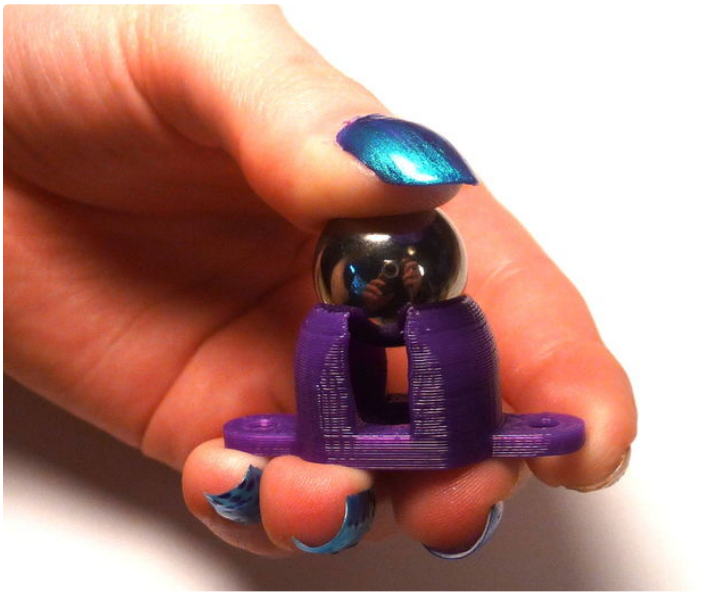


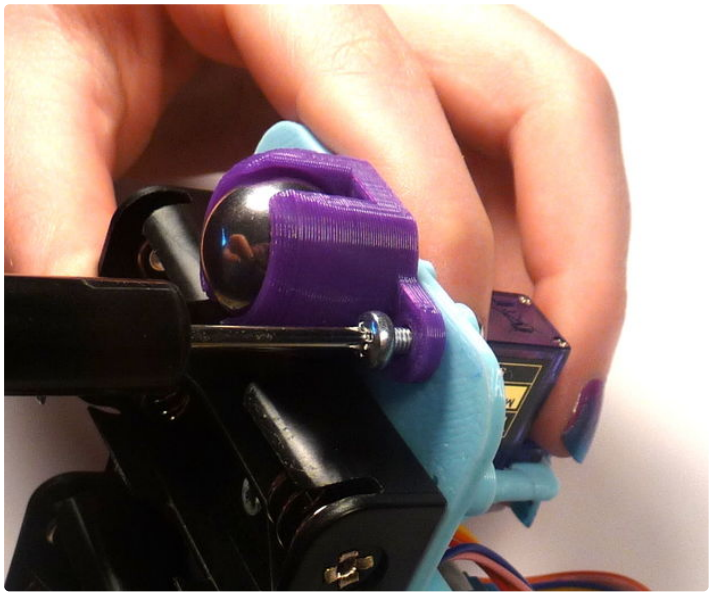
Step 16: ME: Caster

The caster allows the robot to pivot with low friction.

- Gently press the bearing into the holder.
    - If it is too tight, use a hair dryer to soften the plastic.

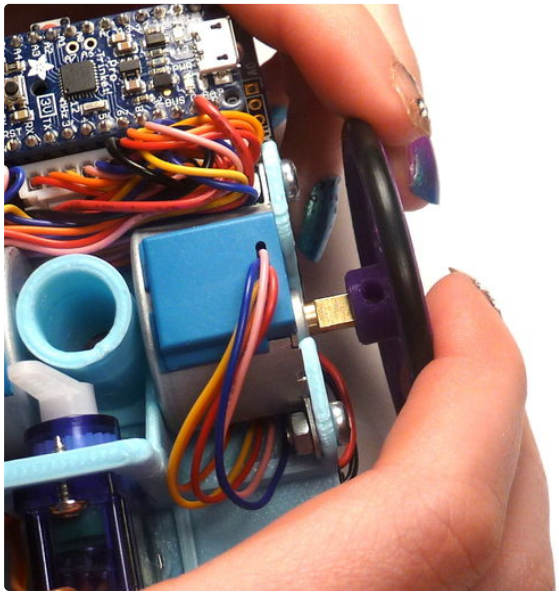
- Attach the caster to the chassis using M3 round-head screws.





Step 17: ME: Wheels

- Slip the o-ring into the rim groove and stretch it to snap in place.
- Gently press the wheel on to the stepper shaft as far as it will go.
- If the wheel is too loose on the shaft, thread a M3 round-head screw in the hub and tighten on the hub.
    - You will have to ensure the battery wires remain clear of the screw as the wheel rotates.



Step 18: ME: Power

- Attach the stepper connectors to the terminal headers on the PCB.
- Fold and press the wires into the cavities between the headers and the steppers to keep them clear of the servo arm during operation.
- Insert the Adafruit Trinket Pro into the headers with the USB hub facing the edge and press into place.
- Ensure the power switch is set to off.
- Insert the batteries.