

InteleCool 2 50/60 Hz Parts Manual Rev. 5/99

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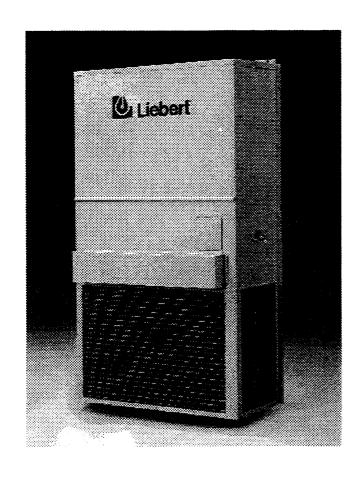
ENVIRONMENTAL CONTROL

Liebert

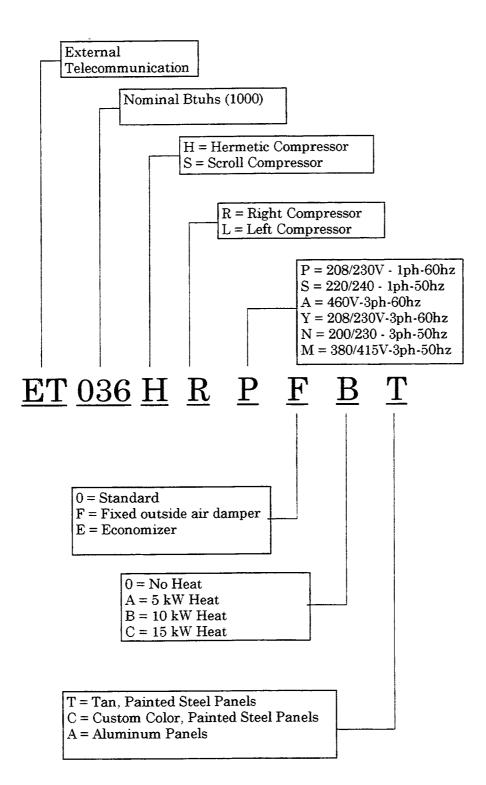
InteleCool®2

1.5 - 5 Tons 50 & 60 Hz

USER MANUAL



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Liebert InteleCool2 Users Manual

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SECTION 1 INTRODUCTION

1.1 GENERAL

The Liebert InteleCool2 Environmental Control System was designed for convenience and dependability in unmanned and remote locations typical of the telecommunications industry. Ease of installation, operation and service coupled with the use of high quality, high reliability components make InteleCool2 ideally suited for maintaining an environment for sensitive electronic equipment.

1.1.1 Self Contained

The InteleCool2 product is completely self contained. All components are enclosed in the weatherproof cabinet.

1.1.2 Space Savings

The InteleCool2 does not use any of the valuable floor space inside the secure space. Instead, it is mounted on the outside wall. No additional space is required outside or on a roof.

1.1.3 Easy to Install

The InteleCool2 is assembled, wired, piped, charged with refrigerant, and fully factory tested as a system, to ensure trouble free installation and start-up.

1.2 STANDARD FEATURES

1.2.1 Reciprocating Hermetic Compressor

The heart of the refrigeration system is a reciprocating hermetic compressor. The compressor features a suction gas cooled motor, internal centrifugal oil pump, vibration isolating mountings, internal thermal overloads, and crankcase heater.

1.2.2 Refrigeration System

The refrigeration circuit includes a liquid line filter drier, an externally equalized expansion valve, and a high-pressure switch.

1.2.3 Evaporator Coil

The evaporator coil is constructed of mechanically expanded copper tubes in enhanced surface aluminum fins. A coated, galvanized, steel condensate drain pan is provided.

1.2.4 Condenser Coil

The air-cooled condenser coil is constructed of mechanically expanded copper tubes in enhanced surface aluminum fins.

Components rated for up to 115°F (46°C) ambient.

1.2.5 Evaporator Blower

Evaporator air is supplied by a direct drive blower package. Fans are centrifugal, double width, double inlet.

1.2.6 Filter

The filter is 2 inches deep, pleated, with a minimum efficiency rating of 20% (based on ASHRAE standard 52.1). Located within the cabinet, the filter is serviceable from the front of the unit.

1.2.7 Cabinet

The exterior cabinet is constructed of painted steel. Internal structural parts (including base) are hot dipped galvanized steel. The evaporator compartment is insulated with ½" thick, 2 lb. density, neoprene faced, fiberglass insulation.

1.2.8 Control Interface

The unit is supplied with customary HVAC wiring designations (R, G, W, Y) inside the low voltage partition of the unit electric box. The control interface can be provided by sources ranging from a wall mounted thermostat, a Liebert control and monitoring system, or a third party building management control.

1.3 OPTIONAL FEATURES

1.3.1 Scroll Compressor

An optional, quiet, efficient scroll compressor is available. The compressor features a suction gas cooled motor, internal centrifugal oil pump, vibration isolating mountings, and internal thermal overloads.

1.3.2 Compressor Location

The standard compressor location is on the right when viewing the unit when it is mounted on the wall. The optional compressor location is on the left, to improve serviceability of the compressor when the unit is installed as one unit of a "pair".

1.3.3 Compressor Crankcase Heater

An optional compressor crankcase heater is available for use with the scroll compressor but is not required because the InteleCool2 unit with scroll compressor refrigerant charge is less than the compressor critical charge.

1.3.4 Refrigeration System Options

1.3.4.1 Low Pressure Switch and Low Pressure Bypass Timer

This option includes a low-pressure switch and a time delay relay for bypass of the lowpressure switch at start-up.

Low Pressure Switch: Used to protect the InteleCool2 if the evaporator blower fails, the air filter becomes clogged, the refrigeration circuit malfunctions or if there is loss of refrigerant. The low-pressure switch is activated when the suction pressure drops below its cutout setting. When activated, the low-pressure switch will inhibit operation of the compressor and condenser fan. The switch will automatically reset once the system pressure rises above its cut-in setting.

Low Pressure Bypass Timer: Condenser Low Ambient Control (also known as Winter Start Option) – To start the system during low outdoor temperatures, the low ambient start timer bypasses the low-pressure switch. A few minutes after start-up the low pressure switch resumes normal operation. This option can be used for applications down to 50°F (10°C), for control down to -20°F (-28.9°C) use the T-pack1 or T-pack2.

1.3.4.2 T-pack1

Includes a low pressure switch, low pressure bypass, and fan cycle control. (See 1.3.4.1 for low pressure switch and low pressure bypass timer descriptions.)

Fan Cycle Control: Condenser Fan Cycling Control – Consists of a reverse acting pressure switch. During low outdoor temperatures the pressure switch cycles the condenser fan to maintain discharge pressures that will allow the systems to function. To be used when the outdoor ambient is lower than 50°F (10°C), down to -20°F (-28.9°C).

1.3.4.3 T-pack2

Includes a low pressure switch, low pressure bypass, and adjustable fan cycle control. (See 1.3.4.1for low pressure switch and low pressure bypass descriptions.)

Adjustable Fan cycle Control: Provides the same features and control as the fan cycle control used in the T-pack1, except that it is adjustable.

1.3.5 High Ambient Condenser Option This option is provided for applications where the ambient temperature exceeds the normal design capabilities of the units. It consists of a condenser motor and fan blades which are sized to provide additional airflow across the condenser coil for these

applications. Designed for applications up to 125°F (51°C) ambient.

1.3.6 Heat

Heat is provided in a single stage from an open wire electric resistance element. Heating capacity options available are 5 kW, 10 kW, and 15 kW depending on unit model size.

1.3.7 Economizer

The economizer allows outside air to be introduced to the space through the evaporator filter when conditions are favorable for economizer cooling. It contains a modulating damper, spring return direct drive actuator, enthalpy control for switch-over, outside air hood, and a mixed air controller set at 55°F (12.8°C). Mechanical cooling and economizer operation do not operate simultaneously.

1.3.8 Fresh Air Damper

Allows outside air to be brought in to meet indoor air requirements. Air is drawn in through the evaporator filter. The amount of air to be introduced to the space is field selectable.

1.3.9 Optional Paint Colors

Optional color choices for the steel panels are almond (light tan, color option for original InteleCool2), terracotta (brick red), or glacier white.

1.3.10 Lockout Relay

The lockout relay latches the detection of a high-pressure condition in the refrigeration circuit and prohibits operation of the compressor until the abnormal pressure conditions are acknowledged. The lockout relay is reset by cycling the unit main power or by changing the setpoint on the thermostat to temporarily eliminate a call for cooling. A normally open set of contacts is provided to terminals 2 and 3 of the customer terminal strip for monitoring the status of the lock out relay when this option is supplied without the Common alarm option.

1.3.11 Common Alarm

The common alarm provides the necessary components to detect a high pressure, low pressure, high temperature, or loss of indoor airflow, to provide a customer signal via a contact closure. (To detect low pressure: the optional low pressure switch with bypass; T-pack1; or T-pack2; must also be selected.

1.3.12 Soft Start

Provides a PTC resistor to assist the start of the compressor motor in low voltage operation. Only available on single phase units.

1.4 ANCILLARY COMPONENTS

1.4.1 Wall Mounted Thermostat

The thermostat provides for heating/cooling application with separate fan control. Supplied with a thermostat sub-base.

1.4.2 Indoor Supply/Return Grills

The supply grill is an aluminum louvered, double deflection type grill allowing user adjustment of direction of air distribution. The return grill is an aluminum louvered, fixed, single deflection style grill.

1.4.3 Additional Spare Filters

Additional sets of the 20% efficiency rated filters (Efficiency based on ASHRAE standard 52.1) may be selected.

ACCESSORIES

1.4.4 Dual Unit Control

The hinged cover dual unit control (DUC) has a 2-stage heat/cool thermostat with individual heat/cool setpoints, adjustable interstage differentials, and bimetallic elements. The control features a solid state timer with 1-2-4-8 day sequence. Unit lead selector, Unit 1 & 2 power-on LED's, Unit 1 or 2 lead unit LED's, 48 hour program save on loss of power, industry standard connections, and 24 volt power from each unit. The DUC provides auto sequencing and displays on-status and operating status parameters.

1.4.5 Tele2 Control

This microprocessor-based controller controls two InteleCool2 units. It has a 10 key keypad, 4 row by 20 column LCD display, allows up to eight customer selectable isolated normally open dry contact alarm inputs, an RS-232 modem port, and an RS-232 terminal port. Requires a THS28-30 or THS28-60 sensor assembly and 120/50-60/1 VAC, 230/50-60/1 VAC or 48 VDC power.

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SECTION 2 INSTALLATION

2.1 PRE-INSTALLATION CONSIDERATIONS

2.1.1 Room Preparation

The room should be well insulated and should be sealed to reduce airborne contaminants from penetrating the site.

Outside air may be introduced through the damper option or be used for economized cooling by using the economizer option. However, uncontrolled outside air should be kept to a minimum. Outside air adds to the cooling, heating, and filtration loads of the site. Doors should be properly sealed to minimize leaks and should not contain grilles.

2.1.2 Location Considerations

The InteleCool2 unit is field mounted on an outside wall. Additional framing in the wall may be required to ensure adequate structural support

The outdoor area near the condenser supply and discharge must also be considered. To assure adequate air supply, the unit should be mounted in a clean area, away from loose dirt and foreign matter that may clog the condenser coil. Unit should not be located near steam, hot air, or fume exhausts. Also, the unit should not be mounted closer than 12 feet (3.7 meters) from an opposing wall, obstruction, or unit. For service clearance, provide 36 inches (914mm) in front of the unit, and 30 inches (762mm) on each side. When mounting multiple units side by side, provide a minimum of 36 inches (914 mm) between adjacent units, unless both units will not be run at the same time. In that case, the units could be placed as close as 18 inches (457 mm) apart. This will make the units more difficult to service. (See and consider the compressor location option for improved serviceability.) Before mounting units check local codes for applicable clearances.

2.1.3 Equipment Inspection

Upon arrival of the unit, inspect all items for visible damage. Concealed damage may be discovered later during installation. Report damage to the shipper immediately and file a damage claim. Also inform your Liebert supplier.

2.2 UNIT INSTALLATION

The InteleCool2 unit is installed against, and through, an outside wall. Two (2) openings in the wall are required for the evaporator supply and return. Install unit in a level position to assure proper refrigerant flow, oil return, and condensate drain. To install the unit, follow the instructions below.

- 1. Verify that an adequate structural support is provided for the unit.
- 2. Using a chalk line, mark the outside wall with a level horizontal line, where the bottom of the unit is to rest.
- 3. Prepare supply and return openings in an outside wall. Measure up from the base chalk line.
- 4. Prepare mounting holes. The mounting holes may be pilot holes for lag screws or clearance holes for bolts that will extend completely through the wall. Refer to Figure 2 for the location of these holes.
- 5. Screw / Bolt unit mounting base angle to the outside wall with six 5/16" bolts/lag screws (not supplied), just below chalk line and centered on the opening in the wall.

WARNING!

Use caution and adequate equipment to safely handle unit. Weight of each unit ranges from 330 to 490 pounds (150 to 222 kg), depending on model.

- 6. With the unit front panel removed, lift the unit onto the base angle, making certain that the rear unit angle falls behind the turned up front edge of the mounting angle. Insert top and side unit fasteners in holes and tighten, drawing the unit into place. (DO NOT INSTALL DUCT PRIOR TO INSERTING UNIT.)
- 7. Caulk and flash top and sides as required to form a watertight seal. Top flashing (not factory supplied) is recommended to ensure water does not run behind unit. All unit tops are sloped to allow water to run off.

2.2.1 Piping Connections

The InteleCool2 is a self-contained, packaged unit. All refrigerant piping connections are made at the factory, so no external condenser is required. The evaporator coil condensate drain is factory supplied and drains outdoors through the unit base pan. The condensate drain tubing should be checked to be certain that it is placed through the hole provided in the base pan.

2.2.2 Ducting

Field supplied ducting can be attached to the unit duct connection once the unit has been mounted to the outside wall. The total external static pressure for the duct, including grille, must not exceed the values shown in Tables 4 and 5. Indoor discharge air rates are given in Tables 4 and 5.

2.2.3 Electrical Connections

WARNING!

Use volt meter to make sure power is turned off before making any electrical connections

CAUTION!

Refer to electrical schematic when making connections.

Each unit is shipped from the factory with all internal wiring completed. Refer to electrical schematic when making connections. Electrical connections to be made at the installation site are:

Line voltage power supply to the power input.

Control wiring to remote control (customer supplied or Liebert option). NOT TO BE RUN WITH HIGH VOLTAGE.

2.2.4 Power Connections

All power and control wiring and ground connections must be in accordance with the National Electrical Code and local codes

Use copper wiring only. Make sure that all connections are tight.

