## ADDENDUM to IOM – Tech Notes

# Superheat

### At Compressor & At Evaporator

**Warning**: Not to be used in Lieu of IOM Manuals included with the unit. Specials units or construction may or may not differ.

**Caution**: *This procedure is for Standard Coolers and Freezers. Special controls may allow for different settings. This manual is for techs that service equipment where theories fear to tread and understanding is the key to a good or bad install. Also, I am taking liberties of being overly simplistic for general purposes of understanding and feel.*

### Basic Info - SUPERHEAT SETTING

Superheat must be adjusted for each installation as the piping in the building and the amount of mis-match between the compressor and the evaporator sizing is rarely one to one or theoretically perfect. Most classes teach you the simple approach of measuring at the evaporator only. If everything is theoretically correct then this may work but for adjusting the system to prevent early compressor failures, optimize performance and minimize defrost, then you need to measure superheat at the compressor *(old School)* and at the evaporator. The box temperature should be close to the desired temperatures for accurate measurements. Initially at start-up insure that you have enough superheat so you don't kill the compressor and come back with the loaded box close to temp, but still a load, to make your final adjustments if you need to. You start by measuring the superheat at the compressor.

### Basic Info - Why Compressor Superheat?

Compressor superheat tells you in what direction to adjust the TXV (Thermal Expansion Valve) on the evaporator. If the superheat is high then you need to open the TXV valve to cool down the superheat (May bring up the suction pressure) and if it is low you need to close the TXV reducing the flow of refrigerant (May lower the suction pressure). The amount of opening or closing is determined by the effect to the system after a small correction.

*Tech note: The more you can flood the evaporator (good) without flooding the compressor (bad) the less temperature differential you will have between the metal and the air temperature in the box. The less temperature differential will mean less icing up or defrost problems (If you want to remove more moisture from the box you want a higher superheat).*

### Basic Info – How does the superheat effect the equipment in the box?

Superheat has an effect on the Temperature Drop or TD within the box. The TD can be said to be the difference of the metal (close to suction pressure) temperature to the air temperature in the box. This difference is usually a design for 10-15degF. At 10degF TD's the compressor tends to bang on and off, where 15degF TD's run longer allowing more moisture to be removed from the box. Moisture in the box needs to be removed before the "overall" box temperature can get lower. So if you had a 10degF TD difference on a 35degF box temperature: the suction should be around 25degF at the evaporator. When you start getting around a 20degF TD or more you will start seeing snow or icicle formations develop.

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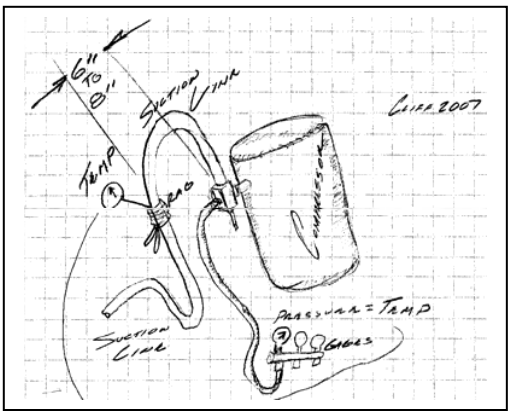
*Tech note: If you think of the moisture in the air as being like round rain droplets: then when the moisture goes thru the finned surface, what doesn't gets pulled into the metal (like a magnet), goes thru with just the outer surface being frozen. Then when the frozen shell with the liquid center hits something it will "spat" and refreeze immediately. The inside of the venturi (fan opening) will show signs and even the box roof outside the unit, but above the fan, will show icicles. The defrost times will be long and many times the defrost termination will throw it out of defrost before the ice is fully removed from the sheet metal of the unit (defrost is not meant to deice sheet metal only the surface of the coil). This is because the frost is not being distributed correctly on the finned surface. If all the ice is not removed after each defrost, you will end up with a ball of expanding ice, like a snowball rolling down hill. The tubes will be crushed, the box warms and it will be your fault because you are the closest human in the area (Remember, at times like that the customer is always right…correct?).*

## Actual Superheat Settings

*Tech note: Here is the Meat & Potato's.*

Superheat setting at the compressor should be between 25 and 35 degrees F and is adjusted at the Evaporator Thermal Expansion Valve or TXV at the evaporator in the box. Compressor Superheat is a temperature measured on the suction line six (6) to eight (8) inches from the compressor and subtracted from the suction pressure when converted to degree F. Make sure you leave at least four (4) to six (6) degF superheat at the evaporator minimum measured around the TXV bulb.




Example Cooler:
45 psig, R-22 and 57degF temperatures on the suction pipe.
Convert 45psig to temperature using pressure/temperature chart for R-22 (= 22 degF)
22 degF – 57 degF = 30 degF Compressor Superheat.
Example Freezer:
20 psig, R-404a and 14degF temperatures on the suction pipe.
Convert 20 psig to temperature using pressure/temperature chart for R-404a (= -16degF)
-16degF – 14degF = 30degF Compressor Superheat.

*Tech Note: Superheat at the compressor has a direct effect on the life of the compressor. Frost line is an indicator, but not an exact science and your compressor needs you. At the same time we need to ake sure that the "change of state" from liquid to gas is being done inside the evaporator coil, (plus a little dditional superheat) hence the "4-6degF minimum" superheat, as noted above. I know, you were taught and in a perfect world the evaporator is "supposed to be adjusted for 10degF superheat but the piping in a building is rarely perfect or other addition loss is encountered. Also the compressor performance may not be an exact one to one match up to the evaporator design. Superheat, at the evaporator, for Low temp systems usually is around 6-12degF and med temp systems are usually 8-14degF. Some systems may have been designed for even higher or lower superheat and TD settings. Bottom line for superheat is: The compressor must be protected. (See Tech Note for TXV for more)*

**Final**: This should provide years of trouble free performance, but don't forget to adjust your condenser fan controls to your region. Thanks for putting up with the humor. See our website for even more info www.russellcoil.com under "Products and Literature" or "Tech Tips".

***Thank you for helping, us help, our Customer.***

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