Laser Glass Level Unit
New Touchscreen Interface
Operating Manual

Main Panel readout and control pushbuttons:

Operation:

Inside panel control cards:

Stack Counts procedure:

Calibration procedure:

New system overview:

Hardware:

- Uses only 1 control board to:
    - process signals,
    - display them,
    - send data to our PI data collection over the plant LAN and
    - output glass level reading to the Tank DCS.

Software:

- Utilize hardware timer interrupts to measure index and beam pulses precisely.

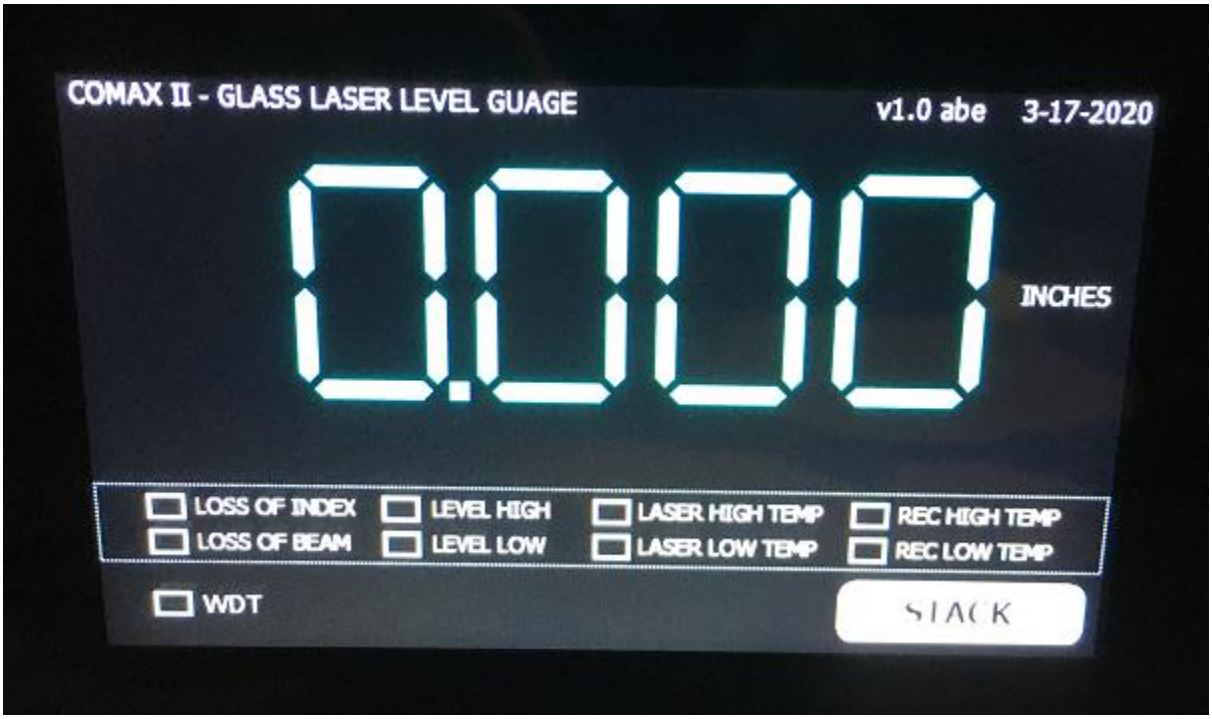
- Uses a user friendly touchscreen unit to:
    - display the current glass level reading in a large font to be easily seen from the doghouse while making adjustments or PM cleaning.
    - make system calibration and changing parameters easier.
    - offers a trend of the level reading and pulse information to make troubleshooting easier.

Main screen.

- Display's real time glass level in inches. (large number display)

- Alarm indications on bottom of screen.
    - Loss of Index or Beam pulses from Laser/Receiver units.
    - Glass level high/low alarms (+/- 0.100).
    - Laser unit high/low temperature alarms (120/70 DegF)
    - Receiver unit high/low temperature alarms (120/70 DegF)

- Watch dog timer indication to show processor running and collecting pulses from laser/receiver units. (Indictor flashes when working)



