Experiment Number 4

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Branch ::	CSE - IoT	Sec/Grp ::	1/A
Semester ::	5th	Date ::	14th Oct, 2021
Subject ::	Embedded System Lab	CODE ::	CSD-333

1. Aim :

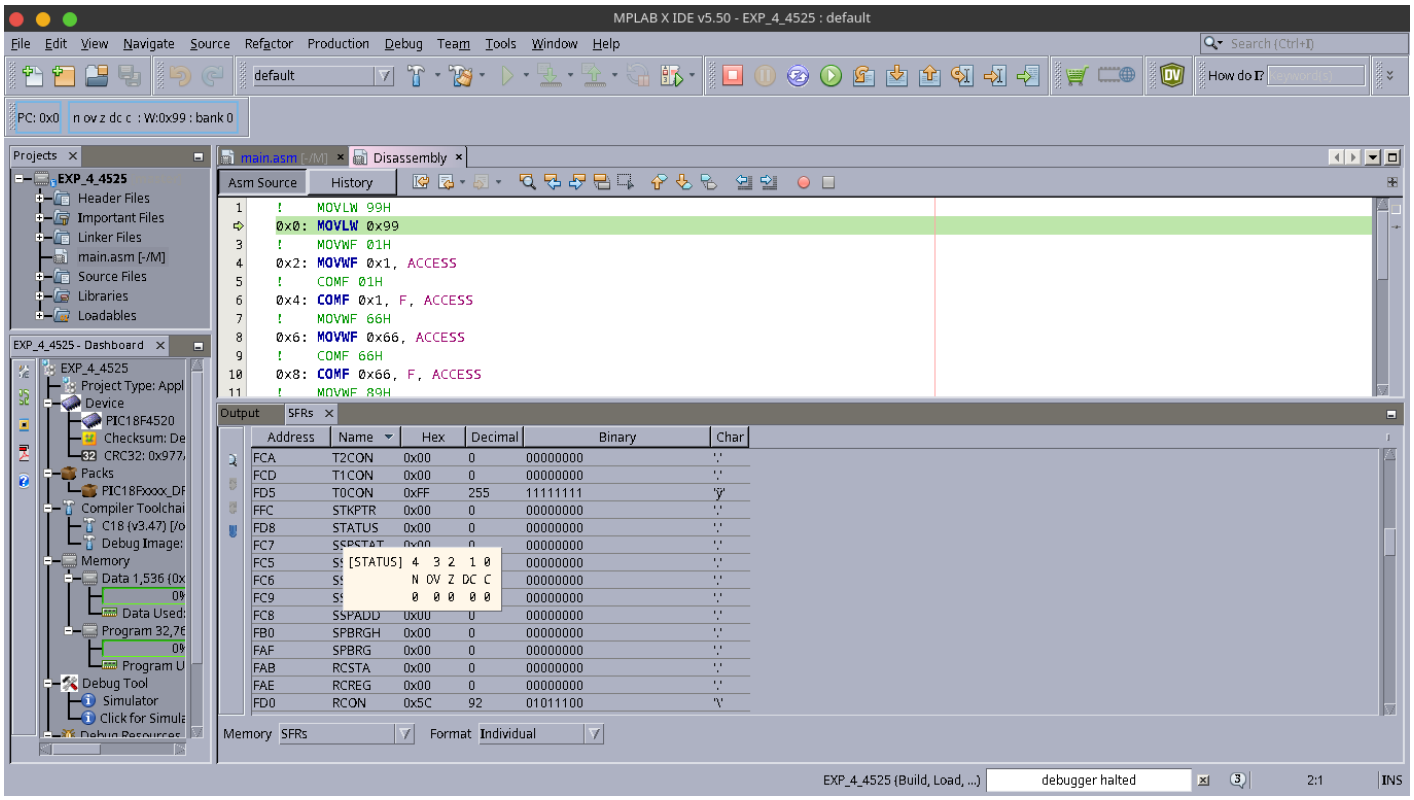
To examine the flag bits of status register.

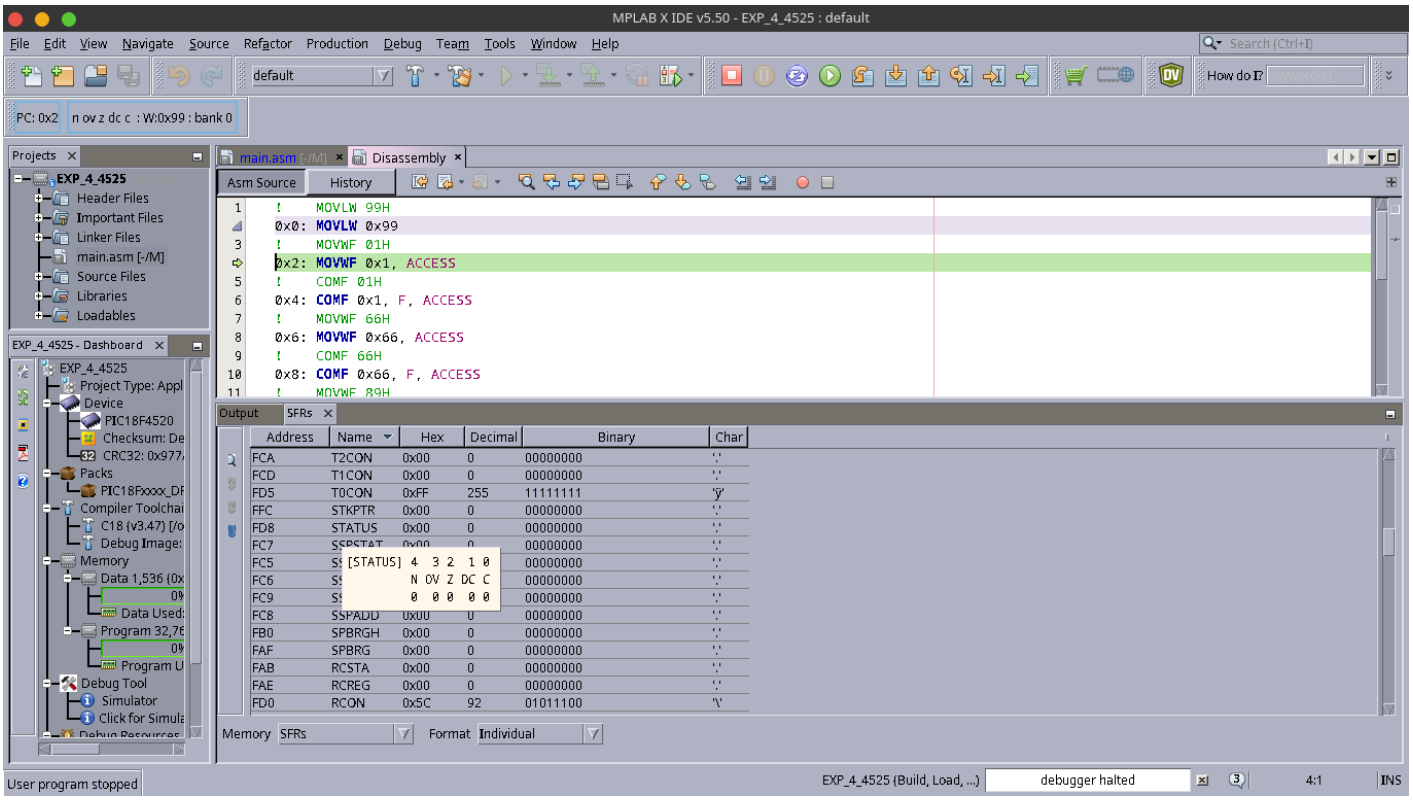
2. Task :

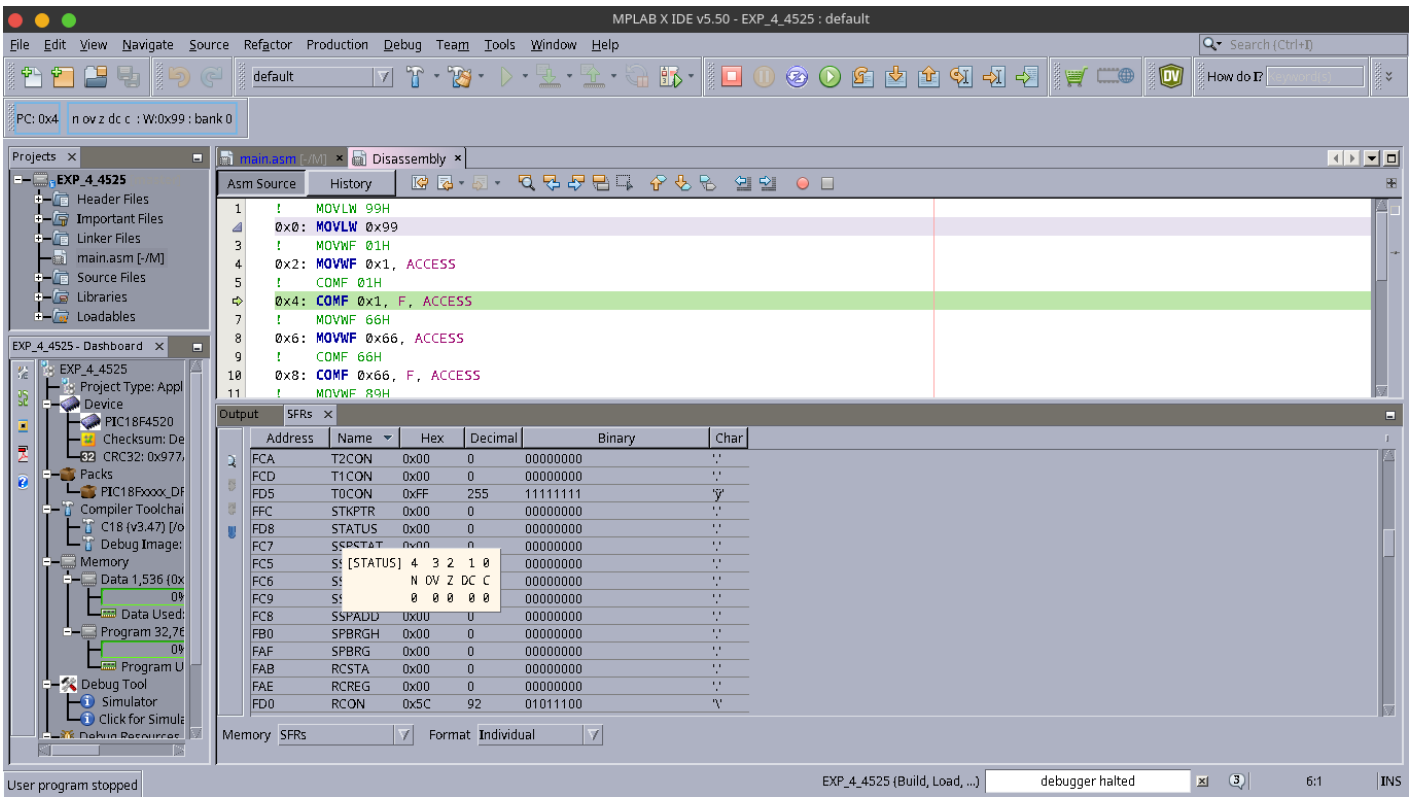
1. Write an assembly program to add the following data and use the simulator to examine the various flag like carry, digital carry and zero flag after the execution of each addition. 99H, 01H, 66H, 89h, 97H, 35H.
2. Write assembly program to load the value into file registers from 20H to 24H location. Use the compliment command in each location and then use the simulator to examine the status of flag and file register content after the execution of each instruction.

