

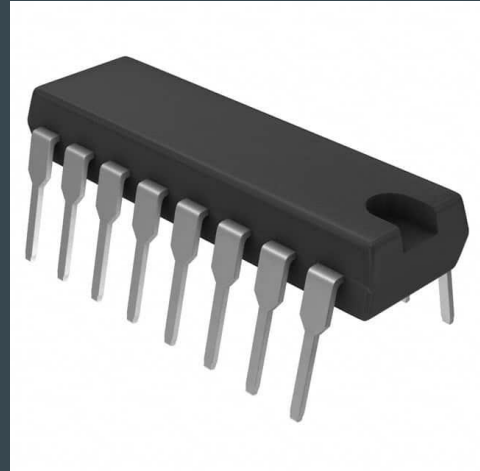
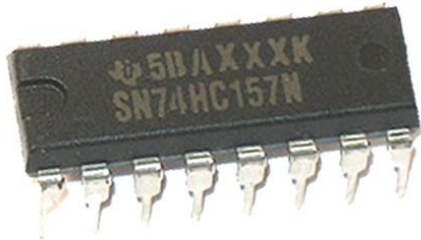
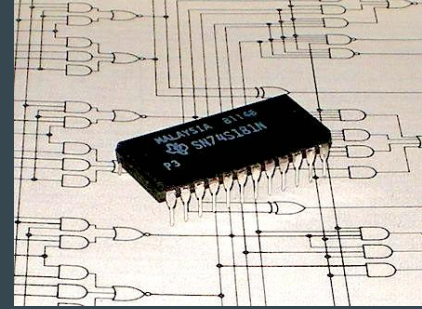
Lab 8 - 4-bit RPN Calculator

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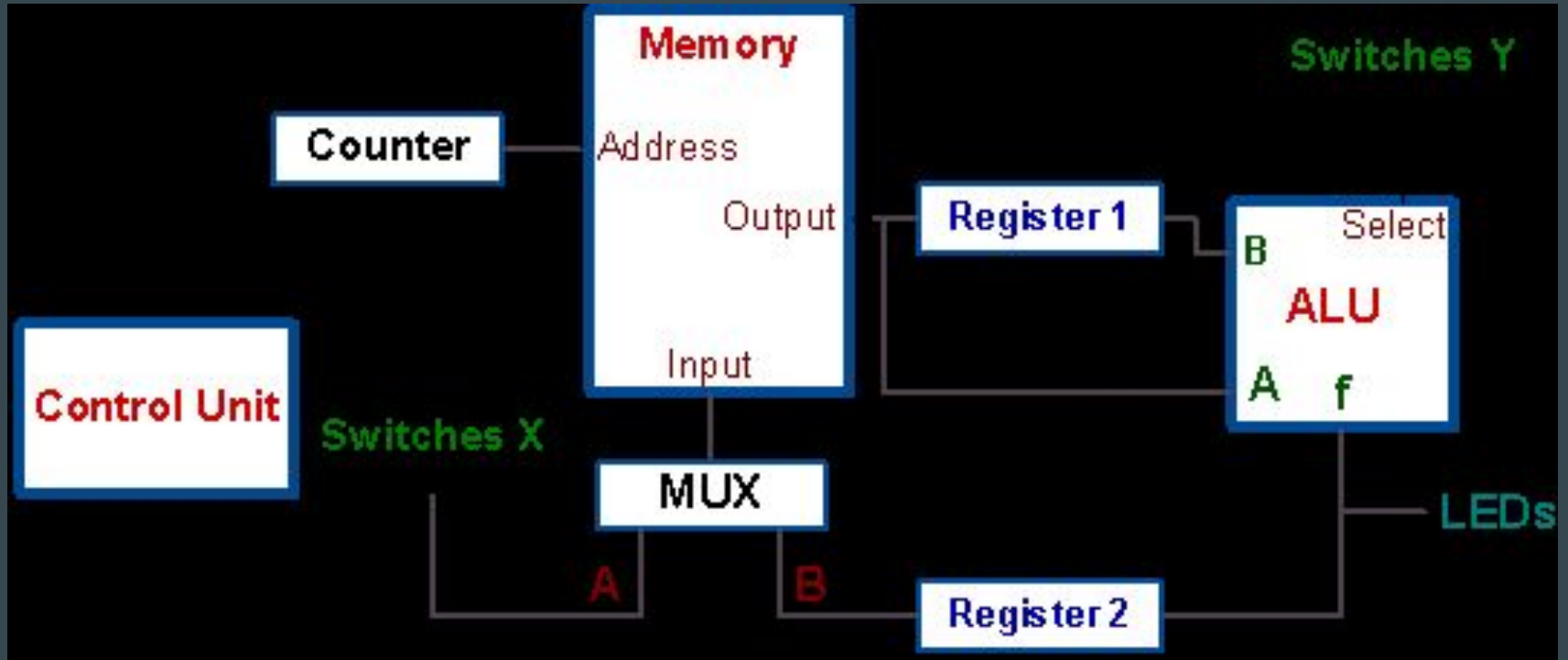
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Lab Objective

