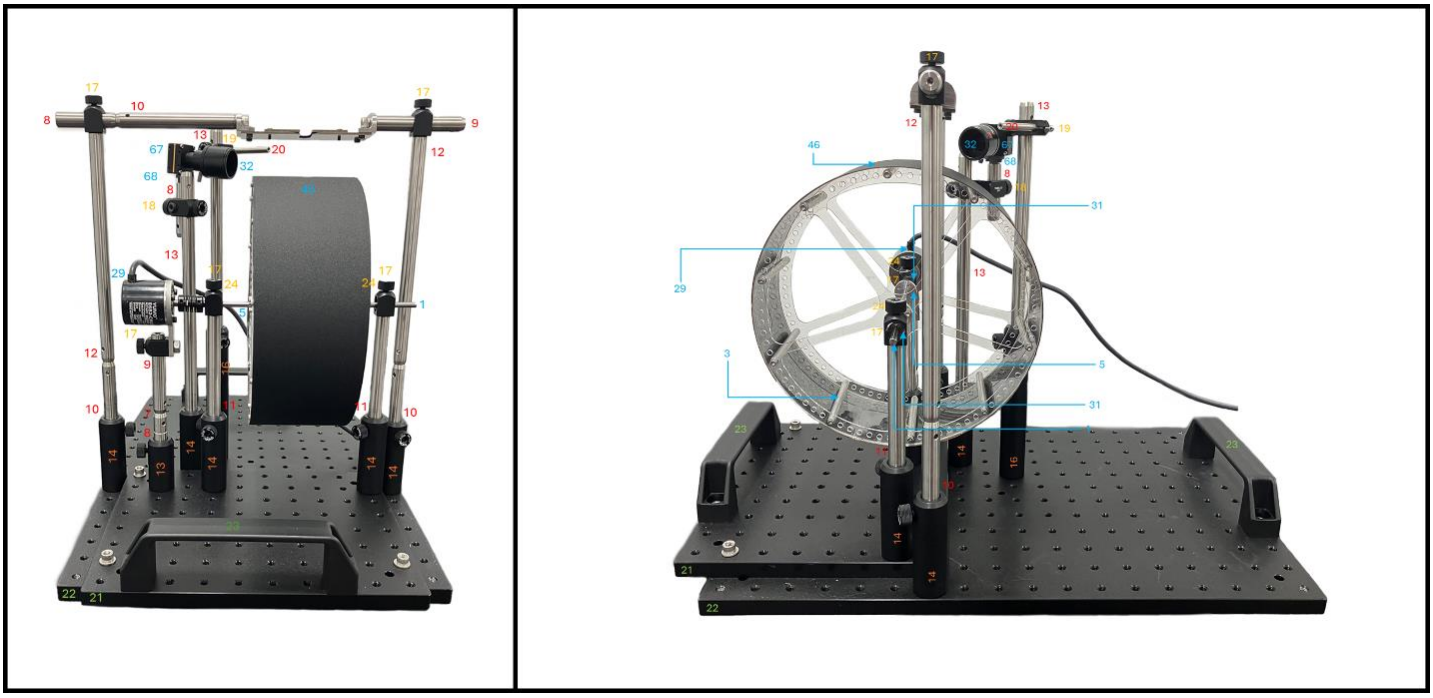
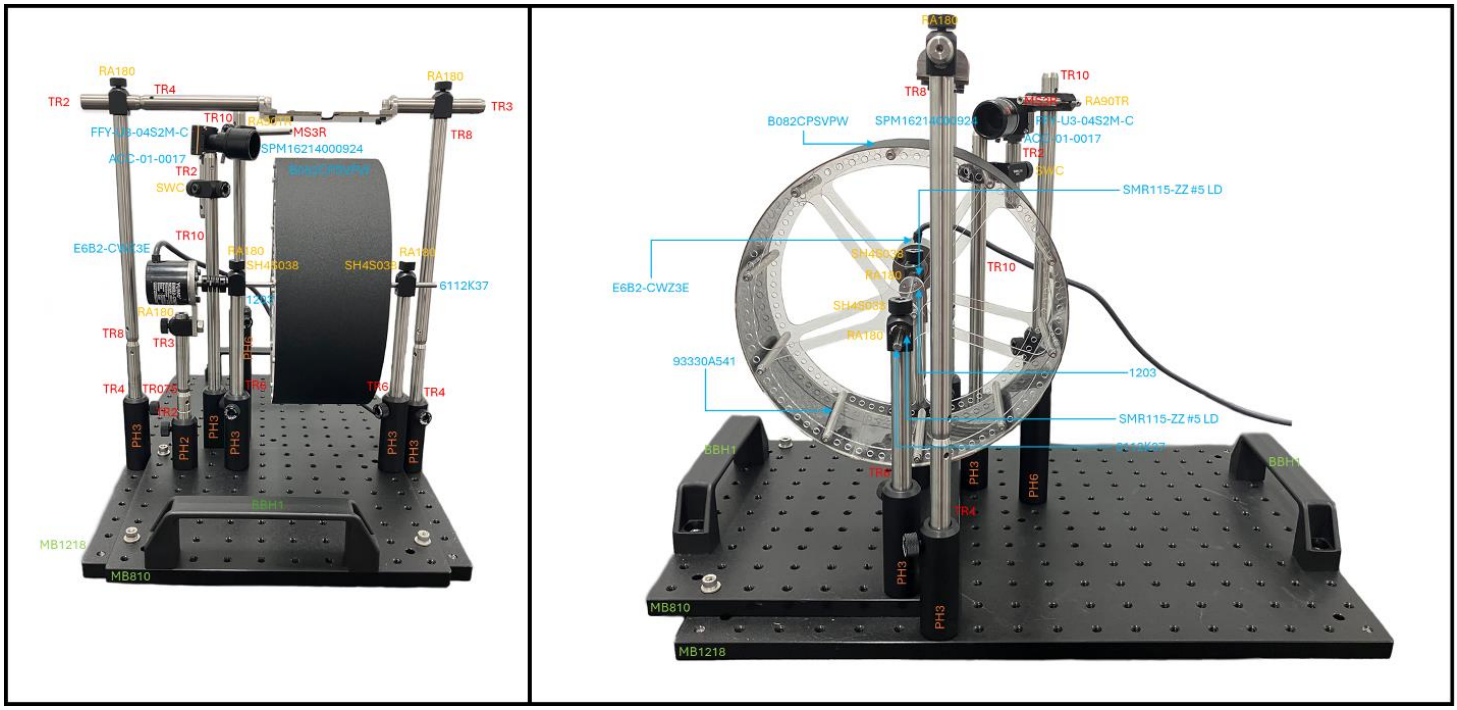
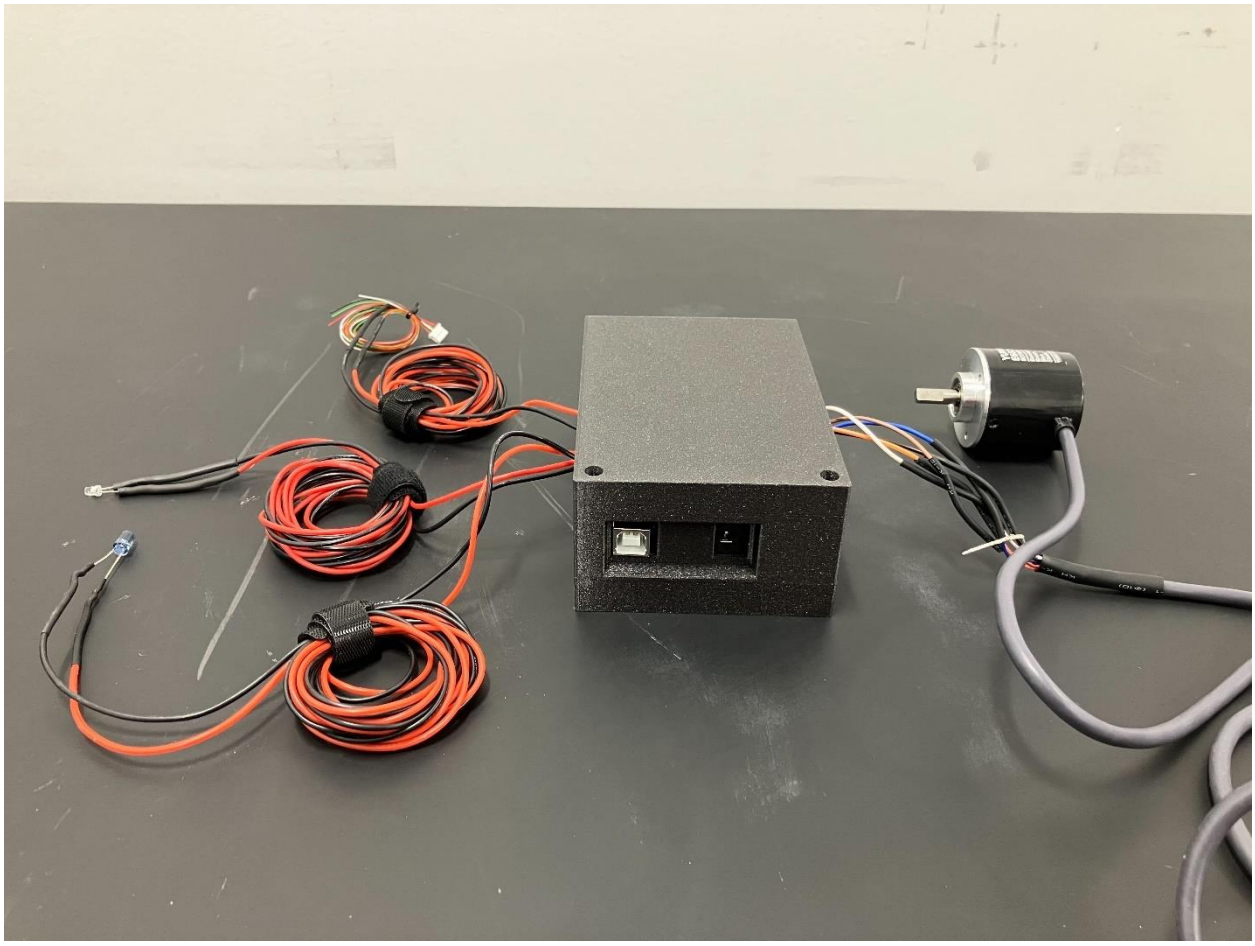
Step By Step Building Guide

