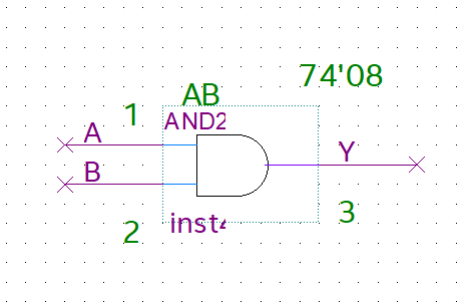
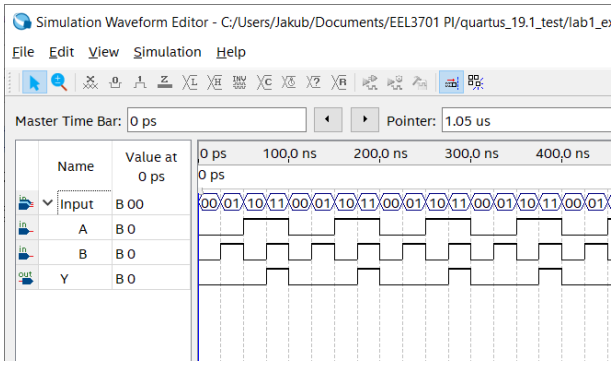
Lab 0 Demo

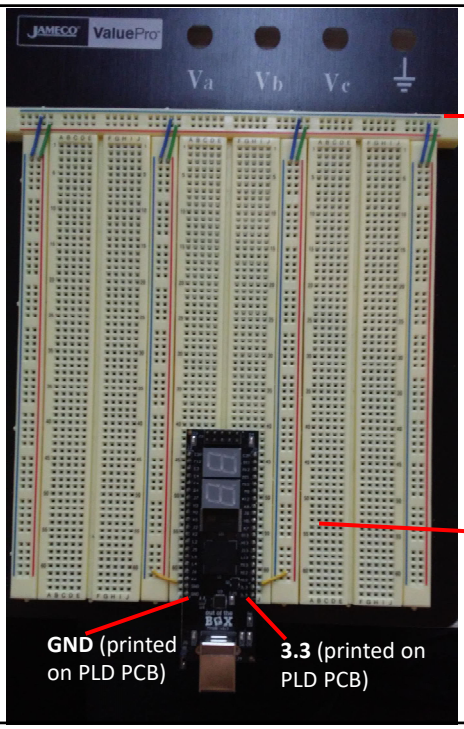
Construction of an AND circuit using a 74'08 chip





Y=AB, all active high

1. Power Supply



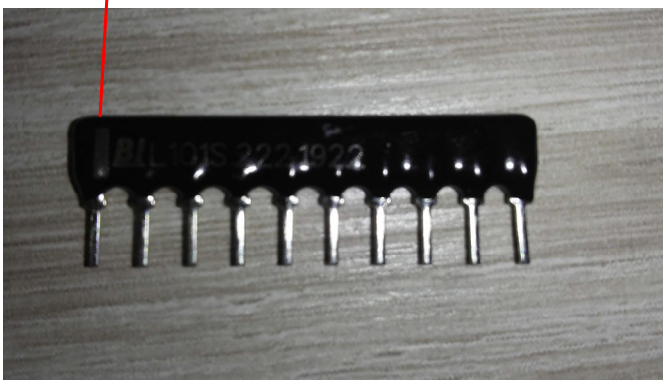
Connect all Vcc lines together, do the same for GND

PLD will be used to supply Vcc (3.3 V) and GND, connect to lines

Lab 0 Demo

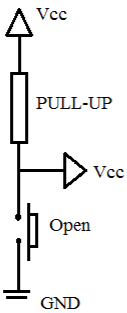
SIP Resistor for Switch Circuit

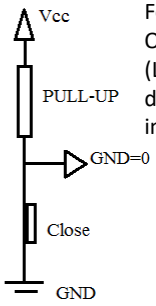
Note the mark, this is the common pin of the resistor package.
Connect this to Vcc. All other pins are opposite side of a resistor.



2. Switch Construction (Inputs)

ON means that the switch is closed





For pull-up, ON=LOW (Logic value depends on our interpretation)

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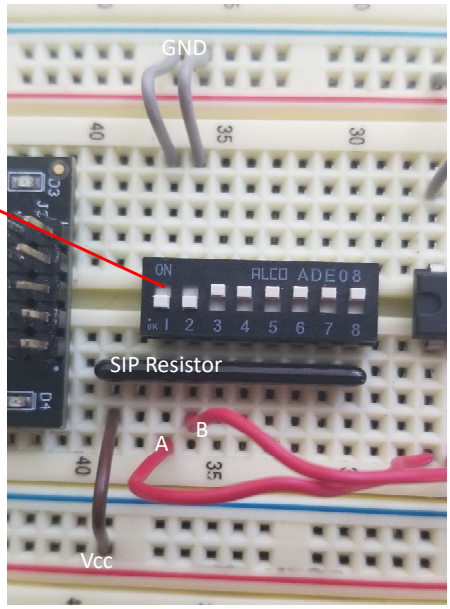
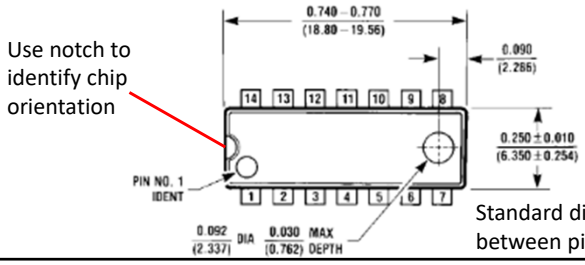


