

ECE 1574 Lab Assignment 3 Introduction to Programming the Fox11 Board

CRNs 11720-11727

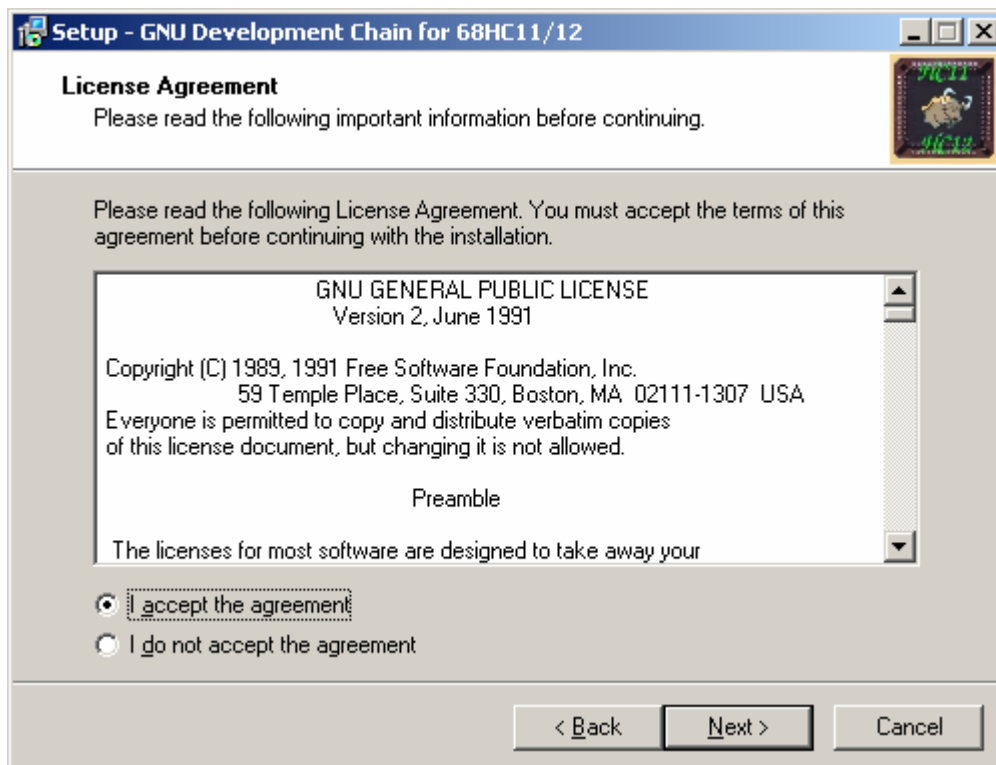
Introduction

In this lab, you will download a program to your Fox11 board to check that the board is functioning properly.

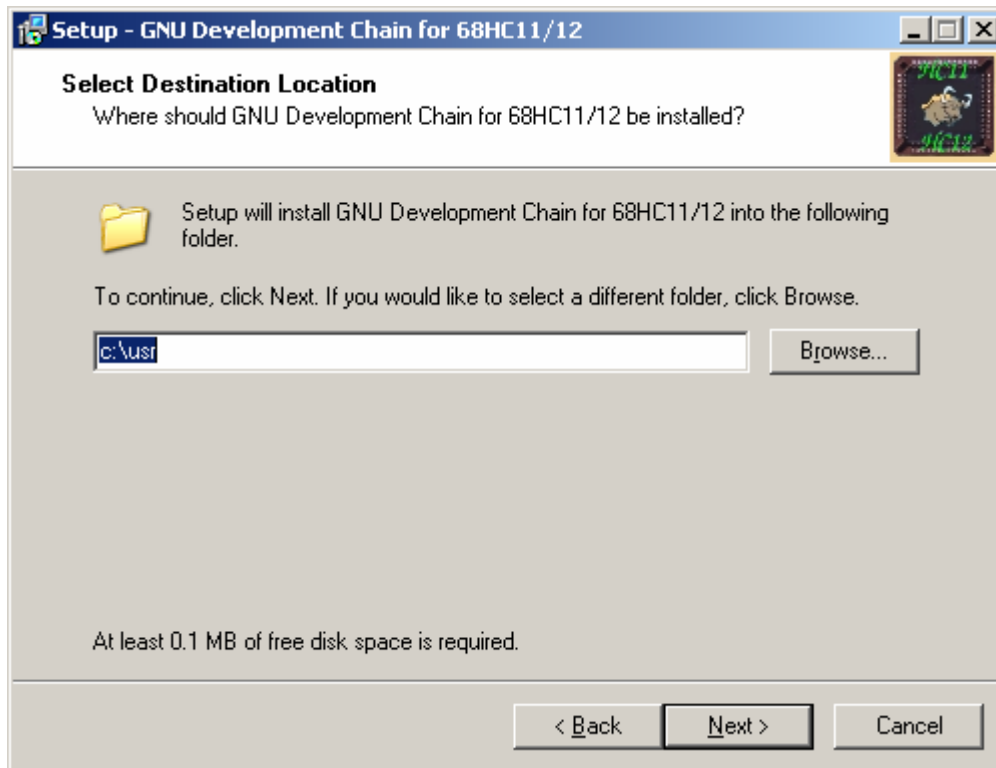
Software Preparation

To create an executable program for the Fox11 board, you will have to use a *cross-compiler*, a compiler that runs on one type of computer (in this case, your PC with its Pentium processor) but creates an executable for another type of computer (the Fox11 board with its 68HC11 processor). The cross-compiler you will be using can be downloaded from <http://stephane.carrez.free.fr/EXE/gnu-68hc1x-3.0.1.exe>. Run the downloaded program and use all the default settings.

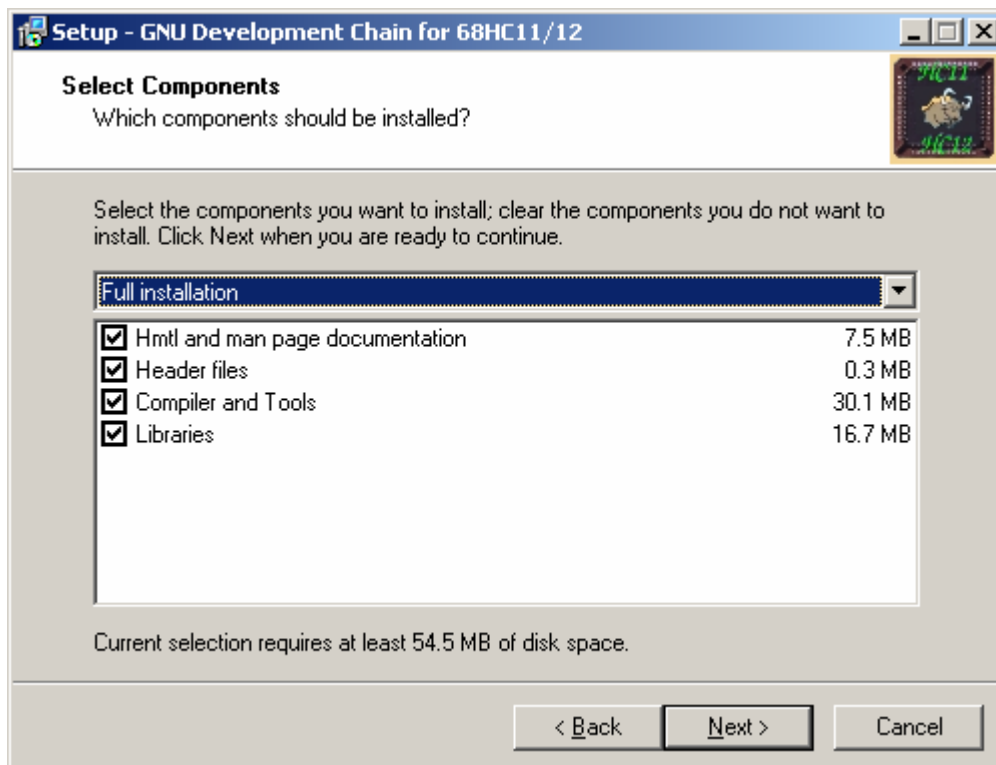
Accept the license agreement:



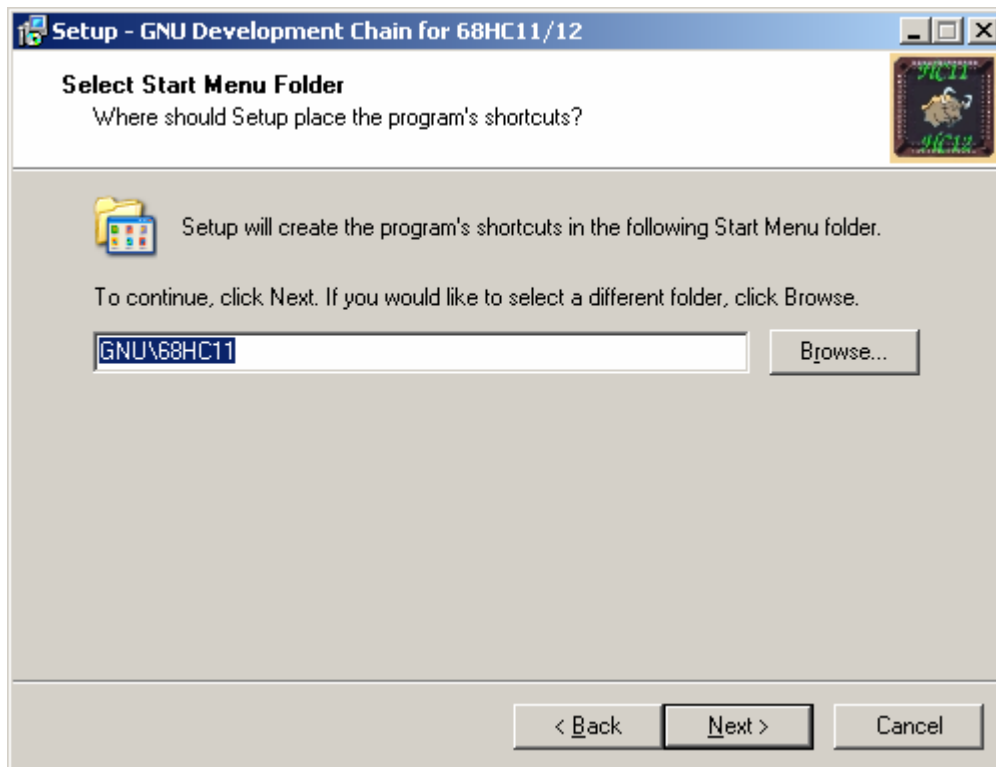
Use the default destination location:



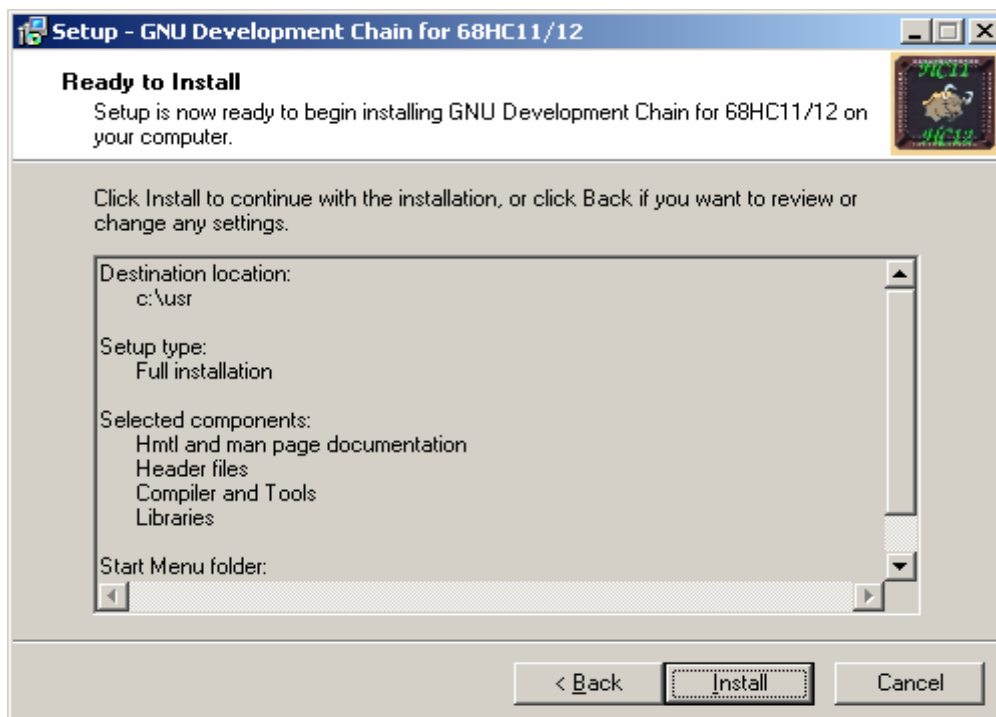
Do a full installation:



Use the default for the start menu:



Select Install and wait a couple of minutes for the installation to complete:



Use Textpad to edit your `.bash_profile` to put the cross-compiler in your path. The last line of your `.bash_profile` should be:

```
export PATH="/cygdrive/c/usr/bin:/cygdrive/c/Program Files/TextPad 4:$PATH"
```

Next, download the `m6811-support.tar.gz` file from the class website. This and `lab3.zip` compressed files contain the source code for the program you will be compiling and downloading to the Fox11 board, as well as the libraries and configuration files that provide input/output for the board.

Open a Bash shell and make a directory called `lab3` and another one called `hc11`. Use Winzip to unpack the files in the `m6811-support.tar.gz` file to the `hc11` directory and all the files in the `lab3.zip` file to the `lab3` directory.

One of the files that will be unpacked is a `Makefile`. Change directories into `lab3`, and use Textpad to edit the `Makefile`:

```
cd lab3
textpad Makefile &
```

Set the `GEL_BASEDIR` variable near the top of the file to the `hc11` directory, e.g.
`C:/cygwin/home/Pushkin/1574/hc11`. Save the changes to the `Makefile` and quit.

Run the `make` command in the `lab3` directory and several files should be created, including the executable file that you will download to the Fox11 board: `example_io.s19`.

Hardware Preparation

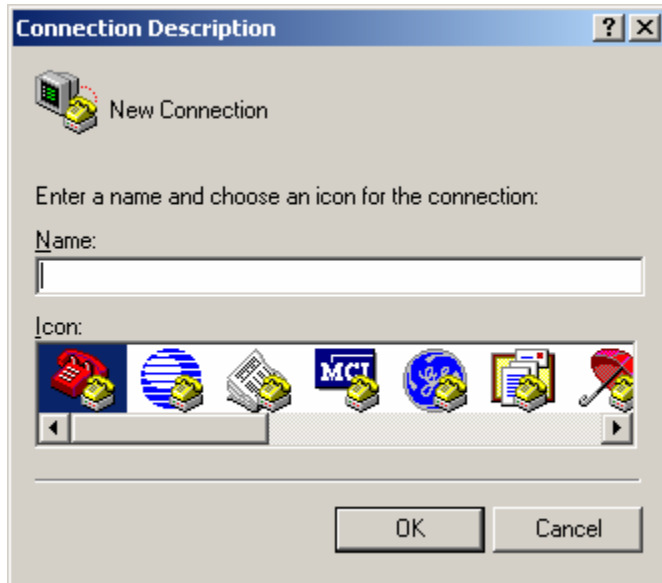
The next step is to set up the Fox11 board. First, plug the AC adapter into an outlet and insert the plug into the jack on the right side of the board (if you are looking at the board oriented so that the breadboard is nearest to you).

Plug the male end of the serial cable into serial port on the board labeled P2 on the upper right side of the Fox11 board, and the female end of the cable into a free serial port on your PC (the remaining instructions will assume that you plugged it into the COM1 port of your PC).

Next, connect the keypad to the Fox11 board on the port labeled KEYPAD on the left side of the board. The port has only 8 pins, but the keypad has 10 pins: Pin number 1 and number 10 on the keypad are not used, so only the middle 8 pins of the keypad will be connected. The keypad connector will have an arrow on it to indicate pin 1; the connector should be inserted with this arrow on the end of the port that has a 1 by it. Please see the Fox11 *Getting Started* document for more information.

Communicating with the Board

To communicate with the board, we will be using HyperTerminal. To start HyperTerminal, select Start->Programs->Accessories->Communications->HyperTerminal. This will open a window for a new connection:

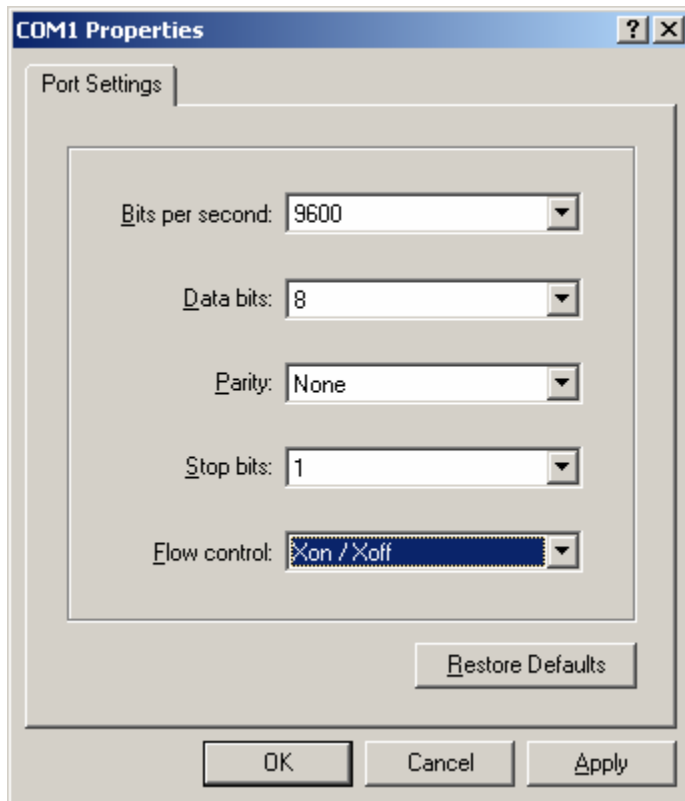


(If this is the very first time you have run HyperTerminal, another window will appear first asking for your area code. HyperTerminal can be used with a modem to make a connection over a telephone line.) Enter `buffalo` for the name and select OK. You will then be prompted for which serial port to use:



If you are using COM1, then select OK, otherwise, pull down the menu for your port and then select OK.

Next a window will open to set the ports communication properties. Set the port settings to 9600 bits per second, 8 data bits, no parity, 1 stop bit, and Xon/Xoff flow control as shown below, and then select OK:



The full HyperTerminal window should then appear. Press and release the reset button on the Fox11 board, and the words

BUFFALO 3.46sc - Bit User Fast Friendly Aid to Logical Operation
should appear. If they do not, please check that you have the correct HyperTerminal settings.

Press the Enter key on your keyboard, and the prompt > will appear.

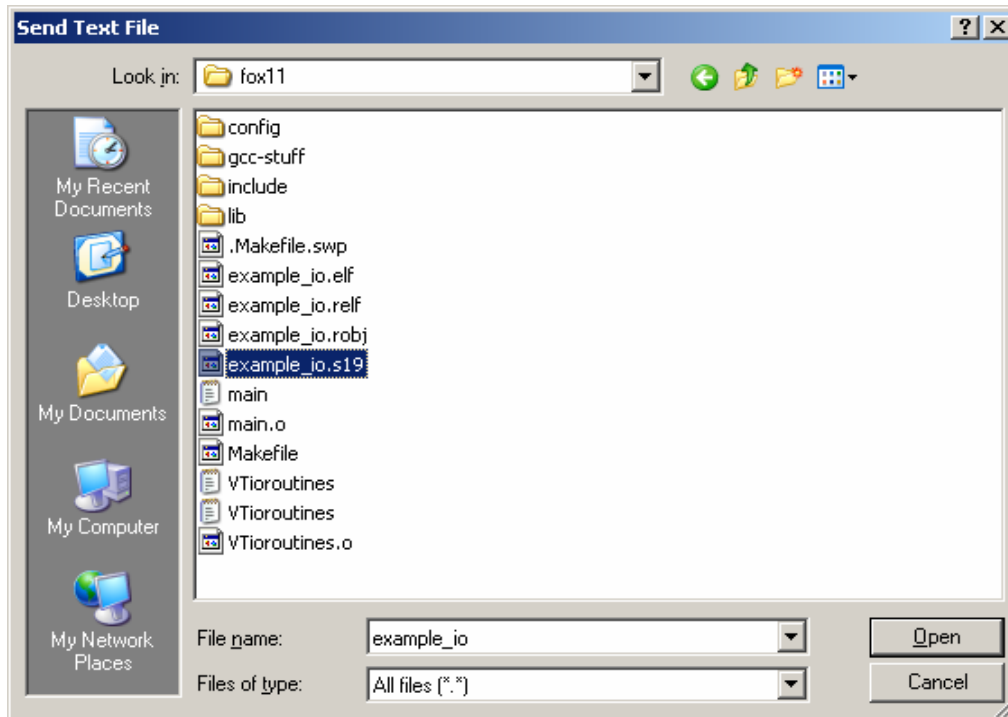
Your PC is now properly communicating with the Fox11 board. The next thing you have to do is to download a program to the board.

