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Destination Index (DI 16-Bits)

It is normally used to hold the **offset address** for **Extra segment** but can also be used for other segments using Segment Overriding. It holds **offset address** of **destination** in Extra Seg, during **String Operations.**

c) ALU (16-Bits)

It has a **16-bit ALU**. It performs 8 and 16-bit arithmetic and logic operations.

d) Operand Register

It is a 16-bit register used by the control register to hold the operands temporarily.
It is **not available** to the Programmer.

e) Instruction Register and Instruction Decoder (Present inside the Control Unit)

The **EU fetches an opcode from** the **queue into** the **Instruction Register**. The **Instruction Decoder decodes** it and sends the information to the control circuit for execution.
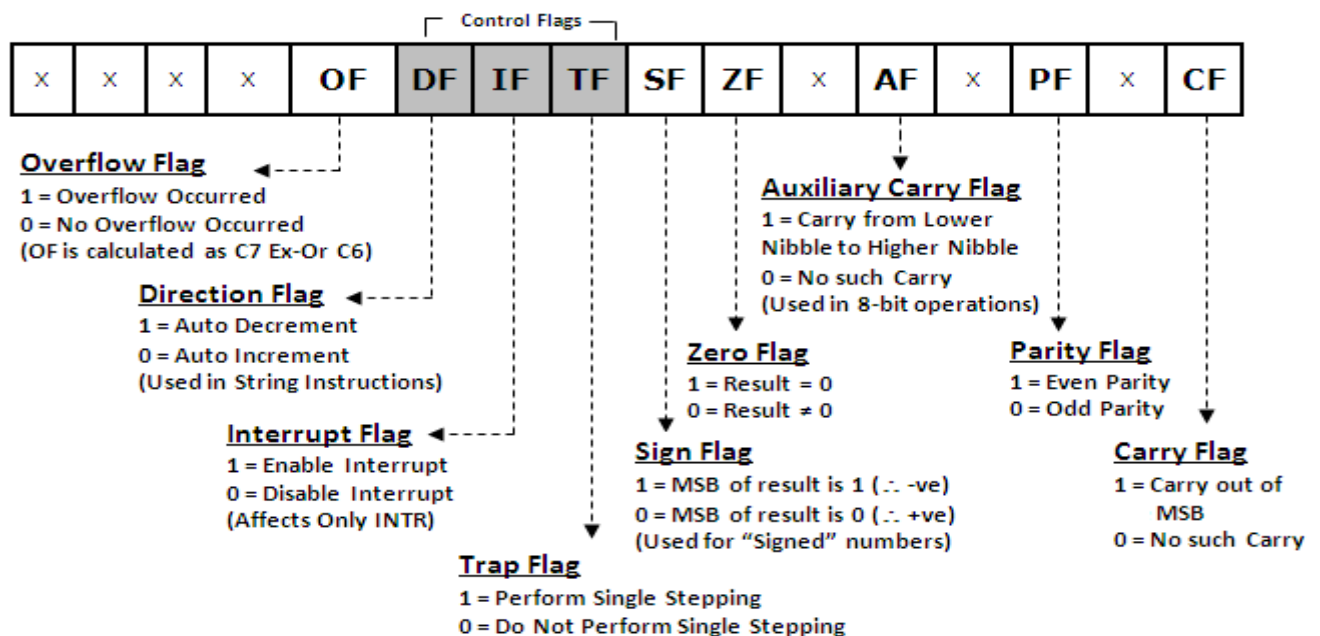
f) Flag Register (16-Bits)

It has **9 Flags**.
These flags are of two types: **6-Status** (Condition) Flags and **3-Control** Flags.
Status flags are affected by the ALU, after every arithmetic or logic operation. They give the **status of the current result**.
The **Control flags** are used to control certain operations.
They are changed by the programmer.

Control Flags

| x | x | x | x | **OF** | **DF** | **IF** | **TF** | **SF** | **ZF** | x | **AF** | x | **PF** | x | **CF** |

Overflow Flag
1 = Overflow Occurred
0 = No Overflow Occurred
(OF is calculated as C7 Ex-Or C6)

Direction Flag
1 = Auto Decrement
0 = Auto Increment
(Used in String Instructions)

Interrupt Flag
1 = Enable Interrupt
0 = Disable Interrupt
(Affects Only INTR)

Trap Flag
1 = Perform Single Stepping
0 = Do Not Perform Single Stepping

Auxiliary Carry Flag
1 = Carry from Lower
Nibble to Higher Nibble
0 = No such Carry
(Used in 8-bit operations)

Zero Flag
1 = Result = 0
0 = Result ≠ 0

Sign Flag
1 = MSB of result is 1 (∴ -ve)
0 = MSB of result is 0 (∴ +ve)
(Used for "Signed" numbers)

Parity Flag
1 = Even Parity
0 = Odd Parity

Carry Flag
1 = Carry out of
MSB
0 = No such Carry

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STATUS FLAGS

1) *Carry flag (CY)*
   It is **set** whenever there is a **carry** {or borrow} out of the MSB of a the result
   (D7 bit for an 8-bit operation D15 bit for a 16-bit operation)

2) *Parity Flag (PF)*
   It is **set** if the result has **even parity**.

3) *Auxiliary Carry Flag (AC)*
   It is **set** if a carry is generated out of the **Lower Nibble**.
   It is used only in 8-bit operations like DAA and DAS.

4) *Zero Flag (ZF)*
   It is **set** if the result is **zero**.

5) *Sign Flag (SF)*
   It is **set** if the **MSB** of the result is **1**.
   For **signed** operations, such a number is treated as **–ve**.

6) *Overflow Flag (OF)*
   It will be set if the **result of** a **signed operation** is **too large to fit** in the number of bits available to represent it. It can be **checked using** the **instruction INTO** (Interrupt on Overflow). #Please refer Bharat Sir's Lecture Notes for this ...

CONTROL FLAGS

1) *Trap Flag (TF)*
   It is used to **set** the Trace Mode i.e. start **Single Stepping Mode**.
   Here the μP is **interrupted after every instruction** so that, the **program** can be **debugged**.

2) *Interrupt Enable Flag (IF)*
   It is used to mask (disable) or unmask (enable) the INTR interrupt.

3) *Direction Flag (DF)*
   If this flag is **set, SI** and **DI** are in **auto-decrementing** mode in **String Operations**.