

# Case Conversion

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## **Aim:**

To write and execute 8086 programs for case conversion.

## **Procedure:**

- Mount masm folder to a drive on DOSBOX.
- Navigate to mounted drive using 'dir' .
- Save 8086 program with the extension '**.asm**' in the same folder using the command '**edit**'.
- Assemble the **.asm** file using the command '**masm filename.asm**'.
- Link the assembled **.obj** file using the command '**link filename.obj**'.
- Debug the executable file **.exe** with the '**debug filename.exe**' command.
  - i. **U**: To view the un-assembled code.
  - ii. **D**: Used as 'D segment:offset' to see the content of memory locations starting from segment:offset address.
  - iii. **E**: To change the values in memory.
  - iv. **G**: Execute the program using command.
  - v. **Q** exits from the debug session.

## **Algorithm:**

- \* **START**: Move the starting address of data segment to AX register and move the data from AX register to DS register.
- \* Move the value of COUNT to CX register.
- \* **L1**: Move 1h to AH register. When int 21H is called with value 1 in AH register will read the letters with echo.
- \* Now compare AL and 60H using CMP.
- \* If the value in AL register is greater than 60H which means the input character is a lower-case letter so we jump to UPPER using JNC.
- \* If the value is less than 60H means the given character is an upper-case letter so we add 20H (32) to AL register to convert it to lower case letter and make an unconditional jump to SKIP using JMP.

- \* UPPER: Subtract the value of AL register by 20H to convert the lower-case letter to upper case letter.
  - \* SKIP: Move 2h to AH register.
  - \* Move the contents of the AL register to DL to register.
  - \* When int 21H is called with 2 in AH register the contents in the DL register is displayed to the standard output device.
  - \* Loop to L1 till CX register becomes 0.
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## Program:

Program	Comments
<b>start:</b> MOV AX,data	Move data segment address contents to AX register
MOV ds,AX	Move data in AX register to DS register
MOV CX, COUNT	loading loop counter
<b>L1:</b> MOV AH, 1	
INT 21H	When AH = 01, INT 21h reads character into AL
CMP AL, 60H	
JNC <b>upper</b>	Jump to UPPER if value in AL is greater than 60H (a-z) case.
ADD AL, 20H	AL = AL + 20H. convert to lower case
JMP <b>skip</b>	Jump to SKIP
<b>upper:</b> SUB AL, 20H	AL = AL - 20H, convert to upper case
<b>skip:</b> MOV AH, 2	
MOV DL, AL	DL = AL. Character must be in DL
INT 21h	When AH = 02, INT 21h prints character in DL
LOOP <b>L1</b>	Loop to L1
MOV ah,4ch	
INT 21h	Request interrupt routine

Unassembled Code:

```
D:\>debug 8.EXE
-U
076A:0000 B86A07      MOV     AX,076A
076A:0003 8ED8        MOV     DS,AX
076A:0005 B91000      MOV     CX,0010
076A:0008 B401        MOV     AH,01
076A:000A CD21        INT     21
076A:000C 3C60        CMP     AL,60
076A:000E 7304        JNB     0014
076A:0010 0420        ADD     AL,20
076A:0012 EB02        JMP     0016
076A:0014 2C20        SUB     AL,20
076A:0016 B402        MOV     AH,02
076A:0018 8AD0        MOV     DL,AL
076A:001A CD21        INT     21
076A:001C E2EA        LOOP    0008
076A:001E B44C        MOV     AH,4C
```

Input and Output:

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D:\>8.EXE
aAnNHhgGIiuUJjnNAaILSseEdDXxSseE
D:\>_
```

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### Result:

8086 ASL programs for case conversion have been executed successfully using MS - DOSBox.