CENG 336
ASSIGNMENT II
"Basic Ports"
Rev1.0

Assigned: 20/03/07
Due: 27/03/07 23:55

Introduction

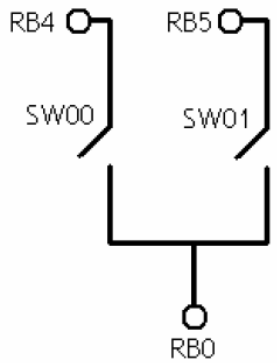
The purpose of this assignment is to make you familiar with basic input output operations on PIC Development Tool. You will do this by coding imaginary "button counter" tasks using push-buttons and 7-seg displays.

Your Mission

Small red leds and 7-Seg Displays will display how many times you pressed SW00 or SW01 push buttons. Leds will be off, disp2 (middle 7-seg display) and disp3 (right 7-seg display) will be 0(zero) initially. For example if you press sw00 six times and sw01 four times, displays should display `[_64]`. Note that, for your convenience, you will count between 0 and 9. For example if you press sw00 twelve times and sw01 fifteen times, displays should display `[_25]`. Meanwhile leds must show us how many times you pressed push buttons in binary form. For example if you press push buttons (i.e. sw00-3 times, sw01-64 times) 67(0x43) times, leds will display `[- o - - - - o o]`, and displays must show `[_34]`.

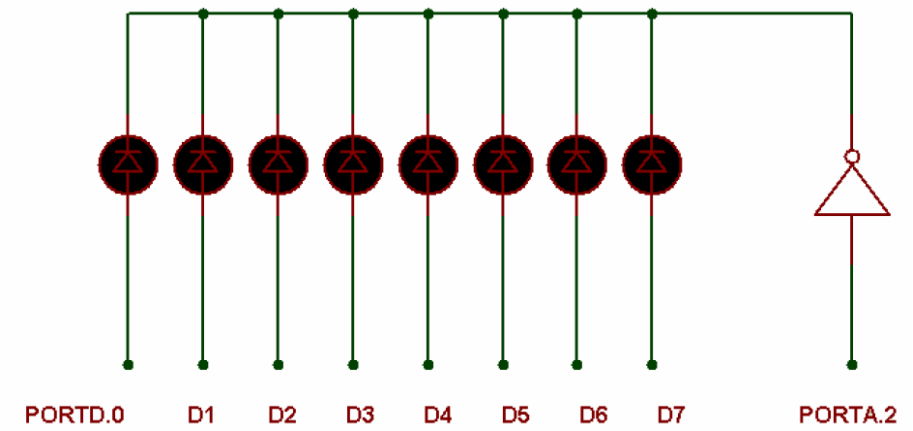
Mini How-to

1- **Push Buttons** **:** Buttons are connected as follows.



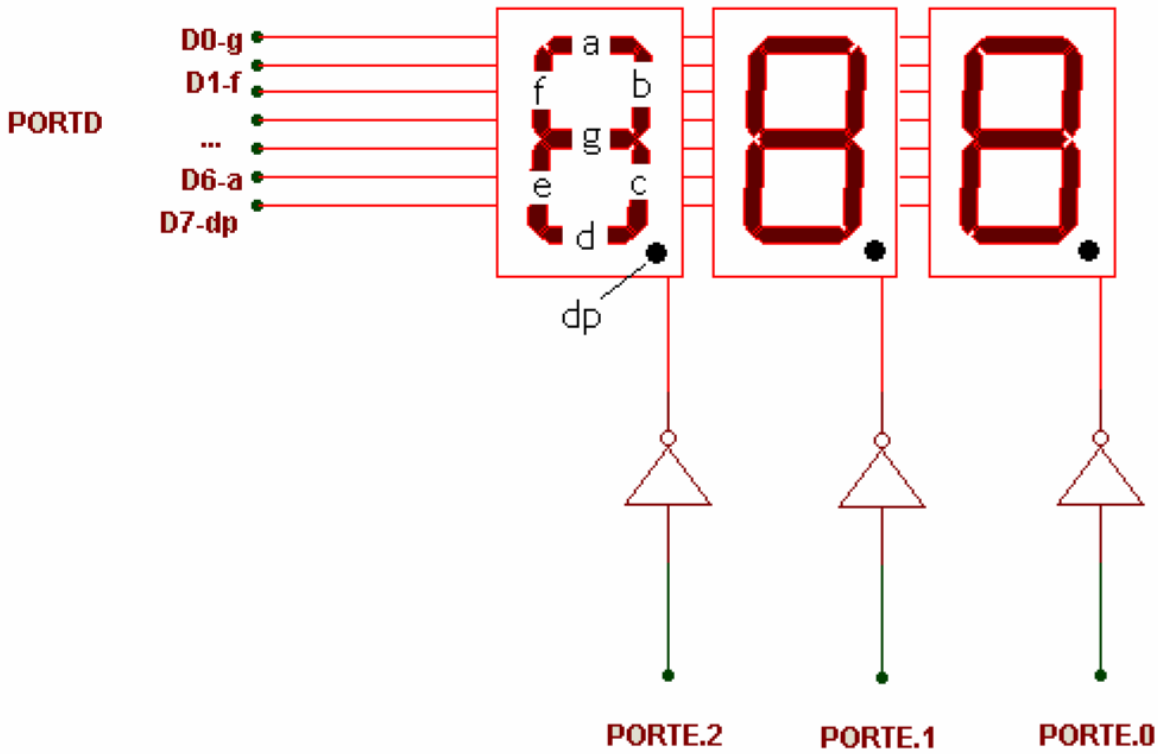
In order to use these two buttons on development board, you should use PORTB (RB0, RB4 and RB5). As you know, each of the PORTB has a weak internal pull-up. So, you must turn on all the pull-ups by clearing RBPU bit (OPTION_REG<7>). Pull up is automatically turned of when the port pin is configured as an output. Note that the pull-ups are disabled on a hard reset.
Because pull-ups turn on, for example, if you want to control whether SW00 has pressed or not, you should clear RB4, set RB5 and check RB0. If RB0 is 0, then it means that sw00 has pressed. Note that buttons are mechanical components; you had better control buttons a few times. That is one of the most important tip you should understand.

