# CONTROL UNITS AND TYPES

NAME:V.TOSHITHA
ROLLNO:23B81A6657
SECTION:CSM_A

INTRODUCTION TO CONTROL UNITS

•The Control Unit (CU) is a vital component of the Central Processing Unit (CPU) in a computer.

•It does **not process data** but controls the operation of the processor and the flow of data between the CPU and other components.

•It acts like a supervisor, interpreting instructions from programs and directing the system to perform necessary operations.

•The CU is essential in executing instructions in the correct sequence and ensuring data is correctly routed.
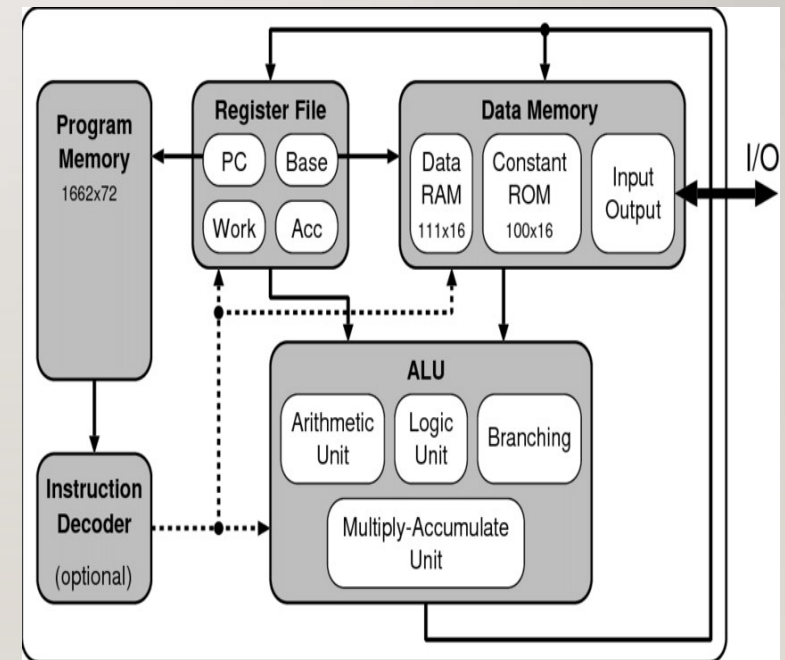
FUNCTIONS OF CONTROL UNITS

The main functions of a control unit include:

1. **Instruction Fetch**: Retrieves instructions from memory.

2. **Instruction Decode**: Interprets the binary instruction into a set of control signals.

3. **Operand Fetch**: Obtains the data needed for the operation.

4. **Execution**: Directs the ALU to perform the desired operation.

5. **Result Storage**: Sends results to registers or memory.

6. **Instruction Sequencing**: Maintains the order of instruction execution.

7. **Control Signal Generation**: Sends control signals to various components like ALU, memory, and I/O

Flowchart for Instruction Cycle
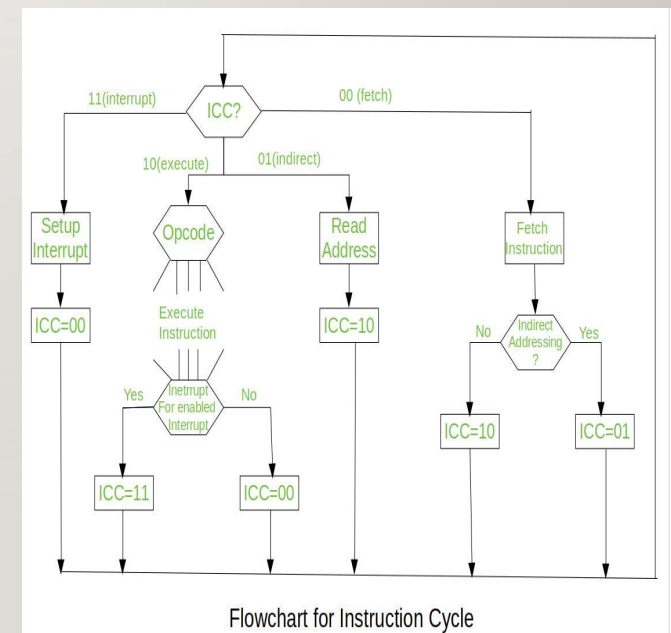
FUNCTIONS OF CONTROL UNITS

Control Units can be categorized based on how they generate control signals for coordinating CPU operations. The two major types are:

- **Hardwired Control Unit**
  Uses combinational logic circuits to produce control signals. Commonly used in systems requiring high speed and efficiency.

