Build an 8-bit CPU with a memory

Objective of this lab:

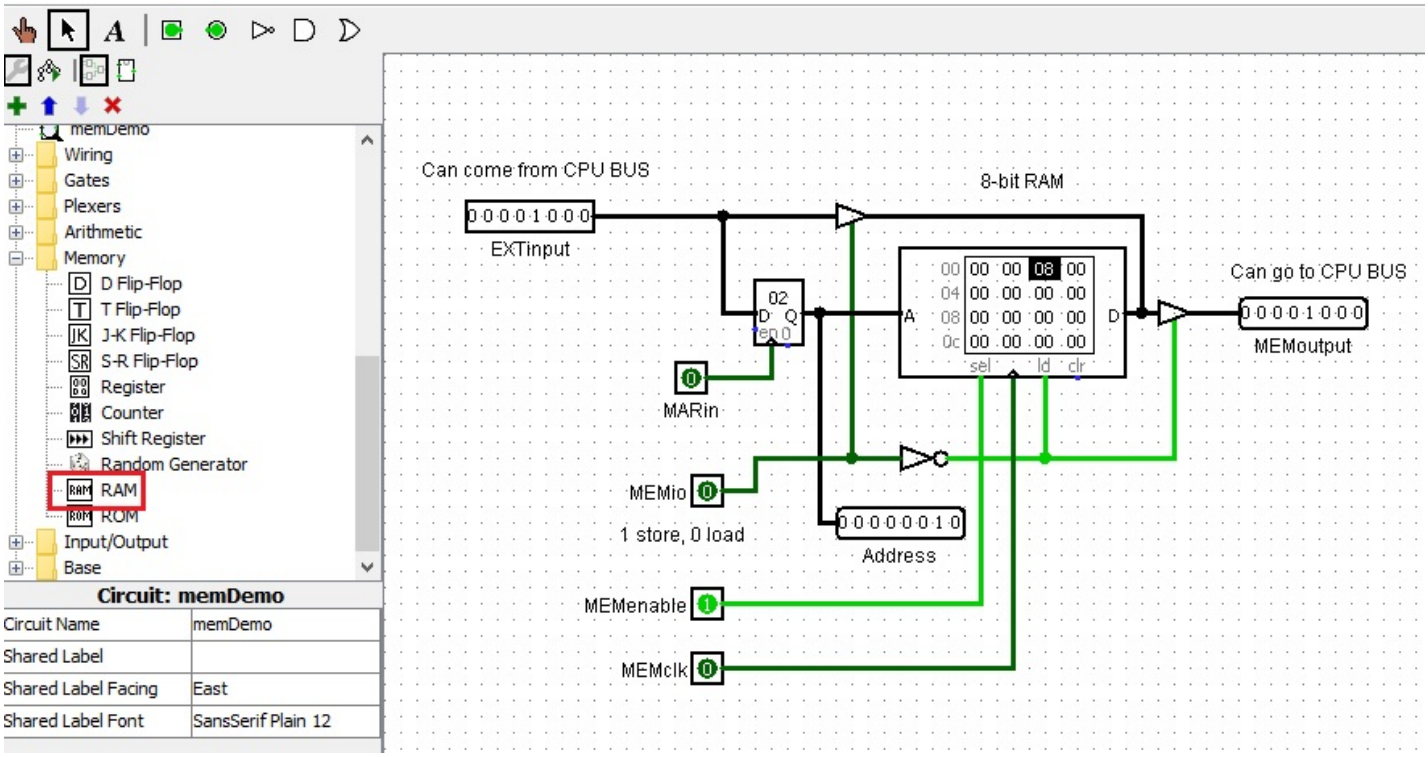
> The purpose of this lab is to learn about CPU Organization
> by building an 8-bit CPU with a memory

Preparation

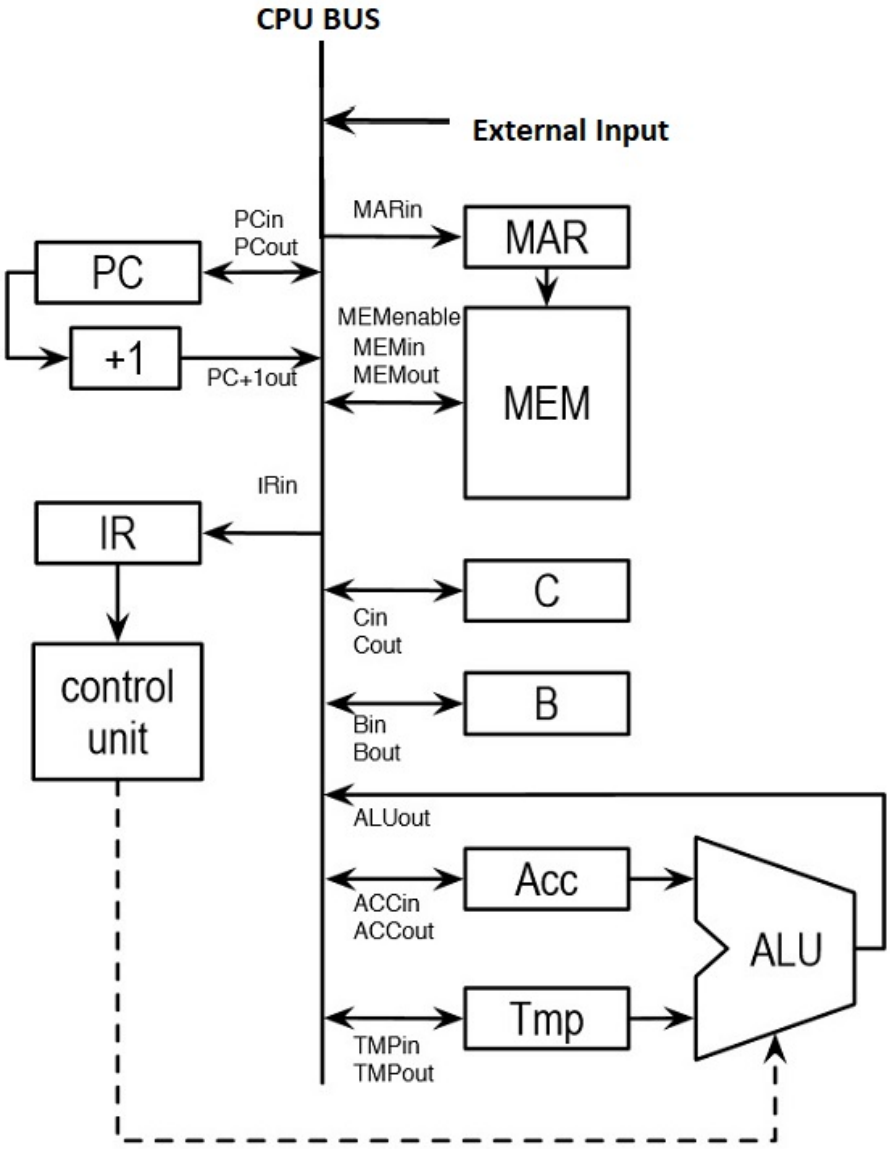
> Read lab lecture notes.

Lab Assignments

1. Create a project Lab3.circ in the Logisim.
2. Add a circuit window to test the 8-bit RAM, replicate the circuit in the lab notes and practice with the steps following the diagram.



3. Add a circuit window to implement the 8-bit CPU design (with memory and PC+1) in the lab notes.



4. In the 8-bit CPU, the highest 2-bit in the instruction register IR will hold the operation code.
   The 8-bit CPU will do the following operations:
   - For instruction 00, do 8-bit XOR, test 00000010 XOR 00000011 = 00000001
   - For instruction 01, do 8-bit AND, test 00000010 AND 00000011 = 00000010
   - For instruction 10, do 8-bit NOT operation, the Operand will be in the register ACC, test NOT 00000010 = 11111101.
   - For instruction 11, do 8-bit OR, test 00000010 OR 00000011 = 00000011

Hand in the following:

1. Submit the file Lab3.circ which includes all the circuits needed.
2. Submit the file Lab3.pdf which contains the following:

   - Screenshot of the circuit testing the 8-bit RAM, replicate the circuit in the lab notes and practice with the steps after the diagram.
   - Screenshot of the 8-bit CPU circuit that you built.
   - The micro instructions (steps necessary) to implement the following operations described above. Remember to pre-load values.
     - Do the XOR operation with the values in register B and C, and store the result in C.
       test 00000010 XOR 00000011 = 00000001
     - Do the AND operation with the values in register B and C, and store the result in B.
       test 00000010 AND 00000011 = 00000010
     - Do the NOT operation with the value in register C and store the result in register B.
       test NOT 00000010 = 11111101
     - Do the OR operation with the values in register B and TMP, and store the result in C.
       test 00000010 OR 00000011 = 00000011

Please Note: For all above four operations, you need to preload values in the registers from the EXTin. Use the above testing examples for your lab assignment hand-in micro instructions.

- Microinstructions to load the following machine code into the memory.

Address	Machine code
00000000	10000001
00000001	00010110
00000010	00000101
00000011	00001000