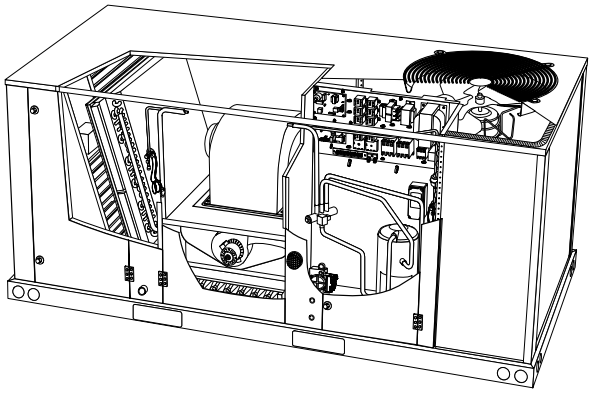
KDB024 through 060

The KDB packaged dual fuel units are available in standard cooling and heating (024, 036, 048 and 060). Cooling capacities range from 23,600 to 58,000 Btuh and heating capacities range from 24,000 to 59,000 Btuh.



KDB are available in single and two-stage gas heating with capacities ranging from 65,000 to 150,000 Btuh. Gas heat sections are designed with Lennox stainless steel tube heat exchangers. The unit control automatically changes between heat pump and gas heat operation.

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

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

⚠WARNING

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

⚠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.

⚠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.

⚠CAUTION

Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

Table of Contents

OPTIONS / ACCESSORIES

Item	Model No.	Catalog No.	Unit Model No. KDB 024	KDB 036	KDB 048	KDB 060
COOLING/HEATING SYSTEM						
Condensate Drain Trap	PVC - C1TRAP20AD2	**76W26**	X	X	X	X
	Copper - C1TRAP10AD2	**76W27**	X	X	X	X
Drain Pan Overflow Switch	K1SNSR71AB1	**74W42**	X	X	X	X
Low Ambient Kit	K1SNSR34*A0	**15C84**	X	X	X	X
Efficiency		High	O	O	O	O
Refrigerant Type		R-410A	O	O	O	O
GAS HEATING SYSTEM						
Bottom Gas Piping Kit	T1GPKT01AN1	**19W50**	X	X	X	X
Low Temperature Vestibule Heater	208/230V-1 or 3 ph - T1CWKT01AN1Y	**19W53**	X	X	X	X
	460V-3ph - T1CWKT01AN1G	**19W54**		X	X	X
	575V-3ph - T1CWKT01AN1J	**19W62**		X	X	X
Combustion Air Intake Extensions	T1EXTN10AN1	**19W51**	X	X	X	X
Gas Heat Input	Standard One-Stage - 65 kBtuh input	Factory	O			
	Standard Two-Stage - 53/70 kBtuh input	Factory		[1] O	[1] O	[1] O
	Medium Two Stage - 81/108 kBtuh input	Factory		O	O	O
	High Two-Stage - 113/150 kBtuh input	Factory			O	O
LPG/Propane Conversion Kits	For one-stage models - C1PROP10AP3	**14N20**	X	X	X	X
	For two-stage standard models - C1PROP28A11	**21A01**		X	X	X
	For two-stage medium and high models - C1PROP20AP3	**14N21**		X	X	X
Vertical Vent Extension	C1EXTN20FF1	**31W62**	X	X	X	X
BLOWER - SUPPLY AIR						
Motors	Direct Drive - 0.33 hp (208/230V-1ph)	Factory	O			
	Direct Drive - 0.50 hp (208/230V-1ph, 208/230V-3ph, 460V-3ph, 575V-3ph)	Factory		O		
	Direct Drive - 0.75 hp (208/230V-1ph, 208/230V-3ph, 460V-3ph, 575V-3ph)	Factory			O	
	Direct Drive - 1.0 hp (208/230V-1ph, 208/230V-3ph, 460V-3ph, 575V-3ph)	Factory				O
	Belt Drive - 0.75 hp (208/230V, 460V, 575V-3ph) (2 Speed)	Factory		O	O	
	Belt Drive - 1 hp (208/230V, 460V, 575V-3ph) (2 Speed)	Factory		O		O
	Belt Drive - 2 hp (208/230V, 460V, 575V-3ph) (2 Speed)	Factory			O	O
Drive Kits See Blower Data Tables for selection	Kit A01 - T1DRKT001-1 - 673-1010 rpm	Factory		O		
	Kit A02 - T1DRKT002-1 - 745-1117 rpm	Factory			O	
	Kit A03 - T1DRKT003-1 - 833-1250 rpm	Factory				O
	Kit A05 - T1DRKT005-1 - 897-1346 rpm	Factory		O		
	Kit A06 - T1DRKT006-1 - 1071-1429 rpm	Factory			O	
	Kit A07 - T1DRKT007-1 - 1212-1548 rpm	Factory				O

[1] Standard Two-Stage Heat is only available with Low NOx option.

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

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

O - Configure to Order (Factory Installed)

X - Field Installed

OPTIONS / ACCESSORIES

Item	Model No.	Catalog No.	Unit Model No. KDB 024	KDB 036	KDB 048	KDB 060
CABINET						
Combination Coil/Hail Guards	C1GARD51A-1	**13R98**	X	X		
	C1GARD51AT1	**13T03**			X	X
Corrosion Protection		Factory	O	O	O	O
Hinged Access Panels		Factory	O	O	O	O
CONTROLS						
Commercial Controls	L Connection® Building Automation System	- - -	X	X	X	X
BACnet®	K0CTRL31A-1	**96W14**	OX	OX		
	K0CTRL31AP1	**12B99**			OX	OX
BACnet® Thermostat with Display	K0SNSR01FF1	**97W23**	X	X	X	X
BACnet® Thermostat without Display	K0SNSR00FF1	**97W24**	X	X	X	X
Novar® 2051	K0CTRL30A-1	**96W11**	OX	OX		
	K0CTRL30AP1	**12B98**			OX	OX
Plenum Cable (75 ft.)	K0MISC00FF1	**97W25**	X	X	X	X
Smoke Detector - Supply or Return (Power board and one sensor)	C1SNSR44AP1	**53W78**	X	X	X	X
Smoke Detector - Supply and Return (Power board and two sensors)	C1SNSR43AP1	**53W79**	X	X	X	X

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

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O - Configure to Order (Factory Installed)

X - Field Installed

OPTIONS / ACCESSORIES

Item	Model No.	Catalog No.	Unit Model No. KDB 024	KDB 036	KDB 048	KDB 060
ECONOMIZER						
Standard Economizer With Outdoor Air Hood (Sensible Control) (Not for Title 24)						
Standard Economizer - Includes Barometric Relief Dampers and Exhaust Hood	K1ECON30A-3-	**14D90**	OX	OX	OX	OX
Economizer - No Exhaust		Factory	O	O	O	O
Standard Economizer Controls (Not for Title 24)						
Single Enthalpy Control	C1SNSR64FF1	**53W64**	OX	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR64FF1	**53W64**	X	X	X	X
High Performance Economizer With Outdoor Air Hood (Sensible Control) (Approved for California Title 24 Building Standards)						
High Performance Economizer - Includes Barometric Relief Dampers and Exhaust Hood	K1ECON32A-5	**23G22**	OX	OX	OX	OX
Hgh Performance Economizer - No Exhaust		Factory	O	O	O	O
High Performance Economizer Controls (Not for Title 24)						
Single Enthalpy Control	C1SNSR65FF1	**23G26**	OX	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR65FF1	**23G26**	X	X	X	X
Economizer Accessories						
Horizontal Economizer Conversion Kit	T1HECK00AN1	**17W45**	X	X	X	X
OUTDOOR AIR						
Outdoor Air Dampers - Includes Outdoor Air Hood						
Motorized	C1DAMP21A-1	**15D17**	OX	OX	OX	OX
Manual	C1DAMP11A-2	**15D18**	OX	OX	OX	OX
POWER EXHAUST FAN						
Standard Static *NOTE - Order Barometric Relief Dampers with Exhaust Hood below if unit is ordered with factory installed Economizer with "No Exhaust" option*	208/230V-1 or 3ph - C1PWRE10A-1P	**79W87**		X	X	X
	460V-3ph - C1PWRE10A-1G	**79W88**		X	X	X
	575V-3ph - C1PWRE10A-1J	**79W89**		X	X	X
[1] BAROMETRIC RELIEF						
Barometric Relief Dampers with Exhaust Hood	C1DAMP50A-1-	**74W38**	X	X	X	X
[1] Required when Economizer is factory installed (no exhaust option) with field installed Power Exhaust Fan option.						
ELECTRICAL						
Disconnect	See Electrical Data Tables for selection		OX	OX	OX	OX
Voltage 60 hz	208/230V - 1 phase		O	O	O	O
	208/230V - 3 phase			O	O	O
	460V - 3 phase			O	O	O
	575V - 3 phase			O	O	O
GFI Service Outlets	15 amp non-powered, field-wired (208/230V, 460V only) LTAGFIK10/15	**74M70**	OX	OX	OX	OX
	20 amp non-powered, field-wired (575V only) C1GFCI20FF1	**67E01**	X	X	X	X
Weatherproof Cover for GFI	C1GFCI99FF1	**10C89**	X	X	X	X

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

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O - Configure to Order (Factory Installed)

X - Field Installed

OPTIONS / ACCESSORIES

Item	Model No.	Catalog No.	Unit Model No. KDB 024	KDB 036	KDB 048	KDB 060
INDOOR AIR QUALITY						
Air Filters						
Healthy Climate® High Efficiency Air Filters Order 4 per unit	MERV 8 (16 x 20 x 2) - C1FLTR15A-1-	**54W20**	X	X		
	MERV 13 (16 x 20 x 2) - T1FLTR40A-1-	**52W37**	X	X		
	MERV 8 (20 x 20 x 2) - C1FLTR15D-1-	**54W21**			X	X
	MERV 13 (20 x 20 x 2) - C1FLTR40D-1-	**52W39**			X	X
Indoor Air Quality (Co_2) Sensors						
Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AS1L	**77N39**	X	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0SNSR53AE1L	**87N54**	X	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications		**85L43**	X	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO2 sensor (**77N39**)		**90N43**	X	X	X	X
UVC Germicidal Lamps						
[1] Healthy Climate® UVC Light Kit (208/230v-1ph)	E1UVCL10AN1	**50W90**	X	X	X	X
ROOF CURBS						
Hybrid Roof Curbs, Downflow						
8 in. height	C1CURB70A-1	**11F50**	X	X	X	[2] X
14 in. height	C1CURB71A-1	**11F51**	X	X	X	[2] X
18 in. height	C1CURB72A-1	**11F52**	X	X	X	[2] X
24 in. height	C1CURB73A-1	**11F53**	X	X	X	[2] X
Hybrid Roof Curbs, Full Perimeter, Downflow						
8 in. height	K1CURB70AP1	**11S47**				X
14 in. height	K1CURB71AP1	**11S48**				X
18 in. height	K1CURB72AP1	**11T01**				X
24 in. height	K1CURB73AP1	**11T06**				X
Adjustable Pitch Curb, Downflow						
14 in. height	C1CURB55AT1	**43W27**	X	X	X	X
CEILING DIFFUSERS						
Step-Down - Order one	RTD9-65S	**13K60**	X	X	X	
	RTD11-95S	**13K61**				X
Flush - Order one	FD9-65S	**13K55**	X	X	X	
	FD11-95S	**13K56**				X
Transitions (Supply and Return) - Order one	T1TRAN10AN1	**17W53**	X	X	X	
	T1TRAN20N-1	**17W54**				X

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

[2] 060 models will fit smaller roof curbs with overhang. See dimension drawing.

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

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

O - Configure to Order (Factory Installed)

X - Field Installed

SPECIFICATIONS - DIRECT DRIVE BLOWER

General Data	Nominal Tonnage	2 Ton	3 Ton	4 Ton	5 Ton
	Model No.	**KDB024H4E**	**KDB036H4E**	**KDB048H4E**	**KDB060H4E**
	Efficiency Type	High	High	High	High
	Blower Type	Direct Drive-ECM	Direct Drive-ECM	Direct Drive-ECM	Direct Drive-ECM
Cooling Performance	Gross Cooling Capacity - Btuh	23,800	35,700	46,800	59,400
	[1] Net Cooling Capacity - Btuh	23,600	35,200	46,000	58,000
	AHRI Rated Air Flow - cfm	800/560	1200/800	1430/1120	1650/1210
	[2] Sound Rating Number (SRN) (dBA)	74	75	77	77
	Total Unit Power - kW	1.8	2.8	3.6	4.7
	[1] SEER (Btuh/Watt)	16.5	16.0	16.0	16.0
	[1] EER (Btuh/Watt) - 208/230V	13.0	12.7	12.8	12.5
	[1] EER (Btuh/Watt) - 460V/575V	13.0	12.4	12.8	12.5
Refrigerant	Type	R-410A	R-410A	R-410A	R-410A
	Charge Furnished	13 lbs. 0 oz.	12 lbs. 13 oz.	14 lbs. 0 oz.	20 lbs. 0 oz.
Heating Performance	Total High Heating Capacity - Btuh	24,000	35,000	46,000	59,000
	Total Unit Power - kW	1.8	2.6	3.4	4.7
	[1] COP	3.88	3.90	3.90	3.70
	[1] HSPF - Region IV (Region V)	8.30	8.50	8.50	8.50
	Total Low Heating Capacity - Btuh	13,000	19,200	26,000	34,000
	Total Unit Power - kW	1.6	2.3	3.0	4.0
	COP	2.34	2.40	2.46	2.46
Gas Heating Options - See page 8		**Standard (1 Stage)**	**Standard (2 Stage) or Medium (2 Stage)**	**Standard (2 Stage), Medium (2 Stage) or High (2 Stage)**	
Compressor Type (one per unit)		Two-Stage Scroll	Two-Stage Scroll	Two-Stage Scroll	Two-Stage Scroll
Outdoor Coil	Net face area - sq. ft.	15.6	15.6	19.3	28.0
	Tube diameter - in.	3/8	3/8	3/8	3/8
	Number of rows	2	2	2	2
	Fins / inch	20	20	20	20
Outdoor Coil Fan	Motor - (No.) HP	(1) 1/3	(1) 1/3	(1) 1/3	(1) 1/3
	Motor rpm	725/500	775/650	850/700	930/785
	Total Motor Input - watts	165/60	193/125	251/140	236/145
	Diameter - (No.) in. / No. of blades	24 - 3	24 - 3	24 - 3	24 - 3
	Total air volume - cfm	3340/2240	3500/2970	4060/3330	4135/3385
Indoor Coil	Net face area - sq. ft.	7.8	7.8	9.7	9.7
	Tube diameter - in.	3/8	3/8	3/8	3/8
	Number of rows	3	3	3	4
	Fins / inch	14	14	14	14
	Drain Connection (no.) and size - in.	(1) 1 NPT	(1) 1 NPT	(1) 1 NPT	(1) 1 NPT
	Expansion device type	Balanced Port Thermostatic Expansion Valve, removable power head			
Indoor Blower	Nominal Motor HP	0.33	0.50	0.75	1
	Wheel nom. diameter x width - in.	(1) 10 x 10	(1) 10 x 10	(1) 10 x 10	(1) 11 x 10
Filters	Type	Disposable		Disposable	
	Number and size - in.	(4) 16 x 20 x 2		(4) 20 x 20 x 2	
Electrical Characteristics - 60 hz		208/230V 1 phase	208/230V 1 phase 208/230V, 460V & 575V 3 phase	208/230V 1 phase 208/230V, 460V & 575V 3 phase	208/230V 1 phase 208/230V, 460V & 575V 3 phase

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

[1] AHRI Certified to AHRI Standard 210/240:
Cooling Ratings - 95°F outdoor air temperature and 80°F db/67°F wb entering indoor coil air.
High Temperature Heating Ratings - 47°F db/43°F wb outdoor air temperature and 70°F entering indoor coil air.
Low Temperature Heating Ratings - 17°F db/15°F wb outdoor air temperature and 70°F entering indoor coil air.

[2] Sound Rating Number (SRN) rated in accordance with test conditions included in AHRI Standard 270-95.

SPECIFICATIONS - BELT DRIVE BLOWER

General Data		Nominal Tonnage	3 Ton	4 Ton	5 Ton
		Model No.	**KDB036H4T**	**KDB048H4T**	**KDB060H4T**
		Efficiency Type	High	High	High
		Blower Type	Two Speed Belt Drive	Two Speed Belt Drive	Two Speed Belt Drive
Cooling Performance		Gross Cooling Capacity - Btuh	36,200	47,600	59,600
		[1] Net Cooling Capacity - Btuh	35,000	46,000	57,500
		AHRI Rated Air Flow - cfm	1200	1600	1800
		[2] Sound Rating Number (SRN) (dBA)	75	77	77
		Total Unit Power - kW	3.0	3.8	4.9
		[1] SEER (Btuh/Watt) - 208/230V	15.0	15.0	15.0
		[1] SEER (Btuh/Watt) - 460V/575V	14.8	14.8	15.0
		[1] EER (Btuh/Watt) - 208/230V	12.0	12.0	12.0
		[1] EER (Btuh/Watt) - 460V/575V	11.8	11.9	11.8
Refrigerant		Type	R-410A	R-410A	R-410A
		Charge Furnished	12 lbs. 13 oz.	14 lbs. 0 oz.	20 lbs. 0 oz.
Heating Performance		Total High Heating Capacity - Btuh	35,000	46,000	59,000
		Total Unit Power - kW	2.8	3.5	4.7
		[1] COP	3.64	3.82	3.64
		HSPF - Region IV (Region V)	8.30	8.30	8.30
		Total Low Heating Capacity - Btuh	19,200	26,000	34,000
		Total Unit Power - kW	2.3	3.0	4.0
		[1] COP	2.22	2.38	2.46
Gas Heating Options - See page 8			**Standard (2 Stage) or Medium (2 Stage)**	**Standard (2 Stage), Medium (2 Stage) or High (2 Stage)**	
Compressor Type (one per unit)			Two-Stage Scroll	Two-Stage Scroll	Two-Stage Scroll
Outdoor Coil		Net face area - sq. ft.	15.6	19.3	28.0
		Tube diameter - in. - Number of rows	3/8 - 2	3/8 - 2	3/8 - 2
		Fins / inch	20	20	20
Outdoor Coil Fan		Motor - (No.) HP	1/3	1/3	1/3
		Motor rpm	775/650	850/700	930/785
		Total Motor Input - watts	195/125	251/140	235/145
		Diameter - (No.) in. / No. of blades	24 - 3	24 - 3	24 - 3
		Total air volume - cfm	3500/2970	4060/3330	4135/3385
Indoor Coil		Net face area - sq. ft.	7.8	9.7	9.7
		Tube diameter - in. - Number of rows	3/8 - 3	3/8 - 3	3/8 - 3
		Fins / inch	14	14	14
		Drain Connection (no.) and size - in.	(1) 1 NPT	(1) 1 NPT	(1) 1 NPT
		Expansion device type	Balanced Port Thermostatic Expansion Valve, removable power head		
[3] **Indoor Blower & Drive Selection**		Nominal Motor HP	0.75 hp (low), 1 hp (high)	0.75 hp (low), 2 hp (high)	1 hp (low), 2 hp (high)
		Maximum Usable Motor HP	0.86 hp (low), 1.15 hp (high)	0.86 hp (low), 2.3 hp (high)	1.15 hp (low), 2.3 hp (high)
		Available Drive Kits	A01 low 449-673 high 673-1010 A05 low 598-897 high 897-1346	A02 low 497-673 high 745-1117 A06 low 714-953 high 1071-1429	A03 low 555-833 high 833-1250 A07 low 808-1032 high 1212-1548
		Wheel nominal diameter x width - in.	(1) 10 x 10	(1) 10 x 10	(1) 10 x 10
Filters		Type	Disposable	Disposable	
		Number and size - in.	(4) 16 x 20 x 2	(4) 20 x 20 x 2	
Electrical Characteristics - 60 hz			208/230V, 460V & 575V 3 phase	208/230V, 460V & 575V 3 phase	208/230V, 460V & 575V 3 phase

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

[1] AHRI Certified to AHRI Standard 210/240:
Cooling Ratings - 95°F outdoor air temperature and 80°F db/67°F wb entering indoor coil air.
High Temperature Heating Ratings - 47°F db/43°F wb outdoor air temperature and 70°F entering indoor coil air.
Low Temperature Heating Ratings - 17°F db/15°F wb outdoor air temperature and 70°F entering indoor coil air.

[2] Sound Rating Number (SRN) rated in accordance with test conditions included in ARI Standard 270-95.

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

SPECIFICATIONS - GAS HEAT - THREE PHASE MODELS

Model No.		036, 048, 060	036, 048, 060	048, 060
Heat Input Type		**Standard (2 Stage)**	**Medium (2 Stage)**	**High (2 Stage)**
Input Btuh	1st Stage	53,000	81,000	113,000
	2nd Stage	70,000	108,000	150,000
Output Btuh	1st Stage	43,000	65,000	90,000
	2nd Stage	57,000	86,000	120,000
Temperature Rise Range - °F	1st stage	5 - 35	25 - 55	30 - 60
	2nd Stage	15 - 45	30 - 70	45 - 75
[1] Thermal Efficiency		80%	80%	80%
Gas Supply Connections		1/2 in. NPT		
Rec. Gas Supply Pressure - Nat./ LPG		7 in.w.g. / 11 in.w.g.		

[1] Thermal Efficiency at full input.

SPECIFICATIONS - LOW NOX GAS HEAT - SINGLE AND THREE PHASE MODELS

Model No.		024	036, 048, 060	036, 048, 060	048, 060
Heat Input Type		**Standard (1 Stage)**	**Standard (2 Stage)**	**Medium (2 Stage)**	**High (2 Stage)**
Input Btuh	1st Stage	65,000	53,000	81,000	113,000
	2nd Stage	- - -	70,000	108,000	150,000
Output Btuh	1st Stage	52,000	43,000	66,000	92,000
	2nd Stage	- - -	57,000	87,000	121,000
Temperature Rise Range - °F	1st stage	35 - 65	5 - 35	25 - 55	30 - 60
	2nd Stage	- - -	15 - 45	30 - 70	45 - 75
[1] AFUE (single phase)		81%	81%	81%	81%
[2] Thermal Efficiency (three phase)		- - -	81%	81%	81%
Gas Supply Connections		1/2 in. NPT			
Rec. Gas Supply Pressure - Nat./ LPG		7 in.w.g. / 11 in.w.g.			

[1] Annual Fuel Utilization Efficiency based on U.S. DOE test procedures and FTC labeling regulations - 1 phase models only.

[2] Thermal Efficiency at full input.

HIGH ALTITUDE DERATE

NOTE - Units may be installed at altitudes up to 2000 ft. above sea level without any modifications. At altitudes above 2000 ft. units must be derated to match information in the table shown. At altitudes above 4500 ft. unit must be derated 2% for each 1000 ft. above sea level.
NOTE - This is the only permissible derate for these units.