Make sure that the voltage supplied agrees with the voltage specified on the unit nameplate. The InteleCool2 comes standard with a factory installed circuit breaker, accessible through an external access panel. An external, wall-mounted power disconnect switch (field supplied) may be required for local codes. If necessary, this switch should be wired according to those codes.

For access to the electrical enclosure:

 Remove the screws securing the middle panel and pull the panel down and forward to remove. Remove the screws securing the electric box cover and remove cover.

Route the supply power to the customer supplied disconnect switch (if required) and then to the unit circuit breaker inside the unit. Route the conduit to the hole provided in the cabinet. Connect earth ground to lug provided near circuit breaker. Refer to unit wiring diagram supplied on the inside of the electrical enclosure cover.

CAUTION!

The optional three-phase scroll compressor must rotate in the correct direction to ensure proper system operation. Wiring must be phased and connected as shown:

PHASE "A" to T1 or L1 PHASE "B" to T2 or L2 PHASE "C" to T3 or L3

2.2.5 Control Connections

Control wiring will be required for the remote control device. This remote device may be a factory/field supplied wall thermostat or similar device. Connections to the unit are made using customary HVAC wiring terminals R, G, W, & Y.

2.2.6 Outside Air Damper (Optional)

Units supplied with fixed (non-modulating) outdoor air damper can be adjusted as follows:

- 1. Remove the screws from the middle panel and remove panel.
- 2. Loosen the damper plate screws on the backside of the middle panel.
- 3. Adjust the damper plate to the desired position and tighten damper plate screws.
- 4. Replace panels.

2.2.7 Economizer (Optional)

Installation

To install the economizer hood, insert the top flanged edge into the economizer opening on the unit front panel. Next, attach bottom left and right corner of the hood with supplied screws.

Adjustment

Unit supplied with Economizer requiring outside air can be adjusted as follows:

- Run motor to fully closed position and disconnect 24 VAC from terminals TR and TR1.
- 2. Connect minimum position potentiometer to terminals P and P1. (T and T1 are disconnected.) (See Figure 1).
- Reconnect 24 VAC to terminals TR and TR1 and adjust potentiometer for desired minimum position by turning Q709 adjustment screw clockwise to increase minimum position; counterclockwise to decrease minimum position.

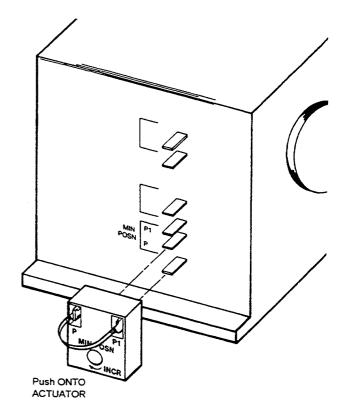


Figure 1. Mounting Minimum Position
Potentiometer on Actuator

2.3 CHECKLIST FOR COMPLETED INSTALLATION

- 1. Proper clearance for service access has been maintained.
- 2. Equipment is level and mounting fasteners are tight.
- 3. Ducting completed, if required.
- 4. Line voltage to power wiring matches equipment nameplate.
- 5. Power wiring connections completed to disconnect switches, including earth ground. Proper phase rotation has been observed so that scroll compressor will rotate in the correct direction.
- 6. Power line circuit breakers or fuses have proper ratings for equipment installed.
- 7. Control wiring connections completed to optional controls.
- 8. All wiring connections are tight.
- 9. Foreign materials have been removed from in and around all equipment installed (shipping materials, construction materials, tools, etc.).
- 10. Fans and blowers rotate freely without unusual noise.

WARNING!

Potentially lethal voltages exist within this equipment during operation. Observe all cautions and warnings in this manual. Failure to do so could result in serious injury or death. Only qualified service and maintenance personnel should work with this equipment.

2.4 START-UP PROCEDURE

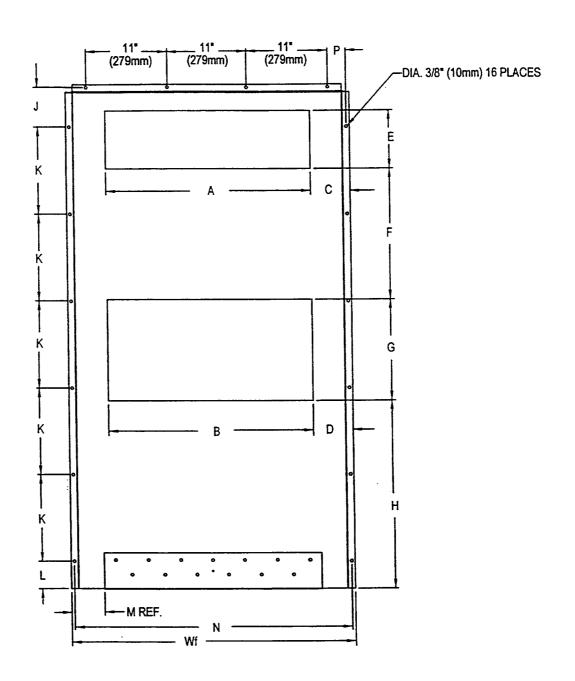
Verify that installation is complete by using the Checklist for Completed Installation.

- 1. Disconnect all power to the InteleCool2 unit.
- 2. Adjust remote control to prevent compressor, heat and fan operation.
- 3. Turn on main breaker and check line voltage on main unit disconnect switch. Line voltage must be within +/- 10 volts of nameplate voltage.
- 4. Turn ON main unit disconnect switch and check secondary voltage at transformer T1. Voltage at T1 must be 24 +/- 2.5 VAC.
- 5. From the remote control, verify proper operation in all modes.
- 6. Make sure all blowers, fans, and the scroll compressor are rotating in the correct direction.
- 7. Check the current draw on all line voltage components and compare with unit nameplate.
- 8. Check adjustment of the optional outside air damper for the desired balance between the flow of room air and outdoor air. Use a gauge or non-polluting airflow indicator.

NOTE

If Unit is supplied with crank case heaters, it is recommended the high voltage be applied 4-6 hrs. prior to startup.

DO NOT ATTACH DUCT PRIOR TO INSTALLING UNIT



						DIM	ENSI	ONAL	DATA	IN. (n	nm)				
MODEL	Wf	A	В	C	D	E	F	G	H	J	K	L	M	N	P
1.5/2 Ton	38 3/4	20	20	9 3/8	9 13/32	8	20 3/4	12	25 1/16	5 15/32	12	3 25/32	4 1/2	37 7/8	2 15/32
InteleCool2	(984)	(508)	(508)	(238)	(239)	(203)	(527)	(305)	(638)	(139)	(305)	(96)	(114)	(962)	(63)
3 Ton	38 3/4	28	28	5 3/8	5 3/8	8	18	14	26	5 15/32	12	3 25/32	4 1/2	37 7/8	2 15/32
InteleCool2	(984)	(711)	(711)	(137)	(137)	(203)	(457)	(356)	(660)	(139)	(305)	(96)	(114)	(962)	(63)
4/5 Ton	42 3/4	30 1/4	29 7/8	6 1/4	6 7/16	9 7/8	30	15 7/8	25 25/64	1 45/64	16	61/64	6 1/2	41 3/4	4 3/8
InteleCool2	(1086)	(768)	(759)	(159)	(164)	(251)	(762)	(403)	(645)	(43)	(406)	(24)	(165)	(1060)	(111)

Figure 2. Unit Mounting Instructions

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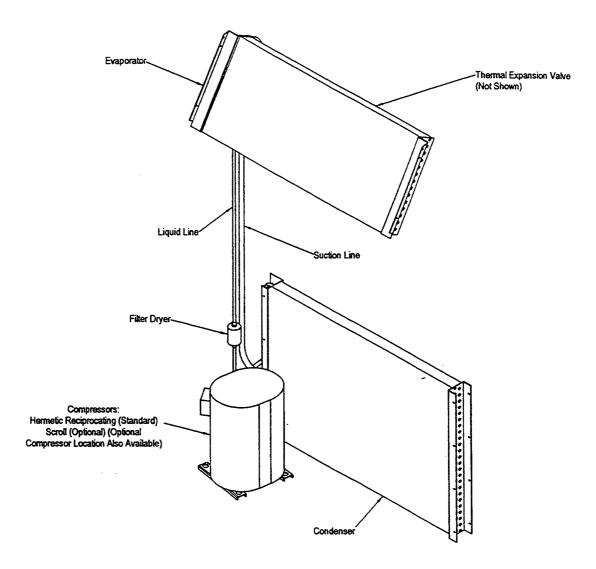
SECTION 3 SYSTEM COMPONENTS

3.1 COMPRESSORIZED COOLING

Compressorized cooling is provided by a high efficiency system consisting of a hermetic, reciprocating compressor, thermostatic expansion valve, evaporator, and condenser coil. An optional scroll compressor can be ordered for reliable, quiet, and smooth operation at a high EER value (Energy Efficiency Rating).

The InteleCool2 uses R-22 refrigerant in a conventional vapor-compression refrigeration cycle. Heat is removed from the air in the space

by blowing it across the evaporator coil. As heat is transferred to the refrigerant in the evaporator it boils and turns to a warm vapor. The refrigerant vapor enters the compressor and is compressed resulting in high pressure and temperature. After entering the condenser, the hot vapor is condensed to a liquid by the air blown across the condenser coil. Liquid refrigerant then passes through the thermal expansion valve and into the evaporator. The expansion reduces the pressure and temperature to complete the cycle.



*NOTE: SYSTEM IS FACTORY PIPED AND CHARGED.

Figure 3. Refrigeration System

3.2 ECONOMIZER COOLING (Optional)

The Economizer mode uses outside air to cool the room when the outside air temperature is cool enough to allow for economical cooling. Components include the damper, spring return direct drive actuator, enthalpy sensor, and actuator control board with integral mixed air sensor.

Economizer operation is enabled when the outside conditions meet the required temperature and humidity as set on the enthalpy sensor. If outdoor conditions are favorable on a call for cooling, the damper actuator will open the economizer damper. The damper position will be controlled based on the mixed air temperature in the evaporator section. The factory set mixed air temperature target is 50-56°F (10-13°C)

The amount of damper opening depends on the cooling capacity of the outside air; the cooler the outside air, the less that is needed to cool the room, and so a smaller damper opening is required. As the outside air temperature rises, the damper will open wider since more of that air is required to keep the room at the same temperature.

The economizer and compressorized cooling will never operate at the same time. If outdoor conditions meet the required enthalpy sensor

setpoint during a cooling cycle, the unit will automatically shut down the compressor and begin using outside air.

3.2.1 Enthalpy Sensor

The enthalpy sensor responds to the total heat content of the outdoor air to provide changeover from compressorized cooling to free cooling operation. The changeover point is factory set (at the 'D' position). This setting will ensure rated capacity when the outdoor conditions allow for economizer cooling.

3.2.2 Actuator

The economizer actuator is mounted in the lower part of the economizer selection below the electric box. It is accessible by opening the lower front panel.

The actuator is a 24 VAC, spring return device that will fully close the economizer damper.

The actuator has internal controls that allow it to operate based on signals from the enthalpy control and mixed air sensor.

3.3 HEATING (Optional)

On units supplied with optional resistance heating, a call for heating closes the heat relay and energizes the evaporator fan and resistive elements.

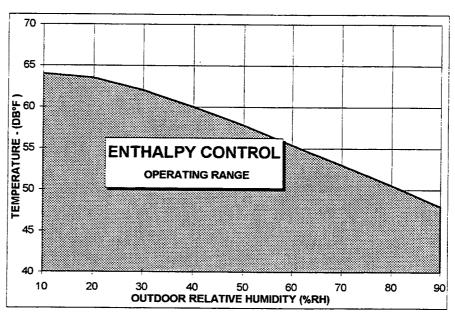


Figure 4. Enthalpy Control Setting

3.4 UNIT CONTROLS

3.4.1 Remote Control Interface

Control connections to the InteleCool2 unit use customary HVAC terminal designations R, G, W, & Y. Contact closures between the 24 VAC (R) and different control connections supply control voltage to the electric panel components responsible for the desired function. Operating modes are controlled by contact closures as follows:

Table 1: Operating Modes/Contact Closures

CONNECTION	OPERATING MODE
R	24 VAC
G	Evaporator Fan
W	Heating
Y	Cooling (compressorized or economizer)

Wall mounted thermostats are to be low voltage, snap action or mercury type. Unmanned sites should use a HEAT/COOL/AUTO type subbase to provide automatic switchover during climate changes.

3.4.2 High Pressure (Standard)

The high pressure switch is mounted in the liquid line. Electrically it is connected in series with the compressor start circuit, which will shut down the compressor and condenser fan if the liquid pressure exceeds 400 PSIG (2758 kPa). This protects the InteleCool2 in the event of condenser motor failure or condenser coil blockage.

The pressure switch is an auto reset device. When the system pressure drops below 300 PSIG (2069 kPa), the switch will reset. (An optional lockout relay is available which allows the switch to be used as a manual reset safety.) If the call for cooling is present, the compressor start circuit will be energized and the compressor will start after the 3 minute anti-short cycle time.

3.4.3 Refrigeration Controls (Optional)

While we have given several options for various applications please see Table 2, for the recommended control options based on the site ambient and year round operation.

Table 2: Recommended Applications for Control Options

✓ Ideal for telecom & 365 days of operation	Unit	Options	Min Ambient	Max Ambient
	Standard	none	50°F (10°C)	115°F (46.1°C)
	Standard	Low pressure & LPBP	50°F (10°C)	115°F (46.1°C)
1	Standard	T-pack1 or T-pack2	-20°F (-28.9°C)	115°F (46.1°C)
	Standard	High ambient	50°F (10°C)	125°F (51.7°C)
	Standard	High ambient, low pressure & LPBP	50°F (10°C)	125°F (51.7°C)
1	Standard	High ambient; and T-pack1	-20°F (-28.9°C)	125°F (51.7°C)
		or T-pack2		

3.4.3.1 Low Pressure & Low Pressure Bypass Timer (Optional)

Low Pressure

The low pressure switch is mounted in the compressor suction line. Electrically it is connected in series with the compressor start circuit, which will shut down the compressor and condenser fan if the suction pressure drops below 35 PSIG (241 kPa). The switch will automatically reset once the system pressure rises above its cut-in setting (60 +/-5 PSIG (414 +/-34 kPa)). This protects the InteleCool2 in the event the evaporator fan fails, the filter beomces clogged, or if there is a loss of refrigerant. If the call for cooling is present, the compressor will start after the 3 minute anti-short cycle time.

