Lecture 10
Computer Technology

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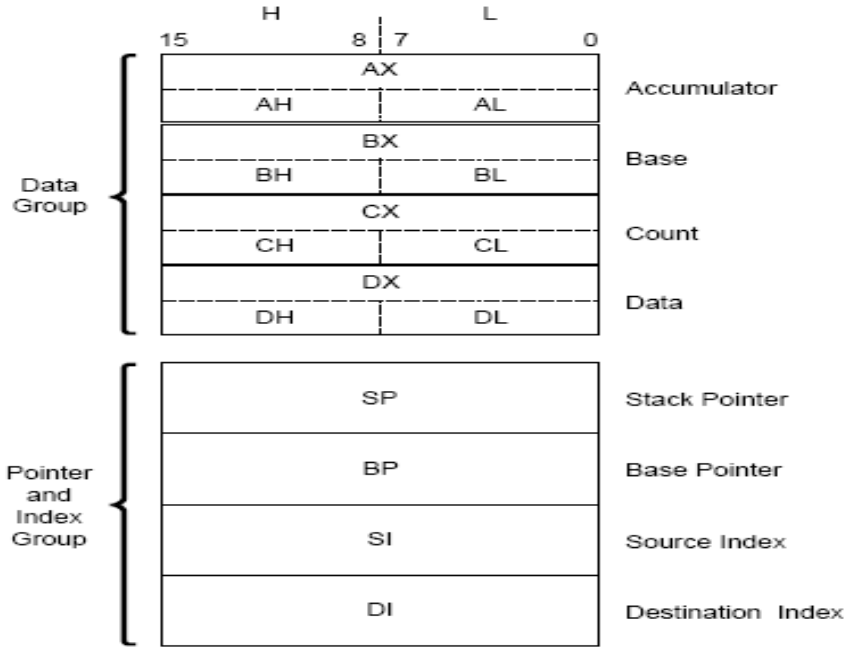
Chapter 10
An Introduction to 8086 Microprocessor Architecture

10.1 Comparison between 8085 & 8086 Microprocessor

- **Size** – 8085 is 8-bit microprocessor, whereas 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.

10.2 Internal Registers of the 8086



10.2.1 Flag Register

It is a 16-bit register that behaves like a flip-flop, i.e. it changes its status according to the result stored in the accumulator. It has 9 flags and they are divided into 2 groups – Conditional Flags and Control Flags.

10.2.2 Conditional Flags

It represents the result of the last arithmetic or logical instruction executed. Following is the list of conditional flags –

- **Carry flag** – This flag indicates an overflow condition for arithmetic operations.
- **Auxiliary flag** – When an operation is performed at ALU, it results in a carry/barrow from lower nibble (i.e. D0 – D3) to upper nibble (i.e. D4 – D7), then this flag is set, i.e. carry given by D3 bit to D4 is AF flag. The processor uses this flag to perform binary to BCD conversion.

- **Parity flag** – This flag is used to indicate the parity of the result, i.e. when the lower order 8-bits of the result contains even number of 1's, then the Parity Flag is set. For odd number of 1's, the Parity Flag is reset.
- **Zero flag** – This flag is set to 1 when the result of arithmetic or logical operation is zero else it is set to 0.
- **Sign flag** – This flag holds the sign of the result, i.e. when the result of the operation is negative, then the sign flag is set to 1 else set to 0.
- **Overflow flag** – This flag represents the result when the system capacity is exceeded.

10.2.3 Control Flags

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

- **Trap flag** – It is used for single step control and allows the user to execute one instruction at a time for debugging. If it is set, then the program can be run in a single step mode.
- **Interrupt flag** – It is an interrupt enable/disable flag, i.e. used to allow/prohibit the interruption of a program. It is set to 1 for interrupt enabled condition and set to 0 for interrupt disabled condition.
- **Direction flag** – It is used in string operation. As the name suggests when it is set then string bytes are accessed from the higher memory address to the lower memory address and vice-a-versa.

10.2.4 General purpose register

There are 8 general purpose registers, i.e., AH, AL, BH, BL, CH, CL, DH, and DL. These registers can be used individually to store 8-bit data and can be used in pairs to store 16bit data. The valid register pairs are AH and AL, BH and BL, CH and CL, and DH and DL. It is referred to the AX, BX, CX, and DX respectively.

- **AX register** – It is also known as accumulator register. It is used to store operands for arithmetic operations.
- **BX register** – It is used as a base register. It is used to store the starting base address of the memory area within the data segment.
- **CX register** – It is referred to as counter. It is used in loop instruction to store the loop counter.
- **DX register** – This register is used to hold I/O port address for I/O instruction.

10.2.5 Stack pointer register

It is a 16-bit register, which holds the address from the start of the segment to the memory location, where a word was most recently stored on the stack.