KGA156 through 300

KGA156H, 180, 210, 240 and 300 units are available in 260,000 and 360,000 Btuh (76.2 and 105.5kW) heating inputs. In addition, KGA180, 210, 240 and 300 units are available in 480,000 Btuh (140.6kW) heating input. Gas heat sections are designed with aluminized steel tube heat exchangers.

KGA units are available in standard and high cooling efficiencies, except for the KGA156 which is available only in high cooling efficiency. Cooling capacities range from 13 to 25 tons (45 to 88kW). The KGA180S uses two compressors; the KGA156H, 180H, 210H, 210S, 240S and 300S use three compressors; and the KGA240H and 300H use four compressors.

Optional Multi-Stage Air Volume units 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 Multi-Stage Air Volume 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.

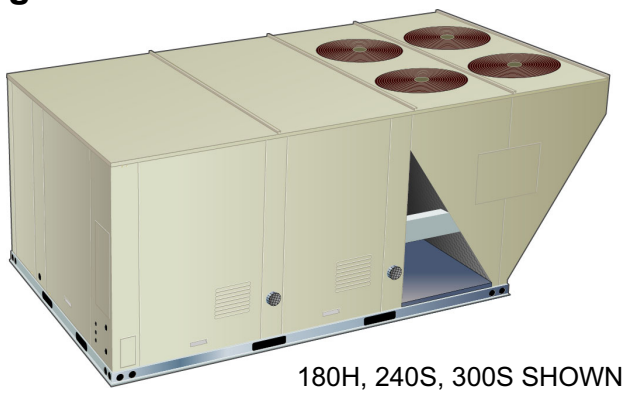
If the unit must be lifted for service, rig unit by attaching four cables to the holes located in the unit base rail (two holes at each corner). Refer to the installation instructions for the proper rigging technique.

⚠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, service agency, or the gas supplier

⚠CAUTION

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



180H, 240S, 300S SHOWN

⚠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.

Table of Contents

OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS

Item Description		Model Number	Catalog Number	180S	210S	240S	300S
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	O	O	O	O
Low Ambient Control		K1LOAM52C11	**10T62**	X			
		K1LOAM53C11	**10T63**		X		
		K1LOAM53C21	**10T64**			X	X
Refrigerant Type			R-410A	O	O	O	O
HEATING SYSTEM							
Bottom Gas Piping Kit		C1GPKT01C-1	**85M31**	X	X	X	X
Combustion Air Intake Extensions (order two)		LTACAIK10/15	**89L97**	X	X	X	X
Gas Heat Input		Standard - 260,000 Btuh	Factory	O	O	O	O
		Medium - 360,000 Btuh	Factory	O	O	O	O
		High - 480,000 Btuh	Factory	O	O	O	O
Low Temperature Vestibule Heater		208/230V-3ph - C1LTVH10C-1Y	**58W28**	X	X	X	X
		460V - C1LTVH10C-1G	**58W29**	X	X	X	X
		575V - C1LTVH10C-1J	**58W30**	X	X	X	X
LPG/Propane Conversion Kits (Order 2 kits)		Standard heat - LTALPGK-130	**72M94**	X	X	X	X
		Medium heat - LTALPGK-180	**72M95**	X	X	X	X
		High heat - LTALPGK-240	**72M96**	X	X	X	X
Stainless Steel Heat Exchanger			Factory	O	O	O	O
Vertical Vent Extension Kit (Order two kits)		C1EXTN20FF1	**42W16**	X	X	X	X
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) - 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) - 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)	3, 5 hp (208/230V)	KVFDB11C-1	**90W52**	X	X	X	X
	3, 5, 7.5, 10 hp (460V and 575V)						
	7.5 hp, 10 hp (208/230V)	KVFDB10C-1	**90W51**	X	X	X	X
Drive Kits		Kit #1 535-725 rpm	Factory	O	O		
		Kit #2 710-965 rpm	Factory	O	O		
See Blower Data Tables for usage and selection		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							
Coil Guards		E1GARD22C11	**98W76**	X	X		
		E1GARD21C11	**93W17**			X	X
Hail Guards		E1GARD12C11	**98W77**	X	X		
		E1GARD11C11	**93W16**			X	X
Hinged Access Panels			Factory	O	O	O	O

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	180S	210S	240S	300S
CONTROLS							
Commercial Controls	L Connection® Building Automation System		- - -	X	X	X	X
BACnet®		KOCTRL31B-1	**96W15**	OX	OX	OX	OX
BACnet® Thermostat with Display		KOSNSR01FF1	**97W23**	X	X	X	X
BACnet® Thermostat without Display		KOSNSR00FF1	**97W24**	X	X	X	X
Novar® 2051		KOCTRL30B-1	**96W12**	OX	OX	OX	OX
Plenum Cable (75 ft.)		KOMISC00FF1	**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
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
INDOOR AIR QUALITY							
Air Filters							
Healthy Climate® High Efficiency Air Filters 24 x 24 x 2 (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							
[2] Healthy Climate® UVC Light Kit (110/230V-1ph)		C1UVCL10C-1	**54W65**	X	X	X	X
ECONOMIZER							
Economizer							
Economizer - Downflow or Horizontal (Outdoor Air Hood furnished)		K1ECON20C-2	**54W77**	OX	OX	OX	OX
Economizer Controls							
Differential Enthalpy		Order 2 - C1SNSR64FF1	**53W64**	X	X	X	X
Single Enthalpy		C1SNSR64FF1	**53W64**	OX	OX	OX	OX
Downflow Barometric Relief Dampers							
Barometric Relief Dampers with Exhaust Hood		C1DAMP50C	**54W78**	OX	OX	OX	OX
Horizontal Barometric Relief Dampers							
Barometric Relief Dampers with Exhaust Hood		LAGEDH18/24	**16K99**	X	X	X	X

[1] Factory installed on all MSAV equipped units.

[2] 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)

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OPTIONS / ACCESSORIES - STANDARD EFFICIENCY MODELS

Item Description	Model Number	Catalog Number	180S	210S	240S	300S
OUTDOOR AIR						
Outdoor Air Dampers						
Motorized Dampers with Outdoor Air Hood	K1DAMP20C-1	**58W62**	OX	OX	OX	OX
Manual Dampers With Outdoor Air Hood	C1DAMP10C-1	**54W76**	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
ROOF CURBS - DOWNFLOW						
Clip Curb						
8 in. height	C1CURB40CD1	**26W32**	X	X	X	X
14 in. height	LARMF18/30S-14	**33K44**	X	X	X	X
18 in. height	LARMF18/30S-18	**33K45**	X	X	X	X
24 in. height	LARMF18/30S-24	**33K46**	X	X	X	X
Standard						
14 in. height	LARMF18/36-14	**16K87**	X	X	X	X
24 in. height	LARMF18/36-24	**16K88**	X	X	X	X
Adjustable Pitched Curb						
14 in. height	L1CURB55C	**43W26**	X	X	X	X
ROOF CURBS - HORIZONTAL (REQUIRES HORIZONTAL RETURN AIR PANEL KIT)						
Standard						
26 in. height - slab applications	LARMFH18/24-26	**97J33**	X	X	X	
37 in. height - rooftop applications	LARMFH18/24-37	**38K53**	X	X	X	
30 in. height - slab applications	LARMFH30/36-30	**33K79**				X
41 in. height - rooftop applications	LARMFH30/36-41	**38K54**				X
Insulation Kit For Standard Horizontal Curbs						
for LARMFH18/24-26	C1INSU11C-1-	**73K32**	X	X	X	
for LARMFH18/24-37	C1INSU13C-1-	**73K34**	X	X	X	
for LARMFH30/36-30	C1INSU12C-1-	**73K33**				X
for LARMFH30/36-41	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	RTD11-185	**29G06**	X			
	RTD11-275-R	**29G07**		X	X	X
Flush - Order one	FD11-185	**29G10**	X			
	FD11-275-R	**29G11**		X	X	X
Transitions (Supply and Return) - Order one	LASRT18	**19K01**	X			
	LASRT21/24	**19K02**		X	X	X

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OPTIONS / ACCESSORIES - HIGH EFFICIENCY MODELS

Item Description	Model Number	Catalog Number	156H	180H	210H	240H	300H
COOLING SYSTEM							
Condensate Drain Trap	PVC - C1TRAP20AD2	**76W26**	X	X	X	X	X
	Copper - C1TRAP10AD2	**76W27**	X	X	X	X	X
Corrosion Protection		Factory	O	O	O	O	O
Drain Pan Overflow Switch	C1SNSR71FF1-	**10C24**	X	X	X	X	X
Efficiency		High	O	O	O	O	O
Low Ambient Control	K1LOAM53C11	**10T63**	X				
	K1LOAM53C21	**10T64**		X	X		
	K1LOAM54C21	**10T65**				X	X
Refrigerant Type		R-410A	O	O	O	O	O
HEATING SYSTEM							
Bottom Gas Piping Kit	C1GPKT01C-1	**85M31**	X	X	X	X	X
Combustion Air Intake Extensions (order two)	LTACAIK10/15	**89L97**	X	X	X	X	X
Gas Heat Input	Standard - 260,000 Btuh	Factory	O	O	O	O	O
	Medium - 360,000 Btuh	Factory	O	O	O	O	O
	High - 480,000 Btuh	Factory		O	O	O	O
Low Temperature Vestibule Heater	208/230V-3ph - C1LTVH10C-1Y	**58W28**	X	X	X	X	X
	460V - C1LTVH10C-1G	**58W29**	X	X	X	X	X
	575V - C1LTVH10C-1J	**58W30**	X	X	X	X	X
LPG/Propane Conversion Kits (Order 2 kits)	Standard heat - LTALPGK-130	**72M94**	X	X	X	X	X
	Medium heat - LTALPGK-180	**72M95**	X	X	X	X	X
	High heat - LTALPGK-240	**72M96**		X	X	X	X
Stainless Steel Heat Exchanger		Factory	O	O	O	O	O
Vertical Vent Extension Kit (Order two kits)	C1EXTN20FF1	**42W16**	X	X	X	X	X
BLOWER - SUPPLY AIR							
Blower Option	CAV (Constant Air Volume)	Factory	O	O	O	O	O
	MSAV (Multi-Stage Air Volume)	Factory	O	O	O	O	O
Motors - Constant Air Volume (CAV)	Belt Drive (standard efficiency) - 2 hp	Factory	O				
	Belt Drive (standard efficiency) - 3 hp	Factory	O	O	O		
	Belt Drive (standard efficiency) - 5 hp	Factory	O	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 (high efficiency) - 2 hp	Factory	O				
	Belt Drive (standard efficiency) - 3 hp	Factory	O	O	O		
	Belt Drive (standard efficiency) - 5 hp	Factory	O	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	X
	7.5 hp, 10 hp (208/230V) KVFDB10C-1	**90W51**		X	X	X	X
Drive Kits See Blower Data Tables for usage and selection	Kit #1 535-725 rpm	Factory	O	O	O		
	Kit #2 710-965 rpm	Factory	O	O	O		
	Kit #3 685-856 rpm	Factory	O	O	O	O	O
	Kit #4 850-1045 rpm	Factory	O	O	O	O	O
	Kit #5 945-1185 rpm	Factory	O	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							
Coil Guards	E1GARD22C11	**98W76**	X				
	E1GARD21C11	**93W17**		X	X	X	X
Hail Guards	E1GARD12C11	**98W77**	X				
	E1GARD11C11	**93W16**		X	X	X	X
Hinged Access Panels		Factory	O	O	O	O	O

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OPTIONS / ACCESSORIES - HIGH EFFICIENCY MODELS

Item Description		Model Number	Catalog Number	156H	180H	210H	240H	300H
CONTROLS								
Commercial Controls	L Connection® Building Automation System		- - -	X	X	X	X	X
BACnet®		KOCTRL31B-1	**96W15**	OX	OX	OX	OX	OX
BACnet® Thermostat with Display		KOSNSR01FF1	**97W23**	X	X	X	X	X
BACnet® Thermostat without Display		KOSNSR00FF1	**97W24**	X	X	X	X	X
Novar® 2051		KOCTRL30B-1	**96W12**	OX	OX	OX	OX	OX
Plenum Cable (75 ft.)		KOMISC00FF1	**97W25**	X	X	X	X	X
Smoke Detector - Supply or Return (Power board and one sensor)		C1SNSR44C-1	**83W40**	X	X	X	X	X
Smoke Detector - Supply and Return (Power board and two sensors)		C1SNSR43C-1	**83W41**	X	X	X	X	X
ELECTRICAL								
Voltage 60 hz	208/230V - 3 phase		Factory	O	O	O	O	O
	460V - 3 phase		Factory	O	O	O	O	O
	575V - 3 phase		Factory	O	O	O	O	O
Disconnect Switch (see Electric Heat Tables for usage)	80 amp - C1DISC080C-1		**54W85**	OX	OX	OX	OX	OX
	150 amp - C1DISC150C-1		**54W86**	OX	OX	OX	OX	OX
	250 amp - C1DISC250C-1		**54W87**	OX	OX	OX	OX	OX
GFI Service Outlets	15 amp non-powered, field-wired (208/230V, 460V only) LTAGFIK10/15		**74M70**	X	OX	OX	OX	OX
	20 amp non-powered, field-wired (575V only) C1GFCI20FF1		**67E01**	X	X	X	X	X
Weatherproof Cover for GFI		C1GFCI99FF1	**10C89**	X	X	X	X	X
[1] Phase Monitor		C1PHZM01FF1-	**10C25**	X	X	X	X	X
INDOOR AIR QUALITY								
Air Filters								
Healthy Climate® High Efficiency Air Filters 24 x 24 x 2 (Order 6 per unit)	MERV 8 - C1FLTR15C-1-		**54W67**	X	X	X	X	X
	MERV 13 - C1FLTR40C-1-		**52W40**	X	X	X	X	X
Replacement Media Filter With Metal Mesh Frame (includes non-pleated filter media)		C1FLTR30C-1-	**44N61**	X	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	X
Sensor - Wall-mount, off-white plastic cover, no display		C0SNSR52AE1L	**87N53**	X	X	X	X	X
Sensor - Black plastic case with LCD display, rated for plenum mounting		C0SNSR51AE1L	**87N52**	X	X	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting		C0MISC19AE1	**87N54**	X	X	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications		C0MISC19AE1-	**85L43**	X	X	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO_2 sensors (**87N53** or **77N39**)		C0MISC16AE1-	**90N43**	X	X	X	X	X
UVC Germicidal Light Kit								
[2] Healthy Climate® UVC Light Kit (110/230V-1ph)		C1UVCL10C-1	**54W65**	X	X	X	X	X
ECONOMIZER								
Economizer - Downflow or Horizontal (Outdoor Air Hood furnished)		K1ECON20C-2	**54W77**	OX	OX	OX	OX	OX
Economizer Controls								
Differential Enthalpy		Order 2 - C1SNSR64FF1	**53W64**	X	X	X	X	X
Single Enthalpy		C1SNSR64FF1	**53W64**	OX	OX	OX	OX	OX
Downflow Barometric Relief Dampers								
Barometric Relief Dampers with Exhaust Hood		C1DAMP50C	**54W78**	OX	OX	OX	OX	OX
Horizontal Barometric Relief Dampers								
Barometric Relief Dampers with Exhaust Hood		LAGEDH18/24	**16K99**	X	X	X	X	X
OUTDOOR AIR								
Outdoor Air Dampers								
Motorized Dampers with Outdoor Air Hood		K1DAMP20C-1	**58W62**	OX	OX	OX	OX	OX
Manual Dampers With Outdoor Air Hood		C1DAMP10C-1	**54W76**	OX	OX	OX	OX	OX
POWER EXHAUST (downflow applications only)								
Standard Static	208/230V - C1PWRE11C-1Y		**75W90**	X	X	X	X	X
	460V - C1PWRE11C-1G		**75W91**	X	X	X	X	X
	575V - C1PWRE11C-1J		**75W92**	X	X	X	X	X

[1] Factory installed on all MSAV equipped units

[2] 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)

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OPTIONS / ACCESSORIES - HIGH EFFICIENCY MODELS

Item Description	Model Number	Catalog Number	156H	180H	210H	240H	300H
ROOF CURBS - DOWNFLOW							
Clip Curb							
8 in. height	C1CURB40CD1	**26W32**	X	X	X	X	X
14 in. height	LARMF18/30S-14	**33K44**	X	X	X	X	X
18 in. height	LARMF18/30S-18	**33K45**	X	X	X	X	X
24 in. height	LARMF18/30S-24	**33K46**	X	X	X	X	X
Standard							
14 in. height	LARMF18/36-14	**16K87**	X	X	X	X	X
24 in. height	LARMF18/36-24	**16K88**	X	X	X	X	X
Adjustable Pitched Curb							
14 in. height	L1CURB55C	**43W26**	X	X	X	X	X
ROOF CURBS - HORIZONTAL (REQUIRES HORIZONTAL RETURN AIR PANEL KIT)							
Standard							
26 in. height - slab applications	LARMFH18/24-26	**97J33**	X	X	X	X	
37 in. height - rooftop applications	LARMFH18/24-37	**38K53**	X	X	X	X	
30 in. height - slab applications	LARMFH30/36-30	**33K79**					X
41 in. height - rooftop applications	LARMFH30/36-41	**38K54**					X
Insulation Kit For Standard Horizontal Curbs							
for LARMFH18/24-26	C1INSU11C-1-	**73K32**	X	X	X	X	
for LARMFH18/24-37	C1INSU13C-1-	**73K34**	X	X	X	X	
for LARMFH30/36-30	C1INSU12C-1-	**73K33**					X
for LARMFH30/36-41	C1INSU14C-1-	**73K35**					X
Horizontal Return Air Panel Kit							
Required for Horizontal Applications with Roof Curb	C1HRAP10C-1-	**87M00**	X	X	X	X	X
CEILING DIFFUSERS							
Step-Down - Order one	RTD11-185	**29G06**	X	X			
	RTD11-275-R	**29G07**			X	X	X
Flush - Order one	FD11-185	**29G10**	X	X			
	FD11-275-R	**29G11**			X	X	X
Transitions (Supply and Return) - Order one	LASRT18	**19K01**	X	X			
	LASRT21/24	**19K02**			X	X	X

NOTE - Catalog and model numbers shown are for ordering field installed accessories.
OX - Configure To Order (Factory Installed) or Field Installed
O = Configure To Order (Factory Installed)
X = Field Installed

SPECIFICATIONS - STANDARD EFFICIENCY MODELS

General Data						
	Nominal Tonnage		**15 Ton**	**15 Ton**	**17.5 Ton**	**17.5 Ton**
	Model Number		**KGA180S4B**	**KGA180S4M**	**KGA210S4B**	**KGA210S4M**
	Efficiency Type		**Standard**	**Standard**	**Standard**	**Standard**
	Blower Type		Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		182,000	182,000	204,000	204,000
	[1] Net Cooling Capacity - Btuh		176,000	176,000	198,000	198,000
	AHRI Rated Air Flow - cfm		5750	5750	6125	6125
	Total Unit Power - kW		16.3	16.3	18.4	18.4
	[1] EER (Btuh/Watt)		10.8	10.8	10.8	10.8
	[2] IEER (Btuh/Watt)		11.0	12.6	12.0	13.1
	Refrigerant Type		R-410A	R-410A	R-410A	R-410A
	Refrigerant Charge Furnished	Circuit 1	7 lbs. 8 oz.	7 lbs. 8 oz.	5 lbs. 12 oz.	5 lbs. 12 oz.
		Circuit 2	7 lbs. 8 oz.	7 lbs. 8 oz.	5 lbs. 8 oz.	5 lbs. 8 oz.
		Circuit 3	- - -	- - -	5 lbs. 8 oz.	5 lbs. 8 oz.
Gas Heat Available			See page 13			
Compressor Type (number)			Scroll (2)	Scroll (2)	Scroll (3)	Scroll (3)
Outdoor Coils	Net face area (total) - sq. ft.		41.4	41.4	41.4	41.4
	Number of rows		1	1	1	1
	Fins per inch		23	23	23	23
Outdoor Coil Fans	Motor - (No.) horsepower		(3) 1/3	(3) 1/3	(3) 1/3	(3) 1/3
	Motor rpm		1075	1075	1075	1075
	Total Motor watts		1100	1100	1100	1100
	Diameter - (No.) in.		(3) 24	(3) 24	(3) 24	(3) 24
	Number of blades		3	3	3	3
	Total Air volume - cfm		12,000	12,000	12,000	12,000
Indoor Coils	Net face area (total) - sq. ft.		18.6	18.6	21.4	21.4
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		3	3	3	3
	Fins per inch		14	14	14	14
	Drain connection - No. and size		(1) 1 in. FPT	(1) 1 in. FPT	(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, 8.63 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	(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 MODELS

General Data		Nominal Tonnage	20 Ton	20 Ton	25 Ton	25 Ton
		Model Number	**KGA240S4B**	**KGA240S4M**	**KGA300S4B**	**KGA300S4M**
		Efficiency Type	**Standard**	**Standard**	**Standard**	**Standard**
		Blower Type	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		238,000	238,000	282,000	282,000
	[1] Net Cooling Capacity - Btuh		228,000	228,000	270,000	270,000
	AHRI Rated Air Flow - cfm		7700	7700	8750	8750
	Total Unit Power - kW		21.1	21.1	27.0	27.0
	[1] EER (Btuh/Watt)		10.8	10.8	10.0	10.0
	[2] IEER (Btuh/Watt)		11.0	13.0	10.0	12.0
	Refrigerant Type		R-410A	R-410A	R-410A	R-410A
	Refrigerant Charge Furnished	Circuit 1	7 lbs. 4 oz.	7 lbs. 4 oz.	7 lbs. 4 oz.	7 lbs. 4 oz.
		Circuit 2	7 lbs. 4 oz.	7 lbs. 4 oz.	7 lbs. 4 oz.	7 lbs. 4 oz.
		Circuit 3	6 lbs. 14 oz.	6 lbs. 14 oz.	6 lbs. 14 oz.	6 lbs. 14 oz.
Gas Heat Available			See page 13			
Compressor Type (number)			Scroll (3)	Scroll (3)	Scroll (3)	Scroll (3)
Outdoor Coils	Net face area (total) - sq. ft.		55.2	55.2	55.2	55.2
	Number of rows		1	1	1	1
	Fins per inch		23	23	23	23
Outdoor Coil Fans	Motor - (No.) horsepower		(4) 1/3	(4) 1/3	(4) 1/3	(4) 1/3
	Motor rpm		1075	1075	1075	1075
	Total Motor watts		1500	1500	1500	1500
	Diameter - (No.) in.		(4) 24	(4) 24	(4) 24	(4) 24
	Number of blades		3	3	3	3
	Total Air volume - cfm		16,000	16,000	16,000	16,000
Indoor Coils	Net face area (total) - sq. ft.		21.4	21.4	21.4	21.4
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		4	4	4	4
	Fins per inch		14	14	14	14
	Drain connection - No. and size		(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT
	Expansion device type		Refrigerant Metering Orifice (RFC)			
[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 K**it 11** 1135-1365 rpm			
	Blower wheel nominal diameter x width - in.		(2) 15 x 15	(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.

