SYSTEM START-UP CHECKLIST

CHECKING THE SYSTEM 24 HOURS PRIOR TO INITIAL START-UP (NO POWER)

JOB NAME: _____
SALES ORDER #: _____

LOCATION: _____

SOLD BY: _____

INSTALLING CONTRACTOR: _____

STARTUP: _____
TECHNICIAN/ COMPANY: _____

DATE: _____

CHILLER
MODEL #: _____
SERIAL #: _____

COMPRESSOR #1
MODEL #: _____
SERIAL #: _____

COMPRESSOR #2
MODEL #: _____
SERIAL #: _____

Unit Checks

☐ 1. Inspect the unit for shipping or installation damage.

☐ 2. Assure that all piping has been completed.

☐ 3. Check that the unit is properly charged and that there are no piping leaks.

☐ 4. Suction and discharge stop valves and the refrigerant liquid stop valves are open (ccw).

CAUTION: Compressor lubrication circuit must be primed with YORK "C" oil prior to start-up. Priming should be done through the Schrader fitting at the compressor oil pump. Stroke oil pump 10 times to prime the lubrication circuit.

☐ 5. The compressor oil level must be maintained between the middle of the upper and middle of the lower sight glass at all operating conditions. At part load operating conditions, it is not abnormal for the oil level to be in the lower sight glass. If it is necessary to add oil, connect a YORK oil pump to the oil charging valve, but do not tighten the flare nut on the delivery tubing. With the bottom (suction end) of the pump submerged in oil to avoid the entrance of air, operate the pump until oil drips from the flare nut joint, allowing the air to be expelled, and tighten the flare nut. Open the compressor oil charging valve and pump in oil until the oil reaches the proper level as described above. Close the compressor oil charging valve.

☐ 6. Assure water pumps are on. Check and adjust water pump flow rate and pressure drop across cooler.

☐ 7. Check panel to see that it is free of foreign material (wires, metal chips, etc.).

☐ 8. Visually inspect wiring (power & control). Must meet NEC and all local codes. (See Fig. 10 & 12)

☐ 9. Check for proper size fuses in main and control power circuits.

☐ 10. Verify that field wiring matches the 3-phase power requirements of the compressor. See nameplate. (See Fig. 10)

☐ 11. Assure 115VAC Control Power to TB1 has 30A minimum capacity. (See Fig. 10)

☐ 12. Be certain all control bulbs are inserted completely in their respective wells and are coated with heat conductive compound.

PANEL CHECKS (POWER ON, BOTH SYSTEM SWITCHES "OFF")

☐ 1. Apply 3-phase power and verify its value. (See Fig. 10). ϕ A: ____, ϕ B: ____, ϕ C: ____ VAC

☐ 2. Apply 115VAC and verify its value on the terminal block in the lower left of the Power Panel. Make the measurement between terminals 5 and 2. Should be 115VAC ± 10%. (See Fig. 10). _____ VAC

☐ 3. Assure crankcase heaters are on. Allow crankcase heaters to remain on a minimum of 24

hours before start-up. This is important to assure no refrigerant is in the oil at start-up!

☐ 4. Program the Dip Switches on the Microprocessor Board (Page 36 - 38) and verify the selection by pressing the OPTIONS key.
Switch 3 should always be closed.
Switch 6 should always be open.

NOTE: It is IMPORTANT that all switches are properly programmed. Otherwise, undesirable operation will result.

☐ 5. Press the PROGRAM key and program each of the 11 limits and record them. They are as follows*:

☐ • Discharge Cutout	____PSIG
☐ • Outside Air Temp Low Cutout	____°F
☐ • Outside Air Temp High Cutout	____°F
☐ • Discharge Pressure Unload Pressure	____PSIG
☐ • Suction Pressure Unload Pressure	____PSIG
☐ • Leaving Water Temp Cutout	____°F
☐ • Suction Pressure Cutout	____PSIG
☐ • Rate Control Temp	____°F
☐ • Anti Recycle Time	____SEC
☐ • Rate Sensitivity	____°F/MIN
☐ • Number of Load Steps	____

* substitute metric value if required

See page 43 for assistance in programming these values.

