University of British Columbia
Electrical and Computer Engineering
ELEC291/292

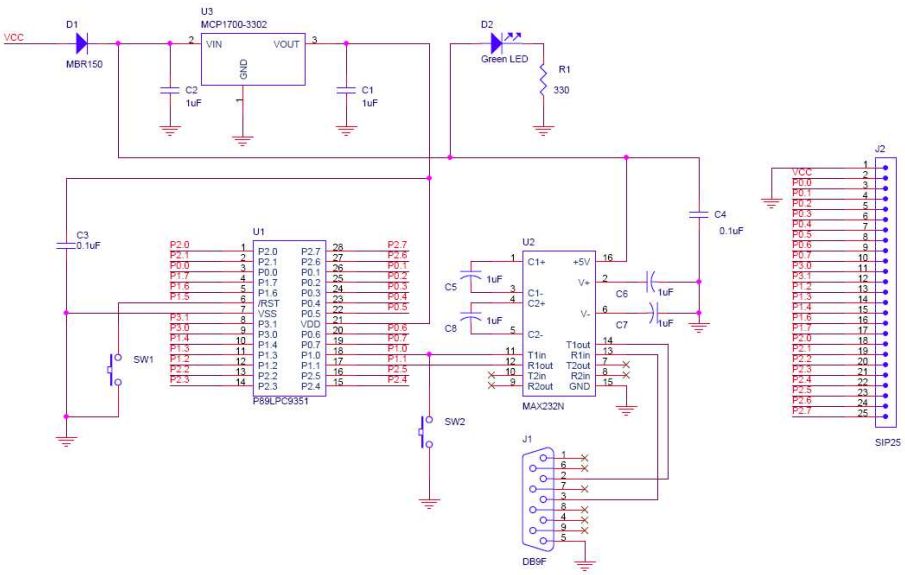
Using the EECE281 board in ELEC291/292.

Introduction

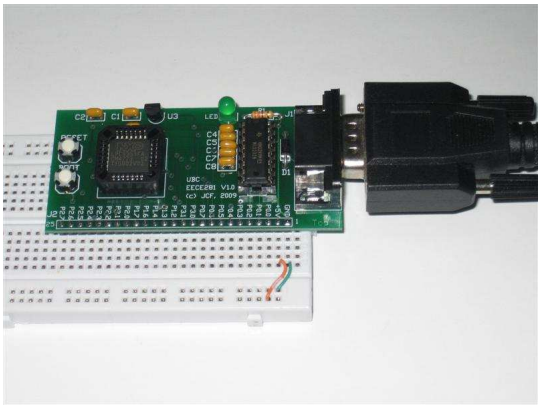
This document shows how to wire the EECE281 board in order to use in ELEC291/292. Additionally, it shows how to compile and load programs to the board.

Setting up the Board

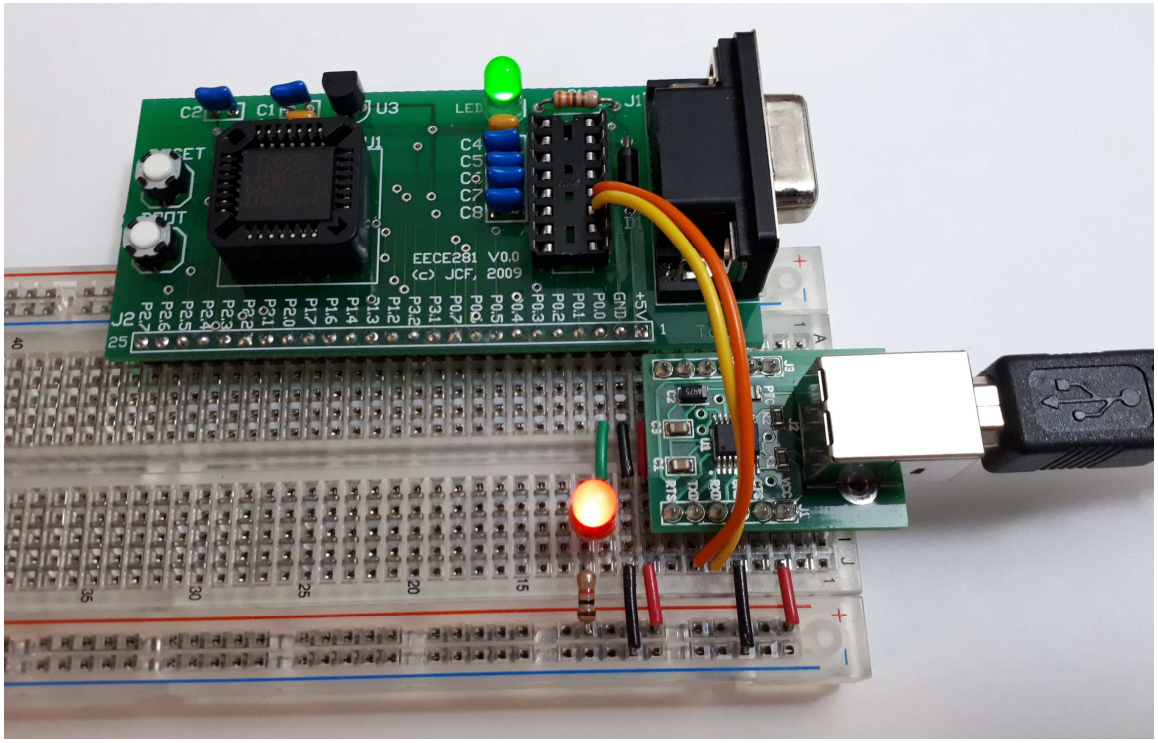
At this point it is assumed that you have soldered the EECE281 board following the instruction posted in Canvas. For your reference, this is the circuit schematic of the board.