SPECIFICATIONS - HIGH EFFICIENCY

General Data		Nominal Tonnage	13 Ton	13 Ton	15 Ton	15 Ton
		Model Number	KGA156H4B	KGA156H4M	KGA180H4B	KGA180H4M
		Efficiency Type	High	High	High	High
		Blower Type	CAV (Constant Air Volume)	MSAV® (Multi-Stage Air Volume)	CAV (Constant Air Volume)	MSAV® (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		154,000	154,000	176,000	176,000
	[1] Net Cooling Capacity - Btuh		150,000	150,000	172,000	172,000
	AHRI Rated Air Flow - cfm		5000	5000	5250	5250
	Total Unit Power - kW		12.5	12.5	14.3	14.3
	[1] EER (Btuh/Watt)		12.0	12.0	12.0	12.0
	[2] IEER (Btuh/Watt)		13.2	14.1	13.5	13.7
Refrigerant Charge	Refrigerant Type		R-410A	R-410A	R-410A	R-410A
	Circuit 1		5 lbs. 12 oz.	5 lbs. 12 oz.	6 lbs. 0 oz.	6 lbs. 0 oz.
	Circuit 2		5 lbs. 4 oz.	5 lbs. 4 oz.	5 lbs. 10 oz.	5 lbs. 10 oz.
	Circuit 3		5 lbs. 10 oz.	5 lbs. 10 oz.	5 lbs. 14 oz.	5 lbs. 14 oz.
Gas Heat Available						
Compressor Type (number)			Scroll (3)	Scroll (3)	Scroll (3)	Scroll (3)
Outdoor Coils	Net face area (total) - sq. ft.		41.4	41.4	55.2	55.2
	Number of rows		1	1	1	1
	Fins per inch		23	23	23	23
Outdoor Coil Fans	Motor - (No.) horsepower		(3) 1/3	(3) 1/3	(4) 1/3	(4) 1/3
	Motor rpm		1075	1075	1075	1075
	Total Motor watts		1100	1100	1500	1500
	Diameter - (No.) in.		(3) 24	(3) 24	(4) 24	(4) 24
	Number of blades		3	3	3	3
	Total Air volume - cfm		12,000	12,000	16,000	16,000
Indoor Coils	Net face area (total) - sq. ft.		21.4	21.4	21.4	21.4
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		3	3	3	3
	Fins per inch		14	14	14	14
	Drain connection - No. and size		(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT
	Expansion device type		Balanced port TXV, removable head			
[3] Indoor Blower and Drive Selection	Nominal motor output		2 hp, 3 hp, 5 hp		3 hp, 5 hp, 7.5 hp	
	Maximum usable motor output (US Only)		2.3 hp, 3.45 hp, 5.75 hp		3.45 hp, 5.75 hp, 8.62 hp	
	Motor - Drive kit number		**2 hp** **Kit 1** 535-725 rpm **Kit 2** 710-965 rpm **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		**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	(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 - high EFFICIENCY MODELS

General Data		Nominal Tonnage	17.5 Ton	17.5 Ton	20 Ton	20 Ton
		Model Number	KGA210H4B	KGA210H4M	KGA240H4B	KGA240H4M
		Efficiency Type	High	High	High	High
		Blower Type	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		204,000	204,000	238,000	238,000
	[1] Net Cooling Capacity - Btuh		198,000	198,000	230,000	230,000
	AHRI Rated Air Flow - cfm		6125	6125	6400	6400
	Total Unit Power - kW		16.5	16.5	19.2	19.2
	[1] EER (Btuh/Watt)		12.0	12.0	12.0	12.0
	[2] IEER (Btuh/Watt)		13.0	14.0	13.2	14.5
	Refrigerant Type		R-410A	R-410A	R-410A	R-410A
	Refrigerant Charge Furnished	Circuit 1	6 lbs. 12 oz.	6 lbs. 12 oz.	6 lbs. 4 oz.	6 lbs. 4 oz.
		Circuit 2	6 lbs. 14 oz.	6 lbs. 14 oz.	6 lbs. 2 oz.	6 lbs. 2 oz.
		Circuit 3	6 lbs. 14 oz.	6 lbs. 14 oz.	5 lbs. 14 oz.	5 lbs. 14 oz.
		Circuit 4	- - -	- - -	5 lbs. 6 oz.	5 lbs. 6 oz.
Gas Heat Available			See page 13			
Compressor Type (number)			Scroll (3)	Scroll (3)	Scroll (4)	Scroll (4)
Outdoor Coils	Net face area (total) - sq. ft.		55.2	55.2	55.2	55.2
	Number of rows		1	1	1	1
	Fins per inch		23	23	23	23
Outdoor Coil Fans	Motor - (No.) horsepower		(6) 1/3	(6) 1/3	(6) 1/3	(6) 1/3
	Motor rpm		1075	1075	1075	1075
	Total Motor watts		1950	1950	1950	1950
	Diameter - (No.) in.		(6) 24	(6) 24	(6) 24	(6) 24
	Number of blades		3	3	3	3
	Total Air volume - cfm		20,000	20,000	20,000	20,000
Indoor Coils	Net face area (total) - sq. ft.		21.4	21.4	21.4	21.4
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		4	4	4	4
	Fins per inch		14	14	14	14
	Drain connection - No. and size		(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT	(1) 1 in. FPT
	Expansion device type		Balanced port TXV, removable head			
[3] Indoor Blower and Drive Selection	Nominal motor output		3 hp, 5 hp, 7.5 hp		5 hp, 7.5 hp, 10hp	
	Maximum usable motor output (US Only)		3.45 hp, 5.75 hp, 8.62 hp		5.75 hp, 8.62 hp, 11.5 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		**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	(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 - HIGH EFFICIENCY MODELS

General Data		**Nominal Tonnage**	**25 Ton**	**25 Ton**
		Model Number	**KGA300H4B**	**KGA300H4M**
		Efficiency Type	**High**	**High**
		Blower Type	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		282,000	282,000
	[1] Net Cooling Capacity - Btuh		270,000	270,000
	AHRI Rated Air Flow - cfm		8400	8400
	Total Unit Power - kW		25.7	25.7
	[1] EER (Btuh/Watt)		10.5	10.5
	[2] IEER (Btuh/Watt)		10.9	13.8
	Refrigerant Type		R-410A	R-410A
	Refrigerant Charge Furnished	Circuit 1	6 lbs. 8 oz.	6 lbs. 8 oz.
		Circuit 2	6 lbs. 6 oz.	6 lbs. 6 oz.
		Circuit 3	6 lbs. 6 oz.	6lbs. 6 oz.
		Circuit 4	5 lbs. 14 oz.	5 lbs. 14 oz.
Gas Heat Available			See page 13	
Compressor Type (number)			Scroll (4)	Scroll (4)
Outdoor Coils	Net face area (total) - sq. ft.		55.2	55.2
	Number of rows		1	1
	Fins per inch		23	23
Outdoor Coil Fans	Motor - (No.) horsepower		(6) 1/3	(6) 1/3
	Motor rpm		1075	1075
	Total Motor watts		1950	1950
	Diameter - (No.) in.		(6) 24	(6) 24
	Number of blades		3	3
	Total Air volume - cfm		20,000	20,000
Indoor Coils	Net face area (total) - sq. ft.		21.4	21.4
	Tube diameter - in.		3/8	3/8
	Number of rows		4	4
	Fins per inch		14	14
	Drain connection - No. and size		(1) 1 in. FPT	(1) 1 in. FPT
	Expansion device type		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
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 - GAS HEAT

Usage Data		Model Number	KGA156 KGA180 KGA210 KGA240 KGA300		KGA180 KGA210 KGA240 KGA300
		Heat Input Type	**Standard (S)**	**Medium (M)**	**High (H)**
		Number of Gas Heat Stages	2	2	2
Gas Heating Performance	Input - Btuh	First Stage	169,000	234,000	312,000
		Second Stage	260,000	360,000	480,000
	Output - Btuh	First Stage	- - -	- - -	- - -
		Second Stage	208,000	288,000	384,000
		Temperature Rise Range - °F	15 - 45	30 - 60	40 - 70
		Thermal Efficiency	80.0%	80.0%	80.0%
		Gas Supply Connections	1 in. npt	1 in. npt	1 in. npt
Recommended Gas Supply Pressure - in. w.g.		Natural	7	7	7
		LPG/Propane	11	11	11

HIGH ALTITUDE DERATE

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

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

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

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

Gas Heat Type	Altitude - ft.	Gas Manifold Pressure - in. w.g.		Input Rate Natural Gas or LPG/Propane - Btuh	
		Natural Gas	LPG/Propane Gas	First Stage	Second Stage
Standard	2001 - 4500	3.4	9.6	169,000	249,000
Medium	2001 - 4500	3.4	9.6	234,000	345,000
High	2001 - 4500	3.4	9.6	312,000	460,000

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 15 for wet coil and option/accessory air resistance data.
See page 15 for factory installed drive kit specifications.

MINIMUM AIR VOLUME REQUIRED FOR DIFFERENT GAS HEAT SIZES

Standard (S) and Medium Heat (M) - 4500 cfm minimum
High Heat (H) - 5125 cfm minimum

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 or High	2	2.30	1	535 - 725
Standard or High	2	2.30	2	710 - 965
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			Gas Heat Exchanger			Economizer	Filters		Horizontal Roof Curb	
	180S	156H 180H 210S	210H 240H 240S 300H 300S	Standard Heat	Medium Heat	High Heat		MERV 8	MERV 13	156H 180H 180S 210H 210S 240H 240S	300H 300S
2750	0.01	0.01	0.02	0.02	0.04	0.05	-	0.01	0.03	0.03	-
3000	0.01	0.01	0.02	0.03	0.04	0.05	-	0.01	0.03	0.04	-
3250	0.02	0.01	0.03	0.03	0.05	0.06	-	0.01	0.04	0.04	0.01
3500	0.02	0.01	0.03	0.03	0.05	0.06	-	0.01	0.04	0.05	0.01
3750	0.02	0.01	0.03	0.04	0.06	0.07	-	0.01	0.04	0.05	0.01
4000	0.02	0.02	0.04	0.04	0.06	0.07	-	0.01	0.04	0.06	0.02
4250	0.02	0.02	0.04	0.04	0.06	0.08	-	0.01	0.05	0.07	0.02
4500	0.02	0.02	0.05	0.05	0.07	0.09	-	0.01	0.05	0.07	0.02
4750	0.02	0.02	0.05	0.05	0.08	0.10	-	0.02	0.05	0.08	0.03
5000	0.03	0.02	0.05	0.05	0.09	0.11	-	0.02	0.06	0.08	0.03
5250	0.03	0.02	0.06	0.06	0.10	0.12	-	0.02	0.06	0.09	0.04
5500	0.03	0.02	0.07	0.06	0.10	0.13	-	0.02	0.06	0.10	0.04
5750	0.03	0.03	0.07	0.06	0.11	0.14	-	0.02	0.07	0.11	0.05
6000	0.04	0.03	0.08	0.07	0.12	0.15	-	0.03	0.07	0.11	0.06
6250	0.04	0.03	0.08	0.07	0.12	0.16	0.01	0.03	0.07	0.12	0.07
6500	0.04	0.03	0.09	0.08	0.13	0.17	0.02	0.03	0.08	0.13	0.08
6750	0.05	0.04	0.10	0.08	0.14	0.18	0.03	0.03	0.08	0.14	0.08
7000	0.05	0.04	0.10	0.09	0.15	0.19	0.04	0.04	0.08	0.15	0.09
7250	0.06	0.04	0.11	0.09	0.16	0.20	0.05	0.04	0.09	0.16	0.10
7500	0.06	0.05	0.12	0.10	0.17	0.21	0.06	0.04	0.09	0.17	0.11
8000	0.07	0.05	0.13	0.11	0.19	0.24	0.09	0.05	0.10	0.19	0.13
8500	0.08	0.06	0.15	0.12	0.20	0.26	0.11	0.05	0.10	0.21	0.15
9000	0.09	0.07	0.16	0.13	0.23	0.29	0.14	0.06	0.11	0.24	0.17
9500	0.10	0.08	0.18	0.14	0.25	0.32	0.16	0.07	0.12	0.26	0.19
10000	0.11	0.08	0.20	0.16	0.27	0.35	0.19	0.07	0.12	0.29	0.21
10500	0.12	0.09	0.22	0.17	0.30	0.38	0.22	0.08	0.13	0.31	0.24
11000	0.14	0.11	0.24	0.18	0.31	0.40	0.25	0.09	0.14	0.34	0.27

BLOWER DATA

CEILING DIFFUSER AIR RESISTANCE - in. w.g.

Air Volume cfm	Step-Down Diffuser						Flush Diffuser	
	RTD11-185			RTD11-275			FD11-185	FD11-275
	2 Ends Open	1 Side/2 Ends Open	All Ends & Sides Open	2 Ends Open	1 Side/2 Ends Open	All Ends & Sides Open		
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.	
		RTD11-185 Step-Down	FD11-185 Flush
156 180	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 outletor 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 DATA

15 TON STANDARD EFFICIENCY — KGA180S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	25			12.2			9		
	Locked Rotor Amps	164			100			78		
Compressor 2	Rated Load Amps	25			12.2			9		
	Locked Rotor Amps	164			100			78		
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	90	100	110	45	50	50	35	35	40
	With (2) 0.33 HP Power Exhaust	100	100	110	50	50	50	35	40	40
[3] Minimum Circuit Ampacity	Unit Only	75	81	88	37	39	43	28	30	33
	With (2) 0.33 HP Power Exhaust	79	85	93	39	42	45	30	32	35

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.

17.5 TON STANDARD EFFICIENCY — KGA210S4

[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

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

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

ELECTRICAL DATA

20 TON STANDARD EFFICIENCY — KGA240S4

[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	22.4			10.6			7.7		
	Locked Rotor Amps	149			75			54		
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	110	125	125	50	60	60	40	45	50
	With (2) 0.33 HP Power Exhaust	125	125	150	60	60	70	40	45	50
[3] Minimum Circuit Ampacity	Unit Only	100	108	116	48	51	55	36	39	41
	With (2) 0.33 HP Power Exhaust	104	112	121	50	54	58	38	41	43

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.

25 TON STANDARD EFFICIENCY — KGA300S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	25			12.2			9		
	Locked Rotor Amps	164			100			78		
Compressor 2	Rated Load Amps	25			12.2			9		
	Locked Rotor Amps	164			100			78		
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	150	60	60	70	45	50	50
	With (2) 0.33 HP Power Exhaust	125	125	150	60	70	70	50	50	50
[3] Minimum Circuit Ampacity	Unit Only	108	116	124	53	56	60	40	43	45
	With (2) 0.33 HP Power Exhaust	113	120	128	56	59	62	42	45	47

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.

KGA156H4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	14.5			6.3			6		
	Locked Rotor Amps	98			55			41		
Compressor 2	Rated Load Amps	14.5			6.3			6		
	Locked Rotor Amps	98			55			41		
Compressor 3	Rated Load Amps	14.5			6.3			6		
	Locked Rotor Amps	98			55			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	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	70	70	80	30	35	35	30	30	30
	With (2) 0.33 HP Power Exhaust	80	80	90	35	35	40	30	30	35
[3] Minimum Circuit Ampacity	Unit Only	62	65	72	28	30	33	26	27	29
	With (2) 0.33 HP Power Exhaust	67	70	77	31	32	35	28	29	31

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.

KGA180H4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 2	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 3	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
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	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	70	80	100	35	40	45	25	30	35
	With (2) 0.33 HP Power Exhaust	80	90	100	35	40	50	30	30	40
[3] Minimum Circuit Ampacity	Unit Only	64	71	80	31	34	38	24	27	30
	With (2) 0.33 HP Power Exhaust	68	75	85	34	37	41	26	29	32

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] Factory installed circuit breaker not available.

KGA210H4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	15.6			7.8			5.8		
	Locked Rotor Amps	110			52			38.9		
Compressor 2	Rated Load Amps	15.6			7.8			5.8		
	Locked Rotor Amps	110			52			38.9		
Compressor 3	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
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	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	45	45	50	35	35	40
	With (2) 0.33 HP Power Exhaust	100	110	110	45	50	50	35	40	45
[3] Minimum Circuit Ampacity	Unit Only	81	87	96	39	42	46	30	32	36
	With (2) 0.33 HP Power Exhaust	86	92	101	42	44	48	32	34	38

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.

KGA240H4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 2	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 3	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
Compressor 4	Rated Load Amps	13.2			6.3			4.9		
	Locked Rotor Amps	93			60			41		
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	100	110	125	50	50	60	35	45	50
	With (2) 0.33 HP Power Exhaust	100	125	125	50	60	60	40	45	50
[3] Minimum Circuit Ampacity	Unit Only	89	98	106	43	47	51	34	37	40
	With (2) 0.33 HP Power Exhaust	93	103	111	46	50	54	36	39	42

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] Factory installed circuit breaker not available.

ELECTRICAL — 25 TON

25 TON HIGH EFFICIENCY — KGA300H4

[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		
Compressor 4	Rated Load Amps	19.6			8.2			6.6		
	Locked Rotor Amps	136			66.1			55.3		
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	125	150	60	60	70	45	50	50
	With (2) 0.33 HP Power Exhaust	125	150	150	60	60	70	45	50	50
[3] Minimum Circuit Ampacity	Unit Only	115	124	132	51	55	59	41	44	47
	With (2) 0.33 HP Power Exhaust	120	128	137	53	57	61	43	46	49

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.

KGA PARTS ARRANGEMENT

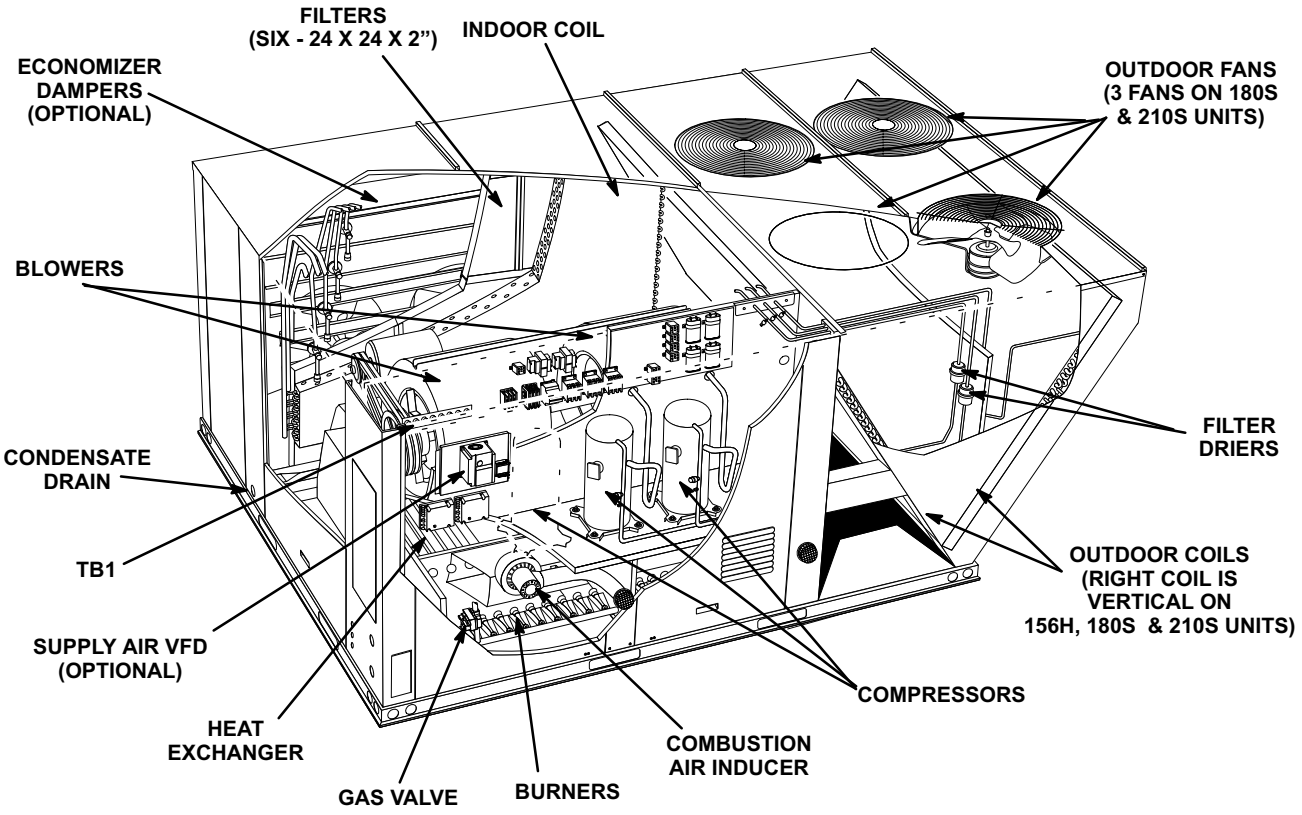


FIGURE 1

KGA CONTROL BOX

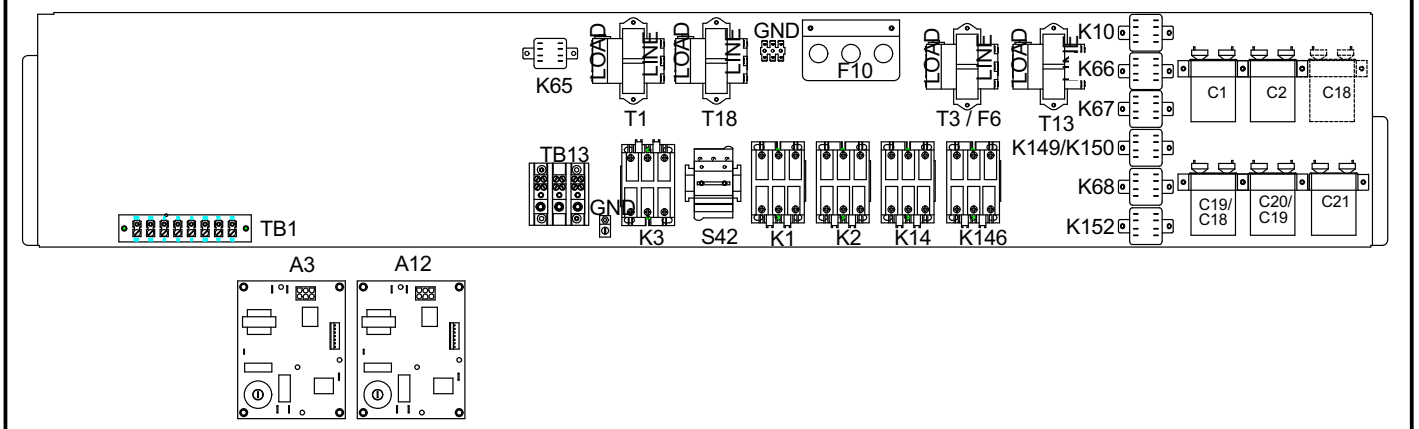


FIGURE 2

I-UNIT COMPONENTS

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

A-Control Box Components

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

1-Disconnect Switch S48 (field 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 TB13

All units are equipped with TB13. Units without S48 will have incoming power connected to TB13.

