

Basic Mechatronics Workshop

Module 3: Introduction to PLC

Lecture-7

Logic Introduction, (YES and NOT, AND, OR)

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Logic Introduction, (YES and NOT, AND, OR)

Objectives

Upon completion of this chapter, Student should be able to

- ✓ Discuss similarities between digital logic circuits and relay logic circuits.
- ✓ Discuss different types of digital logic circuits.
- ✓ Recognize gate symbols used for computer logic circuits.
- ✓ Recognize gate symbols used for NEMA logic circuits.
- ✓ Complete a truth table for the basic gates.

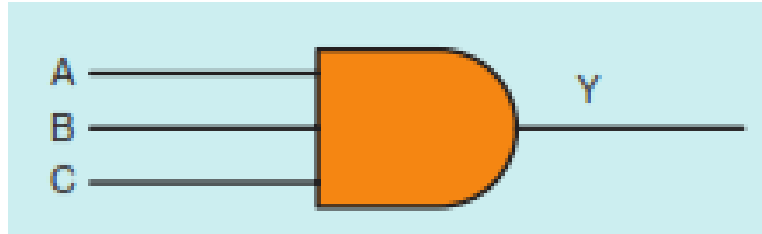
Logic Introduction

Although relays are digital devices, the term digital logic has come to mean circuits that use solid-state control devices known as gates. There are five basic types of gates: the AND, OR, NOR, NAND, and INVERTER.

The AND Gate

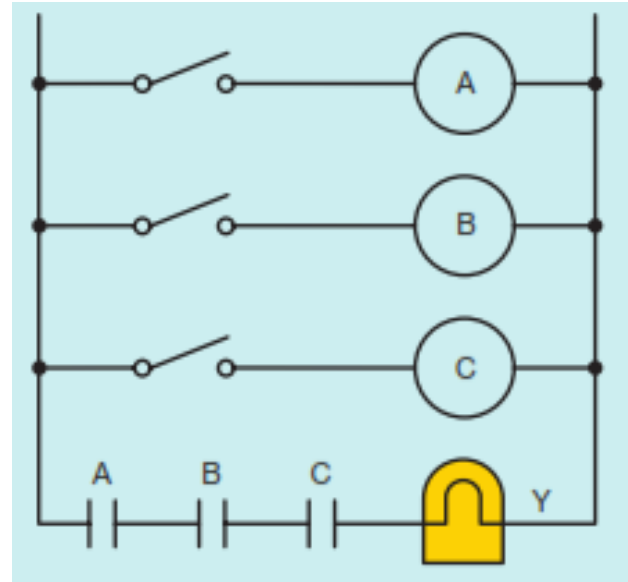
Figure 7-1

(a)



symbol for an AND gate

(b)



Relay equivalent circuit for a three-input AND gate

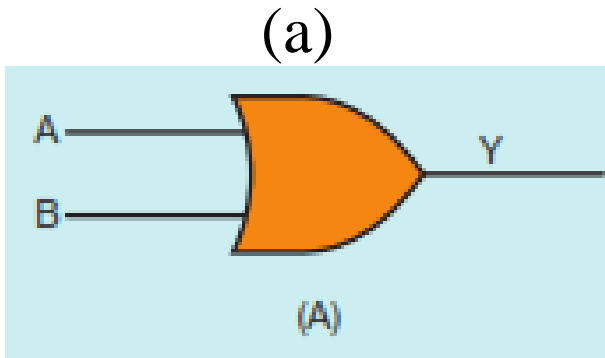
(c)

| A | B | C | Y |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

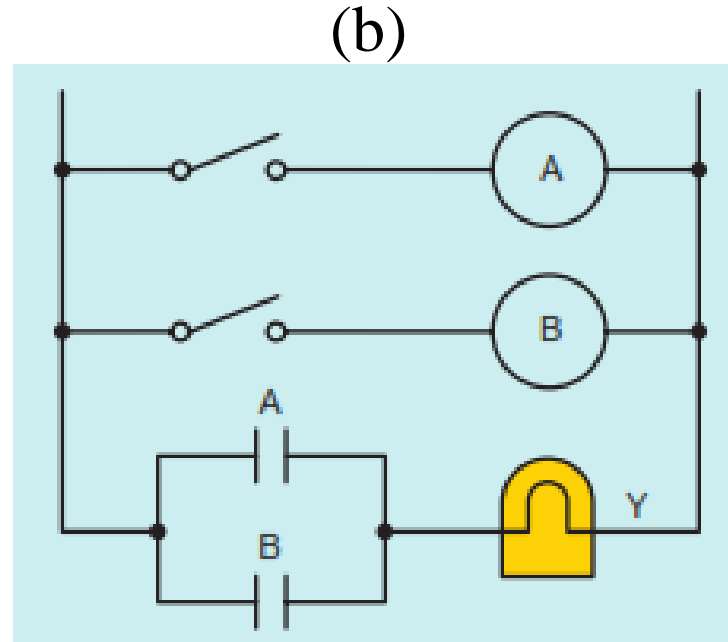
Truth table for a three-input AND gate.