Heat Input Type	Altitude Feet	Gas Manifold Pressure in. w.g.		Input Rate (Btuh)
		Natural Gas	LPG/ Propane	
Standard (1 stage)	2001 - 4500	3.0	9.0	60,000
Standard (2 stage)	2001 - 4500	3.0/1.7	9.0/5.1	65,000 / 49,000
Medium (2 stage)	2001 - 4500	3.0/1.7	9.0/5.1	100,000 / 75,000
High (2 stage)	2001 - 4500	3.0/1.7	9.0/5.1	139,000 / 104,000

BLOWER DATA - DIRECT DRIVE - HIGH EFFICIENCY 2 TON

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

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 19.
2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 19.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					**KDB024H4E**
0.0	635	728	918	1121	1336
0.1	547	689	861	1071	1290
0.2	433	607	806	1031	1253
0.3	371	528	749	986	1212
0.4	280	460	677	927	1166
0.5	217	380	605	868	1120
0.6	- - -	- - -	548	819	1071
0.7	- - -	- - -	491	773	1029
0.8	- - -	- - -	442	714	983
0.9	- - -	- - -	393	653	929
1.0	- - -	- - -	- - -	604	879
HORIZONTAL					**KDB024H4E**
0.0	602	715	908	1096	1302
0.1	509	663	852	1057	1263
0.2	413	588	793	1007	1227
0.3	340	507	736	964	1189
0.4	266	438	679	918	1142
0.5	220	355	620	864	1100
0.6	- - -	- - -	560	809	1061
0.7	- - -	- - -	500	752	1015
0.8	- - -	- - -	444	706	964
0.9	- - -	- - -	390	661	913
1.0	- - -	- - -	352	612	872

BLOWER DATA - DIRECT DRIVE - HIGH EFFICIENCY 3 TON

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

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 19.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 19.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					**KDB036H4E**
0.0	893	1035	1375	1600	1840
0.1	838	965	1330	1574	1780
0.2	768	895	1277	1543	1748
0.3	705	800	1253	1505	1712
0.4	645	750	1200	1473	1677
0.5	575	690	1150	1435	1638
0.6	- - -	- - -	1095	1390	1608
0.7	- - -	- - -	1052	1345	1577
0.8	- - -	- - -	1004	1302	1528
0.9	- - -	- - -	950	1260	1491
1.0	- - -	- - -	900	1218	1455
HORIZONTAL					**KDB036H4E**
0.0	900	1045	1379	1599	1810
0.1	828	970	1305	1549	1749
0.2	777	900	1264	1504	1718
0.3	702	800	1216	1479	1677
0.4	635	750	1173	1434	1649
0.5	553	685	1131	1399	1622
0.6	- - -	- - -	1078	1359	1577
0.7	- - -	- - -	1038	1315	1544
0.8	- - -	- - -	986	1280	1509
0.9	- - -	- - -	933	1236	1471
1.0	- - -	- - -	885	1196	1438

BLOWER DATA - DIRECT DRIVE - HIGH EFFICIENCY 4 TON

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

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 19.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 19.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					**KDB048H4E**
0.0	1225	1310	1561	2015	2168
0.1	1167	1254	1514	1995	2143
0.2	1112	1203	1473	1977	2126
0.3	1052	1145	1424	1942	2097
0.4	1000	1098	1387	1917	2078
0.5	939	1040	1343	1888	2049
0.6	894	996	1300	1854	2020
0.7	840	941	1250	1819	1991
0.8	780	883	1201	1787	1952
0.9	734	839	1159	1749	1914
1.0	681	784	1115	1704	1856
HORIZONTAL					**KDB048H4E**
0.0	1185	1265	1504	1983	2120
0.1	1130	1213	1467	1957	2098
0.2	1085	1171	1432	1932	2077
0.3	1035	1125	1395	1906	2054
0.4	978	1069	1347	1870	2023
0.5	929	1023	1304	1841	1992
0.6	880	977	1267	1811	1962
0.7	822	920	1224	1776	1931
0.8	764	863	1175	1740	1900
0.9	718	820	1133	1710	1869
1.0	549	712	1096	1652	1772

BLOWER DATA - DIRECT DRIVE - HIGH EFFICIENCY 5 TON

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

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 19.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 19.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					**KDB060H4E**
0.0	1351	1405	1801	1982	2339
0.1	1303	1359	1769	1956	2310
0.2	1254	1314	1736	1928	2281
0.3	1206	1268	1703	1900	2253
0.4	1158	1222	1669	1870	2224
0.5	1109	1177	1634	1838	2195
0.6	1061	1131	1598	1806	2166
0.7	1012	1085	1561	1772	2137
0.8	964	1040	1524	1736	2108
0.9	915	994	1486	1700	2080
1.0	867	949	1446	1662	2051
HORIZONTAL					**KDB60H4E**
0.0	1329	1353	1728	1886	2206
0.1	1284	1320	1708	1872	2189
0.2	1239	1285	1685	1859	2174
0.3	1193	1258	1661	1832	2157
0.4	1147	1218	1636	1814	2135
0.5	1100	1178	1608	1796	2118
0.6	1052	1125	1579	1770	2102
0.7	1004	1085	1548	1743	2080
0.8	955	1044	1516	1716	2058
0.9	906	991	1481	1689	2036
1.0	856	938	1445	1654	2020

BLOWER DATA - BELT DRIVE 3 TON

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

FOR ALL UNITS ADD:

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

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

See page 19 for blower motors and drives and page 19 for wet coil and options/accessory air resistance data.

DOWNFLOW **KDB036H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	447	0.09	517	0.12	589	0.15	663	0.17	739	0.19	815	0.20	883	0.23	938	0.25
800	465	0.10	534	0.14	605	0.17	678	0.19	753	0.21	825	0.23	890	0.25	946	0.27
900	486	0.12	554	0.16	623	0.20	695	0.22	767	0.23	836	0.25	897	0.28	953	0.30
1000	508	0.15	576	0.19	643	0.22	713	0.24	783	0.26	848	0.28	907	0.30	961	0.33
1100	533	0.18	599	0.22	665	0.25	733	0.27	800	0.28	863	0.31	919	0.34	971	0.36
1200	560	0.21	625	0.25	689	0.28	755	0.30	820	0.32	879	0.34	932	0.37	983	0.40
1300	591	0.24	654	0.28	716	0.31	779	0.33	841	0.35	897	0.38	948	0.41	996	0.44
1400	631	0.26	690	0.30	748	0.34	807	0.36	864	0.39	916	0.42	964	0.46	1011	0.49
1500	676	0.28	729	0.33	782	0.36	835	0.40	887	0.43	935	0.47	981	0.50	1028	0.54
Air Volume cfm	**External Static - in. w.g.**															
	0.90		**1.00**		**1.10**		**1.20**		**1.30**		**1.40**		**1.50**		**1.60**	
	RPM	**BHP**	**RPM**	**BHP**	**RPM**	**BHP**	**RPM**	**BHP**	**RPM**	**BHP**	**RPM**	**BHP**	**RPM**	**BHP**	**RPM**	**BHP**
700	988	0.27	1039	0.29	1088	0.31	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
800	996	0.30	1047	0.32	1098	0.34	1144	0.36	1185	0.39	1224	0.42	- - -	- - -	- - -	- - -
900	1004	0.33	1055	0.35	1106	0.37	1152	0.40	1193	0.43	1232	0.46	1269	0.49	1305	0.52
1000	1011	0.36	1062	0.38	1111	0.41	1157	0.43	1199	0.47	1238	0.50	1276	0.53	1311	0.56
1100	1020	0.39	1070	0.41	1118	0.44	1163	0.47	1206	0.51	1245	0.54	1282	0.58	1318	0.61
1200	1031	0.43	1079	0.45	1127	0.48	1171	0.52	1213	0.55	1252	0.59	1289	0.62	1324	0.66
1300	1044	0.47	1091	0.49	1137	0.53	1181	0.56	1221	0.60	1259	0.64	1296	0.68	1330	0.71
1400	1058	0.51	1105	0.54	1150	0.57	1191	0.61	1231	0.65	1268	0.69	1303	0.73	1337	0.77
1500	1074	0.56	1120	0.59	1163	0.63	1203	0.67	1241	0.71	1277	0.75	1312	0.79	1345	0.82

BLOWER DATA - BELT DRIVE — 3 TON

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

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).
See page 19 for blower motors and drives and page 19 for wet coil and options/accessory air resistance data.

HORIZONTAL — **KDB036H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	445	0.08	516	0.11	591	0.13	670	0.15	753	0.16	820	0.19	870	0.22	918	0.24
800	463	0.09	534	0.12	608	0.14	685	0.16	766	0.18	830	0.21	878	0.24	926	0.27
900	485	0.11	554	0.14	627	0.16	703	0.18	780	0.21	841	0.23	888	0.27	935	0.30
1000	509	0.13	578	0.16	649	0.19	722	0.21	796	0.23	854	0.26	900	0.29	947	0.33
1100	537	0.16	605	0.19	674	0.21	744	0.24	813	0.26	868	0.29	913	0.33	959	0.36
1200	567	0.19	633	0.22	700	0.24	768	0.27	833	0.30	884	0.33	928	0.37	974	0.40
1300	599	0.22	664	0.25	729	0.28	793	0.30	853	0.33	902	0.37	945	0.41	990	0.44
1400	634	0.26	697	0.29	758	0.31	819	0.34	875	0.38	921	0.42	964	0.46	1008	0.49
1500	669	0.30	730	0.33	789	0.36	846	0.39	897	0.42	941	0.47	983	0.51	1028	0.54

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	969	0.27	1021	0.29	1071	0.32	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
800	977	0.29	1030	0.32	1082	0.34	1128	0.37	1169	0.40	1205	0.42	- - -	- - -	- - -	- - -
900	986	0.32	1039	0.35	1090	0.37	1137	0.40	1177	0.43	1214	0.46	1248	0.49	1280	0.51
1000	997	0.35	1048	0.38	1098	0.41	114	0.44	1184	0.47	1221	0.50	1255	0.53	1287	0.56
1100	1008	0.39	1059	0.41	1107	0.44	1150	0.47	1191	0.51	1228	0.54	1263	0.57	1295	0.60
1200	1022	0.43	1071	0.45	1117	0.48	1160	0.52	1200	0.55	1237	0.59	1271	0.62	1303	0.66
1300	1037	0.47	1058	0.50	1130	0.53	1171	0.57	1210	0.60	1246	0.64	1280	0.68	1312	0.71
1400	1054	0.52	1100	0.54	1144	0.58	1183	0.62	1221	0.66	1256	0.70	1290	0.73	1321	0.77
1500	1073	0.57	1117	0.60	1159	0.64	1197	0.67	1234	0.71	1268	0.75	1301	0.79	1332	0.83

BLOWER DATA - BELT DRIVE 4 TON

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

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).
See page 19 for blower motors and drives and page 19 for wet coil and options/accessory air resistance data.

DOWNFLOW **KDB048H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	466	0.10	525	0.14	586	0.17	646	0.20	729	0.20	821	0.19	899	0.20	953	0.23
1000	484	0.12	543	0.16	603	0.19	664	0.22	745	0.23	834	0.23	908	0.24	959	0.26
1100	505	0.15	563	0.18	622	0.22	682	0.25	762	0.26	847	0.26	917	0.27	966	0.30
1200	527	0.18	584	0.21	643	0.25	702	0.28	779	0.30	860	0.30	927	0.31	973	0.34
1300	550	0.21	607	0.25	664	0.29	722	0.32	797	0.33	875	0.34	937	0.35	981	0.38
1400	574	0.25	630	0.29	687	0.32	744	0.35	817	0.37	890	0.38	949	0.39	991	0.42
1500	603	0.28	659	0.32	714	0.36	770	0.39	839	0.41	907	0.42	962	0.44	1002	0.47
1600	651	0.29	703	0.33	754	0.37	806	0.41	867	0.43	927	0.45	976	0.48	1014	0.51
1700	708	0.30	754	0.34	800	0.38	846	0.42	898	0.46	949	0.49	992	0.53	1028	0.57
1800	764	0.31	804	0.36	844	0.40	884	0.45	927	0.49	970	0.54	1008	0.58	1044	0.63
1900	812	0.34	847	0.39	881	0.44	916	0.49	953	0.54	990	0.59	1025	0.64	1061	0.69
2000	857	0.42	889	0.47	920	0.52	952	0.57	986	0.62	1020	0.68	1055	0.73	1091	0.77

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
1000	996	0.31	1034	0.35	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
1100	1001	0.34	1040	0.38	1083	0.42	1128	0.46	1176	0.49	- - -	- - -	- - -	- - -	- - -	- - -
1200	1008	0.38	1047	0.42	1089	0.46	1133	0.49	1180	0.53	1224	0.56	1261	0.60	- - -	- - -
1300	1017	0.42	1055	0.46	1097	0.50	1139	0.53	1184	0.57	1228	0.60	1264	0.63	1295	0.67
1400	1026	0.46	1065	0.50	1106	0.54	1147	0.57	1191	0.61	1233	0.64	1269	0.68	1300	0.71
1500	1038	0.51	1076	0.55	1117	0.59	1157	0.62	1199	0.65	1240	0.69	1275	0.72	1305	0.76
1600	1050	0.56	1089	0.60	1129	0.64	1168	0.67	1209	0.71	1249	0.74	1282	0.78	1312	0.82
1700	1065	0.61	1103	0.65	1142	0.69	1181	0.73	1221	0.76	1259	0.80	1292	0.83	1320	0.88
1800	1081	0.67	1118	0.71	1156	0.75	1194	0.79	1234	0.82	1271	0.86	1302	0.90	1330	0.94
1900	1098	0.73	1135	0.77	1172	0.81	1209	0.85	1248	0.88	1284	0.92	1314	0.97	1341	1.01
2000	1128	0.82	1164	0.86	1201	0.89	1239	0.93	1276	0.97	1310	1.01	1336	1.06	1362	1.10

BLOWER DATA - BELT DRIVE — 4 TON

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

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).
See page 19 for blower motors and drives and page 19 for wet coil and options/accessory air resistance data.

HORIZONTAL — **KDB048H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	464	0.10	514	0.13	576	0.15	644	0.17	728	0.18	817	0.19	893	0.21	951	0.24
1000	482	0.12	533	0.15	595	0.17	662	0.19	744	0.21	829	0.22	902	0.24	957	0.27
1100	504	0.14	556	0.17	617	0.20	683	0.22	762	0.24	843	0.25	912	0.28	965	0.31
1200	528	0.17	581	0.20	641	0.23	706	0.25	782	0.27	859	0.29	924	0.31	974	0.34
1300	556	0.21	609	0.24	669	0.26	731	0.29	804	0.31	877	0.33	938	0.35	985	0.38
1400	592	0.24	645	0.27	702	0.30	763	0.32	830	0.35	898	0.37	953	0.39	997	0.43
1500	641	0.26	692	0.29	746	0.33	801	0.36	862	0.38	921	0.41	970	0.44	1011	0.48
1600	696	0.28	743	0.32	792	0.35	842	0.39	894	0.42	945	0.45	988	0.49	1027	0.53
1700	750	0.31	792	0.35	836	0.39	880	0.43	924	0.47	968	0.51	1007	0.55	1043	0.59
1800	799	0.35	837	0.39	875	0.43	913	0.48	952	0.52	990	0.56	1026	0.61	1061	0.65
1900	840	0.40	873	0.45	907	0.49	941	0.54	976	0.58	1011	0.63	1045	0.67	1080	0.72
2000	883	0.48	913	0.53	944	0.57	976	0.62	1009	0.67	1043	0.71	1078	0.76	1112	0.8

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	995	0.28	1034	0.31	1077	0.35	1121	0.38	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
1000	999	0.31	1038	0.34	1081	0.38	1124	0.41	1168	0.44	1211	0.47	- - -	- - -	- - -	- - -
1100	1006	0.34	1044	0.38	1086	0.41	1129	0.44	1171	0.47	1213	0.50	1253	0.53	1293	0.56
1200	1014	0.38	1052	0.42	1093	0.45	1135	0.48	1176	0.51	1217	0.54	1257	0.58	1296	0.61
1300	1023	0.42	1061	0.46	1102	0.50	1143	0.53	1184	0.56	1224	0.59	1263	0.62	1302	0.66
1400	1035	0.47	1073	0.51	1112	0.54	1153	0.57	1193	0.61	1232	0.64	1271	0.67	1309	0.71
1500	1048	0.52	1086	0.56	1125	0.59	1164	0.63	1204	0.66	1243	0.69	1280	0.73	1317	0.77
1600	1063	0.57	1100	0.61	1139	0.65	1178	0.68	1216	0.71	1254	0.75	1291	0.79	1326	0.83
1700	1079	0.63	1116	0.67	1154	0.71	1192	0.74	1230	0.78	1267	0.81	1302	0.85	1337	0.89
1800	1097	0.69	1133	0.73	1171	0.77	1209	0.80	1246	0.84	1281	0.88	1315	0.92	1349	0.96
1900	1116	0.76	1152	0.80	1189	0.84	1226	0.87	1262	0.91	1296	0.95	1329	0.99	1361	1.03
2000	1148	0.84	1183	0.88	1220	0.92	1257	0.96	1291	1.00	1323	1.04	1354	1.08	1385	1.12

BLOWER DATA - BELT DRIVE 5 TON

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

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).
See page 19 for blower motors and drives and page 19 for wet coil and options/accessory air resistance data.

DOWNFLOW **KDB060H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	512	0.15	571	0.19	630	0.23	690	0.26	770	0.26	854	0.26	922	0.27	970	0.30
1200	535	0.18	593	0.22	651	0.26	710	0.30	788	0.30	868	0.30	933	0.31	978	0.34
1300	559	0.22	616	0.26	674	0.29	732	0.34	807	0.34	883	0.34	944	0.35	987	0.38
1400	584	0.26	641	0.29	698	0.33	755	0.37	827	0.37	899	0.38	956	0.40	997	0.43
1500	615	0.29	671	0.33	726	0.36	782	0.41	850	0.41	917	0.42	970	0.44	1009	0.47
1600	665	0.30	716	0.34	768	0.38	819	0.44	879	0.44	937	0.46	985	0.49	1022	0.52
1700	723	0.31	768	0.35	814	0.39	860	0.47	910	0.47	959	0.50	1001	0.54	1037	0.58
1800	779	0.32	818	0.37	857	0.41	897	0.50	939	0.50	980	0.55	1018	0.59	1054	0.64
1900	826	0.36	859	0.41	894	0.45	928	0.56	964	0.56	1000	0.61	1036	0.66	1072	0.70
2000	857	0.42	889	0.47	920	0.52	952	0.62	986	0.62	1020	0.68	1055	0.73	1091	0.77
2100	878	0.49	909	0.54	940	0.59	973	0.70	1006	0.70	1041	0.75	1076	0.80	1112	0.85
2200	897	0.55	929	0.61	961	0.66	994	0.78	1028	0.78	1063	0.83	1099	0.89	1134	0.93
2300	918	0.62	950	0.68	983	0.74	1017	0.86	1052	0.86	1087	0.92	1122	0.97	1157	1.02
2400	941	0.70	974	0.77	1008	0.83	1042	0.96	1077	0.96	1111	1.01	1146	1.06	1181	1.11

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	1006	0.35	1045	0.39	1089	0.43	1134	0.46	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
1200	1013	0.38	1053	0.42	1095	0.46	1139	0.50	1186	0.53	1230	0.57	1266	0.60	- - -	- - -
1300	1022	0.42	1062	0.46	1104	0.50	1146	0.54	1192	0.57	1234	0.60	1269	0.64	1301	0.68
1400	1033	0.47	1072	0.51	1114	0.55	1155	0.58	1199	0.61	1240	0.65	1275	0.68	1305	0.72
1500	1045	0.52	1085	0.56	1125	0.60	1165	0.63	1208	0.66	1248	0.69	1281	0.73	1311	0.77
1600	1059	0.57	1098	0.61	1138	0.65	1177	0.68	1218	0.71	1257	0.75	1290	0.79	1319	0.83
1700	1074	0.62	1113	0.66	1152	0.70	1190	0.74	1231	0.77	1268	0.80	1299	0.84	1328	0.89
1800	1091	0.68	1129	0.72	1167	0.76	1205	0.80	1244	0.83	1280	0.87	1310	0.91	1338	0.95
1900	1109	0.75	1146	0.79	1183	0.82	1221	0.86	1260	0.90	1294	0.94	1323	0.98	1349	1.02
2000	1128	0.82	1164	0.86	1201	0.89	1239	0.93	1276	0.97	1310	1.01	1336	1.06	1362	1.10
2100	1148	0.89	1185	0.93	1221	0.97	1258	1.01	1294	1.05	1325	1.09	1351	1.14	1376	1.19
2200	1170	0.97	1206	1.01	1242	1.05	1277	1.09	1311	1.14	1341	1.18	1365	1.23	1390	1.28
2300	1193	1.06	1228	1.09	1262	1.14	1295	1.19	1327	1.24	1355	1.29	1380	1.33	1406	1.37
2400	1216	1.15	1250	1.19	1282	1.24	1313	1.30	1343	1.36	1371	1.40	1396	1.44	1423	1.48

BLOWER DATA - BELT DRIVE — 5 TON

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

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).
See page 19 for blower motors and drives and page 19 for wet coil and options/accessory air resistance data.

