CHA/CHP16, CHP20 SERIES UNITS

CHA/CHP16 and CHP20 series units in the 2 through 5 ton (7.0 through 17.6 kW) sizes 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 single or three phase power supply and can be utilized in downflow or horizontal supply and return air.

CHA/CHP16-024/030 model units are equipped with a reciprocating compressor. CHA/CHP16-036/060 and CHP20-024/060 model units are equipped with scroll compressors. 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.

CHA/CHP16 and CHP20 model units are designed to accept any of several different thermostat control systems with minimum field wiring. Control options such as economizer, warm up kit, Honeywell T7300 thermostat or Honeywell T8600/T8611/T8621 thermostat controls connect to the unit with jack-plugs. When plugged in the controls become an integral part of the unit wiring. Low voltage thermostat connections facilitate thermostat field wiring.

Optional electric heat is field installed. Electric heat operates in single or multiple stages depending on the kW size. 5kW through 25 kW sizes are available for the CHA/CHP16 and CHP20 units.

Information in this manual is for use by a qualified service technicial only. All specifications in this manual are subject to change. Procedures outlined in this manual are repesented 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.

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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.

SPECIFICATIONS CHA16

Model No.			CHA16-024	CHA16-030	CHA16-036	CHA16-048	CHA16-060
Nominal Tonnage			2	2-1/2	3	4	5
★ARI Certified Cooling Ratings	Cooling capacity - Btuh (kW)		22,200 (6.5)	27,600 (8.1)	35,200 (10.3)	45,000 (13.2)	57,000 (16.5)
	Total unit watts		2550	3210	4045	4890	6065
	SEER (Btuh/Watts)		10.0				10.25
	EER (Btuh/Watts)		8.7	8.6	8.7	9.2	9.4
*Sound Rating Number (db)			80			82	
Refrigerant Charge (HCFC-22)			3 lbs. 3 oz. (1.45 kg)	4 lbs. 6 ozs. (1.98 kg)	4 lbs. 13 ozs. (2.18 kg)	5 lbs. 8 oz. (2.49 kg)	7 lbs. 7 oz. (3.37 kg)
Evaporator Blower	Blower wheel nominal diameter x width in. (mm)		9 x 8 (229 x 203)	10 x 7 (254 x 178)		10 x 8 (254 x 203)	11-1/2 x 9 (292 x 229)
	Motor horsepower (W)		1/3 (249)			1/2 (373)	3/4 (560)
Evaporator Coil	Net face area - ft.^{2} (m^2)		3.2 (0.30)		4.1 (0.38)	5.8 (0.54)	
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) - 2				
	Fins per inch (m)		15 (591)	17 (669)		15 (591)	
Condenser Coil	Net face area ft.^{2} (m^2)	Outer coil	8.6 (0.80)			14.3 (1.33)	
		Inner coil	- - - -	8.4 (0.78)		5.9 (0.55)	13.8 (1.28)
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) - 1	3/8 (9.5) - 2		3/8 (9.5) - 1.4	3/8 (9.5) - 2
	Fins per inch (m)		20 (787)				
Condenser Fan	Diameter - in. (mm) & No. of blades		20 (508) - 4			24 (610) - 4	
	Air volume - cfm (L/s)		2400 (1135)	2200 (1040)		4000 (1890)	3600 (1700)
	Motor horsepower (W)		1/6 (124)			1/4 (187)	
	Motor watts		230	220		340	330
Condensate drain size mpt - in. (mm)			3/4 (19)				
No. & size of cleanable polyurethane filters - in. (mm)			(1) 16 x 25 x 1 (406 x 635 x 25)			(1) 20 x 25 x 1 (508 x 635 x 25)	
Net weight of basic unit - lbs. (kg)			300 (136)	331 (150)	320 (145)	438 (199)	473 (215)
Shipping weight of basic unit - lbs. (kg) 1 package			385 (175)	413 (187)	407 (185)	547 (248)	582 (264)
Electrical characteristics - (60hz)			208/230v - 1 phase		208/230v - 1 ph, 208/230v, 460v or 575v - 3 ph		
Optional Electric Heat Ratings	ECH16R-5 ECH16-5	Output - Btuh (kW)	19,000 (5.6)			- - - -	
		☆A.F.U.E.	99.0%			- - - -	
	ECH16R-7 ECH16-7	Output - Btuh (kW)	26,000 (7.6)	27,000 (7.9)	26,000 (7.6)	27,000 (7.9)	
		☆A.F.U.E.	99.0%				
	ECH16R-10 ECH16-10	Output - Btuh (kW)	36,000 (10.5)	37,000 (10.8)	36,000 (10.5)	37,000 (10.8)	
		☆A.F.U.E.	99.0%				
	ECH16-15	Output - Btuh (kW)	53,000 (15.5)	54,000 (15.8)	53,000 (15.5)	54,000 (15.8)	
		☆A.F.U.E.	99.0%				
	ECH16-20	Output - Btuh (kW)	- - - -		70,000 (20.5)	71,000 (20.8)	
		☆A.F.U.E.	- - - -		99.0%		
	ECH16-25	Output - Btuh (kW)	- - - -			88,000 (25.8)	
		☆A.F.U.E.	- - - -			99.0%	

*Sound Rating Number in accordance with test conditions included in ARI Standard 270.
★Rated in accordance with ARI Standard 210/240 and DOE 95°F (35°F) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering evaporator coil air.
☆Annual Fuel Utilization Efficiency based on DOE test procedures and FTC labeling regulations.

SPECIFICATIONS CHP16

Model No.			CHP16-024	CHP16-030	CHP16-036	CHP16-048	CHP16-060
Nominal Tonnage			2	2-1/2	3	4	5
★ARI Cooling Ratings	Cooling capacity - Btuh (kW)		23,800 (7.0)	29,000 (8.5)	34,600 (10.1)	46,500 (13.6)	55,000 (16.1)
	Total unit watts		2615	3185	3870	4915	6225
	SEER (Btuh/Watts)		10.0				
	EER (Btuh/Watts)		9.1		8.6	9.5	8.8
★ARI High Temperature Heating Ratings	Total capacity - Btuh (kW)		23,800 (7.0)	29,400 (8.6)	35,800 (10.5)	49,500 (14.5)	57,500 (16.8)
	Total unit watts		2235	2780	3430	4605	5765
	C.O.P. (Coefficient of Performance)		3.12	3.10	3.06	3.14	2.94
	HSPF - Region IV (Region V)		6.6 (5.9)				
★ARI Low Temperature Heating Ratings	Total capacity - Btuh (kW)		12,800 (3.7)	17,000 (5.0)	22,800 (6.7)	28,000 (8.2)	33,600 (9.8)
	Total unit watts		1855	2330	3182	3800	5045
	C.O.P. (Coefficient of Performance)		2.02	2.14	2.10	2.16	1.98
*Sound Rating Number (db)			80			82	
Refrigerant Charge (HCFC-22)			5 lbs. 10 oz. (2.55 kg)	6 lbs. 0 oz. (2.72 kg)	7 lbs. 0 oz.. (3.18 kg)	10 lbs. 12 oz. (4.88 kg)	10 lbs. 5 oz. (4.68 kg)
Indoor Coil Blower	Blower wheel nominal diameter x width in. (mm)		9 x 8 (229 x 203)	10 x 7 (254 x 178)		10 x 8 (254 x 203)	11-1/2 x 8 (292 x 203)
	Motor horsepower (W)		1/3 (249)			1/2 (373)	3/4 (560)
Indoor Coil	Net face area - sq. ft. (m^2)		3.2 (0.30)	4.1 (0.38)		5.8 (0.54)	
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) - 3				
	Fins per inch (m)		15 (591)				
Outdoor Coil	Net face area sq. ft. (m^2)	Outer coil	8.6 (0.80)			14.3 (1.33)	
		Inner coil	5.3 (0.49)	8.3 (0.77)		9.9 (0.92)	13.8 (1.28)
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) - 1.6	3/8 (9.5) - 2			
	Fins per inch (m)		20 (787)				
Outdoor Coil Fan	Diameter - in. (mm) & No. of blades		20 (508) - 4			24 (610) - 4	
	Air volume - cfm (L/s)		2350 (1110)	2200 (1040)		3600 (1700)	
	Motor horsepower (W)		1/6 (124)			1/4 (187)	
	Motor watts		220			340	
Condensate drain size mpt - in. (mm)			3/4 (19)				
No. & size of cleanable polyurethane filters - in. (mm)			(1) 16 x 25 x 1 (406 x 635 x 25)			(1) 20 x 25 x 1 (508 x 635 x 25)	
Net weight of basic unit - lbs. (kg)			332 (151)	340 (154)	354 (161)	535 (243)	
Shipping weight of basic unit - lbs. (kg) 1 package			417 (187)	426 (193)	436 (198)	610 (277)	
Electrical characteristics - (60hz)			208/230v - 1 phase		208/230v - 1 ph, 208/230v or 460v - 3 ph		
Optional Electric Heat Ratings	ECH16R-5 ECH16-5	Output - Btuh (kW)	19,000 (5.6)			- - - -	
		☆A.F.U.E.	99.0%			- - - -	
	ECH16R-7 ECH16-7	Output - Btuh (kW)	26,000 (7.6)	27,000 (7.9)	26,000 (7.6)	27,000 (7.9)	
		☆A.F.U.E.	99.0%				
	ECH16R-10 ECH16-10	Output - Btuh (kW)	36,000 (10.5)	37,000 (10.8)	36,000 (10.5)	37,000 (10.8)	
		☆A.F.U.E.	99.0%				
	ECH16-15	Output - Btuh (kW)	53,000 (15.5)	54,000 (15.8)	53,000 (15.5)	54,000 (15.8)	
		☆A.F.U.E.	99.0%				
	ECH16-20	Output - Btuh (kW)	- - - -		70,000 (20.5)	71,000 (20.8)	
		☆A.F.U.E.	- - - -		99.0%		
	ECH16-25	Output - Btuh (kW)	- - - -			88,000 (25.7)	
		☆A.F.U.E.	- - - -			99.0%	

*Sound Rating Number in accordance with test conditions included in ARI Standard 270.
★Rated in accordance with ARI Standard 210/240;
Cooling Ratings - 95°F (35°F) 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.

SPECIFICATIONS CHP20

Model No.			CHP20-024	CHP20-030	CHP20-036	CHP20-042	CHP20-048	CHP20-060
Nominal Tonnage			2	2-1/2	3	3-1/2	4	5
★ARI Cooling Ratings	Cooling Capacity — Btuh (kW)		24,000 (7.0)	30,200 (8.8)	33,600 (9.8)	43,000 (12.6)	46,500 (13.6)	59,000 (17.3)
	Total unit watts		2555	3145	3535	4105	4875	6325
	SEER (Btuh/Watts)		11.0		11.05	12.05	11.00	11.05
	EER (Btuh/Watts)		9.4	9.6	9.5	10.5	9.5	9.4
★ARI Certified High Temperature Heating Ratings	Total Capacity — Btuh (kW)		24,200 (7.1)	29,800 (8.7)	34,200 (10.0)	41,500 (12.2)	48,500 (14.2)	62,500 (18.3)
	Total unit watts		2245	2800	3000	3880	4695	6180
	C.O.P		3.16	3.12	3.34	3.20	3.04	2.98
	HSPF — Region IV (Region V)		6.60 (5.90)		7.35 (5.70)	7.15 (6.30)	7.55 (6.70)	6.85 (6.05)
★ARI Certified Low Temperature Heating Ratings	Total Capacity — Btuh (kW)		14,800 (4.3)	18,600 (5.4)	21,400 (6.3)	26,200 (7.7)	31,600 (9.3)	38,600 (11.3)
	Total unit watts		2085	2595	2725	3515	4225	5425
	C.O.P		2.06	2.10	2.30	2.26	2.20	2.10
*Sound Rating Number (db)			80			82		84
Refrigerant Charge (HCFC-22)			5 lbs. 0 oz. (2.27 kg)	6 lbs. 8 oz. (2.95 kg)	6 lbs. 7 oz. (2.92 kg)	9 lbs. 12 oz. (4.42 kg)	10 lbs. 8 oz. (4.76 kg)	10 lbs. 5 oz. (4.68 kg)
Indoor Coil Blower	Blower wheel nominal diameter x width - in. (mm)		9 x 8 (229 x 203)	10 x 7 (254 x 178)		10 x 8 (254 x 203)		11 x 8 (279 x 203)
	Motor output — hp (W)		1/3 (249)			1/2 (373)		3/4 (560)
Indoor Coil	Net face area — sq. ft. (m^2)		3.2 (0.30)	4.1 (0.38)	4.1 (0.38)	5.8 (0.54)	5.8 (0.54)	
	Tube diameter - in. (mm) & No. of rows		3/8 (9.5) — 3					
	Fins per inch (m)		15 (591)					
Outdoor Coil	Net face area — sq. ft. (m^2)	Outer coil	8.6 (0.80)			14.3 (1.33)		
		Inner coil	5.3 (0.49)	8.3 (0.77)		9.9 (1.28)	13.8 (1.28)	
	Tube diameter - in. (mm) & no. of rows		3/8 (9.5) - 1.6	3/8 (9.5) — 2		3/8 (9.5) - 1.7	3/8 (9.5) — 2	
	Fins per inch (m)		20 (787)					
Outdoor Coil Fan	Diameter — in. (mm) & No. of blades		20 (508) — 4			24 (610) — 4		24 (610) - 3
	Air Volume — cfm (L/s)		2350 (1110)	2200 (1040)		3600 (1700)		4000 (1890)
	Motor output — hp (W)		1/6 (124)			1/4 (187)		1/3 (249)
	Motor watts		220			340		430
Condensate drain size mpt — in. (mm)			3/4 (19)					
No. & size of cleanable polyurethane filters - in. (mm)			(1) 16 x 25 x 1 (406 x 635 x 25)			(1) 20 x 25 x 1 (508 x 635 x 25)		
Net weight of basic unit — lbs. (kg)			305 (138)	355 (161)	355 (161)	455 (206)	535 (243)	535 (243)
Shipping weight of basic unit — lbs. (kg) (1 Pkg.)			390 (177)	419 (190)	419 (190)	525 (238)	610 (277)	610 (277)
Electrical characteristics (60 hz)			208/230v-1ph		208/230v-1ph 208/230v or 460v - 3ph	208/230v-1ph	208/230v-1ph 208/230v or 460v - 3ph	
Electric Heat Model No. and Ratings	ECH16R-5	Output — Btuh (kW)	19,000 (5.6)			- - - -	- - - -	
		☆A.F.U.E.	99.0%			- - - -	- - - -	
	ECH16R-7 ECH16-7	Output — Btuh (kW)	26,000 (7.6)	27,000 (7.9)	26,000 (7.6)	27,000 (7.9)		
		☆A.F.U.E.	99.0%					
	ECH16R-10 ECH16-10	Output — Btuh (kW)	36,000 (10.5)	37,000 (10.8)	36,000 (10.5)	37,000 (10.8)		
		☆A.F.U.E.	99.0%					
	ECH16-15	Output — Btuh (kW)	53,000 (15.6)	54,000 (15.8)	53,000 (15.6)	54,000 (15.8)		
		☆A.F.U.E.	99.0%					
	ECH16-20	Output — Btuh (kW)	- - - -	- - - -	70,000 (20.5)	71,000 (20.8)	71,000 (20.8)	
		☆A.F.U.E.	- - - -	- - - -	99.0%			
	ECH16-25	Output — Btuh (kW)	- - - -	- - - -	- - - -	88,000 (25.7)	88,000 (25.8)	
		☆A.F.U.E.	- - - -	- - - -	- - - -	99.0%		

*Sound Rating Number in accordance with test conditions included in ARI Standard 270.
☆Annual Fuel Utilization Efficiency based on DOE test procedures and FTC labeling regulations.
★Certified in accordance with the USE certification program, which is based on ARI standard 210/240.
Cooling Ratings— 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19.5°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.

OPTIONAL ACCESSORIES CHA/CHP16

Model No.			-024	-030	-036	-048	-060
Economizer with Gravity Exhaust Dampers (Down-Flow) — Installs directly in cabinet, recirculated air dampers with pressure operated gravity exhaust damper, formed, gasketed damper blades, nylon bearings, 24v damper motor has adjustable minimum position switch, electronic discharge air sensor, adjustable outdoor air enthalpy control. Utilizes filter furnished with unit, filter rack will accept up to 2 in. (51 mm) filter. Removable exhaust air hood and outdoor air intake hood with cleanable aluminum mesh filter. Choice of economizer controls.	**US Only**	3 position	REMD16-41 - 48 lbs. (22 kg)			REMD16-65 - 66 lbs. (30 kg)	
		Fully Modulating	REMD16M-41 - 48 lbs. (22 kg)			REMD16M-65 - 66 lbs. (30 kg)	
		[1] Indoor Filter	(1) 16 x 25 x 1 (406 x 635 x 25)			(1) 20 x 25 x 1 (508 x 635 x 25)	
		Outdoor Filter	(1) 14 x 25 x 1 (356 x 635 x 25)			(1) 18 x 25 x 1 (457 x 635 x 25)	
	Canada Only	Fully Modulating	REMD16M-41S - 85 lbs. (39 kg)			REMD16M-65S- 105 lbs. (48 kg)	
		[1] Indoor Filter	(1) 16 x 25 x 1 (406 x 635 x 25)			(1) 20 x 25 x 1 (508 x 635 x 25)	
		Outdoor Filter	(1) 19-3/8 x 15-3/4 x 1			(1) 19-7/8 x 22-3/4 x 1 (505 x 578 x 25)	
Economizer Dampers (Horizontal) — Installs directly in cabinet, combination outdoor air and recirculated air damper, formed, gasketed damper blades, nylon bearings, 24v damper motor has adjustable minimum position switch, electronic discharge air sensor, adjustable outdoor air enthalpy control. 1 in (25 mm) fiberglass filter furnished, filter rack will accept up to 2 in. (51 mm) filter, outdoor air intake hood with aluminum mesh filter. Choice of economizer controls.	**US Only**	3 position	EMDH16-41 110 lbs. (50 kg)			EMDH16-65 - 130 lbs. (59 kg)	
		Fully Modulating	EMDH16M-41 - 110 lbs. (50 kg)			EMDH16M-65 - 130 lbs. (59 kg)	
		Indoor Filter	(1) 20 x 24 x 1 (508 x 610 x 25)			(1) 16 x 25 x 1 (406 x 635 x 25) (1) 14 x 25 x1 (356 x 635 x 1)	
		Outdoor Filter	(1) 8 x 24 x 1 (203 x 610 x 25)			(1) 8 x 28 x 1 (203 x 711 x 25)	
	Canada Only	Fully Modulating	EMDH16M-41S - 70 lbs. (32 kg)			EMDH16M-65S - 86 lbs. (39 kg)	
		Indoor Filter	(1) 20 x 20 x 1 (508 x 508 x 25)			(1) 20 x 25 x 1 (508 x 635 x 25)	
		Outdoor Filter	(1) 16-1/2 x 21-3/4 x 1 (419 x 552 x 25)			(1) 22-1/2 x 25-1/4 x 1 (571 x 641 x 25)	
Electric Heat — Field installed, helix wound nichrome elements, time delay for element staging, individual element limit controls, wiring harness, may be two-stage controlled. **ECH16R** - Supplemental thermal cutoff safety fuses and thermal relay sequencer. **ECH16** - Supplemental secondary limits, heating control relay, fuse block, thermal relay sequencer (20-25 kW 208/230v) and galvanized steel control box.			See Electric Heat Data Tables				
Electric Heat Single Point Power Source Sub-Fuse Box — Use with ECH16R electric heaters, use in conjunction with ECH16 fuse box for single point power source applications, installs internal to unit, fuses furnished, constructed of galvanized steel with prepunched mounting holes			See Electric Heat Data Tables				
Unit Single Point Power Source Sub Fuse Box — Installs internal to unit, provides sub-fusing to the unit, used in conjunction with ECH16 or ECH16R for single point power source applications, fuses furnished, constructed of galvanized steel with prepunched mounting holes and electrical inlet and outlet holes, hinged box cover			See Electric Heat Data Tables				
Enthalpy Control, Differential — Used in conjunction with outdoor air enthalpy control. Determines and selects which air has the lowest enthalpy. Return air enthalpy sensor field installs in economizer damper section			**54G44**				
Gravity Exhaust Dampers — For use with EMDH16. Pressure operated assembly field installs in the return air duct adjacent to the economizer assembly. Includes bird screen. - Net Weight			GEDH16-65 - 4 lbs. (2 kg)				
Horizontal Filter Kit (Canada Only) — For horizontal applications, painted steel cabinet with filter access, disposable, pleated fiber filter furnished, number and size of filter - Net Weight			HF16-46S - 18 lbs. (8 kg) (1) 20 x 20 x 2 in. (508 x 508 x 51 mm)			HF16-65S - 21 lbs. (10 kg) (1) 20 x 25 x 2 in. (508 x 635 x 51 mm)	
Low Ambient Control Kit — Units operate down to 30°F (-1°C) outdoor air temperature in cooling mode without any additional controls. A Low Ambient Kit can be field installed, enabling unit to operate properly down to 0°F (-17.7°C).			CHP16 LB-57113BM **(27J00)** CHA16 LB-57113BC **(24H77)**				
Roof Curb Power Entry Kit — Allows power entry through roof mounting frame, knockouts provided in roof frame, kit contains 40 in. (1016 mm) armored conduit and installation hardware, two kits are required, one for low voltage and one for high voltage. See Dimension Drawing		1/2 in. (13 mm)	**18H70**				
		1 in. (26 mm)	**18H71**				
		1-1/2 in. (39 mm)	**18H72**				
Roof Mounting Frame — Nailer strip furnished, mates to unit, U.S. National Roofing Contractors Approved, shipped knocked down. RMF16-41 may be used on all sizes, with a slight unit overhang on CHP16-048 and CHP16-060 units - Net Weight NOTE (US Only) — Sound Reduction Plate must be ordered separately for field installation.			RMF16-41 - 75 lbs. (35 kg) **97G59** Plate (order separately) (**73H80**)			RMF16-41 - 75 lbs. (35 kg) **97G59** Plate (order separately) (**73H80**) RMF16-65 - 86 lbs. (39 kg) **97G60** Plate (order separately) (**73H82**)	
Outdoor Air Damper Section — For down-flow applications, damper assembly replaces blower access panel, manually adjustable, 0 to 25% (fixed) outdoor air, outdoor air hood with cleanable filter included, number and size of filter - Net Weight		**US Only**	OAD16-41 - 12 lbs. (5 kg) (1) 5 x 17 x 1 in. (127 x 432 x 25 mm)			OAD16-65 - 12 lbs. (5 kg) (1) 8 x 17 x 1 in. (203 x 432 x 25 mm)	
		Canada Only	OAD16-41S - 10 lbs. (5 kg) (1) 14 x 6 x 1 in. (356 x 152 x 25 mm)			OAD16-65S - 16 lbs. (7 kg) (1) 18 x 6 x 1 in. (457 x 152 x 25 mm)	
Outdoor Air Damper Section — For horizontal applications, installs in return air duct adjacent to unit, manually adjustable (fixed) outdoor air - Net Weight			OAD3-46/65 - 8 lbs. (4 kg)				
Outdoor Thermostat Kit — Used to lock out some of the electric heating elements on indoor units where two stage control is applicable. Outdoor thermostat maintains the heating load on the low power input as long as possible before allowing the full power load to come on line		Thermostat Kit	LB-29740BA **(56A87)**				
		Mounting Box	M-1595 (**31461**) / BM-10260 (**33A09**) Canada Only				

[1] Indoor filter is not furnished with economizer. REMD16 utilizes existing filter furnished with 16 unit.

OPTIONAL ACCESSORIES CHA/CHP16 Cont.

Model No.		-024	-030	-036	-048	-060
Coil Guards — PVC coated steel wire guards to protect outdoor coil.		LB-82199CF (**47J23**) 2 guards per order			LB-82199CG (**47J24**) 3 guards per order	
Compressor Monitor (Canada Only) — Non-adjustable switch (low ambient cut-out) prevents compressor operation when outdoor temperature is below 35°F (2°C).		T6-1469 **(45F08)**				
Diffusers — Aluminum grilles, 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 - Net Weight	**Step-Down** - double deflection louvers	RTD9-65 - 67 lbs. (30 kg)				
	Flush - fixed blade louvers	FD9-65 - 37 lbs.(17 kg)				
Timed Off Control — Prevents compressor short-cycling and allows time for suction and discharge pressure to equalize, permitting the compressor to start in an unloaded condition. Automatic reset control provides a time delay between compressor shutoff and start-up.		LB-50709BK **(47J27)**				
Transitions (Supply and Return) — Used with diffusers, installs in roof mounting frame, galvanized steel construction, flanges furnished for duct connection, fully insulated - Net Weight		SRT16 - 20 lbs. (9 kg)				
Unit Stand-Off Mounting Kit — Elevates horizontal application units above mounting surface. Includes six high impact polystyrene stand-off mounts. See dimension drawings.		**38H18**				

OPTIONAL ACCESSORIES CHP20

Model No.		CHP20-024 CHP20-030 CHP20-036	CHP20-042 CHP20-048	CHP20-060
Coil Guards — PVC coated steel wire guards to protect outdoor coil.		LB-82199CF (**47J23**) 2 guards per order	LB-82199CG (**47J24**) 3 guards per order	
Diffusers — Aluminum grilles, 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 - Net Weight	**Step-Down** - double deflection louvers	RTD9-65 - 67 lbs. (30 kg)		
	Flush - fixed blade louvers	FD9-65 - 37 lbs.(17 kg)		
Economizer with Gravity Exhaust Dampers (Down-Flow) — Installs directly in cabinet, recirculated air dampers with pressure operated gravity exhaust damper, formed, gasketed damper blades, nylon bearings, 3 position or fully modulating 24v damper motor has adjustable minimum position switch, electronic discharge air sensor, adjustable outdoor air enthalpy control. Utilizes filter furnished with unit, filter rack will accept up to 2 in. (51 mm) filter. Removable exhaust air hood and outdoor air intake hood with aluminum mesh filter. Choice of economizer controls. Model No. - Net Weight - No. & size of filter, in. (mm)		3 Position: REMD16-41 - 48 lbs. (22 kg) Modulating: REMD16M-41 - 48 lbs. (22 kg) [1]Indoor: (1) 16 x 25 x 1 (406 x 635 x 25) Outdoor : (1) 14 x 25 x 1 (356 x 635 x 25)	3 Position: REMD16-65 - 66 lbs. (30 kg) Modulating: REMD16M-65 - 66 lbs. (30 kg) [1]Indoor: (1) 20 x 25 x 1 (508 x 635 x 25) Outdoor : (1) 18 x 25 x 1 (457 x 635 x 25)	
Economizer Dampers (Horizontal) — Installs directly in cabinet, combination outdoor air and recirculated air damper, formed, gasketed damper blades, nylon bearings, 3 position or fully modulating 24v damper motor has adjustable minimum position switch, electronic discharge air sensor, adjustable outdoor air enthalpy control. 1 in (25 mm) fiberglass filter furnished, filter rack will accept up to 2 in. (51 mm) filter, outdoor air intake hood with aluminum mesh filter. Choice of economizer controls. Model No. - Net Weight - No. & size of filter, in. (mm)		3 Position: EMDH16-41 - 110 lbs. (50 kg) Modulating: EMDH16M-41 - 110 lbs. (50 kg) Indoor : (1) 20 x 24 x 1 (508 x 610 x 25) Outdoor : (1) 8 x 24 x 1 (203 x 610 x 25)	3 Position: EMDH16-65 - 130 lbs. (59 kg) Modulating: EMDH16M-65 - 130 lbs. (59 kg) Indoor : (1) 16 x 25 x 1 (406 x 635 x 25) & (1) 14 x 25 x1 (356 x 635 x 1) Outdoor : (1) 8 x 28 x 1 (203 x 711 x 25)	
Electric Heat — Field installed, helix wound nichrome elements, time delay for element staging, individual element limit controls, wiring harness, may be two-stage controlled. **ECH16R** - Supplemental thermal cutoff safety fuses and thermal relay sequencer. **ECH16** - Supplemental secondary limits, heating control relay, fuse block, thermal relay sequencer (20-25 kW 208/230v) and galvanized steel control box.		See Electric Heat Data Tables		
Electric Heat Single Point Power Source Sub-Fuse Box — Use with ECH16R electric heaters, use in conjunction with ECH16 fuse box for single point power source applications, installs internal to unit, fuses furnished, constructed of galvanized steel with prepunched mounting holes		See Electric Heat Data Tables		
Unit Single Point Power Source Sub Fuse Box — Installs internal to unit, provides sub-fusing to the unit, used in conjunction with ECH16 or ECH16R for single point power source applications, fuses furnished, constructed of galvanized steel with prepunched mounting holes and electrical inlet and outlet holes, hinged box cover		See Electric Heat Data Tables		
Enthalpy Control, Differential — Used in conjunction with outdoor air enthalpy control. Determines and selects which air has the lowest enthalpy. Return air enthalpy sensor field installs in economizer damper section		**54G44**		
Gravity Exhaust Dampers — For use with EMDH16. Pressure operated assembly field installs in the return air duct adjacent to the economizer assembly. Includes bird screen. - Net Weight		GEDH16-65 - 4 lbs. (2 kg)		
Low Ambient Control Kit - Units operate down to 30°F (-1°C) outdoor air temperature in cooling mode without any additional controls. A Low Ambient Kit can be field installed, enabling unit to operate properly down to 0°F (-17.7°C).		LB-57113BM **(27J00)**		
Roof Curb Power Entry Kit — Allows power entry through roof mounting frame, knockouts provided in roof frame, kit contains 40 in. (1016 mm) armored conduit and installation hardware, two kits are required, one for low voltage and one for high voltage. See Dimension Drawing	1/2 in. (13 mm)	**18H70**		
	1 in. (26 mm)	**18H71**		
	1-1/2 in. (39 mm)	**18H72**		

OPTIONAL ACCESSORIES CHP20 Cont.

Model No.		CHP20-024, -030, -036	CHP20-042, -048	CHP20-060
Roof Mounting Frame — Nailer strip furnished, mates to unit, U.S. National Roofing Contractors Approved, shipped knocked down. RMF16-41 may be used on all sizes, with a slight unit overhang on CHP20-048 and CHP20-060 units - Net Weight. NOTE (US Only) — Sound Reduction Plate must be ordered separately for field installation.		RMF16-41 - 75 lbs. (35 kg) Plate (order separately) (**73H80**)	RMF16-41 - 75 lbs. (35 kg) Plate (order separately) (**73H80**) RMF16-65 - 86 lbs. (39 kg) Plate (order separately) (**73H82**)	
Outdoor Air Damper Section — For down-flow applications, damper assembly replaces blower access panel, manually adjustable, 0 to 25% (fixed) outdoor air, outdoor air hood with cleanable filter included, number and size of filter - Net Weight		OAD16-41 - 12 lbs. (5 kg) (1) 5 x 17 x 1 in. (127 x 432 x 25 mm)	OAD16-65 - 12 lbs. (5 kg) (1) 8 x 17 x 1 in. (203 x 432 x 25 mm)	
Outdoor Air Damper Section — For horizontal applications, installs in return air duct adjacent to unit, manually adjustable (fixed) outdoor air - Net Weight		OAD3-46/65 - 8 lbs. (4 kg)		
Outdoor Thermostat Kit — Used to lock out some of the electric heating elements on indoor units where two stage control is applicable. Outdoor thermostat maintains the heating load on the low power input as long as possible before allowing the full power load to come on line	Thermostat Kit	LB-29740BA **(56A87**)		
	Mounting Box	M-1595 (**31461**)		
Timed Off Control — Prevents compressor short-cycling and allows time for suction and discharge pressure to equalize, permitting the compressor to start in an unloaded condition. Automatic reset control provides a time delay between compressor shutoff and start-up.		LB-50709BK **(47J27)**		
Transitions (Supply and Return) — Used with diffusers, installs in roof mounting frame, galvanized steel construction, flanges furnished for duct connection, fully insulated - Net Weight		SRT16 - 20 lbs. (9 kg)		
Unit Stand-Off Mounting Kit — Elevates horizontal application units above mounting surface. Includes six high impact polystyrene stand-off mounts. See dimension drawings.		**38H18**		

[1]Indoor filter is not furnished with economizer. REMD16 utilizes existing filter furnished with CHP20 unit.

