CHP16 SERIES UNITS

CHP16-072 packaged heat pumps are available in 69,000 Btuh (20.2 kW) heating capacity and 6 ton (21 kW) cooling capacity. The CHP16 unit consists of one compressor, one reversing valve, one high capacity drier and other parts common to a heat pump. CHP16-072 units are designed for outdoor rooftop or ground level installations in light commercial applications. Electric heat is available in several Kw sizes. Models are available in three phase power supply only and can be utilized in downflow or horizontal supply and return air.

CHP16-072 units are equipped with a single scroll compressor. The scroll compressor offers high volumetric efficiency, quiet operation and the ability to start under system load. Continuous flank contact, maintained by centrifugal force, minimizes gas leakage and maximizes efficiency. The motor is internally protected from excessive current and temperature.

Optional electric heat is field installed. Electric heat operates in single or multiple stages depending on the kW size. 10kW through 40 kW sizes are available for the CHP16-072 units.

Information in this manual is for use by a qualified service technician only. All specifications in this manual are subject to change. Procedures outlined in this manual are represented as a recommendation only and do not supersede or replace state or local codes.

⚠ IMPORTANT

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer, service agency or the gas supplier.

⚠ WARNING

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

⚠ WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.

Failure to follow this warning may result in personal injury or death.

SPECIFICATIONS CHP16

Model No.			CHP16-072
Nominal Tonnage (kW)			6 (21.1)
[1]ARI Cooling Ratings	Cooling Capacity — Btuh (kW)		72,000 (21.1)
	Total unit kW		7.1
	EER (Btuh/Watts)		10.1
[1]ARI Certified High Temperature Heating Ratings	Total Capacity — Btuh (kW)		69,000 (20.2)
	Total unit kW		6.3
	C.O.P (Coefficient of Performance)		3.2
[1]ARI Certified Low Temperature Heating Ratings	Total Capacity — Btuh (kW)		37,000 (10.8)
	Total unit kW		5.4
	C.O.P (Coefficient of Performance)		2.0
Sound Rating Number (db)			86
Refrigerant Charge (HCFC-22)			11 lbs. 4 oz. (5.1 kg)
Indoor Blower and Drive Selection	Blower wheel nominal dia. x width - in. (mm)		12 x 12 (305 x 305)
	Factory Installed [2]Drive	Nominal motor hp (kW)	2 (1.5)
		Maximum usable hp (kW)	2.30 (1.7)
		Voltage & phase	208/230/460v-3ph
		RPM range	845 - 1130
Indoor Coil	Net face area - sq. ft. (m^2)		7.75 (0.72)
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) - 3
	Expansion device type		Thermostatic Expansion Valve
	Fins per inch (m)		14 (552)
	Condensate drain size fpt - in. (mm)		1 (25.4)
Outdoor Coil	Net face area - sq. ft. (m^2)		15.67 (1.46)
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) - 2
	Fins per inch (m)		20 (787)
Outdoor Coil Fan	Diameter - in. (mm) & No. of blades		24 (610) - 4
	Air Volume - cfm (L/s)		5150 (2430)
	Motor horsepower (W)		1/2 (373)
	Motor watts		500
No. & size of filters - in. (mm)			(4) 16 x 20 x 2 (406 x 508 x 51)
Net weight of basic unit - lbs. (kg)			660 (299)
Shipping weight of basic unit - lbs. (kg)			800 (363)
Electrical characteristics			208-230v or 460v - 60 hertz - 3 phase

[1]Certified in accordance with the ULE certification program, which is based on ARI Standard 340/360;
Cooling Ratings - 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering indoor coil air
High Temperature Heating Ratings - 47 °F (8°C) db/43°F(6°C) wb outdoor air temperature and 70°F (21°C) entering indoor coil air
Low Temperature Heating Ratings - 17°F (-8°C) db/15°F (-9°C) wb outdoor air temperature and 70°F (21°C) entering indoor coil air.
[2]Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors furnished by Lennox are shown. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

ELECTRICAL DATA CHP16

Model No.		CHP16-072	
Line voltage data - 60 Hz - 3 phase		208/230v	460v
▶Recommended max. fuse or circuit breaker size (amps)		50	25
†Minimum Circuit Ampacity		34	17
Compressor	Rated load amps	18.6	9.0
	Locked rotor amps	156.0	75.0
Outdoor Fan Motor	Full load amps	3.0	1.5
	Locked rotor amps	6	3.0
Indoor Blower Motor	Motor Output - hp (Kw)	2 (1.5)	
	Full load amps	7.5	3.4
	Locked rotor amps	41	20.4

†Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.
▶Where current does not exceed 100 amps, HACR type circuit breaker may be used in place of fuse (U.S. only).
NOTE - Extremes of operating range are plus and minus 10 % of line voltage.

OPTIONAL ACCESSORIES CHP16

Bottom Power Entry	LB-55757CA **(34G70)** - 12 lbs. (5 kg)
Control Systems	See Optional Temperature Controls Systems
Ceiling Diffusers (Step-Down) - Aluminum grilles, double deflection louvers, large center grille, insulated diffuser box with flanges, hanging rings furnished, interior transition (even air flow), internally sealed (prevents recirculation), adapts to T-bar ceiling grids or plaster ceilings	RTD11-95 - 125 lbs. (57 kg)
Ceiling Diffusers (Flush) - Aluminum grilles, fixed blade louvers, large center grille, insulated diffuser box with flanges, hanging rings furnished, interior transition (even air flow), internally sealed (prevents recirculation), adapts to T-bar ceiling grids or plaster ceilings	FD11-95 - 95 lbs. (43 kg)
Ceiling Diffuser Transitions (Supply and Return) - Used with diffusers, installs in roof mounting frame, galvanized steel construction, flanges furnished for duct connection, fully insulated	SRT16-09 -38 lbs. (17 kg)
Economizer Dampers (Down-Flow) - Mechanically linked recirculated air and outdoor air dampers, plug-in connections to unit, nylon bearings, stainless steel seals (outdoor dampers), 24 volt fully modulating spring return damper motor, adjustable minimum damper position switch, mixed air controller, solid-state adjustable outdoor air enthalpy control, 0 to 100% outdoor air adjustable, gravity exhaust air dampers furnished, powdered enamel paint finish NOTE - Fresh air/exhaust air hood with cleanable aluminum mesh frame filter, is required and must be ordered separately for field installation.	REMD16M-09 - 60 lbs. (27 kg) Net face area - 2.1 ft.^{2} (0.20 m^2) Hood (ordered separately) **(27L58)** No. and size of filters (1) 32-1/4 x 16-1/2 x 1 in. (819 x 419 x 25 mm)
Economizer Dampers (Horizontal) - Mechanically linked recirculated air and outdoor air dampers, plug-in connections to unit, nylon bearings, stainless steel seals (outdoor dampers), 24 volt fully modulating spring return damper motor, adjustable minimum damper position switch, mixed air controller, solid-state adjustable outdoor air enthalpy control, 0 to 100% outdoor air adjustable, galvanized steel cabinet, flanged air openings on return air section, powdered enamel paint finish, fully insulated. NOTE - Outdoor air hood with two cleanable aluminum mesh frame filters is required and must be ordered separately. Also requires optional Horizontal Supply and Return Air Kit for duct connection	EMDH16M-09 - 120 lbs. (54 kg) Hood (ordered separately) **(68G80)** No. and size of filters (2) 16 x 25 x 1 in. (406 x 635 x 25 mm)
Economizer Differential Enthalpy Control - For use with economizer dampers, solid-state return air sensor allows selection between outdoor air and return air (whichever has lowest enthalpy)	**54G44**
Economizer Gravity Exhaust Dampers (Horizontal) - For use with EMDH16 horizontal economizer damper sections, two neoprene coated fiberglass dampers furnished, rain-hoods furnished, bird screen furnished	GED16-09/12 - 5 lbs. (2 kg) Net face area - 0.43 sq. ft. (0.04 m^2) used with EMDH16M
Electric Heat - Field installed, helix wound nichrome elements, time delay for element staging, individual element limit controls, may be two-stage controlled, requires optional Fuse Block	ECH16-82/95 10-15-20-30-40 kW (all voltages)
Unit Fuse Block - Required for electric heat installation, wiring harness and mounting screws furnished	208/230 volt - **50L22** (50 amp) 460 volt - **50L24** (25 amp)
Horizontal Supply and Return Air Kit - Provides duct connection to unit, flanges furnished, hardware furnished, two filler panels furnished for unused air openings, filter access panel furnished	LB-55756BA **(34G71)** 30 lbs. (14 kg)
Low Ambient Controls - Allows unit operation down to 0°F (-17.7°C)	LB-57113BG **(15J80)**
Outdoor Air Damper Section - Linked mechanical dampers, interchangeable unit panel furnished (down-flow applications), two-piece cabinet (control access), cleanable polyurethane frame type filter furnished, 0 to 25% (fixed) outdoor air adjustable, manual or automatic operation (kit required for automatic operation), installs on unit for down-flow applications, installs in return air duct for horizontal applications	OAD16-09 - 41 lbs. (19 kg) No. and size of filters (1) 16 x 20 x 1 in. (406 x 508 x 25 mm)
Outdoor Air Damper Motorized Damper Kit - 3 position damper actuator, plug-in connection	**35G21** - 7 lbs. (3 kg)
Roof Mounting Frame - Nailer strip furnished, mates to unit, U.S. National Roofing Contractors Approved, shipped knocked down	RMF16-09 - 107 lbs. (49 kg)

BLOWER DATA CHP16

BOLD DATA INDICATES FIELD FURNISHED DRIVE

Air Volume cfm (L/s)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge (Pa)																							
	.20 (50)		.30 (75)		.40 (100)		.50 (125)		.60 (150)		.70 (175)		.80 (200)		.90 (225)		1.00 (250)		1.10 (275)		1.20 (300)		1.30 (325)	
	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)
2000 (945)	**585**	**0.35 (0.26)**	**630**	**0.40 (0.30)**	**680**	**0.45 (0.34)**	**725**	**0.50 (0.37)**	**775**	**0.60 (0.45)**	**820**	**0.65 (0.48)**	865	0.75 (0.56)	910	0.80 (0.60)	955	0.90 (0.67)	1000	0.95 (0.71)	1045	1.05 (0.78)	1090	1.15 (0.86)
2200 (1040)	**625**	**0.45 (0.34)**	**670**	**0.50 (0.37)**	**710**	**0.55 (0.41)**	**755**	**0.65 (0.48)**	**795**	**0.70 (0.52)**	**840**	**0.75 (0.56)**	880	0.85 (0.63)	925	0.90 (0.67)	965	1.00 (0.75)	1005	1.05 (0.78)	1050	1.15 (0.86)	1090	1.25 (0.93)
2400 (1135)	**665**	**0.55 (0.41)**	**705**	**0.60 (0.45)**	**745**	**0.70 (0.52)**	**785**	**0.75 (0.56)**	**825**	**0.80 (0.60)**	865	0.90 (0.67)	905	0.95 (0.71)	940	1.05 (0.78)	980	1.10 (0.82)	1020	1.20 (0.90)	1055	1.30 (0.97)	1095	1.40 (1.04)
2600 (1225)	**710**	**0.70 (0.52)**	**745**	**0.75 (0.56)**	**780**	**0.80 (0.60)**	**820**	**0.90 (0.67)**	855	0.95 (0.71)	890	1.05 (0.78)	930	1.10 (0.82)	965	1.20 (0.90)	1000	1.30 (0.97)	1035	1.35 (1.01)	1070	1.45 (1.08)	1105	1.55 (1.16)
2800 (1320)	**750**	**0.85 (0.63)**	**785**	**0.90 (0.67)**	**820**	**0.95 (0.71)**	855	1.05 (0.78)	890	1.10 (0.82)	925	1.20 (0.90)	955	1.30 (0.97)	990	1.35 (1.01)	1025	1.45 (1.08)	1055	1.55 (1.16)	1090	1.65 (1.23)	1125	1.75 (1.31)
3000 (1415)	**795**	**1.00 (0.75)**	**830**	**1.05 (0.78)**	860	1.15 (0.86)	890	1.20 (0.90)	925	1.30 (0.97)	955	1.40 (1.04)	985	1.45 (1.08)	1020	1.55 (1.16)	1050	1.65 (1.23)	1080	1.75 (1.31)	1115	1.85 (1.38)	**1145**	**1.95 (1.45)**
3200 (1510)	**840**	**1.20 (0.90)**	870	1.25 (0.93)	900	1.35 (1.01)	930	1.40 (1.04)	960	1.50 (1.12)	990	1.60 (1.19)	1020	1.70 (1.27)	1050	1.75 (1.31)	1080	1.85 (1.38)	1110	1.95 (1.45)	**1140**	**2.05 (1.53)**	**1170**	**2.15 (1.60)**
3400 (1605)	885	1.40 (1.04)	915	1.50 (1.12)	940	1.55 (1.16)	970	1.65 (1.23)	1000	1.75 (1.31)	1025	1.80 (1.34)	1055	1.90 (1.42)	1085	2.00 (1.49)	1110	2.10 (1.57)	**1140**	**2.20 (1.64)**	**1165**	**2.30 (1.72)**	**1195**	**2.40 (1.79)**
3600 (1700)	930	1.65 (1.23)	960	1.75 (1.31)	985	1.80 (1.34)	1010	1.90 (1.42)	1040	2.00 (1.49)	1065	2.10 (1.57)	1090	2.20 (1.64)	1120	2.30 (1.72)	**1145**	**2.40 (1.79)**	**1170**	**2.50 (1.87)**	**1200**	**2.60 (1.94)**	**1225**	**2.70 (2.01)**
3800 (1795)	975	1.90 (1.42)	1005	2.00 (1.49)	1030	2.10 (1.57)	1055	2.20 (1.64)	1080	2.30 (1.72)	**1105**	**2.40 (1.79)**	**1130**	**2.50 (1.87)**	**1155**	**2.60 (1.94)**	**1180**	**2.70 (2.01)**	**1205**	**2.80 (2.09)**	**1230**	**2.90 (2.16)**	**1255**	**3.00 (2.24)**

NOTE — All data is measured external to the unit with dry coil and with the air filters in place. See below for Accessory Air Resistance data.

