

Fundamentals of Control Logic

- The basic elements of the CPU are ALU, Registers, Internal and External data paths and control unit
- Input to this CPU is from instruction register, flags and interrupt signals

Fundamentals of Control Logic

- The output of the control unit are the microcontrol signals or microoperations, each doing a small task like transfer a data from one register to another, initialize a flag, shift output of address to a register etc.

Fundamentals of Control Logic

- Control unit achieves the behavior of a processor as specified by its microoperations.

Fundamentals of Control Logic

- The performance of control unit is crucial as it determines the clock cycle of the processor.

Fundamentals of Control Logic

- To be more explicit, the control unit performs two basic tasks:
- **Sequencing and Execution**

Fundamentals of Control Logic

- **Sequencing**

The control unit causes the processor to step through a series of microoperations in the proper sequence. This sequence is based on the program being executed.

Fundamentals of Control Logic

- **Execution**

The control unit causes each microoperation to be executed. To approach this problem, a computer designer has to design models of generating such control signals

Control Signals

- The control unit governs the series of steps taken by the data path during the execution of a user-visible instruction, or **macroinstruction** such as load, add, store, conditional branch).

Control Signals

- Each step is a transfer of information within the data path.
- This may include the transformation of data, address, or instruction bits by the function units. A step is called a **register transfer**

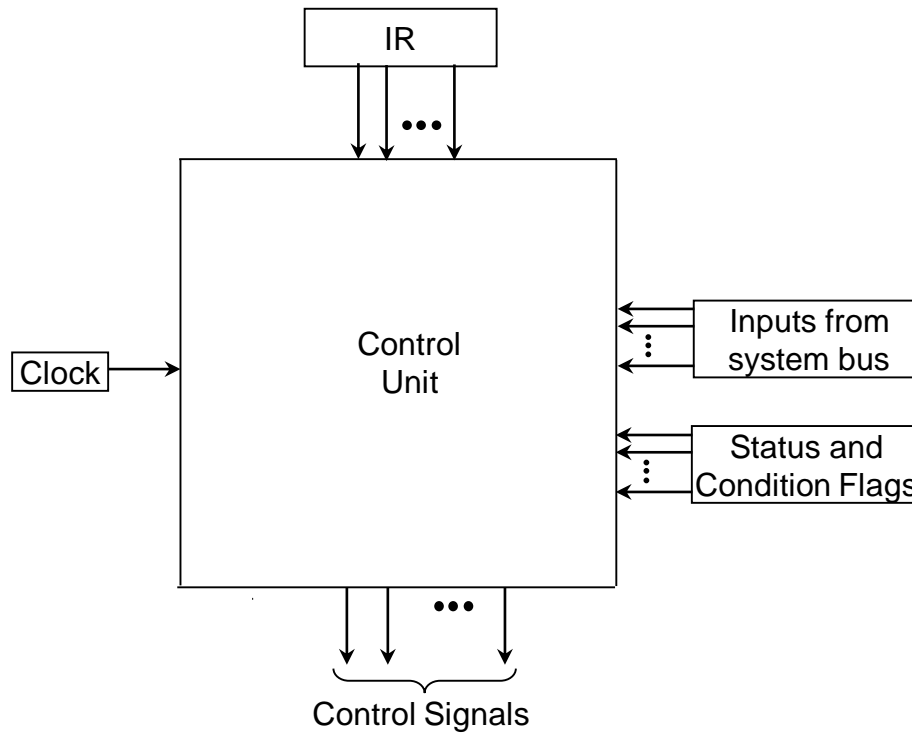
Control Signals

- At the same time, the control unit is receiving new values for one or more registers, which are known as **Control signals**
- These are signals that enable the gates that control sending or receiving of data at the registers **control points** and operation of selection signals.

Control Signals

- The control signals identify the **microoperations** required for each register transfer, and are supplied by the control unit.
- A complete macroinstruction is executed by generating an appropriately timed sequence of groups of control signals (microoperations).

A Control Unit and Control Signals



various inputs and outputs.

- **Inputs**
- **Clock**

The control unit maintains timing of each microoperation using the clock signal. This time is also referred to as the processor cycle time or the clock cycle time.
- **Instruction Register**

holds the opcode of the current instruction. The microoperations needed to execute the instruction are determined from this opcode.
- **Flags**

These signals provide the status of the processor and the status of results of the previous execution of the ALU operation.
- **Control Signals from control bus**

These signals are provided by the system bus when there is an interrupt signal or an acknowledgement.

Output

- The output signals are control signals which are provided to internal buses and to external buses. These are explained as under:
- **Control Signals within the processor:**
These are of two kinds:
that cause data to be moved from one register to another
that activate specific ALU functions
- **Control Signals to control bus**
These are of two types:
control signals to memory
control signals to I/O modules