

Microprocessor and Assembly Language Programming

- * Microprocessor → CPU of a computer built into a single IC chip.
- * Microcomputer → A computer having microprocessor as its CPU.
- * Microcontroller → entire computer built into a single IC chip.

Generation of Computers

- 1st Generation → Vacuum tubes
- 2nd Generation → Transistors
- 3rd Generation → IC chip / LSI (Integrated Circuit)
- 4th Generation → MP / VLSI / ULSI
- 5th Generation → AI / Bio-chips

IC Fabrication Technology

- SSI → Small Scale Integration → Upto 10 gates/chip
- MSI → Medium Scale Integration → 10 - 100 gates/chip
- LSI → Large Scale " → 1000 - ~~100~~ 10000 "
- VLSI → Very Large Scale " → ~~100,000~~ ¹⁰⁰⁰ - 1000,000 "
- ULSI → Ultra Large Scale " → > 100000 gates/chip

History of Microprocessor

→ INTEL Series

- | | |
|------|-------------------------------------|
| 1971 | 4004 → First microprocessor (4-bit) |
| 1972 | 8008 → 8-bit |
| 1974 | 8080 → 8-bit |
| 1976 | 8085 → 8-bit |
| 1978 | 8086 → 16-bit |
| | 8088 |

80286

80386

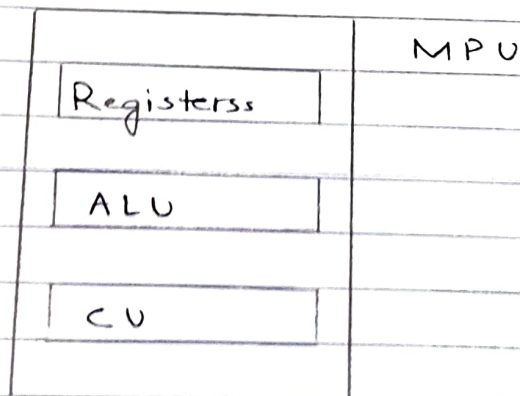
Pentium I/II/III/IV

I/O Interfacing Devices

Introduction to microprocessor & microcomputer

→ A microprocessor is a multipurpose, programmable, clock driven, register based electronic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions & provides result as output.

In short, CPU of a digital computer built into a single IC chip is called microprocessor.



MHz

The clock speed of MP ranges from MHz to GHz.

A microcomputer on the other hand is the digital computer having microprocessor as its CPU.

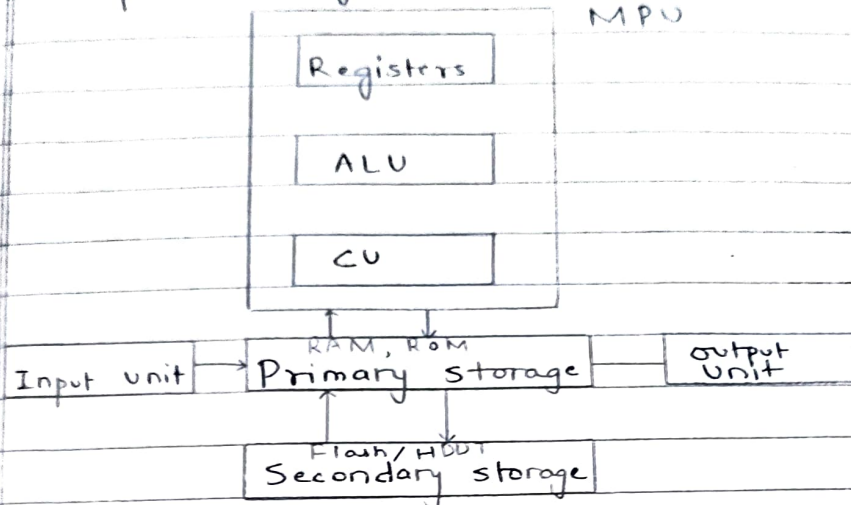


fig: Microcomputer

The advancement in the development of semiconductor devices (IC's) led to the invention of microcontroller.

A microcontroller is a semiconductor device which is fabricated to include mpu, memory, I/O and other peripherals within the same IC-package.
(use pendrive)

In short, entire digital computer built into a single IC-chip is known as microcontroller.

