CSE-3103: Microprocessor and Microcontroller

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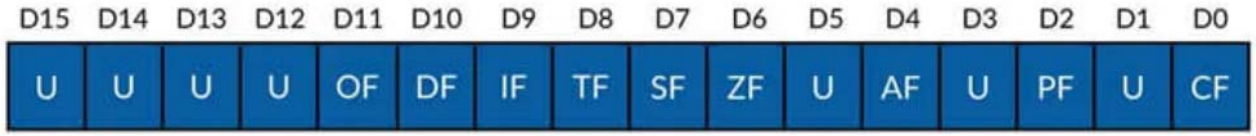
Registers of 8086



U - Unused

Conditional Flags

CF - Carry Flag
PF - Parity Flag
AF - Auxiliary Carry Flag
ZF - Zero Flag
SF - Sign Flag
OF - Overflow Flag

Control Flags

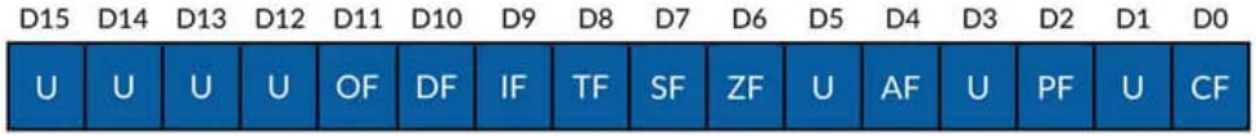
DF - Direction Flag
IF - Interrupt Flag
TF - Trap (Trace) Flag

Status Registers →
Flag register or Program Status Word (PSW) →
- 16-bit register.
- 7 bits remain unused,
- 9 are used.

9 flags →
- 6 condition flags + 3 control flags.
- control flags = TF, IF, DF.
- condition flags = OF, SF, ZF, AF, PF, CF.

CF = 1 →
- addition = carry out of MSB position,
- subtraction = borrow is needed out of MSB position.

Registers of 8086



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Status Registers →

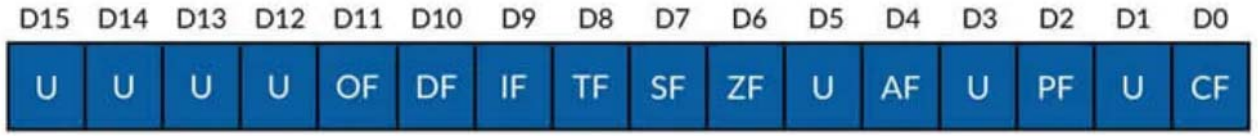
PF = 1 →
lower 8-bits of result = even number of 1's.

AF = 1 →
addition = carry out of bit 3,
subtraction = borrow required from bit 4 into bit 3.

ZF = 1 →
arithmetic or logical operation = zero.

SF = 1 →
MSB of result of operation is 1.
used for unsigned numbers.

Registers of 8086



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Status Registers →
OF = 1 →
result is too large = doesn't fit in destination.
used for signed arithmetic operation.

Control Flags →
set/reset by programmer.
TF = 1 →
processor operates in single stepping mode.
interrupt is recognized, TF flag is cleared.
CPU runs ISS (interrupt service subroutine).
IRET →
CPU returns to main program from ISS,
TF flag status is restored.

Registers of 8086

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
U	U	U	U	OF	DF	IF	TF	SF	ZF	U	AF	U	PF	U	CF