Low Pressure Bypass Timer: Winter Start

A low ambient start relay is included with the low pressure option. This relay locks out (ignores) the low pressure switch on start-on until the system pressure stabilizes. This bypass relay is adjustable and should be set for 3 minutes greater than the anti-short cycle timer setting. This option can be used for applications down to 50°F (10°C). For control down to -20°F (-28.9°C) use the T-pack1 and T-pack2 options, which include fan cycle control.

3.4.3.2 T-pack1 (Optional)

Includes a low pressure switch, low pressure bypass timer, and fan cycle control. (See 3.4.3.1 for low pressure switch and low pressure bypass descriptions.)

Fan Cycle Control: Condenser Fan Cycling Control

Fan cycle control allow the InteleCool2 unit to provide cooling to the space when the outdoor ambient is lower than 50°F (10°C), down to -20°F (-28.9°C). The control uses a reverse acting pressure switch mounted on the discharge line that cycles the condenser fan in response to the discharge pressure. On a call for cooling, when the discharge pressure increases to 250 PSIG (1723 kPa), the switch will close and start the condenser fan. Then the pressure drops below 170 PSIG (1172 kPa), and the switch will open and stop the condenser fan. This is a reverse action pressure swtich. During low outdoor

temperatures, the pressure switch cycles the condenser fan to maintain discharge pressure that will allow the system to function.

NOTE!

During normal operation in low ambient conditions, the condenser fan will cycle frequently.

3.4.3.3 T-pack 2 (Optional)

Includes a low pressure switch, low pressure bypass timer, and an adjustable fan cycle control. (See 3.4.3.1 descriptions for low pressure switch, low pressure bypass timer, and fan cycle control)

3.4.4 Anti-Short Cycle Timer (Standard)

The anti-short cycle timer protects the compressor from continuous ON-OFF operation and restarts after momentary power failures. The timer used is an adjustable timer and is set to a minimum of 3 minutes. On start-up, or any call for cooling after an off cycle of more than 3 minutes, the compressor will start immediately.

3.4.5 Heater Protection (with optional heat)

On units supplied with resistance heating, an auto reset heater safety and a one time (replaceable) thermal link protects the unit wiring and prevents excessive heat conditions caused by a dirty air filter or fan failure.

3.4.6 Lockout Relay (Optional)

The lockout relay latches the detection of a high-pressure condition in the refrigeration circuit and prohibits operation of the compressor until the abnormal pressure conditions are acknowledged. The lockout relay is reset by cycling the unit main power or by changing the setpoint on the thermostat to temporarily eliminate a call for cooling. A normally open set of contacts is provided to terminals 2 and 3 of the customer terminal strip for monitoring the status of the lock out relay when this option is supplied without the Common alarm option.

3.4.7 Common Alarm (Optional)

Consists of an evaporator air sail switch, evaporator high temperature switch, control relays, and an adjustable time delay relay with two normally open and two normally closed alarm contacts. The alarm contacts will activate in the event of a loss of airflow across the evaporator blower, high evaporator temperature, or in the event that the compressor is not functioning due to an abnormally pressure condition. The adjustable time delay relay can be adjusted for a delay of up to ninety seconds to eliminate nuisance tripping of the alarm contacts. (To detect low pressure: the optional low pressure switch with bypass; T-pack1; or T-pack2; must also be selected.)

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		•	

SECTION 4

MAINTENANCE

WARNING!

Potentially lethal voltages exist within this equipment during operation. Observe all cautions and warnings in this manual. Failure to do so could result in serious injury or death. Only qualified service and maintenance personnel should work with this equipment.

4.1 FILTERS

Replaceable evaporator air filter(s) are supplied with the unit. The filter(s) are easily serviceable from the outside, through the top front access panel.

Filters are usually the most neglected item in an environmental control system. To maintain efficient operation, they should be checked monthly and changed as required. Units supplied with economizers may require replacement filters more frequently because of airborne dust and organic materials.

Filters can be replaced from the front by opening the lower front access panel.

WARNING!

Power must be OFF while replacing the filter.

4.2 BLOWER PACKAGE

Periodic checks of the blower package include: blower wheels, housings, motor and motor mounting bracket.

With the power off, inspect and remove any debris from the wheels and housings. Also check to see that they are tightly mounted on the motor shaft and rotate freely without rubbing against the housing.

4.3 ECONOMIZER (OPTIONAL)

Each month the economizer should be inspected and any debris removed from the intake hood, damper blade, and enthalpy sensor.

4.4 HEAT

Heaters can be serviced and/or removed through the discharge opening from indoors. Or the top can be removed from the exterior and heater element removed from the top.

WARNING!

Power must be OFF while working on heaters.

4.5 REFRIGERATION SYSTEM

Each month the components of the refrigeration system should be inspected for proper function and signs of wear. Since in most cases evidence of malfunction is present prior to component failure, periodic inspections can be a major factor in the prevention of most system failures.

4.5.1 Refrigerant Lines

Check all refrigerant lines and capillaries for vibration isolation, and support as necessary. Visually inspect all refrigerant lines for leaks.

4.5.2 Discharge Pressure

Discharge pressure can be increased and decreased by load conditions or condenser efficiency. The high-pressure switch will shut the compressor/contactor at its cut-out setting of 400 PSIG (2758 kPa). (See Section 3.4.2).

4.5.3 Thermostatic Expansion Valve

The thermostatic expansion valve (TEV) keeps the evaporator supplied with enough refrigerant to satisfy load conditions. It does not turn the compressor on or off, but maintains proper refrigerant super heat in the suction gas to the compressor.

Determine TEV operation by measuring superheat. If too little refrigerant is being fed to the evaporator, the superheat will be high; if too much refrigerant is being supplied, the superheat will be low. The correct superheat setting is between 10 and 15°F (5.5 and 8.3°C), under normal load conditions and "steady-state" operation.

Some models of InteleCool2 will be supplied with a <u>non</u>-adjustable expansion valve. No adjustments are possible.

To adjust the superheat setting when an adjustable valve is used:

- 1. Remove the valve cap from the base of the valve.
- 2. Turn the adjustment stem counter-clockwise to lower the superheat.
- 3. Turn the adjustment stem clockwise to increase the superheat.

NOTE!

Make no more than 1/4 turn of the stem at a time. As long as thirty minutes may be required for the new balance to take place.

To determine superheat:

- 1. Measure the temperature of the suction line at the point where the TEV bulb is clamped.
- 2. Obtain the gauge pressure at the compressor suction valve.
- 3. Add the estimated pressure drop between bulb location and the suction valve.
- 4. Convert the sum of the two pressures to the saturated temperature.
- 5. Subtract this temperature from the actual suction line temperature. The difference is superheat.

4.6 AIR COOLED CONDENSER

Restricted airflow through the condenser coil will reduce the operating efficiency of the unit and can result in high compressor head pressure and loss of cooling.

Clean the condenser coil each time the evaporator filters are replaced. Check for bent or damaged coil fins and repair as needed. Check all refrigerant lines for leaks. Clean the condenser coil of all debris that will inhibit airflow. This can be done with compressed air or commercial coil cleaner.

4.7 COMPRESSOR REPLACEMENT

Infrequently a fault in the motor insulation may result in a motor burn, but in a properly installed system burnouts rarely occur. Of those that do, most are the effects of mechanical or lubrication failures, resulting in the burnout as a secondary consequence.

If problems that can cause compressor failures are detected and corrected early, a large percentage can be prevented. Periodic maintenance inspections by alert service personnel on the lookout for abnormal operation can be a major factor in reducing maintenance costs. It is easier and far less costly to take the steps necessary to ensure proper system operation than it is to allow a compressor to fail and require replacement.

When troubleshooting a compressor, check all electrical components for proper operation, including all fuses and circuit breakers and pressure switch operation.

If a compressor failure has occurred, determine whether it is an electrical or mechanical failure

Mechanical Failure

A mechanical compressor failure will be indicated by no burned odor. The motor will attempt to run. If you have determined that a mechanical failure has occurred, the compressor must be replaced.

Electrical Failure

An electrical failure will be indicated by a distinct pungent odor. If a severe burnout has occurred, the oil will be black and acidic.

If a burnout does occur, correct the problem that caused the burnout and clean the system thoroughly using the proper procedure. It is important to note that successive burnouts of the same system are usually caused by improper cleaning.

CAUTION!

Damage to a replacement compressor caused by improper system cleaning constitutes abuse under the terms of the warranty, and the WARRANTY WILL BE VOIDED.

There are two kits that can be used with a complete compressor burnout: Sporlan System Cleaner and Alco Dri-Kleener. Follow the manufacturer's procedure.

CAUTION!

Avoid skin contact with the refrigerant and oils. Severe burns will result. Use long rubber gloves when handling contaminated parts.

Compressor Replacement

Replacement compressors are available from your Liebert supplier. They will be shipped in a reusable crate to the job site as required by the service contractor.

Upon shipping a replacement compressor, the service contractor will be billed in full for the compressor until the failed compressor has been returned to the factory.

The compressor should be returned in the same container used for shipping to the job. The possible damage causes or conditions that were found should be recorded by marking the compressor return tag.

- 1. Disconnect power.
- 2. Attach suction and discharge gauges to access fittings.
- 3. Recover refrigerant using standard recovery procedures and equipment. Use a filter-drier when charging the system with recovered refrigerant.

CAUTION!

Do not loosen any refrigeration or electrical connections before relieving system pressure from both sides of the compressor

NOTE!

Release of refrigerant to the atmosphere is harmful to the environment and is unlawful. Refrigerant must be recycled or discarded in accordance with federal, state, and local regulations

- 4. Disconnect all electrical connections.
- 5. Remove failed compressor.

CAUTION!

The optional three-phase scroll compressor must rotate in the correct direction to ensure proper system operation. Wiring must be phased and connected as shown:

PHASE "A" to T1 or L1
PHASE "B" to T2 or L2
PHASE "C" to T3 or L3

- 6. Install replacement compressor and make all connections.
- 7. Pressurize and leak test the system at approximately 150 PSIG (1034 kPa) pressure.
- 8. Follow manufacturer's instructions for cleanout kits.
- 9. Connect a vacuum pump to both the high and low sides of the system through properly sized connections. Evacuate the system twice to 1500 microns, and the third time to 500 microns. Break the vacuum each time with dry nitrogen to 2 PSIG (13.8 kPa).
- 10. Charge the system with refrigerant. Refer to unit serial tag for refrigerant charge amount.
- 11. Apply power and operate system. Check for proper operation. Suction and discharge pressures will vary with load conditions and coil efficiency. The low pressure switch will shut the compressor down if the suction pressure falls below the cutout setting.

Conversely, the high pressure switch will shut down the compressor if the discharge pressure exceeds the cut-out setting. High suction pressure reduces the ability of the refrigerant to cool compressor components and can result in compressor damage. Refer to Table 2.

NOTE!

High side gauge port is a liquid line connection. Proper procedures should be followed when installing and removing gauges. A 6 foot (1.8m) hose can hold up to 3 oz (0.1L). of refrigerant. Be sure to purge high side to low prior to removal.

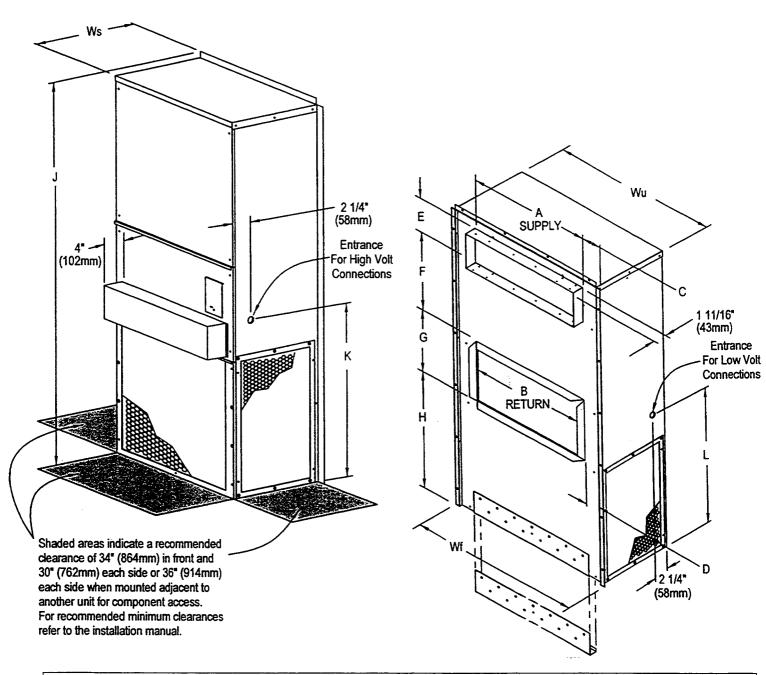
Table 3: Pressure Information

DESIGN PRESSURES PSIG (kPa)	Minimum PSIG (kPa) R-22	Maximum PSIG (kPa) R-22			
Suction	35 (241)	90 (620)			
Liquid (Approx.)	PSIG (kPa)				
95°F (3	5°C) Ambient	250-290 (1723-2000)			
Maximu	360-380 (2480-2618)				
High Pr	400 (2756)				

Note: Based on indoor conditions of 80°F (26.7°C), 50% RH, with clean filter(s).

