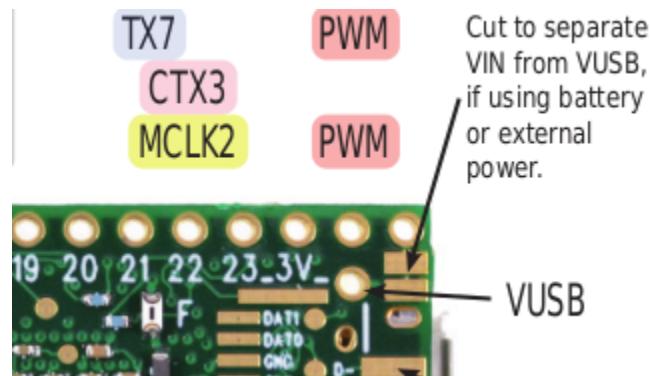


Hello, welcome to the build guide. Quick notes

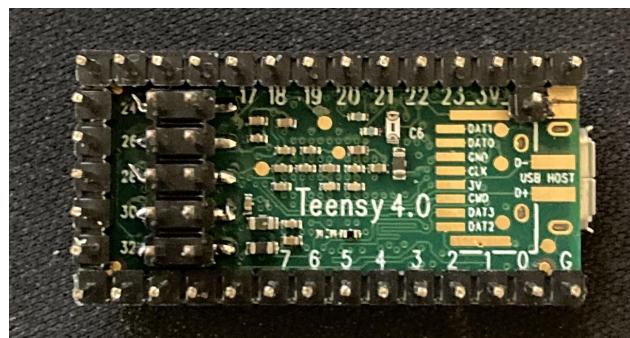
If you are using v1 of the PCB take notes of the errors mentioned.

Setting up the Teensy 4.0

1. First solder the the 2x5 SMD header onto the underside of the Teensy. Apply flux onto the bent ends of the header to make it easier to solder. Solder one pad down first and make adjustments, make sure it is aligned with all the other pads before soldering a second pad.
2. Cut the VIN to VUSB trace. This is done because we will be using an external power supply. Use a xacto knife to slowly(and carefully) swipe away between the 2 pads. Use the continuity mode on the multimeter to check if the trace was fully cut.



3. Now solder headers onto the outer pins of the Teensy. Also solder a 1 pin header into the VUSB pin. Its important to make sure the headers are soldered in straight, otherwise it will be hard to slot into the board.



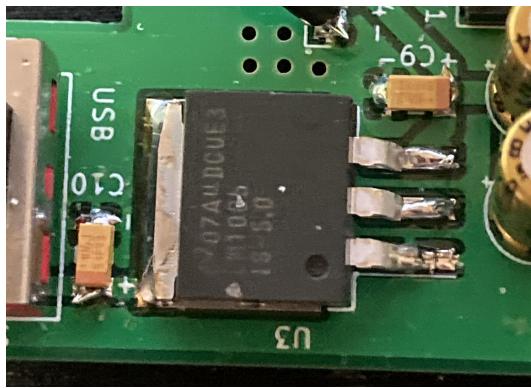
Voltage regulator (and Caps)

1. Solder the Caps. Note the polarity markings.
 - a. C1 - 100uF
 - b. C2 - 0.1uF(Negative side towards “C2” label)
 - c. C3 - 100uF
 - d. C4 - 1uF
 - e. C9 - 10uF
 - f. C10 - 10uF



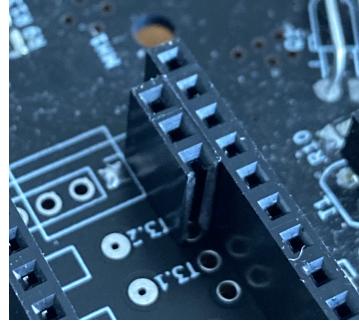
i.

