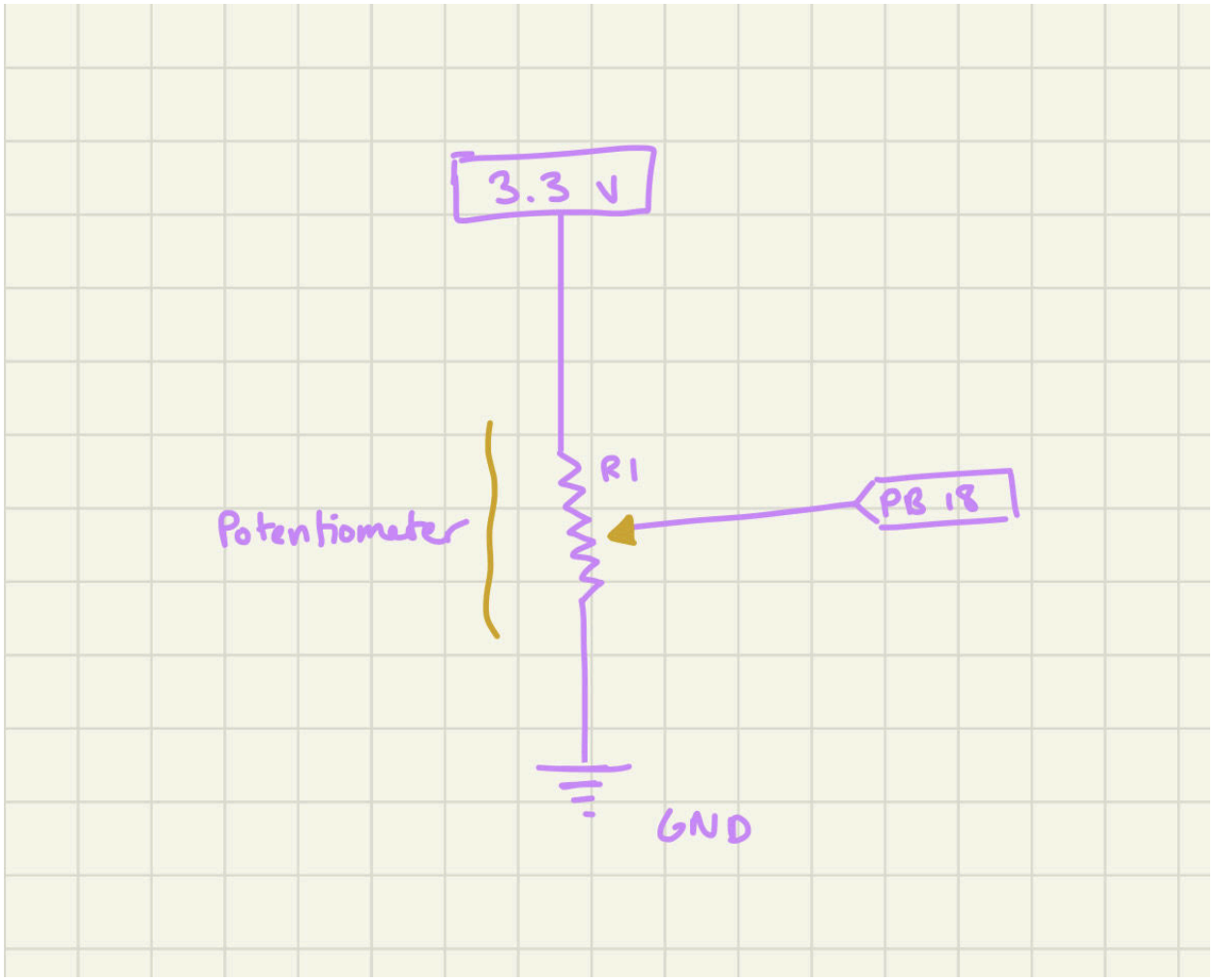
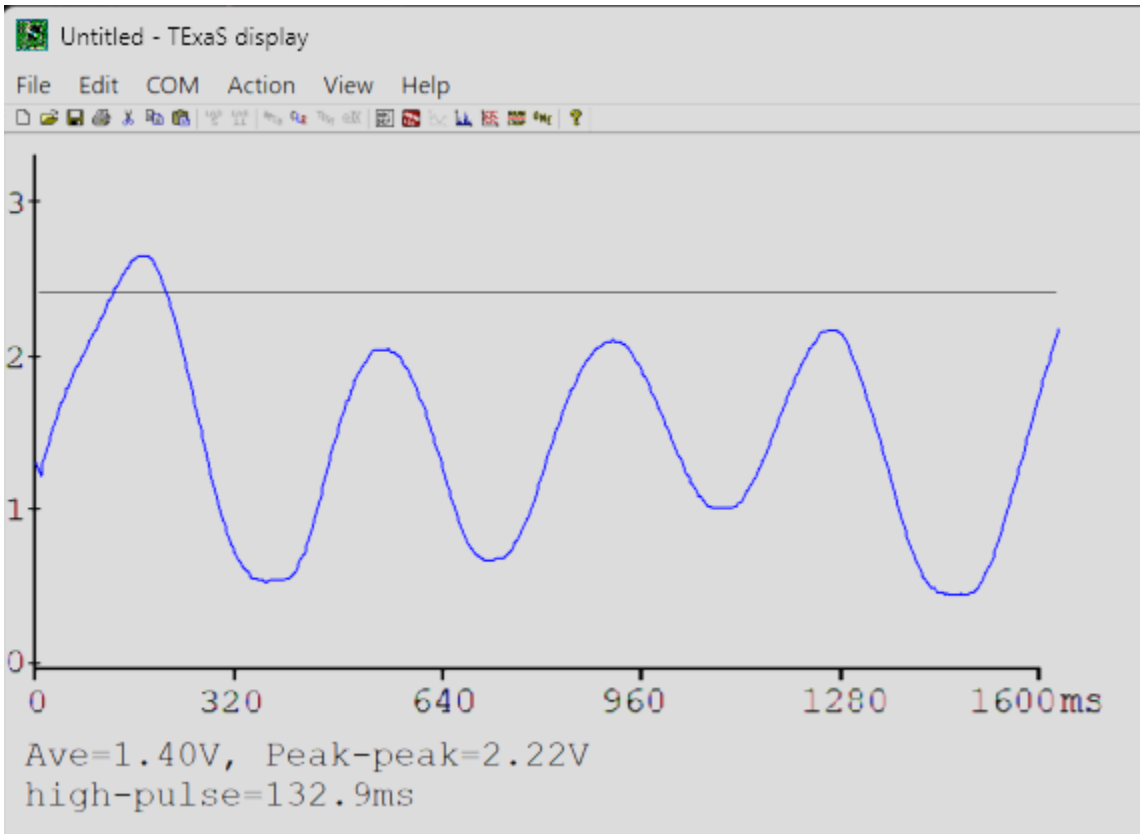
Names: Joshua Koshy and Mikail Sadic
Professor: Telang
EIDS: jk49263 and mfs2447

**1.**



**2**.



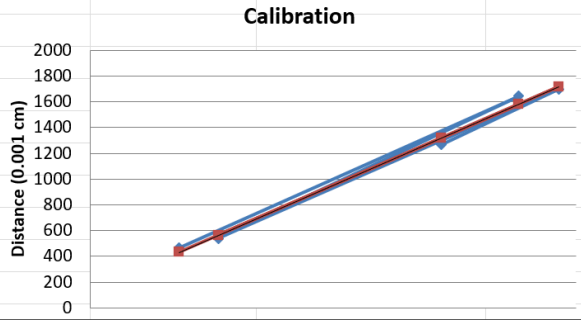

**3.**

ADCtime = 88 cycles
Converttime = 36
OutFixtime = 794436

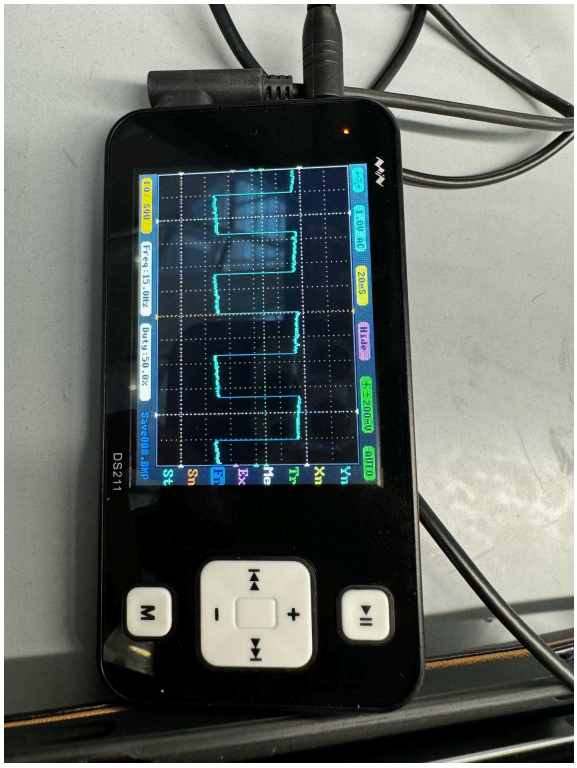
30% of time is required to perform the OutFix Output

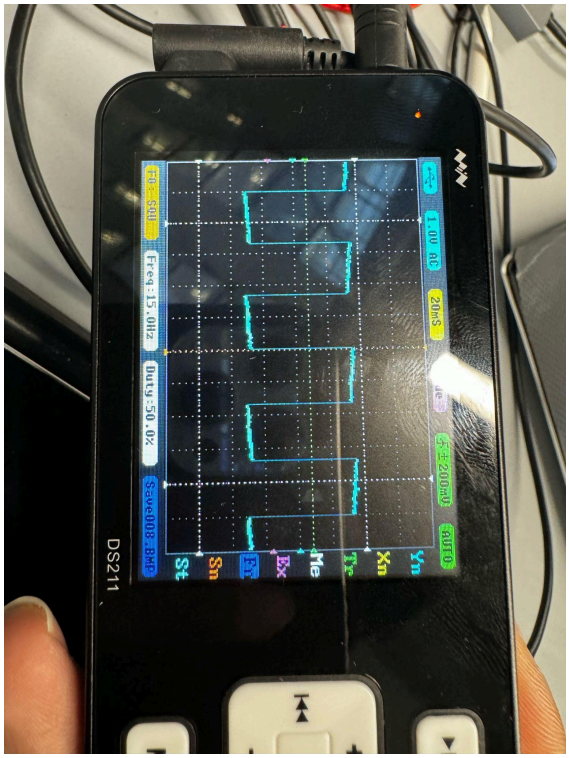
**4.**

| | Do this calibration yourself | | | | | | |
|---|---|---|---|---|---|---|---|
| | y | x | x^2 | x*y | | | |
| | Position (0.001 | ADC Data | | | Fitted Position (0.001c | Error | percent |
| | 465 | 749 | 561001 | 348285 | 432 | -0.033 | 3.30% |
| | 1645 | 3617 | 13082689 | 5949965 | 1581 | -0.064 | 6.40% |
| | 538 | 1081 | 1168561 | 581578 | 565 | 0.027 | 2.70% |
| | 1698 | 3957 | 15657849 | 6718986 | 1717 | 0.019 | 1.90% |
| | 1265 | 2961 | 8767521 | 3745665 | 1318 | 0.053 | 5.30% |
| ium | 5611 | 12365 | 39237621 | 17344479 | | | |
| | n | 5 | | | | Ave | 3.92% |
| | m | 0.400564224 | | | | | |
| | b | 131.6046746 | | | | | |
| | 12 bit | 4096 | | | | | |
| | k1 | 1641 | | | | | |
| | k2 | 132 | | | | | |




**5.**






**6.**

## Average Accuracy Table

| True pos | measured pos | error |
|---|---|---|
| 1.049 cm | 1.029 cm | 0.020 cm |
| 1.717 cm | 1.738 cm | 0.021 cm |
| 0.726 cm | 0.704 cm | 0.022 cm |
| 1.689 cm | 1.691 cm | 0.002 cm |
| 1.268 cm | 1.248 cm | 0.020 cm |

1. Inaccuracies in the calibration, electrical noise in the background and the fact we are only using a 12 bit dac to register the information.
2. Our lab worked very accurately as we received for the most part an average error of only 0.020 centimeters away from the actual amount and our data worked right alongside it.

**7**. My observations through our lab was that although floating point numbers account for a much wider array of values as it can handle much more data and account for bigger values if we were to need, fixed point was better for many purposes including this lab as it handles performance and data at a much faster rate making the lab much simpler and faster than if we were to have utilized floating point numbers instead.

**8.** So what the Nyquist Theorem is basically saying that the sample frequency should be twice of the highest frequency you are measuring which directly applied to our lab as if we moved our potentiometer too fast, the data was skewed and the picture would appear as random points, however if we moved at the right speed of ten samples per period, we could clearly see the visual of the graph wave show up hence the valvano postulate.

**9.** Factors such as non-linearity, sampling depth, the electrical noise of your background and even the buffer that we created through the resistor at the start are all factors that could be affecting the accuracy of our device while measuring data.

**10.**Some conclusions I can defer from our True - Measured graph is that our average error was 0.020 centimeters showing that the accuracy of our lab and potentiometer was very high and the error maintained a constant amount. The small error can be due to factors such as electrical noise of the area we were in while measuring or the calibration.

**11.** Obviously based on CLT, the more data and samples we receive in our potentiometer, the more accurate our table and waves would be when inputting in which is an obvious fact. In our table, we did 5 data points and received an ok linear regression model but we did receive some outliers and offsets, however, if we were to measure much more like 100 samples, I am sure our accuracy of our graph would retain much higher.