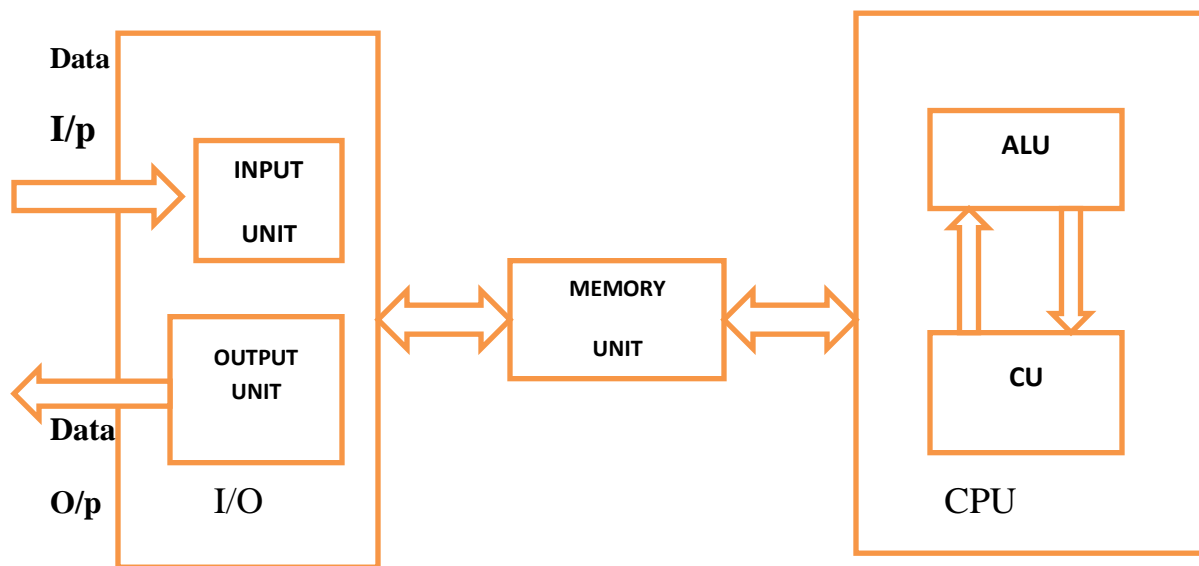


**Computer definition:** computer is programmable machine that receives the data (input) and manipulates the data and provides output in useful format.

## **Basic functional units of computer**

- 1) Input unit.
- 2) Output unit.
- 3) Memory unit.
- 4) ALU (Arithmetic logic unit).
- 5) Control unit.



### **1) INPUT UNIT:**

- Computer accepts coded information through input unit.
- Keyboard is one of the most standard input devices.
- Keyboard is connected to CPU.
- When a key is pressed keyboard send a scan code of letter, digit, and symbol directly to memory or to processor.

**Eg :** keyboard, mouse, joystick, etc...

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**2) MEMORY UNIT:**

The function of memory unit is to store programs and data.

There are two types of memory

- 1) primary memory
- 2) secondary memory

**1) Primary memory:** (Main memory/Temporary Memory /volatile Memory /semi-conductor memory).

- It is fast memory that operated at electronic speed.
- Programs are stored in main memory, during the execution of program.
- Main memory contains large number of semiconductor storage cells.
- Each cell is capable of storing one bit of information either 0 or 1.

**2) Secondary storage :** ( auxiliary memory, non-volatile)

It is used when large amount of data are to be stored.

Eg: hard disk, Magnetic tape, floppy disk, CD, pen drive

**3) ALU (AIRTHEMATIC LOGIC UNIT)**

- ALU consist of electronic circuit like full-adder, half adder, comparator etc...
- Most of computer operation executed in ALU,.
- The result of operation is storage in high speed storage element called register temporary in ALU or result send back to the memory.

**4) CONTROL UNIT**

- Control unit decides which operation is to be performed.
  - Control unit co-ordinates activities of all units & hence control them by sending series of control signals like (IOR, IOW, MEMR, MEMW).
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**5) OUTPUT UNIT**

- The function of output unit is send results to the outside the world.

**Eg: Monitor is an example of o/p device, Printer is a dedicated o/p device.**

**BASIC OPERATIONAL CONCEPT****STORE PROGRAM CONCEPT:**

**Program: program is nothing but set of instruction which performs given task.**

- The store program concept introduced in 1940 by **JOHN VONNEWMANN**.
- The program should be stored within the main memory of computer at the time of execution.
- So that execution of program begins with by fetching (reading) instruction from main memory to processor, finally computed result is stored in main memory.

**Advantages:**

**It allows the processor to execute same set of instruction repeatedly.**

**EXECUTION OF INSTRUCTION:**

**Instruction usually consists of two parts.**

**1) OP CODE**

**2) OPERAND**

**General Format**

<b>OP CODE</b>	<b>OPERAND/S</b>
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**OP CODE: Indicates operation to be performed.**

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Eg: ADD M, Ro

- This instruction adds the content of M and content of Ro and result will be stored in register Ro.

The following steps have to be performed to execute a single instruction.

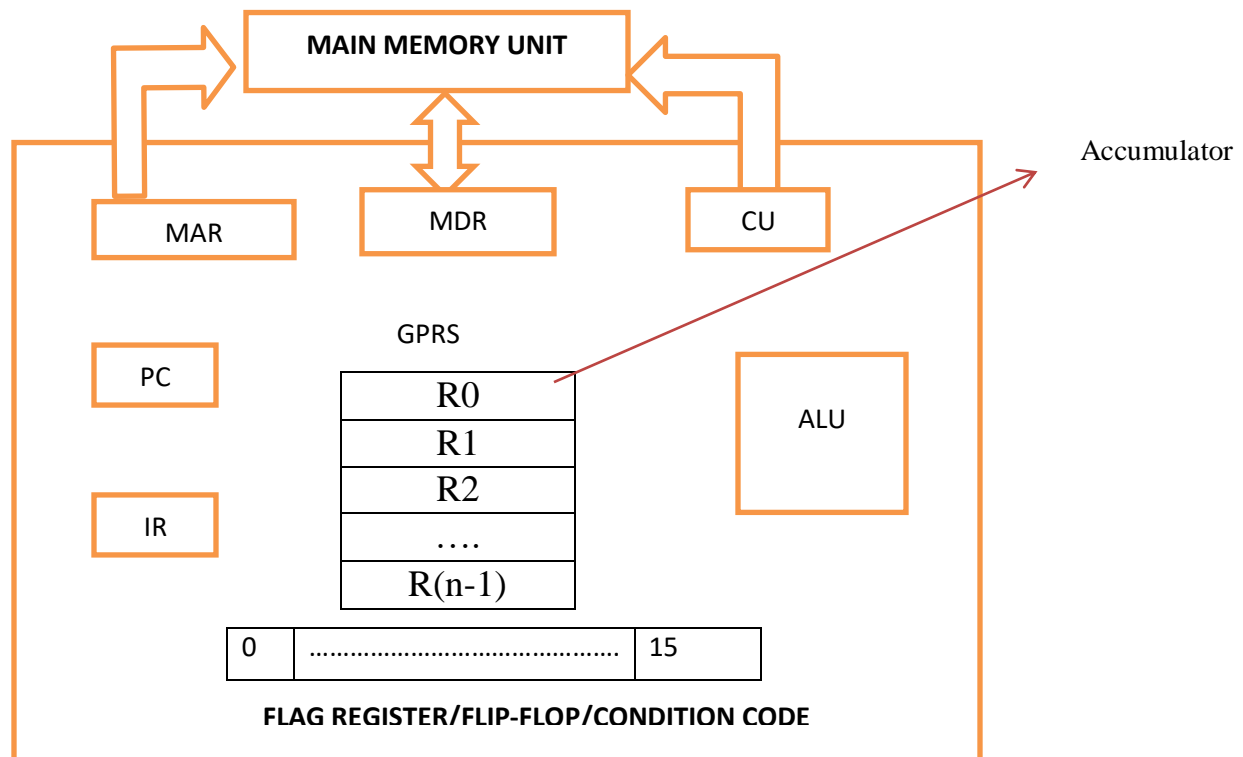
STEP1: fetch the instruction from main memory to the processor.

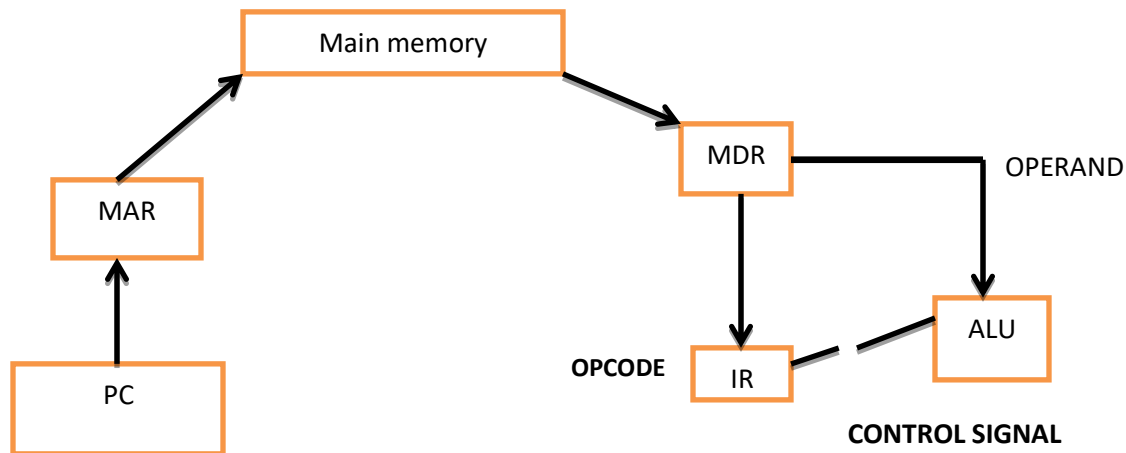
STEP2: fetch the operand from main memory to the processor.

STEP3: adds the operand that is constant of M to Ro and the result is stored in R0.

### PROCESSOR AND MAIN MEMORY INTERACTION

Explain in brief the basic operation concept between processor and the memory





### ACCUMULATOR (R0)

- Register R0 is treated as accumulator.
- All arithmetic operations are carried out in accumulator and result is stored in accumulator.
- It is also holds content of operand.

### IR (INSTRUCTION REGISTER)

- It holds instruction that is currently being executed.
- The constant of IR is decoded by CU.
- Which intern generate timing signal and control signal for actual operation.

### PC (PROGRAM COUNTERS)

- It contains memory adders of the instruction that is currently being executed.
- Usually during execution of current instruction, the content of PC are updated to address of the next instruction to be executed.

### GPRS (GENERAL PURPOSE REGISTER)

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- It is used to hold the content of operand and also hold intermediate result.

**FLAG REGISTER**

- After every arithmetic or logic operation the status of the result is expressed by flag registers /flip-flop/conation code.

**MAR (MEMORY ADDRESS REGISTER):**

- It holds address of memory location to or from which data is to be transferred.

**MDR (MEMORY DATA REGISTERS):**

- It is used to hold the data to be written into or readout from address memory location.

**WORKING:**

- Program execution begins by setting PC to an address of memory location to point the first instruction of program.
- The content of PC that is address of instruction transfer to MAR and control unit issue memory reads control signal to the memory unit,
- After certain amount of time content of address memory location is read out from main memory to and placed into MDR
- The content of MDR transferred to ALU to perform necessary operation, finally result is stored in memory of ALU

**BUS STRUCTURE**

**BUS:** Group of wires are called bus.

- It is used to provide necessary signal for communication between the modules.
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- We know that central processing unit (CPU), memory unit, input unit, output unit are hardware components of computer.

### TYPES OF BUS:

#### 1) DATA BUS.

#### 2) ADDRESS BUS.

#### 3) CONTROL BUS.

##### 1) DATA BUS

- Data bus consists of 8, 16, and 32...are more parallel lines.
- Data lines are bidirectional, this means that CPU can read the data on these lines from memory or from port as well as sends the data on these lines to the memory location or the port.

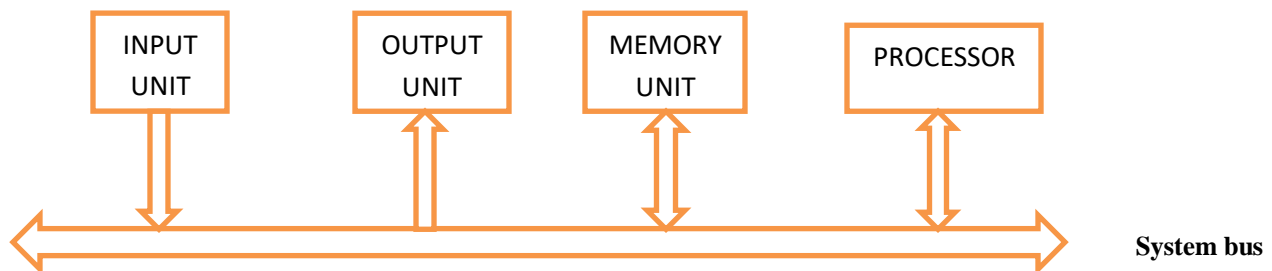
##### 2) ADDRESS BUS

- Address bus consist of 16, 20, 24, 28..... Or more parallel lines.
- Address bus are unidirectional.
- On these lines CPU can send address of memory location I.e. to be written or read.

##### 3) CONTROL BUS

- Control lines regulate activating on these buses.

### SINGLE BUS STRUCTURE



- Here address bus, data bus, control bus are shown in single line is called system bus.
- In single bus structure all units are connected to a common bus is called system bus.
- Only two units can communicate with single bus each other at a time.

**ADVANTAGES**

- Low cost.
- Flexible in attaching peripheral devices.

**Questions**

1. Explain the basic functional unit of a Computer
  2. Describe the role of MAR, MDR, PC and IR.
  3. Explain in brief the basic operation concept between processor and the memory.
  4. Explain the significance of single bus structure.
  5. Explain the role of buffer registers.
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