



Microprocessors Lap

Lecture: 6

2023 - 2024

3) Multiply (MUL):

Multiply the second operand with accumulator for unsigned number and the result is store in (AX for 8 bit, DXAX for 16bit multiplication).

AX = **AL** * operand.

When operand is 8 bits

DX AX = **AX** * operand.

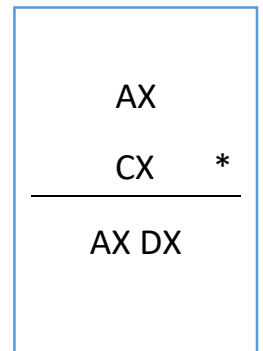
When operand is a 16 bits

MUL reg.

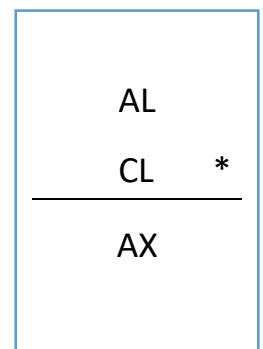
MUL mem.

Example:

MUL CX



MUL CL



Example:

Write a program to perform the following tasks:

- 1- Store the number 1115H in [1100H] and 1004H in [1102H].
- 2- Move the value of [1100H] in Reg. Ax and the value of [1102H] in Reg. Bx.
- 3- Multiply the value of Ax and BX and store it in AX.
- 4- Move the value of Ax into [1200H].
- 5- Move the value of DX into [1202H].

Solution:

```
MOV AX, 0000H
```

```
MOV DS, AX
```

```
MOV [1100H], 1115H
```

```
MOV [1102], 1004H
```

```
MOV AX, [1100H]
```

```
MOV BX, [1102]
```

```
MUL BX
```

```
MOV [1200H], AX
```

```
MOV [1202H], DX
```

```
HLT
```

MUL BX = AX * BX → AXDX

Example:

Write a program to perform the following tasks:

- 1- Loading Register AL by the value 0A and BX by the value 26.
- 2- Calculate the expression $CX = AL^2 + BX$
- 3- Store the result in M.L 0100.

Solution:

```
MOV AX, 0000H
```

```
MOV DS, AX
```

```
MOV AL, 0AH
```

```
MOV BX, 26H
```

```
MUL AL
```

```
ADD AX, BX
```

```
MOV CX, AX
```

```
MOV [0100H], AX
```

```
HLT
```

MUL AL = AL * AL → AX

3) Division (DIV):

Divide the second operand with accumulator for unsigned number and the result is store in (AX for 8 bit, DXAX for 16bit multiplication).

$AL = AX / \text{operand}$
 $AH = \text{remainder (modulus)}$

When operand is 8 bits

$AX = (DX AX) / \text{operand}$
 $DX = \text{remainder (modulus)}$

When operand is a 16 bits

DIV reg.

DIV mem.

Example:

DIV CX

$$\frac{AX}{\text{Source (8bits)}} = AL \quad AH$$

↑ الناتج
↑ باقي القسمة

DIV CL

$$\frac{AX \quad DX}{\text{Source (16bits)}} = AX \quad DX$$

↑ الناتج
↑ باقي القسمة

Example:

Write a program to perform the following tasks:

- 1- Store the number 1115H in [1100H] and 1004H in [1102H].
- 2- Move the value of [1100H] in Reg. Ax and the value of [1102H] in Reg. Bx.
- 3- Divide the value of Ax and BX and store it in AX.
- 4- Move the value of Ax into [1200H].
- 5- Move the value of DX into [1202H].

Solution:

```
MOV AX, 0000H
```

```
MOV DS, AX
```

```
MOV [1100H], 1115H
```

```
MOV [1102], 1004H
```

```
MOV AX, [1100H]
```

```
MOV BX, [1102]
```

```
DIV BX
```

```
MOV [1200H], AX
```

```
MOV [1202H], DX
```

```
HLT
```

DIV BX = AXDX ÷ BX → AXDX

Example:

Write a program to perform the following tasks:

- 1- Loading Register AL by the value 0A and BX by the value 26.
- 2- Calculate the expression $CL = (AL^2 + BX)/2$
- 3- Store the result in M.L 0100.

Solution:

MOV AX, 0000H

MOV DS, AX

MOV AL, 0AH

MOV BX, 26H

MOV CH, 02H

MUL AL

ADD AX, BX

DIV CH

MOV CL, AL

MOV [0100H], CL

HLT

DIV CH= AX ÷ CH → AL AH