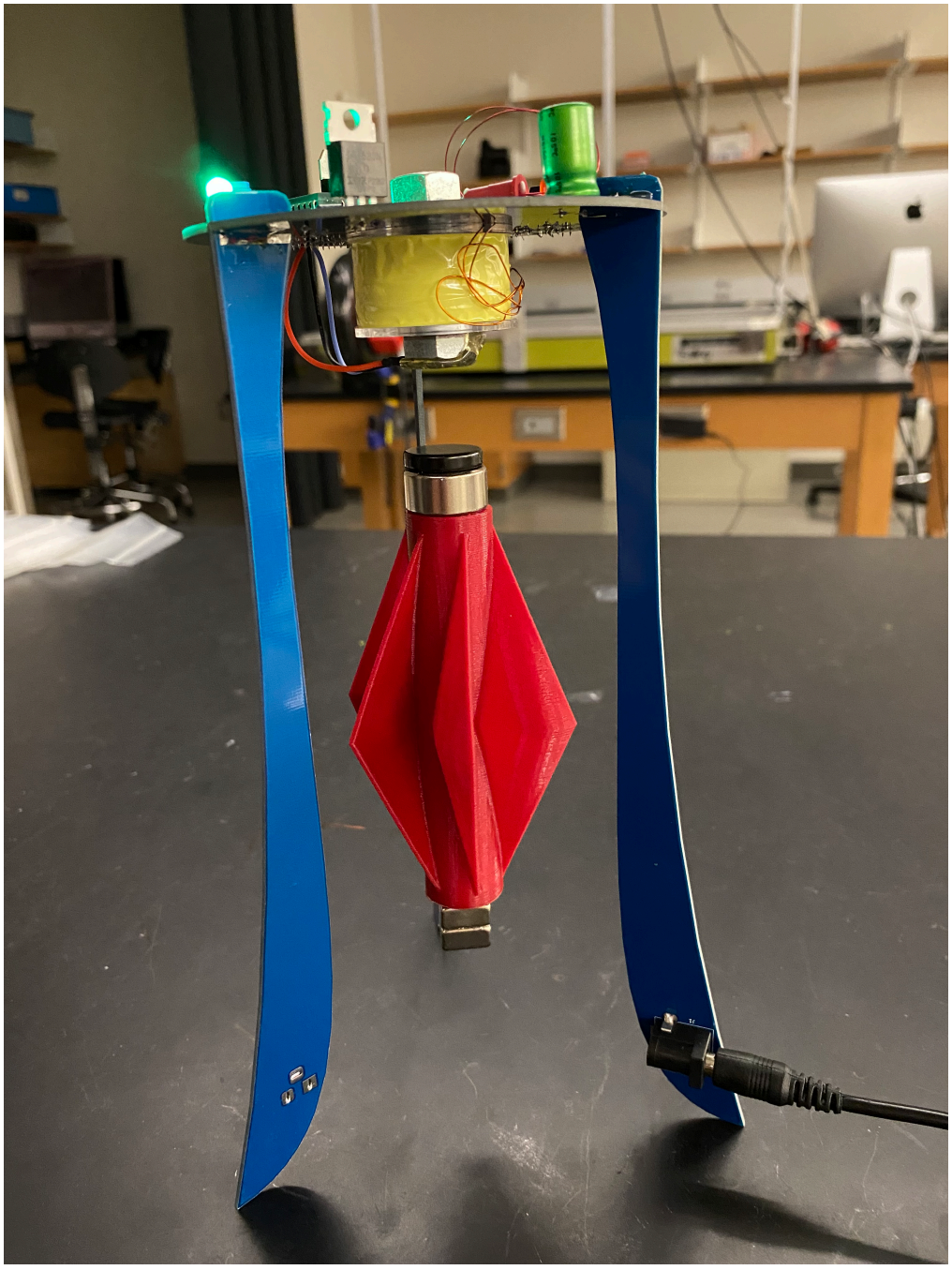
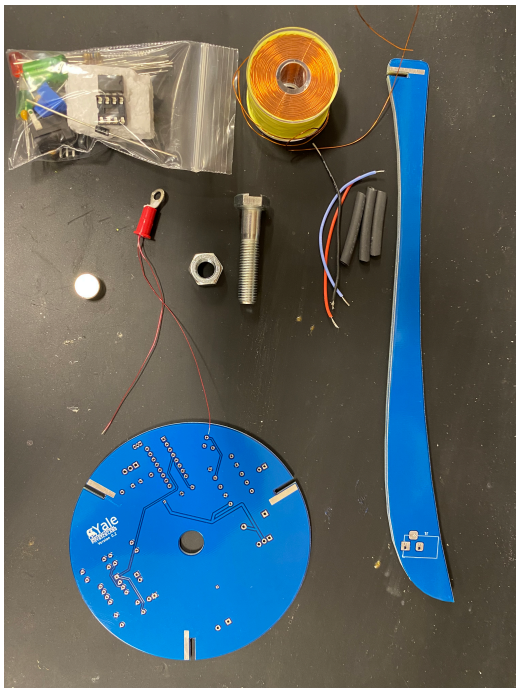
Magnetic Levitator

https://github.com/penoel/Magnetic_Levitator



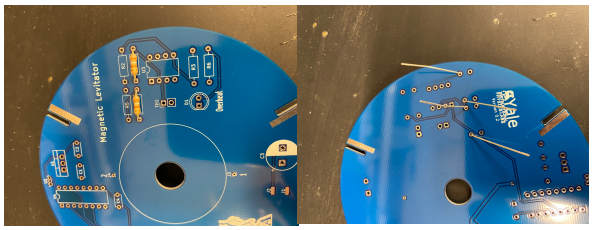
The magnetic levitator uses a feedback circuit to levitate a magnet. The feedback circuit uses an electromagnet and hall sensor. To prevent the levitator from overheating when a magnet is not present a thermistor was added.

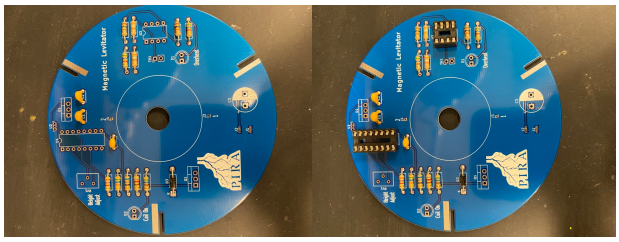


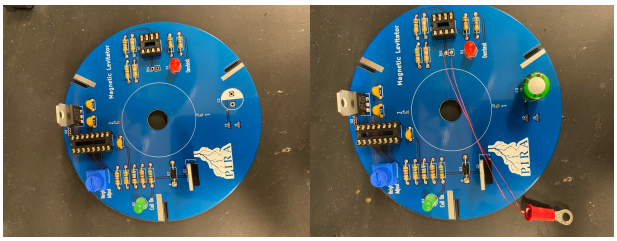
The Magnetic Levitator kit contains the following components:

- 1 – Top PCB
- 3 – Leg PCBs
- 1 – Coil
- 1 – Thermistor TH1
- 1 – Green led D2
- 1 – IC TL494 U4
- 1 – Socket 16 Pin
- 1 – IC SS496b U2
- 2 – Mosfet IRF530N U3
- 1 – Diode 1N4007 D3
- 1 – Capacitor 100 µF C3
- 1 – Capacitor 0.1 µF C2
- 2 – Resistors 10 kΩ R2 & R3
- 1 – Resistor 5.6 kΩ R5
- 1 – Resistor 2.7 kΩ R7
- 1 – Resistor 68 Ω R9
- 1 – Bolt and Nut
- 3 – Wires
- 3 – Heat Shrink Tubing
- 1 – Magnet
- 1 – Yellow led D1
- 1 – IC LM358
- 1 – Socket 8 Pin
- 1 – IC 7805 U1
- 1 – Barrel Jack
- 1 – Potentiometer 50 kΩ RV1
- 1 – Capacitor 0.22 µF C4
- 1 – Capacitor 0.33 µF C1
- 2 – Resistors 39 kΩ R1 & R4
- 2 – Resistors 560 Ω R6 & R11
- 1 – Resistor 56 kΩ R8
- 1 – Resistor 820 Ω R10

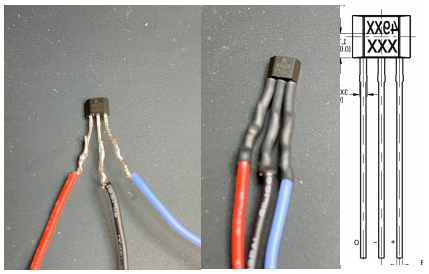
- Take the top PCB and the 2 39 kΩ out, bend the legs of the resistors and put them in the PCB (R1 & R4).
- Bend the resistor legs and flip the board over. Solder them and trim the legs.



