

KHA SERIES

The KHA commercial heat pump is available in 2, 2.5, 3, 4 and 5 ton capacities. The KHA024/060 refrigerant systems utilize one compressor, one reversing valve and other parts common to a heat pump. Optional auxiliary electric heat is field installed in KHA units. Electric heat operates in single stage. 7.5kW through 22.5kW heat sections are available for the KHA heat pump.

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.



⚠ WARNING

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

⚠ CAUTION

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

**ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures**

⚠ CAUTION

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

⚠ 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.

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OPTIONS / ACCESSORIES

Item	Catalog No.	024	030	036	048	060	072
COOLING SYSTEM							
Condensate Drain Trap	PVC - C1TRAP20AD2	76W26	X	X	X	X	X
	Copper - C1TRAP10AD2	76W27	X	X	X	X	X
Drain Pan Overflow Switch	K1SNSR71AB1	74W42	X	X	X	X	X
Low Ambient Kit	K1SNSR13A-1	41W34	X	X	X	X	X
Efficiency	Standard		O	O	O	O	O
Refrigerant Type	R-410A		O	O	O	O	O
Blower - SUPPLY AIR							
Motors	Direct Drive - 0.25 hp		O	O			
	Direct Drive - 0.5 hp				O	O	
	Belt Drive - 1.5 hp Standard Efficiency				O	O	O
	¹ Belt Drive - 2 hp Standard Efficiency				O	O	O
Drive Kits See Blower Data Tables for selection	Kit A01 - T1DRKT001-1 - 673-1010 rpm	Factory			O		
	Kit A02 - T1DRKT002-1 - 745-1117 rpm	Factory				O	
	Kit A03 - T1DRKT003-1 - 833-1250 rpm	Factory					O
	Kit A04 - T1DRKT004-1 - 968-1340 rpm	Factory					O
	Kit A05 - T1DRKT005-1 - 897-1346 rpm	Factory			O		
	Kit A06 - T1DRKT006-1 - 1071-1429 rpm	Factory				O	
	Kit A07 - T1DRKT007-1 - 1212-1548 rpm	Factory					O
	Kit A08 - T1DRKT008-1 - 1193-1591 rpm	Factory					O
CABINET							
Coil Guards	T1GARD20A-1	17W87	X	X	X	X	
	T1GARD20N-1	17W88					X
	K1GARD20AP1	53W21					X
Corrosion Protection			O	O	O	O	O
Hail Guards	T1GARD10A-1	17W89	X	X	X	X	
	T1GARD10N-1	17W90					X
	K1GARD10AP1	53W22					X
Hinged Access Panels		O	O	O	O	O	O
CONTROLS							
Smoke Detector - Supply or Return (Power board and one sensor)	C1SNSR44AP1	53W78	X	X	X	X	X
Smoke Detector - Supply and Return (Power board and two sensors)	C1SNSR43AP1	53W79	X	X	X	X	X
Indoor Air Quality							
Indoor Air Quality (CO₂) Sensors							
Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AS1L	77N39	X	X	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0SNSR53AE1L	87N54	X	X	X	X	X
CO ₂ Sensor Duct Mounting Kit - for downflow applications	C0MISC19AE1-	85L43	X	X	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO ₂ sensor (77N39)	C0MISC16AE1-	90N43	X	X	X	X	X
UVC Germicidal Lamps							
² Healthy Climate® UVC Light Kit (208/230v-1ph)	E1UVCL10AN1	50W90	X	X	X	X	X

NOTE - The catalog and model numbers that appear here are for ordering field installed accessories only.

OX - Field Installed or Configure to Order (factory installed)

O - Configure to Order (Factory Installed)

X - Field Installed

¹ 2 hp blower motor is not available for 208/230V-1ph applications.

² Lamps operate on 110-230V single-phase power supply. Step-down transformer may be ordered separately for 460V and 575V units. Alternately, 110V power supply may be used to directly power the UVC ballast(s).

OPTIONS / ACCESSORIES

Item	Catalog No.	024	030	036	048	060	072
ECONOMIZER							
Economizer							
Economizer, Single Enthalpy Control	T1ECON30A-1	36W96	OX	OX	OX	OX	
Includes Outdoor Air Hood and Barometric Relief Dampers with Hood	T1ECON30N-1	36W97				OX	OX
Horizontal Economizer Conversion Kit	T1HECK00AN1	17W45	X	X	X	X	X
Economizer Controls							
Differential Enthalpy Sensor	T1SNSR60AN1	17W71	X	X	X	X	X
Single Temperature Control	TASEK10/15	76M37	X	X	X	X	X
Differential Temperature Control	Order 2 - TASEK10/15	76M37	X	X	X	X	X
ELECTRICAL							
Disconnect	See Electrical/Electric Heat Tables for selection		X	X	X	X	X
Voltage	208/230V - 1 phase		O	O	O	O	
60 hz	208/230V - 3 phase				O	O	O
	460V - 3 phase				O	O	O
	575V - 3 phase				O	O	O
GFI Service Outlets	LTAGFIK10/15	74M70	X	X	X	X	X
ELECTRIC HEAT							
7.5 kW	208/230V-1ph - T1EH0075AN1P	14W32	X	X	X	X	
	208/230V-3ph - T1EH0075AN1Y	14W35			X	X	X
	460V-3ph - T1EH0075AN1G	14W39			X	X	X
	575V-3ph - T1EH0075AN1J	14W43			X	X	X
10 kW	208/230V-1ph - T1EH0100A1P	30W26	X	X			
15 kW	208/230V-1ph - T1EH0150AN1P	14W33			X	X	X
	208/230V-3ph - T1EH0150AN1Y	14W36			X	X	X
	460V-3ph - T1EH0150AN1G	14W40			X	X	X
	575V-3ph - T1EH0150AN1J	14W44			X	X	X
22.5 kW	208/230V-1ph - T1EH0225AN1P	14W34				X	
	208/230V-3ph - T1EH0225AN1Y	14W37				X	X
	460V-3ph - T1EH0225AN1G	14W41				X	X
	575V-3ph - T1EH0225AN1J	14W45				X	X
30 kW	208/230V-3ph - T1EH0300N-1Y	14W38					X
	460V-3ph - T1EH0300N-1G	14W42					X
	575V-3ph - T1EH0300N-1J	14W46					X
ELECTRIC HEAT ACCESSORIES							
Unit Fuse Block - See Electrical/Electric Heat Tables for Selection			X	X	X	X	X

NOTE - The catalog and model numbers that appear here are for ordering field installed accessories only.

OX - Field Installed or Configure to Order (factory installed)

O - Configure to Order (Factory Installed)

X - Field Installed.

OPTIONS / ACCESSORIES

Item	Catalog No.	024	030	036	048	060	072
OUTDOOR AIR							
Outdoor Air Dampers							
Damper Section - Manual, Includes Outdoor Air Hood	T1DAMP11A-1	16W88	X	X	X	X	
	T1DAMP11N-1	16W91				X	X
Damper Motorized Kit Order Manual Outdoor Air Damper Separately	T1DAMP21AN1	16W92	X	X	X	X	X
POWER EXHAUST FAN							
Standard Static	208/230V-1 or 3 ph - T1PWRE10A-1P	17W39			X	X	
	460V-3ph - T1PWRE10A-1G	17W40			X	X	
	575V-3ph - T1PWRE10A-1J	17W41			X	X	
	208/230V-1 or 3 ph - T1PWRE10N-1P	17W42					X
	460V-3ph - T1PWRE10N-1G	17W43					X
	575V-3ph - T1PWRE10N-1J	17W44					X
	CEILING DIFFUSERS						
Step-Down - Order one	RTD9-65-R	27G87	X	X	X	X	
	RTD11-95	29G04					X
	(Canada Only) RTD11-95S	13K61					X
Flush - Order one	FD9-65-R	27G86	X	X	X	X	
	FD11-95	29G08					X
	(Canada Only) FD11-95S	13K56					X
Transitions (Supply and Return) - Order one	T1TRAN10AN1	17W53	X	X	X	X	
	T1TRAN20N-1	17W54					X
ROOF CURBS - downFlow							
Cliplock							
8 in. height	T1CURB23AN1	16W93	X	X	X	X	1 X
	K1CURB23AP1	52W20					X
14 in. height	T1CURB20AN1	16W94	X	X	X	X	1 X
	K1CURB20AP1	52W21					X
18 in. height	T1CURB21AN1	16W95	X	X	X	X	1 X
	K1CURB21AP1	52W22					X
24 in. height	T1CURB22AN1	16W96	X	X	X	X	1 X
	K1CURB22AP1	52W23					X
Hinged							
8 in. height	T1CURB30AN1	17W46	X	X	X	X	1 X
	K1CURB30AP1	52W17					X
18 in. height	T1CURB32AN1	17W47	X	X	X	X	1 X
	K1CURB32AP1	52W18					X
24 in. height	T1CURB33AN1	17W48	X	X	X	X	1 X
	K1CURB33AP1	52W19					X
Standard							
14 in. height	T1CURB10AN1	13W27	X	X	X	X	1 X
	K1CURB10AP1	52W24					X
Adjustable Pitched Curb							
14 in. height	C1CURB55AT1	43W27	X	X	X	X	1 X

NOTE - The catalog and model numbers that appear here are for ordering field installed accessories only.

X - Field Installed.

¹ 072 models will fit smaller roof curbs with overhang. See dimension drawing.

SPECIFICATIONS - DIRECT DRIVE BLOWER

2 - 4 TON

General Data		Nominal Tonnage	2 Ton	2.5 Ton	3 Ton	4 Ton
		Model No.	KHA024S4D	KHA030S4D	KHA036S4D	KHA048S4D
		Efficiency Type	Standard	Standard	Standard	Standard
Cooling Performance	Gross Cooling Capacity - Btuh		23,600	30,000	37,100	49,000
	¹ Net Cooling Capacity - Btuh		22,800	29,000	35,600	47,000
	AHRI Rated Air Flow - cfm		800	1000	1160	1600
	² Sound Rating Number (dB)		75	75	75	75
	Total Unit Power - kW		2.0	2.6	3.3	4.4
	¹ SEER (Btuh/Watt)		13.0	13.0	13.0	13.0
	¹ EER (Btuh/Watt)		11.2	11.3	10.9	10.7
Refrigerant	Type		R-410A	R-410A	R-410A	R-410A
	Charge Furnished		13 lbs. 0 oz.	13 lbs. 0 oz.	12 lbs. 8 oz.	13 lbs. 2 oz.
Heating Performance	Total High Heating Capacity - Btuh		24,000	29,200	36,400	48,000
	Total Unit Power - kW		2.1	2.5	3.0	4.0
	¹ COP		3.4	3.5	3.6	3.5
	¹ HSPF - Region IV (Region V)		7.7 (6.7)	7.7 (6.7)	7.7 (6.7)	7.7 (6.7)
	Total Low Heating Capacity - Btuh		14,400	17,600	22,000	29,500
	Total Unit Power - kW		1.8	2.3	2.8	3.6
	COP		2.3	2.3	2.3	2.4
Electric Heating Options			See Electrical/Electric Heat Tables page 15			
Compressor Type (no.)			Scroll (1)	Scroll (1)	Scroll (1)	Scroll (1)
Outdoor Coil	Net face area - sq. ft.		15.6	15.6	15.6	15.6
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		2.0	2.0	2.0	2.0
	Fins / inch		20	20	20	20
Outdoor Coil Fan	Motor HP		1/4	1/4	1/4	1/4
	Motor rpm		825	825	825	825
	Total motor watts		250	250	250	250
	Diameter - in. / No. of blades		24 - 3	24 - 3	24 - 3	24 - 3
	Total air volume - cfm		3300	3300	3300	3300
Indoor Coil	Net face area - sq. ft.		7.78	7.78	7.78	7.78
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		3	3	3	3
	Fins / inch		14	14	14	14
	Drain Connection (no. and size) - in.		(1) 3/4 NPT	(1) 3/4 NPT	(1) 3/4 NPT	(1) 3/4 NPT
	Expansion device type		Balanced Port Thermostatic Expansion Valve, removeable power head			
Indoor Blower	Nominal Motor HP		.25	.25	.5	.5
	Wheel nom. diameter x width - in.		10 x 10	10 x 10	10 x 10	10 x 10
Filters	Type		Disposable		Disposable	
	Number and size - in.		(4) 16 x 20 x 2		(4) 16 x 20 x 2	
Electrical Characteristics - 60 hz			208/230V - 1 phase		208/230V 1 phase	208/230V 1 phase
					208/230V, 460V & 575V 3 phase	208/230V, 460V & 575V 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 USE certification program, which is based on AHRI Standard 210/240.

Cooling Ratings - 95°F outdoor air temperature and 80°F db/67°F wb entering indoor coil air.

High Temperature Heating Ratings - 47°F db/43°F wb outdoor air temperature and 70°F entering indoor coil air.

Low Temperature Heating Ratings - 17°F db/15°F wb outdoor air temperature and 70°F entering indoor coil air.

² Sound Rating Number rated in accordance with test conditions included in AHRI Standard 270.

SPECIFICATIONS - BELT DRIVE BLOWER

3 - 6 TON

General Data		Nominal Tonnage	3 Ton	4 Ton	5 Ton	6 Ton	
Model No.			KHA036S4B	KHA048S4B	KHA060S4B	KHA072S4B	
Efficiency Type			Standard	Standard	Standard	Standard	
Cooling Performance	Gross Cooling Capacity - Btuh		37,100	49,000	61,500	71,300	
	¹ Net Cooling Capacity - Btuh		¹ 35,600	¹ 47,000	¹ 59,000	² 69,000	
	AHRI Rated Air Flow - cfm		1160	1600	1985	2060	
	⁴ Sound Rating Number (dB)		75	75	82	83	
	Total Unit Power - kW		3.3	4.4	5.4	6.3	
	¹ SEER (Btuh/Watt)		13.0	13.0	13.0	---	
	³ IEER (Btuh/Watt)		---	---	---	11.2	
	EER (Btuh/Watt)		¹ 10.9	¹ 10.7	¹ 10.9	² 11.0	
Refrigerant	Type		R-410A	R-410A	R-410A	R-410A	
	Charge Furnished		12 lbs. 8 oz.	13 lbs. 2 oz.	16 lbs. 0 oz.	20 lbs. 8 oz.	
Heating Performance	Total High Heating Capacity - Btuh		36,400	48,000	60,500	70,000	
	Total Unit Power - kW		3.0	4.0	4.9	6.2	
	¹ COP		3.6	3.5	3.6	3.3	
	HSPF - Region IV (Region V)		7.7 (6.7)	7.7 (6.7)	7.7 (6.7)	---	
	Total Low Heating Capacity - Btuh		22,000	29,500	36,000	40,000	
	Total Unit Power - kW		2.8	3.6	4.5	5.7	
	¹ COP		2.3	2.4	2.4	2.25	
Electric Heating Options		See Electrical/Electric Heat Tables page 15					
Compressor Type (no.)			Scroll (1)	Scroll (1)	Scroll (1)	Scroll (1)	
Outdoor Coil	Net face area - sq. ft.		15.6	15.6	19.27	28.00	
	Tube diameter - in.		3/8	3/8	3/8	3/8	
	Number of rows		2	2	2	2	
	Fins / inch		20	20	20	20	
Outdoor Coil Fan	Motor HP		1/4	1/4	1/3	1/2	
	Motor rpm		825	825	1075	1075	
	Total motor watts		250	250	405	680	
	Diameter - in. / No. of blades		24 - 3	24 - 3	24 - 3	24 - 4	
	Total air volume - cfm		3300	3300	4800	5735	
Indoor Coil	Net face area - sq. ft.		7.78	7.78	9.7	9.7	
	Tube diameter - in.		3/8	3/8	3/8	3/8	
	Number of rows		3	3	4	4	
	Fins / inch		14	14	14	14	
	Drain Connection (no. and size) - in.		(1) 3/4 NPT	(1) 3/4 NPT	(1) 3/4 NPT	(1) 3/4 NPT	
	Expansion device type		Balanced Port Thermostatic Expansion Valve, removeable power head				
⁵ Indoor Blower & Drive Selection	Nominal Motor HP		1.5 hp, ⁶ 2 hp		1.5 hp, ⁶ 2 hp	1.5 hp, 2 hp	
	Maximum Usable Motor HP		1.72 hp, 2.3 hp		1.72 hp, 2.3 hp	1.72 hp, 2.3 hp	
	Available Drive Kits	A01		A02		A03	A04
		673 - 1010 rpm		745 - 1117 rpm		833 - 1250 rpm	968 - 1340 rpm
		A05		A06		A07	A08
		897 - 1346 rpm		1071 - 1429 rpm		1212 - 1548 rpm	1193 - 1591 rpm
Wheel nom. diameter x width - in.		10 x 10	10 x 10	10 x 10	10 x 10		
Filters	Type		Disposable		Disposable		
	Number and size - in.		(4) 16 x 20 x 2		(4) 20 x 20 x 2		
Electrical Characteristics - 60 hz			208/230V 1 phase	208/230V 1 phase	208/230V 1 phase	208/230V, 460V & 575V 3 phase	
			208/230V, 460V & 575V 3 phase	208/230V, 460V & 575V 3 phase	208/230V, 460V & 575V 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 USE certification program, which is based on AHRI Standard 210/240 or 2 340/360.

Cooling Ratings - 95°F outdoor air temperature and 80°F db/67°F wb entering indoor coil air.

High Temperature Heating Ratings - 47°F db/43°F wb outdoor air temperature and 70°F entering indoor coil air.

Low Temperature Heating Ratings - 17°F db/15°F wb outdoor air temperature and 70°F entering indoor coil air.

³ Integrated Energy Efficiency Ratio certified and tested according to AHRI Standard 210/240.

⁴ Sound Rating Number rated in accordance with test conditions included in AHRI Standard 270.

⁵ Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor hp required. Maximum usable hp of motors furnished are shown. In Canada, nominal motor hp is also maximum usable motor hp. If motors of comparable hp are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

⁶ 2 hp blower motor is not available for 208/230V-1phase applications.

BLOWER DATA - DIRECT DRIVE - KHA024-030

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 14.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 14.

External Static Pressure (in. w.g.)	Air Volume (cfm) at Various Blower Speeds					
	208 VOLTS			230 VOLTS		
	High	Medium	Low	High	Medium	Low
2 and 2.5 Ton Standard Efficiency (Downflow)				KHA024S and KHA030S		
0.0	1199	928	838	1379	1085	877
0.1	1229	926	813	1409	1086	872
0.2	1206	928	782	1367	1094	850
0.3	1183	881	742	1350	1047	820
0.4	1159	843	686	1321	1009	783
0.5	1136	812	643	1282	981	762
0.6	1103	766	569	1242	921	705
0.7	1046	728	496	1195	888	625
0.8	953	648	432	1134	792	583
0.9	909	584	335	1037	738	492
1.0	783	465	247	926	592	411
2 and 2.5 Ton Standard Efficiency (Horizontal)				KHA024S and KHA030S		
0.0	1152	909	801	1325	1063	838
0.1	1152	893	770	1321	1048	826
0.2	1136	866	734	1288	1021	798
0.3	1104	826	697	1260	982	771
0.4	1072	787	643	1222	942	734
0.5	1041	747	589	1175	903	698
0.6	1009	707	534	1137	850	662
0.7	946	654	467	1081	797	588
0.8	861	588	396	1024	718	535
0.9	798	508	319	911	642	468
1.0	715	443	237	846	564	394

BLOWER DATA - DIRECT DRIVE - KHA036-048

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.
FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 14.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 14.