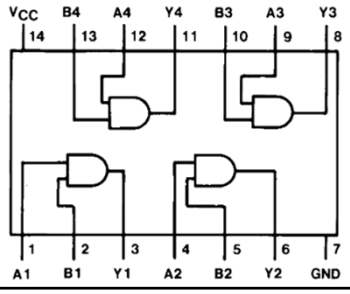
Lab 0 Demo

74HCXX datasheets accessible via course website.

- https://www.futurlec.com/IC74HC00Series.shtml
- https://www.mil.ufl.edu/3701/pinouts/7400.html
- Chips need to be supplied with Vcc and GND to work.
- Each 74HC chip varies in terms of pin assignments for I/O as well as Vcc/GND!



Standard dip IC pin spacing between pins is 0.1 in



3. Logic Implementation

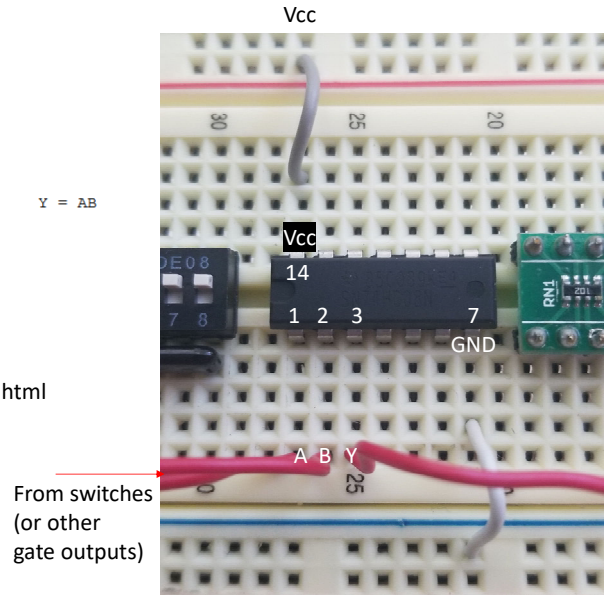
7408

Quad 2-input AND gates.

```
    +---+--+---+              +---+---*---+
 1A |1  +--+ 14| VCC          | A | B | Y |       Y = AB
 1B |2       13| 4B           +===+===*===+
 1Y |3       12| 4A           | 0 | 0 | 0 |
 2A |4  7408 11| 4Y           | 0 | 1 | 0 |
 2B |5       10| 3B           | 1 | 0 | 0 |
 2Y |6        9| 3A           | 1 | 1 | 1 |
GND |7        8| 3Y           +---+---*---+
    +----------+
```

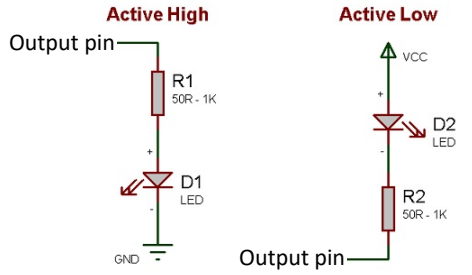
https://www.mil.ufl.edu/3701/pinouts/7400.html

ICs must be powered to function, i.e., pin 14 connected to Vcc and pin 7 connected to GND. (This assignment may not be the same for every chip; always check pinouts!)

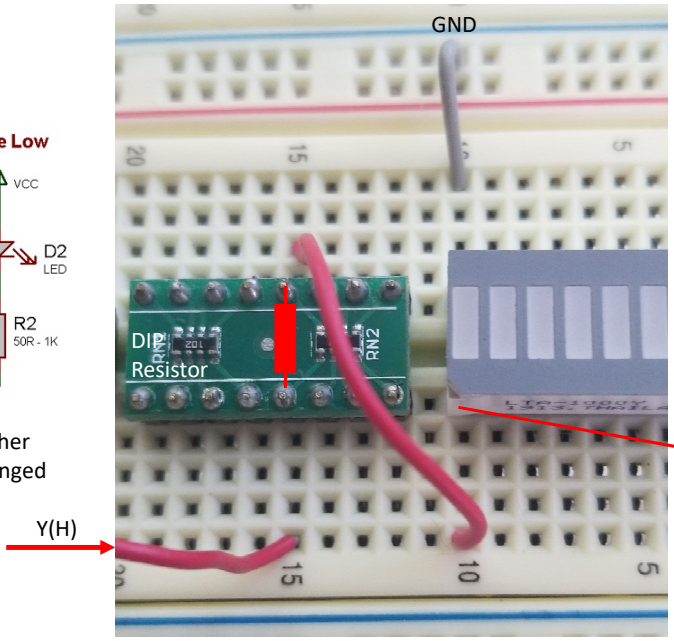


Lab 0 Demo

4. LED Construction (Outputs)

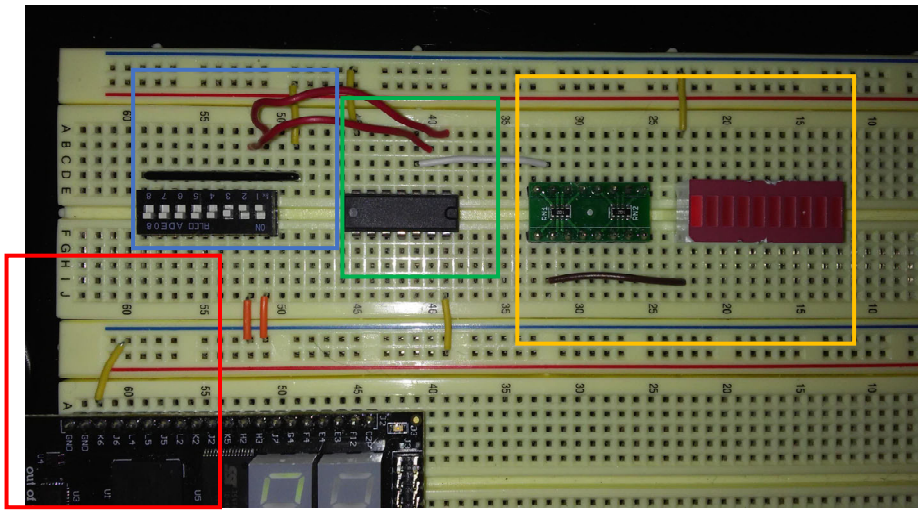


Note that the resistor and LED in either of the above figures can be interchanged (since they are "in series").



Organization is key!

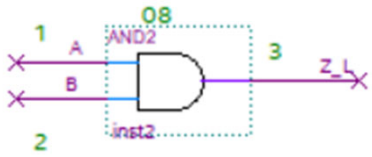
Supply → Switch → Logic → LED



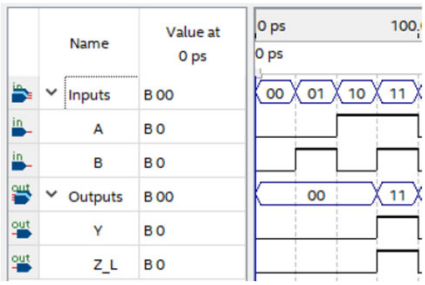
Inputs -> Logic -> Outputs
Physical circuits will quickly become very complex! (Even in Lab 1) Easier to debug (and grade)

Lab 0 Demo

Z = /(AB) with A and B Active High, Z Active Low



Z = /(AB), A_H, B_H, Z_L



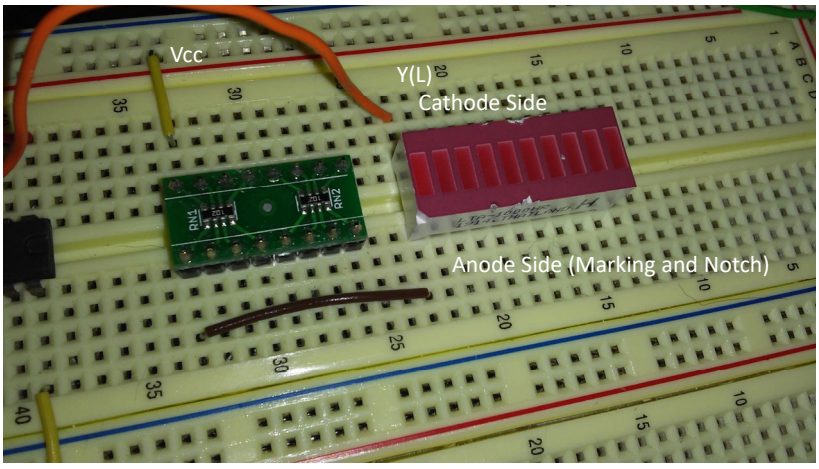
Truth Table

A	B	Z
0	0	1
0	1	1
1	0	1
1	1	0

Voltage Table

A(H)	B(H)	Z(L)
L	L	L
L	H	L
H	L	L
H	H	H

Replace Active High LED Circuit with Active Low



The LED will turn on only if the output is TRUE. This happens when there is a positive voltage difference across the anode and cathode terminals, which occurs for a low voltage output on active-low LED circuit and high voltage on active-high LED circuit.

Lab 0 Demo

Great Resource Made for the Course:

- https://www.youtube.com/watch?v=52hIG55BUa8