- **Microprogrammed Control Unit**
  Generates control signals through a sequence of microinstructions stored in control memory. More flexible and easier to modify.
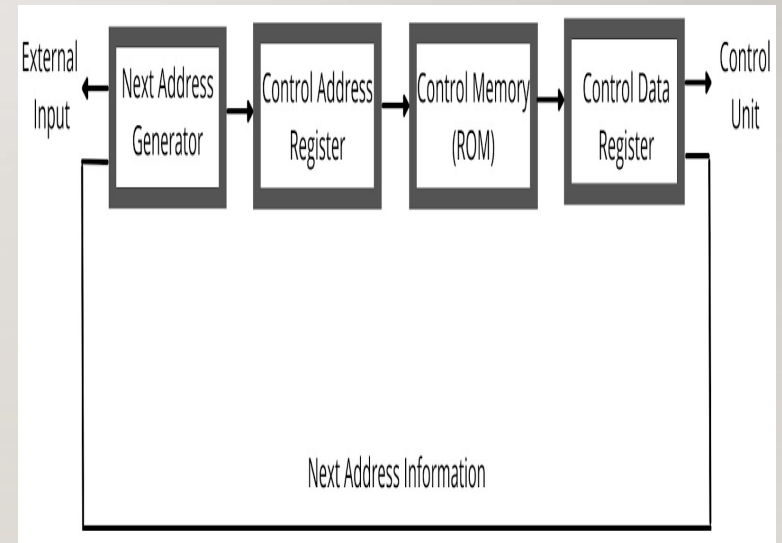
HARDWIRED CONTROL UNIT

•A Hardwired Control Unit uses fixed logic circuits to control signals.

•It is implemented using combinational logic like gates, flip-flops, and decoders.

•Fast and efficient for simple instruction sets.

•**Advantages**:

•High speed due to direct circuit execution.

•Low latency.

•**Disadvantages**:

•Difficult to modify or upgrade.

•Complex design for large instruction sets.

Structure Of hardwired Control Unit
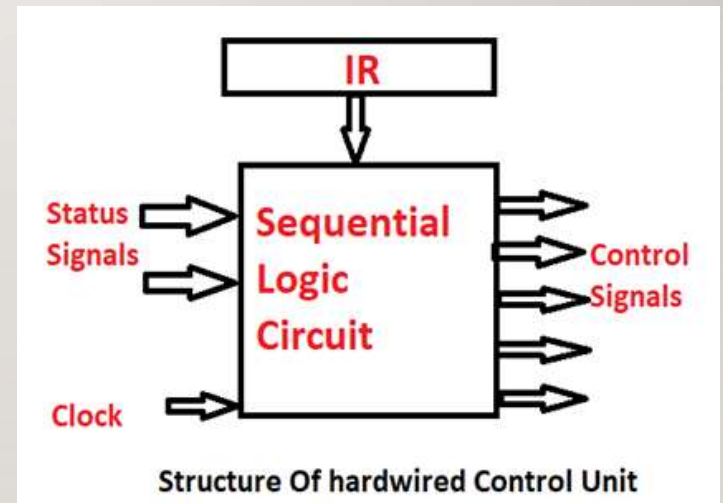
MICROPROGRAMMED CONTROL UNIT

•Uses a set of microinstructions stored in control memory to generate control signals.

•Each instruction has a sequence of micro-operations.

•**Types**:

•Horizontal Microprogramming: Wide control word, multiple control signals at once.

•Vertical Microprogramming: Compact control word, encoded signals.

•**Advantages**:

•Easier to design and modify.

•Suitable for complex instruction sets.

•**Disadvantages**:

•Slower than hardwired CUs due to memory access.

CONCLUSION

•The Control Unit orchestrates the operations of a CPU by managing the instruction cycle.
•Two main types: **Hardwired** (faster, rigid) and **Microprogrammed** (slower, flexible).
•Understanding CUs is key to grasping how processors execute programs.
•As CPUs become more complex, hybrid control mechanisms are being explored to balance speed and flexibility.

THANK YOU