COOLTEC

REFRIG-O-PAK

MULTI-CIRCUITED RACK

CUSTOM PACKAGED
REFRIGERATION SYSTEM

OWNER'S MANUAL

- **INSTALLATION**
- **OPERATION**
- **MAINTENANCE**

COOLTEC REFRIGERATION CORP.
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INTRODUCTION

DESCRIPTION OF REFRIG-O-PAK

The Cooltec remote air cooled Refrig-O-Pak cooling system utilizes safe CFC's and offers tremendous operating efficiency by using single circuited condensers for 2-20 compressors. This high operating efficiency is made through effective use of the condenser coil surface area. The condenser coils on our units are almost twice the size of conventional competitive designs. The large condenser coils provide the unit with summer ambient air temperatures which produce lower compression ratios and higher compressor capacities. Lower compression ratios and higher compressor capacity mean reduce KW/ton, thereby reducing operating cost. A 10 to 20% reduction, in fact, depends on unit size and H.P. in contrast to single condensing units, Refrig-O-Pak systems are easier to install, easier to service, and much less expensive to operate. Complete factory assembly eliminates on-sight construction cost of built-up systems by refrigeration technicians and electricians in the field. The Refrig-O-Pak is designed primarily for institutional food service operation service operations including hospitals, universities, schools, hotels, restaurants, coffee shops and convenience stores.

Refrig-O-Pak pulls fresh air over the compressor bodies to reduce their operating temperature. Compressor ventilation has become increasingly important because of regulation affecting the use of R-22 refrigerant which has higher discharge temperature. The systems are designed from 2-10 condenser fan motors. R-404A refrigerant is used for all low temperature (0 F to -30 F), high and medium temperature (20 F to 50F) applications.

FEATURES OF REFRIG-O-PAK

CONDENSIG UNIT

A refrigeration condensing unit is a highly sophisticated apparatus. It is installed with the anticipation that it will provide many years of trouble-free operation with minimal maintenance. Usually the length of service life realized from a particular condensing unit is directly proportional to the care with which the original installation was performed.

Cleanliness is absolutely mandatory when installing a condensing unit. Utmost care has been taken at the factory to insure that the unit is free of all accommodation. The factory-applied seals must not be removed until the unit is ready for installation. All tubing valves and fitting must be carefully inspected to insure cleanliness.

The correct electrical supply must be provided to the condensing unit control panel. The voltage at the motor-compressor terminals should be checked during start-up and unit

operation under full load to insure a tolerance of plus or minus 10 percent of the nameplate rating.

The lubrication recommendations for the motor compressor and fan motors (where applicable) must be carefully adhere to.

REFRIGERANT
R-404A is used for the Walk-in Cooler and Walk-in Freezer.

CONTROL PANEL
Each Refrig-O-Pak system is provided with a pre-wired, control panel for single point connection with main disconnect.

Control panel is designed to assure efficient unit operation and provide a pre-selected sequence of operation during the refrigeration and defrost cycles. Each control panel is equipped with main disconnect, motor compressor breakers, contractors, fan motor capacitor, defrost time clock for freezer and wiring diagram for service.

The control panel only requires 3-wires for power supply and 4-wires for defrost heaters and unit cooler fan motors in freezer. All system circuits are labels for easy identification.

ELECTRICAL DEFROST
An electrical defrost heater in the freezer is field-connected to the time clock in the control panel. Defrost is initiated by a time clock and stopped by termination solenoid in the time clock connected to defrost limit thermostat in the freezer coil the time clock is set to fail safe termination period at 45 minutes. The freezer requires four defrost per day starting at 12:00 am, 6:00 am, 12:00 pm and 6:00 pm.

ELECTRICAL CHARACTERISTICS
Each Refrig-O-Pak is equipped with 208-230 volts, 3phase, 60 hertz power supply.

STANDARD COMPONETS
Each Refrig-O-Pak consists of two to twenty scroll compressor, multi-circuited condenser with heavy duty fan motors, oversized receivers, factory installed accessories, unit coolers with T-Stat, solenoid valve, TX valve and suction line P-Trap for freezer and cooler.

FACTORY INSTALLED ACCESSORIES
Drier, sight glass, discharge vibration eliminator for scroll compressor, head pressure control, dual pressure control and pre wired control panel.

W.I. UNIT COOLERS

A. Freezer

A lower temperature electric defrost Lo-silhouette Unit Cooler for freezer is provided with each Refrig-O-Pak Unit. The unit Cooler draws air in through the coil and discharges it through the fans. For best results, the Units Cooler should be located 18" from the back wall and blow towards the door. T-sat, solenoid valve, TX valve are installed in the unit Cooler at the factory. A suction line P-trap is also installed in the Unit Cooler for better oil return.

B. Cooler

A medium temperature lo-silhouette Unit Cooler for the Cooler is provided with each Refrig-O-Pak unit. Air defrost is used for defrosting Unit Cooler. The Unit Coolers is provided with T-Stat, solenoid valve, TX valve and suction line P-Trap and is pre-piped and pre-wired for final connections.

The Cooltec "Refrig-O-Pak" package refrigeration units are tested and assembled under strict quality assurance procedures. Each unit is tested and charged with nitrogen prior to shipment.

condensing unit & coil CAPACITY

CONDENSING UNIT CAPACITY					COIL CAPACITY									TOTAL SYSTEM				
HP	COMPRESSOR MODEL NO. (COPELAND)	CAPACITY MBH @ 95 F AMB	ELECTRIC DATA (AMPS) VOLTS/PHASE/60 HZ		DIMENSIONS (INCHES)			COIL QTY.	COIL MODEL NO.	RATINGS@1-PH 60HZ			LINE SIZE (100° MAX)		TOTAL SYSTEM AMPS		SHIP WT.
										FAN MOTOR		DEFROST	SUCTION	LIQUID			
			208-230/1	208-230/3	L	W	H			RLA	VOLTS	HTR. RLA 208V/1PH	O.D.	O.D.	208V 1PH	208V 3PH	LBS.
SCROLL COMPRESSOR R-404 A MEDIUM TEMP. WALK-IN COOLER																	
0.5	RS43C2E-CAV	5.9	5.4		10.75	6.63	11.25	1	ADT052	1.8	115		1/2	1/4	5.4		100
0.75	RS64C1E-CAV	8.2	7.7		10.75	6.63	11.25	1	ADT070	3.6	115		5/8	3/8	7.7		110
1	RS80C2E-TF5	10.8		6.4	10.75	6.63	11.25	1	ADT104	3.6	115		7/8	3/8		6.4	120
1.3	ZB10KCE-PFV	12.2	10		9.5	9.5	14.86	1	ADT120	3.6	115		7/8	3/8	10		125
1.5	ZB11KCE-PFV	13.4	10		9.5	9.5	14.86	1	ADT130	3.6	115		7/8	3/8	10		130
1.8	ZB13KCE-PFV	16.3	12.9		9.5	9.5	14.86	1	ADT156	5.4	115		7/8	3/8	12.9		140
2	ZB14KCE-PFV	17.9	13.6		9.5	9.5	14.86	1	ADT180	5.4	115		7/8	1/2	13.6		150
2.5	ZB19KCE-TF5	22.5		10	9.5	9.5	15.76	1	ADT208	7.2	115		1 1/8	1/2		10	200
3	ZB21KCE-TF5	27.1		12.1	9.5	9.5	15.76	1	ADT260	9	115		1 1/8	1/2		12.1	220
3.5	ZB26KCE-TF5	31.6		13.9	9.5	9.5	15.76	1	ADT312	10.8	115		1 1/8	1/2		13.9	300
4	ZB30KCE-TF5	36.2		15.7	9.47	9.59	17.25	1	ADT370	10.8	115		1 1/8	1/2		15.7	350
5	ZB38KCE-TF5	45.2		22.1	9.47	9.59	17.25	2	ADT208	14.4	115		11/8	5/8		22.1	390
5.5	ZB42KCE-PFV	51.6	31.4		9.47	9.59	17.25	2	ADT260	18	115		1 3/8	5/8	31.4		400
6	ZB45KCE-TF5	53.6		22.5	9.47	9.59	17.25	2	ADT260	18	115		1 3/8	5/8		22.5	400
7	ZB50KCE-TFS	61.6		28.6	10.38	11.19	18.88	2	ADT312	21.6	115		1 5/8	5/8		28.6	425
8	ZB58KCE-TF5	67.9		32.1	10.38	11.19	18.88	2	ADT312	21.6	115		1 5/8	5/8		32.1	425
9	ZB66KCE-TF5	79.2		33.6	10.38	11.19	21.5	2	BMA365	24	115		1 5/8	5/8		33.6	450
10	ZB76KCE-TF5	92.3		41.4	10.38	11.19	21.5	2	BMA450	24	115		2 1/8	7/8		41.4	500
15	ZS92K4E-TWC	113.4		52.9	12.63	13.89	21.54	2	BMA510	32	115		2 1/8	7/8		52.9	600
SCROLL COMPRESSOR R-404A LOW TEMP. WALK-IN FREEZER																	
0.5	RS43C2E-CAV	1.4	5.4		10.75	6.63	11.25	1	TL21	1	115	9.6	1/2	1/4	6.4		100
0.75	RS64C1E-CAV	2.3	7.7		10.75	6.63	11.25	1	TL28	1.2	115	5.7	5/8	3/8	8.9		110
1	CF04K6E-TF5	3.05		6.4	10.28	9.09	13.31	1	LET035	1	208	3.9	5/8	3/8		7.4	120
1.25	CF06K6E-TF5	5.19		7	10.28	9.09	13.31	1	LET047	1	208	3.9	7/8	3/8		8	125
1.5	ZF06K4E-TF5	7.1		9.28	9.5	9.5	14.5	1	LET065	2	208	7.8	7/8	3/8		11.28	130
2	ZF09K4E-TF5	10.1		11.1	9.5	9.5	15.4	1	LET090	2	208	7.8	1 1/8	3/8		13.1	140
2.5	ZF11K4E-TF5	12.4		13.6	9.5	9.5	15.9	1	LET120	3	208	11.7	1 1/8	3/8		16.6	150
3	ZF13K4E-TFS	14		15	9.47	9.6	17.4	1	LET140	3	208	11.7	1 1/8	3/8		18	200
3.5	ZF15K4E-TF5	17.5		21.4	9.47	9.6	17.4	1	LET160	4	208	15.7	1 1/8	1/2		25.4	220
4	ZF18K4E-TF5	21.2		23.9	9.47	9.6	17.4	1	LET200	5	208	19.6	1 3/8	1/2		28.9	300
5	ZF24K4E-TWC	25.7		30	12.63	14.06	21.17	1	LET240	6	208	23.5	1 3/8	1/2		36	350
7.5	ZF33K4E-TWC	36.4		43.6	12.63	14.06	21.17	2	LET180	8	208	31.4	1 3/8	1/2		51.6	425
10	ZF40K4E-TWC	44.9		52.9	12.63	14.06	21.5	2	LET200	10	208	39.2	1 5/8	1/2		62.9	500
12	ZF48K4E-TWC	50.9		60	12.63	14.06	23.3	2	LET280	12	208	47	1 5/8	5/8		72	600

Notes:

1. Condensing unit capabilities are 95°F ambient. Cooler temp. is at 35°F with 25°F suction gas temp. Freezer term is at -10°F with -20°F suction gas temp.

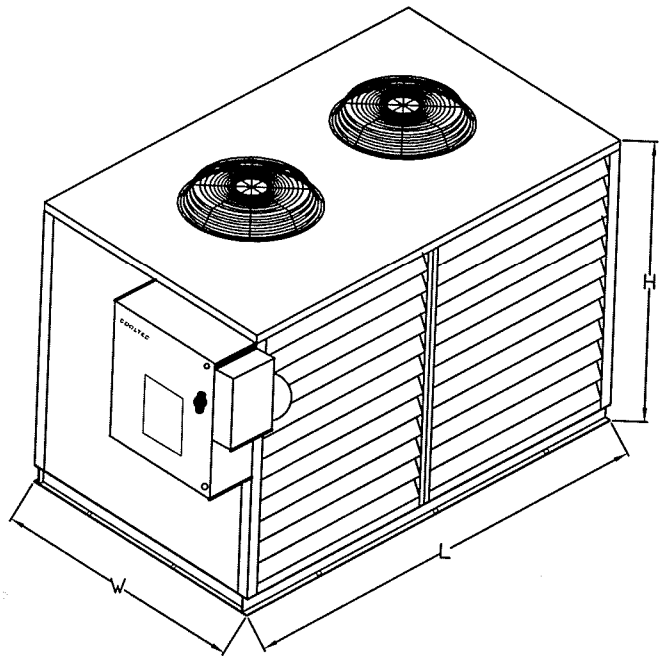
2. Unit cooler and condensing units will have a separate power supplies for walk-in cooler applications and a single power supply for walk-in freezer applications. The Unit Cooler is electrically connected to the condensing unit with a 4-wire color-coded defrost harness.

3. 1MBH = 1000 BTUs/Hour

COOLTEC

REFRIG-O-PAK

MULTI-CIRCUITED RACK



COOLTEC MODEL NO.	DIMENSIONS (inches) Length	Width	Height
CRS-4	48	48	50
CRS-6	72	48	50
CRS-8	96	48	50
CRS-10	120	48	50
CRS-12	144	48	50
CRS-14	168	48	50
CRS-16	192	48	50
CRS-20	240	48	50

NOTES:

Installation clearance – 3 feet all sides. Refrigeration lines stubbed at right end of rack and electrical lines stubbed at left end of rack.

FIGURE 1 - REFRIG-O-PAK DEMENSIONAL DATA

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INSTALLATION

RECEIPT AND INSPECTION OF EQUIPMENT

Inspect the Refrig-O-Pak refrigeration unit and all accessories shipped for any damage or shortages. Any damage or shortages should be reported immediately to the delivering carrier. Damage material becomes the delivering carrier's responsibility and it should not be returned to the manufacturer without prior approval. Do not remove any shipping material until the unit is installed in its permanent location.

LIFTING INSTRUCTIONS (Figure 2)

The Refrig-O-Pak system is a heavy piece of machinery approximately 50 to 5,000 lbs. Careful consideration of lifting procedures should be made before the unit is lifted by any means. Particularly, any cables or any other load-bearing devices must not allow to press against piping, electrical conduit or the motor control panel. The only part of the unit designed to carry any of the lifting load is the base. Lifting loads should be distributed evenly around the base to avoid any twisting.

It is recommended that whenever the unit is lifted by a crane, the lifting space provides in the lower portion of the base frame be used as attachment points for the lifting cables as shown in Figure 2. The lifting cables should be prevented from contacting the unit by means of spreader or similar device.

LOCATION AND VENTILATION

The Refrig-O-Pak unit must be located in an area which allows easy access for installation and service of all electrical lines, refrigeration piping and any accessory equipment. The unit must be level to insure proper lubrication. A minimum of 3 feet clearance must be provided on all sides of the unit.

Equipment should be mounted on a smooth, hard, level surface. Mounting surface should be rigid, and provision should be made to prevent noise transmission to surrounding areas. Air cooled equipment should not be installed under low structural overhangs which can cause condenser air recirculation or restriction. Adequate area (approx. 1 unit width) must be provided around equipment for unrestricted airflow and service. Two units side by side should have a minimum of 1 1/2 unit width between them. Care should be taken to prevent air from other sources from entering condenser if this air is at an elevated temperature.

