

# Department of Engineering

## EE 3710 Lab 1

- Title:** Debugging with an Integrated Development Environment (IDE)
- Objective:** The student should become familiar with the process of building, downloading, debugging and running programs on a microcontroller using an IDE
- Parts:** 1-C8051FX20-TB Evaluation Board  
1-USB Debug Adapter
- Software:** Silicon Laboratories IDE version 3.50.00 or greater
- Preparation:** Write the title and a short description of this lab in your lab book. Make sure the page is numbered and make an entry in the table of contents for this lab.

Create a text file named lab1.asm that contains the following 8051 assembly code. Note that this code contains errors.

```
$include (c8051f020.inc)

        dseg at 30h
str_d:  ds      10h          ; reserve 16 bytes

        iseg at 80h
str_i:  ds      10h          ; reserve 16 bytes
stack:  ds      70h          ; reserve the rest for
stack

        xseg
str_x:  ds      10h          ; reserve 16 bytes

        bseg
flag:   dbit    1           ; reserve 1 bit for flag

        cseg
mov     wdtn,#DEh          ; Disable watchdog
mov     wdtn,#ADh
mov     r0,#255
clrall: mov    @r0,#0       ; clear all internal ram
        djnz  r0,clrall
        setb  flag          ; set flag bit
        mov  sp,#stack-1    ; initialize stack
        mov  dptr,#str_x    ; point dptr at str_x
        mov  r0,#str_d      ; point r0 at str_d
        mov  r1,#str_i      ; point r1 at str_i
        mov  r6,#10         ; copy all the bytes
        mov  r7,#str_c-pc_rel; pc relative offset to str_c
```

```

loop1:  mov     a,r7           ; offset to first (next) byte
        movc   a,@a+pc      ; actually get the byte
pc_rel: mov     @r0,a        ; store in str_d
        mov     @r1,a        ; store in str_i
        movx   @dptr,a      ; store in str_x
        inc    r0
        inc    r1           ; increment pointers
        inc    dptr
        inc    r7
        djnz   r6,loop1     ; loop 16 times
loop2:  sjmp   loop2        ; wait forever

str_c:  db     "Hello, Students", 0
        end

```

Print your copy of the assembly code and affix it to your lab book.

**Procedure:** Bring your evaluation kit and a computer with the Silicon Labs IDE installed to the lab during your scheduled period. If you wish, you can use the IDE that is pre-installed on a laboratory computer.

At the beginning of each lab, you are required to show your preparation work to the lab instructor who will score it based on the following rubric:

Criterion	Points
Lab book is legible and in ink	1
Each used page in the lab book has a page number	1
Each used page in the lab book is initialed and dated	1
Lab book contains a clear title and a short description of the lab	1
Lab book contains an assembly listing and/or a schematic	2
Assembly listing is well documented with comments (not applicable to Lab 1)	1
Schematic components are labeled and have pin numbers (not applicable to labs without schematics)	1
Preparation work was graded at the beginning of the scheduled lab period (or other arrangements were made with the instructor)	2

**Lab Work:** Create an “assembly” project (for lack of a better name, call it lab1. The IDE will automatically append a “.wsp” extension). Add lab1.asm to this project. (If you have difficulty, select Help→IDE Help and refer to the IDE tutorial.)

Add the file C:\SiLabs\MCU\IDEfiles\C51\ASM\C8051F020.INC to the “Header Files” group. C8051F020.INC is a file supplied by the manufacturer that provides symbolic names for all the special

function registers specific to the C8051F020. Adding this file to the Header Files group is for your convenience only.

Build the project. Correct any assembly errors you may have found. Once you can assemble the file cleanly (no errors and no warnings), connect the USB debug adapter to your host computer and attach the JTAG connector from the debug adapter to the C8051Fx20-TB. From the IDE, first select “Connect” to establish a connection to the adapter, then download your code using the DL button on the IDE toolbar.

Set a breakpoint on the line containing loop2 and run your program by selecting the round green button on the toolbar. The program should start (button turns red) and stop (button turns green again) almost instantly.

This program purports to copy the string “Hello, Students” into 3 different memory segments. See if it succeeded by finding the string in the debug windows for RAM and External RAM.

Inspect the code above in an effort to find the error. Once you have discovered the error, correct it, rebuild and re-run your code. Use the RAM and External RAM windows to verify that your code works properly.

Write a summary of this lab in your lab book, sign it and date it. Then show the corrected code to your lab instructor and demonstrate that the string was copied.

The lab instructor will assign a lab completion grade based on the rubric below.

Criterion	Points
The lab was completed successfully and all required demonstrations were made	3
Results, measurements and/or observations are recorded in the lab book.	1
There are no obliterations in the lab book (no white out, nothing scribbled out and nothing overwritten)	1
Lab book contains a signed dated summary, and any new pages are numbered, initialed and dated	1
All demonstrations were made prior to the end of the scheduled lab period	2
Lab book was submitted for grading prior to the beginning of the next scheduled lab period.	2