KCB180S through 300S

KCB180S, 210S, 240S and 300S units are available in 176,000 to 270,000 Btuh (52 to 79kW) standard efficiency cooling capacities. The 180S, 210S, 240S and utilize three compressors and the 300S utilize four compressors.

240S SHOWN

Optional electric heat is field-installed. Electric heat operates in single or multiple stages depending on the kW input size. 15kW to 60kW heat sections are available for 180S units. 15kW to 90kW heat sections are available for the 210, 240 and 300.

Units equipped with an optional supply air inverter (VFD) are available. The blower will operate at lower speeds when cooling demand is low and increase to higher speeds when cooling demand is high. Refer to Supply Air Inverter Start-Up section.

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

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

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

⚠WARNING

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

⚠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.

⚠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.

⚠WARNING

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

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OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS

Item Description		Model Number	Catalog Number	KCB 180	KCB 210	KCB 240	KCB 300
COOLING SYSTEM							
Condensate Drain Trap	PVC - C1TRAP20AD2		**76W26**	X	X	X	X
	Copper - C1TRAP10AD2		**76W27**	X	X	X	X
Corrosion Protection			Factory	O	O	O	O
Drain Pan Overflow Switch		C1SNSR71FF1-	**10C24**	X	X	X	X
Efficiency	Standard or High		Factory	O	O	O	O
Refrigerant Type			R-410A	O	O	O	O
BLOWER - SUPPLY AIR							
Blower Option	CAV (Constant Air Volume)		Factory	O	O	O	O
	MSAV® (Multi-Stage Air Volume)		Factory	O	O	O	O
Motors - Constant Air Volume (CAV)	Belt Drive (standard efficiency) - 2 hp		Factory				
	Belt Drive (standard efficiency) - 3 hp		Factory	O	O		
	Belt Drive (standard efficiency) - 5 hp		Factory	O	O	O	O
	Belt Drive (standard efficiency) - 7.5 hp		Factory	O	O	O	O
	Belt Drive (standard efficiency) - 10 hp		Factory			O	O
Motors - MSAV® (Multi-Stage Air Volume)	Belt Drive (standard efficiency) - 2 hp		Factory				
	Belt Drive (standard efficiency) - 3 hp		Factory	O	O		
	Belt Drive (standard efficiency) - 5 hp		Factory	O	O	O	O
	Belt Drive (standard efficiency) - 7.5 hp		Factory	O	O	O	O
	Belt Drive (standard efficiency) - 10 hp		Factory			O	O
VFD Manual Bypass Kit (for MSAV® equipped units)	2, 3, 5 hp (208/230V) 2, 3, 5, 7.5, 10 hp (460V and 575V)	KVFDB11C-1	**90W52**	X	X	X	X
	7.5, 10 hp (208/230V)	KVFDB10C-1	**90W51**	X	X	X	X
Drive Kits	Kit #1 535-725 rpm		Factory	O	O		
See Blower Data Tables for usage and selection	Kit #2 710-965 rpm		Factory	O	O		
	Kit #3 685-856 rpm		Factory	O	O	O	O
	Kit #4 850-1045 rpm		Factory	O	O	O	O
	Kit #5 945-1185 rpm		Factory	O	O	O	O
	Kit #6 850-1045 rpm		Factory	O	O	O	O
	Kit #7 945-1185 rpm		Factory	O	O	O	O
	Kit #8 1045-1285 rpm		Factory	O	O	O	O
	Kit #10 1045-1285 rpm		Factory			O	O
	Kit #11 1135-1365 rpm		Factory			O	O
CABINET							
Hinged Access Panels			Factory	O	O	O	O
CONTROLS							
Commercial Controls	L Connection® Building Automation System		- - -	X	X	X	X
BACnet®		K0CTRL31C-1	**96W16**	OX	OX	OX	OX
BACnet® Sensor with Display		K0SNSR01FF1	**97W23**	X	X	X	X
BACnet® Sensor without Display		K0SNSR00FF1	**97W24**	X	X	X	X
Novar® 2051		K0CTRL30C-1	**96W13**	OX	OX	OX	OX
Plenum Cable (75 ft.)		K0MISC00FF1	**97W25**	X	X	X	X
Smoke Detector - Supply or Return (Power board and one sensor)		C1SNSR44C-1	**83W40**	X	X	X	X
Smoke Detector - Supply and Return (Power board and two sensors)		C1SNSR43C-1	**83W41**	X	X	X	X

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

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OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS

Item Description		Model Number	Catalog Number	KCB 180	KCB 210	KCB 240	KCB 300
ELECTRICAL							
Voltage 60 hz		208/230V - 3 phase	Factory	O	O	O	O
		460V - 3 phase	Factory	O	O	O	O
		575V - 3 phase	Factory	O	O	O	O
Disconnect Switch (see Electric Heat Tables for usage)		80 amp - C1DISC080C-1	**54W85**	OX	OX	OX	OX
		150 amp - C1DISC150C-1	**54W86**	OX	OX	OX	OX
		250 amp - C1DISC250C-1	**54W87**	OX	OX	OX	OX
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
[1] Phase Monitor		C1PHZM01FF1-	**10C25**	X	X	X	X
[2] ELECTRIC HEAT							
15 kW		208/230V-3ph - C1EH0150C-1Y	**53W84**	OX	OX	OX	OX
		460V-3ph - C1EH0150C-1G	**53W86**	OX	OX	OX	OX
		575V-3ph - C1EH0150C-1J	**53W87**	OX	OX	OX	OX
30 kW		208/230V-3ph - C1EH0300C11Y	**53W88**				
		460V-3ph - C1EH0300C11G	**53W90**				
		575V-3ph - C1EH0300C11J	**53W91**				
		208/230V-3ph - C1EH0300C21Y	**53W92**	OX	OX	OX	OX
		460V-3ph - C1EH0300C21G	**53W94**	OX	OX	OX	OX
		575V-3ph - C1EH0300C21J	**53W95**	OX	OX	OX	OX
45 kW		208/230V-3ph - C1EH0450C11Y	**53W96**				
		460V-3ph - C1EH0450C11G	**53W98**				
		575V-3ph - C1EH0450C11J	**53W99**				
		208/230V-3ph - C1EH0450C21Y	**54W00**	OX	OX	OX	OX
		460V-3ph - C1EH0450C21G	**54W02**	OX	OX	OX	OX
		575V-3ph - C1EH0450C21J	**54W03**	OX	OX	OX	OX
60 kW		208/230V-3ph - C1EH0600C11Y	**54W04**				
		460V-3ph - C1EH0600C11G	**54W06**				
		575V-3ph - C1EH0600C11J	**54W07**				
		208/230V-3ph - C1EH0600C21Y	**54W08**	OX	OX	OX	OX
		460V-3ph - C1EH0600C21G	**54W10**	OX	OX	OX	OX
		575V-3ph - C1EH0600C21J	**54W11**	OX	OX	OX	OX
90 kW		208/230V-3ph - C1EH0900C-1Y	**54W12**		OX	OX	OX
		460V-3ph - C1EH0900C-1G	**54W14**		OX	OX	OX
		575V-3ph - C1EH0900C-1J	**54W15**		OX	OX	OX

[1] Factory installed on all MSAV® equipped units.

[2] NOTE - Factory installed electric heat is only available with high efficiency models.

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

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OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS

Item Description	Model Number	Catalog Number	KCB 180	KCB 210	KCB 240	KCB 300
INDOOR AIR QUALITY						
Air Filters						
Healthy Climate® High Efficiency Air Filters 24 x 24 x 2 in. (Order 6 per unit)	MERV 8 - C1FLTR15C-1-	**54W67**	X	X	X	X
	MERV 13 - C1FLTR40C-1-	**52W40**	X	X	X	X
Replacement Media Filter With Metal Mesh Frame (includes non-pleated filter media)	C1FLTR30C-1-	**44N61**	X	X	X	X
Indoor Air Quality (CO_2) Sensors						
Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AE1L	**77N39**	X	X	X	X
Sensor - Wall-mount, off-white plastic cover, no display	C0SNSR52AE1L	**87N53**	X	X	X	X
Sensor - Black plastic case with LCD display, rated for plenum mounting	C0SNSR51AE1L	**87N52**	X	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0MISC19AE1	**87N54**	X	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications	C0MISC19AE1-	**85L43**	X	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO_2 sensors (**87N53** or **77N39**)	C0MISC16AE1-	**90N43**	X	X	X	X
UVC Germicidal Light Kit						
[1] Healthy Climate® UVC Light Kit (110/230V-1ph)	C1UVCL10C-1	**54W65**	X	X	X	X
ECONOMIZER						
Standard Economizer With Outdoor Air Hood (Not for Title 24)						
Standard Economizer Downflow or Horizontal Applications - Includes Outdoor Air Hood, order Downflow or Horizontal Barometric Relief Dampers separately	K1ECON20C-3	**13U48**	OX	OX	OX	OX
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 (For Title 24) / AMCA Class 1A Certified						
High Performance Economizer Downflow or Horizontal Applications - Includes Outdoor Air Hood, order Downflow or Horizontal Barometric Relief Dampers separately	K1ECON22C-1	**10U61**	OX	OX	OX	OX
High Performance Economizer Controls (Not for Title 24)						
Single Enthalpy Control	C1SNSR60FF1	**10Z75**	OX	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR60FF1	**10Z75**	X	X	X	X
Barometric Relief Dampers With Exhaust Hood						
Downflow Barometric Relief Dampers	C1DAMP50C	**54W78**	OX	OX	OX	OX
Horizontal Barometric Relief Dampers	LAGEDH18/24	**16K99**	X	X	X	X
OUTDOOR AIR						
Outdoor Air Dampers With Outdoor Air Hood						
Motorized	C1DAMP20C-1	**13U04**	OX	OX	OX	OX
Manual	C1DAMP10C-2	**13U05**	OX	OX	OX	OX
POWER EXHAUST (DOWNFLOW APPLICATIONS ONLY)						
Standard Static	208/230V - C1PWRE11C-1Y	**75W90**	X	X	X	X
	460V - C1PWRE11C-1G	**75W91**	X	X	X	X
	575V - C1PWRE11C-1J	**75W92**	X	X	X	X

[1] Lamps operate on 110-230V single-phase power supply. Step-down transformer must be field supplied for field installation in 460V and 575V rooftop units (transformer is furnished for factory installed light kits). Alternately, a separate 110V power supply may be used to directly power the UVC ballast(s)

ROOF CURBS

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

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OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS

Item Description	Model Number	Catalog Number	KCB 180	KCB 210	KCB 240	KCB 300
Hybrid Roof Curbs, Downflow						
8 in. height	C1CURB70C-1	**11F58**	X	X	X	X
14 in. height	C1CURB71C-1	**11F59**	X	X	X	X
18 in. height	C1CURB72C-1	**11F60**	X	X	X	X
24 in. height	C1CURB73C-1	**11F61**	X	X	X	X
Adjustable Pitch Curb						
14 in. height	L1CURB55C	**43W26**	X	X	X	X
Standard Roof Curbs, Horizontal - Requires Horizontal Return Air Panel Kit						
26 in. height - slab applications	C1CURB14C-1	**11T89**	X	X	X	
30 in. height - slab applications	C1CURB15C-1	**11T90**				X
37 in. height - rooftop applications	C1CURB16C-1	**11T96**	X	X	X	
41 in. height - rooftop applications	C1CURB17C-1	**11T97**				X
Insulation Kit For Standard Horizontal Curbs						
for C1CURB14C-1	C1INSU11C-1-	**73K32**	X	X	X	
for C1CURB15C-1	C1INSU12C-1-	**73K33**				X
for C1CURB16C-1	C1INSU13C-1-	**73K34**	X	X	X	
for C1CURB17C-1	C1INSU14C-1-	**73K35**				X
Horizontal Return Air Panel Kit						
Required for Horizontal Applications with Roof Curb	C1HRAP10C-1-	**87M00**	X	X	X	X
CEILING DIFFUSERS						
Step-Down - Order one	RTD11-185S	**13K63**	X			
	RTD11-275S	**13K64**		X	X	X
Flush - Order one	FD11-185S	**13K58**	X			
	FD11-275S	**13K59**		X	X	X
Transitions (Supply and Return) - Order one	C1DIFF33C-1	**12X68**	X			
	C1DIFF34C-1	**12X70**		X	X	X

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

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O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS ONLY

Item Description	Model Number	Catalog Number	KCB 180S	KCB 210S	KCB 240S	KCB 300S
COOLING SYSTEM						
Low Ambient Control	K1LOAM52C11	**10T62**				
	K1LOAM53C11	**10T63**	X	X		
	K1LOAM53C21	**10T64**			X	
	K1LOAM54C21	**10T65**				X
CABINET						
Combination Coil/Hail Guards	C1GARD52C12	**15T92**	X	X		
	C1GARD52C22	**15T93**			X	X

SPECIFICATIONS - STANDARD EFFICIENCY

General Data		15 Ton	17.5 Ton
	Nominal Tonnage	**15 Ton**	**17.5 Ton**
	Model Number	**KCB180S4B**	**KCB210S4B**
	Efficiency Type	**Standard**	**Standard**
	Blower Type	Constant Air Volume (CAV)	Constant Air Volume (CAV)
Cooling Performance	Gross Cooling Capacity - Btuh	182,000	206,000
	[1] Net Cooling Capacity - Btuh	176,000	200,000
	AHRI Rated Air Flow - cfm	6000	5700
	Total Unit Power - kW	16.0	18.2
	[1] EER (Btuh/Watt)	11.0	11.0
	[2] IEER (Btuh/Watt)	12.4	12.4
	Refrigerant Type	R-410A	R-410A
	Refrigerant Charge Furnished - Circuit 1	5 lbs. 14 oz.	6 lbs. 8 oz.
	Refrigerant Charge Furnished - Circuit 2	5 lbs. 12 oz.	6 lbs. 4 oz.
	Refrigerant Charge Furnished - Circuit 3	5 lbs. 13 oz.	6 lbs. 2 oz.
Electric Heat Available, see page 10		15-30-45-60 kW	15-30-45-60-90 kW
Compressor Type (number)		Scroll (3)	Scroll (3)
Outdoor Coils	Net face area (total) - sq. ft.	41.4	41.4
	Number of rows	1	1
	Fins per inch	23	23
Outdoor Coil Fans	Motor - (No.) horsepower	(3) 1/3	(3) 1/3
	Motor rpm	1075	1075
	Total Motor watts	1100	1100
	Diameter - (No.) in.	(3) 24	(3) 24
	Number of blades	3	3
	Total Air volume - cfm	12,000	12,000
Indoor Coils	Net face area (total) - sq. ft.	21.4	21.4
	Tube diameter - in.	3/8	3/8
	Number of rows	3	4
	Fins per inch	14	14
	Drain connection - No. and size	(1) 1 in. FPT	(1) 1 in. FPT
	Expansion device type	Refrigerant Metering Orifice (RFC)	
[3] Indoor Blower and Drive Selection	Nominal motor output	3 hp, 5 hp, 7.5 hp	
	Maximum usable motor output (US Only)	3.45 hp, 5.75 hp, 8.62 hp	
	Motor - Drive kit number	**3 hp** **Kit 1** 535-725 rpm **Kit 2** 710-965 rpm **5 hp** **Kit 3** 685-856 rpm **Kit 4** 850-1045 rpm **Kit 5** 945-1185 rpm **7.5 hp** **Kit 6** 850-1045 rpm **Kit 7** 945-1185 rpm **Kit 8** 1045-1285 rpm	
	Blower wheel nominal diameter x width - in.	(2) 15 x 15	(2) 15 x 15
Filters	Type of filter	Fiberglass, disposable	
	Number and size - in.	(6) 24 x 24 x 2	
Electrical characteristics		208/230V, 460V or 575V - 60 hertz - 3 phase	

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

[1] AHRI Certified to AHRI Standard 340/360; 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure.

[2] Integrated Energy Efficiency Ratio tested according to AHRI Standard 340/360.

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

NOTE – Units equipped with MSAV® (Multi-Stage Air Volume) option are limited to a motor service factor of 1.0.

SPECIFICATIONS - STANDARD EFFICIENCY

General Data			20 Ton	25 Ton	25 Ton
	Nominal Tonnage		**20 Ton**	**25 Ton**	**25 Ton**
	Model Number		**KCB240S4B**	**KCB300S4B**	**KCB300S4M**
	Efficiency Type		**Standard**	**Standard**	**Standard**
	Blower Type		Constant Air Volume (CAV)	Constant Air Volume (CAV)	MSAV® (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		236,000	282,000	282,000
	[1] Net Cooling Capacity - Btuh		230,000	270,000	270,000
	AHRI Rated Air Flow - cfm		6000	8400	8400
	Total Unit Power - kW		20.9	25.7	25.7
	[1] EER (Btuh/Watt)		11.0	10.5	10.5
	[2] IEER (Btuh/Watt)		12.4	11.6	13.8
	Refrigerant Type		R-410A	R-410A	R-410A
	Refrigerant Charge Furnished	Circuit 1	7 lbs. 0 oz.	6 lbs. 4 oz.	6 lbs. 4 oz.
		Circuit 2	7 lbs. 4 oz.	5 lbs. 10 oz.	5 lbs. 10 oz.
		Circuit 3	7 lbs. 0 oz.	6 lbs. 6 oz.	6 lbs. 6 oz.
		Circuit 4	- - -	6 lbs. 0 oz.	6 lbs. 0 oz.
Electric Heat Available, see page 10			15-30-45-60-90 kW	15-30-45-60-90 kW	
Compressor Type (number)			Scroll (3)	Scroll (4)	Scroll (4)
Outdoor Coils	Net face area (total) - sq. ft.		55.2	55.2	55.2
	Number of rows		1	1	1
	Fins per inch		23	20	20
Outdoor Coil Fans	Motor - (No.) horsepower		(4) 1/3	(6) 1/3	(6) 1/3
	Motor rpm		1075	1075	1075
	Total Motor watts		1665	1950	1950
	Diameter - (No.) in.		(4) 24	(6) 24	(6) 24
	Number of blades		3	3	3
	Total Air volume - cfm		16,000	20,000	20,000
Indoor Coils	Net face area (total) - sq. ft.		21.4	21.4	21.4
	Tube diameter - in.		3/8	3/8	3/8
	Number of rows		4	4	4
	Fins per inch		14	14	14
	Drain connection - No. and size		(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT
	Expansion device type		Refrigerant Metering Orifice (RFC)	Balanced port TXV, removable head	
[3] **Indoor Blower and Drive Selection**	Nominal motor output		5 hp, 7.5 hp, 10 hp		
	Maximum usable motor output (US Only)		5.75 hp, 8.62 hp, 11.5 hp		
	Motor - Drive kit number		**5 hp** **Kit 3** 685-856 rpm **Kit 4** 850-1045 rpm **Kit 5** 945-1185 rpm **7.5 hp** **Kit 6** 850-1045 rpm **Kit 7** 945-1185 rpm **Kit 8** 1045-1285 rpm **10 hp** **Kit 7** 945-1185 rpm **Kit 10** 1045-1285 rpm **Kit 11** 1135-1365 rpm		
	Blower wheel nominal diameter x width - in.		(2) 15 x 15	(2) 15 x 15	(2) 15 x 15
Filters	Type of filter		Fiberglass, disposable		
	Number and size - in.		(6) 24 x 24 x 2		
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase		

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

[1] AHRI Certified to AHRI Standard 340/360; 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure.

[2] Integrated Energy Efficiency Ratio tested according to AHRI Standard 340/360.

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

NOTE – Units equipped with MSAV® (Multi-Stage Air Volume) option are limited to a motor service factor of 1.0.

BLOWER DATA

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

FOR ALL UNITS ADD:

1 - Wet indoor coil air resistance of selected unit.
2 - Any factory installed options air resistance (electric heat, economizer, etc.)
3 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.)

Then determine from blower table blower motor output and drive required.
See page 9 for wet coil and option/accessory air resistance data.
See page 9 for factory installed drive kit specifications.

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT

KCA156H units require 5200 cfm minimum air with electric heat.

All other units require 6000 cfm minimum air with electric heat.

Air Volume cfm	TOTAL STATIC PRESSURE - Inches Water Gauge (Pa)																									
	0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60		1.80		2.00		2.20		2.40		2.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2750	385	0.30	505	0.50	600	0.70	680	0.90	755	1.10	820	1.30	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3000	395	0.35	515	0.55	610	0.75	685	1.00	760	1.20	825	1.45	885	1.70	---	---	---	---	---	---	---	---	---	---	---	---
3250	405	0.40	520	0.60	615	0.85	695	1.10	765	1.30	830	1.60	890	1.85	950	2.10	---	---	---	---	---	---	---	---	---	---
3500	415	0.45	530	0.70	620	0.95	700	1.20	775	1.45	840	1.70	900	2.00	955	2.25	1005	2.55	---	---	---	---	---	---	---	---
3750	425	0.50	540	0.75	630	1.05	710	1.30	780	1.60	845	1.85	905	2.15	960	2.45	1010	2.70	1060	3.00	1110	3.30	---	---	---	---
4000	435	0.55	545	0.85	635	1.10	715	1.40	785	1.70	850	2.00	910	2.30	965	2.60	1020	2.90	1070	3.25	1115	3.55	1160	3.85	1205	4.15
4250	445	0.60	555	0.90	645	1.25	725	1.55	795	1.85	855	2.15	915	2.45	970	2.80	1025	3.10	1075	3.45	1120	3.75	1165	4.10	1210	4.45
4500	455	0.70	565	1.00	655	1.35	730	1.65	800	2.00	865	2.35	925	2.65	980	3.00	1030	3.30	1080	3.65	1130	4.05	1175	4.35	1215	4.70
4750	470	0.75	575	1.10	660	1.45	740	1.80	810	2.15	870	2.50	930	2.85	985	3.20	1040	3.55	1085	3.90	1135	4.25	1180	4.65	1225	5.00
5000	480	0.85	585	1.25	670	1.60	750	1.95	815	2.30	880	2.70	940	3.05	995	3.40	1045	3.80	1095	4.15	1140	4.50	1185	4.90	1230	5.30
5250	495	0.95	595	1.35	680	1.70	755	2.10	825	2.50	890	2.90	945	3.25	1000	3.65	1050	4.00	1100	4.40	1150	4.80	1195	5.20	1235	5.60
5500	505	1.05	605	1.45	690	1.85	765	2.25	835	2.65	895	3.05	955	3.45	1010	3.85	1060	4.25	1110	4.70	1155	5.10	1200	5.50	1240	5.90
5750	520	1.15	615	1.60	700	2.00	775	2.45	840	2.85	905	3.25	960	3.65	1015	4.10	1065	4.50	1115	4.95	1160	5.35	1205	5.80	1250	6.25
6000	530	1.30	630	1.75	710	2.15	785	2.60	850	3.05	910	3.45	970	3.90	1025	4.35	1075	4.80	1120	5.20	1170	5.65	1215	6.10	1255	6.55
6250	545	1.40	640	1.90	720	2.35	795	2.80	860	3.25	920	3.70	975	4.15	1030	4.60	1080	5.05	1130	5.50	1175	5.95	1220	6.45	1265	6.90
6500	560	1.55	650	2.05	730	2.50	805	3.00	870	3.45	930	3.95	985	4.40	1040	4.85	1090	5.35	1140	5.85	1185	6.30	1225	6.75	1270	7.25
6750	570	1.70	665	2.20	745	2.70	815	3.20	880	3.70	940	4.20	995	4.65	1045	5.10	1095	5.60	1145	6.10	1190	6.60	1235	7.10	1275	7.60
7000	585	1.85	675	2.35	755	2.90	825	3.40	890	3.95	950	4.45	1005	4.95	1055	5.40	1105	5.95	1155	6.45	1200	6.95	1240	7.45	1285	8.00
7250	600	2.00	690	2.60	765	3.10	835	3.65	900	4.15	955	4.65	1015	5.25	1065	5.75	1115	6.25	1160	6.75	1205	7.30	1250	7.85	1290	8.35
7500	615	2.20	700	2.75	775	3.30	845	3.85	910	4.45	965	4.95	1020	5.50	1075	6.05	1125	6.60	1170	7.15	1215	7.65	1260	8.25	1300	8.75
7750	630	2.40	715	3.00	790	3.55	855	4.10	920	4.70	975	5.25	1030	5.80	1080	6.35	1130	6.90	1180	7.50	1225	8.05	1265	8.60	1305	9.15
8000	640	2.55	725	3.20	800	3.80	865	4.35	930	4.95	985	5.50	1040	6.10	1090	6.70	1140	7.25	1185	7.85	1230	8.40	1275	9.00	1315	9.60
8250	655	2.80	740	3.40	810	4.00	880	4.65	940	5.25	995	5.85	1050	6.45	1100	7.05	1150	7.65	1195	8.25	1240	8.85	1280	9.40	1325	10.05
8500	670	3.00	750	3.65	825	4.30	890	4.90	950	5.55	1005	6.15	1060	6.80	1110	7.40	1160	8.05	1205	8.65	1250	9.25	1290	9.85	1330	10.45
8750	685	3.25	765	3.90	835	4.55	900	5.20	960	5.85	1015	6.45	1070	7.15	1120	7.75	1165	8.35	1215	9.05	1255	9.65	1300	10.30	1340	10.90
9000	700	3.50	780	4.20	850	4.85	910	5.50	970	6.15	1025	6.80	1080	7.50	1130	8.15	1175	8.75	1220	9.40	1265	10.10	1310	10.80	1350	11.40
9250	715	3.75	790	4.45	860	5.15	925	5.85	985	6.55	1040	7.20	1090	7.85	1140	8.55	1185	9.20	1230	9.85	1275	10.55	1315	11.20	---	---
9500	730	4.00	805	4.75	875	5.45	935	6.15	995	6.90	1050	7.60	1100	8.25	1150	8.95	1195	9.60	1240	10.30	1285	11.05	---	---	---	---
9750	745	4.30	820	5.05	885	5.75	950	6.55	1005	7.20	1060	7.95	1110	8.65	1160	9.40	1205	10.05	1250	10.80	1295	11.50	---	---	---	---
10,000	760	4.60	835	5.40	900	6.15	960	6.85	1015	7.60	1070	8.35	1120	9.05	1170	9.80	1215	10.50	1260	11.25	---	---	---	---	---	---
10,250	775	4.90	845	5.65	910	6.45	970	7.20	1030	8.00	1080	8.75	1135	9.55	1180	10.25	1225	11.00	---	---	---	---	---	---	---	---
10,500	790	5.20	860	6.00	925	6.85	985	7.65	1040	8.40	1095	9.20	1145	10.00	1190	10.70	1235	11.45	---	---	---	---	---	---	---	---
10,750	805	5.55	875	6.40	940	7.25	1000	8.05	1055	8.85	1105	9.65	1155	10.45	1200	11.20	---	---	---	---	---	---	---	---	---	---
11,000	820	5.90	890	6.80	950	7.60	1010	8.45	1065	9.30	1115	10.05	1165	10.90	---	---	---	---	---	---	---	---	---	---	---	---

BLOWER DATA

FACTORY INSTALLED BELT DRIVE KIT SPECIFICATIONS

Motor Efficiency	Nominal hp	Maximum hp	Drive Kit Number	RPM Range
Standard	3	3.45	1	535 - 725
Standard	3	3.45	2	710 - 965
Standard	5	5.75	3	685 - 856
Standard	5	5.75	4	850 - 1045
Standard	5	5.75	5	945 - 1185
Standard	7.5	8.63	6	850 - 1045
Standard	7.5	8.63	7	945 - 1185
Standard	7.5	8.63	8	1045 - 1285
Standard	10	11.50	7	945 - 1185
Standard	10	11.50	10	1045 - 1285
Standard	10	11.50	11	1135 - 1365

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

NOTE – Units equipped with MSAV® (Multi-Stage Air Volume) option are limited to a motor service factor of 1.0.

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

Air Volume cfm	Wet Indoor Coil		Electric Heat	Economizer	Filters		Horizontal Roof Curb	
	180S	210S 240S 300S			MERV 8	MERV 13	180S 210S 240S	300S
2750	0.01	0.02	- - -	- - -	0.01	0.03	0.03	- - -
3000	0.01	0.02	- - -	- - -	0.01	0.03	0.04	- - -
3250	0.01	0.03	- - -	- - -	0.01	0.04	0.04	0.01
3500	0.01	0.03	- - -	- - -	0.01	0.04	0.05	0.01
3750	0.01	0.03	- - -	- - -	0.01	0.04	0.05	0.01
4000	0.02	0.04	- - -	- - -	0.01	0.04	0.06	0.02
4250	0.02	0.04	- - -	- - -	0.01	0.05	0.07	0.02
4500	0.02	0.05	- - -	- - -	0.01	0.05	0.07	0.02
4750	0.02	0.05	- - -	- - -	0.02	0.05	0.08	0.03
5000	0.02	0.05	- - -	- - -	0.02	0.06	0.08	0.03
5250	0.02	0.06	- - -	- - -	0.02	0.06	0.09	0.04
5500	0.02	0.07	- - -	- - -	0.02	0.06	0.10	0.04
5750	0.03	0.07	- - -	- - -	0.02	0.07	0.11	0.05
6000	0.03	0.08	0.01	- - -	0.03	0.07	0.11	0.06
6250	0.03	0.08	0.01	0.01	0.03	0.07	0.12	0.07
6500	0.03	0.09	0.01	0.02	0.03	0.08	0.13	0.08
6750	0.04	0.10	0.01	0.03	0.03	0.08	0.14	0.08
7000	0.04	0.10	0.01	0.04	0.04	0.08	0.15	0.09
7250	0.04	0.11	0.01	0.05	0.04	0.09	0.16	0.10
7500	0.05	0.12	0.01	0.06	0.04	0.09	0.17	0.11
8000	0.05	0.13	0.02	0.09	0.05	0.10	0.19	0.13
8500	0.06	0.15	0.02	0.11	0.05	0.10	0.21	0.15
9000	0.07	0.16	0.04	0.14	0.06	0.11	0.24	0.17
9500	0.08	0.18	0.05	0.16	0.07	0.12	0.26	0.19
10,000	0.08	0.20	0.06	0.19	0.07	0.12	0.29	0.21
10,500	0.09	0.22	0.09	0.22	0.08	0.13	0.31	0.24
11,000	0.11	0.24	0.11	0.25	0.09	0.14	0.34	0.27

CEILING DIFFUSER AIR RESISTANCE - in. w.g.