ELECTRICAL DATA CHA16
Single Phase

Model No.		CHA16-024	CHA16-030	CHA16-036	CHA16-048	CHA16-060
Line voltage data - 60 hz		208/230v - 1 phase				
[1]Recommended maximum fuse size (amps)		25	30	40	50	60
†Minimum Circuit Ampacity		16	21	27	34	41
Compressor	Rated load amps	10.1	13.0	17.7	21.8	26.1
	Locked rotor amps	60	69.4	100.0	131.0	170
Condenser Coil Fan Motor	Full load amps	1.1			2.3	
	Locked rotor amps	2.2			4.4	
Evaporator Blower Motor	Full load amps	2.2	3		3.9	5.2
	Locked rotor amps	4.2	6.2		8.3	10

†Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.
[1]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.

ELECTRICAL DATA CHA16
Three Phase

Model No.		CHA16-036			CHA16-048			CHA16-060		
Line voltage data - 60 hz - 3 phase		208/230v	460v	575v	208/230v	460v	575v	208/230v	460v	575v
[1]Recommended maximum fuse size (amps)		30	15		35	15	15	40	20	15
†Minimum Circuit Ampacity		20	11	9	23	11	10	28	14	12
Compressor	Rated load amps	12.2	6.2	4.6	12.8	6.4	5.1	16.2	8.0	6.5
	Locked rotor amps	77	39	31	91	46	37	124	60	47.7
Condenser Coil Fan Motor	Full load amps	1.1	.73	[2].73	2.3	1.1	[2]1.1	2.3	1.1	[2]1.1
	Locked rotor amps	2.2	1.3	[2]1.3	4.4	2	[2]2	4.4	2	[2]2
Evaporator Blower Motor	Full load amps	3.0	1.8	[2]1.8	3.9	1.8	[2]1.8	5.2	2.7	[2]2.7
	Locked rotor amps	6.2	4.4	[2]4.4	8.3	4.4	[2]4.4	10	3.8	[2]3.8

†Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.
[1]Where current does not exceed 100 amps, HACR type circuit breaker may be used in place of fuse (U.S. Only).
[2]Motors are rated at 460 volts. Full load amps shown are for step-down transformer output.
NOTE - Extremes of operating range are plus and minus 10% of line voltage.

ELECTRICAL DATA CHP16

Model No.		-024	-030	-036			-048			-060		
Line voltage data - 60 hz		208/230v - 1 phase		208/230v 1 phase	208/230v 3 phase	460v - 3 phase	208/230v 1 phase	208/230v 3 phase	460v - 3 phase	208/230v 1 phase	208/230v 3 phase	460v - 3 phase
[1]Recommended max. fuse size (amps)		25	30	40	30	15	50	35	15	60	40	20
†Minimum Circuit Ampacity		16	21	27	20	11	34	23	11	39	27	13
Compressor	Rated load amps	10.1	13.0	17.7	12.2	6.2	21.8	12.8	6.4	25.0	15.5	7.5
	Locked rotor amps	60.0	69.4	100.0	77.0	39.0	131.0	91.0	46.0	170.0	124.0	60.0
Outdoor Coil Fan Motor	Full load amps	1.1				0.73	2.3		1.1	2.3	1.1	
	Locked rotor amps	2.2				1.3	4.4		2.0	4.4	2.0	
Indoor Coil Blower Motor	Full load amps	2.1	3.0			1.8	3.9		1.8	4.6	2.4	
	Locked rotor amps	4.2	6.2			4.4	8.3		4.4	10.0	3.8	

†Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.
[1]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.

ELECTRICAL CHP20
Single Phase

CHP20 Model No.		CHP20-024	CHP20-030	CHP20-036	CHP20-042	CHP20-048	CHP20-060
Line voltage data - 60 hz		208/230v					
▶Recommended maximum fuse size (amps)		30	35	40	50	60	70
†Minimum Circuit Ampacity		19	22	25	32	36	44
Compressors	Rated load amps	12.2	13.8	16.1	20.1	23.7	28.8
	Locked rotor amps	61.0	73.0	88.0	104.0	129.0	169.0
Outdoor Coil Fan Motor	Full load amps	1.1			2.3		2.4
	Locked rotor amps	2.2			4.4		
Indoor Coil Blower Motor (1 phase)	Full load amps	2.1	3.0		3.9		4.6
	Locked rotor amps	4.2	6.2		8.3		10.0

†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.
NOTE — Extremes of operating range are plus and minus 10% of line voltage.

ELECTRICAL CHP20
Three Phase

CHP20 Model No.		CHP20-036		CHP20-048		CHP20-060	
Line voltage data - 60 hz - 3 phase		208/230v	460v	208/230v	460v	208/230v	460v
▶Recommended maximum fuse size (amps)		25	15	35	15	45	20
†Minimum Circuit Ampacity		17	10	24	13	29	15
Compressors	Rated load amps	10.3	5.2	13.5	7.4	17.3	9
	Locked rotor amps	77	39	120	49.5	137	62
Outdoor Coil Fan Motor	Full load amps	1.1	0.73	2.3	1.1	2.4	1.3
	Locked rotor amps	2.2	1.3	4.4	2	4.4	2.0
Indoor Coil Blower Motor (1 phase)	Full load amps	3	1.8	3.9	1.8	4.6	2.4
	Locked rotor amps	6.2	4.4	8.3	4.4	10	3.8

†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.
NOTE — Extremes of operating range are plus and minus 10% of line voltage.

BLOWER DATA CHA16

CHA16-024 BLOWER PERFORMANCE @ 230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1370	645	950	450	875	415	660	310
.05	12	1365	645	955	450	880	415	670	315
.10	25	1350	635	960	455	885	420	675	320
.15	37	1340	630	960	455	885	420	680	320
.20	50	1320	625	955	450	880	415	680	320
.25	62	1300	615	950	450	875	415	680	320
.30	75	1280	605	940	445	870	410	675	320
.40	100	1220	575	920	435	850	400	660	310
.50	125	1150	545	880	415	820	385	630	295
.60	150	1070	505	835	395	775	365	585	275
.70	175	975	460	780	370	725	340	535	250
.75	185	925	435	745	350	700	330	500	235

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-024 BLOWER PERFORMANCE @ 230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1405	665	905	425	820	385	620	295
.05	12	1400	660	935	440	845	400	640	300
.10	25	1385	655	955	450	865	410	655	310
.15	37	1370	645	975	460	880	415	665	315
.20	50	1355	640	985	465	890	420	670	315
.25	62	1335	630	990	465	895	420	670	315
.30	75	1310	620	985	465	890	420	670	315
.40	100	1260	595	965	455	870	410	650	305
.50	125	1195	565	915	430	830	390	615	290
.60	150	1120	530	840	395	865	410	560	265
.70	175	1035	490	740	350	675	320	490	230
.75	185	990	465	685	325	620	295	445	210

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-030 BLOWER PERFORMANCE @ 230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1355	640	1255	590	1105	520	900	425
.05	12	1345	635	1250	590	1100	520	910	430
.10	25	1330	630	1245	590	1090	515	915	430
.15	37	1310	620	1235	585	1080	510	915	430
.20	50	1290	610	1220	575	1070	505	910	430
.25	62	1270	600	1205	570	1055	500	900	425
.30	75	1245	590	1180	555	1035	490	890	420
.40	100	1190	560	1130	535	990	465	855	405
.50	125	1125	530	1060	500	935	440	805	380
.60	150	1050	495	980	560	870	410	735	345
.70	175	960	455	885	420	790	375	655	310
.75	185	915	430	835	395	745	350	605	285

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-030 BLOWER PERFORMANCE @ 230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1445	680	1330	630	1105	520	900	425
.05	12	1435	680	1295	610	1105	520	910	430
.10	25	1420	670	1285	605	1105	520	915	430
.15	37	1400	660	1275	600	1100	520	920	435
.20	50	1380	650	1265	595	1095	515	920	435
.25	62	1360	640	1250	590	1085	510	915	430
.30	75	1335	630	1230	580	1070	505	905	425
.40	100	1280	605	1185	560	1035	490	880	415
.50	125	1220	575	1135	535	995	470	840	395
.60	150	1150	545	1070	505	935	440	790	375
.70	175	1070	505	995	470	870	410	720	340
.75	185	1025	485	955	450	830	390	680	320

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

BLOWER DATA CHA16 Cont

CHA16-036 BLOWER PERFORMANCE @ 230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1415	670	1350	635	1135	530	915	430
.05	12	1395	660	1335	630	1125	530	905	425
.10	25	1375	650	1315	620	1115	525	895	420
.15	37	1360	640	1290	610	1110	525	890	420
.20	50	1355	640	1275	600	1105	520	885	420
.25	62	1325	625	1255	590	1095	515	875	415
.30	75	1310	620	1235	585	1085	510	865	410
.40	100	1265	595	1195	565	1060	500	845	400
.50	125	1220	575	1155	545	1020	480	825	390
.60	150	1170	550	1105	520	975	460	785	370
.70	175	1115	525	1045	495	925	435	725	340
.75	185	1085	510	1010	475	895	420	685	325

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-036 BLOWER PERFORMANCE @ 230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1490	705	1460	690	1145	540	920	435
.05	12	1470	695	1440	680	1135	535	910	430
.10	25	1450	685	1420	670	1125	530	900	425
.15	37	1435	675	1395	660	1120	530	895	420
.20	50	1430	675	1375	650	1115	525	890	420
.25	62	1400	660	1355	640	1105	520	880	415
.30	75	1380	650	1335	630	1095	515	870	410
.40	100	1335	630	1285	605	1070	505	850	400
.50	125	1285	605	1235	585	1030	485	830	390
.60	150	1235	585	1195	565	985	465	790	375
.70	175	1185	560	1140	540	935	440	730	345
.75	185	1160	545	1110	525	905	425	690	325

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHA16-036 BLOWER PERFORMANCE @ 460/575 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1625	765	1465	690	1100	520
.05	12	1600	755	1445	680	1100	520
.10	25	1570	740	1420	670	1100	520
.15	37	1555	735	1395	660	1095	515
.20	50	1525	720	1385	655	1090	515
.25	62	1485	700	1365	645	1075	505
.30	75	1465	690	1340	630	1070	505
.40	100	1400	660	1285	605	1035	490
.50	125	1335	630	1235	585	1005	475
.60	150	1260	595	1165	550	955	450
.70	175	1170	550	1085	510	875	415
.75	185	1100	520	1045	495	815	385

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHA16-036 BLOWER PERFORMANCE @ 460/575 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1710	805	1590	750	1105	520
.05	12	1685	795	1565	740	1105	520
.10	25	1655	780	1535	725	1105	520
.15	37	1630	770	1510	715	1100	520
.20	50	1610	760	1490	705	1095	515
.25	62	1570	740	1470	695	1085	510
.30	75	1540	725	1445	680	1075	505
.40	100	1475	695	1385	655	1040	490
.50	125	1405	665	1330	630	1010	475
.60	150	1335	630	1260	595	960	455
.70	175	1240	585	1185	560	885	420
.75	185	1180	555	1150	545	825	390

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHA16-048 BLOWER PERFORMANCE @ 230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2065	975	1715	810	1515	715	1305	615
.05	12	2055	970	1705	805	1505	710	1300	615
.10	25	2040	965	1690	800	1495	705	1300	615
.15	37	2020	955	1680	795	1485	700	1295	610
.20	50	2000	945	1665	785	1475	695	1290	610
.25	62	1975	930	1650	780	1470	695	1285	605
.30	75	1950	920	1635	770	1450	685	1280	605
.40	100	1885	890	1600	755	1425	670	1260	595
.50	125	1810	855	1565	740	1395	660	1225	580
.60	150	1730	815	1525	720	1360	640	1175	555
.70	175	1645	775	1600	755	1320	625	1110	525
.75	185	1600	755	1455	685	1295	610	1070	505

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-048 BLOWER PERFORMANCE @ 230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2140	1010	1785	840	1535	725	1305	615
.05	12	2115	1000	1770	835	1530	720	1300	615
.10	25	2090	985	1755	830	1520	715	1295	610
.15	37	2070	975	1745	825	1510	715	1290	610
.20	50	2045	965	1730	815	1500	710	1285	605
.25	62	2020	955	1715	810	1490	705	1280	605
.30	75	1995	940	1700	800	1480	700	1275	600
.40	100	1935	915	1665	785	1460	690	1260	595
.50	125	1875	885	1630	770	1430	675	1235	585
.60	150	1800	850	1585	750	1400	660	1205	570
.70	175	1710	805	1530	720	1370	645	1170	550
.75	185	1655	780	1495	705	1355	640	1150	545

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

BLOWER DATA CHA16 Cont.

CHA16-048 BLOWER PERFORMANCE @ 460/575 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2140	1010	1745	825	1175	555
.05	12	2120	1000	1730	815	1175	555
.10	25	2080	980	1720	810	1170	550
.15	37	2045	965	1710	805	1170	550
.20	50	2005	945	1695	800	1165	550
.25	62	1975	930	1680	795	1160	545
.30	75	1940	915	1665	785	1150	545
.40	100	1870	885	1625	765	1135	535
.50	125	1790	845	1580	745	1110	525
.60	150	1705	805	1515	715	1075	505
.70	175	1605	760	1430	675	1030	485
.75	185	1555	740	1375	650	1000	470

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHA16-048 BLOWER PERFORMANCE @ 460/575 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2160	1020	1815	855	1210	570
.05	12	2125	1005	1800	850	1210	570
.10	25	2095	990	1790	845	1200	565
.15	37	2060	970	1780	840	1200	565
.20	50	2025	955	1760	830	1195	565
.25	62	1990	940	1745	825	1190	560
.30	75	1955	925	1730	815	1185	560
.40	100	1885	890	1690	800	1170	550
.50	125	1805	850	1640	775	1140	540
.60	150	1715	810	1575	745	1105	520
.70	175	1615	760	1495	705	1065	505
.75	185	1560	735	1445	680	1040	490

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHA16-060 BLOWER PERFORMANCE @ 230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds									
		High		Medium-High		Medium		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2725	1285	2490	1175	2235	1055	1940	915	1620	765
.05	12	2695	1270	2435	1150	2210	1045	1930	910	1625	765
.10	25	2665	1260	2430	1145	2185	1030	1925	910	1625	765
.15	37	2635	1245	2415	1140	2160	1020	1910	900	1610	760
.20	50	2600	1225	2395	1130	2140	1010	1895	895	1590	750
.25	62	2555	1205	2365	1115	2130	1005	1880	885	1580	745
.30	75	2510	1185	2335	1100	2115	1000	1865	880	1565	740
.40	100	2445	1155	2275	1075	2060	970	1830	865	1540	725
.50	125	2385	1125	2230	1050	2005	945	1765	835	1505	710
.60	150	2285	1080	2140	1010	1940	915	1725	815	1455	685
.70	175	2210	1045	2075	980	1880	885	1660	785	1405	665
.75	185	2175	1025	2030	960	1845	870	1615	760	1370	645

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-060 BLOWER PERFORMANCE @ 230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds									
		High		Medium-High		Medium		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2850	1345	2530	1195	2255	1065	1970	930	1640	775
.05	12	2820	1330	2475	1170	2230	1050	1965	925	1645	775
.10	25	2790	1315	2475	1170	2205	1040	1955	925	1645	775
.15	37	2760	1300	2455	1160	2180	1030	1940	915	1630	770
.20	50	2725	1285	2435	1150	2160	1020	1925	910	1610	760
.25	62	2680	1265	2405	1135	2150	1015	1910	900	1600	755
.30	75	2630	1240	2375	1120	2135	1010	1895	895	1585	750
.40	100	2570	1215	2315	1090	2080	980	1860	880	1560	735
.50	125	2510	1185	2270	1070	2025	955	1795	845	1525	720
.60	150	2410	1135	2180	1030	1960	925	1755	830	1475	695
.70	175	2335	1100	2115	1000	1900	895	1690	800	1425	670
.75	185	2300	1085	2070	975	1865	880	1650	780	1390	655

NOTE — For 208v unit operation, derate air volume by 7%. All air data is measured external to the unit with dry coil and without air filter.

CHA16-060 BLOWER PERFORMANCE @ 460/575 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2725	1285	2405	1135	1905	900
.05	12	2680	1265	2365	1115	1890	890
.10	25	2635	1245	2325	1095	1870	880
.15	37	2590	1220	2290	1080	1855	875
.20	50	2550	1205	2255	1065	1840	870
.25	62	2515	1185	2220	1050	1820	860
.30	75	2485	1175	2190	1035	1795	845
.40	100	2395	1130	2120	1000	1745	825
.50	125	2325	1095	2050	965	1680	795
.60	150	2235	1055	1970	930	1570	740
.70	175	2150	1015	1900	895	1560	735
.75	185	2100	990	1860	880	1515	715

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHA16-060 BLOWER PERFORMANCE @ 460/575 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2850	1345	2430	1145	1940	915
.05	12	2805	1325	2385	1125	1920	905
.10	25	2760	1300	2345	1105	1905	900
.15	37	2715	1280	2310	1090	1885	890
.20	50	2670	1260	2275	1075	1870	880
.25	62	2640	1245	2240	1055	1850	875
.30	75	2605	1230	2210	1045	1825	860
.40	100	2515	1185	2140	1010	1775	840
.50	125	2445	1155	2120	1000	1710	805
.60	150	2355	1110	1990	940	1600	755
.70	175	2270	1070	1920	905	1590	750
.75	185	2225	1050	1880	885	1545	730

NOTE - All air data is measured external to the unit with dry coil and without air filter.

BLOWER DATA CHP16/20

CHP16/20-024 BLOWER PERFORMANCE
230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1385	655	1025	485	900	425	685	325
.05	12	1380	650	1035	490	915	430	700	330
.10	25	1365	645	1045	495	925	435	710	335
.15	37	1350	635	1045	495	930	440	715	335
.20	50	1330	630	1040	490	930	440	715	335
.25	62	1305	615	1030	485	925	435	715	335
.30	75	1275	600	1010	475	915	430	705	335
.40	100	1205	570	965	455	880	415	680	320
.50	125	1120	530	890	420	820	385	640	300
.60	150	1015	480	800	380	740	350	585	275
.70	175	900	425	685	325	640	300	510	240
.75	185	835	395	615	290	580	275	470	220

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-024 BLOWER PERFORMANCE
230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1435	675	1035	490	895	420	625	295
.05	12	1420	670	1050	495	915	430	645	305
.10	25	1400	660	1060	500	925	435	660	310
.15	37	1380	650	1060	500	935	440	670	315
.20	50	1360	640	1060	500	935	440	675	320
.25	62	1335	630	1050	495	930	440	675	320
.30	75	1305	615	1035	490	920	435	670	315
.40	100	1235	585	985	465	875	415	650	305
.50	125	1155	545	910	430	810	380	605	285
.60	150	1065	505	810	380	720	340	545	255
.70	175	960	455	690	325	605	285	465	220
.75	185	905	425	620	295	540	255	415	195

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-030 BLOWER PERFORMANCE
230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1485	700	1250	590	1085	500	905	425
.05	12	1460	690	1250	590	1075	505	900	425
.10	25	1430	675	1240	585	1070	505	895	420
.15	37	1400	660	1235	585	1060	500	890	420
.20	50	1375	650	1225	580	1045	495	885	420
.25	62	1345	635	1215	575	1035	490	875	415
.30	75	1315	620	1200	565	1020	480	865	410
.40	100	1255	590	1165	550	990	465	835	395
.50	125	1190	560	1125	530	950	450	805	380
.60	150	1125	530	1075	510	910	430	770	365
.70	175	1060	500	1015	480	865	410	725	340
.75	185	1025	485	985	465	840	395	700	330

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-030 BLOWER PERFORMANCE
230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1485	700	1345	635	1115	525	920	435
.05	12	1480	700	1340	630	1120	530	930	440
.10	25	1465	690	1335	630	1120	530	940	445
.15	37	1455	685	1325	625	1115	525	945	445
.20	50	1435	675	1315	620	1110	525	945	445
.25	62	1420	670	1305	615	1105	520	940	445
.30	75	1400	660	1285	605	1095	515	935	440
.40	100	1350	635	1250	590	1065	505	910	430
.50	125	1295	610	1200	565	1025	485	875	415
.60	150	1230	580	1145	540	975	460	820	385
.70	175	1160	545	1075	505	915	430	755	355
.75	185	1120	530	1040	490	885	420	720	340

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-036 BLOWER PERFORMANCE
230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1360	640	1270	600	1070	505	890	420
.05	12	1355	640	1250	590	1060	500	885	420
.10	25	1350	635	1230	580	1050	495	880	415
.15	37	1330	630	1220	575	1035	490	870	410
.20	50	1310	620	1210	570	1020	480	860	405
.25	62	1295	610	1190	560	1005	475	845	340
.30	75	1280	605	1170	550	990	470	830	390
.40	100	1230	580	1130	535	960	455	800	380
.50	125	1170	550	1070	505	910	430	760	360
.60	150	1100	520	990	465	850	400	700	330
.70	175	1020	480	890	420	780	370	620	295
.75	185	975	460	830	390	740	350	570	270

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-036 BLOWER PERFORMANCE
230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1450	685	1370	645	1080	510	900	425
.05	12	1430	675	1350	635	1070	505	890	420
.10	25	1410	665	1330	630	1060	500	880	415
.15	37	1395	660	1310	615	1055	500	875	415
.20	50	1380	650	1290	610	1050	495	870	410
.25	62	1360	640	1270	600	1040	490	860	405
.30	75	1340	630	1250	590	1030	485	850	400
.40	100	1300	615	1210	570	1010	475	830	390
.50	125	1250	590	1170	550	970	460	810	380
.60	150	1200	565	1120	530	930	440	770	365
.70	175	1150	545	1060	500	890	420	710	335
.75	185	1125	530	1025	485	870	410	670	315

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

BLOWER DATA CHP16/20 Cont.

CHP16/20-036 BLOWER PERFORMANCE
460 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1560	735	1380	650	1070	505
.05	12	1555	735	1355	640	1075	505
.10	25	1540	725	1330	630	1080	510
.15	37	1510	715	1320	625	1070	505
.20	50	1475	695	1315	620	1060	500
.25	62	1450	685	1295	610	1040	490
.30	75	1430	675	1270	600	1025	485
.40	100	1360	640	1215	575	980	460
.50	125	1280	605	1145	540	925	435
.60	150	1185	560	1045	495	850	400
.70	175	1070	505	925	435	750	355
.75	185	990	465	860	405	680	320

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-036 BLOWER PERFORMANCE
460 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1665	785	1490	705	1080	510
.05	12	1640	775	1465	690	1080	510
.10	25	1610	760	1440	680	1080	510
.15	37	1585	750	1420	670	1075	505
.20	50	1555	735	1400	660	1070	505
.25	62	1525	720	1380	650	1060	500
.30	75	1495	705	1355	640	1050	495
.40	100	1435	675	1300	615	1015	480
.50	125	1365	645	1250	590	985	465
.60	150	1295	610	1180	555	935	440
.70	175	1205	570	1100	520	860	405
.75	185	1145	540	1060	500	800	380

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHP20-042 CHP16/20-048 BLOWER PERFORMANCE
230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2015	950	1610	760	1425	670	1240	585
.05	12	2000	945	1595	755	1420	670	1235	585
.10	25	1980	935	1580	745	1415	670	1235	585
.15	37	1960	925	1575	745	1415	670	1230	580
.20	50	1935	915	1560	735	1405	665	1225	580
.25	62	1910	900	1540	725	1395	660	1215	575
.30	75	1885	890	1520	715	1385	655	1205	570
.40	100	1825	860	1485	700	1355	640	1185	560
.50	125	1760	830	1445	680	1315	620	1160	550
.60	150	1690	800	1395	660	1260	595	1130	535
.70	175	1615	760	1335	630	1190	560	1095	515
.75	185	1575	745	1300	615	1145	540	1065	505

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP20-042 CHP16/20-048 BLOWER PERFORMANCE
230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2075	980	1675	790	1445	680	1275	600
.05	12	2060	970	1660	785	1440	680	1270	600
.10	25	2040	965	1645	775	1435	675	1270	600
.15	37	2020	955	1635	770	1435	675	1265	595
.20	50	1995	940	1620	765	1425	670	1260	595
.25	62	1965	930	1600	755	1415	670	1250	590
.30	75	1940	915	1580	745	1405	665	1240	585
.40	100	1880	890	1545	730	1375	650	1220	575
.50	125	1815	855	1500	710	1335	630	1195	565
.60	150	1740	820	1450	685	1280	605	1165	550
.70	175	1655	780	1395	660	1210	570	1130	535
.75	185	1605	755	1365	645	1165	550	1110	525

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-048 BLOWER PERFORMANCE
460 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2075	980	1650	780	1105	520
.05	12	2045	965	1635	770	1105	520
.10	25	2015	950	1625	765	1100	520
.15	37	1980	935	1615	760	1100	520
.20	50	1945	920	1600	755	1095	515
.25	62	1915	905	1585	750	1090	515
.30	75	1880	890	1570	740	1085	510
.40	100	1810	855	1535	725	1070	505
.50	125	1735	820	1490	705	1045	495
.60	150	1650	780	1430	675	1010	475
.70	175	1555	735	1355	640	965	455
.75	185	1500	710	1310	620	935	440

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-048 BLOWER PERFORMANCE
460 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2090	985	1755	830	1115	525
.05	12	2065	975	1740	820	1115	525
.10	25	2035	960	1720	810	1110	525
.15	37	2005	945	1705	805	1110	525
.20	50	1975	930	1685	795	1105	520
.25	62	1950	920	1675	790	1100	520
.30	75	1920	905	1650	780	1095	515
.40	100	1860	880	1600	755	1080	510
.50	125	1790	845	1555	735	1055	500
.60	150	1720	810	1495	705	1020	480
.70	175	1640	775	1425	670	975	460
.75	185	1595	755	1385	655	945	445

NOTE — All air data is measured external to the unit with dry coil and without air filter.

BLOWER DATA CHP16/20 Cont.

CHP16/20-060 BLOWER PERFORMANCE
230 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds									
		High		Medium-High		Medium		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2450	1155	2200	1040	1990	940	1760	830	1460	690
.05	12	2430	1145	2180	1030	1980	935	1750	825	1470	695
.10	25	2410	1135	2170	1025	1970	930	1740	820	1490	705
.15	37	2390	1130	2160	1020	1960	925	1730	815	1500	710
.20	50	2360	1115	2140	1010	1950	920	1720	810	1490	705
.25	62	2340	1105	2120	1000	1930	910	1710	805	1490	705
.30	75	2320	1095	2100	990	1910	900	1700	800	1480	700
.40	100	2270	1070	2060	970	1880	885	1670	780	1470	695
.50	125	2230	1052	2010	950	1830	865	1640	775	1430	675
.60	150	2170	1025	1930	910	1780	840	1600	755	1390	655
.70	175	2120	1000	1890	890	1730	815	1550	730	1340	630
.75	185	2080	980	1850	875	1700	800	1530	720	1310	620

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-060 BLOWER PERFORMANCE
460 VOLTS (With Down-Flow Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2450	1155	2090	985	1740	820
.05	12	2430	1145	2080	980	1740	820
.10	25	2410	1135	2060	970	1730	815
.15	37	2390	1130	2040	965	1720	810
.20	50	2360	1115	2020	955	1710	805
.25	62	2340	1105	2000	945	1700	800
.30	75	2320	1095	1990	940	1680	795
.40	100	2270	1070	1940	915	1630	770
.50	125	2230	1050	1880	885	1590	750
.60	150	2170	1025	1840	870	1520	715
.70	175	2120	1000	1770	835	1460	690
.75	185	2080	980	1740	820	1440	680

NOTE — All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-060 BLOWER PERFORMANCE
230 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds									
		High		Medium-High		Medium		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2570	1215	2220	1050	2000	945	1780	840	1510	715
.05	12	2560	1210	2210	1045	1990	940	1780	840	1520	715
.10	25	2540	1200	2200	1040	1980	935	1770	835	1530	720
.15	37	2520	1190	2190	1035	1970	930	1770	835	1520	715
.20	50	2500	1180	2180	1030	1960	925	1760	830	1510	715
.25	62	2480	1170	2160	1020	1940	915	1750	825	1510	715
.30	75	2440	1150	2140	1010	1920	905	1740	820	1500	710
.40	100	2390	1130	2100	990	1900	895	1710	805	1470	695
.50	125	2320	1095	2060	970	1860	880	1670	790	1440	680
.60	150	2240	1055	2010	950	1810	855	1630	770	1400	660
.70	175	2160	1020	1950	920	1760	830	1580	745	1350	635
.75	185	2120	1000	1920	905	1720	810	1560	735	1330	630

NOTE — For 208v unit operation, derate air volume by 7% All air data is measured external to the unit with dry coil and without air filter.

CHP16/20-060 BLOWER PERFORMANCE
460 VOLTS (With Horizontal Air Openings)

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2570	1215	2100	990	1760	830
.05	12	2560	1210	2090	985	1770	835
.10	25	2540	1200	2070	975	1760	830
.15	37	2520	1190	2050	965	1760	830
.20	50	2500	1180	2030	960	1750	825
.25	62	2480	1170	2010	950	1740	820
.30	75	2440	1150	2000	945	1720	810
.40	100	2390	1130	1960	925	1670	790
.50	125	2320	1095	1910	900	1620	765
.60	150	2240	1105	1870	880	1550	730
.70	175	2160	1020	1800	850	1490	705
.75	185	2120	1000	1760	830	1470	695

NOTE — All air data is measured external to the unit with dry coil and without air filter.

ACCESSORY BLOWER DATA CHA/CHP16/20

FILTER AND ACCESSORY AIR RESISTANCE CHA/CHP16/20

Unit Model No.	Air Volume		Total Air Resistance — inches water gauge (Pa)					
			1 in. (25mm) Filter Furnished	REMD16 Down-Flow Economizer			EMDH16 Horizontal Economizer	
	cfm	L/s		Less Filter	With Optional Pleated Polyester 2 in. (51mm) Filter	With Optional Fiberglass 2 in. (51mm) Filter	With Furnished 1 in. (25mm) Filter	Less Filter
024 030 036	600	285	.13 (32)	.05 (12)	.21 (52)	.09 (22)	.12 (30)	.07 (17)
	800	380	.15 (37)	.05 (12)	.27 (67)	.13 (32)	.18 (45)	.10 (25)
	1000	470	.18 (45)	.06 (15)	.34 (85)	.18 (45)	.26 (65)	.15 (37)
	1200	565	.21 (52)	.09 (22)	.42 (104)	.24 (60)	.35 (87)	.21 (52)
	1400	660	.25 (62)	.15 (37)	.51 (127)	.31 (77)	.46 (114)	.29 (72)
042 048 060	1600	755	.15 (37)	.05 (12)	.40 (99)	.27 (67)	.30 (75)	.17 (42)
	1800	850	.17 (42)	.06 (15)	.48 (119)	.33 (82)	.35 (87)	.19 (47)
	2000	945	.20 (50)	.08 (20)	.56 (139)	.39 (97)	.40 (99)	.22 (55)
	2200	1040	.23 (57)	.10 (25)	.66 (164)	.46 (114)	.47 (117)	.26 (65)

DIFFUSER AIR RESISTANCE CHA/CHP16/20

Unit Model No.	Air Volume		Total Air Resistance — inches water gauge (Pa)			
			RTD9-65 Diffuser			FD9-65 Diffuser
	cfm	L/s	2 Ends Open	1 Side 2 Ends Open	All Ends & Sides Open	
024 030 036	600	285	.12 (30)	.11 (27)	.08 (20)	.08 (20)
	800	380	.15 (37)	.13 (32)	.11 (27)	.11 (27)
	1000	470	.19 (47)	.16 (40)	.14 (35)	.14 (35)
	1200	565	.25 (62)	.20 (50)	.17 (42)	.17 (42)
	1400	660	.33 (82)	.26 (65)	.20 (50)	.20 (50)
o42 048 060	1600	755	.43 (107)	.32 (80)	.20 (50)	.24 (60)
	1800	850	.56 (139)	.40 (90)	.30 (75)	.30 (75)
	2000	945	.73 (182)	.50 (124)	.36 (90)	.36 (90)
	2200	1040	.95 (236)	.63 (157)	.44 (109)	.44 (109)

WET INDOOR COIL AIR RESISTANCE CHA16

Model Number	Air Volume		Air Resistance	
	cfm	L/s	in. w.g.	Pa
CHA16-024	600	285	0.05	12
	800	380	0.06	15
	1000	470	0.07	17
	1200	565	0.08	20
CHA16-030	800	380	0.09	22
	1000	470	0.10	25
	1200	565	0.11	27
CHA16-036	800	380	0.09	22
	1000	470	0.10	25
	1200	565	0.11	27
	1400	660	0.12	30
CHA16-048	1600	755	0.11	27
	1800	850	0.12	30
	2000	945	0.13	32
	2200	1040	0.14	35
CHA16-060	1600	755	0.08	20
	1800	850	0.09	22
	2000	945	0.10	25
	2200	1040	0.11	27

WET INDOOR COIL AIR RESISTANCE CHP16/20

Model Number	Air Volume		Air Resistance	
	cfm	L/s	in. w.g.	Pa
CHP16/20-024	600	285	0.05	12
	800	380	0.06	15
	1000	470	0.07	17
CHP16/20-030	800	380	0.09	22
	1000	470	0.10	25
	1200	565	0.11	27
CHP16/20-036	800	380	0.07	17
	1000	470	0.08	20
	1200	565	0.09	22
	1400	660	0.10	25
CHP20--042 CHP16/20-048	1400	660	0.12	30
	1600	755	0.13	32
	1800	850	0.14	35
	2000	945	0.15	37
	2200	1040	0.16	40
CHP16/20-060	1600	755	0.11	27
	1800	850	0.12	30
	2000	945	0.13	32
	2200	1040	0.14	35

CEILING DIFFUSER AIR THROW DATA CHA16 CHP16/20

Model No.		RTD9-65		FD9-65	
Air Volume		[1] Effective Throw		[1] Effective Throw — ft. (m)	
cfm	L/s	ft.	m	ft.	m
1000	470	10-17	3-5	15-20	5-6
1200	565	11-18	3-5	16-22	5-7
1400	660	12-19	4-6	17-24	5-7
1600	755	12-20	4-6	18-25	5-8
1800	850	13-21	4-6	20-28	6-9
2000	945	14-23	4-7	21-29	6-9
2200	1040	16-25	5-8	22-30	7-9

[1] Effective throw based on terminal velocities of 75 ft. (22.9 m) per minute.

CHA/CHP16, CHP20 PARTS ARRANGEMENT
(shown with scroll compressor)

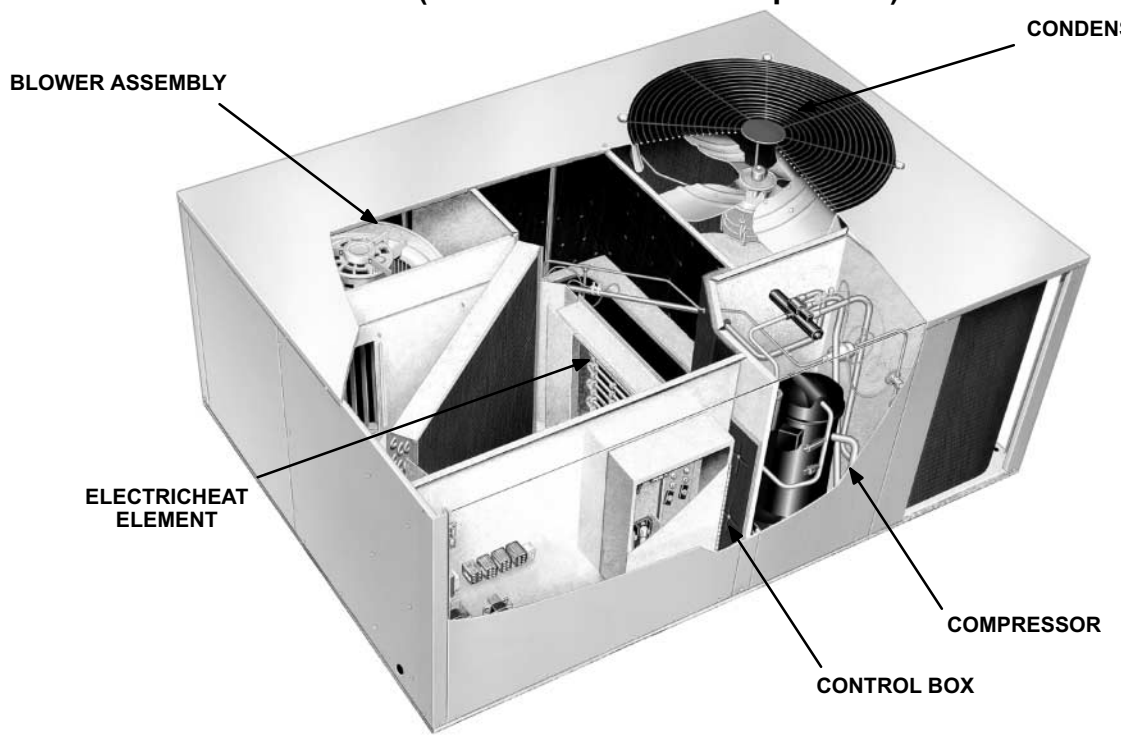


FIGURE 1

CHA/CHP16, CHP20 CONTROL BOX

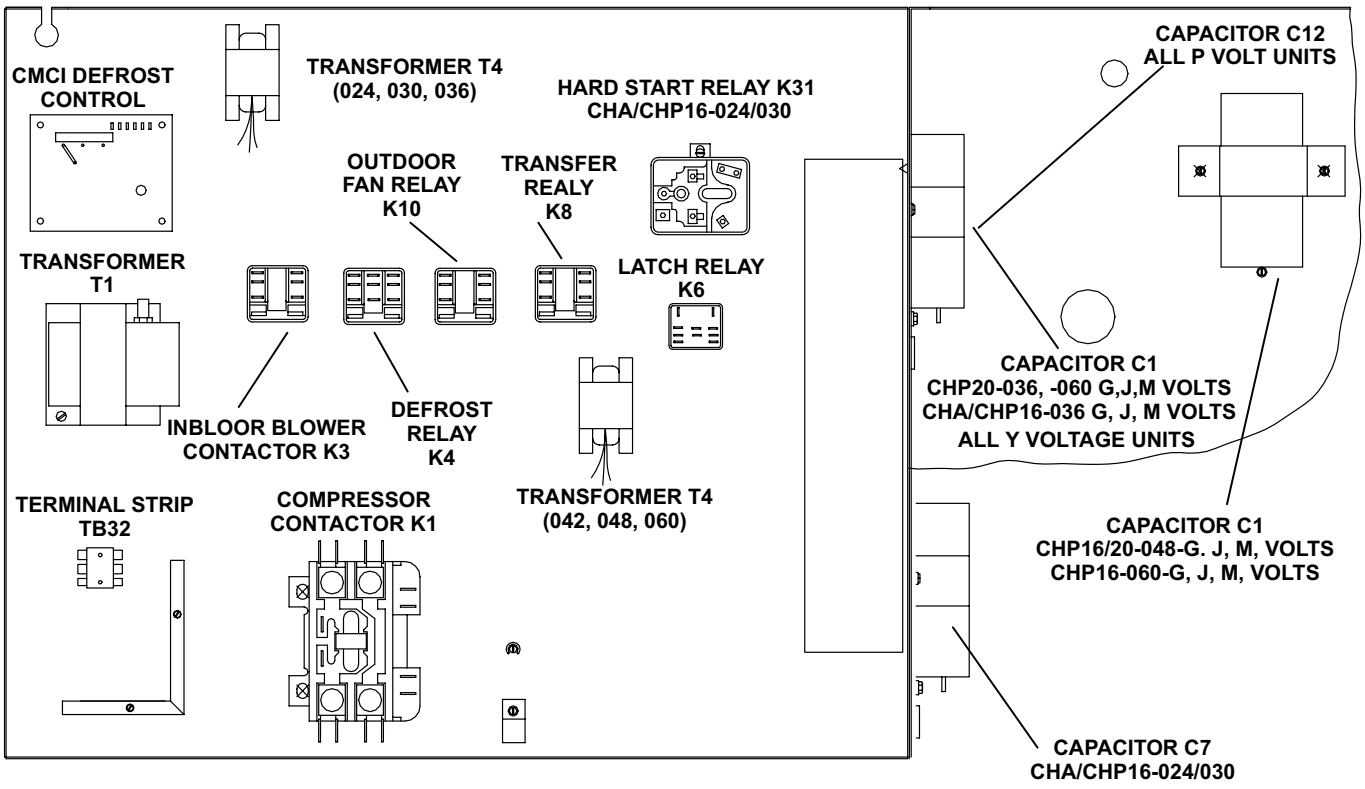


FIGURE 2

I-APPLICATION

CHA/CHP16/20 2, 2 1/2 and 3 ton units are in the one cabinet size. CHA/CHP16/20 3.5, 4 and 5 ton units are also one in one cabinet size. All CHA/CHP16/20 model units are applicable for commercial, single or three phase installations. CHA/CHP16/20 models are factory equipped with the hardware required for installing Lennox' optional thermostat control systems like the T7300 or T8600 (refer to the Engineering Handbook for more specific application data).

II-UNIT COMPONENTS

CHA/CHP16/20 unit components are shown in figure 1.

A-Control Box Components

CHA/CHP16/20 control box is shown in figure 2. The control box is located adjacent to the compressor compartment, behind the control box access panel in front of the unit.

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

The indoor blower access panel (all units) is located on the opposite side of the unit from the heating compartment access.

1-Transformer T1

All CHA/CHP16/20 series units use a single 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).

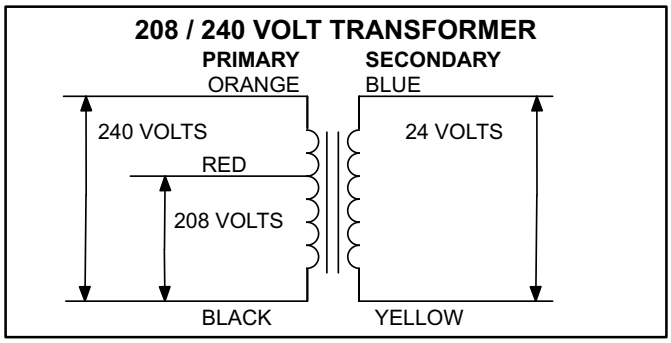


FIGURE 3

2-Cooling Contactor K1

K1 is a 24V to line voltage contactor used to energize the compressor and condenser fan in response to thermostat demand. Three-phase units use three-pole double-break contactors. Single-phase units use single-pole contactors.

⚠ DANGER

Single -phase units use single pole contactors. One leg of compressor, capacitor and condenser fan are connected to line voltage at all times.

Remove all power to disconnect before servicing.

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

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 (Cooling Speed)

208/230 volt units use a single DPDT relay to energize the indoor blower motor. 460 volt and 575 volt units use a single 3PDT relay.

CHP16/20 units **(single-phase and three-phase) 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.

460 (G) voltage units use a unique blower motor which requires the 3PDT relay. The motor utilizes the extra set of N.C. relay contacts to complete an internal circuit when the motor is on heating speed. Refer to the blower motor section of this manual for more information.

4-Defrost Relay K4 (CHP Models Only)

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 through defrost cycle.

5-Start Capacitor C7

Compressor start capacitor C7 is used in CHA/CHP16-024/030 units only, and located in the compressor compartment. C7 is connected in parallel with capacitor (C12). The capacitor is energized during compressor start-up and is switched off by potential relay K31 when the compressor nears full speed. See side of capacitor for ratings.

The start capacitor uses a 15K ohm 2 watt “bleed” resistor connected in parallel with the capacitor terminals. The resistor is used to slowly discharge the capacitor when not in use.

6-Dual Capacitor C12

Single phase CHA/CHP16/20 model units use a single “dual” capacitor, connected to both the fan motor and the compressor. A dual capacitor is two independent capacitors inside one can. Each side of the capacitor has different ratings and will be printed on the side.The capacitor is located inside the compressor compartment.

7-Condenser Fan Relay K10

Condenser fan relay K10, used in all CHP16/20 units, is a DPDT relay with a 24V coil. In all units K10 de-energizes condenser fan B4 in response to defrost demand.

8-Latch Relay K6

CHP16/20 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.

CHP16/20 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 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.

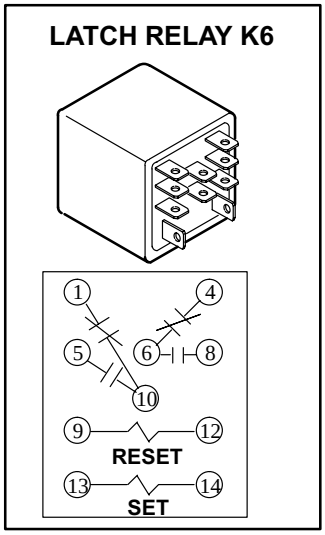


FIGURE 4

CHP16/20 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.

9-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).

10-Potential Relay K31

Relay K31 is used in the CHA/CHP16-024/030 models ONLY and is located in the control box. It is a potential relay which controls the operation of the compressor starting circuit. The relay is normally closed when the compressor (contactor K1) is de-energized. Capacitor (C7) is connected to a set of normally closed K31 contacts and assists the compressor in starting. When K1 energizes, the compressor immediately begins start-up. K31 remains de-energized during compressor start-up and the start capacitor (C7) remains in the circuit. As the compressor gains speed K31 is energized by electromotive forces generated by the compressor. When K31 energizes, its contacts open to take the start capacitor out of the circuit.

11-Defrost Control CMC1

The CMC1 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 maximum 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.

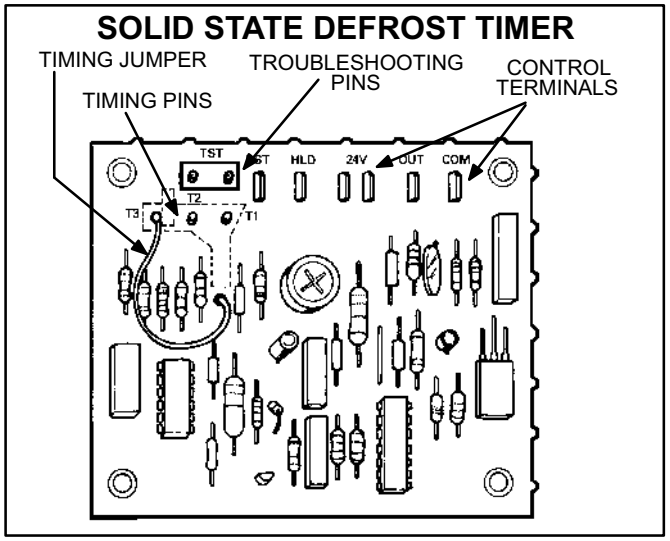


FIGURE 5

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 defrost thermostat and defrost pressure switch are closed when timing sequence ends, the defrost relay is energized and defrost begins. Consequently, the defrost pressure switch must open in order for defrost to be terminated (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).

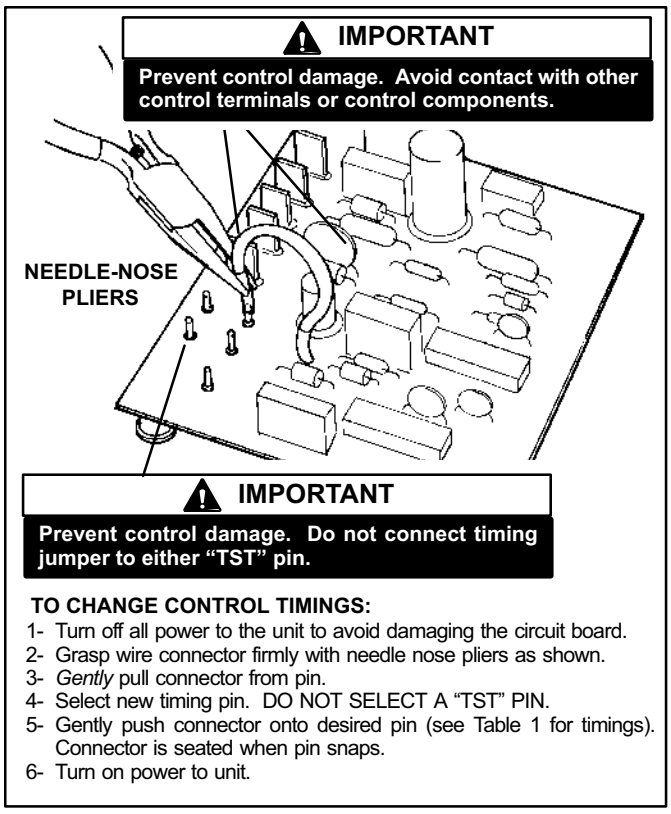


FIGURE 6

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.

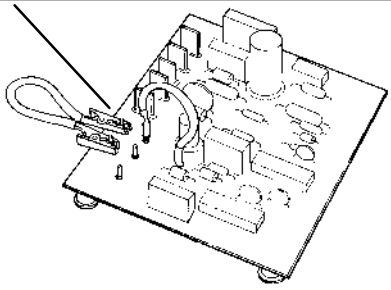


FIGURE 7

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 jumpered 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 pressure switch does 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.

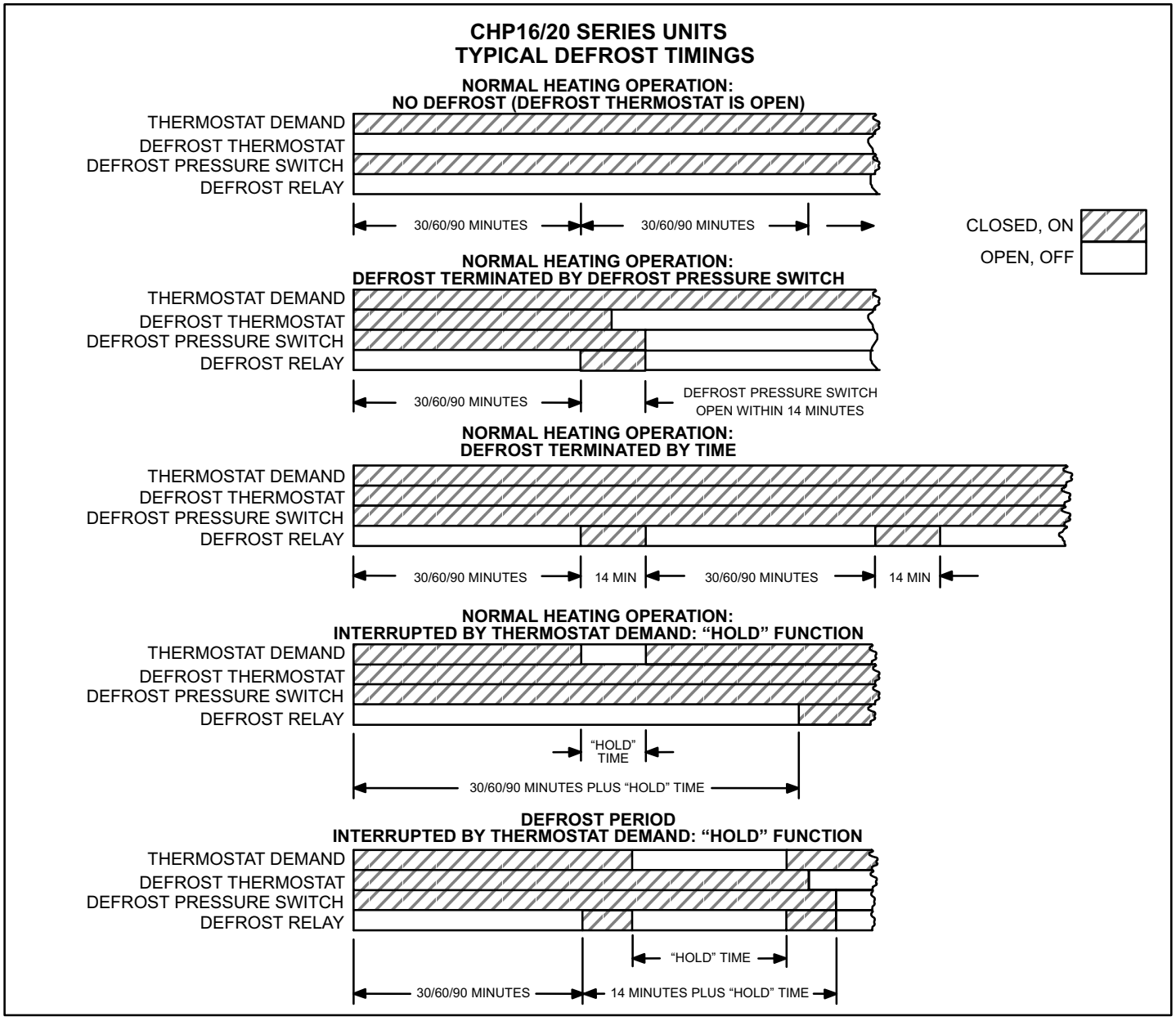


FIGURE 8

B-Cooling Components (Figures 9 and 10)

Figures 9 and 10 show CHP16/20 heat pump units. CHP16/20 units will be equipped with reversing valve, defrost components, drier and check/expansion valve. CHA16 units will be equipped with a liquid line strainer and expansion valve (no check). Common components are high pressure switch, suction and liquid line service gauge ports.

1-Reciprocating Compressor

All CHA/CHP16-024/030 units are equipped with a reciprocating compressor. All reciprocating compressors are protected by internal pressure relief valves for overload and internal crankcase heaters HR1 for proper lubrication. Compressor B1 operates during cooling and heating demand, and is energized by contactor K1 upon receiving thermosatat demand. For compressor specifications see compressor nameplate or ELECTRICAL DATA section in this manual.

⚠ DANGER

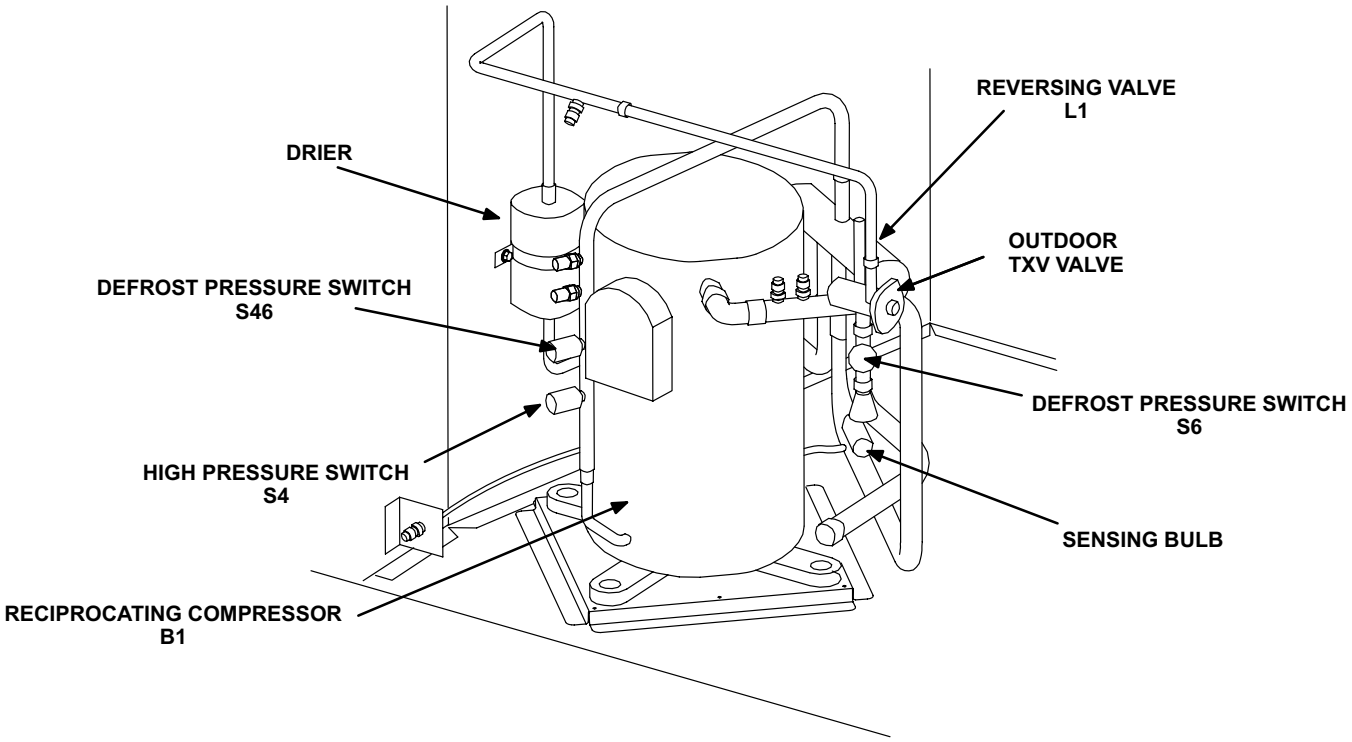
Shock hazard.

Compressor must be grounded. Do not operate without protective cover over terminals. Capacitors contain high voltage. Disconnect power before removing cover. Discharge capacitors before servicing unit. Disconnect power before servicing unit.

Can cause unsafe operation, injury or death.

COOLING COMPONENTS

CHP16-024/030 SHOWN



CHP20-024

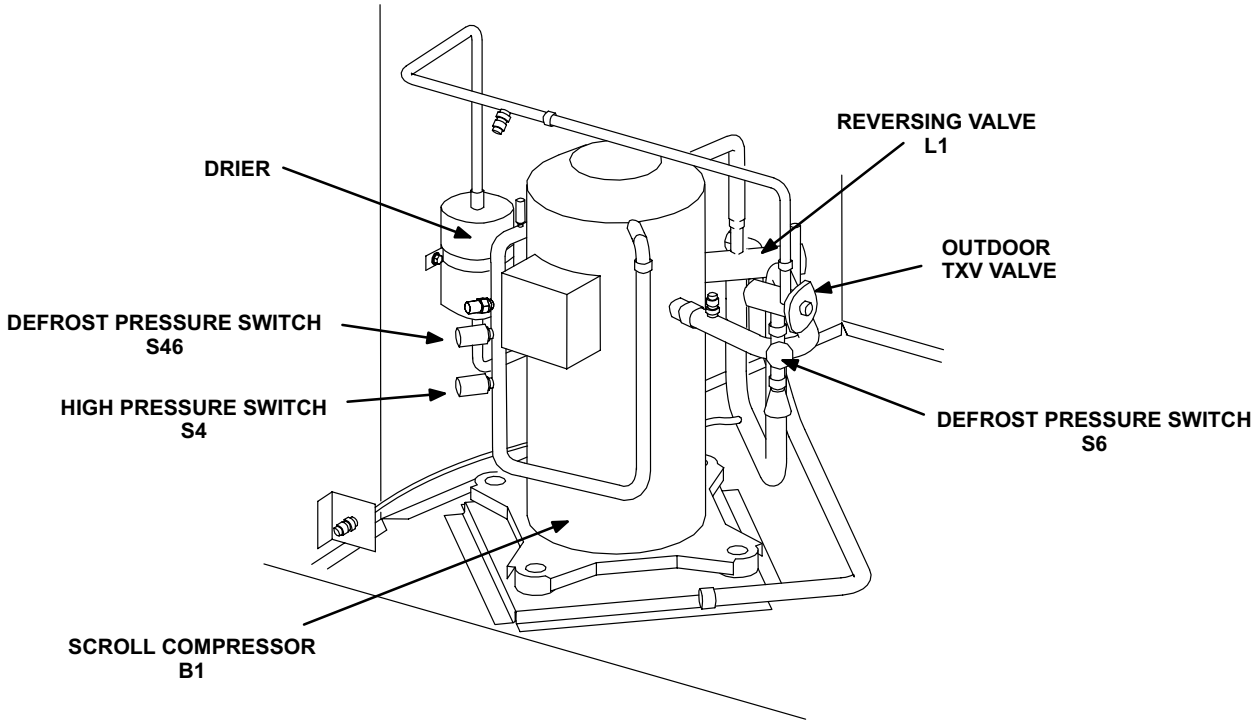
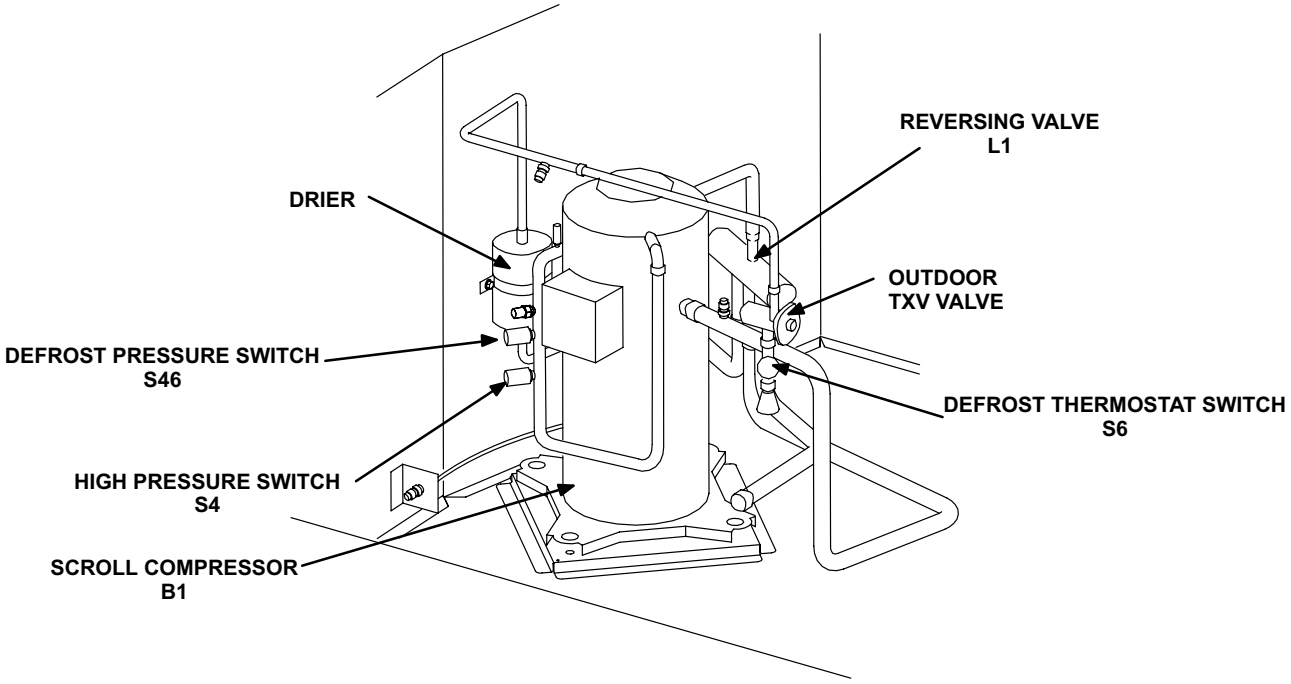


FIGURE 9

COOLING COMPONENTS

CHP20-030, CHA/CHP16/20-036



CHA/CHP16-048/060, CHP20-042/048/060

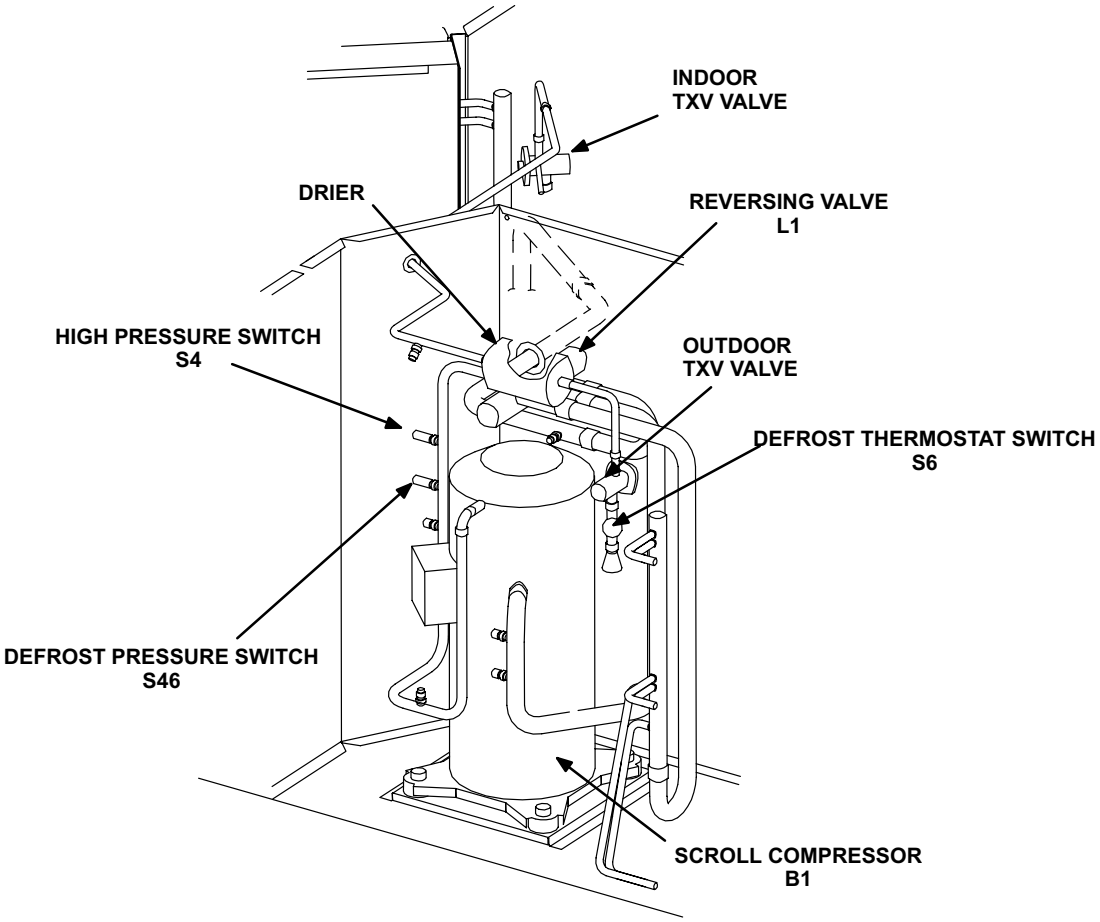


FIGURE 10

2-Scroll Compressor

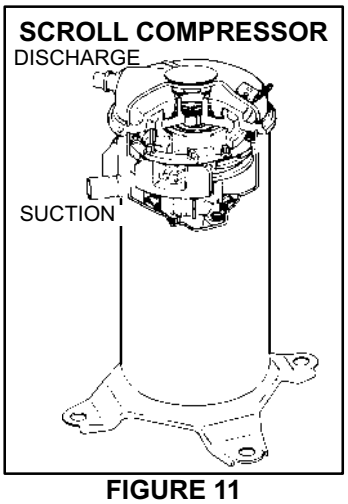


FIGURE 11

All CHA/CHP16/20 (except the CHP16-024/030 units) model 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 11. 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.

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Figure 12 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 13). One scroll remains stationary, while the other is allowed to orbit (figure 14-1). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

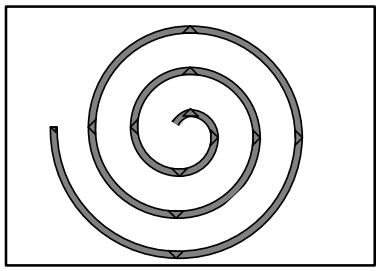


FIGURE 12

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 14-2). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 14-3). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 14-4).

When compressed gas reaches the center, it is discharged vertically into a chamber and discharge port in the top of the compressor (figure11). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 13). During a single orbit, several pockets of gas are compressed simultaneously providing smooth continuous compression.

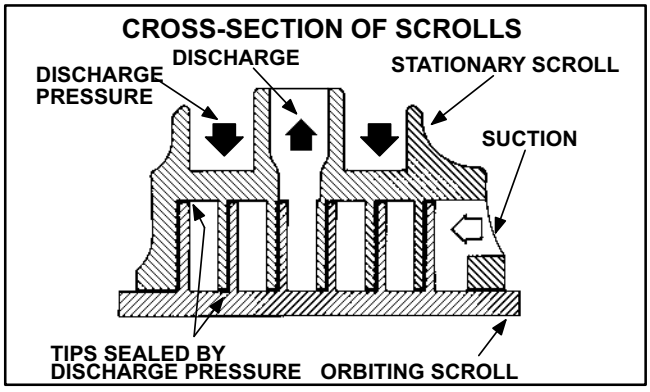


FIGURE 13

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.

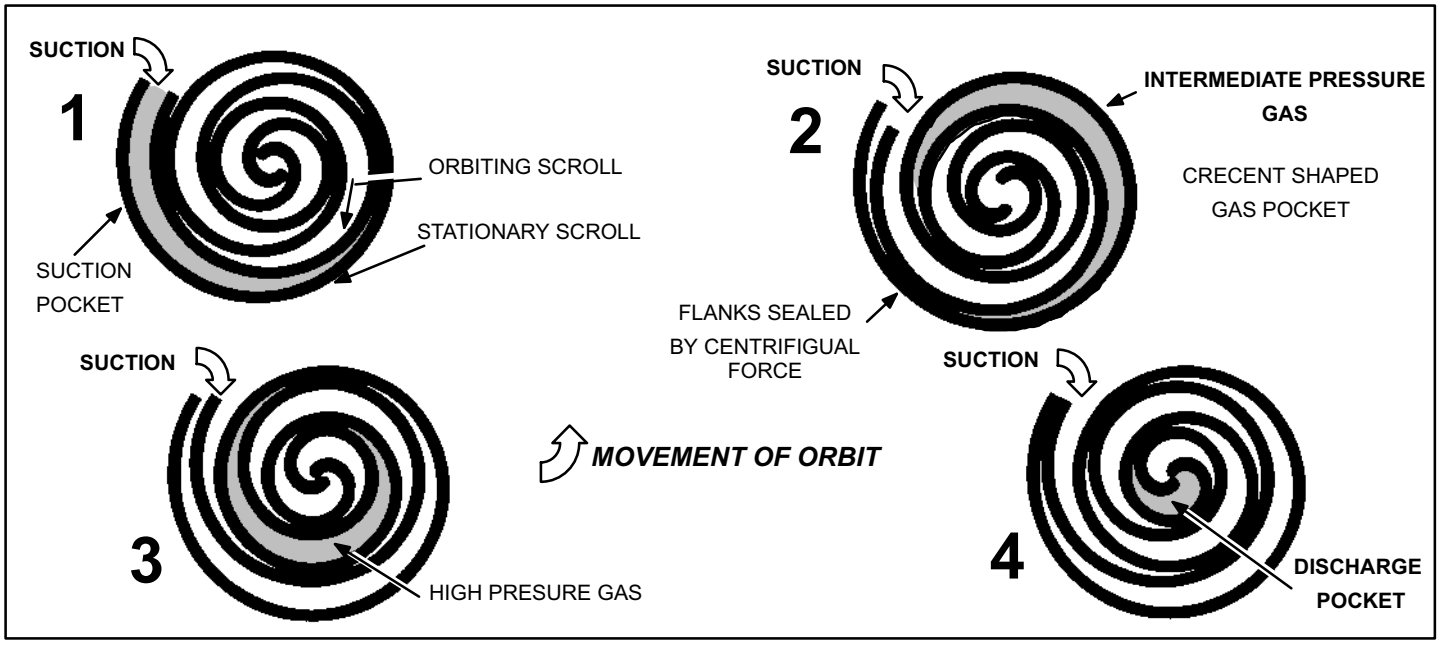


FIGURE 14

3-Evaporator Coil

All CHA/CHP16/20 units have a single slab evaporator coil. The CHA16 coils have two rows of rifled copper tubes fitted with ripple-edged alum
inum fins and the CHP16/20 coils have three, A Thermal Expansion Valve (TXV) feeds multiple parallel circuits through the coil. See figure 15.

4-Condenser Coil

All CHA/CHP16/20 units have a single condenser coil. Each coil in all units has up to two rows of copper tubes fitted with ripple-edged aluminum enhanced fins.

5-Freezestat Switch S49

All CHA/CHP16/20 model 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.

6-High Pressure Switch S4

High pressure switch S4 is standard on all CHP16/20 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 450±10 psig (3103 kPa± 69 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.

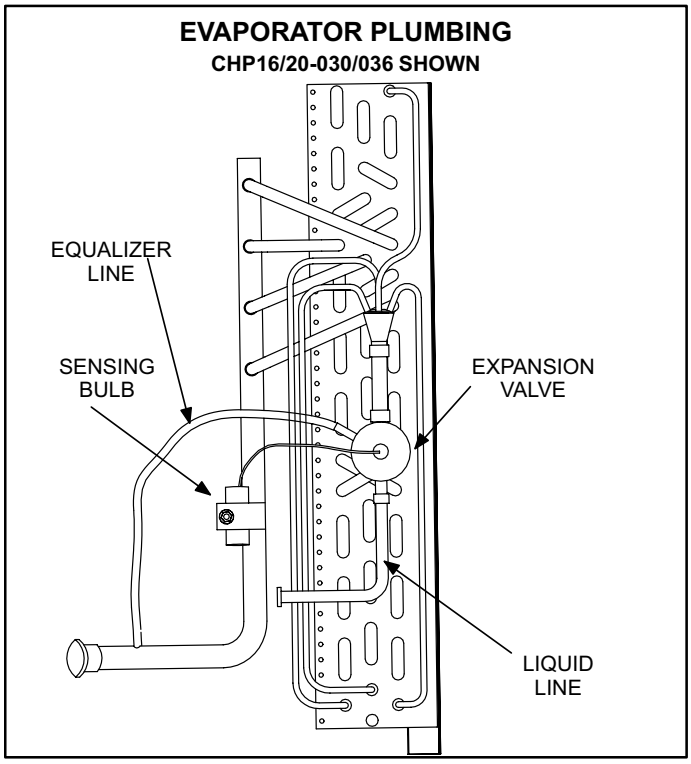


FIGURE 15

7-Reversing Valve L1

All CHP16/20 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 heatingdemand. When thermostat selection is out of cooling mode L1 is de-energized.

8-Drier

All CHP16/20 units have a biflo with 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.

9-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.

10-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.

11-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 low ambient switch S11. This allows the fan to operate during heating demand and to cycle during cooling demand.

12-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-Condenser Fan and Indoor Blower

1-Condenser Fan and Blower Motor B4

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

2-Capacitors C1 & C12

All three phase model units use single-phase PSC outdoor fan motors which requires a run capacitor. C1 is located in the compressor compartment. Single phase units use a dual capacitor C12 instead of C1. The dual capacitor is shared between the compressor and outdoor fan. Ratings for capacitors will be on outdoor fan motor nameplate.

3-Blower Motor B3 & Capacitor C4

All CHA/CHP16/20 series units use single-phase PSC blower motors. A single run capacitor C4 is mounted on the blower housing. Ratings for capacitor will be on motor nameplate. All motors use multiple speed taps. Typically, the high speed tap is energized during compressor operation and a lower speed tap is energized during heating operation. See motor nameplate or ELECTRICAL DATA section for motor specifications.

III-OPTIONAL ECH16 ELECTRIC HEAT

A-Matchups and Ratings

Tables 4 through 15 show all possible CHP16/20 to ECH16 matchups. Also shown in the tables are ECH16 electrical ratings.

B-Electric Heat Components

ECH16 parts arrangement is shown in figure 18. 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-Relay K15

Relay K15 is a single-pole single-throw relay located on the control panel of all commercial single-phase ECH16 units (15, 20 and 25 kW). K15 is equipped with a 24VAC coil which is energized when pilot relay K43 closes. When K15 is energized, the first stage heating elements are energized. (HE1 in ECH16-15; HE1 and HE2 in ECH16-20 and ECH16-25).

2-Contactor K15

Contactor K15 is a three-pole double-break contactor used in all commercial three-phase ECH16 units. K15 is equipped with a 24VAC coil which is energized when pilot relay K43 closes. When K15 is energized, the first stage heating elements are energized.

Contactor K15 used in ECH16-15-1Y and ECH16-25-1G units is equipped with a set of auxiliary single-pole double-throw contacts. The auxiliary contacts are not used in this application.

3-Relay K16

Relay K16 is a single-pole single-throw relay located on the control panel of all commercial single-phase ECH16 units (15, 20 and 25 kW). K16 is equipped with a 24VAC coil which is energized when pilot relay K43 closes. When K16 is energized, the second stage heating elements are energized (HE2 in ECH16-15; HE3 and HE4 in ECH16-20 and ECH16-25).

4-Contactor K16

Contactor K16 is a three-pole double-break contactor used in commercial 20 and 25 kW three-phase ECH16 units. K16 is equipped with a 24VAC coil which is energized when time delay DL2 closes. When K16 is energized, the second stage heating elements are energized.

5-Relay K17

Relay K17 is a single-pole single-throw relay located on the control panel of all commercial single-phase ECH16 units (15, 20 and 25 kW). K17 is equipped with a 24VAC coil which is energized when pilot relay K43 closes. When K17 is energized, the third stage heating elements are energized (HE3 in ECH16-15; HE5 and HE6 in ECH16-20 and ECH16-25).

6-Resistor R6

A resistor is used in parallel with the coil of heat relay K32 in ECH16R-5 electric heaters. The resistor is rated 150 ohm $\pm$ 10%, 10 watt.

The resistor reduces the effects of inrush current on the thermostat. Heat relay K32 draws approximately 0.7 amps immediately after being energized. As the relay coil heats, the current subsides. Within a few seconds after being energized, the current is reduced to minimum level (approximately 0.18 amps).

Contactor K16 used in ECH16-25-1Y unit is equipped with a set of auxiliary single-pole double-throw contacts. The auxiliary contacts are not used in this application.

7-Relay K43

Relay K43 is a double-pole double-throw pilot relay used in all commercial ECH16 units. The relay uses a 24VAC coil which is energized by thermostat demand. The coil is wired in series with the primary high temperature limit S15. If an overtemperature condition becomes present, pilot relay K43 is immediately de-energized and electric heat operation immediately stops.

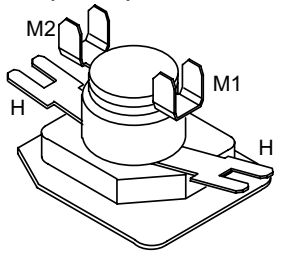
When relay K43 is energized, normally open contacts K43-1 and K43-2 close. When K43-1 closes, contactor K15 (and time delay DL2 if so equipped) are energized to begin electric heat operation. When K43-2 closes, the indoor blower begins operating on heating speed.

8-Thermal (Heat) Relay K32, K33

Thermal sequencing (heat) relays are used to energize heating elements in all ECH16R electric heaters. A heat relay is a normally open relay with a resistive element for a coil and a bimetal disk actuating the contacts. When the relay is energized, internal resistance heats the bimetal disk causing the contacts to close. When the relay is de-energized, the disk cools and the contacts open.

A sequencing relay has multiple contacts. Each set of contacts is connected to a separate bimetal disk. When the relay is energized, internal resistance heats the bimetal disks at different rates causing the contacts to close at different times.

TYPICAL THERMAL SEQUENCING (HEAT) RELAY



The contacts are calibrated to operate on a first on last off basis. Some heat relays may have two resistive coils; each with its own set of contacts. Although they are physically attached, they operate as two independent relays. Figure 16 shows a typical heat relay.

9-Fuse F3

F3 is a current limiting fuse connected in series with each leg of electric heat. See tables 2 or 3 for fuse ratings.

10-High Temperature Primary S15

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. S15 ratings are printed on side of limit.

In ECH16R series units, multiple S15 thermostats may be used. One S15 thermostat is wired in series with each heating element. When S15 trips, some heating elements may remain operable.

PRIMARY LIMIT S15, SECONDARY LIMIT S20

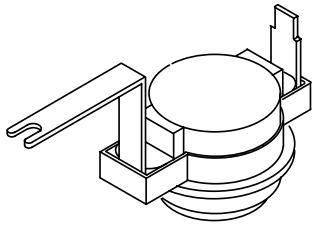


FIGURE 17

In ECH16 commercial units, only one S15 thermostat is used. A single S15 thermostat is wired in series with pilot relay K43. When S15 trips, all heating elements are de-energized.

11-High Temperature Secondary S20

ECH16 commercial units use non-resettable thermostats for secondary high temperature protection. One switch is connected in series with each leg of the element assembly. Each S20 thermostat is physically located adjacent to the element it is protecting. S20 is a single-pole single-throw normally closed thermostat. The thermostat actuates at 185°F ± 8°F on a temperature rise and cannot be reset. Once tripped, it must be replaced.

12-Heating Elements

ECH16 and ECH16R heating elements are composed of helix wound nichrome wire heating elements which are exposed directly to the airstream. Heating elements are energized directly by contactors or thermal (heat) relays located on the control panel. Once energized, heat transfer to the airstream is instantaneous. Overtemperature protection is provided by primary and secondary high temperature limits. Overcurrent protection (ECH16 commercial units only) is provided by current limiting fuses.

13-Time Delay DL2

Time delay DL2 is an electronic single-pole single-throw time delay relay used in 20 and 25kW three phase ECH16/20 units. DL2 allows staging by providing a timed interval between the first and second sets of heating elements. DL2 is energized with contactor K15 when pilot relay K43-1 closes. When the delay coil is energized, it's normally open contacs are delayed 30 seconds before closing. When the delay coil is de-energized, its contacts are delayed one second before opening.

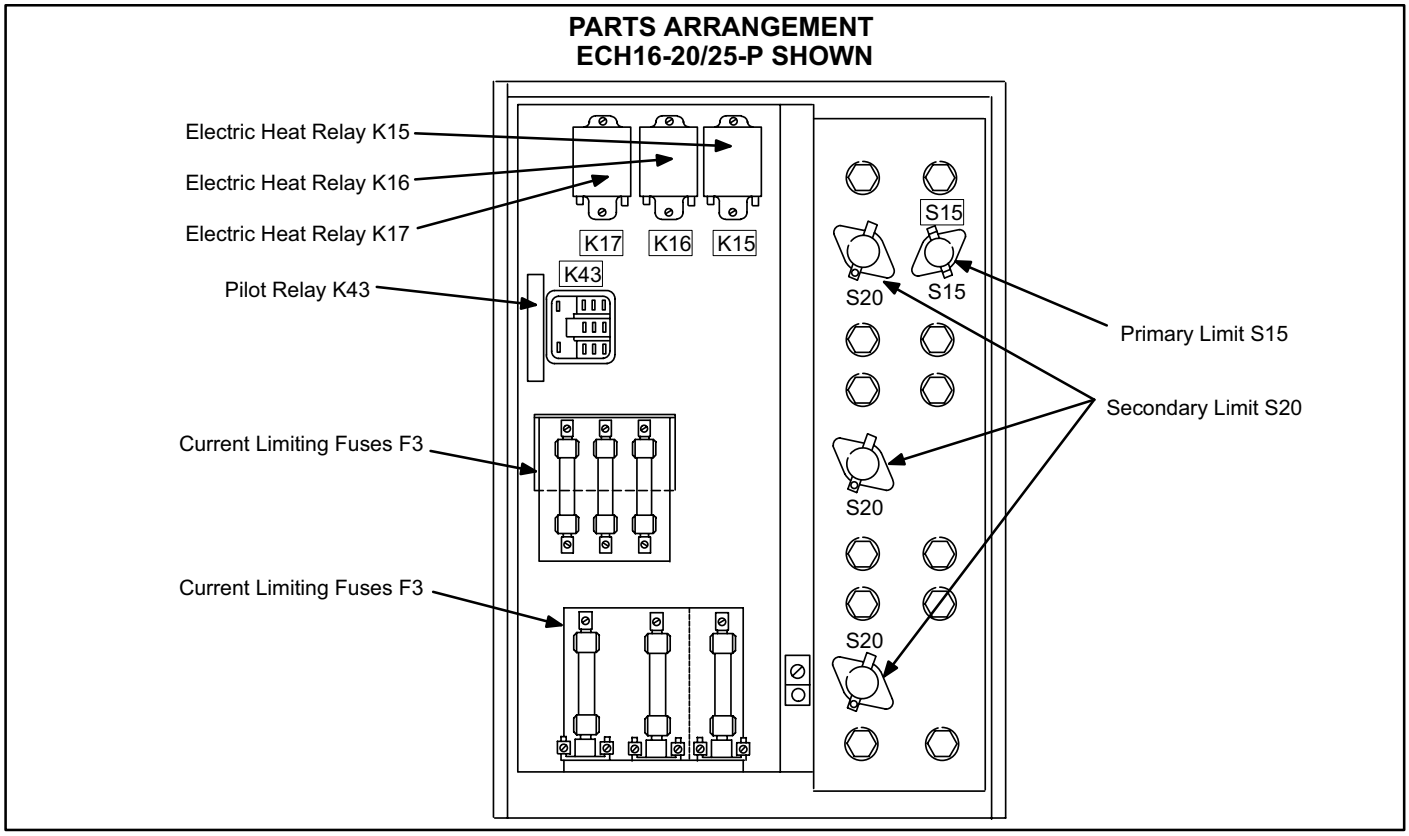


FIGURE 18

TABLE 2

ECH16 (F3) RATING			
UNIT	**VOLTAGE**	**RATING**	**QUANTITY**
ECH16-5	208/230 3 PHASE	20 AMP 250V	THREE
ECH16-7	208/230 3 PHASE	25 AMP 250V	THREE
ECH16-10	208/230V 3 PHASE	40 AMP 250V	THREE
	460V	20 AMP 600V	THREE
	575V	15 AMP 600V	THREE
ECH16-15	208/230V 1 PHASE	35 AMP 250V	TWO
		60 AMP 250V	TWO
	208/230V 3 PHASE	60 AMP 250V	THREE
	460V	30 AMP 600V	THREE
	575V	25 AMP 600V	THREE

TABLE 3

ECH16 (F3) RATING			
UNIT	**VOLTAGE**	**RATING**	**QUANTITY**
ECH16-20	208/230V 1 PHASE	45 AMP 250V	SIX
	208/230V 3 PHASE	40 AMP 250V	SIX
	460V	40 AMP 600V	THREE
	575V	30 AMP 600V	THREE
ECH16-25	208/230V 1 PHASE	60 AMP 250V	SIX
	208/230V 3 PHASE	40 AMP 250V	THREE
		60 AMP 250V	THREE
	460V	50 AMP 600V	THREE
	575V	40 AMP 600V	THREE

TABLE 4 CHA16-024/030

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Minimum Circuit Ampacity
CHA16-024	ECH16R-5 **(34H46)** 9 lbs. (4 kg)	1 step 1 phase	208	23	3.7	12,600	ECH16R-26/41-5 **(34H26)**	ECH16-261 **(31H10)**	26
			220	24	4.2	14,300			27
			230	25	4.6	15,700			28
			240	26	5.0	17,100			29
	ECH16R-7 **(34H47)** 5 lbs. (2 kg)		208	32	5.3	18,100	ECH16R-26/65-7 **(34H25)**		35
			220	34	5.9	20,100			37
			230	35	6.4	21,800			38
			240	37	7.0	23,900			40
	ECH16R-10 **(34H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(34H24)**		48
			220	48	8.4	28,700			51
			230	50	9.2	34,100			53
			240	53	10.0	34,100			55
	ECH16R-15 **(34H48)** 18 lbs. (8 kg)		208	68	11.3	38,600	- - - -		71
			220	72	12.6	43,000			75
			230	75	13.8	47,100			78
			240	79	15.0	51,200			81
CHA16-030	ECH16R-5 **(34H46)** 9 lbs. (4 kg)	1 step 1 phase	208	23	3.7	12,600	ECH16R-26/41-5 **(34H26)**	ECH16-311 **(31H11)**	27
			220	24	4.2	14,300			28
			230	25	4.6	15,700			29
			240	26	5.0	17,100			30
	ECH16R-7 **(34H47)** 5 lbs. (2 kg)		208	32	5.3	18,100	ECH16R-26/65-7 **(34H25)**		36
			220	34	5.9	20,100			38
			230	35	6.4	21,800			39
			240	37	7.0	23,900			41
	ECH16R-10 **(34H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(34H24)**		49
			220	48	8.4	28,700			52
			230	50	9.2	31,400			54
			240	53	10.0	34,100			56
	ECH16R-15 **(34H48)** 18 lbs. (8 kg)		208	68	11.3	38,600			72
			220	72	12.6	43,000			76
			230	75	13.8	47,100			79
			240	79	15.0	51,200			82

†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).

TABLE 5 CHA16-036

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Minimum Circuit Ampacity
CHA16-036	ECH16R-5 **(31H46)** 4 lbs. (2 kg)	1 step (1 phase)	208	23	3.7	12,600	ECH16R-26/41-5 **(31H26)**	ECH16-411 (**31H12**)	27
			220	24	4.2	14,300			28
			230	25	4.6	15,700			29
			240	26	5.0	17,100			30
	ECH16R-7 **(31H47)** 5 lbs. (2 kg)		208	32	5.3	18,100	ECH16R-26/65-7 **(31H25)**		36
			220	34	5.9	20,100			38
			230	35	6.4	21,800			39
			240	37	7.0	23,900			41
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		49
			220	48	8.4	28,700			52
			230	50	9.2	31,400			54
			240	53	10.0	34,100			56
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,600	- - - -		72
			220	72	12.6	43,000			76
			230	75	13.8	47,100			79
			240	79	15.0	51,200			82
	ECH16-20 **(31H28)** 19 lbs. (9 kg)		208	91	15.0	51,200			94
			220	96	16.8	57,300			100
			230	100	18.4	62,800			104
			240	105	20.0	68,300			108
	ECH16-5 208/230v **(31H30)** 17 lbs. (9 kg)	1 step (3 phase)	208	13	3.7	12,600	- - - -	ECH16-413 208/230v **(31H15)**	17
			220	14	4.2	14,300			18
			230	15	4.6	15,700			19
			240	15	5.0	17,100			19
	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 575v **(31H41)** 17 lbs. (8 kg)		208	19	5.3	18,100			22
			220	20	5.9	20,100			23
			230	21	6.4	21,800			24
			240	21	7.0	23,900			25
			440	10	5.8	19,800		ECH16-413 460v **(31H18)**	12
			460	11	6.5	22,200			13
			480	11	7.0	23,900			13
			550	8	5.8	19,800		ECH16-413/513 575v **(31H21)**	10
			575	9	6.4	21,800			11
			600	9	7.0	23,900			11
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 575v **(31H42)** 17 lbs. (8 kg)		208	26	7.5	25,600		ECH16-413 208/230v **(31H15)**	30
			220	28	8.4	28,700			32
			230	29	9.2	31,400			33
			240	31	10.0	34,100			34
			440	14	8.4	28,700		ECH16-413 460v **(31H18)**	16
			460	15	9.2	31,400			17
			480	15	10.0	34,100			18
			550	11	8.4	28,700		ECH16-413/513 575v **(31H21)**	14
			575	12	9.2	31,400			14
			600	12	10.0	34,100			15
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 575v **(31H43)** 17 lbs. (8 kg)		208	40	11.3	38,600		ECH16-413 208/230v **(31H15)**	43
			220	42	12.6	43,000			46
			230	44	13.8	47,100			47
			240	46	15.0	51,200			49
			440	21	12.6	43,000		ECH16-413 460v **(31H18)**	23
			460	22	13.8	47,100			24
			480	23	15.0	51,200			25
			550	17	12.6	43,000		ECH16-413/513 575v **(31H21)**	19
			575	18	13.7	47,100			20
			600	18	15.0	51,200			21
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 575v **(31H44)** 20 lbs. (9 kg)	2 steps (3 phase)	208	53	15.0	51,200		ECH16-413 208/230v **(31H15)**	56
			220	56	16.8	57,300			59
			230	58	18.4	62,800			62
			240	61	20.0	68,300			64
		1 step (3 phase)	440	28	16.8	57,300		ECH16-413 460v **(31H18)**	30
			460	29	18.4	62,800			32
			480	31	20.0	68,300			33
			550	22	16.8	57,300		ECH16-413/513 575v **(31H21)**	25
			575	23	18.3	62,400			26
			600	24	20.0	68,300			27

†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).

TABLE 6 CHA16-048

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Min. Cir. Amp.
CHA16-048	ECH16R-7 **(31H47)** 5 lbs. (2 kg)	1 step (1 phase)	208	32	5.3	18,100	ECH16R-26/65-7 **(31H25)**	ECH16-511 **(31H13)**	37
			220	34	5.9	20,100			39
			230	35	6.4	21,800			40
			240	37	7.0	23,900			42
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		50
			220	48	8.4	28,700			53
			230	50	9.2	31,400			55
			240	53	10.0	34,100			57
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,600	- - - -		73
			220	72	12.6	43,000			77
			230	75	13.8	47,100			80
			240	79	15.0	51,200			83
	ECH16-20 **(31H28)** 19 lbs. (9 kg)		208	91	15.0	51,200			96
			220	96	16.8	57,300			101
			230	100	18.4	62,800			105
			240	105	20.0	68,300			109
	ECH16-25 **(31H29)** 19 lbs. (9 kg)		208	113	18.8	64,200			118
			220	120	21.0	71,700			125
			230	125	23.0	78,500			130
			240	131	25.0	85,300			136
	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 575v **(31H41)** 17 lbs. (8 kg)	1 step (3 phase)	208	19	5.3	18,100	- - - -	ECH16-513 208/230v **(31H16)**	24
			220	20	5.9	20,100			25
			230	21	6.4	21,800			25
			240	21	7.0	23,900			26
			440	10	5.8	19,800		ECH16-413/513 460v **(31H20)**	12
			460	11	6.5	22,200			13
			480	11	7.0	23,900			13
			550	8	5.8	19,800		ECH16-413/513 575v **(31H21)**	10
			575	9	6.4	21,800			11
			600	9	7.0	23,900			11
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 575v **(31H42)** 17 lbs. (8 kg)		208	27	7.5	25,600		ECH16-513 208/230v **(31H16)**	31
			220	28	8.4	28,700			33
			230	29	9.2	31,400			34
			240	31	10.0	34,100			35
			440	14	8.4	28,700		ECH16-413/513 460v **(31H21)**	16
			460	15	9.2	31,400			17
			480	15	10.0	34,100			18
			550	11	8.4	28,700		ECH16-413/513 575v **(31H21)**	14
			575	12	9.2	31,400			14
			600	12	10.0	34,100			15
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 575v **(31H43)** 17 lbs. (8 kg)		208	40	11.3	38,600		ECH16-513 208/230v **(31H16)**	44
			220	42	12.6	43,000			47
			230	44	13.8	47,100			49
			240	46	15.0	51,200			50
			440	21	12.6	43,000		ECH16-413/513 460v **(31H21)**	23
			460	22	13.8	47,100			24
			480	23	15.0	51,200			25
			550	17	12.6	43,000		ECH16-413/513 575v **(31H21)**	19
			575	18	13.7	46,800			20
			600	18	15.0	51,200			21
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 575v **(31H44)** 20 lbs. (9 kg)	2 steps (3 phase)	208	53	15.0	51,200		ECH16-513 208/230v **(31H16)**	57
			220	56	16.8	57,300			60
			230	58	18.4	62,800			63
			240	61	20.0	68,300			65
		1 step (3 phase)	440	28	16.8	57,300		ECH16-513/653 460v **(31H19)**	30
			460	29	18.4	62,800			32
			480	31	20.0	68,300			33
			550	22	16.8	57,300		ECH16-413/513 575v **(31H21)**	25
			575	23	18.3	62,400			26
			600	24	20.0	68,300			27
	ECH16-25 208/230v **(31H35)** 460v **(31H40)** 575v **(31H45)** 20 lbs. (9 kg)	2 steps (3 phase)	208	66	18.8	64,200		ECH16-513 208/230v **(31H16)**	70
			220	69	21.0	71,700			74
			230	72	22.9	78,100			77
			240	76	25.0	85,300			80
		1 step (3 phase)	440	35	21.0	71,700		ECH16-413/513 460v **(31H21)**	37
			460	36	22.9	78,100			39
			480	38	25.0	85,300			40
			550	28	21.1	72,000		ECH16-413/513 575v **(31H21)**	30
			575	29	23.0	78,500			32
			600	31	25.0	85,300			33

†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).

TABLE 7 CHA16-060

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Min. Cir. Amp.
CHA16-060	ECH16R-7 **(31H47)** 5 lbs. (2 kg)	1 step (1 phase)	208	32	5.3	18,100	ECH16R-26/65-7 **(31H25)**	ECH16-651 **(31H14)**	39
			220	34	5.9	20,100			40
			230	35	6.4	21,800			42
			240	37	7.0	23,900			43
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		52
			220	48	8.4	28,700			55
			230	50	9.2	31,400			57
			240	53	10.0	34,100			59
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,600	- - - -		75
			220	72	12.6	43,000			79
			230	75	13.8	47,100			82
			240	79	15.0	51,200			85
	ECH16-20 **(31H28)** 19 lbs. (9 kg)		208	91	15.0	51,200			97
			220	96	16.8	57,300			102
			230	100	18.4	62,800			107
			240	105	20.0	68,300			111
	ECH16-25 **(31H29)** 19 lbs. (9 kg)		208	113	18.8	64,200			120
			220	120	21.0	71,700			126
			230	125	23.0	78,500			132
			240	131	25.0	85,300			137
	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 575v **(31H41)** 17 lbs. (8 kg)	1 step (3 phase)	208	19	5.3	18,100	- - - -	ECH16-653 208/230v **(58L07)**	25
			220	20	5.9	20,100			26
			230	21	6.4	21,800			27
			240	21	7.0	23,900			28
			440	10	5.8	19,800		ECH16-513/653 460v **(31H19)**	13
			460	11	6.5	22,200			14
			480	11	7.0	23,900			14
			550	8	5.8	19,800		ECH16-653 575v **(31H23)**	12
			575	9	6.4	21,800			12
			600	9	7.0	23,900			12
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 575v **(31H42)** 17 lbs. (8 kg)		208	27	7.5	25,600		ECH16-653 208/230v **(58L07)**	33
			220	28	8.4	28,700			35
			230	29	9.2	31,400			36
			240	31	10.0	34,100			37
			440	14	8.4	28,700		ECH16-513/653 460v **(31H19)**	18
			460	15	9.2	31,400			18
			480	15	10.0	34,100			19
			550	11	8.4	28,700		ECH16-653 575v **(31H23)**	15
			575	12	9.2	31,400			15
			600	12	10.0	34,100			16
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 575v **(31H43)** 17 lbs. (8 kg)		208	40	11.3	38,600		ECH16-653 208/230v **(58L07)**	46
			220	42	12.6	43,000			48
			230	44	13.8	47,100			50
			240	46	15.0	51,200			52
			440	21	12.6	43,000		ECH16-513/653 460v **(31H19)**	24
			460	22	13.8	47,100			25
			480	23	15.0	51,200			26
			550	17	12.6	43,000		ECH16-653 575v **(31H23)**	20
			575	18	13.7	46,800			21
			600	18	15.0	51,200			22
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 575v **(31H44)** 20 lbs. (9 kg)	2 steps (3 phase)	208	53	15.0	51,200		ECH16-653 208/230v **(58L07)**	59
			220	56	16.8	57,300			62
			230	58	18.4	62,800			65
			240	61	20.0	68,300			67
		1 step (3 phase)	440	28	16.8	57,300		ECH16-513/653 460v **(31H19)**	31
			460	29	18.4	62,800			33
			480	31	20.0	68,300			34
			550	22	16.8	57,300		ECH16-653 575v **(31H23)**	26
			575	23	18.3	62,400			27
			600	24	20.0	68,300			28
	ECH16-25 208/230v **(31H35)** 460v **(31H40)** 575v **(31H45)** 20 lbs. (9 kg)	2 steps (3 phase)	208	66	18.8	64,200		ECH16-653 208/230v **(58L07)**	72
			220	69	21.0	71,700			76
			230	72	22.9	78,100			79
			240	76	25.0	85,300			82
		1 step (3 phase)	440	35	21.0	71,700		ECH16-513/653 460v **(31H19)**	38
			460	36	22.9	78,100			40
			480	38	25.0	85,300			41
			550	28	21.1	72,000		ECH16-653 575v **(31H23)**	31
			575	29	23.0	78,500			33
			600	31	25.0	85,300			34

†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).

TABLE 8 CHP16-024/030/036

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Minimum Circuit Ampacity
CHP16-024	ECH16R-5 **(31H46)** 4 lbs. (2 kg)	1 step (1 phase)	208	23	3.8	12,800	ECH16R-26/41-5 **(31H26)**	ECH16-261 (**31H10**)	39
			220	24	4.2	14,300			40
			230	25	4.6	15,700			41
			240	26	5.0	17,100			42
	ECH16R-7 **(31H47)** 5 lbs. (2 kg)		208	32	5.3	17,900	ECH16R-26/65-7 **(31H25)**		48
			220	34	5.9	20,100			50
			230	35	6.4	21,900			51
			240	37	7.0	23,900			52
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		61
			220	48	8.4	28,700			64
			230	50	9.2	31,300			66
			240	53	10.0	34,100			68
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,400	- - - -		84
			220	72	12.6	43,000			88
			230	75	13.8	47,100			91
			240	79	15.0	51,200			94
CHP16-030	ECH16R-5 **(31H46)** 4 lbs. (2 kg)	1 step (1 phase)	208	23	3.8	12,800	ECH16R-26/41-5 **(31H26)**	ECH16-311 (**31H11**)	43
			220	24	4.2	14,300			44
			230	25	4.6	15,700			45
			240	26	5.0	17,100			47
	ECH16R-7 **(31H47)** 5 lbs. (2 kg)		208	32	5.3	17,900	ECH16R-26/65-7 **(31H25)**		52
			220	34	5.9	20,100			54
			230	35	6.4	21,900			56
			240	37	7.0	23,900			57
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		66
			220	48	8.4	28,700			69
			230	50	9.2	31,300			71
			240	53	10.0	34,100			73
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,400	- - - -		89
			220	72	12.6	43,000			92
			230	75	13.8	47,000			95
			240	79	15.0	51,200			99
CHP16-036	ECH16R-5 **(31H46)** 4 lbs. (2 kg)	1 step (1 phase)	208	23	3.8	12,800	ECH16R-26/41-5 **(31H26)**	ECH16-411 (**31H12**)	50
			220	24	4.2	14,300			51
			230	25	4.6	15,700			52
			240	26	5.0	17,100			53
	ECH16R-7 **(31H47)** 5 lbs. (2 kg)		208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**		58
			220	34	5.9	20,000			60
			230	35	6.4	22,000			62
			240	37	7.0	23,900			63
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		72
			220	48	8.4	28,700			74
			230	50	9.2	31,300			77
			240	53	10.0	34,100			79
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,500	- - - -		95
			220	72	12.6	43,000			98
			230	75	13.8	47,000			102
			240	79	15.0	51,200			105
	ECH16-20 **(31H28)** 19 lbs. (9 kg)		208	91	15.0	51,200			117
			220	96	16.8	57,300			122
			230	100	18.4	62,700			127
			240	105	20.0	68,200			131

†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).

TABLE 9 CHP16-048/060

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Min. Cir. Amp.
CHP16-048	ECH16R-7 **(31H47)** 5 lbs. (2 kg)	1 step (1 phase)	208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**	ECH16-511 **(31H13)**	66
			220	34	5.9	20,000			67
			230	35	6.4	22,000			69
			240	37	7.0	23,900			70
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		79
			220	48	8.4	28,700			82
			230	50	9.2	31,300			84
			240	53	10.0	34,100			86
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,500	- - - -		102
			220	72	12.6	43,000			106
			230	75	13.8	47,000			109
			240	79	15.0	51,200			112
	ECH16-20 **(31H28)** 19 lbs. (9 kg)		208	91	15.0	51,200			124
			220	96	16.8	57,300			129
			230	100	18.4	62,700			134
			240	105	20.0	68,200			138
	ECH16-25 **(31H29)** 19 lbs. (9 kg)		208	113	18.8	64,200			147
			220	120	21.0	71,700			153
			230	125	23.0	78,500			159
			240	131	25.0	85,300			164
CHP16-060	ECH16R-7 **(31H47)** 5 lbs. (2 kg)	1 step (1 phase)	208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**	ECH16-651 **(31H14)**	70
			220	34	5.9	20,000			72
			230	35	6.4	22,000			74
			240	37	7.0	23,900			75
	ECH16R-10 **(31H48)** 5 lbs. (2 kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		84
			220	48	8.4	28,700			86
			230	50	9.2	31,300			89
			240	53	10.0	34,100			91
	ECH16-15 **(31H27)** 18 lbs. (8 kg)		208	68	11.3	38,500	- - - -		106
			220	72	12.6	43,000			110
			230	75	13.8	47,000			114
			240	79	15.0	51,200			117
	ECH16-20 **(31H28)** 19 lbs. (9 kg)		208	91	15.0	51,200			129
			220	96	16.8	57,300			134
			230	100	18.4	62,700			139
			240	105	20.0	68,200			143
	ECH16-25 **(31H29)** 19 lbs. (9 kg)		208	113	18.8	64,100			151
			220	120	21.0	71,700			158
			230	125	23.0	78,300			163
			240	131	25.0	85,300			169

†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).

TABLE 10 CHP16-036

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Min. Cir. Amp.
CHP16-036	ECH16-5 208/230v **(31H30)** 17 lbs. (8 kg)	1 step (3 phase)	208	13	3.8	12,800	- - - -	ECH16-413 208/230v **(31H15)**	33
			220	14	4.2	14,300			34
			230	15	4.6	15,700			34
			240	15	5.0	17,100			35
	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 17 lbs. (8 kg)		208	19	5.3	18,000			38
			220	20	5.9	20,000			39
			230	21	6.4	22,000			40
			240	21	7.0	23,900			41
			440	10	5.8	19,800		ECH16-413 460v **(31H18)**	20
			460	11	6.5	22,200			20
			480	11	7.0	23,900			21
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 20 lbs. (9 kg)		208	27	7.5	25,600		ECH16-413 208/230v **(31H15)**	46
			220	28	8.4	28,700			47
			230	29	9.2	31,400			49
			240	31	10.0	34,100			50
			440	14	8.4	28,700		ECH16-413 460v **(31H18)**	24
			460	15	9.2	31,300			25
			480	15	10.0	34,100			25
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 20 lbs. (9 kg)		208	40	11.3	38,500		ECH16-413 208/230v **(31H15)**	59
			220	42	12.6	43,000			61
			230	44	13.8	47,000			63
			240	46	15.0	51,200			65
			440	21	12.6	43,000		ECH16-413 460v **(31H18)**	31
			460	22	13.8	47,100			32
			480	23	15.0	51,200			33
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 20 lbs. (9 kg)	2 steps (3 phase)	208	53	15.0	51,300		ECH16-413 208/230v **(31H15)**	72
			220	56	16.8	57,300			75
			230	58	18.4	62,700			77
			240	61	20.0	68,200			80
		1 step (3 phase)	440	28	16.8	57,500		ECH16-413 460v **(31H18)**	38
			460	29	18.4	62,800			40
			480	31	20.0	68,200			41

†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).

TABLE 11 CHP16-048/060

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only †Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat †Min. Cir. Amp.
CHP16-048	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 19 lbs. (9 kg)	1 step (3 phase)	208	19	5.3	18,000	----	ECH16-513 **(31H16)**	41
			220	20	5.9	20,000			42
			230	21	6.4	22,000			43
			240	21	7.0	23,900			44
			440	10	5.8	19,800		ECH16-413/513 460v **(31H21)**	21
			460	11	6.5	22,200			21
			480	11	7.0	23,900			22
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 19 lbs. (9 kg)		208	27	7.5	25,600		ECH16-513 **(31H16)**	49
			220	28	8.4	28,700			50
			230	29	9.2	31,300			52
			240	31	10.0	34,100			53
			440	14	8.4	28,700		ECH16-513/653 460v **(31H19)**	25
			460	15	9.2	31,400			26
			480	15	10.0	34,100			26
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 19 lbs. (9 kg)		208	40	11.3	38,500		ECH16-513 **(31H16)**	62
			220	42	12.6	43,000			64
			230	44	13.8	47,100			66
			240	46	15.0	51,200			68
			440	21	12.6	43,000		ECH16-413/513 460v **(31H21)**	32
			460	22	13.8	47,100			33
			480	23	15.0	51,200			34
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 22 lbs. (10 kg)	2 steps (3 phase)	208	53	15.0	51,200		ECH16-513 **(31H16)**	75
			220	56	16.8	57,300			78
			230	58	18.4	62,700			80
			240	61	20.0	68,200			83
		1 step (3 phase)	440	28	16.8	57,300		ECH16-513/653 460v **(31H19)**	39
			460	29	18.4	62,700			40
			480	31	20.0	68,200			42
	ECH16-25 208/230v **(31H35)** 460v **(31H40)** 22 lbs. (10 kg)	2 steps (3 phase)	208	66	18.8	64,000		ECH16-513 **(31H16)**	88
			220	69	21.0	71,600			92
			230	72	22.9	78,300			95
			240	76	25.0	85,300			98
		1 step (3 phase)	440	35	21.0	71,800		ECH16-413/513 460v **(31H21)**	46
			460	36	22.9	78,300			47
			480	38	25.0	85,300			49
CHP16-060	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 19 lbs. (9 kg)	1 step (3 phase)	208	19	5.3	17,900	----	ECH16-653 **(58L07)**	45
			220	20	5.9	20,000			46
			230	21	6.4	21,900			47
			240	21	7.0	23,900			48
			440	10	5.8	20,000		ECH16-513/653 460v (**31H19**)	23
			460	11	6.5	22,000			23
			480	11	7.0	23,900			24
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 19 lbs. (9 kg)		208	27	7.5	25,600		ECH16-653 **(58L07)**	53
			220	28	8.4	28,700			54
			230	29	9.2	31,300			56
			240	31	10.0	34,100			57
			440	14	8.4	28,600		ECH16-513/653 460v **(31H19)**	27
			460	15	9.2	31,300			28
			480	15	10.0	34,100			28
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 19 lbs. (9 kg)		208	40	11.3	38,500		ECH16-653 **(58L07)**	66
			220	42	12.6	43,000			68
			230	44	13.8	47,000			70
			240	46	15.0	51,200			72
			440	21	12.6	42,900		ECH16-513/653 460v **(31H19)**	34
			460	22	13.8	47,000			35
			480	23	15.0	51,200			36
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 22 lbs. (10 kg)	2 steps (3 phase)	208	53	15.0	51,300		ECH16-653 **(58L07)**	79
			220	56	16.8	57,300			82
			230	58	18.4	62,700			84
			240	61	20.0	68,200			87
		1 step (3 phase)	440	28	16.8	57,500		ECH16-513/653 460v **(31H19)**	41
			460	29	18.4	62,800			42
			480	31	20.0	68,200			43
	ECH16-25 208/230v **(31H35)** 460v **(31H40)** 22 lbs. (10 kg)	2 steps (3 phase)	208	66	18.8	64,000		ECH16-653 **(58L07)**	92
			220	69	21.0	71,600			96
			230	72	22.9	78,300			99
			240	76	25.0	85,300			102
		1 step (3 phase)	440	35	21.0	71,800		ECH16-513/653 460v **(31H19)**	48
			460	36	22.9	78,300			49
			480	38	25.0	85,300			51

†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).

TABLE 12 CHP20-024/30

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only *Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat *Minimum Circuit Ampacity
CHP20-024	ECH16R-5 **(31H46)** 4 lbs. (2kg)	1 step (1 phase)	208	23	3.8	12,800	ECH16R-26/41-5 **(31H26)**	ECH16-261 **(31H10)**	42
			220	24	4.2	14,300			43
			230	25	4.6	15,700			44
			240	26	5.0	17,100			45
	ECH16R-7 **(31H47)** 5 lbs. (2kg)		208	32	5.3	17,900	ECH16R-26/65-7 **(31H25)**		51
			220	34	5.9	20,100			52
			230	35	6.4	21,900			54
			240	37	7.0	23,900			55
	ECH16R-10 **(31H48)** 5 lbs. (2kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		64
			220	48	8.4	28,700			67
			230	50	9.2	31,300			69
			240	53	10.0	34,100			71
	ECH16-15 **(31H27)** 18 lbs. (8kg)		208	68	11.3	38,400	- - - -		87
			220	72	12.6	43,000			91
			230	75	13.8	47,000			94
			240	79	15.0	51,200			97
CHP20-030	ECH16R-5 **(31H46)** 4 lbs. (2kg)	1 step (1 phase)	208	23	3.8	12,800	ECH16R-26/41-5 **(31H26)**	ECH16-311 **(31H11)**	44
			220	24	4.2	14,300			46
			230	25	4.6	15,700			47
			240	26	5.0	17,100			48
	ECH16R-7 **(31H47)** 5 lbs. (2kg)		208	32	5.3	17,900	ECH16R-26/65-7 **(31H25)**		53
			220	34	5.9	20,100			55
			230	35	6.4	21,900			57
			240	37	7.0	23,900			58
	ECH16R-10 **(31H48)** 5 lbs. (2kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		67
			220	48	8.4	28,700			70
			230	50	9.2	31,300			72
			240	53	10.0	34,100			74
	ECH16-15 **(31H27)** 18 lbs. (8kg)		208	68	11.3	38,400	- - - -		90
			220	72	12.6	43,000			93
			230	75	13.8	47,000			97
			240	79	15.0	51,200			100

*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).

TABLE 13 CHP20-036/042

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only *Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat *Minimum Circuit Ampacity
CHP20-036 1 phase	ECH16R-5 **(31H46)** 4 lbs. (2kg)	1 step (1 phase)	208	23	3.8	12,800	ECH16R-26/41-5 **(31H26)**	ECH16-411 **(31H12)**	47
			220	24	4.2	14,300			49
			230	25	4.6	15,700			50
			240	26	5.0	17,100			51
	ECH16R-7 **(31H47)** 5 lbs. (2kg)		208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**		56
			220	34	5.9	20,000			58
			230	35	6.4	22,000			60
			240	37	7.0	23,900			61
	ECH16R-10 **(31H48)** 5 lbs. (2kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		70
			220	48	8.4	28,700			72
			230	50	9.2	31,300			75
			240	53	10.0	34,100			77
	ECH16-15 **(31H27)** 18 lbs. (8kg)		208	68	11.3	38,500	----		92
			220	72	12.6	43,000			96
			230	75	13.8	47,100			100
			240	79	15.0	51,200			103
	ECH16-20 **(31H28)** 19 lbs. (9kg)		208	91	15.0	51,200	----		115
			220	96	16.8	57,300			120
			230	100	18.4	62,700			125
			240	105	20.0	68,200			129
CHP20-036 3 phase	ECH16-5 208/230v **(31H30)** 19 lbs. (9kg)	1 step (3 phase)	208	13	3.7	12,800	----	ECH16-413 **(31H15)**	30
			220	14	4.2	14,300			31
			230	15	4.6	15,600			32
			240	15	5.0	17,100			32
	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 19 lbs. (9kg)		208	19	5.3	17,900	----	ECH16-413 208/230v **(31H15)**	36
			220	20	5.9	20,000			37
			230	21	6.4	21,900			38
			240	21	7.0	23,900			38
			440	10	5.9	20,000	----	ECH16-413 460v **(31H18)**	19
			460	11	6.5	22,200			20
			480	11	7.0	23,900			20
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 19 lbs. (9kg)		208	26	7.5	25,600	----	ECH16-413 208/230v **(31H15)**	43
			220	28	8.4	28,600			45
			230	29	9.2	31,300			46
			240	31	10.0	34,100			48
			440	14	8.4	28,700	----	ECH16-413 460v **(31H18)**	23
			460	15	9.2	31,400			24
			480	15	10.0	34,100			25
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 19 lbs. (9kg)		208	40	11.3	38,500	----	ECH16-413 208/230v **(31H15)**	57
			220	42	12.6	43,000			59
			230	44	13.8	47,000			61
			240	46	15.0	51,200			63
			440	21	12.6	42,900	----	ECH16-413 460v **(31H18)**	30
			460	22	13.8	47,000			31
			480	23	15.0	51,200			32
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 22 lbs. (10kg)	2 steps (3 phase)	208	53	15.0	51,300	----	ECH16-413 208/230v **(31H15)**	70
			220	56	16.8	57,300			73
			230	58	18.4	62,700			75
			240	61	20.0	68,200			78
		1 step (3 phase)	440	28	16.8	57,500	----	ECH16-413 460v **(31H18)**	37
			460	29	18.4	62,800			38
			480	31	20.0	68,200			40
CHP20-042	ECH16R-7 **(31H47)** 5 lbs. (2kg)	1 step (1 phase)	208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**	ECH16-511 **(31H13)**	63
			220	34	5.9	20,000			65
			230	35	6.4	22,000			67
			240	37	7.0	23,900			68
	ECH16R-10 **(31H48)** 5 lbs. (2kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		77
			220	48	8.4	28,700			80
			230	50	9.2	31,300			82
			240	53	10.0	34,100			84
	ECH16-15 **(31H27)** 18 lbs. (8kg)		208	68	11.3	38,500	----		100
			220	72	12.6	43,000			103
			230	75	13.8	47,000			107
			240	79	15.0	51,200			110
	ECH16-20 **(31H28)** 19 lbs. (9kg)		208	91	15.0	51,200	----		122
			220	96	16.8	57,300			127
			230	100	18.4	62,700			132
			240	105	20.0	68,200			136
	ECH16-25 **(31H29)** 19 lbs. (9kg)		208	113	18.8	64,100	----		145
			220	120	21.0	71,700			151
			230	125	23.0	78,300			157
			240	131	25.0	85,300			162

*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).

TABLE 14 CHP20-048

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only *Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat *Minimum Circuit Ampacity
CHP20-048 1 phase	ECH16R-7 **(31H47)** 5 lbs. (2kg)	1 step (1 phase)	208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**	ECH16-511 **(31H13)**	68
			220	34	5.9	20,000			70
			230	35	6.4	22,000			71
			240	37	7.0	23,900			73
	ECH16R-10 **(31H48)** 5 lbs. (2kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		81
			220	48	8.4	28,700			84
			230	50	9.2	31,300			86
			240	53	10.0	34,100			88
	ECH16-15 **(31H27)** 18 lbs. (8kg)		208	68	11.3	38,500	----		104
			220	72	12.6	43,000			108
			230	75	13.8	47,000			111
			240	79	15.0	51,200			114
	ECH16-20 **(31H28)** 19 lbs. (9kg)		208	91	15.0	51,200	----		127
			220	96	16.8	57,300			132
			230	100	18.4	62,700			136
			240	105	20.0	68,200			141
	ECH16-25 **(31H29)** 19 lbs. (9kg)		208	113	18.8	64,100	----		149
			220	120	21.0	71,700			156
			230	125	23.0	78,300			161
			240	131	25.0	85,300			167
CHP20-048 3 phase	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 19 lbs. (9kg)	1 step (3 phase)	208	19	5.3	17,900	----	ECH16-513 **(31H16)**	42
			220	20	5.9	20,000			43
			230	21	6.4	21,900			44
			240	21	7.0	23,900			45
			440	10	5.9	20,000	----	ECH16-413/513 460v **(31H21)**	22
			460	11	6.5	22,000			23
			480	11	7.0	23,900			23
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 19 lbs. (9kg)		208	27	7.5	25,600	----	ECH16-513 **(31H16)**	50
			220	28	8.4	28,700			51
			230	29	9.2	31,300			52
			240	31	10.0	34,100			54
			440	14	8.4	28,600	----	ECH16-413/513 460v **(31H21)**	26
			460	15	9.2	31,400			27
			480	15	10.0	34,100			28
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 19 lbs. (9kg)		208	40	11.3	38,500	----	ECH16-513 **(31H16)**	63
			220	42	12.6	43,000			65
			230	44	13.8	47,000			67
			240	46	15.0	51,200			69
			440	21	12.6	42,900	----	ECH16-413/513 460v **(31H21)**	33
			460	22	13.8	47,000			34
			480	23	15.0	51,200			35
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 22 lbs. (10kg)	2 steps (3 phase)	208	53	15.0	51,300	----	ECH16-513 **(31H16)**	76
			220	56	16.8	57,300			79
			230	58	18.4	62,700			81
			240	61	20.0	68,200			84
		1 step (3 phase)	440	28	16.8	57,500	----	ECH16-413/513 460v **(31H21)**	40
			460	29	18.4	62,800			41
			480	31	20.0	68,200			43
	ECH16-25 208/230v **(31H35)** 460v **(31H40)** 22 lbs. (10kg)	2 steps (3 phase)	208	66	18.8	64,000	----	ECH16-513 **(31H16)**	89
			220	69	21.0	71,600			92
			230	72	22.9	78,300			96
			240	76	25.0	85,300			99
		1 step (3 phase)	440	35	21.0	71,800	----	ECH16-413/513 460v **(31H21)**	47
			460	36	22.9	78,300			49
			480	38	25.0	85,300			50

*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).

TABLE 15 CHP20-060

Single Package Unit Model No.	Electric Heater Model No. & Net Weight	No. of Steps & Phase	Volts Input	Heater Only *Minimum Circuit Ampacity	Electric Heat kW Input	Electric Heat Btuh Input	Optional Single Point Power Source Boxes		
							Heater Sub-Fuse Box	Unit Sub-Fuse Box	Total Unit & Electric Heat *Min. Cir. Amp.
CHP20-060 1 phase	ECH16R-7 **(31H47)** 5 lbs. (2kg)	1 step (1 phase)	208	32	5.3	18,000	ECH16R-26/65-7 **(31H25)**	ECH16-651 **(31H14)**	75
			220	34	5.9	20,000			77
			230	35	6.4	22,000			79
			240	37	7.0	23,900			80
	ECH16R-10 **(31H48)** 5 lbs. (2kg)		208	46	7.5	25,600	ECH16R-26/65-10 **(31H24)**		89
			220	48	8.4	28,700			91
			230	50	9.2	31,300			93
			240	53	10.0	34,100			96
	ECH16-15 **(31H27)** 18 lbs. (8kg)		208	68	11.3	38,500	- - - -		111
			220	72	12.6	43,000			115
			230	75	13.8	47,000			118
			240	79	15.0	51,200			122
	ECH16-20 **(31H28)** 19 lbs. (9kg)		208	91	15.0	51,200	- - - -		134
			220	96	16.8	57,300			139
			230	100	18.4	62,700			143
			240	105	20.0	68,200			148
	ECH16-25 **(31H29)** 19 lbs. (9kg)		208	113	18.8	64,100	- - - -		156
			220	120	21.0	71,700			163
			230	125	23.0	78,300			168
			240	131	25.0	85,300			174
CHP20-060 3 phase	ECH16-7 208/230v **(31H31)** 460v **(31H36)** 19 lbs. (9kg)	1 step (3 phase)	208	19	5.3	17,900	- - - -	ECH16-653 **(58L07)**	47
			220	20	5.9	20,000			48
			230	21	6.4	21,900			49
			240	21	7.0	23,900			50
			440	10	5.9	20,000	- - - -	ECH16-653 460v **(31H19)**	25
			460	11	6.5	22,000			26
			480	11	7.0	23,900			26
	ECH16-10 208/230v **(31H32)** 460v **(31H37)** 19 lbs. (9kg)		208	27	7.5	25,600	- - - -	ECH16-653 **(58L07)**	55
			220	28	8.4	28,700			57
			230	29	9.2	31,400			58
			240	31	10.0	34,100			59
			440	14	8.4	28,600	- - - -	ECH16-653 460v **(31H19)**	29
			460	15	9.2	31,300			30
			480	15	10.0	34,100			30
	ECH16-15 208/230v **(31H33)** 460v **(31H38)** 19 lbs. (9kg)		208	40	11.3	38,500	- - - -	ECH16-653 **(58L07)**	68
			220	42	12.6	43,000			71
			230	44	13.8	47,000			72
			240	46	15.0	51,200			74
			440	21	12.6	42,900	- - - -	ECH16-653 460v **(31H19)**	36
			460	22	13.8	47,000			37
			480	23	15.0	51,200			38
	ECH16-20 208/230v **(31H34)** 460v **(31H39)** 22 lbs. (10kg)	2 steps (3 phase)	208	53	15.0	51,300	- - - -	ECH16-653 **(58L07)**	81
			220	56	16.8	57,300			84
			230	58	18.4	62,800			87
			240	61	20.0	68,200			89
		1 step (3 phase)	440	28	16.8	57,500	- - - -	ECH16-653 460v **(31H19)**	43
			460	29	18.4	62,700			44
			480	31	20.0	68,200			45
	ECH16-25 208/230v **(31H35)** 460v **(31H40)** 22 lbs. (10kg)	2 steps (3 phase)	208	66	18.8	64,000	- - - -	ECH16-653 **(58L07)**	94
			220	69	21.0	71,600			98
			230	72	22.9	78,300			101
			240	76	25.0	85,300			104
		1 step (3 phase)	440	35	21.0	71,800	- - - -	ECH16-653 460v **(31H19)**	50
			460	36	22.9	78,300			51
			480	38	25.0	85,300			53

*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).

IV-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).

V-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

All single phase units use single pole contactors. One leg of compressor, capacitor and condenser fan are connected to line voltage at all times.

Remove all power to disconnect before servicing.

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

VI-START-UP - OPERATION

A-Crankcase Heaters

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

B-Preliminary Check

1- Make sure refrigerant lines do not rub against cabinet or against each other.

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

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

4- Recheck voltage with unit running. If power is not within range listed on unit nameplate, stop unit and consult power company. Check amperage of unit. Refer to unit nameplate for correct running amps.

5- Make sure filter is in place before start-up.

VII-COOLING SYSTEM SERVICE CHECKS

⚠ 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.

The charge should be checked during startup using the method outlined below.

A-Gauge Manifold Attachment

Service gauge ports are identified in figure NO TAG. Attach gauge manifold high pressure line to liquid line gauge port. Attach gauge manifold low pressure line to suction line gauge port.

B-Cooling Sart Up

1- Set thermostat system switch in “Cool” position, fan switch in “On” or “Auto” position and adjust room thermostat to a setting below room temperature.

2- Close unit disconnect switch.

3- Compressor will start and cycle on thermostat demand.

C-Three Phase Compressor Rotation

Three phase scroll compressors must be phased sequentially to ensure correct compressor rotation and operation.

At compressor start-up, a rise in discharge and drop in suction pressures indicates proper compressor phasing and operation. If discharge and suction pressures do not function normally, follow these steps:

1- Disconnect power to the compressor and the unit.

2- Reverse any two field power leads to the unit.

3- Reapply power to the compressor and unit.

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

NOTE - The compressor noise level will be significantly higher when phasing is incorrect and will not provide cooling when operating backwards.

D-Charging

It is not recommended that the system be charged below 60° F (15° C). If charging below 60° F (15° C) is required or if system is completely void of refrigerant, the recommended and most accurate method of charging is to weigh the refrigerant into the unit according to the amount shown on the unit rating plate. If weighing facilities are not available or if unit is just low on charge, use the following procedure:

Charging must be done in cooling mode. Operate unit and allow system pressures to stabilize before and after each adjustment. Make sure all outdoor air dampers are closed.

APPROACH TEMPERATURE =
LIQUID TEMPERATURE - AMBIENT TEMPERATURE.

If ambient temperature is above 60° F (15° C), read liquid line temperature. Approach temperature is the difference between liquid line temperature and ambient temperature.

CAUTION-Use the same thermometer for both temperature readings.

Approach temperature is shown in table 16. Refrigerant must be added to lower approach temperature. Remove refrigerant from system to increase approach temperature.

TABLE 16
APPROACH TEMPERATURE

UNIT	LIQUID TEMP. MINUS AMBIENT TEMP.	
CHP16-024	7°F ± 1	(3.9°C ± 0.5)
CHP16-030	9°F ± 1	(5.0°C ± 0.5)
CHP16-036	11°F ± 1	(6.0°C ± 0.5)
CHP16-048	9°F ± 1	(5.0°C ± 0.5)
CHP16-060	11°F ± 1	(6.0°C ± 0.5)
CHP20-024	7°F ± 1	(3.9°C ± 0.5)
CHP20-030	7°F ± 1	(3.9°C ± 0.5)
CHP20-036	10°F ± 1	(5.6°C ± 0.5)
CHP20-042	6°F ± 1	(3.3°C ± 0.5)
CHP20-048	7°F ± 1	(3.9°C ± 0.5)
CHP20-060	12°F ± 1	(6.7°C ± 0.5)

If ambient temperature is less than 60° F (16° C), air flow must be restricted to achieve pressures in the 200-250 psig range. These higher pressures are necessary for checking charge. To accomplish this, block the outdoor coil from top to bottom evenly from both ends.

VIII-HEATING SYSTEM SERVICE CHECKS

A-Heating - Heat Pump

1- Set thermostat switch in “Heat” position and blower switch in “On” or “Auto” position. Set heating adjustment lever above room temperature. Close unit disconnect switch.

2- Compressor will cycle on demand from room thermostat and outdoor coil fan will cycle with compressor. Blower will operate according to position of blower switch on thermostat.

3- A defrost control is used to prevent excessive outdoor coil icing. As a defrost cycle is initiated, the reversing valve switches, inducing heat to outdoor coil. Outdoor fan stops during this process.

B-Heating - Optional Electric Heat

1- When heat requirements exceed heat pump capacity, the thermostat automatically activates the optional electric heat through W2.

IX-INDOOR BLOWER OPERATION / ADJUSTMENT

Unit is equipped with direct drive, multi-speed indoor blower. See unit wiring diagram for factory setting. Table 17 gives minimum blower speeds for CHP16 & 20 units equipped with optional electric heat.

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 19).

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.

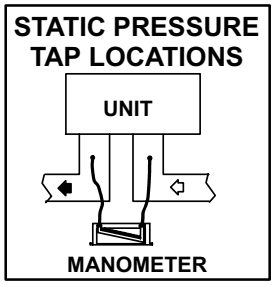


FIGURE 19

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 motor speed taps. Follow the blower speed change instructions below.

B-Blower Operation Adjustment

208-230 Volt Units - Blower speed selection is accomplished by changing the taps at the harness connector at the blower motor. See figure 20 and unit diagram.

460-575 Volt Units-Blower speed selection is accomplished by changing the J38 blower speed jack in the return air section. See unit wiring diagram.

IMPORTANT—To prevent motor burnout, never connect more than one motor lead to any one connection. Black and blue motor taps must be connected together when operating on low or medium speeds. Tape unused motor leads separately.

C-Minimum Blower Speed (With Electric Heat)

Refer to ECH16 installation instructions for minimum allowable blower speed when electric heat is used.

TABLE 17

ELECTRIC HEAT ONLY (EMERGENCY HEAT)		
CHP16 & 20 UNIT		Min. Blower Speed
- 024, 030, 036	208/240V	Med. - High
	460/575V	Medium
- 042	208/240V	Med. - High
	460/575V	Medium
- 048, 060	208/240V	High
	460/575V	Medium
OPTIONAL ELECTRIC HEAT		
UNIT		Min. Blower Speed
ALL UNITS		High

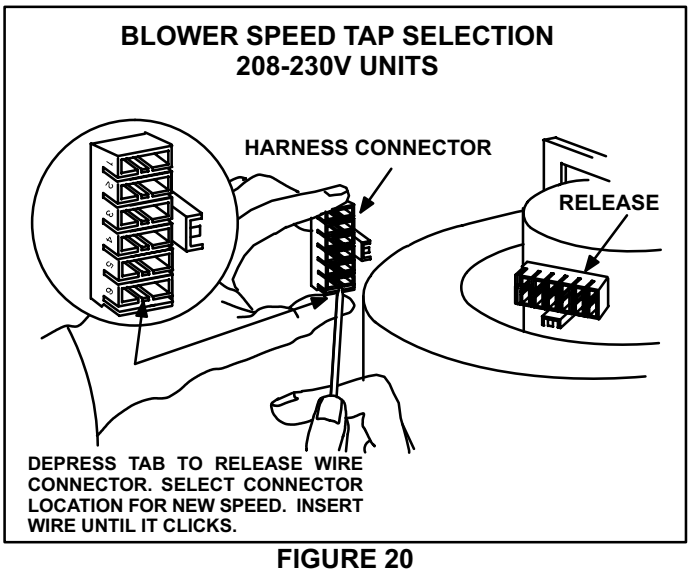


FIGURE 20

X-MAINTENANCE

⚠ CAUTION

Potential for personal injury.

Disconnect power to unit before performing any maintenance or service operation. Avoid contact with sharp metallic edges.

Can cause prsonal injury or death.

A-Lubrication

⚠ IMPORTANT

Always relubricate motors according to manufacturer's lubrication instructions provided on each motor. If no instructions are provided, use the following as a guide:

1 - Supply Air Motor Bearings - Bearings are prelubricated; no further lubrication is required for 10 years of normal operation. Thereafter, oil at oiling ports with a SAE 10W non detergent motor oil or suitable equivalent.

3 - Condenser Fan Motor Bearings - Bearings are prelubricated. For extended bearing life, lubricate each bearing through the oiling ports provided with a few drops of a good grade electric motor oil or SAE10 or SAE20 non-detergent motor oil every two years.

B-Filters

Filters should be checked monthly (or more frequently in severe use) and cleaned or replaced regularly. Take note of the "AIR FLOW DIRECTION" marking on the filter frame when re-installing.

⚠ IMPORTANT

FIlters must be U.L.C certified or equivalent for use in Canada.

1 - Clean coil, if necessary.

2 - Check connecting lines and coil for oil leaks.

3 - Check condensate drain pan and line, if necessary.

C-Condenser Coil

1 - Clean and inspect condenser coil. (May be flushed with a water hose.)

2 - Visually inspect connecting lines and coils for evidence of oil leaks.

⚠ IMPORTANT

If owner complains of insufficient cooling, unit should be gauged and refrigerant charge checked. Refer to gauge manifold attachment, checking charge and charging sections in this instructions.

D-Electrical

1 - Check all wiring for loose connections.

2 - Check for correct voltage at unit (unit operating).

3 - Check amp-draw on both condenser fan motor and blower motor.
Fan Motor Rating Plate ____ Actual _____
Indoor Blower Motor Rating Plate____ Actual____

XI-ACCESSORIES

This section describes the application of most of the optional accessories which can be connected to the CHA/CHP16/20.

1-RMF16 Mounting Frame

When installing a CHA/CHP16/20 unit on a combustible surface for downflow discharge applications, RMF16 roof mounting (figure 21) frame is required. Otherwise, the RMF16 is recommended but not required. The CHA/CHP16/20, 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 CHA/CHP16 /20 **MUST** be mounted level within 1/16" per linear foot in any direction.

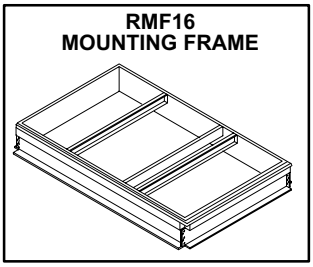


FIGURE 21

The assembled RMF16 mounting frame is shown in figure 21. 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 CHA/CHP16/20 unit, depending upon different roof structures.

2-Economizers

a-REMD16 Downflow Economizer
REMD16M Downflow Economizer

The REMD16 and REMD16M economizers (figure 22) are designed for use with standard (downflow) CHA/CHP16/20s. 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 REMD16-41/65 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. The sequence of operation flowcharts also describe how the economizer interacts with the CHA/CHP16/20's and the control system being used.

3-EMDH16 Horizontal Economizer
EMDH16M Horizontal Economizer

The EMDH16 and EMDH16M economizers (figure 23) operate like the REMD16 and REMD16M except they are designed for CHA/CHP16/20 units requiring horizontal discharge and return air. Internal components and operation of the horizontal economizer are identical to the downflow economizer.

Refer to the EMDH16-41/65 Installation Instruction Manual for specific details regarding installation.

The physical location of controls in REMD16M and REMD16 economizers is shown in figure 22. The physical location of controls in EMDH16M and EMDH16 economizers is shown in figure 23.

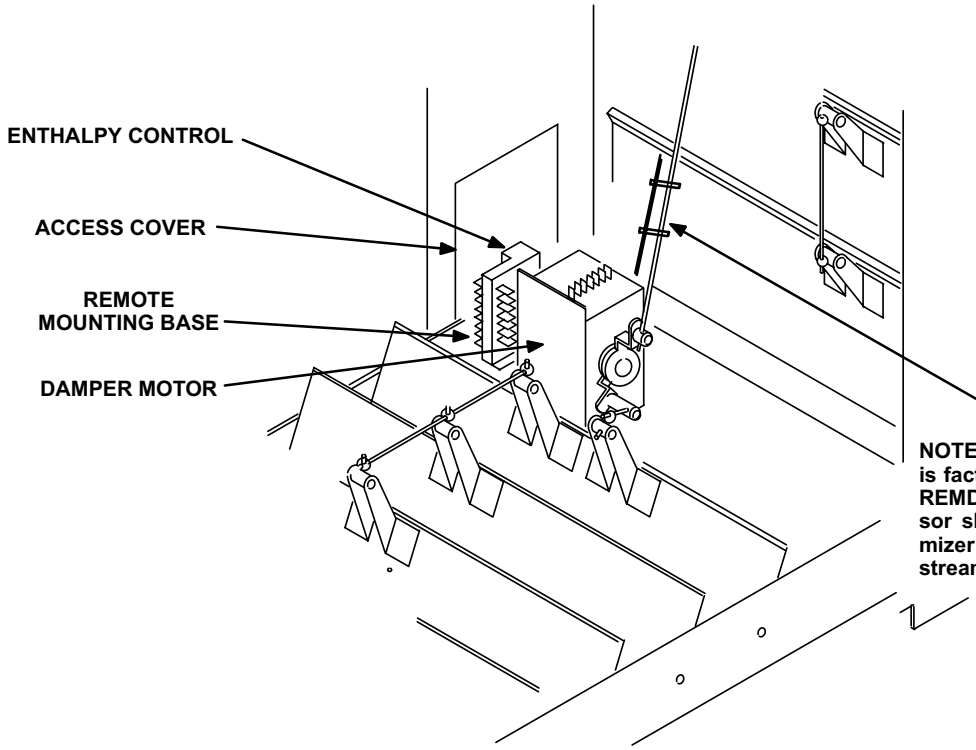
4-Economizer Operation

a-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.

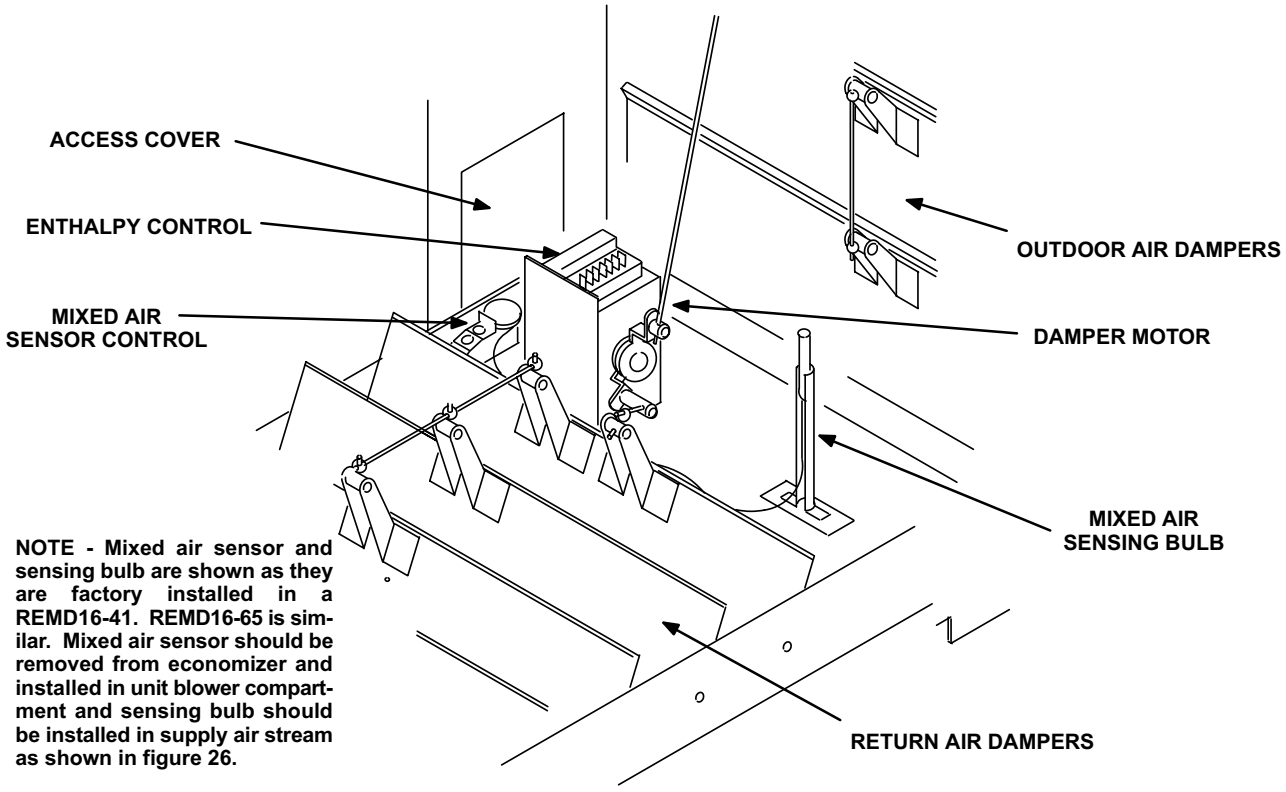
Two types of adjustment may be made at the control. The first is the control setpoint. The setpoint determines the temperature and humidity conditions at which the outdoor air dampers will open and close. The recommended setpoint is "A." If the economizer is allowing air which is too warm or too humid into the system, the control may be changed to a lower setpoint (B,C or D). Refer to enthalpy chart figure 24.

REMD16M PARTS ARRANGEMENT



NOTE - Mixed air sensor is shown as it is factory installed in a REMD16M-41. REMD16M-65 is similar. Mixed air sensor should be removed from economizer and installed in supply air stream as shown in figure 26.

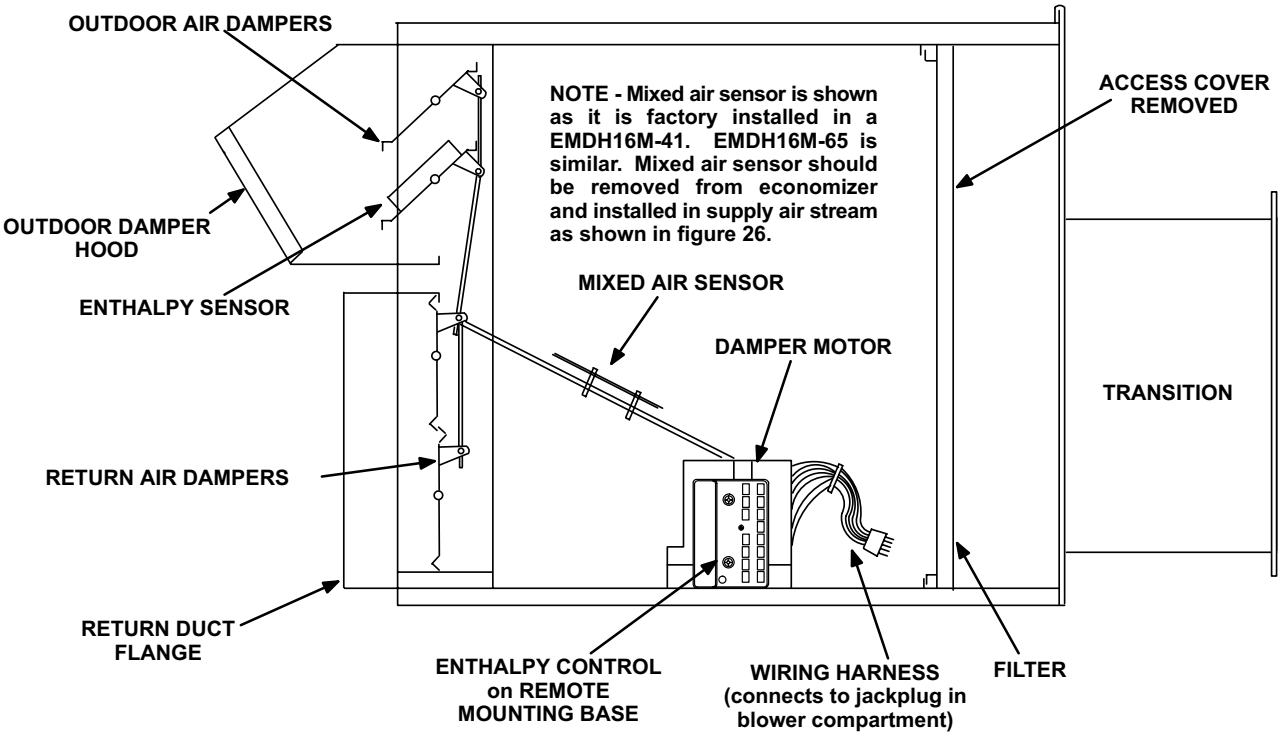
REMD16 PARTS ARRANGEMENT



NOTE - Mixed air sensor and sensing bulb are shown as they are factory installed in a REMD16-41. REMD16-65 is similar. Mixed air sensor should be removed from economizer and installed in unit blower compartment and sensing bulb should be installed in supply air stream as shown in figure 26.

FIGURE 22

EMDH16M PARTS ARRANGEMENT



EMDH16 PARTS ARRANGEMENT

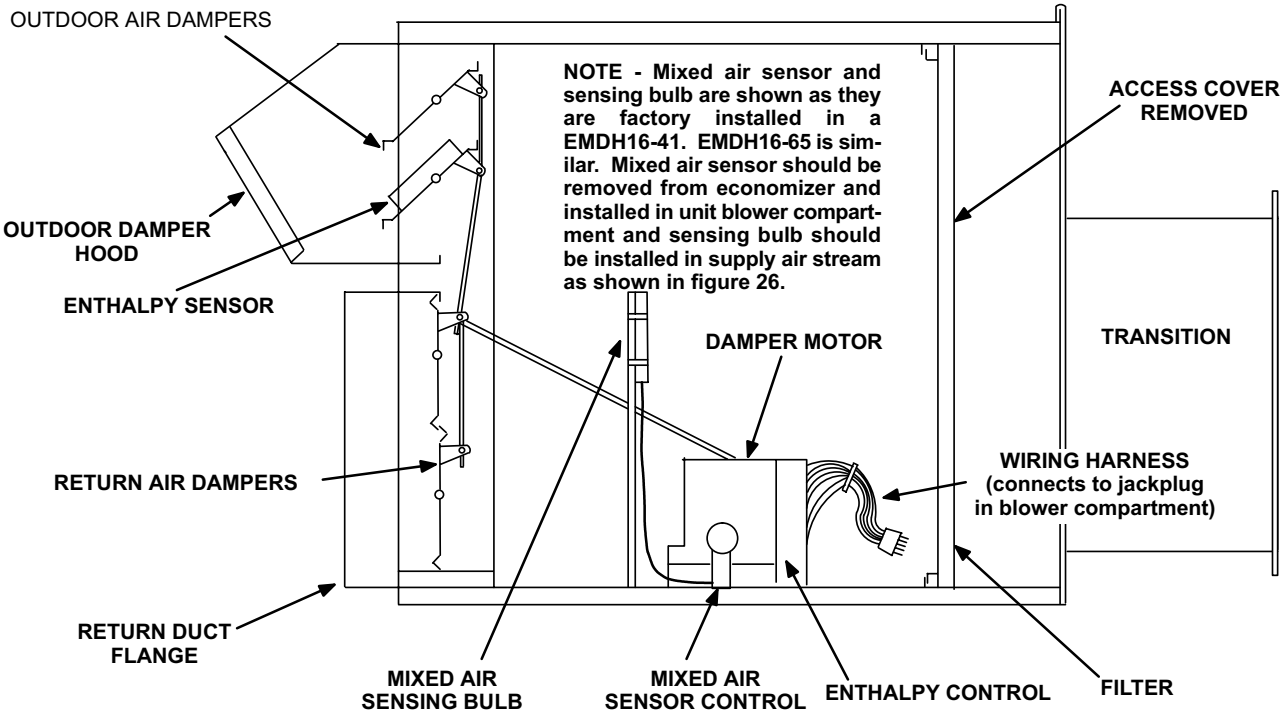


FIGURE 23

5-Economizers

a-Application

REMD16(M) and EMDH16(M) economizers can only be applied to CHA/CHP16/20 commercial units.

b-REMD16 Downflow Economizer

REMD16M Downflow Economizer

The REMD16 and REMD16M economizers (figure 22) 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 REMD16-41/65 Installation Instruction Manual for specific details regarding installation.

6-EMDH16 Horizontal Economizer

EMDH16M Horizontal Economizer

The EMDH16 and EMDH16M economizers (figure 23) operate like the REMD16 and REMD16M except they are designed for CHA/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 EMDH16-41/65 Installation Instruction Manual for specific details regarding installation.

The physical location of controls in REMD16M and REMD16 economizers is shown in figure 22. The physical location of controls in EMDH16M and EMDH16 economizers is shown in figure 23.

7-Economizer Operation

a-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 24.

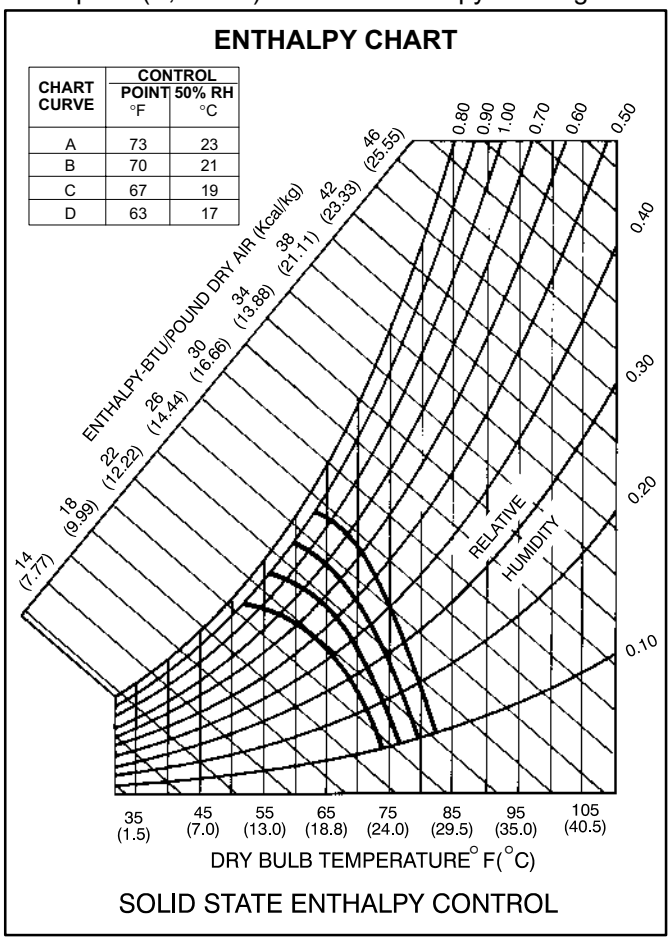


FIGURE 24

Example:

If the enthalpy control is set at setpoint “A” as shown in figure 24, 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.

8-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).

9-Enthalpy Sensor

The enthalpy sensor is located on the outside portion of the outdoor damper blades (as shown in figure 25). 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.

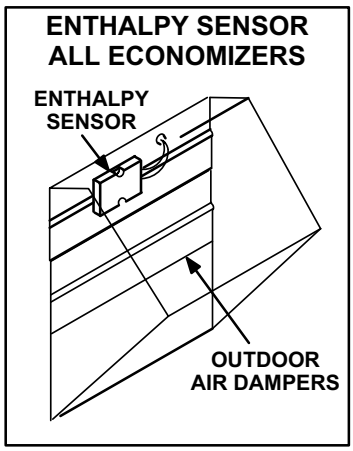


FIGURE 25

10-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. Three position economizers are equipped with a separate sensor (switch) and sensing bulb which are connected by a cap tube.

The mixed air sensor (bulb) is located in the supply air stream. The sensor (modulating economizer) or sensing bulb (three position economizer) fits through a factory supplied hole in the panel dividing the unit return and supply air (see figure 26). The three position economizer sensor (switch) mounts to pre-drilled holes in the unit panel dividing return and supply air.

11-Night Relay

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

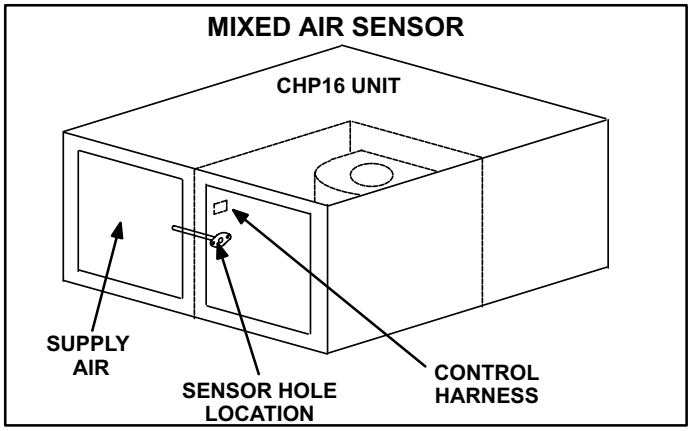


FIGURE 26

12-Warm Up Kit

An optional warm up kit may be added to either REMD16 or EMDH16 economizer (except CHA/CHP16/20 units using a Honeywell W7400 or 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 CHA/CHP16/20 in the control mounting area of the blower compartment. The kit plugs into the unit wiring harness inline between the unit and the economizer.

13-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.

14-DF16 Downflow Filter Kit

Optional downflow filter kit may be added to any CHP16 unit not equipped with factory installed filter brackets. The kit provides a means for filtering (downflow) return air inside the cabinet. The kit includes rails which install in the blower compartment and allow the (one inch thick) filter (furnished) to slide in. Two kits are available. DF16-41 installs in -024, -030, and -036 units and DF16-65 installs in -042, -048 and -060 units.

15-Timed-Off Control Kit

Optional field installed timed-off controls prevent the CHA/CHP16/20 compressors 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 on these applications.

16-Optional Compressor Monitor

Optional compressor monitor can be installed in all units to provide low ambient protection for the compressor. The monitor is a N.O. temperature switch located in the control box area. It is wired in series with the compressor contactor. When ambient temperature drops below 40°F, the switch opens and de-energizes the compressor contactor thereby protecting the compressor from low ambient operation.

NOTE - COMPRESSOR MONITOR CANNOT BE USED WITH OPTIONAL LOW AMBIENT KIT. OPTIONAL FIELD INSTALLED COMPRESSOR MONITOR MUST BE DISCONNECTED BEFORE ALLOWING LOW AMBIENT KIT TO BE USED.

17-Low Ambient Kit

The optional low ambient kit (figure 27) 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.

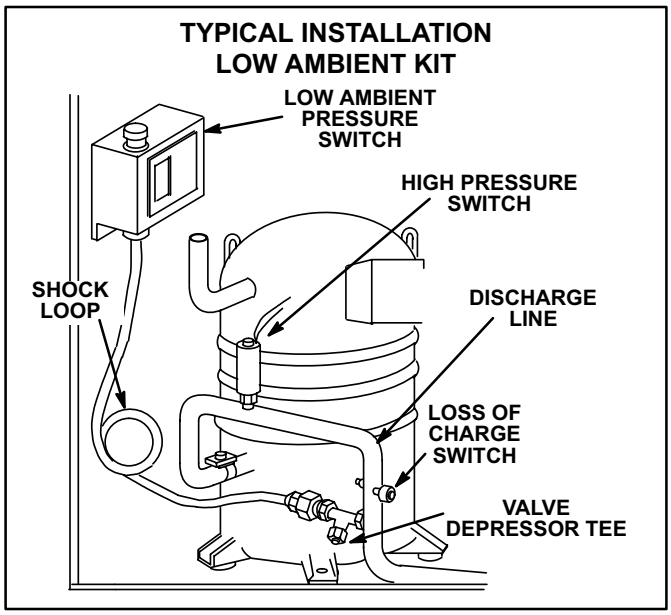


FIGURE 27

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 or CUT-OUT 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 146psig (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 28).

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

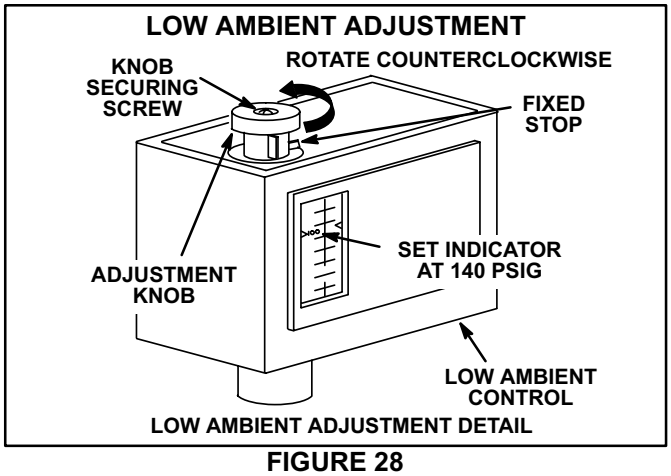


FIGURE 28

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.

18-Roof Curb Power Kit

Optional Roof Curb Power kit allows line and low voltage power to be brought into unit from RMF16 roof mounting frame. Two 7/8” knockouts are provided along the long rails of each mounting frame. All components in Roof Curb Power kit are field assembled and field installed.

19-Transitions

Optional supply/return transitions (SRT16 AND SRTH16) are available for use with downflow CHA/CHP16/20s utilizing the optional RMF16 roof mounting frame. The transition must be installed in the RMF16 mounting frame before mounting the CHA/CHP16/20 to the frame. Refer to the manufacturer’s instructions included with the transition for detailed installation procedures.

20-Supply and Return Diffusers

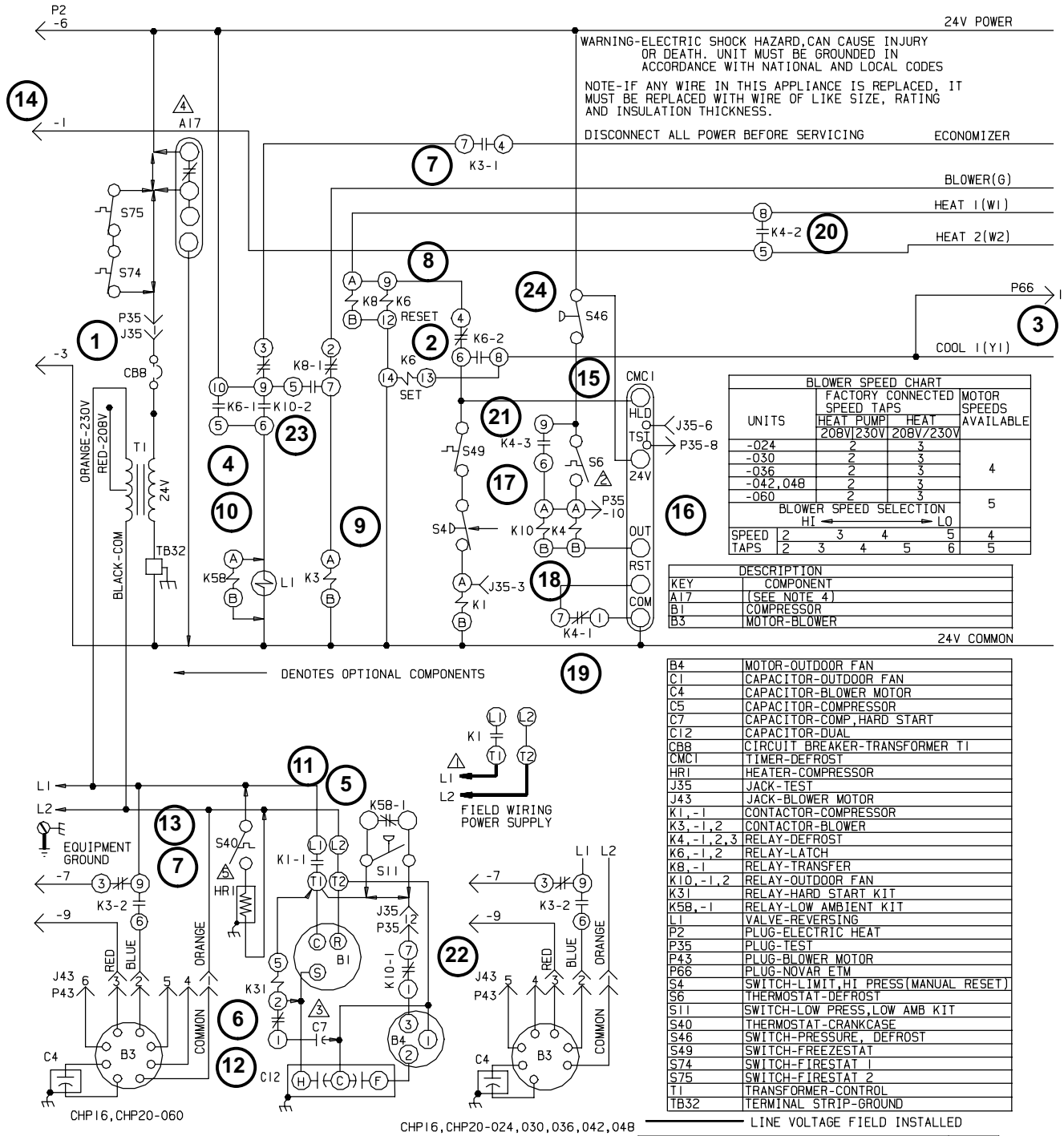
Optional flush mount diffuser/return FD9-65 and extended mount diffuser/return RTD9-65 are available for use with the CHP16. Refer to the manufacturer’s instructions included with the transition for detailed installation procedures.

21-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 from “R” thermostat wire lead through the switch to the red “FILTER” light in the status panel.

XII-Wliring Diagrams and Operation Sequence

CHP16/20 P VOLTAGE



BLOWER SPEED CHART			
UNITS	FACTORY CONNECTED SPEED TAPS HEAT PUMP 208V	HEAT 230V	MOTOR SPEEDS AVAILABLE
	208V	230V	208V/230V
-024	2	3	4
-030	2	3	
-036	2	3	
-042,048	2	3	5
-060	2	3	
BLOWER SPEED SELECTION HI ◄ ► LO			
SPEED	2 3 4 5		4
TAPS	2 3 4 5 6		5

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 4)
B1	COMPRESSOR
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
C1	CAPACITOR-OUTDOOR FAN
C4	CAPACITOR-BLOWER MOTOR
C5	CAPACITOR-COMPRESSOR
C7	CAPACITOR-COMP,HARD START
C12	CAPACITOR-DUAL
CB8	CIRCUIT BREAKER-TRANSFORMER T1
CMC1	TIMER-DEFROST
HR1	HEATER-COMPRESSOR
J35	JACK-TEST
J43	JACK-BLOWER MOTOR
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
K31	RELAY-HARD START KIT
K58,-1	RELAY-LOW AMBIENT KIT
L1	VALVE-REVERSING
P2	PLUG-ELECTRIC HEAT
P35	PLUG-TEST
P43	PLUG-BLOWER MOTOR
P66	PLUG-NOVAR ETM
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	THERMOSTAT-DEFROST
S11	SWITCH-LOW PRESS,LOW AMB KIT
S40	THERMOSTAT-CRANKCASE
S46	SWITCH-PRESSURE, DEFROST
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB32	TERMINAL STRIP-GROUND

⚠1 NOTE-FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE

⚠2 DEFROST THERMOSTAT OPEN(16°C) 60°F, CLOSE(2°C) 35°F

⚠3 C7,K31 NOT USED ON UNITS WITH SCROLL COMPRESSORS

⚠4 CONNECTIONS FOR REMOTE MOUNTED SMOKE DETECTOR A17, MAX LOAD 0.1VA 24VAC CLASS II

⚠5 S40 IS USED ON UNITS WITH SCROLL COMPRESSORS ONLY

WIRING DIAGRAM	5/00
HEAT PUMPS-PACKAGED	
CHP16,CHP20-024,030,036-1-P CHP16,CHP20-042,048,060-1-P 208-230/60/1	
HEAT PUMP SECTION B37	
Supersedes Form No. 533,011W	New Form No. 533,384W

CHP16/20 P VOLTAGE 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 operartion (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 (contacts 6-8 close and 6-4open). Contacts 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 (contacts 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 (contacts 6-8 close), contactor K1 is energized.

5- K1-1 closes to energize compressor and the condenser fan.
CHP16-024/-030 models only (reciprocating compressor)-At compressor start up, terminal S is powered by start capacitor C7.

6- CHP16-024/030 only-When compressor nears full speed potential relay K31 is energized and start capacitor C7 is taken out of circuit. K31 remains energized during compressor operation. Run side of dual capacitor C12 remains in the circuit between terminals R ands S during all compressor operation.

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

Heating:

8- 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.

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

10- 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.

11- K1-1 closes to energize the compressor and condenser fan.
CHP16-024/030 only- As compressor gains speed, compressor terminal S is powered by start capacitor C7.

12- CHP16-024/030 only-At compressor start up, potential relay K31 is energized and start capacitor C7 is taken out of circuit. K31 remains energized during compressor operation. Run side of dual capacitor C12 remains in the circuit between terminals R ands S during all compressor operation.

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

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

Defrost Mode:

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

16- After 30, 60 or 90 minutes of heating demand (depending on how the conrtrol 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.

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

18- When K10 energizes, K10-1 and K10-2 immediatley switch.

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

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

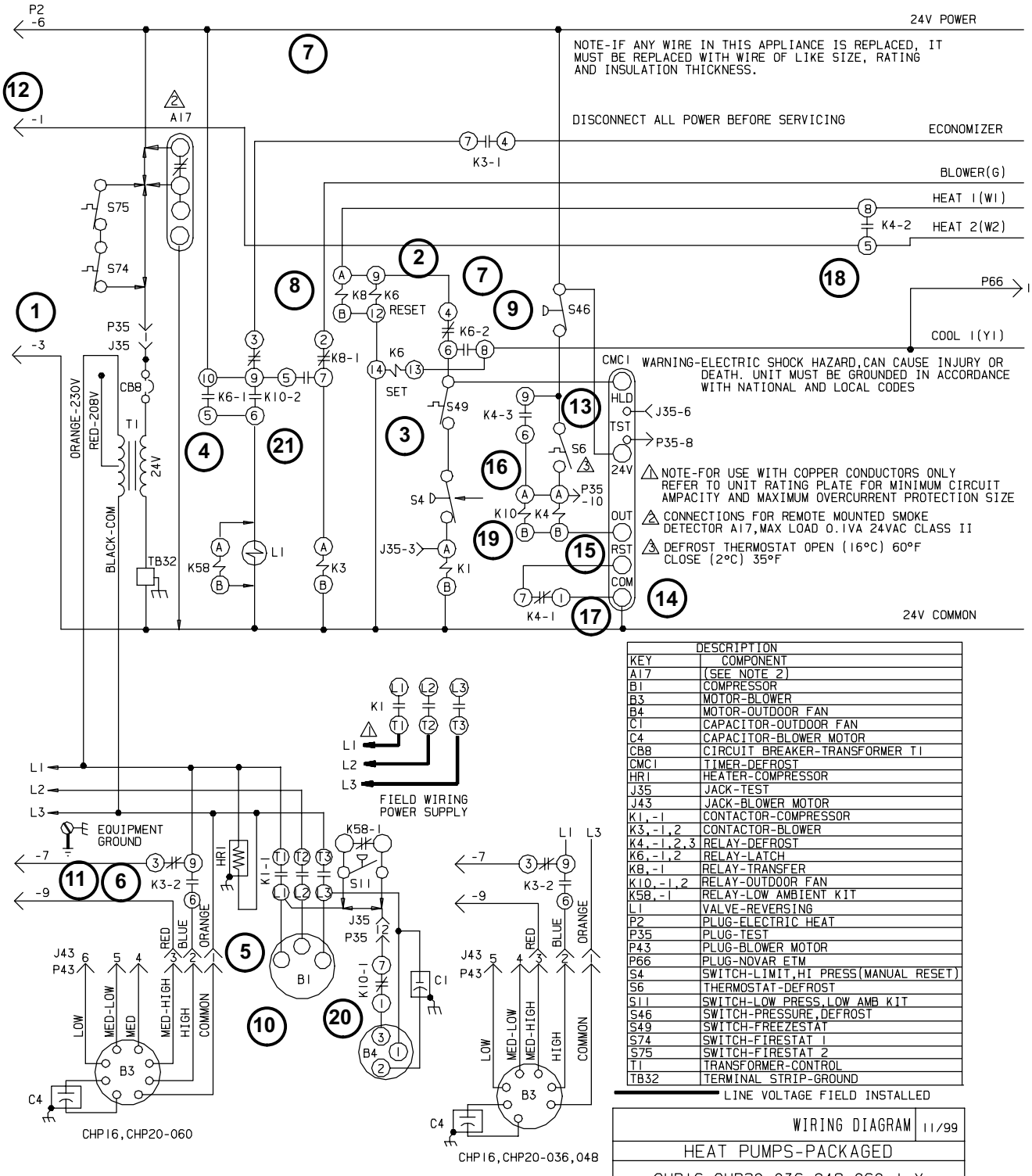
21- When K4-3 closes, defrost relay K4 and outdoor fan relay K10 are latched in until defrost terminates.

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

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

24- 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.

CHP16/20 Y VOLTAGE

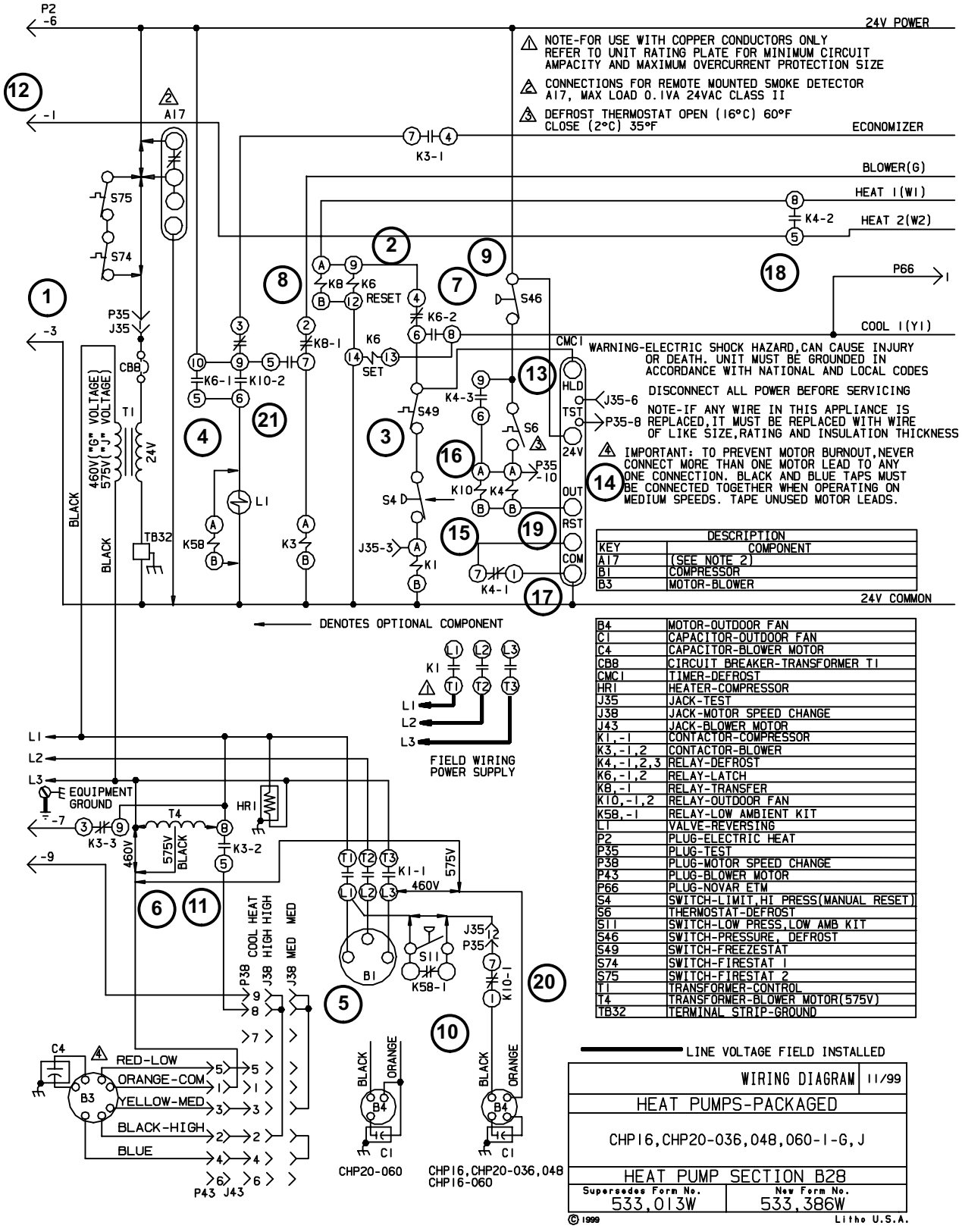


DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 2)
B1	COMPRESSOR
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
C1	CAPACITOR-OUTDOOR FAN
C4	CAPACITOR-BLOWER MOTOR
CB8	CIRCUIT BREAKER-TRANSFORMER T1
CMC1	TIMER-DEFROST
HR1	HEATER-COMPRESSOR
J35	JACK-TEST
J43	JACK-BLOWER MOTOR
K1,-1	CONTACTOR-COMPRESSOR
K3,-1,2	CONTACTOR-BLOWER
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
L1	VALVE-REVERSING
P2	PLUG-ELECTRIC HEAT
P35	PLUG-TEST
P43	PLUG-BLOWER MOTOR
P66	PLUG-NOVAR ETM
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	THERMOSTAT-DEFROST
S11	SWITCH-LOW PRESS,LOW AMB KIT
S46	SWITCH-PRESSURE,DEFROST
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB32	TERMINAL STRIP-GROUND

LINE VOLTAGE FIELD INSTALLED

WIRING DIAGRAM	11/99
HEAT PUMPS-PACKAGED	
CHP16,CHP20-036,048,060-1-Y	
208-230/60/3	
HEAT PUMP SECTION B27	
Supersedes Form No. 533,012W	New Form No. 533,385W

CHP16/20 G VOLTAGE



KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 2)
B1	COMPRESSOR
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
C1	CAPACITOR-OUTDOOR FAN
C4	CAPACITOR-BLOWER MOTOR
CB8	CIRCUIT BREAKER-TRANSFORMER T1
CMC1	TIMER-DEFROST
HR1	HEATER-COMPRESSOR
J35	JACK-TEST
J38	JACK-MOTOR SPEED CHANGE
J43	JACK-BLOWER MOTOR
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
L1	VALVE-REVERSING
P2	PLUG-ELECTRIC HEAT
P35	PLUG-TEST
P38	PLUG-MOTOR SPEED CHANGE
P43	PLUG-BLOWER MOTOR
P66	PLUG-NOVAR ETM
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	THERMOSTAT-DEFROST
S11	SWITCH-LOW PRESS,LOW AMB KIT
S46	SWITCH-PRESSURE, DEFROST
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR(575V)
TB32	TERMINAL STRIP-GROUND

WIRING DIAGRAM	11/99
HEAT PUMPS-PACKAGED	
CHP16,CHP20-036,048,060-1-G,J	
HEAT PUMP SECTION B28	
Supersedes Form No. 533,013W	New Form No. 533,386W

CHP16/20 Y and G VOLTAGE 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 operartion (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 (contacts 6-8 close and 6-4 open). Contacts 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 (contacts 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 (contacts 6-8 close), contactor K1 is energized.

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

6- K3-2 switches to energize the blower on high speed. K3-1 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- K3-2 switches to energize the blower on high speed. K3-1 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 conrtrol 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 immediatley 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.

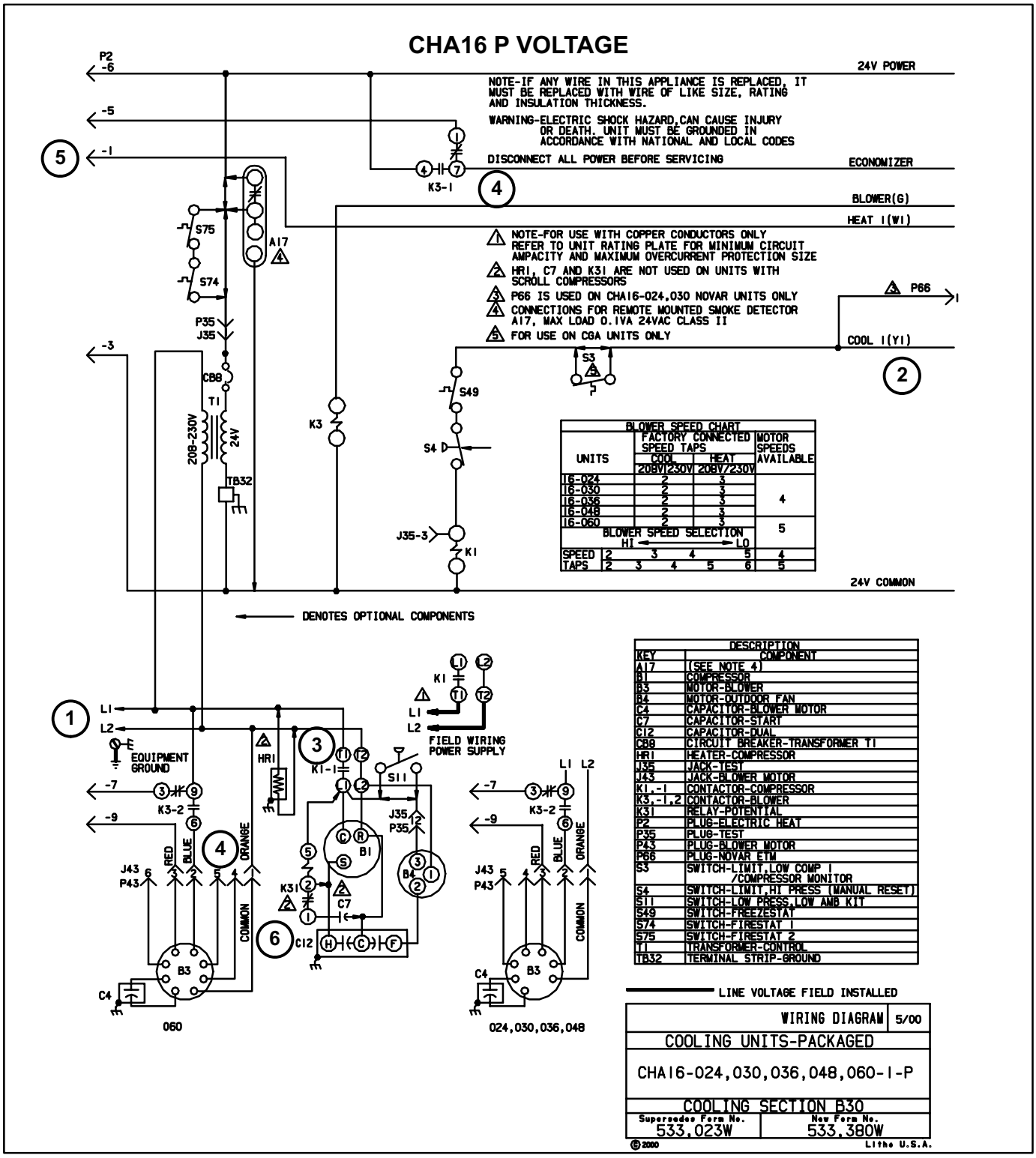
20- When K10-1 opens, the outdoor fan is de-energized.

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.



SEQUENCE OF OPERATION

Cooling:

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

2- Cooling demand energizes Y1 and G in the thermostat. Y1 energizes compressor contactor K1 and G energizes indoor blower relay K3.

3- K1-1 closes to energize compressor and condenser fan.

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

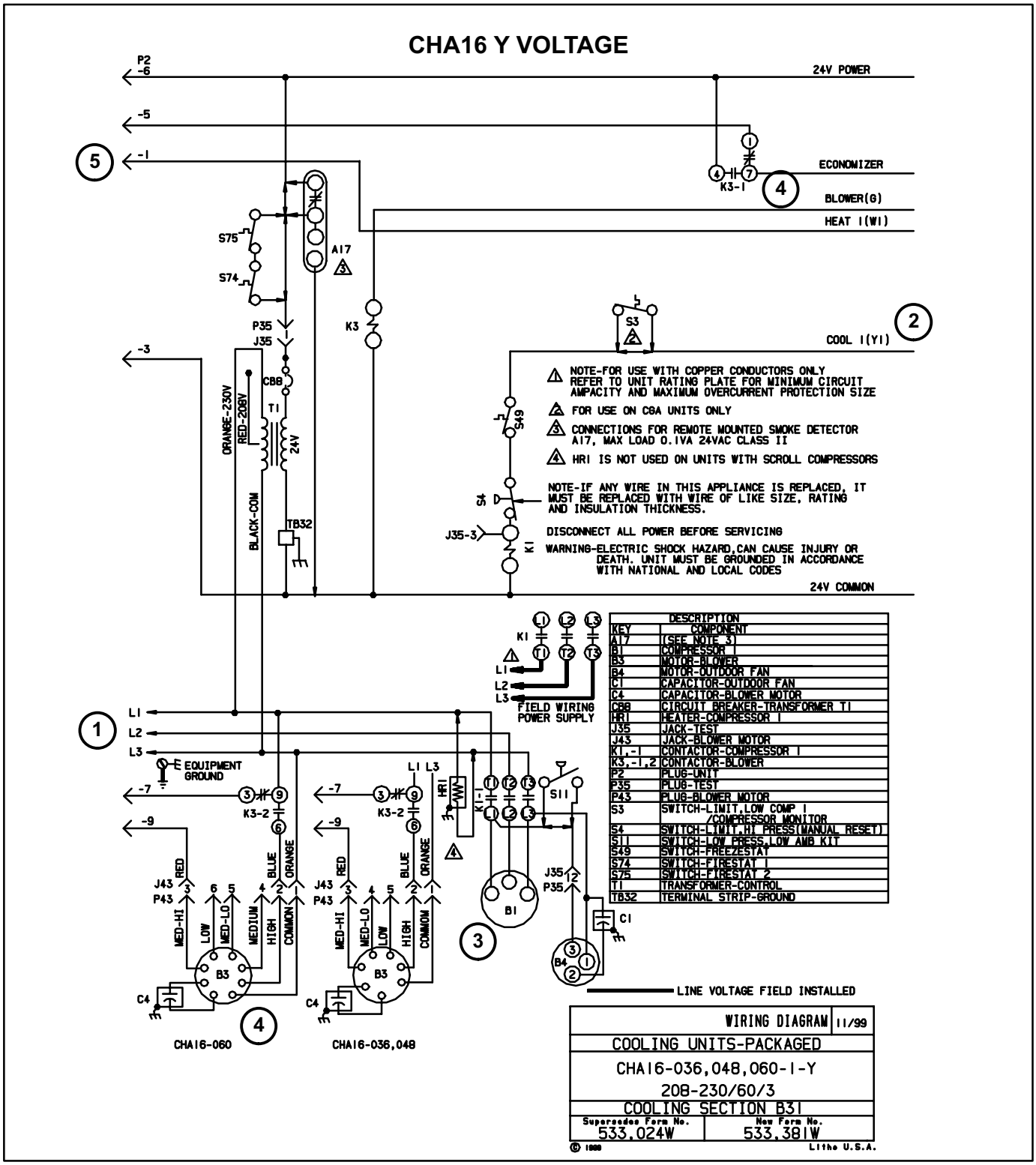
Heating:

5-Heating demand initiates at W1 in the thermostat and passes through to ECH16.

See Electric Heat Sequence of 0peration.

Units equipped with reciprocating compressors:

6-As compressor gains speed, compressor terminal S is powered by start capacitor C7. When compressor nears full speed potential relay K31 is energized and the start capacitor is taken out of the circuit. K31 remains energized during compressor operation.



KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
C1	CAPACITOR-OUTDOOR FAN
C4	CAPACITOR-BLOWER MOTOR
CBB	CIRCUIT BREAKER-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
J35	JACK-TEST
J43	JACK-BLOWER MOTOR
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER
P2	PLUG-UNIT
P35	PLUG-TEST
P43	PLUG-BLOWER MOTOR
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S11	SWITCH-LOW PRESS,LOW AMB KIT
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB32	TERMINAL STRIP-GROUND

SEQUENCE OF OPERATION

Cooling:

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

2- Cooling demand energizes Y1 and G in the thermostat. Y1 energizes compressor contactor K1 and G energizes indoor blower relay K3.

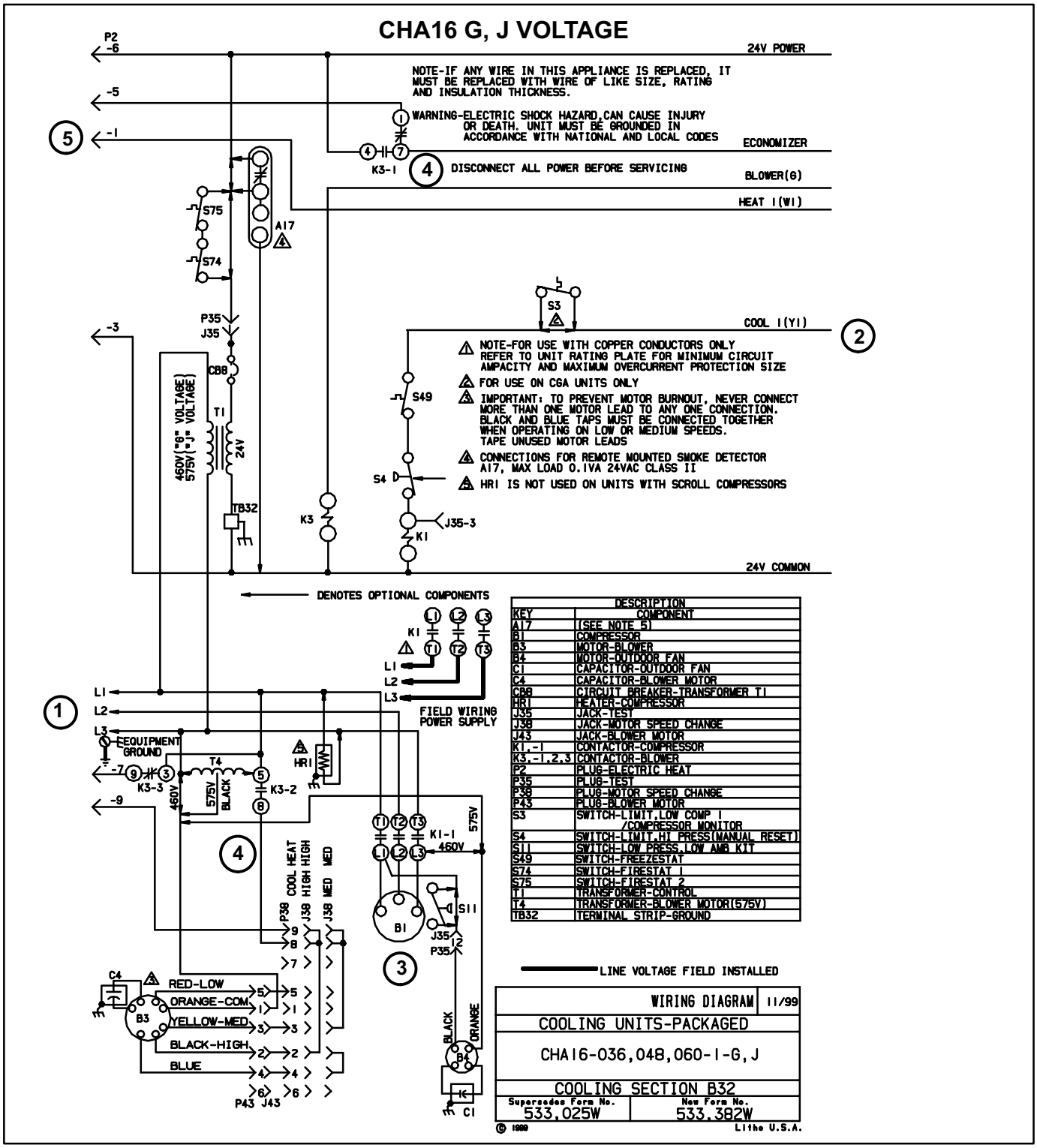
3- K1-1 closes to energize compressor and condenser fan.

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

Heating:

5-Heating demand initiates at W1 in the thermostat and passes through to ECH16.

See Electric Heat Sequence of 0peration.



KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 5)
B1	COMPRESSOR
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
C1	CAPACITOR-OUTDOOR FAN
C4	CAPACITOR-BLOWER MOTOR
CB8	CIRCUIT BREAKER-TRANSFORMER T1
HR1	HEATER-COMPRESSOR
J35	JACK-TEST
J38	JACK-MOTOR SPEED CHANGE
J43	JACK-BLOWER MOTOR
K1,-1	CONTACTOR-COMPRESSOR
K3,-1,2,3	CONTACTOR-BLOWER
P2	PLUG-ELECTRIC HEAT
P35	PLUG-TEST
P38	PLUG-MOTOR SPEED CHANGE
P43	PLUG-BLOWER MOTOR
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S11	SWITCH-LOW PRESS,LOW AMB KIT
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR(575V)
TB32	TERMINAL STRIP-GROUND

SEQUENCE OF OPERATION

Cooling:

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

2- Cooling demand energizes Y1 and G in the thermostat. Y1 energizes compressor contactor K1 and G energizes indoor blower relay K3.

3- K1-1 closes to energize compressor and condenser fan.

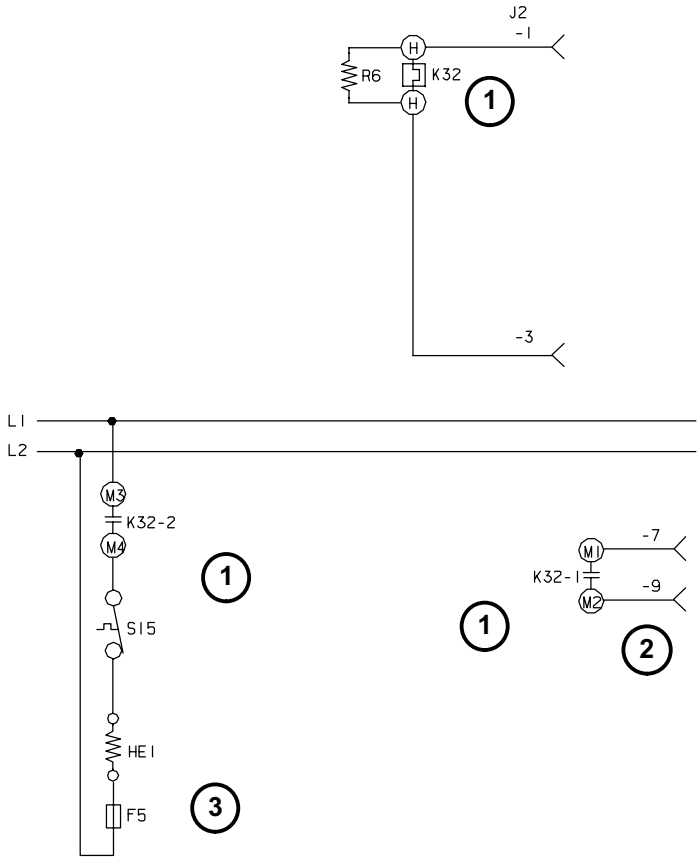
4- K3-2 switches to energize blower on high speed. K3-1 switches to power the economizer (if equipped). Dampers open to minimum position.

Heating:

5-Heating demand initiates at W1 in the thermostat and passes through to ECH16.

See Electric Heat Sequence of 0peration.

ECH16-5kW-P VOLTAGE



DESCRIPTION	
KEY	COMPONENT
F5	fuse-thermal
HE1	element-electric ht
J2	jack-electric ht
K32,-1,2	relay-sequencer, elect ht
R6	resistor-thermostat
S15	switch-limit,primary,elect ht

LENNOX Industries Inc. WIRING DIAGRAM	1/90
HEATING UNITS-ELECTRIC	
ECH16R-5-1P	
HEATING CONTROL SECTION- A28	
Supersedes Form No.	New Form No. 528,958W

Litho U.S.A.

ECH16 5kW P VOLTAGE SEQUENCE OF OPERATION

NOTE - Call for heat is first stage heat for CHA16 units and second stage heat for CHP16/20 units.

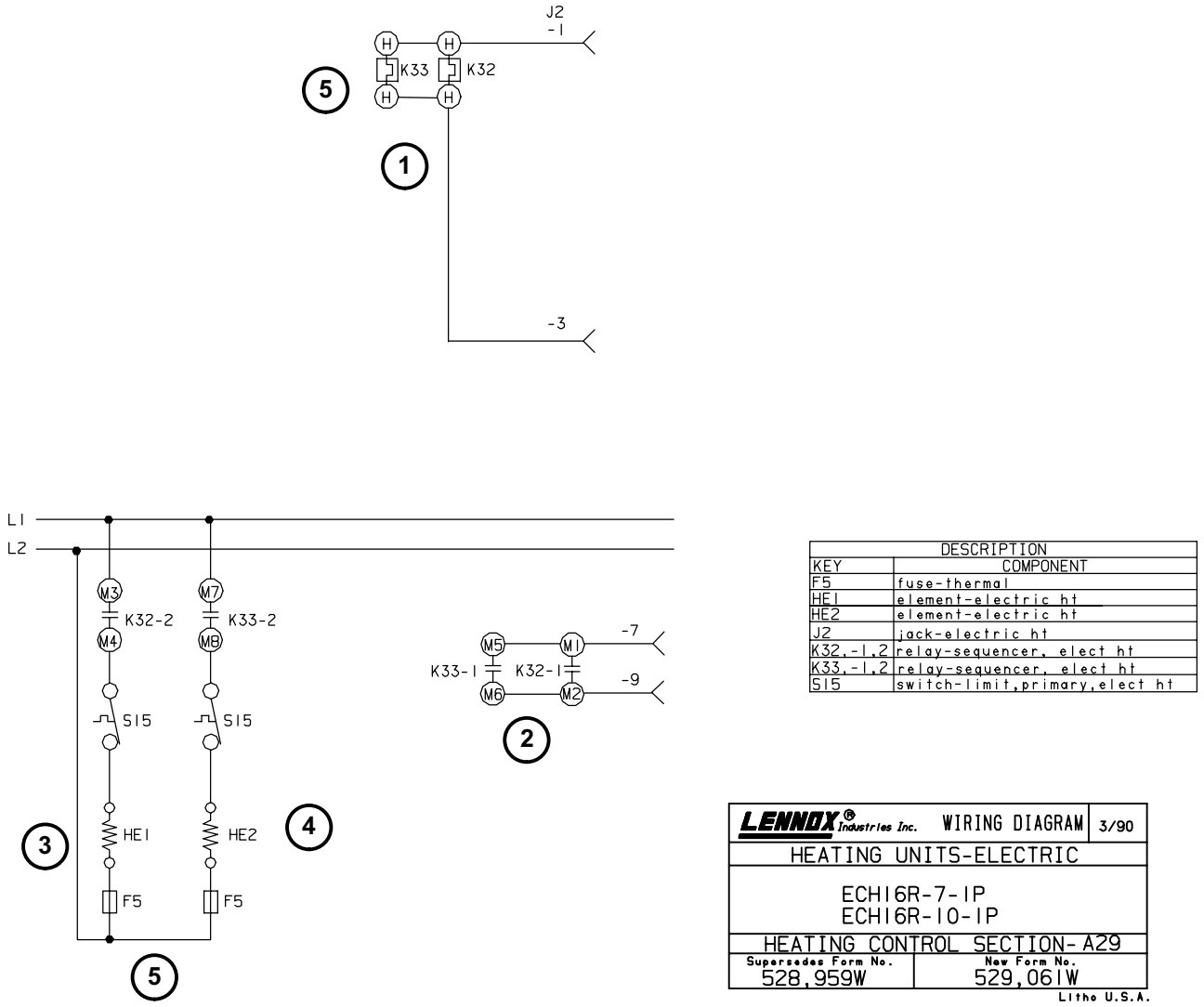
1- On a call for heat, thermal heat relay K32 and resistor R6 are energized. Within 1-110 seconds, contacts K32-1 close followed by K32-2.

2- When K32-1 closes, nothing happens since indoor blower is already energized form first stage heat call.

3- When K32-2 closes, heating element HE1 is energized.

4- When heating demand is satisfied, heat relay K32 is de-energized. Heating element HE1 de-energizes immediately.

ECH16-7/10kW-P VOLTAGE



DESCRIPTION	
KEY	COMPONENT
F5	fuse-thermal
HE1	element-electric ht
HE2	element-electric ht
J2	jack-electric ht
K32,-1,2	relay-sequencer, elect ht
K33,-1,2	relay-sequencer, elect ht
S15	switch-limit,primary,elect ht

LENNOX Industries Inc.	WIRING DIAGRAM	3/90
HEATING UNITS-ELECTRIC		
ECH16R-7-1P ECH16R-10-1P		
HEATING CONTROL SECTION-A29		
Supersedes Form No. 528,959W	New Form No. 529,061W	

Litho U.S.A.

ECH16-7/10kW- P VOLTAGE SEQUENCE OF OPERATION

NOTE - Call for heat is first stage heat for CHA16 units and second stage heat for CHP16/20 units.

1- On a call for heat, thermal heat relay K32 and K33 are energized. Within 1-110 seconds, contacts K32-1 and K33-1 close followed by K32-2 and K33-2.

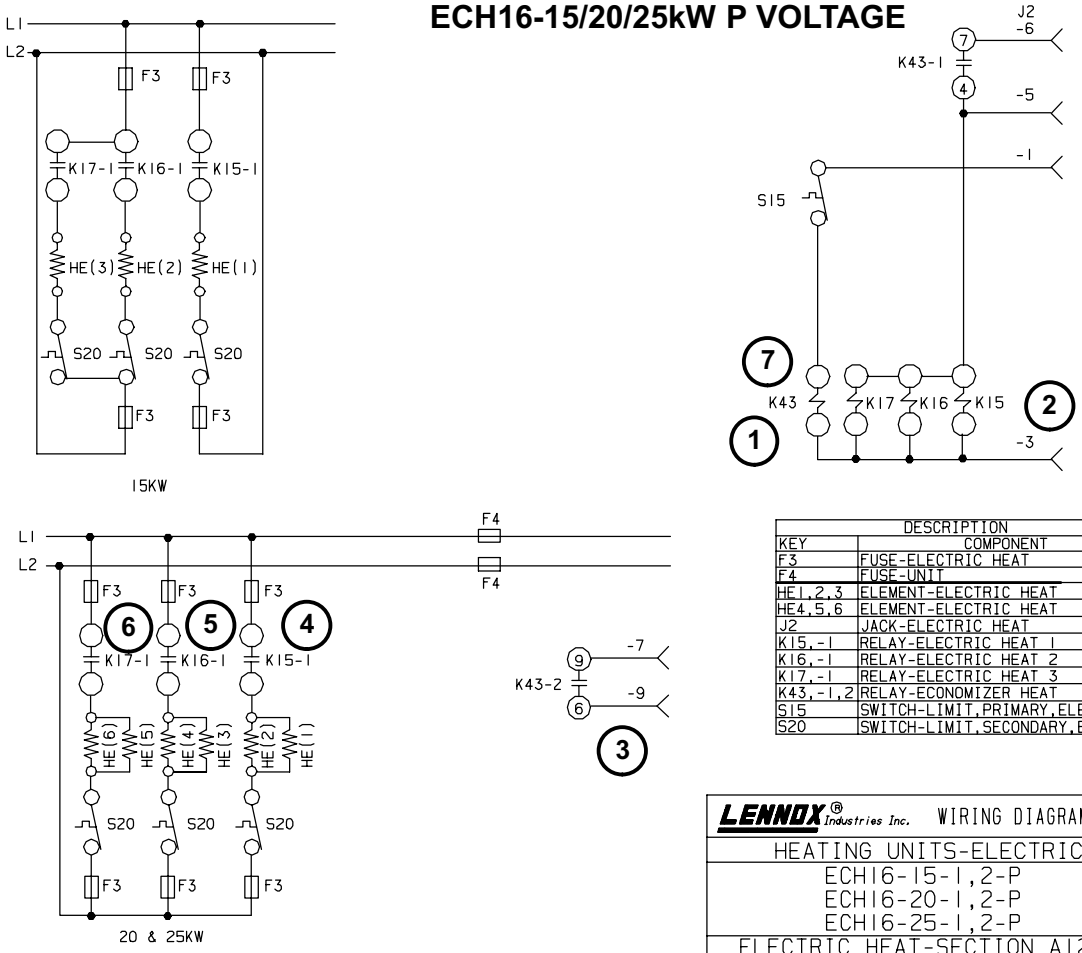
2- When either K32-1 or K33-1 closes, nothing happens as indoor blower is aleady energized from first stage heat call.

3- When K32-2 closes, heating element HE1 is energized.

4- When K33-2 closes, heating element HE2 is energized.

5- When heating demand stops, heat relays K32 and K33 de-energize. Heating element HE1 and HE2 de-energize immediately.

ECH16-15/20/25kW P VOLTAGE



DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1,2,3	ELEMENT-ELECTRIC HEAT
HE4,5,6	ELEMENT-ELECTRIC HEAT
J2	JACK-ELECTRIC HEAT
K15,-1	RELAY-ELECTRIC HEAT 1
K16,-1	RELAY-ELECTRIC HEAT 2
K17,-1	RELAY-ELECTRIC HEAT 3
K43,-1,2	RELAY-ECONOMIZER HEAT
S15	SWITCH-LIMIT,PRIMARY,ELECT HT
S20	SWITCH-LIMIT,SECONDARY,ELECT HT

LENNOX Industries Inc.	WIRING DIAGRAM	12/91
HEATING UNITS-ELECTRIC		
ECH16-15-1,2-P ECH16-20-1,2-P ECH16-25-1,2-P		
ELECTRIC HEAT-SECTION A12		
Supersedes Form No. 528,613W	New Form No. 529,492W	

 Litho U.S.A.

ECH16 15 / 25kW P VOLTAGE SEQUENCE OF OPERATION

NOTE - Call for heat is first stage heat for CHA16 units and second stage heat for CHP16/20 units.

1- On a call for heat, relay K43 is energized. K43-1 closes immediately.

2- When K43-1 closes, heat relays K15, K16 and K17 are energized. K15-1, K16-1 and K17-1 close immediately.

3- When K43-2 closes, nothing happens as indoor blower is already energized from first stage heat call.

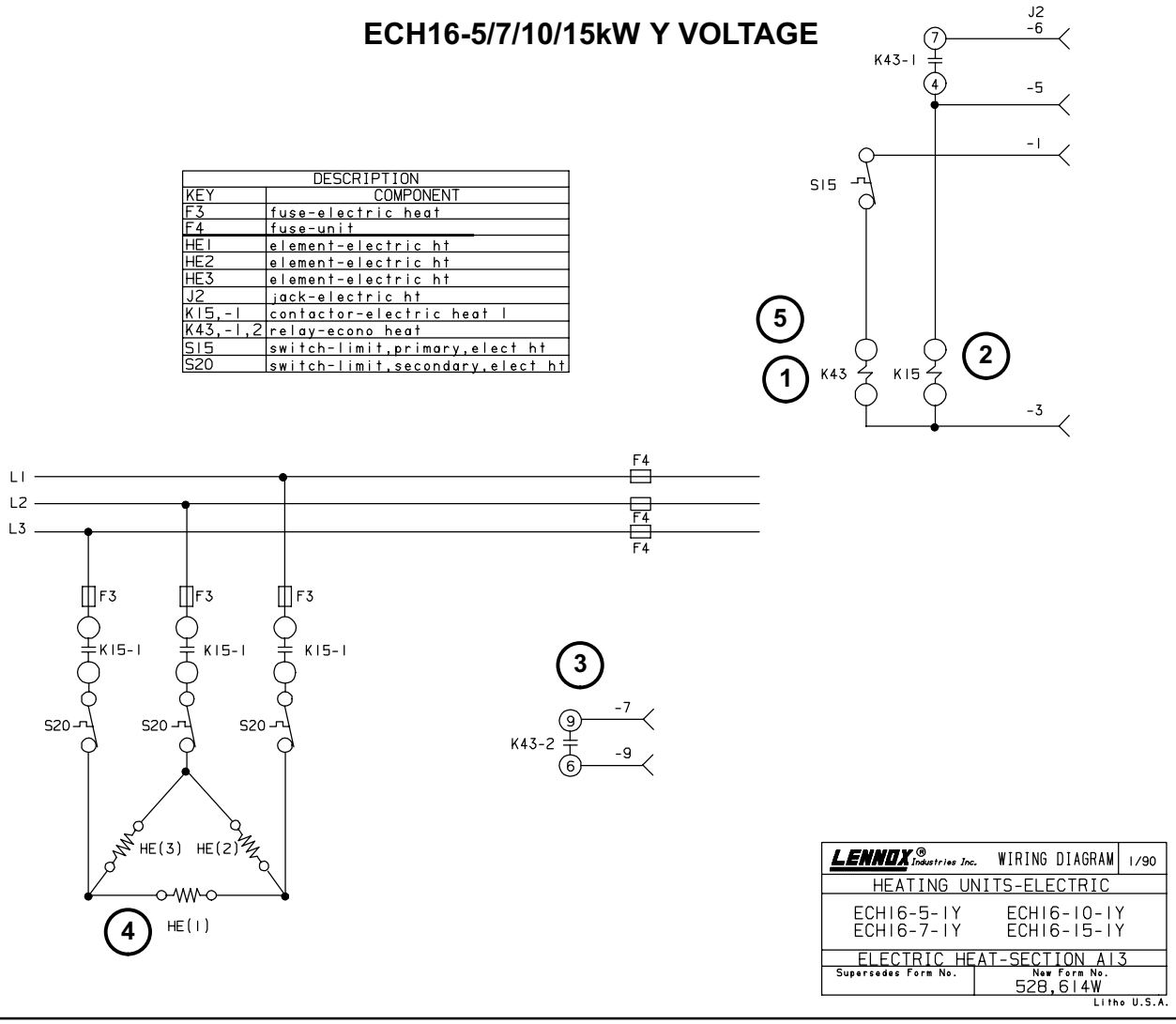
4- When K15-1 closes, 15kW: heating element HE1 is energized.
When K15-1 closes, 20kW or 25kW: heating element HE1 and HE2 are energized.

5- When K16-1 closes, 15kW: heating element HE2 is energized.
When K16-1 closes, 20kW or 25Kw: heating element HE3 and HE4 are energized.

6- When K17-1 closes, 15kW: heating element HE3 is energized.
When K17-1 closes, 20kW or 25kW: heating element HE5 and HE6 are energized.

7- When heating demand is satisfied, heat relay K43 is de-energized. All heating elements de-energized immediately.

ECH16-5/7/10/15kW Y VOLTAGE



ECH16-5 /15kW Y VOLTAGE SEQUENCE OF OPERATION

NOTE - Call for heat is first stage heat for CHA16 units and second stage heat for CHP16/20 units.

1- On a call for second stage heat, relay K43 is energized. K43-1 closes immediately.

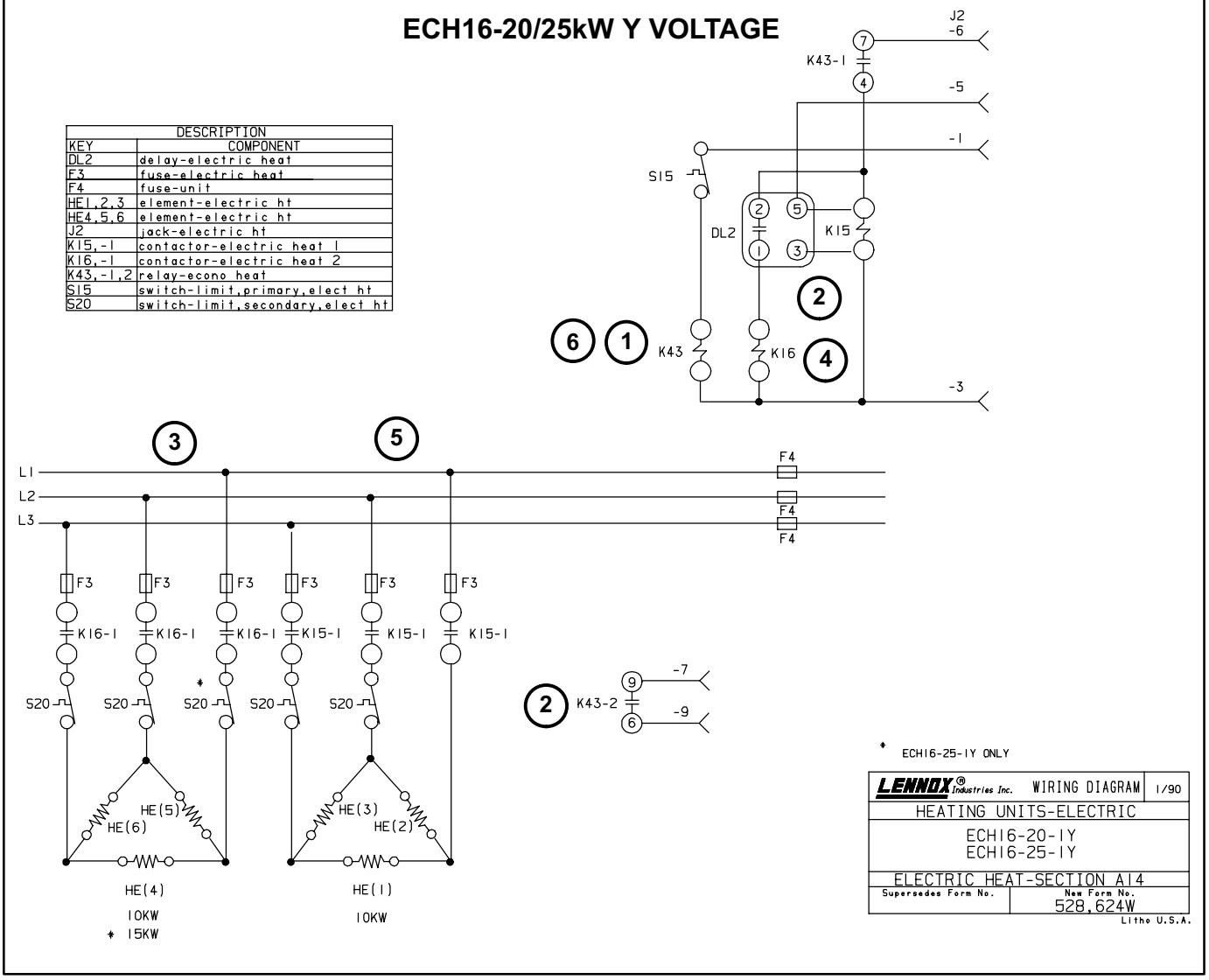
2- When K43-1 closes, heat relay K15 is energized. K15-1 closes immediately.

3- K43-2 closes but nothing happens as indoor blower is already energized from first stage heat call.

4- When K15-1 closes, heating elements HE1, HE2 and HE3 are energized.

5- When heating demand is satified, heat relay K43 is de-energized. All heating elements de-energize immediately.

ECH16-20/25kW Y VOLTAGE



ECH16-20 / 25kW Y VOLTAGE SEQUENCE OF OPERATION

NOTE - Call for heat is first stage heat for CHA16 units and second stage heat for CHP16/20 units.

1- On a call for second stage heat, relay K43 is energized. K43-1 closes immediately.

2- When K43-1 closes, heat relay K15 and time delay relay DL2 are energized. K15-1 closes immediately. DL2 begins 30 second countdown before closing. When K43-2 closes nothing happens as indoor blower is already energized from first stage heat call.

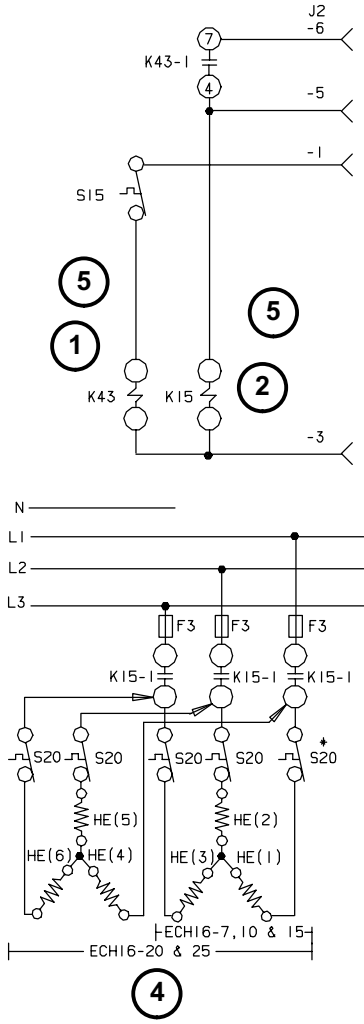
3- When K15-1 closes, heating elements HE1, HE2 and HE3 are energized. HE1, HE2 and HE3 are connected in a “delta” configuration for three-phase operation.

4- After 30 second count, time-delay DL2 closes and energizes heating contactor K16. K16-1 closes immediately.

5- When K16-1 closes, heating elements HE4, HE5 and HE6 are energized. HE4, HE5 and HE6 are connected in a “delta” configuration for three-phase operation.

6- When heating demand is satisfied, heat relay K43 and all heating elements connected to K15 are de-energized. All heating elements connected to K16 are de-energized when DL2 contacts open (about one second later).

ECH16-7/10/15/20/25kW G, J, M VOLTAGE



DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1,2,3	ELEMENT-ELETRIC HEAT
HE4,5,6	ELEMENT-ELECTRIC HEAT
J2	JACK-ELECTRIC HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
K43,-1,2	RELAY-ECONOMIZER HEAT
S15	SWITCH-LIMIT,PRIMARY,ELECT HT
S20	SWITCH-LIMIT,SECONDARY,ELECT HT

DENOTES OPTIONAL COMPONENTS

* ECH16-7,-10,-15-1G,J,M ONLY

LENNOX® Industries Inc.	WIRING DIAGRAM	8/90
HEATING UNITS-ELECTRIC		
ECH16-7-1G,J,M ECH16-10-1G,J,M ECH16-15-1G,J,M	ECH16-20-1G,J,M ECH16-25-1G,J,M	
ELECTRIC HEAT-SECTION A15		
Supersedes Form No.	New Form No. 528,615W	

Litho U.S.A.

ECH16-20 / 25kW G, J, M VOLTAGE SEQUENCE OF OPERATION

NOTE - Call for heat is first stage heat for CHA16 units and second stage heat for CHP16/20 units.

1- On a call for second stage heat, relay K43 is energized. K43-1 and K43-2 contacts close immediately.

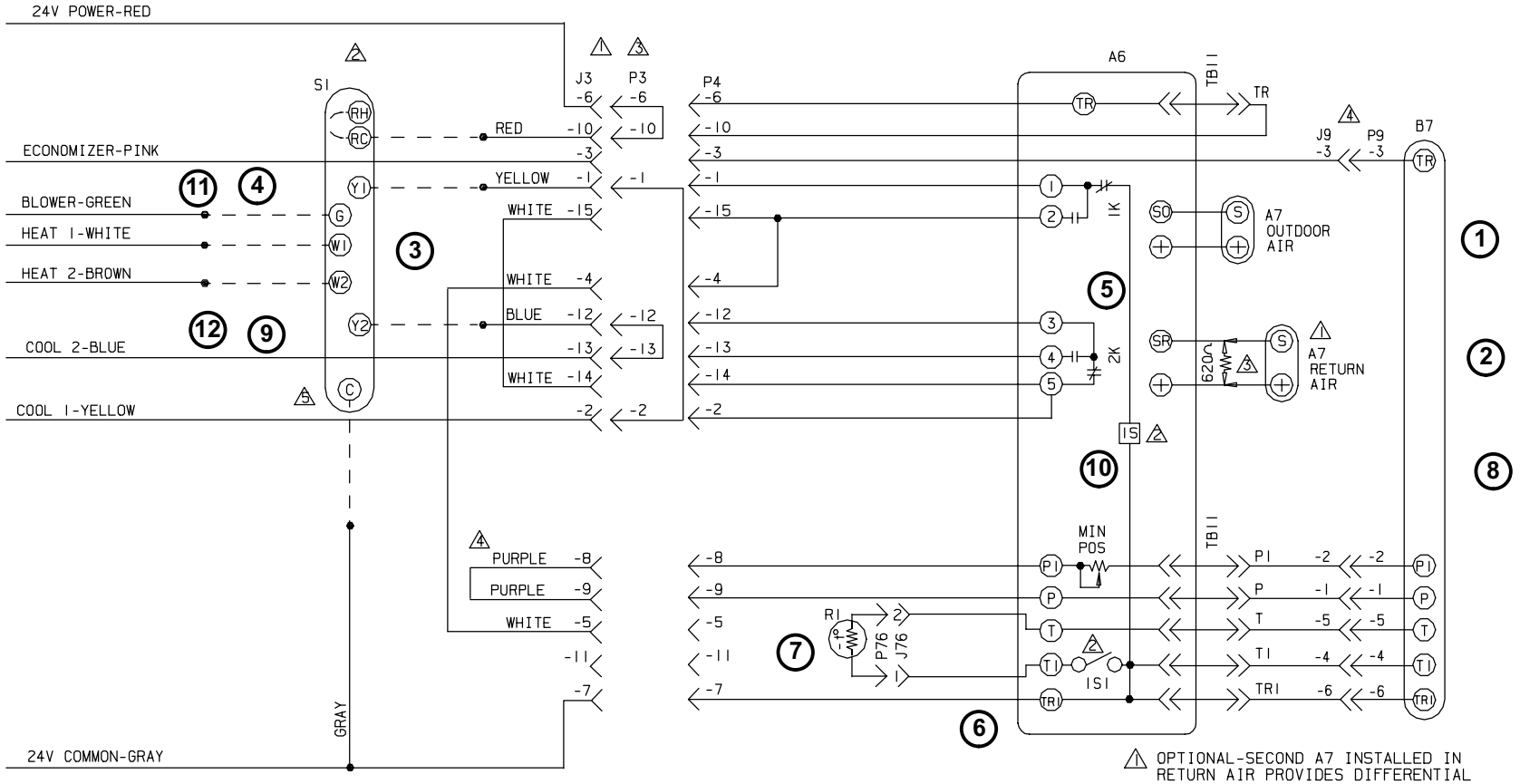
2- When K43-1 closes, heat relay K15 is energized. K15-1 closes immediately.

3- When K43-2 closes nothing happens as indoor blower is already energized from first stage heat call.

4- When K15-1 closes, 7/10/15kW: heating elements HE1, HE2 and HE3 are energized. HE1, HE2 and HE3 are connected in a “wye” configuration. 20/25kW: heating elements HE4, HE5 and HE6 are energized. HE4, HE5 and HE6 are configured in a “wye” configuration.

5- When heating demand is satisfied, K43 is de-energized followed by K15 and all heating elemnts.

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.

Enthalpy High, 2nd Stage Cool:

12-Additional cooling demand is sent from thermostat terminal Y2 through enthalpy control terminals 3 and 4 to energize the 2nd stage compressor.