SECTION 5 SPECIFICATIONS

5.1 DIMENSIONAL DATA



	DIMENSIONAL DATA IN. (mm)												•	
InteleCool2	Wu	Ws	Wf	A	В	C	D	E	F	G	H	J	K	L
1.5/2/ Ton	37 1/8	17 3/4	38 3/4	20	20	9 3/8	9 13/32	8	20 3/4	12	25 1/16	69 3/4	36 3/16	31 5/8
	(943)	(451)	(984)	(508)_	(508)	(238)	(239)	(203)	(527)	(305)	(638)	(1772)	(919)	(803)
3 Ton	37 1/8	17 3/4	38 3/4	28	28	5 3/8	5 3/8	8	18	14	26	69 3/4	36 3/16	31 5/8
	(943)	(451)	(984)	(711)	(711)	(137)	(137)	(203)	(457)	(356)	(660)	(1772)	(919)	(803)
4/5 Ton	41	22 1/2	83	30 1/4	29 7/8	6 1/4	6 7/16	9 7/8	30	15 7/8	25 25/64	83	44	39 1/2
	(1041)	(572)	(2108)	(768)	(759)	(164)	(164)	(251)	(762)	(403)	(645)	(2108)	(1118)	(1003)

5.2 TECHNICAL DATA

Table 4 - Technical Data 60 Hz, English & Metric Units

MODEL		E	T018	,						
Compressor Typ		Hermetic		Hermetic	024	ET036				
			1 301011 0/6705 (40, 400)	Hermeuc	Scroll	Hermetic	Scroli			
Net capacity data based on 80°F (26.7°C) DB/67°F (19.4°C) WB indoor ambient – BTUH (kW)* OUTDOOR AMBIENT										
85°F (29.4°C)		20600 (6.04)	20300 (5.95)		23600 (6.91)	36200 (10.61)		(10.14)		
0505 (05 000)	SENSIBLE	16700 (4.89)	16600 (4.86)	18800 (5.51)		26800 (7.85)		(7.68)		
95°F (35.0°C)	TOTAL	19300 (5.65)	19500 (5.71)	23500 (6.89)	22600 (6.62)	34000 (9.96)		(9.70)		
10505 110 0-0-	SENSIBLE	16300 (4.78)		18200 (5.33)		26000 (7.62)		(7.50)		
105°F (40.6°C)	TOTAL	18000 (5.27)	18700 (5.48)	22000 (6.45)	21600 (6.33)	31900 (9.35)		(9.29)		
11555 115 1111	SENSIBLE	15800 (4.63)	16100 (4.72)	17700 (5.19)	17500 (5.13)	25200 (7.38)		(7.35)		
115°F (46.1°)**	TOTAL	16700 (4.89)	17900 (5.24)	20400 (5.98)	20600 (6.04)	29700 (8.70)		(8.85)		
	SENSIBLE	15400 (4.51)	15800 (4.63)	17100 (5.01)	17200 (5.04)	24400 (7.15)	24600	(7.21)		
Net capacity data	a based on 75	°F (23.9°C) DE	3/62.5°F (16.9°C) WB indoor an	nbient – BTUH (kW)*				
OUTDOOR AME						-				
85°F (29.4°C)	TOTAL	19000 (5.57)	18900 (5.54)	23100 (6.77)	21900 (6.42)	33500 (9.82)	32300	(9.46)		
	SENSIBLE	16400 (4.81)	16400 (4.81)	18500 (5.42)	18000 (5.27)	26400 (7.74)	25900			
95°F (35.0°C)	TOTAL	17700 (5.19)	18100 (5.30)	21600 (6.33)	20900 (6.12)	31400 (9.20)	30800	(9.02)		
	SENSIBLE	16000 (4.69)		17900 (5.24)	17600 (5.16)	25600 (7.50)	25300			
105°F (40.6°C)	TOTAL	16500 (4.83)	17300 (5.07)	20100 (5.89)	19900 (5.83)	29200 (8.56)	29400	(8.61)		
	SENSIBLE	15500 (4.54)		17300 (5.07)	17200 (5.04)	24700 (7.24)	24800	(7.27)		
115°F (46.1°)**	TOTAL	14800 (4.34)		18600 (5.45)	19000 (5.57)	27100 (7.94)	27900			
	SENSIBLE	14800 (4.34)	15500 (4.54)	16700 (4.89)	16900 (4.95)	23900 (7.00)	24200	(7.09)		
	· · · · · · · · · · · · · · · · · · ·					_				
Evaporator Air Fl		–CFM (m3/hr)		_						
External Static P						<u> </u>		·		
0.0 - IN WG			0 (1480)	93	0 (1580)	1300	1300 (2210)			
0.1 - IN WG			0 (1410)	88	0 (1500)	1220 (2070)				
0.2 - IN WG			0 (1320)	84	0 (1430)	1130 (1920)				
0.3 - IN WG			0 (1260)	80	0 (1360)	1030 (1750)				
0.4 - IN WG		67	0 (1140)	73	0 (1240)	920 (1560)				
0.5 - IN WG			0 (1000)	65	0 (1100)	820 (1390)				
Evaporator Air Fl		-CFM (m3/hr)				·				
External Static Pr										
0.0 - IN WG		85	0 (1440)	91	0 (1550)	1200	(2040)			
0.1 - IN WG		81	0 (1380)	86	0 (1460)		(1900)			
0.2 - IN WG		77	0 (1310)	82	20 (1390		(1750)			
0.3 - IN WG	(75 Pa)	72	0 (1220)		0 (1320)		940 (1600)			
	0.4 - IN WG (100 Pa)		0 (1100)		0 (1210)		850 (1440)			
0.5 - IN WG	(125 Pa)	57	0 (970)		0 (1050)		(1270)			
Evaporator			, , , , , , , , , , , , , , , , , , , ,							
Motor Hp		0.2	25 (0.19)	0.2	25 (0.19)	0.25	(0.19)			
Filter Sizes (Quar		16"x3	2.5"x2" (1)		32.5"x2" (1)		16"x32.5"x2" (1)			
Drain Connection	- ID		3/4"		3/4"	3	3/4"	<u>'</u>		
Weight - w/o Eco			30 (150)	33	30 (150)		330 (150)			
Weight - with Eco	nomizer lb/kg		0 (159)		50 (159)		(159)			
*Rased on rated airflow with no external static and no external static air at any level										

^{*}Based on rated airflow with no external static and no outside air, at sea level.

^{**}For applications above 115°F (46.1°C) use high ambient option.

Table 4 - Technical Data 60 Hz, English & Metric Units (con't)

MODEL			048	ET060				
Compressor Typ		Hermetic	Scroll	Hermetic Scroll				
Net capacity data	a based on 80°F	(26.7°C) DB/67°	F (19.4°C) WB inc	door ambient – BTUH (kW)*				
OUTDOOR AME	BIENT							
85°F (29.4°C)		48500 (14.21)	49700 (14.56)	61200 (17.93)	60300 (17.67)			
`	SENSIBLE	37800 (11.08)	38200 (11.19)	42500 (12.45)	42200 (12.36)			
95°F (35.0°C)	TOTAL	45600 (13.36)	47500 (13.92)	58000 (16.99)	57500 (16.85)			
	SENSIBLE	36700 (10.75)	37400 (10.96)	41300 (12.10)	41100 (12.04)			
105°F (40.6°C)	TOTAL	42600 (12.48)	45400 (13.30)	54800 (16.06)	54800 (16.06)			
	SENSIBLE	35700 (10.46)	36700 (10.75)	40100 (11.75)	40100 (11.75)			
115°F	TOTAL		43300 (12.69)	51600 (15.12)	52000 (15.24)			
(46.1°)**	SENSIBLE		37800 (11.08)	<u> </u>	39100 (11.46)			
Net capacity data	a based on 75°F	(23.9°C) DB/62.	5°F (16.9°C) WB i	indoor ambient – BTU	IH (kW)*			
OUTDOOR AME		,						
85°F (29.4°C)	TOTAL	44800 (13.13)	46300 (13.57)	56700 (16.61)	56200 (16.47)			
	SENSIBLE	37200 (10.90)	37800 (11.08)	42100 (12.34)	41800 (12.25)			
95°F (35.0°C)	TOTAL	41900 (12.28)	44200 (12.95)	53600 (15.70)	53500 (15.68)			
	SENSIBLE	36000 (10.55)	36900 (10.81)	40800 (11.95)	40700 (11.92)			
105°F (40.6°C)	TOTAL	39000 (11.43)	42100 (12.34)	50500 (14.80)	50700 (14.85)			
	SENSIBLE	34900 (10.23)	36100 (10.58)	39500 (11.57)	39600 (11.60)			
115°F	TOTAL	36000 (10.55)	40000 (11.72)	47300 (13.86)	48000 (14.06)			
(46.1°)**	SENSIBLE	33800 (9.90)	35300 (10.34)	38200 (11.19)	38500 (11.28)			
Evaporator Air F		-CFM (m3/hr)						
External Static P								
0.0 - IN WG ((3450)		(3450)			
0.1 - IN WG ((3240)		(3240)			
0.2 - IN WG ((3010)		(3010)			
0.3 - IN WG ((2800)		(2800)			
0.4 - IN WG ((2580)	1520 (2580)				
0.5 - IN WG ((2360)	1390 (2360)				
Evaporator Air F		-CFM (m3/hr)						
External Static P								
0.0 - IN WG ((3060)		(3060)			
0.1 - IN WG ((2850)		(2850)			
0.2 - IN WG ((2680)		(2680)			
0.3 - IN WG ((2500)		(2500)			
0.4 - IN WG ((2310)		(2310)			
0.5 - IN WG (125 Pa)	1250	(2120)	1250	(2120)			
Evaporator								
Motor Hr			(0.37)		(0.37)			
Filter Sizes (Qua		21"x36.2		21"x36.2				
Drain Connection			/4"	3/4"				
Weight - w/o Eco			(213)		(213)			
Weight - with Ec lb/kg	onomizer	490	(222)	490	(222)			

^{*}Based on rated airflow with no external static and no outside air, at sea level.

^{**}For applications above 115°F (46.1°C) use high ambient option.

Table 5 - Technical Data 50 Hz, Metric & English Units

MODEL ET017 ET023 ET035							025		
Compressor Type		Hermetic	Scroll	Hermetic	Scroll	Hermetic Scroll			
		°C (80°F) DR/19	4°C (67°E) \//	indoor ambien	+ - DM /DTILLY	, Hermeuc	SCIOII		
Net capacity data based on 26.7°C (80°F) DB/19.4°C (67°F) WB indoor ambient – kW (BTUH)* OUTDOOR AMBIENT									
29.4°C (85°F)	TOTAL	5.16 (17600)	5.95 (20300)	6.30 (21500)	6.62 (22600)	9.11 (31100)	8.70 (29700)		
, ,	SENSIBLE	4.25 (14500)	4.51 (15400)		4.89 (16700)	6.74 (23000)	6.56 (22400)		
35.0°C (95°F)	TOTAL	4.83 (16500)	5.68 (19400)		6.33 (21600)		8.32 (28400)		
	SENSIBLE	4.13 (14100)	4.42 (15100)		4.78 (16300)		6.42 (21900)		
40.6°C (105°F)	TOTAL	4.51 (15400)	5.45 (18600)	5.54 (18900)	6.07 (20700)		7.94 (27100)		
, ,	SENSIBLE	4.01 (13700)	4.34 (14800)	4.48 (15300)	4.69 (16000)	6.33 (21600)	6.30 (21500)		
46.1°C (115°F)**	TOTAL	4.19 (14300)	5.22 (17800)		5.77 (19700)	7.47 (25500)	7.59 (25900)		
	SENSIBLE	3.90 (13300)	4.25 (14500)	4.37 (14900)	4.57 (15600)	6.12 (20900)	6.15 (21000)		
Net capacity data i	pased on 23.9	°C (75°F) DB/16	.9°C (62.5°F) W	/B indoor ambie	ent - kW (BTU)	1)*	1 0.10 (2.000)		
OUTDOOR AMBIE	NT					-7			
29.4°C (85°F)	TOTAL	4.78 (16300)	5.48 (18700)	5.80 (19800)	6.15 (21000)	8.47 (28900)	8.09 (27600)		
	SENSIBLE	4.16 (14200)	4.45 (15200)	4.69 (16000)	4.83 (16500)	6.65 (22700)	6.50 (22200)		
35.0°C (95°F)	TOTAL	4.45 (15200)	5.24 (17900)	5.45 (18600)	5.89 (20100)		7.74 (26400)		
	SENSIBLE	4.04 (13800)	4.37 (14900)	4.54 (15500)	4.72 (16100)		6.36 (21700)		
40.6°C (105°F)	TOTAL	4.13 (14100)	5.01 (17100	5.07 (17300)	5.60 (19100)	7.38 (25200)	7.35 (25100)		
	SENSIBLE	3.93 (13400)	4.28 (14600)	4.39 (15000)	4.63 (15800)	6.21 (21200)	6.21 (21200)		
46.1°C (115°F)**	TOTAL	3.72 (12700)	4.78 (16300)	4.69 (16000)	5.33 (18200)	6.83 (23300)	7.00 (23900)		
	SENSIBLE	3.72 (12700)	4.16 (14200)	4.25 (14500)	4.51 (15400)	6.01 (20500)	6.07 (20700)		
Francisco Att Et									
Evaporator Air Flov		m3/hr (CFM)			1				
External Static Pres									
0.0 Pa (0.0 - I		1230 (1320		1840 (1080)			
25 Pa (0.1 - I		1170 (1240		1730 (1020)			
50 Pa (0.2 - I		1100 (1190		1600 (940)			
75 Pa (0.3 - I		1060 (620)	1130	(670)	1460 (860)			
100 Pa (0.4 -			·						
125 Pa (0.5 - Evaporator Air Flow		-2/- (0514)	·		-				
External Static Pres		m3/nr (CFM)							
0.0 Pa (0.0 - I		4000 /	740)						
25 Pa (0.1 - I		1200 (1290		1700 (
50 Pa (0.2 - II		1150 (1090 (1220		1590			
75 Pa (0.3 - II		1020 (1160		1460			
		1020 (000)	1100	(000)	1330 (780)			
100 Pa (0.4 - IN WG) 125 Pa (0.5 - IN WG)					-				
Evaporator									
Motor KW ((Hp)	0.19 (0	1 25)	0.19 (0.25\	0.40 (0.05)			
Filter Sizes inches		16"x32.5"		16"x32.5		0.19 (0.25)			
Drain Connection -	ID inches	3/4		16 x32.5		16"x32.5"x2" (1)			
Weight - w/o Econo		150 (3		150 (3		3/4" 150 (330)			
Weight - with Econo		159 (3		159 (
*Resed on med				109 (.	330)	159 (3	550)		

^{*}Based on rated airflow with no external static and no outside air, at sea level.

^{**}For applications above 46.1°C (115°F) use high ambient option.

Table 5 - Technical Data 50 Hz, Metric & English Units (con't)

MODEL		E	T047	ET059				
Compressor Type		Hermetic	Scroll	Hermetic Scroll				
		C (80°F) DB/19.4	°C (67°F) WB indo	r ambient – BTUH (kW)*				
OUTDOOR AMBI								
29.4°C (85°F)	TOTAL	12.16 (41500)	12.39 (42300)	15.35 (52400)	15.09 (51500)			
, ,	SENSIBLE	9.46 (32300)	9.55 (32600)	10.67 (36400)	10.58 (36100)			
35.0°C (95°F)	TOTAL	11.43 (39000)	11.87 (40500)	14.56 (49700)	14.42 (49200)			
	SENSIBLE	9.20 (31400)	9.38 (32000)	10.37 (35400)	10.31 (35200)			
40.6°C (105°F)	TOTAL	10.69 (36500)	11.34 (38700)	13.77 (47000)	13.74 (46900)			
	SENSIBLE	8.94 (30500)	9.17 (31300)	10.05 (34300)	10.05 (34300)			
46.1°C	TOTAL	9.96 (34000)	10.84 (37000)	12.95 (44200)	13.07 (44600)			
(115°F)**	SENSIBLE	8.67 (29600)	9.00 (30700)	9.76 (33300)	9.79 (33400)			
		C (75°F) DB/16.9	°C (62.5°F) WB ind	door ambient – BTUI	∃ (kW)*			
OUTDOOR AMBI		···						
29.4°C (85°F)	TOTAL	11.25 (38400)	11.57 (39500)	14.27 (48700)	14.09 (48100)			
	SENSIBLE	9.32 (31800)	9.46 (32300)	10.58 (36100)	10.49 (35800)			
35.0°C (95°F)	TOTAL	10.52 (35900)	11.05 (37700)	13.48 (46000)	13.42 (45800)			
	SENSIBLE	9.05 (30900)	9.26 (31600)	10.25 (35000)	10.23 (34900)			
40.6°C (105°F)	TOTAL	9.79 (33400)	10.55 (36000)	12.69 (43300)	12.75 (43500)			
·	SENSIBLE	8.76 (29900)	9.05 (30900)	9.90 (33800)	9.93 (33900)			
46.1°C	TOTAL	9.05 (30900)	10.02 (34200)	11.90 (40600)	12.07 (41200)			
(115°F)**	SENSIBLE	8.47 (28900)	8.85 (30200)	9.58 (32700)	9.67 (33000)			
Evaporator Air Flo	Dry Coil	m2/br/CEM\						
External Static Pr	occurs	Monii (Crivi)	· · · · · · · · · · · · · · · · · · ·					
0.0 Pa (0.0 -		2870	(1690)	2870 (1690)				
25 Pa (0.1 -			(1590)	2700 (1590)				
50 Pa (0.2 -			(1470)	2500 (1470) ·				
75 Pa (0.3 -			(1370)	2330 (1370)				
100 Pa (0.4		2000	_					
125 Pa (0.5			-					
Evaporator Air Flo		m3/hr (CFM)						
External Static Pr		(2,)						
0.0 Pa (0.0 -		2550	(1500)	2550 (1500)				
25 Pa (0.1 -			(1400)		(1400)			
50 Pa (0.2 -			(1320)		(1320)			
	75 Pa (0.3 - IN WG)		(1220)		(1220)			
100 Pa (0.4 - IN WG)		-	 					
125 Pa (0.5		-			_			
Evaporator								
Motor KV	V (Hp)		(0.50)		' (0.50)			
Filter Sizes inches	s (Quantity)		25"x2" (1)	21"x36.25"x2" (1)				
Drain Connection			/4"	3/4"				
Weight - w/o Ecor			(470)	213 (470)				
Weight - with Eco	nomizer kg/lb	222	(490)	222 (490)				

^{*}Based on rated airflow with no external static and no outside air, at sea level.

^{**}For applications above 46.1°C (115°F) use high ambient option.

Table 6 - Electrical Data - 60 HZ - Amps

			No Heat			5	5 kW Heat 10 kW Heat				15 kW Heat*						
		,							CIRC	1	CIRC2						
Model #	Volts	Phase	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
Model ET018H	208/230	1	13.4	15.8	25	23.4	29.3	30	44.4	55.5	60	NA					1
Model ET018S	208/230	1	14.5	17.2	25	23.4	29.3	30	44.4	55.5	60	NA					İ
Model ET024H	208/230	1	14.7	17.4	25	23.4	29.3	30	44.4	55.5	60	NA	—				
Model ET024S	208/230	1	15.2	18.1	30	23.4	29.3	30	44.4	55.5	60	NA					<u> </u>
Model ET024H	208/230	3	11.3	13.2	20	14.4	18	20	26.4	33	35	NA				 	
Model ET024S	208/230	3	11.7	13.7	20	14.4	18	20	26.4	33	35	NA	†				<u> </u>
Model ET024H	460	3	5.9	6.9	15	7.3	9.1	15	13.3	16.6	20	NA					
Model ET024S	460	3	5.9	6.9	15	7.3	9.1	15	13.3	16.6	20	NA				 	
Model ET036H	208/230	1	21.8	26.3	45	23.4	29.3	45	44.4	55.5	60	44.4	55.5	60	21	26.3	30
Model ET036S	208/230	1	19.5	23.4	40	23.4	29.3	40	44.4	55.5	60	44.4	55.5	60	21	26.3	30
Model ET036H	208/230	3	15.2	18.1	30	15.2	18.1	30	26.4	33	35	38.4	48	50		20.5	- 30
Model ET036S	208/230	3	15.2	18.1	30	15.2	18.1	30	26.4	33	35	38.4	48	50			
Model ET036H	460	3	6.8	8	15	7.3	9.1	15	13.3	16.6	20	19.3	24.1	25			
Model ET036S	460	3	7.7	9.1	15	7.7	9.1	15	13.3	16.6	20	19.3	24.1	25			
Model ET048H	208/230	1	31.5	37.5	60	31.5	37.5	60	46.2	57.8	60	46.2	57.8	60	21	26.3	30
Model ET048S	208/230	1	31.9	38	60	31.9	38	60	46.2	57.8	60	46.2	57.8	60	21	26.3	30
Model ET048H	208/230	3	22.9	26.7	40	22.9	26.7	40	28.2	35.3	40	40.2	50.3	60		20.5	
Model ET048S	208/230	3	21.9	25.5	40	21.9	25.5	40	28.2	35.3	40	40.2	50.3	60			
Model ET048H	460	3	11.5	13.4	20	11.5	13.4	20	14.1	17.6	20	20.1	25.1	30			
Model ET048S	460	3	11	12.8	20	11	12.8	20	14.1	17.6	20	20.1	25.1	30			
Model ET060H	208/230	1	41.9	50.5	60	41.9	50.5	60	46.2	57.8	60	46.2	57.8	60	21	26.3	30
Model ET060S	208/230	1	37.7	45.2	60	37.7	45.2	60	46.2	57.8	60	46.2	57.8	60	21	26.3	30
Model ET060H	208/230	3	29	34.4	50	29	34.4	50	29	35.3	50	40.2	50.3	50		20.5	
Model ET060S	208/230	3	28.3	33.5	50	28.3	33.5	50	28.3	35.3	50	40.2	50.3	50			-
Model ET060H	460	3	13.4	15.8	25	13.4	15.8	25	14.1	17.6	25	20.1	25.1	25			
Model ET060S	460	3	12.7	14.9	20	12.7	14.9	20	14.1	17.6	20	20.1	25.1	30			

^{*15} kW heat option @ 208/230-1 phase requires two electrical feeds. Circuit 1 supplies the compressor, condenser, 10kW heat and the evaporator motor. Circuit 2 supplies the remaining 5 kW heat.

Table 7 - Electrical Data - 50 HZ - Amps

	No Heat			ıt	5 kW Heat			10 kW Heat			15 kW Heat*						
										CIRC1			CIRC2				
Model #	Volts	Phase	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
Model ET017H	220/240	1	12.8	15.1	20	23.4	29.3	30	44.4	55.5	60	NA					
Model ET017S	220/240	1	13.4	15.8	25	23.4	29.3	30	44.4	55.5	60	NA					
Model ET023H	220/240	1	13.7	16.2	25	23.4	29.3	30	44.4	55.5	60	NA					
Model ET023S	220/240	1	15.2	18.1	30	23.4	29.3	30	44.4	55.5	60	NA					
Model ET023H	380/415	3	5.9	6.9	15	8.3	10.4	15	15.3	19.1	20	NA					
Model ET023S	380/415	3	6.3	7.4	15	8.3	10.4	15	15.3	19.1	20	NA					
Model ET035H	220/240	1	20.3	24.4	40	23.4	29.3	40	44.4	55.5	60	44.4	55.5	60	21	26.3	30
Model ET035S	220/240	1	17.4	20.8	35	23.4	29.3	35	44.4	55.5	60	44.4	55.5	60	21	26.3	30
Model ET035H	200/230	3	15.2	18.1	30	15.2	18.1	30	26.4	33	35	38.4	48	50			
Model ET035S	200/230	3	14.5	17.2	25	14.5	18	25	26.4	33	35	38.4	48	50			
Model ET035H	380/415	3	6.8	8	15	8.3	10.4	15	15.3	19.1	20	22.3	27.9	30			
Model ET035S	380/415	3	7.7	9.1	15	8.3	10.4	15	15.3	19.1	20	22.3	27.9	30			
Model ET047H	200/230	3	22.9	26.7	40	22.9	26.7	40	28.2	35.3	40	40.2	50.3	60			
Model ET047S	200/230	3	21.9	25.5	40	21.9	25.5	40	28.2	35.3	40	40.2	50.3	60			
Model ÉT047H	380/415	3	12	14.1	20	12	14.1	20	16.1	20.1	20	23.1	28.9	_30			
Model ET047S	380/415	3	11	12.8	20	11	12.8	20	16.1	20.1	25	23.1	28.9	30			
Model ET059H	200/230	3	29	34.4	50	29	34.4	50	29	35.3	50	40.2	50.3	50			
Model ET059S	200/230	3	28.3	33.5	50	28.3	33.5	50	28.3	35.3	50	40.2	50.3	50			
Model ET059H	380/415	3	13.4	15.8	25	13.4	15.8	25	16.1	20.1	25	23.1	28.9	30			
Model ET059S	380/415	3	12.7	14.9	20	12.7	14.9	20	16.1	20.1	20	23.1	28.9	30			

^{*15} kW heat option @ 220/240 - 1 phase requires two electrical feeds.

Circuit 1 supplies the compressor, condenser, 10kW heat and the evaporator motor.

Circuit 2 supplies the remaining 5 kW heat.

SECTION 6 TROUBLESHOOTING

Table 8

PROBLEM	PROBABLE CAUSE	REMEDY			
	No power to unit	Check voltage to input circuit breaker.			
Unit will not start	Control voltage circuit breaker open	Locate short and reset breaker			
	Shut off by external thermostat or stat is defective	Check operation of thermostat			
	Low refrigerant charge	Check with gauges			
No cooling	Compressor contactor not pulling in	Check voltage at contactor. If not present refer to print and determine voltage loss. Check enthalpy sensor for full CCW or D setting.			
	No output from thermostat	Check operation of stat. Should have voltage output to Y terminal during cooling.			
Unit cycles on high pressure switch	Loss or restriction of air flow	Check condenser blower assembly for proper operation. Check for dirty coil or inlet grill restriction.			
	Defective fan cycling control	Switch should make @ 240 PSIG ± 10 (Check settings on adjustable switch when supplied.)			
	No voltage output from	Check stat for proper output to W			
Heat does not operate	thermostat	terminal			
	Fuseable link blown	Check for open and replace			
	Bad contactor	Check for open and replace			

Liebert InteleCool2 MAINTENANCE INSPECTION CHECKLIST

DATE:	PREPARED BY:
MODEL #:	SERIAL#:
N	MONTHLY
FILTERS	FAN SECTION
Unrestricted air flow	Inpellers free of debris
Check filter	Bearings free
Wipe section clean	ECONOMIZER
	Check damper for tightness & wear
SEM	II-ANNUALLY
COMPRESSOR SECTION	REFRIGERATION CYCLE
Check for leaks	Check suction pressure
Vibration Isolation	Check head pressure
AIR COOLED CONDENSER	Check superheat
Condenser coil clean	Evaporator coil clean
Motor mount tight	Insulation intact
Bearings free	ELECTRICAL PANEL
Refrigerant lines properly supported	Check electrical connections
	Check operational sequences
Notes:	
	SIGNATURE

MAKE PHOTOCOPIES OF THIS FORM FOR YOUR RECORD

SECTION 7 PARTS

Refr	igeration System	Capacity	1.5	Ton	T		2 Ton			<u> </u>	2 70-	
		Model		ET018P	ET023S	ET023M		ET024Y	ET024A	FTM355	3 Ton ET035N	ET035M
Figure	Part Name/ Description	Volts	220-240V	208-230V	220-240V	380-415V	208-230V	208-230V		220-240V	200-240V	360-415V
No.	ļ	Ph Hz	1Ph 50 Hz	1Ph 60Hz	1Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph 60Hz	3Ph 60Hz	1Ph 50Hz	3Ph 50Hz	3Ph 50H ₂
		ļ										350.22
	Run Capacitor, Recip Comp CAP. 25µF, 370V		 	ļ <u>.</u>					ļ <u></u>			
	CAP. 30µF, 370V	C03-005A	1	1	ļ	N/A		N/A	N/A		N/A	N/A
	CAP. 40µF, 370V	1A19537P1 1A19538P1			1	N/A	1	N/A	N/A		N/A	N/A
	CAP. 45µF, 500V	1C1005P2	-			N/A N/A	<u> </u>	N/A	N/A	11	N/A	N/A
	CAP. 55µF, 500V	E17-0250				N/A N/A		N/A	N/A		N/A	N/A
		217 0250				IVA		N/A	N/A		N/A	N/A
	Run Capacitor, Scroll Comp					-	<u> </u>					
	CAP. 30µF, 370V	1A19537P1		1		N/A		N/A	N/A		N/A	N/A
	CAP. 35µF, 440V	C15-0090				N/A		N/A	N/A		N/A	N/A
	CAP. 40µF, 370V	1A19538P1	1		1	N/A	1	N/A	N/A		N/A	N/A
	CAP. 50μF, 370V	C15-0090				N/A		N/A	N/A	i	N/A	N/A
1-7	CAP. 60μF, 370V	E13-2430				N/A		N/A	N/A		N/A	N/A
-	<u></u>											
	Compressors, Reciprocating COMP. 220/240-1	14600171										
	COMP. 208/230-1-60	146301P1	1									
	COMP. 208/230-1-60	146300P1 146303P1		1								
	COMP. 380/460-3	159147P2			1							
	COMP. 208/230-1	146303P1				1	 		1			
	COMP. 200//240-3	159147P1					1					
	COMP. 220//240-1-50	159124P1						1				
	COMP. 200//240-3	159212P2								1		
	COMP. 380//460-3	159212P3									1	
1-5	COMP. 200//230-1	159212P1										1
1-5	COMP. 200//240-3	159151P1										———-
	COMP. 380//460-3	159151P2										
		159150P1										
		127650P1										
		127650P2										
1-5	COMP. 200//230-1	159144P1										
\vdash	<u> </u>											
	COMP 220/265 1	12040070										
		138492P2	1									
		159146P1 138493P2		1								
		148324P2			1	1						
		159145P1					1		1			
		159148P1					- 1 -	1				
		159148P2								1		
1-6		148221P2									1	
		148325P1										
	COMP. 380//460-3	148325P2										
		159149P1							- 			
-		159153P1										
		159153P2										——
		159152P1										
		132101P2										
		132101P3										
1-0	COIVIP. 200/230-1	132101P1										
-	Pressure Switches											
		159482P1										
		159483P1	1 1	1	1	1	1	- 1	1	1	$-\frac{1}{}$	1
		159484P1		L FEATU			1) PED)	1	1	1	1
		P67-0160	OPTIONA	L FEATU	RE - OUA	VTTTY 1 (A	S RECOIL	(ED)				
			1		T VOA			رسب				
j	Filter Dryer	127185P1	1	1	1	1	1	1 -	1	1	1	$\frac{1}{1}$
I		128177P1										
												
		159118P1	1	1	1	1	1	1	1	1	1	1
1-10 C	Condenser Coil – 4/5T	159235P1										
41-	S	1.000000										
		159200P1	1	1	1	1	1	1	1			
		159180P1								1	1	1
		159237P1	i	f	1	i		1	T	T		

	2	Ton (con'	•)	Γ		4 Ton			<u> </u>		5 Ton		
		ET036Y		ETM/N	ET047M		ET048Y	ET048A	ETHSON	ET059M		ET060Y	ETO60A
Part Name/ Description		208-230V			380-415V			460V	200-230V				
Part Name Description			3Ph 60Hz	3Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph 60Hz		3Ph 50Hz				
			ļ		_								
Run Capacitor, Recip Comp		27/4	N7/A		77/4		NT/A	DT/A	NY/A	BY/A		NT/A	NI/A
25μF, 370V		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A
30μF, 370V		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A
40μF, 370V	1	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A
45μF, 500V		N/A N/A	N/A N/A	N/A N/A	N/A N/A	1	N/A N/A	N/A N/A	N/A N/A	N/A N/A	1	N/A N/A	N/A N/A
55μF, 500V		N/A	N/A	IN/A	IN/A		NA	IVA	IVA	NA	1-1-	NA	IVA
Run Capacitor, Scroll Comp													
30μF, 370V		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A
35μF, 440V	L	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A
40μF, 370V	1	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A		N/A	N/A
50μF, 370V		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A
60μF, 370V		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	1	N/A	N/A
Commence Paris	<u> </u>				<u> </u>			-				<u> </u>	ļ
Compressors, Recip.	 	 	 				 	-	-			 	
COMP. 220/240-1	 	 	 	 	 		 	 	 			 	
COMP. 208/230-1-60	-		 	 			 	 	 		-		
COMP. 208/230-1-60		-		 	ļ		 	-	-		 		
COMP. 380/460-3		<u> </u>	ļ		<u> </u>			ļ				ļ	
COMP. 208/230-1	<u> </u>		<u> </u>	ļ		<u> </u>	ļ	<u> </u>	<u> </u>		ļ		
COMP. 200//240-3	<u> </u>	<u> </u>	<u></u>	<u> </u>			<u> </u>		<u> </u>	<u> </u>	<u> </u>		ļ <u> </u>
COMP. 220//240-1-50			l										
COMP. 200//240-3		1											
COMP. 380//460-3		I	1		1								
COMP. 200//230-1	1						1						
COMP. 200//240-3				1			1	-	1				
COMP. 380//460-3	 			 	1		 	1			 	 	
COMP. 200//230-1	 	 	 	 	 	1	 	 	 		 	 	
COMP. 200//240-3	 	 		 	 		+	 	1	 	 	1	
COMP. 380//460-3	-	 				 	 		-	1		 	1
	 	 		 				-	 		 		
COMP. 200//230-1	 	 	 	 	ļ		11	 					
Compressors, Scroll	 	 		 	 		 				<u> </u>	 	
COMP. 220//265-1	 		 	† · · · · · · · · · · · · · · · · · · ·	<u> </u>		<u> </u>	 	-		 	 	
COMP. 200//230-1	 	<u> </u>	 	<u> </u>	 	 		 	 				
COMP. 220//265-1		 	 	+	 	 	 		 	├	 		┼──
		 	ļ	 									
COMP. 380//460-3		 		 		 	 	-	<u> </u>		 	 	
COMP. 200/230-1			 		ļ		 	 	<u> </u>	 	ļ	<u> </u>	
COMP. 200//240-1	<u> </u>		ļ	 	ļ		<u> </u>	ļ	ļ		ļ	<u> </u>	↓
COMP. 380//460-3	ļ	ļ	ļ	ļ	<u> </u>				<u> </u>	ļ	ļ	<u> </u>	
COMP. 220//265-1		<u> </u>	<u> </u>					<u> </u>	<u> </u>	<u> </u>	L	<u> </u>	<u> </u>
COMP. 200//240-1		1	1									1	
COMP. 380//460-3			1										
COMP. 200//230-1	1												
COMP. 200//240-3				1			1					I	
COMP. 380//460-3			T		1			1	T	[T	T	T
COMP. 200//230-1			1			1	1	1					T
COMP. 200/240-3	 		T	1	1	 -	1		1	 	T	1	t
COMP. 380/460-3	†	 	1	1	-	 	 	 	- -	1	 	 	1
COMP. 200/230-1	<u> </u>	1	1	 	†	 	 	†	 	 	1	 	† ^
Pressure Switches													I
High Pressure - 400psi	1	1	1	 1	1	1	1	1 1	11	1	1	1 1	1
Fan Cycle Switch - 170psi	1	1	1	1	1	1 1	1_1_	1	11	11	1 1	1 1	
Low Pressure - 35psi			URE – QU					1	<u> </u>	ļ	<u> </u>	1	
Adj. PrSw for Adj FCC	OPTION	VAL FEAT	URE – QU	ANITTY 1	(AS REQU	JIRED)							
							L						
Filter Dryer	1	1	1				L						
Filter Dryer				1	1	1	1	1	1	1	1	1	1
	1	T	Ţ	1				T				T	T
Condenser Coil - 1.5/3T	1	1	1	1		1			1		1		1
Condenser Coil – 4/5T	T -	 	1	1	1	1	1	1	i	1	1	1 1	1
	†	 	1	 		†	 	†	1	†	1		
Evaporator Coil - 1.5/2T		1	1	 	 	1	 	† · · · · · ·	†	1	 	 	+
Evaporator Coil – 3T	 1	1	1		 	 	 	1	 	 	†	1	
Evaporator Coil – 4/5T	 	 	 -	1	1	1 1	1	1	1	1	1	1	1
Drapolator Con - 7/31	1	<u> </u>				<u> </u>		<u> </u>	<u> </u>	<u>.</u>	1 1	1 1	

Figure	Part Name/ Description	Capacity	1.5	Ton	Γ		2 Ton	··			3 Ton	
No.	<u> </u>	Model	ET017S	ET018P	ET023S	ET023M	FT024P	ET024Y	ET024A	ETM250	ET035N	F7700053.6
		Volts	220-240V	1208-230V	1220-240V	380-415V	208-2303/	200 2201/	46037	000 0407		
		Ph Hz	1Ph 50 Hz	1Ph 60Hz	1Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph 60H2	3DF 60TI-	1DL 500	200-230V 3Ph 50Hz	380-415V
						31 11 30112	11111 00112	DEH OUNZ	3Pfi 60Hz	IPN SUHZ	3Ph 50Hz	3Ph 50Hz
4-1	Thermal Expansion Valve - 1.5T	1C19507P3	1	1								
4-1	Thermal Expansion Valve – 2T	1C19507P1		*			 					
4-1	Thermal Expansion	1C1930/P1	 		1	11	111	1	1			
7.2	Valve - 3T	1C19507P2								1	1	1
4-1	Thermal Expansion	IC19307F2	<u> </u>									
	Valve – 4T Thermal Expansion	159264P1										
	Valve – 5T	159264P2										
	Crankcase Heaters											
7.0	Crankcase Heaters											
1-9	Strap Style 240V Recips	159202P1										
1-9	Strap Style 480V Recips	159202P2										
1-9	Strap Style 240V Scrolls	132102P1	1	1	1		1	1		1	- , 	
1-9	Strap Style 480V Scrolls	132102P2				1			1		1	1
2-1	Well Style (Recips. only)	1A17648P1	1	1		,						
2-2	Retainer Plug	159136P1	1	1	1	1	1	1	11	1	1	1
		13713011			1	1	1	1	1	1	1	1
9-1	Soft Start Kit	1C19540P1	OPTIONAL	EE ATT IDE	TI CALLO	77777 7 7 4 6						
		201954011	OI HONAL	PEATURE	- QUANI	11 Y 1 (AS	KEQUIKE	.D)				
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	3	Ton (con't	.) E220264			4 Ton	F-700 4037	F-770.40.4	FTOCOLI	F70501	5 Ton	F7706014	F770604
	E1036P	ET036Y	E1036A	E104/N	ET047M	ET048P	ET048Y	E1048A	EIUSAN	ET059M	E1060P	ET060Y	ET060A
	208-230V	208-230V	460V	200-230V	380-415V	208-230V	208-230V	460V	200-230V	380-415V	208-230V	208-230V	460V
Part Name/ Description	1Ph 60Hz	3Ph 60Hz	3Ph 60Hz	3Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph 60Hz	3Ph 60Hz	3Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph 60Hz	3Ph 60Hz
Thermal Expansion													·
Valve - 1.5T													
Thermal Expansion					-								
Valve – 2T Thermal Expansion			-										
Valve - 3T	1	1	1										
Thermal Expansion							_						
Valve - 4T Thermal Expansion				1	1	1	1	1					
Valve - 5T									1	1	1	1	1
Crankcase Heaters											<u> </u>		
Strap Style, 240V Recips				11		1	. 1						
Strap Style, 480V Recips					1			1					
Strap Style, 240V Scrolls	1	1		1		1	1		1		1	1	
Strap Style, 480V Scrolls			1		1			1		· 1	ļ		1
W-11 Co-1- Donier (O-1-)		1	,	 -	<u> </u>					 	 	 	
Well Style Recips (Only) Retainer Plug	1	1	1		<u> </u>							 	-
Relainer Flug	1	1	1										-
Soft Start Kit	OPTION	AL FEATU	RE – OUA	NTITY 1 (AS REOUI	RED)					 	 	
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Elect	tric Panel	Capacity	15	Ton			2 Ton		2 Ton			
		Model	ET017S	ET018P	ET023S	ET023M	ET024P	ET024Y	ET024A	FTOSEC	3 Ton	
Figure	Part Name/ Description	Volts	220-240V			380-415V	208-230V	208-230V	460V	ET035S	ET035N	ET035M
No.		Ph Hz	1Ph 50 Hz	1Ph 60Hz	1Ph 50Hz	3Ph 50Hz	1Ph 60Hz			220-240V 1Ph 50Hz	200-230V	380-415V
					11111111111	31 11 30112	1111 00112	3211 00112	Jrii OUFIZ	IFII JUIIZ	3Ph 50Hz	3Ph 50Hz
5-3	Transformer 208/230 V	159463P1	i	1	1	 	1	1	ļ	1	1	'
5-3	Transformer 360/460 V	159463P2			 	1	†	 	1	 	1	
							 	 				1
	Circuit Breakers				 		 	 				
5-1	No Heat		138457P7	138457P3	138457P3	147957P8	138457P3	147957P7	147057D8	129457D1	14705705	147957P8
5-1	5 KW Heat		138457P5	138457P5	138457P5	147957P8		147957P7	147957P8	138457D1	147957P5	
5-1	10 KW Heat		138457P2	138457P2	138457P2	147957P1	138457P2	147957P10	147957P1	13845702	147957P10	147957F0
	15 KW Heat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	138457P2		147957P2
5-2	Heater Breaker		N/A	N/A	N/A	N/A	N/A	N/A	N/A	138457P5	N/A	N/A
										23043713	MA	IVA
	Circuit Breakers-(Scrolls)					i						
	No Heat		138457P3	138457P3	138457P5	147957P8	138457P5	147957P7	147957P8	138457P9	147957P9	147957P6
	5 KW Heat		138457P5	138457P5	138457P5	147957P8		147957P7	147957P8	138457P9	147957P9	147957P6
	10 KW Heat		138457P2	138457P2	138457P2	147957P1		147957P10	147957P1	138457P2	147957P10	147957P1
	15 KW Heat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	138457P2		147957P2
5-2	Heater Breaker		N/A	N/A	N/A	N/A	N/A	N/A	N/A	138457P5	N/A	N/A
 												
	Contactor, Compressor											
5-4	2 POLE, 25R, 20L, 100LR	E-013A	1	1	1		1					
	2 POLE, 35R, 20L, 100LR	E-011B								1		
	2 POLE, 50R, 20L, 100LR	E-011C										
	3 POLE, 20R, 20L, 100LR	124501P1				1		1	1			1
5-4	3 POLE, 30R, 20L, 100LR	E-0110									1	
												
 	Contactor, Heater, 5 KW											
	2 POLE, 25R, 20L, 100LR	E-013A	11	1	1		1			1		
5-9	3 POLE, 20R, 15L, 75LR	124501P1				1		1	1		1	1
-	Contactor, Heater, 10 KW											
	2 POLE, 50R, 40L, 240LR	E-011C	1	11	1		1			1		
	3 POLE, 20R, 15L, 75LR	124501P1				1			1	~=~~		1
5-9	3 POLE, 30R, 25L, 150LR	E-0110						1			1	
 	Canada Ar VIII											
	Contactor, Heater, 15 KW	2001										
	2 POLE, 25R, 20L, 100LR 2 POLE, 50R, 40L, 240LR	E-013A								1		
		E-011C								1		
	3 POLE, 30R, 25L, 150LR 3 POLE, 40R, 30L, 180LR	E-0110										1
3-7	3 FOLE, 40R, 30L, 180LR	E-009F									1	
5-6	Contactor Evaporator Fan	E-0130										
5-6	Contactor Evaporator Fan		1	1	1		11	1		1	1	
1	Collactor Evaporator Patr	E-013A				1			1			1
5-7	Contactor, Condenser Fan	E-013A				,						
 	Condition, Conditioner Pair	E-013A				1			1			1
5-8	Time Delay Relay, Anticycle	148089P1		1	1	1						
1	Time Demy Relay, Panticycle	14000311	-				1	1	1	1	1	1
5-7	Heater Interlock Relay	E03-0170				1						
 	monton aviay	777-01/0				1			1			<u> </u>
5-11	Terminal Strip, 10 Position	159468P1	1	1	1	1						
		-55-501 1		-			1	1	14	1	1	1
5-10	Wall Thermostat 1 Stage	138968P1	1	1	1		1	1	1	1	<u> </u>	
	Thermostat Base	138940P1	1	1	1	1	$\frac{1}{1}$	1	1	1	1	1
		1007 102 2									1	1
	Optional Features											
		138491P1	OPTIONA	L FEATU	RE – OUA	NTITY 1 (AS REQUIR	ED)				
		12.22.2	1		_ ~~	1						
5-12	Economizer Relay	E03-0170	OPTIONA	L FEATU	RE – OUA	NTITY 1 (AS REQUIR	ED)		-		
												