Air Volume cfm	Step-Down Diffuser						Flush Diffuser	
	RTD11-185S			RTD11-275				
	2 Ends Open	1 Side/2 Ends Open	All Ends & Sides Open	2 Ends Open	1 Side/2 Ends Open	All Ends & Sides Open	FD11-185S	FD11-275
5000	.51	.44	.39	- - -	- - -	- - -	.27	- - -
5200	.56	.48	.42	- - -	- - -	- - -	.30	- - -
5400	.61	.52	.45	- - -	- - -	- - -	.33	- - -
5600	.66	.56	.48	- - -	- - -	- - -	.36	- - -
5800	.71	.59	.51	- - -	- - -	- - -	.39	- - -
6000	.76	.63	.55	.36	.31	.27	.42	.29
6200	.80	.68	.59	- - -	- - -	- - -	.46	- - -
6400	.86	.72	.63	- - -	- - -	- - -	.50	- - -
6500	- - -	- - -	- - -	.42	.36	.31	- - -	.34
6600	.92	.77	.67	- - -	- - -	- - -	.54	- - -
6800	.99	.83	.72	- - -	- - -	- - -	.58	- - -
7000	1.03	.87	.76	.49	.41	.36	.62	.40
7200	1.09	.92	.80	- - -	- - -	- - -	.66	- - -
7400	1.15	.97	.84	- - -	- - -	- - -	.70	- - -
7500	- - -	- - -	- - -	.51	.46	.41	- - -	.45
7600	1.20	1.02	.88	- - -	- - -	- - -	.74	- - -
8000	- - -	- - -	- - -	.59	.49	.43	- - -	.50
8500	- - -	- - -	- - -	.69	.58	.50	- - -	.57
9000	- - -	- - -	- - -	.79	.67	.58	- - -	.66
9500	- - -	- - -	- - -	.89	.75	.65	- - -	.74
10,000	- - -	- - -	- - -	1.00	.84	.73	- - -	.81
10,500	- - -	- - -	- - -	1.10	.92	.80	- - -	.89
11,000	- - -	- - -	- - -	1.21	1.01	.88	- - -	.96

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume cfm	[1] Effective Throw Range - ft.	
		RTD11-185S Step-Down	FD11-185S Flush
180	5600	39 - 49	28 - 37
	5800	42 - 51	29 - 38
	6000	44 - 54	40 - 50
	6200	45 - 55	42 - 51
	6400	46 - 55	43 - 52
	6600	47 - 56	45 - 56

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

Model No.	Air Volume cfm	[1] Effective Throw Range - ft.	
		RTD11-275 Step-Down	FD11-275 Flush
210 240 300	7200	33 - 38	26 - 35
	7400	35 - 40	28 - 37
	7600	36 - 41	29 - 38
	7800	38 - 43	40 - 50
	8000	39 - 44	42 - 51
	8200	41 - 46	43 - 52
	8400	43 - 49	44 - 54
	8600	44 - 50	46 - 57
	8800	47 - 55	48 - 59

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure	Air Volume Exhausted
in. w.g.	cfm
0.00	8630
0.05	8210
0.10	7725
0.15	7110
0.20	6470
0.25	5790
0.30	5060
0.35	4300
0.40	3510
0.45	2690
0.50	1840

ELECTRICAL/ELECTRIC HEAT DATA — 15 TON

15 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME — KCB180S4B

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	11.6			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 2	Rated Load Amps	11.6			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 3	Rated Load Amps	11.6			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Outdoor Fan Motors (3)	Full Load Amps (total)	2.4 (7.2)			1.3 (3.9)			1 (3)		
Power Exhaust (2) 0.33 HP	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1 (2)		
Service Outlet 115V GFI (amps)		15			15			20		
Indoor Blower Motor	Horsepower	3	5	7.5	3	5	7.5	3	5	7.5
	Full Load Amps	10.6	16.7	24.2	4.8	7.6	11	3.9	6.1	9
[2] Maximum Overcurrent Protection	Unit Only	60	70	90	35	35	45	25	30	35
	With (2) 0.33 HP Power Exhaust	70	80	100	35	40	50	25	30	35
[3] Minimum Circuit Ampacity	Unit Only	56	63	73	30	33	37	23	26	29
	With (2) 0.33 HP Power Exhaust	61	68	78	32	35	40	25	28	31

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	60	60	70	70	90	90	35	35	45	25	30	35
		30 kW	100	110	100	125	110	125	60	60	60	45	45	50
		45 kW	150	150	150	175	150	175	80	80	90	60	70	70
		60 kW	150	175	150	175	175	175	80	90	90	70	70	70
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	56	59	63	66	73	76	30	33	37	23	26	30
		30 kW	92	104	100	112	109	121	52	55	59	41	44	48
		45 kW	131	149	139	157	148	166	74	78	82	60	62	66
		60 kW	139	158	146	166	156	175	79	82	86	63	66	69
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	70	70	80	80	100	100	35	40	50	30	30	35
		30 kW	100	110	110	125	125	150	60	60	70	45	50	50
		45 kW	150	175	150	175	175	175	80	90	90	70	70	70
		60 kW	150	175	175	175	175	200	90	90	90	70	70	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	61	65	68	72	78	82	32	36	40	26	29	32
		30 kW	98	110	106	118	115	127	55	58	63	44	47	50
		45 kW	137	155	145	163	154	172	77	81	85	62	65	68
		60 kW	145	164	152	172	162	181	82	85	90	66	68	72

ELECTRICAL ACCESSORIES

Disconnect	Unit Only	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust	**54W85**	**54W85**	**54W85**	**54W85**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **15 kW**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **30 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **45 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **60 kW**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust + Elec. Heat **15 kW**	**54W85**	**54W85**	**54W85**	**54W85**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust + Elec. Heat **30 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust + Elec. Heat **45 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust + Elec. Heat **60 kW**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**

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/ELECTRIC HEAT DATA — 17.5 TON

17.5 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME AND MSAV® — KCB210S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
Compressor 2	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
Compressor 3	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
Outdoor Fan Motors (3)	Full Load Amps (total)	2.4 (7.2)			1.3 (3.9)			1 (3)		
Power Exhaust (2) 0.33 HP	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1 (2)		
Service Outlet 115V GFI (amps)		15			15			20		
Indoor Blower Motor	Horsepower	3	5	7.5	3	5	7.5	3	5	7.5
	Full Load Amps	10.6	16.7	24.2	4.8	7.6	11	3.9	6.1	9
[2] Maximum Overcurrent Protection	Unit Only	100	100	110	40	45	50	30	35	40
	With (2) 0.33 HP Power Exhaust	100	110	125	45	45	50	35	35	45
[3] Minimum Circuit Ampacity	Unit Only	82	88	97	36	39	43	29	31	35
	With (2) 0.33 HP Power Exhaust	87	93	102	38	41	45	31	33	37

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	100	100	100	100	110	110	40	45	50	30	35	40
		30 kW	100	110	100	125	110	125	60	60	60	45	45	50
		45 kW	150	150	150	175	150	175	80	80	90	60	70	70
		60 kW	150	175	150	175	175	175	80	90	90	70	70	70
		90 kW	225	250	225	250	225	250	125	125	125	100	100	100
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	82	82	88	88	97	97	36	39	43	29	31	35
		30 kW	92	104	100	112	109	121	52	55	59	41	44	48
		45 kW	131	149	139	157	148	166	74	78	82	60	62	66
		60 kW	139	158	146	166	156	175	79	82	86	63	66	69
		90 kW	201	230	209	238	218	247	115	118	123	92	95	98
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	100	100	110	110	125	125	45	45	50	35	35	45
		30 kW	100	110	110	125	125	150	60	60	70	45	50	50
		45 kW	150	175	150	175	175	175	80	90	90	70	70	70
		60 kW	150	175	175	175	175	200	90	90	90	70	70	80
		90 kW	225	250	225	250	225	300	125	125	150	100	100	110
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	87	87	93	93	102	102	38	41	45	31	33	37
		30 kW	98	110	106	118	115	127	55	58	63	44	47	50
		45 kW	137	155	145	163	154	172	77	81	85	62	65	68
		60 kW	145	164	152	172	162	181	82	85	90	66	68	72
		90 kW	207	236	215	244	224	253	118	122	126	94	97	101

ELECTRICAL ACCESSORIES

Disconnect	Unit Only	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **15 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **30 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **45 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **60 kW**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **90 kW**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**
Unit + Power Exhaust + Elec. Heat **15 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **30 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **45 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **60 kW**		**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **90 kW**		**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**

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.

[4] Disconnect must be field furnished.

ELECTRICAL/ELECTRIC HEAT DATA — 20 TON

20 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME — KCB240S4B

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	22.4			10.6			7.7		
	Locked Rotor Amps	149			75			54		
Compressor 2	Rated Load Amps	22.4			10.6			7.7		
	Locked Rotor Amps	149			75			54		
Compressor 3	Rated Load Amps	25			12.2			9		
	Locked Rotor Amps	164			100			78		
Outdoor Fan Motors (4)	Full Load Amps (total)	2.4 (9.6)			1.3 (5.2)			1 (4)		
Power Exhaust (2) 0.33 HP	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1 (2)		
Service Outlet 115V GFI (amps)		15			15			20		
Indoor Blower Motor	Horsepower	5	7.5	10	5	7.5	10	5	7.5	10
	Full Load Amps	16.7	24.2	30.8	7.6	11	14	6.1	9	11
[2] Maximum Overcurrent Protection	Unit Only	125	125	125	60	60	70	45	45	50
	With (2) 0.33 HP Power Exhaust	125	125	150	60	60	70	45	50	50
[3] Minimum Circuit Ampacity	Unit Only	103	110	118	50	53	57	37	40	43
	With (2) 0.33 HP Power Exhaust	108	115	123	52	56	59	39	42	45

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	125	125	125	125	125	125	60	60	70	45	45	50
		30 kW	125	125	125	125	125	150	60	60	70	45	50	50
		45 kW	150	175	150	175	175	175	80	90	90	70	70	70
		60 kW	150	175	175	175	175	200	90	90	90	70	70	80
		90 kW	225	250	225	250	250	300	125	125	150	100	100	110
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	103	103	110	110	118	118	50	53	57	37	40	43
		30 kW	103	112	110	121	118	129	55	59	63	44	48	50
		45 kW	139	157	148	166	156	174	78	82	86	62	66	68
		60 kW	146	166	156	175	164	183	82	86	90	66	69	72
		90 kW	209	238	218	247	227	256	118	123	126	95	98	101
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	125	125	125	125	150	150	60	60	70	45	50	50
		30 kW	125	125	125	150	150	150	60	70	70	50	50	60
		45 kW	150	175	175	175	175	200	90	90	90	70	70	80
		60 kW	175	175	175	200	175	200	90	90	100	70	80	80
		90 kW	225	250	225	300	250	300	125	150	150	100	110	110
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	108	108	115	115	123	123	52	56	59	39	42	45
		30 kW	108	118	115	127	123	135	58	63	66	47	50	53
		45 kW	145	163	154	172	162	180	81	85	89	65	68	71
		60 kW	152	172	162	181	170	189	85	90	93	68	72	74
		90 kW	215	244	224	253	233	262	122	126	130	97	101	103

ELECTRICAL ACCESSORIES

Disconnect	Unit Only	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **15 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **30 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **45 kW**	**54W86**	**54W86**	**54W87**	**54W87**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **60 kW**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **90 kW**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**
Unit + Power Exhaust + Elec. Heat **15 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **30 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **45 kW**		**54W86**	**54W86**	**54W87**	**54W87**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **60 kW**		**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W86**
Unit + Power Exhaust + Elec. Heat **90 kW**		**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**

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.

[4] Disconnect must be field furnished.

ELECTRICAL/ELECTRIC HEAT DATA — 25 TON

25 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME AND MSAV® — KCB300S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
Compressor 2	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
Compressor 3	Rated Load Amps	22.4			10.6			7.7		
	Locked Rotor Amps	149			75			54		
Compressor 4	Rated Load Amps	22.4			10.6			7.7		
	Locked Rotor Amps	149			75			54		
Outdoor Fan Motors (6)	Full Load Amps (total)	2.4 (14.4)			1.3 (7.8)			1 (6)		
Power Exhaust (2) 0.33 HP	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1 (2)		
Service Outlet 115V GFI (amps)		15			15			20		
Indoor Blower Motor	Horsepower	5	7.5	10	5	7.5	10	5	7.5	10
	Full Load Amps	16.7	24.2	30.8	7.6	11	14	6.1	9	11
[2] Maximum Overcurrent Protection	Unit Only	125	150	150	60	70	70	50	50	50
	With (2) 0.33 HP Power Exhaust	150	150	150	60	70	70	50	50	60
[3] Minimum Circuit Ampacity	Unit Only	121	129	137	56	60	63	43	46	49
	With (2) 0.33 HP Power Exhaust	126	134	142	59	62	66	45	48	51

ELECTRIC HEAT DATA

Electric Heat Voltage			**208V**	**240V**	**208V**	**240V**	**208V**	**240V**	**480V**	**480V**	**480V**	**600V**	**600V**	**600V**
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	125	125	150	150	150	150	60	70	70	50	50	50
		30 kW	125	125	150	150	150	150	60	70	70	50	50	50
		45 kW	150	175	150	175	175	175	80	90	90	70	70	70
		60 kW	150	175	175	175	175	200	90	90	90	70	70	80
		90 kW	225	250	225	250	250	300	125	125	150	100	100	110
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	121	121	129	129	137	137	56	60	63	43	46	49
		30 kW	121	121	129	129	137	137	56	60	63	44	48	50
		45 kW	139	157	148	166	156	174	78	82	86	62	66	68
		60 kW	146	166	156	175	164	183	82	86	90	66	69	72
		90 kW	209	238	218	247	227	256	118	123	126	95	98	101
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	150	150	150	150	150	150	60	70	70	50	50	60
		30 kW	150	150	150	150	150	150	60	70	70	50	50	60
		45 kW	150	175	175	175	175	200	90	90	90	70	70	80
		60 kW	175	175	175	200	175	200	90	90	100	70	80	80
		90 kW	225	250	225	300	250	300	125	150	150	100	110	110
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	126	126	134	134	142	142	59	62	66	45	48	51
		30 kW	126	126	134	134	142	142	59	63	66	47	50	53
		45 kW	145	163	154	172	162	180	81	85	89	65	68	71
		60 kW	152	172	162	181	170	189	85	90	93	68	72	74
		90 kW	215	244	224	253	233	262	122	126	130	97	101	103

ELECTRICAL ACCESSORIES

Disconnect	Unit Only	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Power Exhaust	**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **15 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **30 kW**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **45 kW**	**54W86**	**54W86**	**54W87**	**54W87**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **60 kW**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**
	Unit + Electric Heat **90 kW**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**
Unit + Power Exhaust + Elec. Heat **15 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **30 kW**		**54W86**	**54W86**	**54W86**	**54W86**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **45 kW**		**54W86**	**54W86**	**54W87**	**54W87**	**54W87**	**54W87**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **60 kW**		**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W87**	**54W86**	**54W86**	**54W86**	**54W85**	**54W85**	**54W85**
Unit + Power Exhaust + Elec. Heat **90 kW**		**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**[4] N/A**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**	**54W86**

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.

[4] Disconnect must be field furnished.

ELECTRIC HEAT CAPACITIES

Volts Input	15 kW			30 kW			45 kW			60 kW			90 kW		
	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages
208	11.3	38,600	1	22.5	76,800	1	33.8	115,300	2	45.0	153,600	2	67.6	230,700	2
220	12.6	43,000	1	25.2	86,000	1	37.8	129,000	2	50.4	172,000	2	75.6	258,000	2
230	13.8	47,100	1	27.5	93,900	1	41.3	141,000	2	55.1	188,000	2	82.7	282,200	2
240	15.0	51,200	1	30.0	102,400	1	45.0	153,600	2	60.0	204,800	2	90.0	307,100	2
440	12.6	43,000	1	25.2	86,000	1	37.8	129,000	2	50.4	172,000	2	75.6	258,000	2
460	13.8	47,100	1	27.5	93,900	1	41.3	141,000	2	55.1	188,000	2	82.7	282,200	2
480	15.0	51,200	1	30.0	102,400	1	45.0	153,600	2	60.0	204,800	2	90.0	307,100	2
550	12.6	43,000	1	25.2	86,000	1	37.8	129,000	2	50.4	172,000	2	75.6	258,000	2
575	13.8	47,100	1	27.5	93,900	1	41.3	141,000	2	55.1	188,000	2	82.7	282,200	2
600	15.0	51,200	1	30.0	102,400	1	45.0	153,600	2	60.0	204,800	2	90.0	307,100	2

KCB PARTS ARRANGEMENT

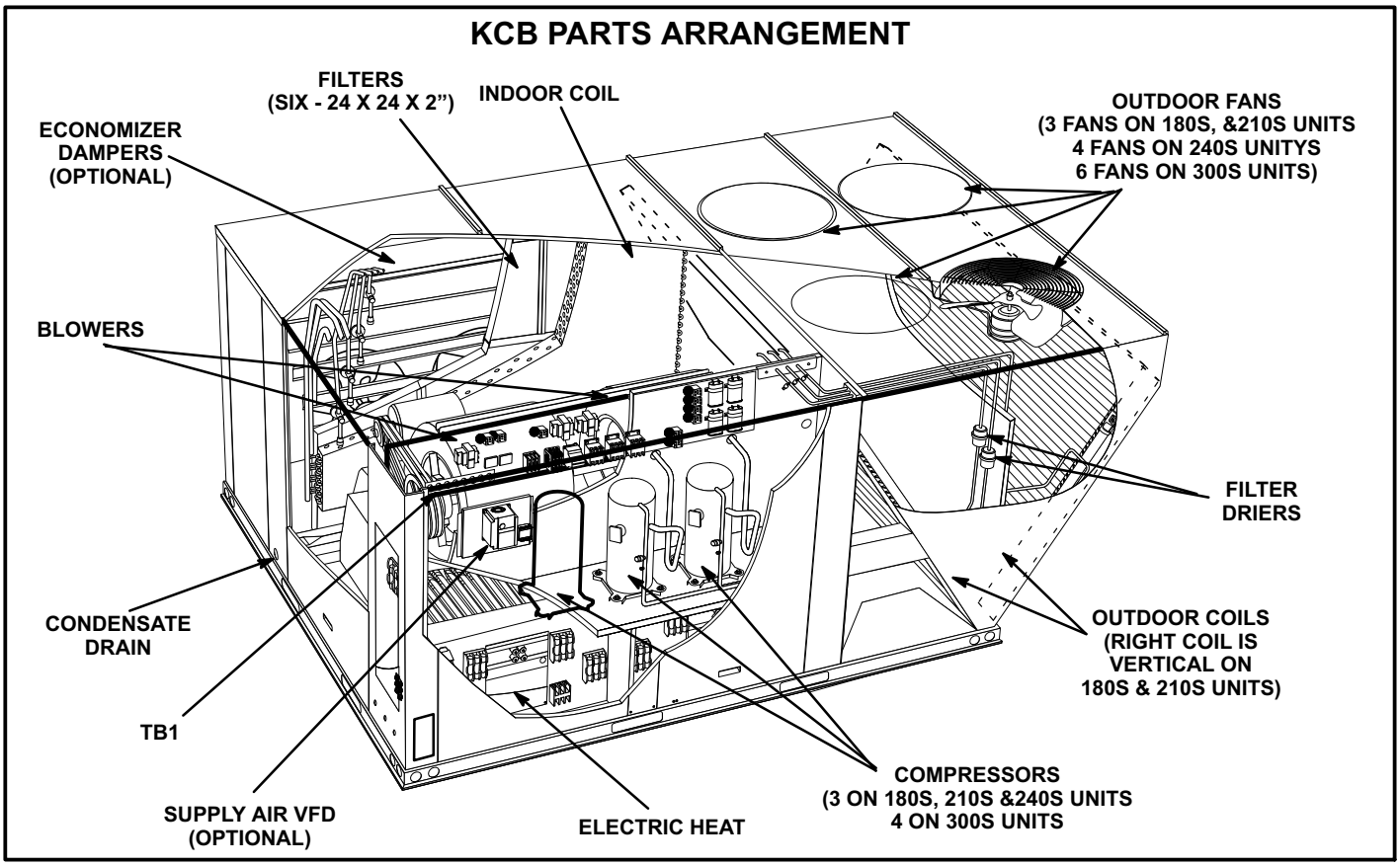


FIGURE 1

KCB CONTROL BOX

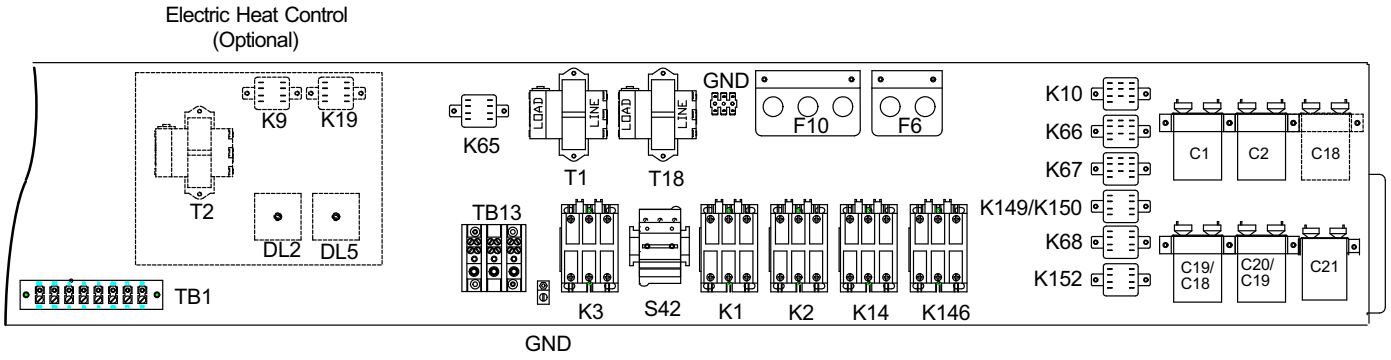


FIGURE 2

I-UNIT COMPONENTS

KCB unit components are shown in figure 1. All units come standard with removeable unit panels. All L1, L2 and L3 wiring is color coded; L1 is red, L2 is yellow and L3 is blue.

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ 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.

A-Control Box Components

KCB control box components are shown in figure 2. The control box is located in the compressor compartment.

1-Disconnect Switch S48 (field- or factory-installed)

All units may be equipped with an optional disconnect switch S48. S48 can be a toggle switch or a twist style switch. Both types can be used by the service technician to disconnect power to the unit.

2-Terminal Strip TB2

Unit without S48 will have supply power connected to TB2.

3-Terminal Strip TB13

All units are equipped with TB13. TB13 is located on the control panel in the compressor compartment.

4-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) which is located on the transformer itself. The 208/230 (Y) voltage transformers have two primary voltage taps, but only one may be used depending on supply voltage. See figure 3. 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

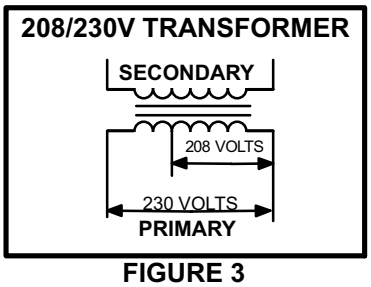


FIGURE 3

5-Fuse F4

Fuse F4 is used only with single point power supply. F4 gives over amperage protection to the compressor and other cooling components. F4, S48 and TB2 are located inside a sheet metal enclosure in the unit left front corner mullion.

6-C. A. I. Transformers T3 & T13 575V Only

All KCB 575 (J) voltage units use transformers T3 and T13 mounted in the control box. The transformers have an output rating of 0.75A. T3 transformer supplies 230 VAC power to combustion air inducer motor B6 and T13 supplies 230 VAC to combustion air inducer motor B15.

7-Control Transformer T18

T18 is a single line voltage to 24VAC transformer used in 180, 210, 240 and 300 units. Transformer T18 is protected by a 3.5 amp circuit breaker (CB18) located on the transformer itself. T18 is identical to transformer T1. The transformer supplies 24VAC power to the contactors.

8-Terminal Strip TB1

All indoor thermostat connections will be to TB1 located on the control panel. For thermostats with “occupied “ and “unoccupied” modes, a factory installed jumper across terminals R and OC should be removed. Unit wiring is designed for a two-stage thermostat. See table 1.

TABLE 1

TB1 TERMINAL DESIGNATIONS	
Y1	Cool Stage 1
Y2	Cool Stage 2
W1	Heat Stage 1
W2	Heat Stage 2
OC	Occupied
G	Indoor Blower
R	24V To Thermostat
C	Ground

9-Outdoor Fan Capacitors C1, C2, C18 (all units) & C19 (240S), C20, C21 (300S only)

Fan capacitors C1, C2, C18, C19, C20, C21 are 10 MFD / 370V capacitors used to assist in the start up of condenser fans B4, B5, B21 (all units), B22 (240 only), B23, B24 (300S only) respectively.

10-Fuses F10 and F6 (240 & 300 Y volt only)

Three F10 line voltage fuses provide overcurrent protection to condenser fans and are rated at 30A. Two F6 line voltage fuses provide overcurrent protection for optional field installed power exhaust fans (Y volt 240 300 units) and are rated at 30A.

11-Outdoor Fan Relay K10, K68, K149, K150, K152

Outdoor fan relays are DPDT relays with a 24VAC coil. See table 2 to determine which fan each relay energizes.

TABLE 2

KCB Unit	Relay	Fan Energized
180S, 210S	K10	B4
	K68	B5, B21
240S	K10	B4, B5
	K149	B21, B22
300S	K10	B4
	K68	B5, B21
	K150	B22
	K152	B23, B24

12-Compressor Contactor K1 & K2, K14 (all units) and K146 (300S only)

All compressor contactors are three-pole-double-break contactors with 24VAC coils. K1, K2, K14 and K146 energize compressor B1, B2, B13 and B20 respectively, in response to thermostat demand.

13-Blower Contactor K3

Blower contactor K3, used in all units, is a three-pole-double-break contactor with a 24VAC coil used to energize the indoor blower motor B3 in response to blower demand. K3 is energized from terminal G on TB1.

14-Blower Motor Overload Relay S42

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

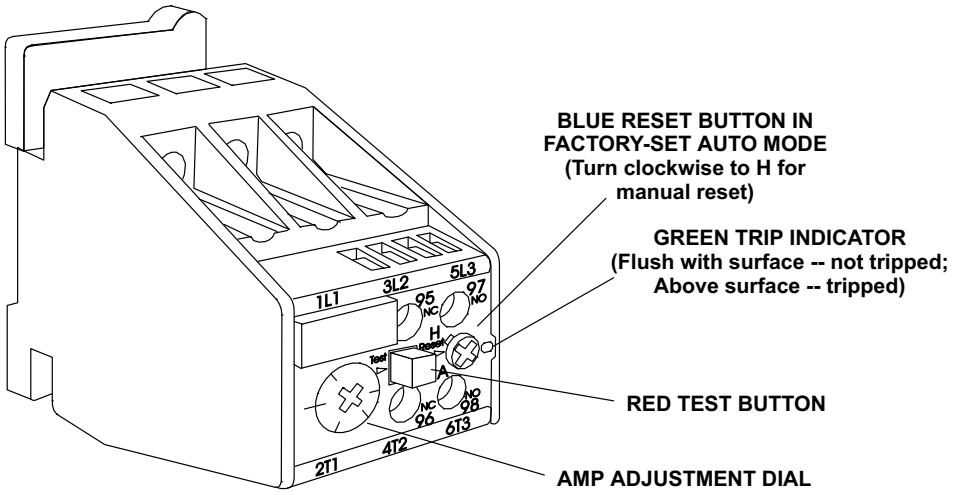
15-Power Exhaust Relay K65 (PED units)

Power exhaust relay K65 is a DPDT relay with a 24VAC coil. K65 is used in units equipped with the field installed 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 fans B10 and B11 are energized.

14-Cooling Stage Pilot Relays K66 and K67

Cooling stage pilot relays are DPDT relays with a 24VAC coil. These relays prevent voltage drop caused by long thermostat wiring when the thermostat is used to energize compressor contactors directly. K66 is energized by a Y1 thermostat call. N.O. contact K66-1 will close allowing 24VAC from T1 transformer to energize stage 1 compressor contactors. K67 is energized by a Y2 thermostat call. N.O. contacts K67-1 will close allowing 24VAC from T18 transformer to energize stage 2 compressor contactor(s).

SIEMENS OVERLOAD RELAY



Adjust relay amp setting according to value given on the blower motor nameplate. Proper relay amp setting equals motor nameplate FLA X service factor of 1.15 X .95.
Use small slotted screwdriver to adjust control mode from automatic reset (A) to manual reset (H). Control must be in the manual reset mode (H) to perform a test. Press the red test button. Green trip indicator should pop out. Press the blue reset screw to reset the relay.

FIGURE 4

KCB180S and 210S
PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL

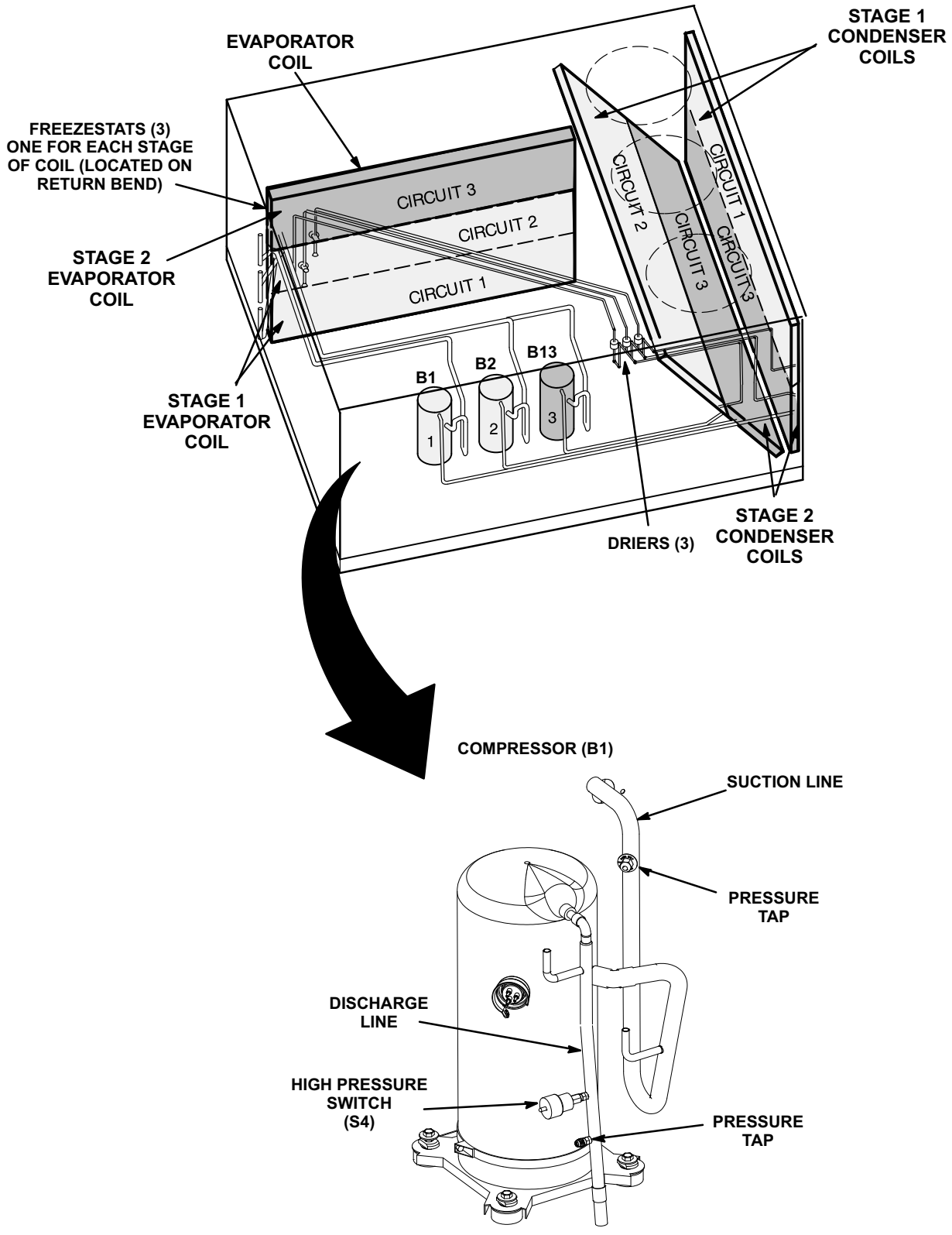


FIGURE 5

KCB240S
PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL

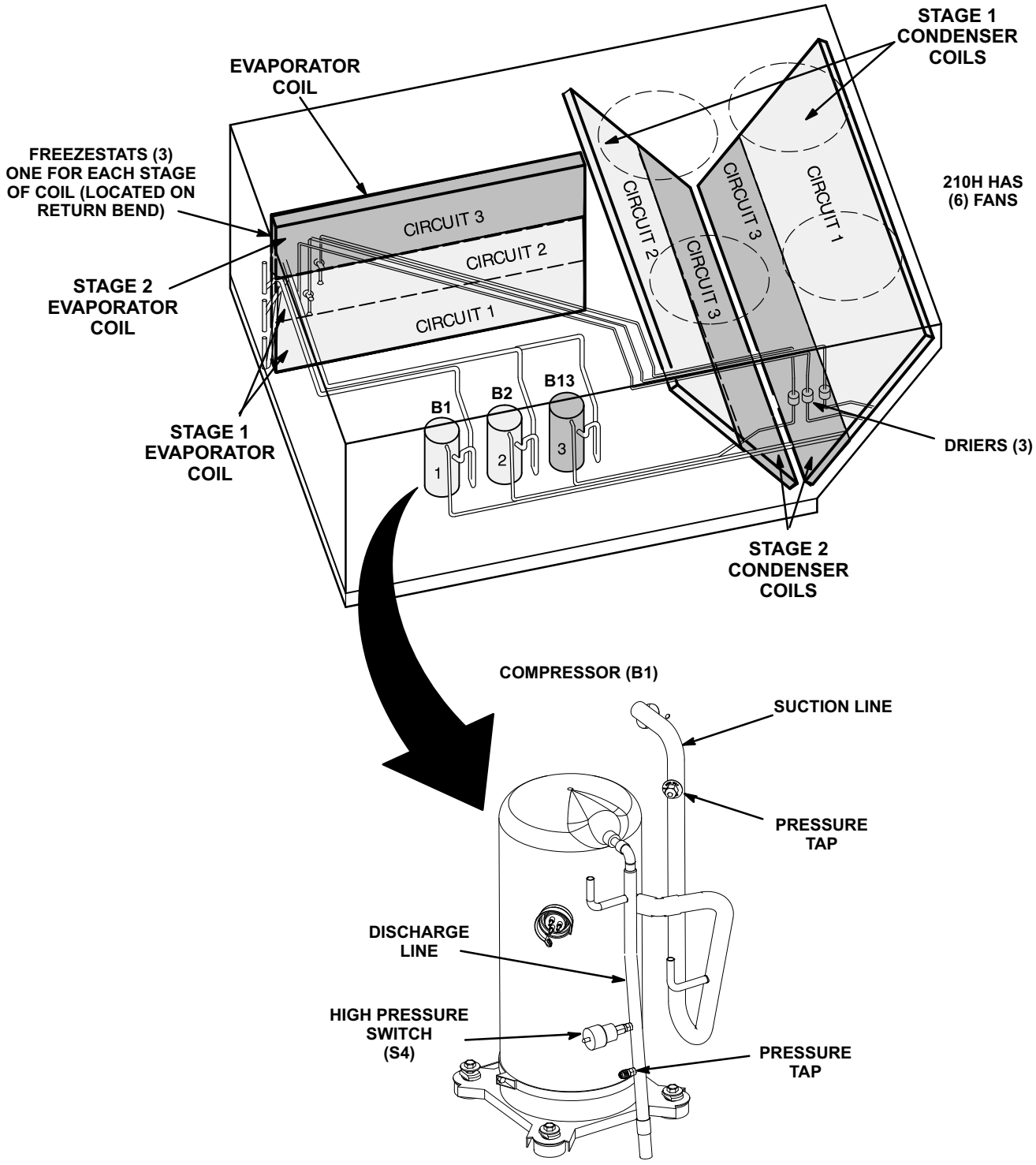


FIGURE 6

KCB300S PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL

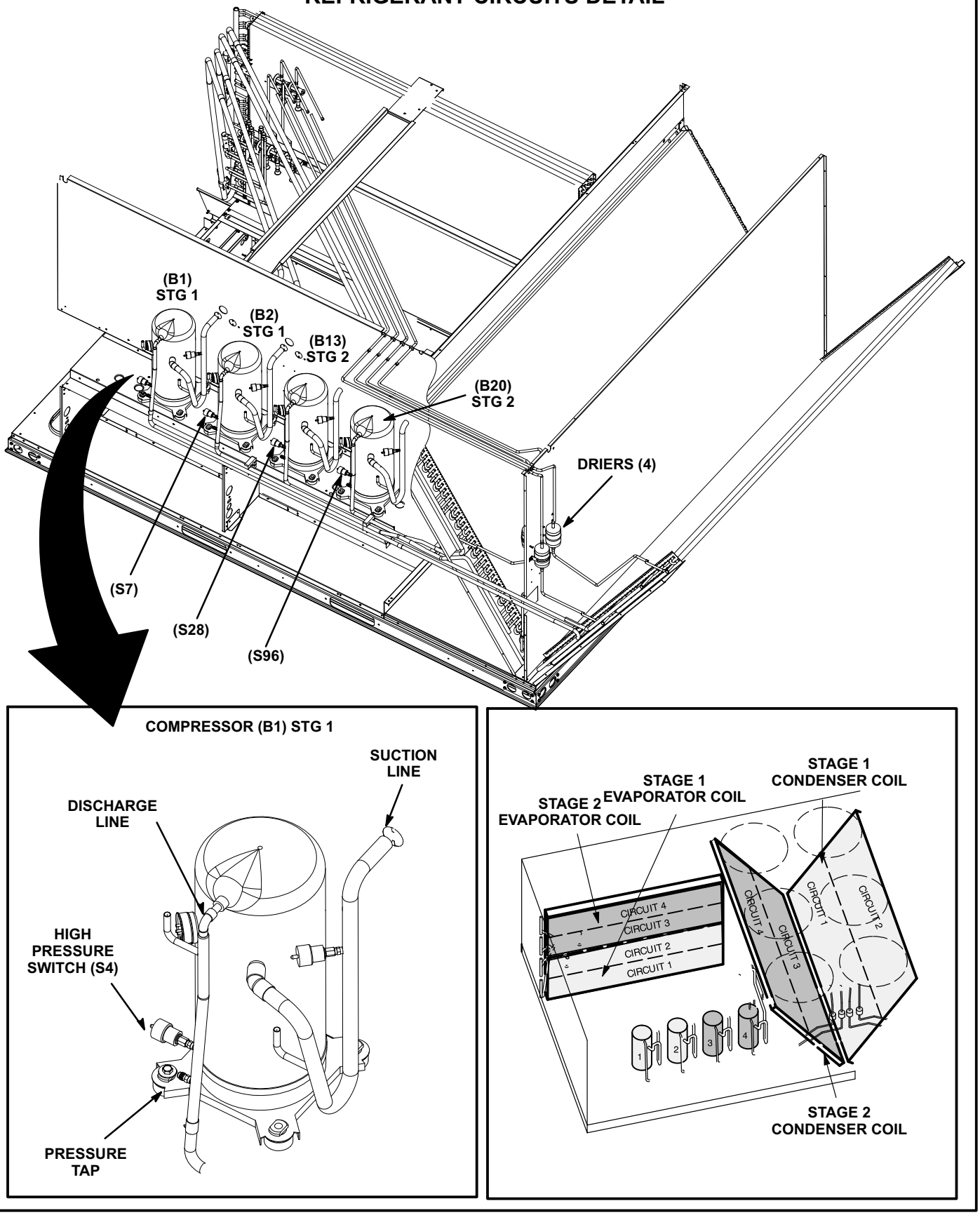


FIGURE 7

16-Variable Frequency Drive A96 (optional)

Units equipped with a VFD alter the supply power frequency and voltage to the blower motor. Blower speed is staged depending on the compressor stages, heating demand, or ventilation demand. The amount of airflow for each stage is preset from the factory. Full speed airflow can be adjusted by changing the variable sheave on the blower motor. Part load cooling speed is ⅔ of full speed. The VFD is located below the upper control panel.