☐ 6. Program the date and time by first assuring that the CLK jumper J18 on the Microprocessor Board (Fig. 26) is in the ON position (Top 2 pins).

Press the SET TIME key and set the date and time (Page 47).

☐ 7. Program the Daily and Holiday Start/Stop Schedule by pressing the SET SCHEDULE/ HOLIDAY key (Page 47).

☐ 8. Program the Chilled Liquid Setpoint and Control Range by pressing the CHILLED LIQUID TEMP/RANGE key (Page 51).

☐ 9. If the Remote Reset is to be used, the maximum reset must be programmed. This can be programmed by pressing the REMOTE RESET TEMP RANGE key (Page 77).

INITIAL STARTUP

After the operator has become thoroughly familiar with the control panel and has performed the preceeding checks 24 hours prior to startup, the unit can be put into operation.

☐ Place the System Switches to the ON position. See the OPERATING SEQUENCE for unit operation.

☐ The compressor will start and a flow of liquid should be noted in the liquid indicator. After several minutes of operation, the bubbles will disappear and there will be a solid column of liquid when the unit is operating normally. On startup, foaming of the oil may be evident in the compressor oil sight glass. After the water temperature has been pulled down to operating conditions, the oil should be clear. Normal operation of the unit is evidenced by a hot discharge line (discharge superheat should not drop below 50°F or 10°C), clear oil in the compressor crankcase, solid liquid refrigerant in the liquid indicator and usually no more than 2 PSIG (13.8 kPa) variation in suction pressure for any given set of operating conditions.

☐ Allow the compressor to run for a short time, being ready to stop it immediately if any unusual noise or other adverse condition should develop. When starting the compressor, always make sure the oil pump is functioning properly. Compressor oil pressure must be as described in the SYSTEM SAFETIES Section, page 62.

☐ Check the system operating parameters. Do this by selecting various readouts such as pressures and temperatures. Compare these to test gauge readings.

CHECKING SUPERHEAT AND SUBCOOLING

The subcooling should always be checked when charging the system with refrigerant and/or before setting the superheat.

When the refrigerant charge is correct, there will be no bubbles in the liquid sightglass with the system operating under full load conditions, and there will be 10°F to 15°F (-12.2 to -9.4°C) subcooled liquid refrigerant leaving the condenser.

An overcharged system should be guarded against. Evidences of overcharge are as follows:

a. If a system is overcharged, the discharge pressure will be higher than normal. (Normal discharge/condensing pressure can be found in refrigerant temperature/pressure chart; use entering air temperature +30°F {-1.1°C] for normal condensing temperatures.)

b. The temperature of the liquid refrigerant out of the condenser should not be more than 15°F (8.3°C) less than the condensing temperature. (The temperature corresponding to the condensing pressure from refrigerant temperature/pressure chart).

The subcooling temperature should be taken by recording the temperature of the liquid line at the outlet of the condenser and recording the liquid line pressure at the liquid stop valve with the system fully loaded after steady state operation has been established and converting it to temperature from a temperature/pressure chart. Be sure to insulate the thermometer or thermocouple attached to the piping.

Example:

LIQUID LINE PRESSURE	
202 PSIG converted to	102°F
Minus Liquid Line Temperature	- 90°F
Subcooling =	12°F

Record: SYS 1_____, SYS 2_____

The proper refrigerant charge is attained when subcooling is measured at 10 - 15°F (-12.2 to -9.4°C). Add charge as needed to increase subcooling and remove charge as necessary to reduce subcooling. Whenever removing charge, be sure to recover it in an approved container.

After the subcooling is set at 10 - 15°F (-12.2 to -9.4°C) by adding or removing charge and steady state fully loaded operation is established, system superheat should also be adjusted for 10 - 15°F (-12.2 to -9.4°C). A factory recommended superheat setting of 15°F (-9.4°C) is appropriate for systems that operate over a variety of ambient temperatures, chilled liquid temperatures, and loading conditions. It also compensates for gauge and temperature sensor inaccuracy. When measuring superheat, be sure to insulate a thermometer or thermocouple attached to the piping to assure a true temperature is measured.

The superheat is the difference between the actual temperature of the returned refrigerant gas entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart. The suction temperature should be taken 6" before the compressor service valve, and the suction pressure is taken at the compressor suction service valve.