3-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.

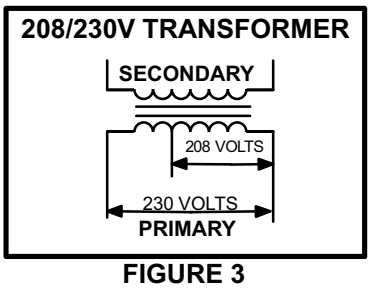


FIGURE 3

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

All KGA 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.

5-Control Transformer T18 (156H, 180H 210, 240, & 300 only)

T18 is a single line voltage to 24VAC transformer used in 210, 240 and 300 units only. 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.

6-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

7-Outdoor Fan Capacitors C1, C2, C18 (all units), C19 (180H, 240, 300 only), C20, C21 (210H, 240H, 300H 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, B22 (180H, 240 & 300 only), B23, B24 (210H, 240H, 300H only) respectively.

8-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.

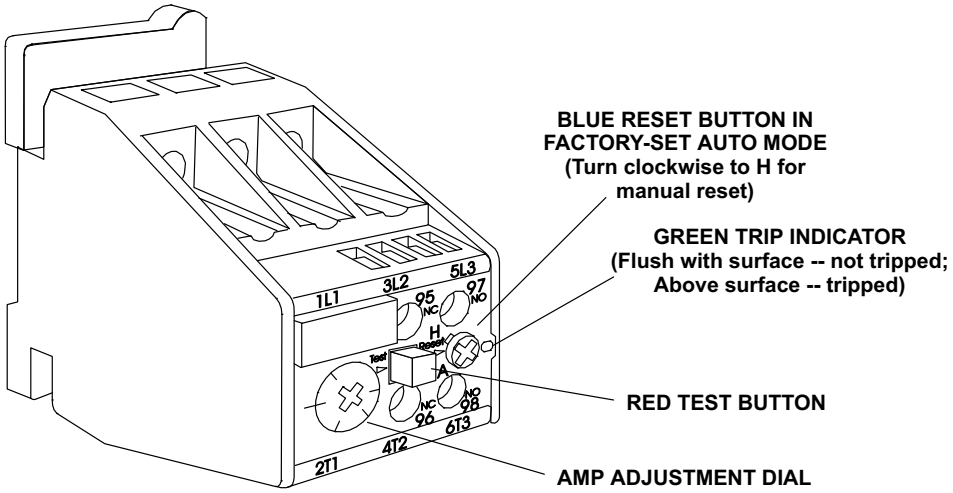
TABLE 2

KGA Unit	Relay	Fan Energized
180S, 156H, 210S	K10	B4
	K68	B5, B21
180H, 240S, 300S	K10	B4, B5
	K149	B21, B22
210H, 240H, 300H	K10	B4
	K68	B5, B21
	K150	B22
	K152	B23, B24

9-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.

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

10-Compressor Contactor K1, K2 (all units), K14 (156H, 180H, 210, 240, & 300 units) K146 (240H & 300H units only)

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

11-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.

12-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.

13-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 T1 transformer (180S units) or T18 (all other units) to energize stage 2 compressor contactor(s).

15-Ignition Control A3 & A12 (figure 5)

⚠WARNING

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

The main control box (see figure 2) houses ignition controls A3 and A12.

The ignition control provides four main functions: gas valve control, blower control, ignition and flame sensing. The control has a green LED to show control status (table 3). The unit will usually ignite on the first attempt and allows three attempts for ignition before locking out. The lockout time is 1 hour. After lockout time expires the

ignition control automatically resets and begins the ignition sequence again. Manual reset after lockout requires removing power from the control for more than 1 second or removing the thermostat call for heat for more than 1 second but no more than 20 seconds. 24 volt thermostat connections (P2) and heating component connections (J1) are made through separate jackplugs. See table 4 for thermostat terminations and table 5 for heating component terminations.

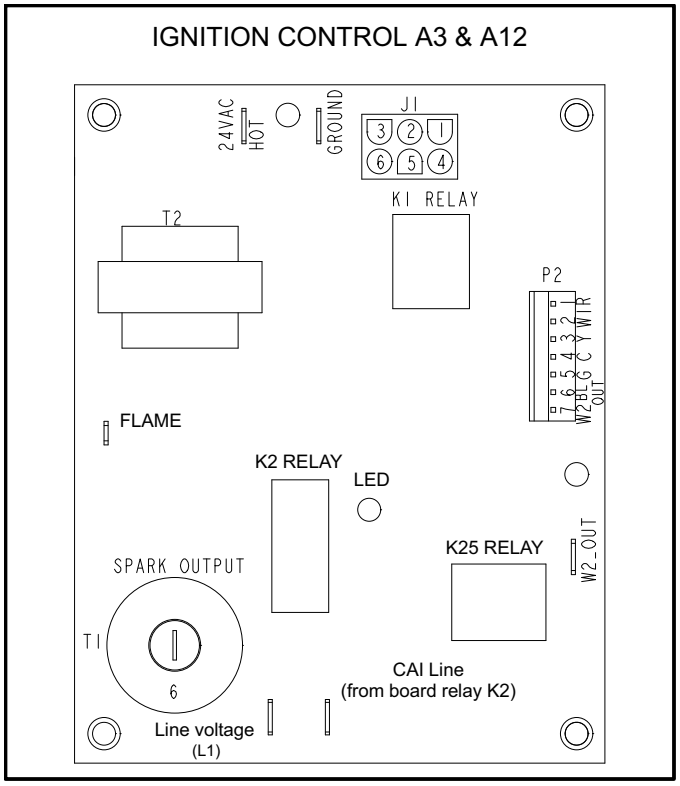


FIGURE 5

TABLE 3
IGNITION CONTROL HEARTBEAT LED STATUS

LED Flashes	Indicates
Slow	Normal operation. No call for heat.
Fast	Normal operation. Call for heat.
Steady Off	Internal control fault OR no power to control OR Gas Valve Relay Fault.
Steady On	Control internal failure.
2	Lockout. Failed to detect or sustain flame.
3	Prove switch open or closed or rollout switch open.
4	Limit switch is open and/or limit has opened three times.
5	Flame sensed but gas valve solenoid not energized.

TABLE 4

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

TABLE 5

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

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

The control shuts off gas flow immediately in the event of a power failure. Upon restoration of gas and power, the control will restart the ignition sequence and continue until flame is established or system lockout (one hour) after which time the control resets and the process begins again.

Operation

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

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

16-Variable Frequency Drive A96 (optional)

MSAV® units are equipped with a VFD which alters 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)

Relay is used in optional MSAV units and is 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 MSAV units. 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 MSAV 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 6, 7, 8, and 9. 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 (all units), B13 (156H, 180H, 210, 240, 300 units) & B20 (240H & 300H only)

All units use scroll compressors. KGA180S units uses two compressors, KGA156H, 180H, 210, 240S and 300S use three compressors and KGA240H and 300H units 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 (all units), S28 (156H, 180H, 210, 240S, 300S), S96 (240H & 300H 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 (all units), S85 (156H, 180H, 210, 240, 300 units) & S96 (240H & 300H)

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

180S 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 (all three fans will be de-energized at the same time). Either S11 or S84 closing will return all three condenser fans to operation.

156H & 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.

180H, 240S and 300S 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 de-energize condenser fans 3 and 4. Either S84 or S85 closing will return condenser fans 3 and 4 to operation.

210H Units -
S11 is wired in series with outdoor fan relay K10 and K68 coils. When S11 opens, condenser fans 1, 2 and 3 are de-energized. When S11 closes, condenser fans 1, 2 and 3 will return to operation. S84 and S85 are wired in series with outdoor fan relay K150 and K152 coils. Both S84 and S85 have to be open to de-energize condenser fans 4, 5 and 6. Either S84 or S85 closing will return condenser fans 3, 4 and 5 to operation.

240H and 300H Units -
S11 is wired in series with outdoor fan relay K10 and K68 coils. When S11 opens, condenser fans 1, 2 and 3 are de-energized. When S11 closes, condenser fans 1, 2 and 3 will return to operation. S84 and S85 are wired in series with outdoor fan relay K150 and K152 coils. Both S84 and S85 have to be open to de-energize condenser fans 4, 5 and 6. Either S84 or S85 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 switches close, energizing the appropriate condenser fans. When liquid pressure drops to 240 ± 10 psig (1655 ± 69 kPa), pressure switches open, de-energizing the appropriate condenser fans. 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)

KGA 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 (all units) S53 (156H, 180H, 210, 240, 300 units only) & S95 (240H, 300H units only)

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 (180H, 210H, 240 & 300 only) B23, B24 (210H, 240H & 300H only)

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.

KGA180S PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL

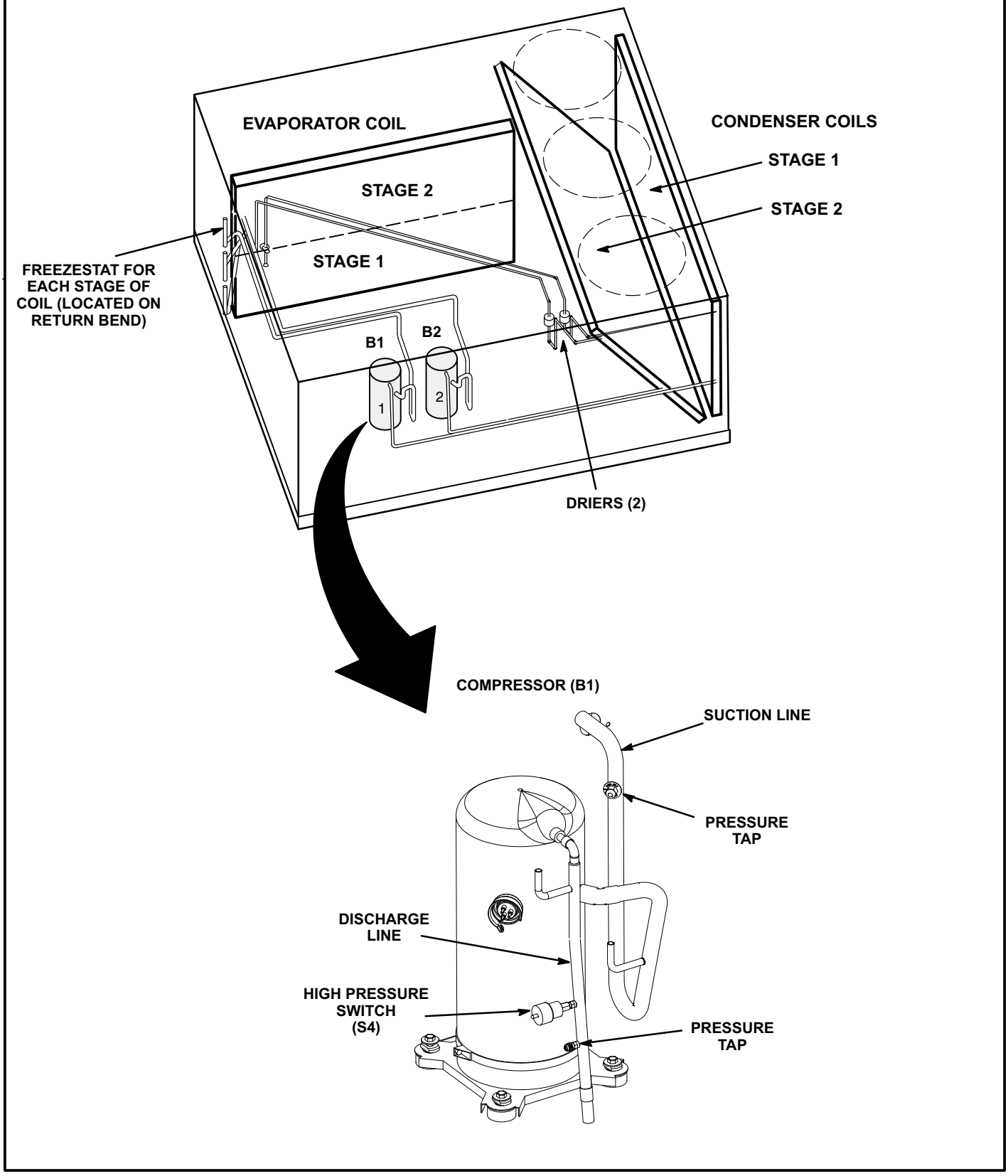


FIGURE 6

KGA156H, 210S PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL

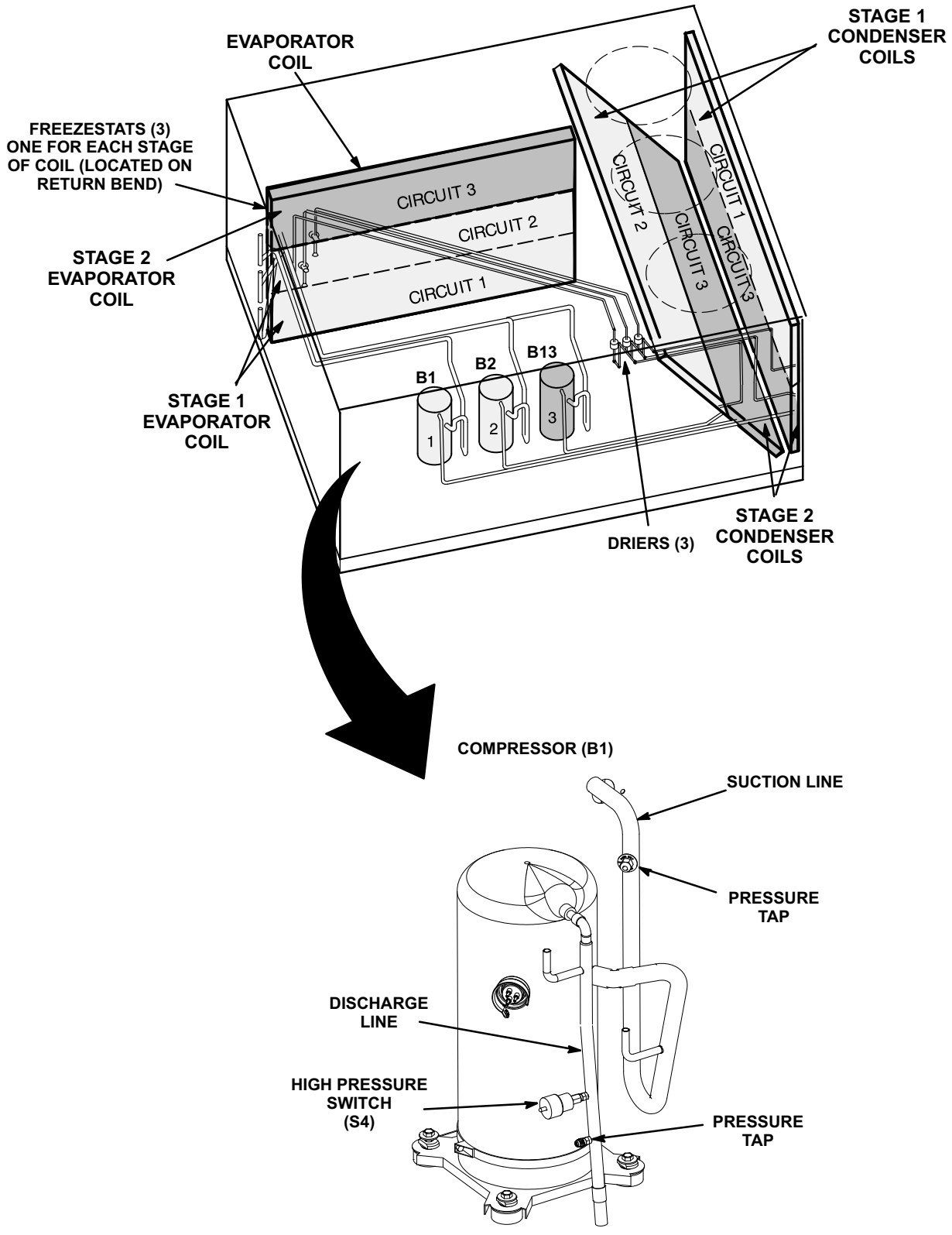


FIGURE 7

KGA180H, 210H, 240S & 300S PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL

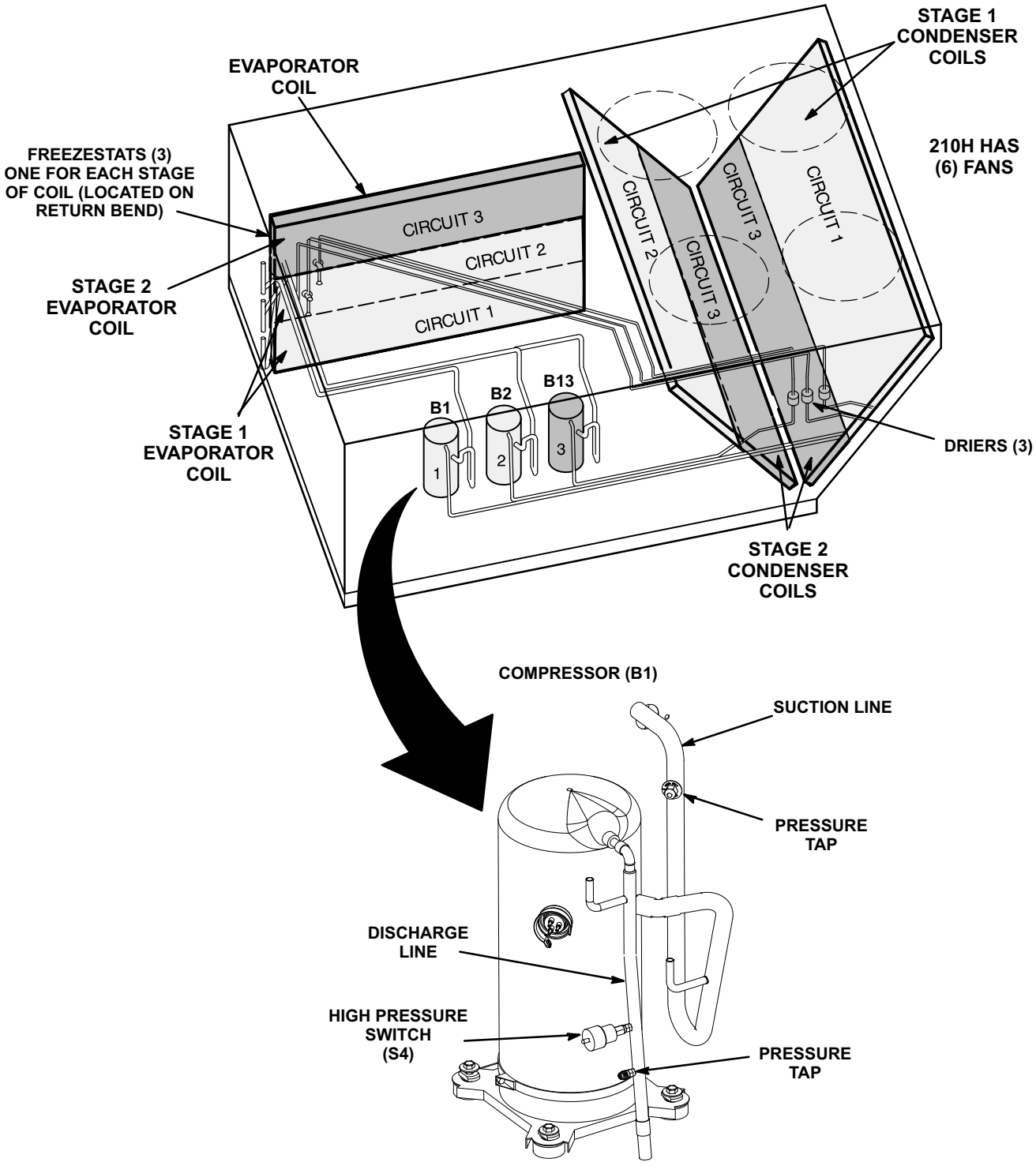
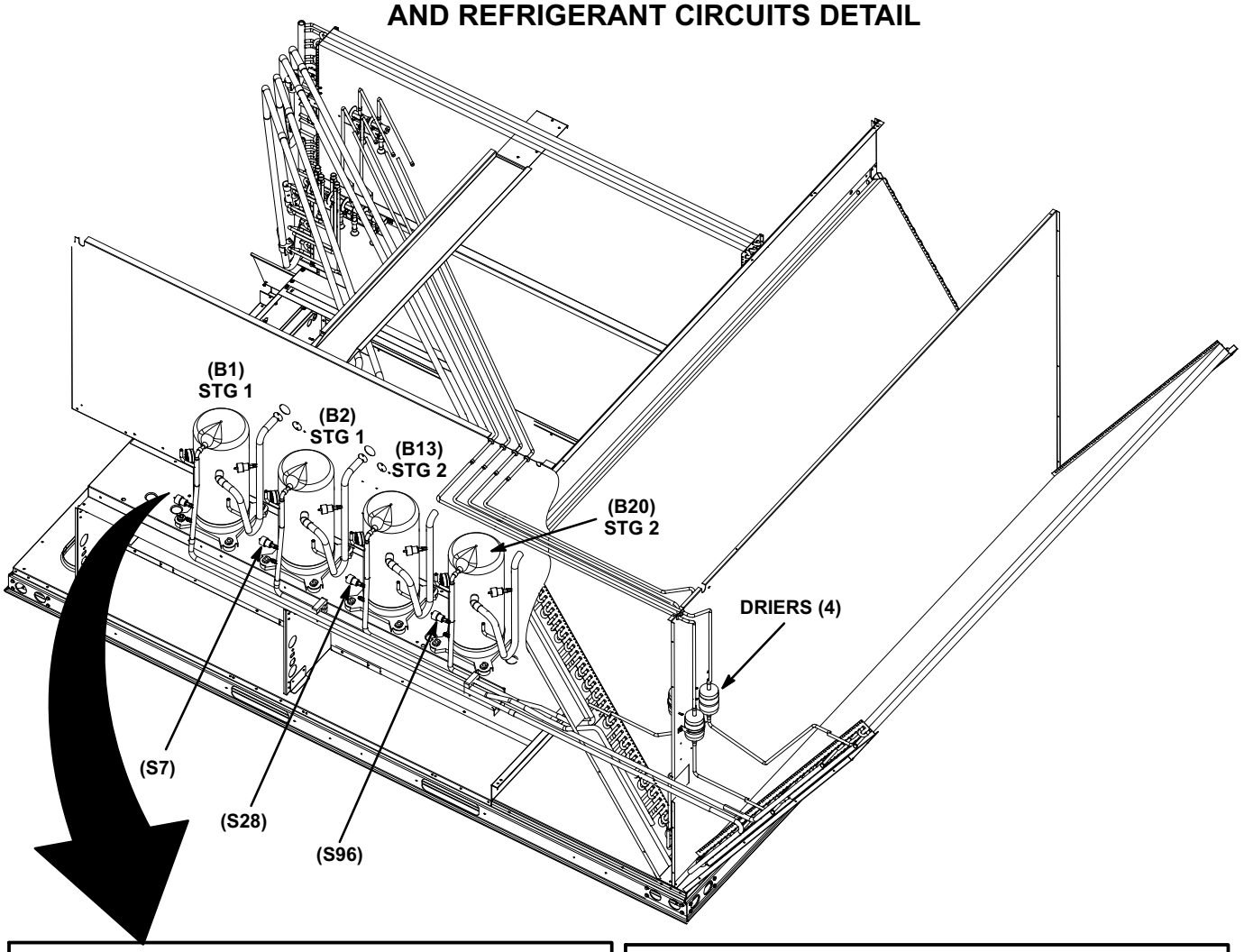
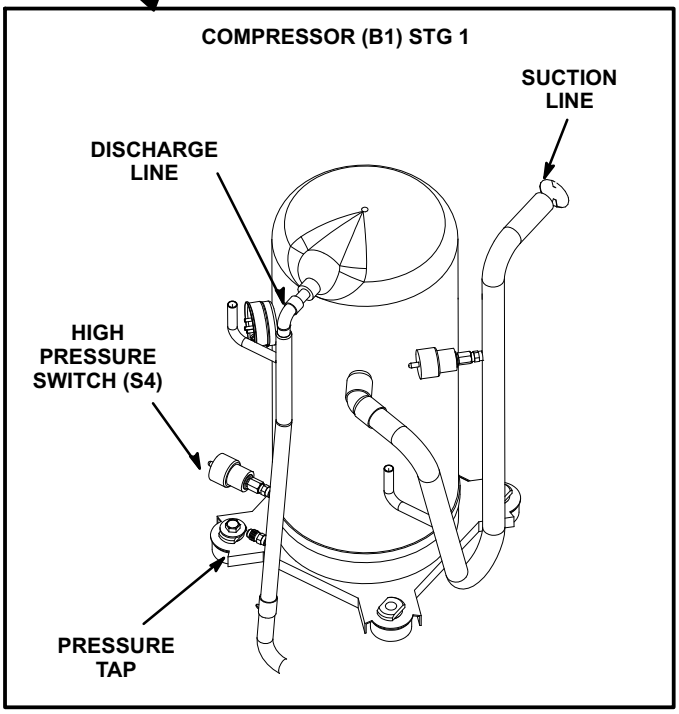


FIGURE 8

KGA240H, 300H PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL





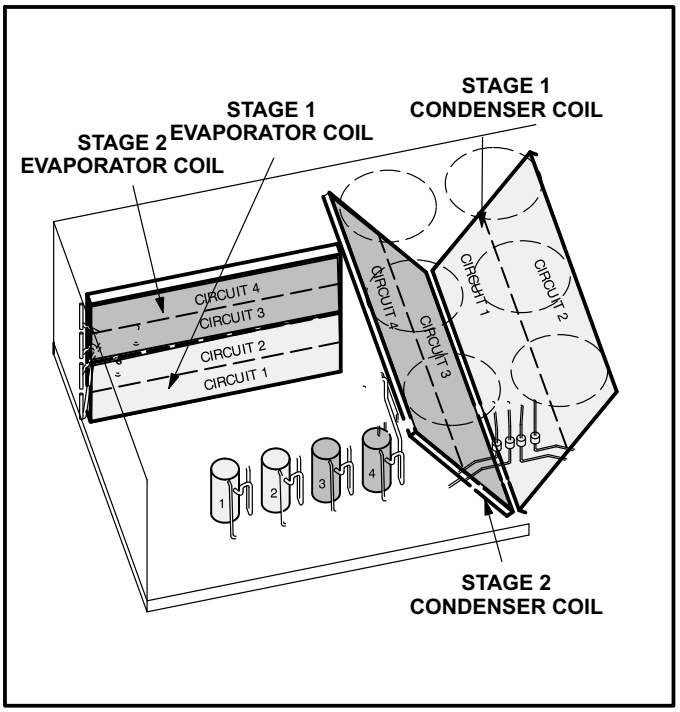


FIGURE 9

C-Blower Compartment

The blower compartment in KGA156H-300 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 10.

1-Blower Wheels

All KGA156H-300 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.

MSAV Units - All MSAV 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.

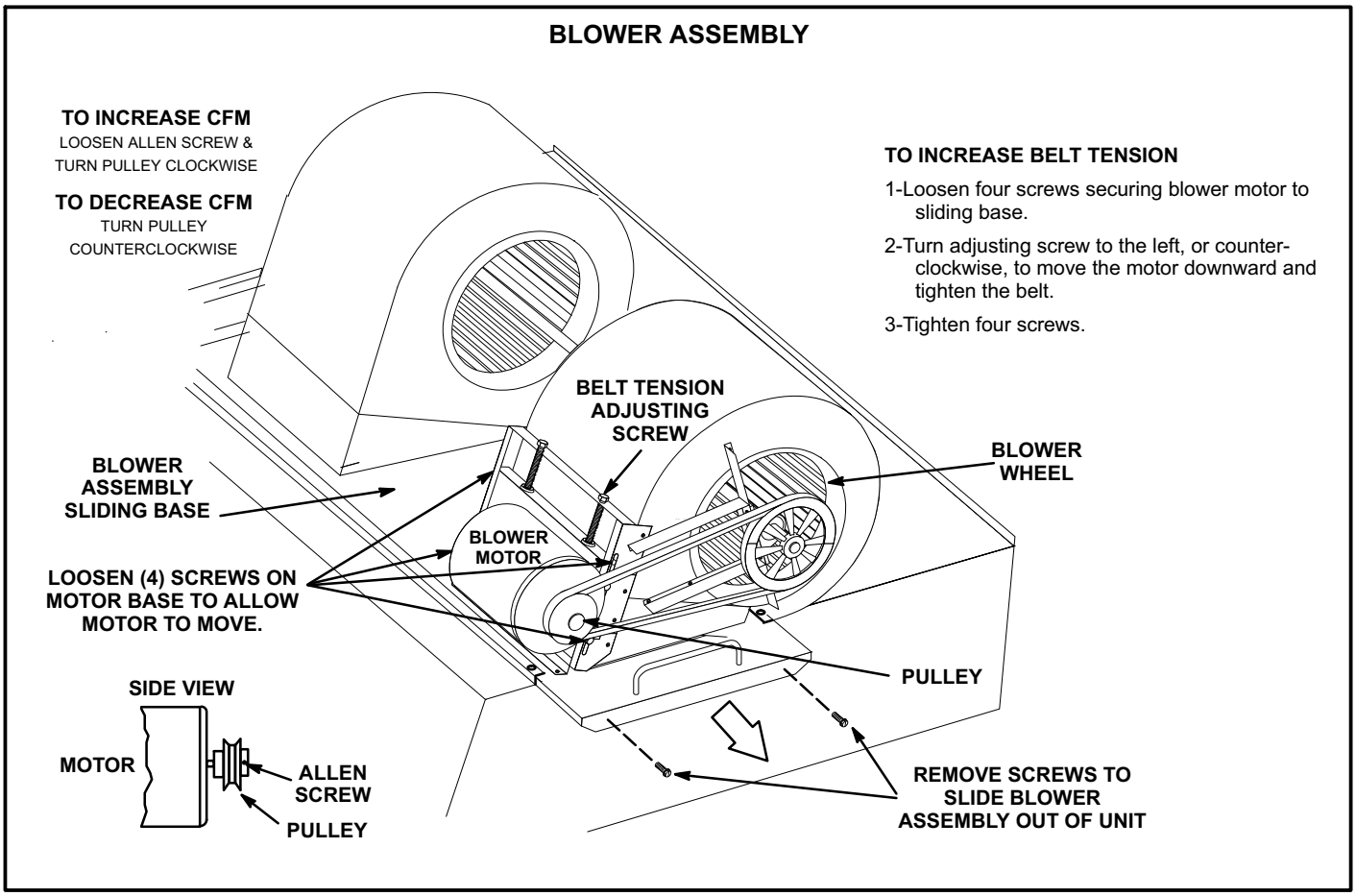


FIGURE 10

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 10.

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 - MSAV *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* MSAV *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 11.

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 10.

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 12.

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

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).

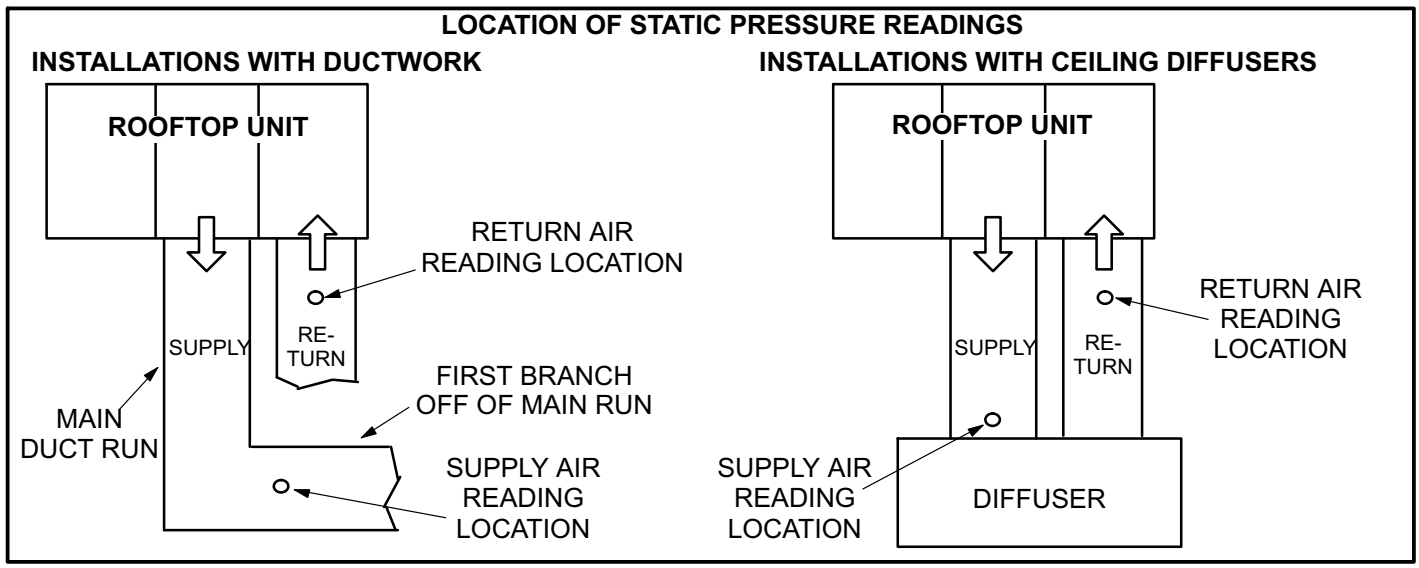


FIGURE 11

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.

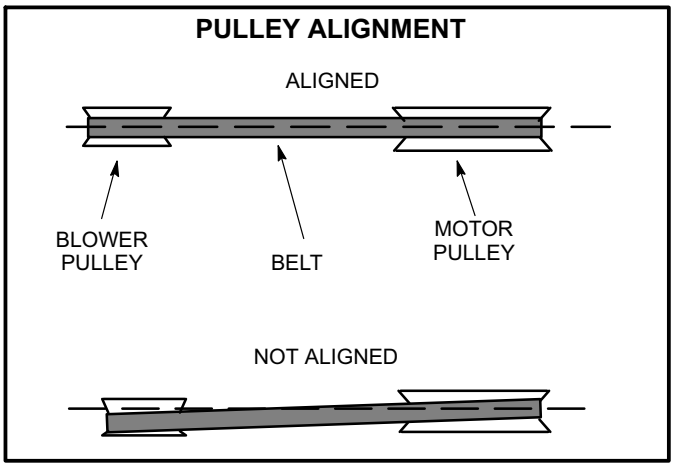


FIGURE 12

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 6 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 13.

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.

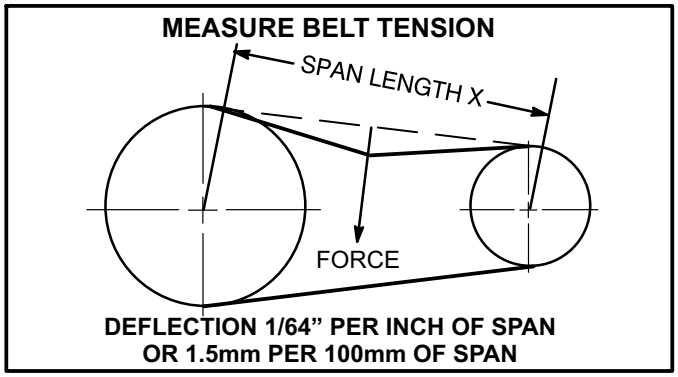


FIGURE 13

TABLE 6
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-GAS HEAT COMPONENTS

See SPECIFICATIONS tables or unit nameplate for Btuh capacities. Units are equipped with two identical gas heat sections (gas heat section one and gas heat section two).

Heat sections consists of heat exchanger and burner box assembly. See figures 14 and 15. Flexible pipe will feed supply gas to both sections. If for service the flexible connection must broken, hand tighten then turn additional 1/4" with a wrench for metal to metal seal (do not overtighten).

NOTE - Do not use thread sealing compound on flex pipe flare connections.

1-Heat Exchanger (Figure 14)

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

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

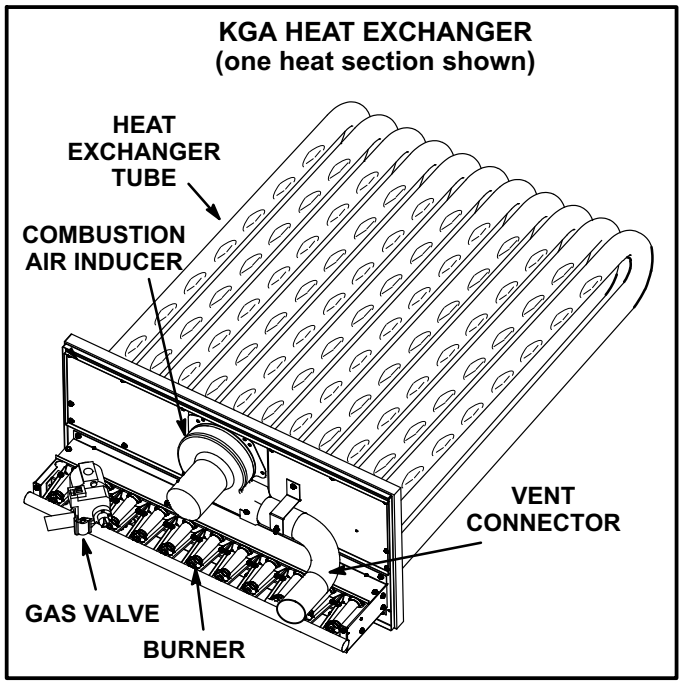


FIGURE 14

2-Burner Box Assembly (Figure 15)

Each heat section is equipped with a burner box assembly. The burner assembly consists of a spark electrode, flame sensing electrode and gas valve. Each assembly is controlled by the heat sections ignition control board (A3 section one and A12 section two)

Burners

All units use inshot burners (see figure 15). Burners are factory set and do not require adjustment. A peep hole with cover is furnished in the heating access panel for flame viewing. Always operate the unit with the access panel in place.

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

Orifice

Each burner uses an orifice which is precisely matched to the burner input. The orifice is threaded into the burner manifold. The burner is supported by the orifice and will easily slide off for service.

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

Each orifice and burner are sized specifically to the unit. Refer to Product Zone @ www.davenet.com for correct sizing information.

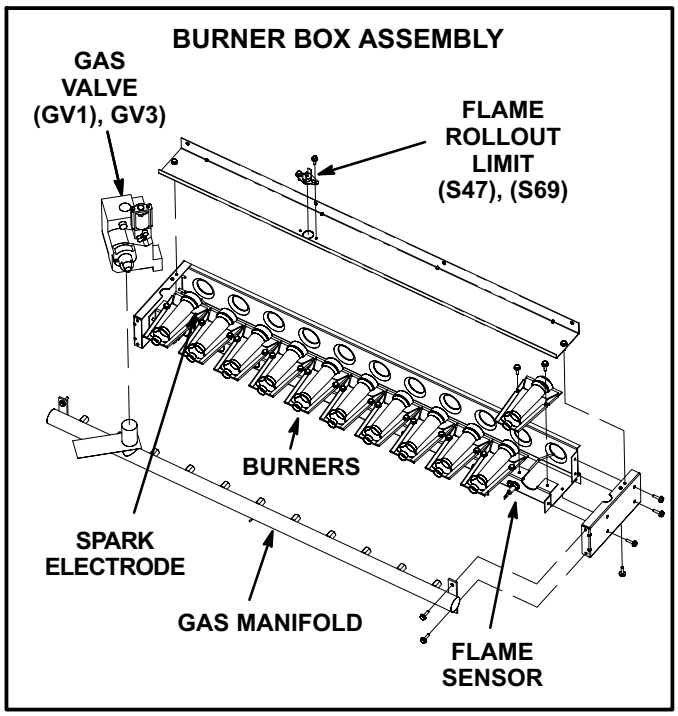


FIGURE 15

3-Flame Rollout Limits S47 & S69

Flame rollout limit S47 (first heat section) and S69 (second heat section), are SPST N.C. high temperature limits located just above the burner air intake opening in the burner enclosures (see figure 15). S47 is wired to the ignition control A3 while S69 is wired to ignition control A12. When S47 or S69 senses flame rollout (indicating a blockage in the combustion air passages), the ignition control immediately closes the gas valve.

Limit S47 and S69 are factory preset to open at 290°F ± 12°F (143°C ± 6.7°C) on a temperature rise in all units. All flame rollout limits are manual reset.

4-Primary High Temperature Limits S10 & S99

S10 is the primary high temperature limit for heat section one, while S99 is the primary high temperature limit for heat section two.

S10 and S99 are located on the drip shield behind the blower housing. In this location S10 and S99 also serve as secondary limits. See figure 16.

Primary limit S10 is wired to the ignition control A3. while primary limit S99 is wired to ignition control A12. Its N.C. contacts open to de-energize the ignition control when excessive temperature is reached in the blower compartment. If either limit trips the blower relay K3 and combustion air inducer will energized. Limit settings are factory set and cannot be adjusted. If limit must be replaced same type and set point must be used.

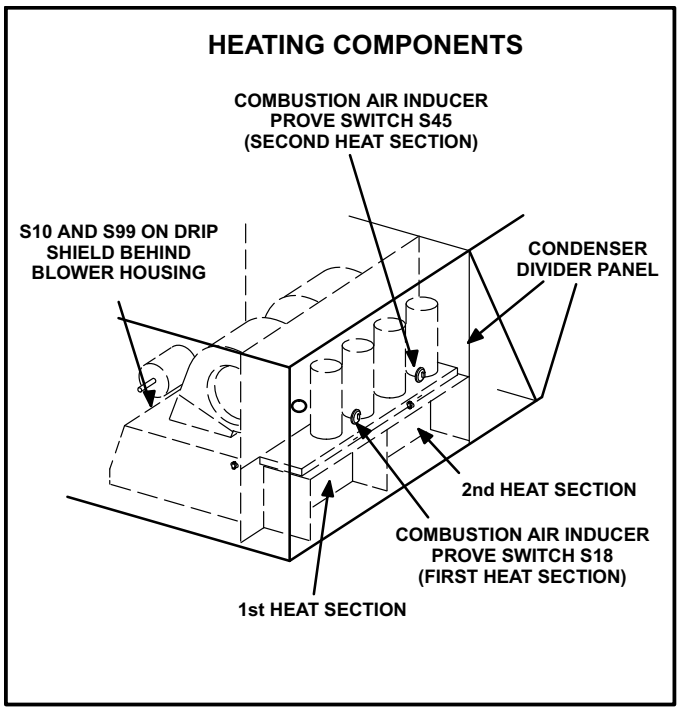


FIGURE 16

5-Combustion Air Prove Switches S18 & S45

S18 (first heat section) and S45 (second heat section) switches are located in the compressor compartment . Both are SPST N.O. switches, are identical and monitor combustion air inducer operation. Switch S18 is wired to ignition control A3 while S45 is wired to ignition control A12.