Labeled Pupillometry Setup





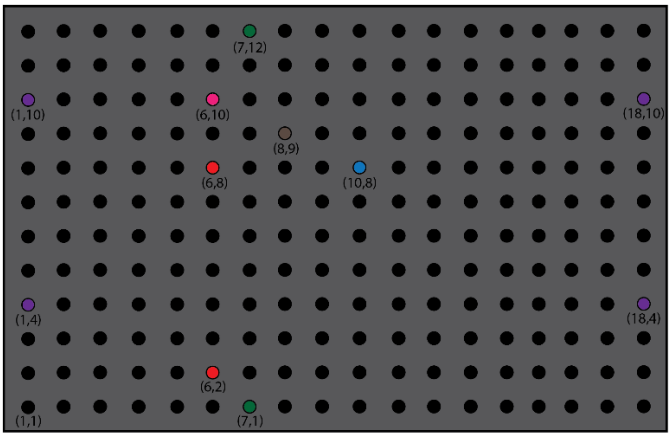
Arduino Protective Cover



*** The printed circuit board housed in the protective Arduino case, with the electrical components required for a single locomotion wheel setup. This includes the rotary encoder, low-power ultraviolet LED, infrared LED, and GPIO cable. After powering the Arduino Mega with a 5-V USB connection or with an external power supply.**

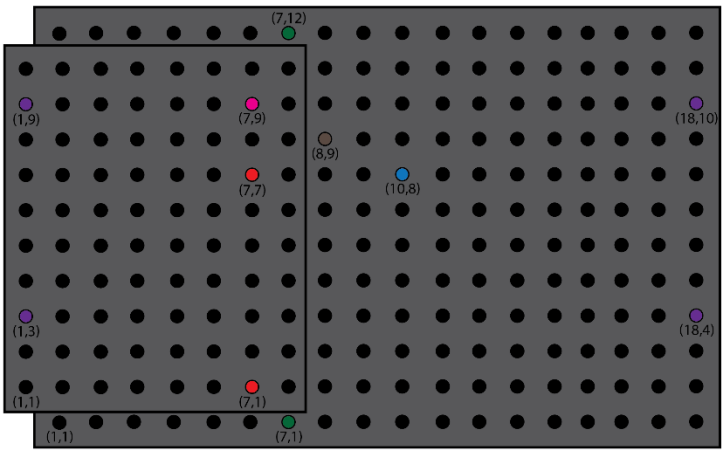
Assemble the Breadboard

Single Breadboard Option



Optical Post Coordinates
Breadboard Handle: (1, 4) (1, 10)
Wheel: (6, 2) (6, 8)
Rotary Encoder: (5, 11)
Head Ring: (7,1) (7,12)
Camera: (8,9)
IR LED: (10,8)
Breadboard Handle: (18, 4) (18, 10)

Modular Breadboard Option



Optical Post Coordinates (10 x 8 Optical Board)
Breadboard Handle: (1, 3) (1, 9)
Rotary Encoder: (7, 9)
Wheel: (7, 1) (7, 7)

Optical Post Coordinates (18 x 12 Optical Board)
Breadboard Handle: (18, 4) (18, 10)
Head Ring: (7,1) (7,12)
IR Camera: (8,9)
IR LED: (10,8)

Assemble the Breadboard (Single Breadboard Option)

1. Mount post holders according to the above figure
    a) Handle - Two SH4S038 screws at coordinates (1,4) and (1,10)
    b) Wheel - Two PH3 post holders at coordinates (6,2) and (6,8)
    c) Rotary encoder - One PH2 post holder at coordinate (5,11)
    d) Head plate - Two PH3 post holder at coordinates (7,1) and (7,12)
    e) IR Camera - One PH3 post holder at coordinate (8,9)
    f) IR LED - One PH6 post holder at coordinate (10,8)
    g) Handle - Two SH4S038 screws at coordinates (18,4) and (18,10)

Assemble the Breadboard (Singular and Modular Breadboard Option)

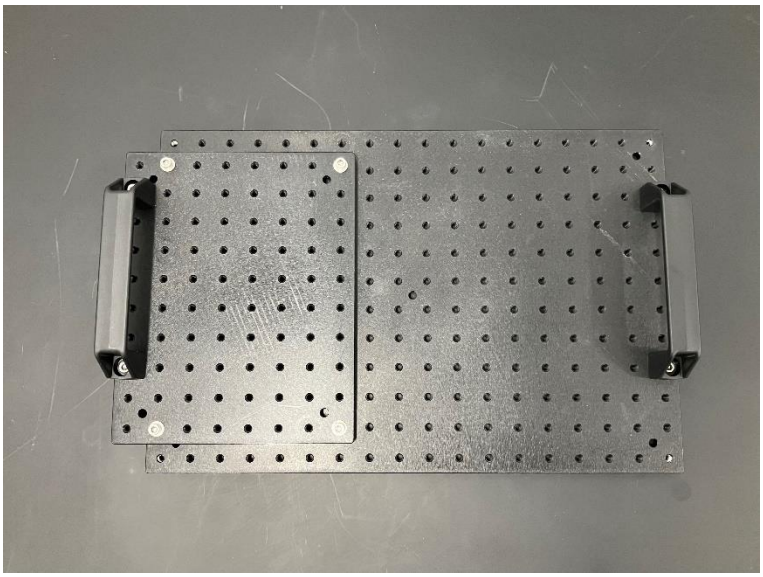
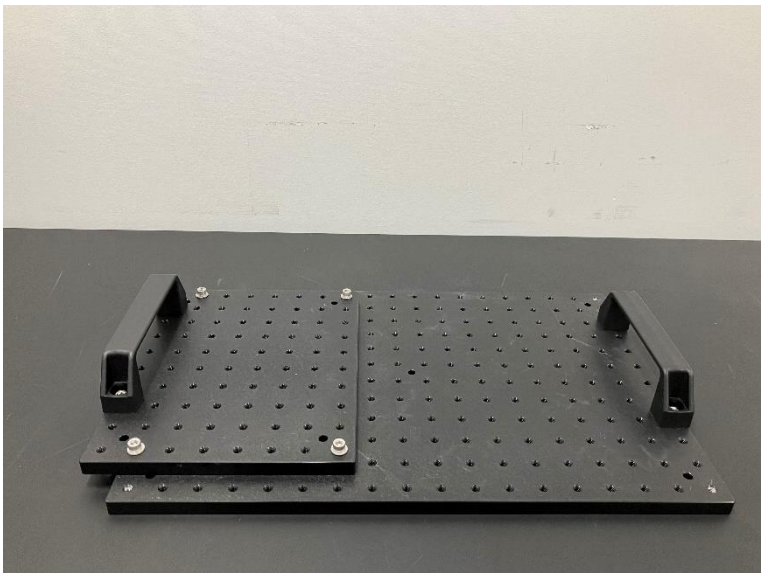
1. Mount post holders according to the singular breadboard option above
    a. Handle - Two SH4S038 screws at coordinates (1,4) and (1,10)
    b. Wheel - Two PH3 post holders at coordinates (6,2) and (6,8)
    c. Rotary encoder - One PH2 post holder at coordinate (5,11)
    d. Head plate - Two PH3 post holder at coordinates (7,1) and (7,12)
    e. IR Camera - One PH3 post holder at coordinate (8,9)
    f. IR LED - One PH6 post holder at coordinate (10,8)
    g. Handle - Two SH4S038 screws at coordinates (18,4) and (18,10)

2. Mount post holders according to the modular breadboard option above
    a. 10 x 8 Optical Board
        - Handle - Two SH4S038 screws at coordinates (1,3) and (1,9)

- Wheel - Two PH3 post holders at coordinates (6,1) and (6,7)
- Rotary encoder - One PH2 post holder at coordinate (5,10)

b. 18 x 12 Optical Board
   - Head plate - Two PH3 post holder at coordinates (7,1) and (7,12)
   - IR Camera - One PH3 post holder at coordinate (8,9)
   - IR LED - One PH6 post holder at coordinate (10,8)
   - Handle - Two SH4S038 screws at coordinates (18,4) and (18,10)

Step 1:

Aerial View	Angled View
	

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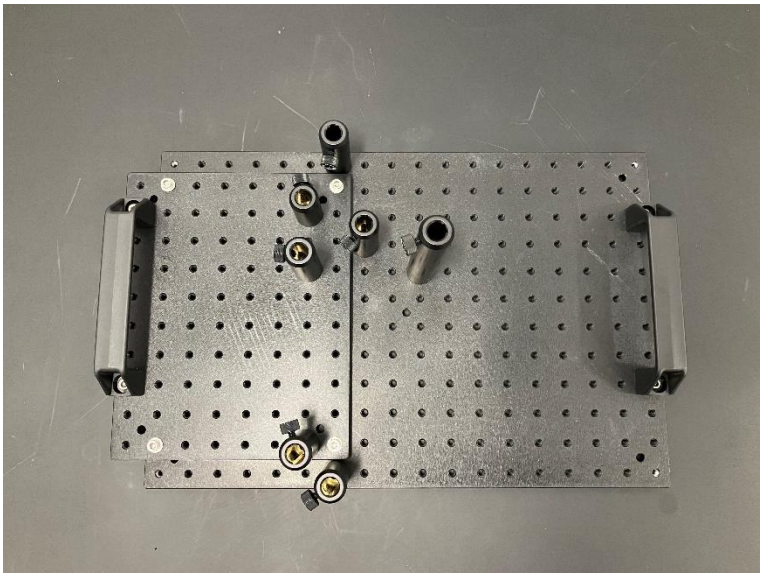
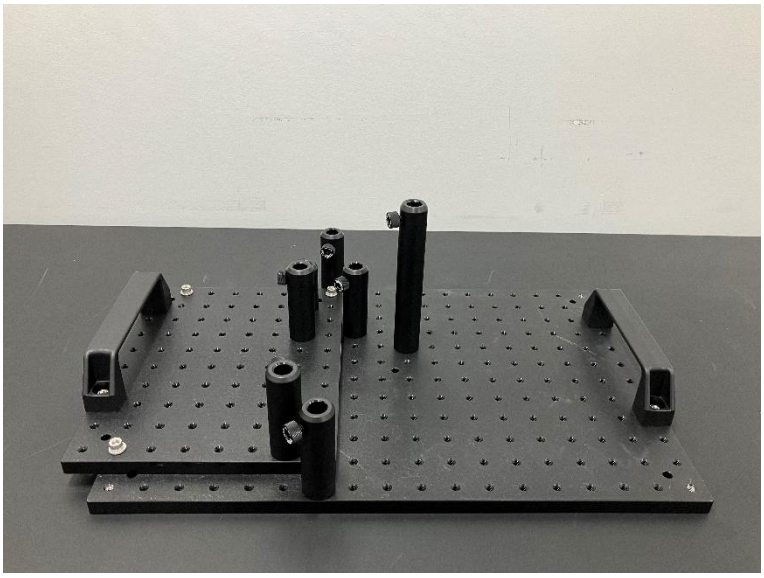
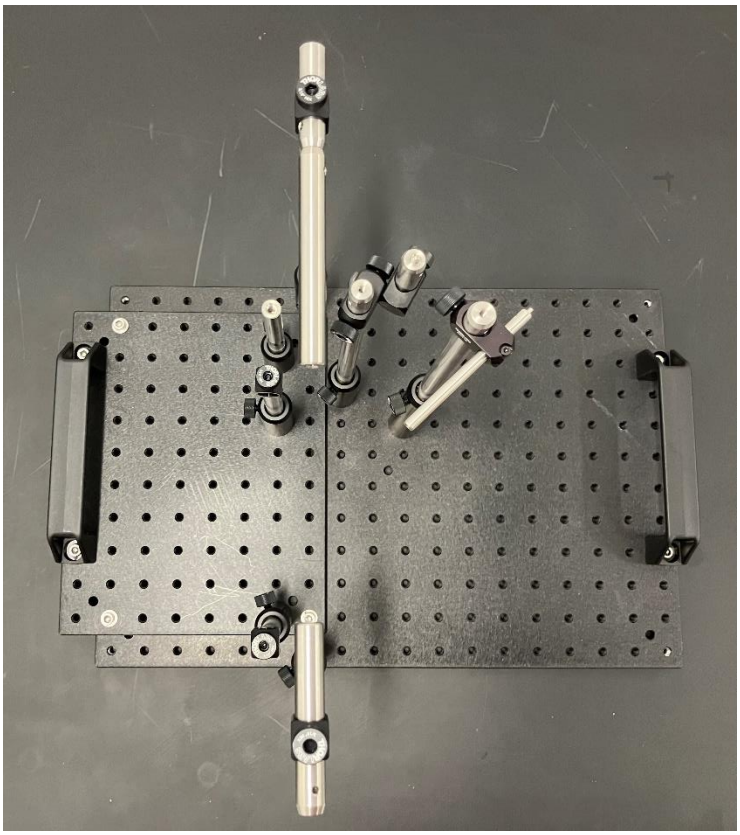
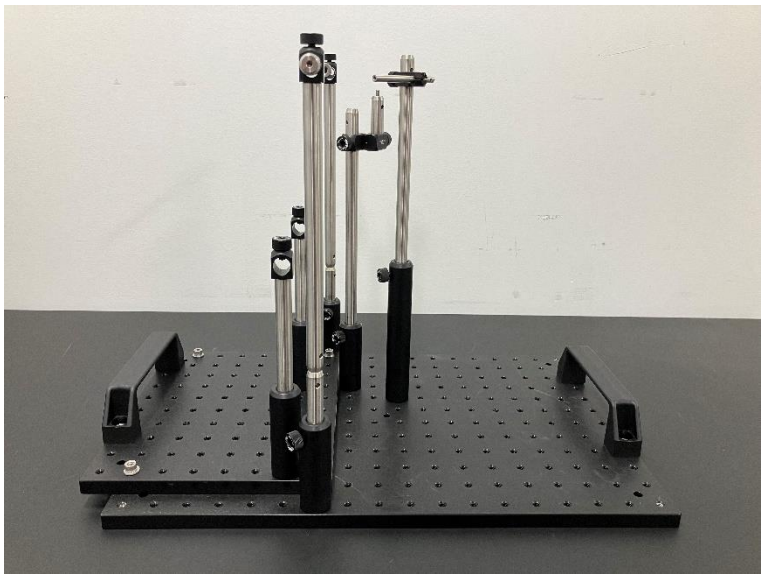
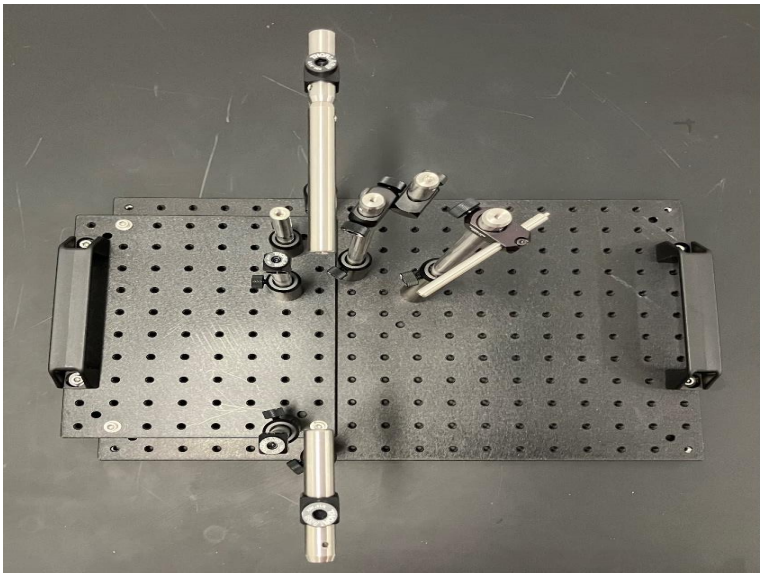
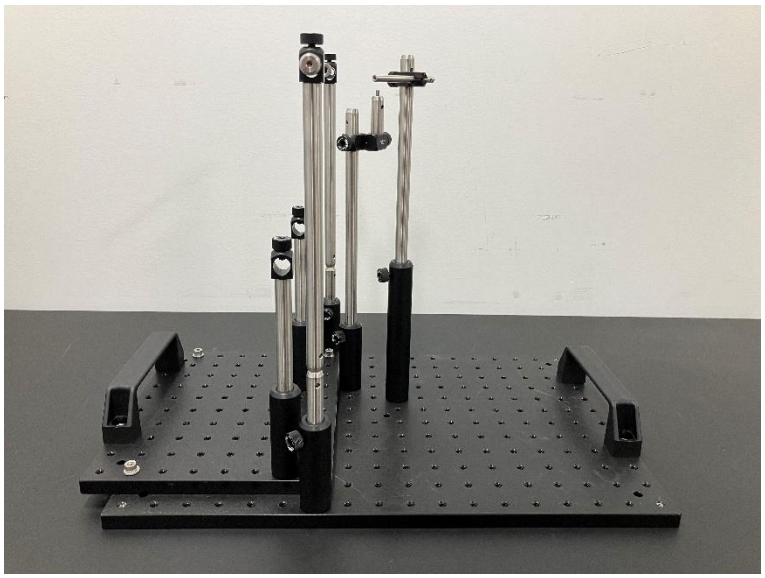
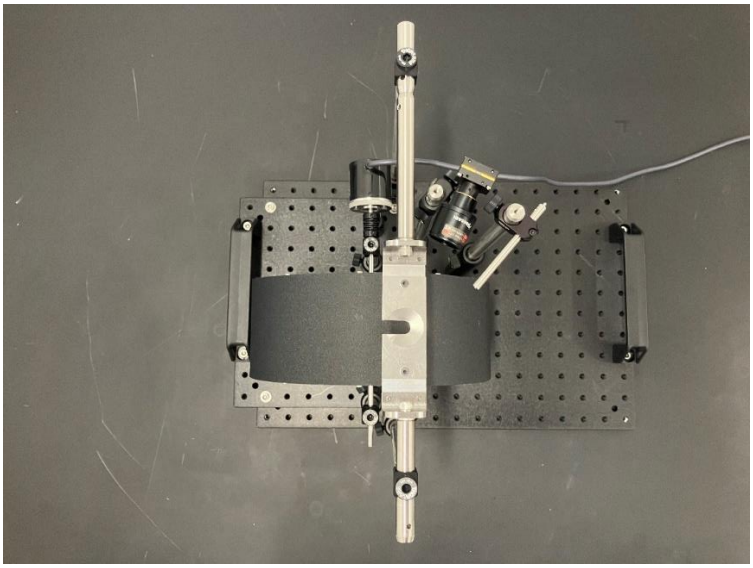
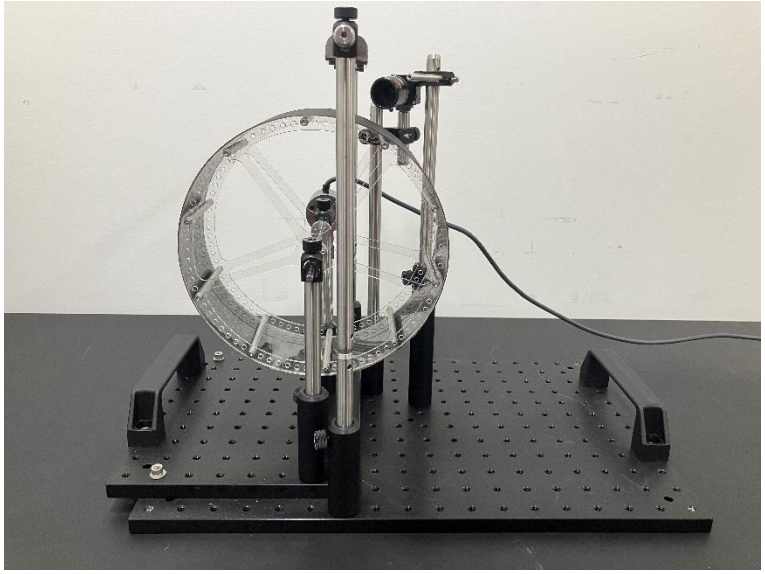
Step 2:

Aerial View	Angled View
	

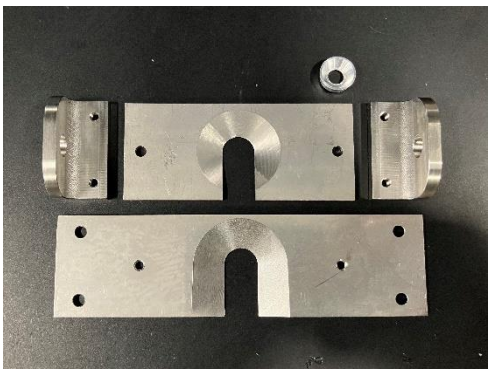
Step 3:

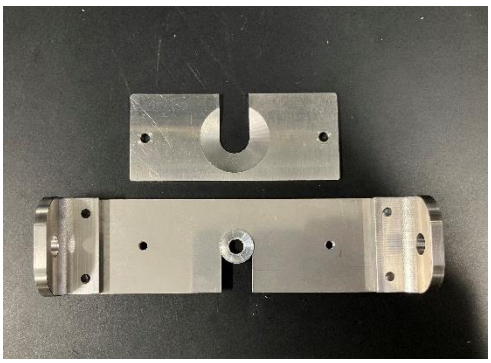
Aerial View	Angled View
	
	

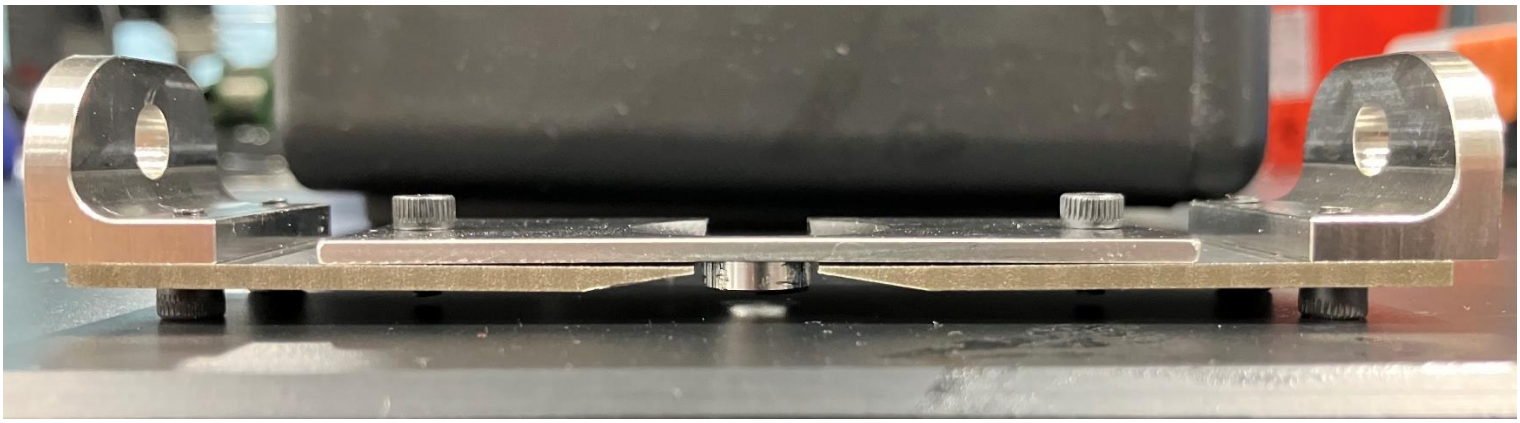
Step 4:

Aerial View	Angled View
	

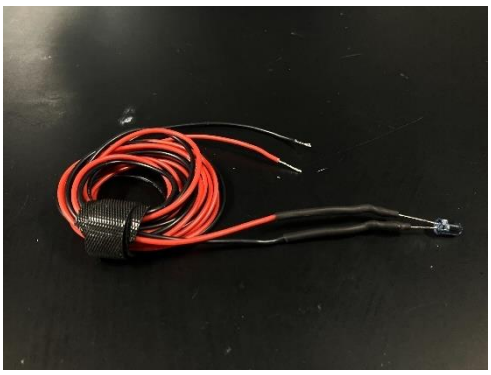
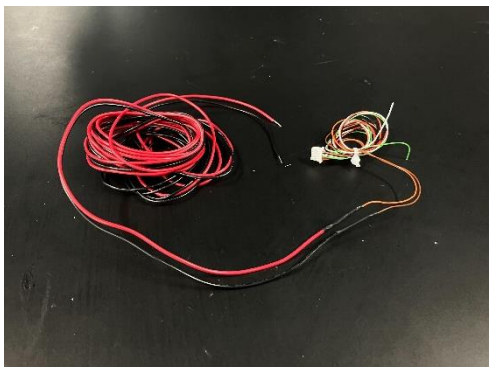
Constructing the Head Plate System





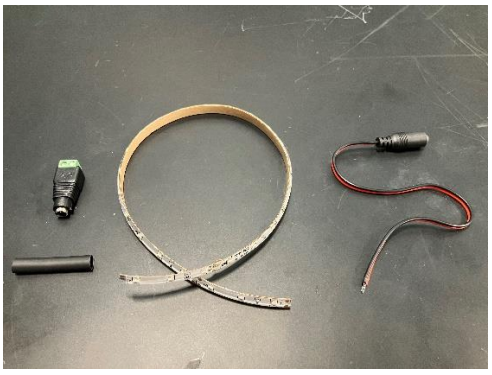
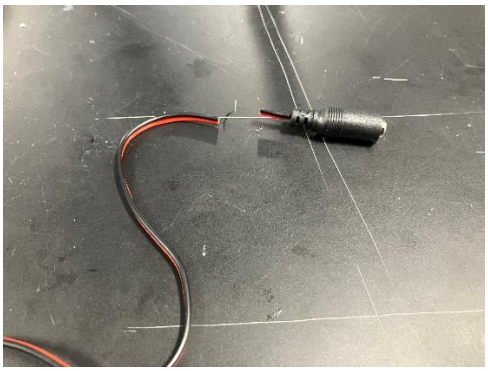


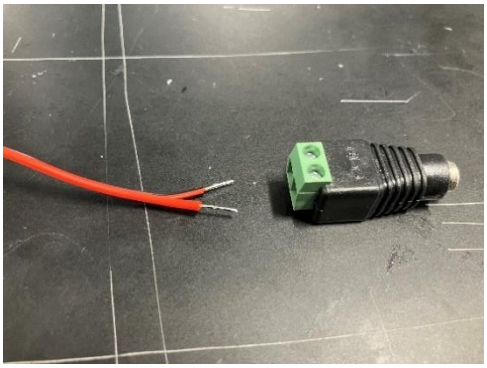
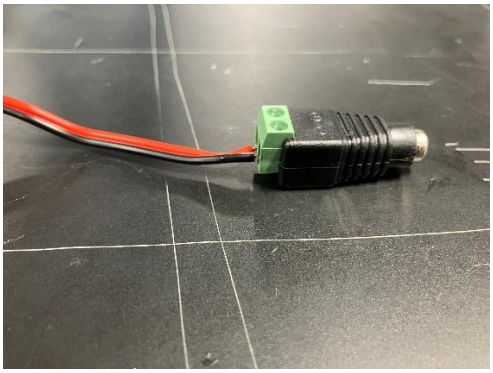
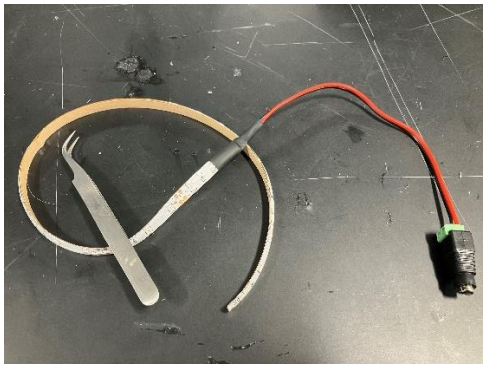
Constructing the UV LED, IR LED, and GPIO Cables

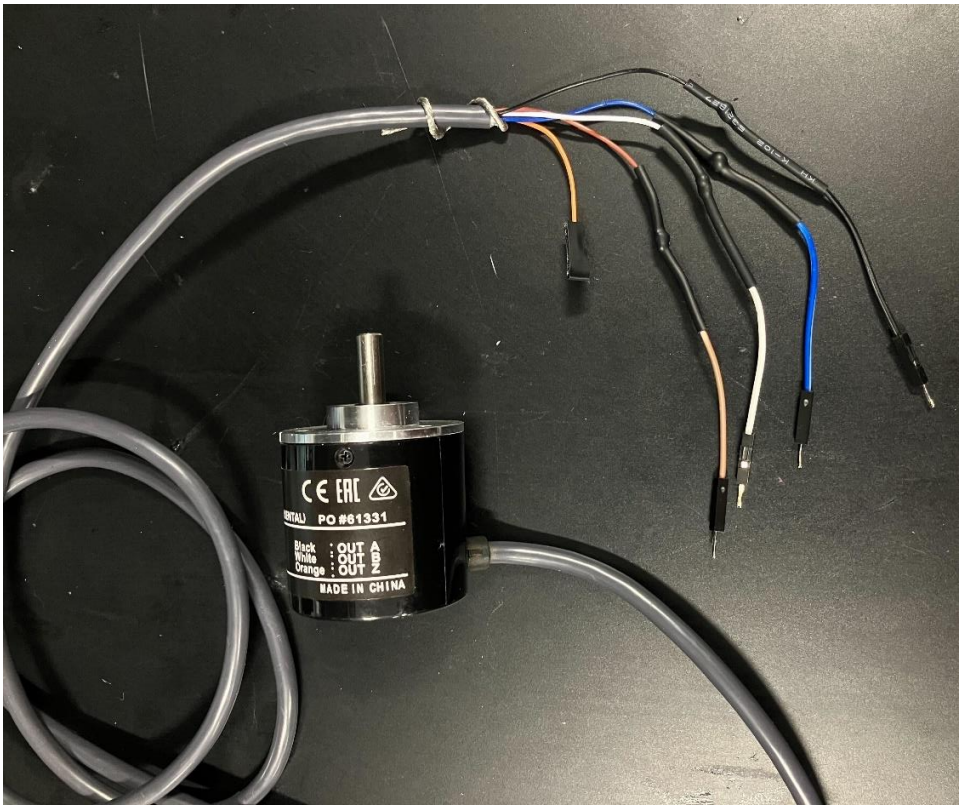
*** If you choose to use a breadboard instead of the Arduino shield, you will need to provide resistance to avoid a short circuit. If you don't want to recreate the MOSFET configuration of the PCB circuit, you can solder resistors between the red wire and the anode of the LEDs. However, the MOSFET transistors allow you to actively control the current. Resistors are passive elements, and don't provide a mechanism to amplify the current, or to switch it on and off.**

Constructing the Red-Light Strips

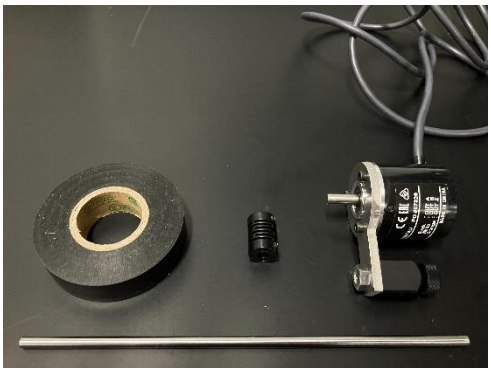



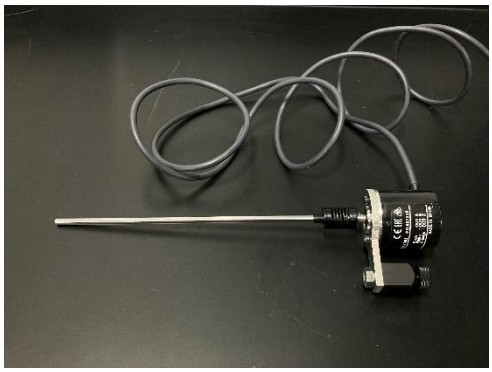





Constructing the Rotary Encoder


PO #61331
Black : OUT A
White : OUT B
Orange : OUT Z
MADE IN CHINA


YUKO





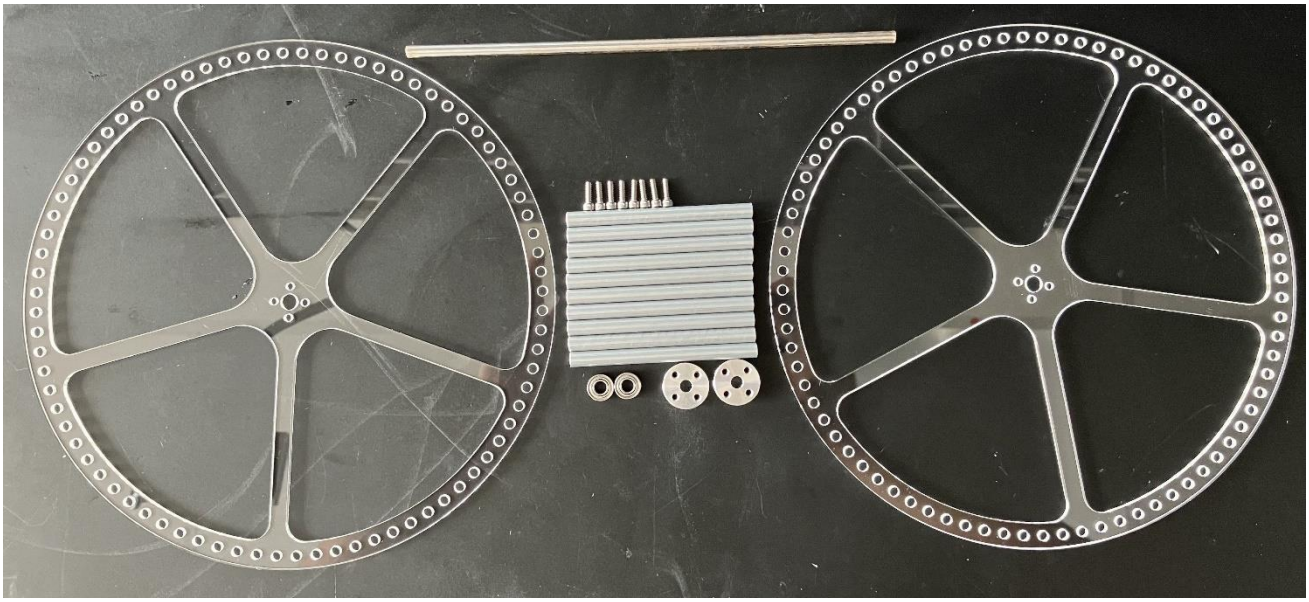
Removing the Additional Camera Shutter

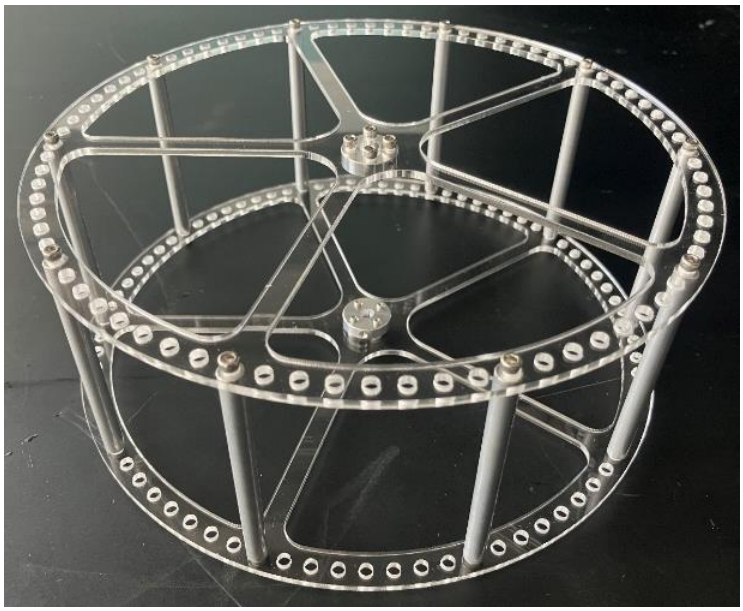


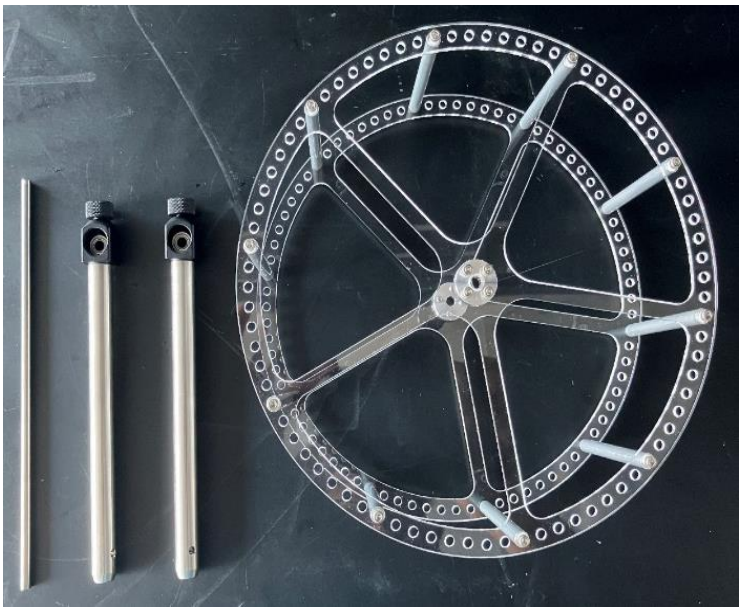



*** Removing the lens shutter of this IR filter lens will allow us to use this lens without an external driver / power supply.**

Constructing the Pupillometry Wheel

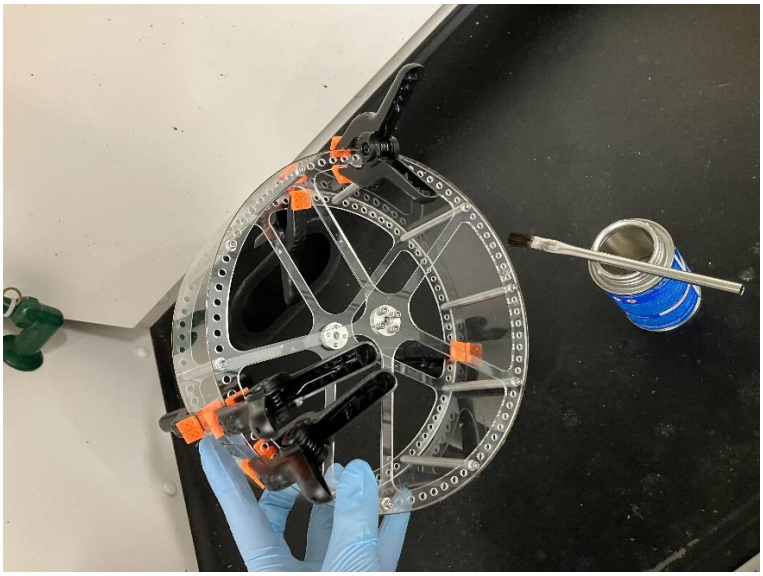




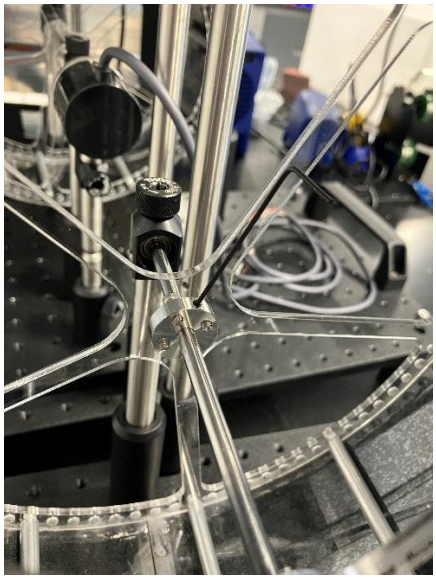


*** Place the 5 mm bearings into the Thorlabs RA180 component. Pass the 5 mm shaft through the mounting hub of the wheel and fit the joined components through the ball bearings.**

Constructing the Pupillometry Wheel

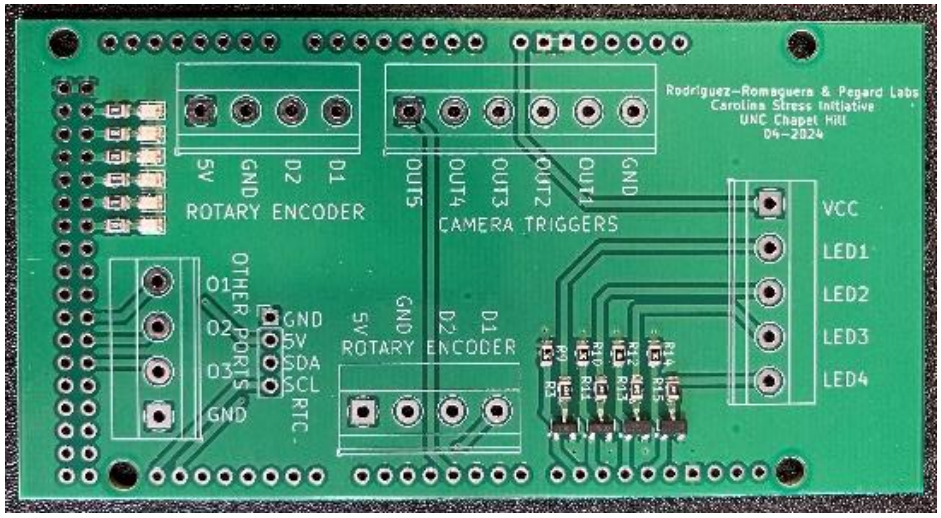


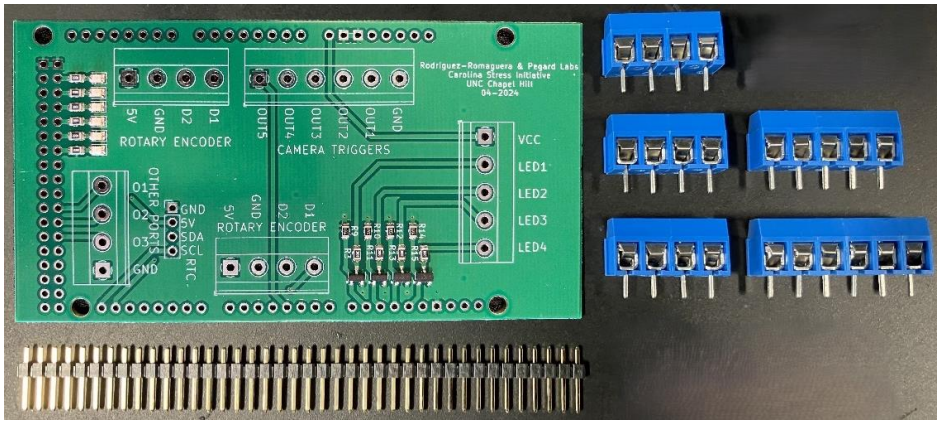
Installing the Pupillometry Wheel

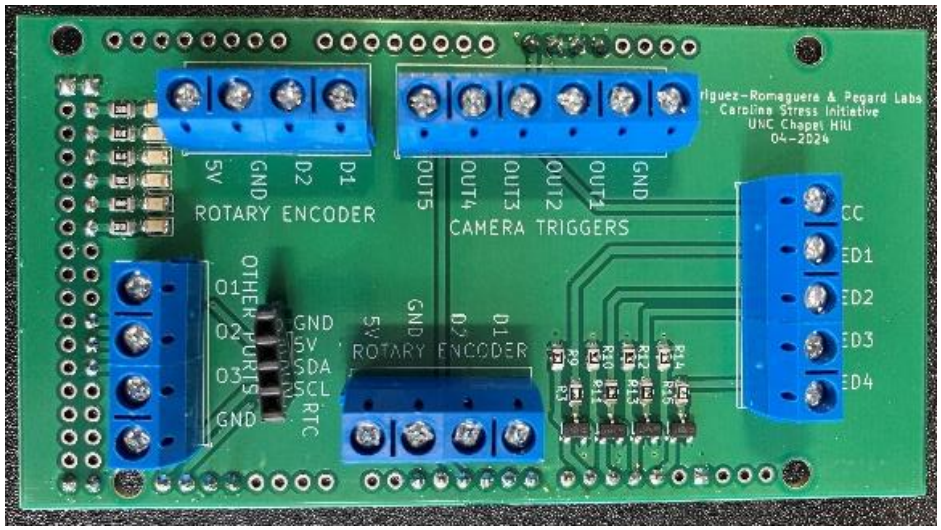


*** The 5 mm mounting hub comes with two smalls screws which can be used to secure the entire pupillometry wheel to the shaft. Tightening this component ensures that movement from the wheel is accurately reflected by the rotary encoder. Insert these two screws into the mounting hub before installing the wheel into the pupillometry system to avoid difficulties.**

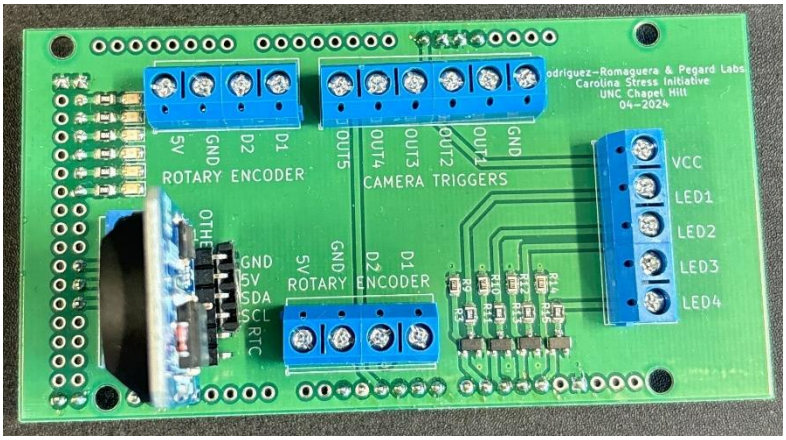
Constructing the Pupillometry Printed Circuit Board

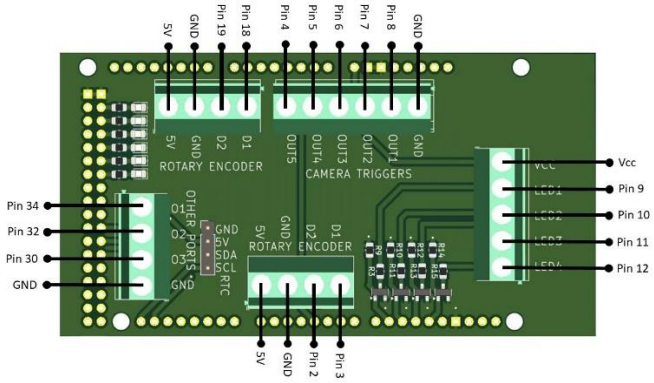


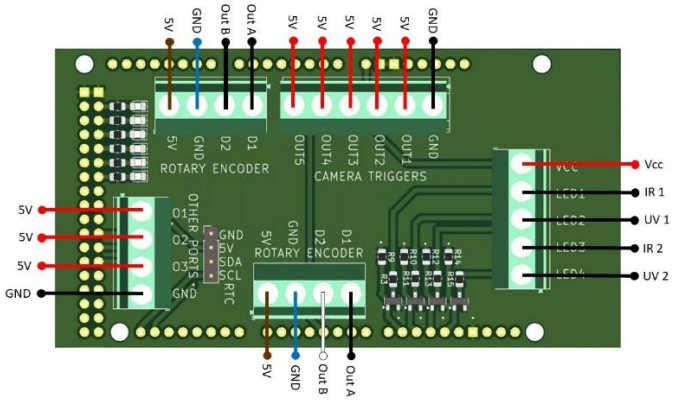




Arduino Compatible Pupillometry Setup PCB







*** The Arduino compatible PCB shield was specifically designed for the purpose of interfacing with all the components necessary for head-fixed experiments. These are the capabilities of the board, based on its current configuration:**

UV / IR LED Terminal Block (1 x 5 Terminal at Arduino Pins 9 through 12)

- Four 5 Volt ports in for two UV LEDs and two IR LEDs (With 4 accompanying transistors and resistors)
- One GND port for all four LEDs

Camera/DAQ/Opto Terminal Block (1 x 6 Terminal at Arduino Pins 4 through 7)

- Four trigger ports for two FLIR cameras and two monochrome cameras
- One port for the DAQ and Optogenetic Interference Module
- One GND port for all four cameras, the DAQ, and the Optogenetic interference system

Real Time Clock Terminal Block (1 x 4 Terminal at Arduino Pins D20 SDA and D21 SLA)

- Two input ports for the single RTC
- One PWR for the single RTC
- One GND port for the single RTC

Rotary Encoder #1 Terminal Block (1 x 4 Terminal at Arduino Pins 2 and 3)

- Two output ports for the single rotary encoder
- One PWR for the single rotary encoder
- One GND port for the single rotary encoder

Rotary Encoder #2 Terminal Block (1 x 4 Terminal at Arduino Pins 18 and 19)

- Two output ports for the single rotary encoder
- One PWR port for the single rotary encoder
- One GND port for the single rotary encoder

Other Digital Pins (1 x 4 Termina Block at Arduino Pins 30, 32, and 34)

- Four digital output pins that can be assigned to any additional electrical systems

Fail safe LEDs (6 LEDs at Arduino Pins 42 through 52)

- Six digital output pins that can be assigned to based on relevant binary events
    - Two LEDs can be assigned when an input signal is sent to the IR LED
    - Two LEDs can be assigned when an output signal has been received from the Rotary Encodes.
    - The remaining LEDs can be assigned to indicate a closed loop for any of the cameras or other systems.