TROUBLESHOOTING THERMOBANK III
HOT GAS DEFROST SYSTEM

The following troubleshooting guide is designed to provide the qualified refrigeration service technician with the basic information necessary to diagnose the most common defrost problems that may be encountered with the Kramer Thermobank III hot gas defrost system. This guide applies to all systems manufactured since approx. January 1997 which utilize a low ambient module in the hot gas bypass line. Please note that it is not the purpose of this guide to provide a complete, comprehensive means of troubleshooting the Thermobank III system, but to assist the technician in diagnosing general defrost failure modes. Nevertheless, this information is of a limited value without a thorough understanding of the operation of the Thermobank III system, therefore we strongly recommend that the service technician first review the Thermobank III SEQUENCE OF OPERATION, as well as the system piping and schematic wiring diagrams originally supplied with the system being serviced.

CAUTION!

Before proceeding beyond this point, visually inspect the system evaporator(s) for any ice build-up on the finned surface of the coil or in the drain pan. *Do not* under any circumstances attempt to remove any ice accumulation from the coil or pan by simply extending the length of the defrost cycle either by adjusting the fail-safe setting on the time clock or increasing the defrost termination pressure control setting. Pump the system down via the manual pumpdown switch located in the condensing unit control panel, disconnect all evaporator power supplies and manually remove the ice from the coil and drain pan using hot water. Coil failure as a result of the progressive build-up of ice on the coil and / or drain pan assembly, (ie. crushed tubes), is not covered under the terms and conditions of Kramer's standard product warranty.

Do not simply "feel" the hot gas line in order to determine if the defrost cycle is functioning. Hot gas will not defrost the evaporator coil. The key to a successful hot gas defrost cycle is pressure and flow. A minimum of (2) refrigeration service gauge manifolds are required to properly troubleshoot the Thermobank III system.

TROUBLESHOOTING DEFROST CONTROLS

1.) ***INCOMPLETE DEFROST***

***A*. Incomplete defrost is characterized by ice accumulation on the finned surface of the coil, in the drain pan or drain line. Frost build-up on the ceiling or adjacent walls, on the outside of the evaporator housing, fan guards or blades does not constitute incomplete defrost since the design of the unit does not allow for any means of automatically defrosting these areas. If the fan blades become excessively frosted and unbalanced, there is an excessive infiltration of warm, moist air into the conditioned space which must be reduced or eliminated. Some effective solutions to this problem may be; reducing door openings into adjacent, unconditioned areas, installing fast-acting automatic doors, air curtains or strips, sealing of all joints, seams, pipe chases and electrical conduits, installing refrigerated ante-rooms. If infiltration cannot be reduced by any of these means, then provisions must be made for periodic removal and cleaning of fan guards and blades as necessary to prevent component failure.**

***B*. Likewise, excessive ice build-up on fan blades, venturi panels, inside fan section or on ceiling immediately in front of the unit fans is not an indication of a defrost problem but of too frequent or excessively long defrost cycles, resulting in steaming. Limit the number of defrosts required per day to the absolute minimum required to maintain a clear coil. Normally, a defrost cycle is not required until the frost build-up starts to bridge between the coil fins, significantly reducing air flow through the coil. Most low temperature Thermobank systems utilize evaporators with a maximum fin spacing of 4 fins per inch which helps to extend the run time between defrost cycles. Ideally, the defrost cycle should terminate via the termination pressure control approx. (1) minute after all frost has melted from the entering and leaving air coil face as confirmed by visual inspection. This will normally ensure that the coil has cleared internally of all frost build-up as well. Refer to RECOMMENDED CONTROL SETTINGS for proper termination control settings.**

2). *ICE IN THE DRAIN PAN*

A. **Check the drain line to make sure that it is clear. If it is plugged with ice, thaw the drain, determine why it froze up and take any necessary corrective action. Problem may be;**

- **Unit pitched incorrectly**
- **Inadequate drain line pitch**
- **Drain line reduced in size from connection provided on evaporator coil**
- **Insufficient heat trace on drain line**
- **Improperly applied heat trace**
- **Defective heat trace**
- **Drain line trap frozen or blocked**
- **Power interrupted to heat trace**

B. **If drain line is clear but pan builds ice, problem may be premature termination of defrost cycle. To correct the problem;**