External Static Pressure (in. w.g.)	Air Volume (cfm) at Various Blower Speeds								
	208 VOLTS			230 VOLTS			460/575 VOLTS		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
3 and 4 Ton Standard Efficiency (Downflow)					KHA036S and KHA048S				
0.0	1938	1552	1119	2167	1772	1317	2136	1716	1212
0.1	1992	1586	1128	2167	1780	1315	2104	1728	1208
0.2	1915	1592	1137	2100	1792	1307	2052	1684	1197
0.3	1865	1536	1083	2043	1735	1266	1994	1647	1172
0.4	1813	1495	1033	1986	1678	1204	1918	1597	1134
0.5	1762	1444	976	1909	1621	1164	1861	1534	1096
0.6	1694	1391	899	1814	1535	1082	1765	1485	1059
0.7	1609	1331	817	1718	1478	1000	1689	1410	996
0.8	1471	1220	730	1603	1364	918	1613	1335	920
0.9	1368	1066	522	1488	1250	755	1498	1235	848
1.0	1108	869	402	1259	1021	640	1345	1036	763
3 and 4 Ton Standard Efficiency (Horizontal)					KHA036S and KHA048S				
0.0	1862	1520	1070	2082	1736	1259	2085	1745	1247
0.1	1867	1530	1069	2031	1717	1246	2070	1744	1257
0.2	1804	1485	1067	1978	1672	1227	2016	1690	1225
0.3	1741	1440	1018	1907	1627	1190	1944	1643	1192
0.4	1677	1396	968	1837	1567	1128	1890	1596	1160
0.5	1614	1329	894	1749	1492	1066	1800	1533	1111
0.6	1550	1284	844	1660	1417	1016	1727	1455	1062
0.7	1455	1195	769	1554	1327	941	1655	1377	996
0.8	1329	1106	670	1448	1237	842	1511	1283	865
0.9	1202	927	496	1307	1087	718	1403	1190	784
1.0	1012	828	385	1150	973	613	1222	1002	670

BLOWER DATA - BELT DRIVE - KHA036

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 13 for blower motors and drives and page 14 for wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit A01									
900	486	0.12	554	0.16	623	0.20	695	0.22	767	0.23	836	0.25	897	0.28	953	0.30
1000	508	0.15	576	0.19	643	0.22	713	0.24	783	0.26	848	0.28	907	0.30	961	0.33
1100	533	0.18	599	0.22	665	0.25	733	0.27	800	0.28	863	0.31	919	0.34	971	0.36
1200	560	0.21	625	0.25	689	0.28	755	0.30	820	0.32	879	0.34	932	0.37	983	0.40
1300	591	0.24	654	0.28	716	0.31	779	0.33	841	0.35	897	0.38	948	0.41	996	0.44
1400	631	0.26	690	0.30	748	0.34	807	0.36	864	0.39	916	0.42	964	0.46	1011	0.49
1500	676	0.28	729	0.33	782	0.36	835	0.40	887	0.43	935	0.47	981	0.50	1028	0.54

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A01		Kit A05													
900	1004	0.33	1055	0.35	1106	0.37	1152	0.40	1193	0.43	1232	0.46	1269	0.49	1305	0.52
1000	1011	0.36	1062	0.38	1111	0.41	1157	0.43	1199	0.47	1238	0.50	1276	0.53	1311	0.56
1100	1020	0.39	1070	0.41	1118	0.44	1163	0.47	1206	0.51	1245	0.54	1282	0.58	1318	0.61
1200	1031	0.43	1079	0.45	1127	0.48	1171	0.52	1213	0.55	1252	0.59	1289	0.62	1324	0.66
1300	1044	0.47	1091	0.49	1137	0.53	1181	0.56	1221	0.60	1259	0.64	1296	0.68	1330	0.71
1400	1058	0.51	1105	0.54	1150	0.57	1191	0.61	1231	0.65	1268	0.69	1303	0.73	1337	0.77
1500	1074	0.56	1120	0.59	1163	0.63	1203	0.67	1241	0.71	1277	0.75	1312	0.79	1345	0.82

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit A01									
900	485	0.11	554	0.14	627	0.16	703	0.18	780	0.21	841	0.23	888	0.27	935	0.30
1000	509	0.13	578	0.16	649	0.19	722	0.21	796	0.23	854	0.26	900	0.29	947	0.33
1100	537	0.16	605	0.19	674	0.21	744	0.24	813	0.26	868	0.29	913	0.33	959	0.36
1200	567	0.19	633	0.22	700	0.24	768	0.27	833	0.30	884	0.33	928	0.37	974	0.40
1300	599	0.22	664	0.25	729	0.28	793	0.30	853	0.33	902	0.37	945	0.41	990	0.44
1400	634	0.26	697	0.29	758	0.31	819	0.34	875	0.38	921	0.42	964	0.46	1008	0.49
1500	669	0.30	730	0.33	789	0.36	846	0.39	897	0.42	941	0.47	983	0.51	1028	0.54

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A01		Kit A05													
900	986	0.32	1039	0.35	1090	0.37	1137	0.40	1177	0.43	1214	0.46	1248	0.49	1280	0.51
1000	997	0.35	1048	0.38	1098	0.41	1143	0.44	1184	0.47	1221	0.50	1255	0.53	1287	0.56
1100	1008	0.39	1059	0.41	1107	0.44	1150	0.47	1191	0.51	1228	0.54	1263	0.57	1295	0.60
1200	1022	0.43	1071	0.45	1117	0.48	1160	0.52	1200	0.55	1237	0.59	1271	0.62	1303	0.66
1300	1037	0.47	1085	0.50	1130	0.53	1171	0.57	1210	0.60	1246	0.64	1280	0.68	1312	0.71
1400	1054	0.52	1100	0.54	1144	0.58	1183	0.62	1221	0.66	1256	0.70	1290	0.73	1321	0.77
1500	1073	0.57	1117	0.60	1159	0.64	1197	0.67	1234	0.71	1268	0.75	1301	0.79	1332	0.83

BLOWER DATA - BELT DRIVE - KHA048

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 13 for blower motors and drives and page 14 for wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit A02									
1200	560	0.21	625	0.25	689	0.28	755	0.30	820	0.32	879	0.34	932	0.37	983	0.40
1300	591	0.24	654	0.28	716	0.31	779	0.33	841	0.35	897	0.38	948	0.41	996	0.44
1400	631	0.26	690	0.30	748	0.34	807	0.36	864	0.39	916	0.42	964	0.46	1011	0.49
1500	675	0.28	729	0.33	782	0.36	835	0.40	887	0.43	935	0.47	981	0.50	1028	0.54
1600	718	0.31	766	0.35	814	0.40	862	0.44	910	0.48	955	0.52	1000	0.55	1046	0.59
1700	756	0.34	799	0.39	843	0.44	887	0.49	932	0.53	976	0.57	1020	0.61	1066	0.64
1800	787	0.40	828	0.45	870	0.50	912	0.55	955	0.59	999	0.63	1043	0.67	1089	0.70
1900	815	0.46	855	0.51	897	0.57	939	0.62	981	0.66	1024	0.69	1068	0.73	1113	0.76
2000	843	0.53	884	0.59	925	0.64	968	0.68	1009	0.72	1052	0.76	1095	0.79	1138	0.83

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A02				Kit A06											
1200	1031	0.43	1079	0.45	1127	0.48	1171	0.52	1213	0.55	1252	0.59	1289	0.62	1324	0.66
1300	1044	0.47	1091	0.49	1137	0.53	1181	0.56	1221	0.60	1259	0.64	1296	0.68	1330	0.71
1400	1058	0.51	1105	0.54	1150	0.57	1191	0.61	1231	0.65	1268	0.69	1303	0.73	1337	0.77
1500	1074	0.56	1120	0.59	1163	0.63	1203	0.67	1241	0.71	1277	0.75	1312	0.79	1345	0.82
1600	1092	0.61	1137	0.65	1178	0.68	1216	0.72	1253	0.76	1288	0.80	1321	0.84	1354	0.88
1700	1112	0.67	1155	0.70	1193	0.75	1230	0.79	1265	0.83	1299	0.87	1332	0.91	1364	0.95
1800	1133	0.73	1174	0.77	1209	0.81	1244	0.85	1278	0.90	1311	0.94	1343	0.98	1375	1.02
1900	1156	0.80	1193	0.84	1226	0.89	1260	0.93	1293	0.97	1325	1.01	1356	1.06	1388	1.10
2000	1178	0.87	1213	0.92	1243	0.97	1275	1.02	1307	1.06	1339	1.10	1370	1.14	1402	1.18

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit A02									
1200	567	0.19	633	0.22	700	0.24	768	0.27	833	0.30	884	0.33	928	0.37	974	0.40
1300	599	0.22	664	0.25	729	0.28	793	0.30	853	0.33	902	0.37	945	0.41	990	0.44
1400	634	0.26	697	0.29	758	0.31	819	0.34	875	0.38	921	0.42	964	0.46	1008	0.49
1500	669	0.30	730	0.33	789	0.36	846	0.39	897	0.42	941	0.47	983	0.51	1028	0.54
1600	705	0.34	763	0.37	819	0.40	873	0.43	921	0.48	963	0.52	1004	0.56	1048	0.59
1700	741	0.38	796	0.41	850	0.45	900	0.49	945	0.53	985	0.58	1026	0.62	1070	0.65
1800	776	0.43	829	0.46	880	0.51	927	0.55	970	0.60	1009	0.64	1050	0.68	1093	0.71
1900	812	0.48	862	0.52	910	0.57	955	0.62	996	0.66	1035	0.71	1076	0.74	1118	0.78
2000	847	0.54	895	0.59	941	0.64	984	0.69	1023	0.74	1062	0.78	1103	0.81	1144	0.85

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A02				Kit A06											
1200	1022	0.43	1071	0.45	1117	0.48	1160	0.52	1200	0.55	1237	0.59	1271	0.62	1303	0.66
1300	1037	0.47	1085	0.50	1130	0.53	1171	0.57	1210	0.60	1246	0.64	1280	0.68	1312	0.71
1400	1054	0.52	1100	0.54	1144	0.58	1183	0.62	1221	0.66	1256	0.70	1290	0.73	1321	0.77
1500	1073	0.57	1117	0.60	1159	0.64	1197	0.67	1234	0.71	1268	0.75	1301	0.79	1332	0.83
1600	1093	0.62	1136	0.66	1175	0.70	1212	0.74	1247	0.78	1281	0.82	1313	0.86	1344	0.90
1700	1114	0.68	1155	0.72	1192	0.76	1227	0.80	1262	0.85	1295	0.89	1327	0.93	1358	0.97
1800	1136	0.75	1175	0.79	1210	0.83	1245	0.88	1278	0.92	1311	0.97	1342	1.01	1373	1.05
1900	1159	0.82	1197	0.86	1229	0.92	1263	0.97	1296	1.01	1328	1.06	1359	1.10	1390	1.14
2000	1183	0.90	1218	0.95	1249	1.01	1282	1.06	1314	1.11	1346	1.15	1377	1.20	1408	1.24

BLOWER DATA - BELT DRIVE - KHA060

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 13 for blower motors and drives and page 14 for wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished								Kit A03							
1600	665	0.30	716	0.34	768	0.38	819	0.41	879	0.44	937	0.46	985	0.49	1022	0.52
1700	723	0.31	768	0.35	814	0.39	860	0.43	910	0.47	959	0.50	1001	0.54	1037	0.58
1800	779	0.32	818	0.37	857	0.41	897	0.46	939	0.50	980	0.55	1018	0.59	1054	0.64
1900	826	0.36	859	0.41	894	0.45	928	0.50	964	0.56	1000	0.61	1036	0.66	1072	0.70
2000	857	0.42	889	0.47	920	0.52	952	0.57	986	0.62	1020	0.68	1055	0.73	1091	0.77
2100	878	0.49	909	0.54	940	0.59	973	0.64	1006	0.70	1041	0.75	1076	0.80	1112	0.85
2200	897	0.55	929	0.61	961	0.66	994	0.72	1028	0.78	1063	0.83	1099	0.89	1134	0.93
2300	918	0.62	950	0.68	983	0.74	1017	0.80	1052	0.86	1087	0.92	1122	0.97	1157	1.02
2400	941	0.70	974	0.77	1008	0.83	1042	0.90	1077	0.96	1111	1.01	1146	1.06	1181	1.11

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A03								Kit A07							
1600	1059	0.57	1098	0.61	1138	0.65	1177	0.68	1218	0.71	1257	0.75	1290	0.79	1319	0.83
1700	1074	0.62	1113	0.66	1152	0.70	1190	0.74	1231	0.77	1268	0.80	1299	0.84	1328	0.89
1800	1091	0.68	1129	0.72	1167	0.76	1205	0.80	1244	0.83	1280	0.87	1310	0.91	1338	0.95
1900	1109	0.75	1146	0.79	1183	0.82	1221	0.86	1260	0.90	1294	0.94	1323	0.98	1349	1.02
2000	1128	0.82	1164	0.86	1201	0.89	1239	0.93	1276	0.97	1310	1.01	1336	1.06	1362	1.10
2100	1148	0.89	1185	0.93	1221	0.97	1258	1.01	1294	1.05	1325	1.09	1351	1.14	1376	1.19
2200	1170	0.97	1206	1.01	1242	1.05	1277	1.09	1311	1.14	1341	1.18	1365	1.23	1390	1.28
2300	1193	1.06	1228	1.09	1262	1.14	1295	1.19	1327	1.24	1355	1.29	1380	1.33	1406	1.37
2400	1216	1.15	1250	1.19	1282	1.24	1313	1.30	1343	1.36	1371	1.40	1396	1.44	1423	1.48

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished								Kit A03							
1600	712	0.29	758	0.32	807	0.36	855	0.39	906	0.43	955	0.46	997	0.50	1035	0.54
1700	766	0.32	808	0.36	850	0.40	892	0.44	936	0.47	978	0.51	1016	0.56	1052	0.60
1800	814	0.36	851	0.40	888	0.44	925	0.49	963	0.53	1000	0.57	1035	0.62	1071	0.66
1900	853	0.41	886	0.46	919	0.50	952	0.55	986	0.60	1021	0.64	1056	0.69	1091	0.73
2000	883	0.48	913	0.53	944	0.57	976	0.62	1009	0.67	1043	0.71	1078	0.76	1112	0.80
2100	906	0.56	936	0.60	967	0.65	999	0.70	1033	0.75	1067	0.79	1101	0.84	1135	0.88
2200	930	0.64	960	0.68	991	0.73	1024	0.78	1058	0.83	1092	0.88	1126	0.92	1160	0.96
2300	954	0.72	985	0.77	1017	0.82	1051	0.87	1085	0.92	1119	0.96	1152	1.00	1186	1.04
2400	981	0.81	1013	0.86	1046	0.91	1079	0.96	1113	1.00	1146	1.05	1180	1.09	1213	1.13

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A03								Kit A07							
1600	1071	0.58	1109	0.62	1147	0.66	1186	0.69	1225	0.72	1263	0.76	1299	0.80	1334	0.83
1700	1088	0.64	1126	0.68	1164	0.72	1202	0.75	1240	0.78	1276	0.82	1311	0.86	1345	0.90
1800	1107	0.70	1143	0.74	1181	0.78	1219	0.81	1256	0.85	1291	0.89	1324	0.93	1357	0.97
1900	1126	0.77	1163	0.81	1200	0.85	1237	0.88	1273	0.92	1306	0.96	1339	1.00	1371	1.04
2000	1148	0.84	1183	0.88	1220	0.92	1257	0.96	1291	1.00	1323	1.04	1354	1.08	1385	1.12
2100	1170	0.92	1206	0.96	1242	1.00	1277	1.04	1310	1.08	1340	1.13	1371	1.17	1401	1.21
2200	1195	1.00	1230	1.04	1265	1.08	1299	1.13	1330	1.18	1359	1.23	1388	1.27	1418	1.31
2300	1220	1.08	1254	1.13	1288	1.17	1320	1.23	1350	1.28	1378	1.34	1406	1.38	1435	1.42
2400	1245	1.18	1278	1.22	1311	1.28	1341	1.33	1370	1.40	1397	1.45	1425	1.50	1454	1.54

BLOWER DATA - BELT DRIVE - DOWNFLOW - KHA072

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 13 for blower motors and drives and page 14 for wet coil and options/accessory air resistance data.

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished										Kit A04					
1900	826	0.36	859	0.41	894	0.45	928	0.50	964	0.56	1000	0.61	1036	0.66	1072	0.70
2000	857	0.42	889	0.47	920	0.52	952	0.57	986	0.62	1020	0.68	1055	0.73	1091	0.77
2100	878	0.49	909	0.54	940	0.59	973	0.64	1006	0.70	1041	0.75	1076	0.80	1112	0.85
2200	897	0.55	929	0.61	961	0.66	994	0.72	1028	0.78	1063	0.83	1099	0.89	1134	0.93
2300	918	0.62	950	0.68	983	0.74	1017	0.80	1052	0.86	1087	0.92	1122	0.97	1157	1.02
2400	941	0.70	974	0.77	1008	0.83	1042	0.90	1077	0.96	1111	1.01	1146	1.06	1181	1.11
2500	966	0.79	1000	0.86	1034	0.93	1068	1.00	1103	1.06	1137	1.11	1171	1.16	1205	1.20
2600	994	0.90	1028	0.97	1062	1.04	1096	1.10	1130	1.16	1164	1.21	1197	1.26	1231	1.30
2700	1023	1.01	1057	1.08	1091	1.15	1125	1.22	1159	1.27	1192	1.32	1225	1.37	1258	1.41
2800	1053	1.13	1088	1.21	1122	1.27	1155	1.33	1188	1.39	1221	1.43	1253	1.48	1286	1.53
2900	1085	1.26	1119	1.33	1153	1.40	1186	1.45	1218	1.51	1250	1.55	1281	1.61	1313	1.66
Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A04												Kit A08			
1900	1109	0.75	1146	0.79	1183	0.82	1221	0.86	1260	0.90	1294	0.94	1323	0.98	1349	1.02
2000	1128	0.82	1164	0.86	1201	0.89	1239	0.93	1276	0.97	1310	1.01	1336	1.06	1362	1.10
2100	1148	0.89	1185	0.93	1221	0.97	1258	1.01	1294	1.05	1325	1.09	1351	1.14	1376	1.19
2200	1170	0.97	1206	1.01	1242	1.05	1277	1.09	1311	1.14	1341	1.18	1365	1.23	1390	1.28
2300	1193	1.06	1228	1.09	1262	1.14	1295	1.19	1327	1.24	1355	1.29	1380	1.33	1406	1.37
2400	1216	1.15	1250	1.19	1282	1.24	1313	1.30	1343	1.36	1371	1.40	1396	1.44	1423	1.48
2500	1240	1.24	1273	1.29	1302	1.36	1331	1.42	1360	1.48	1388	1.52	1414	1.55	1441	1.58
2600	1265	1.34	1296	1.40	1324	1.47	1352	1.54	1381	1.60	1408	1.64	1434	1.67	1460	1.70
2700	1291	1.46	1321	1.52	1347	1.60	1374	1.67	1403	1.72	1429	1.76	1455	1.79	1481	1.82
2800	1317	1.58	1346	1.66	1372	1.74	1399	1.80	1426	1.85	1451	1.89	1477	1.92	1503	1.95
2900	1343	1.72	1371	1.80	1397	1.88	1424	1.95	1450	1.99	1475	2.02	1500	2.05	1526	2.08

BLOWER DATA - BELT DRIVE - HORIZONTAL - KHA072

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 13 for blower motors and drives and page 14 for wet coil and options/accessory air resistance data.

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished								Kit A04							
1900	853	0.41	886	0.46	919	0.50	952	0.55	986	0.60	1021	0.64	1056	0.69	1091	0.73
2000	883	0.48	913	0.53	944	0.57	976	0.62	1009	0.67	1043	0.71	1078	0.76	1112	0.80
2100	906	0.56	936	0.60	967	0.65	999	0.70	1033	0.75	1067	0.79	1101	0.84	1135	0.88
2200	930	0.64	960	0.68	991	0.73	1024	0.78	1058	0.83	1092	0.88	1126	0.92	1160	0.96
2300	954	0.72	985	0.77	1017	0.82	1051	0.87	1085	0.92	1119	0.96	1152	1.00	1186	1.04
2400	981	0.81	1013	0.86	1046	0.91	1079	0.96	1113	1.00	1146	1.05	1180	1.09	1213	1.13
2500	1010	0.91	1042	0.96	1075	1.00	1109	1.05	1142	1.09	1175	1.14	1207	1.18	1239	1.23
2600	1040	1.01	1073	1.05	1106	1.10	1139	1.14	1171	1.19	1203	1.23	1235	1.28	1266	1.33
2700	1072	1.10	1104	1.15	1137	1.20	1169	1.24	1201	1.29	1232	1.34	1263	1.40	1293	1.46
2800	1105	1.21	1137	1.25	1168	1.30	1200	1.35	1231	1.40	1261	1.46	1291	1.52	1321	1.59
2900	1138	1.32	1169	1.37	1200	1.42	1231	1.47	1261	1.53	1291	1.60	1321	1.66	1350	1.73

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit A04														Kit A08	
1900	1126	0.77	1163	0.81	1200	0.85	1237	0.88	1273	0.92	1306	0.96	1339	1.00	1371	1.04
2000	1148	0.84	1183	0.88	1220	0.92	1257	0.96	1291	1.00	1323	1.04	1354	1.08	1385	1.12
2100	1170	0.92	1206	0.96	1242	1.00	1277	1.04	1310	1.08	1340	1.13	1371	1.17	1401	1.21
2200	1195	1.00	1230	1.04	1265	1.08	1299	1.13	1330	1.18	1359	1.23	1388	1.27	1418	1.31
2300	1220	1.08	1254	1.13	1288	1.17	1320	1.23	1350	1.28	1378	1.34	1406	1.38	1435	1.42
2400	1245	1.18	1278	1.22	1311	1.28	1341	1.33	1370	1.40	1397	1.45	1425	1.50	1454	1.54
2500	1271	1.28	1303	1.33	1334	1.39	1363	1.45	1391	1.52	1418	1.57	1446	1.62	1474	1.66
2600	1297	1.39	1328	1.45	1357	1.52	1385	1.58	1412	1.64	1439	1.70	1467	1.74	1495	1.78
2700	1323	1.52	1353	1.58	1382	1.65	1409	1.72	1435	1.77	1462	1.82	1490	1.86	1517	1.90
2800	1351	1.65	1380	1.72	1407	1.78	1434	1.85	1460	1.90	1486	1.95	1513	1.99	1541	2.02
2900	1379	1.79	1407	1.86	1434	1.92	1460	1.98	1485	2.04	1511	2.08	1538	2.12	1565	2.15

BELT DRIVE KIT SPECIFICATIONS

Model No.	Blower Motor Choice (HP)				Drive Kit No.	RPM Range
	Nominal	Maximum	Nominal	Maximum		
036	1.5	1.72	2	2.3	A01	673 - 1010 rpm
					A05	897 - 1346 rpm
048	1.5	1.72	2	2.3	A02	745 - 1117 rpm
					A06	1071 - 1429 rpm
060	1.5	1.72	2	2.3	A03	833 - 1250 rpm
					A07	1212 - 1548 rpm
072	1.5	1.72	2	2.3	A04	968 - 1340 rpm
					A08	1193 - 1591 rpm

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

BLOWER DATA

POWER EXHAUST FANS PERFORMANCE

Return Air System Static Pressure in. w.g.	Air Volume Exhausted - cfm											
	T1PWRE10A						T1PWRE10N					
	208V			230V, 460V and 575V			208V			230V, 460V and 575V		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
0	1290	1300	1320	1300	1305	1295	3545	3915	4230	3880	4135	4340
0.1	1045	1055	1055	1040	1050	1055	2880	3215	3580	3255	3550	3755
0.2	805	805	815	805	810	810	2290	2665	3055	2710	3010	3240
0.3	580	580	600	595	590	585	1735	2175	2605	2200	2500	2770
0.4	390	405	400	405	400	410	1165	1660	2175	1685	2010	2325
0.5	245	315	215	240	255	300	530	1045	1710	1120	1510	1885
0.6	155	340	35	90	165	290	---	250	1160	470	990	1420
0.7	145	515	---	---	140	400	---	---	470	---	430	915

OPTIONS / ACCESSORIES AIR RESISTANCE - in. w.g.

Air Volume cfm	Economizer	Electric Heat	Wet Indoor Coil	
			036-048	060-072
800	0.04	0.01	0.01	0.01
1000	0.04	0.03	0.02	0.01
1200	0.04	0.06	0.02	0.01
1400	0.04	0.09	0.03	0.02
1600	0.04	0.12	0.04	0.03
1800	0.05	0.15	0.05	0.04
2000	0.05	0.18	0.06	0.05
2200	0.05	0.20	0.08	0.06
2400	0.05	0.22	0.09	0.07
2600	0.06	0.24	0.10	0.08
2800	0.06	0.26	0.11	0.09
3000	0.06	0.28	0.13	0.10

CEILING DIFFUSERS AIR RESISTANCE (in. w.g.)

Air Volume cfm	RTD9-65 Step-Down Diffuser			FD9-65 Flush Diffuser	RTD11-95 Step-Down Diffuser			FD11-95 Flush Diffuser
	2 Ends Open	1 Side & 2 Ends Open	All Ends & Sides Open		2 Ends Open	1 Side & 2 Ends Open	All Ends & Sides Open	
800	0.15	0.13	0.11	0.11	---	---	---	---
1000	0.19	0.16	0.14	0.14	---	---	---	---
1200	0.25	0.20	0.17	0.17	---	---	---	---
1400	0.33	0.26	0.20	0.20	---	---	---	---
1600	0.43	0.32	0.20	0.24	---	---	---	---
1800	0.56	0.40	0.30	0.30	0.13	0.11	0.09	0.09
2000	0.73	0.50	0.36	0.36	0.15	0.13	0.11	0.10
2200	0.95	0.63	0.44	0.44	0.18	0.15	0.12	0.12
2400	---	---	---	---	0.21	0.18	0.15	0.14
2600	---	---	---	---	0.24	0.21	0.18	0.17
2800	---	---	---	---	0.27	0.24	0.21	0.20
3000	---	---	---	---	0.32	0.29	0.25	0.25

CEILING DIFFUSER AIR THROW DATA

Air Volume - cfm	1 Effective Throw - ft.	
	Model No.	FD9-65
800	10 - 17	14 - 18
1000	10 - 17	15 - 20
1200	11 - 18	16 - 22
1400	12 - 19	17 - 24
1600	12 - 20	18 - 25
1800	13 - 21	20 - 28
2000	14 - 23	21 - 29
2200	16 - 25	22 - 30
Model No.	RTD11-95	FD11-95
2600	24 - 29	19 - 24
2800	25 - 30	20 - 28
3000	27 - 33	21 - 29

¹ Effective throw based on terminal velocities of 75 ft. per minute.

ELECTRICAL DATA **2 - 2.5 TON**

DIRECT DRIVE BLOWER		KHA024S	KHA030S
¹ Voltage - 60hz		208/230V - 1 Ph	208/230V - 1 Ph
Compressor 1	Rated Load Amps	13.5	14.1
	Locked Rotor Amps	58.3	73
Outdoor Fan Motors (1)	Full Load Amps (total)	1.7	1.7
Service Outlet 115V GFI		15 Amps	15 Amps
Indoor Blower Motor	Horsepower	.25	.25
	Full Load Amps	1.8	1.8
² Maximum Overcurrent Protection	Unit Only	30	35
³ Minimum Circuit Ampacity	Unit Only	21	22

ELECTRIC HEAT DATA

Electric Heat Voltage		208	240	208	240
² Maximum Overcurrent Protection	Unit + 7.5 kW	60	60	60	70
	Electric Heat 10 kW	70	80	70	80
³ Minimum Circuit Ampacity	Unit + 7.5 kW	55	60	55	61
	Electric Heat 10 kW	66	73	67	74

ELECTRICAL ACCESSORIES

Disconnect Kit	Standard Access - 0-10 kW	20W15	20W15	20W15	20W15
	Hinged Access - 0-10 kW	20W21	20W21	20W21	20W21
Fuse Block		28W69	28W69	17W94	17W94

¹ Extremes of operating range are plus and minus 10% of line voltage.
² HACR type breaker or fuse.
³ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRICAL DATA

3 TON

KHA036S

¹ Voltage - 60hz		208/230V - 1 Ph		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	16.7		10.4			5.8			3.8		
	Locked Rotor Amps	79		73			38			36.5		
Outdoor Fan Motors (1)	Full Load Amps (total)	1.7		1.7			1.1			0.7		
Power Exhaust (1) 0.75 HP	Full Load Amps (total)	5		5			2.2			1.5		
Service Outlet 115V GFI		15 Amps		15 Amps			15 Amps			15 Amps		
Indoor Blower Motor	Horsepower	.5	1.5	.5	1.5	2	.5	1.5	2	.5	1.5	2
	Full Load Amps	3.9	11	3.9	6.6	7.5	2	3	3.4	2	2.4	2.7
² Maximum Overcurrent Protection	Unit Only	40	50	25	30	30	15	15	15	15	15	15
	with (1) 0.75 HP Power Exhaust	45	50	30	35	35	15	15	15	15	15	15
³ Minimum Circuit Ampacity	Unit Only	27	34	19	22	23	11	12	12	8	8	9
	with (1) 0.75 HP Power Exhaust	32	39	24	27	28	13	14	14	9	10	10

ELECTRIC HEAT DATA

		Electric Heat Voltage		208	240	208	240	208	240	208	240	208	240	480	480	480	600	600	600
² Maximum Overcurrent Protection	Unit + Electric Heat	7.5 kW	15 kW	70	70	70	80	40	45	45	45	45	50	25	25	25	20	20	20
				100	110	110	125	60	70	70	70	70	70	35	35	35	30	30	30
³ Minimum Circuit Ampacity	Unit + Electric Heat	7.5 kW	15 kW	61	66	68	73	39	42	41	44	42	45	22	23	24	17	17	18
				95	105	102	112	58	64	61	67	62	68	33	34	35	26	26	27
² Maximum Overcurrent Protection	Unit + Electric Heat and (1) 0.75 HP Power Exhaust	7.5 kW	15 kW	70	80	80	80	45	50	50	50	50	50	25	25	30	20	20	20
				100	110	110	125	70	70	70	80	70	80	40	40	40	30	30	30
³ Minimum Circuit Ampacity	Unit + Electric Heat and (1) 0.75 HP Power Exhaust	7.5 kW	15 kW	66	71	73	78	44	47	46	49	47	50	24	25	26	18	19	19
				100	110	107	117	63	69	66	72	67	73	36	37	37	27	28	28

ELECTRICAL ACCESSORIES

Disconnect Kit	Standard Access - 0-7.5 kW	20W15	20W15	20W15	20W15	20W15	20W15	20W15
		15 kW	20W16	20W16	20W15	20W15	20W15	20W15
	Hinged Access - 0-7.5 kW	20W21	20W21	20W21	20W21	20W21	20W21	20W21
		15 kW	20W22	20W22	20W21	20W21	20W21	20W21
Fuse Block	Unit Only	17W95	17W97	18W00	18W01	18W01	18W06	18W06
	Unit + Power Exhaust	17W96	17W97	18W01	18W02	18W02	18W06	18W06

¹ Extremes of operating range are plus and minus 10% of line voltage.

² HACR type breaker or fuse.

³ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRICAL DATA

4 TON

KHA048S

¹ Voltage - 60hz		208/230V - 1 Ph		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	21.8		13.7			6.2			4.8		
	Locked Rotor Amps	117		83.1			41			33		
Outdoor Fan Motors (1)	Full Load Amps (total)	1.7		1.7			1.1			0.7		
Power Exhaust (1) 0.75 HP	Full Load Amps (total)	5		5			2.2			1.5		
Service Outlet 115V GFI		15 Amps		15 Amps			15 Amps			15 Amps		
Indoor Blower Motor	Horsepower	.5	1.5	.5	1.5	2	.5	1.5	2	.5	1.5	2
	Full Load Amps	3.9	11	3.9	6.6	7.5	2	3	3.4	2	2.4	2.7
² Maximum Overcurrent Protection	Unit Only	50	60	35	35	40	15	15	15	15	15	15
	with (1) 0.75 HP Power Exhaust	50	60	40	40	45	15	20	20	15	15	15
³ Minimum Circuit Ampacity	Unit Only	33	40	23	26	27	11	12	13	9	10	10
	with (1) 0.75 HP Power Exhaust	38	45	28	31	32	14	15	15	11	11	11

ELECTRIC HEAT DATA

Electric Heat Voltage		208	240	208	240	208	240	208	240	208	240	480	480	480	600	600	600
² Maximum Overcurrent Protection	Unit + 7.5 kW Electric Heat	80	80	80	90	50	50	50	50	50	50	25	25	25	20	20	20
	15 kW	110	125	110	125	70	70	70	80	70	80	35	35	35	30	30	30
³ Minimum Circuit Ampacity	Unit + 7.5 kW Electric Heat	67	72	74	80	43	46	45	48	46	49	23	24	24	18	19	19
	15 kW	101	111	108	119	62	68	65	71	66	72	34	35	35	27	28	28
² Maximum Overcurrent Protection	Unit + 7.5 kW Electric Heat and (1) 0.75 HP Power Exhaust	80	90	90	90	50	60	50	60	60	60	25	30	30	20	20	20
	15 kW	110	125	125	125	70	80	70	80	80	80	40	40	40	30	30	30
³ Minimum Circuit Ampacity	Unit + 7.5 kW Electric Heat and (1) 0.75 HP Power Exhaust	72	77	79	85	48	51	50	53	51	54	25	26	26	20	20	20
	15 kW	106	116	113	124	67	73	70	76	71	77	36	37	38	29	29	29

ELECTRICAL ACCESSORIES

Disconnect Kit	Standard Access - 0-7.5 kW	20W15	20W16	20W15	20W15	20W15	20W15	20W15
		15 kW	20W16	20W16	20W15	20W15	20W15	20W15
	Hinged Access - 0-7.5 kW	20W21	20W22	20W21	20W21	20W21	20W21	20W21
		15 kW	20W22	20W22	20W21	20W21	20W21	20W21
Fuse Block	Unit Only	17W97	17W98	18W02	18W02	18W03	18W06	18W06
	Unit + Power Exhaust	17W97	17W98	18W03	18W03	18W04	18W06 (.5 hp) 18W07 (1.5-2 hp)	18W06

¹ Extremes of operating range are plus and minus 10% of line voltage.

² HACR type breaker or fuse.

³ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRICAL/ELECTRIC HEAT DATA

5 TON

KHA060S

¹ Voltage - 60hz		208/230V - 1 Ph	208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor 1	Rated Load Amps	26.3	15.6		7.8		5.8	
	Locked Rotor Amps	134	110		52		38.9	
Outdoor Fan Motors (1)	Full Load Amps (total)	2.4	2.4		1.3		1	
Power Exhaust (1) 0.75 HP	Full Load Amps (total)	5	5		2.2		1.5	
Service Outlet 115V GFI		15 Amps	15 Amps		15 Amps		15 Amps	
Indoor Blower Motor	Horsepower	1.5	1.5	2	1.5	2	1.5	2
	Full Load Amps	11	6.6	7.5	3	3.4	2.4	2.7
² Maximum Overcurrent Protection	Unit Only	70	40	45	20	20	15	15
	with (1) 0.75 HP Power Exhaust	70	45	45	20	20	15	15
³ Minimum Circuit Ampacity	Unit Only	47	29	30	15	15	11	11
	with (1) 0.75 HP Power Exhaust	52	34	35	17	17	13	13

ELECTRIC HEAT DATA

Electric Heat Voltage		208	240	208	240	208	240	480	480	600	600
² Maximum Overcurrent Protection	Unit + 7.5 kW	90	100	50	60	60	60	30	30	20	20
	Electric Heat 15 kW	125	125	70	80	70	80	40	40	30	30
	22.5 kW	150	175	90	100	90	100	50	50	40	40
³ Minimum Circuit Ampacity	Unit + 7.5 kW	81	86	51	51	52	52	26	26	20	20
	Electric Heat 15 kW	114	125	68	74	69	75	37	38	29	29
	22.5 kW	148	164	88	97	89	98	48	49	38	39
² Maximum Overcurrent Protection	Unit + 7.5 kW	100	100	60	60	60	60	30	30	25	25
	Electric Heat 15 kW	125	150	80	80	80	80	40	40	35	35
	and (1) 0.75 HP Power Exhaust 22.5 kW	175	175	100	110	100	110	60	60	40	40
³ Minimum Circuit Ampacity	Unit + 7.5 kW	86	91	54	57	54	57	28	28	22	22
	Electric Heat 15 kW	119	130	73	79	74	80	39	40	31	31
	and (1) 0.75 HP Power Exhaust 22.5 kW	153	169	93	102	94	103	51	51	40	40

ELECTRICAL ACCESSORIES

Disconnect Kit	Standard Access - 0-15 kW	20W19	20W18	20W18	20W18	20W18
	22.5 kW	---	20W19	20W19	20W18	20W18
	Hinged Access - 0-15 kW	20W25	20W24	20W24	20W24	20W24
	22.5 kW	---	20W25	20W25	20W24	20W24
Fuse Block	Unit Only	17W99	18W03	18W04	18W07	18W06
	Unit + Power Exhaust	17W99	18W04	18W05	18W07	18W06

¹ Extremes of operating range are plus and minus 10% of line voltage.

² HACR type breaker or fuse.

³ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRICAL/ELECTRIC HEAT DATA

6 TON

KHA072S

1 Voltage - 60hz		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	19		9.7		7.4	
	Locked Rotor Amps	123		62		50	
Outdoor Fan Motor	Full Load Amps	3		1.5		1.2	
Power Exhaust (1) 0.75 HP	Full Load Amps	5		2.2		1.5	
Service Outlet 115V GFI		15 Amps		15 Amps		15 Amps	
Indoor Blower Motor	Horsepower	1.5	2	1.5	2	1.5	2
	Full Load Amps	6.6	7.5	3	3.4	2.4	2.7
² Maximum Overcurrent Protection	Unit Only	50	50	25	25	20	20
	With (1) 0.75 HP Power Exhaust	50	50	25	25	20	20
³ Minimum Circuit Ampacity	Unit Only	34	35	17	18	13	14
	With (1) 0.75 HP Power Exhaust	39	40	19	20	15	15

ELECTRIC HEAT DATA

Electric Heat Voltage			208	240	208	240	480	480	600	600
² Maximum Overcurrent Protection	Unit+ Electric Heat	7.5 kW	60	70	60	70	35	35	25	25
		15 kW	80	80	80	80	40	40	35	35
		22.5 kW	100	110	100	110	60	60	40	45
		30 kW	125	125	125	125	70	70	50	50
³ Minimum Circuit Ampacity	Unit+ Electric Heat	7.5 kW	53	56	54	57	28	29	22	23
		15 kW	73	79	74	80	40	40	31	32
		22.5 kW	92	102	93	102	51	51	40	41
		30 kW	112	124	113	125	62	63	49	50
² Maximum Overcurrent Protection	Unit+ Electric Heat and (1) 0.75 HP Power Exhaust	7.5 kW	70	70	70	70	35	35	25	25
		15 kW	80	90	80	90	45	45	35	35
		22.5 kW	100	110	100	110	60	60	45	45
		30 kW	125	150	125	150	70	70	60	60
³ Minimum Circuit Ampacity	Unit+ Electric Heat and (1) 0.75 HP Power Exhaust	7.5 kW	58	61	59	62	31	31	24	24
		15 kW	78	84	79	85	42	42	33	33
		22.5 kW	97	107	98	107	53	54	42	42
		30 kW	117	129	118	130	64	65	51	51

ELECTRICAL ACCESSORIES

Disconnect Kit	Standard Access - 0-22.5 kW	30 kW	20W18	20W18	20W18	20W18
		30 kW	20W19	20W19	20W18	20W18
	Hinged Access - 0-22.5 kW	30 kW	20W24	20W24	20W24	20W24
		30 kW	20W25	20W25	20W24	20W24

¹ Extremes of operating range are plus and minus 10% of line voltage.

² HACR type breaker or fuse.

³ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRIC HEAT CAPACITIES

Input Voltage	7.5 kW			10 kW			15 kW			22.5 kW			30 kW		
	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output
208	1	5.6	19,200	1	7.5	25,600	1	11.2	38,200	2	16.9	57,700	1	22.5	76,800
220	1	6.3	21,500	1	8.4	28,700	1	12.6	43,000	2	18.9	64,500	1	25.2	86,000
230	1	6.9	23,500	1	9.2	31,400	1	13.8	47,000	2	20.7	70,700	1	27.5	93,900
240	1	7.5	25,600	1	10.0	34,200	1	15.0	51,200	2	22.5	76,800	1	30.0	102,400
440	1	6.3	21,500	---	---	---	1	12.6	43,000	2	18.9	64,500	1	25.2	86,000
460	1	6.9	23,500	---	---	---	1	13.8	47,000	2	20.7	70,700	1	27.5	93,900
480	1	7.5	25,600	---	---	---	1	15.0	51,200	2	22.5	76,800	1	30.0	102,400
550	1	6.3	21,500	---	---	---	1	12.6	43,000	2	18.9	64,500	1	25.2	86,000
575	1	6.9	23,500	---	---	---	1	13.8	47,000	2	20.7	70,700	1	27.5	93,900
600	1	7.5	25,600	---	---	---	1	15.0	51,200	2	22.5	76,800	1	30.0	102,400

KHA PARTS ARRANGEMENT

FILTERS

024, 030, 036, 048, : 16 X 20 X 2"
060S, : 20 X 20 X 2"

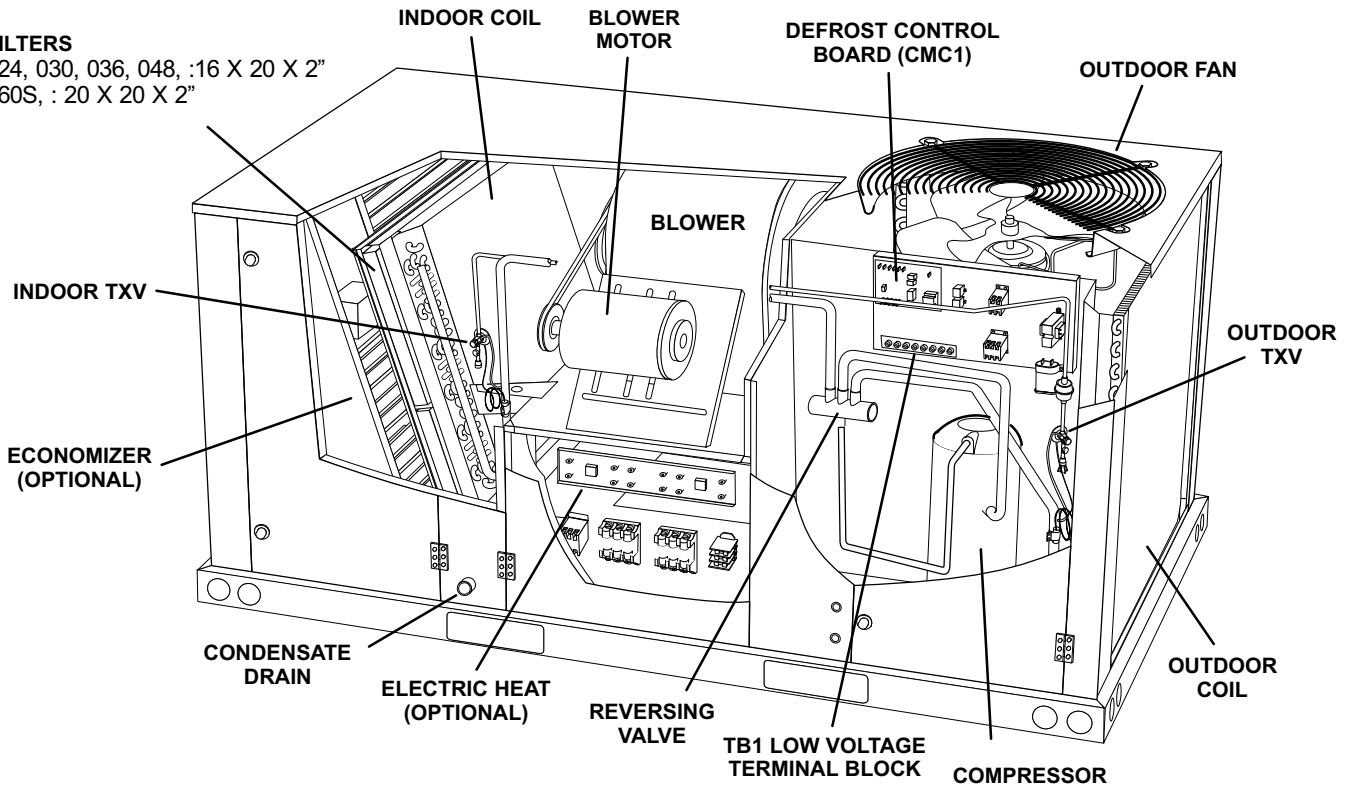


FIGURE 1

KHA CONTROL BOX

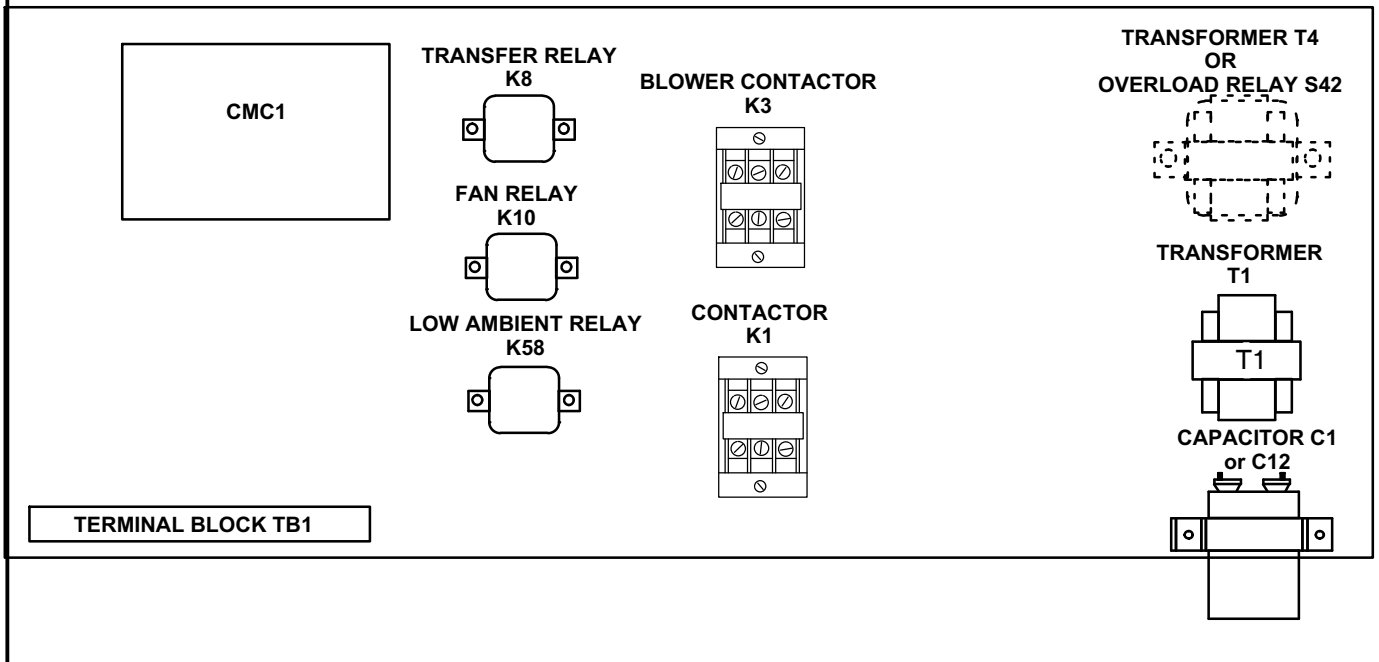


FIGURE 2

I-UNIT COMPONENTS

The KHA unit parts arrangement are shown in figure 1. All L1, L2 and L3 wiring is color coded; L1 is red, L2 is yellow and L3 is blue. See wiring diagrams in the back of this manual for complete call out of components.

