



PUMP OR FAN WILL NOT START

Applies to: across-the-line starters with a control transformer and overload relay. For drives, start at VO-M-028.

SAFETY

Lockout/tagout before opening panels or touching rotating parts. **Live voltage measurements only by trained, qualified personnel with proper PPE (NFPA 70E)** and a CAT-rated meter. **VFDs:** wait for the DC bus to discharge (time per manufacturer) and verify 0 V DC. **Never bypass** smoke, freeze or high-static safeties. Typical values vary: the nameplate and manufacturer data govern.

Run a test (page 2) Fault found: fix it Normal or verified Safety stop What VO shows

A WHAT YOU SEE IN THE BAS

EXAMPLE READOUT

Fan command **ON**
Fan status (proof) **OFF**
Time since command **12 min**
Alarm **Fan failure**

Work the rung from left to right: command, control power, coil, contacts, motor, proof.

B POSSIBLE CAUSES

- No command** at the starter (output, override, program).
- No control power:** transformer or fuse.
- Open control rung:** HOA, safety, overload 95-96.
- Coil or contacts** failed in the contactor.
- Motor** winding or insulation failure.
- Proof** switch set wrong, or a broken belt.

D DIAGNOSE IT, IN ORDER

1 Is the BAS output closing on command?	Check at the DO: T1 . No output: controller output, program or override (VO-M-042).
2 Control power at X1-X2 and coil voltage at A1-A2?	T2 then T3 , and T4 for 95-96. No voltage at A1-A2: find the open device on the rung.
3 Coil energized but contactor not pulling in, or no load voltage?	Open coil: replace coil or contactor (T3). Line OK, load low: burnt contacts (T5).
4 Voltage at T1-T2-T3 but motor not turning, or tripping?	T6 windings and megger. Below 1 MΩ to ground: motor winding failure.
5 Motor runs, status still OFF?	T7 amps vs current switch. Verify: proof ON within the delay, alarm clears.

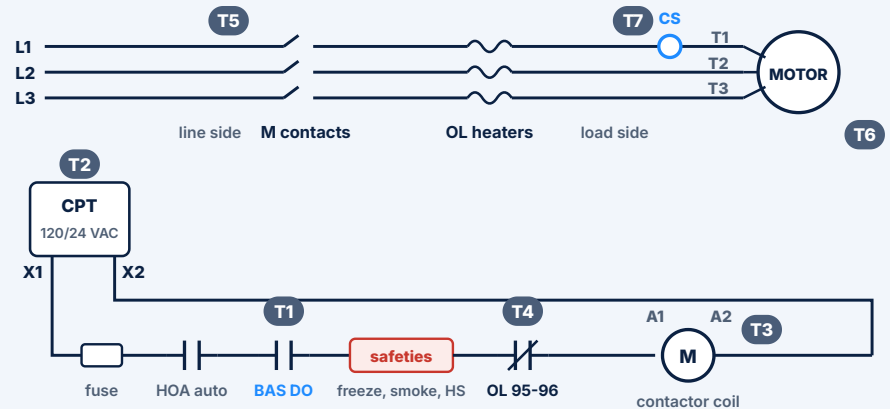
SAFETY FOR THIS JOB

- Starter panels carry line voltage: NFPA 70E PPE for live checks.
- LOTO and verify zero energy before ohms or megger tests.
- Never jumper a freeze, smoke or high-static safety to test.

TOOLS

- True-RMS multimeter (CAT III/IV)
- Clamp ammeter
- Insulation tester (megger)
- LOTO kit, non-contact tester

C POWER CIRCUIT AND CONTROL RUNG (TEST POINTS)



Control rung: one open device anywhere keeps the coil off.

IN VO

Matches finding **CALLED_NOT_RUNNING** (and **ALARM_TREND**). Guide **VO-G-001**, steps PF-3.4, PF-3.9, PF-1.2, PF-4.9. Tests and outcomes continue on page 2. VO reads your system and never changes a setpoint or command on its own.

Educational reference only. AI can make mistakes. Follow site procedures, safety requirements and manufacturer instructions.



E TEST PROCEDURES

T1 BAS OUTPUT

Where: controller DO terminals or the interposing relay contacts.

Meter / tool: AC volts at a powered output; ohms across a dry contact (power off).

Typical good reading: output closed (or control voltage present) when commanded ON.

- **Command ON, no output:** check for an override (VO-M-042), then the output or relay. Repair, or move to a spare output.
- **Output OK:** go to T2.

T2 CONTROL POWER

Where: control transformer secondary X1-X2, then after the control fuse.

Meter / tool: AC volts (live, PPE); fuse ohms with power off.

Typical good reading: nameplate secondary voltage, often 120 or 24 VAC, within about $\pm 10\%$ (typical).

- **0 V at X1-X2, primary present:** transformer failed. Replace the transformer.
- **Voltage before the fuse, none after:** fuse open. Replace it; if it blows again, find the short before re-energizing.

T3 CONTACTOR COIL

Where: coil terminals A1-A2.

Meter / tool: AC volts with command ON; then ohms with power off, one lead lifted.

Typical good reading: full control voltage when called; coil tens to a few hundred ohms (typical, varies by coil).

- **No voltage at A1-A2:** rung open upstream. Measure across each device (HOA, safeties, 95-96): full voltage across a device means it is open.
- **Voltage present, coil reads open (OL):** coil failed. Replace the coil or contactor.
- **Voltage present, coil OK, no pull-in:** contactor mechanically stuck. Replace the contactor.

T4 OVERLOAD RELAY

Where: auxiliary contact 95-96 (NC) and the trip indicator.

Meter / tool: continuity 95-96 (power off); clamp amps per phase running.

Typical good reading: 95-96 closed; amps at or below FLA; dial set per manufacturer (usually FLA).

- **95-96 open after reset:** relay failed. Replace the overload relay.
- **Trips again:** all phases high: mechanical load. One phase high or missing: supply or contacts (T5).

T5 LINE AND LOAD VOLTAGE

Where: contactor L1-L2-L3 (line) and T1-T2-T3 (load), pulled in.

Meter / tool: AC volts phase to phase (live, PPE).

Typical good reading: nameplate voltage on all pairs; imbalance within 1-2% (typical).

- **Line OK, load low or missing on a phase:** burnt or pitted contacts. Replace the contactor.
- **Line missing a phase:** upstream fuse, breaker or supply. Find the cause before re-fusing.

T6 MOTOR WINDINGS AND INSULATION

Where: motor leads, disconnected from the starter (LOTO).

Meter / tool: low ohms lead to lead; megger each lead to ground at 500 V DC for 230/460 V motors (1000 V where rated).

Typical good reading: windings balanced within about 5% (typical); insulation at or above 5 M Ω (IEEE 43 minimum, random-wound below 1 kV).

- **Below 1 M Ω to ground:** winding insulation failure. Motor repair or replace.
- **1 to 5 M Ω :** suspect (often moisture). Dry out and retest.
- **Unbalanced or open winding:** motor repair or replace.

T7 PROOF AND BELT

Where: current switch on one motor lead; belt and sheaves.

Meter / tool: clamp amps on the same lead; switch output; belt check (LOTO).

Typical good reading: amps above the switch trip point, output closed. Set the trip point above broken-belt amps.

- **Amps normal, switch open:** trip point too high or switch failed. Adjust or replace it.
- **Amps well below normal:** broken or slipping belt, or coupling. Replace and tension per manufacturer.

F OUTCOME: FAULT, FIX, VERIFY

Fault found	Fix (part type)	Verify the repair
No output, or override held	Repair the output or use a spare; release the override (P/N: site to fill in)	Starter gets the command
Control transformer or fuse	Replace; clear any short first (P/N: site to fill in)	X1-X2 at nameplate voltage
Open coil or stuck contactor	Replace the coil or contactor (P/N: site to fill in)	Pulls in on command
Burnt contacts	Replace the contactor (P/N: site to fill in)	T1-T2-T3 balanced with line
Overload relay, or high amps	Replace the relay; fix the mechanical cause (P/N: site to fill in)	Amps at or below FLA
Motor winding or insulation	Motor repair or replacement (P/N: site to fill in)	Megger and ohms normal
Proof switch or belt	Adjust or replace the switch; replace the belt (P/N: site to fill in)	Status ON, alarm clears

Safety: Lock out and tag out before opening a panel or touching rotating parts. Live voltage measurements only by trained, qualified personnel with proper PPE (NFPA 70E) and a meter rated for the circuit. VFDs: after removing power, wait for the DC bus to discharge per the manufacturer and verify 0 V DC before touching. Never bypass a smoke, freeze or high-static safety.

Educational reference only. AI can make mistakes. Follow site procedures, safety requirements and manufacturer instructions.

D3 Virtual Operator · D3 CNTRLs | d3cntrlr.com

Niagara is a trademark of Tridium, Inc. BACnet is a registered trademark of ASHRAE. Other names are the property of their owners and are used only to describe compatibility. D3 CNTRLs is independent and not affiliated with Tridium or ASHRAE. Original content © 2026 D3 CNTRLs.