How to Troubleshoot a PLC Output: MicroLogix 1400 Example

This procedure explains how to troubleshoot a PLC when an output fails to activate a connected device, such as an indicator light. Using a MicroLogix 1400 training station as the example system, you will confirm that the PLC is logically activating the output in software, then trace voltage through the wiring with a multimeter to isolate whether the fault lies in the load, the wiring, or the PLC output module itself. This method applies to any discrete (on/off) PLC output where the physical device does not respond as expected.

Scope

This procedure covers troubleshooting a single discrete output on a MicroLogix 1400 PLC, verified through RSLogix 500 Pro programming software and physical voltage measurements at the control panel. It is intended for situations where the output does not turn on an expected load, such as an indicator light.

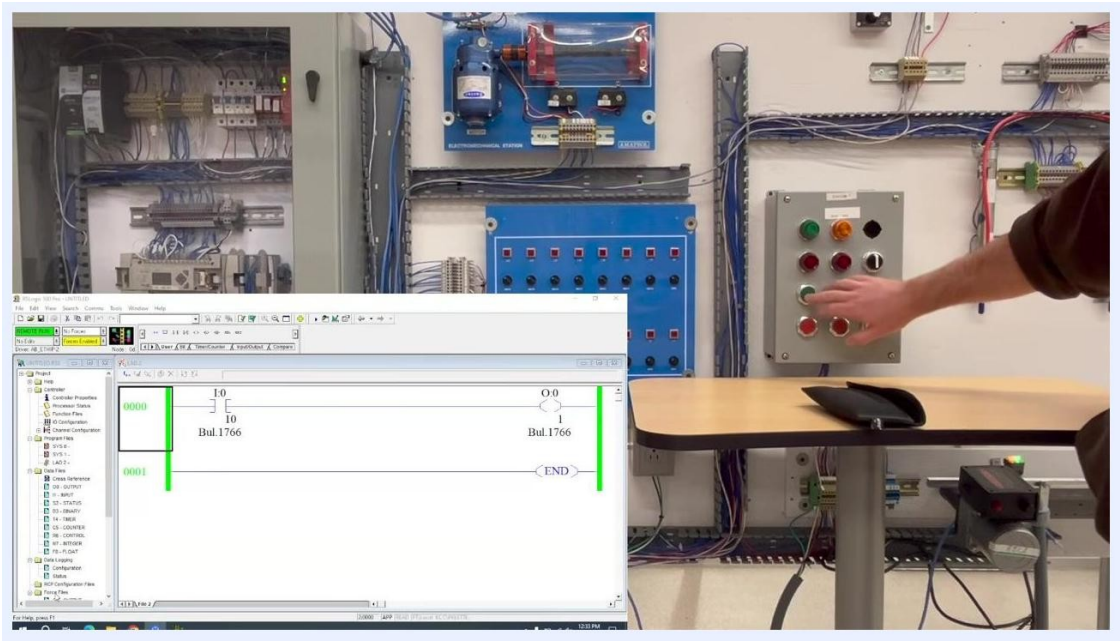
Required equipment

- MicroLogix 1400 PLC control panel with wiring, terminal blocks, and labeled push buttons
- RSLogix 500 Pro programming software, installed and connected to the PLC
- Digital multimeter or clamp meter capable of measuring both AC and DC voltage (for example, a Fluke 365 True RMS Clamp Meter)
- Wiring schematic for the control panel
- Access to the terminal blocks and output wiring inside the control panel

Procedure

Step 1: Identify the fault

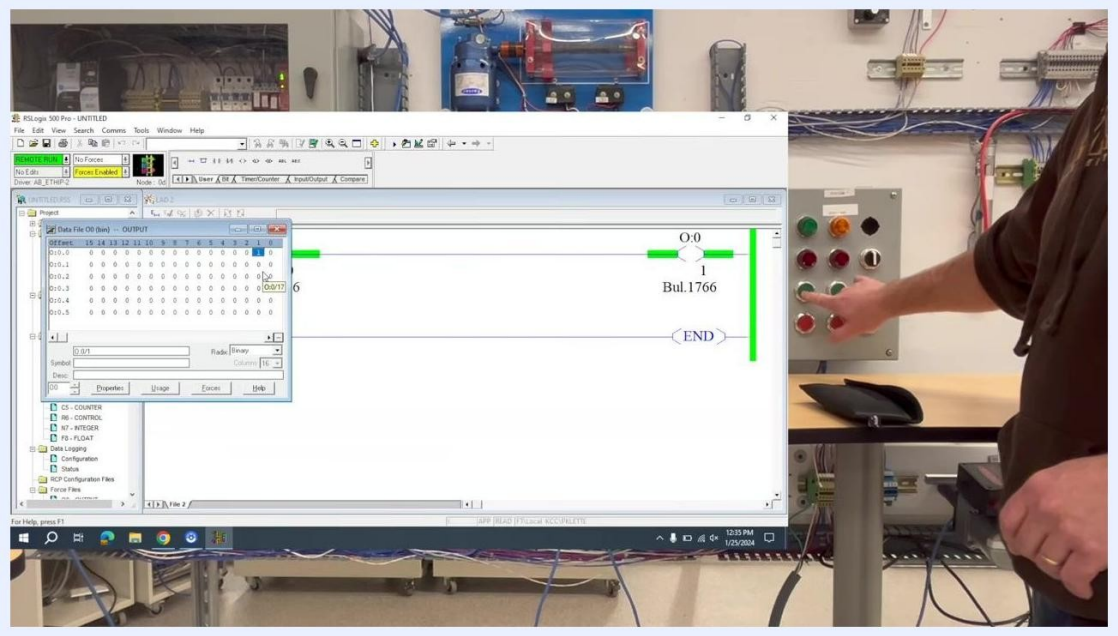
Observe the PLC setup and note any reported issues. In this example, a note on the training station indicates that an output is not working. Confirm the PLC model in use — in this case, a MicroLogix 1400 — and visually inspect the control panel and wiring for obvious faults before proceeding.



A PLC training station with multiple panels, wiring, and labeled push buttons. A note indicates an output is not working.

Step 2: Verify output activation in software

Open the PLC programming software (RSLogix 500 Pro in this example) and locate the ladder logic diagram for the output in question. Press the green push button on the control panel and watch the software to confirm that this action triggers output O:0/1 on slot zero. In this case, the software shows the output being activated, but the corresponding indicator light does not turn on.



RSLogix 500 Pro software open on screen, showing ladder logic and the output data table while a hand presses the green push button on the control panel.

Step 3: Check the output data table

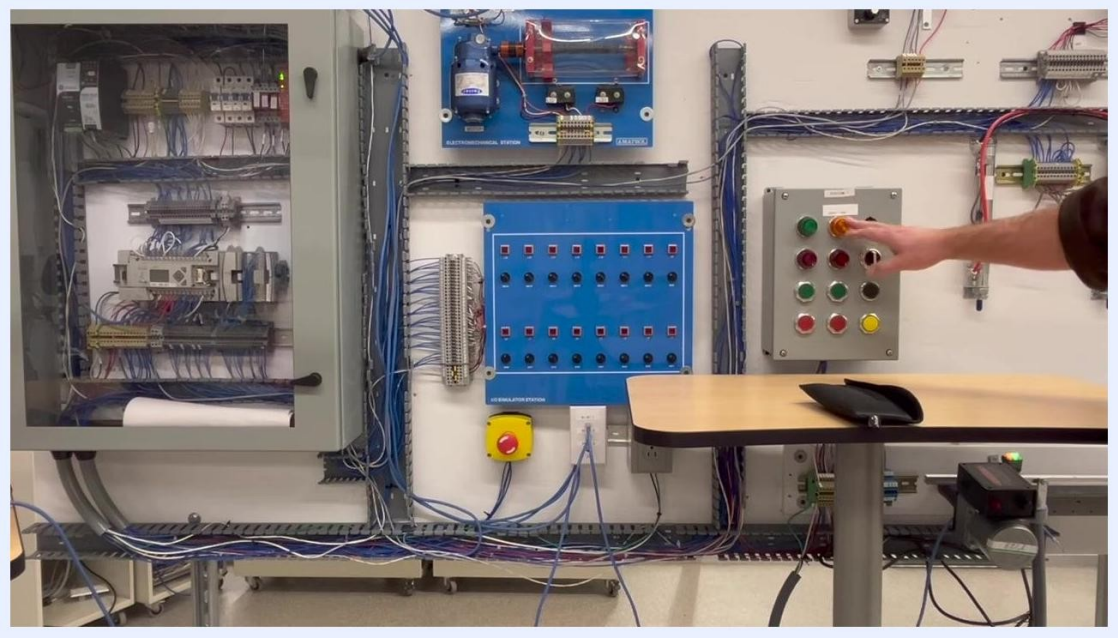
In the software, open the output data table (File O0) and confirm that the bit for the output (O:0/1) changes from 0 to 1 when you press the green push button. This confirms that the PLC is attempting to turn on the output. If the bit changes but the light does not turn on, the issue likely lies outside the PLC logic.

Step 4: Begin physical troubleshooting

Because this is a discrete output (on/off), troubleshooting follows a straightforward sequence. The first physical check is the indicator light (bulb) itself. If you already know the bulb is good, proceed to the next step; if you are unsure, replace or test the bulb first to rule out a simple failure.

Step 5: Measure the output voltage

Determine the expected voltage type and level for the output (for example, 24V DC or 120V AC), and set your multimeter or clamp meter to the matching AC or DC setting. Access the wiring at the back of the control panel where the output is connected, then place the meter probes across the output terminals while the output is activated.



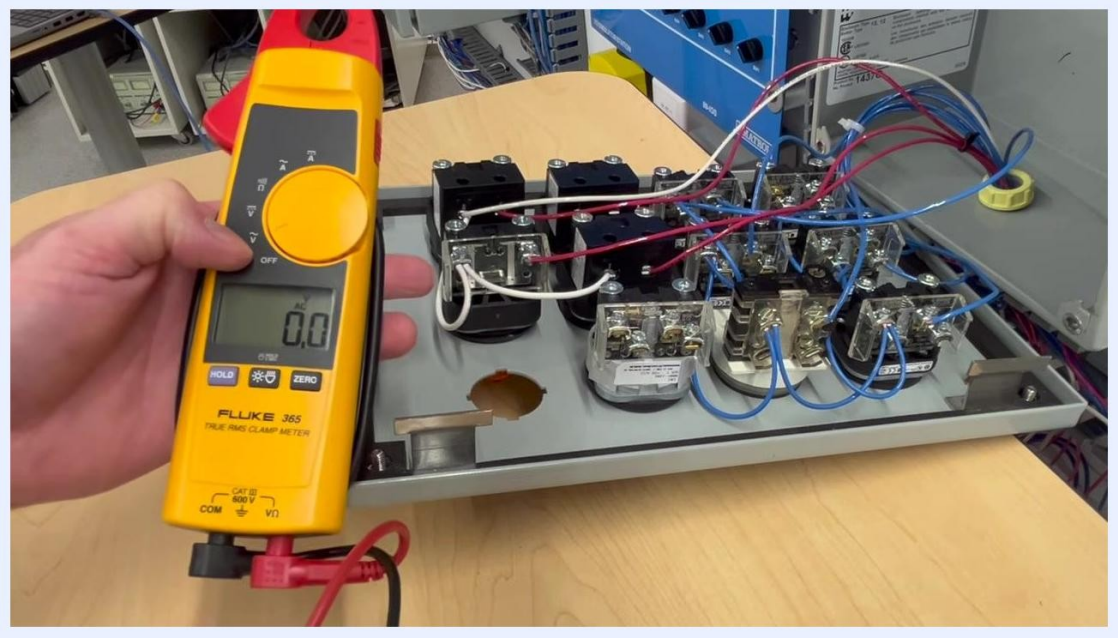
A hand holding a Fluke 365 True RMS Clamp Meter set to measure AC voltage, with the back of the control panel exposed to show wiring and relays.

Step 6: Interpret the voltage reading

If the correct voltage is present at the output terminals when the output is activated, the wiring and PLC output are functioning correctly, and the issue may lie with the load — for example, the light or its wiring. If no voltage is present, the problem may be with the PLC output module, the wiring, or a blown fuse.

Step 7: Confirm output voltage type before measuring

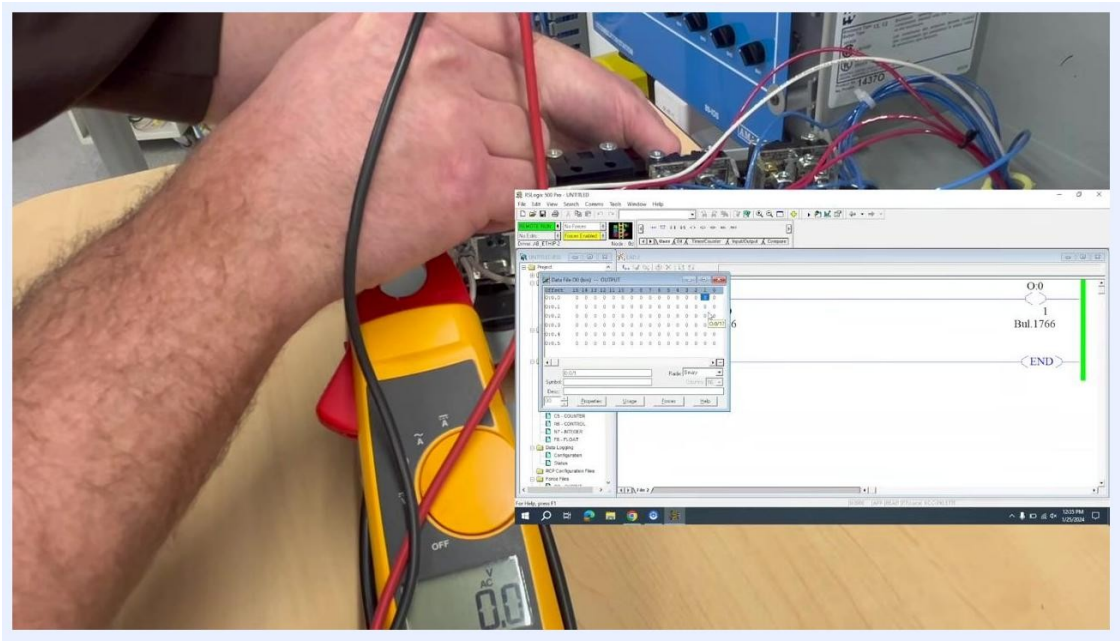
Observe the wiring at the output terminal. A red wire typically indicates AC voltage, but do not rely on wire color alone. Always verify the voltage type using the schematic or by direct measurement. If you are unsure of the voltage type, set your meter to both DC and AC settings and measure to confirm before continuing. In this example, the circuit is confirmed as AC.



A hand holds a Fluke 365 True RMS Clamp Meter set to AC voltage, displaying 0.0V. The probes are near the output terminals inside an open control panel with red, blue, and white wires.

Step 8: Measure voltage at the output terminals

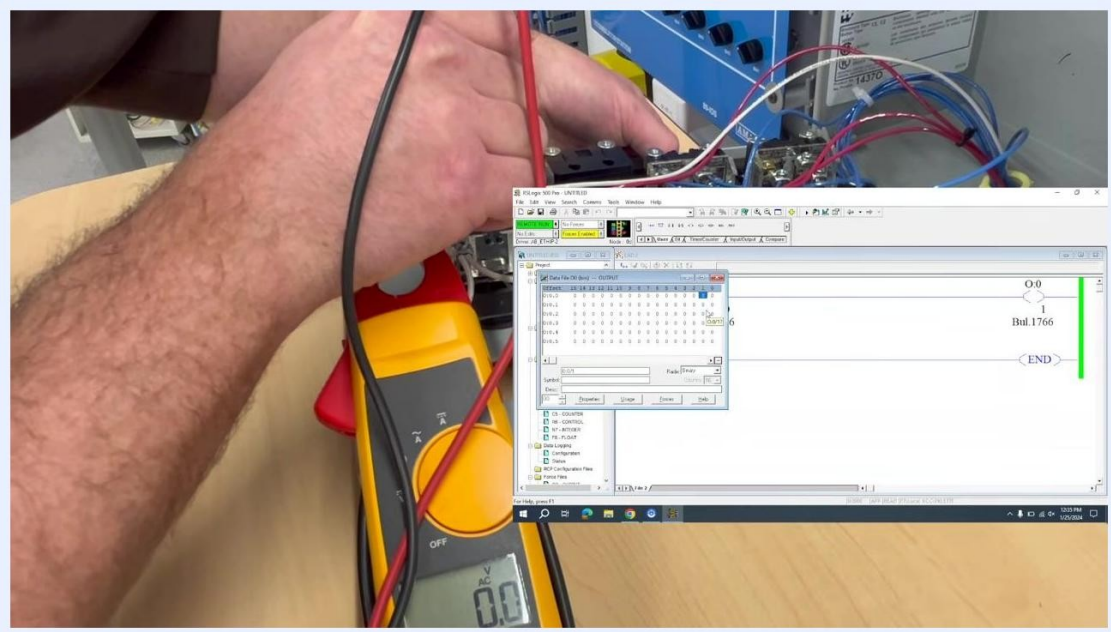
Place the meter probes across the output terminals while the output is activated, and refer to the schematic if needed to confirm the correct measurement points. In this case, the display shows 0.0V AC, indicating no voltage is present at the output.



The clamp meter is positioned near the output terminals, still reading 0.0V AC. A schematic diagram overlay shows where to measure voltage.

Step 9: Correlate software and physical output

Check the RSLogix 500 Pro software again to confirm that the output is being logically activated. The output data table and ladder logic show the output bit (O:0/1) set to 1, while the meter still reads 0.0V AC. This confirms that the PLC is attempting to activate the output, but no voltage reaches the terminal.



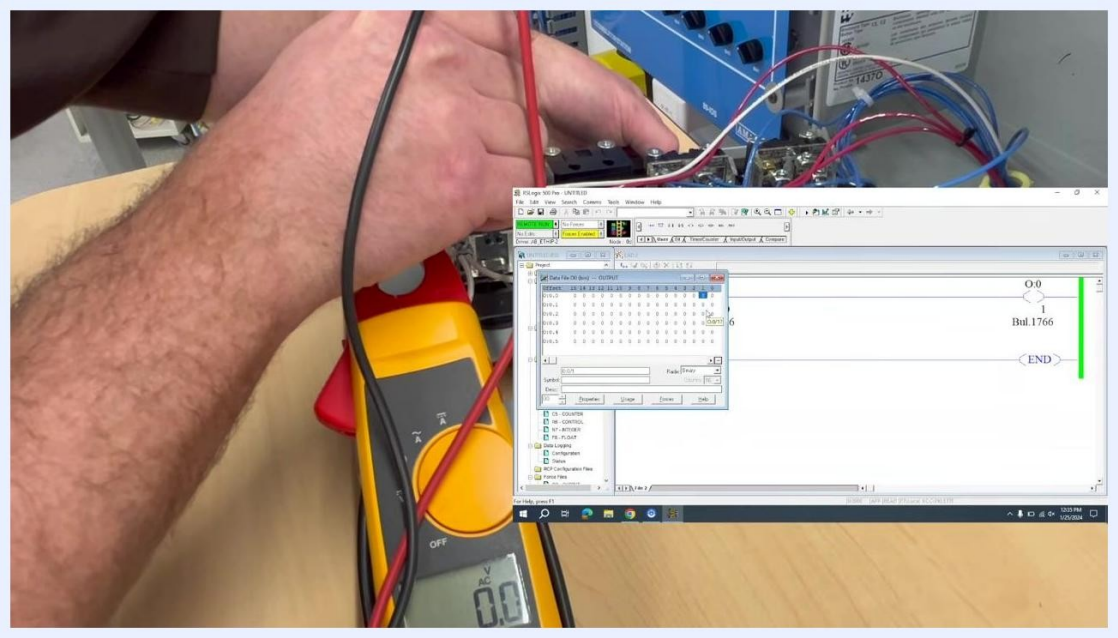
A hand holds meter probes to the output terminals, with the meter reading 0.0V AC. A software overlay shows the output bit set to 1 in the data table and ladder logic.

Step 10: Rule out the load as the problem

Because the output is being activated in software but no voltage is present at the terminal, the issue is not with the load, such as the indicator light or device itself. Close up the output terminal area and prepare to trace the wiring further upstream.

Step 11: Trace wiring back to the control panel

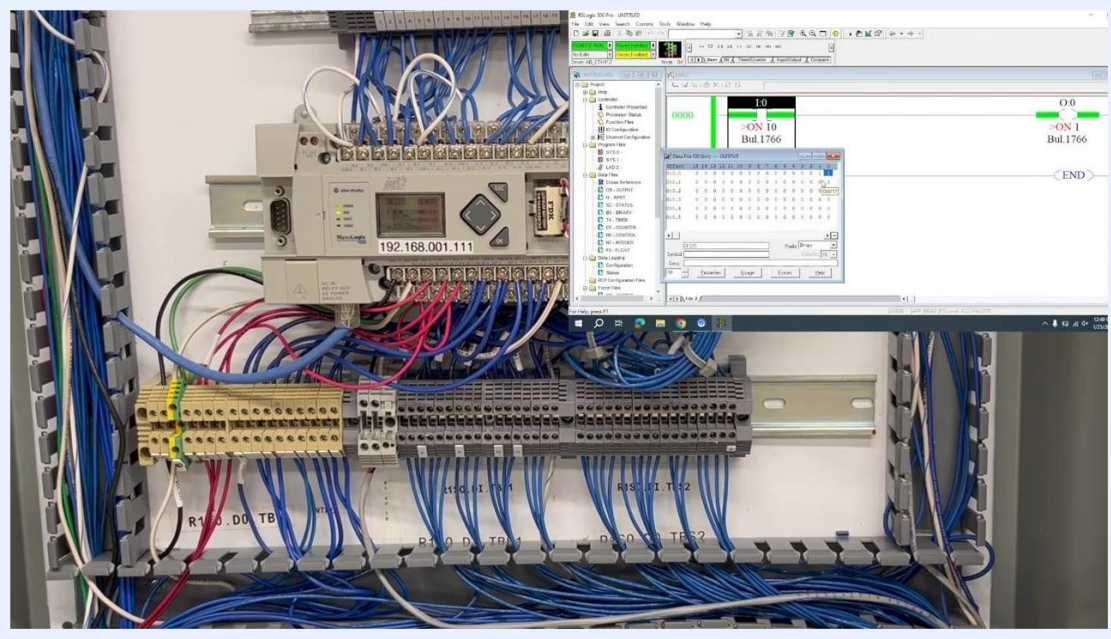
Visually inspect the wiring path from the output terminal back to the control panel. In this setup, there are no intermediate terminal blocks between the output and the control panel, so you can move directly to investigating faults inside the main control panel.



Wide view of the PLC training station, showing the open control panel, wiring, simulator stations, and a laptop running the PLC software.

Step 12: Prepare for further diagnostics

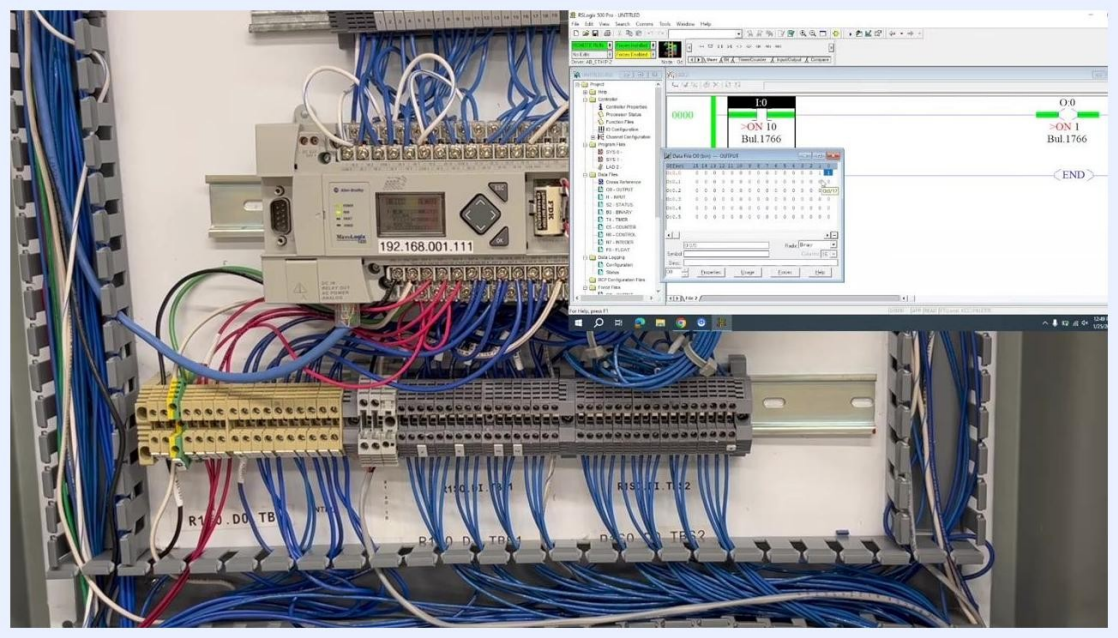
Stand in front of the control panel and review the wiring connections to plan whether the issue is a wiring problem or a faulty PLC output.



A view of the open control panel with wiring and simulator stations visible in a training lab environment.

Step 13: Force the output in software for testing

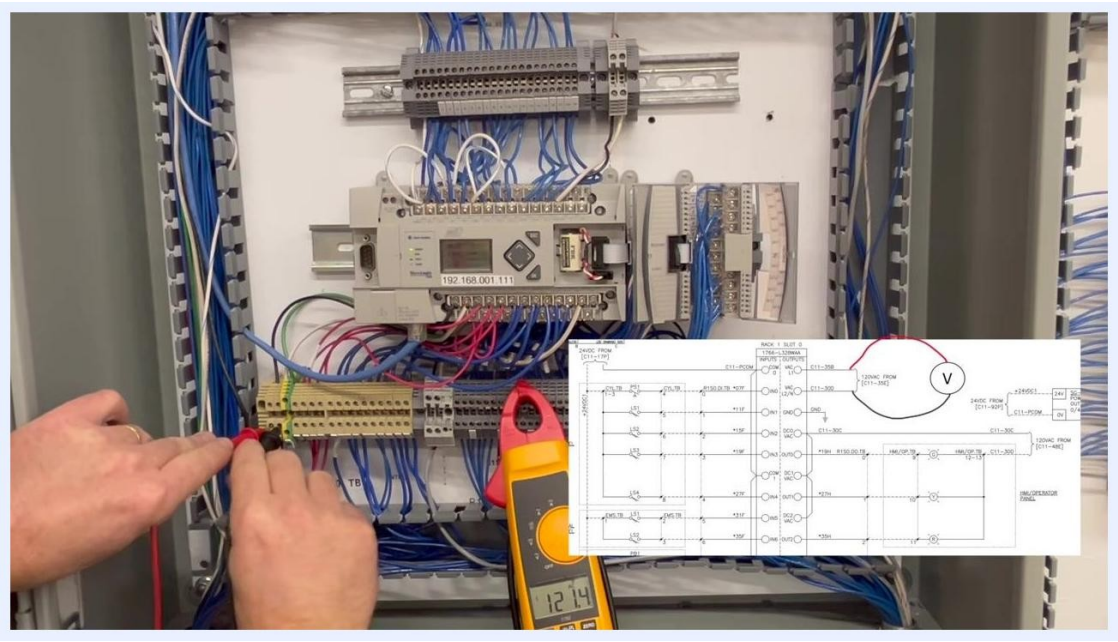
Use the PLC programming software to force the output ON for further testing, then monitor the physical indicator light to see if it responds. In this case, the output is forced ON in software, but the indicator light remains OFF, confirming the issue persists.



Close-up of the PLC inside the control panel with a software overlay showing the output forced ON, alongside visible terminal blocks and wiring.

Step 14: Establish a reliable neutral and hot line reference

Locate a terminal block where you are certain of a consistent 120V AC supply, and confirm exactly where your neutral connection is sourced from to avoid measurement errors. Place one meter probe on the neutral terminal and the other on the hot line terminal, and confirm that you read approximately 120V AC.

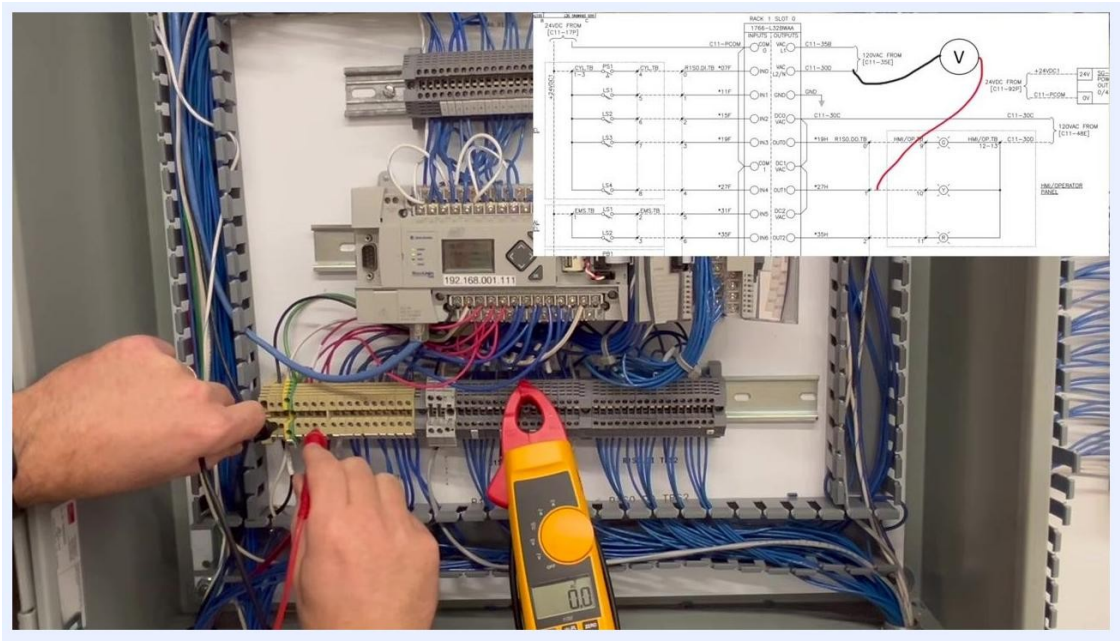


Hands holding multimeter probes to a terminal block inside the control panel. The clamp meter display reads 121.4V, with a schematic overlay showing the measurement points.

Reference check: Keep the neutral probe in the same terminal for all subsequent measurements so that every reading is relative to a known good neutral. The image below confirms this stable reference point of approximately 121.4V.

Step 15: Test the output terminal block connection

Move the hot probe to the terminal block connection that corresponds to the output wire running to the indicator light. If the display shows 0.0V, no voltage is present at this terminal. Repeat this check on adjacent terminals as needed to confirm the absence of voltage.



Hands holding multimeter probes to a different terminal block connection. The clamp meter display reads 0.0V, with a schematic overlay showing the new measurement points.

Step 16: Interpret the measurement results

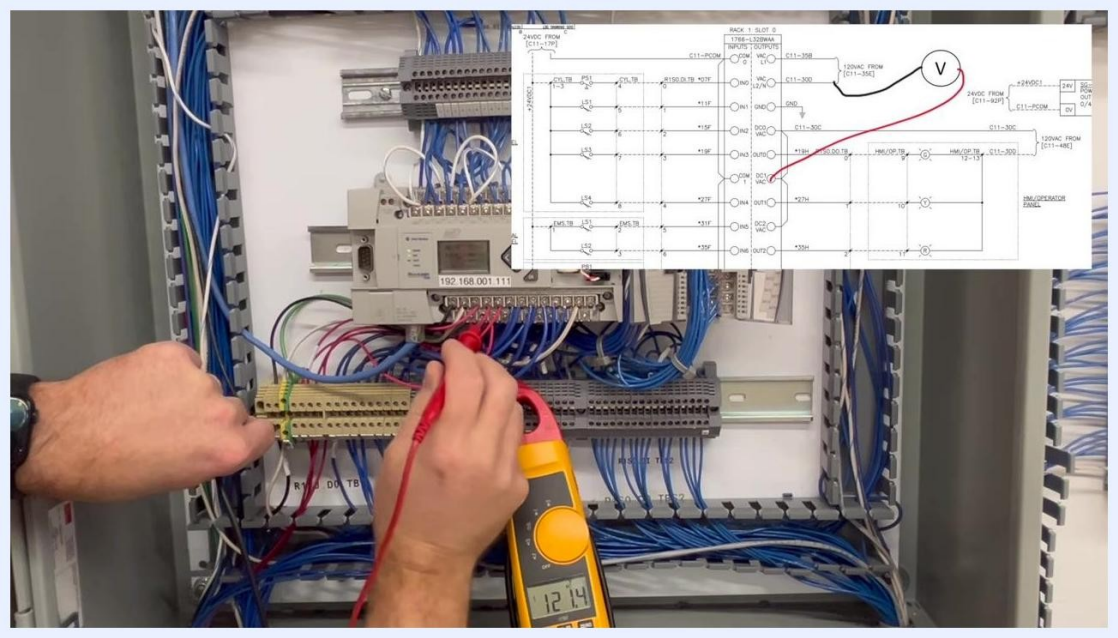
If you measure 120V at the main supply terminals but 0V at the output terminal, the terminal block itself is not the source of the fault. A drop in voltage between two adjacent terminals, while rare, can indicate a break in the terminal block. Since no voltage is found at the output terminal in this case, continue tracing the circuit upstream toward the PLC output.

Step 17: Continue tracing toward the PLC output

Identify which output on the PLC corresponds to the circuit under test — for example, Output 1, typically located on the top row of the PLC module — and prepare to test voltage directly at the PLC output terminal to further isolate the fault.

Step 18: Test the output voltage at the suspected output terminal

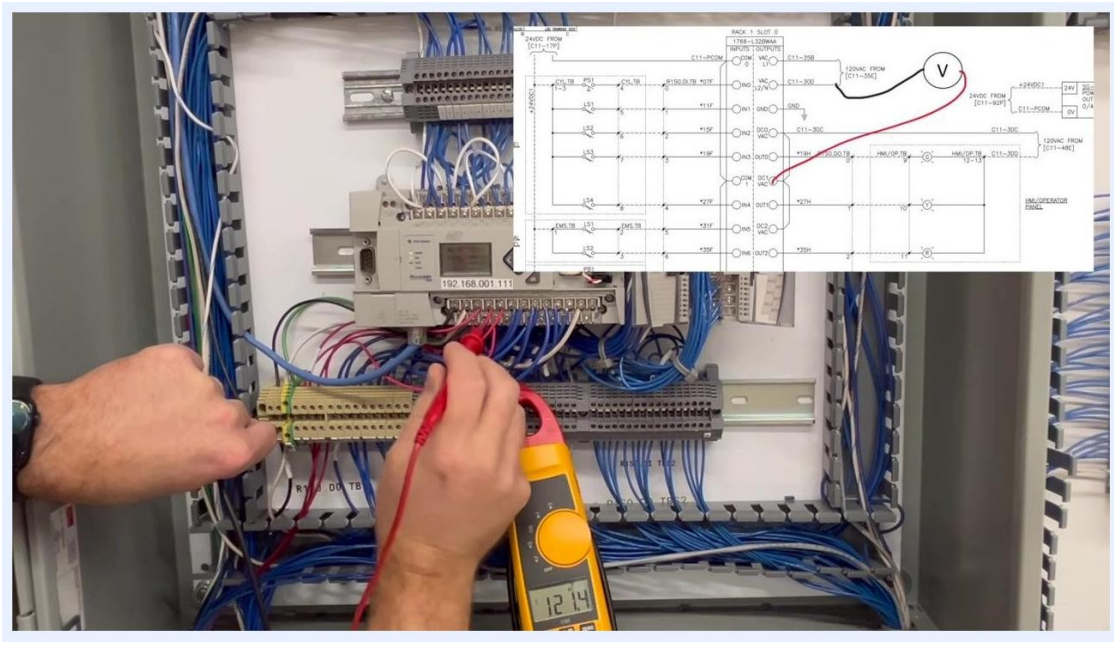
Place the multimeter probes on the output terminal and the corresponding neutral/ground terminal as shown, referring to the schematic overlay to confirm probe placement. The multimeter display reads 0.0 volts, confirming no voltage is present at this output.



Multimeter probes placed on the output terminal, with the meter reading 0.0V and a schematic overlay visible.

Step 19: Confirm the output is not closing

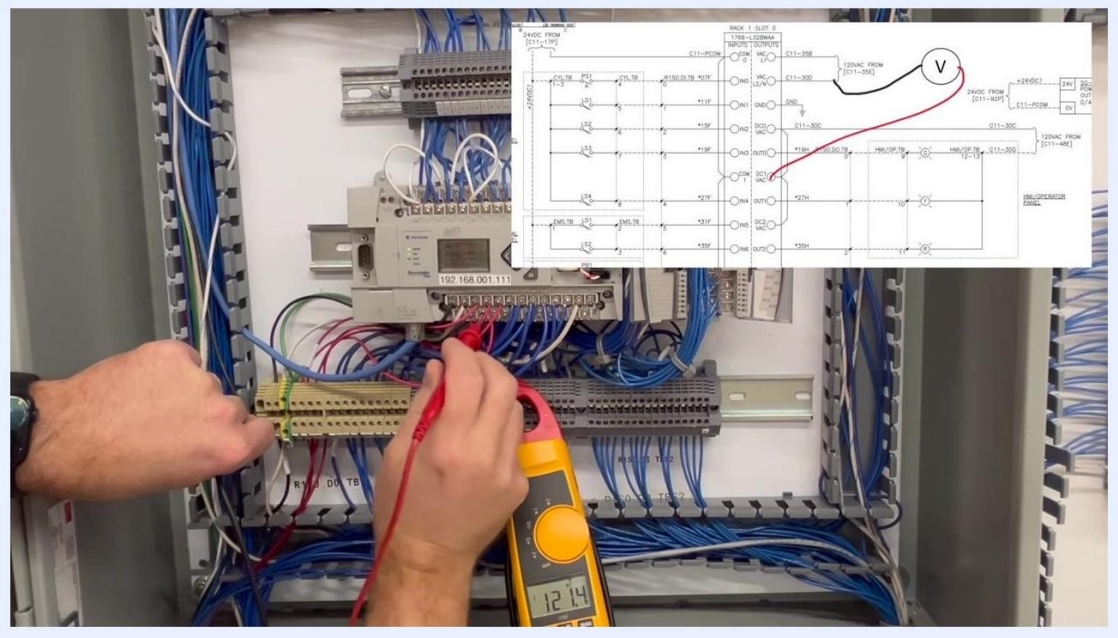
Keep the probes in place and verify that the multimeter still reads 0.0 volts. This confirms that the PLC output contact is not closing as expected.



Multimeter probes remain on the same terminals, with the meter still reading 0.0V and the schematic overlay visible.

Step 20: Verify voltage at the output contact

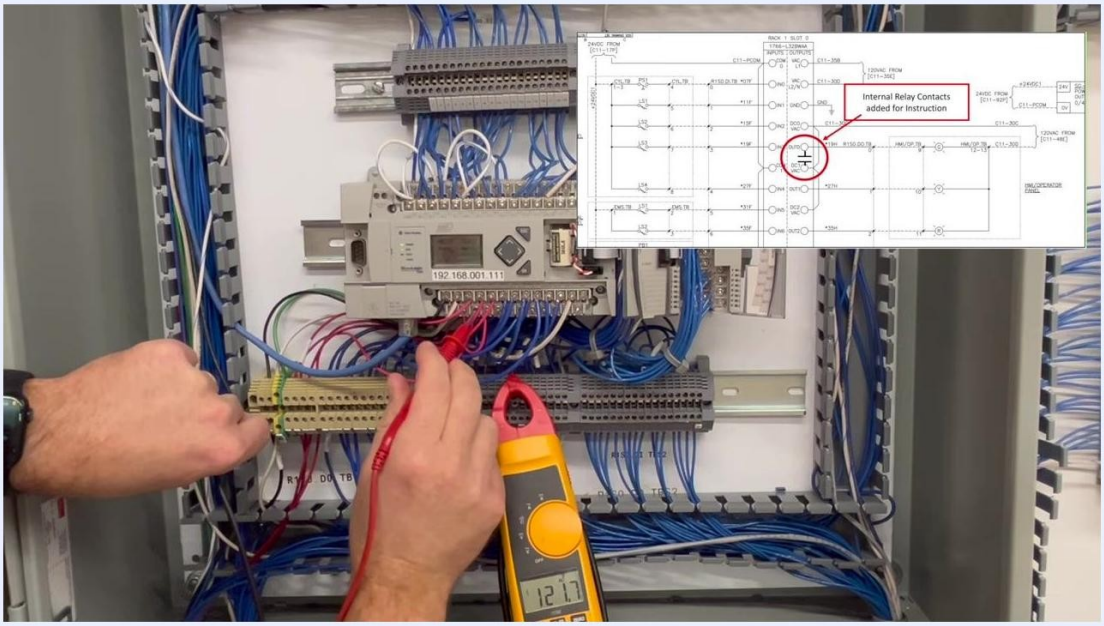
Move the red probe to the output contact terminal as indicated in the schematic. The multimeter now reads 121.4 volts, confirming that power is available up to the contact, even though it is not passing through to the output.



Multimeter probes on the output contact, with the meter reading 121.4V and the schematic overlay visible.

Step 21: Diagnose the PLC output as faulty

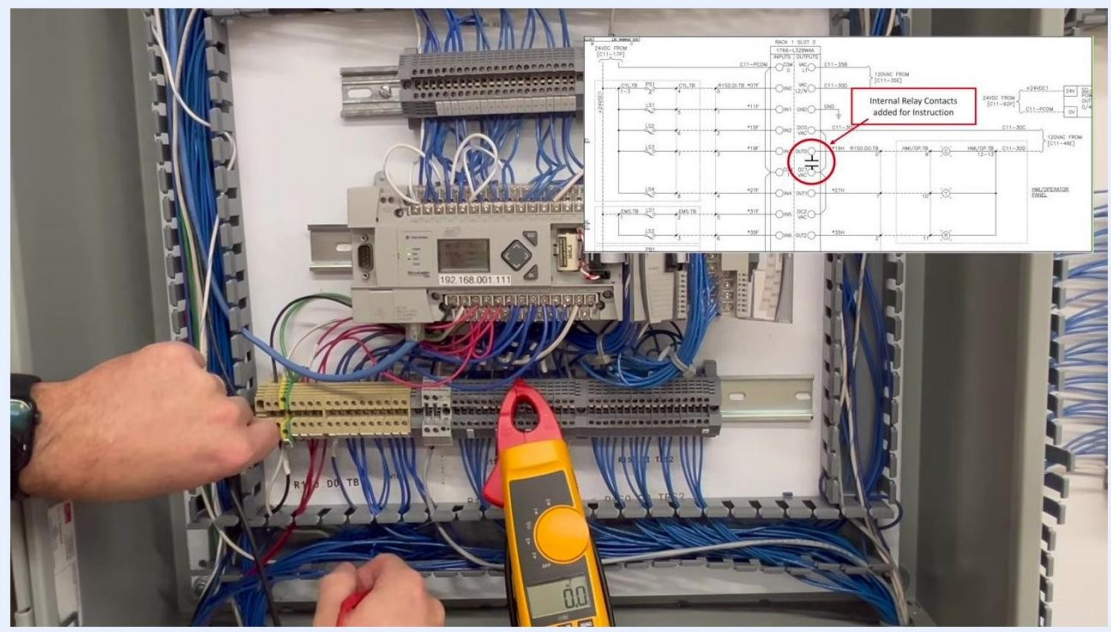
Continue measuring at the output contact. The multimeter reads 127.7 volts at the contact but 0.0 volts at the output, showing that the contact for this output is not closing. This means the PLC output itself is bad; there is no repair available for this output, but you can either swap the PLC or move the load to a functioning output.



Multimeter probes on the output contact, with the meter reading 127.7V and the schematic overlay highlighting the internal relay contacts.

Step 22: Remove probes and prepare for further testing

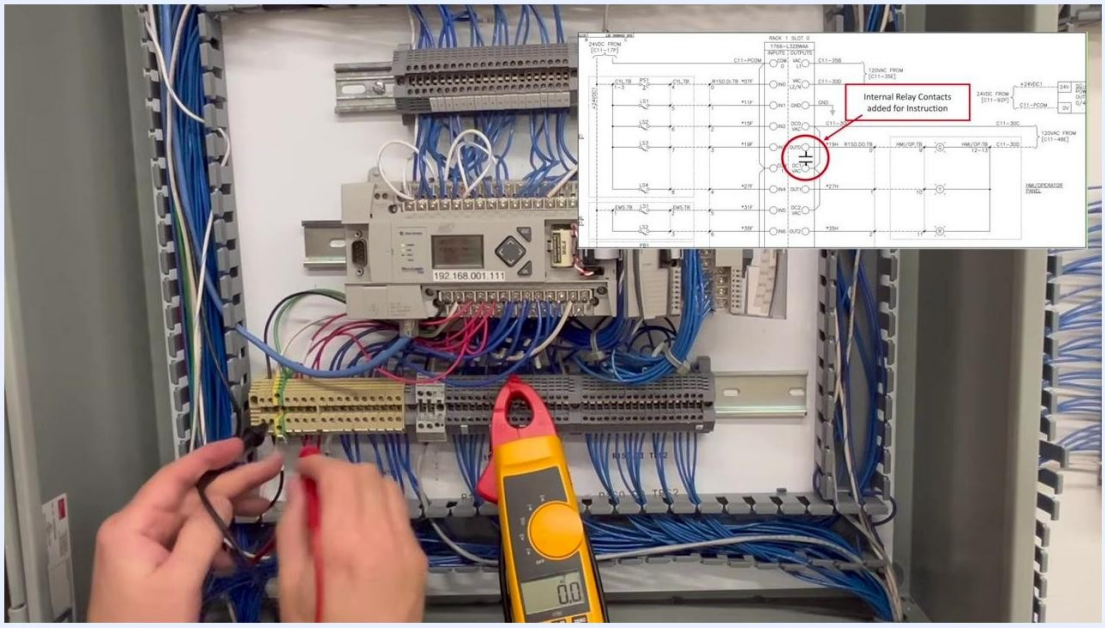
Remove the red probe from the terminal block, leaving the black probe in place. The multimeter display returns to 0.0 volts, and the schematic overlay continues to highlight the internal relay contacts.



The red probe is removed while the black probe remains, with the meter reading 0.0V and the schematic overlay visible.

Step 23: Trace the power path for verification

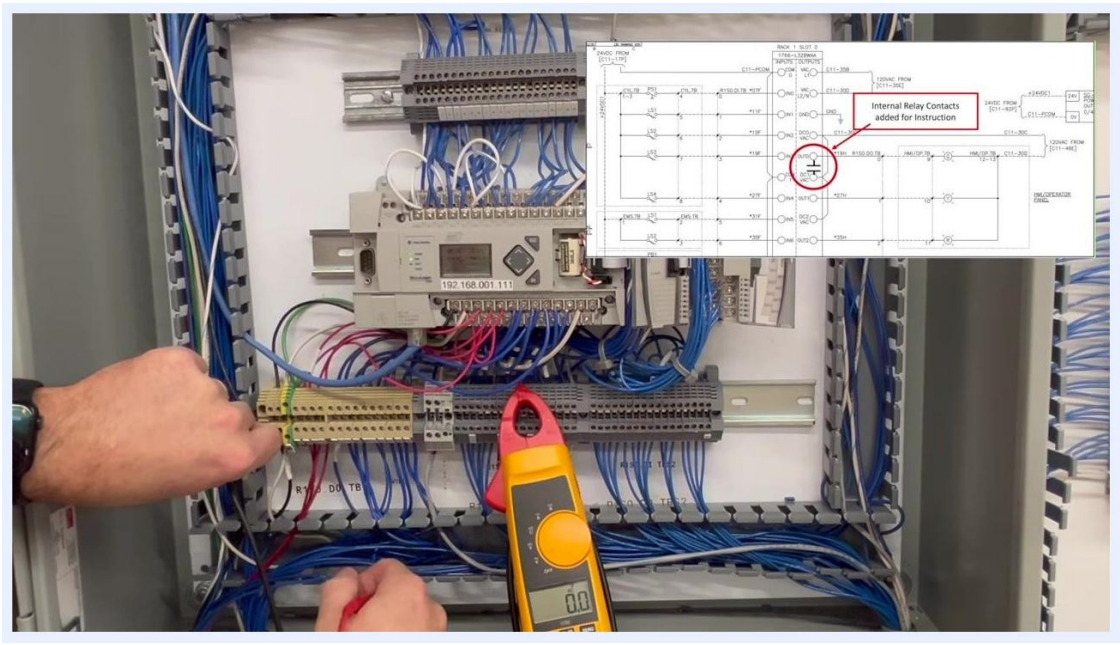
Use both probes to trace the power path through the terminal block and wiring, following the schematic to confirm continuity and voltage presence along the expected route.



Both probes trace the power path, with the meter reading 0.0V and the schematic overlay visible.

Step 24: Continue tracing and confirming the power path

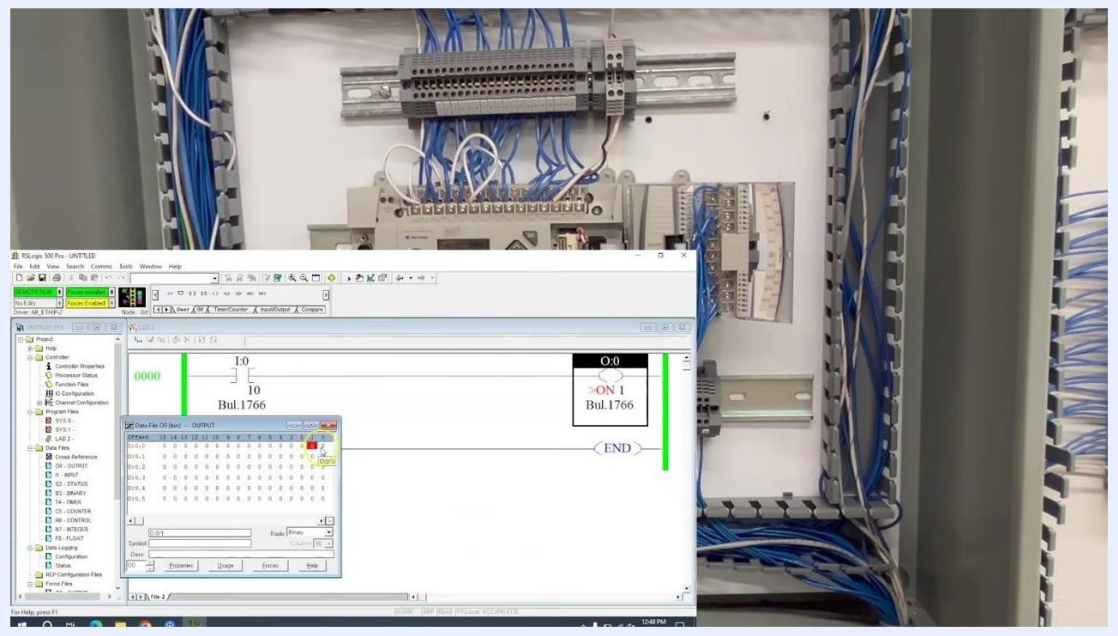
Continue checking additional points along the wiring with the probes. The multimeter continues to read 0.0 volts, confirming that the output is not delivering voltage anywhere along this section.



Probes check additional points along the wiring, with the meter reading 0.0V and no schematic overlay.

Step 25: Confirm the wiring is intact

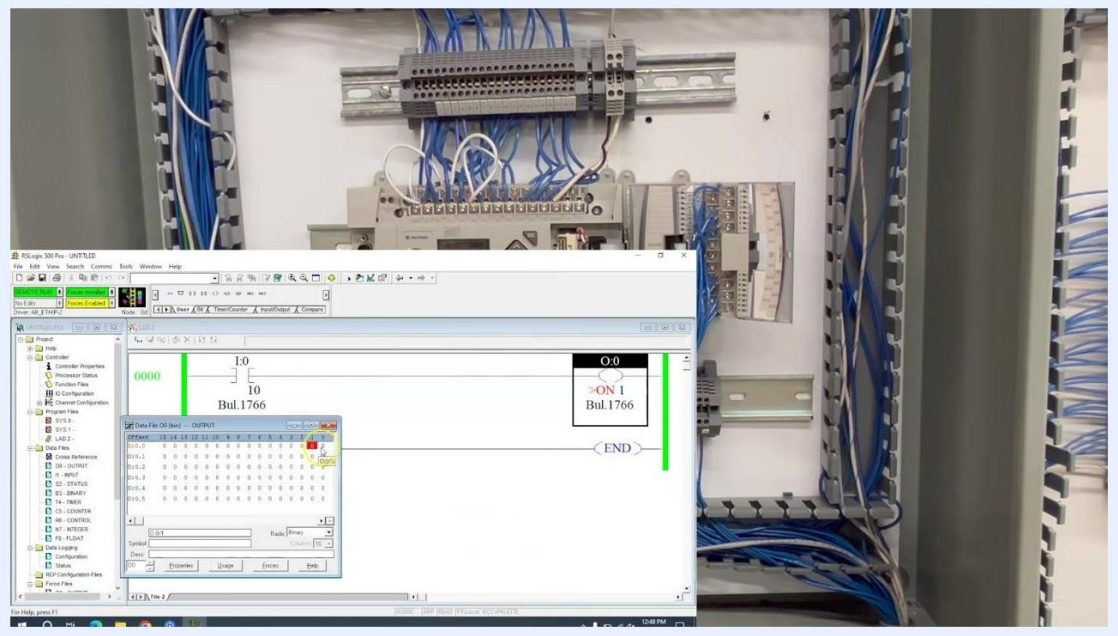
Trace the power line through the remaining sections of wiring. The wiring itself is confirmed intact, isolating the issue to the PLC output relay or contact rather than the wiring path.



Probes trace the wiring, with the meter reading 0.0V and no schematic overlay.

Step 26: Conclude that the output is bad

With the wiring confirmed good, the conclusion is that the PLC output itself is bad, not the wiring. Both probes are held in hand while the multimeter reads 0.0 volts, and the schematic overlay highlights the faulty relay contact.



Both probes are held in hand, with the meter reading 0.0V and the schematic overlay highlighting the faulty relay contact.

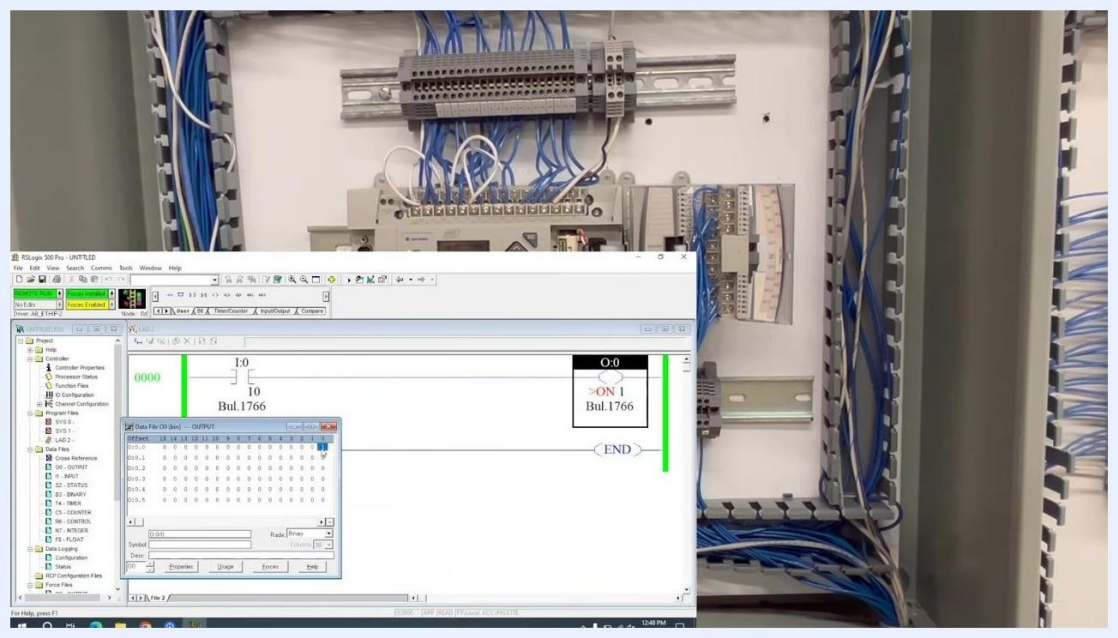
Step 27: Review the PLC logic in RSLogix 500

Open the RSLogix 500 Pro software interface and review the ladder logic diagram showing the input and output rungs. The output (O:0/0) is forced ON, highlighted in red in the data file window, and the status bar indicates "Force Enabled" and "Process Inhibited". This confirms the PLC logic is commanding the output ON, even though the physical output is not functioning.

RSLogix 500 Pro software showing the ladder logic with the output forced ON and the status bar displaying "Force Enabled".

Step 28: Confirm output status and remote run mode

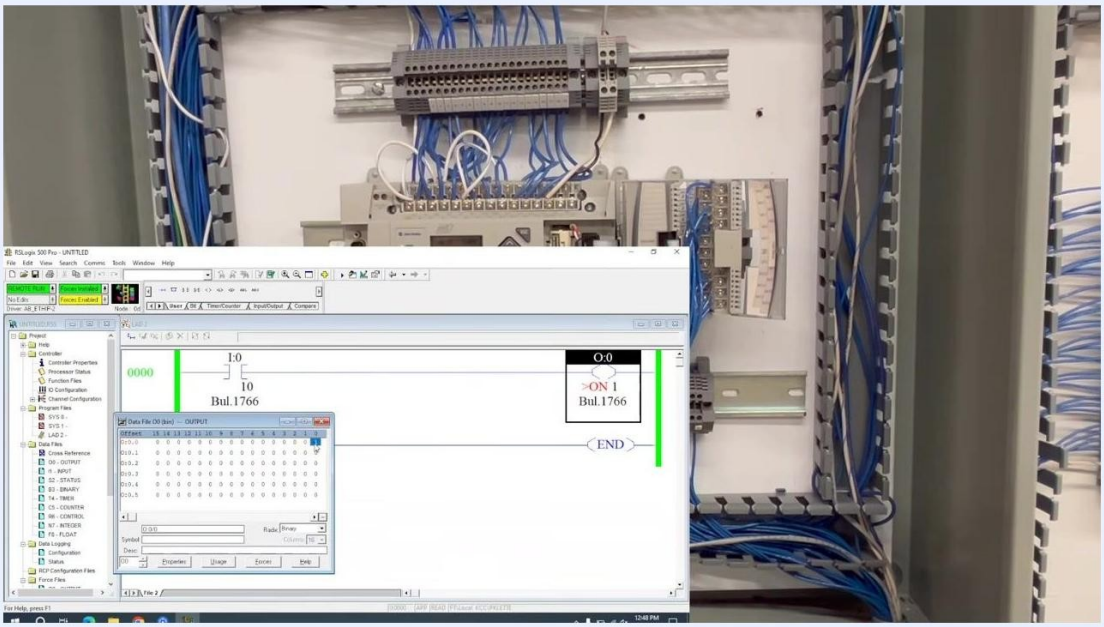
Review the software interface again, displayed on a computer screen in front of the open control panel. The ladder logic shows an input (I:0/10) and an output (O:0/0), with the output highlighted and marked "ON 1" (forced ON). The status bar indicates "REMOTE RUN", "Force Enabled", and "Process Inhibited", and the Data File (O) window shows O:0/0 set to 1. This step confirms in software only, with no physical action performed, that the PLC logic is commanding the output ON.



RSLogix 500 Pro software interface with the ladder logic, output forced ON, and status bar showing "Force Enabled" and "Process Inhibited".

Step 29: Measure voltage at the output terminal block

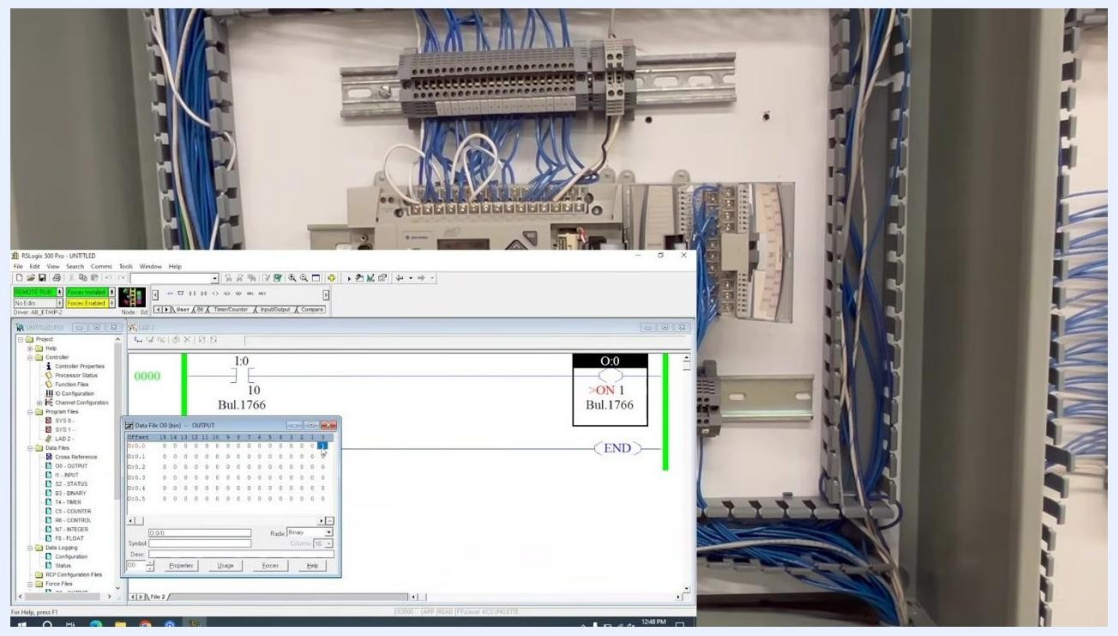
In the control panel, use the digital clamp meter to measure voltage at the output terminal block. Place the black probe on the neutral/ground terminal and the red probe on the output terminal as indicated in the schematic overlay. The meter reads 115.1 volts, confirming that 120V AC is available at this point, matching the schematic.



Hands hold multimeter probes at the terminal block, with the meter reading 115.1V and the schematic overlay showing probe placement.

Step 30: Continue tracing voltage through the output path

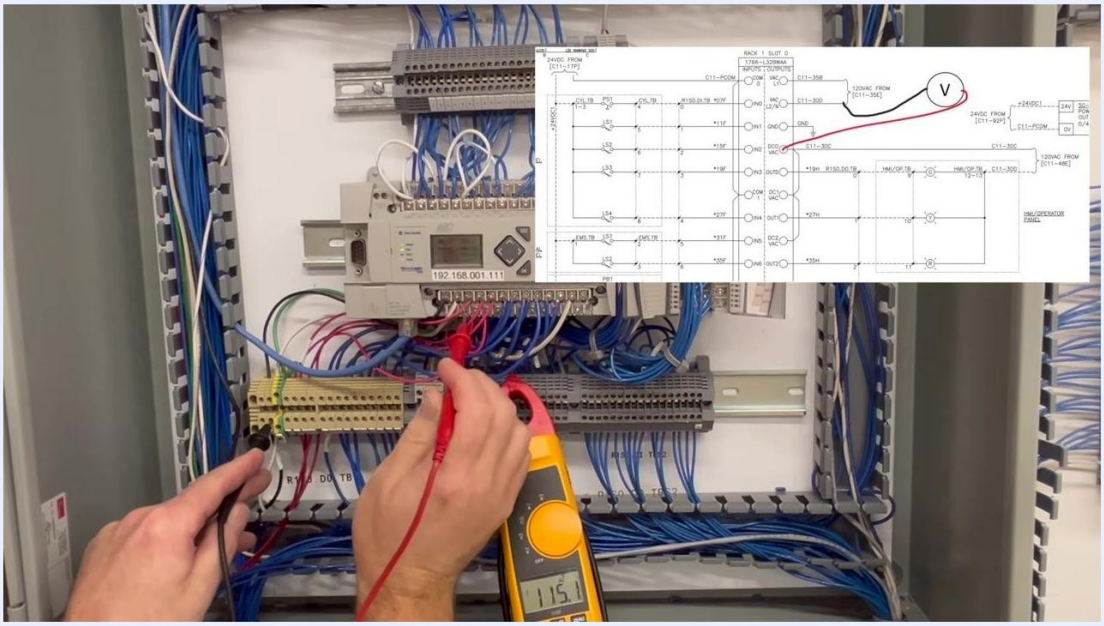
Move the red probe to the next terminal in the output path as shown in the schematic overlay. The meter now reads 121.2 volts, confirming that the output circuit is energized further along the path.



Hands hold probes at a new terminal, with the meter reading 121.2V and the schematic overlay showing the updated probe position.

Step 31: Verify voltage at the final output terminal

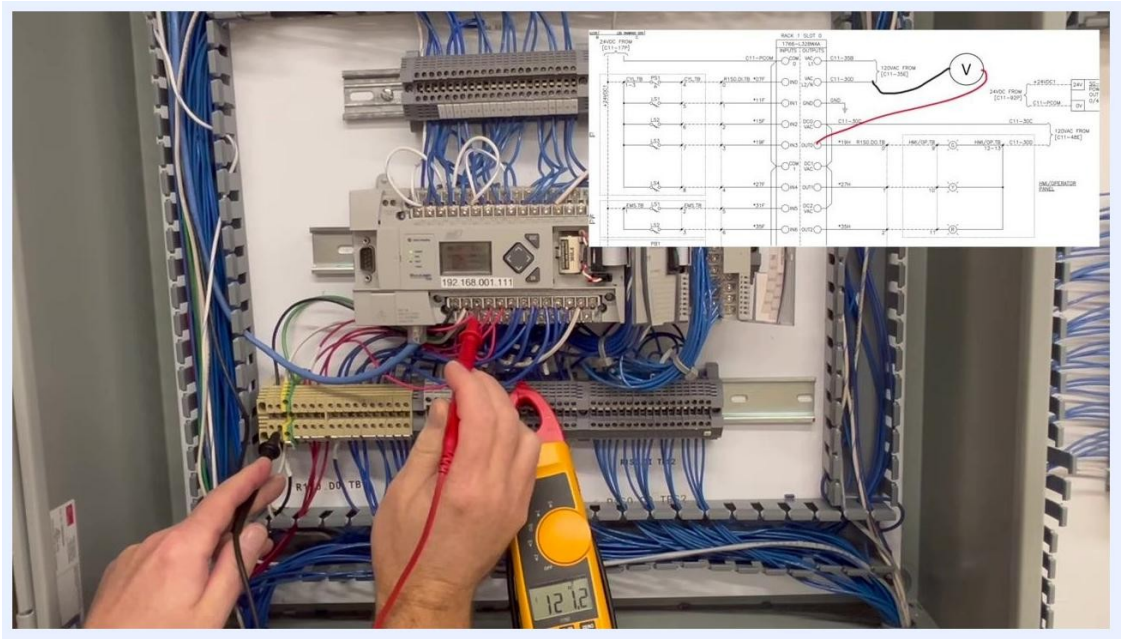
Remove the red probe and place it at the final output terminal, leaving only the black probe in contact with the terminal block. The meter now reads 0.0 volts, confirming that despite the PLC logic commanding the output ON, no voltage reaches the final output terminal — a failure in the output relay or contact.



Only the black probe remains in place, with the meter reading 0.0V and no schematic overlay.

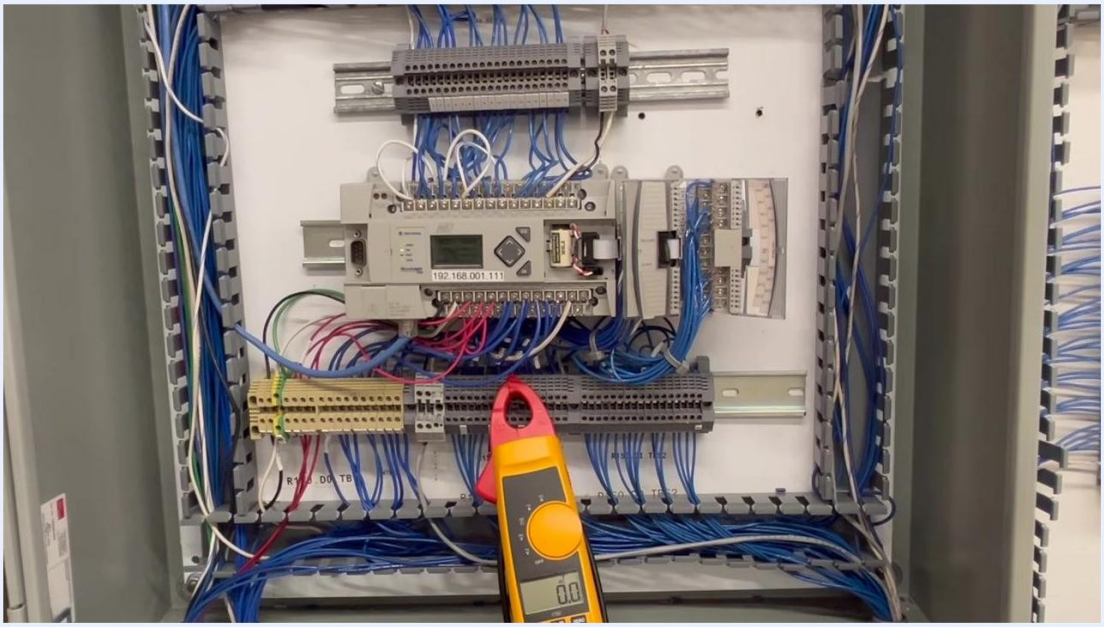
Verification and summary

Review the completed measurements: the control panel remains open, showing the PLC, terminal blocks, and organized wiring, with the digital clamp meter resting on the terminal block and displaying 0.0 volts. No probes are held at this point, marking the end of the troubleshooting sequence.



Control panel with the PLC and wiring visible, meter resting on the terminal block and displaying 0.0V, no probes held.

The control panel setup remains unchanged in the final check, with the digital clamp meter still resting on the terminal block and displaying 0.0 volts, marking the conclusion of the PLC output troubleshooting procedure.



Control panel with the PLC and wiring visible, meter resting on the terminal block and displaying 0.0V, no probes held.

By following this procedure, you have:

- Confirmed the PLC is sending the output signal in software using RSLogix 500 Pro.
- Checked the physical indicator (bulb) to rule out a simple load failure.
- Measured voltage at the output terminals with the correct meter setting, using the schematic to verify measurement points.
- Traced voltage systematically from a known good neutral and hot line reference through the terminal blocks and output contact.
- Confirmed the output relay/contact is not passing voltage, isolating the fault to the PLC hardware.

What's next

Since the PLC output relay/contact is confirmed faulty and cannot be repaired, your corrective options are to swap out the PLC or move the affected load to a functioning output on the same module.