The THA180 and 240 packaged heat pump units are available in 192,000 Btuh to 220,000 Btuh (55.1 kW to 64.5 kW) heating outputs and 15 or 20-ton (52.8 or 70.3 kW) cooling capacities. The THA180/240 refrigerant systems utilize two compressors, two reversing valves and other parts common to a heat pump. Optional auxiliary electric heat is factory-or field-installed in THA units. Electric heat operates in single or multiple stages depending on the kW input size. 15kW through 60kW heat sections are available for the THA180 and 15kW through 90kW heat sections are available for the THA240.

THA units are designed to accept any of several different energy management thermostat control systems with minimum field wiring. Factory or field provided control options connect to the unit with jack plugs. When ”plugged in” the controls become an integral part of the unit wiring.

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

If the unit must be lifted for service, rig unit by attaching four cables to the holes located in the unit base rail (two holes at each corner). Refer to the installation instructions for the proper rigging technique.

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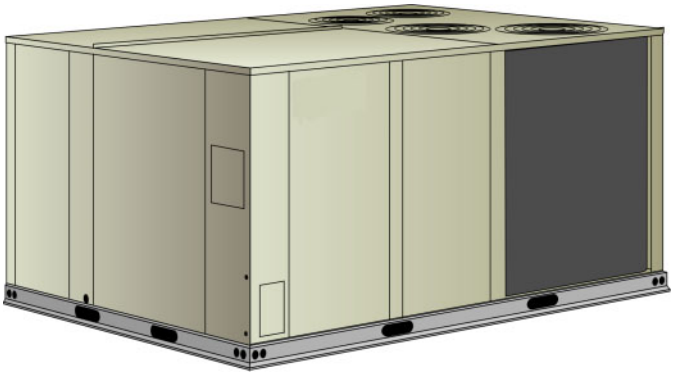


⚠CAUTION

Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

⚠WARNING

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

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠CAUTION

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

Phone: (803) 738-4000

OPTIONs / ACCESSORIES

Item			180	240
COOLING SYSTEM				
Condensate Drain Trap		PVC - LTACDKP09/36	x	x
		Copper - LTACDKC09/36	x	x
Corrosion Protection			○	○
Efficiency		Standard	○	○
Low Ambient Kit		TALAK10/15	x	x
ELECTRIC HEAT				
15 kW	EHA240-7.5 (order 1) and EHA240S-7.5 (order 1)	208/230V-3ph	x	x
		460V-3ph	x	x
		575V-3ph	x	x
30 kW	EHA360-15 (order 1) and EHA360S-15 (order 1)	208/230V-3ph	x	x
		460V-3ph	x	x
		575V-3ph	x	x
45 kW	EHA360-22.5 (order 2)	208/230V-3ph	x	x
		460V-3ph	x	x
		575V-3ph	x	x
60 kW	EHA150-30 (order 2)	208/230V-3ph	x	x
		460V-3ph	x	x
		575V-3ph	x	x
90 kW	EHA360-45 (order 2)	208/230V-3ph		x
		460V-3ph		x
		575V-3ph		x
Electric Heat Control Kit		208/230V-3ph - T1EHKT01C-1Y	x	x
		460V-3ph - T1EHKT01C-1G	x	x
		575V-3ph - T1EHKT01C-1J	x	x
Unit Fuse Blocks		See Electric Heat Tables for Ordering Information		
Blower - SUPPLY AIR – See Blower Data Tables for Specifications				
		Low Static Motor/Drive Combination	○	○
		Standard Static Motor/Drive Combination (stock unit)	○	○
		High Static Motor/Drive Combination	○	○
		[2] Standard to Low Static Conversion Kit - Drive Kit #A - C1DRKT044-1	x	
		[2] Standard to Low Static Conversion Kit - Drive Kit #2 - C1DRKT045-1		x
		[3] High to Standard Static Conversion Kit - Drive Kit #3 - C1DRKT038-1	x	
CONTROLS				
Control Systems		See Engineering Handbook	x	x
Blower Proving Switch		LTABPSK	x	x
Dirty Filter Switch		LTADFSK	x	x
Smoke Detector - Supply		LTASASDK10/36	x	x
Smoke Detector - Return		LTARASDK10/30	x	x
Indoor Air Quality (Co_2) Sensors				
CO_2 Sensor Duct Mounting Kit		LTIAQSDMK03/36	x	x
Sensor - white case CO_2 display		LTAIAQSWDK03/36	x	x
Sensor - white case no display		LTAIAQSWN03/36	x	x
Sensor - black case CO_2 display		LTAIAQSND03/36	x	x
Sensor - black case, no display		LTAIAQSDMBN03/36	x	x
Aspiration Box for duct mounting		LTIAQABD03/36	x	x
Handheld CO_2 Monitor		LTAIAQSHM03/36	x	x
ELECTRICAL				
Voltage		208/230V - 3 phase	○	○
60 hz		460V - 3 phase	○	○
		575V - 3 phase	○	○
HACR Circuit Breakers		T1HACR***-1- (***indicate size)	x	x
Disconnect Switch		See Optional Electric Heat Tables	x	x
GFI Service Outlets		LTAGFIK10/15	x	x
CABINET				
Coil Guards		C1GARD20C-1	x	x
Hail Guards		C1GARD10C-1	x	x
Horizontal Return Air Panel Kit		C1HRAP10C-1	x	x
AIR FILTERS				
MERV 11 High Efficiency		24 x 24 x 2 order 6 per unit - C1FLTR10C-1	x	x
Replaceable Media Filter Kit with Frame		24 x 24 x 2 order 6 per unit - C1FLTR30C-1	x	x

○ - Configure to Order (Factory Installed) Factory installed items are special order with extended lead times and must be ordered with the unit.
X - Field Installed.
[2] Standard static drive can be converted to low static drive with field installed kit.
[3] High static drive can be converted to standard static drive with field installed kit.

OPTIONs / ACCESSORIES

Item		180	240
CEILING DIFFUSERS			
Step-Down	RTD11-185(S)	x	
Order one	RTD11-275(S)		x
Flush	FD11-150/180S or FD11-185	x	
Order one	FD11-275(S)		x
Transitions - (Supply and Return)	LASRT18(S)	x	
Order one	LASRT21/24(S)		x
ECONOMIZER			
Economizer - Order Hood Separately	T1ECON10C-1	⊗	⊗
Economizer Controls			
Differential Enthalpy	C1SNSR07AE1-	x	x
Single Enthalpy	C1SNSR06AE1-	⊗	⊗
Sensible	TASEK03/36	x	x
Differential Sensible	TASEK03/36	[1]x	[1]x
Barometric Relief			
Down-Flow Barometric Relief Dampers - Order Hood Separately	LAGED18/24	⊗	⊗
Hood for Down-Flow LAGED	C1HOOD20C-1	x	x
Horizontal Barometric Relief Dampers - Hood Furnished	LAGEDH18/24	x	x
OUTDOOR AIR			
Outdoor Air Dampers			
Damper Section (down-flow) - Automatic - Order Hood Separately	T1DAMP20C-1	⊗	⊗
Damper Section (down-flow) - Manual - Order Hood Separately	LAOAD18/24	⊗	⊗
Outdoor Air Hoods			
Outdoor Air Hood (down-flow) includes 3 - 16 x 25 x 1 in. (406 x 635 x 25 mm) filters	C1HOOD10C-1	⊗	⊗
Power Exhaust			
Standard Static	208/230V - C1PWRE20C-1Y	x	x
	460V - C1PWRE20C-1G	x	x
	575V - C1PWRE20C-1J	x	x
ROOF CURBS - CLIPLOCK 1000			
Down-Flow			
14 in. (356 mm) height	LARMF18/30S-14	x	x
18 in. (457 mm) height	LARMF18/30S-18	x	x
24 in. (610 mm) height	LARMF18/30S-24	x	x
Horizontal			
26 in. (660 mm) height	LARMFH18/24S-26	x	x
37 in. (940 mm) height	LARMFH18/24S-37	x	x
ROOF CURBS - STANDARD			
Down-Flow			
14 in. (356 mm) height	LARMF18/36-14	x	x
24 in. (610 m) height	LARMF18/36-24	x	x
Horizontal			
26 in. (660 mm) height	LARMFH18/24-26	x	x
37 in. (940 mm) height	LARMFH18/24-37	x	x
Insulation Kits for Standard Horizontal Roof Curbs			
for LARMFH18/24-26	C1INSU11C-1	x	x
for LARMFH18/24-37	C1INSU13C-1	x	x

⊗ - Field Installed or Configure to Order (factory installed). Factory installed items are special order with extended lead times and must be ordered with the unit.
X - Field Installed.
[1] - Order two each

SPECIFICATIONS

General Data			Model No.	THA180S2B	THA240S2B
			Efficiency Type	Standard	Standard
			Nominal Tonnage	15 Ton	20 Ton
Cooling Performance	Gross Cooling Capacity - Btuh (kW)			187,000 (54.8)	227,000 (66.5)
	[1] Net Cooling Capacity - Btuh (kW)			182,000 (52.3)	220,000 (64.5)
	ARI Rated Air Flow - cfm (L/s)			5700 (2690)	7000 (3305)
	Total Unit Power (kW)			19.6	24.5
	[1] EER (Btuh/Watt)			9.3	9.0
	[2] Integrated Part Load Value (Btuh/Watt)			9.7	9.4
	Refrigerant Charge Furnished (R-22)	Circuit 1		24 lbs. 8 oz. (11.1 kg)	26 lbs. 0 oz. (11.8 kg)
		Circuit 2		24 lbs. 8 oz. (11.1 kg)	26 lbs. 0 oz. (11.8 kg)
Heating Performance	[1] Total High Heating Capacity - Btuh (kW)			192,000 (56.2)	220,000 (64.5)
	Total Unit Power (kW)			18.1	20.8
	[1] C.O.P.			3.1	3.1
	[1] Total Low Heating Capacity - Btuh (kW)			106,000 (31.0)	118,000 (34.6)
	Total Unit Power (kW)			15.7	17.3
	[1] C.O.P.			2.0	2.0
Electric Heat Available - See Electrical Data / Electric Heat Tables					
Compressor Type (No.)				Scroll (2)	Scroll (2)
Outdoor Coil	Net face area - sq. ft. (m^2)			57.0 (5.30)	57.0 (5.30)
	Tube diameter - in. (mm)			3/8 (9.5)	3/8 (9.5)
	Number of rows			2	2
	Fins per inch (m)			20 (787)	20 (787)
	Expansion device type			Balanced Port Thermostatic Expansion Valve, removeable power head	
Outdoor Fans	Motor horsepower (W)			(4) 1/3 (249)	(4) 1/3 (249)
	Motor rpm			1075	1075
	Total Motor watts			1395	1395
	Diameter - in. (mm)			(4) 24 (610)	(4) 24 (610)
	Number of blades			3	3
	Total Air volume - cfm (L/s)			15,450 (7290)	15,450 (7290)
Indoor Coil	Net face area - sq. ft. (m^2)			22.3 (2.07)	22.3 (2.07)
	Tube diameter - in. (mm)			3/8 (9.5)	3/8 (9.5)
	Number of rows			3	4
	Fins per inch (m)			14 (551)	14 (551)
	Condensate Drain - number & size			(1) 1 in. NPT coupling	(1) 1 in. NPT coupling
	Expansion device type			Balanced Port Thermostatic Expansion Valve, removeable power head	
[3, 4] Indoor Blower and Drive Selection	Nominal motor HP	Low Static		3 hp (2.2 kW)	5 hp (3.7 kW)
		Standard Static		3 hp (2.2 kW)	7.5 hp (5.6 kW)
		High Static		5 hp (3.7 kW)	10 hp (7.5 kW)
	Max. usable motor output (US Only)	Low Static		3.45 hp (2.6 kW)	5.75 hp (4.3 kW)
		Standard Static		3.45 hp (2.6 kW)	8.63 hp (6.4 kW)
		High Static		5.75 hp (4.3 kW)	11.5 hp (8.6 kW)
	Drive Kit	Low Static		#A - 535-725 rpm	#2 - 685- 865 rpm
		Standard Static		#1 - 710-965 rpm	#7 - 850-1045 rpm
		High Static		#4 - 945-1185 rpm	#6 - 1045-1285 rpm
	Field Installed Drive Kits	Standard to Low Static		#A - 535-725 rpm	#9 - 685-865 rpm
		High to Standard Static		#3 - 850-1045 rpm	- - -
	Wheel nominal diameter x width			(2) 15 x 15 in. (381 x 381 mm)	(2) 15 x 15 in. (381 x 381 mm)
Filters	Type of filter			Disposable, pleated MERV 7	
	Number and size - in. (mm)			(6) 24 x 24 x 2 (610 x 610 x 51)	
Electrical characteristics				208/230V, 460V or 575V - 60 hertz - 3 phase	

NOTE — Net capacity includes evaporator blower motor heat deduction. Gross capacity does not include evaporator blower motor heat deduction.

[1] Certified in accordance with the ULE certification program, which is based on ARI Standard 340/360.
Cooling Ratings - 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering indoor coil air.
High Temperature Heating Ratings - 47°F (8°C) db/43°F (6°C) wb outdoor air temperature and 70°F (21°C) entering indoor coil air.
Low Temperature Heating Ratings - 17°F (-8°C) db/15°F (-9°C) wb outdoor air temperature and 70°F (21°C) entering indoor coil air.

[2] Integrated Part Load Value rated at 80°F (27°C) outdoor air temperature.

[3] Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors furnished are shown. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

[4] Stocked models are available with standard static drives. High static drives are factory installed (configure to order). Low static drive can be factory installed (configure to order) or standard static drives can be converted to low static with field installed kit. High static models can be converted to standard static with field installed kit.

BLOWER DATA — 15 TON

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT WITH WET INDOOR COIL & AIR FILTERS IN PLACE.
FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (electric heat, economizer, etc.). See table below
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.). See page 13

Then determine from table the blower motor output and drive required.

0.40 to 1.50 in. w.g. — **THA180**

Air Volume cfm	External Static (in. w.g.)																							
	0.40		0.50		0.60		0.70		0.80		0.90		1.00		1.10		1.20		1.30		1.40		1.50	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Low Static – 3 HP, Drive Kit A								Standard Static – 3 HP, Drive Kit 1															
4800	577	1.13	620	1.31	662	1.48	702	1.66	742	1.83	777	2.01	811	2.18	842	2.36	872	2.54	902	2.72	932	2.89	960	3.07
5000	585	1.25	628	1.43	670	1.60	710	1.78	750	1.95	783	2.13	815	2.30	848	2.50	880	2.70	910	2.88	940	3.05	968	3.23
5500	605	1.45	648	1.65	690	1.85	728	2.05	765	2.25	800	2.45	835	2.65	865	2.85	895	3.05	925	3.25	955	3.45	983	3.65
6000	630	1.75	670	1.95	710	2.15	748	2.38	785	2.60	818	2.83	850	3.05	880	3.25	910	3.45	**940**	**3.68**	970	3.90	998	4.13
6500	650	2.05	690	2.28	730	2.50	768	2.75	805	3.00	838	3.23	870	3.45	**900**	**3.70**	**930**	**3.95**	**958**	**4.18**	985	4.40	1013	4.63
7000	675	2.35	715	2.63	755	2.90	790	3.15	825	3.40	**858**	**3.68**	**890**	**3.95**	**920**	**4.20**	**950**	**4.45**	978	4.70	1005	4.95	1030	5.18
7200	687	2.55	725	2.81	763	3.06	798	3.33	**833**	**3.60**	**866**	**3.86**	**898**	**4.11**	**926**	**4.36**	**954**	**4.61**	984	4.90	1013	5.19	1038	5.44

NOTE - **Bold** - To operate in this range, unit must be ordered with High Static Drive and drive kit #3 must be ordered separately for field installation.

1.60 to 2.60 in. w.g. — **THA180**

Air Volume cfm	External Static (in. w.g.)																							
	1.60		1.70		1.80		1.90		2.00		2.10		2.20		2.30		2.40		2.50		2.60			
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP		
	High Static – 5 HP, Drive Kit 4																		Field Furnished Drive					
4800	987	3.24	1014	3.42	1041	3.60	1064	3.78	1087	3.95	1112	4.13	1136	4.30	1159	4.50	1181	4.70	1204	4.88	1226	5.06		
5000	995	3.40	1020	3.60	1045	3.80	1070	3.98	1095	4.15	1118	4.33	1140	4.50	1163	4.70	1185	4.90	1208	5.10	1230	5.30		
5500	1010	3.85	1035	4.05	1060	4.25	1085	4.48	1110	4.70	1133	4.90	1155	5.10	1178	5.30	1200	5.50	1220	5.70	1240	5.90		
6000	1025	4.35	1050	4.58	1075	4.80	1098	5.00	1120	5.20	1145	5.43	1170	5.65	1193	5.88	1215	6.10	1235	6.33	1255	6.55		
6500	1040	4.85	1065	5.10	1090	5.35	1115	5.60	***1140***	***5.85***	***1163***	***6.08***	***1185***	***6.30***	1205	6.53	1225	6.75	1248	7.00	1270	7.25		
7000	1055	5.40	1080	5.68	***1105***	***5.95***	***1130***	***6.20***	***1155***	***6.45***	***1178***	***6.70***	1200	6.95	1220	7.20	1240	7.45	1263	7.73	1285	8.00		
7200	1063	5.68	***1088***	***5.94***	***1113***	***6.19***	***1136***	***6.44***	***1159***	***6.69***	***1182***	***6.96***	1204	7.23	1226	7.50	1248	7.77	1269	8.03	1289	8.28		

NOTE - ***Bold, italics*** - drive is capable of the values noted but will exceed motor horsepower.

AIR RESISTANCE (in. w.g.) - Factory Installed Options

Air Volume - cfm	Electric Heat	Economizer	Horizontal Roof Curb	MERV 11 Filter
4800	- - -	- - -	.08	.01
5000	- - -	- - -	.08	.01
5500	- - -	- - -	.10	.02
6000	.01	- - -	.11	.02
6500	.01	.02	.13	.02
7000	.01	.04	.15	.03
7200	.01	.05	.16	.03

BLOWER DATA — 20 TON

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT WITH WET INDOOR COIL & AIR FILTERS IN PLACE.
FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (electric heat, economizer, etc.). See table below
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.). See page 13

Then determine from table the blower motor output and drive required.

0.30 to 1.30 in. w.g. — **THA240**

Air Volume cfm	External Static (in. w.g.) Covered By Drive At Nominal Air With Economizer, Standard Filters And Wet Indoor Coil																					
	.30		0.40		0.50		0.60		0.70		0.80		0.90		1.00		1.10		1.20		1.30	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
			Low Static – 5 HP, Drive Kit 2										Standard Static – 7.5 HP, Drive Kit 7									
6400	648	1.99	688	2.22	727	2.46	764	2.69	801	2.92	834	3.15	866	3.39	896	3.62	926	3.85	954	4.08	981	4.30
7000	675	2.35	715	2.63	755	2.90	790	3.15	825	3.40	858	3.68	890	3.95	920	4.20	950	4.45	978	4.70	1005	4.95
7500	700	2.75	738	3.03	775	3.30	810	3.58	845	3.85	878	4.15	910	4.45	938	4.70	965	4.95	993	5.23	1020	5.50
8000	725	3.20	763	3.50	800	3.80	833	4.08	865	4.35	898	4.65	930	4.95	958	5.23	985	5.50	1013	5.80	1040	6.10
8500	750	3.65	788	3.98	825	4.30	858	4.60	890	4.90	920	5.23	950	5.55	978	5.85	1005	6.15	1033	6.48	1060	6.80
9000	780	4.20	815	4.53	850	4.85	880	5.18	910	5.50	940	5.83	970	6.15	998	6.48	1025	6.80	1053	7.15	1080	7.50
9600	811	4.87	845	5.22	879	5.57	910	5.94	941	6.31	970	6.67	999	7.02	1027	7.38	1054	7.74	1079	8.08	1104	8.41

1.40 to 2.50 in. w.g. — **THA240**

Air Volume cfm	External Static (in. w.g.) Covered By Drive At Nominal Air With Economizer, Standard Filters And Wet Indoor Coil																					
	1.40		1.50		1.60		1.70		1.80		1.90		2.00		2.10		2.20		2.30		2.40		2.50	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Standard Static				High Static – 10 HP, Drive Kit 6																			
6400	1008	4.53	1035	4.75	1060	4.98	1085	5.22	1110	5.45	1135	5.68	1157	5.91	1180	6.15	1202	6.40	1225	6.65	1246	6.88	1268	7.11
7000	1030	5.18	1055	5.40	1080	5.68	1105	5.95	1130	6.20	1155	6.45	1178	6.70	1200	6.95	1220	7.20	1240	7.45	1263	7.73	1285	8.00
7500	1048	5.78	1075	6.05	1100	6.33	1125	6.60	1148	6.88	1170	7.15	1193	7.40	1215	7.65	1238	7.95	1260	8.25	1280	8.50	*1300*	*8.75*
8000	1065	6.40	1090	6.70	1115	6.98	1140	7.25	1163	7.55	1185	7.85	1208	8.13	1230	8.40	1253	8.70	1275	9.00	*1295*	*9.30*	*1315*	*9.60*
8500	1085	7.10	1110	7.40	1135	7.73	1160	8.05	1183	8.35	1205	8.65	1228	8.95	1250	9.25	1270	9.55	*1290*	*9.85*	*1310*	*10.15*	*1330*	*10.45*
9000	1105	7.83	1130	8.15	1153	8.45	1175	8.75	1198	9.08	1220	9.40	1243	9.75	1265	10.10	*1288*	*10.45*	*1310*	*10.80*	*1330*	*11.10*	*1350*	*11.40*
9600	1129	8.77	1154	9.13	1177	9.46	1199	9.78	1222	10.14	1244	10.50	1267	10.87	*1289*	*11.23*	- - -		- - -		- - -		- - -	

NOTE - *italics* - field furnished drive.

