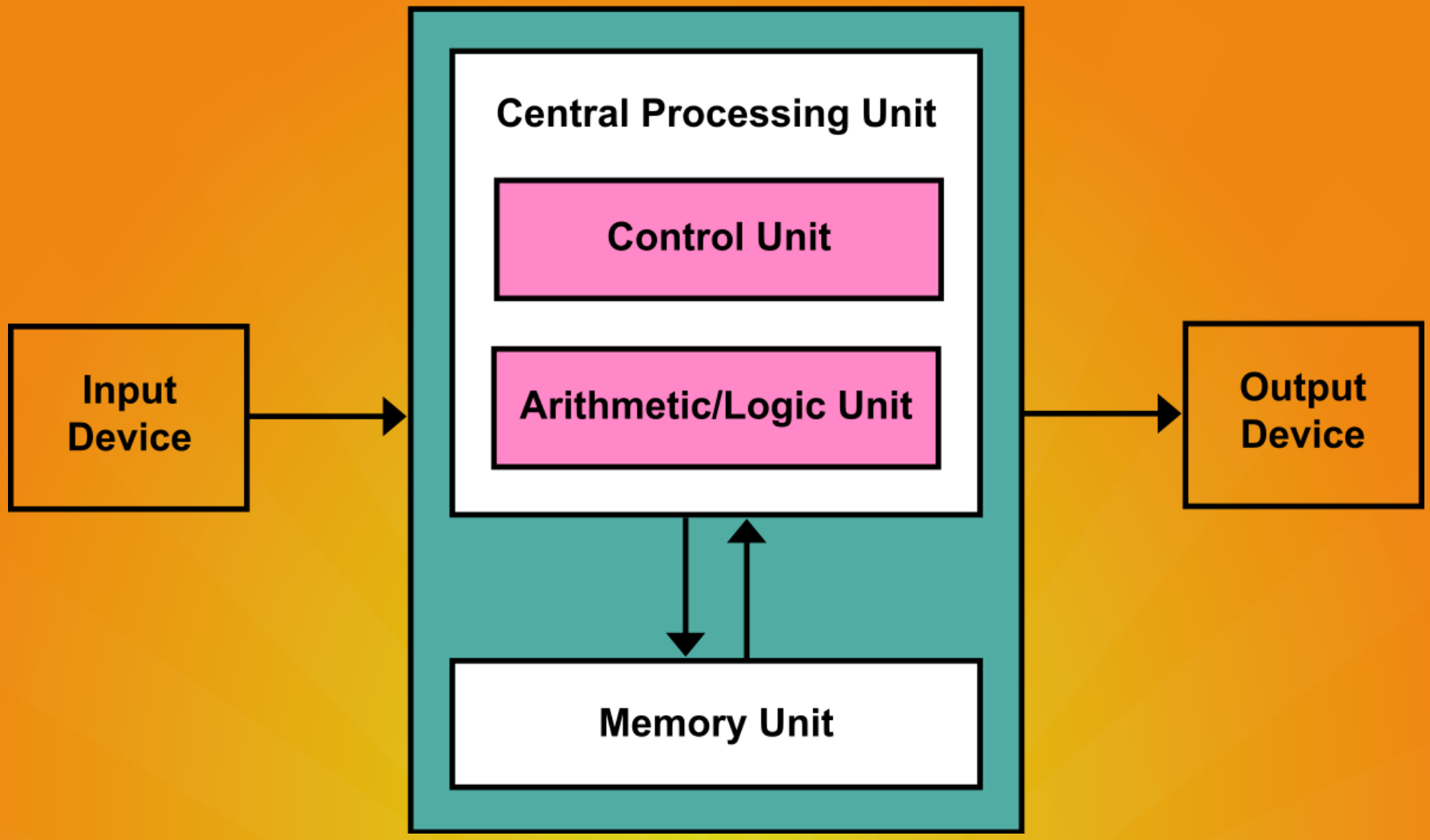
BASIC COMPUTER ORGANIZATION AND DESIGN

Von Neumann Architecture/ Stored Program Organization



Register

- Special memory unit used for storing data on temporary basis.
- Its not part of the CPU.
- Used for quick and direct accessibility of small amount of data for processing.
- Registers can contain the address of memory location where data is stored rather than the actual data itself.

Types of Registers

- Accumulator Register
- “R” Register
- Program Counter (PC)
- Stack Pointer (SP)
- Memory Address Register (MAR)
- Memory Buffer Register (MBR)

RTL

- The symbolic notation used to describe the microoperation transfers among registers is called a Register transfer language.
- Register transfer language
  - A symbolic language
  - A convenient tool for describing the internal organization of digital computers
  - Can also be used to facilitate the design process of digital systems.

Micro-operations

- Register Transfer Microoperation
- Arithmetic Microoperation
- Logic Microoperation
- Shift Microoperation

Shift Micro-operation

- Logical shift micro operation
- Arithmetic shift micro operation
- Circular shift micro operation

Bus

- Special unit use to exchange data between the one part of the computer to the other at a time.
- The bus size is determined by amount of information that can be transferred at a time known as its width.

Types of Bus

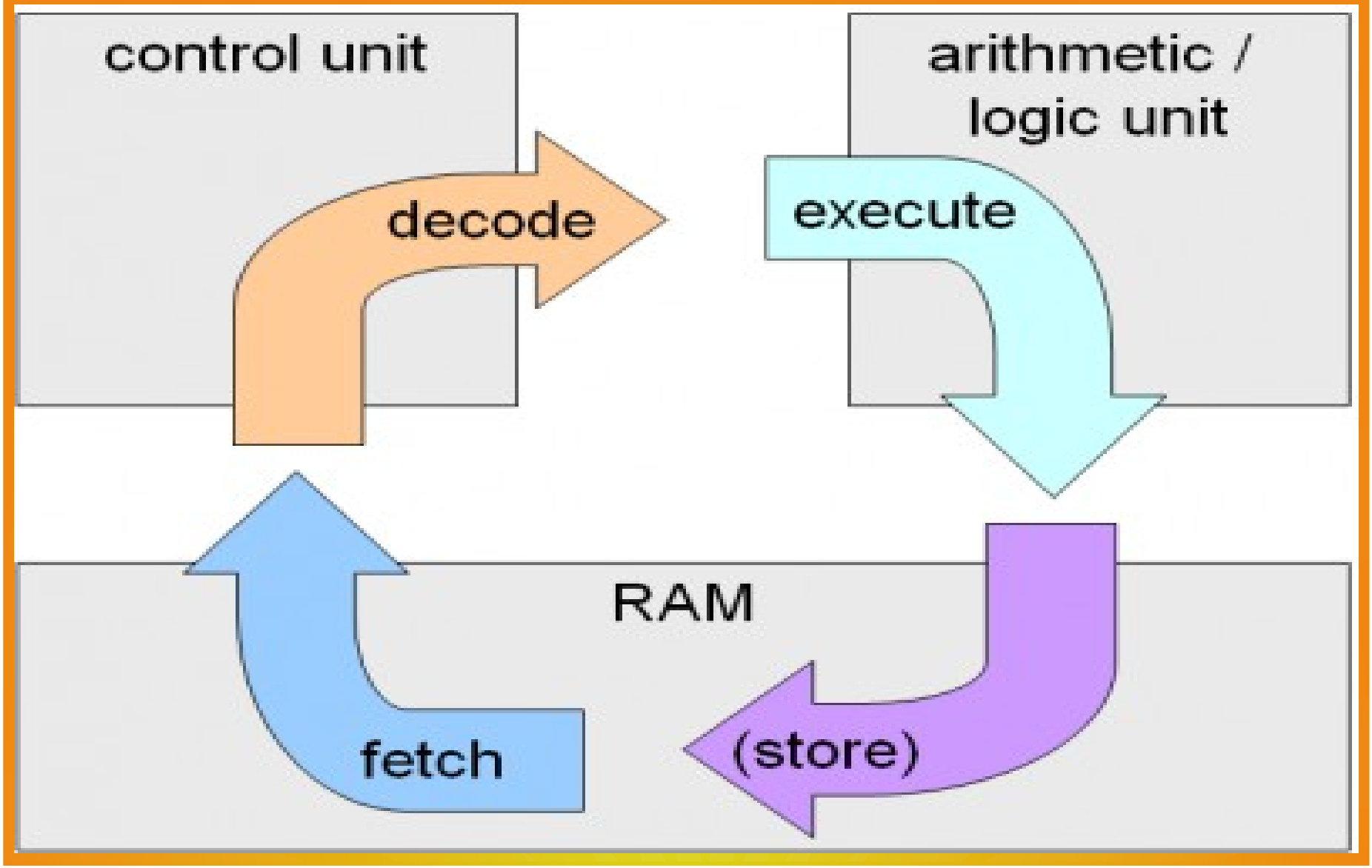
- Control Bus – Used by the CPU to direct and monitor the actions of the other functional areas of the computer, transmit variety of individual signals necessary to control and manage the operations of the computer.

Types of Bus

- Data Bus – Use to handel the transfer of all data and instruction between different parts of computer. It is bidirectional and sometimes called memory bus.
- Address Bus – Used to transport memory addresses which the CPU want to access in order to read and write data.It is unidirectional bus. Before data or instructions can be writtern into or read from memory bye the CPU or I/O sections, an address must be transmitted to memory over the address bus.

CPU-Memory Communication

Instruction Cycle



Instruction Classification

- Data Trasfer Operation
- Arithmetic Operations
- Logic Operations
- Branching Operations
- Machine Control Operations

Instruction Format

- One-word or 1 byte instruction
- Two-word or 2 byte instruction
- Three-word or 3 byte instruction

Instruction Format

- One word or one byte Instruction

  It includes the opcode and operand in the same byte.

  Example: ADD B
- Two word or two byte Instruction

  First byte specifies the opcode and second byte specifies the operand.

  Example: MVI A, 05
- Three word or three byte Instruction
- The first byte specifies the opcode and the following two bytes specify the 16 bit address. The second byte is lower order and the other is higher order.

  Example: JMP 2085H