Example:

Suction Temperature	46°F
Minus Suction Pressure - 56 PSIG	
Converted to Temperature	- 31°F
Superheat =	15°F

Superheat SYS 1 ____, SYS 2 ____

Normally, the thermal expansion valve need not be adjusted in the field. If, however, an adjustment is to be made, the expansion valve adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and return to settled operation.

Proper subcooling and superheat will assure optimum performance and reliability of the system. Checks should always be made when commissioning a chiller and on a yearly basis.

If the unit has been functioning satisfactorily during the initial operating period, it is ready for continuous operation.

☐ Leak check compressors, fittings, and piping to assure no leaks are present from improper handling.

OPERATING SEQUENCE UTILIZING RETURN WATER CONTROL

NOTE: The operating sequence described below relates to operation after power has been applied on a hot water start such as startup commissioning or a hot water start at the beginning of the day. It also assumes that 10 steps of loading are available and programmed. If less than 10 steps are available, no chiller response will take place at some of the operating points described.

1. For the system compressors to run, all Manual Reset Cutouts must be reset, the Flow Switch must be closed, the System Switches must be ON, the Daily Schedule must be scheduling the chiller to run, and temperature demand must be present.

2. As long as power is applied, the Crankcase Heaters will be on and stay on as long as the compressors are not running.

3. If power has just been applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure.

   NOTE: Compressor Crankcase Heaters should be on for a period of 24 hours prior to commissioning. Failure to allow the heater sufficient time to warm the oil may damage the compressor due to liquid refrigerant in the oil.

4. **At the end of the 2 minute timer**, the microprocessor will check for cooling demand as well as check to see if any system safeties have been exceeded. If all conditions allow for start, the lead compressor will start unloaded. Coincident with the start, the programmable anti-recycle timer will be set and begin counting downward to “0”. The liquid line solenoid of the compressor will open.

5. **After 4 seconds of run time**, the motor current of the lead compressor must be > 14% FLA and < 115% FLA. Oil pressure must be > 5 PSID (34.5 kPa). If these conditions are not met, the lead compressor will shut down.

6. **After 30 seconds of run time**, the oil pressure of the lead compressor must be > 20 PSID (137.9 kPa) and the suction pressure must be > 50% of cutout. If these conditions are not met, the lead compressor will shut down.

7. **After 1 minute of run time**, the lead compressor will load the 1st step, if cooling demand (temperature and rate control) requires.

8. **After 2 minutes of run time**, the lead compressor will load the 2nd step, if cooling demand (temperature and rate control) requires.

9. **After 3 minutes of run time**, the lead compressor will load its 3rd step, if temperature demand (temperature and rate control) requires.

10. **After 4 minutes of operation**, the oil pressure of the lead compressor must be >25 PSID (172.4 kPa) and the suction pressure must be > cutout. If these conditions are not met, the lead compressor will shut down. If cooling demand requires (temperature and rate control), the lag compressor will start unloaded and its anti-recycle counter will begin counting back to "0". The liquid line solenoid will open. The lead compressor will unload 2 steps to its 1st step of 3 loading steps.

11. **After 4 minutes and 4 seconds of run time**, the motor current of the lag compressor must be >14% FLA and < 115% FLA. Oil pressure must be > 5 PSID (34.5 kPa). If these conditions are not met, the lag compressor will shut down.

12. **After 4 minutes and 30 seconds of run time**, the oil pressure of the lag compressor must be >20 PSID (137.9 kPa) and the suction pressure must be > 50% cutout. If these conditions are not met, the lag compressor will shut down.

13. **After 5 minutes of run time**, the lag compressor will load to the 1st step of loading, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 1st step of loading.

14. **After 6 minutes of run time**, the lead compressor will load to its 2nd step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 1st step of loading.

15. **After 7 minutes of run time**, the lag compressor will load to its 2nd step of loading, if cooling demand requires.

16. **After 8 minutes of operation**, the oil pressure of the lag compressor must be > 25 PSID (172.4 kPa) and the suction pressure must be > cutout . If these conditions are not met, the lag compressor will shut down (temperature and rate control). The lead compressor will load to its 3rd and final step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 2nd step of loading.

