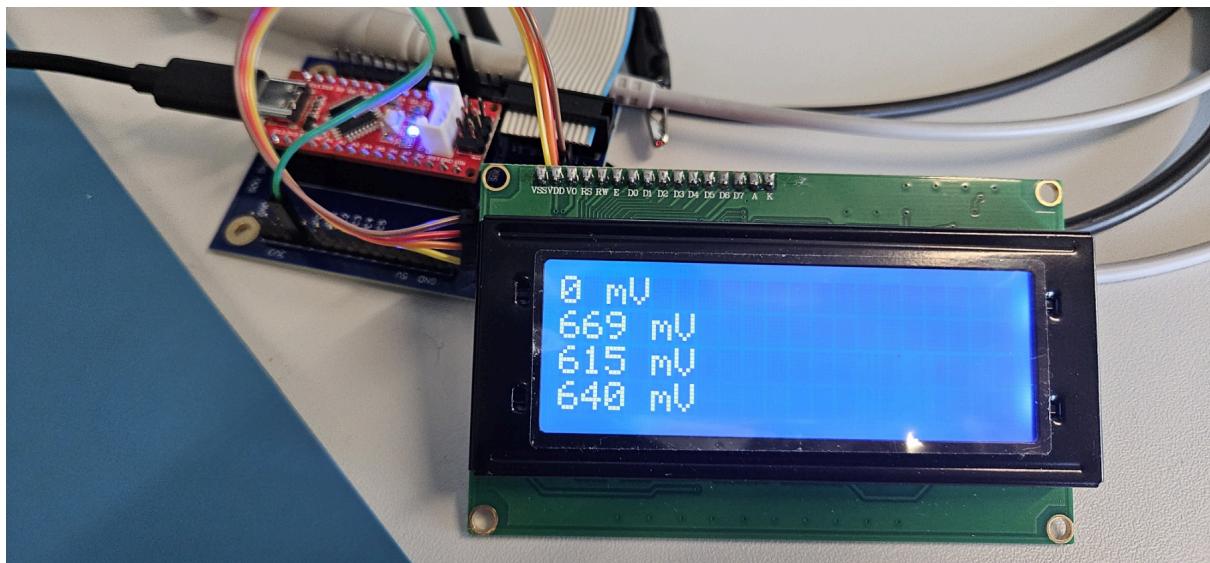
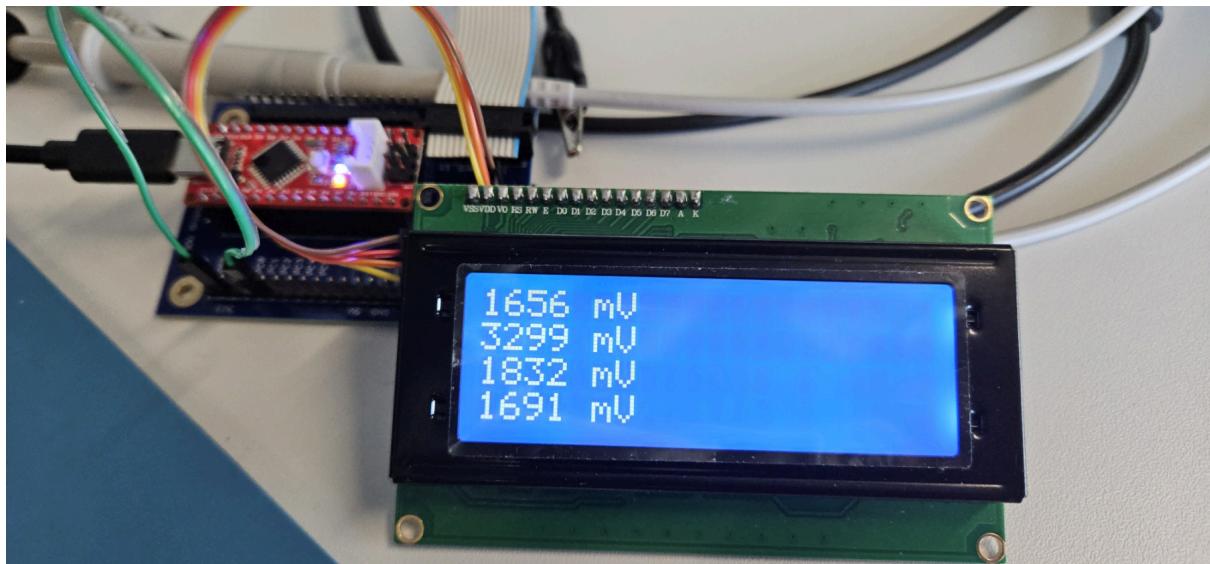


Practice Assignment 8 - EMB2

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1. 8a

The first part of the assignment required us to use 4 channels of the ADC of the arduino to convert 4 external analog voltages to digital values and display them on an LCD.



