Flag Register

→ flag register contains the status of the current result.

→ Control flags
→ conditional flags → Trap flag (TF)
→ Interrupt flag (IF)
→ Directional flag (DF)

→ Control flags

(1) Sign flag (SF) (2) Overflow flag (OF)
(3) Carry flag (CF) (4) Zero flag (ZF)
(5) Parity flag (PF) (6) Auxiliary flag (AF)

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nibble = 4 bit
byte = 8 bit

SF gives you the
MSB = 1 SF = 1 not neg
MSB = 0 SF = 0

unsigned number

0000 0000
FFFF

OF = indicates there is an overflo in a signed number (gone out of range)

CF = 1 ; when there is a carry out of MSB.

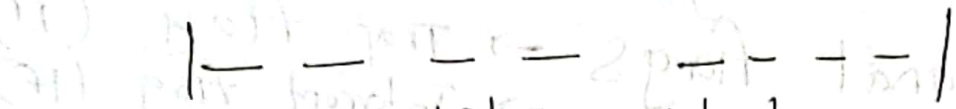
```
  1 1 1 1
+ 0 0 0 1
---------
(1) 0 0 0 0
```

CF=1

- PF = depending how many 1's are there inside the result.
  For odd number of 1's, PF = 0
  for even " " " , PF = 1.
- AF = Auxiliary carry flag
  when there is a carry from the lower half nibble to upper half nibble.
- ZF = tells you; whether your result zero or not. Result = 0000 ZF=1
  = 0010 ZF=0.

Suppose, your roll number or cricket score is always zero.

Unsigned number



0 — 255 dec $2^8 = 256$ combination

00h — FFh hex

There is no bit for sign.

So, if MSB = SF does not apply for unsigned number.

~~Signed number~~

0 0000 1111 — F

0 0000 1111 — F

signed numbers

→ can be either positive/negative.

→ we cannot put '−' in front of number like we do in our paper. MP wont understand

→ we use (MSB) as sign bit.

→ $2^8 = 256$ combination will be

half. half (+ve)
half (−ve)

−128 −1 0 —— +127

80 −01 00 —— 7Fh

$2^7 = 128$ combinations

| sign | —— 7 bit mag ——

sign
1 = −ve
0 = +ve

0 000 → 0000 → smallest value
0 111 → 1111 → biggest value

we cannot make it 1 → it will make the num neg.

7 F

negative side

-80 ~~-7F -7E~~ -01

if i got a result

1000 0011

8 3 h

can have two meanings for signed numbers, the number is always stored in 2's complement form.

unsigned system since they are all magnitudes.

1000 0011

0111 1101

-7 D

if we convert it to

if: SF = MSB is not always right, it can be mentioned by OF-; (i.e when there will be overflow)

The continuation of SF comes into overflow flag, when you get ~~of~~ out of range for signed numbers.

i.e. $\underbrace{-80 \cdots -01}_{\text{less than } -80}$ $\underbrace{00 \cdots 7Fh}_{\text{more than } 7F}$

if you want to be sure check your ~~over~~ overflow flag first, at that time only you will know whether your SF is right/wrong.

if, OF = 0, SF = 1/0 is actual sign & it is correct

if, OF = 1, SF = 1/0 is wrong, or showing the wrong sign.

0	0	1	1

$$\begin{array}{r} 42h \\ +\ 23h \\ \hline 65h \end{array} \qquad \begin{array}{r} 0100\ \ 0010 \\ +\ 0010\ \ 0011 \\ \hline 0110\ \ 0101 \end{array}$$

OF	SF	ZF	PF	AF	CF
0	0	0	1	0	0

even

did not cross the range +7Fh

$$\begin{array}{r} 37h \\ +\ 29h \\ \hline 60h \end{array} \qquad \begin{array}{r|r} 0011 & 0111 \\ +\ 0010 & 1001 \\ \hline 0110 & 0000 \end{array}$$

OF	SF	ZF	AF	PF	CF
0	0	0	1	1	0

$$\begin{array}{r} 42h \\ +\ 43h \\ \hline 85 \end{array}$$

85 out of range 7F

OF	SF	ZF	AF	PF	CF
1	1	0	0	0	0

does not care during unsigned system.

16 - 10h

DF ☐ TF = 1 ; single step.

TF

IF

→ changed by the programmer for controlling the process of single stepping

☐ IF = 1 ; enable

IF = 0 disable

in embedded system Atomic state

hard time embedded system.

→ air bag should be deployed or not:

☐ DF = 1 ↓ string instruction copied

DF = 0 ↓ auto decremented / incremented

copy/paste.

since both the numbers are out of range

+ ABh

- CDh

wrong question

- 12h → ☐ 001 0010

- 40h → ☐ 100 0000

① 101 0010

- 5 2h

both signs are similar

SF = 1,

OF = 0, since it is within range

AF = 0

PF = 0

ZF = 0

CF = 0

- 7Dh

+ 23h

170

☐	1111	1101
0	0010	0011
	101	1110
①	101	1010
	- 5	Ah