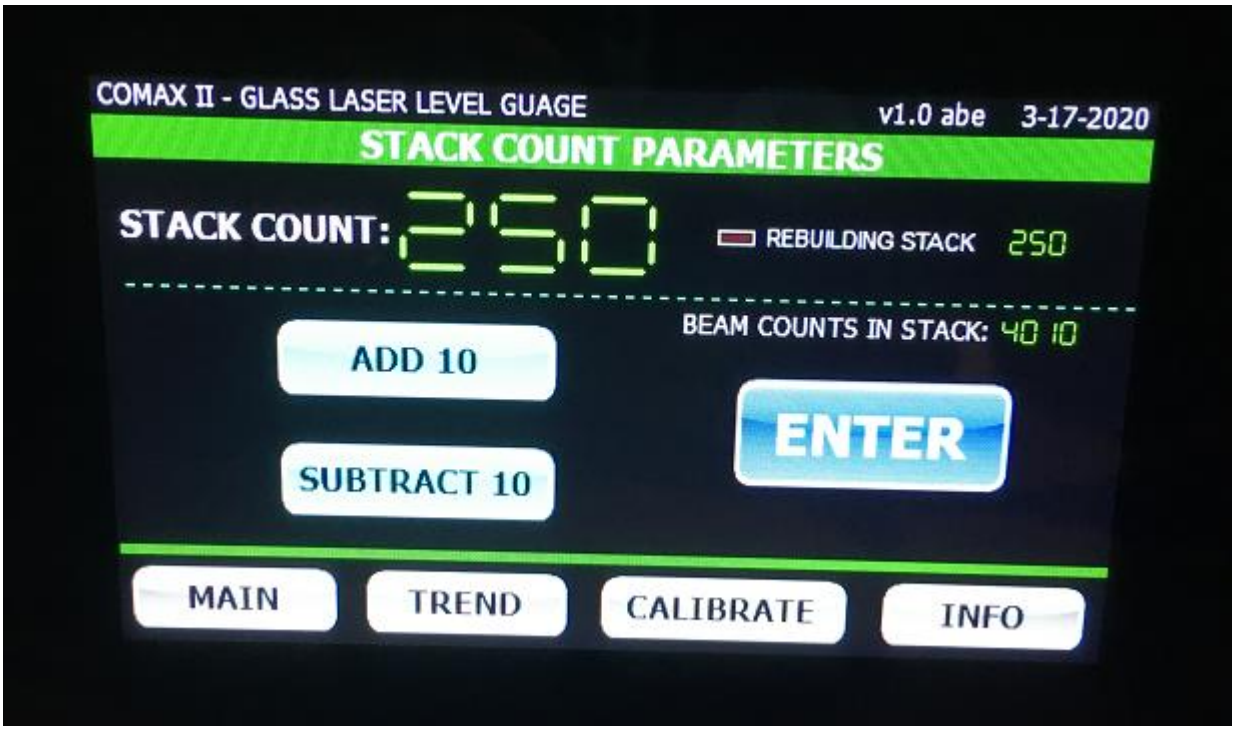
Stack Count screen:

Purpose of the stack count is to filter the glass level readings.

Display current stack set-point.
Will indicate that the stack is being rebuilt with a flashing red indicator and stack counter.
Will also show beam pulse counts entering stack.

To adjust stack count set-point:

1. Touch either “ADD 10” or “SUBTRACT 10” pushbuttons to enter desired new set-point.
2. Touch the “ENTER” pushbutton to enter new stack count set-point.
3. The stack will start to rebuild collecting new glass level samples. During this time the glass level reading will not change from it’s current value until the stack is rebuilt.
4. After the stack is rebuilt, will enter the newest reading into the stack replacing the oldest reading and then will re-average the glass level reading. The stack is a FIFO first reading in first reading out in a round robin sequence.



Calibration screen:

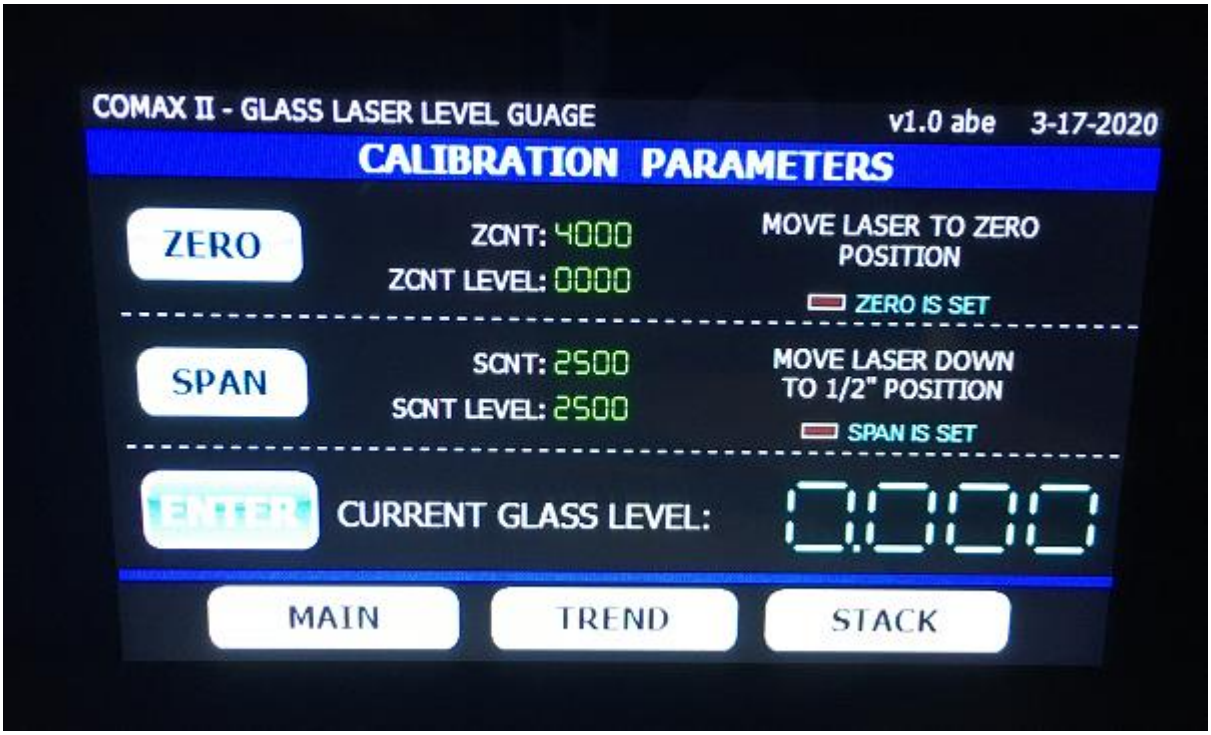
To recalibrate the system, need to set-up the “zero” and “span” of the glass level readings.

Zero Calibration:

1. Move laser to zero position, glass level at 0.000.
2. Current glass level reading is displayed at the bottom of screen.
3. Touch the “ZERO” pushbutton. Zero is set indicator will turn on.
   Note: if don’t want to use zero values, just touch the “ZERO” pushbutton again and the previous set-up will return.
4. Touch the “ENTER” pushbutton to enter the new zero values.
   - (Beam pulse count and level reading)

Span Calibration:

1. Move laser to ½” position, glass level reading at 0.250.
   - (move laser down ½” inch to indicate ¼” reading)
2. Current glass level reading is displayed at the bottom of screen.
3. Touch the “SPAN” pushbutton. Span is set indicator will turn on.
   Note: if don’t want to use zero values, just touch the “SPAN” pushbutton again and the previous set-up will return.
4. Touch the “ENTER” pushbutton to enter the new zero values.
   - (Beam pulse count and level reading)



Trending screen:

5 minute trend displaying the glass level reading.