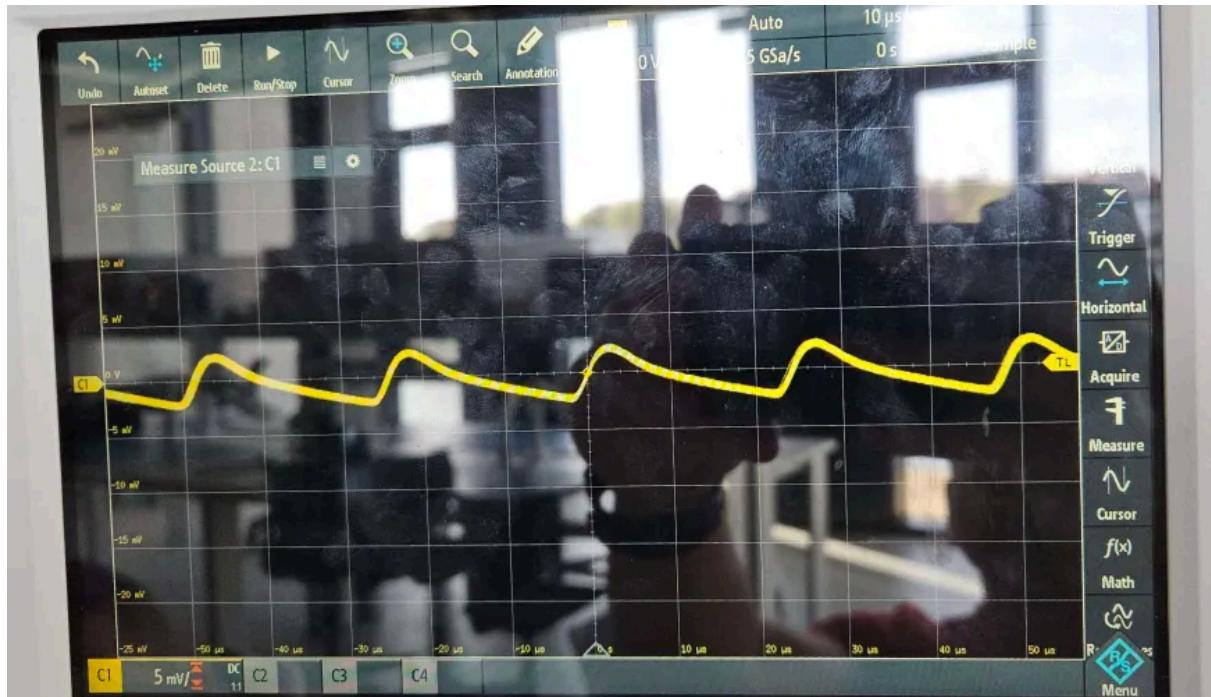
src\main.c

```
1 #include <stdio.h>
2 #include <stdint.h>
3 #include <avr/io.h>
4 #include <util/delay.h>
5 #include <time.h>
6 #include <math.h>
7
8 #include "uart.h"
9 #include "i2cmaster.h"
10 #include "lcd.h"
11 #include "lm75.h"
12 #include <avr/eeprom.h>
13 #include <avr/interrupt.h>
14
15 #define ADC_PIN 0
16
17 uint16_t adc_read(uint8_t adc_channel);
18
19 int main(void) {
20
21     uint16_t adc_result[4];
22
23     //uart_init();
24     //io_redirect();
25     i2c_init();
26     LCD_init();
27
28     //shield board init
29     DDRD = 0b11110000;
30     DDRC = 0x00;
31     PORTC = 0b00000000;
32     DDRB |= 1 << PB5;
33
34     ADMUX = (1 << REFS0);
35
36     ADCSRA |= (1 << ADPS2) | (1 << ADPS1) | (1 << ADPS0) | (1 << ADEN);
37
38     while (1)
39     {
40         for (int i = 0; i <= 3; i++)
41         {
42             LCD_set_cursor(0,i);
43             adc_result[i] = adc_read(i);
44             adc_result[i] = ((float)adc_result[i]*5000)/1023;
45             printf("%d mV", adc_result[i]);
46             if (adc_result[i] > 1000)
47             {
48                 PORTB |= 1 << PB5;
```

```
49     }
50     else
51     {
52         PORTB &= ~(1 << PB5);
53     }
54 }
55 _delay_ms(1000);
56 LCD_clear();
57 }
58 }
59
60 uint16_t adc_read(uint8_t adc_channel)
61 {
62     ADMUX &= 0xF0;
63     ADMUX |= adc_channel;
64     ADCSRA |= (1 << ADSC);
65     while ((ADCSRA & (1 << ADSC)));
66
67     return ADC;
68 }
69 }
```

2. 8b

The second part of the assignment required us to use the PCF8591 chip to make a DAC - generate a signal from the arduino and then have it converted to an analog value and then measure it with the oscilloscope.



src\main.c

```
1 #include <stdio.h>
2 #include <stdint.h>
3 #include <avr/io.h>
4 #include <util/delay.h>
5 #include <time.h>
6 #include <math.h>
7
8 #include "uart.h"
9 #include "i2cmaster.h"
10 #include "lcd.h"
11 #include "lm75.h"
12 #include <avr/eeprom.h>
13 #include <avr/interrupt.h>
14
15 #include "pcf8591.h"
16
17 #define ADC_PIN 0
18
19 int main(void) {
20
21     //uart_init();
22     //io_redirect();
23     i2c_init();
24     LCD_init();
25     pcf8591_init();
26     int a;
27
28     //shield board init
29     DDRD = 0b11110000;
30     DDRC = 0x00;
31     PORTC = 0b00000000;
32     DDRB |= 1 << PB5;
33
34     while (1)
35     {
36         for (a = 0; a < 250; a=a+10)
37         {
38             _delay_ms(100);
39             set_value(a);
40         }
41     }
42 }
```