CONTROL UNIT

- Control Memory
- Address Sequencing
- Microprogram Example
- Design of Control Unit

Control Memory

- **The function of Control unit is to Initiate sequences of microoperations**

•In a bus-organized system, Control signals *specifies microoperations to be executed in* group of bits that select the paths in multiplexers, decoders, and arithmetic logic units

- **Two major types of Control Unit**

»Hardwired Control :

- ❖ The control logic is implemented with gates, F/Fs, decoders, and other digital circuits
- ❖ Fast operation.
- ❖ Wiring change(if the design has to be modified)

»Microprogrammed Control:

- ➢ The control information is stored in a control memory, and the control memory is programmed to initiate the required sequence of microoperations
- ➢ Any required change can be done by updating the microprogram in control memory.
- ➢ Slow operation eg. CISC(Complex instruction set computers)

Control Word

The control variables at any given time can be represented by a string of 1's and 0's called a control word. It can be programmed to perform various operations

Microprogrammed Control Unit

A control unit whose binary control variables are stored in memory is called microprogrammed control unit(*control memory*).

Microinstruction

The microinstruction specifies one or more microoperations

Microprogram

A sequence of microinstruction constitutes a microprogram

»Dynamic microprogramming :*Control Memory* =RAM

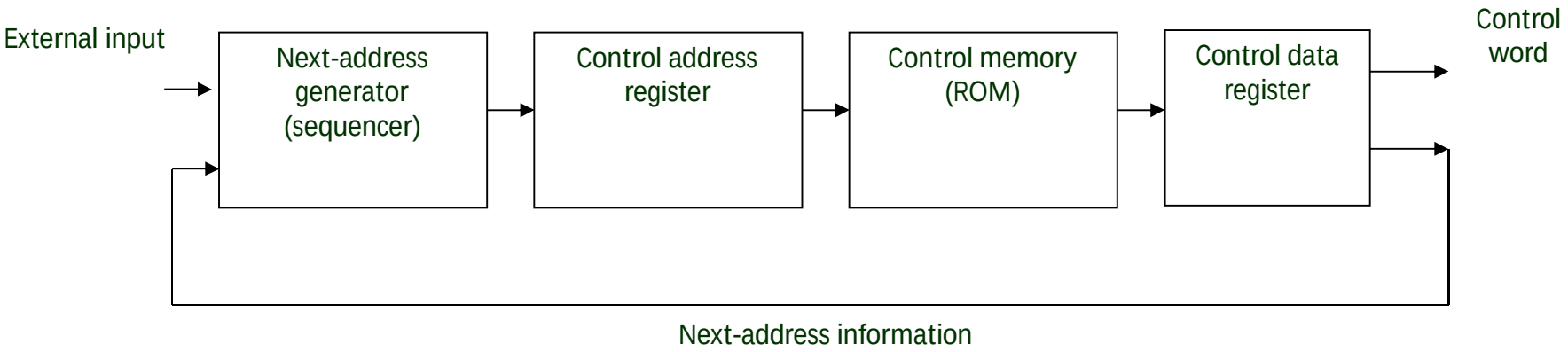
- RAM can be used for writing (*to change a writable control memory*)
- Microprogram is loaded initially from an auxiliary memory such as a magnetic disk

»Static microprogramming : *Control Memory* =ROM

- Control words in ROM are made permanent during the hardware production.

Control memory: A memory that is part of the control unit is called control memory

Microprogrammed Control Organization

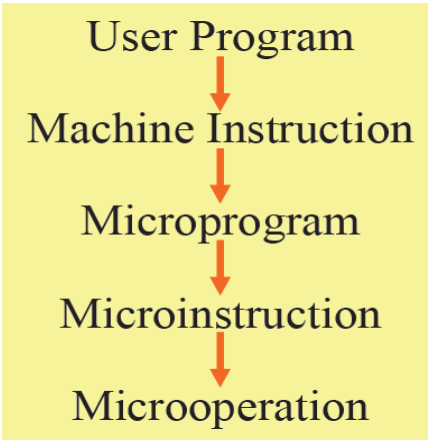


Control Memory

»A memory is part of a control unit :

»Computer Memory (*employs a microprogrammed control unit*)

- Main Memory : for storing user program (*Machine instruction/data*)
- Control Memory : for storing microprogram (*Microinstruction*)



Control Address Register

»Specify the address of the microinstruction

Sequencer

»Determine the address sequence that is read from control memory

»Next address of the next microinstruction can be specified several way depending on the sequencer input.

Sequencing Capabilities Required in a Control Storage

1. Incrementing of the control address register
2. Unconditional and conditional branches
3. A mapping process from the bits of the machine instruction to an address for control memory
4. A facility for subroutine call and return

Control data register

»Hold the microinstruction read from control memory

»Allows the execution of the microoperations specified by the control word ***simultaneously*** with the generation of the next microinstruction