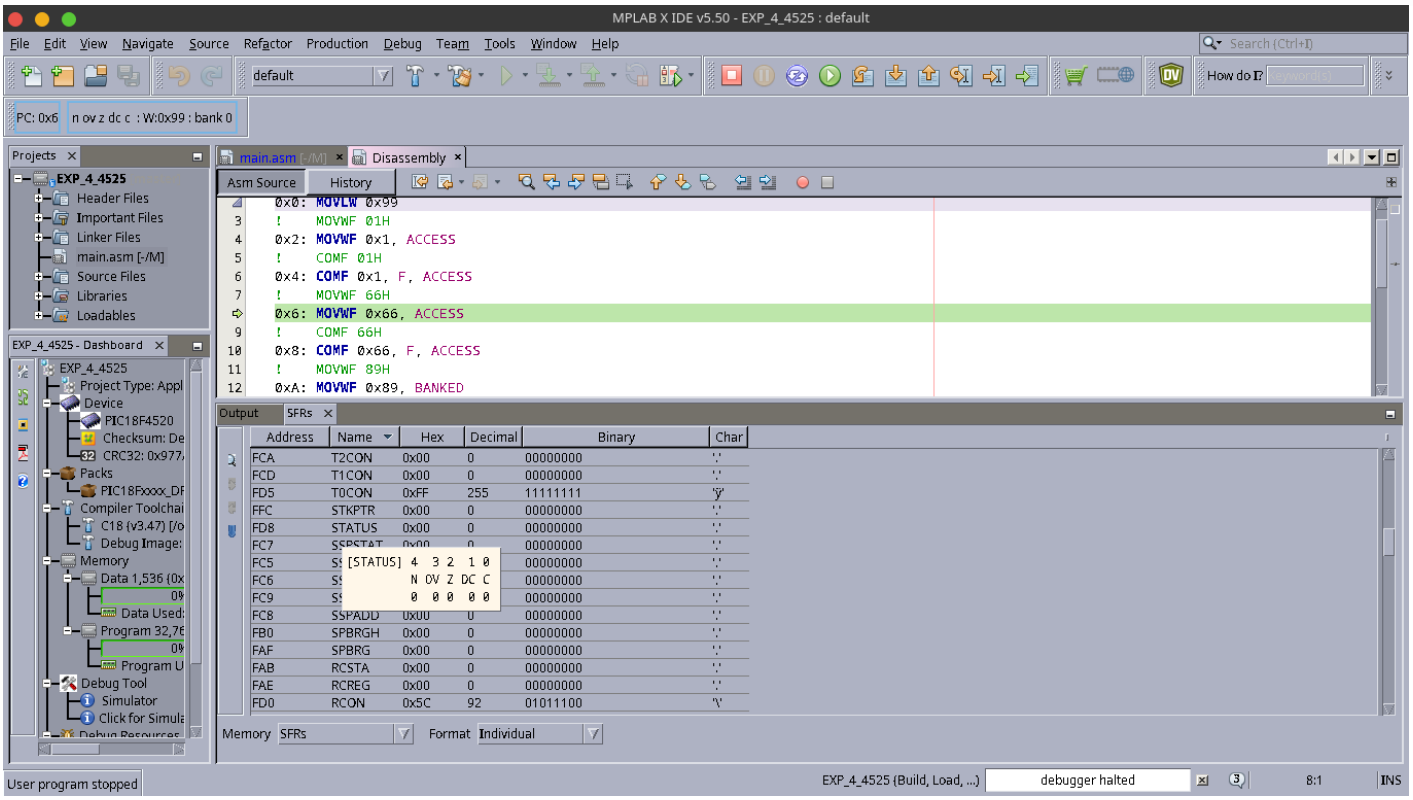
3A. Algorithm :

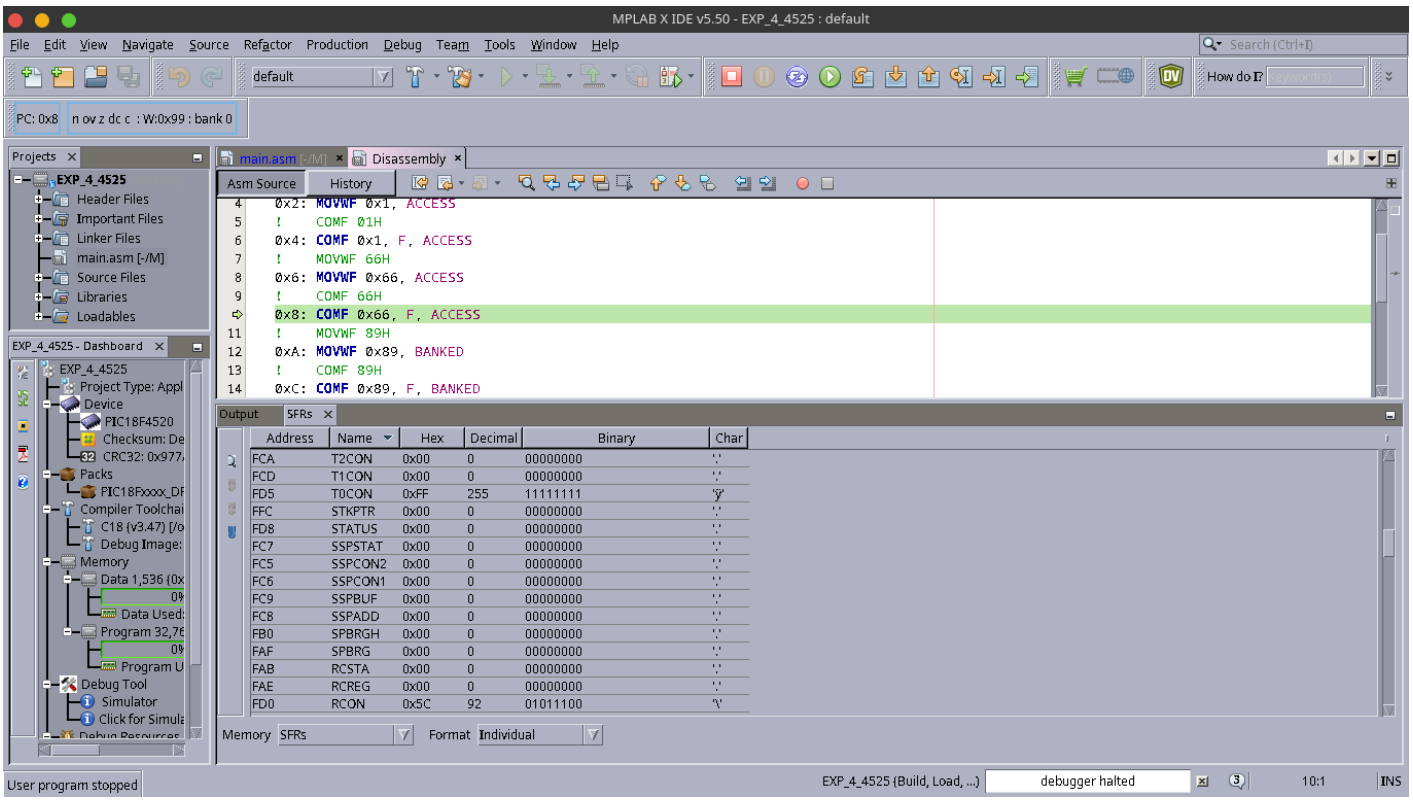
- Create a new file
- Write the header file
- Write the starting location
- Move the literal value to the working register
- Move the working register to file register
- Now, Complement the file register
- Repeat Step 5 and Step 6 for every literal value until you reach the end using different values to move from working register to file register and the complement that file register.

