

PLCs & Ladder Logic

Introduction and examples



VCU

College of Engineering

Programmable Logic Controller (PLC)

- Industrial digital computer





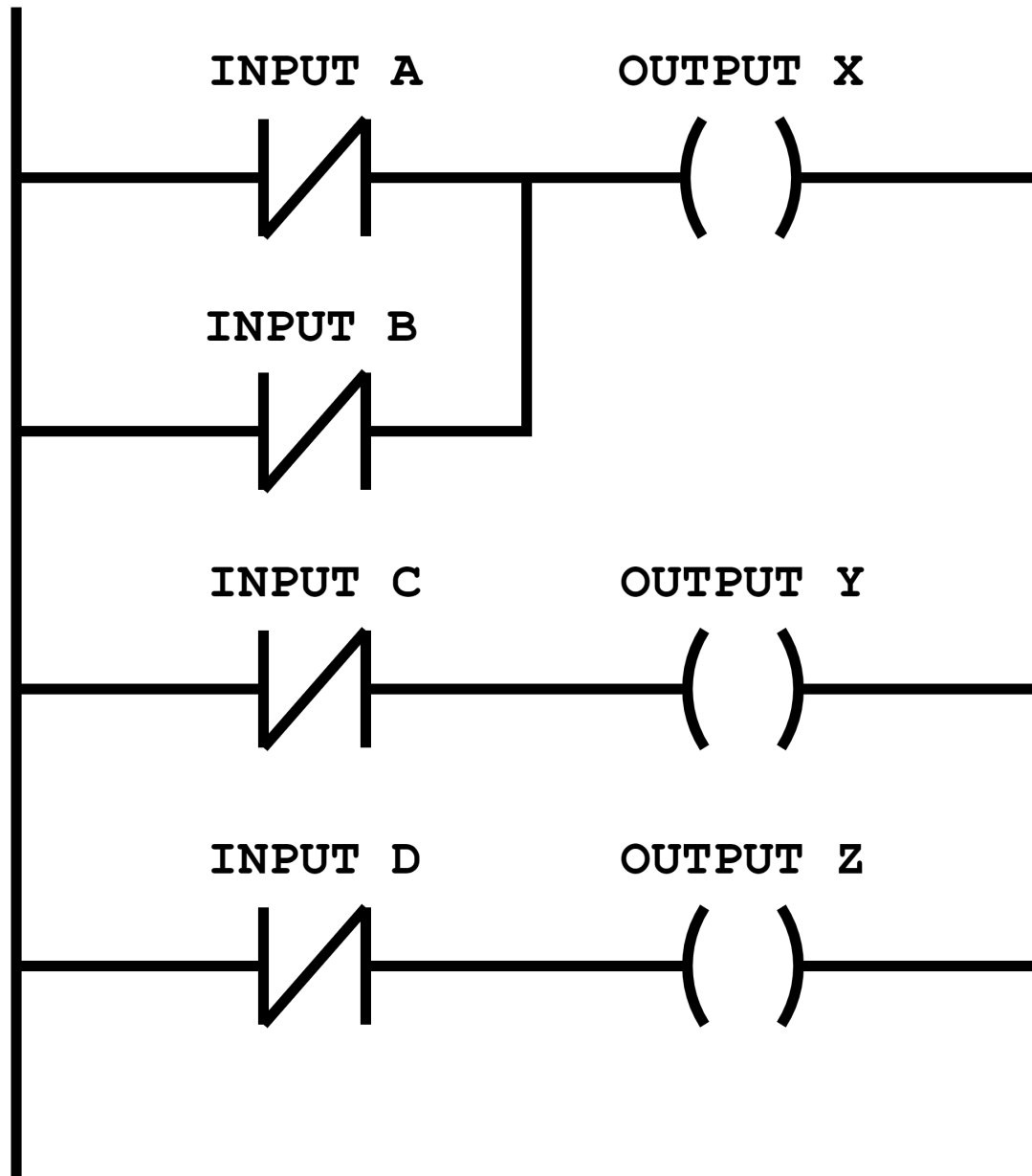
Programmable Logic Controller (PLC)

- Industrial digital computer
- Provides control solutions for industrial environments



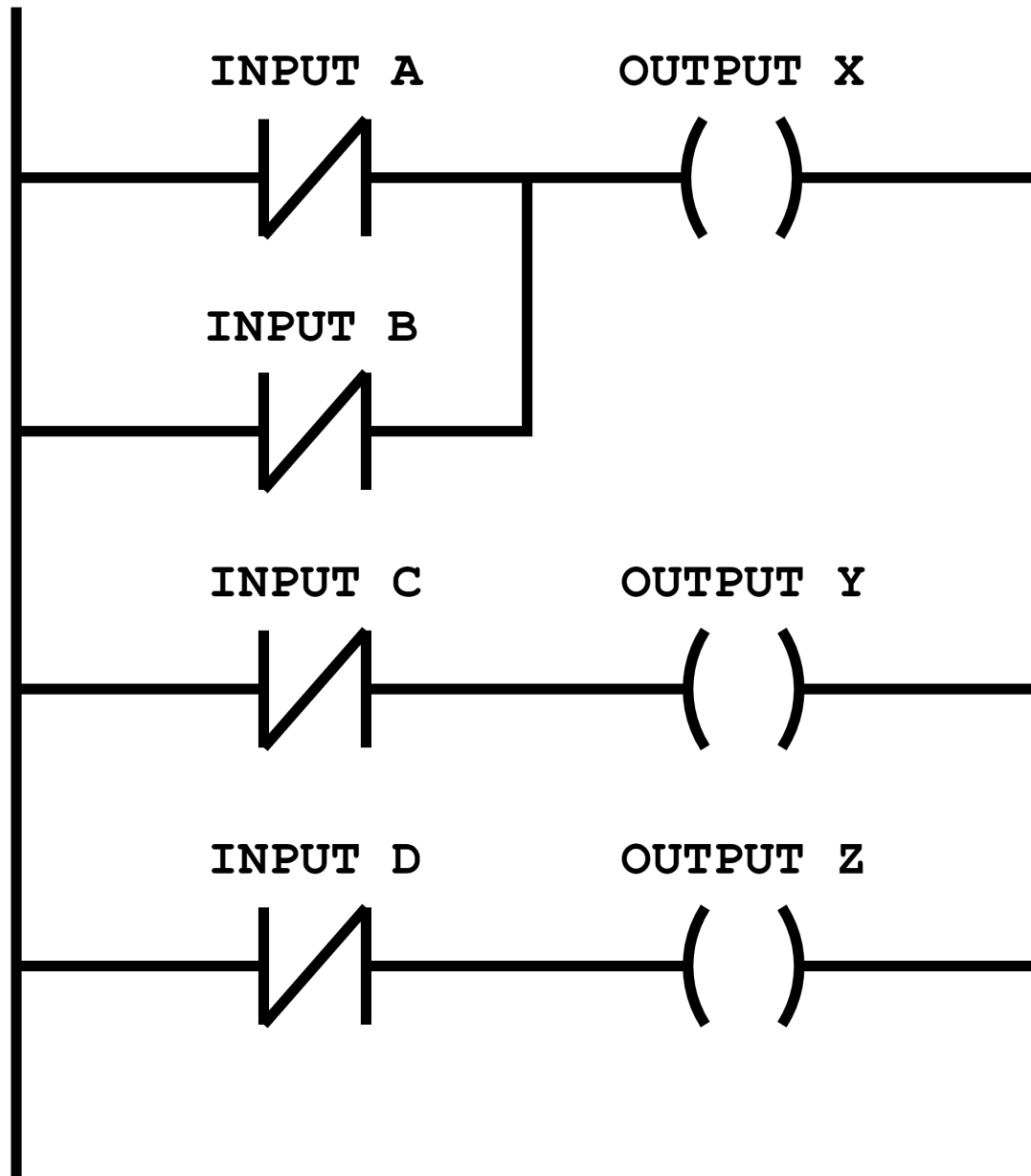
Programmable Logic Controller (PLC)

- Industrial digital computer
- Provides control solutions for industrial environments
- Designed to be operated by engineers with limited knowledge of computers and programming languages



