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Computer Engineering

MICROCOMPUTER LAB REPORT

Lab No : 03
Lab Date : 10.10.2013
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1. THE AIM/CONTENT of THE EXPERIMENT

The purpose of doing this experiment is examining relationship between calling subroutine and stack pointer on Motorola 6802.

2. EQUIPMENT

Only ITU-Training Kit has been used in the experiment. This kit consists of the following hardware components:

- CPU: MC6802
- Memory: 24K*8 R/W + 16K*8 Read Only
- Address decoder
- Control unit
- Display and Keypad
- Parallel Port
- Serial Port
- Programmable counter

In addition to this kit, for observing the simulation results during the experiment, one of our group members has used his own computer to run the simulation software of the microprocessor.

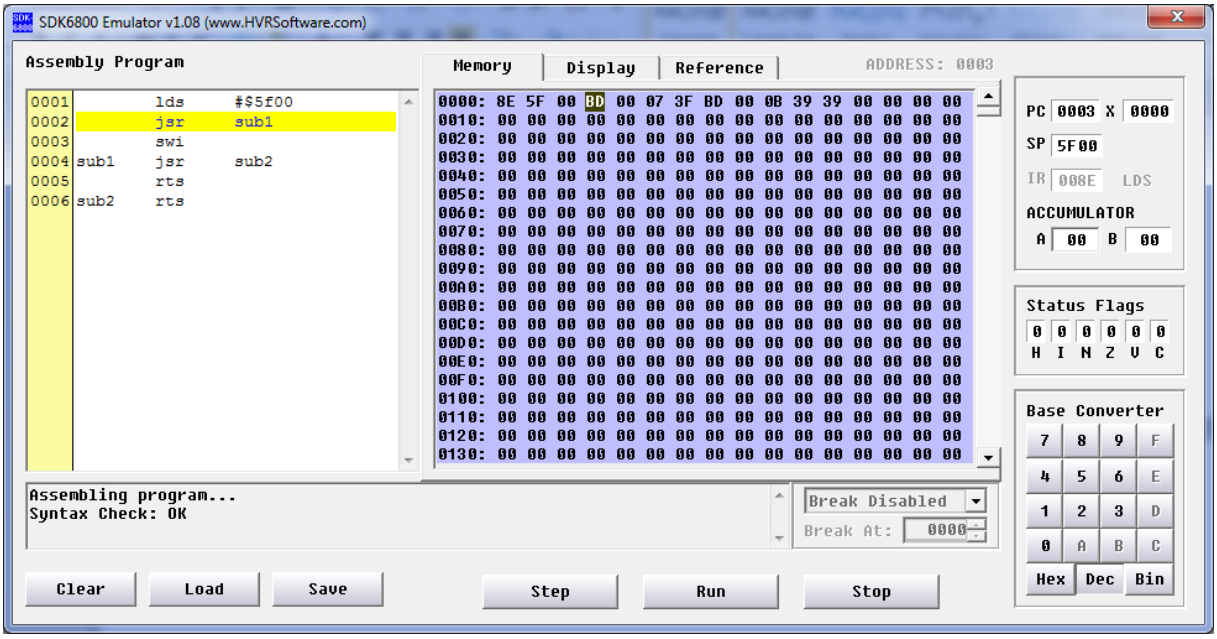
3. THE PROGRAMS for THE EXPERIMENT

The machine codes of the instructions in the code fragment below and their addressing modes had been determined before coming to the lab. Also, that code fragment had been written and run on the simulator software of the microprocessor. In the lab, the code has been run on ITU-Training Kit. Here are the machine codes of the instructions, their addressing modes, what they do and screenshots for each of them from the simulation software of the microprocessor:

3.1. SECTION 2: CALLING SUBROUTINES

The following calling subroutine code is written and then converted the assembly into machine code and run on ITU-TRAINING Kit:

```
      lds  #$5f00
      jsr  sub1
      swi
sub1  jsr  sub2
      rts
sub2  rts
```