17-Inverter Default Relay K232 (optional)

Units equipped with a VFD use a two-pole, double-throw relay with a 24VAC coil. K232 is energized through the A96 VFD B-C normally closed contact. If the VFD fails, the B-C contact will open and de-energize the K232 coil and cut the 24VAC power to the thermostat and the whole unit. K232 is located beside A96.

18-Phase Monitor A42 (Optional)

Phase monitor detects the phasing of incoming power. If the incoming power is out of phase or if any of the three phases are lost, an indicator LED on the phase monitor will turn red and the unit will not start. In normal operation with correct incoming power phasing, the LED will be green. A42 is located beside A96.

19-VFD Control Board A183 (Optional)

VFD control board A183 is a solid-state control board powered with 24VDC from the variable frequency drive A96. This option is used on units equipped with a VFD. A183 gets signals from the thermostat, ignition control and economizer modules to determine blower speeds and damper minimum positions. For more information on the A183, refer to the Supply Air Inverter Start Up section. A183 is located on the left side of the control area.

B-Cooling Components

All units use independent cooling circuits consisting of separate compressors, condenser coils and evaporator coils. See figures 5, 6 and 7. Draw-through type condenser fans are used in all units. All units are equipped with belt-drive blowers which draw air across the evaporator during unit operation.

Cooling may be supplemented by an optional factory- or field-installed economizer. The evaporators are slab type and are stacked. Each evaporator is equipped with enhanced fins and rifled tubing. In all units each compressor is protected by a freezestat (on each evaporator) and a high pressure switch (on each discharge line). Optional field installed low ambient switches are available for additional compressor protection.

1-Compressors B1, B2, B13 (all units) and B20 (300S)

All units use scroll compressors. KCB180S, 210S and 240S units use three compressors and KCB300S use four compressors. All compressors are equipped with independent cooling circuits. Compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications.

⚠WARNING

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

Each compressor is energized by a corresponding compressor contactor.

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

2-High Pressure Switches S4, S7, S28 (all units) S96 (300S units)

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

S4 (first circuit), S7 (second circuit), S28 (third circuit) and S96 (fourth circuit) are wired in series with the respective compressor contactor coils.

When discharge pressure rises to 640 ± 20 psig (4413 ± 138 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate). The switch will reset when discharge pressure drops below 475 ± 20 psig (3275 ± 138 kPa) and the respective compressor will restart.

3-Low Ambient Switches (optional) S11, S84, S85 (all units) & S94 (300S)

The low ambient switch is an optional field installed auto-reset N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. The switch is located in each liquid line prior to the indoor coil.

180S & 210S Units -

S11, S84 and S85 are wired in series with outdoor fan relay K10 and K68 coils. All three low ambient switches; S11, S84 and S85 have to be open to de-energize condenser fans (all three fans will be de-energized at the same time). Any one low ambient switch, S11, S84, or S85 closing will return all three condenser fans to operation.

240S Units -

S11 is wired in series with outdoor fan relay K10 coil. When S11 opens, condenser fans 1 and 2 are de-energized. When S11 closes, both condenser fans 1 and 2 will return to operation. S84 and S85 are wired in series with outdoor fan relay coil K149. Both S84 and S85 have to be open to deenergize condenser fans 3 and 4. Either S84 or S85 closing will return condenser fans 3 and 4 to operation.

300S Units -

S11 and S84 are wired in series with outdoor fan relay K10 and K68 coils. Both S11 and S84 have to be open to de-energize condenser fans 1, 2 and 3. Either S11 or S84 closing will return condenser fans 1, 2 and 3 to operation. S85 and S94 are wired in series with outdoor fan relay K150 and K152 coils. Both S85 and S94 have to be open to de-energize condenser fans 4, 5 and 6. Either S85 or S94 closing will return condenser fans 4, 5 and 6 to operation.

All Units -

When liquid pressure rises to 450 ± 10 psig (3103 ± 69 kPa), pressure switch(es) close, energizing the appropriate condenser fan(s). When liquid pressure drops to 240 ± 10 psig (1655 ± 69 kPa), pressure switch(es) open, de-energizing the appropriate condenser fan(s). Intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the evaporator coil and losing capacity.

4-Filter Drier (all units)

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

5-Freezestats S49, S50, S53 (all units) S95 (300S)

Each unit is equipped with a low temperature switch located on a return bend of each evaporator coil. S49 (first circuit), S50 (second circuit), S53 (third circuit) and S95 (fourth circuit) are located on the corresponding evaporator coils.

Each freezestat is wired in series with the corresponding compressor contactor. Each freezestat is an 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.

6-Condenser Fans B4, B5, B21 (all units), B22 (240S, 300S) & B23, B24 (300S)

See SPECIFICATIONS tables at the front of this manual for specifications of condenser fans used in all units. All condenser fans used have single-phase motors. The fan assembly may be removed for servicing and cleaning.

C-Blower Compartment

The blower compartment in KCB180-300S units is located between the evaporator coil and the compressor / control section on the opposite side of the condenser coil. The blower assembly is accessed by removing the screws on either side of the sliding base. The base pulls out as shown in figure 8.

1-Blower Wheels

All KCB180-300S units have two 15 in. x 15 in. (381 mm x 381 mm) blower wheels. Both wheels are driven by one motor mounted on a single shaft. Shaft bearings are equipped with grease ports for service.

2-Indoor Blower Motor B3

All units use three-phase single-speed blower motors. CFM adjustments are made by adjusting the motor pulley (sheave). Motors are equipped with sealed ball bearings. All motor specifications are listed in the SPECIFICATIONS (table of contents) in the front of this manual. Units may be equipped with motors manufactured by various manufacturers, therefore electrical FLA and LRA specifications will vary. See unit rating plate for information specific to your unit.

OPERATION / ADJUSTMENT

Three Phase Scroll Compressor Voltage Phasing

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

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

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

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

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of TB2. Do not reverse wires at blower contactor.

5- Make sure the connections are tight.

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

Supply Air Inverter Units - These units are equipped with a phase monitor located in the control compartment. The phase monitor will detect the phasing of incoming power. If the incoming power is out of phase or if any of the three phases are lost, the indicating LED on the phase monitor will turn red and the unit will not start. In normal operation with correct incoming power phasing, the LED will be green.

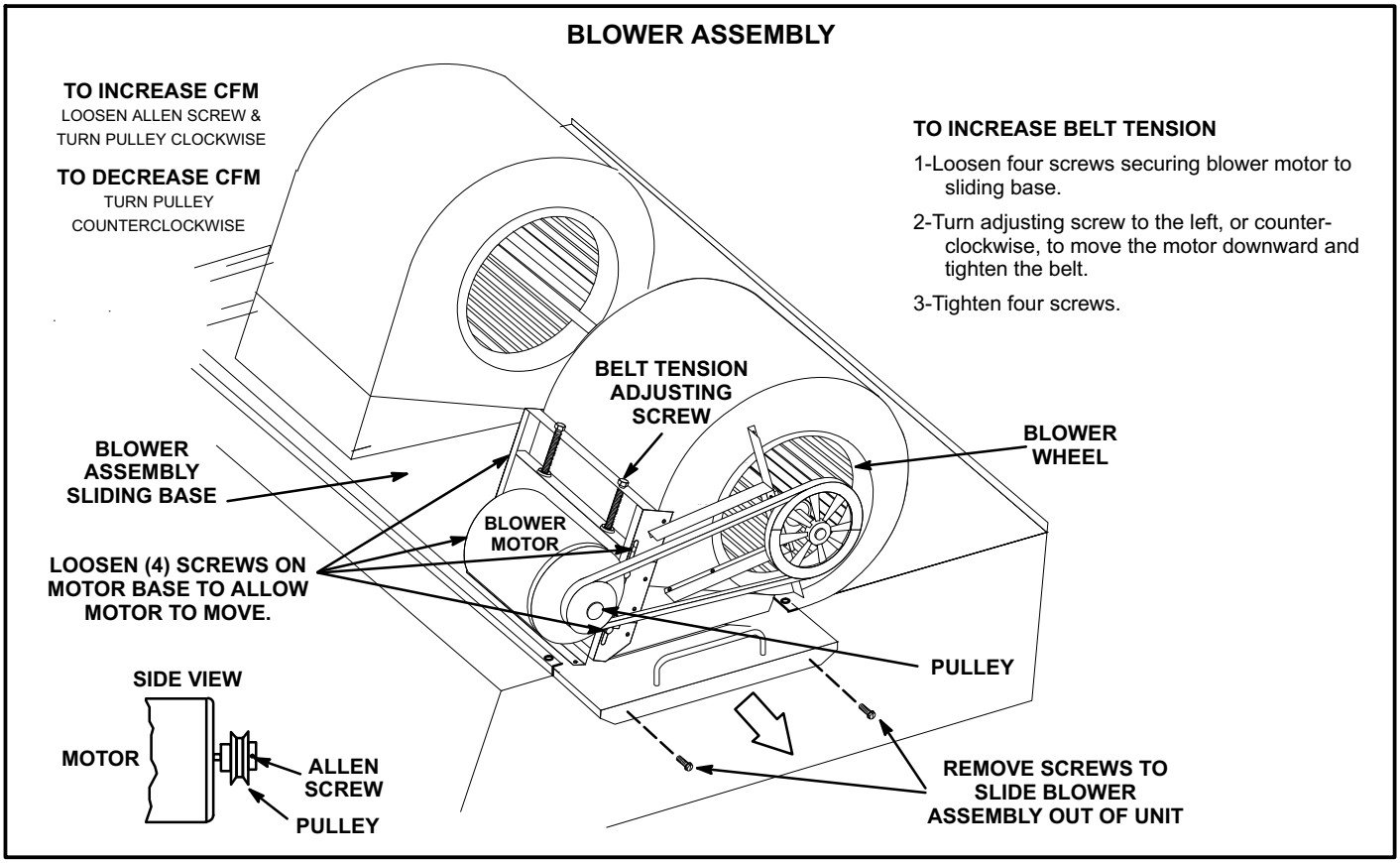


FIGURE 8

Blower Operation

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

1- Blower operation is manually set at the thermostat subbase fan switch. With fan switch in **ON** position, blowers will operate continuously.

2- With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

Blower Access

The blower assembly is secured to a sliding base which allows the entire assembly to be pulled out of the unit. See figure 8.

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

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

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

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

Determining Unit Air Volume

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

1- The following measurements must be made with a dry indoor coil. Run blower without cooling demand. 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 9.

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

3- Measure the indoor blower wheel RPM.

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

5- The RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase RPM. Turn counterclockwise to decrease RPM. See figure 8.

Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat grooves. Make sure blower and motor pulley are aligned as shown in figure 10.

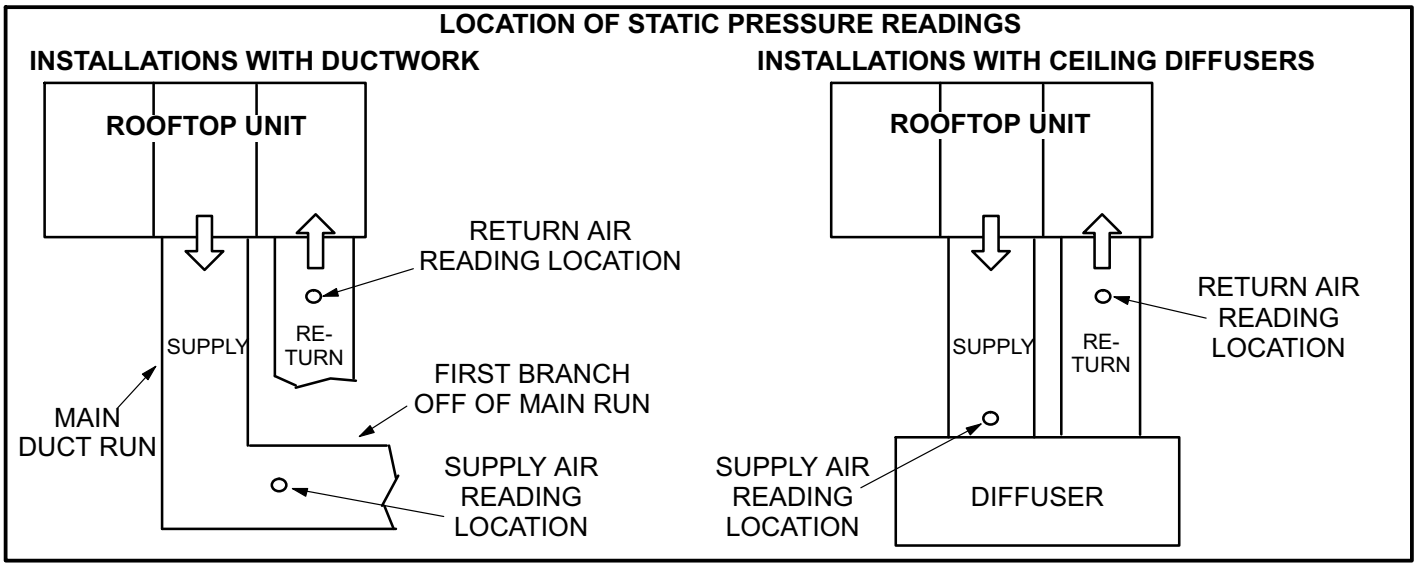


FIGURE 9

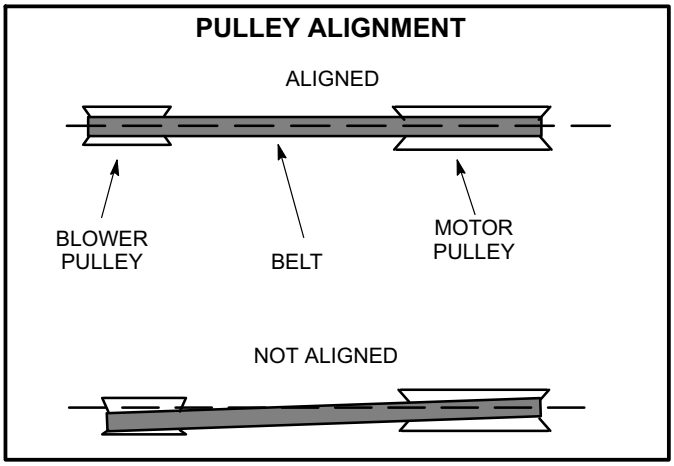


FIGURE 10

1- Loosen four bolts securing motor base to mounting frame. See figure 8.

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

To increase belt tension -
Turn the adjusting bolt to the left, or counterclockwise to increase belt tension. This increases the distance between motor pulley and blower housing pulley (motor moves downward and tightens belt).

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

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

Field-Furnished Blower Drives

For field-furnished blower drives, use blower tables in the front of this manual to determine BHP and RPM required and to determine the drive number. Table 3 shows the drive component manufacturer's model number.

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 used belt, the deflection force should be 5 lbs. (35kPa). A new belt deflection force should be 7 lbs. (48kPa).

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

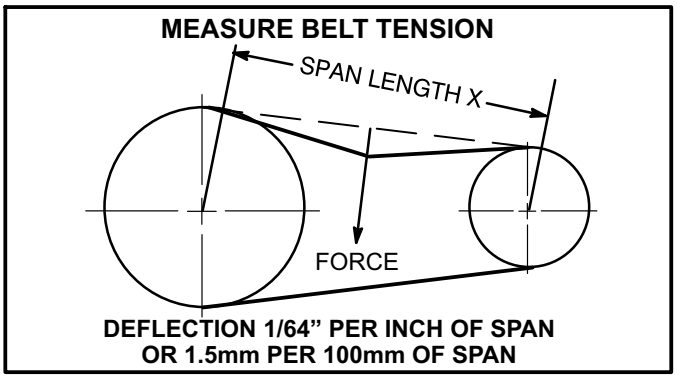


FIGURE 11

TABLE 3
MANUFACTURER'S NUMBERS

Drive No.	H.P.	DRIVE COMPONENTS									
		RPM		ADJUSTABLE SHEAVE		FIXED SHEAVE		BELTS		SPLIT BUSHING	
		Min	Max	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.
1	2, 3	535	725	1VP40x7/8	79J0301	BK95X1-7/16	80K1601	BX59	59A5001	N/A	N/A
2	2, 3	710	965	1VP40x7/8	79J0301	BK72x1-7/16	100244-13	BX55	63K0501	N/A	N/A
3	5	685	865	1VP50x1-1/8	P-8-1977	BK100x1-7/16	39L1301	BX61	93J9801	N/A	N/A
4	5	850	1045	1VP65x1-1/8	100239-03	BK110H	100788-06	BX65	100245-08	H-1-7/16	49M6201
5	5	945	1185	1VP60x1-1/8	41C1301	BK90H	100788-04	BX61	93J9801	H-1-7/16	49M6201
6	7.5	850	1045	1VP65x1-3/8	78M7101	BK110H	100788-06	BX66	97J5901	H-1-7/16	49M6201
7	7.5, 10	945	1185	1VP60x1-3/8	78L5501	BK90H	100788-04	BX63	97J5501	H-1-7/16	49M6201
8	7.5	1045	1285	1VP65x1-3/8	78M7101	BK90H	100788-04	BX64	97J5801	H-1-7/16	49M6201
10	10	1045	1285	1VP65x1-3/8	78M7101	1B5V86	78M8301	5VX670	100245-21	B-1-7/16	100246-01
11	10	1135	1365	1VP65x1-3/8	78M7101	1B5V80	100240-05	5VX660	100245-20	B-1-7/16	100246-01

D-Optional Electric Heat Components

See ELECTRICAL / ELECTRIC HEAT (table of contents) for possible KCB to EHA match-ups and electrical ratings. All electric heat sections consist of electric heating elements exposed directly to the air stream. See figure 1. Two electric heat sections (first section and second section) are used in all 15kW through 90kW heaters used in KCB180/300 units. Multiple-stage elements are sequenced on and off in response to thermostat demand. EHA parts arrangement is shown in figures 13 and 14.

Control Box Components

The main control box (see figure 2) houses some electric heat components and the electric heat control “hat” section (figure 12).

Electric Heat Hat Section (Figure 12)

1-Electric Heat Relay K9

All KCB series units with electric heat use an electric heat relay K9. K9 is a N.O. DPDT pilot relay intended to electrically isolate the unit's 24V circuit from the electric heat assembly 24V circuit. K9 is energized by W1 TB1. K9-1 closes, enabling T2 to energize the electric heat.

2-Electric Heat Relay K19

All KCB series units with electric heat use an electric heat relay K19. K19 is a N.O. SPDT pilot relay intended to electrically isolate the unit's 24V circuit from the electric heat assembly 24V circuit. K19 is energized by TB1 (once K9 is energized). K9-1 closes, enabling T2 to energize the remaining electric heat.

3-Time Delay DL2

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

4-Time Delay DL5

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

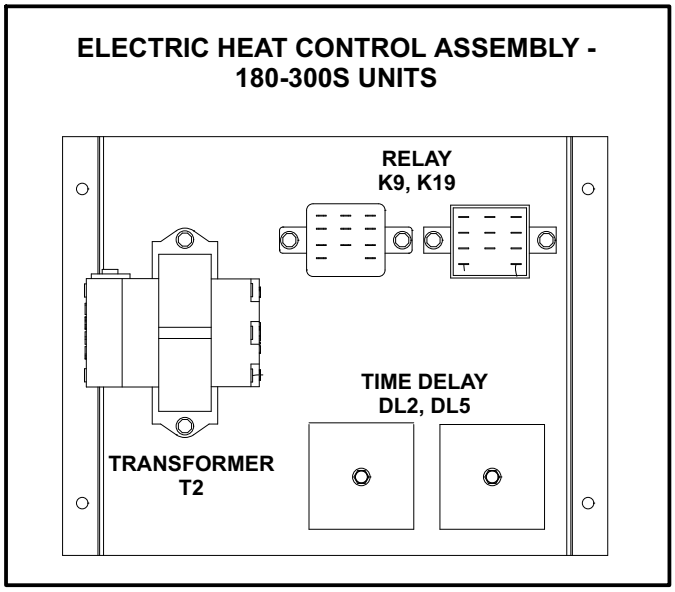


FIGURE 12

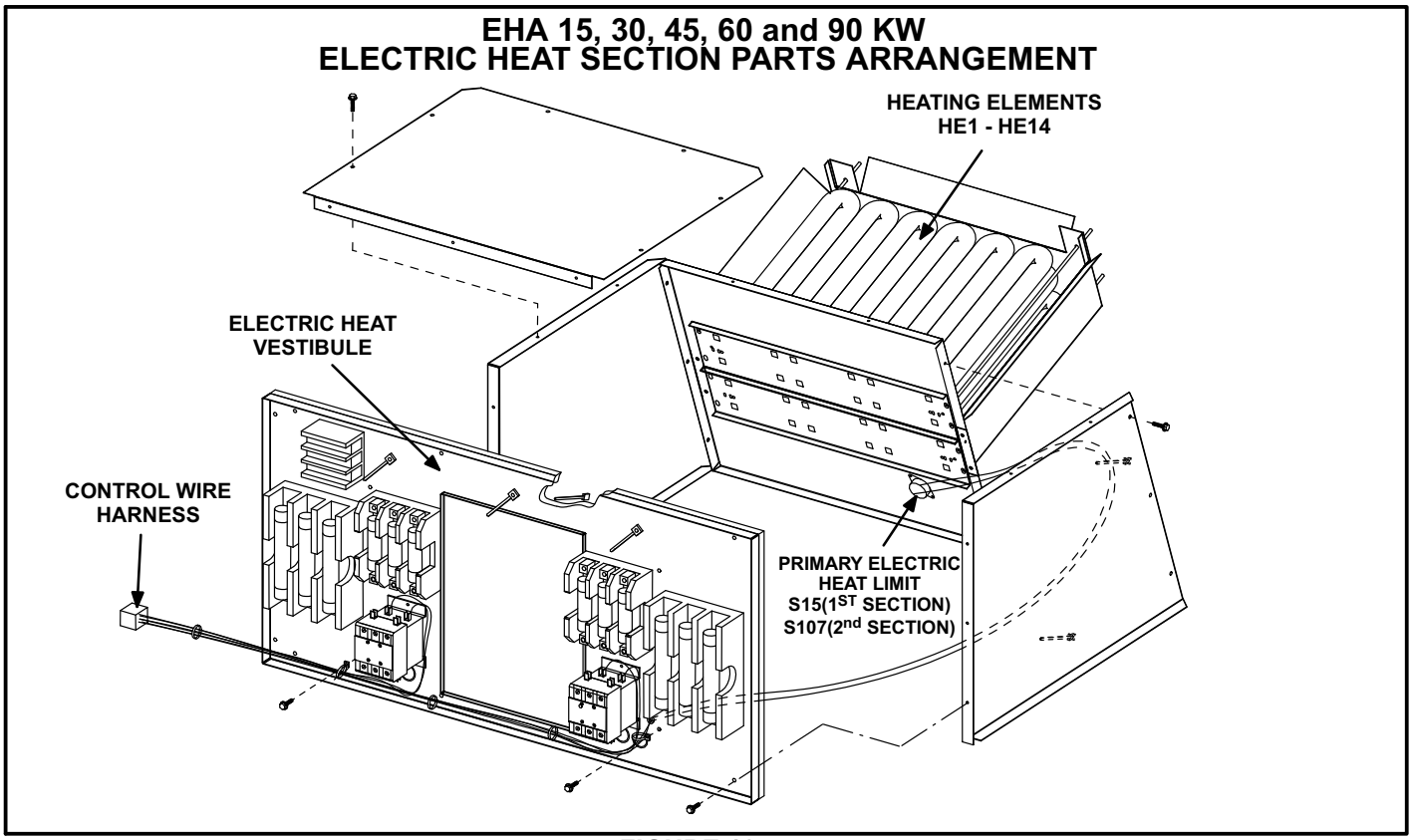
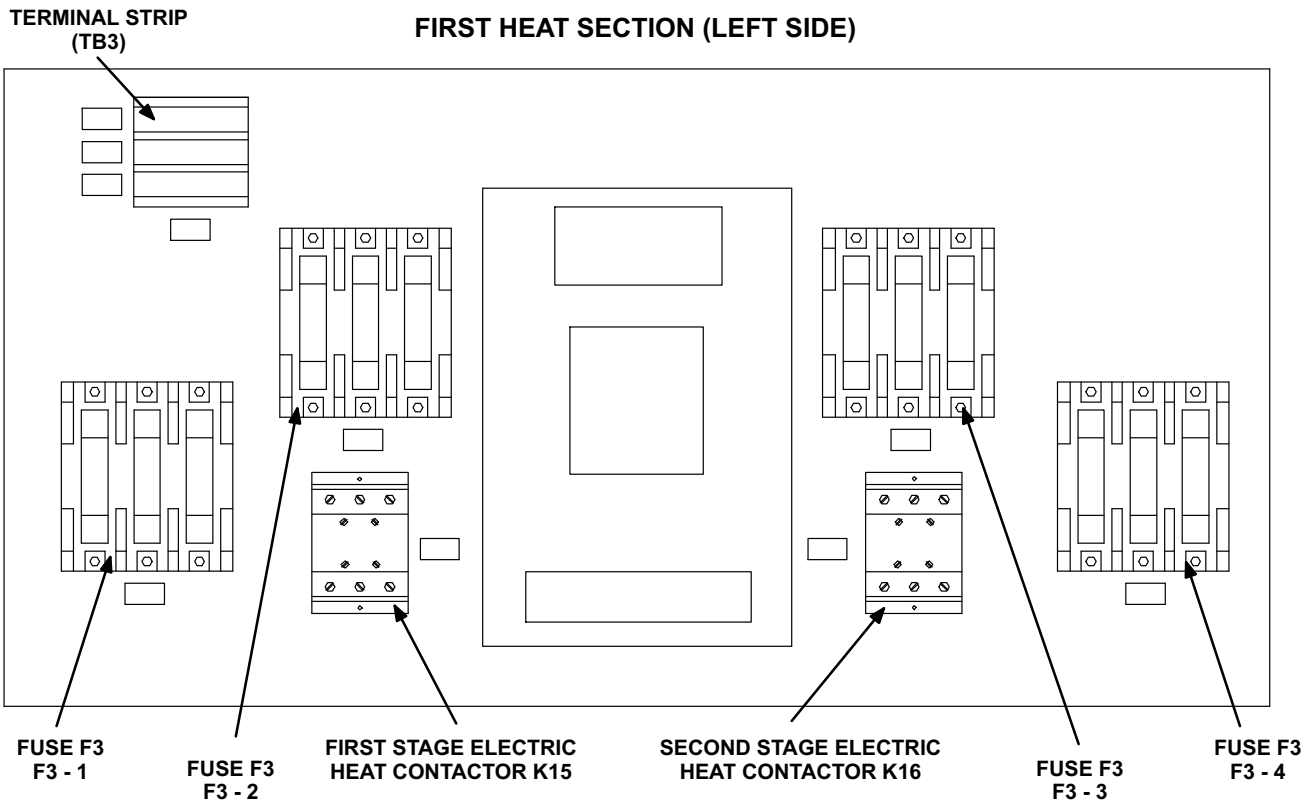


FIGURE 13

KCB180/300 ELECTRIC HEAT VESTIBULE PARTS ARRANGEMENT

FIRST HEAT SECTION (LEFT SIDE)



SECOND HEAT SECTION (RIGHT SIDE)

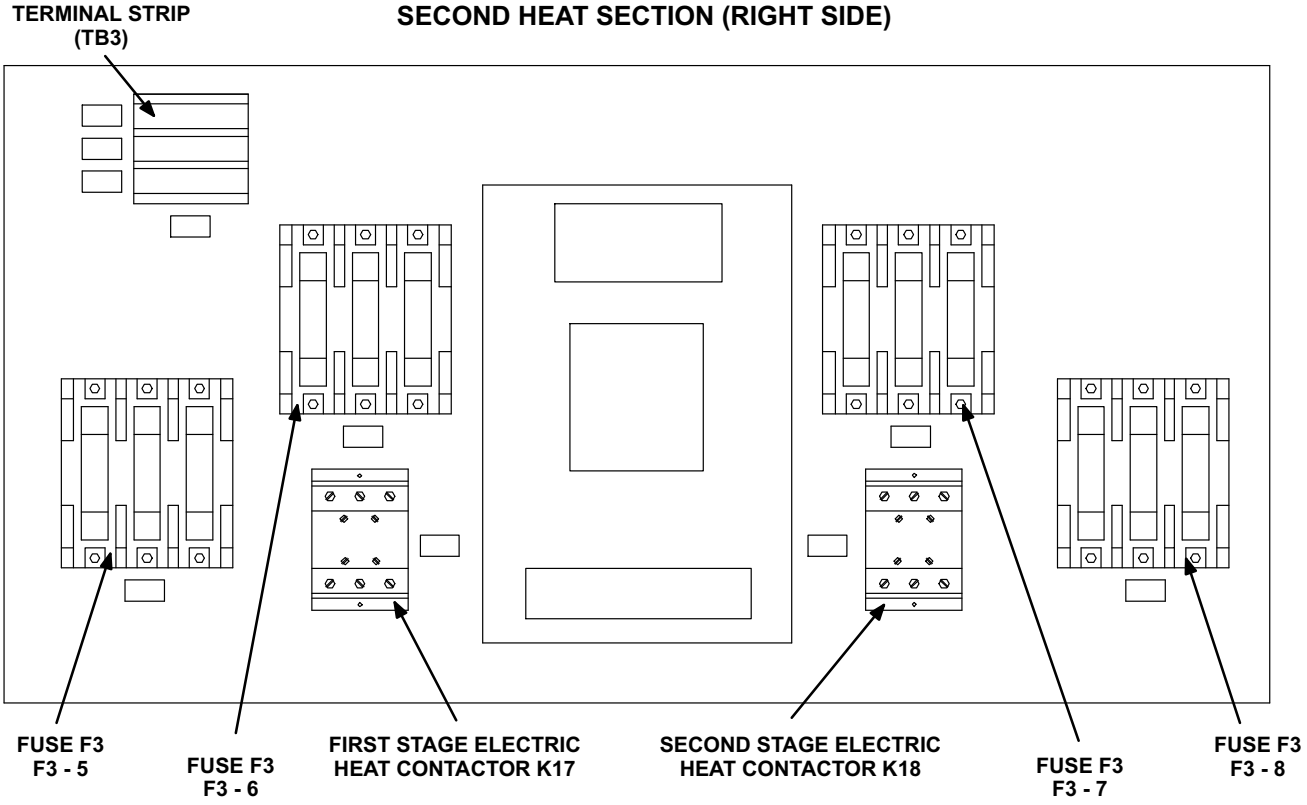


Figure 14

5-Electric Heat Transformer T2

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

Electric Heat Sections

6-Contactors K15, K16, K17 and K18

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

7-Fuse F3

Fuse F3 are housed in a fuse block which holds three fuses. Each F3 fuse is connected in series with each leg of electric heat. Figure 14 and table 4 show the fuses used with each electric heat section. For simplicity, the service manual labels the fuses F3 - 1 through F3 - 8.

8-Terminal Strip TB3

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

9-High Temperature Limits S15 and S107 (Primary)

S15 and S107 are SPST N.C. auto-reset thermostats located on the back panel of the electric heat section below the heating elements. S15 is the high temperature limit for the first electric heat section, while S107 is the high temperature limit for the second electric heat section. Both thermostats are identical and are wired in series with the first stage contactor coil. When either S15 or S107 opens, indicating a problem in the system, contactor K15 is de-energized. When K15 is de-energized, first stage and all subsequent stages of heat are de-energized. The thermostats used on EHA360-45-1 Y/G/J are factory set to open at 200°F ± 5°F (93.3°C ± 2.8°C) on a temperature rise and automatically reset at 160°F ± 6°F (71.1°C ± 3.3°C) on a temperature fall. All other electric heat section thermostats are factory set to open at 170°F ± 5°F (76.7°C ± 2.8°C) on a temperature rise and automatically reset at 130°F ± 6°F (54.4°C ± 3.3°C) on a temperature fall. The thermostats are not adjustable.

10-Heating Elements HE1 through HE14

Heating elements are composed of helix wound bare nichrome wire exposed directly to the air stream. Three elements are connected in a three-phase arrangement. The elements in 208/230V units are connected in a “Delta” arrangement. Elements in 460 and 575V units are connected in “Wye” arrangement. Each stage is energized independently by the corresponding contactors located on the electric heat vestibule panel. Once energized, heat transfer is instantaneous. High temperature protection is provided by primary and redundant high temperature limits and overcurrent protection is provided by fuses.

TABLE 4

KCB180/300 ELECTRIC HEAT SECTION FUSE RATING

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

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.

III-STARTUP - OPERATION

Refer to startup directions and to the unit wiring diagram when servicing. See unit nameplate for minimum circuit ampacity and maximum fuse size.

A-Preliminary and Seasonal Checks

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

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

3- Check to ensure that refrigerant lines are in good condition and do not rub against the cabinet or other refrigerant lines.

4- Check voltage at the disconnect switch (if applicable) or TB2. 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-Cooling Start Up

Supply Air Invert Units - Refer to the Supply Air Inverter Start-Up section.

A-Operation

1- Remove coil covers before starting unit.

2- Initiate first and second stage cooling demands according to instructions provided with thermostat.

Compressor Stages

3- *180S, 210S, 240S units -*
First-stage thermostat demand will energize compressors 1 and 2; a second-stage thermostat demand will energize compressor 3.

300S units -
First-stage thermostat demand will energize compressors 1 & 2; a second-stage thermostat demand will energize compressors 3 and 4.

On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressors 1 and 2 on 180S, 210S, 240S & 300S units.

Refrigerant Circuits

4- *180S, 210S, 240S -*
Units contain three refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuits 1 and 2 make up stage 1 cooling. Evaporator and condenser refrigerant circuit 3 makes up stage 2 cooling.

300S -
Units contain four refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuits 1 and 2 make up stage 1 cooling. Evaporator and condenser refrigerant circuit 3 and 4 make up stage 2 cooling.

Outdoor Fan Operation

5- *180S, 210S -*
First-stage thermostat demand will energize condenser fans 1, 2 and 3. Fans will continue to operate with additional thermostat demands. See figure 15.

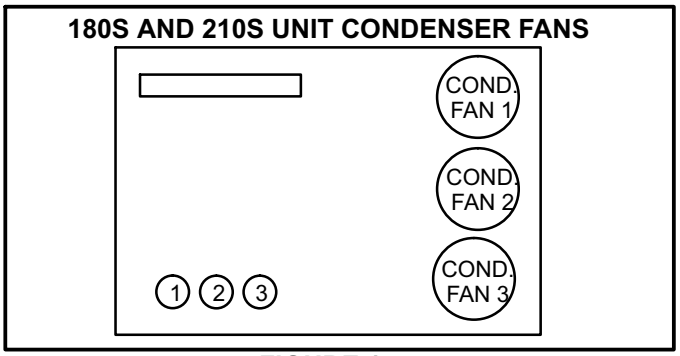


FIGURE 15

240S -
First-stage thermostat demand will energize condenser fans 1, 2, 3 and 4. See figure 16. Fans will continue to operate with additional thermostat demands.

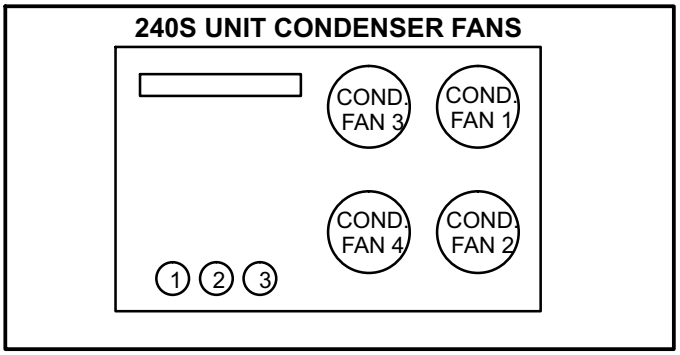


FIGURE 16

300S -
First-stage thermostat demand will energize condenser fans 1, 2 and 3. Second-stage thermostat demand will energize condenser fans 4, 5 and 6. See figure 17.

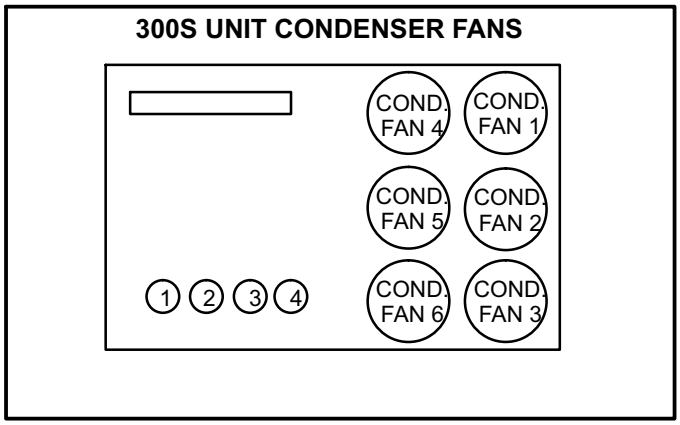


FIGURE 17

6- Each refrigerant circuit is separately charged with R-410A refrigerant. See unit rating plate for correct amount of charge.

7- Refer to Cooling Operation and Adjustment section for proper method to check refrigerant charge.

IV-CHARGING

A-All-Aluminum Outdoor Coil

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- Check each system separately with all stages operating. Compare the normal operating pressures (see tables 5 -8) 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 compressor compartment where the liquid lines enter from the condenser 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.

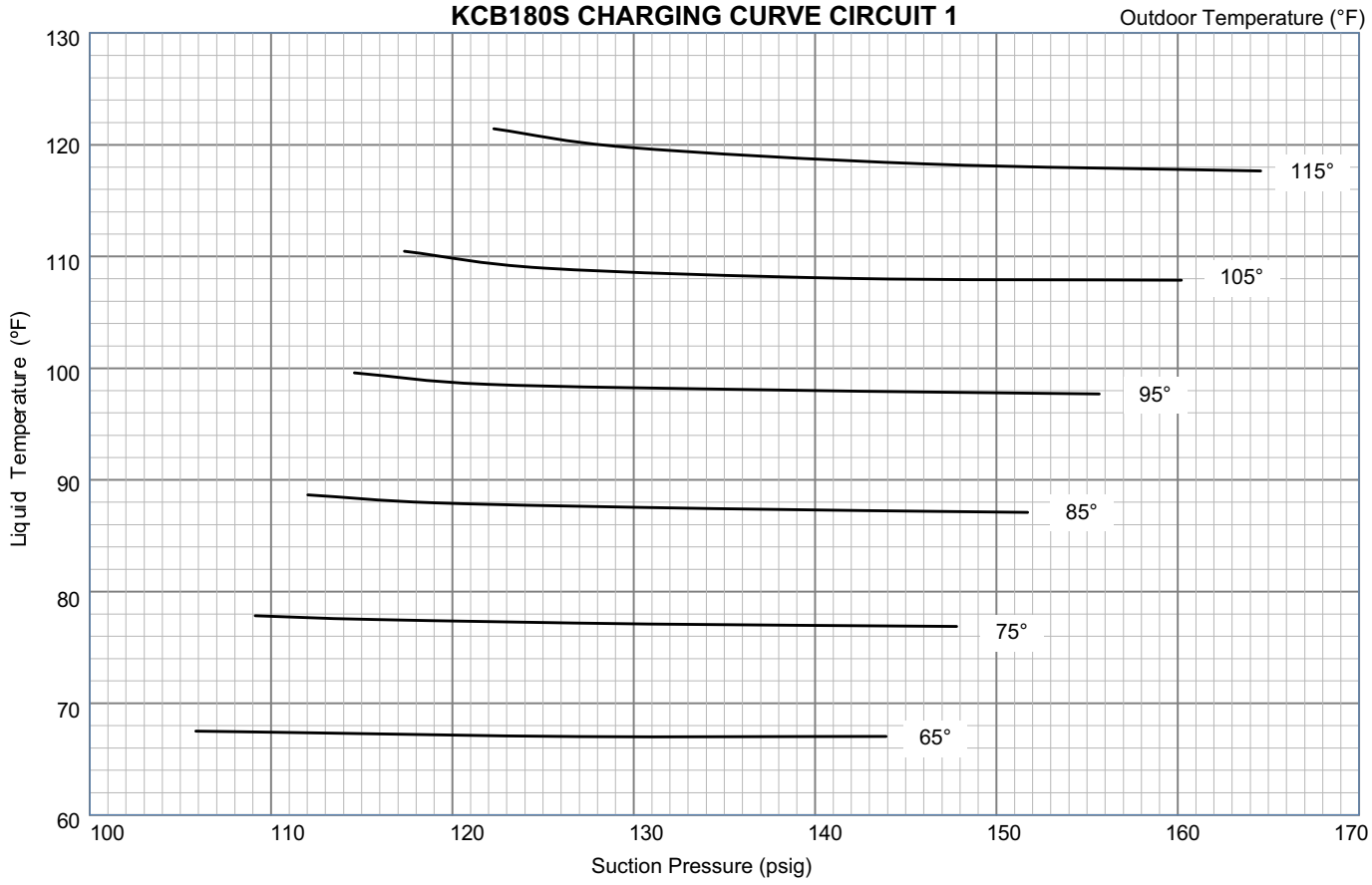
5- Add or remove charge in increments. Allow the system to stabilize each time refrigerant is added or removed.

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.

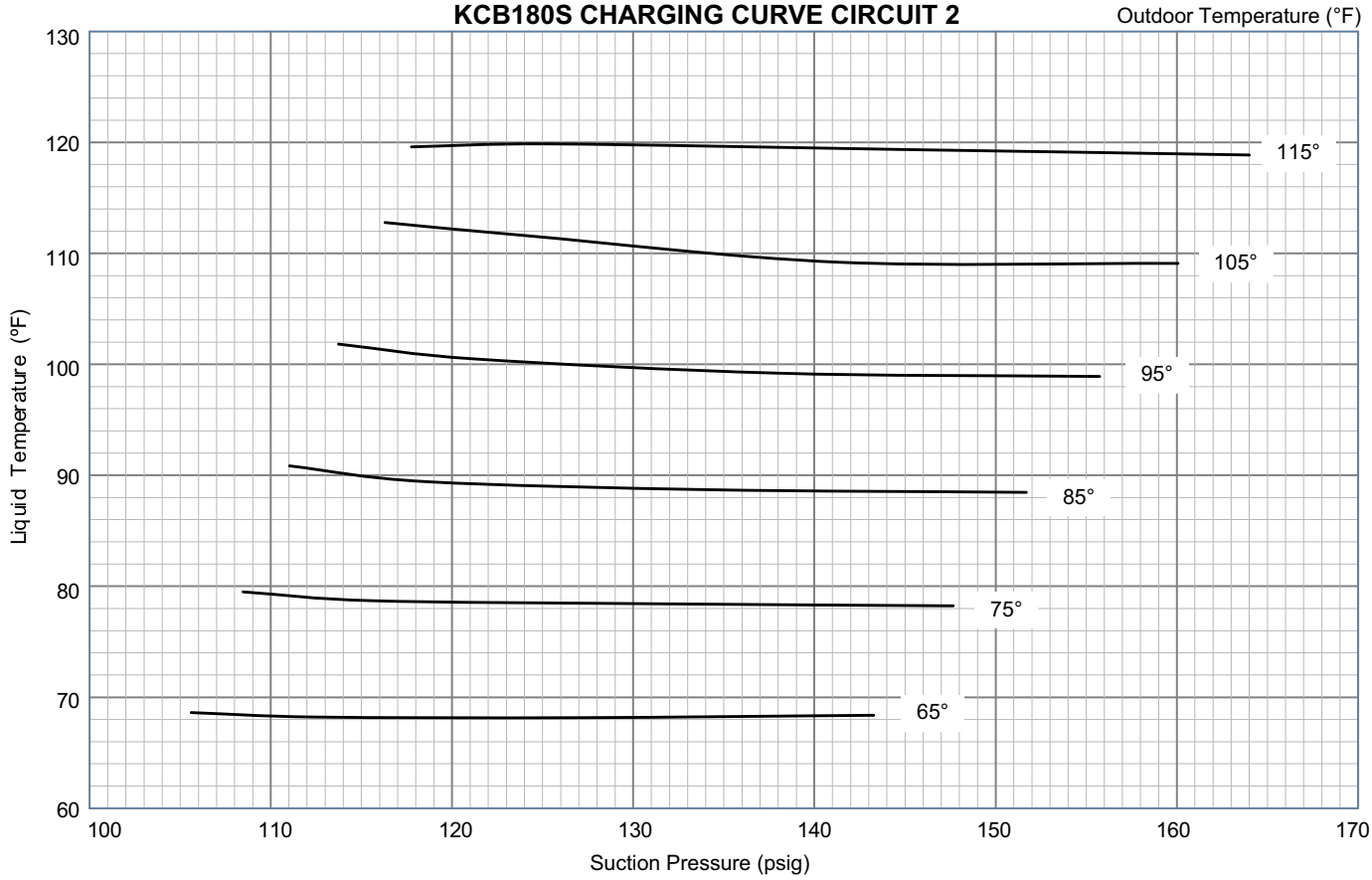
7- Example KCB180S Circuit 1: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 98°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 5
KCB180S NORMAL OPERATING PRESSURES

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)
Circuit 1	106	249	109	286	112	328	115	373	117	422	122	477
	112	256	116	292	119	333	122	378	125	429	130	484
	127	275	131	311	134	352	138	398	142	447	146	505
	144	299	148	336	152	376	156	424	160	478	165	535
Circuit 2	106	251	108	288	111	330	114	372	116	421	118	477
	113	258	116	294	119	334	121	379	124	429	125	484
	127	273	131	311	134	350	138	397	141	445	145	501
	143	296	148	333	152	375	156	421	160	473	164	528
Circuit 3	110	266	113	306	115	348	118	394	120	442	125	497
	117	274	120	311	123	356	126	403	129	454	132	508
	132	292	136	333	139	376	143	424	146	475	149	540
	148	314	153	355	157	401	161	450	165	505	168	568



KCB180S CHARGING CURVE CIRCUIT 2



KCB180S CHARGING CURVE CIRCUIT 3

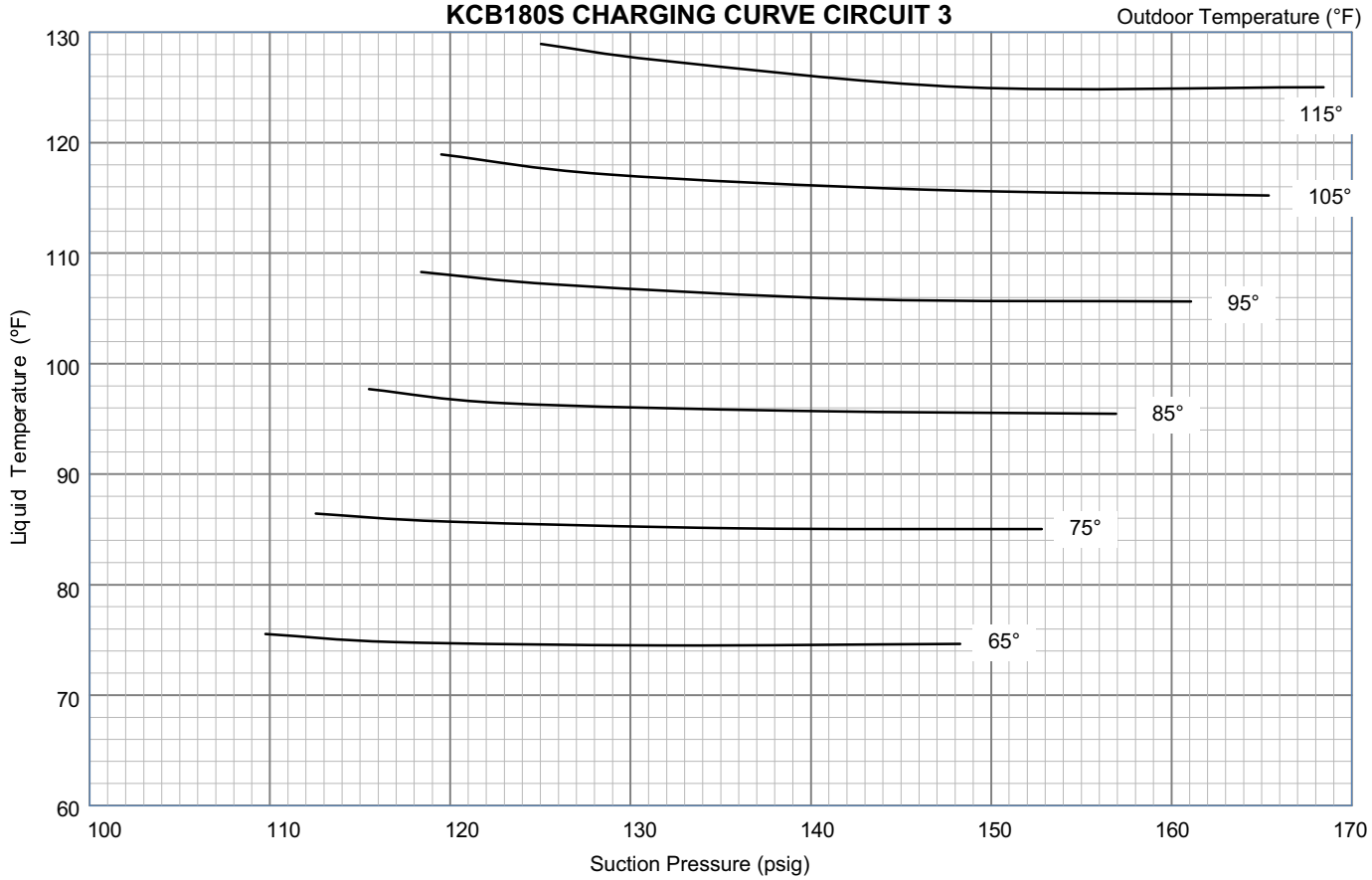
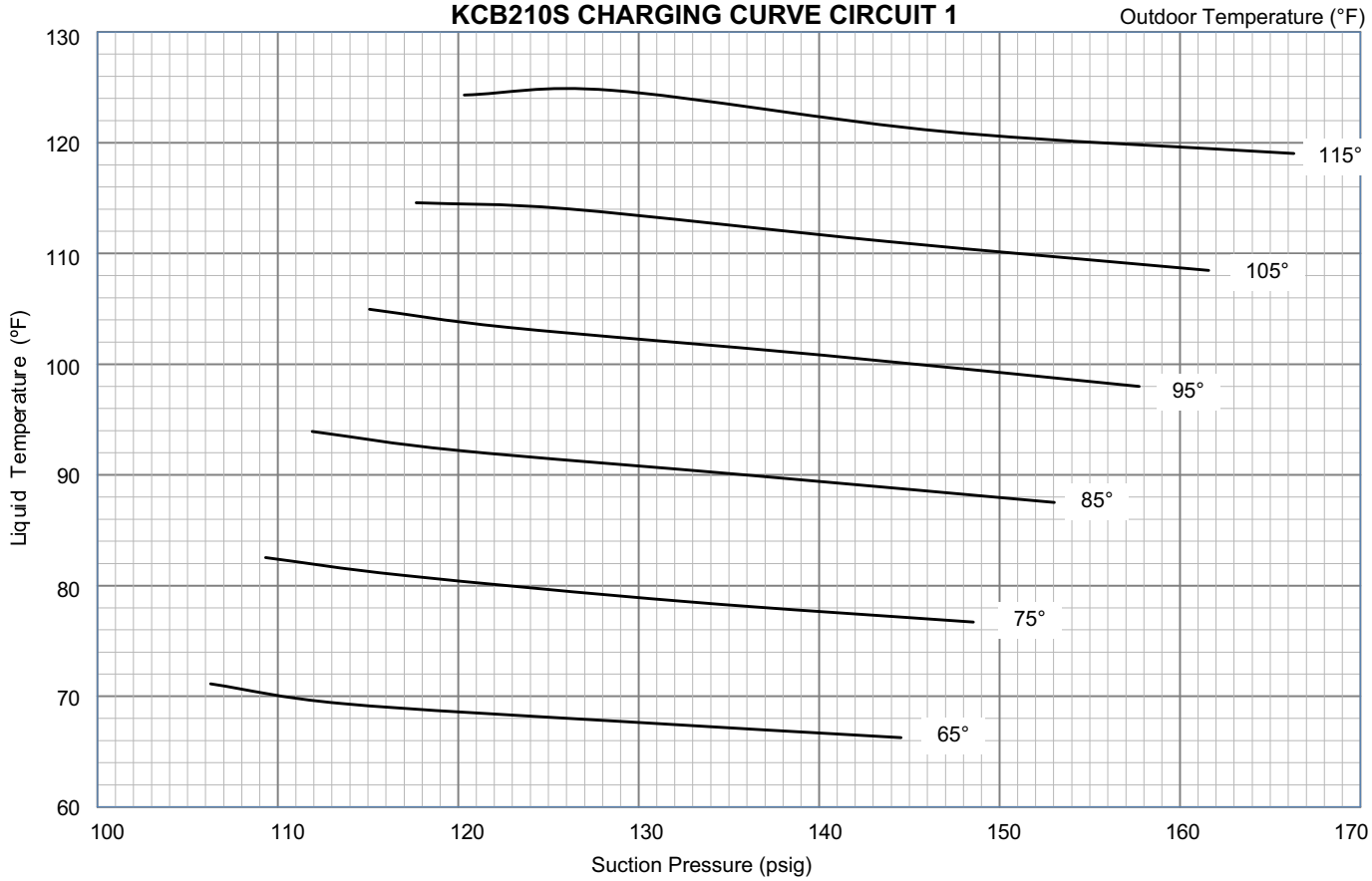
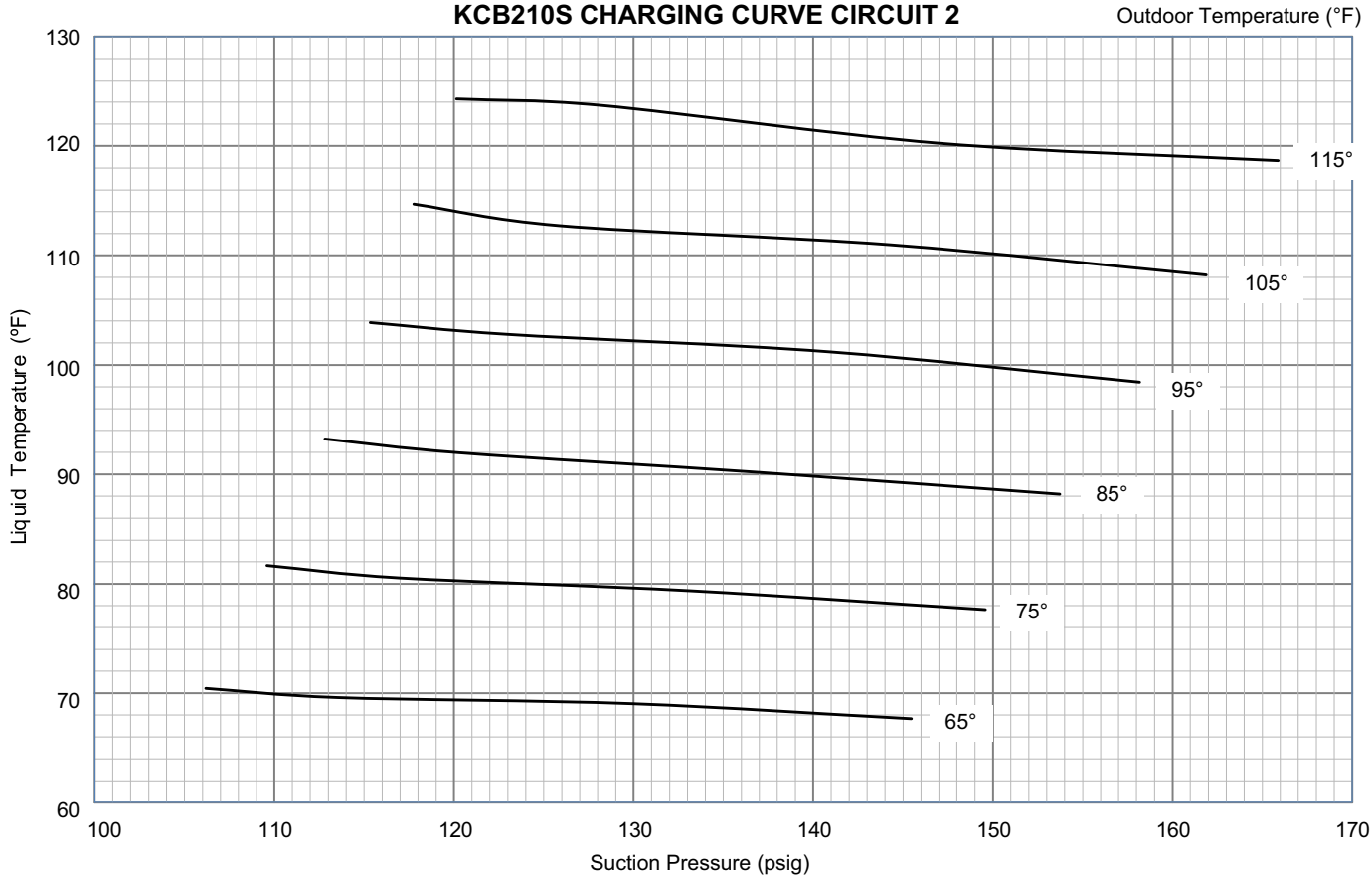


TABLE 6
KCB210S NORMAL OPERATING PRESSURES

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)
Circuit 1	106	253	109	291	112	333	115	380	118	427	120	481
	114	258	117	295	120	338	123	385	126	435	129	487
	129	272	133	309	136	351	140	398	144	449	147	506
	145	289	149	324	153	366	158	412	162	462	166	522
Circuit 2	106	262	110	300	113	339	115	384	118	430	120	485
	114	269	117	305	120	346	123	392	126	439	128	495
	130	286	133	322	137	363	141	409	144	457	147	514
	145	303	150	339	154	380	158	425	162	471	166	528
Circuit 3	108	276	111	314	114	356	117	402	119	451	123	503
	115	284	119	322	122	364	125	410	128	462	131	516
	132	304	135	343	139	385	143	433	146	484	149	541
	148	321	152	361	156	403	161	450	164	498	167	557



KCB210S CHARGING CURVE CIRCUIT 2



KCB210S CHARGING CURVE CIRCUIT 3

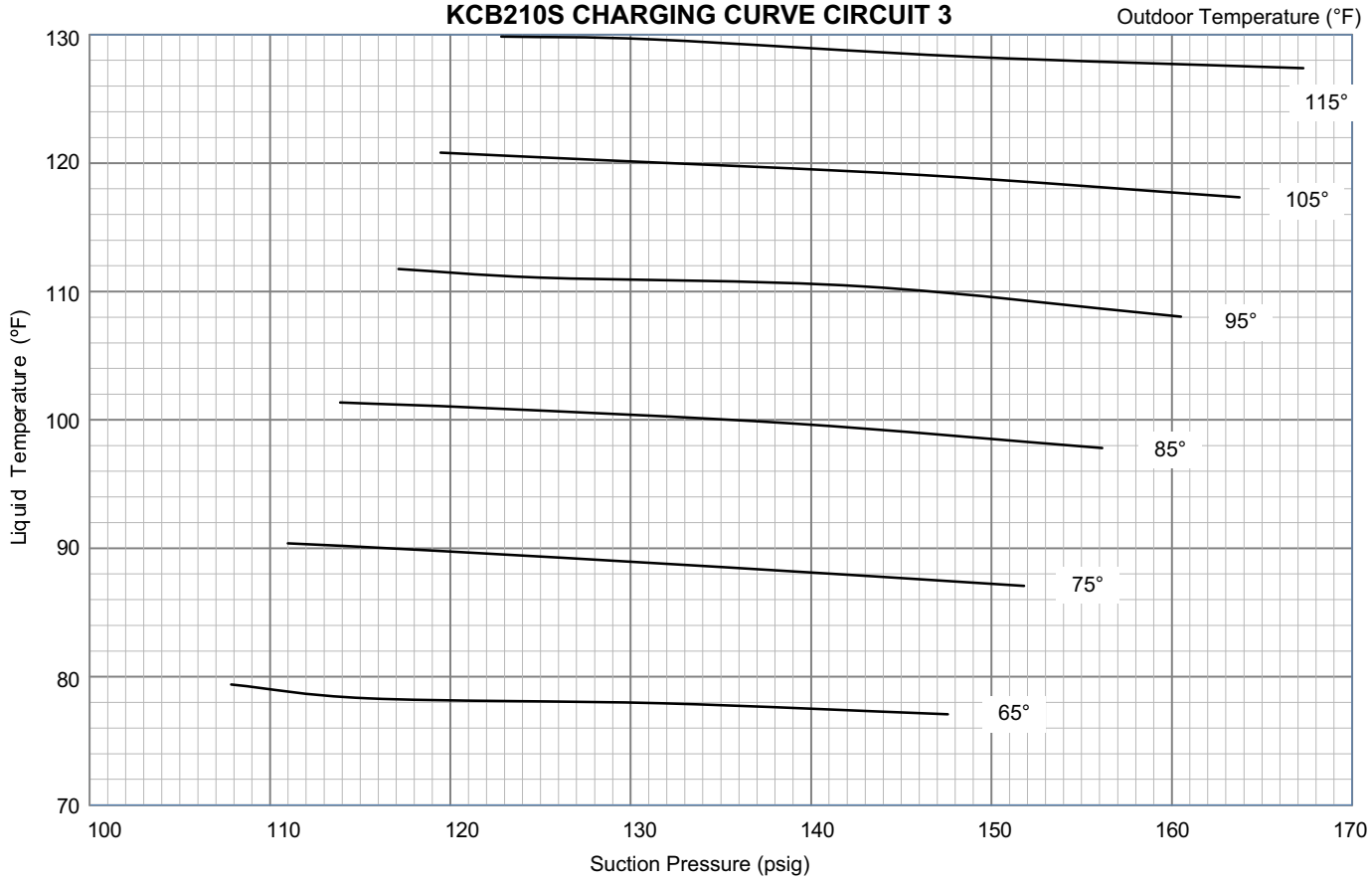
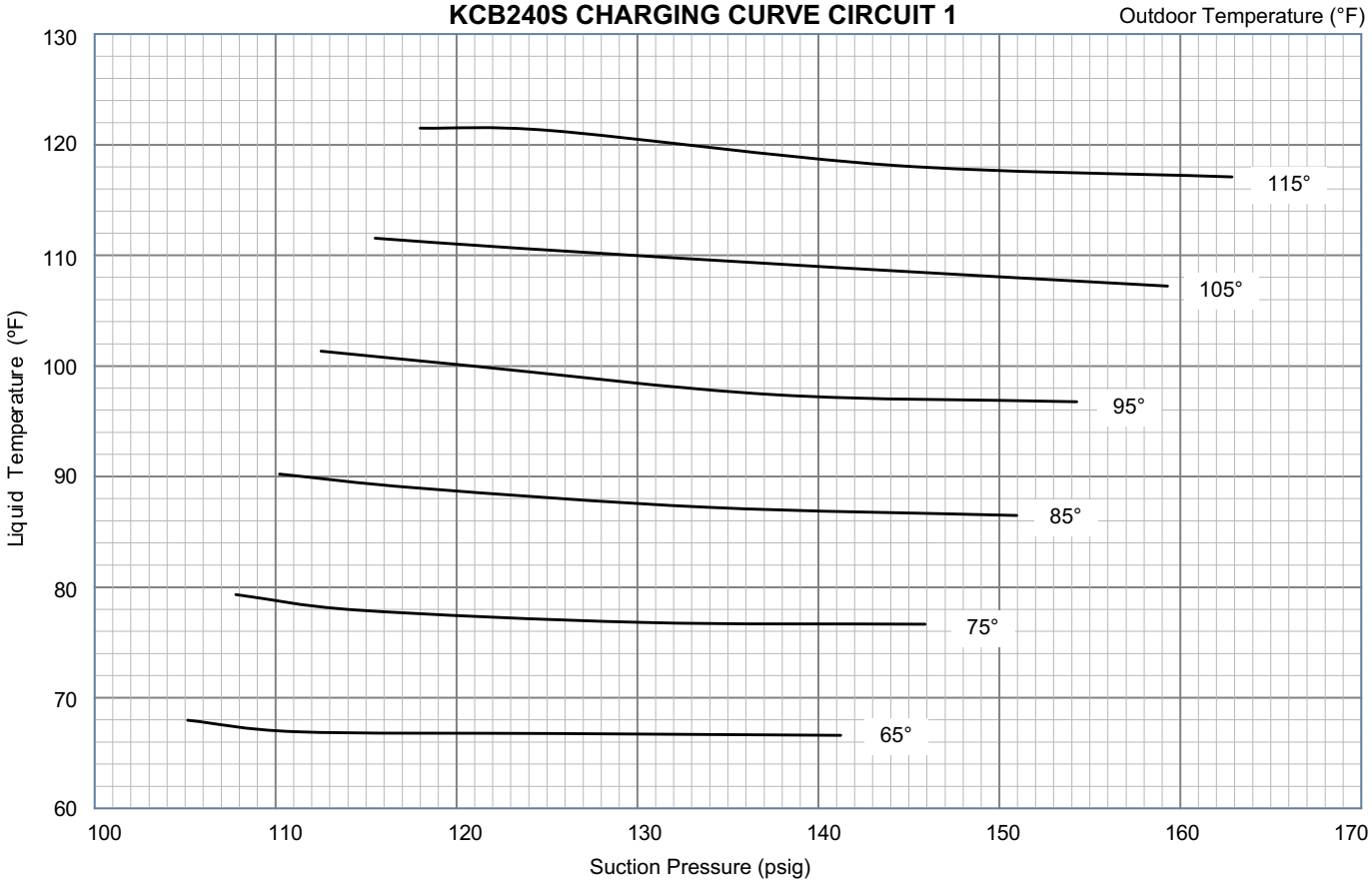
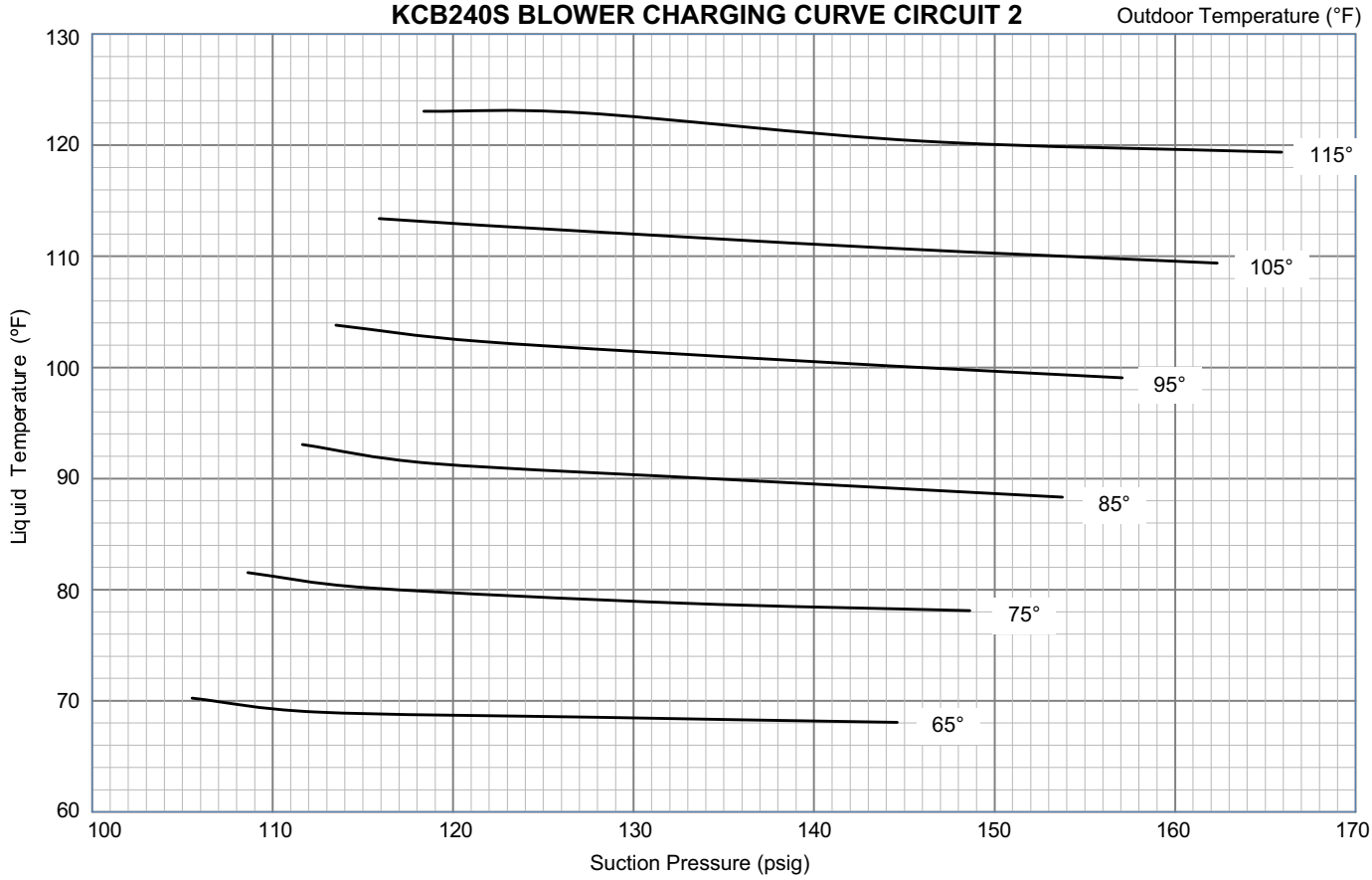