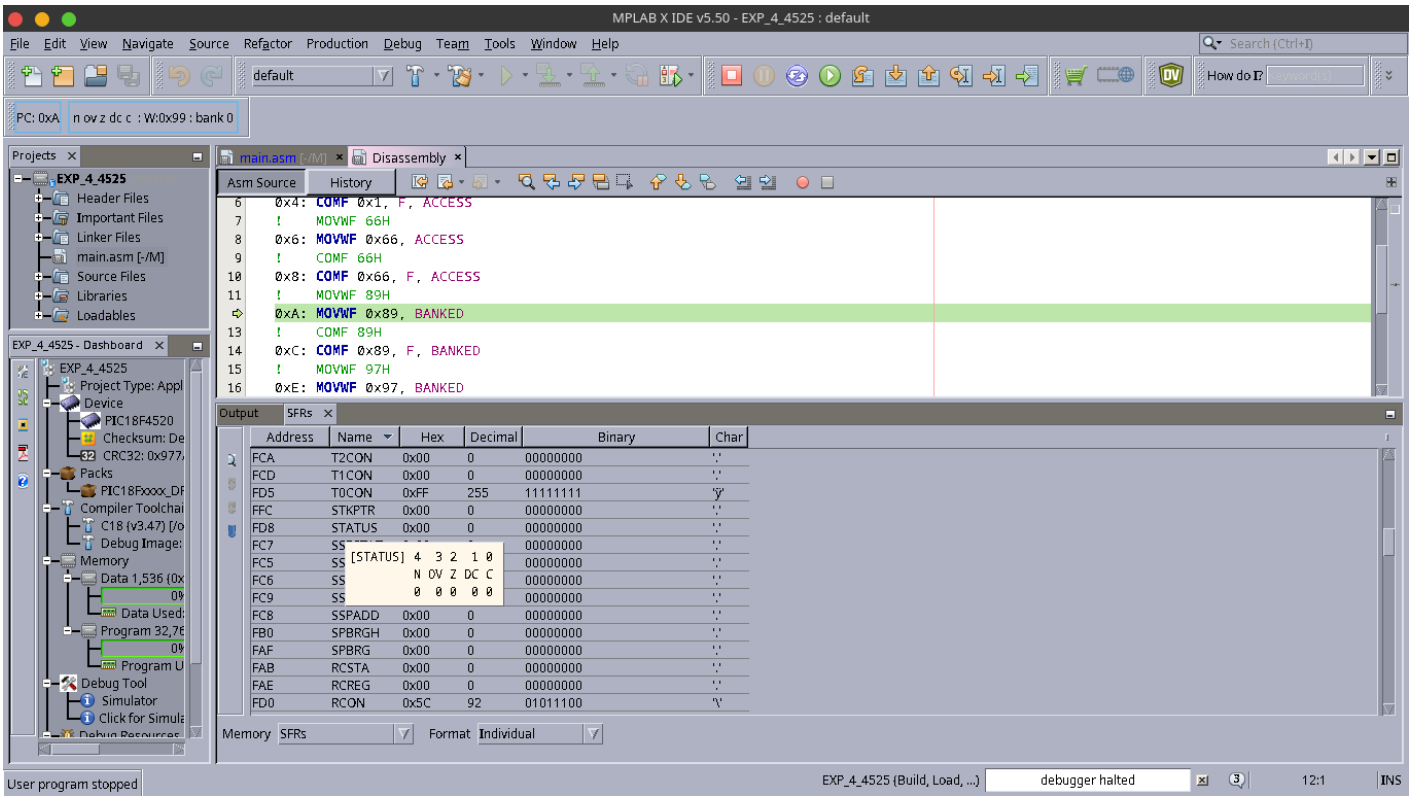


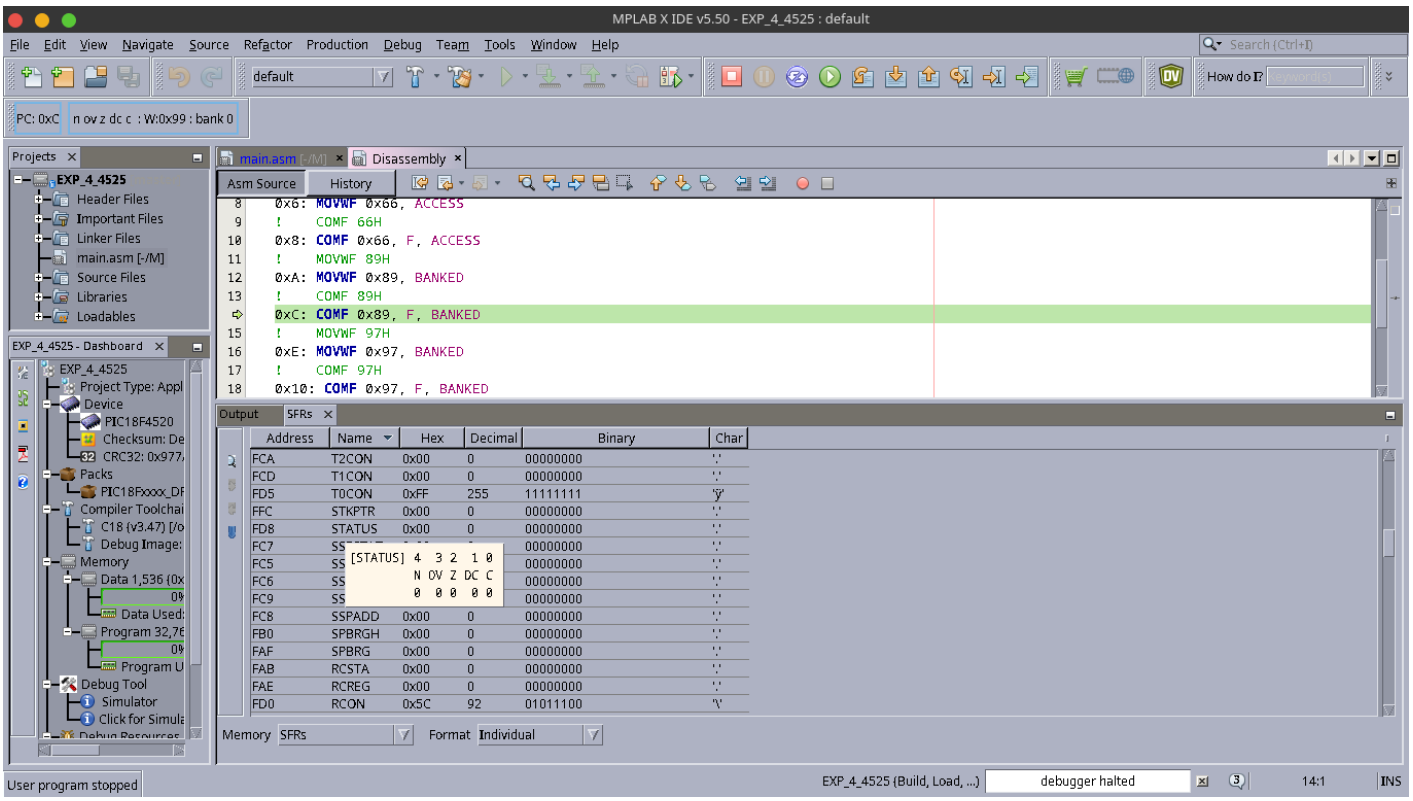

MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x2
main.asm
Disassembly
1 ! MOVLW 99H
0x0: MOVLW 0x99
3 ! MOVWF 01H
0x2: MOVWF 0x1, ACCESS
5 ! COMF 01H
6 0x4: COMF 0x1, F, ACCESS
7 ! MOVWF 66H
8 0x6: MOVWF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
User program stopped
debugger halted

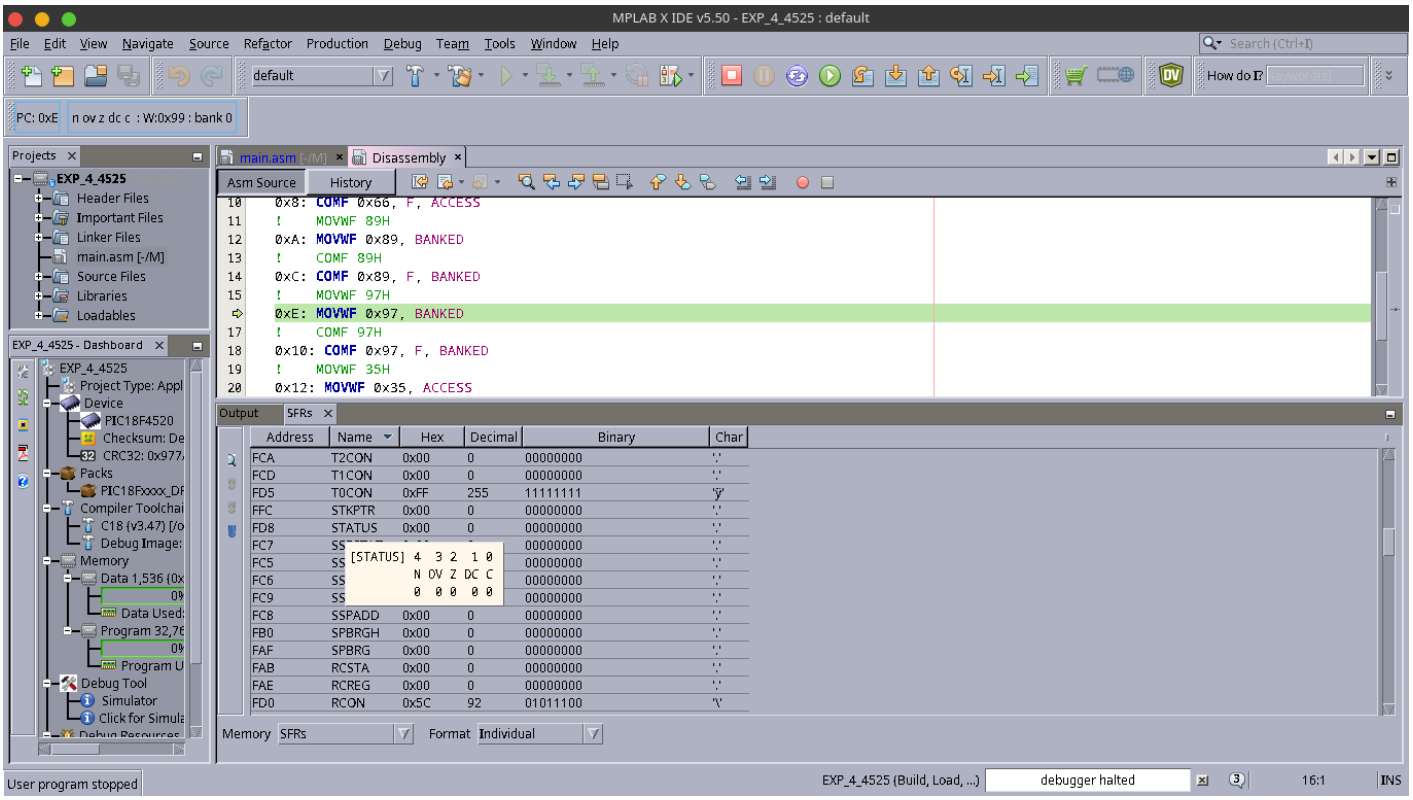

MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x4
main.asm
Disassembly
1 ! MOVLW 99H
0x0: MOVLW 0x99
3 ! MOVWF 01H
4 0x2: MOVWF 0x1, ACCESS
5 ! COMF 01H
0x4: COMF 0x1, F, ACCESS
7 ! MOVWF 66H
8 0x6: MOVWF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
User program stopped
debugger halted

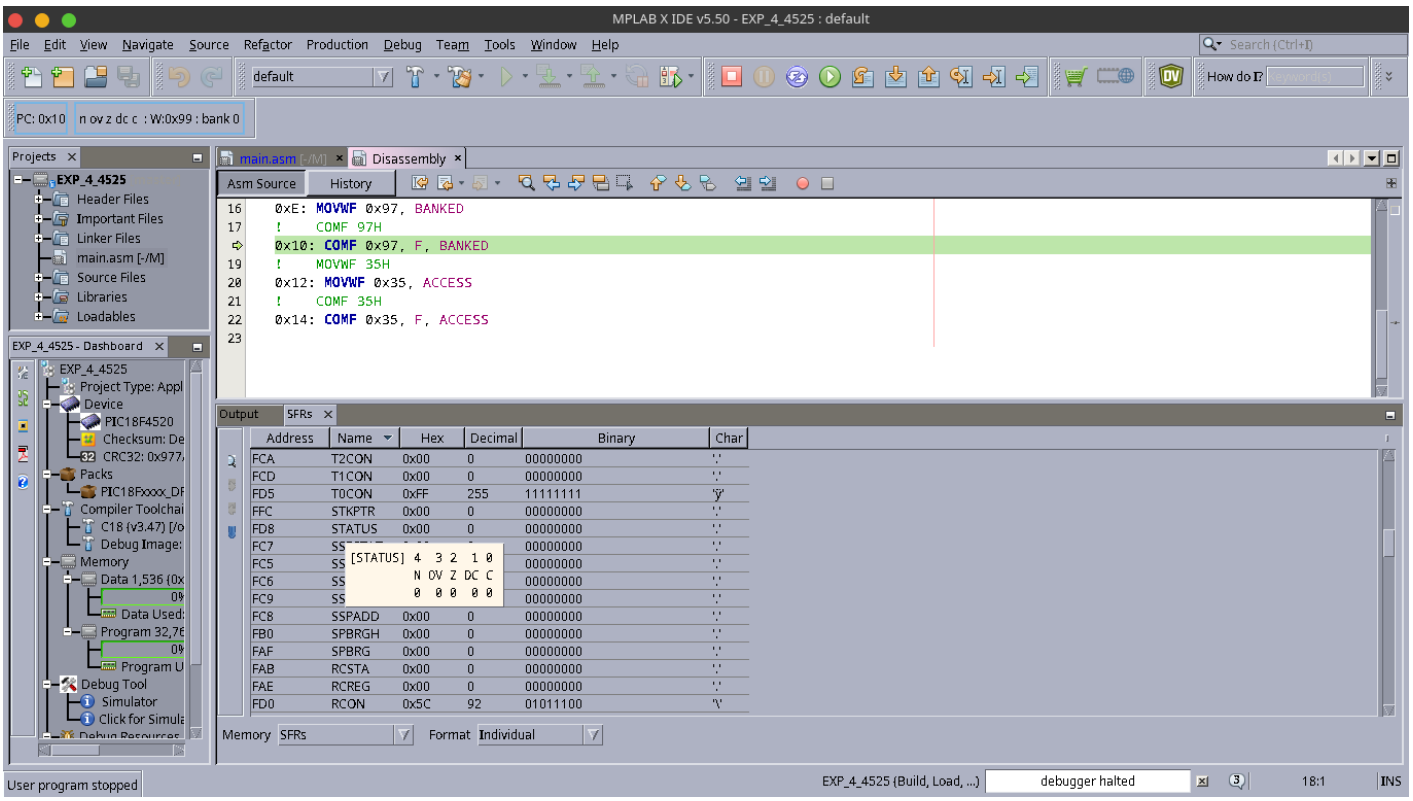

MPLAB X IDE v5.50 - EXP_4_4525 : default
File Edit View Navigate Source Refactor Production Debug Team Tools Window Help
PC: 0x6
n ov z dc c : W:0x99 : bank 0
Projects
EXP_4_4525
Header Files
Important Files
Linker Files
main.asm [-/M]
Source Files
Libraries
Loadables
main.asm [-/M]
Disassembly
Asm Source
History
0x0: MOVLW 0x99
! MOVWF 01H
0x2: MOVWF 0x1, ACCESS
! COMF 01H
0x4: COMF 0x1, F, ACCESS
! MOVWF 66H
0x6: MOVWF 0x66, ACCESS
! COMF 66H
0x8: COMF 0x66, F, ACCESS
! MOVWF 89H
0xA: MOVWF 0x89, BANKED
Output
SFRs
Address Name Hex Decimal Binary Char
FCA T2CON 0x00 0 00000000
FCD T1CON 0x00 0 00000000
FD5 T0CON 0xFF 255 11111111
FFC STKPTR 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FC7 SSPSTAT 0x00 0 00000000
FC5 SSPCON2 0x00 0 00000000
FC6 SSPCON1 0x00 0 00000000
FC9 SSPBUF 0x00 0 00000000
FC8 SSPADD 0x00 0 00000000
FB0 SPBRGH 0x00 0 00000000
FAF SPBRG 0x00 0 00000000
FAB RCSTA 0x00 0 00000000
FAE RCREG 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
Memory SFRs
Format Individual
User program stopped
EXP_4_4525 (Build, Load, ...)
debugger halted
8:1
INS