When the board was first made available to students over ten years ago, they had to buy a USB to RS232 serial adapter and connect it as shown in the figure below.



Instead of using an USB to RS232 serial adapter we will use the BO230XS board. This has the advantage of not only providing communication with the board but also of deriving power directly from USB. To attach the BO230XS board, remove U2 from the EECE281 board and add to wires as shown in the picture below from the socket of U2 to the pins of the BO230XS board. Pin 11 from the socket of U2 is connected to RXD while pin 12 is connected to TXD. The picture below also shows power from the BO230XS board (VCC=+5V and GND) connected to the EECE281 board. The figure also shows an LED+1kΩ attached to test the program using 'blinky.asm'.



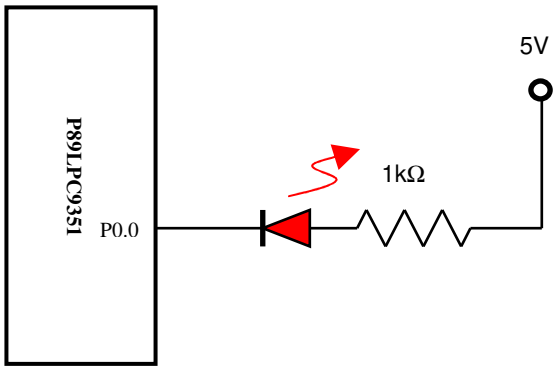
Creating, assembling, downloading, and running code in a microcontroller system.

a. Download and install CrossIDE from Canvas. Note: If your are using the computers in the lab, you can only install CrossIDE into your network drive 'Z:'.

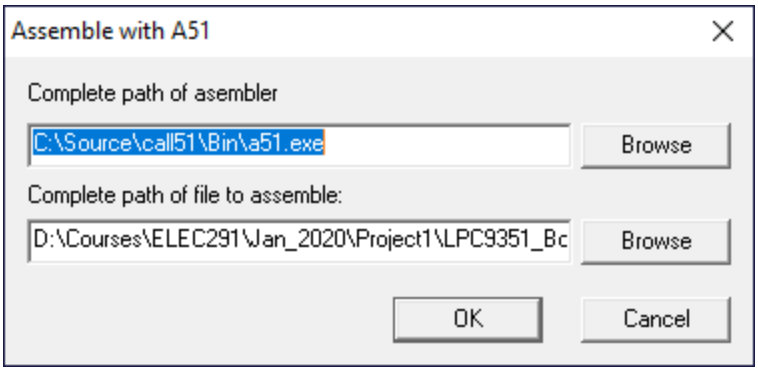
b. Run CrossIDE and create a new assembly file adding the code below. Save the file as "Blinky.asm". Tip: You may be able to cut and paste from this file!

```
; Blinky.asm: blinks an LED connected to pin 0 of the
; p89lpc9351 microcontroller each second.

$MOD9351

org 0000H
    ljmp myprogram
org 001BH
    ljmp 1803H ; Needed if using the debugger

; For a 7.373MHz internal oscillator, one machine
; cycle takes 2/7.373MHz =0.27126us
WaitHalfSec:
    mov R2, #20
L3: mov R1, #250
L2: mov R0, #184
L1: djnz R0, L1 ; 2 machine cycles-> 2*0.27126us*184=100us
    djnz R1, L2 ; 100us*250=0.025s
    djnz R2, L3 ; 0.025s*20=0.5s
    ret

myprogram:
    mov SP, #7FH
    ;Since we will be using P0.0, make it bi-directional...
    mov P0M1, #00H
    mov P0M2, #00H
M0:
    cpl P0.0
    lcall WaitHalfSec
    sjmp M0
END
```

c. Attach a red LED to P0.0 of the microcontroller. The LED circuit is shown below.



d. Compile the program using A51. In CrossIDE click “Build”, then “Compile/Link with A51”, you’ll get a pop-up like this one:



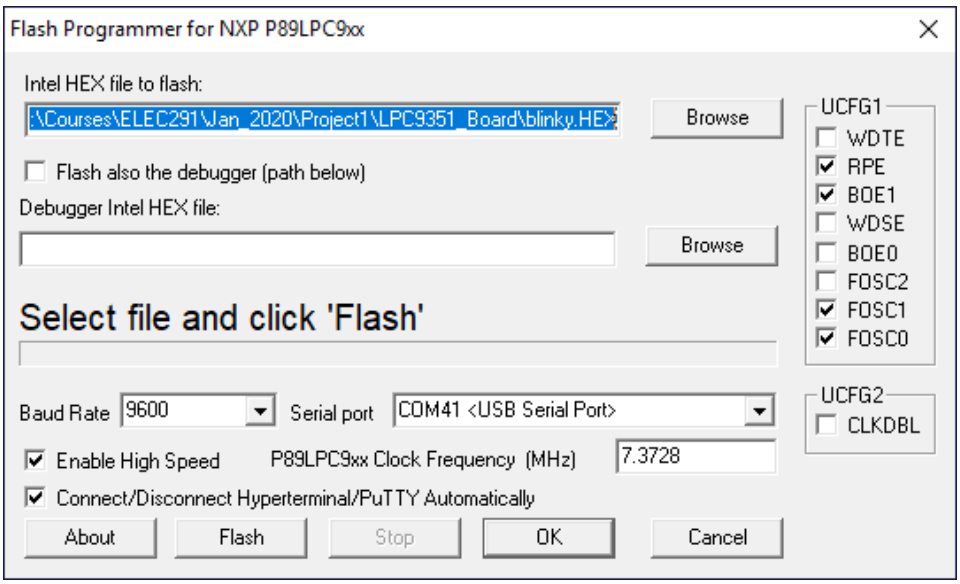
Make sure the complete path of a51.exe is correct, and click ok.

If everything went well and you did not get any errors, the assembler should have created the file 'blinky.hex':

```
------- CrossIde - Assembling -------
D:\Courses\ELEC291\Jan_2020\Project1\LPC9351_Board\blinky.asm:1: Assembling...
No errors found
```

The HEX file is what we download to the microcontroller. If you get any errors, they will be reported directly in CrossIDE. Fix them, and try assembling again. If you want more detailed information about the errors check the file "blinky.lst".

e. To download the code to the board, we will be using CrossIDE's built-in flasher. Make sure the BO230XS+EECE281 combo is connected to your computer using a USB cable. On CrossIDE click "fLash" followed by "NXP P89LPC9xx". You should get a pop-up like this:



Select the "hex" file created by the assembler, and click "Flash". Also make sure you are using the serial port number assigned by your computer to the BO230XS board. In my case is COM41, but in your case it will be likely different. It is

imperative that you keep the check boxes as shown in the pop-up window above. Before the flashing process begins, it is necessary to put the microcontroller in ISP (or boot) mode:

i) Press and hold the "BOOT" push button in the EECE281 microcontroller board.
ii) Press and release the "RESET" push button while pressing the "BOOT" push button.
iii) Release the "BOOT" push button.

Wait for the download process to finish and then press the reset button again. Verify that the red LED is blinking.