TABLE 7
KCB240S NORMAL OPERATING PRESSURES

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)
Circuit 1	105	242	108	279	110	320	113	365	115	414	118	468
	111	247	114	284	118	326	121	372	124	421	125	474
	125	263	130	299	134	339	138	383	141	432	144	489
	141	281	146	317	151	359	154	403	159	454	163	508
Circuit 2	106	253	109	290	112	330	114	374	116	424	118	474
	112	259	115	295	119	336	122	382	124	430	127	482
	128	274	133	310	136	350	140	394	144	446	146	501
	145	292	149	328	154	370	157	414	162	465	166	516
Circuit 3	99	262	102	300	104	343	107	390	107	436	110	489
	105	268	108	307	111	350	114	396	117	448	117	499
	121	285	124	325	127	368	130	414	134	466	135	525
	136	303	140	344	145	390	149	436	153	490	155	548



KCB240S BLOWER CHARGING CURVE CIRCUIT 2



KCB240S BLOWER CHARGING CURVE CIRCUIT 3

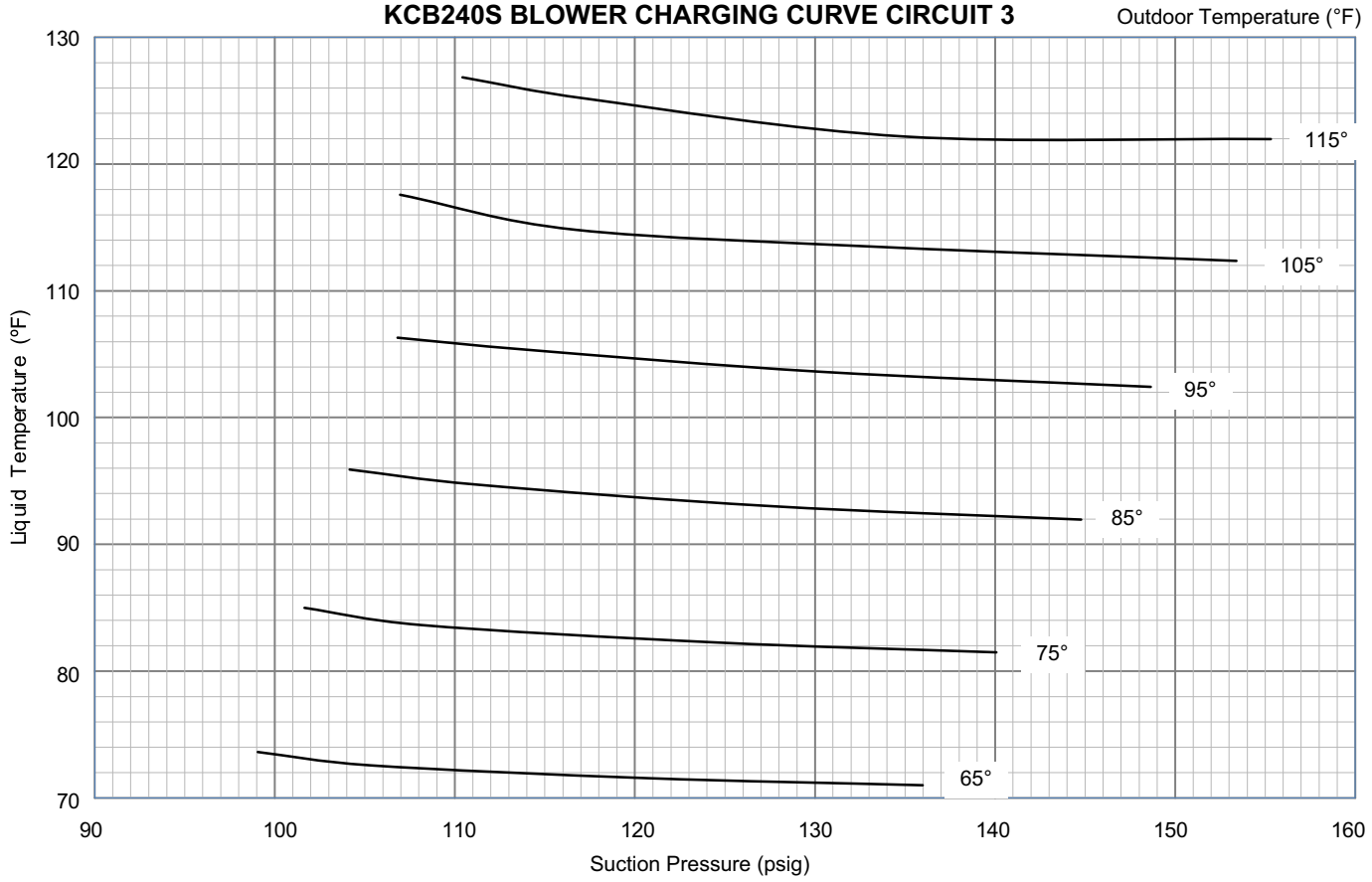
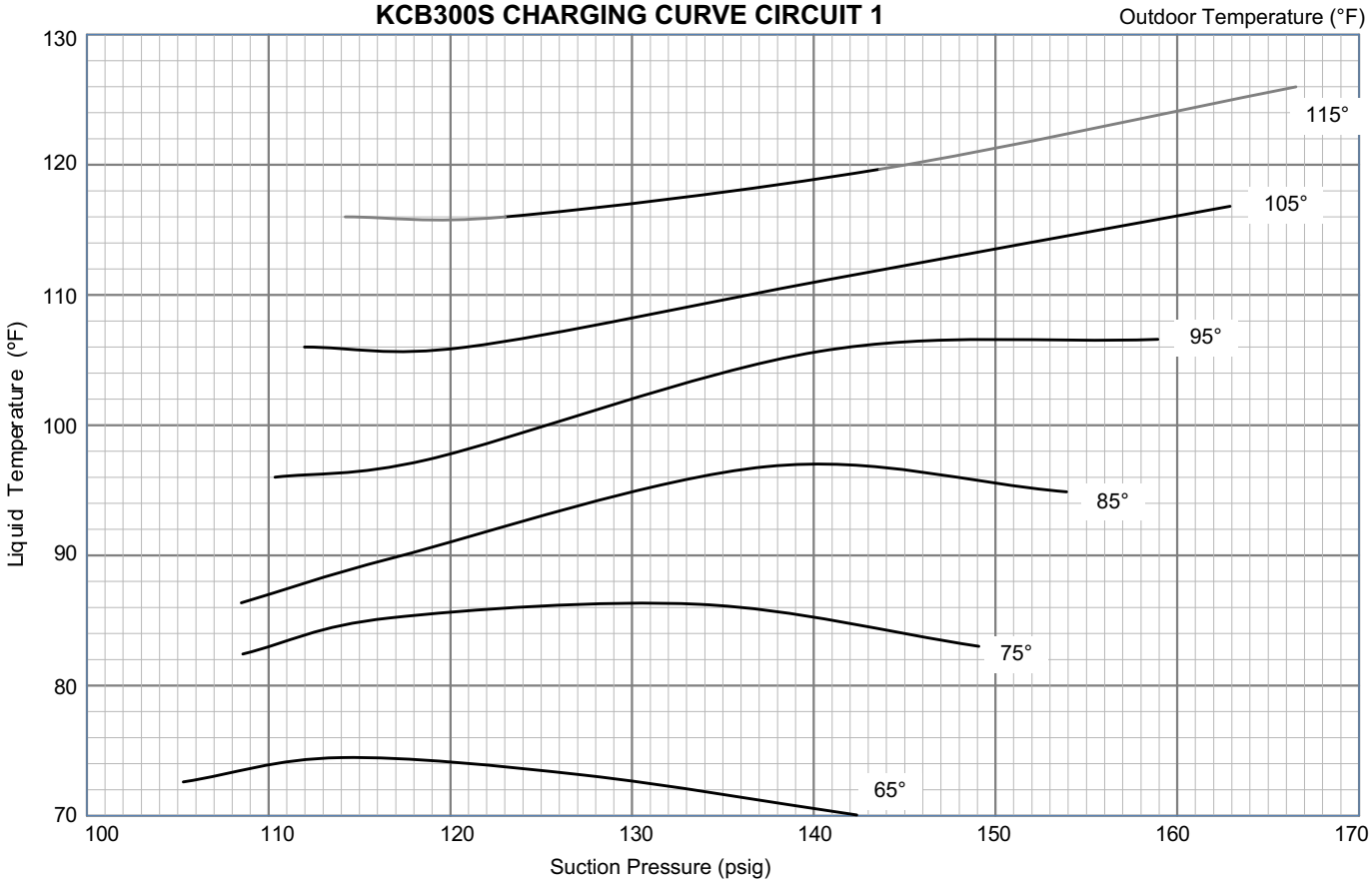


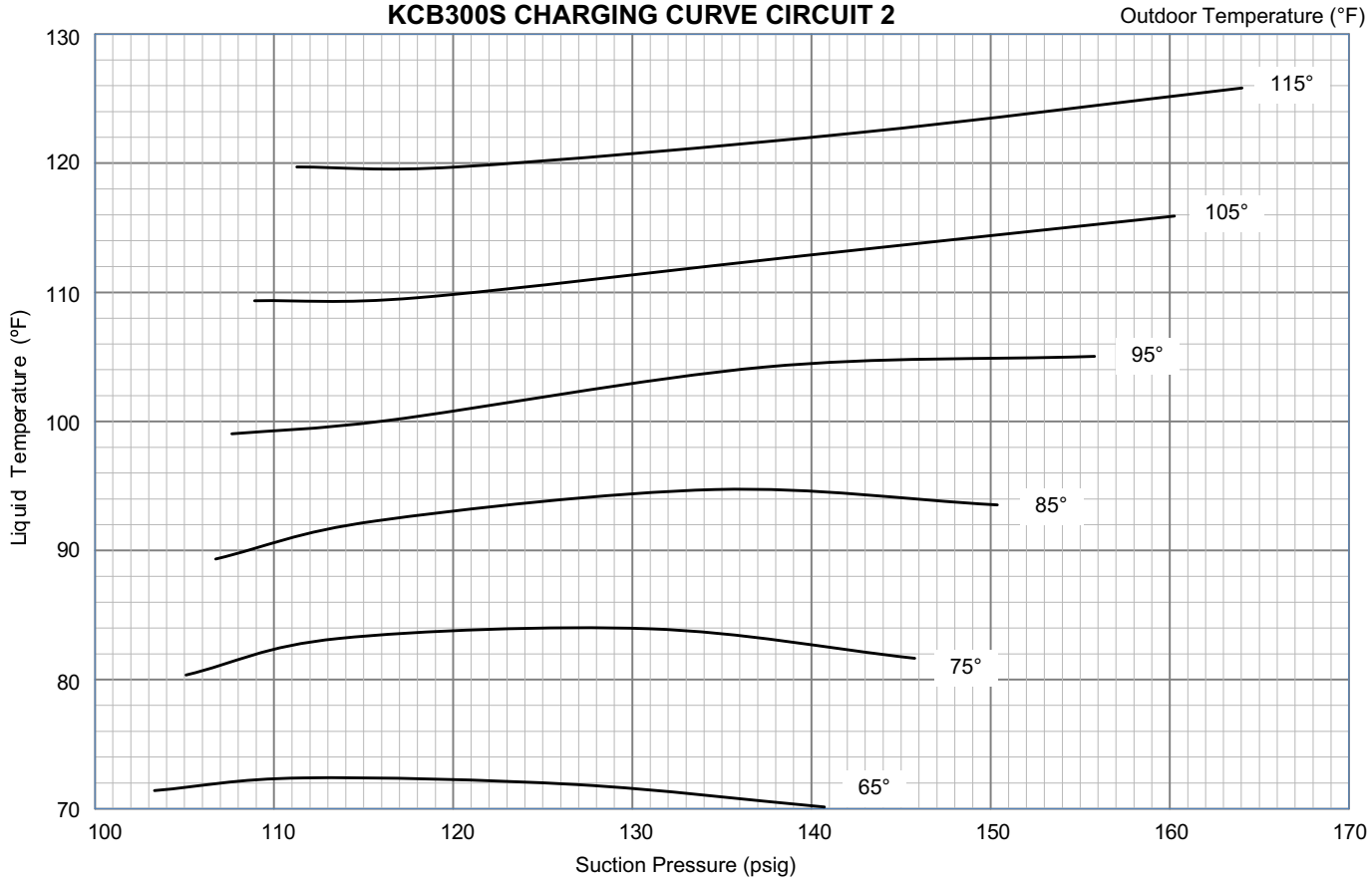
TABLE 8
KCB300S NORMAL OPERATING PRESSURES

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)
Circuit 1	105	248	109	283	109	330	110	381	112	432	114	486
	114	250	117	291	117	338	119	384	121	432	123	487
	127	253	134	300	137	343	140	388	141	444	144	501
	142	265	149	308	154	349	159	399	163	449	167	503
Circuit 2	103	236	105	272	107	318	108	373	109	428	111	484
	112	238	114	278	116	325	116	374	118	425	120	482
	127	246	131	285	135	327	137	377	140	433	142	491
	141	254	146	294	150	332	156	385	160	437	164	495
Circuit 3	104	258	105	302	107	345	109	399	111	456	114	519
	112	263	114	308	115	354	117	403	120	463	123	524
	131	297	133	320	136	367	138	410	140	465	142	526
	147	313	147	334	152	381	156	423	160	476	165	537
Circuit 4	100	246	103	289	104	329	105	381	107	437	110	500
	109	253	110	293	112	337	114	383	116	443	119	505
	126	281	127	303	131	349	133	391	136	443	139	499
	141	296	143	321	149	370	152	410	157	462	161	521

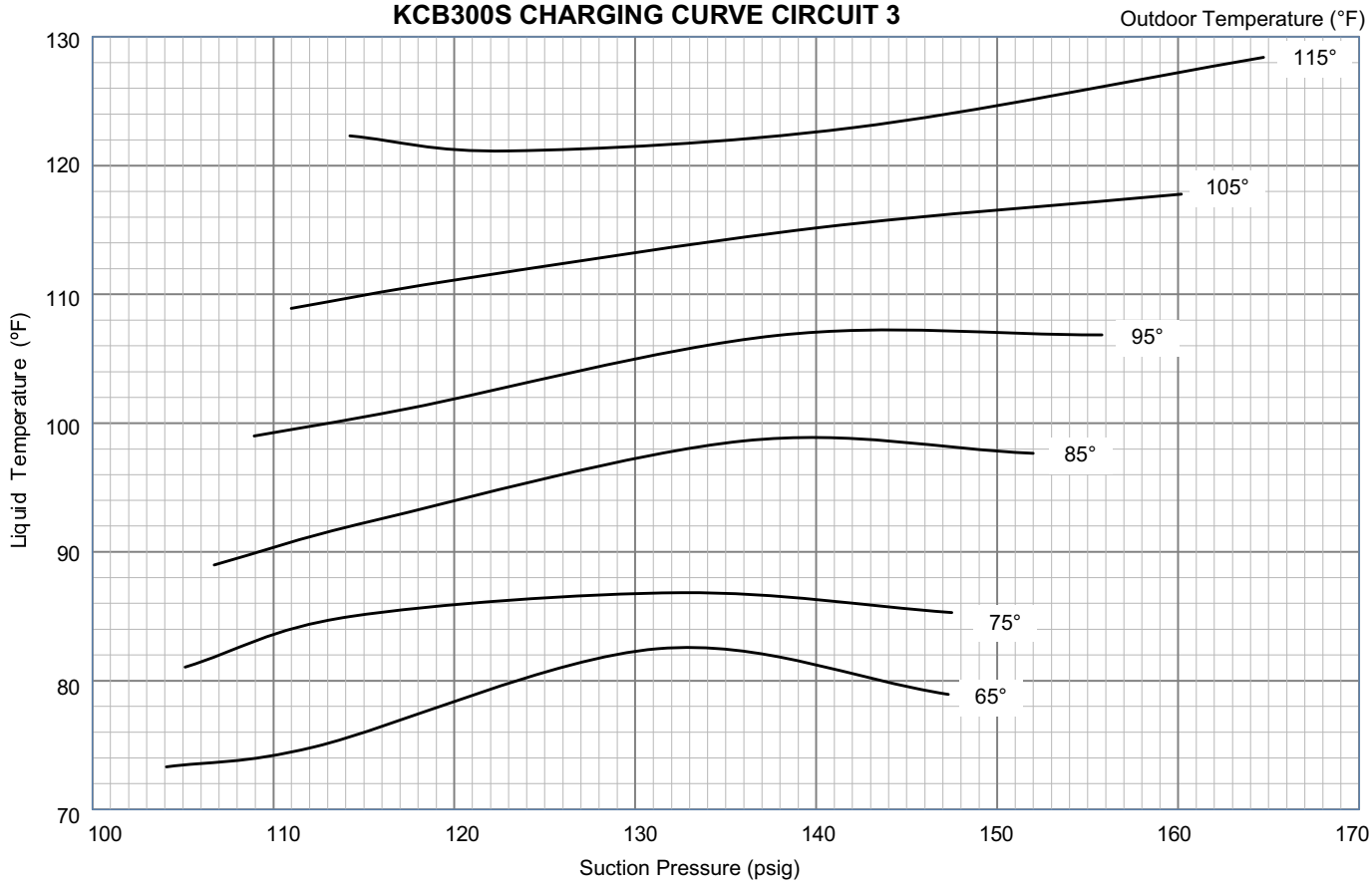
KCB300S CHARGING CURVE CIRCUIT 1



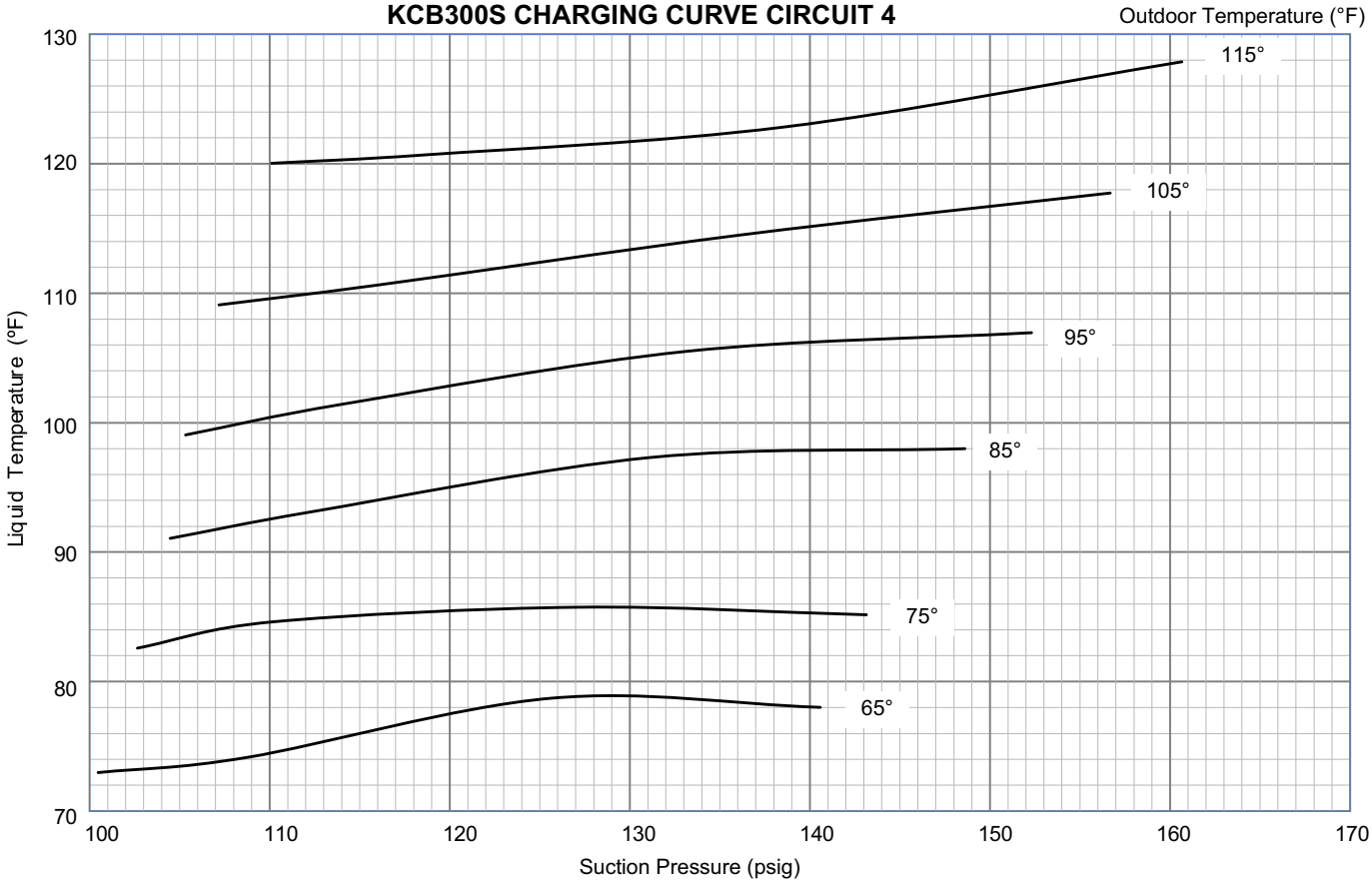
KCB300S CHARGING CURVE CIRCUIT 2



KCB300S CHARGING CURVE CIRCUIT 3



KCB300S CHARGING CURVE CIRCUIT 4



V- SYSTEMS SERVICE CHECKS

A-Cooling System Service Checks

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

NOTE - When unit is properly charged discharge line pressures should approximate those in tables 5 through 8.

VI-MAINTENANCE

⚠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

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

⚠CAUTION

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

⚠WARNING

The State of California has determined that this product may contain or produce a chemical or chemicals, in very low doses, which may cause serious illness or death. It may also cause cancer, birth defects, or reproductive harm.

A-Filters

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

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

B-Lubrication

All motors used in KCB units are factory lubricated, no further lubrication is required.

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

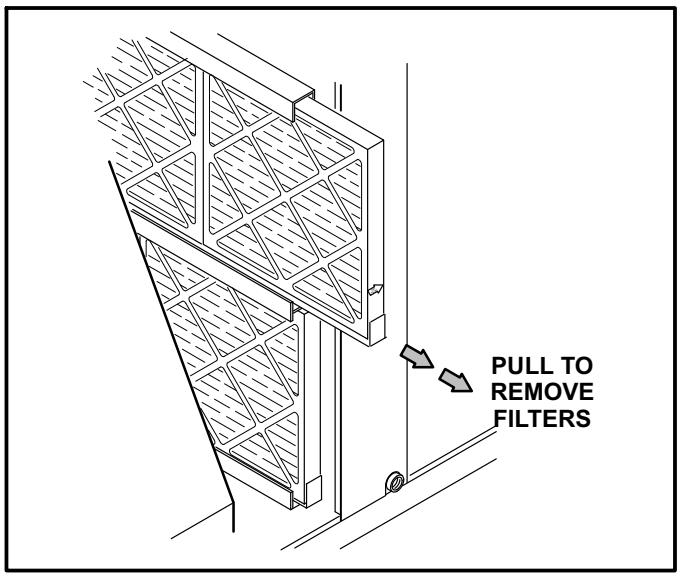


FIGURE 18

C-Evaporator Coil

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

D-Condenser Coil

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season. Access panels are provided on the front and back of the condenser section.

E-Supply Air Blower Wheel

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

F-Electrical

1- Check all wiring for loose connections.

2- Check for correct voltage at unit (unit operating).

3- Check amp-draw on both condenser fan motor and blower motor.
Fan Motor Rating Plate ____ Actual _____
Indoor Blower Motor Rating Plate____ Actual____

VII-OPTIONAL ACCESSORIES

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

A-Roof Curb

When installing units on a combustible surface for downflow discharge applications, the C1CURB roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the KCB units are not mounted on a flat (roof) surface, they MUST be supported under all edges and under the middle of the unit to prevent sagging. The units MUST be mounted level within 1/16" per linear foot or 5mm per meter in any direction.

The assembled C1CURB mounting frame is shown in figure 19. Refer to the roof mounting frame installation instructions for details of proper assembly and mounting. The roof mounting frame MUST be squared to the roof and level before mounting. Plenum system MUST be installed before the unit is set on the mounting frame. Typical roof curbing and flashing is shown in figure 20. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

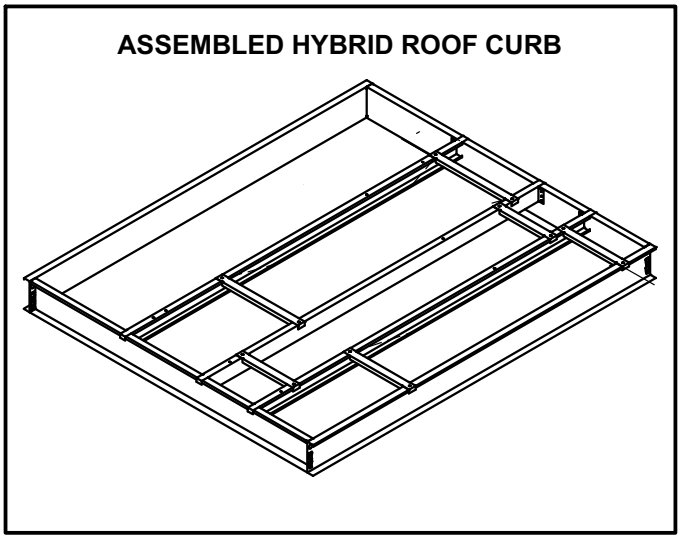


FIGURE 19

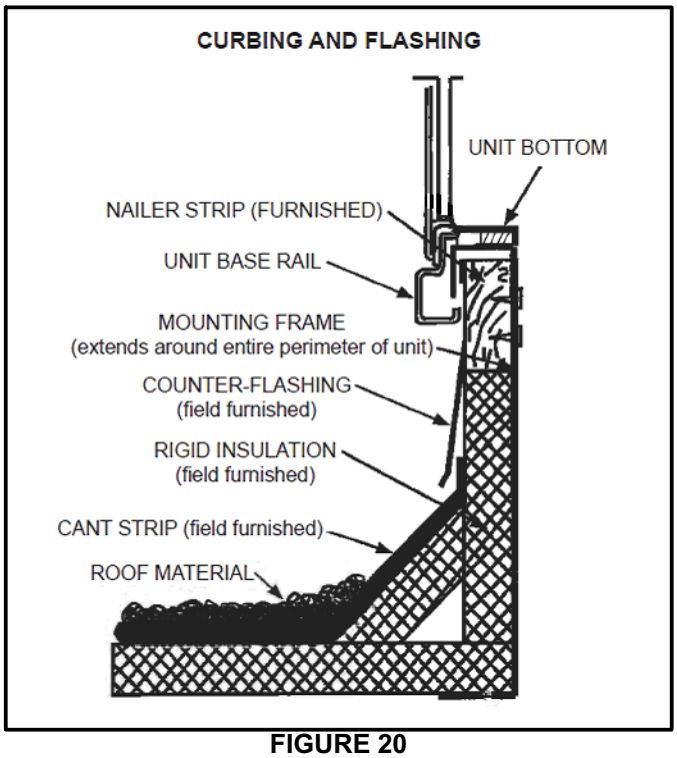


FIGURE 20

B-Transitions

Optional supply/return transitions C1DIFF33C-1 is available for use with the -180 units utilizing optional C1CURB roof mounting frame. C1DIFF34C-1 is available for use with -210S, -240S and -300S units. Transition must be installed in the mounting frame before setting the unit on the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

C-Supply and Return Diffusers (all units)

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

D-K1ECON20 Standard Economizer & K1ECON22C High Performance Economizer

K1ECON20C Standard Economizer

The standard economizer is equipped with a W7212 economizer control module A6. The default OA temperature sensor is the OA thermostat, S175, provided in this kit. See table 9 for outdoor and return air (OA and RA) sensor options. Refer to instructions provided with sensors for installation

The A6 enthalpy control is located in the economizer access area. See figure 21. The S175 temperature sensor or A7 enthalpy sensor is located on the division panel between horizontal supply and return air sections.

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

TABLE 9
STANDARD ECONOMIZER SENSORS

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

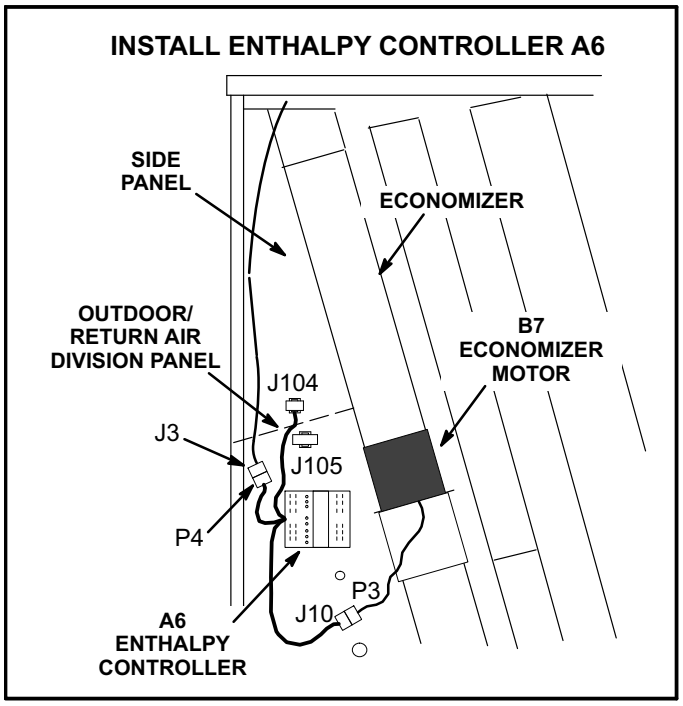


FIGURE 21

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

Refer to instructions provided with sensors for installation.

A6 Enthalpy Control 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 22.

