VANIER COLLEGE – Computer Engineering Technology – Autumn 2017

Introduction to Microprocessors (247-302)

Lab 2

Basic digital input and output

NOTE:
To be completed in 1.5 lab sessions of 4.5 hrs.
One report has to be submitted **not later than one week** after the last lab session.
This exercise is to be done **individually** except where specified in the procedure. **Each** student must submit a lab report with original design, observations and conclusions.

OBJECTIVES:

After completing the project, the student will be able to:

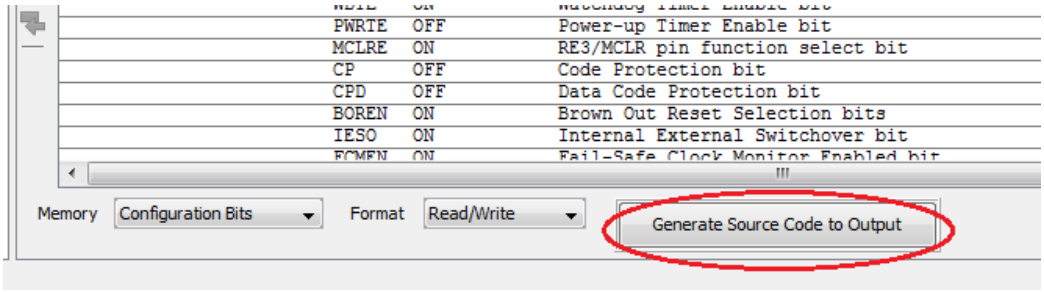
1. Setup basic internal clock source of PIC16F887.
2. Perform basic configuration of digital I/O on PIC microcontroller.
3. Read digital inputs from a push button switch.
4. Drive an LED through an I/O pin.

Lab procedures

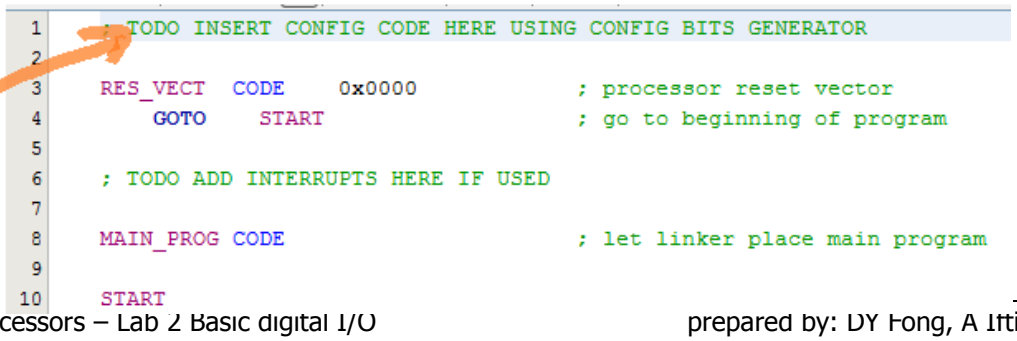
Note : *This lab is based on your PIC16F887 prototype board built in lab 1. Make sure your circuit is correctly designed and connected before you proceed with this lab.*

PART A: Setup internal clock source of PIC16F887

1. Refer to chapter on "Oscillator Module" of PIC16F887 datasheets. Briefly describe all the 8 possible clock modes that can be configured in oscillator module of PIC16F887.
2. Using the basic project generated in Lab 1, setup your device to use internal oscillator with clock output..
   a) Select **Window ▶PIC Memory Views ▶Configuration Bits.** Set the necessary option to enable internal oscillator as clock source, with clock out function.
   b) Turn off the following options
      - Watchdog Timer
      - Internal/External Switchover
      - Fail-Safe clock monitor
   c) Click **Generate Source Code to Output** to automatically generate the necessary configuration codes.



   d) Copy the configuration codes and paste at the top of the source file.



3. Build the code and load the program to your device.
   a) What is the pin number of the device that output the internal clock?
   b) What is the frequency, shape, and peak-to-peak voltage of the waveform observed at this pin? Does this match your expectation? Explain.
4. Show your waveform to the instructor and attach your source code in your report.

PART B: Drive an LED using a general purpose I/O pin

5. Modify your circuit by connecting an LED and an appropriate current limiting resister to RA0.
6. Start a new project in MPLABX and name the project *Lab2b*.
7. Write your code to drive the LED "ON" at RA0.
   a) Configures and initializes RA0 as digital output pin.
   b) Drive appropriate value to RA0 to turn on LED
8. Compile and download your code to your circuit. Check if it works as expected. Show your working board and software to your teacher.

PART C: Control an LED using a push button switch

9. Enhance your circuit by adding a simple push button switch as input to RB0. You are required to turn off the LED at RA0 when the switch is pressed. Ensure that your switch circuit is being design correctly.
10. Illustrate the logic of your code using basic flowchart.
11. Modify your code accordingly to meet the design requirements. Compile and download to your circuit. Check if it works as expected. Show your working board and software to your teacher.
12. Include a copy of your source codes, flowchart and full detailed schematic in your report.