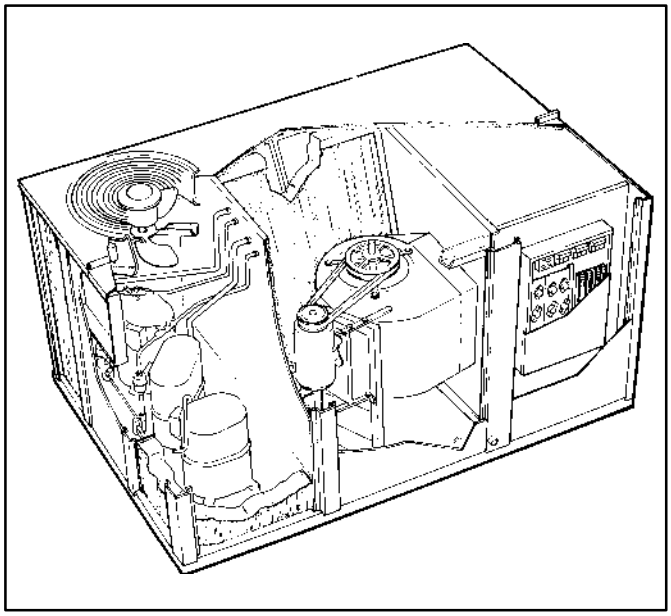
CHA16 SERIES

CHA16 series units are packaged commercial air conditioners. All units provide two-stage dx cooling. 15 ton units are equipped with three compressors. All other units are equipped with two compressors. Optional electric heat sections install inside the cabinet and are available in 10kW through 90kW input sizes. Electric heat operates in single or multiple stages depending on kW input size. Units are designed for rooftop or side of building installation with either bottom or horizontal discharge and return air.

For commercial applications, the CHA16 is designed to accept any of several different thermostat control systems with minimum field wiring. Control options such as economizer, warm up kit, Honeywell W973 control, Honeywell W7400 control or other field specified controls 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 thermostat field wiring.

All specifications in this manual are subject to change.



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SPECIFICATIONS - CHA16-823 & CHA16-953

Model No.			CHA16-823	CHA16-953
*ARI Standard 210/240 Ratings	Total cooling capacity (Btuh)		73,000	88,000
	Total unit watts		8,110	9,780
	EER (Btuh/Watts)		9.0	9.0
★ARI Standard 270 SRN (Bels)			8.6	8.6
Refrigerant (22) Charge	Stage 1		5 lbs. 10 oz.	6 lbs. 4 oz.
	Stage 2		5 lbs. 2 oz.	5 lbs. 14 oz.
Evaporator Blower and Drive Selection	Blower wheel nominal diameter x width (in.)		12 x 12	
	**Factory Installed Drives	Nominal motor horsepower	2	
		Maximum usable horsepower	2.30	
		Voltage & phase	208/230/460v-3ph	
		RPM range	740 — 1010	
Evaporator Coil	Net face area (sq. ft.)		7.75	
	Tube diameter (in.) & No. of rows		3/8 — 3	
	Fins per inch		14	
Condenser Coil	Net face area (sq. ft.)		15.67	
	Tube diameter (in.) & No. of rows		3/8 — 2	
	Fins per inch		20	
Condenser Fans	Diameter (in.) & No. of blades		24 — 4	
	Air volume (cfm)		4800	5300
	Motor horsepower		1/2	3/4
	Motor watts		620	660
Condensate drain size mpt (in.)			3/4	
No. & size of filters (in.)			(4) 16 x 20 x 2	
Electrical characteristics			208/230v or 460v — 60 hertz — 3 phase	

★Sound Rating Number in accordance with ARI Standard 270.
*Rated in accordance with ARI Standard 210/240; 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air.
**Using total air volume and system static pressure requirements determine from blower performance tables rpm and bhp required. Maximum usable hp of motors furnished by Lennox are shown. If motors of comparable hp are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

OPTIONAL ACCESSORIES CHA16-823 & CHA16-953 (Ordered Extra)

Unit Model No.			CHA16-823 & CHA16-953
Electric Heat	Model No.		ECH16-82/95
	Kw input range		10-15-20-30-40
	*Fuse Block	208/230 volt	**61H86** (-823) **61H83** (-953)
		460 volt	**61H87** (-823) **61H84** (-953)
Roof Mounting Frame			RMF16-95 **(32G90)**
Economizer Dampers — No. & size of filters (in.)			REMD16M-95 **(74G22)** (2) 16 x 25 x 1
Horizontal Economizer Dampers — No. & size of filters (in.)			EMDH16M-95 **(24H03)** (2) 16 x 25 x 1
Exhaust Dampers (Net Face Area)			GED16-95/135/160 (0.43 sq. ft.) **(34G80)**
Differential Enthalpy Control			**54G44**
Horizontal Supply and Return Air Kit (LB-55756BA)			**34G71**
Bottom Power Entry Kit (LB-55757CA)			**34G70**
Ceiling Supply and Return Air Diffusers (Net Weight)	Step-Down		RTD11-95 **(29G04)**
	Flush		FD11-95 **(29G05)**
	Transition		SRT16-95 **(33G96)**
Outdoor Air Dampers — No. & size of filters (in.)			OAD16-95 **(35G26)** (1) 16 x 20 x 1
Automatic OAD16 Damper Kit			**35G21**
Low Ambient Control Kit (LB-57113BG)			**15J80**
Timed-Off Control (2) LB-50709BA			**40G20**

*Must be ordered extra. Factory installed heaters will have fuse block installed. Fuse block must be field installed in field installed heaters.

SPECIFICATIONS — CHA16-1353 & CHA16-1603

Model No.			CHA16-1353	CHA16-1603
*ARI Standard 210/240 Ratings or Standard ☆360 Ratings	Total cooling capacity (btuh)		119,000	☆142,000
	Total unit watts		13,220	☆16,820
	EER (Btuh/Watts)		9.0	☆8.50
	Integrated Part Load Value		- - - -	☆8.8
★ARI Standard 270 SRN (Bels)			8.8	- - - -
Refrigerant (22) Charge	Stage 1		7 lbs. 4 oz.	10 lbs. 12 oz.
	Stage 2			7 lbs. 12 oz.
Evaporator Blower and Drive Selection	Blower wheel nominal diameter x width (in.)		15 x 15	
	**Factory Installed Drives	Nominal motor horsepower	2	3
		Maximum usable horsepower	2.30	3.45
		Voltage & phase	208/230/460v-3ph	
		RPM range	730 — 950	
	**Optional Factory Installed Drives	Nominal motor horsepower	3	- - - -
		Maximum usable horsepower	3.45	- - - -
		Voltage & phase	208/230/460v-3ph	- - - -
		RPM range	730 — 950	- - - -
Evaporator Coil	Net face area (sq. ft.)		9.46	11.9
	Tube diameter (in.) & No. of rows		3/8 — 4	3/8 — 3
	Fins per inch		12	12
Condenser Coil	Net face area (sq. ft.)		20.0	24.4
	Tube diameter (in.) & No. of rows		3/8 — 2	3/8 — 2
	Fins per inch		20	
Condenser Fans	Diameter (in.) & No. of blades		(2) 20 — 5	(2) 22 — 4
	Air volume (cfm)		6400 Total	7700 Total
	Motor horsepower		(2) 1/3	(2) 1/2
	Motor watts		875 Total	1050 Total
Condensate drain size mpt (in.)			3/4	
No. & size of filters (in.)			(4) 16 x 25 x 2	(4) 20 x 25 x 2
Electrical characteristics			208/230v or 460v — 60 hertz — 3 phase	

★Sound Rating Number in accordance with ARI Standard 270.
*Rated in accordance with ARI Standard 210/240 or ☆360; 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air.
**Using total air volume and system static pressure requirements determine from blower performance tables rpm and bhp required. Maximum usable hp of motors furnished by Lennox are shown. If motors of comparable hp are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

OPTIONAL ACCESSORIES — CHA16-1353 & CHA16-1603 (Ordered Extra)

Unit Model No.			CHA16-1353	CHA16-1603
Electric Heat	Model No.		ECH16-135/160	ECH16-135/160
	Kw input range		15-20-30-40-50	
	*Fuse Block	208/230 volt	**72G10**	**72G13**
		460 volt	**72G11**	**72G14**
Roof Mounting Frame			RMF16-135/160 **(32G91)**	
Economizer Dampers No. & size of filters (in.)			REMD16M-135 (2) 16 x 25 x 1 **(74G23)**	REMD16M-160 (2) 20 x 25 x 1 **(51G25)**
Horizontal Economizer Dampers No. & size of filters (in.)			EMDH16M-135 (2) 16 x 25 x 1 **(24H04)**	EMDH16M-160 (2) 20 x 25 x 1 **(24H05)**
Exhaust Dampers (Net Face Area)			GED16-95/135/160 (0.43 sq. ft.) **(34G80)**	
Differential Enthalpy Control			**54G44**	
Horizontal Supply and Return Air Kit			LB-55756BB **(35G42)**	LB-55756BC **(51G27)**
Bottom Power Entry Kit (LB-55757CA)			**34G70**	
Ceiling Supply and Return Air Diffusers	Step-Down		RTD11-135 **(29G05)**	RTD11-185 **(29G06)**
	Flush		FD11-135 **(29G09)**	FD11-185 **(29G10)**
	Transition		SRT16-135 **(97H10)**	SRT16-160 **(97H11)**
Outdoor Air Dampers No. & size of filters (in.)			OAD16-135 **(35G25)** (1) 16 x 20 x 1	OAD16-160 **(51G30)** (1) 16 x 20 x 1
Automatic OAD16 Damper Kit			**35G21**	
Low Ambient Control Kit			LB-57113BH **(16J86)**	LB-57113BJ **(16J87)**
Timed-Off Control (2) LB-50709BA			**40G20**	

*Must be ordered extra. Factory installed heaters will have fuse block installed. Fuse block must be field installed in field installed heaters.

SPECIFICATIONS — CHA16-1853

Model No.			CHA16-1853
*ARI Standard 360 Ratings	Total cooling capacity (btuh)		178,000
	Total unit watts		20,300
	EER (Btuh/Watts)		8.8
	Integrated Part Load Value		9.6
Refrigerant (22) Charge	Stage 1		7 lbs. 9 oz.
	Stage 2		
	Stage 3		
Evaporator Blower and Drive Section	Blower wheel nominal diameter x width (in.)		18 x 18
	Factory Installed **Drives	Nominal motor horsepower	3
		Maximum useable horsepower	3.45
		Voltage & Phase	208/230/460v-3ph
		RPM Range	610 - 780
	Factory Installed **Drives	Nominal motor horsepower	5
		Maximum useable horsepower	5.75
		Voltage & Phase	208/230/460v-3ph
		RPM Range	770 - 980
Evaporator Coil	Net face area (sq. ft.)		16.0
	Tube diameter (in.) & No. of rows		3/8 — 3
	Fins per inch		13
Condenser Coil	Net face area (sq. ft.)		30.5
	Tube diameter (in.) & No. of rows		3/8 - 2
	Fins per inch		20
Condenser Fan(s)	Diameter (in.) & No. of blades		(2) 26 — 4
	Air volume (cfm)		12,000 Total
	Motor horsepower		(2) 1
	Motor watts		2200 Total
Condensate Drain Size mpt (in.)			1
No. & Size of filters (in.)			(4) 24 x 24 x 2
Electrical characteristics			208/230 to 460 volt - 60 hertz - 3 phase

*Rated in accordance with ARI Standard 360; 95°F outdoor air temperature and 80°F db/ 67°F wb entering evaporator air; minimum external duct static pressure.
**Using total air volume and system static pressure requirements determine from blower tables rpm and bhp required. Maximum usable hp of motors furnished by Lennox are shown. If motors of comparable hp are used be sure to keep within the service factor limitations outlined on the motor nameplate.

OPTIONAL ACCESSORIES — CHA16-1853 (Ordered Extra)

Unit Model No.			CHA16-1853
Electric Heat	Model No.		ECH16-185/275
	Kw input range		15-30-45-60-75
	*Fuse Block	208/230 volt (with 3 hp motor)	**29H26**
		208/230 volt (with 5 hp motor)	**29H27**
		460 volt	**29H31**
Roof Mounting Frame			RMF16-185 **(12H05)**
Economizer Dampers with Gravity Exhaust— No. & size of filters (in.)			REMD16M-185 **(40H14)** (2) 25 x 25 x 1
Differential Enthalpy Control			**54G44**
Power Exhaust Fans (Down-Flo Only)	Model No.	208/230 volt	PED16-185 **(12H16)**
		460 volt	PED16-185 **(12H17)**
	Diameter (in.) & No. of Blades		(2) 16 — 5
	Total air volume (cfm)		4200
	Motor Horsepower		(2) 1/4
	Watts Input (total)		500
Horizontal Supply and Return Air Kit (LB-55756BD)			**12H04**
Ceiling Supply and Return Air Diffusers	Step-Down		RTD11-185 **(29G06)**
	Flush		FD11-185 **(29G10)**
	Transition		SRT16-185 **(97H12)**
Outdoor Air Dampers — No. & size of filters (in.)			OAD16-185 **(12H03)** (1) 25 x 27 x 1
Automatic OAD16 Damper Kit			**35G21**
Low Ambient Control Kit (LB-57113BK)			**16J88**

*Must be ordered extra. Factory installed heaters will have fuse block installed. Fuse block must be field installed in field installed heaters.

SPECIFICATIONS — CHA16-2553 & CHA16-2753

Model No.			CHA16-2553	CHA16-2753
*ARI Standard 360 Ratings	Total Cooling Capacity (Btuh)		●210,000	†240,000
	Total Unit Watts		21,400	26,700
	EER (Btuh/Watts)		●9.8	†9.0
	Integrated Part Load Value		10.4	9.7
Refrigerant (22) Charge	Stage 1		18 lbs. 8 oz.	19 lbs. 0 oz.
	Stage 2		18 lbs. 8 oz.	19 lbs. 0 oz.
Evaporator Blower and Drive Selection	Blower wheel nominal diameter x width (in.)		20 x 18	
	**Factory Installed Drives	Nominal motor horsepower	5	
		Maximum usable horsepower	5.75	
		Voltage & phase	208/230v-3ph or 460v-3ph	
		RPM range	660 — 840	
	**Optional Factory Installed Drives	Nominal motor horsepower	7.5	
		Maximum usable horsepower	8.60	
		Voltage & phase	208/230v-3ph or 460v-3ph	
		RPM range	750 — 905	
Evaporator Coil	Net face area (sq. ft.)		21.0	
	Tube diameter (in.) & No. of rows		3/8 — 3	
	Fins per inch		13	
Condenser Coil	Net face area (sq. ft.)		48.5	
	Tube diameter (in.) & No. of rows		3/8 — 2	
	Fins per inch		20	
Condenser Fans	Diameter (in.) & No. of blades		(2) 26 — 4	
	Air volume (cfm)		14,000 (Total)	
	Motor horsepower		(2) 1	
	Motor watts		2100 (Total)	
Condensate drain size mpt (in.)			(2) 1	
No. & size of filters (in.)			(6) 20 x 25 x 2	
Electrical characteristics			208/230v or 460v — 60 hertz — 3 phase	

* Rated in accordance with ARI Standard 360; 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure.
**Using total air volume and system static pressure requirements determine from blower performance tables rpm and bhp required. Maximum usable hp of motors furnished by Lennox are shown. If motors of comparable hp are used, be sure to keep within the service factor limitations outlined on the motor nameplate.
●208,000 Btuh and 9.6 EER at 208 volts.
†238,000 Btuh and 8.9 EER at 208 volts.

OPTIONAL ACCESSORIES — CHA16-2553 & CHA16-2753 (Ordered Extra)

Unit Model No.			CHA16-2553 & CHA16-2753	
Electric Heat	Model No.		ECH16-185/275	ECH16-275/300
	Kw input range		30-45-60-75	90
	*Fuse Block	208/230 volt	**50H28**	
		460 volt	**50H31**	
Roof Mounting Frame			RMF16-300 **(41H04)**	
Economizer Dampers with Gravity Exhaust — No. & size of filters (in.)			REMD16M-300 **(44H47)** (3) 20 x 25 x 1	
Differential Enthalpy Control			**54G44**	
Power Exhaust Fans (Down-Flo Only)	Model No.	208/230v	PED16-300 **(44H79)**	
		460v	PED16-300 **(44H80)**	
	Diameter (in.) & No. of Blades		(3) 16 — 5	
	Total air volume (cfm)		6300	
	Motor Horsepower		(3) 1/4	
	Watts Input (total)		750	
Horizontal Supply and Return Air Kit (LB-55756BE)			**41H23**	
Ceiling Supply and Return Air Diffusers	Step-Down		RTD11-275 **(29G07)**	
	Flush		FD11-275 **(29G11)**	
	Transition		SRT16-300 **(97H13)**	
Outdoor Air Dampers — No. & size of filters (in.)			OAD16-300 (1) 26 x 31 x 1 **(40H47)**	
Automatic OAD16 Damper Kit			**35G21**	
Low Ambient Control Kit (LB-57113BL)			**16J89**	

*Must be ordered extra. Factory installed heaters will have fuse block installed. Fuse block must be field installed in field installed heaters.

SPECIFICATIONS — CHA16-3003

Model No.			CHA16-3003
*ARI Standard 360 Ratings	Total Cooling Capacity (btuh)		•284,000
	Total Unit Watts		33,400
	EER (Btuh/Watts)		8.5
	Integrated Part Load Value		9.1
Refrigerant (22) Charge	Stage 1		20 lbs. 0 oz.
	Stage 2		
Evaporator Blower and Drive Selection	Blower wheel nom. diameter x width (in.)		20 x 18
	**Factory Installed Drives	Nominal motor horsepower	7.5
		Max. usable horsepower	8.6
		Voltage & phase	208/230v-3ph or 460v-3ph
		RPM range	610 — 780
	Optional **Factory Installed Drives	Nominal motor horsepower	10
		Max. usable horsepower	11.5
		Voltage & phase	208/230v-3ph or 460v-3ph
		RPM range	770 — 980
Evaporator Coil	Net face area (sq. ft.)		21.0
	Tube diameter (in.) & No. of rows		3/8 — 3
	Fins per inch		13
Condenser Coil	Net face area (sq. ft.)		48.5
	Tube diameter (in.) & No. of rows		3/8 — 3
	Fins per inch		16
Condenser Fans	Diameter (in.) & No. of blades		(2) 26 — 4
	Air volume (cfm)		14,500 (Total)
	Motor horsepower		(2) 1
	Motor watts		2200 (Total)
Condensate drain size mpt (in.)			(2) 1
No. & size of filters (in.)			(6) 20 x 25 x 2
Electrical characteristics			208/230v or 460v — 60 hertz — 3 phase

•Rated at ARI Standard 360 Test Conditions.
* Rated in accordance with ARI Standard 360; 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure.
**Using total air volume and system static pressure requirements determine from blower performance tables rpm and bhp required. Maximum usable hp of motors furnished by Lennox are shown. If motors of comparable hp are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

OPTIONAL ACCESSORIES — CHA16-3003 (Ordered Extra)

Unit Model No.			CHA16-3003
Electric Heat	Model No.		ECH16-185/275 & ECH16-275/300
	Kw input range		30-45-60-75-90
	*Fuse Block	208/230 volt	**50H28**
		460 volt	**50H31**
Roof Mounting Frame			RMF16-300 **(41H04)**
Economizer Dampers with Gravity Exhaust — No. & size of filters (in.)			REMD16M-300 **(44H47)** (3) 20 x 25 x 1
Differential Enthalpy Control			**54G44**
Power Exhaust Fans (Down-Flo Only)	Model No.	208/230v	PED16-300 **(44H79)**
		460v	PED16-300 **(44H80)**
	Diameter (in.) & No. of Blades		(3) 16 — 5
	Total air volume (cfm)		6300
	Motor Horsepower		(3) 1/4
	Watts Input (total)		750
Horizontal Supply and Return Air Kit			**41H23**
Ceiling Supply and Return Air Diffusers	Step-Down		RTD11-275 **(29G07)**
	Flush		FD11-275 **(29G11)**
	Transition		SRT16-300 **(97H13)**
Outdoor Air Dampers — No. & size of filters (in.)			OAD16-300 (1) 26 x 31 x 1 **(40H47)**
Automatic OAD16 Damper Kit			**35G21**
Low Ambient Control Kit			LB-57113BL **(16J89)**

*Must be ordered extra. Factory installed heaters will have fuse block installed. Fuse block must be field installed in field installed heaters.

ELECTRICAL DATA — CHA16-823, -953, -1353 & -1603

Model No.		CHA16-823		CHA16-953		CHA16-1353				CHA16-1603	
Line voltage data — 60 hz — 3 phase		208/230v	460v	208/230v	460v	208/230v		460v		208/230v	460v
Compressors (2)	Rated load amps — each (total)	11.4/11.4 (22.8)	5.3/5.3 (10.6)	14.8/14.1 (28.9)	7.7/7.1 (14.8)	17.3/17.3 (34.6)		9.6/9.6 (19.2)		27.1/17.9 (45.0)	14.2/10.0 (24.2)
	Locked rotor amps — each (total)	66/66 (132.0)	35/35 (70.0)	130/130 (260.0)	64/64 (128.0)	150/150 (300.0)		73/73 (146.0)		183/150 (333.0)	91/73 (164)
Condenser Fan Motor(s)	Full load amps (total)	2.6	1.6	3.7	1.9	2.1/2.1 (4.2)		1.2/1.2 (2.4)		3.0/3.0 (6.0)	1.5/1.5 (3.0)
	Locked rotor amps (total)	5.9	3.3	7.3	3.7	5.1/5.1 (10.2)		2.7/2.7 (5.4)		6.2/6.2 (12.4)	3.4/3.4 (6.8)
Evaporator Blower Motor	Horsepower	2	2	2	2	2	3	2	3	3	3
	Full load amps	7.5	3.4	7.5	3.4	7.5	10.6	3.4	4.8	10.6	4.8
	Locked rotor amps	41.0	20.4	41.0	20.4	41.0	58.0	20.4	26.8	58.0	26.8
**Recommended maximum fuse size (amps)		45	20	50	25	60	60	35	35	90	45
*Minimum Circuit Ampacity		36.0	17.0	44.0	23.0	51.0	54.0	28.0	29.0	69.0	36.0
Unit power factor		.88	.88	.88	.88	.88	.88	.88	.88	.88	.88

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements.
NOTE — Extremes of operating range are plus and minus 10 % of line voltage.
**Where current does not exceed 100 amps, HACR type circuit breaker may be used in place of fuse.

ELECTRICAL DATA — CHA16-1853, -2553, -2753 & -3003

Model No.			CHA16-1853				CHA16-2553				CHA16-2753				CHA16-3003			
Line voltage data — 60 hz — 3 phase			208/230v		460v		208/230v		460v		208/230v		460v		208/230v		460v	
Compressors	Rated load amps	each	(3) 19.2		(3) 9.6		(2) 30.9		(2) 16.8		(2) 37.1		(2) 17.8		(2) 43.0		(2) 21.0	
		total	57.6		28.8		61.8		33.6		74.2		35.6		86.0		42.0	
	Locked rotor amps	each	(3) 124		(3) 62		(2) 205.0		(2) 104.0		(2) 239.0		(2) 120.0		(2) 269.0		(2) 135.0	
		total	372.0		186.0		410.0		208.0		478.0		240.0		538.0		270.0	
Condenser Fan Motors (2)	Full load amps (total)		9.6		4.8		9.6		4.8		9.6		4.8		9.6		4.8	
	Locked rotor amps (total)		24.0		12.0		46.0		23.0		46.0		23.0		46.0		23.0	
Evaporator Blower Motor	Horsepower		3	5	3	5	5	7-1/2	5	7-1/2	5	7-1/2	5	7-1/2	7-1/2	10	7-1/2	10
	Full load amps		10.6	16.7	4.8	7.6	16.7	24.2	7.6	11.0	16.7	24.2	7.6	11.0	24.2	30.8	11.0	14.0
	Locked rotor amps		58.0	91.0	26.8	45.6	105.0	152.0	45.6	66.0	105.0	152.0	45.6	66.0	152.0	193.0	66.0	84.0
Optional Power Exhaust Fans	(No.) Horsepower		(2) — 1/4		(2) — 1/4		(3) — 1/4		(3) — 1/4		(3) — 1/4		(3) — 1/4		(3) — 1/4		(3) — 1/4	
	Full load amps (total)		2.8		1.4		4.2		2.2		4.2		2.2		4.2		2.2	
	Locked rotor amps (total)		6.5		3.3		8.7		3.9		8.7		3.9		8.7		3.9	
**Recommended max. fuse size (amps)	Less exhaust fans		100	110	50	50	110	125	60	70	150	150	70	70	175	175	80	80
	With exhaust Fans		100	110	50	50	125	125	70	70	150	150	70	70	175	175	80	80
Unit power factor	Less exhaust fans		.84	.84	.84	.84	.88	.88	.88	.88	.88	.88	.88	.88	.87	.87	.87	.87
	With exhaust Fans		.84	.84	.84	.84	.88	.88	.88	.88	.88	.88	.88	.88	.87	.87	.87	.87
*Minimum Circuit Ampacity	Less exhaust fans		82.0	92.0	43.0	48.0	101.0	108.0	53.0	57.0	114.0	122.0	55.0	58.0	131.0	138.0	64.0	67.0
	With exhaust Fans		85.0	95.0	45.0	50.0	110.0	117.0	56.0	59.0	118.0	126.0	57.0	61.0	135.0	142.0	66.0	69.0

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements.
NOTE — Extremes of operating range are plus and minus 10 % of line voltage.
**Where current does not exceed 100 amps, HACR type circuit breaker may be used in place of fuse.

CHA16-823 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																	
	.20		.40		.60		.70		.80		.90		1.00		1.10		1.30		1.50	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2200	----	----	----	----	740	0.65	785	0.75	825	0.80	865	0.90	905	0.95	945	1.05	1020	1.20	1090	1.40
2400	----	----	----	----	765	0.75	805	0.85	845	0.90	880	1.00	920	1.10	955	1.15	1025	1.35	1095	1.50
2600	----	----	----	----	790	0.90	825	0.95	865	1.05	900	1.15	935	1.20	970	1.30	1040	1.50	1105	1.70
2800	----	----	740	0.85	815	1.00	850	1.10	885	1.20	920	1.30	955	1.40	985	1.45	1055	1.65	1115	1.85
3000	----	----	770	1.00	840	1.15	875	1.25	910	1.35	940	1.45	975	1.55	1005	1.65	1070	1.85	1130	2.05
3200	735	1.00	805	1.15	870	1.35	905	1.45	935	1.55	965	1.65	1000	1.75	1030	1.85	1090	2.05	1150	2.25
3400	775	1.20	840	1.35	900	1.55	930	1.65	965	1.75	995	1.85	1020	1.95	1050	2.05	1110	2.25	----	----

NOTE — All data is measured external to the unit with dry coil and with the air filters in place. See Pages 11 thru 13 for Accessory Air Resistance data.

CHA16-953 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																	
	.20		.40		.60		.70		8.0		9.0		1.00		1.10		1.30	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2600	----	----	----	----	850	1.15	895	1.30	930	1.40	980	1.50	1020	1.65	1055	1.80	1155	2.05
2800	----	----	800	1.05	875	1.35	920	1.40	955	1.55	995	1.65	1030	1.80	1065	1.95	1145	2.25
3000	----	----	840	1.20	910	1.40	940	1.55	980	1.70	1015	1.90	1050	2.05	1085	2.20	----	----
3200	815	1.20	885	1.45	940	1.70	975	1.75	1005	1.90	1045	2.10	1080	2.20	----	----	----	----
*3400	860	1.45	920	1.65	975	1.85	1010	2.00	1045	2.15	1080	2.30	----	----	----	----	----	----
3600	900	1.70	960	1.90	1015	2.10	1045	2.25	----	----	----	----	----	----	----	----	----	----
3800	950	1.95	995	2.20	----	----	----	----	----	----	----	----	----	----	----	----	----	----

NOTE — All data is measured external to the unit with dry coil and air filters in place. See Pages 11 thru 13 for Accessory Air Resistance data.
*Minimum air volume at .25 in. w. g. with electric heat.

CHA16-1353 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																	
	.20		.40		.60		.70		.80		.90		1.00		1.10		1.30		1.50	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3600	585	0.89	665	1.13	735	1.37	770	1.52	795	1.65	820	1.80	850	1.93	875	2.08	935	2.41	985	2.68
3800	605	1.00	685	1.25	750	1.52	785	1.67	805	1.80	830	1.94	860	2.08	890	2.26	940	2.56	995	2.85
4000	630	1.14	705	1.41	770	1.68	795	1.81	820	1.96	845	2.11	875	2.26	905	2.43	955	2.67	1000	3.01
4200	650	1.29	725	1.57	790	1.86	810	2.01	835	2.16	865	2.31	890	2.46	920	2.63	970	2.93	1005	3.15
4400	680	1.46	745	1.76	800	2.04	825	2.22	855	2.37	880	2.51	910	2.69	930	2.83	980	3.14	----	----
4600	705	1.65	770	1.95	820	2.27	845	2.43	870	2.58	900	2.75	925	2.92	950	3.06	995	3.33	----	----
4800	730	1.85	790	2.17	840	2.50	865	2.66	890	2.82	920	2.99	945	3.15	970	3.32	----	----	----	----
5000	755	2.07	810	2.42	860	2.75	885	2.91	910	3.07	935	3.24	960	3.41	----	----	----	----	----	----
5200	775	2.30	830	2.69	885	3.02	910	3.18	935	3.34	----	----	----	----	----	----	----	----	----	----

NOTE — All data is measured external to the unit with dry coil and with the air filters in place. See Pages11 thru 13 for Accessory Air Resistance data.
NOTE — Data in shaded area denotes optional 3 hp drive kit.

CHA16-1603 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																			
	.20		.40		.60		.70		.80		.90		1.00		1.10		1.30		1.50	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4200	- - - -	- - - -	715	1.53	780	1.77	810	1.91	840	2.05	870	2.17	900	2.31	930	2.45	985	2.77	1035	3.06
4400	- - - -	- - - -	740	1.71	805	1.99	830	2.10	860	2.24	890	2.39	915	2.51	945	2.67	995	2.96	1050	3.31
4600	700	1.66	765	1.82	825	2.17	855	2.33	880	2.45	910	2.60	935	2.75	960	2.89	1015	3.21	1065	3.56
4800	730	1.85	790	2.14	850	2.43	875	2.54	905	2.70	930	2.85	955	3.01	980	3.26	1030	3.41	1080	3.81
5000	755	2.06	815	2.37	875	2.68	900	2.80	925	2.96	950	3.11	975	3.27	1000	3.41	1050	3.75	1095	4.06
5200	785	2.38	845	2.65	900	2.95	920	3.07	950	3.25	975	3.42	1000	3.56	1025	3.75	1070	4.06	1115	4.39
5400	810	2.61	870	2.95	920	3.24	950	3.41	970	3.55	995	3.70	1020	3.87	1045	4.09	1090	4.38	1135	4.74
5600	840	2.95	895	3.23	950	3.58	970	3.72	995	3.88	1020	4.05	1045	4.22	1065	4.37	1100	4.72	1155	5.08
5800	865	3.25	920	3.53	970	3.90	995	4.05	1020	4.25	1045	4.42	1065	4.57	1090	4.76	1130	5.08	1175	5.46

NOTE — All data is measured external to the unit with dry coil and with the air filters in place. See Pages11 thru13 for Accessory Air Resistance data.
NOTE — Data in shaded area denotes field furnished drive kit.

CHA16-1853 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																			
	.20		.40		.60		.70		.80		.90		1.00		1.10		1.30		1.50	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5000	540	1.50	600	1.70	660	1.95	690	2.20	720	2.25	740	2.40	765	2.60	785	2.75	830	3.00	870	3.20
5200	555	1.60	615	1.80	670	2.20	700	2.30	730	2.40	750	2.50	775	2.75	795	2.80	840	3.20	880	3.50
5400	570	1.70	630	2.00	690	2.30	710	2.40	740	2.50	760	2.70	785	2.80	810	3.00	850	3.30	890	3.75
5600	580	1.75	640	2.25	700	2.45	725	2.55	750	2.70	775	2.85	795	3.00	820	3.20	860	3.50	905	3.95
5800	600	2.00	655	2.35	715	2.65	740	2.75	765	2.90	785	3.10	805	3.25	830	3.35	870	3.70	915	4.20
6000	615	2.20	670	2.60	725	2.80	750	2.95	775	3.15	795	3.30	820	3.50	840	3.65	880	4.05	925	4.45
6200	630	2.40	685	2.75	740	3.00	765	3.20	785	3.40	810	3.60	830	3.80	850	3.90	895	4.30	935	4.75
6400	645	2.55	700	2.90	750	3.20	775	3.40	800	3.70	820	3.75	845	4.00	860	4.25	905	4.60	940	5.00
6600	660	2.80	715	3.15	765	3.40	790	3.65	810	3.90	835	4.10	850	4.20	875	4.50	915	4.80	955	5.30
6800	670	3.00	730	3.40	780	3.75	800	3.95	825	4.15	845	4.40	865	4.50	890	4.90	930	5.20	965	5.60
7000	695	3.30	745	3.60	790	4.00	815	4.20	840	4.50	860	4.65	880	4.90	900	5.05	950	5.60	- - - -	- - - -
7200	710	3.55	760	3.85	810	4.40	830	4.55	850	4.70	870	4.95	895	5.30	915	5.65	- - - -	- - - -	- - - -	- - - -
7400	730	3.75	775	4.10	820	4.60	840	4.70	860	5.00	880	5.25	900	5.40	925	5.70	- - - -	- - - -	- - - -	- - - -
7600	740	3.90	785	4.35	830	4.70	850	4.95	870	5.15	890	5.40	920	5.60	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

NOTE — All data is measured external to the unit with dry coil and with the air filters in place. See Pages 11 thru 13 for Accessory Air Resistance data.
NOTE — Data in shaded area denotes optional 5 hp drive kit.

BLOWER DATA

CHA16-2553, CHA16-2753 & CHA16-3003 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																	
	.30	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP	RPM BHP
6000	465 1.60	495 1.80	520 1.95	545 2.15	565 2.30	590 2.45	610 2.65	635 2.85	655 3.00	675 3.20	695 3.40	710 3.55	730 3.75	750 4.00	765 4.15	785 4.40	800 4.60	815 4.75
6250	480 1.80	505 1.95	530 2.15	555 2.30	575 2.45	600 2.65	620 2.85	640 3.00	665 3.25	680 3.40	700 3.60	720 3.80	740 4.00	755 4.20	775 4.45	790 4.60	810 4.85	825 5.05
6500	490 1.95	515 2.15	540 2.30	565 2.50	585 2.65	610 2.85	630 3.05	650 3.25	670 3.45	690 3.65	710 3.85	730 4.05	745 4.25	765 4.45	780 4.65	800 4.90	815 5.10	830 5.30
6750	500 2.15	525 2.30	550 2.50	575 2.70	600 2.90	620 3.10	640 3.30	660 3.45	680 3.70	700 3.90	720 4.10	735 4.30	755 4.50	770 4.70	790 4.95	805 5.15	820 5.35	840 5.60
7000	515 2.35	540 2.55	565 2.75	585 2.90	610 3.15	630 3.35	650 3.50	670 3.70	690 3.95	710 4.15	730 4.40	745 4.55	765 4.80	780 5.00	800 5.25	815 5.45	830 5.65	845 5.90
7250	530 2.60	555 2.80	575 3.00	600 3.20	620 3.40	640 3.55	660 3.75	680 4.00	700 4.20	720 4.45	735 4.60	755 4.85	770 5.05	790 5.30	805 5.50	820 5.70	840 6.00	855 6.25
7500	540 2.80	565 3.00	590 3.25	610 3.45	630 3.60	650 3.85	670 4.05	690 4.25	710 4.50	730 4.75	745 4.90	765 5.15	780 5.35	800 5.65	815 5.85	830 6.05	845 6.30	860 6.50
7750	555 3.05	575 3.25	600 3.50	620 3.70	645 3.95	665 4.15	680 4.30	700 4.55	720 4.80	740 5.05	755 5.20	775 5.45	790 5.70	805 5.90	825 6.20	840 6.40	855 6.65	870 6.90
8000	570 3.35	590 3.55	610 3.75	635 4.00	655 4.20	675 4.45	695 4.65	710 4.85	730 5.10	750 5.35	765 5.55	785 5.80	800 6.05	815 6.25	830 6.50	850 6.80	865 7.00	880 7.25
8250	580 3.60	605 3.85	625 4.05	645 4.25	665 4.50	685 4.75	705 4.95	725 5.20	740 5.40	760 5.70	775 5.90	795 6.15	810 6.40	825 6.60	840 6.85	855 7.10	870 7.35	890 7.65
8500	595 3.90	615 4.10	635 4.35	660 4.60	675 4.80	695 5.05	715 5.30	735 5.55	750 5.75	770 6.05	785 6.25	805 6.55	820 6.75	835 7.00	850 7.25	865 7.50	880 7.75	895 8.00
8750	610 4.25	630 4.45	650 4.70	670 4.90	690 5.15	710 5.40	725 5.60	745 5.90	760 6.10	780 6.40	795 6.60	815 6.90	830 7.15	845 7.40	860 7.65	875 7.90	890 8.15	905 8.40
9000	620 4.50	645 4.80	665 5.05	685 5.30	700 5.50	720 5.75	740 6.05	755 6.25	775 6.55	790 6.75	805 7.00	825 7.30	840 7.55	855 7.80	870 8.05	885 8.30	900 8.60	915 8.90
9250	635 4.90	655 5.10	675 5.35	695 5.65	715 5.90	730 6.10	750 6.40	765 6.60	785 6.90	800 7.15	815 7.40	835 7.70	850 7.95	865 8.25	880 8.50	895 8.80	910 9.00	925 9.25
9500	650 5.25	670 5.50	690 5.80	710 6.05	725 6.25	745 6.55	760 6.75	780 7.10	795 7.30	810 7.55	830 7.90	845 8.15	860 8.40	875 8.65	890 9.00	905 9.15	920 9.35	935 9.60
9750	665 5.65	685 5.90	705 6.20	720 6.40	740 6.70	755 6.95	775 7.25	790 7.50	805 7.75	825 8.05	840 8.30	855 8.60	870 8.75	885 9.20	900 9.35	915 9.60	930 9.85	945 10.15
10,000	680 6.05	695 6.30	715 6.55	735 6.85	750 7.10	770 7.40	785 7.65	805 8.00	820 8.25	835 8.50	850 8.70	865 8.90	880 9.30	895 9.55	910 9.75	925 10.05	940 10.40	955 10.60
10,250	690 6.30	705 6.40	725 6.75	745 7.10	760 7.25	780 7.80	795 8.00	815 8.35	830 8.70	845 8.85	860 9.10	875 9.35	890 9.75	905 9.90	920 10.20	935 10.40	950 10.75	965 11.15
10,500	705 6.55	720 6.85	735 7.10	755 7.45	775 7.85	790 8.25	810 8.55	825 8.80	840 9.15	855 9.25	870 9.55	885 9.70	895 10.00	915 10.25	930 10.60	950 11.00	960 11.20	975 11.50
10,750	715 7.00	735 7.25	745 7.50	770 7.95	785 8.35	805 8.70	820 8.90	835 9.25	850 9.45	865 9.70	880 10.15	895 10.30	905 10.40	925 10.80	940 11.20	960 11.50	----	----
11,000	730 7.50	745 7.70	760 7.95	780 8.35	800 8.85	815 9.10	830 9.40	845 9.65	860 9.85	875 10.20	890 10.50	905 10.70	915 10.85	935 11.30	----	----	----	----
11,250	740 7.85	755 8.10	775 8.50	795 9.00	810 9.25	830 9.70	845 9.85	855 10.05	870 10.35	885 10.60	900 10.85	915 11.15	925 11.40	----	----	----	----	----
11,500	755 8.30	770 8.70	785 9.05	810 9.55	825 9.80	840 10.00	855 10.25	865 10.55	880 10.75	895 11.10	910 11.30	----	----	----	----	----	----	----
11,750	770 8.85	780 9.25	805 9.70	820 9.90	840 10.25	855 10.50	865 10.75	875 10.85	890 11.25	905 11.45	----	----	----	----	----	----	----	----
12,000	780 9.65	795 9.85	820 10.15	835 10.40	850 10.65	865 11.00	875 11.20	885 11.35	----	----	----	----	----	----	----	----	----	----
12,250	795 10.15	810 10.35	835 10.65	850 10.90	860 11.15	875 11.35	----	----	----	----	----	----	----	----	----	----	----	----
12,500	805 10.50	825 10.75	845 11.20	860 11.35	870 11.50	----	----	----	----	----	----	----	----	----	----	----	----	----

NOTE — All data is measured external to the unit with dry coil and air filters in place. See Page 24 for Accessory Air Resistance data.
NOTE — Maximum air volume for CHA16-2553 and CHA16-2753 is 10,000 cfm. Maximum air volume for CHA16-3003 is 12,500 cfm.
Light shaded area denotes optional 7-1/2 hp drive kit for CHA16-2553 and CHA16-2753 units.
Dark shaded area denotes optional 10 hp drive kit for CHA16-3003 units.

ACCESSORY AIR RESISTANCE

Unit Model No.	Air Volume (cfm)	Total Resistance (inches water gauge)							
		Wet Evaporator Coil	*ECH16 Electric Heat	REMD16M Down-flo Economizer	EMDH16M Horizontal Economizer	RTD11 Step-Down Diffuser			FD11 Flush Diffuser
						2 Ends Open	1 Side 2 Ends Open	All Ends & Sides Open	
CHA16-823 CHA16-953	2400	.12	- - - -	.03	.03	.21	.18	.15	.14
	2600	.13	- - - -	.04	.04	.24	.21	.18	.17
	2800	.14	- - - -	.04	.04	.27	.24	.21	.20
	3000	.16	- - - -	.05	.05	.32	.29	.25	.25
	3200	.18	- - - -	.05	.05	.41	.37	.32	.31
	3400	.19	- - - -	.06	.06	.50	.45	.39	.37
	3600	.21	- - - -	.06	.06	.61	.54	.48	.44
	3800	.23	- - - -	.07	.07	.73	.63	.57	.51
CHA16-1353	3600	.12	- - - -	.03	.03	.36	.28	.23	.15
	3800	.13	- - - -	.04	.04	.40	.32	.26	.18
	4000	.14	- - - -	.04	.04	.44	.36	.29	.21
	4200	.15	- - - -	.05	.05	.49	.40	.33	.24
	4400	.16	- - - -	.05	.05	.54	.44	.37	.27
	4600	.17	- - - -	.06	.06	.60	.49	.42	.31
	4800	.18	- - - -	.07	.07	.65	.53	.46	.35
	5000	.19	- - - -	.09	.09	.69	.58	.50	.39
	5200	.20	- - - -	.10	.10	.75	.62	.54	.43
CHA16-1603	4200	.10	- - - -	.06	.06	.22	.19	.16	.10
	4400	.11	- - - -	.07	.07	.28	.24	.20	.12
	4600	.12	- - - -	.07	.07	.34	.29	.24	.15
	4800	.13	- - - -	.08	.08	.40	.34	.29	.19
	5000	.14	- - - -	.08	.08	.46	.39	.34	.23
	5200	.15	- - - -	.09	.09	.52	.44	.39	.27
	5400	.16	- - - -	.10	.10	.58	.49	.43	.31
	5600	.17	- - - -	.12	.12	.64	.54	.47	.35
	5800	.18	- - - -	.13	.13	.70	.59	.51	.39
CHA16-1853	5000	.07	.15	.11	- - - -	.51	.44	.39	.27
	5200	.08	.16	.12	- - - -	.56	.48	.42	.30
	5400	.09	.17	.13	- - - -	.61	.52	.45	.33
	5600	.10	.19	.14	- - - -	.66	.56	.48	.36
	5800	.11	.21	.15	- - - -	.71	.59	.51	.39
	6000	.12	.23	.16	- - - -	.76	.63	.55	.42
	6200	.13	.25	.17	- - - -	.80	.68	.59	.46
	6400	.14	.27	.18	- - - -	.86	.72	.63	.50
	6600	.15	.29	.20	- - - -	.92	.77	.67	.54
	6800	.16	.31	.22	- - - -	.99	.83	.72	.58
	7000	.17	.32	.23	- - - -	1.03	.87	.76	.62
	7200	.18	.34	.24	- - - -	1.09	.92	.80	.66
	7400	.19	.36	.25	- - - -	1.15	.97	.84	.70
	7600	.20	.38	.26	- - - -	1.20	1.02	.88	.74
CHA16-2553 CHA16-2753 CHA16-3003	6000	.06	.09	.01	- - - -	.36	.31	.27	.29
	6500	.07	.10	.02	- - - -	.42	.36	.31	.34
	7000	.08	.11	.02	- - - -	.49	.41	.36	.40
	7500	.09	.12	.04	- - - -	.51	.46	.41	.45
	8000	.10	.13	.06	- - - -	.59	.49	.43	.50
	8500	.11	.14	.08	- - - -	.69	.58	.50	.57
	9000	.12	.15	.10	- - - -	.79	.67	.58	.66
	9500	.13	.16	.12	- - - -	.89	.75	.65	.74
	10,000	.15	.17	.14	- - - -	1.00	.84	.73	.81

*Electric heaters for CHA16-823 thru CHA16-1603 units have no appreciable air resistance.

PED16-185 & PED16-300
POWER EXHAUST FANS PERFORMANCE

Model No.	Air Volume (cfm Exhausted)	Return Air System Static Pressure (Inches Water Gauge)
PED16-185	4200	0
	3800	.05
	3500	.10
	3200	.15
	2700	.20
	2200	.25
PED16-300	6300	0
	5750	.05
	5200	.10
	4625	.15
	4050	.20

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume (cfm)	*Effective Throw Range (feet)	
		RTD11 Step-Down	FD11 Flush
CHA16-823 CHA16-953	3000	27 — 33	25 — 30
	3375	30 — 37	28 — 34
	3750	34 — 41	31 — 38
CHA16-1353	4400	34 — 42	32 — 40
	4950	38 — 47	36 — 45
	5500	43 — 52	40 — 50
CHA16-1603	4200	39 — 46	40 — 48
	5000	41 — 50	43 — 52
	5800	43 — 52	45 — 54
CHA16-1853	6000	45 — 55	48 — 55
	6750	47 — 56	50 — 58
	7500	49 — 58	55 — 66
CHA16-2553 CHA16-2753 CHA16-3003	8000	39 — 44	53 — 62
	9000	47 — 56	55 — 64
	10,000	49 — 58	57 — 67

*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. per minute. Four sides open.

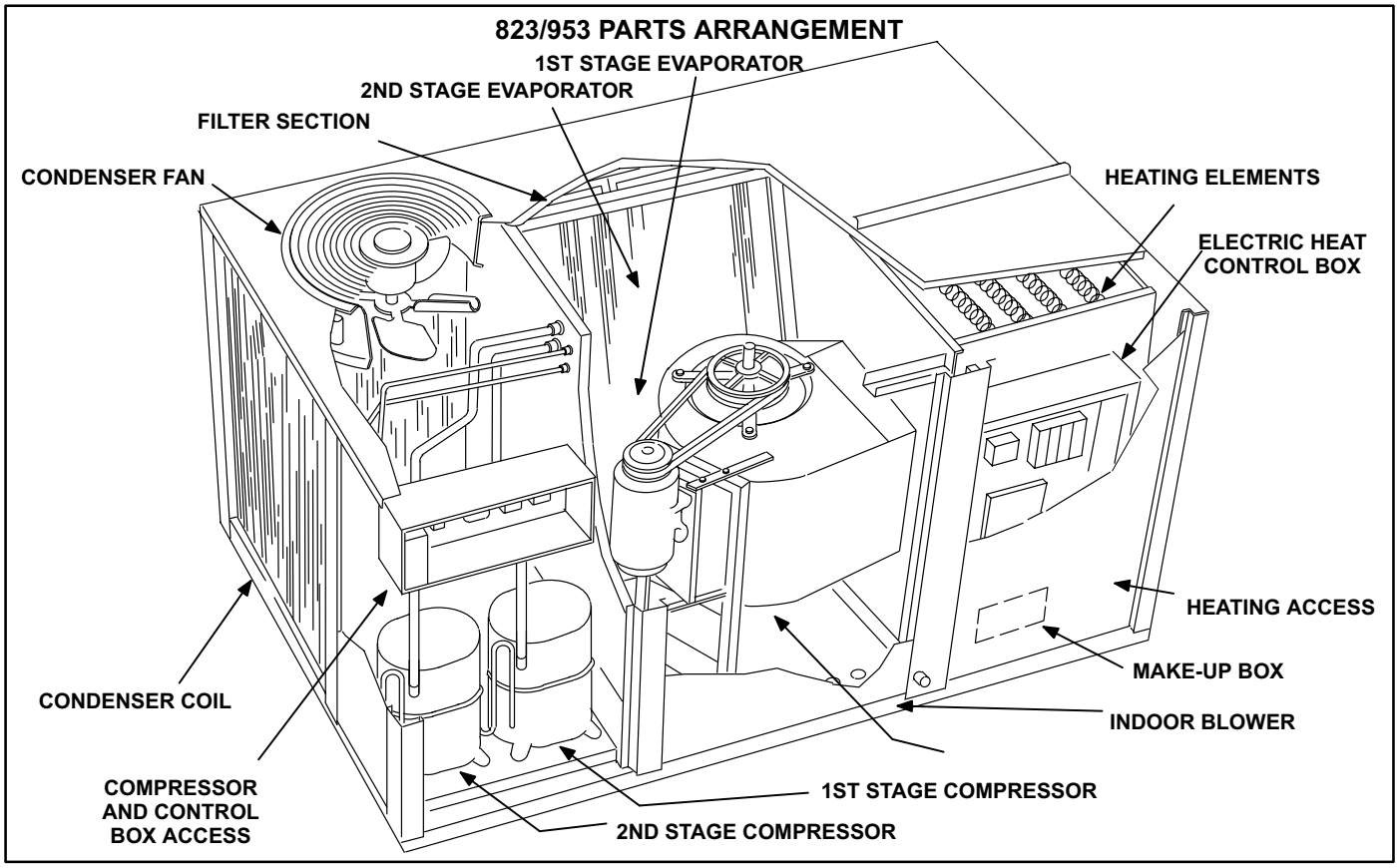


FIGURE 1

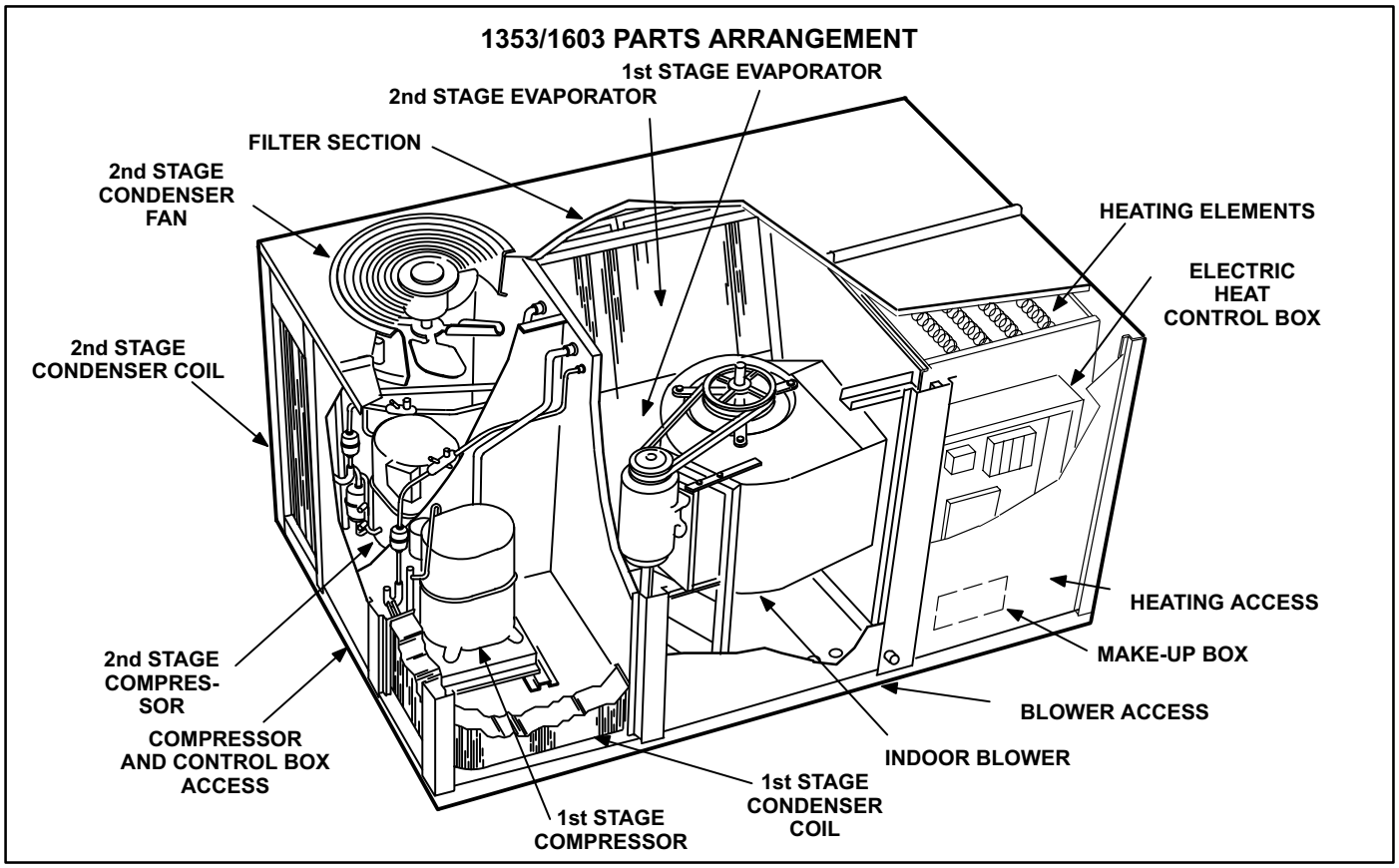


FIGURE 2

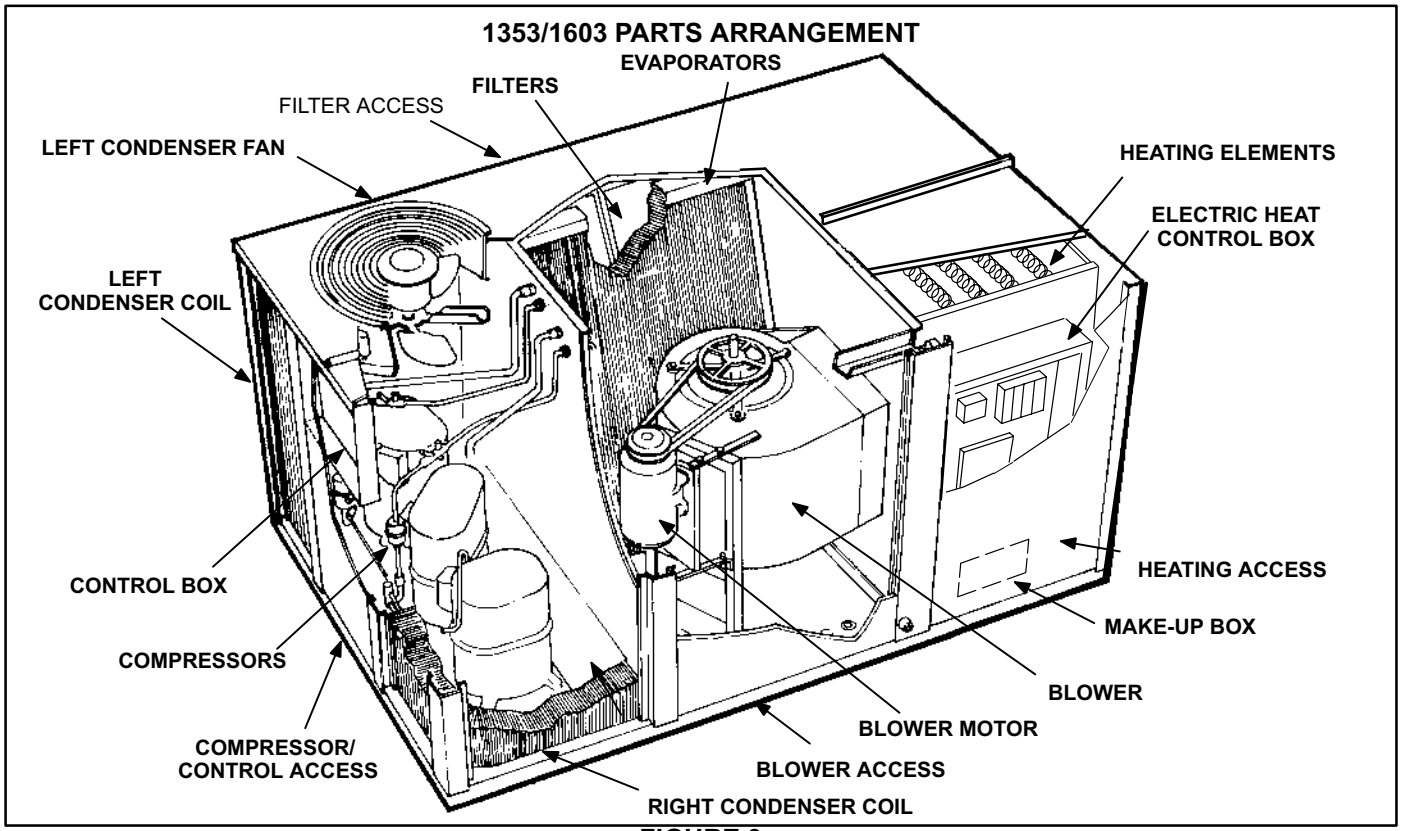


FIGURE 3

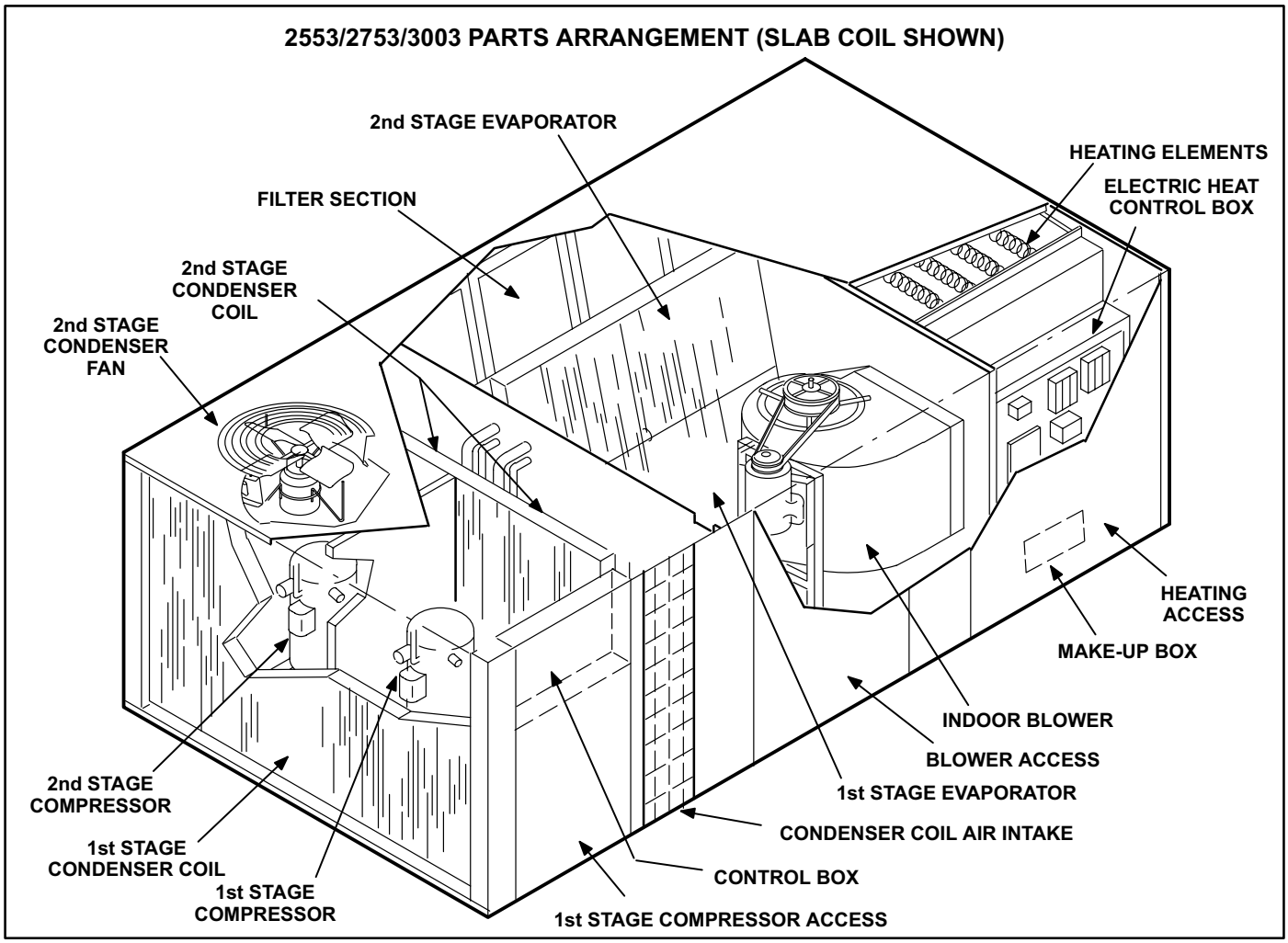


FIGURE 4

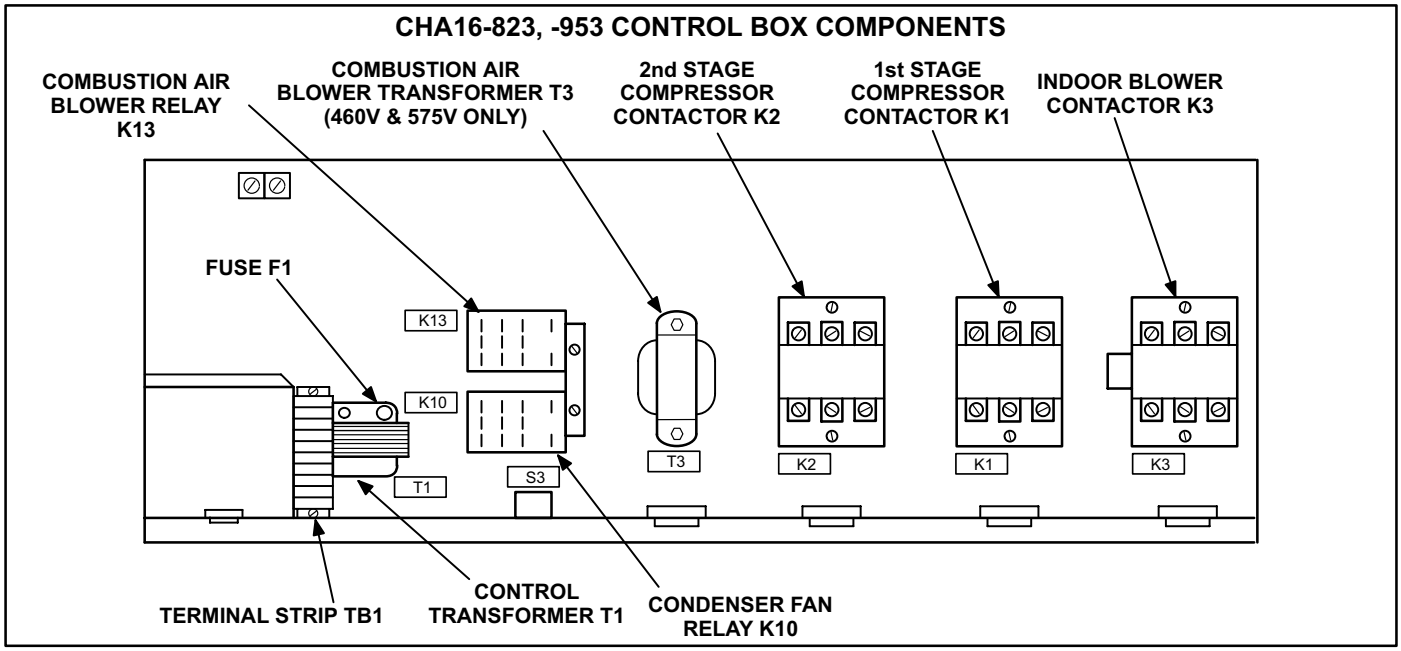


FIGURE 5

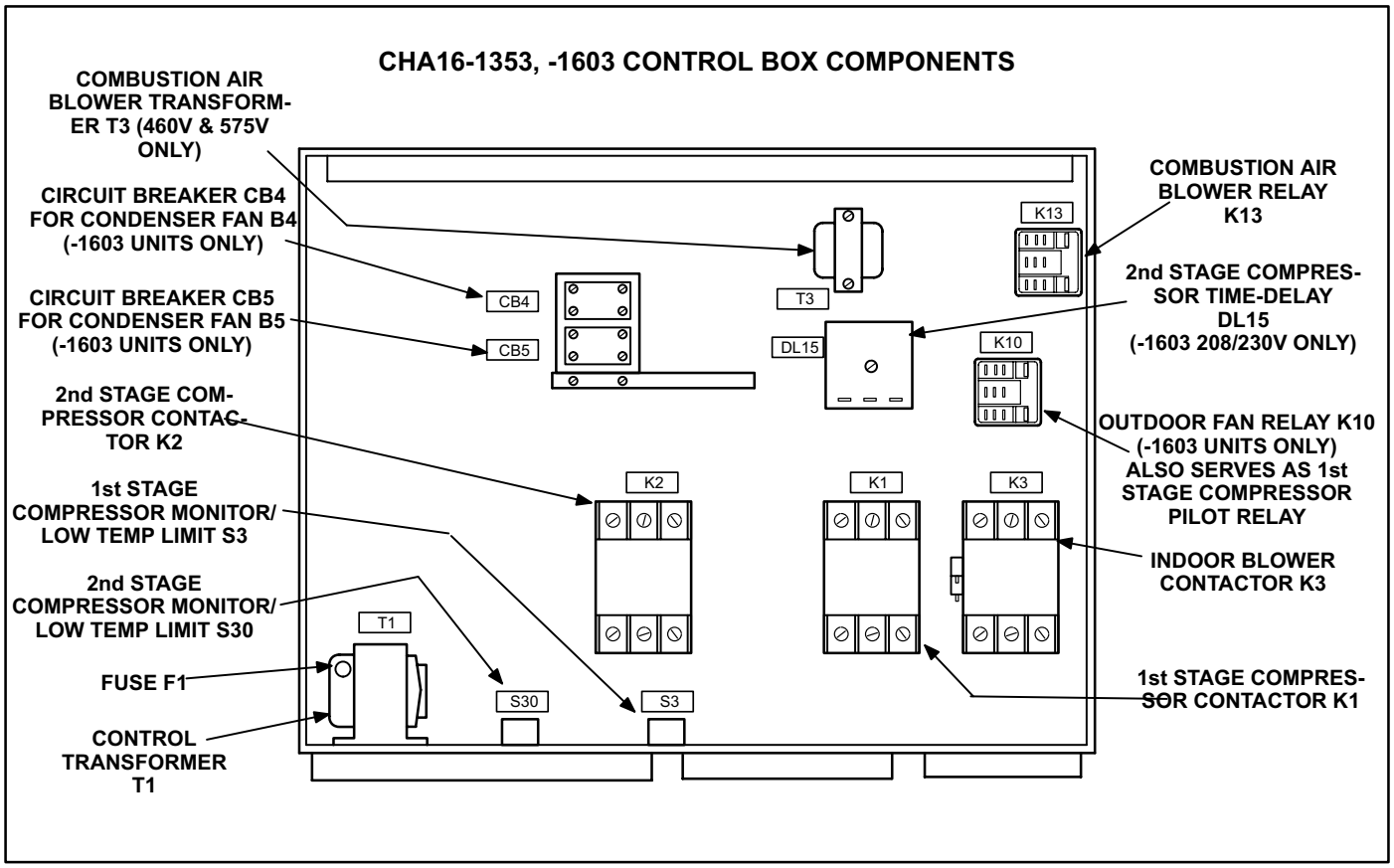


FIGURE 6

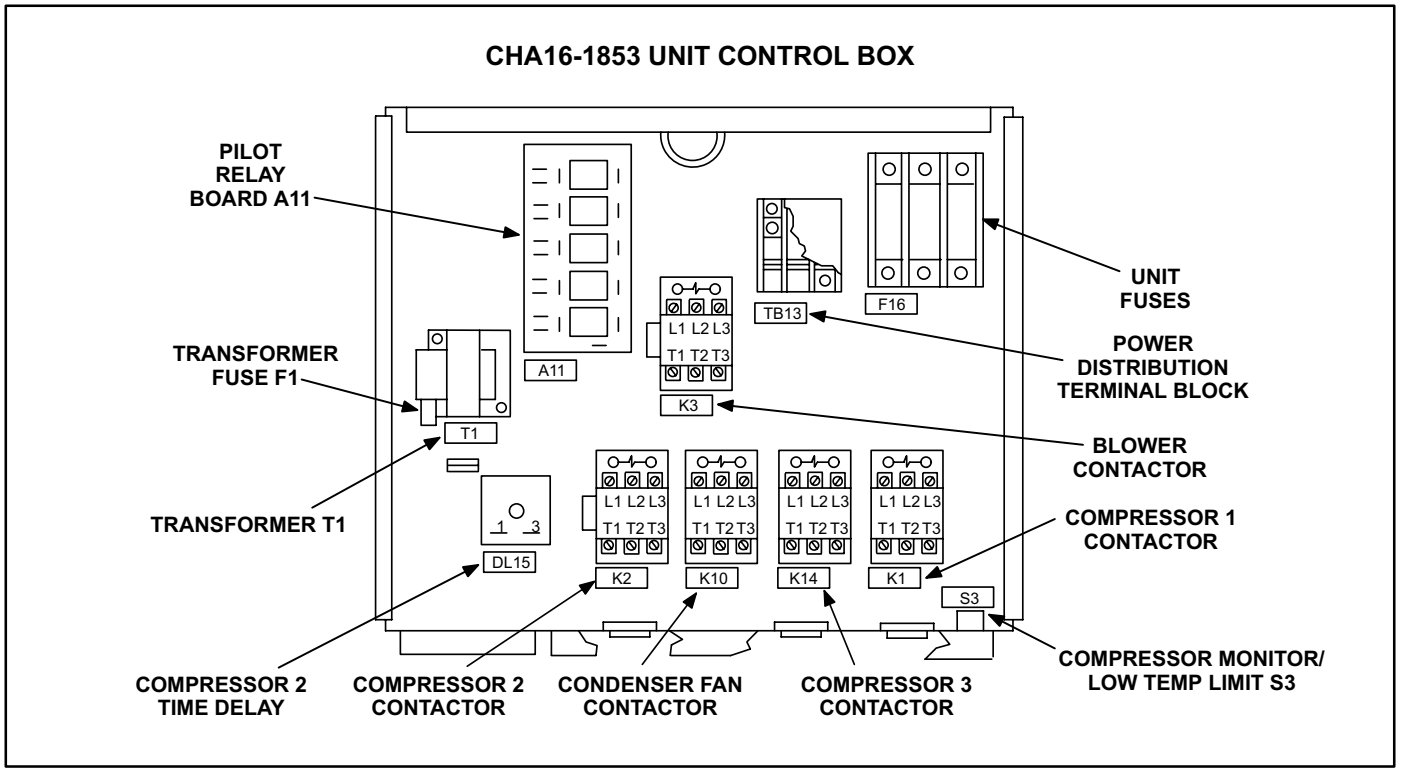


FIGURE 7

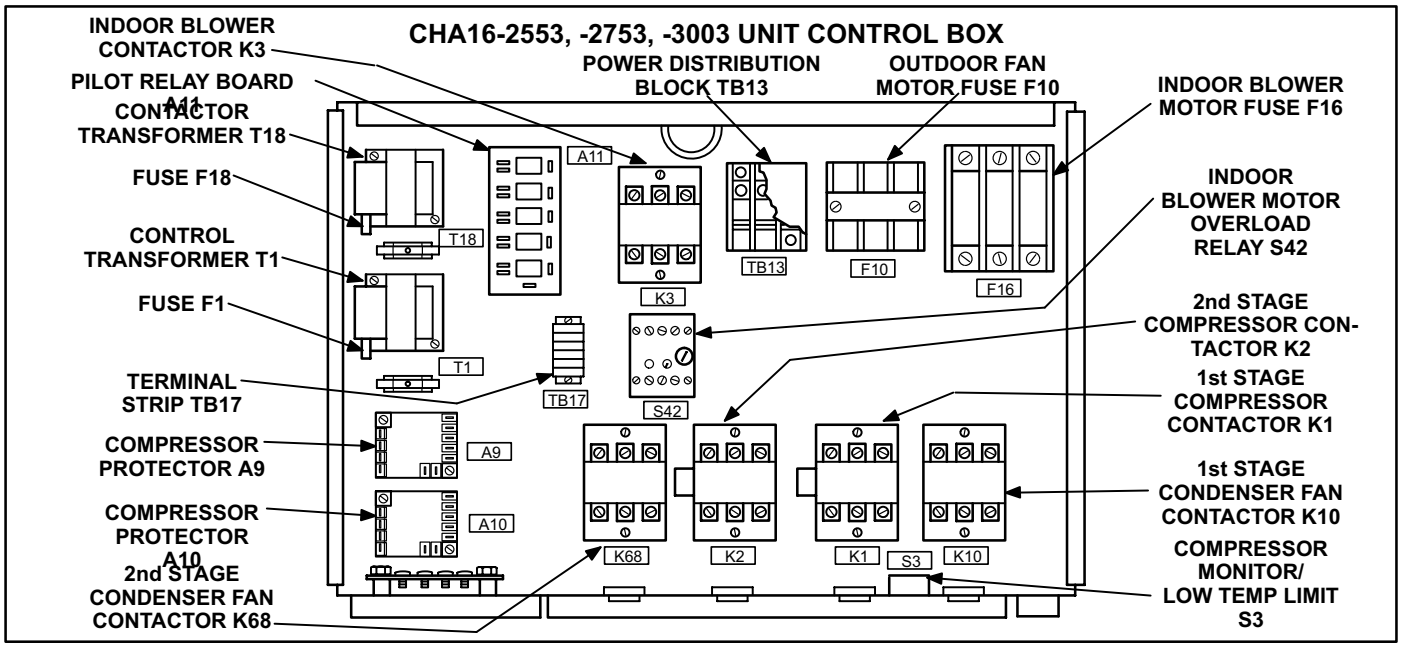


FIGURE 8

I-APPLICATION

CHA16 15 ton units are available in a single cabinet size (refer to the Engineering Handbook for more specific application data). All units 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 all previously released CHA16 commercial units. For example, a Honeywell W973 control will plug in to a CHA16-1853 as easily as it will plug in to a CHA16-411 (and no field wiring is required for either).

II-UNIT COMPONENTS

An overview of CHA16 series unit components are shown in figures 1, 2, 3 and 4.

A-Lifting Brackets

Each unit is equipped with factory installed lifting brackets as shown in figure 9. Brackets are used for lifting the unit during installation or when servicing. Lifting lugs can be removed from the unit and reused. If unit must be lifted for service, use only lifting brackets to lift unit.

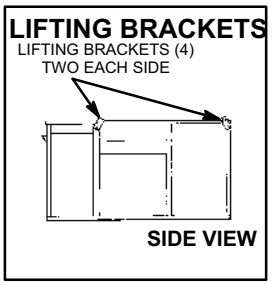


FIGURE 9

B-Control Box Components

CHA16 control box is shown in figures 5, 6, 7 and 8. The control box is located in the upper portion of the compressor compartment behind the compressor compartment access panel. In larger units, a hinged door with magnetic latch located behind the compressor access panel, provides access to control components.

1-Power Distribution Terminal Block TB13 (-1853, -2553, -2753, -3003)-3003)

All Larger CHA16 units use a power distribution terminal block to provide a line voltage electrical connection between the control box components and the power entry area in the heating compartment. Line voltage cables connect TB13 with the unit terminal block TB2 located in the heating compartment.

2-Terminal Block TB17 (-2553, -2753, -3003)

TB17 is a low voltage terminal block located in the control box of 18.5 ton and larger units. The terminal strip is designed for diagnostic troubleshooting and test running the unit from the control box area. TB17 terminals are designated as shown in table 1.

TABLE 1

TERMINAL NUMBER	TB17 TERMINAL DESIGNATIONS
1	24VAC Power
2	First stage thermostat Y1
3	Input to pilot relay K66 (24VAC applied here will energize 1st stage cooling)
4	Second stage thermostat Y2
5	Input to pilot relay K67 (24VAC applied here will energize 2nd stage cooling)
6	24VAC common

3-Transformer T1 (all units)

All CHA16 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 (except the heating section). Transformer is rated at 70VA. 208/230 (P) voltage transformers use two primary voltage taps as shown in figure 10.

In 20 ton and larger units, T1 is used only to supply 24VAC power to the pilot control circuit and all 24VAC devices other than the contactors and transformer T18 is used to supply 24VAC power to the contactors.

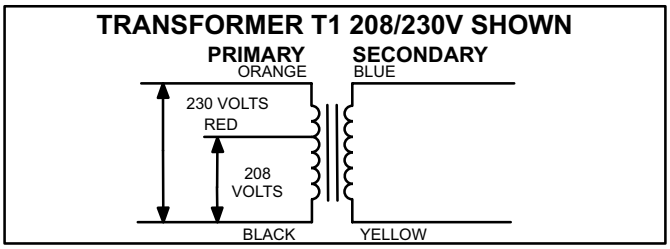


FIGURE 10

4-Transformer T18 (-2553, -2753, -3003 only)

Transformer T18 is a line voltage to 24VAC transformer used in 20 ton and larger units. T18 is identical to transformer T1 and is used to supply 24VAC power to the contactors.

5-Transformer T3 (all 460V and 575V units)

460 (G) and 575 (J) voltage units use a line voltage to 230V autotransformer to power the combustion air blower. The autotransformer is connected directly to line voltage and is powered at all times. It has an output rating of 0.5A. In units over 12.5 ton capacity, T3 is located in the heating control box in the heating section.

6-Transformer Fuse F1 (all units)

T1 transformer is equipped with an integral fuse connected in series with the blue secondary voltage wire. The fuse may be accessed outside the transformer and is rated 3.5A.

7-Condenser Fan Motor Fuse F10 (-2553, -2753, -3003 only)

Line voltage fuses F10 are used to provide overcurrent protection to all condenser fans (and optional power exhaust fans) in the unit. The fuses are rated at 20A in 208/230V units and 15A in all others.

8-Unit Line Voltage Fuses F16 (-1853, -2553, -2753, -3003)

Line voltage fuses F16 are used to provide overcurrent protection to all line voltage components in the unit (except compressors, crankcase heaters and optional electric heat). The fuses are rated at 35A in 208/230V units and 30A in all others.

9-Circuit Breaker CB4, CB5 (-1603 Y voltage only)

Circuit breaker CB4 provides overcurrent protection to condenser fan B4 in 12.5 ton units and CB5 provides overcurrent protection to condenser fan B5. Both circuit breakers are two-pole 240V manual reset switches with a 15A rating.

10-Compressor Contactor K1 (all units)

K1 is a 24V to line voltage contactor used to energize the first compressor (B1) in response to first stage cooling demand. All units use three-pole-double-break contactors for three-phase operation with a 24VAC coil.

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.

11-Compressor Contactor K2 (all units)

K2 is a 24V to line voltage contactor used to energize the second compressor (B2) in response to cooling demand. All units use three-pole-double-break contactors for three-phase operation with a 24VAC coil. In -1853 units, contactor K2 is used for the second first stage compressor. In all other units, K2 is used to energize the second stage compressor.

In -1603 and -1853 units, K2 is energized after a 30 second delay is initiated by time delay DL15. The time delay is used to stagger the electrical load and limit the effects of electrical inrush on unit components.

12-Compressor Contactor K14 (-1853 only)

K14 is a 24V to line voltage contactor used to energize the 3rd compressor (B13) in response to second stage cooling demand. Contactor K14 is identical to contactor K1. All units use three-pole-double-break contactors.

13-Condenser Fan Contactor K10 (all units except -1353)

K10 is a 24V to line voltage contactor used to energize both condenser fans (B4 and B5) in response to demand. Both condenser fans are energized with the first compressor upon receiving a cooling demand. Both fans operate throughout all cooling (compressor) demand. All units use three-pole-double-break contactors with a 24VAC coil.

14-Condenser Outdoor Fan Contactor K68 (-2553, -2753, -3003 only)

CHA16 20 ton and larger units are equipped with separate condenser fan contactors for each stage of cooling. K68 is identical to K10. In units equipped with two condenser fan contactors, K10 operates with first stage circuit on a call for first stage cooling and K68 operates with second stage circuit on a call for second stage cooling.

15-Blower Motor Overload Relay S42 (5 & 10 HP Motors only)

Units equipped with 5 and 10 horsepower indoor blower motors are also equipped with a thermal overload relay connected inline with the blower motor. See figure 11. The relay monitors the current flowing to the blower motor. When the relay senses an overload condition, a set of N.C. contacts in the relay open to de-energize all control voltage in the unit.

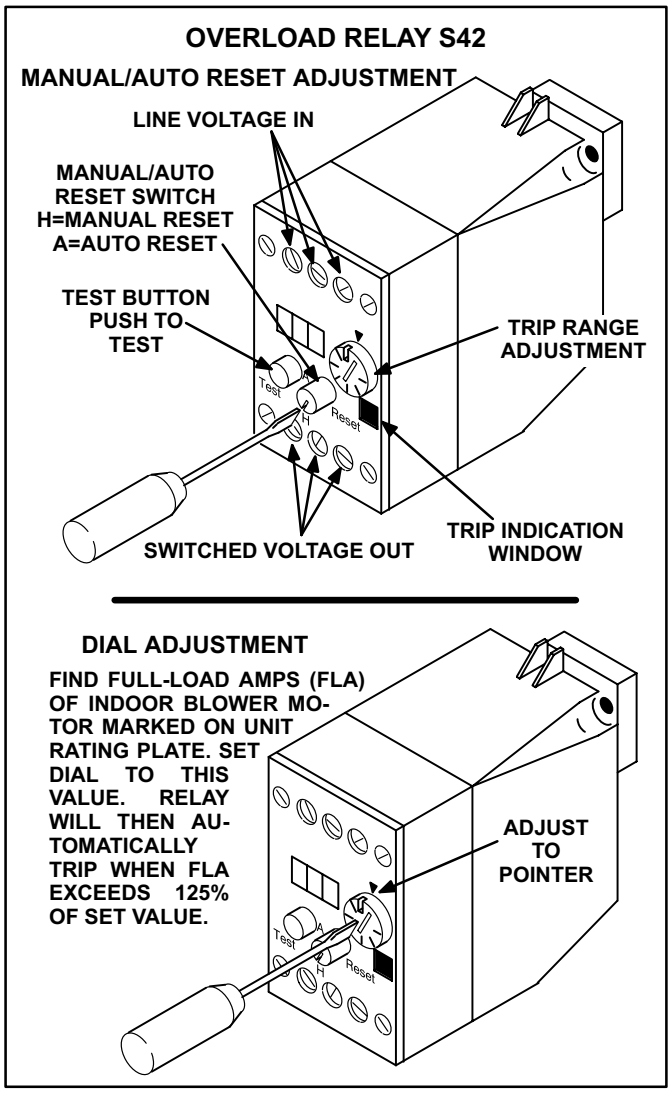


FIGURE 11

16-Compressor Delay DL15 (-1603 Y voltage, all -1853 voltages only)

Time delay DL15 is a SPST N.O. time-delay switch. Once energized, the delay waits 30 seconds ± 3 seconds before closing. The purpose of the delay is to prevent voltage drop at the contactor coil due to (the possibility of) multiple contactors being energized at the same time. With the delay added, only two contactors (K1 and K10) can energize at the same time while the third contactor (K2) must wait 30 seconds before energizing. When thermostat demand stops, DL15 immediately opens and resets.

In both units, the delay is wired in series with compressor contactor coil (K2). In CHA16-1603 units, the delay is energized upon receiving a call for second stage cooling. In CHA16-1853 units the delay is energized simultaneously with compressor 1 contactor K1 and condenser outdoor fan contactor K10.

In CHA16-1853 units, once contactor K2 is energized, a set of N.O. K2-2 auxiliary contacts close to bypass the time delay (wired in parallel with time delay DL15). When K2-2 closes, the resulting shunt eliminates any load added by the time delay (allows K2 to receive full voltage).

17-Pilot Relay Board A11 (-1853, -2553, -2753, -3003 only)

A11 is a pilot relay board (figure 12) used in all CHA16 15 ton and larger units. Pilot relays are used in 24VAC control circuits to limit voltage drop caused by a long run of thermostat wire. The relays on the circuit board are added electrically in between the thermostat (or thermostat control system) and the contactors in the unit.

Relays draw much less current from the transformer than the unit contactors. When a long run of thermostat wire is used from the unit to the thermostat and back to energize unit contactors, current drawn by the contactors could potentially cause voltage drop resulting in contactor chattering. The pilot relays are added between the thermostat and the contactors (refer to unit wiring diagram) to electrically isolate the contactor coils from the thermostat wire and thereby minimize the potential for voltage drop at the contactors.

18-Indoor Blower Contactor K3 (all units)

K3 is a 24V to line voltage contactor used to energize the indoor blower motor in response to blower demand. In cooling mode K3 is energized by pilot relay K46 in response to cooling or constant fan demand. In heating mode K3 is energized by relays K20 or K25 (in the heating section) in response to heating demand. All units use three-pole-double-break contactors.

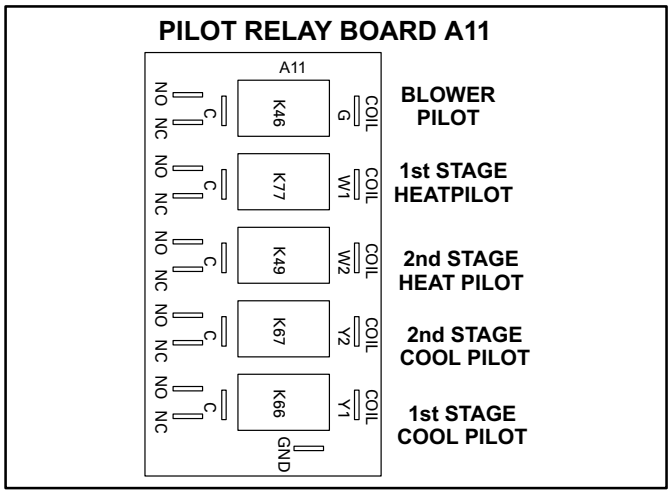


FIGURE 12

⚠ WARNING

Do not remove or bypass the pilot relay board. Control damage or failure could result.

19- Low Ambient Lockout Switch (Compressor Monitor) S3 (all units)

CHA16 units are equipped with a single compressor monitor located in the unit 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 circuits. When outdoor temperature drops below 40°F the compressor monitor opens to electrically disconnect all compressors. When the compressors are disconnected, cooling demand is handled by optional REMD16 economizer (if installed). The monitor automatically resets when outdoor temperature rises above 50°F.

NOTE-Compressor monitors must be disconnected if optional low ambient kit is used.

20- Low Ambient Lockout Switch (Compressor Monitor) S30 (-1353, -1603 only)

CHA16-1353 and -1603 (10 and 12.5 ton) units are equipped with a second compressor monitor (S30) used in addition to compressor monitor S3. S3 is identical to S30. In units equipped with two compressor monitors, S3 protects the first stage compressors and S30 protects the second stage compressors.

21-Compressor Motor Protector A9, A10 (-2553, -2753, -3003 only)

Motor protectors A9 and A10 are used in all CHA16 18.5 ton and larger units to provide compressor over-temperature sensing which helps protect the compressors. Compressors in these units have thermistors imbedded in the motor windings. The motor protectors monitor the sensors in each compressor and shuts off the compressor when resistance increases above a preset limit. As the compressor windings cool, the resistance through the sensors drops and the control resets. Table 2 shows the resistance values for the winding temperature sensors.

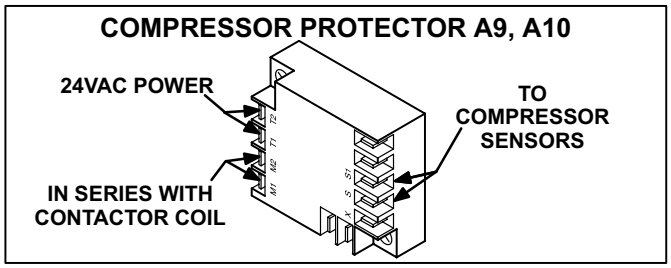


FIGURE 13

TABLE 2

Compressor Winding Temperature Sensor	Trip Ohms Temp. Rise	Reset Ohms Tem. Fall
	16K to 24K	5.5K to 6.9K

C-Cooling Components

Summary of Features

CHA16 series units use independent cooling circuits consisting of separate compressors, condenser coils and evaporator coils. See figures 14, 15, 16, 17 and 18. See figure 16 for CHA16-1853 vapor circuitry and figure 17 for CHA16-1853 liquid circuitry. A draw-through type condenser fan is used in all units. CHA16-823, -953 units use a single fan. All other units use two. All units are equipped with a single belt drive blower that draws air across the evaporator during unit operation.

On all units cooling may also be supplemented by field-installed economizer. The evaporators are slab type and are stacked as shown in figures 19, 20 and 21. Each evaporator uses a thermostatic expansion valve as the primary expansion device. Each evaporator is also equipped with enhanced fins and rifled tubing. CHA16-1853 units are equipped with two condenser coils split into three independent circuits. Compressor 1 uses an independent circuit in the right condenser coil, compressor 2 uses an independent circuit in the left condenser coil and compressor 3 uses an independent circuit split between the left and right condenser coils. See figures 17and 20. In all units each compressor is protected by a crankcase heater, high pressure switch and loss of charge switch. Additional protection is provided by factory installed low ambient thermostat (unit control box) and freezestats (on each evaporator). Each cooling circuit is equipped with a thermometer well for charging.

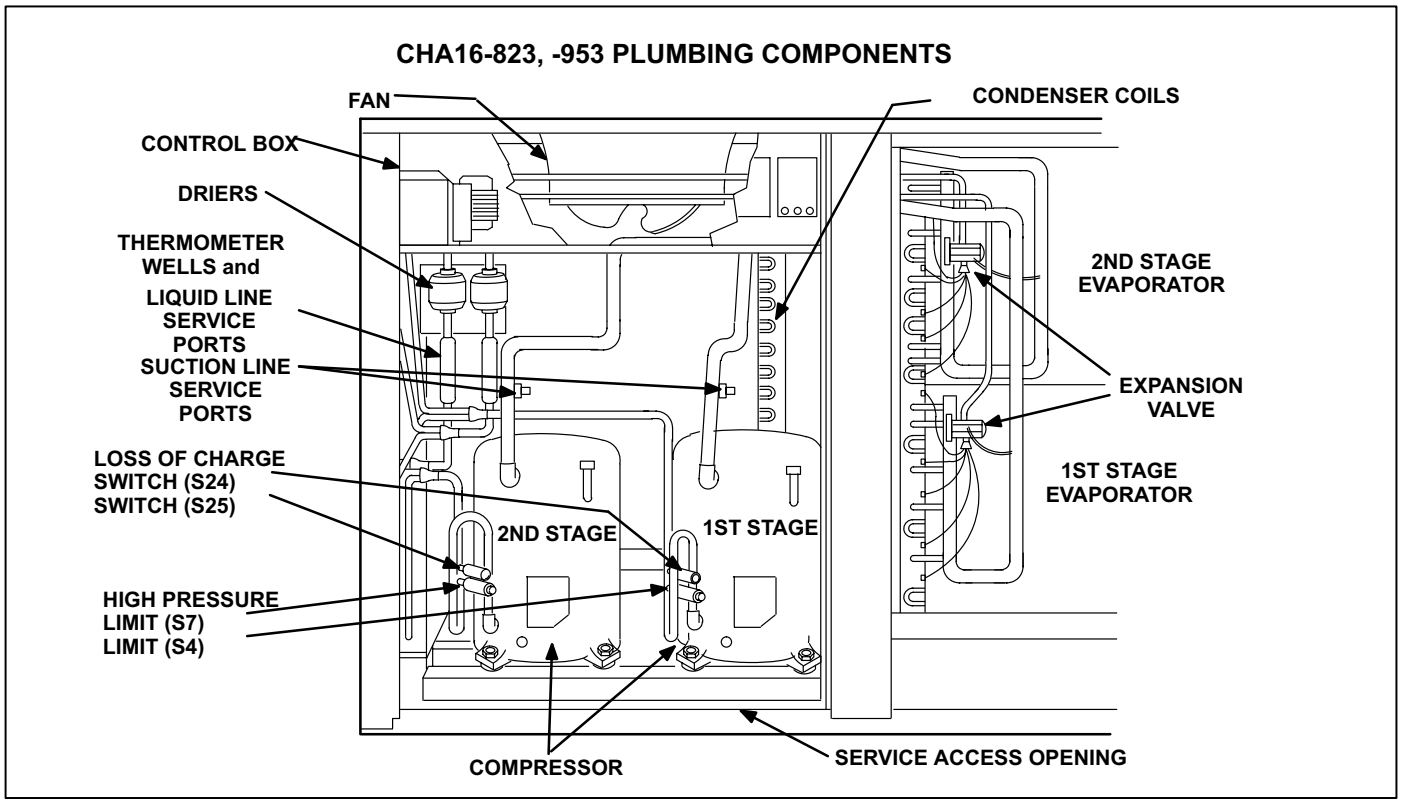


FIGURE 14

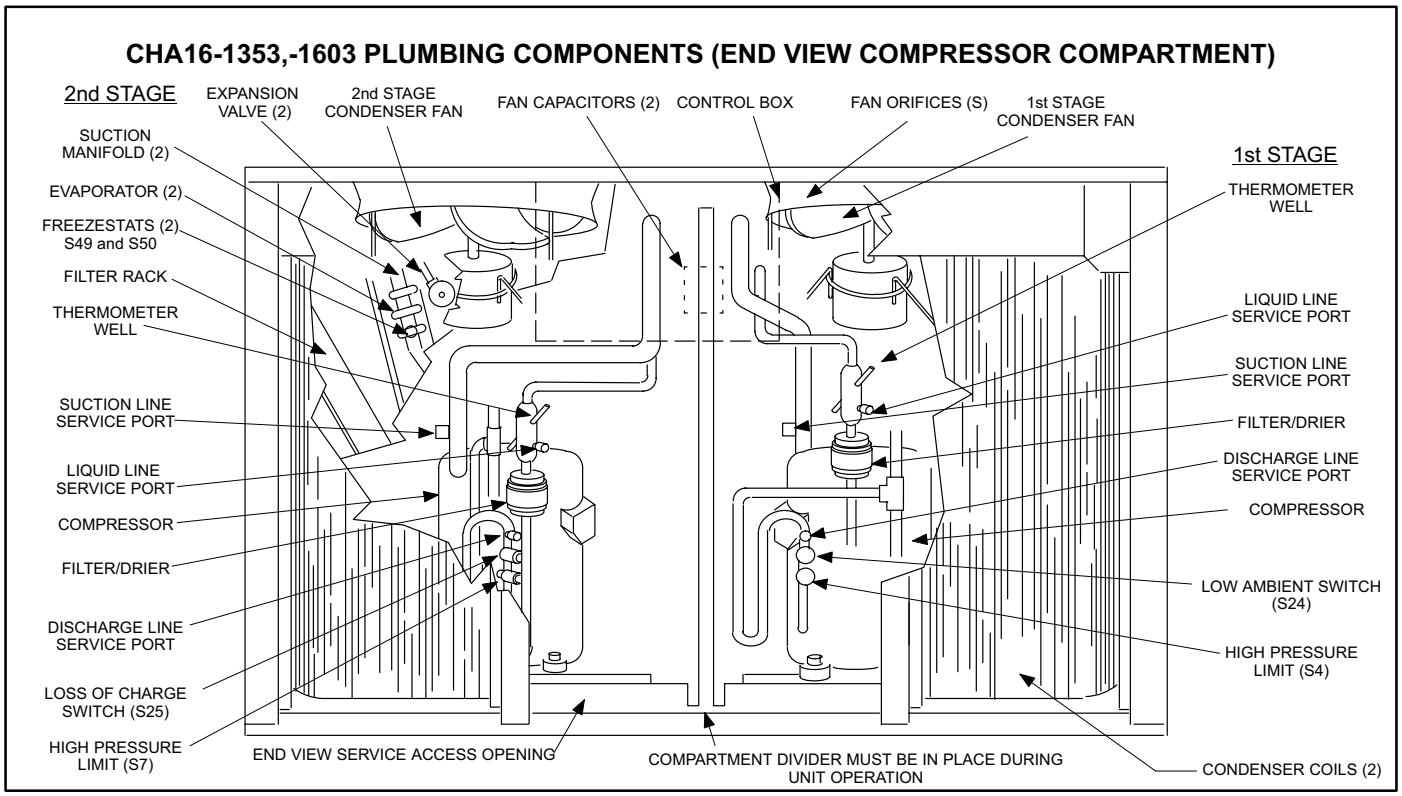


FIGURE 15

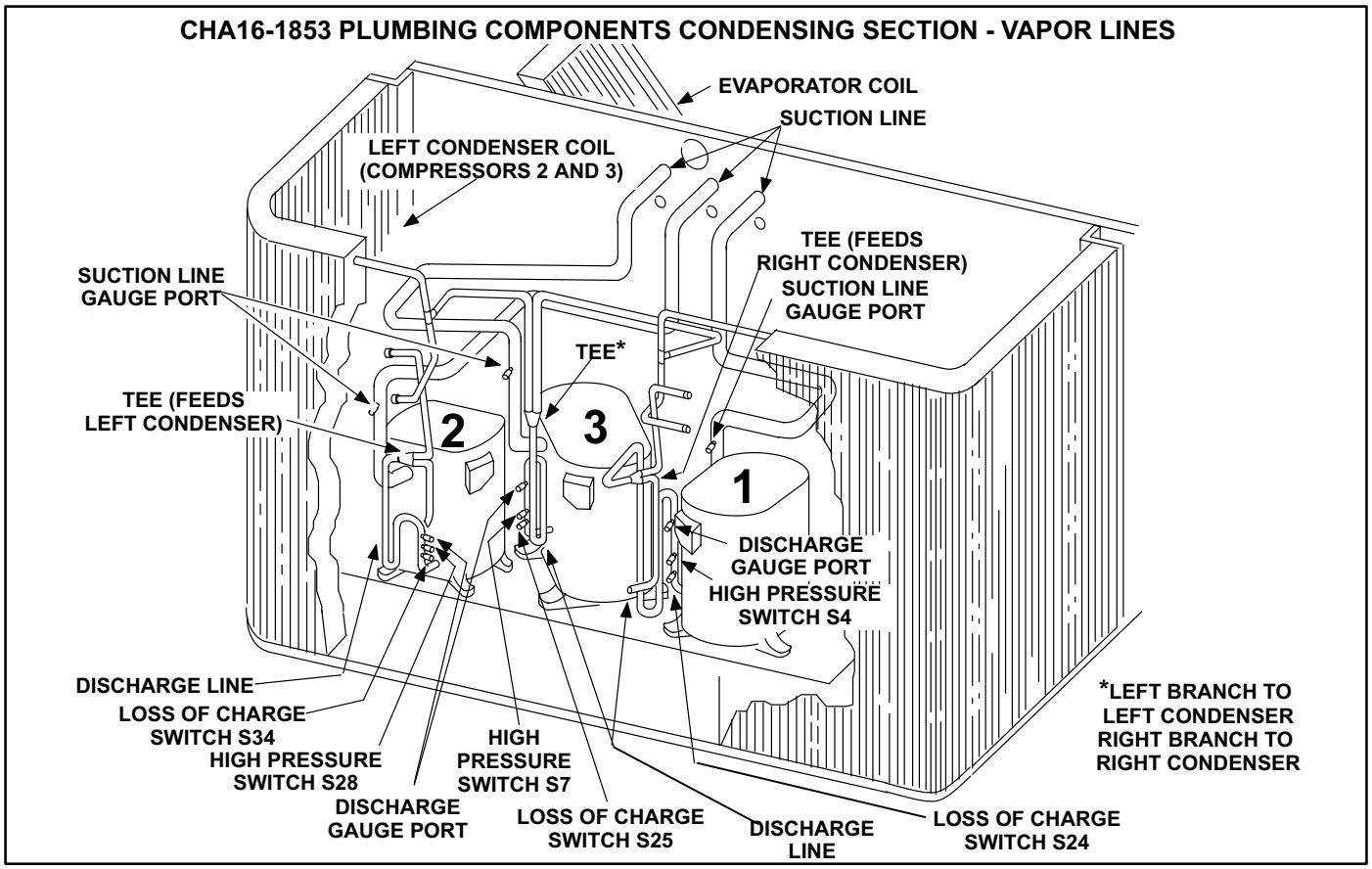


FIGURE 16

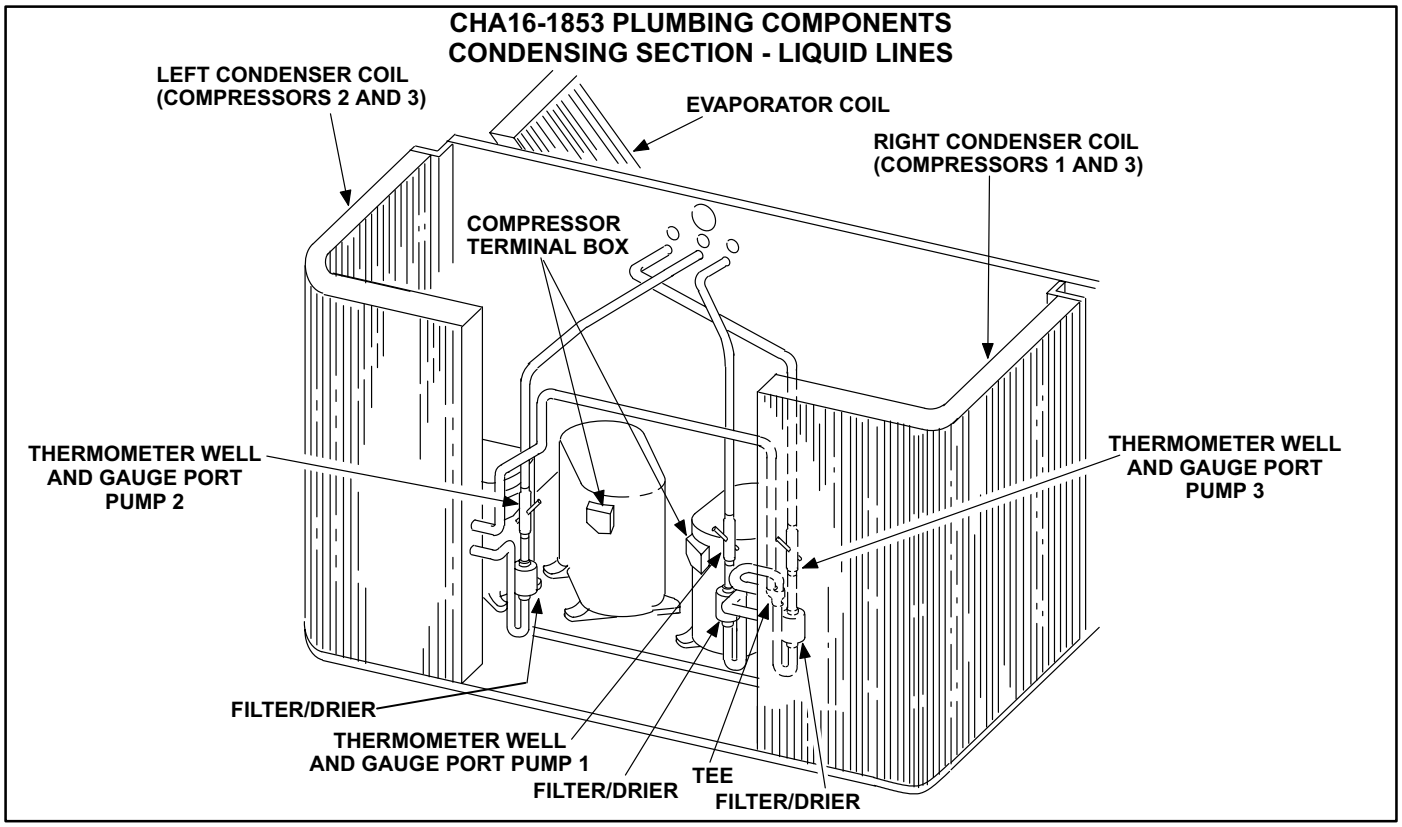


FIGURE 17

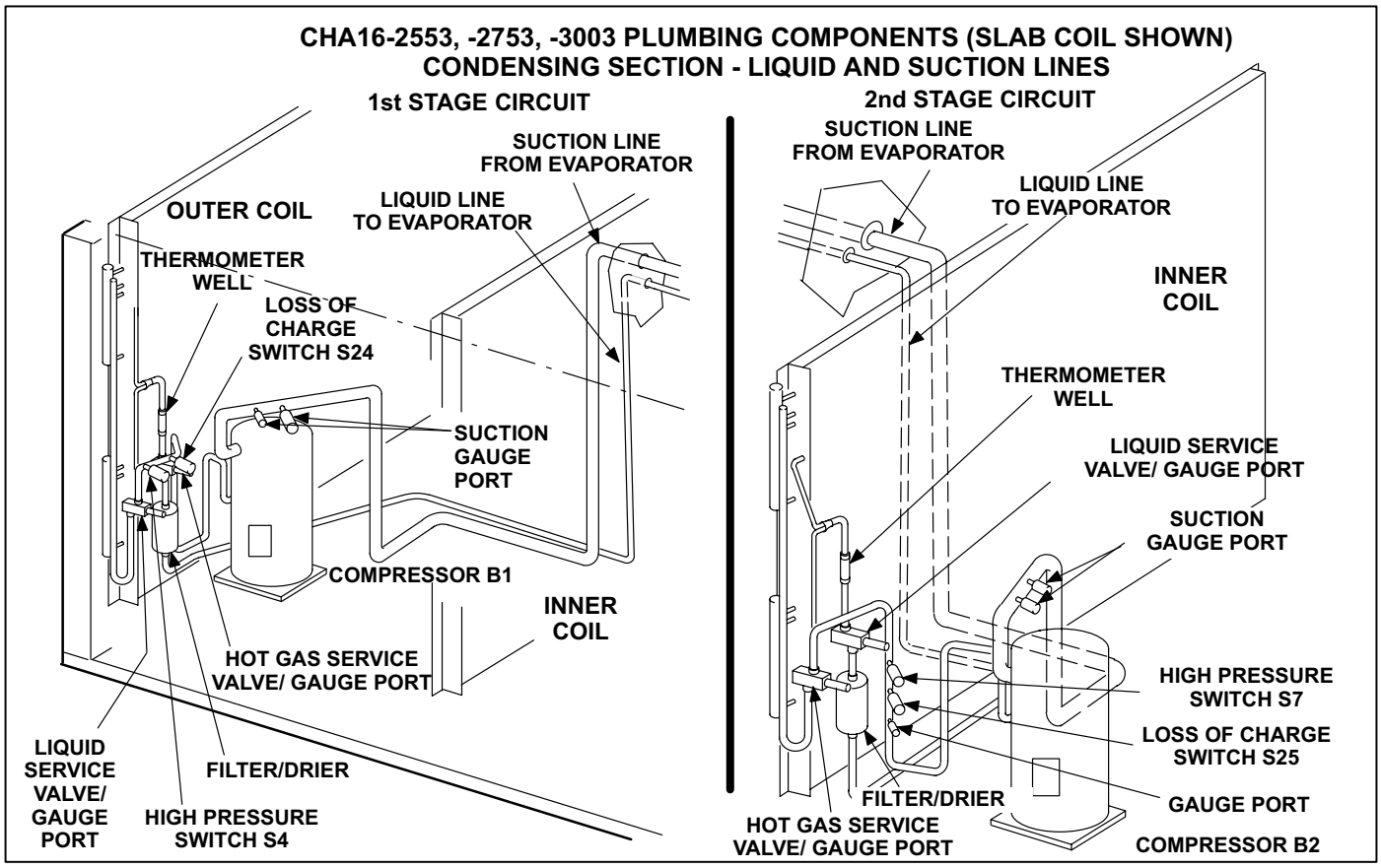


FIGURE 18

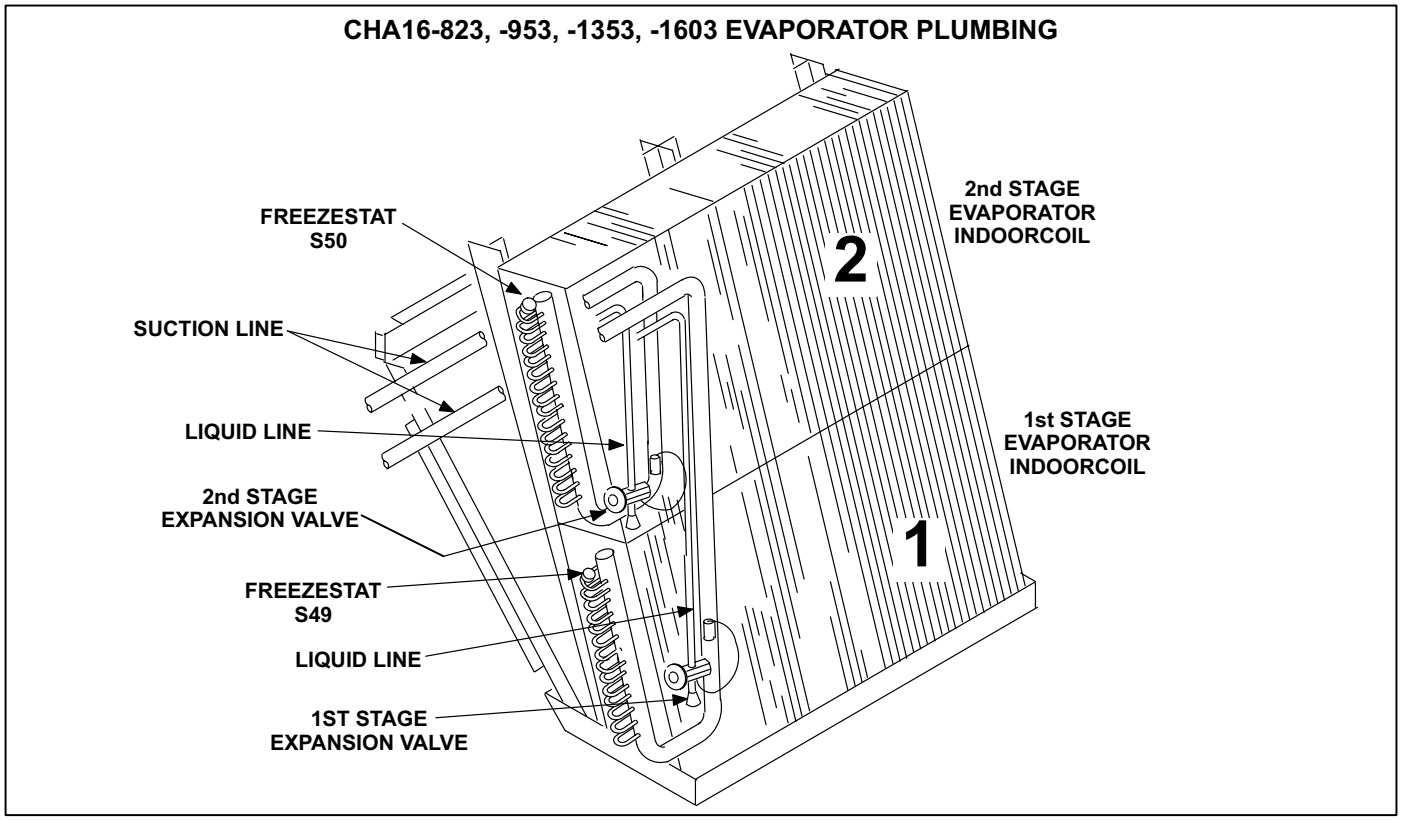


FIGURE 19

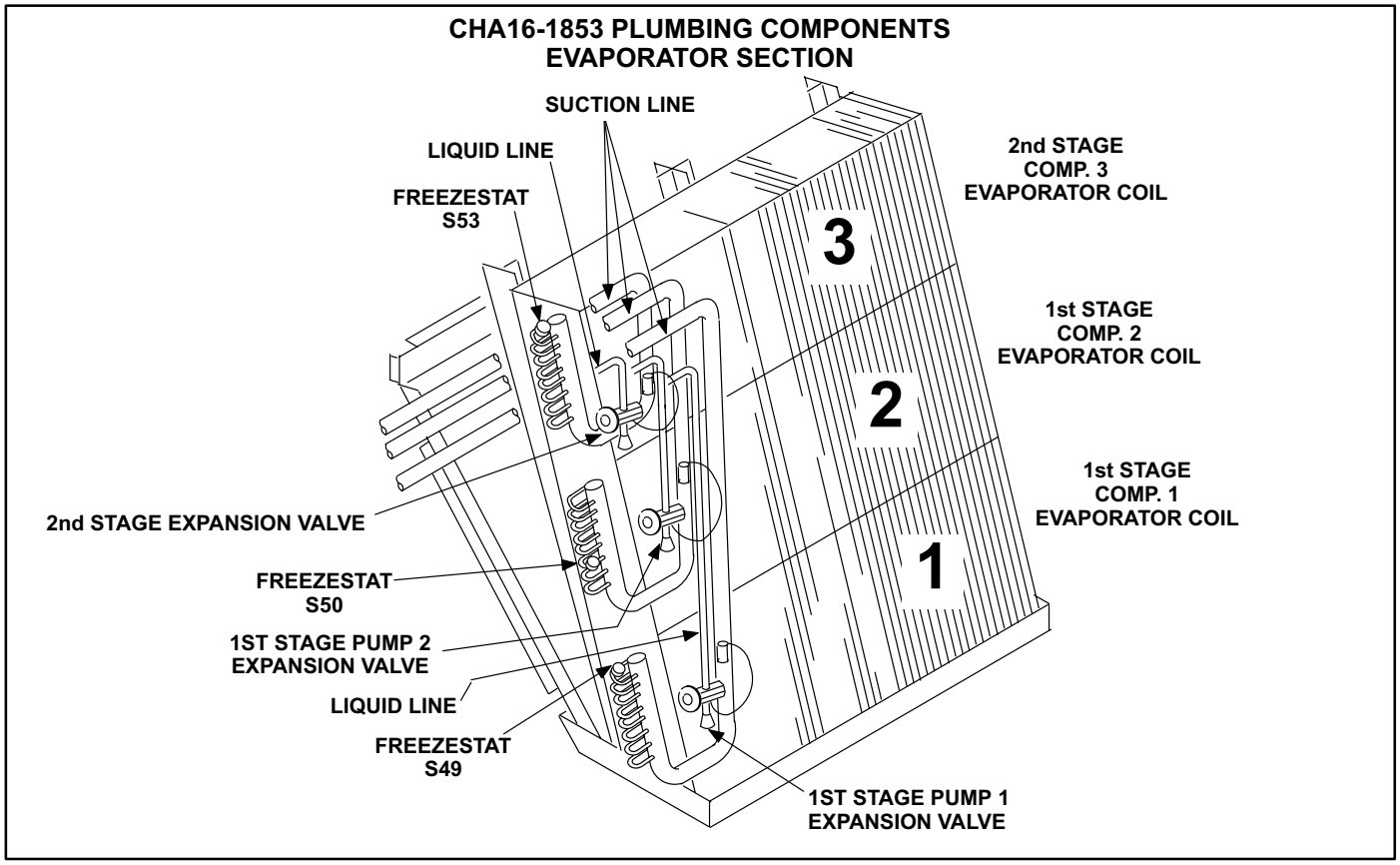


FIGURE 20

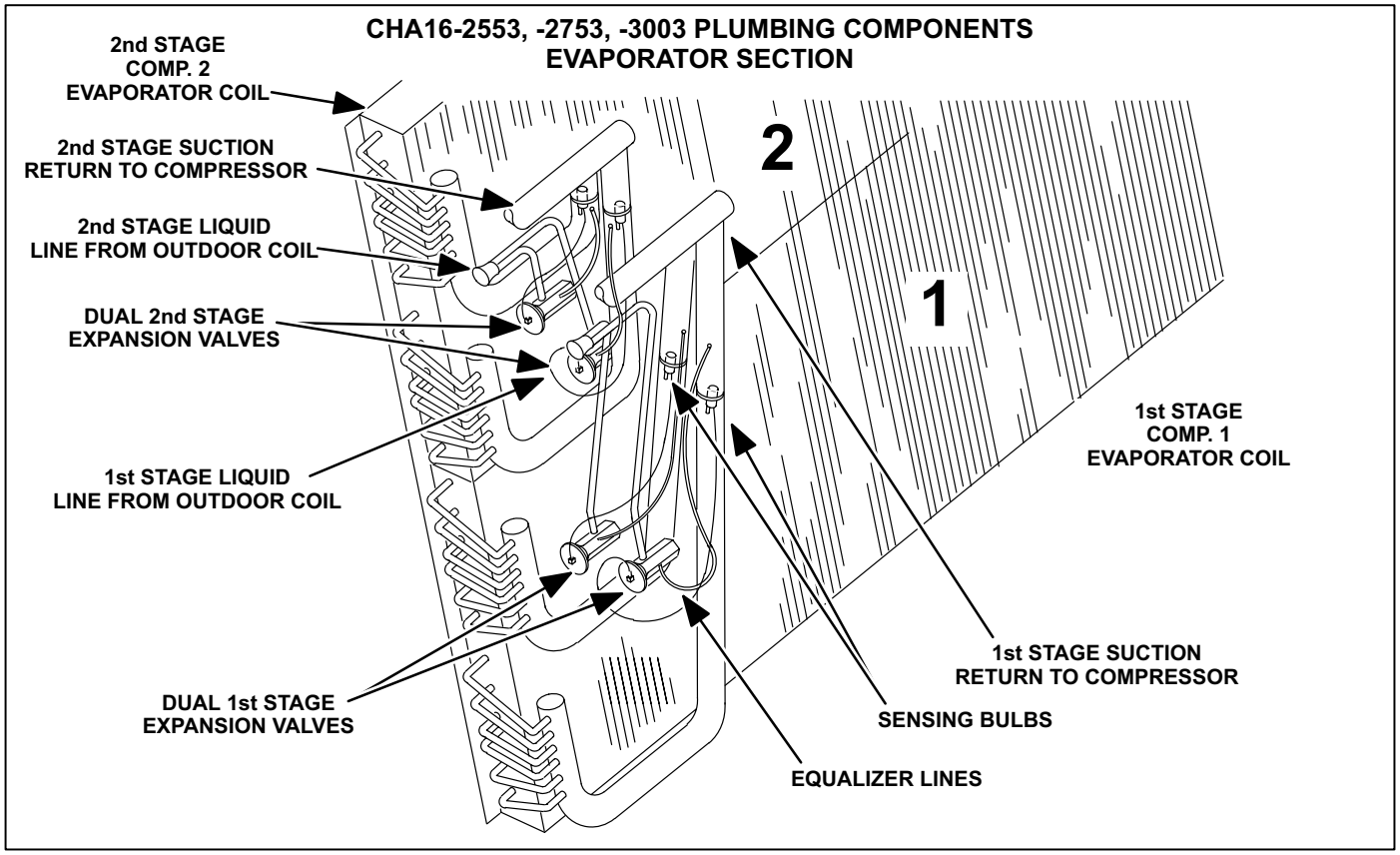


FIGURE 21

1-Compressors B1, B2 and B13

Compressors are supplied by various manufacturers. All units are equipped with two independent cooling circuits except 15 ton units which are equipped with three independent cooling circuits. Compressor electrical specifications vary by manufacturer. Likewise, compressor capacity may vary from first stage to second stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See unit rating plate for specific compressor capacity ratings and electrical data.

Units with two cooling circuits:

Compressor B1 is compressor 1. It operates during all cooling demand and is energized by contactor K1 upon receiving a first stage demand. Compressor B2 is compressor 2. It operates only during second stage cooling demand and is energized by contactor K2 upon receiving a second stage demand.

NOTE-Refer to wiring diagram section B9 for specific unit operation.

Units with three cooling circuits:

Compressor B1 is compressor 1. It operates during all cooling demand and is energized by contactor K1 upon receiving a first stage demand. Compressor B2 is compressor 2. It operates only during first stage cooling demand and is energized by contactor K2 upon receiving a first stage demand (after time delay DL15 closes). Compressor B13 is compressor 3. It is energized by contactor K14 upon receiving a second stage demand.

Each compressor used in CHA16 units is equipped with a self-regulating crankcase heater. Fifteen ton and smaller units use insertion type heaters while 18.5 ton and larger units use belly-band style heaters. All compressors are protected by internal overload protection circuitry.

⚠ WARNING

Electrical shock hazard. Compressor must be grounded. Do not operate without protective cover over terminals. Disconnect power before removing protective cover. Discharge capacitors before servicing unit. Failure to follow these precautions could cause electrical shock resulting in injury or death.

⚠ 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.

2-Crankcase Heaters HR1, HR2 and HR5

⚠ CAUTION

Self-regulating crankcase heaters are connected to line voltage at all times (not switched by unit circuitry.)

All CHA16-1853 compressors are equipped with self-regulating type crankcase heaters. Fifteen ton and smaller units use insertion type heaters while 18.5 ton and larger units use belly-band style heaters. Heater HR1 is installed in compressor B1, heater HR2 is installed in compressor B2 and heater HR5 is installed in compressor B13 (if unit is equipped with three compressors). Crankcase heater wattage varies by compressor manufacturer. See unit rating plate for specific electrical data.

3-High Pressure Limit S4, S7 and S28

The high pressure limit is a manually reset SPST N.C. switch which opens on a pressure rise. All CHA16 units are equipped with this limit. The switch is located in the compressor discharge line and is wired in series with the compressor contactor.

In three pump systems, S4 is wired in series with the first stage compressor 1 contactor, S7 is wired in series with the first stage compressor 2 contactor and S28 is wired in series with the second stage compressor 3 contactor. In two pump systems, S4 is wired in series with the first stage compressor contactor and S7 is wired in series with the second stage compressor contactor.

When discharge pressure rises above 410+10 psig (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate.) After the problem has been found and corrected, the switch can be reset by pushing-in the switch button.

4-Loss of Charge Switch S24, S25 and S34

The loss of charge switch is an auto-reset SPST N.C. switch which opens on a pressure drop (almost complete loss of charge). All CHA16 units are equipped with this switch. The switch is located in the compressor discharge line next to the high pressure switch and is wired in series with the high pressure switch and compressor contactor.

In three pump systems, S24 is wired in series with first stage (compressor #1) contactor K1, S25 is wired in series with first stage (compressor #2) contactor K2 and S34 is wired in series with the second stage (compressor #3) contactor K14. In two pump systems, S24 is wired in series with first stage compressor contactor and S25 is wired in series with second stage 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 switch automatically resets when refrigerant is added and pressure in the discharge line rises above 55±5 psig.

5-Thermometer Well (Figure 22)

All units are factory equipped with a thermometer well for charging the unit. The well is used to accurately measure the temperature of the liquid line. The temperature measured is then used to calculate the approach or subcooling temperature. Approach and subcooling temperatures are compared to tables printed in the charging section of this manual to determine the correct charge. Thermometer wells are equipped with a gauge port for high pressure gauge connection.

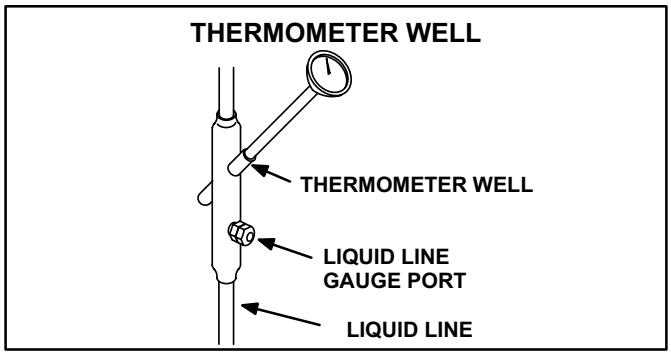


FIGURE 22

To accurately measure the temperature of the liquid line, the well should be filled with a light mineral oil before using. This will ensure good heat transfer to the thermometer.

6-Freezestats S49, S50 and S53

Each evaporator is equipped with a low temperature limit located on a suction feeder. In three pump systems, S49 is located on the first stage compressor 1 coil, S50 is located on the first stage compressor 2 coil and S53 is located on the second stage coil. In two pump systems, S49 is located on the first stage evaporator coil and S50 is located on the second stage evaporator coil.

Each freezestat is wired in series with its respective compressor contactor coil. Each freezestat is a SPST auto-reset limit which opens at 29°F ± 3°F on a temperature drop and closes at 58°F ± 4°F on a temperature rise. To prevent coil icing, the freezestats open during compressor operation to temporarily disable the respective compressor until the coil warms sufficiently to melt any accumulated frost.

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

7-Condenser Fans B4 and B5

The specifications tables on pages 2-6 in this manual shows the specifications of condenser fans used in CHA16 series units. Condenser outdoorfans in all CHA16CHP16CHA16 units (all voltages) use three-phase motors which do not require a run capacitor. CHA16-823 and CHA16-953 units are equipped with a single condenser fan which operates during all compressor operation. All other CHA16 units are equipped with two condenser fans. In CHA16-1603 and CHA16-1853 units, both condenser fans are energized upon receiving a first stage cooling demand. Condenser fans draw air across both condenser coils during all compressor operation. In all other CHA16 series units, the condenser fans operate independently and are staged with the compressors.

D-Blower Compartment / Power Make-Up Components

1-Indoor Blower Motor B3

All CHA16 units use three-phase single-speed blower motors. CFM adjustments are made by adjusting the motor pulley (sheave). Blower motor ratings are shown in table 23. Motors are equipped with sealed ball bearings. All motors and operate at 1725 to 1760 RPM and all are internally overload protected. Units may be equipped with motors manufactured by Century, G.E., Emerson, Marathon or other manufacturer. Electrical FLA and LRA specifications vary by manufacturer. See unit rating plate for information specific to your unit.

TABLE 23

BLOWER MOTOR				
Drive		Units	Electrical Characteristics	
HP	Usage		Volts	Phase
2	Standard	CHA16-823-Y,G CHA16-953-Y,G CHA16-1353-Y,G	208/230 switchable to 460	3
2	Standard	CHA16-823-J CHA16-953-J CHA16-1353-J	575	3
3	Optional	CHA16-1353-Y,G	208/230 switchable to 460	3
	Standard	CHA16-1603-Y,G CHA16-1853-Y,G		
3	Optional	CHA16-1353-J	575	3
	Standard	CHA16-1603-J CHA16-1853-J		
5	Optional	CHA16-1853-Y,G	208/230 switchable to 460	3
	Standard	CHA16-2553-Y,G		
5	Optional	CHA16-1853-J	575	3
	Standard	CHA16-2553-J		
7.5	Optional	CHA16-2553-Y,G CHA16-2753-Y,G	208/230 switchable to 460	3
	Standard	CHA16-3003-Y,G		
7.5	Optional	CHA16-2553-J CHA16-2753-J	575	3
	Standard	CHA16-3003-J		
10	Optional	CHA16-3003-Y,G	208/230 switchable to 460	3
10	Optional	CHA16-3003-J	575	3

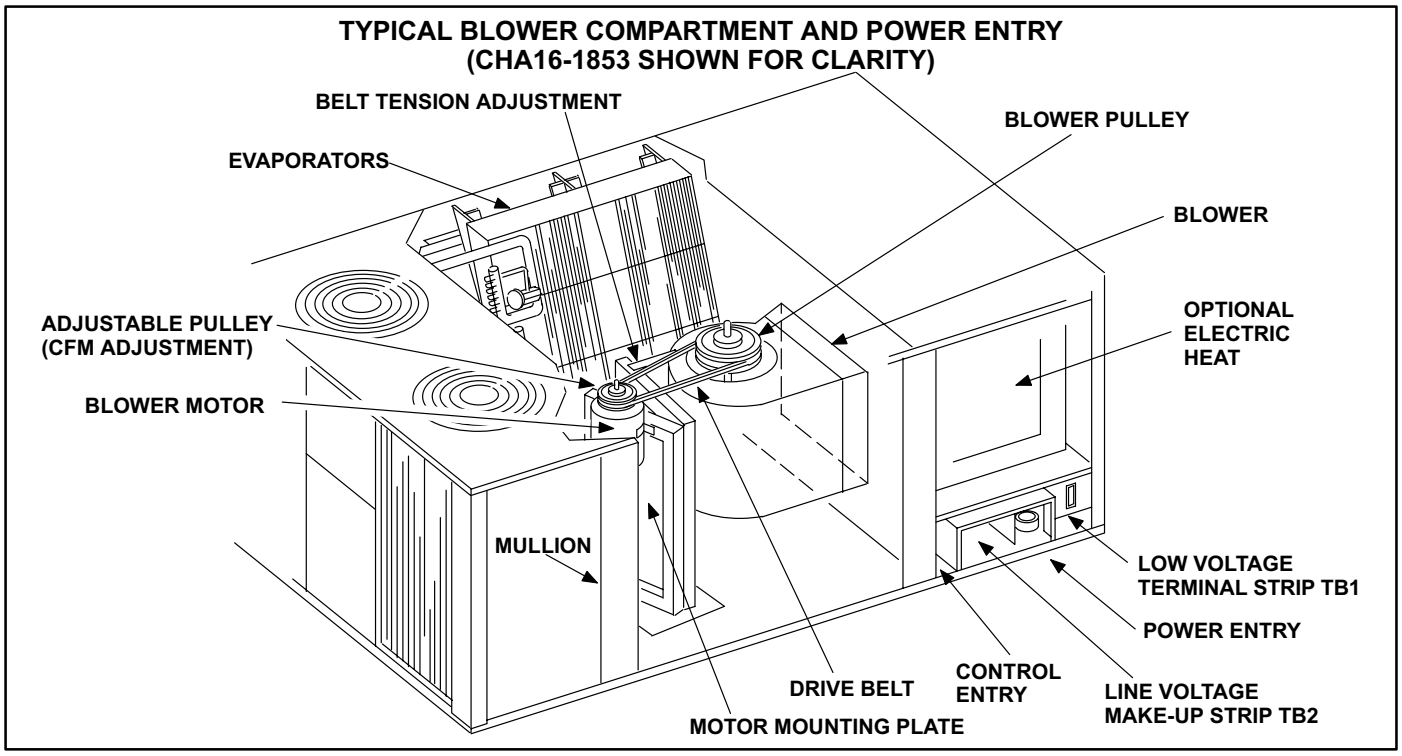


FIGURE 24

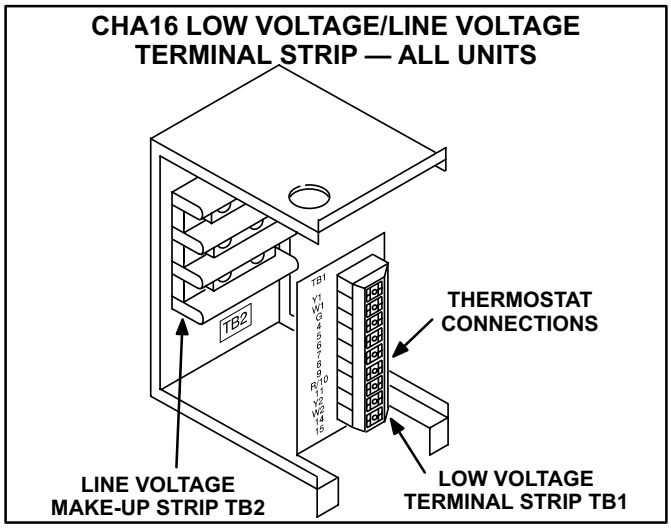


FIGURE 25

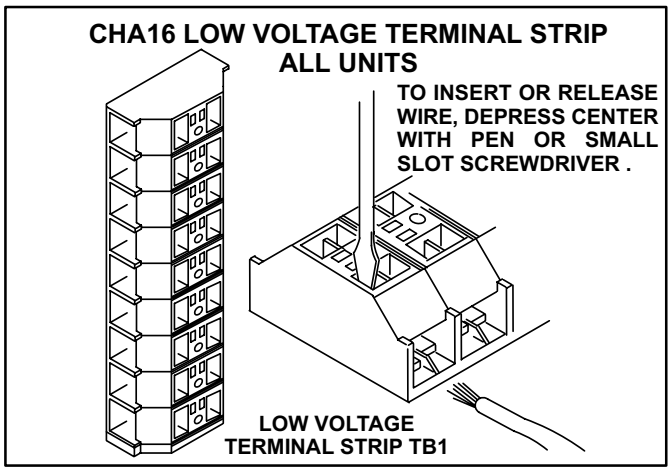


FIGURE 26

2-Low Voltage Terminal Strip TB1

All units are equipped with a low voltage terminal strip TB1 located in the heating/power entry make-up compartment. See figures 24 and 25. Most low voltage (thermostat) electrical connections can be made to this terminal strip. A separate access panel is provided adjacent to the blower access panel. Knock-outs provided in the base pan of the unit cabinet allow for passage of wires into conduit and roof mounting frame. Special instructions are provided where needed for low voltage connections that cannot be made to the terminal strip. A detail drawing of TB1 is also shown in figure 26.

TB1 uses spring crimp type retainers for securing wires. A small slot screwdriver must be used to depress the spring in order to insert or remove a wire (see figure 26). Strip wire no more than 1/4".

3-Line Voltage Make-Up Strip TB2

All units are equipped with a line voltage make-up strip TB2 located in the heating/power entry make-up compartment. See figures 24 and 25. TB2 is used to make connection of all line voltage wiring. Knock-outs provided in the base pan of the unit cabinet allow for passage of wires into conduit and roof mounting frame. A separate access panel is provided adjacent to the blower access panel.

III-ELECTRICAL CONNECTIONS

A-Power Supply

Refer to startup directions and refer closely to the unit wiring diagram when servicing. See unit nameplate for minimum circuit ampacity and maximum fuse size. 208/460/575 volt units are factory wired with red wire connected to control transformer primary. 230 volt units are field wired with orange wire connected to control transformer primary.

IV-PLACEMENT AND INSTALLATION

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

V-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 (see section VII-C-Blower Belt Adjustment).

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 Operation and Adjustment section for proper method of checking charge.

C-Heating Startup

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

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

6- Additional stages are controlled by indoor thermostat and electric heat time delays.

D-Safety or Emergency Shutdown

Turn off power to the unit.

VI-COOLING SYSTEM SERVICE CHECKS

CHA16 is factory charged and requires no further adjustment; however, charge should be checked periodically using the approach method. The approach method compares actual liquid temperature with the outdoor ambient temperature. Thermometer wells have been provided to allow accurate liquid temperature measurement.

A-Gauge Manifold Attachment

Service gauge ports are identified in figures 14, 15, 16, 17 and 18. Attach high pressure line to liquid line gauge port on thermometer well. Attach low pressure line to suction line service port.

NOTE-If owner complains of insufficient cooling, the unit should be gauged and refrigerant charge checked.

B-Charging

All units are factory charged and requires no further adjustment; however, check charge during start-up using the approach method outlined below. Approach method compares actual liquid temperature with outdoor ambient temperature. Thermometer wells have been provided to allow accurate liquid temperature measurement.

If the system is completely void of refrigerant, the recommended and most accurate method of charging is to weigh refrigerant into the unit according to the amount shown on the unit nameplate and in the specifications table. If weighing facilities are not available or if the unit is just low on charge, use the following procedures:

⚠ WARNING

Do not exceed nameplate charge under any conditions. Compressor damage will result.

1- This method uses a thermometer inserted in the thermometer wells to check liquid line temperature. *Make sure thermometer wells are filled with oil before checking.*

2- *IMPORTANT - Block compressor compartment with access panel so air will not by-pass the coils.*

3- Operate unit (all compressors) for at least five minutes until pressures stabilize.

TABLE 3

APPROACH TEMPERATURE		
UNIT	Degrees F Liquid Line Warmer Than Outdoor Air	
	1st Stage	2nd Stage
CHA16-823	7°F ± 1 (3.9°C ± 0.5)	
CHA16-953	8°F ± 1 (4.5°C ± 0.5)	
CHA16-1353	6°F ± 1 (3.3°C ± 0.5)	
CHA16-1603	6°F ± 1 (3.3°C ± 0.5)	
CHA16-1853	7°F ± 1 (3.9°C ± 0.5)	
CHA16-2553*	7°F ± 1 (3.9°C ± 0.5)	
CHA16-2753*	7°F ± 1 (3.9°C ± 0.5)	
CHA16-3003*	7°F ± 1 (3.9°C ± 0.5)	
CHA16-2553†	7°F ± 1 (3.9°C ± 0.5)	8°F ± 1 (4.5°C ± 0.5)
CHA16-2753†	8°F ± 1 (4.5°C ± 0.5)	10°F ± 1 (5.6°C ± 0.5)
CHA16-3003†	9°F ± 1 (5.1°C ± 0.5)	10°F ± 1 (5.6°C ± 0.5)

*Round cornered condenser coils.
†Slab type condenser coils.

4- Check each stage separately with all stages operating. Compare liquid temperatures to outdoor ambient temperature. Liquid line temperature should be a few degrees warmer than the outdoor air temperature. Table 3 shows how much warmer the liquid line should be. For best results use same thermometer for both readings.

Add refrigerant to make the liquid line cooler.

Recover refrigerant to make the liquid line warmer.

VII-INDOOR BLOWER OPERATION / ADJUSTMENT

A-Blower Operation

NOTE-The following is a generalized procedure and does not apply to all thermostat control systems.

1- Blower operation is dependent on the thermostat control system option that has been installed in the CHA16. Refer to the operation sequence for the control system installed for detailed descriptions of blower operation.

2- Generally, blower operation is set at the thermostat fan switch. With the fan switch in “ON” position, the blower operates continuously. With the fan switch in “AUTO” position, the blower cycles with demand (or, with some control systems, runs continuously while the heating or cooling circuits cycle).

3- In most cases, the blower and entire unit will be off when the system switch is in the “OFF” position. The only exception is immediately after a heating demand until blower control switches off.

B-Determining Unit CFM

1- The following measurements must be made with a dry indoor coil. Run the blower without the cooling demand. Air filters must be in place when measurements are taken.

2- Measure static pressure external to the unit (from supply to return).

To Measure Discharge Static Pressure:

a- Locate taps as shown in figure 27.

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

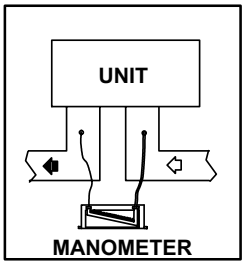


FIGURE 27

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

d- Seal around the hole when the check is complete.

3- Measure indoor blower wheel RPM (figure 28).

4- Refer to unit nameplate to determine the blower motor horsepower.

5- Use the static pressure and RPM readings to determine unit CFM.

6- The CFM can be adjusted at the motor pulley (see section C-Blower Belt Adjustment).

Determining Unit CFM (Alternative Method):

Air volume may also be determined by measuring pressure drop across the indoor coil.

1- Remove lifting lug bolt located on the blower side of unit above condensate drain. Use an awl or screw driver to open a hole in the insulation.

2- Insert the positive or high pressure hose of draft gauge 1 inch past the insulation.

3- Remove filter access panel and insert other hose through hole provided on the panel above filter and connect to negative (low) pressure side of gauge.
4- Turn on blower and determine draft gauge reading.
5- Adjust blower speed as required (see section C-Blower Belt Adjustment).

C-Blower Belt Adjustment

Proper pulley alignment and belt tension must be maintained for maximum belt life.

NOTE-Tension new belt after 24-48 hours of operation. This will allow belts to stretch and seat in grooves. To increase belt tension, loosen two locking bolts and pull mounting plate. Tighten motor mounting plate in vertical position.

Adjusting Unit CFM:

The CFM can be changed by using the following procedure:

1- Remove the blower belt.
2- Loosen the set screws on motor pulley and remove key as shown in figure 28.
3- Turn pulley clockwise to increase CFM and counterclockwise to decrease CFM. One half turn changes blower speed approximately 20 RPM.

NOTE-The pulley is factory set at three turns open.

4- Replace the key and tighten the set screw. Replace and tighten the blower belt.

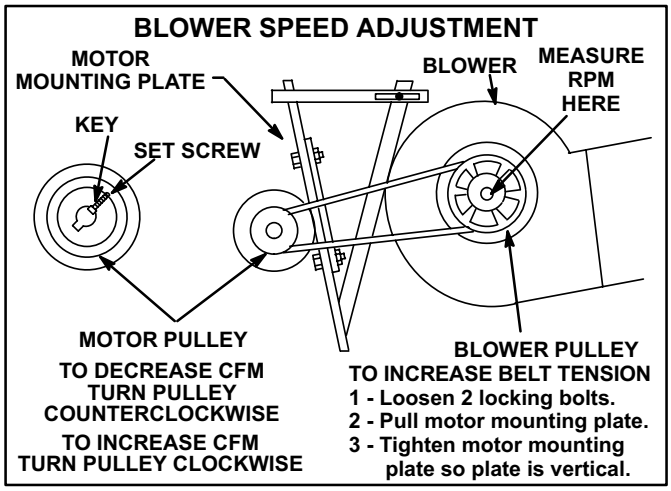


FIGURE 28

VIII-MAINTENANCE

⚠ CAUTION

Electrical shock hazard. Turn off power to unit before performing any maintenance, cleaning or service operation on the unit.

A-Filters (Figure 29)

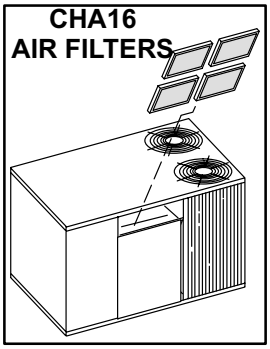


FIGURE 29

CHA16 unit is equipped with four pleated 2" throw-away type filters. Permanent 1" foam filters are acceptable replacements. Filters should be checked monthly (or more frequently in severe use) and cleaned or replaced regularly. If permanent foam filters are used as a replacement, they should be checked and cleaned periodically with warm water and a mild detergent. Take note of the "AIR FLOW DIRECTION" marking on the filter frame when re-installing.

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

B-Lubrication

All motors used in CHA16 units are prelubricated; no further lubrication is required.

C-Supply Air Blower Wheel

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

D-Evaporator Indoor Coil

Inspect and clean coil at beginning of each season. Clean using mild detergent or commercial coil cleanser. Check condensate drain pan and line, if necessary. Flush coil and condensate drain with water taking care not to get insulation, filters, return air ducts wet. Check connecting lines and coil for evidence of oil leaks.

E-Condenser Coil

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season. Check connecting lines and coil for evidence of oil leaks.

Condenser coils are made of individual coil slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate slabs and wash thoroughly. See figure 30.

F-Electrical

1- Check all wiring for loose connections.
2- Check for correct voltage at unit (unit operating).
3- Check amp-draw on both condenser fan motor and blower motor.
Fan Motor Rating Plate ____ Actual _____
Indoor Blower Motor Rating Plate____ Actual____

IX-OPTIONAL ECH16 ELECTRIC HEAT

CHA16-823 MODELS (TABLE 4)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity
ECH16-82/95-10 208/230v **(61H68)** 460v **(61H73)** (38 lbs.)	1	208	7.5	25,600	36.0
		220	8.4	28,700	39.0
		230	9.2	31,400	
		240	10.0	34,100	
	1	440	8.4	28,700	20.0
		460	9.2	31,400	
		480	10.0	34,100	
ECH16-82/95-15 208/230v **(61H69)** 460v **(61H74)** (38 lbs.)	1	208	11.3	38,600	49.0
		220	12.6	43,000	54.0
		230	13.5	46,100	
		240	15.0	51,200	
	1	440	12.6	43,000	27.0
		460	13.8	46,100	
		480	15.0	51,200	
ECH16-82/95-20 208/230v **(61H70)** 460v **(61H75)** (42 lbs.)	**2	208	15.0	51,200	62.0
		220	16.8	57,300	69.0
		230	18.4	62,800	
		240	20.0	68,300	
	1	440	16.8	57,300	35.0
		460	18.4	62,800	
		480	20.0	68,300	
ECH16-82/95-30 208/230v **(61H71)** 460v **(61H76)** (42 lbs.)	**2	208	22.5	76,800	88.0
		220	25.2	86,000	99.0
		230	27.5	93,900	
		240	30.0	102,400	
	1	440	25.2	86,000	50.0
		460	27.6	93,900	
		480	30.0	102,400	
ECH16-82/95-40 208/230v **(61H72)** 460v **(61H77)** (53 lbs.)	**3	208	30.0	102,400	114.0
		220	33.6	114,700	129.0
		230	36.8	125,600	
		240	40.0	136,500	
	**2	440	33.6	114,700	65.0
		460	36.8	125,600	
		480	40.0	136,500	

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

**May be used with two stage control.

NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-953 MODELS (TABLE 5)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity
ECH16-82/95-10 208/230v **(61H68)** 460v **(61H73)** (38 lbs.)	1	208	7.5	25,600	44.0
		220	8.4	28,700	44.0
		230	9.2	31,400	
		240	10.0	34,100	
	1	440	8.4	28,700	23.0
		460	9.2	31,400	
		480	10.0	34,100	
ECH16-82/95-15 208/230v **(61H69)** 460v **(61H74)** (38 lbs.)	1	208	11.3	38,600	49.0
		220	12.6	43,000	54.0
		230	13.5	46,100	
		240	15.0	51,200	
	1	440	12.6	43,000	27.0
		460	13.8	46,100	
		480	15.0	51,200	
ECH16-82/95-20 208/230v **(61H70)** 460v **(61H75)** (42 lbs.)	**2	208	15.0	51,200	62.0
		220	16.8	57,300	69.0
		230	18.4	62,800	
		240	20.0	68,300	
	1	440	16.8	57,300	35.0
		460	18.4	62,800	
		480	20.0	68,300	
ECH16-82/95-30 208/230v **(61H71)** 460v **(61H76)** (42 lbs.)	**2	208	22.5	76,800	88.0
		220	25.2	86,000	99.0
		230	27.5	93,900	
		240	30.0	102,400	
	1	440	25.2	86,000	50.0
		460	27.6	93,900	
		480	30.0	102,400	
ECH16-82/95-40 208/230v **(61H72)** 460v **(61H77)** (53 lbs.)	**3	208	30.0	102,400	114.0
		220	33.6	114,700	129.0
		230	36.8	125,600	
		240	40.0	136,500	
	**2	440	33.6	114,700	65.0
		460	36.8	125,600	
		480	40.0	136,500	

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

**May be used with two stage control.

NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-1353 MODELS (TABLE 6)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity	
					2 hp	3 hp
ECH16 -135/160-15 208/230v **(72G21)** 460v **(72G26)** (38 lbs.)	1	208	11.3	38,600	51.0	54.0
		220	12.6	43,000	55.0	58.0
		230	13.5	46,100		
		240	15.0	51,200		
	1	440	12.6	43,000	28.0	29.0
		460	13.8	46,100		
		480	15.0	51,200		
ECH16 -135/160-20 208/230v **(72G22)** 460v **(72G27)** (42 lbs.)	**2	208	15.0	51,200	62.0	66.0
		220	16.8	57,300	69.0	73.0
		230	18.4	62,800		
		240	20.0	68,300		
	1	440	16.8	57,300	35.0	37.0
		460	18.4	62,800		
		480	20.0	68,300		
ECH16 -135/160-30 208/230v **(72G23)** 460v **(72G28)** (42 lbs.)	**2	208	22.5	76,800	88.0	92.0
		220	25.2	86,000	99.0	103.0
		230	27.5	93,900		
		240	30.0	102,400		
	1	440	25.2	86,000	50.0	52.0
		460	27.6	93,900		
		480	30.0	102,400		
ECH16 -135/160-40 208/230v **(72G24)** 460v **(72G29)** (53 lbs.)	**3	208	30.0	102,400	114.0	118.0
		220	33.6	114,700	129.0	133.0
		230	36.8	125,600		
		240	40.0	136,500		
	**2	440	33.6	114,700	65.0	67.0
		460	36.8	125,600		
		480	40.0	136,500		
ECH16 -135/160-50 208/230v **(72G25)** 460v **(72G30)** (58 lbs.)	**4	208	37.5	128,000	140.0	144.0
		220	42.0	143,300	159.0	163.0
		230	46.0	157,000		
		240	50.0	170,600		
	**2	440	43.8	149,500	80.0	82.0
		460	46.0	157,000		
		480	50.0	170,600		

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.
**May be used with two stage control.
NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-1603 MODELS (TABLE 7)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity
ECH16 -135/160-15 208/230v **(72G21)** 460v **(72G26)** (38 lbs.)	1	208	11.3	38,600	69.0
		220	12.6	43,000	69.0
		230	13.5	46,100	
		240	15.0	51,200	
	1	440	12.6	43,000	36.0
		460	13.8	46,100	
		480	15.0	51,200	
ECH16 -135/160-20 208/230v **(72G22)** 460v **(72G27)** (42 lbs.)	**2	208	15.0	51,200	69.0
		220	16.8	57,300	73.0
		230	18.4	62,800	
		240	20.0	68,300	
	1	440	16.8	57,300	37.0
		460	18.4	62,800	
		480	20.0	68,300	
ECH16 -135/160-30 208/230v **(72G23)** 460v **(72G28)** (42 lbs.)	**2	208	22.5	76,800	92.0
		220	25.2	86,000	103.0
		230	27.5	93,900	
		240	30.0	102,400	
	1	440	25.2	86,000	52.0
		460	27.6	93,900	
		480	30.0	102,400	
ECH16 -135/160-40 208/230v **(72G24)** 460v **(72G29)** (53 lbs.)	**3	208	30.0	102,400	118.0
		220	33.6	114,700	133.0
		230	36.8	125,600	
		240	40.0	136,500	
	**2	440	33.6	114,700	67.0
		460	36.8	125,600	
		480	40.0	136,500	
ECH16 -135/160-50 208/230v **(72G25)** 460v **(72G30)** (58 lbs.)	**4	208	37.5	128,000	144.0
		220	42.0	143,300	163.0
		230	46.0	157,000	
		240	50.0	170,600	
	**2	440	43.8	149,500	82.0
		460	46.0	157,000	
		480	50.0	170,600	

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.
**May be used with two stage control.
NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-1853 MODELS (TABLE 8)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity	
					3 hp	5 hp
ECH16 -185-15 208/230v **(24H27)** 460v **(24H32)** (47 lbs.)	1	208	11.3	38,600	86.0	92.0
		220	12.6	43,000	86.0	92.0
		230	13.5	46,100		
		240	15.0	51,200		
	1	440	12.6	43,000	44.0	47.0
		460	13.8	46,100		
		480	15.0	51,200		
ECH16 -185/300-30 208/230v **(24H28)** 460v **(24H33)** (51 lbs.)	**2	208	22.5	76,800	92.0	99.0
		220	25.2	86,000	103.0	110.0
		230	27.5	93,900		
		240	30.0	120,400		
	1	440	25.2	86,000	52.0	55.0
		460	27.5	93,900		
		480	30.0	102,400		
ECH16 -185/300-45 208/230v **(24H29)** 460v **(24H34)** (62 lbs.)	**3	208	33.8	115,300	131.0	139.0
		220	37.8	129,000	148.0	155.0
		230	41.3	141,000		
		240	45.0	153,600		
	**2	440	37.8	129,000	74.0	78.0
		460	41.3	141,000		
		480	45.0	153,600		
ECH16 -185/300-60 208/230v **(24H30)** 460v **(24H35)** (67 lbs.)	**4	208	45.0	153,600	170.0	177.0
		220	50.4	172,000	193.0	200.0
		230	55.1	188,000		
		240	60.0	204,800		
	**2	440	50.4	172,000	97.0	100.0
		460	55.1	188,000		
		480	60.0	204,800		
ECH16 -185/300-75 460v **(24H36)** (88 lbs.)	**3	440	63.0	215,000	119.0	123.0
		460	68.9	235,100		
		480	75.0	255,900		

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.
**May be used with two stage control.
NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-2553 MODELS (TABLE 9)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity	
					5 hp	7.5 hp
ECH16 -185/300-30 208/230v **(24H28)** 460v **(24H33)** (51 lbs.)	**2	208	22.5	76,800	110.0	117.0
		220	25.2	86,000	110.0	118.0
		230	27.5	93,900		
		240	30.0	102,400		
	1	440	25.2	86,000	55.0	59.0
		460	27.5	93,900		
		480	30.0	104,400		
ECH16 -185/300-45 208/230v **(24H29)** 460v **(24H34)** (62 lbs.)	**3	208	33.8	115,300	139.0	148.0
		220	37.8	129,000	155.0	163.0
		230	41.3	141,000		
		240	45.0	153,600		
	**2	440	37.8	129,000	78.0	82.0
		460	41.3	141,000		
		480	45.0	153,600		
ECH16 -185/300-60 208/230v **(24H30)** 460v **(24H35)** (67 lbs.)	**4	208	45.0	153,600	178.0	187.0
		220	50.4	172,000	200.0	208.0
		230	55.1	188,100		
		240	60.0	204,800		
	**2	440	50.4	172,000	100.0	104.0
		460	55.1	188,100		
		480	60.0	204,800		
ECH16 -275/300-75 208/230v **(24H31)** ECH16 -185/300-75 460v **(24H36)** (88 lbs.)	**5	208	56.3	192,200	217.0	226.0
		220	63.0	215,000	245.0	253.0
		230	68.9	235,000		
		240	75.0	255,900		
	**3	440	63.0	215,000	123.0	127.0
		460	68.9	235,000		
		480	75.0	255,900		
ECH16 -275/300-90 460v **(24H37)** (92 lbs.)	**3	440	75.6	258,000	145.0	150.0
		460	82.7	282,000		
		480	90.0	307,100		

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.
**May be used with two stage control.
NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-2753 MODELS (TABLE 10)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity	
					5 hp	7.5 hp
ECH16 -185/300-30 208/230v **(24H28)** 460v **(24H33)** (51 lbs.)	**2	208	22.5	76,800	118.0	126.0
		220	25.2	86,000	117.0	124.0
		230	27.5	93,900		
		240	30.0	102,400		
	1	440	25.2	86,000	57.0	61.0
		460	27.5	93,900		
		480	30.0	104,400		
ECH16 -185/300-45 208/230v **(24H29)** 460v **(24H34)** (62 lbs.)	**3	208	33.8	115,300	139.0	148.0
		220	37.8	129,000	155.0	163.0
		230	41.3	141,000		
		240	45.0	153,600		
	**2	440	37.8	129,000	78.0	82.0
		460	41.3	141,000		
		480	45.0	153,600		
ECH16 -185/300-60 208/230v **(24H30)** 460v **(24H35)** (67 lbs.)	**4	208	45.0	153,600	178.0	187.0
		220	50.4	172,000	200.0	208.0
		230	55.1	188,100		
		240	60.0	204,800		
	**2	440	50.4	172,000	100.0	104.0
		460	55.1	188,100		
		480	60.0	204,800		
ECH16 -275/300-75 208/230v **(24H31)** ECH16 **-185/300-75** 460v **(24H36)** (88 lbs.)	**5	208	56.3	192,200	217.0	226.0
		220	63.0	215,000	245.0	253.0
		230	68.9	235,000		
		240	75.0	255,900		
	**3	440	63.0	215,000	123.0	127.0
		460	68.9	235,000		
		480	75.0	255,900		
ECH16 -275/300-90 460v **(24H37)** (92 lbs.)	**3	440	75.6	258,000	145.0	150.0
		460	82.7	282,000		
		480	90.0	307,100		

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

**May be used with two stage control.

NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

CHA16-3003 MODELS (TABLE 11)

Electric Heat Model No. & Net Weight	No. of Steps	Volts Input	kw Input	Btuh Output	*Total Unit & Electric Heat Minimum Circuit Ampacity	
					7.5 hp	10 hp
ECH16 -185/300-30 208/230v **(24H28)** 460v **(24H33)** (51 lbs.)	**2	208	22.5	76,800	143.0	150.0
		220	25.2	86,000	141.0	147.0
		230	27.5	93,900		
		240	30.0	102,400		
	1	440	25.2	86,000	68.0	71.0
		460	27.5	93,900		
		480	30.0	104,400		
ECH16 -185/300-45 208/230v **(24H29)** 460v **(24H34)** (62 lbs.)	**3	208	33.8	115,300	148.0	156.0
		220	37.8	129,000	163.0	171.0
		230	41.3	141,000		
		240	45.0	153,600		
	**2	440	37.8	129,000	82.0	86.0
		460	41.3	141,000		
		480	45.0	153,600		
ECH16 -185/300-60 208/230v **(24H30)** 460v **(24H35)** (67 lbs.)	**4	208	45.0	153,600	187.0	195.0
		220	50.4	172,000	208.0	216.0
		230	55.1	188,100		
		240	60.0	204,800		
	**2	440	50.4	172,000	104.0	108.0
		460	55.1	188,100		
		480	60.0	204,800		
ECH16 -275/300-75 208/230v **(24H31)** ECH16 **-185/300-75** 460v **(24H36)** (88 lbs.)	**5	208	56.3	192,200	226.0	234.0
		220	63.0	215,000	253.0	261.0
		230	68.9	235,000		
		240	75.0	255,900		
	**3	440	63.0	215,000	127.0	131.0
		460	68.9	235,000		
		480	75.0	255,900		
ECH16 -275/300-90 460v **(24H37)** (92 lbs.)	**3	440	75.6	258,000	150.0	153.0
		460	82.7	282,000		
		480	90.0	307,100		

*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements. Use wires suitable for at least 167°F.

**May be used with two stage control.

NOTE — Fuse block must be ordered extra. Factory installed heaters will have the fuse block factory installed. Fuse block must be installed in field installed heaters. See Optional Accessories tables.