5-11	LockOut Relay	E03-0170	OPTIONA	L FEATU	RE - OUA	NTITY 1 (AS REOUIR	ED)				
				Ī		·		/				
	Common Alarm Assembly											
	Air Flow Switch	B02-0190	OPTIONA	L FEATU	RE – QUA	NTITY 1 (AS REQUIR	ED)				
	T/D Relay	E-3530					AS REQUIR					
8-3	Relay R1	E03-0170	OPTIONA	L FEATU	RE – QUA	NTITY 1 (A	AS REQUIR	ED)				
	Relay R2	E03-0170					AS REQUIR					
8-5	Thermostat	E-0230										

	Ton (con't)		4 Ton 5 Ton									5 Ton						
			F770 473 1	E770 473 4		ET0403/	ET040 A	ETOSON	ETOSON (ETOCON	ETOGOA						
ET036P	ET036Y	ET036A		ET047M	ET048P	ET048Y		ET059N				ET060A						
208-230V	208-230V	460V		380-415V		208-230V	460V				208-230V							
1Ph 60Hz	3Ph 60Hz	3Ph 60Hz	3Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph60Hz	3Ph60Hz	3Ph 50Hz	3Ph 50Hz	1Ph 60Hz	3Ph 60Hz	3Ph 60Hz						
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138457P8	147957P5	147057P8	147957P4	147957P1	138457P2	147957P4	147957P1	147957P3	147957P3	138457P2	147957P3	147957P11						
138457P8	147957 P 5																	
138457P2	147957P10				138457P2							147957P11						
138457P2	147957P3	147957P11	147957P6	147957P2	138457P2	147957P6	147957P2	147957P3	147957P3	138457P2	147957P3	147957P11						
138457P5	N/A	N/A	N/A	N/A	138457P5	N/A	N/A	N/A	N/A	138457P5	N/A	N/A						
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138457P1	147957P5	147957P8										147957P1						
138457P1	147957P5	147957P8	147957P4	147957P1	138457P2	147957P4	147957P1	147957P3	147957P1	138457P2	147957P3	147957P1						
138457P2	147957P10											147957P1						
138457P2	147957P3	147957P11																
138457P5	N/A	N/A	N/A	N/A	138457P5	N/A	N/A	N/A	N/A	138457P5	N/A	N/A						
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OPTIC	NAL FEAT	URE – QUA	NTITY 1 (AS REQUI	RED)			1			L							
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OPTIC	NAL FEAT	IRE - OUA	NTITY 14	AS REOUT	RED)			1	 	 	+	 						
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Moto	are -	Communic	T		T							
MOL	015	Capacity	1.5	Ton		1	2 Ton	,	,		3 Ton	
Figure		Model Volts		ET018P	ET023S	ET023M	ET024P	ET024Y	ET024A	ET035S	ET035N	ET035M
No,	Part Name/ Description	Ph Hz	1Db 50 11-	208-230V	220-240V	380-415V	208-230V	208-230V	460V	220-240V	200-230V	380-415V
1.0,	Condenser Fan Motors	111 112	IFII 30 FIZ	1Ph 60Hz	IPN SUHZ	3Ph SUHZ	1Ph 60Hz	3Ph 60Hz	3Ph 60Hz	1Ph 50Hz	3Ph 50Hz	3Ph 50Hz
—	Standard		 									
1-1	Motor 1/8HP, 208/230V (Std)	150206P1	1	1		ļ						
1-1	Motor 1/8HP, 380/460V (Std)	159206P2	 	 	1	1	1	1	ļ	1	1	
1-1	Motor 1/3HP, 200/240V (Std)		 			 	<u> </u>	 	1			11
1-1	Motor 1/3HP, 380/460V (Std)	159266P2	<u> </u>			 		ļ				<u> </u>
1-2	Fan Prop, 4Blade, 20", 26-deg	159112P2	1	1	1	1	1	1				·
1-2	Fan Prop, 2Blade, 20", 26-deg	159189P2				<u>1</u>	1		1			ļ
1-2	Fan Prop, 4Blade, 24", 26-deg	159241P2								1	1	1
	High Ambient Option											
1-1	1/5HP, 208/230V (High Amb)		1	1	1		1	1		1	1	
1-1	1/5HP, 380-460V (High Amb)	159205P2				1			1			1
1-1	1/2HP, 200/240V (High Amb)	159265P1										
1-1	1/2HP, 380/460V (High Amb)											
1-2	Fan Prop, 4Blade, 20", 22-deg	159112P1	1	1	1	ī	1	ı	1			
1-2	Fan Prop, 2Blade, 20", 22-deg	159112P2							-	1	1	1
1-2	Fan Prop, 4Blade, 24", 24-deg	159241P1										
<u></u>								-	-			
1-8	Capacitor, Run 5µF, 370V	B-1220	1	1	1	1	1	1	i	1	1	1
1-8	Capacitor, Run 10µF, 370V	B03-0003	1	1	1	1	1	1	i	1	1	1
1-4	Motor Mount	159174P1	1	1	1	$\frac{1}{1}$	1	1	1	1	1	1
1-4	Motor Mount	159263P1										
<u> </u>												
	Evaporator Fan Motors											
3-11	Motor 1/4HP Dual 206/230V	159207P1	1	1	1		1	$\frac{1}{1}$		1	1	
	Motor 1/4HP Dual 380/460V	159207P2				1			1			
	Motor 1/2HP Dual 200/230V	159267P1										
	Motor 1/2HP Dual 380/460V	159267P2										
3-2	Blower, CW	159201P2	1	1	1	1	1	$\overline{}$	1	-1	1	1
	Blower, CCW	159201P1	1	1	1	1	1	1	1	1	i	- i
	Blower, CW	159254P2										
3-1	Blower, CCW	159254P1										
3-3	Capacitor, Run 5µF, 370V	B-1220	1	1	1	1	1	1	1	1	1	1
3-3	Capacitor, Run 10μF, 370V	B03-0030										
3-8	Motor Mount	159174P1	1	1	1	1	1	1	1	1	1	1
3-8	Motor Mount	159263P1										
3-9	Mount Bolt	100061	1	1	1	1	1	1	1	1	1	1
3-10	Mount Nut	S-3380	1	1	1	1	1	1	1	1	1	1
3-4	Grommot Washer	127843P1	6	6	6	6	6	6	6	6	6	6
	Screw	147993P1	6	6	6	6	6	6	6	6	6	6
3-6		127843P2	6	6	6	6	6	6	6	6	6	6
3-7	Spacing Sleeve	127843P3	6	6	6	6	6	6	6	6	6	6
\vdash	Hootom (Ontine D)											
	Heaters (Optional)	16015055										
		159170P1	1	1	1	1	1	1		1	1	1
6-1	Heater Element, 10kW, 240V	159170P2	, -						1			
6-1	Heater Element, 10kW, 240V Heater Element, 10kW, 277V	150170P4	1	1	1	1	_1	1		1	1	1
6-1	Heater Element, 10kW, 27/V Heater Element, 15kW, 240V	15017075	-, $+$						1			
6-1	Heater Element, 15kW, 240V Heater Element, 15kW, 277V	12012020	1	1	1	1	1	1		1	1	1
	Fuse Link, Safety								1			
		147896P1	3	3	3	3	3	3	3	3	3	3
-~- +	Therm Switch, Safety (SKW)	R-013A	1	1	1	1	1	1	1	1	1	1
6-1		R-013B	1	,		.	. 1		_			
		146807G1	4	4	4	2	1 4	1 1	1 1	1	1	1
		000701					4	3	2	4	3	2
	Economizer (Optional)		· · · · · · · · · · · · · · · · · · ·	<u> </u>	т		 -					
	Actuator Motor, Spring Return	159115P1	OPTIONA	L FEATUR	SE - OTTAR	VIIIV 1 (A	C DECITI	SED!				
7-2				L FEATUR								
			OPTIONA	L FEATUR	E - OITA	VIIIY 1 (A	SREGIM	RED)				
			OPTIONA	L FEATUR	E - OLIA	VIIIY 1 (A	S REOIT	RED)				
7-5		159137P1	OPTIONA	L FEATUR	E - OLIAN	VIIIY 1 (A	S REOI IT	(ED)				
7-6		129645P1	OPTIONA	L FEATUR	E - OUAN	VIIIY 1 (A	S REOI III	RED)				
			T	1		1						
7-7	Filter, 20%, 2" x 16" x 32.5"	138447P2	1	1	1	1	1	1	1	1		1
7-7	Filter, 20%, 2" x 21" x 36.25"	138447P3							-			
									<u>L</u>			

_	3 Ton (con't.) 4 Ton 5 Ton												
	ET036P		-) ET036A	ET047N		4 Ton ET048P	ETMAOV	ETD49 A	ETOSON	EMEGN	5 Ton	ETOCOSCI	ETOCO
Part Name/ Description	208-230V	208-230V 3Ph60Hz	460V	200-230V		208-230V	208-230V	460V	200-230V	380-415V	208-230V	208-230V	460V
Condenser Fan Motors	II HOURIZ	JE HOUHZ	PENOUHZ	JEILOUHZ	PLIDOHZ	THOUHZ	JEU OUHZ	PEU OUHS	SEE SUHZ	orn outiz	1Ph 60Hz	ביn 60Hz	orno0H
Standard	 			<u> </u>	 					——			
Motor 1/8HP,208/230V(Std)	1	1		——	 	 	 	 			 		<u> </u>
Motor 1/8HP,380/460V(Std)	1	+	1					 					' <u> </u>
Motor 1/3HP,200/240V(Std)	 			1		1			1		1	1	
Motor 1/3HP,380/460V(Std)	 	 	\longmapsto	<u> </u>	1			1	1	1	1		1
Fan Prop, 4Blade, 20", 26-deg	 								└	·			1
Fan Prop, 2Blade, 20", 26-deg	1	1	1									\	
Fan Prop, 4Blade,24",26-deg	1	· ·		1	1	1	1	1	1	1	1	1	1
	 	 			 						1		1
High Ambient Option	 		\leftarrow		——			- 			-		
1/5HP,208/230V(High Amb)	1	1				 				'			
1/5HP,380-460V(High Amb)	1	 	1			 	 			\ 	+	\ -	
1/2HP,200/240V(High Amb)	 	 	 	1	 	1	1		1	'	1	1	
1/2HP,380/460V(High Amb)	1	 			1	-		1	-	ī			1
Fan Prop, 4Blade, 20", 22-deg	1			-		 			·			\- 	
Fan Prop, 2Blade, 20", 22-deg	1	1	1			 						`	`
Fan Prop, 4Blade,24",24-deg	1	1		1	1	1	1	1	1	1	1	1	1
	1	 											1
Capacitor, Run 5µF,370V	1	1	1		- 		 	\leftarrow	١		·	·	·
Capacitor, Run 10µF,370V	1			1	1	1 1	1	1	1	1	1	1	1
Motor Mount	1	1	1	1	1	1	1	1	1	1	1	1	1
Motor Mount	 			1	1	1	1	1	1	1	1	$\frac{1}{1}$	1
,	 	 				1					1	1 1	1
Evaporator Fan Motors	1 1								'		-		
Motor 1/4HP Dual 206/230V	1	1			·	+				·	+	'	
Motor 1/4HP Dual 380/460V	 	 	1		\longrightarrow	-	└	·		'		`	
Motor 1/2HP Dual 380/460V Motor 1/2HP Dual 200/240V	 			1		1	1	\longrightarrow	1			\ <u>_</u>	
Motor 1/2HP Dual 380/460V	 		٠		1	1	1	1	1 1	-	1	1	•
Blower, CW	1	1	1				\longrightarrow	1	·	1		`	1
Blower, CCW	1	1	1		\longrightarrow								
Blower, CCW	 			1	1	i	1	1	1	'	└ , →	\ 	
Blower, CW			<u> </u>	1	$-\frac{1}{1}$	1 1	1	1	1	1 1	1 1	1	1
	 	, 			1	1		1		1	1	1	1
Capacitor, Run 5µF, 370V	1	1	1		·	+	 					'	
Capacitor, Run 5µF, 370V Capacitor, Run 10µF, 370V	 	1		1	1	1	1	1	·		1	<u> </u>	
Motor Mount	1	1	1	1		1	1	1	1	1	1	1	1
Motor Mount Motor Mount	 	· · · · · · · · · · · · · · · · · · ·		1	1	1	1	1	1	<u> </u>	-, 		
Mount Bolt	1	1	1	1	$\frac{1}{1}$	1	1	1		1	1	1	1
Mount Nut	1	1	1	$\frac{1}{1}$	1	1	1	1 1	1 1	1	1 1	1	1
Grommot Washer	6	6	6	6	6	6	6	6	6			1 1	T
Screw	6	6	6	6	6	6	6			6	L	1	
Grommot Tube	6	6	6	6	6	6	6	6	6	6			
Spacing Sleeve	6	6	6	6	6	6	6	6	6	6			
	 		<u> </u>				-	<u> </u>		0		<u> </u>	
Heaters (Optional)								└─ →		<u>'</u>		`	
Heater Element, 5kW,240V	1	1		1	1	1	1		ī	1	—	`	
Heater element, 5kW,277V	1	-	1					1		1	1	1	1
Heater Element, 10kW,240V	1	1	<u> </u>	1	1	1	1			<u>'</u>		└ ┯╃	1
Heater Element, 10kW,240V	 		1					1	1	1	1	1	-
Heater Element, 15kW,240V	1	1		1	1	1	1		1	';		└ ─,─┤	1
Heater Element, 15kW,277V	+	 	1	1	1	1		1	1	1	1	1	-
Fuse Link, Safety	3	3	3	3	3	3	3	3	<u> </u>			<u> </u>	1
Therm Switch, Safety (5kW)	1	1	1	1	1	1			3	3	3	3	3
Therm Switch, Safety (5kW)	 	+				-	1	1	1	1	1	1	1
Safety (10,15kW)	1	1	1	1	1	1	1	1	1	١ , ١	1, 1	,)	
Jumper Wire	4	3	2	3	2	4	3	2	3	2	1 4	1 3	1 2
1	+ +		 	-	-	+ +					4	3	2
Economizer (Optional)	 												1
Actuator Motor, Spring Return	OPTIO	NAL FEAT	JRF C	JANTTT	(AC DEC	IIDEL.			<u> </u>		—		
Min Position Potentiometer	Obligo.	NAL FEATU	JRF ^	JANTTT	(AC PEC	(liber/				<u> </u>	—		<u> </u>
Enthalpy Control		NAL FEAT								-	L	L	
Mixed Air Sensor		IAL FEAT					-						<u> </u>
Push Rod		NAL FEAT									 		
Linkage, Ball Type		NAL FEAT											L
	2. 1.OV	EAI	<u> Qt</u>	Y itter	- (m REQ	المتعبية		 					
Filter, 20%, 2"x16"x32.5"	1	1	1								 		<u> </u>
Filter, 20%, 2"x21"x35.2.5"	 	- 1	 	1	1	1	1	1	1	1	1	1	1
			·				<u></u>	· .	1 1	·	1 1 1	· 1 1	, 1

