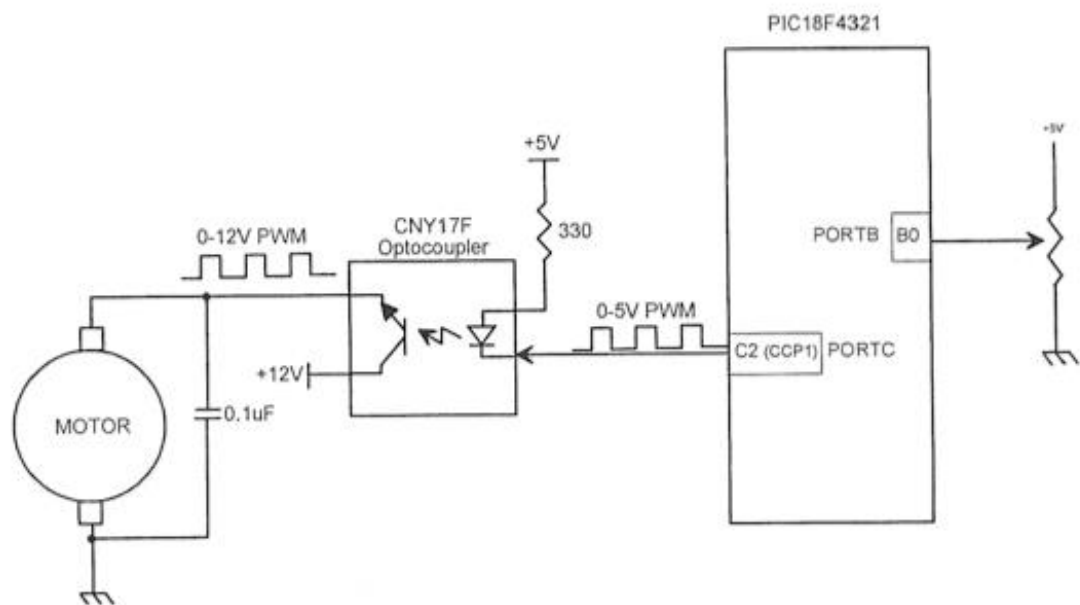ECE Department

Dr. Rafi

LAB # 12

INTERFACING THE PIC18F4321 WITH A DC MOTOR USING PWM MODE AND C

1. **Title:** DC Motor Speed Control using the PIC18F4321
2. **Objective:** The purpose of this lab is to control the speed of a DC motor using PIC18F4321's PWM module.

3. **Prelab:**

In the above figure, it is desired to change the speed of a DC motor by dynamically changing its pulse width using a potentiometer connected at bit 0 of PORTB. The larger is the duration of the pulse width, the higher is the speed of the motor. Note that the PWM duty cycle is controlled by the potentiometer. The PIC18F4321 will input a 20Kohm potentiometer voltage via the PIC18F4321's   on-chip A/D converter using interrupts, generate an 800Hz PWM waveform on the CCP1 pin, and will then change the speed of the motor as the potentiometer voltage is varied. Assume 4-

MHz crystal and TMR2 prescaler and postscaler values of 16 and 1 respectively. Ignore the fractional part of the duty cycle.
Write a C language program to accomplish the above.

4. **Equipment, Software, and Components required:**

   -Microchip's MPLAB assembler /Debugger

   - Parts List:

   ➢ PICKit3 and PIC18F4321 chip from Microchip
   ➢ Push button and 20KΩ potentiometer
   ➢ Breadboard
   ➢ Resistors
   ➢ Power Supply
   ➢ Optocoupler chip (CNY17F) from Jameco.com
   ➢ Computer Fan (DC Motor)
   ➢ Wires and Clip leads

5. **Description (corresponding topics covered in the textbook):**
   Calculate PR2. Assuming 8-bit ADC for converting the potentiometer voltage, divide 255 by PR2 analytically to obtain the nearest decimal value (n). In the C-program, divide the contents of ADRESH by 'n' so that the value will be between 0 and PR2. Move the integer part of this division result into CCPR1L. This will represent the decimal part of the duty cycle. Using TMR2 and the registers associated with CCPx module, write the C-program for the problem described in the prelab. (Example 11.5 pages 333-336)

6. **Prerequisites:**
   Section 11.2 on Pages 332-333, Section 10.15 on Pages 322-324)

7. **Procedure:**

   -Compile the C language program using the MPLAB.
   -Download the compiled program into the PIC18F4321 on the breadboard from your Personal Computer or Laptop using the PICKit3™ and MPLAB following the steps provided in Appendix H of the book.

-Use the default clock of the PIC18F4321 and connect the appropriate RESET circuit to the PIC18F4321 $\overline{\text{MCLR}}$ pin.
-Connect the hardware to the PIC18F4321, and demonstrate the lab as a PIC18F4321-based stand-alone system.

8. Deliverables:

i) Postlab
Write a PIC18F assembly language program to accomplish the Prelab.

ii) Lab report

- Submit a final Lab report (Staple Signed prelab, postlab, and the schematic (if any) using Word, p-spice, Wordpro or other software tools, at the end of the quarter or semester).

8. Concluding remarks:
- Complete each prelab before coming to the lab. Please get it signed.