REFRIGERANT CHARGING GUIDELINES

FOR KRAMER MODEL *C, KS & CTT* CONDENSING UNITS

Prior to starting the actual charging process, you must first calculate the total system refrigerant charge required. The system charge consists of;

- **Condensing Unit Charge**
- **Evaporator Charge**
- **Liquid Line Charge**

From the appropriate condensing unit charge chart, (attached), obtain the condensing unit charge. If your system was supplied with a factory mounted head pressure control valve for low ambient operation, then you will need to select the charge listed under the column, "WINTER". If no head pressure control valves are utilized, select the appropriate charge under the column, "SUMMER". The difference between the "WINTER" and "SUMMER" charge is the additional amount of refrigerant required to "back flood" the condenser during the lowest outdoor ambient temperature in which the unit might be expected to operate. During milder ambient temperatures, this additional refrigerant is stored safely in the liquid receiver which has been adequately sized to accommodate the "WINTER" charge. With the proper refrigerant charge, the head pressure control valve system is designed to maintain the following <u>minimum</u> operating head pressures regardless of outdoor ambient temperature or condenser fan cycling control settings;

- **R-22; 170 P.S.I.G.; (+90 Degrees S.C.T.)**
- **R-404A / R-507; 205 P.S.I.G.; (+90 Degrees S.C.T.)**

From the evaporator charge chart, (attached), obtain the operating refrigerant charge for the appropriate model unit, temperature application and refrigerant type. If multiple evaporators are used on a single system, be sure to include the total refrigerant charge required for all coils.

Estimate the number of pounds of liquid refrigerant contained in the liquid line by referring to the "Estimated Weight of Refrigerant" chart, (attached). Enter the chart based upon the appropriate refrigerant and liquid line size under the column, "LIQUID". Divide the listed weight by 100 and multiply this value by the actual length of liquid line on your particular system. This value will be the total estimated liquid line charge.

Total the (3) values obtained in the steps outlined above, secure the appropriate amount of refrigerant from your local supplier, and proceed as follows.

With the compressor off and the system in a vacuum, connect a charging hose and appropriate refrigerant cylinder to the receiver outlet, (king), valve gauge fitting. Open the refrigerant cylinder and briefly "crack" open the charging hose fitting at the valve gauge fitting to purge all air and non-condensable from the charging hose. Using the appropriate service valve wrench, partially front-seat, (close off), the receiver outlet valve and introduce liquid refrigerant into the system until the pressure in the system is equal to the pressure in the refrigerant cylinder.

Temporarily **install a jumper wire around the condenser fan cycling pressure control. If the ambient air temperature entering the condenser coil is above approx. +70 degrees, install additional jumper wires or re-adjust remaining temperature fan cycling controls to force all condenser fans on.**

Temporarily **adjust the low pressure control to cut-out in a slight vacuum and raise the cut-in setting to a minimum of 25 P.S.I.G..**

Temporarily **bypass any evaporator fan delay controls to force all evaporator fans on.**

Check to be sure that the system room thermostat is calling for cooling, (contacts closed), and the liquid line solenoid valve coil is energized, (open).

Completely close off, (front seat), the receiver outlet, (king), valve. This will allow the rapid introduction of liquid refrigerant directly into the liquid line for faster charging of the system and reduce the possibility of liquid flood back to the compressor during the charging procedure.

Start the compressor. Allow it to operate for brief periods of time while monitoring the rapid transfer of liquid refrigerant directly into the liquid line. If necessary, start and stop the compressor directly via the compressor start switch. During this time, monitor the compressor oil level closely. If the level should drop to the bottom of the sight glass, shut off the compressor, close the refrigerant tank outlet valve or gauge manifold valve and open, (backseat), the receiver outlet valve.

Make sure to close off either the refrigerant tank outlet valve or gauge manifold completely before opening the receiver outlet valve to avoid

the introduction of high pressure liquid refrigerant back into the refrigerant charging cylinder!

This will allow full flow of refrigerant into the evaporator and should increase the operating suction pressure sufficiently to return oil to the compressor crankcase. If the compressor oil level does not rise after several minutes of operation, only then should you stop the compressor, isolate it from the system by closing the discharge and suction service valves, and add oil directly to the compressor crankcase until a minimum level of ¼ glass is achieved. Open the compressor service valves and restart the compressor.

Once the majority of the estimated system refrigerant charge has been charged into the system, discontinue liquid charging, close off the service gauge manifold and refrigerant cylinder and fully backseat, (open), the receiver outlet valve. Any small amount of remaining refrigerant may then be safely added to the system through the schraeder fitting on the suction line filter.

Allow the system to operate for a period of time at stabilized conditions. Check the liquid line sight glass. The glass may show occasional bubbles or even heavy flashing as the expansion valve(s) open in response to the room load / temperature. This is not necessarily an indication of a system undercharge condition, particularly during the initial temperature pull down of a warm room. Preferably, any final adjustment of the system operating refrigerant charge should be delayed until the design operating room temperature has been achieved. As a reference, the operating condensing temperature or pressure can be compared to typical condensing unit design parameters. These are as follows;

15 Degree T.D.; Low Temp. Units; (0 to –40 Degrees S.S.T.)*
20 Degree T.D.; Med. Temp. Units; (0 to +25 Degrees S.S.T.)*
30 Degree T.D.; High Temp. Units; (+30 to +45 Degrees S.S.T.)*

Note: T.D. refers to the difference between the average air temperature entering the condenser coil and the operating saturated condensing temperature of the system. (*These values are only relevant above approx. +75 degrees air temperature entering the condenser coil while operating at or near design room temperature conditions).

Remove <u>all</u> jumper wire(s) which may have been previously placed around condenser fan cycling controls or evaporator fan delay controls and adjust these controls, as well as the low pressure control, according to Recommended Control Settings, (attached).

Continue to monitor the system closely throughout the entire, initial pull-down period. Observe all operating system pressures and temperatures and make any other necessary control adjustments. During this time, the compressor oil level should be maintained within the sight glass and suction superheat measured occasionally at the compressor suction service valve to ensure adequate motor cooling and no liquid refrigerant is being returned directly to the compressor.

Make expansion valve superheat adjustments only after the room temperature has been lowered to within a reasonable range of the original design temperature parameters. To accurately measure superheat at the evaporator outlet, attach a suction service gauge to the schraeder valve on the evaporator outlet connection and place a calibrated thermometer / thermistor at the 3 or 9 o'clock position on a clean, straight run of suction piping near the TXV sensing bulb. Insulate the thermometer sensing bulb or thermistor to minimize the affects of the surrounding ambient air, while making sure the sensor is in good physical contact with the suction line pipe.

Convert the measured suction pressure to saturated suction temperature on a pressure temperature chart and subtract this temperature from temperature obtained with the thermometer / thermistor. Open or close the TXV adjustment stem as required to obtain desired coil performance. Suggested superheat settings are;

- **6 to 8 Degrees; Low Temp. Systems**
- **10 to 12 Degrees; Medium & High Temp. Systems**