How to use the LC3 State Machine Component

When you poke the LC3 State machine it will pop up a dialog asking for a command. Here you will type what signals to assert and which clock cycles to assert them

So for example FETCH you should already know that
Clock Cycle 1: PCMUX=PC+1, LDPC, GatePC, LDMAR
Clock Cycle 2: LDMDR, MEMEN
Clock Cycle 3: GateMDR, LDIR

In Clock Cycle 1 you increment the PC and put it into the MAR
In Clock Cycle 2 put the value from memory into the MDR
In Clock Cycle 3 put the value in the MDR into the IR

- *Special note. MEMEN is the signal that "kicks" memory and tells it to load or store something. MEMWE is the signal that tells memory whether to do a load or a store.*
- *Do not assert MEMEN, a GateXXX signal, and LDMAR/MDR in the same clock cycle. The way these registers (MAR/MDR) work is that they try to load from the BUS or MEMORY if both wires have values then results are undefined (I will give you an error message).*

So to use this in my LC3 state machine you will poke this and in the dialog that pops up you will type
PCMUX=PC+1, LDPC, GatePC, LDMAR ; LDMDR, MEMEN ; GateMDR, LDIR

The semicolons here separate the signals into different clock cycles.

To test that this works you may set the PC to some address and in memory put something at that address. And then run the command above and see that the value appears in the IR.

Note: CaSe does matter here so if you type pcMux=Pc+1 it will not recognize that signal.

Here is a listing of each signal and each value you can set these signals to

Register / Gate Control	Multiplexor Control	ALU / Memory Control
LDMAR LDMDR LDIR LDREG LDCC LDPC GatePC GateMDR GateALU GateMARMUX	PCMUX=PC+1,BUS,ADDER SRC2MUX=SEXT,SRC ADDR1MUX=PC,BaseR ADDR2MUX=ZERO,[5:0],[8:0], [10:0] MARMUX=[7:0], ADDER	ALUK=ADD,AND,NOT,MOV MEMWE=LD,ST MEMEN

- **Register Control Signals**
  - Just mention them
  - Ex. LDPC will write enable the PC
- **Gate Control Signals**
  - Just mention them
  - Ex. GatePC will gate the pc to the bus.
- **Multiplexor Control Signals**
  - You must say XXMUX=INPUT
  - Ex. PCMUX=PC+1 selects the incrementer output for the PC
- **ALU Control Signals**
  - You must say ALUK=OP
  - note MOV stands for MOVE the Right input (A) to the output of the alu
  - Ex ALUK=MOV to perform MOV.
- **Memory Control Signals**
  - You just say SIGNAL=VALUE
  - Ex. MEMWE=LD memory will do a load.
- **RegFile Control Signals (SRC1, SRC2, DR)**
  - You say the Name and then the Register Number.
  - This will automatically set the inputs to the register file for testing
  - Ex. Saying SRC1=3 Will select register 3 as the source 1 output.
- **Default Values**
  - The default value of any signal is 0 or the first option stated. So for instance if you don't say MEMWE then it is assumed that MEMWE=LD.
  - However for clarity (and for good study notes for the quiz!) you should mention all of the signals values anyway