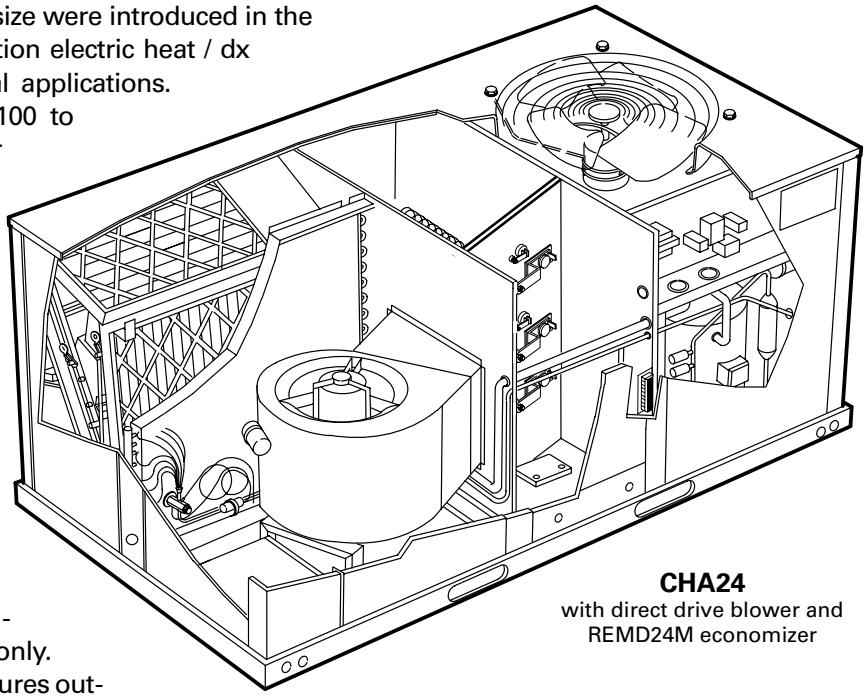
CHA24 SERIES 5 and 6 TON UNITS

CHA24 series units in the 5 and 6 ton cooling size were introduced in the fall of 1993. The units are packaged combination electric heat / dx cool units designed primarily for commercial applications. Electric heat sections are available with 18,100 to 102,400 Btuh input sizes. Units are designed for rooftop or side of building installation with bottom or horizontal discharge.

The CHA24 is designed to accept any of several different thermostat/control systems with minimum field wiring. Factory or field provided control options connect to the unit with jack–plugs. When "plugged in" the controls become an integral part of the unit wiring. Units are also equipped with a low voltage terminal strip to facilitate space thermostat field wiring.



CHA24
with direct drive blower and
REMD24M economizer

Information contained in this manual is intended for use by Lennox service technicians only. All specifications are subject to change. Procedures outlined in this manual are presented as a recommendation only and do not supersede or replace local or state codes. In the absence of local or state codes, the guidelines and procedures outlined in this manual (except where noted) are recommended only.

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SPECIFICATIONS — CHA24(D)-651-653 & CHA24-813

Model No.			CHA24D-651-653 Direct Drive	CHA24-653 Belt Drive	CHA24-813 Belt Drive
Cooling Ratings	Gross cooling capacity — Btuh (kW)		61,000 (18.9)		76,000 (22.3)
	*Net cooling capacity — Btuh (kW)		58,000 (17.0)		73,000 (25.8)
	*Total unit watts		6520		7680
	*SEER (Btuh/Watt)		10.0		- - - -
	*EER (Btuh/Watt)		8.9		9.5
	★ARI Standard 270 Sound Rating Number (bels)		8.4		8.6
Refrigerant (HCFC-22) Charge — Lbs. (kg)			8 lbs. 12 oz. (3.97)		10 lbs. 0 oz. (4.54)
Evaporator Blower and Drive Selection	Blower wheel nom. dia. x width — in. (mm)		11-1/2 x 9 (292 x 229)	12 x 12 (305 x 305)	12 x 12 (305 x 305)
	**Factory Installed Drives	Nominal motor horsepower (W)	.75 (560)	1.5 (1120)	1.5 (1120)
		Max. usable horsepower (W)	- - - -	1.72 (1280)	1.72 (1280)
		Voltage & phase	208/230v-1 or 3 ph 460v or 575V-3ph	208/230/460v/575v-3ph	208/230/460v/575v-3ph
		RPM range	direct drive	835 — 1135	835 — 1135
Evaporator Coil	Net face area — sq. ft. (m^2)		6.25 (0.58)		6.25 (0.58)
	Tube diameter — in. (mm) & No. of rows		3/8 (9.5) — 2		3/8 (9.5) — 3
	Fins per inch (m)		15 (591)		14 (551)
	Expansion device type		Thermostatic Expansion Valve		
	Drain connection (No. & size) — in. (mm) fpt		(1) 3/4 (19)		
Condenser Coil	Net face area — sq. ft. (m^2)		12.9 (1.20)		
	Tube diameter — in.(mm) & No. of rows		3/8 (9.5) — 2		
	Fins per inch (m)		20 (787)		
Condenser Fan	(No.) Diameter — in.(mm) & No. of blades		(1) 24 (610) — 3		(1) 24 (610) — 4
	Air volume — cfm (L/s)		4200 (1980)		4500 (2125)
	Motor horsepower (W)		1/3 (224)	1/3 (224) 1/2 (373) @ 575v	1/2 (373)
	Motor rpm		1075		1075
	Motor watts		460		500
Filters (furnished)	Type of filter		Pleated Disposable		
	No. & size — in. (mm)		(4) 12 x 24 x 2 (305 x 610 x 51)		
Net weight of basic unit — lbs. (kg)			638 (289)	677 (307)	700 (318)
Shipping weight of basic unit — lbs. (kg) (1 Package)			738 (335)	777 (352)	800 (363)
Electrical characteristics			208/230v-1 or 3 ph 460v or 575v-3ph	208/230v/460v/575v-3ph	208/230v/460v/575v-3ph

★ Sound Rating Number in accordance with ARI Standard 270.
* Rated in accordance with ARI Standard 210/240; 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering evaporator air.
NOTE — ARI capacity is net and includes evaporator blower motor heat deduction. Gross capacity does not include evaporator blower motor heat deduction.
** Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. In Canada, nominal motor output is also maximum usable motor output.

OPTIONAL ACCESSORIES — (Must Be Ordered Extra)

Unit Model No.		CHA24D-651-653 CHA24-653	CHA24-813
Roof Mounting Frame — Net Weight		RMF24-81 **(45J19)** (100 lbs. (45 kg)	
Ceiling Supply and Return Air Diffusers Net Weight lbs. (kg)	Step-Down	RTD11-95 **(29G04)** (88 lbs.) (40 kg)	
	Flush	FD11-95 **(29G05)** (75 lbs.) (34 kg)	
	Transition	SRT24-81 **(48J27)** (28 lbs.) (13 kg)	
*Electric Heat	Model Number	ECH24	
	Kw input range	7–10–15–20–25–30	
*Heater Sub-Fuse Box	Model Number	FB24	
	Kw input range	7–10–15–20–25–30	
*Unit/Electric Heat Sub-Fuse Box	Model Number	SPP24	
	Kw input range	7–10–15–20–25–30	
Horizontal Supply and Return Air Kit — Net Weight		HDK24-81 **(45J25)** (20 lbs. (9 kg)	
Economizer Dampers With Exhaust dampers	Model Number — Net Weight	REMD24M-81 **(45J20)** (68 lbs.) (31 kg)	
	No. & size of filters — in. (mm)	(1) 16 x 25 x 1 (406 x 635 x 25)	
	Exhaust Dampers Net Face Area	2.5 sq. ft. (0.23 m^2)	
Differential Enthalpy Control		**54G44**	
Outdoor Air Dampers — Net Weight No. & size of filters — in. (mm)		OAD24-81 **(45J21)** (18 lbs.) (8 kg)	
Automatic Damper — Net Weight		OAD24M-81 **(45J22)** (24 lbs.) (11 kg)	
Low Ambient Control Kit		LB-57113BC **(24H77)**	
Timed-Off Control		LB-50709BA **(32F21)**	

*See Optional Electric Heat Data Tables for specific information.

ELECTRICAL DATA — CHA24D-651-653, CHA24-653 & CHA24-813

Model No.			CHA24D-651-653				CHA24-653			CHA24-813		
Line voltage data — 60 Hz			208/230v 1 phase	208/230v 3 phase	460v 3 phase	575v 3 phase	208/230v 3 phase	460v 3 phase	575v 3 phase	208/230v 3 phase	460v 3 phase	575v 3 phase
Compressor	Rated load amps		27.0	16.7	8.6	6.1	16.7	8.6	6.1	20.8	8.2	6.5
	Locked rotor amps		141	110	55	44	110	55	44	142	72	58
Condenser Fan Motor	Full load amps		2.3	2.3	1.1	††1.1	2.3	1.1	1.2	3.0	1.5	1.2
	Locked rotor amps		4.5	4.5	2.2	†† 2.2	4.5	2.2	2.9	5.8	3.0	2.9
Evaporator Blower Motor	Motor Output	hp	3/4	3/4	3/4	3/4	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
		W	560	560	560	560	1120	1120	1120	1120	1120	1120
	Full load amps		4.6	4.6	2.3	†† 2.3	5.7	2.8	2.4	5.7	2.8	2.4
	Locked rotor amps		10.0	10.0	5.4	†† 5.4	40.0	20.0	15.0	40.0	20.0	15.0
Rec. maximum fuse size (amps)			60	40	20	15	45	20	15	50	20	15
*Minimum Circuit Ampacity			41.0	28.0	15.0	12.0	29.0	15.0	12.0	35.0	15.0	12.0
Unit Power Factor			.98	.85	.86	.88	.85	.86	.88	.84	.85	.86

*Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.
†† Motors are rated at 460v. Full load amps shown are for stepdown transformer output.
NOTE — Extremes of operating range are plus and minus 10 % of line voltage.

ELECTRIC HEAT DATA — CHA24D-651

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 Sub-Fuse Boxes		Total Unit & Electric Heat *Minimum Circuit Ampacity
							†Heater Only Sub-Fuse Box	†Unit/Electric Heat Sub-Fuse Box	
CHA24D-651	ECH24-7 **(45J26)** (9 lbs.) (4 kg)	1 step (1 phase)	208	31.6	5.3	18,100	FB24-7 **(58J30)**	SPP24-65-7 **(58J01)**	41.0
			220	33.5	5.9	20,100			41.0
			230	35.0	6.4	21,800			41.0
			240	36.5	7.0	23,900			42.3
	ECH24-10 **(45J27)** (9 lbs) (4 kg)	1 step (1 phase)	208	45.1	7.5	25,600	FB24-10 **(58J31)**	SPP24-65-10 **(58J02)**	50.9
			220	47.8	8.4	28,700			53.6
			230	50.0	9.2	31,400			55.8
			240	52.1	10.0	34,100			57.9
	ECH24-15 **(45J28)** (9 lbs.) (4 kg)	1 step (1 phase)	208	67.8	11.3	38,600	FB24-15 **(58J32)**	SPP24-65-15 **(58J03)**	73.6
			220	71.6	12.6	43,000			77.4
			230	74.9	13.8	47,100			80.7
			240	78.1	15.0	51,200			83.9
	ECH24-20 **(45J29)** (12 lbs.) (6 kg)	1 step (1 phase)	208	90.3	15.0	51,200	FB24-20 **(58J33)**	SPP24-65-20 **(58J04)**	96.1
			220	95.5	16.8	57,300			101.3
			230	99.8	18.4	62,800			105.6
			240	104.1	20.0	68,300			109.9
	ECH24-25 **(45J30)** (12 lbs.) (6 kg)	1 step (1 phase)	208	112.9	18.8	64,200	FB24-25 **(58J34)**	SPP24-65-25 **(58J05)**	118.7
			220	119.4	21.0	71,700			125.2
			230	124.9	23.0	78,500			130.7
			240	130.3	25.0	85,300			136.1

*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).
†NOTE — FB24 heater sub-fuse box is required for fusing electric heat. Not required if SPP24 Unit/Electric Heat Single Point Power Source Box is used. SPP24 contains fusing for both electric heat and packaged unit.

ELECTRIC HEAT DATA — CHA24D-653

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 Sub-Fuse Boxes		Total Unit & Electric Heat *Minimum Circuit Ampacity
							†Heater Only Sub-Fuse Box	†Unit/Electric Heat Sub-Fuse Box	
CHA24D-653	ECH24-7 208/230v **(45J31)** 460v **(45J37)** 575v **(45J43)** (9 lbs.) (4 kg)	1 step (3 phase)	208	18.3	5.3	18,100	FB24-7 (208/230v) **(58J35)**	SPP24-65-7 (208/230v) **(58J06)**	28.0
			220	19.3	5.9	20,100			28.0
			230	20.1	6.4	21,800			28.0
			240	21.0	7.0	23,900			28.0
			440	9.6	5.8	19,800	FB24-7 (460v/575v) **(58J41)**	SPP24-65/81-7 (460v) **(58J12)**	15.0
			460	10.1	6.5	22,200			15.0
			480	10.5	7.0	23,900			15.0
			550	7.6	5.8	19,800		SPP24-65/81-7 (575v) **(58J18)**	12.0
			575	8.0	6.4	21,800			12.0
			600	8.4	7.0	23,900			12.0
	ECH24-10 208/230v **(45J32)** 460v **(45J38)** 575v **(45J44)** (9 lbs.) (4 kg)	1 step (3 phase)	208	26.1	7.5	25,600	FB24-10 (208/230v) **(58J36)**	SPP24-65-10 (208/230v) **(58J07)**	31.9
			220	27.6	8.4	28,700			33.4
			230	28.9	9.2	31,400			34.7
			240	30.1	10.0	34,100			35.9
			440	13.8	8.4	28,700	FB24-10 (460v) **(58J42)**	SPP24-65/81-10 (460v) **(58J13)**	16.7
			460	14.4	9.2	31,400			17.3
			480	15.0	10.0	34,100			17.9
			550	11.0	8.4	28,700	FB24-10 (575v) **(58J47)**	SPP24-65/81-10 (575v) **(58J19)**	13.9
			575	11.5	9.2	31,400			14.4
			600	12.0	10.0	34,100			14.9
	ECH24-15 208/230v **(45J33)** 460v **(45J39)** 575v **(45J45)** (9 lbs.) (4 kg)	1 step (3 phase)	208	39.1	11.3	38,600	FB24-15 (208v/230) **(58J37)**	SPP24-65-15 (208/230v) **(58J08)**	44.9
			220	41.4	12.6	43,000			47.2
			230	43.2	13.8	47,100			49.0
			240	45.1	15.0	51,200			50.9
			440	20.6	12.6	43,000	●FB24-15/20 (460v) **(58J43)**	SPP24-65/81-15 (460v) **(58J14)**	23.5
			460	21.6	13.8	47,100			24.5
			480	22.5	15.0	51,200			25.4
			550	16.5	12.6	43,000	FB24-15 (575v) **(58J48)**	SPP24-65/81-15 (575v) **(58J20)**	19.4
			575	17.3	13.7	46,800			20.2
			600	18.0	15.0	51,200			20.9
	ECH24-20 208/230v **(45J34)** 460v **(45J40)** 575v **(45J46)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	52.1	15.0	51,200	FB24-20 (208v/230) **(58J38)**	SPP24-65-20 (208/230v) **(58J09)**	57.9
			220	55.1	16.8	57,300			60.9
			230	57.6	18.4	62,800			63.4
			240	60.1	20.0	68,300			65.9
		1 step (3 phase)	440	27.6	16.8	57,300	●FB24-20/25 (460v) **(58J44)**	SPP24-65/81-20 (460v) **(58J15)**	30.5
			460	28.9	18.4	62,800			31.8
			480	30.1	20.0	68,300			33.0
			550	22.0	16.8	57,300	●FB24-15/20 (575v) **(58J43)**	SPP24-65/81-20 (575v) **(58J21)**	24.9
			575	23.0	18.3	62,400			25.9
			600	24.0	20.0	68,300			26.9
	ECH24-25 208/230v **(45J35)** 460v **(45J41)** 575v **(45J47)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	65.1	18.8	64,200	FB24-25 (208v/230) **(58J39)**	SPP24-65-25 (208/230v) **(58J10)**	70.9
			220	68.9	21.0	71,700			74.7
			230	72.0	22.9	78,100			77.8
			240	75.1	25.0	85,300			80.9
		1 step (3 phase)	440	34.5	21.0	71,700	●FB24-25/30 (460v) **(58J45)**	SPP24-65/81-25 (460v) **(58J16)**	37.4
			460	36.0	22.9	78,100			38.9
			480	37.6	25.0	85,300			40.5
			550	27.6	21.1	72,000	●FB24-20/25 (575v) **(58J44)**	SPP24-65/81-25 (575v) **(58J22)**	30.5
			575	28.9	23.0	78,500			31.8
			600	30.1	25.0	85,300			33.0
	ECH24-30 208/230v **(45J36)** 460v **(45J42)** 575v **(45J48)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	78.1	22.5	76,800	FB24-30 (208v/230) **(58J40)**	SPP24-65-30 (208/230v) **(58J11)**	83.9
			220	82.6	25.2	86,000			88.4
			230	86.3	27.5	93,900			92.1
			240	90.1	30.0	102,400			95.9
		1 step (3 phase)	440	41.3	25.2	86,000	FB24-30 (460v) **(58J46)**	SPP24-65/81-30 (460v) **(58J17)**	44.2
			460	43.2	27.5	93,900			46.1
			480	45.1	30.0	102,400			48.0
			550	33.1	25.2	86,000	●FB24-25/30 (575v) **(58J45)**	SPP24-65/81-30 (575v) **(58J23)**	36.0
			575	34.6	27.5	93,900			37.5
			600	36.1	30.0	102,400			39.0

*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).
†NOTE — FB24 heater sub-fuse box is required for fusing electric heat. Not required if SPP24 Unit/Electric Heat Single Point Power Source Box is used. SPP24 contains fusing for both electric heat and packaged unit.
●NOTE — FB24-15/20 **(58J43)**, FB24-20/25 **(58J44)** and FB24-25/30 **(58J45)** Sub-Fuse Boxes are designated for use with either 460v or 575v electric heaters.

ELECTRIC HEAT DATA — CHA24-653

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 Sub-Fuse Boxes		Total Unit & Electric Heat *Minimum Circuit Ampacity
							†Heater Only Sub-Fuse Box	†Unit/Electric Heat Sub-Fuse Box	
CHA24-653	ECH24-7 208/230v **(45J31)** 460v **(45J37)** 575v **(45J43)** (9 lbs.) (4 kg)	1 step (3 phase)	208	18.3	5.3	18,100	FB24-7 (208/230v) **(58J35)**	SPP24-65-7 (208/230v) **(58J06)**	29.0
			220	19.3	5.9	20,100			29.0
			230	20.1	6.4	21,800			29.0
			240	21.0	7.0	23,900			29.0
			440	9.6	5.8	19,800	FB24-7 (460v/575v) **(58J41)**	SPP24-65/81-7 (460v) **(58J12)**	15.0
			460	10.1	6.5	22,200			15.0
			480	10.5	7.0	23,900			15.0
			550	7.6	5.8	19,800		SPP24-65/81-7 (575v) **(58J18)**	12.0
			575	8.0	6.4	21,800			12.0
			600	8.4	7.0	23,900			12.0
	ECH24-10 208/230v **(45J32)** 460v **(45J38)** 575v **(45J44)** (9 lbs.) (4 kg)	1 step (3 phase)	208	26.1	7.5	25,600	FB24-10 (208/230v) **(58J36)**	SPP24-65-10 (208/230v) **(58J07)**	33.2
			220	27.6	8.4	28,700			34.7
			230	28.9	9.2	31,400			36.0
			240	30.1	10.0	34,100			37.2
			440	13.8	8.4	28,700	FB24-10 (460v) **(58J42)**	SPP24-65/81-10 (460v) **(58J13)**	17.3
			460	14.4	9.2	31,400			17.9
			480	15.0	10.0	34,100			18.5
			550	11.0	8.4	28,700	FB24-10 (575v) **(58J47)**	SPP24-65/81-10 (575v) **(58J19)**	14.0
			575	11.5	9.2	31,400			14.5
			600	12.0	10.0	34,100			15.0
	ECH24-15 208/230v **(45J33)** 460v **(45J39)** 575v **(45J45)** (9 lbs.) (4 kg)	1 step (3 phase)	208	39.1	11.3	38,600	FB24-15 (208v/230) **(58J37)**	SPP24-65-15 (208/230v) **(58J08)**	46.2
			220	41.4	12.6	43,000			48.5
			230	43.2	13.8	47,100			50.3
			240	45.1	15.0	51,200			52.2
			440	20.6	12.6	43,000	●FB24-15/20 (460v) **(58J43)**	SPP24-65/81-15 (460v) **(58J14)**	24.1
			460	21.6	13.8	47,100			25.1
			480	22.5	15.0	51,200			26.0
			550	16.5	12.6	43,000	FB24-15 (575v) **(58J48)**	SPP24-65/81-15 (575v) **(58J20)**	19.5
			575	17.3	13.7	46,800			20.3
			600	18.0	15.0	51,200			21.0
	ECH24-20 208/230v **(45J34)** 460v **(45J40)** 575v **(45J46)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	52.1	15.0	51,200	FB24-20 (208v/230) **(58J38)**	SPP24-65-20 (208/230v) **(58J09)**	59.2
			220	55.1	16.8	57,300			62.2
			230	57.6	18.4	62,800			64.7
			240	60.1	20.0	68,300			67.2
		1 step (3 phase)	440	27.6	16.8	57,300	●FB24-20/25 (460v) **(58J44)**	SPP24-65/81-20 (460v) **(58J15)**	31.1
			460	28.9	18.4	62,800			32.4
			480	30.1	20.0	68,300			33.6
			550	22.0	16.8	57,300	●FB24-15/20 (575v) **(58J43)**	SPP24-65/81-20 (575v) **(58J21)**	25.0
			575	23.0	18.3	62,400			26.0
			600	24.0	20.0	68,300			27.0
	ECH24-25 208/230v **(45J35)** 460v **(45J41)** 575v **(45J47)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	65.1	18.8	64,200	FB24-25 (208v/230) **(58J39)**	SPP24-65-25 (208/230v) **(58J10)**	72.2
			220	68.9	21.0	71,700			76.0
			230	72.0	22.9	78,100			79.1
			240	75.1	25.0	85,300			82.2
		1 step (3 phase)	440	34.5	21.0	71,700	●FB24-25/30 (460v) **(58J45)**	SPP24-65/81-25 (460v) **(58J16)**	38.0
			460	36.0	22.9	78,100			39.5
			480	37.6	25.0	85,300			41.1
			550	27.6	21.1	72,000	●FB24-20/25 (575v) **(58J44)**	SPP24-65/81-25 (575v) **(58J22)**	30.6
			575	28.9	23.0	78,500			31.9
			600	30.1	25.0	85,300			33.1
	ECH24-30 208/230v **(45J36)** 460v **(45J42)** 575v **(45J48)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	78.1	22.5	76,800	FB24-30 (208v/230) **(58J40)**	SPP24-65-30 (208/230v) **(58J11)**	85.2
			220	82.6	25.2	86,000			89.7
			230	86.3	27.5	93,900			93.4
			240	90.1	30.0	102,400			97.2
		1 step (3 phase)	440	41.3	25.2	86,000	FB24-30 (460v) **(58J46)**	SPP24-65/81-30 (460v) **(58J17)**	44.8
			460	43.2	27.5	93,900			46.7
			480	45.1	30.0	102,400			48.6
			550	33.1	25.2	86,000	●FB24-25/30 (575v) **(58J45)**	SPP24-65/81-30 (575v) **(58J23)**	36.1
			575	34.6	27.5	93,900			37.6
			600	36.1	30.0	102,400			39.1

*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).
†NOTE — FB24 heater sub-fuse box is required for fusing electric heat. Not required if SPP24 Unit/Electric Heat Single Point Power Source Box is used. SPP24 contains fusing for both electric heat and packaged unit.
●NOTE — FB24-15/20 **(58J43)**, FB24-20/25 **(58J44)** and FB24-25/30 **(58J45)** Sub-Fuse Boxes are designated for use with either 460v or 575v electric heaters.

ELECTRIC HEAT DATA — CHA24-813

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 Sub-Fuse Boxes		Total Unit & Electric Heat *Minimum Circuit Ampacity
							†Heater Only Sub-Fuse Box	†Unit/Electric Heat Sub-Fuse Box	
CHA24-813	ECH24-7 208/230v **(45J31)** 460v **(45J37)** 575v **(45J43)** (9 lbs.) (4 kg)	1 step (3 phase)	208	18.3	5.3	18,100	FB24-7 (208/230v) **(58J35)**	SPP24-81-7 (208/230v) **(58J24)**	35.0
			220	19.3	5.9	20,100			35.0
			230	20.1	6.4	21,800			35.0
			240	21.0	7.0	23,900			35.0
			440	9.6	5.8	19,800	FB24-7 (460v/575v) **(58J41)**	SPP24-65/81-7 (460v) **(58J12)**	15.0
			460	10.1	6.5	22,200			15.0
			480	10.5	7.0	23,900			15.0
			550	7.6	5.8	19,800		SPP24-65/81-7 (575v) **(58J18)**	12.0
			575	8.0	6.4	21,800			12.0
			600	8.4	7.0	23,900			12.0
	ECH24-10 208/230v **(45J32)** 460v **(45J38)** 575v **(45J44)** (9 lbs.) (4 kg)	1 step (3 phase)	208	26.1	7.5	25,600	FB24-10 (208/230v) **(58J36)**	SPP24-81-10 (208/230v) **(58J25)**	35.0
			220	27.6	8.4	28,700			35.0
			230	28.9	9.2	31,400			36.0
			240	30.1	10.0	34,100			37.2
			440	13.8	8.4	28,700	FB24-10 (460v) **(58J42)**	SPP24-65/81-10 (460v) **(58J13)**	17.3
			460	14.4	9.2	31,400			17.9
			480	15.0	10.0	34,100			18.5
			550	11.0	8.4	28,700	FB24-10 (575v) **(58J47)**	SPP24-65/81-10 (575v) **(58J19)**	14.0
			575	11.5	9.2	31,400			14.5
			600	12.0	10.0	34,100			15.0
	ECH24-15 208/230v **(45J33)** 460v **(45J39)** 575v **(45J45)** (9 lbs.) (4 kg)	1 step (3 phase)	208	39.1	11.3	38,600	FB24-15 (208v/230) **(58J37)**	SPP24-81-15 (208/230v) **(58J26)**	46.2
			220	41.4	12.6	43,000			48.5
			230	43.2	13.8	47,100			50.3
			240	45.1	15.0	51,200			52.2
			440	20.6	12.6	43,000	●FB24-15/20 (460v) **(58J43)**	SPP24-65/81-15 (460v) **(58J14)**	24.1
			460	21.6	13.8	47,100			25.1
			480	22.5	15.0	51,200			26.0
			550	16.5	12.6	43,000	FB24-15 (575v) **(58J48)**	SPP24-65/81-15 (575v) **(58J20)**	19.5
			575	17.3	13.7	46,800			20.3
			600	18.0	15.0	51,200			21.0
	ECH24-20 208/230v **(45J34)** 460v **(45J40)** 575v **(45J46)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	52.1	15.0	51,200	FB24-20 (208v/230) **(58J38)**	SPP24-81-20 (208/230v) **(58J27)**	59.2
			220	55.1	16.8	57,300			62.2
			230	57.6	18.4	62,800			64.7
			240	60.1	20.0	68,300			67.2
		1 step (3 phase)	440	27.6	16.8	57,300	●FB24-20/25 (460v) **(58J44)**	SPP24-65/81-20 (460v) **(58J15)**	31.1
			460	28.9	18.4	62,800			32.4
			480	30.1	20.0	68,300			33.6
			550	22.0	16.8	57,300	●FB24-15/20 (575v) **(58J43)**	SPP24-65/81-20 (575v) **(58J21)**	25.0
			575	23.0	18.3	62,400			26.0
			600	24.0	20.0	68,300			27.0
	ECH24-25 208/230v **(45J35)** 460v **(45J41)** 575v **(45J47)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	65.1	18.8	64,200	FB24-25 (208v/230) **(58J39)**	SPP24-81-25 (208/230v) **(58J28)**	72.2
			220	68.9	21.0	71,700			76.0
			230	72.0	22.9	78,100			79.1
			240	75.1	25.0	85,300			82.2
		1 step (3 phase)	440	34.5	21.0	71,700	●FB24-25/30 (460v) **(58J45)**	SPP24-65/81-25 (460v) **(58J16)**	38.0
			460	36.0	22.9	78,100			39.5
			480	37.6	25.0	85,300			41.1
			550	27.6	21.1	72,000	●FB24-20/25 (575v) **(58J44)**	SPP24-65/81-25 (575v) **(58J22)**	30.6
			575	28.9	23.0	78,500			31.9
			600	30.1	25.0	85,300			33.1
	ECH24-30 208/230v **(45J36)** 460v **(45J42)** 575v **(45J48)** (12 lbs.) (6 kg)	2 steps (3 phase)	208	78.1	22.5	76,800	FB24-30 (208v/230) **(58J40)**	SPP24-81-30 (208/230v) **(58J29)**	85.2
			220	82.6	25.2	86,000			89.7
			230	86.3	27.5	93,900			93.4
			240	90.1	30.0	102,400			97.2
		1 step (3 phase)	440	41.3	25.2	86,000	FB24-30 (460v) **(58J46)**	SPP24-65/81-30 (460v) **(58J17)**	44.8
			460	43.2	27.5	93,900			46.7
			480	45.1	30.0	102,400			48.6
			550	33.1	25.2	86,000	●FB24-25/30 (575v) **(58J45)**	SPP24-65/81-30 (575v) **(58J23)**	36.1
			575	34.6	27.5	93,900			37.6
			600	36.1	30.0	102,400			39.1

*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).
†NOTE — FB24 heater sub-fuse box is required for fusing electric heat. Not required if SPP24 Unit/Electric Heat Single Point Power Source Box is used. SPP24 contains fusing for both electric heat and packaged unit.
●NOTE — FB24-15/20 **(58J43)**, FB24-20/25 **(58J44)** and FB24-25/30 **(58J45)** Sub-Fuse Boxes are designated for use with either 460v or 575v electric heaters.

RATINGS

CHA24(D)-651-653 COOLING CAPACITY

Entering Wet Bulb Temperature	Total Air Volume		Outdoor Air Temperature Entering Condenser Coil																					
			85°F (29°C)						95°F (35°C)						105°F (41°C)						115°F (46°C)					
			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb		
	L/s	cfm	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C
63°F (17.2°C)	825	1750	17.3	59,200	4840	.72	.86	.98	16.6	56,500	5190	.73	.88	1.00	15.8	53,800	5610	.74	.90	1.00	14.9	50,800	6140	.76	.93	1.00
	945	2000	17.9	61,000	4900	.74	.90	1.00	17.1	58,300	5260	.76	.92	1.00	16.2	55,300	5690	.77	.94	1.00	15.3	52,200	6220	.79	.98	1.00
	1060	2250	18.3	62,500	4940	.77	.93	1.00	17.5	59,800	5300	.79	.95	1.00	16.5	56,300	5730	.81	.98	1.00	15.6	53,300	6280	.83	1.00	1.00
67°F (19.4°C)	825	1750	18.2	62,100	4920	.56	.71	.84	17.4	59,400	5290	.57	.72	.85	16.6	56,500	5740	.58	.74	.87	15.7	53,500	6300	.59	.75	.89
	945	2000	18.8	64,100	4980	.58	.73	.88	17.9	61,200	5360	.59	.75	.89	17.1	58,200	5820	.60	.76	.91	16.1	55,000	6390	.61	.78	.94
	1060	2250	19.3	65,700	5030	.60	.76	.91	18.4	62,700	5420	.61	.77	.93	17.5	59,600	5890	.62	.79	.95	16.5	56,200	6460	.63	.81	.98
71°F (21.7°C)	825	1750	19.0	64,900	5000	.42	.56	.70	18.2	62,000	5390	.42	.57	.72	17.3	59,100	5870	.43	.58	.73	16.4	55,900	6440	.43	.59	.74
	945	2000	19.6	66,900	5060	.43	.58	.73	18.7	63,900	5460	.43	.59	.74	17.8	60,800	5950	.44	.60	.76	16.9	57,500	6540	.44	.61	.78
	1060	2250	20.1	68,600	5110	.44	.60	.76	19.2	65,500	5520	.44	.61	.77	18.2	62,200	6010	.44	.62	.79	17.2	58,800	6620	.45	.63	.81

NOTE — All values are gross capacities and do not include evaporator coil blower motor heat deduction.

CHA24-813 COOLING CAPACITY

Entering Wet Bulb Temperature	Total Air Volume		Outdoor Air Temperature Entering Condenser Coil																					
			85°F (29°C)						95°F (35°C)						105°F (41°C)						115°F (46°C)					
			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb			Total Cooling Capacity		Compressor Motor Watts Input	Sensible To Total Ratio (S/T) Dry Bulb		
	L/s	cfm	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C	kW	Btuh		75°F 24°C	80°F 27°C	85°F 29°C
63°F (17.2°C)	945	2000	21.2	72,300	5740	.71	.86	.98	20.2	68,900	6260	.72	.87	1.00	19.2	65,600	6800	.74	.90	1.00	18.3	62,300	7360	.75	.92	1.00
	1130	2400	22.1	75,400	5820	.75	.90	1.00	21.0	71,800	6350	.77	.93	1.00	19.9	67,800	6890	.78	.95	1.00	18.9	64,500	7460	.80	.98	1.00
	1320	2800	22.7	77,400	5870	.79	.95	1.00	21.7	73,900	6400	.81	.97	1.00	20.5	69,900	6960	.83	1.00	1.00	19.5	66,600	7540	.84	1.00	1.00
67°F (19.4°C)	945	2000	22.4	76,500	5850	.56	.70	.83	21.4	73,000	6380	.57	.71	.85	20.4	69,600	6950	.58	.73	.86	19.4	66,100	7530	.58	.74	.88
	1130	2400	23.4	79,700	5910	.58	.73	.88	22.3	76,100	6460	.59	.75	.90	21.2	72,300	7040	.60	.77	.92	20.1	68,700	7640	.61	.79	.94
	1320	2800	24.1	82,100	5960	.61	.77	.93	22.9	78,200	6530	.62	.79	.95	21.8	74,300	7120	.63	.81	.98	20.7	70,600	7720	.64	.83	1.00
71°F (21.7°C)	945	2000	23.6	80,500	5930	.42	.56	.70	22.5	76,900	6490	.42	.57	.71	21.5	73,300	7080	.43	.58	.72	20.5	69,800	7690	.43	.59	.73
	1130	2400	24.6	83,800	6000	.43	.58	.73	23.5	80,100	6570	.43	.59	.75	22.3	76,200	7170	.44	.60	.76	21.2	72,500	7790	.44	.61	.78
	1320	2800	25.3	86,200	6050	.44	.60	.77	24.1	82,200	6630	.44	.62	.79	22.9	78,300	7240	.45	.63	.80	21.8	74,400	7870	.45	.64	.82

NOTE — All values are gross capacities and do not include evaporator coil blower motor heat deduction.

BLOWER DATA

CHA24D-651-653 BLOWER PERFORMANCE @ 208 VOLTS (With Down-Flow Supply and Return 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	2530	1195	2265	1070	1970	930	1720	810	1440	680
.10	25	2495	1175	2235	1055	1945	920	1700	800	1430	675
.20	50	2450	1155	2200	1040	1915	905	1670	790	1415	670
.30	75	2405	1135	2160	1020	1880	890	1640	775	- - - -	- - - -
.40	100	2355	1110	2115	1000	1840	870	1605	755	- - - -	- - - -
.50	125	2300	1085	2065	975	1795	845	1565	740	- - - -	- - - -
.60	150	2235	1055	2010	950	1745	825	1515	715	- - - -	- - - -
.70	175	2165	1020	1945	920	1690	800	1460	690	- - - -	- - - -
.80	200	2090	985	1875	885	1620	765	1400	660	- - - -	- - - -
.90	225	2000	945	1790	845	1550	730	- - - -	- - - -	- - - -	- - - -
1.00	250	1895	895	1695	800	1460	690	- - - -	- - - -	- - - -	- - - -
1.10	275	1770	835	1580	745	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
1.20	300	1620	765	1440	680	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

NOTE — All air data is measured external to unit with dry coil and 2 inch (51 mm) filters. See page 9 for Accessory Air Resistance Table.

BLOWER DATA

CHA24D-651-653 BLOWER PERFORMANCE @ 230 VOLTS (With Down-Flow Supply and Return 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	2750	1300	2500	1180	2245	1060	1955	925	1630	770
.10	25	2705	1275	2470	1165	2215	1045	1925	910	1600	755
.20	50	2650	1250	2430	1145	2180	1030	1890	890	1570	740
.30	75	2585	1220	2390	1130	2140	1010	1850	875	1535	725
.40	100	2535	1195	2340	1105	2100	990	1810	855	1500	710
.50	125	2475	1170	2290	1080	2050	965	1760	830	1455	685
.60	150	2405	1135	2225	1050	1995	940	1705	805	1405	665
.70	175	2330	1100	2155	1015	1930	910	1640	775	- - - -	- - - -
.80	200	2245	1060	2075	980	1865	880	1575	745	- - - -	- - - -
.90	225	2155	1015	1975	930	1780	840	1495	705	- - - -	- - - -
1.00	250	2050	965	1860	880	1690	800	1405	665	- - - -	- - - -
1.10	275	1935	915	1720	810	1585	750	- - - -	- - - -	- - - -	- - - -
1.20	300	1805	850	1560	735	1450	685	- - - -	- - - -	- - - -	- - - -

NOTE — All air data is measured external to unit with dry coil and 2 inch (51 mm) filters. See below for Accessory Air Resistance Table.

CHA24D-651-653 BLOWER PERFORMANCE @ 460/575 VOLTS (With Down-Flow Supply and Return 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	2820	1330	2460	1160	1975	930
.10	25	2770	1305	2430	1145	1950	920
.20	50	2720	1285	2395	1130	1920	905
.30	75	2670	1260	2345	1105	1885	890
.40	100	2610	1230	2310	1090	1845	870
.50	125	2545	1200	2260	1065	1800	850
.60	150	2475	1170	2200	1040	1755	830
.70	175	2400	1130	2140	1010	1700	800
.80	200	2315	1090	2065	975	1635	770
.90	225	2220	1045	1980	935	1565	740
1.00	250	2115	1000	1880	885	1480	700
1.10	275	2000	945	1760	830	- - - -	- - - -
1.20	300	1860	875	1615	760	- - - -	- - - -

NOTE — All air data is measured external to unit with dry coil and 2 inch (51 mm) filters. See below for Accessory Air Resistance Table.

ACCESSORY AIR RESISTANCE

Air Volume		Total Resistance — inches water gauge (Pa)					
		Wet Evaporator Coil	REMD24M Down-flow Economizer	RTD11 Step-Down Diffuser			FD11 Flush Diffuser
cfm	L/s			2 Ends Open	1 Side 2 Ends Open	All Ends & Sides Open	
1800	850	.06 (15)	.11 (27)	.13 (32)	.11 (27)	.09 (22)	.09 (22)
2000	945	.07 (17)	.12 (30)	.15 (37)	.13 (32)	.11 (27)	.10 (25)
2200	1040	.09 (22)	.14 (35)	.18 (45)	.15 (37)	.12 (30)	.12 (30)
2400	1135	.11 (27)	.16 (40)	.21 (52)	.18 (45)	.15 (37)	.14 (35)
2600	1225	.13 (32)	.18 (45)	.24 (60)	.21 (52)	.18 (45)	.17 (42)
2800	1320	.16 (40)	.20 (50)	.27 (67)	.24 (60)	.21 (52)	.20 (50)
3000	1415	.20 (50)	.23 (57)	.32 (80)	.29 (72)	.25 (62)	.25 (62)

NOTE — Electric heaters have no appreciable air resistance.

CEILING DIFFUSER AIR THROW DATA

Unit Model No.	Air Volume		*Effective Throw Range			
			RTD11 Step-Down		FD11 Flush	
	cfm	L/s	ft.	m	ft.	m
CHA24(D)-650 CHA24-813	3000	1415	27 — 33	8 — 10	25 — 30	8 — 9
	3375	1595	30 — 37	9 — 11	28 — 34	9 — 10
	3750	1770	34 — 41	10 — 12	31 — 38	9 — 12

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

BLOWER DATA CHA24-653, CHA24-813

Air Volume cfm (L/s)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge (Pa)																	
	.10 (25)		.20 (50)		.30 (75)		.40 (100)		.50 (125)		.60 (150)		.70 (175)		.80 (200)		.90 (225)		1.00 (250)		1.10 (275)		1.20 (300)	
	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)
1600 (755)	540	0.20 (0.15)	585	0.25 (0.19)	635	0.30 (0.22)	685	0.35 (0.26)	735	0.40 (0.30)	780	0.45 (0.34)	825	0.55 (0.41)	850	0.60 (0.45)	910	0.65 (0.48)	955	0.75 (0.56)	990	0.80 (0.60)	1030	0.90 (0.67)
1700 (800)	560	0.25 (0.19)	605	0.30 (0.22)	655	0.35 (0.26)	700	0.40 (0.30)	750	0.45 (0.34)	795	0.50 (0.37)	840	0.60 (0.45)	880	0.65 (0.48)	920	0.70 (0.52)	960	0.80 (0.60)	1000	0.85 (0.63)	1040	0.95 (0.71)
1800 (850)	580	0.30 (0.22)	625	0.35 (0.26)	675	0.40 (0.30)	720	0.45 (0.34)	765	0.50 (0.37)	810	0.55 (0.41)	855	0.65 (0.48)	895	0.70 (0.52)	935	0.80 (0.60)	975	0.85 (0.63)	1010	0.95 (0.71)	1050	1.00 (0.75)
1900 (895)	605	0.35 (0.26)	650	0.40 (0.30)	695	0.45 (0.34)	740	0.50 (0.37)	785	0.55 (0.41)	825	0.60 (0.45)	870	0.70 (0.52)	910	0.75 (0.56)	945	0.85 (0.63)	985	0.90 (0.67)	1020	1.00 (0.75)	1060	1.10 (0.82)
2000 (945)	625	0.40 (0.30)	670	0.45 (0.34)	715	0.50 (0.37)	760	0.55 (0.41)	805	0.60 (0.45)	845	0.70 (0.52)	885	0.75 (0.56)	925	0.85 (0.63)	960	0.90 (0.67)	1000	1.00 (0.75)	1035	1.05 (0.78)	1070	1.15 (0.88)
2100 (990)	650	0.45 (0.34)	695	0.50 (0.37)	740	0.55 (0.41)	780	0.60 (0.45)	820	0.65 (0.48)	860	0.75 (0.56)	900	0.80 (0.60)	940	0.90 (0.67)	975	0.95 (0.71)	1010	1.05 (0.78)	1045	1.10 (0.82)	1080	1.20 (0.90)
2200 (1040)	675	0.50 (0.37)	720	0.55 (0.41)	760	0.60 (0.45)	805	0.70 (0.52)	845	0.75 (0.56)	880	0.80 (0.60)	920	0.90 (0.67)	955	0.95 (0.71)	990	1.05 (0.78)	1025	1.10 (0.82)	1060	1.20 (0.90)	1095	1.30 (0.97)
2300 (1085)	700	0.55 (0.41)	745	0.60 (0.45)	785	0.70 (0.52)	825	0.75 (0.56)	865	0.80 (0.60)	900	0.90 (0.67)	935	0.95 (0.71)	975	1.05 (0.78)	1010	1.10 (0.82)	1040	1.20 (0.90)	1075	1.30 (0.97)	1110	1.40 (1.04)
2400 (1130)	730	0.60 (0.45)	770	0.70 (0.52)	810	0.75 (0.56)	845	0.80 (0.60)	885	0.90 (0.67)	920	0.95 (0.71)	955	1.05 (0.78)	990	1.10 (0.82)	1025	1.20 (0.90)	1060	1.30 (0.97)	1090	1.35 (1.01)	1125	1.45 (1.08)
2500 (1180)	755	0.70 (0.52)	795	0.75 (0.56)	835	0.85 (0.63)	870	0.90 (0.67)	905	1.00 (0.75)	940	1.05 (0.78)	975	1.15 (0.88)	1010	1.20 (0.90)	1045	1.30 (0.97)	1075	1.40 (1.04)	1110	1.50 (1.12)	1140	1.55 (1.16)
2600 (1225)	780	0.75 (0.56)	820	0.85 (0.63)	855	0.90 (0.67)	895	1.00 (0.75)	930	1.05 (0.78)	965	1.15 (0.88)	995	1.20 (0.90)	1030	1.30 (0.97)	1060	1.40 (1.04)	1095	1.50 (1.12)	1125	1.55 (1.16)	1155	1.65 (1.23)
2700 (1275)	810	0.85 (0.63)	845	0.95 (0.71)	880	1.00 (0.75)	915	1.10 (0.82)	950	1.15 (0.88)	985	1.25 (0.93)	1015	1.30 (0.97)	1050	1.40 (1.04)	1080	1.50 (1.12)	1110	1.60 (1.19)	1140	1.65 (1.23)	1170	1.75 (1.31)
2800 (1320)	835	0.95 (0.71)	870	1.05 (0.78)	905	1.10 (0.82)	940	1.20 (0.90)	975	1.25 (0.93)	1005	1.35 (1.01)	1040	1.45 (1.08)	1070	1.50 (1.12)	1100	1.60 (1.19)	1130	1.70 (1.27)	1160	1.80 (1.34)	1190	1.90 (1.42)
2900 (1370)	865	1.05 (0.78)	900	1.15 (0.88)	930	1.20 (0.90)	965	1.30 (0.97)	995	1.35 (1.01)	1030	1.45 (1.08)	1060	1.55 (1.16)	1090	1.65 (1.23)	1120	1.75 (1.31)	1150	1.80 (1.34)	1180	1.90 (1.42)	1210	2.00 (1.49)
3000 (1415)	890	1.15 (0.88)	925	1.25 (0.93)	960	1.35 (1.01)	990	1.40 (1.04)	1020	1.50 (1.12)	1050	1.60 (1.19)	1080	1.65 (1.23)	1110	1.75 (1.31)	1140	1.85 (1.38)	1170	1.95 (1.45)	1200	2.05 (1.53)	1230	2.15 (1.60)

NOTE — All data is measured external to the unit with dry coil and 2 inch (51 mm) air filters in place. See page 9 for Accessory Air Resistance data

NOTE — Shaded area denote field furnished drive.

CHA24 PARTS ARRANGEMENT

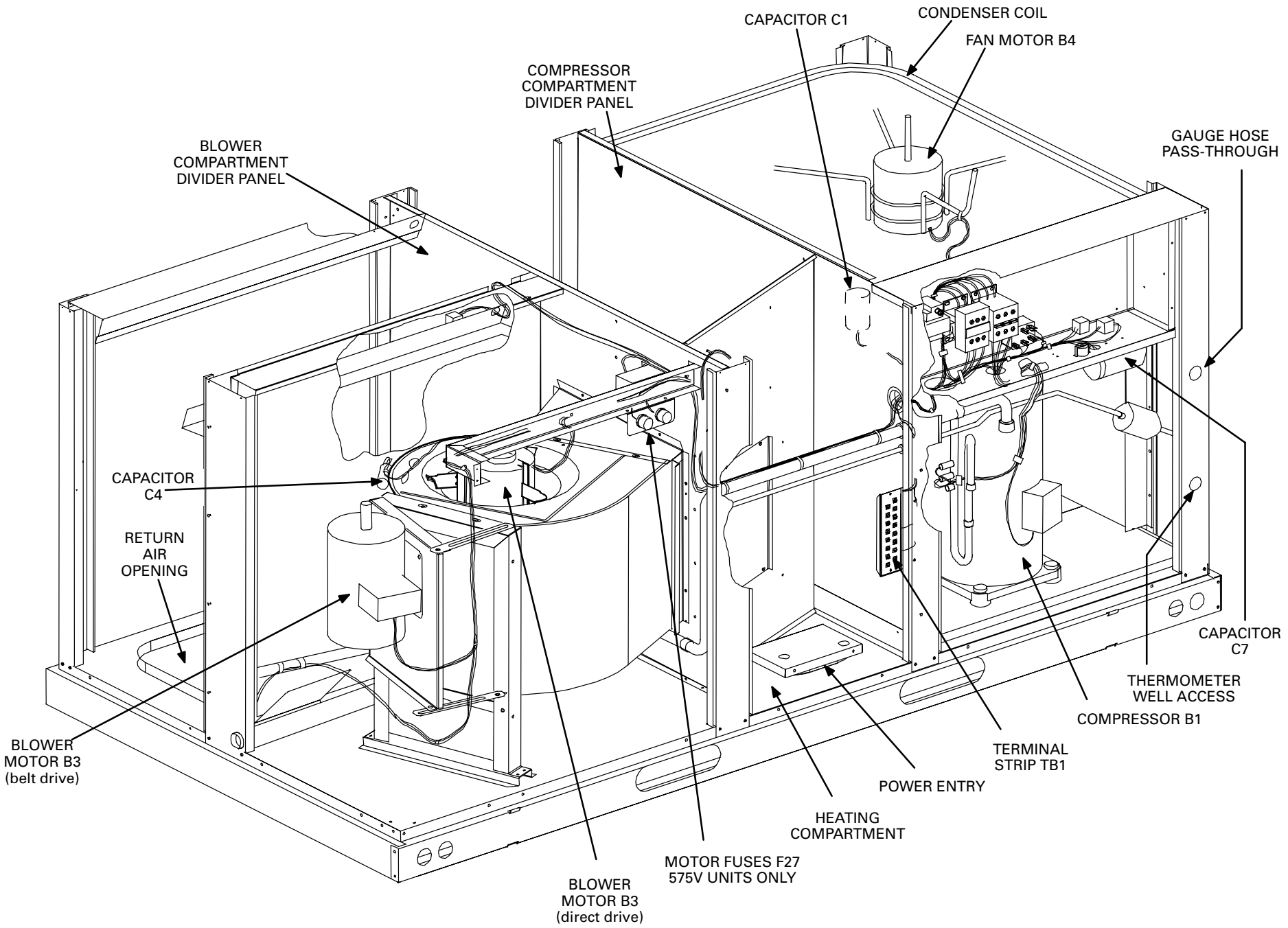


FIGURE 1

I– APPLICATION

Refer to the Engineering Handbook for specific application data. CHA24 models are available in direct-drive or belt-drive blower motors. The direct-drive blower motors are designated by a D such as CHA24D. All other models use a belt-drive motor. CHA24 belt drive models are available in three-phase power only, while CHA24D models are available in single or three-phase. CHA24 series models are dedicated commercial units and are convertible from downflow to horizontal installation. All models are factory equipped with the hardware required for installing Lennox' optional thermostat control systems. Lennox' optional thermostat control systems are the same controls, harnesses, and harness plugs used in GCS16 commercial units. For example, a Honeywell W973 control will plug in to a CHA24D–651 as easily as it will plug in to a GCS16–1353 (and no field wiring is required for either).

II– GENERAL INFORMATION

CHA24 unit components are shown in figure 1.

Replacement Parts

Electrical and mechanical control components are available from Lennox repair parts. Specifications of temperature and pressure switches tend to change frequently, but the setpoints and part number will be printed or embossed on the side of the part. Likewise, new part numbers are sometimes substituted for older part numbers. When parts are replaced, be sure to match the part number and specifications of the new part to the numbers which are printed or embossed on the replaced part. When ordering, you will be notified if the part number has been substituted or if the part specification has changed.

III– Control Box Components

CHA24 control box is shown in figure 3. The control box is located in the upper portion of the compressor compartment behind the compressor compartment access panel.

A–Transformer T1

All CHA24 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. 208/240 (P) voltage transformers use two primary voltage taps as shown in figure 2.

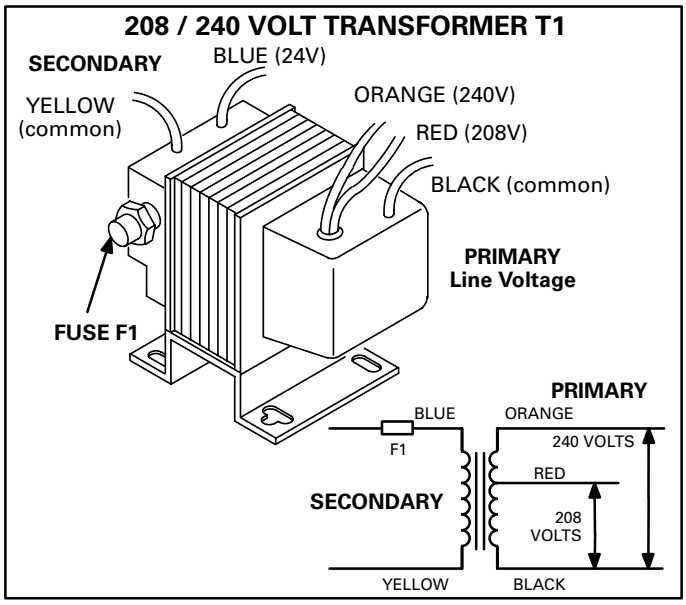


FIGURE 2

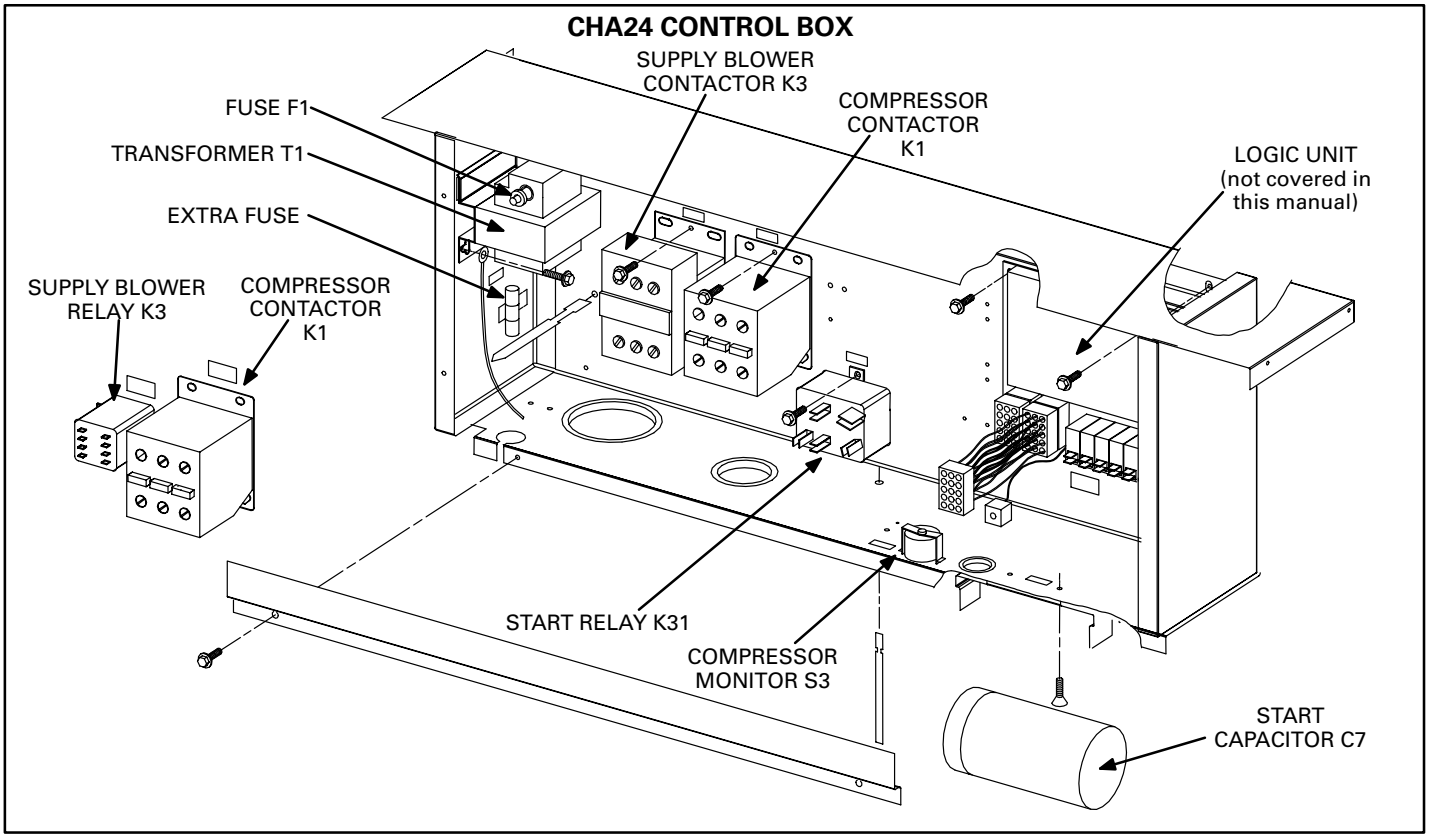


FIGURE 3

B–Transformer Fuse F1

Control transformers in all units are equipped with internal secondary voltage overcurrent protection. Figure 2 shows the transformer used in 208/240V units. The fuse may be accessed outside the transformer and is rated at 3.5A for all 70 VA transformers. A spare fuse is taped to the control box.

C–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.

NOTE–Contactor K1 is energized by the thermostat control system. Depending on the control system installed, the contactors may or may not be immediately energized upon demand. Refer to the operation sequence for the control system installed.

D–Indoor Blower Relay K3 (cooling speed, D models)

K3 is a 24V to line voltage contactor used to energize the indoor blower motor and the economizer in all CHA24 series models. Direct drive units use a 2PDT relay while the belt drive units use a 3PDT relay. The relay coil is energized by blower demand from indoor thermostat terminal "G" (cooling demand or fan switch in "ON" position). When the coil is energized, a set of N.O. contacts closes to energize the blower motor while another set of N.O. contacts closes to energize the economizer.

E–Potential Relay K31 (single-phase)

Single-phase units use a potential relay which controls the operation of the starting circuit. The potential relay is located inside the unit control box (see figure 3). The relay is normally closed when the compressor (contactor K1) is de-energized. Capacitor (C7) is connected to a set of N.C. K31 contacts and is used to assist 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.

F–Compressor Monitor S3

All CHA24 units are equipped with a single compressor monitor located in the control box. The compressor monitor is a SPST bimetal thermostat which opens on a temperature drop. It is connected inline with the 24VAC compressor control circuit. When outdoor temperature drops below 40°F the compressor monitor opens to electrically disconnect the compressor. When the compressor is disconnected, cooling demand is handled by optional REMD24M (if installed). The monitor automatically resets when outdoor temperature rises above 50°F.

G–Start Capacitor C7 (single-phase)

Single-phase units use a start capacitor (C7) wired in parallel with the compressor side of the dual capacitor. The start capacitor is located under the unit control box. C7 is engaged during compressor start-up and is switched off by the potential relay as the compressor nears full speed. Capacitor ratings may be different for each motor, but the rating and repair part number will be printed on the side of the capacitor.

IV– HEATING COMPONENTS

A–Matchups and Ratings

The tables on pages 4 through 7 show all possible CHA24 to optional ECH24 matchups and electrical ratings.

B–Electric Heat Components

The electric heat section is connected to the unit using jack J2 and plug P2. ECH24 parts arrangement is shown in figures 4, 5, 6 and 7. All ECH24 units consist of electric heating elements exposed directly to the airstream. Multiple-stage elements are sequenced on and off by time delays in response to thermostat demand.

1–Relay K9

ECH24 heat sections use a pilot relay (K9) to electrically isolate the CHA24 and ECH24 24V circuits. The 20, 25, and 30 KW 208/230 3 phase heat sections use a DPDT relay, while the other heat sections use a SPDT relay. The K9 relay coil is connected to first stage heating demand from the CHA24. When K9 is energized in the 20, 25, and 30 KW 208/230 3 phase heat section, two sets of contacts switch. When K9-1 switches, the indoor blower is energized. When K9-2 closes, second-stage electric heat is enabled (but not energized until second-stage demand is received from the thermostat). In all other heat sections only one set of contacts switches (K9-1) allowing the indoor blower to energize.

2–Contactor K15

All ECH24 electric heat sections are equipped with K15, located in the electric heat control panel. Four different N.O. contactors are used for K15. All four contactors have slightly different ratings: two are three-pole double-break and two are single-pole single-throw. The contactor used depends upon the size and voltage of the heat section. K15 is equipped with a 24VAC coil which is energized on first-stage heat demand (W1). When K15 is energized, the heating elements (first-stage heating elements if equipped with multi-stage heater) are energized.

3–Contactor K16

Contactor K16 is used in all the 7 through 25 KW single-phase and ECH24-20, 25, 30-1-Y electric heat sections. K16 is located in the electric heat control panel. Four different N.O. contactors are used for K16. All four contactors have slightly different ratings: two are three-pole double-break and two are single-pole single-throw. The contactor used depends upon the size and voltage of the heat section. K16 is equipped with a 24VAC coil which is energized on first-stage heat demand (W1) in all single-phase electric heat sections. K16 is energized on second-stage heat demand (W2) when time delay DL2 closes in the 208/230 three-phase 20, 25, and 30 KW electric heat sections. When K16 is energized, the second-stage heating elements are energized.

4–Contactor K17

Contactor K17 is used in all the 7 through 25 KW single-phase electric heat sections, and is located in the electric heat control panel. Two different SPST N.O. contactors are used for K17. Each has a slightly different rating. The contactor used depends upon the size of the heat section. K17 is equipped with a 24VAC coil which is energized on first-stage heat demand (W1). When K17 is energized, the third-stage heating elements are energized.

5–Time Delay DL2

Time delay DL2 is factory installed in all multiple-stage electric heat units (20, 25, and 30 KW 208/230 3 phase). DL2 allows staging by providing a timed interval between the first and second-stage heating elements. The delay is a single-pole single-throw 24VAC relay with normally open contacts. When the relay coil is energized, the contacts delay 30 seconds (±20%) before closing. When the relay coil is de-energized, there is a 1 second (±20%) delay before the contacts open.

DL2 is enabled when K9-2 closes, but is energized only after receiving a second stage thermostat demand.

6–High Temperature Switch S15 (Primary)

S15 is the primary high temperature switch. It is located in the electric heat unit immediately downstream from the heating elements. S15 is a SPST normally closed thermostat wired between contactor (K15) and heating element #1 except in the 7, 10, and 15 KW 208/230 single-phase heat sections. In the 7 and 10 KW heat sections two switches are used, while three switches are used in the 15 KW. Each switch is wired between the contactor and the heating element in the ECH24-7, 10, 15-1-P heat sections. Three different thermostats are used with slightly different ratings. The thermostat used depends upon the size and voltage of the heat section. Temperature differential is factory set and is not adjustable.

Only one primary high temperature switch is used on the 20 and 25 KW single-phase and all three-phase heating elements. S15 is wired in series with the contactor coils.

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

7–High Temperature Switch S20 (Secondary)

All heating element assemblies, except ECH24-7, 10, 15-1-P, are electrically connected to a high temperature switch S20 (refer to wiring diagrams in back of this manual). In the single-phase heating elements, each element is connected in series with one high temperature switch. In the three-phase heating elements, each switch is connected in series with one leg of the three-phase element assembly. The third leg of each assembly is not equipped with a switch. Three-phase operating characteristics allow one of the two switches to protect the third leg.

Each S20 switch is physically located adjacent to the element it is protecting. S20 is a SPST N.C. thermostat. The switch opens on a temperature rise at 185°F ± 8°F. Once tripped, the switch must be replaced.

8–Thermal Fuse F5 (Secondary)

In the single-phase 7, 10, and 15 KW electric heat sections, a thermal cut-off fuse (F5) is used for secondary high temperature protection. Each heating element is connected in series with one thermal cut-off fuse.

Each thermal cut-off fuse is physically located adjacent to the element it is protecting. The fuses are ceramic non-resettable fusible links which must be replaced after being tripped. Each cut-off is preset to open at a given temperature which is 196°F ± 9°F for the 7 KW, 212°F ± 7°F for the 10 KW, and 249°F ± 7°F for the 15 KW.

9–Heating Elements HE1, HE2, HE3, HE4, HE5, HE6

ECH24 heating elements are composed of helix wound bare nichrome wire exposed directly to the airstream. Heating elements are energized directly by contactors in the ECH24 control box. Once energized, heat transfer to the air stream is instantaneous. Overtemperature protection is provided by primary and secondary high temperature switches. Overcurrent protection is provided by current limiting fuses.

10–Electric Heat Sub-Fuse Box FB24 (Required)

FB24 series fuse box assembly is required for multi-disconnect switch application and provides fuse protection for the ECH24 series heaters ONLY. The FB24 contains F3 fuses. F3 is a current-limiting fuse connected in series with each leg of electric heat (each stage of electric heat uses three fuses). Fuses used in FB24 are shown in table 1.

11–Unit/Electric Heat Single-Point Power Source Sub-Fuse Box SPP24 (Optional)

SPP24 series fuse box assembly is required for single disconnect switch application and provides fuse protection for both the ECH24 series heaters and the CHA24 unit. The SPP24 contains F3 and F4 fuses. F3 fuses protect the electric heat section while F4 fuses protect the unit. F3 is a current-limiting fuse connected in series with each leg of electric heat (each stage of electric heat uses three fuses). F4 is also a current-limiting fuse, but it is connected in series with unit line voltage L1, L2, and L3. Fuses used in SPP24 are shown in table 2.

TABLE 1

CHA24 ELECTRIC HEAT SECTION FB24 FUSE RATING		
KW, Voltage, Phase	**Fuse F3 1st Stage Electric Heat (3 Fuses)**	**Fuse F3 2nd Stage Electric Heat (3 Fuses)**
7kW 208/230v 1 phase	50 Amp 250v (2)	—
10kw 208/230v 1 phase	60 Amp 250v (2)	—
15kw 208/230v 1 phase	35 Amp 250v (2)	60 Amp 250v (2)
20kw 208/230v 1 phase	45 Amp 250v	45 Amp 250v
25kw 208/230v 1 phase	60 Amp 250v	60 Amp 250v
7kW 208/230v 3 phase	25 Amp 250v	—
10kw 208/230v 3 phase	40 Amp 250v	—
15kw 208/230v 3 phase	60 Amp 250v	—
20kw 208/230v 3 phase	40 Amp 250v	40 Amp 250v
25kw 208/230v 3 phase	40 Amp 250v	60 Amp 250v
30kw 208/230v 3 phase	60 Amp 250v	60 Amp 250v
7kW 460v 3 phase	10 Amp 6000v	—
10kw 460v 3 phase	20 Amp 600v	—
15kw 460v 3 phase	30 Amp 600v	—
20kw 460v 3 phase	40 Amp 600v	—
25kw 460v 3 phase	50 Amp 600v	60 Amp 250v
30kw 460v 3 phase	60 Amp 600v	—
7kW 575v 3 phase	10 Amp 600v	—
10kw 575v 3 phase	15 Amp 600v	—
15kw 575v 3 phase	25 Amp 600v	—
20kw 575v 3 phase	60 Amp 600v	—
25kw 575v 3 phase	40 Amp 600v	—
30kw 575v 3 phase	50 Amp 600v	—

TABLE 2

CHA24 ELECTRIC HEAT SECTION SPP24 FUSE RATING			
KW, Voltage, Phase, Tonnage	**Fuse F3 1st Stage Electric Heat (3 Fuses)**	**Fuse F3 2nd Stage Electric Heat (3 Fuses)**	**Fuse F4 Unit Fuse (3 Fuses)**
7kW, 208/230v, 1 phase, 5 ton	50 Amp 250v	—	60 Amp 250v (2)
10kw, 208/230v, 1 phase, 5 ton	60 Amp 250v	—	60 Amp 250v (2)
15kw, 208/230v, 1 phase, 5 ton	35 Amp 250v	60 Amp 250v (2)	60 Amp 250v (2)
20kw, 208/230v, 1 phase, 5 ton	45 Amp 250v	45 Amp 250v	60 Amp 250v (2)
25kw, 208/230v, 1 phase, 5 ton	60 Amp 250v	60 Amp 250v	60 Amp 250v (2)
7kW, 208/230v, 3 phase, 5 ton	25 Amp 250v	—	40 Amp 250v
10kw, 208/230v, 3 phase, 5 ton	40 Amp 600v	—	40 Amp 250v
15kw, 208/230v, 3 phase, 5 ton	60 Amp 250v	—	40 Amp 250v
20kw, 208/230v, 3 phase, 5 ton	40 Amp 250v	40 Amp 250v	40 Amp 250v
25kw, 208/230v, 3 phase, 5 ton	40 Amp 250v	60 Amp 250v	40 Amp 250v
30kw, 208/230v, 3 phase, 5 ton	60 Amp 250v	60 Amp 250v	40 Amp 250v
7kW, 208/230v, 3 phase, 6 ton	25 Amp 250v	—	50 Amp 250v
10kw, 208/230v, 3 phase, 6 ton	40 Amp 250v	—	50 Amp 250v
15kw, 208/230v, 3 phase, 6 ton	60 Amp 250v	—	50 Amp 250v
20kw, 208/230v, 3 phase, 6 ton	40 Amp 250v	40 Amp 250v	50 Amp 250v
25kw, 208/230v, 3 phase, 6 ton	40 Amp 250v	60 Amp 250v	50 Amp 250v
30kw, 208/230v, 3 phase, 6 ton	60 Amp 250v	60 Amp 250v	50 Amp 250v
7kW, 460v, 3 phase, 5 & 6 ton	10 Amp 600v	—	20 Amp 600v
10kw, 460v, 3 phase, 5 & 6 ton	20 Amp 600v	—	20 Amp 600v
15kw, 460v, 3 phase, 5 & 6 ton	30 Amp 600v	—	20 Amp 600v
20kw, 460v, 3 phase, 5 & 6 ton	40 Amp 600v	—	20 Amp 600v
25kw, 460v, 3 phase, 5 & 6 ton	50 Amp 600v	—	20 Amp 600v
30kw, 460v, 3 phase, 5 & 6 ton	60 Amp 600v	—	20 Amp 600v
7kW, 575v, 3 phase, 5 & 6 ton	10 Amp 600v	—	15 Amp 600v
10kw, 575v, 3 phase, 5 & 6 ton	15 Amp 600v	—	15 Amp 600v
15kw, 575v, 3 phase, 5 & 6 ton	25 Amp 600v	—	15 Amp 600v
20kw, 575v, 3 phase, 5 & 6 ton	30 Amp 600v	—	15 Amp 600v
25kw, 575v, 3 phase, 5 & 6 ton	40 Amp 600v	—	15 Amp 600v
30kw, 575v, 3 phase, 5 & 6 ton	50 Amp 600v	—	15 Amp 600v

PARTS ARRANGEMENT
ELECTRIC HEAT SECTION
CHA24 SERIES UNITS 5 and 6 TONS
ECH24–7/10/15–1P

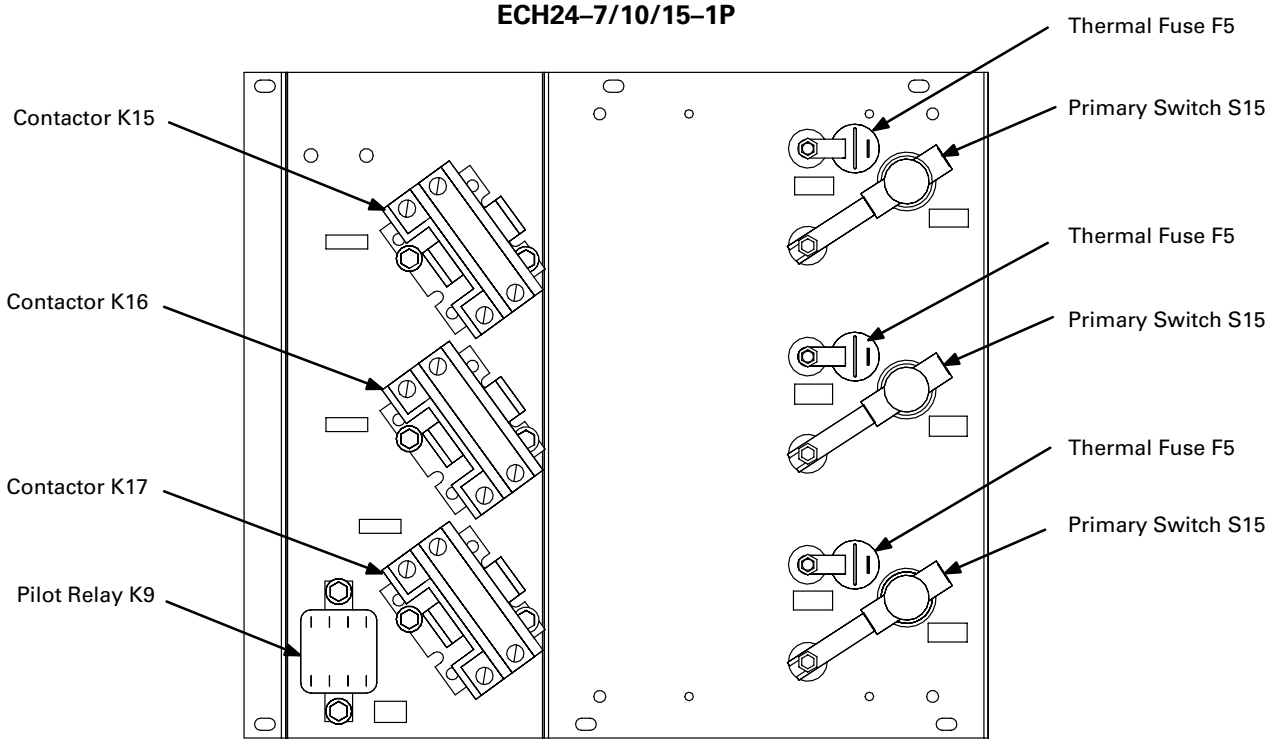


FIGURE 4

PARTS ARRANGEMENT FOR ELECTRIC HEAT SECTION
CHA24 SERIES UNITS 5 and 6 TONS
ECH24–20/25–1P

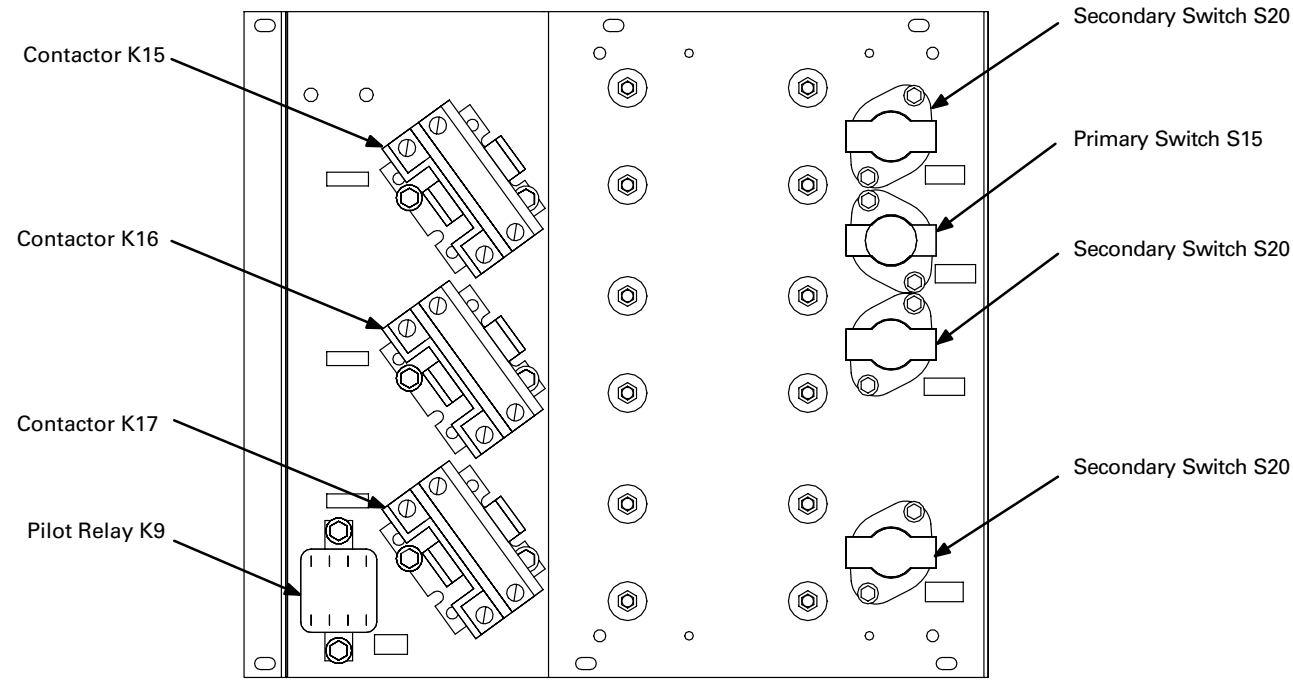


FIGURE 5

PARTS ARRANGEMENT FOR ELECTRIC HEAT SECTION
CHA24 SERIES UNITS 5 and 6 TONS
ECH24–20/25/30–1Y

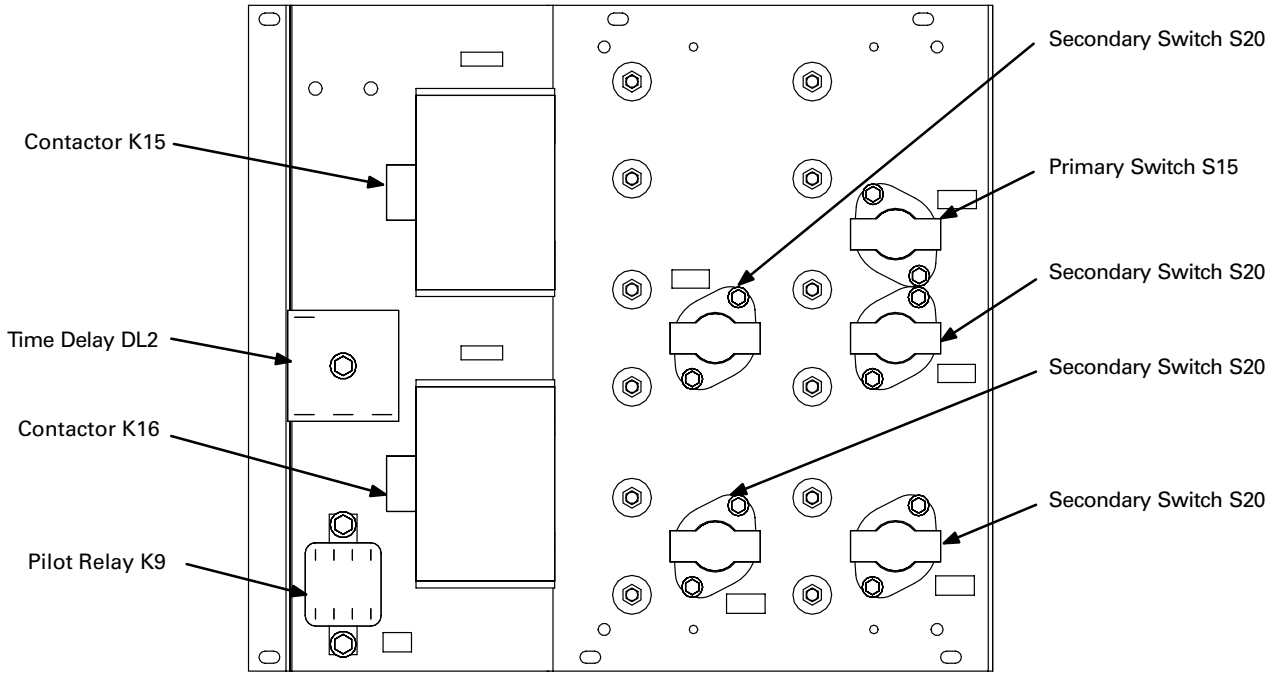


FIGURE 6

PARTS ARRANGEMENT FOR ELECTRIC HEAT SECTION
CHA24 SERIES UNITS 5 and 6 TONS
ECH24–20/25/30–1G /J
ECH24–7/10/15–1Y/G/J

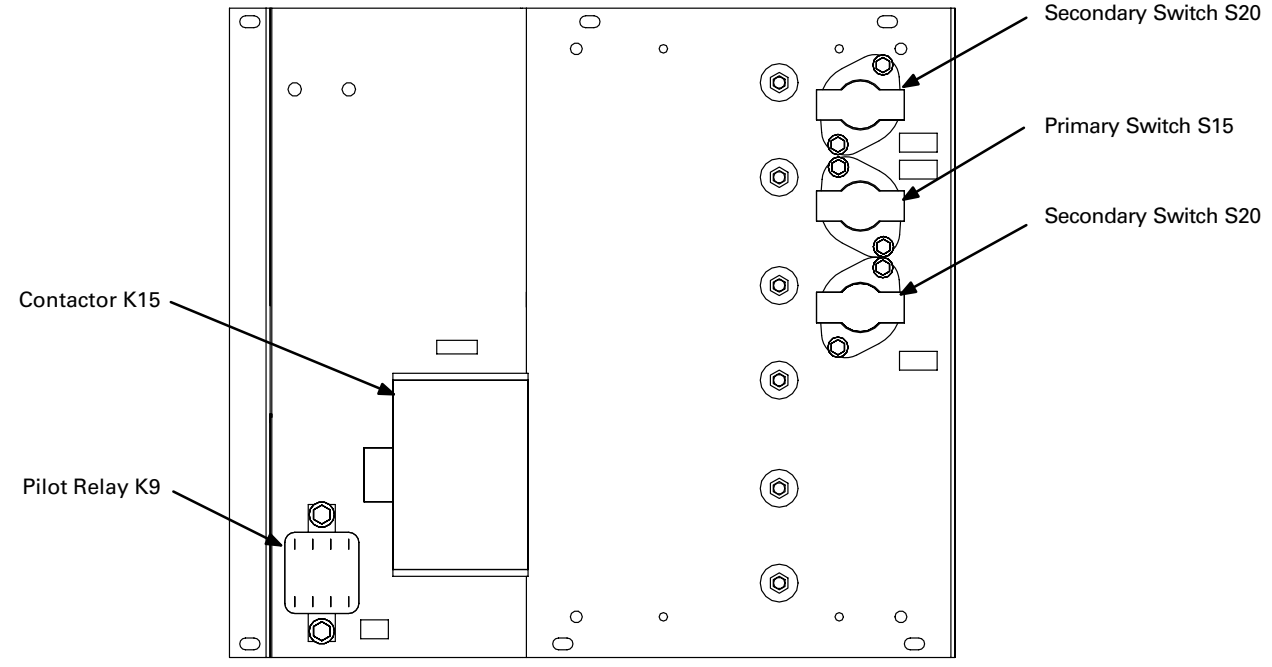


FIGURE 7

V– BLOWER COMPARTMENT

Overview

Units may be equipped with direct-drive or belt-drive blowers and can be distinguished by model number; direct drive models have a "D" suffix in the model number (CHA24D).

The blower housing in belt-drive models swings out for cleaning and inspection. In addition, the swing-out blower allows access to the heat exchanger tubes for inspection.

Line and low voltage make-up in all models is located in the lower corner of the blower compartment. Electrical entrance is made through the base pan of the unit. Both can be accessed by removing the blower compartment end panel.

Access

In all models, the blower can be accessed by removing a unit front panel or end panel. In belt-drive models, the blower motor can most easily be accessed by removing the blower compartment end panel.

In all models, the evaporator coil, expansion valve and drain pan can be accessed by removing the blower compartment end panel.

A–Terminal Strip TB1

All CHA24 units are equipped with a low voltage terminal strip (TB1) located above the line voltage make-up box inside the blower compartment. The strip is equipped with screw terminals which are used for making all indoor thermostat and unit low voltage control wiring connections (see figure 1).

B– Blower Motor B3

All direct-drive CHA24 units use single-phase PSC motors. Belt-drive units use three-phase motors (same as supply voltage). See section IX (B) for blower speed adjustment.

Single-phase 208/230V motors

Direct-drive motors are equipped with five speed taps for adjusting blower speed. All motors are ball bearing type and use a single capacitor (C4) located on the blower housing.

Single-phase 460V motors

All CHA24D 460V and 575V units use a 460V single-phase PSC blower motor. The motor is equipped with three speed taps for adjusting blower speed. All motors are ball bearing type and use a capacitor (C4) located on the blower housing.

The blower motor in 575V units uses an auto-transformer (T4) to step-down 575V to 460V. T4 is located in the blower compartment and is powered at all times.

Three-phase motors

All belt-drive blower motors used in 5 and 6 ton units are three-phase. Three-phase motors do not use run capacitors. All motors are single-speed ball-bearing type which use an adjustable pulley for adjusting blower speed.

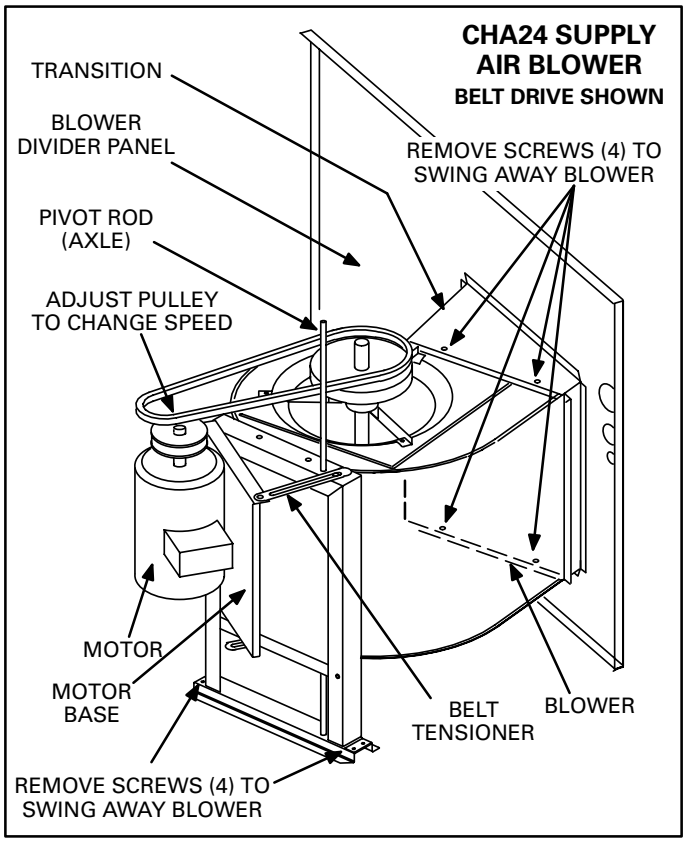


FIGURE 8

C– Motor Fuses F27

Blower motors in 575V direct-drive units are protected by line voltage fuses located in the upper portion of the blower compartment (figure 1).

D– Blower Motor Capacitor C4

All single-phase blower motors are PSC type which require a run capacitor. Capacitor ratings may be different for each motor, but the rating and repair part number will be printed on the side of the capacitor.

E– Transformer T4

575 (J) voltage direct-drive units use a line voltage to 460V auto-transformer to power the indoor blower and outdoor fan. This auto-transformer is also connected directly to line voltage and is powered at all times. It has a maximum rating of 3.4A.

F– Freezestat S49

The evaporator is equipped with a low temperature switch located on the return bend of the evaporator coil. The freezestat is a SPST auto-reset switch which opens at 29$\pm$3°F on a temperature drop and closes at 58$\pm$4°F on a temperature rise. To prevent coil icing, the freezestat opens during compressor operation to disable the compressor until the coil warms sufficiently to melt any accumulated frost or ice.

If the freezestat is tripping frequently due to coil icing, check the unit charge, airflow and filters before allowing the unit back in operation. Make sure to eliminate all conditions which might promote evaporator ice buildup.

VI– COOLING COMPONENTS

Overview (Cooling Components)

All models use single-stage dx cooling with a non-bleed port thermostatic expansion valve as the primary expansion device. Single-phase models are factory equipped with compressor starting components located in the control box.

When an economizer is installed and outdoor conditions are suitable for cooling, the economizer may be used to satisfy first-stage cooling demand. The compressor satisfies second-stage cooling demand. When outdoor conditions are not suitable for cooling, the outdoor dampers are closed (return to minimum position) and the compressor satisfies all cooling demand.

The condenser coil is formed with two rows of copper tubes fitted with ripple-edged lanced aluminum fins. The five-ton evaporator coil consists of a single two-row slab while the six-ton evaporator coil consists of a single three-row slab both using copper tubes and ripple-edged lanced aluminum fins.

Access

Access to the compressor compartment is gained by removing the access panel located on the right. Small openings in the corner mullion (next to the compressor access panel) allow the charge to be checked with the access panel in place (figure 1). The lower opening allows access to the thermometer well and the upper opening allows gauge hoses to be passed through for gauge port connections.

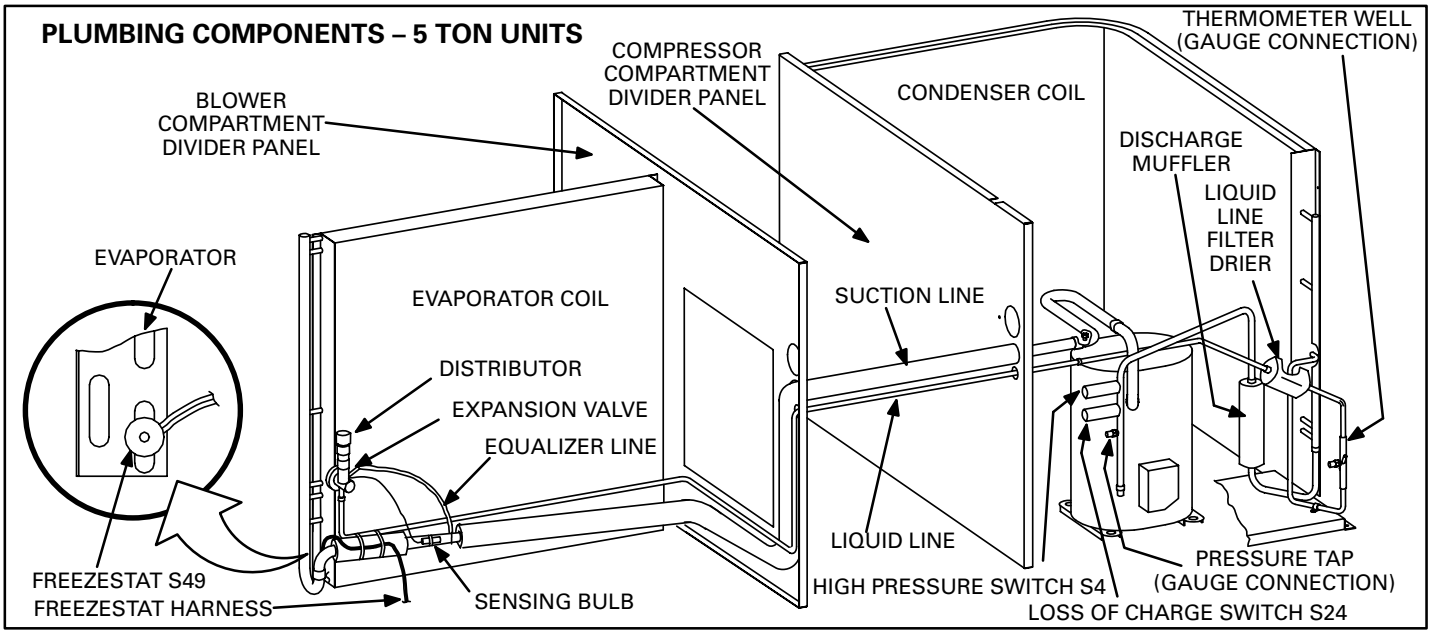


FIGURE 9

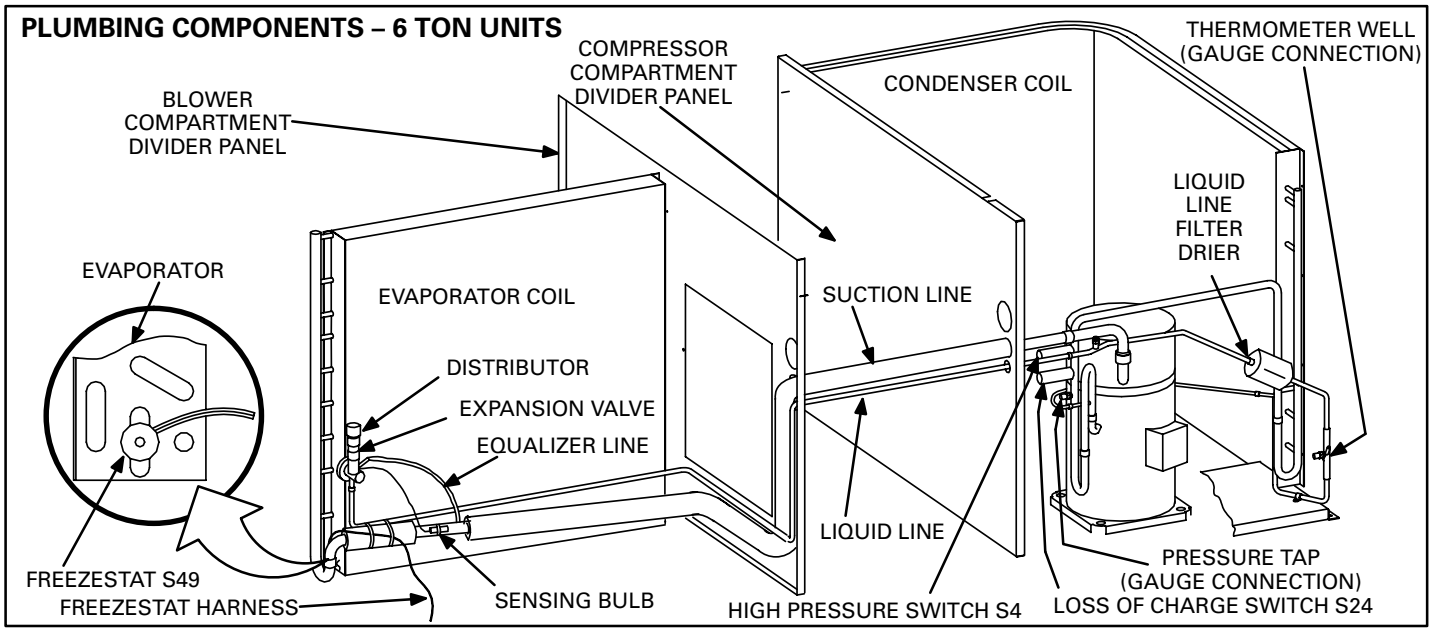


FIGURE 10

A– Compressor B1

CHA24 units use a reciprocating or scroll hermetically sealed compressor. The compressor is energized when contactor K1 is energized. Single-phase units use single-phase PSC compressor motors. Three-phase units use three-phase compressor motors. Only single-phase PSC motors use run capacitors.

The run capacitor used in single-phase units is a "dual" capacitor which is shared with the condenser fan motor.

Single-phase units are also factory equipped with start components. Start components consist of potential relay K31 and start capacitor C7.

All compressors are equipped with internal pressure relief and internal thermal overload protection.

Some models may use a scroll compressor. Three-phase scroll compressors are phase sensitive (that is, they may run backwards). A scroll compressor running backwards will sound louder than normal, will not pump, and the dome of the compressor (normally hot) will feel cool. A simple field procedure can reverse the direction of a scroll compressor which is running backward: Turn off power to the unit, swap any two line voltage legs, then turn on power to unit. Be sure to turn off power before attempting this procedure. Attempting this procedure with power turned on presents a dangerous, potentially lethal shock hazard, and may cause damage to the motor by "single phasing."

B– Crankcase Heater HR1

Some compressors are equipped with either insertion type or belly-band crankcase heaters. Heater ratings may be different for each compressor, but the rating and repair part number will be printed on the side of the heater.

C– Compressor Run Capacitor (C12)

Single-phase units use single-phase PSC compressor motors. PSC motors require a run capacitor C12.

The run capacitor is a "dual" capacitor which is shared with the condenser fan motor. A dual capacitor functions as two capacitors in a single can. One side of the dual capacitor is connected to the compressor and the other side of the capacitor is connected to the condenser fan. Each side of the capacitor has a different rating.

Capacitor ratings may be different for each motor, but the rating and repair part number is printed on the capacitor.

D– Condenser Fan Motor B4

Each unit uses a single condenser fan. All units use single-phase PSC condenser fan motors.

All motors are ball-bearing type and use a run capacitor (C1). Motors in five-ton units and 575V units use a single (purple) capacitor wire and motors in six-ton units (except 575V) use two (purple) capacitor wires (see unit wiring diagram).

E– Condenser Fan Motor Capacitor (C1, three-phase units) (C12, single-phase units)

All units use single-phase PSC condenser fan motors which use a run capacitor. Single-phase units use a "dual" capacitor and three-phase units use a single capacitor. A dual capacitor functions as two capacitors in a single can. One side of the dual capacitor is connected to the compressor and the other side of the capacitor is connected to the condenser fan. Each side of the capacitor has a different rating.

Capacitor ratings may be different for each motor, but the rating and repair part number will be printed on the side of the capacitor.

F– High Pressure Switch S4

The high pressure switch is a manually reset SPST N.C. switch which opens on a pressure rise. All CHA24 units are equipped with this switch. The switch is located in the compressor discharge line and is wired in series with the compressor contactor. The switch is factory set and cannot be adjusted. When discharge pressure rises above 410±10 psig (indicating a problem in the system) 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 reset button.

G– Loss of Charge Switch S24

The loss of charge switch is an auto-reset SPST N.C. switch which opens on a pressure drop. All CHA24 units are equipped with this switch. The switch is located in the compressor discharge line next to the high pressure switch. S24 is wired in series with the high pressure switch and the compressor contactor. When discharge pressure drops below 25±5 psig (indicating a loss of charge in the system) the switch opens and the compressor is de-energized (the economizer can continue to operate). The switch automatically resets when refrigerant is added and the discharge line pressure rises above 55±5 psig.

VII– STARTUP – OPERATION

A–Preliminary and Seasonal Checks

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

2– Inspect all electrical wiring, both field and factory installed for loose connections. Tighten as required. Refer to unit diagram located on inside of unit control box cover.

3– Check to ensure that refrigerant lines are in good condition and do not rub against the cabinet or other refrigerant lines.

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

5– Recheck voltage and amp draw with unit running. If power is not within range listed on unit nameplate, stop unit and consult power company. Refer to unit nameplate for correct running amps.

6– Inspect and adjust blower belt.

B–Cooling Startup

NOTE–The following is a generalized procedure and does not apply to all thermostat control systems. Electronic and ramping thermostat control systems may operate differently. Refer to the operation sequence section of this manual for more information.

⚠ WARNING

Crankcase heaters must be energized for 24 hours before attempting to start compressors. Set thermostat so there is no compressor demand before closing disconnect switch. Attempting to start compressors during the 24-hour warm-up period could result in damaged or failed compressors.

1– Set fan switch to AUTO or ON and move the system selection switch to COOL. Adjust the thermostat to a setting far enough below room temperature to bring on all compressors. Compressors will start and cycle on demand from the thermostat (allowing for unit and thermostat time delays).

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

3– Refer to Cooling System Service Checks (Section VII) for proper method of checking charge.

C–Heating Startup

1– Set the fan switch to AUTO or ON and move the system selection switch to HEAT. Adjust the thermostat setting above room temperature.

2– The indoor blower and first-stage electric heat immediately start.

3– Additional stages are controlled by indoor thermostat.

D–Safety or Emergency Shutdown

Turn off power to the unit.

VIII– COOLING SYSTEM SERVICE CHECKS

A–Refrigerant Charge and Check

This unit is factory charged and requires no further adjustment; however, check charge using the approach method outlined below. The approach method compares actual liquid temperature with the outdoor ambient temperature. A thermometer well has been provided to allow accurate liquid temperature measurement.

1– Attach gauge manifolds by threading manifold hoses through openings provided in compressor compartment mullion. Attach hose connections to high and low pressure taps. Hang manifold on mullion openings outside of unit.

2– Insert thermometer through mullion opening and into well pocket.

NOTE–Thermometer pocket must be filled with oil for accurate reading.

3– Replace compressor access panel.

4– Operate unit until system stabilizes (approximately five minutes).

5– Compare liquid temperature to outdoor ambient temperature.

Approach Temperature = Liquid temperature minus ambient temperature. (For best results use same thermometer for both readings).

6– Approach temperature should match values on the unit charging sticker and table 3. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

TABLE 3

APPROACH TEMPERATURE	
UNIT	LIQUID TEMP. MINUS AMBIENT TEMP.
CHA24–650 & 813	7°F ± 1 (3.9°C ± 0.5)

7– When unit is properly charged, the system pressure should approximate pressure given in the Normal Operating Pressure Table (table 4).

TABLE 4

CHA24 NORMAL OPERATING PRESSURES				
Outdoor Entering Air Temperature	CHA24-651 / 653		CHA24-813	
	Liq ±10 psig	Suc ±5 psig	Liq ±10 psig	Suc ±5 psig
65°F	150	71	157	72
75°F	176	73	185	73
85°F	207	74	216	75
95°F	242	76	250	77
105°F	280	78	287	78

This table is provided to assist in determining normal operating conditions and is not to be used as a charging procedure. Due to the many differences that exist between installations, i.e., indoor air volume, humidity and load, this table may be used only as a guide and minor differences should be expected. Significant differences could indicate the malfunction of a component or an improper charge.

B–Charging

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 nameplate. If weighing facilities are not available or if unit is just low on charge, use the procedure outlined in section A–Refrigerant Charge and Check.

IX– INDOOR BLOWER ADJUSTMENT

A–External Static Pressure

1– Measure tap locations as shown in figure 11.

2– Punch a 1/4" diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.

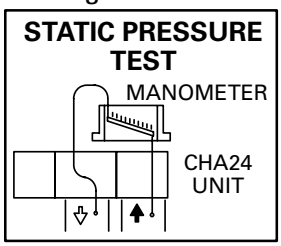


FIGURE 11

3– With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements.

4– Seal around the hole when the check is complete.

B–Direct-Drive Blower Speed Adjustment

Blower speed tap selection is accomplished by changing the taps at the blower motor harness connector (J43). Disconnect harness connector from motor to expose speed selectors.

To Change Blower Speed:

(208/230V Direct-Drive Units)

1– Referring to blower performance tables in front of this manual, use the static pressure and blower speed tap to determine unit CFM.
2– Turn off electric power to furnace.
3– Remove blower access door.
4– Disconnect blower motor harness from motor.
5– Select desired speeds for heating and cooling. (Pin 6 = Low, Pin 5 = Med-Low, Pin 4 = Medium, Pin 3 = Med-High, Pin 2 = High).
6– Depress harness connector tab to release wire terminal (J43). Select connector location for new speed (refer to unit wiring diagram). Insert wire terminal until it is securely in place. See figure 13.
7– Replace harness connector to motor .

To Change Blower Speed:

(460V and 575V Direct-Drive Units)

1– Referring to blower performance tables in front of this manual, use the static pressure and blower speed tap to determine unit CFM.
2– Turn off electric power to furnace.
3– Remove blower access door.
4– Disconnect blower motor harness from motor.
5– Table 5 shows the speeds associated with each pin in the harness plug. Referring to figure 12, choose the blower speed desired and make appropriate wiring changes.
6– Depress harness connector tab to release wire terminal. Select connector location for new speed (refer to unit wiring diagram). Insert wire terminal until it is securely in place. See figure 13.
7– Replace harness connector to motor .

⚠ CAUTION

Motor can be damaged if speed change is made improperly. Use table 5 as a guide and remember:
Black Lead = Speed Tap
Orange Lead = Common
Blue Lead = Internal circuit, connected to high speed (pin 2) *only* when medium speed (pin 3) or low speed (pin4) are connected to black wire.

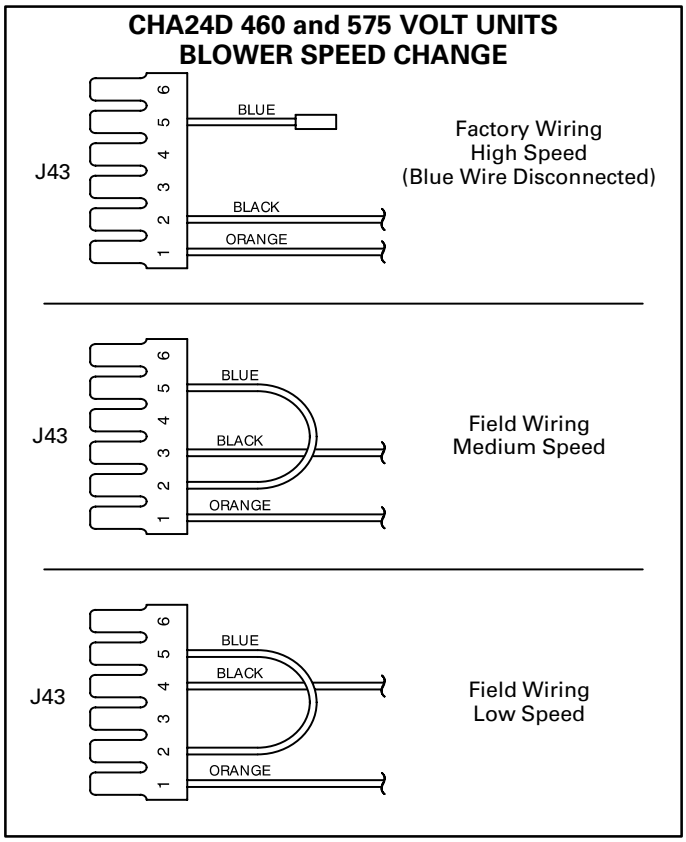


FIGURE 12

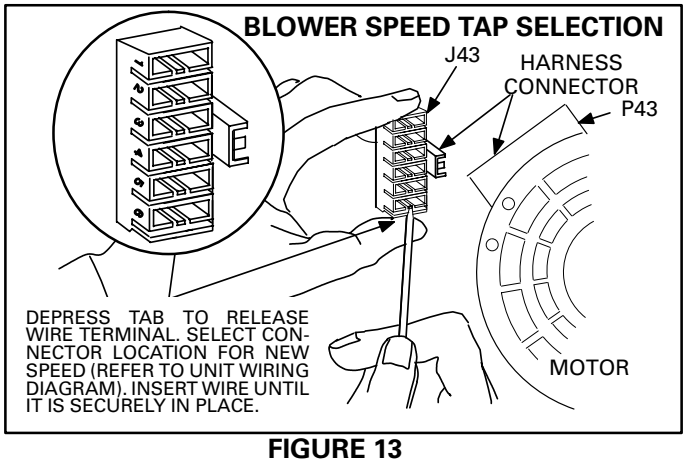


FIGURE 13

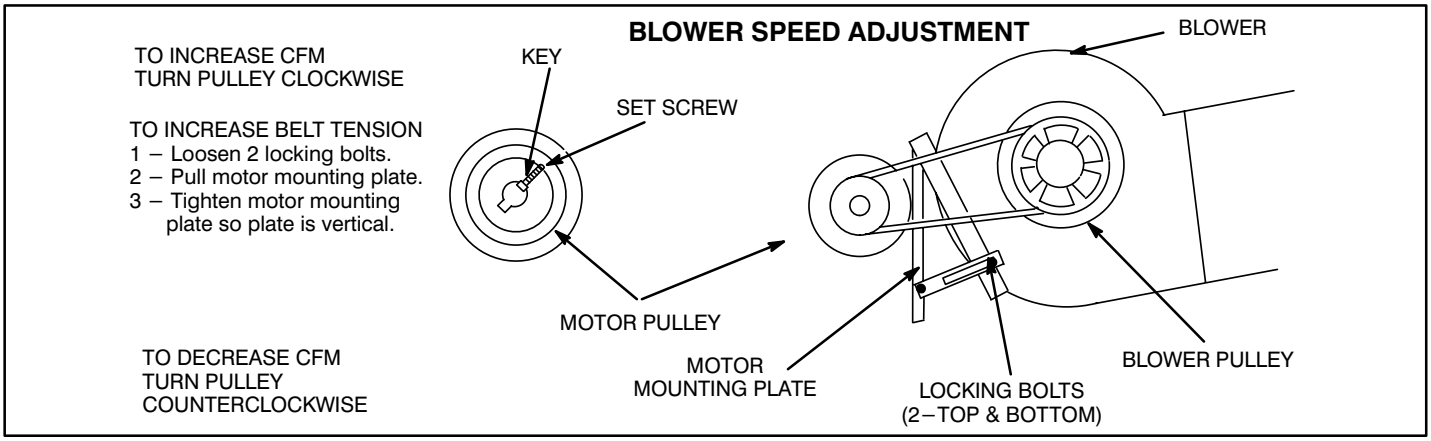


FIGURE 14

TABLE 5

LEADLESS 460V THREE SPEED BLOWER MOTORS	
Speed	**Motor Terminal**
Low	4
Medium	3
High	2
Internal Circuit	5
Common	1
NOT USED	6

To Change Blower Speed:

(Belt Drive Drive Units)

1– Measure indoor blower wheel RPM
2– Refer to unit nameplate to determine the blower motor horsepower.
3– Referring to blower performance table in the front of this manual, use the static pressure and RPM to determine unit CFM.
4– The CFM can be adjusted at the motor pulley by adjusting the pulley diameter.

Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained.

Important–Tension new belt after a 24–48 hour period of operation. This will allow belts to stretch and seat into grooves. To increase belt tension, loosen two locking bolts and pull mounting plate. Tighten motor mounting plate in vertical position. See figure 14.

X– MAINTENANCE

⚠ WARNING

Electric shock hazard and danger of explosion. Can cause injury, death, or product or property damage. Turn off gas and electrical power to unit before performing any maintenance of servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back in operation after service or maintenance.

⚠ CAUTION

Sharp metal edges can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

A–Filters

The specifications tables in the front of this manual show the filter dimensions. Filters can be accessed by removing the return air compartment end panel. Filters slide into rails furnished in the cabinet. All models use pleated 2" throw-away type filters.

At the beginning of each heating season, the system should be checked as follows: Filters should be inspected monthly and must be replaced when dirty to assure proper furnace operation.

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

B–Supply Air Blower

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

On belt drive blowers, remove four screws securing blower housing to transition. Remove four screws securing motor mount to unit hat section. See figure 15. Swing blower in direction of arrow to clean blower and evaporator coil.

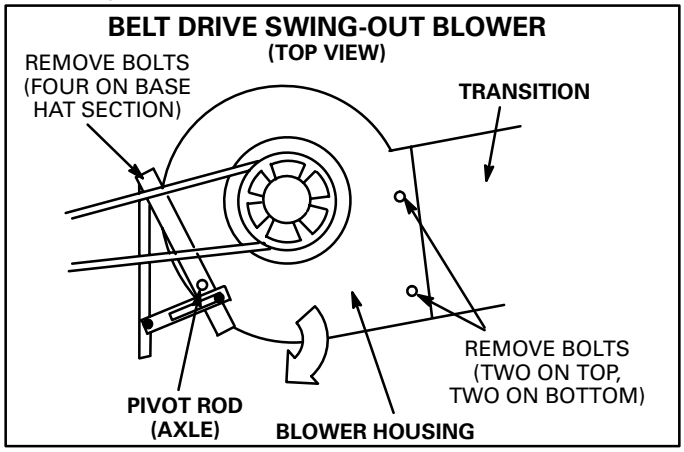


FIGURE 15

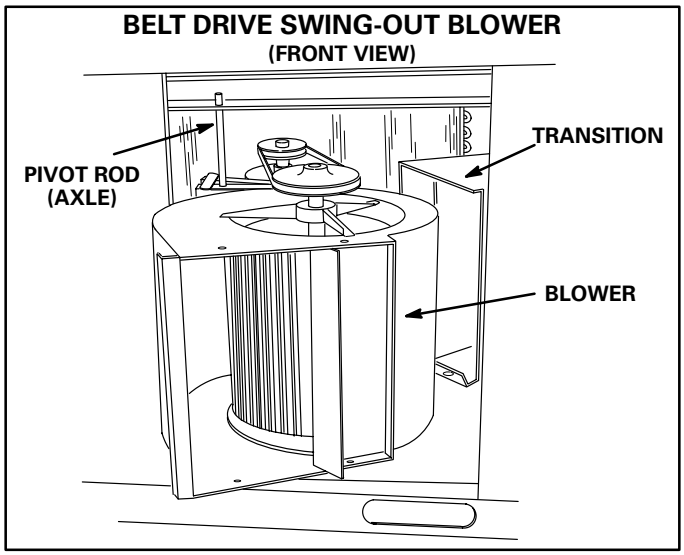


FIGURE 16

1– Check and clean blower wheel.
2– Motors used in the CHA24 series units are permanently lubricated and need no further lubrication.

C–Electrical

1– Check all wiring for loose connections.
2– Check for correct voltage.
3– Check amp–draw on blower motor.

D–Lubrication

All CHA24 motors and blower shaft bearings are pre-lubricated. No further lubrication is required.

E–Evaporator Coil

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

F–Condenser Coil

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

Formed condenser coils are made of individual coil slabs. Dirt and debris may become trapped between the coil slabs. To clean coil slabs, carefully separate coil slabs and wash them thoroughly.

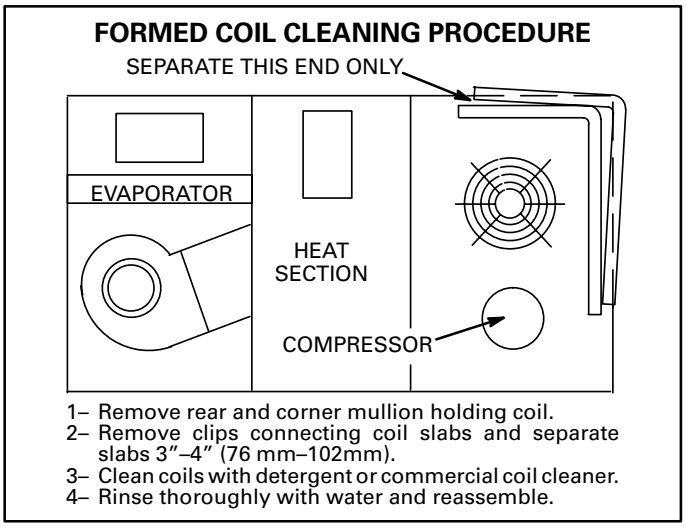


FIGURE 17

XI– ACCESSORIES

This section describes the application of popular accessories which can be integrated into the CHA24. Some of the accessories (for example, the Warm Up Kit) are described in the operation sequence section of this manual.

Many types of roof framing or supports can be used to mount the CHA24 unit, depending upon different roof structures.

A–REMD24M Economizer

REMD24M economizer can be applied to any CHA24 unit. The economizer is designed to fit inside the return air section of the unit and can be easily configured for horizontal or bottom return air.

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 REMD24–81 Installation Instructions 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 CHA24 and the control system being used.

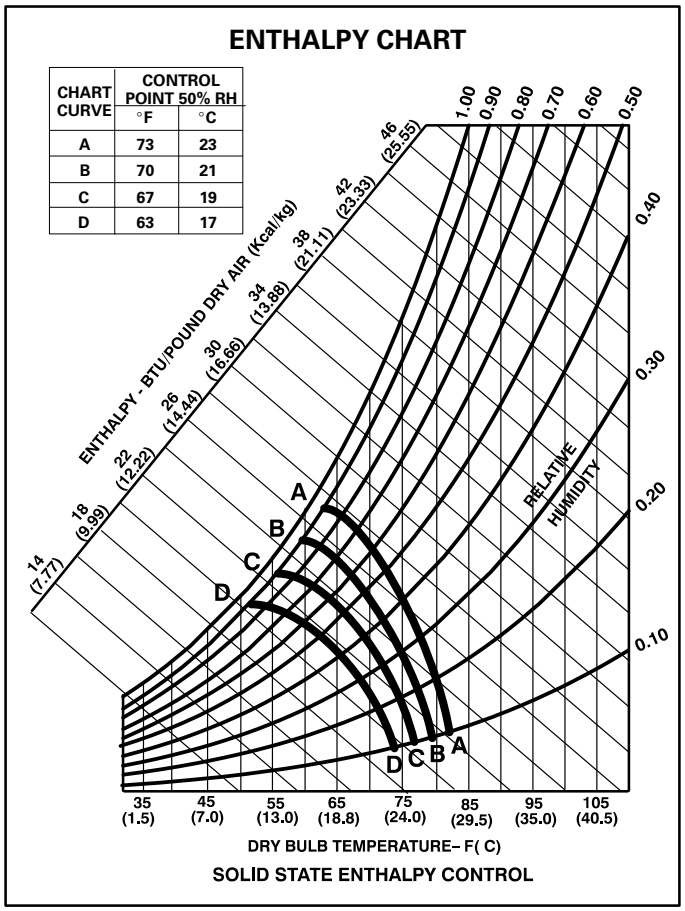


FIGURE 18

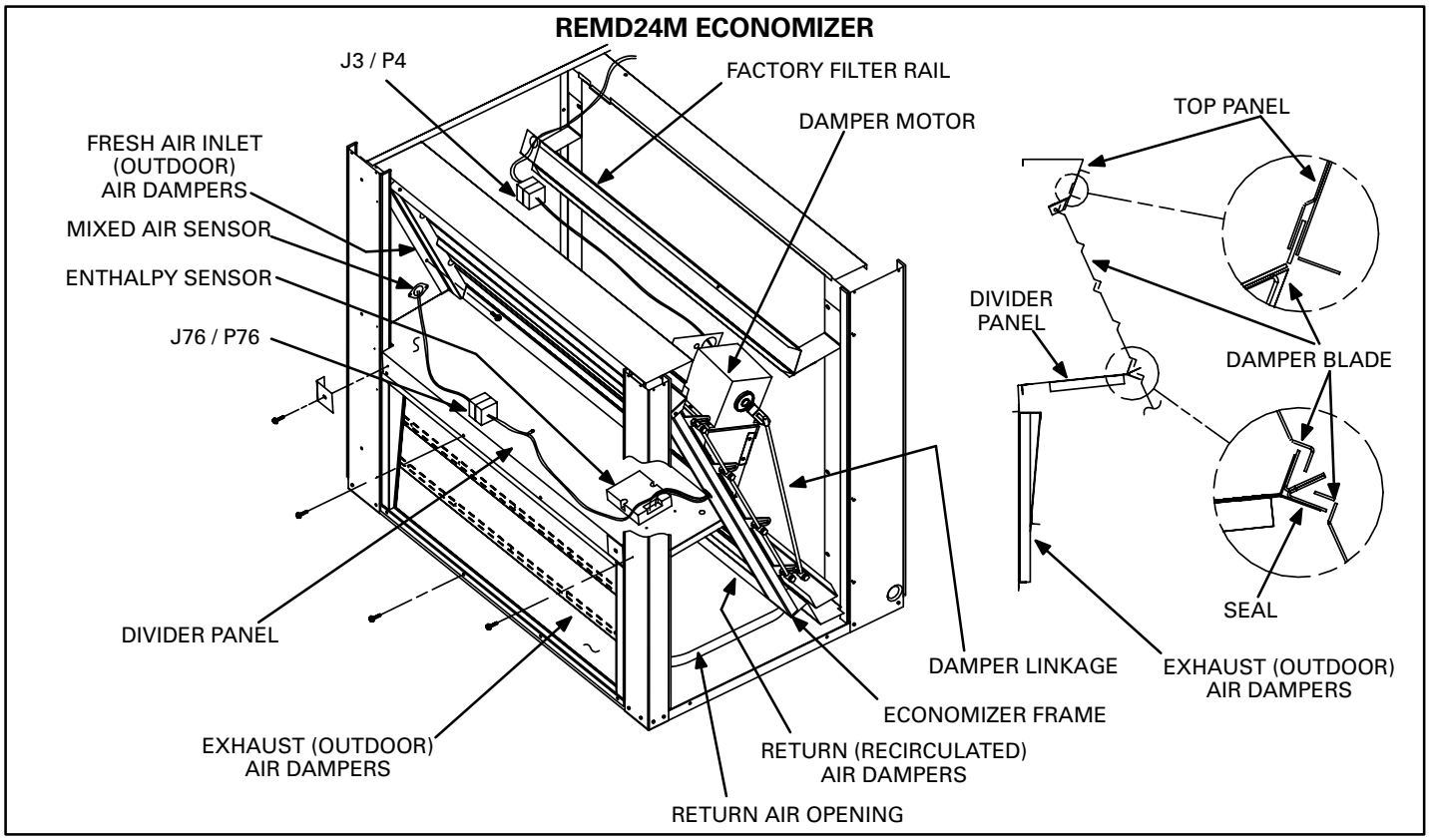


FIGURE 19

Economizer Operation

1—Enthalpy Control (A6): Setpoint Control

The key to economizer operation is the enthalpy control. The enthalpy control senses the total heat content of the outside air (temperature plus humidity) and uses that information to control the amount of outside air brought into the system. When the enthalpy of the outside air is below the control setpoint, the control actuates a motor which adjusts the outdoor dampers to meet the cooling demands of the building. When the heat content rises above the control setpoint, the control de-activates and the dampers close to a 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 18.

Example:

If the enthalpy control is set at setpoint "A" as shown in figure 18, the following situation could occur. A cooling demand when the outside air is at 75°Fand 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.

2—Minimum Positioner (part of A6)

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.

3—Enthalpy Sensor (A7)

The enthalpy sensor is located on the outside portion of the outdoor dampers (as shown in figure 19). 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.

4—Mixed Air Sensor (R1)

The mixed air 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 the economizer is operating to determine how far to open the outdoor air dampers.

The sensor fits through a factory supplied hole in the panel dividing the unit return and supply air (see figure 19).

5—Wiring, Installation, Maintenance

The economizer uses a harness plug (P4) to connect to the CHA24's harness connector (J3) located in the blower compartment. Although a harness connector is used to connect the CHA24 to the economizer, the economizer electrically connects to the CHA24 differently depending on which control system has been installed. The different electrical connections are made in relay kits and controls located in the control area of the blower compartment and/or control box. All connections are made with quick–connect type harness connectors. For specific details of economizer wiring and operation, refer to the sequence of operation section of this manual.

6—Modulating Damper Motor Check

1– Disconnect main power to the CHA24.

2– Turn thermostat to OFF position (occupied mode).

3– Install jumper across terminals 6–9 on blower relay in unit control box.

4– Install jumper across enthalpy control terminals T and T1. See figure 20 for terminal location.

5– Restore power to unit. Outdoor damper should drive to fully open position (60 to 90 sec. required for full travel). Observe travel for proper damper operation.

6– Disconnect power to the unit. Outdoor damper should spring return to closed position.

7– Remove T and T1 jumper then restore power to the unit. Outdoor damper should drive to minimum position. Adjust minimum damper position pot located on control. See figure 20.

8– Disconnect power to unit and remove jumper on blower relay terminals 6–9. Replace all panels. Restore power to unit.

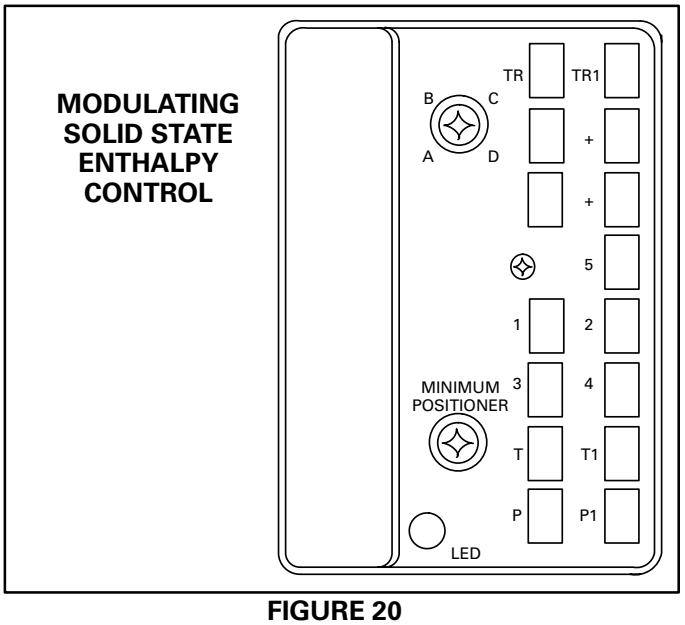


FIGURE 20

7—Warm Up Kit

An optional warm up kit may be added to REMD24M economizer (except CHA24s using a Honeywell W7400 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 installs in the CHA24 control mounting area of the blower compartment. The kit plugs into the unit wiring harness inline between the unit and the economizer. For detailed wiring and operation, refer to the sequence of operation section of this manual.

8—Night Relay (K11)

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

If a W973 system is used, the relay holds the outdoor dampers closed during setback. If an electromechanical thermostat system is used, the relay holds the outdoor dampers closed during setback, de–energizes the indoor thermostat and energizes the setback thermostat. Night relay is not required for any other control system. Field wiring is shown in the following section of this manual.

B–OAD24 and OAD24M Outdoor Air Damper

An outdoor air damper is a field installed accessory which may be used in lieu of an economizer. Two versions are available: manual (OAD24 - figure 21) and motorized (OAD24M - figure 22). The outdoor air damper section installs in place of the unit return air access panel to allow a fixed amount of outside air into the system for ventilation and cooling. The OAD24M automatically moves to fully open or fully closed. The OAD24 is manually positioned and locked in place to allow up to 25 percent outside air into the system at all times.

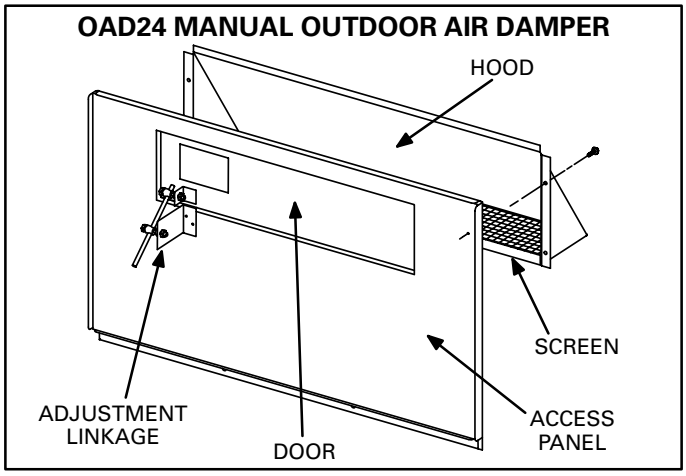


FIGURE 21

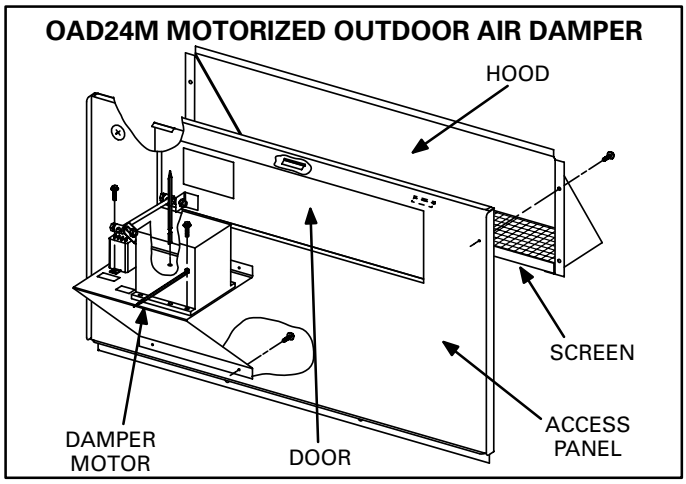


FIGURE 22

C–Firestats S74 and S75

Some local codes may require the installation of discharge air and return air firestats to automatically shut down the unit when excessive temperature is reached. Other local codes may require firestats wired to perform tasks such as energizing a blower or closing dampers. These field provided firestats MUST be mounted and wired per local codes or insuring agencies. Manual reset controls MUST be accessible.

Wiring diagrams in back of this manual show typical firestat wiring connections. When either or both firestats open, the control circuit is de–energized while control transformer T1 remains energized to operate dampers, exhaust blower, etc. The unit shuts down and economizer outdoor dampers drive full closed.

D–Transitions

Optional supply/return transitions (SRT24) are available for use with downflow CHA24s utilizing the optional RMF24 roof mounting frame. The SRT24 provides segregated and simple duct connections to the supply and return diffuser. The transition must be installed in the RMF24 mounting frame before mounting the CHA24 to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

E–Status Panels SP11 and SSP11

Optional status panels allow remote monitoring of system operation. Two types of panels are available. See figure 23. The SP11 provides system readout only. The SSP11 switching status panel is a combination switching subbase and system readout. The SSP11 also has an "After Hours Timer" to override the unoccupied mode (night heating setback / cooling setup).

NOTE—Status panels are not applicable to all CHA24 control systems. Refer to Engineering Handbook and status panel installation instructions for more information.

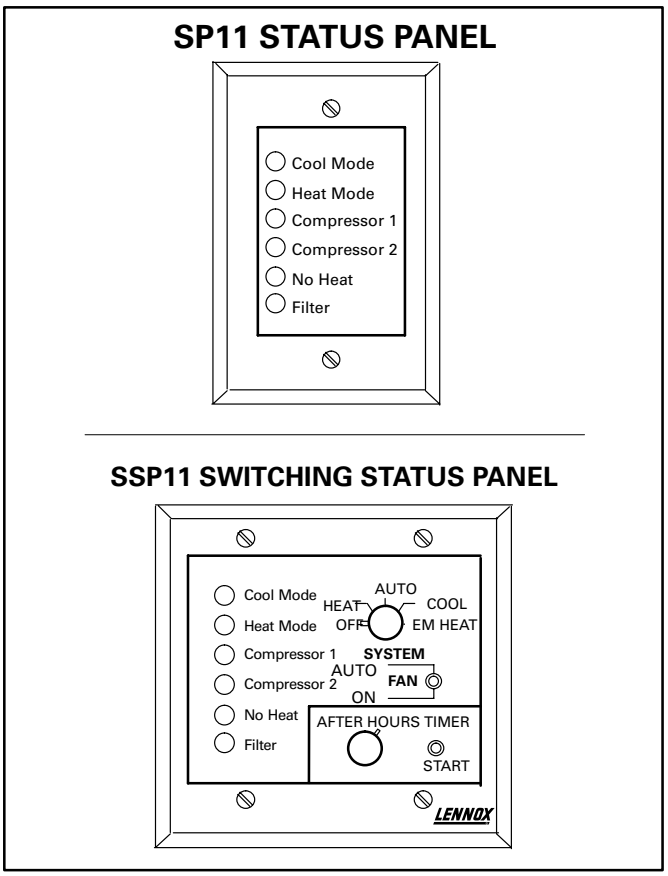
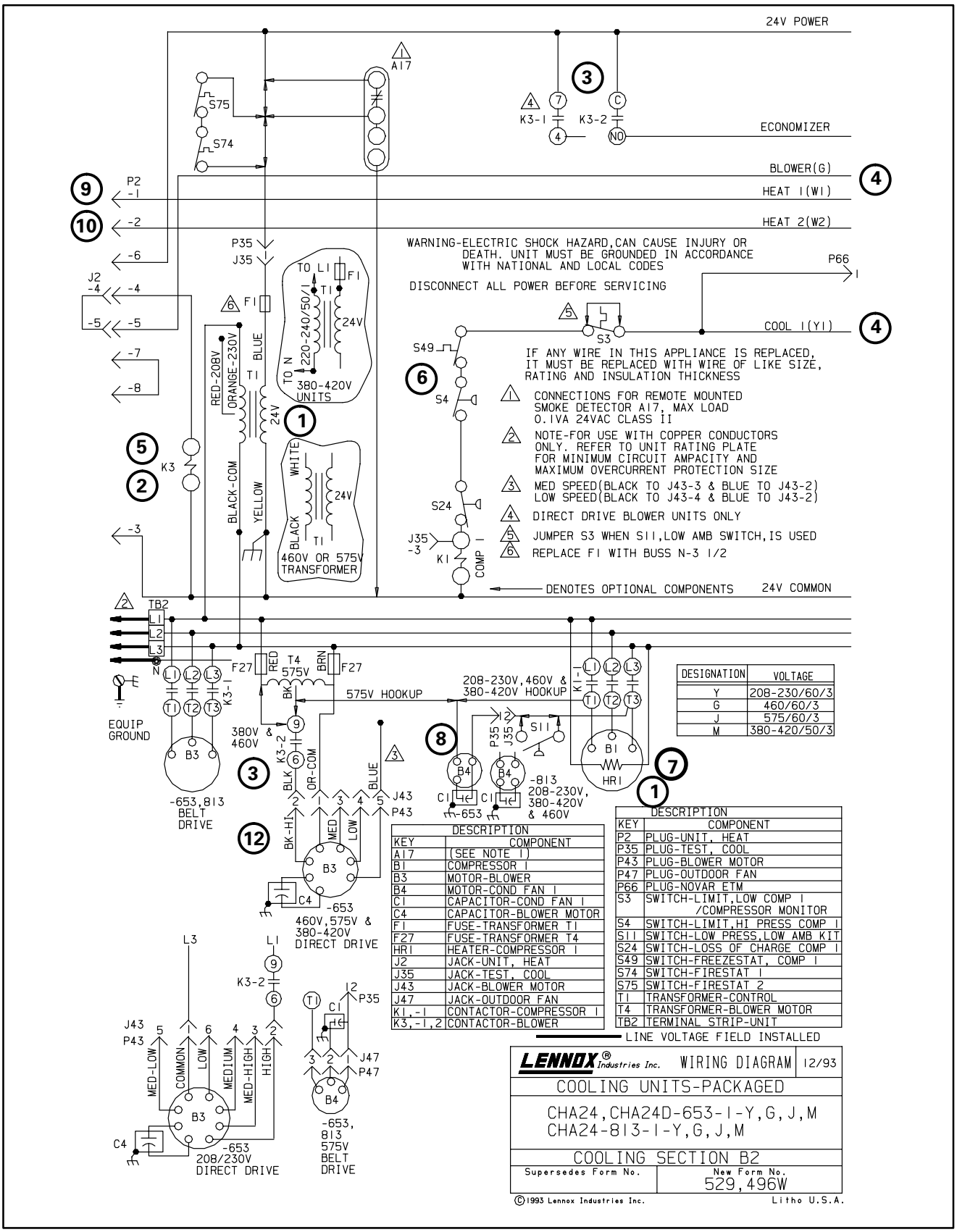


FIGURE 23

XII–WIRING DIAGRAMS AND OPERATING SEQUENCES



DESIGNATION	VOLTAGE
Y	208-230/60/3
G	460/60/3
J	575/60/3
M	380-420/50/3

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 1)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C1	CAPACITOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
F1	FUSE-TRANSFORMER T1
F27	FUSE-TRANSFORMER T4
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
J47	JACK-OUTDOOR FAN
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER

DESCRIPTION	
KEY	COMPONENT
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P47	PLUG-OUTDOOR FAN
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR
TB2	TERMINAL STRIP-UNIT

LENNOX® Industries Inc. WIRING DIAGRAM 12/93

COOLING UNITS-PACKAGED

CHA24,CHA24D-653-1-Y,G,J,M
CHA24-813-1-Y,G,J,M

COOLING SECTION B2

Supersedes Form No. | New Form No. 529,496W

B2 DIAGRAM

A–Three-Phase Unit Operating Sequence

CHA24-653-813 & CHA24D-653

Information on this page is used to show the step by step sequence that takes place when thermostat demand is received by the CHA24. The sequence describes the actions of devices in the units which control blowers, fans and other components in the system. The sequence is outlined by numbered steps which correspond to circled numbers on the adjacent diagram.

This operating sequence does not include the operation of optional low ambient kit, smoke detectors or firestats. These devices are shown on the factory unit wiring diagram. Refer to the installation instructions for these kits for more information.

The following sequence describes the operation of the unit without optional economizer installed.

Operation Sequence:

Power:

1– When the unit disconnect closes, line voltage energizes transformer T1 and the crankcase heater. Transformer T1 provides 24VAC power to unit thermostat, cooling, blower and heating controls. Crankcase heater begins heating compressor. Crankcase heater *must* be energized for 24 hours before starting compressor.

Blower Operation:

2– Blower demand from thermostat terminal G energizes blower contactor K3.

3– *Direct Drive:*
When K3 is energized, K3-1 contacts close to energize the economizer (if economizer is installed, outdoor damper drives to minimum position). K3-2 contacts close to energize the blower motor. Blower motor operates at speed determined by motor speed tap.

Belt Drive:
When K3 is energized, K3-2 contacts close to energize the economizer (if economizer is installed, outdoor damper drives to minimum position). K3-1 contacts close to energize the blower motor. Blower motor operates at speed determined by motor pulley.

1st Stage Cooling:

4– Cooling demand energizes Y1 and G in the thermostat.

5– G energizes K3 as described in previous steps.

6– Y1 passes through compressor monitor S3, freezestat S49, high pressure switch S4 and loss of charge switch S24 to energize compressor contactor K1.

7– Contacts K1-1 close to energize the compressor (B1) and condenser fan B4.

8– The condenser fan uses a PSC motor which requires a run capacitor.

1st Stage Heating:

9– Heating demand energizes W1 in the thermostat. The operation sequance of electric heat units varies depending on size (KW input rating) and line voltage rating.

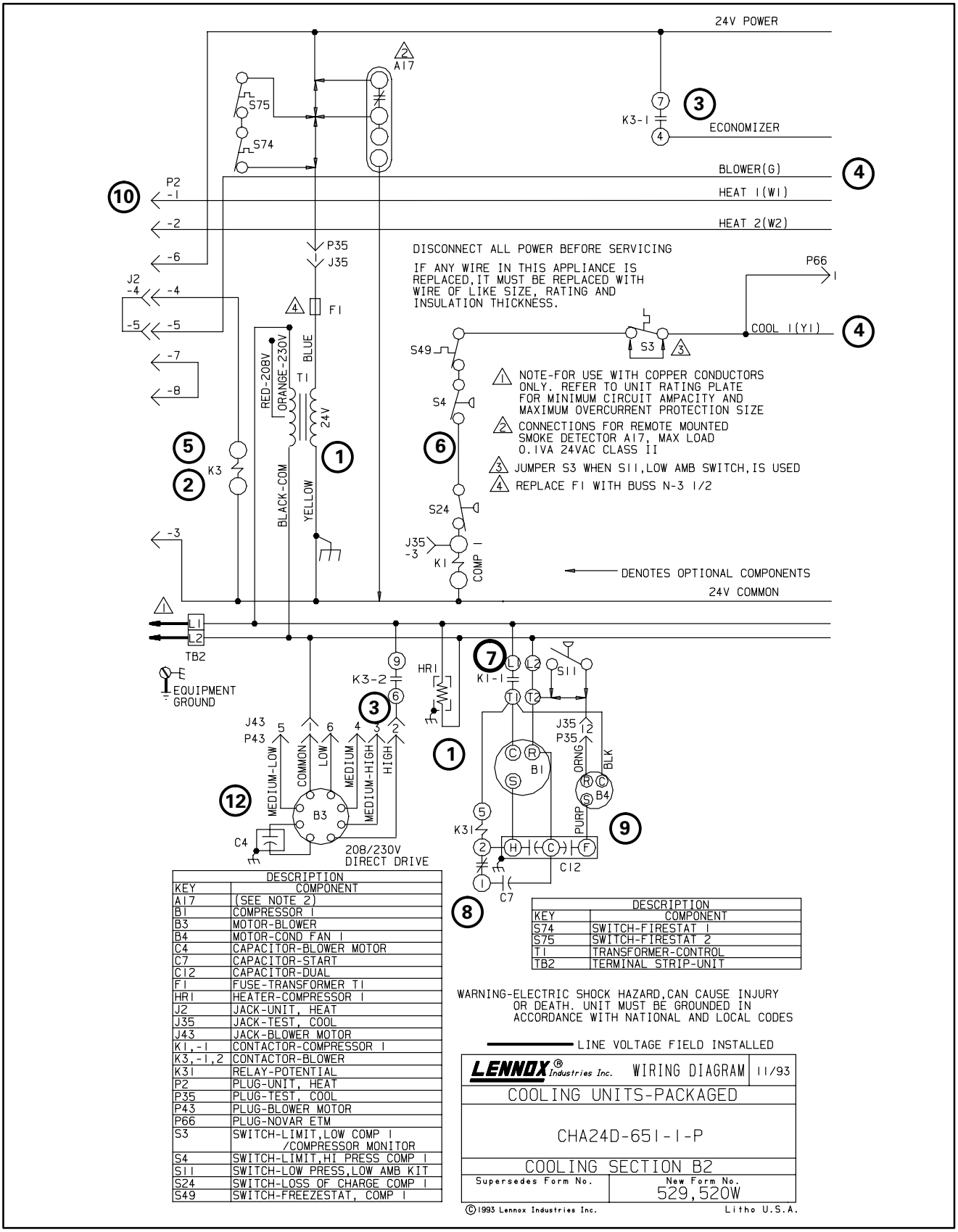
2nd Stage Heating:

10– Additional heating demand energizes W2 in the thermostat. The operation sequence of electric heat units varies depending on size (KW input rating) and line voltage rating.

Safety Blower Operation:

11– If either limits in the electric heat section trips, the heating elements are immediately de-energized.

12– The indoor blower remains energized, powered by K3 which is energized by thermostat demand.



DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 2)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
C7	CAPACITOR-START
C12	CAPACITOR-DUAL
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER
K31	RELAY-POTENTIAL
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1

DESCRIPTION	
KEY	COMPONENT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB2	TERMINAL STRIP-UNIT

WARNING-ELECTRIC SHOCK HAZARD,CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

LINE VOLTAGE FIELD INSTALLED

LENNOX® Industries Inc. WIRING DIAGRAM 11/93

COOLING UNITS-PACKAGED

CHA24D-651-1-P

COOLING SECTION B2

Supersedes Form No.	New Form No.
	529,520W

 Litho U.S.A.

B2 DIAGRAM

B–Single-Phase Unit Operating Sequence

CHA24D-651

Information on this page is used to show the step by step sequence that takes place when thermostat demand is received by the CHA24. The sequence describes the actions of devices in the units which control blowers, fans and other components in the system. The sequence is outlined by numbered steps which correspond to circled numbers on the adjacent diagram.

This operating sequence does not include the operation of optional low ambient kit, smoke detectors or firestats. These devices are shown on the factory unit wiring diagram. Refer to the installation instructions for these kits for more information.

The following sequence describes the operation of the unit without optional economizer installed.

Operation Sequence:

Power:

1– When the unit disconnect closes, line voltage energizes transformer T1 and the crankcase heater. Transformer T1 provides 24VAC power to unit thermostat, cooling, blower and heating controls. Crankcase heater begins heating compressor. Crankcase heater *must* be energized for 24 hours before starting compressor.

Blower Operation:

2– Blower demand from thermostat terminal G energizes blower contactor K3.

3– When K3 is energized, K3-1 contacts close to energize the economizer (if economizer is installed, outdoor damper drives to minimum position). K3-2 contacts close to energize the blower motor. Blower motor operates at speed determined by motor speed tap.

1st Stage Cooling:

4– Cooling demand energizes Y1 and G in the thermostat.

5– G energizes K3 as described in previous step.

6– Y1 passes through compressor monitor S3, freezestat S49, high pressure switch S4 and loss of charge switch S24 to energize compressor contactor K1.

7– Contacts K1-1 close to energize the compressor (B1) and condenser fan B4.

8– During compressor startup, potential relay K31 remains closed and start capacitor C7 remains in the circuit. As the compressor gains speed, K31 is energized by electromotive forces generated inside the compressor. When K31 is energized, K31 contacts open and start capacitor C7 is taken out of the circuit.

9– The compressor and the condenser fan both use PSC motors which require a run capacitor. Dual capacitor C12 serves both motors.

1st Stage Heating:

10– Heating demand energizes W1 in the thermostat. The operation sequence of electric heat units varies depending on size (KW input rating) and line voltage rating.

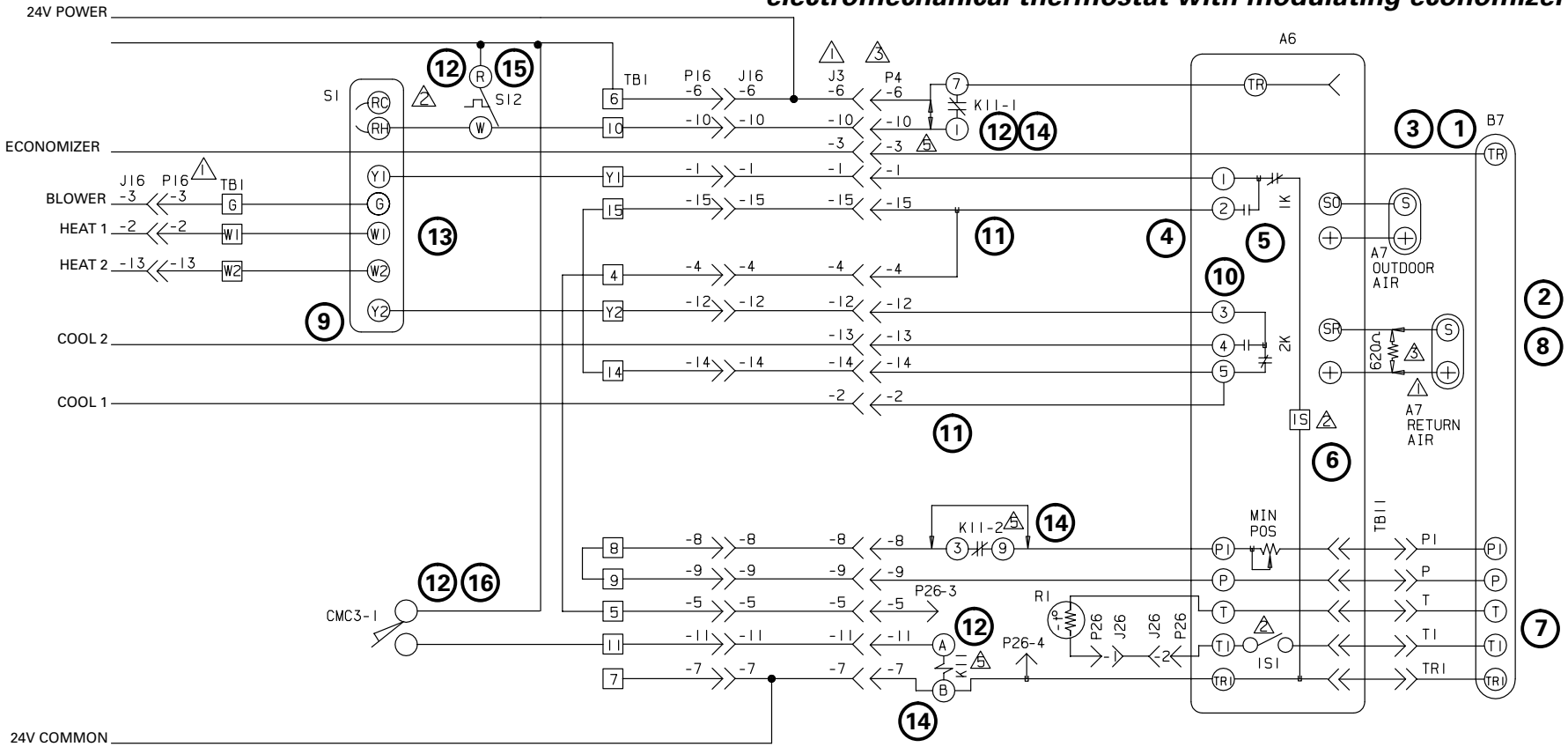
Safety Blower Operation:

11– If either limits in the electric heat section trips, the heating elements are immediately de-energized.

12– The indoor blower remains energized, powered by K3 which is energized by thermostat demand.

C1 diagram with D5 diagram

electromechanical thermostat with modulating economizer



DESCRIPTION	
KEY	COMPONENT
J3	jack-unit economizer
J16	jack-unit
P3	plug-less economizer
P16	plug-unit
SI	thermostat-room
TBI	block-terminal

DESCRIPTION	
KEY	COMPONENT
A6	control-enthalpy W7459A
A7	sensor-enthalpy
B7	motor-damper
J26	jack-enthalpy
J28	jack-W7400
K7,-1	relay-W7400
K11,-1,2	relay-nite setback
P4	plug-economizer
P26	plug-enthalpy
RI	sensor-supply air
TBII	strip-terminal

— — — — LOW VOLTAGE FIELD WIRING

———— FACTORY WIRING

Economizer Footnotes

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. WHEN W7400 CONTROL IS USED, REMOVE J26 JUMPER AND INSTALL J28. J28 AND K7 RELAY ARE PART OF W7400 KIT (74G11)
5. K11 NITE RELAY MAY NOT BE PART OF ECONOMIZERS ON UNITS BELOW 7.5T CAPACITY

Thermostat Footnotes

3. REMOVE P3 WHEN ECONOMIZER IS USED
2. THERMOSTAT SUPPLIED BY USER
1. J3 MAXIMUM LOAD 20VA 24VAC CLASS II

LENNOX Industries Inc.	WIRING DIAGRAM	6/89
ACCESS-COMBINATION UNITS-ROOFTOP		
ELECTROMECHANICAL THERMOSTAT FOR 11 & 16 SERIES UNITS (2 HEAT, 2 COOL)		
THERMOSTAT-SECTION C1		
Supersedes Form No.	New Form No.	

Litho U.S.A.

LENNOX Industries Inc.	WIRING DIAGRAM	4/89
ACCESS-COMBINATION UNITS-ROOFTOP		
REMD16M REMD11M EMDH16M EMD17-95/135 (MODULATING ECONOMIZER)		
ECONOMIZER-SECTION D5		
Supersedes Form No.	New Form No.	

Litho U.S.A.

C1 DIAGRAM with D5 DIAGRAM

C–Electromechanical Thermostat with Modulating Economizer

C1 Section with D5 Section–Basic (modulating) Economizer Operation

When an REMD24M Economizer section is applied to the CHA24 with electromechanical thermostat, two stages of cooling are available dependent on the actions of the enthalpy control inside the economizer. By sensing outside temperature and relative humidity, the enthalpy control determines if outside air can be used as a first stage of cooling. If so, first stage cooling is handled by outdoor air dampers and second stage cooling is handled by the compressor. The enthalpy control continuously adjusts the outdoor air dampers to maintain a balanced mixed air temperature. When outdoor air conditions become unsatisfactory for cooling, the outdoor air dampers close and the compressor handles all cooling demand.

NOTE – In order to understand how optional controls affect operation of the CHA24, you must first read and understand how all the CHA24 components work.

Factory jumper–plug P3 is removed from unit harness jack J3 and discarded. Economizer plug P4 replaces plug P3. These connections are made in the unit blower compartment.

Operation Sequence:

NOTE–In this operation sequence the unit diagram has been omitted in order to concentrate on the interaction between thermostat and controls.

1– Economizer outdoor air dampers drive full closed anytime blower B3 is not operating.

2– Damper motor terminal TR is powered by unit relay K3 when there is a blower demand or by K13 when there is a heating demand. When 24VAC is applied between terminals TR and TR1, the damper motor is energized and the outdoor dampers open to minimum position.

3– Blower B3 is energized by thermostat terminal G. On a cooling demand, thermostat terminal G energizes relay K3 which in turn energizes the blower. 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.

I. Enthalpy Control in Low Position (outside air can be used for cooling).

First stage cool (all models):

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

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

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 a voltage is applied across terminals T and T1 of damper motor, the damper motor energizes and outdoor dampers open. Supply air sensor R1 varies the voltage across T and T1 and the outdoor air dampers adjust accordingly. first stage cooling is provided by outdoor air.

Second stage cool (all models):

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 compressor. The compressor provides all additional cooling.

II. Enthalpy Control in High Position (outside air cannot be used for cooling).

Cooling:

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 compressor. The compressor handles all cooling.

Night Setback (optional field installed)

12–Optional field installed time–clock, night thermostat S12 and Night Relay K11 must be connected for night setback operation (night setback relay K11 not factory equipped in modulating economizer it must be field installed for night setback).

13–Blower B3 operates only during a heating demand when night thermostat is closed.

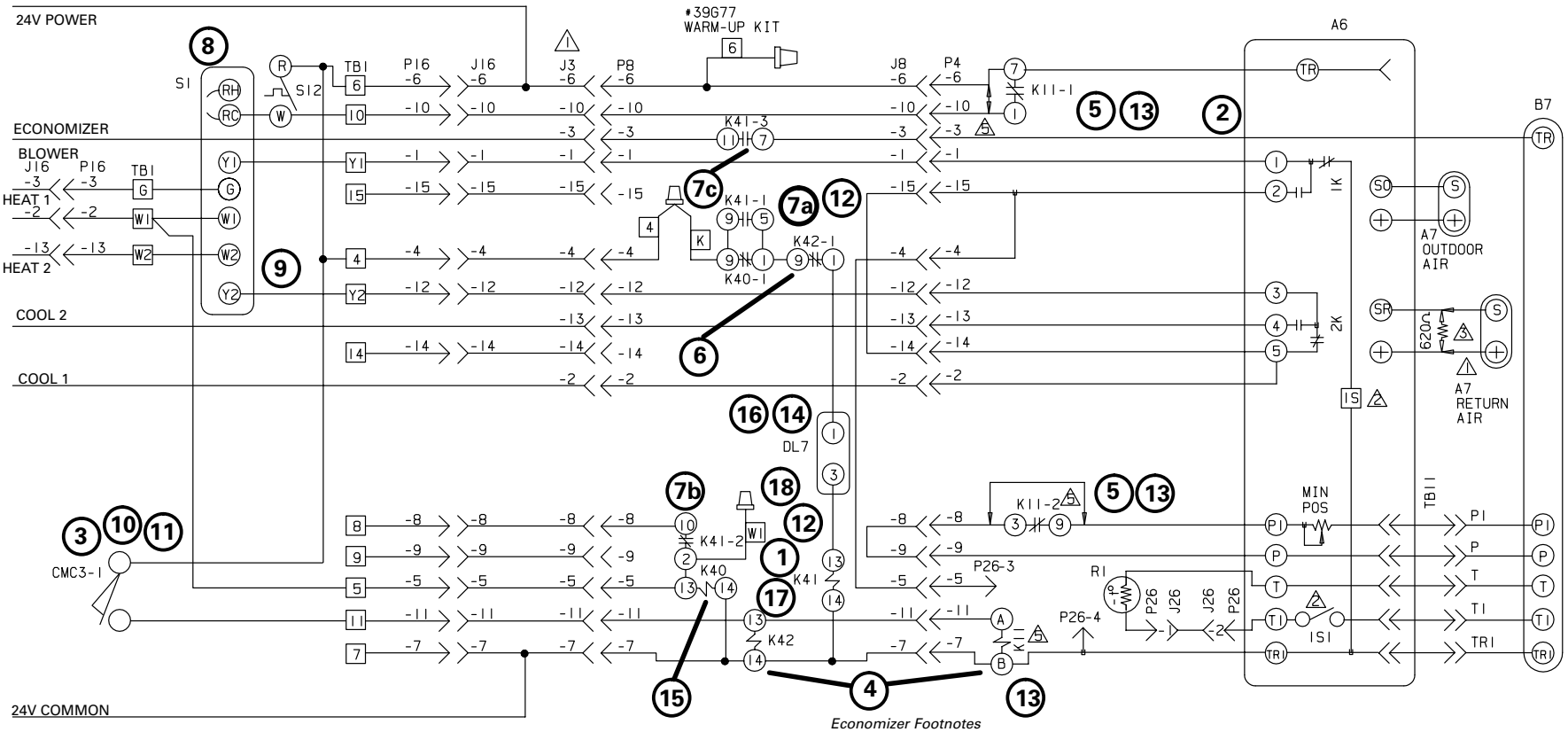
14–When clock contacts close, relay K11 energizes. Contacts K11–1 open to disable the day thermostat and contacts K11–2 open to drive the dampers full closed.

15–Night thermostat S12 is typically set with setpoints below thermostat S1. During unoccupied periods, K11–1 opens while S1 is disabled. When S12 closes, power is supplied to S1 and the unit operates normally. When S12's setpoint is reached, S12 opens, S1 is disabled and unit operation stops.

16–Shortly before the building is to be occupied, clock contacts open to de–energize relay K11. Contacts K11–1 close to restore power to the thermostat S1. Contacts K11–2 close to restore power to the minimum positioner. Outdoor air dampers open to minimum position during blower operation.

C2–1 diagram with D5 diagram

electromechanical thermostat with modulating economizer and warm–up



Economizer Footnotes

1. OPTIONAL-SECOND A7 INSTALLED IN RETURN AIR PROVIDES DIFFERENTIAL ENTHALPY CONTROL
2. WHEN 1S RECEIVES POWER, 1S1 CLOSES.
3. FACTORY INSTALLED 620 OHM, 1 WATT, 5% RESISTOR. REMOVE WHEN SECOND A7 SENSOR IS INSTALLED TO PROVIDE DIFFERENTIAL ENTHALPY CONTROL
4. WHEN W7400 CONTROL IS USED, REMOVE J26 JUMPER AND INSTALL J28. J28 AND K7 RELAY ARE PART OF W7400 KIT (74G11)
5. K11 NITE RELAY MAY NOT BE PART OF ECONOMIZERS ON UNITS BELOW 7.5T CAPACITY

Thermostat Footnotes

1. J3 MAXIMUM LOAD 20VA 24VAC CLASS II

DESCRIPTION	
KEY	COMPONENT
CMC3-1	timer-clock
DL7	delay-readout
J3	jack-economizer
J8	jack-warm up kit
J16	jack-unit
K40,-1	relay-warm up kit-ht latch
K41,-1,2,3,4	relay-warm up kit-latch
K42,-1	relay-warm up kit-clock
P8	plug-warm up kit
P16	plug-unit
S1	thermostat-room
S12	thermostat-nite
TB1	block-terminal(low volt)

DESCRIPTION	
KEY	COMPONENT
A6	control-enthalpy W7459A
A7	sensor-enthalpy
B7	motor-damper
J26	jack-enthalpy
J28	jack-W7400
K7,-1	relay-W7400
K11,-1,2	relay-nite setback
P4	plug-economizer
P26	plug-enthalpy
R1	sensor-supply air
TB11	strip-terminal

LENNOX® Industries Inc.	WIRING DIAGRAM	8/87
ACCESS-COMBINATION UNITS-ROOFTOP		
THERMOSTAT SECTION FOR GCS,CHA,CHP11 & 16 SERIES UNITS WITH WARM UP KIT		
THERMOSTAT SECTION-C2-1		
Supersedes Form No.	New Form No.	

Litho U.S.A.

LENNOX® Industries Inc.	WIRING DIAGRAM	4/89
ACCESS-COMBINATION UNITS-ROOFTOP		
REMD16M EMDH16M REMD11M EMD17-95/135 (MODULATING ECONOMIZER)		
ECONOMIZER-SECTION D5		
Supersedes Form No.	New Form No.	

Litho U.S.A.

C2–1 DIAGRAM WITH D5 DIAGRAM

D–Electromechanical Thermostat with Modulating Economizer and Warm–Up

C2–1 Section with D5 Section

An optional feature of the REMD24M economizer is a warm–up kit which holds economizer outdoor air dampers closed during night heat operation and while the CHA24 is warming the building after night setback. The warm–up kit temporarily disables the economizer (outdoor dampers are held closed) during morning warm–up to keep cool outside air from being mixed with return air. Once the temperature setpoint is reached, the economizer is allowed to operate normally (outdoor air dampers open to minimum position to allow required minimum air exchange).

NOTE – In order to understand how optional controls affect operation of the CHA24, you must first read and understand how all the CHA24 components work.

NOTE –

1–The warm–up kit requires the use of optional time clock CMC3–1.

2–Optional field installed night relay K11 and night thermostat S12 are also required.

3–The warm–up kit can only be applied to a CHA24 that has an economizer.

WARNING – CONNECT ONLY RELAY KITS DESIGNED FOR THIS CONTROL SYSTEM. RELAY KITS DESIGNED FOR OTHER CONTROL SYSTEMS ARE NOT COMPATIBLE AND CONTROL DAMAGE OR FAILURE WILL RESULT. FOR EXAMPLE, A W973 RELAY KIT MUST NOT BE CONNECTED TO A ELECTROMECHANICAL THERMOSTAT CONTROL SYSTEM.

WARNING – BE CAREFUL TO CONNECT RELAY KITS TO THE PROPER JACK AND PLUG IN THE CHA24 BLOWER COMPARTMENT. REFER TO WIRING DIAGRAM. IMPROPER CONNECTION WILL CAUSE CONTROL FAILURE.

The warm–up kit mounts in the control mounting area of the CHA24 blower compartment. No wiring is required. Jumper plug P3 is removed and discarded. Warm–up kit harness plug P8 connects directly into jack J3 in the blower compartment. Warm–up kit harness jack J8 connects to economizer harness plug P4.

Operation Sequence:

NOTE–This operation sequence emphasizes warm–up kit operation. Unit diagram has been omitted.

1– When relay K41 is energized during normal operation, the economizer functions normally and is locked in until night setback.

2– Economizer outdoor air dampers drive full closed anytime blower B3 is not operating.

Night Setback:

3– Time clock CMC3–1 should be adjusted so that clock contacts remain closed during hours when the building is not occupied. The contacts are set to open shortly (usually 1 hour) before the building is to be occupied.

4– When clock contacts close, relay K11 in the economizer and K42 in the warm–up kit are energized.

5– Contacts K11–1 open to disconnect power to thermostat S1. K11–2 contacts open to drive the dampers full closed.

6– Contacts K42–1 open to disengage relay K41.

7– When relay K41 disengages, power is disconnected to the economizer:

1–Contacts K41–1 open to lock out economizer operation.

a–Contacts K41–2 close (not used).

b–Contacts K41–3 open to disconnect power to the economizer.

c–Contacts K41–4 open (not used).

8– During unoccupied periods, K11–1 opens and S1 is disabled. When S12 closes, power is returned to S1 and the unit operates (heating demand) normally. When S12's setpoint is reached, S12 opens, S1 is disabled and unit operation stops.

9– Blower operates only on demand energized by CHA24 heat relay K25 when S12 is closed.

10– Thermostat S1 and economizer remain inoperable until time clock CMC3–1 contacts open.

First Heat Demand After Night Setback (Begin Warm–Up)

11– Shortly before the building is to be occupied, time clock CMC3–1 contacts open.

12– Relay K42 disengages and contacts K42–1 close.

13– Relay K11 disengages. Contacts K11–1 close to allow power to thermostat S1. Contacts K11–2 close to allow outdoor air dampers to open. Note that dampers remain closed until relays K3 and K41 are energized.

14– Since contacts K40–1 are normally closed and contacts K42–1 have just switched closed, timer DL7 is energized. Timer DL7 is normally open and closes 30 sec. after being energized.

15– If heat demand W1 reaches relay K40 before delay DL7 closes, contacts K40–1 open, delay DL7 loses power and resets and the economizer is locked out for the first heat demand by relay K41 (contacts K41–3 remain open). If heat demand W1 reaches relay K40 after delay DL7 closes, relay K41 energizes and the economizer locks in for the day until night setback.

16– When first heat demand is satisfied, relay K40 disengages and relay contacts K40–1 close. Relay contacts K42–1 are already closed (clock contacts open). Time delay DL7 begins 30 sec. count. If a second heat demand W1 reaches relay K40 within 30 sec., delay DL7 loses power and resets. If a second heat demand W1 does not reach relay K40 within 30 sec., time delay DL7 contacts close and relay K41 energizes.

17– When relay K41 energizes, the economizer is allowed to operate normally, controlled by relay K3:

a–Contacts K41–1 closes to lock in economizer operation until night setback.

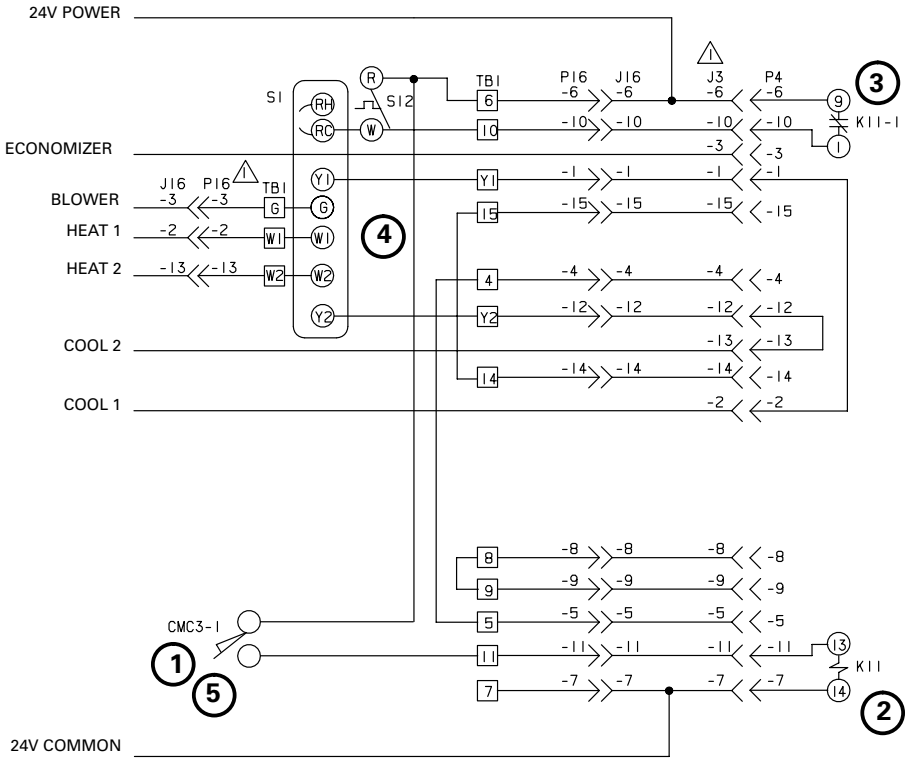
b–Contacts K41–2 opens (not used).

c–Contacts K41–3 closes to allow power to the economizer.

d–Contacts K41–4 closes (not used).

18– Once energized, relay K41 locks in and the economizer operates until relay K42 is energized by night setback (contacts K42–1 open to disengage relay K41).

C11–1 diagram *electromechanical thermostat with night setback relay kit*



DESCRIPTION	
KEY	COMPONENT
CMC3-1	timer-clock
J3	jack-economizer
J16	jack-unit
K11,-1	relay-nite setback
P4	plug-nite kit
P16	plug-unit
S1	thermostat-room
S12	thermostat-nite
TB1	block-terminal(low volt)

LENNOX® Industries Inc. WIRING DIAGRAM 2/87 5/87

ACCESS-COMBINATION UNITS-ROOFTOP

ELECTROMECHANICAL THERMOSTAT FOR GCS,CHA,CHP11 & 16 SERIES UNITS WITH NITE KIT

THERMOSTAT SECTION-C11-1

Supersedes Form No. | New Form No.

Litho U.S.A.

C11 DIAGRAM

E–Electromechanical Thermostat with Night Setback Thermostat and without Economizer

C11 SECTION (electromechanical thermostat with night relay kit)

Optional night (setback relay) kit allows CHA24 units without economizer (REMD16 or EMDH16) to automatically setback the thermostat to reduce energy consumption during times when the building is not occupied. The night kit achieves this by electrically disconnecting thermostat S1 and connecting a night thermostat during periods when the building is not occupied. The night thermostat can then be adjusted with a lower setpoint as needed for unoccupied heating.

NOTE – In order to understand how these optional controls affect the operation of the CHA24, you must first understand how all CHA24 components work. Refer to the operation sequence for basic unit operation.

WARNING – CONNECT ONLY RELAY KITS DESIGNED FOR THIS CONTROL SYSTEM. RELAY KITS DESIGNED FOR OTHER CONTROL SYSTEMS ARE NOT COMPATIBLE AND CONTROL DAMAGE OR FAILURE WILL RESULT. FOR EXAMPLE, ON UNITS USING AN ELECTROMECHANICAL THERMOSTAT WITHOUT AN ECONOMIZER, A WARM–UP KIT MUST NOT BE CONNECTED. ONLY THE OPTIONAL NIGHT KIT CAN BE USED.

WARNING – BE CAREFUL TO CONNECT RELAY KITS TO THE PROPER JACK AND PLUG IN THE CHA24 BLOWER COMPARTMENT. REFER TO WIRING DIAGRAM. IMPROPER CONNECTION WILL CAUSE CONTROL FAILURE.

NOTE –

1–The night kit accessory requires the use of optional time clock CMC3–1 and optional night thermostat.

2–The time clock accessory requires the use of field wired night kit relay K11.

No wiring is required for installing the kit. Jumper plug P3 is removed from the unit and discarded. Night kit harness plug P4 connects directly into jack J3 in the unit blower compartment.

Night Setback:

NOTE–This operation sequence emphasizes night kit operation. Unit diagram has been omitted.

1– Time clock CMC3–1 contacts are open during normal operation of the unit when the building is occupied. All cooling and heating stages function normally.

2– When clock contacts switch closed (when the building is not occupied) relay K11 is energized.

3– When relay K11 is energized, contacts K11–1 open disconnecting power to thermostat S1. Thermostat S1 remains disconnected until clock contacts open (usually 1 hour before the building is to be occupied). During the time thermostat S1 is disconnected, night thermostat S12, which has been set at a lower setpoint than S1, controls operation of the unit.

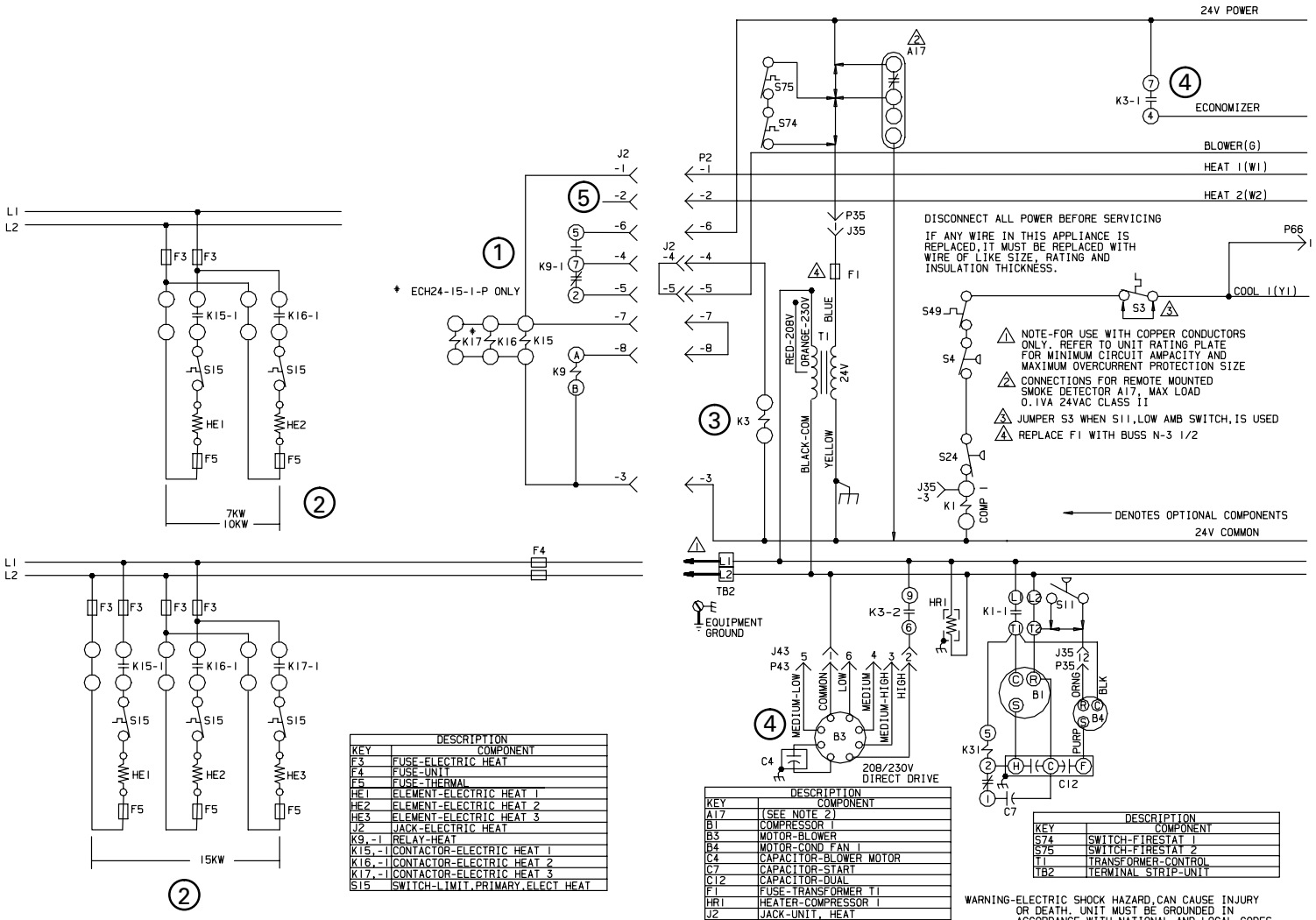
During unoccupied periods, K11–1 opens and S1 is disabled. When S12 closes, power is supplied to S1 and the unit operates normally. When S12's setpoint opens, S1 is disabled and unit operation stops.

4– The blower operates as normal, controlled by heating demand when S12 is closed.

5– Shortly before the building is to be occupied, time clock CMC3–1 contacts open and relay K11 is de–energized. Contacts K11–1 then close and power is restored to thermostat S1.

A1diagram with B2 diagram

7, 10, or 15 KW electric heat matched to 208/230V single phase packaged unit



DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
F5	FUSE-THERMAL
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
J2	JACK-ELECTRIC HEAT
K9,-1	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
K16,-1	CONTACTOR-ELECTRIC HEAT 2
K17,-1	CONTACTOR-ELECTRIC HEAT 3
S15	SWITCH-LIMIT,PRIMARY,ELECT HEAT

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 2)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
C7	CAPACITOR-START
C12	CAPACITOR-DUAL
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER
K31	RELAY-POTENTIAL
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1

DESCRIPTION	
KEY	COMPONENT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB2	TERMINAL STRIP-UNIT

WARNING-ELECTRIC SHOCK HAZARD,CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

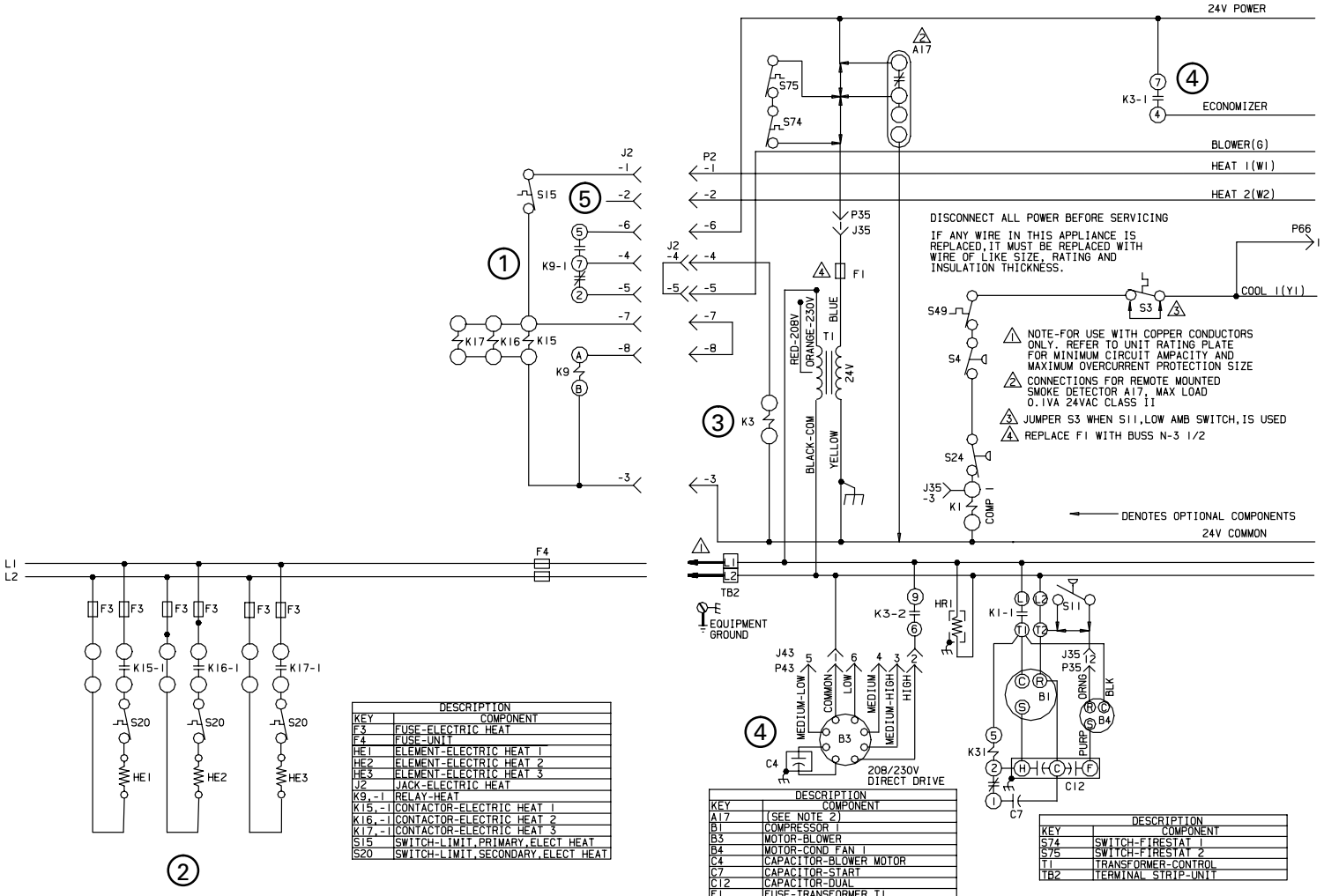
LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc.	WIRING DIAGRAM	12/93
HEATING-ELECTRIC		
ECH24-7,10,15-1-P		
HEATING SECTION A1		
Supersedes Form No.	New Form No. 529,661W	

LENNOX Industries Inc.	WIRING DIAGRAM	11/93
COOLING UNITS-PACKAGED		
CHA24D-651-1-P		
COOLING SECTION B2		
Supersedes Form No.	New Form No. 529,520W	

A1diagram with B2 diagram

20 or 25 KW electric heat matched to 208/230V single phase packaged unit



DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
J2	JACK-ELECTRIC HEAT
K9,-1	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
K16,-1	CONTACTOR-ELECTRIC HEAT 2
K17,-1	CONTACTOR-ELECTRIC HEAT 3
S15	SWITCH-LIMIT,PRIMARY,ELECT HEAT
S20	SWITCH-LIMIT,SECONDARY,ELECT HEAT

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 2)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
C7	CAPACITOR-START
C12	CAPACITOR-DUAL
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER
K31	RELAY-POTENTIAL
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1

DESCRIPTION	
KEY	COMPONENT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
TB2	TERMINAL STRIP-UNIT

WARNING-ELECTRIC SHOCK HAZARD,CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc.	WIRING DIAGRAM	9/93
HEATING-ELECTRIC		
ECH24-20,25-1-P		
HEATING SECTION A1		
Supersedes Form No.	New Form No. 529,662W	

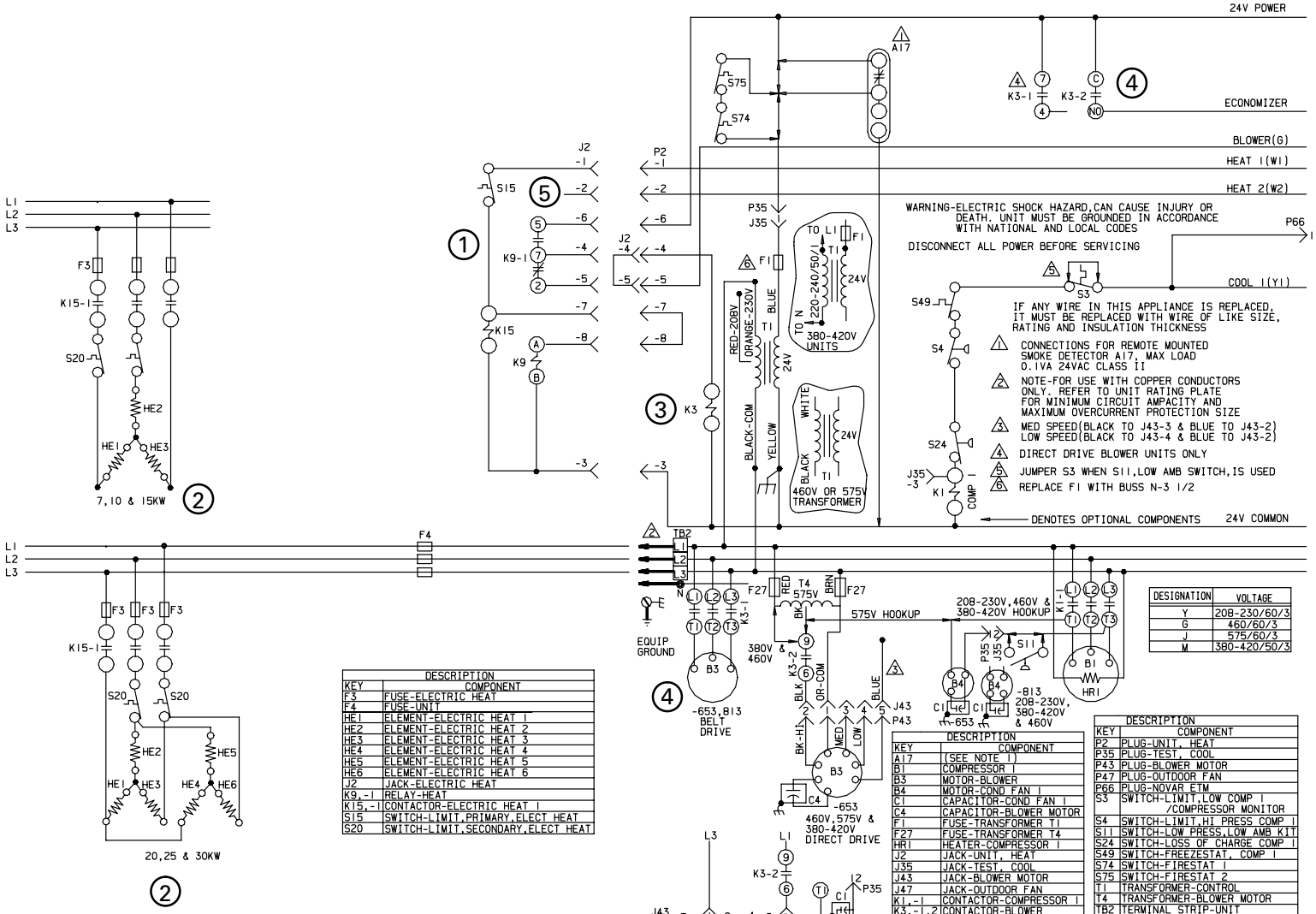
 Litho U.S.A.

LENNOX Industries Inc.	WIRING DIAGRAM	11/93
COOLING UNITS-PACKAGED		
CHA24D-651-1-P		
COOLING SECTION B2		
Supersedes Form No.	New Form No. 529,520W	

 Litho U.S.A.

A1diagram with B2 diagram

7, 10, 15, 20, 25 or 30 KW electric heat matched to 208/230, 460, or 575V three phase packaged unit



DESIGNATION	VOLTAGE
Y	208-230/60/3
G	460/60/3
J	575/60/3
M	380-420/50/3

DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
HE4	ELEMENT-ELECTRIC HEAT 4
HE5	ELEMENT-ELECTRIC HEAT 5
HE6	ELEMENT-ELECTRIC HEAT 6
J2	JACK-ELECTRIC HEAT
K9,-1	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
S15	SWITCH-LIMIT,PRIMARY,ELECT HEAT
S20	SWITCH-LIMIT,SECONDARY,ELECT HEAT

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 1)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C1	CAPACITOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
F1	FUSE-TRANSFORMER T1
F27	FUSE-TRANSFORMER T4
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
J47	JACK-OUTDOOR FAN
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER

DESCRIPTION	
KEY	COMPONENT
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P47	PLUG-OUTDOOR FAN
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR
TB2	TERMINAL STRIP-UNIT

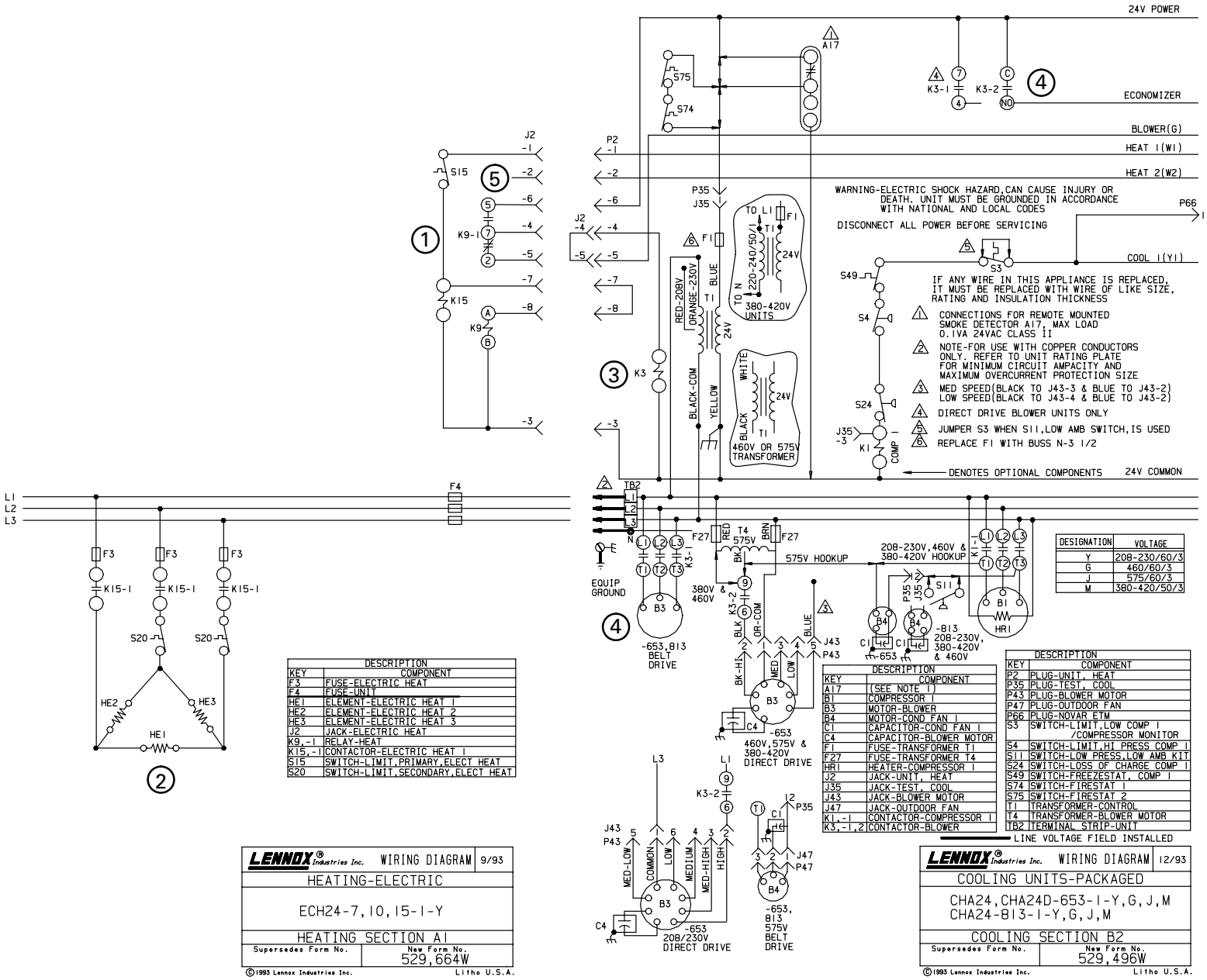
LINE VOLTAGE FIELD INSTALLED

LENNOX® Industries Inc.	WIRING DIAGRAM	9/93
HEATING-ELECTRIC		
ECH24-7,10,15,20,25,30-1-G,J		
HEATING SECTION A1		
Supersedes Form No.	New Form No. 529,663W	

LENNOX® Industries Inc.	WIRING DIAGRAM	12/93
COOLING UNITS-PACKAGED		
CHA24,CHA24D-653-1-Y,G,J,M CHA24-813-1-Y,G,J,M		
COOLING SECTION B2		
Supersedes Form No.	New Form No. 529,496W	

A1diagram with B2 diagram

7, 10, or 15 KW electric heat matched to 208/230, 460, or 575V three phase packaged unit



DESIGNATION	VOLTAGE
Y	208-230/60/3
G	460/60/3
J	575/60/3
M	380-420/50/3

DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
J2	JACK-ELECTRIC HEAT
K9,-1	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
S15	SWITCH-LIMIT,PRIMARY,ELECT HEAT
S20	SWITCH-LIMIT,SECONDARY,ELECT HEAT

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 1)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C1	CAPACITOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
F1	FUSE-TRANSFORMER T1
F27	FUSE-TRANSFORMER T4
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
J47	JACK-OUTDOOR FAN
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER

DESCRIPTION	
KEY	COMPONENT
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P47	PLUG-OUTDOOR FAN
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR
TB2	TERMINAL STRIP-UNIT

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc. WIRING DIAGRAM 9/93

HEATING-ELECTRIC

ECH24-7,10,15-1-Y

HEATING SECTION A1

Supersedes Form No. | New Form No. 529,664W

LENNOX Industries Inc. WIRING DIAGRAM 12/93

COOLING UNITS-PACKAGED

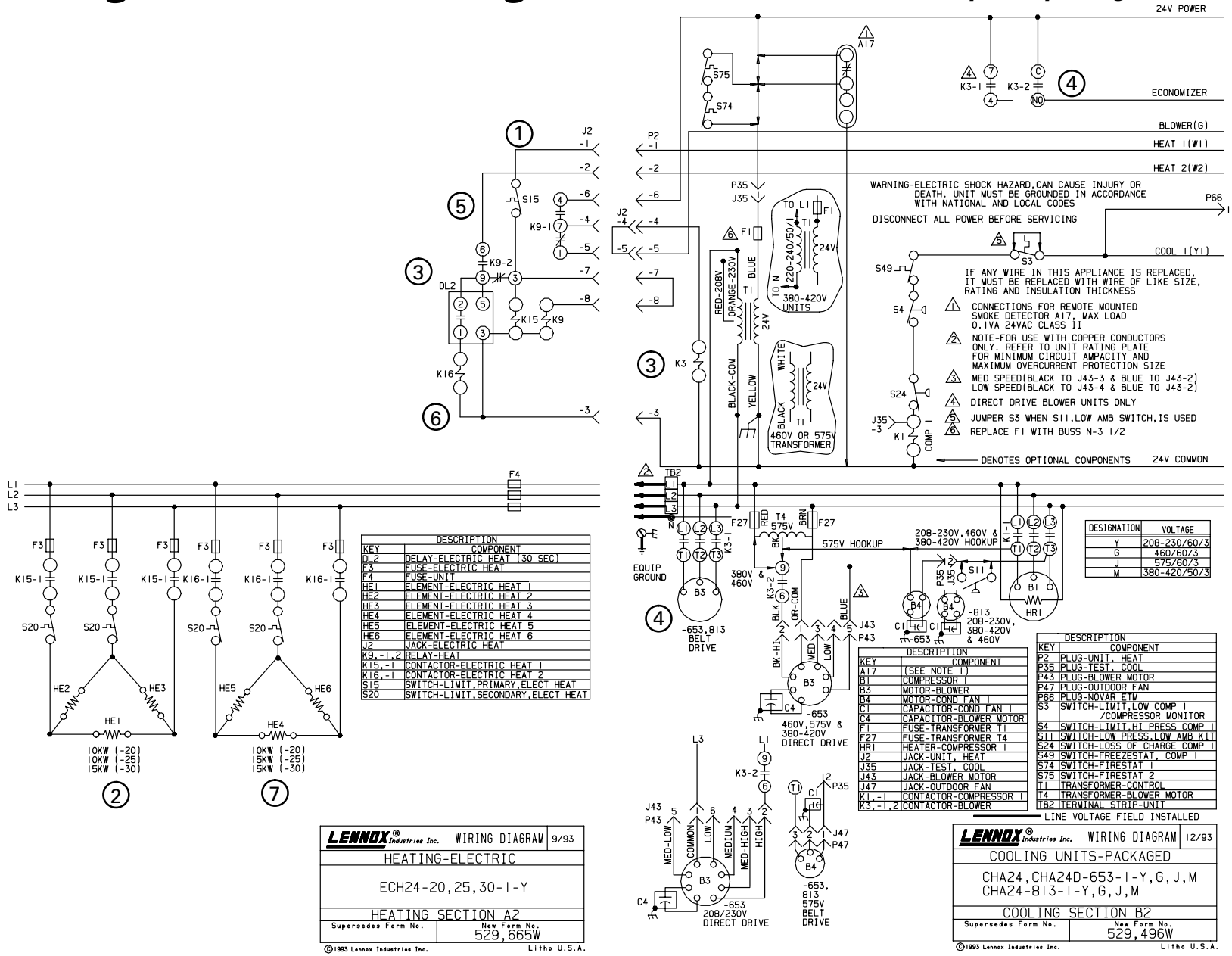
CHA24,CHA24D-653-1-Y,G,J,M
CHA24-813-1-Y,G,J,M

COOLING SECTION B2

Supersedes Form No. | New Form No. 529,496W

A1diagram with B2 diagram

20, 25, 30 KW electric heat matched to 208/230, 460, or 575V three phase packaged unit



DESCRIPTION	
KEY	COMPONENT
DL2	DELAY-ELECTRIC HEAT (30 SEC)
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
HE4	ELEMENT-ELECTRIC HEAT 4
HE5	ELEMENT-ELECTRIC HEAT 5
HE6	ELEMENT-ELECTRIC HEAT 6
J2	JACK-ELECTRIC HEAT
K9,-1,2	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
K16,-1	CONTACTOR-ELECTRIC HEAT 2
S15	SWITCH-LIMIT,PRIMARY,ELECT HEAT
S20	SWITCH-LIMIT,SECONDARY,ELECT HEAT

DESIGNATION	VOLTAGE
Y	208-230/60/3
G	460/60/3
J	575/60/3
M	380-420/50/3

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 1)
B1	COMPRESSOR 1
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C1	CAPACITOR-COND FAN 1
C4	CAPACITOR-BLOWER MOTOR
F1	FUSE-TRANSFORMER T1
F27	FUSE-TRANSFORMER T4
HR1	HEATER-COMPRESSOR 1
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
J43	JACK-BLOWER MOTOR
J47	JACK-OUTDOOR FAN
K1,-1	CONTACTOR-COMPRESSOR 1
K3,-1,2	CONTACTOR-BLOWER

DESCRIPTION	
KEY	COMPONENT
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P43	PLUG-BLOWER MOTOR
P47	PLUG-OUTDOOR FAN
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S49	SWITCH-FREEZESTAT, COMP 1
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR
TB2	TERMINAL STRIP-UNIT

LINE VOLTAGE FIELD INSTALLED

LENNOX® Industries Inc. WIRING DIAGRAM 9/93

HEATING-ELECTRIC

ECH24-20,25,30-1-Y

HEATING SECTION A2

Supersedes Form No. | New Form No. 529,665W

 Litho U.S.A.

LENNOX® Industries Inc. WIRING DIAGRAM 12/93

COOLING UNITS-PACKAGED

CHA24,CHA24D-653-1-Y,G,J,M
CHA24-813-1-Y,G,J,M

COOLING SECTION B2

Supersedes Form No. | New Form No. 529,496W

 Litho U.S.A.

A1 WITH B2 DIAGRAM

F–Electric Heat with CHA24 Packaged Unit

Operation Sequence: A1 and B2 Sections (Page 38)
(7/10/15KW 208/230V electric heat wired to CHA24D–651)

1– First stage heating demand closes W1. W1 energizes contactors K15, K16, K17 (K17 is only in the 15KW heat section) and relay K9. K15-1, K16-1, K17-1 contacts close and K9-1 switches.
2– When K15-1, K16-1, and K17-1 close, heating elements HE1, HE2 and HE3 are energized.
3– When K9-1 switches, indoor blower contactor K3 is energized.
4– When K3 is energized, the indoor blower is powered (and optional economizer opens to minimum position).
5– Additional heating demand W2 is not used.

Operation Sequence: A1 and B2 Sections (Page 39)
(20/25KW 208/230V electric heat wired to CHA24D–651)

1– First stage heating demand closes W1. W1 passes through primary limit S15 to energize contactors K15, K16, K17 and relay K9. K15-1, K16-1, K17-1 contacts close and K9-1 switches.
2– When K15-1, K16-1, and K17-1 close, heating elements HE1, HE2 and HE3 are energized.
3– When K9-1 switches, indoor blower contactor K3 is energized.
4– When K3 is energized, the indoor blower is powered (and optional economizer opens to minimum position).
5– Additional heating demand W2 is not used.

Operation Sequence: A1 and B2 Sections (Page 40)
(7/10/15/20/25/30KW 460/575V electric heat wired to CHA24(D)–653/CHA24–813)

1– First stage heating demand closes W1. W1 passes through primary limits S15 to energize contactor K15 and relay K9. K15-1 contacts close and K9-1 switches.
2– When K15-1 closes, heating elements HE1, HE2, HE3, HE4, HE5, and HE6 (HE4, HE5, HE6 only in 20, 25, 30 KW) are energized.
3– When K9-1 switches, indoor blower contactor K3 is energized.
4– When K3 is energized, the indoor blower is powered (and optional economizer opens to minimum position).
5– Additional heating demand W2 is not used.

Operation Sequence: A1 and B2 Sections (Page 41)
(7/10/15KW 208/230V electric heat wired to CHA24(D)–653/CHA24–813)

1– First stage heating demand closes W1. W1 passes through primary limits S15 to energize contactor K15 and relay K9. K15-1 contacts close and K9-1 switches.
2– When K15-1 closes, heating elements HE1, HE2, and HE3 are energized.
3– When K9-1 switches, indoor blower contactor K3 is energized.
4– When K3 is energized, the indoor blower is powered (and optional economizer opens to minimum position).
5– Additional heating demand W2 is not used.

Operation Sequence: A1 and B2 Sections (Page 42)
(20/25/30KW 208/230V electric heat wired to CHA24(D)–653/CHA24–813)

1– 1st stage heating demand closes W1. W1 passes through primary limits S15 to energize contactor K15 and relay K9. K15-1 contacts close and K9-1 and K9-2 both switch.
2– When K15-1 closes, heating elements HE1, HE2, and HE3 are energized.
3– When K9-1 switches, indoor blower contactor K3 is energized. When K9-2 switches, time delay DL2 is enabled (circuit is closed to W2).
4– When K3 is energized, the indoor blower is powered (and optional economizer opens to minimum position).
5– Additional heating demand W2 passes through K9-2 to energize time delay DL2.
6– DL2 closes after 30 seconds. Contactor K16 is energized.
7– When K16-1 closes, heating elements HE4, HE5, and HE6 are energized.

NOTES