Lecture – 3

8085 System Bus

Computer system consist primary of:-

1- Microprocessor.
2-Memory
3-Input.
4-Output

The internal logic design of the microprocessor called its "architecture", determine how and what various operations are performed by "MICROPROCESSOR".

Microprocessor architecture and its operations: The microprocessor is programmable logic device designed with register, flip-flop and timing elements.

All function performed by microprocessor can by classified in three general categories:-

1- Microprocessor initiated operations
2- Internal data operations.
2- Peripheral (or externally) initiated operations.

To performed these operations, microprocessor needs [logic circuit and control signals].

1- Microprocessor Initiated Operations:-

Primarily microprocessor performs **four** operations:-
a) Memory read (Reads data from memory).
b) Memory writes (Write data into memory).
c) I/O read (Accept data to output device).
d) I/O writes (Sends data to output device).

These operations are part of communication process.
Microprocessor performed these functions using sets of buses:

1. **Data bus**
2. **Address bus**
3. **Control bus].**

System Bus:

- This network of wires or electronic pathways is called the 'Bus'.
- A system bus is a single computer bus that connects the major components of a computer system.
- It combines the functions of a data bus to carry information, an address bus to determine where it should be sent, and a control bus to determine its operation.
- The technique was developed to reduce costs and improve modularity.

Address Bus:

- It is a group of wires or lines that are used to transfer the addresses of Memory or I/O devices.
- It is unidirectional.
- The width of the address bus corresponds to the maximum addressing capacity of the bus, or the largest address within memory that the bus can work with.
- The addresses are transferred in binary format, with each line of the address bus carrying a single binary digit.
- Therefore the maximum address capacity is equal to two to the power of the number of lines present (2^lines).
- Address bus is a group of 16 lines, identified as 0 – 15. This bus is unidirectional (bit flow in one direction) from Microprocessor to peripheral. Each memory location or peripheral identified with binary number called address. (2^{16} =65536= 64K).

Data Bus:

- It is used to transfer data within Microprocessor and Memory/Input or Output devices.
- It is bidirectional as Microprocessor requires sending or receiving data.
- Each wire is used for the transfer of signals corresponding to a single bit of binary data.
- As such, a greater width allows greater amounts of data to be transferred at the same time.
- Data bus is a group of 8 lines used for data flow, these lines are bidirectional from (00 – FF) =2^8 =256 numbers. The largest number = 1111 1111 = FF, thus 8085 Microprocessor is called 8bit Microprocessor.

Control Bus

- Microprocessor uses control bus to process data, i.e. what to do with the selected memory location.
- Some control signals are Read, Write and Opcode fetch etc.
- Various operations are performed by microprocessor with the help of control bus.
- This is a dedicated bus, because all timing signals are generated according to control signal.

The microprocessor needs to perform the following steps:-

i) Identify the peripheral (memory location).
ii) Transfer data.
iii) Provide timing or synchronization signals.

2- Internal Data Operations:-

The internal architecture of the 8085/8080A microprocessor determines how and what operation can be performed with the data. These operations are:-

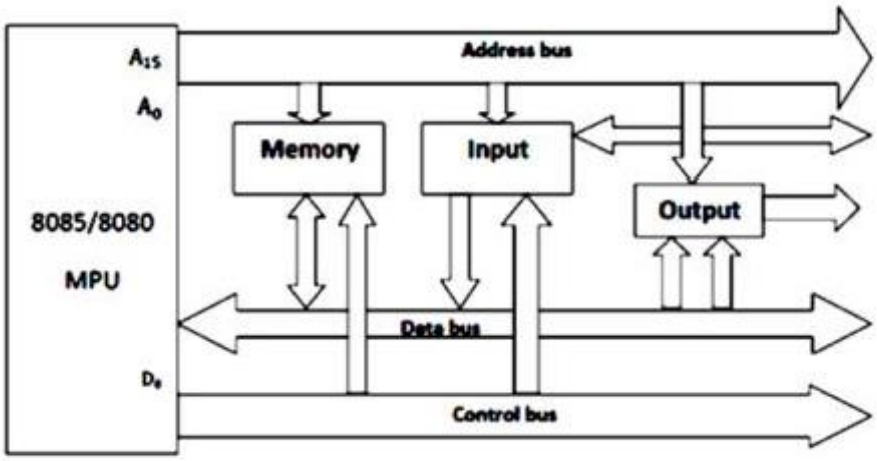

Fig. 1.1 the 8085 Bus System

1- Store 8-bit data.

2- Performed arithmetic and logical operations.

3- Test for conditions.

4- Sequence the execution of instructions.

5- Store data temporarily during execution in the defined R/W memory locations called the stack.

To perform these operations the Microprocessor requires:-

a) Registers.

b) Arithmetic logic unit (ALU) & control logic.

c) Internal buses (paths for information flow).

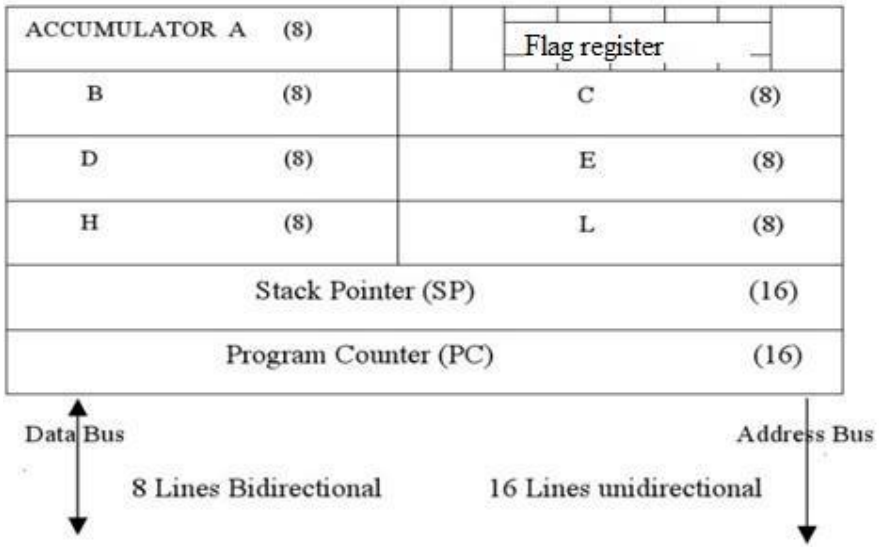

Fig 1.2 : The 8085 Programmable Register

3- Peripheral or Externally Initiated Operations:-

External devices (or signals) can initiate the following operation for which individual pins on Microprocessor chip are assigned: **Reset, Interrupt, Ready, Hold.**

A) Reset: when reset is activated all internal operations are suspended and the program counter is cleared.

B) Interrupt: the Microprocessor can be interrupted from normal execution and asked to execute other instructions called **"service routine"** (emergency), Microprocessor resumes its operation after that.

C) Ready: 8085 has pin called ready, if the signal is low Microprocessor enters into wait state, this signal used to synchronized slower peripherals with Microprocessor.

D) Hold: when hold pin activated by external signal Microprocessor relinquishes control buses and allows the external peripheral to use the. For example: Hold signal is used in direct memory access data transfer.