2. Solder the voltage regulator. First place some flux on the pads, Place the Voltage regulator on the pad. Position it so there is enough space on the top tab to place the iron. Solder one of the feet. Next try soldering the tab down. If there is not enough gap to place your iron on the pad. Move the voltage regulator down a bit by heating up the foot that was just soldered and moving it down. Once there is space, solder in the tab. If the pad is not getting hot enough, turn the temperature on your soldering iron up.
 - i. https://www.youtube.com/watch?v=L_DlpkIxXcl&t=39s&ab_channel=John Gammell. This video is pretty good example of how to do it.



Miscellaneous Components

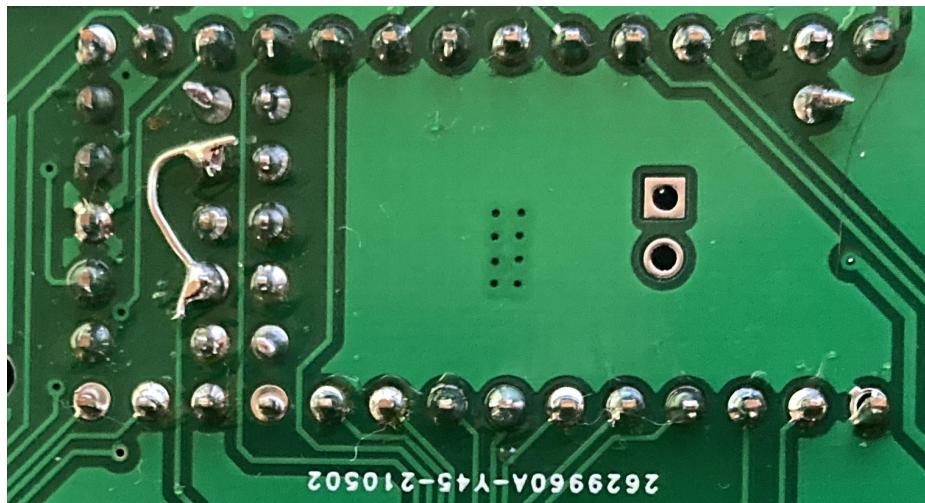
1. Solder the SMD LEDs into the pads: D5, D6, D4, **make sure they are oriented to follow the polarity markings**. Also solder their resistors (**124 Ohms**) onto the underside into the pads labeled, R20, R21, R19.
2. Solder in the 2x8 DIP Socket into **U2**. Orient the notched side correctly following the silk screen.
3. Solder the battery connector, into **J4** or **BT1**. This can vary depending on the battery. Ex. Some may use a 1x2 male header.
4. Solder the slide switch into **S1**. Solder the push switches into S2 and S3.
5. Solder the Female Headers for U1. First solder the 2x5 Female header block. Then solder the rest of the female headers for the pins on the outer edge. Make sure these are as straight as possible. Also Make sure to solder a header in for the VUSB, if you do not have a 1 pin female header, you can just cut a longer one.
6. Solder the 1x6 Female header into J1, this is for the bluetooth module. Also solder a 1x2 male header into J3, this allows you to put the HC05 into command mode.



Voltage Meter

The voltage meter is a resistor divider on the battery that connects to an analog pin on the Teensy. It will allow the Teensy to monitor the voltage of the battery.

1. Solder Resistors
 - a. R22 - 47K Ohm
 - b. R23 - 24K Ohm
2. **[If using V1 PCB]** There is a small error where I did not connect the output of the voltage divider to an analog pin on the Teensy. To fix this add a jumper wire to the underside of the teensy. This will connect the voltage divider output into pin 26. Also make sure not to use pin 30 in the code since it is where the output was originally connected to.

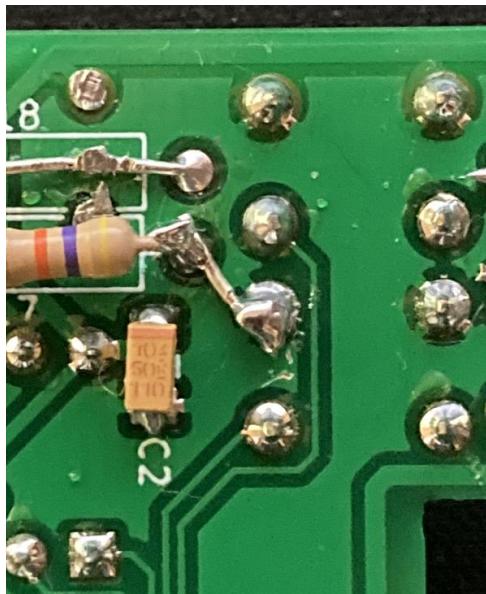


3. Double check the voltage divider is working properly. Connect a fully charged battery to the PCB, making sure the polarity is correct [no reverse voltage protection :(]. Without the Teensy Installed, probe GND and the header pin where pin 26 would slot into, the voltage read should be under 3.1v. The pins on the Teensy are 3.3V tolerant so anything above 3.3V can damage the Teensy.

Buzzer

Uses a Piezzo buzzer driven by an Mosfet.

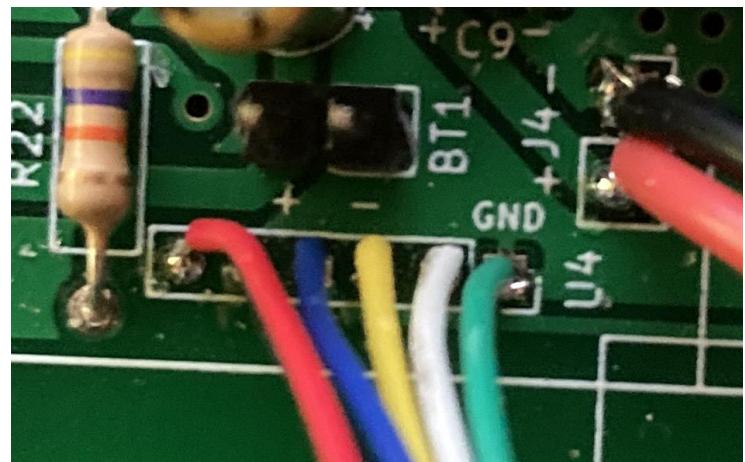
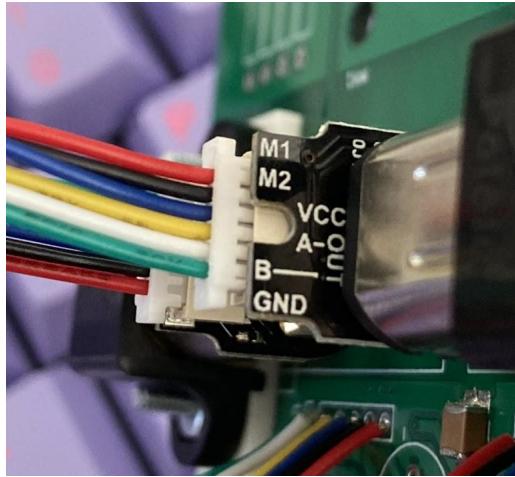
1. Solder the resistors on the underside. Make sure to solder them on the underside. Then cut the excess wire, try to make sure to cut them as flush with the top as possible as the buzzer will be installed on top.
 - a. R17 - 47K Ohm
 - i. Try to make sure to place the resistor so it is not covering the buzzer pin, as we will need to insert the buzzer next. [ik bad placement on my part :(]
 - b. R18 - 0 Ohms (Solder a wire)
2. Insert the Piezzo buzzer into **BZ1** make sure it is oriented following the polarity markings on the silk screen. Cut the Excess wire, make sure not to cut the resistor.
3. Install the N-channel mosfet into **T4**.
4. **[If using V1 PCB]** There is an error where I forgot to connect the Buzzer circuit to GND. To fix this place a jumper wire to the GND connections on **S3** (see pic blow)



Motors + Encoders

Ensure you have a pair of the following: Motor brackets, 6 PIN JST cable, Motors, Encoder Modules, and Magnetic Wheel.

