Lab no 05: Breadboard & NOT IC & NOR IC

The purpose of this Lab is to: use the breadboard and connect different components, like LED, resistor, NOT IC, and NOR IC.

Required Components

- Breadboard.
- 5V battery.
- Jumper wires.
- 330-ohm Resistor.
- LEDs.
- NOT IC 7404.
- NOR IC 7402.

Parts:

1. **Connect & Test the NOT IC on the Breadboard.**
2. **Connect & Test the NOR IC on the Breadboard.**
3. **Lab 4 Revision.**

Part 1: Connect & Test the NOT IC on the Breadboard.

A 7404 is a hex inverter gates chip. This means it contains 6 NOT gates inside it, as shown in Figure 4.

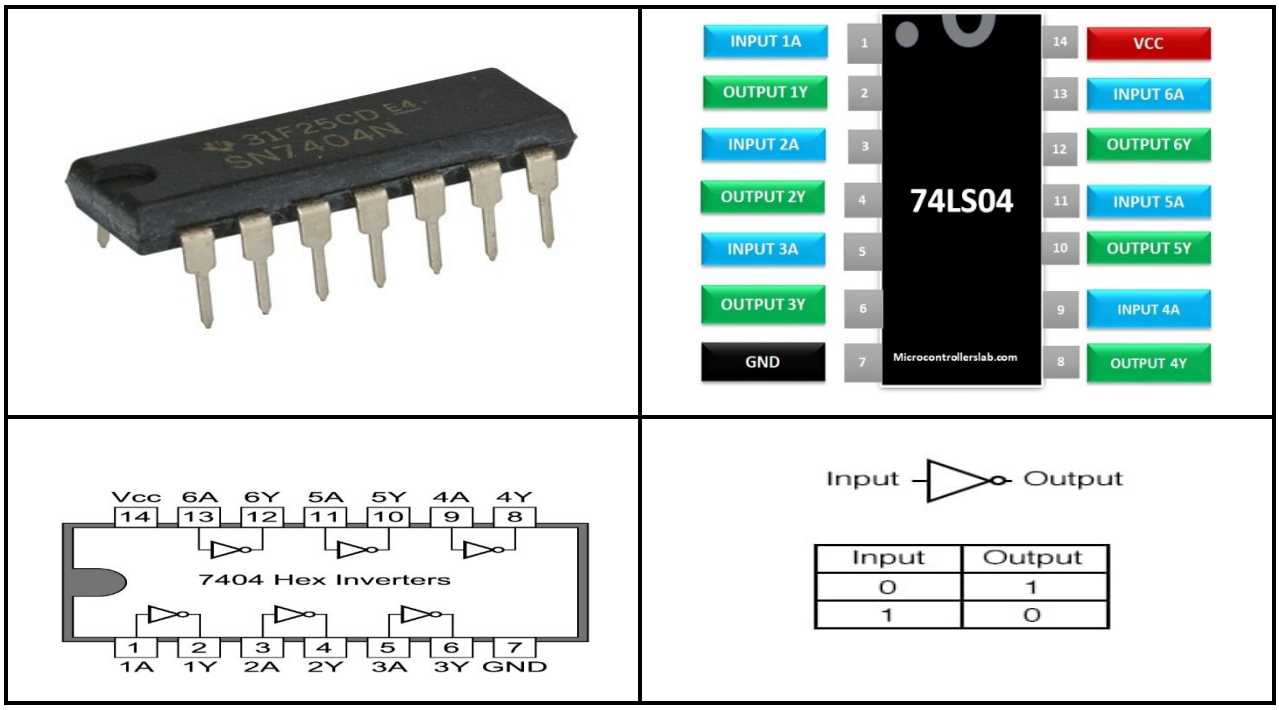


Figure 1. NOT Gate IC, Schematic, Pin Configuration, and truth table.

1) As shown in Figure 1, Pin 7 is the ground and Pin 14 is VCC. So, **Connect** 7404 Pin 7 to the ground line, and Pin 14 to the 5V power line, as shown in Figure 2.
2) **Connect** Inputs of the first NOT gate, Input A1 (Pin 1), to the Ground (logic 0), the purple wire shown in Figure 1.
3) **Connect** Output Y1 to the resistor, as shown in Figure 5.