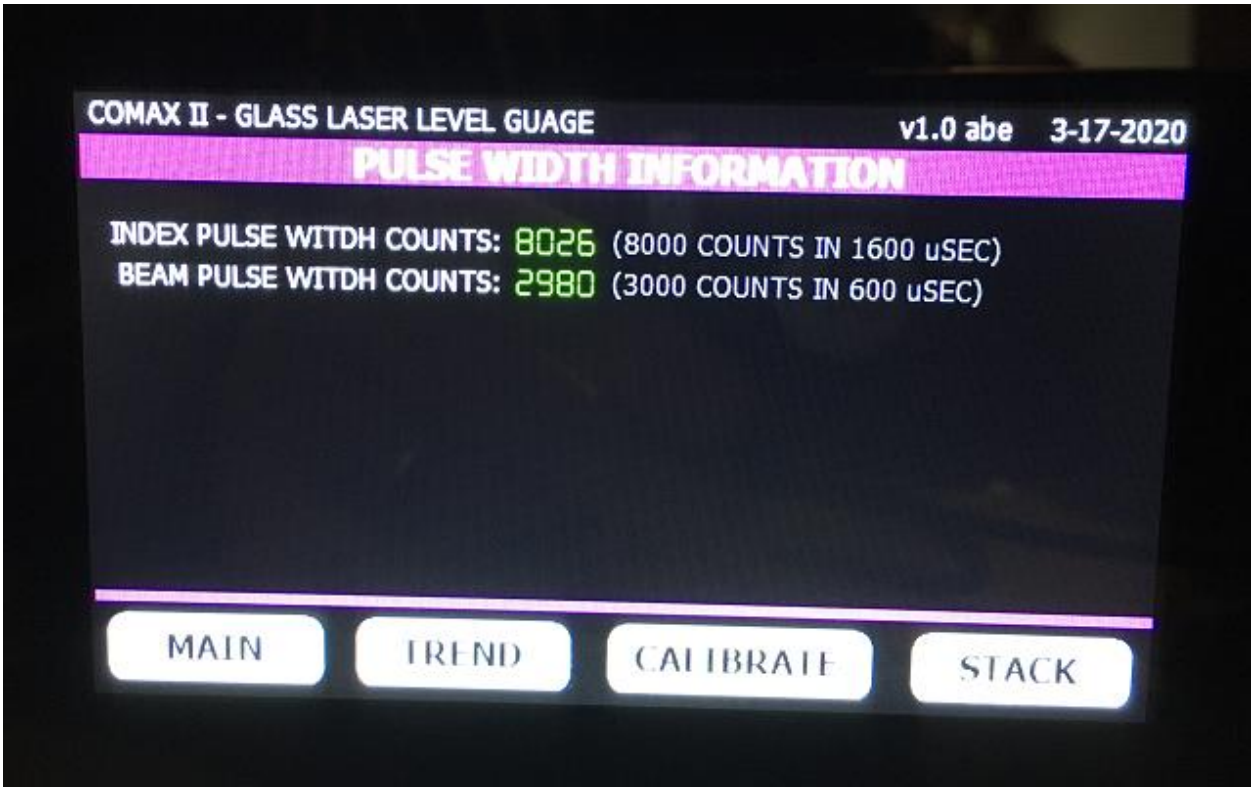
Top of screen:
Top left: displays current level reading.
Top right: shows beam pulse counts going into stack and next to this is the stack count.
Bottom Left: display current beam pulse count.

Index/Beam Pulse Information screen:

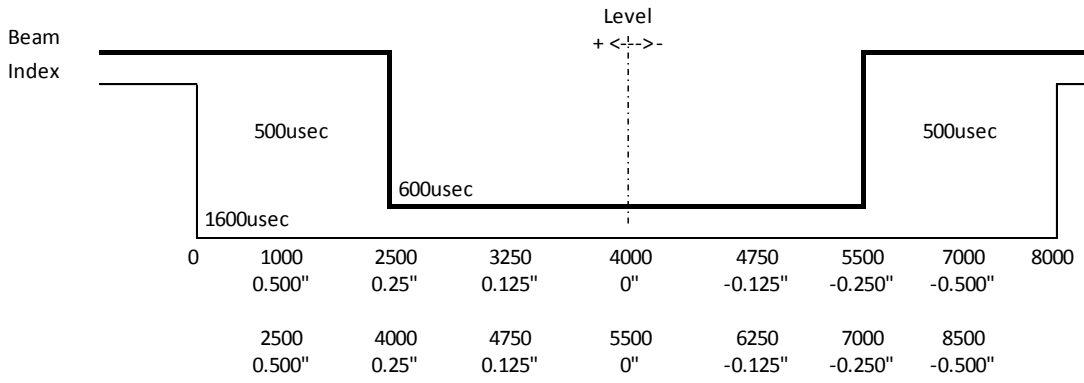
Displays information about the index and beam pulsing.

- This was the heart of the project trying to read 0.2 microsecond counts coming from the laser/receiver units. Needed a scan rate of 5 MHz, the processor used is running at 16 MHz so was able to scan fast enough and keep up will counting beam pulses.
- Information from existing system operation was gathered from old manuals and documentation.
- The existing system uses hardware chips to count pulses but requires several cards, which are expensive.
- The new design only uses 1 main processing board.

- This display allows for easy troubleshooting the laser/receiver units to ensure they are working properly.