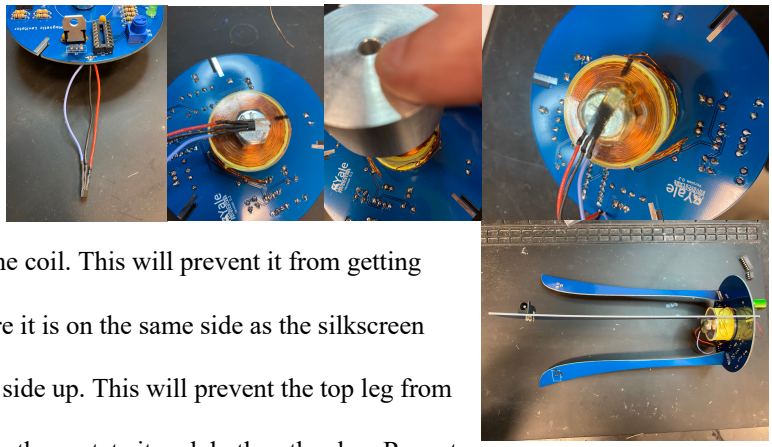




- Place the remaining resistor in the PCB using the value and designators from the components list above. Solder and trim the legs.
- Place the capacitors and diode (make sure the orientation is correct) solder them and trim the legs.
- Place the two sockets in U3 and U4. Tape them down and flip the board over. Solder them in place.
- Place the potentiometer and solder it in place.
- Place the 2 leds and solder them in place.
- Place the 7805 and MOSFET making sure they are in the right spot, then solder them in place.
- Place the large capacitor C3 and solder in place.
- Place the thermistor in and solder. Make sure that you solder the part without insulation.
- Take the hall sensor SS496 out along with the 3 wires and heat shrink tubing.



- With the hall sensor writing side up solder the red wire on the left, the black wire in the middle, and the blue wire on the right.
- Add the heat shrink tubing over the solder joint and use a lighter or hairdryer to warm it up.
- Bolt the coil down making sure the groove points to the hall sensor footprint. The thermistor terminal ring should be under the nut. That will allow it to be in thermal contact with the coil.
- Put the red wire closest to the ic socket, followed by the black and blue wires.
- Place the hall sensor in the groove of the bolt.
- Use hot glue to hold it in place. You can use a piece of metal as a heatsink, that will give you a flat glue surface.
- The line on the coil should be pointing towards the large capacitor. Solder the coil wires in the holes closest to them.



- Fold the wire up and put it by the side of the coil. This will prevent it from getting tangled.
- Solder the barrel plug on the leg. Make sure it is on the same side as the silkscreen square.
- Slide all the legs in the slots and point one side up. This will prevent the top leg from being off.
- Solder the top and bottom of the leg on top, then rotate it and do the other leg. Repeat for the third leg.
- Plug the ICs in and enjoy.

Magnetic Levitator operation

Plug in your levitator and hold your magnet below the coil. The magnet will try to flip if the orientation is wrong or be attracted to the coil if the magnet is oriented in the right direction. After your magnet is in the proper direction add something to the bottom of the magnet (a bolt, battery, fan blade), this will add stability and make it look cooler. Now turn down the pot on top of the levitator, so the coil on light turns of when a magnet is by it. Hold the magnet below the coil at a point where it almost wants to fly up and hit the bolt (the coil light should be off). Turn the pot up until the light comes on and the object floats. It can take a few scans. The github has a video of the process, so watch the video if you are having trouble.

Hints:
You can use a bigger magnet if you have one. Make sure your magnet mass is uniform and the hall probe is centered.

Schematic: