

# Design Assignment 3

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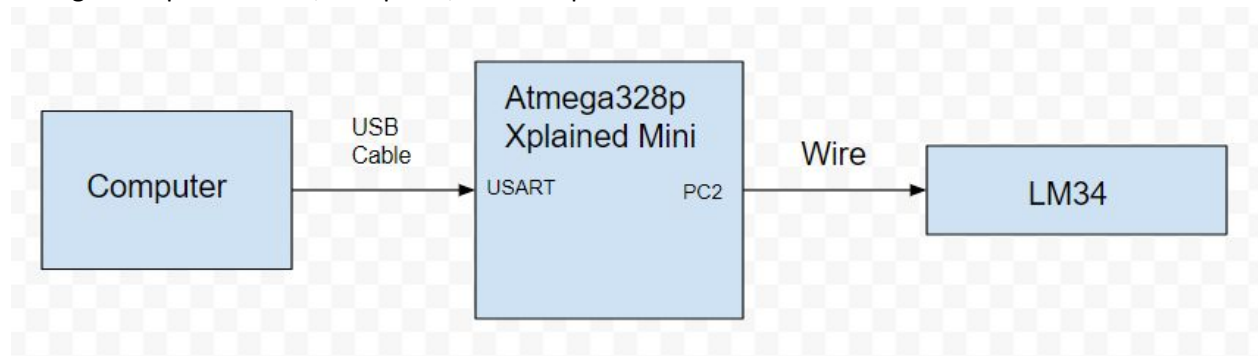
**DO NOT REMOVE THIS PAGE DURING SUBMISSION:**

The student understands that all required components should be submitted in complete for grading of this assignment.

NO	SUBMISSION ITEM	COMPLETED (Y/N)	MARKS (/MAX)
1	COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS		
2.	INITIAL CODE OF TASK 1/A		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 2/B		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 3/C		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 4/D		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 5/E		
4.	SCHEMATICS		
5.	SCREENSHOTS OF EACH TASK OUTPUT		
5.	SCREENSHOT OF EACH DEMO		
6.	VIDEO LINKS OF EACH DEMO		
7.	GOOGLECODE LINK OF THE DA		

## 1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

Atmega328 Xplained Mini, Computer, LM34 chip.



## 2. INITIAL/DEVELOPED CODE OF TASK 1/A

```

/*
 * Assignment3.c
 *
 * Created: 3/29/2018 4:07:41 PM
 * Author : JSharpHalpin
 */

/* ADC Test
For an Atmega 48 88 or 168
Sends ADC results to the serial port
Set your terminal to 2400 N 8 1
Atmega168 DIP TX PD1 (pin3)
Atmega168 DIP RX PD0 (pin2)
Atmega168 DIP ADC2 PC2 (PIN25) */
#define F_CPU 16000000UL //set clock rate at 16 MHz
#define BAUD 9600 //set baud rate to 9600
#define MYUBRR F_CPU/16/BAUD-1 //set the UBRR number

// #define UBRR_1200 51
// #define UBRR_2400 25 // for 1Mhz
// #define UBRR_2400 207 // for 8Mhz with .2% error
// #define UBRR_9600 51 // for 8Mhz with .2% error
// #define UBRR_19200 25 // for 8Mhz with .2% error
#include <avr/io.h>
#include <util/delay.h>
#include <stdio.h>
#include <avr/interrupt.h>

void read_adc(void); // Function Declarations
void adc_init(void);
void USART_init( unsigned int ubrr );
void USART_tx_string(char *data);
volatile unsigned int adc_temp;
char outs[20];

int main(void) {

    adc_init(); // Initialize the ADC (Analog / Digital Converter)
    USART_init(MYUBRR); // Initialize the USART (RS232 interface)
    USART_tx_string("Connected!\r\n"); // we're alive!
    _delay_ms(125); // wait a bit

    sei();
    while(1)
    {

```

```

void adc_init(void)
{
    /** Setup and enable ADC */
    ADMUX = (0<<REFS1)| // Reference Selection Bits

    (1<<REFS0)| // AVcc - external cap at AREF
    (0<<ADLAR)| // ADC Left Adjust Result
    (0<<MUX2)| // Analog Channel Selection Bits
    (1<<MUX1)| // ADC2 (PC2 PIN25)
    (0<<MUX0);

    ADCSRA = (1<<ADEN)| // ADC ENable

    (0<<ADSC)| // ADC Start Conversion
    (0<<ADSCF)| // ADC Auto Trigger Enable
    (0<<ADIF)| // ADC Interrupt Flag
    (0<<ADIE)| // ADC Interrupt Enable
    (1<<ADPS2)| // ADC Prescaler Select Bits
    (0<<ADPS1)|
    (1<<ADPS0);

    // Timer/Counter1 Interrupt Mask Register

    TIMSK1 |= (1<<TOIE1); // enable overflow interrupt
    TCCR1B |= (1<<CS12)|(1<<CS10); // native clock
    TCNT1 = 49911; //set Timer counter
}

/* READ ADC PINS */
void read_adc(void) {
    unsigned char i =4;
    adc_temp = 0;
    while (i-->0) {
        ADCSRA |= (1<<ADSC);
        while(ADCSRA & (1<<ADSC));
        adc_temp+= ADC;
        _delay_ms(50);
    }
    adc_temp = adc_temp / 8; // Average a few samples
}

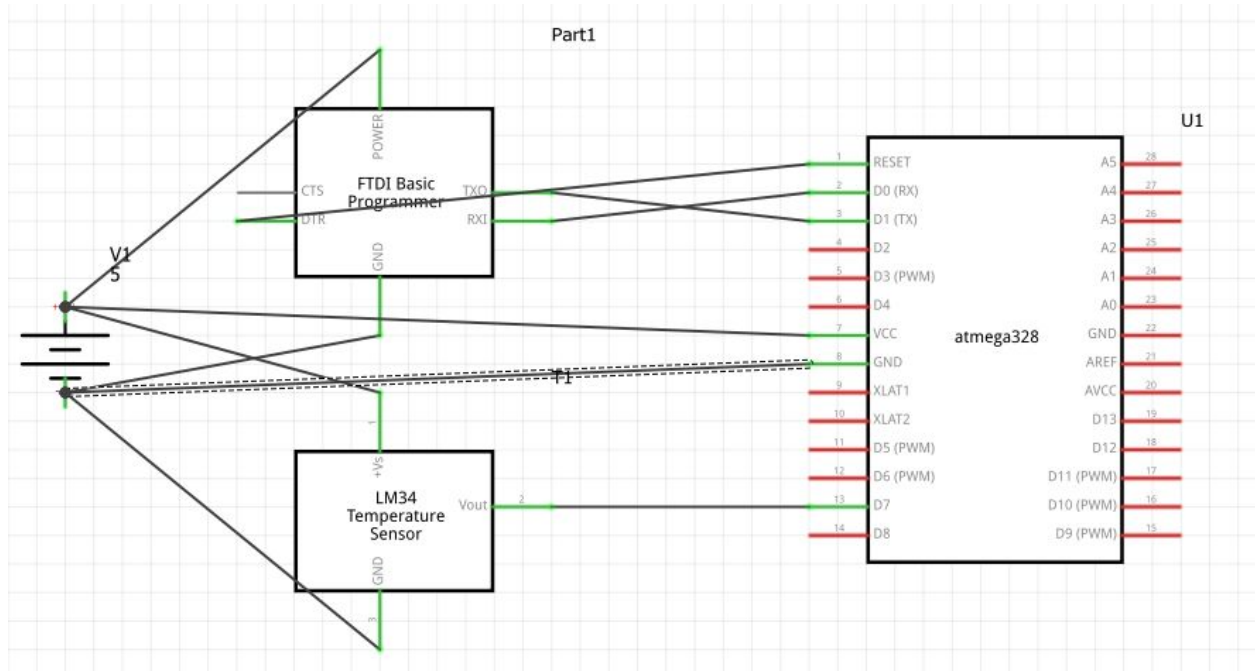
/* INIT USART (RS-232) */
void USART_init( unsigned int ubrr ) {
    UBRR0H = (unsigned char)(ubrr>>8);
    UBRR0L = (unsigned char)ubrr;
    UCSR0B = (1 << TXEN0); // Enable receiver, transmitter & RX interrupt
    UCSR0C = (3 << UCSZ00); //asynchronous 8 N 1
}

void USART_tx_string( char *data ) {
    while ((*data != '\0')) {
        while (!(UCSR0A & (1 <<UDRE0)));
        UDR0 = *data;
        data++;
    }
}

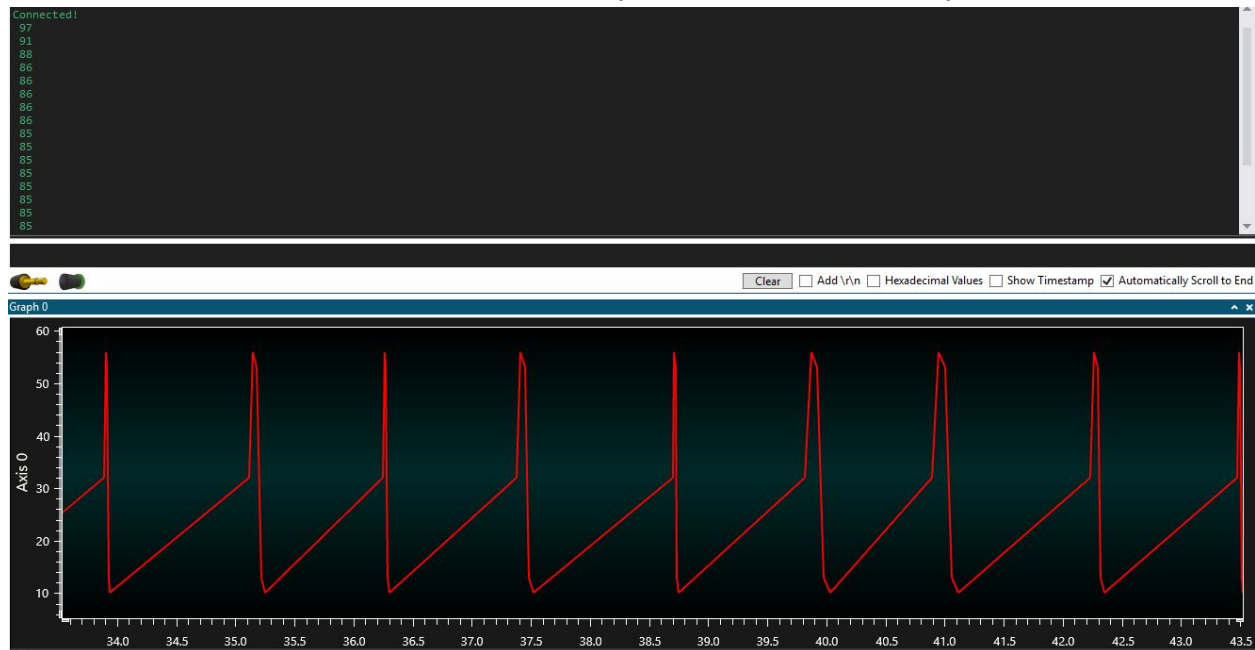
ISR(TIMER1_OVF_vect)
{
    read_adc(); //call the ADC read function
    snprintf(outs,sizeof(outs),"%3d\r\n", adc_temp); // print it
    USART_tx_string(outs); //Output a string to the screen
    TCNT1 = 49911; //reset Timer counter
}

```

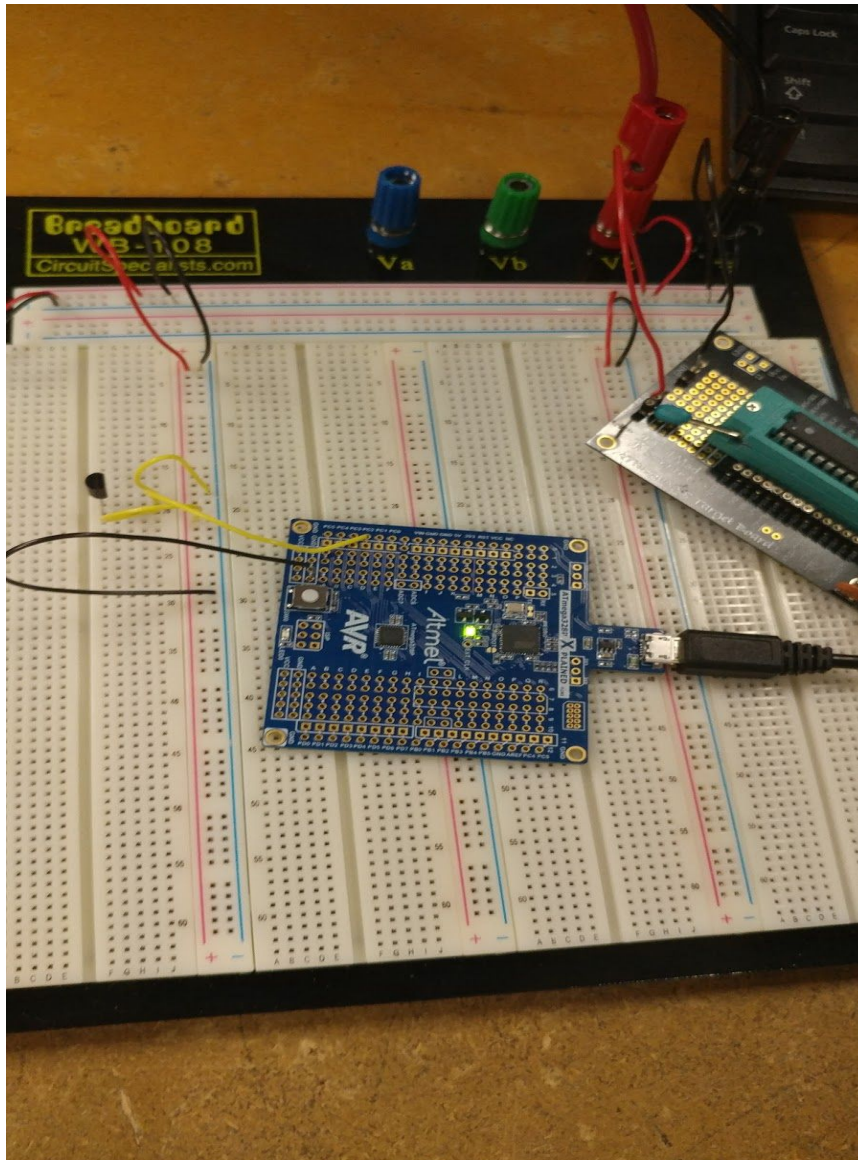
### 3. SCHEMATICS



### 4. SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)



5. SCREENSHOT OF EACH DEMO (BOARD SETUP)



6. VIDEO LINKS OF EACH DEMO

<https://youtu.be/D2bYWDZFLFE>

7. GITHUB LINK OF THIS DA

<https://github.com/jsharpin/My-Repos>

Student Academic Misconduct Policy

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

Joseph Sharp Halpin