Johan Ospina
HW 2

I partnered with Elizabeth Kenny and Evan Lowell for this part.

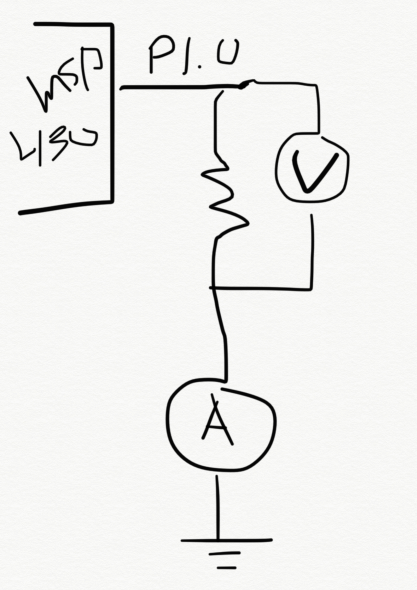


FIG 1 – Active High Circuit

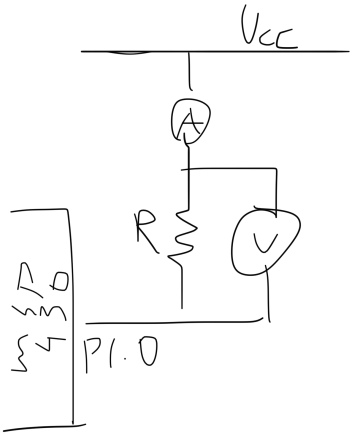
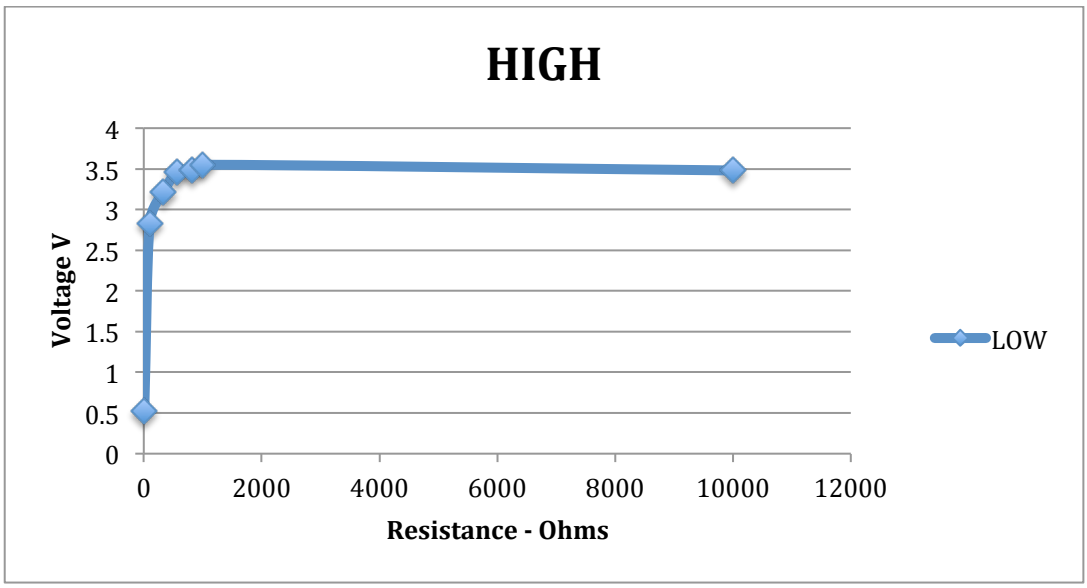


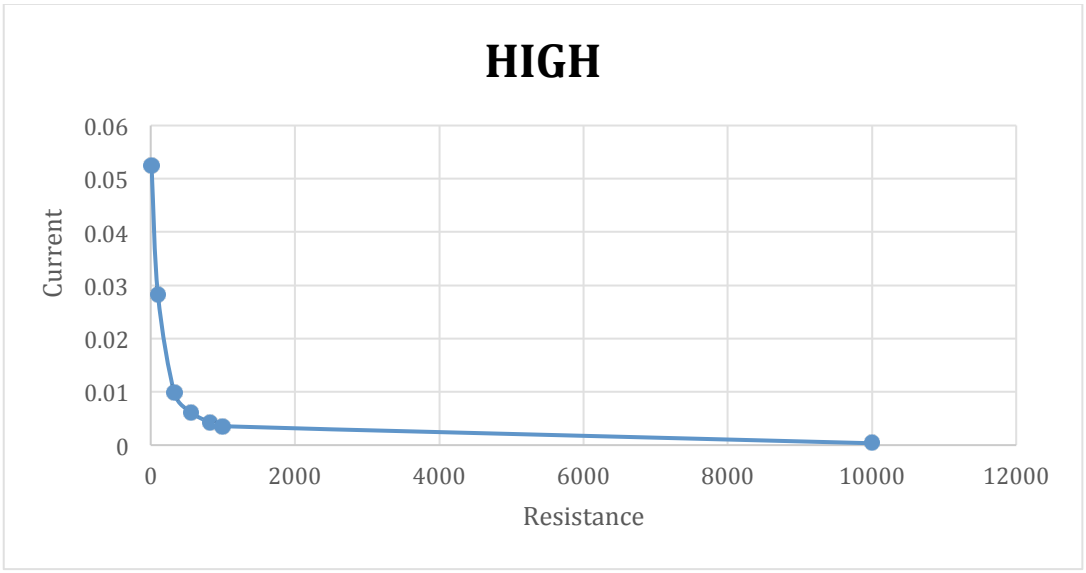
FIG 2 – Active Low Circuit

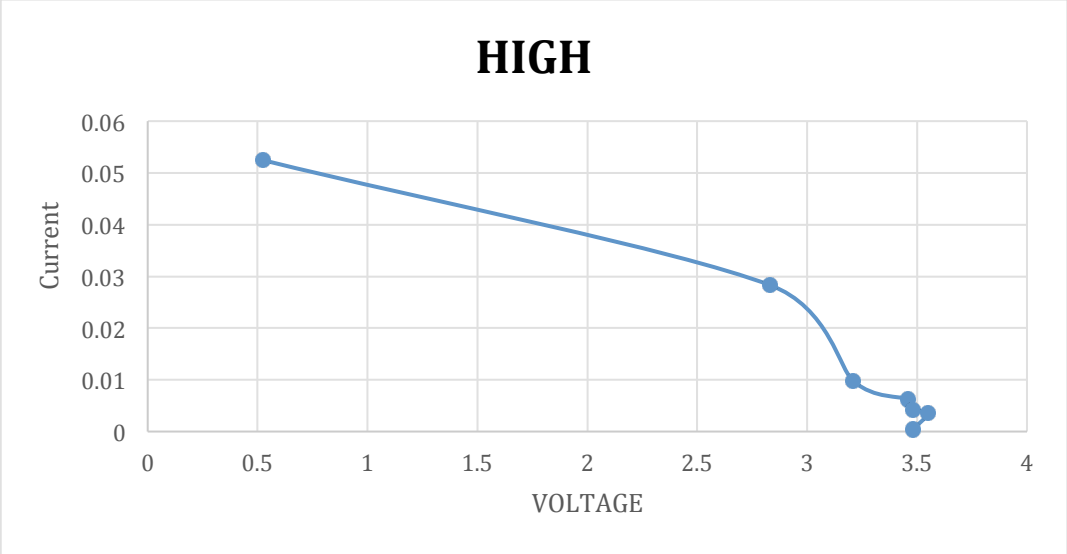
For the Active High Circuit, we measured values from 10 to 10000

Resistance in Ohms	Voltage in V	Current in A
10	0.524	0.0524
100	2.831	0.02831
330	3.21	0.009727273
560	3.46	0.006178571
820	3.48	0.004243902
1000	3.55	0.00355
10000	3.48	0.000348

From this data we plotted some graphs and saw that as resistance went up the active high voltage remained at about 3.5


HIGH
Voltage V
4
3.5
3
2.5
2
1.5
1
0.5
0
0
2000
4000
6000
8000
10000
12000
Resistance - Ohms
LOW

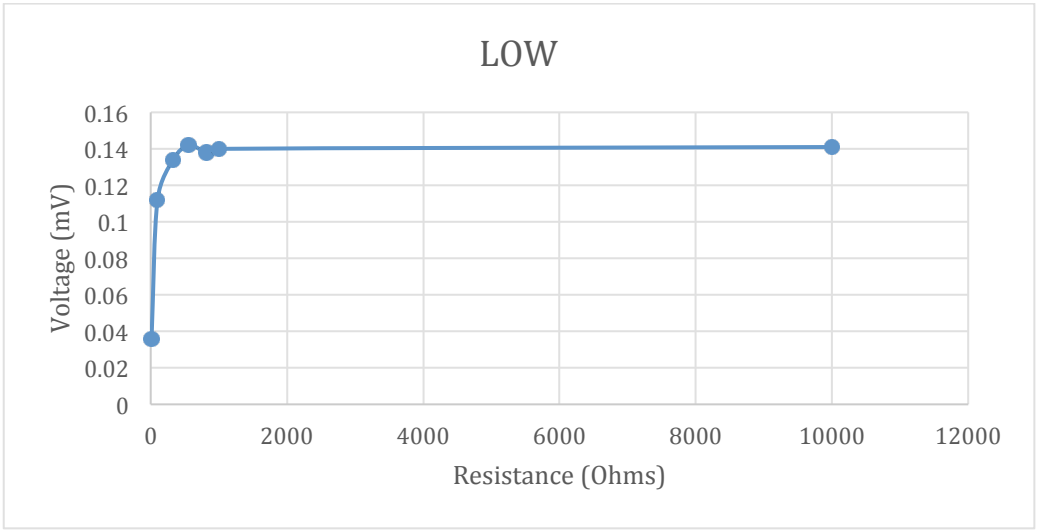

HIGH
Current
0.06
0.05
0.04
0.03
0.02
0.01
0
0
2000
4000
6000
8000
10000
12000
Resistance

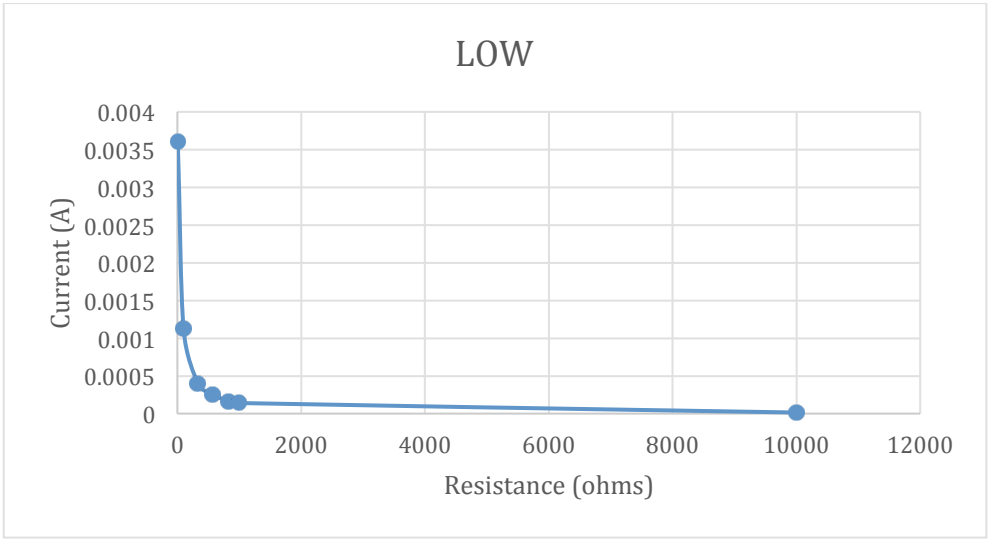


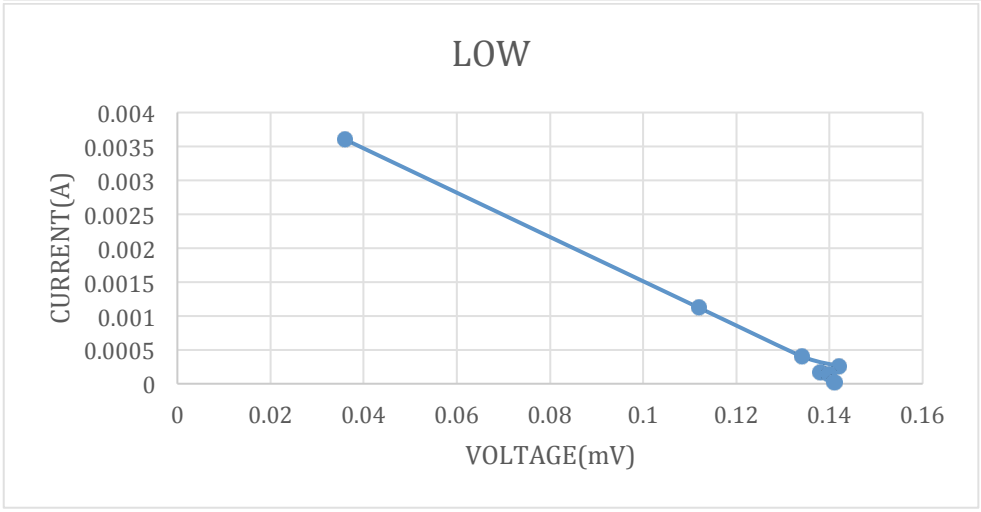
Active Low Configuration

We measured the same resistances but this time in the configuration seen in FIG 2.

Resistance in Ohms	Voltage in mV	Current in A
10	0.036	0.0036
100	0.112	0.00112
330	0.134	0.000406061
560	0.142	0.000253571
820	0.138	0.000168293
1000	0.14	0.00014
10000	0.141	0.0000141







Procedure for measuring DCO frequency.

For this part, a simple program was set up to run a counter until the Watchdog timer's interrupt was called. From there the assembly code of the program was analyzed to come up with a rough but acceptable estimate of the frequency the at which the Digitally Controlled Oscillator was operating using the equation $f = 8 * [average\ of\ count\ variable\ arrays] + 40$

From there, the values of DCO, RSEL and MOD were changed to modify the clock speed of the MCLK to different values.

The data gathered is below and it shows that the clock can be set to around 10MHz by setting bits 0-2 of the DCO and bits 4-1 of the RSEL.

DCO Configuration	Frequency in MHz	DCO value	RSEL value	MOD value
Default	1.065218286	3	7	0
Maximum	19.805613	7	15	0
Tuned to 10MHz from above	10.50110514	3	14	0
Tuned to 10MHz from below	9.810361143	2	14	0

The accuracy is rough at best due to the fact that optimal board operation took place with completely constant values. Though by taking the average of 15 samples, some error was fixed.