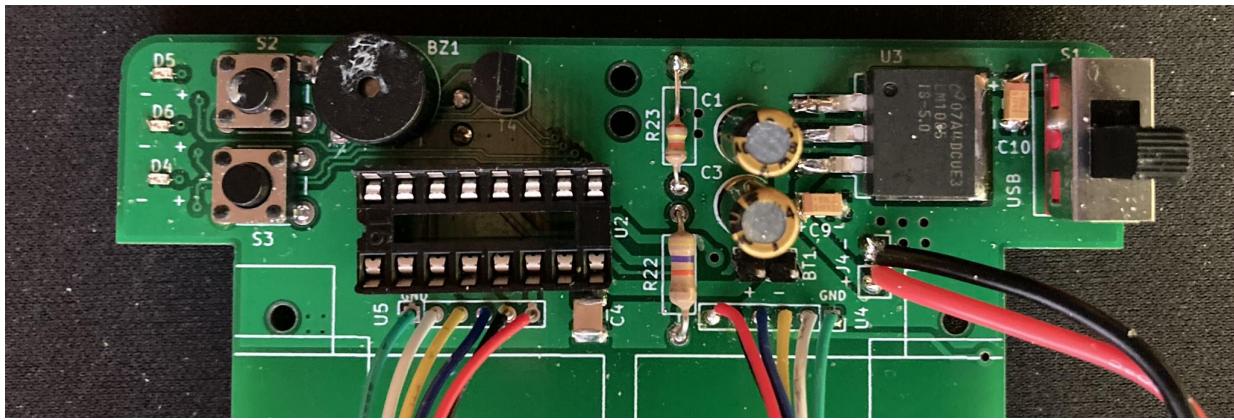
1. Install the JST cable into the encoder. Take note at which colored wire corresponds to the GND connection of the encoder module. Ex. for mine, the Green wire refers to the GND. Now unplug the JST cable and solder the ends into the PCB slots labeled U5 and U4. Ex. for mine, I would make sure to solder the Green wire into the pin labeled GND on the PCB, and the rest would go in their order. [Make sure to try this with your own cable, as your JST cable may not follow the same coloring as mine.]



2. Now Solder the Encoder Modules onto the ends of the motors.
3. Place the magnetic disk provided with the encoder module on the end of the encoder shaft. Place the motors aside as they will be installed at the end.

(INSERT PICS)

At this point we are finished with the back of the mouse. Verify yours looks like the following.



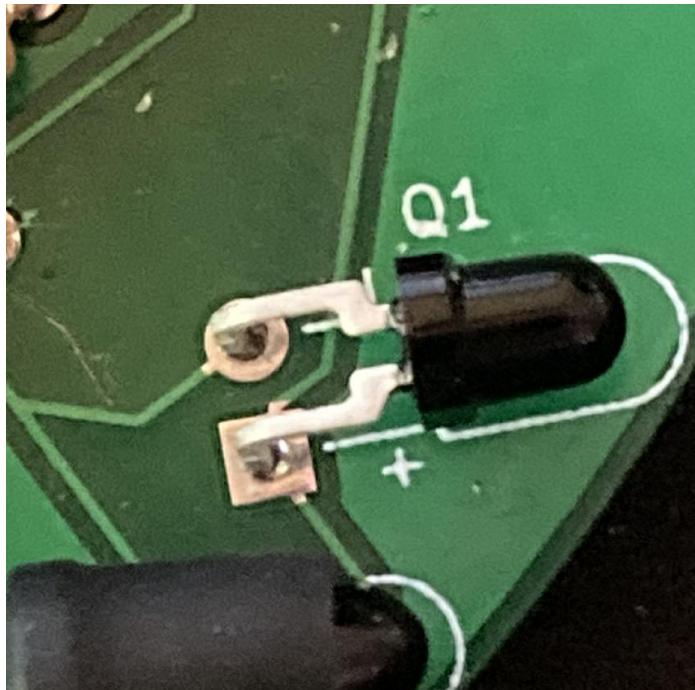
Emitters + Receivers

Emitters a switched on and off with an N-channel Mosfet.

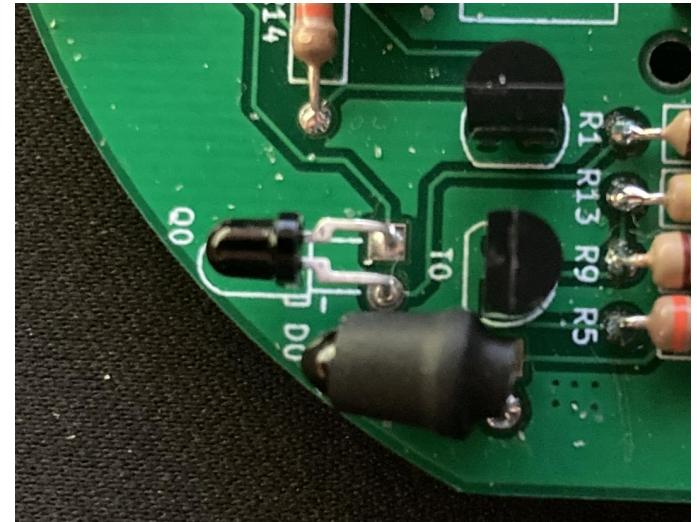
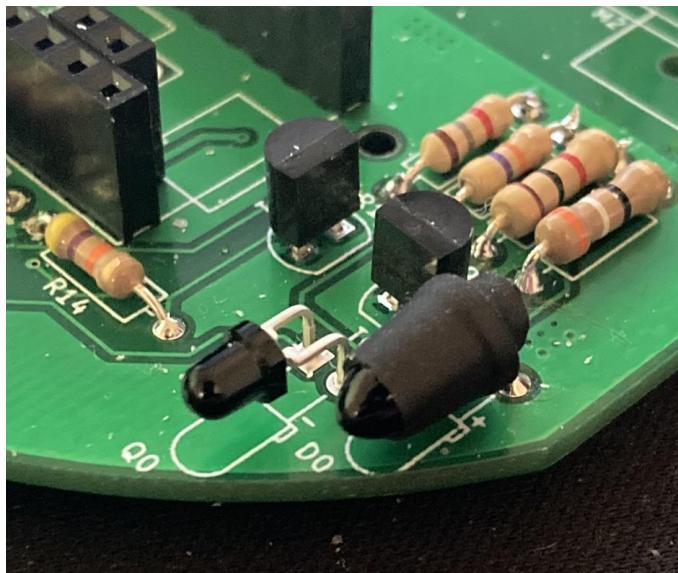
1. Solder the Resistors, cut off the excess wires.
 - a. R1, R2, R3, R4 - 1.8K Ohms
 - i. The silkscreen for R2 and R4 got cut off, but they are located on the underside of the PCB to the left and right of the 2 holes.

