CONTROL UNIT

CONTROL UNIT

- Control Memory

- Address Sequencing

- Microprogram Example

- Design of Control Unit

Control Memory

- The function of control unit is to initiate sequence of microoperation.
- When the control signals are generated by hardware using conventional logic design, the control unit is a said to be **hardwired control unit.**
- Systematic method of controlling the microoperation sequences in a digital computer is said to be **micro programmed control unit**
- Control variable can be represented by a string of 0's and 1's called as **control word.**
- Each word in control memory contains a **microinstruction.**
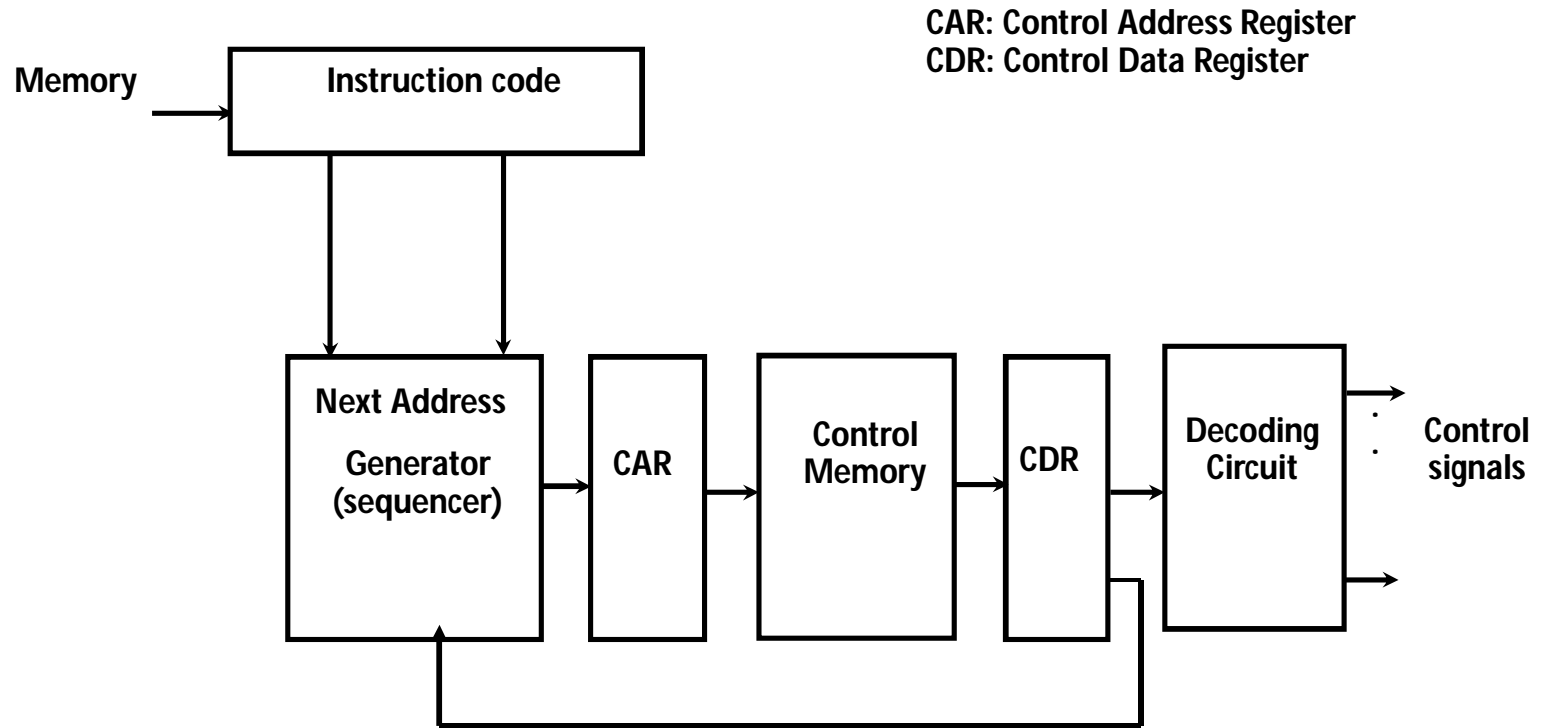- A sequence of microinstruction constitutes a **microprogram.**

Control Memory

- Control memory is a ROM in which the words are made permanent during the hardware production.
- The content of word in ROM at a given address specifies **Microinstruction.**
- A more advanced development known as dynamic microprogramming that permits a microprogram to be loaded initially from an auxiliary memory.
- A memory that is part of a control unit is referred to as **control memory.**

Control Memory

- A computer that employs a microprogrammed control unit have two separate memories:

  1. Main memory   2. Control memory

- Main memory is available to the user for storing the programs.

- Control memory holds a fixed microprogram that cannot be altered by the user.

- The general configuration of microprogrammed control unit is shown below:

Control Memory

CAR: Control Address Register
CDR: Control Data Register

Memory → [**Instruction code**]

[**Next Address Generator (sequencer)**] → [**CAR**] → [**Control Memory**] → [**CDR**] → [**Decoding Circuit**] → **Control signals**

Control Memory

- Control memory is assumed to be ROM within which all control information's are permanently stored.
- Control Address Register(CAR) specifies the address of the microinstruction.
- Control Data Register(CDR) holds the microinstruction read from memory.
- The microinstruction contains a control word that specifies one or more microoperations for the data processor.
- Once the operation is executed, the control must determine the next address.

Control Memory

- The next address is computed in the next address generator circuit usually called as sequencer and then transferred into the CAR to read next microinstruction.

- The function of sequencer is to increment the CAR by one.

- CDR holds the present microinstruction, until the next address is computed and read from memory.

- This configuration requires two phase clock, with one clock applied to address register and other to the data register.

- The main advantage of microprogrammed control unit is once the hardware configuration is made, there is no need of hardware or wiring changes.