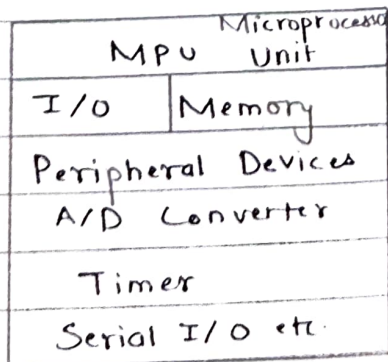


fig: Microcontroller

- clock speed is in the range of MHz
- It is used for specific purpose.

Application of microprocessor

- Microprocessor can be found in variety of products
- The applications can be classified primarily into two categories
- ① Re-programmable system
- ② Embedded system

Reprogrammable system is a microcomputer system that uses microprocessor as its computing unit.

In embedded system, the MP is a part of final product and is not available for reprogramming to end-user. eg: Traffic light control system

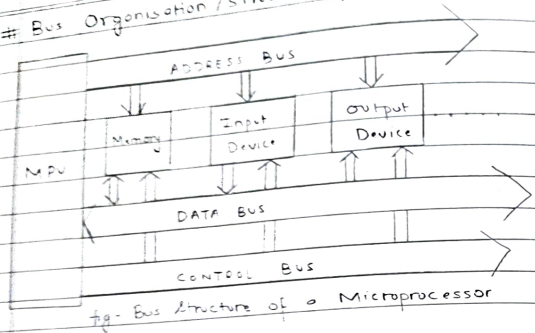
Summary of Applications

1. Microcontroller
2. Industrial Controls
3. Robotics
4. Medical Equipment (CT scanner, etc)
5. Washing Machine
6. Traffic light control, etc.

Evolution of microprocessor (Summary)

	Processor	Year	Clock Speed	Databus	Address bus
I	4004	1971	108 KHz	4-bit	10-bit
N	8008	1972	200 KHz	8-bit	14-bit
T	8080	1974	2 MHz	8-bit	16-bit
E	8085	1976	5 MHz	8-bit	16-bit
L	8086	1978	5 MHz	16-bit	20-bit
	8088	1979	5 MHz	8-bit	20-bit
S	80386	1985	16 MHz	32-bit	32-bit
E	Pentium I	1993	60 MHz	32/64-bit	32-bit
R	Pentium II	1997	233 MHz	64 bit	36-bit
I					
E	Pentium IV	2000	1.4 GHz	64 bit	64-bit
S	Xeon	2001	1.7 GHz		
	Pentium M	2003	1.7 GHz		
	Dual Core	2005	2.8 GHz	32 bit	
	Core2 Duo	2006	2.66 GHz	32 bit	
	Atom	2008	1.86 GHz		
	2 nd gen Core	2010	3.8 GHz		
	3 rd gen Core	2012	2.9 GHz		
	I7	2008			
	I5	2009			
	I3	2010			
	I9				

Bus Organisation / Structure of a microprocessor



→ A bus is a path or group of wires through which data & information (bits) travels.

→ It is an electronic path through which binary bits of data flow takes place.

→ It consists of

1. Address Bus

→ Address bit travels (that carrier address bits)

→ Multiple of 4

→ Total addressable memory for 'n' bits is 2^n .

For eg: 8085 MP has 16-bit address bus.

$$\begin{aligned} \text{Addressable Memory} &= 2^{16} \\ &= 65536 \text{ bytes} \\ &= 64 \text{ KB} \end{aligned}$$

→ unidirectional

2. Data Bus

→ that carries data

→ indicates the data bit capacity of MP

→ Bidirectional

→ It maybe 4-bit, 8-bit, 16-bit, 32-bit & 64-bit.

3. Control Bus

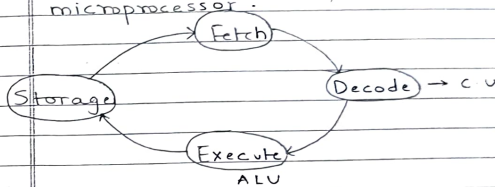
→ That carries control signals

→ The width of a bus depend upon the types of control signals used

→ Control signals maybe memory read, memory write, I/O read, I/O write.

Concept of Fetch, Decode & Execute:

→ It constitutes a basic instruction cycle of a microprocessor.



Computer Architecture

Von-Neumann
Architecture

Hardward
Architecture

* Von-Neumann Architecture

Program &
Data Memory

CPU

I/O

John Von-
Neumann (Proposed
by)

* Hardward Architecture

Program
Memory

CPU

Data
Memory

I/O

Hardward
Hathaway Aiken

BIOS

→ Bootstrap Loading