A-Matchups and Ratings

Tables 4 thru 11 show all possible CHA16 to ECH16 matchups and electrical ratings.

B-Electric Heat Components

ECH16 parts arrangement is shown in figures 32 and 33. All ECH16 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-Contactor K15

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

2-Contactor K16

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

3-Contactor K17

Contactor K17 is also a three-pole double-break contactor located in the control box. All three stage ECH16 electric heat sections are equipped with K17. K17 has a 24VAC coil which is energized after time delays DL2 and DL4 close in sequence. When K17 is energized, the third-stage heating elements are energized.

4-Contactor K18

Contactor K18 is also a three-pole double-break contactor located in the control box. ECH16-185-60 208/230V electric heat unit (which is equipped with four stages of heat) and 208/230V ECH16-275/300-75 (which is equipped with two stages of heat) are equipped with K18. K18 has a 24VAC coil which is energized after time delays DL2, DL4 and DL5 close in sequence. When K18 is energized, fourth-stage heating elements are energized (ECH16-185-60) or heating element 4 is energized (ECH16-275/300-75).

5-Contactor K75

Contactor K75 is also a three-pole double-break contactor located in the control box. Only 208/230V ECH16-275/300-75 (which is equipped with two stages of heat is equipped with K18. K18 has a 24VAC coil which is energized after time delays DL2, DL4, DL5 and DL18 close in sequence. When K18 is energized, second stage heating elements are energized.

6-Relay K9

Relay K9 is a three-pole double-throw pilot relay intended to electrically isolate the CHA16 and ECH16 24V circuits. The coil of relay K9 is connected to first stage heating demand from the CHA16. When K9 is energized, three 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). When K9-3 closes, contactor K15 is energized.

7-Relay K19

Relay K19 is a single-pole double-throw pilot relay also intended to electrically isolate the CHA16 24VAC circuits from the ECH16 24V circuits. The coil of relay K19 is connected to second-stage heating demand from the CHA16. When K19 is energized, a single set of contacts switch. When K19-1 closes, second-stage electric heat is energized.

8-Time Delay DL2

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

DL2 is energized with first stage thermostat demand in 50kW 208/230V electric heat units. In all other multiple-stage electric heat units, DL2 is energized only after receiving a second stage thermostat demand.

9-Time Delay DL4

Time delay DL4 is identical to DL2. It is factory installed in all multiple-stage electric heat units with at least three stages of electric heat. DL4 allows staging by providing a timed interval between the second and third heating elements. The delay is identical to DL2.

DL4 is energized with second stage thermostat demand in 50kW 208/230V electric heat units. In all other multiple-stage electric heat units, DL4 is energized only after time delay DL2 closes.

10-Time Delay DL5

Time delay DL5 is only used in 50 and 75kW 208/230V electric heat units. The delay is identical to DL2 and DL4. DL5 allows four stages of heat by providing a timed interval between the third and fourth heating elements.

11-Time Delay DL18

Time delay DL18 is only used in 75kW 208/230V electric heat units. The delay is identical to DL2, DL4 and DL5. DL18 allows five stages of heat by providing a timed interval between the fourth and fifth heating elements. DL18 is energized only after time delay DL5 closes.

12-High Temperature Limit S15 (Primary)

S15 is the primary high temperature limit. It is located in the electric heat unit immediately downstream from the heating elements. S15 is a single-pole single-throw normally closed thermostat wired in series with the first stage contactor coil. The thermostat actuates at temperatures shown in table 12. The temperature differential is factory set and is not adjustable.

TABLE 12

S15 SPST AUTO-RESET HIGH TEMPERATURE LIMIT			
Unit	**Voltage**	**Open on Rise**	**Close On Fall**
7.5 Tons And Under	All	175°F ± 5°F	135°F ± 10°F
10 Thru 12.5 Tons	All	145°F ± 5°F	105°F ± 6°F
15 Tons And Larger	208/230V	145°F ± 5°F* 130°F ± 5°F	105°F ± 6°F * 90°F ± 6°F
	460 & 575V	125°F ± 5°F	95°F ± 6°F

***Early Production**

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

13-High Temperature Limit S63 (Redundant)

S63 is a redundant (primary) temperature limit factory installed in 460 & 575V units. The redundant limit is operable only when connected to CHP16 units and does not function when connected to CHA16 units.

14-High Temperature Limit S20 (Secondary)

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

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

15-Fuse F3

F3 is a current limiting fuse connected in series with each leg of electric heat (each stage of electric heat uses three fuses). Fuses used in CHA16 series heating sections are shown in table 13.

TABLE 13

CHA16 ELECTRIC HEAT SECTION FUSE RATINGS					
kW & Voltage	**Fuse F3 1st Stage (3 Fuses)**	**Fuse F3 2nd Stage (3 Fuses)**	**Fuse F3 3rd Stage (3 Fuses)**	**Fuse F3 4th Stage (3 Fuses)**	**Fuse F3 5th Stage (3 Fuses)**
10kW 208/230V	60 Amp 250V	---	---	---	---
10kW 460 & 575V	30 Amp 600V	---	---	---	---
15kW 208/230V	60 Amp 250V	---	---	---	---
15kW 460 & 575V	30 Amp 600V	---	---	---	---
20kW 208/230V	60 Amp 250V	60 Amp 250V	---	---	---
20kW 460 & 575V	60 Amp 600V	---	---	---	---
30kW 208/230V	60 Amp 250V	60 Amp 250V	---	---	---
30kW 460 & 575V	60 Amp 600V	---	---	---	---
40kW 208/230V	60 Amp 250V	60 Amp 250V	60 Amp 250V	---	---
40kW 460 & 575V	60 Amp 600V	30 Amp 600V	---	---	---
45kW 208/230V	60 Amp 250V	60 Amp 250V	60 Amp 250V	---	---
45kW 460 & 575V	60 Amp 600V	30 Amp 600V	---	---	---
50kW 460 & 575V	60 Amp 600V	30 Amp 600V	60 Amp 600V	30 Amp 600V	---
50kW 460 & 575V	60 Amp 600V	30 Amp 600V	---	---	---
60kW 208/230V	60 Amp 250V	60 Amp 250V	60 Amp 250V	60 Amp 250V	---
60kW 460 & 575V	60 Amp 600V	60 Amp 600V	---	---	---
75kW 208/230V	60 Amp 250V	60 Amp 250V	60 Amp 250V	60 Amp 250V	60 Amp 250V
75kW 460 & 575V	60 Amp 600V	60 Amp 600V	30 Amp 600V	---	---
90kW 460 & 575V	60 Amp 600V	60 Amp 600V	60 Amp 600V	---	---

16-Terminal Strip TB3

Electric heat line voltage connections are made to terminal strip TB3 located in the lower right corner of the control box. CHA16 unit electrical connections are also made here.

17-Transformer T2

T2 is a line voltage to 24V transformer located in the electric heat control box. The transformer provides 24VAC power to all ECH16 controls (contactor coils and time delays). Pilot relays (K9 and K19) plug-in to the CHA16 provide 24V circuit isolation.

Transformer T2 is rated in table 14.

TABLE 14

T2 TRANSFORMER RATINGS			
Electric Heat Unit	**Primary**	**Secondary**	**Internal Fuse**
208/230V Exc. 75kW	Red Tap-208V Orange Tap-230V Black Tap-Common	50VA Blue Tap-24VAC Yellow Tap-Common	2.5A
208/230V 75kW	Red Tap-208V Orange Tap-230V Black Tap-Common	70 VA Blue Tap-24VAC Yellow Tap-Common	3.5A
All 460V	Red Tap-440V Black Tap-Common	48VA Blue Tap-24VAC Yellow Tap-Common	2.5A
15kW, 30kW 45kW, 60kW 90kW 575V	Red Tap-550V Black Tap-Common	50VA Blue Tap-24VAC Yellow Tap-Common	2.5A
75kW 575V	Red Tap-575V Black Tap-Common	70VA Blue Tap-24VAC Yellow Tap-Common	3.5A

18-Heating Elements

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

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

Each stage is energized independently by a three-pole double-break contactor and is protected by safety limits. Heating elements used in ECH16 series units are listed in table 15.

TABLE 15

CHA16 HEATING ELEMENTS			
Unit	**Heat Section**	**Total Watts**	**Number of Elements/ Arrangement**
CHA16-823 & CHA16-953	ECH16-82/95-10-Y	10000 @ 240V	3 / Delta
	ECH16-82/95-10-G	10000 @ 460V	3 / Wye
	ECH16-82/95-10-J	10000 @ 575V	3 / Wye
	ECH16-82/95-15-Y	15000 @ 240V	3 / Delta
	ECH16-82/95-15-G	15000 @ 460V	3 / Wye
	ECH16-82/95-15-J	15000 @ 575V	3 / Wye
	ECH16-82/95-20-Y	20000 @ 240V	6 / Delta
	ECH16-82/95-20-G	20000 @ 460V	6 / Wye
	ECH16-82/95-20-J	20000 @ 575V	6 / Wye
	ECH16-82/95-30-Y	30000 @ 240V	6 / Delta
	ECH16-82/95-30-G	30000 @ 460V	6 / Wye
	ECH16-82/95-30-J	30000 @ 575V	6 / Wye
	ECH16-82/95-40-Y	40000 @ 240V	9 / Delta
	ECH16-82/95-40-G	40000 @ 460V	9 / Wye
	ECH16-82/95-40-J	40000 @ 575V	9 / Wye
CHA16-1353 & CHA16-1603	ECH16-135/160-15-Y	15000 @ 240V	3 / Delta
	ECH16-135/160-15-G	15000 @ 460V	3 / Wye
	ECH16-135/160-15-J	15000 @ 575V	3 / Wye
	ECH16-135/160-20-Y	20000 @ 240V	3 / Delta
	ECH16-135/160-20-G	20000 @ 460V	3 / Wye
	ECH16-135/160-20-J	20000 @ 575V	3 / Wye
	ECH16-135/160-30-Y	30000 @ 240V	6 / Delta
	ECH16-135/160-30-G	30000 @ 460V	6 / Wye
	ECH16-135/160-30-J	30000 @ 575V	6 / Wye
	ECH16-135/160-40-Y	40000 @ 240V	6 / Delta
	ECH16-135/160-40-G	40000 @ 460V	6 / Wye
	ECH16-135/160-40-J	40000 @ 575V	6 / Wye
	ECH16-135/160-50-Y	50000 @ 240V	12 / Delta
	ECH16-135/160-50-G	50000 @ 460V	12 / Wye
	ECH16-135/160-50-J	50000 @ 575V	12 / Wye
CHA16-1853	ECH16-185-15-Y	15000 @ 240V	3 / Delta
	ECH16-185-15-G	15000 @ 460V	3 / Wye
	ECH16-185-15-J	15000 @ 575V	3 / Wye
CHA16-1853/ CHA16-2553/ CHA16-2753 & CHA16-3003	ECH16-185/300-30-Y	30000 @ 240V	6 / Delta
	ECH16-185/300-30-G	30000 @ 460V	6 / Wye
	ECH16-185/300-30-J	30000 @ 575V	6 / Wye
	ECH16-185/300-45-Y	45000 @ 240V	9 / Delta
	ECH16-185/300-45-G	45000 @ 460V	9 / Wye
	ECH16-185/300-45-J	45000 @ 575V	9 / Wye
	ECH16-185/300-60-Y	60000 @ 240V	12 / Delta
	ECH16-185/300-60-G	60000 @ 460V	12 / Wye
	ECH16-185/300-60-J	60000 @ 575V	12 / Wye
CHA16-2553/ CHA16-2753 & CHA16-3003	ECH16-275/300-75-Y	75000 @ 240V	15 / Delta
CHA16-1853/ CHA16-2553/ CHA16-2753 & CHA16-3003	ECH16-275/300-75-G	75000 @ 460V	15 / Wye
	ECH16-275/300-75-J	75000 @ 575V	15 / Wye
CHA16-2553/ CHA16-2753 & CHA16-3003	ECH16-275/300-90-G	90000 @ 460V	18 / Wye
	ECH16-275/300-90-J	90000 @ 575V	18 / Wye

PARTS ARRANGEMENT
ELECTRIC HEAT SECTION
CHA16 SERIES UNITS 7.5 THRU 12.5 TONS
10, 15, 20, 30, 40 AND 50 KW

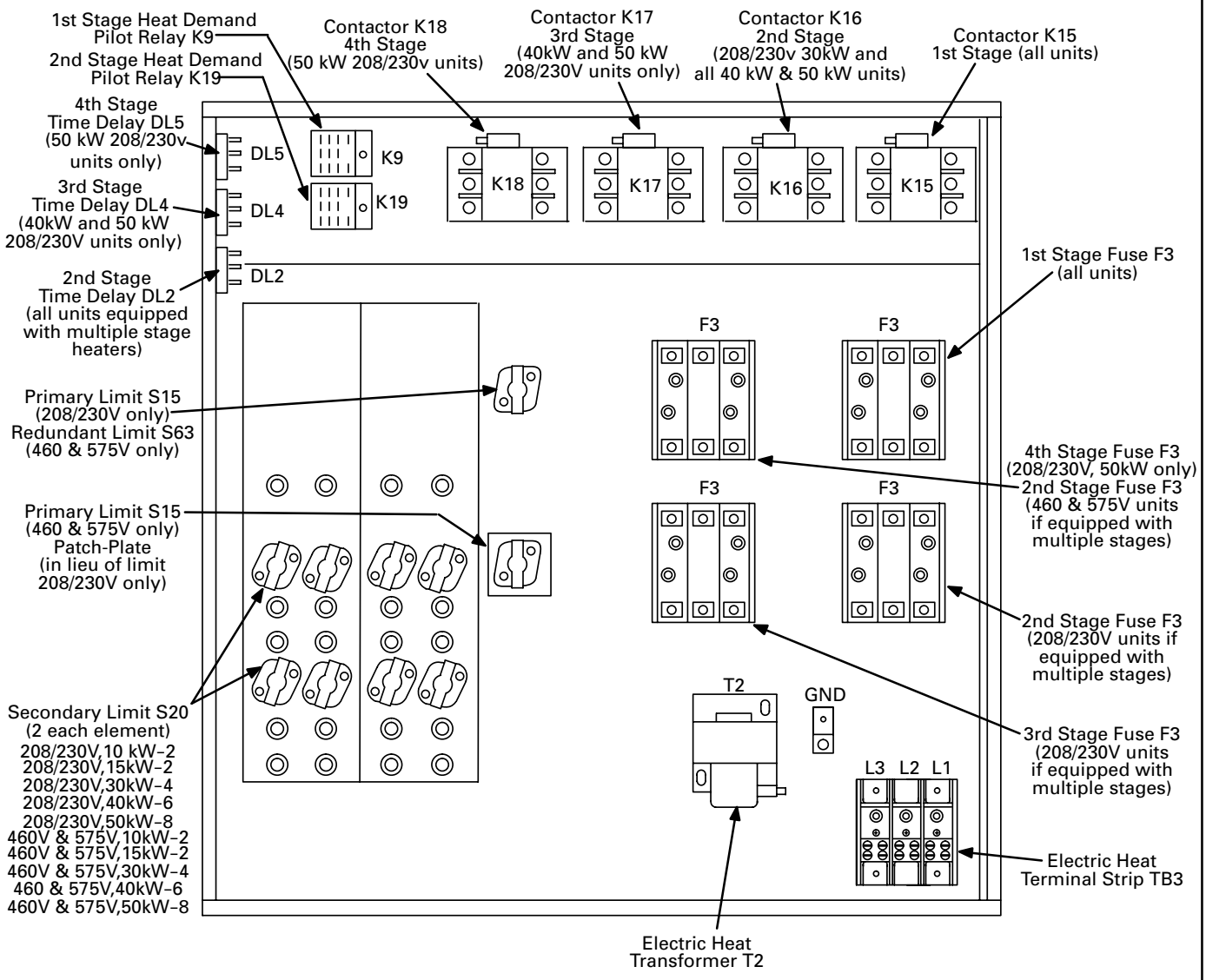


FIGURE 31

PARTS ARRANGEMENT
ELECTRIC HEAT SECTION
CHA16 SERIES UNITS 15 TONS AND LARGER
15, 30, 45, 60 AND 460/575V 75kW

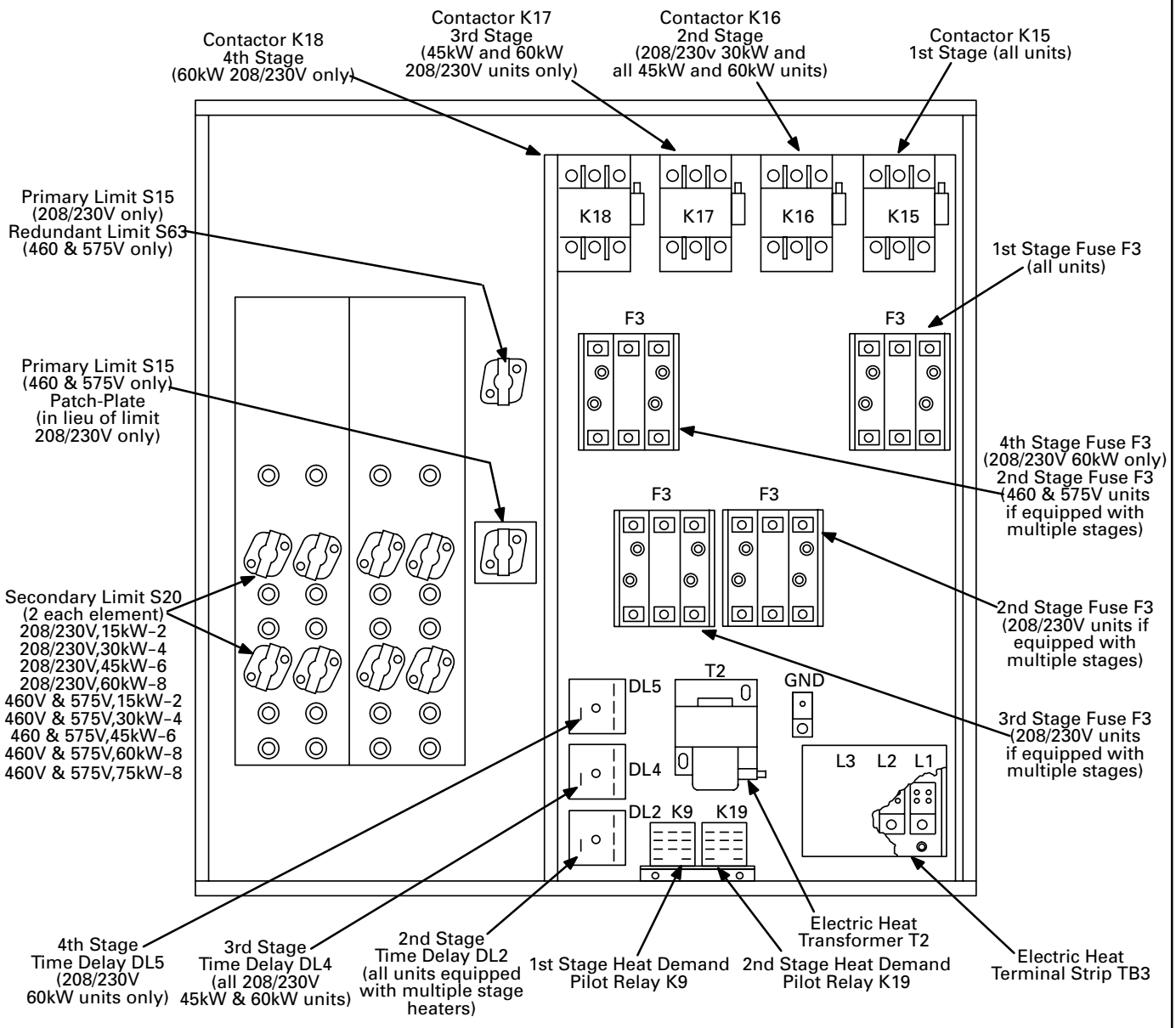


FIGURE 32

PARTS ARRANGEMENT
ELECTRIC HEAT SECTION
208/230V 75kW AND 460/575V 90kW

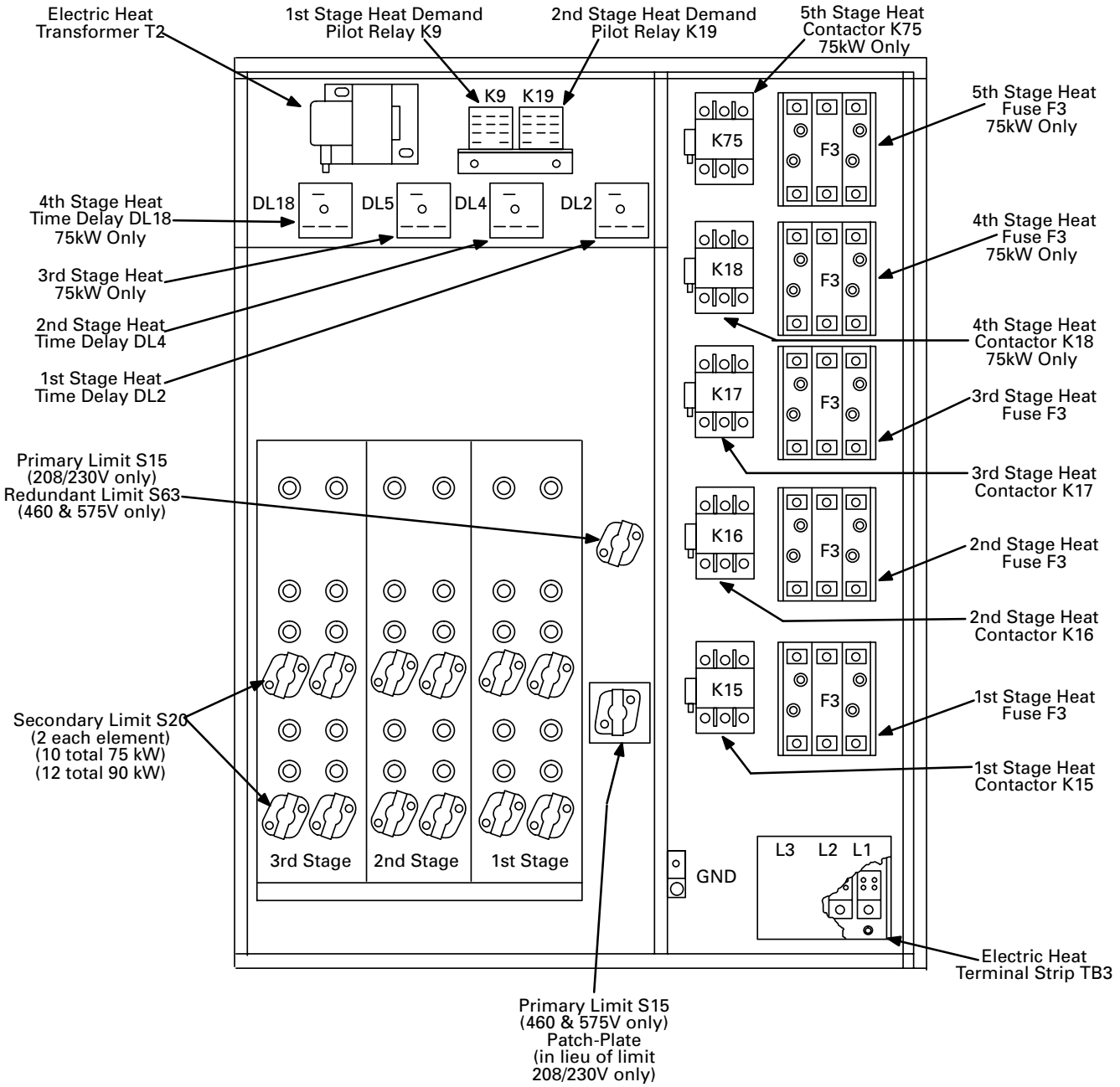


FIGURE 33

X-ACCESSORIES

This section describes the application of most of the optional accessories which can be connected to the CHA16.Some of the accessories (for example, the Warm Up Control Kit) are described in the commercial controls section of this manual.

A-RMF16 Mounting Frame

When installing a CHA16 unit on a combustible surface for downflow discharge applications, the Lennox RMF16 roof mounting (figure 34) frame is used.Otherwise, the RMF16 is recommended but not required.The CHA16, if not mounted on a flat (roof) surface, MUST be supported under all edges and under the middle of the unit to prevent sagging.The CHA16 MUST be mounted level within 1/16" per linear foot in any direction.

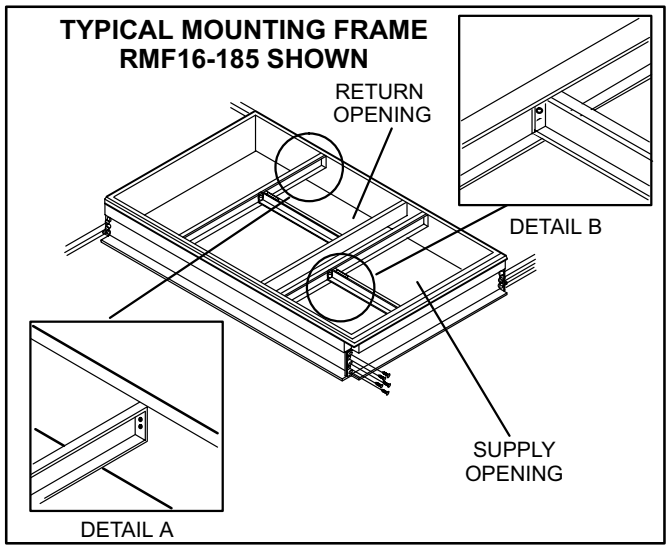


FIGURE 34

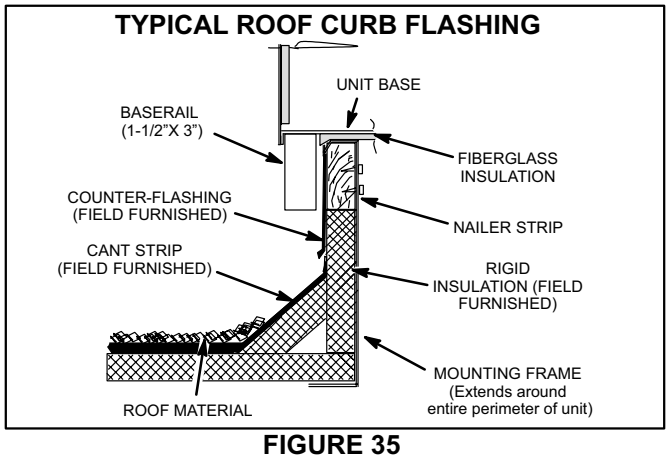


FIGURE 35

The assembled RMF16 mounting frame is shown in figure 34.Refer to the RMF16 installation instructions for details of proper assembly and mounting.The roof mounting frame MUST be squared to the roof before mounting.Plenum system MUST be installed before the unit is set on the mounting frame.Typical roof curbing and flashing is shown in figure 35.Refer to the RMF16 installation instructions for proper plenum construction and attachment.

B-OAD16 Outdoor Air Damper

OAD16 is a manual outdoor air damper section (figure 36) which installs in CHA16 to allow a fixed amount of outside air into the system.OAD16 consists of a set of manually operated dampers which may be adjusted and locked in place to allow up to 25 percent outside air into the system at all times.Automatic operation is available with addition of an electric spring-return three-position damper actuator.Refer to OAD16 installation instructions for specific installation procedure. Washable filter supplied with the OAD16 can be cleaned with water and a mild detergent.It should be sprayed with Filter Handicoater when dry prior to reinstallation.Filter Handicoater is R.P. Products coating no. 418 and is available as Lennox Part No. P-8-5069.

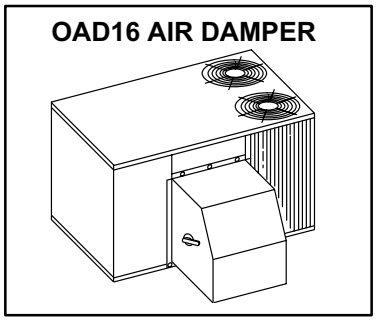


FIGURE 36

C-Economizer

Optional economizer dampers can be applied directly to CHA16.An economizer consists of a mechanically linked recirculated air and outdoor air damper assembly, an enthalpy sensor and damper motor installed in the economizer. An enthalpy control assembly is also furnished and may be installed in the filter access area of the unit or in the economizer (depending on model). An exhaust damper assembly installed in the economizer provides return air exhaust.

Several accessories are available and may be used with any economizer. Optional Warm Up Kit may be added to any economizer if electromechanical or simple electronic control thermostat is used with night setback. Warm Up Kit forces outdoor air dampers closed during initial morning warm up. Optional GED16 gravity exhaust dampers may be installed on any economizer to provide automatic pressure relief in return air duct. Optional PED16 power exhaust damper may be added to larger size economizers in place of gravity exhaust dampers to provide forced air exchange during economizer operation.The PED16 installs between the economizer and the gravity exhaust damper assembly.

Optional differential enthalpy control may be added to any economizer to monitor both indoor and outdoor air conditions. With differential enthalpy installed, the economizer selects the lowest of the two enthalpy conditions to satisfy cooling demand.

1-REMD16M Downflow Economizer (all units)

The REMD16M economizer is designed for standard (downflow) use with CHA16 units.In 15 ton and larger units, the economizer can also be adapted to horizontal discharge.In 12.5 ton and smaller units, the REMD16M cannot be converted to horizontal discharge and a separate horizontal economizer (EMDH16M) is used for horizontal applications. Both applications are shown in figure 39.The economizer monitors outdoor air conditions and opens the outdoor air dampers to allow 0 to 100 percent outdoor air to be used for cooling when outdoor humidity and temperature are acceptable.Damper position continually adjusts to outdoor conditions.Additional (second stage) cooling demand is shifted to the first stage compressor while the dampers remain open to provide first stage cooling.If outdoor air becomes unacceptable, the outdoor air dampers close to a predetermined minimum position while the compressor cooling circuit cycles as needed. First stage cooling is shifted back to the first stage compressor and second stage cooling is directed to the second stage compressor.

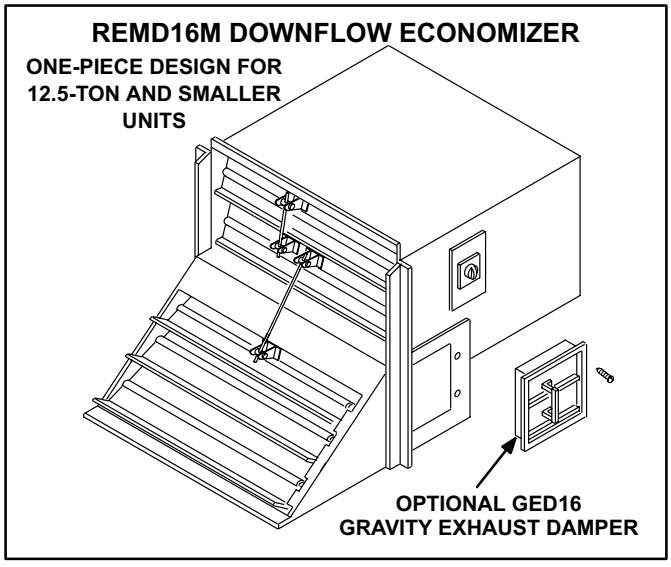


FIGURE 37

Refer to the REMD16M installation instruction for specific installation details.Refer to the operation sequence (in back of this manual) for detailed economizer operation.Operation sequence flowcharts also describe how the economizer interacts with the CHA16 and the control system being used.

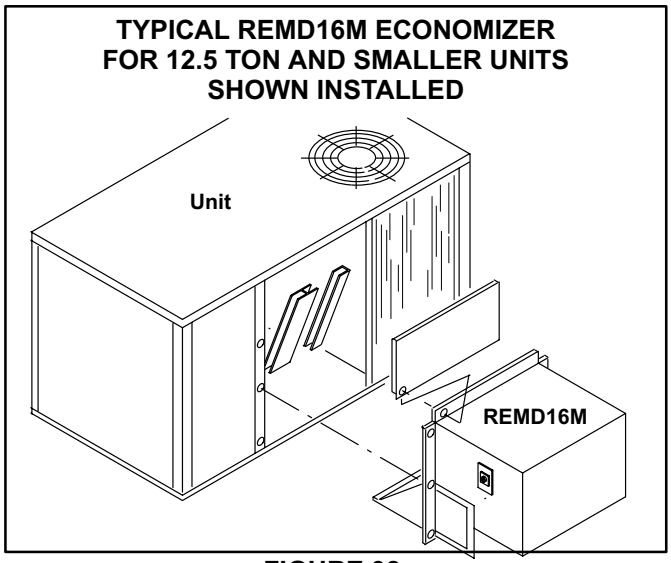


FIGURE 38

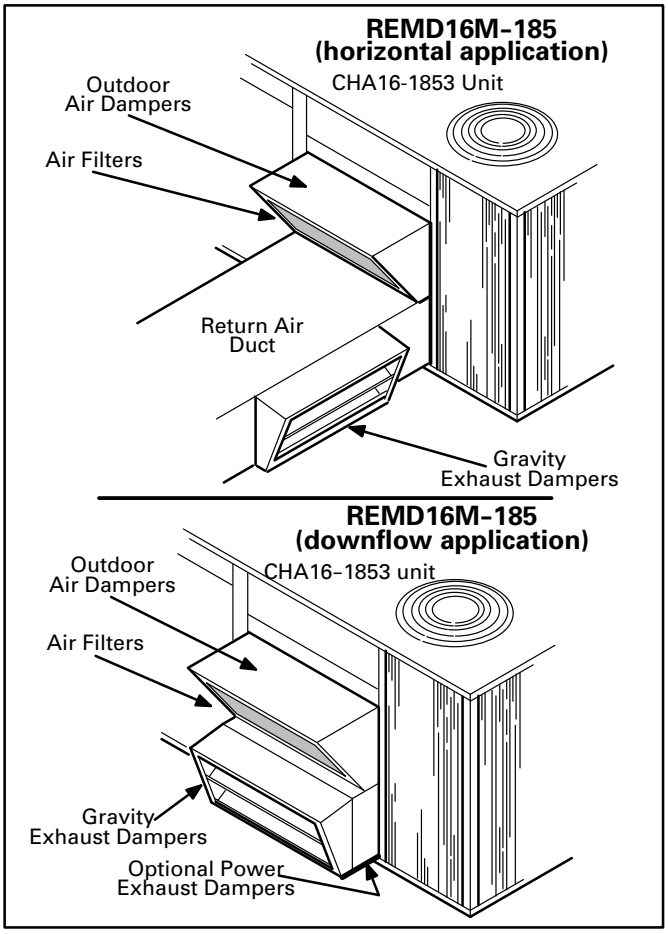


FIGURE 39

2-EMDH16M Horizontal Economizer (-823, -953, -1353, -1603 only)

A separate horizontal economizer is available for 12.5 ton and smaller units which require the use of an economizer in combination with horizontal air discharge. Although the EMDH16M is physically different than the REMD16M (figure 40) both economizers are wired the same and are identical in terms of function.

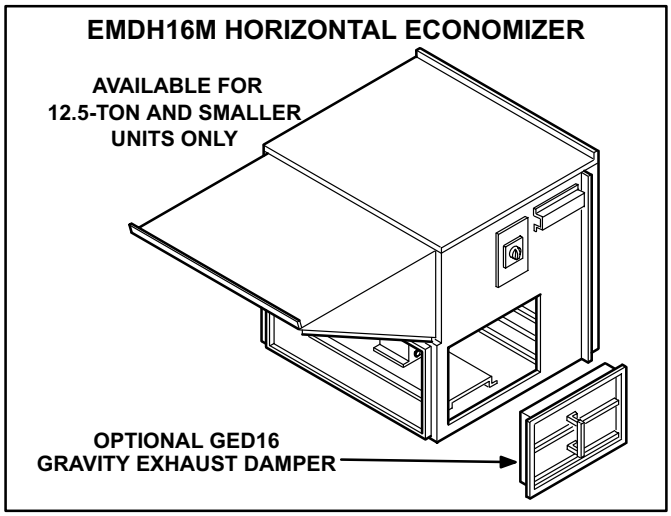


FIGURE 40

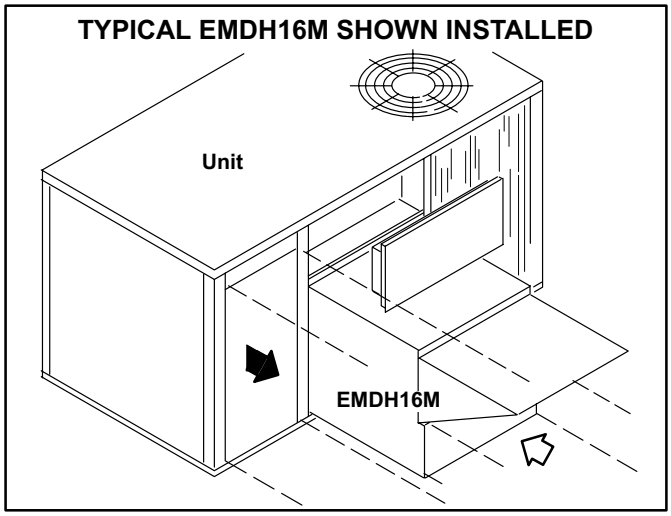


FIGURE 41

3-Economizer Accessories

a-GED16 Gravity Exhaust Dampers (economizers not equipped with PED16)

Optional GED16 gravity exhaust dampers may be connected to REMD16M or EMDH16M economizers. Automatic exhaust dampers provide positive pressure relief in return air duct. See fiigure 40.

b-PED16 Power Exhaust Damper (-1853, -2553, -2753, -3003 only)

TABLE 16

POWER EXHAUST FAN PERFORMANCE	
Air Volume (cfm) Exhausted)	**Return Air System Static Pressure (inches Water Gauge)**
4200	0
3800	.05
3500	.10
3200	.15
2700	.20
2200	.25

Optional PED16 power exhaust fans (figure 42) are used in conjunction with REMD16M economizer to provide forced exhaust of return air.PED16 consists of two fans (figure 42) which install in the return air portion of the economizer and a control kit which installs in the unit filter section.

The PED16 is operated by a relay control kit (figure 43) located in the unit filter access section.A mercury switch located on the damper blades senses economizer operation.As the damper blades open the mercury switch (figure 46) closes and energizes a relay in the control kit.When the relay is energized a set of normally open contacts close and the PED16 exhaust fans are energized.

PED16 fan motors use unit line voltage except in 575V units.575V units use 460V fan motors.A 575V to 460V transformer and fuse are provided in the PED16 control kit to provide stepped-down voltage to the fan motors.

The PED16 control kit (figure 43) and the economizer enthalpy control (figure 51) are designed to be located in the same area of the unit filter section simultaneously.The enthalpy control is attached to a stand-off bracket which allows the PED16 control kit to be installed behind as shown in figure 44.

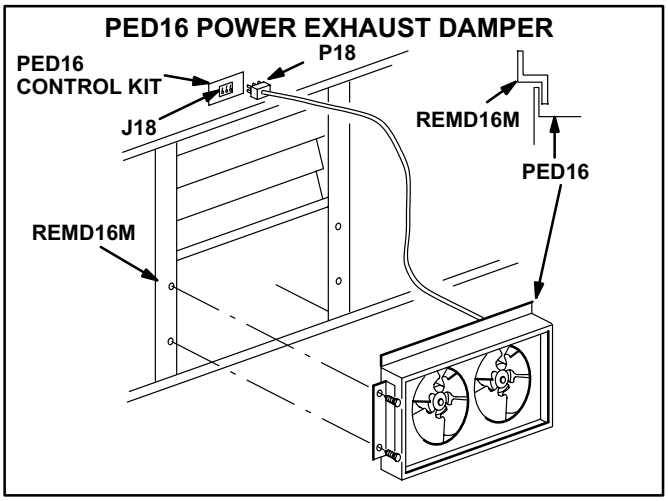


FIGURE 42

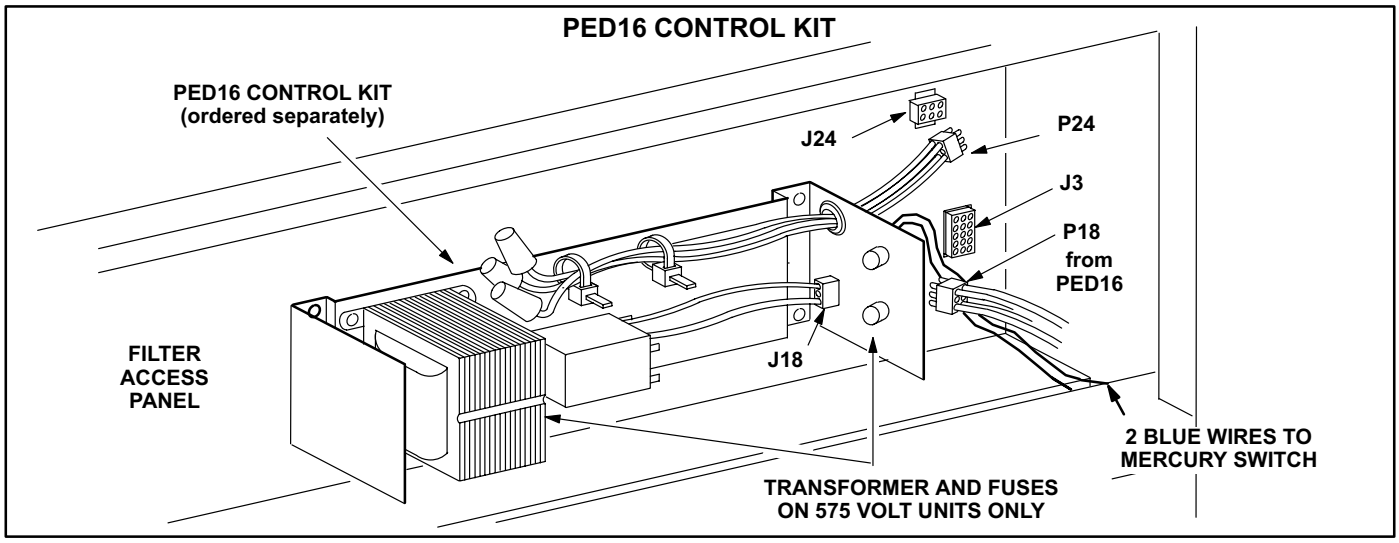


FIGURE 43

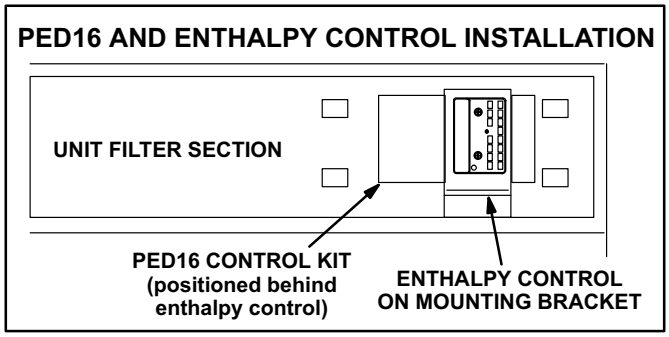


FIGURE 44

c-Warm Up Kit (units equipped with standard or electronic thermostat and night setback function)

An optional warm up kit may be added to the REMD16M economizer (except CHA16 units 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 CHA16 filter access section.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.

If a W973 system is used, the relay kit holds the outdoor dampers closed during setback.If an electromechanical thermostat system is used, the relay kit holds the outdoor dampers closed during setback, de-energizes the indoor thermostat and energizes the setback thermostat.

d-Differential Enthalpy (all economizers)

Optional differential enthalpy control may be added to any economizer to monitor both indoor and outdoor air conditions. With differential enthalpy installed, the economizer selects the lowest of the two enthalpy conditions to satisfy cooling demand.

When differential enthalpy is installed, the second enthalpy sensor is installed in the retrun air duct while the original enthalpy sensor remains installed on the outdoor air dampers.

Refer to the wiring diagram section of this manual for wiring.

4-Economizer Operation and Controls (all economizers)

a-Enthalpy Control: Setpoint Control

The key to economizer operation is the enthalpy control.The enthalpy control senses total heat content of outside air (temperature plus humidity) and uses that information to control the amount of outside air brought into the system.When the enthalpy of outside air drops below the control setpoint and cooling demand is present, the control actuates a motor which in turn adjusts outdoor dampers to meet cooling demand.With outdoor air dampers open, the indoor blower draws in outdoor air for cooling and first stage compressors are disabled.When heat content rises above the setpoint, the control de-activates and the dampers close to the preset minimum position. First stage compressors are switched to handle all first stage cooling.

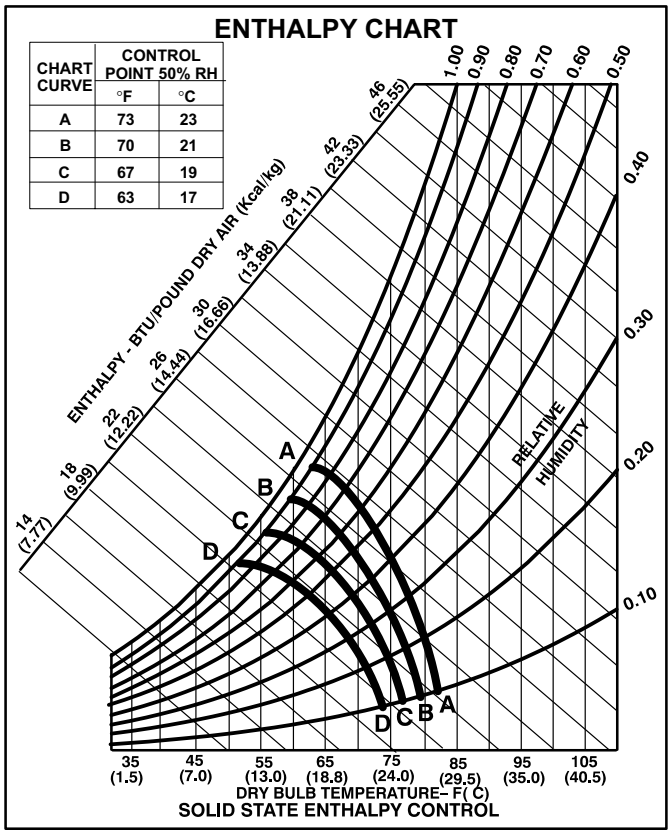


FIGURE 45

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 45.

Example:

If the enthalpy control is set at setpoint “A” as shown in figure 45, the following situation could occur.A cooling demand when the outside air is at 75° and 20 percent humidity would drive the economizer outdoor air dampers open to utilize outdoor air for cooling.The compressor cooling circuit would be disabled.However, if the outdoor air should change to 70°F (a drop in temperature) and 70 percent humidity (a dramatic rise in humidity), the “total heat content” of the outdoor air would rise above the enthalpy control setpoint and deactivate 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.

b-Minimum Positioner

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

c-Enthalpy Sensor

The enthalpy sensor is located on the outside portion of the outdoor damper blades (as shown in figure 46).The sensor monitors the total heat content of the outdoor air (temperature plus humidity) and sends the information to the enthalpy control.The enthalpy control uses the information to determine if outdoor air can be used for cooling.

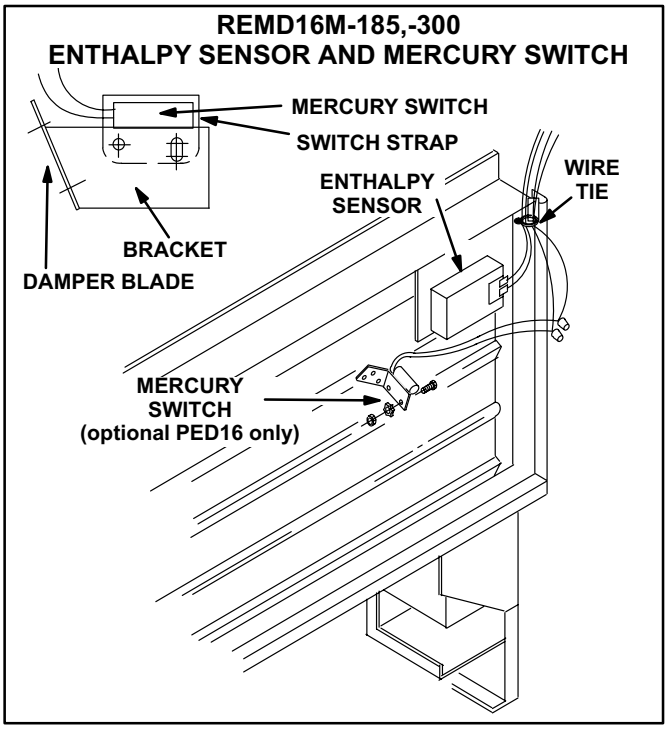


FIGURE 46

d-Mixed Air Sensor

The mixed air sensor measures the resultant temperature of the mixed air downstream from the evaporator coil.Temperature is measured in the heating compartment (figure 47).The mixed air temperature is used by the enthalpy control when outdoor dampers are open to help determine outdoor air damper position.The economizer is factory equipped with a single mixed air sensor which fits through a factory supplied hole in the panel dividing unit return and supply air (see figure 47).

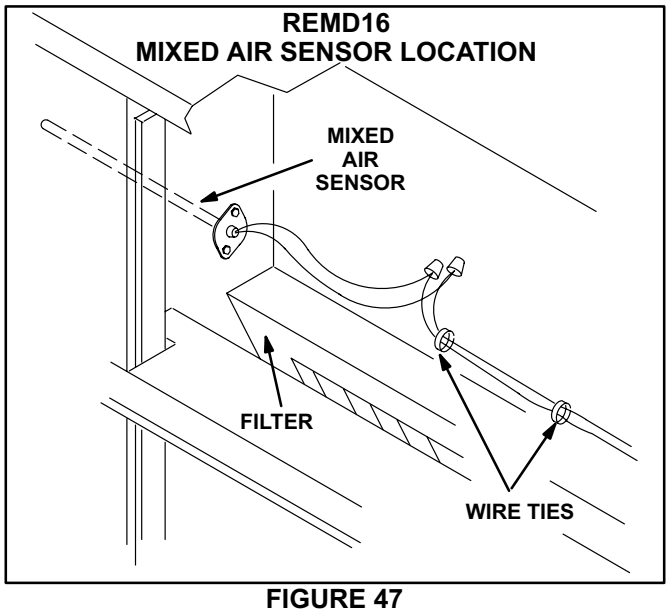


FIGURE 47

e-Wiring, Installation, Maintenance

The economizer uses harness plugs to connect to the CHA16 unit harness connector located in the filter access compartment.Unlike smaller 16 series economizers which are unitary in construction (all one piece), the REMD16M-185 economizer has a control relay kit (consists of enthalpy control and relays) installed in the unit filter access section.The damper section (consists of dampers and damper motor) is installed separately in the return air section.Figure 48 shows economizer control installation and wiring.Figures 49 and 50 show REMD16M installation.Although harness connectors are used to connect the CHA16 to the economizer, the economizer electrically connectsto the CHA16 differently depending on which control system has been installed.The different electrical connections are made in relay kits and controls located in the filter access area of the unit.All connections (except for enthalpy sensor and mixed air sensor) 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.

Figures 49 and 50 show how an REMD16M is installed in a CHA16 cabinet (downflow application shown).For detailed installation and maintenance instructions, refer to the REMD16-185M installation instructions.

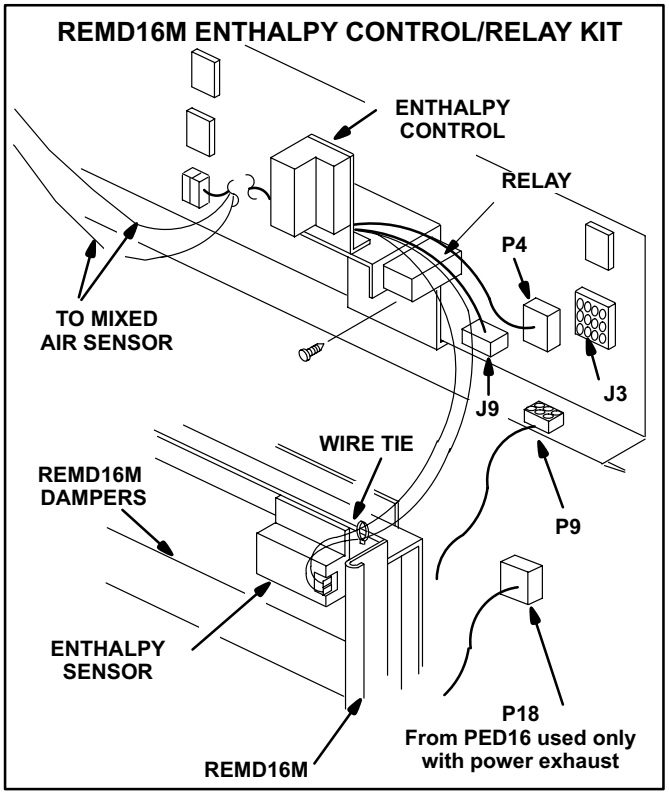


FIGURE 48

f-Modulating Damper Motor Check

The following procedure checks only the damper motor.For detailed economizer checkout procedure refer toLennox' Solid State Economizer Checkout And Troubleshooting Guide.

