BLOCK DIAGRAM OF INTEL 8085

GURSHARAN SINGH TATLA

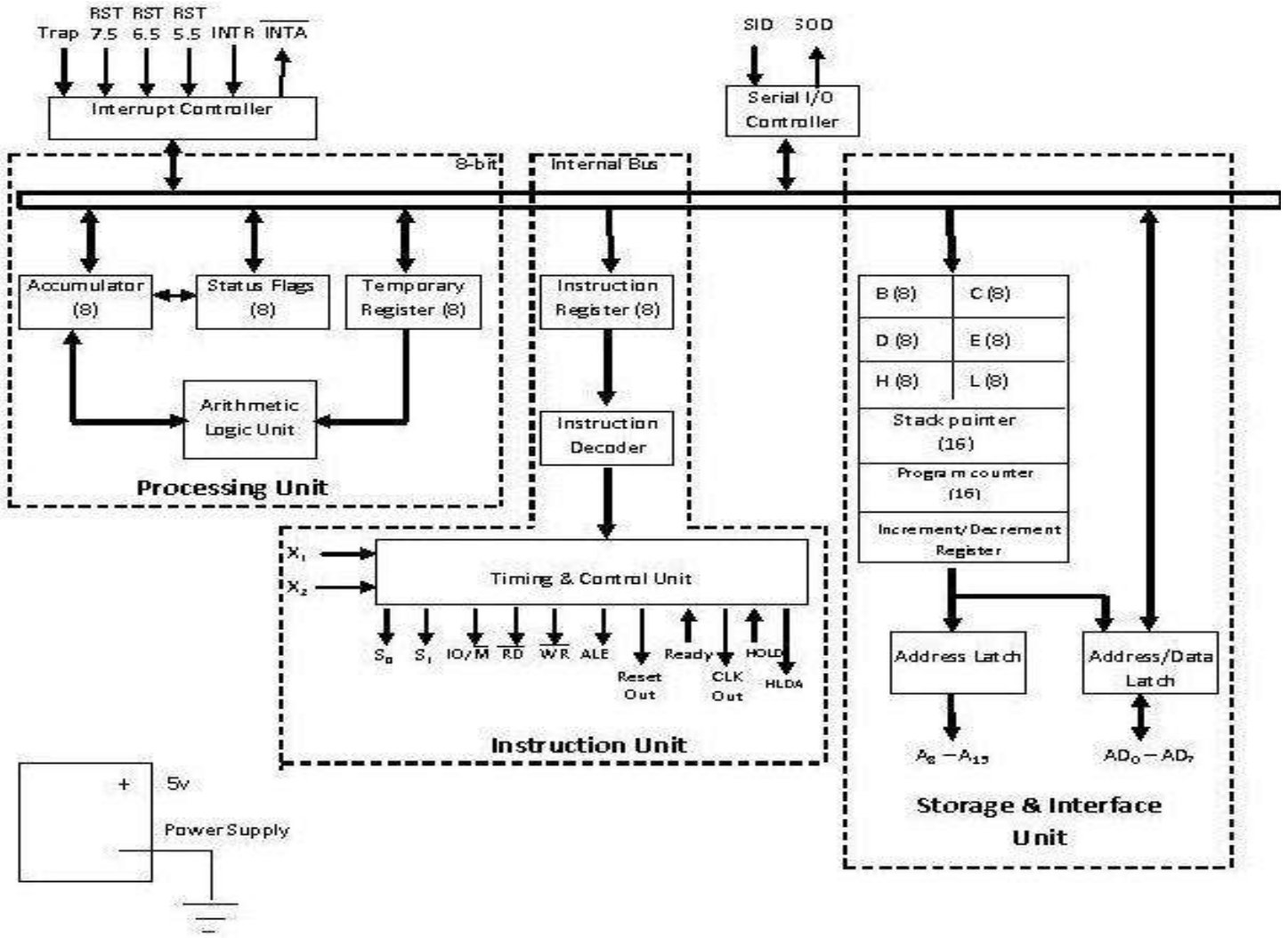
professorgstatla@gmail.com

Introduction to 8085

- Introduced in 1977.
- It is 8-bit MP.
- It is a 40 pin dual-in-line chip.
- It uses a single +5V supply for its operations.
- Its clock speed is about 3MHz.

