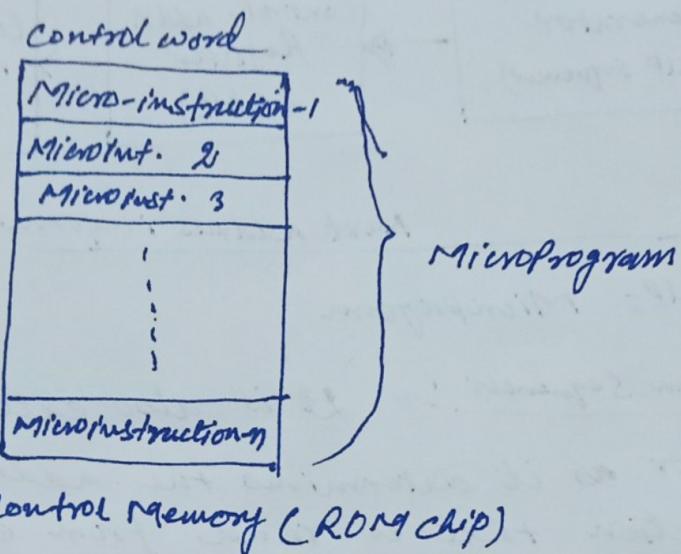


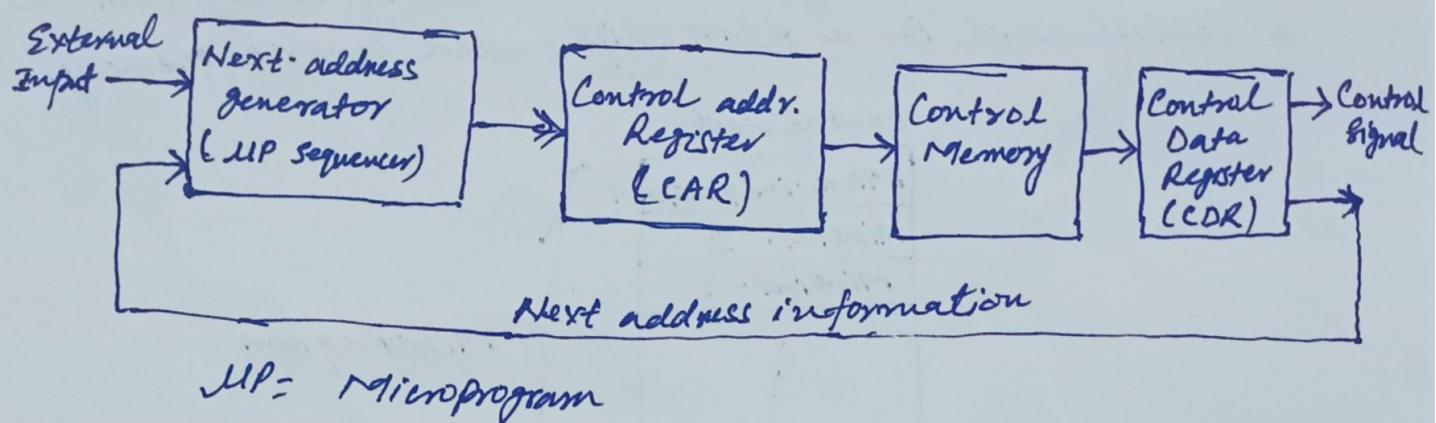
## Microprogrammed Control Unit

A microprogrammed control unit is a control unit in which control signals are stored in binary form as a control word in a ROM chip called control memory.



- Each control word consists of microinstructions.
- A microinstruction is a control word stored in control memory (ROM chip).
- A set of micro-instruction is called microprogramming.
- Microprogramming is the art of writing microprogram (microcode) for the control unit in CPU.
- Each micro-instruction when executed generates a sequence of micro-operation to fetch micro-instruction from memory, calculate effective address, fetch operand etc.
- Execution of micro-instruction is responsible for generation of set of control signals.

General configuration of Microprogrammed Control Unit:-



MP = Microprogram

Microprogram Sequencer :- It is also called the next address generator as it determines the address of next micro-instruction that is read from control memory.

Control Address Register (CAR) :- It holds the address of the micro-instruction in the control memory. It is represented by CAR.

Control memory :- The control memory is actually a ROM chip where all the micro-instructions are stored.

Control Data Register (CDR) :- It stores the micro-instruction after reading from control memory. The micro-instruction when executed, perform set of micro-operations along with providing the next address information.

### Advantages :-

- ① The design of micro-program control unit is less complex because micro-programs are implemented using software routines.
- ② The micro-programmed control unit is more ~~flexible~~ flexible because design, modifications, correction and enhancement is easily possible.
- ③ The new or modified instruction set of CPU can be easily implemented by simply rewriting or modifying the contents of control memory.
- ④ The fault can be easily diagnosed in the micro-program control unit using diagnostic tools by maintaining the contents of flags, registers and counters.

### Disadvantages

- ① The micro-program control unit is ~~sometimes~~ slower than hardwired control unit. That means to execute an instruction in micro-program control unit requires more time.
- ② Hardware cost is more because of the control memory and its access circuitry.

## Comparison

Comparison b/w Hardwired & Microprogrammed Control Unit.

### Basis of Comparison

- (1) Speed
- (2) Cost of Implementation
- (3) Flexibility
- (4) Ability to handle complex instruction
- (5) Decoding
- (6) Instruction set size
- (7) Control Memory
- (8) Applications

### Hardwired Control

Fast

More

Not flexible, difficult to modify for new instruction

Difficult

Complex

Small

Absent

RISC Microprocessor

### Microprogrammed Control

Slow

Cheaper

Flexible, new instruction can easily be added

Easier

Easy.

Large

Present

CISC Microprocessor.