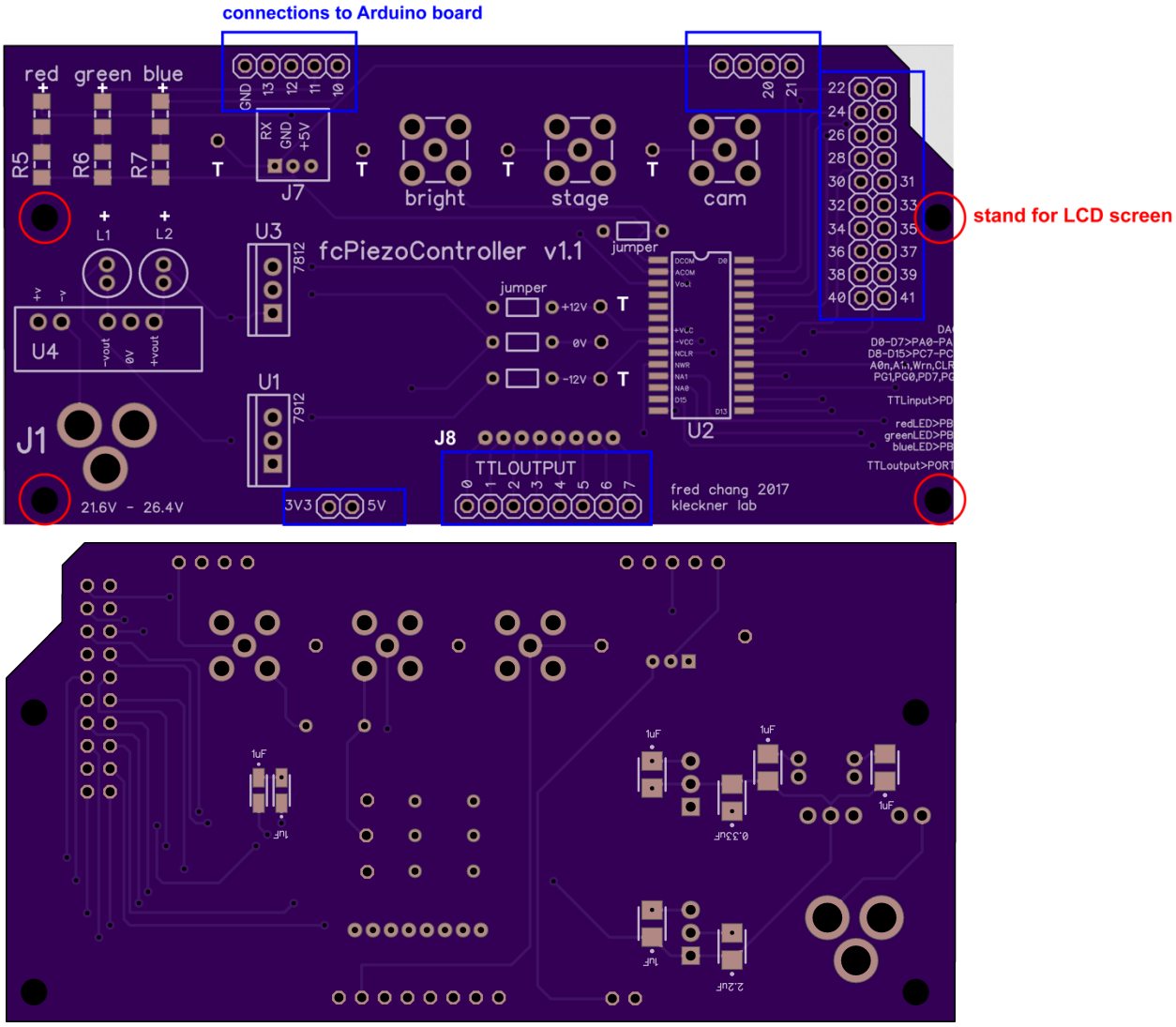
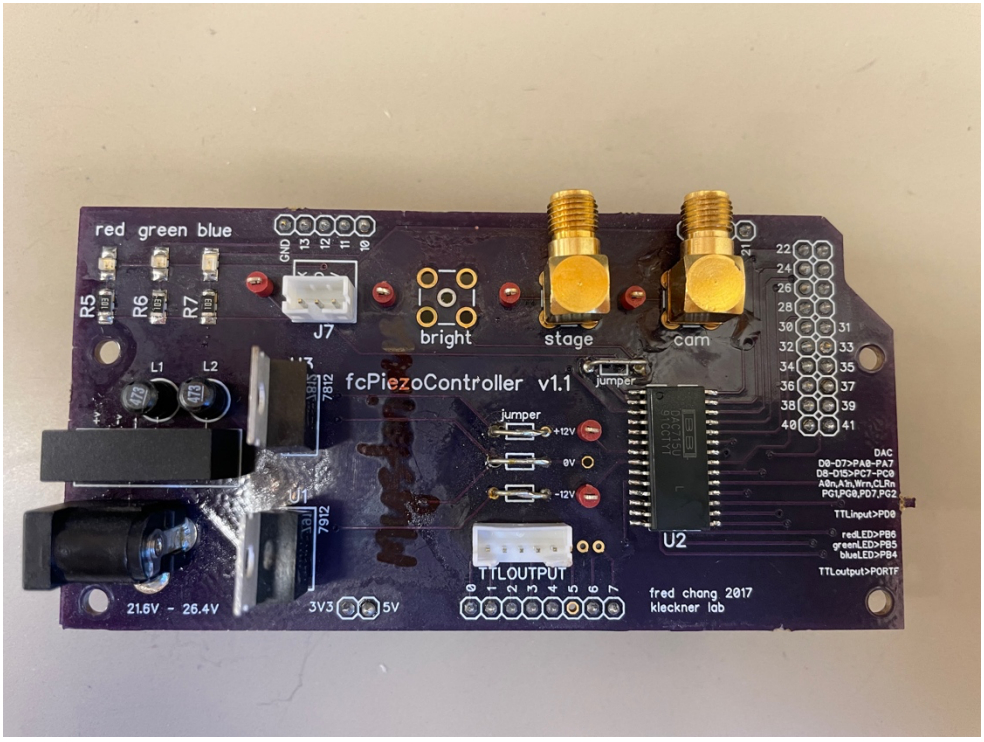
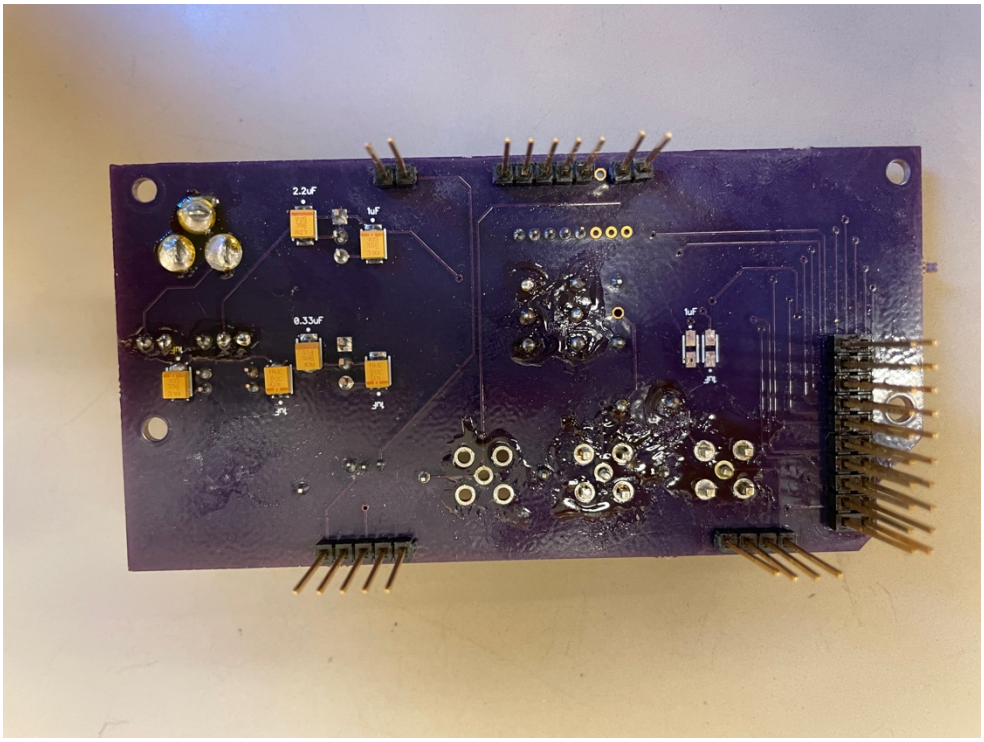
Soldering TTL Controller board



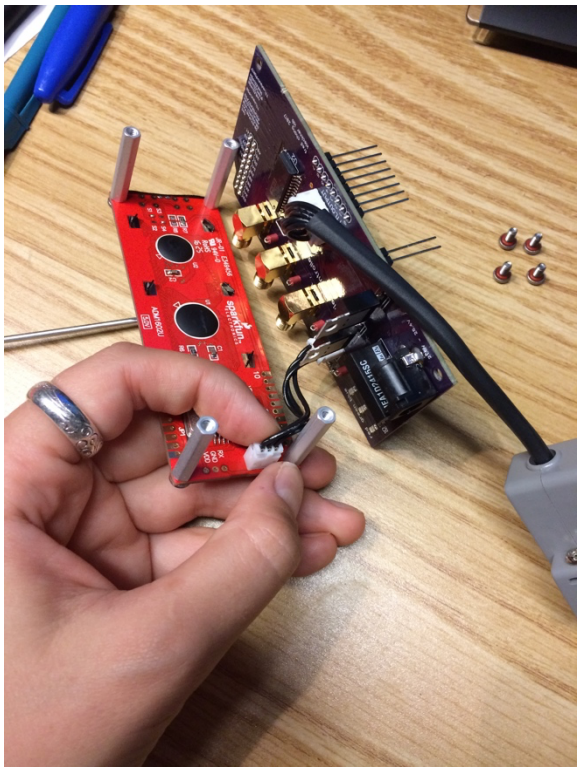
1. First populate the power block of the board (front: J1, U1,U3, U4, L1, L2, jumpers and test-points; and back: 1uF, 2.2uF and 0.33uF, do not attach DAC's capacitors!), check voltage between 0 and 12 V points, expect to see +/- 12 V, 10% error is allowable. Note:
   - U1 and U3 have different numbers, polarity marked as a white strip on one side.
   - Polarity of L1 and L2 capacitors is marked as different length of legs, longer leg is positive. Co-orient the positive pole with the positive pole of capacitors.
   - Polarity of 1uF, 2.2uF and 0.33uF capacitors is marked as a strip on the positive side, co-align it with the dot on the board.
   - Jumpers can be made from a piece of wire left after soldering L1/L2 and bent in U-shape (see photos below).
2. Next solder R5-R7 resistors, LEDs, J7 (LCD screen), camera, stage, brightfield, J8 (epi) TTLs and the pins connecting the board to Arduino, check the voltage again. Note:
   - LEDs are polar, the negative pole (cathode) of the LED has green stripe, locate it to the left on the board.
3. Last attach U2 (DAC) and 1 uF capacitors at the bottom, check the voltage. Below is the picture of the soldered board (DAC capacitors and brightfield TTL are missing; fifth pin of J8 that can be used to trigger additional device is unpopulated).


red green blue
R5
R6
R7
J7
bright
stage
cam
L1
L2
U3
7812
fcPiezoController v1.1
jumper
jumper
+12V
0V
-12V
U1
7912
U2
TTLOUTPUT
21.6V - 26.4V
3V3
5V
fred chang 2017
kleckner lab
DAC
D8-D7>PA8-PA7
D8-D15>PC7-PC0
A0n,A1n,Wrn,CLRn
PG1,PG0,PD7,PG2
TTLinput>PD0
redLED>PB6
greenLED>PB5
blueLED>PB4
TTLoutput>PORTF

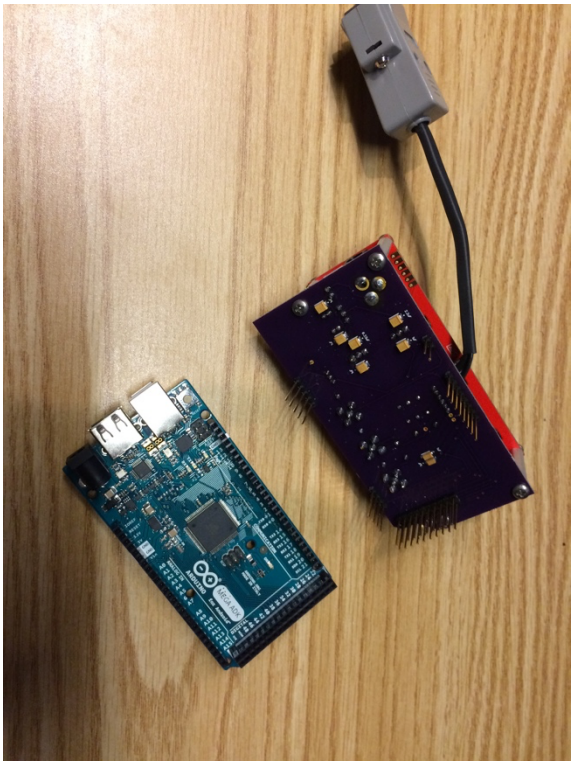

2.2uF
1uF
0.33uF
1uF

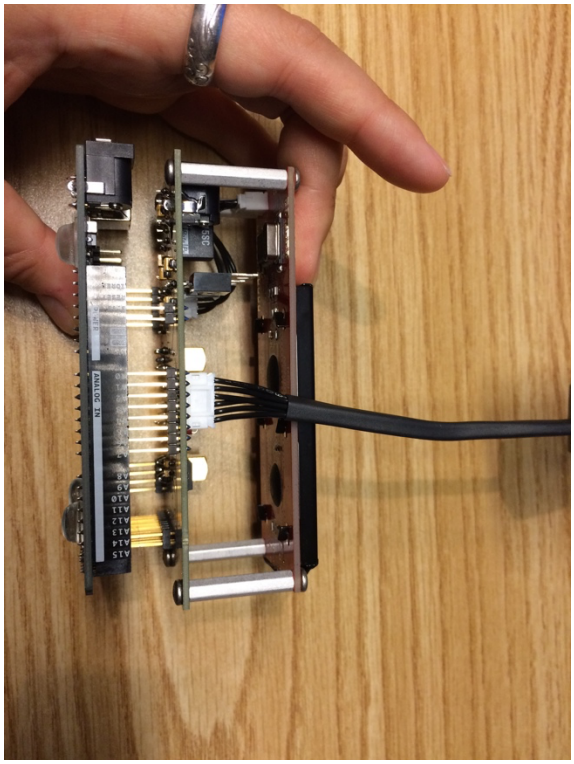
Assembling the controller

1. Assemble the connection for LCD screen, insert it to J7 housing on the board and to the housing of the screen, mount the screen using stands and screws.



2. Attach Arduino

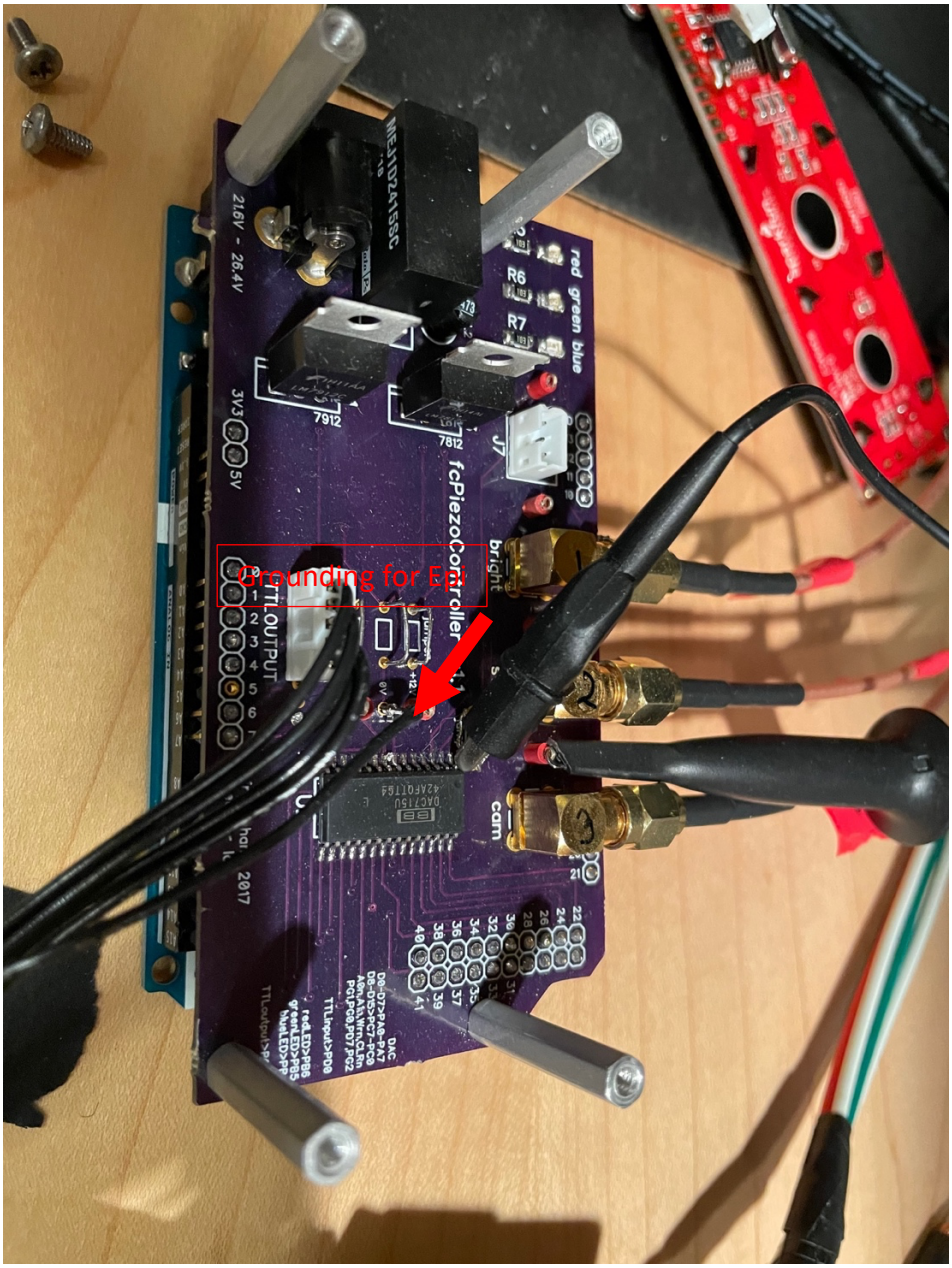




3. Make appropriate cable connections for epi-illumination and brightfield light sources, camera, and stage.

An example for connecting the board (J8) to epi-illumination light source with 5 BNC TTL inputs:

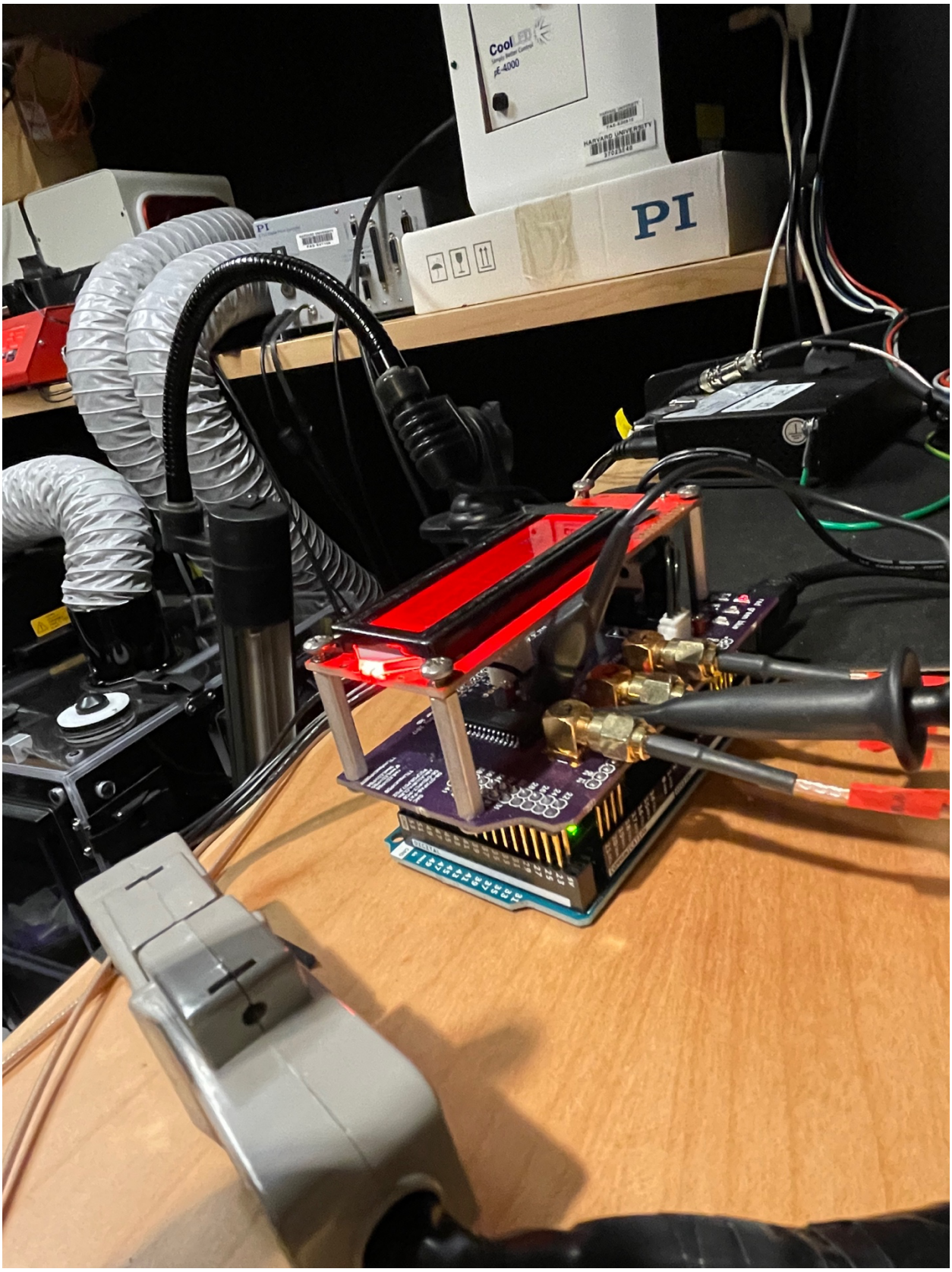
- Start by soldering 5 position cable assembly (1460-1296-ND) to female D-sub connector (AE11025-ND, AE11015-ND); use one of the D-sub pins for grounding the connection at 0V on the board



- Next solder male D-sub connector (1122-1175-ND, A122223-ND, AE11015-ND) to 5 cables with BNC outputs (501-1693-ND) making sure to use the same pins as for female D-sub, ground all the BNC outputs to the ground pin of the male D-sub.

4. Connect Arduino to computer via USB and power up the custom PCB at J1 using power supply (102-3628-ND).

Below is an example of assembled and connected TTL controller.



Testing the controller

- Load to Arduino (using Arduino IDE) code from https://github.com/mariavmukhina/ScopeScript/tree/main/hardwareControl/piezoController/arduinoFirmware/testPiezoController.
- Attach ground probe of the oscilloscope to the jumper between DAC and stage and signal probe to the test point between stage and cam.
- Expect to see triangle pulses.