Gursharan Singh Tatla
professorgstatla@gmail.com

Block Diagram of 8085



Gursharan Singh Tatla
professorgstatla@gmail.com

Three Units of 8085

- Processing Unit
- Instruction Unit
- Storage and Interface Unit

Gursharan Singh Tatla
professorgstatla@gmail.com

Processing Unit

- Arithmetic and Logic Unit
- Accumulator
- Status Flags
- Temporary Register

Gursharan Singh Tatla
professorgstatla@gmail.com

Instruction Unit

- Instruction Register
- Instruction Decoder
- Timing and Control Unit

Gursharan Singh Tatla
professorgstatla@gmail.com

Storage and Interface Unit

- General Purpose Registers
- Stack Pointer
- Program Counter
- Increment/Decrement Register
- Address Latch
- Address/Data Latch

Gursharan Singh Tatla
professorgstatla@gmail.com

Three Other Units

- Interrupt Controller
- Serial I/O Controller
- Power Supply

Gursharan Singh Tatla
professorgstatla@gmail.com

Accumulator

- It the main register of microprocessor.
- It is also called register ‘A’.
- It is an 8-bit register.
- It is used in the arithmetic and logic operations.
- It always contains one of the operands on which arithmetic/logic has to be performed.
- After the arithmetic/logic operation, the contents of accumulator are replaced by the result.

Gursharan Singh Tatla
professorgstatla@gmail.com

Arithmetic & Logic Unit (ALU)

- It performs various arithmetic and logic operations.
- The data is available in accumulator and temporary/general purpose registers.
- **Arithmetic Operations:**
  - Addition, Subtraction, Increment, Decrement etc.
- **Logic Operations:**
  - AND, OR, X-OR, Complement etc.

Gursharan Singh Tatla
professorgstatla@gmail.com

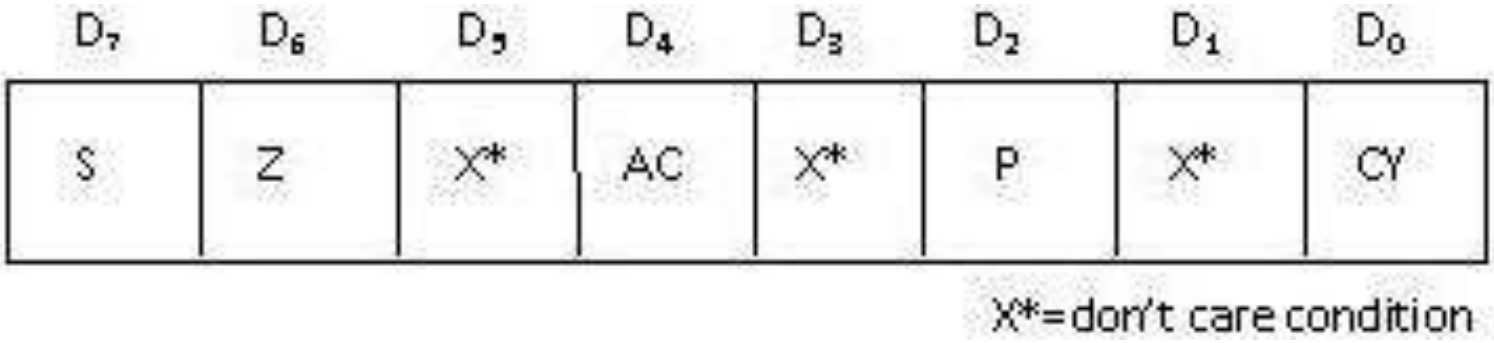
Temporary Register

- It is an 8-bit register.
- It is used to store temporary 8-bit operand from general purpose register.
- It is also used to store intermediate results.

Gursharan Singh Tatla
professorgstatla@gmail.com

Status Flags

- Status Flags are set of flip-flops which are used to check the status of Accumulator after the operation is performed.



Gursharan Singh Tatla
professorgstatla@gmail.com

Status Flags

- S = Sign Flag
- Z = Zero Flag
- AC = Auxiliary Carry Flag
- P = Parity Flag
- CY = Carry Flag

Gursharan Singh Tatla
professorgstatla@gmail.com

Status Flags

- **Sign Flag (S):**
  - It tells the sign of result stored in Accumulator after the operation is performed.
  - If result is –ve, sign flag is set (1).
  - If result is +ve, sign flag is reset (0).

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professorgstatla@gmail.com

Status Flags

- **Zero Flag (Z):**
  - It tells whether the result stored in Accumulator is zero or not after the operation is performed.
  - If result is zero, zero flag is set (1).
  - If result is not zero, zero flag is reset (0).

Gursharan Singh Tatla
professorgstatla@gmail.com

Status Flags

- **Auxiliary Carry Flag (AC):**
  - It is used in BCD operations.
  - When there is carry in BCD addition, we add 0110 (6) to the result.
  - If there is carry in BCD addition, auxiliary carry is set (1).
  - If there is no carry, auxiliary carry is reset (0).