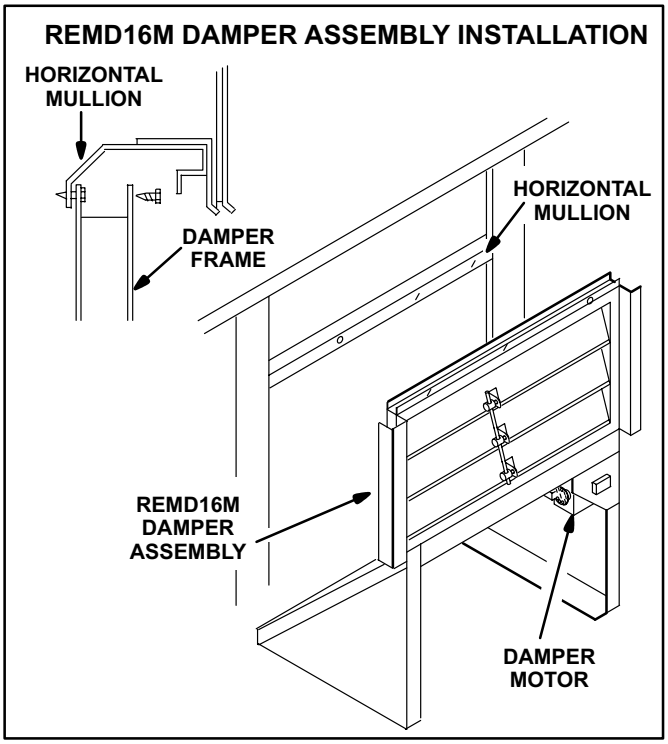


FIGURE 49

1- Disconnect power.Turn thermostat to OFF position (occupied mode).

2- Install jumper across contactor K3-2 terminals (see unit diagram) in unit control box. Install jumper across enthalpy control terminals T and T1. See figure 51 for terminal location.

3- 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.

4- Disconnect power to unit. Outdoor damper should spring return to closed position.

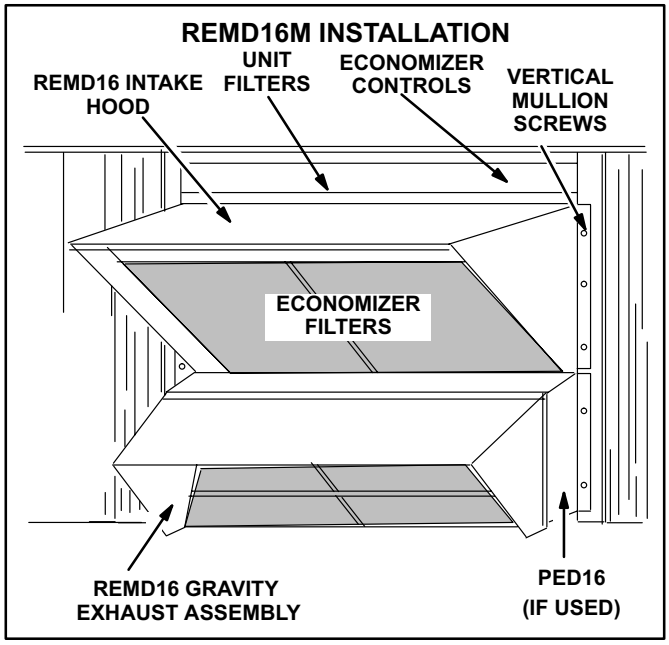


FIGURE 50

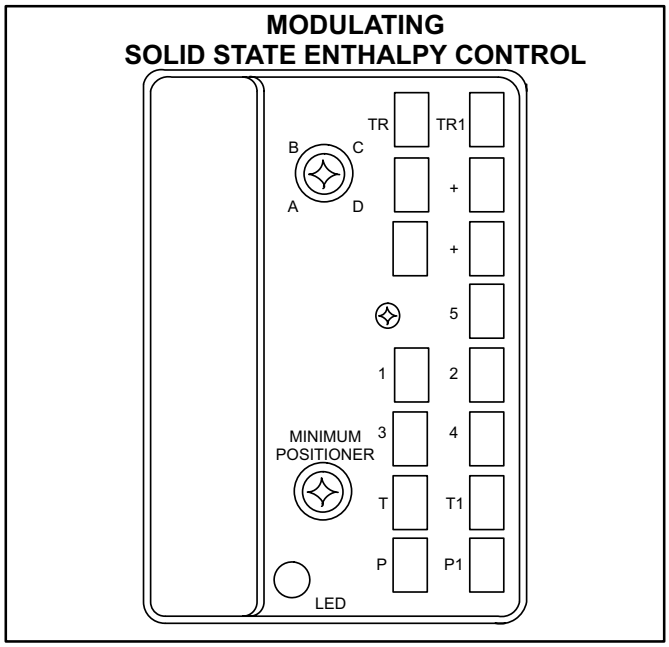


FIGURE 51

5- Remove T and T1 jumper then restore power to unit.Outdoor damper should drive to minimum position. Adjust minimum damper position pot located on control.See figure 51.

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

D-Transitions

Optional supply/return transition SRT16 is available for use with CHA16 sries units utilizing optional RMF16 roof mounting frame.The transition must be installedin the RMF16 mounting frame before mounting the CHA16 to frame.Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

E-Supply and Return Diffusers

Optional flush mount diffuser/return FD11 and extended mount diffuser/return RTD11 are available for use with the CHA16. Refer to manufacturer's instructions included with transition for detailed installation procedures.

F-Firestats

Some local codes require the installation of discharge air and return air firestats to automatically shut down the unit when excessive temperature is reached .Other local codes 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.If manual reset controls are used, they MUST be accessible.

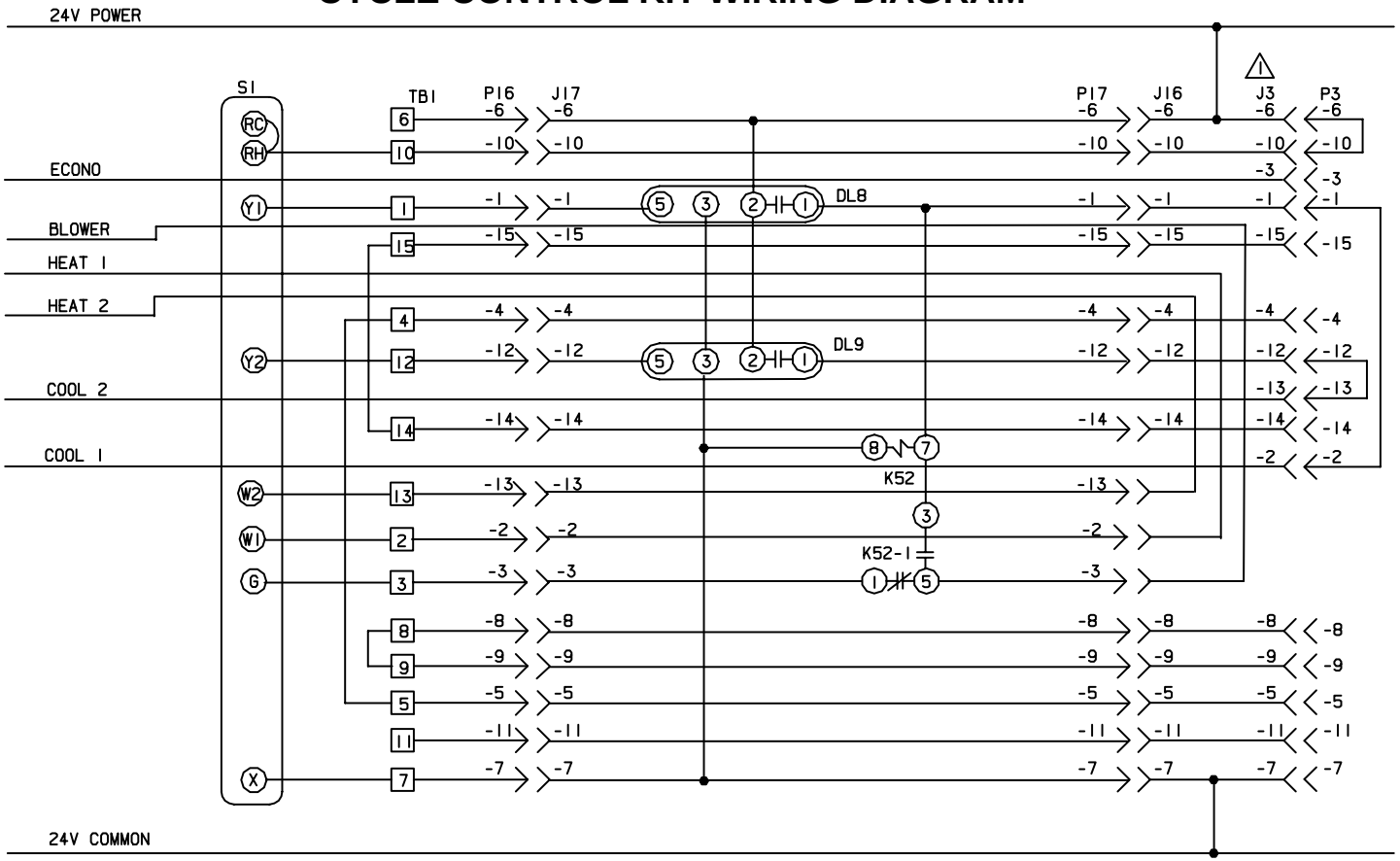
Firestat wiring is shown on the unit wiring digrams in back of this manual.

G-Cycle Control Kit (Figure 52)

Optional cycle control kit, when applied to CHA16 unit with electromechanical thermostat, prevents frequent cycling caused by thermostat diddling or thermostat bulb vibration.The cycle controls require minimum on and minimum off times before compressors can be energized or de-energized.The cycle controls plug-in to the J16/P16 jackplug located in the control box.No field wiring is required.The kit consists of two cycle control delays DL8 and DL9.Once installed, DL8 prevents the first stage compressors from being energized until the first stage thermostat bulb has been closed for at least 30 seconds. First stage thermostat bulb must be open for at least 240 seconds before first stage compressors can be de-energized.DL9 prevents second stage compressors from being energized until second stage thermostat bulb has been closed for at least 60 seconds.Second stage thermostat bulb must be open forat least 240 seconds before second stage compressors can be de-energized.

NOTE-Late production CHA16 units are equipped with factory installed cycle controls.

CYCLE CONTROL KIT WIRING DIAGRAM



DESCRIPTION	
KEY	COMPONENT
DL8	DELAY-CYCLE,STAGE 1 COOL
DL9	DELAY-CYCLE,STAGE 2 COOL
J3	JACK-UNIT,ECONOMIZER
J16	JACK-UNIT
J17	JACK-LOGIC PANEL
K52,-1	RELAY-BLOWER HOLD
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
P17	PLUG-LOGIC PANEL
S1	THERMOSTAT-ROOM
TB1	TERMINAL STRIP-LOW VOLT

TB1

TERM. NO.	UNIT FUNCTION
1	Y1 COOL 1
2	W1 HEAT 1
3	G BLOWER
4	4
5	5
6	R 24V POWER
7	C 24V COMMON
8	8
9	9
10	10 POWER TO S1
11	11
12	Y2 COOL 2
13	W2 HEAT 2
14	14
15	15

⚠1 J3 MAXIMUM LOAD 20VA 24VAC CLASS II

LENNOX® Industries Inc.	WIRING DIAGRAM	3/93
ACCESSORIES		
THERMOSTAT FOR GCS/CHA11,16 & 24 SERIES COMPRESSOR CYCLE CONTROL		
CONTROL SECTION-C38		
Supersedes Form No.	New Form No. 529,426W	

 Litho U.S.A.

FIGURE 52

H-Low Ambient Kit (all units)

The optional low ambient kit (figure 53) allows for mechanical cooling operation at low outdoor temperature.*NOTE-See CAUTION.*

⚠ CAUTION

Compressor monitor (Low Ambient Lockout Switch) S3 cannot be used with optional low ambient kit.Compressor monitor MUST be disconnected before allowing low ambient kit to be used.

The components included in the low ambient kit vary from unit to unit.Low ambient kits may include any combination of a pressure switch, a low ambient thermostat or a relay.

⚠ WARNING

Electrical shock hazard. Low ambient kit wiring changes depending on unit size. Depending on the application, low ambient controls may be wired to low voltage or line voltage. Be sure to disconnect power to unit before servicing. Then check unit wiring diagram and become familiar with low ambient wiring before proceeding.

The pressure switch, if used, is connected to the condenser fan and the compressor discharge line. The pressure switch senses a drop in outdoor temperature by monitoring the pressure of the discharge line. When discharge line pressure drops below a preset limit, the pressure switch opens the circuit to the condenser fan. With the condenser fan de-energized, the discharge pressure will slowly increase. When discharge pressure increases above a preset limit the pressure switch closes the circuit to the condenser fan and the fan resumes operation. The pressure switch will continue to cycle the fan in this fashion as long as low ambient conditions exist.

The low ambient thermostat, if used, is connected to the second stage compressor. The switch monitors outdoor temperature conditions and opens the circuit to the second stage compressor when outdoor temperture drops below a preset limit. The second stage compressor remains disconnected from the circuit until outdoor temperature rises above the preset limit.

The low ambient kit relay, if used, is typically used to sense a call for compressor demand. When the relay coil is energized, the contacts switch to complete a circuit through the low ambient pressure switch.

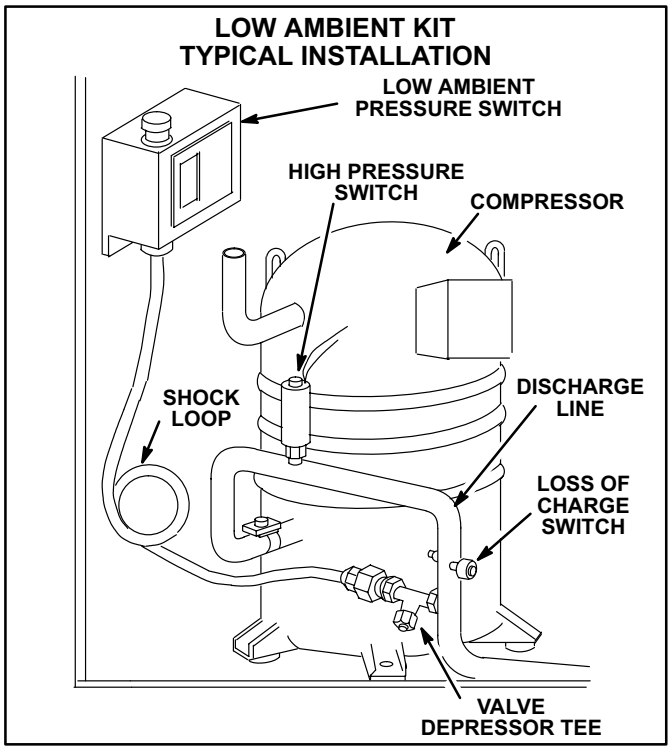


FIGURE 53

Refer to low ambient kit installation instructions for detailed installation and operation information. Low ambient kit wiring is shown on the unit wiring digrams in back of this manual.

I-Status Panels SP11 and SSP11

Optional status panels allow remote monitoring of system operation.Two types of panels are available.The SP11 (figure 54) provides system readout only.The SSP11 switching status panel (figure 55) 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).

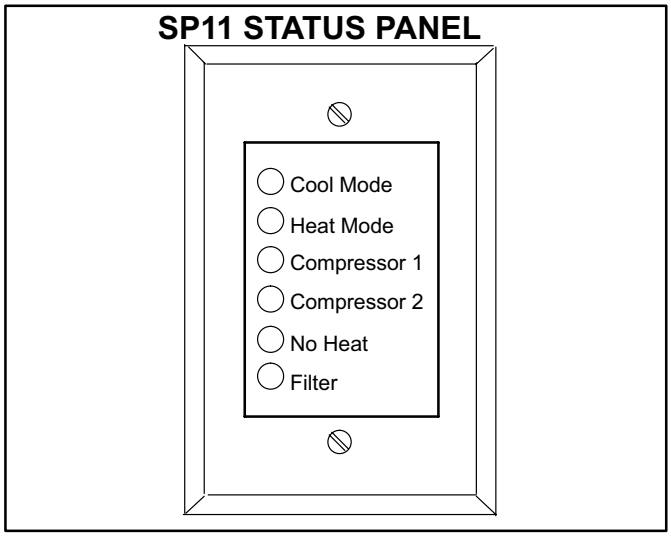


FIGURE 54

1-SP11 Application

The SP11 may be applied to any CHA16 control system. To operate an SP11, a readout relay kit including an electric heat current sensing relay is required to interface the ECH16 to the SP11.Optional filter switch kit must be added in order to make the filter light functional.

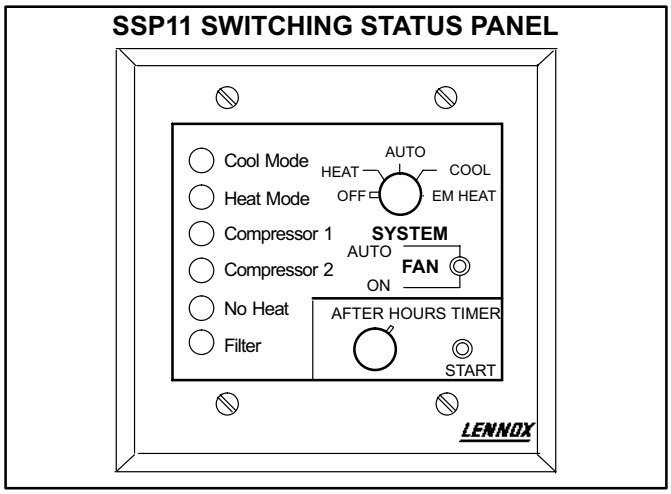


FIGURE 55

2-SSP11 Application

The SSP11 may be applied to CHA16 units using standard electromechanical thermostat or Honeywell W973 control systems only.The W7400 and T7300 control systems provide switching features similar to the SSP11, therefore, the SSP11 is not needed.To operate an SSP11, a readout relay kit is required to interface the CHA16 to the SSP11.An SSP11 relay kit is also required (in addition to the readout relay kit and current sensing relay) in units using an electromechanical thermostat.

Optional filter switch kit is required to make the dirty-filter light functional.

3-Indications and Functions

Both status panels are identical in function except for the switching and after hours capabilities of the SSP11.

a- The “COOL MODE” LED lights green to indicate economizer “free cooling” operation when unit includes the economizer option.Otherwise the LED indicates mechanical cooling operation.

b- The “HEAT MODE” LED lights green during normal heating operation.

c- The “COMPRESSOR 1” LED lights green when compressor 1 is running.The light turns red if a compressor safety switch opens during a compressor demand.

d- The “COMPRESSOR 2” LED lights green when compressor 3 is running.The light turns red if a compressor safety switch opens during a compressor demand.

e- The “NO HEAT” LED lights red on a loss of heat during a heating demand.

f- The “FILTER” LED lights red when optionalpressure switch contacts close indicating dirty filters.

g- The “SYSTEM” switch on the SSP11 has five positions to indicate the following functions:
“OFF” - System off.
“HEAT” - System operates in heating mode only.
“AUTO” - System automatically provides heating or cooling on demand.
“COOL” - System operates in cooling mode only.
“EM HEAT” - (Emergency Heat) Not used in CHA16 units, but if placed in this position, the unit operates in the normal heating only mode.

h- The “FAN” switch on the SSP11 has two positions to indicate the following functions:
“AUTO” - Blower cycles with demand.
“ON” - Blower runs continuously.

i- The “AFTER HOURS TIMER” on the SSP11 provides override of unoccupied mode operation (night heating setback / cooling setup) from 0 to 12 hours.In the occupied (day) mode, the after hours timer has no effect on unit operation.

The unit must be in the unoccupied mode (night) to activate the timer.Set the potentiometer for the number of hours desired override and push the momentary start button.The unit reverts to occupied mode operation for the set number of hours.

J-Commercial Controls Hardware

All CHA16 units are factory equipped with the hardware required to connect and operate Lennox’ Commercial Controls (W973, W7400, economizer, warm-up, etc...). The hardware consists of an economizer wiring harness (figure 56), a control system wiring harness and associated jackplugs. The economizer and control harnesses are pre-wired to facilitate economizer, controls and/or warm-up connections.

Each unit is equipped with marked jackplugs at various locations throughout the unit. Each jack is marked with a “J” number on the jack (for example J5) and a corresponding “P” number on the plug (for example P5). The J16/P16 jackplug and the J3/P3 jackplug are used as connection points for commercial control systems in all Lennox commercial equipment. Lennox supplied control systems are supplied pre-wired with plugs which match the corresponding jackplugs in the unit.

Following is a list of important jackplugs found in Lennox commercial equipment and the function of each:

1 - *Jack J2 / (opt. Plug P2)*
Jack J2 is located in the heating section of the unit and is wired to the unit wiring harness. It is used for the connection of the heating section. GCS16 and CHA16 units are identical on the J2 side of the harness.
The matching **plug P2** is located in the heating control box (if unit is furnished with a heating section). The only difference between GCS16 (gas heating) units and CHA16 (electric heating) units is the wiring on the P2 side of the harness (see unit wiring diagrams).
In GCS16 equipment 12.5 tons and smaller, the gas heating section is considered an integral part of the unit. Jackplugs are not included between the unit and the heating section.

2 - *Jack J3 / Plug P3*
Jack J3 is located in the unit filter section of all units. It is wired to the unit wiring harness and is used for the connection of an economizer or any of the relay kits which are used to interface optional controls to the unit.
The mating **plug P3** is a jumper plug which is necessary to complete circuits internal to the unit when the unit is operated without accessories. When the unit is operated with accessories, P3 is removed and discarded.

3 - *Jack J16 / Plug P16*
Jackplug J16/P16 is located in the unit control box of 6.25 ton through 12.5 ton units. In larger units, the pair is located in the unit filter section.
Jackplug J16/P16 is used exclusively as a connection point for the control portion of optional control systems. Plug P16 is wired to the unit low voltage terminal strip and jack J16 is wired to the unit wiring harness.

4 - *Jack J18 / Plug P18*
(used in 15 ton and larger units only)
Jackplug J18/P18 is used as an extension harness to connect power exhaust damper fans in the economizer to the PED16 relay kit located in the unit filter section.

5 - *Jack J24 / (opt. Plug P24)*
(used in 15 ton and larger units only)
Jack J24 is located in the filter section. It is wired to the unit wiring harness and is used for the connection of an optional power exhaust damper (PED16) control kit.
The matching **plug P24** is located in the optional PED16 control kit. The PED16 control kit installs in the filter access area of the unit.

6 - *Jack J25 / (opt. Plug P25)*
(used in 15 ton and larger units only)
Jack J25 is located in the unit control box. It is wired to the unit wiring harness and is used for the connection of an optional SP11 or SSP11 status panel.
The matching **plug P25** is located in the optional status panel relay kit.

7 - *Jack J33 / (opt. Plug P34)*
(used in 15 ton and larger units only)
Jack J33 is located in the heating section of the unit and is wired to the unit wiring harness. It is used for the connection of an optional third stage (W3) heating relay.
The matching **plug P34** is provided in the optional third stage heating relay kit.

8 - *Jack J35 / Plug P35*
(used in 12.5 ton and smaller units only)
Jackplug J35/P35 is located in the unit control box is used for assembly line tests only. J35/P35 is not used for the connection of any control or control system.

9 - *Jack J36 / Plug P36*
(used in 15 ton and larger units only)
Jackplug J36/P36 is located in the unit control box is used for assembly line tests only. J36/P36 is not used for the connection of any control or control system.

10 - *Jack J57 / (opt. Plug P57)*
(used in 15 ton and larger units only)
Jack J57 is located in the unit control box. It is wired to the unit wiring harness and to jack J25 and is used for the connection of an optional “dirty filter” indicator switch to the optional status panel.
The matching **plug P57** is located in “dirty filter” switch assembly. Note that this switch assembly does not perform any function unless the optional status panel is installed.

In 12.5 ton and smaller units, access to the unit filter section is gained by removing the filter access panel. In 15 ton and larger, an access door is provided. Access to the unit filter section is gained by loosening the two quarter-turn fasteners on the access door (figure 56) with a slot screwdriver. The quarter-turn fasteners hold the access door shut with a spiral spring. Once the fasteners are loosened, the filter access door hinges open.

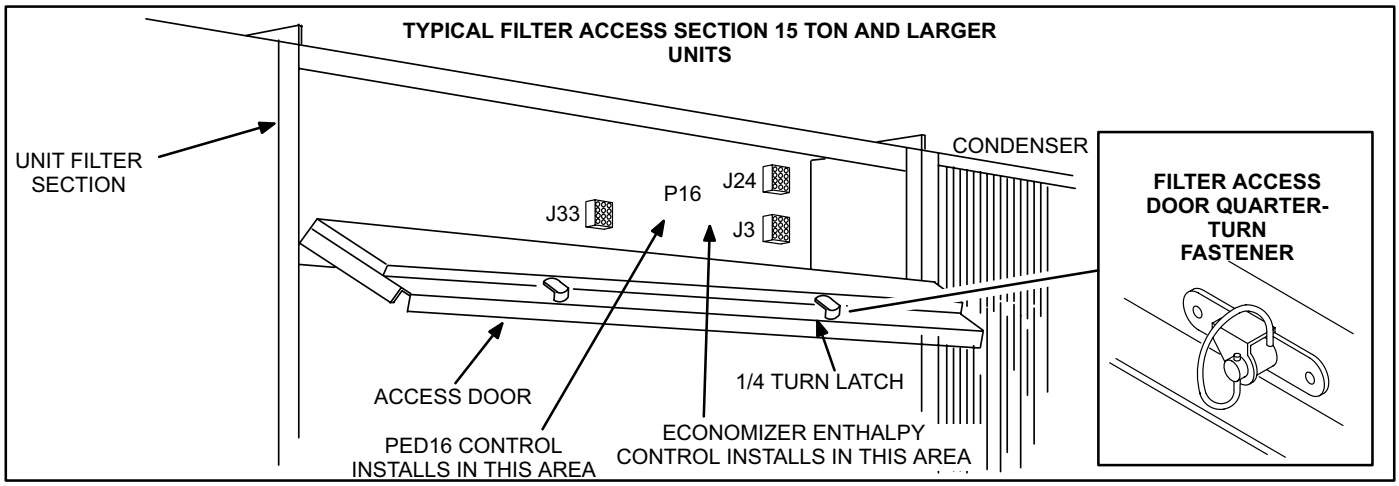


FIGURE 56

K-Optional Commercial Controls Systems

Optional "16 Series Commercial Controls" may be connected to any CHA16 series commercial unit. These are the same controls which are optional in all 16 series commercial units. The following list describes the components used in all currently available (at time of printing) optional control system combinations. Each system is assigned a "C" number for easy reference. The "C" number identifies the control system on the wiring diagram (likewise, each CHA16 unit wiring diagram is assigned a "B" number, each heating section is assigned an "A" number and each economizer diagram is assigned a "D" number). Look for these numbers on the diagram to help you identify how the unit is setup and the control system being used.

The control system wiring diagrams and the accompanying system "Operation Sequences" are not included in this manual. Look for the control system diagrams and the operation sequence sections in the "16 Series Control Systems" manuals printed separately.

The following section is provided to help service personnel become familiar with Lennox' Commercial Controls and the associated wiring schemes.

1 - *D5 Wiring Diagram - Modulating Economizer Model Number REMD16M-185*

Downflow Modulating Economizer. Optional field installed in all CHA16 units. Sensors continuously monitor air conditions and adjust dampers accordingly. Infinite number of damper positions.

All wiring connections are made by jackplug connections to the commercial controls harness in the unit. **Plug P4** in the economizer connects to Jack J3 in the unit to make this connection.

2 - *Warm-Up Kit*

Warm-up kit is shown in Figure 57. Warm-up kit is an accessory to the economizer (diagram D5).

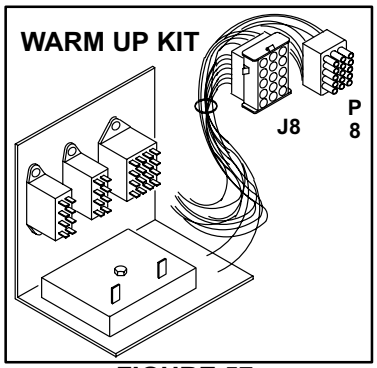


FIGURE 57

The kit provides warm-up capabilities by holding outdoor air dampers closed during the first heating period after night setback. When first heating demand is satisfied, warm-up kit allows outdoor air dampers to open to minimum position.

Warm-up kit does not have its own wiring diagram. It is included in the C2, C4, C6 and C14 wiring diagrams.

All wiring connections are made by jackplug connections to the commercial controls harness in the unit. See figures 58 and 59. **Plug P8** in the warm up kit connects to Jack J3 in the unit to make this connection. **Jack J8** in the warm up kit connects to Plug P4 in the economizer. Thermostat wiring connections are made to the unit low voltage terminal strip.

Some of the following optional thermostat control systems have built-in warm up capabilities and the warm up kit (figure 57) cannot be added due to wiring incompatibility.

The warm-up kit is an option to the REMD16M economizer. The warm-up kit may be applied to any economizer (except units using W7400 control system or T7300 control system). If W973 control system is being used, CMC3-1 time clock must also be used. If electromechanical control system is being used, CMC3-1 time clock and night thermostat must be used.

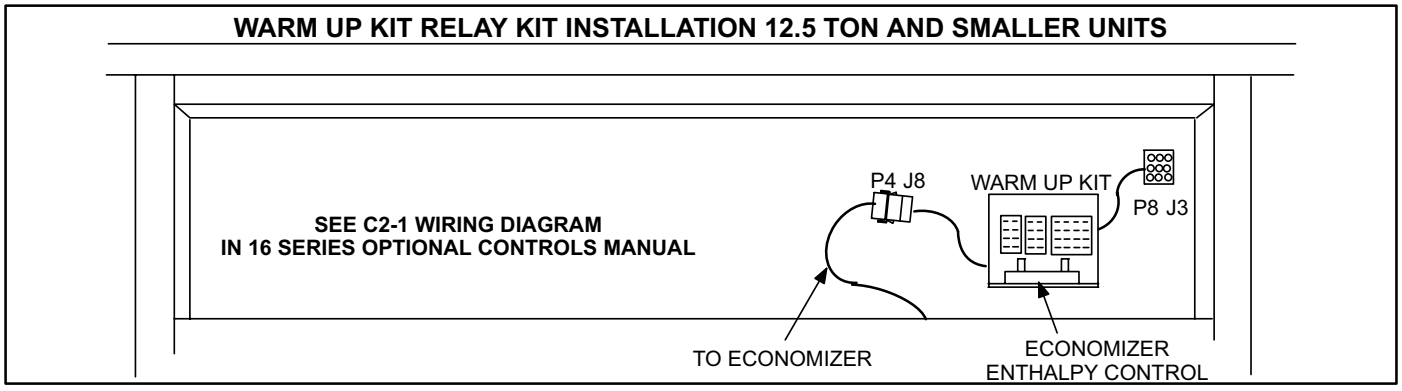


FIGURE 58

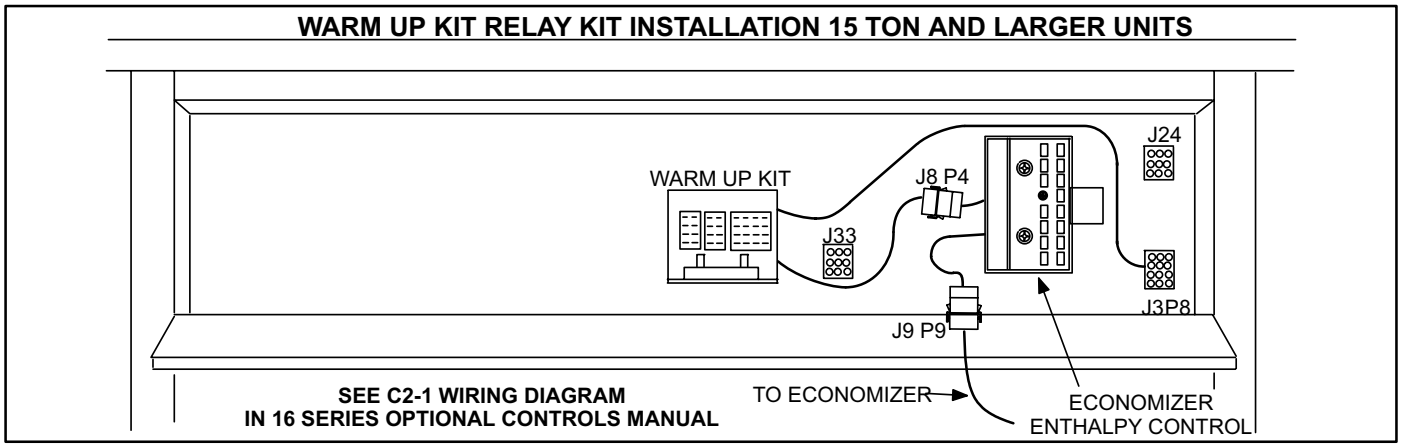


FIGURE 59

⚠ CAUTION

Do not connect a warm-up kit to a W7400 relay kit or to a system using a T7300. Warm-up kit wiring is not compatible with these control systems and component damage will result. These control systems have a warm-up feature built in. A warm-up kit is not needed.

An economizer allows outside air to be used for cooling when conditions are acceptable and permits a preset amount of air exchange during all other unit operation. Warm-up kit holds outdoor air dampers full closed during first heating demand after night setback (during morning warm-up).

No wiring is required (see figures 58 and 59). The kit plugs into the unit wiring harness between the unit and economizer. Unit plug P3 is removed and discarded. Relay kit plug P8 connects to unit jack J3. Relay kit jack J8 connects to economizer plug P4.

3 - *C1 Wiring Diagram*
Standard 2heat/2cool thermostat for all units without economizer or warm-up. All wiring connections are made to the unit low volatage terminal strip.

4 - *C2-1 Wiring Diagram*
Standard 2heat/2cool thermostat for all units with economizer and warm-up. CMC3-1 clock and night thermostat must be added for night setback. Night relay must also be added to economizer for night setback. The warm up kit "plugs-in" to the unit with **plug P8**. Warm up kit **jack J8** connects to unit jumper plug P3 or economizer plug P4. The thermostat connects to the unit's low voltage terminal strip.

5 - C11-1 *Wiring Diagram*
Standard 2heat/2cool thermostat for all units without economizer or warm-up. C11 Night Kit adds a relay facilitating night setback function (see figure 60). CMC3-1 clock and night thermostat must also be added to make setback relay functional.

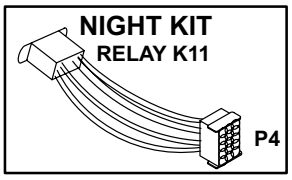


FIGURE 60

⚠ 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, do not connect a warm-up kit to this control system.

All wiring connections are made by jackplug connections to the commercial controls harness in unit (see figures 61 and 62). **Plug P4** in the economizer connects to Jack J3 in the unit to make connection.

The night kit is used only with the C11 wiring diagram. It cannot be used with any other control system options or control damage will result. This system is designed for use with optional CMC3-1 time clock and night thermostat.

Night (setback relay) kit allows CHA16 units without REMD16M economizer to automatically "set back" the thermostat to reduce energy consumption during times when the building is not occupied. The night kit achieves this by 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.

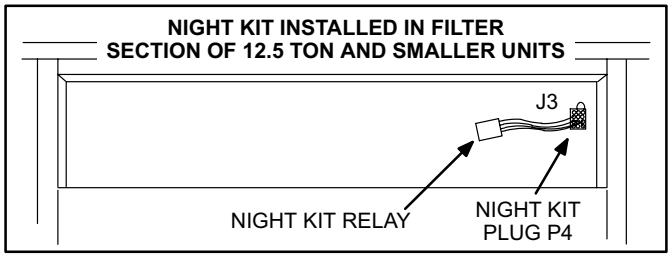


FIGURE 61

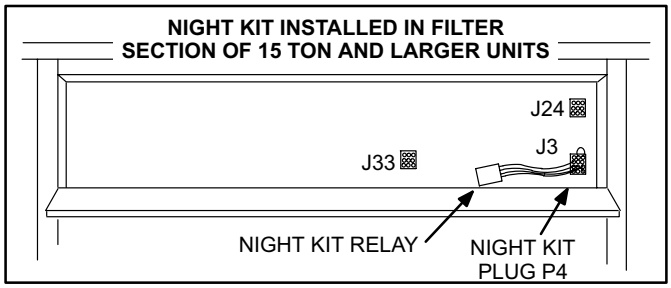


FIGURE 62

6 - *C3 Wiring Diagram*
Flexstat L2F-N for units without economizer or warm-up. Setback is built in. Wiring connections are made to the unit's low voltage terminal strip.

NOTE - Flexstat (C3 and C4 diagrams) was discontinued as a control system option in July 1989 and is not shown in the CHA16-1853. However, Flexstat remains a valid matchup to commercial CHA16 units of all sizes until inventories are depleted. You may find some CHA16-1853 units using it.

7 - *C4 Wiring Diagram*
Flexstat L2F-N is for units with an economizer and warm-up. Setback is built in. Thermostat wiring connections are made to unit's low voltage terminal strip while warm up kit "plugs-in" to the unit's control harness.

8 - *C5 Wiring Diagram*
Prostat T5010 for units without economizer or warm-up. Setback is built in. Wiring connections are made to the unit's low voltage terminal strip.

9 - *C6 Wiring Diagram*
Prostat T5010 for units with economizer and warm-up. Setback is built in.Thermostat wiring connections are made to the unit's low voltage terminal strip while the warm up kit "plugs-in" to the unit's control harness

10 - *C7-3 Wiring Diagram*
W7400 control system for units. See figure 6463. Requires W7400 relay kit and economizer. Warm up and setback are built in. Thermostat T7400 wiring connections are made to the unit's low voltage terminal strip. W7400 control module **jackplugs J17/P17** connect to the unit control harness at jackplug J16/P16. W7400 relay kit **plug P5** connects to unit jack J3 and relay kit **jack J5** connects to warm up kit plug P8. Another plug equipped in the W7400 relay kit, **Jackplug J23/P23,** is used in LVAV applications only.

⚠ 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, do not connect a w973 relay kit to this control system.

The W7400 is used only with the C7-3 control system option. It cannot be used with any other control system option or control damage will result.

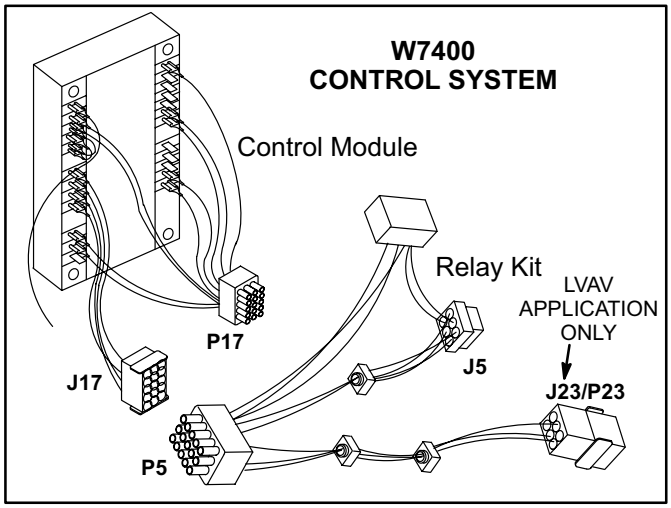


FIGURE 64

The Honeywell W7400/T7400 control system, when applied to the CHA16, allows fully programmable operation of the unit during occupied and unoccupied periods. Morning warm-up capabilities are built in to the control system. An external warm-up kit is not needed.

⚠ CAUTION

Do not connect a warm-up kit to jack J5 of the W7400 relay kit. Warm-up kit wiring is not compatible with W7400 wiring and component damage will result. The W7400 system has a warm-up feature built in. A warm-up kit is not needed.

11 - *C8-1 Wiring Diagram*
W973 control system for units without economizer or warm-up. See figure 65. Requires W973 relay kit and CMC3-1 clock for night setback. W973 control module **jackplugs J17/P17** connect to the unit control harness at jackplug J16/P16. W973 relay kit **plug P6** connects to unit jack J3 and relay kit **jack J6** connects to unit plug P3 or economizer plug P4. Room temperature sensor connections are made to the unit's low voltage terminal strip.

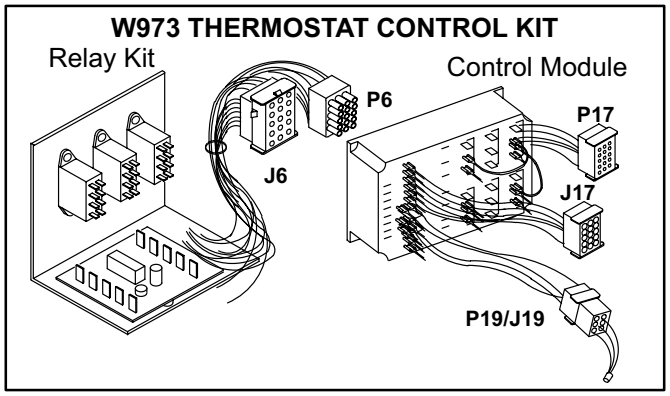


FIGURE 66

The W973 is used only with the C8-1 and C14-1 wiring diagrams. It cannot be used with any other control system options or control damage will result.

The Honeywell W973 control, when added to a CHA16, allows use of electronic "ramping" thermostats, discharge temperature sensors, return air temperature sensors and/or remote thermostats and transmitters. The W973 control system is designed for use with Honeywell T7067 electronic "ramping" thermostat and Q667 subbase.

An interconnecting W973 relay kit must be used to adapt the W973 to the CHA16. Optional CMC3-1 time clock must also be used for night setback capabilities.

The relay kit changes the thermostat setpoints for night setback. A night thermostat is not needed.

12 - *C14-1 Wiring Diagram*
W973 control system for units with economizer and warm-up. Requires W973 relay kit. Also requires CMC3-1 clock and night relay for night setback. Wiring connections are similar to *C8-1 diagram* except with addition of warm up kit. Warm up kit plug P8 connects to W973 relay Kit jack J5 and all other jackplug connections are made as described in previous sections. Room temperature sensor connections are made to the unit's low voltage terminal strip.

13 - *C12 Wiring Diagram*
T7300 electronic thermostat for units without economizer. T7300 thermostat wiring connections are made to the unit's low voltage terminal strip.

14 - *C12-2 Wiring Diagram*
T7300 electronic thermostat for units with economizer. Warm-up is built in.

L-Clocks / Timers (CMC3-1)

Two optional clocks (both designated model# CMC3-1) are available for use with either the electromechanical thermostat or the Honeywell W973 control system. Both allow mechanical thermostats to "set back" during unoccupied periods. The clocks, models 202A and 702A, allow 24-hour and 7-day programmability respectively.

Other CHA16 control system options (W7400, T7300, Pro-stat, etc.) are equipped with built-in clocks for this purpose and do not need CMC3-1.

Both CMC3-1 clocks are alike except for programmability. The clocks are rated 24VAC*, 60Hz and have SPDT contacts rated at 15A and 120VAC.

**NOTE-Some clocks may be 120VAC while most are 24VAC. Be sure to check clock motor rating and wire clock according to its rating.*

Wiring connections should be made to N.O. terminal 1 and 3 (see figure 67). Refer to the sequence of operation for the control system being used (back of this manual) for correct wiring connections. Refer to the manufacturer's operation and installation instructions printed inside the front cover of each clock.

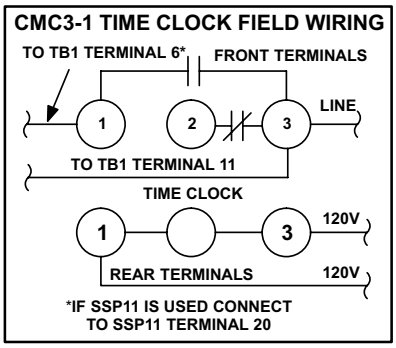


FIGURE 67

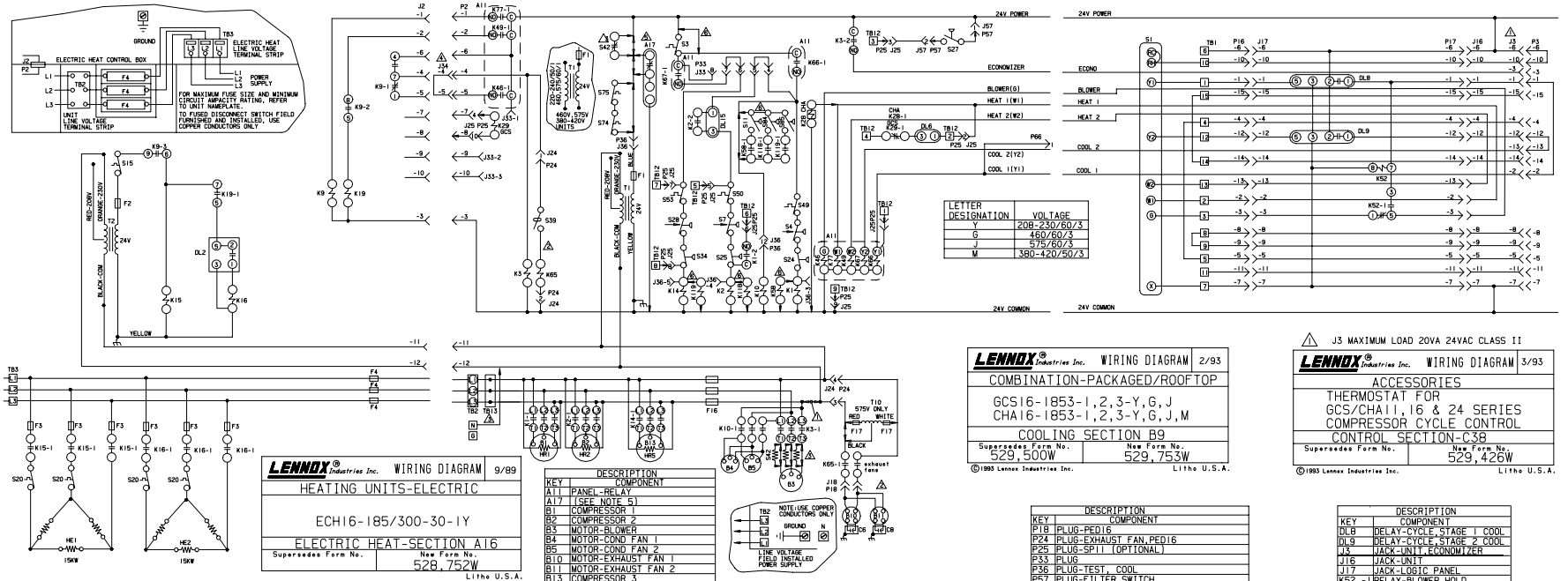
NOTES

NOTE-THE FOLLOWING DIAGRAM AND OPERATION SEQUENCE SHOWS A BASIC UNIT (B9 and A16 DIAGRAMS) CONNECTED TO AN ELECTROMECHANICAL THERMOSTAT (C1 DIAGRAM) ONLY.

OPTIONAL "16 SERIES CONTROLS" WIRING DIAGRAMS ARE NOT PRINTED IN THIS MANUAL. LOOK FOR CONTROL SYSTEM DIAGRAMS AND OPERATION SEQUENCES IN INDIVIDUAL UNIT INFORMATION CONTROL SYSTEM MANUALS PRINTED SEPARATELY.

C1 diagram with B9 and A16 diagrams

basic thermostat with CHA16-1853, with typical electric heat and without economizer



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

LENNOX Industries Inc. WIRING DIAGRAM 9/89

HEATING UNITS-ELECTRIC

ECH16-185/300-30-1Y

ELECTRIC HEAT-SECTION A16

Supersedes Form No.	New Form No.
	528,752W

Litho U.S.A.

DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION	
KEY	COMPONENT
DL2	delay-electric heat (30sec)
F2	fuse-transformer, T2
F3	fuse-electric heat
F4	fuse-unit
HE1	element-electric heat 1
HE2	element-electric heat 2
J2	jack-electric ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K19,-1	relay-heat, stage 2
S15	switch-limit,primary,elect ht
S20	switch-limit,secondary,elect ht
T2	transformer-electric heat
TB3	terminal strip-electric heat

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

1. Y,G,J VOLTAGE UNITS
2. OPTIONAL EXHAUST FAN, PED16
3. M VOLTAGE UNITS ONLY
4. REMOVE JACK J34 WHEN ELECTRIC HEAT IS USED (CHA UNITS ONLY)
5. CONNECTIONS FOR REMOTE MOUNTED SMOKE DETECTOR A17, MAX LOAD 0.1VA 24VAC CLASS II
6. LOW AMBIENT KIT USING PRESSURE SWITCHES ON ALL THREE COMPRESSORS

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

IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING AND INSULATION THICKNESS.

REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE

DISCONNECT ALL POWER BEFORE SERVICING

ADJUSTABLE HEAT ANTICIPATION
1ST STAGE HEAT 0.1 AMP
2ND STAGE HEAT 0.4 AMP

DENOTES OPTIONAL COMPONENTS

LENNOX Industries Inc. WIRING DIAGRAM 2/93

COMBINATION-PACKAGED/ROOFTOP

GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M

COOLING SECTION B9

Supersedes Form No.	New Form No.
529,500W	529,753W

 Litho U.S.A.

DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

J3 MAXIMUM LOAD 20VA 24VAC CLASS II

LENNOX Industries Inc. WIRING DIAGRAM 3/93

ACCESSORIES

THERMOSTAT FOR GCS/CHA11,16 & 24 SERIES COMPRESSOR CYCLE CONTROL

CONTROL SECTION-C38

Supersedes Form No.	New Form No.
	529,426W

 Litho U.S.A.

DESCRIPTION	
KEY	COMPONENT
DL8	DELAY-CYCLE,STAGE 1 COOL
DL9	DELAY-CYCLE,STAGE 2 COOL
J3	JACK-UNIT,ECONOMIZER
J16	JACK-UNIT
J17	JACK-LOGIC PANEL
K52,-1	RELAY-BLOWER HOLD
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
P17	PLUG-LOGIC PANEL
S1	THERMOSTAT-ROOM
TB1	TERMINAL STRIP-LOW VOLT

TB1

TERM. NO.		UNIT FUNCTION
1	Y1	COOL 1
2	W1	HEAT 1
3	G	BLOWER
4	4	
5	5	
6	R	24V POWER
7	C	24V COMMON
8	8	
9	9	
10	10	POWER TO S1
11	11	
12	Y2	COOL 2
13	W2	HEAT 2
14	14	
15	15	

C1 DIAGRAM WITH B9 AND A16 DIAGRAMS

Electromechanical Thermostat Connected to CHA16-1853 with Typical Electric Heat Unit (and Without Economizer)

A-CHA16-1853

This flowchart is used to show the step by step sequence that takes place when thermostat demand is sent to the CHA16. The sequence describes the actions of devices in the unit which control blowers, fans and other components in the system.

Operation Sequence: C1 Section B9 and A8 Sections (Electromechanical Thermostat wired to CHA16-1853)

Power:

1- When the unit disconnect closes, line voltage energizes both transformers T1 and T2. Transformer T1 provides 24VAC power to unit cooling and blower controls and thermostat. Transformer T2 provides 24VAC power to unit heating controls.

2- If the unit is 575V and is equipped with optional PED16 exhaust fans, line voltage simultaneously energizes transformer T10. Transformer T10 provides 460VAC power to PED16 fan motors and is switched through relay K65 (NOTE-PED16 fan motors use line voltage in all units except 575V models).

Pilot Relays:

3- All thermostat demand is switched via pilot relays located on pilot relay board A11. A11 is used to reduce voltage drop caused by long runs of thermostat wire or undersized thermostat wire.

Blower Operation:

4- Blower demand from thermostat terminal G energizes pilot relay K46. Normally open K46-1 contacts close.

5- When K46-1 closes 24VAC power is routed through N.C. K9-1 contacts to energize blower contactor K3 (and mercury exhaust switch S39 if optional PED16 is installed).

6- When K3 is energized K3-1 closes to energize blower motor B3 and K3-2 closes to energize the economizer damper motor (if economizer is installed, outdoor damper drives to minimum position).

7- Optional REMD16 and PED16 installed: As the economizer damper drives open, mercury switch S39 closes and relay K65 is energized.

8- When K65 is energized, K65-1 closes to energize both PED16 exhaust fan motors B10 and B11.

1st Stage Cooling(compressors B1 and B2 operate separated by delay):

9- Cooling demand energizes Y1 and G in the thermostat. G energizes pilot relay K46. See step 5 and subsequent steps for blower operation. After a delay from DL8 (30 second on delay, 240 second off delay), Y1 energizes pilot relay K66. Normally open K66 contacts contacts close.

10- When K66-1 closes, 24VAC power is routed through low ambient thermostat S3, high temperature limit S49, high pressure limit S4 and low pressure limit S24 to energize compressor contactor K1.

11- Contactor K1-1 contacts close to energize compressor B1.

12- Simultaneously when K66-1 closes, time delay DL15 and contactor K10 are energized. DL15 initiates a 30 second delay before closing. K10-1 closes to energize both condenser fan motors B4 and B5.

13- After 30 second delay has elapsed, DL15 closes and 24VAC power is routed through high temperature limit S50, high pressure limit S7 and low pressure limit S25 to energize compressor contactor K2.

14- Contactor K2-1 contacts close to energize compressor B2. K2-2 auxiliary contacts close to bypass (latch) DL15.

2nd Stage Cooling(compressor B13 operates in addition to B1 and B2):

15- Additional cooling demand energizes Y2 in the thermostat. After a delay from DL9 (30 second on delay, 240 second off delay), Y2 energizes pilot relay K67. Normally open K67 contacts close.

16- When K67-1 closes, 24VAC power is routed through high temperature limit S53, high pressure limit S28 and low pressure limit S34 to energize compressor contactor K14.

17- Contactor K14-1 closes to energize compressor B13.

1st Stage Heating Operation:

18- Heating demand energizes W1 in the thermostat. W1 energizes pilot relay K77. Normally open K77-1 contacts close.

19- When K77-1 closes the 1st stage heating pilot relay (K9) is energized. K9-1 normally open contacts switch closed (and normally closed contacts switch open) and K9-2 and K9-3 normally open contacts switch closed.

20- When K9-1 switches, blower contactor K3 (and mercury exhaust switch S39 if optional PED16 is installed) is energized.

21- When K9-2 switches closed, 2nd stage electric heat is enabled.

22- When K9-3 closes, electric heat operation begins. The operation sequence of electric heat units varies depending on size (kW input rating) and line voltage rating.

23- When K3 is energized K3-1 closes to energize blower motor B3 and K3-2 closes to energize the economizer damper motor (if economizer is installed, outdoor damper drives to minimum position).

2nd Stage Heating Operation:

24- Additional heating demand energizes W2 in the thermostat. W2 energizes pilot relay K49. Normally open K49-1 contacts close.

25- When K49-1 closes, demand passes through K9-2 (2nd stage enable contacts) to energize the 2nd stage heating pilot relay. The operation sequence of electric heat units varies depending on size (kW input rating) and line voltage rating.

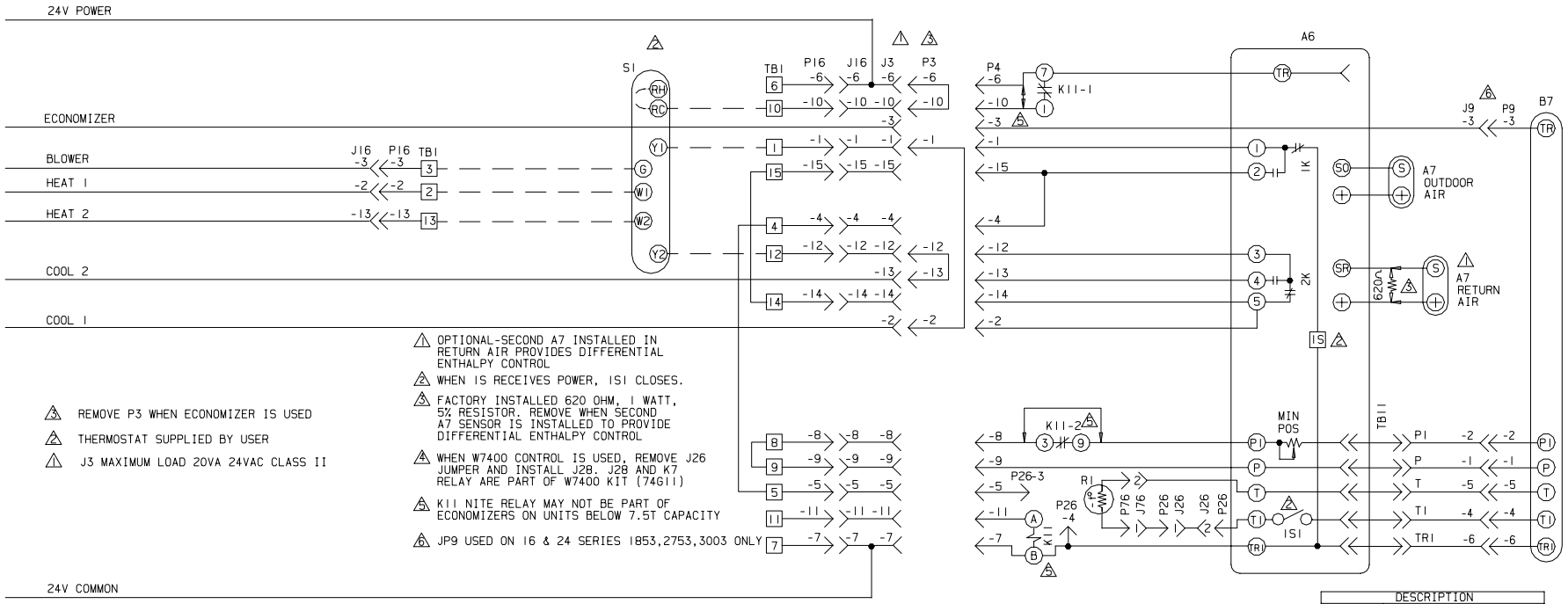
Safety Blower Operation:

26- If either the primary or secondary limits in the electric heat section trip, the heating elements are immediately de-energized.

27- The indoor blower remains energized powered by K9 which is energized by thermostat demand.

C1 diagram with D5 diagram

electromechanical thermostat with modulating economizer



TBI

FOR UNITS WITHOUT A CONTROL BETWEEN P16 & J16

TERM. NO.	UNIT FUNCTION	
1	Y1	COOL 1
2	W1	HEAT 1
3	G	BLOWER
4	4	
5	5	
6	R	24V POWER
7	C	24V COMMON
8	8	
9	9	
10	10	POWER TO SI
11	11	
12	Y2	COOL 2
13	W2	HEAT 2
14	14	
15	15	

— — — LOW VOLTAGE FIELD WIRING

——— FACTORY WIRING

LENNOX® Industries Inc. WIRING DIAGRAM 3/93

ACCESSORIES

ELECTROMECHANICAL THERMOSTAT FOR 11,16 & 24 SERIES UNITS (2 HEAT, 2 COOL)

THERMOSTAT-SECTION C1

Supersedes Form No.	New Form No.
	528,394W

DESCRIPTION	
KEY	COMPONENT
J3	JACK-UNIT,ECONOMIZER
J16	JACK-UNIT
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
SI	THERMOSTAT-ROOM
TBI	TERMINAL STRIP-LOW VOLTAGE

DESCRIPTION	
KEY	COMPONENT
A6	CONTROL-ENTHALPY W7459A
A7	SENSOR-ENTHALPY
B7	MOTOR-DAMPER
J9	JACK-ECONOMIZER
J26	JACK-ENTHALPY
J28	JACK-W7400
J76	JACK-SENSOR ECONOMIZER
K7,-1	RELAY-W7400
K11,-1,2	RELAY-NITE SETBACK
P4	PLUG-ECONOMIZER
P9	PLUG-ECONOMIZER
P26	PLUG-ENTHALPY
P76	PLUG-SENSOR ECONOMIZER
R1	SENSOR-SUPPLY AIR
TBII	TERMINAL STRIP

LENNOX® Industries Inc. WIRING DIAGRAM 3/93

ACCESSORIES

EMD-14,17-M EMDH-16,24-M
REMD-11,16,24-M
(MODULATING ECONOMIZER)

ECONOMIZER-SECTION D5

Supersedes Form No.	New Form No.
529,063W	529,485W

C1 DIAGRAM WITH D5 DIAGRAM

Electromechanical Thermostat with Economizer

B-REMD16M

When a REMD16M economizer section is applied to the CHA16-1853 with electromechanical thermostat, three stages of cooling are available dependent on the actions of the economizer enthalpy control. By sensing outdoor temperature and relative humidity, the enthalpy control determines if outside air can be used as a first stage of cooling. If so, 1st stage cooling is handled by outdoor air dampers and 2nd 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 and the compressors handle all cooling demand.

NOTE-In order to understand how optional controls affect the operation of the CHA16, you must first read and understand how all the CHA16 components work.

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

Operation Sequence: C1 Diagram with D5 Diagram (economizer connected to CHA16-1853 with electromechanical thermostat)

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

NOTE-Relay K9 is part of the ECH16 electric heater used with the CHA16 unit for heating.

1- Economizer outdoor air dampers drive full closed anytime blower B3 is not operating.
2- Damper motor terminal TR is powered by unit contactor K3 when there is a blower demand or by K9 when there is a heating demand. When 24VAC is applied to between terminals TR and TR1, the damper motor is energized and the outdoor air dampers open to minimum position.
3- Blower B3 is energized (indirectly) by thermostat terminal G. On a cooling demand, thermostat terminal G energizes contactor K3 which in turn energizes the blower (refer to operation sequence on previous page for exact sequence). When K3 energizes, K3-1 closes to energize the blower and K3-2 closes to energize the economizer (see step 2) and open the outdoor air dampers to minimum position.

Enthalpy Low, 1st Stage Cool:

4- Initial cooling demand Y1 is sent to enthalpy control A6 and terminal 1.
5- Enthalpy control A6 has determined that outside air can be used for cooling and has switched internal relays 1K and 2K.
6- Cooling demand is routed through enthalpy control to energize internal relay 1S. Internal contacts 1S1 close to complete a circuit through damper motor terminals T and T1.
7- When a voltage is applied across terminals T and T1 of damper motor, the damper motor energizes and outdoor air dampers open. Supply air sensor R1 varies the voltage across T and T1 and the outdoor air dampers adjust accordingly. 1st stage cooling is provided by outdoor air.

Enthalpy Low, 2nd Stage Cool:

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

Enthalpy High, 1st Stage Cool:

10- Enthalpy control internal relays 1K and 2K switch. Internal relay 1S is de-energized and 1S1 opens. Outdoor air dampers close to minimum position.
11- Cooling demand is sent from thermostat terminal Y1 through enthalpy control terminals 1 and 2 and through enthalpy control terminal 5 to energize the 1st stage compressors.

Enthalpy High, 2nd Stage Cool:

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

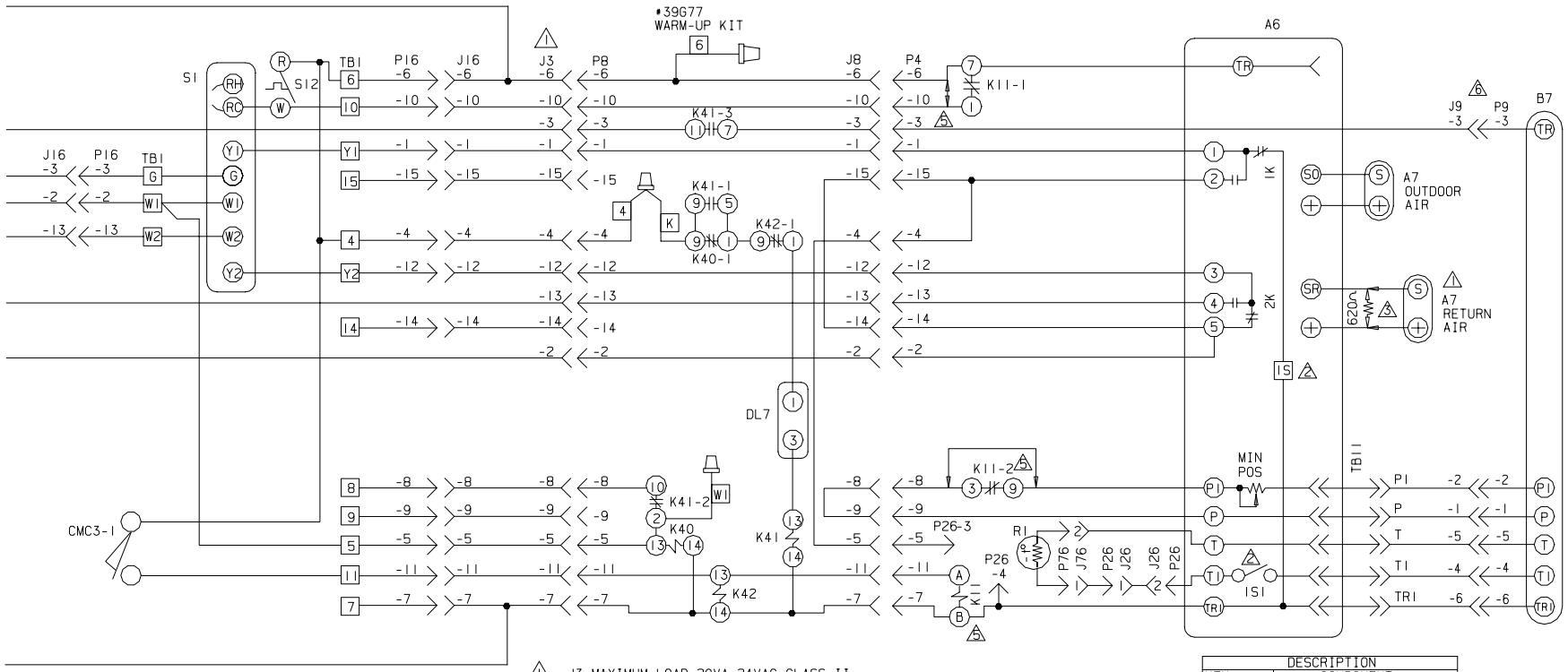
Night Setback (optional field installed)

NOTE-K11 relay is part of the REMD16M-185 economizer.

13- Optional field installed time-clock and night thermostat S12 must be connected for night setback operation.
14- Blower B3 operates only during a heating demand when night thermostat is closed.
15- 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.
16- 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 applied to S1 and the unit operates normally. When the setpoint is reached, S12 opens, S1 is disabled and unit operation stops.
17- Shortly before the building is to be occupied, clock contacts open to de-energize relay K11. Contacts K11-1 close to restore power to thermostat S1 and 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



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)

⚠1 J3 MAXIMUM LOAD 20VA 24VAC CLASS II

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

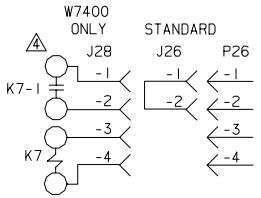
⚠2 WHEN IS RECEIVES POWER, ISI CLOSES.

⚠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

⚠6 JP9 USED ON 16 & 24 SERIES 1853,2753,3003 ONLY



DESCRIPTION	
KEY	COMPONENT
A6	CONTROL-ENTHALPY W7459A
A7	SENSOR-ENTHALPY
B7	MOTOR-DAMPER
J9	JACK-ECONOMIZER
J26	JACK-ENTHALPY
J28	JACK-W7400
J76	JACK-SENSOR ECONOMIZER
K7,-1	RELAY-W7400
K11,-1,2	RELAY-NITE SETBACK
P4	PLUG-ECONOMIZER
P9	PLUG-ECONOMIZER
P26	PLUG-ENTHALPY
P76	PLUG-SENSOR ECONOMIZER
RI	SENSOR-SUPPLY AIR
TB11	TERMINAL STRIP

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. 528,152W

Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM	3/93
ACCESSORIES	
EMD-14,17-M EMDH-16,24-M REMD-11,16,24-M (MODULATING ECONOMIZER)	
ECONOMIZER-SECTION D5	
Supersedes Form No. 529,063W	New Form No. 529,485W

Litho U.S.A.

C2-1 DIAGRAM WITH D5 DIAGRAM

Electromechanical Thermostat with Economizer and Warm-Up

C-WARM-UP KIT

An optional feature of the REMD16M economizer is a warm-up kit which holds the economizer outdoor air dampers closed during night heat operation and while the CHA16 is warming the building the morning after. The warm-up kit temporarily disables the economizer (outdoor air 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 the operation of the CHA16, you must first read and understand how all the CHA16 components work.

NOTE-

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

2 - Optional night thermostat S12 must be installed.

3 - The warm-up kit can only be installed in CHA16 units with REMD16 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 CHA16 BLOWER COMPARTMENT. REFER TO WIRING DIAGRAM. IMPROPER CONNECTION WILL CAUSE CONTROL FAILURE.

The warm-up kit installs in the control mounting area of the CHA16 filter access 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. When relay K41 is de-energized, economizer is disabled.

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 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:
a-Contacts K41-1 open to lock-out economizer operation.
b-Contacts K41-2 close (not used).
c-Contacts K41-3 open to disconnect power to the economizer.
d-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 S12s setpoint is reached, S12 opens, S1 is disabled and unit operation stops.

9 - Blower operates only on demand energized by ECH16 heat relay K9 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.

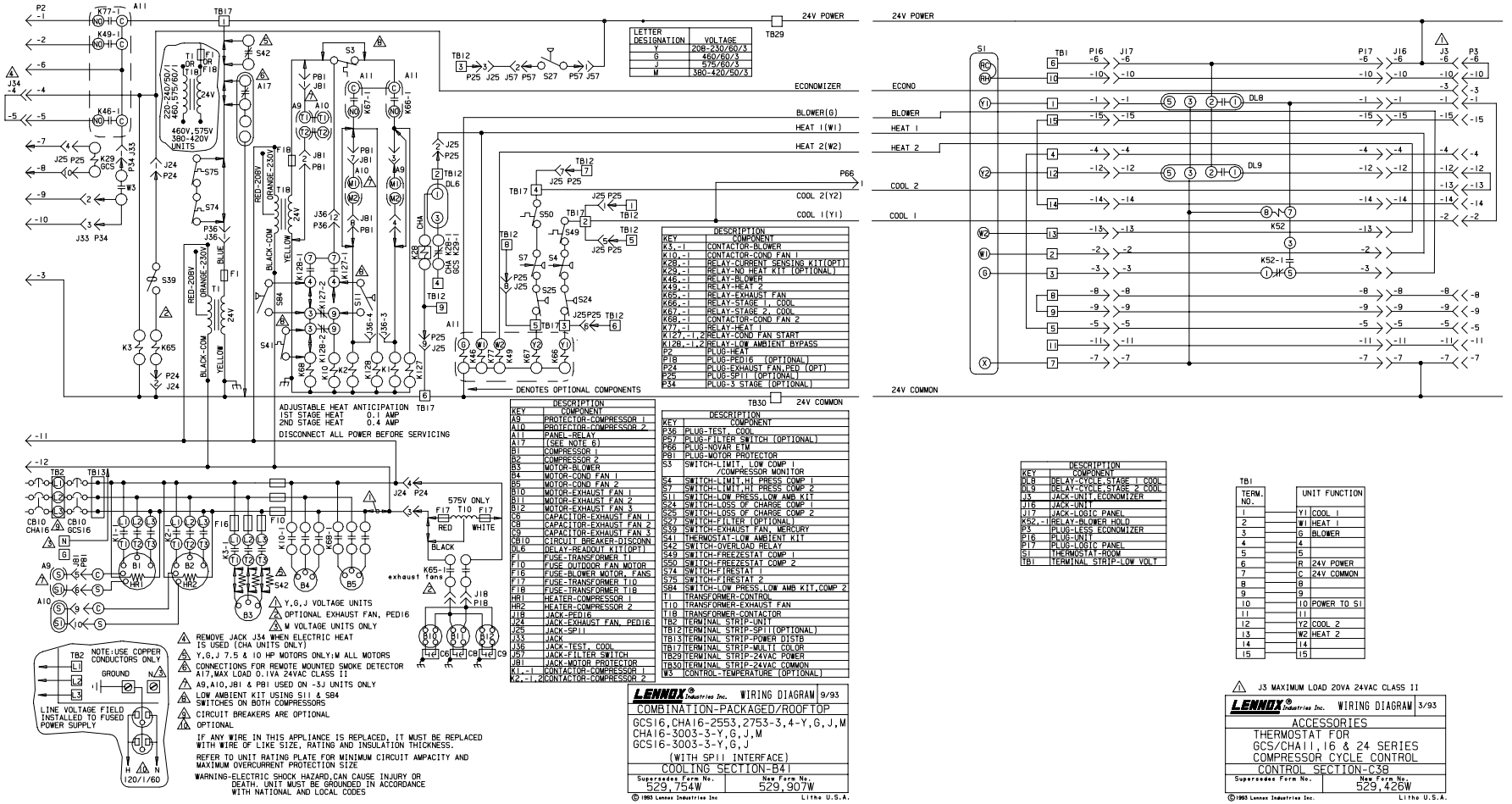
15 - If heat demand W1 reaches relay K40 before delay DL7 closes, contacts K40-1 open, delay DL7 loses power and resets and the economizer is locked-out for the first heat demand by relay K41 (contacts K41-3 remain open). If heat demand W1 reaches relay K40 after delay DL7 closes, relay K41 energizes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

16 - When first heat demand is satisfied, relay K40 disengages and relay K40 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 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 open (not used).
c-Contacts K41-3 close to allow power to the economizer.
d-Contacts K41-4 close (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).

B41 diagram with C1 diagram *CHA16-2553, 2753, 3003 Operating Sequence*



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

KEY	DESCRIPTION COMPONENT
K3,-1	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN 1
K28,-1	RELAY-CURRENT SENSING KIT(OPT)
K29,-1	RELAY-NO HEAT KIT (OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K68,-1	CONTACTOR-COND FAN 2
K77,-1	RELAY-HEAT 1
K127,-1,-2	RELAY-COND FAN START
K128,-1,-2	RELAY-LOW AMBIENT BYPASS
P2	PLUG-HEAT
P18	PLUG-PED16 (OPTIONAL)
P24	PLUG-EXHAUST FAN,PED (OPT)
P25	PLUG-SPI1 (OPTIONAL)
P34	PLUG-3 STAGE (OPTIONAL)

KEY	DESCRIPTION COMPONENT
A9	PROTECTOR-COMPRESSOR 1
A10	PROTECTOR-COMPRESSOR 2
A11	PANEL-RELAY
A17	(SEE NOTE 6)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B12	MOTOR-EXHAUST FAN 3
C8	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
C9	CAPACITOR-EXHAUST FAN 3
CB10	CIRCUIT BREAKER-DISCONN
DL6	DELAY-READOUT KIT(OPT)
F1	FUSE-TRANSFORMER T1
F10	FUSE-OUTDOOR FAN MOTOR
F16	FUSE-BLOWER MOTOR, FANS
F17	FUSE-TRANSFORMER T10
F18	FUSE-TRANSFORMER T1B
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J18	JACK-PED16
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
J81	JACK-MOTOR PROTECTOR
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2

KEY	DESCRIPTION COMPONENT
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH (OPTIONAL)
P66	PLUG-NOVAR ETM
P81	PLUG-MOTOR PROTECTOR
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S39	SWITCH-EXHAUST FAN, MERCURY
S41	THERMOSTAT-LOW AMBIENT KIT
S42	SWITCH-OVERLOAD RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
T1B	TRANSFORMER-CONTACTOR
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB
TB17	TERMINAL STRIP-MULTI COLOR
TB29	TERMINAL STRIP-24VAC POWER
TB30	TERMINAL STRIP-24VAC COMMON
W3	CONTROL-TEMPERATURE (OPTIONAL)

KEY	DESCRIPTION COMPONENT
DL8	DELAY-CYCLE-STAGE 1 COOL
DL9	DELAY-CYCLE-STAGE 2 COOL
J3	JACK-UNIT,ECONOMIZER
J16	JACK-UNIT
J17	JACK-LOGIC PANEL
K52,-1	RELAY-BLOWER HOLD
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
P17	PLUG-LOGIC PANEL
S1	THERMOSTAT-ROOM
TB1	TERMINAL STRIP-LOW VOLT

TB1 TERM. NO.	UNIT FUNCTION
1	Y1 COOL 1
2	W1 HEAT 1
3	G BLOWER
4	4
5	5
6	R 24V POWER
7	C 24V COMMON
8	8
9	9
10	10 POWER TO SI
11	11
12	Y2 COOL 2
13	W2 HEAT 2
14	14
15	15

LENNOX Industries Inc. WIRING DIAGRAM 9/93

COMBINATION-PACKAGED/ROOFTOP

GCS16,CHA16-2553,2753-3,4-Y,G,J,M
CHA16-3003-3-Y,G,J,M
GCS16-3003-3-Y,G,J

(WITH SPI1 INTERFACE)

COOLING SECTION-B41

Supersedes Form No.	New Form No.
529,754W	529,907W

 Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 3/93

ACCESSORIES

THERMOSTAT FOR GCS/CHA11,16 & 24 SERIES COMPRESSOR CYCLE CONTROL

CONTROL SECTION-C38

Supersedes Form No.	New Form No.
	529,426W

 Litho U.S.A.

CHA16-2553, -2753, -3003 Operation Sequence: B41 Section and C1 Sections

(Basic Unit with Basic Electromechanical Thermostat)

Blower Operation:

1- Blower demand from thermostat terminal G energizes pilot relay K46.
2- N.O. K46-1 closes energizing blower contactor K3 and energizes the economizer (If installed). Outdoor damper drives to minimum position.
3- N.O. K3-1 closes, blower begins operation.

1st Stage Cooling:

4- Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 1).
5- After a delay from DL8 (30 second on delay, 240 second off delay), Y1 energizes pilot relay K66 after passing through N.C. Freezstat S49, N.C. High Pressure limit S4 and Loss of Charge Switch S24.
6- N.O. K-66-1 closes and 24VAC energizes Fan Start Relay K127and Compressor Contactor K1 after passing through N.C. compressor monitor switch S3.
7- K1-1 closes energizing compressor.
8- K127-1 closes energizing Condenser Fan contactor K10.
9- N.O. K10-1 closes energizing condenser fan motor B4.

2nd Stage Cooling:

10- After a delay from DL9 (30 second on delay, 240 second off delay), second stage cooling demand Y2 is routed through N.C freezstat S50, high pressure limit S7 and low pressure limit S25 energizing pilot relay K67.
11- N.O. contacts K67-1 close energizing Compressor Contactor K2 and Condenser Fan 2 Contactor K68.
12- N.O. contacts K2-1 close energizing compressor B2.
13- N.O. contacts K68-1 close energizing condenser fan motor 2 (B5).

1st Stage Heating: (See CHA16-1853 with Electric Heat Pages 56-57)

14- Heating demand energizes W1 in the thermostat. Pilot relay K77 is energized.
15- N.O. K77-1 close energizing electric heat stage 1 The operation sequence of electric heat units varies depending on size (kW input rating) and line voltage rating.

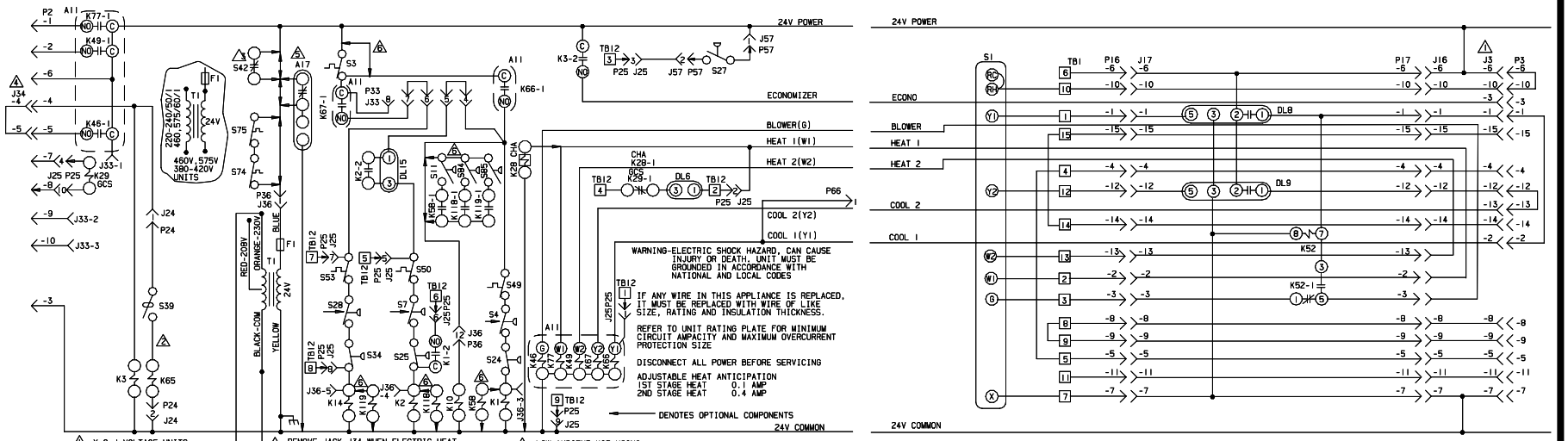
2nd Stage Heating (If equipped with multiple stage heating): (See CHA16-1853 with Electric Heat Pages 56-57)

16- Additional heating demand energizes W2 in the thermostat. Pilot relay K49 is energized.
17- N.O. K49-1 close energizing electric heat stage. The operation sequence of electric heat units varies depending on size (kW input rating) and line voltage rating.

Safety Blower Operation:

18- If either limits in the electric heat section trip, the heating elements are immediately de-energized.
19- The indoor blower remains energized powered by K3 which is energized by thermostat demand.

B9 diagram with C1 diagram *CHA16-1853 Operating Sequence*



DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPT1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1-,-1,2	CONTACTOR-COMPRESSOR 1
K2-,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 2, COOL
K67,-1	RELAY-STAGE 1, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPT1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETW
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPT1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

DESCRIPTION	
KEY	COMPONENT
DL8	DELAY-CYCLE,STAGE 1 COOL
DL9	DELAY-CYCLE,STAGE 2 COOL
J3	JACK-UNIT,ECONOMIZER
J16	JACK-UNIT
J17	JACK-LOGIC PANEL
K52,-1	RELAY-BLOWER HOLD
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
P17	PLUG-LOGIC PANEL
S1	THERMOSTAT-ROOM
TB1	TERMINAL STRIP-LOW VOLT

TB1

TERM. NO.	UNIT FUNCTION
1	
2	Y1 COOL 1
3	W1 HEAT 1
4	G BLOWER
5	4
6	5
7	R 24V POWER
8	C 24V COMMON
9	8
10	9
11	10 POWER TO S1
12	11
13	Y2 COOL 2
14	W2 HEAT 2
15	14
	15

J3 MAXIMUM LOAD 20VA 24VAC CLASS II

LENNOX Industries Inc. WIRING DIAGRAM 2/93

COMBINATION-PACKAGED/ROOFTOP

GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M

COOLING SECTION B9

Supersedes Form No.	New Form No.
529,500W	529,753W

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LENNOX Industries Inc. WIRING DIAGRAM 3/93

ACCESSORIES
THERMOSTAT FOR
GCS/CHA11,16 & 24 SERIES
COMPRESSOR CYCLE CONTROL

CONTROL SECTION-C38

Supersedes Form No.	New Form No.
	529,426W

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CHA16-1853 Operation Sequence: B9 Section and C1 Sections (Basic Unit with Basic Electromechanical Thermostat)

Blower Operation:

1- Blower demand from thermostat terminal G energizes pilot relay K46. N.O. K46-1 doses energizing blower contactor K3. K3-2 energizes the economizer (If installed). Outdoor damper drives to minimum position.
2- N.O. K3-1 closes, blower begins operation.

1st Stage Cooling:

3- Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 1).
4- After a delay from DL8 (30 second on delay, 240 second off delay), Y1 energizes pilot relay K66.
5- N.O. K66-1 closes. 24VAC power energizes outdoor fan relay K10 and Time Delay DL15. In 30 seconds compressor two will begin operation (see step 8). The unit is equipped with three compressors. Two compressors operate in the first stage of cooling.
6- 24VAC power energizes outdoor fan relay K10.
7- N.O. K10-1 closes energizing condenser fan motors B4 and B5.
8- 24VAC power is routed through N.C. low discharge temp. sensor S3, N.C. freezstat S49, N.C. high pressure limit S4 and N.C. low pressure limit S24 to energize compressor contactor K1.
9- N.O. Contacts K1-1 close energizing compressor B1.
10- Time delay DL15 closes in 30 seconds from initial first stage thermostat demand. 24VAC power is routed through N.C. freezstat S50, N.C. high pressure limit S7 and N.C. loss of charge switch S25 energizing compressor contactor K2.
11- N.O. Contacts K2-1 close energizing compressor B2.

2nd Stage Cooling:

12- Second stage cooling demand energizes Y2.
13- After a delay from DL9 (30 second on delay, 240 second off delay), Y2 energizes pilot relay K67.
14- N.O. K67-1 closes.
15- 24VAC power is routed through N.C. freezstat S53, N.C. high pressure limit S28 and N.C. loss of charge switch S34 to energize compressor contactor K14.
16- N.O. K14-1 closes energizing compressor 3 (second stage.)

1st Stage Heating: (See CHA16-1853 with Electric Heat Pages 56-57)

17- Heating demand energizes W1 in the thermostat. Pilot relay K77 is energized.
18- N.O. K77-1 close energizing electric heat stage 1 The operation sequence of electric heat units varies depending on size (kW input rating) and line voltage rating.

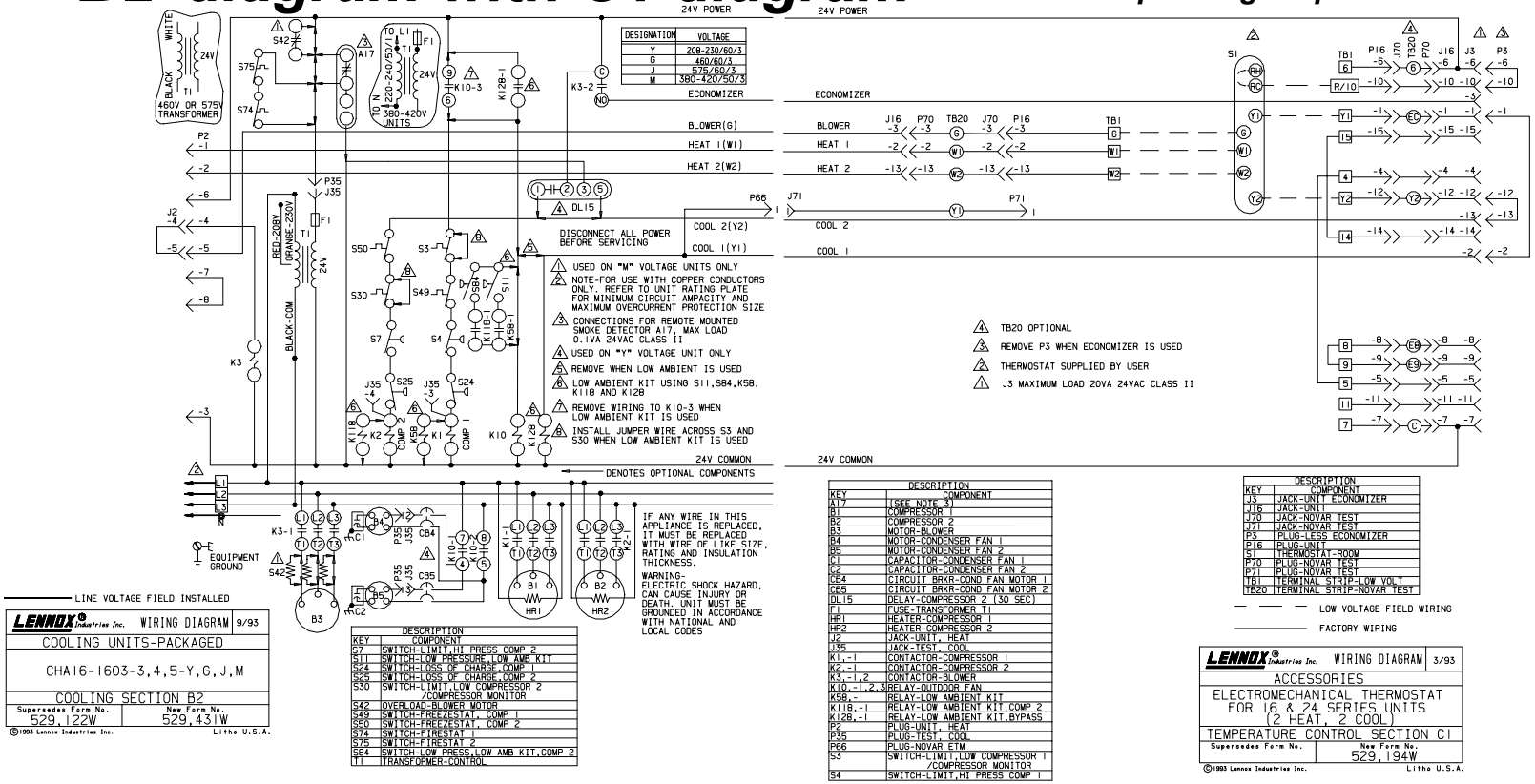
2nd Stage Heating (If equipped with multiple stage heating): (See CHA16-1853 with Electric Heat Pages 56-57)

19- Additional heating demand energizes W2 in the thermostat. Pilot relay K49 is energized.
20- N.O. K49-1 close energizing electric heat stage . The operation sequence of electric heat units varies depending on size (kW input rating) and line voltage rating.

Safety Blower Operation:

21- If either limits in the electric heat section trip, the heating elements are immediately de-energized.
22- The indoor blower remains energized, powered by K3 which is energized by thermostat demand.

B2 diagram with C1 diagram *CHA16-1603 Operating Sequence*



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

KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER 1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K128,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

KEY	DESCRIPTION COMPONENT
J3	JACK-UNIT ECONOMIZER
J16	JACK-UNIT
J70	JACK-NOVAR TEST
J71	JACK-NOVAR TEST
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
S1	THERMOSTAT-ROOM
P70	PLUG-NOVAR TEST
P71	PLUG-NOVAR TEST
TB1	TERMINAL STRIP-LOW VOLT
TB20	TERMINAL STRIP-NOVAR TEST

KEY	DESCRIPTION COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LENNOX Industries Inc. WIRING DIAGRAM 9/93
COOLING UNITS-PACKAGED
CHA16-1603-3,4,5-Y,G,J,M
COOLING SECTION B2
Supersedes Form No. 529,122W | New Form No. 529,431W
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LENNOX Industries Inc. WIRING DIAGRAM 3/93
ACCESSORIES
ELECTROMECHANICAL THERMOSTAT FOR 16 & 24 SERIES UNITS (2 HEAT, 2 COOL)
TEMPERATURE CONTROL SECTION C1
Supersedes Form No. | New Form No. 529,194W
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CHA16-1603 Operation Sequence: B2 Section and C1 Sections
(Basic Unit with Basic Electromechanical Thermostat)

Blower Operation:

1- Blower demand from thermostat terminal G energizes blower contactor K3.
2- N.O. K3-1 closes, blower begins operation. N.O. K3-2 closes energizing economizer damper motor (if economizer is installed, outdoor damper drives to minimum position).

1st Stage Cooling (Low Ambient Kit Installed):

3- Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 1.)
4- 24VAC power energizes low ambient relay K-128.
5- N.O. K-128-1 closes energizing outdoor fan relay K10.
6- N.O. K10-1,-2 close energizing condenser fan motors B4 and B5.
7- N.O. K10-3 closes. 24VAC power is routed around N.C. low discharge temp. sensor S3, through N.C. freezstat S49, N.C. high pressure limit S4 and N.C. low pressure limit S24 to energize compressor contactor K1.
8- N.O. Contacts K1-1 close energizing compressor B1.

1st Stage Cooling (Low Ambient Kit Not Installed):

9- Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 1.)
10- 24VAC power energizes outdoor fan relay K10.
11- N.O. K10-1,-2 close energizing condenser fan motors B4 and B5.
12- N.O. K10-3 closes. 24VAC power is routed through N.C. low discharge temp. sensor S3, N.C. freezstat S49, N.C. high pressure limit S4 and N.C. low pressure limit S24 to energize compressor contactor K1.
13- N.O. Contacts K1-1 close energizing compressor B1.

2nd Stage Cooling (With Low Ambient Kit):

14- Second stage cooling demand energizes Y2. 24VAC power is routed through N.C freezstat S50, around N.C. low discharge temp. sensor S30, through high pressure limit S7 and low pressure limit S25 energizing compressor contactor K2.
15- N.O. contacts K2-1 close energizing compressor B2.

2nd Stage Cooling (With Out Low Ambient Kit):

16- Second stage cooling demand energizes Y2. 24VAC power is routed through N.C freezstat S50, through N.C. low discharge temp. sensor S30, through high pressure limit S7 and low pressure limit S25 energizing compressor contactor K2.
17- N.O. contacts K2-1 close energizing compressor B2.

1st Stage Heating: (See CHA16-1853 with Electric Heat Pages 56-57)

18- 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.

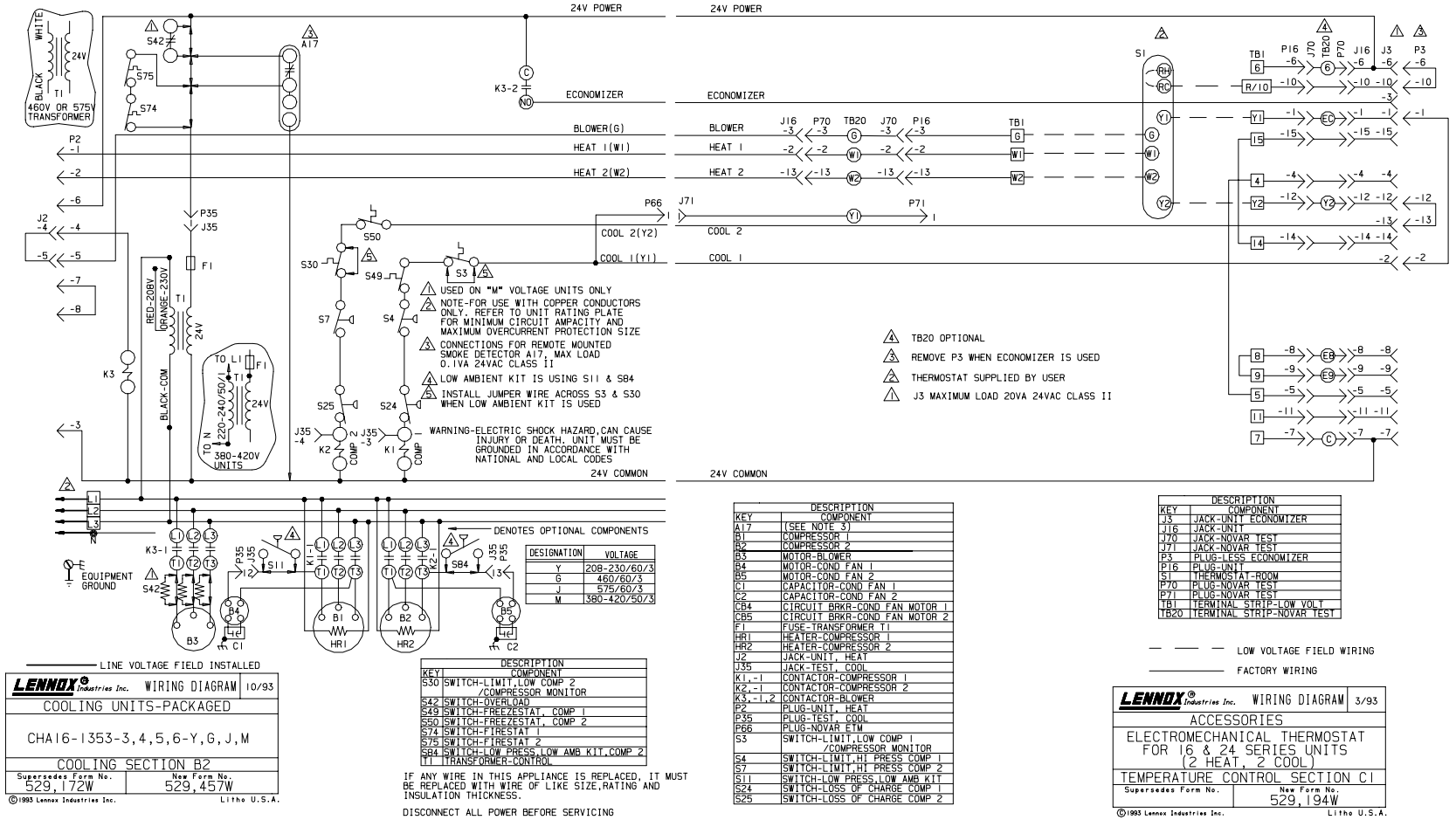
2nd Stage Heating (If equipped with multiple stage heating):
(See CHA16-1853 with Electric Heat Pages 56-57)

19- 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:

20- If either limits in the electric heat section trip, the heating elements are immediately de-energized.
21- Indoor blower remains energized powered by K3 energized by thermostat demand.

B2 diagram with C1 diagram *CHA16-1353 Operating Sequence*



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

KEY	DESCRIPTION COMPONENT
A17	[SEE NOTE 3]
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
C1	CAPACITOR-COND FAN 1
C2	CAPACITOR-COND FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2

KEY	DESCRIPTION COMPONENT
J3	JACK-UNIT ECONOMIZER
J16	JACK-UNIT
J70	JACK-NOVAR TEST
J71	JACK-NOVAR TEST
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
S1	THERMOSTAT-ROOM
P70	PLUG-NOVAR TEST
P71	PLUG-NOVAR TEST
TB1	TERMINAL STRIP-LOW VOLT
TB20	TERMINAL STRIP-NOVAR TEST

KEY	DESCRIPTION COMPONENT
S30	SWITCH-LIMIT,LOW COMP 2 /COMPRESSOR MONITOR
S42	SWITCH-OVERLOAD
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH WIRE OF LIKE SIZE,RATING AND INSULATION THICKNESS.

DISCONNECT ALL POWER BEFORE SERVICING

LENNOX Industries Inc. WIRING DIAGRAM 10/93
COOLING UNITS-PACKAGED
CHA16-1353-3,4,5,6-Y,G,J,M
COOLING SECTION B2
Supersedes Form No. 529,172W | New Form No. 529,457W
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LENNOX Industries Inc. WIRING DIAGRAM 3/93
ACCESSORIES
ELECTROMECHANICAL THERMOSTAT FOR 16 & 24 SERIES UNITS (2 HEAT, 2 COOL)
TEMPERATURE CONTROL SECTION C1
Supersedes Form No. | New Form No. 529,194W
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CHA16-1353 Operation Sequence: B2 Section and C1 Sections
(Basic Unit with Basic Electromechanical Thermostat)

Blower Operation:

1- Blower demand from thermostat terminal G energizes blower contactor K3.
2- N.O. K3-1 closes, blower begins operation. N.O. K3-2 closes energizing economizer damper motor (if economizer is installed, outdoor damper drives to minimum position).

1st Stage Cooling (both compressors B1 and B2 operate separately):

3- Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 1.)
4- 24VAC power is routed through compressor monitor S3, N.C. freezstat S49, N.C. high pressure limit S4 and N.C. low pressure limit S24 to energize compressor contactor K1.
5- N.O. Contacts K1-1 close energizing compressor B1 and condenser fan B4.

2nd Stage Cooling:

6- Second stage cooling demand energizes Y2. 24VAC power is routed through freeze-stat S50, compreesor monitor S3, high pressure limit S7 and low pressure limit S25 energizing compressor contactor K2.
7- N.O. contacts K2-1 close energizing compressor B2 and condenser fan B5.

1st Stage Heating: (See CHA16-1853 with Electric Heat Pages 56-57)

8- 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.

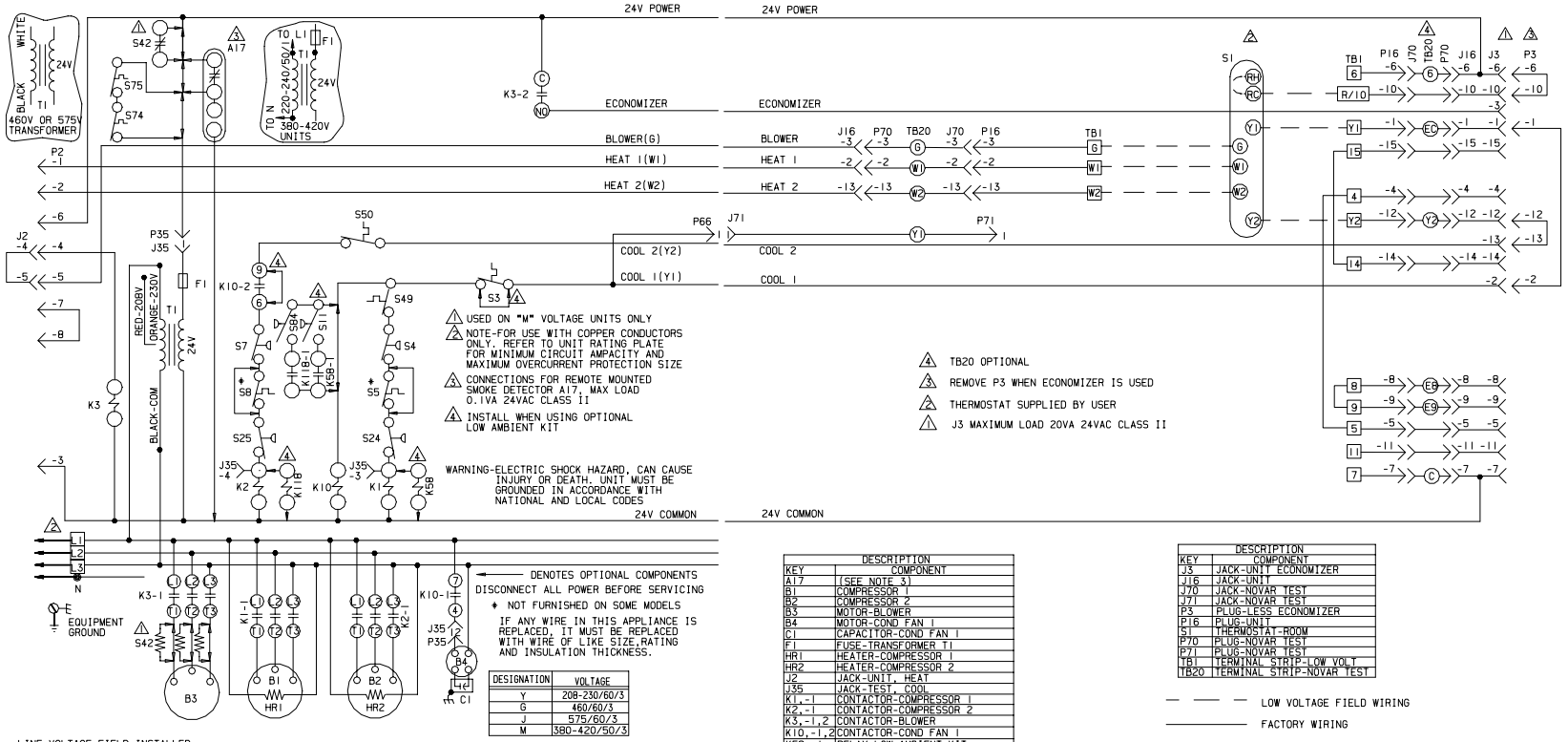
2nd Stage Heating (If equipped with multiple stage heating):
(See CHA16-1853 with Electric Heat Pages 56-57)

9- 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:

10- If either limits in the electric heat section trip, the heating elements are immediately de-energized.
11- The indoor blower remains energized powered by K3 which is energized by thermostat demand.

B1 diagram with C1 diagram *CHA16-823 / 953 Operating Sequence*



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

KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
C1	CAPACITOR-COND FAN 1
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2	CONTACTOR-COND FAN 1
K58,-1	RELAY-LOW AMBIENT KIT
K11B,-1	RELAY-LOW AMBIENT KIT,COMP 2
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR E1M
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S5	SWITCH-LIMIT,HI TEMP COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S8	SWITCH-LIMIT,HI TEMP COMP 2
S11	SWITCH-LOW PRESS,LOW AMB KIT

KEY	DESCRIPTION COMPONENT
J3	JACK-UNIT ECONOMIZER
J16	JACK-UNIT
J70	JACK-NOVAR TEST
J71	JACK-NOVAR TEST
P3	PLUG-LESS ECONOMIZER
P16	PLUG-UNIT
S1	THERMOSTAT-ROOM
P70	PLUG-NOVAR TEST
P71	PLUG-NOVAR TEST
TB1	TERMINAL STRIP-LOW VOLT
TB20	TERMINAL STRIP-NOVAR TEST

KEY	DESCRIPTION COMPONENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S42	SWITCH-OVERLOAD
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LENNOX Industries Inc. WIRING DIAGRAM 3/94

COOLING UNITS-PACKAGED

CHA16-953-1,4,5-Y,G
CHA16-953-2,3-J CHA16-823-1,2-Y,G
CHA16-953-1,2-M CHA16-823-1-J

COOLING SECTION B1

Supersedes Form No. 529,295W | New Form No. 529,450W

LENNOX Industries Inc. WIRING DIAGRAM 3/93

ACCESSORIES

ELECTROMECHANICAL THERMOSTAT FOR 16 & 24 SERIES UNITS (2 HEAT, 2 COOL)

TEMPERATURE CONTROL SECTION C1

Supersedes Form No. | New Form No. 529,194W

CHA16-823, -953 Operation Sequence: B1 Section and C1 Sections
(Basic Unit with Basic Electromechanical Thermostat)

Blower Operation:

1- Blower demand from thermostat terminal G energizes blower contactor K3.
2- N.O. K3-1 closes, blower begins operation. N.O. K3-2 closes energizing economizer damper motor (if economizer is installed, outdoor damper drives to minimum position).

1st Stage Cooling (both compressors B1 and B2 operate separately):

3- Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 1.) Y1 energizes condenser contactor K10. N.O. K10-1 closes energizing condenser fan B4.
4- N.O. K10-2 closes enabling second stage compressor contactor K2.
5- 24VAC power is routed through compressor monitor S3, N.C. freezstat S49, N.C. high pressure limit S4 and N.C. low pressure limit S24 to energize compressor contactor K1.
6- N.O. Contacts K1-1 close, compressor B1 begins operation.

2nd Stage Cooling:

7- Second stage cooling demand energizes Y2. 24VAC power is routed through high pressure limit S7 and low pressure limit S25 energizing compressor contactor K2.
8- N.O. contacts K2-1 close energizing compressor B2. B2 begins operation.

1st Stage Heating: (See CHA16-1853 with Electric Heat Pages 56-57)

9- 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.

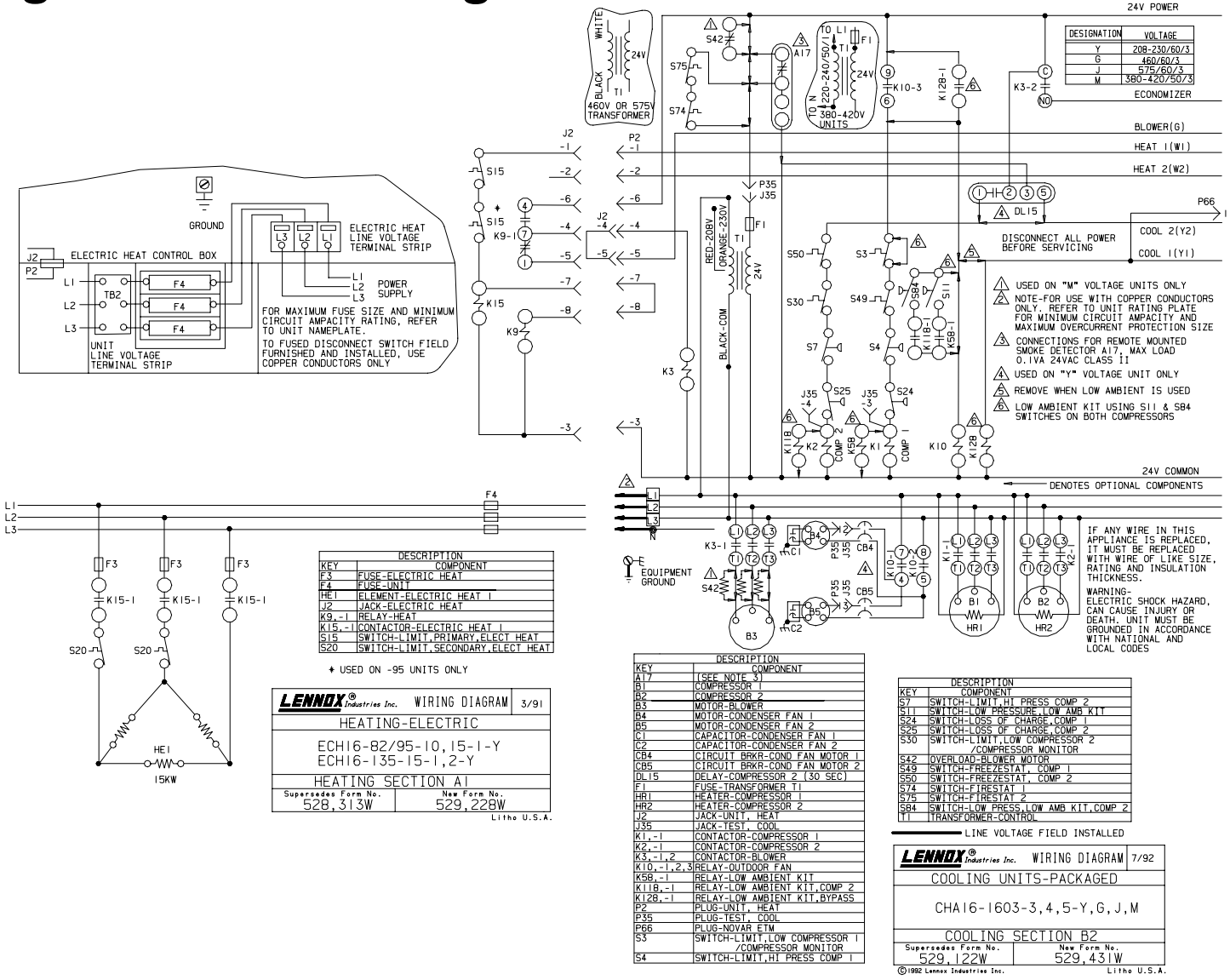
2nd Stage Heating (If equipped with multiple stage heating):
(See CHA16-1853 with Electric Heat Pages 56-57)

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 limits in the electric heat section trip, heating elements are immediately de-energized.
12- I indoor blower remains energized powered by K3 energized by thermostat demand.

A1 diagram with B2 diagram *ECH16-82/95/135/160 10kW & 15kW 208/230V Sequence*



DESCRIPTION	
KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
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

✦ USED ON -95 UNITS ONLY

LENNOX Industries Inc.	WIRING DIAGRAM	3/91
HEATING-ELECTRIC		
ECH16-82/95-10,15-1-Y ECH16-135-15-1,2-Y		
HEATING SECTION A1		
Supersedes Form No. 528,313W	New Form No. 529,228W	

Litho U.S.A.

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K5B,-1	RELAY-LOW AMBIENT KIT
K11B,-1	RELAY-LOW AMBIENT KIT,COMP 2
K12B,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

DESCRIPTION	
KEY	COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

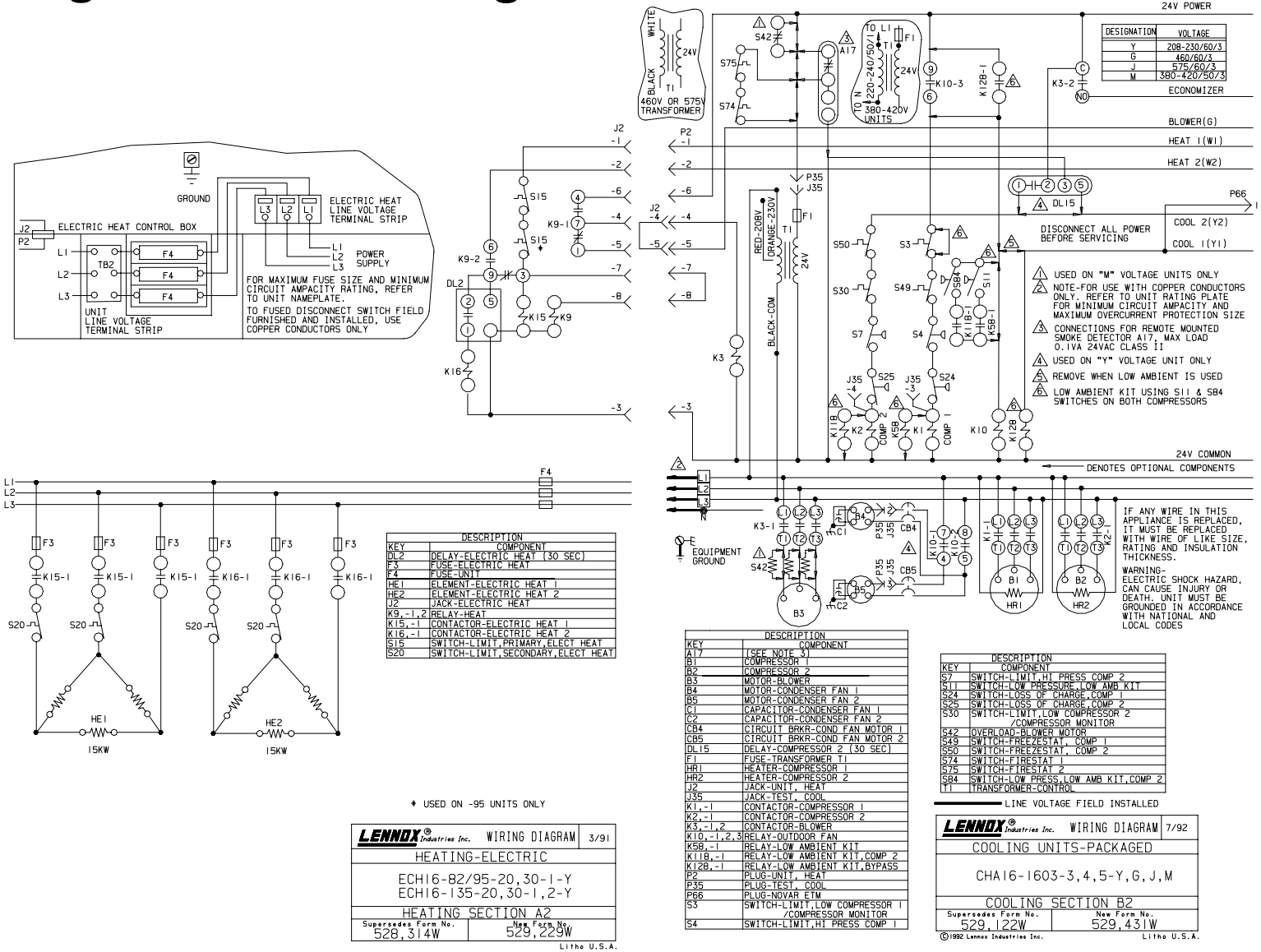
LENNOX Industries Inc.	WIRING DIAGRAM	7/92
COOLING UNITS-PACKAGED		
CHA16-1603-3,4,5-Y,G,J,M		
COOLING SECTION B2		
Supersedes Form No. 529,122W	New Form No. 529,431W	

Litho U.S.A.

Operation Sequence: A1 Section and B2 Sections
(15kW 208/230V electric heat wired to CHA16-1603)

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 switches.
2- When K15-1 closes, heating heating elements HE1 are energized. The elements are arranged in a "Delta" configuration for 208/230V operation.
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 when K3-2 contacts close).
5- Additional heating demand W2 is not used.

A2 diagram with B2 diagram *ECH16-82/95/135/160 20kW & 30kW 208/230V Sequence*



KEY	DESCRIPTION COMPONENT
DL2	DELAY-ELECTRIC HEAT (30 SEC)
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
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

♦ USED ON -95 UNITS ONLY

KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K128,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

KEY	DESCRIPTION COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc.	WIRING DIAGRAM	3/91
HEATING-ELECTRIC		
ECH16-82/95-20,30-1-Y ECH16-135-20,30-1,2-Y		
HEATING SECTION A2		
Supersedes Form No. 528,314W	New Form No. 529,229W	

Litho U.S.A.

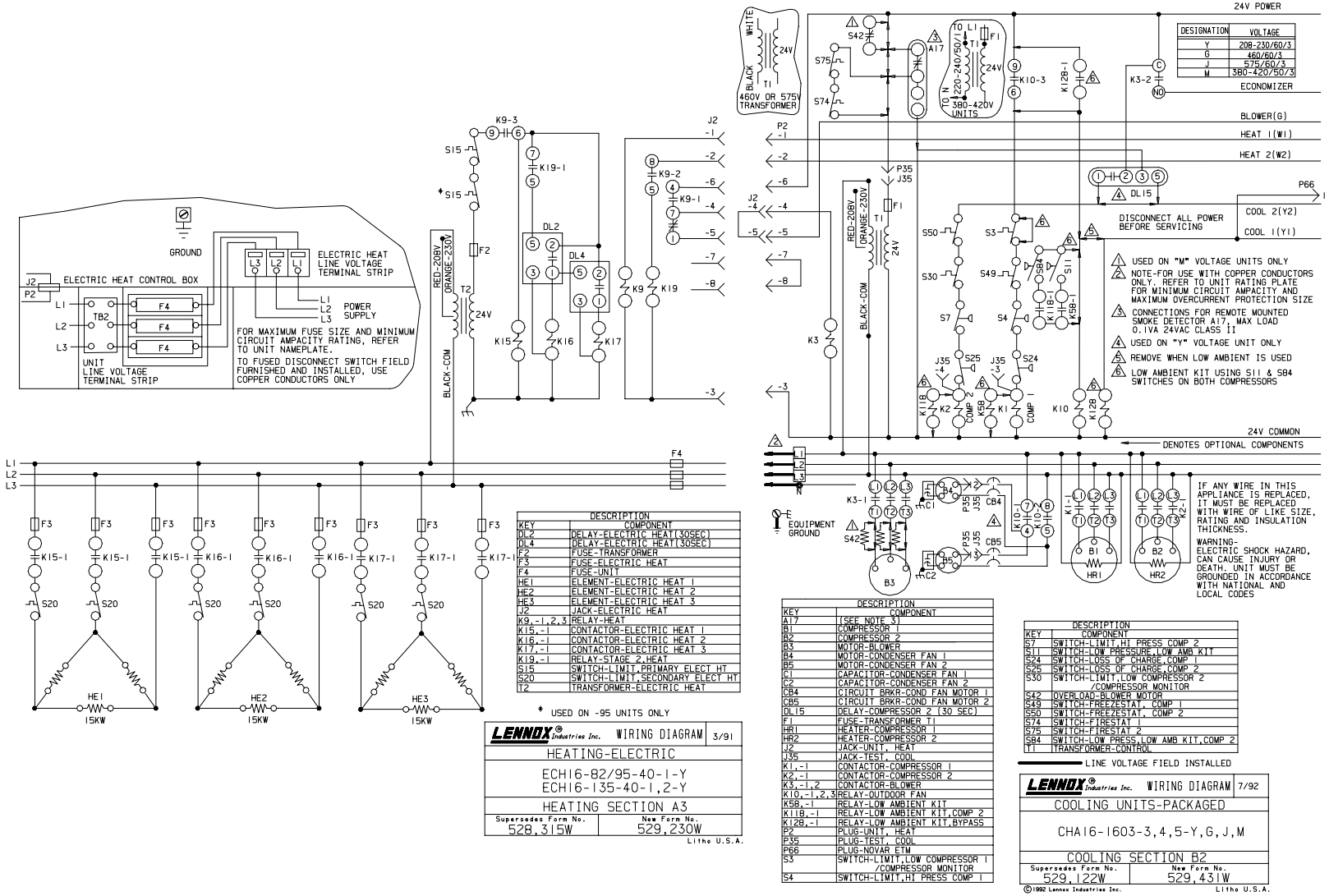
LENNOX Industries Inc.	WIRING DIAGRAM	7/92
COOLING UNITS-PACKAGED		
CHA16-1603-3,4,5-Y,G,J,M		
COOLING SECTION B2		
Supersedes Form No. 529,122W	New Form No. 529,431W	

Litho U.S.A.

Operation Sequence: A2 Section and B2 Sections
(20/30kW 208/230V electric heat wired to CHA16-1603)

1- 1st stage heating demand closes W1. W1 passes through primary limits S15 to energize contactor K15, relay K9 and time delay DL2. K15-1 contacts close and K9-1 and K9-2 both switch.
2- When K15-1 closes, heating elements HE1 are energized. The elements are arranged in a "Delta" configuration for 208/230V operation.
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 when K3-2 contacts close).
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 HE2 are energized.

A3 diagram with B2 diagram *ECH16-82/95/135/160 40kW 208/230V Operating Sequence*



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

* USED ON -95 UNITS ONLY

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K128,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

DESCRIPTION	
KEY	COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc.	WIRING DIAGRAM	3/91
HEATING-ELECTRIC		
ECH16-82/95-40-1-Y ECH16-135-40-1,2-Y		
HEATING SECTION A3		
Supersedes Form No. 528,315W	New Form No. 529,230W	

Litho U.S.A.

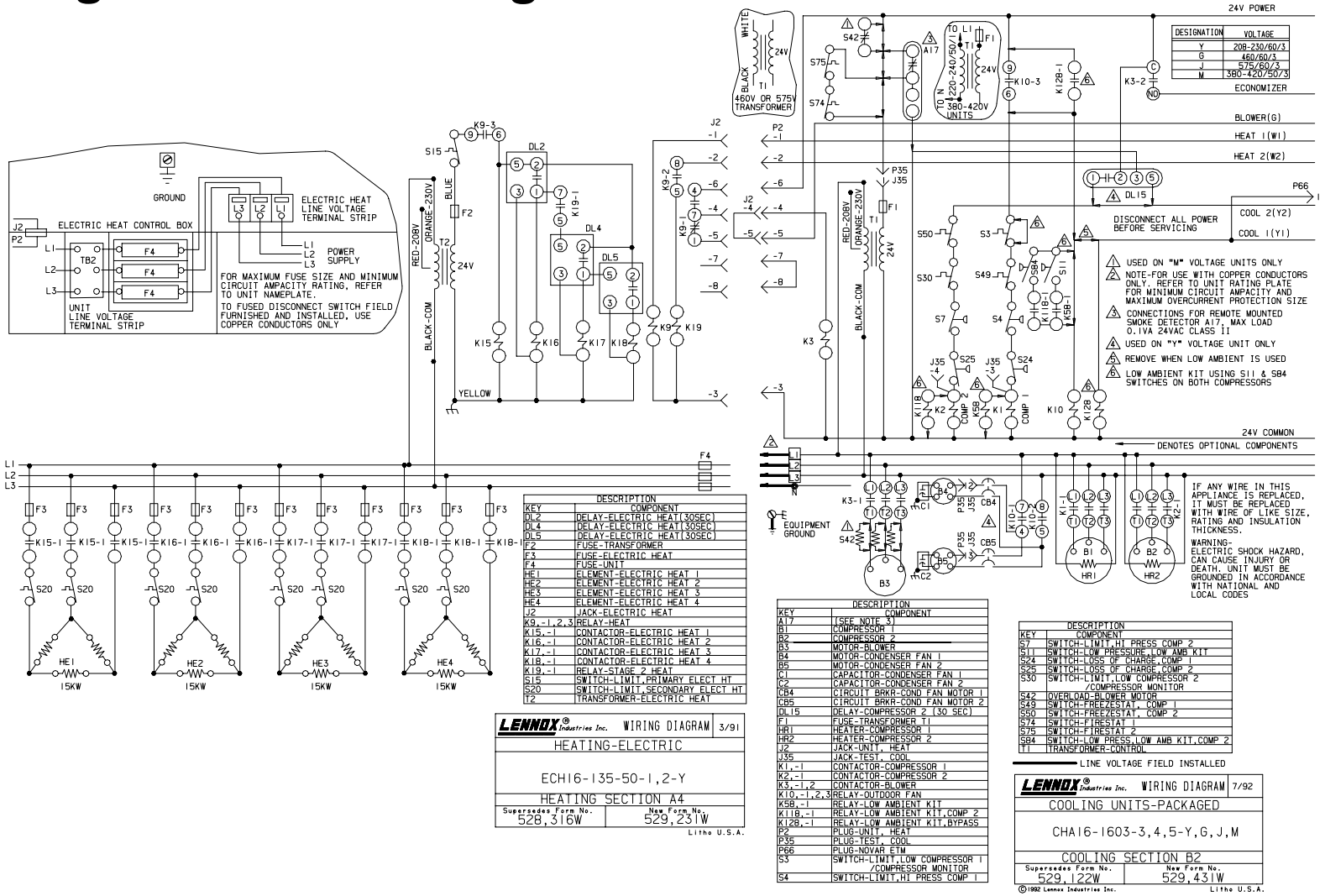
LENNOX Industries Inc.	WIRING DIAGRAM	7/92
COOLING UNITS-PACKAGED		
CHA16-1603-3,4,5-Y,G,J,M		
COOLING SECTION B2		
Supersedes Form No. 529,122W	New Form No. 529,431W	

Litho U.S.A.

Operation Sequence: A3 Section and B2 Sections
(40kW 208/230V electric heat wired to CHA16-1603)

1- Control voltage in this heater is supplied by a separate transformer T2 which is powered at all times.
2- 1st stage heating demand closes W1. W1 energizes relay K9.
3- When K9-1 switches, indoor blower contactor K3 is energized. The indoor blower is powered (and optional economizer opens to minimum position when K3-2 contacts close).When K9-2 closes, second stage heat is enabled. When K9-3 closes, control voltage passes through primary limits S15 to energize contactor K15.
4- When K15-1 closes, heating elements HE1 are energized. All elements are arranged in a “Delta” configuration for 208/230V operation.
5- Additional heating demand W2 passes through K9-2 to energize relay K19.
6- When K19-1 switches, time delay DL2 is energized. DL2 closes 30 seconds later to energize contactor K16 and time delay DL4.
7- When K16-1 closes heating elements HE2 are energized,
8- DL4 closes after 30 seconds to energize contactor K17 is energized.
9- When K17-1 closes, heating elements HE3 are energized.

A4 diagram with B2 diagram *ECH16-82/95/135/160 50kW 208/230V Operating Sequence*



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

KEY	DESCRIPTION COMPONENT
DL2	DELAY-ELECTRIC HEAT(30SEC)
DL4	DELAY-ELECTRIC HEAT(30SEC)
DL5	DELAY-ELECTRIC HEAT(30SEC)
F2	FUSE-TRANSFORMER
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
HE4	ELEMENT-ELECTRIC HEAT 4
J2	JACK-ELECTRIC HEAT
K9,-1,2,3	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HEAT 1
K16,-1	CONTACTOR-ELECTRIC HEAT 2
K17,-1	CONTACTOR-ELECTRIC HEAT 3
K18,-1	CONTACTOR-ELECTRIC HEAT 4
K19,-1	RELAY-STAGE 2 HEAT
S15	SWITCH-LIMIT,PRIMARY ELECT HT
S20	SWITCH-LIMIT,SECONDARY ELECT HT
T2	TRANSFORMER-ELECTRIC HEAT

KEY	DESCRIPTION COMPONENT (SEE NOTE 3)
A17	COMPRESSOR 1
B1	COMPRESSOR 2
B2	MOTOR-BLOWER
B3	MOTOR-CONDENSER FAN 1
B4	MOTOR-CONDENSER FAN 2
B5	CAPACITOR-CONDENSER FAN 1
C1	CAPACITOR-CONDENSER FAN 2
C2	CIRCUIT BRKR-COND FAN MOTOR 1
CB4	CIRCUIT BRKR-COND FAN MOTOR 2
CB5	DELAY-COMPRESSOR 2 (30 SEC)
DL15	FUSE-TRANSFORMER T1
F1	HEATER-COMPRESSOR 1
HR1	HEATER-COMPRESSOR 2
HR2	JACK-UNIT, HEAT
J2	JACK-TEST, COOL
J35	CONTACTOR-COMPRESSOR 1
K1,-1	CONTACTOR-COMPRESSOR 2
K2,-1	CONTACTOR-BLOWER
K3,-1,2	RELAY-OUTDOOR FAN
K10,-1,2,3	RELAY-LOW AMBIENT KIT
K58,-1	RELAY-LOW AMBIENT KIT,COMP 2
K118,-1	RELAY-LOW AMBIENT KIT,BYPASS
K128,-1	PLUG-UNIT, HEAT
P2	PLUG-TEST, COOL
P35	PLUG-NOVAR ETM
P66	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S3	SWITCH-LIMIT,HI PRESS COMP 1
S4	SWITCH-FREEZESTAT, COMP 1
S49	SWITCH-FREEZESTAT, COMP 2
S50	SWITCH-FIRESTAT 1
S74	SWITCH-FIRESTAT 2
S75	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S84	TRANSFORMER-CONTROL
T1	LINE VOLTAGE FIELD INSTALLED

KEY	DESCRIPTION COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR

LENNOX Industries Inc. WIRING DIAGRAM 3/91
HEATING-ELECTRIC
ECH16-135-50-1,2-Y
HEATING SECTION A4
Supersedes Form No. 528,316W
New Form No. 529,231W
Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 7/92
COOLING UNITS-PACKAGED
CHA16-1603-3,4,5-Y,G,J,M
COOLING SECTION B2
Supersedes Form No. 529,122W
New Form No. 529,431W
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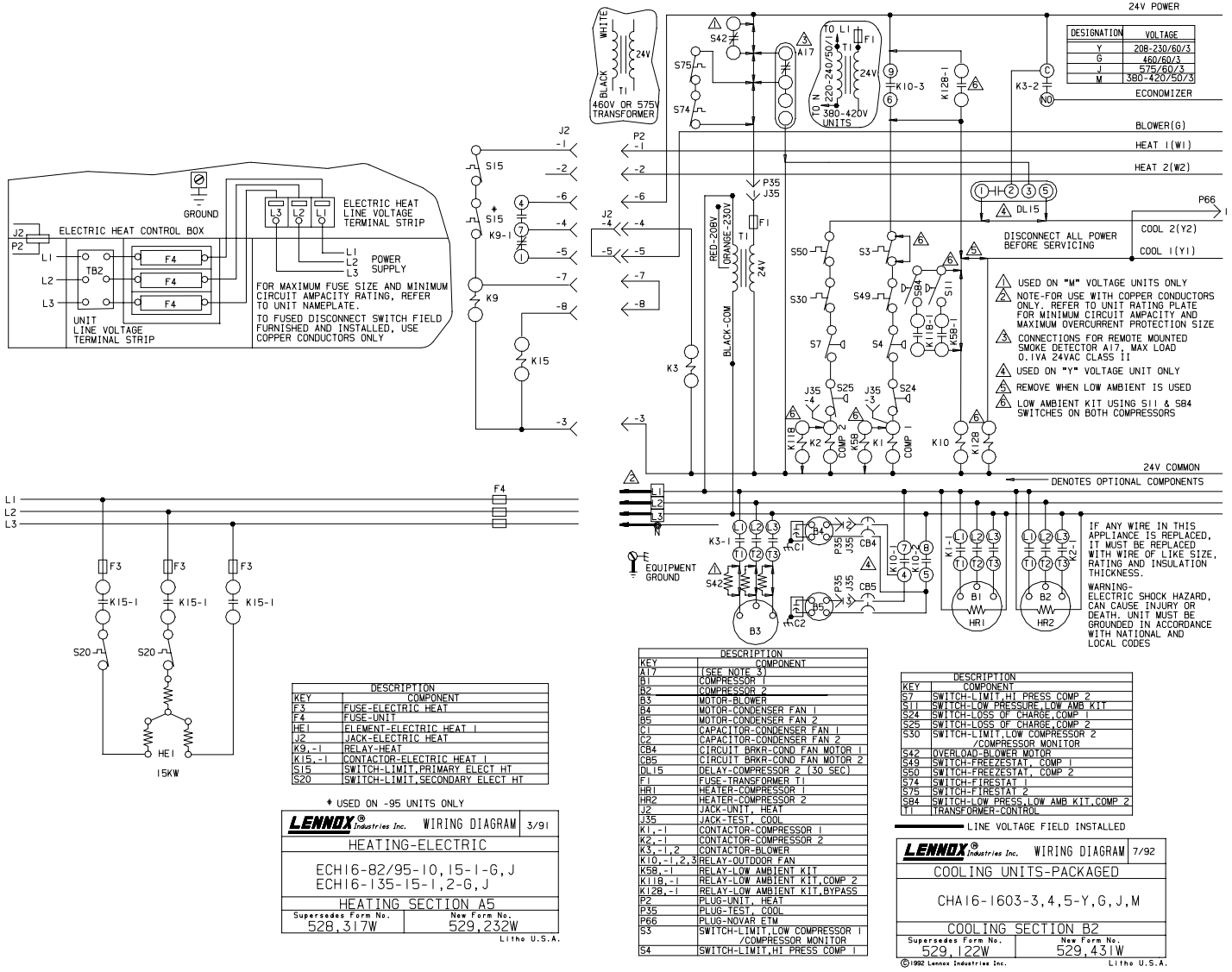
Operation Sequence: A4 Section and B2 Sections
(50kW 208/230V electric heat wired to CHA16-1603)

1- Control voltage in this heater is supplied by a separate transformer T2 which is powered at all times.
2- 1st stage heating demand closes W1. W1 energizes relay K9.
3- When K9-1 switches, indoor blower contactor K3 is energized. The indoor blower is powered (and optional economizer opens to minimum position when K3-2 contacts close). When K9-2 closes, second stage heat is enabled. When K9-3 closes, control voltage passes through primary limit S15 to energize contactor K15 and time delay DL2.
4- When K15-1 closes, heating elements HE1 are energized. All elements are arranged in a "Delta" configuration for 208/230V operation.
5- DL2 closes 30 seconds later to energize contactor K16.
6- When K16-1 closes heating elements HE2 are energized.
7- Additional heating demand W2 passes through K9-2 to energize relay K19.
8- When K19-1 switches, time delay DL4 is energized. DL4 closes 30 seconds later to energize contactor K17 and time delay DL5.
9- When K17-1 closes heating elements HE3 are energized,
10- DL5 closes after 30 seconds to energize contactor K18 is energized.
11- When K18-1 closes, heating elements HE4 are energized.

A5 diagram with B2 diagram *ECH16-82/95/135/160 10kW & 15kW 460V & 575V Sequence*



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

✦ USED ON -95 UNITS ONLY

LENNOX Industries Inc. WIRING DIAGRAM	3/91
HEATING-ELECTRIC	
ECH16-82/95-10,15-1-G,J ECH16-135-15-1,2-G,J	
HEATING SECTION A5	
Supersedes Form No. 528,317W	New Form No. 529,232W

Litho U.S.A.

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K11B,-1	RELAY-LOW AMBIENT KIT,COMP 2
K12B,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

DESCRIPTION	
KEY	COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc. WIRING DIAGRAM	7/92
COOLING UNITS-PACKAGED	
CHA16-1603-3,4,5-Y,G,J,M	
COOLING SECTION B2	
Supersedes Form No. 529,122W	New Form No. 529,431W

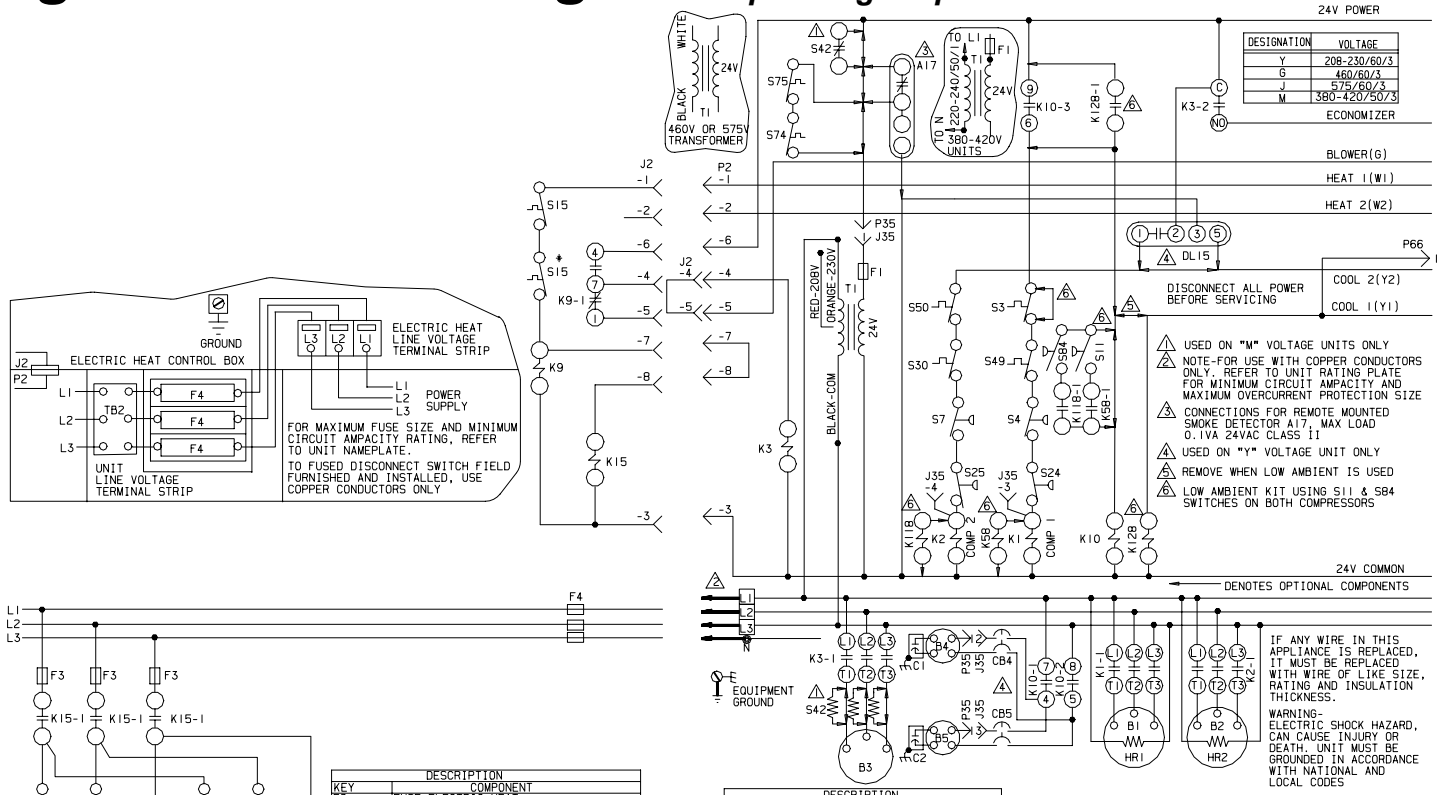
Litho U.S.A.

Operation Sequence: A5 Section and B2 Sections
(10/15kW 460 or 575V electric heat wired to CHA16-1603)

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 switches.
2- When K15-1 closes, heating heating elements HE1 are energized. The elements are arranged in a "Wye" configuration for 460V or 575V operation.
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 when K3-2 contacts close).
5- Additional heating demand W2 is not used.

A6 diagram with B2 diagram

ECH16-82/95/135/160 20kW & 30kW 460V & 575V Operating Sequence



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

1. USED ON "M" VOLTAGE UNITS ONLY
2. NOTE-FOR USE WITH COPPER CONDUCTORS ONLY. REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE
3. CONNECTIONS FOR REMOTE MOUNTED SMOKE DETECTOR A17, MAX LOAD O.1VA 24VAC CLASS II
4. USED ON "Y" VOLTAGE UNIT ONLY
5. REMOVE WHEN LOW AMBIENT IS USED
6. LOW AMBIENT KIT USING S11 & S84 SWITCHES ON BOTH COMPRESSORS

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

* USED ON -95 UNITS ONLY

DESCRIPTION	
KEY	COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K128,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

DESCRIPTION	
KEY	COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc.	WIRING DIAGRAM	3/91
HEATING-ELECTRIC		
ECH16-82/95-20,30-1-G,J ECH16-135-20,30-1,2-G,J		
HEATING SECTION A6		
Supersedes Form No. 528,318W	New Form No. 529,233W	

Litho U.S.A.

LENNOX Industries Inc.	WIRING DIAGRAM	7/92
COOLING UNITS-PACKAGED		
CHA16-1603-3,4,5-Y,G,J,M		
COOLING SECTION B2		
Supersedes Form No. 529,122W	New Form No. 529,431W	

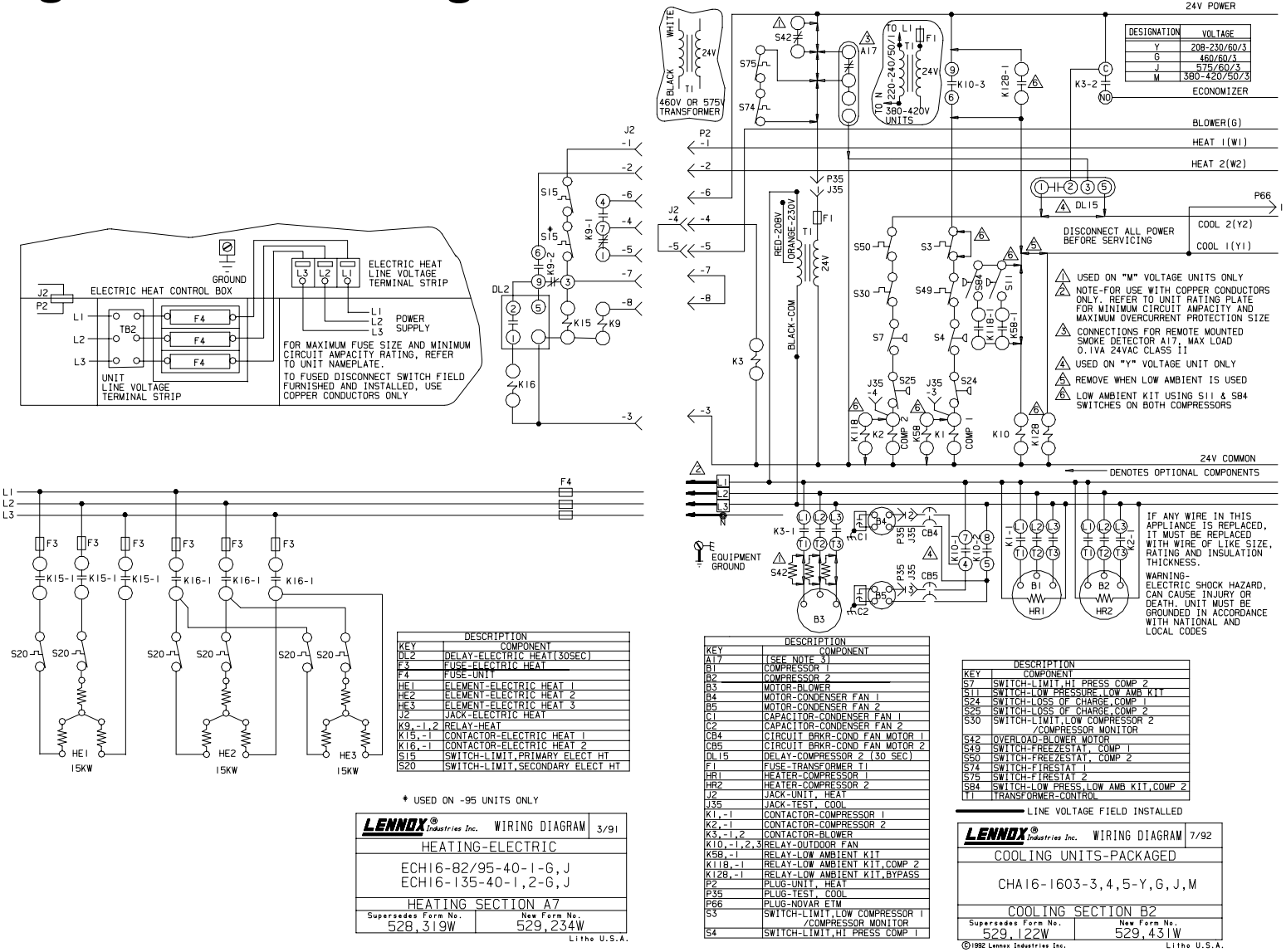
Litho U.S.A.

Operation Sequence: A6 Section and B2 Sections
(20/30kW 460V or 575V electric heat wired to CHA16-1603)

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 switch.
2- When K15-1 closes, heating elements HE1 and HE2 are both energized. The elements are arranged in a "Wye" configuration for 460V or 575V operation.
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 when K3-2 contacts close).
5- Additional heating demand W2 is not used.

A7diagram with B2 diagram

ECH16-82/95/135/160 40kW 460V & 575V Operating Sequence



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

♦ USED ON -95 UNITS ONLY

KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K128,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

KEY	DESCRIPTION COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc. WIRING DIAGRAM 3/91

HEATING-ELECTRIC

ECH16-82/95-40-1-G,J
ECH16-135-40-1,2-G,J

HEATING SECTION A7

Supersedes Form No.	New Form No.
528,319W	529,234W

Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 7/92

COOLING UNITS-PACKAGED

CHA16-1603-3,4,5-Y,G,J,M

COOLING SECTION B2

Supersedes Form No.	New Form No.
529,122W	529,431W

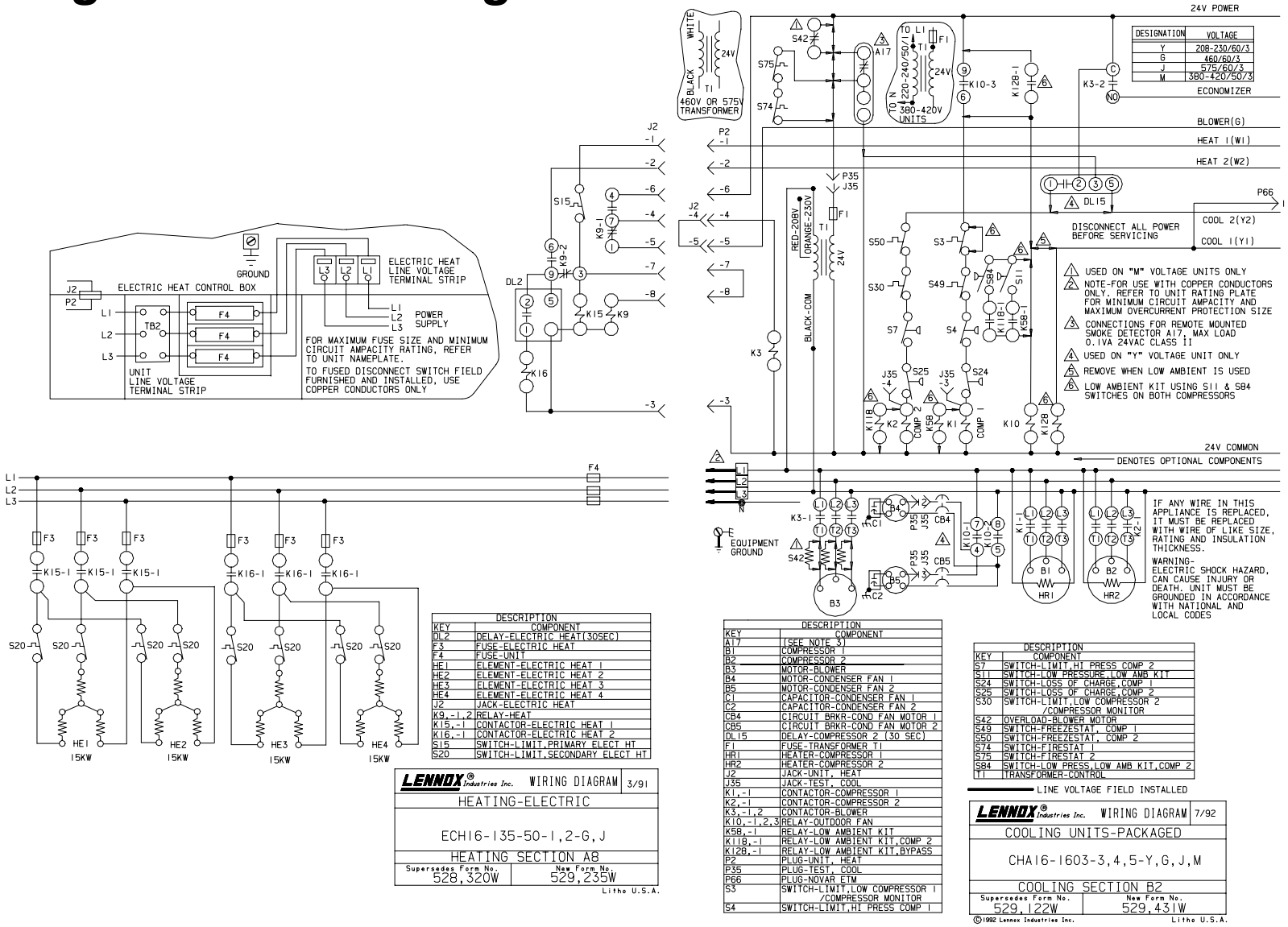
Litho U.S.A.

Operation Sequence: A7 Section and B2 Sections
(40kW 460V or 575V electric heat wired to CHA16-1603)

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 are energized. The elements are arranged in a "Wye" configuration for 460V or 575V operation.
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 when K3-2 contatcs close).
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 HE2 and HE3 are energized.

A8 diagram with B2 diagram

ECH16-82/95/135/160 50kW 460V & 575V Operating Sequence



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

KEY	DESCRIPTION COMPONENT
A17	(SEE NOTE 3)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-CONDENSER FAN 1
B5	MOTOR-CONDENSER FAN 2
C1	CAPACITOR-CONDENSER FAN 1
C2	CAPACITOR-CONDENSER FAN 2
CB4	CIRCUIT BRKR-COND FAN MOTOR 1
CB5	CIRCUIT BRKR-COND FAN MOTOR 2
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J2	JACK-UNIT, HEAT
J35	JACK-TEST, COOL
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN
K58,-1	RELAY-LOW AMBIENT KIT
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K128,-1	RELAY-LOW AMBIENT KIT,BYPASS
P2	PLUG-UNIT, HEAT
P35	PLUG-TEST, COOL
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT,LOW COMPRESSOR 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1

KEY	DESCRIPTION COMPONENT
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESSURE,LOW AMB KIT
S24	SWITCH-LOSS OF CHARGE,COMP 1
S25	SWITCH-LOSS OF CHARGE,COMP 2
S30	SWITCH-LIMIT,LOW COMPRESSOR 2 /COMPRESSOR MONITOR
S42	OVERLOAD-BLOWER MOTOR
S49	SWITCH-FREEZESTAT, COMP 1
S50	SWITCH-FREEZESTAT, COMP 2
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
T1	TRANSFORMER-CONTROL

LINE VOLTAGE FIELD INSTALLED

LENNOX Industries Inc. WIRING DIAGRAM 3/91

HEATING-ELECTRIC

ECH16-135-50-1,2-G,J

HEATING SECTION A8

Supersedes Form No. 528,320W | New Form No. 529,235W

Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 7/92

COOLING UNITS-PACKAGED

CHA16-1603-3,4,5-Y,G,J,M

COOLING SECTION B2

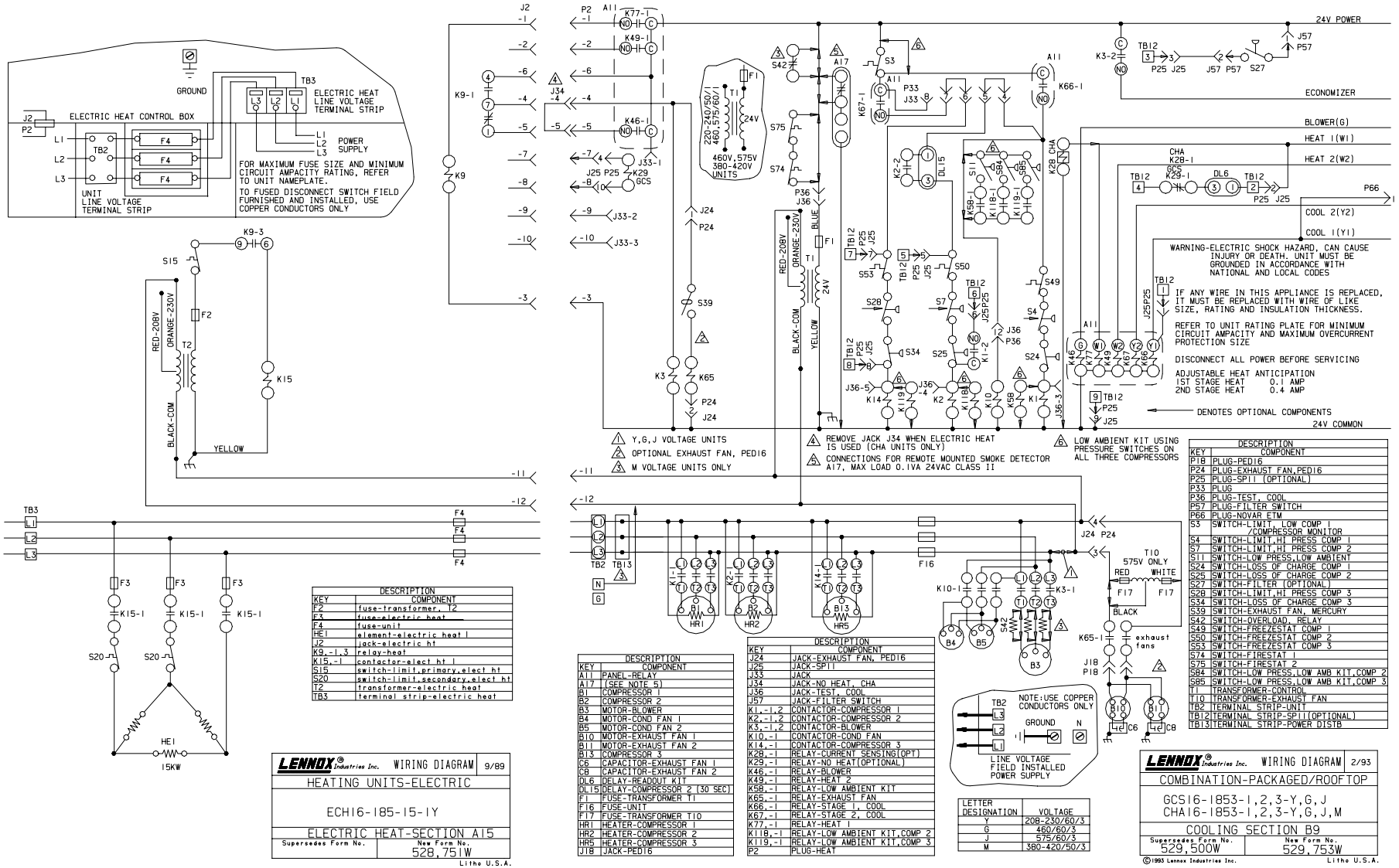
Supersedes Form No. 529,122W | New Form No. 529,431W

Litho U.S.A.

Operation Sequence: A8 Section and B2 Sections
(50kW 460V or 575V electric heat wired to CHA16-1603)

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 and HE2 are both energized. The elements are arranged in a “Wye” configuration for 460V or 575V operation.
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 when K3-2 contacts close).
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 HE3 and HE4 are energized.

A15 diagram with B9 diagram *ECH16-185 15kW 208/230V Operating Sequence*



DESCRIPTION	
KEY	COMPONENT
F2	fuse-transformer, T2
F3	fuse-electric heat
F4	fuse-unit
HE1	element-electric heat 1
J2	jack-electric ht
K9,-1,3	relay-heat
K15,-1	contactor-elect ht 1
S15	switch-limit,primary,elect ht
S20	switch-limit,secondary,elect ht
T2	transformer-electric heat
TB3	terminal strip-electric heat

DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED18

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

LENNOX Industries Inc. WIRING DIAGRAM 9/89
HEATING UNITS-ELECTRIC
ECH16-185-15-1Y
ELECTRIC HEAT-SECTION A15
Supersedes Form No. | New Form No. 528,751W
Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 2/93
COMBINATION-PACKAGED/ROOFTOP
GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M
COOLING SECTION B9
Supersedes Form No. 529,500W | New Form No. 529,753W
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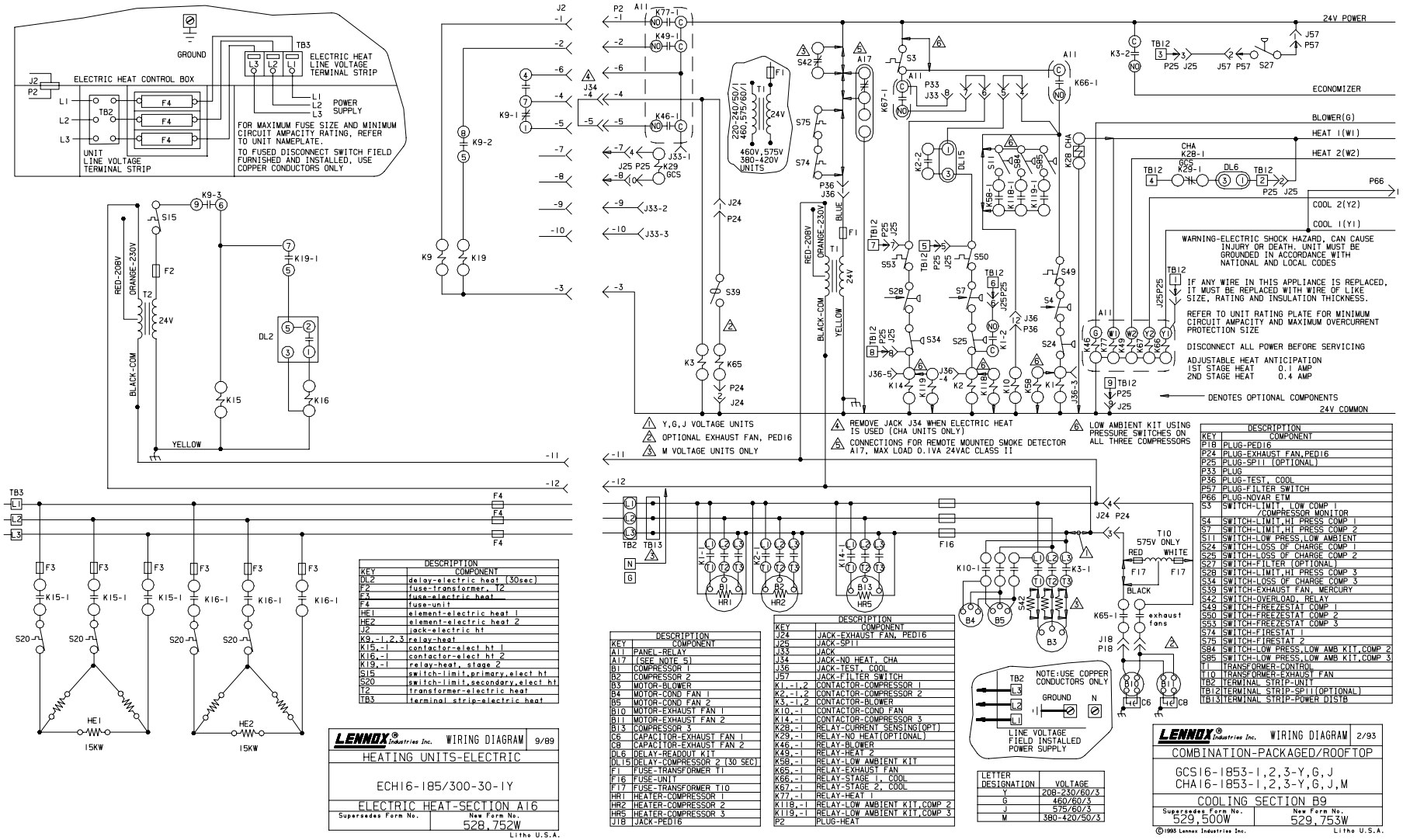
Operation Sequence: A15 Section and B9 Sections (15kW 208/230V electric heat wired to CHA16-1853)

1- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
2- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes.
3- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
4- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
5- When K15-1 closes, the heating elements are energized. The elements are arranged in a “Delta” configuration for 208/230V operation.
6- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
7- When K49-1 closes, nothing happens; ECH16-185-15Y is a single stage electric heater.