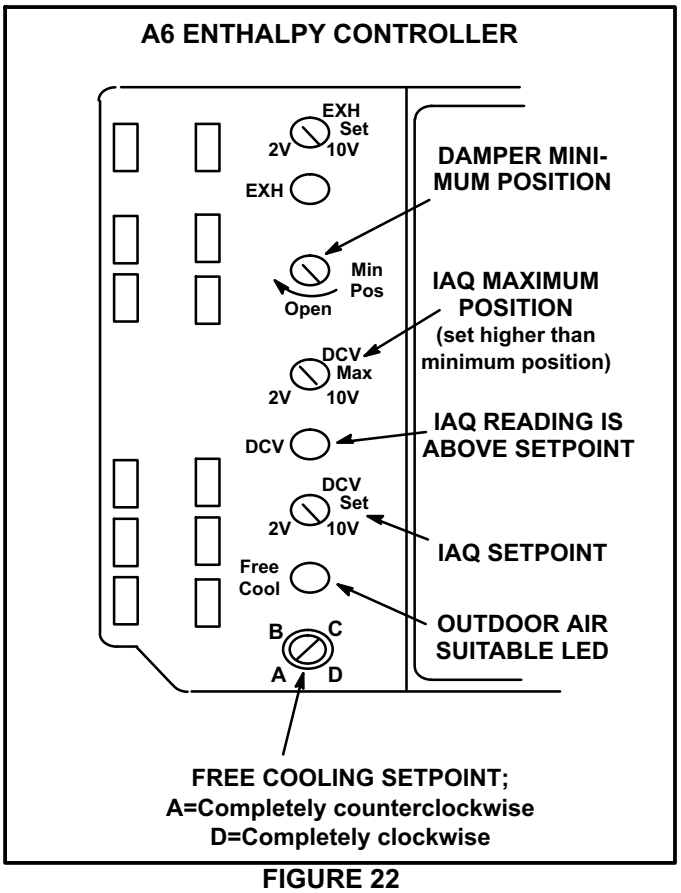


FIGURE 22

Free Cooling Setpoint

Single Temperature or Enthalpy Sensing:

The enthalpy control (A6) setpoint may be adjusted when an enthalpy (A7) sensor is used to determine outdoor air suitability, See figure 22.

Free cooling will be enabled when outdoor air temperature or enthalpy are lower than the free cooling setpoint. The free cooling setpoints for sensible temperature sensors is 55°F. Table 10 shows the free cooling setpoints for enthalpy sensors. Use the recommended setpoint and adjust as necessary.

For example: At setting A (table 10), free cooling will be enabled when outdoor air enthalpy is lower than 73°F and 50% RH. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be enabled at 70°F and 50% RH.

TABLE 10
ENTHALPY FREE COOLING SETPOINTS

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

*Setting A is recommended.

Differential Sensing:

Two sensors can be used to compare outdoor air to return air. When outdoor air is cooler than return air, outdoor air is suitable for free cooling. Adjust the free cooling setpoint to “D” in this application.

When return air is cooler than outdoor air, the damper will modulate to the minimum position.

Damper Minimum Position

NOTE - A jumper is factory-installed between TB1 R and OC terminals to maintain occupied status (allowing minimum fresh air). See figure 23. When using an electronic thermostat or energy management system with an occupied/unoccupied feature, remove jumper. Make wire connections to R and OC as shown in literature provided with thermostat or energy management system literature. Either the jumper wire or optional device must be connected to R and OC for the economizer to function.

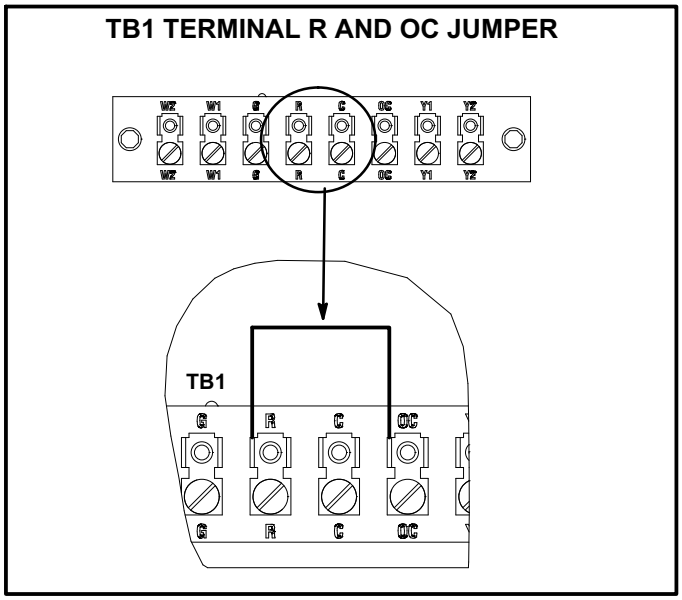


FIGURE 23

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.

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 figure 24 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 clockwise (further open). If fresh air percentage is more than desired, adjust MIN POS SET potentiometer counterclockwise (less open). Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

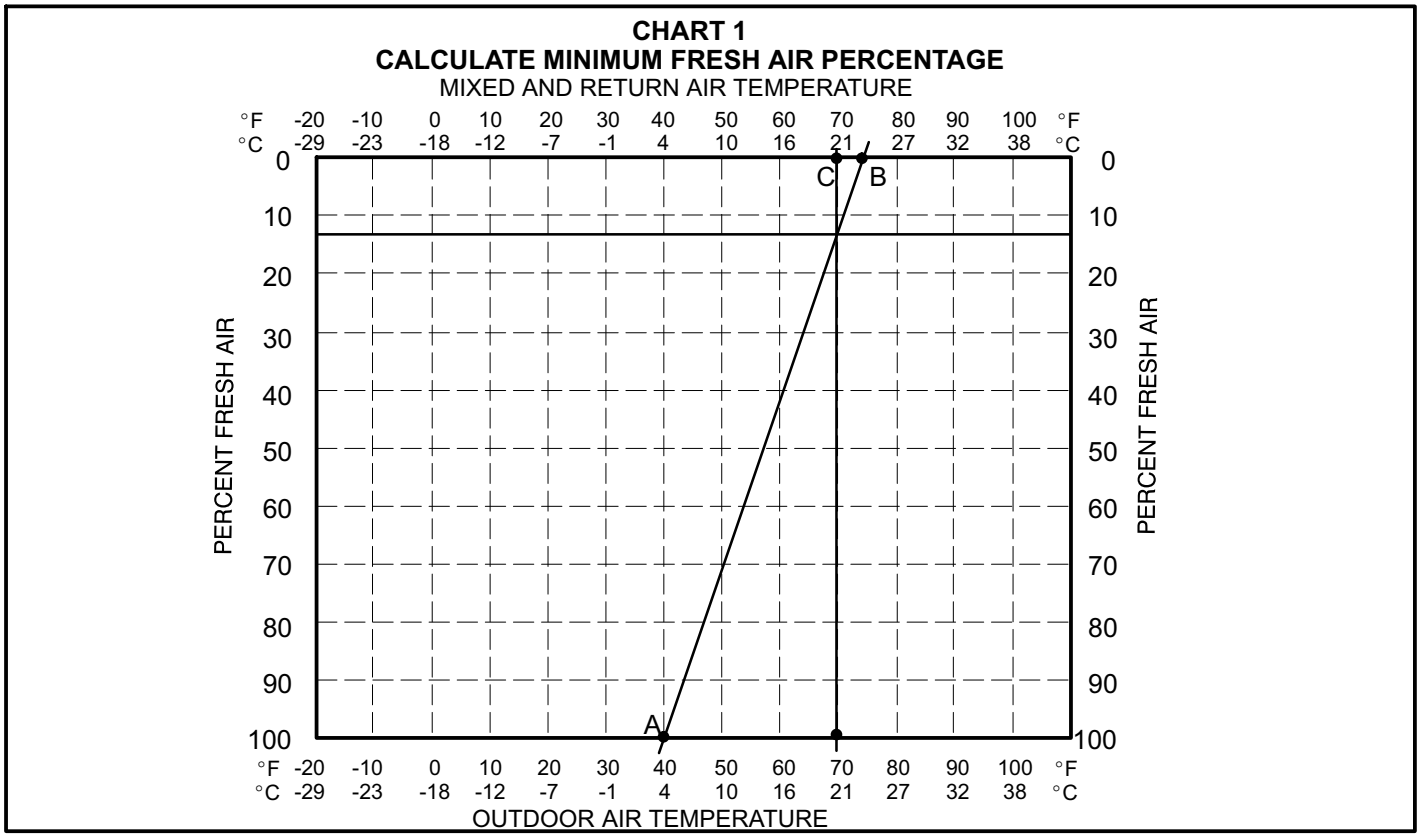


FIGURE 24

DCV Set and Max Settings

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

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

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

Economizer Operation

When the outdoor air is suitable, dampers will modulate between minimum position and full open to maintain 55°F (12.8°C) supply air.

See table 11 for economizer operation when outdoor air is suitable. See table 12 for economizer operation when outdoor air is NOT suitable.

IAQ Sensor

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. The DCV MAX setting may override damper free cooling position when occupancy is high and outdoor air temperatures are low.

NOTE - R1 senses mixed air temperature below 45°F (7°C), dampers will move to minimum position until mixed air temperature rises to 48°F (9°C).

TABLE 11

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

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

TABLE 12

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

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

*IAQ sensor can open damper to DCV max.

K1ECON22C High Performance Economizer

The high performance economizer is equipped with a W7220 control module A6. This application provides low leak, fault detection and diagnostic capabilities. The default OA temperature sensor or high limit sensor (RT26) is a CEC approved, California Title 24 fixed dry bulb device (provided in this kit). See table 13 for outdoor and return air (OA and RA) sensor options. Refer to manufacturer's instructions provided for more details.

The A6 enthalpy control is located in the economizer access area. See figure 21.

TABLE 13
HIGH PERFORMANCE ECONOMIZERS

Sensors	Dampers modulate to maintain 55°F mixed air (R1) when:
Single OA Sensible DEFAULT - approved for CA Title24	OA temperature (RT26) is lower than free cooling setpoint.
Single OA Enthalpy Not approved for CA Title 24	OA temperature and humidity (A7) is lower than free cooling setpoint.
Differential Enthalpy - 1 in OA & 1 in RA Not approved for CA Title 24	OA temperature and humidity (A7) is lower than RA temperature and humidity (A62).
IAQ Sensor	CO_2 sensed (A63) is higher than CO_2 setpoint.

FREE COOLING SETPOINT

Single OA Sensible Sensing (Default) -

The default free cooling setpoint or high limit setpoint is 63°F. This means that the outdoor air is suitable for free cooling at 62°F and below and not suitable at 64°F and above. This setpoint is adjustable.

For *California Title 24* compliance, adjust the free cooling setpoint based on:

-The climate zone where the unit is installed. See table 14.

-The setpoint requirement published by the California Energy Commission. See *Section 140.4 - Prescriptive Requirements for Space Conditioning Systems of the 2013 Building Energy Efficiency Standards.*

***NOTE** - Values in the referenced standard will supersede values listed in table 14.*

TABLE 14
FREE COOLING SETPOINT - SINGLE SENSIBLE

Climate Zone	Setpoint
1, 3, 5, 11-16	75°F
2, 4, 10	73°F
6, 8, 9	71°F
7	69°F

To adjust the setpoint, navigate to the *"SETPOINTS"* menu and change the *"DRYBLB SET"* parameter accordingly.

Single OA Enthalpy Sensing (Optional) -

The controller uses enthalpy boundary "curves" for economizing when used with an enthalpy sensor. Refer to the Honeywell installation instruction for details.

Differential Sensing (Optional) -

Two sensors can be used to compare outdoor air to return air. When outdoor air is cooler than return air, outdoor air is suitable for free cooling. When return air is cooler than outdoor air, the damper will modulate to the minimum position.

DAMPER MINIMUM POSITION

NOTE** - 24 volts must be provided at unit TB1 terminals **R** and **OC** to enable economizer operation (allowing minimum fresh air). Typically a separately ordered thermostat or energy management system with an occupied/unoccupied output is connected between TB1 **R** and **OC

*terminals. The thermostat will provide 24 volts to the A6 economizer control during the occupied time period to enable economizer minimum position. If a device is not used to enable the economizer, install a jumper wire between TB1 terminals **R** and **OC** to maintain minimum position continuously. See figure 23.*

UNITS WITH 1-SPEED SUPPLY AIR BLOWER

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. Turn on the blower using the thermostat or a jumper between TB1 terminals R and G.
3. Navigate to the *"SETPOINTS"* menu and select "*MIN POS"*. Adjust value (2-10VDC) to the approximate desired fresh air percentage.

3.0 VDC - 12% Open Damper

3.5 VDC - 18% Open Damper

4.0 VDC - 25% Open Damper

4.5 VDC - 31% Open Damper

5.0 VDC - 37% Open Damper

5.5 VDC - 43% Open Damper

6.0 VDC - 50% Open Damper

***NOTE** - Damper minimum position can be set lower than traditional minimum air requirements when an IAQ sensor is specified.*

4. Measure outdoor air temperature. Mark the point on the bottom line of chart 1 figure 24 and label the point "A" (40°F, 4°C shown).
5. Measure return air temperature. Mark that point on the top line of chart 1 and label the point "B" (74°F, 23°C shown).
6. 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).
7. Draw a straight line between points A and B.
8. Draw a vertical line through point C.
9. Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
10. Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

If fresh air percentage is less than desired, use the A6 keypad to adjust "MIN POS" values higher (further open). If fresh air percentage is more than desired, adjust "MIN POS" values lower (less open). Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

UNITS WITH 2-SPEED SUPPLY AIR BLOWER

***NOTE** - AFTER setting minimum positions, set the "VENT SPEED" switch on the VFD control board to "LO". See figure 25. Minimum position potentiometers do not function when the unit is equipped with a W7220 economizer control.*

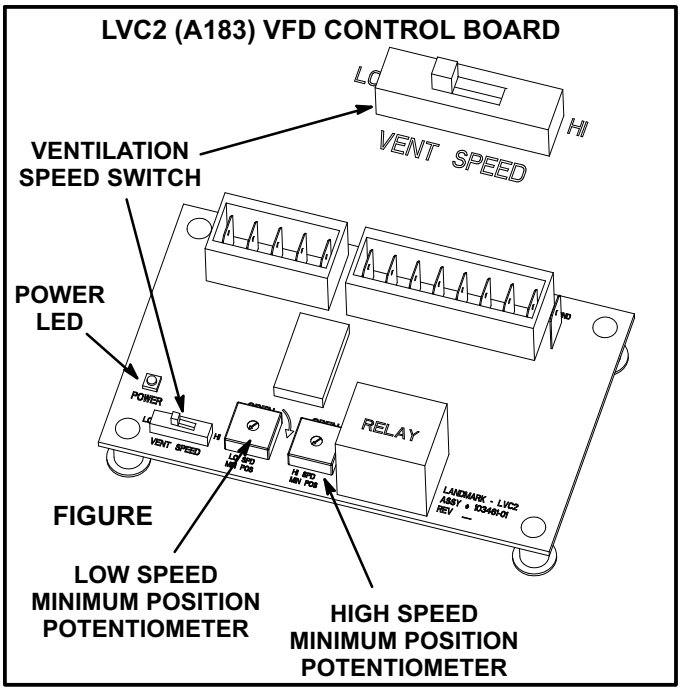


FIGURE 25

1. Set thermostat to occupied mode if the feature is available. Make sure a jumper is in place between TB1 terminals R and OC when using a thermostat which does not have this feature.
2. **Minimum damper position setting - Low Speed Switch the blower speed setting on the VFD control board to "LO".**
3. Turn on the indoor blower using the thermostat or by placing a jumper between TB1 terminals R and G. The inverter or variable frequency drive (VFD) should display "40.00Hz".
4. Navigate to the *"SETPOINTS"* menu and select "*MIN POS L"*. Adjust value (2-10VDC) to the approximate desired fresh air percentage and save the input.

3.0 VDC - 12% Open Damper

3.5 VDC - 18% Open Damper

4.0 VDC - 25% Open Damper

4.5 VDC - 31% Open Damper

5.0 VDC - 37% Open Damper

5.5 VDC - 43% Open Damper

6.0 VDC - 50% Open Damper

***NOTE** - Damper minimum position can be set lower than traditional minimum air requirements when an IAQ sensor is specified.*

5. Navigate to the “CHECKOUT” menu and select “VMAX-LS”. Press ↵.
6. Display will read “DAMPER VMAX-LS RUN?”. Press ↵.
7. Damper will drive to the setpoint value stored in step 4..
8. Measure outdoor air temperature. Mark the point on the bottom line of chart 1 figure 24 and label the point “A” (40°F, 4°C shown).
9. Measure return air temperature. Mark that point on the top line of chart 1 and label the point “B” (74°F, 23°C shown).
10. 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).
11. Draw a straight line between points A and B.
12. Draw a vertical line through point C.
13. Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
14. Repeat steps 4 through 13 until calculation reads desired fresh air percentage.

If fresh air percentage is less than desired, use the A6 keypad to adjust “MIN POS L” values higher (further open). If fresh air percentage is more than desired, adjust “MIN POS L” values lower (less open).

15. **Minimum damper position setting - High Speed Switch the blower speed setting on the VFD control board to “HI”.** The VFD should display “60.00HZ”.
16. Navigate to the *“SETPOINTS”* menu and select “*MIN POS H”*. Adjust value (2-10VDC) to the approximate desired fresh air percentage.

3.0 VDC - 12% Open Damper

3.5 VDC - 18% Open Damper

4.0 VDC - 25% Open Damper

4.5 VDC - 31% Open Damper

5.0 VDC - 37% Open Damper

5.5 VDC - 43% Open Damper

6.0 VDC - 50% Open Damper

***NOTE** - Damper minimum position can be set lower than traditional minimum air requirements when an IAQ sensor is specified.*

17. Navigate to the “CHECKOUT” menu and select “VMAX-HS”. Press ↵.
18. Display will read “DAMPER VMAX-HS RUN?”. Press ↵.
19. Damper will drive to the setpoint value stored in step 16..
20. Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point “A” (40°F, 4°C shown).
21. Measure return air temperature. Mark that point on the top line of chart 1 and label the point “B” (74°F, 23°C shown).
22. 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).
23. Draw a straight line between points A and B.
24. Draw a vertical line through point C.
25. Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
26. Repeat steps 16 through 25 until calculation reads desired fresh air percentage.

If fresh air percentage is less than desired, use the A6 keypad to adjust *“MIN POS H”* values higher (further open). If fresh air percentage is more than desired, adjust *“MIN POS H”* values lower (less open).

27. **Set the “VENT SPEED” switch on the VFD control board to “LO”.**

DEMAND CONTROL VENTILATION (DCV) 8-

When a 2-10VDC CO_2 sensor is wired to the controller (leads provided), the *DCV SET, VENTMIN*, and *VENTMAX* parameters will appear under *“SETPOINTS“* menu. Navigate to the *“SETPOINTS“* menu to adjust setpoints as desired. Refer to the Honeywell manual provided for more details.

E-Outdoor Air Dampers

Both manual (C1DAMP10C-2) and motorized (C1DAMP20C-1) outdoor air dampers are available for use with KCB units to allow outside air into the system (see figure 26). The motorized damper assembly opens to minimum position during the occupied time period and remains closed during the unoccupied period. Manual damper assembly position is set at installation and remains in that position. Washable filter supplied with the outdoor air dampers can be cleaned with water and a mild detergent. It should be sprayed with Filter Handicoater when dry prior to reinstallation. Filter Handicoater is R.P. Products coating no. 418 and is available as Part No. P-8-5069.

Follow the steps to determine fresh air percentage

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

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

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

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

5- Draw a vertical line through point C.

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

7- If fresh air percentage is less than desired, adjust thumb wheel higher. If fresh air percentage is more than desired, adjust thumb wheel lower. Repeat steps until calculation reads desired fresh air percentage. See figure 27.

Set damper minimum position in the same manner as economizer minimum position. Adjust motorized damper position using the thumb wheel on the damper motor. See figure 27. Manual damper fresh air intake percentage can be determined in the same manner.

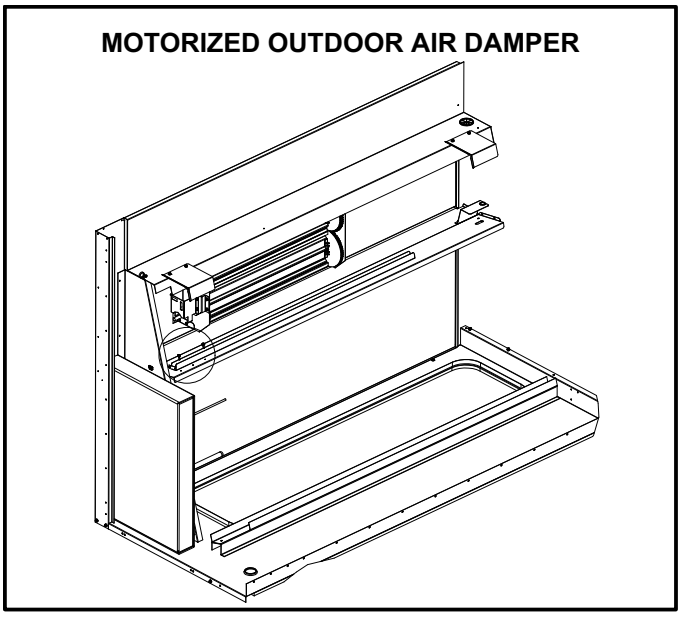


FIGURE 26

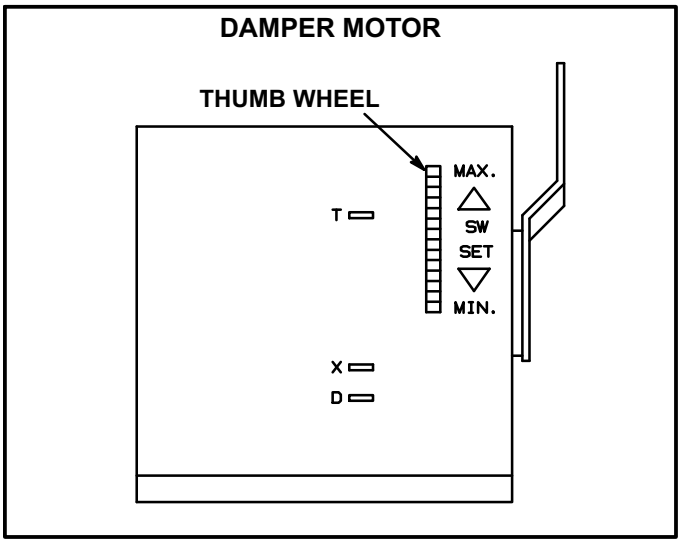


FIGURE 27

F-Barometric Relief/Gravity Exhaust Dampers

C1DAMP50C dampers (figure 28) are used in downflow and LAGED(H)18/24 are used in horizontal air discharge applications. LAGED(H) barometric relief / gravity exhaust dampers are installed in the return air plenum. The dampers must be used any time an economizer or power exhaust fan is applied to KCB series units.

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

G-C1PWRE11C Power Exhaust Fans

C1PWRE11C power exhaust fans are used in downflow applications only. The fans require optional downflow barometric relief / gravity exhaust dampers and K1ECON economizers. Power exhaust fans provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. Figure 28 shows the location of the C1PWRE11C. See installation instructions for more detail.

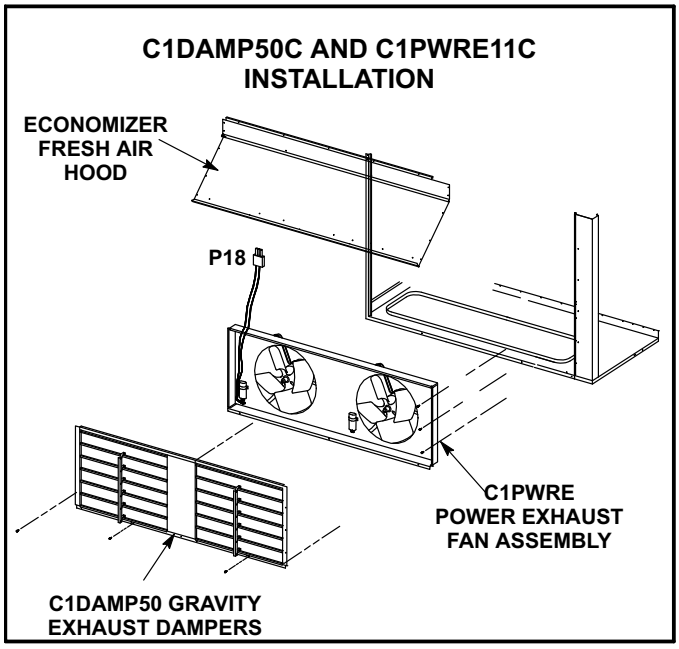


FIGURE 28

H-Control Systems

Different types of control systems may be used with the KCB series units. All thermostat wiring is connected to terminal block TB1 located in the control box of the unit. Each thermostat has additional control options available. See thermostat installation instructions for more detail.

I-Smoke Detectors A171 and A172

Photoelectric smoke detectors are a field-installed option. The smoke detectors can be installed in the supply air section (A172), return air section (A171), or in both the supply and return air section.

J-Indoor Air Quality (CO_2) Sensor A63

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

K-UVC Kit

UVC germicidal lamps are a field-installed option. The lamp emits ultraviolet light that greatly reduces the growth and proliferation of mold and other bio-aerosols on illuminated surfaces. The lamp is mounted in the blower compartment with the light directed towards the indoor coil. For more details refer to the installation instructions provided with the UVC lamp.

L-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.

M-Supply Air Inverter Start-Up

A-General

Optional VFD units are available which provide two blower speeds. The blower will operate at lower speeds when cooling demand is low and higher speeds when cooling demand is high. This results in lower energy consumption.

VFD units will operate at high speed during ventilation (blower “G” only signal) but can be adjusted to operate at low speed.

Low speed is approximately 2/3 of the full speed RPM.

B-Set Maximum Blower CFM

1- Initiate a blower (G) only signal from the room thermostat or control system.

2- Adjust the blower pulley to deliver the full (high speed) CFM in the typical manner. See *Determining Unit CFM* in the Blower Operation and Adjustment section.

C-Set Blower Speed During Ventilation

To save energy during ventilation, the blower speed can be set to low. This is accomplished by changing the ventilation speed switch on the VFD control board to “LO”. See figure 29.

NOTE - On units equipped with an economizer, set damper minimum position as shown in the next section. After adjusting the low speed minimum position, the ventilation speed switch will be in the “LO” position.

D-Set Damper Minimum Position (Units W/ Economizer)

To maintain required minimum ventilation air volumes when the unit is in the occupied mode, two minimum damper positions must be set. A high and a low speed potentiometer are provided on the VFD control board to adjust minimum damper position. See figure 29.

Set High Speed Minimum Position

1. Initiate a blower (G) only AND occupied demand from the room thermostat or control system.
2. Set the ventilation speed switch on the VFD control board to “HI”.
3. Rotate the high speed potentiometer on the VFD control board to set the high speed minimum damper position.
4. Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the potentiometer to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

NOTE - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.

Set Low Speed Minimum Position

1. Initiate a blower (G) only AND occupied demand from the room thermostat or control system.
2. Set the ventilation speed switch on the VFD control board to “LO”.
3. Rotate the low speed potentiometer on the VFD control board to set the low speed minimum damper position.
4. Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the potentiometer to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

NOTE - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.

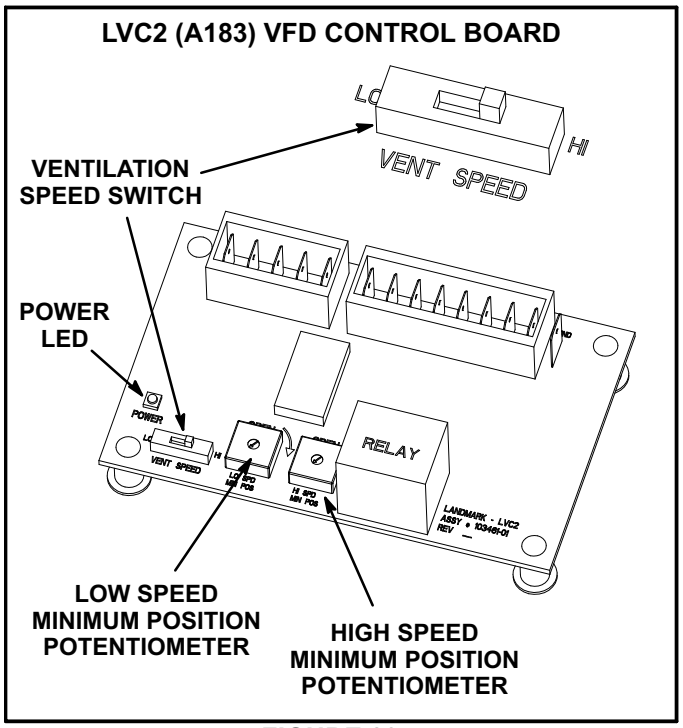


FIGURE 29

Troubleshoot LVC2 Board (A183)

Refer to wiring diagram sections B (unit), C (control) and D (economizer) located on inside of unit panels.

1- Inspect the LVC2 for damaged components. Replace the LVC2 if damaged components are found.

2- Check all wire connections to LVC2; secure if loose.

3- Check for 24VAC signal at the thermostat blower input (G to GND terminal). See figure 30.

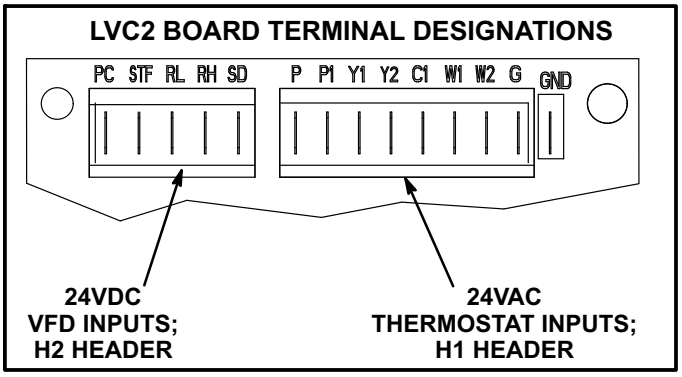


FIGURE 30

4- If there is no thermostat signal, troubleshoot back toward the thermostat.

5- Check the power LED on the board. See figure 29.

6- If the power LED is not on, check voltage between LVC2 terminals PC (H2-1) and SD (H2-5). Voltage should read 24VDC.

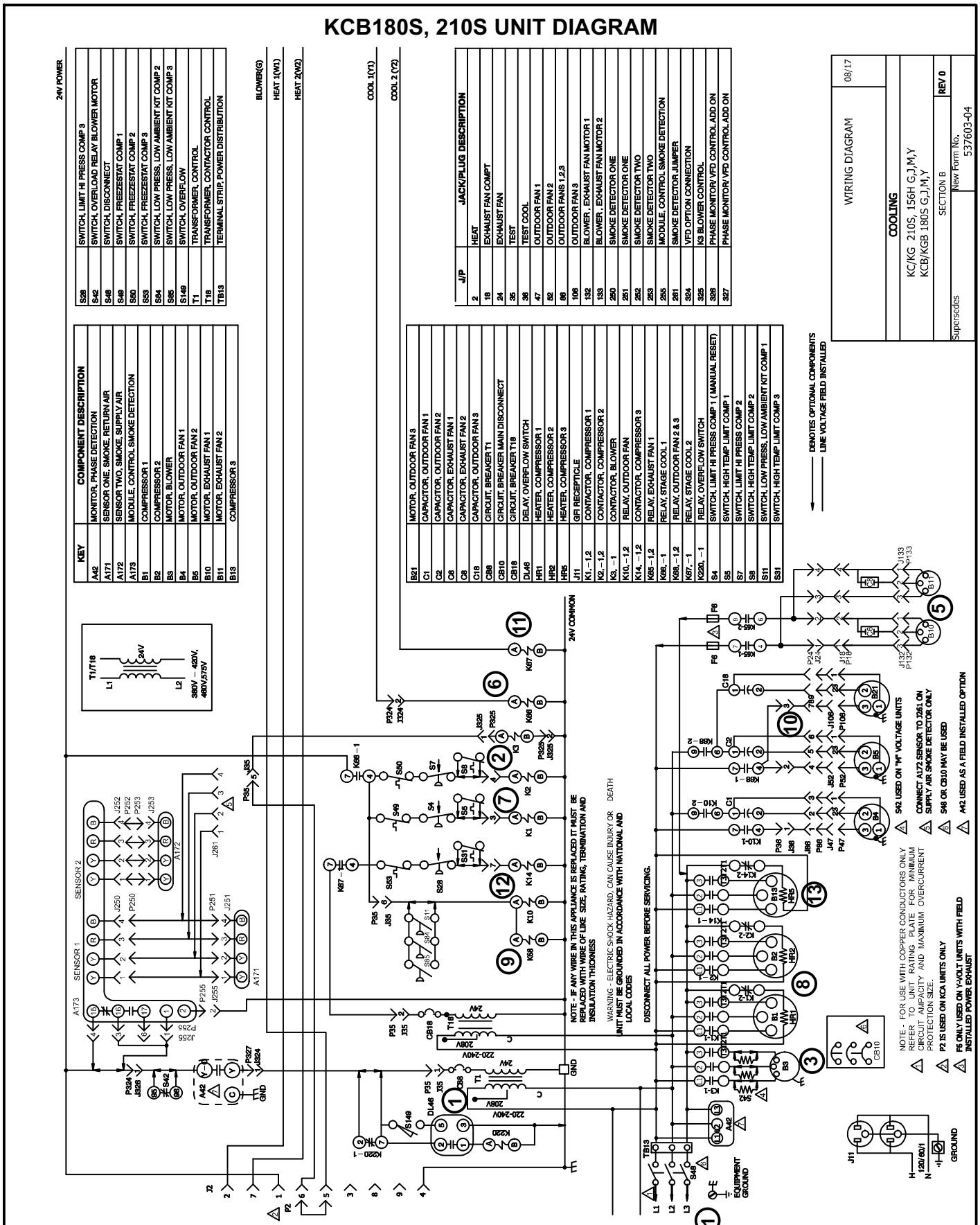
7- If voltage does not read 24VDC, disconnect the H2 header from the LVC2 VFD inputs terminal block (to make sure the LVC2 is not shorting 24VDC supply from the inverter). Measure the voltage between the end terminals on the H2 header. If 24VDC is present, replace the LVC2 board. If no voltage is read, troubleshoot the VFD.