The switch closes on a *negative* pressure fall. This negative pressure fall and switch actuation allows the ignition sequence to continue (proves, by closing, that the combustion air inducer is operating before allowing the gas valve to open.) The combustion air prove switch is factory set and not adjustable. The switch will automatically open on a pressure rise (less negative pressure). Table 7 shows prove switch settings.

TABLE 7
S18 & S45 Prove Switch Settings

Close“ wc (Pa)	Open “ wc (Pa)
0.25 ± 5 (62.3±12.4)	0.10±5 (24.8±12.4)

6-Combustion Air Inducers B6 & B15

Combustion air inducers B6 (first heat section) and B15 (second heat section), are identical inducers which provide fresh air to the corresponding burners while clearing the combustion chamber of exhaust gases. The inducers begin operating once the safety switch check (closed limits and open CAI prove switches) is complete upon receiving a thermostat demand, and are de-energized immediately following a 5 second post-purge when thermostat demand is satisfied.

Both combustion air inducers use either a 208/230V or 460V single-phase PSC motor and a 4.81in. x 1.25in. (122mm x 32mm) inducer wheel. All motors operate from 3200 RPM to 3450 RPM and are equipped with auto-reset overload protection. Inducers are supplied by various manufacturers. Ratings may vary by manufacturer. Specific inducer electrical ratings can be found on the unit rating plate.

On a heating demand (W1), the ignition controls initiates the heating cycle. The control then allow 30 seconds for the combustion air inducers to vent exhaust gases from the burners. When the combustion air inducers are purging the exhaust gases, the combustion air prove switches close, proving that the combustion air inducers are operating before allowing the ignition sequence to continue. When the combustion air prove switches are closed and the delay is over, the ignition controls activate the first stage operator of the gas valves (low fire), the spark and the flame sensing electrode. Sparking stops immediately after flame is sensed or at the end of the eight second trial for ignition.

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

7-Combustion Air Motor Capacitors C3 & C11

The combustion air inducer motors in all KGA units require run capacitors. Capacitor C3 is connected to combustion air inducer B6 and C11 is connected to combustion air inducer B15. Ratings will be on capacitor side or combustion air motor nameplate.

8-Gas Valves GV1 & GV3

GV1 and GV3 are identical two-stage redundant gas valves. Units are equipped with valves manufactured by Honeywell. See figure 17. On a call for first-stage heat, the valve (Honeywell) is energized by the ignition control simultaneously with the spark electrode. On a call for second stage-heat, the second-stage operator is energized directly from A3 (GV1) and A12 (GV3). A manual shut-off knob is provided on the valve for shut-off.

Manual shut-off knob immediately closes both stages without delay. Figure 17 shows Honeywell gas valve components. Table 8 shows factory gas valve regulation for KGA series units. Both valves are quick opening (on-off in less than 30 seconds) for first-stage heat.

TABLE 8

GAS VALVE REGULATION FOR KGA UNITS

Maximum Inlet Pressure	Operating Pressure (outlet) Factory Setting			
	Natural		L.P	
	Low	High	Low	High
13.0"W.C. 3232Pa	1.6±0.2"W.C. 398±50Pa	3.7±0.3"W.C. 920±75Pa	5.5±0.3"W.C. 1368±75Pa	10.5±0.5"W.C. 2611±7124Pa

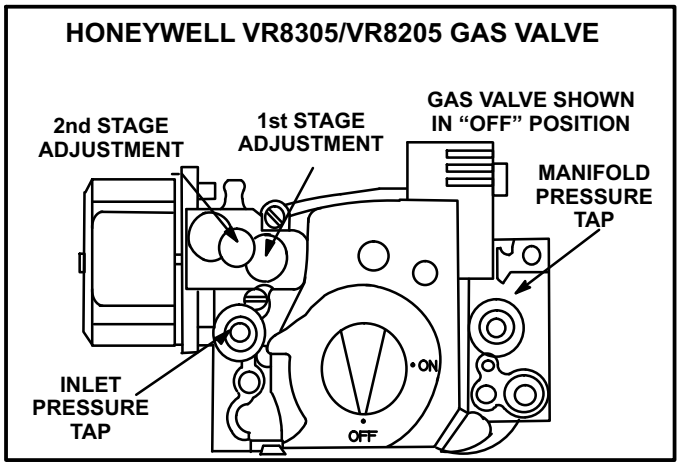


FIGURE 17

9-Spark Electrodes

An electrode assembly is used for ignition spark. Two identical electrodes are used (one for each gas heat section). The electrode is mounted through holes on the left-most end of the burner support. The electrode tip protrudes into the flame envelope of the adjacent burner. The electrode assembly is fastened to burner supports and can be removed for service without removing any part of the burners.

During ignition, spark travels through the spark electrode (figure 18) and ignites the left burner. Flame travels from burner to burner until all are lit.

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

⚠ IMPORTANT

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

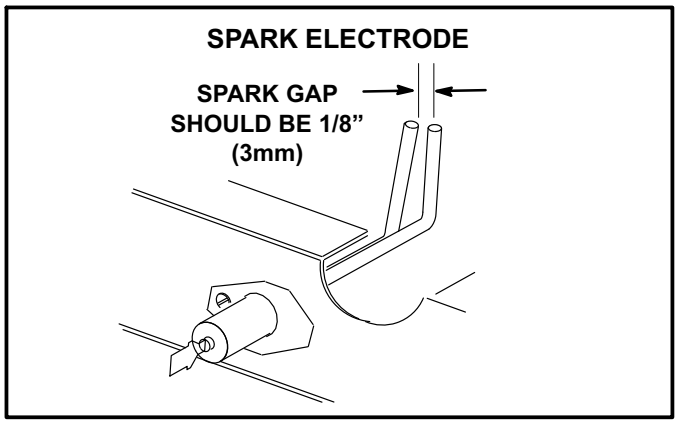


FIGURE 18

10-Flame Sensors (Figure 19)

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

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

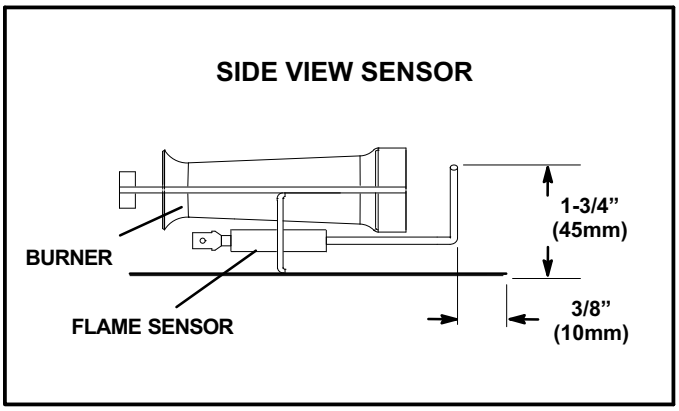


FIGURE 19

II-PLACEMENT AND INSTALLATION

Make sure the unit is installed in accordance with the installation instructions and all applicable codes. See accessories section for conditions requiring use of the optional roof mounting frame (LARMF18/36 or LARMFH18/24).

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-Heating Startup

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠WARNING

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

⚠WARNING

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

⚠WARNING

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

⚠WARNING

SMOKE POTENTIAL

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

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

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

⚠WARNING

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

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

A-Placing Unit In Operation

⚠WARNING

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

Gas Valve Operation Honeywell VR8205Q/VR8305Q (figure 20)

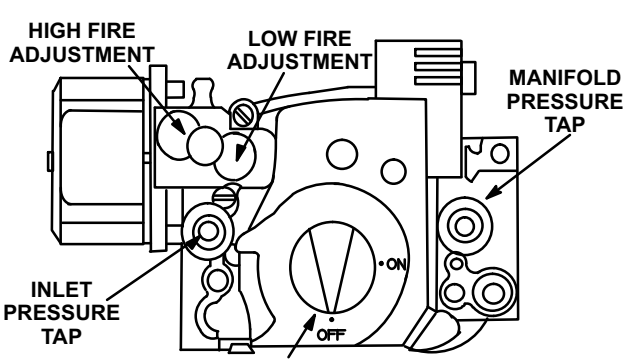


FIGURE 20

1- Set thermostat to lowest setting.

2- Turn off all electrical power to appliance.

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

4- Open or remove the heat section access panel.

5- Turn the knob on the gas valve clockwise ↷ to **"OFF"**. Depress knob slightly. Do not force.

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

7- Turn the knob on the gas valve counterclockwise ↶ to **"ON"**. Do not force.

8- Close or replace the heat section access panel.

9- Turn on all electrical power to appliance.

10- Set thermostat to desired setting.

11- The ignition sequence will start.

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

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

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

Turning Off Gas to Unit

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

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

3- Open or remove the heat section access panel.

4- Turn the knob on the gas valve clockwise ↷ to **"OFF"**. Depress knob slightly. Do not force.

5- Close or replace the heat section access panel.

⚠WARNING

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

C-Safety or Emergency Shutdown

Turn off power and main manual shut off valve to unit.

D-Cooling Start Up

MSAV *Units - Refer to the* MSAV *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 units -*
First-stage thermostat demand will energize compressor 1; a second-stage thermostat demand will energize compressor 2.

156H, 180H, 210, 240S, 300S units -
First-stage thermostat demand will energize compressors 1 & 2; a second-stage thermostat demand will energize compressor 3.

240H, 300H units -
First-stage thermostat demand will energize compressors 1 & 2; a second-stage thermostat demand will energize compressors 3 & 4.

On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressor 1 (and compressor 2 on 156H, 180H, 210, 240 & 300 units).

Refrigerant Circuits

4- *180S -*
Units contain two refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuit 1 makes up stage 1 cooling. Evaporator and condenser coil refrigerant circuit 2 makes up stage 2 cooling.

156H, 180H, 210, 240S, 300S -
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.

240H, 300H -

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- *156H, 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 21.

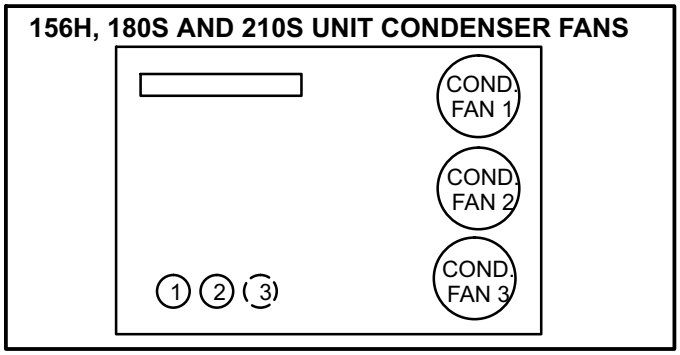


FIGURE 21

180H, 240S, 300S -

First-stage thermostat demand will energize condenser fans 1, 2, 3 and 4. See figure 22. Fans will continue to operate with additional thermostat demands.

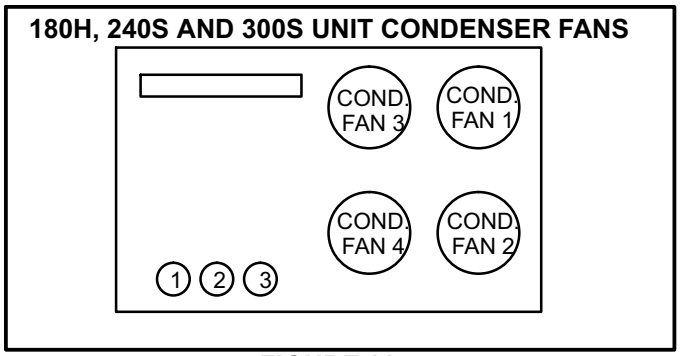


FIGURE 22

210H -

First-stage thermostat demand will energize condenser fans 1, 2, 3, 4, 5 and 6. See figure 23. Fans will continue to operate with additional thermostat demands.

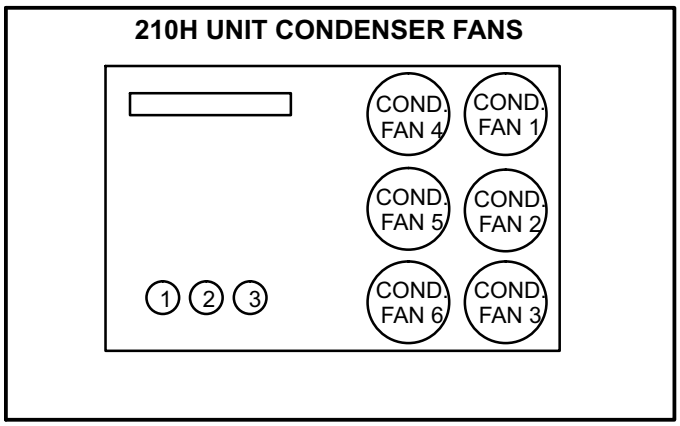


FIGURE 23

240H, 300H -

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 24.

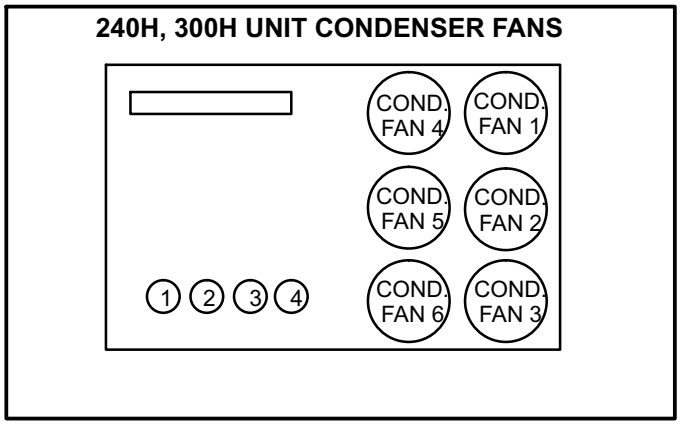


FIGURE 24

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-Fin/Tube Outdoor Coil

⚠ WARNING

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

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

WARNING-Do not exceed nameplate charge under any condition.

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

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

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

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

2- Check each system separately with all stages operating.

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

4- Apply the outdoor temperature to tables 9 through 12 to determine normal operating pressures. Pressures are listed for sea level applications at 80°F dry bulb and 67°F wet bulb return air.

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

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

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

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

TABLE 9
KGA180S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Circuit 1		Circuit 2	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	268	128	282	132
75°F	310	130	325	134
85°F	353	132	368	135
95°F	400	135	417	138
105°F	449	137	470	140
115°F	505	141	527	144

TABLE 10
KGA210S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	290	133	290	128	307	133
75°F	330	136	330	132	347	135
85°F	373	137	373	135	390	138
95°F	421	140	421	138	437	140
105°F	474	143	474	140	488	143
115°F	526	146	526	142	540	146

TABLE 11
KGA240S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	270	136	286	135	285	137
75°F	313	138	329	138	327	140
85°F	351	140	366	140	368	142
95°F	397	143	412	143	414	144
105°F	450	146	467	147	465	147
115°F	506	149	522	150	524	150

TABLE 12
KGA300S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	290	136	296	132	306	137
75°F	330	138	338	135	348	138
85°F	375	141	382	137	394	140
95°F	423	144	432	140	440	142
105°F	475	146	486	142	492	145
115°F	526	149	546	144	550	148

C-Charge Verification - Approach Method - AHRI Testing

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

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

2- Approach temperatures should match values in table 13. An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.

3- Do not use the approach method if system pressures do not match pressures in tables 9 through 12. The approach method is not valid for grossly over or undercharged systems.

TABLE 13
APPROACH TEMPERATURES

Unit	Liquid Temp. Minus Ambient Temp.		
	1st Stage	2nd Stage	3rd Stage
180S	8°F ± 1 (4.4°C ± 0.5)	8°F ± 1 (4.4°C ± 0.5)	NA
210S	8°F ± 1 (4.4°C ± 0.5)	8°F ± 1 (4.4°C ± 0.5)	10°F ± 1 (5.6°C ± 0.5)
240S	8°F ± 1 (4.4°C ± 0.5)	8°F ± 1 (4.4°C ± 0.5)	8°F ± 1 (4.4°C ± 0.5)
300S	7°F ± 1 (3.9°C ± 0.5)	7°F ± 1 (3.9°C ± 0.5)	9°F ± 1 (5.0°C ± 0.5)

B-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 14 -22) 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 on Page 48 through Page 63 to determine a target liquid temperature.

NOTE - Pressures are listed for sea level applications.

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

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

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

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

7- Example KGA/KCA180S Circuit 1: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 99.5°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 14
KG/KC 180S 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	103	253	106	290	109	333	112	377	114	426	116	482
	110	260	113	295	117	337	120	385	123	435	125	492
	123	278	127	313	131	354	136	401	140	454	143	513
	136	298	142	336	147	378	152	426	156	477	161	533
Circuit 2	105	255	109	294	111	337	113	381	116	428	119	486
	112	262	116	300	119	342	122	389	124	437	127	496
	125	279	129	315	134	356	138	404	142	457	146	514
	139	300	144	338	149	380	154	428	158	480	163	537

TABLE 15
KG/KC 210S 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	107	266	110	303	113	345	116	392	118	441	119	492
	115	274	118	311	121	353	124	399	127	450	127	504
	130	292	133	302	137	370	141	418	144	471	147	529
	147	321	151	356	155	397	159	447	163	502	167	559
Circuit 2	105	262	107	300	110	341	112	385	115	434	116	484
	112	269	115	306	118	349	120	394	123	442	124	493
	127	284	131	321	134	363	138	411	140	463	143	521
	142	308	147	345	151	388	155	437	159	489	163	544
Circuit 3	109	276	113	316	115	360	118	408	119	459	125	516
	117	284	120	324	124	368	126	415	127	468	131	524
	131	301	135	342	139	385	144	434	147	487	147	550
	146	323	151	364	156	410	160	461	165	517	165	578

TABLE 16
KG/KC 240S 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	109	250	112	286	115	328	117	376	119	430	121	478
	116	255	119	289	123	336	126	381	128	432	130	486
	132	272	136	309	139	351	143	398	146	449	149	510
	148	291	152	330	157	372	160	417	165	473	170	528
Circuit 2	111	259	113	295	116	334	118	382	120	434	123	483
	118	263	121	297	124	342	127	387	129	438	131	492
	134	282	138	318	141	360	144	406	148	457	151	519
	151	303	155	341	160	384	162	428	167	486	171	541
Circuit 3	111	258	113	297	116	336	120	384	121	436	124	488
	118	261	121	296	124	345	127	390	130	443	131	495
	134	277	137	314	141	359	144	407	148	457	151	519
	150	295	155	333	159	378	162	424	167	481	170	535

TABLE 17
KG/KC 300S 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	107	264	110	303	112	344	114	393	116	443	120	502
	113	271	117	308	120	352	123	400	125	453	127	508
	128	289	131	324	135	367	139	414	143	466	145	528
	141	308	146	345	151	388	156	437	160	487	164	545
Circuit 2	107	276	110	315	112	357	114	402	117	452	120	511
	114	284	118	319	120	362	123	412	126	465	128	521
	129	306	132	341	136	382	140	429	143	481	146	539
	144	329	148	365	153	410	157	458	162	507	166	561
Circuit 3	107	267	110	307	113	349	115	396	117	446	121	507
	113	273	117	311	120	356	123	404	126	458	128	513
	128	289	131	326	135	370	139	419	143	473	145	531
	142	307	147	346	151	389	156	440	160	491	164	546

TABLE 18
KG/KC 156H NORMAL OPERATING PRESSURES - 580615-03

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	110	232	108	274	110	319	112	372	114	457	116	577
	119	236	119	272	119	318	120	373	123	445	126	534
	138	243	141	282	143	324	142	373	144	428	147	497
	157	251	161	289	165	330	167	376	170	429	171	494
Circuit 2	103	237	104	275	107	318	109	367	112	440	114	558
	114	239	114	275	116	319	117	368	121	434	123	525
	135	244	138	283	140	323	140	371	141	427	144	495
	154	252	158	289	161	331	164	376	167	427	169	488
Circuit 3	111	248	112	289	114	336	115	387	117	477	119	603
	123	254	123	290	124	337	125	390	127	454	129	559
	142	264	146	304	147	347	147	395	150	450	151	523
	162	273	166	313	170	356	173	402	176	455	178	516

TABLE 19
KG/KC 180H 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	104	235	106	275	105	326	106	389	110	466	113	552
	114	238	118	275	115	319	117	378	119	447	122	527
	130	245	134	281	136	320	136	365	138	424	141	483
	146	253	153	289	157	330	159	374	162	421	165	478
Circuit 2	100	241	103	281	104	327	105	379	109	442	112	513
	111	244	112	282	113	327	115	379	116	445	119	507
	128	249	132	286	131	331	132	377	135	434	139	488
	144	257	151	295	154	336	158	382	158	439	161	498
Circuit 3	106	241	110	278	110	326	111	380	114	447	117	536
	118	242	115	282	120	326	120	380	123	437	126	512
	134	250	138	287	140	328	139	378	142	431	145	491
	151	260	157	298	160	340	163	385	165	435	167	494

TABLE 20
KG/KC 210H 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	110	228	113	262	114	302	116	349	118	402	119	466
	119	231	121	266	123	305	125	352	127	405	128	466
	136	238	139	271	141	312	143	358	146	409	149	464
	152	246	157	277	161	319	165	363	169	414	171	472
Circuit 2	112	232	111	267	113	312	115	358	116	414	119	479
	121	235	123	272	125	311	127	357	126	415	129	476
	137	242	141	278	144	317	146	365	149	415	151	471
	153	253	159	289	164	333	168	374	171	425	174	478
Circuit 3	105	241	106	284	108	327	110	375	112	429	115	489
	112	244	115	282	118	323	121	369	121	428	123	487
	130	251	132	289	135	332	138	378	141	428	145	484
	146	261	151	297	156	339	159	386	163	437	165	495

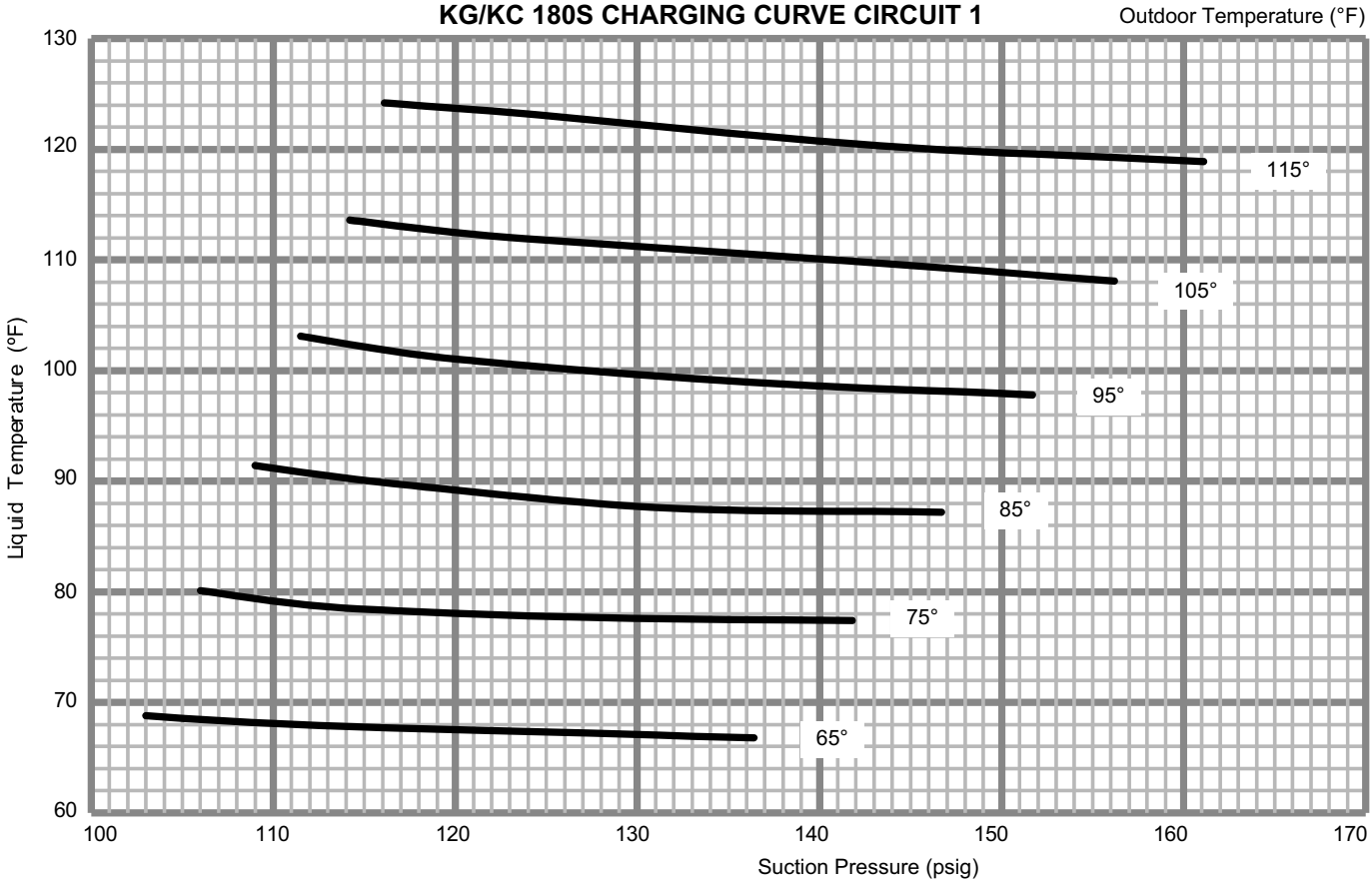
TABLE 21
KG/KC 240H NORMAL OPERATING PRESSURES

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	107	249	109	286	111	331	113	391	116	450	118	513
	115	251	118	285	120	332	122	383	125	443	128	513
	134	255	136	291	139	334	141	383	143	441	146	506
	156	269	160	305	164	352	163	393	166	451	168	508
Circuit 2	105	236	106	277	109	320	112	373	114	445	116	538
	114	239	116	275	117	323	119	372	122	438	125	530
	131	245	134	279	136	322	138	372	140	427	144	489
	153	257	157	291	161	337	161	377	164	433	167	486
Circuit 3	110	247	112	286	114	330	115	386	117	444	119	507
	119	251	121	289	122	334	123	384	126	442	128	512
	136	259	139	298	141	341	144	389	145	445	147	506
	157	276	162	314	166	358	166	399	168	457	170	511
Circuit 4	104	240	106	276	108	319	110	372	111	435	115	492
	113	244	114	280	117	320	117	371	120	432	123	497
	128	251	131	289	133	331	136	376	139	430	142	486
	149	264	154	301	157	345	157	387	161	442	165	493

TABLE 22
KG/KC 300H 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	107	252	109	290	111	335	113	385	115	440	118	500
	115	256	118	295	120	339	122	388	124	442	127	502
	130	268	134	305	138	348	140	395	143	450	146	506
	146	283	150	321	154	363	159	410	163	462	166	521
Circuit 2	106	240	108	278	110	322	112	371	115	427	117	486
	114	244	117	282	119	326	121	376	123	429	126	490
	129	254	133	290	137	333	139	379	142	433	144	493
	145	266	149	304	154	344	158	392	162	446	166	509
Circuit 3	110	252	111	294	112	342	114	394	118	447	121	509
	118	258	121	298	123	345	124	398	127	451	129	512
	133	270	137	307	141	352	143	399	146	457	148	517
	150	282	153	323	158	369	162	416	167	470	170	533
Circuit 4	105	247	107	286	110	330	112	379	113	434	116	496
	112	252	115	292	117	336	120	386	123	437	125	500
	128	263	131	300	134	345	136	392	140	448	143	507
	143	274	146	313	151	359	155	407	159	461	164	523

KG/KC 180S CHARGING CURVE CIRCUIT 1



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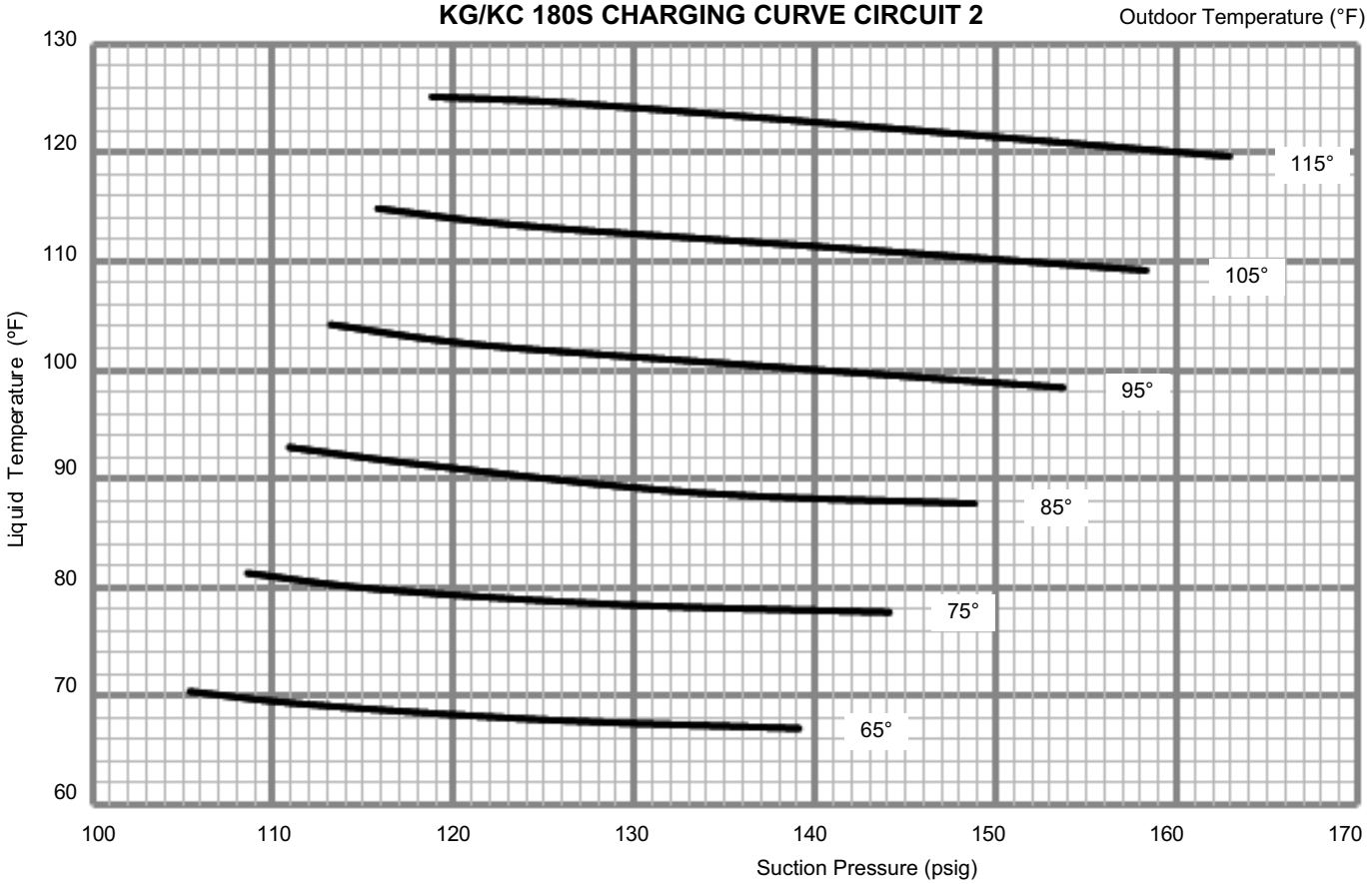

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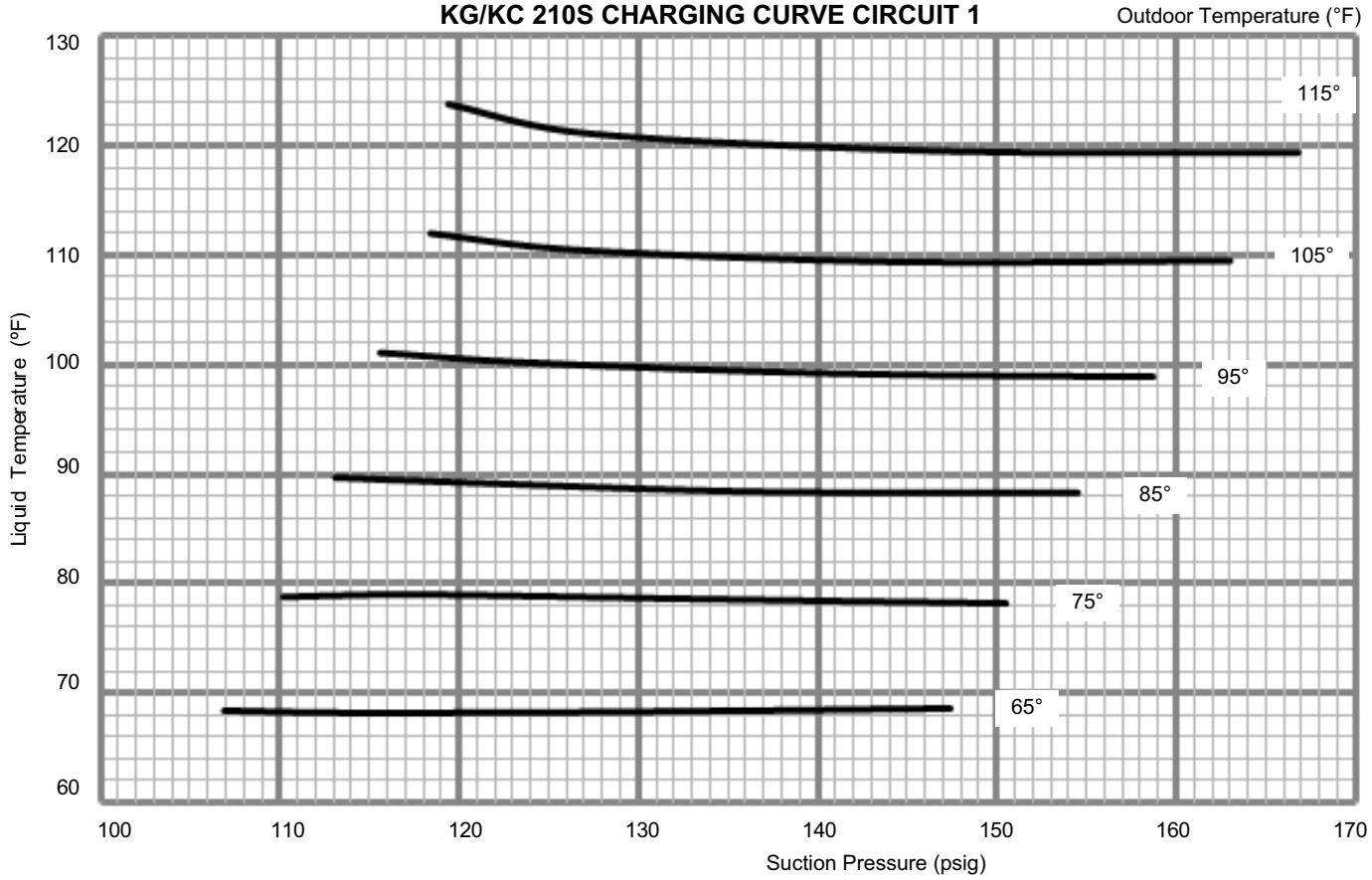

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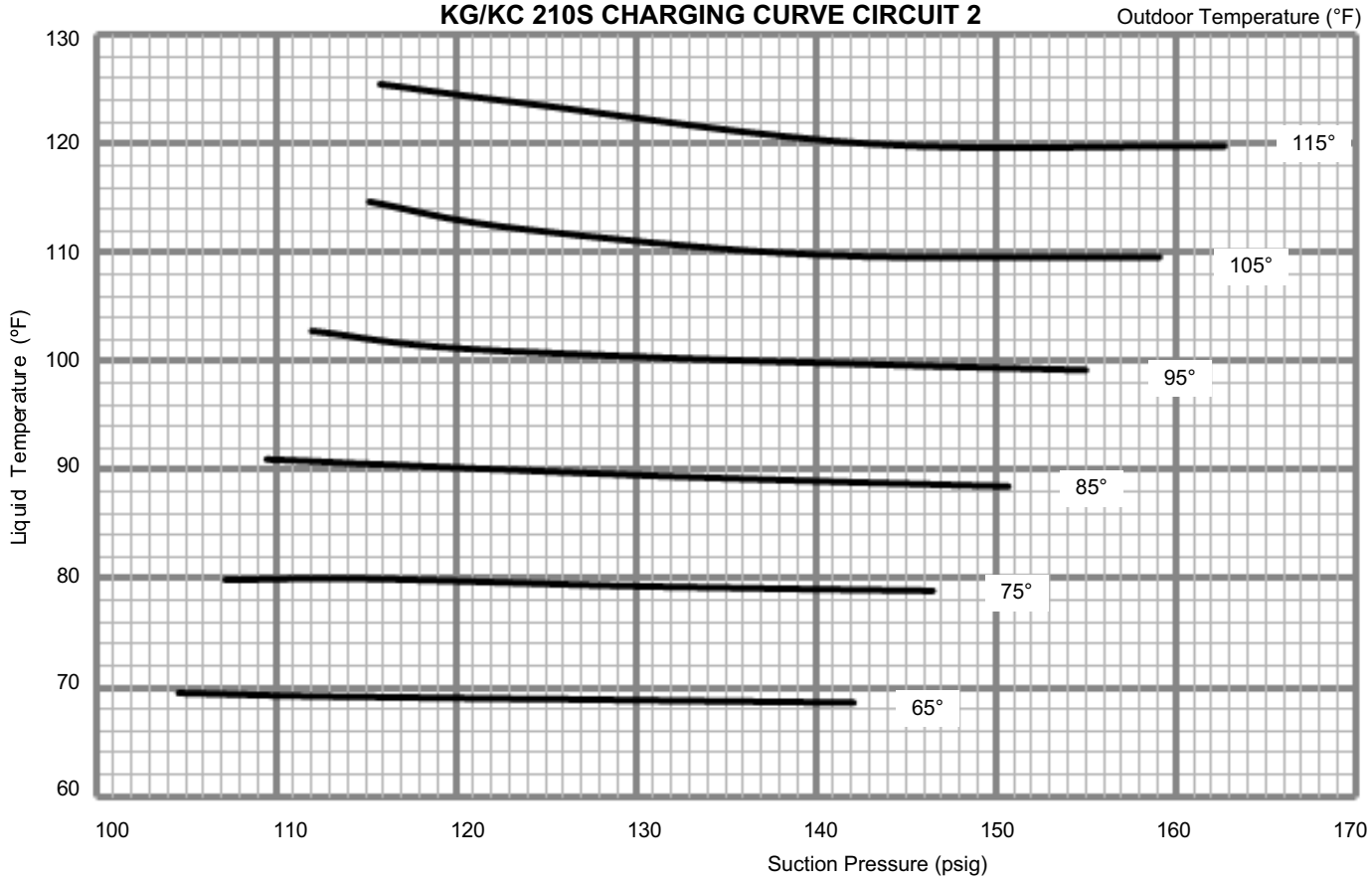

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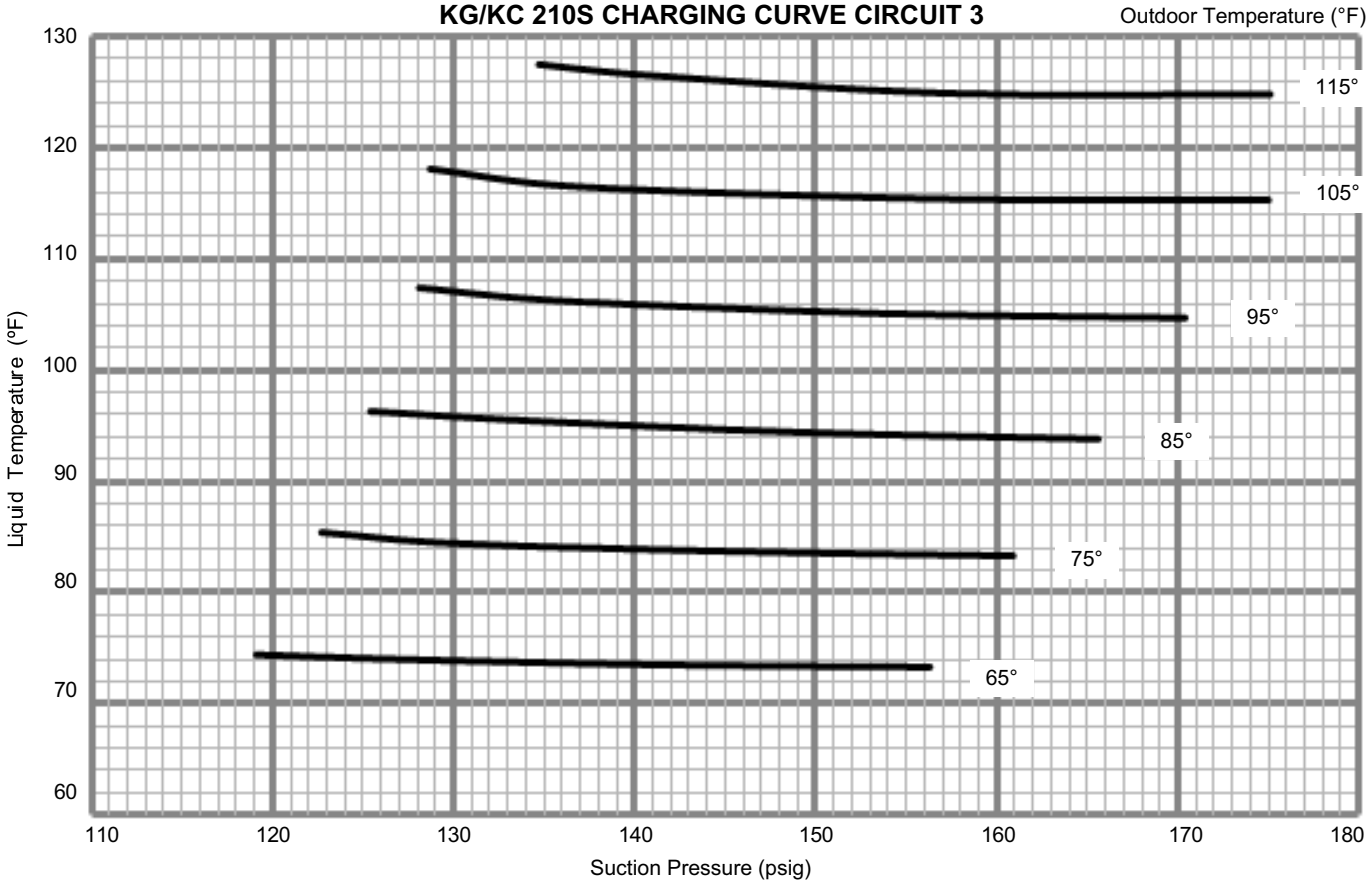

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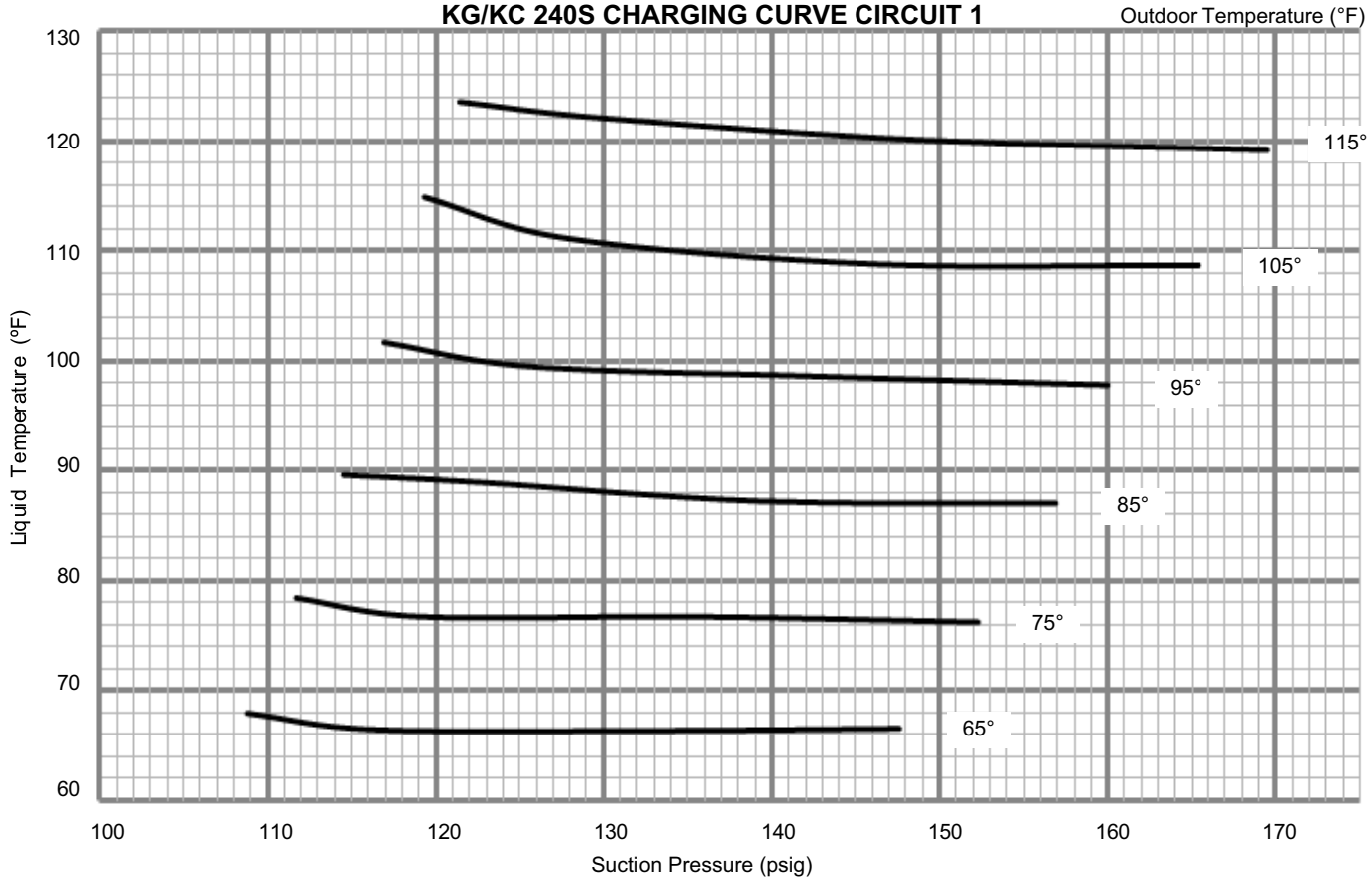

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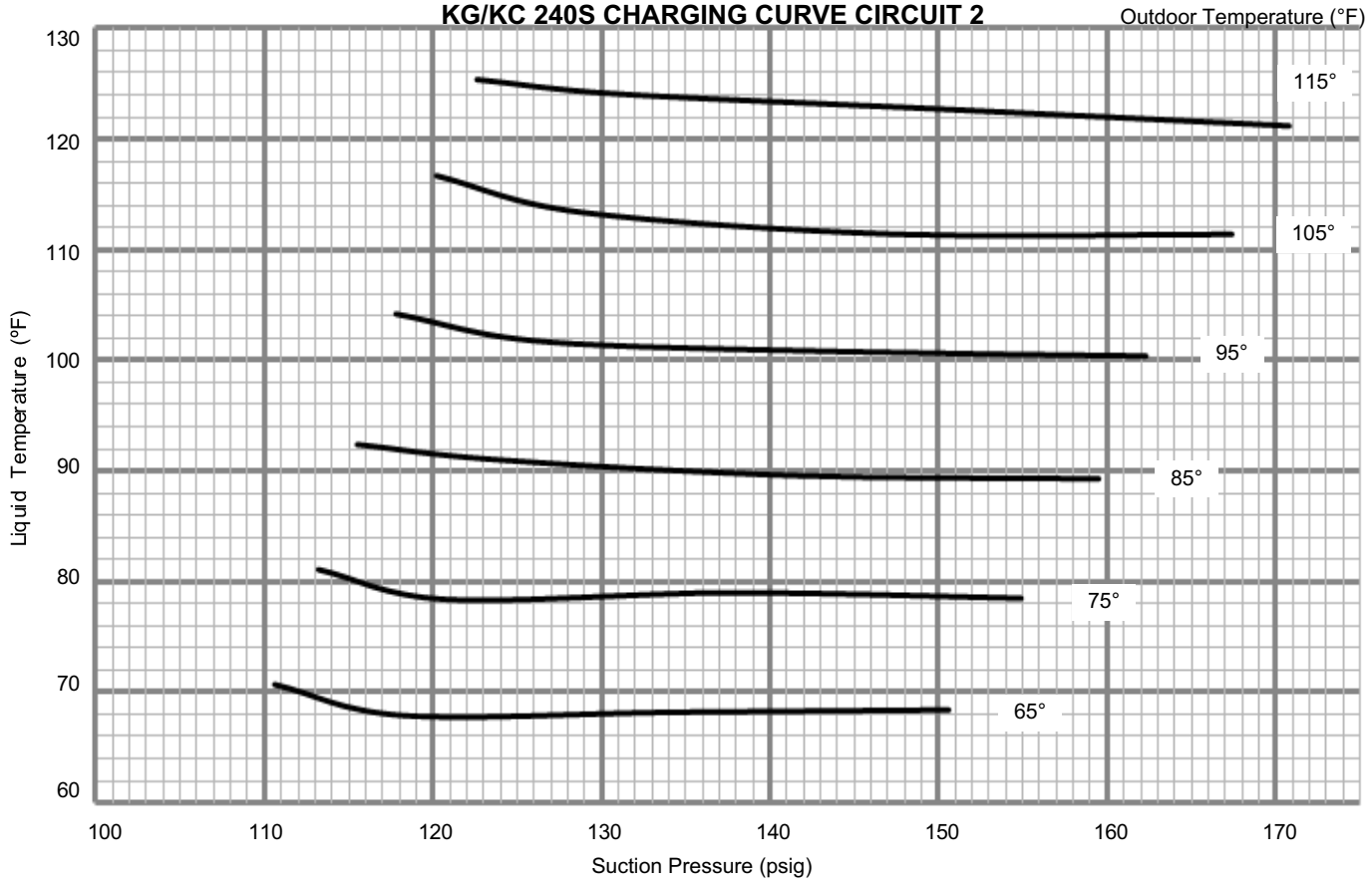

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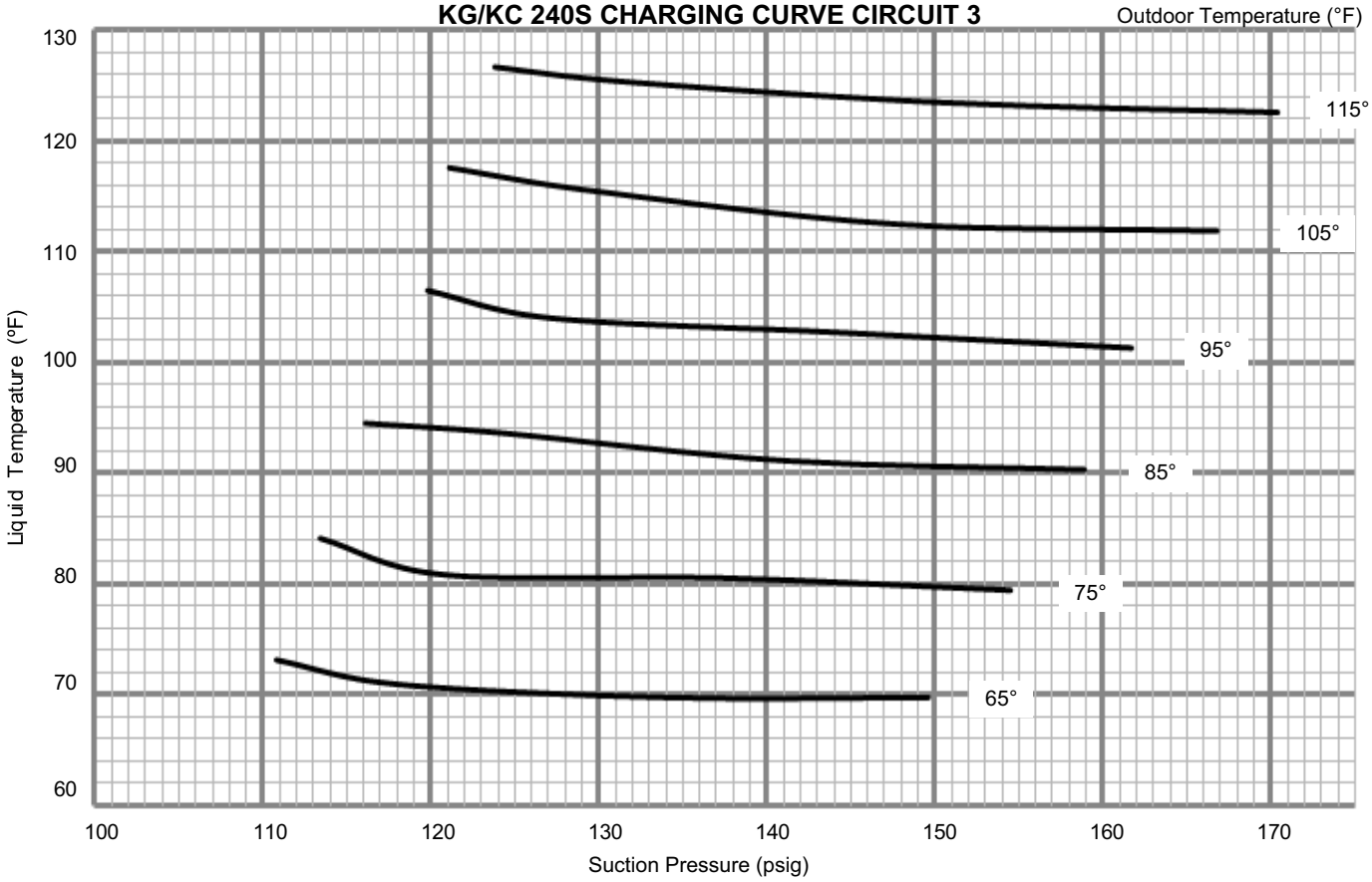

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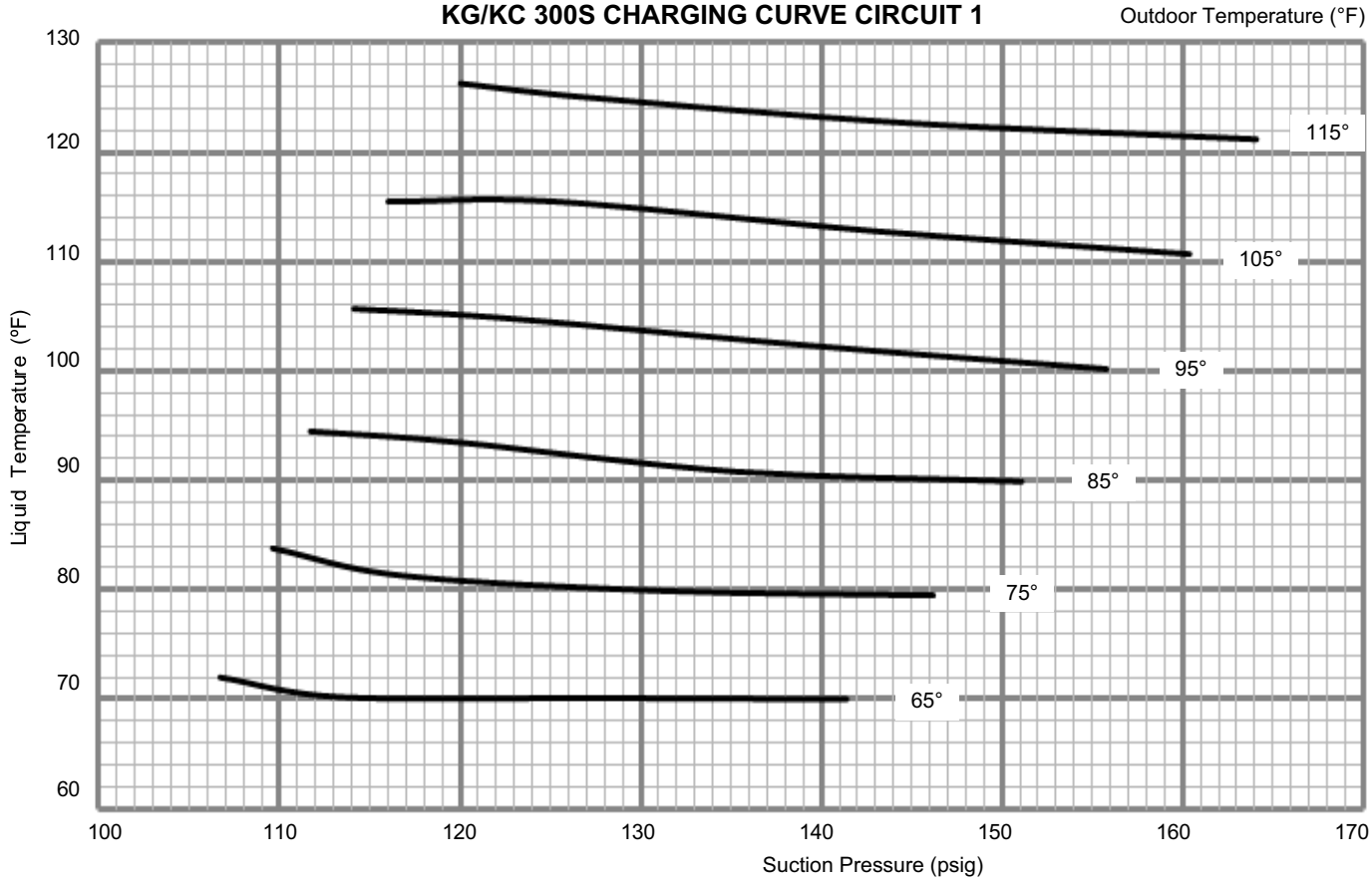

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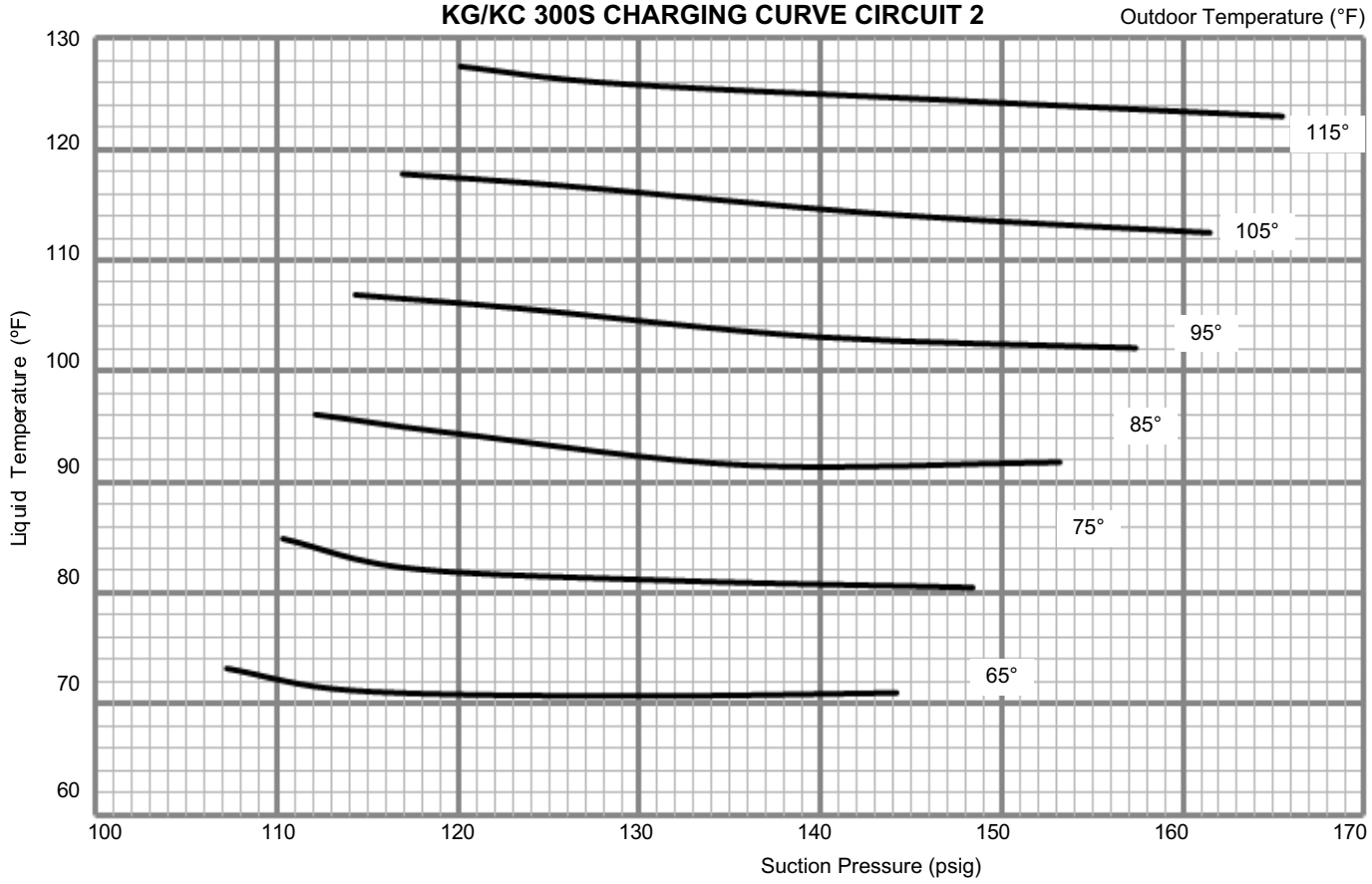

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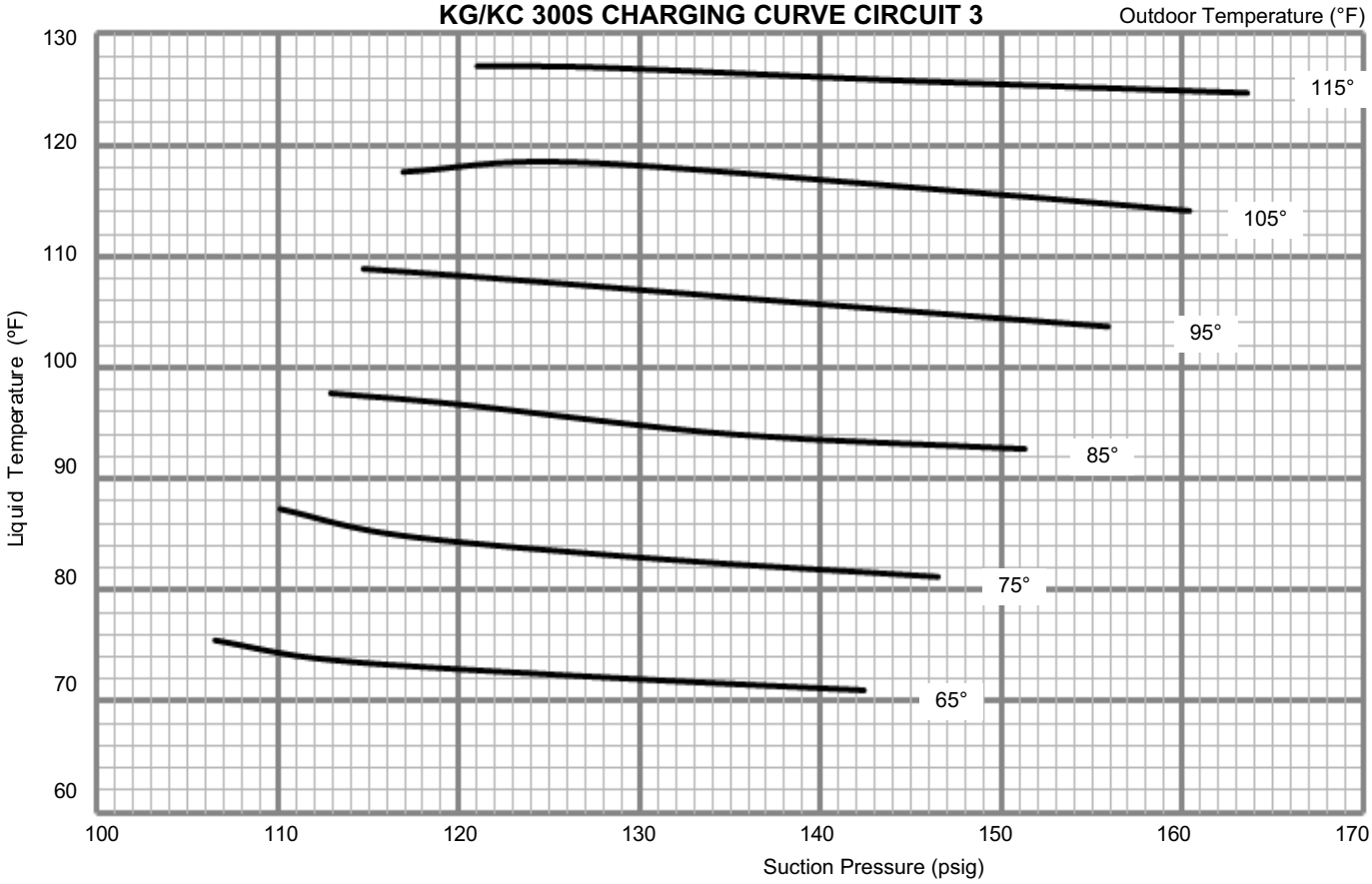

