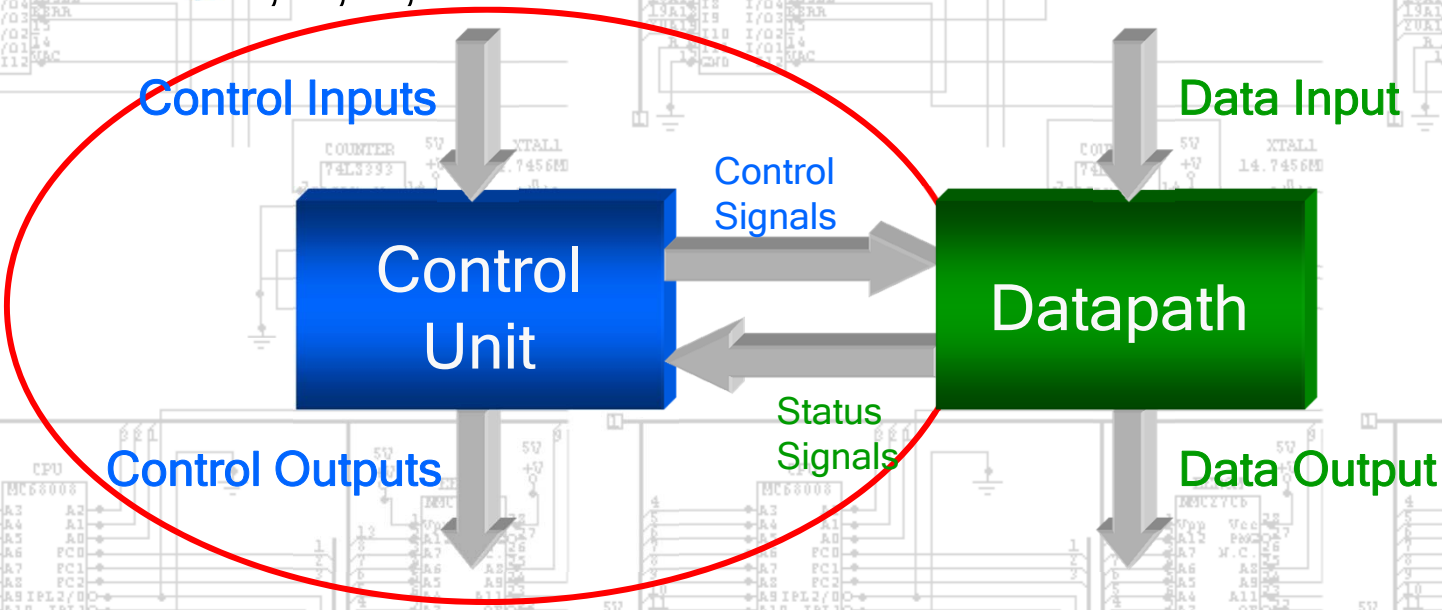
CS2022 The Control Unit

- Control unit's job:
  - Supply all the control signals to the datapath
  - Respond appropriately to its status signals:
    - Z, N, C, V



CS2022 Von Neumann Architecture

- Input to the control unit:
  - A stream of instructions coming from memory **M**
  - This steam must be converted to a sequence of micro-operations for the datapath
- Control Unit uses:
  - Program counter **PC** to index in M the next executable instruction

CS2022 Algorithmic State Machine

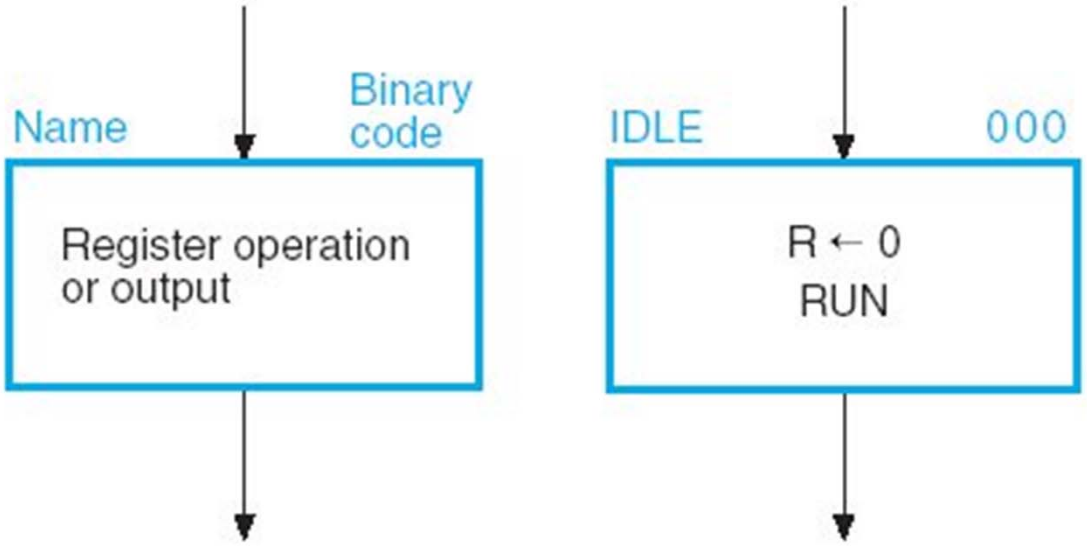
- Data processing may be achieved through:
  - Sequencing Register transfer operations
  - May be specified as hardware algorithm
    - Consists of a finite number of procedural steps
- ASM are used:
  - Control Unit
  - Datapath