AIR RESISTANCE (in. w.g.) - Factory Installed Options

Air Volume - cfm	Electric Heat	Economizer	Horizontal Roof Curb	MERV 11 Filter
6400	.01	.02	.13	.02
7000	.01	.04	.15	.03
7500	.01	.06	.17	.03
8000	.02	.09	.19	.04
8500	.02	.11	.21	.04
9000	.04	.14	.24	.04
9600	.05	.16	.26	.05

BLOWER DATA

CEILING DIFFUSER AIR RESISTANCE

Air Volume		Step-Down Diffuser												Flush Diffuser			
		RTD11-185						RTD11-275						FD11-185		FD11-275	
		2 Ends Open		1 Side/2 Ends Open		All Ends & Sides Open		2 Ends Open		1 Side/2 Ends Open		All Ends & Sides Open					
cfm	L/s	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa
5000	2360	.51	127	.44	109	.39	97	- - -	- - -	- - -	- - -	- - -	- - -	.27	67	- - -	- - -
5200	2455	.56	139	.48	119	.42	104	- - -	- - -	- - -	- - -	- - -	- - -	.30	75	- - -	- - -
5400	2550	.61	152	.52	129	.45	112	- - -	- - -	- - -	- - -	- - -	- - -	.33	82	- - -	- - -
5600	2645	.66	164	.56	139	.48	119	- - -	- - -	- - -	- - -	- - -	- - -	.36	90	- - -	- - -
5800	2735	.71	177	.59	147	.51	127	- - -	- - -	- - -	- - -	- - -	- - -	.39	97	- - -	- - -
6000	2830	.76	189	.63	157	.55	137	.36	90	.31	77	.27	67	.42	104	.29	72
6200	2925	.80	199	.68	169	.59	147	- - -	- - -	- - -	- - -	- - -	- - -	.46	114	- - -	- - -
6400	3020	.86	214	.72	179	.63	157	- - -	- - -	- - -	- - -	- - -	- - -	.50	124	- - -	- - -
6500	3065	- - -	- - -	- - -	- - -	- - -	- - -	.42	104	.36	90	.31	77	- - -	- - -	.34	85
6600	3115	.92	229	.77	191	.67	167	- - -	- - -	- - -	- - -	- - -	- - -	.54	134	- - -	- - -
6800	3210	.99	246	.83	206	.72	174	- - -	- - -	- - -	- - -	- - -	- - -	.58	144	- - -	- - -
7000	3305	1.03	256	.87	216	.76	189	.49	122	.41	102	.36	90	.62	154	.40	99
7200	3400	1.09	271	.92	229	.80	199	- - -	- - -	- - -	- - -	- - -	- - -	.66	164	- - -	- - -
7400	3490	1.15	286	.97	241	.84	209	- - -	- - -	- - -	- - -	- - -	- - -	.70	174	- - -	- - -
7500	3540	- - -	- - -	- - -	- - -	- - -	- - -	.51	127	.46	114	.41	102	- - -	- - -	.45	112
7600	3585	1.20	301	1.02	254	.88	219	- - -	- - -	- - -	- - -	- - -	- - -	.74	184	- - -	- - -
8000	3775	- - -	- - -	- - -	- - -	- - -	- - -	.59	147	.49	122	.43	107	- - -	- - -	.50	124
8500	4010	- - -	- - -	- - -	- - -	- - -	- - -	.69	172	.58	144	.50	124	- - -	- - -	.57	142
9000	4245	- - -	- - -	- - -	- - -	- - -	- - -	.79	196	.67	167	.58	144	- - -	- - -	.66	164
9500	4485	- - -	- - -	- - -	- - -	- - -	- - -	.89	221	.75	186	.65	162	- - -	- - -	.74	184
10,000	4720	- - -	- - -	- - -	- - -	- - -	- - -	1.00	249	.84	209	.73	182	- - -	- - -	.81	201
10,500	4955	- - -	- - -	- - -	- - -	- - -	- - -	1.10	273	.92	229	.80	199	- - -	- - -	.89	221
11,000	5190	- - -	- - -	- - -	- - -	- - -	- - -	1.21	301	1.01	251	.88	219	- - -	- - -	.96	239

POWER EXHAUST FANS

Return Duct Negative Static Pressure		Air Volume Exhausted	
in. w.g.	Pa	cfm	L/s
0	0	8630	4070
0.05	12	8210	3875
0.10	25	7725	3645
0.15	37	7110	3355
0.20	50	6470	3055
0.25	62	5790	2730
0.30	75	5060	2390
0.35	87	4300	2030
0.40	100	3510	1655
0.45	112	2690	1270
0.50	125	1840	870

BLOWER DATA

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume		[1] Effective Throw Range			
			Step-Down		Flush	
	cfm	L/s	ft.	m	ft.	m
	Diffuser Model		**RTD11-185**		**FD11-185**	
180 Models	5600	2645	39 - 49	12 - 15	28 - 37	9 - 11
	5800	2740	42 - 51	13 - 16	29 - 38	9 - 12
	6000	2830	44 - 54	13 - 17	40 - 50	12 - 15
	6200	2925	45 - 55	14 - 17	42 - 51	13 - 16
	6400	3020	46 - 55	14 - 17	53 - 52	13 - 16
	6600	3115	57 - 56	14 - 17	45 - 56	14 - 17
	Diffuser Model		**RTD11-275**		**FD11-275**	
240 Models	7200	3400	33 - 38	10 - 12	26 - 35	8 - 11
	7400	3490	35 - 40	11 - 12	28 - 37	9 - 11
	7600	3585	36 - 41	11 - 13	29 - 38	9 - 12
	7800	3680	38 - 43	11 - 13	40 - 50	12 - 15
	8000	3775	39 - 44	12 - 13	42 - 51	13 - 16
	8200	3870	41 - 46	12 - 14	43 - 52	13 - 16
	8400	3965	43 - 49	13 - 15	44 - 54	13 - 17
	8600	4060	44 - 50	13 - 15	46 - 57	14 - 17
	8800	4155	47 - 55	14 - 17	48 - 59	15 - 18

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

DRIVE KIT SPECIFICATIONS

Blower Motor Outputs				RPM Range							
Nominal hp	Maximum hp	Nominal kW	Maximum kW	Drive A	Drive 1	Drive 2	Drive 3	Drive 4	Drive 6	Drive 7	Drive 9
3	3.45	2.2	2.6	535-725	710-965	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
5	5.75	3.7	4.3	- - - -	- - - -	685-865	850-1045	945-1185	- - - -	- - - -	- - - -
7.5	8.63	5.6	6.4	- - - -	- - - -	- - - -	- - - -	- - - -	1045-1285	850-1045	685-865
10	11.5	7.5	8.6	- - - -	- - - -	- - - -	- - - -	- - - -	1045-1285	- - - -	- - - -

*Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors furnished by manufacturer are shown. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

MANUFACTURER'S NUMBERS

		DRIVE COMPONENTS									
		RPM		ADJUSTABLE SHEAVE		FIXED SHEAVE		BELTS		SPLIT BUSHING	
Drive No.	H.P.	Min	Max	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.
A	3	535	725	1VP40x7/8	79J0301	BK95X1-7/16	80K1601	BX59	59A5001	N/A	N/A
1	3	710	965	1VP40x7/8	79J0301	BK72x1-7/16	100244-13	BX56	100245-11	N/A	N/A
2	5	685	865	1VP50x1-1/8	P-8-1977	BK100x1-7/16	39L1301	BX62	57A7701	N/A	N/A
3	5	850	1045	1VP65x1-1/8	100239-03	BK110H	100788-06	BX66	97J5901	H-1-7/16	49M6201
4	5	945	1185	1VP60x1-1/8	41C1301	BK90H	100788-04	BX72	57A7701	H-1-7/16	49M6201
6	7.5	1045	1285	1VP65x1-3/8	78M7101	BK90H	100788-04	BX64	97J5801	H-1-7/16	49M6201
6	10	1045	1285	1VP65x1-3/8	78M7101	1B5V86	78M8301	5VX670	100245-21	B-1 7/16	100246-01
7	7.5	850	1045	1VP65x1-3/8	78M7101	BK110H	100788-06	BX66	97J5901	H-1-7/16	49M6201
9	7.5	685	865	1VP60x1-3/8	78L5501	AK114x1-7/16	100244-01	AX68	100245-06	H-1-7/16	49M6201

ELECTRIC HEAT CAPACITIES

Input Voltage	15 kW			30 kW			45 kW			60 kW			90 kW		
	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output
208	1	11.3	38,600	1	22.5	76,800	1	33.8	115,300	1	45.0	153,600	1	67.6	230,700
220	1	12.6	43,000	1	25.2	86,000	1	37.8	129,000	1	50.4	172,000	1	75.6	258,000
230	1	13.8	47,100	1	27.5	93,900	1	41.3	141,000	1	55.1	188,000	1	82.7	282,200
240	1	15.0	51,200	1	30.0	102,400	1	45.0	153,600	1	60.0	204,800	1	90.0	307,100
440	1	12.6	43,000	1	25.2	86,000	1	37.8	129,000	1	50.4	172,000	1	75.6	258,000
460	1	13.8	47,100	1	27.5	93,900	1	41.3	141,000	1	55.1	188,000	1	82.7	282,200
480	1	15.0	51,200	1	30.0	102,400	1	45.0	153,600	1	60.0	204,800	1	90.0	307,100
550	1	12.6	43,000	1	25.2	86,000	1	37.8	129,000	1	50.4	172,000	1	75.6	258,000
575	1	13.8	47,100	1	27.5	93,900	1	41.3	141,000	1	55.1	188,000	1	82.7	282,200
600	1	15.0	51,200	1	30.0	102,400	1	45.0	153,600	1	60.0	204,800	1	90.0	307,100

ELECTRICAL/ELECTRIC HEAT DATA — THA180

Voltage - 60hz - 3 phase			208/230V			460V			575V		
Compressors (2)	Rated Load Amps	each	28.8			14.7			10.8		
		total	57.6			29.4			21.6		
	Locked Rotor Amps	each	195			9.5			80		
		total	390			190			160		
Outdoor Fan Motors (4)	Full Load Amps	each	2.4			1.3			1.0		
		total	9.6			5.2			4.0		
	Locked Rotor Amps	each	4.7			2.4			1.9		
		total	18.8			9.6			7.6		
Power Exhaust Fans (2)	Horsepower		1/3 (249)			1/3 (249)			1/3 (249)		
	Full Load Amps		4.8			2.6			2.0		
	Locked Rotor Amps		9.4			4.8			3.8		
Service Outlet 115V GFI			15 Amps			15 Amps			15 Amps		
Indoor Blower Motor	Horsepower		**3**	**5**	**7.5**	**3**	**5**	**7.5**	**3**	**5**	**7.5**
	Rated Load Amps		10.6	16.7	24.2	4.8	7.6	11.0	3.9	6.1	9.0
	Locked Rotor Amps		66	105	152	26.8	45.6	66	23.4	26.6	54
[1] Minimum Circuit Ampacity	with power exhaust	**0 kW**	90	96	104	46	49	52	35	37	40
		15 kW	135	142	149	69	71	75	53	55	58
		30 kW	181	187	194	91	94	97	71	73	76
		45 kW	226	232	239	114	117	120	89	91	94
		60 kW	235	241	248	118	121	125	92	95	97
	without power exhaust		85	92	99	44	46	50	33	35	38
[2] Maximum Overcurrent Protection	with power exhaust	**0 kW**	110	110	125	60	60	60	45	45	50
		15 kW	150	150	150	70	80	80	60	60	60
		30 kW	[3] 200	[3] 200	[3] 200	100	100	100	80	80	80
		45 kW	[3] 250	[3] 250	[3] 250	125	125	125	90	100	100
		60 kW	[3] 250	[3] 250	[3] 250	125	125	125	100	100	100
	without power exhaust		110	110	125	50	60	60	40	45	45
Unit Fuse Block- only used with Electric Heat	with power exhaust		LAFB110A8-2		LAFB125A8-2	LAFB60A9			LAFB45A8		LAFB50A8
	without power exhaust		LAFB110A8-2		LAFB125A8-2	LAFB50A8	LAFB60A9		LAFB40A8	LAFB45A8	
Disconnect		**0 kW**	T1DISC150-1			T1DISC080-1			T1DISC080-1		
		15 kW	T1DISC150-1			T1DISC080-1			T1DISC080-1		
		30 kW	T1DISC250-1			T1DISC150-1			T1DISC080-1		
		45 kW	T1DISC250-1			T1DISC150-1			T1DISC150-1		
		60 kW	N/A			T1DISC150-1			T1DISC150-1		
Electric Heat Control Kit - only used with Electric Heat			T1EHKT01C-1Y			T1EHKT01C-1G			T1EHKT01C-1J		

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

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

2 HACR type breaker or fuse.

3 Factory installed circuit breaker not available.

ELECTRICAL/ELECTRIC HEAT DATA — THA240

Voltage - 60hz - 3 phase			208/230V			460V			575V		
Compressors (2)	Rated Load Amps	each	30.1			15.5			12.1		
		total	60.2			31.0			24.2		
	Locked Rotor Amps	each	225			114			80		
		total	450			228			160		
Outdoor Fan Motors (4)	Full Load Amps	each	2.4			1.3			1.0		
		total	9.6			5.2			4.0		
	Locked Rotor Amps	each	4.7			2.4			1.9		
		total	18.8			9.6			7.6		
Power Exhaust Fans (2)	Horsepower		1/3 (249)			1/3 (249)			1/3 (249)		
	Full Load Amps		4.8			2.6			2.0		
	Locked Rotor Amps		9.4			4.8			3.8		
Service Outlet 115V GFI			15 Amps			15 Amps			15 Amps		
Indoor Blower Motor	Horsepower		**5**	**7.5**	**10**	**5**	**7.5**	**10**	**5**	**7.5**	**10**
	Rated Load Amps		16.7	24.2	30.8	7.6	11.0	14.0	6.1	9.0	11.0
	Locked Rotor Amps		105	152	193	45.6	66	84	36.6	54	66
[1] **Minimum Circuit Ampacity**	with power exhaust	**0 kW**	99	107	113	51	54	57	40	43	45
		15 kW	144	152	159	73	77	80	58	61	63
		30 kW	190	197	204	96	99	102	76	79	81
		45 kW	235	242	249	118	122	125	94	97	99
		60 kW	244	251	258	123	126	129	98	100	102
		90 kW	316	323	330	159	162	162	126	129	131
	without power exhaust		95	102	109	48	52	55	38	41	43
[2] **Maximum Overcurrent Protection**	with power exhaust	**0 kW**	125	125	125	60	60	70	50	50	50
		15 kW	150	175	175	80	80	90	60	70	70
		30 kW	[3] 200	[3] 200	[3] 225	100	100	110	80	80	90
		45 kW	[3]250	[3]250	[3]250	125	125	125	100	100	100
		60 kW	[3]250	[3]300	[3]300	125	150	150	100	110	110
		90 kW	[3]350	[3]350	[3]350	175	175	175	150	150	150
	without power exhaust		110	125	125	60	60	60	45	50	50
Unit Fuse Block- only used with Electric Heat	with power exhaust		LAFB125A8-2			LAFB60A9		LAFB70A9	LAFB50A8		
	without power exhaust		LAFB110A8-2	LAFB125A8-2	LAFB125A8-2	LAFB60A9			LAFB45A8	LAFB50A8	
Disconnect		**0 kW**	T1DISC150-1			T1DISC080-1			T1DISC080-1		
		15 kW	T1DISC150-1	T1DISC250-1	T1DISC250-1	T1DISC080-1			T1DISC080-1		
		30 kW	T1DISC250-1			T1DISC150-1			T1DISC080-1		
		45 kW	T1DISC250-1			T1DISC150-1			T1DISC150-1		
		60 kW	N/A			T1DISC150-1			T1DISC150-1		
		90 kW	N/A			T1DISC250-1			T1DISC150-1		
Electric Heat Control Kit - only used with Electric Heat			T1EHKT01C-1Y			T1EHKT01C-1G			T1EHKT01C-1J		

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

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

2 HACR type breaker or fuse.

3 Factory installed circuit breaker not available.

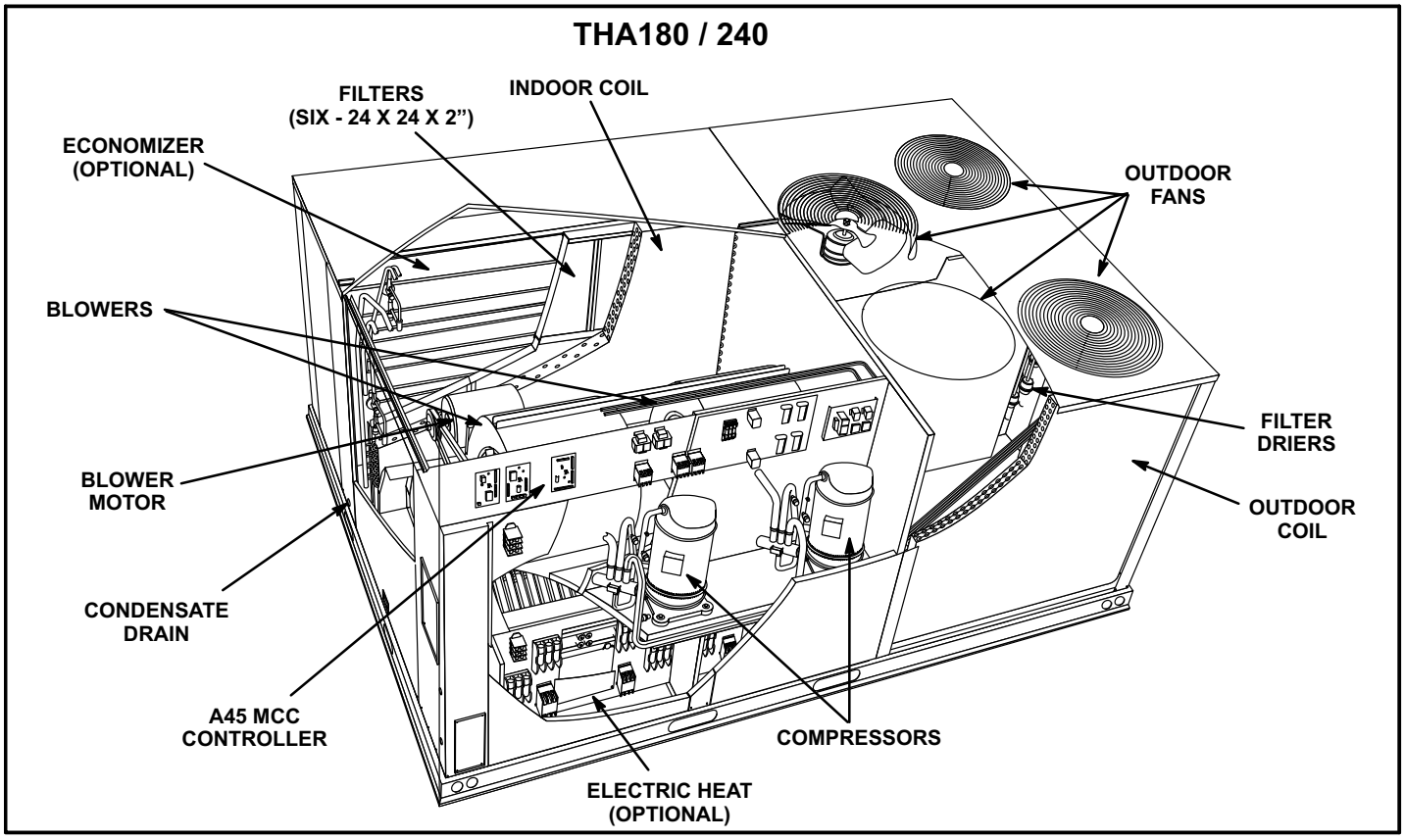


FIGURE 1

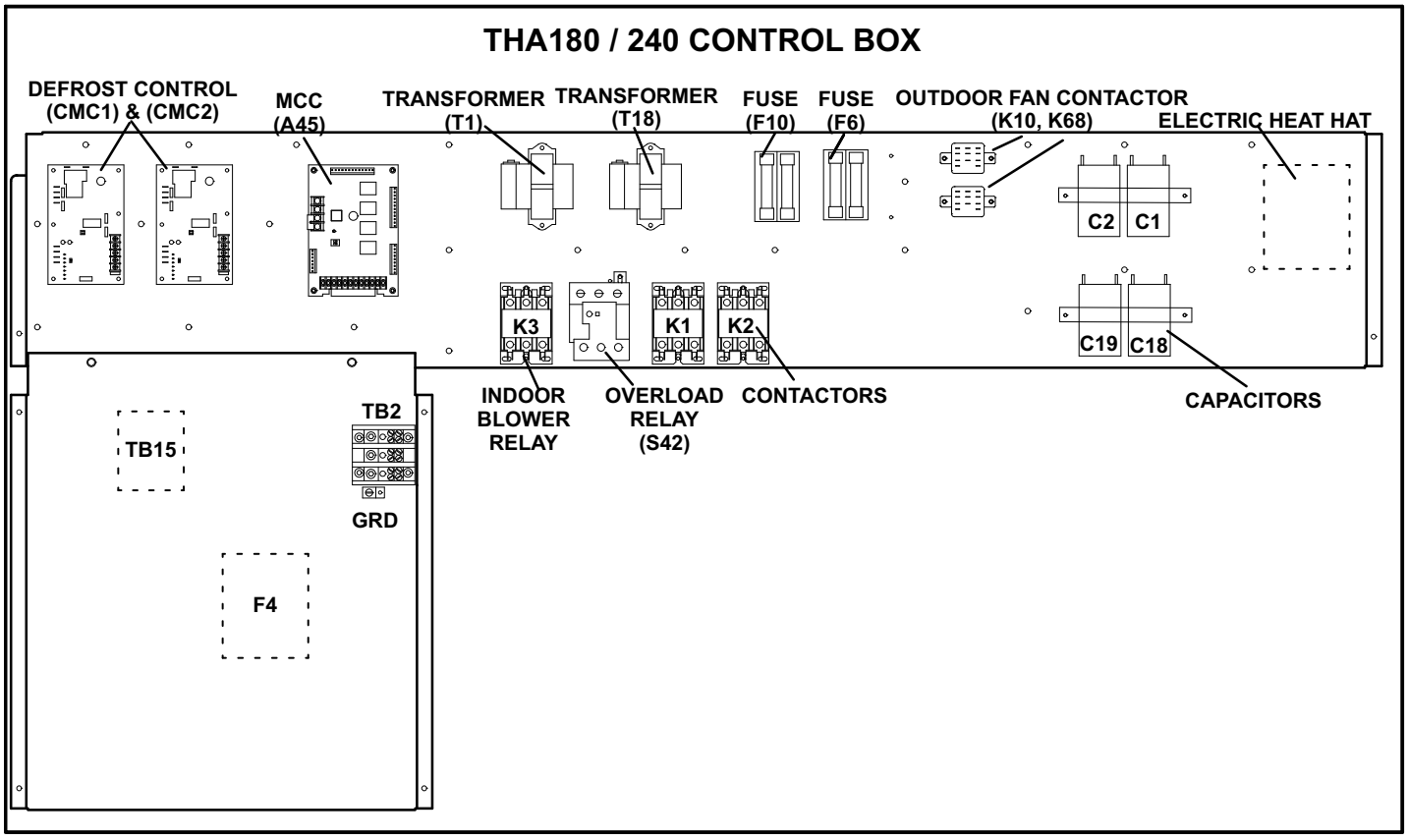


FIGURE 2

I-UNIT COMPONENTS

The THA 15 and 20 ton (52.8 and 70.3 kW) series unit components are in figure 1. All L1, L2, and L3 wiring is color coded; L1 is red, L2 is yellow, and L3 is blue. See wiring diagram in the back of this manual for a complete listing of unit components.