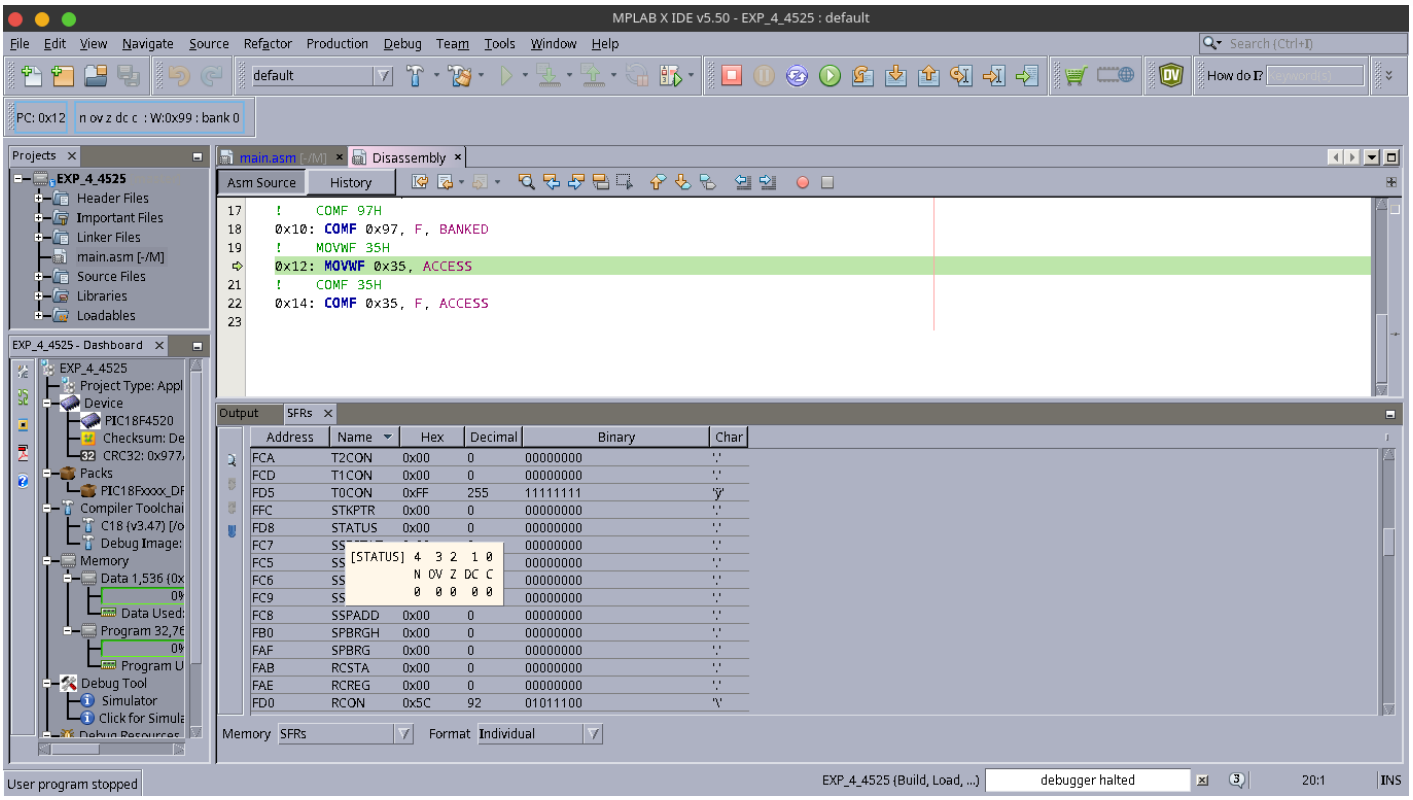

MPLAB X IDE v5.50 - EXP_4_4525 : default
File Edit View Navigate Source Refactor Production Debug Team Tools Window Help
PC: 0x8
n ov z dc c : W:0x99 : bank 0
Projects
EXP_4_4525
Header Files
Important Files
Linker Files
main.asm [-/M]
Source Files
Libraries
Loadables
main.asm [-/M]
Disassembly
Asm Source
History
0x2: MOVWF 0x1, ACCESS
! COMF 01H
0x4: COMF 0x1, F, ACCESS
! MOVWF 66H
0x6: MOVWF 0x66, ACCESS
! COMF 66H
0x8: COMF 0x66, F, ACCESS
! MOVWF 89H
0xA: MOVWF 0x89, BANKED
! COMF 89H
0xC: COMF 0x89, F, BANKED
Output
SFRs
Address Name Hex Decimal Binary Char
FCA T2CON 0x00 0 00000000
FCD T1CON 0x00 0 00000000
FD5 T0CON 0xFF 255 11111111
FFC STKPTR 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FC7 SSPSTAT 0x00 0 00000000
FC5 SSPCON2 0x00 0 00000000
FC6 SSPCON1 0x00 0 00000000
FC9 SSPBUF 0x00 0 00000000
FC8 SSPADD 0x00 0 00000000
FB0 SPBRGH 0x00 0 00000000
FAF SPBRG 0x00 0 00000000
FAB RCSTA 0x00 0 00000000
FAE RCREG 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
Memory SFRs
Format Individual
User program stopped
EXP_4_4525 (Build, Load, ...)
debugger halted
10:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0xA
n ov z dc c : W:0x99 : bank 0
0x4: COMF 0x1, F, ACCESS
! MOVWF 66H
0x6: MOVWF 0x66, ACCESS
! COMF 66H
0x8: COMF 0x66, F, ACCESS
! MOVWF 89H
0xA: MOVWF 0x89, BANKED
! COMF 89H
0xC: COMF 0x89, F, BANKED
! MOVWF 97H
0xE: MOVWF 0x97, BANKED
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
User program stopped
debugger halted
12:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0xC
n ov z dc c : W:0x99 : bank 0
0x6: MOVWF 0x66, ACCESS
! COMF 66H
0x8: COMF 0x66, F, ACCESS
! MOVWF 89H
0xA: MOVWF 0x89, BANKED
! COMF 89H
0xC: COMF 0x89, F, BANKED
! MOVWF 97H
0xE: MOVWF 0x97, BANKED
! COMF 97H
0x10: COMF 0x97, F, BANKED
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
User program stopped
debugger halted
14:1
INS

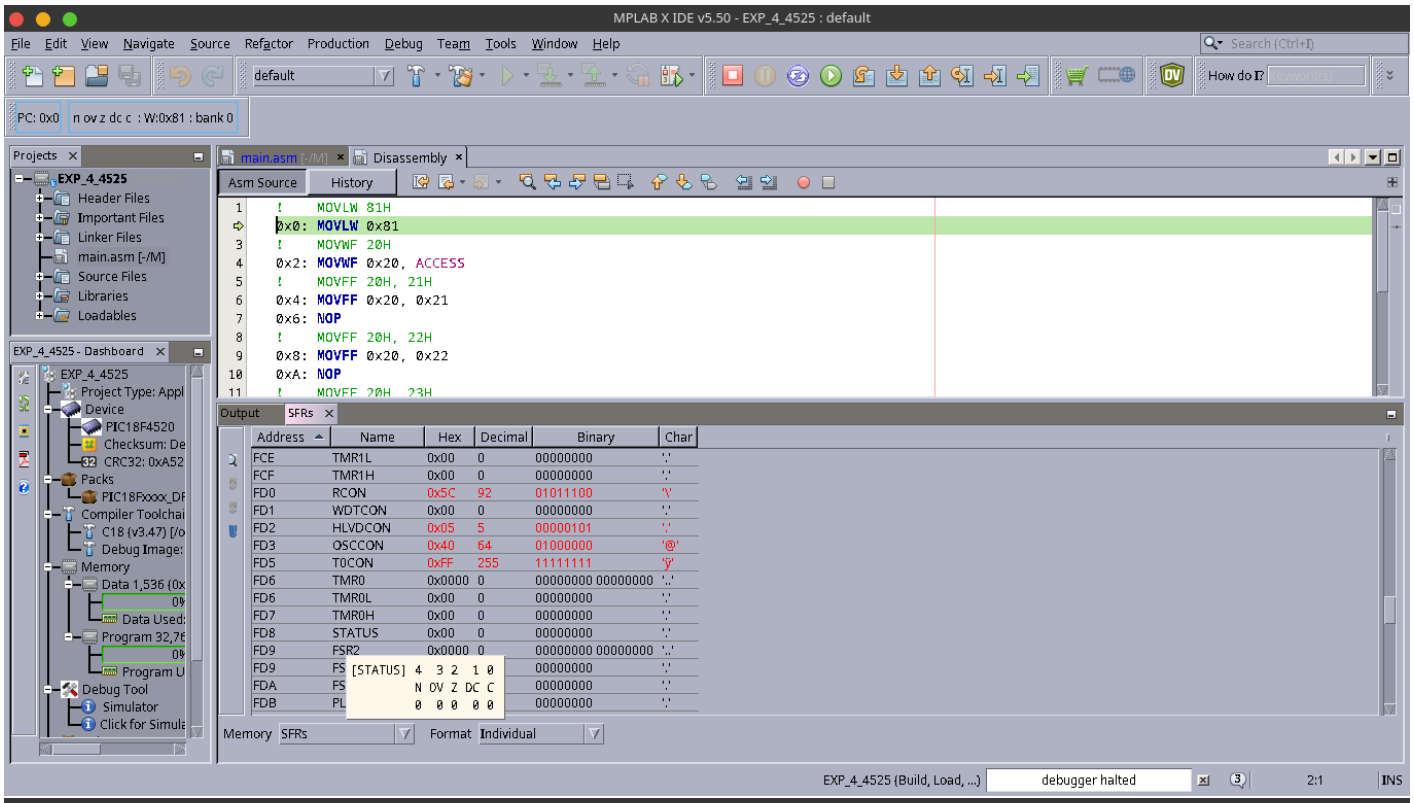

MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0xE
n ov z dc c : W:0x99 : bank 0
main.asm
Disassembly
Asm Source
History
0x8: COMF 0x66, F, ACCESS
! MOVWF 89H
0xA: MOVWF 0x89, BANKED
! COMF 89H
0xC: COMF 0x89, F, BANKED
! MOVWF 97H
0xE: MOVWF 0x97, BANKED
! COMF 97H
0x10: COMF 0x97, F, BANKED
! MOVWF 35H
0x12: MOVWF 0x35, ACCESS
Address Name Hex Decimal Binary Char
FCA T2CON 0x00 0 00000000
FCD T1CON 0x00 0 00000000
FD5 T0CON 0xFF 255 11111111
FFC STKPTR 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
FB0 SPBRGH 0x00 0 00000000
FAF SPBRG 0x00 0 00000000
FAB RCSTA 0x00 0 00000000
FAE RCREG 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
Memory SFRs
Format Individual
User program stopped
debugger halted
16:1
INS