CS2022 ASM Chart

- Algorithmic State Machine (ASM) Chart
  - Defines the hardware algorithm
  - Defines relation ship to time
    - Clock
- Three basic elements:
  - State Box
  - Decision Box
  - Conditional Output Box

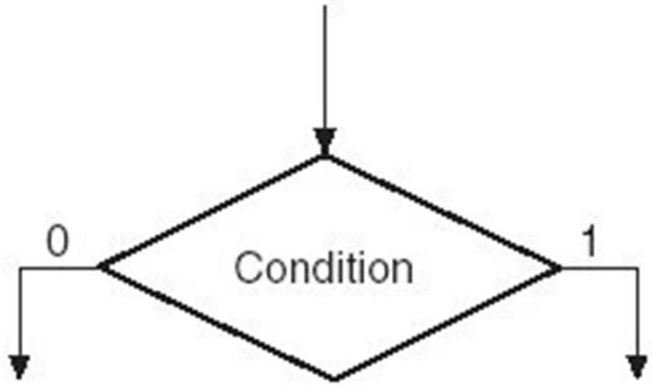
CS2022 State Box

- State Box contains:
  - Register transfer operation or output signals that are activated while the control unit is in this state.
  - RUN is 1 for any box it appears and 0 for any box it does not appear.



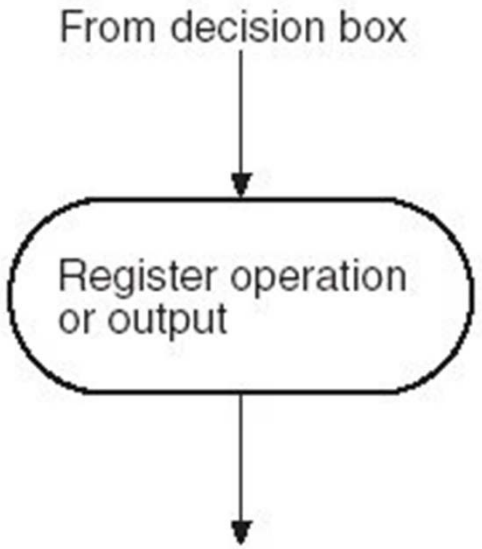
CS2022 Decision Box

- Exit path is taken if input condition is:
  - True (1)
  - False (0)

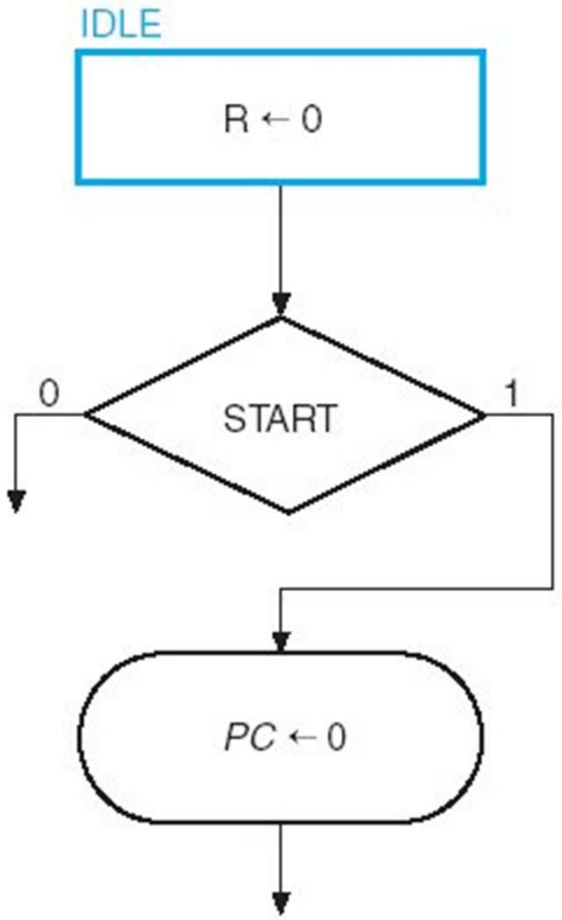


CS2022 Conditional Output Box

- Conditional Output Box entry path must pass through one or more decision boxes.



CS2022 ASM Box Example



CS2022 ASM Block