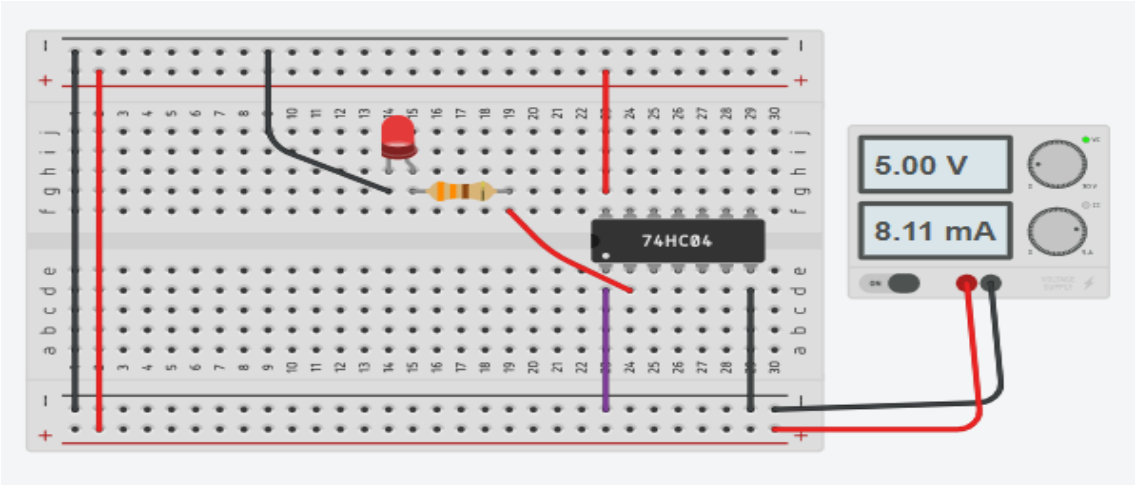
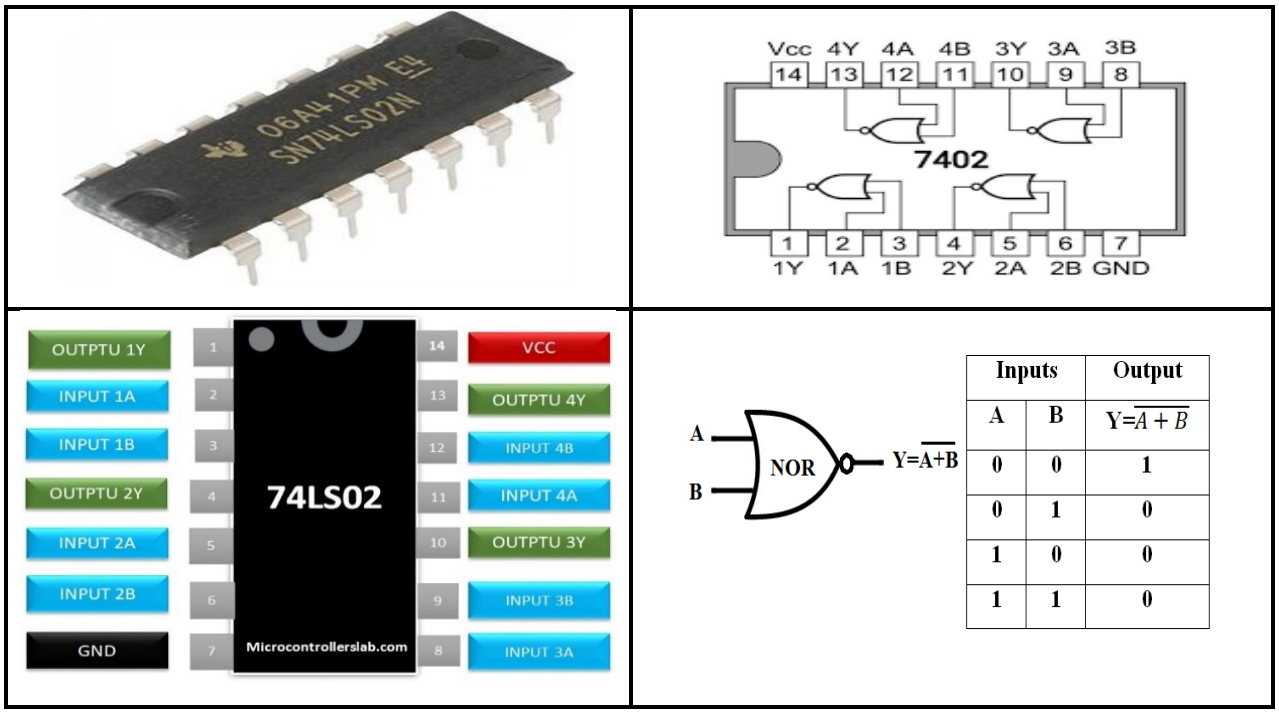