HORIZONTAL — **KDB060H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	509	0.15	562	0.18	624	0.20	691	0.22	771	0.24	852	0.25	919	0.28	970	0.31
1200	535	0.18	589	0.21	650	0.23	715	0.25	792	0.27	869	0.29	932	0.32	980	0.35
1300	564	0.21	618	0.24	678	0.27	741	0.29	815	0.31	887	0.33	946	0.36	991	0.39
1400	604	0.24	657	0.27	715	0.30	775	0.33	842	0.35	908	0.37	962	0.40	1004	0.43
1500	656	0.26	706	0.30	760	0.33	814	0.36	874	0.39	931	0.41	979	0.45	1019	0.48
1600	712	0.29	758	0.32	807	0.36	855	0.39	906	0.43	955	0.46	997	0.50	1035	0.54
1700	766	0.32	808	0.36	850	0.40	892	0.44	936	0.47	978	0.51	1016	0.56	1052	0.60
1800	814	0.36	851	0.40	888	0.44	925	0.49	963	0.53	1000	0.57	1035	0.62	1071	0.66
1900	853	0.41	886	0.46	919	0.50	952	0.55	986	0.60	1021	0.64	1056	0.69	1091	0.73
2000	883	0.48	913	0.53	944	0.57	976	0.62	1009	0.67	1043	0.71	1078	0.76	1112	0.80
2100	906	0.56	936	0.60	967	0.65	999	0.70	1033	0.75	1067	0.79	1101	0.84	1135	0.88
2200	930	0.64	960	0.68	991	0.73	1024	0.78	1058	0.83	1092	0.88	1126	0.92	1160	0.96
2300	954	0.72	985	0.77	1017	0.82	1051	0.87	1085	0.92	1119	0.96	1152	1.00	1186	1.04
2400	981	0.81	1013	0.86	1046	0.91	1079	0.96	1113	1.00	1180	1.05	1180	1.09	1213	1.13

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	1010	35.00	1049	0.38	1091	0.42	1134	0.45	1176	0.78	1218	0.51	1258	0.54	1297	0.57
1200	1019	0.38	1058	0.42	1099	0.46	1141	0.49	1182	0.52	1223	0.55	1263	0.58	1302	0.61
1300	1030	0.43	1068	0.47	1108	0.50	1149	0.53	1190	0.56	1230	0.59	1270	0.63	1308	0.66
1400	1042	0.47	1080	0.51	1120	0.55	1160	0.58	1200	0.61	1240	0.65	1278	0.68	1315	0.72
1500	1056	0.53	1094	0.57	1133	0.60	1172	0.63	1212	0.67	250	0.70	1288	0.74	1324	0.77
1600	1071	0.58	1109	0.62	1147	0.66	1186	0.69	1225	0.72	1263	0.76	1299	0.80	1334	0.83
1700	1088	0.64	1126	0.68	1164	0.72	1202	0.75	1240	0.78	1276	0.82	1311	0.86	1345	0.90
1800	1107	0.70	1143	0.74	1181	0.78	1219	0.81	1256	0.85	1290	0.89	1324	0.93	1357	0.97
1900	1126	0.77	1163	0.81	1200	0.85	1237	0.88	1273	0.92	1306	0.96	1339	1.00	1371	1.04
2000	1148	0.84	1183	0.88	1220	0.92	1257	0.96	1291	1.00	1323	1.04	1354	1.08	1385	1.12
2100	1170	0.92	1206	0.96	1242	1.00	1277	1.04	1310	1.08	1340	1.13	1370	1.17	1401	1.21
2200	1195	1.00	1230	1.04	1265	1.08	1299	1.13	1330	1.18	1359	1.23	1388	1.27	1418	1.31
2300	1220	1.08	1254	1.13	1288	1.17	1320	1.23	1350	1.28	1378	1.34	1406	1.38	1435	1.42
2400	1245	1.18	1278	1.22	1311	1.28	1341	1.33	1370	1.40	1397	1.45	1425	1.50	1454	1.54

BLOWER DATA

BELT DRIVE KIT SPECIFICATIONS

Model No.	Motor HP		No. of Speeds	Drive Kits and RPM Range					
	Nominal	Maximum		A01	A02	A03	A05	A06	A07
036	0.75	0.86	2	low 449-673 high 673-1010	- - -	- - -	- - -	- - -	- - -
	1	1.15	2	- - -	- - -	- - -	low 598-897 high 897-1346	- - -	- - -
048	0.75	0.86	2	- - -	low 497-673 high 745-1117	- - -	- - -	- - -	- - -
	2	2.3	2	- - -	- - -	- - -	- - -	low 714-953 high 1071-1429	- - -
060	1	1.15	2			low 555-833 high 833-1250			
	2	2.3	2						low 808-1032 high 1212-1548

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

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

Air Volume cfm	Wet Indoor Coil		Gas Heat		Economizer	Filters	
	024 036, 048	060	Medium Input	High Input		MERV 8	MERV 13
800	0.01	0.01	0.02	0.02	0.04	0.04	0.05
1000	0.02	0.01	0.02	0.02	0.04	0.04	0.07
1200	0.02	0.01	0.02	0.02	0.04	0.04	0.07
1400	0.03	0.02	0.02	0.03	0.04	0.04	0.07
1600	0.04	0.03	0.03	0.04	0.04	0.04	0.07
1800	0.05	0.04	0.03	0.05	0.05	0.05	0.07
2000	0.06	0.05	0.04	0.06	0.05	0.05	0.08
2200	0.08	0.06	0.04	0.07	0.05	0.05	0.08
2400	0.09	0.07	0.05	0.08	0.05	0.05	0.08
2600	0.10	0.08	0.05	0.09	0.06	0.05	0.08
2800	0.11	0.09	0.06	0.10	0.06	0.05	0.08
3000	0.13	0.10	0.07	0.11	0.06	0.05	0.08

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

Air Volume cfm	RTD9-65S Step–Down Diffuser			FD9-65S Flush Diffuser
	2 Ends Open	1 Side & 2 Ends Open	All Ends & Sides Open	
800	0.15	0.13	0.11	0.11
1000	0.19	0.16	0.14	0.14
1200	0.25	0.20	0.17	0.17
1400	0.33	0.26	0.20	0.20
1600	0.43	0.32	0.20	0.24
1800	0.56	0.40	0.30	0.30
2000	0.73	0.50	0.36	0.36
2200	0.95	0.63	0.44	0.44

CEILING DIFFUSER AIR THROW DATA

Air Volume - cfm	1 Effective Throw - ft.	
Model No.	RTD9-65S	FD9-65S
800	10 - 17	14 - 18
1000	10 - 17	15 - 20
1200	11 - 18	16 - 22
1400	12 - 19	17 - 24
1600	12 - 20	18 - 25
1800	13 - 21	20 - 28
2000	14 - 23	21 - 29
2200	16 - 25	22 - 30

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

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure - in. w.g.	Air Volume Exhausted cfm
0.00	2000
0.05	1990
0.10	1924
0.15	1810
0.20	1664
0.25	1507
0.30	1350
0.35	1210

ELECTRICAL DATA — 2 - 3 TON

DIRECT DRIVE BLOWER		KDB024H	KDB036H			
[1] Voltage - 60hz		208/230V - 1 Ph	208/230V - 1 Ph	208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor 1	Rated Load Amps	11.7	15.3	11.6	5.7	4
	Locked Rotor Amps	58.3	83	73	38	25.6
Outdoor Fan Motors (1)	Full Load Amps (total)	2.8	2.8	2.8	1.4	1.1
Power Exhaust (1) 0.33 HP	Full Load Amps (total)	2.4	2.4	2.4	1.3	1
Service Outlet 115V GFI (amps)		15	15	15	15	20
Indoor Blower Motor	Horsepower	0.33	0.50	0.50	0.50	0.50
	Type	Direct	Direct	Direct	Direct	Direct
	Full Load Amps	2.6	4.6	4.6	2.3	1.8
[2] Maximum Overcurrent Protection	Unit Only	30	40	30	15	15
	with (1) 0.33 HP Power Exhaust	- - -	40	35	15	15
[3] Minimum Circuit Ampacity	Unit Only	21	27	22	11	8
	with (1) 0.33 HP Power Exhaust	- - -	29	25	13	9
ELECTRICAL ACCESSORIES						
Disconnect	Standard Access	**20W15**	**20W15**	**20W15**	**20W15**	**20W15**
	Hinged Access	**20W21**	**20W21**	**20W21**	**20W21**	**20W21**

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 — 4 TON

DIRECT DRIVE BOWER - KDB048H

[1] Voltage - 60hz		208/230V - 1 Ph	208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor	Rated Load Amps	21.2	14	6.4	4.6
	Locked Rotor Amps	104	83.1	41	33
Outdoor Fan Motors (1)	Full Load Amps (total)	2.8	2.8	1.4	1.1
Power Exhaust (1) 0.33 HP	Full Load Amps (total)	2.4	2.4	1.3	1
Service Outlet 115V GFI (amps)		15	15	15	20
Indoor Blower Motor	Horsepower	0.75	0.75	0.75	0.75
	Type	Direct	Direct	Direct	Direct
	Full Load Amps	6.3	6.3	3.2	2.5
[2] Maximum Overcurrent Protection	Unit Only	50	40	15	15
	with (1) 0.33 HP Power Exhaust	50	40	20	15
[3] Minimum Circuit Ampacity	Unit Only	36	27	13	10
	with (1) 0.33 HP Power Exhaust	38	29	14	11
ELECTRICAL ACCESSORIES					
Disconnect	Standard Access	**20W18**	**20W18**	**20W18**	**20W18**
	Hinged Access	**20W24**	**20W24**	**20W24**	**20W24**

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 — 5 TON

DIRECT DRIVE BOWER - KDB060H

[1] Voltage - 60hz		208/230V - 1 Ph	208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor	Rated Load Amps	27.1	16.5	7.2	5.5
	Locked Rotor Amps	152.9	110	52	38.9
Outdoor Fan Motors (1)	Full Load Amps (total)	2.8	2.8	1.4	1.1
Power Exhaust (1) 0.33 HP	Full Load Amps (total)	2.4	2.4	1.3	1
Service Outlet 115V GFI (amps)		15	15	15	20
Indoor Blower Motor	Horsepower	1	1	1	1
	Type	Direct	Direct	Direct	Direct
	Full Load Amps	7.4	7.4	3.7	3.0
[2] Maximum Overcurrent Protection	Unit Only	70	45	20	15
	with (1) 0.33 HP Power Exhaust	70	45	20	15
[3] Minimum Circuit Ampacity	Unit Only	45	31	15	11
	with (1) 0.33 HP Power Exhaust	47	34	16	12

ELECTRICAL ACCESSORIES

Disconnect	Standard Access	**20W18**	**20W18**	**20W18**	**20W18**
	Hinged Access	**20W24**	**20W24**	**20W24**	**20W24**

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 — 3 TON

BELT DRIVE BLOWER - KDB036H

[1] Voltage - 60hz		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	11.6		5.7		4	
	Locked Rotor Amps	73		38		25.6	
Outdoor Fan Motors (1)	Full Load Amps (total)	2.8		1.4		1.1	
Power Exhaust (1) 0.33 HP	Full Load Amps (total)	2.4		1.3		1	
Service Outlet 115V GFI (amps)		15		15		20	
Indoor Blower Motor	Horsepower	0.75	1	0.75	1	0.75	1
	Type	Belt	Belt	Belt	Belt	Belt	Belt
	Full Load Amps	3.5	4.6	1.6	2.1	1.3	1.7
[2] Maximum Overcurrent Protection	Unit Only	30	30	15	15	15	15
	with (1) 0.33 HP Power Exhaust	30	35	15	15	15	15
[3] Minimum Circuit Ampacity	Unit Only	21	22	11	11	8	8
	with (1) 0.33 HP Power Exhaust	24	25	12	12	9	9

ELECTRICAL ACCESSORIES

Disconnect	Standard Access	**20W15**	**20W15**	**20W15**	**20W15**
	Hinged Access	**20W21**	**20W21**	**20W21**	**20W21**

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 — 4 TON

BELT DRIVE BLOWER - KDB048H

[1] Voltage - 60hz		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	14		6.4		4.6	
	Locked Rotor Amps	83.1		41		33	
Outdoor Fan Motors (1)	Full Load Amps (total)	2.8		1.4		1.1	
Power Exhaust (1) 0.33 HP	Full Load Amps (total)	2.4		1.3		1	
Service Outlet 115V GFI (amps)		15		15		20	
Indoor Blower Motor	Horsepower	0.80	2	0.75	2	0.75	2
	Type	Belt	Belt	Belt	Belt	Belt	Belt
	Full Load Amps	3.5	7.5	1.6	3.4	1.3	2.7
[2] Maximum Overcurrent Protection	Unit Only	35	40	15	15	15	15
	with (1) 0.33 HP Power Exhaust	40	40	15	20	15	15
[3] Minimum Circuit Ampacity	Unit Only	24	28	11	13	9	10
	with (1) 0.33 HP Power Exhaust	27	31	13	15	10	11

ELECTRICAL ACCESSORIES

Disconnect	Standard Access	**20W18**	**20W18**	**20W18**	**20W18**
	Hinged Access	**20W24**	**20W24**	**20W24**	**20W24**

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 — 5 TON

BELT DRIVE BLOWER - KDB060H

[1] Voltage - 60hz		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	16.5		7.2		5.5	
	Locked Rotor Amps	110		52		38.9	
Outdoor Fan Motors (1)	Full Load Amps (total)	2.8		1.4		1.1	
Power Exhaust (1) 0.33 HP	Full Load Amps (total)	2.4		1.3		1	
Service Outlet 115V GFI (amps)		15		15		20	
Indoor Blower Motor	Horsepower	1	2	1	2	1	2
	Type	Belt	Belt	Belt	Belt	Belt	Belt
	Full Load Amps	4.6	7.5	2.1	3.4	1.7	2.7
[2] Maximum Overcurrent Protection	Unit Only	40	45	15	20	15	15
	with (1) 0.33 HP Power Exhaust	45	45	20	20	15	15
[3] Minimum Circuit Ampacity	Unit Only	29	31	13	14	10	11
	with (1) 0.33 HP Power Exhaust	31	34	14	16	11	12

ELECTRICAL ACCESSORIES

Disconnect	Standard Access	**20W18**	**20W18**	**20W18**	**20W18**
	Hinged Access	**20W24**	**20W24**	**20W24**	**20W24**

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.

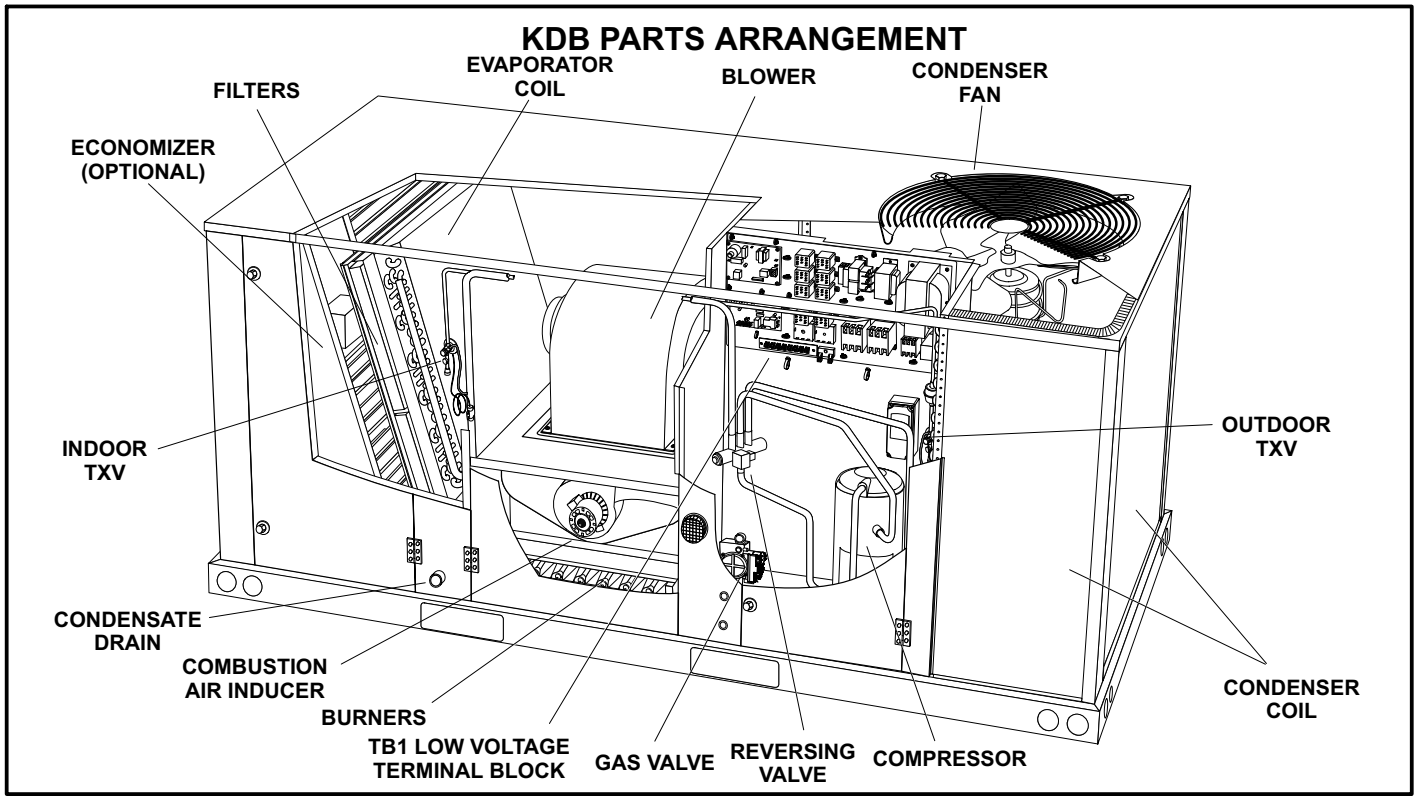


FIGURE 1

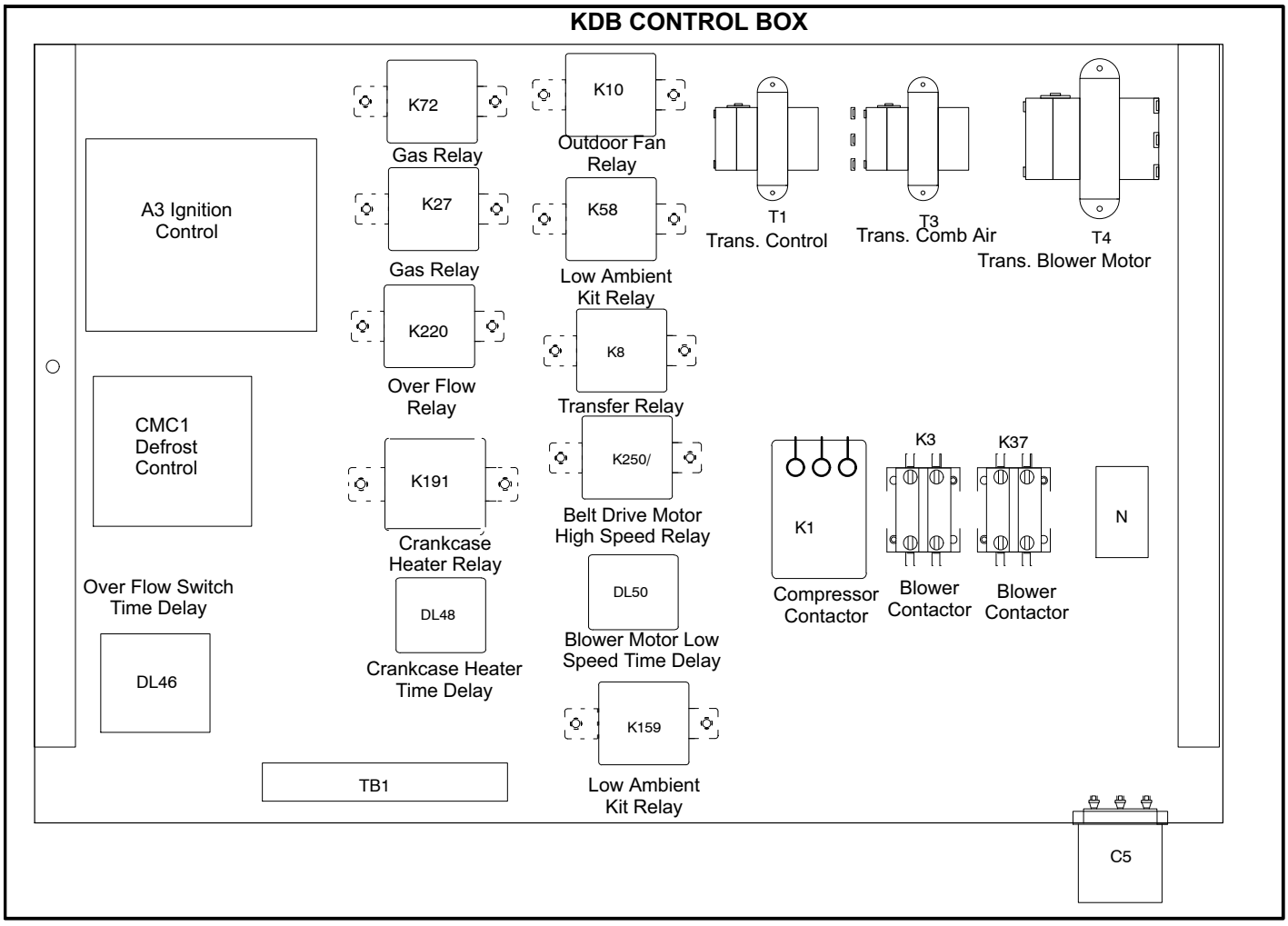


FIGURE 2

I-UNIT COMPONENTS

All 2 through 5 ton units are built to order units (BTO). The KDB unit components are shown in figure 1. All units come standard with removable unit panels. All L1, L2, and L3 wiring is color coded; L1 is red, L2 is yellow, and L3 is blue.

A-Control Box Components

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

1-Control Transformer T1

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

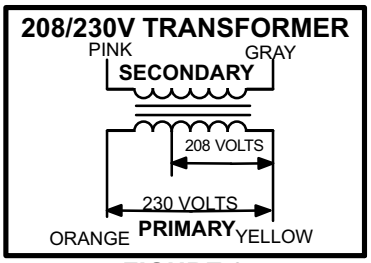


FIGURE 3

2-C. A. I. Transformers T3 (G, J voltage)

All (G) 460 and 575 (J) voltage units use transformer T3 mounted in the control box. The transformers have an output rating of 0.75A. T3 transformer supplies 230 VAC power to the combustion air inducer motor (B6).

3-Transformer T4 (G & J)

All (G) 460 and (J) 575 voltage direct drive units use transformer T4 mounted in the control box. T4 is a line voltage to 230V transformer to power the indoor blower. It is connected to line voltage and is powered at all times.

4-Low Ambient Kit Relay K58, K159 (with low ambient switches S11 & S185)

Y1 or Y2 energizes K58. When liquid pressure rises to 300±10 psig, S185 closes sending 24VAC through the N.C. K159-2 contacts energizing condenser fan B1 on extra low speed. (Y1, or Y2 demand).

When liquid pressure rises to 450±10 psig, S11 closes, energizing K159. 24VAC energizes K159-9 (Y1) and K159-7 (Y2). Condenser fan runs at low speed with Y1 demand, and runs at high speed with demand Y2.

5-Blower Delay DL50 (belt drive units only)

DL50 causes a 1.5 second delay switching from high speed to low speed to allow the blower to slow down before energizing low speed windings.

6-Condenser Fan Relay K10

Outdoor fan relay K10 is an optional DPDT relay with a 24VAC coil. K10 energizes condenser fan B4.

7-Terminal Strip TB1

All indoor thermostat connections will be to TB1 located in the control box. Thermostats without “occupied “ and “unoccupied” modes and installed with economizer or motorized outdoor air equipped units, should have a jumper across terminals “R“ and “OC”.

8-Transfer Relay K8

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

9-Compressor Contactor K1

In all KDB units, K1 energizes compressors B1 in response to thermostat demand. Three phase units use three pole double break contactors with a 24 volt coil. Single phase units use single pole double break contactors with a 24 volt coil.

10-Relay K250 (belt drive units only)

Relay K250 passes the “G” signal to contactor K3 energizing the blower on low speed. On a Y2 call K250 passes the signal to K37 energizing the blower on high speed. L34 is energized by CMC1 (Y2-out), when there is Y2 or W1 thermostat call.

11-Blower Contactor K37 (belt drive units only)

On two-speed operation K37 acts as the high speed blower contactor and K3 acts as the low speed contactor in response to blower demand.

12-Blower Contactor K3 (belt drive units only)

On three phase units, K3 is a two pole double-break contactor with a 24VAC coil. K3 energizes the indoor blower motor B3 in response to blower demand.

13-Crankcase Heater Delay DL48 & Crankcase Heater Relay K191

Delay DL48 and relay K191 keep crankcase heater de-energized during and immediately following compressor shut down. They ensure the crankcase heater is off while compressor is energized.

14-Gas Relay K72 (two stage units)

Relay K72 is normally closed and controls combustion air inducer B6. K72 switches the inducer B6 to high speed in response to two stage heat demand.

15-Transfer 2 Relay K27

K27 relay is a two-pole relay with a 24V coil and is energized with a W2 heating thermostat demand. 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-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 main control box (see figure 2) houses the burner control A3.

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 1). 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 2 for thermostat terminations and table 3 for heating component terminations.

Flame rectification sensing is used on all 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.

TABLE 1

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.

TABLE 2

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 3

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

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 20 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, roll-out 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 45 seconds begins along with a 180 second blower off delay.

