CSE 331L / EEE 332L

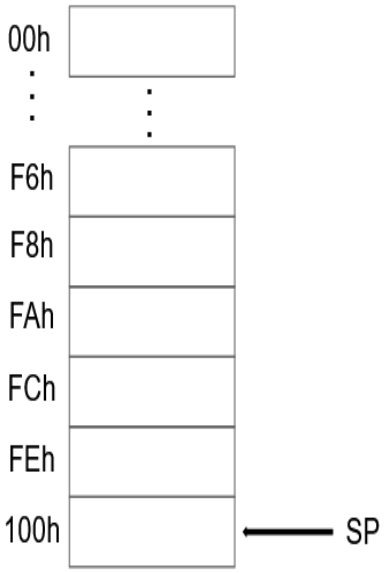
Microprocessor Interfacing & Embedded System

Section: 5,6&7, Fall 21

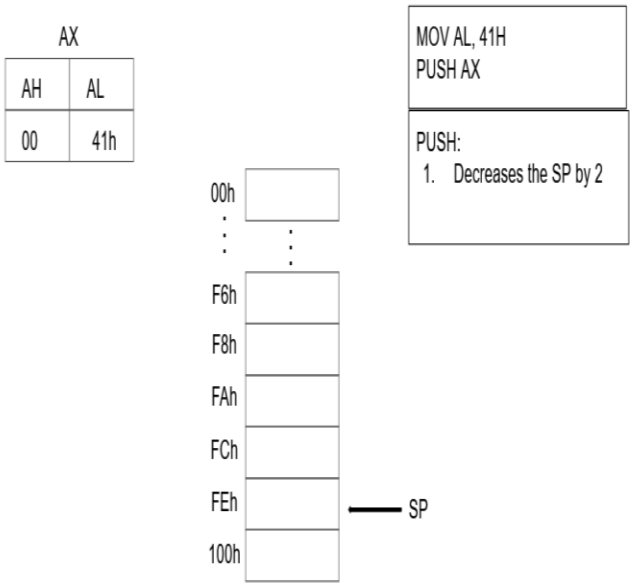
Lab- 08: Stack and Procedure

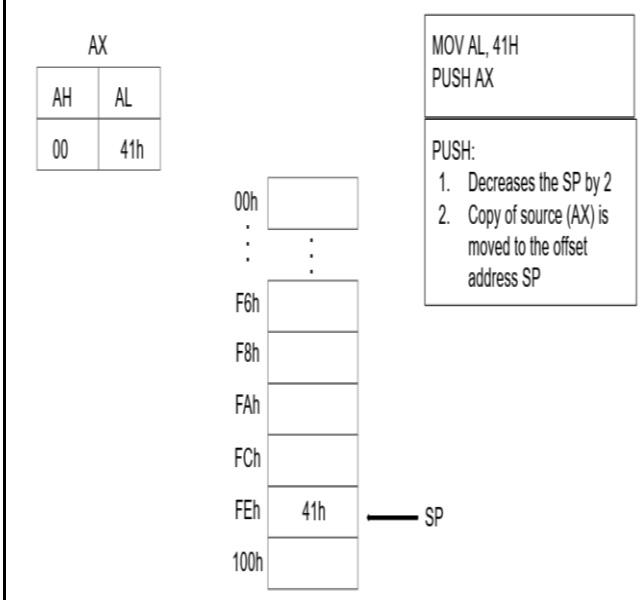
STACK:

1. PUSH: **PUSH source**
   source must be a **16-bit register or memory word.**
2. First **decrease SP by 2**, then copy of the source is moved to **SS:SP.**
3. SP contains the offset address of the top of the stack.
4. POP: **POP destination**
   destination must be a **16-bit register or memory word**.
5. First, the content of **SS:SP** (top of the stack) is moved to destination, then SP **increases by 2**

