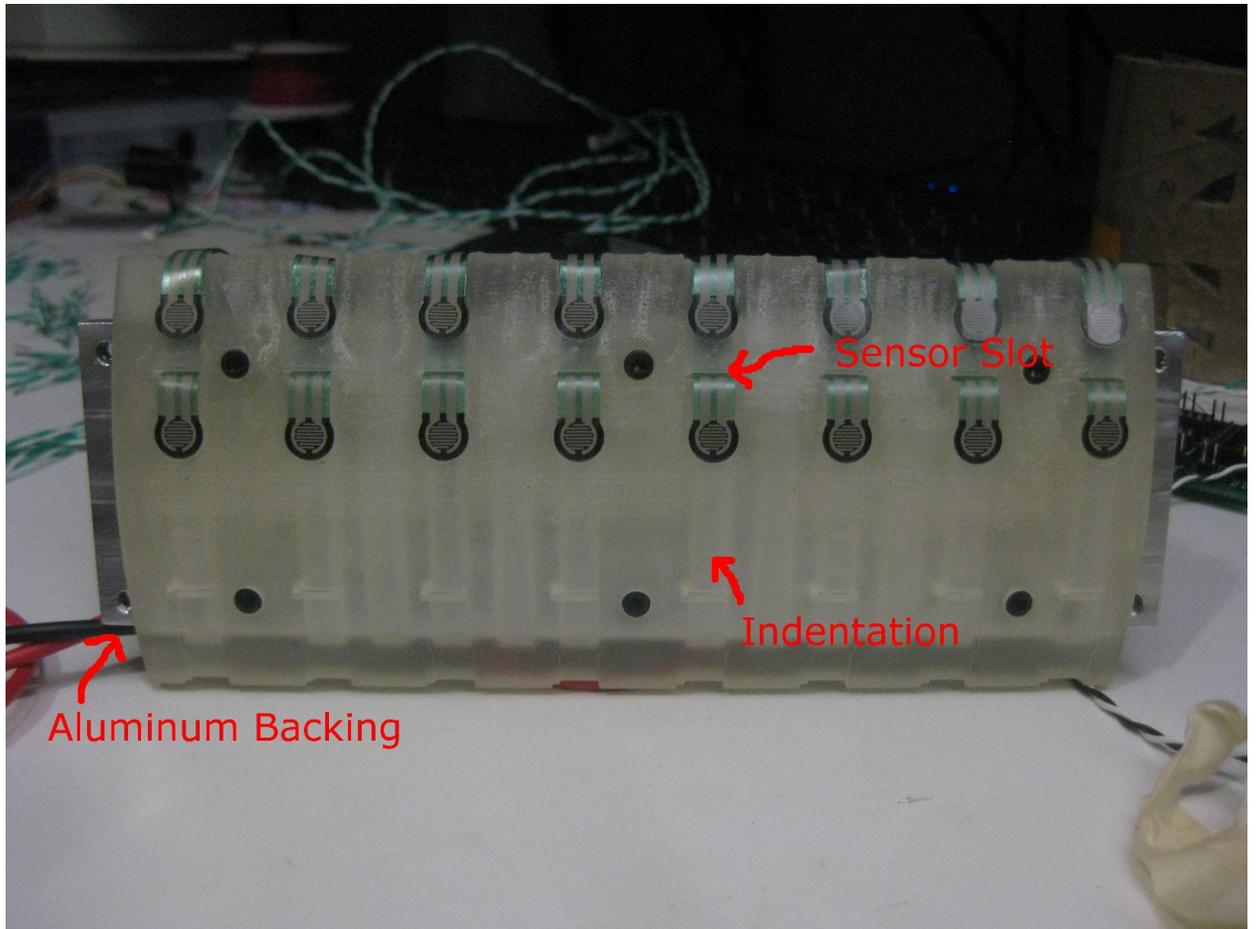


## Assembly of sensor wheel (not necessary for product sent)

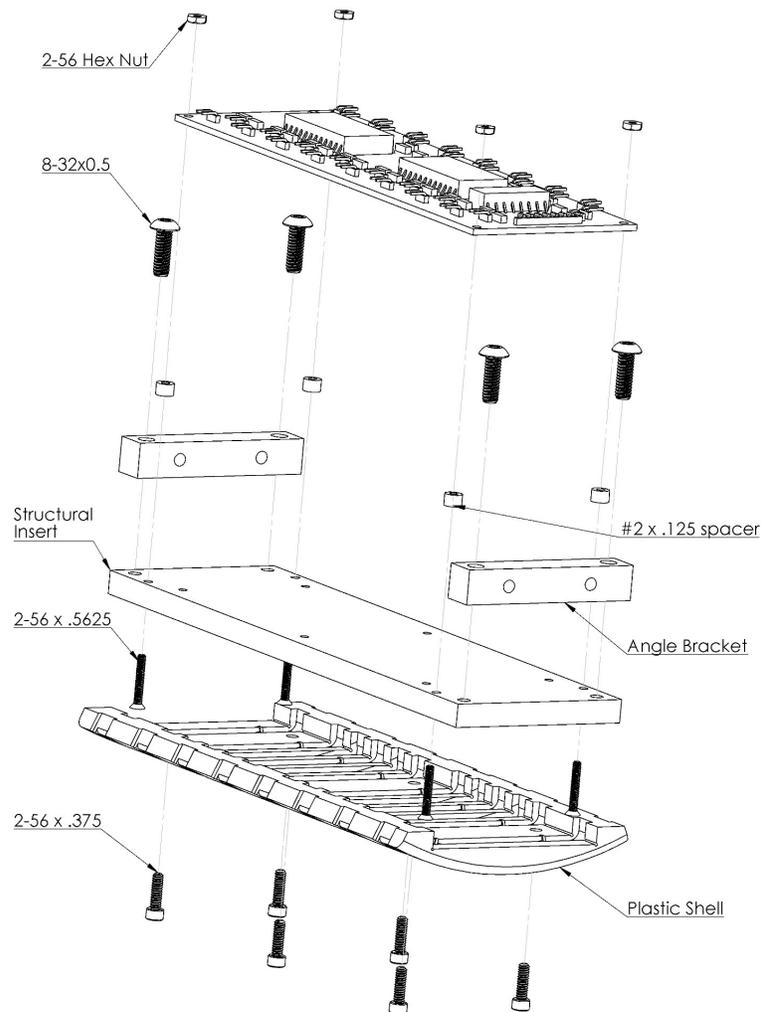
Sensor attachment and electrical assembly:

- Each Sensor Board PCB should have all components soldered in place according to wiring diagrams
- Each individual sensor should be soldered to two three-inch long insulated 24-gauge stranded wires, with a female header connector at the other end.
- All sensors should be fed through the appropriate slots in the 3D printed section and glued into the indentations using two-part epoxy.



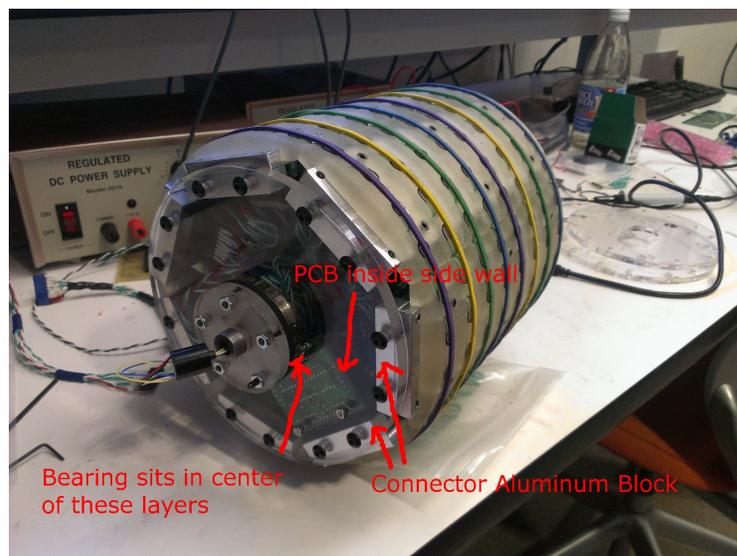
### Section Mechanical Assembly:

- To assemble the individual sections, the first step is to attach the PCB's to the aluminum insert using four countersunk 7/16 2-56 screws and hex nuts, with 1/8 inch thick spacers separating the board from the metal surface.
- The sensor shell can then be attached to the outside, with care being taken to avoid stressing the sensor traces present. **The end with the numbers should be pointed towards the connector end of the PCB.** Secure them together with 6 3/8 4-40 hex cap screws, as shown.
- Complete the electrical connections between the sensors and the PCB, taking care to maintain their order, with the inner sensors attached to the inner headers, and so on.
- Finally, connect the 3/8 inch square bracket blocks to the structural insert using four 8-32 x 1/2 inch button-head screws.