The OR Gate

Figure 7-2



symbol for an OR gate



Relay equivalent circuit for a OR gate

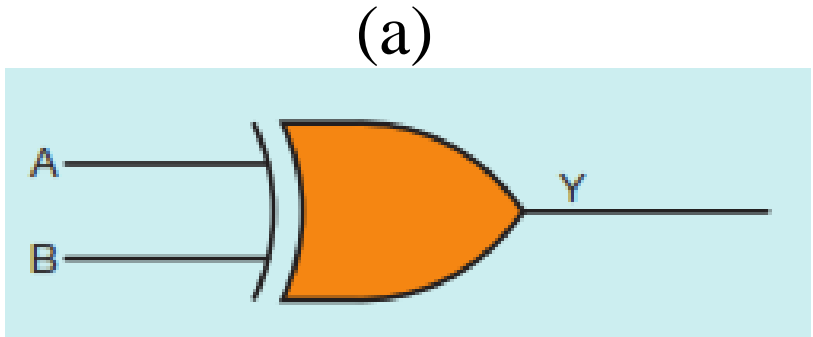
(c)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

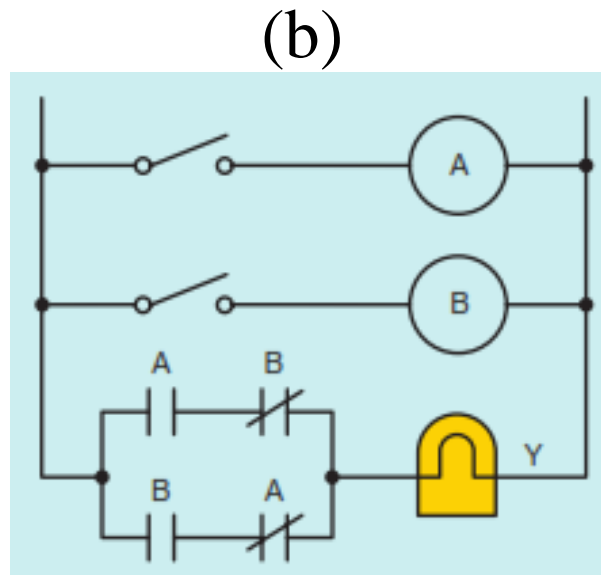
Truth table for a two-input OR gate.

EXCLUSIVE OR

Figure 7-3



Computer logic symbol for an EXCLUSIVE OR gate.



Relay equivalent circuit for a OR gate

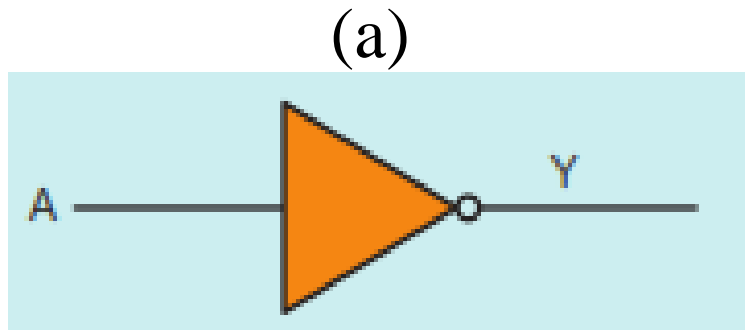
(c)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

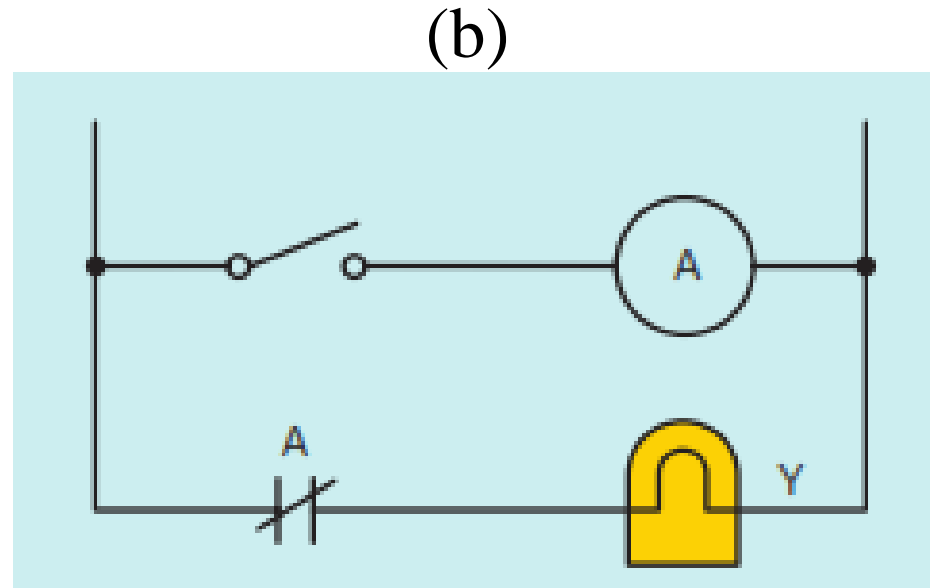
Truth table for an EXCLUSIVE OR gate.