A-Control Box Components

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

1-Terminal Strip TB1

All indoor thermostat connections will be to TB1 located in the control box.

2-Transformer T1

All KHA 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

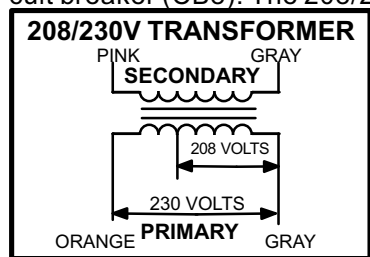


FIGURE 3

3-Outdoor Fan Capacitor C1 (Y, G, J & M)

Fan capacitors C1 is used to assist in the start up of condenser fan motor B4. Capacitor ratings will be on outdoor fan motor nameplate.

4-Dual Capacitor C12 (Single Phase)

A single dual capacitor is used for both the outdoor fan and compressor (see unit diagram). The fan side and the compressor side have different MFD ratings. See side of capacitor for ratings,.

5-Compressor Contactor K1

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

6-Low Ambient Kit Relay K58

(option used with S11 low ambient switch)

Low ambient relay K58 is a N.C.DPDT relay with a 24V coil wired in parallel with reversing valve L1. When L1 is energized in the cooling cycle, K58 is also energized opening K58-1. Therefore, K58-1 is always closed during heating demand bypassing S11. This allows the fan to operate during the heating demand and cycle during the cooling demand.

7-Blower Contactor K3

Blower contactor K3 is used in all units. K3 has a 24V coil used to energize the indoor blower motor in response to blower demand. In single phase units K3 is a single-pole contactor and in three phase units K3 is a two-pole contactor.

8-Transfer Relay K8

K8 is a two-pole relay with a 24V coil used to de-energize the reversing valve during a heat call. On a first stage heat call K8-1 closes de-energizing the reversing valve and K8-2 closes energizing Y1 on the CMC1 board. Without K8 the reversing valve would remain energized at all times.

9-Outdoor Fan Relay K10 G, J & M Voltage

Outdoor fan relay K10 is a DPDT relay switch with a 24VAC coil. K10 energizes condenser fan motor B4 in response to a heating or cooling demand.

10-Transformer T4 (J voltage)

All (J) 575 voltage units use transformer T4 mounted in the control box. T4 is a line voltage to 460V to power the indoor blower. It is connected to line voltage and is powered at all times.

11-Defrost Control CMC1

The KHA defrost system includes two components: a defrost thermostat and a defrost control.

Defrost Thermostat (Defrost Switch S6)

The defrost thermostat is located on the liquid line between the outdoor check/expansion valve and the distributor. When defrost thermostat senses 42°F (5.5°C) or cooler, the thermostat contacts close and send a signal to the defrost control board to start the defrost timing. It also terminates defrost when the liquid line warms up to 70°F (21°C).

Defrost Control

The defrost control board includes the combined functions of a time/temperature defrost control, defrost relay and diagnostic LEDs.

The control provides automatic switching from normal heating operation to defrost mode and back. During compressor cycle (call for defrost), the control accumulates compressor run times at 30-, 60-, or 90-minute field-adjustable intervals. If the defrost thermostat is closed when the selected compressor run time interval ends, the defrost relay is energized and defrost begins.

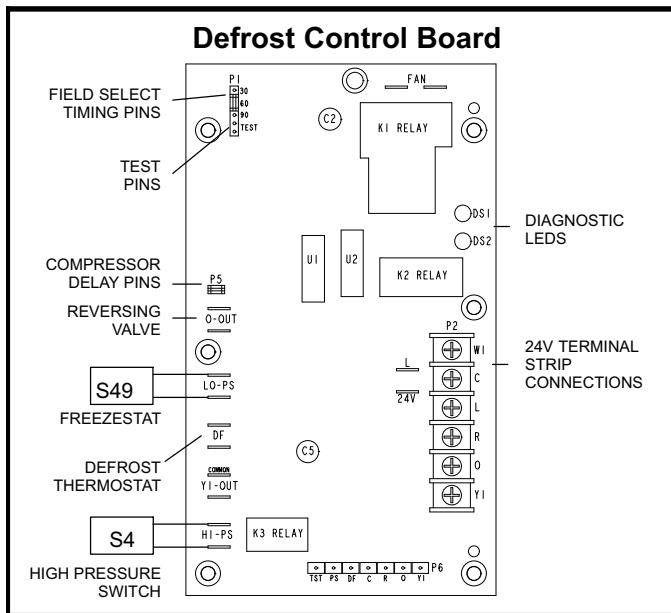


FIGURE 4

Defrost Control Timing Pins

Each timing pin selection provides a different accumulated compressor run time period. This time period must occur before a defrost cycle is initiated. The defrost interval can be adjusted to 30, 60 or 90 minutes (see figure 4). 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. The maximum defrost period is 14 minutes and cannot be adjusted.

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 jumper is in the TEST position at power-up, the 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 thermostat opens or 14 minutes have passed. If the jumper is not re-

moved 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.

Compressor Delay

The defrost board has a field-selectable function to reduce occasional sounds that may occur while the unit is cycling in and out of the defrost mode. The compressor will be cycled off for 30 seconds going in and out of the defrost mode when the compressor delay jumper is removed.

NOTE - The 30-second compressor feature is ignored when the defrost test pins are jumpered.

Time Delay

The timed-off delay is five minutes long. The delay helps to protect the compressor from short-cycling in case the power to the unit is interrupted (demand met for example) or a pressure switch opens. The delay is bypassed by placing the timer select jumper across the TEST pins for 0.5 seconds.

Pressure Switch Circuit

The defrost control incorporates two pressure switch circuits. An optional high pressure switch (S4) is connected to the board's HI PS terminals (see figure 4). The board also includes terminals LO PS for a freezestat (S49) or low pressure switch (S87). Switches are shown in the unit wiring diagram. During a single demand cycle, the defrost control will lock out the unit after the fifth time that the circuit is interrupted by any switch wired to the control board. In addition, the diagnostic LEDs will indicate a locked-out switch after the fifth occurrence of an open pressure switch (see Table 1). The unit will remain locked out until power to the board is interrupted, then re-established or until the jumper is applied to the TEST pins for 0.5 seconds.

NOTE - The defrost control board ignores input from the LO PS terminals as follows:

during the TEST mode,

during the defrost cycle,

during the 90-second start-up period,

and for the first 90 seconds each time the reversing valve switches heat/cool modes.

Diagnostic LEDs

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

TABLE 1

Defrost Control Board Diagnostic LED		
Mode	Green LED (DS2)	Red LED (DS1)
No power to control	OFF	OFF
Normal operation / power to control	Simultaneous Slow FLASH	
Anti-short cycle lockout	Alternating Slow FLASH	
Low pressure switch, freezestat fault	OFF	Slow FLASH
Low pressure switch, freezestat lockout	OFF	ON
High pressure switch fault	Slow FLASH	OFF
High pressure switch lockout	ON	OFF

KHA PLUMBING and S49 FREEZESTAT LOCATION

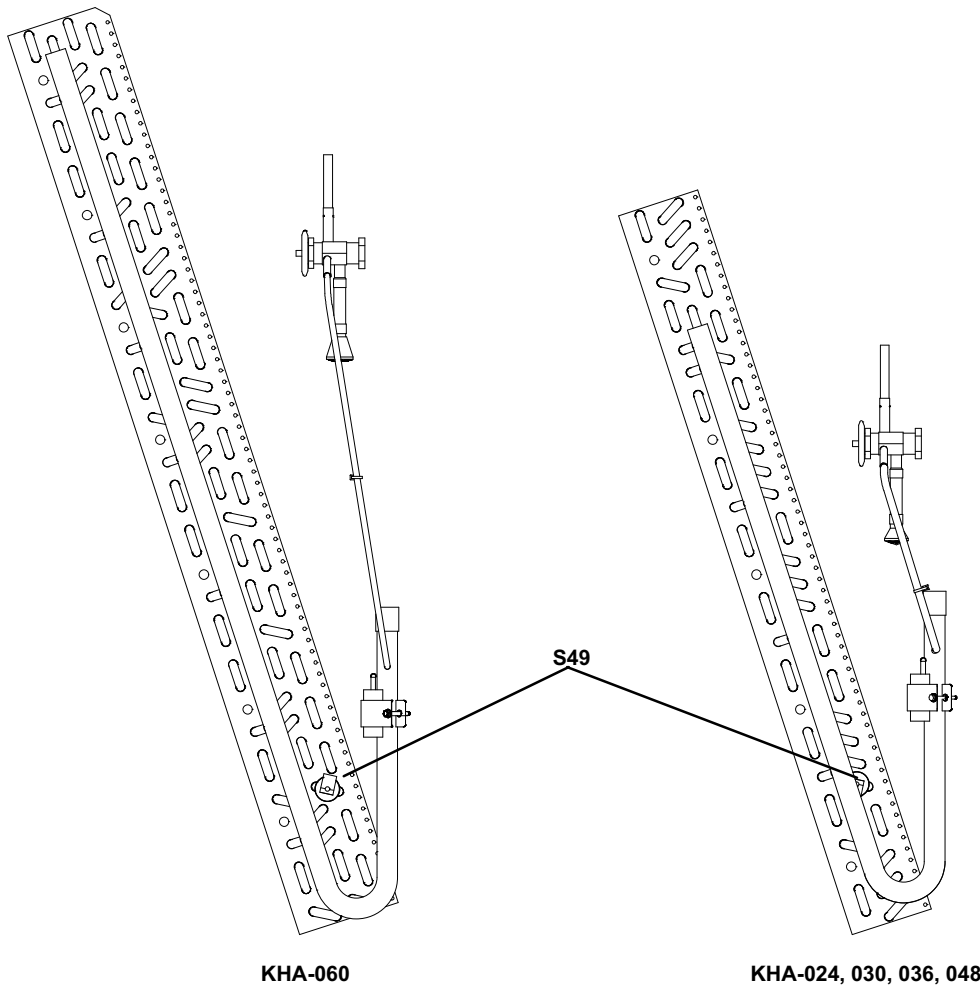
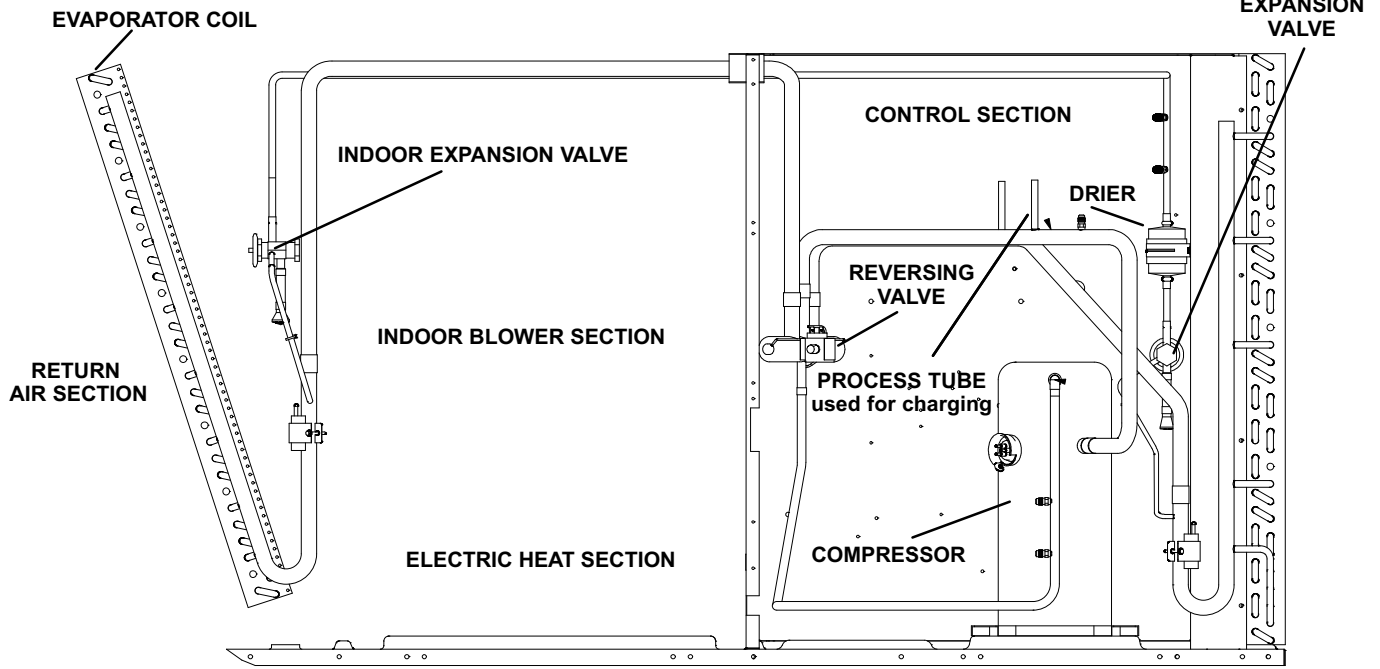


FIGURE 5

B-Cooling Components

If Interlink compressor replacement is necessary, call 1-800-4-LENNOX (1-800-453-6669).

⚠ IMPORTANT

Some scroll compressors have an internal vacuum protector that will unload scrolls when suction pressure goes below 20 psig. A hissing sound will be heard when the compressor is running unloaded. Protector will reset when low pressure in system rises above 40 psig. DO NOT REPLACE COMPRESSOR.

KHA units use one cooling circuit consisting of a compressor, outdoor coil and indoor coil. See figure 5. Units are equipped with one draw-through type condenser fan. All units are equipped with indoor blowers which draw air across the indoor coil during unit operation. KHA units have three condensate drain locations: front, back and bottom of unit. See unit installation instructions for more detail.

Cooling may be supplemented by a factory or field-installed economizer. The indoor coil is slab type. The indoor coil uses a thermostatic check/expansion valve as the primary expansion device. The indoor coil is also equipped with enhanced fins and rifled tubing. In all units the compressor is protected by a freeze-stat (S49) (on the indoor coil) and a high pressure switch (S4). A low ambient switch (S84) is available as an option for additional compressor protection.

1-Compressor B1

All KHA024/060 units use scroll compressor. See "SPECIFICATIONS" and "ELECTRICAL DATA" (table of contents) or compressor nameplate for compressor specifications.

⚠ 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.

The compressor is energized by a corresponding compressor contactor.

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

2-Freeze-stat S49

Each unit is equipped with a low temperature switch (freeze-stat) located on the return bend of the indoor coil.

The freeze-stat is wired to "LO PS" on the CMC1 board and is a SPST N.C. auto-reset switch which opens at $29^{\circ}\text{F} \pm 3^{\circ}\text{F}$ ($-1.7^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$) on a temperature drop and closes at $58^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($14.4^{\circ}\text{C} \pm 2.2^{\circ}\text{C}$) on a temperature rise. To prevent coil icing, the freeze-stat opens during compressor operation to temporarily disable the compressor until the coil warms sufficiently to melt any accumulated frost.

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

3-High Pressure Switch S4

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 to "HI PS" on the CMC1 board.

When discharge pressure rises to 640 ± 10 psig (4413 ± 69 kPa) (indicating a problem in the system) the switch opens and the CMC1 board de-energizes the compressor (the economizer can continue to operate). S4 will close when pressure drops back to 475 psig (3275 kPa).

4-Low Ambient Switch S11 (option)

The low ambient switch is an auto-reset SPST N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. In all models a switch is located in the liquid line prior to the indoor coil section.

In the P and Y voltage units S11 is wired in series with the K1 contactor and the CMC1 board fan contacts. In G, J and M voltage units S11 in series with outdoor fan relay K10 and low ambient relay K58 (if used).

When liquid pressure rises to 450 ± 10 psig (3102 ± 69 kPa), the switch closes and the condenser fan is energized. When discharge pressure in drops to 240 ± 10 psig (1655 ± 69 kPa), the switch opens and the condenser fan in that refrigerant circuit is de-energized. This intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the indoor coil and losing capacity.

5-Reversing Valve L1

A refrigerant reversing valve with a 24 volt solenoid coil is used to reverse refrigerant flow during unit operation in all KHA 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.

Reversing valve L1 is controlled by the CMC1 board and transfer relay K8 in response to cooling demand or by defrost.

6-Condenser Fan Motor B4

See specifications section of this manual for specifications of condenser fan B4. B4 is energized by contactor K1 in P and Y voltage units and K10 in G and J units. All motors are ball bearing type single-phase motors. The fans may be removed for servicing and cleaning by removing the fan grilles.

7-Low Temperature Switch S3 (option) (compressor monitor)

S3 is a SPST bimetal thermostat which opens on temperature drop. It is wired in line with the indoor thermostat and transfer relay K8. In the cooling mode, when outdoor temperature drops below 40°F (4.5°C) the switch opens and

de-energizes the compressor. When the compressor is de-energized the cooling demand is handled by the economizer. The switch automatically resets when outdoor temperature rises to 50° F (10° C).

8-Filter Drier (all units)

KHA units have a filter drier located in the liquid line of the refrigerant circuit at the exit of the condenser coil (outdoor coil in KHA units). The drier removes contaminants and moisture from the system. Replacement must be suitable for R-410A refrigerant.

9-Crankcase Heater HR1 & Thermostat S40

All units have a crankcase heater. HR1 prevents migration of liquid refrigeration into the compressor and ensures proper compressor lubrication.

S40 is a N.C. thermostat located on the discharge line which opens when discharge line temperature rises above 94°F (34°C). When S40 opens the crankcase heater is de-energized. The thermostat closes when discharge line temperature drops below 74°F (23°C) energizing the crankcase heater.

C-Blower Compartment

KHA036 and 048 units are equipped with either direct drive or belt drive blowers. KHA024S and 030S units are equipped with direct drive blowers only and KHA060S units are available with belt drive blowers only. See unit nameplate for blower type. The blower compartment in all KHA036/060 units is located between the evaporator coil and the compressor compartment.

1-Blower Wheels

All belt drive units use 10" x 10" (254 mm x 254 mm) blower wheels. The KHA024, 030, 036 and 048 direct drive units use 10" x 10" (254 mm x 254 mm) blower wheels also.

2-Indoor Blower Motor Capacitor C4

All single phase blower motors are PSC and requires a run capacitor. Ratings may vary from each motor. See motor nameplate for capacitor ratings.

3-Indoor Blower Motor B3

All direct drive units use single phase PSC motors. Belt drive units use single or three phase motors (same as supply voltage). CFM adjustments on belt drive units are made by adjusting the motor pulley (sheave). CFM adjustments on direct drive units are made by changing speed taps. Belt drive motors are equipped with sealed ball bearings. Direct drive motors are equipped with sleeve bearings. 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

! IMPORTANT

Three phase scroll compressors must be phased sequentially for correct compressor and blower rotation. Follow "COOLING START-UP" section of installation instructions to ensure proper compressor and blower operation.

A-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- Blower operation is manually set at the thermostat sub-base fan switch. With fan switch in **ON** position, blowers will operate continuously.
- 2- With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

B-Determining Unit CFM - Direct Drive Blowlers

- 1- The following measurements must be made with air filters in place and no cooling demand.
- 2- With all access panels in place, measure static pressure external to unit (from supply to return). Add any additional air resistance for options and accessories shown in air resistance table on Page 13.
- 3- Use figure 6 to determine the factory set blower speed.

