Lab 01

Pushbutton to Toggle LED

EECE 4038C Embedded Systems Design

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Abstract:

The purpose of this lab is to familiarize ourselves with the PIC Microcontroller and the MPLAB X ID. The simple experiment is designed to go through the documentation provided and reproduce an experiment of turning on and off the 4th LED on the demo board when onboard push button is depressed. It is to be noted that the initial state of the LED is to be set to off and when the button is depressed to be turned to the on state and this cycle is to continue indefinitely.

Methodology:

Pre-lab Preparation:

- I began by installing MPLAB X IDE and the XC8 compiler on my laptop computer, following the provided links and documentation from the course and lab assignment.
- I established a physical connection between my laptop computer and the Microchip PIC DM164130-3 28-Pin LIN Demo Board using a USB cable.
- In preparation for the lab, I wrote an assembly code to implement the required functions on the demo board:
- Initially ensuring that the on-board LED DS4 is OFF.
- Creating a program that responds to the on-board pushbutton as instructed.

Lab Experiments:

- After assembling the Microchip PIC DM164130-3 28-Pin LIN Demo Board as per the pre-lab preparation steps, I loaded the assembly code I had developed onto the demo board.
- I powered on the demo board and observed the initial state of the on-board LED DS4, which was OFF.
- I proceeded to momentarily press the on-board pushbutton once, noting the change in LED DS4 status.
- Repeating the previous step for a second time, I ensured that the LED DS4 toggled OFF.
- I continued this process of momentarily pressing the pushbutton and observed the LED DS4 state change with each press, as per the lab instructions.
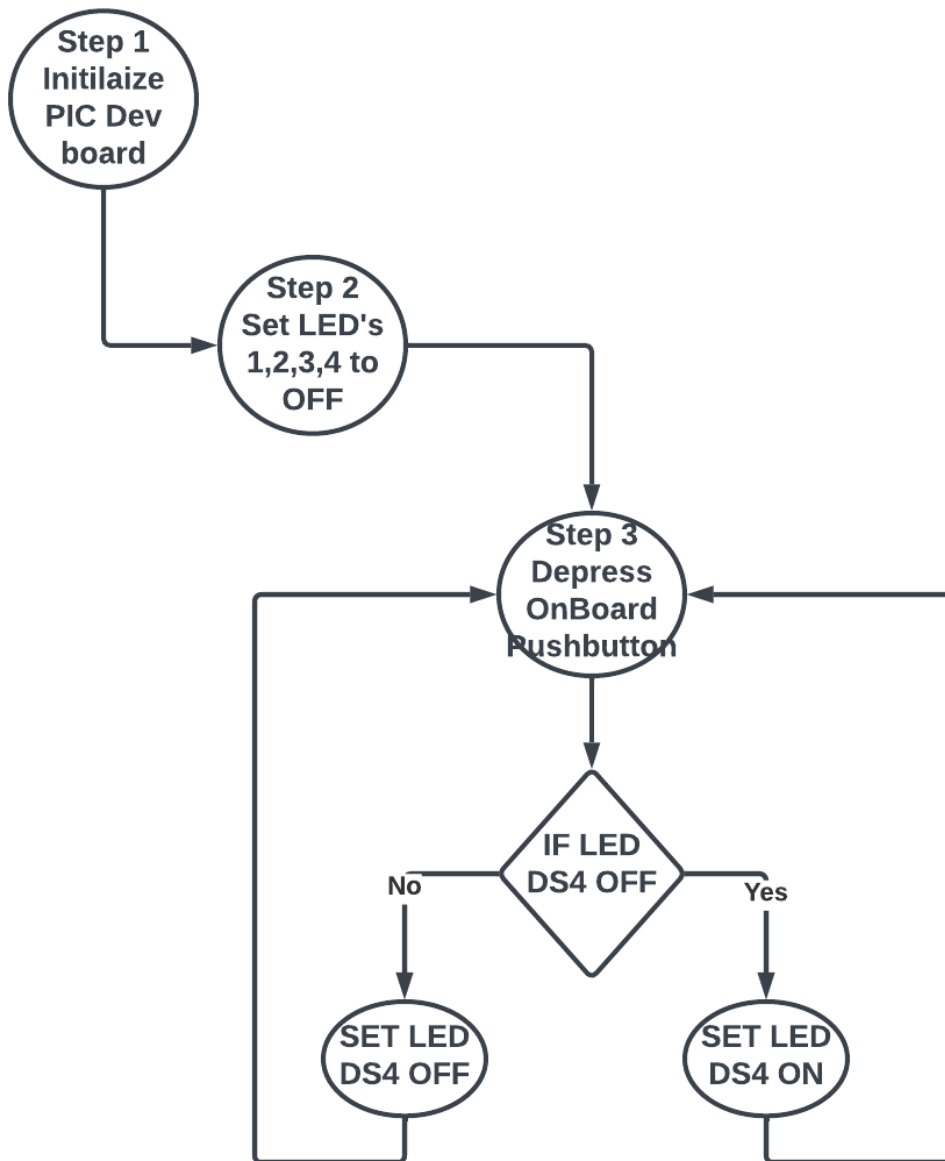
Lab Documentation:

