



YILDIZ TECHNICAL UNIVERSITY
MECHATRONICS ENGINEERING
MICROPROCESSORS AND PROGRAMMING LAB
EXPERIMENT#1
G21

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Experiment Objective (Rephrased)

The aim of this experiment is to configure specific microcontroller pins as input and output using assembly language and to implement a button-controlled LED system. In this setup, pressing the buttons connected to pins D0 and D2 will activate the LEDs connected to pins D1 and D3, respectively — pressing the button on D0 will turn on the LED on D1, while pressing the button on D2 will turn off the LED on D3. When no button is pressed, the D1 LED should remain off and RD3 LED should be active. It is important to note that the buttons are connected using different wiring configurations, which affects their logic behavior. The schematic diagram of the circuit used in this experiment is shown below.

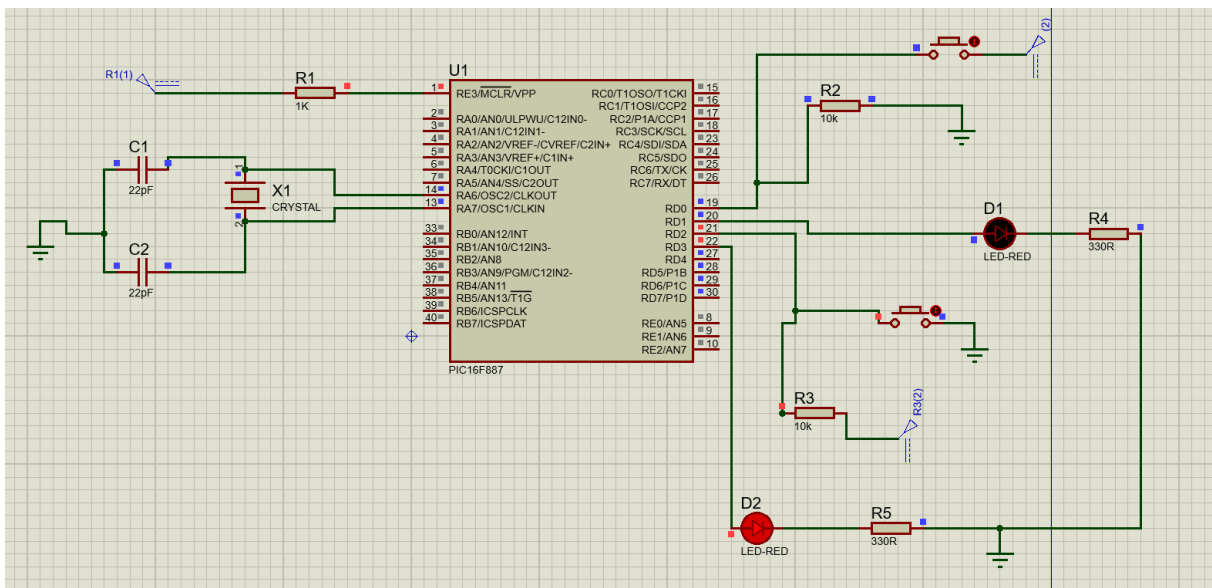


Figure 1.1: Pull-up button configuration used to turn on the second LED.

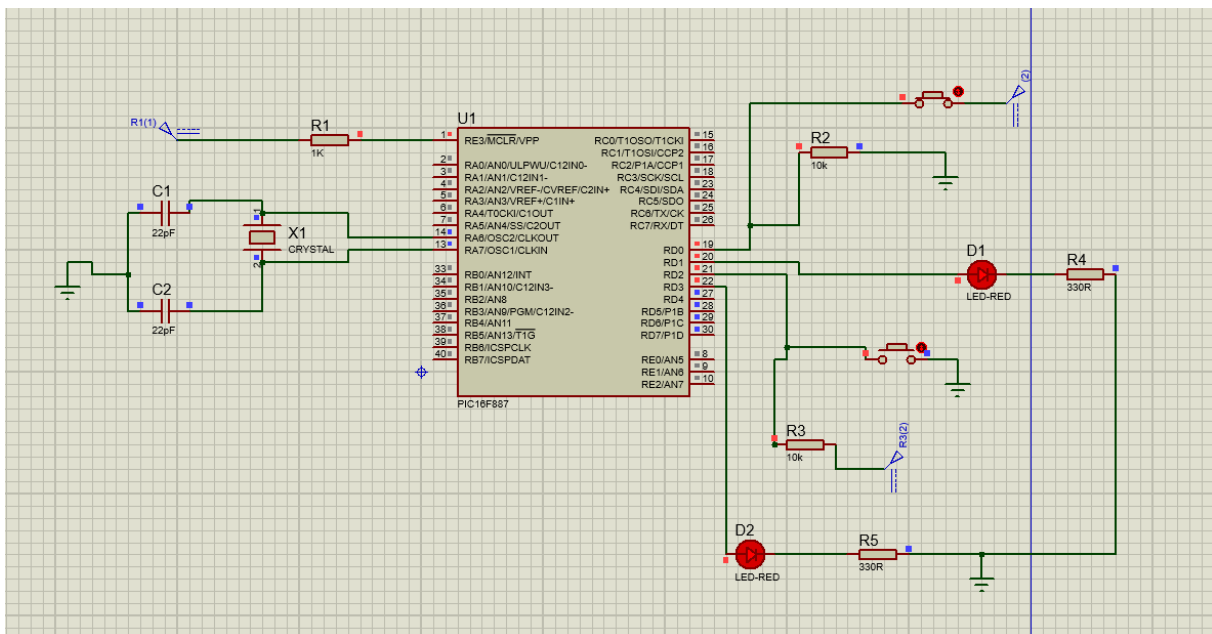


Figure 1.2: Pull-down button configuration used to turn on the first LED.

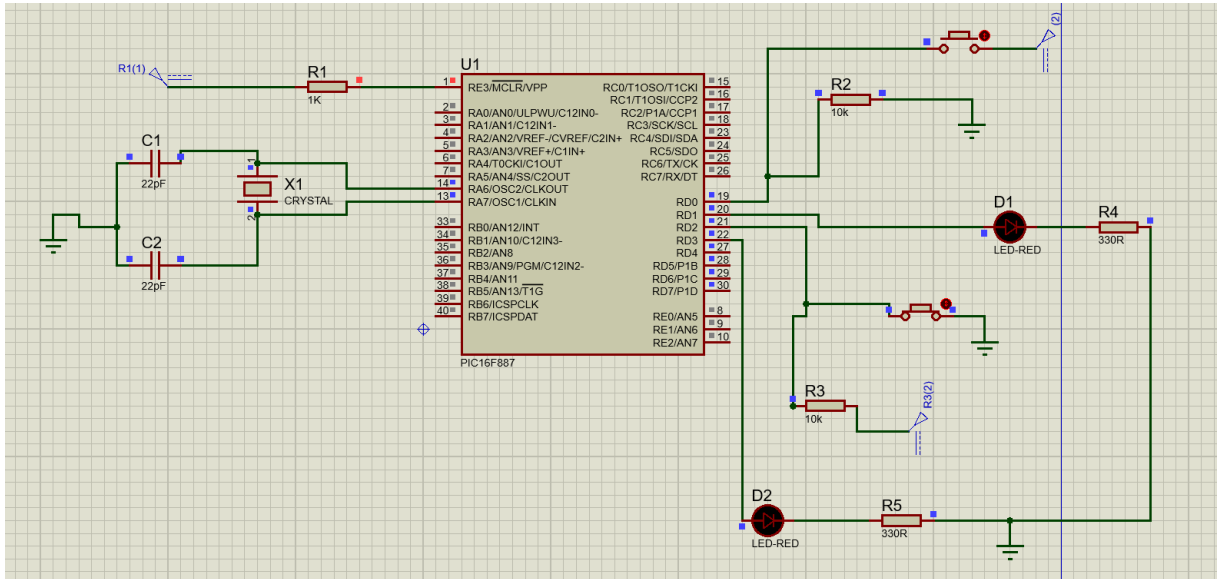


Figure 1.3: Circuit showing both pull-up and pull-down button configurations activating their corresponding LEDs.

```

newAsmTemplate.asm x led2.asm x
Asm Source History
2 list p=16F887
3 include <P16F887.inc>
4
5 _CONFIG _CONFIG1, _FOSC_HS & _WDTE_OFF & _PWRTE_ON & _LVP_OFF & _CP_OFF
6 _CONFIG _CONFIG2, _WRT_OFF
7
8
9 org 0x00
10 goto MAIN
11
12 MAIN:
13 bsf STATUS, RP0
14 movlw b'00000101'
15 movwf TRISD
16 bcf STATUS, RP0
17 clrf PORTD
18
19 LOOP:
20 btfsc PORTD, 0
21 bsf PORTD, 1
22 btfss PORTD, 0
23 bcf PORTD, 1
24
25 btfsc PORTD, 2
26 bsf PORTD, 3
27 btfss PORTD, 2
28 bcf PORTD, 3
29
30 goto LOOP
31
32 end

```

Figure 1.4: Assembly code used to operate the circuit.



Learning Outcomes

By the end of this experiment, students will be able to:

1. **Configure Input and Output Pins Using Assembly Language**
Demonstrate the ability to define and configure microcontroller pins as input or output through assembly language instructions, emphasizing register-level control using TRIS and PORT registers.
2. **Perform Digital Input and Output Operations**
Gain hands-on experience in reading digital signals from input devices (buttons) and controlling output devices (LEDs), developing fundamental skills in digital I/O interfacing.
3. **Implement Logical Conditions and Control Flow**
Apply conditional branching and logical operations (btfsc, btfss, goto) to create control flow that determines LED behavior based on button press states.
4. **Program LED Operation in Assembly Language**
Write assembly code that turns LEDs on or off according to specific input conditions, reinforcing low-level programming and output control concepts.
5. **Adapt to Various Button Configurations**
Understand the effects of different button wiring methods, such as pull-up and pull-down configurations, and modify assembly code accordingly to achieve correct logic operation.
6. **Analyze Microcontroller Architecture and Pin-Level Control**
Develop a deeper understanding of microcontroller architecture, focusing on how individual pins are controlled through registers, and gain experience in interfacing with external hardware components like LEDs and push-buttons.
7. **Debugging and Verification of Assembly Programs**
Develop the ability to debug, test, and verify assembly code functionality using simulation tools such as MPLAB and Proteus, ensuring correct timing, logic, and hardware interaction.