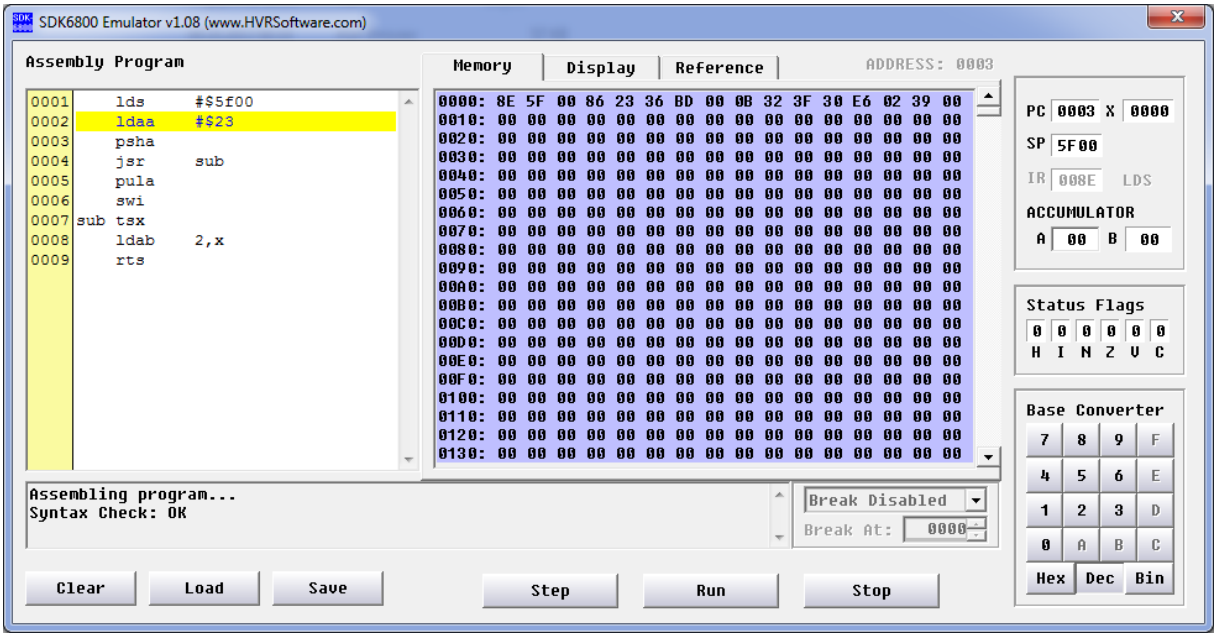
It is shown below in the table which is include stack pointer and its values after each instruction is executed.

PC	STACK_POINTER	Memory[STACK_POINTER]
0000	F000	00
0003	5F00	00
0007	5EFE	00
000B	5EFC	00
000A	5EFE	0A
0006	5F00	06
0000	5EF9	00
0003	5F00	00

3.2. SECTION 2: ARGUMENT PASSING

The following argument passing code is written and then converted the assembly into machine code and run on ITU-TRAINING Kit:

```
      lds  #$5f00
      ldaa #$23
      psha
      jsr  sub
      pula
      swi
sub   tsx
      ldab 2,x
      rts
```



It is shown below in the table which is including stack pointer and its values after each instruction is executed.

PC	STACK_POINTER	Memory[STACK_POINTER]
0000	F000	00
0003	5F00	00
0005	5F00	00
0006	5EFF	00
000B	5EFD	00
000C	5EFD	00
000E	5EFD	00
0009	5EFF	09
000A	5F00	23
0000	5EF9	00
0003	5F00	00

3.3. SECTION 3: EXPERIMENT

Here is a program which calculates i'th value of Fibonacci numbers. This program starts from the address $4000 and applies the following algorithm:

```
int fibonacci(int n){
     if(n==1 || n==0)
          return n;
     else
          return (fibonacci(n-1)+fibonacci(n-2));
}
```

Assembly code of algorithm is converted from algorithm. Here is the code of the program in Motorola 6800 Assembly programming language:

```
n         .equ      #6        // value for calculate
          ldx       #$0050
          lds       #$0080
          ldab      #n
sub1      cmpb      #0
```

```
            ble         topla
            cmpb        #1
            ble         topla
sub3        decb
            pshb
            decb
            pshb
sub4        pulb
            sts         $0050
            cpx         0081
            bge         son
            jmp         sub1
topla       INC         $0090
            jmp         sub4
son         swi
```

It has been converted into machine codes and run on ITU-Training Kit. Here are screenshots demonstrating the result from the simulation software of the microprocessor: