Oil Tank Transfer Box

Troubleshooting Guide

PLC Program #3201
Schneider Electric Zelio Logic SR3B261FU
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THE PROBLEM: System works in Manual mode but fails in Automatic mode.

PHASE 1: Power & Hardware Check

What to verify:

- Main module: **SR3B261FU** (100-240V AC supply)
- Expansion module: **SR3XT141FU**
- PLC cycle time: **20ms** (RUN light should be solid green)
- System clock accurate (for Daylight Saving logic)

Action: Verify power supply voltage and physical bus connection between modules.

PHASE 2: Critical Input Signals

These are your "gatekeepers" - if they fail, the system won't start.

Priority 1: Input IL (System Ready)

- **Most critical input** - appears in rungs 1, 3, 4, 6, 7, 9, 19
- Controls relay **M1** which gates both pumps Q1 and Q2
- **Test:** Use multimeter to verify signal at terminal IL
- **Fault Code:** FAULT: NO-RDY if M1 is OFF

Priority 2: Directional Inputs (ID & IE)

- **ID:** Triggers Tank A transfer (controls relay M4)
- **IE:** Triggers Tank B transfer (controls relay M5)
- **Test:** Check continuity on float switches
- **Fault Code:** BLOCK: DIR if both M4 and M5 are OFF

Note on Input Filtering:

- System uses **3ms "Slow" filtering**
- Flickering sensors faster than 3ms will be ignored by PLC
- May cause intermittent failures if sensors are vibrating

PHASE 3: Valve Timing & Sequencing

The 1.5-Second Window:

Critical timers **T9** and **TA** are set to **1.5 seconds**. Valves must open fully within this window or pumps will shut down.

Test procedure:

1. Trigger a transfer in Auto mode
2. Verify solenoids **Q6** (Pump 1) or **Q7** (Pump 2) fire immediately
3. Measure time between valve opening and pump starting
4. If time exceeds 1.5s → **TIMEOUT FAULT**

Fault Codes:

- **FAULT: T-OUT 9** - Timer T9 expired, Pump Q1 blocked (check Q6 valve or feedback sensor IF)
- **FAULT: T-OUT A** - Timer TA expired, Pump Q2 blocked (check Q7 valve or feedback sensor IG)

PHASE 4: Safety Interlocks

Relay M3 (Safety Interlock)

- Prevents system from starting if conflicting outputs are active
- **Blocked if:** Any of q6, q7, q8 are stuck ON simultaneously
- **Test:** Monitor that no valves are stuck in active state
- **Fault Code:** BLOCK: SAFE if M3 is OFF

Relay M6 (Emergency Stop)

- Acts as normally closed contact in pump circuit
- **If M6 activates** → breaks circuit and stops both pumps
- Often linked to E-Stop button or thermal overload

Quick Fault Diagnosis

Symptom	Likely Cause	Check This
Pump won't start in Auto	Input IL open/flickering	Terminal IL voltage
Pump starts then stops	1.5s timer expired	Valves Q6/Q7 actuation speed
No direction selected	Float switches failed	Inputs ID and IE continuity
System "locked"	Safety interlock active	Relay M3 status
Both pumps dead	Master gate blocked	Relay M1 and Input IL

Field Inspection Checklist

Pre-Start

- ■ LOTO procedures completed
- ■ Supply voltage confirmed (100-240V AC)
- ■ PLC in RUN mode, 20ms cycle

Input Tests

- ■ Input IL signal verified at terminal
- ■ Inputs ID and IE continuity checked
- ■ No flickering signals faster than 3ms

Output/Timing Tests

- ■ Solenoids Q6, Q7, Q8 actuate within 1.5s
- ■ Timers T9 and TA not timing out
- ■ No conflicting outputs active simultaneously

Internal Logic (via Zelio Soft or PLC display)

- ■ Relay M1 is ON (system ready)
- ■ Relay M2 is ON (transfer requested)
- ■ Relay M3 is ON (safety interlock clear)
- ■ Relay M6 is OFF (no stop condition)
- ■ Either M4 or M5 is ON (direction latched)

Post-Test

- ■ All LOTO devices removed
- ■ Enclosure secured

Most Likely Root Causes

Based on "works in Manual but not Auto" behavior:

1. **Input IL missing signal** (70% probability)
2. **1.5s timer too short for valve actuation** (20% probability)
3. **Input filtering rejecting fast signals** (10% probability)