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⚙️ Fundamentals of PLC Logic

This manual is designed for beginners who want to understand how PLC logic truly works, not just copy ladder diagrams or press simulation buttons.

Its goal is to teach you to think in logic flows - like an engineer - using Function Block Diagram (FBD) language, which is one of the most structured and visual PLC programming methods.

◆ 1. What Is a PLC?

A Programmable Logic Controller (PLC) is the “brain” of an automation system.

It reads inputs, decides what to do, and sends commands to outputs - all based on the logic you design.

You can imagine it like a human:

- Eyes and ears → Inputs (I)
- Muscles → Outputs (Q)
- Memory → Internal bits (M)
- Brain → Program (logic you build)

◆ 2. What Is FBD (Function Block Diagram)?

FBD is a graphical programming language used in PLCs, where signals flow through blocks that perform logical or mathematical operations.

Each block has inputs, outputs, and internal logic - similar to electronic circuits. Unlike Ladder Diagram (LD), which imitates electrical relays and coils, FBD represents logic as a network of functions - more like data flowing through a digital system than current through wires.

◆ 3. Inputs (I), Outputs (Q) and Analog Inputs (AI)

Inputs are signals that tell the PLC what’s happening in the real world. Outputs are the actuators - the things your PLC controls. Analog inputs measure continuous signals - voltage, current, temperature, etc, they don’t just say “ON/OFF” - they tell you how much.

Task 1: Jog motor left/right

🎯 Goal

- You choose direction via key switch S3
- You press Start button S1 → the motor turns ON and stays ON until you release the button.

This is the most basic circuit.

⚙️ Hardware connections

Component	Type	LOGO! input/output
Start	Button S1 Normally Open (NO)	I2
Jog left	Button S3 (left)	I4
Jog right	Button S3 (right)	I5
Motor jog left	out	Q1
Motor jog right	out	Q2

Blocks you will use

Block	Function	Why we need it
I1, I2	Input	Input signal from sensors, buttons
AND	Combine inputs	Motor should run only all conditions are true
Q1, Q2	Output	Controls motor

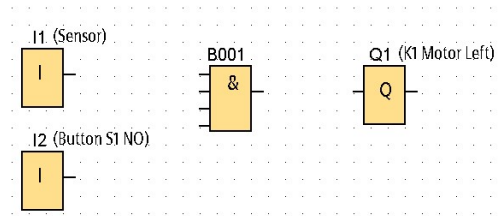
Step 1 - Jog left

🧠 Mental model

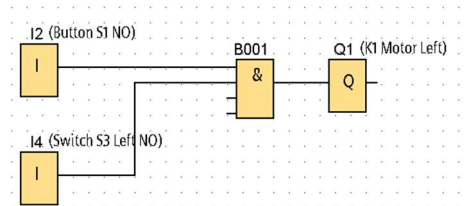
If button S1 pressed AND key switch S3 in position left → Jog left

🔧 What to do

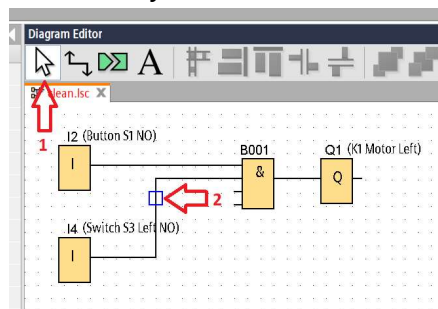
1. Open clean.lsc from project folder on USB stick
2. Drag and drop two input blocks, one out and one AND block



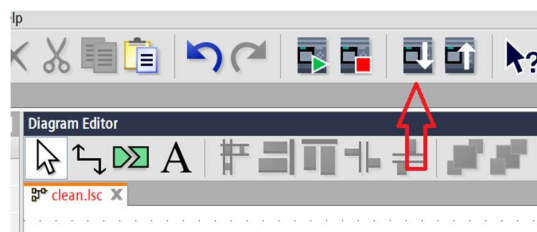
3. You must setup two inputs, I2 for button S1 and I4 for Switch S3 (left).
Double click on I1 block and change it to I4
4. Connect I2 → AND (B001) block
5. Connect I4 → AND (B001) block
6. Connect AND (B001) → Q1 block



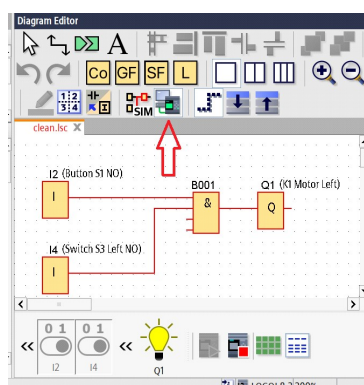
7. You can move wires that's LSC generates, just click on mouse (1) then click on wire (2) and move as you need



8. Load to LOGO! From tools → Transfer → PC to LOGO! or button on panel



9. Also you can activate online mode and see how it works on logo block by block



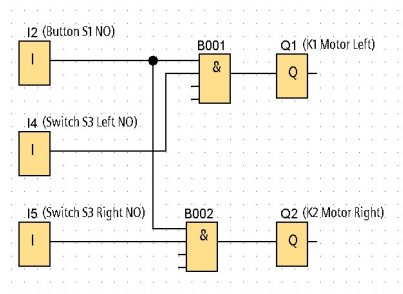
Step 2 - jog right

⚡ Mental model

If button S1 pressed AND key switch S3 in position right → Jog right

🔧 What to do

1. Add INPUT block and change it to I5
2. Add AND block
3. Add OUT block and change it to Q2 if needed
4. Connect I2 → AND (B002) block
5. Connect I5 → AND (B002) block
6. Connect AND (B002) → Q2 block



7. Load to LOGO! and test

✓ Result

Now you have:

- Jog left/right
- Motor turns ON only if you press button