036 Units		024, 030, 048 Units	
<input type="checkbox"/>	1 Com	<input type="checkbox"/>	1 Com
<input type="checkbox"/>	2 Hi	<input type="checkbox"/>	2 Hi
<input type="checkbox"/>	3 Med	<input checked="" type="checkbox"/>	3 Med*
<input type="checkbox"/>	4 Low*	<input type="checkbox"/>	4 Low

*Factory Setting

FIGURE 6

- 4- Use the blower tables starting on Page 7, measured static pressure and the factory-set blower speed to determine CFM. If CFM is lower than the design specified CFM, move the lead from speed tap 3 or 4 to speed tap 2. See figure 7.

Note - Speed tap 3 can be used on 036 units if speed tap 2 delivers more CFM than required by design specification.

For 460/575V units, remove the isolation lead from speed tap 2 before moving the wire to speed tap 2. Tape the exposed end of the isolation lead and secure away from other components. See figure 7.

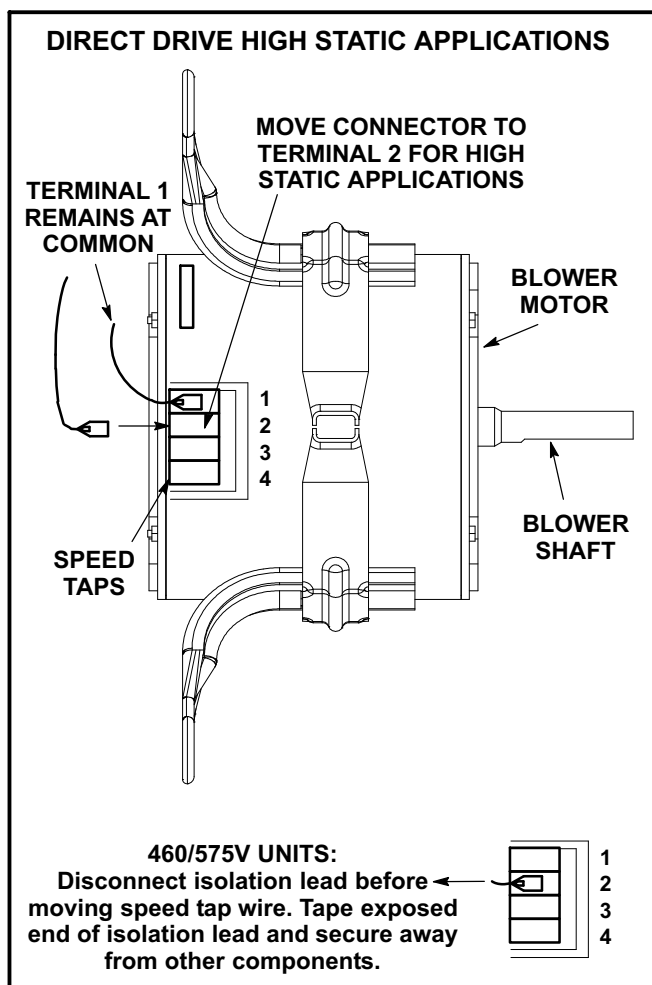


FIGURE 7

C-Determining Unit CFM - Belt Drive Blowers

- 1- The following measurements must be made with air filters in place and no cooling demand.
- 2- With all access panels in place, measure static pressure external to unit (from supply to return).
- 3- Measure the indoor blower wheel RPM.
- 4- Referring to the blower tables starting on Page 7 use static pressure and RPM readings to determine unit CFM. Use air resistance table on Page 13 when installing units with any of the options or accessories listed.
- 5- 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 8. Do not exceed minimum and maximum number of pulley turns as shown in table 2.

**TABLE 2
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Min. Turns Open	Max. Turns Open
A Section	No minimum	5

D-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 8.
- 2- *To increase belt tension -*
Slide blower motor downward to tighten the belt. This increases the distance between the blower motor and the blower housing.
- 3- *To loosen belt tension -*
Slide blower motor upward to loosen the belt. This decreases the distance between the blower motor and the blower housing.
- 4- Tighten four bolts securing motor base to the mounting frame.

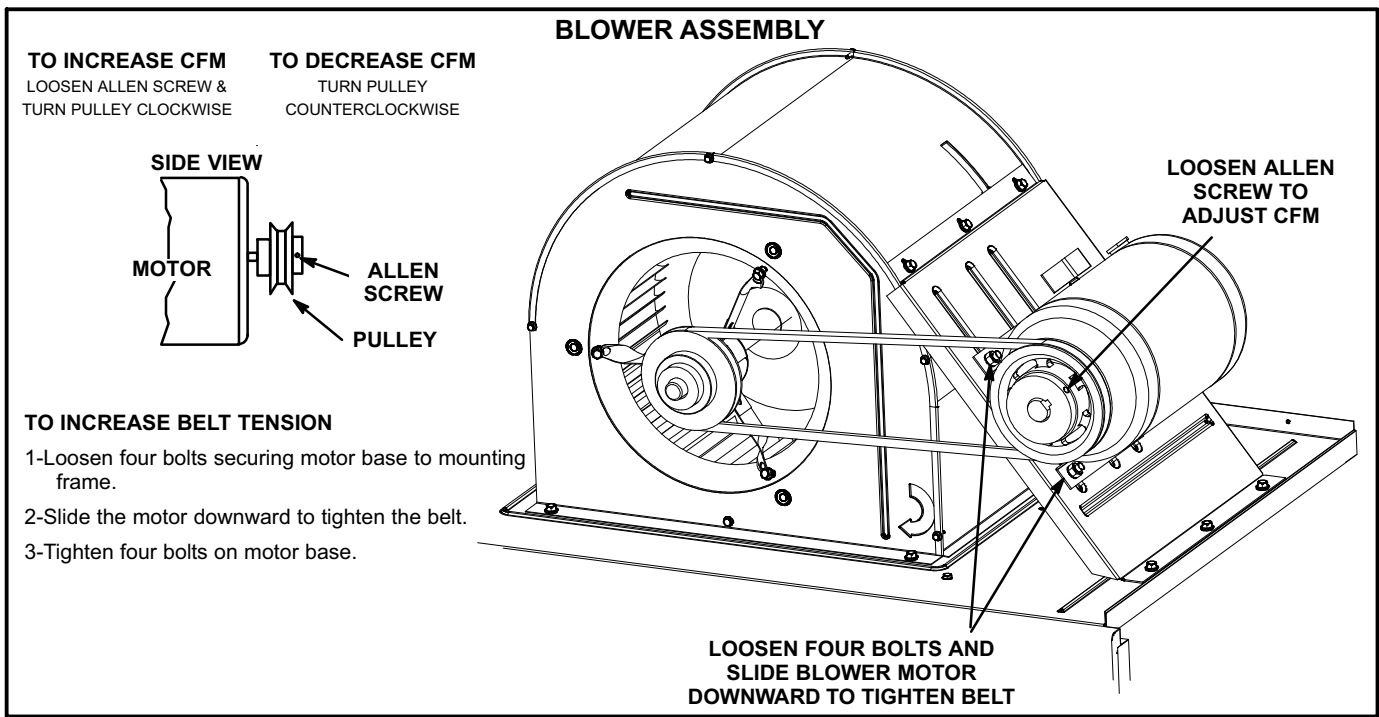


FIGURE 8

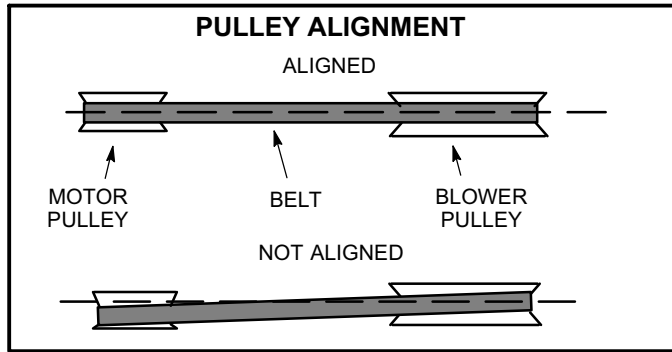


FIGURE 9

E-Check Belt Tension

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

- 1- Measure span length X. See 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.

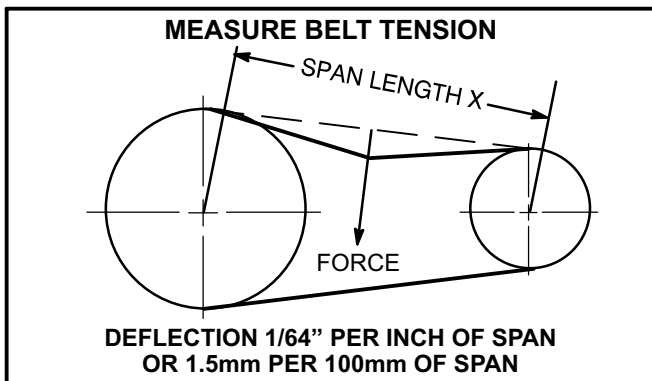


FIGURE 10

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

F-Field-Furnished Blower Drives

See blower data tables for field-furnished blower drives to determine BHP and RPM required. See drive kit table on to determine the drive kit number.

D-Optional Electric Heat Components

Electric heat matchups are found in the ELECTRICAL DATA tables. See table of contents.

All electric heat sections consist of electric heating elements exposed directly to the airstream. See figure 11. See figure 12 for vestibule parts arrangement.

1-Contactors K15, K16

All contactors are double break and either single, double or three pole (see diagram) and equipped with a 24VAC coil. The coils in the K15 and K16 contactors are energized by the indoor thermostat. In all units K15 energizes the heating elements, while in the 22.5 kW units, K15 and K16 energize the heating elements simultaneously.

2-High Temperature Limits S15 (Primary)

S15 is a SPST N.C. auto-reset thermostat located on the back panel of the electric heat section above the heating elements. S15 is the high temperature limit for the electric heat section. When S15 opens, indicating a problem in the system, contactor K15 is de-energized (including K16 in 22.5 kW units). When K15 is de-energized, all stages of heat are de-energized. See table 3 for S15 set points. Set points are factory set and not adjustable.

TABLE 3

Unit kW (Voltage)	S15 Opens ° F	S15 Closes ° F
7.5 (Y, G, J, P)	160	120
10 (P)	170	130
15 (Y)	170	130
15 (G, J, P)	160	120
22.5 (Y, G, J)	160	120
22.5 (P)	150	110

3-High Temperature Limit S20 and S157 (Secondary)

S20 and S157 are SPST N.C. manual-reset thermostats. S20 and S157 are wired in series with the heating elements. See T1EH wiring diagrams. When either limit opens K15 and K16 are de-energized. When the contactors are de-energized, all stages of heat are de-energized. The thermostat is factory set to open at $220^{\circ}\text{F} \pm 6^{\circ}\text{F}$ ($104^{\circ}\text{C} \pm 3.3^{\circ}\text{C}$) on a temperature rise and can be manually reset when temperature falls below 160°F (71.0°C). See figure 12 for location.

4-Terminal Strip TB2

Terminal strip TB2 is used for single point power installations only. TB2 distributes power to TB3. Units with multi-point power connections will not use TB2.

5-Terminal Strip TB3

P and Y voltage units are equipped with terminal strip TB3. Electric heat line voltage connections are made to TB3, which distributes power to the electric heat components and is located on the vestibule. See figure 12.

6-Heating Elements HE1 through HE6

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.

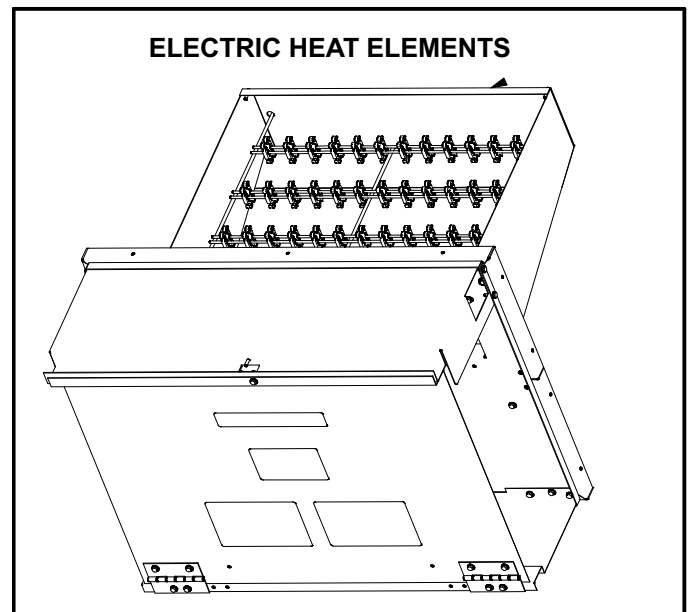


FIGURE 11

7-Fuse F3 and F42

Fuse F3 and F42 are housed in a fuse block which holds two or three fuses. Each F3 fuse is connected in series with each leg of electric heat. Figure 12 and table 4 show the fuses used with each electric heat section.

8-Unit Fuse Block & Fuse F4

Unit fuses F4 provide short circuit and ground fault protection to all cooling components in the KHA units with electric heat. The fuses are rated in accordance with the amperage of the cooling components. The F 4 fuse block is located inside a sheetmetal enclosure.

TABLE 4

Unit	Voltage-Phase	FUSE		Qty each	Qty total
		F3	F42		
T1EH0075	208/230V-1P	40 A-250V	---	2	2
	208/230V-3P	25 A-250V	---	3	3
	460V-3P	15 A-600V	---	3	3
	575V-3P	15 A-600V	---	3	3
T1EH0010	208/230V-1P	30 A-250V	30A-250V	2	2
T1EH0015	208/230V-1P	40 A-250V	40A-250V	2	4
	208/230V-3P	50 A-250V	---	3	3
	460V	25 A-600V	---	3	3
	575V	20 A-600V	---	3	3
T1EH00225	208/230V-1P	40 A-250V	40A-250V	3	6
	208/230V-3P	45 A-250V	45A-250V	3	6
	460V-3P	35 A-600V	---	3	3
	575V-3P	30 A-600V	---	3	3
T1EH0300	208/230V-3P	60 A-250V	60A-250V	3	6
	460V-3P	50 A-600V	---	3	3
	575V-3P	40 A-600V	---	3	3

ELECTRIC HEAT VESTIBULE

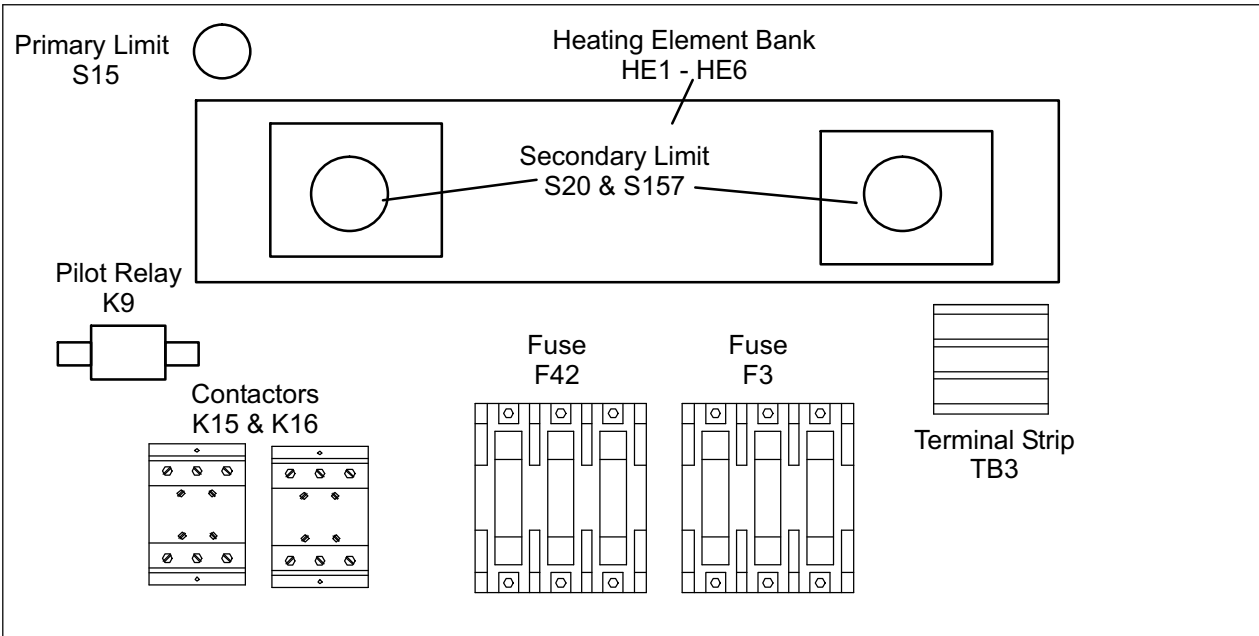


FIGURE 12

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 (T1CURB).

III-START UP - 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 Start Up

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

A first-stage heating demand (W1) will energize compressor 1 and the outdoor fan.

Note - L1 reversing valve is de-energized in the heating mode.

KHA Units With Optional Electric Heat -

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

C-Cooling Start Up

⚠ 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- 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 Y1 cooling demand will energize L1 reversing valve and the compressor.

Units With Optional Economizer -

The optional economizer will start on a Y1 cooling demand when outdoor air enthalpy is suitable.

- 2- Refrigerant circuits are factory charged with R-410A refrigerant. See unit rating plate for correct amount of charge.

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 K1 contactor. Do not reverse wires at blower contactor.

Make sure the connections are tight.

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

IV- SYSTEMS SERVICE CHECKS

Refrigerant Charge and Check

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).
- 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 5 through 9 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, reclaim the charge, evacuate the system then add refrigerant.
 - 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 5
KHA024S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	226	147
75°F	258	148
85°F	304	151
95°F	351	154
105°F	402	157
115°F	460	160

**TABLE 6
KHA030S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	235	145
75°F	273	148
85°F	316	151
95°F	363	153
105°F	416	156
115°F	476	158

**TABLE 7
KHA036S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	247	140
75°F	289	143
85°F	331	145
95°F	381	148
105°F	434	151
115°F	492	154

**TABLE 8
KHA048S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	272	139
75°F	313	142
85°F	359	145
95°F	410	148
105°F	465	150
115°F	529	152

**TABLE 9
KHA060S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	265	136
75°F	304	139
85°F	348	141
95°F	397	144
105°F	447	147
115°F	507	149

C-Charge Verification - Approach Method

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

Approach Temperature = Liquid temperature minus ambient temperature.

9- Approach temperature should match values in table 10. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

10- Do not use the approach method if system pressures do not match pressures in tables 5 through 9. The approach method is not valid for grossly over or under-charged systems.

**TABLE 10
APPROACH TEMPERATURE**

Unit	Liquid Temp. Minus Ambient Temp.
024S	7°F ± 1 (3.9°C ± 0.5)
030S, 036S	9°F ± 1 (5.0°C ± 0.5)
048S, 060S	11°F ± 1 (6.1°C ± 0.5)

V-MAINTENANCE

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

⚠ 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.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

A-Lubrication

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

B-Filters

Units are equipped with temporary filters which need to be replaced before the building is occupied. See table 11 for correct filter size. Refer to local codes or appropriate jurisdiction for approved filters.

Approved filters should be checked monthly and replaced when necessary. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 13.

⚠ WARNING

Units are shipped from the factory with temporary filters. Replace filters before building is occupied. Damage to unit could result if filters are not replaced with approved filters. Refer to appropriate codes.

**TABLE 11
UNIT FILTERS**

Unit	Qty	Filter Size - inches (mm)
024, 030, 036, 048,	4	16 X 20 X 2 (406 X 508 X 51)
060	4	20 X 20 X 2 (508 X 508 X 51)

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

C-Supply Air Blower Wheel

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

D-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 single and two formed slabs. On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 14. Flush coils with water following cleaning.

Note - Remove all screws and gaskets prior to cleaning procedure and replace upon completion.

F-Filter Drier

The unit is equipped with a biflow filter drier. If replacement is necessary, order another of like design.

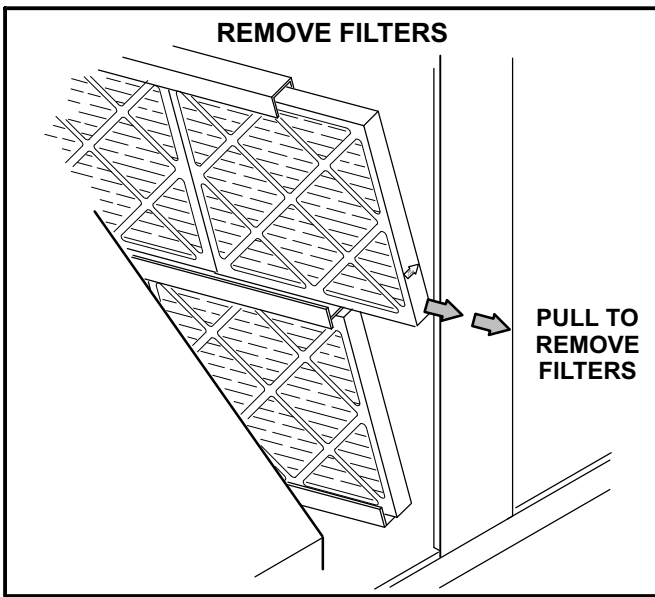


FIGURE 13

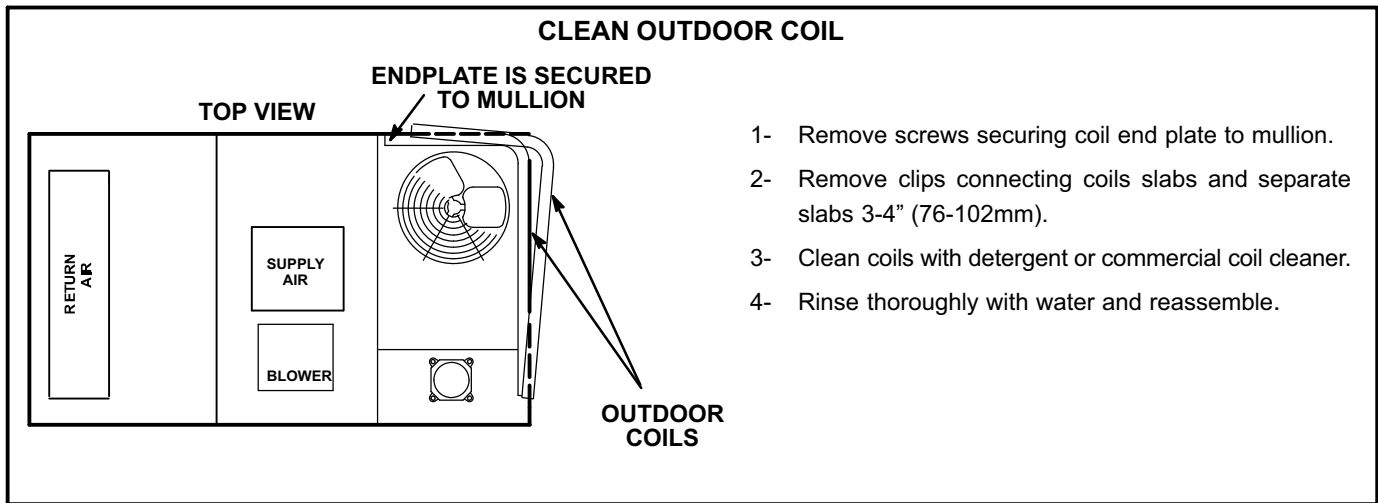


FIGURE 14

VI-ACCESSORIES

The accessories section describes the application of most of the optional accessories which can be factory or field installed to the KHA units.

A-T1CURB

When installing the KHA units on a combustible surface for downflow discharge applications, the Lennox T1CURB 8 inch, 14-inch, 18 inch or 24-inch height roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the 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 mounting frame is shown in figure 15. 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 16. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

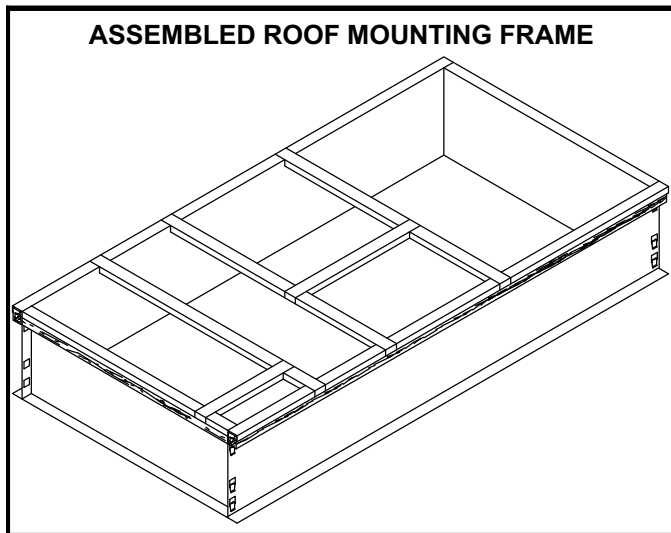


FIGURE 15

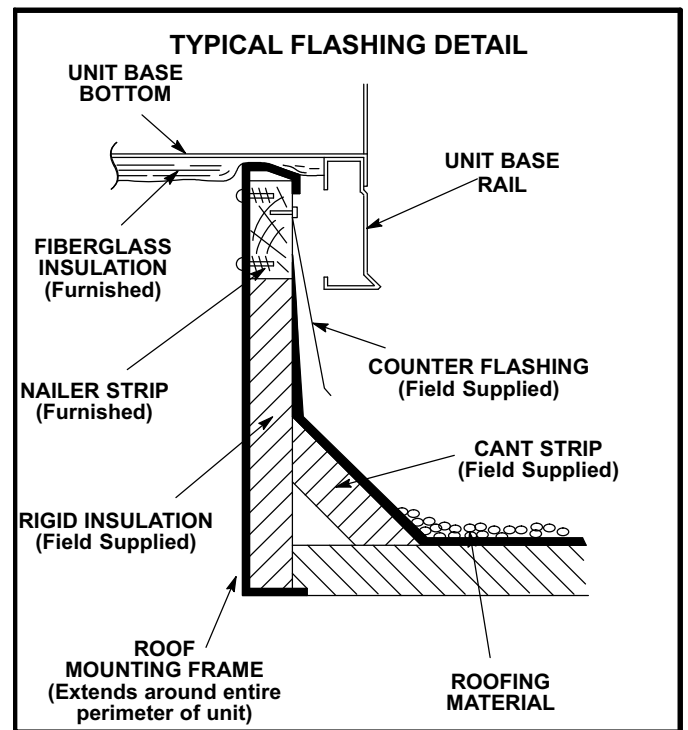


FIGURE 16

B-Transitions

Optional supply/return transitions T1TRAN10AN1 is available for use with the KHA 2, 2.5, 3, 4 and 5 units utilizing optional T1CURB roof mounting frames. Transition must be installed in the mounting frame before mounting the unit to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

C-Outdoor Air Dampers

T1DAMP11A-1 is available for KHA024, 030 036, 048 units and T1DAMP11N-1 is available for the KHA060S. Both sets include the outdoor air hood. A motorized kit (T1DAMP21AN1) can be ordered separately for all KHA unit sizes. The dampers may be manually or motor (M) operated to allow up to 25 percent outside air into the system at all times (see figure 17). 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 and is available as Lennox Part No. P-8-5069.

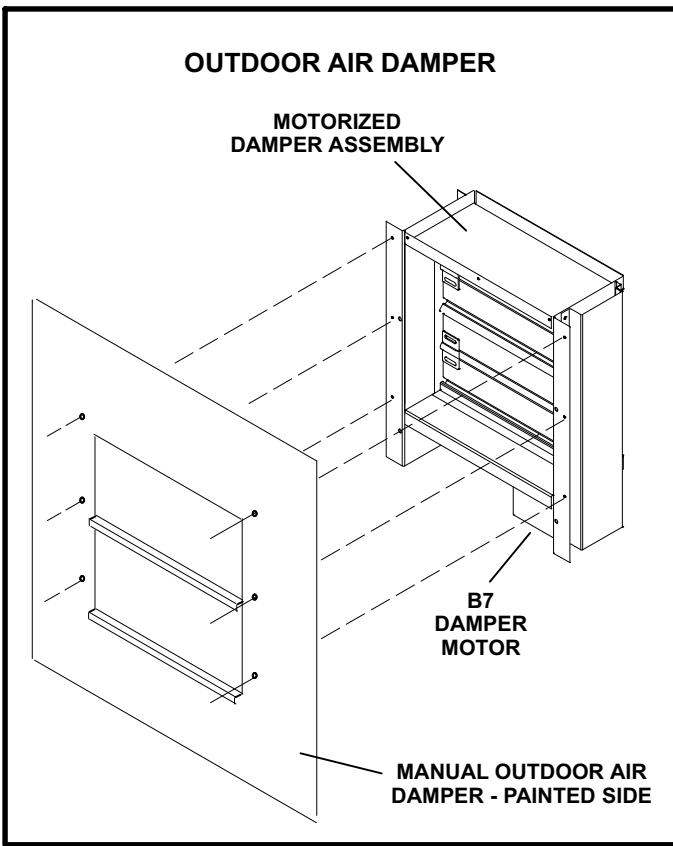


FIGURE 17

D-Supply and Return Diffusers (all units)

Optional flush mount diffuser/return FD9-65 and extended mount diffuser/return RTD9-65 available for use with all KHA units. Refer to manufacturer's instructions included with transition for detailed installation procedures.

E-Economizer

(Field or Factory Installed)

Unit may contain an optional field or factory-installed economizer equipped with an A6 enthalpy control and an A7 outdoor enthalpy sensor. The modulating economizer opens fully to use outdoor air for free cooling when temperature is suitable and opens to minimum position during the occupied time period.

The A6 enthalpy control is located in the economizer access area. See figure 18. The A7 enthalpy sensor is located on the division panel between horizontal supply and return air sections.

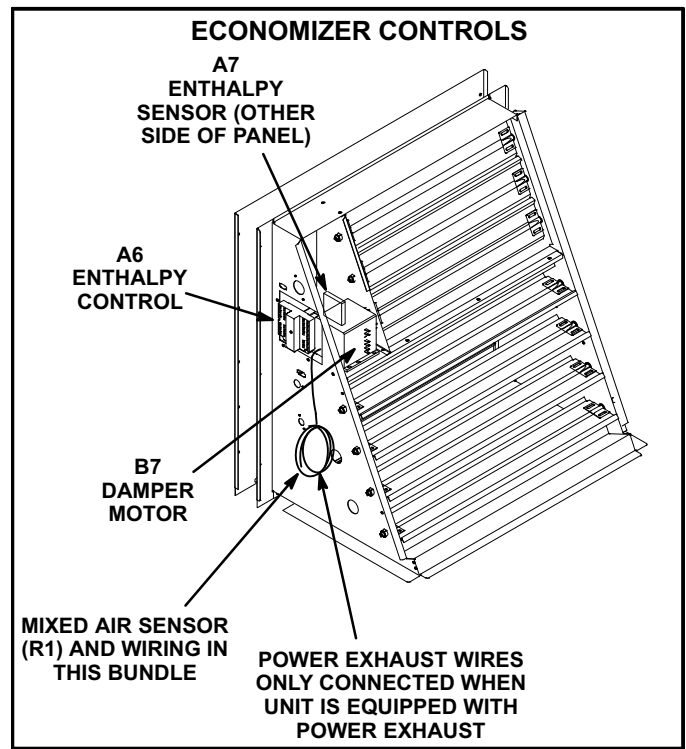


FIGURE 18

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 temperature, outdoor air is used for free cooling.

Mixed air sensor (R1) is used to modulate dampers to 55°F (13°C) discharge air.

An optional IAQ sensor (A63) may be used to lower operating costs by controlling outdoor air based on CO₂ 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 CO₂ 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 19.

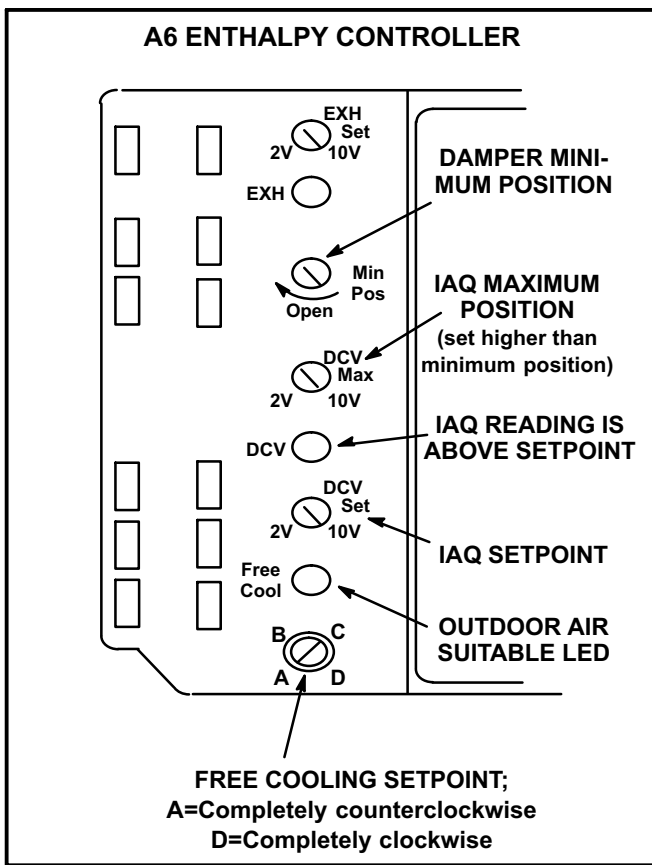


FIGURE 19

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 12. Setting A is recommended. See figure 19. 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 12
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 must be installed between TB1 R and OC 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 TB1 terminals R and OC 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

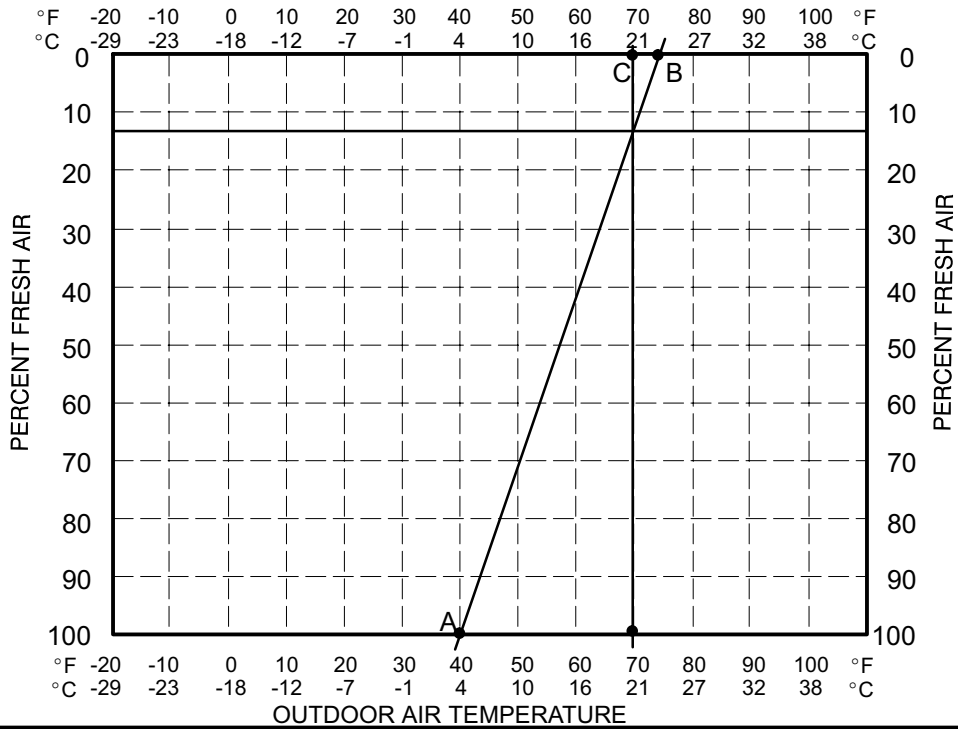
Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO₂ 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 19.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO₂ rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 19.

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

**CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE
MIXED AND RETURN AIR TEMPERATURE**



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.

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 13 for economizer operation with a standard two-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

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

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 20. Manual damper fresh air intake percentage can be determined in the same manner.

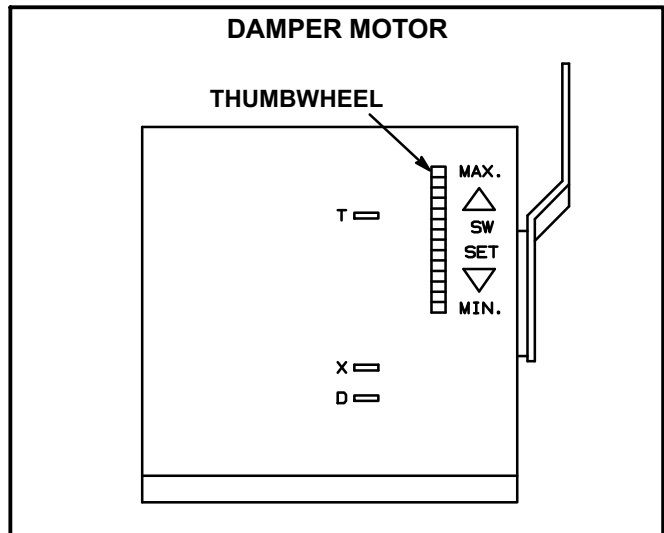


FIGURE 20

**TABLE 13
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	OPEN*	OPEN*	NO
Y2	OPEN*	OPEN*	STAGE 1

*Dampers will modulate to maintain 55°F (13°C) supply air when an R1 mixed air sensor is installed.

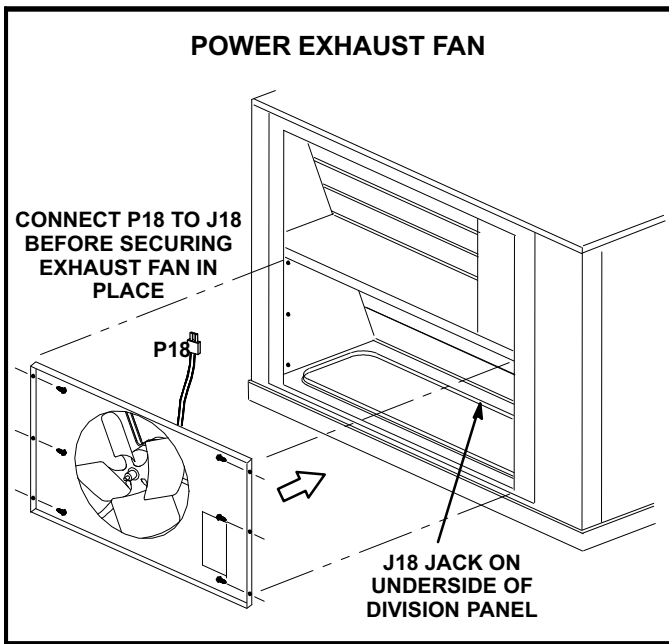


FIGURE 21

F-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 KHA 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 fan B10 is energized.

G-Power Exhaust Fans

T1PWRE10A available for KHA036, 048 units and T1PWRE10N available for 060 units, provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. See figure 21 and installation instructions for more detail.

H-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 in the filter section on the left unit mullion.

I-Indoor Air Quality (CO₂) Sensor A63

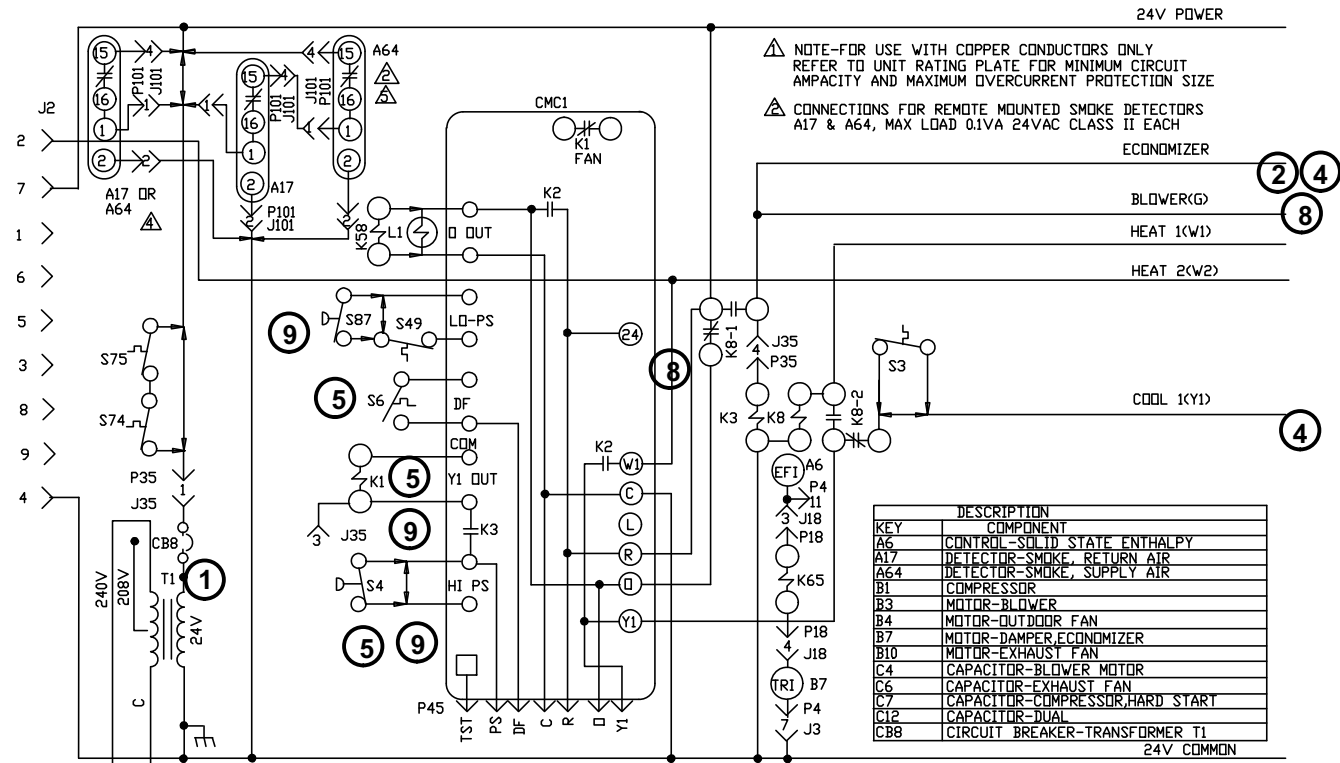
The indoor air quality sensor monitors CO₂ levels and reports the levels to the economizer enthalpy control A6. Controller A6 adjusts the economizer dampers according to the CO₂ levels. The sensor is mounted next to the indoor thermostat or in the return air duct. Refer to the indoor air quality sensor installation instructions for proper adjustment.

J-Drain Pan Overflow Switch S149 (optional)

The overflow switch is used to interrupt cooling operation when excessive condensate collects in the drain pan. The N.O. overflow switch is controlled by K220 and DL46 relays, located in the unit control panel. When the overflow switch closes, 24VAC power is interrupted and after a five-second delay unit compressors are de-energized. Once the condensate level drops below the set level, the switch will open. After a five-minute delay the compressor will be energized.

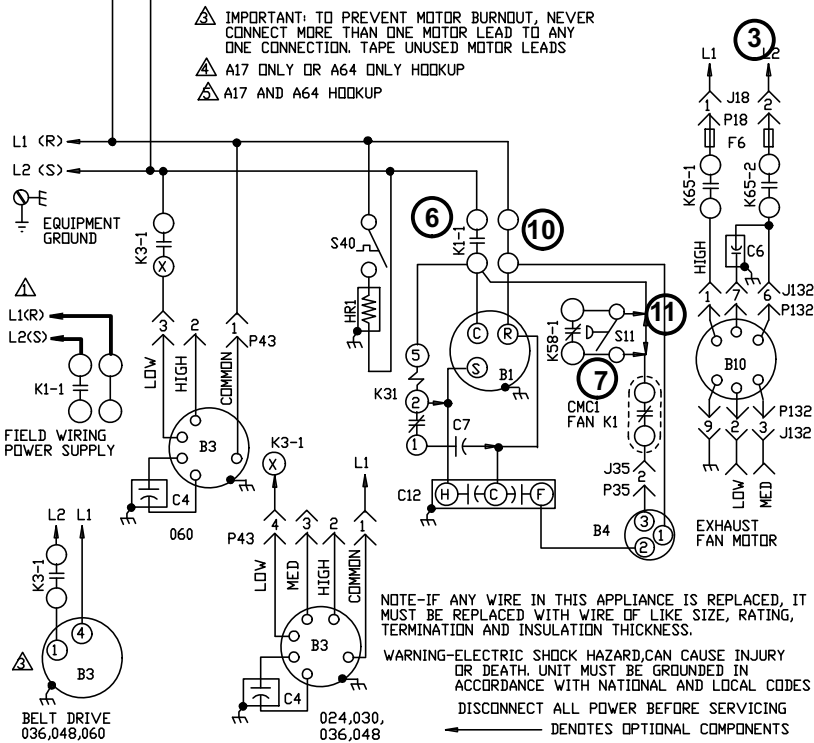
VII- WIRING DIAGRAMS / SEQUENCE OF OPERATION

KHA024, 036, 048, 060 P Voltage



⚠ IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
 ⚠ A17 ONLY OR A64 ONLY HOOKUP
 ⚠ A17 AND A64 HOOKUP

KEY	DESCRIPTION
A6	CONTROL-SOLID STATE ENTHALPY
A17	DETECTOR-SMOKE, RETURN AIR
A64	DETECTOR-SMOKE, SUPPLY AIR
B1	COMPRESSOR
B2	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
B7	MOTOR-DAMPER,ECONOMIZER
B10	MOTOR-EXHAUST FAN
C4	CAPACITOR-BLOWER MOTOR
C6	CAPACITOR-EXHAUST FAN
C7	CAPACITOR-COMPRESSOR,HARD START
C12	CAPACITOR-DUAL
C88	CIRCUIT BREAKER-TRANSFORMER T1



CMC1	TIMER-DEFROST, COMPRESSOR 1
F6	FUSE-EXHAUST FAN
HRI	HEATER COMPRESSOR
J2	JACK-HEAT
J3	JACK-UNIT ECONOMIZER
J18	JACK-EXHAUST FAN
J35	JACK-TEST
J132	JACK-BLOWER,EXHAUST FAN MOTOR
K1-1	CONTACTOR-COMPRESSOR
K3-1	CONTACTOR-BL O W E R
KB-1,2	RELAY-TRANSFER 1
K31	RELAY-HARD START KIT
K58-1	RELAY-LOW AMBIENT KIT
K65-1,2	RELAY-EXHAUST FAN
L1	VALVE-REVERSING
P4	PLUG-ECONOMIZER
P18	PLUG-EXHAUST FAN
P35	PLUG-TEST
P43	PLUG-BLOWER MOTOR
P45	PLUG-INPUT
P132	PLUG-BLOWER,EXHAUST FAN MOTOR
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	SWITCH-DEFROST, COMPRESSOR 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S40	THERMOSTAT-CRANKCASE
S49	SWITCH-FREEZE STAT
S74	SWITCH-FIRE STAT 1
S75	SWITCH-FIRE STAT 2
S87	SWITCH-LOW PRESS, COMPRESSOR 1
T1	TRANSFORMER-CONTROL

WIRING DIAGRAM 11/07

COOLING UNITS-PACKAGED

KHA,THA-024,030,036,048,060-P

208-230/60/1

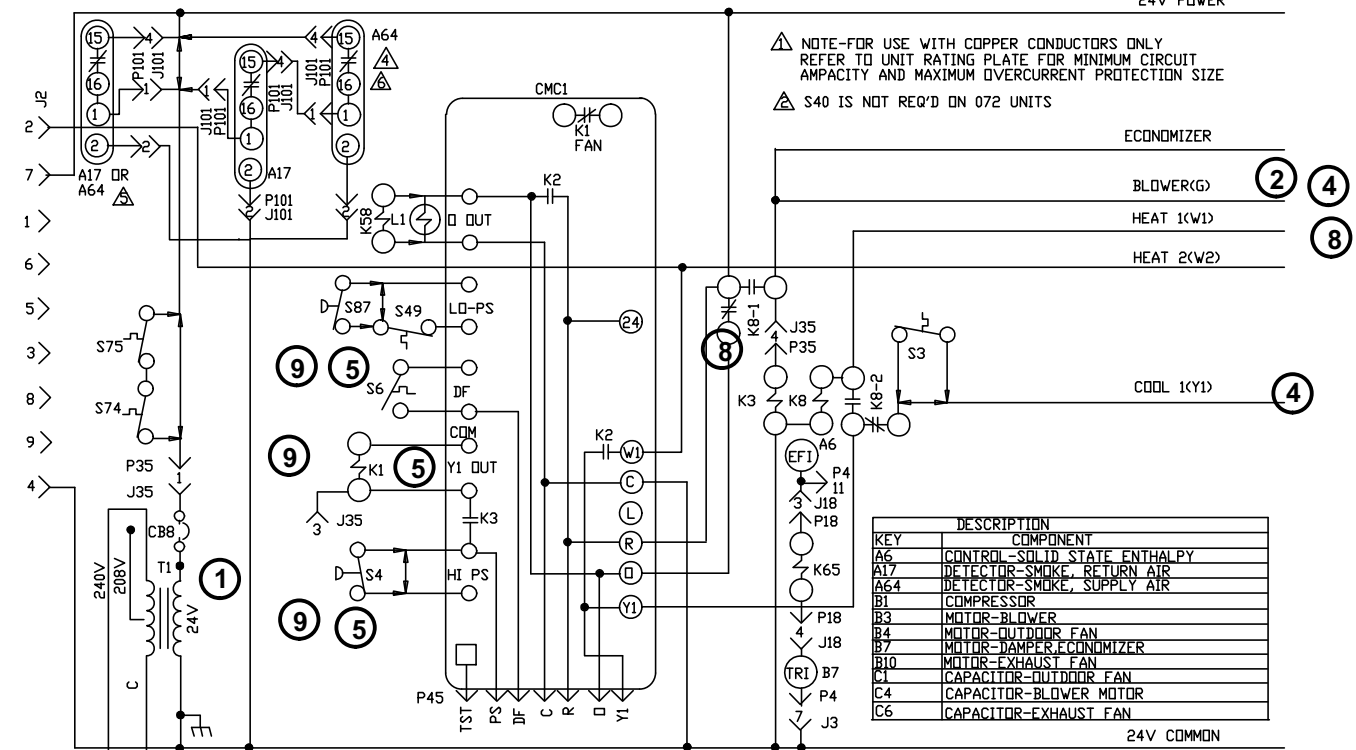
COOLING SECTION B33

Supersedes Form No. New Form No. 535.025W

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KHA036, 048, 060 Y Voltage

24V POWER



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

S40 IS NOT REQ'D ON 072 UNITS

KEY	DESCRIPTION	COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY	
A17	DETECTOR-SMOKE, RETURN AIR	
A64	DETECTOR-SMOKE, SUPPLY AIR	
B1	COMPRESSOR	
B3	MOTOR-BLOWER	
B4	MOTOR-OUTDOOR FAN	
B7	MOTOR-DAMPER/ECONOMIZER	
B10	MOTOR-EXHAUST FAN	
C1	CAPACITOR-OUTDOOR FAN	
C4	CAPACITOR-BLOWER MOTOR	
C6	CAPACITOR-EXHAUST FAN	

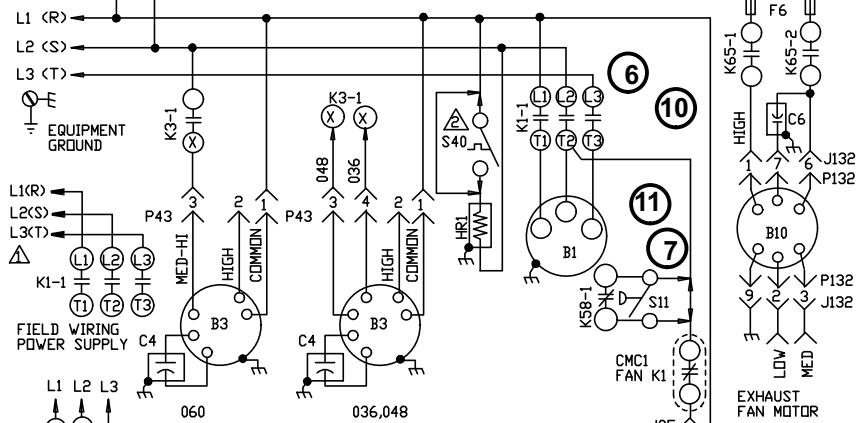
IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS

CONNECTIONS FOR REMOTE MOUNTED SMOKE DETECTORS A17 & A64, MAX LOAD 0.1VA 24VAC CLASS II EACH

A17 ONLY OR A64 ONLY HOOKUP

A17 AND A64 HOOKUP

C88	CIRCUIT BREAKER-TRANSFORMER T1
CMC1	TIMER-DEFROST, COMPRESSOR 1
F6	FUSE-EXHAUST FAN
HR1	HEATER COMPRESSOR
J2	JACK-HEAT
J3	JACK-UNIT ECONOMIZER
J18	JACK-EXHAUST FAN
J35	JACK-TEST
J132	JACK-BLOWER,EXHAUST FAN MOTOR
K1-1	CONTACTOR-COMPRESSOR
K3-1	CONTACTOR-BLOWER
K8-1,2	RELAY-TRANSFER 1
K58-1	RELAY-LOW AMBIENT KIT
K65-1,2	RELAY-EXHAUST FAN
L1	VALVE-REVERSING
P4	PLUG-ECONOMIZER
P18	PLUG-EXHAUST FAN
P35	PLUG-TEST
P43	PLUG-BLOWER MOTOR
P45	PLUG-INPUT
P132	PLUG-BLOWER,EXHAUST FAN MOTOR
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	SWITCH-DEFROST, COMPRESSOR 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S40	THERMOSTAT-CRANKCASE
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S87	SWITCH-LOW PRESS, COMPRESSOR 1
T1	TRANSFORMER-CONTROL



DISCONNECT ALL POWER BEFORE SERVICING

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

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

← DENOTES OPTIONAL COMPONENTS

— LINE VOLTAGE FIELD INSTALLED

WIRING DIAGRAM 11/07

COOLING UNITS-PACKAGED

KHA,THA-036,048,060,072-Y
208-230/60/3

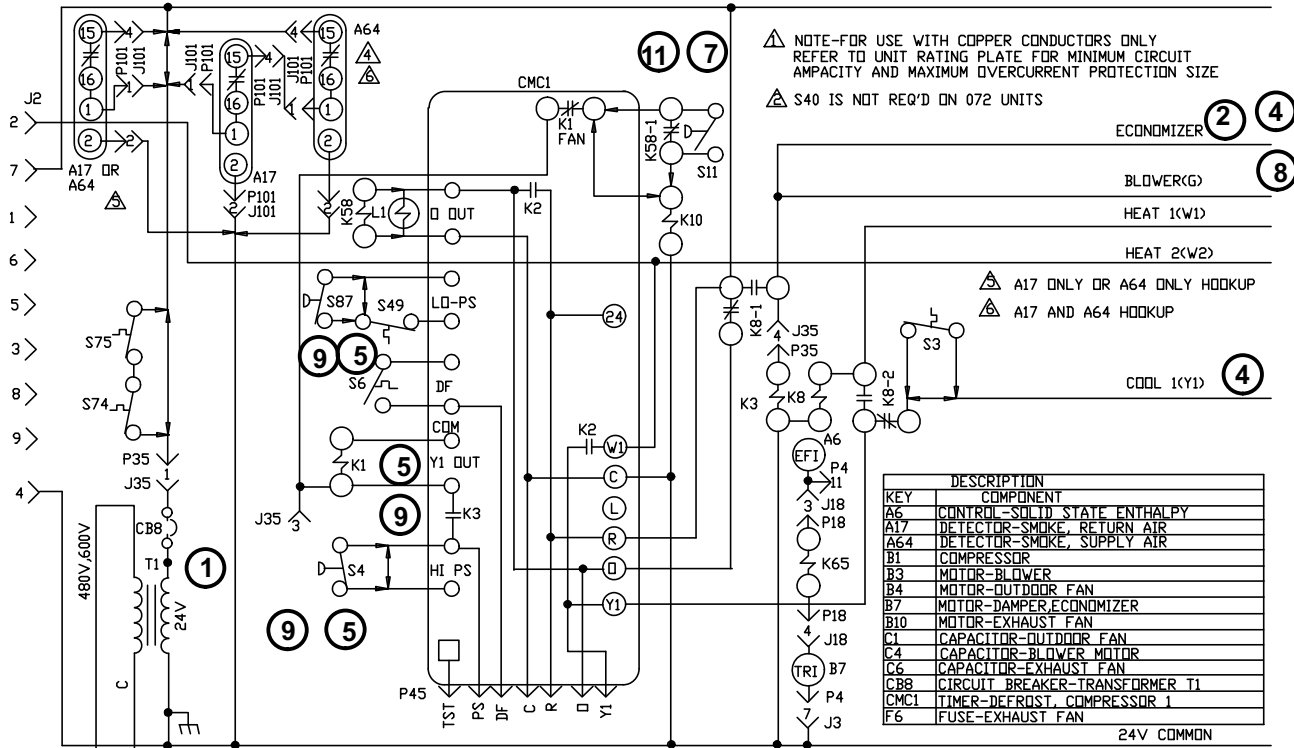
COOLING SECTION B33

Supersedes Form No. New Form No.
535,026W

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KHA036, 048, 060 G, J Voltage

24V POWER



NOTE-FOR USE WITH COPPER CONDUCTORS ONLY
REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT
AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE
S40 IS NOT REQ'D ON 072 UNITS

- ECONOMIZER (2) (4)
- BLOWER(G) (8)
- HEAT 1(W1)
- HEAT 2(W2)
- COOL 1(Y1) (4)

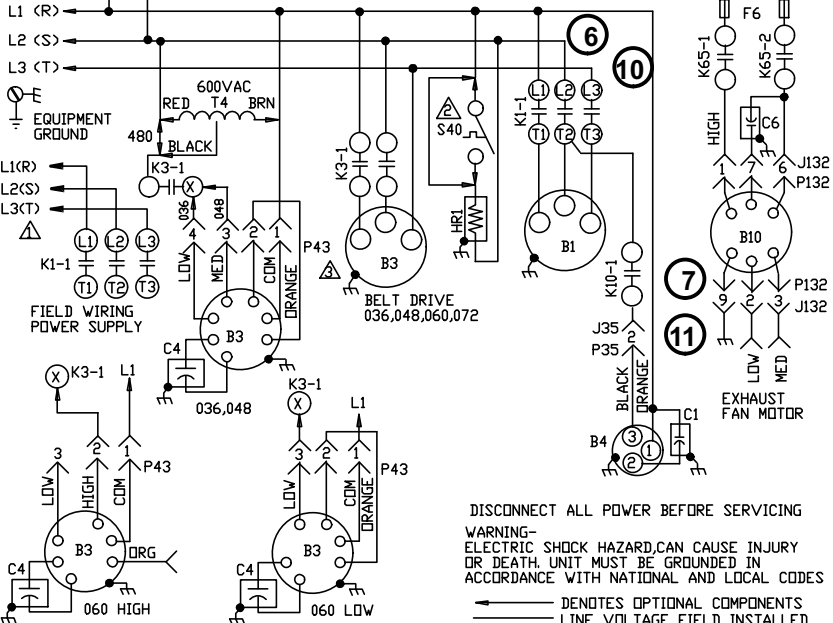
A17 ONLY OR A64 ONLY HOOKUP
A17 AND A64 HOOKUP

KEY	DESCRIPTION
A6	CONTROL-SOLID STATE ENTHALPY
A17	DETECTOR-SMOKE, RETURN AIR
A64	DETECTOR-SMOKE, SUPPLY AIR
B1	COMPRESSOR
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN
B7	MOTOR-DAMPER/ECONOMIZER
B10	MOTOR-EXHAUST FAN
C1	CAPACITOR-OUTDOOR FAN
C4	CAPACITOR-BLOWER MOTOR
C6	CAPACITOR-EXHAUST FAN
CBB	CIRCUIT BREAKER-TRANSFORMER T1
CMC1	TIMER-DEFROST, COMPRESSOR 1
F6	FUSE-EXHAUST FAN

24V COMMON

IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER
CONNECT MORE THAN ONE MOTOR LEAD TO ANY
ONE CONNECTION. TAPE UNUSED MOTOR LEADS
CONNECTIONS FOR REMOTE MOUNTED SMOKE DETECTORS
A17 & A64, MAX LOAD 0.1VA 24VAC CLASS II EACH
NOTE-IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT
MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING,
TERMINATION AND INSULATION THICKNESS.

HRI	HEATER COMPRESSOR
J2	JACK-HEAT
J3	JACK-UNIT ECONOMIZER
J18	JACK-EXHAUST FAN
J35	JACK-TEST
J132	JACK-BLOWER, EXHAUST FAN MOTOR
K1-1	CONTACTOR-COMPRESSOR
K3-1	CONTACTOR-BLOWER
K8-1,2	RELAY-TRANSFER 1
K10-1	RELAY-OUTDOOR FAN 1
K58-1	RELAY-LOW AMBIENT KIT
K65-1,2	RELAY-EXHAUST FAN
L1	VALVE-REVERSING
P4	PLUG-ECONOMIZER
P18	PLUG-EXHAUST FAN
P35	PLUG-TEST
P43	PLUG-BLOWER MOTOR
P45	PLUG-INPUT
P132	PLUG-BLOWER, EXHAUST FAN MOTOR
S3	SWITCH-LIMIT,LOW COMP 1 /COMPRESSOR MONITOR
S4	SWITCH-LIMIT,HI PRESS(MANUAL RESET)
S6	SWITCH-DEFROST, COMPRESSOR 1
S11	SWITCH-LOW PRESS,LOW AMB KIT
S40	THERMOSTAT-CRANKCASE
S49	SWITCH-FREEZESTAT
S74	SWITCH-FIRESTAT 1
S75	SWITCH-FIRESTAT 2
S87	SWITCH-LOW PRESS, COMPRESSOR 1
T1	TRANSFORMER-CONTROL
T4	TRANSFORMER-BLOWER MOTOR



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
— DENOTES OPTIONAL COMPONENTS
— LINE VOLTAGE FIELD INSTALLED

WIRING DIAGRAM 11/07

COOLING UNITS-PACKAGED

KHA,THA-036,048,060,072-G,J

COOLING SECTION B33

Supersedes Form No.	New Form No.
	535,023W

Litho U.S.A.

SEQUENCE OF OPERATION KHA024/060

Power:

1. Line voltage from unit disconnect energizes transformer T1. T1 provides 24VAC power to terminal strip TB1 found in the control box. TB1 provides 24VAC to the unit cooling, heating and blower controls.

Blower Operation:

2. Indoor thermostat terminal "G" energizes contactor K3. K3 closes, energizing blower B3.

Economizer Operation:

3. The EXH (power exhaust set point) found on the face of A6, is factory set at approximate 50% of the dial range. Economizer control module A6 receives a demand and opens outside dampers 50%. Power exhaust fan relay K65 is energized 30 seconds after dampers are 50% open. K65-1 and K65-2 close, energizing power exhaust fan B10.

Cooling Demand

Cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 2.)

4. Indoor thermostat COOLING mode energizes reversing valve L1.
5. CMC1 proves N.C. freezestat S49 and optional N.C. high pressure switch S4 to energize compressor contactor K1.
6. K1 closes energizing compressor B1.
7. *P and Y Voltage*
Line voltage is routed through optional N.O. low ambient pressure switch S11 and optional low ambient kit K58 to energize outdoor fan B4.
G, J and M Voltage
24VAC passes through optional N.O. low pressure switch S11 and optional low ambient kit K58 to energize outdoor fan relay K10. N.O. contacts K10-1 close energizing outdoor fan B4 .

First Stage Heat

NOTE: On heating demand after unit has been in cooling mode, indoor thermostat in HEATING mode will de-energize reversing valve L1.

8. Heating demand energizes W1 in the thermostat. Relay K8 is energized. N.C. K8-1 opens, de-energizing reversing valve L1.
9. CMC1 proves N.C. high pressure switches S4 and N.C. freezestats S49 . Compressor contactor K1 is energized.
10. K1 closes energizing compressor B1.
11. *P and Y Voltage*
Line voltage from CMC1 is routed through optional N.C. low ambient switch S11 to energize outdoor fan B4.
G, J and M Voltage
24VAC passes through optional N.O. low pressure switch and optional low ambient switch K58 to energize outdoor fan relay K10. K10-1 closes energizing outdoor fan B4.

Second Stage Heat (electric heat):

12. Second stage heat demand energizes W2 in the thermostat.

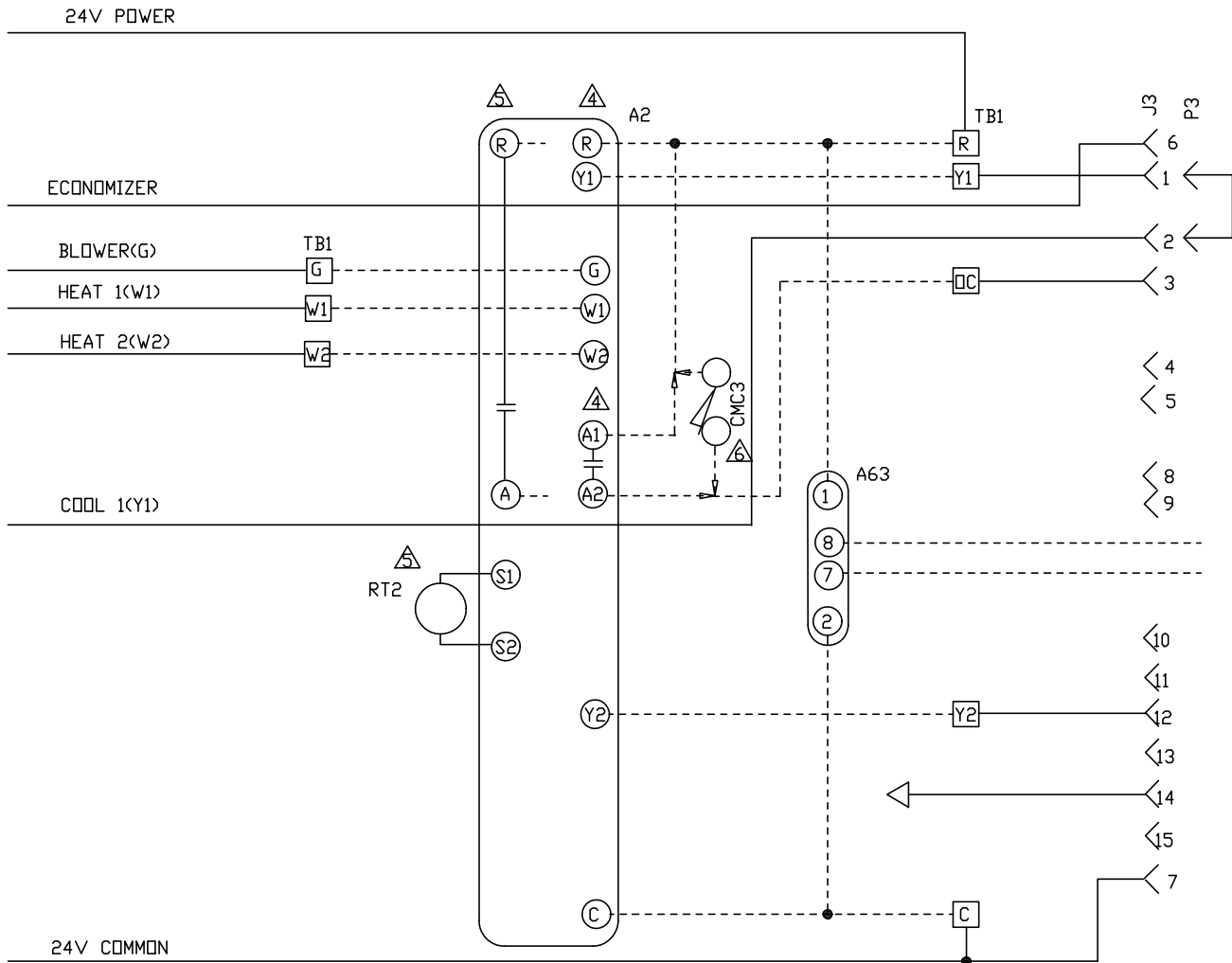
See sequence of operation for electric heat.

Defrost Mode:


DEFROST MODE:

13. When a defrost cycle is initiated, the control energizes the reversing valve solenoid and turns off the condenser fan. The control will also put 24VAC on the "W1" (auxiliary heat) line. The unit will stay in this mode until either the defrost thermostat (S6) temperature is above the termination temperature of 70°, the defrost time of 14 minutes has been completed, or the room thermostat demand cycle has been satisfied. If the room thermostat demand cycle terminates the cycle, the defrost cycle will be held until the next room thermostat demand cycle. If the defrost thermostat (S6) temperature is still below the termination temperature, the control will continue the defrost cycle until the cycle is terminated in one of the methods mentioned above.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT









DESIGNATES OPTIONAL WIRING
 CLASS II FIELD WIRING

	WIRING DIAGRAM	11/07
ACCESSORIES		
ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT T AND K SERIES UNITS A BOX		
ECONDMIZER SECTION C1		
Supersedes Form No.	New Form No. 535,057W	

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KEY	DESCRIPTION
A2	SENSOR-ELECTRONIC
A63	SENSOR-CO2
CMC3	CLOCK-TIME
J3	JACK-UNIT ECONDMIZER
P3	PLUG-LESS ECONDMIZER
RT2	SENSOR-REMOTE THERMOSTAT
TB1	TERMINAL STRIP-CLASS II VOLTAGE

-  THERMOSTAT SUPPLIED BY USER
-  REMOVE P3 WHEN ECONDMIZER IS USED
-  J3 MAXIMUM LOAD 20VA 24VAC CLASS II
-  T7300 THERMOSTAT
-  T88220 TOUCHSCREEN THERMOSTAT
-  TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED

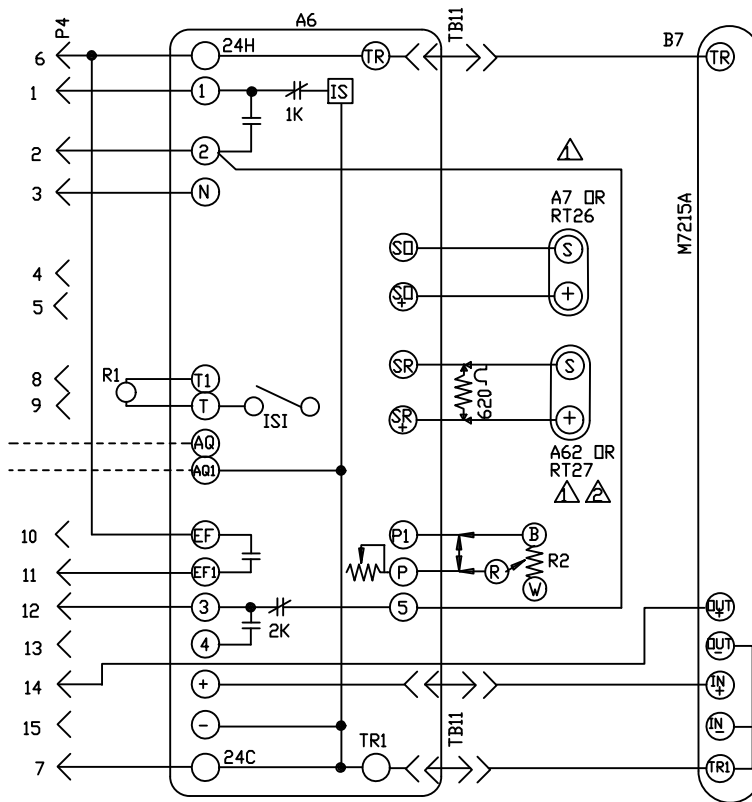
POWER:

1. Terminal strip TB1 found in the main control box supplies thermostat components with 24VAC.

OPERATION:

2. TB1 receives data from the electronic thermostat A2 (Y1, Y2, W1, W2, G) and energizes the appropriate components for heat or cool demand.

ECONOMIZER




KEY	DESCRIPTION
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
B7	MOTOR-DAMPER, ECONOMIZER
P4	PLUG-ECONOMIZER
R1	SENSOR-MIXED AIR OR SUPPLY AIR
R2	POT-MINIMUM POSITION
RT26	SENSOR-OUTDOOR AIR TEMP
RT27	SENSOR-INDOOR AIR TEMP
TB11	TERMINAL STRIP

- △ A62 ENTHALPY SENSOR OR RT27 USED FOR DIFFERENTIAL SENSING
- △ RT26 AND RT27, TEMPERATURE SENSORS MAY BE USED INSTEAD OF A7 AND A62 ENTHALPY SENSORS

DESIGNATES OPTIONAL WIRING

 CLASS II FIELD WIRING

	WIRING DIAGRAM	11/07
ACCESSORIES		
ECONOMIZER FOR K AND T SERIES UNITS		
A BOX		
ECONOMIZER SECTION D1		
Supersedes Form No.	New Form No. 535,059W	

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SEQUENCE OF OPERATION

POWER:

1. Terminal strip TB1 found in the main control box energizes the economizer components with 24VAC.

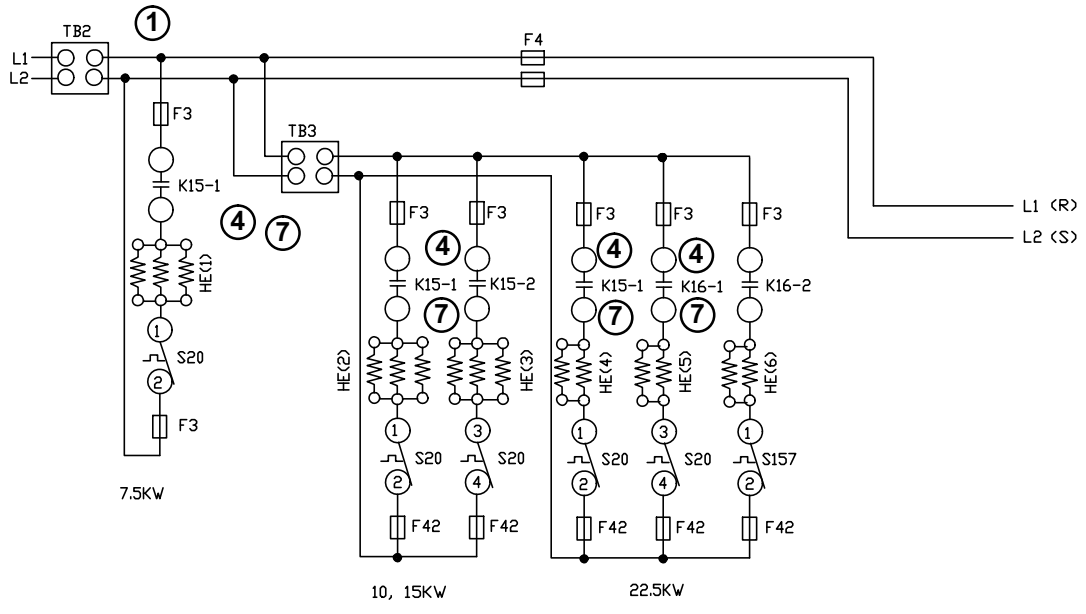
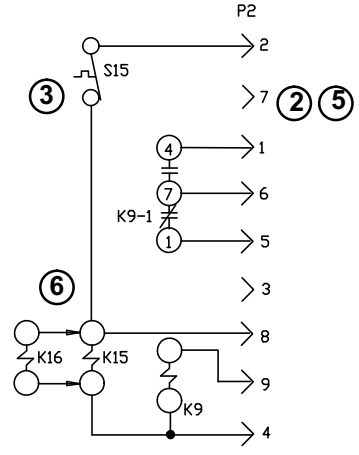
OPERATION:

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.

T1EH-7.5, 10, 15, 22.5 kW P VOLTAGE

24V POWER

KEY	DESCRIPTION	COMPONENT
F3	FUSE-ELECTRIC HEAT	
F4	FUSE-UNIT	
F42	FUSE-ELECTRIC HEAT 2	
HE1	ELEMENT-ELECTRIC HEAT 1	
HE2	ELEMENT-ELECTRIC HEAT 2	
HE3	ELEMENT-ELECTRIC HEAT 3	
HE4	ELEMENT-ELECTRIC HEAT 4	
HE5	ELEMENT-ELECTRIC HEAT 5	
HE6	ELEMENT-ELECTRIC HEAT 6	
K9-1	RELAY-HEAT	
K15-1,2	CONTACTOR-ELECTRIC HEAT 1	
K16-1,2	CONTACTOR-ELECTRIC HEAT 2	
P2	PLUG-UNIT HEAT	
S15	SWITCH-LIMIT, PRIMARY ELECT HT	
S20	SWITCH-LIMIT, SECONDARY ELECT HT	
S157	SWITCH-LIMIT, SECONDARY ELECT HT 2	
TB2	TERMINAL STRIP-UNIT	
TB3	TERMINAL STRIP-ELECTRIC HEAT, CIRC 1	



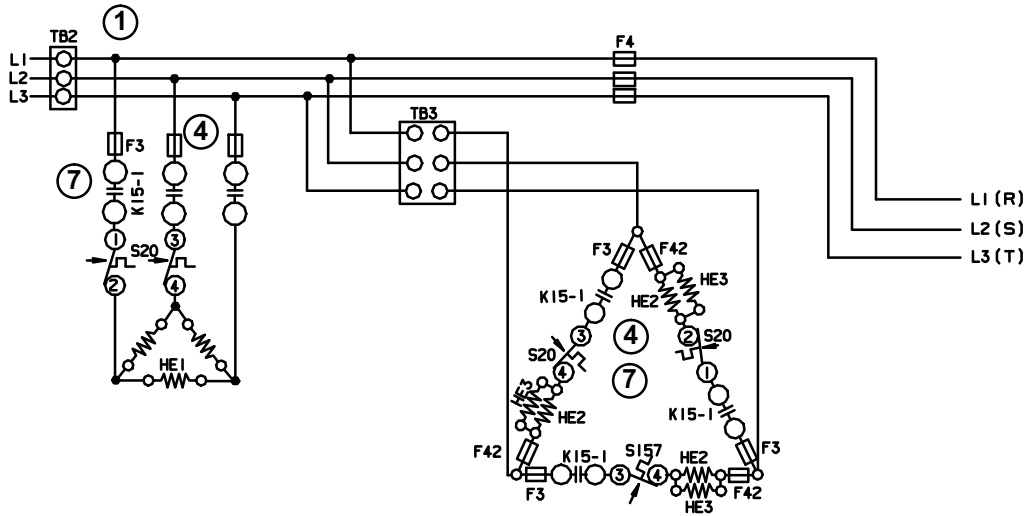
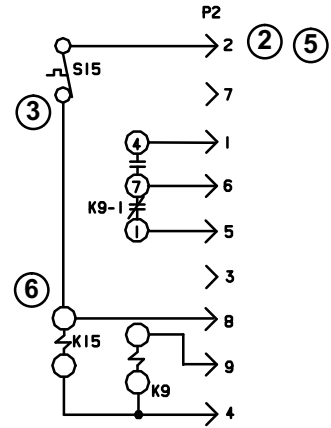
060	036	048							
			KW	HE1	HE2	HE3	HE4	HE5	HE6
			7.5	7.5	5	5			
			10		7.5	7.5			
			15				7.5	7.5	7.5
			22.5						

WIRING DIAGRAM		3/07
HEATING-ELECTRIC		
T1EH-7.5,10,15,22.5-P		
A BOX		
HEATING SECTION A3		
Supersedes Form No.	New Form No.	
	535,048W	
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T1EHA-7.5, 15, 22.5kW Y VOLTAGE KHA SERIES UNITS

24V POWER

KEY	DESCRIPTION
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
F42	FUSE-ELECTRIC HEAT 2
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
K9, -1	RELAY-HEAT
K15, -1	CONTACTOR-ELECTRIC HEAT 1
P2	PLUG-UNIT HEAT
S15	SWITCH-LIMIT, PRIMARY ELECT HT
S20	SWITCH-LIMIT, SECONDARY ELECT HT
S157	SWITCH-LIMIT, SECONDARY ELECT HT 2
TB2	TERMINAL STRIP-UNIT
TB3	TERMINAL STRIP-ELECTRIC HEAT, CIRC 1



072	060	036	048			
KW	HE1	HE2	HE3			
7.5	7.5					
15	15	15	7.5			
22.5			15			
30						

WIRING DIAGRAM	9/05
HEATING-ELECTRIC	
T1EH-7.5, 15, 22.5, 30-Y	
HEATING SECTION A4	
Supersedes Form No.	New Form No.
	535,049W

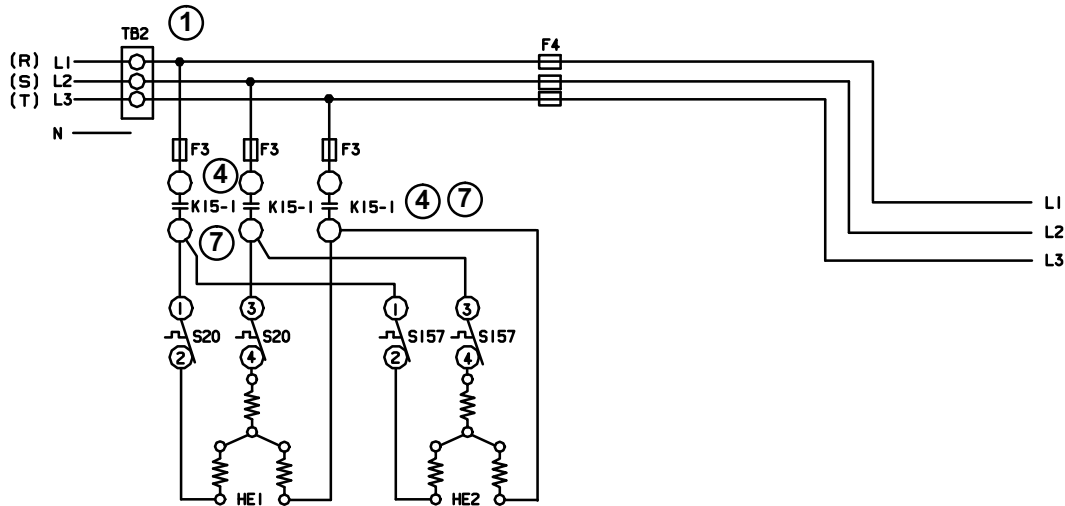
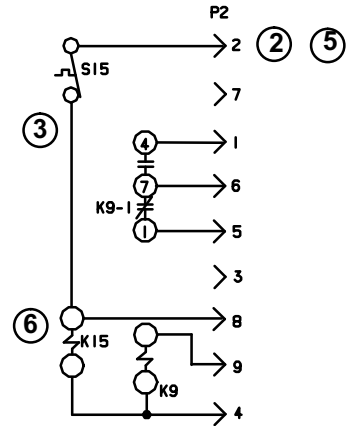
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T1EHA-7.5, 15, 22.5kW G, J VOLTAGE KHA SERIES UNITS

24V POWER

KEY	DESCRIPTION
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
K9 -1	RELAY-HEAT
K15.-1	CONTACTOR-ELECTRIC HEAT 1
P2	PLUG-UNIT HEAT
S15	SWITCH-LIMIT, PRIMARY ELECT HT
S20	SWITCH-LIMIT, SECONDARY ELECT HT
S157	SWITCH-LIMIT, SECONDARY ELECT HT 2
TB2	TERMINAL STRIP-UNIT



072	060	036	048	KW	HE1	HE2
				7.5	7.5	
				15	15	
				22.5	15	7.5
				30	15	15

WIRING DIAGRAM		9/05
HEATING-ELECTRIC		
T1EH-7.5, 15, 22.5, 30-G, J, M		
A BOX		
HEATING SECTION A2		
Supersedes Form No.	New Form No.	
	535,047W	

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Sequence of Operation -T1EH 7.5, 10, 15, 22.5kW - P Voltage

HEATING ELEMENTS:

- 1 - Terminal Strip TB2 is energized when the unit disconnect closes. TB2 supplies line voltage to electric heat elements HE1 and TB3. TB3 supplies line voltage to HE2 through HE6. Elements are protected by fuses F3 and F42.

FIRST STAGE HEAT:

- 2 - Heating demand initiates at W1 in thermostat.
- 3 - 24VAC is routed from the indoor thermostat through N.C. primary limit S15. Electric heat contactor K15 and heat relay K9 are energized. K9 energizes blower contactor K3 and economizer.
- 4 - *7.5kW units* - N.O. contacts K15-1 close energizing HE1.
10kW 15kW units - K15-1 and K15-2 close energizing HE2 and HE3.
22.5kW units - K15-1, K16-1 and K16-2 close energizing HE4, HE5 and HE6.

END OF FIRST STAGE HEAT:

- 5 - Heating demand is satisfied. Terminal W1 in the thermostat is de-energized.
- 6 - Electric heat contactor K15 is de-energized.
- 7 - *7.5kW units* - N.O. contacts K15-1 open de-energizing HE1.
15kW units - K15-1 and K15-2 open de-energizing HE2 and HE3.
22.5kW units - K15-1, K16-1 and K16-2 open de-energizing HE4, HE5 and HE6.

Sequence of Operation -T1EH 7.5, 15, 22.5kW - Y, G, J Voltage

HEATING ELEMENTS:

- 1 - Terminal Strip TB2 is energized when the unit disconnect closes. TB2 supplies line voltage to electric heat elements HE1 and TB3. TB3 supplies line voltage to HE2 and HE3. Elements are protected by fuses F3 and or F42.

FIRST STAGE HEAT:

- 2 - Heating demand initiates at W1 in thermostat.
- 3 - 24VAC is routed from the indoor thermostat through N.C. primary limit S15. Electric heat contactor K15 and heat relay K9 are energized. Heat relay K9 energizes blower contactor K3 and economizer.
- 4 - *7.5kW and 15kW units* - N.O. contacts K15-1 close energizing HE1.
22.5kW units - N.O. contacts K15-1 close energizing HE2 and HE3.

END OF FIRST STAGE HEAT:

- 5 - Heating demand is satisfied. Terminal W1 in the thermostat is de-energized.
- 6 - Electric heat contactor K15 is de-energized.
- 7 - *7.5kW and 15kW units* - N.O. contacts K15-1 open de-energizing HE1.
22.5kW units - N.O. contacts K15-1 open de-energizing HE2 and HE3.