

Microprocessor and its Applications

1. R.S. Gaonkar: “Microprocessor architecture, Programming and Applications with 8085/8080”, Penram Publication.
2. B.Ram : “ Fundamental of Microprocessor and Microcomputer”, Dhanpat Rai Publication, 4th edition.
3. R. Singh and B.P. Singh: “ Microprocessor Interfacing and its application”, New Age International Publishers, 2nd Edition.
4. D.V. Hall: “ Microprocessor Interfacing”, TMH (Revised 2nd Edition).
5. R. Singh and B.P. Singh: “Advanced Microprocessor and Micro-controllers”, New Age International Publishers, 2nd Edition

UNIT 1

Category of Memory, Microprocessor, Microcontroller, Buses, machine Language, Assembly Language, High Level Language, Assembly Language Program Development Tool.

8085 Microprocessor:

Architecture, Pin diagram, Instruction Type, Instruction Cycle, Timing Diagram, Addressing Modes, Instruction Set. Assembly Programming based on 8085, Interrupt and Interrupt Service Routine.

What is Memory?

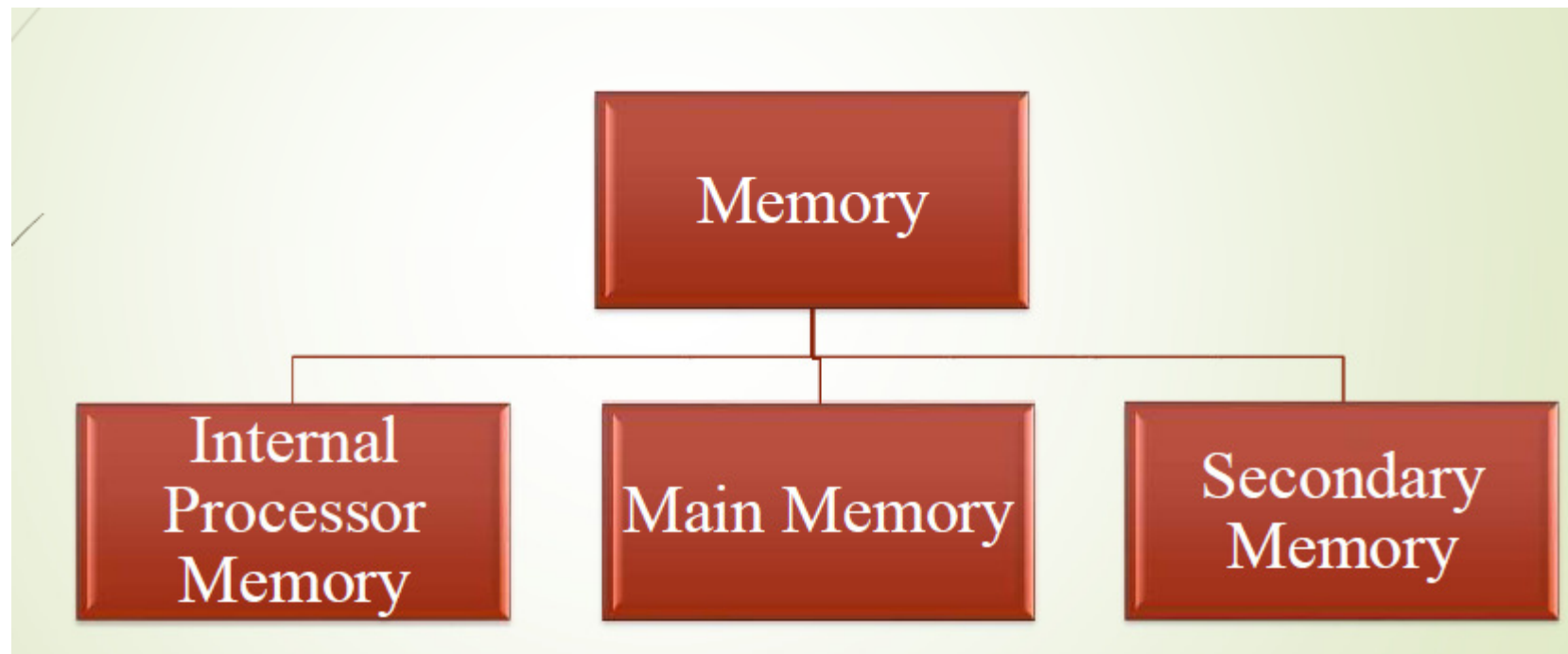
Computer memory is any physical device capable of storing information temporarily or permanently.

