

# Design Assignment 3B

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Primary Github address: <https://github.com/WorkuT1226/CPE301.git>

Directory:

Submit the following for all Labs:

- In the document, for each task submit the modified or included code (only) with highlights and justifications of the modifications. Also, include the comments.
  - Use the previously create a Github repository with a random name (no CPE/301, Lastname, Firstname). Place all labs under the root folder ESD301/DA, sub-folder named LABXX, with one document and one video link file for each lab, place modified asm/c files named as LabXX-TYY.asm/c.
  - If multiple asm/c files or other libraries are used, create a folder LabXX-TYY and place these files inside the folder.
  - The folder should have a) Word document (see template), b) source code file(s) and other include files, c) text file with youtube video links (see template).
- 
- **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

List of Components used

Block diagram with pins used in the Atmega328P

- **INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A**

```
#define F_CPU 16000000UL
```

```
#define BAUD_RATE 9600
```

```
#include <avr/io.h>
```

```
#include <util/delay.h>
```

```
#include <avr/interrupt.h>
```

```
void usart_2(unsigned int x);
```

```
int main(void){
```

```
    ADMUX = (0<<REFS1)|
```

```
        (1<<REFS0)|
```

```

(0<<ADLAR)|  

(1<<MUX2)|  

(0<<MUX1)|  

(1<<MUX0);  
  

ADCSRA =(1<<ADEN)|  

(0<<ADSC)|  

(1<<ADATE)|  

(0<<ADIF)|  

(0<<ADIE)|  

(1<<ADPS2)|  

(0<<ADPS1)|  

(1<<ADPS0);  

TCCR1B = 5;  

TIMSK1 = (1<<TOIE1);  

TCNT1 = 49911;  

sei();  

while(1){}
}  
  

ISR(TIMER1_OVF_vect){
    ADCSRA|= (1<<ADSC);
    while((ADCSRA&(1<<ADIF)) == 0);

    ADCSRA |= (1<<ADIF);

    int time = ADCL;
    time = time|(ADCH<<8);
    time = (time/1024) * 4096/10;
    usart_2((time/100) +'0');
    time = time%100;
    usart_2((time/10) + '0');
    time = time%10;
    TCNT1 = 49911;
}
void usart_1(){
    UCSR0B = (1<<TXEN0);
    UCSR0C = (1<<UCSZ01)|(1<<UCSZ00);
    UBRR0L = F_CPU/16/BAUD_RATE - 1;
}

void usart_2(unsigned int x){
    while(!(UCSR0A & (1<<UDRE0)));
    UDR0 = x;
}

```

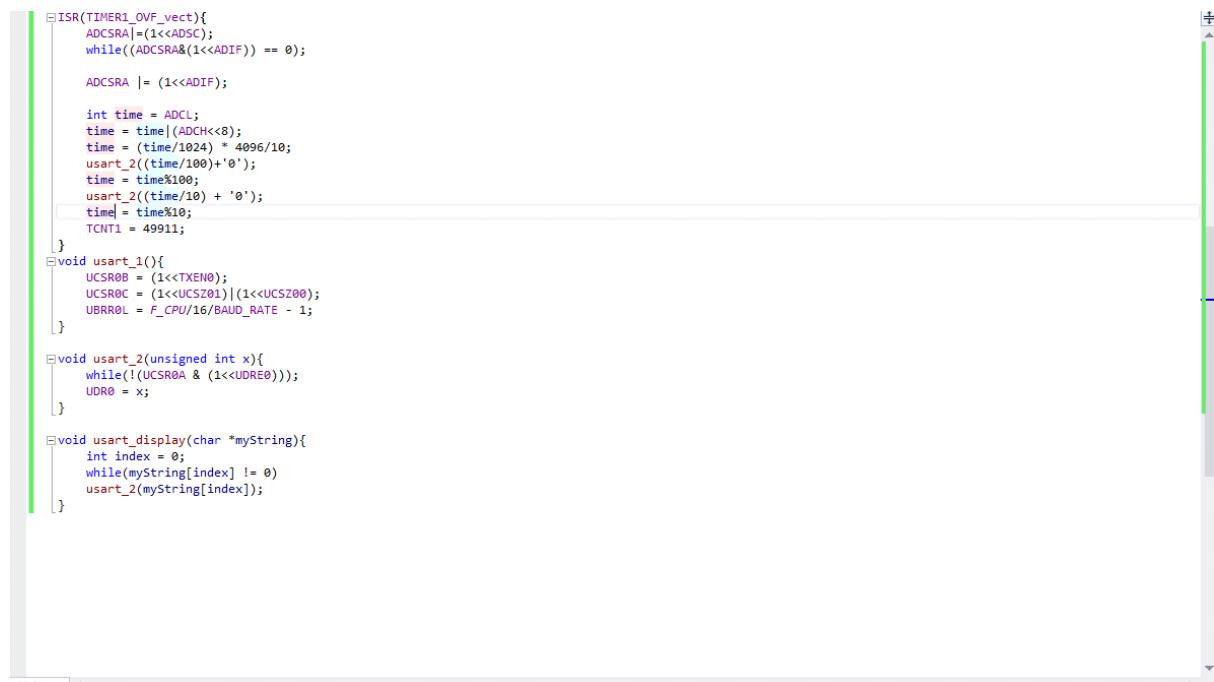
```

}

void usart_display(char *myString){
    int index = 0;
    while(myString[index] != 0)
        usart_2(myString[index]);
}

```

- **SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)**



The screenshot shows the Atmel Studio IDE interface with the code editor open. The code is organized into several functions:

- ISR(TIMER1\_OVF\_vect):** This function handles the timer overflow interrupt. It reads the ADC value from ADCL and ADCH, converts it to a time value, and then calls usart\_2 to send the character representation of the time.
- void usart\_1():** This function initializes the USART. It sets UCSR0B to enable TXEN0 and sets UCSR0C to enable UCSZ01. It also configures the baud rate in UBRRL0.
- void usart\_2(unsigned int x):** This function sends a byte over USART. It waits for UDRE0 to be set and then writes the byte x to UDR0.
- void usart\_display(char \*myString):** This function displays a string over USART. It iterates through the characters in myString and calls usart\_2 for each character.

```
ISR(TIMER1_OVF_vect){
    ADCSRA|= (1<<ADSC);
    while((ADCSRA&(1<<ADIF)) == 0);

    ADCSRA |= (1<<ADIF);

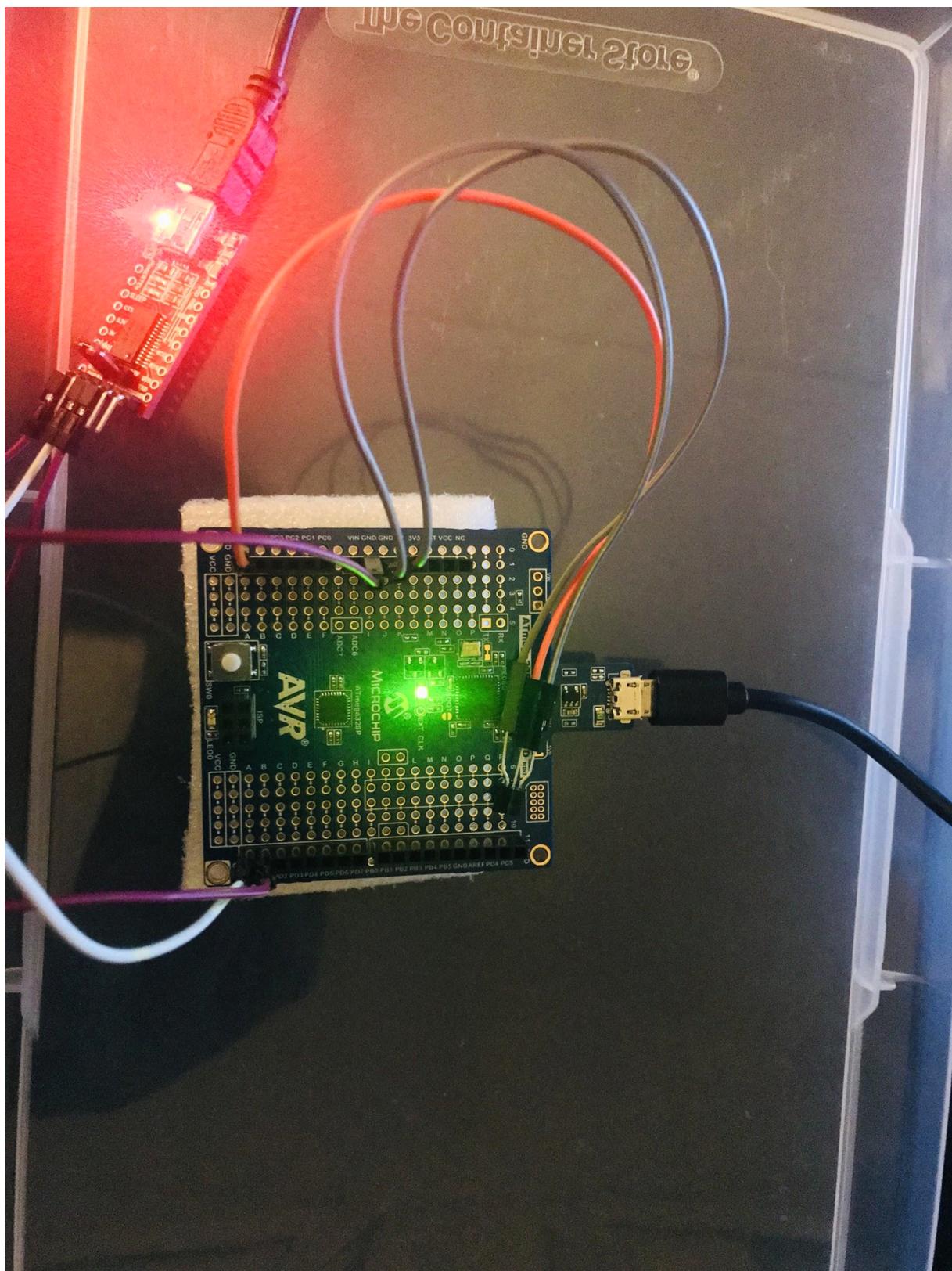
    int time = ADCL;
    time = time|(ADCH<<8);
    time = (time/1024) * 4096/10;
    usart_2((time/100) +'0');
    time_2(time%100);
    usart_2((time/10) + '0');
    time_2(time%10);
    TCNT1 = 49911;
}

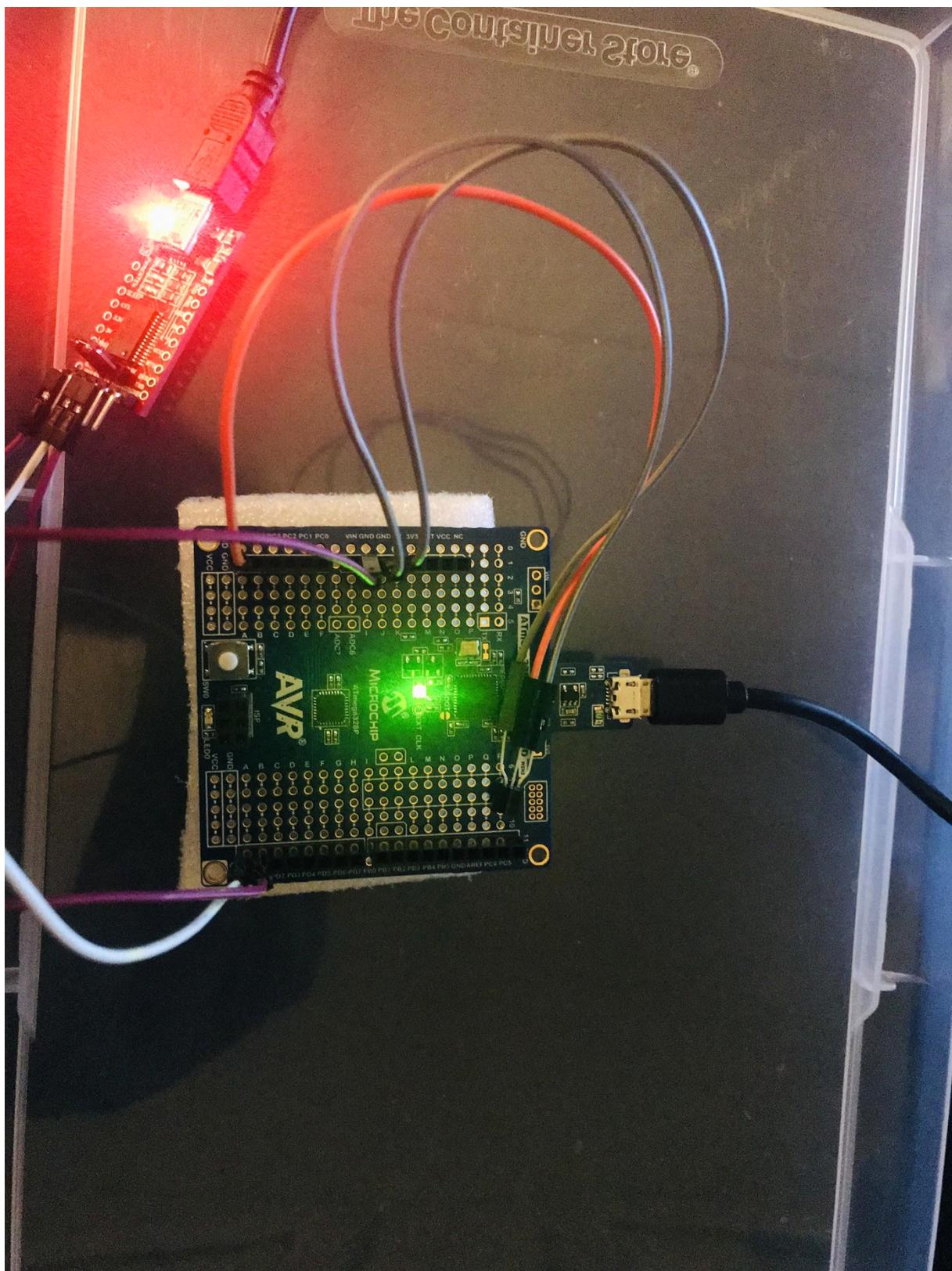
void usart_1(){
    UCSR0B = (1<<TXEN0);
    UCSR0C = (1<<UCSZ01)|(1<<UCSZ00);
    UBRR0L = F_CPU/16/BAUD_RATE - 1;
}

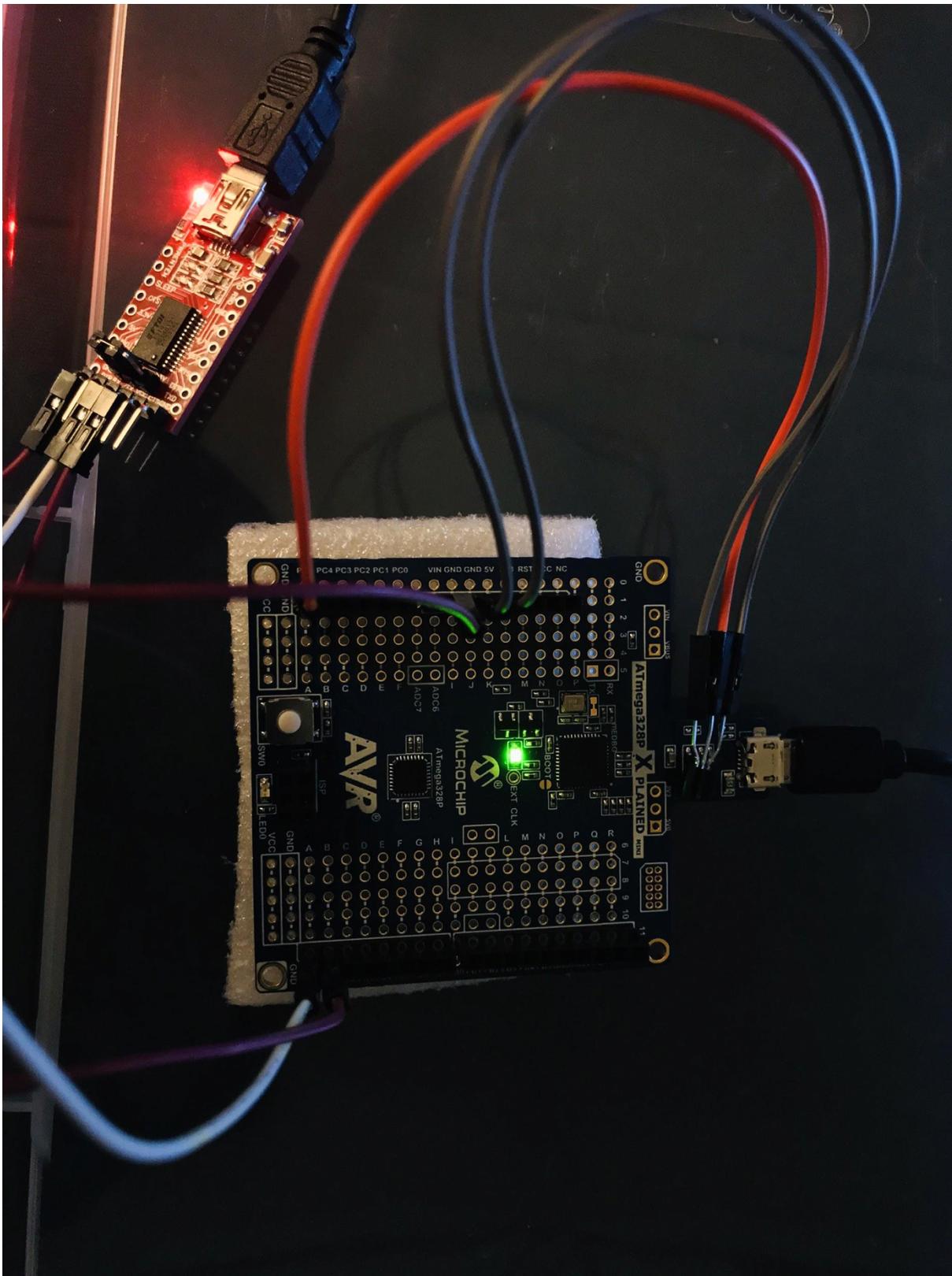
void usart_2(unsigned int x){
    while(!UCSR0A & (1<<UDRE0)));
    UDR0 = x;
}

void usart_display(char *myString){
    int index = 0;
    while(myString[index] != 0)
        usart_2(myString[index]);
}
```

- **SCREENSHOT OF EACH DEMO (BOARD SETUP)**







- VIDEO LINKS OF EACH DEMO

- **GITHUB LINK OF THIS DA**

**Student Academic Misconduct Policy**

<http://studentconduct.unlv.edu/misconduct/policy.html>

*"This assignment submission is my own, original work".*

Worku Tafara