KDB DUAL FUEL SERIES

The KDB commercial combination heat pump and gas heat unit is available in 7.5-, 8.5-, and 10-ton cooling capacities. The KDB092, 102, and 122 refrigerant systems utilize two compressors, two reversing valves, two accumulators (122 only), and other parts common to a heat pump. Units are available in 130,000, 180,000 or 240,000Btuh (38.1, 52.7 or 70.3 kW) heating inputs. Gas heat sections are designed with stainless steel tube heat exchangers.

KDB092 and 102 units are equipped with constant volume, belt-drive supply air blowers.

KDB092 and 102 units are available equipped with an optional supply air inverter. KDB122 units are equipped with variable-volume, direct drive blowers. These units will provide supply air at lower speeds when cooling demand is low and increase to higher speeds when cooling demand is high. Refer to Supply Air Start-Up sections.

KDB units are designed to accept any of several different energy management thermostat control systems with minimum field wiring.

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

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

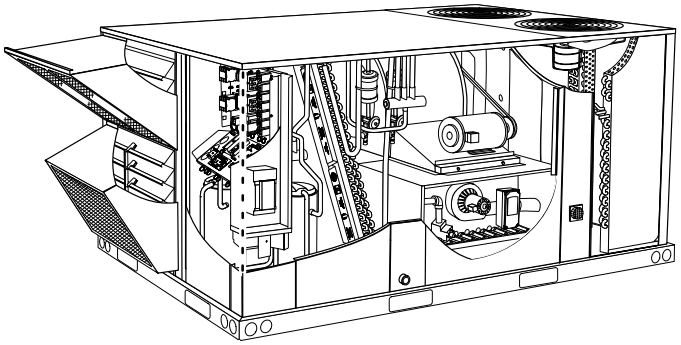
⚠WARNING

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 HVAC installer or equivalent, service agency, or the gas supplier

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.



⚠CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

⚠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.

Table of Contents

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No KDB 092	KDB 102	KDB 122
COOLING/HEATING SYSTEM					
Condensate Drain Trap	PVC - C1TRAP20AD2	**76W26**	X	X	X
	Copper - C1TRAP10AD2	**76W27**	X	X	X
Corrosion Protection		Factory	O	O	O
Drain Pan Overflow Switch	K1SNSR71AB1-	**74W42**	X	X	X
Efficiency		High	O	O	O
Low Ambient Kit	K1SNSR34*B0	**14N31**	X	X	X
Refrigerant Type		R-410A	O	O	O
GAS HEATING SYSTEM					
Bottom Gas Piping Kit	C1GPKT01B-01	**54W95**	X	X	X
Combustion Air Intake Extensions	T1EXTN10AN1	**19W51**	X	X	X
Gas Heat Input	130,000 Btuh	Factory	O	O	O
	180,000 Btuh	Factory	O	O	O
	240,000 Btuh	Factory	O	O	O
Low Temperature Vestibule Heater	208/230V-3ph - C1LTVH10B-2Y	**13X63**	X	X	X
	460V - C1LTVH10B-2G	**13X64**	X	X	X
	575V - C1LTVH10B-2J	**13X65**	X	X	X
LPG/Propane Conversion Kits	Standard Heat - C1PROP23BS1	**14N22**	X	X	X
	Medium Heat - C1PROP22BS1	**14N23**	X	X	X
	High Heat - C1PROP21BS1	**14N25**	X	X	X
Vertical Vent Extension	C1EXTN2021	**42W16**	X	X	X
BLOWER - SUPPLY AIR					
Blower Option	CAV (Constant Air Volume)	Factory	O	O	
	Staged Air Volume	Factory	O	O	
	Direct Drive Staged Air Volume	Factory			O
Blower Motors	Belt Drive - 2 hp	Factory	O	O	
	Belt Drive - 3 hp	Factory	O	O	
	Belt Drive - 5 hp	Factory	O	O	
VFD Manual Bypass Kit (for staged equipped units only)	KVFDB12C-1	**90W53**	X	X	
Drive Kits	Kit #1 590-890 rpm	Factory	O	O	
See Blower Data Tables for selection	Kit #2 800-1105 rpm	Factory	O	O	
	Kit #3 795-1195 rpm	Factory	O	O	
	Kit #4 730-970 rpm	Factory	O	O	
	Kit #5 940-1200 rpm	Factory	O	O	
	Kit #6 1015-1300 rpm	Factory	O	O	
	Kit #10 900-1135 rpm	Factory	O	O	
	Kit #11 1040-1315 rpm	Factory	O	O	
	Kit #12 1125-1425 rpm	Factory	O	O	

NOTE - Catalog and model numbers shown are for ordering field installed accessories.

OX - Configure To Order (Factory Installed) or Field Installed

O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No KDB 092	KDB 102	KDB 122
CABINET					
Combination Coil/Hail Guards	High Efficiency - K1GARD53B-1	**14Y77**	X	X	
	High Efficiency - E1GARD51BP1	**13T06**			X
Hinged Access Panels		Factory	O	O	O
Horizontal Discharge Kit	K1HECK00B-1	**51W25**	X	X	X
Return Air Adaptor Plate (for LC/LG/LH and TC/TG/TH unit replacement)	C1CONV10B-1	**54W96**	X	X	X
CONTROLS					
Commercial Controls			X	X	X
BACnet®	K0CTRL31B-1	**96W15**	OX	OX	OX
BACnet® Thermostat with Display	K0SNSR01FF1	**97W23**	X	X	X
BACnet® Thermostat without Display	K0SNSR00FF1	**97W24**	X	X	X
Novar® 2051	K0CTRL30B-1	**96W12**	OX	OX	OX
Plenum Cable (75 ft.)	K0MISC00FF1	**97W25**	X	X	X
Smoke Detector - Supply or Return (Power board and one sensor)	C1SNSR44B-2	**11K76**	X	X	X
Smoke Detector - Supply and Return (Power board and two sensors)	C1SNSR43B-2	**11K80**	X	X	X
INDOOR AIR QUALITY					
High Efficiency Air Filters 20 x 25 x 2 (Order 4 per unit)	MERV 8 - C1FLTR15B-1	**50W61**	X	X	X
	MERV 13 - C1FLTR40B-1	**52W41**	X	X	X
Replacement Media Filter With Metal Mesh Frame (includes non-pleated filter media)	C1FLTR30B-1-	**Y3063**	X	X	X
Indoor Air Quality (CO_2) Sensors					
Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AE1L	**77N39**	X	X	X
Sensor - Wall-mount, off-white plastic cover, no display	C0SNSR52AE1L	**87N53**	X	X	X
Sensor - Black plastic case with LCD display, rated for plenum mounting	C0SNSR51AE1L	**87N52**	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0MISC19AE1	**87N54**	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications	C0MISC19AE1-	**85L43**	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO_2 sensors (**87N53** or **77N39**)	C0MISC16AE1-	**90N43**	X	X	X
UVC Germicidal Lamps					
UVC Light Kit (208/230v-1ph)	C1UVCL10B-1	**54W62**	X	X	X
ELECTRICAL					
Voltage 60 hz	208/230V - 3 phase	Factory	O	O	O
	460V - 3 phase	Factory	O	O	O
	575V - 3 phase	Factory	O	O	O
Disconnect Switch	80 amp - C1DISC080B-1	**54W56**	OX	OX	OX
GFI Service Outlets	15 amp non-powered, field-wired (208/230V, 460V only) LTAGFIK10/15	**74M70**	OX	OX	OX
	20 amp non-powered, field-wired (575V only) C1GFCI20FF1	**67E01**	X	X	X
Weatherproof Cover for GFI	C1GFCI99FF1	**10C89**	X	X	X

NOTE - Catalog and model numbers shown are for ordering field installed accessories.

OX - Configure To Order (Factory Installed) or Field Installed

O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No KDB 092	KDB 102	KDB 122
ECONOMIZER					
Standard Economizer (Not for Title 24)					
Standard Economizer with Single Temperature Control Downflow or Horizontal Applications - Includes Barometric Relief Dampers and Air Hoods	K1ECON20B-2	**13U45**	OX	OX	OX
Standard Economizer Controls (Not for Title 24)					
Single Enthalpy Control	C1SNSR64FF1	**53W64**	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR64FF1	**53W64**	X	X	X
High Performance Economizer (Approved for California Title 24 Building Standards)					
High Performance Economizer with Single Temperature Control Downflow or Horizontal Applications - Includes Barometric Relief Dampers and Air Hoods	K1ECON22B-5	**23G23**	OX	OX	OX
High Performance Economizer Controls (Not for Title 24)					
Single Enthalpy Control	C1SNSR65FF1	**23G26**	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR65FF1	**23G26**	X	X	X
Horizontal Low Profile Barometric Relief Dampers With Exhaust Hood					
Horizontal Low Profile Barometric Relief Dampers With Exhaust Hood	LAGEDH03/15	**53K04**	X	X	X
OUTDOOR AIR					
Outdoor Air Dampers with Outdoor Air Hood					
Motorized	C1DAMP20B-1	**14G28**	OX	OX	OX
Manual	C1DAMP10B-2	**14G29**	OX	OX	OX
POWER EXHAUST					
Standard Static	208/230V-3ph - K1PWRE10B-1Y	**53W44**	X	X	X
	460V-3ph - K1PWRE10B-1G	**53W45**	X	X	X
	575V-3ph - K1PWRE10B-1J	**53W46**	X	X	X
ROOF CURBS					
Hybrid Roof Curbs, Downflow					
8 in. height	C1CURB70B-1	**11F54**	X	X	X
14 in. height	C1CURB71B-1	**11F55**	X	X	X
18 in. height	C1CURB72B-1	**11F56**	X	X	X
24 in. height	C1CURB73B-1	**11F57**	X	X	X
Adjustable Pitch Curb, Downflow					
14 in. height	C1CURB55B-1	**54W50**	X	X	X
CEILING DIFFUSERS					
Step-Down - Order one	RTD11-95S	**13K61**	X		
	RTD11-135S	**13K62**		X	X
Flush - Order one	FD11-95S	**13K56**	X		
	FD11-135S	**13K57**		X	X
Transitions (Supply and Return) - Order one	C1DIFF30B-1	**12X65**	X		
	C1DIFF31B-1	**12X66**		X	X

NOTE - Catalog and model numbers shown are for ordering field installed accessories.

OX - Configure To Order (Factory Installed) or Field Installed

O = Configure To Order (Factory Installed)

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SPECIFICATIONS

General Data		Nominal Tonnage	7.5 Ton	7.5 Ton	8.5 Ton	8.5 Ton	10 Ton
		Model Number	KDB092H4B	KDB092H4M	KDB102H4B	KDB102H4M	KDB122H4E
		Efficiency Type	High	High	High	High	High
		Blower Type	Constant Air Volume (CAV)	Staged Air Volume	Constant Air Volume (CAV)	Staged Air Volume	Staged Air Volume (Direct Drive)
Cooling Performance	Gross Cooling Capacity - Btuh		91,600	91,600	103,400	103,400	121,000
	[1] Net Cooling Capacity - Btuh		89,000	89,000	100,000	100,000	118,000
	AHRI Rated Air Flow - cfm		3,000	3,000	3,400	3,400	3600
	Total Unit Power - kW		7.3	7.3	8.3	8.3	9.6
	[1] EER (Btuh/Watt)		12.1	12.1	12.0	12.0	12.3
	[1] IEER (Btuh/Watt)		12.9	14.2	12.5	14.3	14.8
	Refrigerant Type		R-410A	R-410A	R-410A	R-410A	R-410A
	Refrigerant Charge Furnished	Circuit 1	13 lbs. 8 oz.	13 lbs. 8 oz.	13 lbs. 8 oz.	13 lbs. 8 oz.	19 lbs. 8 oz.
		Circuit 2	13 lbs. 8 oz.	13 lbs. 8 oz.	13 lbs. 0 oz.	13 lbs. 0 oz.	20 lbs. 8 oz.
Heating Performance	[1] Total High Heat Capacity - Btuh		86,000	86,000	100,000	100,000	116,000
	Total Unit Power - kW		7.0	7.0	8.1	8.1	9.5
	[1] C.O.P.		3.60	3.60	3.60	3.60	3.60
	[1] Total Low Heat Capacity - Btuh		51,000	51,000	55,000	56,000	70,000
	Total Unit Power (kW)		6.1	6.1	6.7	6.7	8.6
	[1] C.O.P.		2.40	2.40	2.30	2.30	2.40
Gas Heating Options Available - See page 6			Standard (2 stage), Medium (2 Stage), High (2 Stage)				
Compressor Type (number)			Scroll (2)	Scroll (2)	Scroll (2)	Scroll (2)	Scroll (2)
Outdoor Coils	Net face area (total) - sq. ft.		25.9	25.9	25.9	25.9	40.4
	Tube diameter - in.		3/8	3/8	3/8	3/8	3/8
	Number of rows		3	3	3	3	3
	Fins per inch		20	20	20	20	20
Outdoor Coil Fans	Motor - (No.) horsepower		(2) 1/3 ECM	(2) 1/3 ECM	(2) 1/3 ECM	(2) 1/3 ECM	(3) 1/3 ECM
	Motor rpm		530-950	530-950	650-1010	650-1010	530-950
	Total Motor watts		140-620	140-620	220-700	220-700	180-800
	Diameter - (No.) in.		(2) 24	(2) 24	(2) 24	(2) 24	(3) 24
	Number of blades		3	3	3	3	3
	Total Air volume - cfm		3600-7000	3600-7000	4600-7500	4600-7500	5500-10,600
Indoor Coils	Net face area (total) - sq. ft.		12.8	12.8	12.8	12.8	12.8
	Tube diameter - in.		3/8	3/8	3/8	3/8	3/8
	Number of rows		4	4	4	4	4
	Fins per inch		14	14	14	14	14
	Drain connection - Number and size		(1) 1 in. NPT coupling				
	Expansion device type		Balance port TXV, removable head				
[2] Indoor Blower and Drive Selection	Nominal motor output		2 hp, 3 hp, 5 hp				3.75 hp (ECM)
	Maximum usable motor output (US Only)		2.3 hp, 3.45 hp, 5.75 hp				- - -
	Motor - Drive kit number		2 hp [3] **Kit 1** 590-890 rpm **Kit 2** 800-1105 rpm **Kit 3** 795-1195 rpm		3 hp **Kit 4** 730-970 rpm **Kit 5** 940-1200 rpm **Kit 6** 1015-1300 rpm		- - -
			5 hp **Kit 10** 900-1135 rpm **Kit 11** 1040-1315 rpm **Kit 12** 1125-1425 rpm				
	Blower wheel nominal diameter x width - in.		(1) 15 X 15	(1) 15 X 15	(1) 15 X 15	(1) 15 X 15	(1) 22 x 19
Filters	Type of filter		Disposable				
	Number and size - in.		(4) 20 x 25 x 2				
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase				

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

[1] AHRI Certified to AHRI Standard 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.

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

[4] Standard motor and drive kit furnished with unit.

NOTE – Units equipped with staged air volume option are limited to a motor service factor of 1.0.

SPECIFICATIONS - GAS HEAT

			Heat Input Type	Standard	Medium	High
			Number of Gas Heat Stages	**2**	**2**	**2**
Gas Heating Performance	Input - Btuh	First Stage		84,500	117,000	156,000
		Second Stage		130,000	180,000	240,000
	Output - Btuh	Second Stage		104,000	144,000	192000
			Temperature Rise Range - °F	15-45	30-60	40-70
			Thermal Efficiency	80%	80%	80%
			Gas Supply Connections	3/4 in NPT	3/4 in NPT	3/4 in NPT
Recommended Gas Supply Pressure - in. w.g.			Natural	7	7	7
			LPG/Propane	11	11	11

HIGH ALTITUDE DERATE

Units may be installed at altitudes up to 2000 feet above sea level without any modification.

At altitudes above 2000 feet, units must be derated to match gas manifold pressures shown in table below.

At altitudes above 4500 feet unit must be derated 2% for each 1000 feet above sea level.

NOTE − This is the only permissible derate for these units.

Gas Heat Type	Altitude	Gas Manifold Pressure		Input Rate Natural Gas or LPG/Propane	
		Natural Gas	LPG/Propane Gas	First Stage	Second Stage
	ft.	In. w.g.	In. w.g.	Btuh	Btuh
Standard	2001-4500	3.4	9.6	84,500	124,000
Medium	2001-4500	3.4	9.6	117,000	172,000
High	2001-4500	3.4	9.6	156,000	230,000

BLOWER DATA - BELT DRIVE — 7.5 AND 8.5 TON

KDB092H4B, KDB102H4B - BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY (NO HEAT SECTION) WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE. FOR ALL UNITS ADD:

1 − Wet indoor coil air resistance of selected unit.

2 − Any factory installed options air resistance (heat section, economizer, etc.)

3 − Any field installed accessories air resistance (duct resistance, diffuser, etc.)

Then determine from blower table blower motor output required.

See page 9 for blower motors and drives.

See page 9 for wet coil and option/accessory air resistance data.

MAXIMUM STATIC PRESSURE WITH GAS HEAT - 2.0 in. w.g.

Total Air Volume cfm	Total Static Pressure − in. w.g.													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1750	480	0.19	548	0.39	618	0.57	689	0.70	758	0.81	824	0.92	885	1.07
2000	492	0.27	560	0.47	629	0.64	700	0.77	768	0.88	832	1.00	892	1.16
2250	505	0.35	573	0.55	643	0.72	713	0.85	780	0.97	842	1.10	900	1.25
2500	520	0.45	588	0.64	658	0.81	727	0.94	793	1.07	853	1.21	909	1.37
2750	536	0.55	604	0.74	674	0.91	743	1.05	806	1.19	865	1.34	919	1.50
3000	553	0.66	622	0.85	692	1.02	760	1.17	821	1.32	878	1.48	930	1.64
3250	572	0.77	641	0.98	712	1.15	778	1.32	837	1.48	892	1.64	942	1.81
3500	592	0.90	663	1.12	733	1.31	798	1.48	854	1.65	907	1.82	955	1.99
3750	614	1.04	687	1.28	756	1.48	818	1.66	872	1.83	922	2.01	969	2.19
4000	639	1.22	712	1.47	780	1.67	838	1.85	890	2.03	939	2.22	983	2.42
4250	666	1.42	740	1.68	804	1.88	859	2.06	909	2.25	956	2.45	998	2.67
4500	697	1.65	769	1.91	829	2.10	881	2.28	929	2.48	973	2.71	1013	2.95
4750	729	1.91	798	2.15	854	2.34	903	2.53	948	2.75	991	3.00	1030	3.27
5000	763	2.18	826	2.41	878	2.60	925	2.81	968	3.05	1009	3.33	1046	3.61
5250	797	2.47	854	2.69	903	2.90	947	3.12	989	3.39	1028	3.69	1064	3.99
5500	830	2.78	882	3.00	927	3.22	969	3.48	1010	3.77	1047	4.09	1083	4.40
5750	861	3.11	908	3.34	951	3.58	992	3.87	1031	4.19	1068	4.52	1102	4.84
6000	890	3.45	935	3.71	976	3.98	1016	4.31	1053	4.65	1089	4.99	1122	5.30
6250	918	3.84	961	4.12	1001	4.43	1040	4.79	1076	5.14	1110	5.48	- - -	- - -

Total Air Volume cfm	Total Static Pressure − in. w.g.											
	1.6		1.8		2		2.2		2.4		2.6	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1750	941	1.23	992	1.40	1039	1.55	1084	1.70	1128	1.85	1156	2.08
2000	946	1.32	995	1.48	1041	1.65	1085	1.81	1127	1.97	1160	2.13
2250	952	1.42	999	1.59	1044	1.76	1087	1.93	1127	2.10	1164	2.27
2500	959	1.54	1005	1.71	1048	1.89	1089	2.07	1127	2.25	1166	2.42
2750	968	1.67	1012	1.86	1053	2.04	1092	2.23	1129	2.41	1167	2.60
3000	977	1.83	1020	2.02	1059	2.21	1096	2.41	1133	2.60	1170	2.79
3250	988	2.00	1028	2.20	1066	2.41	1102	2.61	1138	2.81	1174	3.01
3500	999	2.19	1038	2.41	1074	2.63	1109	2.84	1144	3.04	1180	3.24
3750	1010	2.41	1048	2.64	1084	2.87	1118	3.09	1152	3.29	1188	3.50
4000	1023	2.65	1060	2.90	1095	3.14	1128	3.36	1162	3.57	1198	3.77
4250	1036	2.92	1072	3.18	1106	3.42	1139	3.65	1172	3.86	1208	4.07
4500	1050	3.22	1085	3.48	1118	3.73	1151	3.96	1184	4.17	1221	4.39
4750	1065	3.55	1099	3.81	1132	4.06	1164	4.29	1198	4.51	1235	4.74
5000	1081	3.90	1114	4.17	1146	4.42	1178	4.65	1212	4.87	1250	5.09
5250	1098	4.28	1130	4.55	1162	4.80	1194	5.02	1228	5.24	1266	5.47
5500	1116	4.69	1147	4.96	1179	5.20	1211	5.42	1246	5.63	- - -	- - -
5750	1134	5.12	1165	5.38	1196	5.61	- - -	- - -	- - -	- - -	- - -	- - -
6000	1153	5.58	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
6250	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

BLOWER DATA - DIRECT DRIVE 10 TON

KDB122H4E - BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY (NO HEAT SECTION) WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE. FOR ALL UNITS ADD:

1 − Wet indoor coil air resistance of selected unit.

2 − Any factory installed options air resistance (heat section, economizer, etc.)

3 − Any field installed accessories air resistance (duct resistance, diffuser, etc.)

See page 9 for wet coil and option/accessory air resistance data.

MAXIMUM STATIC PRESSURE WITH GAS HEAT - 2.0 in. w.g.

Total Air Volume cfm	Total Static Pressure - in. w.g.													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
1750	711	188	771	279	836	366	905	453	975	544	1044	640	1109	737
2000	752	242	812	332	876	420	944	510	1011	606	1075	709	1138	812
2250	799	300	860	389	923	479	988	575	1052	678	1113	787	1171	896
2500	853	362	914	453	976	548	1038	650	1097	761	1154	877	1209	990
2750	914	434	974	529	1033	629	1091	739	1146	858	1199	979	1250	1098
3000	980	513	1037	614	1092	720	1146	837	1198	961	1247	1088	1295	1215
3250	1048	598	1101	705	1153	819	1203	941	1251	1071	1298	1206	1343	1343
3500	1116	693	1166	809	1214	931	1261	1060	1307	1198	1351	1341	1395	1489
3750	1185	806	1232	931	1277	1063	1322	1201	1365	1348	1407	1499	1448	1657
4000	1254	937	1299	1072	1341	1214	1383	1363	1424	1518	1464	1679	1503	1844
4250	1324	1089	1366	1234	1406	1386	1445	1545	1484	1708	1522	1876	1559	2046
4500	1395	1262	1433	1417	1471	1579	1508	1745	1544	1913	1581	2084	1616	2256
4750	1465	1455	1501	1619	1536	1787	1571	1957	1606	2128	1641	2299	1675	2470
5000	1534	1666	1568	1834	1602	2004	1635	2174	1668	2345	1701	2514	1735	2682
5250	1603	1887	1635	2055	1667	2224	1699	2392	1731	2559	1763	2724	- - -	- - -
5500	1671	2110	1702	2275	1733	2441	1764	2605	- - -	- - -	- - -	- - -	- - -	- - -
5750	1738	2325	1768	2488	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

Total Air Volume cfm	Total Static Pressure - in. w.g.											
	1.6		1.8		2.0		2.2		2.4		2.6	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
1750	1172	833	1231	932	1287	1039	1340	1156	1391	1283	1442	1426
2000	1197	913	1253	1019	1306	1135	1357	1261	1407	1398	1457	1547
2250	1227	1003	1280	1117	1330	1242	1379	1378	1428	1525	1477	1680
2500	1261	1103	1311	1226	1360	1361	1407	1507	1454	1663	1501	1826
2750	1299	1219	1347	1350	1394	1494	1440	1649	1485	1813	1530	1982
3000	1342	1346	1388	1487	1432	1640	1476	1803	1520	1973	1563	2146
3250	1388	1485	1432	1638	1475	1800	1517	1969	1558	2143	1600	2319
3500	1437	1643	1479	1805	1519	1975	1560	2148	1600	2325	1640	2502
3750	1489	1821	1528	1990	1567	2164	1605	2340	1645	2517	1685	2693
4000	1541	2014	1579	2187	1616	2364	1654	2540	1693	2715	1732	2887
4250	1596	2218	1632	2393	1668	2569	1705	2742	1743	2913	- - -	- - -
4500	1652	2429	1687	2603	1722	2775	1759	2944	- - -	- - -	- - -	- - -
4750	1709	2641	1743	2811	1778	2979	- - -	- - -	- - -	- - -	- - -	- - -
5000	1768	2850	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
5250	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
5500	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
5750	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

BLOWER DATA

FACTORY INSTALLED BELT DRIVE KIT SPECIFICATIONS

Nominal hp	Maximum hp	Drive Kit Number	RPM Range
2	2.3	1	590 - 890
2	2.3	2	800 - 1105
2	2.3	3	795 - 1195
3	3.45	4	730 - 970
3	3.45	5	940 - 1200
3	3.45	6	1015 - 1300
5	5.75	10	900 - 1135
5	5.75	11	1040 - 1315
5	5.75	12	1125 - 1425

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

NOTE – Units equipped with option are limited to a motor service factor of 1.0.

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure	Air Volume Exhausted
in. w.g.	cfm
0	3175
0.05	2955
0.10	2685
0.15	2410
0.20	2165
0.25	1920
0.30	1420
0.35	1200

FACTORY INSTALLED OPTIONS/FIELD INSTALLED ACCESSORY AIR RESISTANCE - in. w.g.

Air Volume cfm	Wet Indoor Coil	Gas Heat Exchanger			Economizer	Filters		Return Air Adaptor Plate
	092,102,122	Standard Heat	Medium Heat	High Heat		MERV 8	MERV 13	
1750	0.04	0.06	0.02	0.02	0.05	0.01	0.03	0.00
2000	0.05	0.07	0.05	0.06	0.06	0.01	0.03	0.00
2250	0.06	0.07	0.07	0.08	0.08	0.01	0.04	0.00
2500	0.07	0.09	0.10	0.11	0.11	0.01	0.05	0.00
2750	0.08	0.09	0.11	0.12	0.12	0.02	0.05	0.00
3000	0.10	0.11	0.12	0.13	0.13	0.02	0.06	0.02
3250	0.11	0.12	0.15	0.16	0.15	0.02	0.06	0.02
3500	0.12	0.12	0.16	0.17	0.15	0.03	0.07	0.04
3750	0.14	0.14	0.19	0.20	0.15	0.03	0.08	0.07
4000	0.15	0.14	0.21	0.22	0.19	0.04	0.08	0.09
4250	0.17	0.14	0.24	0.28	0.19	0.04	0.09	0.11
4500	0.19	0.15	0.26	0.32	0.22	0.04	0.09	0.12
4750	0.20	0.16	0.29	0.37	0.25	0.05	0.10	0.16
5000	0.22	0.16	0.34	0.43	0.29	0.06	0.10	0.18
5250	0.24	0.16	0.37	0.47	0.32	0.06	0.11	0.19
5500	0.25	0.18	0.44	0.54	0.34	0.07	0.12	0.22
5750	0.27	0.19	0.49	0.59	0.45	0.07	0.12	0.25
6000	0.29	0.20	0.54	0.64	0.52	0.08	0.13	0.27

BLOWER DATA

CEILING DIFFUSERS AIR RESISTANCE - in. w.g.

Unit Size	RTD11 Step-Down Diffuser				FD11 Flush Diffuser
	Air Volume cfm	2 Ends Open	1 Side, 2 Ends Open	All Ends & Sides Open	
092 Models	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
	3200	0.41	0.37	0.32	0.31
	3400	0.50	0.45	0.39	0.37
	3600	0.61	0.54	0.48	0.44
	3800	0.73	0.63	0.57	0.51
102 & 122 Models	3600	0.36	0.28	0.23	0.15
	3800	0.40	0.32	0.26	0.18
	4000	0.44	0.36	0.29	0.21
	4200	0.49	0.40	0.33	0.24
	4400	0.54	0.44	0.37	0.27
	4600	0.60	0.49	0.42	0.31
	4800	0.65	0.53	0.46	0.35
	5000	0.69	0.58	0.50	0.39
	5200	0.75	0.62	0.54	0.43

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume	[1] Effective Throw Range	
		RTD11 Step-Down	FD11 Flush
	cfm	ft.	ft.
092 Models	2600	24 - 29	19 - 24
	2800	25 - 30	20 - 28
	3000	27 - 33	21 - 29
	3200	28 - 35	22 - 29
	3400	30 - 37	22 - 30
102 & 122 Models	3600	25 - 33	22 - 29
	3800	27 - 35	22 - 30
	4000	29- 37	24 - 33
	4200	32 - 40	26 - 35
	4400	34 - 42	28 - 37

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

ELECTRICAL DATA — 7.5 TON

BELT DRIVE BLOWER - KDB092H4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.1			6.1			4.4		
	Locked Rotor Amps	83.1			41			33		
Compressor 2	Rated Load Amps	13.1			6.1			4.4		
	Locked Rotor Amps	83.1			41			33		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.8 (5.6)			1.4 (2.8)			1.1 (2.2)		
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4			1.3			1		
Service Outlet 115V GFI (amps)		15			15			20		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	25	30	15	20	20
	With (1) 0.33 HP Power Exhaust	50	60	70	25	25	30	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	43	46	53	20	22	25	15	16	19
	With (1) 0.33 HP Power Exhaust	45	49	56	22	23	26	16	17	20
ELECTRICAL ACCESSORIES										
Disconnect		**54W56**			**54W56**			**54W56**		

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[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 — 8.5 TON

BELT DRIVE BLOWER - KDB102H4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	14.5			6.3			6		
	Locked Rotor Amps	98			55			41		
Compressor 2	Rated Load Amps	14.5			6.3			6		
	Locked Rotor Amps	98			55			41		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.8 (5.6)			1.4 (2.8)			1.1 (2.2)		
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4			1.3			1		
Service Outlet 115V GFI (amps)		15			15			20		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	60	60	70	25	25	30	20	25	25
	With (1) 0.33 HP Power Exhaust	60	60	70	25	25	30	25	25	25
[3] Minimum Circuit Ampacity	Unit Only	46	49	56	21	22	25	19	20	22
	With (1) 0.33 HP Power Exhaust	49	52	58	22	24	27	20	21	23
ELECTRICAL ACCESSORIES										
Disconnect		**54W56**			**54W56**			**54W56**		

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[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 — 10 TON

DIRECT DRIVE BLOWER - KDB122H4

[1] Voltage - 60hz		208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor 1	Rated Load Amps	15.6	7.8	5.8
	Locked Rotor Amps	110	52	38.9
Compressor 2	Rated Load Amps	15.6	7.8	5.8
	Locked Rotor Amps	110	52	38.9
Outdoor Fan Motors (3)	Full Load Amps	2.8	1.4	1.1
	(total)	(8.4)	(4.2)	(3.3)
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4	1.3	1
Service Outlet 115V GFI (amps)		15	15	20
Indoor Blower Motor	Horsepower	3.75	3.75	3.75
	Full Load Amps	8.8	4.3	3.4
[2] Maximum Overcurrent Protection	Unit Only	60	30	25
	With (1) 0.33 HP Power Exhaust	70	35	25
[3] Minimum Circuit Ampacity	Unit Only	53	27	20
	With (1) 0.33 HP Power Exhaust	60	30	23
ELECTRICAL ACCESSORIES				
Disconnect		**54W56**	**54W56**	**54W56**

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[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.

KDB PARTS ARRANGEMENT

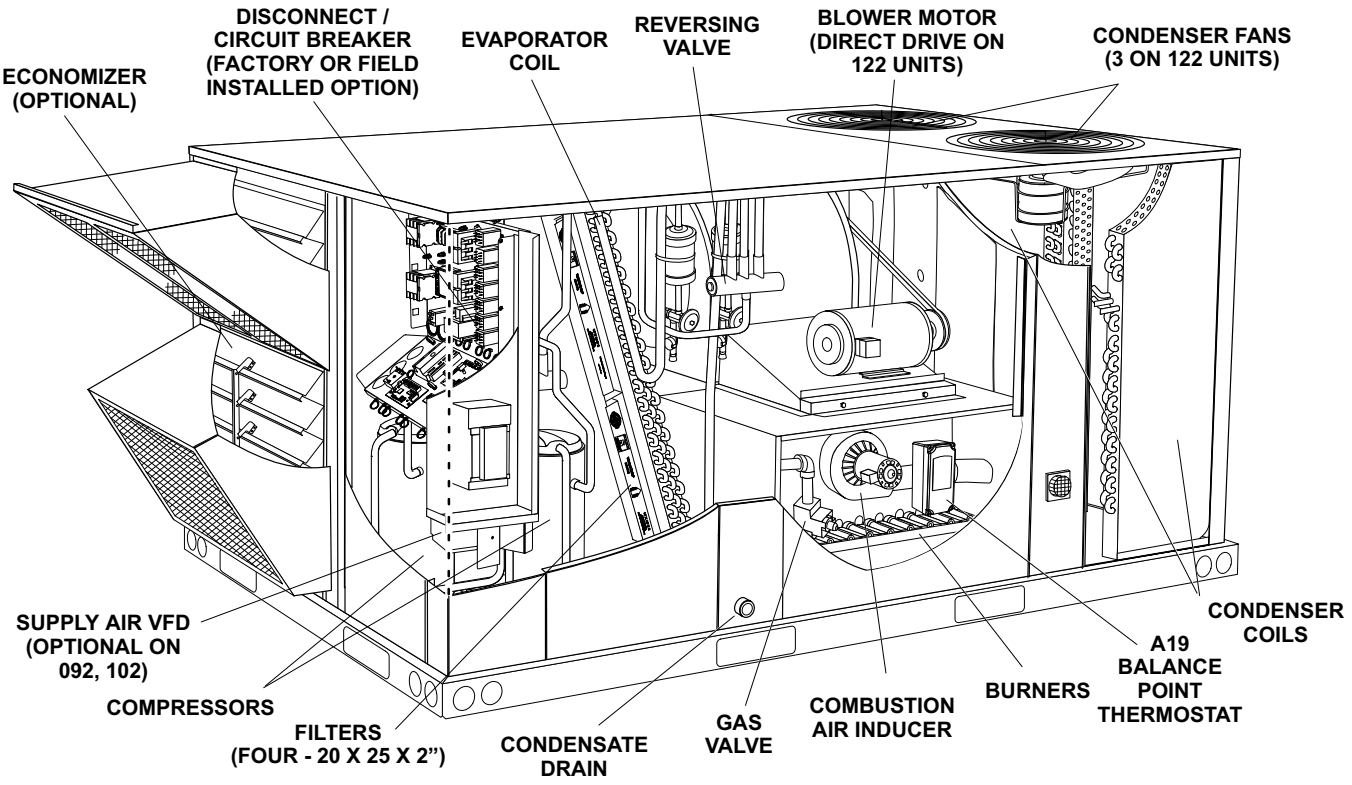


FIGURE 1

KDB092/102/122 CONTROL BOX

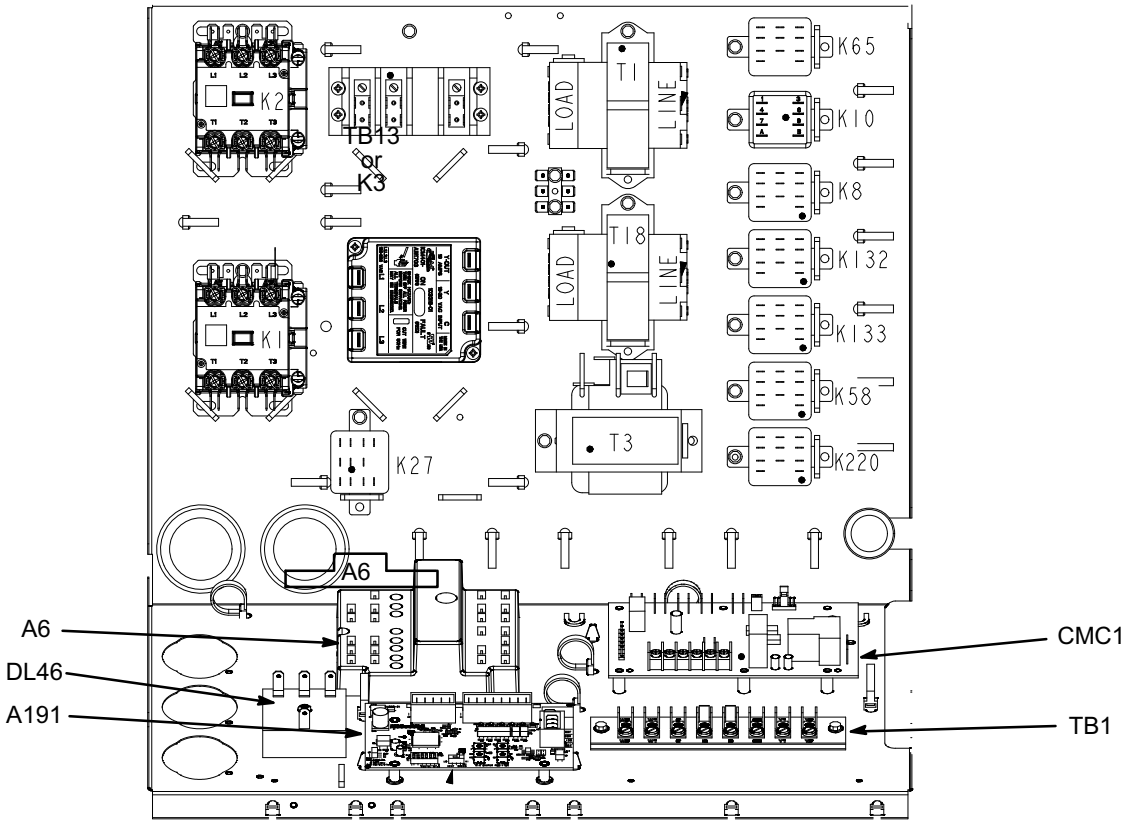


FIGURE 2

I-UNIT COMPONENTS

The KDB 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 per KDB unit.

All 7.5 through 10 ton (26.3 through 34 kW) units are configure to order units (CTO).

A-Control Box Components

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

1-Disconnect Switch S48 or Circuit Breaker CB10 (field installed)

KDB units may be equipped with an optional disconnect switch S48 or circuit breaker CB10. S48 and CB10 are toggle switches, which can be used by the service technician to disconnect power to the unit.

2-Transformer T1

All KDB series units use a single line voltage to 24VAC transformer mounted in the control box. Transformer supplies power to CMC1 and control circuits in the unit. The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker (CB8). The 208/230 (Y) voltage transformers use two primary voltage taps as shown in figure 3, while 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

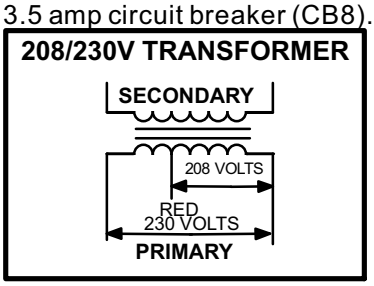


FIGURE 3

3-CAI Transformer T3 (575V Units)

All KDB 575(J) voltage units use transformer T3 located in the control box. The transformers have an output rating of 0.5A. T3 transformer supplies 230 VAC power to the combustion air inducer motor (B6).

4-Transformer T18

T18 is a single line voltage to 24VAC transformer used in all KDB units. T18 is identical to T1 and is protected by a 3.5 amp circuit breaker (CB18). T18 provides 24VAC to K1 and K2 coil and reversing valve L1 and L2 (via K58-1 contacts).

5-Compressor Contactor K1 & K2

All compressor contactors are three-pole-double-break contactors with a 24VAC coil. In all KDB units, K1 and K2 energize compressors B1 and B2 respectively in response to first or second stage cooling demands. The auxiliary N.C. contacts are opened to disable the crankcase heaters when compressor is energized.

6-Blower Contactor K3

Blower contactor K3, used in CAV units, is a three-pole-double-break contactor with a 24VAC coil used to energize the indoor blower motor B3 in response to blower demand. K3 is energized by a thermostat cooling demand.

7-Outdoor Fan Relay K10

Outdoor fan relay K10 is a DPDT relay with a 24VAC coil.

K10 is energized by CMC1 defrost timer (K1 FAN contacts) during a heating or cooling demand. K10-2 N.O. contacts close allowing a signal from the A191 VFD board to start outdoor fans. K10-1 N.C. contacts open allowing S6 or S9 to initiate defrost.

K10 is de-energized by CMC1 defrost timer (K1 FAN contacts) during defrost. K10-2 N.O. contacts open preventing outdoor fan operation. K10-1 N.C. contacts close allowing S46 or S104 to terminate defrost.

8-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 KDB 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.

9-Compressor On Relays (K132 & K133)

K132 and K133 are two-pole relays with a 24V coil used to energize compressor contactor coils. K1 is energized by K132 with a Y1 demand. K2 is energized by K133 with a Y2 demand. Both K1 and K2 are energized by K132 and K133 with a W1 demand.

10-Transfer Relay (K8)

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

11-Low Ambient Kit Relay (K58)

Low ambient relay K58 is a DPDT relay with a 24V coil energized by a CMC1 output in the heating cycle. K58-1 closes to allow power to reversing valves L1 and L2 during a heating demand only.

12-Blower Motor Overload Relay Switch (S42)

The blower motor overload relay is used in all units equipped with high efficiency motors. The relay (S42) is connected in line with the blower motor to monitor the current flow to the motor. When the relay senses and overload condition, a set of normally closed contacts open to de-energize 24VAC power T1 transformer.

13-Terminal Block (TB1)

TB1 provides 24VAC field connections. All indoor thermostat connections are connected to TB1 located in the control box.

14-Enthalpy Control (A6)

Refer to description in economizer section.

15-Transfer 2 Relay (K27)

K27 relay is a two-pole relay with a 24V coil and is energized when W2 heating demand is called. High gas heat is energized via J2-7. K27-1 N.O. terminals 7 and 4 close to energize low gas heat via J2-2. K27-1 N.C. terminals 7 and 1 open to discontinue 1st stage heat pump operation.

Note - If the outdoor ambient is above A19 setpoint (35°F default) **AND** the thermostat demand increases from W1 to W2, the unit will change from heat pump heating to high gas heat. If the outdoor ambient is below A19 setpoint **AND** the thermostat demand increases from W1 to W2, the unit will change from low gas heat to high gas heat.

16-Terminal Block (TB13)

TB13 provides power distribution for units with direct drive blowers (122 only). TB13 is also used on belt drive units (092 & 102), equipped with a supply air inverter (A96), without a by-pass kit.

17-Overflow Switch (S149) Optional

The overflow switch is used to interrupt cooling operation when excessive condensate collects in the drain pan. The switch is located inside the drain pan on the front or back side of the unit.

When the condensate level rises above the set level, the N.O. switch closes and unit compressors are de-energized. Once the condensate level drops below the set level, the switch will open allowing compressor operation.

18-Fan Control Board FCB (A191)

The fan control board (FCB) controls the indoor blower and outdoor fans.

Supply Air Control -

On 092 and 102 units equipped with an inverter, the FCB provides two stages of supply air. See figure 4. On 092 and 102 units equipped with constant air volume, belt-driven blowers, the FCB supply air function is not used. On 122 units equipped with a direct-drive blower, A191 provides a 0-10 volt output for variable supply air. See figure 5.

Outdoor Fan Control -

The FCB uses a pulse width modulation (PWM) signal to vary outdoor fan speed. The FCB will operate the fans in low speed with a Y1 thermostat demand. When the thermostat demand increases to Y2, the FCB will operate the fans in high speed. During the heating mode, a W1 demand results in high speed operation; there is no change to the blower operation when the heating demand increase to W2.

When an optional economizer is installed, the FCB will operate the fans at low speed during ventilation and high speed during minimum damper position.

Depending on the liquid line pressure, the FCB will operate the fans at 25%. The fans cycle off and on less frequently to improve system efficiency and reliability.

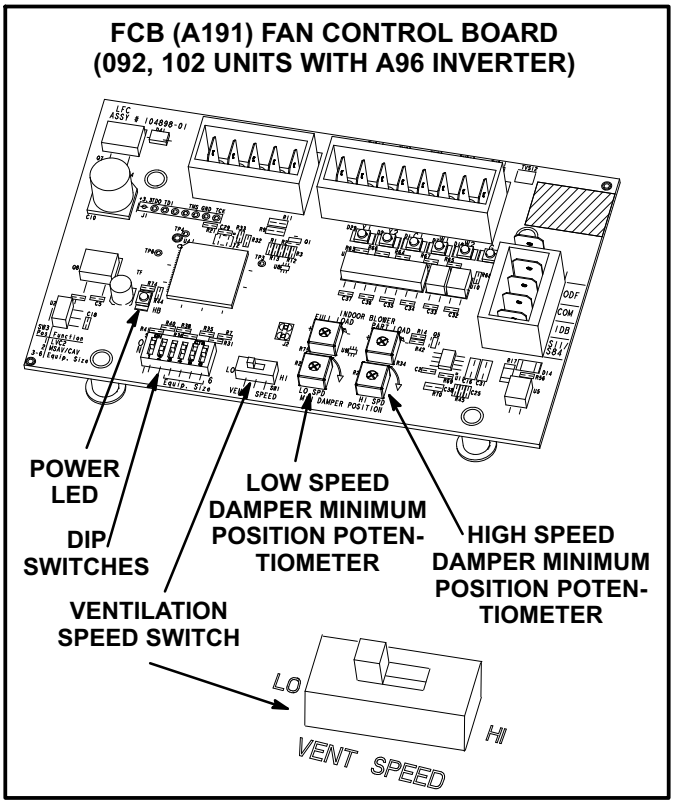


FIGURE 4

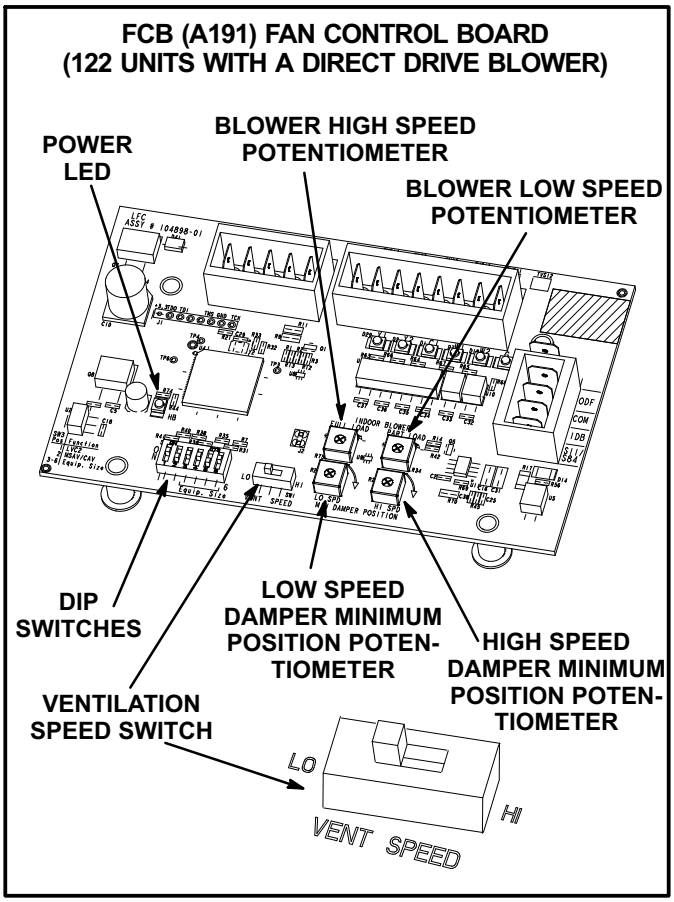


FIGURE 5

Power LED -

See table 1 for FCB diagnostic LED explanation.

TABLE 1

FCB Diagnostic LED	
Indicates	**LED**
Normal operation	Blink at a 1-second rate
Power to board but a problem exists	Dim and not blinking
Board failure/no power	Off

FCB DIP Switch Settings -

DIP switch settings 1 and 2 identify the unit supply air and settings 3 through 6 identify the unit capacity. Verify the FCB (A191) fan control board DIP switch settings are correct. Use the model number on the unit nameplate and figure 6.

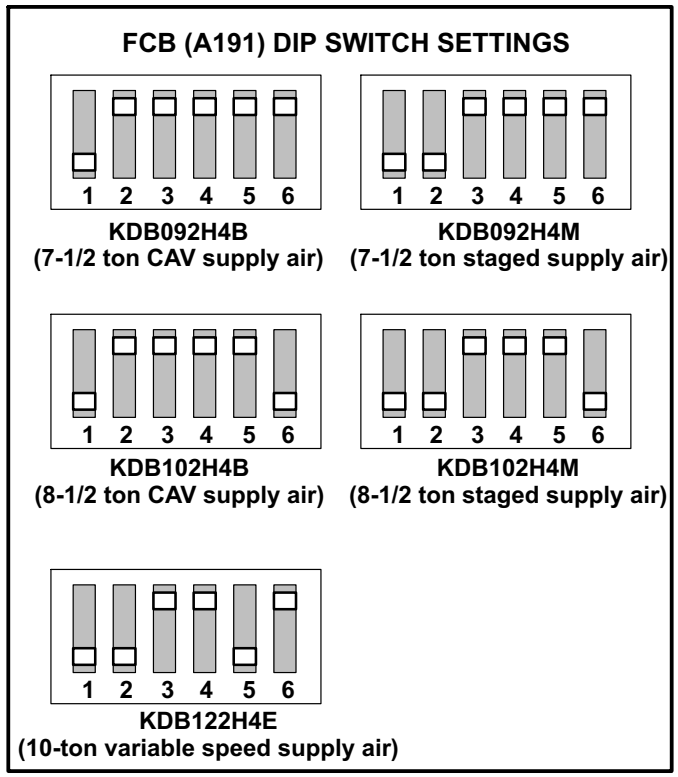


FIGURE 6

19-Defrost Control Board CMC1

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

Compressor Accumulated Run-Time Interval

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

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

Low gas heat is energized by CMC1 W1 24VAC contacts during defrost.

Defrost Test Option

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

Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a sequence according to the condition. See table 2.

TABLE 2

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

DEFROST CONTROL BOARD CMC1

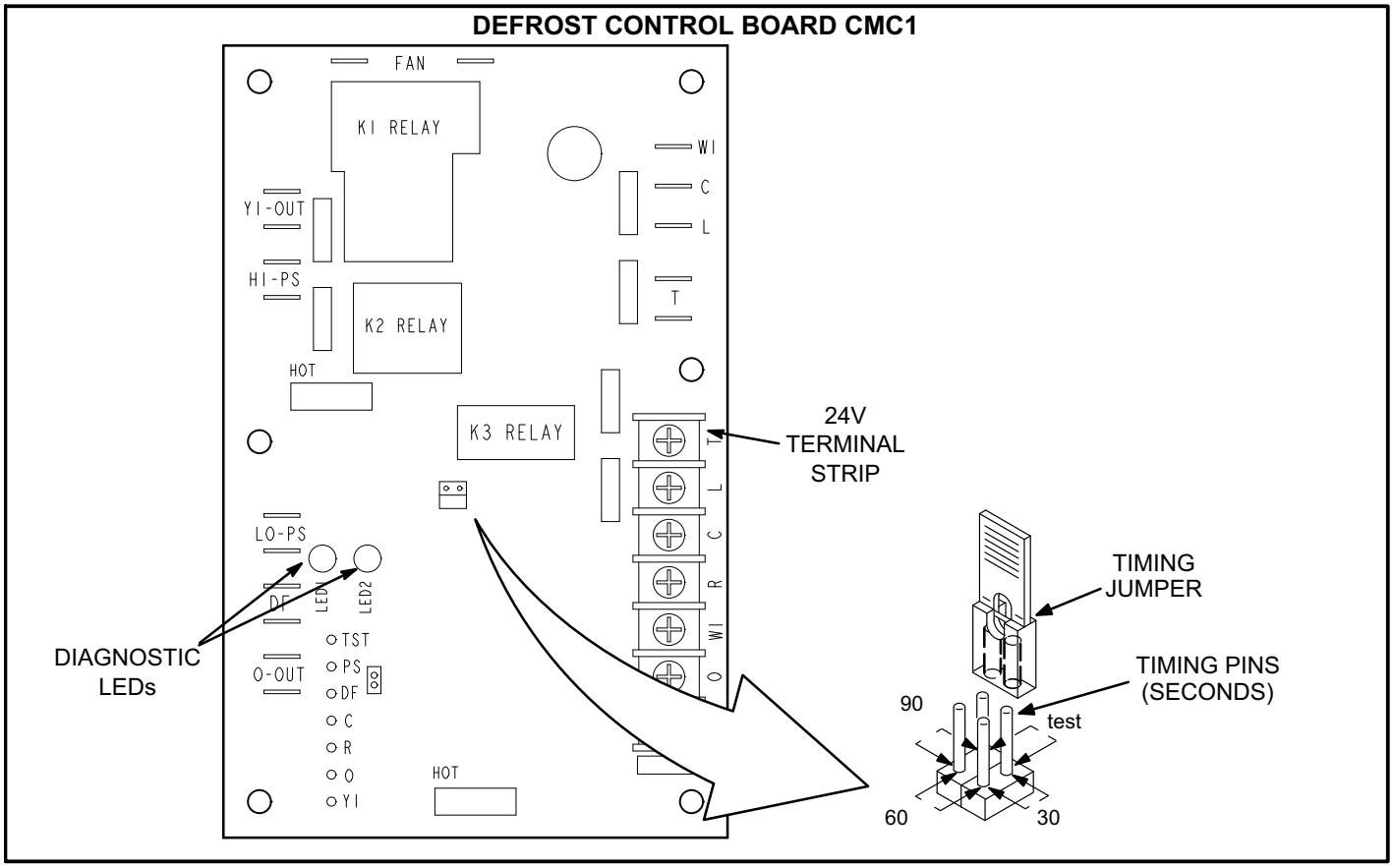
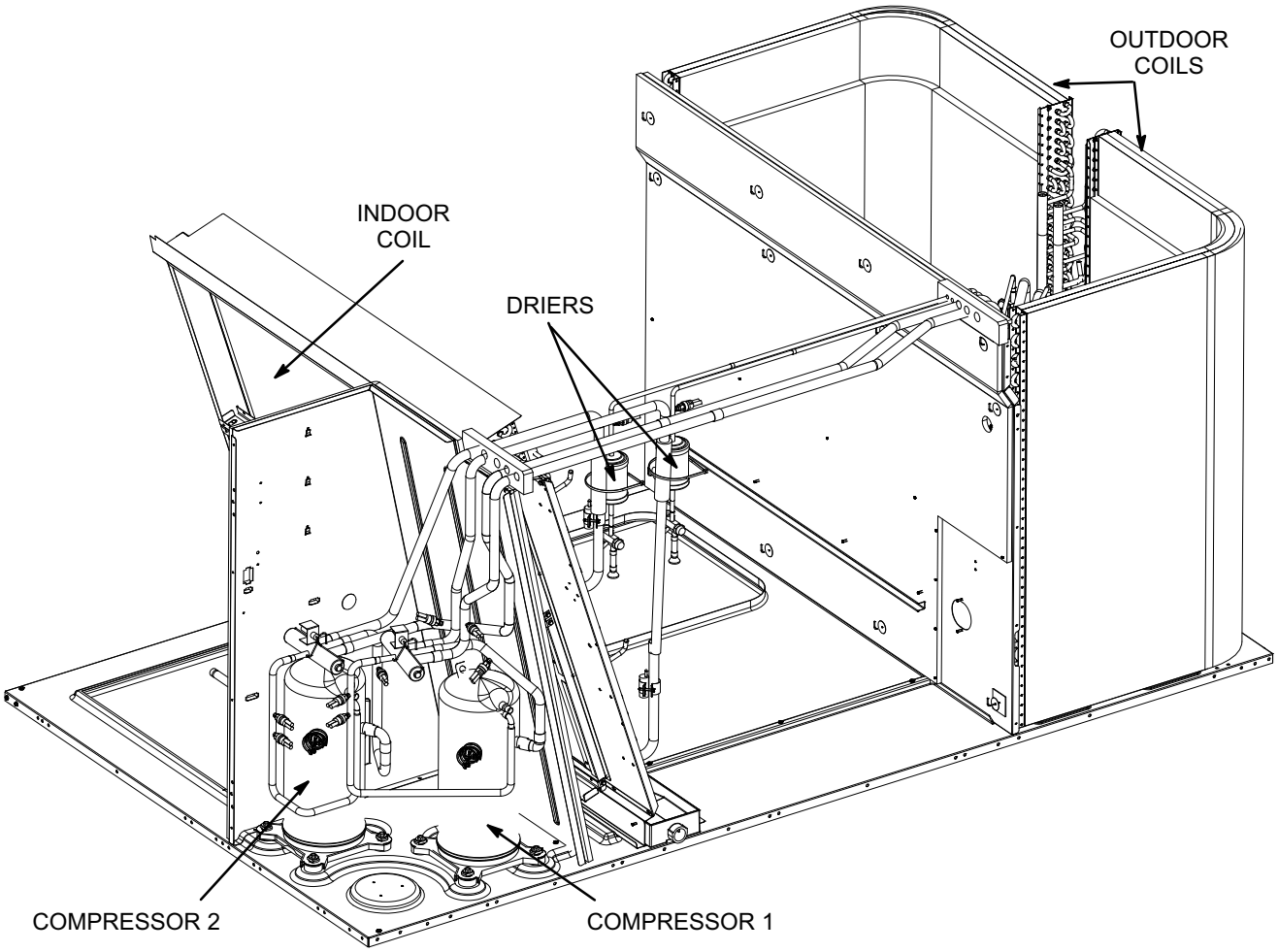


FIGURE 7

KDB PLUMBING COMPONENTS (092, 102)



COMPRESSOR DETAIL
front view

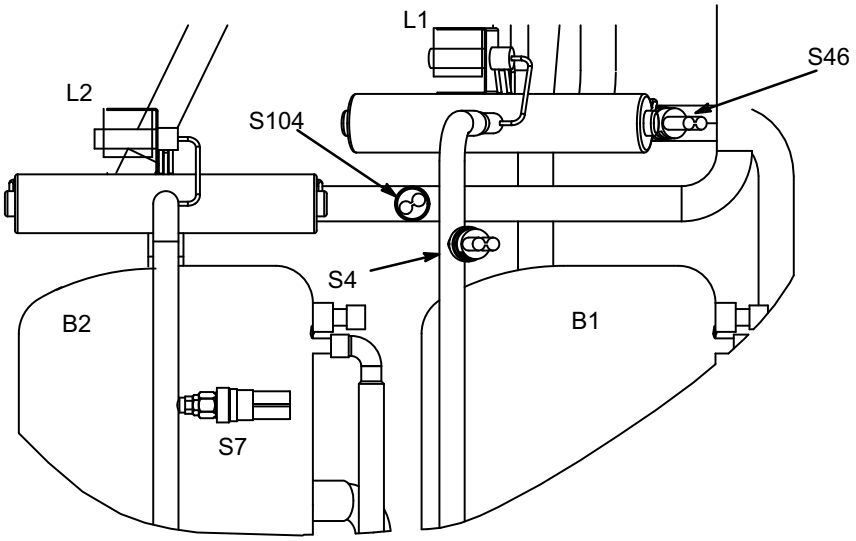
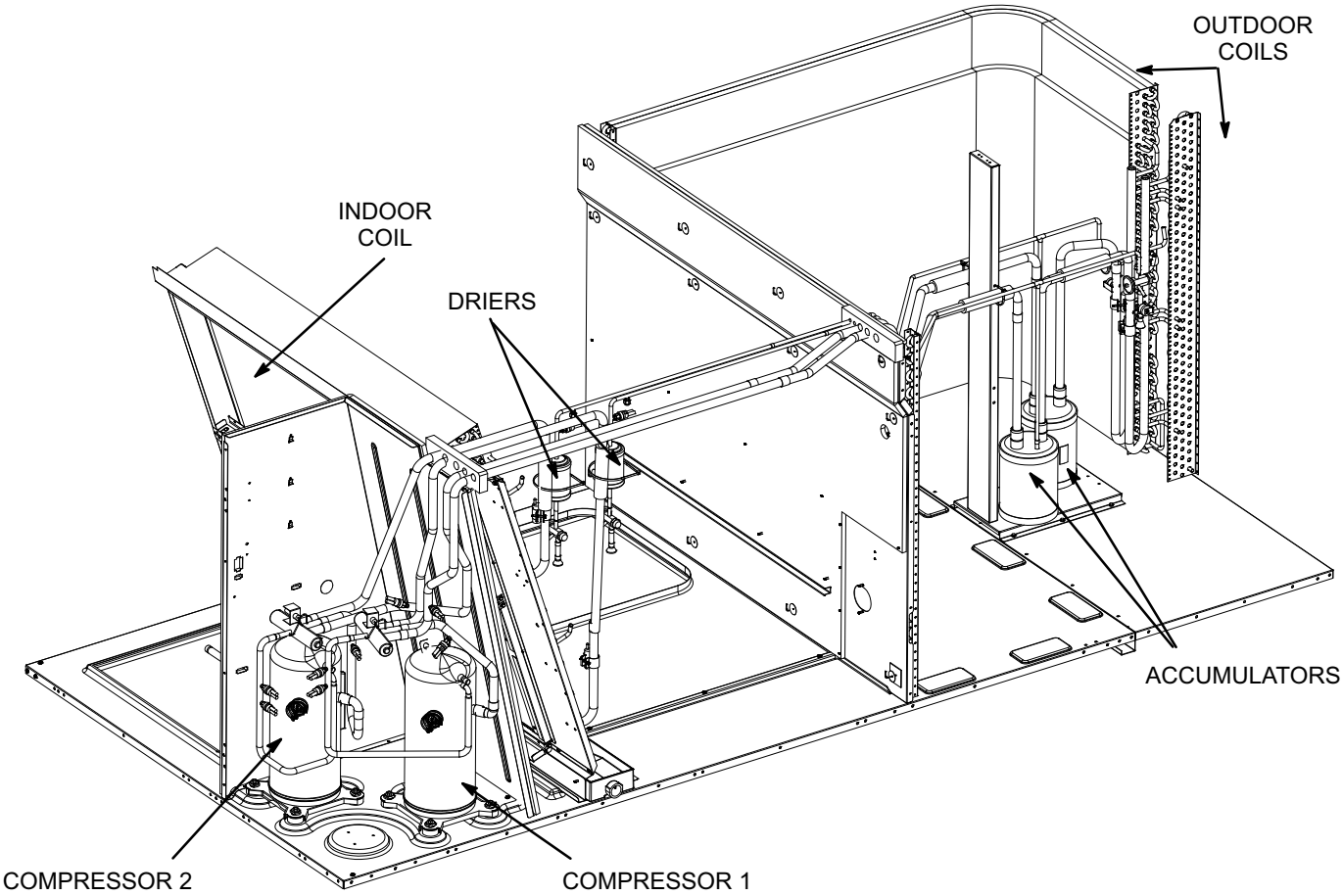


FIGURE 8

KDB PLUMBING COMPONENTS (122)



COMPRESSOR DETAIL
front view

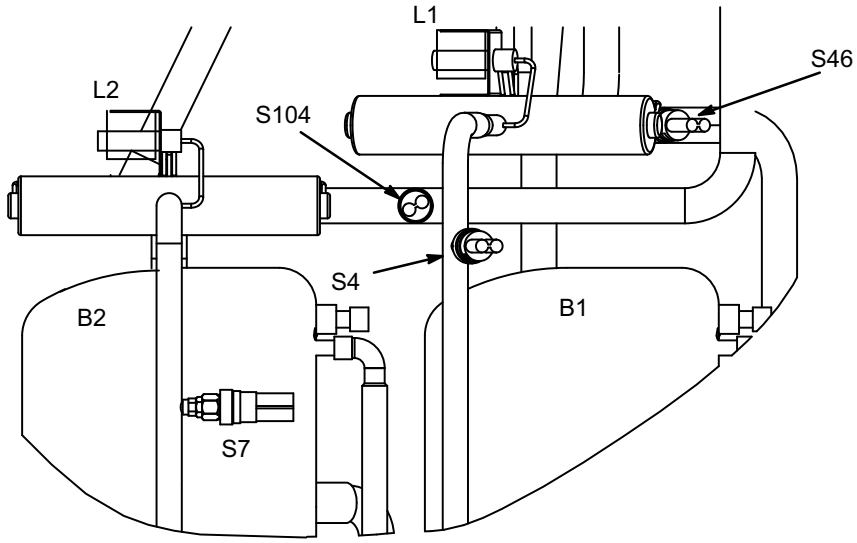


FIGURE 9

B-Cooling Components

KDB units use independent cooling circuits consisting of separate compressors, outdoor coils and indoor coil (with 2 separate stages). See figure 8 for 092 and 102 units and figure 9 for 122 units. Units are equipped with two draw-through type condenser fans. 092 and 102 units are equipped with belt-drive blowers and 122 units are equipped with direct-drive blowers. Both types of blowers draw air across the indoor coil during unit operation.

Cooling may be supplemented by a factory- or field-installed economizer. The indoor coils are slab type and are stacked. Each indoor coil uses a thermostatic expansion valve as the primary expansion device. Each indoor coil is also equipped with enhanced fins and rifled tubing. In all units each compressor is protected by a freezestat (on each indoor coil) and a high pressure switch (S4, S7). Low ambient switches (S11, S84) are available as an option for additional compressor protection.

1-Compressors B1 and B2

All KDB092/122 units use two scroll compressors. All compressors are equipped with independent cooling circuits. Compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications.

⚠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.

Each compressor is energized by a corresponding compressor contactor.

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

⚠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.

2-Freezestats S49 and S50

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

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

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

3-High Pressure Switches S4 and S7

The high pressure switches is a manual reset SPST N.C. switch which opens on a pressure rise. The switch is located in the compressor discharge line and is wired in series with the compressor contactor coil.

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

When discharge pressure rises to 640 ± 10 psig (4412 ± 69 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate).

4-Low Ambient Switches S11, S84, S185 (optional)

The low ambient switch is an auto-reset SPST N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. S11 and S185 are located in the stage 1 liquid line prior to the indoor coil section. S84 is located in the stage 2 liquid line prior to the indoor coil section. See figure 10.

When stage 1 and 2 liquid pressure rises to 450 ± 10 psig (3102 ± 69 kPa), S11 and S84 close. When stage 1 and 2 liquid pressure falls to 240 ± 10 psig (1655 ± 69 kPa), S11 and S84 open. This provides a signal to A191 outdoor fan control board.

When stage 1 liquid pressure rises to 300 ± 10 psig (3102 ± 69 kPa), S185 closes. When liquid pressure falls to 240 ± 10 psig (1655 ± 69 kPa), S185 opens. This allows or interrupts the A191 pulse width modulation (PWM) signal which operates all fans.

See table 3 for fan operation. Note that operation is dependent on whether liquid pressure is rising or falling.

This intermittent or lower speed fan operation results in higher evaporating temperature allowing the system to operate without icing the indoor coil and losing capacity. When A191 operates the the outdoor fans at 25%, fans cycle off and on less frequently to improve system efficiency and reliability.

TABLE 3

Liquid Pressure (psig)	Operation
↓ From 450 to 240	All OD Fans On
↓ From 240 to 180	All OD Fans at 25% of Full Speed
↓ From 180 to 0	All OD Fans Off
↑ From 0 to 300	All OD Fans Remain Off
↑ From 300 to 450	All OD Fans at 25% of Full Speed
↑ From 450 to higher	All OD Fans On

LOW AMBIENT PRESSURE SWITCH LOCATION

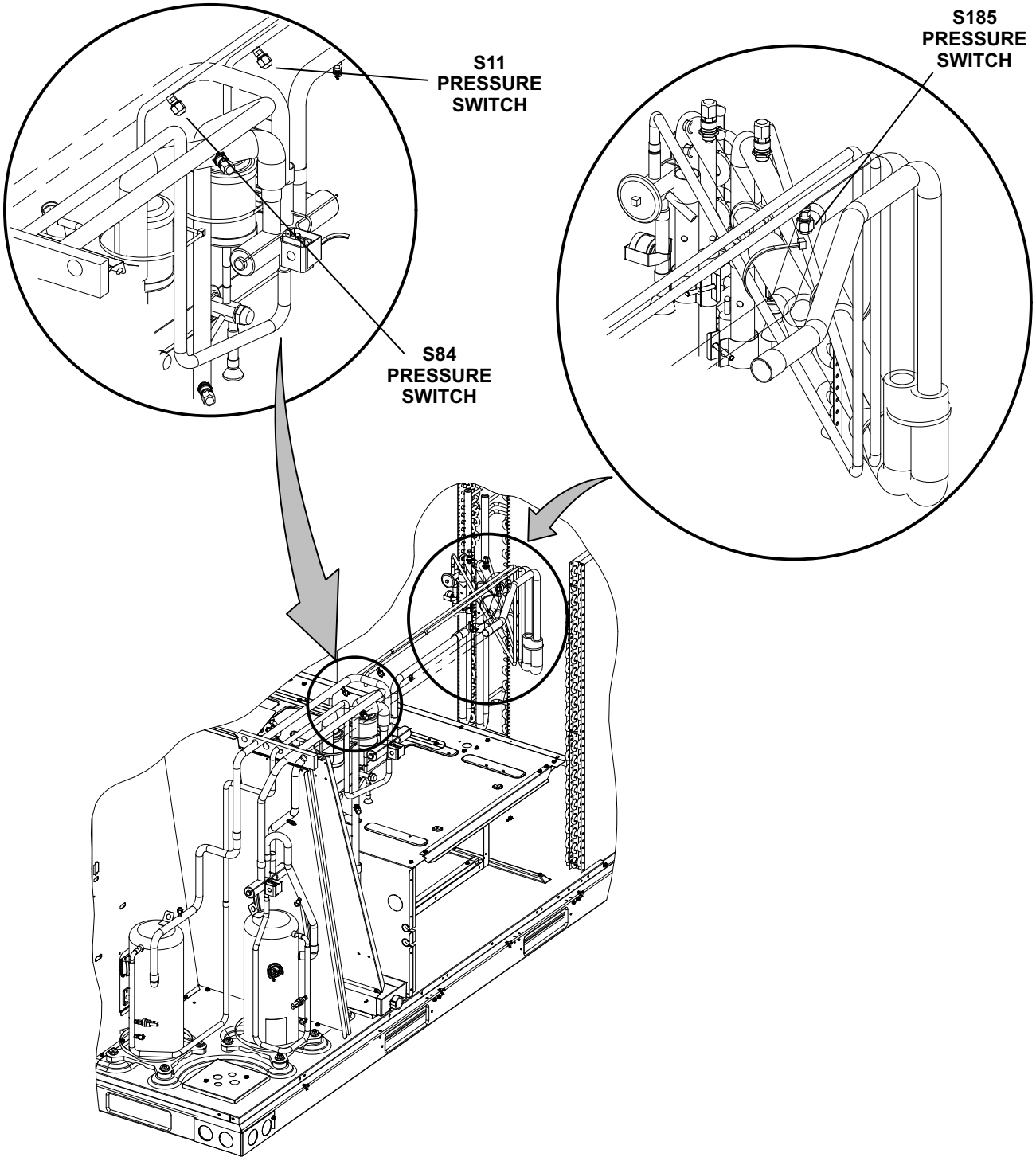


FIGURE 10

5-Reversing Valve L1 and L2

A refrigerant reversing valve with a 24 volt solenoid coil is used to reverse refrigerant flow during unit operation in all KDB 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 and L2 are controlled by the defrost control board CMC1 in response to cooling demand or by defrost.

6-Defrost Pressure Switch S46 and S104

The defrost pressure switch S46 and S104 are auto-reset SPST N.C. pressure switches which open on a pressure rise. All KDB units are equipped with these switches. The switches are located on the discharge line. S46 and S104 are wired in series with the CMC1 control board.

When discharge pressure reaches 450 ± 10 psig (3102 ± 69 kPa) in either circuit (indicating defrost is completed) the appropriate switch opens. The switches automatically reset when pressure in the suction line drops to 300 ± 20 psig (2068 ± 138 kPa).

7-Defrost Temperature Switch S6 and S9

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

8-Filter Drier (all units)

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

9-Condenser Fan Motors B4, B5, B21

See specifications section of this manual for specifications of condenser fans B4 , B5, and B21 (B21 on 122 units only). All KDB motors are electrically commutated condenser fan motors (ECM). The ECM motors are wired directly to 230VAC power but do not operate until a pulse width modulated (PWM) control signal is sent from A191 fan control board. All outdoor fans will run at the same speed when the appropriate PWM signal is received. The fans may be removed for servicing and cleaning by removing the fan grilles.

10-Crankcase Heaters HR1, HR2

Heater HR1 is installed around compressor B1 and heater HR2 is installed around compressor B2. Crankcase heater wattage varies by compressor manufacturer.

C-Blower Compartment

The blower compartment in all KDB092/122 units is located between the indoor coil and the outdoor coil section. The blower assembly is accessed by disconnecting the blower motor and all other plugs and removing the screws in front of the blower housing. The blower pulls out as shown in figure 11.

1-Blower Wheels

KDB092/102 units have one 15 in. x 15 in. (381 mm x 381 mm) blower wheel. KDB122 units have a direct drive blower assembly with a backward-inclined blower wheel.

2-Indoor Blower Motor B3

KDB092 and 102 units use three-phase, single-speed, belt-drive blower motors. Optional supply air inverters are available to provide two stages of supply air. CFM adjustments on belt-drive blowers are made by adjusting motor pulley (sheave). Motors are equipped with sealed ball bearings.

KDB122 units are equipped with three-phase, direct drive, variable speed blower motors.

All motor specifications are listed in the SPECIFICATIONS (table of contents) in the front of this manual. Units may be equipped with motors manufactured by various manufacturers, therefore electrical FLA and LRA specifications will vary. See unit name plate for information specific to your unit.

OPERATION / ADJUSTMENT

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 subbase 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.

Blower Access

The blower assembly is secured to a sliding base which allows the entire assembly to be pulled out of the unit. See figure 12 or 13.

Belt Drive Blowers

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

2- Remove and retain screws on either side of sliding base. Pull base toward outside of unit.

3- Slide base back into original position when finished servicing. Replace the clamp and blower wiring in the previous location on the blower motor base. Re-install screws on blower sliding base.

Direct Drive Blowers

1- Loosen the reusable wire tie which secures the controls and high voltage blower wiring to the blower housing.

2- Remove and retain screws in front and on either side of blower housing. Pull frame toward outside of unit.

3- Slide frame back into original position when finished servicing. Reattach the blower wiring in the previous location on the blower motor base using the wire tie.

4- Replace retained screws in front and on either side of the blower housing.

Determining Unit CFM

IMPORTANT - Belt-driven supply air inverter units are factory-set to run the blower at full speed when there is a blower (G) demand without a heating or cooling demand. Use the following procedure to adjust motor pulley to deliver the full load cooling or heating CFM. See Belt-Driven Supply Air Inverter Start-Up section to set blower CFM for all modes once the motor pulley is set.

IMPORTANT - Direct drive variable blower unit CFM is determined by the Fan Control board. Refer to the Direct Drive Variable Speed Start-Up section.

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

2- With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in figure 11.

Note - Static pressure readings can vary if not taken where shown.

3- Refer to blower tables in BLOWER DATA (table of contents) in the front of this manual. Use static pressure and RPM readings to determine unit air volume.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 11. Do not exceed minimum and maximum number of pulley turns as shown in table 4. See table 5 for manufacturer's drive numbers.

TABLE 4
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

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

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

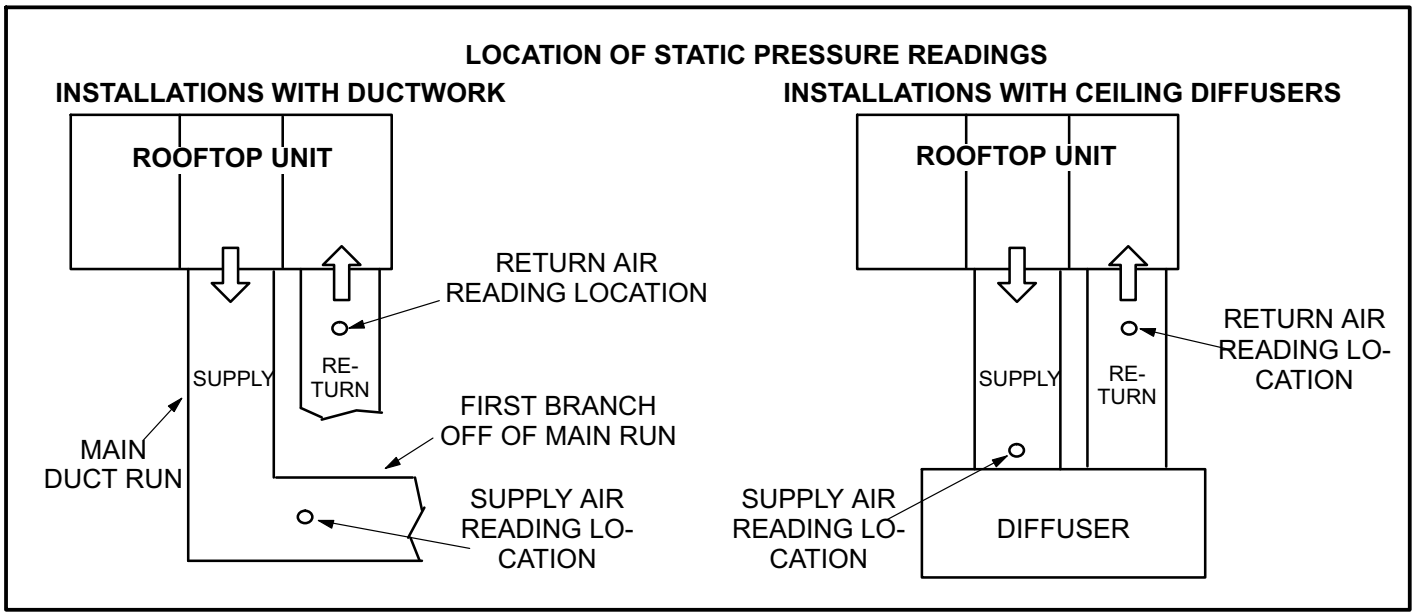


FIGURE 11

BLOWER ASSEMBLY

TO INCREASE BELT TENSION

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

2-Turn adjusting bolt to the right, or clockwise, to move the motor outward and tighten the belt.

3-Tighten two bolts on motor pulley side.

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

4-Tighten two bolts on other side of base.

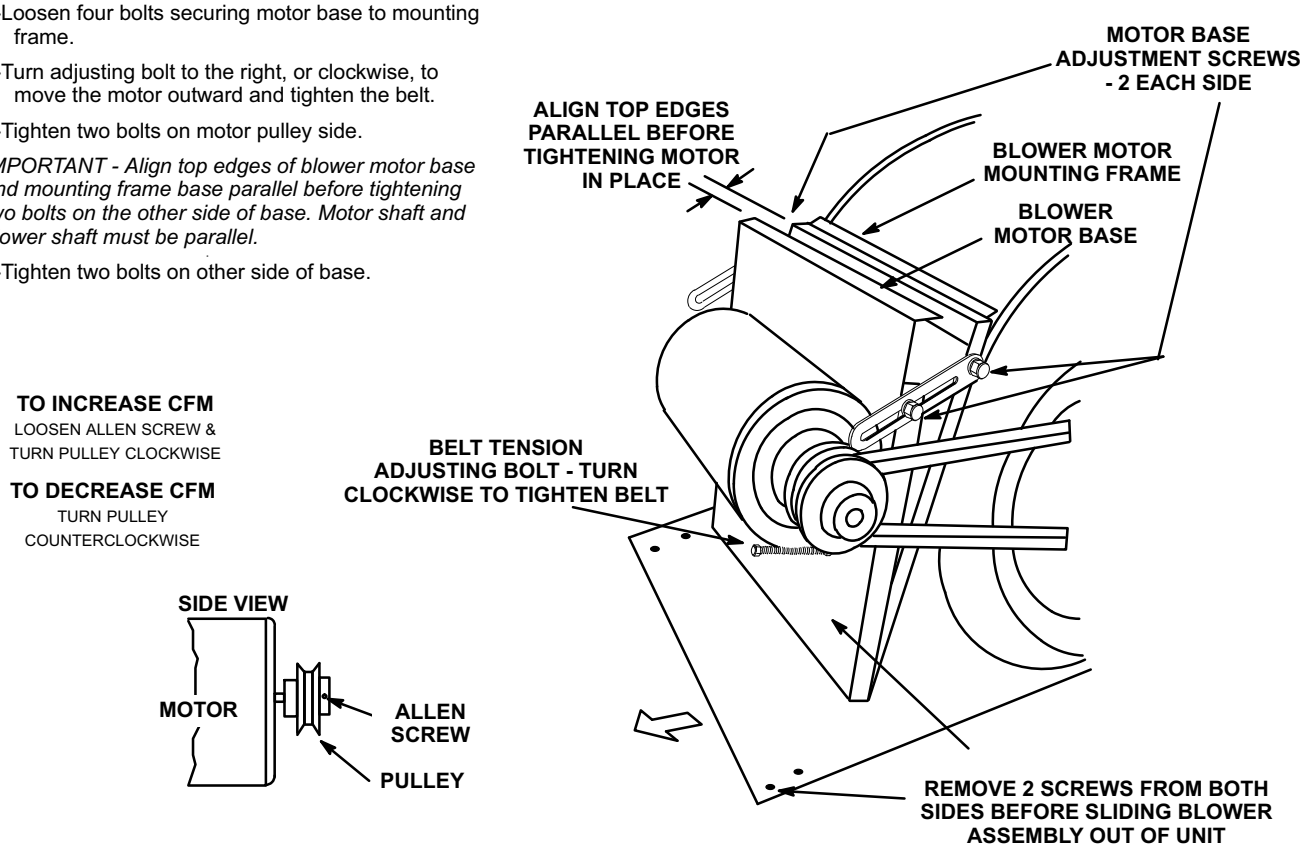


FIGURE 12

DIRECT DRIVE BLOWER ASSEMBLY

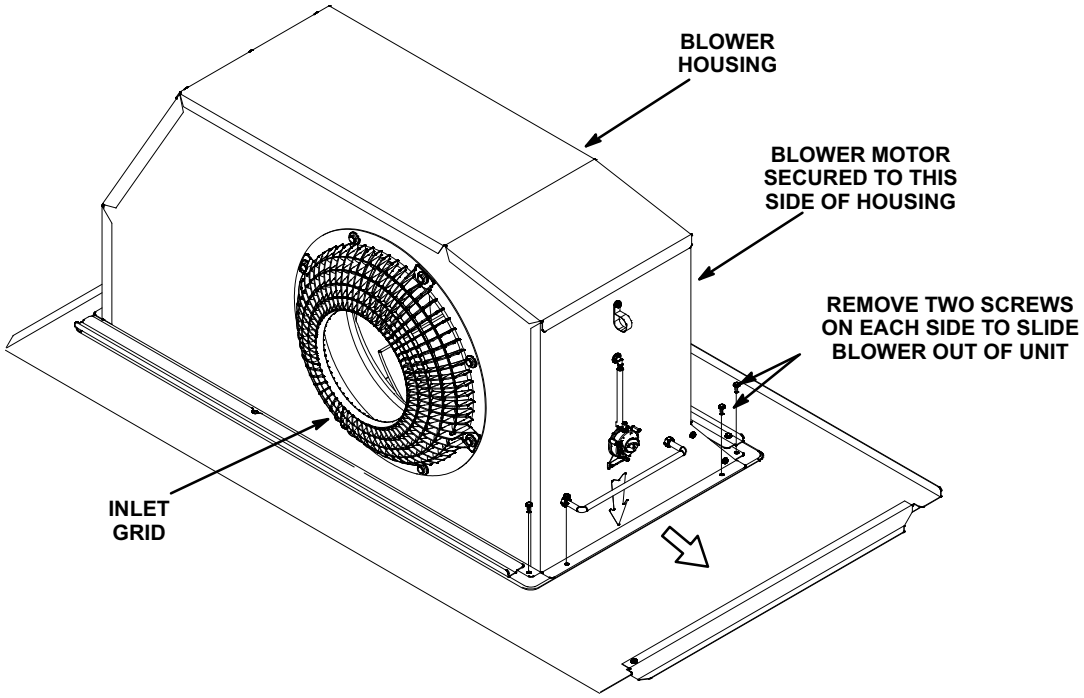


FIGURE 13

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 14.

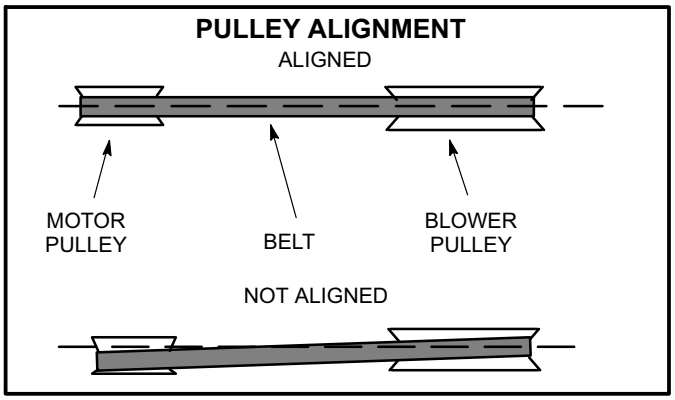


FIGURE 14

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

2- *To increase belt tension -*
Turn adjusting bolt to the right, or clockwise, to move the motor outward and tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -
Turn the adjusting bolt to the left, or counterclockwise to loosen belt tension.

3- Tighten two bolts on motor pulley side.

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

4- Tighten two bolts on other side of base.

Check Belt Tension

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

1- Measure span length X. See figure 15.

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

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

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

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

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

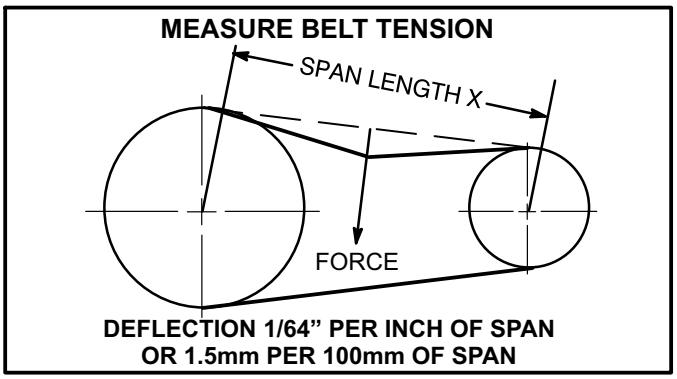


FIGURE 15

TABLE 5
MANUFACTURER'S NUMBERS

DRIVE NO.	DRIVE COMPONENTS					
	ADJUSTABLE SHEAVE		FIXED SHEAVE		BELT	
	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.
1	1VP34x7/8	31K6901	AK61x1	100244-20	AX54	100245-25
2	1VP40x7/8	79J0301	AK59x1	31K6801	AX55	100245-26
3	1VP34x7/8	31K6901	AK46x1	100244-17	AX52	100245-33
4	1VP44x7/8	53J9601	AK74x1	100244-21	AX58	100245-34
5	1VP50x7/8	98J0001	AK69x1	37L4701	AX58	100245-34
6	1VP50x7/8	98J0001	AK64x1	12L2501	AX57	100245-28
10	1VP50x1-1/8	P-8-1977	BK77x1	49K4001	BX59	59A5001
11	1VP50x1-1/8	P-8-1977	BK67x1	100244-24	BX57	78L5301
12	1VP50x1-1/8	P-8-1977	BK62x1	100244-23	BX56	100245-11

D-Gas Heat Components

KDB092/122 units are available in 130,000 BTUH (38.1 kW), 180,000 BTUH (52.7 Kw) or 240,000 BTUH (70.3 kW) heat sizes.

1-Heat Exchanger Figure 16

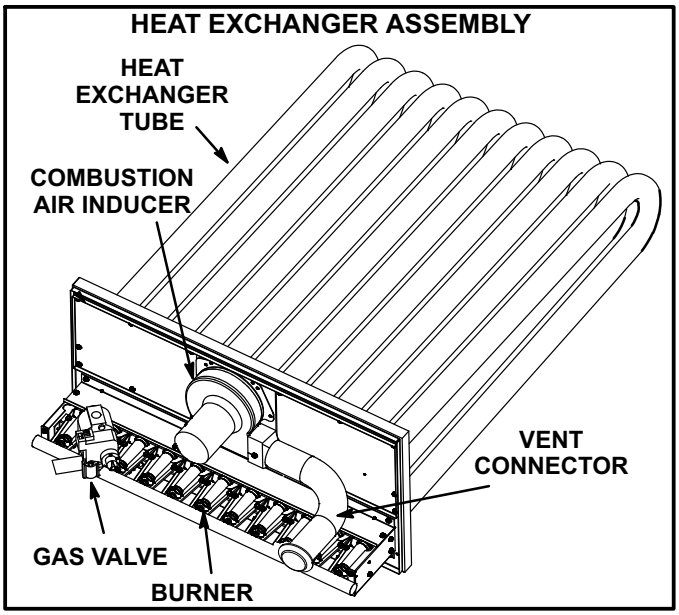


FIGURE 16

KDB units use stainless steel steel inshot burners with tubular stainless steel heat exchangers and two-stage redundant gas valves. KDB092/122 units use one eleven tube/burner for high heat, one eight tube/burner for medium heat and one six tube/burner for standard heat. Burners in all units use a burner venturi to mix gas and air for proper combustion. Combustion takes place at each tube entrance. As hot combustion gases are drawn upward through each tube by the combustion air inducer, exhaust gases are drawn out the top and fresh air/gas mixture is drawn in at the bottom. Heat is transferred to the air stream from all surfaces of the heat exchanger tubes. The supply air blower forces air across the tubes to extract the heat of combustion. The shape of the tubes ensures maximum heat exchange.

The gas valves accomplish staging by allowing more or less gas to the burners as called for by heating demand.

2-Gas Heat Exchanger Inserts - Direct Drive Only - 122 Units (Figure 18)

Inserts are installed on standard (130,000Btuh) and high (240,000Btuh) heat exchangers. Medium heat exchangers do not require inserts. See figure 17.

Inserts are used to maintain even temperature distribution through the heat exchanger. Temperature distribution can vary depending on supply air flow, number of heat exchanger tubes, and the blower deck opening.

3-Burner Box Assembly (Figure 18)

The burner assembly consists of a spark electrode, flame sensing electrode and gas valve. Ignition board A3 controls all functions of the assembly.

Burners

All units use inshot burners. Burners are factory set and do not require adjustment. A peep hole with cover is furnished in the heating access panel for flame viewing. Always operate the unit with the access panel in place.

Burners can be removed individually for service. Burner maintenance and service is detailed in the SERVICE CHECKS section of this manual.

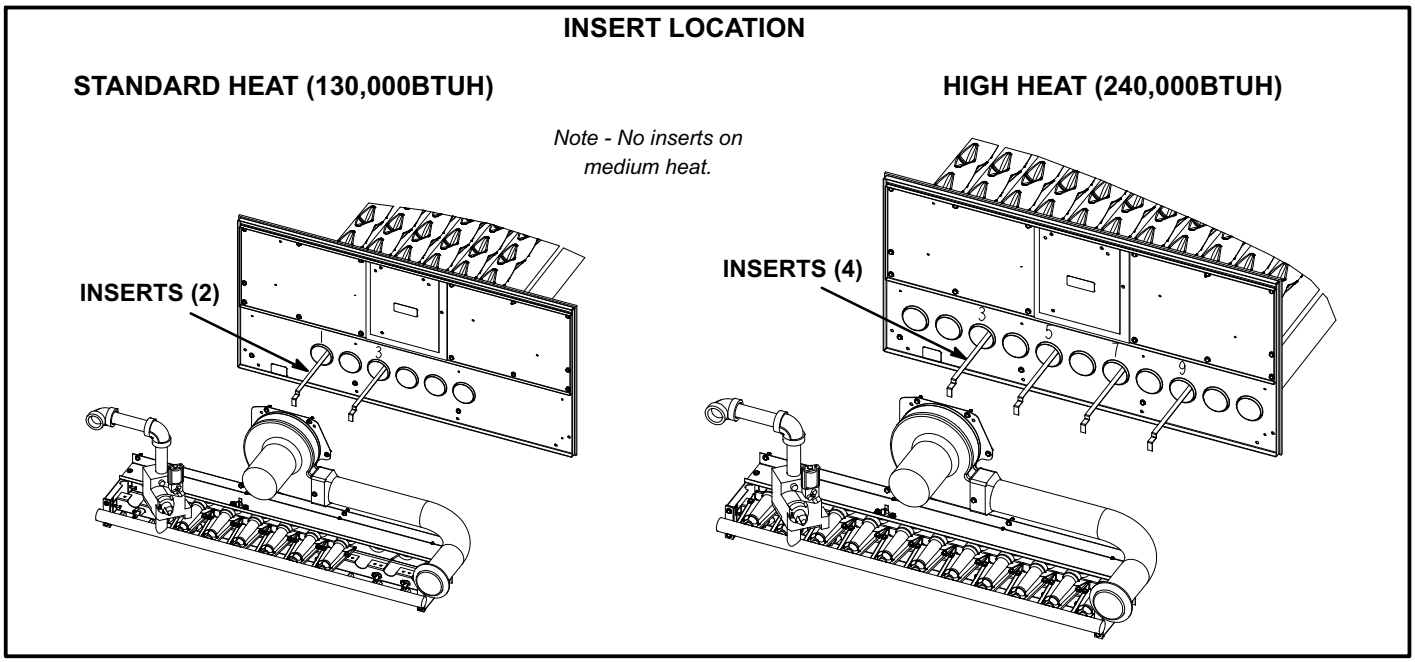


FIGURE 17

Orifice

Each burner uses an orifice which is matched to the burner input. The orifice is threaded into the burner manifold. The burner is supported by the orifice and will easily slide off for service once the mounting screws are removed from the burners. Each orifice and burner are sized specifically to the unit.

NOTE-Do not use thread sealing compound on the orifices. Using thread sealing compound may plug the orifices.

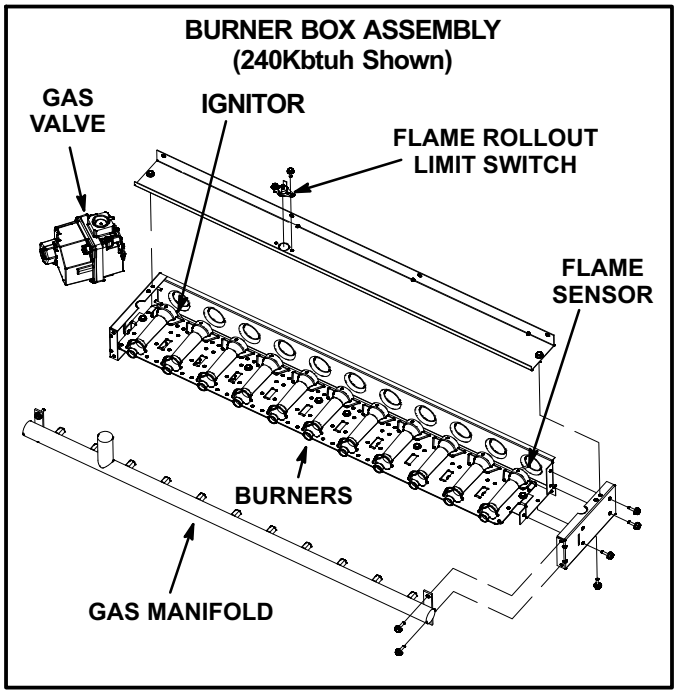


FIGURE 18

4-Primary High Temperature Limit S10

S10 is a SPST N.C. high temperature primary limit for gas heat in KDB092/102 units. On KDB122 S10 is located on the blower. See figure 19.

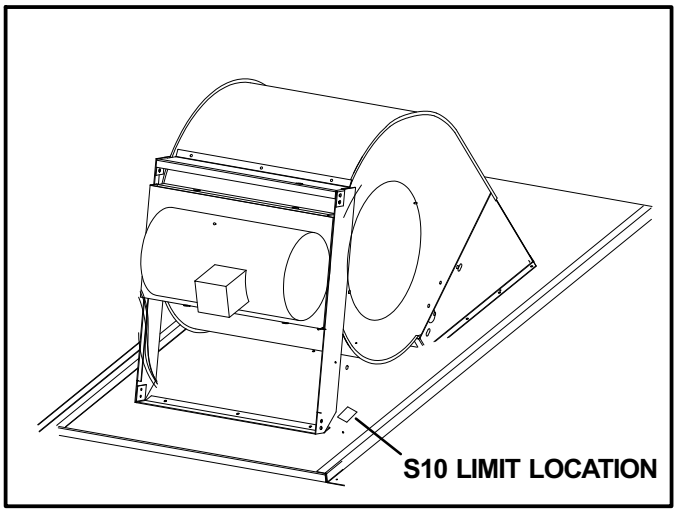


FIGURE 19

Primary limit S10 is wired to the ignition control A3. Its N.C. contacts open to de-energize the ignition control when excessive temperature is reached in the blower compartment. If the limit trips the blower relay coil K3 will be energized by ignition control A3. Three limits with different actuating temperatures are used for limits S10.

5-Flame Roll-out Limit Switch S47

Flame roll-out limit switch S47 is a SPST N.C. high temperature limit located just above the burner air intake opening in the burner enclosures (see figure 18). S47 is wired to the ignition control A3. When S47 senses flame roll-out (indicating a blockage in the combustion air passages), the flame roll-out limit trips and the ignition control immediately closes the gas valve.

Limit S47 is factory preset to open at 290°F ± 12°F (143°C ± 6.7°C) on a temperature rise on all units. All flame roll-out limits are manual reset.

6-Combustion Air Prove Switch S18

Prove switch S18 is a SPST N.O. switch located to the right of the induced draft assembly. S18 monitors combustion air inducer operation. Switch S18 is wired to the ignition control A3. The switch closes on a *negative* pressure fall. This negative pressure fall and switch actuation allows the ignition sequence to continue (proves, by closing, that the combustion air inducer is operating before allowing the gas valve to open.) The combustion air prove switch is factory set and not adjustable. The switch will automatically open on a pressure rise (less negative pressure). Table 6 shows prove switch settings.

TABLE 6
S18 Prove Switch Settings

Close“ w.c. (Pa)	Open “ w.c. (Pa)
0.25 ± 5 (62.3 ± 12.4)	0.10 ± 5 (24.8 ± 12.4)

7-Combustion Air Inducer B6

Combustion air inducers on KDB092/122 units provide air to the corresponding burners while clearing the combustion chamber of exhaust gases. The inducer begins operating immediately upon receiving a thermostat demand and is de-energized when thermostat demand is satisfied.

The inducer uses a 208/230V single-phase PSC motor and a 4.81in. x 1.25in. (122mm x 32mm) blower wheel. All motors operate at 3200RPM and are equipped with auto-reset overload protection. Inducers are supplied by various manufacturers. Ratings may vary by manufacturer. Specific inducer electrical ratings can be found on the unit rating plate.

On a heating demand (W1), the ignition control A3 initiates the heating cycle. A3 then allows 30 to seconds for the combustion air inducer to vent exhaust gases from the burners. When the combustion air inducer is purging the exhaust gases, the combustion air prove switch closes, proving that the combustion air inducer is operating before allowing the ignition sequence to continue. When the combustion air prove switch is closed and the delay is over, the

ignition control activates the first stage operator of the gas valve (low fire), the spark and the flame sensing electrode. Sparking stops immediately after flame is sensed or at the end of the eight second trial for ignition.

All combustion air inducer motors are sealed and cannot be oiled. The inducer cannot be adjusted but can be disassembled for cleaning.

8-Combustion Air Motor Capacitor C3

The combustion air inducer motors in all KDB units require run capacitors. Capacitor C3 is connected to combustion air inducer B6. Ratings will be on side of capacitor or combustion air motor nameplate.

9-Gas Valves GV1

Gas valve GV1 is a two-stage redundant valve. Units are equipped with valves manufactured by White-Rodgers or Honeywell. On a call for first stage heat (low fire), the valve is energized by the ignition control simultaneously with the spark electrode. On a call for second stage heat (high fire), the second stage operator is energized directly from A3. A manual shut-off knob is provided on the valve for shut-off. Manual shut-off knob immediately closes both stages without delay. On both valves first stage (low fire) is quick opening (on and off in less than 3 seconds).

On the White-Rodgers valve second stage is slow opening (on to high fire pressure in 40 seconds and off to low fire pressure in 30 seconds). The White-Rodgers valve is adjustable for high fire only. Low fire is not adjustable. On the Honeywell valve second stage is quick opening. The Honeywell valve is adjustable for both low fire and high fire. Figures 25 and 26 show gas valve components. Table 7 shows factory gas valve regulation for KDB series units.

TABLE 7

GAS VALVE REGULATION				
Max. Inlet Pressure	Operating Manifold Pressure			
13.0" W.C.	Natural		L.P.	
	Low	High	Low	High
	1.6 ± 0.2" W.C.	3.7 ± 0.3" W.C.	6.5" ± 0.3" W.C	10.5" ± 0.5" W.C.

10-Spark Electrode Figure 20

An electrode assembly is used for ignition spark. The electrode is mounted through holes under the left most burner location. The electrode tip protrudes into the flame envelope of the adjacent burner. The electrode assembly is fastened to burner supports and can be removed for service without removing any part of the burners.

During ignition, spark travels through the spark electrode (figure 20) and ignites the left burner. Flame travels from burner to burner until all are lit.

The spark electrode is connected to the ignition control by a 8 mm silicone-insulated stranded high voltage wire. The wire uses 1/4" (6.35 mm)female quick connect on both ends of the wire.

NOTE - If electrode wire is replaced, wire and suppression must be same type cable.

The spark electrode assembly can be removed for inspection by removing the screw securing the electrode assembly and sliding it out of unit.

For proper unit operation, electrodes must be positioned and gapped correctly.

Spark gap may be checked with appropriately sized twist drills or feeler gauges. Disconnect power to the unit and remove electrode assembly. The gap should be between 0.125" ± 0.015" (3.2 mm ± .4 mm). See figure 20.

NOTE-IN ORDER TO MAXIMIZE SPARK ENERGY TO ELECTRODE, HIGH VOLTAGE WIRE SHOULD TOUCH UNIT CABINET AS LITTLE AS POSSIBLE.

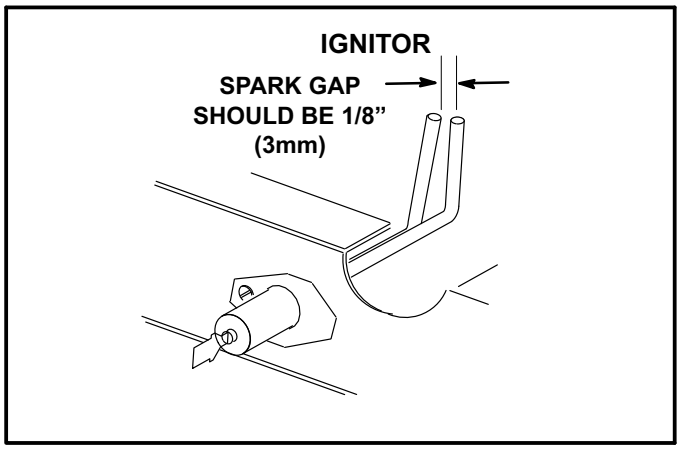


FIGURE 20

11-Flame Sensor Figure 21

A flame sensor is located under the right most side burner. The sensor is mounted through a hole in the burner support and the tip protrudes into the flame envelope of the right most burner. The sensor assembly is fastened to burner supports and can be removed for service without removing any part of the burners.

When flame is sensed by the flame sensor (indicated by microamp signal through the flame) sparking stops immediately or after the eight second trial for ignition. During operation, flame is sensed by current passed along the ground electrode (located on the spark electrode), through the flame and into the sensing electrode. The ignition control allows the gas valve to stay open as long as a flame signal (current passed through the flame) is sensed.

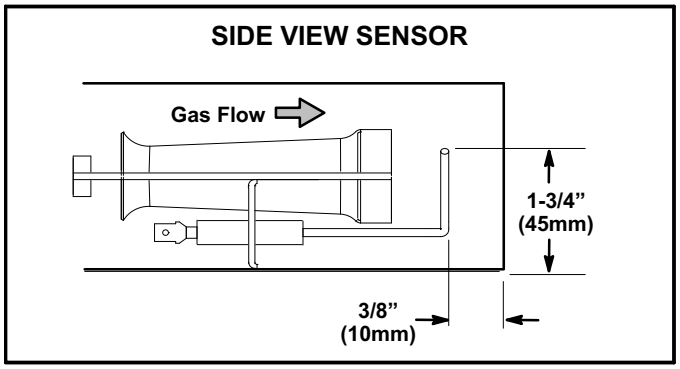


FIGURE 21

12-Burner Control A3

⚠WARNING

Shock hazard. Spark related components contain high voltage which can cause personal injury or death. Disconnect power before servicing. Control is not field repairable. Unsafe operation will result. If control is inoperable, simply replace the entire control.

The burner control A3 is located in the gas heat section. See figures 23 and 22.

The ignition control provides four main functions: gas valve control, blower control, ignition and flame sensing. The control has a green LED to show control status (table 8). The unit will usually ignite on the first trial and A3 allows three trials for ignition before locking out. The lockout time is 1 hour . After lockout, the ignition control automatically resets and provides three more attempts at ignition. Manual reset after lockout requires removing power from the control for more than 1 second or removing the thermostat call for heat for more than 1 second but no more than 20 seconds. 24 volt thermostat connections (P2) and heating component connections (J1) are made through separate jack/plugs. See table 9 for thermostat terminations and table 10 for heating component terminations.

TABLE 8

LED	STATUS
Slow Flash	Normal operation. No call for heat.
Fast Flash	Normal operation. Call for heat.
Steady Off	Internal Control Fault, No Power To Board or Gas Valve Relay Fault
Steady On	Control Internal Failure.
2 Flashes	Lockout. Failed to detect or sustain flame.
3 Flashes	Rollout switch open / Prove switch open or closed.
4 Flashes	Primary High Limit switch open.
5 Flashes	Flame sensed but gas valve not open.
6 Flashes	On Board Microprocessors Disagree

TABLE 9

P2 TERMINAL DESIGNATIONS	
Pin #	**Function**
1	**R** 24 Volts to thermostat
2	**W1** Heat Demand
3	**Y** Cool Demand
4	**C** Common
5	**G** Indoor Blower
6	**BL OUT** Indoor Blower Relay
7	**W2** Second Stage Heat

TABLE 10

J1 TERMINAL DESIGNATIONS	
Pin #	Function
1	Limit Switch Out
2	Rollout Switch / Prove Switch Out
3	Gas Valve Common
4	Gas Valve Out
5	Rollout Switch / Prove Switch In
6	Limit Switch In

IGNITION CONTROL A3

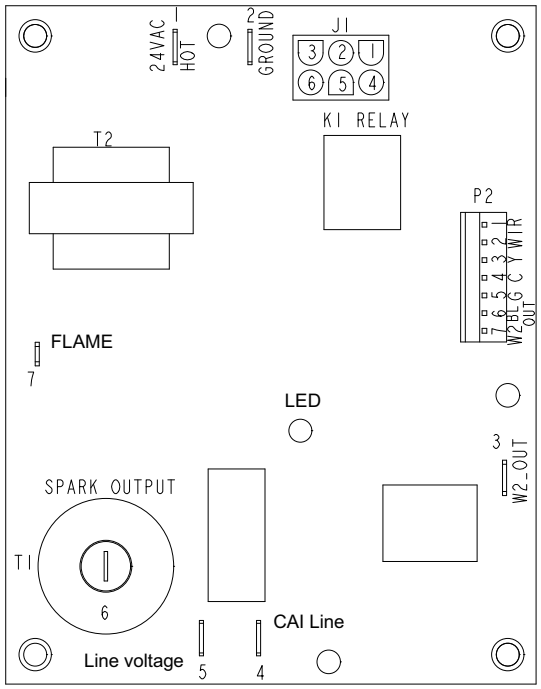


FIGURE 22

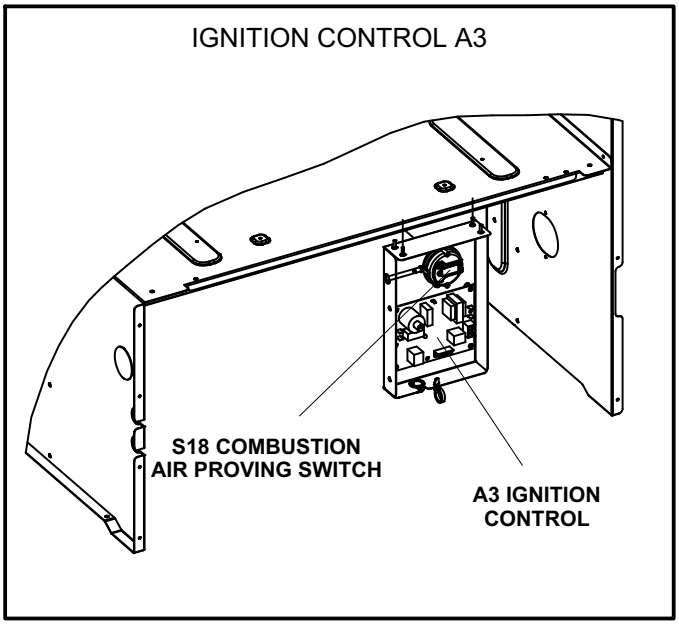


FIGURE 23

Flame rectification sensing is used on all KDB units. Loss of flame during a heating cycle is indicated by an absence of flame signal (0 microamps). If this happens, the control will immediately restart the ignition sequence and then lock out if ignition is not gained after the third trial. See System Service Checks section for flame current measurement.

The control shuts off gas flow immediately in the event of a power failure. Upon restoration of gas and power, the control will restart the ignition sequence and continue until flame is established or system locks out.

Operation

On a heating demand, the ignition control checks for a closed limit switch and open combustion air prove switch. Once this check is complete and conditions are correct, the ignition control then allows 30 seconds for the combustion air inducer to vent exhaust gases from the burners. When the combustion air inducer is purging the exhaust gases, the combustion air prove switch closes proving that the combustion air inducer is operating before allowing the ignition control to energize. When the combustion air prove switch is closed and the delay is over, the ignition control activates the gas valve, the spark electrode and the flame sensing electrode. Once the gas valve is energized the non-adjustable 40 second indoor blower delay period begins. Sparking stops immediately after flame is sensed or at the end of the 8 second trial for ignition.

The control then proceeds to “steady state” mode where all inputs are monitored to ensure the limit switch, rollout switch and prove switch are closed as well as flame is present. When the heat call is satisfied and the gas valve is de-energized, a combustion air inducer post purge period of 5 seconds begins along with a 120 second blower off delay.

13-Balance Point Thermostat A19

When outdoor air temperature is above setpoint (35°F+5°F default), the unit will operate in heat pump mode. When outdoor air temperature falls below setpoint, the unit will operate in gas heat mode. See figure 24. The thermostat is located in the heat section next to the combustion air inducer.

Note - Only stage one is used; stage 2 is not used.

Although the recommended balance point setpoint is 35°F, the setpoint can be adjusted. Weigh the comfort / cost benefit when increasing the setpoint.

Use the thermostat LCD display and SET and arrow buttons to adjust balance point thermostat as follows:

1- F/C - Press SET button and use arrow keys to select C (Celsius) or F (Fahrenheit). Press SET to confirm.

2- S1 - Push SET button to adjust the changeover setpoint. “S1” will blink on the display. Use arrow keys to change setpoint. Press SET to confirm. Factory default is 35°F.

Note - The setpoint is adjustable between 1-55°F.

3- DIF 1 - Push SET button to adjust the differential range. “DIF 1” will blink on the display. Use arrow keys to change the differential range. Press SET to confirm. Factory default is 5°F.

4- C1/H1 - Push SET button and arrow keys to select Cooling (C1) mode. C1 will apply the setpoint differential above the setpoint. Press SET to confirm.

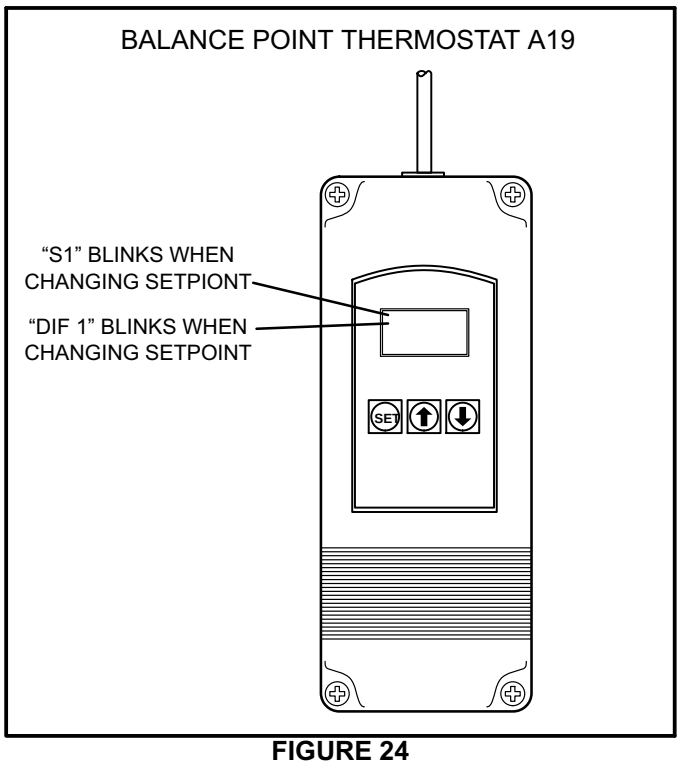


FIGURE 24

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 (LARMF).

III-START UP - OPERATION

Refer to start-up 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-Heat Pump Start Up

Note - The outdoor air ambient temperature must be above the outdoor air thermostat (A19) setpoint (35°F default) to enable heat pump operation. The thermostat is located next to the combustion air inducer in the gas heat section.

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

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

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

2- An increased heating demand (W2) will energize high gas heat and de-energize heat pump operation. Low gas heat is energized during the defrost mode.

C-Gas Heating Start Up

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠WARNING

Electric shock hazard. Can cause injury or death. Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control which has been under water.

⚠WARNING

Danger of explosion. Can cause injury or product or property damage. If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

⚠WARNING

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

⚠WARNING

SMOKE POTENTIAL

The heat exchanger in this unit could be a source of smoke on initial firing. Take precautions with respect to building occupants and property. Vent initial supply air outside when possible.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

⚠WARNING

Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

This unit is equipped with an automatic spark ignition system. There is no pilot. In case of a safety shutdown, move thermostat switch to **OFF** and return the thermostat switch to **HEAT** to reset ignition control.

Placing Unit In Operation

⚠WARNING

Danger of explosion and fire. Can cause injury or product or property damage. You must follow these instructions exactly.

Gas Valve Operation for Honeywell VR8205Q/VR8305Q and White Rodgers 36H54 (figure 25 and 26)

1- Set outdoor thermostat setpoint above the outdoor ambient temperature to disable heat pump operation.

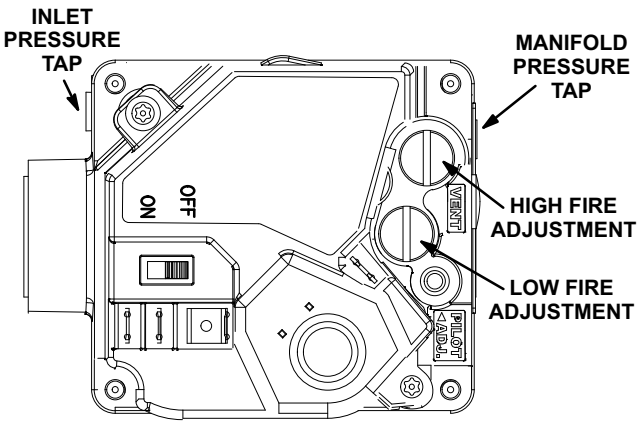


FIGURE 25

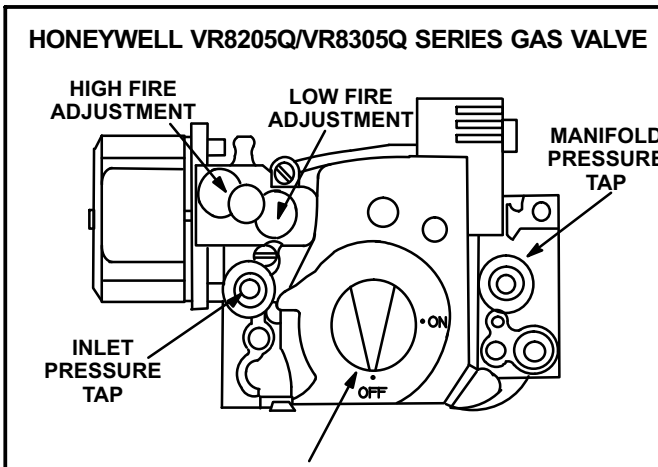


FIGURE 26

2- Set thermostat to lowest setting.

3- Turn off all electrical power to appliance.

4- This appliance is equipped with an ignition device which automatically lights the burner. Do **not** try to light the burner by hand.

5- Open or remove the heat section access panel.

6- Turn gas valve switch to **OFF**. See figure 25. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise ↷ to **"OFF"**. Do not force. See figure 26.

7- Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas, go to the next step.

8- Turn gas valve switch to **ON**. See figure 25. On Honeywell VR8305Q gas valves, turn the knob on the gas valve counterclockwise ↶ to **"ON"**. Do not force. See figure 26.

9- Close or replace the heat section access panel.

10- Turn on all electrical power to appliance.

11- Set thermostat to desired setting.

12- The ignition sequence will start.

13- If the appliance does not light the first time (gas line not fully purged), it will attempt up to two more ignitions before locking out.

14- If lockout occurs, repeat steps 1 through 10.

15- If the appliance will not operate, follow the instructions "Turning Off Gas to Appliance" and call your service technician or gas supplier.

Turning Off Gas to Unit

1- If using an electromechanical thermostat, set to the lowest setting.

2- Before performing any service, turn off all electrical power to the appliance.

3- Open or remove the heat section access panel.

4- Turn gas valve switch to **OFF**. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise ↷ to **"OFF"**. Do not force.

5- Close or replace the heat section access panel.

⚠WARNING

Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

D-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 first-stage Y1 cooling demand will energize L1 and L2 reversing valve solenoids and compressor 1. An increased cooling demand Y2 will initiate compressor 2.

Units With Optional Economizer -
The optional economizer will start on a first stage (Y1) cooling demand when outdoor air enthalpy is suitable. An increased cooling demand (Y2) with the economizer open will energize 1 compressor only.

2- A first-stage Y1 cooling demand will energize all fans in low speed. An increased Y2 cooling demand will energize all fans in high speed

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

3- Units contain two refrigerant circuits or systems. See figure 27 or 28.

Three Phase Scroll Compressor Voltage Phasing

Three phase power supplied to the unit disconnect switch must be phased sequentially to ensure the scroll compressor and indoor blower rotate in the correct direction. 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 K2 contactor or disconnect switch if installed. Do not reverse wires at blower contactor.

5- Make sure the connections are tight.

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

E-Safety or Emergency Shutdown

Turn off power to the unit. Close manual and main gas valves.

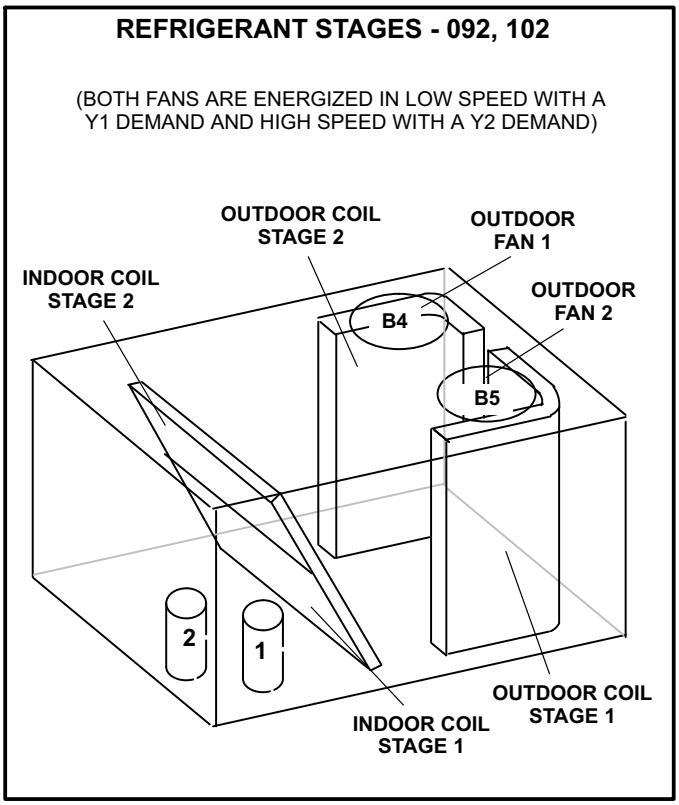


FIGURE 27

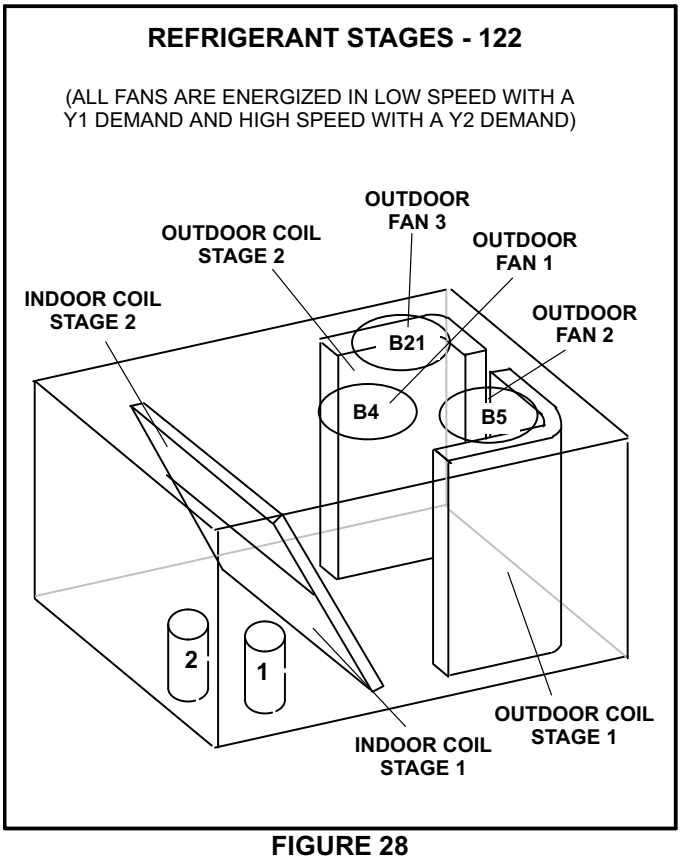


FIGURE 28

IV- SYSTEMS SERVICE CHECKS

⚠ WARNING

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

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

A-Charging

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, *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 with economizer disabled 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 11 through 13 to determine normal operating pressures. Pressures are listed for sea level applications at 60°F dry bulb and 67°F wet bulb return air.

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

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

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

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

B-Charging - Approach Method - AHRI Testing

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

Approach Temperature = Liquid temperature (at condenser outlet) minus ambient temperature.

2- Approach temperature should match values in table 14. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

3- The approach method is not valid for grossly over or undercharged systems. Use tables 11 through 13 as a guide for typical operating pressures.

TABLE 11
KDB092H NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Disch. ±10 psig	Suction ±5 psig	Disch. ±10 psig	Suction ±5 psig
65º F	250	140	257	142
75º F	287	143	295	145
85º F	329	146	336	147
95º F	371	148	382	150
105º F	423	151	435	153
115º F	472	154	486	156

TABLE 12
KDB102H NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Disch. ±10 psig	Suction ±5 psig	Disch. ±10 psig	Suction ±5 psig
65º F	257	136	261	139
75º F	296	139	298	142
85º F	335	141	339	144
95º F	384	144	390	147
105º F	431	147	441	149
115º F	485	150	495	152

TABLE 13
KDB122H NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis-charge ±10 psig	Suction ±5 psig	Dis-charge ±10 psig	Suction ±5 psig
65º F	248	131	251	134
75º F	284	134	287	136
85º F	322	136	329	139
95º F	371	139	381	142
105º F	416	142	429	144
115º F	470	145	488	148

TABLE 14
APPROACH TEMPERATURE

Unit	Liquid Temp. Minus Ambient Temp.	
	1st Stage	2nd Stage
092H, 102H	8°F ± 1 (4.4°C ± 0.5)	9°F ± 1 (5.0°C ± 0.5)
122H	6°F ± 1 (3.3°C ± 0.5)	6°F ± 1 (3.3°C ± 0.5)

C-Heating System Service Checks

All KDB units are ETL/CSA design certified without modification.

Before checking piping, check with gas company or authorities having jurisdiction for local code requirements. Refer to the KDB Installation instruction for more information.

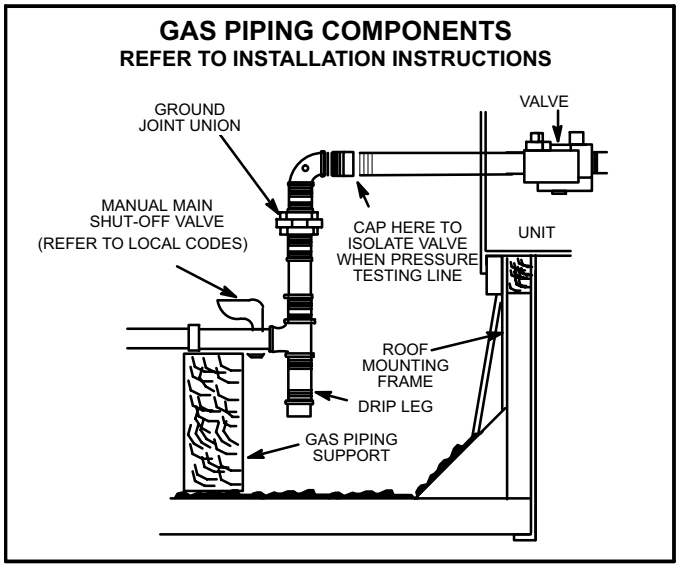


FIGURE 29

1-Gas Piping

Gas supply piping must not allow more than 0.5"W.C. (124.3 Pa) drop in pressure between the gas meter and the unit. Supply gas pipe must not be smaller than the unit gas connection. Refer to installation instructions for details.

2-Testing Gas Piping

NOTE-In case emergency shutdown is required, turn off the main manual shut-off valve and disconnect the main power to the unit. These controls should be properly labeled by the installer.

When pressure testing gas lines, the gas valve must be disconnected and isolated. **Gas valves can be damaged if subjected to more than 0.5 psig [14"W.C. (3481 Pa)]**. See figure 29.

When checking piping connection for gas leaks, use the preferred means. Common kitchen detergents can cause harmful corrosion on various metals used in gas piping. The use of specialty Gas Leak Detector is strongly recommended. See CORP 8411-L10, for further details.

Do not use matches, candles, flame or any other source of ignition to check for gas leaks.

3-Testing Gas Supply Pressure

When testing gas supply pressure, connect test gauge to the inlet pressure tap located on unit gas valve GV1. Test supply gas pressure with unit firing at maximum rate (both stages energized). Make sure the reading falls within the range of the following values. Low pressure may result in erratic operation or "underfire." High pressure can result in permanent damage to the gas valve or "overfire." For natural gas units, operating pressure at the unit gas connection must be between 4.7"W.C. and 10.5"W.C. (1168 Pa and 2610 Pa). For L.P. gas units, operating pressure at the unit gas connection must be between 10.8"W.C. and 13.5"W.C. (2685.3 Pa and 3356.7 Pa).

On multiple unit installations, each unit should be checked separately while operating at maximum rate, beginning with the one closest to the supply gas main and progressing to the one furthest from the main. Multiple units should also be tested with and without the other units operating. Supply pressure must fall within the range listed in the previous paragraph.

4-Check and Adjust Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move test gauge to the outlet pressure tap located on unit gas valve GV1. See figure 25 or 26 for location of pressure tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. See table 15. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See figure 25 or 26 for location of gas valve (manifold pressure) adjustment screw.

All gas valves are factory regulated. The gas valve should completely and immediately cycle off in the event of gas or power failure. The manual shut-off knob can be used to immediately shut off gas supply.

⚠ CAUTION

For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

Manifold Adjustment Procedure

1- Connect test gauge to the outlet pressure tap on the gas valve. Start the unit (call for second stage heat) and allow five minutes for the unit to reach steady state.

2- While waiting for the unit to stabilize, notice the flame. The flame should be stable without flashback and should not lift from the burner heads. Natural gas should burn basically blue with some clear streaks. L.P. gas should burn mostly blue with some clear yellow streaks.

3- After allowing the unit to stabilize for five minutes, record the manifold pressure and compare to the values given in table 7.

5-High Altitude

Units may be installed at altitudes up to 2000 feet (610 m) above sea level without any modification. At altitudes above 2000 feet (610 m), units must be derated to match the gas manifold pressures shown in table 15.

NOTE - This is the only permissible derate for these units.

TABLE 15

Altitude - ft. (m)	Gas Manifold Pressure in. w.g. (kPa)	
	Natural	LP (Propane)
0 - 2000 (610)	3.7 (0.92)	10.5 (2.61)
2001 - 3000 (610 - 915)	3.6 (0.90)	10.2 (2.54)
3001 - 4000 (915 - 1220)	3.5 (0.87)	9.9 (2.46)
4001 - 5000 (1220 - 1525)	3.4 (0.85)	9.6 (2.39)
5001 - 6000 (1525 - 1830)	3.3 (0.82)	9.4 (2.34)
6001 - 7000 (1830 - 2135)	3.2 (0.80)	9.1 (2.26)
7001 - 8000 (2135 - 2440)	3.1 (0.77)	8.8 (2.19)

*Contact Technical Support for altitudes higher than 8000 ft. (2400m).

⚠ IMPORTANT

Disconnect heating demand as soon as an accurate reading has been obtained.

6-Proper Gas Flow

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in table 16. Seconds in table 16 are based on a 1 cu.ft. dial and gas value of 1000 btu's for natural and 2500 btu's for LP. Adjust manifold pressure on gas valve to match time needed.

NOTE - To obtain accurate reading, shut off all other gas appliances connected to meter.

TABLE 16

Unit in Btu's	Seconds for Natural	Seconds for Propane
130,000	28	69
180,000	20	50
240,000	15	37

7-Heat Exchanger

To Access or Remove Heat Exchanger From Unit:

1- Turn off gas and electric power.
2- Remove access panel(s) and unit center mullion.
3- Remove gas valve, manifold assembly and burners.
4- Remove combustion air inducer and flue box cover. Pay careful attention to the order in which gaskets and orifice are removed.
5- Support heat exchanger (to prevent it from falling when final screws are removed.)
6- Remove screws supporting heat exchanger.
7- To install heat exchanger, reverse procedure. Be sure to secure all wires and check plumbing and burner plate for airtight seal. Screws must be torqued to 35 in.-lbs. to ensure proper operation.

8-Flame Sensing

Flame current is an electrical current which passes from the ignition control through the sensor electrode during unit operation. The current passes from the sensor through the flame to the ground electrode (located on the flame electrode) to complete a safety circuit. The electrodes should be located so the tips are at least 1/2” (12.7 mm) inside the flame envelope. Do not bend electrodes. To measure flame current, follow the procedure on the following page:

NOTE-Electrodes are not field adjustable. Any alterations to the electrode may create a hazardous condition that can cause property or personal injury.

1- Disconnect power to unit.
2- Remove lead from sensing electrode and install a 0-50DC microamp meter in series between the sensing electrode and the sensing lead.
3- Reconnect power and adjust thermostat for heating demand.
4- When flame is established, microamp reading should be 0.5 to 1.0. Do not bend electrodes. *Drop out signal is .09 or less.*
5- Disconnect power to unit before disconnecting meter. Make sure sensor wire is securely reconnected before reconnecting power to unit.

NOTE-If the meter scale reads 0, the leads are reversed. Disconnect power and reconnect leads for proper polarity.

D-Cooling System Service Checks

KDB units are factory charged and require no further adjustment; however, charge should be checked periodically using the approach method. The approach method compares actual liquid temperature with the outdoor ambient temperature. See *Charging - Approach Method* section..

NOTE-When unit is properly charged discharge line pressures should approximate those in tables 11 through 13.

V-MAINTENANCE

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

⚠ CAUTION

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

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

⚠ WARNING

This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm.

A-Lubrication

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

B-Filters

Units are equipped with four 18 X 24 X 2" filters. Filters should be checked and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 30.

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 two formed slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs *(no more than 4 inches)* and wash them thoroughly. See figure 31. Flush coils with water following cleaning.

F-Filter Drier

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

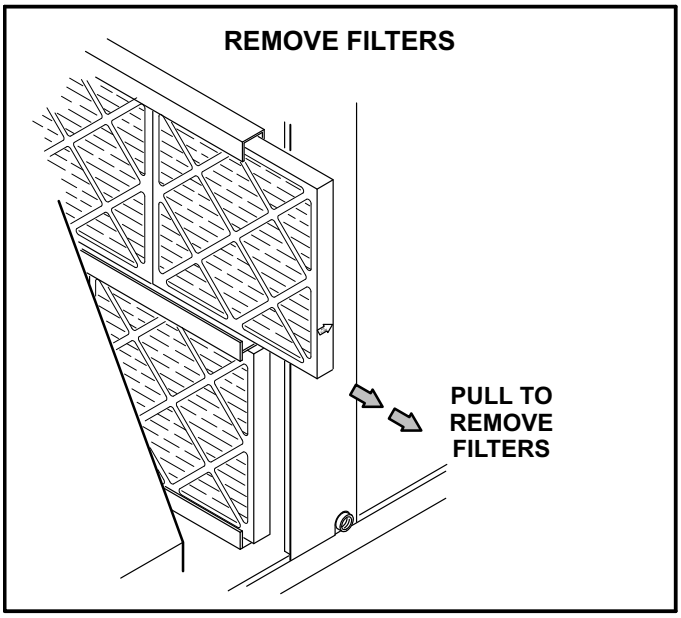
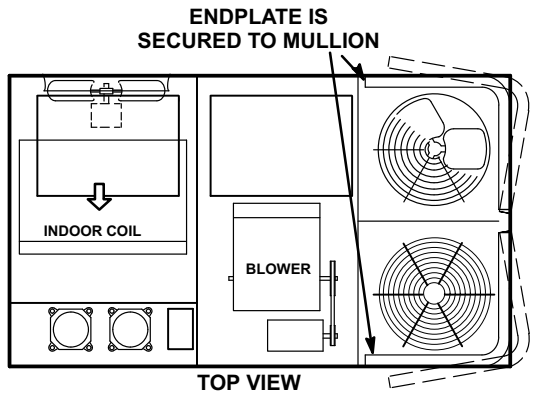


FIGURE 30

CLEAN OUTDOOR COIL



1- Remove screws securing coil end plate to mullion.

2- Remove clips connecting coils slabs and separate slabs 3-4" (76-102mm).

3- Clean coils with detergent or commercial coil cleaner.

4- Rinse thoroughly with water and reassemble.

FIGURE 31

VI-ACCESSORIES

The accessories section describes the application of most of the optional accessories which can be factory or field installed to the KDB units. OPTIONAL ACCESSORIES section (see table of contents) show specific size per unit.

A-C1CURB Mounting Frames

When installing the KDB units on a combustible surface for downflow discharge applications, the C1CURB roof mounting frame is used. The roof mounting frames are available in heights from 8 to 24 inches and are recommended in all other applications but not required. If the KDB 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 C1CURB mounting frame is shown in figure 32. 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 33. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

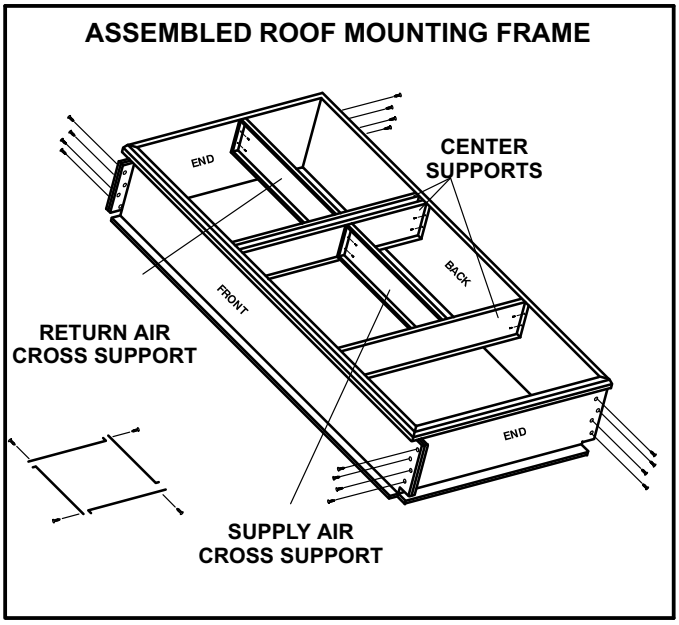


FIGURE 32

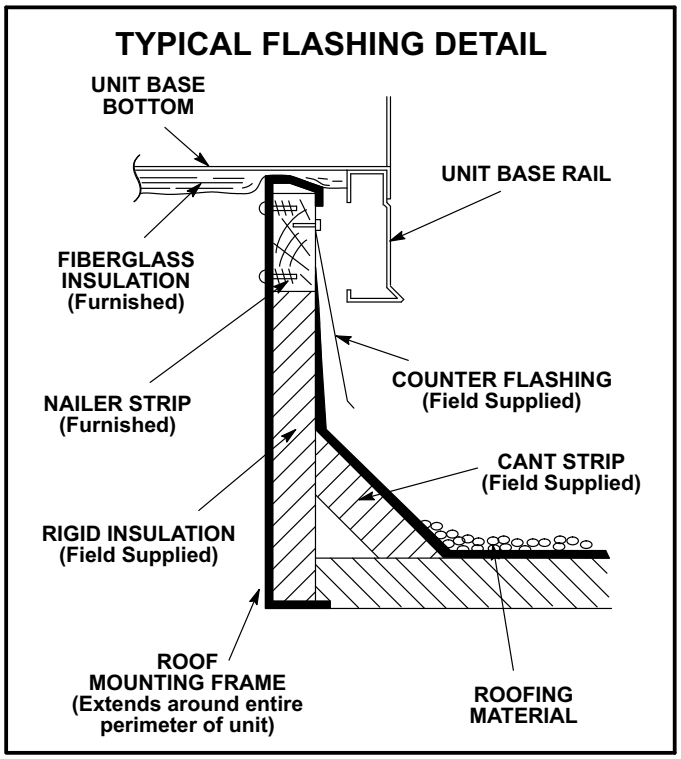


FIGURE 33

B-Transitions

Optional supply/return transition C1DIFF30B-1 is available for use with KDB 7.5-ton units. C1DIFF31B-1 is available for 8.5 and 10-ton units and C1DIFF32B-1 is available for use with KDB 12.5 ton units. All transitions are used with the appropriate C1CURB roof mounting frame. Transition must be installed in the mounting frame before installing the unit on the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

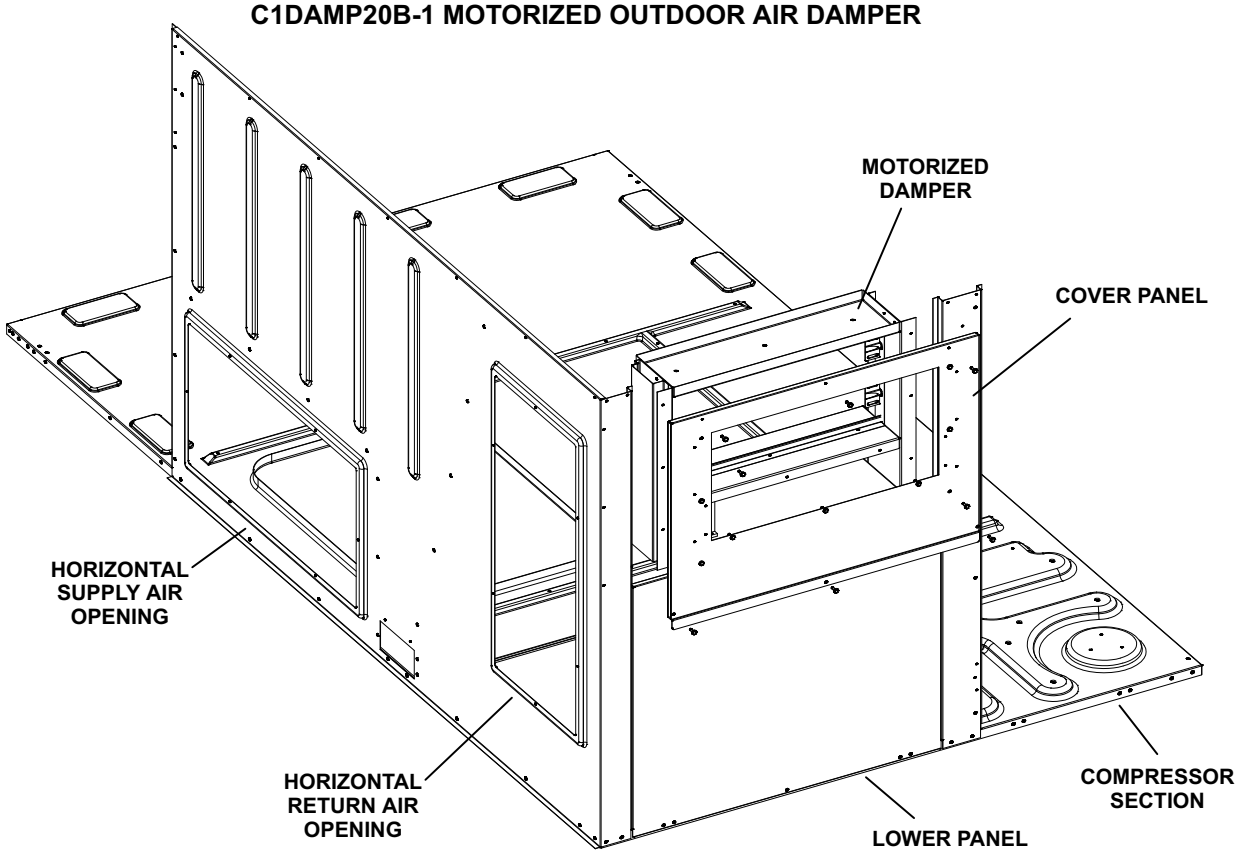
C-Supply and Return Diffusers

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

D-C1DAMP Outdoor Air Dampers Field- or Factory-Installed

Optional manual (C1DAMP10B-1) and motorized (C1DAMP20B-1) outdoor air dampers provide up to 25 percent fresh air for return. Motorized damper opens to minimum position simultaneously with the blower during the occupied period and remains closed during the unoccupied period. Manual damper assembly is manually operated; damper position is manually set at installation and remains in that position.

C1DAMP20B-1 MOTORIZED OUTDOOR AIR DAMPER



C1DAMP10B-1 MANUAL OUTDOOR AIR DAMPER

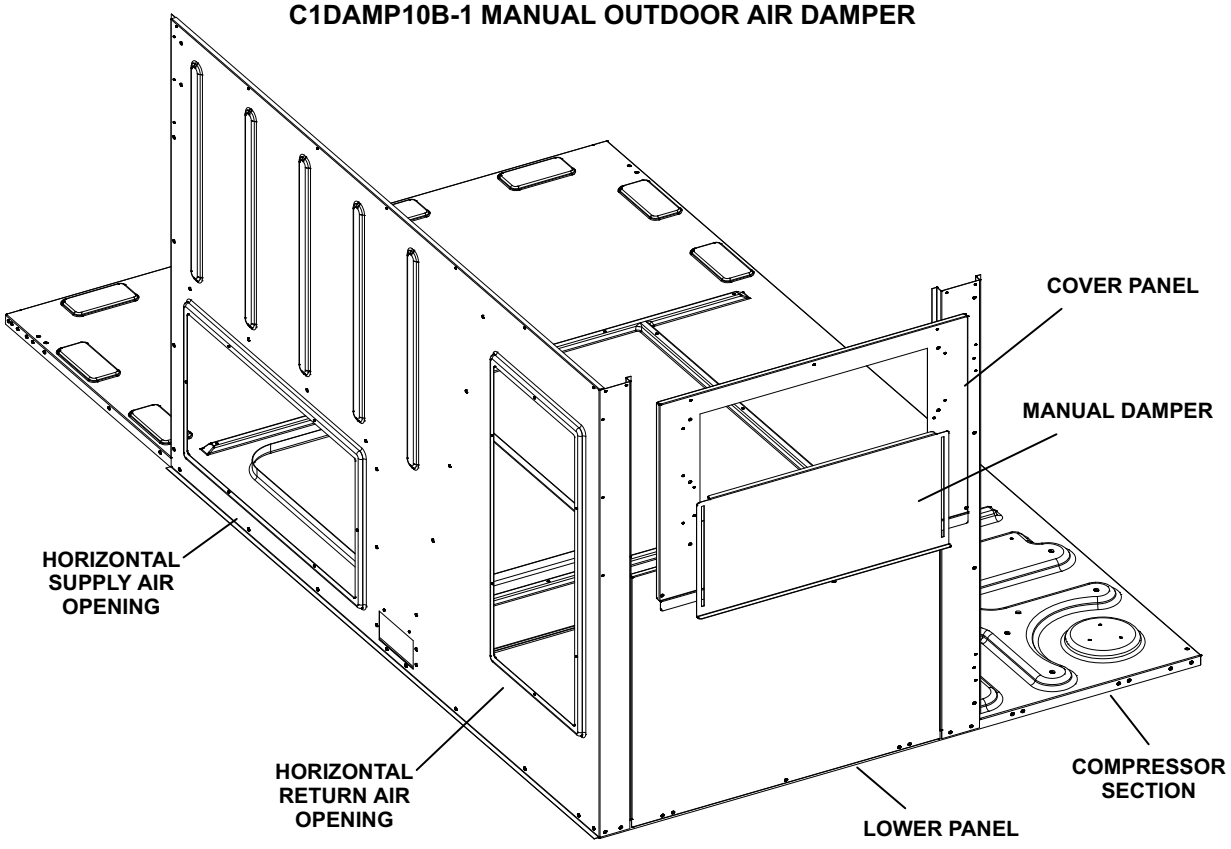


FIGURE 34

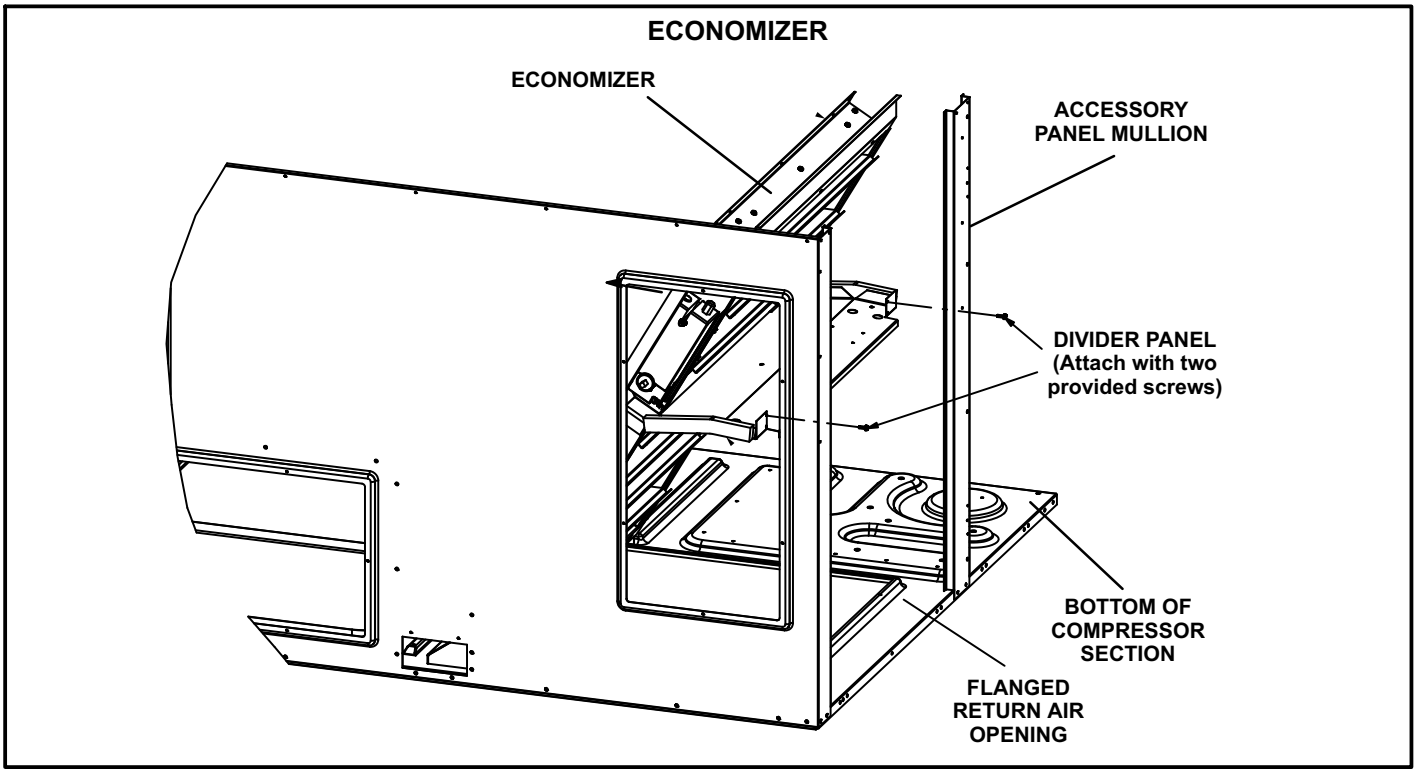


FIGURE 35

E-K1ECON20B Economizer

(Field- or Factory-Installed)

Economizers use outdoor air for free cooling when temperature and/or humidity is suitable. See figure 35.

The mixed air temperature sensor (R1) measures the supply air sensible temperature. See figure 36. The outdoor air sensible control is the default economizer control. An outdoor air single sensible sensor, S175, is also provided. See table 17 for outdoor and return air (OA and RA) sensor options. Refer to instructions provided with sensors for installation.

An IAQ sensor is used when demand control ventilation (DCV) is specified. Damper minimum position can be set lower than traditional minimum air requirements resulting in cost savings. The IAQ sensor allows the A6 to open dampers to traditional ventilation requirements as room occupancy (CO_2) increases.

TABLE 17

Sensors	Dampers will modulate to 55°F discharge air (RT6) when:
Single OA Sensible	OA temperature (S175) is lower than free cooling setpoint.
Single OA Sensible	OA temperature and humidity (A7) is lower than free cooling setpoint.
Differential Enthalpy - 1 in OA and 1 in RA	OA temperature and humidity (A7) is lower than RA temperature and humidity (A62).
IAQ Sensor	CO_2 sensed (A63) is higher than CO_2 setpoint.

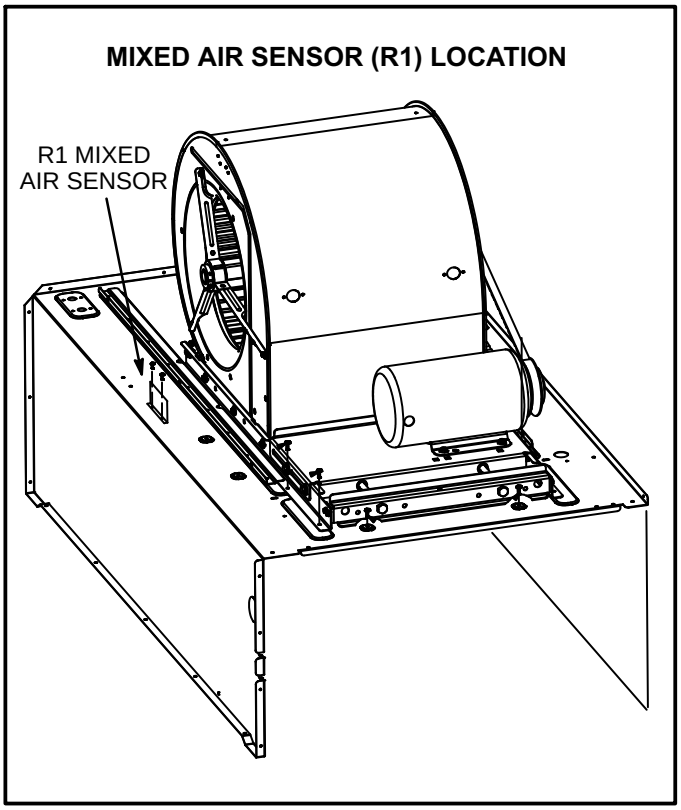


FIGURE 36

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 37.

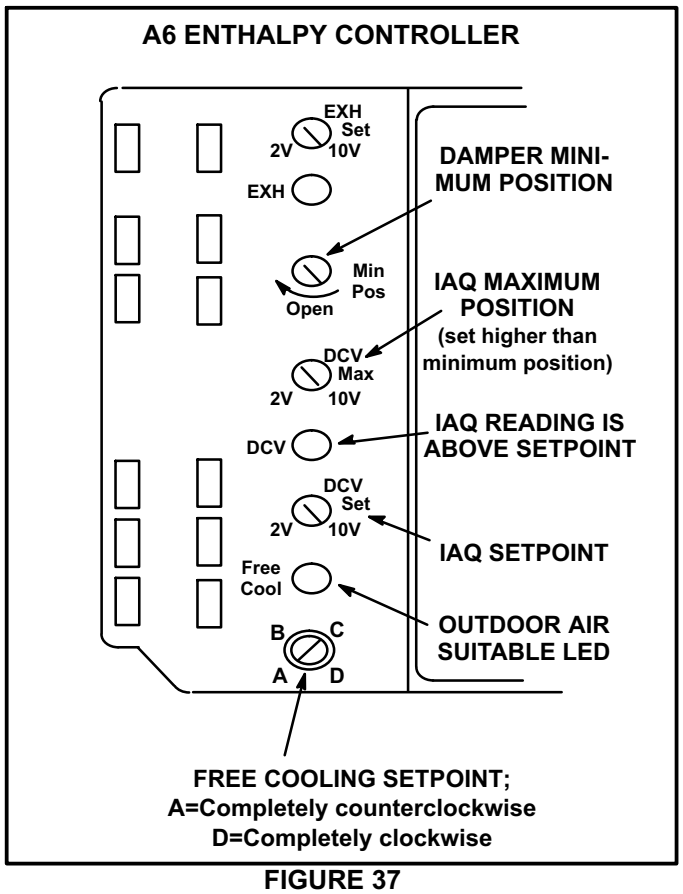


FIGURE 37

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 18. Setting A is recommended. See figure 37. 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 18
ENTHALPY CONTROL SETPOINTS

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

Damper Minimum Position

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

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

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

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

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

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

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

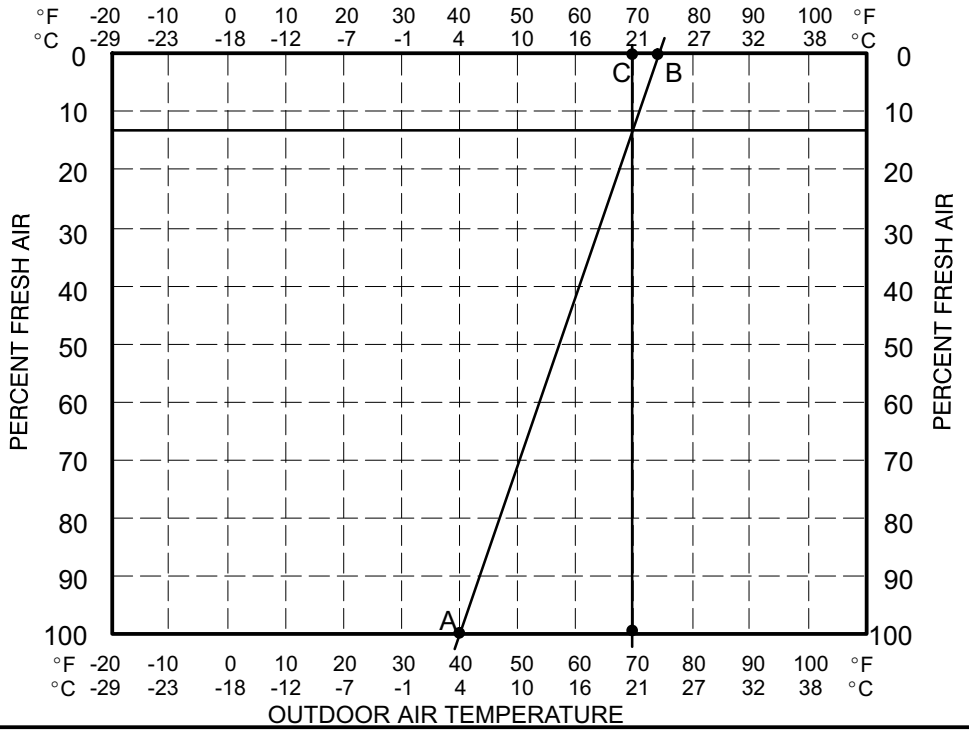
6- Draw a straight line between points A and B.

7- Draw a vertical line through point C.

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

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

CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE



DCV Set and Max Settings

Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO_2 sensor, dampers will start to open when the IAQ sensor reads approximately 1000ppm. Adjust the DCV SET potentiometer to the approximate setting specified by the controls contractor. Refer to figure 37.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO_2 rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 37.

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

Economizer Operation

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

Outdoor Air Not Suitable:

During the unoccupied time period dampers are closed.

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

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 19 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).

TABLE 19

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

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

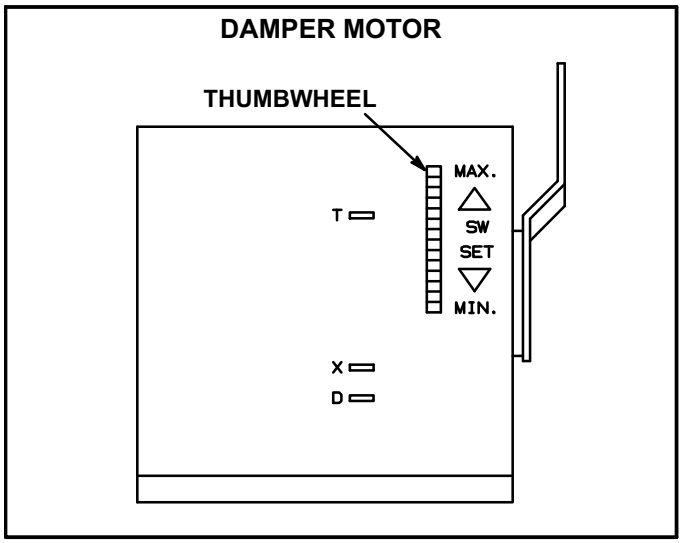


FIGURE 38

F-Barometric Relief Dampers

Dampers are used in downflow (see figure 39) and horizontal (see figure 40) air discharge applications. Horizontal barometric relief dampers are installed in the return air duct. The dampers must be used any time an economizer and a power exhaust fan is applied to KDB series units.

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

NOTE- Barometric relief damper is optional except required with power exhaust dampers.

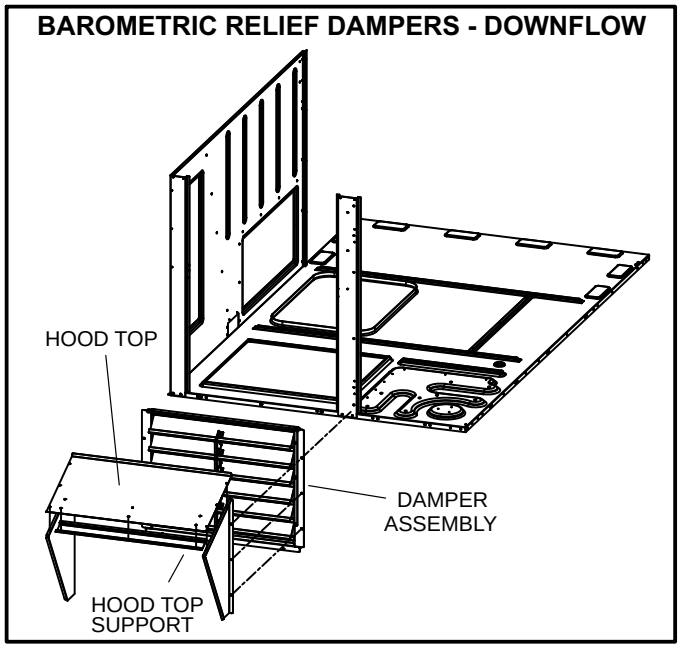


FIGURE 39

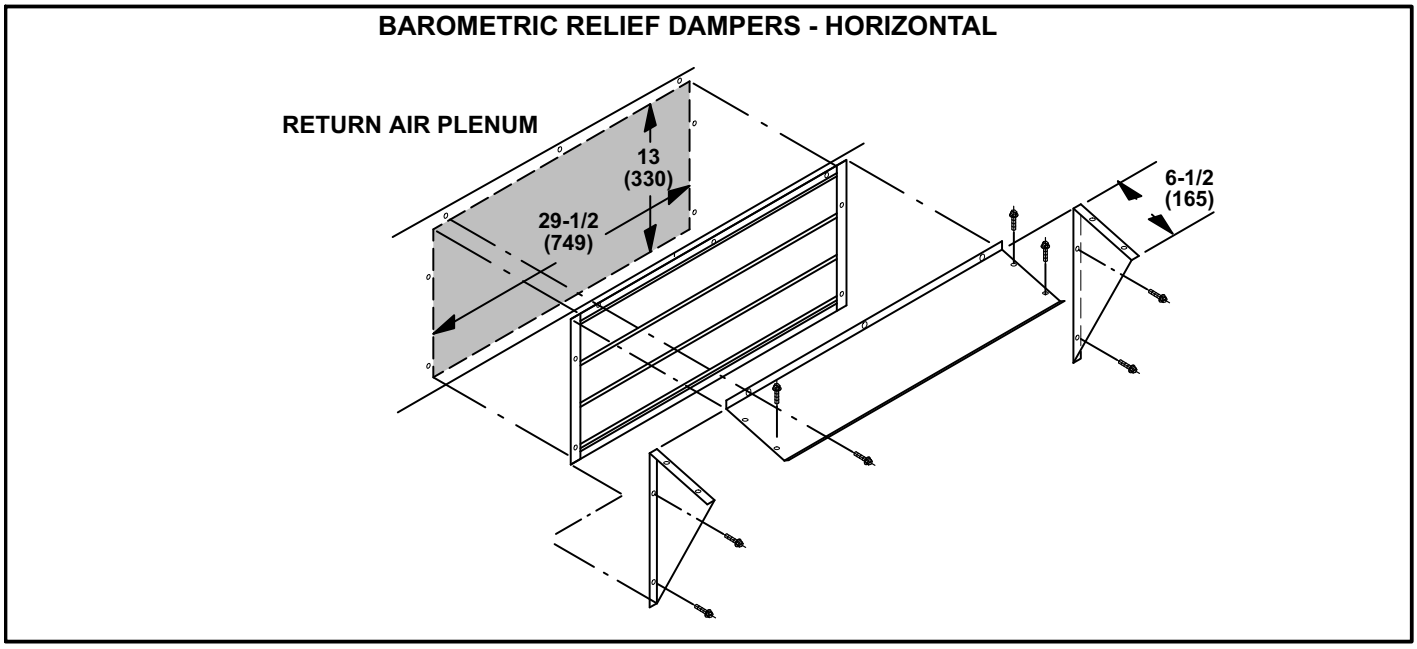


FIGURE 40

G-Power Exhaust Fan

The power exhaust fan (K1PWRE10B) requires an optional gravity exhaust damper and economizer and is used in downflow applications only. See figure 41. The power exhaust fan provides exhaust air pressure relief and also runs when return air dampers are closed and the supply air blower is operating. See installation instructions for more detail.

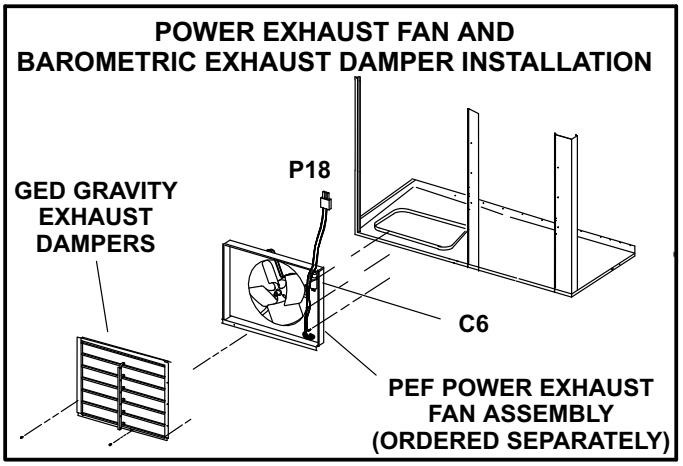


FIGURE 41

Power Exhaust Setpoint Adjustment

Locate the A6 enthalpy control in the control area. The EXH SET potentiometer is factory-set at approximately 50% of the dial range. See figure 42. Power exhaust fans will be energized 30 seconds after dampers are 50% open. Adjust the EXH SET potentiometer higher (clockwise toward 10V) to energize fans when dampers are further open. Adjust the EXH SET potentiometer lower (counterclockwise toward 2V) to energize fans when dampers are further closed. (Thirty-second delay allows dampers to partially open before exhaust fan starts.)

H-Control Systems

Any two-heat, two-cool thermostat may be used. All thermostat wiring is connected to terminal block TB1. Each thermostat has additional control options available. See thermostat installation instructions for more detail.

NOTE-KDB heat pumps use standard heat cool type thermostats. Attempted use of heat pump-type thermostats on KDB units will result in improper operation.

I-Smoke Detectors A171 and A172

Photoelectric smoke detectors are a field installed option. The smoke detectors can be installed in the supply air section (A64), return air section (A17), or in both the supply and return air section.

J-LP / Propane Kit

Units require a natural to LP /propane kit. The kit includes one LP spring conversion kit, up to eleven burner orifices and three stickers. For more detail refer to the natural to LP gas changeover kit installation instructions.

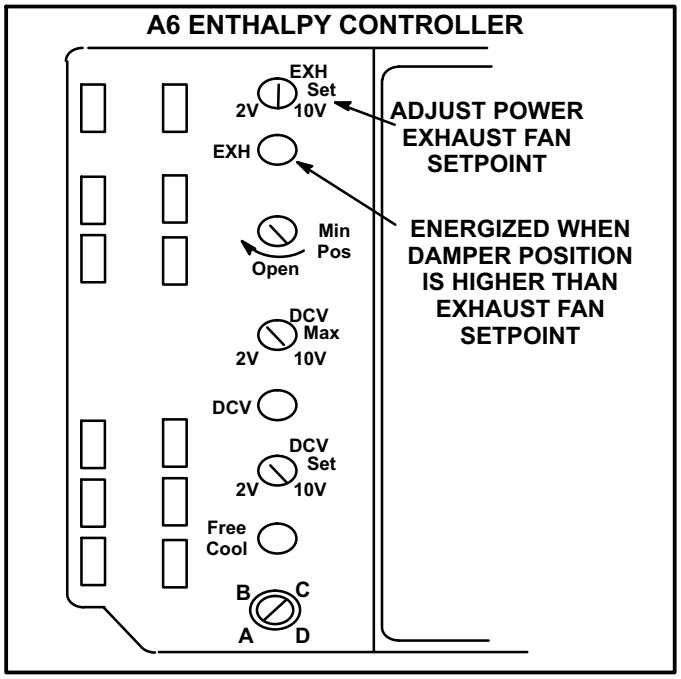


FIGURE 42

K-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.

L-Optional Cold Weather Kit (Canada only)

Electric heater is available to automatically control the minimum temperature in the gas burner compartment. Heater is ETL/CSA certified to allow cold weather operation of unit down to -60° F (-50° C).

The kit includes the following parts:

1- Transformer (T20) is a 600V to 120/240V step-down transformer mounted in the blower compartment.

2- T20 has two in line fuses (F20), one on each leg of the transformer. Both are rated at 15 amps.

3- The strip heater (HR6) is located as close as possible to the gas valve. It is wired in series with T20. The strip heater is rated at 500 Watts

4- A thermostat mounting box is installed on the vestibule of the heating compartment. Included in the box are the following thermostat switches:

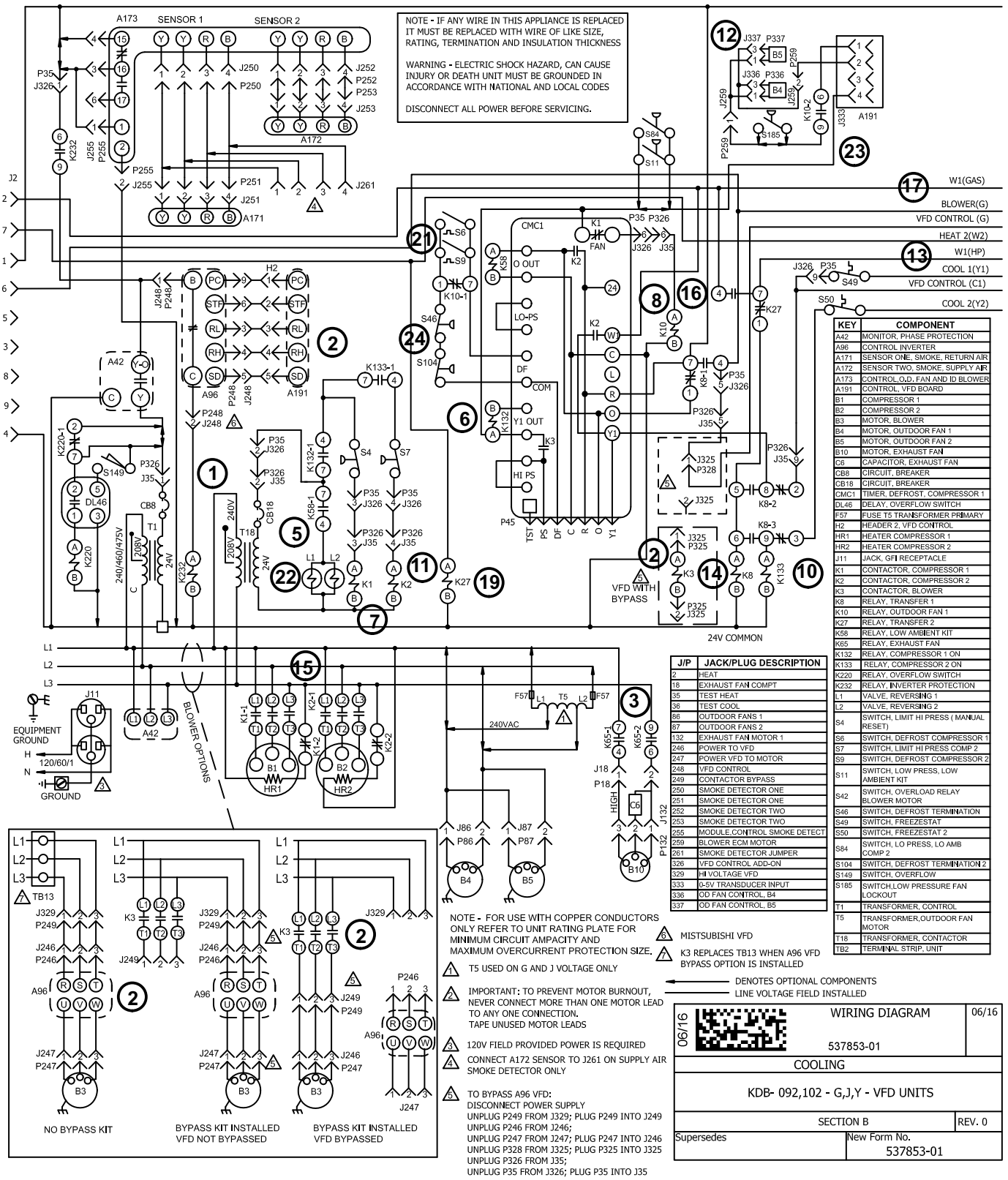
a - Thermostat switch (S59) is an auto-reset SPST N.C. switch which opens on a temperature drop. The switch is wired in series with 24v power and the combustion air blower switch. When the temperature drops below -30° F (-35° C) the switch opens and the gas heat section is de-energized. The switch automatically resets when the heating compartment temperature reaches -10° F (-12° C).

b - Thermostat switch (S60) is an auto-reset SPST N.C. switch which opens on a temperature rise. The switch is wired in series with HR6 and T20. When the temperature rises above 20° F (-7° C) the switch opens and the electric heater is de-energized. The switch automatically resets when the heating compartment temperature reaches -10° F (23.3° C).

c -Thermostat switch (S61) is an auto-reset SPST N.O. switch which closes on a temperature drop. The switch is wired in series with HR6 and T20. When temperature drops below 20° F (-7° C) the switch closes and electric heater is energized. The switch automatically opens when heating compartment temperature reaches 76° F (24° C).

VII- WIRING DIAGRAMS / SEQUENCE OF OPERATION

KDB092, 102 UNIT WIRING SCHEMATIC



KEY	COMPONENT
A42	MONITOR, PHASE PROTECTION
A96	CONTROL INVERTER
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	CONTROL,O.D. FAN AND ID BLOWER
A191	CONTROL, VFD BOARD
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
B10	MOTOR, EXHAUST FAN
C6	CAPACITOR, EXHAUST FAN
CB8	CIRCUIT, BREAKER
CB18	CIRCUIT, BREAKER
CMC1	TIMER, DEFROST, COMPRESSOR 1
DL46	DELAY, OVERFLOW SWITCH
F57	FUSE T5 TRANSFORMER PRIMARY
H2	HEADER 2, VFD CONTROL
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
J11	JACK, GFI RECEPTACLE
K1	CONTACTOR, COMPRESSOR 1
K2	CONTACTOR, COMPRESSOR 2
K3	CONTACTOR, BLOWER
K8	RELAY, TRANSFER 1
K10	RELAY, OUTDOOR FAN 1
K27	RELAY, TRANSFER 2
K58	RELAY, LOW AMBIENT KIT
K65	RELAY, EXHAUST FAN
K132	RELAY, COMPRESSOR 1 ON
K133	RELAY, COMPRESSOR 2 ON
K220	RELAY, OVERFLOW SWITCH
K232	RELAY, INVERTER PROTECTION
L1	VALVE, REVERSING 1
L2	VALVE, REVERSING 2
S4	SWITCH, LIMIT HI PRESS (MANUAL RESET)
S6	SWITCH, DEFROST COMPRESSOR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S9	SWITCH, DEFROST COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S46	SWITCH, DEFROST TERMINATION
S49	SWITCH, FREEZESTAT
S50	SWITCH, FREEZESTAT 2
S84	SWITCH, LO PRESS, LO AMB COMP 2
S104	SWITCH, DEFROST TERMINATION 2
S149	SWITCH, OVERFLOW
S185	SWITCH,LOW PRESSURE FAN LOCKOUT
T1	TRANSFORMER, CONTROL
T5	TRANSFORMER,OUTDOOR FAN MOTOR
T18	TRANSFORMER, CONTACTOR
TB2	TERMINAL STRIP, UNIT

J/P	JACK/PLUG DESCRIPTION
2	HEAT
18	EXHAUST FAN COMPT
35	TEST HEAT
36	TEST COOL
86	OUTDOOR FANS 1
87	OUTDOOR FANS 2
132	EXHAUST FAN MOTOR 1
246	POWER TO VFD
247	POWER VFD TO MOTOR
248	VFD CONTROL
249	CONTACTOR BYPASS
250	SMOKE DETECTOR ONE
251	SMOKE DETECTOR ONE
252	SMOKE DETECTOR TWO
253	SMOKE DETECTOR TWO
255	MODULE,CONTROL SMOKE DETECT
259	BLOWER ECM MOTOR
261	SMOKE DETECTOR JUMPER
326	VFD CONTROL ADD-ON
329	HI VOLTAGE VFD
333	0-5V TRANSDUCER INPUT
336	OD FAN CONTROL, B4
337	OD FAN CONTROL, B5

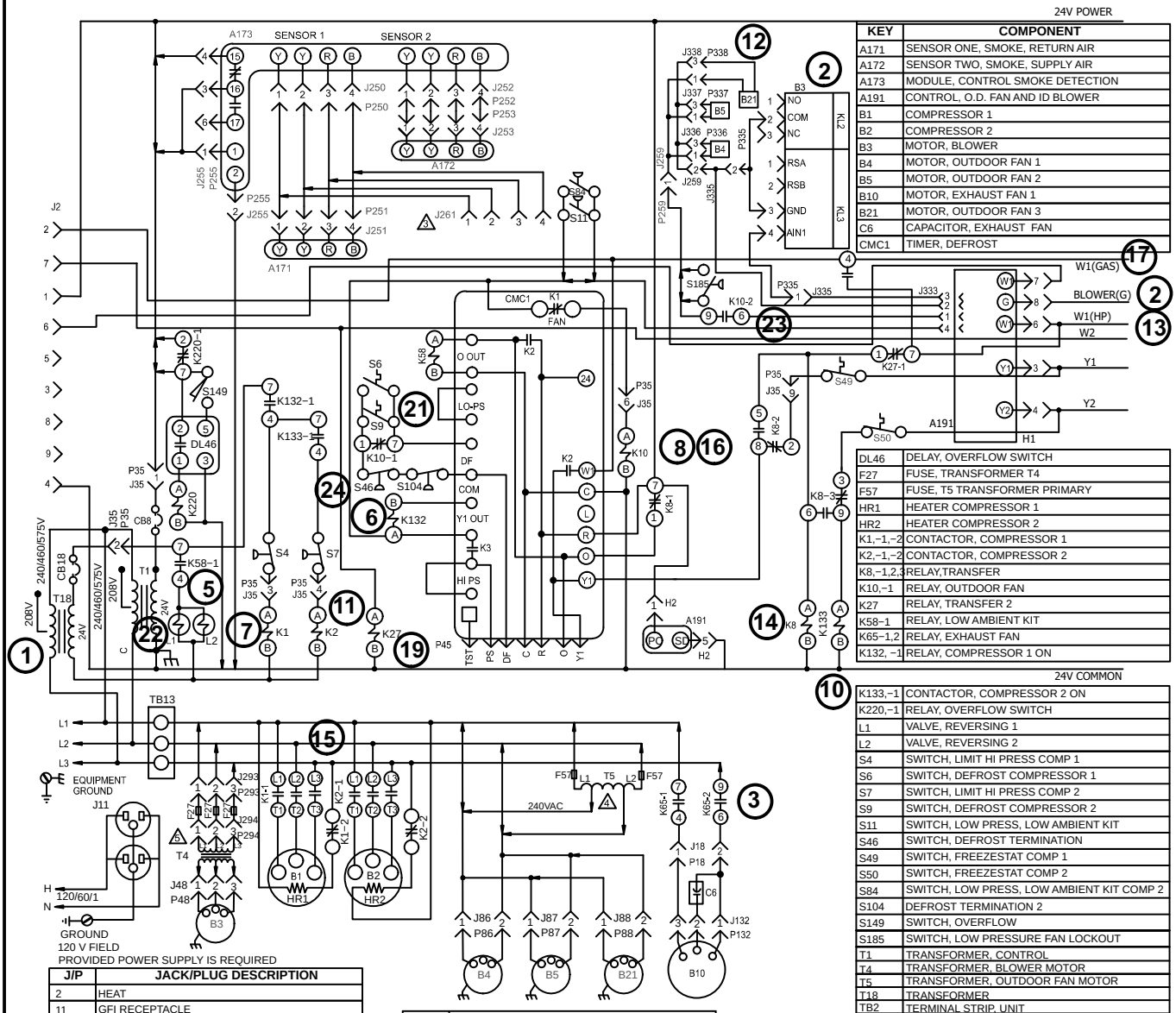
NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.

1. T5 USED ON G AND J VOLTAGE ONLY
2. IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
3. 120V FIELD PROVIDED POWER IS REQUIRED
4. CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY
5. TO BYPASS A96 VFD:
   DISCONNECT POWER SUPPLY
   UNPLUG P249 FROM J329; PLUG P249 INTO J249
   UNPLUG P246 FROM J246;
   UNPLUG P247 FROM J247; PLUG P247 INTO J246
   UNPLUG P328 FROM J325; PLUG P325 INTO J325
   UNPLUG P326 FROM J35;
   UNPLUG P35 FROM J326; PLUG P35 INTO J35
6. MISTSUBISHI VFD
7. K3 REPLACES TB13 WHEN A96 VFD BYPASS OPTION IS INSTALLED

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

06/16	WIRING DIAGRAM 537853-01	06/16
	COOLING	
	KDB- 092,102 - G,J,Y - VFD UNITS	
	SECTION B	REV. 0
Supersedes	New Form No. 537853-01	

KDB122 UNIT WIRING SCHEMATIC



KEY	COMPONENT
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
A191	CONTROL, O.D. FAN AND ID BLOWER
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
B10	MOTOR, EXHAUST FAN 1
B21	MOTOR, OUTDOOR FAN 3
C6	CAPACITOR, EXHAUST FAN
CMC1	TIMER, DEFROST

DL46	DELAY, OVERFLOW SWITCH
F27	FUSE, TRANSFORMER T4
F57	FUSE, T5 TRANSFORMER PRIMARY
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
K1,−1,−2	CONTACTOR, COMPRESSOR 1
K2,−1,−2	CONTACTOR, COMPRESSOR 2
K8,−1,2,3	RELAY,TRANSFER
K10,−1	RELAY, OUTDOOR FAN
K27	RELAY, TRANSFER 2
K58−1	RELAY, LOW AMBIENT KIT
K65−1,2	RELAY, EXHAUST FAN
K132, −1	RELAY, COMPRESSOR 1 ON
K133,−1	CONTACTOR, COMPRESSOR 2 ON
K220,−1	RELAY, OVERFLOW SWITCH
L1	VALVE, REVERSING 1
L2	VALVE, REVERSING 2
S4	SWITCH, LIMIT HI PRESS COMP 1
S6	SWITCH, DEFROST COMPRESSOR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S9	SWITCH, DEFROST COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S46	SWITCH, DEFROST TERMINATION
S49	SWITCH, FREEZESTAT COMP 1
S50	SWITCH, FREEZESTAT COMP 2
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S104	DEFROST TERMINATION 2
S149	SWITCH, OVERFLOW
S185	SWITCH, LOW PRESSURE FAN LOCKOUT
T1	TRANSFORMER, CONTROL
T4	TRANSFORMER, BLOWER MOTOR
T5	TRANSFORMER, OUTDOOR FAN MOTOR
T18	TRANSFORMER
TB2	TERMINAL STRIP, UNIT
TB13	TERMINAL STRIP, POWER DISTRIBUTION

J/P	JACK/PLUG DESCRIPTION
2	HEAT
11	GFI RECEPTACLE
18	EXHAUST FAN COMPT
35	TEST HEAT
36	TEST COOL
48	MOTOR, FRESH AIR BLOWER
86	OUTDOOR FANS 1
87	OUTDOOR FANS 2
88	OUTDOOR FANS 3
132	EXHAUST FAN MOTOR 1
250	SMOKE DETECTOR ONE
251	SMOKE DETECTOR ONE
252	SMOKE DETECTOR TWO
253	SMOKE DETECTOR TWO
255	MODULE, CONTROL SMOKE DETECTION
259	BLOWER ECM MOTOR
261	SMOKE DETECTOR JUMPER
293	F27 LINE SIDE
294	F27 LOAD SIDE

333	0−5V TRANSDUCER INPUT
335	EBM CONTROL
336	OD FAN CONTROL, B4
337	OD FAN CONTROL, B5
338	OD FAN CONTROL, B21

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
3. CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY
4. T5 USED ON G AND J VOLTAGE ONLY
4. T4 USED ON J VOLTAGE ONLY

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

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

DISCONNECT ALL POWER BEFORE SERVICING.

WIRING DIAGRAM	11/16
COOLING	
KDB 122 - G,J,Y	
SECTION B	REV. 0
Supersedes	New Form No. 537848-02

SEQUENCE OF OPERATION KDB092/122

Power:

1- Line voltage from unit disconnect energizes transformer T1 and T18. T1 provides 24VAC power to terminal strip TB1. TB1 provides 24VAC to the unit cooling, heating and blower controls and thermostat. T18 provides 24VAC to K1 and K2 relay coils, A191 fan control board, and L1 and L2 reversing valves.

Blower Operation:

2- Constant air volume blowers (092/102) -
Indoor thermostat terminal G energizes blower contactor K3 with 24VAC. N.O. K3 closes, energizing the blower.

Blowers equipped with an inverter (092/102)-
Y1 thermostat demand is routed through TB1-Y1 and J3-1 & 2 to A191 FCB control C1 terminal (see thermostat C section). When A191 FCB terminal C1 is energized, a **low** speed signal (RL) is sent to A96 inverter via J/P248. A96 alters the frequency and voltage to run the B3 blower at low speed through terminals R, S, T and U, V, W.

During **free cooling**, Y1 does not energize A191 FCB terminal C1. G thermostat demand is routed to A191 FCB terminal G. A191 FCB sends a high speed signal (RH) to A96 inverter and energizes B3 blower motor at **high** speed in a similar manner as low speed.

A **Y2, W1, W2, or G only** (ventilation) thermostat demand is routed to A191 FCB resulting in **high** speed blower similar to a free cooling call.

Note - To operate the blower in high speed during ventilation (G only), move the switch on A191 FCB to "HI".

Direct Drive Blowers (122)-

A **G+Y1** thermostat input to the A191 FCB results in a **low** speed output through J333-3 (IDB) to B3 terminal 4 (AIN1). The blower will operate at approximately 66% of full CFM (set on the A191 FCB low speed potentiometer at start-up).

A **Y2, W1, W2, or G only** thermostat input to A191 FCB results in a **high** speed output through J333-3 (IDB) to B3 terminal 4 (AIN1). The blower will operate at full CFM (set on the A191 FCB low speed potentiometer at start-up).

Note - To operate the blower in high speed during ventilation (G only), move the switch on A191 FCB to "HI".

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.

First Stage Cooling Demand (compressor B1)

4- First stage cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 2-)

5- Transformer T18 energizes reversing valves L1 and L2 via K58-1.

6- Y1 demand energizes K132 relay coil which closes K132-1 N.O. contacts and routes 24VAC to S49 N.C. freezestat and S4 N.C. high pressure switch. Compressor contactor K1 is energized.

7- K1-1 N.O. closes energizing compressor B1. K1-2 opens de-energizing crankcase heater HR1.

8- Y1 signal from CMC1 module energizes K10 relay coil. K10-2 N.O. contacts close energizing outdoor fans B4 and B5 (and B21 on 122 units) at low speed via A191.

Second Stage Cooling Demand (compressor B2)

9- Second stage cooling demand energizes Y2.

10- Y2 demand energizes relay K133 relay coil which closes K133-1 N.O. contacts. 24VAC is routed to S50 N.C. freezestat and S7 N.C. high pressure switch. Compressor contactor K2 is energized.

11- K2-1 N.O. closes to energize compressor B2. K2-2 N.C. opens to de-energize crankcase heater HR2.

12- Outdoor fans B4 and B5 (and B21 on 122 units) operate at high speed via A191.

First Stage Heat - OD Temp **ABOVE** A19 Balance Point (35°F Default)

13- A19 N.O. contacts close when temperature is above setpoint providing a W1(HP) demand.

14- W1 demand energizes K8 relay coil which closes K8-2 and K8-3 N.O. contacts and K132 and K133 coils. 24VAC is routed to K1 and K2 contactors

15- K1-1 and K2-1 close energizing compressor B1 and B2. K2-1 and K2-2 open de-energizing crankcase heaters.

16- 24VAC from CMC1 module energizes K10 relay coil. K10-2 N.O. contacts close allowing A191 pulse width modulated signal to energize outdoor fans B4 and B5 (and B21 in 122 units) at high speed.

Second Stage Heat - OD Temp **ABOVE** A19 Balance Point (35°F Default)

17- Second stage heat demand energizes W2 in the thermostat. K27 relay coil is energized opening K27-1 N.C. contacts to stop heat pump operation. In addition, W2 is routed to J2-7 to initiate high gas heat.

18- See sequence of operation for gas heat.

First Stage Heat - OD Temp **BELOW** A19 Balance Point (35°F Default)

19- A19 N.C. contacts remain closed when temperature is below setpoint providing a W1(Gas) low gas heat demand to J2-2.

20- See sequence of operation for gas heat.

Second Stage Heat - OD Temp **BELOW** A19 Balance Point (35°F Default)

21- Second stage heat demand energizes W2 in the thermostat. K27 relay coil is energized opening K27-1 N.C. contacts to stop heat pump operation. In addition, W2 is routed to J2-7 to initiate high gas heat.

22- See sequence of operation for gas heat.

Defrost Mode:

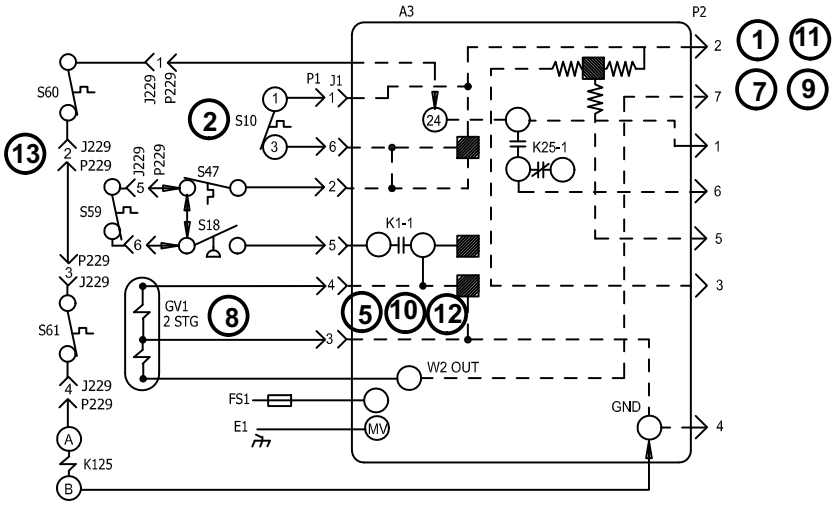
23- During heating operation, when outdoor coil drops to 35 ± 4° the defrost thermostat S6 or S9 closes initiating defrost (after minimum run time of 30, 60 or 90 minutes).

24- When defrost begins, the reversing valve L1 or L2 is energized. Supplemental gas heat (low heat) is energized.

25- When L1 energizes, outdoor fan relay K10 and outdoor fans B4 and B5 (and B21 on 122 units) are de-energized via A191.

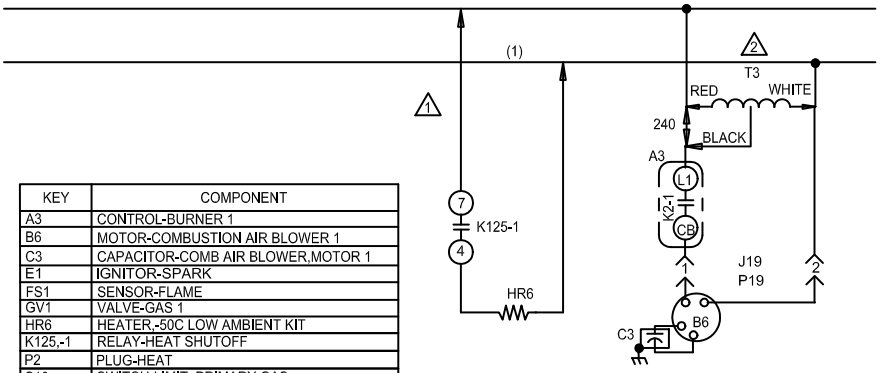
26- Defrost terminates when the pressure switch for the circuit S46 or S104 opens, or when 15 minutes has elapsed. The defrost cycle is **not** terminated when thermostat demand ends.

GAS HEAT FOR KDB 092/122 UNITS



1 CSA(-50C)LOW AMBIENT KIT (OPTIONAL)

2 T3 USED ON 480V AND 600V UNITS



INDICATES MICRO PROCESSER

DENOTES OPTIONAL COMPONENTS

KEY	COMPONENT
A3	CONTROL-BURNER 1
B6	MOTOR-COMBUSTION AIR BLOWER 1
C3	CAPACITOR-COMB AIR BLOWER,MOTOR 1
E1	IGNITOR-SPARK
FS1	SENSOR-FLAME
GV1	VALVE-GAS 1
HR6	HEATER,-50C LOW AMBIENT KIT
K125,-1	RELAY-HEAT SHUTOFF
P2	PLUG-HEAT
S10	SWITCH-LIMIT, PRIMARY GAS
S18	SWITCH-COMB AIR BLOWER, PROVE
S47	SWITCH-FLAME ROLLOUT, BURNER 1
S59	THERMOSTAT-OPEN -20F, CLOSE 10F
S60	THERMOSTAT-OPEN 20F, CLOSE -10F
S61	THERMOSTAT-OPEN 50F, CLOSE 20F
T3	TRANSFORMER-COMB AIR BLOWER 1

J/P	JACK/PLUG DESCRIPTION
1	GAS LIMIT
19	COMBUSTION AIR BLOWER
229	VESTIBULE HEATER,CONTROL 1

02/16	WIRING DIAGRAM 537063-03	02/16
HEATING - GAS		
KDB/ZGA/KGA UNITS - 130 THRU 240		
SECTION A		REV 1
Supersedes	New Form No. 537063-03	

GAS HEAT SEQUENCE OF OPERATION

First Stage Heat:

1- The thermostat initiates W1 heating demand.

2- 24VAC is routed from TB1 to ignition control A3 through P2. A3 proves N.C. primary limit S10 and N.C. Roll-out switch S47.

3- Combustion air inducer blower B6 is energized.

4- After the combustion air inducer B6 has reached full speed, the combustion air proving switch S18 contacts close.

5- After a 30 second delay, A3 energizes the ignitor and LO terminal (low fire) of gas valve GV1.

Second Stage Heat:

6- With first stage heat operating, an additional heating demand from the thermostat initiates W2.

7- A second stage heating demand is received by TB1. The second stage heat signal passes from TB1 to A3.

8- A3 energizes HI terminal (high fire) of gas valve GV1.

End of Second Stage Heat:

9- Heating demand is satisfied. Terminal W2 (high fire) is de-energized.

10- Terminal HI of GV1 is de-energized by A3 control module.

End of First Stage Heat:

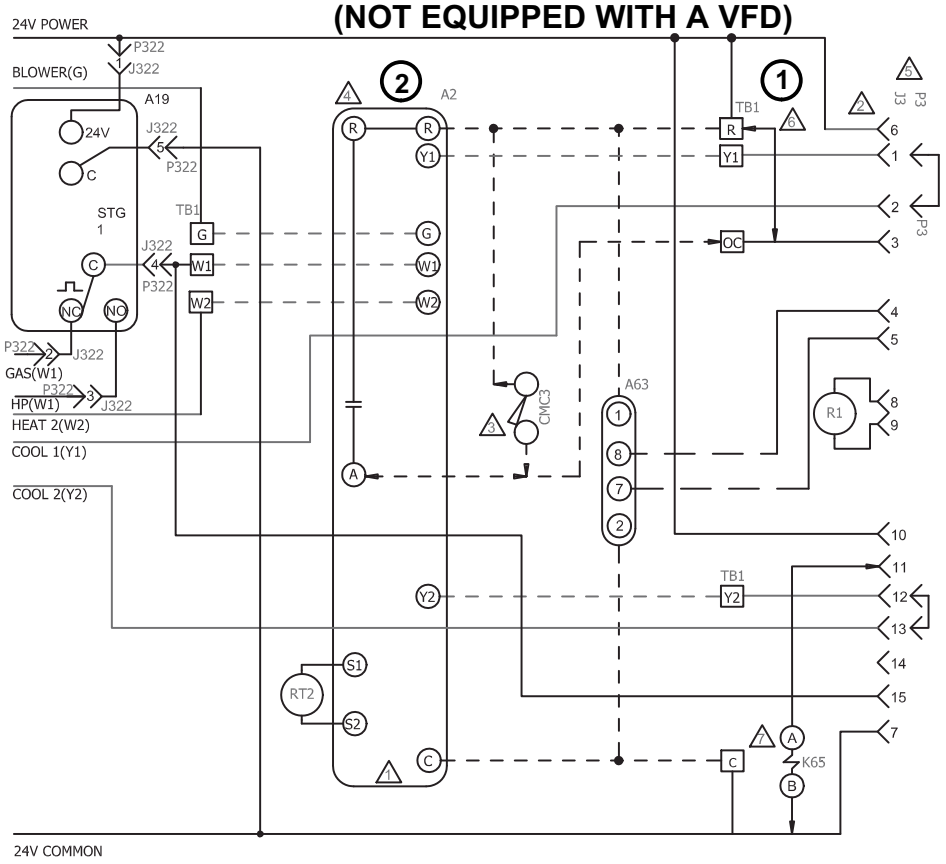
11- Heating demand is satisfied. Terminal W1 (low fire) is de-energized.

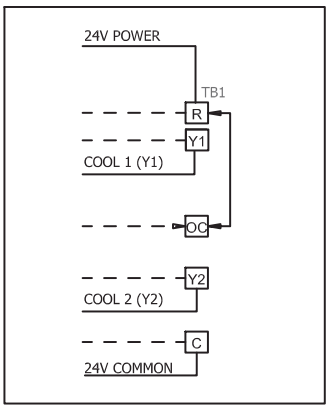
12- Ignition A3 is de-energized in turn de-energizing terminal LO of GV1.

Optional Low Ambient Kit:
(ETL/CSA -50° C Low Ambient Kit)

13- Line voltage is routed through the N.C. low ambient kit thermostats S60 and S61. K125 relay is energized closing N.O. K125-1 contacts and energizing the low ambient kit heater HR6.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT KDB SERIES UNITS (NOT EQUIPPED WITH A VFD)





△7 CONNECTION SCHEME FOR KDB UNITS WITHOUT ECONOMIZER ONLY

KEY	COMPONENT
A2	SENSOR, ELECTRONIC THERMOSTAT
A63	SENSOR, CO2
CMC3	CLOCK, TIME
J3	JACK, UNIT ECONOMIZER
J322	JACK, A19 OUTDOOR THERMOSTAT
K65	RELAY, EXHAUST FAN
P3	PLUG, ECONOMIZER
P322	PLUG, A19 OUTDOOR THERMOSTAT
R1	SENSOR, MIXED AIR OR SUPPLY AIR
RT2	SENSOR, REMOTE THERMOSTAT
TB1	TERMINAL STRIP, CLASS II VOLTAGE

△1 THERMOSTAT SUPPLIED BY USER

△2 J3 MAXIMUM LOAD 20VA 24VAC CLASS II

△3 TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED

△4 TOUCHSCREEN THERMOSTAT

△5 J3 AND P3 ARE USED ON KDB UNITS WITH ECONOMIZER

△6 REMOVE JUMPER BETWEEN TB1-R AND TB1-OCP WHEN USING A NITE SETBACK THERMOSTAT

△7 092-122 UNITS ONLY

DENOTES OPTIONAL COMPONENTS

CLASS II FIELD WIRING

09/16	WIRING DIAGRAM 537847-01	09/16
CONTROL - KDB		
ELECTRONIC/ELECTROMECHANICAL THERMOSTAT		
SECTION C		REV 1
Supersedes	New Form No. 537847-01	

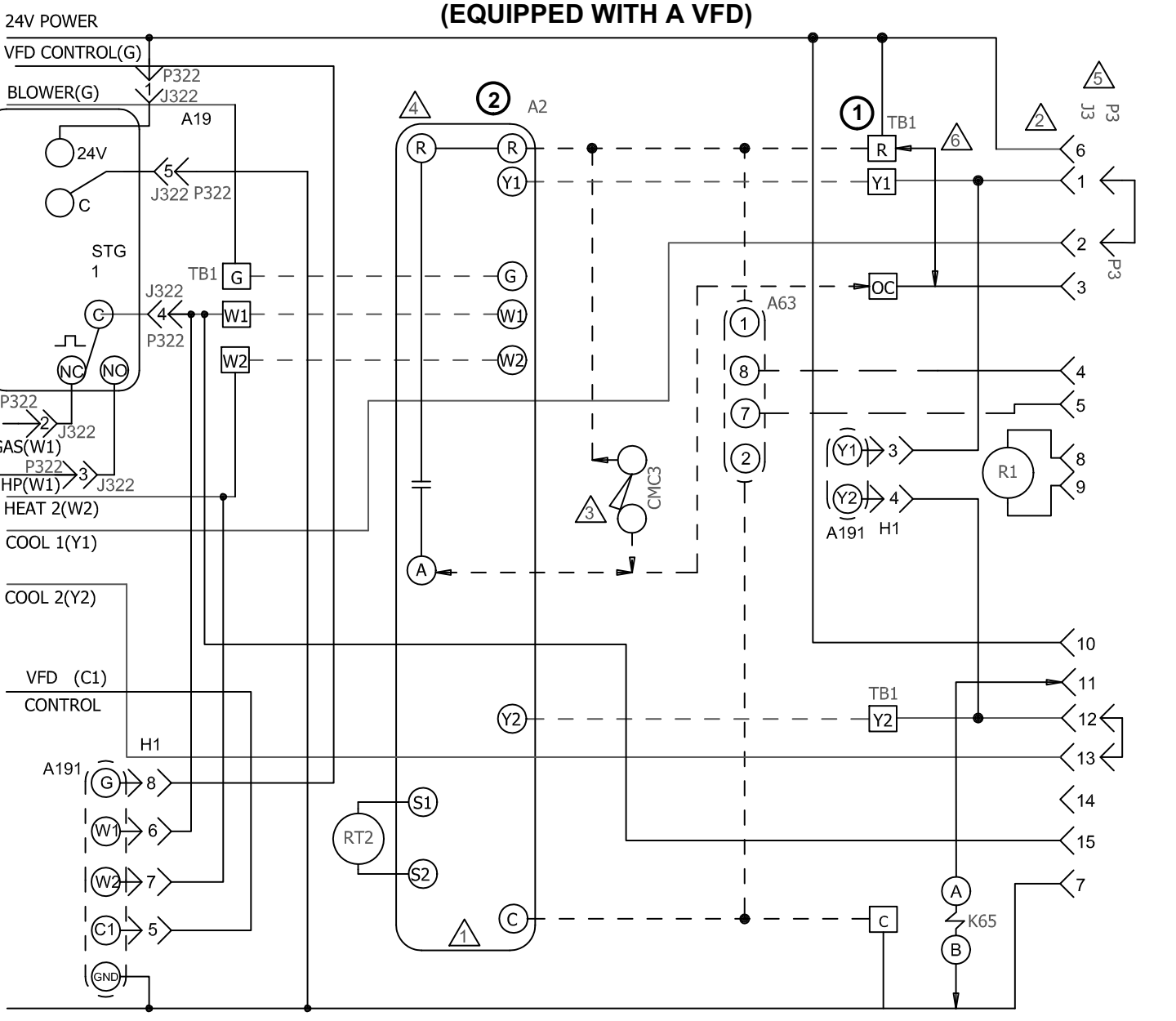
POWER:

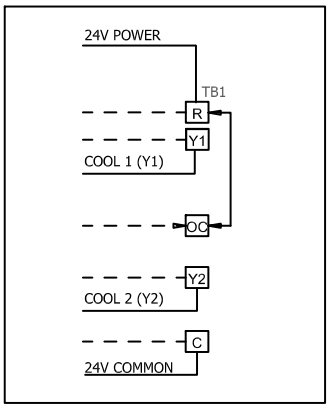
1- Terminal strip TB1 energizes thermostat components with 24VAC.

OPERATION:

2- TB1 receives data from the electronic thermostat A2 (Y1, Y2, W1, W2, G, OCP). The 24VAC signal from TB1 energizes the appropriate components for heat or cool demand.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT KDB SERIES UNITS (EQUIPPED WITH A VFD)





CONNECTION SCHEME FOR KDB UNITS WITHOUT ECONOMIZER ONLY

DENOTES OPTIONAL COMPONENTS
CLASS II FIELD WIRING

KEY	COMPONENT
A2	SENSOR, ELECTRONIC THERMOSTAT
A19	THERMOSTAT, ELECTRONIC CONTROL
A63	SENSOR, CO2
A191	CONTROL, FCB BOARD
CMC3	CLOCK, TIME
H1	HEADER ON FCB BOARD
J3	JACK, UNIT ECONOMIZER
J322	JACK, A19 OUTDOOR THERMOSTAT
K65	RELAY, EXHAUST FAN
P3	PLUG, ECONOMIZER
P322	PLUG, A19 OUTDOOR THERMOSTAT
R1	SENSOR, MIXED AIR OR SUPPLY AIR
RT2	SENSOR, REMOTE THERMOSTAT
TB1	TERMINAL STRIP, CLASS II VOLTAGE

1. THERMOSTAT SUPPLIED BY USER
2. J3 MAXIMUM LOAD 20VA 24VAC CLASS II
3. TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED
4. TOUCHSCREEN THERMOSTAT
5. J3 AND P3 ARE USED ON KDB UNITS WITH ECONOMIZER
6. REMOVE JUMPER BETWEEN TB1-R AND TB1-OCP WHEN USING A NITE SETBACK THERMOSTAT

09/16	WIRING DIAGRAM 537859-01	09/16
CONTROL - KDB-VFD		
ELECTRONIC/ELECTROMECHANICAL THERMOSTAT		
SECTION C		REV 1
Supersedes	New Form No. 537859-01	

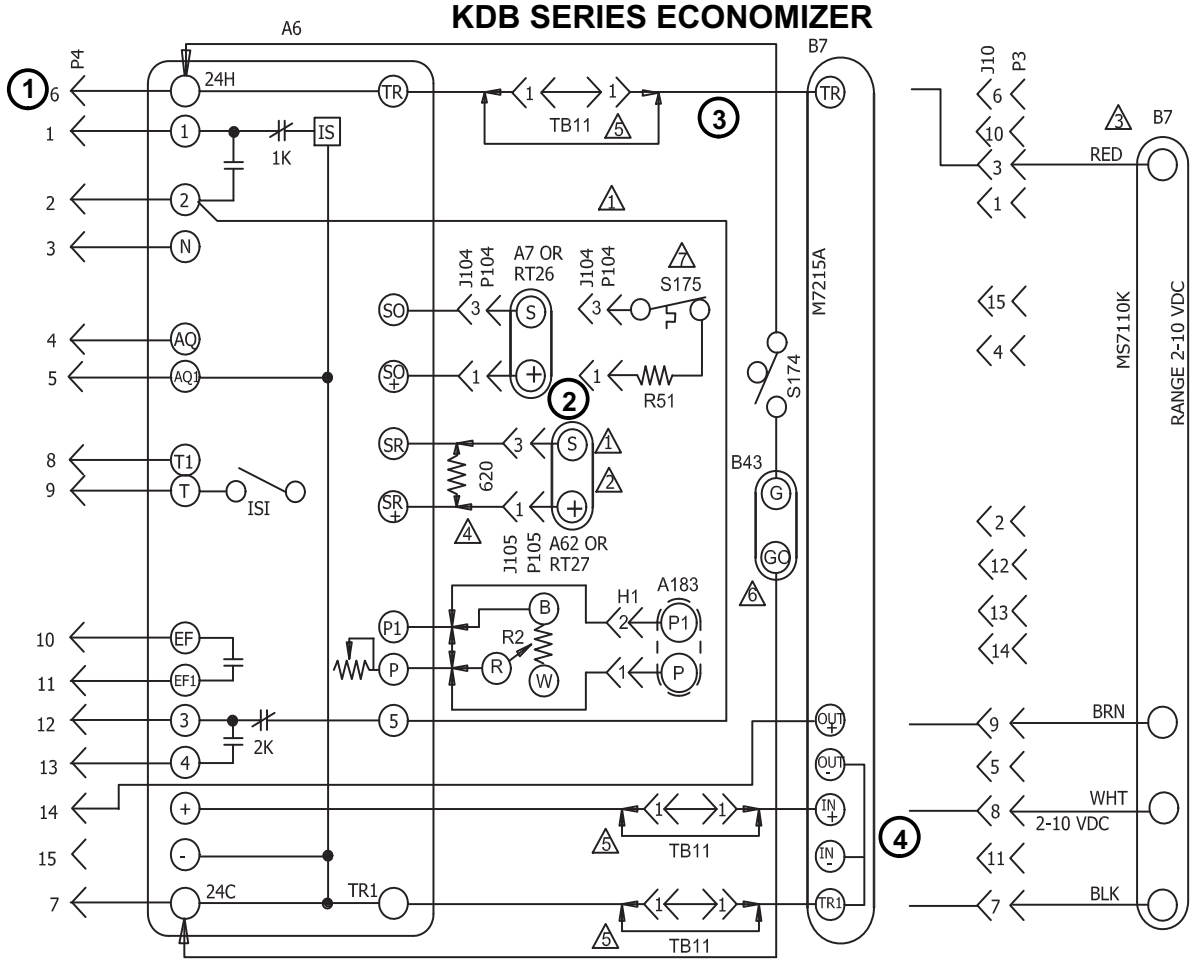
POWER:

1- Terminal strip TB1 energizes thermostat components with 24VAC.

OPERATION:

2- TB1 receives data from the electronic thermostat A2 (Y1, Y2, W1, W2, G, OCP). The 24VAC signal from TB1 energizes the appropriate components for heat or cool demand.

KDB SERIES ECONOMIZER



KEY	COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
A183	CONTROL, VFD BOARD
B7	MOTOR-DAMPER, ECONOMIZER
B43	MOTOR-EXHAUST DAMPER
H1	HEADER 1 ON LANDMARK VFD BOARD
J10	JACK-ECONOMIZER
J104	JACK-SENSOR,OUTDOOR ENTHALPY
J105	JACK-SENSOR,RETURN AIR ENTHALPY
P3	PLUG-LESS ECONOMIZER
P4	PLUG-ECONOMIZER
P104	PLUG-SENSOR,OUTDOOR ENTHALPY
P105	PLUG-SENSOR,RETURN AIR ENTHALPY
R2	POT-MINIMUM POSITION
R51	RESISTOR-SENSIBLE 820 OHM
RT26	SENSOR-OUTDOOR AIR TEMP
RT27	SENSOR-INDOOR AIR TEMP
S175	THERMOSTAT-SENSIBLE TEMP 55-70F
S174	SWITCH-EXHAUST DAMPER
TB11	TERMINAL STRIP-CLASS II VOLT

1. RT26 AND RT27, TEMPERATURE SENSORS MAY BE USED INSTEAD OF A7 AND A62 ENTHALPY SENSORS
2. A62 ENTHALPY SENSOR OR RT27 USED FOR DIFFERENTIAL SENSING
3. USED ON C BOX UNITS
4. REPLACE A7 OR RT26 WITH 620 OHM RESISTOR FOR CONTROLS WITH GLOBAL ECON
5. TB11 USED ON "C" BOX ONLY WITH MOTOR M7215A
6. OPTIONAL EXHAUST DAMPER TO HOLD EXHAUST DAMPER CLOSED WHEN OUTSIDE AIR DAMPER IS CLOSED
7. OPTIONAL OUTDOOR THERMOSTAT TO REPLACE RT26 SENSIBLE SENSOR

DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

LANDMARK WIRING DIAGRAM		11/11
ACCESSORIES		
ECONOMIZER		
SECTION D		REV 0
Supersedes	New Form No. 537080-02	

SEQUENCE OF OPERATION

POWER:

1- Terminal strip TB1 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.