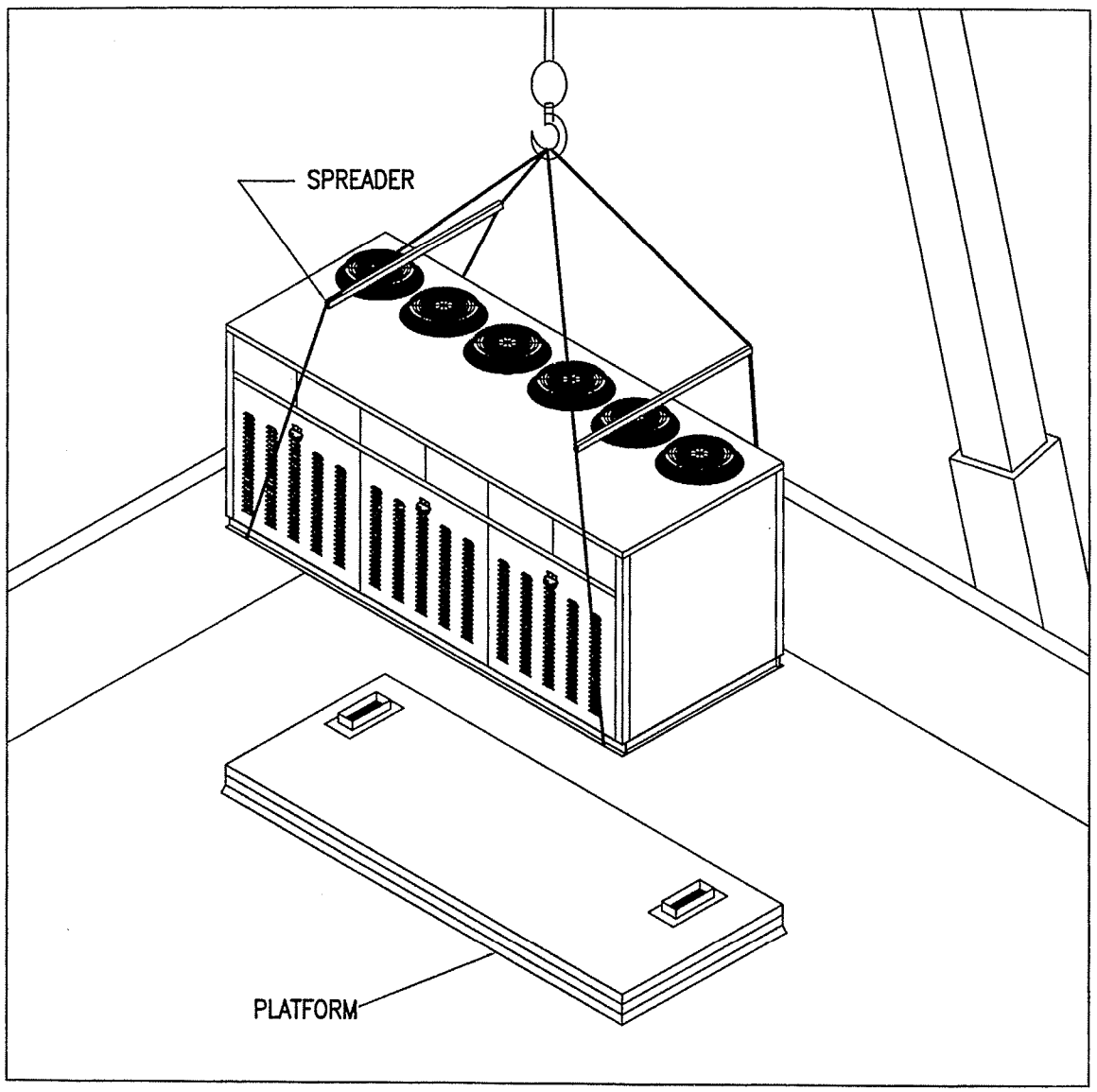

FIGURE 2 - REFRIG-O-PAK RIGGIN DRAWING

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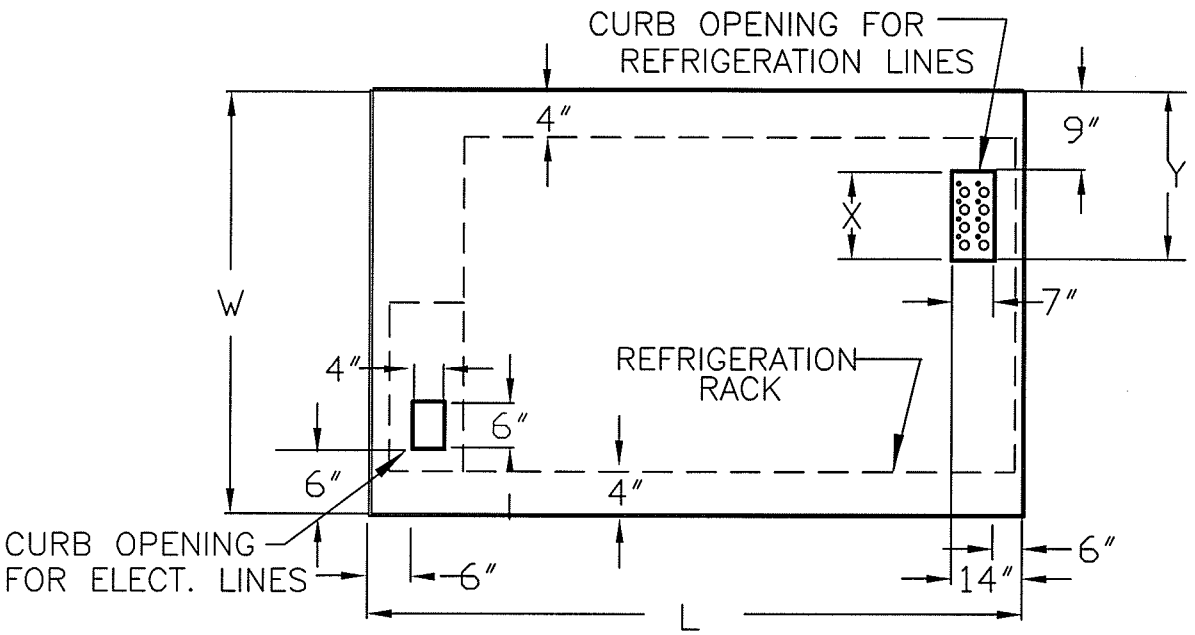

COOLTEC REFRIG-O-PAK DIMENSIONS									ROOF PLATFORM DIMENSIONS (IN)				
COOLTEC MODEL NUMBER	MAXIMUM NUMBER OF COMPRESSOR		ENCLOUSURE WEIGHT	DIMENSIONS (INCHES) REFRIG-O-PAK			CONDENSER FAN MOTORS 208V, 1PH 60 HZ		OVERALL PLATFORM			CURB OPENING	OPENING LOCATION
	SCROLL HERMETIC	SEMI-HERMETIC	(LBS.)	L	W	H	QTY	AMPS	L	W	H	X	Y
CRS-4	3	2	300	48	48	50	2	7.2	62	56	6	13	22
CRS-6	5	4	400	72	48	50	2	7.2	86	56	6	17	27
CRS-8	7	6	500	96	48	50	3	10.8	110	56	6	20	29
CRS-10	9	8	600	120	48	50	4	14.4	134	56	6	20	29
CRS-12	11	10	800	144	48	50	5	18.0	158	56	8	30	39
CRS-14	13	12	1000	168	48	50	6	21.6	182	56	8	30	39
CRS-16	15	14	1400	192	48	50	6	21.6	206	56	8	30	39
CRS-20	19	17	1800	240	48	50	8	28.8	254	56	8	30	39

FIGURE 3 - PLATFORM DETAILS

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INSTALLATION AREA (FIGURE 3)

Figure 3 illustrates the overall dimensions and installation requirements.

