EXPERIMENT 8

Logic Instructions

Objective

- Understand working of Logic instruction.

Theory

Logic instruction

There are four logic instructions in 8086/88 assembly language. These instructions are AND (AND operation), OR (OR operation), XOR (Exclusive OR operation) and NOT (Inverting operation). The logic instruction is important to perform operation on some specific bit(s) and unchanged other bit(s) of the register.

The AND operation

The AND operation is used to clear bit or number of bits of the source register while all other bits remain unchanged. To clear bit write 0 and to make bit unchanged write 1 on the specific bit position.
E.g.
If upper nibble of the register is required and lower nibble is set to zero then AND operation is used as.

```
MOV   AL, 72 H      ; AL = 72 H
AND   AL, 0F0 H     ; AL = 70 H
```

Working

```
          0111 0010 B   (72) H
    AND   1111 0000 B   (0F0) H
-------------------------------------------------
          0111 0000 B   (70) H
-------------------------------------------------
```

The OR operation

The OR operation is used to set bit or number of bits of source register while all other bits remain unchanged. To set bit write 1 and to make bit unchanged write 0 on the specific bit position.
E.g.
If an ASCII character (8-bit) is present in the register and wants to convert in lower case regardless the character is already in lower case.

```
MOV   AL, 'A'        ; AL = 41H (ASCII of A)
OR    AL, 20 H       ; AL = AL OR 20H
```

Working
If AL contain 41 H (0100 0001 B)

```
          0100 0001 B   (41) H
    OR    0010 0000 B   (20) H
-------------------------------------------------
          0110 0001 B   (61) H        ASCII of 'a'
-------------------------------------------------
```

And if AL contain 61 H (0110 0001 B)

```
          0110 0001 B   (61) H
    OR    0010 0000 B   (20) H
-------------------------------------------------
          0110 0001 B   (61) H        ASCII of 'a'
-------------------------------------------------
```

The XOR operation

The XOR (Exclusive OR) operation is used to compliment (invert) specific bit or number of bits of the source register while all other bits remain unchanged. To invert bit write 1 and to make bit unchanged write 0 on the specific bit position.
E.g.
If upper nibble of the register is required to invert while lower nibble is want to remain unchanged then XOR operation is used as.

```
MOV   AL, 0A5 H     ; AL = A5 H
XOR   AL, 0F0 H     ; AL = 55 H
```

Working

```
          1010 0101 B   (A5) H
    AND   1111 0000 B   (F0) H
-------------------------------------------------
          0101 0101 B   (55) H
-------------------------------------------------
```

The NOT operation

The NOR (Compliment or Inverting) operation is used to compliment (invert) the bits of register. In the NOT operation the 1 is change by 0 and 0 is change by 1.
E.g.
Compliment the bits in the register

```
MOV   AL, 0AA H     ; AL = AA H
NOT   AL            ; AL = 55 H
```

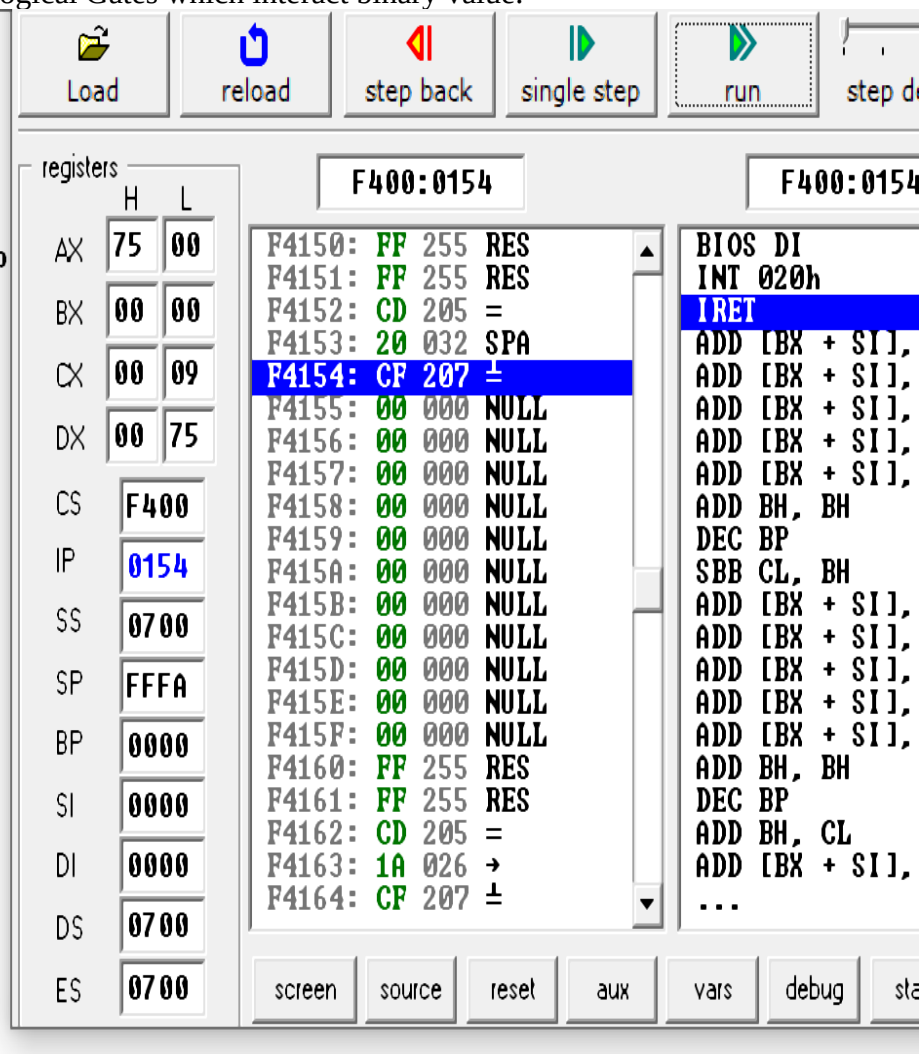
Working

```
        NOT    1010 1010 B    (AA) H
-----------------------------------------------
               0101 0101 B    (55) H
-----------------------------------------------
```

Exercise

1. Write a program using Logical Gates which interact binary value.

```
org 100h

.model small
.data
.code
main proc

        mov ah,10001010b

        NOT ah

        mov dl,ah

        main endp

ret
```



2. Write a program that compute binary calculation in the form of binary calculator.

```
.model small
.data
.code
main proc

        mov ah,10001010b
        mov bh,11010111b

        AND ah,bh


        mov dl,ah


        sub dl,81
        mov ah,02
        int 21h

        add dl,2
        mov ah,02
        int 21h

        sub dl,3
        mov ah,02
        int 21h


        main endp

ret
```