### Full Wheel Assembly:

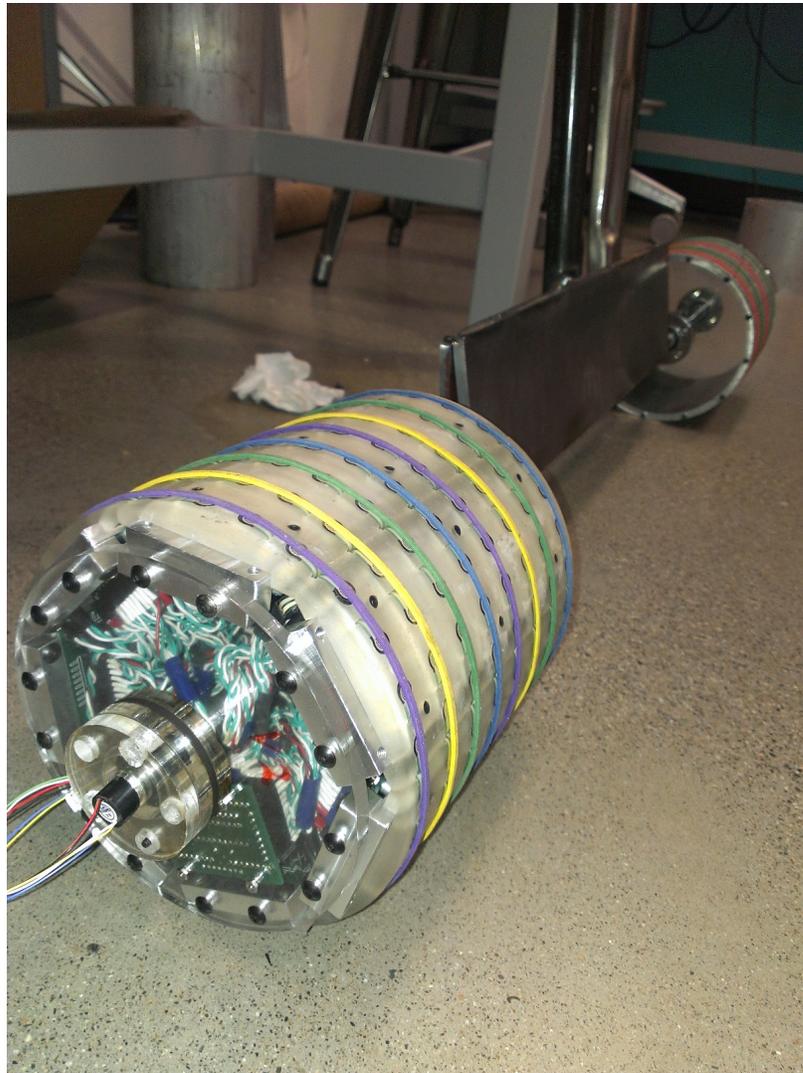
- The bearing should be attached to the side plate with the acrylic and duron spacers.
  - The order of the pieces starting closest to the side of the wheel is acrylic with larger center hole (1.25"), duron, acrylic with 0.5"/0.75" center hole.
  - The acrylic closest to the wheel should have two cutouts on the outside to allow for screwing in the PCB (the cutouts face toward the 2-56 holes in the side face)
  - The stack should be held onto the side plate with screws and nuts.
  - The side that holds the microcontroller PCB should have the bearing stack mounted on the outside of the wheel, while the other side should have the stack on the inside of the wheel.
- The small microcontroller PCB should then be attached with 2-56 screws and nuts to the side wall.



- Each section should be connected to the microcontroller board through the headers.
  - The sections should be connected in order going around the microcontroller PCB.
  - The +5v pin on the section PCB should be connected to pin 1 of the corresponding header on the microcontroller PCB.
- The microcontroller should have a cable attached to provide power and data in/out of the wheel and that cable should be fed through the remaining off-center hole in the side wall of the wheel.
  - This cable then connected to the slip ring.
- All of the sections should then be screwed into both side plates.

## Assembly of test rig

- First, slide the dummy wheel over one of the test-rig's two axles, with the protruding bearing pointed out. Secure it with one ½ inch snap ring into the corresponding groove on the axle.
- Attach the sensor wheel:
  - Feed the other axle through the end with the recessed bearing, until it protrudes on the other end. Some patience may be required to avoid damaging the wires within.
  - Secure the wheel to the axle using another snap ring.
  - Thread the cable leading from the slip ring through the axle.
  - Optional: attach slip-ring support plate. This was not necessary for our tests, but rougher handling might require more rigid support for the cables.



- Slide the handle over the 1-inch bar welded to the plates, and secure it with the included ¼-20 x 1.5 inch bolt and nut.

- Connect the cable to the header adapter, being careful to align the white stripes on each connector.
- The 1x6 header connects to the FTDI chip with the black wire indicating Ground.
- The FTDI chip connects to a computer with a USB-A to USB-mini B cable.
- The rubber bands on the sensor wheel should be straightened so that they lay flat over the center of all sensors around the circumference to prevent aberrant sensor readings

## Running PC Interface

To run GUI from source:

- Download/install Processing IDE (<https://www.processing.org/download/>)
- Install ControlP5 library (<http://www.sojamo.de/libraries/controlP5/#installation>)
- Checkout GUI code from GitHub (or just download .zip) ([here](#))
- Open simple\_interface.pde in Processing; Press “**Play**”

To run pre-compiled Windows executable:

- Download and run exe from GitHub ([here](#))

(We recommend running from source, if possible).

1. Plug in the USB/FTDI adapter.
2. Run GUI, either from source or the .exe
3. Select the appropriate COM port from dropdown menu in upper-left hand corner.
4. Press the Connect button.
5. The Overlay setting will show the sensor numbers as well as the raw sensor values (0-1023 scale).

## Maintenance and Care

When running tests, ensure that rubber bands are on sensors properly to obtain consistent results.

Take care not to bend the sensors at too sharp of an angle so they don't break.

Keep away from liquids, animals, and small children.