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Air Conditioning Diagnosis Made Easy

Four Problems Covered:

1. Pressures not right – Noisy compressor – not cooling –
2. Icing evaporator and/or suction line
3. Compressor Failure
4. Restriction

Technical questions to ask when there is an unusual or repeated failure.

Split System Air Conditioning

Condenser Model _____

Serial _____

Evaporator Model _____

Serial _____

1. Problem: Pressures not right – Noisy compressor – not cooling

- Is the unit soldered or brazed?
 - a. It must be brazed. Soldering is for low pressure plumbing and it is common for balls of solder to plug the metering device as well as being a weak joint that will eventually leak.
- Where is the liquid line drier located?
 - a. It must be installed just before the metering device even if the manufacturer installed a drier inside the condenser cabinet. If not, there could be a restriction.
- What is the subcooling and superheat at the service valves?
 - a. See the 'Troubleshooting Tips' class handout.
 - b. Remember that residential AC has a critical charge of +/- 2 ounces. If there is any doubt about the charge, the unit can be recovered and recharged with a digital scale in minutes. See the 'Exact Charge' class handout for details.

Recovery takes only a few minutes if the compressor is warm. Either run it until warm or use a heat gun at the bottom to force out the cold refrigerant.

2. Problem: Icing evaporator and/or suction line

• How did you check air flow?

- a. ESP (External Static Pressure) should be .5" WC or less
- b. Is the filter, blower and evaporator coil clean? Note: On 90+ furnaces you must check the secondary heat exchanger coil for dirt accumulation.
- c. CFM is determined by using the temperature rise formula. $CFM = \frac{BTUH}{(Temperature\ Rise) \times 1.08}$
The installation manual also has a CFM chart based on the ESP

3. Problem: Compressor Failure

- When replacing the new compressor, did you install a low side drier in addition to a high side drier?
Or---did you clean the entire system with Quick System Flush?
- a. When using Quick System Flush, no low side drier is needed.

• What is the voltage?

- a. 3 voltage readings are required. They are the available static voltage on the line side of the contactor and the Running and Locked Rotor voltage on the compressor C and R terminals.
- b. All units are 208/230 VAC. Requirement is +10 % and -5 %
This means that 253 volts static (no load) is the maximum and 197.6 volts is the LRV minimum.

Running voltage is checked with both the compressor and fan on.

Locked Rotor Voltage is checked by locking out a reciprocating compressor before pressures equalize or by removing one run capacitor wire on a scroll compressor.

• Stuck Compressor

- a. Check Locked Rotor Voltage – LRV – Must be minimum of 197.6 VAC
- b. Try a hard start kit

• Shorted to ground

- a. Check resistance from any terminal to ground (copper tubing).

Any reading other than meg ohms or infinity is a short to ground.

- **Open Winding**

- a. **There must resistance readings between any 2 terminals. If the compressor is hot, the overload may be open. Cool it down with water from a garden hose.**

When cooled and it still shows an open winding, replace the compressor.

- **Correct terminals are found with resistance readings between any 2 terminals**

Common: Across from the highest reading

Start: The next highest reading

Run: The lowest reading

4. Problem: Restriction

- a. **Restrictions can be on either the low or high side. Typically low side is caused by a kinked suction line. High side usually is something plugged just before the metering device. Restrictions in the condenser coil are rare**

Ask the same questions as stated above about either soldering or brazing and where the liquid line drier is located.

- b. **Any restriction can be diagnosed by taking temperature readings at various locations on the line set. That temperature will be colder directly after the restriction.**
- c. **When adding gas to a high side restricted system at the metering device, the high side will continue to rise while the low side may not increase very much.**
- d. **Because the evaporator is starving with any restriction or an undercharge, you must diagnose by checking the subcooling. Please refer to the 'Troubleshooting Tips' class handout.**
- f. **An undercharged system will have very low subcooling and a restricted system will start stacking refrigerant and result in high subcooling.**
- g. **Compressor overheating will also occur**