Lab 0: Introduction to the Development Kit

Demo Due: February 6, 2014

Learning Objectives:

In this lab, you will familiarize yourself with PIC microcontrollers, the 16-bit 28-pin starter board, the PICKit3 in-circuit debugger, and C-based software development using the MPLAB X Integrated Development Environment.

Datasheets and References

Microchip 16-bit 28-pin Starter Board User's Guide

PIC24FJ64GA002 Datasheet

Provided Software Code:

1. lab0.c

Lab Procedure and Demo:

Part 1: Setting up the Development Environment

Description:

In this part, you will set up your development environment that you will use for all of the projects in this course.

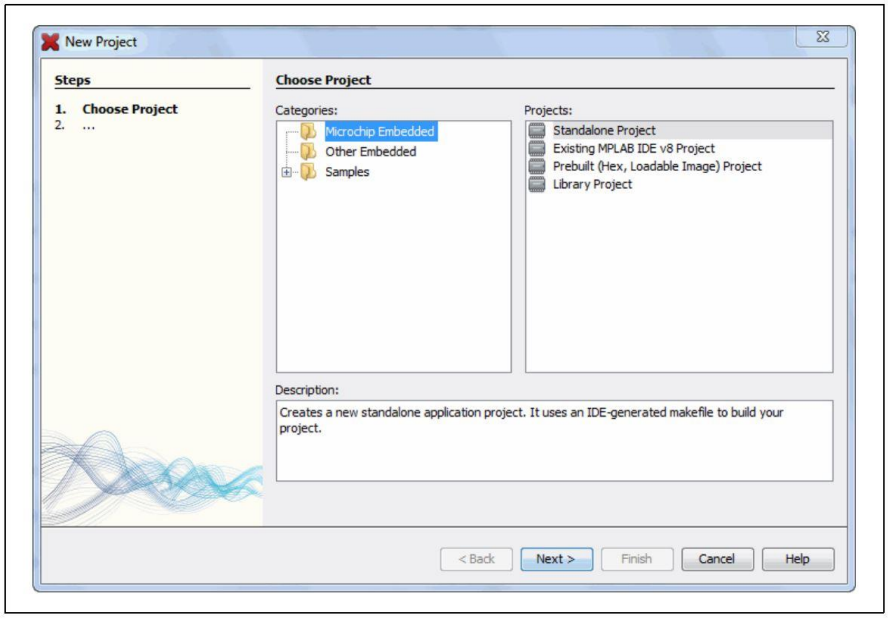
Procedures

1. Install **MPLAB® X IDE** http://www.microchip.com/pagehandler/en-us/family/mplabx/
2. For MPLAB® X IDE user guide. http://ww1.microchip.com/downloads/en/DeviceDoc/52027B.pdf
3. Install MPLAB C Compiler for PIC24 MCUs (**MPLAB XC16**). Use the MPLAB® X IDE link above and then click on MPLAB® X FREE DOWNLOAD tab.
4. Install HyperTerminal or TeraTerm in order to communicate between your PIC24F demo board and the computer (your laptop/PC) [to receive and send characters]. TeraTerm is available at: http://ttssh2.sourceforge.jp/index.html.en