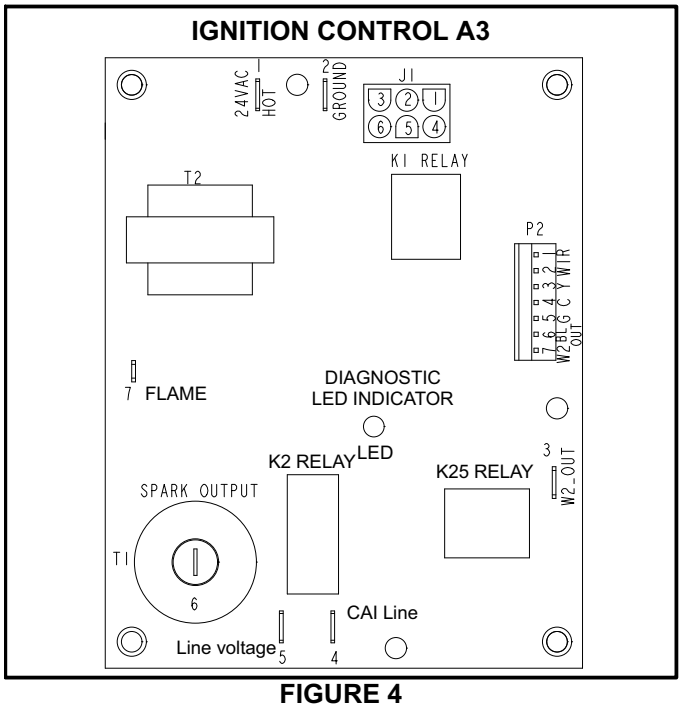


FIGURE 4

17-Defrost Control CMC1

The defrost system includes three components: an outdoor coil / outdoor ambient sensor, defrost thermostat and a defrost control. See unit wiring diagram to determine which controls are used in each unit. Optional controls are identified on wiring diagrams by arrows at junction points.

The defrost control ensures that the heat pump outdoor coil does not ice excessively during the heating mode. The defrost control uses input from the outdoor coil sensor and ambient temperature sensor on 100135 series defrost control boards.

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

Series 100135 (Figure 5)

After 34 minutes of heating mode operation, if the difference between the ambient temperature (RT13) and the coil temperature (RT21) is higher than the maximum difference allowed by the control, the defrost control will initiate defrost. The defrost control will also initiate defrost after 6 hours of heating mode operation when coil temperatures remain below 35°F (2°C). The defrost cycle ends when the coil temperature is higher than the termination temperature (50°F default) or after 14 minutes of operation. If the defrost is terminated by the 14-minute timer, another defrost cycle will be initiated after 34 minutes of run time.

Note - *The defrost termination temperature can be adjusted to 50, 70, 90 or 100°F. The jumper termination pin is factory-set at 50°F (10°C). If the temperature jumper is not installed, the default termination temperature is 90°F (32°C). See figure 5.*

Ambient and Coil Temperature Sensors (RT13, RT21)

Both sensors provide input to the defrost control which cycles defrost. The ambient sensor is located on the inside of the corner mullion on the back of the outdoor coil section. The coil sensor is located on a return bend on the front of the outdoor coil.

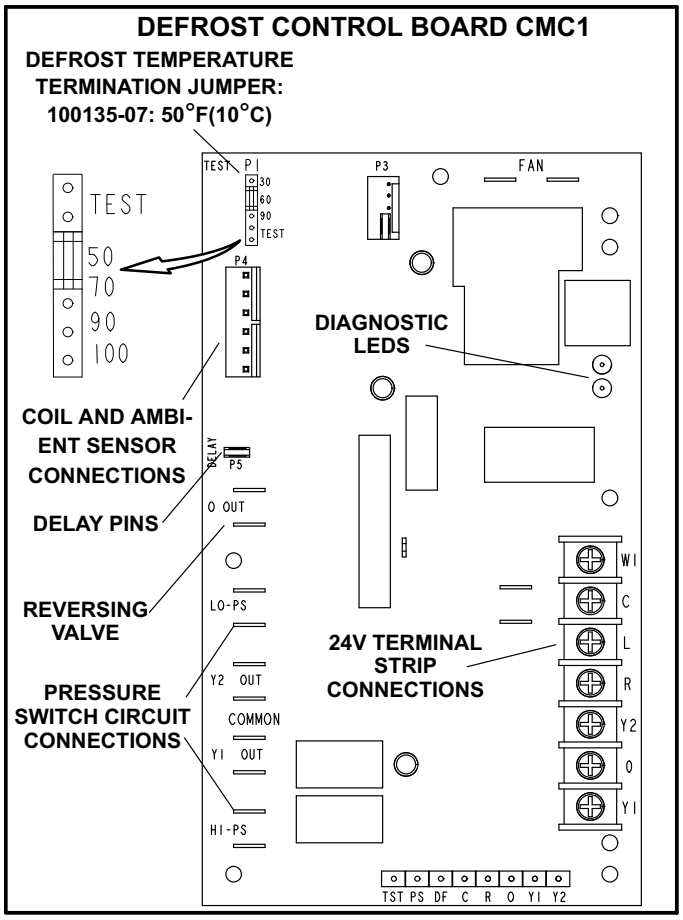


FIGURE 5

Defrost Test Option

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

Diagnostic LEDs

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

TABLE 1

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

B-Cooling Components

All units use independent cooling circuits consisting of separate compressor, condenser coil and evaporator coil. See figure 6. One draw-through type condenser fan is used in KDB024-060 units. Units are equipped with belt-drive or direct drive blowers which draw air across the evaporator during unit operation.

Cooling may be supplemented by a factory- or field-installed economizer. The evaporator coil is slab type and uses a thermostatic expansion valve or fixed orifice assembly as the primary refrigerant metering device. Each evaporator is also equipped with enhanced fins and rifled tubing. In all units each compressor is protected by a freezestat (S49) on the evaporator coil and a high pressure switch (S4) on the discharge line. See figure 6. Low ambient switches (S11) and (S185) are available as a field accessory for additional compressor protection.

1-Compressor B1

⚠IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

All KDB024/060 units use one scroll compressor. See "SPECIFICATIONS" and "ELECTRICAL DATA" (table of contents) or compressor nameplate for compressor specifications.

⚠ WARNING

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

Each compressor is energized by a corresponding compressor contactor.

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

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

⚠IMPORTANT

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

2-Freezestat S49

Each unit is equipped with a low temperature switch (freezestat) located on a return bend of each evaporator coil.

The freezestat is wired in series with the compressor contactor K1. The 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 temperature rises.

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

3-High Pressure Switch S4

The high pressure switch is an auto reset SPST N.C. switch which opens on a pressure rise.

S4 is located in the compressor discharge line and wired in series with the compressor contactor coil.

When discharge pressure rises to 640 ± 20 psig (4412 ± 138 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate). When discharge pressure drops to 475 ± 30 psig (3275 ± 206 kPa), the switch closes.

4-Low Ambient Switches S11 & S185 (option)

The low ambient switches are auto-reset SPST N.O. pressure switches which allow for mechanical cooling operation at low outdoor temperatures. In all models the switches are installed on a valve depressor tee, which is located in each liquid line prior to the indoor coil section and wired in series with outdoor fan relay K10 coil.

S185 opens at 180 ± 10 psig, and closes at 300 ±10 psig. S11 opens at 240 ± 10 psig, and closes at 450 ±10 psig.

When liquid pressure rises to 300 ±10 psig, the S185 switch closes and the condenser fan runs at extra low speed (300 rpm). When liquid pressure rises to 450 ±10 psig, the S11 switch closes and the condenser fan runs normal cooling speed (low or high). When the liquid pressure drops to 240 ±10 psig, the S11 switch opens and the condenser fan runs at extra low speed (300rpm). When the liquid pressure drops to 180 ±10 psig, the S185 switch opens and the condenser fan is de-energized. This intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the evaporator coil and losing capacity.

5-Reversing Valve L1

A refrigerant reversing valve with a 24 volt solenoid coil is used to reverse refrigerant flow during unit operation in all 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 is controlled by the CMC1 board and transfer relay K8 in response to cooling demand or by defrost.

6-Condenser Fan Motor B4

See specifications section of this manual for specifications of condenser fan B4. B4 is energized by K10. All motors are ball bearing type variable speed EC motors. The fans may be removed for servicing and cleaning by removing the fan grilles.

7-Filter Drier (all units)

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

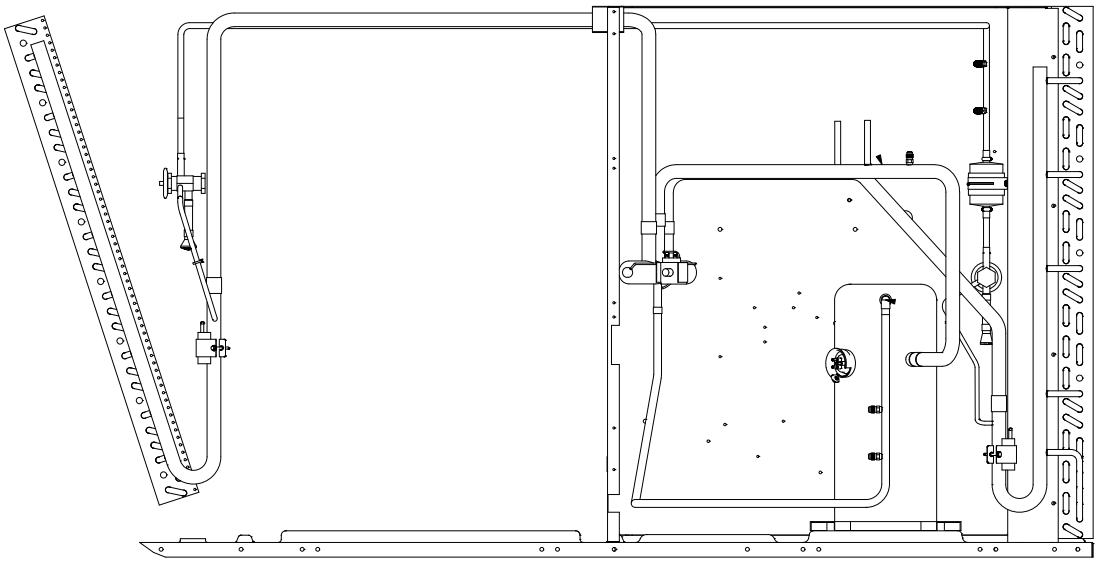
8-Crankcase Heater HR1

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

9-Crankcase Heater Delay DL48 & Crankcase Heater Relay K191

Delay DL48 and relay K191 keep crankcase heater de-energized during and immediately following compressor shut down. They ensure the crankcase heater is off while compressor is energized.

KDB PLUMBING and S49 FREEZESTAT LOCATION



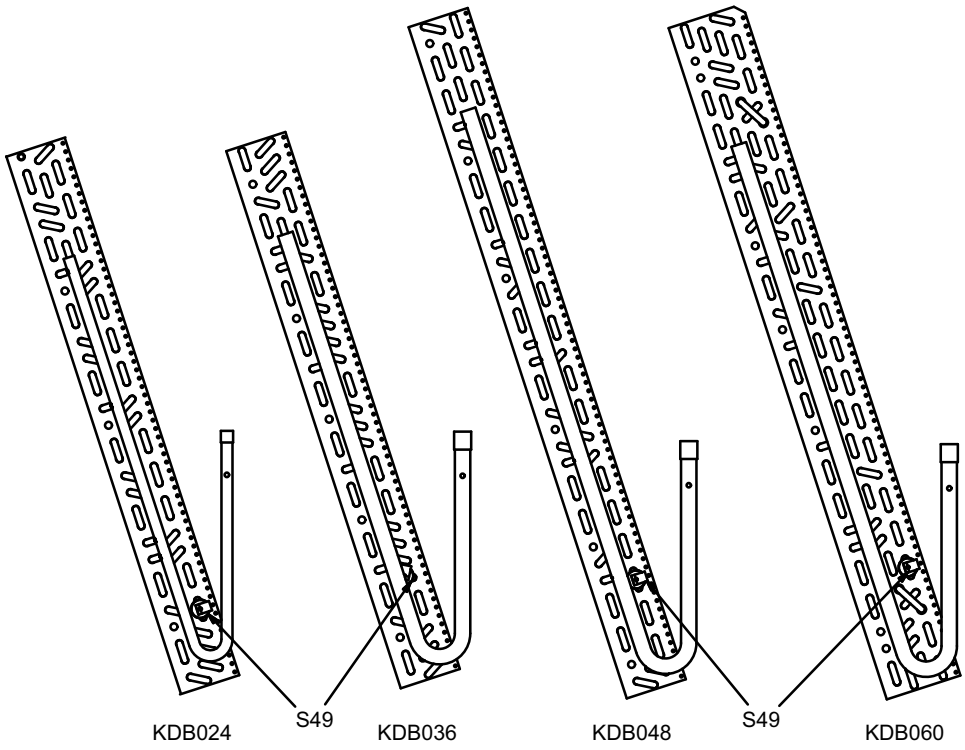


FIGURE 6

C-Blower Compartment

KDB024 is equipped with direct drive blowers only. The , 036, 048 and 060 units are equipped with either direct drive blowers or belt drive blowers. See unit nameplate for blower type. The blower compartment in all units is located between the evaporator coil and the compressor compartment.

1-Blower Wheels

KDB024, 036, 048 direct drive units and KDB036, 048, 060 belt drive units use 10" x 10" blower wheels. KDB060 direct drive units use 11" x 10" blower wheels.

2-Indoor Blower Motor B3

All direct drive units use single phase EC motors. Belt drive units use three phase motors (same as supply voltage).CFM adjustments on belt drive units are made by adjusting the motor pulley (sheave). CFM adjustments on direct drive units are made by changing speed taps. Motors are equipped with sealed ball bearings. All motor specifications are listed in the Specifications (table of contents) section 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 rating plate for information specific to your unit.

⚠IMPORTANT

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

A-Blower Operation

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

1- Blower operation is manually set at the thermostat 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.

Belt Drive Blowers

1- Loosen the reusable wire tie which secures the blower wiring to the blower motor mounting plate.

2- Remove and retain screws on either side of sliding frame. 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 on either side of the sliding frame.

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.

B-Determining Unit CFM - Direct Drive Blowers

1- The following measurements must be made with air filters in place.

2- With all access panels in place, measure static pressure external to unit (from supply to return). Add any additional air resistance for options and accessories shown in accessory air resistance tables. Blower performance data is based on static pressure readings taken in locations shown in figure 8.

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

3- Use figure 7 to determine the factory-set blower speed.

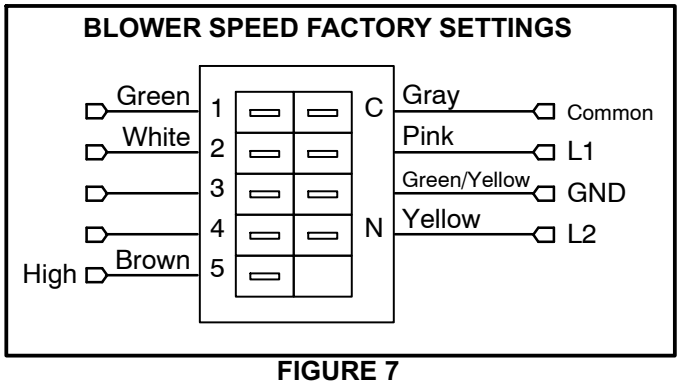


FIGURE 7

4- Use direct drive blower tables, the measured static pressure and the factory-set blower speed to determine CFM. If CFM is lower or higher than the design specified CFM, move the leads as shown in figure 7.

C-Determining Unit CFM - Belt Drive Blowers

IMPORTANT - Direct drive multi-tap ECM blower unit CFM is determined by the blower motor speed tap. 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 8.

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

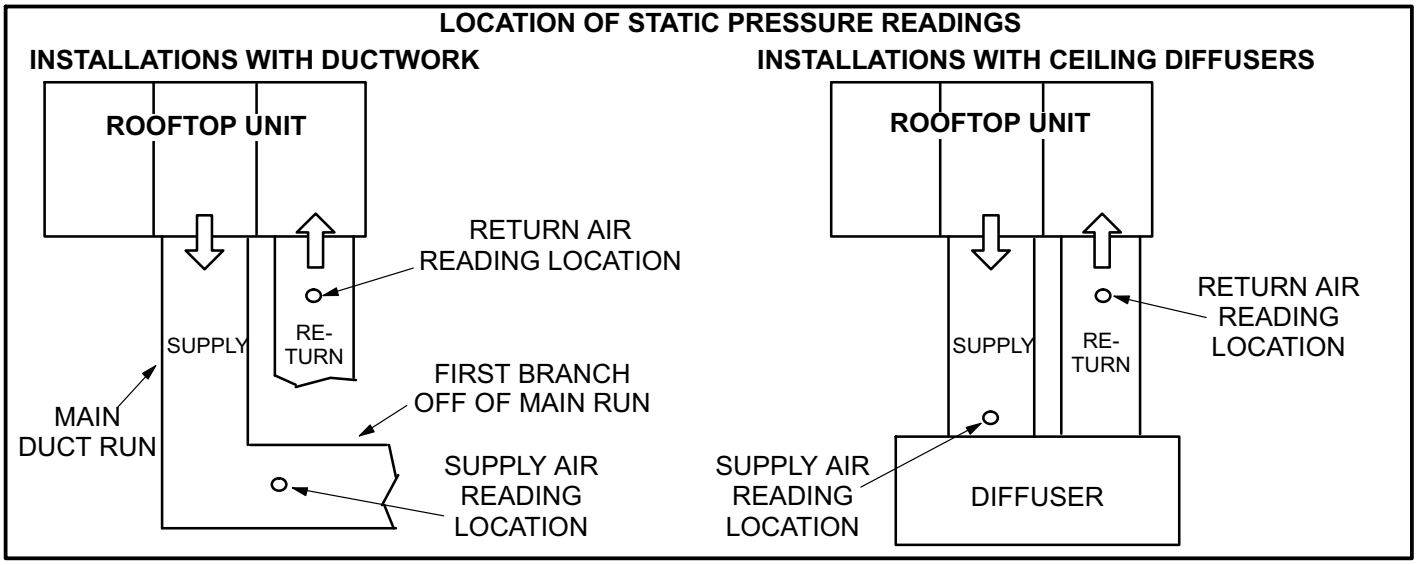


FIGURE 8

3- Referring to blower data tables (table of contents) use static pressure and RPM readings to determine unit CFM.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 10. Do not exceed minimum and maximum number of pulley turns as shown in table 4.

TABLE 4
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum Turns Open
A Section	0	5

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

D-Blower Belt Adjustment

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

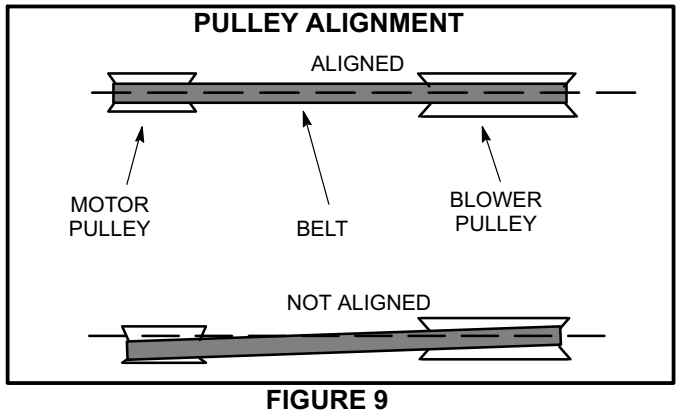


FIGURE 9

1- Loosen four bolts securing motor base to mounting frame. See figure 10.

2- *To increase belt tension -*
Slide blower motor downward to tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -
Slide blower motor upward to loosen the belt. This decreases the distance between the blower motor and the blower housing.

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

E-Check Belt Tension

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

1- Measure span length X. See figure 11.

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 new 2 and 3hp belt, the deflection force should be 5.0-7.0 lbs. (35-48kPa).

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

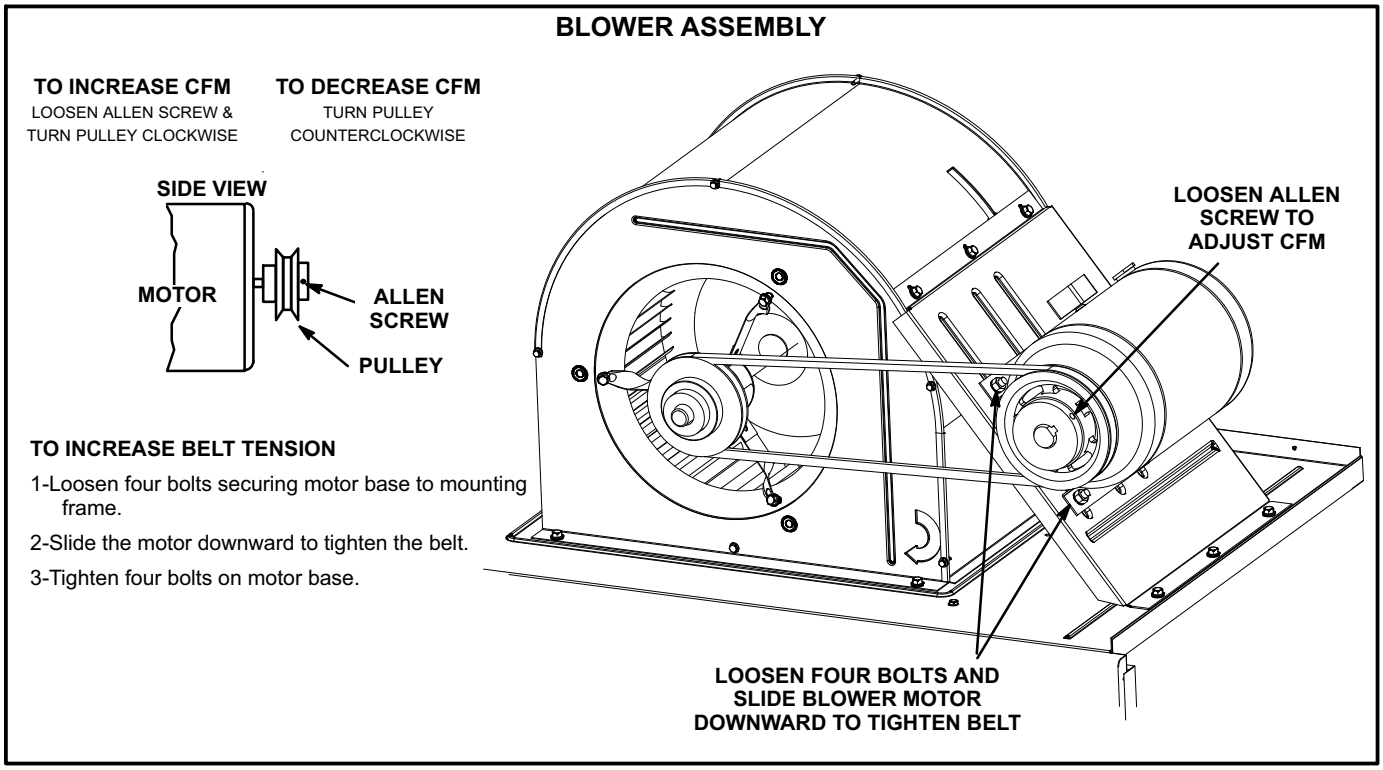


FIGURE 10

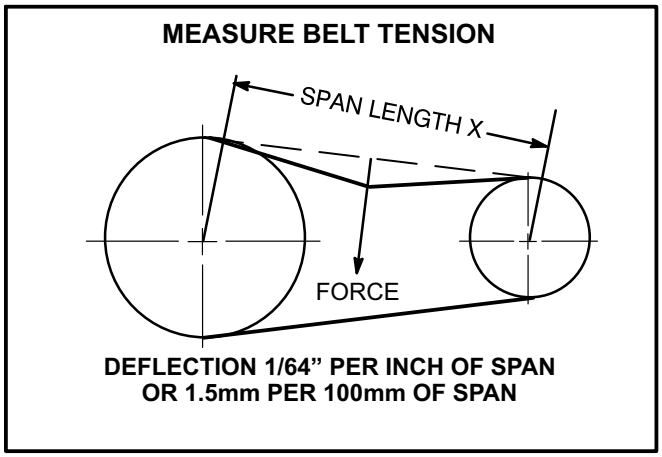


FIGURE 11

F-Field-Furnished Blower Drives

For field-furnished blower drives, use blower data tables to determine BHP and RPM required. Reference table 5 for drive component manufacturer's numbers.

TABLE 5
MANUFACTURER'S NUMBERS

	DRIVE COMPONENTS					
	MOTOR PULLEY		BLOWER PULLEY		BELTS	
Drive No.	Browning No.	OEM Part No.	Browning No.	OEM Part No.	Browning No.	OEM Part No.
A01	1VP34 X 7/8	31K6901	AK54 X 1	100244-19	A40	100245-17
A02	1VP34 X 7/8	31K6901	AK49 X 1	100244-18	A39	100245-16
A03	1VP34 X 7/8	31K6901	AK44X 1	100244-16	A39	100245-16
A04	1VP40 X 7/8	79J0301	AK49 X 1	100244-18	A41	100245-18
A05	1VP34 X 7/8	31K6901	AK41 X 1	100244-15	A39	100245-16
A06	1VP44 X 7/8	P-8-1488	AK51 X 1	18L2201	A41	100245-18
A07	1VP50 X 7/8	P-8-2187	AK54 X 1	100244-19	AX43	73K8201
A08	1VP44 X 7/8	P-8-1488	AK46 X 1	100244-17	A40	100245-17

D-GAS HEAT COMPONENTS

KDB024 units are available in single stage heat and 036, 048 and 060 are available in two-stage heat.

See Gas Heat Specifications for more detail.

1-Heat Exchanger Figure 12

The KDB units use aluminized steel inshot burners with tubular stainless steel heat exchangers and redundant gas valve. 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 on two stage units accomplish staging by allowing more or less gas to the burners as called for by heating demand.

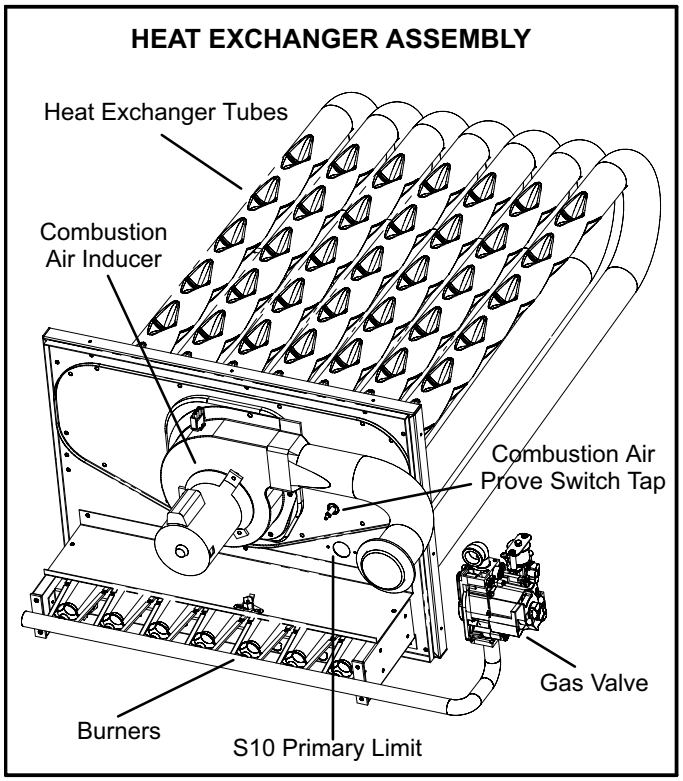


FIGURE 12

2-Burner Box Assembly (Figure 13)

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.

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.

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

Each orifice and burner are sized specifically to the unit. Refer to Lennox Repair Parts Listing for correct sizing information.

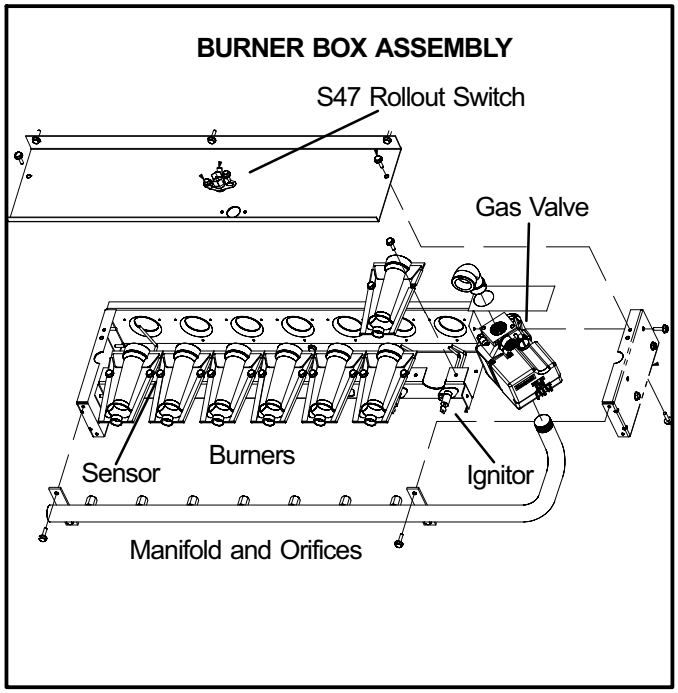


FIGURE 13

3-Primary High Temperature Limit S10

S10 is a SPST N.C. high temperature primary limit for gas heat in KDB024-060 units. S10 is located on the vestibule panel. See figure 12.

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. Limit set points are factory set and cannot be adjusted. See Lennox Repair Parts for set point and replacement.

4-Flame Rollout Limit Switch S47

Flame rollout 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 13). S47 is wired to the ignition control A3. When S47 senses flame rollout (indicating a blockage in the combustion air passages), the flame rollout limit trips, and the ignition control immediately closes the gas valve.

Limit S47 is factory preset to open at 340°F ± 16°F on a temperature rise on all units. All flame rollout limits are manual reset.

5-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 at *negative* 0.10"W.C. ± 0.05" (24.8 Pa ± 12.4 Pa) on 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.

6-Combustion Air Inducer B6

Combustion air inducers 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 5.24 in. x .96in. blower wheel. All motors operate at 3300RPM 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.

On two stage natural gas units the inducer will operate on low speed for first stage heat (W1) and ramp up to high speed for second stage heat (W2).

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

7-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.

8-Gas Valves GV1

KDB036, 048 and 060 units are equipped with a two stage gas valve. KDB024 units use a single stage gas valve only. 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).

Both valves are adjustable for manifold pressure. Figures 19 and 20 show gas valve components. Table 6 shows factory gas valve regulation for KDB series units.

TABLE 6

Operating Manifold Pressure			
Natural		L.P.	
Low	High	Low	High
2.0 ± 0.3" W.C.	3.5 ± 0.3" W.C.	5.9" ± 0.3" W.C	10.5" ± 0.5" W.C.

9-Spark Electrode (Ignitor) Figure 14

An electrode assembly is used for ignition spark. The electrode is mounted through holes under the right 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 14) and ignites the right burner. Flame travels from burner to burner until all are lit.

The spark electrode is connected to the ignition control by a 20 Ga nickel plated copper conductor. The wire uses 1/4" (6.35 mm)female quick connect on both ends of the wire.

NOTE - If electrode wire must be replaced, wire and suppression must be same type cable. See Lennox Repair Part Handbook for replacement.

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 14.

⚠IMPORTANT

In order to maximize spark energy to electrode, high voltage wire should touch unit cabinet as little as possible.

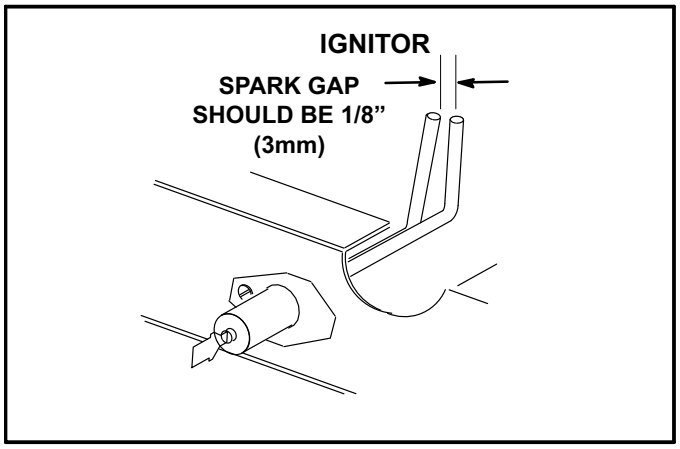


FIGURE 14

10-Flame Sensor Figure 15

A flame sensor is located under the left most side burner. The sensor is mounted through a hole in the burner support and the tip protrudes into the flame envelope of the left 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.

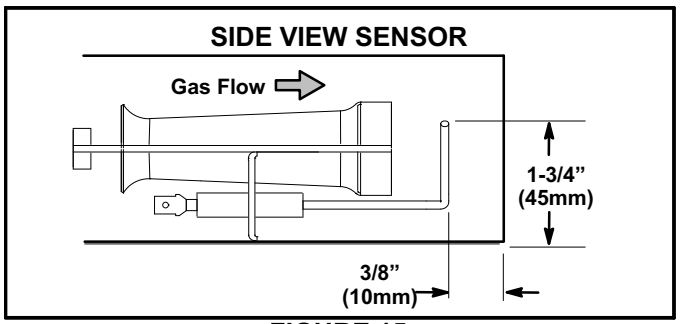


FIGURE 15

11-Balance Point Thermostat A19

A19 thermostat is an electronic temperature control. 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 16. See figure 17 for A19 location on 024-048 units and figure 18 for A19 location on 060 units.

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.

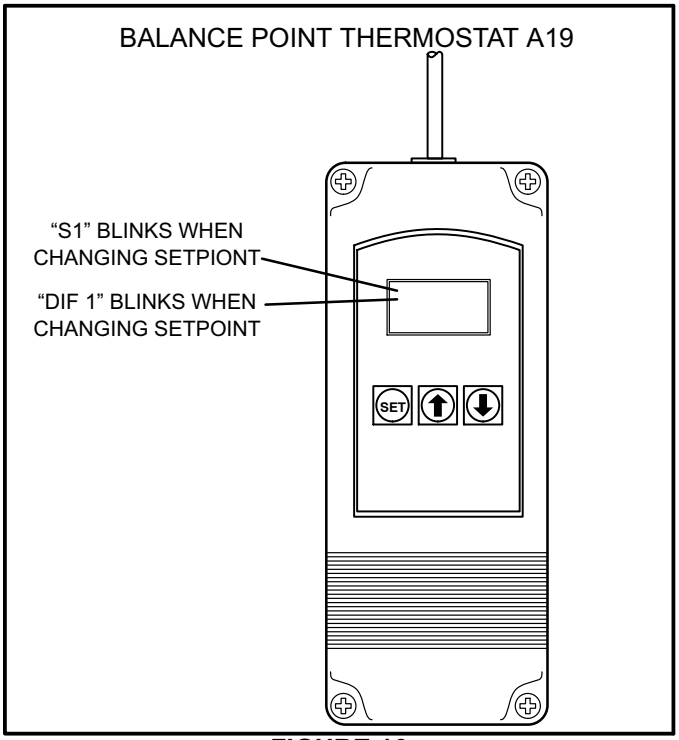


FIGURE 16

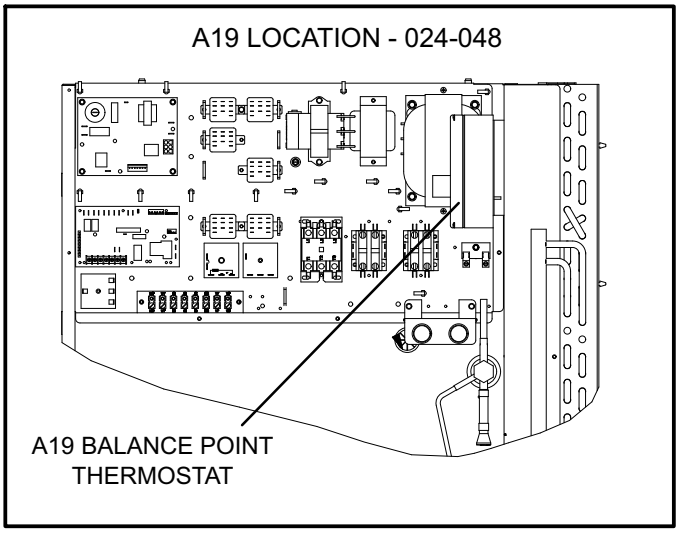


FIGURE 17

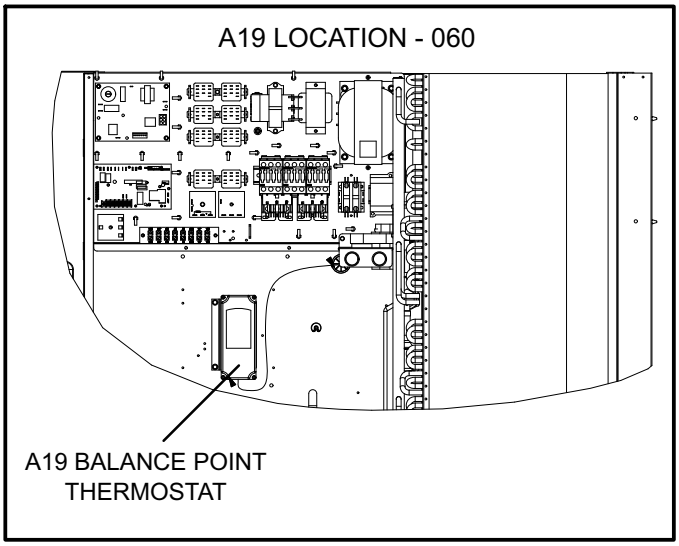


FIGURE 18

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 (C1CURB-A1 or K1CURB-AP1).

III-START UP - OPERATION

A-Preliminary and Seasonal Checks

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

2- Inspect all electrical wiring, both field and factory installed for loose connections. Tighten as required. Refer to unit diagram located on inside of unit compressor access panel.

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 balance point thermostat (A19) setpoint (35° F default) to enable heat pump operation.

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

A first-stage heating demand (W1) will energize the compressor. The outdoor fan is energized with a W1 demand.

Note - L1 reversing valve is 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-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.

The gas valve may be equipped with either a gas control lever or gas control knob. Use only your hand to push the lever or turn the gas control knob. Never use tools. If the the lever will not move or 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.

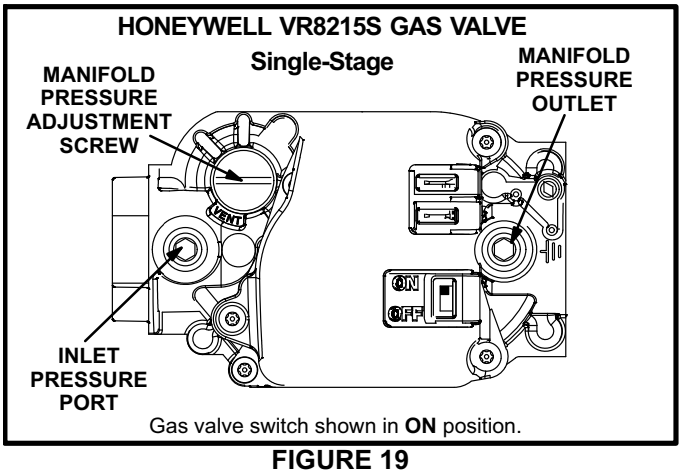
A-Placing Unit In Operation

⚠WARNING

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

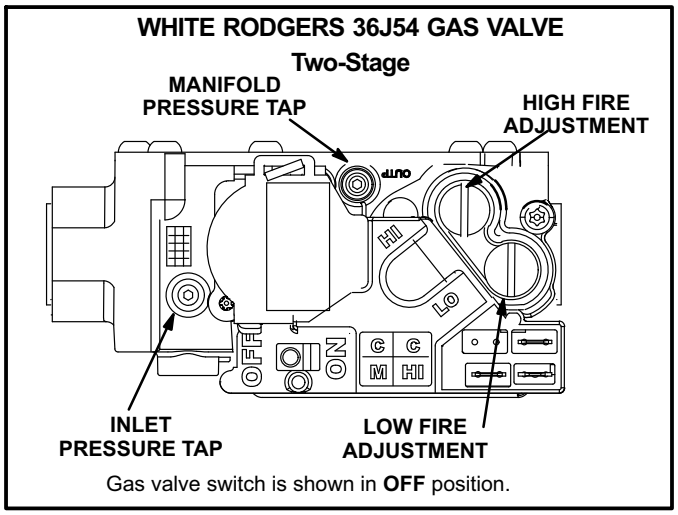
Gas Valve Operation (figures 19 and 20)

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



Gas valve switch shown in **ON** position.

FIGURE 19



Gas valve switch is shown in **OFF** position.

FIGURE 20

6- *Honeywell VR8215S Gas Valve with ON/OFF Lever* - Switch gas valve lever to **OFF**. See figure 19 .
7- *White Rodgers 36J54 Gas Valve with ON/OFF Lever* - Switch gas valve lever to **OFF.** See figure 20.

8- 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.

9- *Honeywell VR8215S Gas Valve with ON/OFF Lever* - Switch gas valve lever to **ON**. See figure 19 .

10- *White Rodgers 36J54 Gas Valve with ON/OFF Lever* - Switch gas valve lever to **ON.** See figure 20.

11- Close or replace the heat section access panel.

12- Turn on all electrical power to appliance.

13- Set thermostat to desired setting.

NOTE - When unit is initially started, steps 1 through 9 may need to be repeated to purge air from gas line.

14- 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- *Honeywell VR8215S, White Rodgers 36J54 Gas Valve with ON/OFF Lever* - Switch gas valve lever to **OFF**.

5- Close or replace the heat section access panel.

D-Cooling Start up

Operation

1- Initiate first and second stage cooling demands according to instructions provided with thermostat. See table 7 for operation.

2- Units contain one refrigerant circuit or stage.

Note - Units are equipped with two-stage compressors.

3- Unit is charged with R-410A refrigerant. See unit rating plate for correct amount of charge.

4- Refer to Refrigerant Charge and Check section for proper method to check refrigerant charge.

TABLE 7
COOLING OPERATION

T'Stat Demand	Energized	
No Economizer or Outdoor Air Unsuitable		
Y1	Compressor Low Speed*	OD Fan Low Sp.
Y2	Compressor High Speed**	OD Fan High Sp.
Unit Equipped With An Economizer		
Y1	Economizer	na
Y2	Economizer + Compressor Low Speed*	OD Fan Low Sp.

*67% of full capacity
**100% of full capacity

Note - The reversing valve is energized at the same time as the compressor.

Three Phase Scroll Compressor Voltage Phasing

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

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

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

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

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of K1 contactor. Do not reverse wires at blower contactor.

Make sure the connections are tight.

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

E-Safety or Emergency Shutdown

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

IV-CHARGING

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires 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:

IMPORTANT - Charge unit in standard cooling mode.

1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.

2- Compare the normal operating pressures (see table 8 through 11) to the pressures obtained from the gauges. Check unit components if there are significant differences.

3- Measure the outdoor ambient temperature and the suction pressure. Refer to the appropriate circuit charging curve to determine a target liquid temperature.

Note - Pressures are listed for sea level applications.

4- Use the same thermometer to accurately measure the liquid temperature (in the outdoor section).

- If measured liquid temperature is higher than the target liquid temperature, add refrigerant to the system.
- If measured liquid temperature is lower than the target liquid temperature, recover some refrigerant from the system.

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

6- Continue the process until measured liquid temperature agrees with the target liquid temperature. Do not go below the target liquid temperature when adjusting charge. Note that suction pressure can change as charge is adjusted.

7- Example KDB024: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 102°F. For a measured liquid temperature of 112°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 8

KDB024H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
113	217	114	254	117	295	119	342	121	395	124	455
120	222	125	259	123	304	128	349	130	401	133	459
141	226	143	262	142	303	145	353	148	404	154	465
154	233	162	270	167	312	170	358	171	410	175	466

TABLE 9

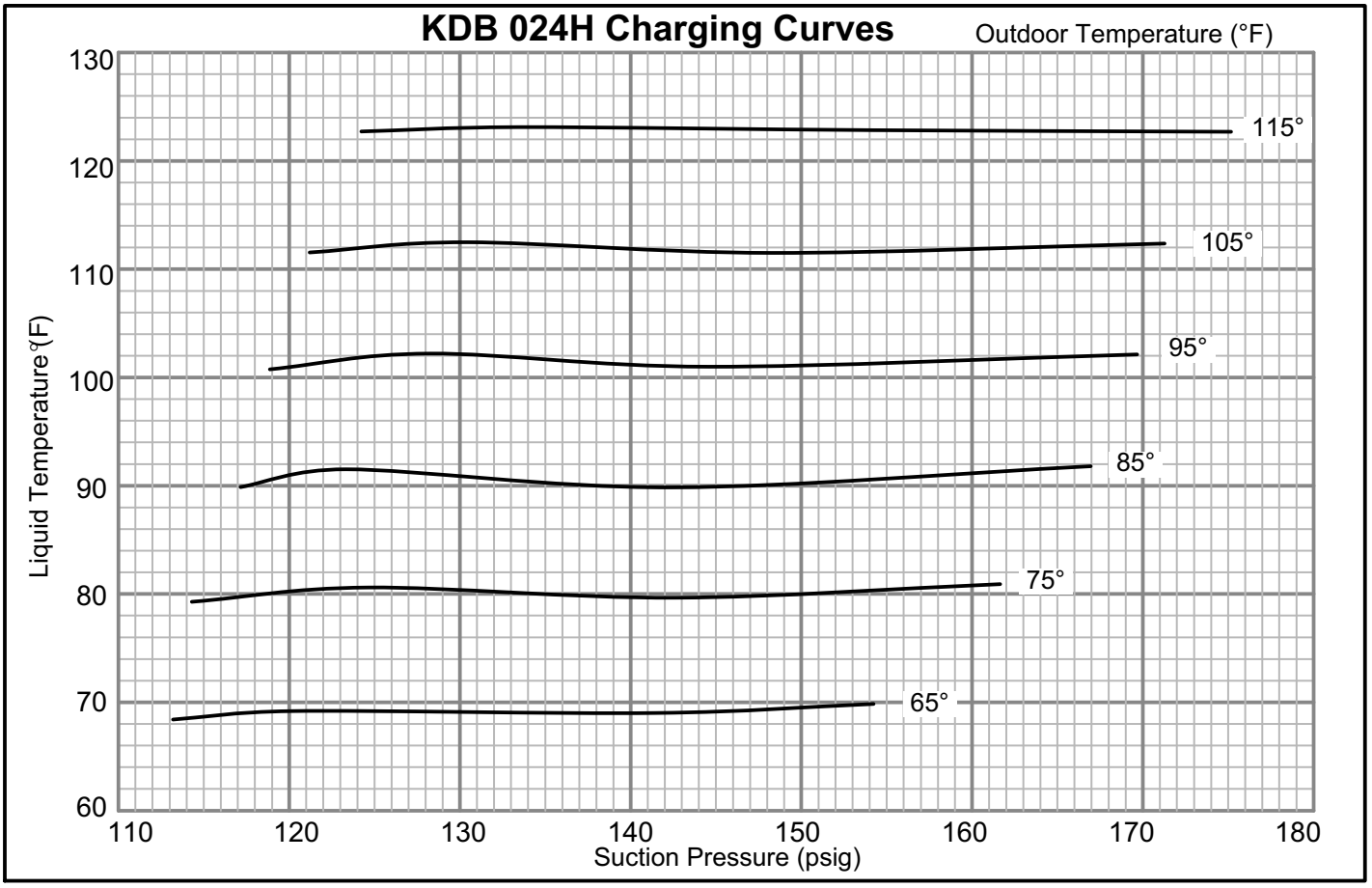
KDB036H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
113	230	115	268	117	310	119	358	121	412	121	471
121	233	123	273	125	314	128	364	130	417	130	476
142	240	142	278	144	321	146	370	149	425	151	483
157	247	163	286	165	330	168	378	170	431	173	491

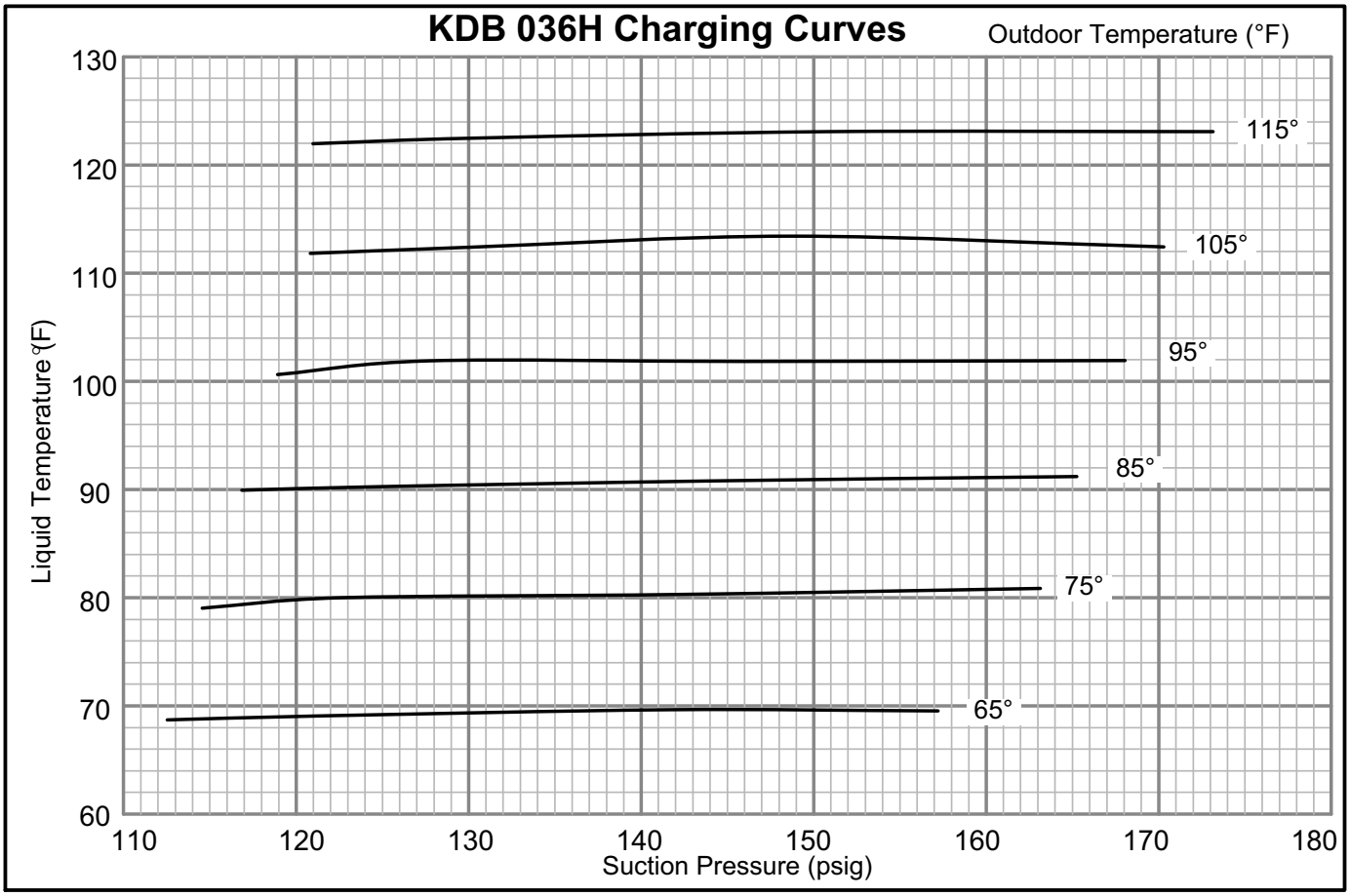
TABLE 10

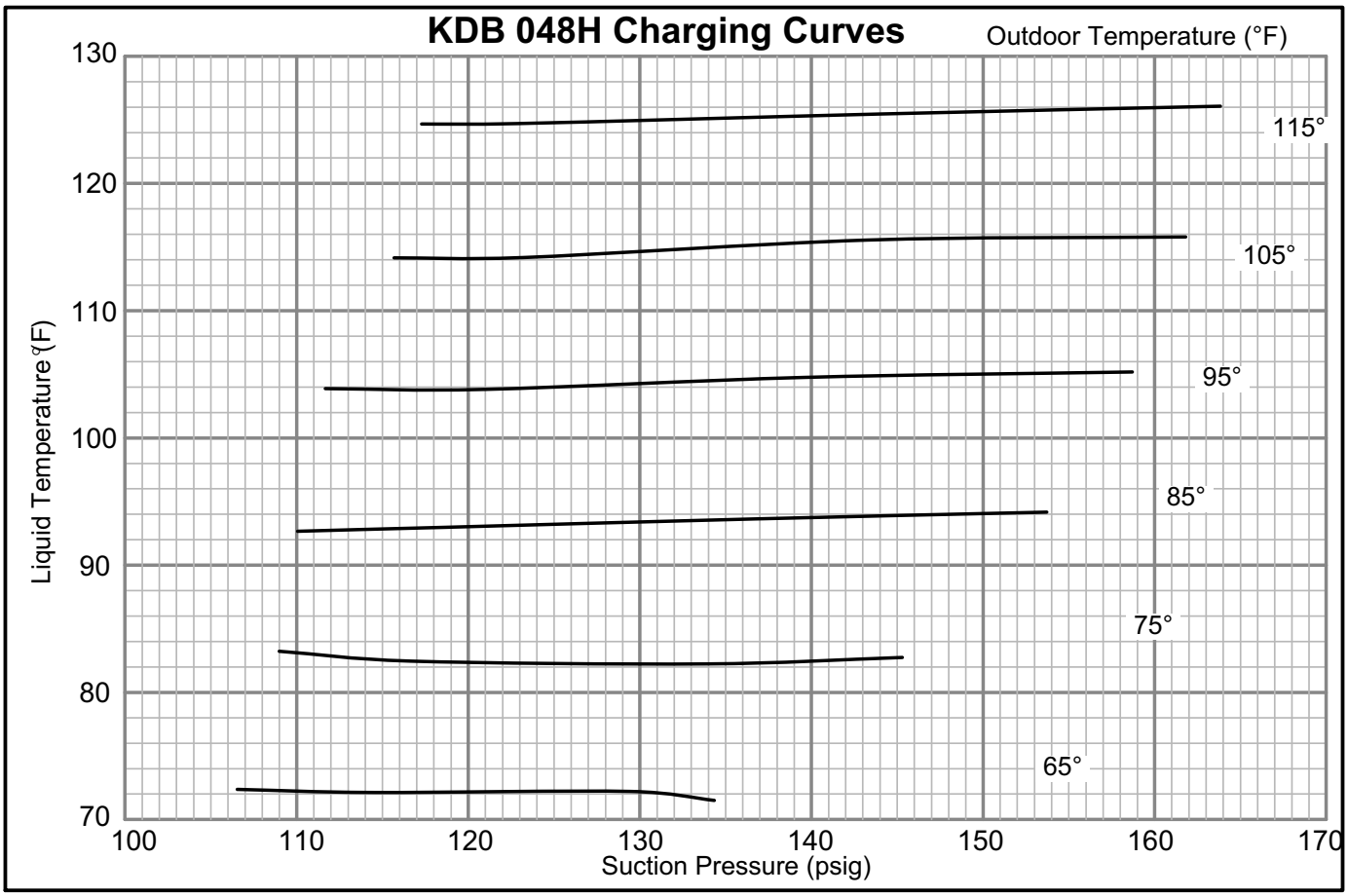
KDB048H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
107	234	109	272	110	314	112	363	116	409	117	462
115	242	117	279	119	321	121	366	123	415	123	470
129	247	134	284	137	328	140	375	143	425	144	480
134	251	145	292	154	335	159	382	162	432	164	489

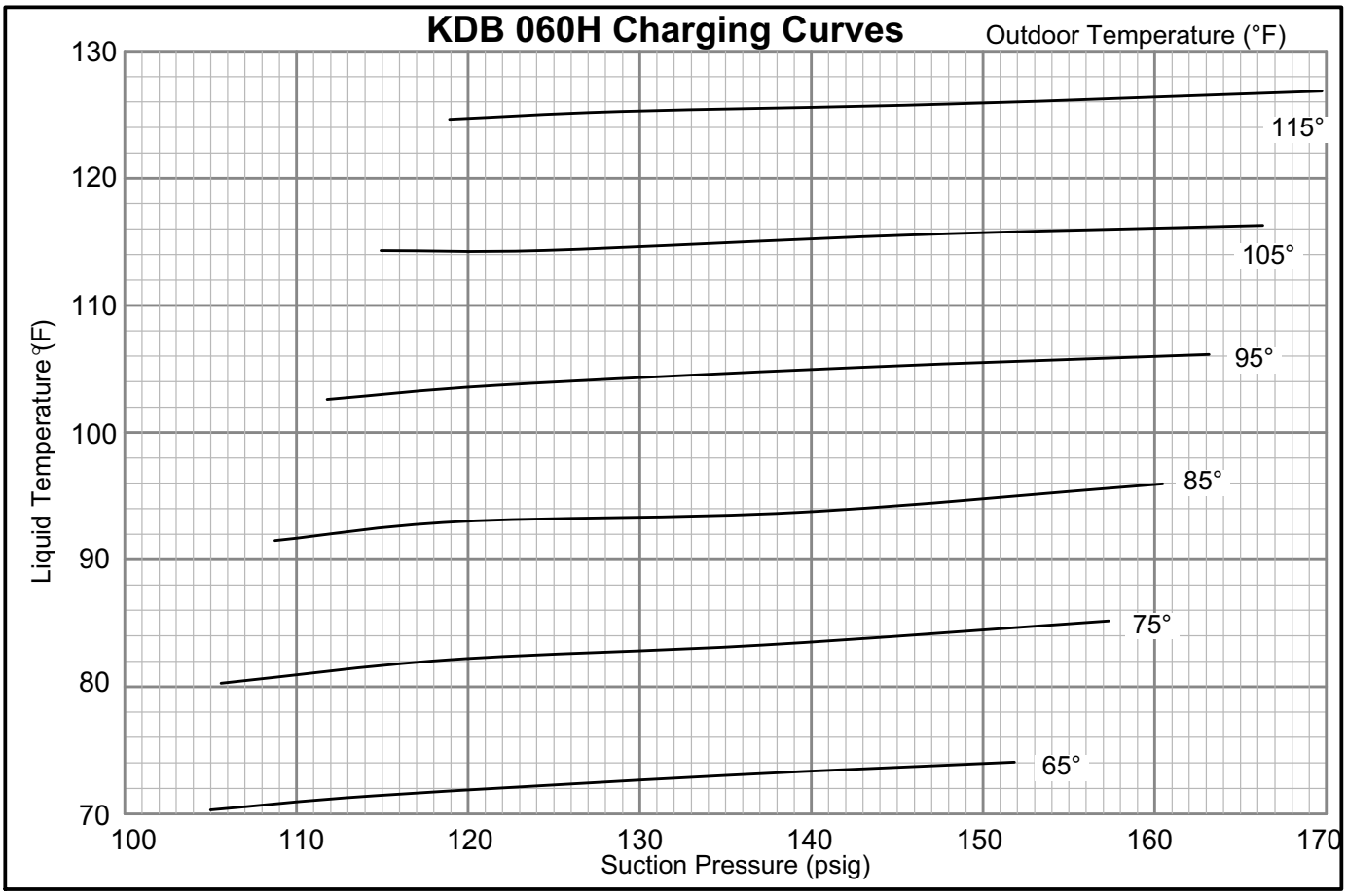
TABLE 11

KDB060H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
105	236	106	274	109	317	112	365	115	419	119	474
115	243	119	280	119	324	122	372	124	422	129	480
135	251	137	289	139	332	142	381	146	432	148	489
152	261	157	300	160	344	163	392	166	443	170	500




KDB 036H Charging Curves
Outdoor Temperature (°F)
115°
105°
95°
85°
75°
65°
Liquid Temperature (°F)
Suction Pressure (psig)
130
120
110
100
90
80
70
60
110
120
130
140
150
160
170
180


KDB 048H Charging Curves
Outdoor Temperature (°F)
115°
105°
95°
85°
75°
65°
Liquid Temperature (°F)
Suction Pressure (psig)
130
120
110
100
90
80
70
100
110
120
130
140
150
160
170


KDB 060H Charging Curves
Outdoor Temperature (°F)
115°
105°
95°
85°
75°
65°
Liquid Temperature °(F)
130
120
110
100
90
80
70
100
110
120
130
140
150
160
170
Suction Pressure (psig)

V- SYSTEM SERVICE CHECKS

A-Heating System Service Checks

All KDB units are C.S.A. 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.

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 21.

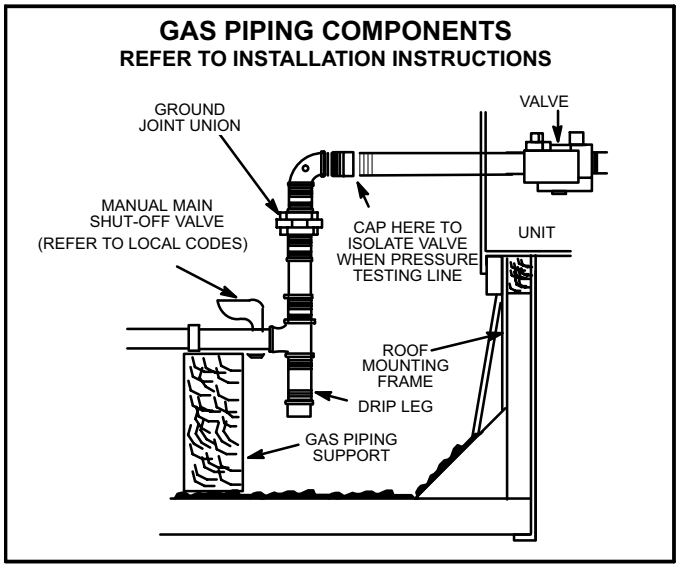


FIGURE 21

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. It is available through Lennox under part number 31B2001. 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 4.5"W.C. and 10.5"W.C. For L.P. gas units, operating pressure at the unit gas connection must be between 10.5"W.C. and 13.0"W.C.

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 figures 19 and 20 for location of pressure tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. See table 6. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See figure 19 and 20 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 6.

5-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 12. Seconds in table 12 are based on a 1 cu. ft. dial and gas value of 1000 btu/ft^3 for natural and 2500 btu/ft^3' 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 12

Unit Input Rate	Seconds for Natural	Seconds for Propane
65,000	55	138
70,000	51	129
108,000	33	83
150,000	24	60

⚠ IMPORTANT

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

6-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. 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.

7-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.

B-Cooling System Service Checks

KDB units are factory charged and require no further adjustment; however, charge should be checked periodically. See section IV- CHARGING.

NOTE-When unit is properly charged discharge line pressures should approximate those in tables 8 through 11.

VI-MAINTENANCE

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

⚠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.

⚠CAUTION

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

A-Filters

Units are equipped with temporary filters which must be replaced prior to building occupation. See table 13 for correct filter size. Refer to local codes or appropriate jurisdiction for approved filters. Approved filters should be checked monthly and replaced when necessary. Take note of air flow direction marking on filter frame when reinstalling filters

TABLE 13

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

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

B-Lubrication

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

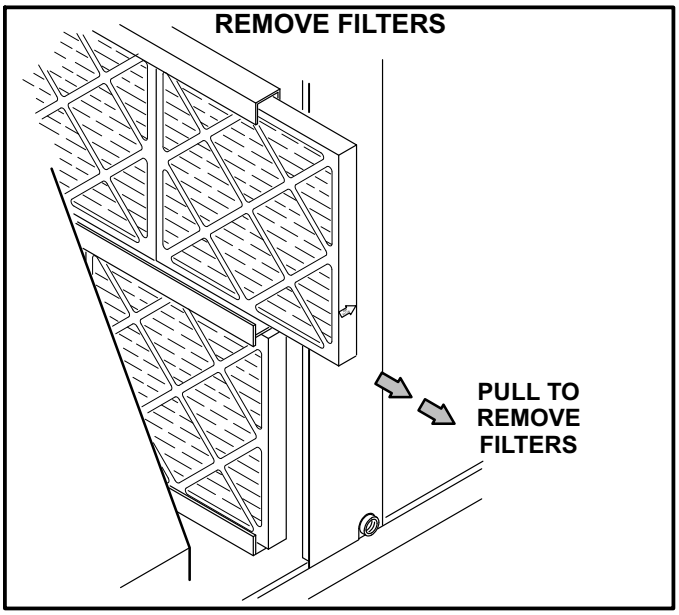


FIGURE 22

C-Burners

Periodically examine burner flames for proper appearance during the heating season. Before each heating season examine the burners for any deposits or blockage which may have occurred.

Clean burners as follows:

1- Turn off both electrical power and gas supply to unit.

2- Remove burner compartment access panel.

3- Remove top burner box panel.

4- Remove two screws securing burners to burner support and lift the burners from the orifices. See figure 13. Clean as necessary.

⚠WARNING

Danger of explosion. Can cause injury or death. Do not overtighten main burner mounting screws. Snug tighten only.

D-Combustion Air Inducer

A combustion air proving switch checks combustion air inducer operation before allowing power to the gas controller. Gas controller will not operate if inducer is obstructed.

Under normal operating conditions, the combustion air inducer wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule.

Clean combustion air inducer as follows:

1- Shut off power supply and gas to unit.

2- Remove the mullion on the right side of the heat section.

3- Disconnect pressure switch air tubing from combustion air inducer port.

4- Remove and retain screws securing combustion air inducer to flue box. Remove vent connector. See figure 12.

5- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Take care not to damage exposed fan blades. Clean accumulated dust from front of flue box cover.

6- Return combustion air inducer motor and vent connector to original location and secure with retained screws. It is recommended that gaskets be replaced during reassembly.

7- Replace mullion.

8- Clean combustion air inlet louvers on heat access panel using a small brush.

E-Flue Passageway and Flue Box

Remove flue box cover only when necessary for equipment repair. Clean inside of flue box cover and heat exchanger tubes with a wire brush when flue box cover has to be removed. Install a new flue box cover gasket and replace cover. Make sure edges around flue box cover are tightly sealed.

F-Supply 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.

G-Evaporator or Indoor Coil

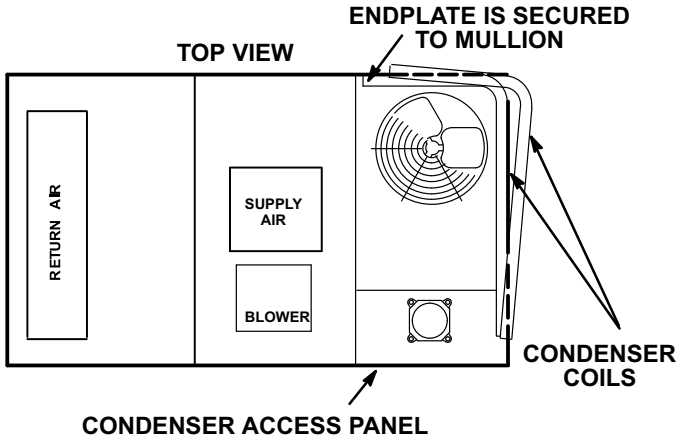
Inspect and clean coil at beginning of each cooling season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

H-Condenser or Outdoor Coil

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

Condenser coils are made of two formed slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 23. Flush coils with water following cleaning.

CLEAN CONDENSER COIL



1- Remove unit top panel and condenser section access panel.

2- Remove screws securing coil end plate to mullion.

3- Remove wire ties connecting coils slabs and separate slabs 3-4” (76-102mm).

4- Clean coils with detergent or commercial coil cleaner.

5- Rinse thoroughly with water and reassemble.

6- Secure coil slabs together using field-provided wire ties.

FIGURE 23

VII-ACCESSORIES

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

A-C1CURB / K1CURB

When installing the KDB units on a combustible surface for downflow discharge applications, the Lennox C1CURB / K1CURB 8 inch, 14-inch, 18 inch or 24-inch height roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the 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 mounting frame is shown in figure 24. 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 25. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

B-Transitions

Optional supply/return transitions T1TRAN10AN1 is available for use with the KDB 2, 3, 4 ton units and the T1TRAN20N-1 is available for the 5 ton units utilizing optional K1CURB roof mounting frames. Transition must be installed in the K1CURB mounting frame before mounting the unit to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

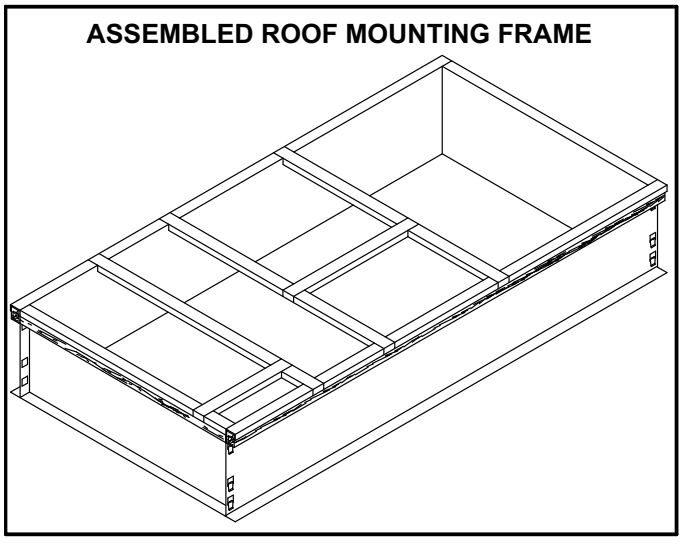


FIGURE 24

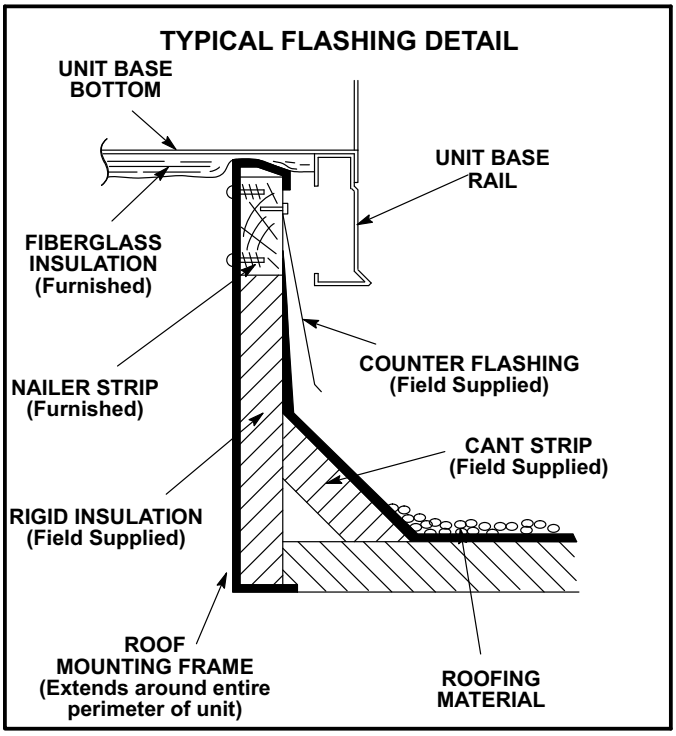


FIGURE 25

C-Outdoor Air Dampers

C1DAMP11A-2 is available for KDB 2, 3, 4 and 5 ton unit. Both sets include the outdoor air hood. A motorized kit (C1DAMP21A-1) can be ordered separately for all KDB unit sizes. The dampers may be manually or motor (M) operated to allow up to 25 percent outside air into the system at all times (see figure 26). Washable filter supplied with the outdoor air dampers can be cleaned with water and a mild detergent. It should be sprayed with Filter Handicoater when dry prior to re-installation. Filter Handicoater is R.P. Products coating no. 418 and is available as Lennox Part No. P-8-5069.

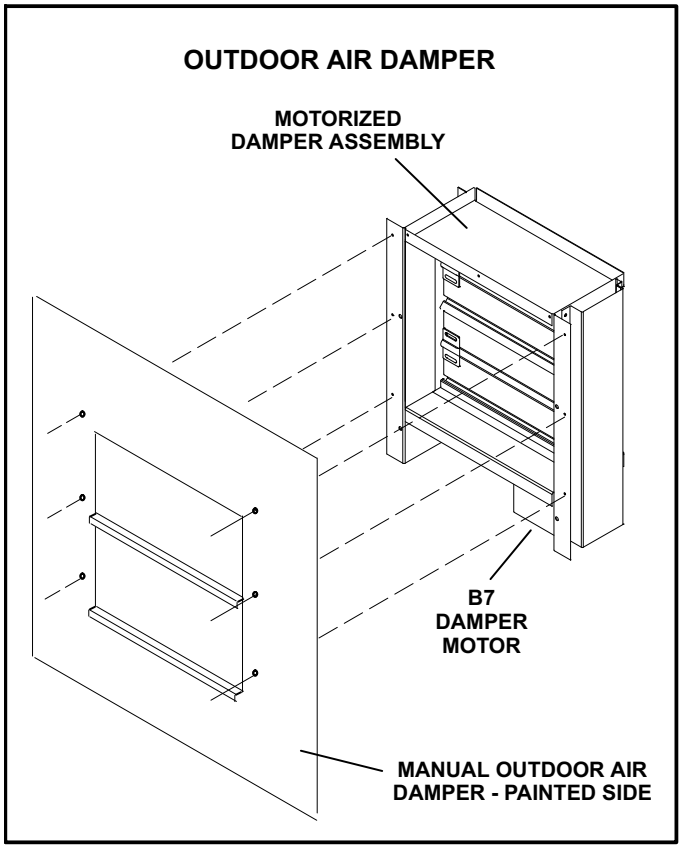


FIGURE 26

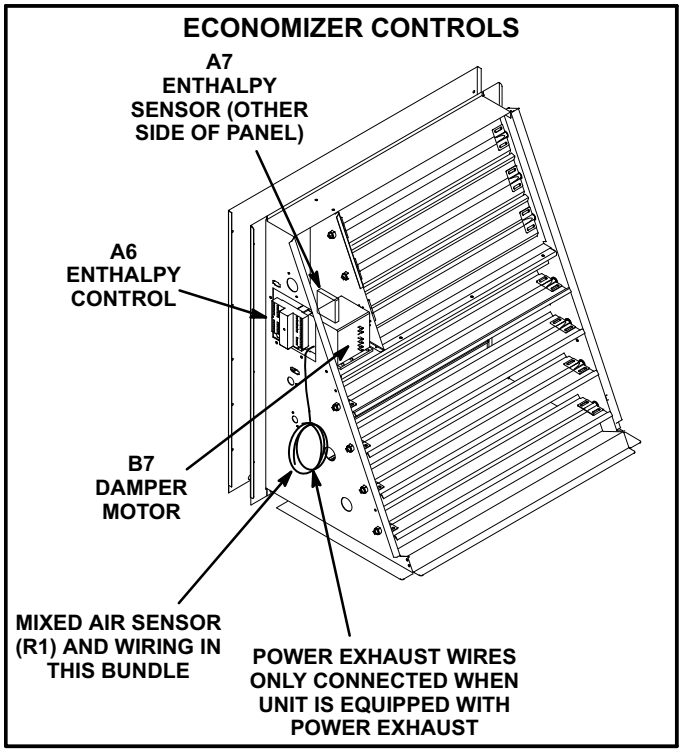


FIGURE 27

D-Supply and Return Diffusers (all units)

Optional flush mount diffuser/return FD9-65 and FD11-95 and extended mount diffuser/return RTD9-65 and RTD11-95 are available for use with all KDB units. Refer to manufacturer's instructions included with transition for detailed installation procedures.

E-Economizer

(Field or Factory Installed)

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

The A6 enthalpy control is located in the economizer access area. See figure 27. The A7 enthalpy sensor is located on the division panel between horizontal supply and return air sections.

Optional Sensors

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

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

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

Refer to instructions provided with sensors for installation.

A6 Enthalpy Control LEDs

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 28.

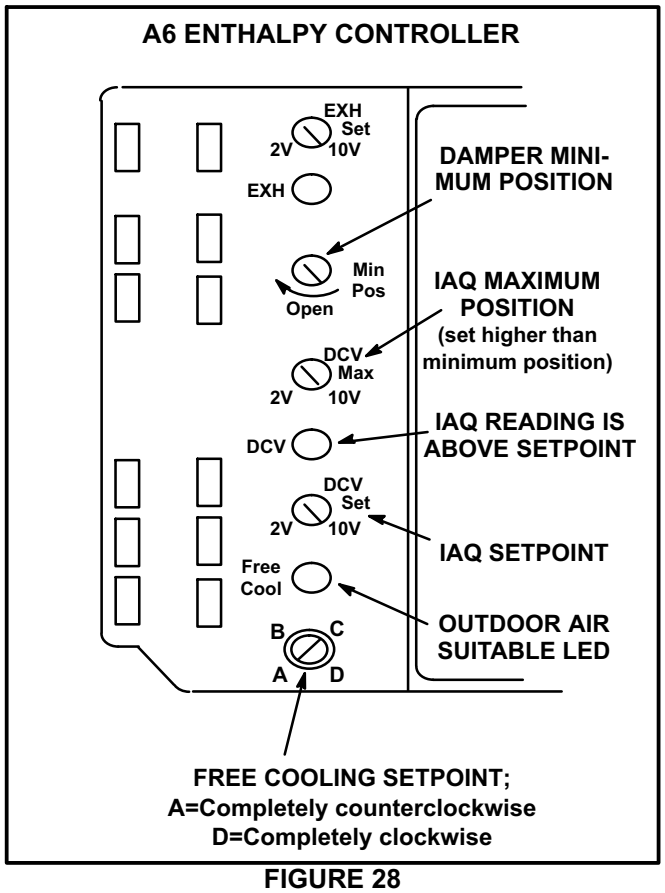


FIGURE 28

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 14. Setting A is recommended. See figure 28. At setting A, free cooling will be energized when outdoor air is approximately 73°F (23°C) and 50% relative humidity. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be energized at 70°F (21°C) and 50% relative humidity.

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

TABLE 14
ENTHALPY CONTROL SETPOINTS

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

Damper Minimum Position

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

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

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

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

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

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

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

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

7- Draw a vertical line through point C.

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

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

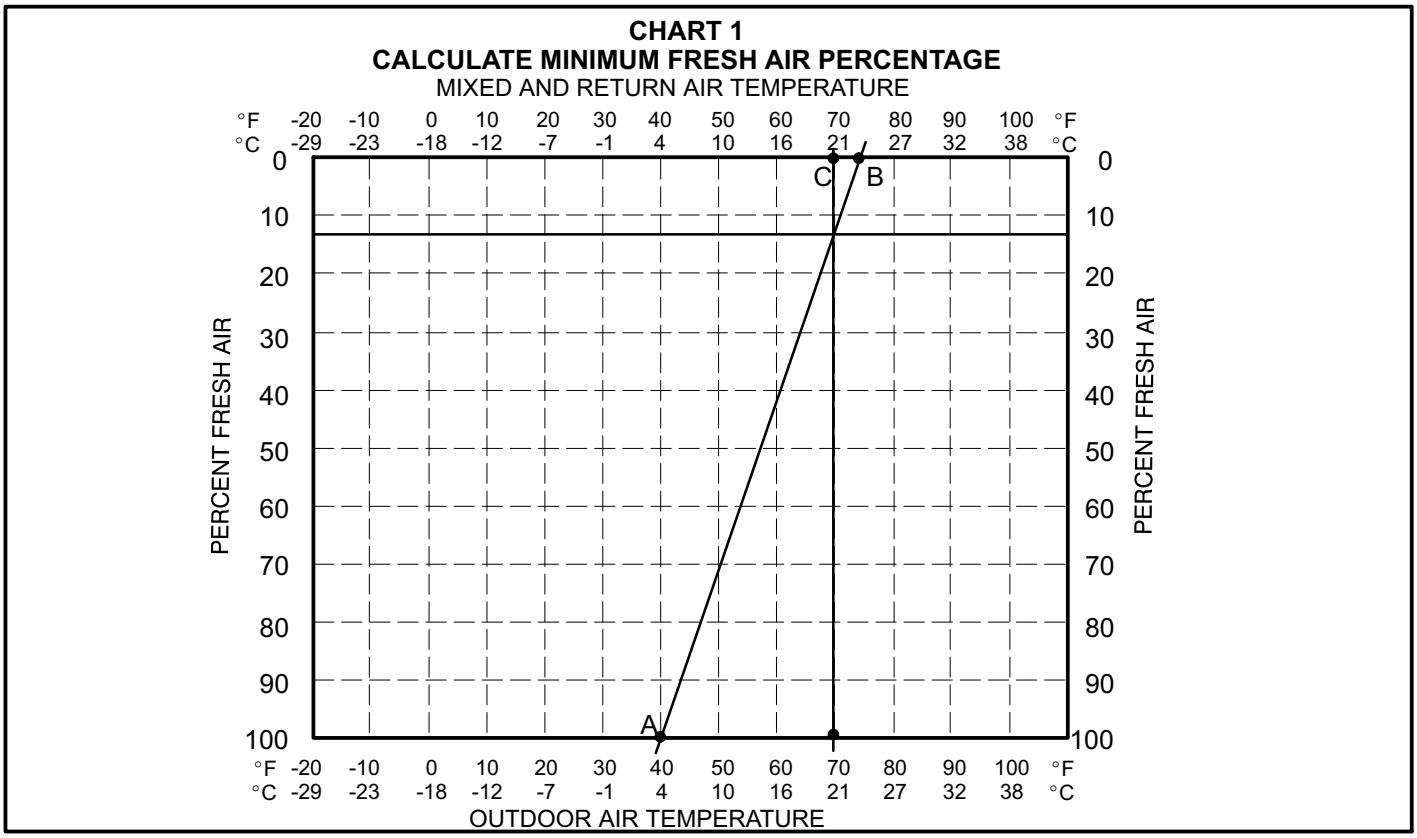
DCV Set and Max Settings

Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm 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 28.

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 28.

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 15 for economizer operation with a standard two-stage thermostat.

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

B-Outdoor Air Dampers

Optional manual and motorized outdoor air dampers provide fresh outdoor air. The motorized damper assembly opens to minimum position during the occupied time period and remains closed during the unoccupied period. Manual damper assembly is set at installation and remains in that position.

Set damper minimum position in the same manner as economizer minimum position. Adjust motorized damper position as shown in figure 29. Manual damper fresh air intake percentage can be determined in the same manner.

INTERLINK DAMPER MOTOR

Damper stops are factory-set at 100% outdoor air and are adjustable in five degree increments. To adjust fresh air percentage, remove retainer clip and adjust damper stop to desired air percentage. Replace retainer clip.

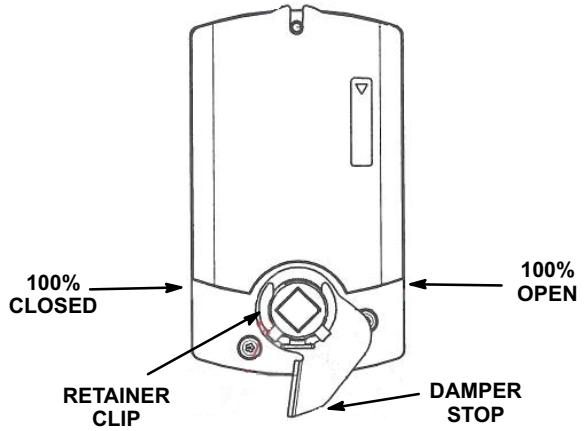


FIGURE 29

TABLE 15
ECONOMIZER OPERATION
OUTDOOR AIR IS SUITABLE FOR FREE COOLING -- FREE COOL LED "ON"

THERMOSTAT DEMAND	DAMPER POSITION		MECHANICAL COOLING
	UNOCCUPIED	**OCCUPIED**	
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	OPEN*	OPEN*	NO
Y2	OPEN*	OPEN*	STAGE 1

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

F-Power Exhaust Relay K65 (power exhaust units)

Power exhaust relay K65 is a 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 enthalpy control A6, after the economizer dampers reach 50% open (adjustable) When K65 closes, exhaust fan B10 is energized.

G-Power Exhaust Fans

T1PWRE10A available for KDB 3, 4 and 5 ton units and T1PWRE10N available for 6 and 7-1/2 ton units, provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. See figure 30 and installation instructions for more detail.

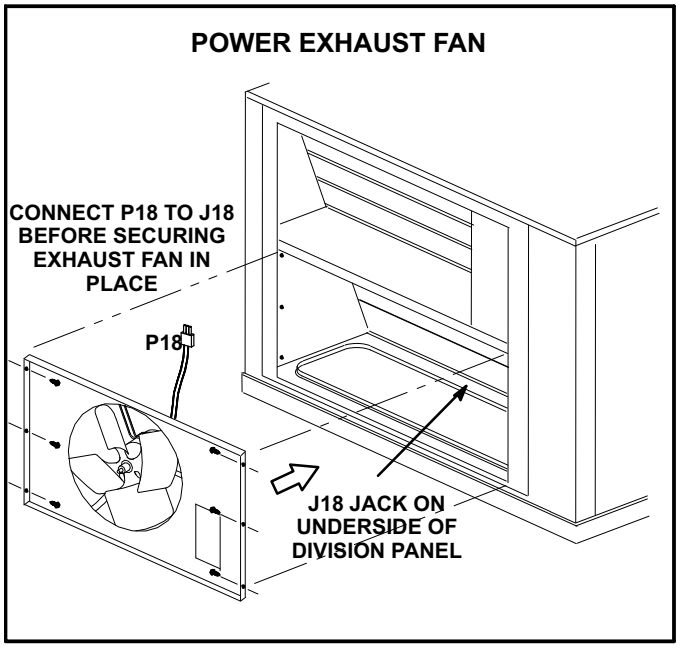


FIGURE 30

H-Optional Cold Weather Kit

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

The kit includes the following parts:

1- The strip heater (HR6) is located as close as possible to the gas valve. The strip heater is rated at 500 Watts

2- A thermostat mounting box is installed on the wall of the compressor 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. 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. 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 70° F (21° C).

I-Control Systems

All thermostat wiring is connected to TB1 located in the control box. Each thermostat has additional control options available. See thermostat installation instructions for more detail.

1- Electro-mechanical thermostat

The electro-mechanical thermostat is a two stage heat / two stage cool thermostat with dual temperature levers. A non-switching or manual system switch subbase may be used.

2- Electronic thermostat

Any two stage heat / two stage cool electronic thermostat may be used.

J-Smoke Detectors A17 and A64

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

K-Dirty Filter Switch S27

The dirty filter switch senses static pressure increase indicating a dirty filter condition. The switch is N.O. and closes at 1" W.C. (248.6 Pa) The switch is mounted in the filter section on the left unit mullion.

L-Indoor Air Quality (CO_2) Sensor A63

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

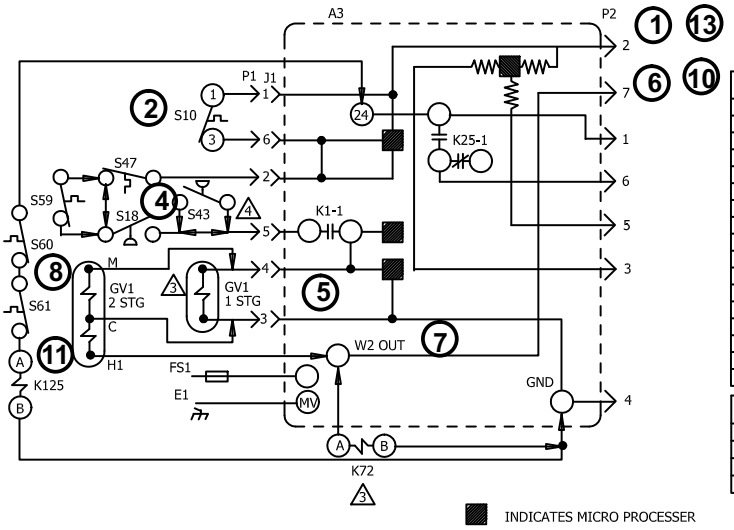
M-LP / Propane Kit

All units require a natural to LP /propane kit. The kit for single stage units include one LP spring , seven burner orifices, and three stickers. Two stage kits include the same but has a prove switch used to lock out first stage on the combustion air inducer. For more detail refer to the natural to LP gas changeover kit installation instructions.

N-Drain Pan Overflow Switch S149 (optional)

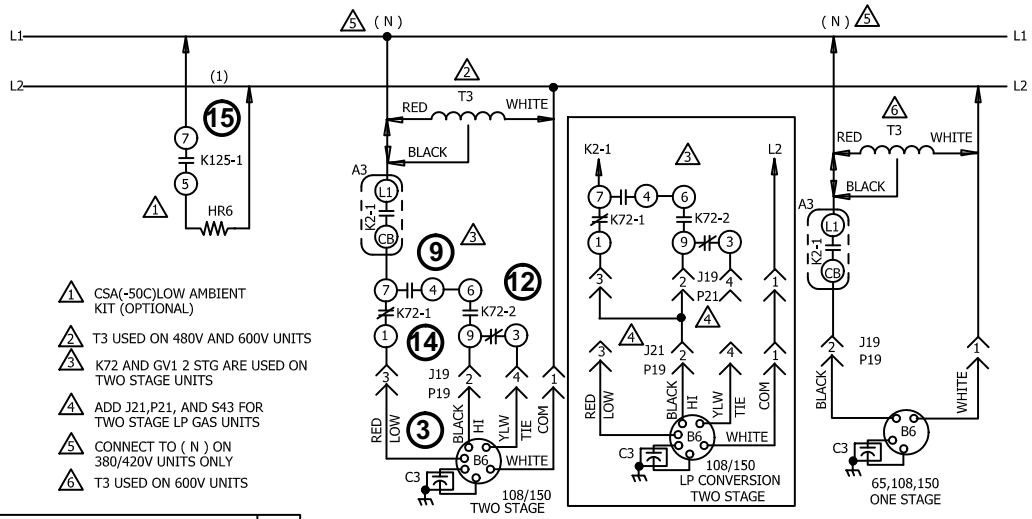
The overflow switch is used to interrupt cooling operation when excessive condensate collects in the drain pan. The N.O. overflow switch is controlled by K220 and DL46 relays, located in the unit control panel. When the overflow switch closes, 24VAC power is interrupted and after a five-second delay 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.

GAS HEAT FOR KDB024/060 UNITS



KEY	DESCRIPTION
A3	CONTROL - BURNER 1
B6	MOTOR, COMBUSTION AIR BLOWER 1
C3	CAPACITOR, COMB AIR BLOWER MOTOR 1
E1	SPARK
FS1	SENSOR, FLAME
GV1	VALVE, GAS 1
HR6	HEATER, 50C LOW AMBIENT KIT
K72-1, 2	RELAY, GAS 3
K125-1	RELAY, HEAT SHUTOFF
S10	SWITCH, LIMIT PRIMARY GAS
S18	SWITCH, COMB AIR BLOWER PROVE
S43	SWITCH, LOW GAS PRESSURE
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

J/P	JACK/PLUG DESCRIPTION
1	GAS LIMIT
2	HEAT
19	COMB AIR BLOWER
21	COMB AIR BLOWER 2



1. CSA(-50C)LOW AMBIENT KIT (OPTIONAL)
2. T3 USED ON 480V AND 600V UNITS
3. K72 AND GV1 2 STG ARE USED ON TWO STAGE UNITS
4. ADD J21,P21, AND S43 FOR TWO STAGE LP GAS UNITS
5. CONNECT TO (N) ON 380/420V UNITS ONLY
6. T3 USED ON 600V UNITS

02/16	WIRING DIAGRAM 537776-02	02/16
HEATING		
GAS HEAT - KGA, KGB - 65 THRU 150 UNITS		
SECTION A		REV. 0
Supersedes 537776-01	New Form No. 537776-02	

First Stage Heat:

1- The thermostat initiates W1 heating demand.

2- 24VAC is routed from TB1 to ignition control A3. A3 proves N.C. primary limit S10 and N.C. rollout 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 gas valve GV1 on first stage.

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 ignition control A3.

8- A3 energizes gas valve GV1 on second stage.

9- Relay K72-1 terminals 1 and 7 open, 7 and 4 close. K72-2 terminals 6 and 9 close and 9 and 3 open, energizing combustion air inducer B6 on high speed.

End of Second Stage Heat:

10- Heating demand is satisfied. Terminal W2 (second stage) is de-energized.

11- Second stage heat is de-energized on GV1 by ignition control A3.

12- K72 terminals 4 and 7 open and 1 and 7 close. K72 terminals 6 and 9 open, 9 and 3 close. Combustion air inducer B6 is now on low speed.

End of First Stage Heat:

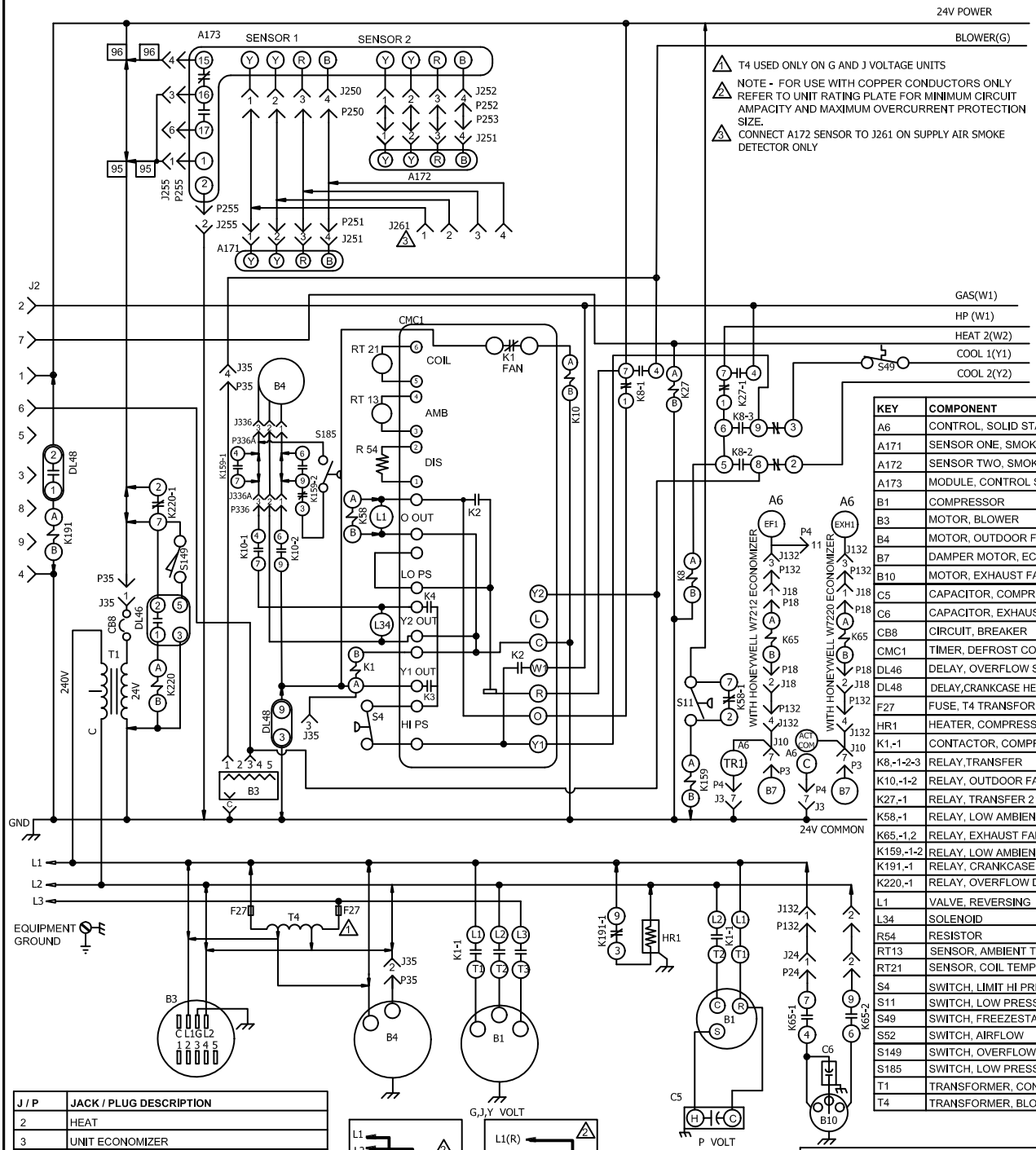
13- Heating demand is satisfied. Terminal W1 (first stage) is de-energized.

14- Ignition A3 is de-energized in turn de-energizing gas valve GV1 and combustion air inducer B6.

Optional Low Ambient Kit:
(C.S.A. -50° C Low Ambient Kit)

15- Line voltage is routed through the N.C. low ambient kit thermostats S60 and S61,to energize low ambient kit heater HR6.

KDB024/060 With Direct Drive



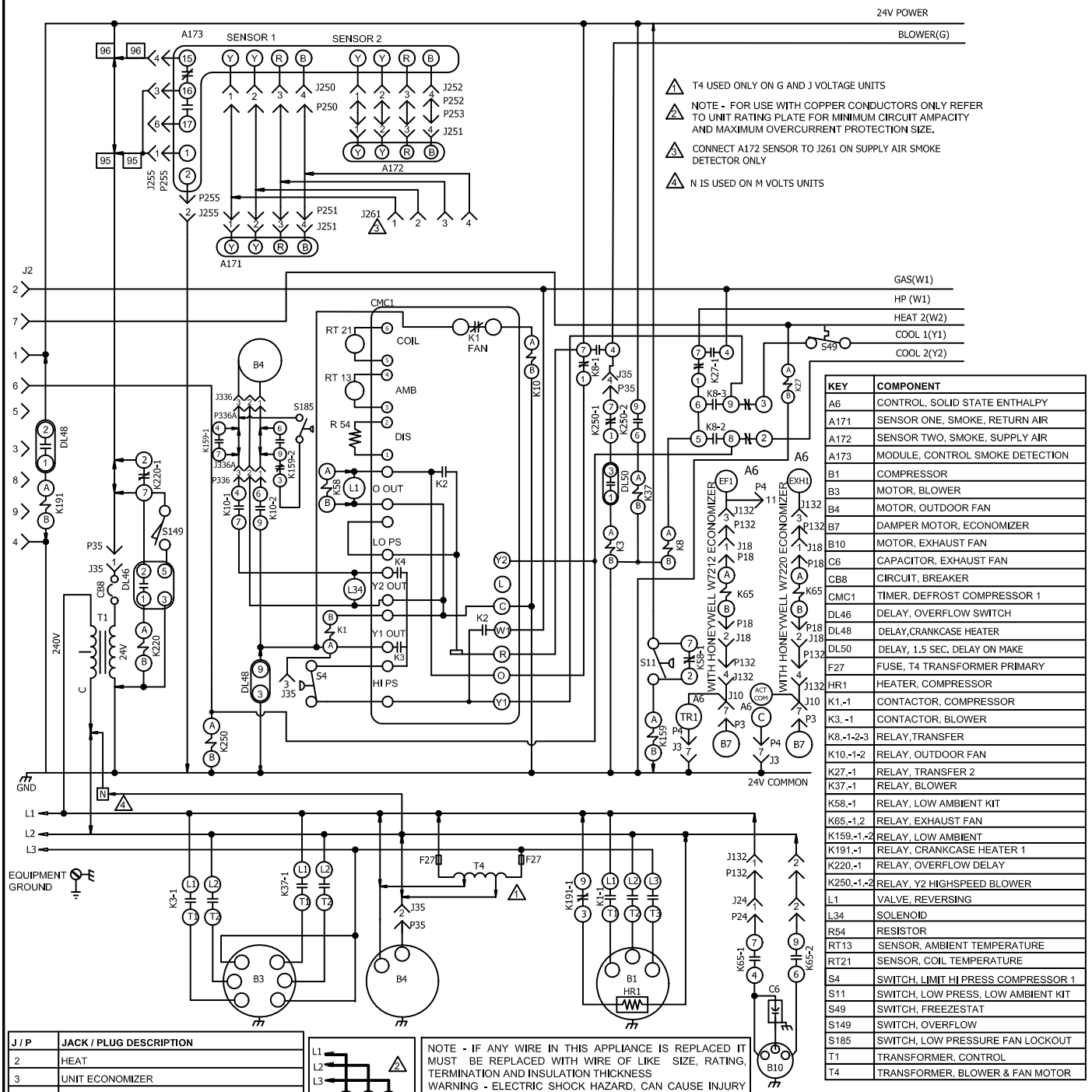
KEY	COMPONENT
A6	CONTROL, SOLID STATE ENTHALPY
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
B1	COMPRESSOR
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN
B7	DAMPER MOTOR, ECONOMIZER
B10	MOTOR, EXHAUST FAN
C5	CAPACITOR, COMPRESSOR
C6	CAPACITOR, EXHAUST FAN
CB8	CIRCUIT, BREAKER
CMC1	TIMER, DEFROST COMPRESSOR 1
DL46	DELAY, OVERFLOW SWITCH
DL48	DELAY,CRANKCASE HEATER
F27	FUSE, T4 TRANSFORMER PRIMARY
HR1	HEATER, COMPRESSOR
K1,-1	CONTACTOR, COMPRESSOR
K8,-1-2-3	RELAY,TRANSFER
K10,-1-2	RELAY, OUTDOOR FAN
K27,-1	RELAY, TRANSFER 2
K58,-1	RELAY, LOW AMBIENT KIT
K65,-1,2	RELAY, EXHAUST FAN
K159,-1-2	RELAY, LOW AMBIENT
K191,-1	RELAY, CRANKCASE HEATER 1
K220,-1	RELAY, OVERFLOW DELAY
L1	VALVE, REVERSING
L34	SOLENOID
R54	RESISTOR
RT13	SENSOR, AMBIENT TEMPERATURE
RT21	SENSOR, COIL TEMPERATURE
S4	SWITCH, LIMIT HI PRESS COMPRESSOR 1
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S49	SWITCH, FREEZESTAT
S52	SWITCH, AIRFLOW
S149	SWITCH, OVERFLOW
S185	SWITCH, LOW PRESSURE FAN LOCKOUT
T1	TRANSFORMER, CONTROL
T4	TRANSFORMER, BLOWER & FAN MOTOR

J / P	JACK / PLUG DESCRIPTION
2	HEAT
3	UNIT ECONOMIZER
4	UNIT ECONOMIZER
10	ECONOMIZER
18	EXHAUST FAN
24	EXHAUST FAN
35	TEST
132	BLOWER , EXHAUST FAN MOTOR
250	SMOKE ONE
251	SENSOR ONE
252	SMOKE TWO
253	SENSOR TWO
255	MODULE, CONTROL SMOKE DETECTION
261	SMOKE DETECTOR JUMPER
336,336A	OUTDOOR FAN CONTROL, B4

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.

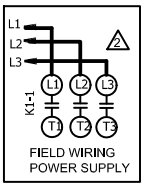
09/16	WIRING DIAGRAM 537857-01	09/16
COOLING		
KDB - 024H, 036H, 048H, 060H - G,J,P,Y DIRECT DRIVE		
SECTION B		REV 1
Supersedes	New Form No. 537857-01	

KDB024/060 With Belt Drive



KEY	COMPONENT
A6	CONTROL, SOLID STATE ENTHALPY
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
B1	COMPRESSOR
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN
B7	DAMPER MOTOR, ECONOMIZER
B10	MOTOR, EXHAUST FAN
C6	CAPACITOR, EXHAUST FAN
CB8	CIRCUIT, BREAKER
CMC1	TIMER, DEFROST COMPRESSOR 1
DL46	DELAY, OVERFLOW SWITCH
DL48	DELAY,CRANKCASE HEATER
DL50	DELAY, 1.5 SEC. DELAY ON MAKE
F27	FUSE, T4 TRANSFORMER PRIMARY
HR1	HEATER, COMPRESSOR
K1,-1	CONTACTOR, COMPRESSOR
K3, -1	CONTACTOR, BLOWER
K8,-1-2-3	RELAY,TRANSFER
K10,-1-2	RELAY, OUTDOOR FAN
K27,-1	RELAY, TRANSFER 2
K37,-1	RELAY, BLOWER
K58,-1	RELAY, LOW AMBIENT KIT
K65,-1,2	RELAY, EXHAUST FAN
K159,-1,-2	RELAY, LOW AMBIENT
K191,-1	RELAY, CRANKCASE HEATER 1
K220,-1	RELAY, OVERFLOW DELAY
K250,-1,-2	RELAY, Y2 HIGHSPEED BLOWER
L1	VALVE, REVERSING
L34	SOLENOID
R54	RESISTOR
RT13	SENSOR, AMBIENT TEMPERATURE
RT21	SENSOR, COIL TEMPERATURE
S4	SWITCH, LIMIT HI PRESS COMPRESSOR 1
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S49	SWITCH, FREEZESTAT
S149	SWITCH, OVERFLOW
S185	SWITCH, LOW PRESSURE FAN LOCKOUT
T1	TRANSFORMER, CONTROL
T4	TRANSFORMER, BLOWER & FAN MOTOR

J / P	JACK / PLUG DESCRIPTION
2	HEAT
3	UNIT ECONOMIZER
4	UNIT ECONOMIZER
10	ECONOMIZER
18	EXHAUST FAN
24	EXHAUST FAN
35	TEST
132	BLOWER , EXHAUST FAN MOTOR
250	SMOKE ONE
251	SENSOR ONE
252	SMOKE TWO
253	SENSOR TWO
255	MODULE, CONTROL SMOKE DETECTION
261	SMOKE DETECTOR JUMPER
336,336A	OUTDOOR FAN CONTROL, B4



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.

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

09/16	WIRING DIAGRAM	09/16
	537858-01	
COOLING		
KDB - 036H, 048H, 060H - G,J,M,Y BELT DRIVE		
SECTION B		REV 1
Supersedes	New Form No. 537858-01	

SEQUENCE OF OPERATION KDB024/060

Power:

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

Blower Operation:

2- Belt drive motors:Indoor thermostat terminal “G” energizes contactor K3. K3 closes, energizing blower B3. Direct drive motors: Indoor thermostat terminal “G” energizes blower B3 directly.

Economizer Operation:

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

Cooling Demand

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

4- Indoor thermostat COOLING mode energizes reversing valve L1.

5- CMC1 proves optional N.C. high pressure switch S4 to energize compressor contactor K1.

6- K1 closes energizing compressor B1.

7- Thermostat Y2 energizes blower B3 on high speed. CMC1 Y2 energizes compressor solenoid L34, transferring 24VAC to K10. K10-7 and K10-9 close energizing condenser fan B4 on high speed.

8- Low ambient option: cooling mode energizes K58, when liquid pressure rises to 300±10 psig, S185 closes, 24VAC passes through the N.C. K159-2 contacts energizing condenser fan at extra low speed. (Y1, or Y2 demand).
When liquid pressure rises to 450±10 psig, S11 closes, energizing K159. 24VAC passes through K159-9 to condenser fan (Y1), and to K159-7 (Y2). Condenser fan runs at low speed with Y1 demand, and runs at high speed with demand Y2.

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

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

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

10- Relay K8 is energized. N.C. K8-1 opens, de-energizing reversing valve L1. K8-2 energizes blower and enables compressor for high speed. K8-3 energizes compressor.

11- CMC1 proves optional N.C. high pressure switches S4. Compressor contactor K1 and outdoor fan relay K10 is energized.

12- CMC1 Y2 OUT energizes compressor solenoid L34 for high speed.

13- CMC1 energizes condenser fan relay K10 (with "K1 fan" closes). 24VAC passes through the N.O. K10 contacts, from K10-9 to J336-3, from K10-7 to J336-1. condenser fan runs high speed.

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

14- 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.

15- See sequence of operation for gas heat.

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

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

17- See sequence of operation for gas heat.

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

18- 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.

19- See sequence of operation for gas heat.

Defrost Mode:

DEFROST OPERATION:

20- The need for a defrost cycle while in Demand Defrost operation is determined by one of two factors: Time or Frost Detection.

Should six hours of compressor run time elapse without a defrost cycle and the coil temperature is below the frost accumulation temperature, a defrost will be initiated. If this defrost is terminated on time rather than temperature, the controller shall establish a new clear coil temperature condition. If the defrost is terminated on temperature the unit will continue with demand mode operations. The compressor run time will be reset when the defrost cycle is complete.

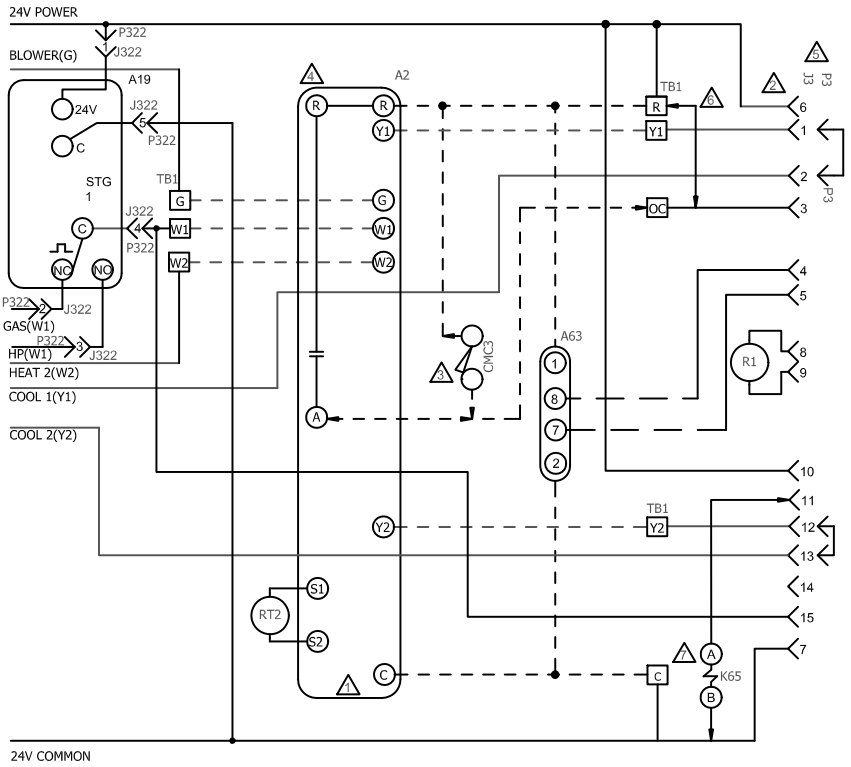
The control shall be capable of detecting frost accumulation on the outdoor coil and initiate a defrost cycle when the initial clear coil ΔT has been increased by 2.3F° (IE – Target ΔT = clear coil ΔT + 2.3F°). In addition, the Target ΔT, once established, is adjusted as the ambient temperature changes to compensate for expected changes in the coil temperature. For every 8F° increase in ambient temperature, the target ΔT value is increased by 1F°; and, for every 8F° decrease in ambient temperature, the target ΔT value is decreased by 1F°.

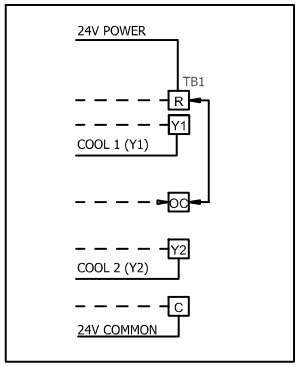
DEFROST MODE OPERATION:

21- When operating in the defrost mode, the control will activate the compressor contactor, reversing valve, and auxiliary heat outputs (W1 low gas heat). The condenser fan relay contacts will be open, de-energizing the fan motor. The accumulated defrost time is monitored while in the defrost mode and compressor stays energized.

When a defrost cycle has been initiated, if the W1 thermostat input is removed, the current defrost cycle will be suspended, but the accumulated defrost time is frozen, and the control will resume defrost operation at the start of the next heating cycle (W1 active and coil temperature is below 35_F) without delay. The accumulated defrost time resumes when the compressor output is re-energized.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT





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	

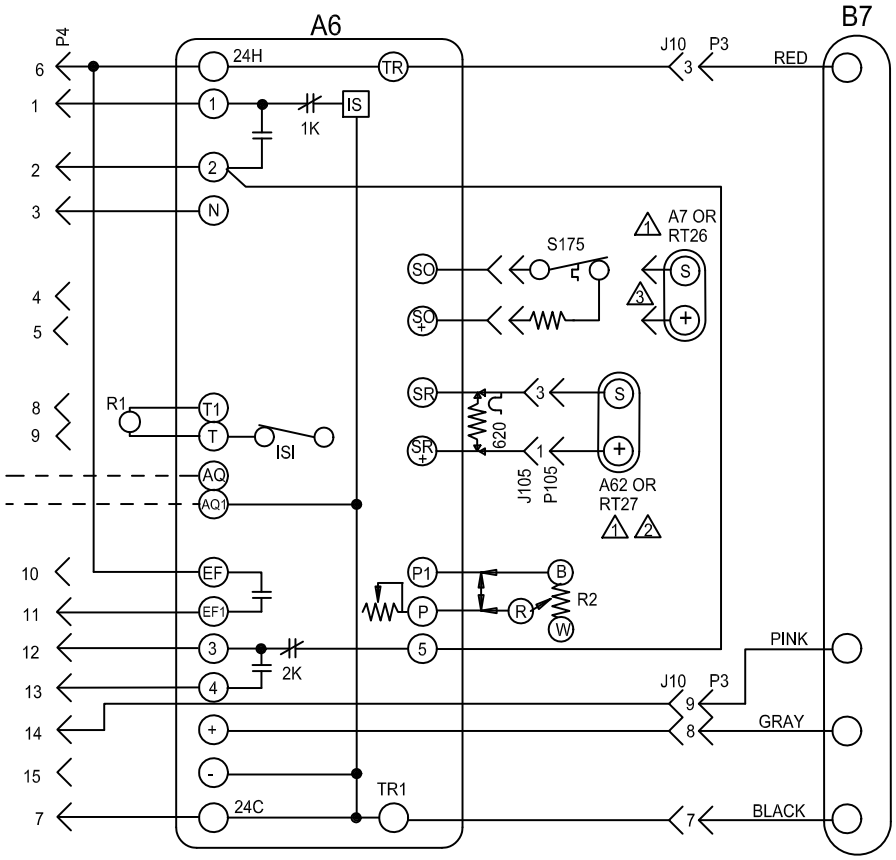
POWER:

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

OPERATION:

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

ECONOMIZER



KEY	COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
B7	MOTOR-DAMPER, ECONOMIZER
J10	JACK, ECONOMIZER
P3	PLUG, ECONOMIZER
P4	PLUG-ECONOMIZER
R1	SENSOR-MIXED AIR OR SUPPLY AIR
R2	POT-MINIMUM POSITION
RT26	SENSOR-OUTDOOR AIR TEMP
RT27	SENSOR-INDOOR AIR TEMP
S175	THERMOSTAT, SENSIBLE AIR

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. OPTIONAL OUTDOOR AIR THERMOSTAT TO REPLACE RT26 SENSIBLE SENSOR

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

08/15	537620-01	08/15
ACCESSORIES		
ECONOMIZER LANDMARK A-BOX		
SECTION D1		REV 1
Supersedes Form No. 537484-01	New Form No. 537620-01	

SEQUENCE OF OPERATION

POWER:

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

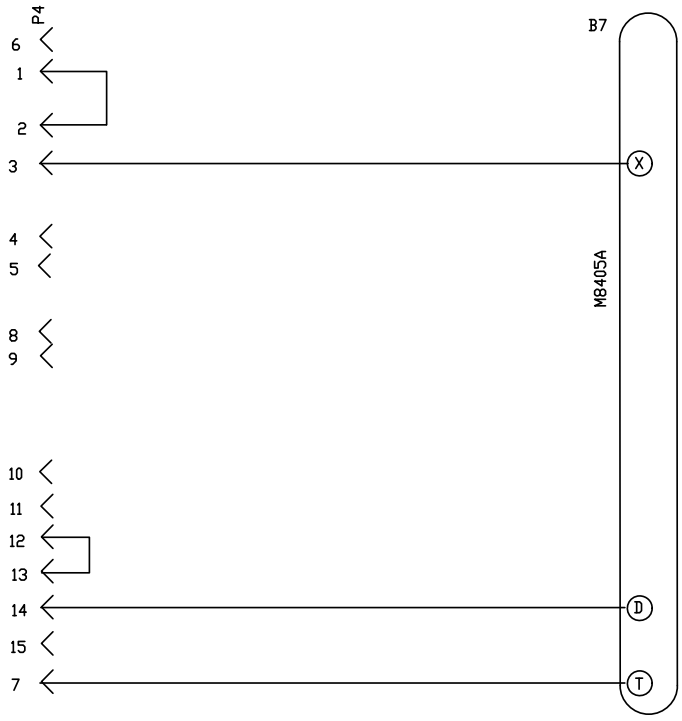
OPERATION:

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.

OUTDOOR AIR DAMPER



DESCRIPTION	
KEY	COMPONENT
B7	MOTOR-DAMPER, ECONOMIZER
P4	PLUG-ECONOMIZER

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

WIRING DIAGRAM	11/07
ACCESSORIES	
MOTORIZED OAD FOR KCA/KGA,TCA/TGA UNITS	
ECONOMIZER SECTION D2	
Supersedes Form No.	New Form No. 534,489W

Litho U.S.A.

SEQUENCE OF OPERATION

OPERATION:

Occupied Mode

1. 24 volt signal from terminal “OC” on TB1 opens B7 dampers to minimum position.

Unoccupied Mode

2. Dampers remain closed.