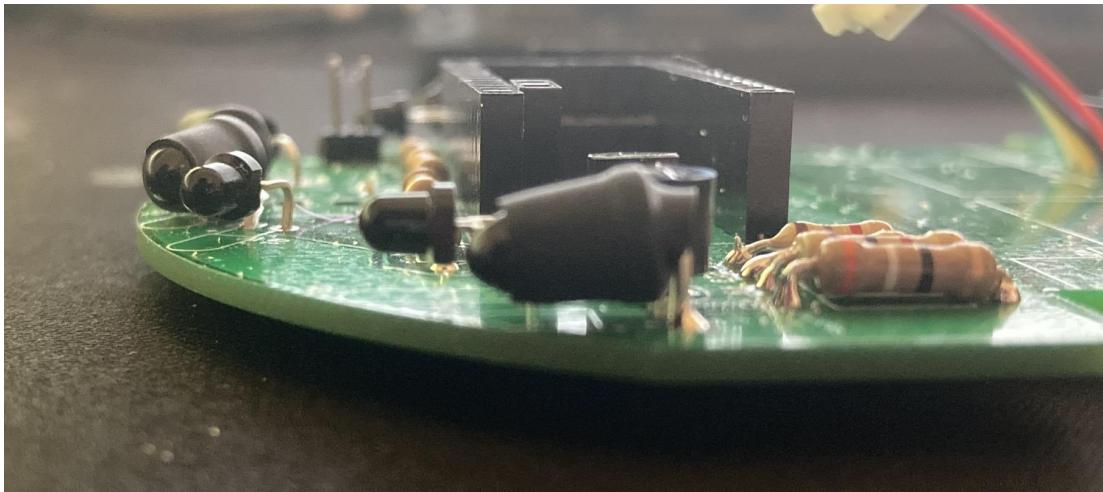


- b. R5, R6, R7, R8 - 39 Ohms (0.5W)
 - i. The silk screen for R6 and R8 got cut off, but they are located on the underside of the PCB .
-
- c. R9, R10, R11, R12 - 1K Ohms
- d. R13, R14, R15, R16 - 47K Ohms
2. Solder the N-channel Mosfets into T0, T1, T2, T3
3. With the emitters and receivers, **the long end is the negative terminal and the short end is the positive terminal. This means that the long end will go into the side with the - . And the short end will go into the side with the +.**
Start by planning where each Emitter and Receiver will go, then bend the wire 90 degrees. For Emitters, tend them pretty close to the black part. And for the receivers leave a little bit of space between the black part and the bend. See picture below for Reference.

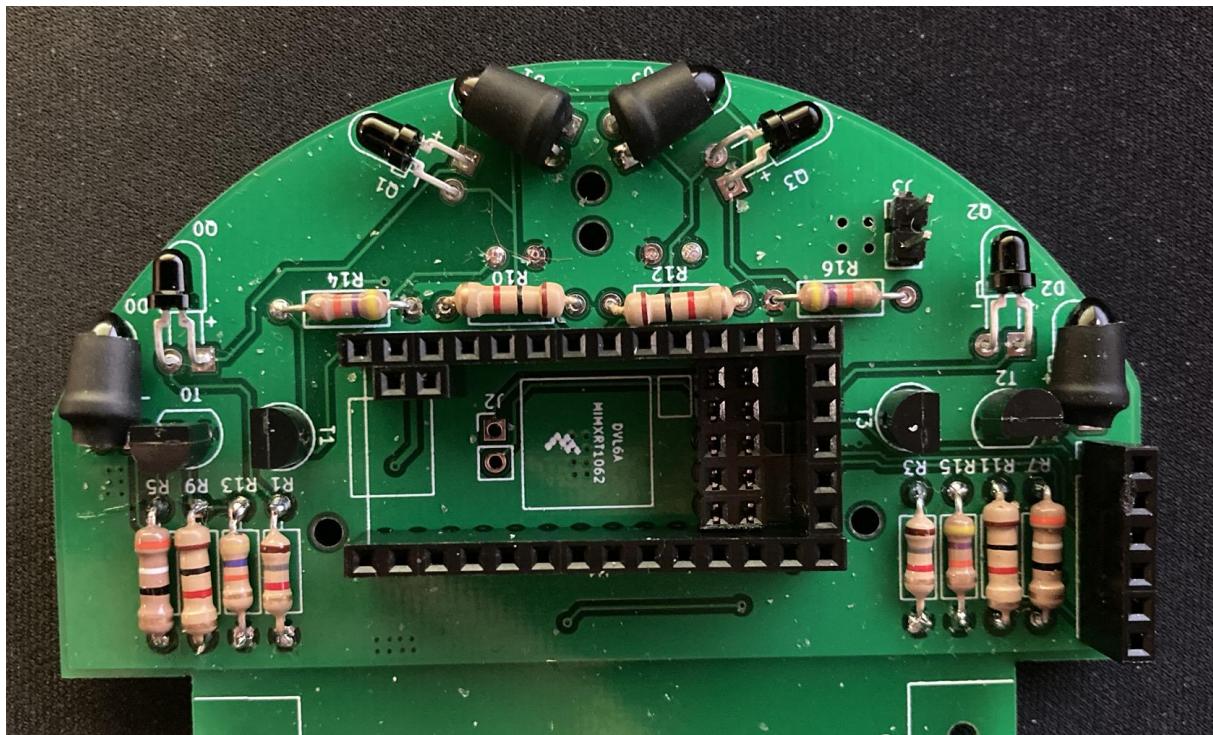


4. Next cut pieces of heat shrink and install them on the Emitters, refer to the picture above for how to position them.
5. Next solder in the emitters and receivers. Start by soldering in one of the ends and checking it is positioned correctly. Use the silk screen and pictures above and below for reference on howto position them.



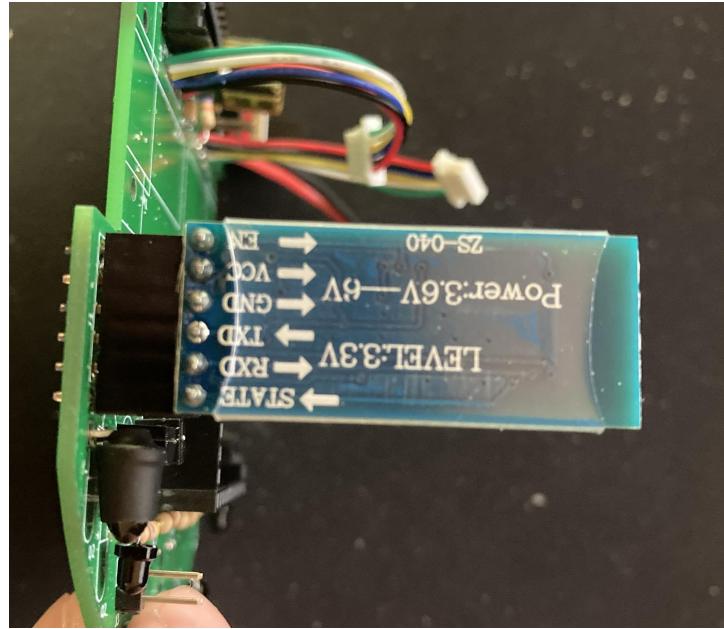


At this point we are finished with the front of the mouse. Verify yours looks like the picture below

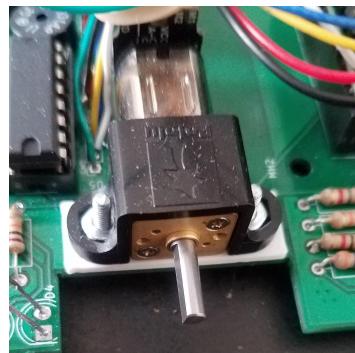


Installing the rest.

1. Carefully Insert the Teensy into the socket, make sure to push down slowly and carefully, and make sure everything is lining up.
2. Insert the motor driver H bridge into the U2 DIP socket
3. Insert BLE module. Make sure your module follows the same pinout as mine below.



4. Install the motors. Make sure to install the 3D printed standoffs under the motors.



5. Install the wheels. Take off the rubber, loosen the set screw, insert the wheel on shaft and then tighten the set screw once it is in the correct position. Re install rubber.
6. Install Mouse skates
 - a. WIP

Once everything is installed, verify it looks like the picture below