A-Control Box Components

THA control box components are shown in figure 2. The control box is located in the upper left portion of the compressor compartment.

1-Disconnect Switch S48 (field installed)

All units may be equipped with an optional disconnect switch S48, or circuit breaker, CB10. S48 and CB10 can be a toggle switch or a twist style switch. Both types can be used by the service technician to disconnect power to the unit. CB10 when use, will be in the same location as S48 on the wiring diagram.

2-Terminal Strip TB2

All units are shipped with factory installed TB2. Units without S48 or CB10 will have supply power connected to TB2.

3-Control Transformer T1

All THA series units use a single line voltage to 24VAC transformer mounted in the control box. Transformer supplies power to control circuits in the unit. The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker (CB8). The 208/230 (Y) voltage transformers use two primary voltage taps as shown in figure 3, while 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

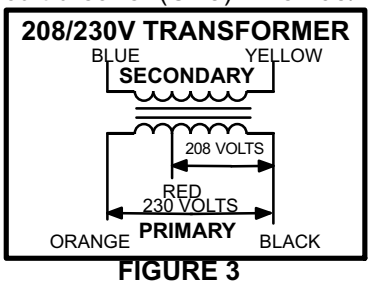


FIGURE 3

4-Transformer T18

T18 is a single line voltage to 24VAC transformer used in all THA units. Transformer T18 is protected by a 3.5 amp circuit breaker (CB18) located on the transformer itself. T18 is identical to T1 and is protected by a 3.5 amp circuit breaker (CB18). T18 provides 24VAC to CMC1, CMC2 and reversing valves L1 and L2.

5-Fuses F10 and F6

Two line voltage fuses F10 provide overcurrent protection to all condenser fans in all THA units and rated at 30A. Fuses F6 provide overcurrent protection for optional field installed power exhaust fans and rated at 15A.

6-Terminal Strip TB1

All indoor thermostat connections will be to TB1 located on MCC board A45. For thermostats with “occupied “ and “unoccupied” modes, a factory installed jumper across terminals A1 and A2 should be removed. Unit wiring is designed for a three-stage thermostat. For two-stage applications jumper between Y2 and Y3 on TB1.

7-Terminal Strip TB14

Terminal strip TB14 located on the MCC board A45 distributes 24V power from transformer T1 to the control box components. Units not equipped with smoke detectors A17 or A64, will have a factory installed jumper across terminals 24VAC and R.

8-Outdoor Fan Capacitors C1, C2, C18, & C19

Fan capacitors C1, C2, C18, C19 are 370V / 10 MFD capacitors used to assist in the start up of condenser fans B4, B5, B21, B22 respectively.

9-Compressor Contactor K1 & K2

All compressor contactors are three-pole-double-break contactors with a 24VAC coil. In all THA units K1 (energized by A55) and K2 (energized by A61) energize compressors B1 and B2 respectively, in response to thermostat demand.

10-Blower Contactor K3 (all units)

Blower contactor K3, used in all units, is a three-pole-double-break contactor with a 24VAC coil used to energize the indoor blower motor B3 in response to blower demand. K3 is energized by main control panel (A55).

11-Outdoor Fan Relay K10 & K68

Outdoor fan relays K10 and K68, used in all units, are DPDT relays with a 24VAC coil. In all THA units K10 energizes condenser fan B4 (fan 1) and K68 energizes B5 (fan 2) in response to thermostat demand.

12-Power Exhaust Relay K65 (PED units)

Power exhaust relay K65 is a N.O. DPDT relay with a 24VAC coil. K65 is used in all THA units equipped with the optional power exhaust dampers. K65 is energized by the economizer control panel (A6), after the economizer dampers reach 50% open (adjustable on control A6). When K65 closes, the exhaust fans B10 and B11 are energized.

13-Blower Motor Overload Relay S42

S42 is a manual reset overload relay, used in all TCA units equipped with 10 or more HP standard efficiency motors. The relay is connected in line with the blower motor to monitor the current flow to the motor. When the relay senses an overload condition, a set of normally closed contacts opens de-energizing the 24 volt output of T1. See figure figure 4.

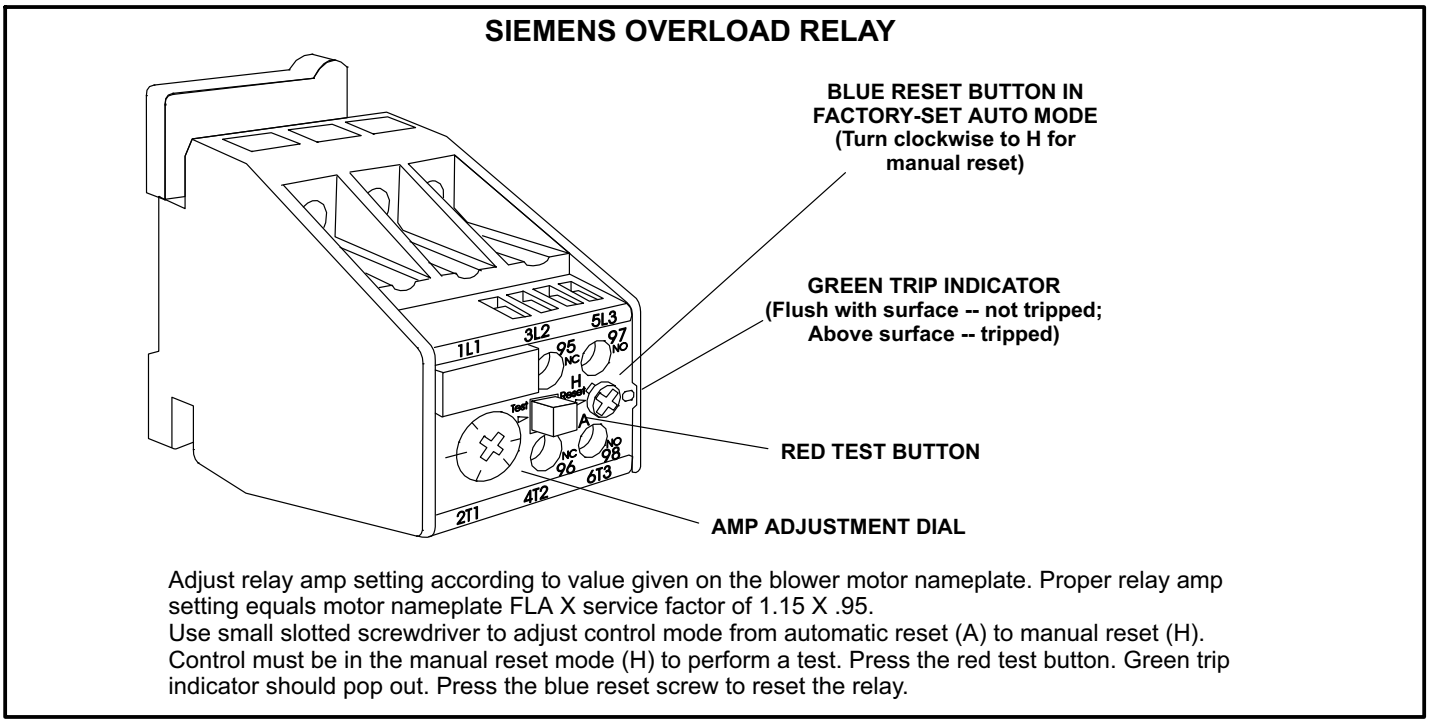


FIGURE 4

14-MCC Control A45

The main control module A45 (figure 6) is the heart of the system. It controls all cooling and heating operation and serves as a staging point for all internal inputs to the appropriate components of the THA unit. The MCC control receives and sends out 24 volts to the components located in the THA control box, economizer and supply/return compartments. Relays KA and KB located on the board, correspond to compressors contactors K1 and K2. Relay KC corresponds to reversing valve solenoids L1 and L2 and relay KD corresponds to indoor blower contactor K3. Thermostat connections (TB1) and accessory low voltage connections (TB14) are located on the board. See tables 2 and 4 for terminal designations. Table s 5 through 7 show pin terminal designations.

TABLE 1

LED Status	Indicates	Action
Off	No power to board.	Check field wiring.
On	Processor error.	Press MCC pushbutton and hold for three seconds to reset processor.*
Flashing Slowly	Normal.	None.
Flashing Rapidly	Invalid unit DIP switch selected.	Make sure switches are set correctly. Refer to figure NO TAG.
Flashing Rapidly	Simultaneous heat and cool demands.	Check thermostat and wiring.

*Press pushbutton and immediately release to override the 4-minute compressor-minimum run time.

Features

The MCC is equipped with a green LED for board status. See table 1 for LED flash codes. While in the cooling mode the board will incorporate AUTO-STAGING. If the board receives a Y3 demand (if applicable) the board will energize Y1, Y2 and Y3 in successive order. In the same manner a Y2, will be interpreted as a Y1/Y2. The MCC control also incorporates a minimum run time of 4 minutes for up to 3 independent cooling stages. This 4 minute run time can be interrupted by pushing SW1 located on the board. If pressed for 3 seconds or more, the control goes into TEST mode disabling AUTO-STAGING. The MCC control board is used for all T series units so a dip switch is provided for factory setting unit type (TGA, TCA, THA) See figure 5.

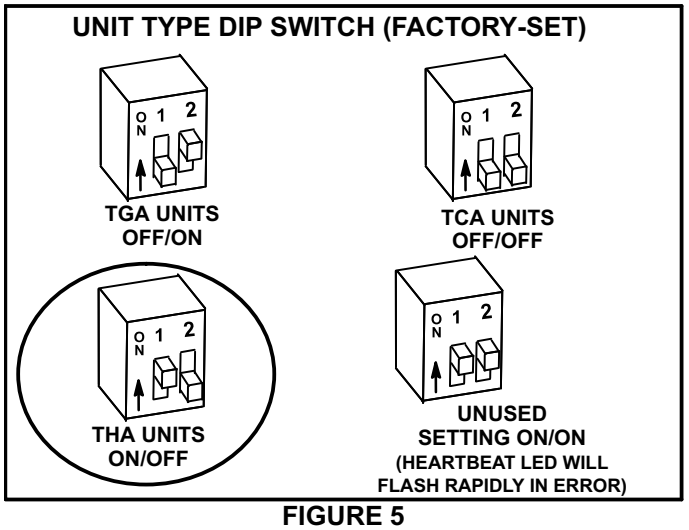


FIGURE 5

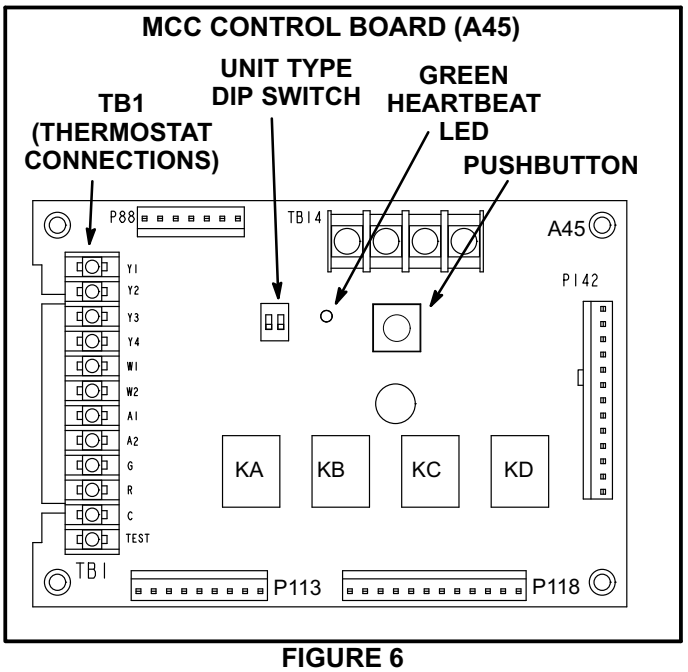


FIGURE 6

TABLE 2

TB1 TERMINAL DESIGNATIONS	
Y1	Cool Stage 1
Y2	Cool Stage 2
Y3	Cool Stage 3
Y4	Cool Stage 4
W1	Heat Stage 1
W2	Heat Stage 2 (Electric Heat)
A1	Occupied Loop
A2	Occupied Loop
G	Indoor Blower
R	24V To Thermostat
C	Ground
TEST	Test Terminal

TABLE 3

P113 TERMINAL DESIGNATIONS	
Terminal	Function
S49	Relay KC To Freeze Stat
S49	From Freeze Stat
K10	Relay KA To Outdoor Fan Contactor
K1	Freeze Stat to Compressor Contactor
S50	Relay KB To Freeze Stat
S50	From Freeze Stat
K2	Freeze Stat To Compressor Contactor
K3	KD To Blower Contactor
C	Ground To Cooling Components

TABLE 4

TB14 24VAC TERMINAL DESIGNATIONS	
24VAC	Uninterrupted 24 Volt Power
R	24 Volt Accessories (from T1 transformer)
T18	24 Volts Accessories (from T18 transformer)
C	Ground

TABLE 5

P142 TERMINAL DESIGNATIONS	
Terminal	Function
Y2	To Economizer
Y2E	To Processor (micro chip)
Y1	To Economizer
Y1E	To Processor (micro chip)
24V	To Smoke Detector
24V	From T1 Transformer
A1	Occupied Loop from Thermostat
24V	To Economizer
GND	Ground to Economizer
24V	From Transformer T1
GND	Ground
24V	From Transformer T2
Y3	To Processor (micro chip)

TABLE 6

P118 TERMINAL DESIGNATIONS	
Terminal	Function
O - CMC1	Reversing Valve - Defrost Board
S53	N/A
O - CMC2	Reversing Valve - CMC2
K14	N/A
S95	N/A
S95	N/A
K146	N/A
T18	N/A
C	Common
C	Common
T18	24V from T18
C	Common

TABLE 7

P88 TERMINAL DESIGNATIONS	
Terminal	Function
R	24V
W1	Heat Stage
Y1	N/A
C	Ground
G	N/A
G	N/A
W2	Heat Stage

15-Defrost Control Boards CMC1 & CMC2

The defrost thermostat, defrost pressure switch and the defrost control work together to ensure that the heat pump outdoor coil does not ice excessively during the heating mode.

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 60 minutes (default). The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 7.

The defrost interval can be adjusted to 30, 60, or 90 minutes. The defrost timing jumper is factory-installed to provide a 60-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval.

Note - When adjusting timing pins, set both CMC1 and CMC2 defrost controls to the same defrost interval.

Defrost Test Option

A TEST option is provided for troubleshooting. The TEST mode may be started any time the unit is in the heating mode and the defrost thermostat is closed or jumpered.

If the timing jumper is in the TEST position at power-up, the defrost control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost pressure switch opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a sequence according to the condition.

TABLE 8

Defrost Control Board Diagnostic LED		
Indicates	**LED 1**	**LED 2**
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure / no power	Off	Off
Board failure	On	On
Pressure switch open	Flash	On