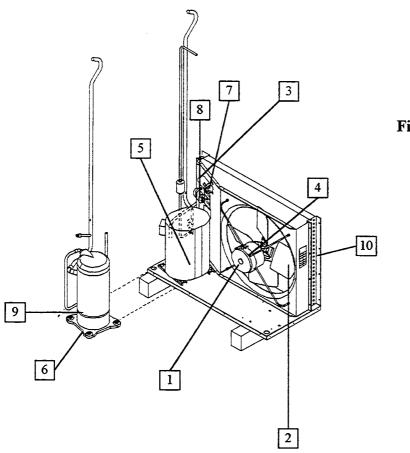
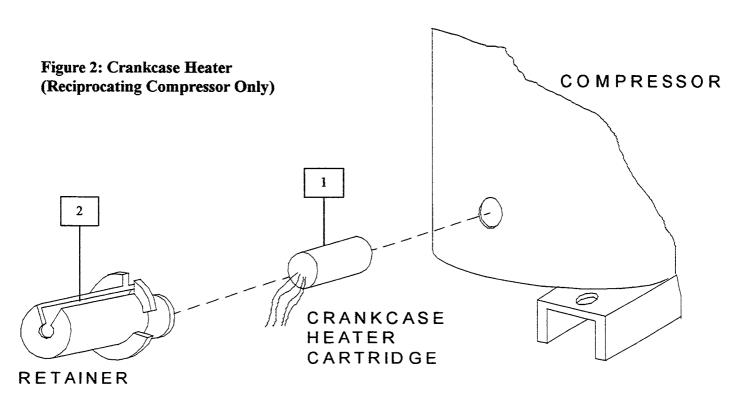
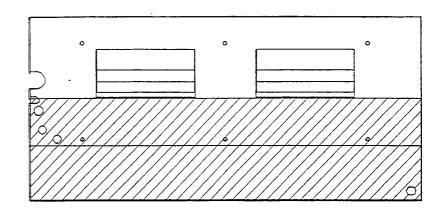
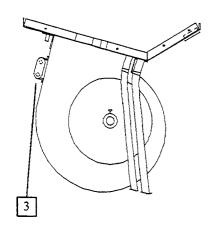


Figure 1: Condenser/Piping Assembly







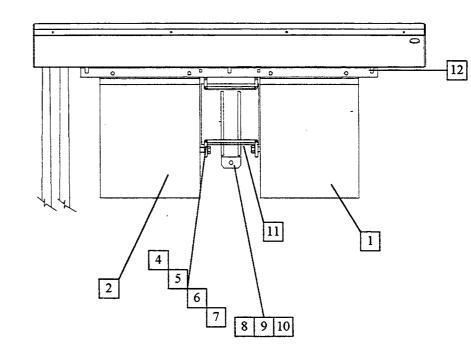
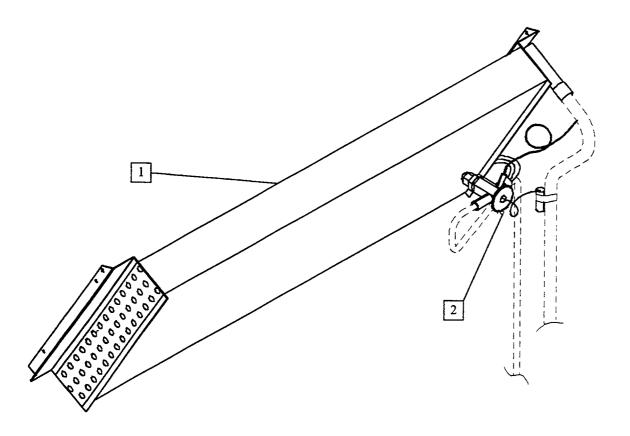


Figure 3: Evaporator Blower



TEV SYSTEMS

Figure 4: Evaporator Coil and Expansion Valve

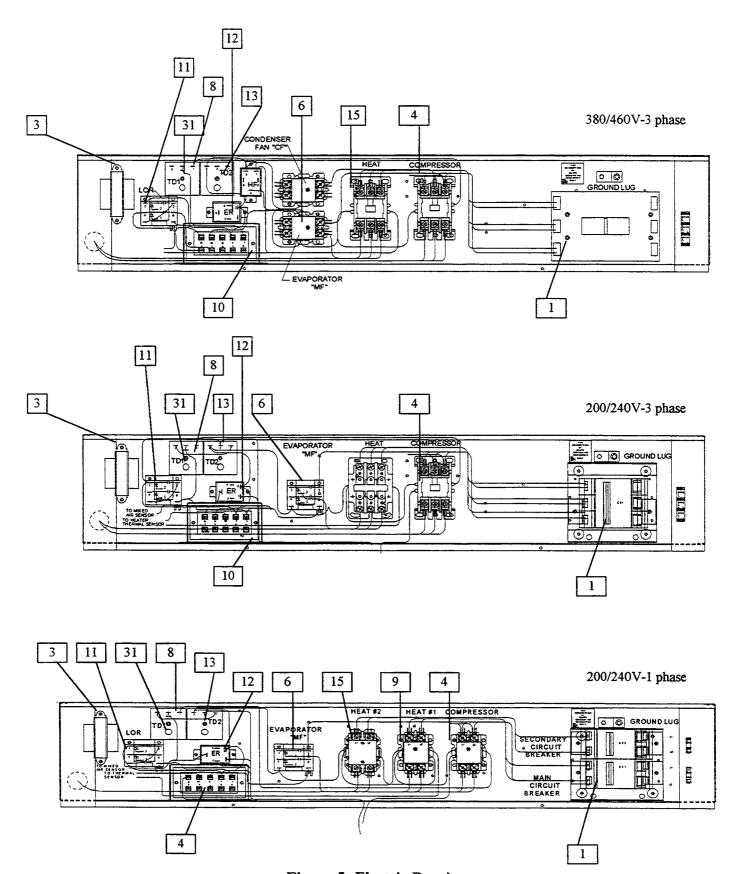


Figure 5: Electric Panels

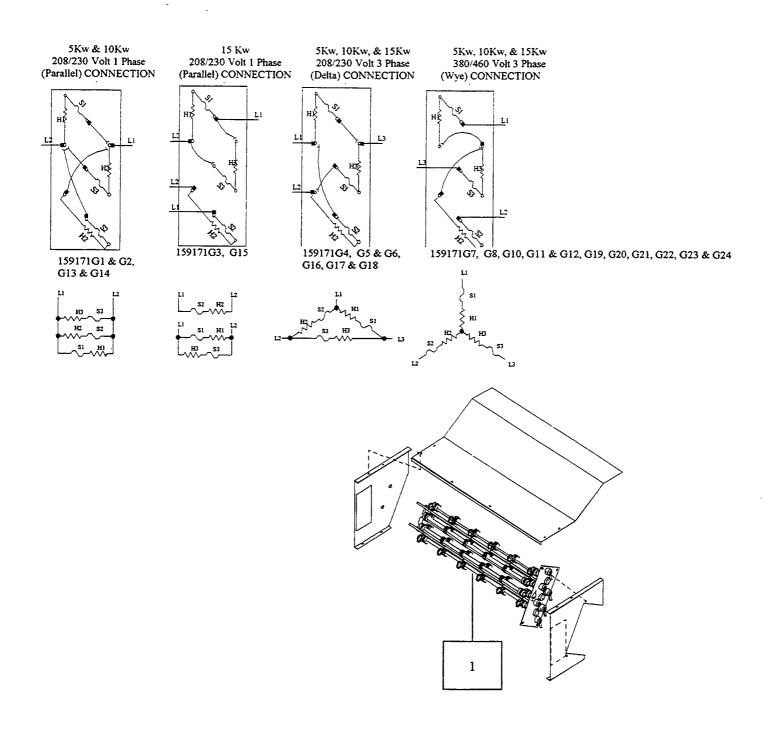


Figure 6: Heater Assembly

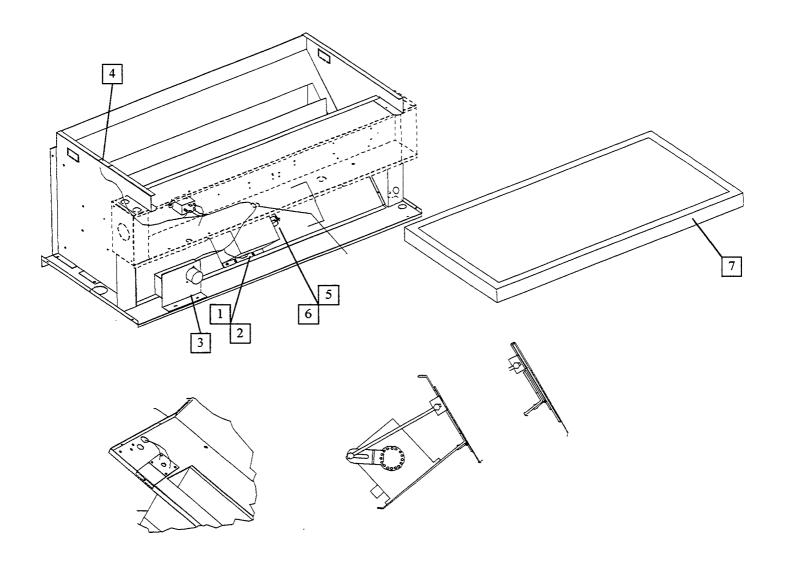


Figure 7: Economizer Assembly

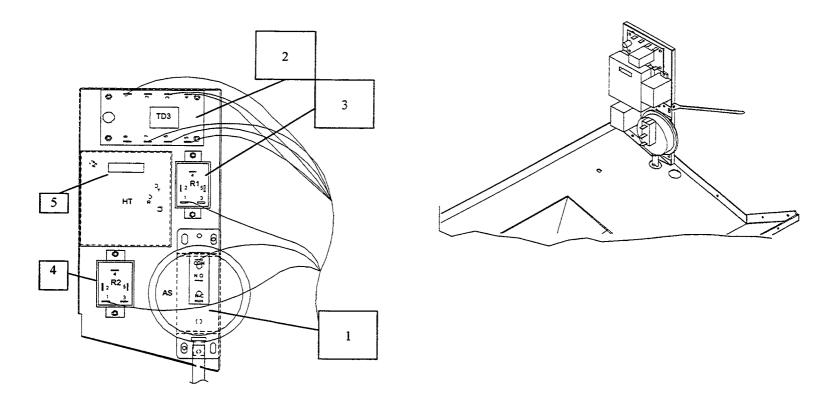


Figure 8: Common Alarm Rotary Assembly

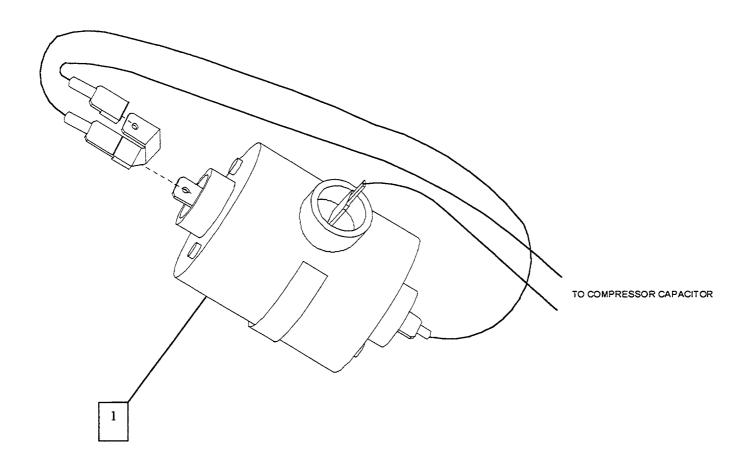


Figure 9: Soft Start Device



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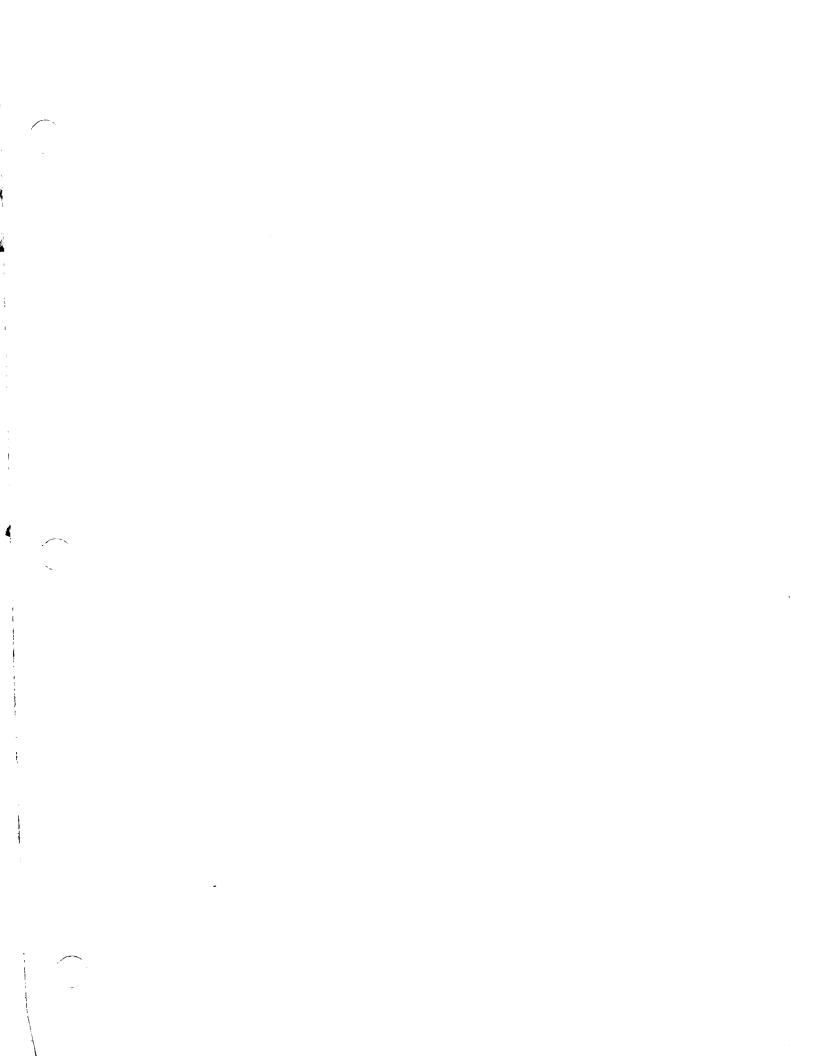
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