The *INVERTER*

Figure 7-4



Computer logic symbol for an INVERTER;



Relay equivalent circuit for an INVERTER gate

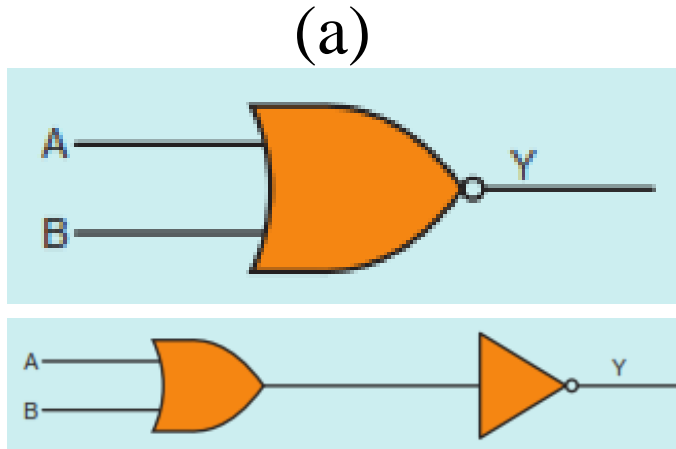
(c)

| A | Y |
|---|---|
| 0 | 1 |
| 1 | 0 |

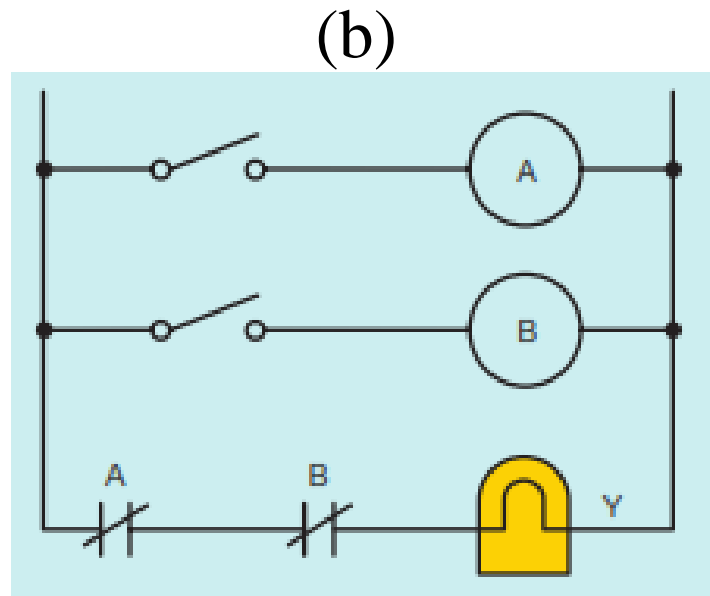
Truth table for an INVERTER.

The NOR Gate

Figure 7-5



Computer symbol for a two-input NOR gate;



Relay equivalent circuit for a NOR gate

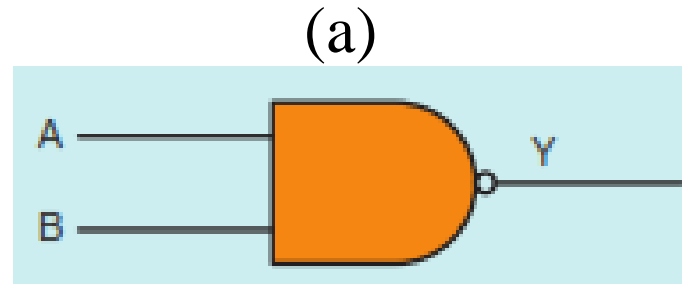
(c)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

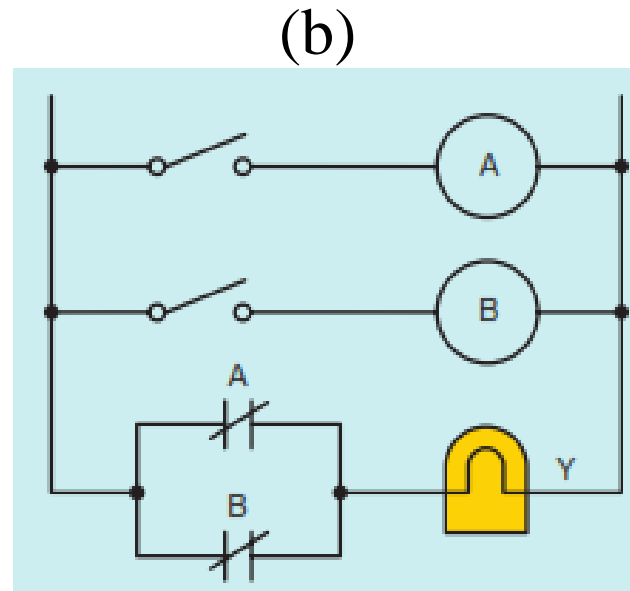
Truth table for a two-input NOR gate.

The NAND Gate

Figure 7-6



Computer logic symbol for a two-input NAND gate



equivalent relay circuit for a two-input NAND gate.

(c)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Truth table for a two-input NAND gate.