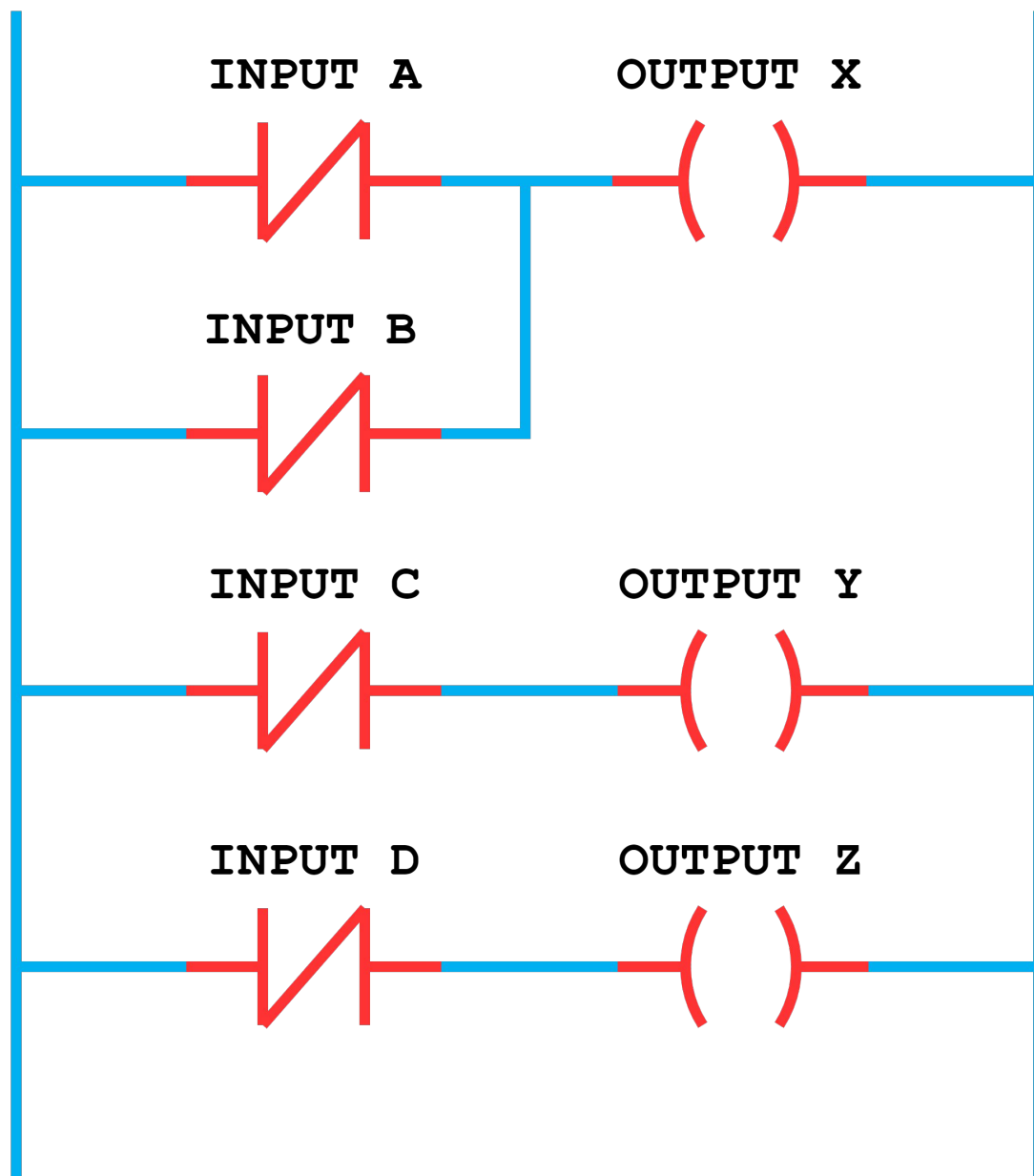
Ladder Logic

- Graphical language used to write machine code for PLCs



Ladder Logic

- Graphical language used to write machine code for PLCs
- Every software is built using diagrams



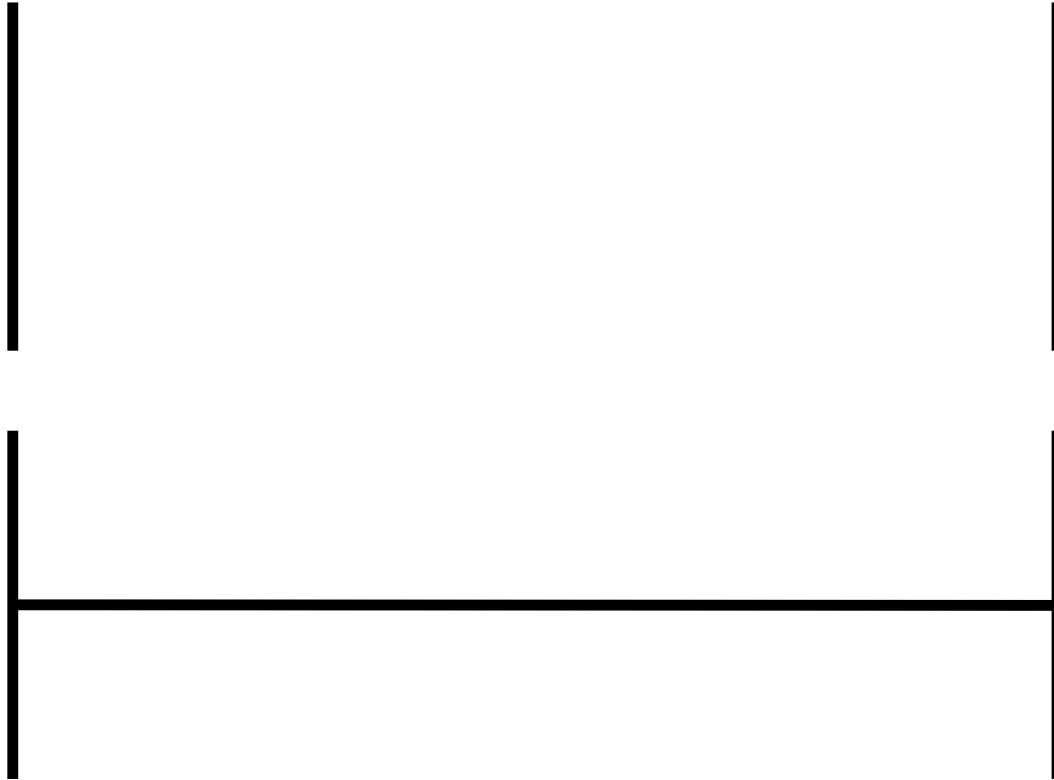
Ladder Logic

- Graphical language used to write machine code for PLCs
- Every software is built using diagrams
- Every diagram is made up of **symbols**, representing input and output elements, and **lines**, which connect and organize these symbols logically into the diagrams