ROOF PLATFORM REQUIREMENTS

The roof platform requirements are shown in figure 3. The location and installation of all equipment should be in accordance with all local code requirements. The unit can usually be placed directly upon the roof platform, since each compressor is mounted on vibration isolation pads. For light roof construction, vibration isolation pads can be used underneath the supporting frame.

PITCH POCKET

A. 8" x 24" pitch pocket must be provided for refrigeration. After lines are installed backfill opening with hot pitch and make sure there are no leaks.
B. 4" X 6" pitch pocket must be provided for electrical lines. After lines are install backfill opening with hot pitch and make sure there are no leaks.

ELECTRICAL (Figure 4A & 4B)

To insure operation of equipment and reduce the responsibility of electrical power interruption, the following precautions must be observed:

1. All electrical work must be done in accordance with the National Electrical Code and existing local codes.
2. The power supply must be the same as that which appears on the data plate of the motors.
3. An adequate power supply must be provided.
4. Voltage fluctuations in excess of plus or minus 10 percent should be corrected.
5. 120 volts, 1 phase, 60 Hz. Power supply must be provided for walk-in cooler (Figure 4 A).
6. All units wiring terminals should be checked for tightness before power is applied to the equipment.
7. When wiring is completed, fan motors should be checked for proper rotation. All fan motors of multiple fan equipment have been factory wired to operate with same rotation. If rotation is found to be incorrect, reverse two of three leads on main incoming power.

Before starting a Refrig-O-Pak unit, check that all breakers and motor protective devices are in place and that all wiring is secure. A wiring diagram for troubleshooting the unit is included on the cover.

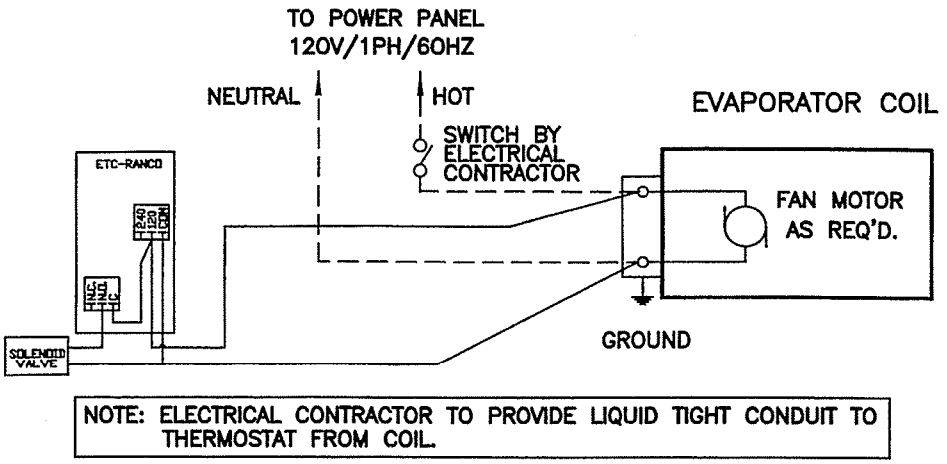

FIGURE 4A - WIRING DIAGRAM FOR WALK-IN COOLER

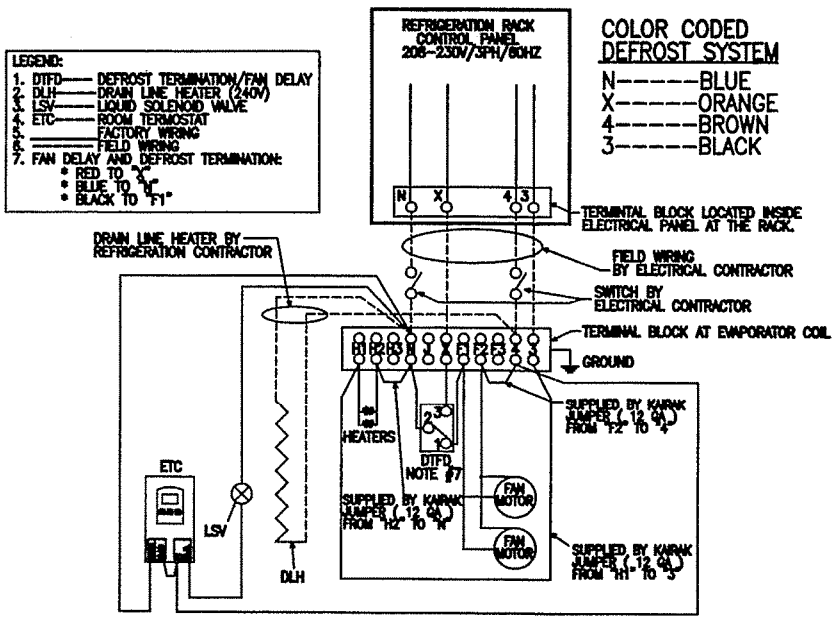

FIGURE 4B - WIRING DIAGRAM FOR WALK-IN FREEZER

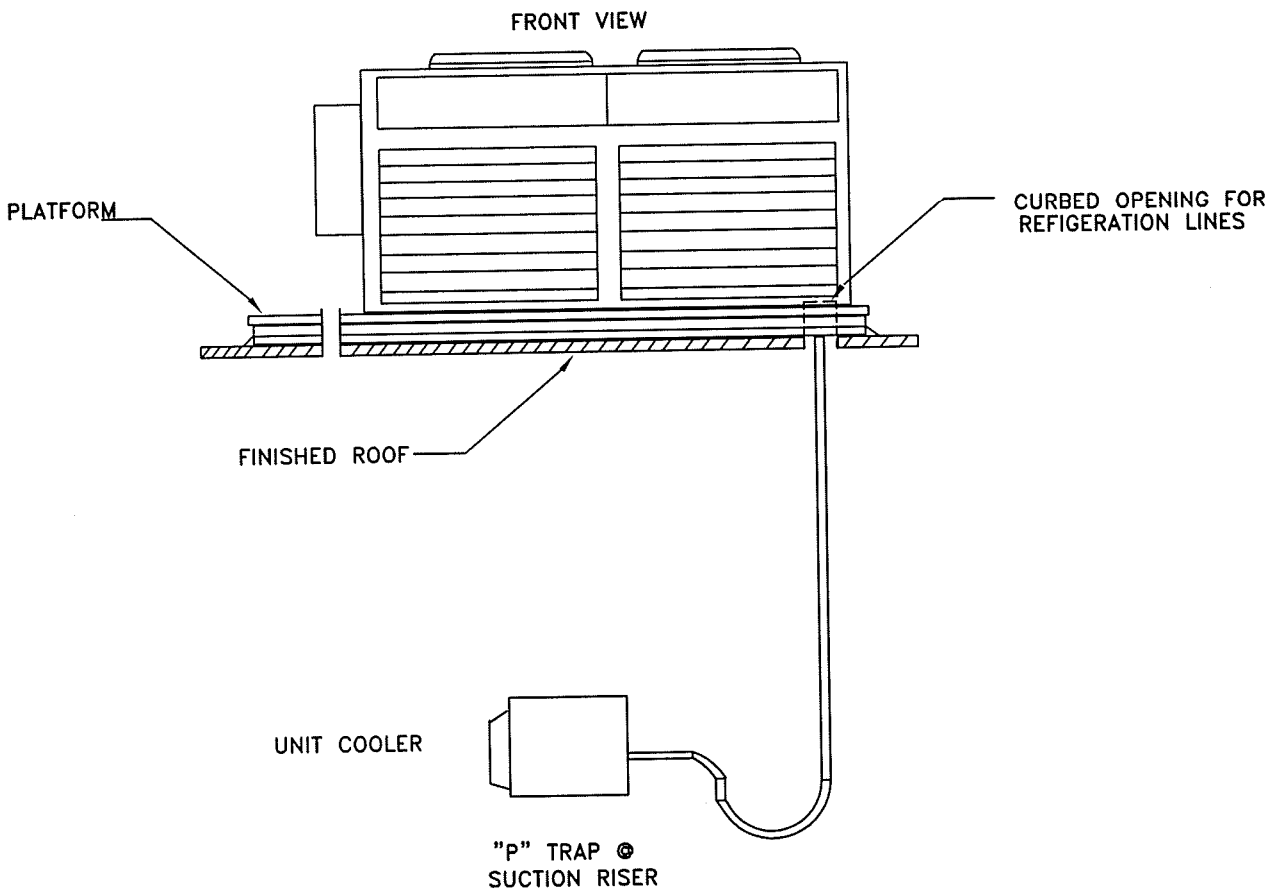

FIGURE 5 - PIPING DETAILS

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REFRIGERATION (FIGURE 5)

1. Piping

Connect suction and liquid lines with the unit coolers and condensing unit on the roof. Leave access tubing in the attic space and backfill opening with hot pitch after installation so that there are no leaks.

Piping must be installed to prevent liquid refrigeration from entering the compressor, either during operation time or "off" time. All piping must be supported with hangers that can withstand the combined weight of tubing, insulation, valves and fluid in the tubing.

2. Leak Testing

After all refrigeration lines are connected, the entire system must be leak tested. Particular care should be given to those parts which will be inaccessible at a later date. **The use of an electric leak detector is highly recommended because of its greater sensitivity to small leaks.**

3. System Evacuation

With refrigerant piping completed and leak tested, equipment is ready to evacuate. Do not use compressor to evacuate system. A quality vacuum pump of 350 micron vacuum is necessary for adequate and dependable system vacuum. Moisture in a refrigeration system can cause corrosion, expansion valve freeze-up and oil sludge.

Attach vacuum pump to both high and low side of system through compressor service valves and evacuated to 350 microns (all service valves*, hand valves, and solenoids must be open during evacuation). It is suggested that vacuum pump be run for a period of time after vacuum has been reached.

*Service valves are back setting valves and must be mid-position to open to both sides of the system.

4. System Charging (Less Flooded Head Pressure Control)

With system wired, piped and evacuated, unit is ready for refrigerant charging. All charging lines and manifolds must be evacuated prior to admitting refrigerant in to system to prevent contaminating system with noncondensibles.

Connect charging line to receiver outlet valve and admit "liquid" refrigerant into high side of system until flow stops due to pressure equalization between high sides and drum pressure. Backseat outlet valve and disconnect charging line.

Connect charging line to compressor suction service valve and admit "vapor" into low side system.

Energize equipment and continue to admit vapor into low side of system until liquid line sight glass clears, indicating a fully charged system (it may be necessary to defeat low pressure control on initial start to prevent nuisance trip until low side pressure is above cut out point of control.

5. System Charging (With Flooded Head Pressure Control)
Initial charging is the same as outlined in item 4.

Do not adjust control valves. These are either factory preset or nonadjustable, depending on size.

Set unloaders (if supplied) to load compressor to 100% while charging. Add additional charge to bring total charge up to required charge as calculated in item 3. Additional charge to be added through low side (vapor) as outlined in 4, fourth paragraph.

This is a continuation of "system charging" and must be performed before equipment can be left operating and unattended. This will involve checking and adjusting of all safety and operating controls (pressure and temperature controls have been set at the factory: however, it is still desirable to confirm that the settings are correct and controls function properly.) Do not attempt to function safety controls without some means of stopping compressor in event of extreme high or low pressure conditions that could damage the equipment. If controls fail to function at set points, determine cause and correct. Jumping any safety control other than for testing purposes is dangerous to personnel and equipment, and nullifies equipment warranty.

Energize crankcase heaters and allow a minimum of 24 hours operation before a compressor start.

1. **High Pressure Control** – Connect a gauge to the compressor discharge service valve. Stop condenser air flow by stopping fans on air cooled equipment or restricting water flow on water cooled equipment. Control should open immediately when discharge pressure reaches control set point.
2. **Low Pressure (Pump-Down) Control** – Connect a gauge to the compressor suction service valve. Throttle receiver outlet valve to lower suction pressure at compressor. Compressor should pump-down and be energized when suction pressure reaches "cut-out" setting control. Open receiver outlet valve and observe rise in pressure at

3. **Oil Pressure Control** – (A) Copeland Compressor-jumper between terminals T1 and T2 of the oil pressure safety control. Compressor should run approximately 120 seconds cycle off. Remove jumper and reset control. Check operating oil pressure this is the differential between oil pump discharge pressure and suction pressure and should be a minimum of 10 psig. Also, after several hours running time, check oil level in compressor. Proper level is approximately ¼ level on oil sight glass. (B) Carlyle Compressor-jumper between terminals T1 and T2 of the oil pressure safety control. Compressor should run approximately 45/60 seconds and cycle off. Remove jumper and reset control. Check operating oil pressure. This is the differential between oil pump discharge and suction pressure and should be a minimum of 7 psig. Also, after several hours of running time, check oil level in compressor. Proper level is approximately 1/3 to ½ level on oil sight glass.

4. **Thermal Expansion Valve** – Adjustment superheat setting to job requirements. How to determine superheat correctly

A) Measure the temperature of the suction line at the point the bulb is clamped.

B) Obtain the suction pressure that exists in the suction line at the bulb location by either of the following methods.

   1) If the valve is externally equalized, a gauge in the external equalizer line will indicate the desired pressure directly and accurately.

   OR

   2) Read the gauge pressure at the suction valve of compressor. To the pressure add the estimated pressure drop through the suction line between bulb location and compressor suction valve. The sum of the gauge reading and the estimated pressure drop will equal the approximate suction line pressure at the bulb.

C) Convert the pressure obtain in 4b (1) or 4b (2) to saturated evaporator temperature by using a temperature pressure chart.

D) Subtract the two temperature obtained in 4a and 4c, the difference is superheat.

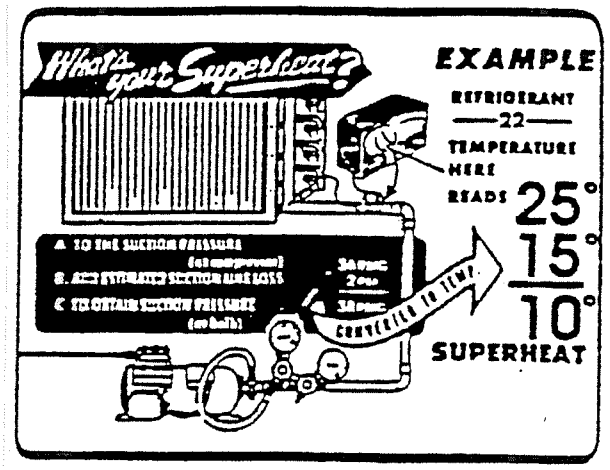

FIGURE 6 - EXAMPLE OF SUPERHEAT

Figure 6 illustrates a typical example of superheat measurement of a refrigeration system using Refrigerant 22 the temperature of suction line at the bulb location is read at 25 F. The suction pressure at the compressor is 36 psig and the estimated line pressure drop is 2 psig…36 psig + 2 psig = 38 psig at the bulb, which is equivalent to a 15 F saturation temperature. 15 F subtracted from 25 F = 10 F superheat.

START-UP PROCEDURE

After the installation has been completed, the following items should be covered before the system is placed in operation.

CONDENSING UNITS

1. Check electrical connections. Be sure they are all tight.
2. Observe the motor-compressor oil level before start-up. The oil level should be at or slightly above the center of the sight glass. Use only SUNISO 3 g of 3GS compressor oil.
3. Insure that the rubber grommets are installed under the motor-compressor mounting nuts and that the motor compressor rides freely on its mounting vibration isolators.
4. Check the high and low pressure controls and all the other safety controls. Adjust if necessary.
5. Check the Walk-In Cooler and Freezer thermostats for correct operation.
6. Suitable tags are provided to indicate the refrigerant used in the system.
7. The instruction manual, bulletins, tags, etc., attached to the unit should be placed inside the electrical panel for future reference.
8. Observe system pressures during initial operation. Do not add oil while the system is short of refrigerant unless the oil level is dangerously low.
9. Do not leave the unit unattached until the system has reached normal operation conditions, and the oil pressure has been properly adjusted to maintain the oil level at the center of the sight glass.

- - CAUTION - -
DO NOT OVERCHARGE WITH OIL

UNIT COOLER

Before Start-Up:

1. Make sure system is wired correctly
2. Check to make sure all electrical terminals are tight
3. Make sure fan sets screws are tight
4. Make sure unit is mounted securely using all the hangers and is level as possible
5. Make sure the drain connection is tightened to drain line securely.
6. Pour water into the drain pan to check for complete drainage of drain pan and drain line

After Start-Up:

1. On initial start-up of freezer unit cooler, the fans will not start until the coil temperature reaches about twenty-five degrees Fahrenheit.

2. Check the expansion valve superheat setting. It is important that the valve is set properly for efficient operating and even frost formation.
3. Make sure the drain line heater is working properly.
4. Heavy moisture loads are usually encountered when starting a system for the first time. This will cause a rapid frost build-up be watched and the unit be defrosted manually as required.
5. Observe the system as it goes through the first defrost cycle make sure that the timer, defrost heaters, termination thermostat and other system component function properly.

OPERATIONAL CHECK-OUT

Only after the system has operated for at least two hours at normal operating conditions without any indications of malfunctions should it be allow to operate overnight on automatic controls. A through recheck of the entire system operation should be made as follows:

1. Check the motor-compressor head and suction pressure. If the pressures are not within the system design limits, determine why and take corrective action.
2. Check the liquid line sight glass and expansion valve operation. If there are indications that more refrigerant is required, leak test all connections and system components and repair any leak before adding refrigerant.
3. Observe the oil level in the motor-compressor crankcase sight glass and add oil as necessary to bring the level in the center of the sight glass.
4. Thermostatic expansion valves must be checked for proper superheat settings. Feeler bulbs must be positive thermal contact with the suction line. Valves with high superheat settings produce little refrigeration and poor oil return. Too little superheat causes low refrigeration capacity and promotes liquid slugging and compressor bearing washout. Liquid refrigerant must be prevented from reaching the crankcase. If proper controls cannot be achieved with the system in normal operation, a suction accumulator must be installed in the suction line just ahead of motor compressor to prevent liquid refrigerant from reaching the motor-compressor.
5. Using suitable instruments, carefully check line voltage and amperage at the compressor terminals. Voltage must be plus or minus 10 percent of that indicated on the compressor nameplate rating. If amperage draw is excessive, immediately determine the cause and take corrective action. On three phase motor-compressor, check to see that a balanced load is drawn by each phase.
6. Check fan motor on air-cooled condensers and in walk-in evaporator coils for correct rotation. Fan motor mounts should be carefully checked for tightness and proper alignment.
7. High pressure controls on condensing units should be set to cut out as follow: The

R-12	R-22 & R-404
225 psig	350 psig

   cut-out point of these controls should be checked by stopping the condenser fan and simultaneously monitoring the head pressures with an accurate gauge.

8. Re-check all safety controls and operating controls for proper operation and adjust if necessary.

9. Check the defrost time clock for initiation, termination and length of defrost period as described below:

The standard defrost timer furnished by Cooltec provides frequency controls including a fail-safe feature that automatically terminates defrost after a set time if the termination thermostat fails to function properly. The standard timer is furnished with a 240 volt clock motor and has a contact rating of 40 amps at 240 volts. Figure 7 shows the timer dial with captive TRIPPERS for easy settings.

A) To set the number of defrost every 24 hours, push down on trippers into the outer dial for desired time of defrost.
B) To set the time of day, rotate dial clockwise until the correct time of day concedes with the arrow on the inner dial.

The time should initially be set for 4 defrost cycles per day. However, each installation should be checked for the system to operated efficiently with a minimum number of defrost cycles. The fail-safe setting should not normally exceed 45 minutes because of danger of overheating the unit if the defrost cycle is prolonged too long.

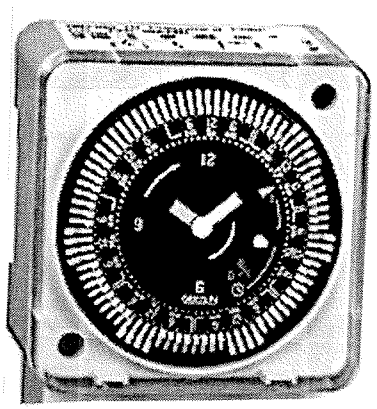

FIGURE 7 - TIMER DIAL

10. Dual pressure controls settings on the condensing unit should be set to cut in and out as follows:

	High	Low	
Fixture Description	Cut Out Psig	In Psig	Out Psig
Walk-In Freezer	350	26	15
Walk-In Cooler	225	28	17

SHUT DOWN

Equipment which will not be required to operate for a period of time should be secured by storing refrigerant charge in the receiver or condenser.

1. Front seat the receiver outlet valve. Set thermostat at a setting below system temperature to insure that liquid line solenoid is energized. Defeat the low pressure control and allow unit to pump down to a suction pressure of approximately 5 psig. It may be necessary to repeat pump-down as some refrigerant will remain in oil and will slowly boil off. When suction pressure holds at 5 psig, front seal suction service valve. Lock disconnect in position.
2. On units with water cooled condensers, special precautions must be taken to completely drain the vessels to prevent freezing if ambient should be below 32 F.
3. Inspect system for possible worn or faulty components and repair if required.

SYSTEM RESTART AFTER SHUT DOWN

1. Through leak test should be performed.
2. Coil(s) should be checked for dirt accumulation or obstruction and cleaned if necessary.
3. Energize crankcase heaters and allow a minimum of 24 hours operation before a compressor restart.
4. Install gauges, start system and check for correct refrigerant charge, and proper system operation and balance.

MAINTENACE

AIR-COOLED CONDENSER

Air-cooled condenser should be cleaned with a brush and vacuum cleaner every four to six months to remove all accumulations of dust, leaves and other debris. Where air-cooled condenser must operate in usually dusty locations, cleaning should be schedule as often as conditions dictate.

WARNING

BE SURE THAT THE MAIN DISCONNECT SWITCH IS IN THE OFF POSITION BEFORE ANY CLEANING OF THE CONDENSERS IS ATTEMPED.

ELECTRICAL AND PIPING CONNECTIONS

All electrical connections should be periodically checked to be sure they are tight. A loose connection contributes to low voltage conditions which can cause motor failure.

Refrigerant connections should be inspected to insure that they have not loosened. Whenever it in necessary to add refrigerant, a careful leak check of all of all refrigerant connections should be made.

CRANKCASE LUBRICATION

As indicated under the operational check-out procedures, the oil level in the motor-compressor crank case should be at the center of the sight glass at all times. If the oil level is low, more oil should be added to bring the level up to the center of the sight glass and the cause of oil migration corrected. Check the expansion valve adjustment and the size of risers and traps.

The quality of the compressor oil can, however be checked rather easily by using an oil sample. Visual examination of the compressor oil can disclose the condition of the system. Acid test is highly recommended to measure the extent of contamination in a system. Dirty, discolored oil properly indicates one of the following:

1. Contaminations such as moisture, air, etc., trapped in the system.
2. Excessive system pressure drop of improper control settings allow motor-compressors to operate at a dangerously low suction pressure. This may cause motor compressor overheating and oil discoloration.

