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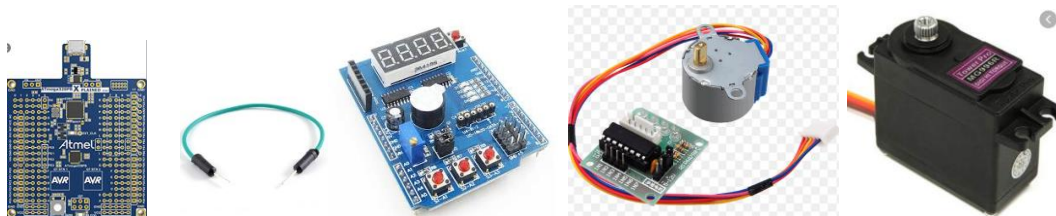
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Primary Github address: https://github.com/MeralAbuJaser/Submission_da.git

Directory: https://github.com/MeralAbuJaser/Submission_da/tree/master/DA4B

1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS



Pin-out

Figure 5-1. 28-pin PDIP

| | | | |
|--------------------------|----|----|------------------------|
| (PCINT14/RESET) PC6 | 1 | 28 | PC5 (ADC5/SCL/PCINT13) |
| (PCINT16/RXD) PD0 | 2 | 27 | PC4 (ADC4/SDA/PCINT12) |
| (PCINT17/TXD) PD1 | 3 | 26 | PC3 (ADC3/PCINT11) |
| (PCINT18/INT0) PD2 | 4 | 25 | PC2 (ADC2/PCINT10) |
| (PCINT19/OC2B/INT1) PD3 | 5 | 24 | PC1 (ADC1/PCINT9) |
| (PCINT20/XCK/T0) PD4 | 6 | 23 | PC0 (ADC0/PCINT8) |
| VCC | 7 | 22 | GND |
| GND | 8 | 21 | AREF |
| (PCINT6/XTAL1/TOSC1) PB6 | 9 | 20 | AVCC |
| (PCINT7/XTAL2/TOSC2) PB7 | 10 | 19 | PB5 (SCK/PCINT5) |
| (PCINT21/OC0B/T1) PD5 | 11 | 18 | PB4 (MISO/PCINT4) |
| (PCINT22/OC0A/AIN0) PD6 | 12 | 17 | PB3 (MOSI/OC2A/PCINT3) |
| (PCINT23/AIN1) PD7 | 13 | 16 | PB2 (SS/OC1B/PCINT2) |
| (PCINT0/CLKO/ICP1) PB0 | 14 | 15 | PB1 (OC1A/PCINT1) |



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

```
/*
 * DA4B_Task1.c
 *
 * Created: 5/9/2020 1:33:36 AM
 * Author : Meral
 */
#define F_CPU 16000000UL
#include <avr/io.h>

void read_adc(void) {
    TCCR0A |= (1<<COM0A1)|(1<<WGM01); //enable CTC mode
    DDRC &= ~(1<<PINC0); //potentiometer input
    ADMUX = ADMUX = (1<<REFS0);
    ADCSRA |= (1<<ADEN)|(1<<ADPS2)|(1<<ADPS1)|(1<<ADPS0); //pre-scaler set to 128
}

void get_adc(){
    volatile unsigned int speed;
    ADCSRA |= (1<<ADSC); //start converting
    while((ADCSRA & (1<<ADIF)) == 0); //get the value of speed
    speed = ADC & 0x03FF;
    OCR1A = speed; //set speed
}

void delay(){
    while (!(TIFR1 & (1<<OCF1A)));
    TIFR1 |= (1<<OCF1A); //set the delay for each pin port
}

int main(void){
    read_adc(); //adc conversion
    DDRB = 0x0F; //set portD as output
    DDRC = 0x00; //set input for potentiometer
    PORTB = 0x00;
    TCCR1B |= 0x0C; //set prescaler

    while(1){
        get_adc();
        //controlling speed
        if(PORTB = 0x09)
            delay();
        if(PORTB = 0x03)
            delay();
        if(PORTB = 0x06)
            delay();
        if(PORTB = 0x0C)
            delay();
    }
}
```

3. DEVELOPED MODIFIED CODE OF TASK 2/A from TASK 1/A

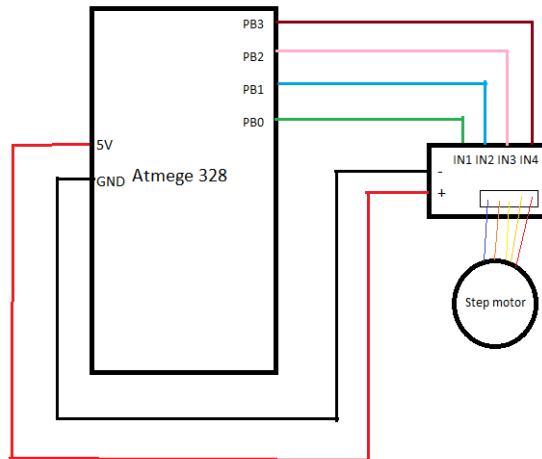
```
/*
 * DA4B_Task2.c
 *
 * Created: 5/10/2020 5:54:14 PM
 * Author : Meral
 */
#define F_CPU 16000000
#include <avr/io.h>
#include <util/delay.h>
int adc_motor; //to store the potentiometer value
// Initialize ADC
void adc_init(void) {
    /**Setup and enable ADC**/
    ADMUX = (0<<REFS1) | //Reference selection bits
    (1<<REFS0) | //AVcc - external cap at AREF (5)V
    (0<<ADLAR) | //ADC right adjust result
    (1<<MUX2) | //Analog channel selection bits
    (0<<MUX1) | //ADC4 (PC4 PIN27)
    (0<<MUX0);

    ADCSRA = (1<<ADEN) | //ADC enable
    (0<<ADSC) | //ADC start conversion
    (0<<ADIF) | //ADC interrupt flag
    (0<<ADIE) | //ADC interrupt enable
    (1<<ADPS2) | //ADC Prescaler select bits
    (1<<ADPS1) | //128 AS PRESCALAR SELECTION BIT
    (1<<ADPS0); //Select channel
}
void read_adc(void){
    unsigned char i=4; //number of samples
    adc_motor = 0;
    while(i--){
        ADCSRA |= (1<<ADSC);
        while(ADCSRA & (1<<ADSC));
        adc_motor += ADC;
    }
    adc_motor = adc_motor/4; // average of samples
}
int main(void){
    TCCR1A |= (1<<COM1A1)|(1<<COM1B1)|(1<<WGM11);
    TCCR1B|=(1<<WGM13)|(1<<WGM12)|(1<<CS11)|(1<<CS10); //pre-scaler setup
    ICR1 = 4999; //Period = 20ms Standard
    DDRB |= (1<<PB1); //output
    adc_init();

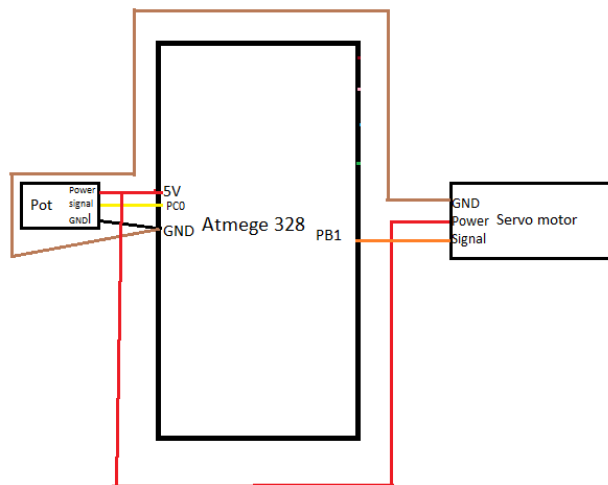
    while(1) {
        read_adc();
        if (adc_motor >= 1023) {
            OCR1A = 535; // 180 degree
            _delay_ms(500);
        }
        else if (adc_motor <= 20) {
            OCR1A = 97; // 0 degree
            _delay_ms(500);
        }
    }
    return 0;
}
```

4. SCHEMATICS

Task 1



Task 2



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

Task 1

```
Done executing task "RunOutputFileVerifyTask".
Done building target "CoreBuild" in project "DA4B_Task1.cproj".
Target "PostBuildEvent" skipped, due to false condition; ('$(PostBuildEvent)' != '') was evaluated as ('' != '').
Target "Build" in file "C:\Program Files (x86)\Atmel\Studio\7.0\Vs\Avr.common.targets" from project "C:\Users\Meral\Documents\
Done building target "Build" in project "DA4B_Task1.cproj".
Done building project "DA4B_Task1.cproj".
```

```
Build succeeded.
===== Build: 1 succeeded or up-to-date, 0 failed, 0 skipped =====
```

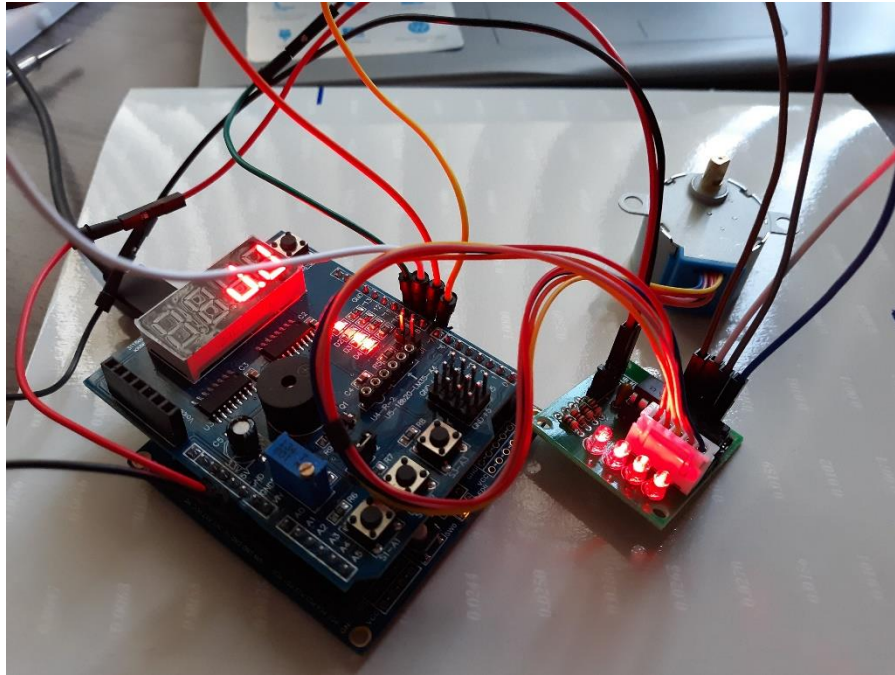
Task 2

```
Done executing task "RunOutputFileVerifyTask".
Done building target "CoreBuild" in project "DA4B_Task2.cproj".
Target "PostBuildEvent" skipped, due to false condition; ('$(PostBuildEvent)' != '') was evaluated as ('' != '').
Target "Build" in file "C:\Program Files (x86)\Atmel\Studio\7.0\Vs\Avr.common.targets" from project "C:\Users\Meral\Documents\Atmel
Done building target "Build" in project "DA4B_Task2.cproj".
Done building project "DA4B_Task2.cproj".
```

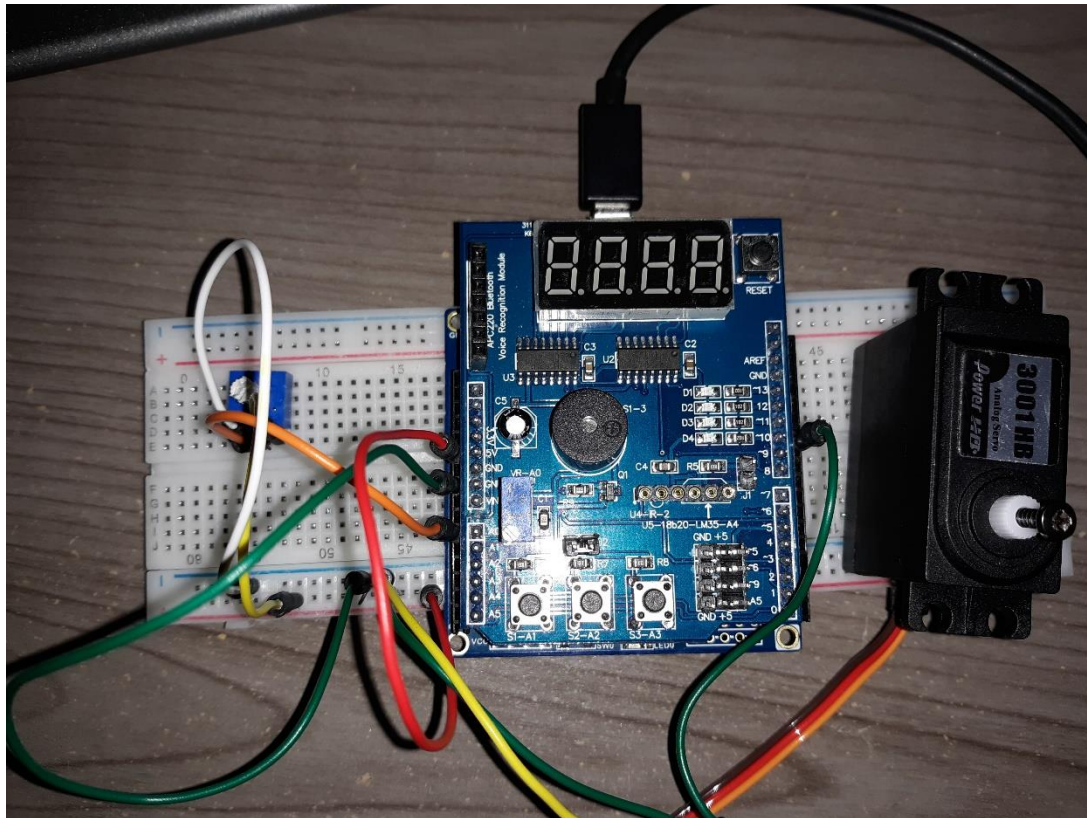
```
Build succeeded.
===== Build: 1 succeeded or up-to-date, 0 failed, 0 skipped =====
```

6. SCREENSHOT OF EACH DEMO (BOARD SETUP)

Task 1



Task 2



***note when I opened the servo motor package, I only found a screw without a horn.**

7. VIDEO LINKS OF EACH DEMO

Task 1

<https://www.youtube.com/watch?v=Mj0H0sGVxis>

8. GITHUB LINK OF THIS DA

https://github.com/MeralAbuJaser/Submission_da/tree/master/DA4B

“This assignment submission is my own, original work”.

Meral Abu-Jaser