- **Increase termination pressure per recommended control settings**
- **Increase defrost time**
- **Increase frequency of defrost *NOTE*: A key indicator of inadequate length of defrost is the "bridging" of ice between coil fins on the bottom edge of coil just above the drain pan. Prolonging the defrost cycle will allow these few remaining drops of water to drain completely from the coil fins.**
- **Unit improperly pitched or pan damaged allowing standing water to remain in pan**
- **Inadequate contact of hot gas pan loops with bottom of drain pan, (May apply to LPG models and some early MSG / CSG models only).**

2.) *ICE BUILD-UP ON COIL*

A. **Manually remove *ALL* ice from coil, drain pan and return bend ends of coil. Allow system to operate in normal refrigeration mode for several hours to buildup frost on evaporator surface. With a minimum of (3) service gauges installed, (discharge at compressor service valve, suction at compressor service valve and discharge at inlet of holdback valve or suction filter), advance the time clock into**

defrost. Initially, compressor discharge pressure should drop drastically and then slowly rise as defrost progresses. Suction pressure at compressor may be initially just above a vacuum but after approx. 1-2 minutes, pressure should increase to maximum holdback valve setting, (see recommended control settings). This gauge reading will normally fluctuate somewhat as the quantity and / or quality of liquid refrigerant varies returning from the evaporator. If liquid floodback leaving the Thermobank is observed at any time during this test, confirm that the bank is full to over flowing with water and the immersion heater thermostat is set to a minimum of 120 degrees F. If necessary, re-adjust the holdback valve to recommended setting. If refrigerant and / or oil is noticed escaping from under holdback valve adjustment cap, then valve bellows is leaking and valve will not regulate with adjusting cap and seal in place and valve must be replaced. "Evaporator" pressure, (measured with discharge gauge at inlet of holdback valve or suction filter), will initially rise to a point near the equivalent of +32 degrees saturated suction temperature for the system refrigerant, (R-22 = Approx. 58 P.S.I.G.; R-404a = Approx. 72 P.S.I.G.), Once all frost has visually melted from the coil face, evaporator pressure will rise rapidly to the termination pressure, (refer to RECOMMENDED CONTROL SETTINGS for *MINIMUM* defrost termination pressure). *NOTE*: On a properly adjusted Thermobank III system, the typical length of the defrost cycle may only average approx. 5 minutes!

B. **If defrost terminates on time, (head pressure normal), problem may be;**

- **Defective or improperly adjusted defrost termination pressure control**
- **Defective termination solenoid in defrost time clock**
- **Holdback valve set to low**
- **Leaking discharge solenoid valve**
- **Leaking check valve in receiver outlet piping**
- **Excessive air movement through defrosting evaporator**

C. **If defrost terminates on time, but head pressure is high or unit trips out on high head pressure prior to defrost termination, problem may be;**

- **Hot gas solenoid valve fails to open or sticking closed**
- **Bypass solenoid valve fails to open or sticking closed**
- **Undersized liquid line**
- **Holdback valve set to high or wide open**
- **Suction solenoid valve leaking through or stuck open**

D. **If unit trips out on oil safety control during the defrost cycle, problem may be;**

- **Low water level in Thermobank**
- **Low water temperature in Thermobank at initiation of defrost cycle, (insufficient compressor run time prior to defrost, immersion heater inoperative or t-stat set to low, holdback check valve leaking through during refrigeration cycle)**
- **Holdback valve set to high or valve wide open due to leaking bellows**
- **Suction solenoid valve stuck open or leaking through**
- **Defrost cycle to long, (defrost termination control set to high or defective, defrost timer fail-safe set to long, excessive frost build-up on evaporator coil, [increase frequency of defrost cycles], excessive air movement through defrosting evaporator)**

E. **If unit cycles on discharge solenoid pressure control during the defrost cycle, problem may be;**

- **Holdback valve set to high or wide open due to leaking bellows**
- **Suction solenoid valve stuck open or leaking through**
- **Defrost cycle to long, (defrost termination control set to high or defective, defrost timer fail-safe set to long)**

F. **If defrost cycle terminates on pressure but coil does not clear of all frost build-up, problem may be;**

- **Holdback valve set to high, (reduce holdback valve setting to lengthen defrost cycle)**
- **Insufficient number of defrost cycles. Add defrost pins to timer as necessary to maintain clear coil.**
- **Excessive frost build-up on coil due to excessive moisture infiltration into conditioned space.**

G. **If unit trips out on high head pressure immediately following a defrost cycle, problem may be;**

- **Normally open discharge solenoid valve at inlet of condenser sticking or fails to open**