ACCESSORY AIR RESISTANCE

Unit Model No.	Air Volume		Total Resistance - inches water gauge (Pa)						
			Wet Indoor Coil	REMD16M Down-Flow Economizer	EMDH16M Horizontal Economizer	RTD11 Step-Down Diffuser			FD11 Flush Diffuser
	cfm	L/s				2 Ends Open	1 Side 2 Ends Open	All Ends & Sides Open	
CHP16-072	2000	945	0.10 (25)	0.11 (27)	0.02 (5)	0.15 (37)	0.12 (30)	0.11 (27)	0.08 (20)
	2200	1040	0.11 (27)	0.15 (37)	0.03 (7)	0.18 (45)	0.15 (37)	0.13 (32)	0.11 (27)
	2400	1185	0.12 (30)	0.19 (47)	0.03 (7)	0.21 (52)	0.18 (45)	0.15 (37)	0.14 (35)
	2600	1225	0.13 (32)	0.23 (57)	0.04 (10)	0.24 (60)	0.21 (52)	0.18 (45)	0.17 (42)
	2800	1320	0.14 (35)	0.27 (67)	0.04 (10)	0.27 (67)	0.24 (60)	0.21 (52)	0.20 (50)
	3000	1415	0.16 (40)	0.31 (77)	0.05 (12)	0.32 (80)	0.29 (72)	0.25 (62)	0.25 (62)
	3200	1510	0.18 (45)	0.35 (87)	0.05 (12)	0.41 (102)	0.37 (92)	0.32 (80)	0.31 (77)
	3400	1605	0.19 (47)	0.41 (102)	0.06 (15)	0.50 (124)	0.45 (112)	0.39 (97)	0.37 (92)
	3600	1700	0.21 (52)	0.47 (117)	0.06 (15)	0.61 (152)	0.54 (134)	0.48 (119)	0.44 (109)
	3800	1795	0.23 (57)	0.57 (142)	0.07 (17)	0.73 (182)	0.63 (157)	0.57 (142)	0.51 (127)

NOTE — Electric heat has no appreciable air resistance.

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume		[1] Effective Throw Range			
			RTD11 Step-Down		FD11 Flush	
	cfm	L/s	ft.	m	ft.	m
CHP16-072	2625	1240	24 - 29	7 - 9	22 - 26	7 - 8
	3000	1415	27 - 33	8 - 10	25 - 30	8 - 9
	3375	1595	30 - 37	9 - 11	28 - 34	9 - 10
	3750	1770	34 - 41	10 - 12	31 - 38	9 - 12

[1] Throw is the horizontal or vertical distance an air stream travels on leaving the outlet or diffuser before the maximum velocity is reduced to 50 ft. (15 m) per minute. Four sides open.

CHP16-072 PARTS ARRANGEMENT

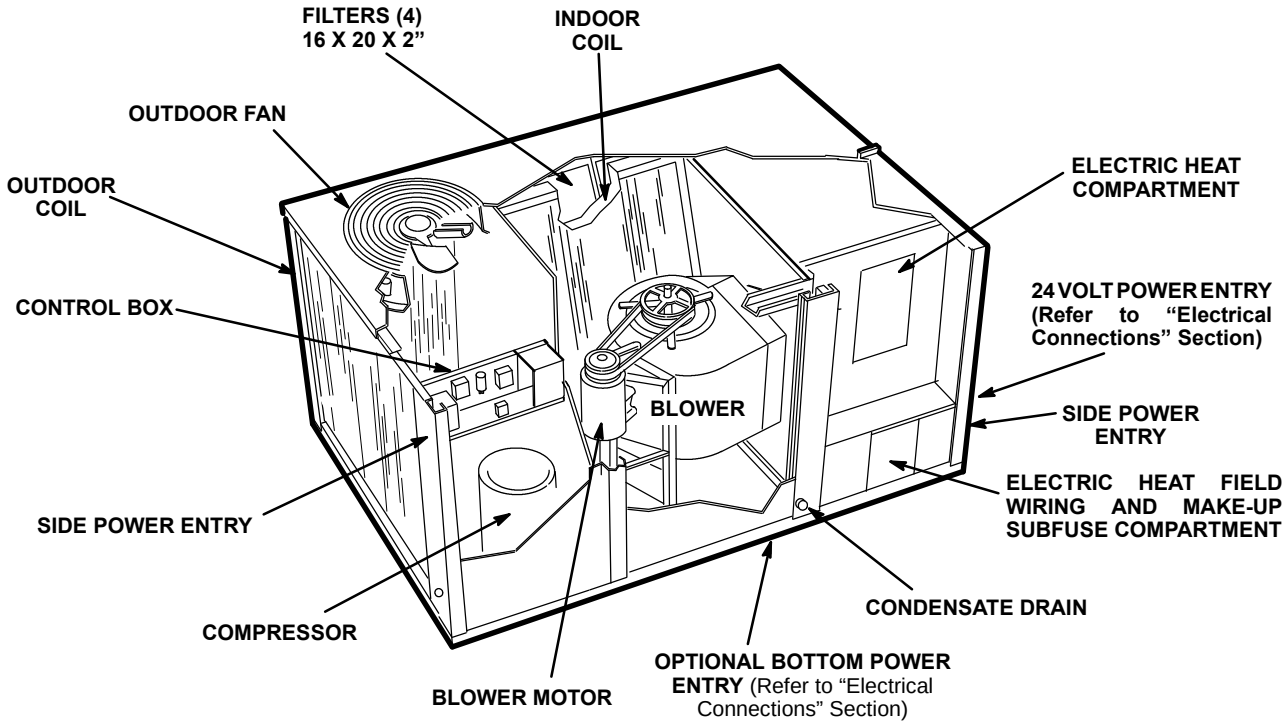


FIGURE 1

CHP16-072 CONTROL BOX

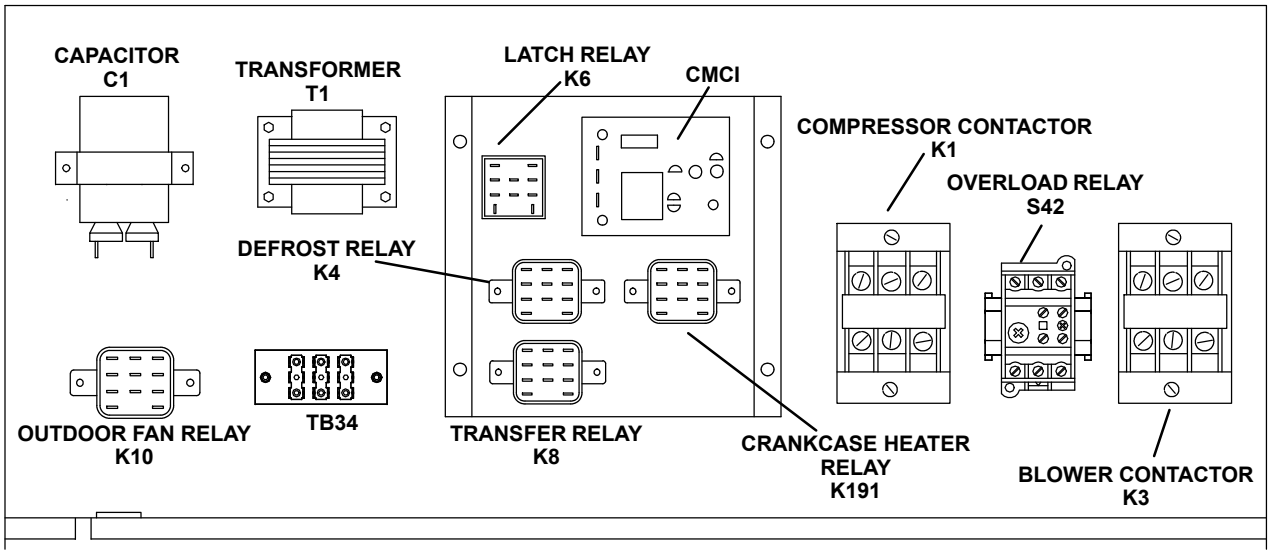


FIGURE 2

I-UNIT COMPONENTS

CHP16-072 parts arrangement is shown in figure 1.

A-Control Box Components

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions during unit installation and service to protect the unit's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the unit , the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface, such as the blower deck, before performing any service procedure.

CHP16-072 control box is shown in figure 2. The control box is located in the upper portion of the compressor compartment behind the compressor compartment access panel.

The outdoor fan can be accessed by removing the fan grill located on top of the unit.

The indoor blower access panel is located between the compressor compartment and electric heat compartment.

1-Transformer T1

CHP16-072 units use line voltage to 24VAC transformer mounted in the control box. The transformer supplies power to control circuits in the unit. Transformers are rated at 70VA and use two primary voltage taps as shown in figure 3. T1 is protected by a 3.5 amp circuit breaker (CB8).

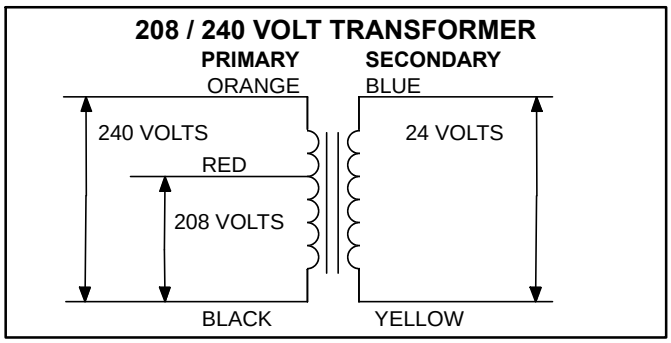


FIGURE 3

2-Compressor Contactor K1

K1 is a 24V to line voltage three-pole double-break contactor used to energize the compressor and condenser fan in response to thermostat demand.

NOTE-Contactor K1 is energized by the thermostat control system. Depending on the control system installed, the contactor may or may not be immediately energized upon demand.

3-Indoor Blower Relay K3

All CHP-072 units use a 3PDT relay to energize the indoor blower motor.

CHP16-072 units **use a conventional 2 heat / 2 cool thermostat.** Transfer relay K8 is used to direct power to blower relay K3 depending on whether the unit is in cooling or heating mode. In cooling mode transfer relay K8 is de-energized and blower relay K3 is energized by thermostat terminal G through K8-1 normally closed contacts. In heating mode transfer relay K8 is energized and blower relay K3 is energized directly by transformer T1 through K8-1 normally open contacts.

4-Defrost Relay K4

Relay K4 initiates defrost in response to demand. K4 is energized when defrost thermostat S6 closes and defrost control CMC1 calls for defrost. Once energized, contacts K4-1 open to reset the internal timer to zero, contacts K4-2 close to energize the electric heat (if installed) and K4-3 closes to latch condenser fan relay K10 and defrost relay K4.

5-Outdoor Fan Relay K10

Outdoor fan relay K10, used in all CHP16 units, is a DPDT relay with a 24V coil. In all units K10 energizes outdoor fan B4 in response to thermostat demand.

6-Blower Motor Overload Relay S42

Relay S42 is used on M voltage CHP16 models only. The relay is connected in line with the blower motor to monitor the current flow to the motor. When the relay senses an overload condition, a set of normally closed contacts open to de-energize the blower and terminate 24V supply to TB34.

7-Latch Relay K6

CHP16 commercial units are designed to use conventional heat/cool thermostats and are equipped with latch relay K6. Latch relay K6 is used in commercial heat pumps to control operation of the reversing valves when a heat/cool thermostat is used.

CHP16 series units are plumbed so that the unit is in cooling mode when the reversing valve is energized. Latch relay K6 controls operation of the reversing valves and is controlled (indirectly) by the indoor thermostat.

A latch relay (figure 4) is a special type of relay with two coils; a “SET” coil and a “RESET” coil. When 24VAC is applied to the “SET” coil, the normally open contacts close and the normally closed contacts open. When power is removed from the “SET” coil, nothing happens; the N.O. contacts remain closed and the N.C. contacts remain open. The contacts do not return to their normal position until the “RESET” coil is energized. Once the contacts are reset, they remain in their normal position when power is removed.

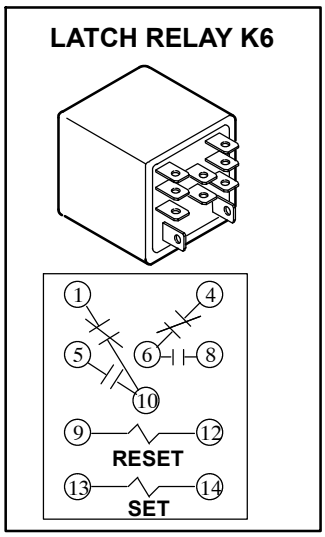


FIGURE 4

CHP16 series units use a DPDT latch relay. One set of normally open contacts is connected in series with thermostat Y1 and compressor contactor K1 while the matching normally closed contacts are connected in series with thermostat W1 and compressor contactor K1. The other set of normally open contacts is connected in series with the reversing valve. When the “SET” coil is energized (Y1), the normally open contacts close to energize the reversing valve (thereby placing the unit in cooling mode) and to energize the compressor contactor. When power is removed from the “SET” coil (such as when cooling demand is satisfied), the normally open contacts remain closed, the reversing valve remains energized and the unit remains in cooling mode.

8-Transfer Relay K8

The combined operation of latch relay K6 and transfer relay K8 allow the CHP16 to use a conventional heat/cool thermostat as opposed to a heat pump thermostat. Transfer relay K8 switches thermostat blower demand from cooling mode to heating mode. Relay K8 routes blower demand from the appropriate thermostat output to the blower relay depending on whether the unit is in cooling or heating mode.

During cooling mode, the blower relay receives power from thermostat terminal G (relay K8 de-energized). During heating demand transfer relay K8 is energized. When K8 is energized, power routing is switched so that the blower relay receives power from heating thermostat demand (W1).

9-Defrost Control CMC1

The CMC defrost control (figure 5) is a solid state control which provides automatic switching from normal heating operation to defrost mode and back. The control provides 14 minute defrost periods at 30, 60 or 90-minute field-changeable intervals. Each control monitors thermostat demand and “holds” the timer in place between thermostat demand. A set of diagnostic pins are also provided for troubleshooting the refrigeration circuit.

The control contains a solid state timer which switches an external defrost relay through 1/4” male spades mounted on the control’s circuit board. The control energizes the defrost relay at regular timed intervals. Defrost thermostat S6 initiates defrost and pressure switch S46 terminates defrost. If S46 does not terminate defrost, CMC1 will terminate defrost after 14 minutes.

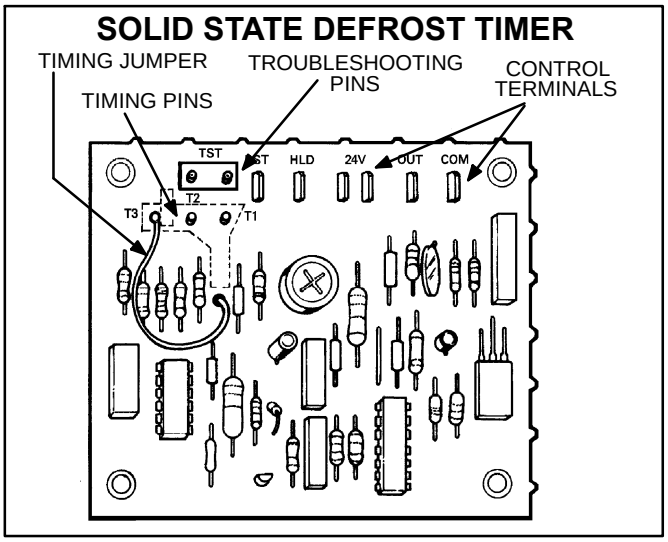


FIGURE 5

When the indoor thermostat closes (call for heat or cool), defrost timer initiates 30, 60 or 90-minute (depending on how the control is preset) timing sequence. At the end of the timing sequence, the control attempts to energize the defrost relay. If both the defrost thermostat and defrost pressure switch are closed when timing sequence ends, the defrost relay is energized and defrost begins. Consequently, only the defrost pressure switch must open in order for defrost to be terminated by switches (defrost can also be terminated by the internal timer of the defrost control).

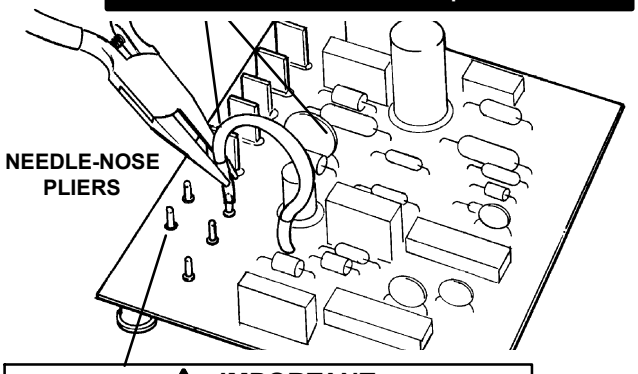
Defrost Control Components

a- Timing Pins 30(T1), 60(T2), 90(T3)

Each of these pins provides different timed interval between defrosts. A jumper connects the pins to circuit board pin W1. Table 1 shows the timings of each pin. The defrost interval can be field changed to 30, 60 or 90 minutes. The defrost period (14 minutes) cannot be changed. To change the interval between defrosts, simply remove the jumper from the pin it is connected to and reconnect the jumper to one of the other available pins (see figure 6).

⚠ IMPORTANT

Prevent control damage. Avoid contact with other control terminals or control components.



⚠ IMPORTANT

Prevent control damage. Do not connect timing jumper to either "TST" pin.

TO CHANGE CONTROL TIMINGS:

1- Turn off all power to the unit to avoid damaging the circuit board.
2- Grasp wire connector firmly with needle nose pliers as shown.
3- *Gently* pull connector from pin.
4- Select new timing pin. DO NOT SELECT A "TST" PIN.
5- Gently push connector onto desired pin (see Table 1 for timings). Connector is seated when pin snaps.
6- Turn on power to unit.

FIGURE 6

b- Timing Jumper

A timing jumper is factory installed on the circuit board and is used to connect pin W1 to one of three timing pins. The jumper may be connected to any one timing pin but must never be connected to the "TST" pins. See following Caution.

⚠ IMPORTANT

Potential for control damage.

Do not connect timing jumper to "TST" pins. "TST" pins are used only during a test and must not connect with timing pins.

TABLE 1

DEFROST CONTROL CMC TIMINGS	INTERVAL BETWEEN DEFROSTS WITH JUMPER CONNECTED TO:			DEFROST TIME
	30 (T1)	60 (T2)	90 (T3)	
NORMAL OPERATION	30 ± 3 MIN.	60 ± 6 MIN.	90 ± 9 MIN.	14 ± 1.4 MIN.
"TST" PINS JUMPERED TOGETHER	7 ± 0.7 SEC.	14 ± 1.4 SEC.	21 ± 2.1 SEC.	3.3 ± 0.3 SEC.

c- "24V" Terminal

Terminal "24V" receives 24VAC from the control transformer. This terminal powers the control's internal timer and relays. Terminal "24V" must be powered at all times in order to provide "HOLD" between thermostat demands.

TO PLACE CONTROL IN TEST MODE:

1- Turn off all power to avoid damaging the circuit board.
2- Make sure all control terminals are connected as shown on unit wiring diagram before attempting to place control in test mode. See NOTE below.

NOTE - Control will not go into test mode when disconnected from unit. Unit load must be applied to control terminals before the control will go into test mode.

3- Connect jumper to "TST" pins as shown.
4- Turn indoor thermostat to heat mode and adjust to highest temperature setting.
5- Turn on power to unit.
6- See Table 1 for control timings in "TST" mode.
7- Be sure to turn off power and remove jumper when test is complete. Turn on power and re-adjust thermostat.

⚠ IMPORTANT

Prevent control damage. Avoid contact with other control terminals or control components.

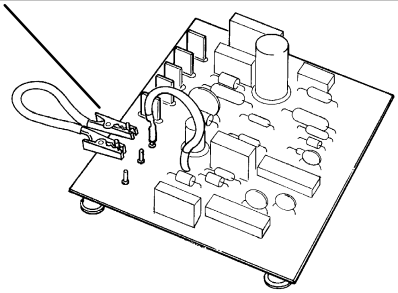


FIGURE 7

d- "COM" Terminal

Terminal "COM" provides 24VAC common.

e- "HLD" Terminal

Terminal "HLD" holds an internal timer in place between thermostat demands and allows the unit to continue timing upon resumption of thermostat demand. When thermostat demand is present, the control is allowed to count down to the next defrost. Terminal "HLD" is connected directly to thermostat demand.

f- "OUT" Terminal

Terminal "OUT" controls defrost when connected to one side of the defrost relay coil. An internal relay connected to terminal "OUT" closes (allowing an internal path from "OUT" to "COM") to allow external defrost relay to energize and initiate defrost. At the end of the defrost period, the internal relay connected to terminal "OUT" opens to de-energize the external defrost relay.

g- "RST" Terminal

Terminal "RST" resets the internal timer when power is removed and begins timer operation when power is returned. Terminal "RST" is connected to terminal "COM" through a set of normally closed defrost relay contacts. When the defrost relay contacts open terminal "RST" loses power (the path through "RST" is disrupted) and internal timer is reset. The control resumes timing when the defrost relay contacts close.

h- "TST" Pins

Each board is equipped with a set of test pins for use in troubleshooting the unit. When jumped together, these pins reduce the control timing to a fraction of the original time (see table 1 and figure 7).

⚠ IMPORTANT

Prevent control damage.

Control will begin test mode only if normal load is applied to control terminals. Do not attempt to operate or test control out of unit.

A defrost period can last up to 14 minutes and can be terminated two ways. First, if the defrost thermostat and defrost pressure switch do not open within 14 minutes after defrost begins, the internal timer (by opening the internal path from "OUT" to "COM") will de-energize the defrost relay and the unit will resume normal operation. Second, if the defrost pressure switch opens during the 14 minute defrost period, the defrost relay is de-energized and the unit resumes normal operation. Refer to figure 8.

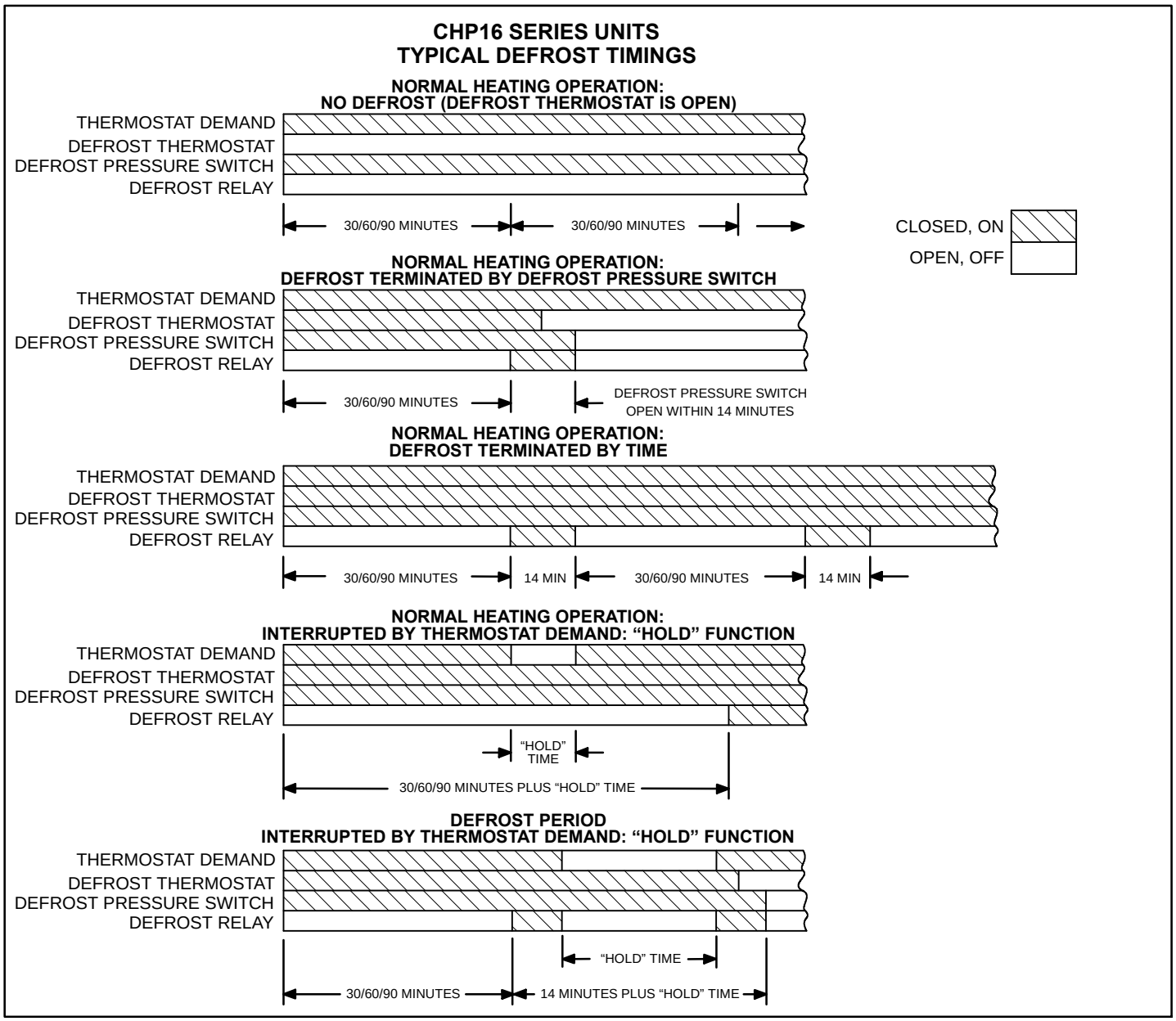


FIGURE 8

B-Cooling Components Figure 9

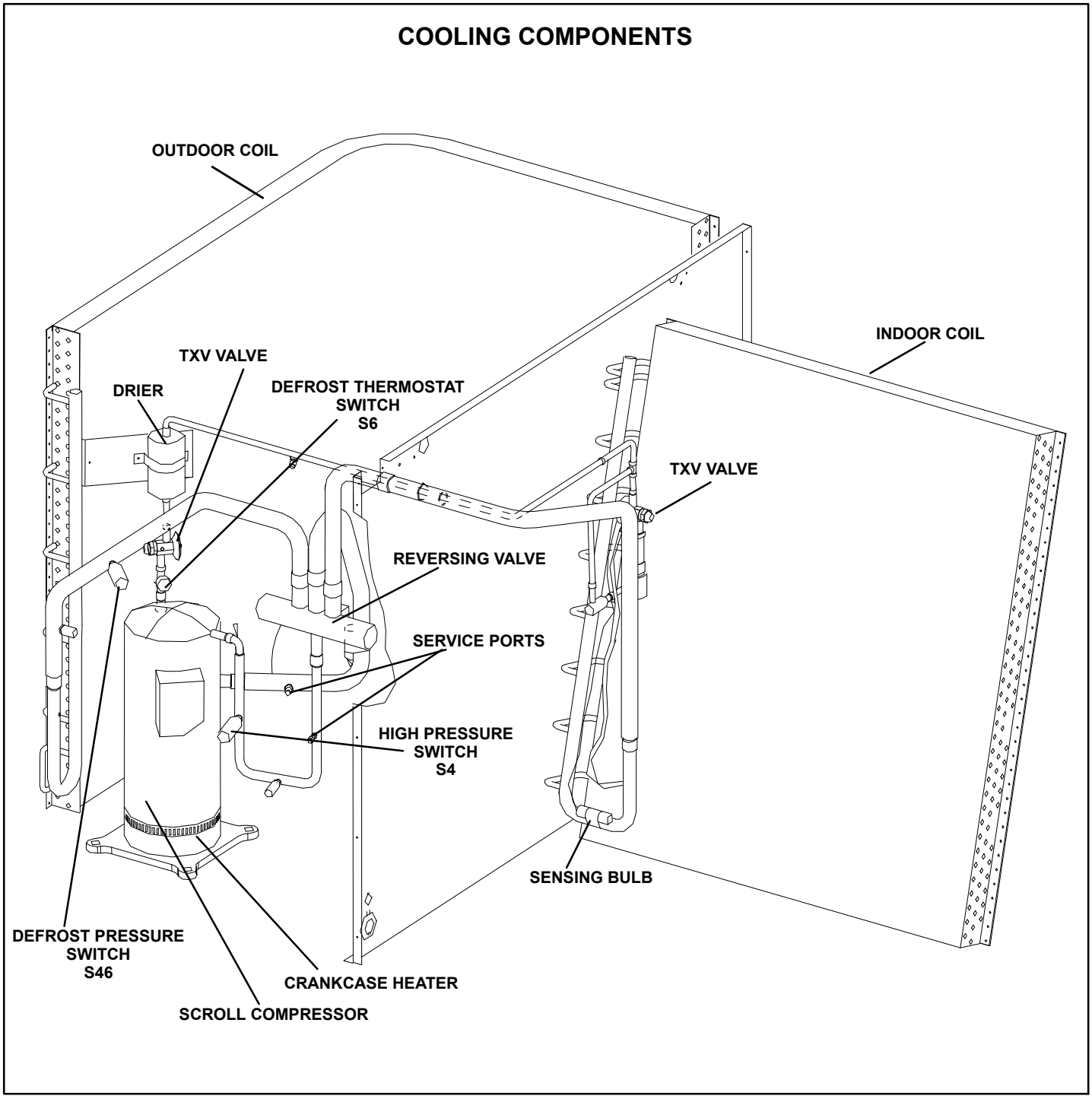


FIGURE 9

1-Scroll Compressor

⚠ DANGER

Shock hazard.
Compressor must be grounded. Do not operate without protective cover over terminals. Can cause unsafe operation, injury or death.

CHP16-072 units utilize a scroll compressor. The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 10. The scrolls are located in the top of the compressor can and the motor is located in the bottom of the compressor can. The oil level is immediately below the motor and oil is pressure fed to the moving parts of the compressor. The lower portion of the compressor shell is exposed to low side pressure while only the very top of the shell is exposed to high side pressure.

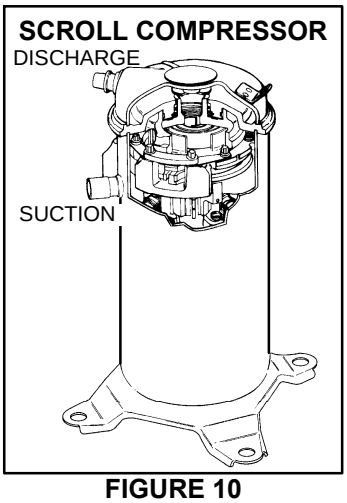


FIGURE 10

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Figure 11 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 12). One scroll remains stationary, while the other is allowed to orbit (figure 13-1). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

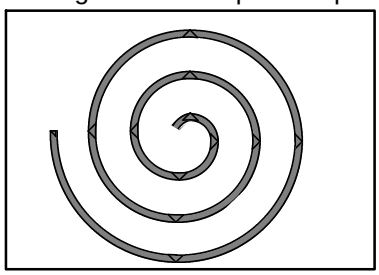


FIGURE 11

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 13-2). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 13-3). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 13-4).

When compressed gas reaches the center, it is discharged vertically into a chamber and discharge port in the top of the compressor (figure10). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 12). During a single orbit, several pockets of gas are compressed simultaneously providing smooth continuous compression.

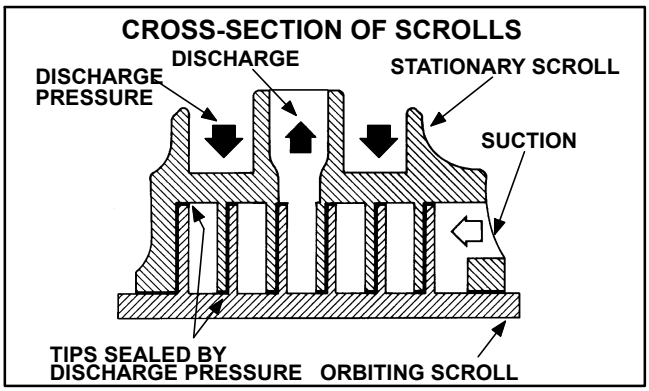


FIGURE 12

The scroll compressor is tolerant to the effects of liquid return. If liquid enters the scrolls, the orbiting scroll is allowed to separate from the stationary scroll. The liquid is worked toward the center of the scroll and is discharged. If the compressor is replaced, conventional Lennox cleanup practices must be used.

Due to its efficiency, the scroll compressor is capable of drawing a much deeper vacuum than reciprocating compressors. Deep vacuum operation can cause internal fusite arcing resulting in damaged internal parts and compressor failure. It is permissible to “pump-down” the system using the compressor but never use a scroll compressor for drawing a vacuum on the system. This type of damage can be detected and will result in denial of warranty claims.

⚠ CAUTION

The head of a scroll compressor may be hot since it is in constant contact with discharge gas.

Contact could result in serious burns.

For compressor specifications see compressor nameplate or ELECTRICAL DATA section in this manual. All compressors are protected by internal overload protection circuitry.

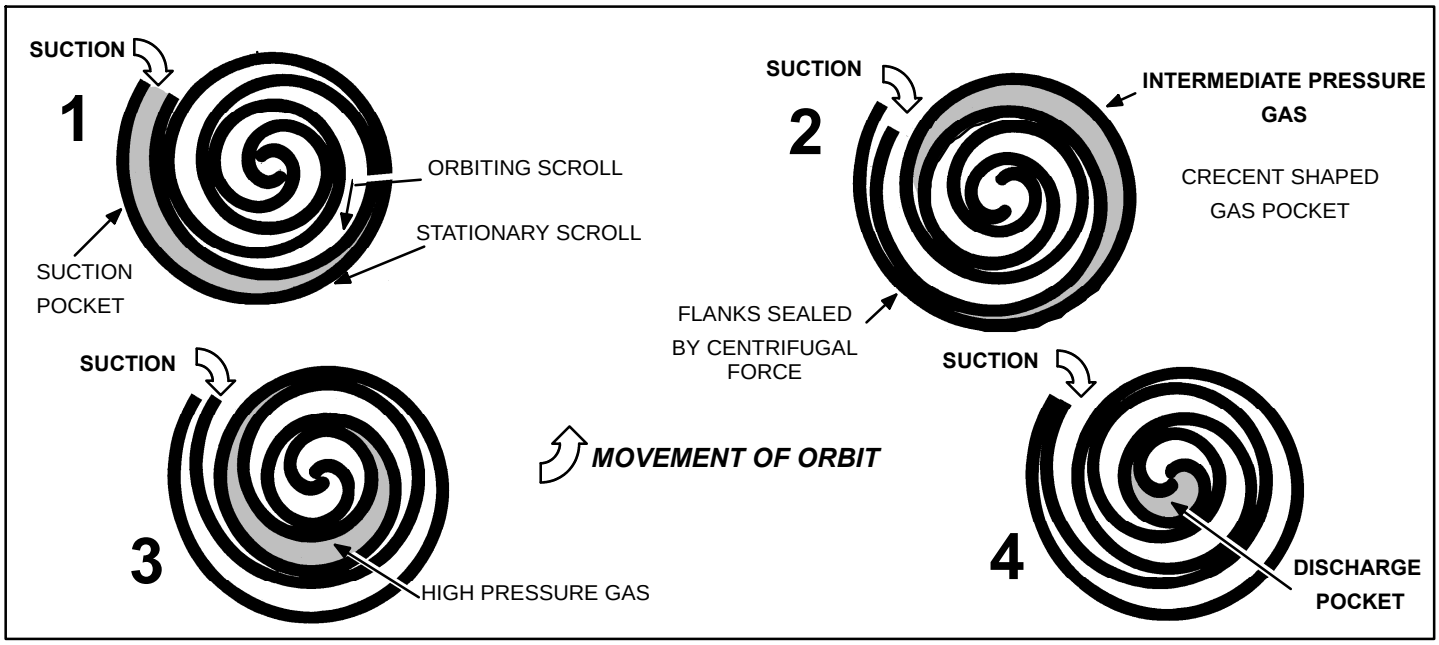


FIGURE 13

2-Indoor (evaporator) Coil

CHP16-072 units have a single slab evaporator coil. The coil has three rows of rifled copper tubes fitted with ripple-edged aluminum fins. A Thermal Expansion Valve (TXV) feeds multiple parallel circuits through the coil. See figure 14.

3-Outdoor (condenser) Coil

CHP16-072 units have a single condenser coil. Each coil has two rows of copper tubes fitted with ripple-edged aluminum enhanced fins.

4-Freezestat Switch S49

CHP16-072 units are equipped with a low temperature freezestat switch S49. S49 is wired in series with high pressure switch S4 and compressor contactor K1. S49 is a SPST N.C. auto-reset switch which opens at 29ºF ± 3 ºF (-1.7ºC ± 1.7 ºC) on temperature drop and closes at 58ºF ± 4 ºF (14.4ºC ± 2.2 ºC) on a temperature rise. To prevent coil icing, S49 opens during compressor operation to temporarily disable the compressor until the coil warms sufficiently to melt any accumulated frost.

If S49 trips frequently due to coil icing, check the unit charge, air flow and filters before allowing unit back in operation. Make sure to eliminate conditions which might promote ice build up.

5-High Pressure Switch S4

High pressure switch S4 is standard on all CHP16 model units. S4 is a manually reset SPST N.C. high pressure switch which opens on pressure rise. The switch is located on the discharge line and wired in series with compressor contactor K1. When discharge pressure rises above 410±10 psig (2825 kPa± 70 kPa) the switch opens and the compressor is de-energized (the economizer can continue to operate). After the problem has been found and corrected, the switch can be reset by pushing-in the switch button.

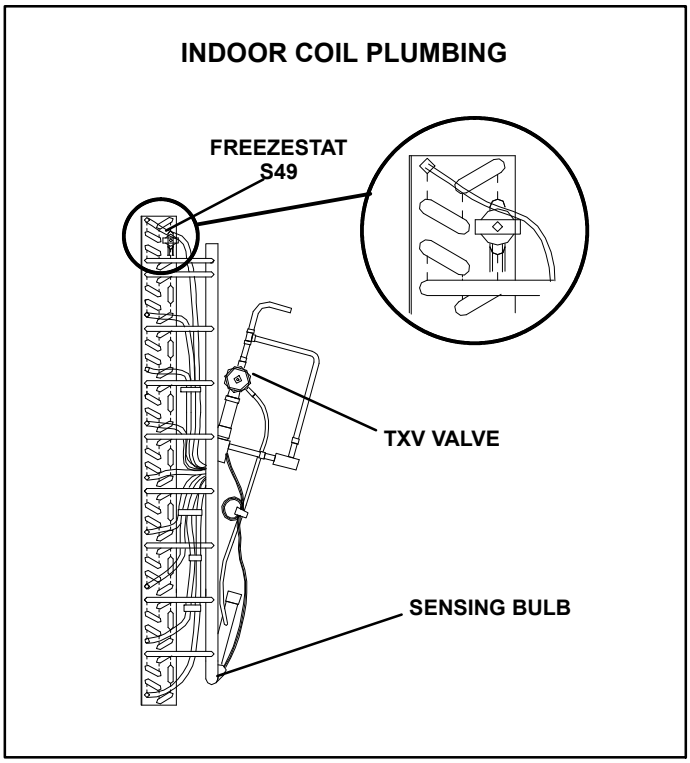


FIGURE 14

6-Reversing Valve L1

CHP16-072 units are equipped with refrigerant reversing valve L1. L1 has a 24VAC solenoid coil used to reverse refrigerant flow during unit operation. L1 is connected in the vapor line of the refrigerant circuit. Internal thermostat wiring energizes L1 during Cooling demand and de-energizes during Heating demand. When thermostat selection is out of Cooling mode L1 is de-energized.

7-Drier

All CHP16 units have a biflo filter drier located in the liquid line of each refrigerant circuit at the exit of the condenser coil. The drier removes contaminants and moisture from the system.

8-Defrost Thermostat S6

Defrost thermostat S6 works in conjunction with defrost control CMC1 to initiate defrost. The switch is a SPST N.O. thermostat located on the liquid line between the outdoor coil distributor and the outdoor coil thermal expansion valve. It remains open during normal cooling and heating operation (to prevent defrosting) and defrost timer CMC1 continues to accumulate time. When outdoor coil temperature drops below 35°F ± 4°F, the switch closes and the defrost circuit is enabled (call for defrost). If S6 is closed when CMC1 checks for defrost (every 30, 60 or 90 minutes) then defrost relay K4 is energized. S6 remains closed until liquid line temperature rises above 60°F ± 5°F.

Defrost thermostat S6 is intended only to initiate defrost. Pressure switch S46 is used to terminate defrost. Once defrost starts, contacts K4-3 close to latch-in K10 and K4. Typically S6 will open before the end of the 14 minute defrost period leaving relay K4 energized through contacts K4-3.

9-Defrost Pressure Switch S46

Defrost pressure switch S46 is a SPST N.C. pressure switch located in the compressor discharge line.

The purpose of the latch circuit is to ensure thorough defrost by forcing defrost relay K4 to terminate only when S46 is satisfied or after the 14 minute defrost time period. When discharge (head) pressure during defrost rises above 275psi ± 10psi (1896 ± 69 kPa) the switch opens. At 275psi (1896 kPa), the condensing temperature of HCFC-22 refrigerant is approximately 125°F (52°). Head pressure builds rapidly due to the outdoor fan being disabled during defrost. By the time head pressure is elevated to 275psi (1896 kPa), the condensing temperature is elevated to the point that the outdoor coil is defrosted.

If S46 opens during defrost, defrost is terminated (K4 is de-energized). S46 automatically resets (closes) when the unit resumes heating operation and discharge (head) pressure drops below 195psi ± 10psi.

10-Low Ambient Bypass Relay K58

Optional low ambient bypass relay K58 is a N.O. DPDT relay with a 24VAC coil. K58 is wired in parallel with compressor reversing valve (L1). When L1 is energized in the cooling cycle, K58 is also energized, opening K58-1. Therefore, K58-1 is always closed during heating demand bypassing S11. This allows the fan to operate during heating demand and to cycle during cooling demand.

11-Low Ambient Switch S11

Optional low ambient switch S11 is an auto-reset SPST N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. S11 is located in the liquid line prior to the indoor coil section. When liquid pressure rises to 275 ± 10 psig (1896 ± 69 kPa), the switch closes and the condenser fan is energized. When liquid pressure in the refrigerant circuit drops to 150 ± 10 psig (1034 ± 69 kPa), the switch opens and the condenser fan is de-energized. This intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the evaporator coil and losing capacity.

C-Outdoor Fan and Indoor Blower

1-Outdoor Fan B4

See specifications section of this manual for the specifications of outdoor fans used. In all CHP units. the outdoor fan is controlled by outdoor fan relay K10. In all CHP units the condenser fan is controlled by contactor K1.

2-Capacitors C1

All CHP16-072 units use single-phase PSC outdoor fan motors which requires a run capacitor. C1 is located in the control box. Ratings for capacitor will be on outdoor fan motor nameplate.

3-Blower Motor B3 & Capacitor C4

All CHP16 series units use three-phase motors with an adjustable pulley. For blower speed and static pressure see section V- OPERATION and ADJUSTMENT. See motor nameplate or ELECTRICAL DATA section for motor specifications.

II-OPTIONAL ECH16 ELECTRIC HEAT

A-Matchups and Ratings

Table 3 shows all possible CHP16 to ECH16 matchups. Also shown in the tables are ECH16 electrical ratings.

B-Electric Heat Components

ECH16 parts arrangement is shown in figure 15. All ECH16 units consist of electric heating elements exposed directly to the airstream. Elements are sequenced on and off by heat relays or contactors in response to thermostat demand.

1-Contactor K15

Contactor K15 is a three-pole double-break contactor located in the control box. All ECH16 electric heat sections are equipped with K15. K15 is equipped with a 24VAC coil which is energized when pilot relay K9 closes. When K15 is energized, the heating elements (first stage heating elements if equipped with multi-stage heater) are energized.

2-Contactor K16

Contactor K16 is also a three-pole double-break contactor located in the control box. All multiple stage ECH16 electric heat sections are equipped with K16. K16 is equipped with a 24VAC coil which is energized after time delay DL2 closes. When K16 is energized, the second stage heating elements are energized.

3-Contactor K17

Contactor K17 is also a three-pole double-break contactor located in the control box. The 40kW 208/230 units use three stage ECH16 electric heat sections, which are equipped with K17. K17 is equipped with a 24VAC coil which is energized after time delay DL2 and DL4 close in sequence. When K17 is energized, the third stage heating elements are energized.

4-Relay K9

Relay K9 is a three-pole double-throw pilot relay intended to electrically isolate the CHP16 and ECH16 24V circuits. The coil of relay K9 is connected to first stage heating demand from the CHP16. When K9 is energized, one to three sets of contacts switch, depending on the kW size and voltage of the unit. When K9-2 closes, second stage electric heat is enabled (but not energized until second stage demand is received from the thermostat). When K9-3 closes, contactor K15 is energized.

5-Relay K19

Relay K19 is a single-pole double-throw pilot relay also intended to electrically isolate the CHP16 24VAC circuits from the ECH16 24V circuits on the 40kW 208/230 units. The coil of relay K19 is connected to second-stage heating demand from the CHP16. When K19 is energized, a single set of contacts switch. When K19-1 closes, second-stage electric heat is energized.

6-Time Delay DL2

Time delay DL2 is factory installed in all multiple-stage electric heat units. DL2 allows staging by providing a timed interval between the first and second stage heating elements. The delay control is a single-pole single-throw 24VAC relay with normally open contacts. When the relay coil is energized, the contacts are delayed 30 seconds (±20%) before closing. When the relay coil is de-energized, the contacts are delayed 1 second (±20%) before opening.

7-Time Delay DL4

Time delay DL4 is identical to DL2. It is factory installed in 40kW 208/230 units and all other units which have three or more stages. DL4 allows staging by providing a timed interval between the second and third heating elements. DL4 is identical to DL2 and is energized only after time delay DL2 closes.