17. **After 9 minutes of run time**, the lag compressor will load its 3rd and final step, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 3rd step of loading.

OPERATING SEQUENCE UTILIZING LEAVING WATER CONTROL

NOTE: The operating sequence described below relates to operation after power has been applied on a hot water start such as at start-up commissioning or a hot water start up at the beginning of the day. It also assumes that 10 steps of loading are available and programmed. If less than 10 steps are available, no chiller response will take place at some of the operating points described.

1. For the system compressors to run, all Manual Reset Cut-outs must be reset, the Flow Switch must be closed, any Remote Cycling Contracts must be closed, the System Switches must be ON, the Daily Schedule must be scheduling the chiller to run, and temperature demand must be present.

2. As long as power is applied, the Crankcase Heaters will be on and stay on as long as the compressors are not running.

3. If power has just been applied to the system, the microprocessor will start a 2-minute timer. This is the same timer that prevents an instantaneous start after a power failure. NOTE: Compressor Crankcase Heaters should be on for a period of 24 hours prior to commissioning. Failure to allow the heater sufficient time to warm the oil may damage the compressor due to liquid refrigerant in the oil.

4. **At the end of the 2 minute timer**, the microprocessor will check for cooling demand as well as check to see if any system safeties have been

exceeded. If all conditions allow for start, the lead compressor will start unloaded. Coincident with the start, the programmable anti-recycle timer will be set and begin counting downward to “0”. The liquid line solenoid of the lead compressor will open.

5. **After 4 seconds of run time**, the motor current of the lead compressor must be > 14% FLA and <115% FLA. Oil pressure must be > 5 PSID 34.5 kPa). If these conditions are not met, the lead compressor will shut down.

6. **After 30 seconds of run time**, the oil pressure of the lead compressor must be > 20 PSID (137.9 kPa) and the suction pressure must be > 50% of cut-out. If these conditions are not met, the lead compressor will shut down.

7. **After 2 minutes and 30 seconds of run time**, the lead compressor will load the 1st step, if cooling demand (temperature and rate control) requires.

8. **After 4 minutes of operation**, the oil pressure of the lead compressor must be > 25 PSID (172.4 kPa) and the suction pressure must be > cut-out. If these conditions are not met, the lead compressor will shut down.

9. **After five minutes of run time**, the lead compressor will load the second step, if cooling demand (temperature and rate control) requires.

10. **After 7 minutes and 30 seconds of run time**, the lead compressor will load its 3rd step, if temperature demand (temperature and rate control) requires.

11. **After 10 minutes of run time**, if cooling demand requires (temperature and rate control), the lag compressor will start unloaded and its anti-recycle counter will begin counting back to “0”. The liquid line solenoid will open. The lead compressor will unload two steps to its 1st step of 3 loading steps.

12. **After 10 minutes and 4 seconds of run time**, the motor current of the lag compressor must be > 14% FLA and < 115% FLA. Oil pressure must be > 5 PSID (34.5 kPa). If these conditions are not met, the lag compressor will shut down.

13. **After 10 minutes and 30 seconds of run time**, the oil pressure of the lag compressor must be > 20 PSID (137.9 kPa) and the suction pressure must be > 50% cutout. If these conditions are not met, the lag compressor will shut down.

14. **After 12 minutes and 30 seconds of run time**, the lag compressor will load to the 1st step of loading, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 1st step of loading.

15. **After 14 minutes of operation**, the oil pressure of the lag compressor must be > 25 PSID (172.4 kPa) and the suction pressure must be > cutout . If these conditions are not met, the lag compressor will shut down.

16. **After 15 minutes of run time**, the lead compressor will load to its 2nd step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 1st step of loading.

17. **After 17 minutes and 30 seconds of run time**, the lag compressor will load to its 2nd step of loading, if cooling demand requires (temperature and rate control). The lead compressor remain unchanged at the 2nd step on loading.

18. **After 20 minutes of run time**, the lead compressor will load to its 3rd and final step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 2nd step of loading.

19. **After 22 minutes and 30 seconds of run time**, the lag compressor will load to its 3rd and final step, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 3rd step of loading.