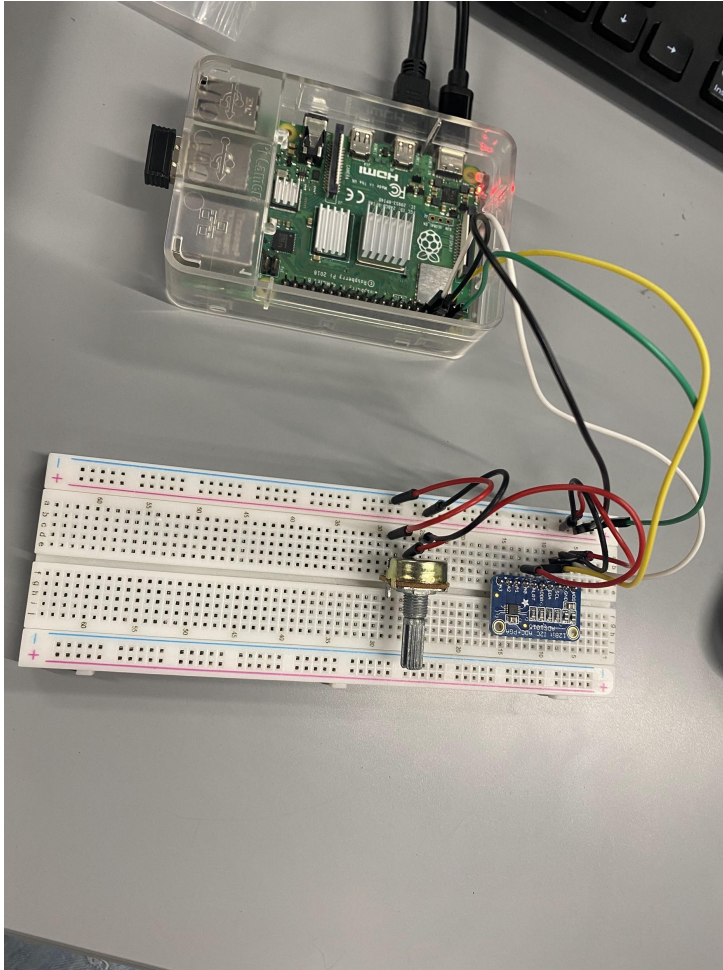


Lab #3 - Analog to Digital and Digital to Analog Conversions

Roger Bennett & Matt Law

1. Exercise 1

1.1

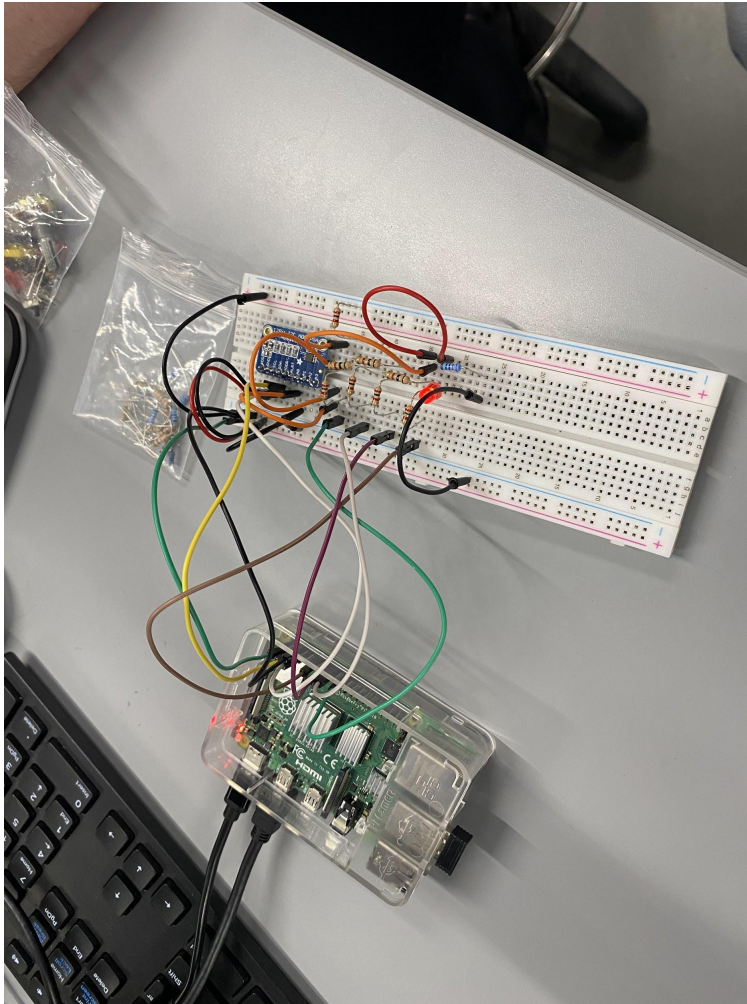


1.2

```
group_01 > ECEN3213Lab3 > @ Lab3EX1.cpp
12 //voltage emitted by the potentiometer.
13
14 //Reference the lab supplement ad1815.pdf and I2CProtocol.pdf
15 //for more details on the Adafruit AD01815 12 Bit converter
16 //and I2C protocol.
17
18 // single-end, 0-6.144V
19
20 //Use g++ -std=c++11 -o Lab3EX1 Lab3EX1.cpp -lwiringPi
21
22 #include <iostream>
23 #include <iomanip>
24 #include <unistd.h>
25 #include <wiringPi.h>
26 #include <wiringPiI2C.h>
27 #include <signal.h>
28 #include <stdlib.h>
29 using namespace std;
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33 int adcVal();
34 int adc;
35 void stop(int);
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3. Exercise 3

3.1



3.2

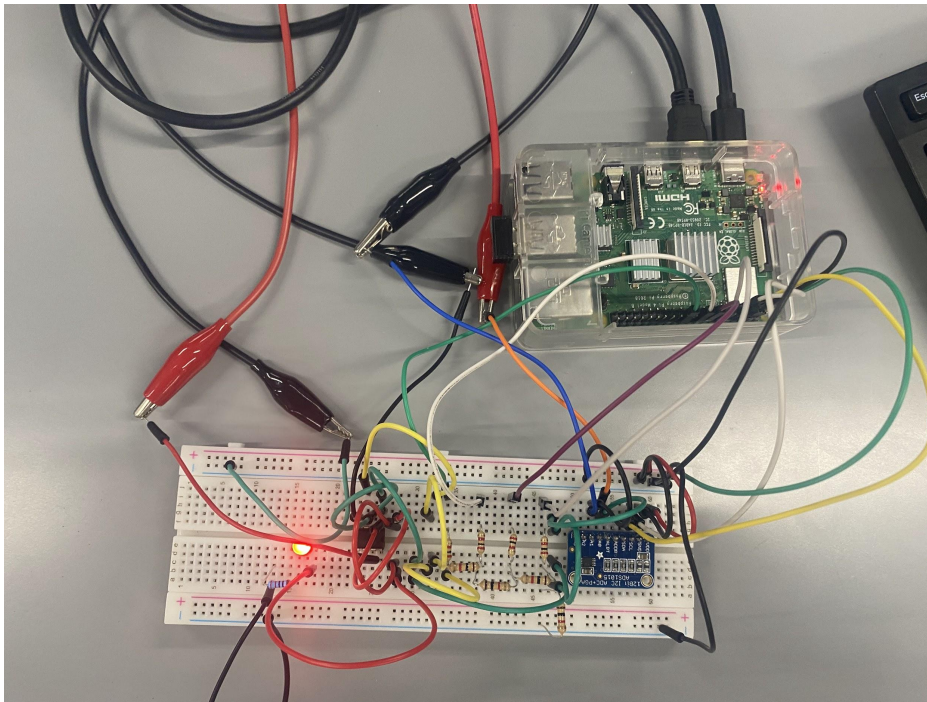
```
The converted analog voltage for the binary input 1111 to R-2R ladder is 2107.03
The converted analog voltage for the binary input 1110 to R-2R ladder is 2036.99
The converted analog voltage for the binary input 1101 to R-2R ladder is 1998.98
The converted analog voltage for the binary input 1100 to R-2R ladder is 1924.94
The converted analog voltage for the binary input 1011 to R-2R ladder is 1908.93
The converted analog voltage for the binary input 1010 to R-2R ladder is 1824.89
The converted analog voltage for the binary input 1001 to R-2R ladder is 1780.87
The converted analog voltage for the binary input 1000 to R-2R ladder is 1640.8
The converted analog voltage for the binary input 0111 to R-2R ladder is 1622.79
The converted analog voltage for the binary input 0110 to R-2R ladder is 1326.65
The converted analog voltage for the binary input 0101 to R-2R ladder is 1170.57
The converted analog voltage for the binary input 0100 to R-2R ladder is 856.418
The converted analog voltage for the binary input 0011 to R-2R ladder is 786.384
The converted analog voltage for the binary input 0100 to R-2R ladder is 856.418
The converted analog voltage for the binary input 0001 to R-2R ladder is 316.154
The converted analog voltage for the binary input 0000 to R-2R ladder is 0
^Cpi@raspberrypi:~/group 01/ECEN3213Lab3 $
```


3.3

Decimal	Binary	Analog Voltage	ELVIS III Reading
00	0000	2107.03mV	2.097V
01	0001	2036.99mV	2.0356V
02	0010	1998.98mV	1.9929V
03	0011	1924.94mV	1.9364V
04	0100	1908.93mV	1.8874V
05	0101	1824.89mV	1.8264V
06	0110	1780.87mV	1.7810V
07	0111	1640.80mV	1.6409V
08	1000	1622.79mV	1.5976V
09	1001	1326.65mV	1.3381V
10	1010	1170.67mV	1.3278V
11	1011	856.418mV	0.8570V
12	1100	786.384mV	0.7877V
13	1101	856.418mV	0.8570V
14	1110	316.154mV	0.31595V
15	1111	0mV	-0.046V

4. Exercise 4

4.1



4.2

```
The converted analog voltage for the binary input 1111 to R-2R ladder is 2123.04
The converted analog voltage for the binary input 1110 to R-2R ladder is 2047
The converted analog voltage for the binary input 1101 to R-2R ladder is 2008.98
The converted analog voltage for the binary input 1100 to R-2R ladder is 1930.94
The converted analog voltage for the binary input 1011 to R-2R ladder is 1912.93
The converted analog voltage for the binary input 1010 to R-2R ladder is 1824.89
The converted analog voltage for the binary input 1001 to R-2R ladder is 1776.87
The converted analog voltage for the binary input 1000 to R-2R ladder is 1626.79
The converted analog voltage for the binary input 0111 to R-2R ladder is 1640.8
The converted analog voltage for the binary input 0110 to R-2R ladder is 1344.66
The converted analog voltage for the binary input 0101 to R-2R ladder is 1186.58
The converted analog voltage for the binary input 0100 to R-2R ladder is 868.424
The converted analog voltage for the binary input 0011 to R-2R ladder is 798.39
The converted analog voltage for the binary input 0100 to R-2R ladder is 868.424
The converted analog voltage for the binary input 0001 to R-2R ladder is 320.156
The converted analog voltage for the binary input 0000 to R-2R ladder is 0
^Cpi@raspberrypi:~/group 01/ECEN3213Lab3 $
```

4.3

Decimal	Binary	Analog Voltage	ELVIS III Reading
00	0000	0	-0.372
01	0001	0.156076	0.156
02	0010	0.810396	0.812
03	0011	0.546267	0.546
04	0100	0.812397	0.811
05	0101	0.964471	0.967
06	0110	1.19859	1.199
07	0111	1.34866	1.366
08	1000	1.6328	1.635
09	1001	1.78887	1.791
10	1010	2.02099	2.023
11	1011	2.17706	2.178
12	1100	2.44119	2.443
13	1101	2.58926	2.596
14	1110	2.82938	2.831
15	1111	2.98546	2.986

Supplemental Questions

1. In this lab, we learned how to implement an ADC, or Analog Digital Converter, to get a voltage from a circuit and convert it between the two forms of numbers. We also got to mess around with a potentiometer to manually change the voltage, and we also learned how to have a program slowly lower the voltage over time, and show it through an LED slowly getting dimmer.
2. These lines of code are used to reverse the high 8-bit and low 8-bit of the output data.
3. The columns for each respective table between 3 and 4 are inverses of each other. One reason this is the case is because on the Ex4, the current starts at a high voltage and slowly comes down, which is the opposite of Ex3.