

INDIAN INSTITUTE OF TECHNOLOGY PATNA

EC3101: MICROCONTROLLER AND
EMBEDDED SYSTEM LAB



Experiment No: 03

Submitted by :

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Aim:

To show the rotation of stepper motor using PIC16F84A Microcontroller.

Apparatus :

Proteus Simulator software , MicroC ,PIC16F84A (Microcontroller), ULN2003A(Driver), Stepper Motor.

THEORY :

This circuit is a stepper motor control system using a PIC16F84A microcontroller and a ULN2003A driver IC. The PIC16F84A is an 8-bit microcontroller that provides digital outputs to control external devices. In this circuit, it is used to generate the required sequence of pulses to drive a stepper motor. Stepper motors require a specific sequence of energizing their coils to rotate in steps, and the microcontroller handles this logic. Since the PIC's I/O pins cannot directly drive the higher current needed by the motor, a ULN2003A driver IC is used. The ULN2003A is a Darlington transistor array that works as a current amplifier, allowing low-power signals from the microcontroller to control higher-power loads like motors.

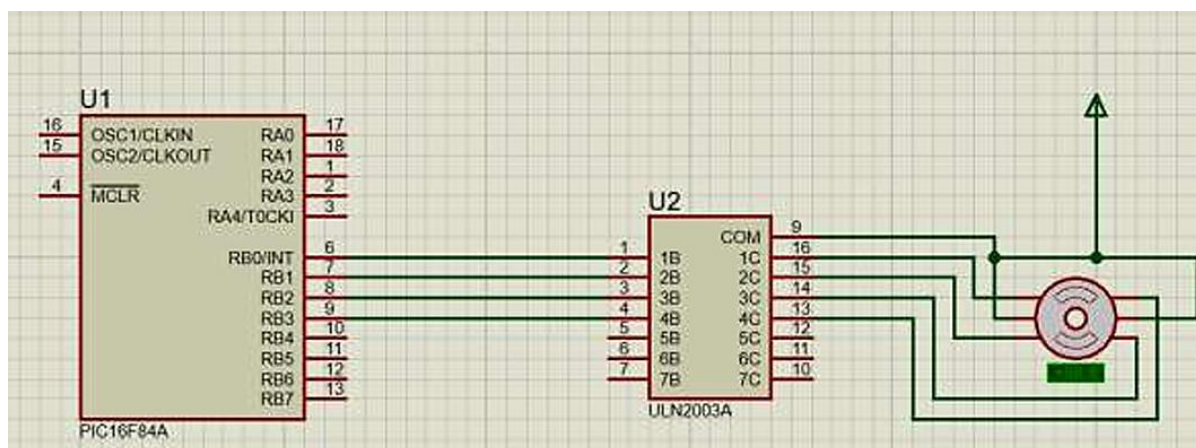
- 1) The RB0–RB3 pins of the PIC are connected to the inputs of the ULN2003A (pins 1B–4B).
- 2) The corresponding outputs (1C–4C) of the ULN2003A are connected to the stepper motor windings.
- 3) The COM pin of ULN2003A is tied to the motor's supply voltage to handle the back EMF generated by the coils.

When the microcontroller sends a logic HIGH on one of its output pins, the ULN2003A sinks current through the motor winding, energizing it. By sending a proper sequence of signals (full-step, half-

step, or wave drive), the motor shaft rotates step by step.

Working:

1. The PIC16F84A executes a program that generates the step (0001 → 0010 → 0100 → 1000), The signals are passed to ULN2003A, which amplifies them to drive the stepper motor.
2. The motor rotates by discrete steps, and the direction/speed depends on the pulse sequence and frequency from the microcontroller.



Code B:

```
void main() {  
    TRISB = 0x00; // Set PORTB as output  
    PORTB = 0x00; // Initialize PORTB  
    while(1) {  
        PORTB = 0b0001; // For sequence 0001  
        Delay_ms(200); // Delay of 200 ms  
        PORTB = 0b0010; // For sequence 0010  
        Delay_ms(200); // Delay of 200 ms  
        PORTB = 0b0100; // For sequence 0100  
        Delay_ms(200); // Delay of 200 ms  
        PORTB = 0b1000; // For sequence 1000  
        Delay_ms(200); // Delay of 200 ms  
    }  
}
```

Results:

The stepper motor was successfully interfaced with the PIC16F84A microcontroller through the ULN2003A driver IC. By applying the programmed sequence, the motor rotated in discrete steps.
