PLTW Engineering

10-12/Reading Electrical Schematics

4/14/2020

10-12/DE

Lesson: **4/14/2020**

Objective/Learning Target: Students will be able to recognize and apply correct schematic symbols for electrical drawings

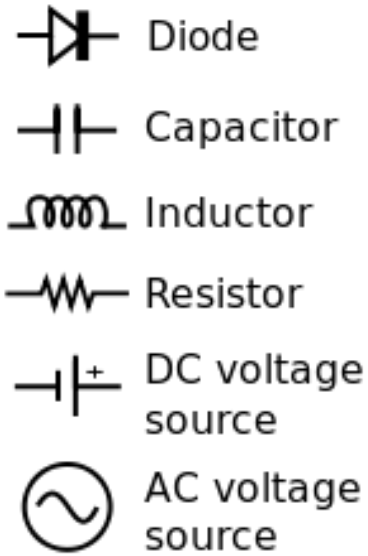
Symbols and what they mean

There are many different electrical symbols engineers and designers use to create blueprints for electrical circuits.

We need to be able to recognize the most common symbols and know what they mean.

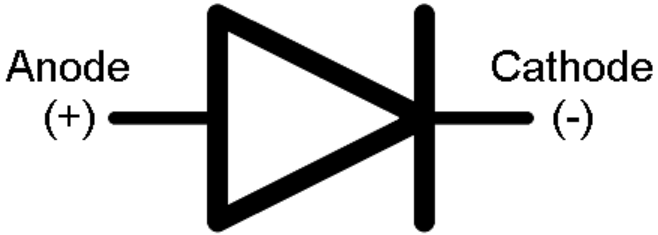
Symbols and what they mean

The first group we will look at are analog symbols:



Analog symbols

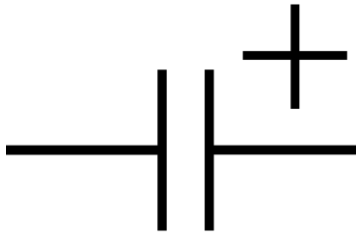
Diode



The diode allows current to flow in one direction but not backwards.

Analog symbols

Capacitor



The capacitor stores electrical energy to be later discharged.

Analog symbols

Inductor

An inductor is sometimes referred to as a coil or choke. It stores energy in a magnetic field.

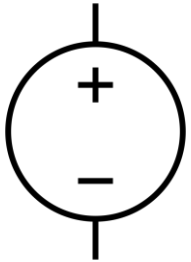
Analog symbols

Resistor

An resistor does just that – it resists current flow. It can also adjust signal levels, divide voltages, and bias active components.

Analog symbols

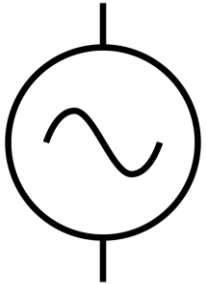
DC Voltage Source
(Direct Current)



A DC voltage source is one that supplies and maintains a fixed output power level. An example would be a battery.

Analog symbols

AC Voltage Source
(Alternating Current)



An AC voltage source is one that periodically changes polarity/direction between positive and negative.

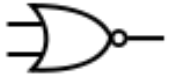
Digital Symbols

Next, we will look at digital symbols:


And gate


Nand gate


Or gate

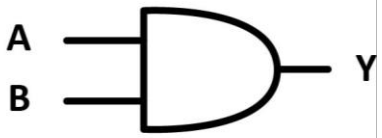

Nor gate


Xor gate


Inverter
(Not gate)

Digital Symbols

And gate



AND

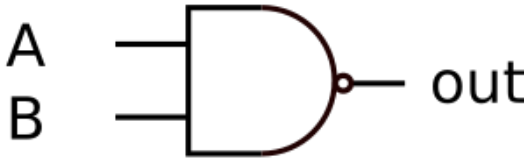
Inputs		Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Truth Table

The And gate is a digital gate with 2 inputs and one output. It behaves in accordance to the truth table at the right.

Digital Symbols

Nand gate



NAND:

A	B	out
0	0	1
0	1	1
1	0	1
1	1	0

The Nand gate is a digital gate with 2 inputs and one output. It behaves in accordance to the truth table at the right.