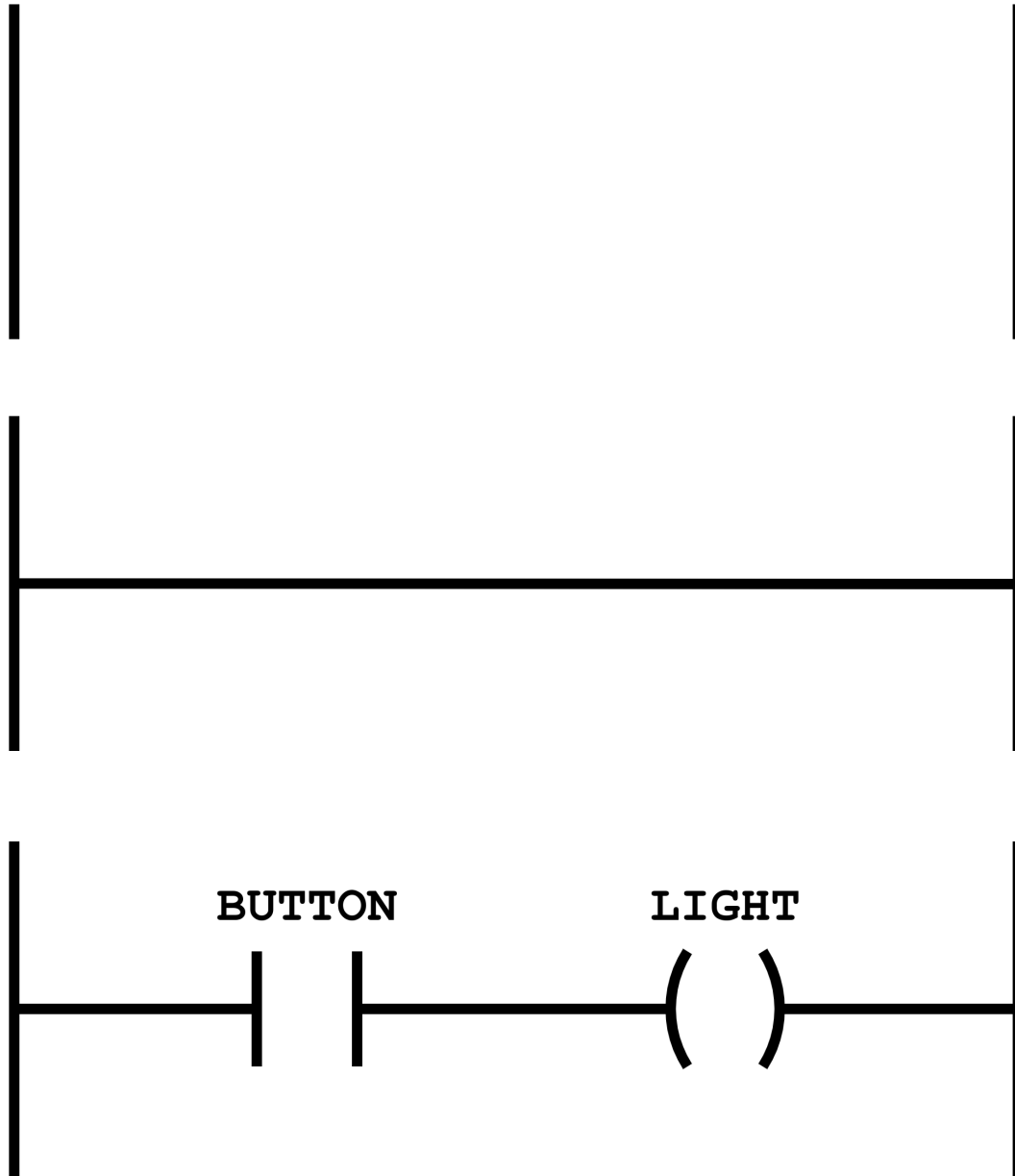
Building a diagram

- A diagram starts with two vertical lines called power rails, between which circuits are connected



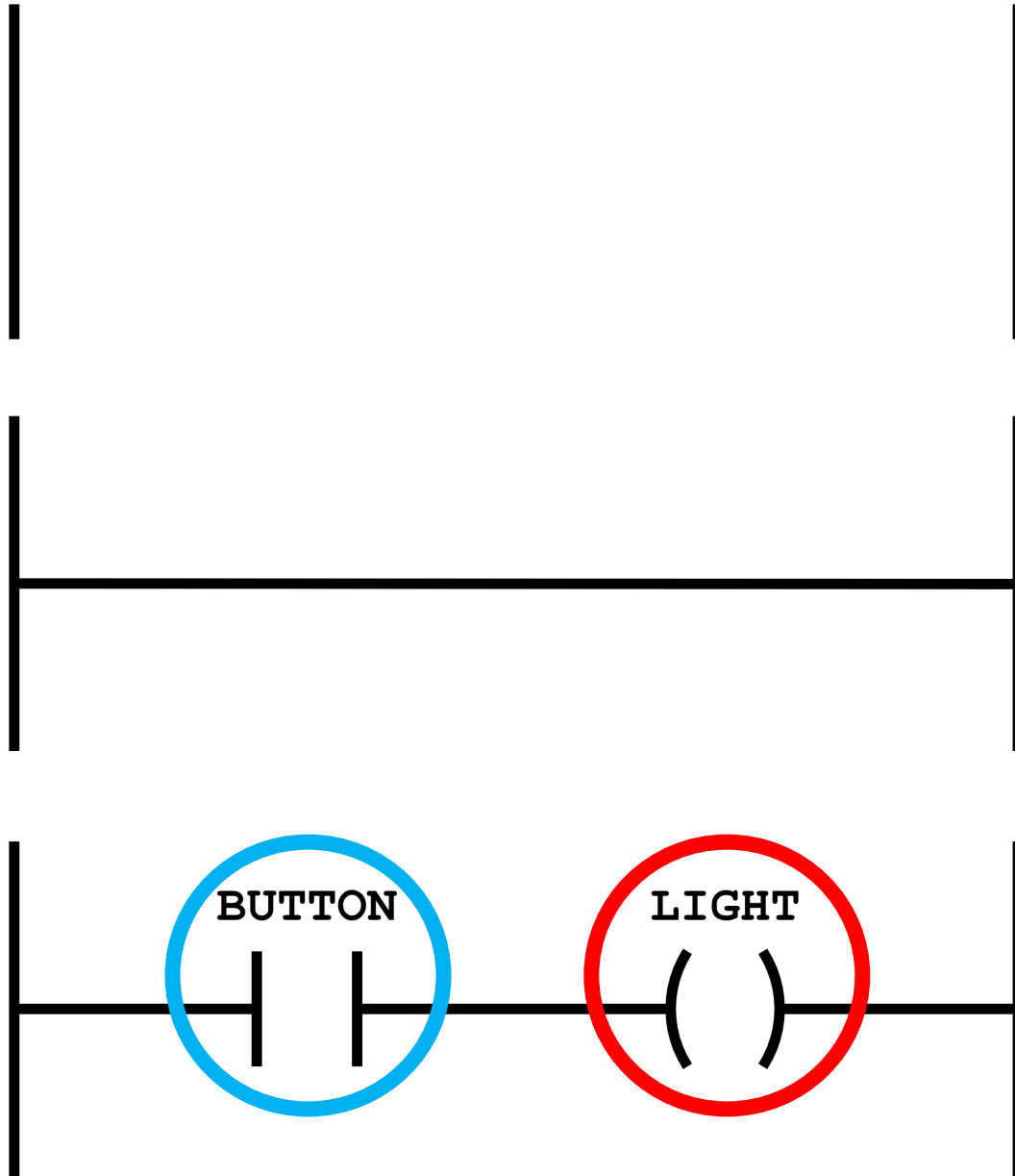
Building a diagram

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Building a diagram

- A diagram starts with two vertical lines called power rails, between which circuits are connected
- One or more horizontal lines (rungs) are added connecting the two power rails
- Input and output symbols are placed on the rungs and identified by descriptive labels



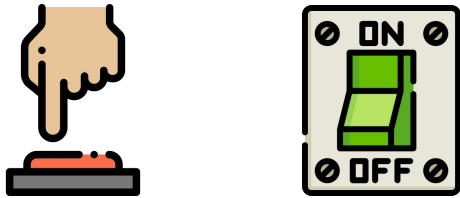
Building a diagram

- A diagram starts with two

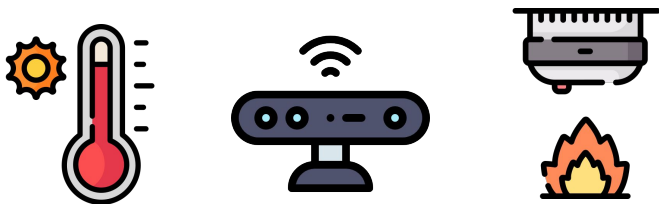
Every rung starts with one or more **input symbols** and ends with one **output symbol**

placed on the rungs and identified by descriptive labels

Examples of inputs

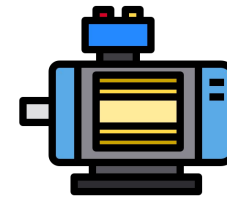


Switches

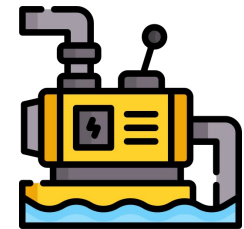


Sensors

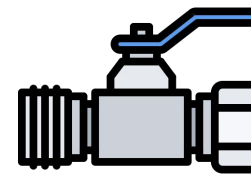
Examples of outputs



Motors



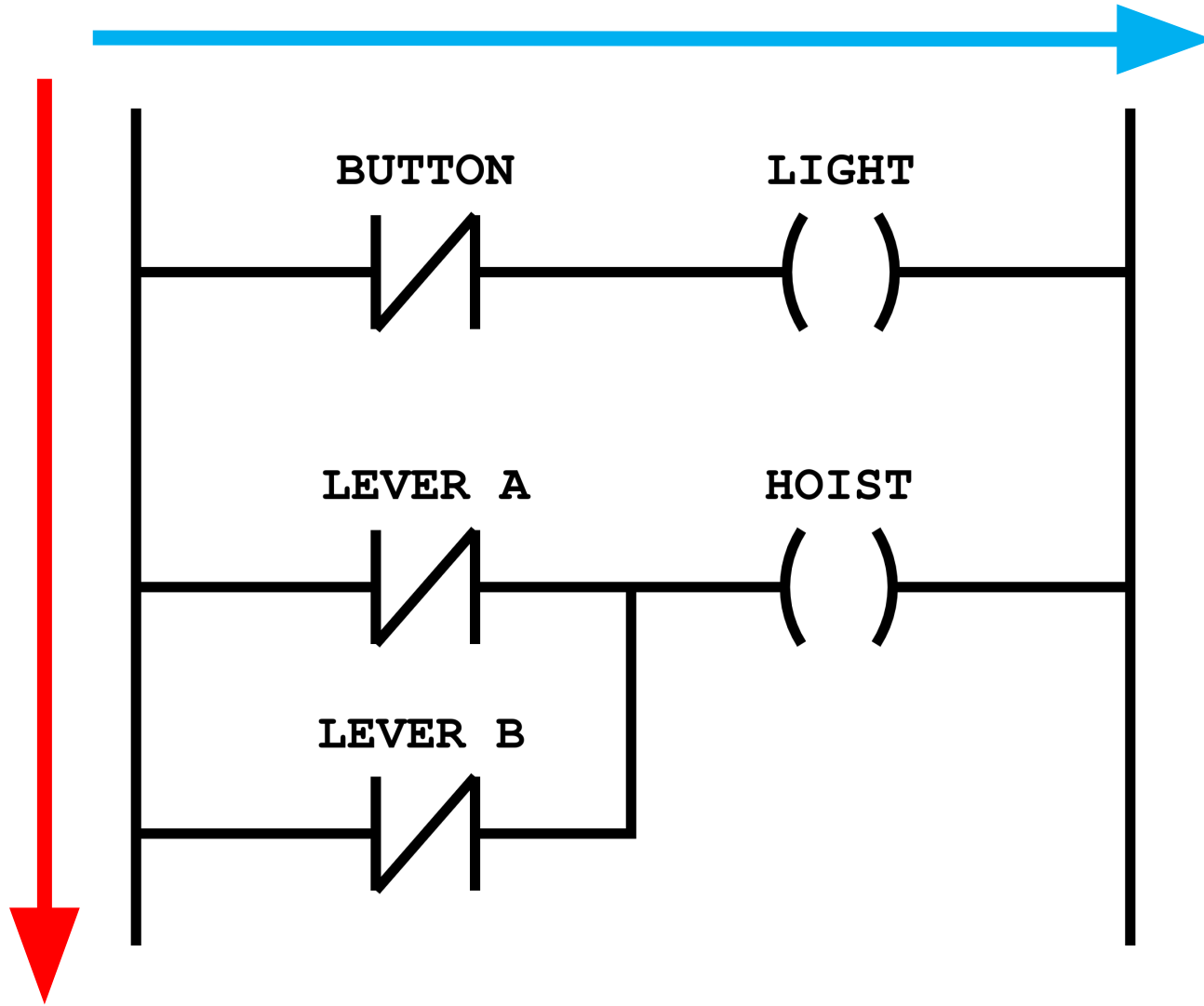
Pumps



Valves

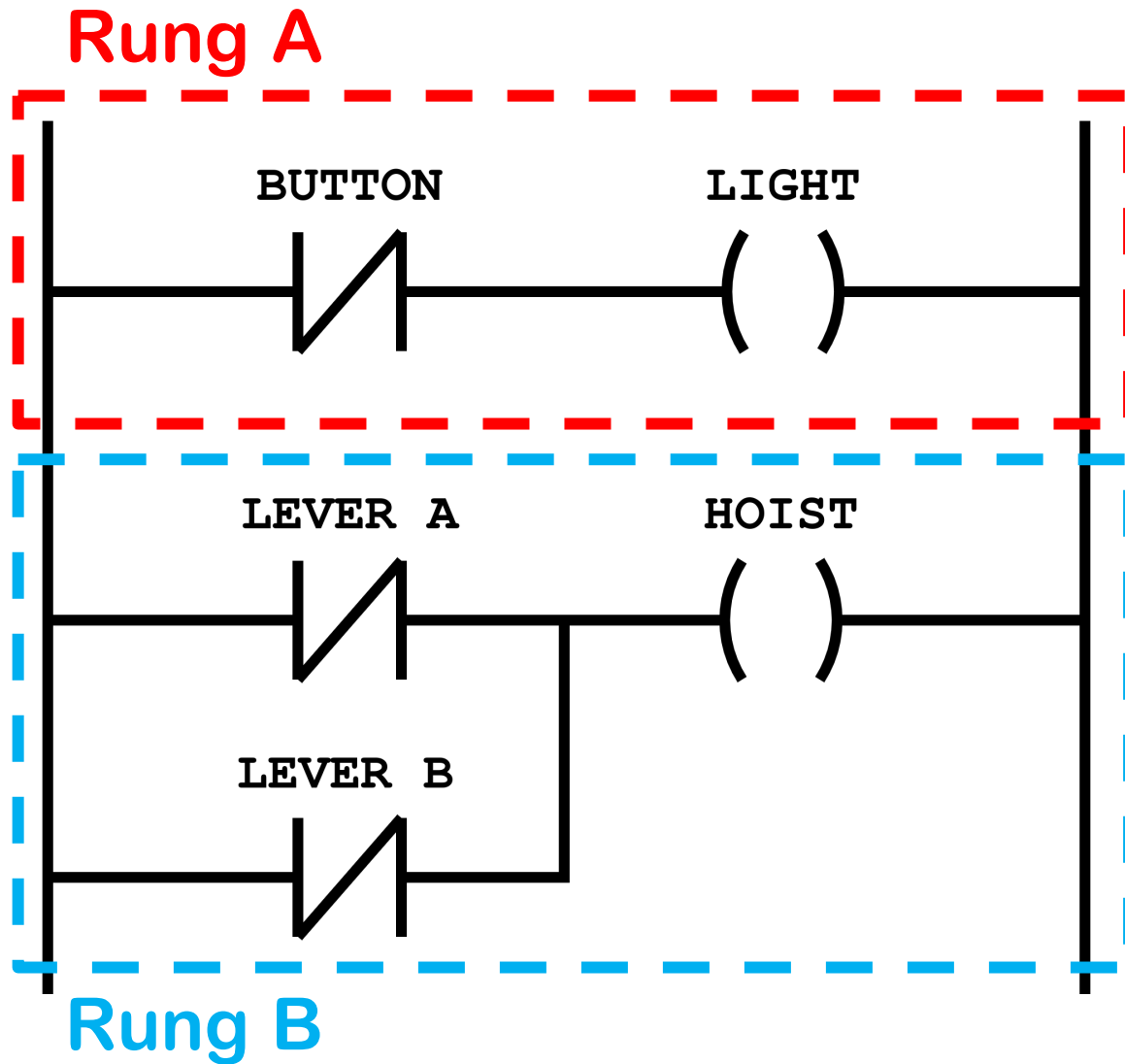


Lights



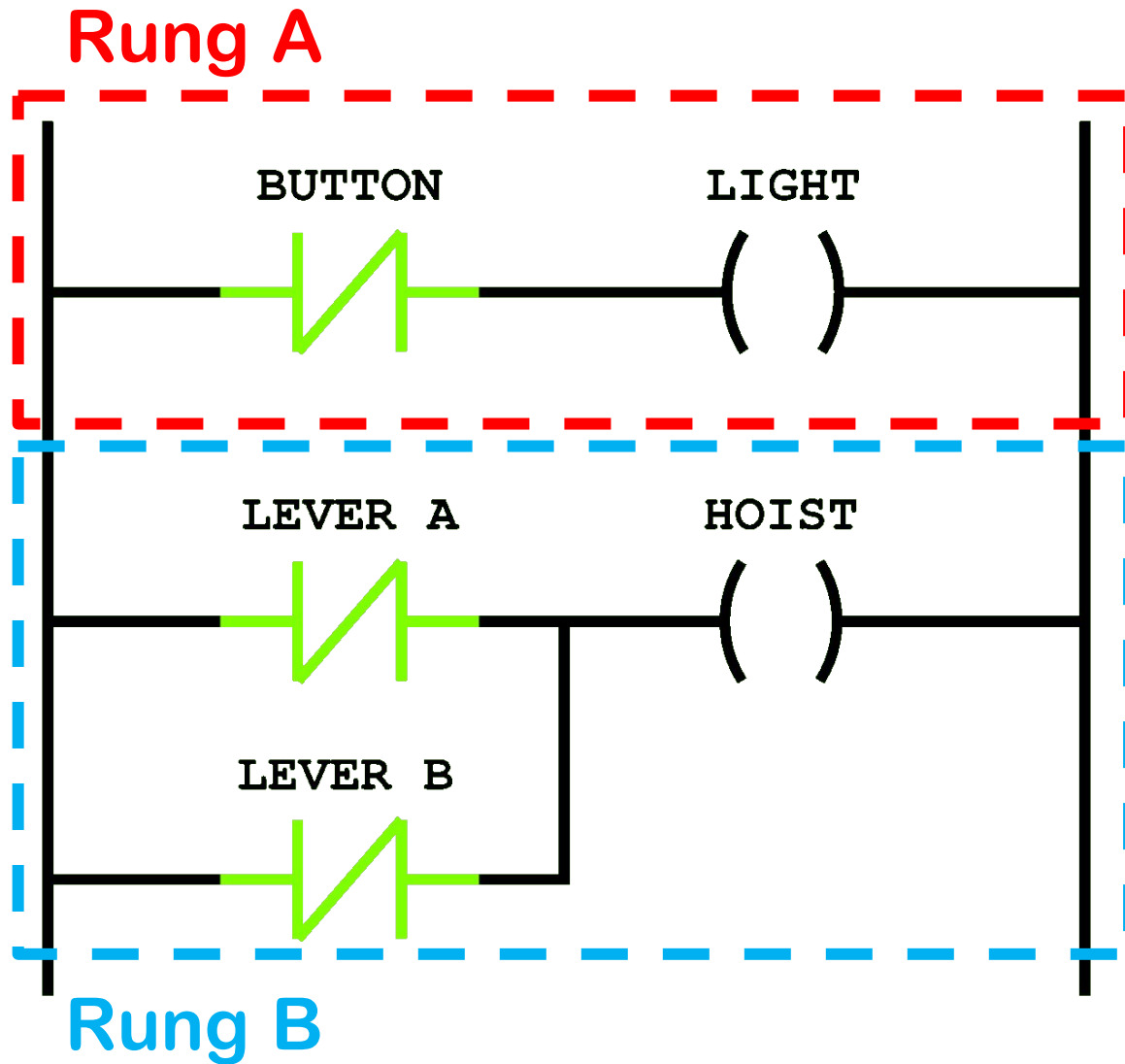
Understanding a diagram

- A diagram in Ladder Logic is always read from left to right and from top to bottom



Understanding a diagram

- A diagram in Ladder Logic is always read from left to right and from top to bottom
- Each rung on a diagram defines one operation in the control process

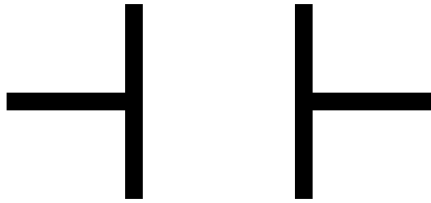


Understanding a diagram

- A diagram in Ladder Logic is always read from left to right and from top to bottom
- Each rung on a diagram defines one operation in the control process
- When a diagram is executed, the power flow cycles through the rungs following the same criteria as the reading

Symbols

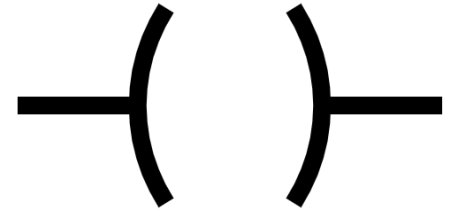
NORMALLY
OPEN CONTACT



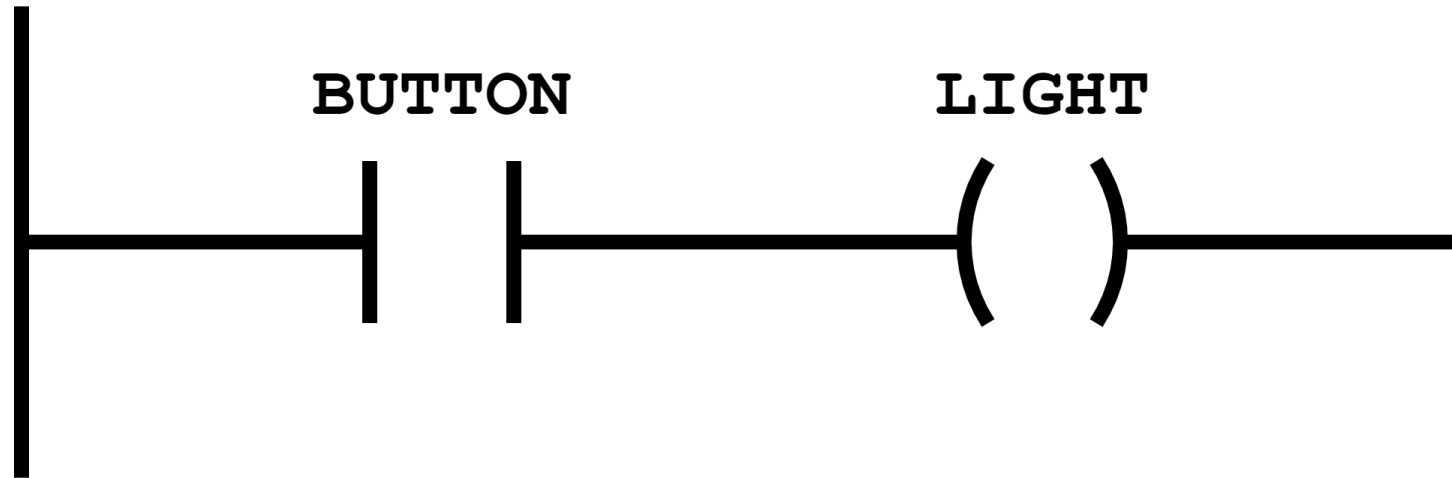
NORMALLY
CLOSED CONTACT



COIL

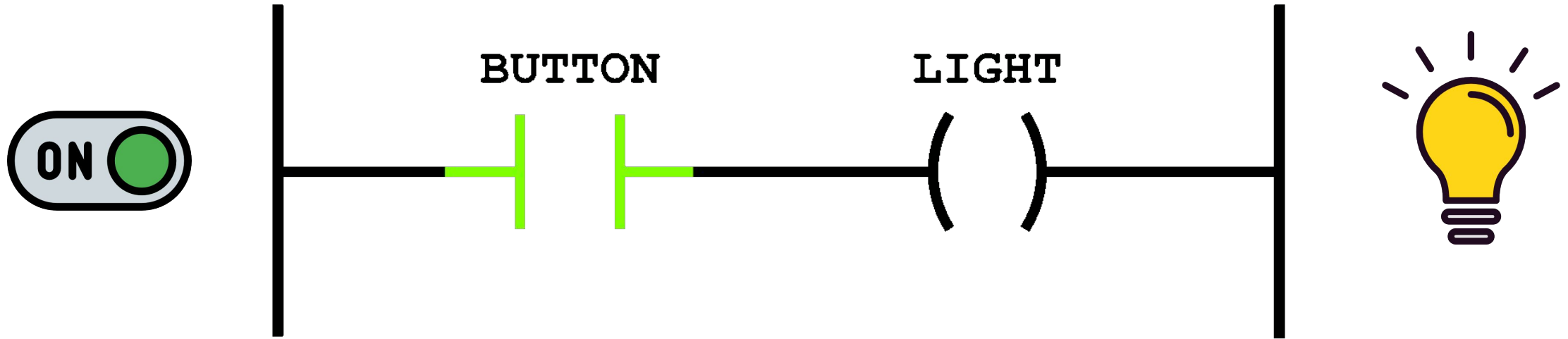


Simple Example



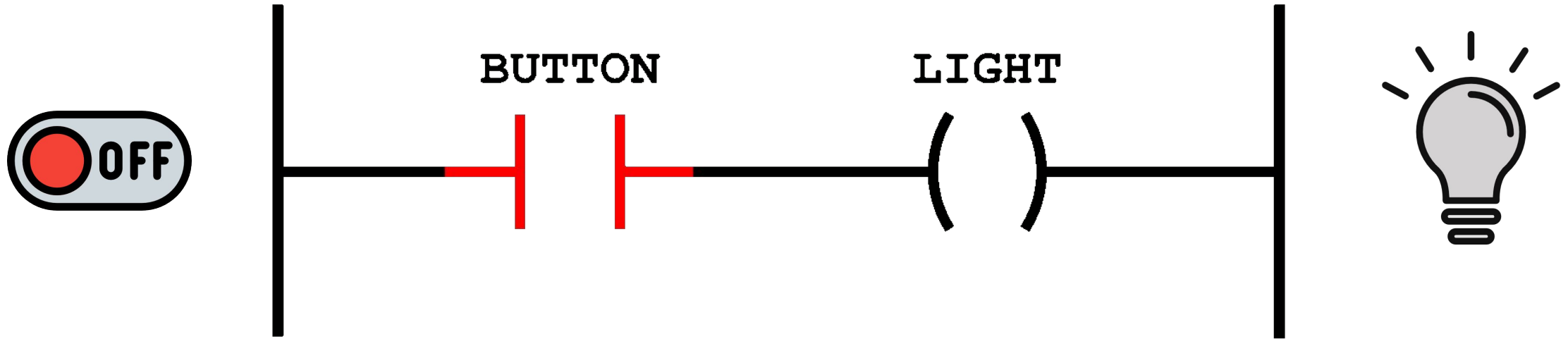
BUTTON	LIGHT
true	true
false	false

Simple Example



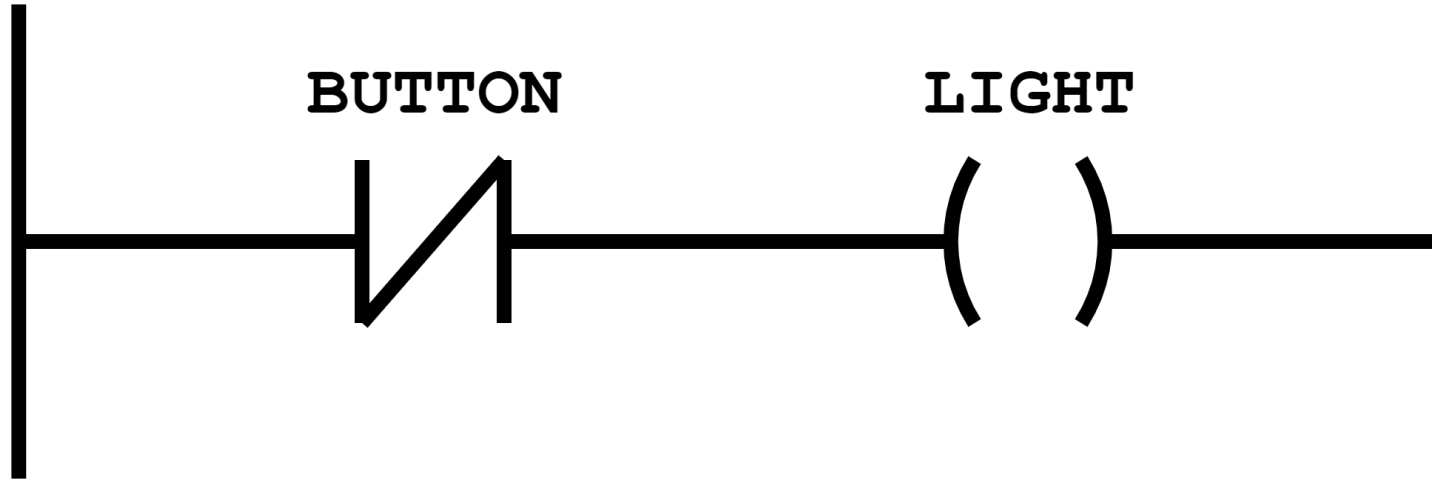
BUTTON	LIGHT
true	true
false	false

Simple Example



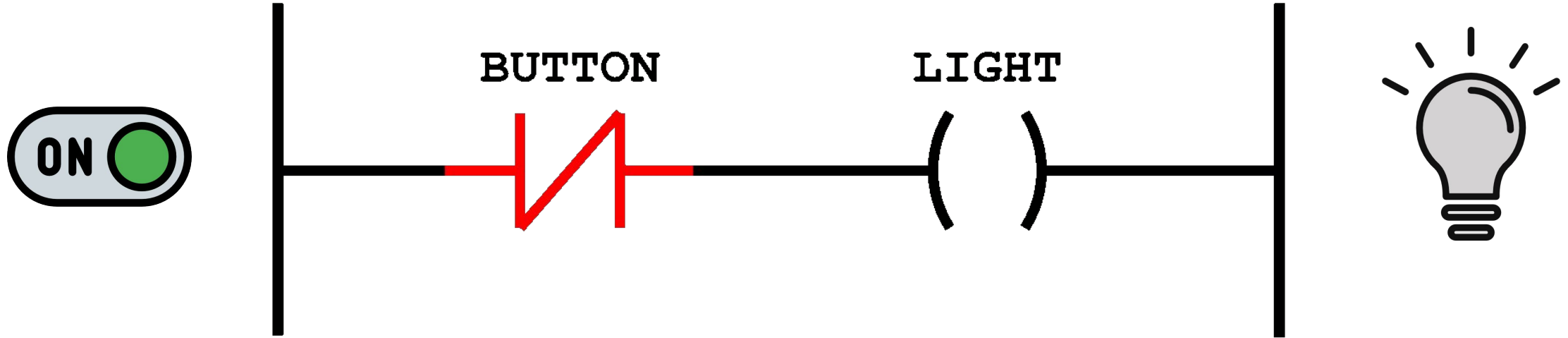
BUTTON	LIGHT
true	true
false	false

NOT Example



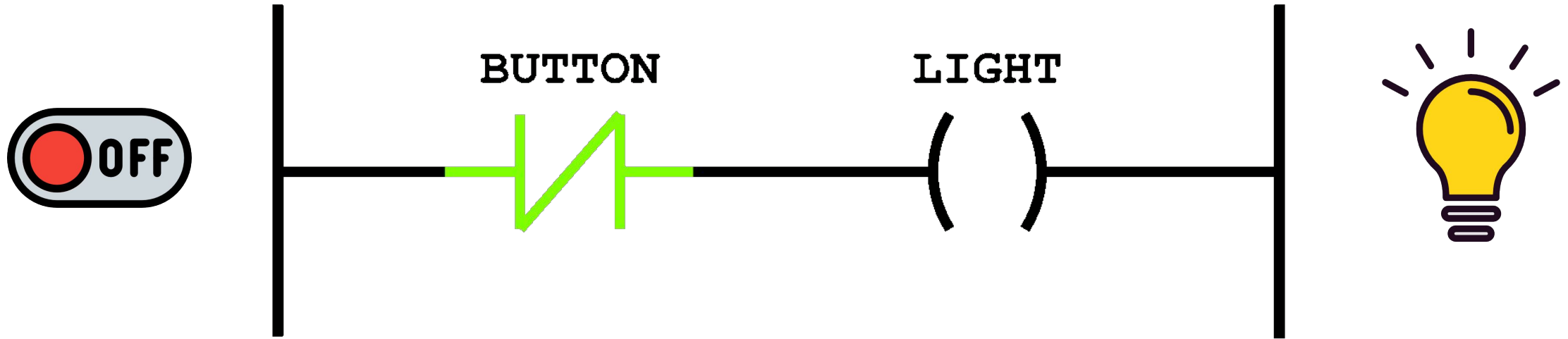
BUTTON	LIGHT
true	false
false	true

NOT Example



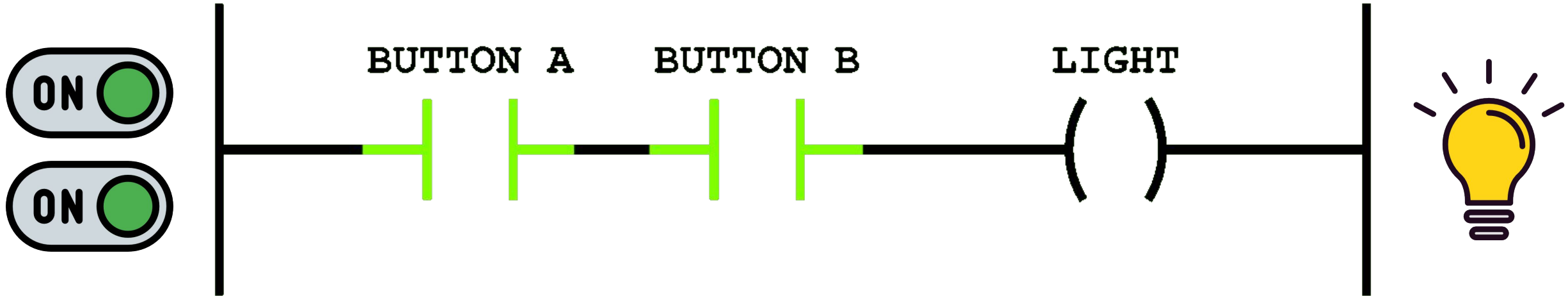
BUTTON	LIGHT
true	false
false	true

NOT Example



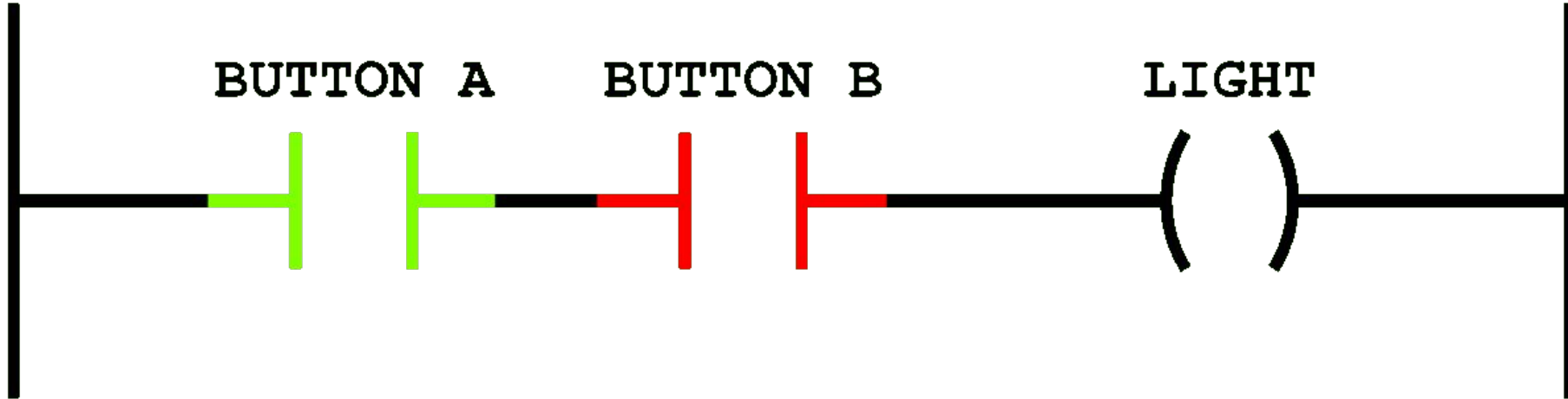
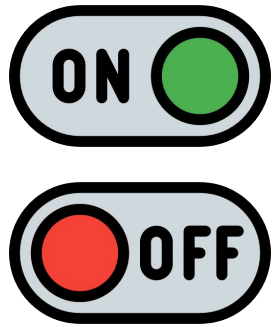
BUTTON	LIGHT
true	false
false	true

AND Example



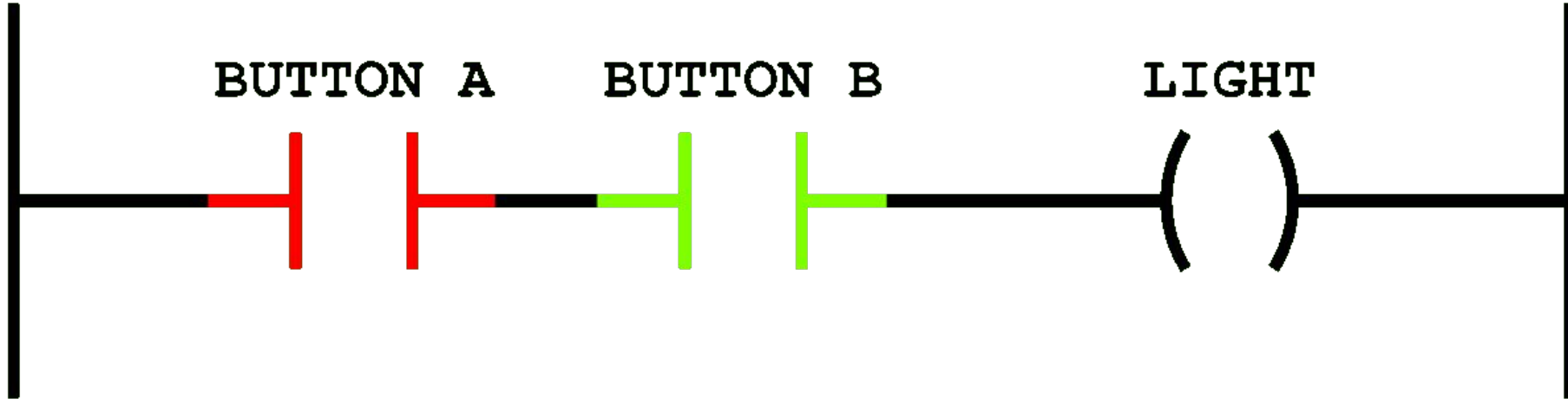
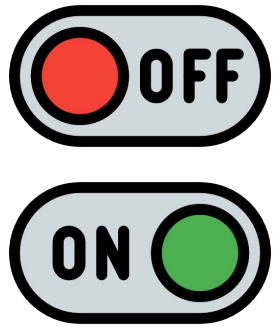
BUTTON A	BUTTON B	LIGHT
true	true	true
true	false	false
false	true	false
false	false	false

AND Example



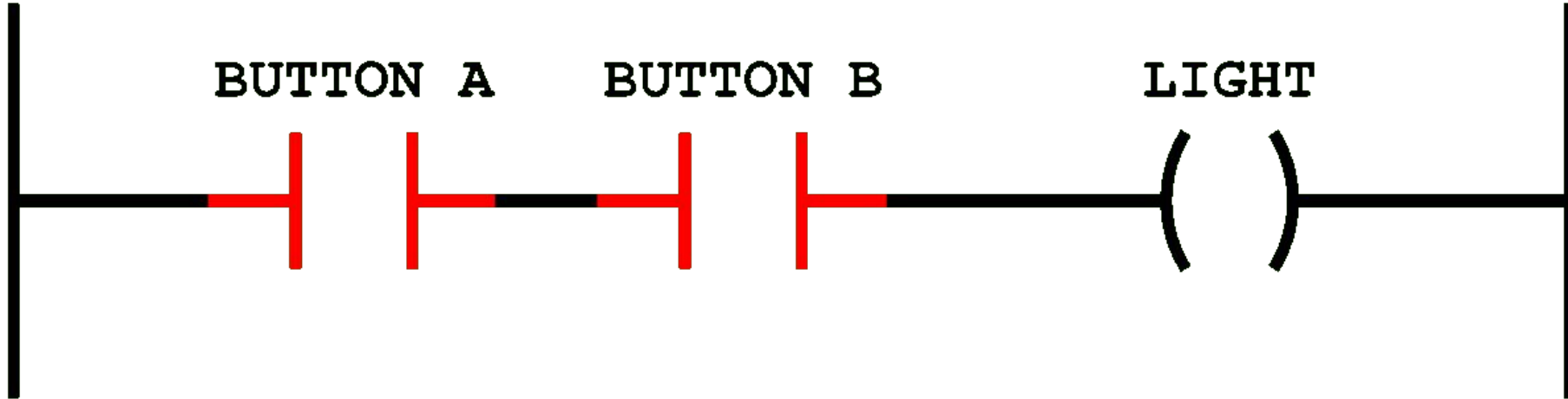
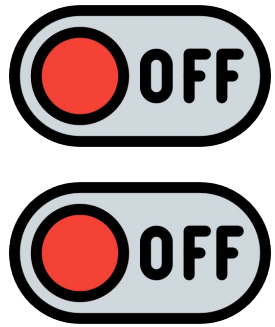
BUTTON A	BUTTON B	LIGHT
true	true	true
true	false	false
false	true	false
false	false	false

AND Example



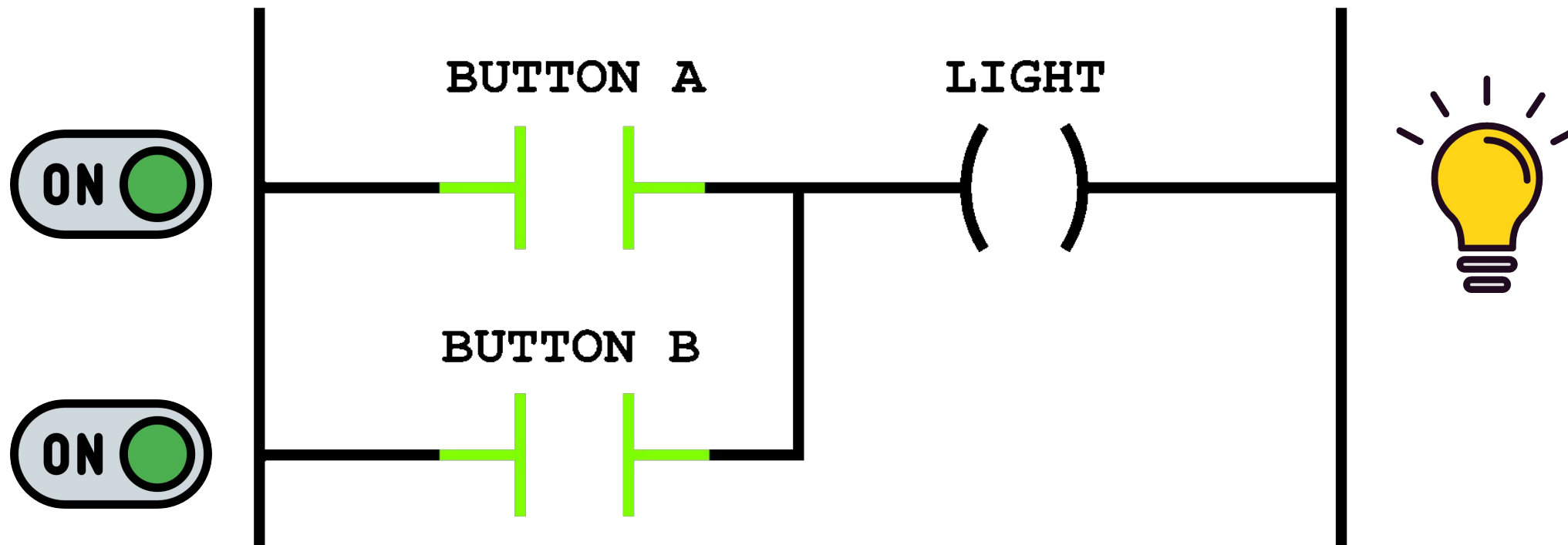
BUTTON A	BUTTON B	LIGHT
true	true	true
true	false	false
false	true	false
false	false	false