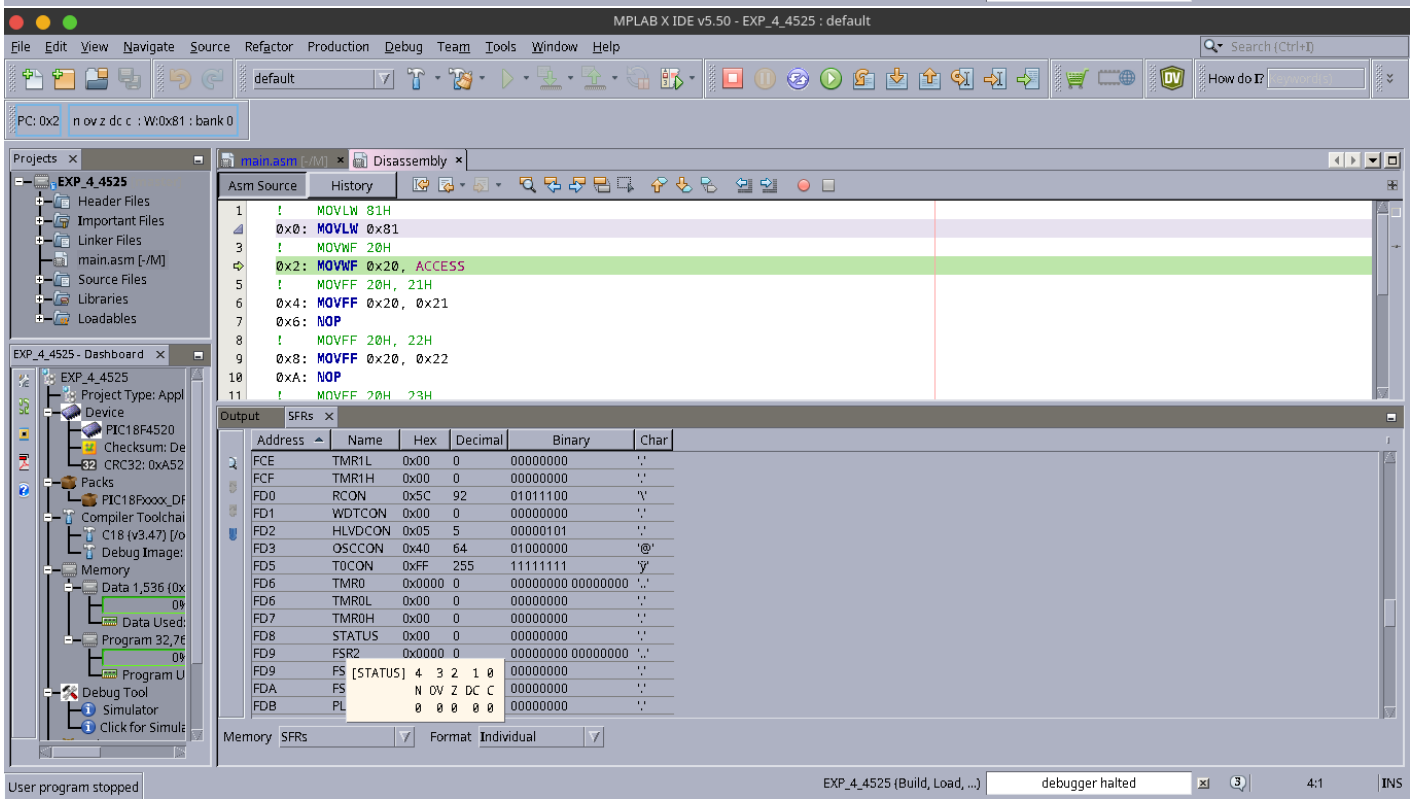

MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x10
n ov z dc c : W:0x99 : bank 0
main.asm
Disassembly
Asm Source
History
0xE: MOVWF 0x97, BANKED
! COMF 97H
0x10: COMF 0x97, F, BANKED
! MOVWF 35H
0x12: MOVWF 0x35, ACCESS
! COMF 35H
0x14: COMF 0x35, F, ACCESS
Address Name Hex Decimal Binary Char
FCA T2CON 0x00 0 00000000
FCD T1CON 0x00 0 00000000
FD5 T0CON 0xFF 255 11111111
FFC STKPTR 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
FB0 SPBRGH 0x00 0 00000000
FAF SPBRG 0x00 0 00000000
FAB RCSTA 0x00 0 00000000
FAE RCREG 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
Memory SFRs
Format Individual
User program stopped
debugger halted
18:1
INS

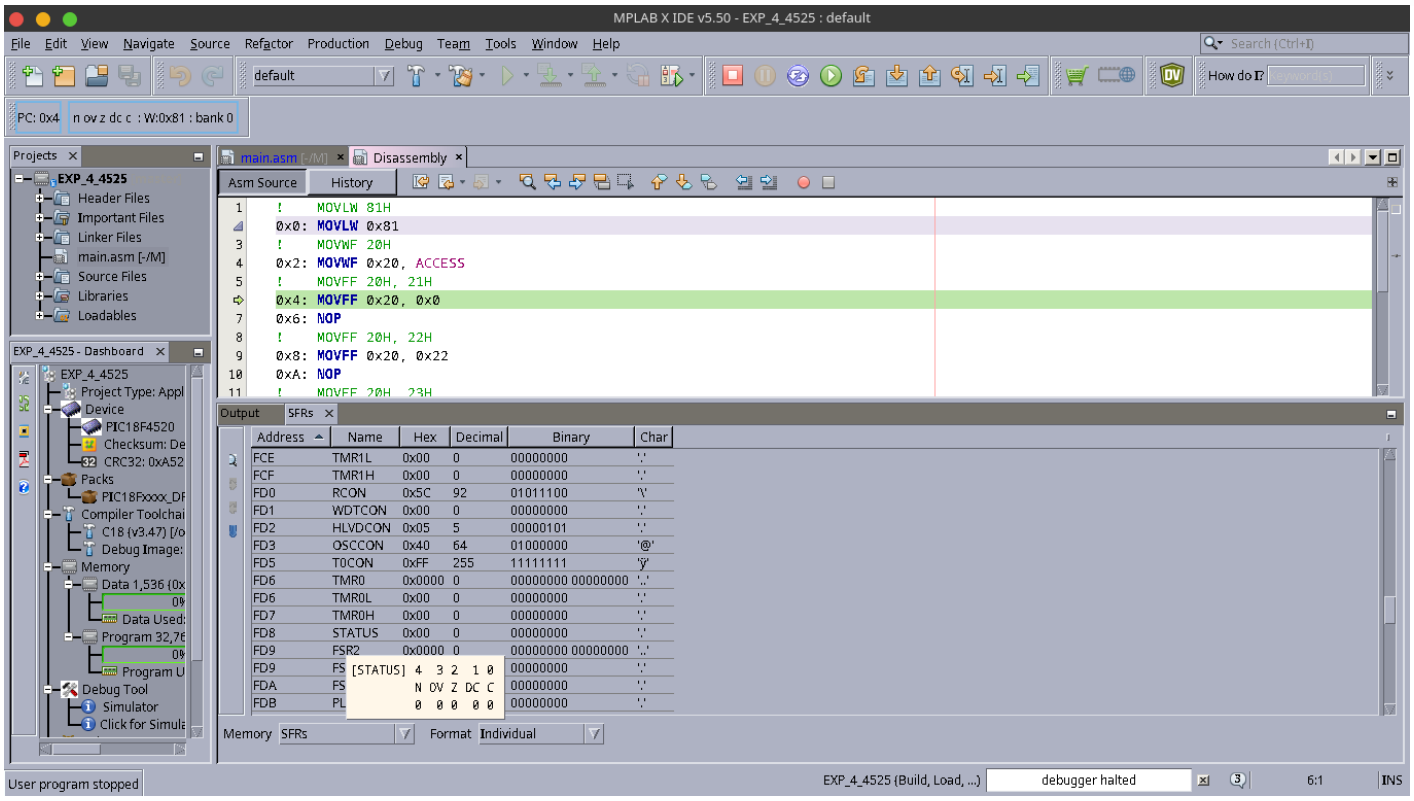


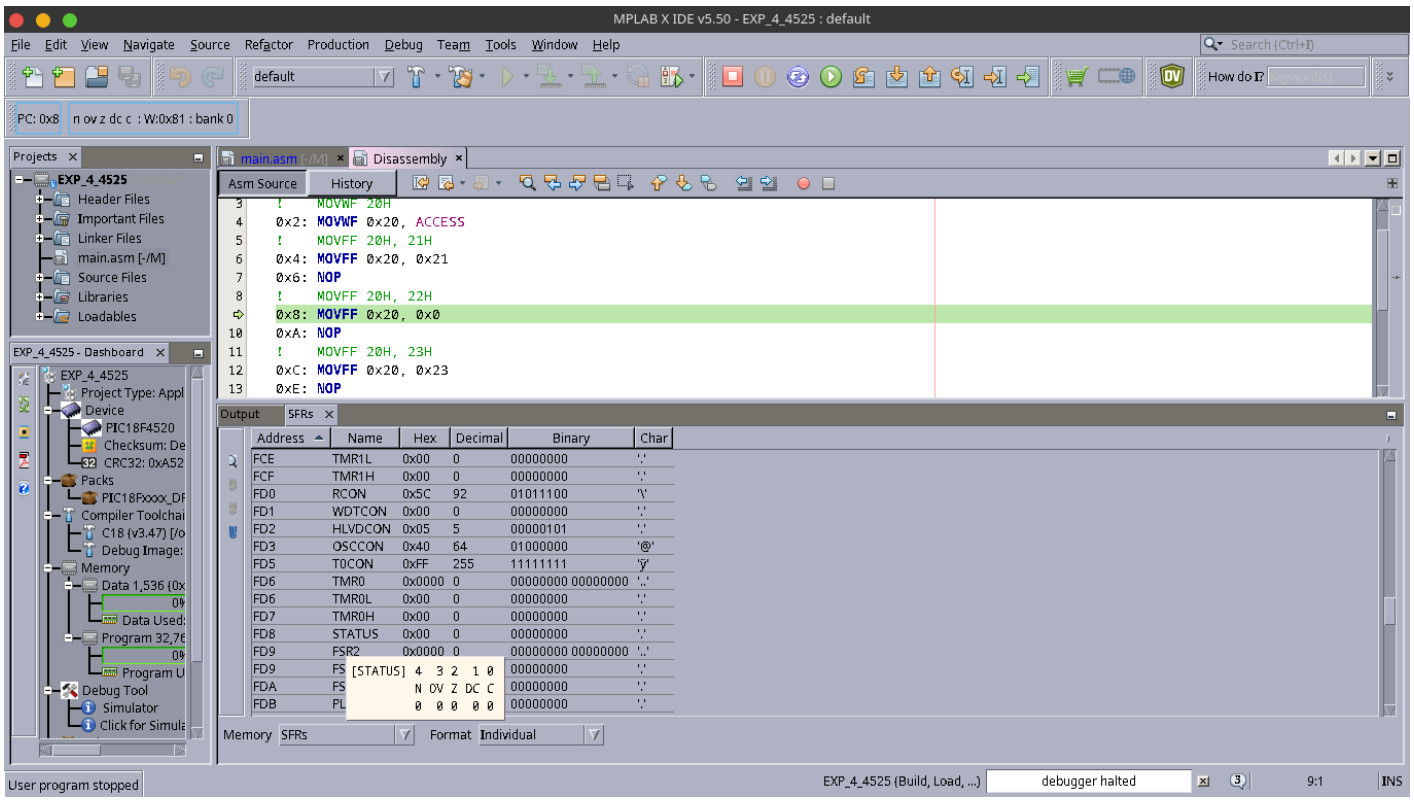
3B. Algorithm :