Figure 2. Test NOT IC on the Breadboard.

Part 2: Connect & Test the NOR IC on the Breadboard.

A 7402 is a quad NOR gates chip. This means it contains 4 NOR gates inside it, as shown in Figure 3.



Inputs		Output
A	B	$Y=\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

Figure 3. NOR Gate IC, Schematic, Pin Configuration, and truth table.

1) As shown in Figure 6, Pin 7 is the ground and Pin 14 is VCC. So, **Connect** 7402 Pin 7 to the ground line, and Pin 14 to the 5V power line, as shown in Figure 4.
2) **Connect** Inputs of the first NOR gate, Input A1 (Pin 1) and Input B1 (Pin3), tothe Ground (logic 0), the purple wires shown in Figure 4.
3) **Connect** Output Y1 to the resistor, as shown in Figure 4.

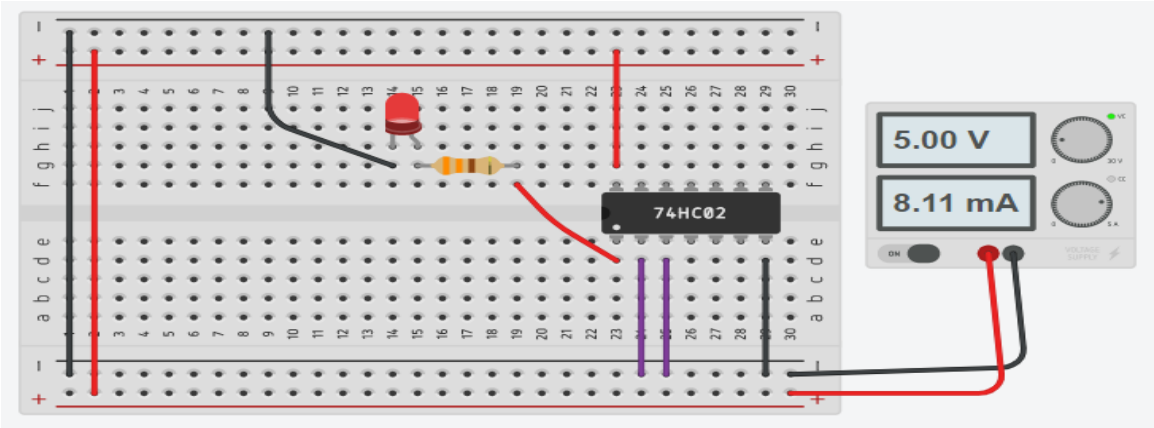


Figure 4. Test NOR IC on the Breadboard.

Note

- **Logic gates ICS in breadboard simulator**

https://www.youtube.com/watch?v=u3mzk9pj-18

- **ICS datasheets, Simulator, Proteus download link**

https://drive.google.com/drive/folders/1u8BetHA6FxWgylGntXkzlJKgvWMOLriT?fbclid=IwAR3NH4paqkEhMjA1bdD5RT9j5rCOe94NPd21WA-BJj6vEcQlchucLiCYh2s

- **Tinkercad**

Tinkercad | Create 3D digital designs with online CAD | Tinkercad

- **Resistor Calculator**

https://www.calculator.net/resistor-calculator.html

Lab 04 - Revision: Connect LED on the Step 1: The Breadboard and How it Works

- The breadboard is used to build circuits by connecting different components.
- As shown in Figure. 1, the bus terminals are the long strips on the side where you connect power lines (+ve power supply and ground).
- As shown in Figure. 1, the terminal strips are the short strips in the middle where you will build your circuit.

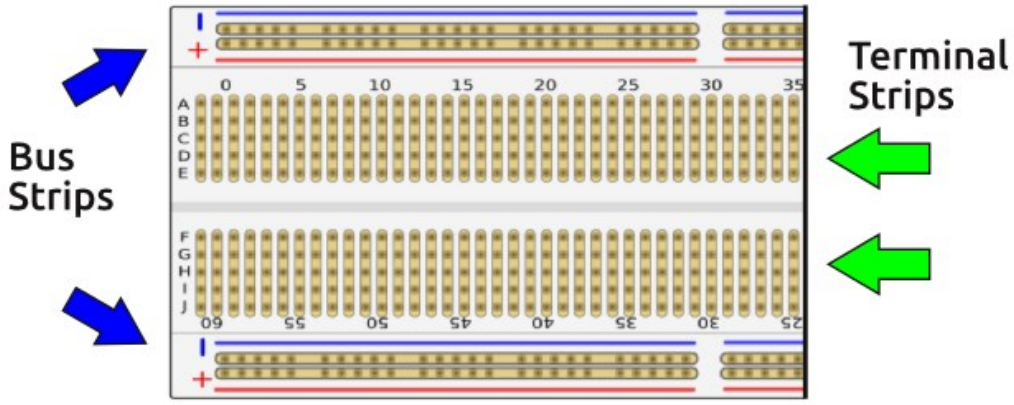


Figure 1. breadboard

- **Step 2: Powering Breadboard Safely**
  - Bring your power source, here you will use a 5V battery, as shown in Figure.2.
  - Use wires as shown in Figure 2, Connects the black wire to the blue bus terminal or ground and the red wire to the red bus terminal.

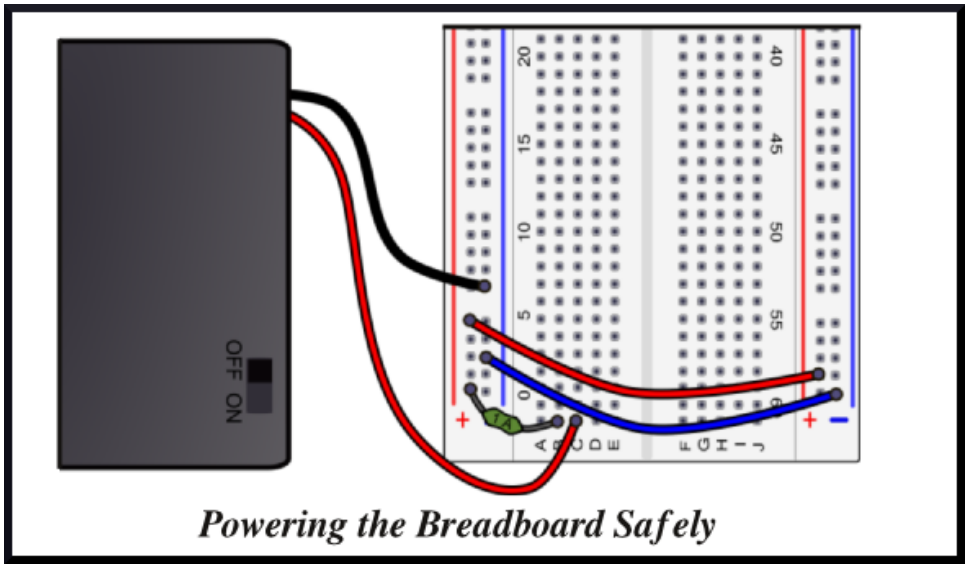


Figure 2. powering the breadboard

- **Step 3: read and select a Resistor**
  - Download the resistor color code, you can find an app on the android market to help you read the resistors.
  - Now, get a 330-ohm resistor, and verify its value based on the color code, shown in Figure 3.

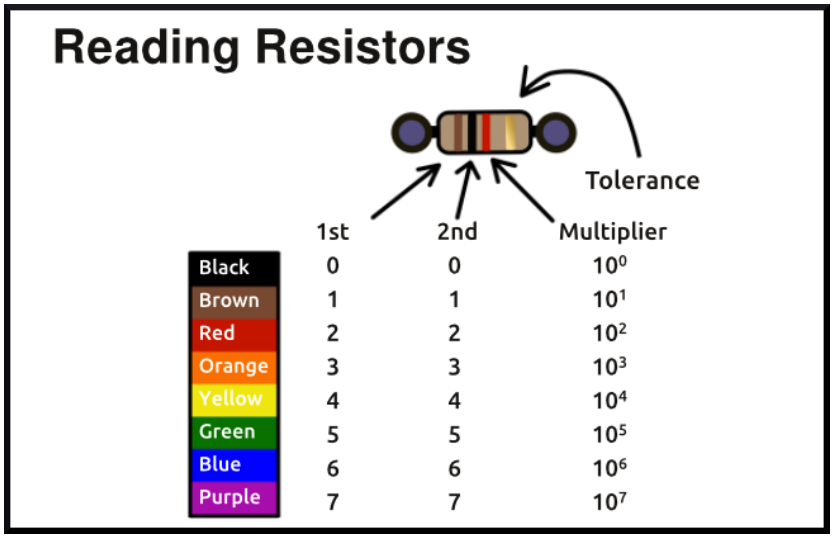


Figure 3. Resistance Color Code.

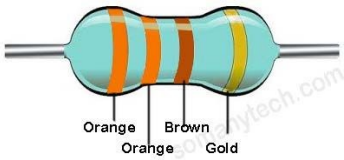


Fig. showing color code of 330 ohm resistor

330-ohm resistor color code for 4-band is calculated as:

- (1st digit) = Orange = 3
- (2nd digit) = Orange = 3
- (multiplier) = Brown = 1 = 10^1 = 10
- (tolerance) = Gold= ±5%
- 33×10±5% –> 330±5% ohms –> 330±5% Ω

The real value of the 330 Ω resistor is between 313.5 Ω to 346.5 Ω

- **Step 4: LED Circuit**
  - As shown in Figure 4, The LED has two pins, Cathode and Anode.
  - Connect the LED cathode to 0 V on the breadboard, as shown in Figure 4.

- Connect the LED anode to one terminal of the 330-ohm resistor, as shown in Figure 4.
- Connect the other terminal of the 330-ohm resistor to the 5v on the breadboard, as shown in Figure 4. You can see the LED is ON.
- Now, connect the other terminal of the 330-ohm resistor to the 0v on the breadboard, rather than the 5v line. You can see the LED is OFF.

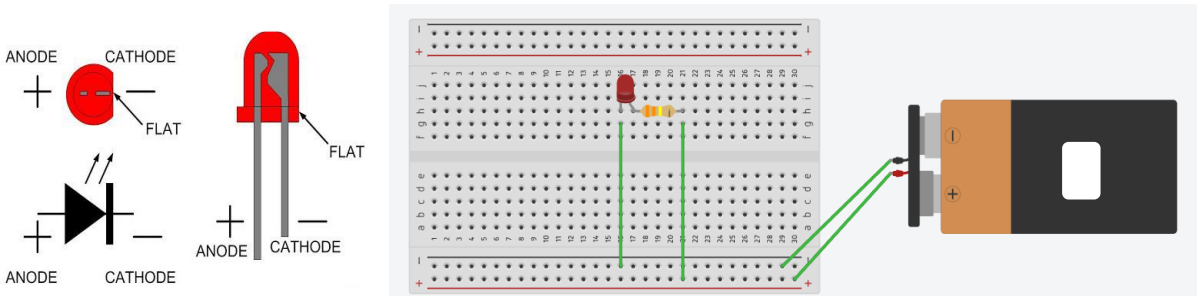


Figure 4. Turn on LED on the breadboard.