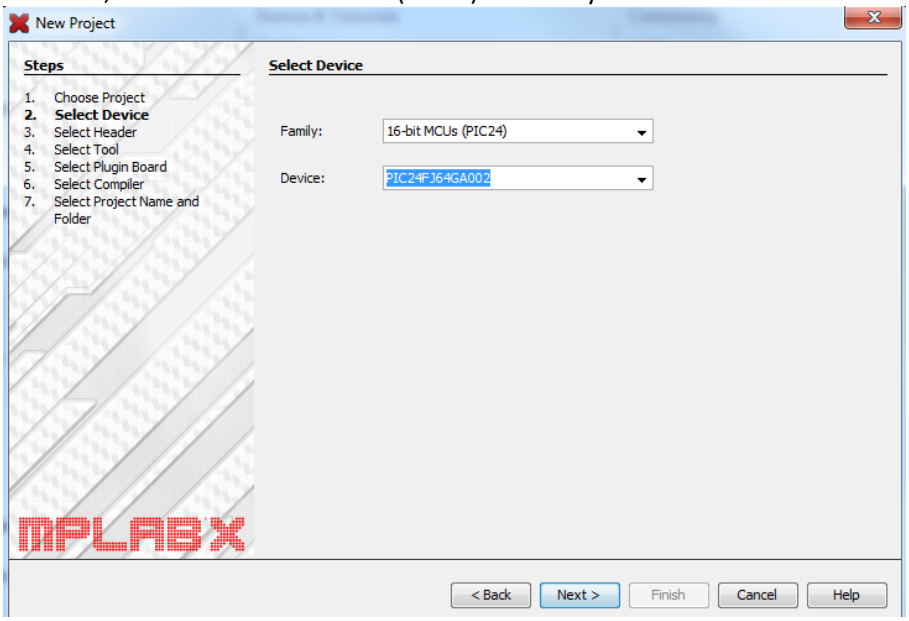
Note: HyperTerminal is not installed by default in Windows Vista or Windows 7 (there is a free trial version available on Internet). MAC users can use a terminal command which will be detailed later.

5. Replace the dsPIC33F microcontroller chip that may be pre-installed on the 16-bit 28-pin starter board with the PIC24F microcontroller chip provided in the small black antistatic box.
6. Open MPLAB X IDE and create a new project.
7. Create a project from the microchip embedded category. Choose a standalone project from the projects: pane. Click next.

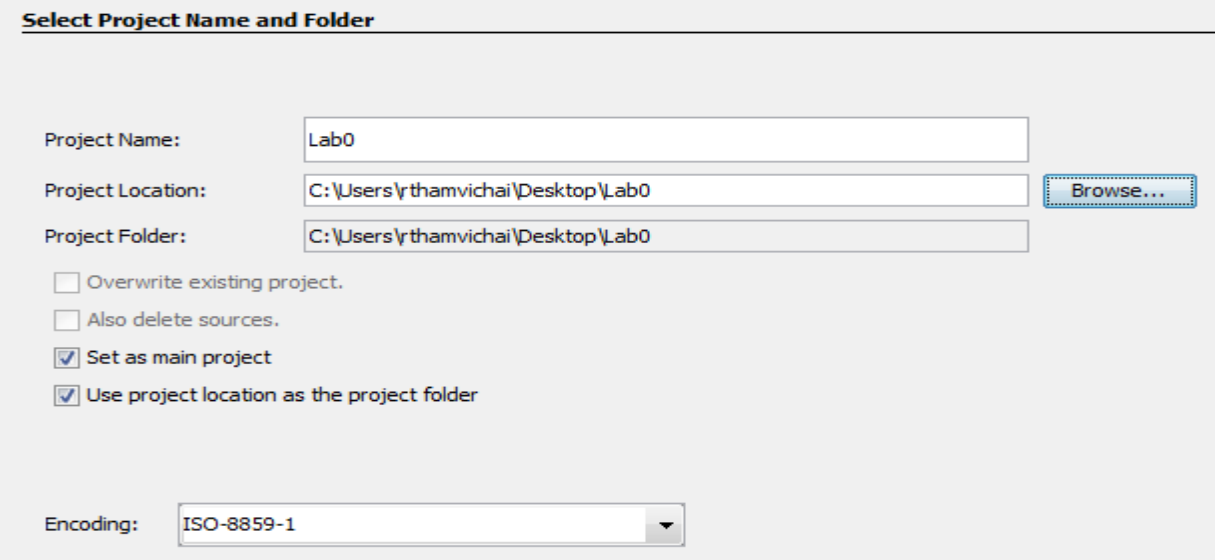
FIGURE 3-1: PROJECT WIZARD – CHOOSE PROJECT



