

# ELC 2137 Lab 2: Transistor Logic Gates

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## Summary

This lab introduced the idea of logic gates and transistors, which act like switches. Basic circuits, including a two pushbutton AND gate circuit, an inverter circuit, and a NOR gate circuit, were constructed to become familiar with gates and how they work. To further aid comprehension, current paths were drawn on instructor-given circuits. Said circuits are found in Figure 1 and Figure 2. After mastering these basic skills, a final gate was constructed by combining two inverters and the previously made NOR gate. This combination of gates produced an AND gate, and the truth table describing it can be found in Table 1.

## Q&A

1. What logic operation does the final gate implement?

The final gate applies the AND operation.

## Results

In Table 1, A and B refer to switches in the Final Gate circuit found in Figure 2. C refers to the LED light in this circuit.

Table 1: Truth Table for the Final Gate

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

When the switch in the Inverter circuit in Figure 1 is on, current flows to ground and not through the LED light, so the light remains off. If the switch were to be turned off, current would flow through the light, turning it on.

## Circuit Demonstration Page

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Carlos Hernandez

### Instructor Initials

Pushbutton <sup>And</sup> "Or Gate"

[Signature]

Transistor Not gate

[Signature]

Transistor Nor gate

[Signature]

Transistor unknown gate

[Signature]

### Diagrams

On each of the circuits below, draw the current paths and note whether each switch, transistor, and LED is ON or OFF.

Inverter:

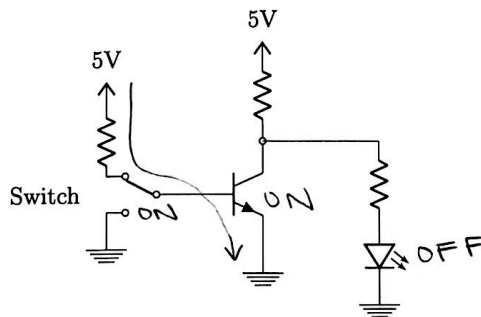
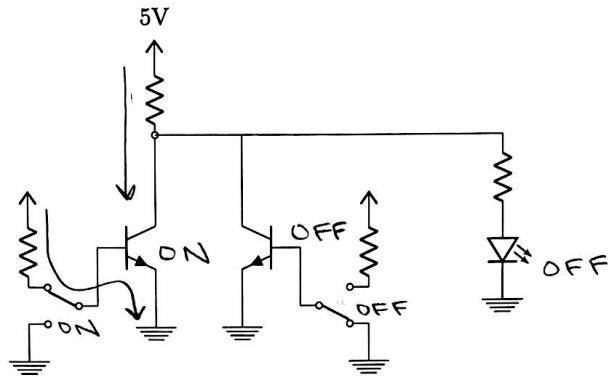


Figure 1: In-Class Circuit Demonstration Page 1

NOR:



Final gate:

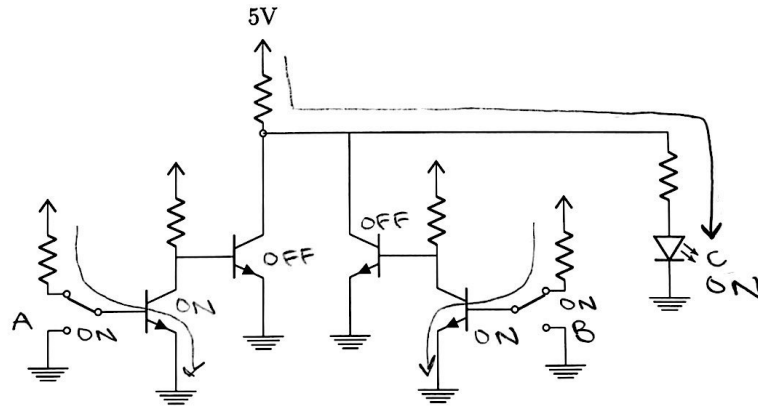


Figure 2: In-Class Circuit Demonstration Page 2

When one switch in the NOR gate circuit in Figure 2 is on, current flows to ground and not through the LED light, so the light remains off. If the switch were to be turned off, current would flow through the light, turning it on. Turning both switches on would also prevent current from flowing through the light, keeping the light turned off. Only if both switches were off would current flow through the light, turning it on.

When both switches in the Final Gate circuit in Figure 2 are on, current flows through the LED light, turning it on. If one or both switches were to be turned off, current would flow to ground and not through the light, turning the light off. The light would only be on if both switches were on. This is an example of an AND operation and is modeled by Table 1.