2- Leds **:** Leds are connected as follows.

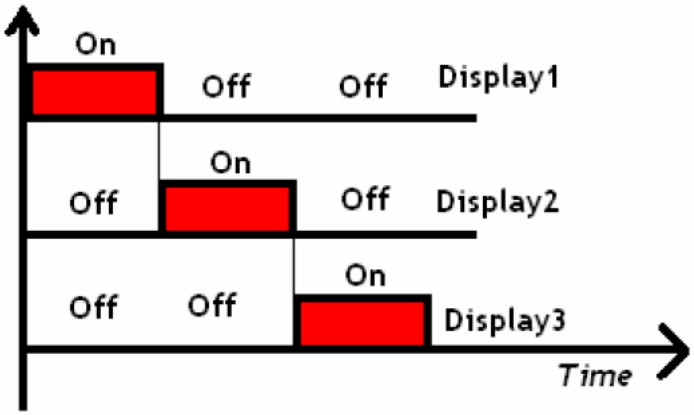


There are 8 small and red leds connected to PORTD on the development board. You should select led module using RA2 pin. If you want to make D2 and D5 leds on, after making RA2 at logic1, then you will send 00100100 to PORTD. Note that PORTA is default analog input instead of digital output we need, so you must be careful (ADCON1 register).

3- 7-seg Displays: There are three common cathode displays mounted on the board. PORTD will be used as data bus again. Also PORTE will be used as selection pins. For example if you want to show number "3" on rightmost display, you will first select it by setting RE0, then to show number "3", you will send binary "01111001" (0x79) to PORTD, hence, f, e and dp segments on display will be 0; a, b, c, d and g segments will turn on. Note that RD7 pin is used for dp pin of displays. Attention that PORTE is assigned by PIC as default analog input as PORTA is. (See ADCON1), and also note that PORTD is shared. Think how you can use both leds and three displays.



If you want to display, for instance ”123”, you will first select only first digit, then you will send “1” and wait for a while, after that, you will select only second digit, then you will send “2” etc.



Resources

1- **Course’s web page.**
2- **PIC Development Tool Programming Manual**
3- **PIC Development Tool User Manual**
4- Newsgroup

Evaluation

You will **certainly** use PIC assembler language. Any other languages will **NOT** be accepted.

Total of the lab is worth **100** points.

- **30** points for proper displaying 7-segment displays. Too low/high brightness will reduce it.
- **20** points for proper displaying led displays. Too low/high brightness will reduce it.
- **2x25** points for push buttons. For example, although you press once, if displays change more than one, this will reduce the grade.

Hand In Instructions

- You will submit a single file, “hw2.asm”.
- DO NOT tar or zip the file.
- DO NOT send an email attached your solution.
- Make sure you have included your names and IDs in a comment at the top of your hand in file.
- You will submit “hw2.asm” file using http://cow.ceng.metu.edu.tr
- No late submission is allowed.
- **Demo** days will be announced later.