AND Example



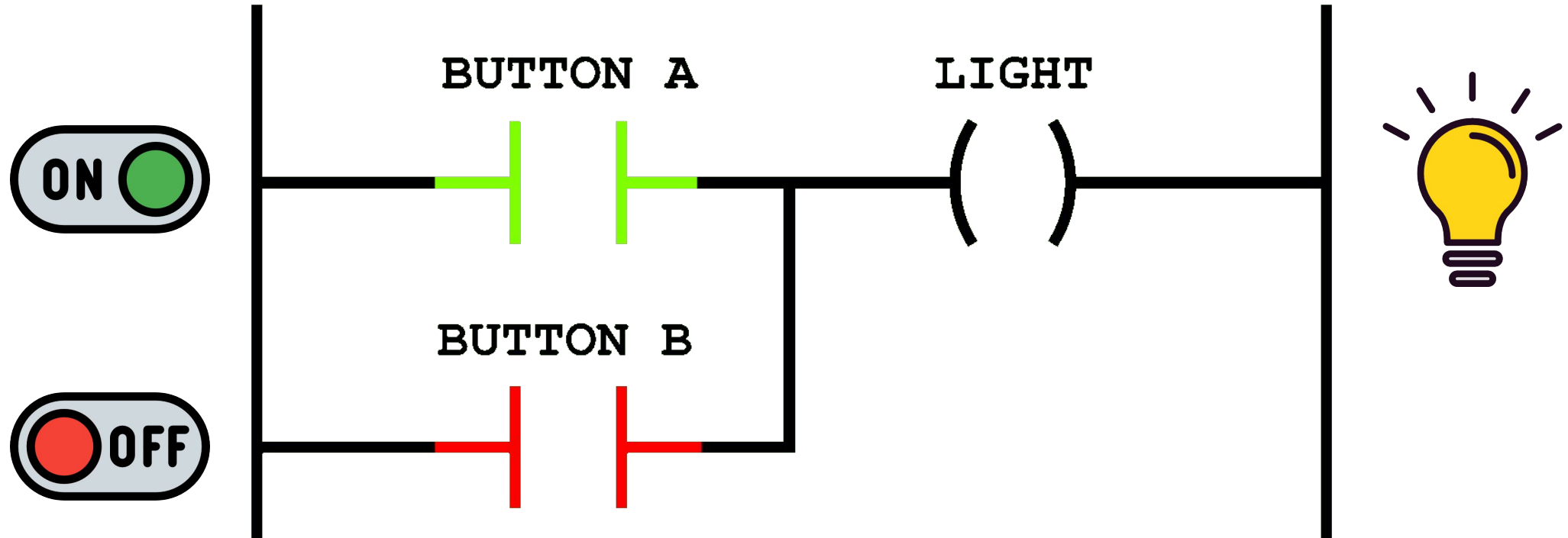
BUTTON A	BUTTON B	LIGHT
true	true	true
true	false	false
false	true	false
false	false	false

OR Example



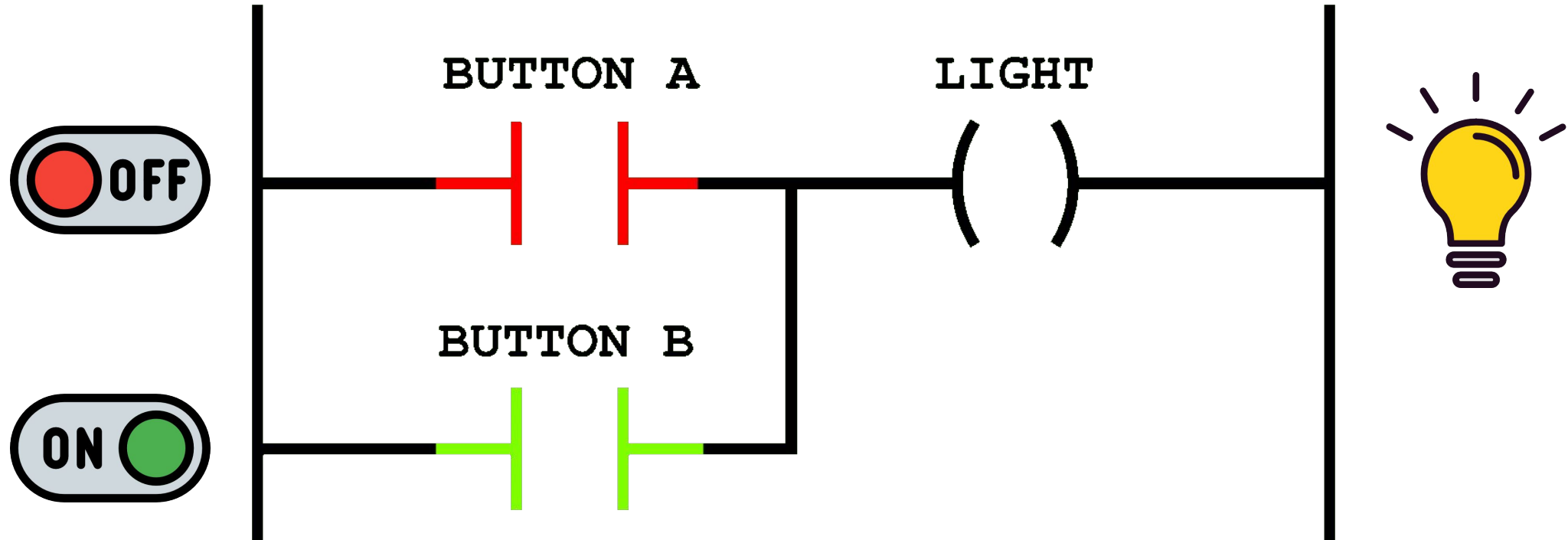
BUTTON A	BUTTON B	LIGHT
true	true	true
true	false	true
false	true	true
false	false	false

OR Example



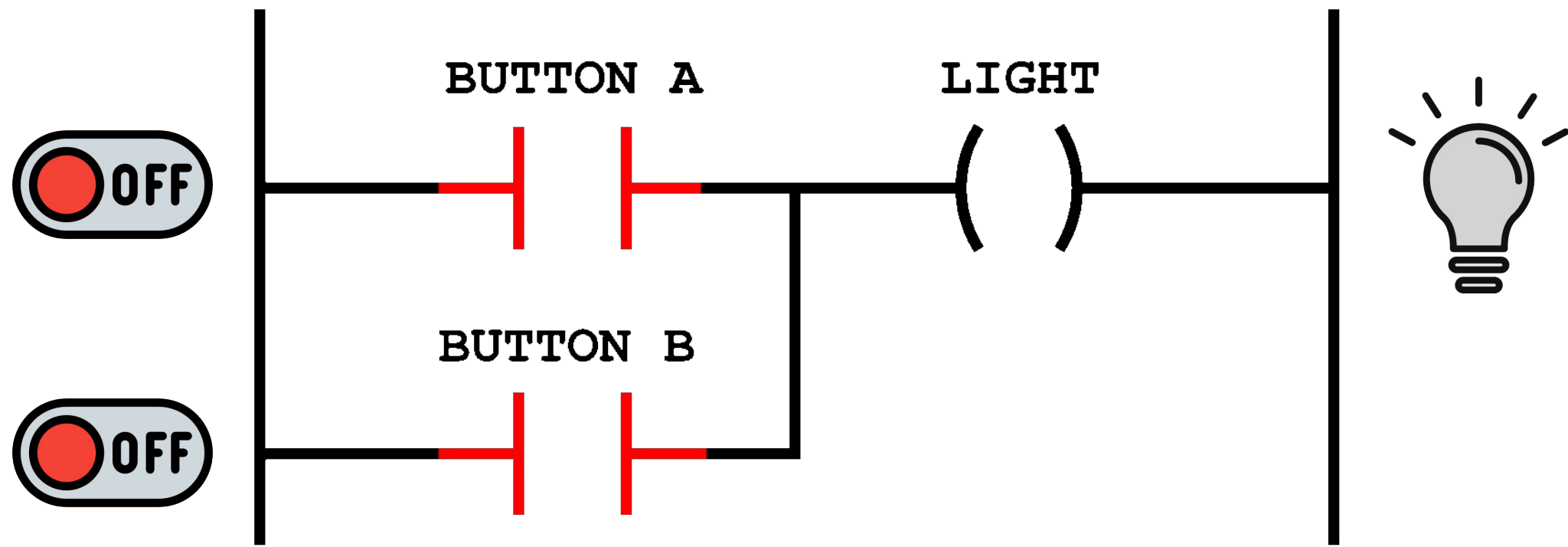
BUTTON A	BUTTON B	LIGHT
true	true	true
true	false	true
false	true	true
false	false	false

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true	true	true
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false	true	true
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OR Example



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true	false	true
false	true	true
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