Experiment/ Task: Stepper Motor Interfacing with 8086 Microprocessor.

i. Clockwise & Anticlockwise Rotation.
ii. Speed Change.
iii. Show Speed into 7-segment Display.

Objective:

- Interfacing a stepper motor with 8086 Microprocessor.
- Change motor Speed.
- Show speed into a 7-segment display.

Software Use:

- Proteus 8 Professional V8.13

Proteus Component List

- 74HC373 Letch
- 8086 Microprocessor
- 8255A PPI
- CELL -12V
- Logic-state
- ULN2003A Motor Driver
- Stepper Motor
- White-LED
- 7-Segment Display

Block Diagram:

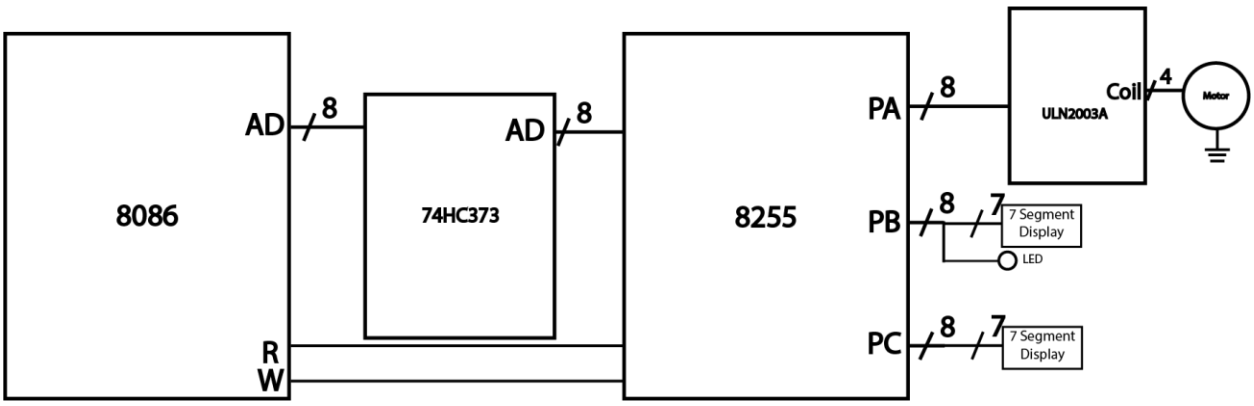
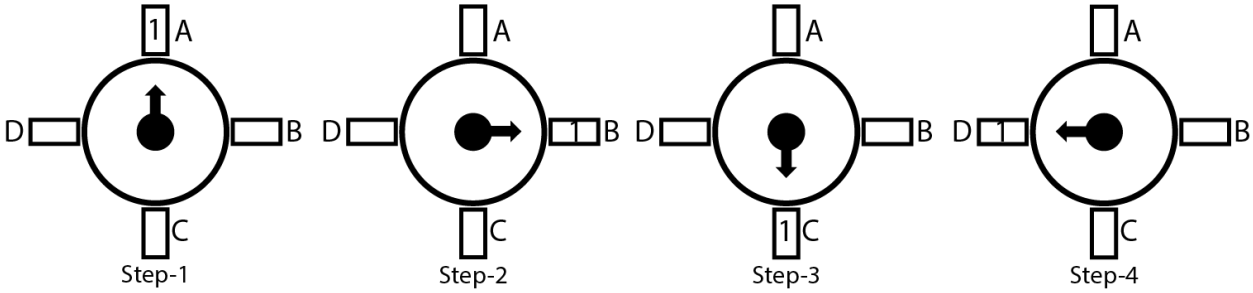


Fig: Block Diagram of stepper motor interfacing

Coil Full Mode Sequence:



Steps	**A**	**B**	**C**	**D**		
1	1	0	0	0	08H	CLOCKWISE (90^{o} Rotation)
2	0	1	0	0	04H	
3	0	0	1	0	02H	
4	0	0	0	1	00H	
5	1	0	0	0	08H	
6	0	0	0	1	00H	ANTICLOCKWISE (90^{o} Rotation)
7	0	0	1	0	02H	
8	0	1	0	0	04H	
9	1	0	0	0	08H	
10	0	0	0	1	00H	

Port Address:

Port A: 80H
Port B: 82H
Port C: 84H
CW: 86H

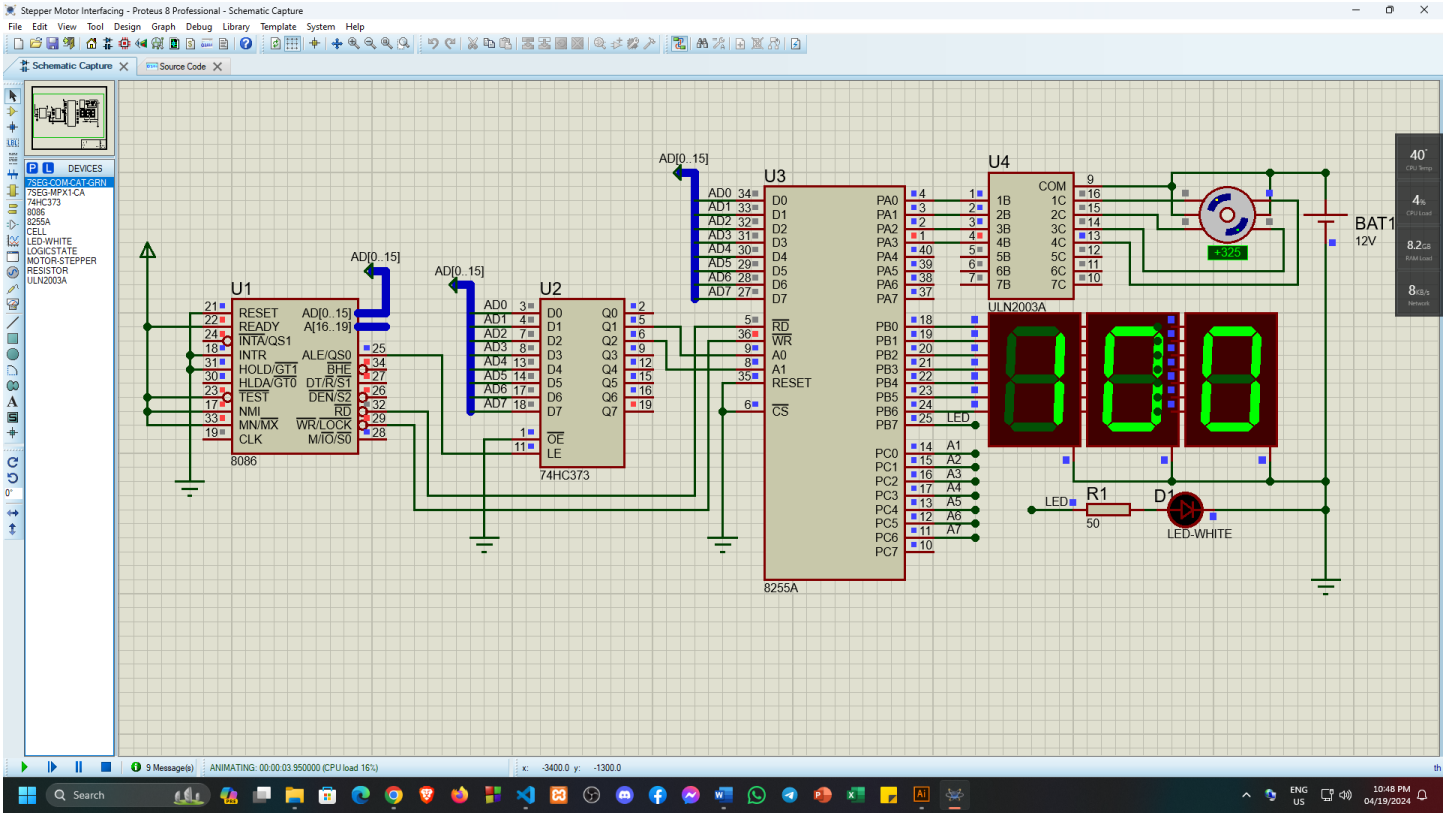
CWR: 10000000B

Code:

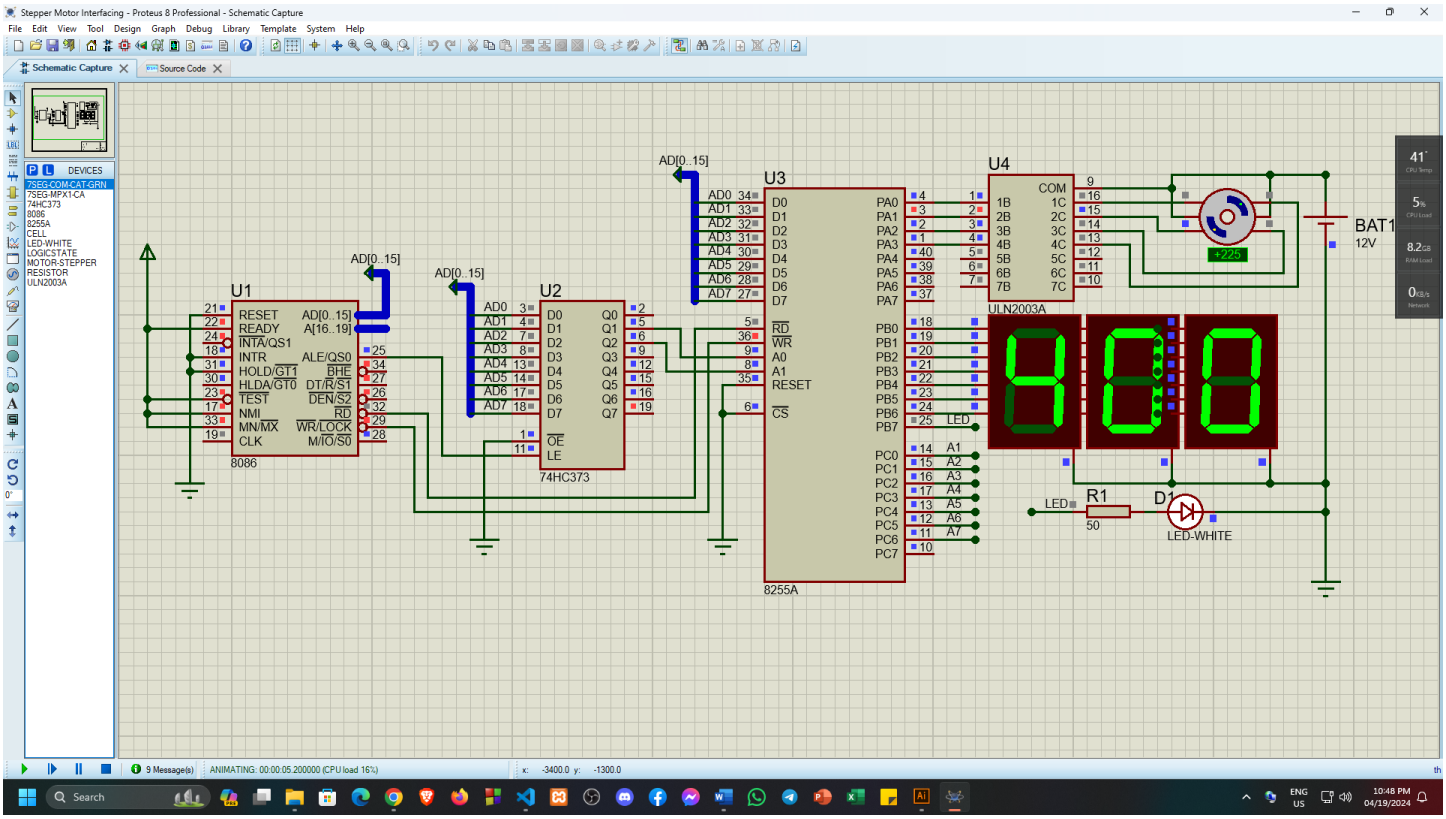
```
CODE    SEGMENT PUBLIC 'CODE'
        ASSUME CS:CODE

START:

        ; port addresses
        porta equ 80h
        portb equ 82h
        portc equ 84h
        config equ 86h

        mov al, 10000000b  ; i/o mode with
output port
        mov dx, config
        out dx, al

        mov dx, portc
        mov al, 00111111b ; digit 0
        out dx, al

ENDLESS:
        mov al, 00000110b ; digit 1
        mov dx, portb
        out dx, al
        mov dx, porta

        mov al, 00001000b ; clockwise
        out dx, al
        call delay100
        mov al, 00000100b ; clockwise
        out dx, al
        call delay100
        mov al, 00000010b ; clockwise
        out dx, al
        call delay100
        mov al, 00000001b ; clockwise
        out dx, al
        call delay100
        mov al, 00001000b ; clockwise
        out dx, al
        call delay100
        mov al, 00000001b ; anticlockwise
        out dx, al
        call delay100
        mov al, 00000010b ; anticlockwise
        out dx, al
        call delay100
        mov al, 00000100b ; anticlockwise
        out dx, al
        call delay100
        mov al, 00001000b ; anticlockwise
        out dx, al
        call delay100
        mov al, 00000001b ; anticlockwise
        out dx, al
        call delay100
        mov al, 11100110b ; digit 4
        mov dx, portb
        out dx, al
        mov dx, porta


        mov al, 00001000b ; clockwise
        out dx, al
        call delay400
        mov al, 00000100b ; clockwise
        out dx, al
        call delay400
        mov al, 00000010b ; clockwise
        out dx, al
        call delay400
        mov al, 00000001b ; clockwise
        out dx, al
        call delay400
        mov al, 00001000b ; clockwise
        out dx, al
        call delay400
        mov al, 00000001b ; anticlockwise
        out dx, al
        call delay400
        mov al, 00000010b ; anticlockwise
        out dx, al
        call delay400
        mov al, 00000100b ; anticlockwise
        out dx, al
        call delay400
        mov al, 00001000b ; anticlockwise
        out dx, al
        call delay400
        mov al, 00000001b ; anticlockwise
        out dx, al
        call delay400

        JMP ENDLESS

delay100:
        mov cx, 05d01h        ; 100 ms delay
        l1: nop
        loop l1
        ret

delay400:
        mov cx, 0FED6h        ; 400 ms delay
        l2: nop
        loop l2
        ret


CODE    ENDS
        END START
```

Simulation Screenshots:

- Rotate with 100 ms speed.



- Rotate with 400 ms speed.



Discussion:

In this assignment I've build a circuit using 8086 microprocessor, 8255 ppi, stepper motor & 7-segment display that will rotate the stepper motor and show the speed of the motor into the 7-segment display. By using 8086 I've rotated the stepper motor clockwise 90 degrees. For this I need to find the addresses of 8255 PPI, control word register address. For rotating the stepper motor clockwise and anticlockwise I've found the coils step sequences. Where the sequence steps are given in the table of stepper motor sequence. The port addresses are 80h, 82h, 84h, 86h and the control word register was 10000000B (80H). I've connected the stepper motor with Port A of the stepper motor and the 7-segment display with Port B & Port C. Here the 7-segment display will show the delay speed for the rotation. Where I've set two types of delay 100 ms delay and 400 ms delay. In the circuit when the delay is 100 ms the motor will rotate faster and when the delay is 400 ms the motor will rotate slower. And the 100 & 400 will show into the 7-segment display. Then after set all of those things I wrote the assembly language program for this circuit.