RECOMMENDED START-UP PROCEDURE
FOR KRAMER
THERMOBANK HOT GAS DEFROST SYSTEMS

- **Review system refrigerant piping layout. All piping must be adequately clamped and supported, (particularly at valve stations), to prevent possible movement during system operation which can result in line breakage and refrigerant loss. All suction risers over (2) feet must have a P-trap at the bottom of the riser. All suction lines must be pitched a minimum of ¼" per foot in the direction of flow to ensure proper oil to the compressor(s). All field piped suction line(s) must be insulated wherever practical to minimize excessive return gas temperatures on suction cooled compressors and prevent condensate dripping and potential safety and / or product damage. Confirm ALL lines are properly sized for the intended operating design conditions in accordance with the Operation & Installation manual supplied with the equipment. Note: To minimize pressure drop through the liquid line during the defrost cycle the common liquid line on Thermobank systems is typically at least (1) size larger than required for normal liquid line duty on a conventional refrigeration system.**

- **With ALL electrical power disconnected and locked out to the system, check ALL factory and field electrical connections for tightness, including at compressor motor terminals.**

- **Visually verify the correct settings of all operating and safety controls as per the supplemental data provided. Adjust as necessary and confirm actual cut-in & cut-out settings of all pressure controls after system has been placed in operation.**

- **Remove pipe fill plug and add 100% tap water to Thermobank(s) to the point of overflowing. Remove immersion heater cover and adjust thermostat setting to maintain approx. +120 degrees.**

- **Remove fan guards and check all fan / motor assemblies. Check motor mounting bolts / brackets & fan blade set screws for proper tightness. Confirm proper location / height of fan blade with respect to venturi. Manually rotate fan blades to confirm proper blade clearance and motor rotation. (Perform this check on ALL evaporator and condenser fan assemblies).**

- **Turn off, (down position), both manual pumpdown and compressor kill switch.**

- **TEMPORARILY place a jumper wire around the post defrost pressure control to force evaporator fans to run and also to prevent excessive cycling of suction and liquid line solenoid valves due to abnormally high suction pressure during initial room temperature pulldown.**

- **TEMPORARILY remove all defrost tripper pins from the outer defrost timer dial to prevent the system from initiating a defrost cycle while the post defrost pressure control is jumped out. Note: Do not under any circumstances allow the system to initiate a defrost cycle while the post defrost control is jumped out or the compressor may suffer irreparable liquid damage.**

- **TEMPORARILY lower the control settings or otherwise jump out all condenser fan cycling controls to force all fans on during the initial refrigerant charging process. Remember to remove all jumpers and re-adjust these controls after the initial charging process is completed.**

- **Calculate the approx. year-round operating refrigerant charge for each system. Manually open the liquid line solenoid valve via the manual lift stem on the bottom of the valve body. Attached the high side hose of a service gauge manifold to the ¼" service gauge fitting on the receiver outlet, (king), valve and attached the charging hose to a cylinder of the appropriate system refrigerant. Purge the service gauge hoses and set the refrigerant cylinder for liquid charging. Open the receiver valve stem to the mid-seat position and introduce liquid refrigerant directly into the receiver and liquid line until the pressure equalizes. Once the pressure has equalized and refrigerant flow has stopped, front seat, (close), the receiver outlet valve so that the refrigerant tank is open directly into the liquid line downstream of this valve. Note: Once this initial liquid refrigerant charge has been added to the system, be sure to close the liquid line solenoid valve manual lift stem.**

- **Attach a service gauge manifold to the suction and discharge service valves of each compressor in the unit. The discharge valve(s) should be front seated approx. (1/2) turn to allow gauge pressure reading. Completely close, (front seat), the suction service valve on each compressor and then open the valve approx. (2) full turns. Manually attend to this valve throughout the initial start-up period to help prevent excessive, (high), suction pressure or any potential liquid refrigerant return to the compressor(s).**

- **Momentarily apply main power to the system and verify correct rotation of all condenser and evaporator fans. If the unit is equipped**

with the optional phase loss monitor, it may be necessary to switch any (2) of the (3) main power leads feeding the phase loss monitor in order to energize the unit control circuit. (Compressors are not rotation sensitive). If any or all fan motors are running backwards, disconnect main power and switch any (2) of the (3) power leads feeding these motors. Verify correct power supply is available, (+/- 10% of unit nameplate rating), between all (3) phases at main power terminal block.