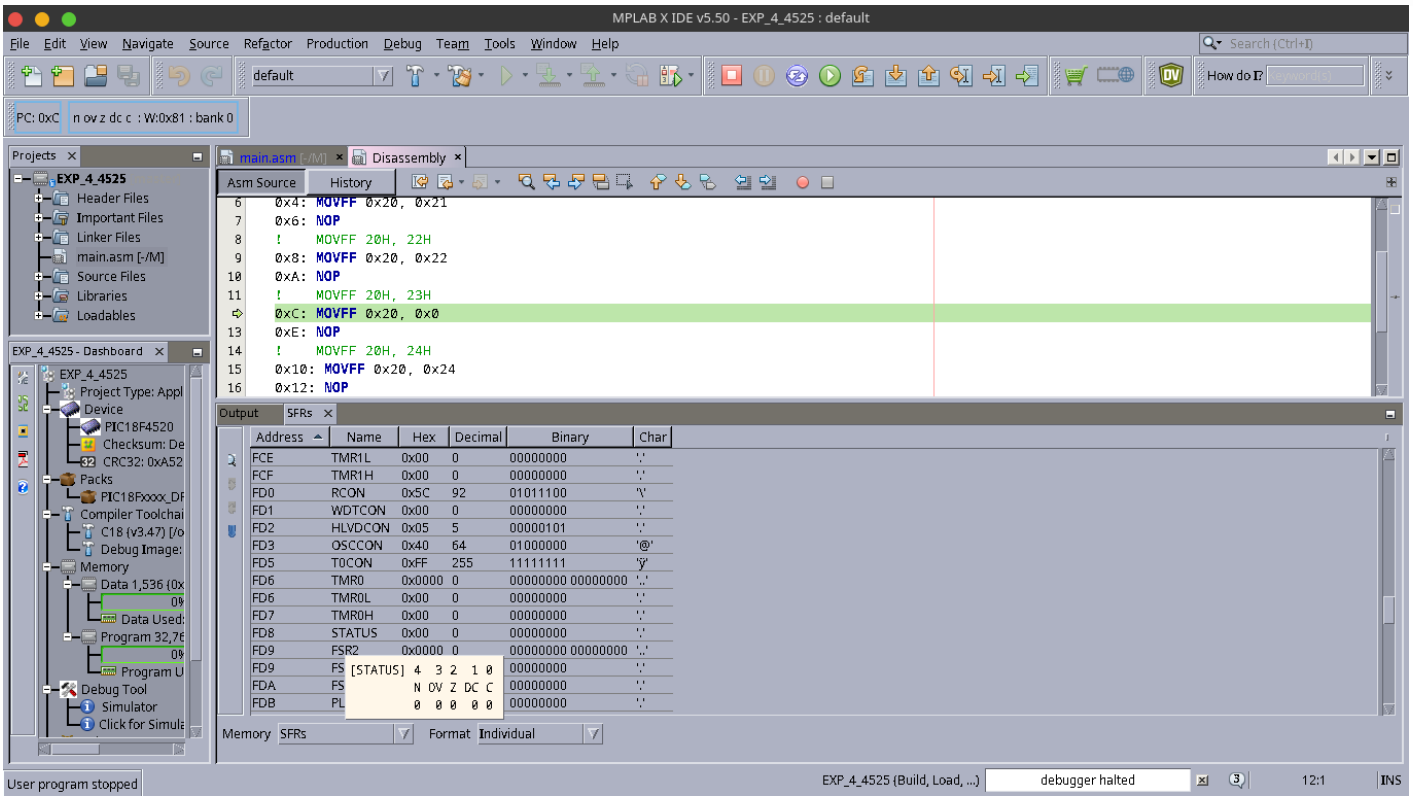
- Create the new asm file
- Write the header file
- Write the starting location
- Move the literal value to the WREG
- Move the working register to the file register
- Now, load the value of file register from 20H to 24H
- Now, Complement the file register

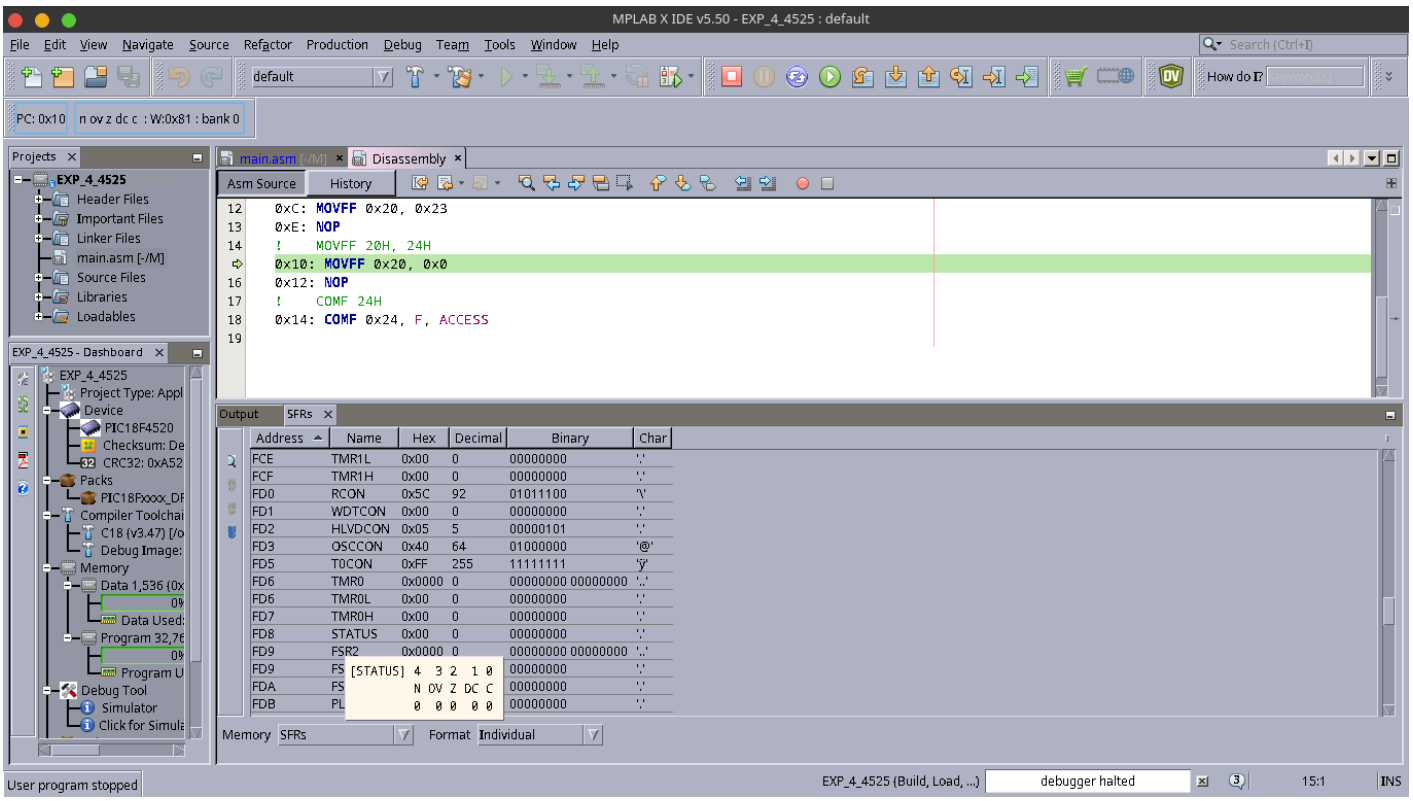

MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x0
n ov z dc c : W:0x81 : bank 0
main.asm
Disassembly
Asm Source
History
1 ! MOVLW 81H
2 0x0: MOVLW 0x81
3 ! MOVWF 20H
4 0x2: MOVWF 0x20, ACCESS
5 ! MOVFF 20H, 21H
6 0x4: MOVFF 0x20, 0x21
7 0x6: NOP
8 ! MOVFF 20H, 22H
9 0x8: MOVFF 0x20, 0x22
10 0xA: NOP
Output
SFRs
Address Name Hex Decimal Binary Char
FCE TMR1L 0x00 0 00000000
FCF TMR1H 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
FD1 WDTCON 0x00 0 00000000
FD2 HLVDCON 0x05 5 00000101
FD3 OSCCON 0x40 64 01000000
FD5 T0CON 0xFF 255 11111111
FD6 TMR0 0x0000 0 00000000 00000000
FD6 TMR0L 0x00 0 00000000
FD7 TMR0H 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FD9 FSR2 0x0000 0 00000000 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
Memory SFRs
Format Individual
EXP_4_4525 (Build, Load, ...)
debugger halted
2:1
INS