- During the experiment, I took clear photographs and captured screenshots at key stages of the experiment, including the initial state, the LED turning ON, and the LED turning OFF.

Project Requirements:

Microchip PIC DM164130-3 28-Pin LIN Demo Board, MPLAB X IDE, USB cable, Windows Laptop

Design Diagram:

Step 1
Initilaize
PIC Dev
board

Step 2
Set LED's
1,2,3,4 to
OFF

Step 3
Depress
OnBoard
Pushbutton

IF LED
DS4 OFF

No

Yes

SET LED
DS4 OFF

SET LED
DS4 ON

Code:

; Assembly source line config statements

#include "p16f886.inc"

; CONFIG1

; __config 0x20D4

  __CONFIG _CONFIG1, _FOSC_INTRC_NOCLKOUT & _WDTE_OFF & _PWRTE_OFF & _MCLRE_OFF & _CP_OFF & _CPD_OFF & _BOREN_OFF & _IESO_OFF & _FCMEN_OFF & _LVP_OFF

; CONFIG2

; __config 0x3EFF

  __CONFIG _CONFIG2, _BOR4V_BOR21V & _WRT_OFF

; Place code below this line

```
PwrOnRst   CODE   0x0    ; Execution begins at address 0 after power on
   goto Main           ; Branch to main to begin execution
IntVect    CODE   0x4    ; Interrupt code must be placed at address 0x4
   ; Left blank for now, there are no interrupts to service


UsrCode    CODE          ; User code space. Not providing an address allows the
                 ;  assembler to place it where it thinks most
                 ;  convenient
Main:
   banksel         ANSELH   ; Tell the assembler to access the memory back this
   clrf      ANSELH   ; Set all I/O on PORTB to digital (0 or 1)
   banksel   TRISB        ; Selects bank containing register TRISB
   clrf      TRISB        ; All port B pins are configured as outputs
   movlw     b'00100000'
   movwf     TRISB        ; Pin RA1 is input
   banksel   PORTB        ; Selects bank containing register TRISB
   clrf      PORTB
Off:
   bcf PORTB, 3
   btfss PORTB, 5         ; Check if S1 (bit 5 of PORTB) is pressed
   goto On
   goto Off
On:
```

```
bsf PORTB, 3

btfss PORTB, 5          ; Check if S1 (bit 5 of PORTB) is pressed

goto Off

goto On

end
```

Inserted bellow is a screen shot of the code:

Results:

| PIC Initialized | Button Depressed | Button Depressed |

Conclusion:

We can conclude from this experiment that we are sucessuffly able to demonstrate that we can use the PIC DM164130-3 28-Pin LIN Demo Board and its physical controls , ie we are able to take inputs from the switch and convert them into physical changes to specific LED lights on the board.