Khalifa University of Science, Technology and Research

Electronic Engineering Department

ELCE333: Microprocessor Systems Laboratory

Pre-lab Report- lab2

Development and Testing of HCS12 Programs Using Branching and Loops

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Pre-lab

In this pre-lab report, branching & loops in assembly language will be practiced using different mnemonics. In the first pre-lab task, it is required to write a comparison instruction that compares between the contents of Acc A & B, and storing the biggest value in address $1000. "**If Acc A >Acc B, Store Acc A→[$1000] and if Acc B>Acc A; Store Acc B→[$1000].**"

> **Load Acc A = #$10 and Acc B = #$20. Use BGT or BLE branch instructions.**

The following table shows some of the instructions that should be used in this part.

Table 1: The operations of BGT and BLE

BGT	Branch if greater than
BLE	Branch if less than

The code compare the contents of accumulators A and B, if A is greater than B, then it branches to the YES section and sets MAX to the contents of A, otherwise it will execute the next instruction which sets MAX to the contents of accumulators B. The instruction is following:

```
; Include derivative-specific definitions
        INCLUDE 'derivative.inc'

        XDEF Entry
MAX     EQU $1000

        ORG $4000

Entry:
        CLRA
        CLRB
        LDAA #$10 ; ($10)--> A
        LDAB #$20 ; ($20)--> B
        CBA       ; compare A to B
        BGT  YES  ; branch if A is greater than B
        STAB MAX  ; set value of B to maximum
        BRA Exit  ; exit the program
YES     STAA MAX
Exit    BRA Exit
```

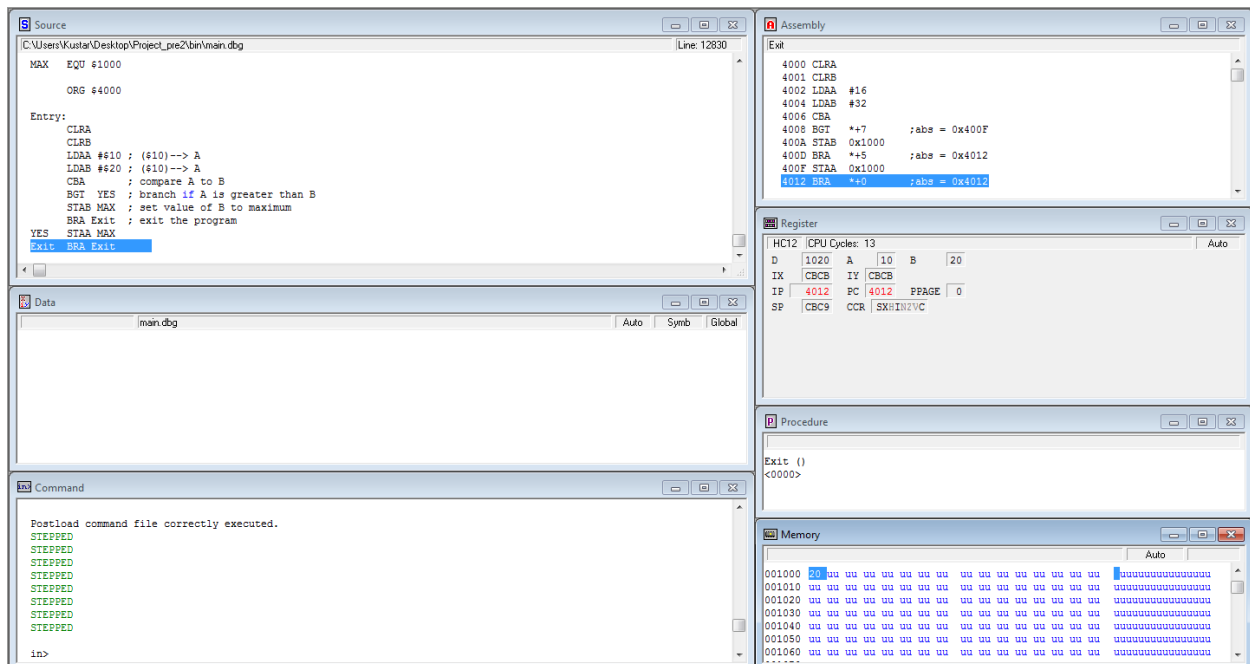The address $1000 contents is the value of B, $ 20, which is greater than A. Figure 1 shows the results.