If this situation occurs and oil discoloration is not too dark, the installation of a new liquid line filter-drier may be enough to remove contamination and clear the oil. If the discoloration is severe, the oil should be replaced and a new liquid filter drier installed as many times necessary to eliminate the contamination. After the oil is replaced, the system controls be readjusted.

UNIT COOLER

Unit cooler should be checked at least once a month for proper defrosting to maintain amount and pattern of frosting. It is dependent on the temperature of the room, the type of product being stored, how often new product is brought into the room and the percentage of time the door to the room is open. Also, if the coil is not defrosting completely, check for faulty defrost heaters.
Under normal usage, maintenance should cover the following items at least once every six months.

1. Tighten all electrical connections
2. Tighten fan set screws
3. Clean the coil surface
4. Check the operation of control system
5. Clean the drain pan and check for proper drainage
6. Check the drain line heaters

HEATER REPLACEMENT IN LOW TEMP UNIT COOLER

1. Make sure the electrical power to the heaters is turned off.
2. Disconnect heater leads on both ends of the heater to be removed.
3. Remove the sheet metal screws holding the heater retainer to the heater plate on the electrical connection end the unit.
4. Pull heater(s) to be replaced out of the tube holes in the coil. It is necessary to lower the drain pan to remove the bottom heater.
5. Replacement coil heaters are received coiled in a two foot diameter. Before inserting the heater in the coil, uncoil about one foot of the straight end to make it easier to insert the heater into the tube hole.
6. Insert the end of the heater into the tube hole and uncoil it while pushing it through coil.
7. Attach tube clamp and retaining bracket to new heater just before rubber boot. Push heater in until bracket meets the heater plate. Fasten bracket to the header plate to prevent heater "creep".
8. Reconnect the heater leads as shown on the wiring diagram.

SERVICE DIAGNOSIS – CONDENSING UNITS

SYMPTOM	CAUSE	REMEDY
A. Compressor does not run	1. Motor Line open 2. Fuse blown 3. Tripped overload 4. Control contacts dirty or Jammed in open position 5. Piston seized 6. Frozen compressor or motor bearings 7. Control in off position because of cold location 8. Defective starting component (single phase compressor only)	1. Close start or disconnect switch 2. Replace fuse 3. See part C 4. Repair or replace 5. Remove motor compressor head. Look for broken valve and jammed parts 6. Repair or replace 7. Use thermostatic control or move control to warmer location 8. Locate and replace
B. Unit short cycles	1. Control differential set too closely 2. Discharge valve leaking 3. Motor-compressor overload 4. Refrigerant shortage 5. Refrigerant overcharge 6. Cycling on high pressure	1. Widen differential 2. Correct condition 3. Check for high head pressure, tight bearing, seized, pistons, clogged air cool condenser. 4. Repair leak and recharge 5. Purge 6. Check water supply, dirty condenser or defective fan
C. Compressor will not start hums intermittently (cycling on overhead).	1. Improperly wired 2. Low line voltage 3. Relay contacts not closing 4. Open circuit in starting winding 5. Stator winding grounded 6. High discharge pressure 7. Tight compressor	1. Check wiring against diagram 2. Check main line voltage and determine location of voltage and drops 3. Check by operating manually 4. Check stator leads, if leads are OK, replace stator 5. Check stator leads, if leads are OK, replace stator 6. Eliminate cause of excessive pressure. Make sure discharge shut-off valve is open. 7. Check oil level; correct binding

D. Unit operates log or continuously	1. Refrigerant shortage 2. Control contacts sticking closed position 3. Dirty condenser 4. Air in system 5. Compressor inefficient 6. Improper wiring	1. Repair leak and recharge 2. Clean points or replace control 3. Clean condenser 4. Purge 5. Check valves and piston 6. Check wiring and correct it if necessary
E. Unit operates long or continuously	1. Refrigerant shortage 2. Control set too high 3. Control wiring loose 4. Expansion valve or strainer plugged 5. Compressor inefficient 6. Expansion valve set too high 7. Iced or dirty coil 8. Unit too small 9. Clogged or small gas lines 10. Oil logged system	1. Repair leak and recharged 2. Reset control 3. Check wiring control 4. Clean and replace 5. Check valves and piston 6. Lower setting 7. Defrost or clean 8. Add unit replace 9. Clear clogging or increase line size 10. Remove excess oil, check refrigerant. Charge
F. Head pressure too high	1. Refrigerant overcharge 2. Air in system 3. Dirty air-cooled condenser 4. Insufficient water supply 5. Re-circulating cooling air 6. High side restriction 7. Head pressure control valve set wrong.	1. Purge 2. Purge 3. Clean area around air cooled condenser and inspect for airbome dirt source. 4. Check water valves and inspect cooler 5. Seal off unit from other machines and provide intake isolated from air outlet. 6. Remove blockage 7. Readjust
G. Head pressure too low	1. Refrigerant shortage 2. Compressor suction or discharge valves 3. Cold ambient or cold water	1. Repair leak and recharge 2. Clean or replace leaky valve plates 3. No remedy, as efficiency is generally increased. However, if condensing temperature is below 85 F expansion valve will

	4. Head pressure control valve	not be able to feed properly and some form of head pressure control must be provided. 4. Readjust or install a head pressure control valve.
H. Noisy Unit	1. Insufficient compressor oil 2. Tubing rattle 3. Mounting loose 4. Oil slugging or refrigerant flood back 5. Unbalanced fan or defective fan motor	1. Repair leak and recharge 2. bend tubes away from contact 3. Tighten 4. Adjust oil level or refrigerant change. Check expansion valve for leak or oversized orifice. 5. Replace bent or broken fan blades. Check motor bearings.
I. Compressor loses oil	1. Short of refrigerant 2. Gas-oil ratio low 3. Plugged expansion valve or strainer 4. Oil trapping in lines 5. Short cycling 6. Superheat too high at compressor suction	1. Repair leak and recharge 2. Add 1 pt. oil for each 10lbs. of refrigerant added to factory charge 3. Clean or replace 4. Drain tubing toward compressor 5. Refer to part B 6. Change location of expansion valve bulb or adjust valve to return wet gas to compressor.
J. Frosted or sweating suction line	1. Expansion valve admitting excess refrigerant	1. Adjust expansion valve
K. Hot liquid line	1. Shortage of refrigerant 2. Expansion valve open too wide	1. Repair leak and recharge 2. Adjust expansion valve
L. Frosted liquid line	1. Receiver shut-off valve partially closed or restricted 2. Clogged dehydrator	1. Open valve or remove 2. Replace clogged part
M. Unit on vacuum	1. Ice plugging expansion	1. Apply hot wet cloth to expansion valve. If suction pressure now increase, there is moisture in the system and a

	2. Plugged expansion valve	dryer should be installed in the line 2. Clean strainer or replace expansion valve
N. Compressor will not unload or load up	1. Defective capacity control 2. Unloader mechanism defective 3. Faulty thermostat stage or broken capillary tube 4. Stages not safe	1. Replace 2. Replace 3. Replace 4. Replace
O. Compressor loading-unloading intervals too short	1. Erratic water thermostat 2. Insufficient water flow	1. Replace 2. Adjust gpm
P. Little or no oil pressure	1. Clogged suction oil strainer 2. Excessive liquid in crankcase 3. Oil pressure gauge defective 4. Low oil pressure safety switch defective 5. Worn oil pump 6. Oil pump reversing gear stuck in wrong position 7. Worn bearing 8. Low oil level 9. Loose fitting on oil lines 10. Pump housing gasket leaks 11. Flooding of refrigerant into crankcase	1. Clean 2. Check crankcase heater. Reset expansion valve for higher superheat. Check liquid line solenoid valve operation. 3. Repair or replace. Keep valve closed except when taking reading 4. Replace 5. Replace 6. Reverse direction of compressor rotation 7. Replace compressor 8. Add oil 9. Check and tighten system 10. Replace gasket 11. Adjust thermal expansion valve
Q. Motor overload relays or circuit breaker open	1. Low voltage during high load conditions 2. defective or grounded wiring in motor or power circuits 3. Loose power wiring 4. High condensing temperature	1. Check supply voltage for excessive line drop 2. Replace compressor motor 3. Check all connection and tighten 4. See corrective steps for high discharge pressure 5. Check supply voltage. Notify