Digital Symbols

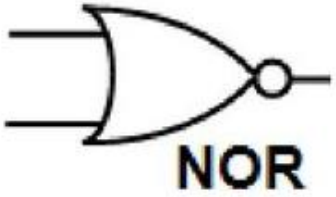
Or gate

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

The Or gate is a digital gate with 2 inputs and one output. It behaves in accordance to the truth table at the right.

Digital Symbols

Nor gate

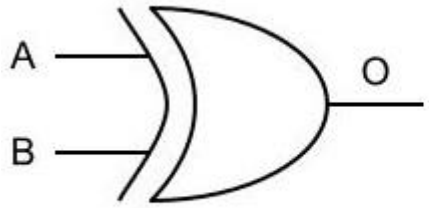


Inputs		Output
A	B	F
0	0	1
1	0	0
0	1	0
1	1	0

The Nor gate is a digital gate with 2 inputs and one output. It behaves in accordance to the truth table at the right.

Digital Symbols

Xor gate



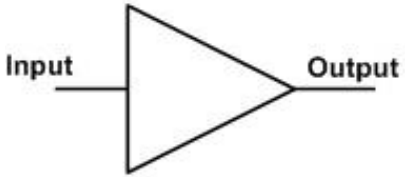
A	B	O
0	0	0
0	1	1
1	0	1
1	1	0

The Xor gate is a digital gate with 2 inputs and one output. It behaves in accordance to the truth table at the right.

Digital Symbols

Inverter gate

Symbol

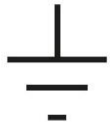


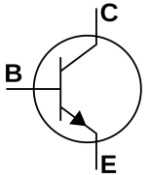
Truth Table

Input	Output
0	0
1	1

The Inverter gate is a digital gate with 1 input and 1 output. It behaves in accordance to the truth table at the right.

Additional symbols

Ground  The ground serves as a return path for current

Transistor 

The transistor is used to amplify or switch power signals

LED  The light emitting diode is a low voltage bright light bulb

7 segment display 

The seven segment display is a group of LEDS that can display a number.

Example electronic schematic

Take a look at the example circuit below and identify as many symbols as possible:

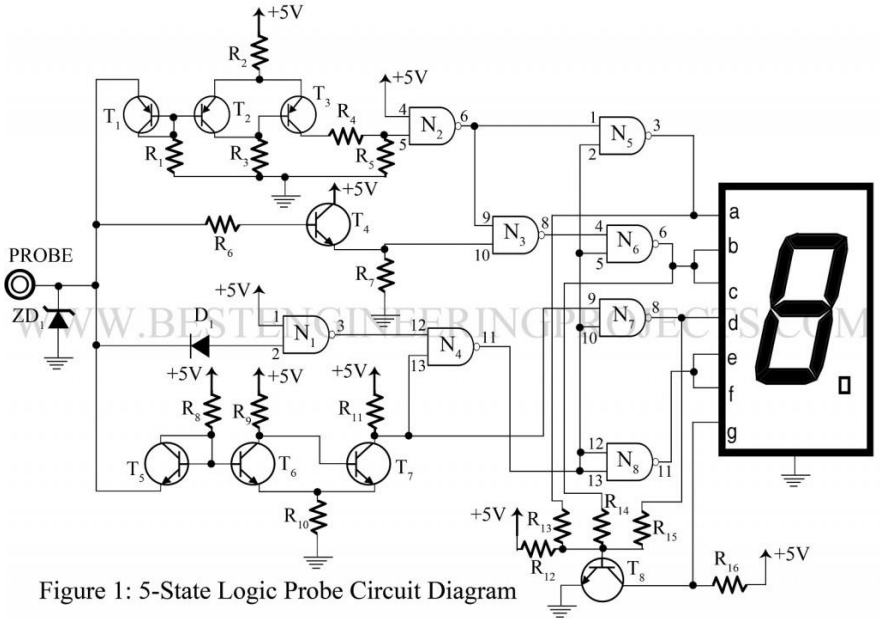


Figure 1: 5-State Logic Probe Circuit Diagram

Helpful Links

Electronics Hub guide to schematics

Sparkfun guide to reading electrical shematics