DEFROST CONTROL BOARD CMC1 AND CMC2

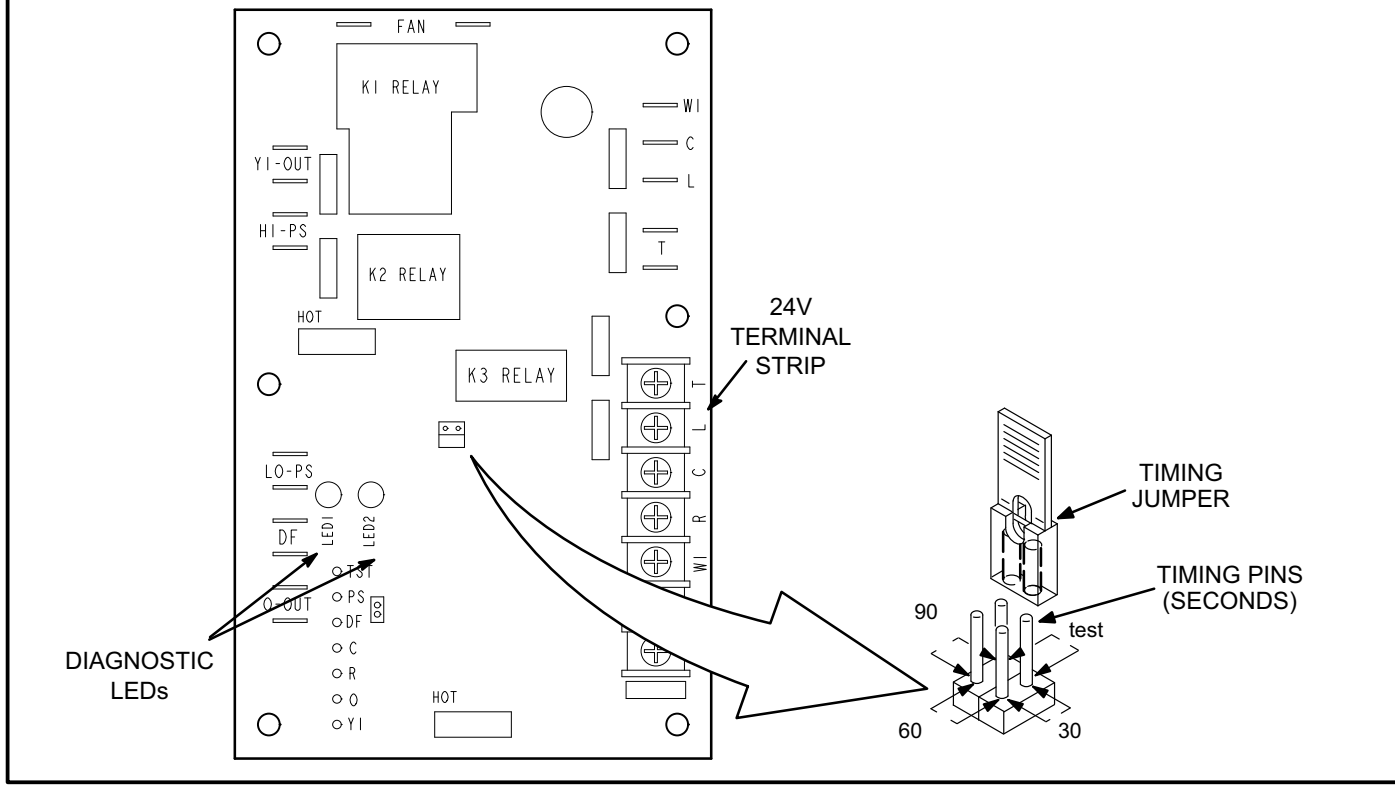


FIGURE 7

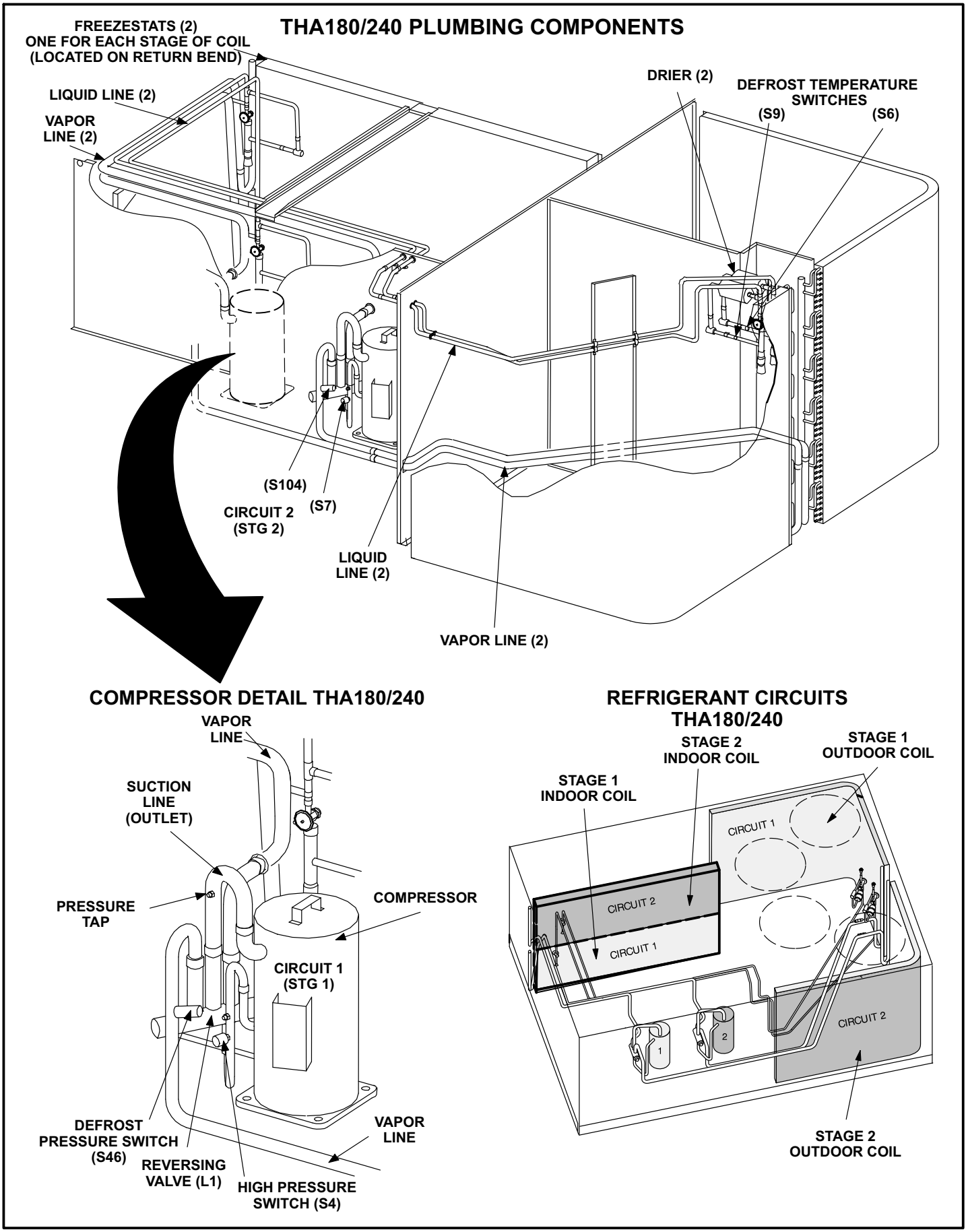

THA180/240 PLUMBING COMPONENTS
FREEZESTATS (2)
ONE FOR EACH STAGE OF COIL
(LOCATED ON RETURN BEND)
LIQUID LINE (2)
VAPOR
LINE (2)
DRIER (2)
DEFROST TEMPERATURE
SWITCHES
(S9)
(S6)
(S104)
(S7)
CIRCUIT 2
(STG 2)
LIQUID
LINE (2)
VAPOR LINE (2)
COMPRESSOR DETAIL THA180/240
VAPOR
LINE
SUCTION
LINE
(OUTLET)
PRESSURE
TAP
COMPRESSOR
CIRCUIT 1
(STG 1)
DEFROST
PRESSURE SWITCH
(S46)
REVERSING
VALVE (L1)
HIGH PRESSURE
SWITCH (S4)
VAPOR
LINE
REFRIGERANT CIRCUITS
THA180/240
STAGE 2
INDOOR COIL
STAGE 1
OUTDOOR COIL
STAGE 1
INDOOR COIL
CIRCUIT 1
CIRCUIT 2
CIRCUIT 1
CIRCUIT 2
1
2
STAGE 2
OUTDOOR COIL

FIGURE 8

B-Cooling Components

THA units use independent cooling circuits consisting of separate compressors, condenser coils and evaporator coils. See figure 8. Four draw-through type condenser fans are used in all units. All units are equipped with belt-drive blowers which draw air across the evaporator during unit operation.

Cooling may be supplemented by a factory- or field-installed economizer. The evaporators are slab type and are stacked. Each evaporator uses a thermostatic expansion valve as the primary expansion device. Each evaporator is also equipped with enhanced fins and rifled tubing. In all units each compressor is protected by a crankcase heater and high pressure switch. Additional protection is provided by low ambient switches (option) and freezestats (on each evaporator).

1-Compressors B1 and B2

All THA 15 ton (52.8 kW) units use two 7.5-ton (26.4 kW) compressors and 20-ton (70.3 kW) units use two 10-ton (35.2 kW) compressors. All units are equipped with independent cooling circuits. Likewise, compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See SPECIFICATIONS and ELECTRICAL DATA (table of contents) or compressor nameplate for compressor specifications.

Each compressor is energized by a corresponding compressor contactor.

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

⚠ 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.

2-Freezestats S49 and S50

Each unit is equipped with a low temperature switch (freezestat) located on a return bend of each indoor coil. S49 (first circuit), S50 (second circuit), are located on the corresponding indoor coils.

Each freezestat is wired to the main control module A45. Each freezestat is a SPST N.C. auto-reset switch which opens at 29°F ± 3°F (-1.7°C ± 1.7°C) on a temperature drop and closes at 58°F ± 4°F (14.4°C ± 2.2°C) on a temperature rise. To prevent coil icing, freezestats open during compressor operation to temporarily disable the respective compressor until the coil warms sufficiently to melt any accumulated frost.

3-Crankcase Heaters HR1 and HR2

THA units use belly-band type crankcase heaters. HR1 is installed around compressor B1, heater HR2 compressor B2. Crankcase heater wattage varies by compressor size.

4-High Pressure Switches S4 and S7

The high pressure switch is an auto-reset SPST N.C. switch which opens on a pressure rise. The switch is located in the compressor discharge line and is wired in series with the compressor contactor coil. THA units are equipped with two switches.

S4 (first circuit) and S7 (second circuit) are wired in series with the respective compressor contactor coils.

When discharge pressure rises to 450 ± 10 psig (3103± 69 kPa) (indicating a problem in the system) the switch opens and the compressor is de-energized (the economizer can continue to operate).

5-Reversing Valves L1 and L2

A refrigerant reversing valve with a 24 volt solenoid coil is used to reverse refrigerant flow during unit operation in all THA units. The reversing valve is connected in the vapor line of the refrigerant circuit. The reversing valve coil is energized during cooling demand and during defrost.

6-Low Ambient Switches S11 & S84 (optional accessory)

The low ambient switch is an auto-reset SPST N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. All THA units are equipped with this switch. In all models a switch is located in each liquid line prior to the indoor coil section. In the THA180/240 units S11 is wired in series with outdoor fan relay K10, while S84 is wired in series with outdoor fan relay K68.

When liquid pressure rises to 275 ± 10 psig (1896 ± 69 kPa), the switch closes and the condenser fan is energized. When discharge pressure in both refrigerant circuits drop to 150 ± 10 psig (1034 ± 69 kPa), the switch opens and the condenser fan is de-energized. This intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the evaporator coil and losing capacity.

7-Condenser Fans B4, B5, B21, and B22 (all units)

See table of contents for SPECIFICATIONS of condenser fans used in THA units. All condenser fans used have single-phase motors. All units are equipped with four condenser fans. The complete fan assembly may be accessed for servicing and cleaning by removing the fan grill and turning the complete assembly until the motor brackets line up with the notches in the top panel. Lift the fan assembly out of the unit and disconnect the jack plug located on the motor.

8-Defrost Components and Operation

a-Defrost Pressure Switch S46 and S104

The defrost pressure switches (S46 and S104) are auto-reset SPST N.C. pressure switches which open on a pressure rise. All THA units are equipped with these switches. The switches are located on the suction line during heating cycle (discharge line during cooling and defrost cycle). S46 (refrigeration circuit one) is wired to the main control board CMC1. S104 (refrigeration circuit two) is wired to the heat pump control board CMC2.

When discharge pressure reaches 275 ± 10 psig (1096 ± 69 kPa) (indicating defrost is completed) the switch opens. The switch automatically resets when pressure in the suction line drops to 80 ± 10 psig (552 ± 69 kPa).

b-Defrost Thermostat Switches S6 and S9 (all THA180/240 units)

Defrost thermostat switches S6 (refrigeration circuit one) and S9 (refrigeration circuit two) are S.P.S.T. N.O. contacts which close on a temperature fall (initiating defrost). The switches are located on each of the expansion valve distributor assemblies at the inlet to the outdoor coil. The switches monitor the outdoor coil suction temperature to determine when defrost is needed. When the outdoor coil suction temperature falls to 35°F ± 4°F (1.7°C ± 2.2°C) the switch closes (initiating defrost after minimum run time of 30, 60, or 90 minutes). When the temperature rises to 60°F ± 5°F (15.6°C ± 2.8°C) the switch opens.

DEFROST OPERATION

Defrost operation of each of the two refrigeration circuits are controlled independently with separete timers, thermostats (S6 and S9) and pressure switches (S46 and S104).

During heating operation when outdoor coil temperature drops to 35 ± 4 °, the defrost thermostat S6 or S9 closes initiating defrost.

When defrost begins, the reversing valve (L1 or L2) for the circuit in defrost mode is energized. Supplemental electric heat is then energized.

When L1 energizes, N.C. K58-1 contacts open de-energizing outdoor fan relay K10, followed by outdoor fan B4. When L2 energizes, N.C. K118-1 contacts open de-energizing outdoor fan relay K68, followed by outdoor fan B5.

Defrost of a circuit terminates when the pressure switch for the circuit (S46 or S104) opens or when 15 minutes elapse. Defrost does **not** terminate when thermosts demand ends.

9-Filter Drier

THA units have a filter drier located in the liquid line of each refrigerant circuit at the exit of each condenser coil (outdoor coil in THA units). The drier removes contaminants and moisture from the system.

C-Blower Compartment

The blower compartment in all THA units is located between the evaporator coil and the compressor / control section on the opposite side of the condenser coil. The blower assembly is accessed by removing the screws on either side of the sliding base. The base pulls out as shown in figure NO TAG.

1-Blower Wheels

All units have two 15 in. x 15 in. (381 mm x 381 mm) blower wheels. Both wheels are driven by one motor.

2-Indoor Blower Motor B3 (all units)

THA units use three-phase single-speed blower motors. CFM adjustments are made by adjusting the motor pulley (sheave). Motors are equipped with sealed ball bearings. All motor specifications are listed in the tables on pages 3, 5, and 6. Units may be equipped with motors manufactured by various manufacturers, therefore electrical FLA and LRA specifications will vary. See unit rating plate for information specific to your unit.

OPERATION / ADJUSTMENT

A-Three Phase Scroll Compressor Voltage Phasing

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

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

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

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

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of TB2 or TB15 (on units equipped with electric heat). Do not reverse wires at blower contactor.

5- Make sure the connections are tight.

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

B-Blower Operation

Initiate blower demand at thermostat according to instructions provided with thermostat. Unit will cycle on thermostat demand. The following steps apply to applications using a typical electro-mechanical thermostat.

1- Set thermostat or temperature control device fan switch to **AUTO** or **ON.** With fan switch in **ON** position, blower will operate continuously. With fan switch in **AUTO** position, the blower will cycle with demand.

2- Blower and entire unit will be off when thermostat or temperature control device system switch is in **OFF** position.

C-Blower Access

The blower assembly is secured to a sliding base which allows the entire assembly to be pulled out of the unit. See figure 11.

1- Remove the clamp which secures the blower wiring to the blower motor base.

2- Remove and retain screws on either side of sliding base. Pull base toward outside of unit. When pulling the base out further than 12" (305mm), disconnect wiring to K3 blower contactor T1, T2, and T3. Pull wiring toward blower to allow enough slack to slide the base out further.

3- Slide base back into original position when finished servicing. Replace the clamp and blower wiring in the previous location on the blower motor base. Reconnect wiring to K3 if it was disconnected.

4- Replace retained screws on either side of the sliding base.

D-Determining Unit CFM

1- The following measurements must be made with a dry indoor coil and with air filters in place. Run blower without a cooling demand. Measure the indoor blower shaft RPM.

2- With all access panels in place, measure static pressure external to unit (from supply to return).

3- Refer to blower data tables (table of contents) to determine unit CFM.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 11. Tighten Allen screw after adjustment. Do not exceed minimum and maximum number of pulley turns as shown in table 9.

TABLE 9
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum Turns Open
A Section	No minimum	5
B Section	1*	6

*No minimum number of turns open when B belt is used on pulleys 6" O.D. or larger.

E-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a **24-48** hour period of operation. This will allow belt to stretch and seat grooves. Make sure blower and motor pulley are aligned as shown in figure 9.

1- Loosen four bolts securing motor base to mounting frame. See figure 11.

2- *To relieve belt tension -*
Turn adjusting bolt to the right, or clockwise, to move the motor upward and loosen the belt. This decreases the distance between the blower motor pulley and the blower housing pulley.

3- Tighten four bolts securing motor base to mounting frame.

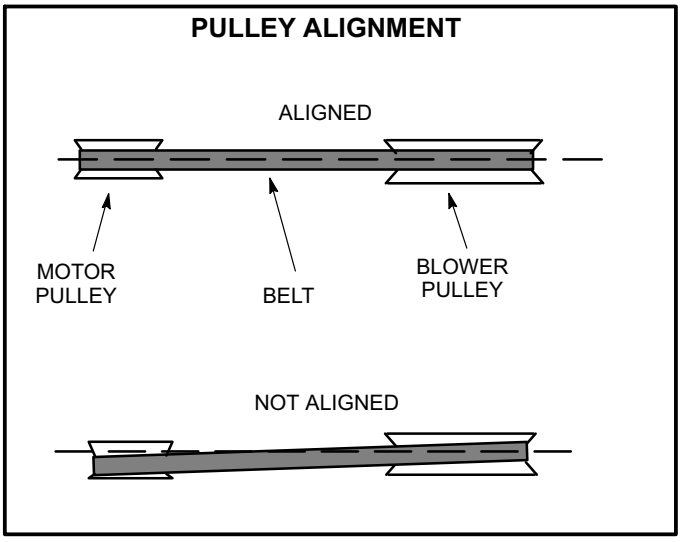


FIGURE 9

IMPORTANT - Align top edges of blower motor base and mounting frame base parallel before tightening two bolts on the other side of base. Motor shaft and blower shaft must be parallel.

F-Check Belt Tension

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

1- Measure span length X. See figure 10.

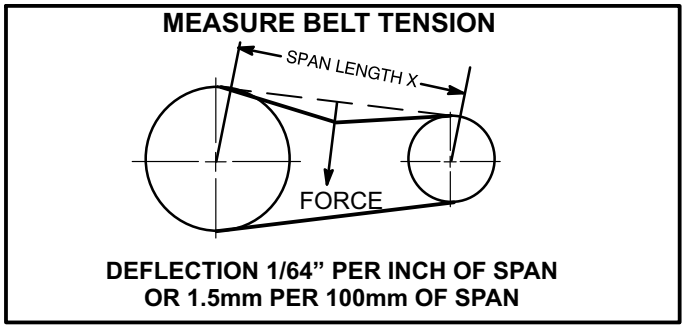


FIGURE 10

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

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

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

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

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

G-Field-Furnished Blower Drives

See blower data tables (table of contents) for drive kits and the manufacturer's model number.

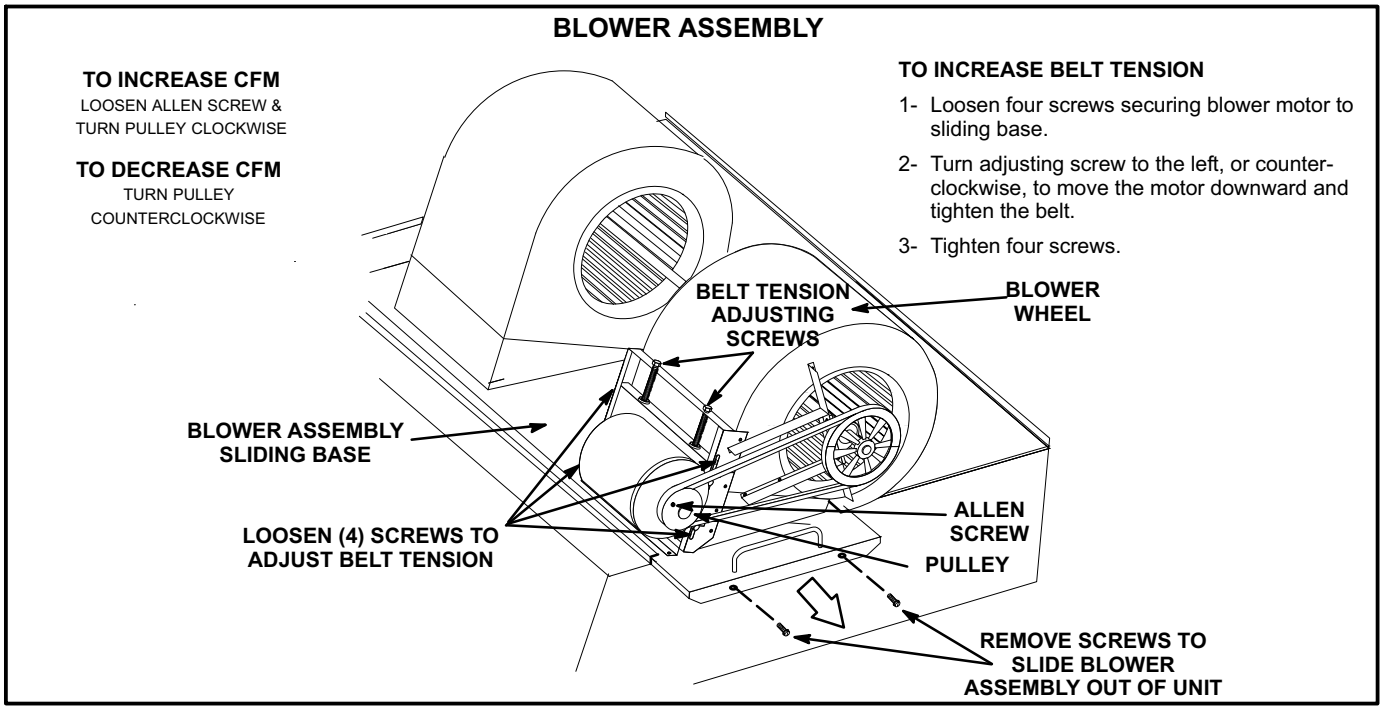


FIGURE 11

D-Optional Electric Heat Components

See ELECTRICAL / ELECTRIC HEAT (table of contenst) for possible THA to EHA matchups and electrical ratings.

All electric heat sections consist of electric heating elements exposed directly to the airstream. See figure 1. Two electric heat sections (first section and second section) are used in all 15kW through 90kW heaters used in THA180/240 units. Multiple-stage elements are sequenced on and off in response to thermostat demand. EHA parts arrangement is shown in figures 14 and 15.

Control Box Components

The main control box (see figure 12) houses some electric heat components and the electric heat “hat” section (figure 13).

1-Terminal Strip TB15

TB15 distributes line power to the EHA unit andis used in all applications.

2-Fuse F4

Fuse F4 is used only with single point power supply. F4 gives over amperage protection to the compressor and other cooling components. F4 is located inside a sheet metal enclosure.

Electric Heat Hat Section

3-Electric Heat Relay K9

All THA series units with electric heat use an electric heat relay K9. K9 is a N.O. SPST pilot relay intended to electrically isolate the unit’s 24V circuit from the electric heat 15 to 60 kW 24V circuit. K9 is energized by the main control board A45. K9-1 closes, enabling T2 to energize the electric heat.

4-Time Delay DL2

DL2 is a solid state timer used in all electric heat units. DL2 staggers the energizing of the first (W1) and second (W2) stage heating elements by providing a timed interval. When the timer is de-energizing, the contacts are delayed 1 second before opening.

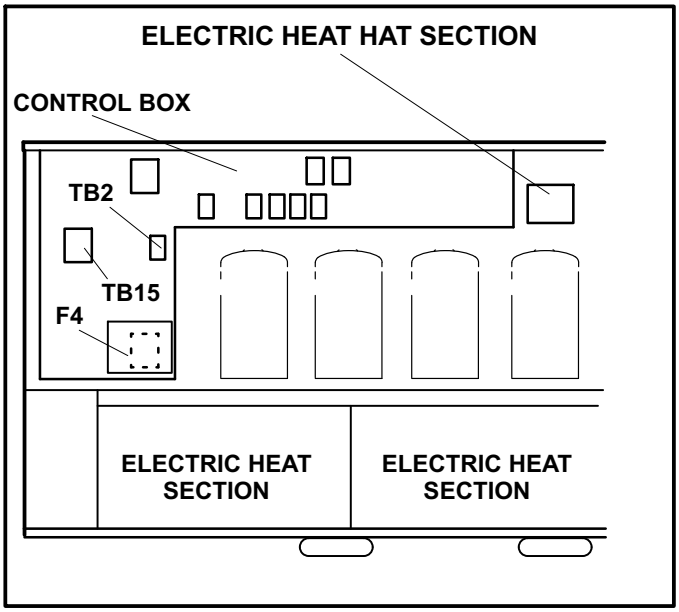


FIGURE 12

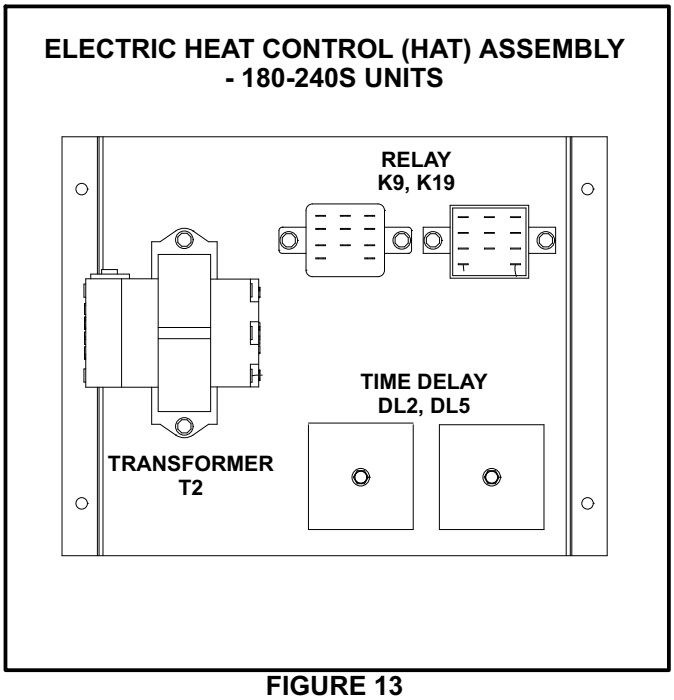


FIGURE 13

5-Time Delay DL5

Time delay DL5 is identical to DL2. DL5 further staggers the (W2) second stage heating elements by providing a timed interval between the energizing of the elements activated by DL2 and elements activated by DL5.

6-Electric Heat Transformer T2

All THA series units with electric heat use a single line voltage to 24VAC transformer mounted in the electric heat control hat section in the control box. The transformer supplies power to all electric heat controls (contactors and coils). The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker CB13. The 208/230 (Y) voltage transformers use two primary voltage taps as shown in figure 3. Transformer T2 is identical to T1.

Electric Heat Sections

7-Contactors K15, K16, K17 and K18

Contactors K15, K16, K17 and K18 are all three-pole double-break contactors located on the electric heat vestibule. K15 and K16 are located on the first electric heat section, while K17 and K18 are located on the second electric heat section. However, in the 15 and 30kW heaters, the first section houses all contactors and fuses. All contactors are equipped with a 24VAC coil. The coils in the K15, K16, K17 and K18 contactors are energized by the main panel A45. Contactors K15 and K17 energize the first stage heating elements, while K16 and K18 energize the second stage heating elements.

8-Fuse F3

Fuse F3 are housed in a fuse block which holds three fuses. Each F3 fuse is connected in series with each leg of electric heat. Figure 15 and table 10 show the fuses used with each electric heat section. For simplicity, the service manual labels the fuses F3 - 1 through F3 - 8.

9-Terminal Strip TB3

Electric heat line voltage connections are made to terminal strip TB3 (or a fuse block on some models) located in the upper left corner of the electric heat vestibule.

10-High Temperature Limits S15 and S107 (Primary)

S15 and S107 are SPST N.C. auto-reset thermostats located on the back panel of the electric heat section below the heating elements. S15 is the high temperature limit for the first electric heat section, while S107 is the high temperature limit for the second electric heat section. Both thermostats are identical and are wired in series with the first stage contactor coil. When either S15 or S107 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. The thermostats used on EHA360-45-1 Y/G/J are factory set to open at 200°F ± 5°F (93.3°C ± 2.8°C) on a temperature rise and automatically reset at 160°F ± 6°F (71.1°C ± 3.3°C) on a temperature fall. All other electric heat section thermostats are factory set to open at 170°F ± 5°F (76.7°C ± 2.8°C) on a temperature rise and automatically reset at 130°F ± 6°F (54.4°C ± 3.3°C) on a temperature fall. The thermostats are not adjustable.

11-Heating Elements HE1 through HE14

Heating elements are composed of helix wound bare nichrome wire exposed directly to the airstream. Three elements are connected in a three-phase arrangement. The 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 the corresponding contactors located on the electric heat vestibule panel. Once energized, heat transfer is instantaneous. High temperature protection is provided by primary and redundant high temperature limits and overcurrent protection is provided by fuses.

EHA 15, 30, 45, 60, and 90 KW
ELECTRIC HEAT SECTION PARTS ARRANGEMENT

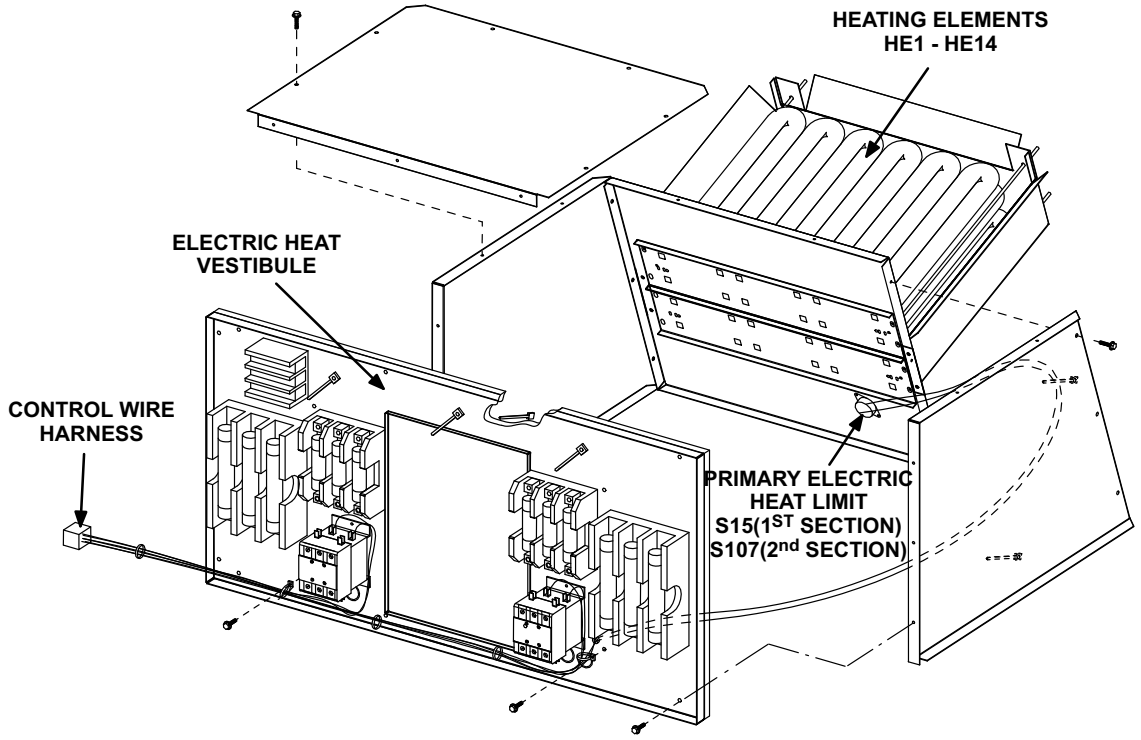


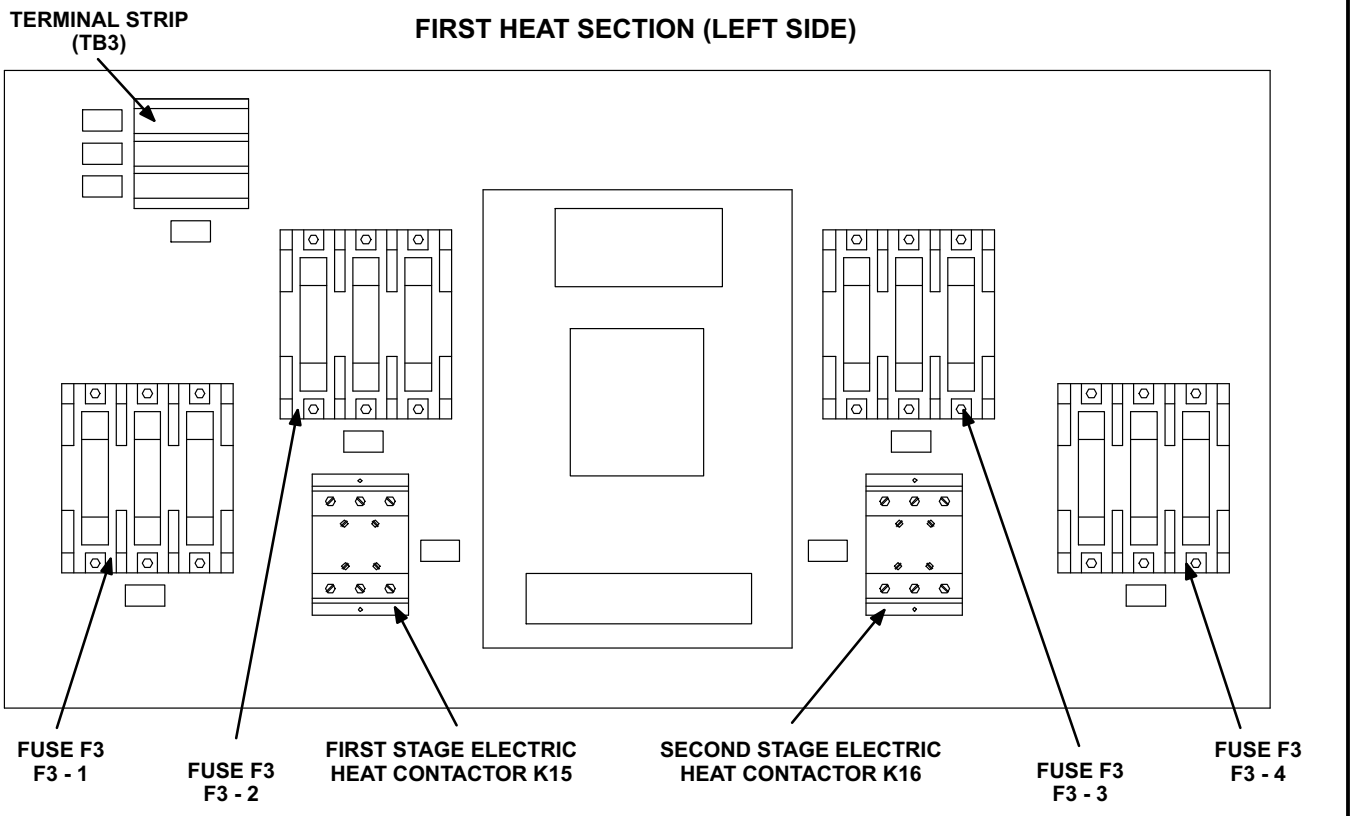
FIGURE 14

TABLE 10

THA180/240 ELECTRIC HEAT SECTION FUSE RATING									
EHA QUANTITY & SIZE	VOLTAGES	FUSE (3 each)							
		F3 - 1	F3 - 2	F3 - 3	F3 - 4	F3 - 5	F3 - 6	F3 - 7	F3 - 8
(1) EHA240-7.5 & (1) EHA240S-7.5 (15 kW Total)	208/230V	50 Amp 250V	-----	-----	-----	-----	-----	-----	-----
	460V	25 Amp 600V	-----	-----	-----	-----	-----	-----	-----
	575V	20 Amp 600V	-----	-----	-----	-----	-----	-----	-----
(1) EHA360-15 & (1) EHA360S-15 (30 kW Total) or (1) EHA156-15 & (1) EHA156S-15	208/230V	60 Amp 250V	60 Amp 250V	-----	-----	-----	-----	-----	-----
	460V	50 Amp 600V	-----	-----	-----	-----	-----	-----	-----
	575V	40 Amp 600V	-----	-----	-----	-----	-----	-----	-----
(2) EHA360-22.5 (45 kW Total) or (2) EHA156-22.5	208/230V	50 Amp 250V	-----	-----	25 Amp 250V	50 Amp 250V	-----	-----	25 Amp 250V
	460V	25 Amp 600V	-----	-----	15 Amp 600V	25 Amp 600V	-----	-----	15 Amp 600V
	575V	20 Amp 600V	-----	-----	10 Amp 600V	20 Amp 600V	-----	-----	10 Amp 600V
(2) EHA150-30 (60 kW Total) or (2) EHA156-30	208/230V	50 Amp 250V	-----	-----	50 Amp 250V	50 Amp 250V	-----	-----	50 Amp 250V
	460V	25 Amp 600V	-----	-----	25 Amp 600V	25 Amp 600V	-----	-----	25 Amp 600V
	575V	20 Amp 600V	-----	-----	20 Amp 600V	20 Amp 600V	-----	-----	20 Amp 600V
(2) EHA360-45 (90 kW Total)	208/230V	50 Amp 250V	-----	60 Amp 250V	60 Amp 250V	50 Amp 250V	-----	60 Amp 250V	60 Amp 250V
	460V	25 Amp 600V	-----	-----	50 Amp 600V	25 Amp 600V	-----	-----	50 Amp 600V
	575V	20 Amp 600V	-----	-----	40 Amp 600V	20 Amp 600V	-----	-----	40 Amp 600V

THA180/240 ELECTRIC HEAT VESTIBULE PARTS ARRANGEMENT

FIRST HEAT SECTION (LEFT SIDE)



SECOND HEAT SECTION (RIGHT SIDE)

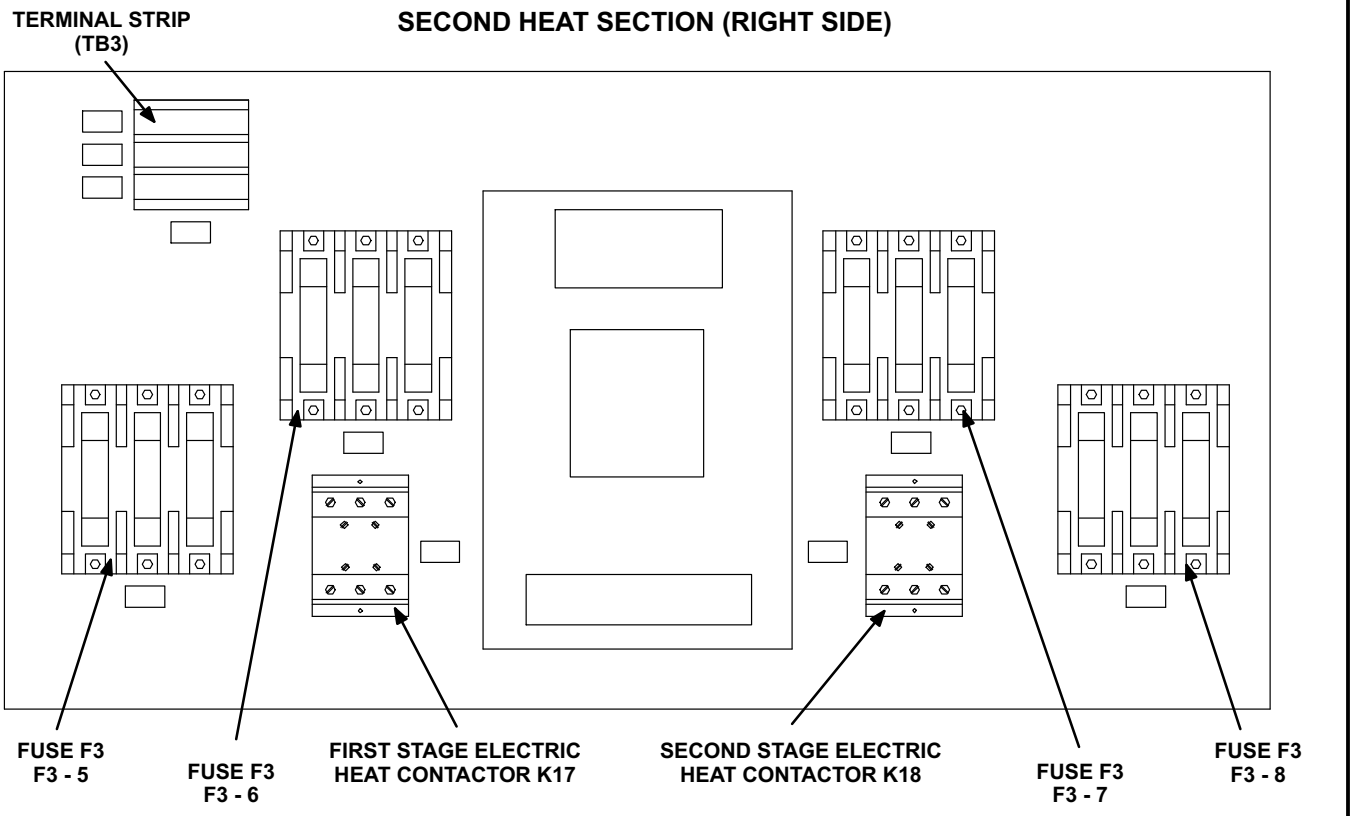


FIGURE 15

II-PLACEMENT AND INSTALLATION

Make sure 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 (LARMF18/36 or LARMFH18/24).

⚠ WARNING

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

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

III-STARTUP - OPERATION

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.

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 voltage is not within range listed on unit nameplate, stop unit and consult power company. Refer to unit nameplate for maximum rated load amps.

6- Inspect and adjust blower belt (see section on Blower Compartment - Blower Belt Adjustment).

B-Heating Startup

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

A first-stage heating demand (W1) will energize compressors 1 and 2. Both outdoor fans are energized with a W1 demand.

Note - L1 and L2 reversing valves are de-energized in the heating mode.

THA Units With Optional Electric Heat -

An increased heating demand (W2) will energize electric heat. Electric heat is also energized during the defrost cycle (W1) to maintain discharge air temperature.

C-Cooling Startup

⚠IMPORTANT

If unit is equipped with a crankcase heater. Make sure heater is energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

1- Remove coil covers before starting unit.

2- Set thermostat or temperature control device fan switch to **AUTO** or **ON.** Set thermostat or temperature control device to initiate a first-stage cooling demand.

A first-stage (Y1) cooling demand will energize compressor 1 and outdoor fans 1 & 2. An increased cooling demand (Y2) will initiate compressor 2 and outdoor fans 3 & 4. On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressor 1 and outdoor fans 1 & 2.

3- Refrigerant circuits are factory charged with HCFC-22 refrigerant. See unit rating plate for correct amount of charge.

4- Units contain two refrigerant circuits or systems. See figure 16.

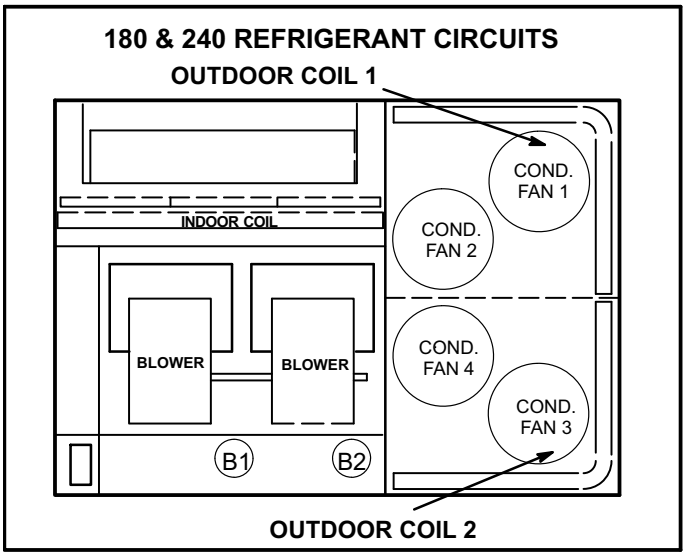


FIGURE 16

D-Safety or Emergency Shutdown

Turn off power to the unit.

IV-CHARGING

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires charge, *reclaim the charge, evacuate the system,* and *add required nameplate charge.*

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

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

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

2- Check each system separately with all stages operating.

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

4- Apply the outdoor temperature to tables 11 and 12 to determine normal operating pressures.

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

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

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

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

TABLE 11
THA180 NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	155	70	158	71
75°F	182	71	187	73
85°F	212	71	216	74
95°F	242	72	247	75
105°F	270	72	278	76
115°F	300	73	309	78

TABLE 12
THA240 NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	168	73	168	74
75°F	194	74	195	76
85°F	224	75	228	77
95°F	255	76	260	79
105°F	287	76	292	80
115°F	319	77	322	82

CHARGE VERIFICATION - APPROACH METHOD

1- Using the same thermometer, compare liquid temperature to outdoor ambient temperature.

Approach Temperature = Liquid temperature minus ambient temperature.

2- .Approach temperatures should match those in table 13. be 10°F ± 1 (5.5°C ± 0.5) for both circuits. An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.

TABLE 13
APPROACH TEMPERATURES

UNIT	CIRCUIT 1	CIRCUIT 2
180	10°F ± 1 (5.5°C ±0.5)	10°F ± 1 (5.5°C ±0.5)
240	11°F ± 1 (6.1°C ± 0.5)	11°F ± 1 (6.1°C ± 0.5)

3- Do not use the approach method if system pressures do not match tables 11 and 12. The approach method is not valid for grossly over or undercharged systems.

V-MAINTENANCE

The unit should be inspected once a year by a qualified service technician.

⚠ CAUTION

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

⚠ WARNING

Product contains fiberglass wool.
Disturbing the insulation in this product during installation, maintenance, or repair will expose you to fiberglass wool. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)
Fiberglass wool may also cause respiratory, skin, and eye irritation.
To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown on unit nameplate or contact your supervisor.

A-Lubrication

All motors are lubricated at the factory. No further lubrication is required.

Blower shaft bearings are prelubricated. For extended bearing life, relubricate at least once every two years with a lithium base grease, such as Alvania 3 (Shell Oil), Chevron BRB2 (Standard Oil) or Regal AFB2 (Texas Oil). Use a hand grease gun for relubrication. Add only enough grease to purge through the bearings so that a bead of grease appears at the seal lip contacts.

B-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.

C-Filters

Units are equipped with six 24 X 24 X 2" filters. Filters should be checked and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 17.

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

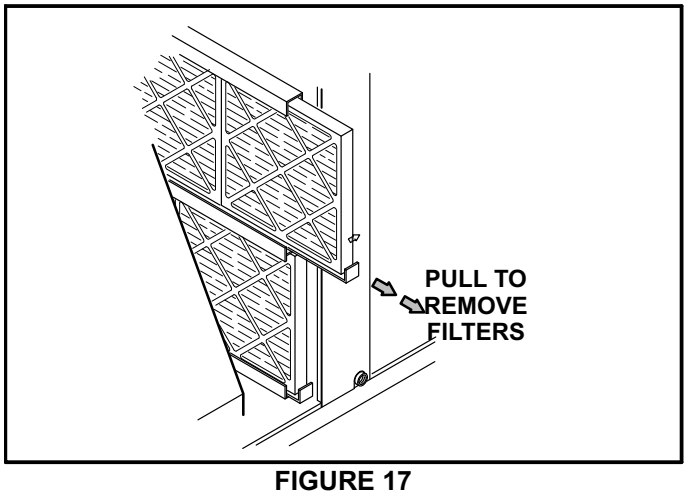


FIGURE 17

D-Indoor Coil

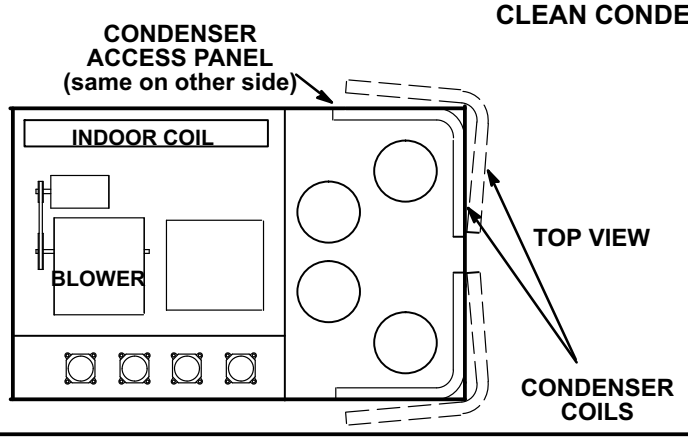
Inspect and clean coil at beginning of each cooling and heating season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

E-Outdoor Coil

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

Outdoor coils are made of two formed slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs *(no more than 4 inches)* and wash them thoroughly. See figure 18. Flush coils with water following cleaning.

CLEAN CONDENSER COIL



1- Remove unit top panel and both condenser access panels.
2- Remove screws securing coil end plates to mullions.
3- Remove clips connecting coils slabs and separate slabs 3-4" (76-102mm).
4- Clean coils with detergent or commercial coil cleaner.
5- Rinse thoroughly with water and reassemble.

FIGURE 18

VI-ACCESSORIES

The accessories section describes the application of most of the optional accessories which can be installed to the TGA units.

A-LARMF and LARMFH Mounting Frames

When installing either the TCA units on a combustible surface for downflow discharge applications, the LARMF18/36 14-inch or 24-inch (356 mm or 610mm) height roof mounting frame is used. For horizontal discharge applications, use LARMFH18/24 26-inch or 37-inch (660mm or 940mm) height roof mounting frame. This frame converts unit from down-flow to horizontal air flow. The 37 inch (940mm) horizontal frame meets National Roofing Code requirements. The roof mounting frames are recommended in all other applications but not required. If the TCA units are not mounted on a flat (roof) surface, they MUST be supported under all edges and under the middle of the unit to prevent sagging. The units MUST be mounted level within 1/16" per linear foot or 5mm per meter in any direction. The assembled LARMF18/36 mounting frame is shown in figure 19. Refer to the roof mounting frame installation instructions for details of proper assembly and mounting. The roof mounting frame MUST be squared to the roof and level 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 20. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

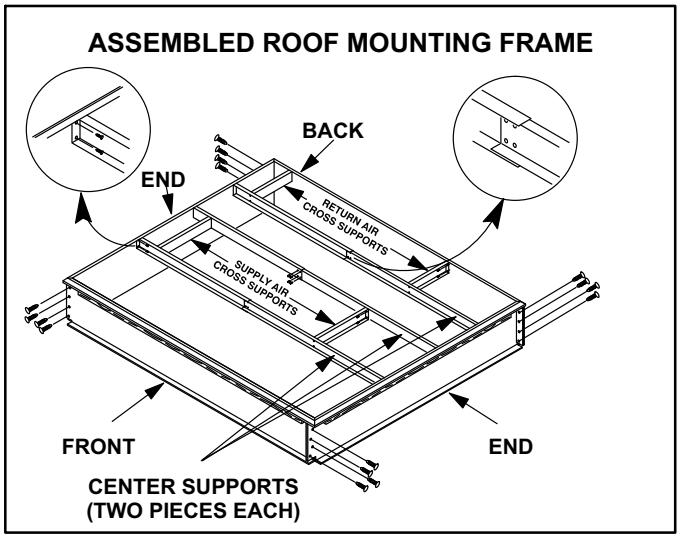


FIGURE 19

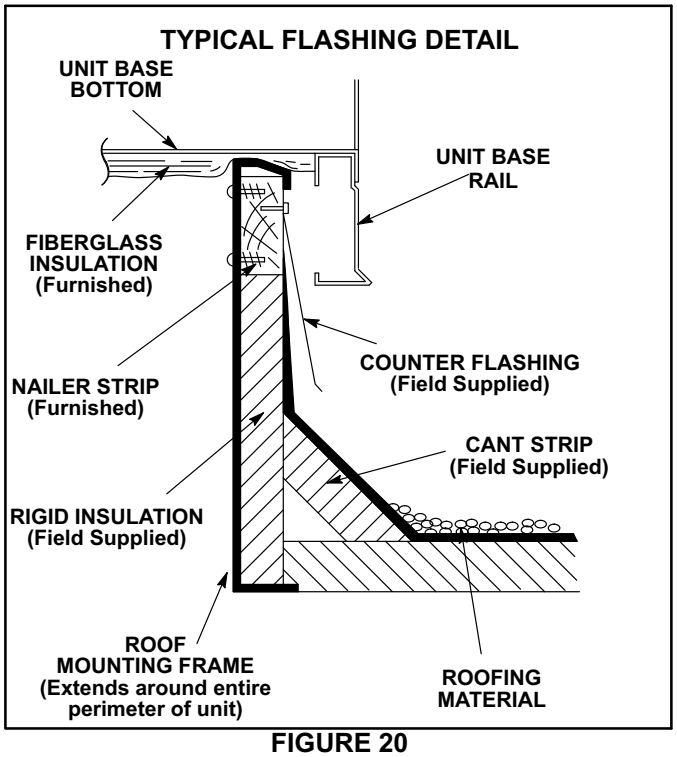


FIGURE 20

B-Transitions

Optional supply/return transitions LASRT18/24 are available for use with TCA series units utilizing optional LARMF18/36 roof mounting frame. Transition must be installed in the LARMF18/36 mounting frame before mounting the unit to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

C-Supply and Return Diffusers (all units)

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

D-T1ECON

Unit may contain an optional modulating economizer equipped with an A6 enthalpy control and an A7 outdoor enthalpy sensor. The economizer modulates to use outdoor air for free cooling when temperature is suitable.

The A6 enthalpy control is located in the economizer access area. See figure 21. The A7 enthalpy sensor is located on the division panel between horizontal supply and return air sections.

Optional Sensors

An optional differential sensor (A62) may be used with the A7 outdoor sensor to compare outdoor air enthalpy to return air enthalpy. When the outdoor air enthalpy is below the return air enthalpy, outdoor air is used for free cooling.

A mixed air sensor (R1) is used in modulating the dampers to 55°F (13°C) blower compartment air temperature.

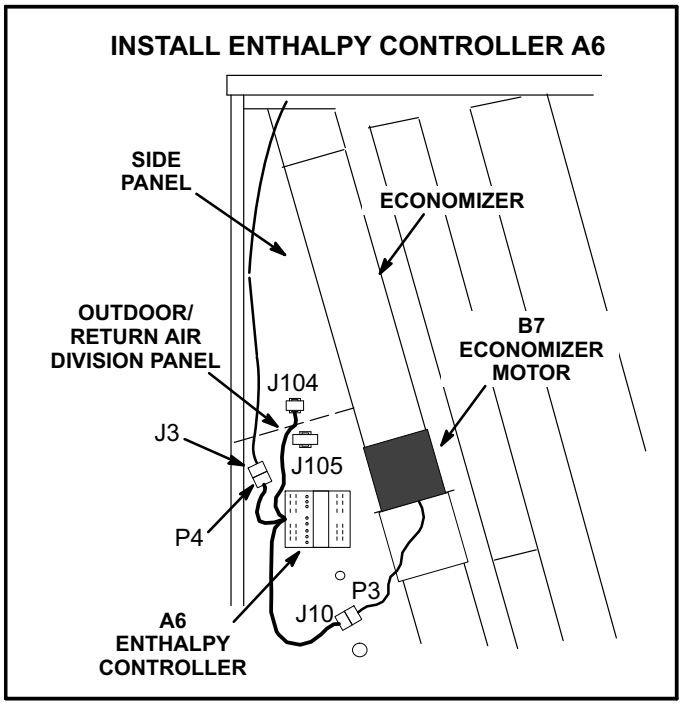


FIGURE 21

An optional IAQ sensor (A63) may be used to lower operating costs by controlling outdoor air based on CO_2 level or room occupancy (also called demand control ventilation or DCV). Damper minimum position can be set lower than traditional minimum air requirements; dampers open to traditional ventilation requirements when CO_2 level reaches DCV (IAQ) setpoint.

Refer to instructions provided with sensors for installation.

A6 Enthalpy Control LED's

A steady green Free Cool LED indicates that outdoor air is suitable for free cooling.

When an optional IAQ sensor is installed, a steady green DCV LED indicates that the IAQ reading is higher than setpoint requiring more fresh air. See figure 22.

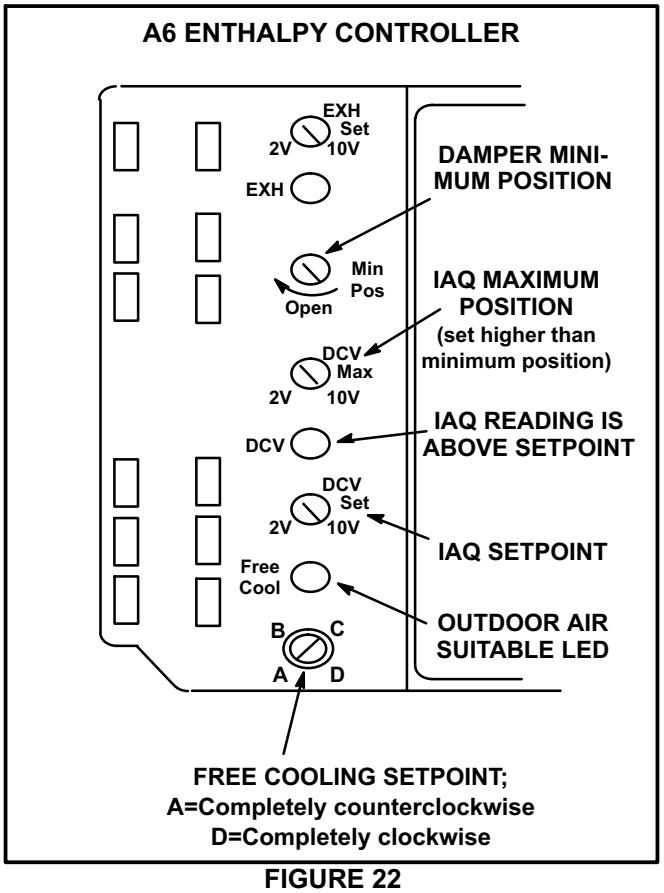


FIGURE 22

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 14. Setting A is recommended. See figure 22. At setting A, free cooling will be energized when outdoor air is approximately 73°F (23°C) and 50% relative humidity. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be energized at 70°F (21°C) and 50% relative humidity.

When an optional A62 differential sensor is installed, turn A6 enthalpy control free cooling setpoint potentiometer completely clockwise to position "D".

TABLE 14
ENTHALPY CONTROL SETPOINTS

Control Setting	Free Cooling Setpoint At 50% RH
A	73° F (23° C)
B	70° F (21° C)
C	67° F (19° C)
D	63° F (17° C)

Damper Minimum Position

NOTE - A jumper is factory-installed between TB1 A1 and A2 terminals to maintain occupied status (allowing minimum fresh air). When using an electronic thermostat or energy management system with an occupied/unoccupied feature, remove jumper.

1- Set thermostat to occupied mode if the feature is available. Make sure jumper is in place between A45 control board TB1 terminals A1 and A2 if using a thermostat which does not have the feature.

2- Rotate MIN POS SET potentiometer to approximate desired fresh air percentage.

Note - Damper minimum position can be set lower than traditional minimum air requirements when an IAQ sensor is specified. Dampers will open to DCV MAX setting (if CO2 is above setpoint) to meet traditional ventilation requirements.

3- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point “A” (40°F, 4°C shown).

4- Measure return air temperature. Mark that point on the top line of chart 1 and label the point “B” (74°F, 23°C shown).

5- Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point “C” (70°F, 21°C shown).

6- Draw a straight line between points A and B.

7- Draw a vertical line through point C.

8- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.

9- If fresh air percentage is less than desired, adjust MIN POS SET potentiometer higher. If fresh air percentage is more than desired, adjust MIN POS SET potentiometer lower. Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

DCV Set and Max Settings

Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO_2 sensor, dampers will start to open when the IAQ sensor reads approximately 1000ppm. Adjust the DCV SET potentiometer to the approximate setting specified by the controls contractor. Refer to figure 22.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO_2 rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 22.

Note - DCV Max must be set higher than economizer minimum position setting for proper demand control ventilation.

Economizer Operation

The occupied time period is determined by the thermostat or energy management system.

Outdoor Air Not Suitable:

During the unoccupied time period dampers are closed.

During the occupied time period a cooling demand will open dampers to minimum position and mechanical cooling functions normally. See table 15.

During the occupied time period dampers will open to DCV MAX when IAQ reading is above setpoint (regardless of thermostat demand or outdoor air suitability).

Outdoor Air Suitable:

See table 16 for economizer operation with a standard three-stage thermostat.

During the occupied period, dampers will open to DCV MAX when IAQ reading is above setpoint (regardless of thermostat demand or outdoor air suitability). DCV MAX will NOT override damper full-open position. When an R1 mixed air sensor for modulating dampers is installed, DCV MAX may override damper free cooling position when occupancy is high and outdoor air temperatures are low. If R1 senses discharge air temperature below 45°F (7°C), dampers will move to minimum position until discharge air temperature rises to 48°F (9°C).

B-Outdoor Air Dampers

T1DAMP20 used on TCA units consists of a set of dampers which may be manually or motor (M) operated to allow outside air into the system (see figure 25). Either air damper can be installed in TCA units.The motorized damper assembly opens to minimum position during the occupied time period and remains closed during the unoccupied period. Manual damper assembly is set at installation and remains in that position. See figure 23. Washable filter supplied with the outdoor air dampers 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.

Optional manual and motorized outdoor air dampers provide fresh outdoor air.

Follow the steps to determine fresh air percentage

1- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point “A” (40°F, 4°C shown).

2- Measure return air temperature. Mark that point on the top line of chart 1 and label the point “B” (74°F, 23°C shown).

3- Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point “C” (70°F, 21°C shown).

4- Draw a straight line between points A and B.

5- Draw a vertical line through point C.

6- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.

7- If fresh air percentage is less than desired, adjust thumbwheel higher. If fresh air percentage is more than desired, adjust thumbwheel lower. Repeat steps until calculation reads desired fresh air percentage. See figure 24.

Set damper minimum position in the same manner as economizer minimum position. Adjust motorized damper position using the thumbwheel on the damper motor. See figure 24. Manual damper fresh air intake percentage can be determined in the same manner.

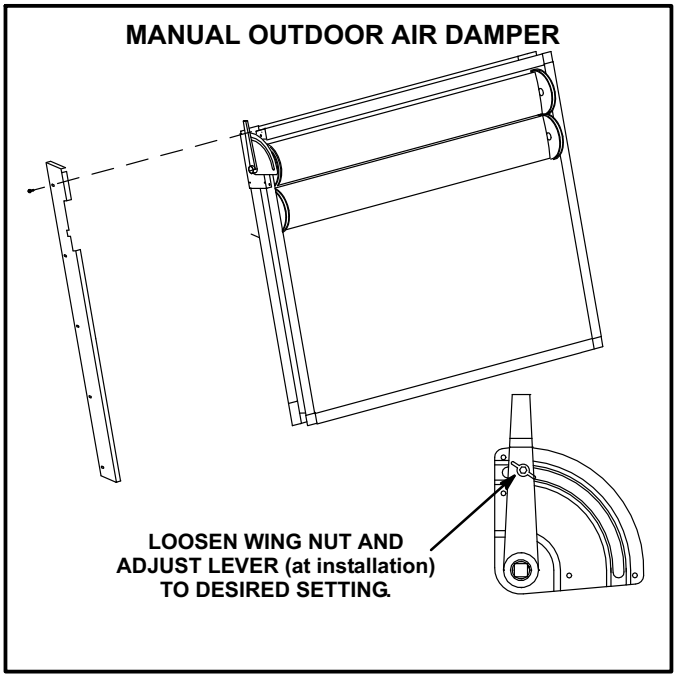


FIGURE 23

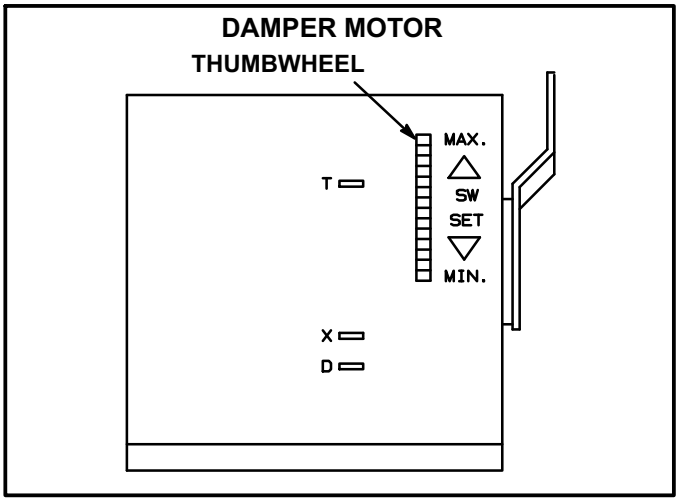


FIGURE 24

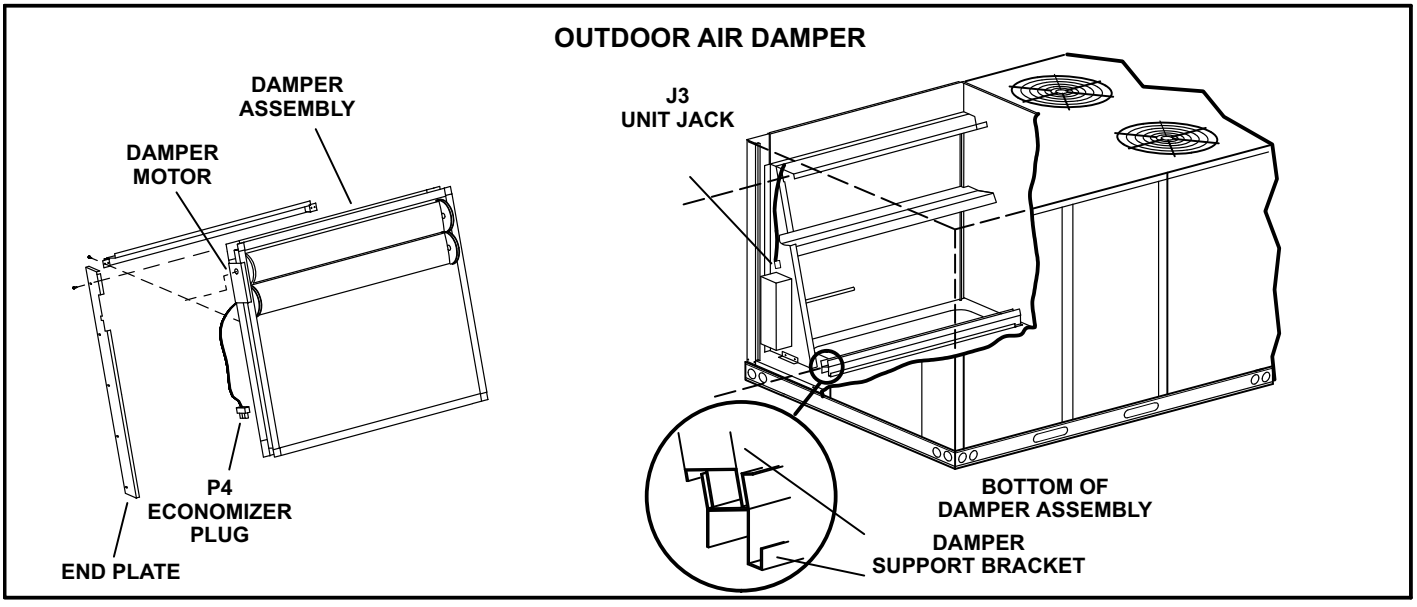


FIGURE 25

CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE

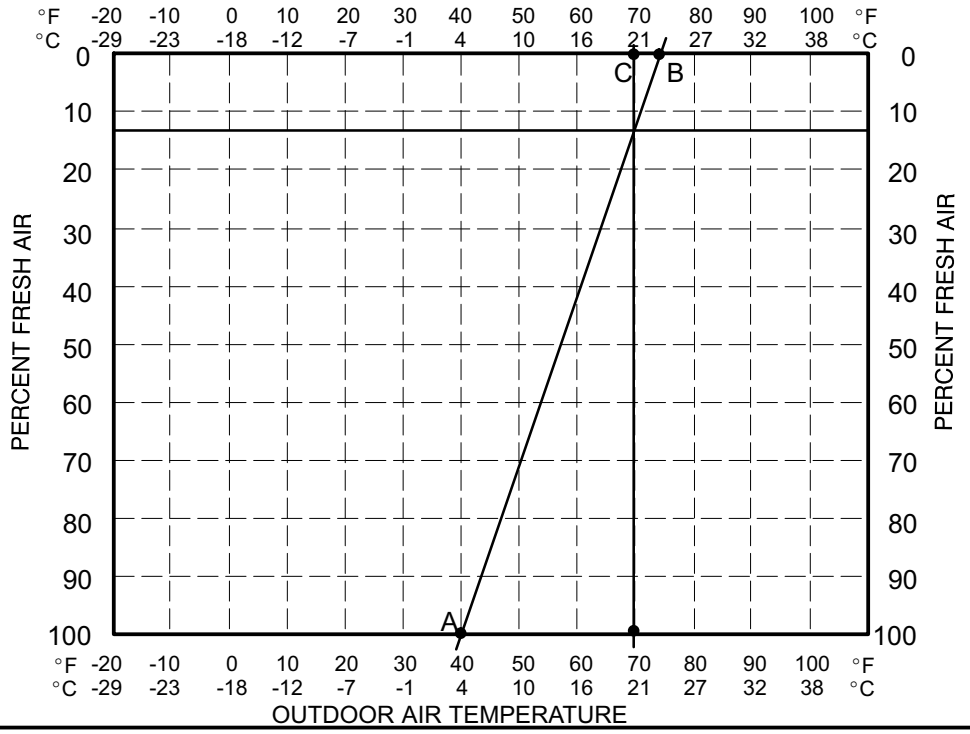


TABLE 15

ECONOMIZER OPERATION-OUTDOOR AIR IS **NOT SUITABLE** FOR FREE COOLING -- FREE COOL LED "OFF"

THERMOSTAT DEMAND	DAMPER POSITION		MECHANICAL COOLING
	UNOCCUPIED	**OCCUPIED**	
Off	Closed	Closed	No
G	Closed	Minimum*	No
Y1	Closed	Minimum*	Stage 1
Y2	Closed	Minimum*	Stage 2
Y3	Closed	Minimum*	Stage 2

*IAQ sensor can open damper to DCV max.

TABLE 16

ECONOMIZER OPERATION-OUTDOOR AIR IS **SUITABLE** FOR FREE COOLING -- FREE COOL LED "ON"

THERMOSTAT DEMAND	DAMPER POSITION		MECHANICAL COOLING
	UNOCCUPIED	**OCCUPIED**	
Off	Closed	Closed	No
G	Closed	Minimum	No
Y1	Modulating	Modulating	No
Y2	Modulating	Modulating	Stage 1
Y3	Modulating	Modulating	Stage 2

E-LAGED(H) Gravity Exhaust Dampers

LAGED18/24 dampers (figure 26) available for TCA180/300 units, are used in downflow and LAGED(H)18/24 are used in horizontal air discharge applications. LAGED(H) gravity exhaust dampers are installed in the return air plenum . The dampers must be used any time an economizer or power exhaust fans are applied to TCA series units.

Gravity exhaust dampers allow exhaust air to be discharged from the system when an economizer and/or power exhaust is operating. Gravity exhaust dampers also prevent outdoor air infiltration during unit off cycle. See installation instructions for more detail.

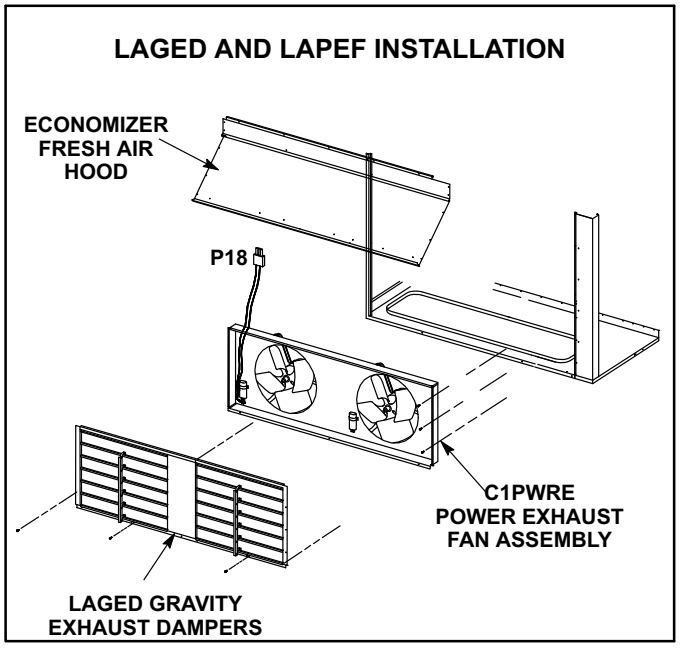


FIGURE 26

F-C1PWRE20C Power Exhaust Fans

C1PWRE20C available for TCA180/300 units are power exhaust fans used in downflow applications only. The fans require optional down-flow gravity exhaust dampers and T1ECON economizers. Power exhaust fans provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. Figure 26 shows the location of the C1PWRE. See installation instructions for more detail.

G-Dirty Filter Switch S27

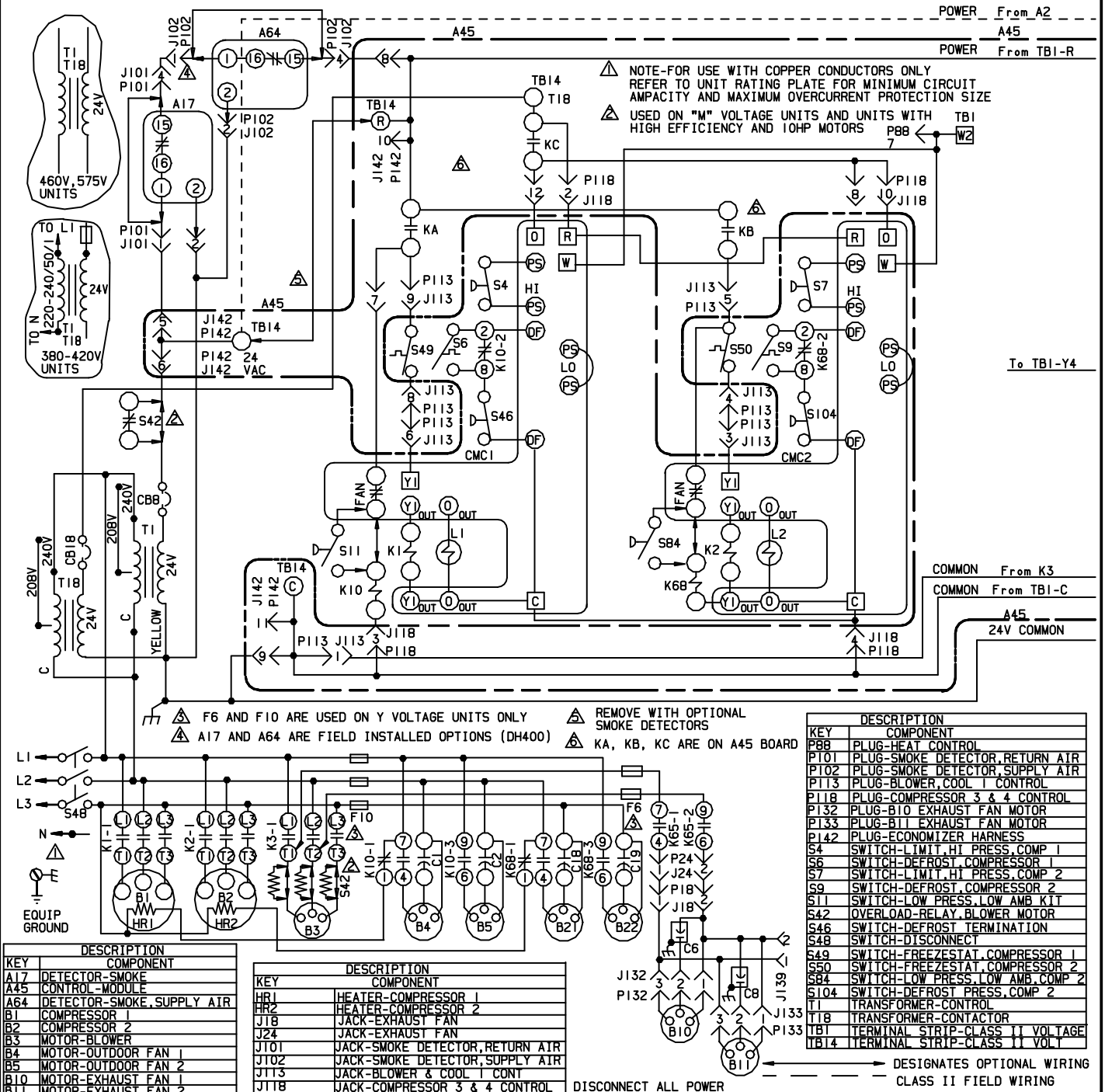
The dirty filter switch senses static pressure increase indicating a dirty filter condition. The switch is N.O. and closes at 1" W.C. (248.6 Pa) The switch is mounted on the top filter channel corner.

H-Indoor Air Quality (CO_2) Sensor A63

The indoor air quality sensor monitors CO_2 levels and reports the levels to the economizer control module A6. The board adjusts the economizer dampers according to the CO_2 levels. The sensor is mounted next to the indoor thermostat or in the return air duct. Refer to the indoor air quality sensor installation instructions for proper adjustment.

VII-WIRING DIAGRAMS AND OPERATION SEQUENCE

THA180 / 240



DESCRIPTION	
KEY	COMPONENT
P88	PLUG-HEAT CONTROL
P101	PLUG-SMOKE DETECTOR,RETURN AIR
P102	PLUG-SMOKE DETECTOR,SUPPLY AIR
P113	PLUG-BLOWER,COOL 1 CONTROL
P118	PLUG-COMPRESSOR 3 & 4 CONTROL
P132	PLUG-B10 EXHAUST FAN MOTOR
P133	PLUG-B11 EXHAUST FAN MOTOR
P142	PLUG-ECONOMIZER HARNESS
S4	SWITCH-LIMIT,HI PRESS,COMP 1
S6	SWITCH-DEFROST,COMPRESSOR 1
S7	SWITCH-LIMIT,HI PRESS,COMP 2
S9	SWITCH-DEFROST,COMPRESSOR 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S42	OVERLOAD-RELAY,BLOWER MOTOR
S46	SWITCH-DEFROST TERMINATION
S48	SWITCH-DISCONNECT
S49	SWITCH-FREEZESTAT,COMPRESSOR 1
S50	SWITCH-FREEZESTAT,COMPRESSOR 2
S84	SWITCH-LOW PRESS,LOW AMB,COMP 2
S104	SWITCH-DEFROST PRESS,COMP 2
T1	TRANSFORMER-CONTROL
T18	TRANSFORMER-CONTACTOR
TB1	TERMINAL STRIP-CLASS II VOLTAGE
TB14	TERMINAL STRIP-CLASS II VOLT

DESCRIPTION	
KEY	COMPONENT
A17	DETECTOR-SMOKE
A45	CONTROL-MODULE
A64	DETECTOR-SMOKE,SUPPLY AIR
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN 1
B5	MOTOR-OUTDOOR FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B21	MOTOR-OUTDOOR FAN 3
B22	MOTOR-OUTDOOR FAN 4
C1	CAPACITOR-OUTDOOR FAN 1
C2	CAPACITOR-OUTDOOR FAN 2
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
C18	CAPACITOR-OUTDOOR FAN 3
C19	CAPACITOR-OUTDOOR FAN 4
CB8	CIRCUIT BREAKER-TRANS T1
CB18	CIRCUIT BREAKER-TRANS T18
CMC1	TIMER-DEFROST,COMP 1
CMC2	TIMER-DEFROST,COMP 2
F6	FUSE-EXHAUST FAN
F10	FUSE-OUTDOOR FAN MOTOR

DESCRIPTION	
KEY	COMPONENT
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J18	JACK-EXHAUST FAN
J24	JACK-EXHAUST FAN
J101	JACK-SMOKE DETECTOR,RETURN AIR
J102	JACK-SMOKE DETECTOR,SUPPLY AIR
J113	JACK-BLOWER & COOL 1 CONT
J118	JACK-COMPRESSOR 3 & 4 CONTROL
J132	JACK-BLOWER,EXHAUST FAN MTR
J133	JACK-B11 EXHAUST FAN MOTOR
J139	JACK-EXHAUST FAN 3
J142	JACK-ECONOMIZER HARNESS
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3-1	RELAY/CONTACTOR-BLOWER
K10,-1,2,3	RELAY-OUTDOOR FAN 1
K65-1,2	RELAY-EXHAUST FAN
K68,-1,2,3	RELAY-OUTDOOR FAN 2
L1	VALVE-REVERSING 1
L2	VALVE-REVERSING 2
P18	PLUG-EXHAUST FAN
P24	PLUG-EXHAUST FAN

DISCONNECT ALL POWER BEFORE SERVICING

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

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

WIRING DIAGRAM	4/05
HEAT PUMP-PACKAGED	
THA-180,240-1-G,J,M,Y	
HEAT PUMP SECTION B5	
Supersedes Form No. 534,480W	New Form No. 535,028W

Litho U.S.A.

SEQUENCE OF OPERATION THA180/240

Power:

1. Line voltage from unit disconnect energizes transformer T1 and T18. T1 provides 24VAC power to terminal strip TB1 found on the MCC board A45. TB1 provides 24VAC to the unit cooling, heating and blower controls and thermostat. T18 provides 24VAC to CMC1, CMC2 and reversing valves L1 and L2.

Blower Operation:

2. The main control module A45 receives a demand from thermostat terminal G. A45 energizes blower contactor K3 with 24VAC. K3 closes, energizing blower B3.

Optional Power Exhaust Operation:

3. The economizer control module receives a demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).
4. N.O. K65-1 and N.O. K65-2 both close, energizing exhaust fan motors B10 and B11.

First Stage Cooling Demand (compressor B1)

5. First stage cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 2.)
6. A45 energizes reversing valves L1 and L2.
7. 24VAC is routed from main control module A45, P113 to N.C. freezestats S49. Compressor contactor K1 is energized.
8. K1 closes energizing compressor B1.
9. 24VAC is routed through optional optional N.O. low ambient pressure switch S11 (now closed) to energize outdoor fan contactor K10.
10. N.O. K10-1 and K10-2 close energizing outdoor fan B4 and B5. .

Second Stage Cooling Demand (compressor B2)

11. Second stage cooling demand energizes Y2.
12. 24VAC is routed from main control module A45, P113 to N.C. freezestats S50. Compressor contactor K2 is energized.
13. K2 closes energizing compressor B2.
14. 24VAC is routed through N.O. low ambient pressure switch S84 (now closed) to energize outdoor fan contactor K68.
15. N.O. K68-1 and K68-2 close energizing outdoor fan B21 and B22.

First Stage Heat (compressors B1 and B2)

NOTE: On first heating demand after unit has been in cooling mode, module A45 will de-energize reversing valve L1 and L2.

16. Heating demand energizes W1 in the thermostat.
17. Main control module A45 proves N.C.high pressure switches S4 and S7 and N.C. freezestats S49 and S50 compressor contactors K1 and K2 are energized.
18. K1 and K2 close energizing compressor B1 and B2.
19. 24VAC is routed from main control module A45, P113 to N.C. freezestats S49 and S50. Compressor contactors K1 and K2 are energized.
20. 24VAC is routed through optional N.C. low ambient switches S11 and S84 to energize outdoor fan relays K10 and K68.
21. K10 and K68 close energizing outdoor fans B4, B5, B21 and B22.

