

# Lab report #8

## Saad Ahmad

### (20P-0051)

#### Subroutines:

Subroutines are the functions in the assembly languages which are used for “create once and use again again”.

In assembly language a function created by a label and is call by the “call” keyword and is ended by “ret” keyword.

A function can be without a parameter or it may contain parameters depends on the user’s requirement.

#### Code:

```
report8.asm X
coal > ASM report8.asm
1  [org 0x0100]
2
3  jmp main
4
5  data: dw 10 , 5
6  result: dw 0
7
8  ftn:
9      add ax , bx
10     mov [result] , ax
11     ret
12
13  main:
14     mov ax , [data]
15     mov bx , [data + 2]
16
17     call ftn
18
19     mov ax , 0x4c00
20     int 0x21
21
```

## Output:

```
DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -
AX 0000 SI 0000 CS 19F5 IP 0100 Stack +0 0000 Flags 7202
BX 0000 DI 0000 DS 19F5 +2 20CD
CX 001E BP 0000 ES 19F5 HS 19F5 +4 9FFF 0F DF IF SF ZF AF PF CF
DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 0 0

CMD >

0100 E90C00 JMP 010F
0103 0A00 OR AL,[BX*SI]
0105 050000 ADD AX,0000
0108 0001 ADD [BX*DI],AL
010A D8A30701 ESC 04,[0107*BP+DI]
010E C3 RET
010F A10301 MOV AX,[0103]
0112 8B1E0501 MOV BX,[0105]

DS:0000 CD 20 FF 9F 00 EA F0 FE
DS:0008 AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01
DS:0018 01 01 01 00 02 FF FF FF
DS:0020 FF FF FF FF FF FF FF FF
DS:0028 FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19
DS:0038 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00
DS:0048 00 00 00 00 00 00 00 00

2 0 1 2 3 4 5 6 7 8 9 A B C D E F
DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00 = f.2= i|.+.
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF .....f. ....
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11 .....δ.ι.
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00 6.....J. ....
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....

1 Step 2ProcStep 3Retrieve 4help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri
```

```
DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -
AX 0000 SI 0000 CS 19F5 IP 010F Stack +0 0000 Flags 7200
BX 0000 DI 0000 DS 19F5 +2 20CD
CX 001E BP 0000 ES 19F5 HS 19F5 +4 9FFF 0F DF IF SF ZF AF PF CF
DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 0 0

CMD > -000A-

0100 E90C00 JMP 010F
010F A10301 MOV AX,[0103]
0112 8B1E0501 MOV BX,[0105]
0116 E8F0FF CALL 0109
0119 B8004C MOV AX,4C00
011C CD21 INT 21
011E 0000 ADD [BX*SI],AL
0120 0000 ADD [BX*SI],AL
0122 0000 ADD [BX*SI],AL

DS:0000 CD 20 FF 9F 00 EA F0 FE
DS:0008 AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01
DS:0018 01 01 01 00 02 FF FF FF
DS:0020 FF FF FF FF FF FF FF FF
DS:0028 FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19
DS:0038 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00
DS:0048 00 00 00 00 00 00 00 00

2 0 1 2 3 4 5 6 7 8 9 A B C D E F
DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00 = f.2= i|.+.
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF .....f. ....
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11 .....δ.ι.
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00 6.....J. ....
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....

1 Step 2ProcStep 3Retrieve 4help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri
```

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -

AX 000A SI 0000 CS 19F5 IP 0112 Stack +0 0000 Flags 7200

BX 0000 DI 0000 DS 19F5 +2 20CD

CX 001E BP 0000 ES 19F5 HS 19F5 +4 9FFF 0F DF IF SF ZF AF PF CF

DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 0 0

CMD >

010F A10301 MOV AX,[0103]

0112 8B1E0501 MOV BX,[0105]

0116 E8F0FF CALL 0109

0119 B8004C MOV AX,4C00

011C CD21 INT 21

011E 0000 ADD [BX+SI],AL

0120 0000 ADD [BX+SI],AL

0122 0000 ADD [BX+SI],AL

0124 0000 ADD [BX+SI],AL

1

DS:0000 CD 20 FF 9F 00 EA F0 FE

DS:0008 AD DE 1B 05 C5 06 00 00

DS:0010 18 01 10 01 18 01 92 01

DS:0018 01 01 01 00 02 FF FF FF

DS:0020 FF FF FF FF FF FF FF FF

DS:0028 FF FF FF FF EB 19 C0 11

DS:0030 A2 01 14 00 18 00 F5 19

DS:0038 FF FF FF FF 00 00 00 00

DS:0040 05 00 00 00 00 00 00 00

DS:0048 00 00 00 00 00 00 00 00

2

DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00

DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF

DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11

DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00

DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00

1 Step

2ProcStep

3Retrieve

4Help ON

5BRK Menu

6

7 up

8 dn

9 le

10 ri

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -

AX 000A SI 0000 CS 19F5 IP 0116 Stack +0 0000 Flags 7200

BX 0005 DI 0000 DS 19F5 +2 20CD

CX 001E BP 0000 ES 19F5 HS 19F5 +4 9FFF 0F DF IF SF ZF AF PF CF

DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 0 0

CMD >

0112 8B1E0501 MOV BX,[0105]

0116 E8F0FF CALL 0109

0119 B8004C MOV AX,4C00

011C CD21 INT 21

011E 0000 ADD [BX+SI],AL

0120 0000 ADD [BX+SI],AL

0122 0000 ADD [BX+SI],AL

0124 0000 ADD [BX+SI],AL

0126 0000 ADD [BX+SI],AL

1

DS:0000 CD 20 FF 9F 00 EA F0 FE

DS:0008 AD DE 1B 05 C5 06 00 00

DS:0010 18 01 10 01 18 01 92 01

DS:0018 01 01 01 00 02 FF FF FF

DS:0020 FF FF FF FF FF FF FF FF

DS:0028 FF FF FF FF EB 19 C0 11

DS:0030 A2 01 14 00 18 00 F5 19

DS:0038 FF FF FF FF 00 00 00 00

DS:0040 05 00 00 00 00 00 00 00

DS:0048 00 00 00 00 00 00 00 00

2

DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00

DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF

DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11

DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00

DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00

1 Step

2ProcStep

3Retrieve

4Help ON

5BRK Menu

6

7 up

8 dn

9 le

10 ri

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD

AX 000A SI 0000 CS 19F5 IP 0109 Stack +0 0119 Flags 7200

BX 0005 DI 0000 DS 19F5 +2 0000

CX 001E BP 0000 ES 19F5 HS 19F5 +4 20CD OF DF IF SF ZF AF PF CF

DX 0000 SP FFFC SS 19F5 FS 19F5 +6 9FFF 0 0 1 0 0 0 0 0

CMD >

0116 E8F0FF CALL 0109

0109 01D8 ADD AX,BX

010B A30701 MOV [0107],AX

010E C3 RET

010F A10301 MOV AX,[0103]

0112 8B1E0501 MOV BX,[0105]

0116 E8F0FF CALL 0109

0119 B8004C MOV AX,4C00

011C CD21 INT 21

1 0 1 2 3 4 5 6 7

DS:0000 CD 20 FF 9F 00 EA F0 FE

DS:0008 AD DE 1B 05 C5 06 00 00

DS:0010 18 01 10 01 18 01 92 01

DS:0018 01 01 01 00 02 FF FF FF

DS:0020 FF FF FF FF FF FF FF FF

DS:0028 FF FF FF FF EB 19 C0 11

DS:0030 A2 01 14 00 18 00 F5 19

DS:0038 FF FF FF FF 00 00 00 00

DS:0040 05 00 00 00 00 00 00 00

DS:0048 00 00 00 00 00 00 00 00

2 0 1 2 3 4 5 6 7 8 9 A B C D E F

DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00 = f.0= i|..+...

DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF .....f. ....

DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11 .....δ.L.

DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00 6.....J. ....

DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ..... .....

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD

AX 000F SI 0000 CS 19F5 IP 010B Stack +0 0119 Flags 7204

BX 0005 DI 0000 DS 19F5 +2 0000

CX 001E BP 0000 ES 19F5 HS 19F5 +4 20CD OF DF IF SF ZF AF PF CF

DX 0000 SP FFFC SS 19F5 FS 19F5 +6 9FFF 0 0 1 0 0 0 1 0

CMD >

0109 01D8 ADD AX,BX

010B A30701 MOV [0107],AX

010E C3 RET

010F A10301 MOV AX,[0103]

0112 8B1E0501 MOV BX,[0105]

0116 E8F0FF CALL 0109

0119 B8004C MOV AX,4C00

011C CD21 INT 21

011E 0000 ADD [BX+SI],AL

1 0 1 2 3 4 5 6 7

DS:0000 CD 20 FF 9F 00 EA F0 FE

DS:0008 AD DE 1B 05 C5 06 00 00

DS:0010 18 01 10 01 18 01 92 01

DS:0018 01 01 01 00 02 FF FF FF

DS:0020 FF FF FF FF FF FF FF FF

DS:0028 FF FF FF FF EB 19 C0 11

DS:0030 A2 01 14 00 18 00 F5 19

DS:0038 FF FF FF FF 00 00 00 00

DS:0040 05 00 00 00 00 00 00 00

DS:0048 00 00 00 00 00 00 00 00

2 0 1 2 3 4 5 6 7 8 9 A B C D E F

DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00 = f.0= i|..+...

DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF .....f. ....

DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11 .....δ.L.

DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00 6.....J. ....

DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ..... .....

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

```

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -
AX 000F SI 0000 CS 19F5 IP 0119 Stack +0 0000 Flags 7204
BX 0005 DI 0000 DS 19F5 +2 20CD
CX 001E BP 0000 ES 19F5 HS 19F5 +4 9FFF OF DF IF SF ZF AF PF CF
DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 1 0

[CMD >]
010E C3 RET
0119 B804C MOV AX,4C00
011C CD21 INT 21
011E 0000 ADD [BX+SI],AL
0120 0000 ADD [BX+SI],AL
0122 0000 ADD [BX+SI],AL
0124 0000 ADD [BX+SI],AL
0126 0000 ADD [BX+SI],AL
0128 0000 ADD [BX+SI],AL

[0 1 2 3 4 5 6 7]
DS:0000 CD 20 FF 9F 00 EA F0 FE
DS:0008 AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01
DS:0018 01 01 01 00 02 FF FF FF
DS:0020 FF FF FF FF FF FF FF FF
DS:0028 FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19
DS:0038 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00
DS:0048 00 00 00 00 00 00 00 00

[2]
DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

= f.8= i.+.+.
.....f. |...
.....d.t.
6.....J. ....
.....

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

```

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD

AX 4C00 SI 0000 CS 19F5 IP 011C Stack +0 0000 Flags 7204  
BX 0005 DI 0000 DS 19F5 +2 20CD  
CX 001E BP 0000 ES 19F5 HS 19F5 +4 9FFF OF DF IF SF ZF AF PF CF  
DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 1 0

CMD >

0119 B804C MOV AX,4C00  
011C CD21 INT 21  
011E 0000 ADD [BX+SI],AL  
0120 0000 ADD [BX+SI],AL  
0122 0000 ADD [BX+SI],AL  
0124 0000 ADD [BX+SI],AL  
0126 0000 ADD [BX+SI],AL  
0128 0000 ADD [BX+SI],AL  
012A 0000 ADD [BX+SI],AL

1 0 1 2 3 4 5 6 7  
DS:0000 CD 20 FF 9F 00 EA F0 FE  
DS:0008 AD DE 1B 05 C5 06 00 00  
DS:0010 18 01 10 01 18 01 92 01  
DS:0018 01 01 01 00 02 FF FF FF  
DS:0020 FF FF FF FF FF FF FF FF  
DS:0028 FF FF FF FF EB 19 C0 11  
DS:0030 A2 01 14 00 18 00 F5 19  
DS:0038 FF FF FF FF 00 00 00 00  
DS:0040 05 00 00 00 00 00 00 00  
DS:0048 00 00 00 00 00 00 00 00

2 0 1 2 3 4 5 6 7 8 9 A B C D E F  
DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00 = f.A= i|..+...  
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF .....A. ....  
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11 ..L.  
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00 6.....J. ....  
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri