CPE301 – SPRING 2019

Design Assignment 3B

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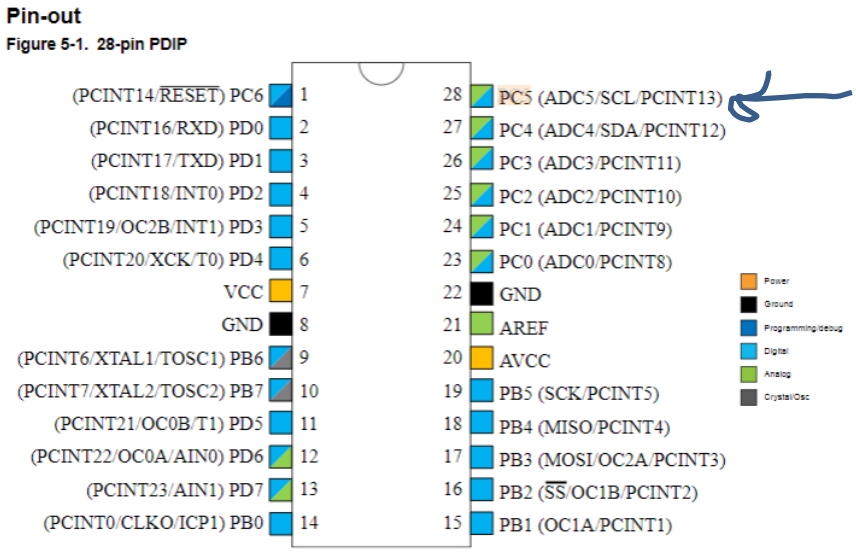
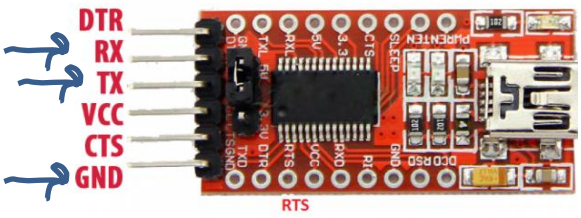
1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

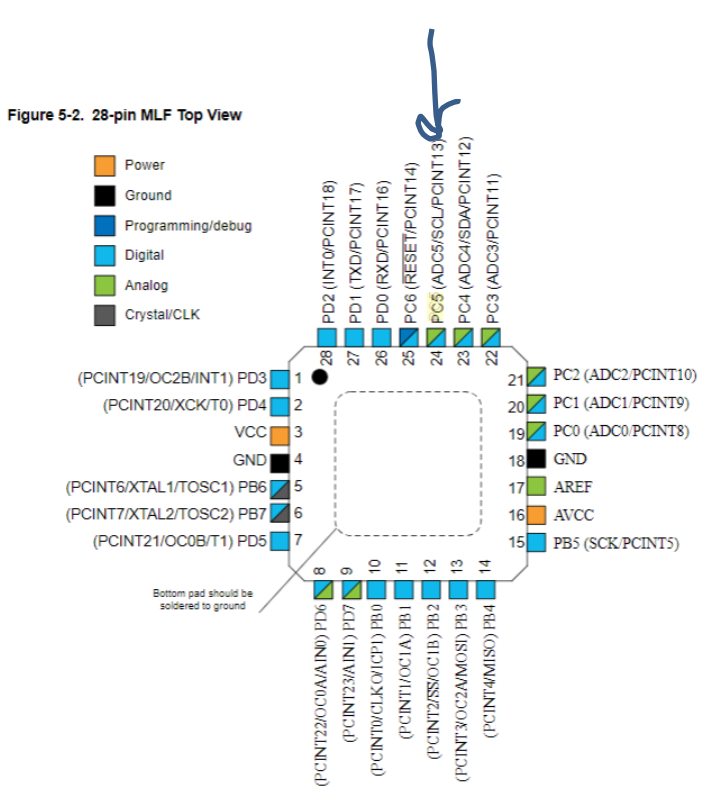
List of Components used

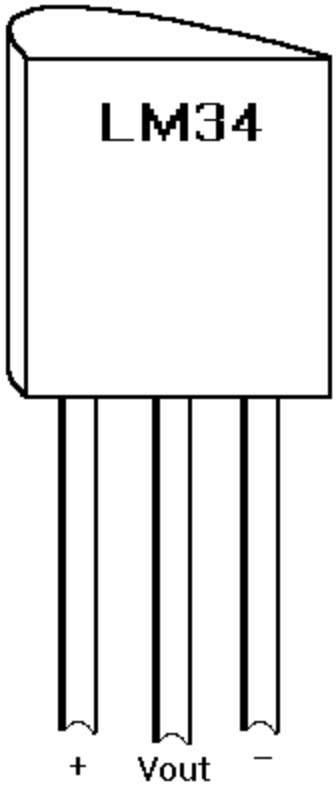
- Xplained mini
- Breadboard
- FTDI
- Micro USB cable
- Female and Male wires
- LM34
- Atmel Studio 7

Block diagram with pins used in the Atmega328P









2. DEVELOPED CODE OF TASK 1

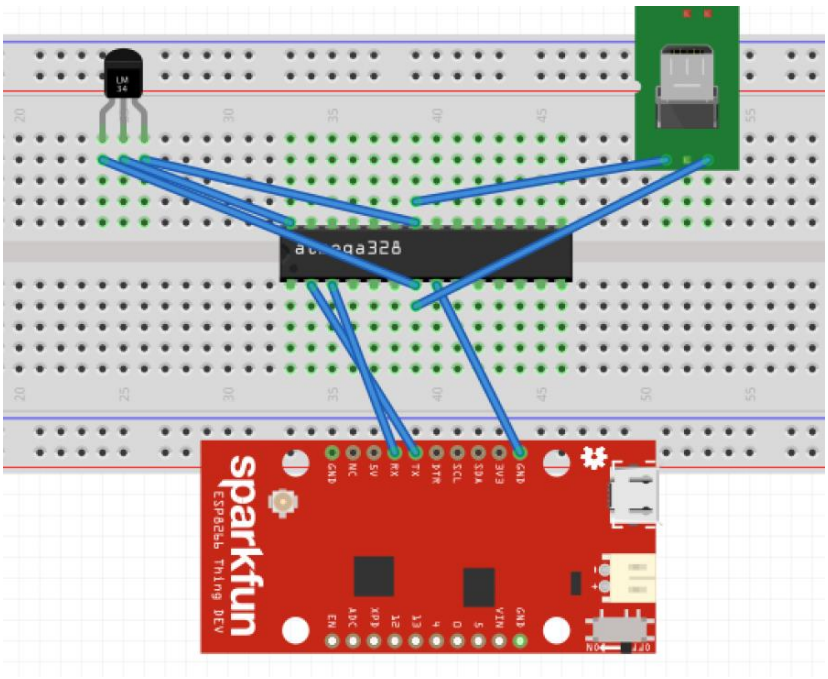
```
#define F_CPU 16000000UL
#define BAUD_RATE 9600
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>

void usart_init();
void usart_send(unsigned char ch);

int main(void)
{
	usart_init();

	/** Setup and enable ADC **/

	ADMUX = (0<<REFS1)|
	(1<<REFS0)| //AVcc - external cap at AREF
	(0<<ADLAR)| //ADC Left Adjust Result
	(1<<MUX2)| //Analog Channel Selection Bits
	(0<<MUX1)| //ADC5(PC5 PIN28)
	(1<<MUX0);
	ADCSRA =(1<<ADEN)|  //ADC Enable
	(0<<ADSC)|  //ADC Start Conversion
	(1<<ADATE)| //ADC Auto Trigger Enable
	(0<<ADIF)| //ADC Interrupt Flag
	(0<<ADIE)| //ADC Interrupt Enable
	(1<<ADPS2)| //ADC Prescaler Select Bits
```

```
	(0<<ADPS1)|
	(1<<ADPS0);
	TCCR1B =	5;	//setting	the	prescaler	to	1024
	TIMSK1 =	(1<<TOIE1);	//enable	interrupt	flag
	TCNT1  =	49911; //set TCNT
	sei();//enable	interrupt
	while(1)
	{
		//main loop
	}
}

ISR(TIMER1_OVF_vect)
{
	ADCSRA|=(1<<ADSC); //start conversion
	while((ADCSRA&(1<<ADIF)) ==0); //wait for conversion to finish

	ADCSRA |= (1<<ADIF);
	//*************************
	//used to convert and print temperatures
	int a = ADCL;
	a = a | (ADCH<<8);
	a = (a/1024.0) * 5000/10;
	usart_send((a/100)+'0');
	a = a % 100;
	usart_send((a/10) + '0');
	a = a % 10;
	usart_send((a)+'0');
	usart_send('\r');
	TCNT1 = 49911;
	//*************************
}

usart_init(void)
{
	UCSR0B = (1<<TXEN0); //enable tx
	UCSR0C = (1<<UCSZ01)|(1<<UCSZ00); //8-bit data
	UBRR0L = F_CPU/16/BAUD_RATE - 1;
}

void usart_send(unsigned char ch)
{
	while(!(UCSR0A & (1<<UDRE0)));  //wait until UDR0 is empty
	UDR0 = ch;                                        //transmit ch
}

void usart_print(char * str)
{
	int i = 0; //initialize to 0
	while(str[i] != 0) //
	usart_send(str[i]); //print string at i index
}
```

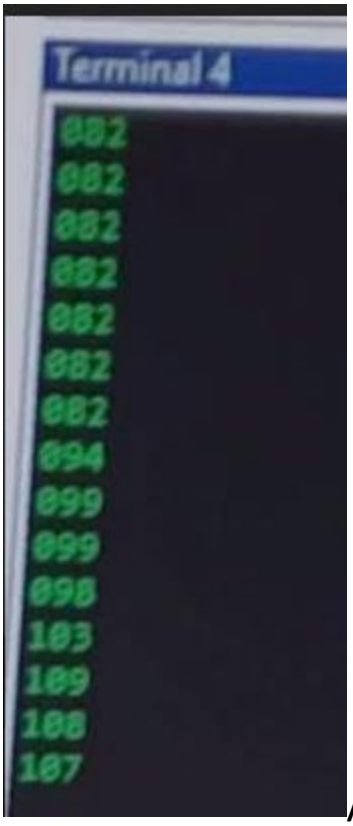
TASK 2

See Atmel Studio Output

3. SCHEMATICS

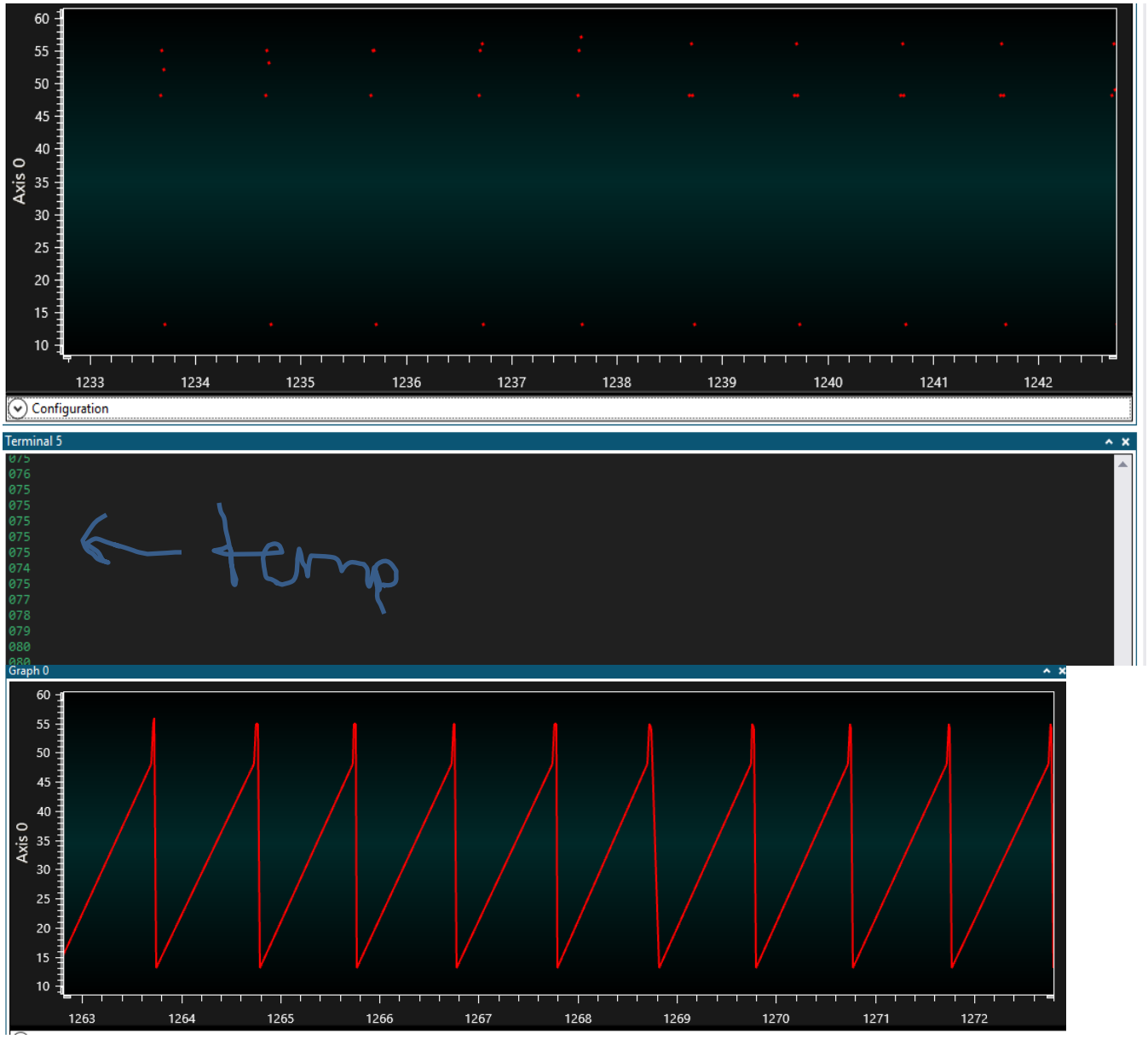


4. SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)



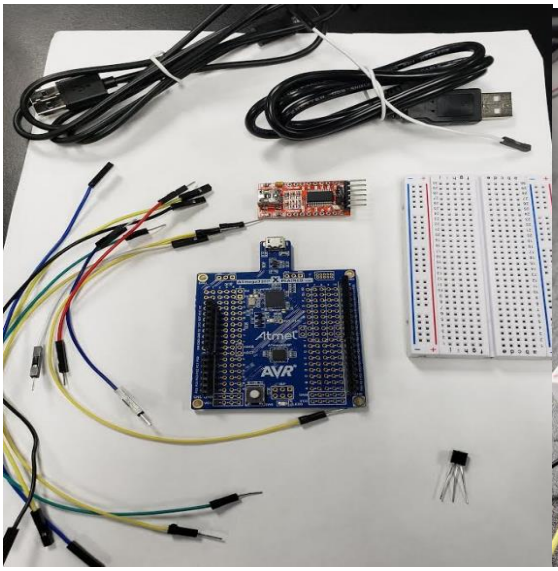
//temperatures when heat is applied

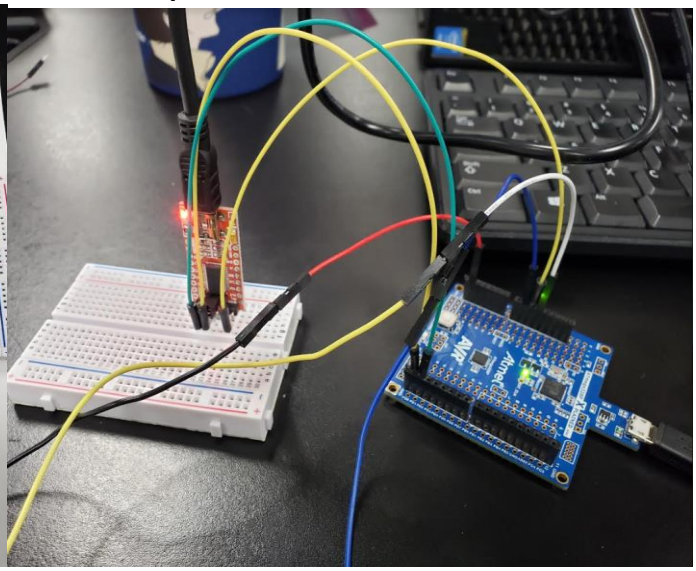
Terminal demonstrates temperature changing however I had a tough time displaying it on chart



5. SCREENSHOT OF EACH DEMO (BOARD SETUP)

Before **After Setup**





6. VIDEO LINKS OF EACH DEMO

https://www.youtube.com/watch?v=gv1vmSvwG6s

7. GITHUB LINK OF THIS DA

https://github.com/HadidBuilds/hw_sub_da1

Student Academic Misconduct Policy

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

Itzel Becerril