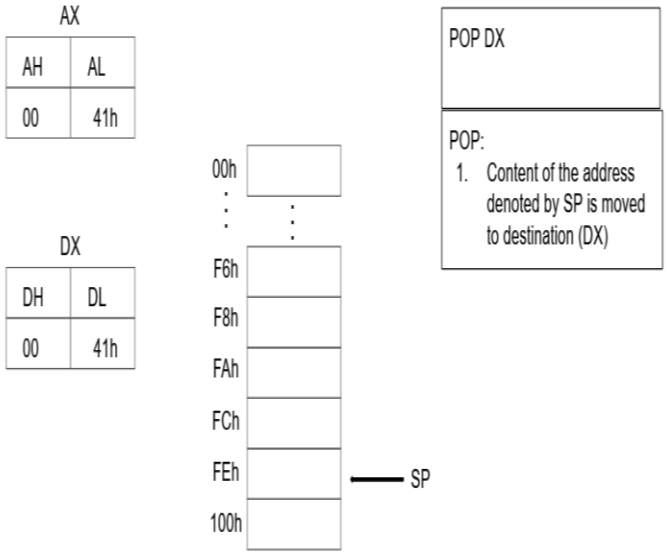


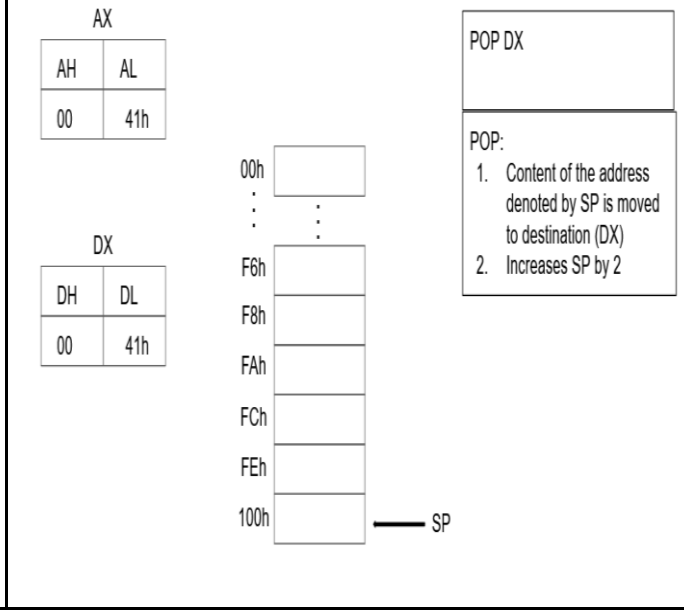
PUSH instruction





POP instruction





Example: Write a program that takes a text input from the user until the user enters **a carriage return.** Display the text in reverse order (you must use stack instructions).

```
.MODEL SMALL
.STACK 100H
.DATA
        MSG1 DB "Enter a line of text: $"
        MSG2 DB 0AH, 0DH, "Reverse: $"
        MSG3 DB 0AH, 0DH, "The stack is empty.$"

.CODE
        MOV AX, @DATA
        MOV DS, AX

        MOV AH, 9
        LEA DX, MSG1
        INT 21H

        MOV CX, 0           ;input count set to 0

        INPUT:              ;take input
        MOV AH, 1
        INT 21H
        CMP AL, 0DH         ;check if CRET?
        JE DISPLAY          ;if CRET, exit loop & go to display

        XOR AH, AH          ;clear AH
        PUSH AX             ;push the input on stack
        INC CX              ;increment input count
        JMP INPUT           ;loop back

        DISPLAY:
        CMP CX, 0H          ;check if stack is empty
        JE EMPTY_STACK      ;if empty go to empty_stack

        MOV AH, 9           ;if not not empty, display the reverse
        LEA DX, MSG2
        INT 21H

        REV:
        POP DX                      ;get a character from stack
        MOV AH, 2
```

```
    INT 21H             ;display the character

    LOOP REV
    JMP EXIT            ;as done with display, go to exit

    EMPTY_STACK:
    MOV AH, 9
    LEA DX, MSG3        ;show the empty stack message
    INT 21H

    EXIT:
    MOV AH, 4CH         ;terminate program
    INT 21H
```

Procedure is a part of code that can be called from your program in order to make some specific task. Procedures make programs more structural and easier to understand. Generally the procedure returns to the same point from where it was called.

The syntax for procedure declaration:

```
name PROC
    ; here goes the code
    ; of the procedure ...
    RET
name ENDP
```

name - is the procedure name, the same name should be in the top and bottom, this is used to check the correct closing of procedures.

RET instruction is used to return the control from procedure to the caller.

PROC and **ENDP** are compiler directives, so they are not assembled into any real machine code. Compiler just remembers the address of the procedure.
CALL instruction is used to call a procedure.

```
INCLUDE EMU8086.INC

.MODEL SMALL
.STACK 100H
.CODE

MAIN PROC

        CALL SCAN_NUM   ;LIBRARY PROC
        PRINTN
        MOV AX, CX
        CALL SCAN_NUM   ;LIBRARY PROC
        PRINTN

        CALL SUM        ;USER-DEFINED PROC

        CALL PRINT_NUM  ;LIBRARY PROC

        EXIT:
        MOV AH, 4CH
        INT 21H

MAIN ENDP

SUM PROC
        ADD AX, CX

        RET
SUM ENDP

DEFINE_SCAN_NUM
DEFINE_PRINT_NUM
DEFINE_PRINT_NUM_UNS
```