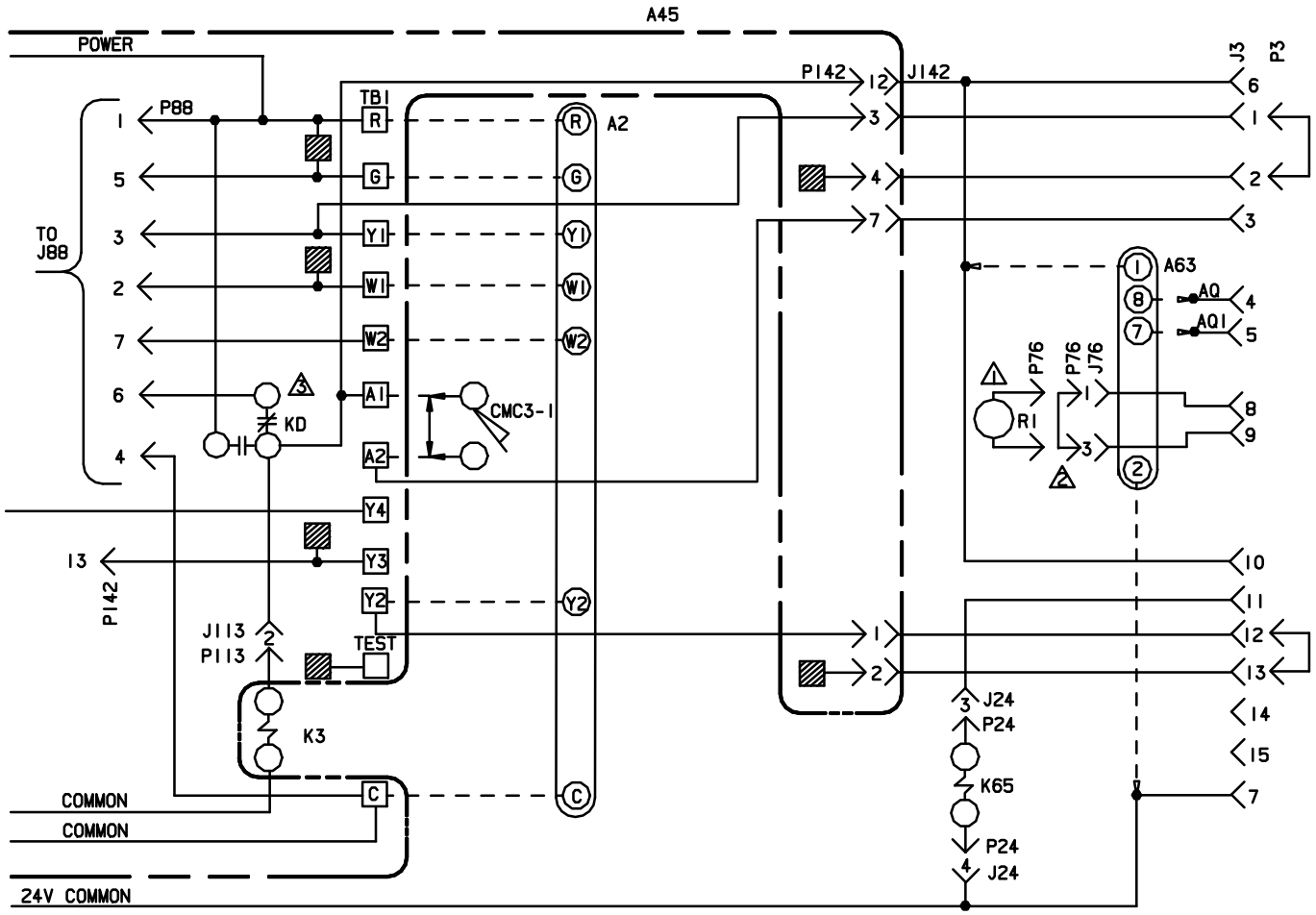
Second Stage Heat (electric heat):

22. Second stage heat demand energizes W2 in the thermostat.
23. See sequence of operation for electric heat.

Defrost Mode

24. During heating operation, when outdoor coil drops to 35 ± 4° the defrost thermostat S6 or S9 closes initiating defrost (after minimum run time of 30, 60 or 90 minutes).
25. When defrost begins, the reversing valve L1 or L2 is energized. Supplemental electric heat (W2) is energized.
26. When L1 energizes, outdoor fan relay K10 and outdoor fans B4 and B5 are de-energized. When L2 energizes, outdoor fan relay K68 and outdoor fans B21 and B22 are de-energized.
27. Defrost terminates when the pressure switch for the circuit S46 or S104 opens, or when 15 minutes has elapsed.The defrost cycle is **not** terminated when thermostat demand ends.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT



⚠1 R1 IS USED WITH OPTIONAL MODULATING ECONOMIZER FIELD KIT

⚠2 REMOVE JUMPER WHEN R1 IS USED

⚠3 KD IS ON A45 BOARD

DESCRIPTION	
KEY	COMPONENT
A2	SENSOR-ELECTRONIC
A45	CONTROL-MODULE
A63	SENSOR-CO2
CMC3-1	CLOCK-TIME
J3	JACK-UNIT, ECONOMIZER
J24	JACK-EXHAUST FAN
J76	JACK-SENSOR, ECONOMIZER
J113	JACK-BLOWER & COOL 1 CONTROL
J142	JACK-ECONOMIZER HARNESS
K3	RELAY/CONTACTOR-BLOWER
K65	RELAY-EXHAUST FAN
P3	PLUG-LESS ECONOMIZER
P24	PLUG-EXHAUST FAN
P76	PLUG-SENSOR, ECONOMIZER
P88	PLUG-HEAT CONTROL
P113	PLUG-BLOWER & COOL 1 CONTROL
P142	PLUG-ECONOMIZER HARNESS
R1	SENSOR-MIXED OR SUPPLY AIR
TB1	TERMINAL STRIP-24V CLASS II

THERMOSTAT HEAT ANTICIPATION SETTING 0.1 AMP

INDICATES MICRO PROCESSER

DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

WIRING DIAGRAM	2/05
ACCESSORIES	
ELECTROMECHANICAL OR ELECTRONIC THERMOSTAT FOR TCA/TGA UNITS	
TEMPERATURE CONTROL SECTION CI	
Supersedes Form No.	New Form No. 534,484W

 Litho U.S.A.

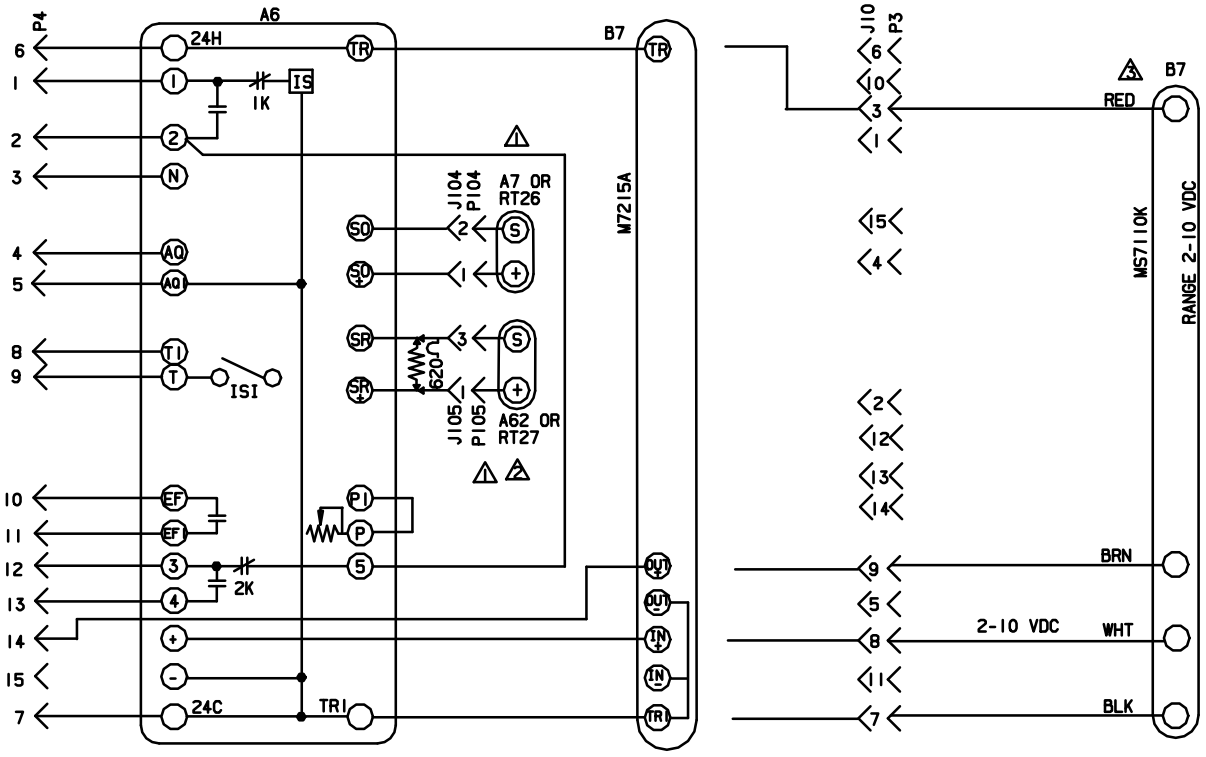
POWER:

1. Terminal strip TB1 found on the main control module A45 energize thermostat components with 24VAC.

OPERATION:

2. The main control module A45 receives data from the electronic thermostat A2 (Y1, Y2, Y3, W1, W2, G, OCP) A45 energizes the appropriate components for heat or cool demand.

"T" SERIES ECONOMIZER



KEY	DESCRIPTION COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
B7	MOTOR-DAMPER, ECONOMIZER
J10	JACK-ECONOMIZER
J104	JACK-SENSOR,OUTDOOR ENTHALPY
J105	JACK-SENSOR,RETURN AIR ENTHALPY
P3	PLUG-LESS ECONOMIZER
P4	PLUG-ECONOMIZER
P104	PLUG-SENSOR,OUTDOOR ENTHALPY
P105	PLUG-SENSOR,RETURN AIR ENTHALPY
RT26	SENSOR-OUTDOOR AIR TEMP
RT27	SENSOR-INDOOR AIR TEMP

△3 USED ON C BOX UNITS

△2 A62 ENTHALPY SENSOR OR RT27 USED FOR DIFFERENTIAL SENSING

△1 RT26 AND RT27, TEMPERATURE SENSORS MAY BE USED INSTEAD OF A7 AND A62 ENTHALPY SENSORS

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

WIRING DIAGRAM	12/04
ACCESSORIES	
ECONOMIZER FOR TCA/TGA UNITS	
ECONOMIZER SECTION DI	
Supersedes Form No.	New Form No. 534,965W

SEQUENCE OF OPERATION

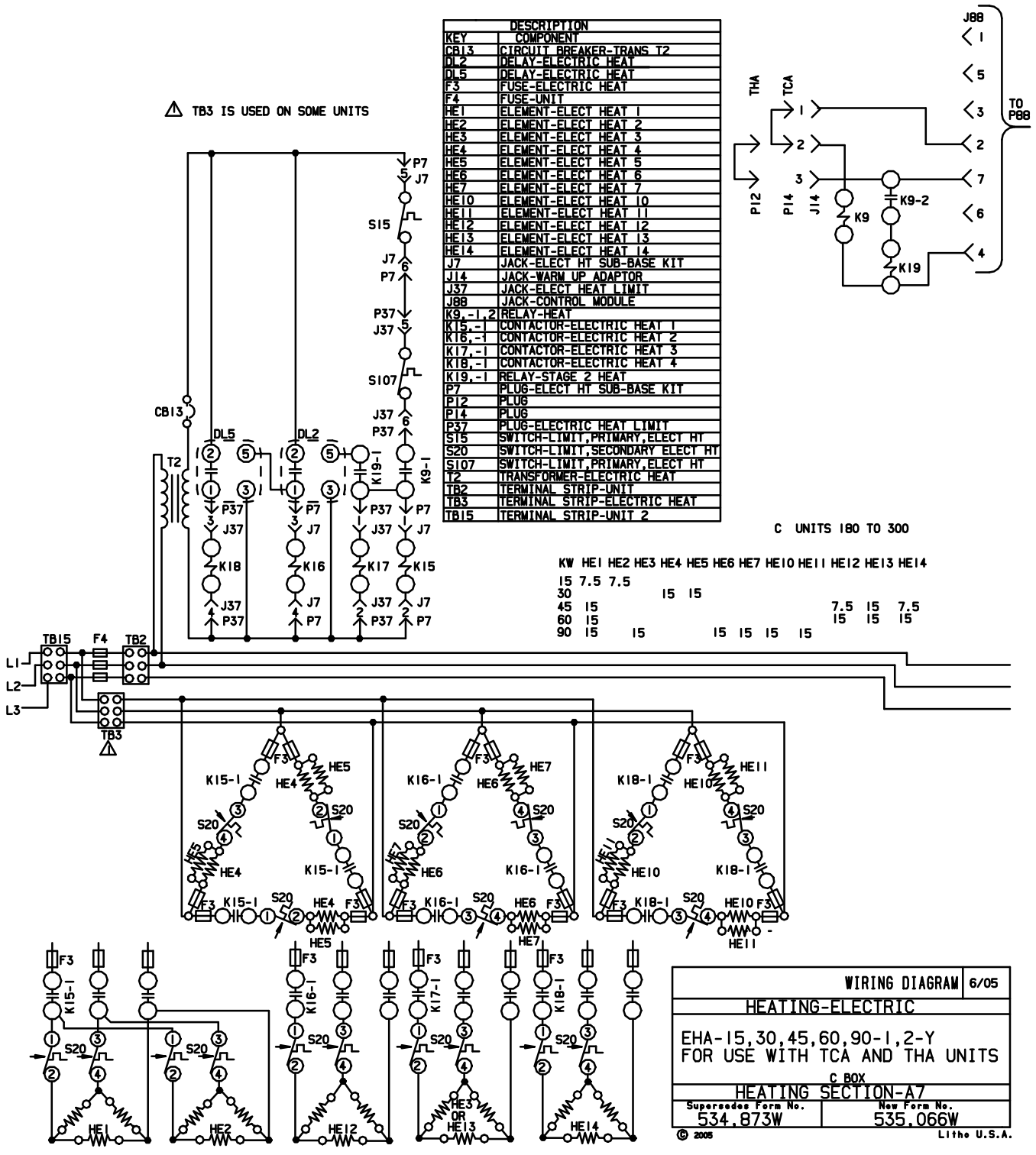
POWER:

1. Economizer control module A6 is energized through main module A45, P142 when contactor K3 is energized.

OPERATION:

2. Enthalpy sensor A7 and A62 (if differential enthalpy is used) communicates to the economizer control module A6 when to power the damper motor B7.
3. Economizer control module A6 supplies B7 with 0 - 10 VDC to control the positioning of economizer.
4. The damper actuator provides 2 to 10 VDC position feedback.

EHA-15, 30, 45, 60, 90kW Y VOLTAGE



DESCRIPTION	
KEY	COMPONENT
CB13	CIRCUIT BREAKER-TRANS T2
DL2	DELAY-ELECTRIC HEAT
DL5	DELAY-ELECTRIC HEAT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECT HEAT 1
HE2	ELEMENT-ELECT HEAT 2
HE3	ELEMENT-ELECT HEAT 3
HE4	ELEMENT-ELECT HEAT 4
HE5	ELEMENT-ELECT HEAT 5
HE6	ELEMENT-ELECT HEAT 6
HE7	ELEMENT-ELECT HEAT 7
HE10	ELEMENT-ELECT HEAT 10
HE11	ELEMENT-ELECT HEAT 11
HE12	ELEMENT-ELECT HEAT 12
HE13	ELEMENT-ELECT HEAT 13
HE14	ELEMENT-ELECT HEAT 14
J7	JACK-ELECT HT SUB-BASE KIT
J14	JACK-WARM UP ADAPTOR
J37	JACK-ELECT HEAT LIMIT
J88	JACK-CONTROL MODULE
K9,-1,2	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
P7	PLUG-ELECT HT SUB-BASE KIT
P12	PLUG
P14	PLUG
P37	PLUG-ELECTRIC HEAT LIMIT
S15	SWITCH-LIMIT,PRIMARY,ELECT HT
S20	SWITCH-LIMIT,SECONDARY ELECT HT
S107	SWITCH-LIMIT,PRIMARY,ELECT HT
T2	TRANSFORMER-ELECTRIC HEAT
TB2	TERMINAL STRIP-UNIT
TB3	TERMINAL STRIP-ELECTRIC HEAT
TB15	TERMINAL STRIP-UNIT 2

C UNITS 180 TO 300

KW	HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE10	HE11	HE12	HE13	HE14
15	7.5	7.5										
30			15	15								
45	15									7.5	15	7.5
60	15									15	15	15
90	15		15			15	15	15	15			

WIRING DIAGRAM	6/05
HEATING-ELECTRIC	
EHA-15,30,45,60,90-1,2-Y FOR USE WITH TCA AND THA UNITS	
C BOX HEATING SECTION-A7	
Supersedes Form No. 534.873W	New Form No. 535.066W

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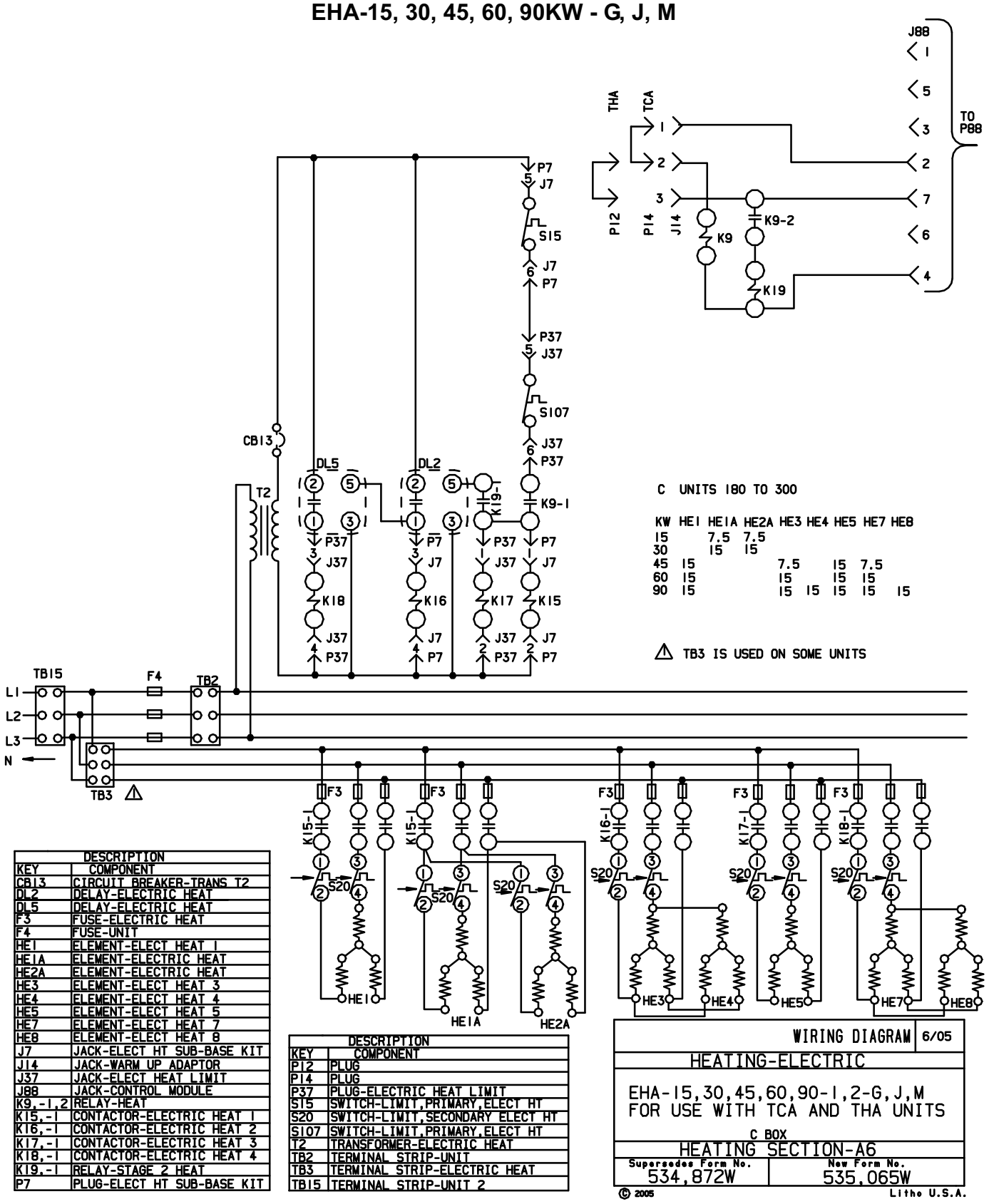
EHA-15, 30, 45, 60, 90KW - G, J, M



KEY	DESCRIPTION COMPONENT
CB13	CIRCUIT BREAKER-TRANS T2
DL2	DELAY-ELECTRIC HEAT
DL5	DELAY-ELECTRIC HEAT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECT HEAT 1
HE1A	ELEMENT-ELECTRIC HEAT
HE2A	ELEMENT-ELECTRIC HEAT
HE3	ELEMENT-ELECT HEAT 3
HE4	ELEMENT-ELECT HEAT 4
HE5	ELEMENT-ELECT HEAT 5
HE7	ELEMENT-ELECT HEAT 7
HE8	ELEMENT-ELECT HEAT 8
J7	JACK-ELECT HT SUB-BASE KIT
J14	JACK-WARM UP ADAPTOR
J37	JACK-ELECT HEAT LIMIT
J88	JACK-CONTROL MODULE
K9,-1,2	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
P7	PLUG-ELECT HT SUB-BASE KIT

KEY	DESCRIPTION COMPONENT
P12	PLUG
P14	PLUG
P37	PLUG-ELECTRIC HEAT LIMIT
S15	SWITCH-LIMIT,PRIMARY,ELECT HT
S20	SWITCH-LIMIT,SECONDARY ELECT HT
S107	SWITCH-LIMIT,PRIMARY,ELECT HT
T2	TRANSFORMER-ELECTRIC HEAT
TB2	TERMINAL STRIP-UNIT
TB3	TERMINAL STRIP-ELECTRIC HEAT
TB15	TERMINAL STRIP-UNIT 2

WIRING DIAGRAM 6/05

HEATING-ELECTRIC

EHA-15,30,45,60,90-1,2-G,J,M
FOR USE WITH TCA AND THA UNITS

C BOX

HEATING SECTION-A6

Supersedes Form No.	New Form No.
534,872W	535,065W

Sequence of Operation -EHA15, 30, 45, 60, 90kW - Y and G, J, M

NOTE: This sequence of operation is for all Electric Heat kW ratings Y, G, J and M voltages.

HEATING ELEMENTS:

1- Terminal Strip TB15 supplies power to TB3. TB3 supplies line voltage to electric heat elements HE1 through HE14. Each element is protected by fuse F3.

W2 HEAT DEMAND:

Electric heat demand initiates at W2 in thermostat.

2 - 24VAC is routed from T2, proving N.C. primary limits S15 (first heat section) and S107 (second heat section). Voltage then energizes contactors K15 and K17. 24VAC is routed through module A45 P88 energizing relays K9 and K19. N.O. K9-1 and K19-1 close.

3 - N.O. contact K15-1 closes allowing the first bank of elements to be energized. N.O. K17-1 closes allowing the second bank of elements to be energized.

4 - Once K19-1 closes timer DL2 is energized.

5 - After a 30 second delay, DL2 closes energizing contactor K16 and timer DL5.

6 - N.O. contacts K16-1 close allowing the third bank of elements to be energized.

7 - After a 30 second delay, DL5 closes energizing contactor K18. K18-1 closes allowing the fourth bank of elements to be energized.

W2 HEAT DEMAND SATISFIED

Heating demand is satisfied. Terminal W2 in the thermostat is de-energized.

8 - Electric heat contactors K15 and K17 are de-energized.

9 - The second and first set of electric heat elements are de-energized.

10 - Electric heat contactors K16 and K18 are de-energized.

11 - The fourth and third set of elements are de-energized.

Heating demand is satisfied. Terminal W2 in the thermostat is de-energized.