- The objective of lab 8 is to have students attempt to design and create a 4 bit RPN calculator utilizing prior knowledge of components such as counters, multiplexers, ram, ALU, and other integrated circuits that were used in previous labs.



Block Diagram

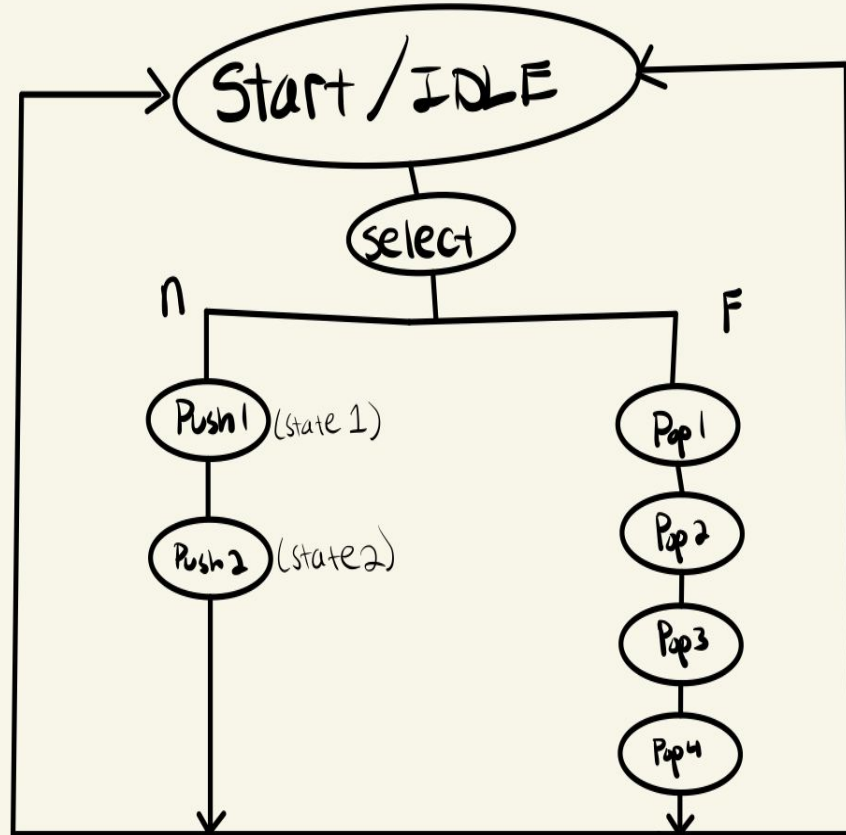


Block Diagram Explained

- The counter will be inputted into the memory address
- Memory outputs will go to Register 1 which will be connected to the ALU where a select is permissible along with a few connected LEDs.
- The control unit will be connected to the mux which will be the input of the memory along with having a 2nd register connected to that same mux which is also connected to the ALU.
- So in total there will 2 registers connected to the ALU.

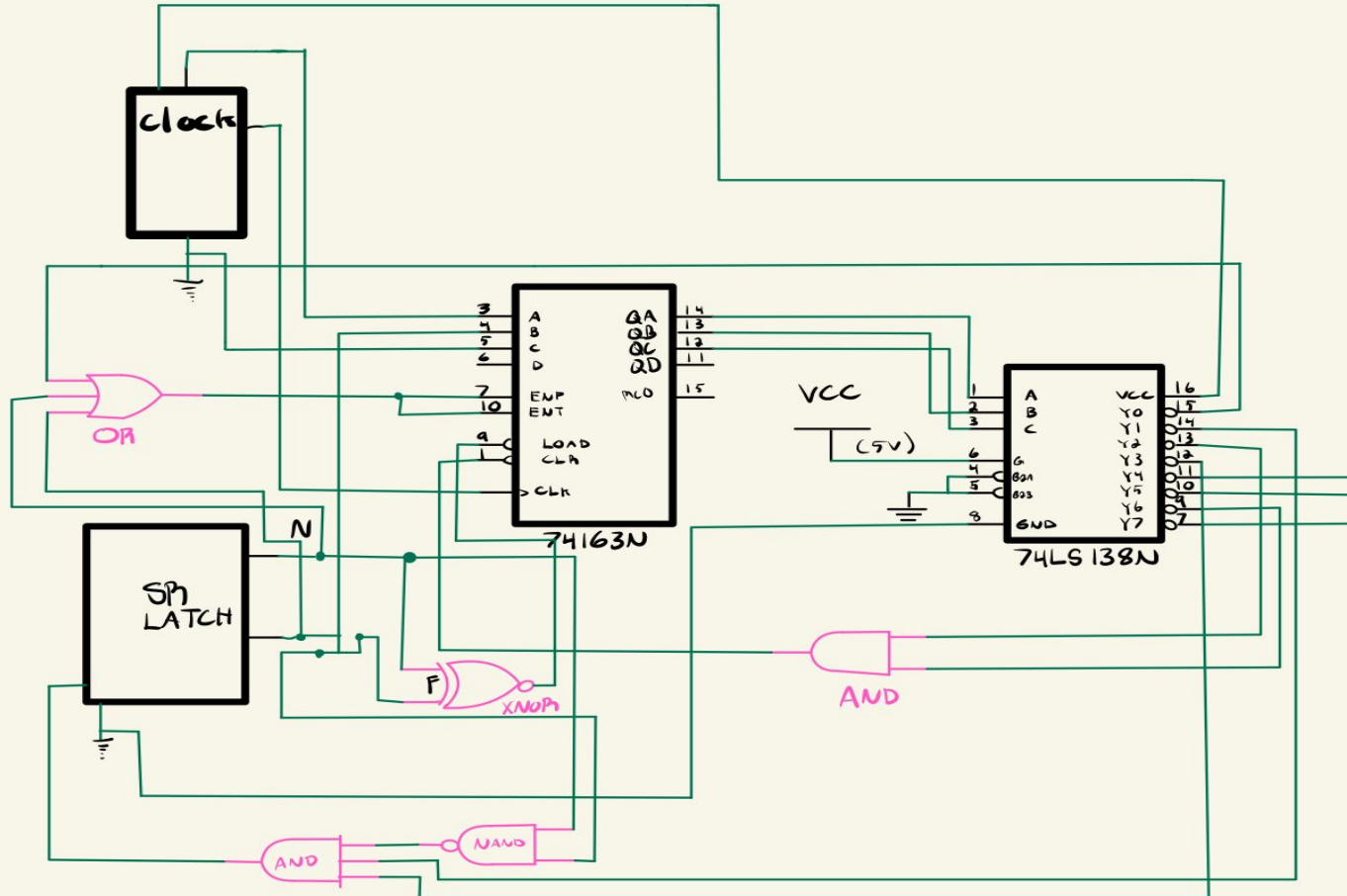
- For our state diagram it first starts out at IDLE
- Until we select n or f we stays at idle.
- When we press n
 - goes to:
 - State 1 (Push 1)
 - State 2 (Push 2)
- When we press f
 - goes to:
 - State 3 (Pop 1)
 - State 4 (Pop 2)
 - State 5 (Pop 3)
 - State 6 (Pop 4)

STATE DIAGRAM

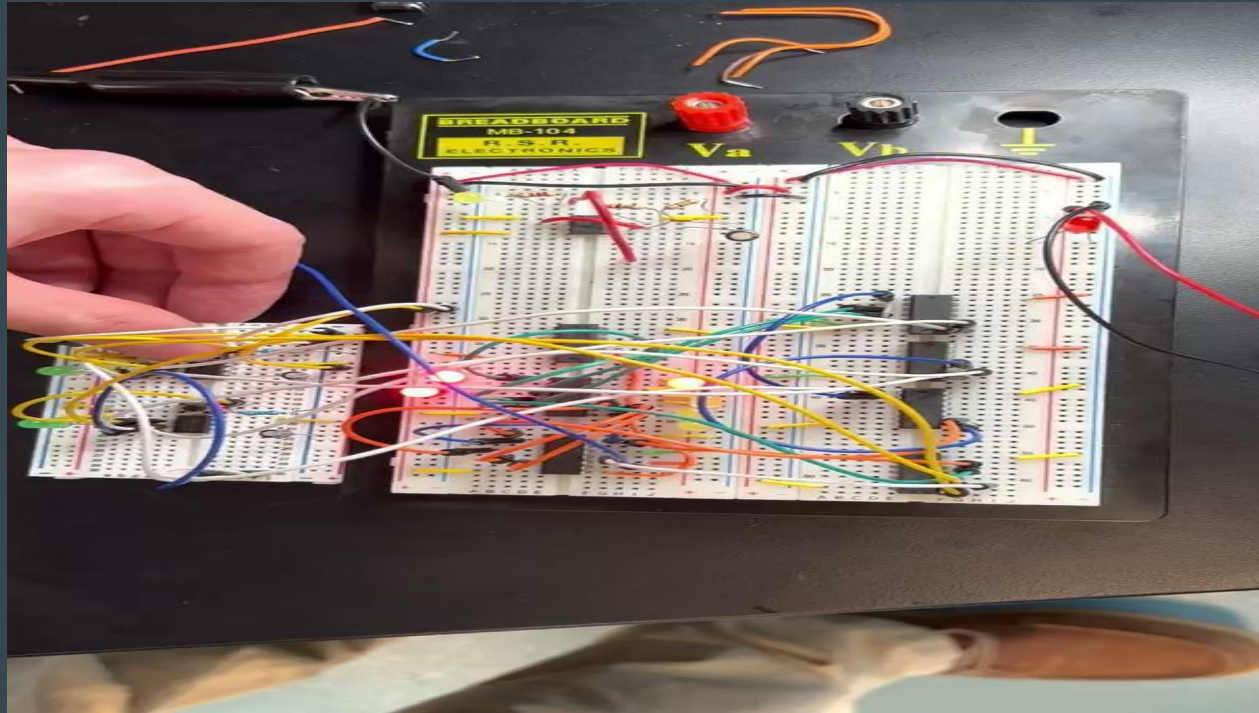


State Diagram

Control Unit

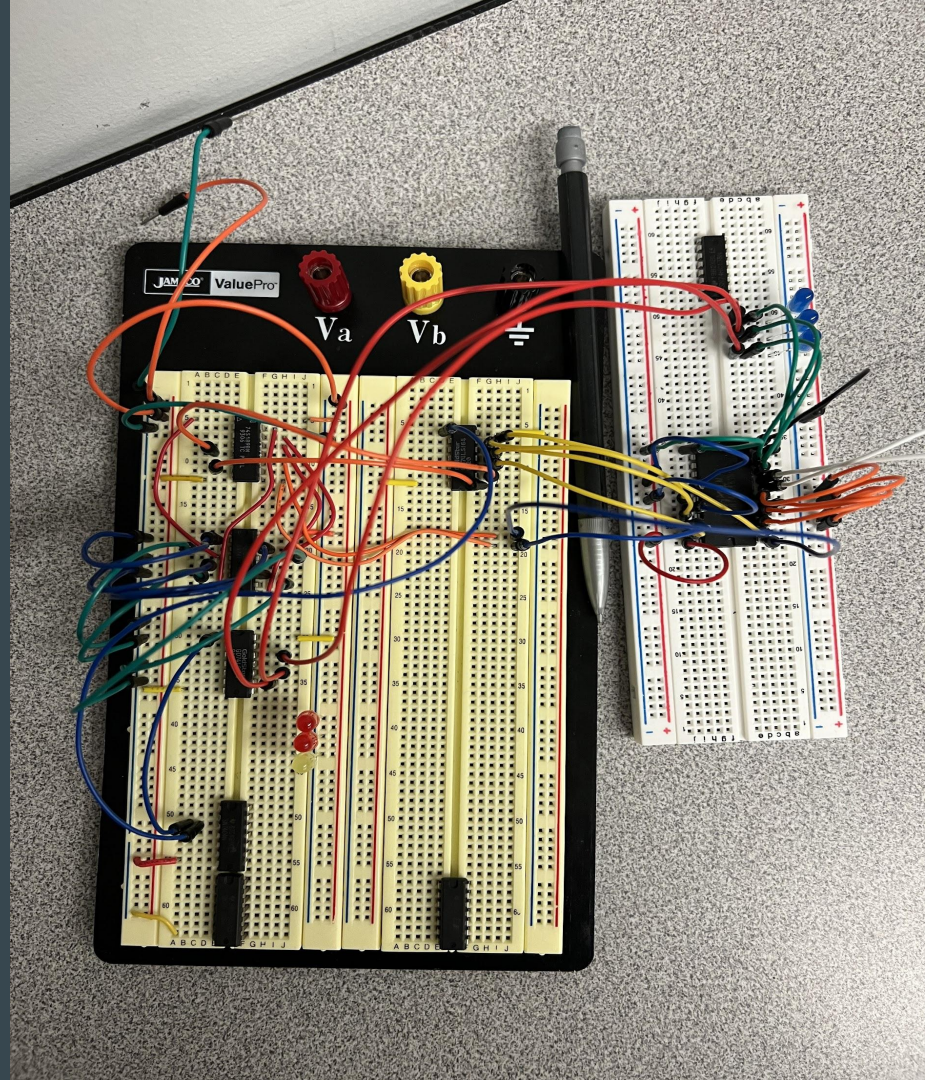


Control Unit Demo



Ram, Mux, ALU, Registers

- Here are the Ram, Mux, and ALU
 - The input of the RAM would be connected to the MUX which are indicated by the red wires connecting the two.
 - The output of the Ram connects to a register which would then be connected to the ALU currently on the second miniature board.



Conclusion

Although we are not finished with the calculator we were able to completely configure and test the control unit.

We have also begun connecting the ram, mux, and registers to the control unit to test the input of different signals but require some more time to fully wire and test the overall calculator.

Work Cited

- https://www.digikey.com/en/products/detail/texas-instruments/SN74F163AN/562694?utm_adgroup=Logic%20-%20Counters%2C%20Dividers&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_Integrated%20Circuits%20%28ICs%29_NEW&utm_term=&utm_content=Logic%20-%20Counters%2C%20Dividers&gclid=EAIaIQobChMIkbSw1oyy9wIVj9rVCh3tpwBLEAOYCyABEgIip_D_BwE
- <https://components101.com/ics/74hc157-multiplexer-pinout-equivalent-datasheet>
- <https://en.wikipedia.org/wiki/74181>
- NJIT ECE Lab Manual for Lab 8
- <http://ecelabs.njit.edu/ece394/lab8.php>