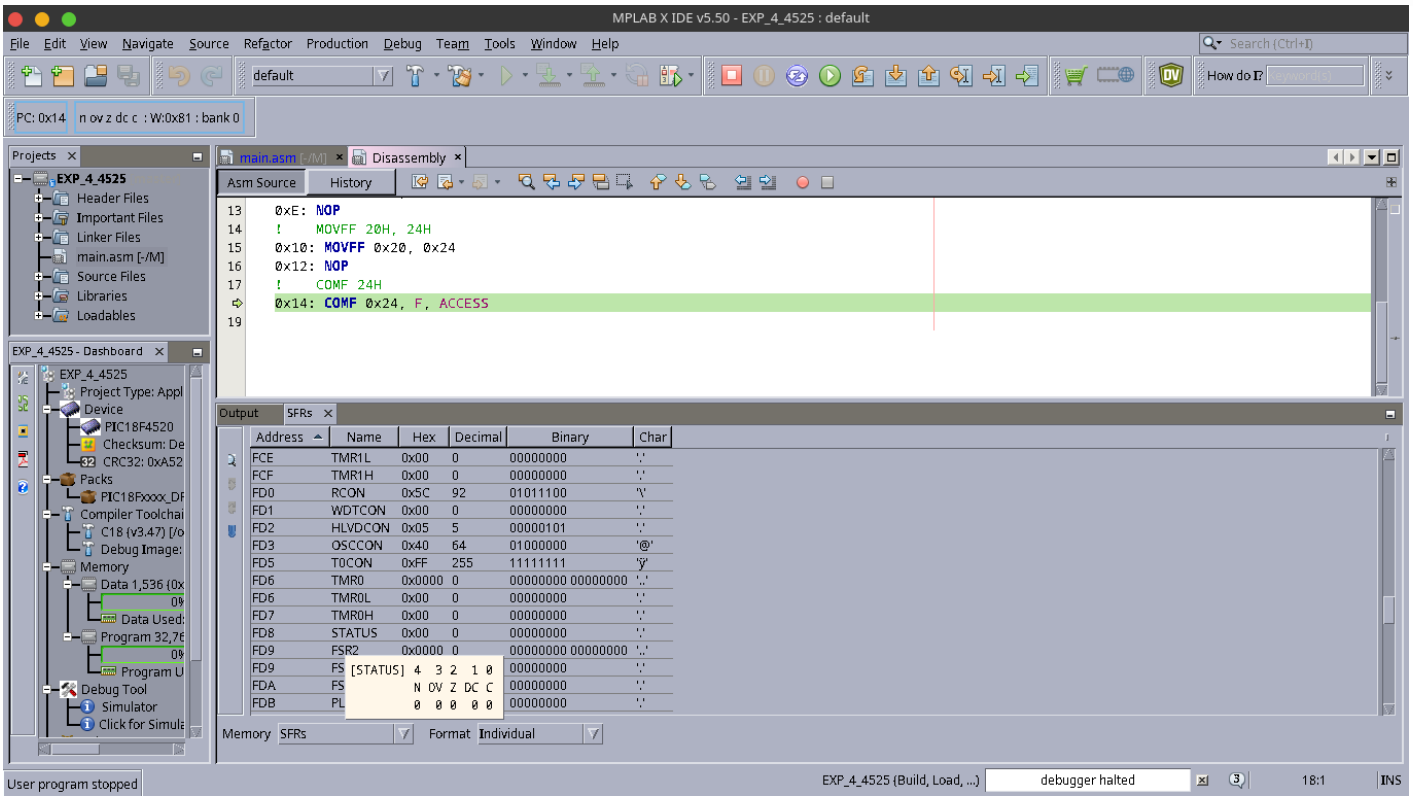

MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x2
n ov z dc c : W:0x81 : bank 0
main.asm
Disassembly
Asm Source
History
1 ! MOVLW 81H
2 0x0: MOVLW 0x81
3 ! MOVWF 20H
4 0x2: MOVWF 0x20, ACCESS
5 ! MOVFF 20H, 21H
6 0x4: MOVFF 0x20, 0x21
7 0x6: NOP
8 ! MOVFF 20H, 22H
9 0x8: MOVFF 0x20, 0x22
10 0xA: NOP
Output
SFRs
Address Name Hex Decimal Binary Char
FCE TMR1L 0x00 0 00000000
FCF TMR1H 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
FD1 WDTCON 0x00 0 00000000
FD2 HLVDCON 0x05 5 00000101
FD3 OSCCON 0x40 64 01000000
FD5 T0CON 0xFF 255 11111111
FD6 TMR0 0x0000 0 00000000 00000000
FD6 TMR0L 0x00 0 00000000
FD7 TMR0H 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FD9 FSR2 0x0000 0 00000000 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
Memory SFRs
Format Individual
User program stopped
EXP_4_4525 (Build, Load, ...)
debugger halted
4:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x4
n ov z dc c : W:0x81 : bank 0
main.asm
Disassembly
Asm Source
History
1 ! MOVLW 81H
0x0: MOVLW 0x81
3 ! MOVWF 20H
4 0x2: MOVWF 0x20, ACCESS
5 ! MOVFF 20H, 21H
0x4: MOVFF 0x20, 0x0
7 0x6: NOP
8 ! MOVFF 20H, 22H
9 0x8: MOVFF 0x20, 0x22
10 0xA: NOP
Address Name Hex Decimal Binary Char
FCE TMR1L 0x00 0 00000000
FCF TMR1H 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
FD1 WDTCON 0x00 0 00000000
FD2 HLVDCON 0x05 5 00000101
FD3 OSCCON 0x40 64 01000000
FD5 T0CON 0xFF 255 11111111
FD6 TMR0 0x0000 0 00000000 00000000
FD6 TMR0L 0x00 0 00000000
FD7 TMR0H 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FD9 FSR2 0x0000 0 00000000 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
Memory SFRs
Format Individual
User program stopped
debugger halted
6:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x8
n ov z dc c : W:0x81 : bank 0
main.asm
Disassembly
Asm Source
History
3 ! MOVWF 20H
4 0x2: MOVWF 0x20, ACCESS
5 ! MOVFF 20H, 21H
6 0x4: MOVFF 0x20, 0x21
7 0x6: NOP
8 ! MOVFF 20H, 22H
0x8: MOVFF 0x20, 0x0
10 0xA: NOP
11 ! MOVFF 20H, 23H
12 0xC: MOVFF 0x20, 0x23
13 0xE: NOP
Address Name Hex Decimal Binary Char
FCE TMR1L 0x00 0 00000000
FCF TMR1H 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
FD1 WDTCON 0x00 0 00000000
FD2 HLVDCON 0x05 5 00000101
FD3 OSCCON 0x40 64 01000000
FD5 T0CON 0xFF 255 11111111
FD6 TMR0 0x0000 0 00000000 00000000
FD6 TMR0L 0x00 0 00000000
FD7 TMR0H 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FD9 FSR2 0x0000 0 00000000 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
Memory SFRs
Format Individual
User program stopped
debugger halted
9:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0xC
n ov z dc c : W:0x81 : bank 0
0x4: MOVFF 0x20, 0x21
0x6: NOP
! MOVFF 20H, 22H
0x8: MOVFF 0x20, 0x22
0xA: NOP
! MOVFF 20H, 23H
0xC: MOVFF 0x20, 0x0
0xE: NOP
! MOVFF 20H, 24H
0x10: MOVFF 0x20, 0x24
0x12: NOP
User program stopped
debugger halted
12:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
PC: 0x10
n ov z dc c : W:0x81 : bank 0
0xC: MOVFF 0x20, 0x23
0xE: NOP
! MOVFF 20H, 24H
0x10: MOVFF 0x20, 0x0
0x12: NOP
! COMF 24H
0x14: COMF 0x24, F, ACCESS
User program stopped
debugger halted
15:1
INS


MPLAB X IDE v5.50 - EXP_4_4525 : default
File Edit View Navigate Source Refactor Production Debug Team Tools Window Help
PC: 0x14
n ov z dc c : W:0x81 : bank 0
Projects
EXP_4_4525
Header Files
Important Files
Linker Files
main.asm [-/M]
Source Files
Libraries
Loadables
main.asm [-/M]
Disassembly
Asm Source
History
13 0xE: NOP
14 ! MOVFF 20H, 24H
15 0x10: MOVFF 0x20, 0x24
16 0x12: NOP
17 ! COMF 24H
0x14: COMF 0x24, F, ACCESS
19
Output
SFRs
Address Name Hex Decimal Binary Char
FCE TMR1L 0x00 0 00000000
FCF TMR1H 0x00 0 00000000
FD0 RCON 0x5C 92 01011100
FD1 WDTCON 0x00 0 00000000
FD2 HLVDCON 0x05 5 00000101
FD3 OSCCON 0x40 64 01000000
FD5 T0CON 0xFF 255 11111111
FD6 TMR0 0x0000 0 00000000 00000000
FD6 TMR0L 0x00 0 00000000
FD7 TMR0H 0x00 0 00000000
FD8 STATUS 0x00 0 00000000
FD9 FSR2 0x0000 0 00000000 00000000
[STATUS] 4 3 2 1 0
N OV Z DC C
0 0 0 0 0
Memory SFRs Format Individual
User program stopped
EXP_4_4525 (Build, Load, ...)
debugger halted
18:1
INS

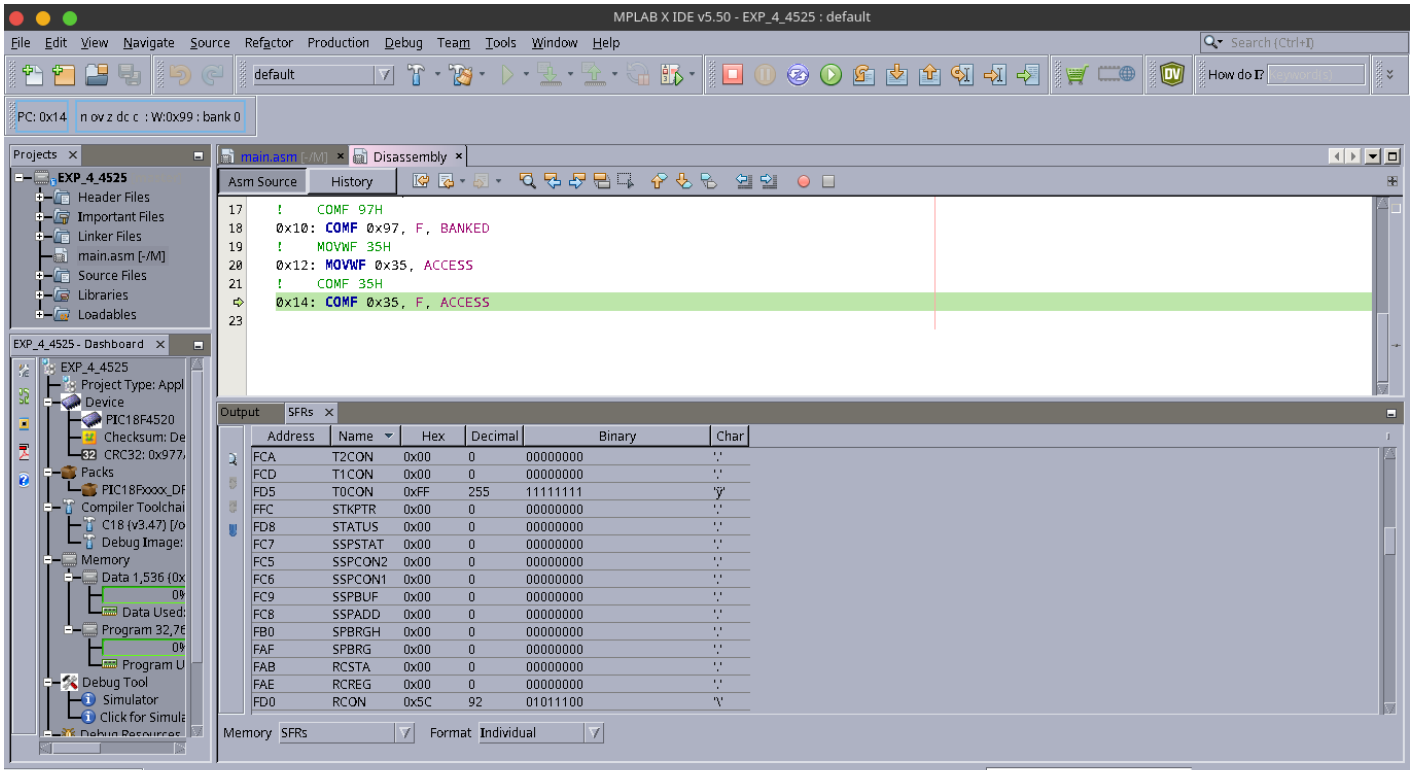
4A. Source Code :

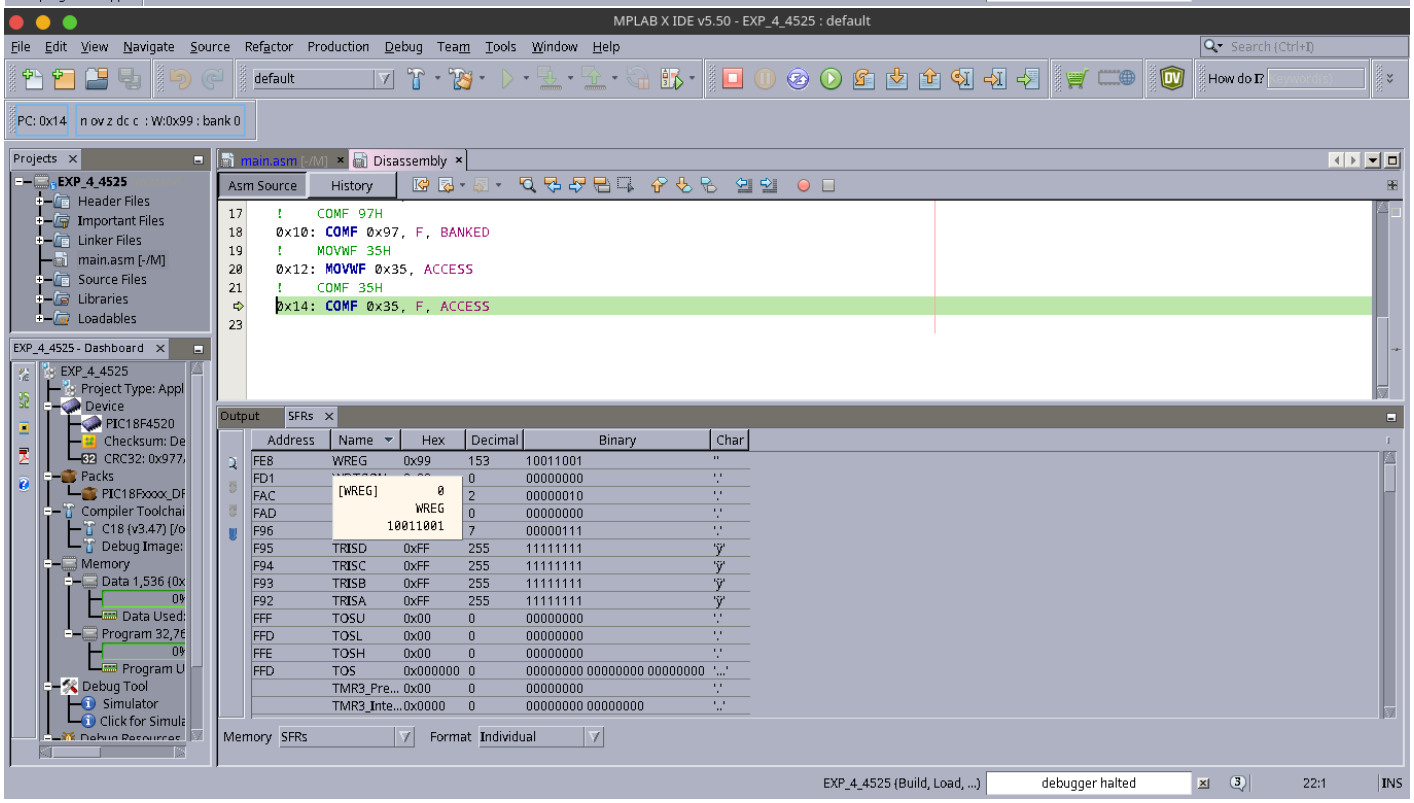
```
#include p18f4520.inc
     org 00
     MOVLW 99H
     MOVWF 01H
     COMF 01H
     MOVWF 66H
     COMF 66H
     MOVWF 89H
     COMF 89H
     MOVWF 97H
     COMF 97H
     MOVWF 35H
     COMF 35H
     END
```

4B Source Code :

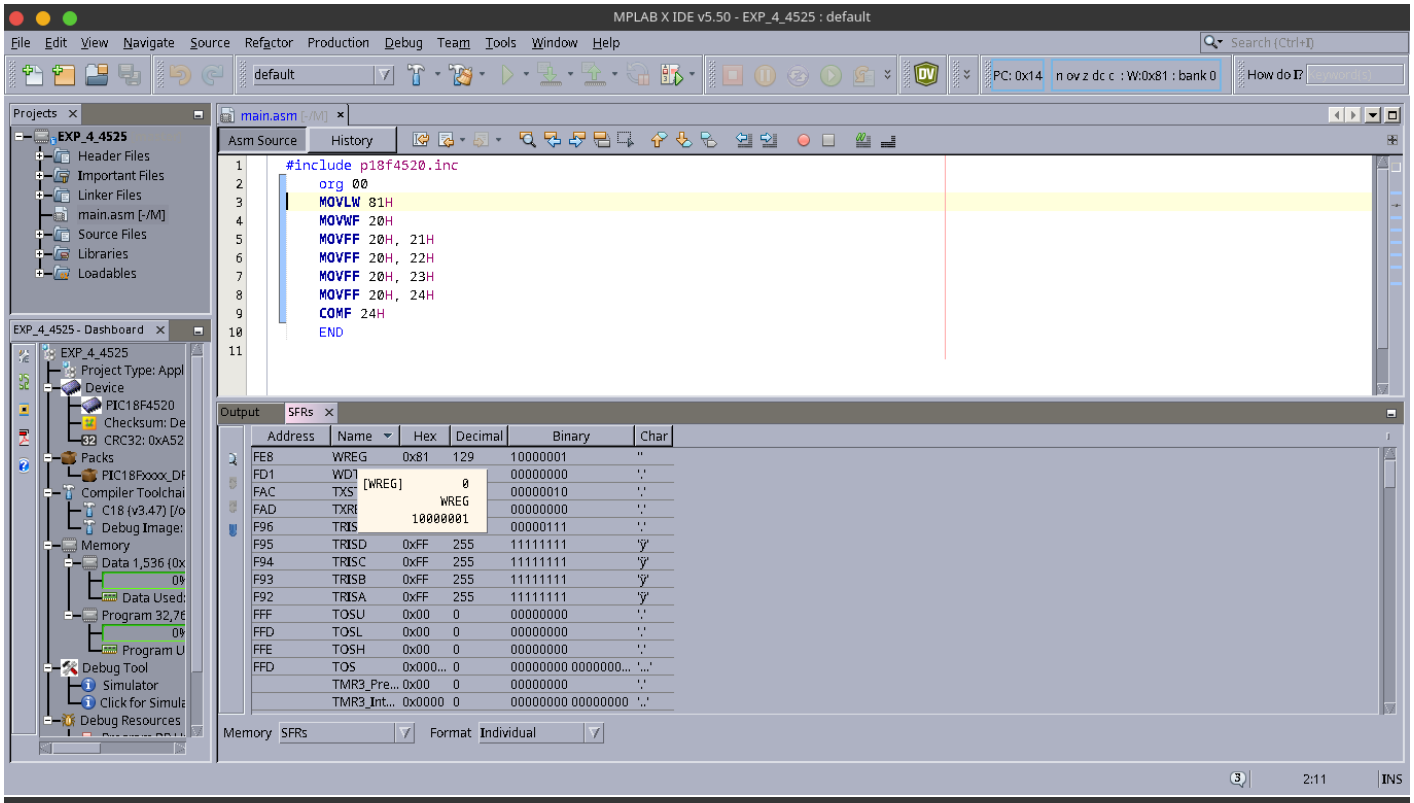
```
#include p18f4520.inc
     org 00
     MOVLW 81H
     MOVWF 20H
     MOVFF 20H, 21H
     MOVFF 20H, 22H
     MOVFF 20H, 23H
     MOVFF 20H, 24H
     COMF 24H
     END
```

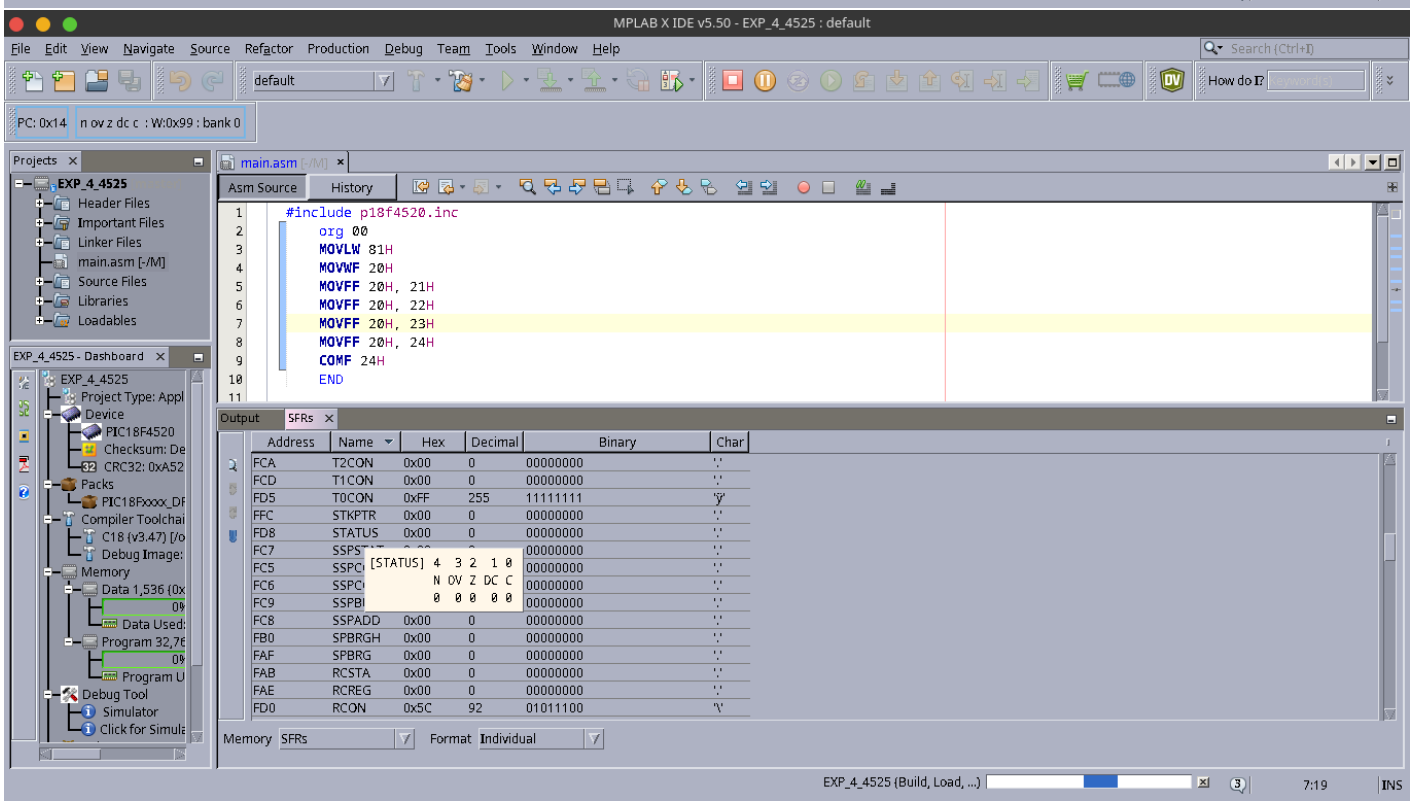
5A. Observations :

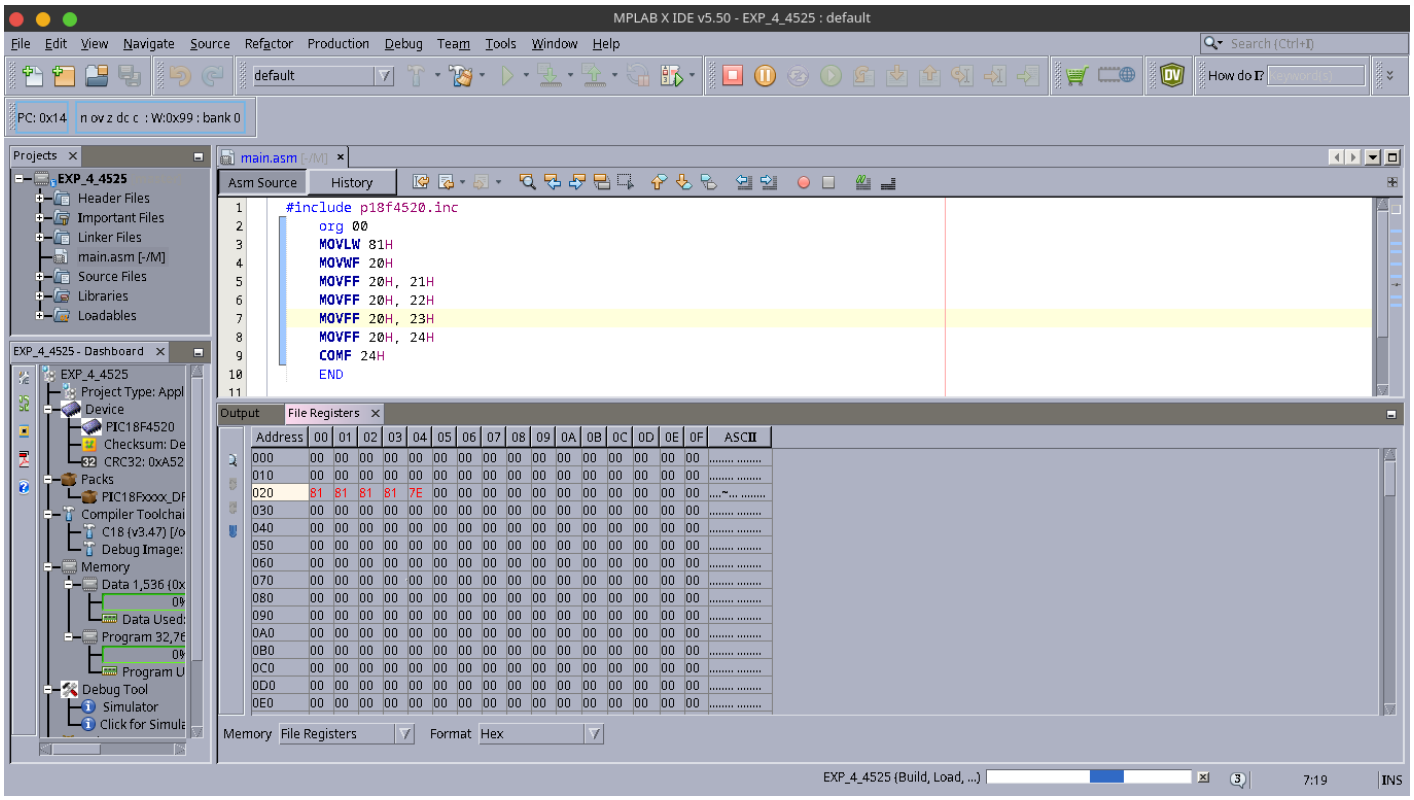




5B. Observations :







Learning Outcomes :

- Learn the different instructions such as COMF use to complement the file register.
- Learn to check the status register.
- Learn to load the value of file register and use complement of them.

S. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			