- **Re-establish main power and turn on, (up position), both manual pumpdown and compressor kill switch(es). Allow compressor(s) to start and cycle off on low pressure control.**

- **Continue to add liquid refrigerant directly into the receiver outlet / liquid line to speed the charging process. Since the compressors can essentially only be operated in short bursts during this time, it may be necessary to manually adjust or otherwise close the contacts of the low pressure control in order to maximize the compressor(s) run time and introduce as much liquid refrigerant into the system as possible. Note: If compressor oil levels should happen to drop below the visible level in the oil sight glass during this time, discontinue refrigerant charging by turning off the charging manifold gauge attached to the receiver outlet, (king), valve, then opening, (backseating), this valve to allow full refrigerant flow through the liquid receiver, then open, (backseat), the suction service valve. If sufficient liquid refrigerant has been added to the system to maintain a reasonable, operating suction pressure at the compressor, then the velocity of the refrigerant gas through the suction line should be enough to return any excessive oil laying out in the system back to the compressor(s).**

- **Add the remainder of the refrigerant charge as a vapor through the suction filter gauge access fitting or directly into the suction service valve at the compressor(s). During the initial room temperature pull down, it is not unusual to observe flashing in the liquid line sight glass due to high load conditions and / or high superheat at the evaporator outlet. Note: If bubbles are observed in the liquid line sight glass after the system is completely charged, DO NOT add any additional refrigerant beyond the quantity originally calculated for the system unless a refrigerant leak is confirmed.**

- **Continue to manually monitor all system operating conditions and controls throughout the entire, initial room temperature pull down period. Periodically check system oil levels, compressor and fan motor amperage draws, refrigerant system pressures and compressor suction superheat during this time. High superheat**

would be considered normal during this time but if excessive floodback, (ie. low), superheat is observed it may be necessary to begin adjustment, (closing), of the thermostatic expansion valve(s), particularly as the room temperature is reduced.

- **Normal "wetting" of all internal system piping components may necessitate that additional oil be added to the sealed system. If this becomes necessary, use only a POE lubricant approved by the compressor manufacturer. On parallel compressor systems utilizing an oil equalization system, (discharge oil separator, oil reservoir and individual compressor oil floats), the operating oil level should be maintained between the (2) sight glasses on the oil reservoir.**

- **Remove ALL jumper wires from operating controls, (fan cycling controls and post defrost control), and return ALL controls to recommended factory settings.**

- **After the system has operated for several hours and the room temperature has been reduced to a minimum of +40 degrees, the tripper pins should be reinserted into the outer dial of the defrost time clock and the timer manually advanced to initiate a defrost cycle. A MINIMUM of (2) service gauge manifolds should be installed to adequately monitor the operating system pressures during the defrost cycle. Install (1) set of service gauges at the compressor(s) service valves and a second set on the gauge port fitting of the suction line filter. NOTE: Due to the high pressure, (approx. 200 P.S.I.G.), produced in the suction line during the defrost cycle, we recommend that you attach the high side gauge to the suction connection at the suction line filter connection.**

- **Manually advance the timer into defrost and observe readings at both service gauge manifolds. Be prepared to make quick observations of both pressure gauge readings as the defrost cycle may progress quite rapidly, particularly if little frost build up is present on the evaporator coil(s) when the defrost cycle is initiated. Initially, both operating suction and discharge pressures will drop at the compressor, temporarily stabilize after a short period of time and then begin to steadily increase as the defrost cycle progresses. The suction pressure at the compressor should never exceed 15 - 20 P.S.I.G., based upon the setting of the holdback valve(s) located at the suction inlet of the Thermobank(s). The high side gauge pressure measured at the suction filter connection, (upstream of the holdback valves), will continue to rise steadily until the evaporator coil temperature exceeds +32 degrees, then level off for a short period of time as the frost build-up is melted from the coil surface. Once all frost is melted from the evaporator coil surface, the**

"suction" pressure will rise rapidly towards defrost termination pressure, (approx. 200 P.S.I.G.). When the defrost termination pressure control closes energizing the "X" terminal on the defrost time clock, the clock will be automatically switched back into the refrigeration cycle. For the next 2 - 3 minutes, (approx.), the post defrost pressure control will remain open as the suction pressure upstream of the holdback valve(s) is reduced to the cut-in setting of this control, (approx. 25 P.S.I.G. on low temp. systems). This provides for a "pump-out" cycle, continuing to run the high pressure liquid still contained in the low side through the Thermobank(s), where it is reduced to a low pressure vapor. This post switch also prevents the liquid solenoid valve from opening and allowing any additional liquid refrigerant into the evaporator and also provides an evaporator fan delay.

- **If the operating suction pressure during the defrost cycle exceeds 15 – 20 P.S.I.G. at the compressor suction service valve, then the adjustment caps should be removed from the holdback valve(s) and the valves adjusted during the next subsequent defrost cycle. Using a 5/16" hex wrench, the valve(s) should be adjusted slowly, (approx. (1) turn at a time, (counterclockwise), to decrease the pressure setting. On systems employing (2) holdback valves, both valves should be adjusted simultaneously in order to equalize refrigerant flow through both Thermobanks. <u>NOTE: In order to avoid potential compressor damage, DO NOT RUN THE SYSTEM THROUGH MULTIPLE, BACK TO BACK DEFROST CYCLES. Always allow the system to "regenerate" the heat stored in the Thermobank(s) by allowing the system to operate continuously for a minimum of (1) hour in the normal refrigeration cycle before initiating a second defrost cycle.</u>**