8-High Temperature Limit S15 (Primary)

S15 is the primary high temperature limit. It is located in the electric heat unit immediately downstream from the heating elements. S15 is a single-pole single-throw normally closed thermostat wired in series with first stage contactor coil. Temperature differential is factory set and is not adjustable.

When S15 opens, indicating a problem in the system, contactor K15 is de-energized. When K15 is de-energized, first stage and all subsequent stages of heat are de-energized. Since the indoor blower is controlled by demand (K9 remains energized), the indoor blower continues operating.

9-High Temperature Limit S20 (Secondary)

Each heating element assembly is electrically connected to two high temperature limits S20 (refer to wiring diagrams in back of this manual). Each limit is connected in series with one leg of the three-phase element assembly. The third leg of each assembly is not equipped with a limit. Three-phase operating characteristics allow one of the other two limits to protect the third leg.

Each S20 limit is physically located adjacent to element it is protecting. S20 is a single-pole single-throw normally closed thermostat. Thermostat actuates at 185° F ± 8° F (85° C ± 4.4° C) on a temperature rise and cannot be reset. Once tripped, it must be replaced.

10-Fuse F3

F3 is a current limiting fuse connected in series with each leg of electric heat (each stage of electric heat uses three fuses). Fuses used in CHP16 series heating sections are shown in table 2.

TABLE 2

CHP16 ELECTRIC HEAT SECTION FUSE RATING			
KW & Voltage	**Fuse F3 1st Stage (3 Fuses)**	**Fuse F3 2nd Stage (3 Fuses)**	**Fuse F3 3rd Stage (3 Fuses)**
10 kW 208/230v	60 Amp 250v	---	---
10kw 460v & 575v	30 Amp 600v	---	---
15kw 208/230v	60 Amp 250v	---	---
15kw 460v & 575v	30 Amp 600v	---	---
20kw 208/230v	60 Amp 250v	60 Amp 250v	---
20kw 460v & 575v	60 Amp 600v	---	---
30kw 208/230v	60 Amp 250v	30 amp 250v	---
30kw 460v & 575v	60 Amp 600v	---	---
40kw 208/230v	60 Amp 250v	60 amp 250v	60 amp 250v
40kw 460v & 575v	60 Amp 600v	30 amp 600v	---

11-Transformer T2

T2 is a line voltage to 24V transformer located in the electric heat control box of the 40kW 208/230v unit. The transformer provides 24VAC power to all ECH16 controls (contactor coils and time delays). Pilot relays (K9 and K19) plug in to the CHP16 to provide 24V circuit isolation. Transformer T2 is rated at 50VA and has a 2.5 amp internal fuse (F2).

12-Heating Elements

Heating elements are composed of helix wound bare nichrome exposed directly to the airstream. Heating elements are energized directly by contactors in the ECH16 control box. Once energized, heat transfer is instantaneous. Overtemperature protection is provided by primary and secondary high temperature limits. Overcurrent protection is provided by fuses.

Each stage of electric heat consists of three elements connected in a three-phase arrangement. Elements in 208/230V units are connected in a “Delta” arrangement. Elements in 460 and 575V units are connected in “Wye” arrangement.

PARTS ARRANGEMENT
ELECTRIC HEAT SECTION
ECH16-82-95 10, 15, 20, 30, AND 40 KW

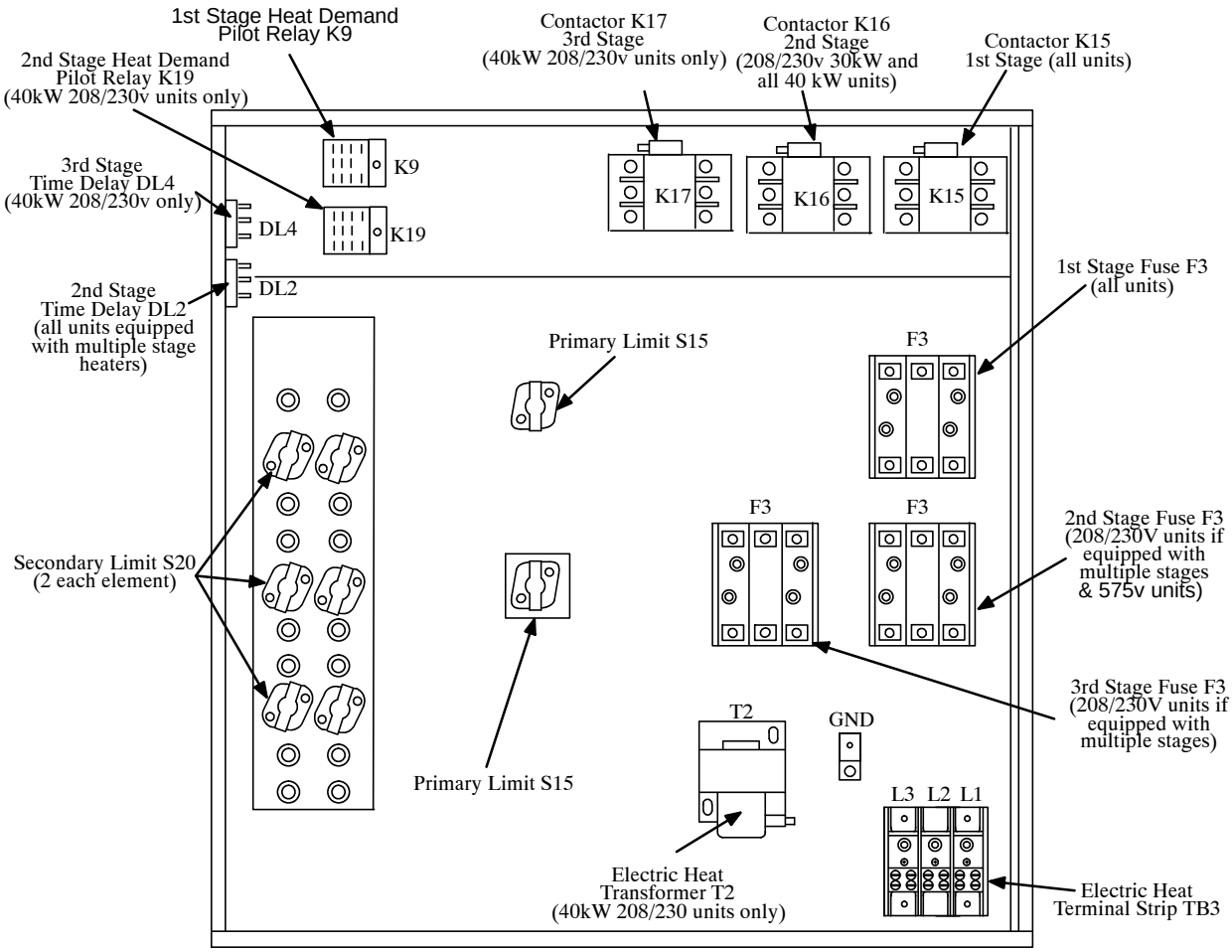


FIGURE 15

TABLE 3

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	†Total Unit & Electric Heat Minimum Circuit Ampacity
ECH16-82/95-10 208/230v **(61H68)** 460v **(61H73)** 38 lbs. (17 kg)	1	208	7.5	25,600	60
		220	8.4	28,700	64
		230	9.2	31,400	
		240	10.0	34,100	
	1	440	8.4	28,700	32
		460	9.2	31,400	
		480	10.0	34,100	
ECH16-82/95-15 208/230v **(61H69)** 460v **(61H74)** 38 lbs. (17 kg)	1	208	11.3	38,600	73
		220	12.6	43,000	79
		230	13.5	46,100	
		240	15.0	51,200	
	1	440	12.6	43,000	39
		460	13.8	46,100	
		480	15.0	51,200	
ECH16-82/95-20 208/230v **(61H70)** 460v **(61H75)** 42 lbs. (19 kg)	[1]2	208	15.0	51,200	86
		220	16.8	57,300	94
		230	18.4	62,800	
		240	20.0	68,300	
	1	440	16.8	57,300	47
		460	18.4	62,800	
		480	20.0	68,300	
ECH16-82/95-30 208/230v **(61H71)** 460v **(61H76)** 42 lbs. (19 kg)	[1]2	208	22.5	76,800	112
		220	25.2	86,000	124
		230	27.5	93,900	
		240	30.0	102,400	
	1	440	25.2	86,000	62
		460	27.6	93,900	
		480	30.0	102,400	
ECH16-82/95-40 208/230v **(61H72)** 460v **(61H77)** 53 lbs. (24 kg)	[1]3	208	30.0	102,400	139
		220	33.6	114,700	154
		230	36.8	125,600	
		240	40.0	136,500	
	[1]2	440	33.6	114,700	77
		460	36.8	125,600	
		480	40.0	136,500	

†Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F (75°C).
[1]May be used with two stage control.

III-PLACEMENT AND INSTALLATION

Make sure that the unit is installed in accordance with the installation instructions and all applicable codes. See accessories section for conditions requiring use of the optional roof mounting frame (RMF16).

IV-ELECTRICAL CONNECTIONS

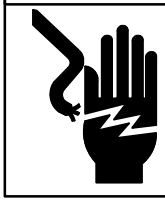
A-Field Wiring

Unit and optional thermostat field wiring is shown in the unit diagram section of this manual.

B-Power Supply

Refer to start-up directions and refer closely to the unit wiring diagram when servicing. Refer to unit nameplate for minimum circuit ampacity and maximum fuse size. 208 volt units are field wired with red wire connected to control transformer primary. 230 volt units are factory wired with orange wire connected to control transformer primary.

⚠ DANGER



Remove all power to disconnect before servicing.

Electrical shock resulting in death or injury may result if power is not disconnected.

V-INDOOR BLOWER OPERATION / ADJUSTMENT

A-Blower Operation

1- Blower operation is manually set at the thermostat subbase fan switch. When fan switch is in “On” position, blower operates continuously.

2- When fan switch is in “Auto” position, blower will cycle with demand. Blowers and entire unit will be off when system switch is in “Off” position.

To Measure Discharge Static Pressure:

a-Measure tap locations (figure 16).

b-Punch a 1/4” diameter hole. Insert manometer hose flush with the inside edge of hole or insulation. Seal around hole with Permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. Connect other end of manometer to the return duct as above.

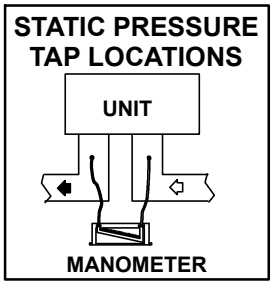


FIGURE 16

c-With only the blower motor running, observe the manometer reading.

d-Seal around the hole when check is complete.

3- The CFM can be adjusted by changing the belt tension. See figure 17. Follow the blower speed change instructions below.

B-Blower Belt Adjustment

NOTE - Remove shipping screw from top of motor mounting plate.

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belt after a 24-48 hour period of operation. This will allow belt to stretch and seat grooves. To increase belt tension, loosen locking bolt and pull mounting plate. Tighten bolt so that the motor mounting plate is in a vertical position. See figure 17.

D-Check Belt Tension

Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

1- Measure span length X. See figure 18.

2- Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length.

Example: Deflection distance of a 40" span would be 40/64" or 5/8".

Example: Deflection distance of a 400mm span would be 6mm.

3- Measure belt deflection force. For a used belt, the deflection force should be 5 lbs. (35kPa). A new belt deflection force should be 7 lbs. (48kPa).

A force below these values indicates and undertensioned belt. A force above these values indicates an overtensioned belt.

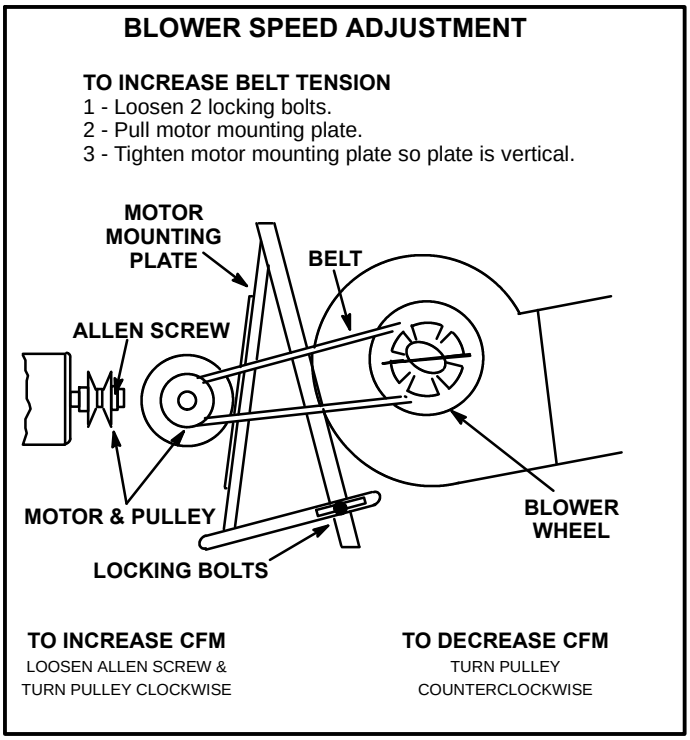


FIGURE 17

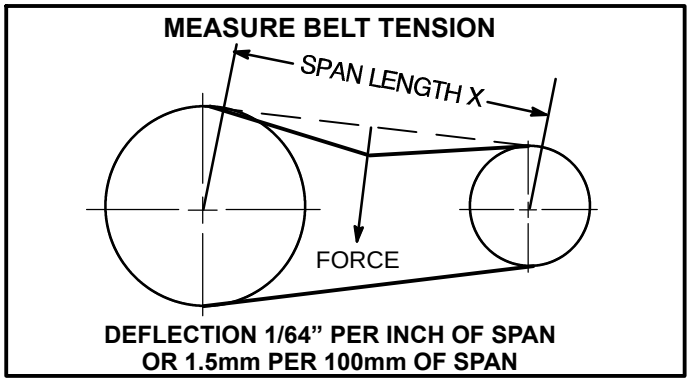


FIGURE 18

VI-START-UP - OPERATION

A-Crankcase Heaters

Crankcase heaters must be energized for 24 hours before attempting to start compressors. Set thermostat so there is no demand to prevent compressor from cycling. Apply power to unit.

B-Preliminary Check

1- Make sure that unit is installed in accordance with the installation instructions and applicable codes.

2- Inspect all electrical wiring, both field and factory installed, for loose connections. Tighten as required.

3- Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.

4- Check voltage at disconnect switch. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.

5- Make sure filters are in place before start-up.

C-Cooling Start-Up

1- Set fan switch to **AUTO** or **ON** and move system selection switch to cool. Adjust thermostat to a setting below room temperature to bring on compressor. Compressor will start and cycle on first-stage demand from thermostat.

Units With Optional Economizer -
The optional economizer will start on a first-stage cooling demand when outdoor air enthalpy is suitable. A second-stage cooling demand will energize the compressor.

2- Each refrigerant circuit is separately charged with R-22 refrigerant. See unit rating plate for correct amount of charge.

D-Three Phase Scroll Compressor Voltage Phasing

Three phase scroll compressors must be phased sequentially to ensure correct compressor and blower rotation and operation. Compressor and blower are wired in phase at the factory. Power wires are color-coded as follows: line 1-red, line 2-yellow, line 3-blue.

1- Observe suction and discharge pressures and blower rotation on unit start-up.

2- Suction pressure must drop, discharge pressure must rise, and blower rotation must match rotation marking.

If pressure differential is not observed or blower rotation is not correct:

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of S48 disconnect or TB13 terminal strip. Do not reverse wires at blower contactor.

5- Make sure the connections are tight.

Discharge and suction pressures should operate at their normal start-up ranges.

E-Heating Start-Up

1- Set thermostat or temperature control device to initiate a first-stage heating demand.

A first-stage heating demand (W1) will energize compressor 1. Outdoor fan is energized with a W1 demand.

Units With Optional Electric Heat -
An increased heating demand (W2) will energize electric heat.

VII-COOLING SYSTEM SERVICE CHECKS

A-Gauge Manifold Attachment

Service gauge ports are identified in figure 9. Attach gauge manifold high pressure line to liquid line gauge port. Attach gauge manifold low pressure line to suction line gauge port.

IMPORTANT - The crankcase heaters must be energized for 24 hours before attempting to start compressors. Set thermostat so there is no demand to prevent compressors from cycling. Apply power to unit.

B-Refrigerant Charge and Check

WARNING-Do not exceed nameplate charge under any conditions.
This unit is factory charged and should require no further adjustment. If the system requires charge, *reclaim the charge, evacuate the system,* and *add required nameplate charge.*

NOTE - System charging is not recommended below 60°F (15°C). In temperatures below 60°F (15°C), the charge ***must*** *be weighed into the system.*

If weighing facilities are not available, or to check the charge, use the following procedure:

1- Attach gauge manifolds and operate unit in cooling mode until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.

2- Use a thermometer to accurately measure the outdoor ambient temperature.

3- Apply the outdoor temperature to table 1 to determine normal operating pressures.

TABLE 1
CHP16-072 NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp - °F (°C)	DIscharge ±10 psig (kPa)	Suction ±5 psig (kPa)
65 (18)	172 (1186)	72 (496)
75 (24)	204 (1407)	74 (510)
85 (29)	236 (1627)	76 (524)
95 (35)	270 (1862)	78 (538)
105 (41)	302 (2082)	80 (552)
115 (46)	334 (2303)	82 (565)

4- Compare the normal operating pressures to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. **Correct any system problems before proceeding.**

5- If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.

- Add or remove charge in increments.
- Allow the system to stabilize each time refrigerant is added or removed.

6- Use the following approach method along with the normal operating pressures to confirm readings.

Charge Verification - Approach Method

1- Using the same thermometer, compare liquid temperature (measured in the compressor compartment) to outdoor ambient temperature.

Approach Temperature = Liquid temperature minus ambient temperature.

2- **Approach temperature should be 11°F ± 1 (6°C ± 0.5).** An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

3- Do not use the approach method if system pressures do not match pressures shown. The approach method is not valid for grossly over or undercharged systems.

VIII-ACCESSORIES

This section describes the application of most of the optional accessories which can be connected to the CHP16.

1-RMF16 Mounting Frame

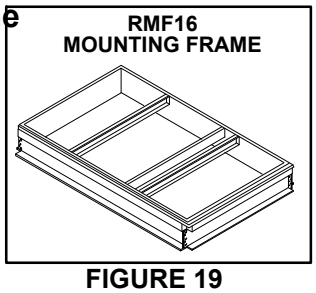


FIGURE 19

When installing a CHP16-072 unit on a combustible surface for downflow discharge applications, RMF16 roof mounting (figure 19) frame is required. Otherwise, the RMF16 is recommended but not required. The CHP16, if not mounted on a flat (roof) surface, MUST be supported under all edges and under the middle of the unit to prevent sagging. The CHP16 **MUST** be mounted level within 1/16" per linear foot in any direction.

The assembled RMF16 mounting frame is shown in figure 19. Refer to the RMF16 installation instructions for details of proper assembly and mounting. The roof mounting frame MUST be squared to the roof before mounting. Plenum system MUST be installed before the unit is set on the mounting frame. Refer to the RMF16 installation instructions for proper plenum construction.

Many types of roof framing or supports can be used to mount the CHP16 unit, depending upon different roof structures.

2-Economizers

a-REMD16M Downflow Economizer

The REMD16M economizers are designed for use with standard (downflow) CHP16s. The economizer opens a set of dampers to allow 0 to 100 percent outdoor air to be used for cooling when outdoor humidity and temperature are acceptable. Additional (2nd stage) cooling demand is directed to the compressor while the dampers remain open. If outdoor air becomes unacceptable, the outdoor air dampers close to a predetermined minimum position while the compressor cooling circuit cycles as needed.

Refer to the REMD16M-09 Installation Instruction Manual for specific details regarding installation. Refer to the sequence of operation flowcharts (in back of this manual) for detailed operation of the economizer.

b-EMDH16M Horizontal Economizer

The EMDH16M economizer operates like the REMD16M except it is designed for CHP16 units requiring horizontal discharge and return air. Internal components and operation of the horizontal economizer are identical to the downflow economizer.

Refer to the EMDH16M-09 Installation Instruction Manual for specific details regarding installation.

c-Economizer Operation

Enthalpy Control: Setpoint Control

The key to economizer operation is the enthalpy control. The enthalpy control senses total heat content in outside air (temperature plus humidity) and uses that information to control the amount of outside air brought into the system. When the outside air enthalpy is below the control setpoint, the control actuates a motor which in turn adjusts outdoor dampers to meet cooling demands of the building. When the heat content rises above control setpoint, the control de-activates and dampers close to preset minimum (not closed) position.

Two types of adjustment may be made at the control. The first is the control setpoint. The setpoint determines the temperature and humidity conditions at which the outdoor air dampers will open and close. The recommended setpoint is "A." If the economizer is allowing air which is too warm or too humid into the system, the control may be changed to a lower setpoint (B,C or D). Refer to enthalpy chart figure 20.

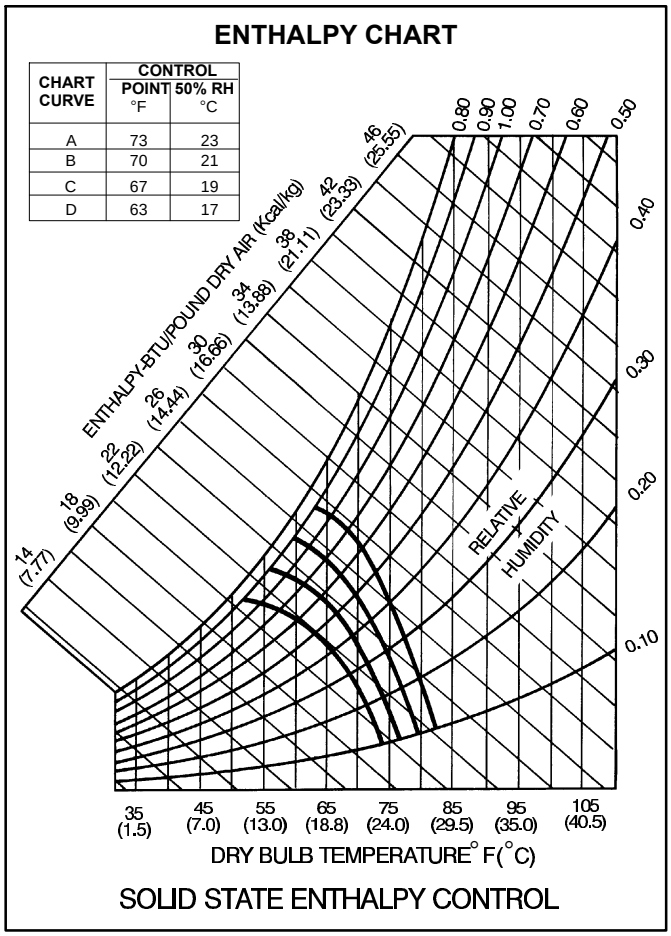


FIGURE 20

Example:

If the enthalpy control is set at setpoint "A" as shown in figure 20, the following situation could occur. A cooling demand when the outside air is at 75° and 20 percent humidity would drive the economizer outdoor air dampers open to utilize outdoor air for cooling. The compressor cooling circuit would be disabled. However, if the outdoor air should change to 70°F (a drop in temperature) and 70 percent humidity (a dramatic rise in humidity), the "total heat content" of the outdoor air would rise above the enthalpy control setpoint and de-activate the damper motor to the preset minimum position. If cooling demand is still present when the total heat of the outside air rises above the control setpoint, cooling demand is routed from the economizer to the compressor cooling circuit.

Minimum Positioner

The second type of adjustment which may be made at the control is the minimum position of the outdoor damper blades. Each economizer has a minimum positioner switch (potentiometer) which allows the outdoor dampers to be adjusted to a preset minimum position. This allows a preset amount of air exchange at all times during unit operation. When unit operation stops, the dampers drive fully closed. The potentiometer is located on the enthalpy control face (modulating economizer) or on the damper motor (three position economizer).

Enthalpy Sensor

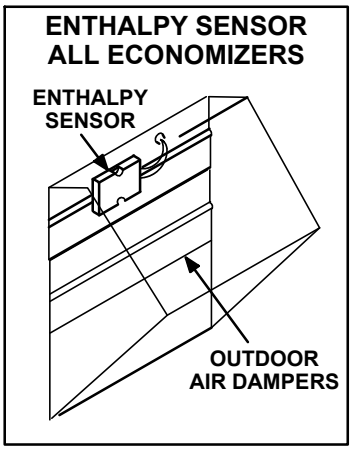


FIGURE 21

The enthalpy sensor is located on the outside portion of the outdoor damper blades (as shown in figure 21). The sensor monitors the total heat content of the outdoor air (temperature plus humidity) and sends the information to the enthalpy control. The enthalpy control uses the information to determine if outdoor air can be used for cooling.

Mixed Air Sensor

The sensor measures the resultant temperature of the mixed air downstream of the evaporator coil. The mixed air temperature is used by the enthalpy control when outdoor dampers are open to help determine whether outdoor air dampers should close. Modulating economizers are equipped with a single mixed air sensor.

The mixed air sensor (bulb) is located in the supply air stream. The sensor (modulating economizer) fits through a factory supplied hole in the panel dividing the unit return and supply air (see figure 22).

Night Relay

Optional night relay must be added to economizer when night setback functions are desired with W973 or electromechanical control systems. Kit includes a DPDT relay which is hard-wired to the economizer harness.

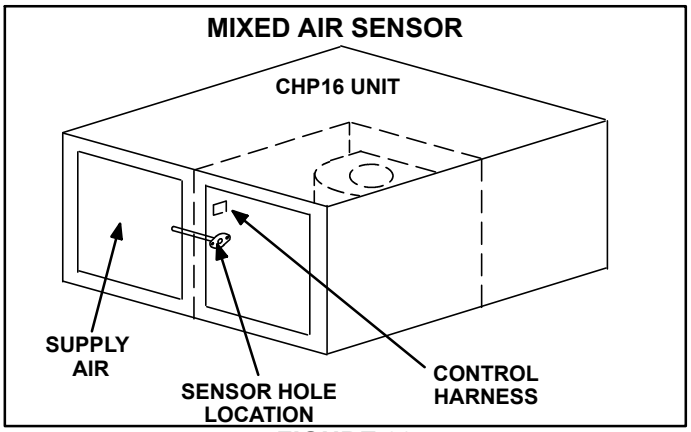


FIGURE 22

Warm Up Kit

An optional warm up kit may be added to either REMD16M or EMDH16M economizer (except CHP16 units using a Honeywell T7300 Control System). The Warm Up Kit holds the dampers closed during night setback and morning warm up. When the first thermostat demand of the day is satisfied, the warm up kit opens the outdoor dampers to minimum position. The warm up kit mounts to the CHP16 in the control mounting area of the blower compartment. The kit plugs into the unit wiring harness inline between the unit and the economizer.

3-Condenser Coil Guard Kit

Optional condenser coil guard kit is available for all units. The kit includes PVC coated steel wire coil guard which is field installed. OPTIONAL ACCESSORIES (see table of contents) show guard quantity per unit.

4-Timed-Off Control Kit

Optional field installed timed-off controls prevent the CHP16 compressor from short cycling. After a thermostat demand, automatic reset timed-off control keeps compressor off for 3-7 minutes.

NOTE - Some electronic thermostats have built in time delay. Field installed time delay is not needed.

5-Low Ambient Kit

The optional low ambient kit (figure 23) allows for mechanical cooling operation at low outdoor temperature.

Low ambient pressure switch is wired in series with the condenser fan L1 lead. Refer to low ambient kit installation instruction manual for detailed installation instructions.

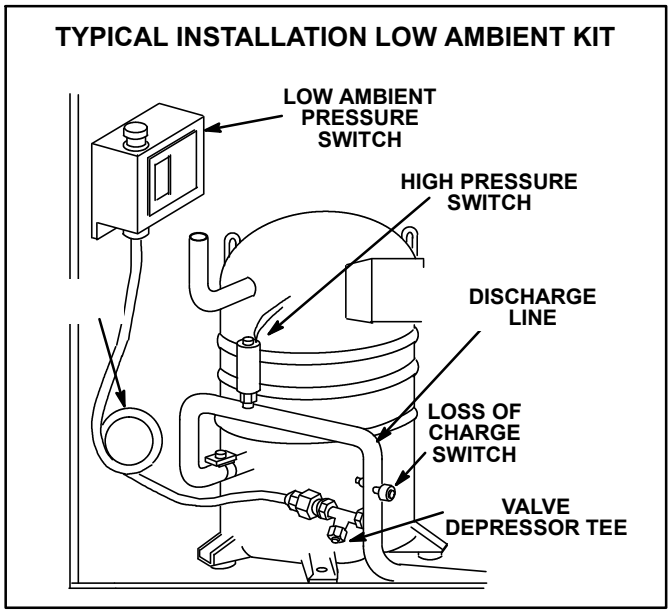


FIGURE 23

The low ambient pressure switch cycles the condenser fan while allowing normal compressor operation. This intermittent fan operation results in a high evaporating temperature which allows the system to operate without icing the evaporator coil and losing capacity.

Adjustment:

The low ambient pressure switch is adjustable but the adjustment knob *does not* adjust CUT-IN points. CUT-IN point is fixed and cannot be adjusted. The scale on the switch measures the difference in pressure between preset CUT-IN and adjustable CUT-OUT points. Adjustment knob changes CUT-OUT point by adjusting the DIFFERENCE between CUT-IN and CUT-OUT.

The low ambient pressure switch is factory set to CUT-IN at 285psig with a difference of 145 psig (CUT-OUT at 140psig). Adjustment should not be needed. If adjustment is needed, adjust the switch as follows:

1- Loosen knob securing screw to allow knob stop to pass over fixed stop on control (see figure 24).

DIFFERENCE (set by knob) = CUT-IN POINT (fixed) minus CUT-OUT POINT

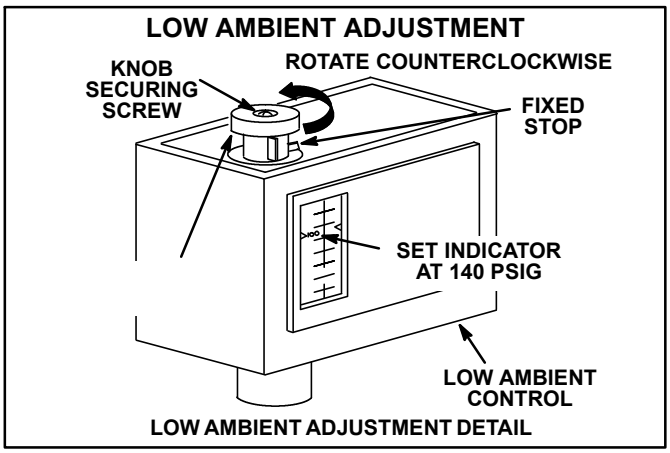


FIGURE 24

To find CUT-OUT point, re-arrange the equation so that:

CUT-OUT = CUT-IN minus the DIFFERENCE.

2- Rotate the knob as needed to set the difference indicator at 145psig (1000kPa).

3- Tighten the securing screw after adjusting.

6-Transitions

Optional supply/return transitions SRT16 are available for use with downflow CHP16s utilizing the optional RMF16 roof mounting frame. The transition must be installed in the RMF16 mounting frame before mounting the CHP16 to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

7-Supply and Return Diffusers

Optional flush mount diffuser/return FD11-95 and extended mount diffuser/return RTD11-95 are available for use with the CHP16. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

8-Filter Switch Kit

An air filter switch kit is available for use with SP11 and SSP11. The switch is activated by high negative pressure in the blower compartment caused by dirty air filters or other restrictions. When high negative pressure causes the switch to close, power is routed to the red "FILTER" light in the status panel indicating a dirty filter.

IX-MAINTENANCE

⚠WARNING

Product contains fiberglass wool.

Disturbing the insulation in this product during installation, maintenance, or repair will expose you to fiberglass wool. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)

Fiberglass wool may also cause respiratory, skin, and eye irritation.

To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown below, or contact your supervisor.

P.O. Box 799900
Dallas, TX 75379-9900

Units should be inspected yearly by a qualified service technician.

A-Lubrication

All motor bearings are prelubricated. No further lubrication is required.

B-Filters

Unit is equipped with four 16 X 20 X 2" (406 X 508 X 51mm) pleated throw-away type filters. Filters should be checked and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters.

NOTE-Filters must be U.L.C. certified or equivalent for use in Canada.

F-Indoor Coil

Inspect and clean coil at beginning of each cooling and heating season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

G-Outdoor Coil

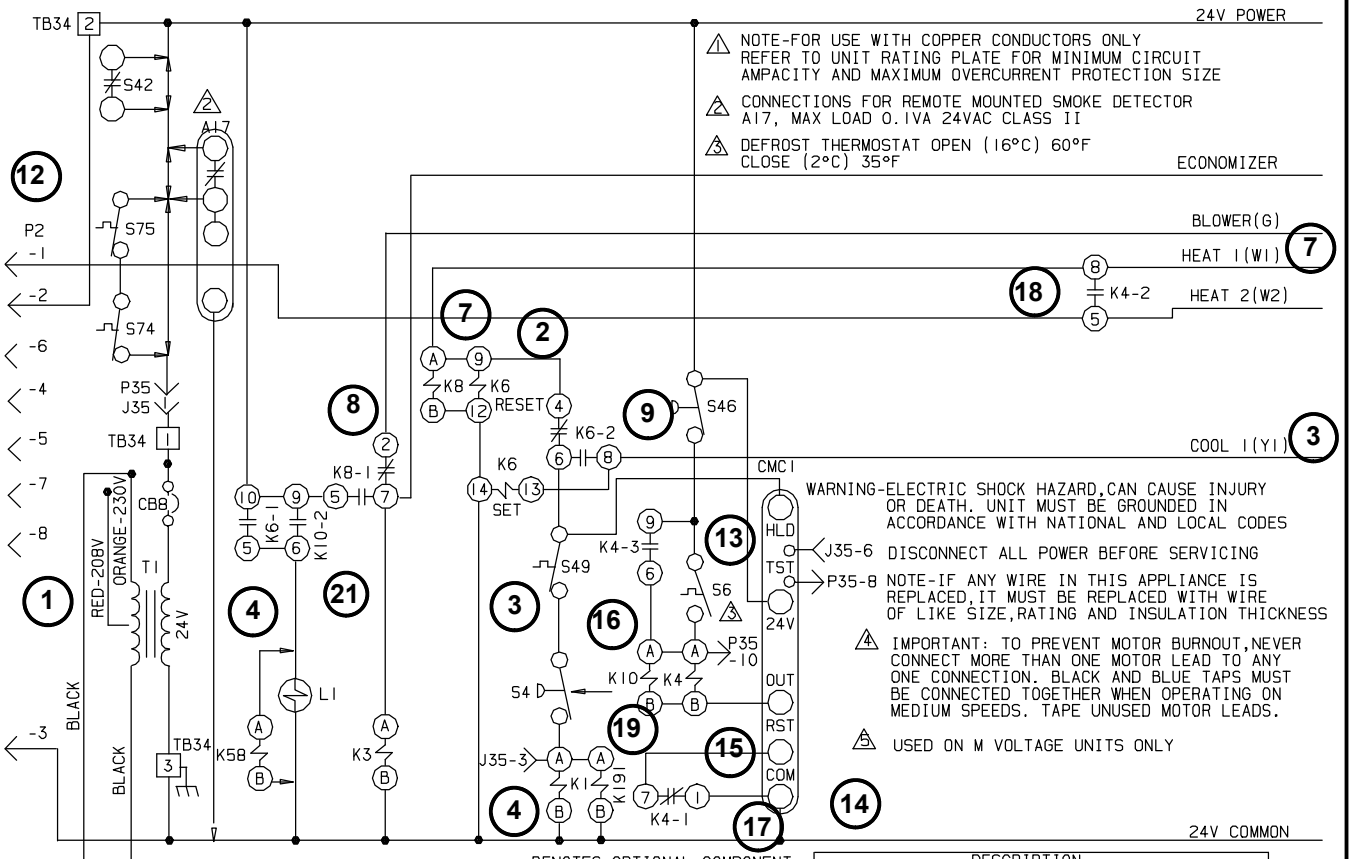
Clean outdoor coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season.

H-Supply Air Blower Wheel

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.

X-Wiring Diagrams and Operation Sequence

CHP16-072 WIRING DIAGRAM



DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 2)
B1	COMPRESSOR
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
C1	CAPACITOR-OUTDOOR FAN
CB8	CIRCUIT BREAKER-TRANSFORMER T1
CMC1	TIMER-DEFROST
HR1	HEATER-COMPRESSOR
J35	JACK-TEST
K1,-1	CONTACTOR-COMPRESSOR
K3,-1,2	CONTACTOR-BLOWER
K4,-1,2,3	RELAY-DEFROST
K6,-1,2	RELAY-LATCH
K8,-1	RELAY-TRANSFER
K10,-1,2	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K191,-1	RELAY-CRANKCASE HEATER
L1	VALVE-REVERSING
P2	PLUG-ELECTRIC HEAT
P35	PLUG-TEST
P38	PLUG-MOTOR SPEED CHANGE
P43	PLUG-BLOWER MOTOR
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	THERMOSTAT-DEFROST
S11	SWITCH-LOW PRESS,LOW AMB KIT
S42	OVERLOAD-RELAY,BLOWER MOTOR
S46	SWITCH-PRESSURE, DEFROST
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB34	TERMINAL STRIP-GROUND

WIRING DIAGRAM	11/00
HEAT PUMPS-PACKAGED	
CHP16-072-1-G,J,M,Y	
HEAT PUMP SECTION B28	
Supersedes Form No.	New Form No. 533,504W

CHP16-072 SEQUENCE OF OPERATION

Operation Sequence
Cooling:

1- Line voltage energizes transformer T1. Transformer T1 provides 24VAC power to all unit controls and thermostat.

2- Latch relay K6 controls operation of reversing valve L1 during normal operation (contacts K10-2 control reversing valve during defrost). Latch relay K6 operates as follows:

a- 24VAC from Y1 cooling demand applied to K6 "SET" coil closes K6-1 and switches K6-2 (terminals 6-8 close and 6-4 open). Terminals 6 and 8 remains closed when power is removed.

b- 24VAC from W1 heating demand applied to K6 "RESET" coil opens K6-1 and switches K6-2 (terminals 6-8 open and 6-4 close). K6-1 and K6-2 remain in this position when power is removed.

3- Cooling demand energizes Y1 and G in the thermostat. Y1 energizes K6 relay "SET" coil. K6-1 and K6-2 immediately switch. G energizes indoor blower relay K3.

4- When K6-1 closes, reversing valve L1 is energized. When K6-2 switches (terminals 6-8 close), contactor K1 and defrost control CMC1 are energized.

5- K1-1 closes to energize compressor and the condenser fan.

6- K3-1 switches to energize the blower on high speed. K3-2 switches to power the economizer (if equipped). Dampers open to minimum position.

Heating:

7- 1st. stage heating demand energizes W1 in the thermostat. W1 energizes transfer relay K8 and K6 relay "RESET" coil. K6-1, K6-2 and K8-1 all switch immediately.

8- When K8-1 switches indoor blower relay K3 is energized.

9- When K6-1 opens, reversing valve L1 is de-energized. When K6-2 switches (terminals 6-8 open and 6-4 close), compressor contactor K1 and de-frost board CMC1 are energized.

10- K1-1 closes to energize the compressor and condenser fan.

11- K3-1 switches to energize the blower on high speed. K3-2 switches to power the economizer (if equipped). Dampers open to minimum position.

12- Additional heating demand W2 is directed to optional electric heat (not shown).

Defrost Mode:

13- During heating operation, when outdoor coil temperature drops below 35ºF± 4ºF, the defrost thermostat closes.

14- After 30, 60 or 90 minutes of heating demand (depending on how the control is pre-set) CMC1 checks for defrost demand by closing a set of relay contacts connected to terminal OUT. Terminal OUT remains enabled for 14±1 minutes. If defrost temperature thermostat S6 is closed when terminal OUT is enabled, defrost relay K4 and outdoor fan relay K10 are allowed to energize and defrost begins.

15- When K4 energizes, K4-1 opens and K4-2 and K4-3 close.

16- When K10 energizes, K10-1 and K10-2, immediately switch.

17- When K4-1 opens internal timer is reset to zero.

18- When K4-2 closes, W1 is shunted to W2 to energize optional electric heat.

19- When K4-3 closes, defrost relay K4 and outdoor fan relay K10 are latched in until defrost terminates.

20- When K10-1 opens, the outdoor fan is de-energized.

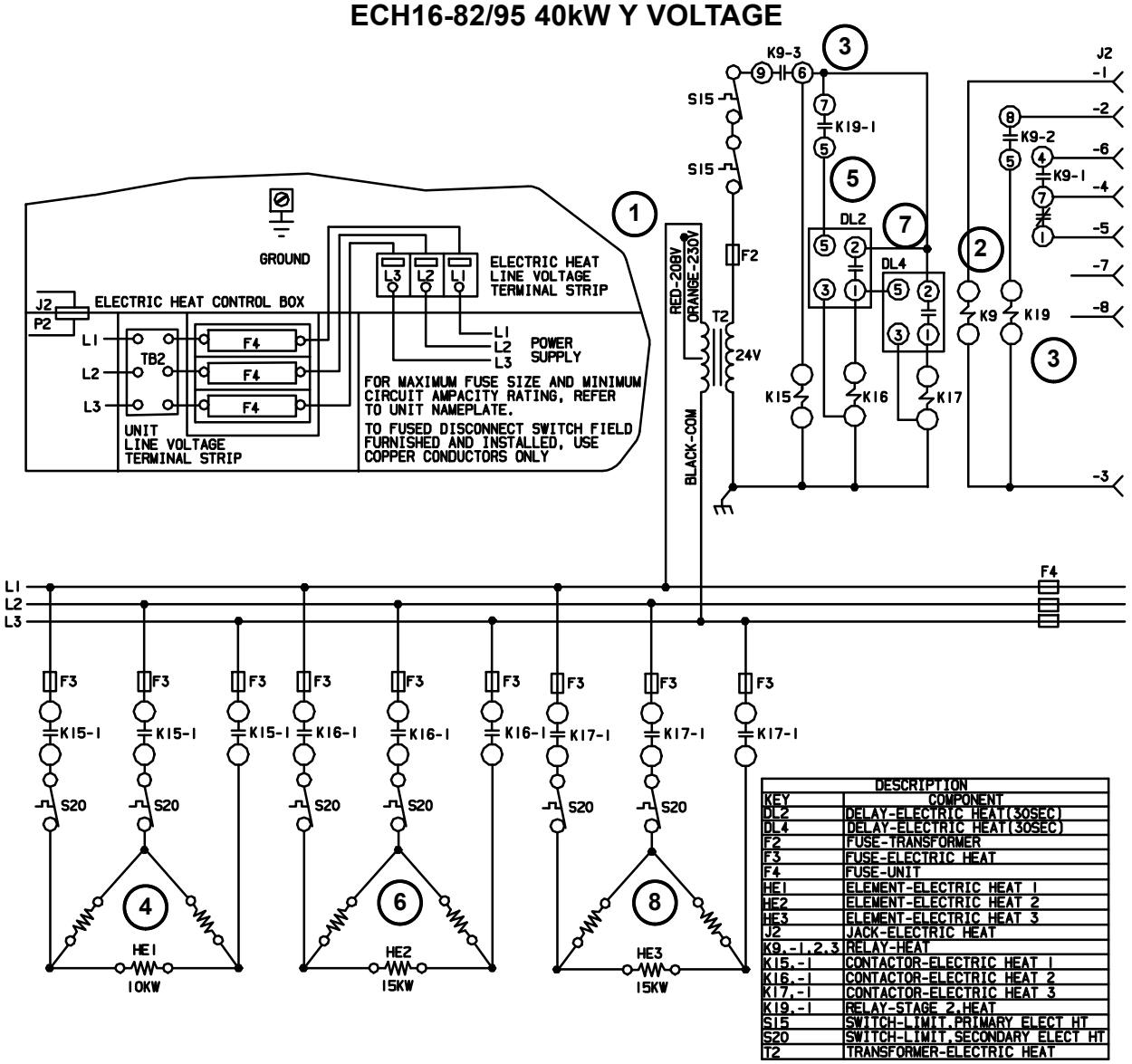
21- When K10-2 switches, reversing valve L1 is energized.

22- Defrost is terminated when relay K4 loses power. K4 can lose power two ways.

1) If defrost is not satisfied after 14±1 minutes, CMC1 (terminal OUT) internal relay contacts open, K4 is de-energized and defrost is terminated.

2) If S46 opens before 14 minutes has elapsed, K4 and K10 are de-energized and defrost is terminated.

