

PRE-STARTUP CHECKLIST

JOB NAME: _____
SALES ORDER #: _____
LOCATION: _____
SOLD BY: _____
INSTALLING CONTRACTOR: _____
START-UP TECHNICIAN/ COMPANY: _____
START-UP DATE : _____

UNIT MODEL #: _____
SERIAL #: _____

CHECKING THE SYSTEM PRIOR TO INITIAL START (No Power)

Unit Checks

- 1. Inspect the unit for shipping or installation damage.
- 2. Assure that all piping has been completed.
- 3. Visually check for refrigerant piping leaks.
- 4. Open suction line ball valve, discharge line ball valve, and liquid line valve for each system.
- 5. The compressor oil level should be maintained so that an oil level is visible in the sight glass. The oil level can only be tested when the compressor is running in stabilized conditions, guaranteeing that there is no liquid refrigerant in the lower shell of the compressor. In this case, the oil must be between 1/4 and 3/4 in the sight glass. At shutdown, the oil level can fall to the bottom limit of the oil sight glass.
- 6. Verify proper CFM of air across evaporator coil. Verify air flow switch operation.
- 7. Check the control panel to assure it is free of foreign material (wires, metal chips, etc.).
- 8. Visually inspect wiring (power and control). Wiring MUST meet N.E.C. and local codes.
- 9. Check tightness of power wiring inside the power panel on both sides of the motor contactors.
- 10. Check for proper size fuses in main and control circuits.
- 11. Assure 120VAC Control Power to CTB2 has 15A minimum capacity. See Table 7.

- 12. Be certain field wiring for discharge air sensor, liquid line solenoid valves, and zone thermostats (if applicable) and air proving switches have been correctly wired.

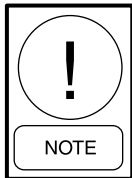
PANEL CHECKS (Power ON – Both Unit Switches OFF)

- 1. Apply 3-phase power and verify its value. Voltage imbalance should be no more than 2% of the average voltage.
- 2. Apply 120VAC and verify its value on the terminal block in the Power Panel. Make the measurement between terminals 5 and 2 of CTB2. The voltage should be 120VAC +/- 10%.
- 3. Program/verify the Cooling Setpoints, Program Setpoints, and unit Options. Record the values below (see sections on Setpoints and Unit keys for programming instruction).
- 4. Put the unit into Service Mode (as described under the Control Service And Troubleshooting section) and cycle each condenser fan to ensure proper rotation.
- 5. Prior to this step, turn system 2 off (if applicable - refer to Option 2 under “Unit Keys” section for more information on system switches.) Connect a manifold gauge to system 1 suction and discharge service valves.

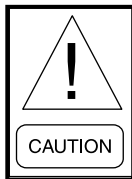
TABLE 10 – SETPOINTS

OPTIONS	
Display Language	
Sys 1 Switch	
Sys 2 Switch	
Unit Type	
Ambient Control	
Local/ Remote Mode	
Control Mode	
Display Units	
Lead/Lag Control	
Fan Control	
Manual Override	
COOLING SETPOINTS	
Cooling Setpoint	
Range	
EMS-PWM Max. Setpoint	
PROGRAM	
Discharge Pressure Cutout	
Suct. Pressure Cutout	
Low Amb. Temp. Cutout	
Anti-Recycle Time	
Fan Control On-Pressure	
Fan Differential Off-Pressure	
Total # of Compressors	

Place the Unit Switch in the control panel to the ON position. **As each compressor cycles on, ensure that the discharge pressure rises and the suction pressure decreases.** If this does not occur, the compressor being tested is operating in the reverse direction and must be corrected. After verifying proper compressor rotation, turn the Unit Switch to "OFF"



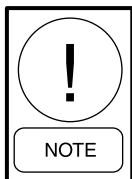
The cooling setpoint may need to be temporarily lowered to ensure all compressors cycle "ON."



This unit uses scroll compressors which can only operate in one direction. Failure to observe these steps could lead to compressor failure.

- ❑ 6. YCUL00125 - YCUL0275 units only – Turn system 1 off and system 2 on (refer to Option 2 under "Unit Keys" section for more information on system switches.)

Place the Unit Switch in the control panel to the ON position. **As each compressor cycles "ON," ensure that the discharge pressure rises and the suction pressure decreases.** If this does not occur, the compressor being tested is operating in the reverse direction and must be corrected. After verifying proper compressor rotation, turn the Unit Switch to "OFF"



The cooling setpoint may need to be temporarily lowered to ensure all compressors cycle "ON."

- ❑ 7. After verifying compressor rotation, return the Unit Switch to the OFF position and ensure that both Systems are programmed for "ON" (refer to Option 2 under "Unit Keys" section for more information on system switches).

INITIAL START-UP

After the preceding checks have been completed and the control panel has been programmed as required in the pre-startup checklist, the unit may be placed into operation.

- ❑ 1. Place the Unit Switch in the control panel to the ON position.

