THREE PHASE POWER AND SCROLL COMPRESSORS

While most HVAC applications for Mobile and Modular industry use single phase scroll compressors, there are many "major" projects that have three phase electrical power available. A three phase scroll compressor will not work properly, and will probably damage the HVAC unit, if the incoming power is phased incorrectly. Therefore, upon initial startup, the three phase compressor rotation should be checked to verify that the wiring is connected correctly.

Some HVAC units use Copeland's scroll compressor. The only way to know which (if any) compressor is in the wall mount or roof mount HVAC unit is to look at the unit specification sheet. In other words, the only "rule" to help you know which HVAC unit brand, tonnage, or model has a scroll compressor is: “look it up each time.” Manufacturers: if you have a three phase job, help your dealers and contractors out; ask your supplier to tell you if the HVAC units you’ve ordered have three phase scroll compressors, and make a note on the plans accordingly.

Scroll compressors, like other types of compressors, will only compress in one rotational direction. Direction of rotation is not an issue with single phase compressors, since they will always start and run in the proper direction.

Three phase compressors, on the other hand, will rotate in either direction, depending upon phasing of the power. Since there is a 50-50 chance of connecting the power in such a way as to cause reverse rotation, proper rotation must be verified when the site power is initially applied. Even after the Manufacturer test runs the HVAC unit in the factory, proper compressor rotation must be verified again in the field after the wiring is connected. Dealers should pay attention to this issue and specifically instruct the site electrical contractor to verify proper rotation on three phase HVAC units with scroll compressors. If the site electrical contractors are not qualified to properly verify the compressor rotation, it may be necessary for the Dealer to hire an HVAC contractor to do so.

Why is it so important to check for proper scroll compressor rotation up front? Reverse rotation for over an hour may cause the compressor to pump the oil out of the bearing pump. Of course running the unit without oil damages the HVAC unit. Verifying proper compressor rotation upon start up prevents this damage.

The HVAC contractor can verify the proper rotation by observing the refrigerant suction pressure and the discharge pressure when the compressor is energized. An elevated sound level or “odd noise” also indicates reverse rotation, but newer scroll compressors don’t rattle when run backwards. Therefore, sound is not the best way to determine if you have a problem.

The direction of rotation of the three phase scroll compressor may be changed by reversing any two of the three line connections at the HVAC unit.
Some wall mount brands come equipped with a three phase line monitor to prevent compressor damage due to phase reversal. The phase monitor is equipped with two LED's. If proper phasing of the unit is present at the phase monitor, the green LED will light and the unit will run properly. If the phases are reversed, the red fault LED lights up and the compressor will not operate. LED’s do not light up until the compressor is energized. The phase monitor is usually located in the HVAC unit's electrical panel.

If a fault condition occurs, reverse any two of the electrical leads at the HVAC unit. Do not reverse any of the HVAC unit's factory wires as damage may occur.

I would like to be able to tell you that verifying the compressor rotation is a one-time-only concern, but it is not. In addition to the initial unit startup, proper rotation must again be verified when the:

• Three phase scroll compressor is changed out
• Power company changes out a line transformer
• Power company switches the leads around
• Project comes back off lease and is used on a different site

Having a phase monitor on the unit will protect the scroll compressor from damage.

Thanks to all of you who read and comment on the subjects and content of this article. Please keep those questions coming. Take care of each other and don't . . . get your wires crossed . . . until the next time we meet in . . . The Comfort Zone.