

ProjectPrototypeSoftware

James Eyler

Each step of the assignment has a brief summary describing the step(s)

Part 1: Steps 3.5 - 3.7

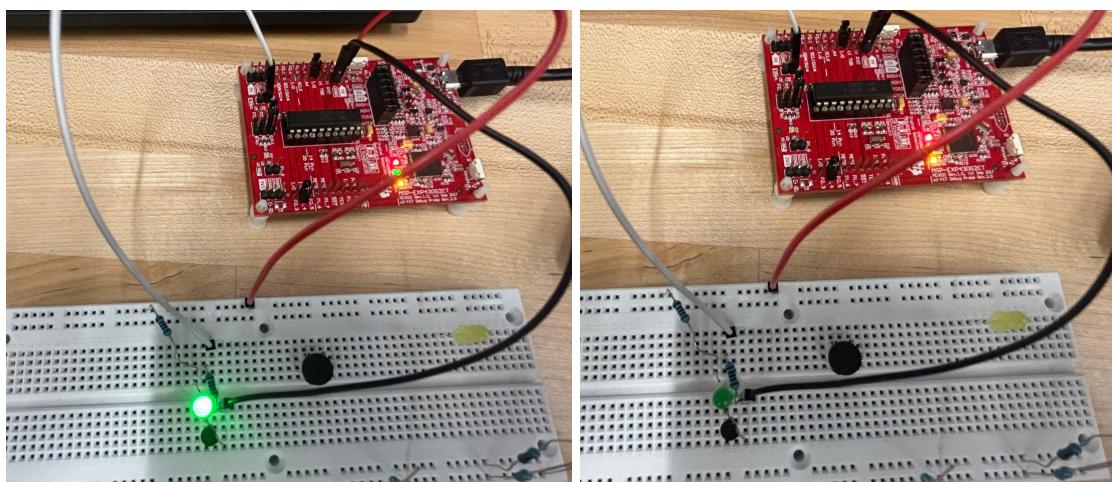
3.5 - Create the code and prototype board for the blinking LED

CODE

```
#include <msp430.h>
#include <stdio.h>
#include <Junior_Design.h>

/***
 * main.c
 */
int main(void)
{
    WDTCTL = WDTPW | WDTHOLD; // stop watchdog timer
    Init_HW();
    // LCD_Initialize();
    while(1)
    {
        P1OUT ^= BIT0;
        Delay_Timer(DELAYT_500ms);
    }

    return 0;
}
```



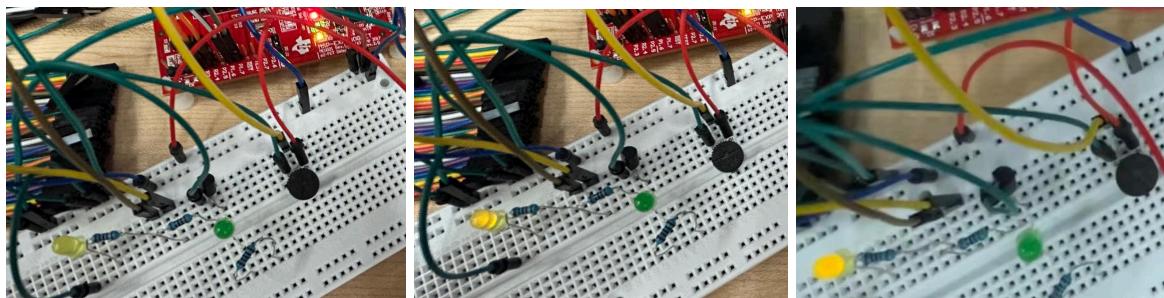
3.6, 3.7 - Create the code and prototype for the dimmable LED

CODE

```
#include <msp430.h>
#include <stdio.h>
#include <Junior_Design.h>

/***
 * main.c
 */
int main(void)
{
    WDTCTL = WDTPW | WDTHOLD; // stop watchdog timer
    Init_HW();
    // LCD_Initialize();
    P1OUT |= BIT1;
    Duty = 100;
    while(1)
    {
        if(Duty == 0)
        {
            Duty = 100;
        }
        Delay_Timer(DELAYT_500ms);
        if(Duty == 100)
        {
            Duty = 0;
        }
        Delay_Timer(DELAYT_500ms);
    }

    return 0;
}
```



The yellow LED is the active LED and the pictures range from lowest duty cycle to highest

Part 2: Steps 3.9 - 3.10

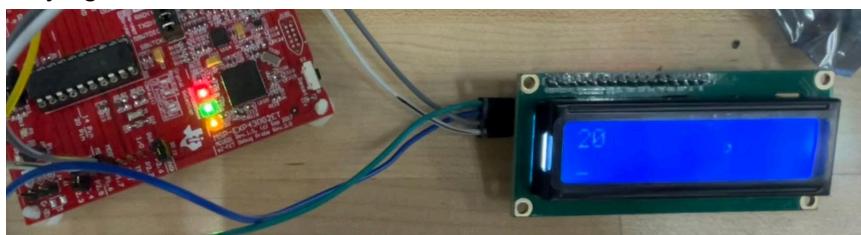
3.9 - Create a code the increments values by 10 onto the LCD screen

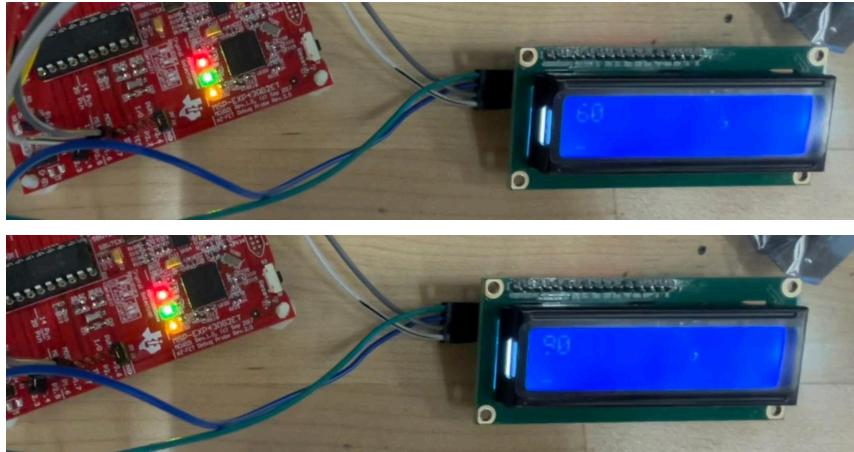
CODE

```
#include <msp430.h>
#include <stdio.h>
#include <Junior_Design.h>

int main(void)
{
    int i = 0;
    Init_HW();
    LCD_Initialize();
    char Data2[32] = "";
    WDTCTL = WDTPW | WDTHOLD;      // stop watchdog timer
//    char Data[] = "Junior Design";
    while (1)
    {
        LCD_CLRscreen();
//        LCD_String(Data);
//        Delay_Timer(DELAYT_500ms);
        i = (i + 10) % 100;
        Duty = i;
        sprintf(Data2, "%d", (int)Duty);
        LCD_String(Data2);
        LCD_Cursor_Postion(0x40);
        LCD_Cursor_On_No_Blink();
        Delay_Timer(DELAYT_500ms);
    }
    return 0;
}
```

Varying Values on LCD:



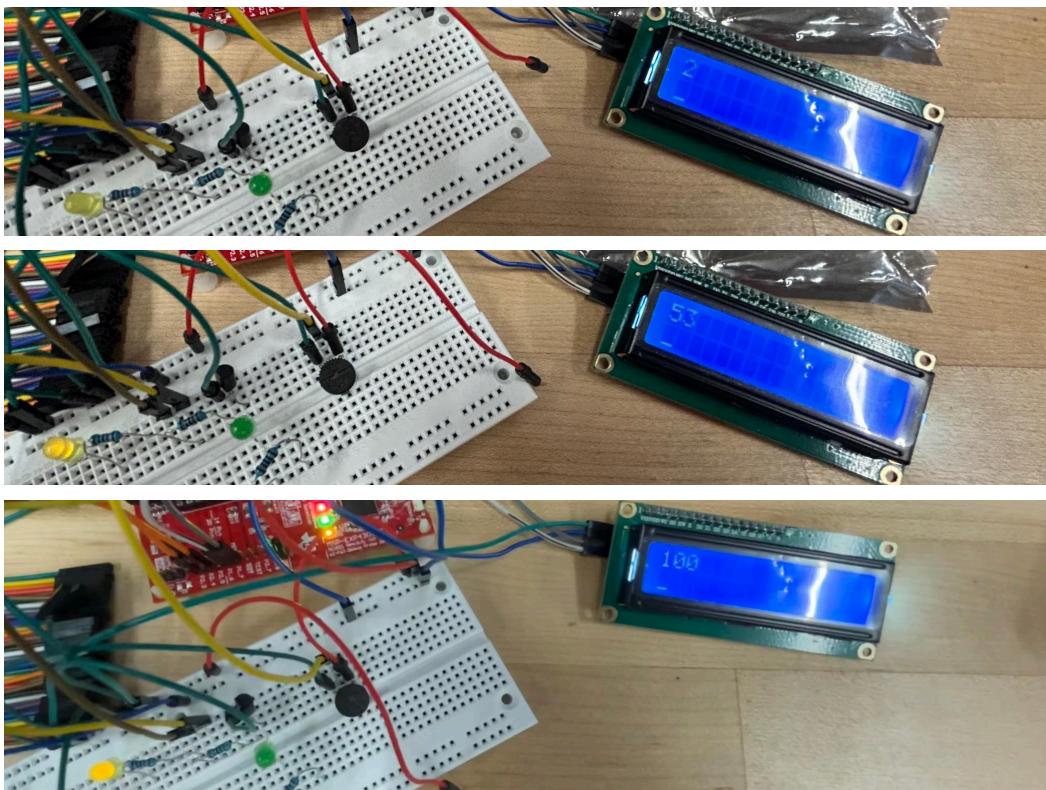


3.10 - Create a code that displays the value of the duty cycle determined by the $10k\Omega$ resistor