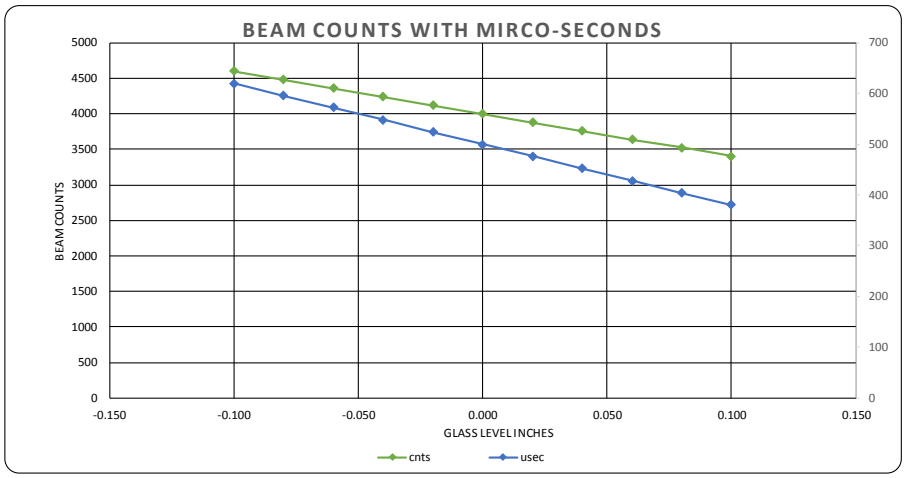
Index and Beam Pulse Relationship:



Index/Beam Pulse Information screen: (continued)

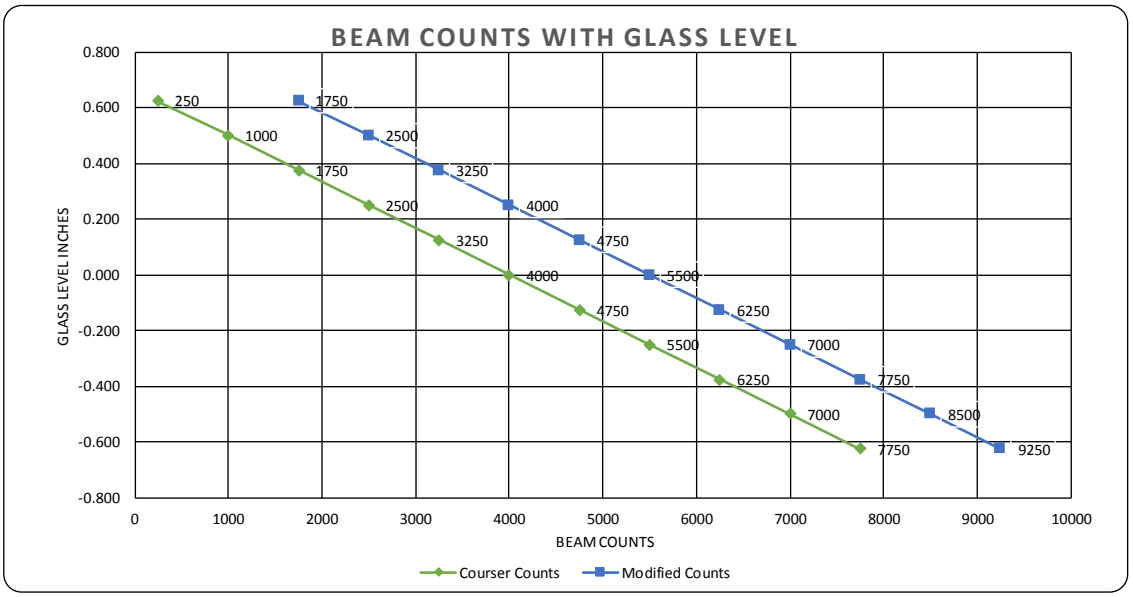
Beam Counts associated with micro second count slices:

8000 cnts	5	cnts/usec	
1600 usec			
6 cnts = 0.001"			
5 cnts = 1 usec	1 cnt = 0.2 usec		
level	cnts	usec	(Beam start pulse)
0.100	3400	380	
0.080	3520	404	
0.060	3640	428	
0.040	3760	452	
0.020	3880	476	= 500-(4000-3880)/5
0.000	4000	500	
-0.020	4120	524	= 500+(4120-4000)/5
-0.040	4240	548	
-0.060	4360	572	
-0.080	4480	596	
-0.100	4600	620	