	5. Power line fault causing unbalance voltage 6. High ambient temperature around the overload relay 7. Failure of second starter to pull in on part winding system	power company. Do not start until fault is corrected. 6. Provide ventilation to reduce heat. 7. Repair or replace starter or time delay mechanism
R. Compressor thermal protector switch open	1. Operating beyond design conditions 2. Discharge valve partially shut 3. Blown valve gasket	1. Add facilities so that conditions are within allowance limits 2. Open valve 3. Replace gasket
S. Freeze protection opens	1. Thermostat set too low 2. Low water flow 3. Low suction pressure	1. Reset to 40 F or above 2. Adjust gpm 3. See "Low Suction Pressure"

COOLTEC

STANDARD WARRANTY

Cooltec Refrigeration Corp. warrants to the extend of the purchase price that the new product of its manufacturer are, when originally sold, free of defects in materials and factory workmanship if properly installed, cared for, and operated, under normal conditions, with competent supervision. Cooltec Refrigeration Corp. obligations under this warranty shall be fully discharge discharged by a correction of such defects in any parts which within one year of shipment of the products to the original purchase, shall be returned in sealed containers, tagged as to serial and model numbers, with transportation charges prepaid, to the factory or service location designated by Cooltec Refrigeration Corp. Cooltec Refrigeration Corp. shall not be liable for any loss, damage, or expense, directly or indirectly arising from defects in its products, the use of its products, or any other cause. Cooltec Refrigeration Corp. does not assume responsibility for any expenses (including labor and travel expenses) incurred in the filed incidental to the repair or replacement of its products.

This warranty is extended only to the original purchaser and shall not apply to any other products which must be replaced because of normal wear, which have been the subject to misuse, negligence, or accident, or which have been repaired or altered by persons other than those authorized by Cooltec Refrigeration Corp. to service its products, or any other product on which a serial number has been altered or removed. This warranty does not apply to any motor, switches, controls accessories, or other parts, manufactured by others and purchased by Cooltec Refrigeration Corp. unless the manufacturer warranties the same to Cooltec Refrigeration Corp and then only to the extent of such manufacturer's warranty to Cooltec Refrigeration Corp.

The decision of Cooltec Refrigeration Corp. service department as to whether a defect is within the terms of this warranty shall be final.

This warranty supersedes and is in lieu of all other warranties, expressed or implied, and no representative, dealer, distributor, or any other liability not strictly in accordance with this policy (except to the extent that such further warranty is made in writing and signed by an official Cooltec Refrigeration Corp. for additional consideration in accordance with an established policy for such further warranties).

Cooltec Refrigeration Corp. failure to object to provisions contained in a customer's purchase order or other communication shall not be deemed a waiver of the terms of conditions herof or acceptance of such provisions.

Cooltec Refrigeration Corp. whose policy is one of continued improvement and progress, reverses the right to chance design, color, specifications and quotations without notice or incurring obligations.

COOLTEC REFRIGERATION CORP.
1280 E. NINTH STREET, POMONA, CA 91766 ❄ T: 909-865-2229 ❄ F: 909-868-0777
e-mail: sales@cooltec-online.com

COOLTEC

COOLTEC HEREINAFTER REFERRED TO AS SELLER

FOUR-YEAR EXTENDED COMPRESSOR WARRANTY

Compressor Serial No._____ Condensing Unit Model No._____

The compressor manufacturer provides a standard one-year warranty on the compressor denoted above. COOLTEC ("Seller" hereby assigns to the original purchaser-user any rights which Seller may have hereunder.

THE SELLER DISCLAIMS ALL WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE.

FIVE-YEAR MAINTENACE CONTRACT (OPTIONAL AT EXTRA COST) - The original purchaser-user is protected during the first year following receipt of the compressor by the manufacturer's warranty referred to above and during this period Seller shall have no responsibility hereunder. If the compressor should prove defective during years two through five, Seller agrees to repair or replace any part or parts that prove defective, and which Seller examination discloses to its satisfaction to be thus defective, with a new or rebuilt part.

The one year warranty and five-year maintenance agreement shall not apply to or cover the following:

1. Any motor compressor or any part thereof which has been subject to accident, alteration, negligence, misuse or abuse, operation on low or improper voltage, or which has not been operated in accordance with the manufactures recommendation, or if the serial number of the unit has been altered, defaced, or removed.
2. Damages caused by fire, flood, or other Act of God.
3. Products used outside the continental United States.
4. Labor costs for replacement of parts, or for freight, shipping expenses, sales tax, or upgrading.
5. Products damaged by improper installation.

Purchaser's sole remedy for the Seller's negligence, breach of any warranty, including, if applicable, any implied warranty in tort, and for any other breach of any contractual or tort obligation or duty is repair or replacement of defective parts by the Seller subject to the terms and conditions stated above, or, in the event the Seller fails to repair or replace within a reasonable time, refund of the purchase price by the Seller. Seller shall not be liable under any circumstances for any consequential damages, including loss of profit, additional labor costs, loss of refrigerant of food products, or injury to personnel or property caused by defective material or parts or for any delay in its performance hereunder due to causes beyond its control. The forgoing shall constitute the sole and exclusive remedy of any purchaser and the sole and exclusive liability of Seller in connection with this product.

MAIL CLAIMS TO:

COOLTEC REFRIGERATION CORP.

1280 E. NINTH STREET, POMONA, CA 91766 ❄ T: 909-865-2229 ❄ F: 909-868-0777

e-mail: sales@cooltec-online.com

COOLTEC

SERVICE RECORD

A permanent data sheet should be prepared on each installation contractor's files. If another form is to handle service and installation, with a copy for the owner and the original for the maintenance, additional copies should be prepared as necessary.

System Reference Data
The following information should be filled out and signed by Refrigeration Installation Contractor.

Date System Installed: _____
Installer and Address: _____
_____
_____

Condensing Unit Unit Model #: _____
Unit Serial #: _____

Compressor Model #: _____ Compressor Model #: _____
Compressor Serial #: _____ Compressor Serial #: _____
Electrical _____ Volts _____ Phase _____
Voltage at Compressor L1_____ L2_____ L3_____
Amperage at Compressor L1_____ L2_____ L3_____

Evaporator(s) Quantity _____
Evaporator Model #: _____ Evaporator Model #: _____
Evaporator Serial #: _____ Evaporator Serial #: _____
Electrical _____ Volts _____ Phase _____
Expansion Valve Manufacturer/Model _____
Ambient at Start-Up _____ F
Design Box Temperature _____ F _____ F
Operating Box Temperature _____ F _____ F
Thermostat Setting _____ F _____ F
Defrost Setting _____/ day _____minutes fail-safe _____/ day _____minutes fail-safe
Compressor Discharge Pressure _____ F _____ F
Compressor Suction Pressure _____ F _____ F
Suction Line Temperature @ Comp. _____ F _____ F
Discharge Line Temperature @ Comp. _____ F _____ F
Superheat at Compressor _____ F _____ F
Suction Line Temperature @ Evaporator _____ F _____ F
Superheat at Evaporator _____ F _____ F
Evacuation: # times _____ Final Micron _____ # times _____ Final Micron _____
Evaporator Drain Line Trapped Outside of Box: yes _____ no _____

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