CODE

```
#include <msp430.h>
#include <stdio.h>
#include <Junior_Design.h>
int main(void)
{
    static unsigned int ADC_Result;
    Init_HW();
    LCD_Initialize();
    char Data2[32] = "";
    WDTCTL = WDTPW | WDTHOLD; // stop watchdog timer
    while (1)
    {
        LCD_CLRscreen();
        ADC_Result = ADC_Read();
        Duty = (int)((float)ADC_Result / (float)10.23);
        sprintf(Data2, "%d", (int)Duty);
        LCD_String(Data2);
        LCD_Cursor_Positon(0x40);
        LCD_Cursor_On_No_Blink();
        Delay_Timer(DELAYT_500ms);
    }
    return 0;
}
```

Varying LED levels on LCD:



Part 3: Steps 3.12 - Create a code that displays measurement values from the ultrasonic sensor onto the LCD screen

CODE

```
#include <msp430.h>
#include <stdio.h>
#include <Junior_Design.h>

int main(void)
{
    static unsigned int ADC_Result;
    static unsigned long int d1;
    int d_1, d_10;

    Init_HW();
    LCD_Initialize();
    char Data2[32] = "";
    WDTCTL = WDTPW | WDTHOLD; // stop watchdog timer
//    char Data[] = "Junior Design";
    while (1)
    {
```

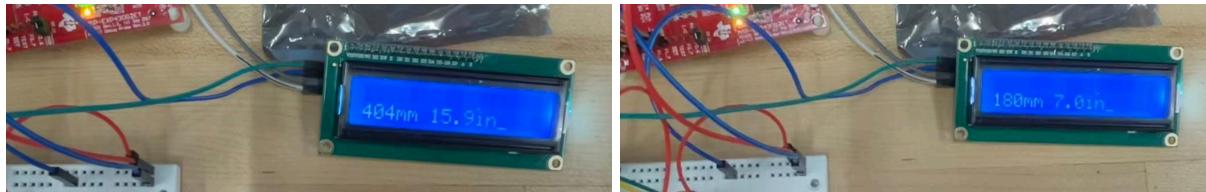
```

LCD_CLRscreen();
Ultrasonic_Trigger();
Delay_Timer(DELAYT_100ms);
d1 = Ultrasonic_Echo_Read();
d_1 = (int) ((float) d1 * 0.066929);
d_10 = (int) ((float) d1 * 0.66929) - d_1 * 10;
LCD_Cursor_Positon(0x40);
LCD_Cursor_On_No_Blink();
sprintf(Data2,"%dmm %d.%din", (int)((float)d1*3.4/2.0), d_1, d_10);
LCD_String(Data2);
Delay_Timer(DELAYT_500ms);
}

return 0;
}

```

Varying Ultrasonic Distances:



Part 4: Steps 3.13 - Create the final code that blinks the LED, creates the dimmable LED based on the potentiometer position, prints the values from the ultrasonic sensor to the LCD along with the duty cycle percentage from the potentiometer

CODE

```

#include <msp430.h>
#include <stdio.h>
#include <Junior_Design.h>

/**
 * main.c
 */
int main(void)
{
    Init_HW();
    LCD_Initialize();
    char Data[] = "Junior Design TI";
    static unsigned int ADC_Result;
    static unsigned long int d1;
    int d_1, d_10;
    LCD_String(Data);

```

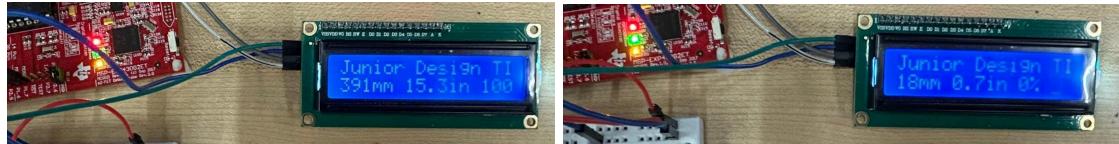
```

char Data2[32] = "";
WDTCTL = WDTPW | WDTHOLD; // stop watchdog timer
// char Data[] = "Junior Design";
while (1)
{
    P1OUT ^= BIT0;
    LCD_CLRscreen();
    LCD_String(Data);
    Ultrasonic_Trigger();
    Delay_Timer(DELAYT_100ms);
    d1 = Ultrasonic_Echo_Read();
    d_1 = (int) ((float) d1 * 0.066929);
    d_10 = (int) ((float) d1 * 0.66929) - d_1 * 10;
    ADC_Result = ADC_Read();
    Duty = (int) ((float) ADC_Result / (float) 10.23);
    LCD_Cursor_Positon(0x40);
    LCD_Cursor_On_No_Blink();
    sprintf(Data2, "%dmm %d.%din %d%% ", (int) ((float) d1 * 3.4 / 2.0),
            d_1, d_10, Duty);
    LCD_String(Data2);

    Delay_Timer(DELAYT_500ms);
}

return 0;
}

```



What I Learned:

I learned how to work with the pinouts from the MSP430 microcontroller to use with external LCD screens, Ultrasonic Sensors, and LEDS. I've done similar projects in the past with Arduino boards but it did not go into this much detail.