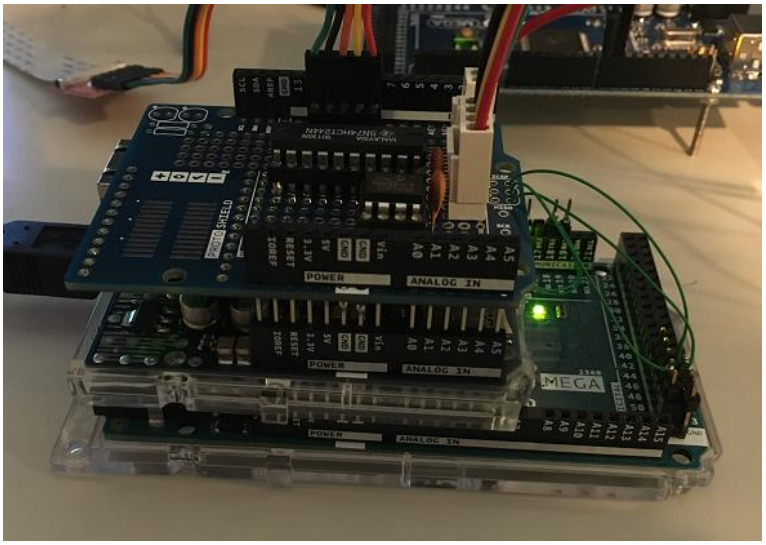
Beam Counts associated with glass level readings:

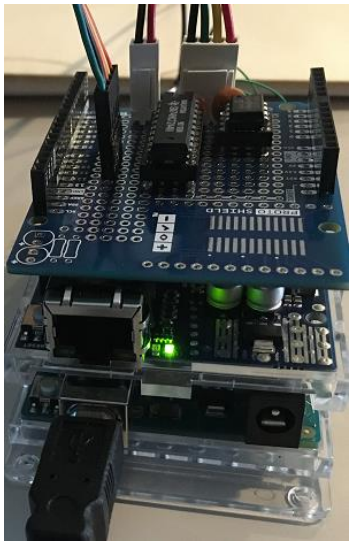
Modified Counts	Courser Counts	Level	Beam uSec Start
1750	250	0.625	
2500	1000	0.500	
3250	1750	0.375	50
4000	2500	0.250	200
4750	3250	0.125	350
5500	4000	0.000	500
6250	4750	-0.125	650
7000	5500	-0.250	800
7750	6250	-0.375	950
8500	7000	-0.500	
9250	7750	-0.625	

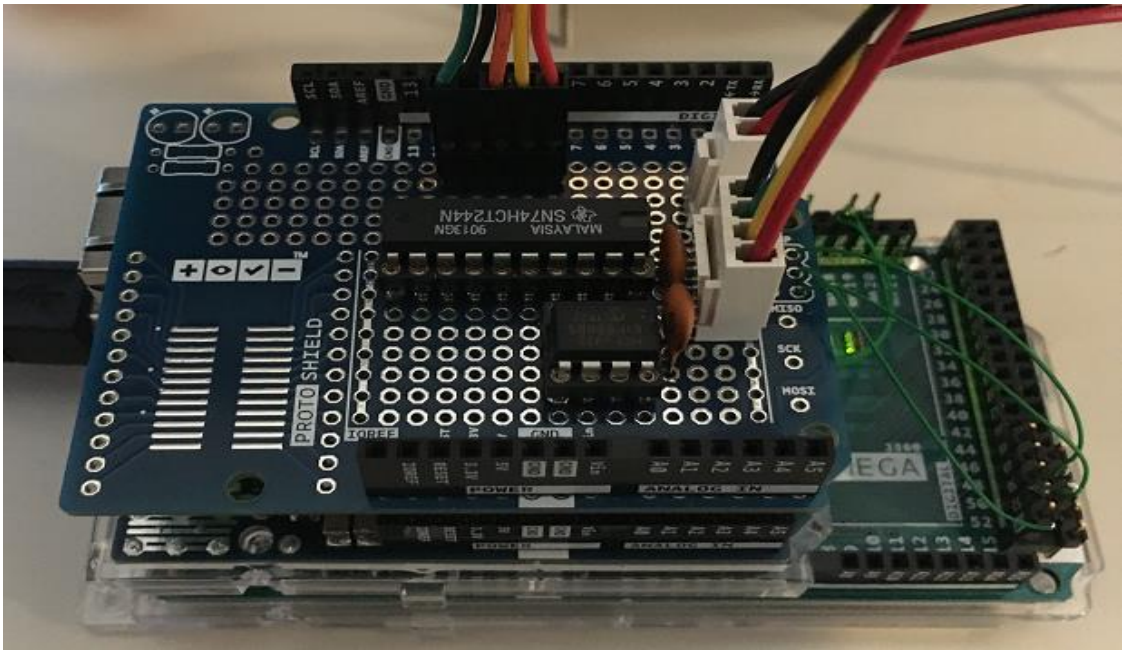


Control boards/hardware electrical print:

Control boards:







Hardware electrical print: