

Omron PLC Controller

Integrated Controller — Standard on All Pump Stations



KEY SPECIFICATIONS

Model: ZEN-10C1AR-A-V2

Power: 100-240 VAC, 50/60 Hz

I/O: 6 inputs + 4 relay outputs

Display: LCD, 12x4 char

Mounting: DIN rail / surface

Specifications

The Omron PLC functions as a small-scale controller for automation of pump sequencing, timers, & humidistat logic in the FanMist System.

Key Specifications (PLC Model: ZEN-10C1AR-A-V2)

Power Supply Voltage	100–240 VAC (85– 264 VAC range)
Frequency	50/60 Hz
Power Consumption	8 VA maximum
I/O Configuration	6 digital inputs + 4 relay outputs (8A @ 250 VAC/24 VDC)
Display	LCD, 12 characters × 4 lines backlit
Program Capacity	Ladder logic — timers, counters, comparators
Mounting	DIN rail or surface; ~70×90×56mm
Other Features	Clock/calendar, EEPROM backup, expandable I/O
Operating Range	0–55°C, 10–90% RH (non-condensing)
Standards	CE, UL — industrial use

Breakdown of the Omron ZEN Model Code

Reading (ZEN-10C1AR-A-V2)

ZEN	Series name (Programmable Relay).
10	I/O points on the base CPU unit (6 in + 4 out)
C	CPU Unit (core controller)
1	Standard type (vs. economy/LED-only)
AR	Analog inputs possible + relay outputs
A	AC power supply (D would be DC.)
V2	Version 2 — see Omron “ZEN V2 Operation Manual” Cat. No. Z211

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PLC Screen Display — Stage-by-Stage

Sequencing, screen symbols, and indicator lights as the system moves from idle through startup.

1. Start Signal Received

The humidistat calls for humidity and sends a start signal to the PLC. The green cube relay LED illuminates and remains on as long as the call continues. Fans start immediately; no output squares are yet active.



SA00:26 RUN

I: ●○○○○○

Q: □□□□

RUN

2. Fans Start

The PLC sends an output signal to start the fans. The first output square darkens and the orange indicator light on the pump enclosure turns on. A 10-second pump delay timer begins.



SA00:26 RUN

I: ●○○○○○

Q: ■□□□

RUN

3. Pump Starts

After the 10-second fan delay expires, the PLC energizes the inlet solenoid valve and pump contactor. The green indicator illuminates and the 25-second pressure-build timer begins.



SA00:26 RUN

I: ●○○○○○

Q: ■■□□

RUN

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PLC Screen Display — Stage-by-Stage (cont.)

4. Pressure Build Phase

The third output square darkens and the red indicator turns on. Both red and green lights stay lit while the PLC monitors the high-pressure switch (HPS), waiting for confirmation of ≥ 550 psi within 25 seconds.



SA00:26 RUN

I: ●○○○○○

Q: ■■■■

RUN

5. Pressure Achieved — Normal Operation

If the system reaches ≥ 550 psi within 25 seconds, the red light turns off, leaving only green illuminated. The pump continues operating at approximately 1000 psi until the humidistat is satisfied.



SA00:26 RUN

I: ●●○○○○

Q: ■■■■

RUN

6. Pressure Fault — System Shutdown

If the system fails to reach 550 psi within 25 seconds, the PLC triggers a fault. The pump shuts down immediately and the red FAULT light remains on; other output squares sequentially turn off.



SA00:26 RUN

I: ●○○○○○

Q: □□■□

RUN

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PLC Screen Display — Stage-by-Stage (cont.)

7. System Remains OFF Until Reset

While in fault mode, the cube relay LED stays lit because the humidistat's start signal is still active. No power reached the pump or fans. The system stays locked out until the pressure issue is corrected and the PLC is reset.



System OFF
Idle/Ready State

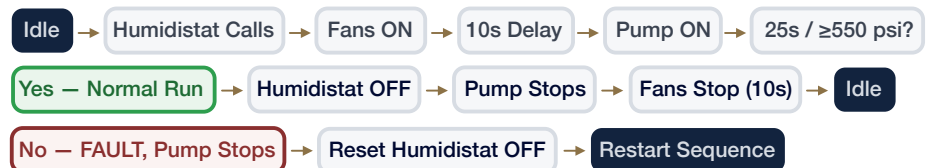
8. Normal Shutdown Sequence

When the humidistat stops calling, the cube light turns off, the PLC stops the pump immediately, and opens the electric drain valve to release pressure. Fans continue 10 more seconds before stopping; the system returns to idle.

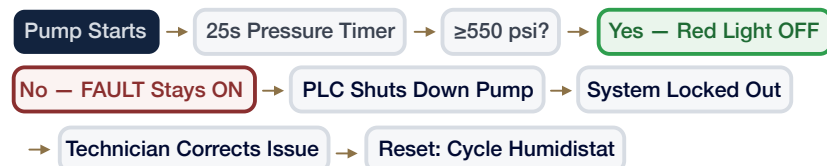
SA00:26 RUN
I: ○○○○○○
Q: □□□□
RUN

PLC Central Control Functions

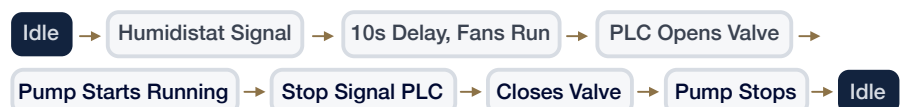
A. Auto-Controlled Sequencing of Pump and Fans



B. High-Pressure Safety (HPS) Fault Sequence



C. Inlet Solenoid Valve Sequence



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PLC Integration with Other Components

Humidistat (HRO20) 24 VAC via cube relay

Integrates through a 24 VAC signal via the cube relay. When humidity falls below the setpoint, the humidistat sends a start signal, starting fans immediately and the pump after a 10-second delay. At setpoint, the signal drops, stopping the pump immediately and the fans after a 10-second off-delay.

Inlet Solenoid Valve opens only when pump runs

Stays closed when idle. When the humidistat calls, the PLC opens the valve after a 10-second fan delay to allow water flow. Once satisfied, the PLC closes it immediately to stop flow.

Electric Drain Valve (EDV) opens on pump stop

Stays closed while the pump runs. When the humidistat stops calling, the PLC stops the pump and opens the EDV to release pressure — closing the nozzles and draining ~1/4 gallon, preventing drips after shutdown.

Fan Contactor / Relay Box 24 VAC from Fan Control terminals

Fans are controlled through a remote contactor box via a 24 VAC signal from the PLC's Fan Control terminals. Fans start immediately on a call, and keep running 10 seconds after the pump stops.

High-Pressure Switch (HPS) must confirm 550 psi

Used as a safety device. On pump start, the PLC runs a 25-second timer and lights the red FAULT indicator. If HPS confirms 550 psi in time, the red light clears; if not, the PLC shuts down the pump and holds the fault until reset.

Indicator Lights direct PLC outputs

Green = pump running. Red = failed to reach 550 psi within 25 seconds. Amber = 500 hours of runtime reached (maintenance due); cleared with buttons 3+4.

Analog Hour Meter 500-hour maintenance reminder

Tracks total pump runtime. At 500 hours, the PLC lights the amber MAINT indicator. After service, the operator resets the timer with buttons 3+4 to continue monitoring toward the next interval.

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Changing PLC Timers

T1: Delay ON for the motor/pump start (Q1). (Pump starts after a delay once the start signal is received)

T2: Delay OFF for the Fans (Q0).

(Fans continue running for a set time after the pump stops)

Important: Fans (Q0) have no start delay. Pump (Q1) has no stop delay.

How to Change Timer Settings

- 1 Enter Parameter Mode** — Press OK, use the Down Arrow to highlight Parameter, press OK.
- 2 Select the Timer** — if the number shown isn't the timer you want, press OK (the "T" blinks), use Up/Down to select T1 or T2, press OK.
- 3 Edit the Timer Value** — press Left Arrow to move to the timer value, press OK, use Left Arrow to move between digits and Up/Down to change the value, then press OK.
- 4 Save and Exit** — press ESC twice to return to the main screen. The new timer setting is now active.

Quick Tips

- T1 controls how long the fans run before the pump starts (typically 10 seconds).
- T2 controls how long the fans continue running after the pump stops (typically 10 seconds).
- Always verify the new timer values by observing system operation after making changes.
- If you accidentally enter the wrong timer, simply repeat the steps above to correct it.

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Troubleshooting the PLC

Symptom	Likely Cause — Check	Recommended Action
Pump will not start	No 24 VAC start signal from humidistat — <i>Check: cube relay green LED</i>	Verify humidistat setting and wiring; check 24V supply.
Pump will not start	Fault condition not reset — <i>Check: red FAULT light</i>	Turn humidistat OFF then back ON to reset PLC.
Red FAULT light stays on	Pump failed to reach 550 psi in 25s — <i>Check: HPS signal / actual pressure</i>	Inspect for leaks, clogged filter, low water supply, or faulty HPS.
Red FAULT light stays on	HPS not activating — <i>Check: pressure gauge reaches 550+ psi</i>	Check HPS wiring/connection to PLC; replace HPS if faulty.
Red FAULT light stays on after reset	Ongoing pressure issue or wiring fault — <i>Check: pressure during startup</i>	Troubleshoot pressure loss before attempting another reset.
Amber MAINT light is on	500 hours of runtime reached — <i>Check: analog hour meter</i>	Perform 500-hr maintenance (oil, filter, belt); reset via buttons 3+4.
Fans do not start	No 24 VAC output to fan contactor — <i>Check: Fan Control terminals</i>	Verify 24V signal is sent from PLC when humidistat calls.
Fans do not start	Faulty remote contactor or wiring — <i>Check: voltage at contactor coil</i>	Repair or replace wiring between PLC and remote relay box.
Fans start but pump does not	10-second pump delay timer issue — <i>Check: PLC screen during startup</i>	Check/adjust T1 timer (Pump ON delay) in PLC parameters.
Pump starts but pressure is low	Inlet Solenoid Valve not opening — <i>Check: valve click / voltage at valve</i>	Verify PLC is energizing the solenoid after the 10-second delay.
Nozzles drip after shutdown	EDV not opening — <i>Check: EDV signal when pump stops</i>	Verify PLC is commanding EDV to open on shutdown.
System shuts down after 25 seconds	HPS not reaching setpoint — <i>Check: pressure gauge during startup</i>	Check for restrictions, air in lines, or pump issues.
PLC will not reset after fault	Fault counters not cleared — <i>Check: ESC button on PLC screen</i>	View active fault counters, then cycle humidistat signal OFF → ON.
Intermittent starting / stopping	Unstable 24 VAC signal from humidistat — <i>Check: cube relay LED behavior</i>	Inspect humidistat wiring and connections for loose terminals.
Green light does not come on	Pump not running or PLC output issue — <i>Check: pump actually running</i>	Verify PLC output to pump contactor and green light circuit.
PLC screen is blank or frozen	Power supply issue or PLC fault — <i>Check: 24V supply to PLC</i>	Verify transformer output and fuse protection.
Maintenance timer resets itself	Incorrect reset procedure — <i>Check: buttons 3+4 pressed together</i>	Press and hold buttons 3 and 4 simultaneously until amber light turns off.
Pump runs, no mist from nozzles	Inlet Solenoid Valve stuck closed or clogged — <i>Check: valve opening</i>	Inspect and clean/replace Inlet Solenoid Valve.
System runs continuously	Humidistat stuck calling or wiring short — <i>Check: cube relay LED stays on</i>	Verify humidistat is functioning correctly and not shorted.
PLC does not recognize maint. reset	Timer not properly reset — <i>Check: amber light status after reset</i>	Repeat reset procedure; check PLC parameters if issue persists.