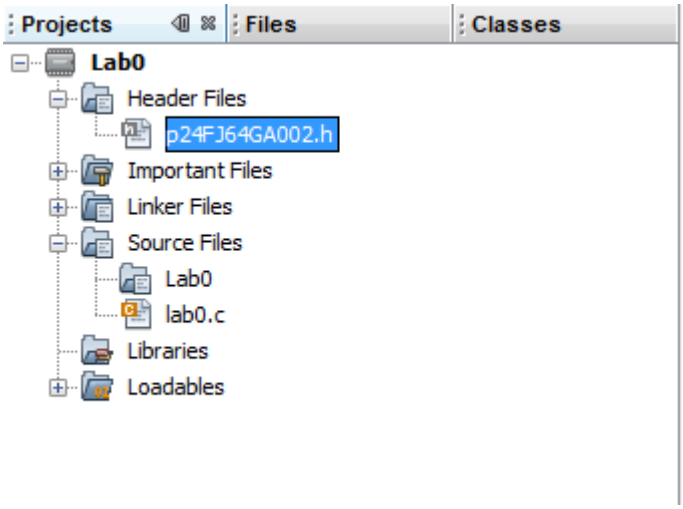
8. Now, choose the 16-bit MCUs (PIC24) for Family and PIC24FJ64GA002 for Device. Click next.



9. Do not choose a header. Click next.
10. Choose the PICKit 3 as the tool. Click next.
11. Choose XC16 as the compiler. If you have not correctly installed the XC16 compiler, this will not work for you. Install it correctly and try again. Click next.
12. Browse to a folder on your PC where you would like to keep your project files. Name the project “Lab0.”



13. Familiarize yourself with the MPLAB X IDE interface using sections 3.3.2 - 3.3.5 in the MPLAB X IDE user guide.
14. Download the lab0 zip file from D2L and extract it to a folder of your choosing.
15. Open the project folder from the locations you saved it.
16. For making other projects, the PIC24FJ64GA002.h header file should be located in the directory ***C:\Program Files(x86)\Microchip\xc16\v1.11\support\PIC24F\h\. For MAC's, the location is in \Applications\Microchip\….*** Your projects pane should look like this after you are done except for a few extra files:



17. Double-click the lab0.c file in the Projects window to open the file.
    a. Read the comments within the provided software code to get an ideal on how this provided code serial works!
18. Connect the starter board and PICkit3 to the computer
    b. Connect the 16-Bit 28-Pin Starter Development Board to your computer (laptop/PC) with the USB cable. You may need to install the software for the new hardware (if yes, read chapter 2 of the user guide)
    c. Connect the PICkit3 to your computer with USB cable
    d. Connect the PICkit3 to ***J6*** position on the 16-Bit 28-Pin Starter Development Board

e. Make sure that ***SW2*** on the 16-Bit 28-Pin Starter Development Board is in the "USB/DEBUG" position.

Part 2: Blinking LEDs

Description:

In this part, you will use the provided project to create your first program for the PIC24F which controls the blinking of LEDs.

Requirements:

For every distinct press of SW1 on the development board, the illuminated LED on the development board will change to the next LED. If the switch is pressed for a longer period of time (2 seconds), then the illuminated LED will change in the opposite direction. This will be implemented using a finite-state machine. This is done by using a switch statement in the code. Be sure to follow coding guidelines.

Procedures

1. Examining the code, fill in the parts that say TODO: to achieve the desired functionality.

Part 3: Programming in Stand-alone Mode:

Description:

In this part, using the code created in Part 2, you will program the microcontroller in stand-alone mode. This means it does not need to be connected to a debugger to run. Additionally, when the device is reset by the reset button, it will run the code it was programmed with automatically.

Requirements:

The microcontroller should run the code described in Part 2 in stand-alone mode.

Procedures:

1. Place SW2 on the 16-Bit 28-Pin Starter Development Board is in the “PROGRAM” position.
2. Click on  Make and Program Device Project Icon to program your device
3. Once programming is complete, SW2 must be switched back to the “USB/Debug” position for UART communication via the USB bridge. Otherwise, nothing will appear in your terminal.
4. At this point, you can remove the PICkit3 connected to J6 of the board.
5. If your program is still working this means you have successfully program your device in the stand-alone operation.
6. Push the “RESET” switch if you want your board to start working.