8086 flag register

The Flag register is a Special Purpose Register. Depending upon the value of result after any arithmetic and logical operation the flag bits become set (1) or reset (0).

Figure – Format of flag register

There are total 9 flags in 8086 and the flag register is divided into two types:

A)Status Flags(conditional flags)

- **Status Flags** – There are 6 flag registers in 8086 microprocessor which become set(1) or reset(0) depending upon condition after either 8-bit or 16-bit operation.

  These flags are conditional/status flags. 5 of these flags are same as in case of 8085 microprocessor and their working is also same as in 8085 microprocessor. The sixth one is the overflow flag.

The 6 status flags are:

1. Sign Flag (S)
2. Zero Flag (Z)
3. Auxiliary Cary Flag (AC)
4. Parity Flag (P)
5. Carry Flag (CY)
6. Overflow Flag (O)

- **Sign Flag (S)** – After any operation if the MSB (B(7)) of the result is 1, it indicates the number is negative and the sign flag becomes set, i.e. 1. If the MSB is 0, it indicates the number is positive and the sign flag becomes reset i.e. 0.
  from 00H to 7F, sign flag is 0
  from 80H to FF, sign flag is 1
  1- MSB is 1 (negative)
  0- MSB is 0 (positive)

- **Zero Flag (Z)** – After any arithmetical or logical operation if the result is 0 (00)H, the zero flag becomes set i.e. 1, otherwise it becomes reset i.e. 0.
  00H zero flag is 1.
  from 01H to FFH zero flag is 0
  1- zero result
  0- non-zero result

Auxiliary Carry Flag (AC) – This flag is used in BCD number system(0-9). If after any arithmetic or logical operation D(3) generates any carry and passes on to D(4) this flag becomes set i.e. 1, otherwise it becomes reset i.e. 0. This is the only flag register which is not accessible by the programmer

1-carry out from bit 3 on addition or borrow into bit 3 on subtraction
0-otherwise

- **Parity Flag (P)** – If after any arithmetic or logical operation the result has even parity, an even number of 1 bits, the parity register becomes set i.e. 1, otherwise it becomes reset i.e. 0.

  1-accumulator has even number of 1 bits
  0-accumulator has odd parity

- **Carry Flag (CY)** – Carry is generated when performing n bit operations and the result is more than n bits,
  Carry flag is also called borrow flag.
  1-carry out from MSB bit on addition or borrow into MSB bit on subtraction
  0-no carry out or borrow into MSB bit

- **Overflow Flag (O)** – This flag will be set (1) if the result of a signed operation is too large to fit in the number of bits available to represent it, otherwise reset (0). After any operation,

  if D[6] generates any carry and passes to D[7] OR if D[6] does not generates carry but D[7] generates, overflow flag becomes set, i.e., 1.

  When we add two positive numbers(two negative numbers) and the result is negative(positive) overflow flag becomes set, i.e., 1.

  (If D[6] and D[7] both generate carry or both do not generate any carry, then overflow flag becomes reset, i.e., 0.)

examples

- (6C)H 01101100
- (43)H 01000011 +

- (AF)H 10101111

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- (50)H is 01010000 which is positive
- (32)H is 00110010 which is positive +
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- (82)H is 10000010 which is negative

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- (4B)H 01001011
- (80)H 10000000 +

- (CB)H 11001011

B)Control Flags

Control flags controls the operations of the execution unit. Following is the list of control flags −

- **Directional Flag (D)**This flag is specifically used in string instructions.
  If directional flag is set (1), then access the string data from higher memory location towards lower memory location.

  If directional flag is reset (0), then access the string data from lower memory location towards higher memory location.

Interrupt Flag (I) – This flag is for interrupts.

If interrupt flag is set (1), the microprocessor will recognize interrupt requests from the peripherals.

If interrupt flag is reset (0), the microprocessor will not recognize any interrupt requests and will ignore them.

Trap Flag (T) – This flag is used for on-chip debugging. Setting trap flag puts the microprocessor into single step mode for debugging. In single stepping, the microprocessor executes a instruction and enters into single step ISR.
If trap flag is set (1), the CPU automatically generates an internal interrupt after each instruction, allowing a program to be inspected as it executes instruction by instruction.
If trap flag is reset (0), no function is performed.

8085 vs. 8086

Comparison between 8085 & 8086 Microprocessor

Size – 8085 is 8-bit microprocessor,
Where as 8086 is 16-bit microprocessor.

Address Bus – 8085 has 16-bit address bus while 8086 has 20-bit address bus.

Memory – 8085 can access up to 64Kb, whereas 8086 can access up to 1 Mb of memory.

Instruction – 8085 doesn't have an instruction queue, whereas 8086 has an instruction queue.

Pipelining – 8085 doesn't support a pipelined architecture while 8086 supports a pipelined architecture.

I/O – 8085 can address 2^8 = 256 I/O's, whereas 8086 can access 2^16 = 65,536 I/O's.

Cost – The cost of 8085 is low whereas that of 8086 is high.

8086 Vs.8088

- 8086/The instruction Queue is 6 byte long.
- 8088/The instruction Queue is 4 byte long.

- In 8086, memory divides into two banks
- -even or lower bank
- -odd or higher bank

The memory in 8088 does not divide into two banks

- The data bus of 8086 is 16-bit wide
- The data bus of 8088 is 8-bit wide.

8086 Vs.8088

- 8086 has BHE (bar) signal and S7
- 8088 does not have BHE (bar). It has no S7 pin.

- Control pin in 8086 is M/IO' (bar).
- Control pin in 8088 is IO/M'(bar).

- In 8086, all address & data Buses are multiplexed.
- In 8088, address bus; AD7- AD0 buses are multiplexed.