- ❑ 2. The first compressor will start and a flow of refrigerant will be noted in the sight glass. After several minutes of operation, the vapor in the sight glass will clear and there should be a solid column of liquid when the TXV stabilizes.
- ❑ 3. Allow the compressor to run a short time, being ready to stop it immediately if any unusual noise or adverse conditions develop.
- ❑ 4. Check the system operating parameters. Do this by selecting various displays such as pressures and temperatures and comparing these readings to pressures and temperatures taken with manifold gauges and temperature sensors.
- ❑ 5. With an ammeter, verify that each phase of the condenser fans and compressors are within the RLA as listed under Electrical Data.

CHECKING SUPERHEAT AND SUBCOOLING

The subcooling and superheat should always be checked when charging the system with refrigerant.

When the refrigerant charge is correct, there will be no vapor in the liquid sight glass with the system operating under full load conditions, and there will be 15°F (8.34°C) subcooled liquid leaving the condenser.

An overcharged system should be guarded against. The temperature of the liquid refrigerant out of the condenser should be no more than 15°F (8.34°C) subcooled at design conditions.

The subcooling temperature of each system can be calculated by recording the temperature of the liquid line at the outlet of the condenser and subtracting it from the liquid line saturation temperature at the liquid stop valve (liquid line saturation temp. is converted from a temperature/pressure chart).

Example:

$$\begin{array}{r}
 \text{Liquid line pressure} = \\
 202 \text{ PSIG converted to} \quad 102^\circ\text{F} \\
 \text{minus liquid line temp.} \quad - 87^\circ\text{F} \\
 \text{SUBCOOLING} = \quad 15^\circ\text{F}
 \end{array}$$

The subcooling should be adjusted to 15°F at design conditions.

- ❑ 1. Record the liquid line pressure and its corresponding temperature, liquid line temperature and subcooling below:

	SYS 1	SYS 2	
Liq Line Press =	_____	_____	PSIG
Saturated Temp =	_____	_____	°F
Liq Line Temp =	_____	_____	°F
Subcooling =	_____	_____	°F

After the subcooling is verified, the suction superheat should be checked. The superheat should be checked only after steady state operation of the unit has been established, the discharge air temperature (or suction pressure) has been pulled down to within the control range, and the unit is running in a fully loaded condition. Correct superheat setting for a system is 10°F (5.56°C) 18" (46 cm) from the evaporator.

The superheat is calculated as the difference between the actual temperature of the refrigerant gas in the suction line and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart.

Example:

$$\begin{array}{r}
 \text{Suction Temp} = 46^{\circ}\text{F} \\
 \text{minus Suction Press} \\
 60 \text{ PSIG converted to Temp} \quad -34^{\circ}\text{F} \\
 \hline
 \text{Superheat} = 12^{\circ}\text{F}
 \end{array}$$

When adjusting the expansion valve, the 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 stabilize.

Assure that superheat is set at 10°F (5.56°C).

- 2. Record the suction temperature, suction pressure, suction saturation temperature, and superheat of each system below:

	SYS 1	SYS 2	
Suction temp =	_____	_____	°F
Suction Pressure =	_____	_____	PSIG
Saturation Temp =	_____	_____	°F
Superheat =	_____	_____	°F

LEAK CHECKING

- 1. Leak check compressors, fittings, and piping to assure no leaks.

If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the compressors cycle to control discharge air temperature (or suction pressure), the chiller is ready to be placed into operation.

UNIT OPERATING SEQUENCE

The operating sequence described below relates to operation after power has been applied, such as start-up commissioning. When a compressor starts, internal timers limit the minimum time before another compressor can start to 1 minute.

1. For the condensing unit to run, any remote cycling contacts must be closed, the Daily Schedule must not be scheduling the condensing unit off, the air proving switch(es) must be closed, and a load must be present.
 2. When power is 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.
 3. At the end of the 2 minute timer, the microprocessor will check for cooling demand. If all conditions allow for start, the first compressor on the lead system will start and the liquid line solenoid will open. The compressor with the least run time in that system will be the first to start. Coincident with the start, the anti-coincident timer will be set and begin counting downward from "60" seconds to "0" seconds.
- If the unit is programmed for Auto Lead/Lag, the system with the shortest average run-time of the compressors will be assigned as the "lead" system. A new lead/lag assignment is made whenever all systems shut down.
4. Several seconds after the compressor starts, that system's first condenser fan will be cycled on (outdoor air temperature > 25°F (-3.89°C)). See the section on Operating Controls for details concerning condenser fan cycling.
 5. After 3 minutes of compressor run time, the next compressor in sequence will start when a system has to load. This compressor will be the one with the least run time that is currently not running in that system. Additional compressors will be started at 150 to 180 second intervals as needed to satisfy (discharge temperature or suction pressure) setpoint.
 6. If demand requires, the lag system will cycle on with the same timing sequences as the lead system. Refer to the section on Capacity Control for a detailed explanation of system and compressor staging.
 7. As the load decreases below setpoint, the compressors will be shut down in sequence. This will occur at intervals of either 60 or 30 seconds, depending on the mode of control as compared to setpoint. See the section on Capacity Control for a detailed explanation.
 8. When the last compressor in a "system" (two or three compressors per system), is to be cycled off, the system will initiate a pump-down. On a non-safety, non-unit switch shutdown, the LLSV will be turned off, and the last compressor will be allowed to run until the suction pressure falls below the suction pressure cut-out, or for 180 seconds, whichever comes first.