- Electronic components that store instructions, data, and results.
- Each byte stored in unique location called an address, similar to seats in a concert hall

MEMORY CAPACITY

<i>Unit</i>	<i>Description</i>	<i>Approximate Size</i>
1 bit	1 binary digit	
1 nibble	4 bits	
1 byte	8 bits	1 character
1 kilobyte	1,024 bytes	≈1/2 page, double spaced
1 megabyte	1,048,576 bytes	≈500,000 pages
	1 million bytes	
1 gigabyte	1,073,741,824 bytes	≈5 million pages
	1 billion bytes	
1 terabyte	1 trillion bytes	≈5 billion pages

CLASSIFICATION OF MEMORY



INTERNAL PROCESSOR MEMORY

- A small high speed memory inside the processor.
- Temporary storage of instruction and data.
- Example: Registers, built-in cache.
- Like in Intel 8085 Microprocessor there are 6, 8-bit Registers (B,C,D,E,H,L)

MAIN MEMORY

- It is relatively large memory placed outside the processor.
- Data and instruction storage for the operation of the processor.
- Can be accessed directly and rapidly by the CPU.
- Example: RAM, ROM

IMAGES OF MAIN MEMORY



TYPES

MAIN
MEMORY

```
graph TD; A[MAIN MEMORY] --> B[RAM]; A --> C[ROM];
```

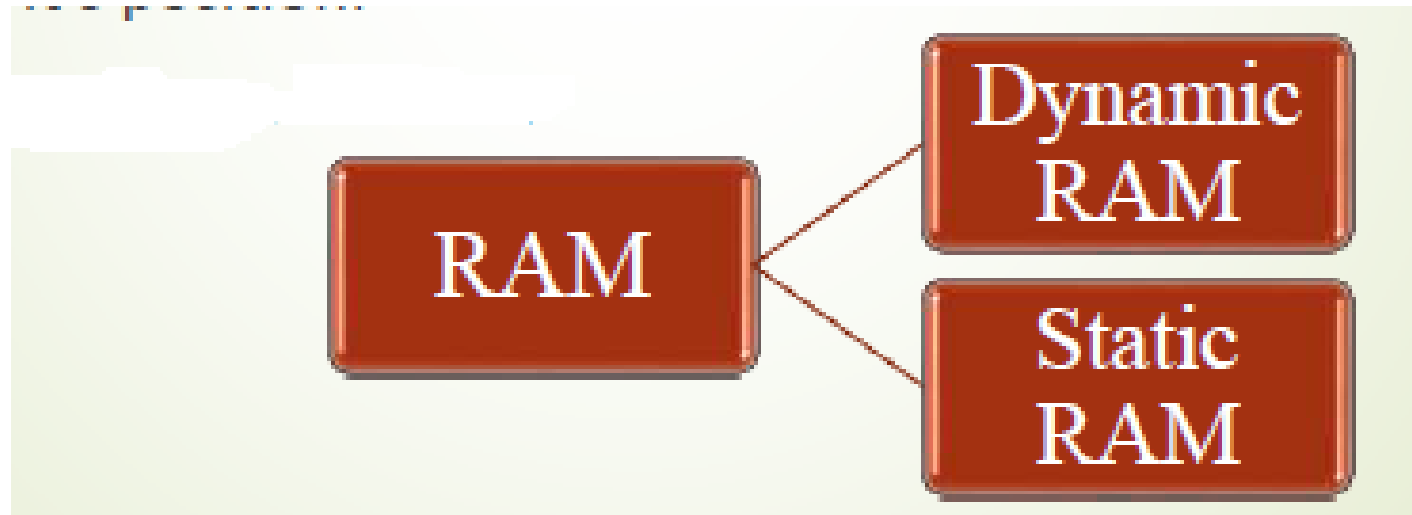
RAM

ROM

RANDOM ACCESS MEMORY

- A temporary storage that can be read from or written into by the user.
- Volatile memory.
- Every location can be accessed independently.
- Access time for every location is constant and independent of its position.

Two types of RAM



DYNAMIC RAM

- DRAM stands for Dynamic RAM.
- Relatively slower and low cost memory.
- Used for main memory.
- Contents are constantly refreshed 1000 times per second
- Access time 60 – 70 nanoseconds

TYPES OF DYNAMIC RAM

➤ **DDR SDRAM (Double Data Rate Synchronous RAM)**

- DDR RAM transfers data twice per clock cycle
- DDR clock speeds range between 200 MHz (DDR-200) and 400 MHz (DDR-400)
- DDR-200 transfers 1600 MB/s, while DDR-400 transfers 3200 MB/s.

➤ **DDR2 SDRAM (Double Data Rate 2 Synchronous RAM)**

- DDR2 is twice as fast as DDR which means twice as much data is carried to the module for each clock cycle.
- DDR2 speeds range between 400 MHz (DDR2-400) and 800 MHz (DDR2-800). DDR2-400 transfers 3200 MB/s.
- DDR2-800 transfers 6400 MB/s.

➤ **DDR3 SDRAM (Double Data Rate 3 Synchronous RAM)**

- DDR3 is supposed to act twice as fast as DDR2 memories
- Thus DDR3 speeds range between 800 MHz (DDR3-800) and 1600 MHz (DDR3-1600).
- DDR3-800 transfers 6400 MB/s; DDR3-1600 transfers 12800 MB/s.

STATIC RAM

- SRAM stands for static RAM.
- Characterized by high speed and high cost.
- Use six transistors to store data.
- Access time 60 – 70 nanoseconds
- Can accept one command and transfer one word of
- data per clock cycle.