Gursharan Singh Tatla
professorgstatla@gmail.com

Status Flags

- **Parity Flag (P):**
  - It tells the parity of data stored in Accumulator.
  - If parity is even, parity flag is set (1).
  - If parity is odd, parity flag is reset (0).

Gursharan Singh Tatla
professorgstatla@gmail.com

Program Status Word (PSW)

- The contents of Accumulator and Status Flags clubbed together is known as Program Status Word (PSW).
- It is a 16-bit word.

Gursharan Singh Tatla
professorgstatla@gmail.com

Instruction Register

- It is used to hold the current instruction which the microprocessor is about to execute.
- It is an 8-bit register.

Gursharan Singh Tatla
professorgstatla@gmail.com

Instruction Decoder

- It interprets the instruction stored in instruction register.
- It generates various machine cycles depending upon the instruction.
- The machine cycles are then given to the Timing and Control Unit.

Gursharan Singh Tatla
professorgstatla@gmail.com

Timing and Control Unit

- It controls all the operations of microprocessor and peripheral devices.
- Depending upon the machine cycles received from Instruction Decoder, it generates 12 control signals:
  - S_0 and S_1 (Status Signals).
  - ALE (Address Latch Enable).

Gursharan Singh Tatla
professorgstatla@gmail.com

Timing and Control Unit

- $\overline{RD}$ (Read, active low).
- $\overline{WR}$ (Write, active low).
- $IO/\overline{M}$ (Input-Output/Memory).
- READY
- $\overline{\text{RESET IN}}$
- RESET OUT
- CLK OUT
- HOLD and HLDA

Gursharan Singh Tatla
professorgstatla@gmail.com

General Purpose Registers

- There are 6 general purpose registers, namely B, C, D, E, H, L.
- Each of the them is 8-bit register.
- They are used to hold data and results.
- To hold 16-bit data, combination of two 8-bit registers can be used.
- This combination is known as ***Register Pair***.
- The valid register pairs are:
  - B – C, D – E, H – L.

Gursharan Singh Tatla
professorgstatla@gmail.com

Program Counter

- It is used to hold the address of next instruction to be executed.
- It is a 16-bit register.
- The microprocessor increments the value of Program Counter after the execution of the current instruction, so that, it always points to the next instruction.

Gursharan Singh Tatla
professorgstatla@gmail.com

Stack Pointer

- It holds the address of top most item in the stack.
- It is also 16-bit register.
- Any portion of memory can be used as stack.

Gursharan Singh Tatla
professorgstatla@gmail.com

Increment/Decrement Register

- This register is used to increment or decrement the value of Stack Pointer.
- During PUSH operation, the value of Stack Pointer is incremented.
- During POP operation, the value of Stack Pointer is decremented.

Gursharan Singh Tatla
professorgstatla@gmail.com

Address Latch

- It is group of 8 buffers.
- The upper-byte of 16-bit address is stored in this latch.
- And then it is made available to the peripheral devices.

Gursharan Singh Tatla
professorgstatla@gmail.com

Address/Data Latch

- The lower-byte of address and 8-bit of data are multiplexed.
- It holds either lower-byte of address or 8-bits of data.
- This is decided by ALE (Address Latch Enable) signal.
- If ALE = 1 then
  - Address/Data Latch contains lower-byte of address.
- If ALE = 0 then
  - It contains 8-bit data.

Gursharan Singh Tatla
professorgstatla@gmail.com

Serial I/O Controller

- It is used to convert serial data into parallel and parallel data into serial.
- Microprocessor works with 8-bit parallel data.
- Serial I/O devices works with serial transfer of data.
- Therefore, this unit is the interface between microprocessor and serial I/O devices.

Gursharan Singh Tatla
professorgstatla@gmail.com

Interrupt Controller

- It is used to handle the interrupts.
- There are 5 interrupt signals in 8085:
  - TRAP
  - RST 7.5
  - RST 6.5
  - RST 5.5
  - INTR

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professorgstatla@gmail.com

Interrupt Controller

- Interrupt controller receives these interrupts according to their priority and applies them to the microprocessor.
- There is one outgoing signal $\overline{\text{INTA}}$ which is called Interrupt Acknowledge.

Gursharan Singh Tatla
professorgstatla@gmail.com

Power Supply

- This unit provides +5V power supply to the microprocessor.
- The microprocessor needs +5V power supply for its operation.

Gursharan Singh Tatla
professorgstatla@gmail.com