HVAC FIELD CARD · PISTON (FIXED ORIFICE) SYSTEMS

Superheat & Subcooling Diagnosis

Example: WB 66°F · outdoor 85°F
Target superheat = 15°F

① Three key readings

Evaporator TD

Return air – supply air

Shows **cooling performance**
Normal ≈ **20°F**
Too small → not cooling
Too large → low airflow

Superheat (SH)

Suction temp – evap. sat. temp

Is the **coil starved?** (low side)
Find the **target** first
▲ **High** → short of refrigerant
▼ **Low** → floodback risk

Subcooling (SC)

Cond. sat. temp – liquid temp

Is liquid **backing up?** (high side)
Example normal ≈ **8°F**
▼ **Low** → undercharged
▲ **High** → restriction / overcharge

② Quick diagnosis table

Condition	TD	Superheat	Subcooling	Other signs
✓ **Normal**	≈ 20°F	≈ target (15°F)	≈ 8°F	—
Low airflow	▲ **High** (28°F)	▼ **Very low** (2°F)	Little change	Very cold coil and suction line; floodback risk
Undercharged	▼ **Low** (10°F)	▲ **High** (25°F)	▼ **Low** (2°F)	Low suction pressure; warm suction line
Restriction	▼ **Low**	▲ **High** (25°F)	▲ **High** (17°F)	Suction may look normal; compressor can overheat and trip

③ Undercharge or restriction? Both show high superheat. Check subcooling!

Superheat ▲ **High** + subcooling ▼ **Low**
→ **Undercharged: fix the leak, then charge**

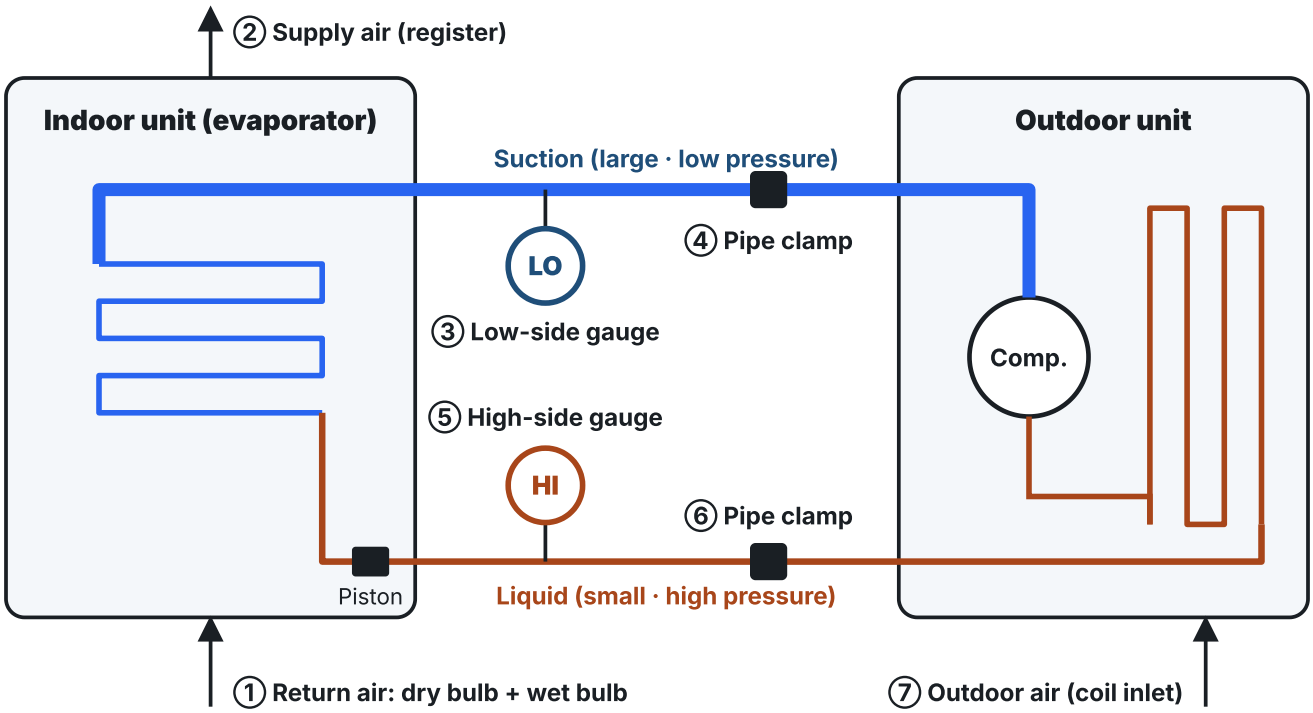
Superheat ▲ **High** + subcooling ▲ **High**
→ **Restriction: do NOT add refrigerant**

④ Field reminders

1. **Read temperatures, not just pressures.** Convert pressure to saturation temperature. With a restriction the gauges can look normal; superheat gives it away.
2. **Piston systems: charge by superheat, recalculate the target every time.** Hotter outside or more humid inside = higher target.
3. **Watch subcooling while charging.** A little charge doubles subcooling but the low side doesn't move? Stop: it is stacking up in the condenser.

How to measure TD / SH / SC

①–⑦ = measuring points
Large line = suction



TD (evaporator)

Measure: ① return air, ② supply air at the register closest to the indoor unit

Tool: probe thermometer

TD = ① – ②

e.g. 75 − 55 = **20°F**

SH (superheat)

Measure: ③ low-side pressure, converted to **evaporator saturation temp** with a PT chart or digital manifold; ④ suction line temp

SH = ④ – ③ sat. temp

e.g. 60 − 45 = **15°F**

Target: ① wet bulb + ⑦ outdoor temp, from a slide chart or app

SC (subcooling)

Measure: ⑤ high-side pressure, converted to **condensing saturation temp**; ⑥ liquid line temp

SC = ⑤ sat. temp – ⑥

e.g. 100 − 92 = **8°F**

Measuring tips

- Let the system **run 10–15 minutes** and record once readings are steady.
- Set the gauges to the **right refrigerant** (e.g. R-410A), or the saturation temps will be wrong.
- Clamp on **clean copper near the service valves**, insulate the clamp and keep it out of direct sun.
- Take wet bulb at the **return grille**; outdoor temp in the **shade on the condenser's air inlet side**.