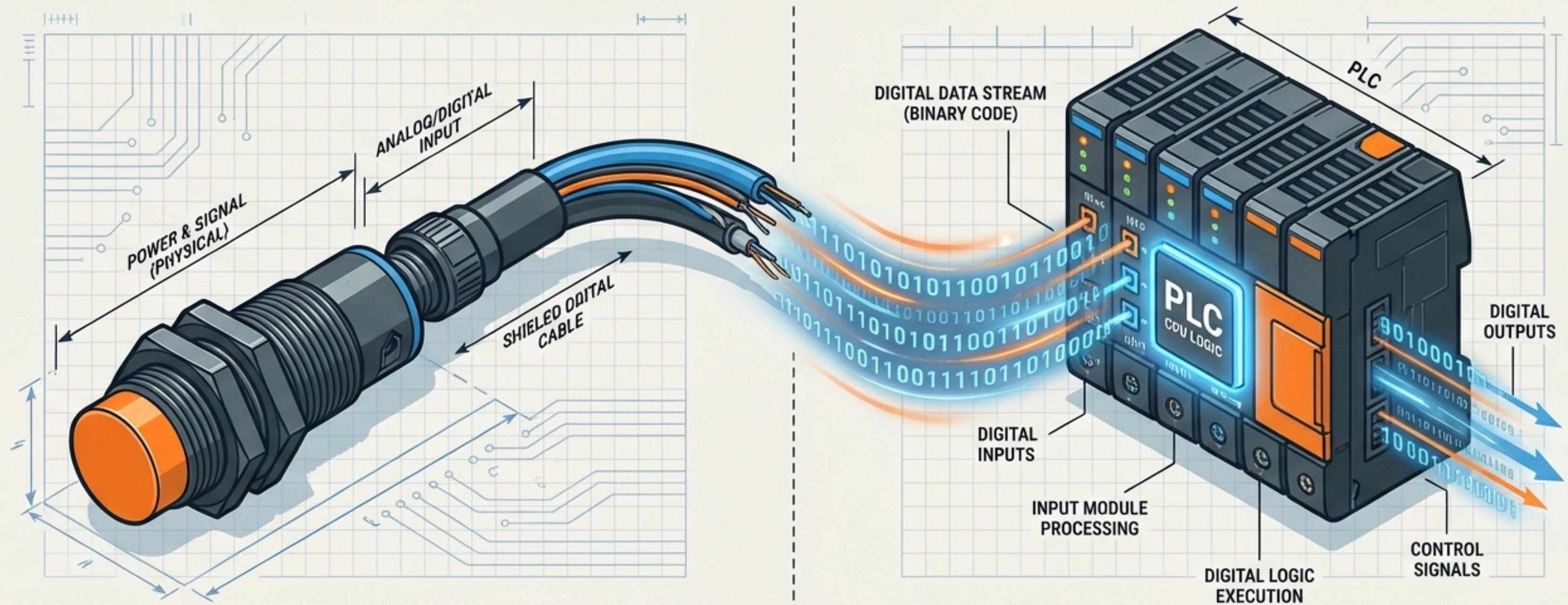
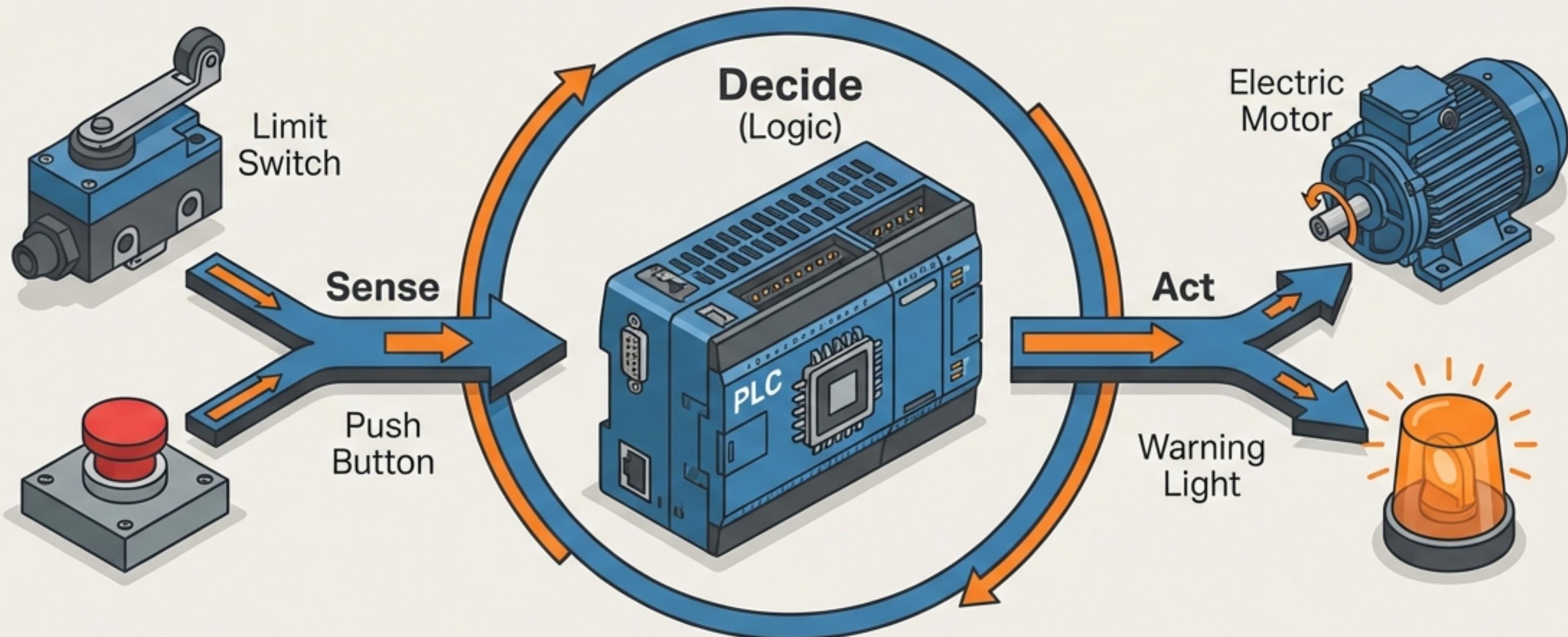


PLC Wiring Essentials: A Visual Guide

From Physical Sensors to Digital Logic



The Nervous System of Automation



Inputs (Eyes & Ears)

Switches and sensors provide status information.

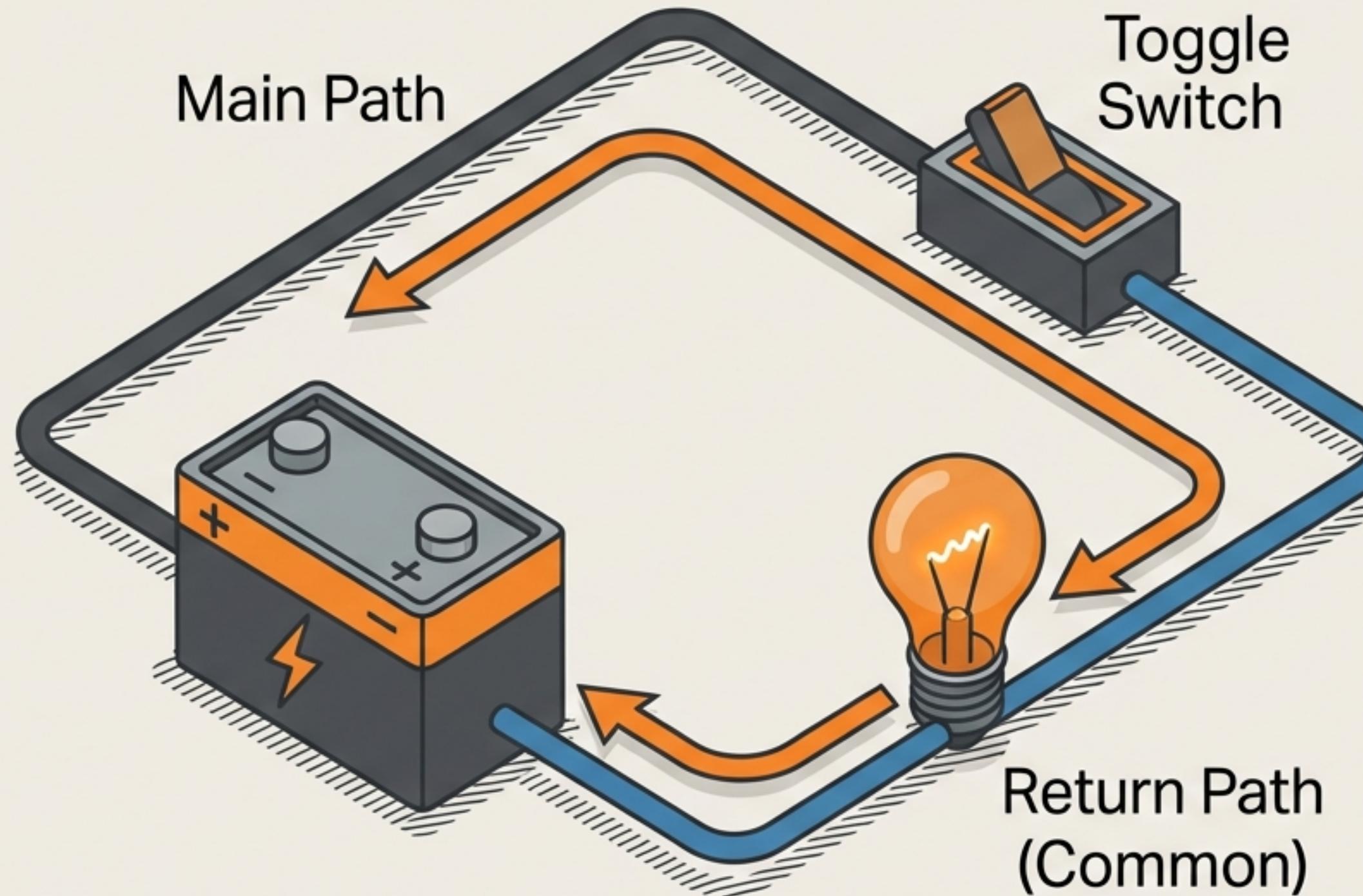
CPU (Brain)

Microprocessor stores instructions and executes logic.

Outputs (Hands & Feet)

Actuators, motors, and lights perform the work.

The Golden Rule: The Current Loop



The Rule: Current must enter at one terminal and exit at another to complete the circuit.

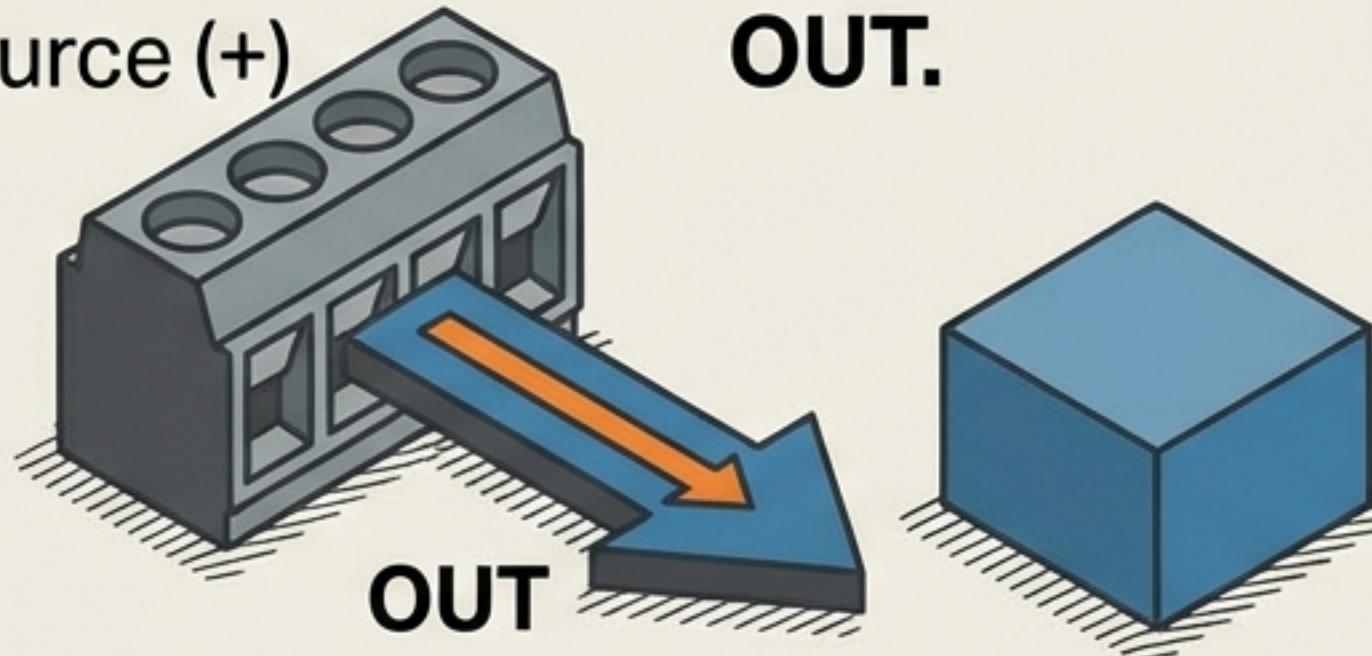
Note: Input/Output banks often share a return path (Common) to save space.

Decoded: Sinking vs. Sourcing

It is all about the direction of current flow (DC Circuits Only)



Source (+)



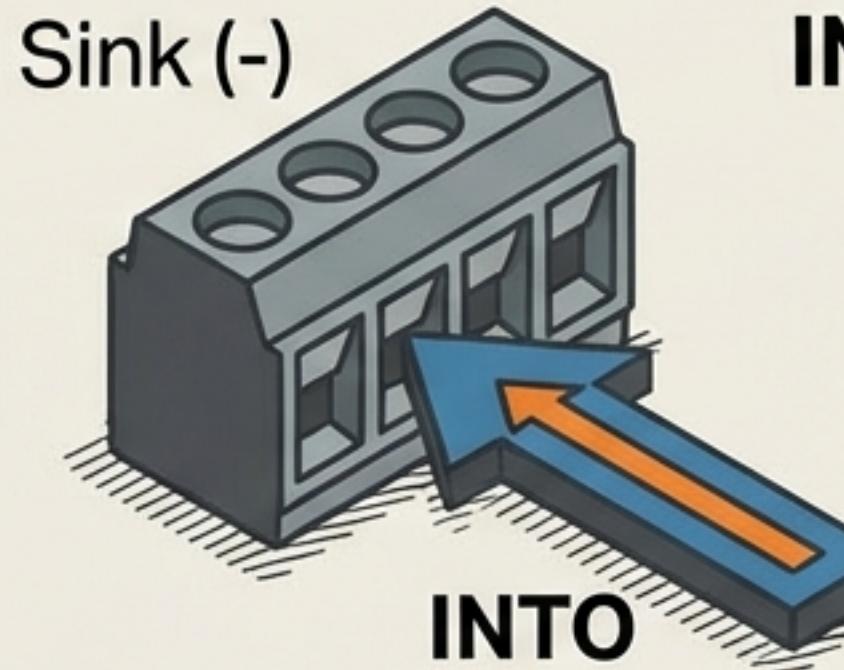
Sourcing

Device provides voltage (+).

Current flows **OUT**.



Sink (-)



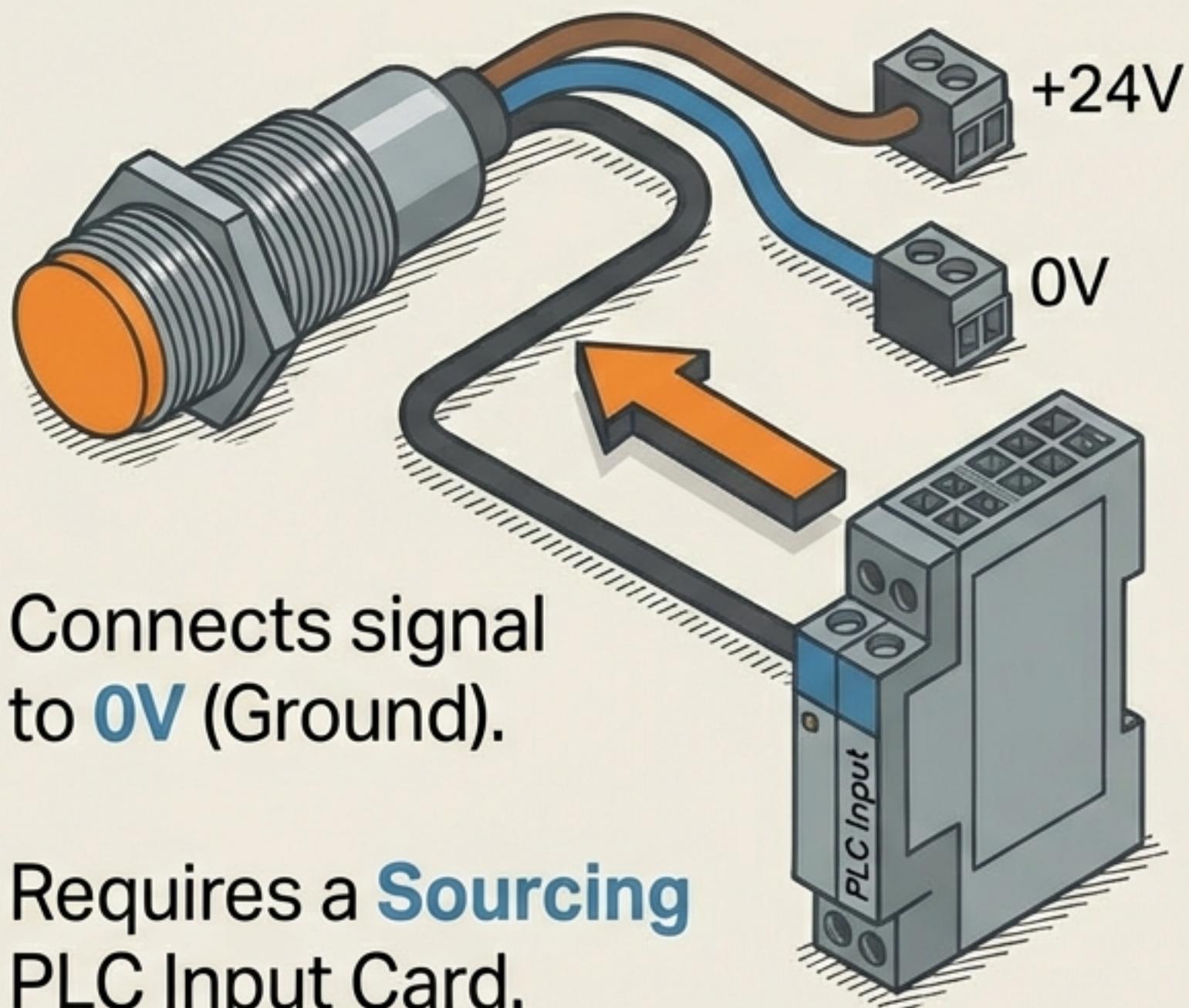
Sinking

Device provides path to ground (-).

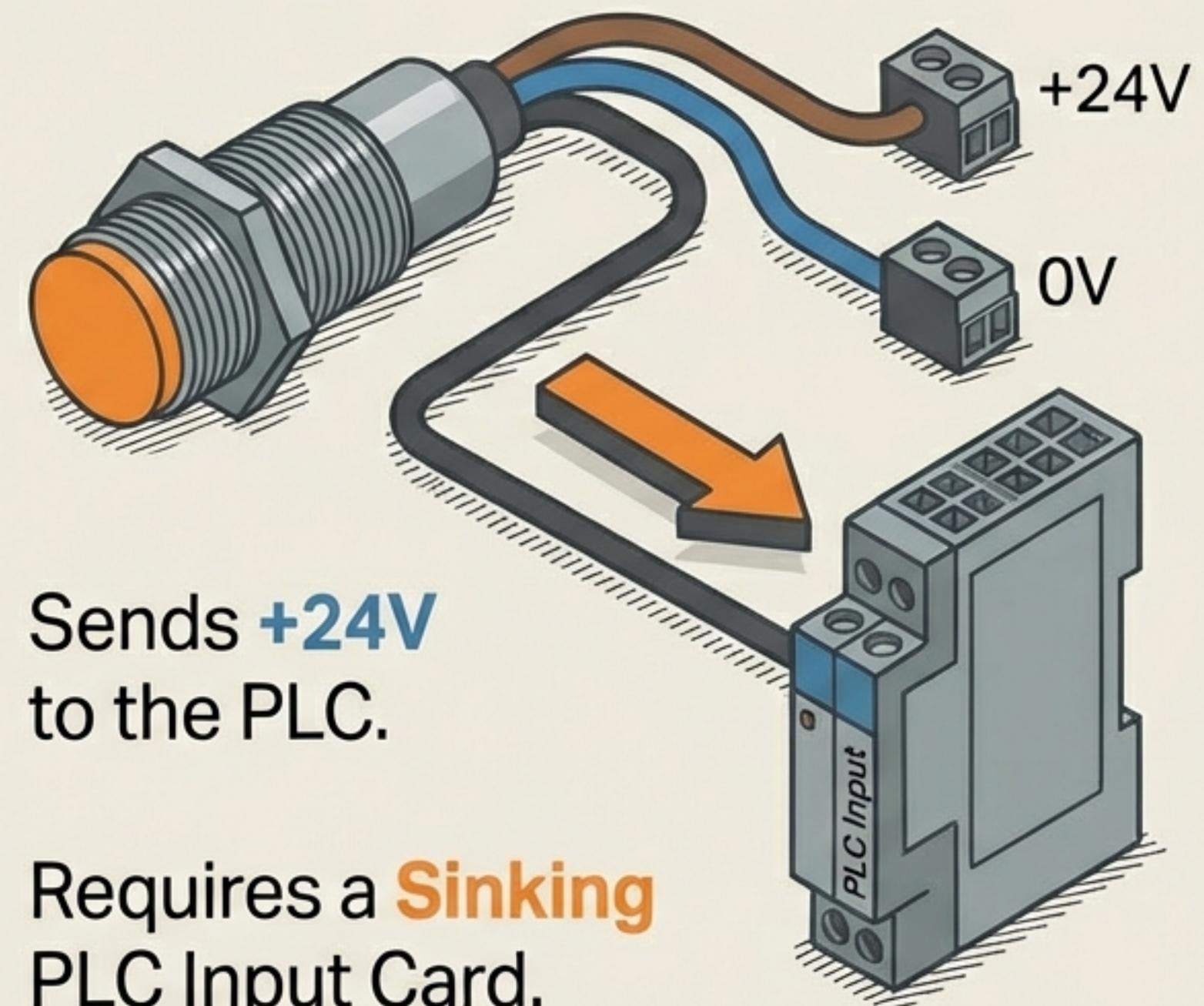
Current flows **IN**.

Input Sensors: NPN vs. PNP

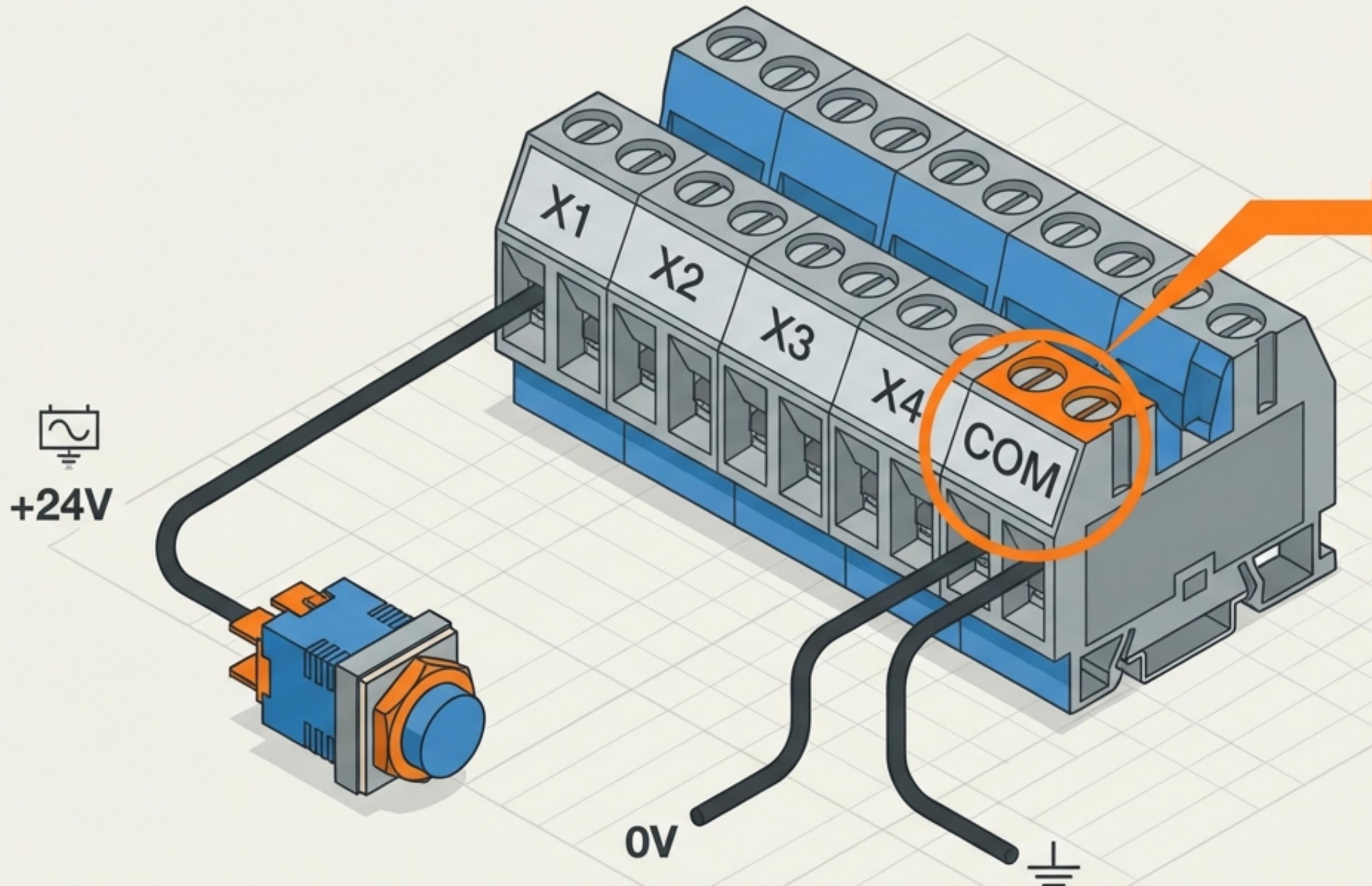
NPN Sensor (Sinking)



PNP Sensor (Sourcing)



Digital Inputs: The Physical Connection



****The Common Terminal****

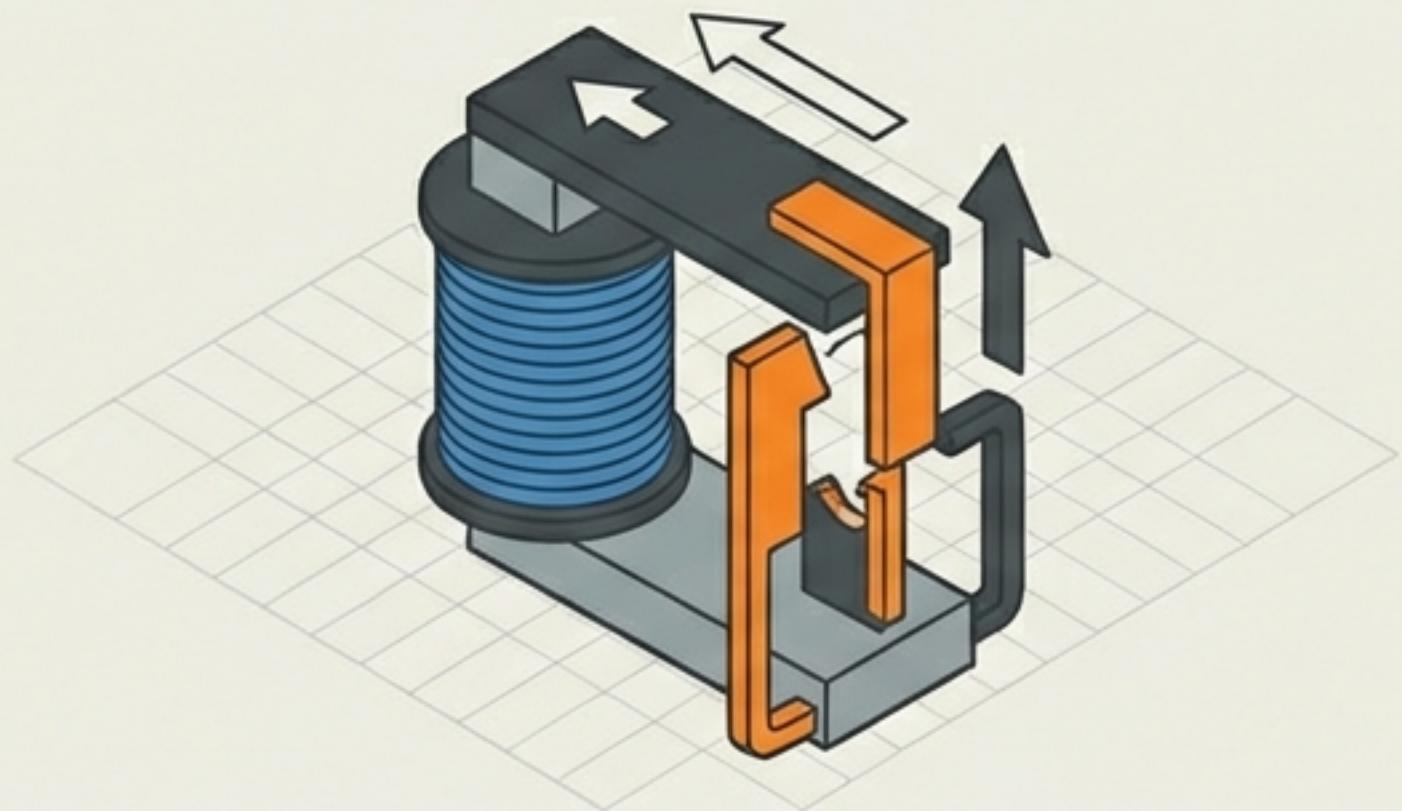
Determines the logic of the Helvetica Now logic of the entire bank.

If COM = 0V, Inputs are Sinking (expecting **+24V**).

If COM = +24V, Inputs are Sourcing (expecting **0V**).

Digital Outputs: Relays vs. Transistors

Relay Outputs



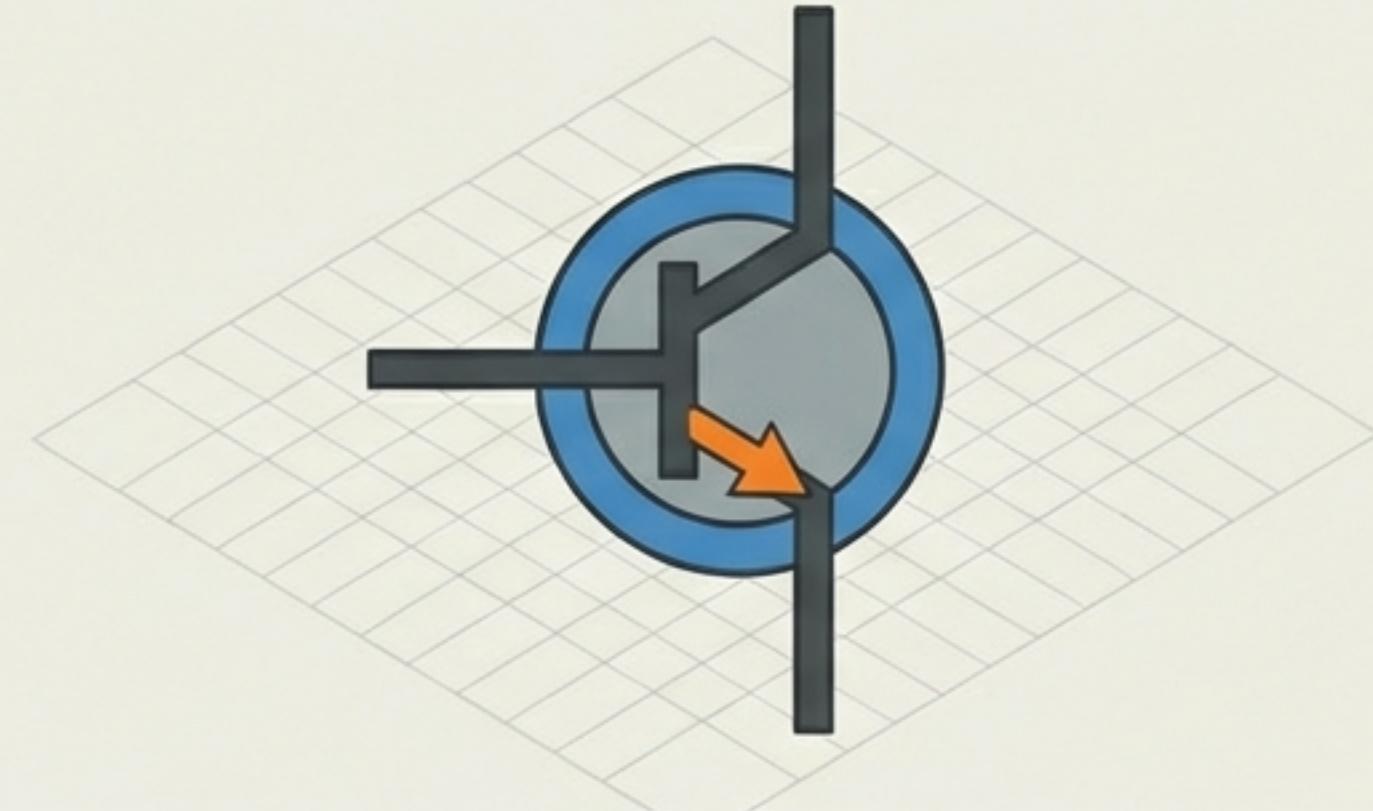
Mechanism: Mechanical Contacts

Voltage: AC or DC

Pros: High current, Electrical isolation, Volt-free.

Cons: Slow switching, Mechanical wear.

Transistor Outputs



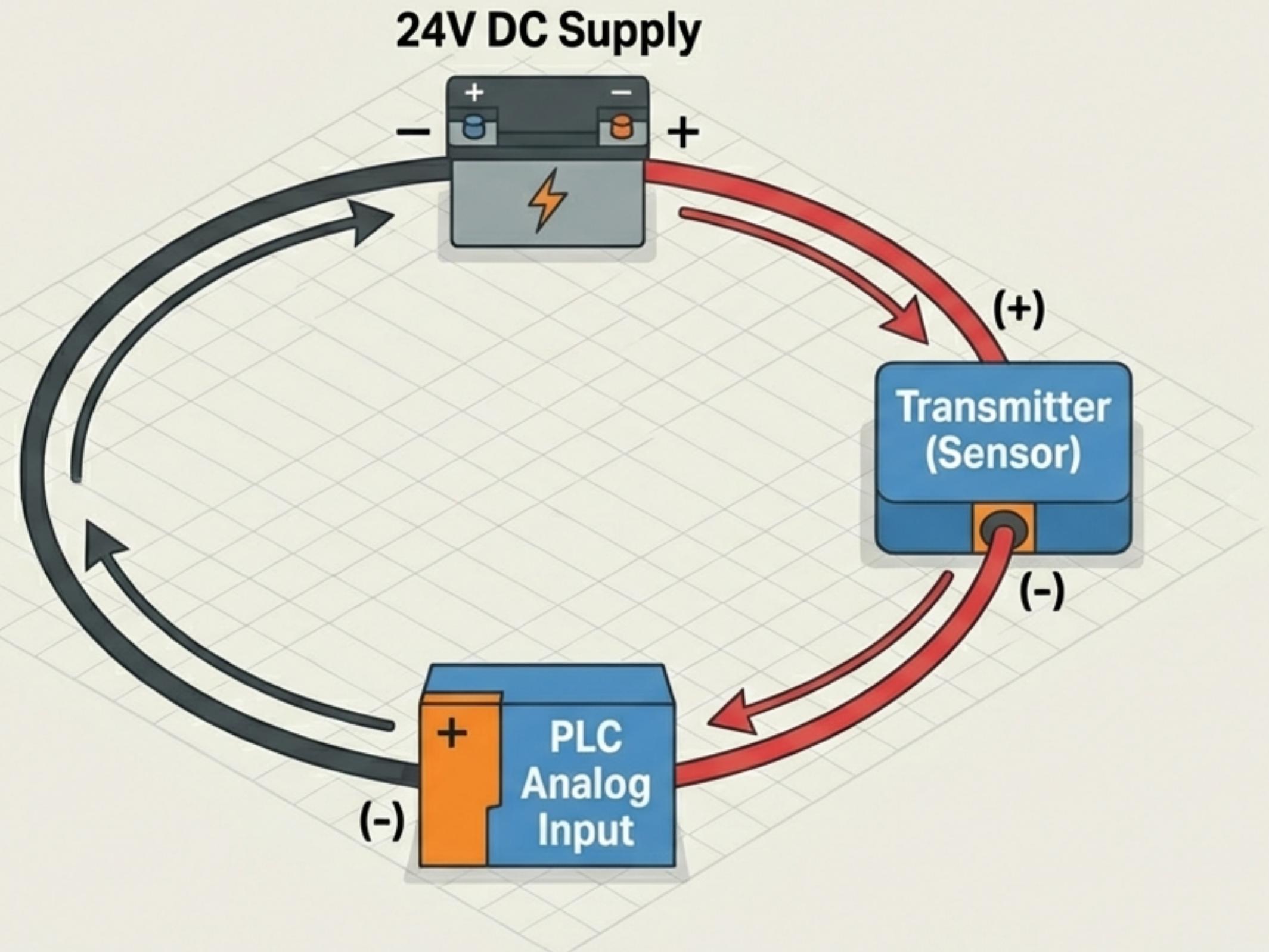
Mechanism: Solid-State Switching

Voltage: DC Only

Pros: Fast switching, Long life, PWM capable.

Cons: Low current, Polarity sensitive.

Analog Wiring: The 2-Wire "Loop Powered" Circuit



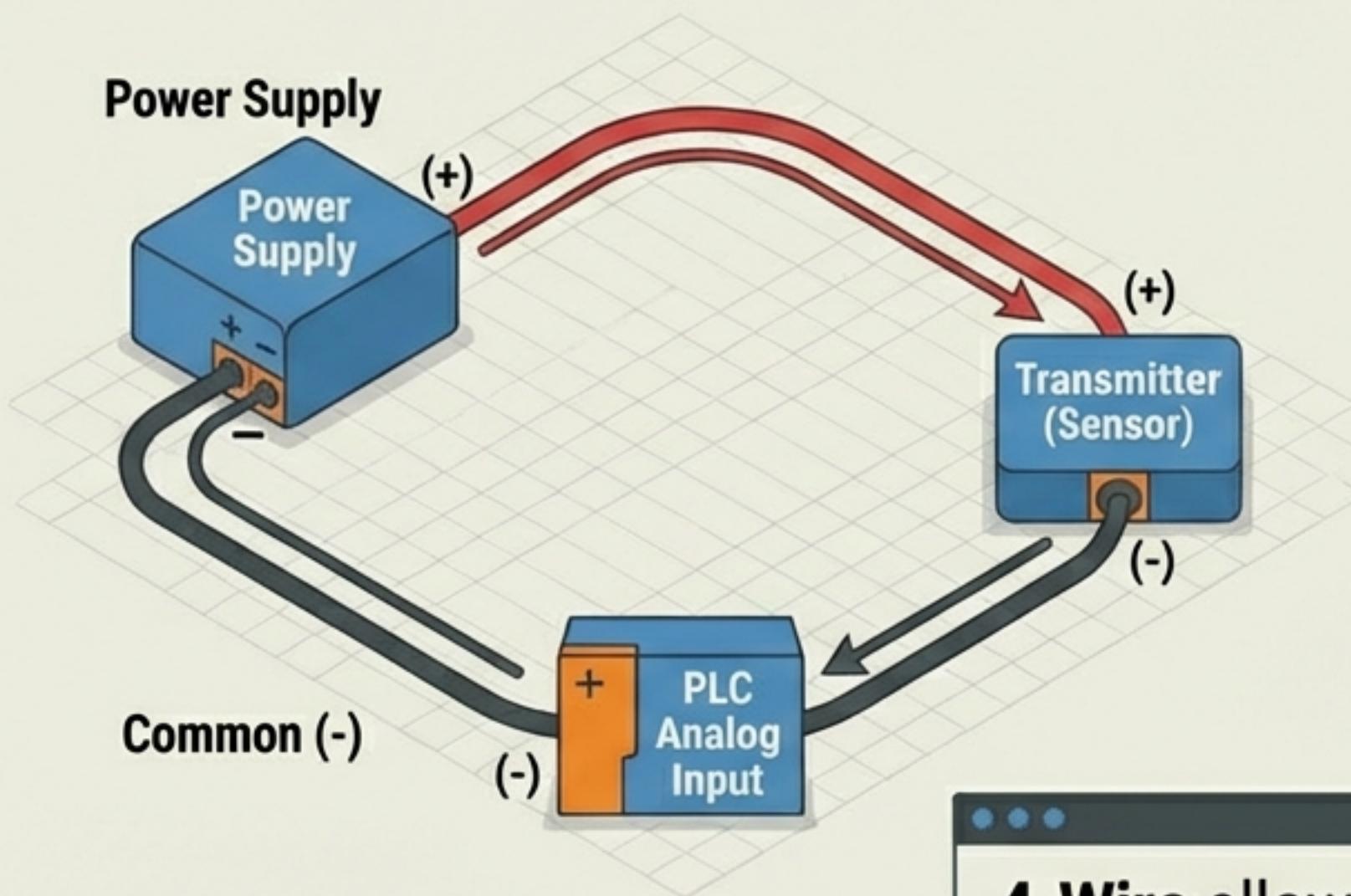
****Loop Powered:****
The transmitter "steals" power from the 4-20mA signal line.

****Wiring:**
Only 2 wires required.

Analog Wiring: 3-Wire & 4-Wire Configurations

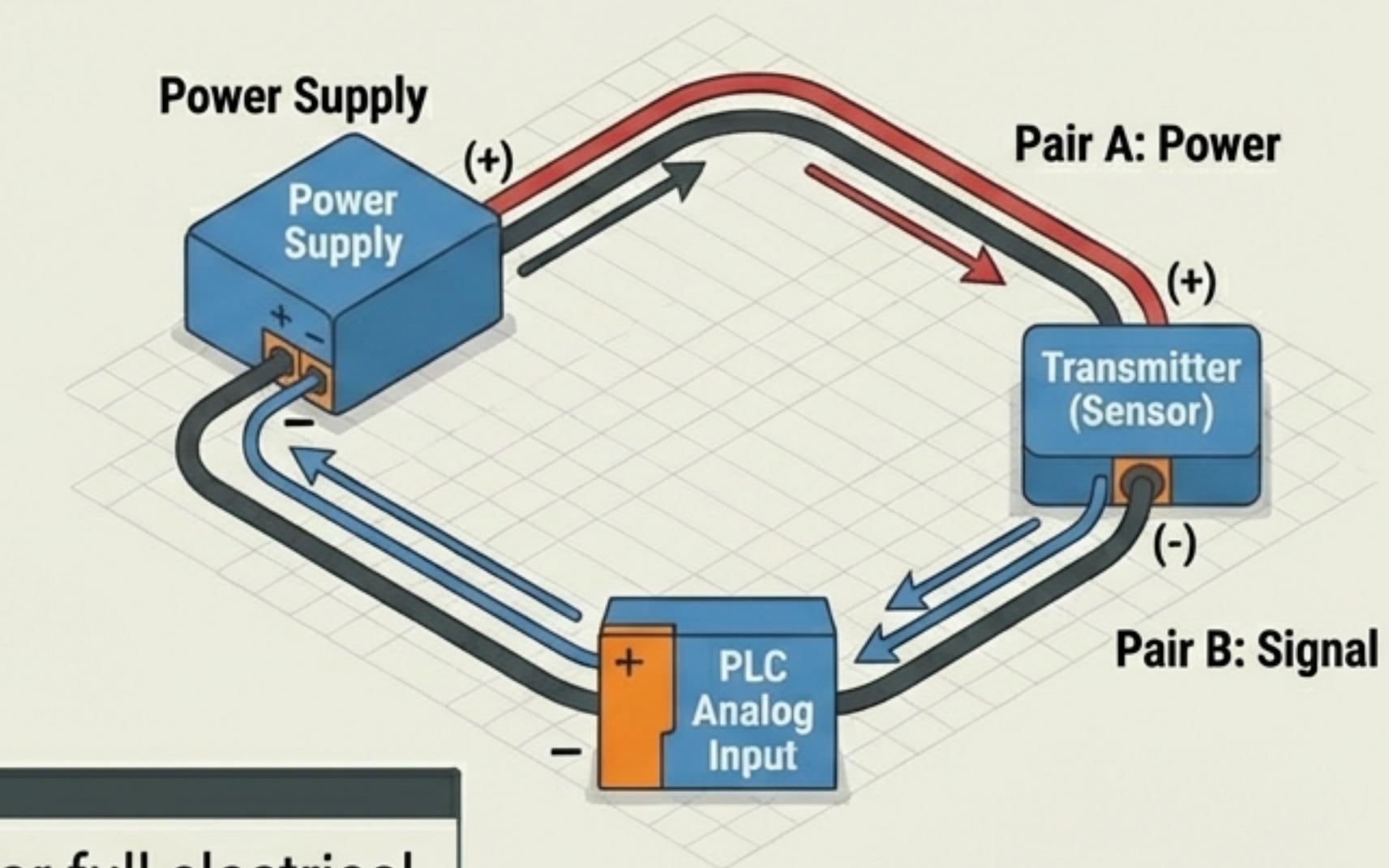
3-Wire

Shared Common / No Isolation



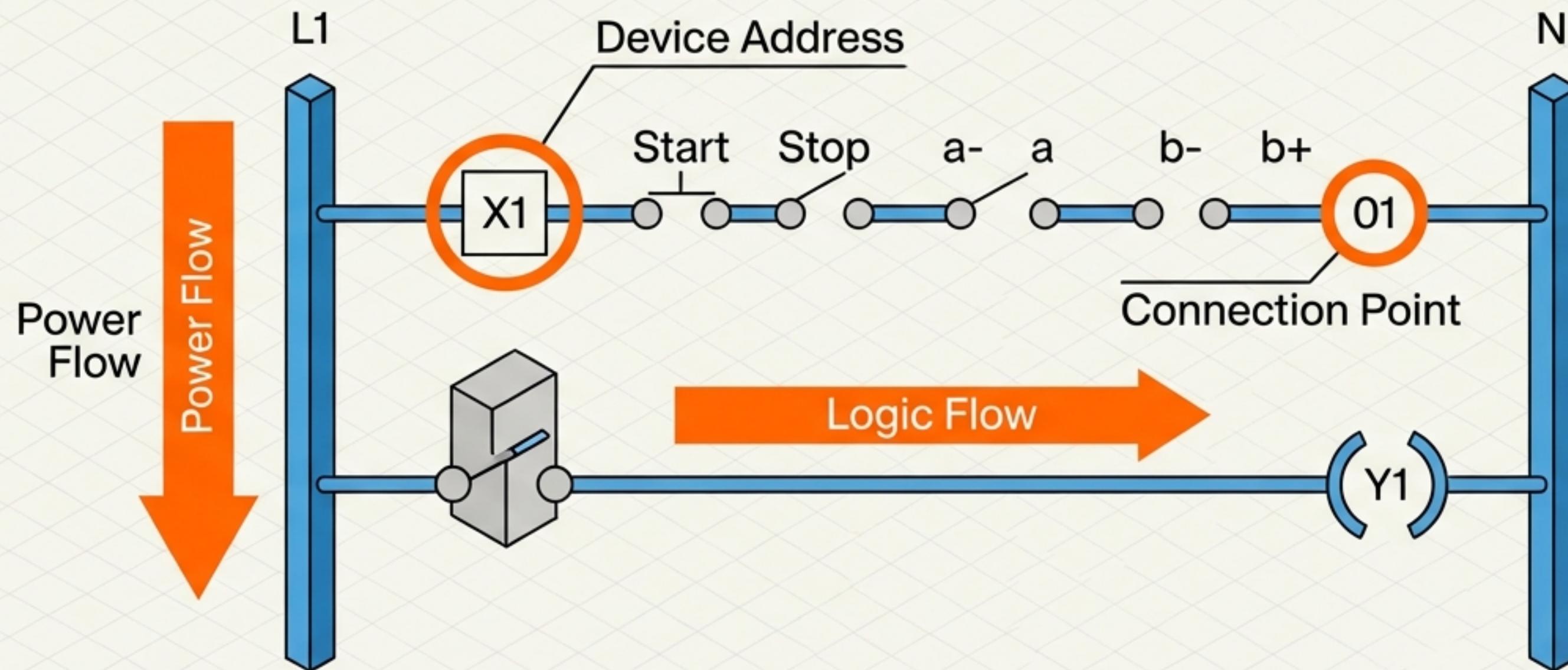
4-Wire

Isolated Supply / Separate Circuits



4-Wire allows for full electrical isolation to prevent noise.

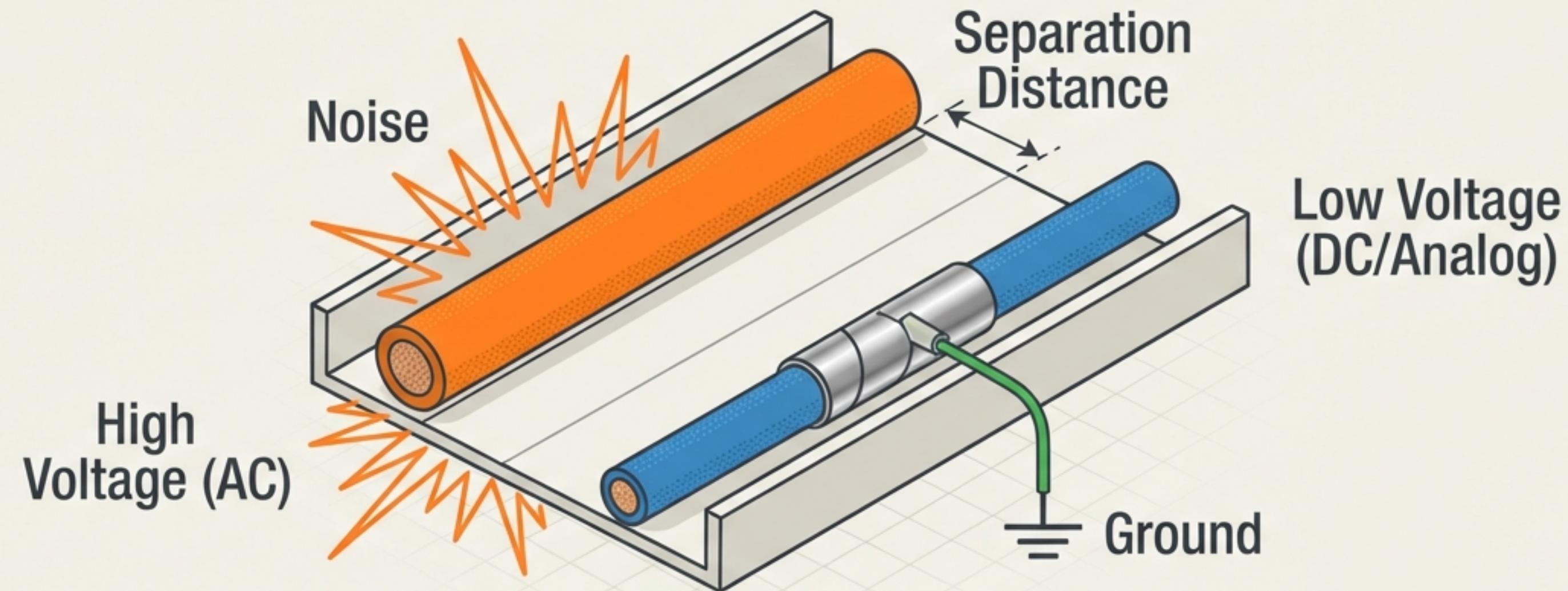
Reading the Map: The Wiring Diagram



Rule 1: Read Left-to-Right, Top-to-Bottom.

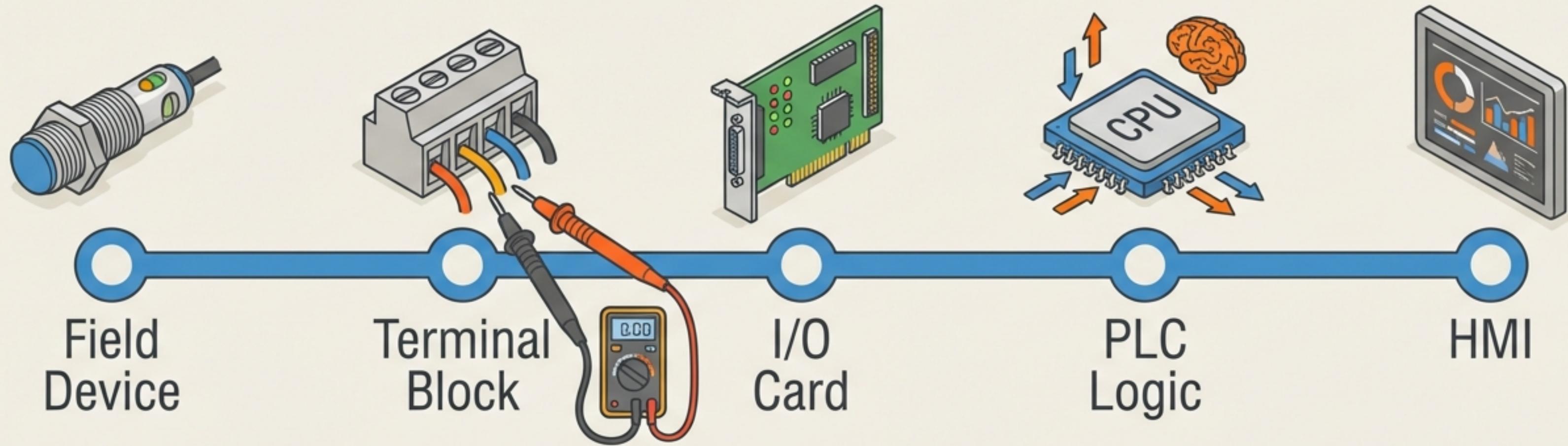
Rule 2: Page Number + Column = Device Address.

Grounding & Noise Protection



- **Separation:** Keep AC power and DC signals in separate trays.
- **Shielding:** Use shielded cable for analog signals.
- **Grounding:** Ground the shield at *one end only* to prevent ground loops.

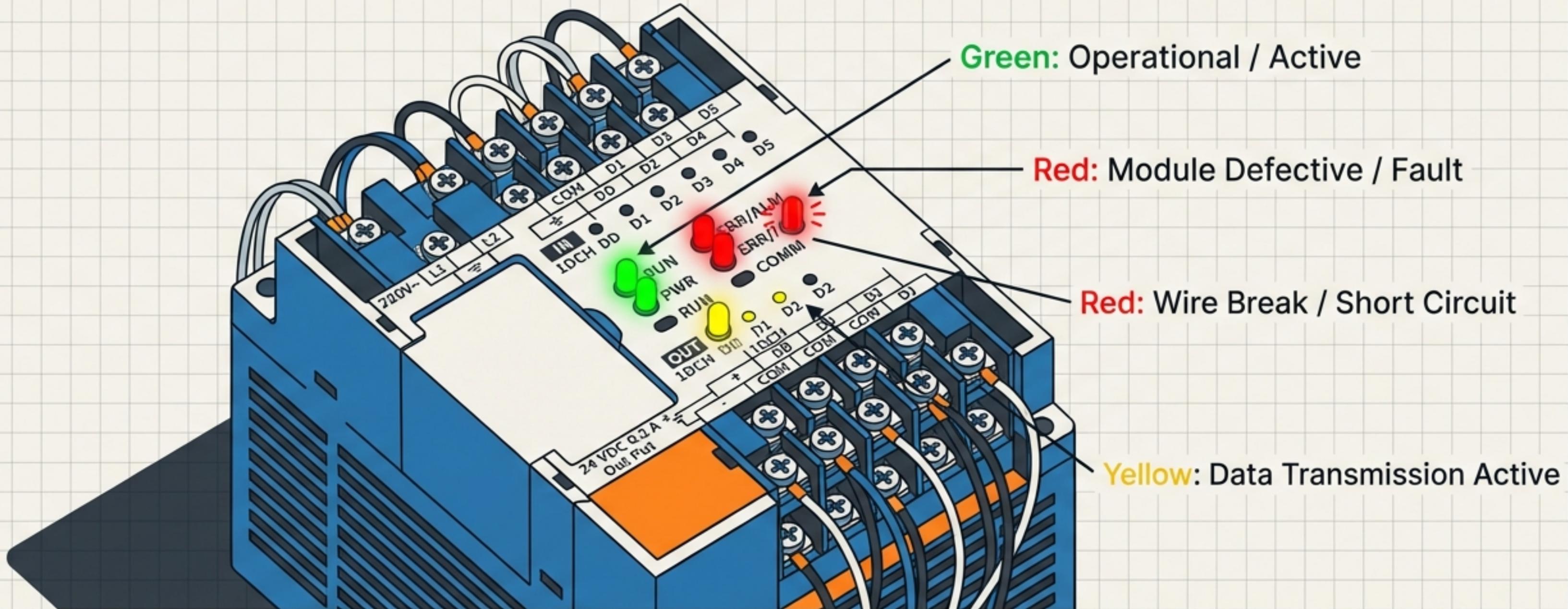
Troubleshooting: The 'Dead Link' Method



Trace the Data Flow: Start where you know you have a signal. Move down the chain until the signal is lost.

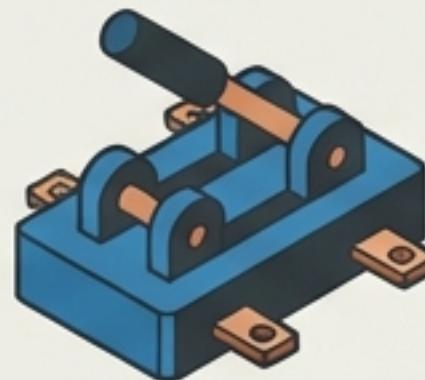
- **Inputs:** Signal at device but not card? → Wiring Fault.
- **Outputs:** Signal at card but not device? → Wiring Fault.

Reading the Hardware: Status LEDs



The hardware tells a story. Check LEDs before opening the laptop.

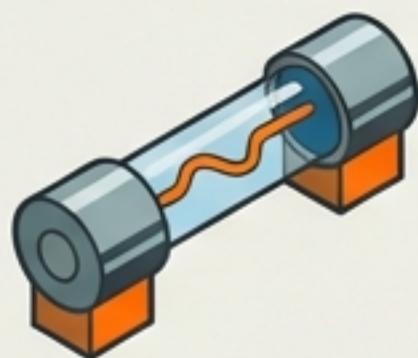
Safety First: Isolate and Protect



Disconnect all power sources before touching wiring.



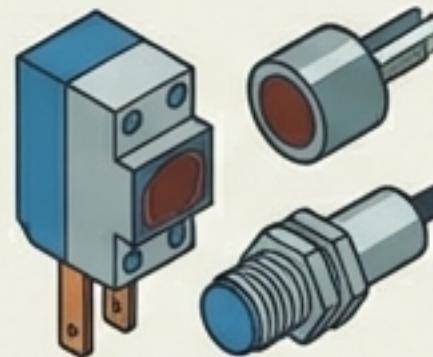
Never bypass interlocks or safety circuits.



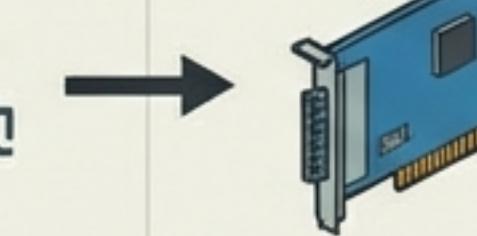
Use proper over-current protection (fuses) on supply lines.

The Wiring Compatibility Cheat Sheet

Sensor to Card Matching



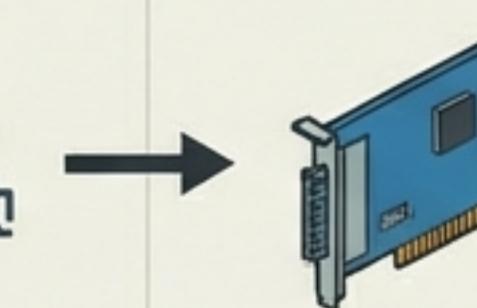
If you have an **NPN** Sensor (Sinking)...



Connect to a **Sourcing** Input Card.



If you have a **PNP** Sensor (Sourcing)...



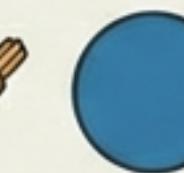
Connect to a **Sinking** Input Card.



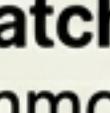
Standard Wire Colors (DC)



Brown Swatch
+24V DC



Blue Swatch
0V / Common



Black Swatch
Switching Signal



Quick Checks



Input LED off but
sensor active?



Check Polarity
(Sink/Source mismatch).



Analog value erratic?



Check Shield Grounding.

Always verify sensor type matches card type before wiring.