A16 diagram with B9 diagram

ECH16-185/255/275/300 30kW 208/230V Operating Sequence



KEY	COMPONENT
DL2	delay-electric heat (30sec)
F2	fuse-transformer, T2
F3	fuse-electric heat
F4	fuse-unit
HE1	element-electric heat 1
HE2	element-electric heat 2
J2	jack-electric ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K19,-1	relay-heat, stage 2
S15	switch-limit,primary,elect ht
S20	switch-limit,secondary,elect ht
T2	transformer-electric heat
TB3	terminal strip-electric heat

KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER 11
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

LENNOX Industries Inc. WIRING DIAGRAM 9/89

HEATING UNITS-ELECTRIC

ECH16-185/300-30-1Y

ELECTRIC HEAT-SECTION A16

Supersedes Form No. | New Form No. 528,752W

Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 2/93

COMBINATION-PACKAGED/ROOFTOP

GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M

COOLING SECTION B9

Supersedes Form No. 529,500W | New Form No. 529,753W

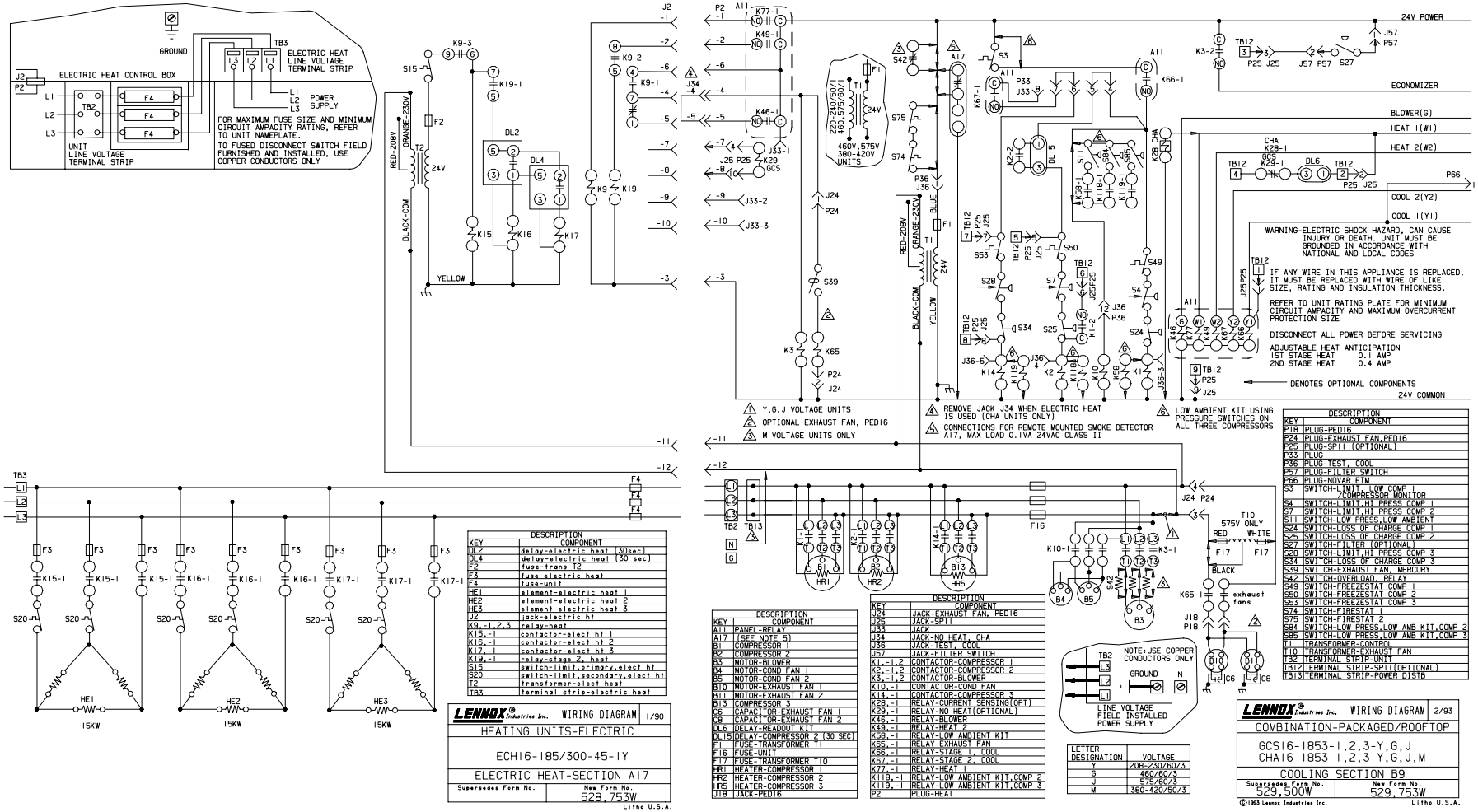
Litho U.S.A.

Operation Sequence: A16 Section and B9 Sections
(30kW 208/230V electric heat wired to CHA16-1853)

1- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
2- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 closes to enable K19.
3- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
4- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
5- When K15-1 closes, heating elements HE1 are energized. All elements are arranged in a "Delta" configuration for 208/230V operation.
6- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
7- When K49-1 closes, pilot relay K19 is energized. K19-1 closes and DL2 is energized. After 30 seconds DL2 closes.
8- When DL2 closes, contactor K16 is energized. K16-1 closes.
9- When K16-1 closes, heating elements HE2 are energized.

A17 diagram with B9 diagram

ECH16-185/255/275/300 45kW 208/230V Operating Sequence



DESCRIPTION KEY	COMPONENT
DL2	delay-electric heat (30sec)
DL4	delay-electric heat (30 sec)
F2	fuse-trans T2
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 ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K17,-1	contactor-elect ht 3
K19,-1	relay-stage 2, heat
S15	switch-limit,primary,elect ht
S20	switch-limit,secondary,elect ht
T2	transformer-elect heat
TB3	terminal strip-electric heat

DESCRIPTION KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPTI
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

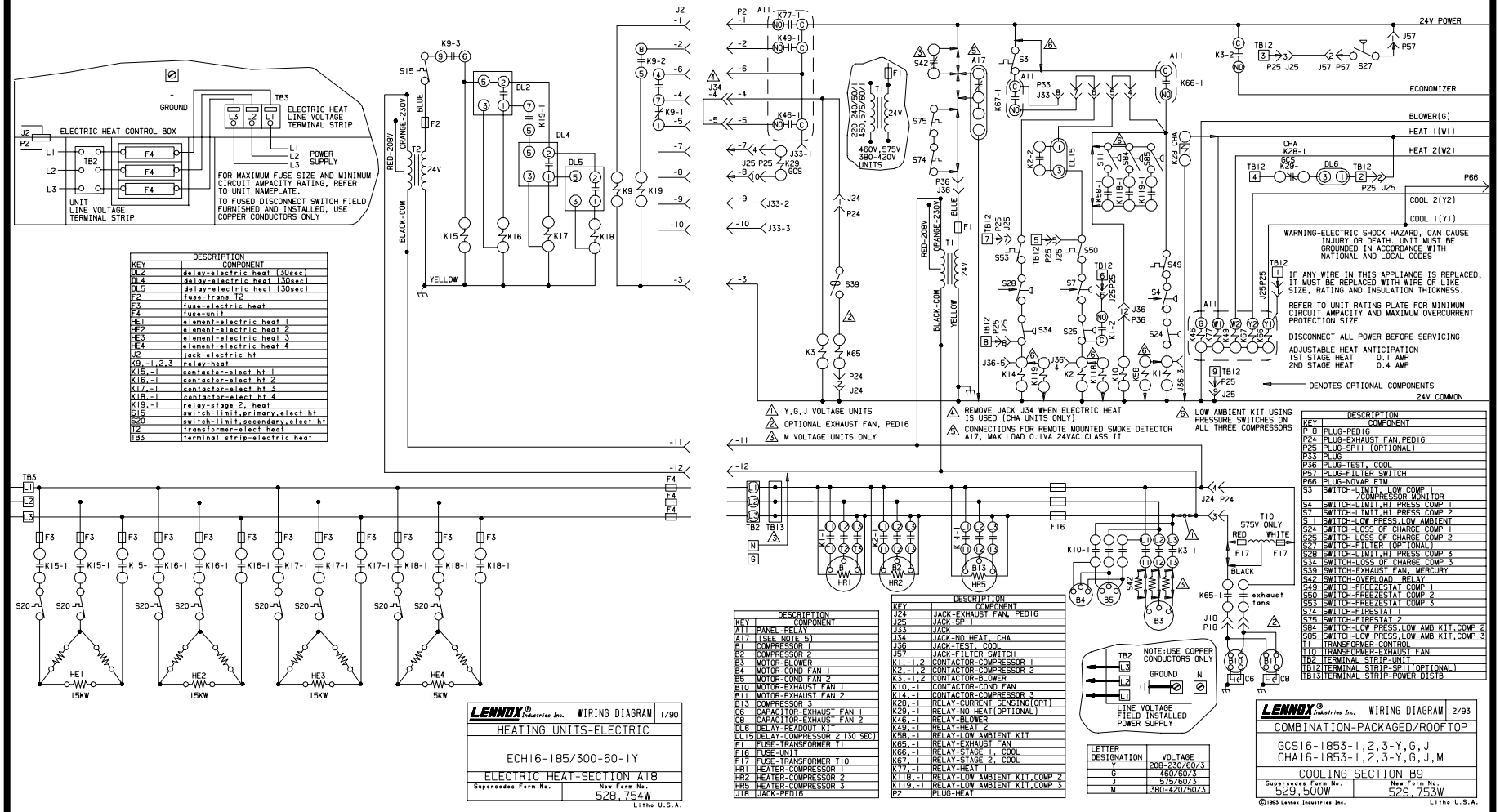
DESCRIPTION KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPTI (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR EIM
S3	SWITCH-LIMIT, LOW COMP 1 COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPTI(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

Operation Sequence: A17 Section and B9 Sections
(45kW 208/230V electric heat wired to CHA16-1853)

1- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
2- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 closes to enable K19.
3- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
4- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
5- When K15-1 closes, heating elements HE1 are energized. All elements are arranged in a "Delta" configuration for 208/230V operation.
6- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
7- When K49-1 closes, pilot relay K19 is energized. K19-1 closes and DL2 is energized. After 30 seconds, DL2 closes.
8- When DL2 closes, contactor K16 and time delay DL4 are both energized. K16-1 closes and DL4 begins counting.
9- When K16-1 closes, heating elements HE2 are energized.
10- When DL4 closes, contactor K17 is energized.
11- When K17-1 closes, heating element HE3 is energized.

A18 diagram with B9 diagram

ECH16-185/255/275/300 60kW 208/230V Operating Sequence



DESCRIPTION	
KEY	COMPONENT
DL2	delay-electric heat (30sec)
DL4	delay-electric heat (30sec)
DL5	delay-electric heat (30sec)
F2	fuse-trans T2
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
J2	jack-electric ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K17,-1	contactor-elect ht 3
K18,-1	contactor-elect ht 4
K19,-1	relay-stage 2, heat
S15	switch-limit,primary,elect ht
S20	switch-limit,secondary,elect ht
T2	transformer-elect heat
TB3	terminal strip-electric heat

DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL5	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPTI
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPTI (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPTI(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTR

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

LENNOX Industries Inc. WIRING DIAGRAM 1/90
HEATING UNITS-ELECTRIC
ECH16-185/300-60-1Y
ELECTRIC HEAT-SECTION A18
Supersedes Form No. | New Form No. 528,754W
Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 2/93
COMBINATION-PACKAGED/ROOFTOP
GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M
COOLING SECTION B9
Supersedes Form No. 529,500W | New Form No. 529,753W
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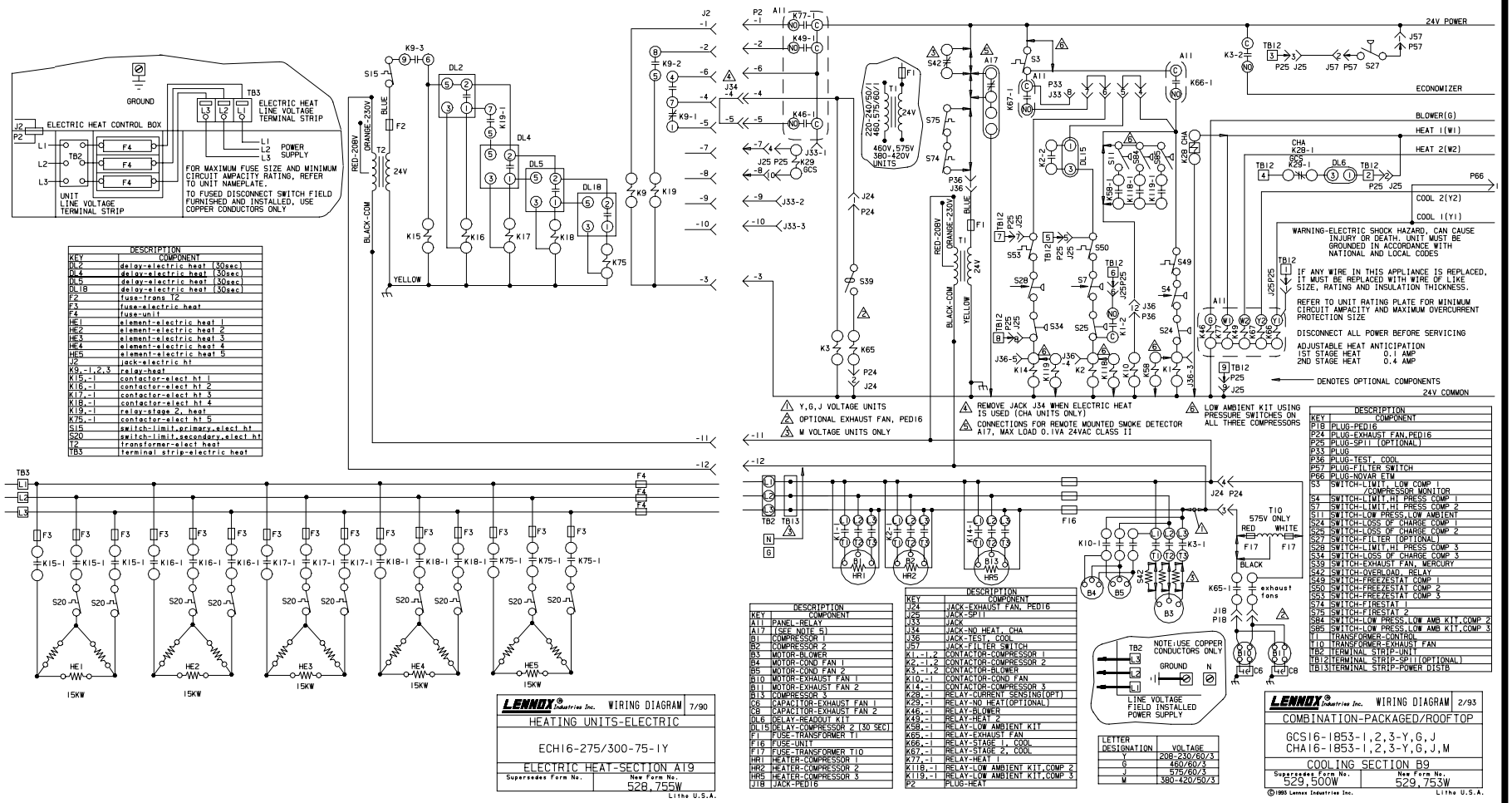
Operation Sequence: A18 Section and B9 Sections
(60kW 208/230V electric heat wired to CHA16-1853)

1- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
2- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 closes to enable K19.
3- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
4- When K9-3 closes, electric heat contactor K15 and time delay DL2 are both energized. K15-1 closes and DL2 begins timing. After 30 seconds, DL2 closes.
5- When K15-1 closes, heating elements HE1 are energized. All elements are arranged in a “Delta” configuration for 208/230V operation.
6- When DL2 closes, contactor K16 is energized.
7- When K16 is energized, heating elements HE2 are energized.
8- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
9- When K49-1 closes, pilot relay K19 is energized. K19-1 closes and DL4 is energized. After 30 seconds, DL4 closes.
10- When DL4 closes, contactor K17 and time delay DL5 are both energized. K17-1 closes and DL5 begins counting. After 30 seconds, DL5 closes.
11- When K17-1 closes, heating elements HE3 are energized.
12- When DL5 closes, contactor K18 is energized.
13- When K18-1 closes, heating element HE4 is energized.

A19 diagram with B9 diagram

ECH16-185/255/275/300 75kW 208/230V Operating Sequence



DESCRIPTION	
KEY	COMPONENT
DL2	delay-electric heat (30sec)
DL4	delay-electric heat (30sec)
DL5	delay-electric heat (30sec)
DL18	delay-electric heat (30sec)
F2	fuse-trans T2
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
J2	jack-electric ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K17,-1	contactor-elect ht 3
K18,-1	contactor-elect ht 4
K19,-1	relay-stage 2, heat
K75,-1	contactor-elect ht 5
S15	switch-limit,primary,elect ht
S20	switch-limit,secondary,elect ht
T2	transformer-elect heat
TB3	terminal strip-electric heat

DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	IGC (SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-	CONTACTOR-COND FAN
K14,-	CONTACTOR-COMPRESSOR 3
K28,-	RELAY-CURRENT SENSING(OPT)
K29,-	RELAY-NO HEAT(OPTIONAL)
K46,-	RELAY-BLOWER
K49,-	RELAY-HEAT 2
K58,-	RELAY-LOW AMBIENT KIT
K65,-	RELAY-EXHAUST FAN
K66,-	RELAY-STAGE 1, COOL
K67,-	RELAY-STAGE 2, COOL
K77,-	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

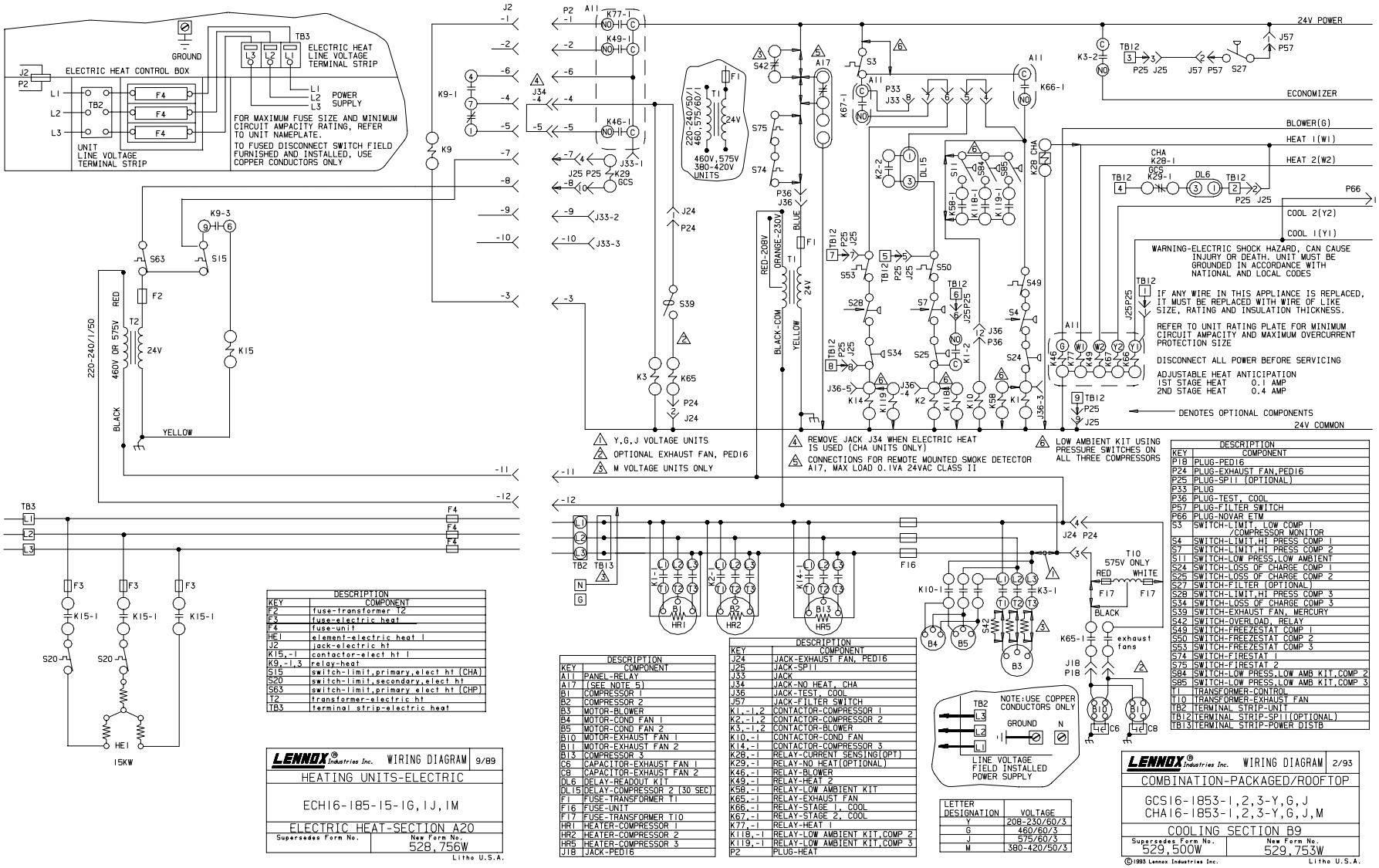
LETTER DESIGNATION	VOLTAGE
Y	208-230/60/3
G	460/60/3
J	575/60/3
M	380-420/50/3

Operation Sequence: A19 Section and B9 Sections
(75kW 208/230V electric heat wired to CHA16-1853)

1- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
2- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 close to enable K19.
3- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 cotacts close).
4- When K9-3 closes, electric heat contactor K15 and time delay DL2 are both energized. K15-1 closes and DL2 begins timing. After 30 seconds, DL2 closes.
5- When K15-1 closes, heating elements HE1 are energized. All elements are arranged in a “Delta” configuration for 208/230V operation.
6- When DL2 closes, contactor K16 is energized.
7- When K16 is energized, heating elements HE2 are energized.
8- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
9- When K49-1 closes, pilot relay K19 is energized. K19-1 closes and DL4 is energized. After 30 seconds, DL4 closes.
10- When DL4 closes, contactor K17 and time delay DL5 are both energized. K17-1 closes and DL5 begins counting. After 30 seconds, DL5 closes.
11- When K17-1 closes, heating elements HE3 are energized.
12- When DL5 closes, contactor K18 and time delay DL18 are both energized. K18-1 closes and DL18 begins counting. After 30 seconds, DL18 closes.
13- When K18-1 closes, heating element HE4 is energized.
14- When DL18 closes, contactor K75 is energized.
15- When K75-1 closes, heating elements HE5 are energized.

A20 diagram with B9 diagram

ECH16-185 15kW 460V & 575V Operating Sequence



KEY	DESCRIPTION COMPONENT
F2	fuse-transformer T2
F3	fuse-electric heat
F4	fuse-unit
HE1	element-electric heat 1
J2	jack-electric ht
K15,-1	contactor-elect ht 1
K9,-1,3	relay-heat
S15	switch-limit,primary,elect ht (CHA)
S20	switch-limit,secondary,elect ht
S63	switch-limit,primary elect ht (CHP)
T2	transformer-electric ht
TB3	terminal strip-electric heat

KEY	DESCRIPTION COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

KEY	DESCRIPTION COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPT1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

KEY	DESCRIPTION COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

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

LENNOX Industries Inc.	WIRING DIAGRAM	9/89
HEATING UNITS-ELECTRIC		
ECH16-185-15-1G, 1J, 1M		
ELECTRIC HEAT-SECTION A20		
Supersedes Form No.	New Form No. 528,756W	

Litho U.S.A.

LENNOX Industries Inc.	WIRING DIAGRAM	2/93
COMBINATION-PACKAGED/ROOFTOP		
GCS16-1853-1,2,3-Y,G,J CHA16-1853-1,2,3-Y,G,J,M		
COOLING SECTION B9		
Supersedes Form No. 529,500W	New Form No. 529,753W	

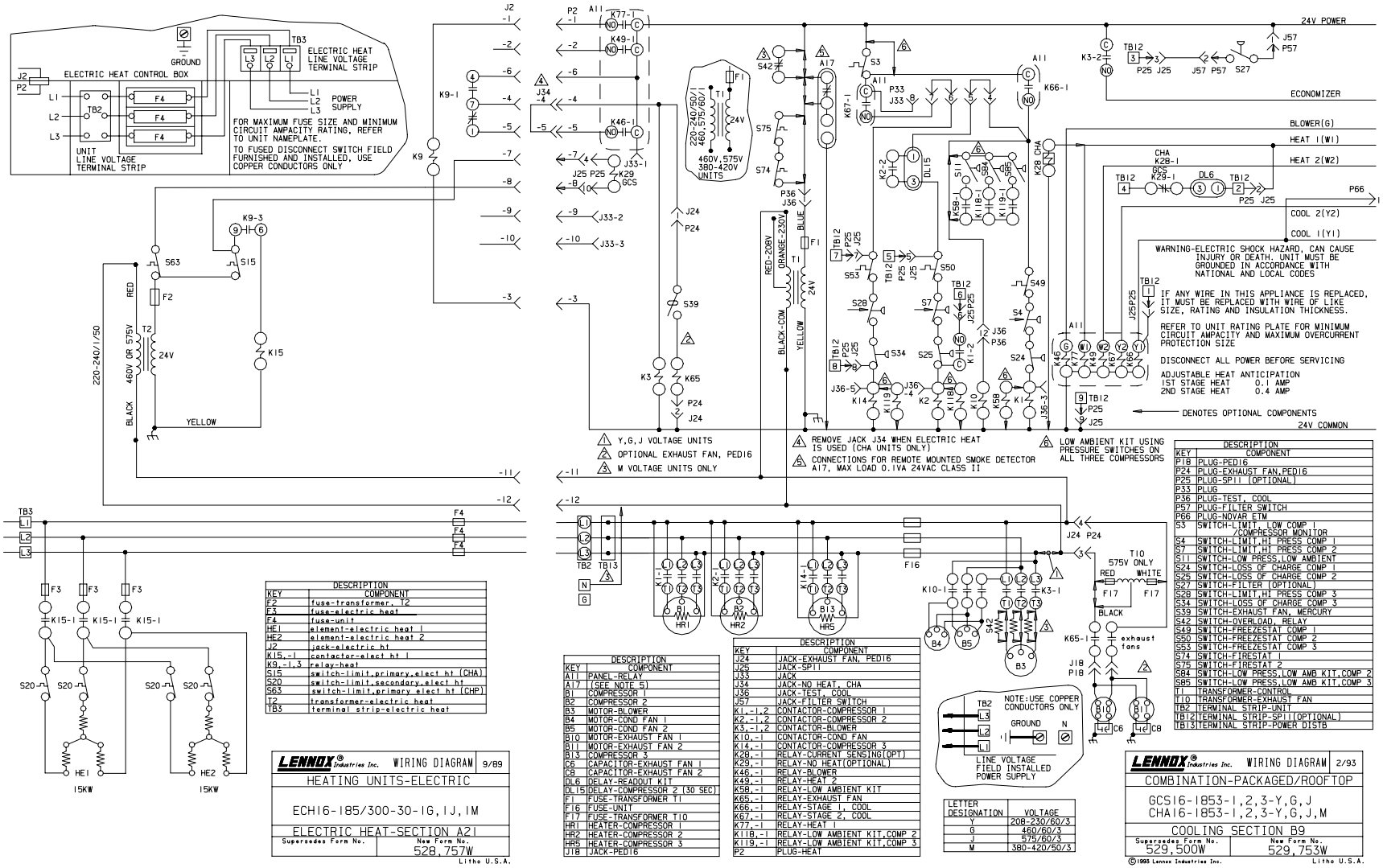
Litho U.S.A.

Operation Sequence: A20 Section and B9 Sections
(15kW 460V or 575V electric heat wired to CHA16-1853)

1- No-heat relay K29 is not used in this application and is omitted. Since this circuit remains open, primary limit S63 remains unused.
2- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
3- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes.
4- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
5- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
6- When K15-1 closes, the heating elements are energized. The elements are arranged in a “Wye” configuration for 460V or 575V operation.
7- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
8- When K49-1 closes, nothing happens; ECH16-185-15G, J, M is a single stage electric heater.

A21 diagram with B9 diagram

ECH16-185/255/275/300 30kW 460V & 575V Sequence



DESCRIPTION	
KEY	COMPONENT
F2	fuse-transformer, T2
F3	fuse-electric heat
F4	fuse-unit
HE1	element-electric heat 1
HE2	element-electric heat 2
J2	jack-electric ht
K15,-1	contactor-elect ht 1
K9,-1,3	relay-heat
S15	switch-limit,primary,elect ht (CHA)
S20	switch-limit,secondary,elect ht
S63	switch-limit,primary elect ht (CHP)
T2	transformer-electric heat
TB3	terminal strip-electric heat

DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPT1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPT1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPT1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

LENNOX Industries Inc. WIRING DIAGRAM 9/89

HEATING UNITS-ELECTRIC

ECH16-185/300-30-1G,1J,1M

ELECTRIC HEAT-SECTION A21

Supersedes Form No.	New Form No.
	528,757W

Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 2/93

COMBINATION-PACKAGED/ROOFTOP

GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M

COOLING SECTION B9

Supersedes Form No.	New Form No.
529,500W	529,753W

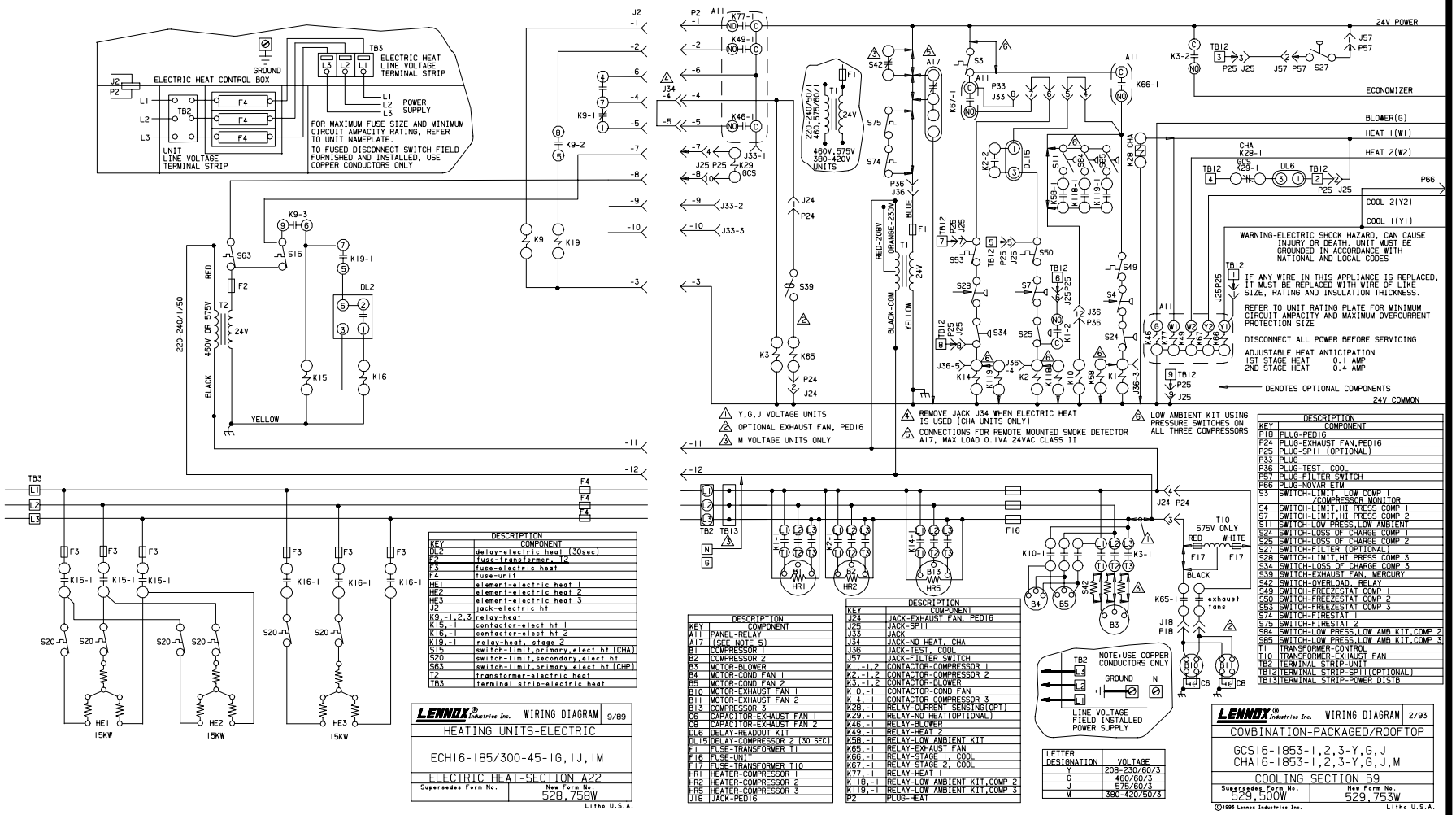
Litho U.S.A.

Operation Sequence: A21 Section and B9 Sections
(30kW 460V or 575V electric heat wired to CHA16-1853)

1- No-heat relay K29 is not used in this application and is omitted. Since this circuit remains open, primary limit S63 remains unused.
2- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
3- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes.
4- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
5- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
6- When K15-1 closes, heating elements HE1 and HE2 are both energized. The elements are arranged in a “Wye” configuration for 460V or 575V operation.
7- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
8- When K49-1 closes, nothing happens; ECH16-185-30G, J, M is a single stage electric heater.

A22 diagram with B9 diagram

ECH16-185/255/275/300 45kW 460V & 575V Sequence



DESCRIPTION	
KEY	COMPONENT
DL2	delay-electric heat (30sec)
F2	fuse-transformer, T2
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 ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K19,-1	relay-heat, stage 2
S15	switch-limit,primary,elect ht (CHA)
S20	switch-limit,secondary,elect ht
S63	switch-limit,primary elect ht (CHP)
T2	transformer-electric heat
TB3	terminal strip-electric heat

DESCRIPTION	
KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

DESCRIPTION	
KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

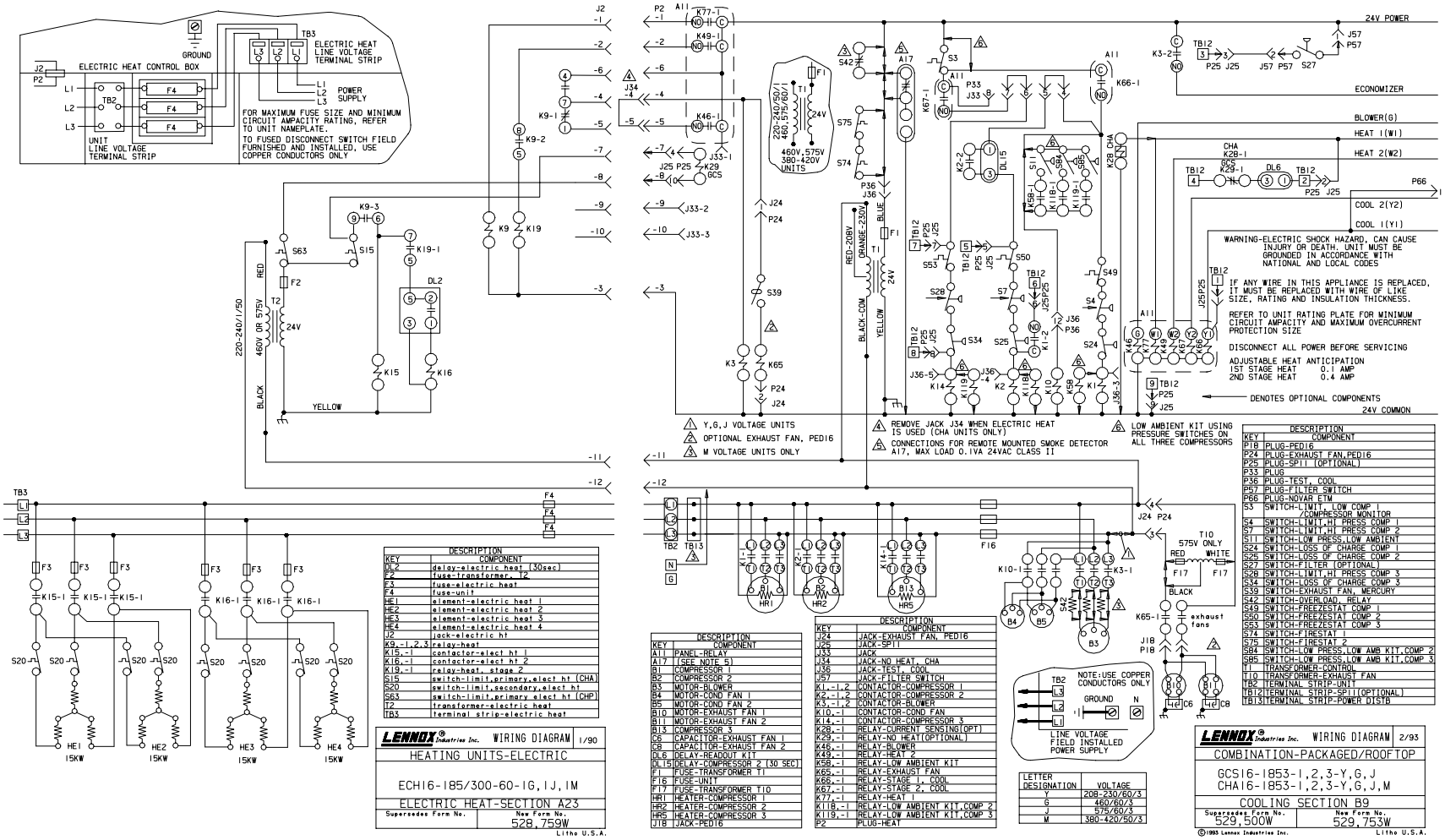
DESCRIPTION	
KEY	COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

Operation Sequence: A22 Section and B9 Sections
(45kW 460V or 575V electric heat wired to CHA16-1853)

1- No-heat relay K29 is not used in this application and is omitted. Since this circuit remains open, primary limit S63 remains unused.
2- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
3- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 closes to enable K19.
4- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
5- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
6- When K15-1 closes, heating elements HE1 and HE2 are both energized. The elements are arranged in a “Wye” configuration for 460V or 575V operation.
7- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
8- When K49-1 closes, relay K19 is energized.
9- When K19-1 closes, time delay DL2 is energized. DL2 begins counting. After 30 seconds, DL2 closes.
10- When DL2 closes, contactor K16 is energized.
11- When K16-1 closes, heating element HE3 is energized.

A23 diagram with B9 diagram

ECH16-185/255/275/300 60kW 460V & 575V Sequence



KEY	DESCRIPTION COMPONENT
DL2	delay-electric heat (30sec)
F2	fuse-transformer, T2
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
J2	jack-electric ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K19,-1	relay-heat, stage 2
S15	switch-limit,primary,elect ht (CHA)
S20	switch-limit,secondary,elect ht
S63	switch-limit,primary elect ht (CHP)
T2	transformer-electric heat
TB3	terminal strip-electric heat

KEY	DESCRIPTION COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
J18	JACK-PED16

KEY	DESCRIPTION COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPTI
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

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

KEY	DESCRIPTION COMPONENT
P18	PLUG-PED16
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPTI (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S39	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPTI(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTR

LENNOX Industries Inc.	WIRING DIAGRAM	1/90
HEATING UNITS-ELECTRIC		
ECH16-185/300-60-1G,1J,1M		
ELECTRIC HEAT-SECTION A23		
Supersedes Form No.	New Form No. 528,759W	

Litho U.S.A.

LENNOX Industries Inc.	WIRING DIAGRAM	2/93
COMBINATION-PACKAGED/ROOFTOP		
GCS16-1853-1,2,3-Y,G,J CHA16-1853-1,2,3-Y,G,J,M		
COOLING SECTION B9		
Supersedes Form No. 529,500W	New Form No. 529,753W	

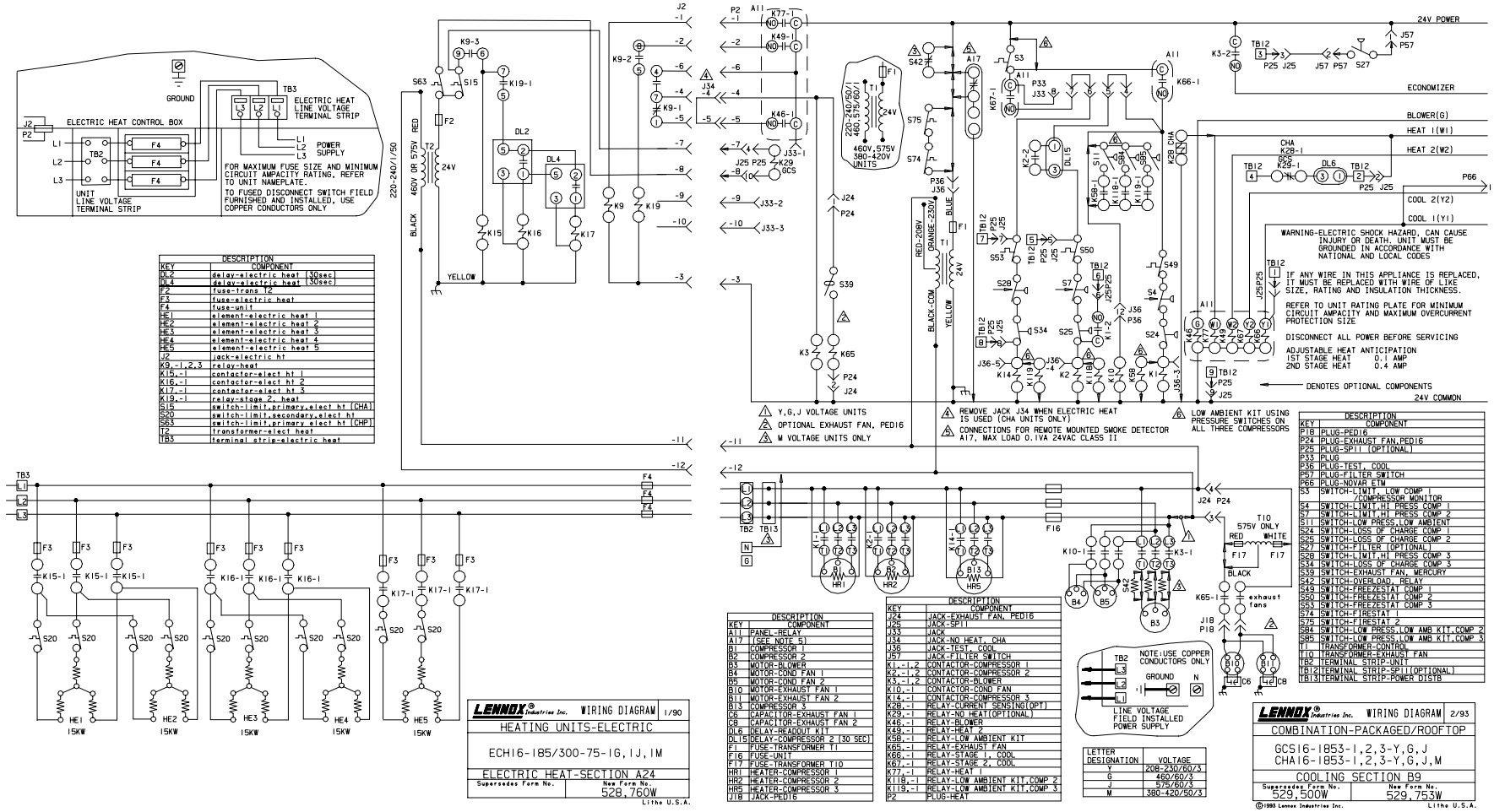
Litho U.S.A.

Operation Sequence: A23 Section and B9 Sections
(60kW 460V or 575V electric heat wired to CHA16-1853)

1- No-heat relay K29 is not used in this application and is omitted. Since this circuit remains open, primary limit S63 remains unused.
2- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
3- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 closes to enable K19.
4- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 contacts close).
5- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
6- When K15-1 closes, heating elements HE1 and HE2 are both energized. The elements are arranged in a “Wye” configuration for 460V or 575V operation.
7- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
8- When K49-1 closes, relay K19 is energized.
9- When K19-1 closes, time delay DL2 is energized. DL2 begins counting. After 30 seconds, DL2 closes.
10- When DL2 closes, contactor K16 is energized.
11- When K16-1 closes, heating elements HE3 and HE4 are both energized.

A24 diagram with B9 diagram

ECH16-185/255/275/300 75kW 460V & 575V Sequence



DESCRIPTION KEY	COMPONENT
DL2	delay-electric heat (30sec)
DL4	delay-electric heat (30sec)
F2	fuse-trans T2
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
J2	jack-electric ht
K9,-1,2,3	relay-heat
K15,-1	contactor-elect ht 1
K16,-1	contactor-elect ht 2
K17,-1	contactor-elect ht 3
K19,-1	relay-stage 2, heat
S15	switch-limit,primary,elect ht (CHA)
S20	switch-limit,secondary,elect ht
S63	switch-limit,primary elect ht (CHP)
T2	transformer-elect heat
TB3	terminal strip-electric heat

DESCRIPTION KEY	COMPONENT
A11	PANEL-RELAY
A17	(SEE NOTE 5)
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-COND FAN 1
B5	MOTOR-COND FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
DL6	DELAY-READOUT KIT
DL15	DELAY-COMPRESSOR 2 (30 SEC)
F1	FUSE-TRANSFORMER T1
F16	FUSE-UNIT1
F17	FUSE-TRANSFORMER T10
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR6	HEATER-COMPRESSOR 3
J18	JACK-PED18

DESCRIPTION KEY	COMPONENT
J24	JACK-EXHAUST FAN, PED16
J25	JACK-SPI1
J33	JACK
J34	JACK-NO HEAT, CHA
J36	JACK-TEST, COOL
J57	JACK-FILTER SWITCH
K1,-1,2	CONTACTOR-COMPRESSOR 1
K2,-1,2	CONTACTOR-COMPRESSOR 2
K3,-1,2	CONTACTOR-BLOWER
K10,-1	CONTACTOR-COND FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K28,-1	RELAY-CURRENT SENSING(OPT)
K29,-1	RELAY-NO HEAT(OPTIONAL)
K46,-1	RELAY-BLOWER
K49,-1	RELAY-HEAT 2
K58,-1	RELAY-LOW AMBIENT KIT
K65,-1	RELAY-EXHAUST FAN
K66,-1	RELAY-STAGE 1, COOL
K67,-1	RELAY-STAGE 2, COOL
K77,-1	RELAY-HEAT 1
K118,-1	RELAY-LOW AMBIENT KIT,COMP 2
K119,-1	RELAY-LOW AMBIENT KIT,COMP 3
P2	PLUG-HEAT

DESCRIPTION KEY	COMPONENT
P18	PLUG-PED18
P24	PLUG-EXHAUST FAN,PED16
P25	PLUG-SPI1 (OPTIONAL)
P33	PLUG
P36	PLUG-TEST, COOL
P57	PLUG-FILTER SWITCH
P66	PLUG-NOVAR ETM
S3	SWITCH-LIMIT, LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS COMP 1
S7	SWITCH-LIMIT,HI PRESS COMP 2
S11	SWITCH-LOW PRESS,LOW AMBIENT
S24	SWITCH-LOSS OF CHARGE COMP 1
S25	SWITCH-LOSS OF CHARGE COMP 2
S27	SWITCH-FILTER (OPTIONAL)
S28	SWITCH-LIMIT,HI PRESS COMP 3
S34	SWITCH-LOSS OF CHARGE COMP 3
S49	SWITCH-EXHAUST FAN, MERCURY
S42	SWITCH-OVERLOAD, RELAY
S49	SWITCH-FREEZESTAT COMP 1
S50	SWITCH-FREEZESTAT COMP 2
S53	SWITCH-FREEZESTAT COMP 3
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S84	SWITCH-LOW PRESS,LOW AMB KIT,COMP 2
S85	SWITCH-LOW PRESS,LOW AMB KIT,COMP 3
T1	TRANSFORMER-CONTROL
T10	TRANSFORMER-EXHAUST FAN
TB2	TERMINAL STRIP-UNIT
TB12	TERMINAL STRIP-SPI1(OPTIONAL)
TB13	TERMINAL STRIP-POWER DISTB

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

LENNOX Industries Inc. WIRING DIAGRAM 1/90
HEATING UNITS-ELECTRIC
ECH16-185/300-75-1G,1J,1M
ELECTRIC HEAT-SECTION A24
Supersedes Form No. | New Form No. 528,760W
Litho U.S.A.

LENNOX Industries Inc. WIRING DIAGRAM 2/93
COMBINATION-PACKAGED/ROOFTOP
GCS16-1853-1,2,3-Y,G,J
CHA16-1853-1,2,3-Y,G,J,M
COOLING SECTION B9
Supersedes Form No. | New Form No. 529,753W
529,500W
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Operation Sequence: A24 Section and B9 Sections
(75kW 460V or 575V electric heat wired to CHA16-1853)

1- No-heat relay K29 is not used in this application and is omitted. Since this circuit remains open, primary limit S63 remains unused.
2- 1st stage heating demand closes W1. W1 energizes pilot relay K77. K77-1 closes.
3- When K77-1 closes, heating pilot relay K9 is energized. K9-1 switches and K9-3 closes. K9-2 closes to enable K19.
4- When K9-1 switches, indoor blower contactor K3 is energized (and optional power exhaust fan relay K65 is enabled when K3-2 cotacts close).
5- When K9-3 closes, electric heat contactor K15 is energized. K15-1 closes.
6- When K15-1 closes, heating elements HE1 and HE2 are both energized. The elements are arranged in a “Wye” configuration for 460V or 575V operation.
7- Additional heating demand W2 energizes pilot relay K49. K49-1 closes.
8- When K49-1 closes, relay K19 is energized.
9- When K19-1 closes, time delay DL2 is energized. DL2 begins counting. After 30 seconds, DL2 closes.
10- When DL2 closes, contactor K16 and tiime delay DL4 are both energized. DL4 begins counting. After 30 seconds, DL4 closes.
11- When K16-1 closes, heating elements HE3 and HE4 are both energized.
12- When DL4 closes, contactor K17 is energized.
13- When K17-1 closes, heating element HE5 is energized.