Figure 1:The contents of memory location $1000 is 20

The second part follows the previous one but with using other instruction.

I. Load Acc A = #$93 and Acc B = #$56. Use BMI or BPL branch instructions.

The following table shows some of the instructions that should be used in this part.

Table 2 :The operations of BMI & BPL

BMI	Branch if minus
BPL	Branch if plus

The code compares the contents of accumulators A and B, if A is greater than B, then it branches to the YES section and sets MAX to the contents of A, otherwise it will execute the next instruction which sets MAX to the contents of accumulators B. The instruction is following:

```
;   Include derivative-specific definitions
        INCLUDE 'derivative.inc'
        XDEF  Entry
MAX     EQU  $1000
        ORG  $4000
Entry:
        CLRA
        CLRB
        LDAA  #$93  ; ($93)--> A
        LDAB  #$56  ; ($56)--> B
        CBA         ; compare A to B
        BPL   YES   ; if the result is positive
        STAB  MAX   ; set value of B to maximum
        BRA Exit    ; exit the program
YES     STAA  MAX
Exit    BRA  Exit
```

The contents of location $1000 is $93, which is the highest value that is in accumulator A. Figure 2 shows the results.
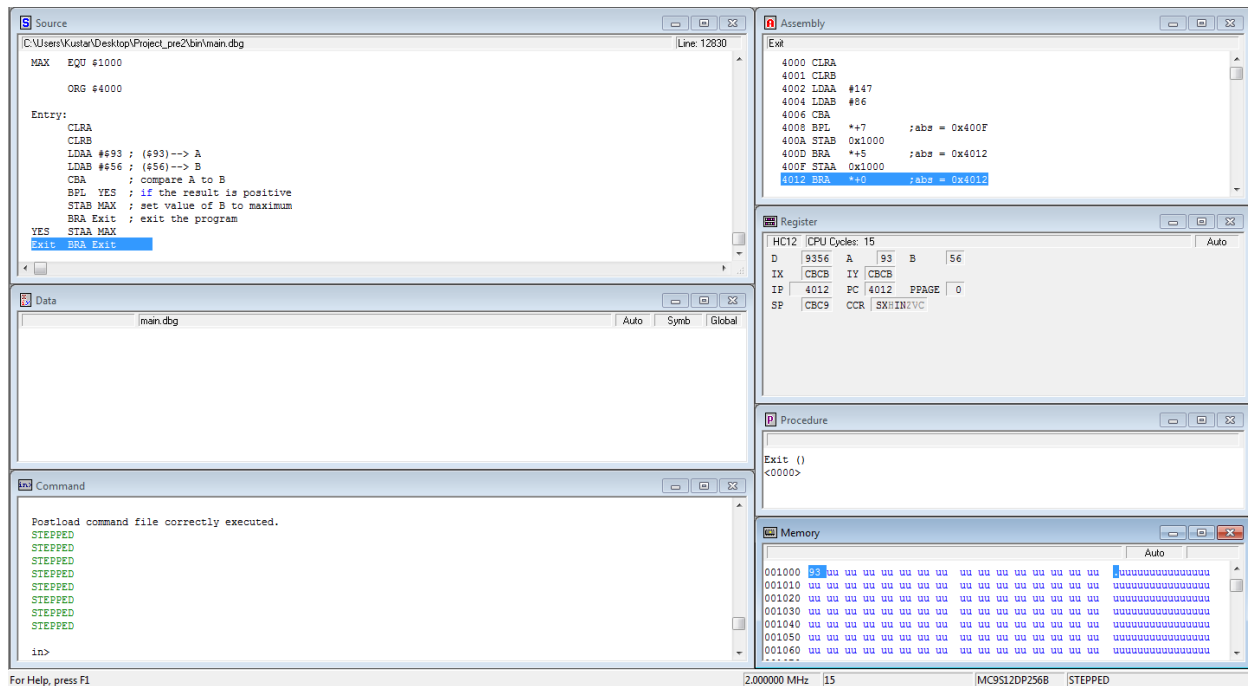

Figure 2: The contents of address $1000 is 93

II. Load Acc A = #$85 and Acc B = #$92. Use BCC or BCS branch instructions.

The following table shows some of the instructions that should be used in this part.

Table 3: The operations of BCC & BCS

BCC	Branch if carry clear
BCS	Branch if carry set

The code compares the contents of accumulators A and B, if A is greater than B, the program will set MAX to the contents of A, otherwise it will branch and the YES section will be executed and the contents of accumulators B will be stored in the in MAX. The instruction is following:

```
; Include derivative-specific definitions
        INCLUDE 'derivative.inc'

        XDEF  Entry

MAX     EQU   $1000

        ORG   $4000

Entry:
        CLRA
        CLRB
        LDAA  #$85  ;
        LDAB  #$92  ;
        CBA         ;
        BCS   YES   ;
        STAA  MAX   ;
        BRA   Exit  ;
YES     STAB  MAX
Exit    BRA   Exit
```

The contents of location $1000 is 92, which is the biggest value, that is accumulator B. Figure 3 shows the contents of the location.
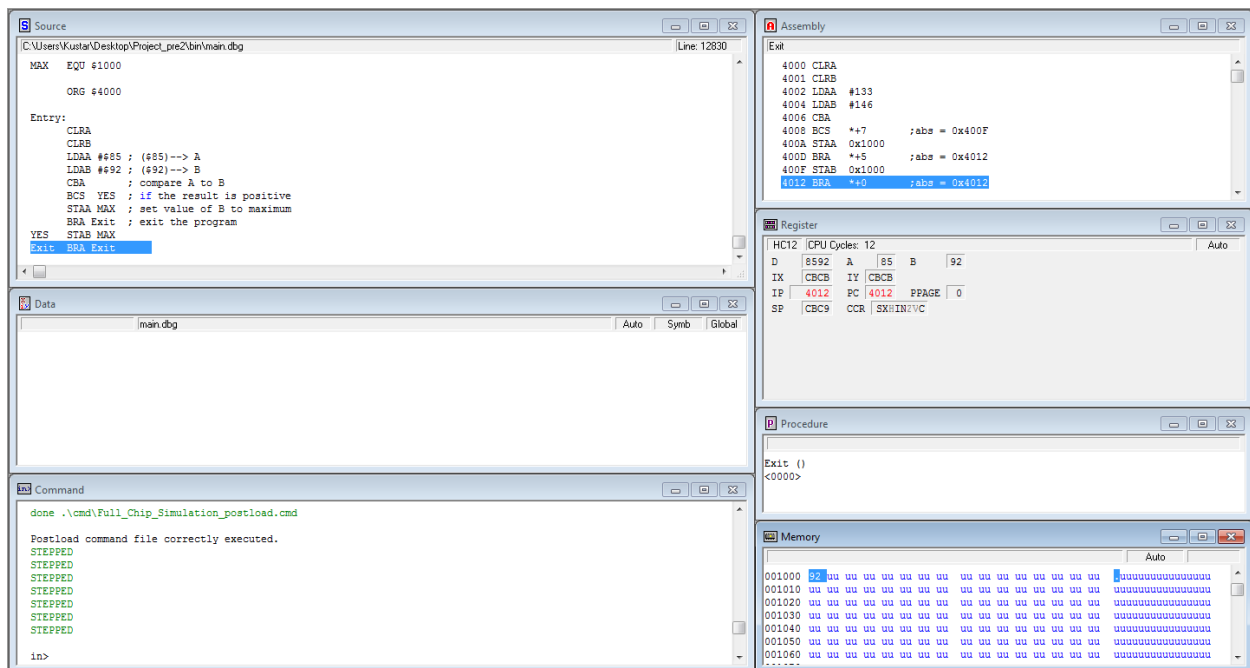

Figure 3: The contents of address $1000 is 92

Pre-lab question:

In this task, the contents of the registers : lX, IY and A will be examined by simulating the following instructions:

```
; Include derivative-specific definitions
        INCLUDE 'derivative.inc'

        XDEF Entry

LOC   EQU $1000
LOC2  EQU $1001


        ORG $4000

Entry:
        CLRA
        CLRB

        LDAA #$15
        STAA LOC
        LDAB #$24
        STAB LOC2

        LDX # LOC
        LDX LOC
        LDY #(LOC-1)
        LDAA (LOC+1)
Here    JMP Here
```

Table 4 : Registers IX, IY and Acc. A

	IX	IY	Acc. A
LDX # LOC	1000	CB	15
LDX LOC	1524	CBCB	15
LDY #(LOC-1)	1524	FFF	15
LDAA (LOC+1)	1524	FFF	24