8- When LVC2 24VAC thermostat blower (G) input and 24VDC power are present, check the LVC2 low and high speed outputs. The LVC2 uses inverse logic to enable the blower; 1VDC will be read at the enabled blower speed terminal. See table 15.

9- If all inputs are correct and the unit still does not operate as intended, replace LVC2 board.

TABLE 15
LVC2 BOARD BLOWER OUTPUTS

Output Terminals	Voltage	Blower Operation
RL-SD	1VDC	Low Speed
RH-SD	24VDC	
RL-SD	24VDC	High Speed
RH-SD	1VDC	
RL-SD	1VDC	Illegal State (replace board)
RH-SD	1VDC	
RL-SD	24VDC	Blower Off (replace board)
RH-SD	24VDC	


KCB180S, 210S UNIT DIAGRAM
WIRING DIAGRAM
08/17
COOLING
KC/KG 210S, 156H G,J,M,Y
KCB/KGB 180S G,J,M,Y
SECTION B
REV 0
New Form No. 537603-04
Supersedes
KEY
COMPONENT DESCRIPTION
A42 MONITOR, PHASE DETECTION
A171 SENSOR ONE, SMOKE, RETURN AIR
A172 SENSOR TWO, SMOKE, SUPPLY AIR
A173 MODULE, CONTROL SMOKE DETECTION
B1 COMPRESSOR 1
B2 COMPRESSOR 2
B3 MOTOR, BLOWER
B4 MOTOR, OUTDOOR FAN 1
B5 MOTOR, OUTDOOR FAN 2
B10 MOTOR, EXHAUST FAN 1
B11 MOTOR, EXHAUST FAN 2
B13 COMPRESSOR 3
S28 SWITCH, LIMIT HI PRESS COMP 3
S42 SWITCH, OVERLOAD RELAY BLOWER MOTOR
S48 SWITCH, DISCONNECT
S49 SWITCH, FREEZESTAT COMP 1
S50 SWITCH, FREEZESTAT COMP 2
S53 SWITCH, FREEZESTAT COMP 3
S84 SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S85 SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 3
S149 SWITCH, OVERFLOW
T1 TRANSFORMER, CONTROL
T18 TRANSFORMER, CONTACTOR CONTROL
TB13 TERMINAL STRIP, POWER DISTRIBUTION
J/P JACK/PLUG DESCRIPTION
2 HEAT
18 EXHAUST FAN COMPT
24 EXHAUST FAN
35 TEST
36 TEST COOL
47 OUTDOOR FAN 1
52 OUTDOOR FAN 2
86 OUTDOOR FANS 1,2,3
106 OUTDOOR FAN 3
132 BLOWER, EXHAUST FAN MOTOR 1
133 BLOWER, EXHAUST FAN MOTOR 2
250 SMOKE DETECTOR ONE
251 SMOKE DETECTOR ONE
252 SMOKE DETECTOR TWO
253 SMOKE DETECTOR TWO
255 MODULE, CONTROL SMOKE DETECTION
281 SMOKE DETECTOR JUMPER
324 VFD OPTION CONNECTION
325 K3 BLOWER CONTROL
326 PHASE MONITOR/ VFD CONTROL ADD ON
327 PHASE MONITOR/ VFD CONTROL ADD ON
B21 MOTOR, OUTDOOR FAN 3
C1 CAPACITOR, OUTDOOR FAN 1
C2 CAPACITOR, OUTDOOR FAN 2
C6 CAPACITOR, EXHAUST FAN 1
C18 CAPACITOR, EXHAUST FAN 2
C28 CAPACITOR, OUTDOOR FAN 3
CB9 CIRCUIT, BREAKER T1
CB10 CIRCUIT, BREAKER MAIN DISCONNECT
CB18 CIRCUIT, BREAKER T18
DL46 DELAY, OVERFLOW SWITCH
HR1 HEATER, COMPRESSOR 1
HR2 HEATER, COMPRESSOR 2
HR5 HEATER, COMPRESSOR 3
J11 GFI RECEPTICLE
K1, -1,2 CONTACTOR, COMPRESSOR 1
K2, -1,2 CONTACTOR, COMPRESSOR 2
K3, -1 CONTACTOR, BLOWER
K10, -1,2 RELAY, OUTDOOR FAN
K14, -1,2 CONTACTOR, COMPRESSOR 3
K66, -1,2 RELAY, EXHAUST FAN 1
K86, -1 RELAY, STAGE COOL 1
K88, -1,2 RELAY, OUTDOOR FAN 2 & 3
K67, -1 RELAY, STAGE COOL 2
K220, -1 RELAY, OVERFLOW SWITCH
S4 SWITCH, LIMIT HI PRESS COMP 1 (MANUAL RESET)
S5 SWITCH, HIGH TEMP LIMIT COMP 1
S7 SWITCH, LIMIT HI PRESS COMP 2
S8 SWITCH, HIGH TEMP LIMIT COMP 2
S11 SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 1
S31 SWITCH, HIGH TEMP LIMIT COMP 3
DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED
24V POWER
BLOWER(G)
HEAT 1(W1)
HEAT 2(W2)
COOL 1(Y1)
COOL 2 (Y2)
24V COMMON
T1/T18
L1
L2
24V
380V - 420V, 460V/575V
SENSOR 1
SENSOR 2
A173
A172
A171
J2
P2
GND
GROUND
EQUIPMENT GROUND
TB13
L1
L2
L3
S48
J11
120/60/1
H
N
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.
NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
P2 IS USED ON KCA UNITS ONLY
F5 ONLY USED ON Y-VOLT UNITS WITH FIELD INSTALLED POWER EXHAUST
S42 USED ON "M" VOLTAGE UNITS
CONNECT A172 SENSOR TO J251 ON SUPPLY AIR SMOKE DETECTOR ONLY
S48 OR CB10 MAY BE USED
A42 USED AS A FIELD INSTALLED OPTION

KCB180S, 210S SEQUENCE OF OPERATION

Power:

1- Line voltage from unit disconnect S48 or TB13 energizes transformer T1 and T18. T1 and T18 provide 24VAC to the unit cooling, heating and blower controls and TB1.

Blower Operation:

2- TB1 receives a demand from thermostat terminal G and energizes blower contactor K3 with 24VAC.

3- N.O. K3 closes, energizing blower B3.

Optional Power Exhaust Operation:

4- The economizer control module receives a demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).

5- N.O. K65-1 and N.O. K65-2 both close, energizing exhaust fan motors B10 and B11.

1st Stage Cooling (compressor B1 and B2)

6- Y1 energizes the pilot relay K66 and N.O. K66-1 closes.

7- 24VAC is routed from T1 to N.C. freezestats S49 and S50 and N.C. high pressure switch S4 and S7. Compressor contactors K1 and K2 are energized.

8- N.O. contacts K1 and K2 close energizing compressors B1 and B2.

9- Optional N.O. low ambient switch S11 and/or S84 and/or S85 closes to energize condenser fan relay K10 and K68.

10- N.O. contacts K10-1 and K10-2 close energizing condenser fan B4. N.O. Contacts K68-1 and K68-2 close energizing B5 and B21.

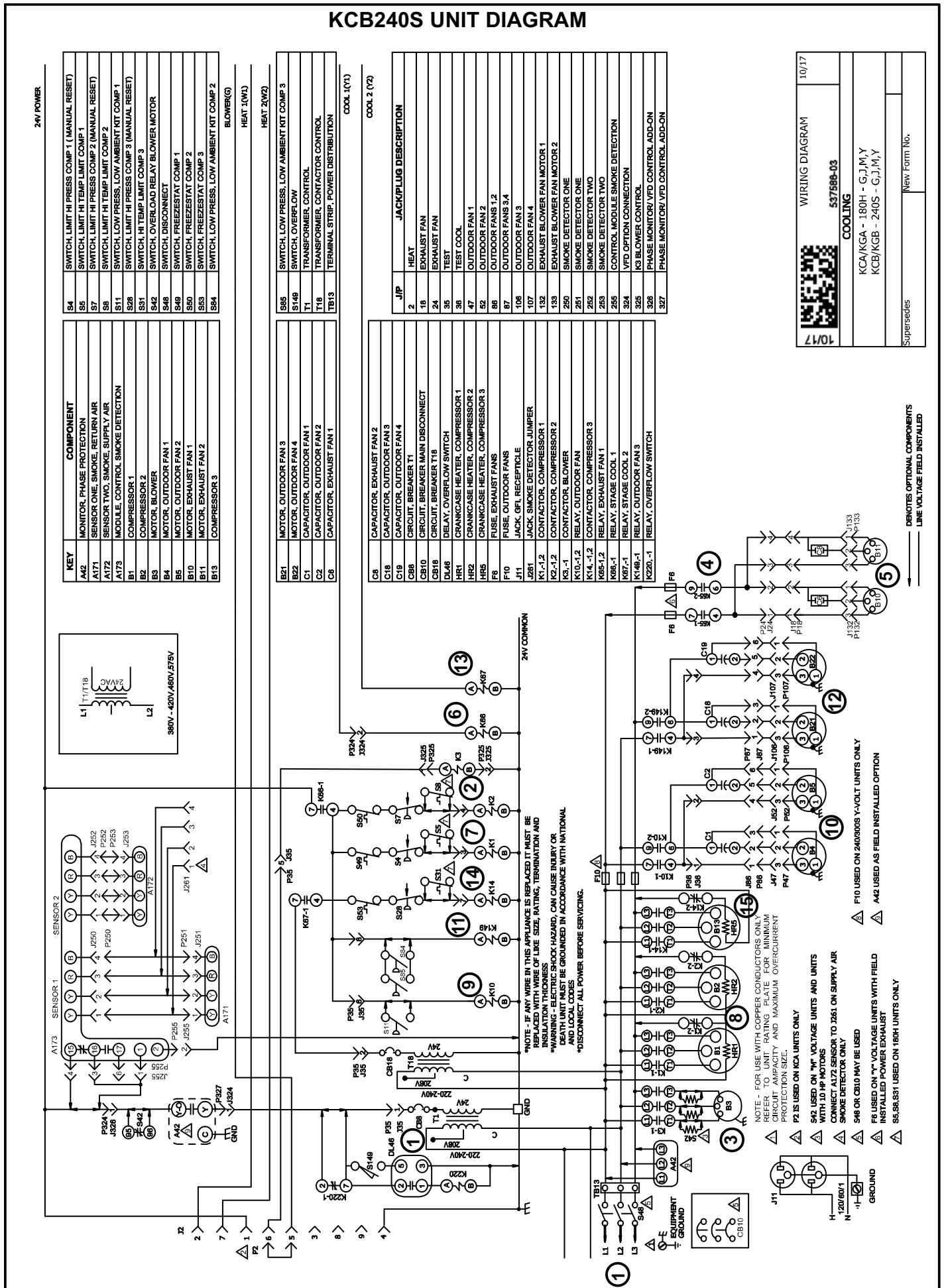
2nd Stage Cooling (compressor B13 is energized)

11- Y2 energizes the pilot relay K67 and N.O. K67-1 closes.

12- 24VAC is routed from T18 to N.C. freezestat S53 and N.C. high pressure switch S28. Compressor contactor K14 is energized.

13- N.O. K14 closes energizing compressor B13.

KCB240S UNIT DIAGRAM



KEY	COMPONENT
A42	MONITOR, PHASE PROTECTION
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
B10	MOTOR, EXHAUST FAN 1
B11	MOTOR, EXHAUST FAN 2
B13	COMPRESSOR 3
B21	MOTOR, OUTDOOR FAN 3
B22	MOTOR, OUTDOOR FAN 4
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
C6	CAPACITOR, EXHAUST FAN 1
C8	CAPACITOR, EXHAUST FAN 2
C18	CAPACITOR, OUTDOOR FAN 3
C19	CAPACITOR, OUTDOOR FAN 4
CB8	CIRCUIT, BREAKER T1
CB10	CIRCUIT, BREAKER MAIN DISCONNECT
CB18	CIRCUIT, BREAKER T18
DL46	DELAY, OVERFLOW SWITCH
HR1	CRANKCASE HEATER, COMPRESSOR 1
HR2	CRANKCASE HEATER, COMPRESSOR 2
HR5	CRANKCASE HEATER, COMPRESSOR 3
F6	FUSE, EXHAUST FANS
F10	FUSE, OUTDOOR FANS
J11	JACK, GFI, RECEPTICLE
J261	JACK, SMOKE DETECTOR JUMPER
K1,-1,2	CONTACTOR, COMPRESSOR 1
K2,-1,2	CONTACTOR, COMPRESSOR 2
K3,-1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K14,-1,2	CONTACTOR, COMPRESSOR 3
K85,-1,2	RELAY, EXHAUST FAN 1
K86,-1	RELAY, STAGE COOL 1
K87,-1	RELAY, STAGE COOL 2
K148,-1	RELAY, OUTDOOR FAN 3
K220,-1	RELAY, OVERFLOW SWITCH
S4	SWITCH, LIMIT HI PRESS COMP 1 (MANUAL RESET)
S5	SWITCH, LIMIT HI TEMP LIMIT COMP 1
S7	SWITCH, LIMIT HI PRESS COMP 2 (MANUAL RESET)
S8	SWITCH, LIMIT HI TEMP LIMIT COMP 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 1
S28	SWITCH, LIMIT HI PRESS COMP 3 (MANUAL RESET)
S31	SWITCH, HI TEMP LIMIT COMP 3
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S48	SWITCH, DISCONNECT
S49	SWITCH, FREEZESTAT COMP 1
S50	SWITCH, FREEZESTAT COMP 2
S53	SWITCH, FREEZESTAT COMP 3
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S85	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 3
S149	SWITCH, OVERFLOW
T1	TRANSFORMER, CONTROL
T18	TRANSFORMER, CONTACTOR CONTROL
TB13	TERMINAL STRIP, POWER DISTRIBUTION

J/P	JACK/PLUG DESCRIPTION
2	HEAT
18	EXHAUST FAN
24	EXHAUST FAN
35	TEST
36	TEST COOL
47	OUTDOOR FAN 1
52	OUTDOOR FAN 2
86	OUTDOOR FANS 1,2
87	OUTDOOR FANS 3,4
106	OUTDOOR FAN 3
107	OUTDOOR FAN 4
132	EXHAUST BLOWER FAN MOTOR 1
133	EXHAUST BLOWER FAN MOTOR 2
250	SMOKE DETECTOR ONE
251	SMOKE DETECTOR ONE
252	SMOKE DETECTOR TWO
253	SMOKE DETECTOR TWO
255	CONTROL MODULE SMOKE DETECTION
324	VFD OPTION CONNECTION
325	K3 BLOWER CONTROL
326	PHASE MONITOR/ VFD CONTROL ADD-ON
327	PHASE MONITOR/ VFD CONTROL ADD-ON

KCB240S SEQUENCE OF OPERATION

Power:

1- Line voltage from unit disconnect S48 or TB13, energizes transformer T1 and T18. T1 and T18 provide 24VAC to the unit cooling, heating and blower controls and TB1.

Blower Operation:

2- TB1 receives a demand from thermostat terminal G and energizes blower contactor K3 with 24VAC.

3- N.O. K3 closes, energizing blower B3.

Optional Power Exhaust Operation:

4- The economizer control module receives a demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).

5- N.O. K65-1 and N.O. K65-2 both close, energizing exhaust fan motors B10 and B11.

1st Stage Cooling (compressor B1 and B2)

6- Y1 energizes the pilot relay K66 and N.O. K66-1 closes.

7- 24VAC is routed from T1 to N.C. freezestats S49 and S50 and N.C. high pressure switches S4 and S7. Compressor contactor K1 and K2 is energized.

8- N.O. contacts K1 and K2 closes energizing compressor B1 and B2.

9- Optional N.O. low ambient switch S11 closes to energize condenser fan relay K10.

10- N.O. contacts K10-1 and K10-2 close energizing condenser fan B4 and B5.

11- Optional N.O. low ambient switch S84 and/or S85 close to energize condenser fan relay K149.

12- N.O. contacts K149-1 and K149-2 close energizing condenser fan B21 and B22.

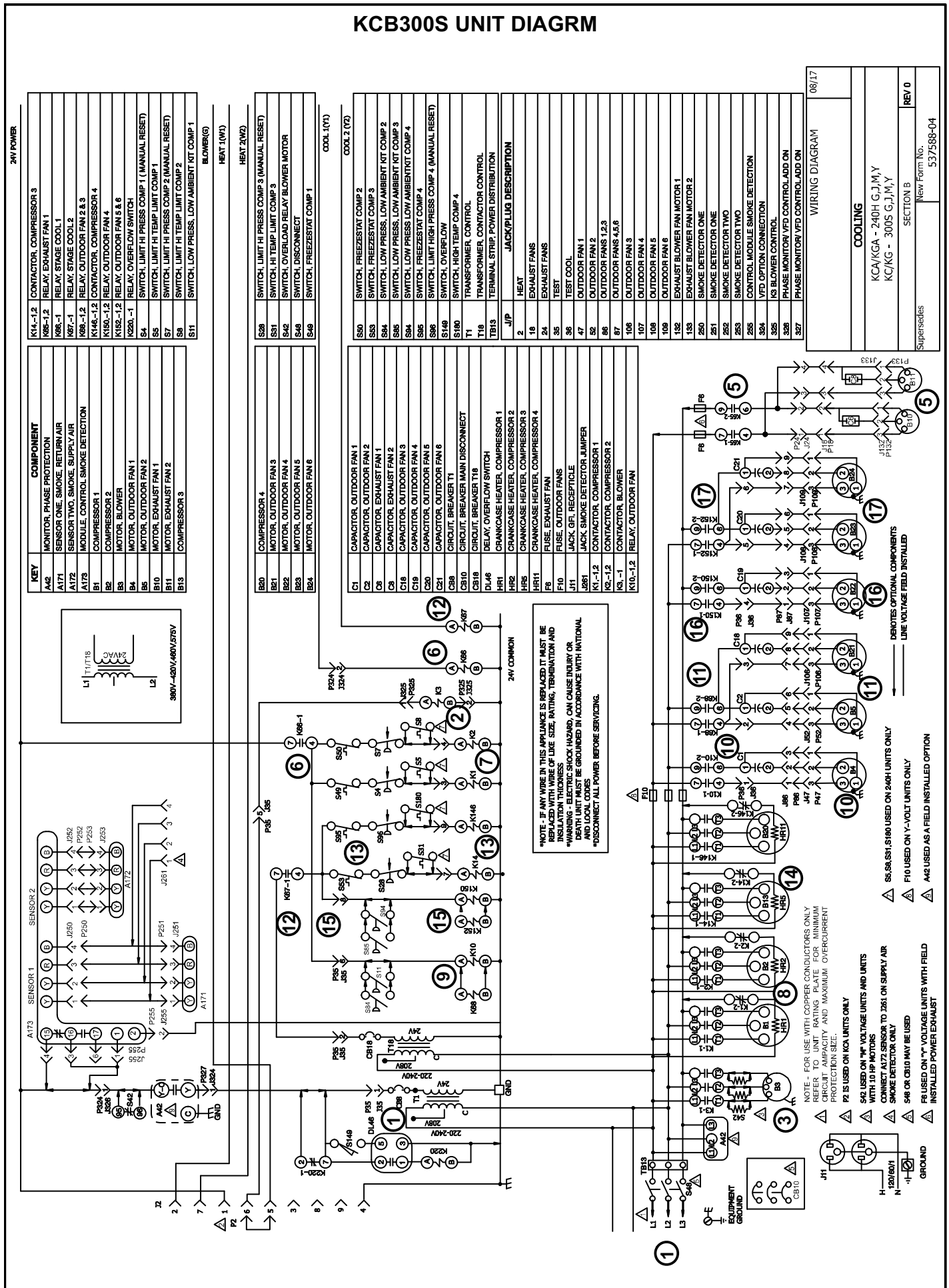
2nd Stage Cooling (compressor B13 is energized)

13- Y2 energizes the pilot relay K67 and N.O. K67-1 closes.

14- 24VAC is routed from T18 to N.C. freezestat S53 and N.C. high pressure switch S28. Compressor contactor K14 is energized.

15- N.O. K14 closes energizing compressor B13.

KCB300S UNIT DIAGRM



KCB300S SEQUENCE OF OPERATION

Power:

1- Line voltage from unit disconnect S48 or TB13, energizes transformer T1 and T18. T1 and T18 provide 24VAC to the unit cooling, heating and blower controls and TB1.

Blower Operation:

2- TB1 receives a demand from thermostat terminal G and energizes blower contactor K3 with 24VAC.

3- N.O. K3 closes, energizing blower B3.

Optional Power Exhaust Operation:

4- The economizer control module receives a demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable). See thermostat diagram.

5- N.O. K65-1 and N.O. K65-2 both close, energizing exhaust fan motors B10 and B11.

1st Stage Cooling (compressor B1 and B2)

6- Y1 energizes the pilot relay K66 and N.O. K66-1 closes.

7- 24VAC is routed from T1 to N.C. freezestats S49 and S50 and N.C. high pressure switches S4 and S7. Compressor contactor K1 and K2 is energized.

8- N.O. contacts K1 and K2 close energizing compressor B1 and B2.

9- Optional N.O. low ambient switches S11 and/or S84 close to energize condenser fan relay K10 and K68.

10- N.O. contacts K10-1 and K10-2 close energizing condenser fan B4.

11- N.O. contacts K68-1 and K68-2 close energizing condenser fans B5 and B21.

2nd Stage Cooling (compressor B13 is energized)

12- Y2 energizes the pilot relay K67 and N.O. K67-1 closes.

13- 24VAC is routed from T18 to N.C. freezestat S53, S95 and N.C. high pressure switch S28 and S96. Compressor contactors K14 and K146 are energized.

14- N.O. Contacts K14-1 close energizing compressor B13. N.O. Contacts K146-1 close energizing compressor B20.

15- Optional N.O. low ambient switches S85 and/or S94 close to energize condenser fan relay K150 and K152.

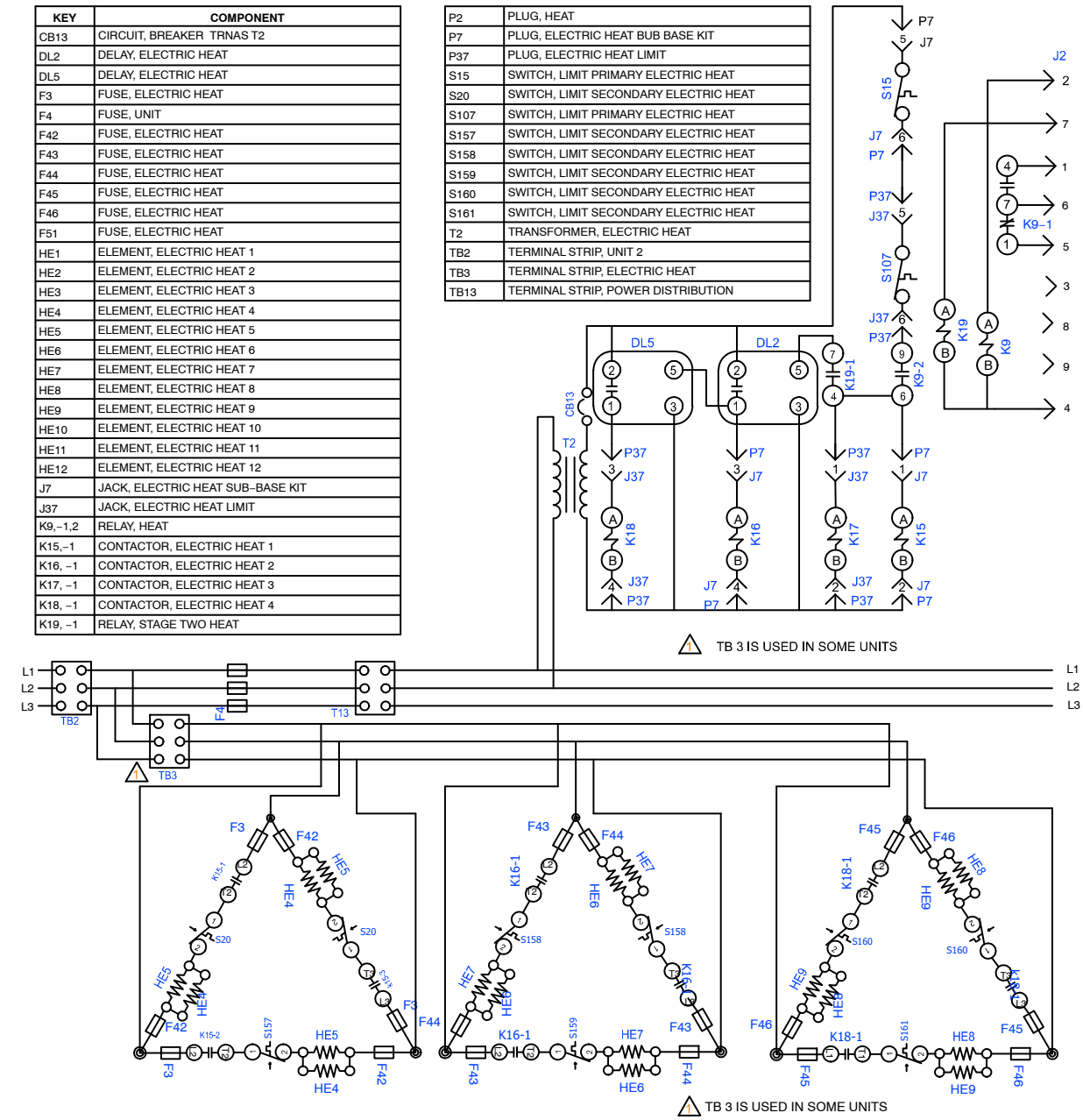
16- N.O. contacts K150-1 and K150-2 close energizing condenser fan B22.

17- N.O. contacts K152-1 and K152-2 close energizing condenser fans B23 and B24.

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

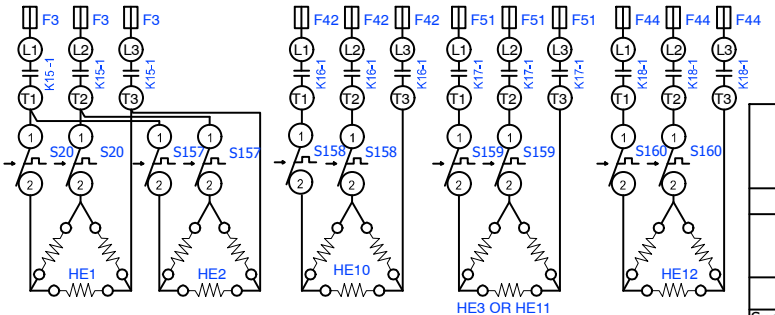
KEY	COMPONENT
CB13	CIRCUIT, BREAKER TRNAS T2
DL2	DELAY, ELECTRIC HEAT
DL5	DELAY, ELECTRIC HEAT
F3	FUSE, ELECTRIC HEAT
F4	FUSE, UNIT
F42	FUSE, ELECTRIC HEAT
F43	FUSE, ELECTRIC HEAT
F44	FUSE, ELECTRIC HEAT
F45	FUSE, ELECTRIC HEAT
F46	FUSE, ELECTRIC HEAT
F51	FUSE, ELECTRIC HEAT
HE1	ELEMENT, ELECTRIC HEAT 1
HE2	ELEMENT, ELECTRIC HEAT 2
HE3	ELEMENT, ELECTRIC HEAT 3
HE4	ELEMENT, ELECTRIC HEAT 4
HE5	ELEMENT, ELECTRIC HEAT 5
HE6	ELEMENT, ELECTRIC HEAT 6
HE7	ELEMENT, ELECTRIC HEAT 7
HE8	ELEMENT, ELECTRIC HEAT 8
HE9	ELEMENT, ELECTRIC HEAT 9
HE10	ELEMENT, ELECTRIC HEAT 10
HE11	ELEMENT, ELECTRIC HEAT 11
HE12	ELEMENT, ELECTRIC HEAT 12
J7	JACK, ELECTRIC HEAT SUB–BASE KIT
J37	JACK, ELECTRIC HEAT LIMIT
K9,–1,2	RELAY, HEAT
K15,–1	CONTACTOR, ELECTRIC HEAT 1
K16, –1	CONTACTOR, ELECTRIC HEAT 2
K17, –1	CONTACTOR, ELECTRIC HEAT 3
K18, –1	CONTACTOR, ELECTRIC HEAT 4
K19, –1	RELAY, STAGE TWO HEAT

P2	PLUG, HEAT
P7	PLUG, ELECTRIC HEAT BUB BASE KIT
P37	PLUG, ELECTRIC HEAT LIMIT
S15	SWITCH, LIMIT PRIMARY ELECTRIC HEAT
S20	SWITCH, LIMIT SECONDARY ELECTRIC HEAT
S107	SWITCH, LIMIT PRIMARY ELECTRIC HEAT
S157	SWITCH, LIMIT SECONDARY ELECTRIC HEAT
S158	SWITCH, LIMIT SECONDARY ELECTRIC HEAT
S159	SWITCH, LIMIT SECONDARY ELECTRIC HEAT
S160	SWITCH, LIMIT SECONDARY ELECTRIC HEAT
S161	SWITCH, LIMIT SECONDARY ELECTRIC HEAT
T2	TRANSFORMER, ELECTRIC HEAT
TB2	TERMINAL STRIP, UNIT 2
TB3	TERMINAL STRIP, ELECTRIC HEAT
TB13	TERMINAL STRIP, POWER DISTRIBUTION



C UNITS 156 TO 300

KW	HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	HE10	HE11	HE12
15	7.5	7.5										
30				15	15							
45	15									7.5	15	7.5
60	15									15	15	15
90	15		15			15	15	15	15			



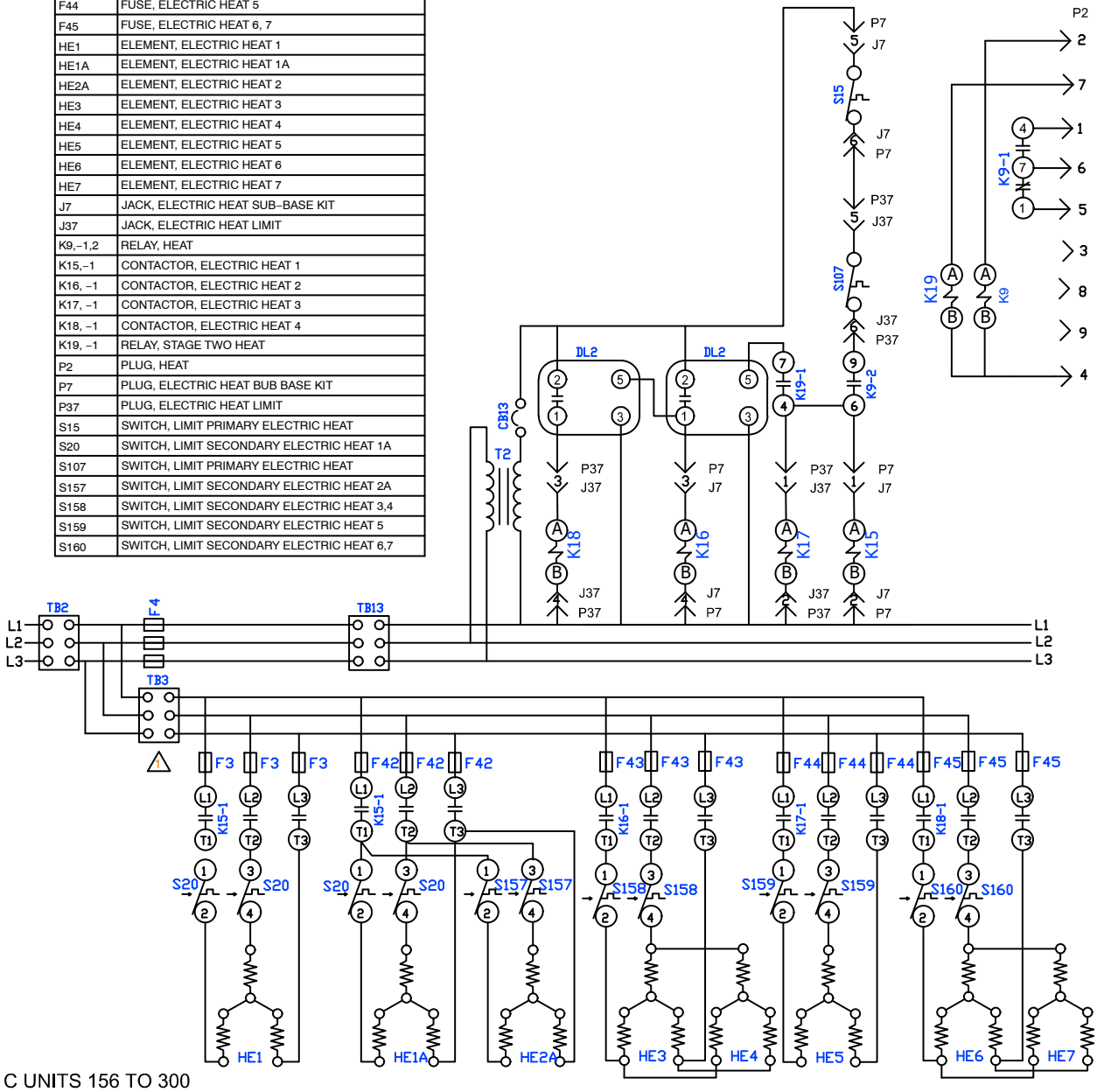
WIRING DIAGRAM	02/18
HEATING	
EHA - 15, 30, 45, 60, 90 - Y FOR USE WITH KCA/KCB AND KHA UNITS	
SECTION B	REV. 3
Supersedes 535066W	Form No. 537060-01

EHA-15, 30, 45, 60, 90kW - G, J, M VOLTAGE

KEY	COMPONENT
CB13	CIRCUIT, BREAKER TRNAS T2
DL2	DELAY, ELECTRIC HEAT
DL5	DELAY, ELECTRIC HEAT
F3	FUSE, ELECTRIC HEAT 1, 1A, 2A
F4	FUSE, UNIT
F43	FUSE, ELECTRIC HEAT 3, 4
F44	FUSE, ELECTRIC HEAT 5
F45	FUSE, ELECTRIC HEAT 6, 7
HE1	ELEMENT, ELECTRIC HEAT 1
HE1A	ELEMENT, ELECTRIC HEAT 1A
HE2A	ELEMENT, ELECTRIC HEAT 2
HE3	ELEMENT, ELECTRIC HEAT 3
HE4	ELEMENT, ELECTRIC HEAT 4
HE5	ELEMENT, ELECTRIC HEAT 5
HE6	ELEMENT, ELECTRIC HEAT 6
HE7	ELEMENT, ELECTRIC HEAT 7
J7	JACK, ELECTRIC HEAT SUB-BASE KIT
J37	JACK, ELECTRIC HEAT LIMIT
K9,-1,2	RELAY, HEAT
K15,-1	CONTACTOR, ELECTRIC HEAT 1
K16, -1	CONTACTOR, ELECTRIC HEAT 2
K17, -1	CONTACTOR, ELECTRIC HEAT 3
K18, -1	CONTACTOR, ELECTRIC HEAT 4
K19, -1	RELAY, STAGE TWO HEAT
P2	PLUG, HEAT
P7	PLUG, ELECTRIC HEAT BUB BASE KIT
P37	PLUG, ELECTRIC HEAT LIMIT
S15	SWITCH, LIMIT PRIMARY ELECTRIC HEAT
S20	SWITCH, LIMIT SECONDARY ELECTRIC HEAT 1A
S107	SWITCH, LIMIT PRIMARY ELECTRIC HEAT
S157	SWITCH, LIMIT SECONDARY ELECTRIC HEAT 2A
S158	SWITCH, LIMIT SECONDARY ELECTRIC HEAT 3,4
S159	SWITCH, LIMIT SECONDARY ELECTRIC HEAT 5
S160	SWITCH, LIMIT SECONDARY ELECTRIC HEAT 6,7

T2	TRANSFORMER, ELECTRIC HEAT
TB 2	TERMINAL STRIP, UNIT 2
TB 3	TERMINAL STRIP, ELECTRIC HEAT
TB15	TERMINAL STRIP, UNIT 2

⚠1 TB3 IS USED IN SOME UNITS



C UNITS 156 TO 300

KW	HE1	HE1A	HE2A	HE3	HE4	HE5	HE6	HE7
15		7.5	7.5					
30		15	15					
45	15			7.5		15	7.5	
60	15			15		15	15	
90	15			15	15	15	15	15

WIRING DIAGRAM	02/18
HEATING	
EHA - 15,30,45,60,90 - G,J FOR USE WITH KCA/KCB AND KHA UNITS	
SECTION B	REV. 1
Supersedes	New Form No. 537059-02

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

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

HEATING ELEMENTS:

1- Terminal Strip TB2 supplies power to TB3. TB3 supplies line voltage to electric heat elements HE1 through HE14. Each element is protected by fuse F3.

FIRST STAGE HEAT:

Heating demand initiates at W1 in thermostat.

1 - TB1 receives W1 demand and energizes relay K9. N.O. K9-1 closes which allows 24VAC from TB1 to energize blower contactor K3.

2 - 24VAC is routed from T2, proving N.C. primary limits S15 (first heat section) and S107 (second heat section). Voltage then energizes contactors K15 and K17.

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

SECOND STAGE HEAT:

With the first stage heat operating, an additional heating demand initiates at W2 in the thermostat.

4 - Relay K19 is energized. N.O. contacts K19-1 close energizing timer DL2.

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

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

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

END OF SECOND STAGE HEAT:

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

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

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

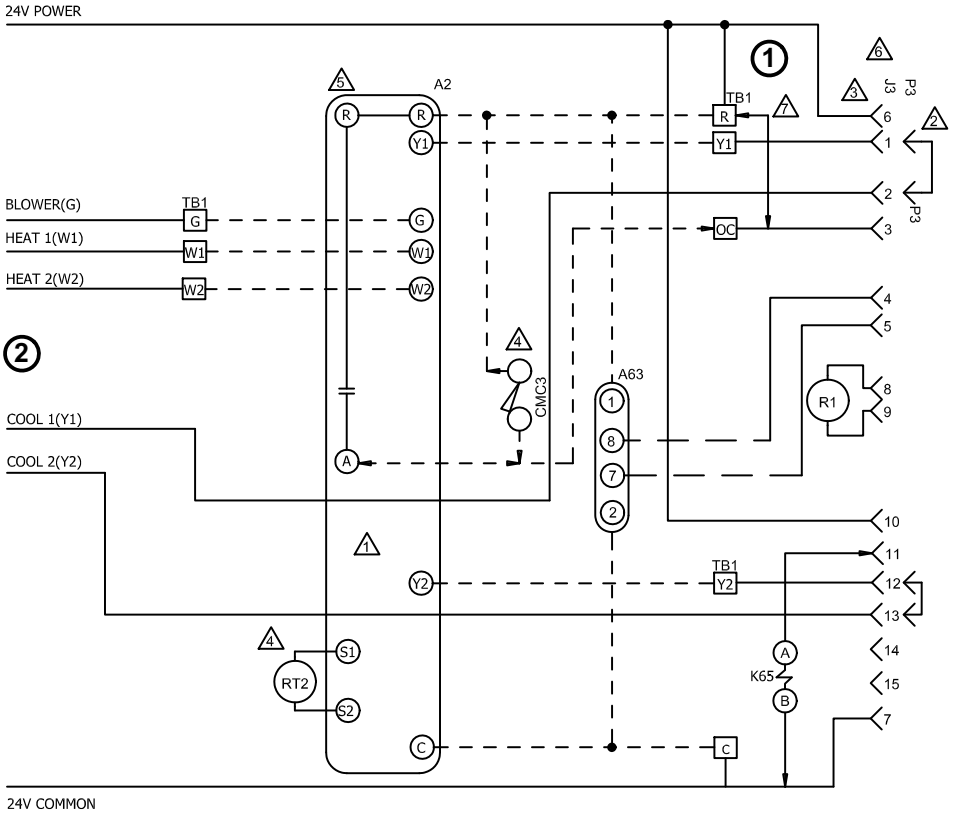
END OF FIRST STAGE HEAT:

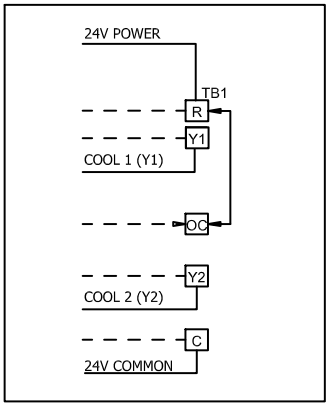
Heating demand is satisfied. Terminal W1 in the thermostat is de-energized.

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

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

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT





CONNECTION SCHEME FOR KCA, KGA AND KHA 092 THROUGH 150 UNITS WITHOUT ECONOMIZER ONLY

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

1. THERMOSTAT SUPPLIED BY USER
2. REMOVE P3 WHEN ECONOMIZER IS USED, ONLY ON KCA, KGA AND KHA 156 THROUGH 300 UNITS.
3. J3 MAXIMUM LOAD 20VA 24VAC CLASS II
4. TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED
5. TOUCHSCREEN THERMOSTAT
6. J3 AND P3 ARE NOT USED ON KCA, KGA AND KHA 092 THROUGH 150 UNITS WITHOUT ECONOMIZER
7. REMOVE JUMPER BETWEEN TB1-R AND TB1-OCP WHEN USING A NITE SETBACK THERMOSTAT

DENOTES OPTIONAL COMPONENTS
CLASS II FIELD WIRING

01/13	WIRING DIAGRAM 537612-01	01/13
CONTROL		
ELECTRONIC/ELECTROMECHANICAL THERMOSTAT		
SECTION C		REV. 0
Supersedes	New Form No. 537612-01	

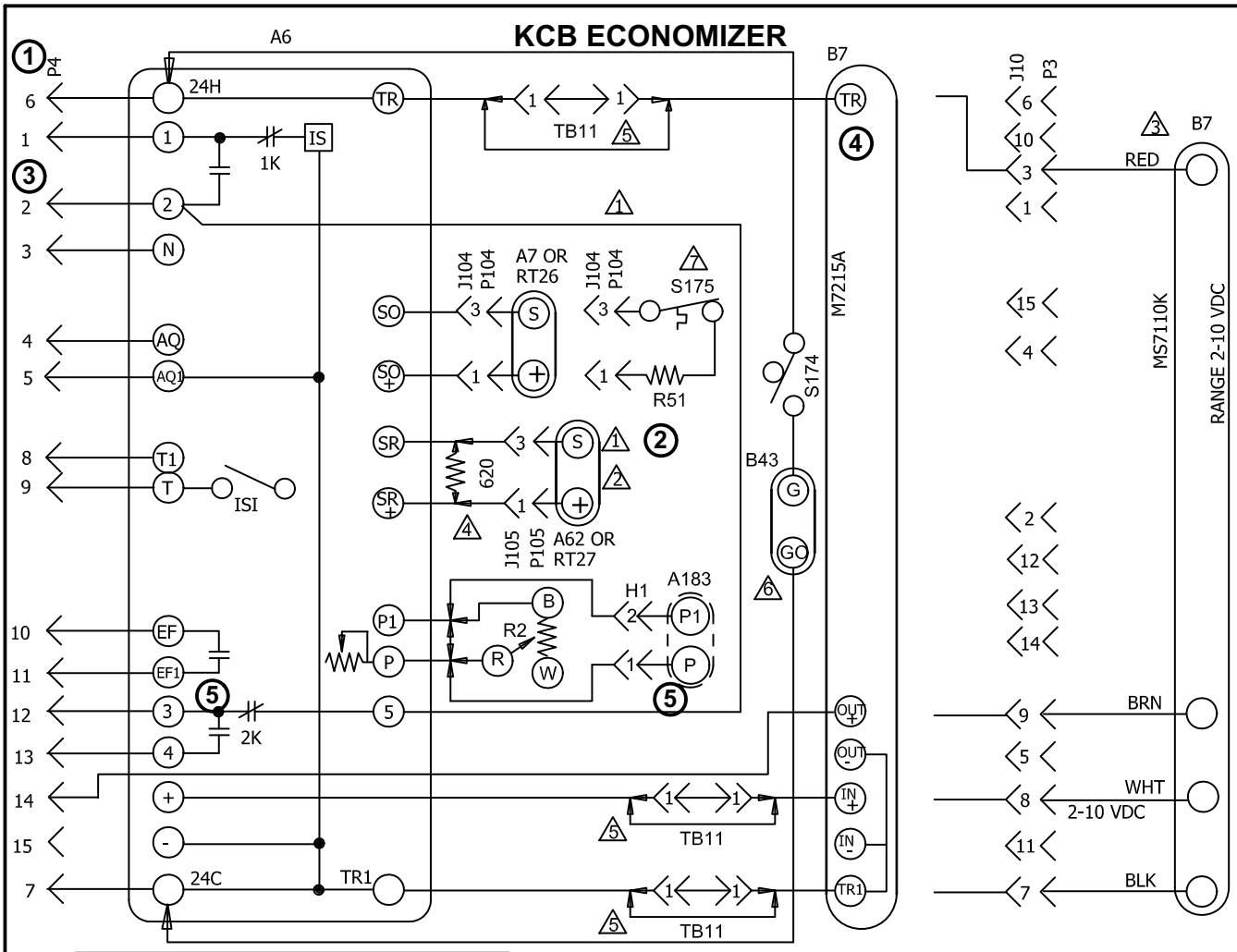
POWER:

1- Terminal strip TB1 found on the control panel energizes thermostat components with 24VAC.

OPERATION:

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

KCB ECONOMIZER



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

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

DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

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

SEQUENCE OF OPERATION

POWER:

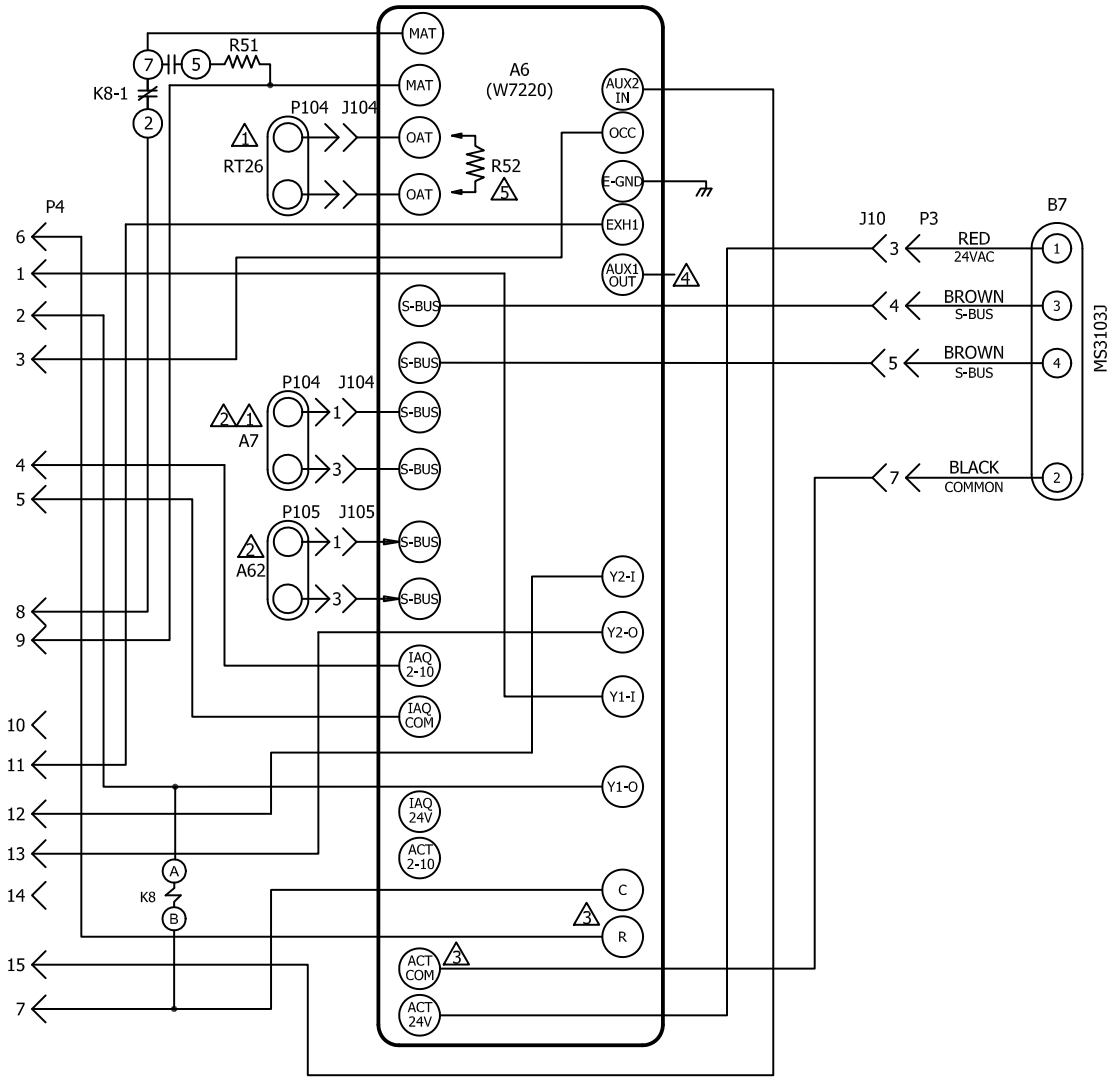
1- Economizer control module A6 is energized through P4-6.

OPERATION:

2- Temperature sensor S175 or enthalpy sensor A7 and A62 (if differential enthalpy is used) communicates to the economizer control module A6 when outdoor air is suitable for free cooling.

3. A6 energizes the economizer.
4. Economizer control module A6 supplies B7 with 0 - 10 VDC to control the positioning of economizer.
5. The damper actuator provides 2 to 10 VDC position feedback.

KCB ECONOMIZER



KEY	COMPONENT
A6	CONTROL - ECONOMIZER
A7	SENSOR - OUTDOOR ENTHALPY
A62	SENSOR - INDOOR ENTHALPY
B7	MOTOR - DAMPER, ECONOMIZER
J10	JACK - ECONOMIZER MOTOR
J104	JACK - SENSOR OUTDOOR
J105	JACK - SENSOR RETURN AIR
K8	TRANSFER RELAY
P3	PLUG - ECONOMIZER MOTOR
P4	PLUG - ECONOMIZER
P104	PLUG - SENSOR OUTDOOR
P105	PLUG - SENSOR RETURN AIR
RT26	SENSOR - OUTDOOR AIR TEMP
R51	RESISTOR, MAT BYPASS
R52	RESISTOR, OAT BYPASS

DESIGNATES OPTIONAL WIRING

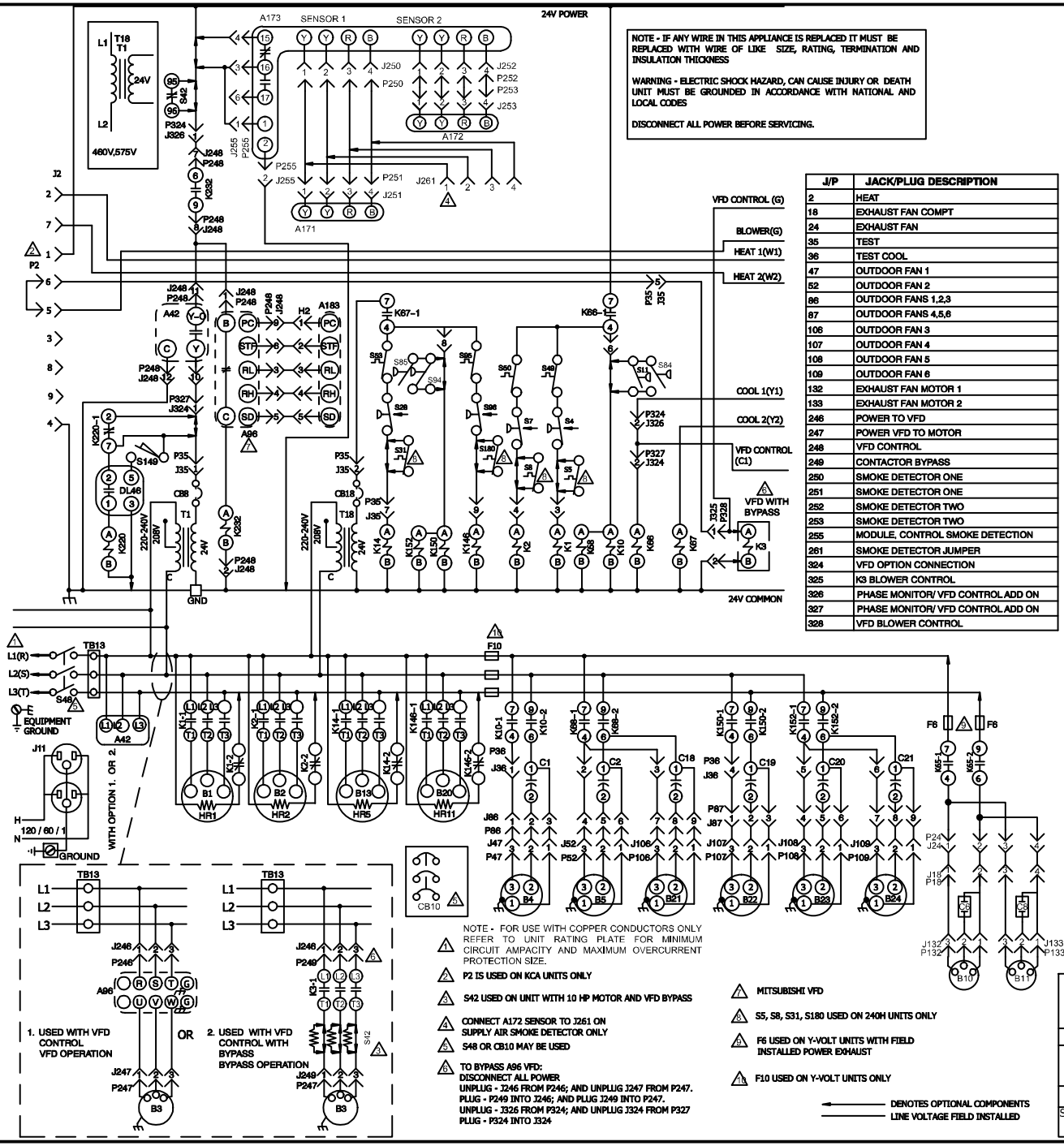
CLASS II FIELD WIRING

1. OUTDOOR AIR TEMP SENSOR RT26 OR OUTDOOR AIR ENTHALPY SENSOR A7 MAY BE USED
2. FOR DIFFERENTIAL ENTHALPY SENSING USE OUTDOOR ENTHALPY SENSOR A7 AND INDOOR ENTHALPY SENSOR A62
3. REFER ALSO TO MAIN UNIT WIRING DIAGRAM SECTION C
4. PROGRAMMABLE, USE FOR EXHAUST FAN 2 OUTPUT OR ERV OR SYSTEM ALARM OUTPUT
5. R52 USED WITH NOVAR 2024 OR 2051 DDC CONTROLS.

10/13	WIRING DIAGRAM 537636-01	10/13
ACCESSORIES		
JADE CONTROL ECONOMIZER (B & C-BOX)		
SECTION B		REV 0
Supersedes	New Form No. 537636-01	

OPERATION:

When the outdoor air is suitable and a thermostat demand calls for 1st. stage cooling (Y1), the economizer will modulate the dampers between the minimum and fully open positions to maintain a 55°F (12.8°C) mixed air temperature. When there is an increased thermostat demand for second stage cooling (Y2), the economizer damper opens 100% and the economizer controller (A6) will bring on the compressor. At that point, K8 relay will switch from the R1 mixed air sensor to R51 resistor allowing the economizer damper to stay open 100%. The damper will stay open 100% with the compressor running simultaneously until Y2 demand is met.



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.

J/P	JACK/PLUG DESCRIPTION
2	HEAT
18	EXHAUST FAN COMPT
24	EXHAUST FAN
35	TEST
36	TEST COOL
47	OUTDOOR FAN 1
52	OUTDOOR FAN 2
86	OUTDOOR FANS 1,2,3
87	OUTDOOR FANS 4,5,6
106	OUTDOOR FAN 3
107	OUTDOOR FAN 4
108	OUTDOOR FAN 5
109	OUTDOOR FAN 6
132	EXHAUST FAN MOTOR 1
133	EXHAUST FAN MOTOR 2
246	POWER TO VFD
247	POWER VFD TO MOTOR
248	VFD CONTROL
249	CONTACTOR BYPASS
250	SMOKE DETECTOR ONE
251	SMOKE DETECTOR ONE
252	SMOKE DETECTOR TWO
253	SMOKE DETECTOR TWO
255	MODULE, CONTROL SMOKE DETECTION
261	SMOKE DETECTOR JUMPER
324	VFD OPTION CONNECTION
325	K3 BLOWER CONTROL
326	PHASE MONITOR/ VFD CONTROL ADD ON
327	PHASE MONITOR/ VFD CONTROL ADD ON
328	VFD BLOWER CONTROL

KEY	COMPONENT
A42	MONITOR, PHASE PROTECTION
A96	CONTROL INVERTER
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
A183	CONTROL, VFD BOARD
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
B10	MOTOR, EXHAUST FAN 1
B11	MOTOR, EXHAUST FAN 2
B13	COMPRESSOR 3
B21	MOTOR, OUTDOOR FAN 3
B22	MOTOR, OUTDOOR FAN 4
B23	MOTOR, OUTDOOR FAN 5
B24	MOTOR, OUTDOOR FAN 6
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
C6	CAPACITOR, EXHAUST FAN 1
C8	CAPACITOR, EXHAUST FAN 2
C18	CAPACITOR, OUTDOOR FAN 3
C19	CAPACITOR, OUTDOOR FAN 4
C20	CAPACITOR, OUTDOOR FAN 5
C21	CAPACITOR, OUTDOOR FAN 6
CB8	CIRCUIT, BREAKER T1
CB10	CIRCUIT, BREAKER MAIN DISCONNECT
CB18	CIRCUIT, BREAKER T18
DL46	DELAY, OVERFLOW SWITCH
F6	FUSE, EXHAUST FAN
H2	HEADER 2, LVC1
HR1	HEATER, COMPRESSOR 1
HR2	HEATER, COMPRESSOR 2
HR5	HEATER, COMPRESSOR 3
J11	JACK, GFI, RECEPTICLE
K1,-1,2	CONTACTOR, COMPRESSOR 1
K2,-1,2	CONTACTOR, COMPRESSOR 2
K3,-1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K14,-1,2	CONTACTOR, COMPRESSOR 3
K65-1,2	RELAY, EXHAUST FAN 1
K66,-1	RELAY, STAGE COOL 1
K67,-1	RELAY, STAGE COOL 2
K68,-1,2	RELAY, OUTDOOR FAN 2&3
K150,-1,2	RELAY, OUTDOOR FAN 4
K152,-1,2	RELAY, OUTDOOR FAN 5&6
K220, -1	RELAY, OVERFLOW SWITCH
K232	RELAY, INVERTER PROTECTION
S4	SWITCH, LIMIT HI PRESS COMP 1(MANUAL RESET)
S7	SWITCH, LIMIT HI PRESS COMP 2 (MANUAL RESET)
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 1
S28	SWITCH, LIMIT HI PRESS COMP 3 (MANUAL RESET)
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S48	SWITCH, DISCONNECT
S49	SWITCH, FREEZESTAT COMP 1
S50	SWITCH, FREEZESTAT COMP 2
S53	SWITCH, FREEZESTAT COMP 3
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S85	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 3
S149	SWITCH, OVERFLOW
T1	TRANSFORMER, CONTROL
T18	TRANSFORMER, CONTACTOR CONTROL
TB13	TERMINAL STRIP, POWER DISTRIBUTION

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

P2 IS USED ON KCA UNITS ONLY

S42 USED ON UNIT WITH 10 HP MOTOR AND VFD BYPASS

CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY

S48 OR CB10 MAY BE USED

TO BYPASS A96 VFD:
DISCONNECT ALL POWER
UNPLUG - J246 FROM P246; AND UNPLUG J247 FROM P247.
PLUG - P249 INTO J246; AND PLUG J249 INTO P247.
UNPLUG - J326 FROM P324; AND UNPLUG J324 FROM P327
PLUG - P324 INTO J324

MITSUBISHI VFD

S5, S8, S31, S180 USED ON 240H UNITS ONLY

F6 USED ON Y-VOLT UNITS WITH FIELD INSTALLED POWER EXHAUST

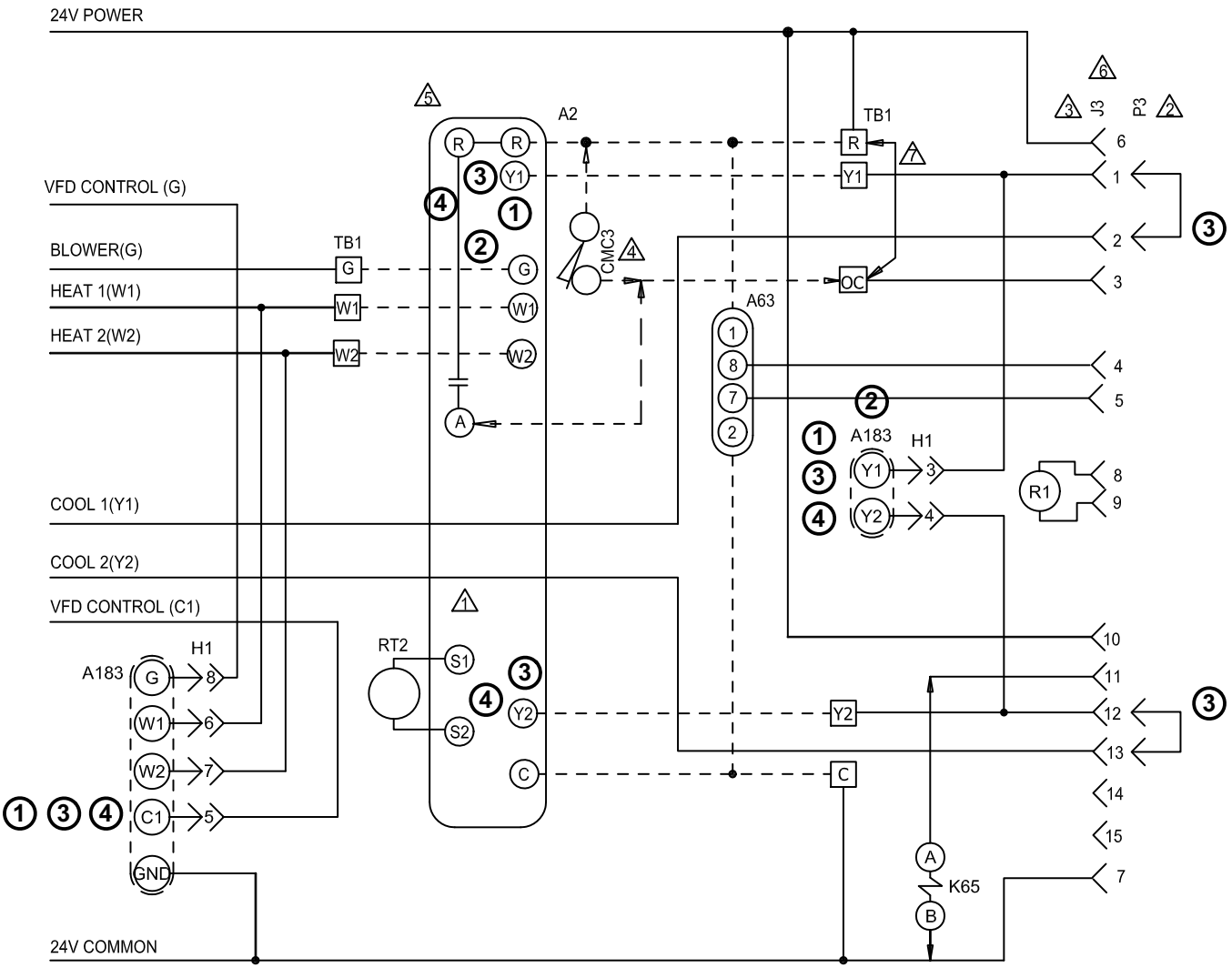
F10 USED ON Y-VOLT UNITS ONLY

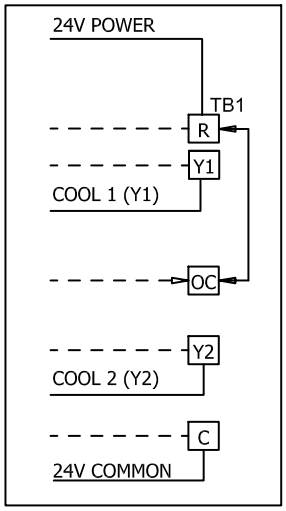
DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

TYPICAL MSAV UNIT DIAGRAM

WIRING DIAGRAM	07/17
COOLING	
KC/KG - 240H, 300S - G,J,Y - VFD	
SECTION B	REV 0
Supersedes	New Form No. 537608-04

ELECTROMECHANICAL OR ELECTRONIC THERMOSTAT WITH VFD





CONNECTION SCHEME FOR KCA, KGA, AND KHA 092 THROUGH 150 UNITS WITHOUT ECONOMIZER ONLY

KEY	COMPONENT
A2	SENSOR, ELECTRONIC
A63	SENSOR, CO2
A183	CONTROL, VFD BOARD
CMC3	CLOCK, TIME
H1	HEADER 1 ON VFD BOARD
J3	JACK, UNIT ECONOMIZER
K65	RELAY, EXHAUST FAN
P3	PLUG, LESS ECONOMIZER
R1	SENSOR, MIXED / SUPPY AIR
RT2	SENSOR, REMOTE THERMOSTAT
TB1	TERMINAL STRIP, CLASS II VOLTAGE

1. THERMOSTAT SUPPLIED BY USER
2. REMOVE P3 WHEN ECONOMIZER IS USED; ONLY ON KCA, KGA AND KHA 156 THRU 300 UNITS
3. J3 MAXIMUM LOAD 20VA 24VAC CLASS II
4. TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED
5. TOUCHSCREEN THERMOSTAT
6. J3 AND P3 ARE NOT USED ON KCA,KGA, AND KHA 092 THRU 150 UNITS WITHOUT ECONOMIZER
7. REMOVE JUMPER BETWEEN TB1-R AND TB1-OC WHEN USING A NITE SETBACK THERMOSTAT

DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

01/13	WIRING DIAGRAM 537615-01	01/13
CONTROL - VFD		
ELECTRONIC/ELECTROMECHANICAL THERMOSTAT		
SECTION C		REV. 0
Supersedes	New Form No. 537615-01	

VFD BLOWER OPERATION

Cooling and heating operate the same as non-VFD units except for blower operation.

During ventilation, the blower speed is determined by the low/high switch on the A183 VFD control board.

During heating, the blower operates on high speed.

See table 16 for blower speed during cooling.

TABLE 16

Diagram Reference No.	Outdoor Air Condition For Free Cooling	Thermostat Demand	A183 Terminals Energized	Blower Speed
1	Not Suitable (or no economizer)	Y1	Y1 and C1*	Low
2	Suitable	Y1	Y1	High
3	Not Suitable (or no economizer)	Y1 and Y2	Y1, C1* and Y2	High
4	Suitable	Y1 and Y2	Y1, C1* and Y2	High

*C1 is energized via A6 enthalpy control.

Y1 thermostat demand, outdoor air NOT suitable for free cooling (or no economizer):

1- 24v is routed to A183 VFD control board Y1 and C1 (via A6-2) terminals. A183 operates the blower in low speed.

Y1 thermostat demand, outdoor air SUITABLE for free cooling:

2- 24v is routed to A183 VFD control board Y1 terminal. A183 operates the blower in high speed.

Y1 and Y2 thermostat demand, outdoor air NOT suitable for free cooling (or no economizer)

3- 24v is routed to A183 VFD control board Y1, Y2 and C1 (via A6-2) terminals. A183 operates the blower in high speed.

Y1 and Y2 thermostat demand, outdoor air SUITABLE for free cooling:

4- 24v is routed to A183 VFD control board Y1, Y2 and C1 (via A6-3) terminals. A183 operates the blower in high speed.