Downloading a program to the board and running it

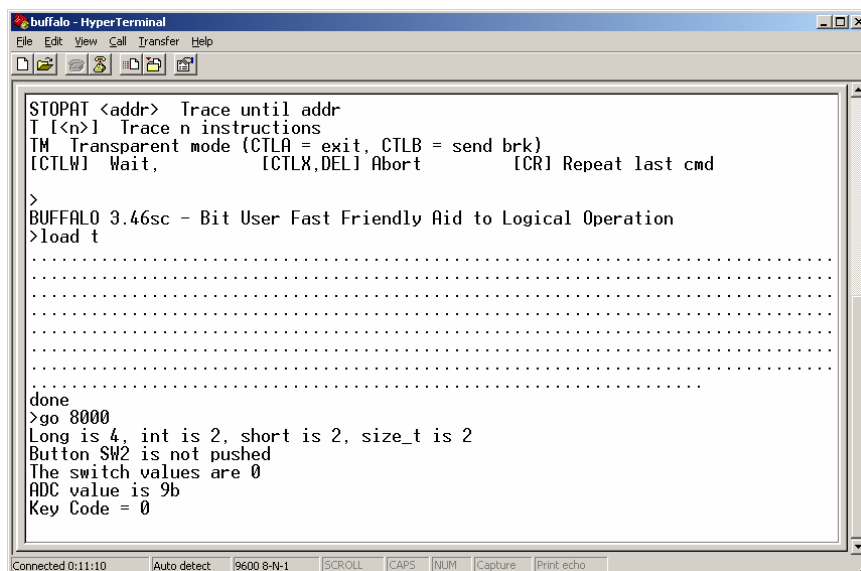
At the > prompt, type `load t` (which stands for “load a text file”) and press enter.

Next, select Transfer->Send Text File from the menu at the top of HyperTerminal. Navigate to your lab3 directory, and change the “Files of type” to “All Files (*.*)”. Select `example_io.s19` as shown below and then select open. It is important that you select the

.s19 file, as it is formatted in such a way that the Fox11 board can download it and then put it into its memory.



The HyperTerminal will then have a series of periods appear as the file downloads. When the word done and the prompt appears, type `go 8000` and hit Enter. This will tell the Fox11 board to begin executing the program at memory location 8000, which is where downloaded programs are stored by default. HyperTerminal will now appear as shown below:



The program you have downloaded tests both input to the Fox11 board (e.g., keypad, DIP switches) as well as the LCD output. It checks input values and writes output whenever the Enter key is pressed in HyperTerminal. Perform the following steps to make sure your board is functioning correctly:

- (1) Type your name and hit Enter. Verify that it appears on the LCD.
- (2) Set a value on the DIP switches (upper left side). Hit enter and verify that the line that reads `The switch values are` has the value that you set.
- (3) While holding down a key on the keypad, hit enter and keep holding down the keypad key until the speaker stops buzzing. Verify that the line that reads `Key Code =` has a non-zero value. If the value is zero, make sure that the keypad is inserted correctly and that you hold the keypad key down until the speaker stops.
- (4) Press the pushbutton labeled SW2, hit enter and keep holding down the pushbutton until speaker stops buzzing. Verify that the line that reads `Button SW2 is pushed.`
- (5) At each step, verify that the binary value displayed by the LEDs matches the iteration number shown on the LCD.
- (6) Edit the `main.cpp` file. Change the line that reads `VTled(iter)` so that instead of the LEDs showing the iteration number, they show the binary value given on the DIP switches (the DIP switch value is contained in the variable `switch_value`). Save your changes and quit the file. Then run make, reset the Fox11 board, and download the new executable to it.

TA initials:

1)_____

2)_____

3)_____

4)_____

5)_____

6)_____

Try several different settings of the DIP switches, hitting Enter after setting each value. The LED value will equal the DIP switch value from the previous time you hit the Enter key. Edit the `main.cpp` file and find out why this is so. Move the `VTled` function call so that the LED values equal the DIP switch values at the time Enter is pressed rather than the previous time. (Hint: Where are the switch values being read and stored in the `switch_value` variable?)

Once you have completed each of the above steps, please validate your lab by showing the TA that all five functions work properly and that your LCD contains your message. The TA should initial each step above and then sign below to show that the lab has been validated. This lab (and all further labs) must be validated during your lab section.

Your Name

Date

GTA name / Signature