

Nitrogen Pressure Testing: Prove It Before You Pull It

YES Electric • Arc Workforce Academy HVAC Apprenticeship

Draft 1 (October 2026). This lesson is under review. Videos are made by other companies, not YES Electric; follow this lesson and your journeyman where they differ. Boxes marked "Shop photo coming" will get real photos from our shop in a later version.

Unit 4 • Copper, Brazing & System Integrity • supports Comp 5 & Comp 17 — curriculum gap #1 skill, taught in full Class time: ~3.5 hrs (1 video + 2.5 bench)

1. What you'll be able to do

- Run the **standing pressure test** that follows every braze job and precedes every evacuation: pressurize with dry nitrogen, temperature-correct the reading, hold, and pass/fail honestly.
- Pick the right test pressure from the **nameplate low-side design pressure** (and never exceed it).
- **Bubble-test** every joint methodically — the pattern, the solution, the patience.
- Temperature-correct a standing test: **~1 PSI per 2°F** ambient swing — so an overnight cold front doesn't get called a leak.
- Sequence it right: pressure test **FIRST**, evacuation **SECOND** — and say why a vacuum is a terrible leak detector.

This is the lesson the signed Appendix A forgot (gap #1) — and the step that separates installers who get callbacks from installers who don't. Nothing gets evacuated until it holds pressure. Nothing gets charged until it holds vacuum. In that order, forever.

2. Tools & materials

- Nitrogen bottle + regulator (high-pressure gauge side matters today), hoses rated for it
- Student-built brazed assemblies from 4.4 (the test articles), plus the practice system with the instructor's hidden leak
- Bubble solution (commercial — clings better than dish soap), small mirror, flashlight
- Digital gauges/probes (resolution matters for standing tests), thermometer, log sheets

3. Watch first

Order	Video	Channel	Length	Why
1	HVAC Pressure Testing Procedure — Step by Step	AC Service Tech	7:43	The core procedure
2	Top 7 Crucial Tips for Pressure Testing	AC Service Tech	11:14	The judgment layer
3	Nitrogen Pressure Test + the Oil Blowout	AC Service Tech	11:02	What happens when you rush the sequence
4	Pressure Testing and Leak Checking	HVAC School	46:58	Best practices framing
5	Install Series: Brazing & Pressure Testing P1-P3	AC Service Tech	10:02+	The skill inside a real install

4. The idea

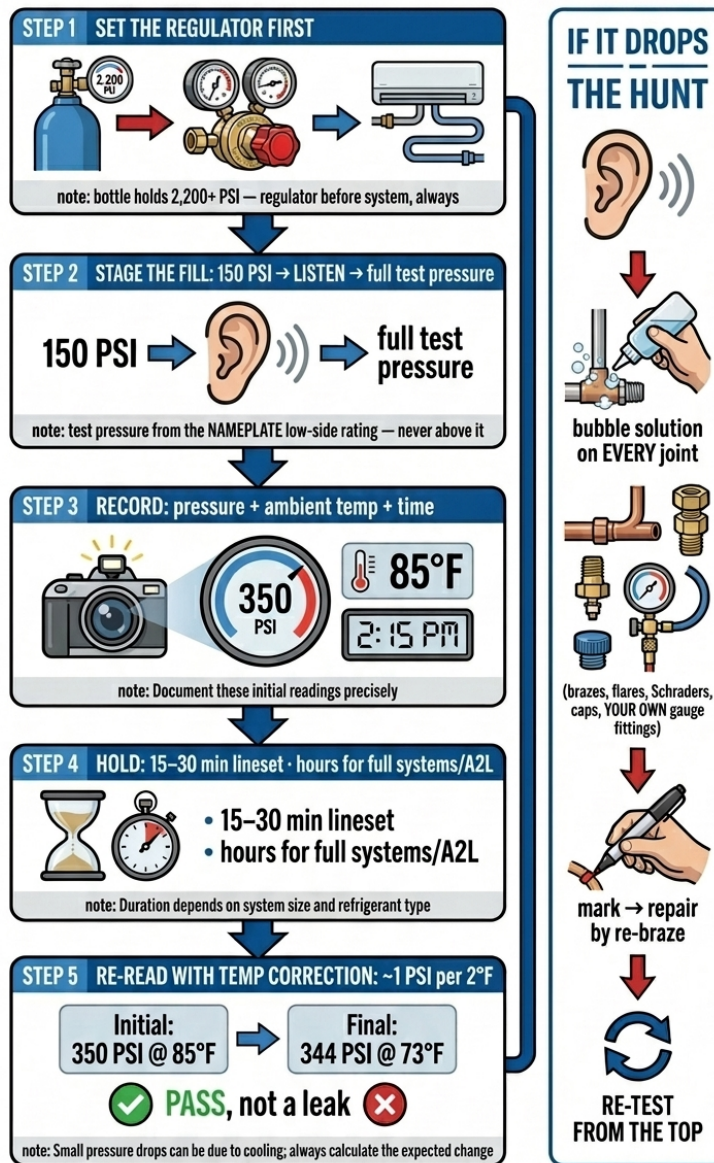
Why nitrogen, why now

Dry nitrogen is inert, bone dry, cheap, and — at test pressures — finds the leaks refrigerant would have found for \$90/lb later. The sequence is law:

Braze (N₂ flowing) → PRESSURE TEST → evacuate → charge.

Why pressure-test BEFORE evacuation? Two reasons: (1) a vacuum gauge rising can't tell a leak from moisture off-gassing (you'd chase ghosts — 4.6 explains); (2) a vacuum maxes out at 14.7 PSI of pressure difference — your 350 PSI nitrogen test stresses joints 20× harder. The vacuum proves DRY; the pressure proves TIGHT. Different jobs.

THE STANDING PRESSURE TEST



PRESSURE PROVES TIGHT • VACUUM PROVES DRY — IN THAT ORDER

Setting the test pressure

Read the **nameplate "design pressure low side"** (the lower of the two numbers — typically 250–450 PSI on R-410A equipment). Test at a healthy fraction up to that number per manufacturer instruction — commonly **300–450 PSI for 410A-class equipment; never above the nameplate low-side rating** (the evaporator/low side is the weakest vessel you're pressurizing). Brand-new lineset only (no equipment connected)? You can go to the lineset's rating — but the habit of "nameplate governs" keeps you out of trouble. **Regulator discipline:**

set the regulator BEFORE opening to the system; nitrogen bottles carry 2,200+ PSI and a wide-open mistake is a grenade-adjacent event.

The standing test

1. Pressurize in stages (150 → listen → full test pressure). The big leaks announce themselves early and cheap.
2. **Record: pressure, ambient temp, time.** Photo of the gauge is the professional move.
3. Hold: **15-30 min minimum for a lineset; longer (hours, or overnight) for full systems and any A2L install** (many manufacturers now specify extended holds).
4. Re-read WITH temperature correction: **roughly 1 PSI per 2°F** (nitrogen obeys gas law; the pipe doesn't know it's being tested). 350 PSI at 85°F afternoon → ~344 at 73°F evening is a PASS, not a leak.
5. Drop beyond correction = there's a leak. Now hunt.

The hunt (when it drops)

- **Ears first** (big leaks hiss at 350), then **bubble solution** on every joint in a pattern: every braze, every flare, every Schrader and cap seat, gauge connections themselves (the #1 false accusation — your OWN fittings).
- Mirror + flashlight for joint backsides; patience for slow ones (a bubble that grows over 30 seconds is still a fail).
- Mark, bleed down, repair (cut out and re-braze — not rod-over), re-test from the top. The test isn't passed until the FULL hold passes clean.

5. Bench procedure

1. **Regulator reps:** set 150 / 300 / 450 on the bench manifold, blind ("set me 300") until smooth. Include the safety brief on bottle handling (4.3's rules apply — this bottle is 10× the acetylene pressure).
2. **Test your own work:** each student's 4.4 joint ladder gets the full standing test at 350: staged fill, log sheet, temp recorded, 30-minute hold during which...
3. **...the hunt drill** runs on the instructor's rigged practice system (a pinhole braze + a loose Schrader + a leaking gauge fitting — three leaks, three different finds: ears, bubbles, and the humility of your own hose).
4. **Temperature-correction math:** four scenarios on the worksheet (pass-looking fail, fail-looking pass, etc.). The fail-looking pass — 348→341 over a 15°F evening drop — is the one that saves a needless 2-hour hunt.
5. **The oil-blowout cautionary demo (instructor):** why you NEVER blast nitrogen backwards through a compressor-connected system without thinking — the video's lesson, made memorable safely.
6. **Log like a pro:** every test on the program log sheet: date, system, pressure, temp at start/end, duration, verdict, photo. This habit = warranty armor.

Checkout: full standing test on own assembly — staged fill to a correctly chosen pressure, logged, held, temperature-corrected verdict — plus all three rigged leaks found inside 20 minutes. Passing assemblies advance to 4.6 (they get evacuated next — the capstone continues).

6. Field gotchas

- **Your own gauge rig leaks more than your brazes.** Bubble your manifold connections FIRST on any "mystery" pressure drop; low-loss fittings and fresh gaskets are cheap.
- **Schraders back out and caps seal** — a tightened core + capped port have saved a thousand "leaks." Core tool torque, caps with gaskets, every time (1.2's leak-spot list).
- **Cold fronts impersonate leaks** on overnight holds. Log the temp or you'll re-braze perfectly good joints at 7 AM.
- **Never pressure-test with the service valves open to a charged unit** — you'll blend nitrogen into the charge (then weigh-out and re-charge is the only fix — expensive lesson).
- **A2L installs:** manufacturers commonly require documented extended pressure tests — the log sheet isn't optional paperwork anymore, it's compliance.
- **Don't leave a system under test pressure unattended without a tag** — the next trade who cracks a fitting at 400 PSI will remember you.

7. Competency link

- Completes the **pressure-test skill** (gap #1, half one); pairs with 4.6 evacuation for the Unit 4 capstone where **Comp 5 signs in full**.
- Standing-test discipline returns at EVERY install capstone (7/8/9) and every major repair in Unit 6+.

8. Check yourself

1. The sequence law — four steps, in order, and why pressure-before-vacuum (two reasons).
 2. Where does the test pressure number come from, and which side's rating governs?
 3. Why stage the fill?
 4. The temperature correction rule — and work one: 350 PSI @ 90°F, morning reads 339 @ 68°F. Verdict?
 5. Three places leaks hide that aren't brazes.
 6. What's wrong with rodding-over a leaking braze found at test?
 7. Why does the bottle demand respect beyond the acetylene rules?
 8. What does the vacuum prove that pressure can't, and vice versa?
 9. What goes on the log sheet, and who is it armor against?
 10. The gauge dropped 4 PSI in 25 minutes, temp steady. Next three moves?
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