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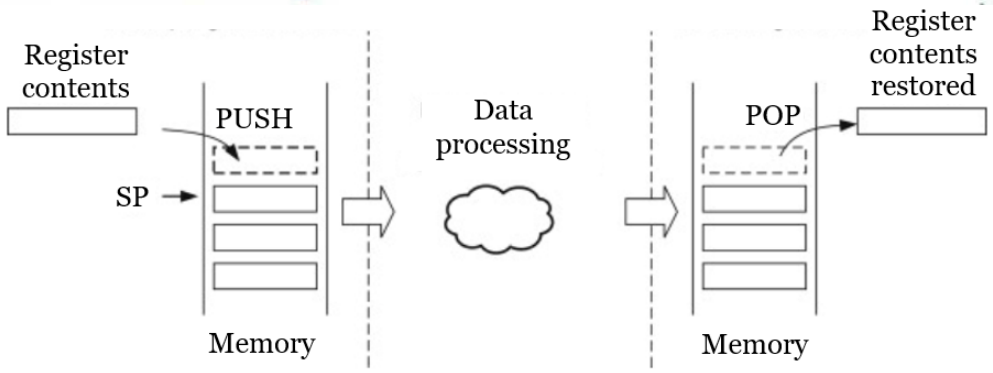
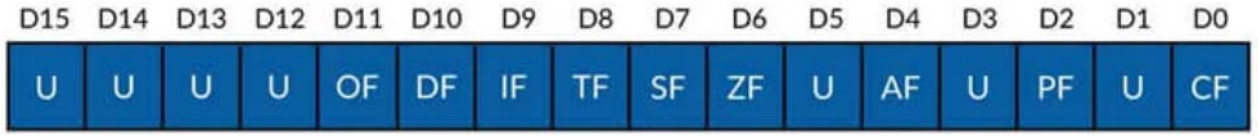


Control Flags →
TF = set/reset →
push flag register on stack,
change TF as desired,
pop flag register from stack.

IF = 1 →
maskable interrupt INTR is enabled.
interrupt is recognized, IF flag is cleared.
IRET in ISS →
returns to main program,
IF flag status is restored.
STI = IF set instruction,
CLI = IF clear instruction.
8086 is reset → IF is cleared.

Registers of 8086



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Control Flags →

DF →

used in string operations.
STD = DF set instruction,
CLD = DF clear instruction.

DF = 1 →

DI and SI are automatically decremented, access string from highest memory location down to lowest memory location.

Registers of 8086

Pointers and Index Group of Registers:

SP and BP = pointer registers.

SI and DI = index registers.

All 4 → 16-bit registers.

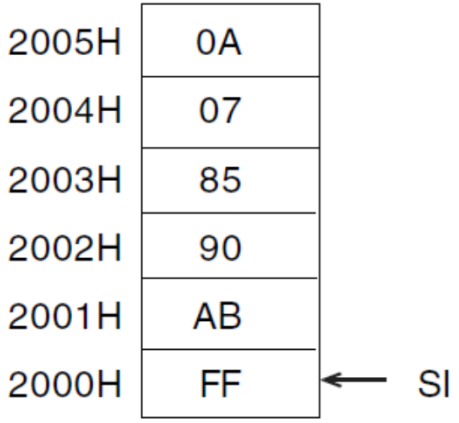
store offset addresses of memory locations.

SI = 2000H,

MOV AH, [SI] →

AH ← FFH

[SI+1:SI] = ABFFH



SI, DI in string instructions →

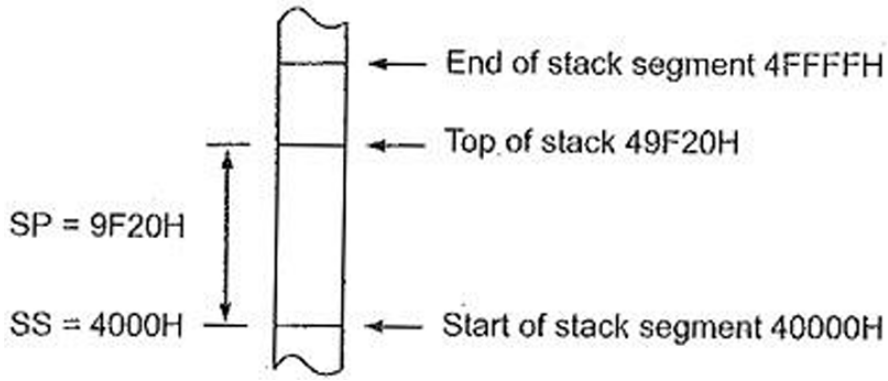
SI → source index register,
source address = DS×10 + SI

DI → destination index register,
destination address = ES×10 + DI

Registers of 8086

Pointers and Index Group of Registers:

SP → stack pointer.
contains offset address or stack top address.
stack address = [SS]×10 + [SP]



BP → base pointer.
used to access data area in stack segment.
stack address = [SS]×10 + [BP]

IP → instruction pointer.
contains offset address of next instruction to be fetched.
cannot be programmed by programmer.

SI, DI, BP →
also used as general purpose registers.