ECH16-82/95 40kW Y VOLTAGE



DESCRIPTION	
KEY	COMPONENT
DL2	DELAY-ELECTRIC HEAT(30SEC)
DL4	DELAY-ELECTRIC HEAT(30SEC)
F2	FUSE-TRANSFORMER
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
J2	JACK-ELECTRIC HEAT
K9.-1,2,3	RELAY-HEAT
K15.-1	CONTACTOR-ELECTRIC HEAT 1
K16.-1	CONTACTOR-ELECTRIC HEAT 2
K17.-1	CONTACTOR-ELECTRIC HEAT 3
K19.-1	RELAY-STAGE 2 HEAT
S15	SWITCH-LIMIT,PRIMARY ELECT HT
S20	SWITCH-LIMIT,SECONDARY ELECT HT
T2	TRANSFORMER-ELECTRIC HEAT

WIRING DIAGRAM	4/99
HEATING-ELECTRIC	
ECH16-82/95-40-1,2-Y ECH16-135-40-1,2,3-Y	
HEATING SECTION A3	
Supersedes Form No. 528,315W	New Form No. 529,230W

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1- Control voltage in this heater is supplied by a separate transformer T2 which is powered at all times.

2- 2nd stage heating demand closes W2. W2 energizes relay K9.

3- When K9-1 switches, nothing happens as indoor blower contactor K3 and indoor blower are already energized. When K9-2 closes, relay K19 is energized. When K9-3 closes, voltage passes through primary limits S15 to energize contactor K15.

4- When K15-1 closes, heating elements HE1 are ener gized. All elements are arranged in a “Delta” configu ration for 208/230V operation.

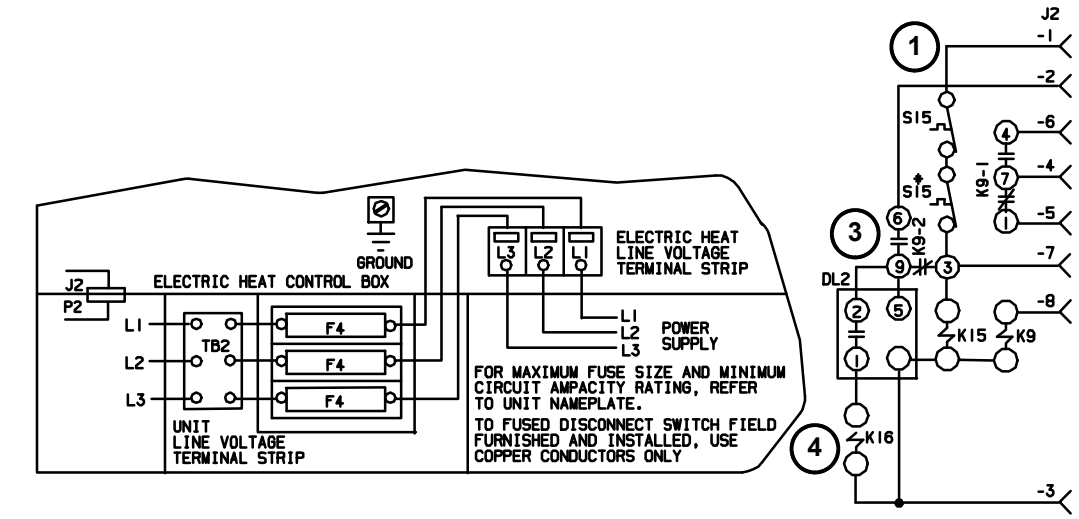
5- When K19-1 switches, time delay DL2 is energized. DL2 closes 30 seconds later to energize contactor K16 and time delay DL4.

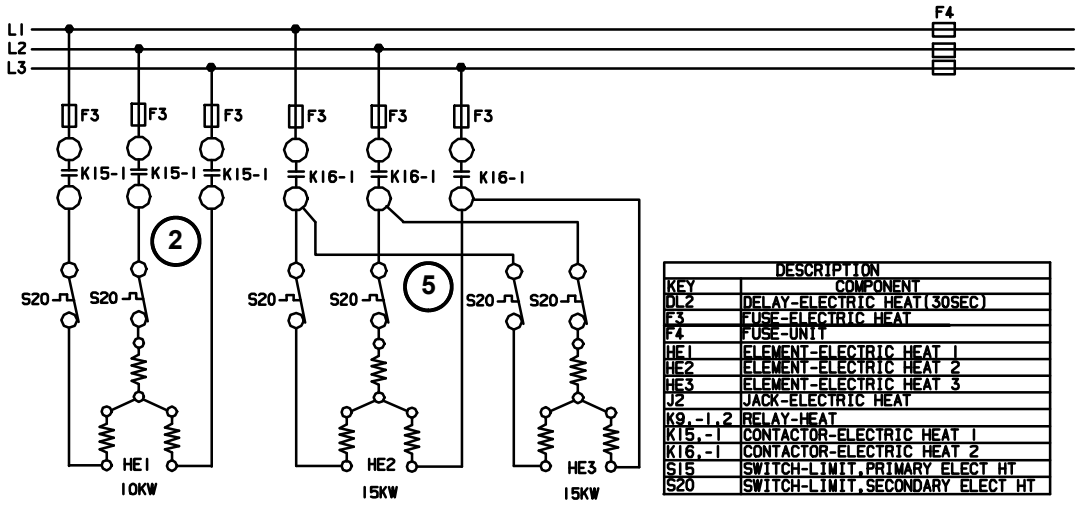
6- When K16-1 closes heating elements HE2 are ener gized,

7- DL4 closes after 30 seconds to energize contactor K17 is energized.

8- When K17-1 closes, heating elements HE3 are ener gized.

ECH16-82/95 40kW G, J VOLTAGE





DESCRIPTION	
KEY	COMPONENT
DL2	DELAY-ELECTRIC HEAT(30SEC)
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
J2	JACK-ELECTRIC HEAT
K9,-1,2	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
K16,-1	CONTACTOR-ELECTRIC HEAT 2
S15	SWITCH-LIMIT,PRIMARY ELECT HT
S20	SWITCH-LIMIT,SECONDARY ELECT HT

* USED ON -95 AND 090 UNITS ONLY

WIRING DIAGRAM	4/99
HEATING-ELECTRIC	
ECH16-82/95-40-1,2-G,J ECH16-135-40-1,2,3-G,J	
HEATING SECTION A7	
Supersedes Form No. 528,319W	New Form No. 529,234W

 Litho U.S.A.

Operation Sequence: A7 and B1 Sections

1- 2nd stage heating demand closes W2. W2 passes through primary limits S15 to energize contactor K15 and relay K9. K15-1 contacts close and K9-1 and K9-2 both switch.

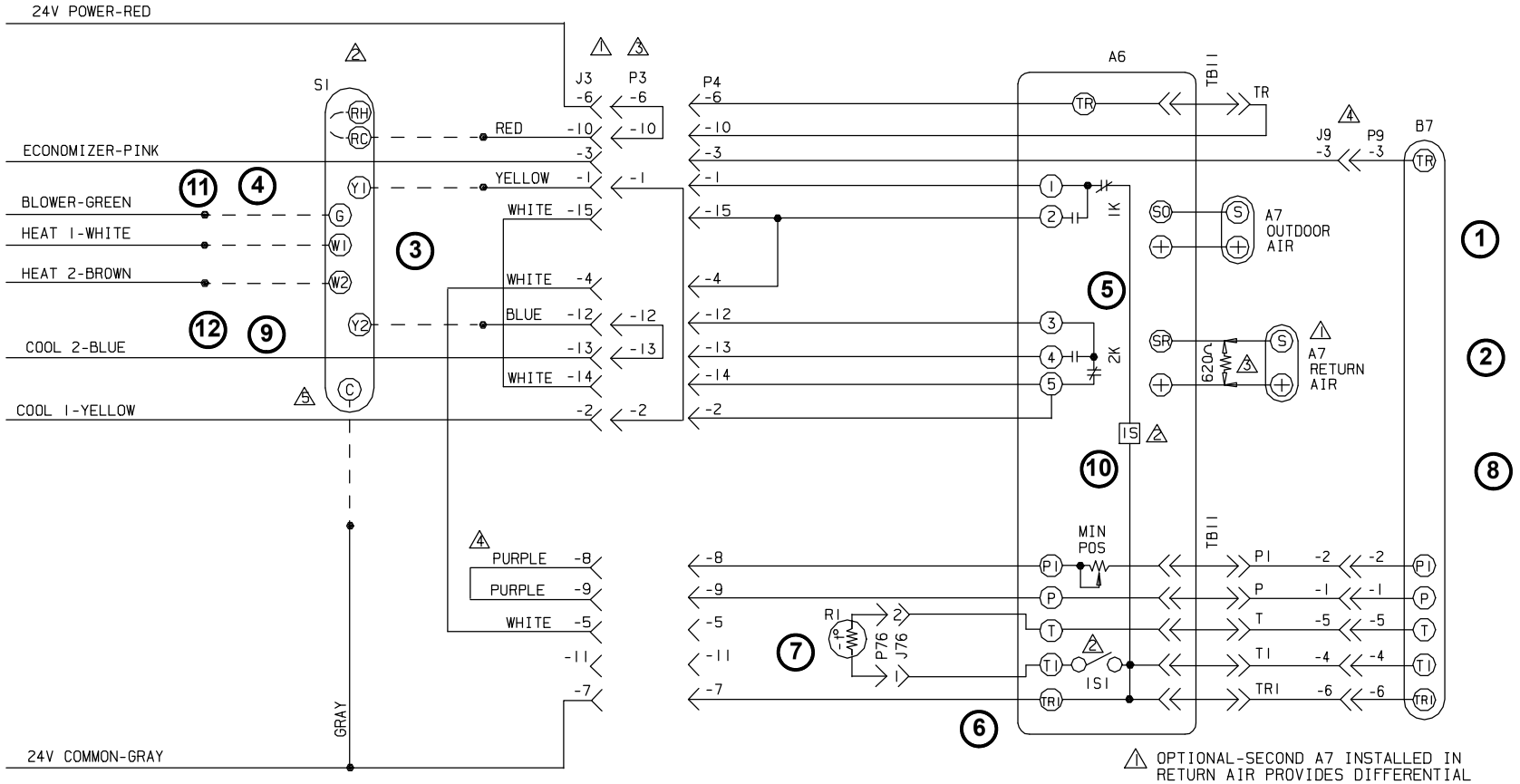
2- When K15-1 closes, heating elements HE1 are energized. The elements are arranged in a “Wye” configuration for 460 and 575V operation.

3- When K9-1 switches, nothing happens as indoor blower contactor K3 and indoor blower are already energized. When K9-2 switches, time delay DL2 is energized.

4- DL2 closes after 30 seconds. Contactor K16 is energized.

5- When K16-1 closes, heating elements HE2 and HE3 are energized.

ELECTROMECHANICAL THERMOSTAT WITH ECONOMIZER



DESCRIPTION	
KEY	COMPONENT
J3	JACK-UNIT,ECONOMIZER
P3	PLUG-LESS ECONOMIZER
S1	THERMOSTAT-ROOM

LOW VOLTAGE FIELD WIRING

FACTORY WIRING

5 DO NOT CONNECT GRAY COMMON WIRE UNLESS THE THERMOSTAT HAS TERMINAL "C" COMMON. MOST ELECTROMECHANICAL THERMOSTATS DO NOT HAVE THE "C" TERMINAL

4 PURPLE JUMPER WIRE IS MADE LONG TO EXTEND INTO JUNCTION BOX

3 REMOVE P3 WHEN ECONOMIZER IS USED

2 THERMOSTAT SUPPLIED BY USER

1 J3 MAXIMUM LOAD 20VA 24VAC CLASS II

DESCRIPTION	
KEY	COMPONENT
A6	CONTROL-ENTHALPY W7459A
A7	SENSOR-ENTHALPY
B7	MOTOR-DAMPER
J9	JACK-ECONOMIZER,MOTOR
J76	JACK-SENSOR ECONOMIZER
P4	PLUG-ECONOMIZER
P9	PLUG-ECONOMIZER,MOTOR
P76	PLUG-SENSOR ECONOMIZER
R1	SENSOR-SUPPLY AIR
TB11	TERMINAL STRIP

1 OPTIONAL-SECOND A7 INSTALLED IN RETURN AIR PROVIDES DIFFERENTIAL ENTHALPY CONTROL

2 WHEN IS RECEIVES POWER, ISI CLOSES.

3 FACTORY INSTALLED 620 OHM, 1 WATT, 5% RESISTOR. REMOVE WHEN SECOND A7 SENSOR IS INSTALLED TO PROVIDE DIFFERENTIAL ENTHALPY CONTROL

4 J9 AND P9 MAY OR MAY NOT BE USED

WIRING DIAGRAM	11/99
ACCESSORIES	
ELECTROMECHANICAL THERMOSTAT FOR 16 & 20 SERIES VALUE LINE (2 HEAT, 2 COOL)	
THERMOSTAT-SECTION C1	
Supersedes Form No. 532,928W	New Form No. 533,392W

WIRING DIAGRAM	11/99
ACCESSORIES	
REMD-16-M EMDH-16-M MODULATING ECONOMIZER FOR VALUE LINE UNITS	
ECONOMIZER-SECTION D5	
Supersedes Form No.	New Form No. 533,305W

ELECTROMECHANICAL THERMOSTAT WITH ECONOMIZER

Operation Sequence:

1- Economizer outdoor air dampers drive full closed anytime blower B3 is not operating (switched by K3-2 in the unit).

2- Damper motor terminal TR is powered by unit contactor K3 when there is a blower demand or a heating demand. When 24VAC is applied between terminals TR and TR1, the damper motor is energized and the outdoor air dampers open to minimum position.

3- Blower B3 is energized (indirectly) by thermostat terminal G. On a cooling demand, thermostat terminal G energizes contactor K3 which in turn energizes the blower (refer to operation sequence on previous page for exact sequence). When K3 energizes, K3-1 closes to energize the blower and K3-2 closes to energize the economizer (see step 2) and open the outdoor air dampers to minimum position.

Enthalpy Low, 1st Stage Cool:

4- Initial cooling demand Y1 is sent to enthalpy control A6 and terminal 1.

5- Enthalpy control A6 has determined that outside air can be used for cooling and has switched internal relays 1K and 2K.

6- Cooling demand is routed through enthalpy control to energize internal relay 1S. Internal contacts 1S1 close to complete a circuit through damper motor terminals T and T1.

7- When 24 volts is applied across terminals T and T1 of damper motor, the damper motor energizes and outdoor air dampers open. Supply air sensor R1 varies the voltage across T and T1 and the outdoor air dampers open and adjust accordingly. 1st stage cooling is provided by outdoor air.

Enthalpy Low, 2nd Stage Cool:

8- Economizer outdoor air dampers remain open.

9- Additional cooling demand is routed from thermostat Y2 through enthalpy control terminals 3 and 5 to energize the 1st stage compressors. The 1st stage compressors provide all additional cooling.

Enthalpy High, 1st Stage Cool:

10-Enthalpy control internal relays 1K and 2K switch. Internal relay 1S is de-energized and 1S1 opens. Outdoor air dampers close to minimum position.

11-Cooling demand is sent from thermostat terminal Y1 through enthalpy control terminals 1 and 2 and through enthalpy control terminal 5 to energize the 1st stage compressors.