

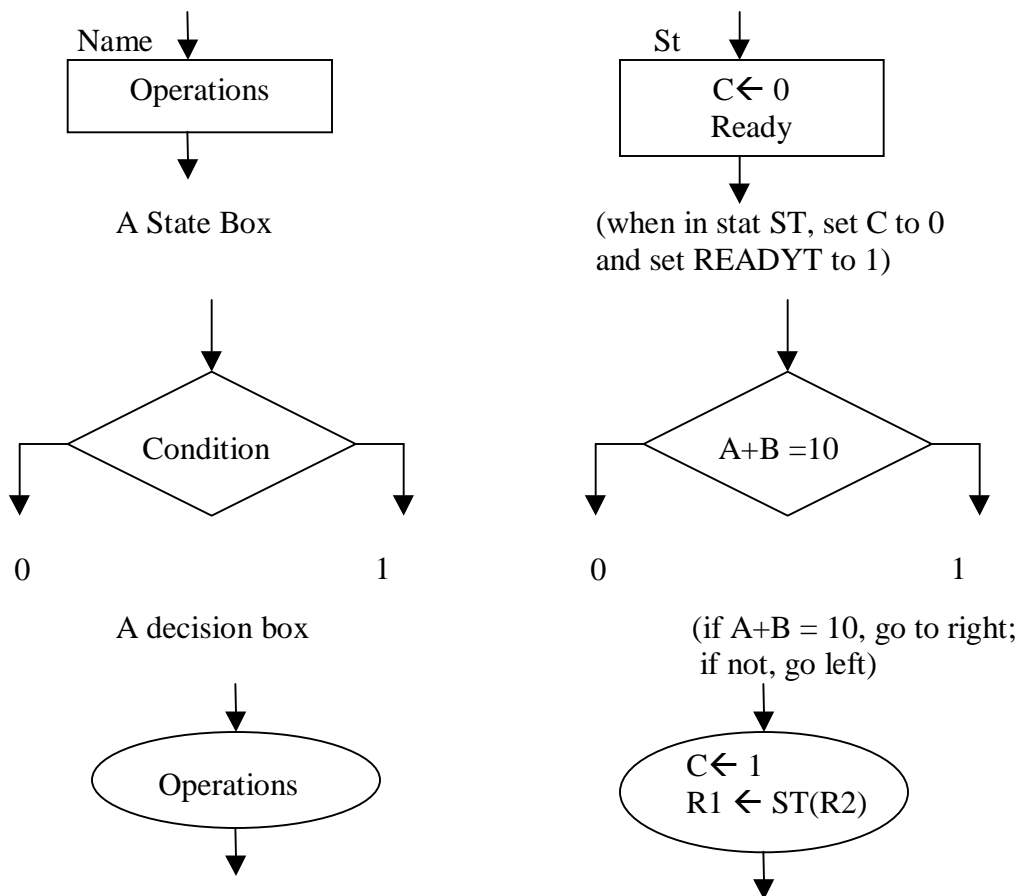
## Sequencing & Control

- we'll ignore the data path for the moment
  - o we will assume that it can do the register transfers we need
- the control unit activates operations in the data path
  - o it connected to the datapath control inputs and status outputs
- a programmable system and none-programmable system have very different control units
- programmable system:
  - o input instructions from memory
  - o must keep a program counter
  - o must be able to decode instructions & direct datapath to execute.
- None programmable system
  - o No instruction memory, FC, fetch, decode

## ASM Diagrams

Will be used to describe the behavior of the control unit

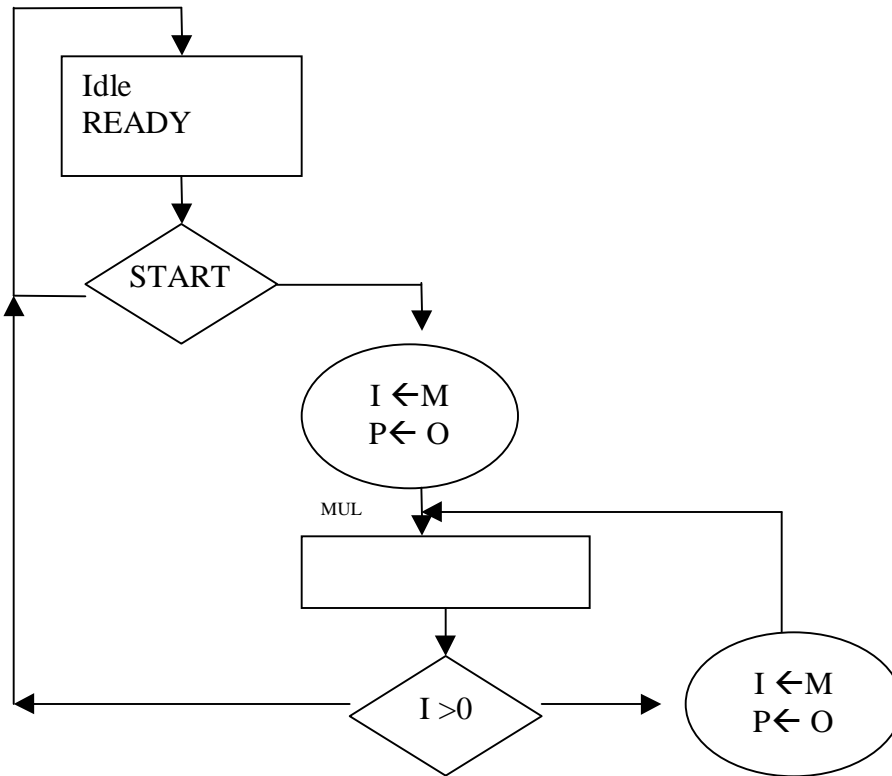
Parts:



- A state box is positive-edge triggered by the clock
  - o Control doesn't enter a state box until the next cycle
  - o You can't set the value of a register and use it in the same cycle
- Every block starts with a state box & ends just before the next

### Example ASM

- Multiply M by N and put the result into P
- First example: do this by adding M copies of N together



- P gets M Ns added to it
  - o I counts for M down to zero to keep track
- This assumes:
  - o We have registers M, N, P, I
  - o I can load and decrement
  - o We can add two registers into P
  - o P can be reset to 0
  - o Both are operations on P and I can be done in one cycle
  - o The data path returns the value of I > 0 as a status signal

- Examples

cycle	state	M	N	I	P	start
1	idle	2	6			1
2	idle			2	0	
3	mul			1	6	
4	mul			0	12	
5	mul					
6	idle					