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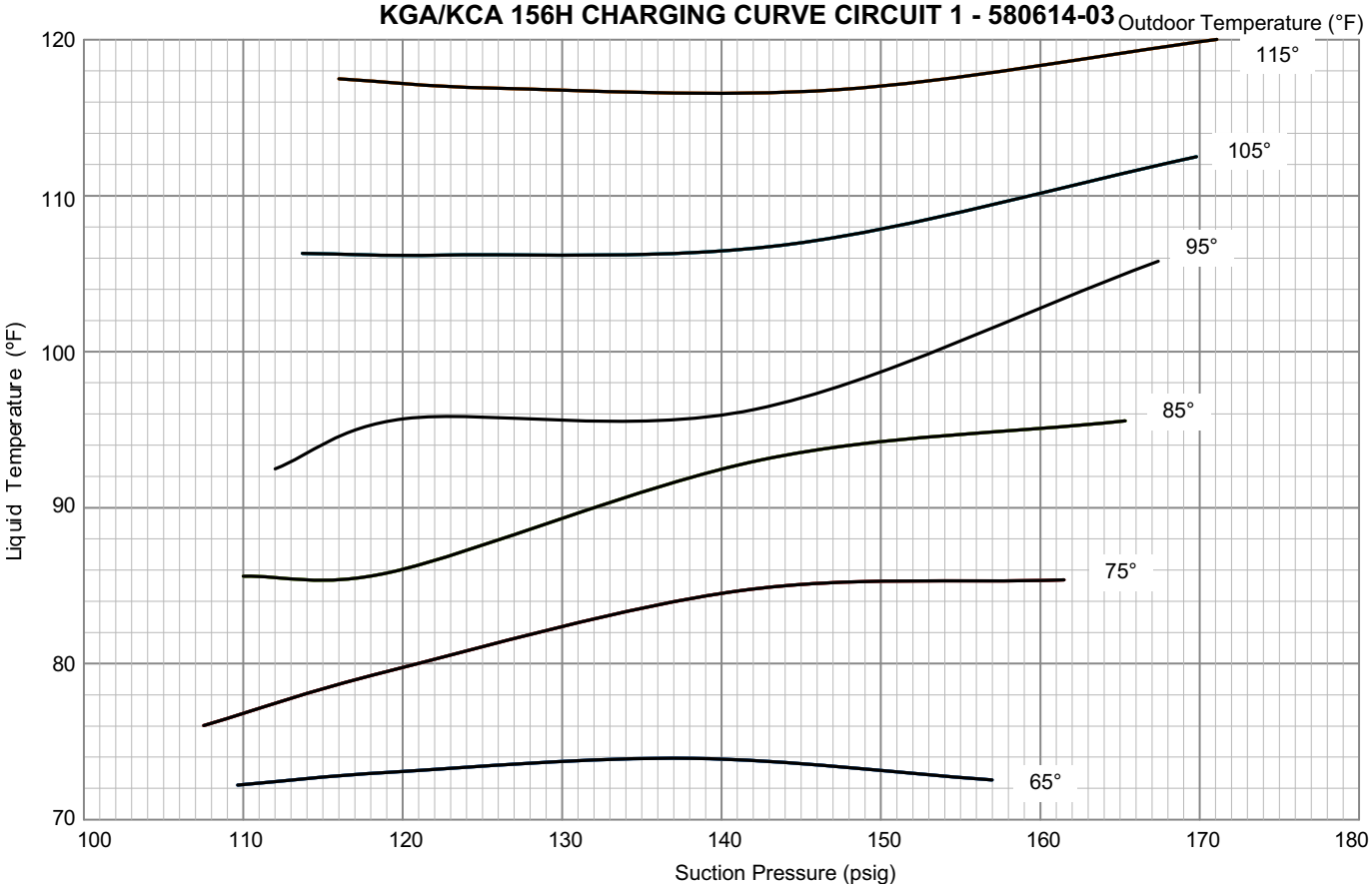

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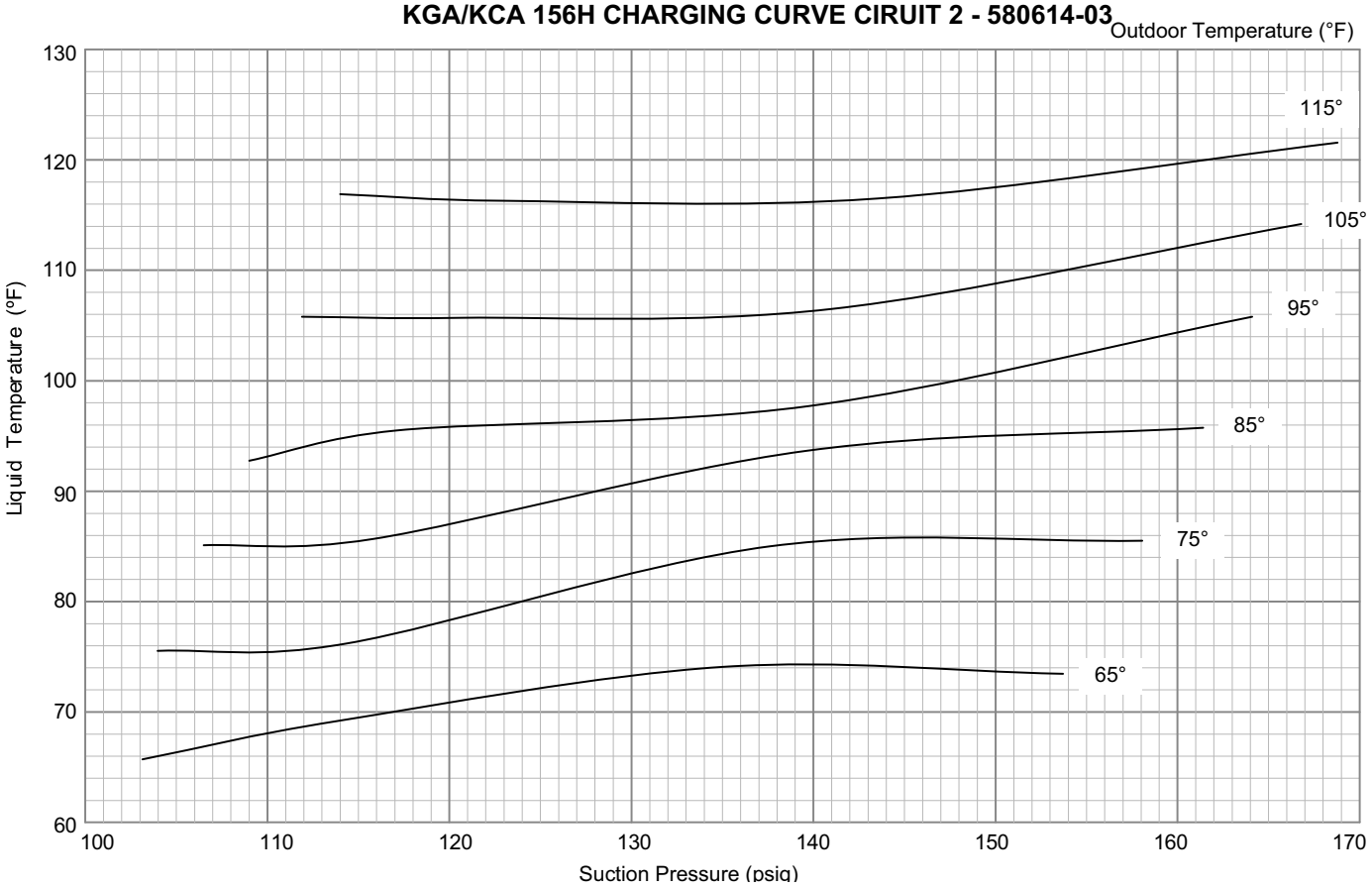

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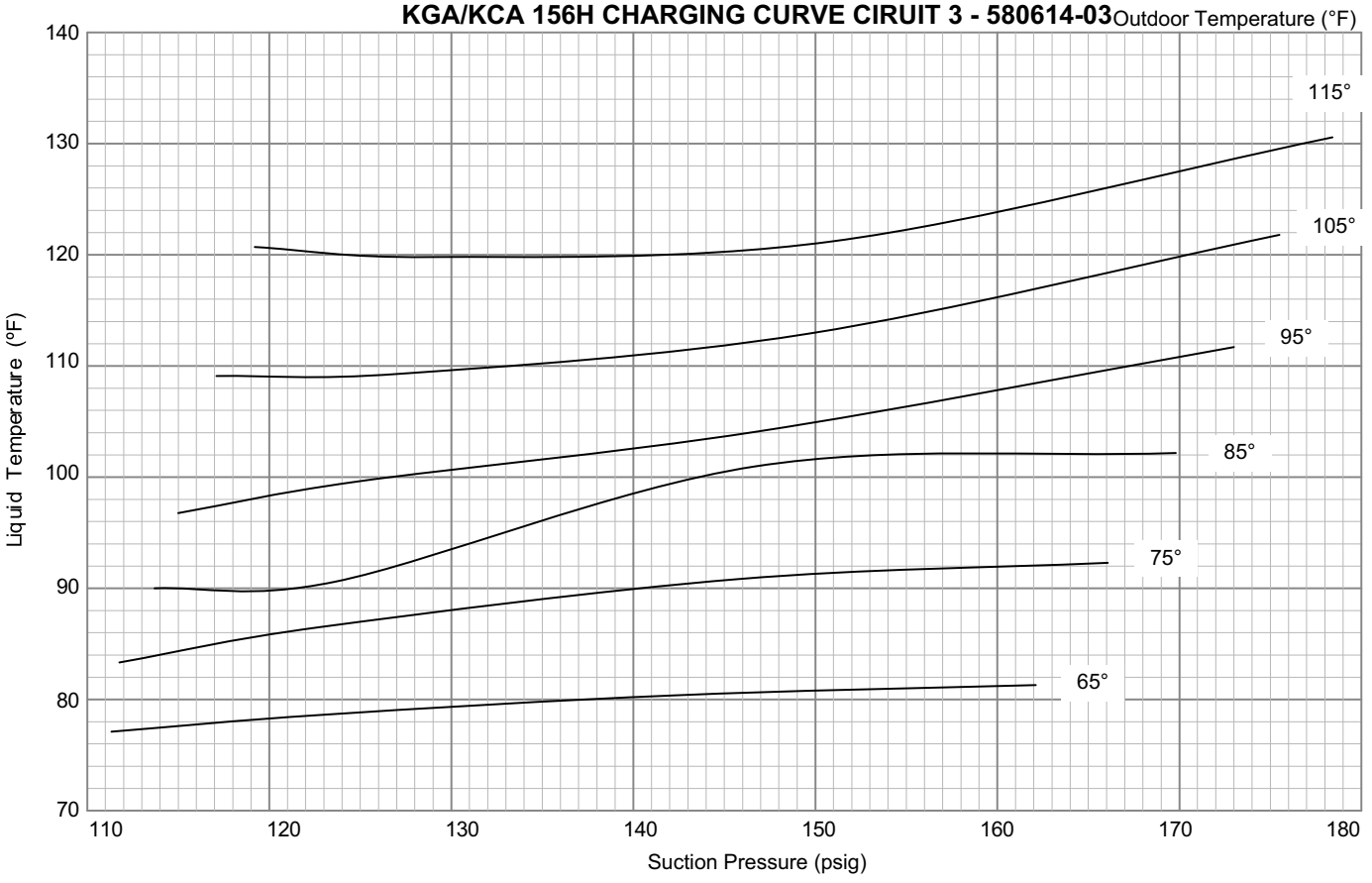

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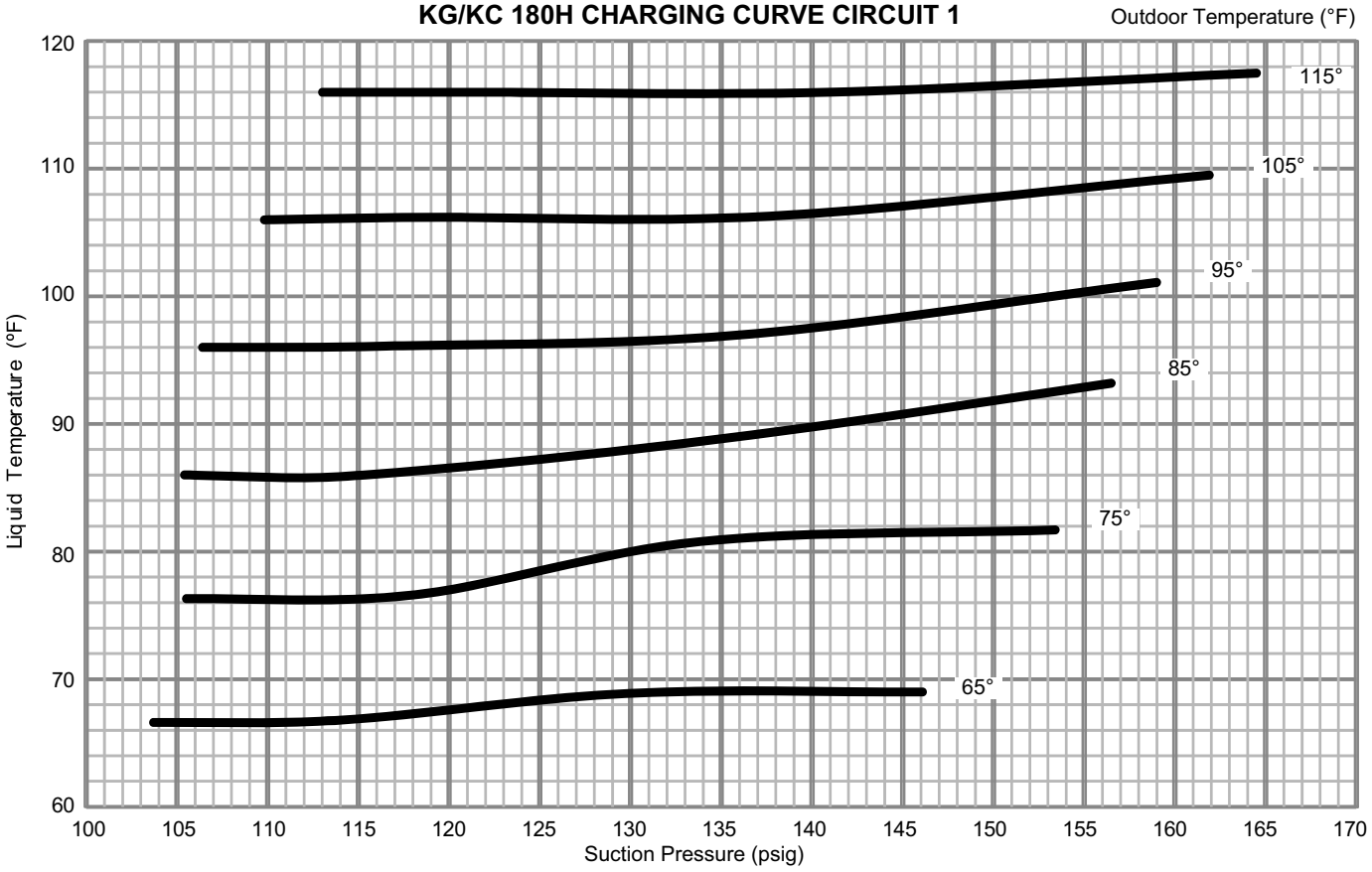

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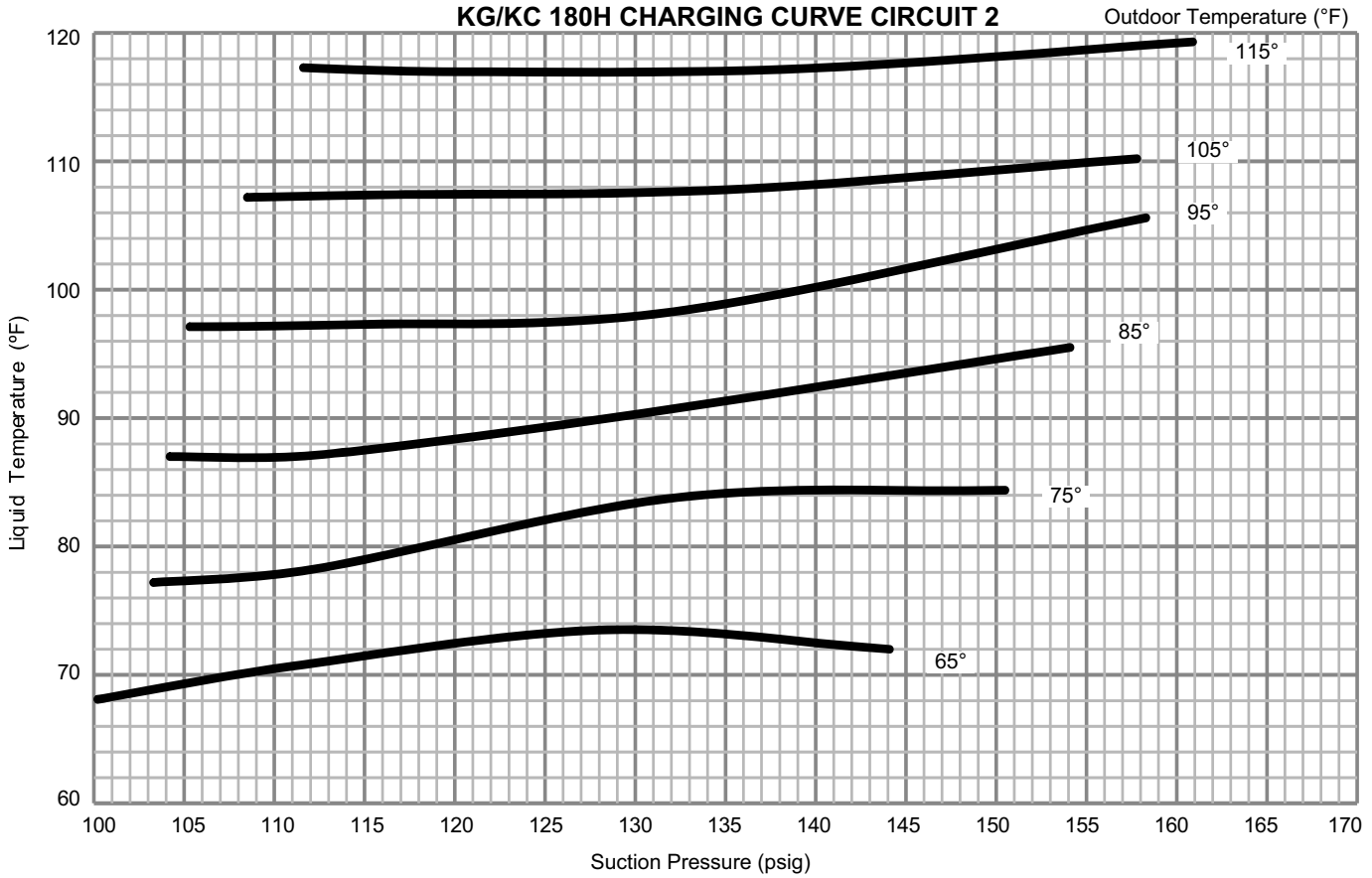

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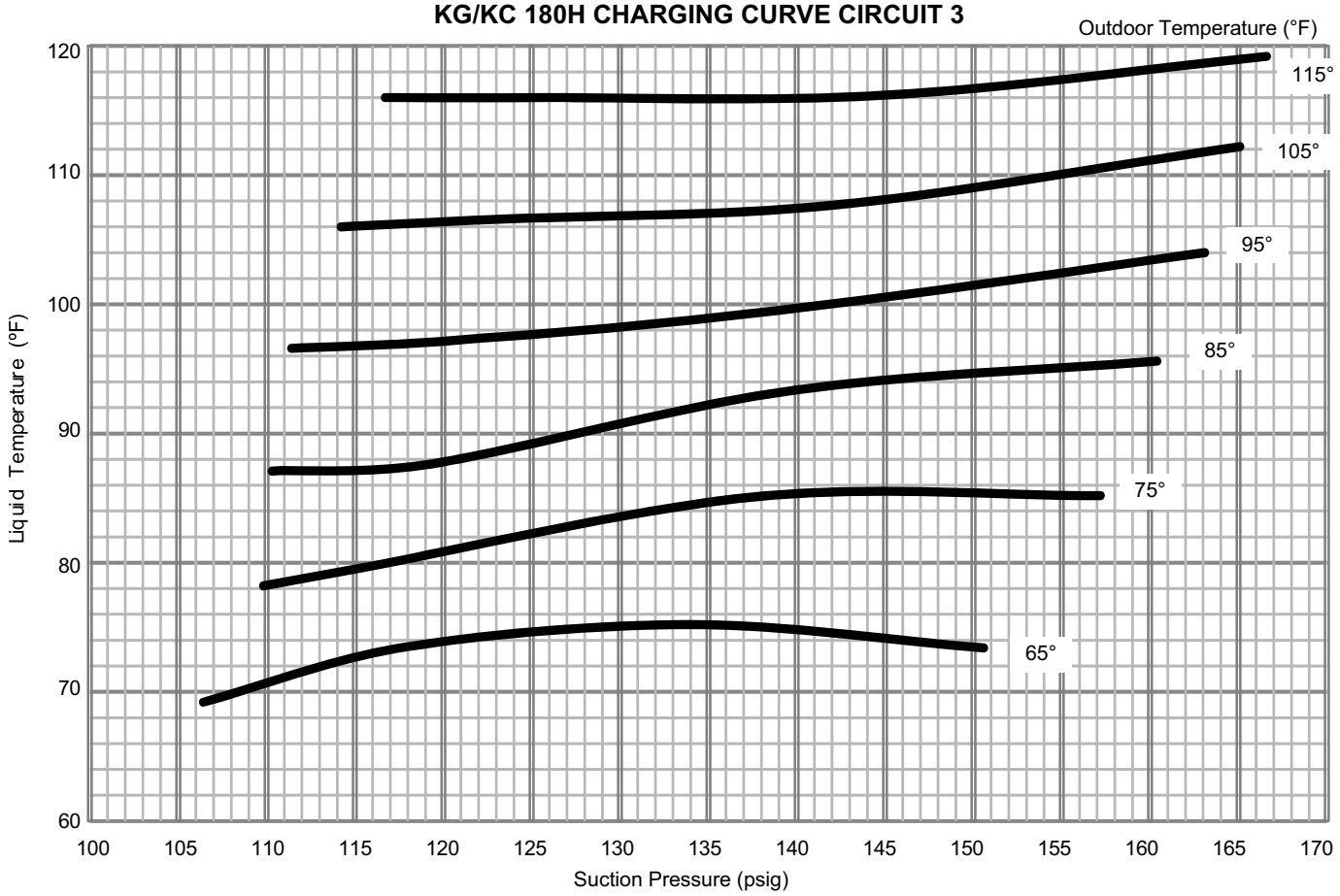

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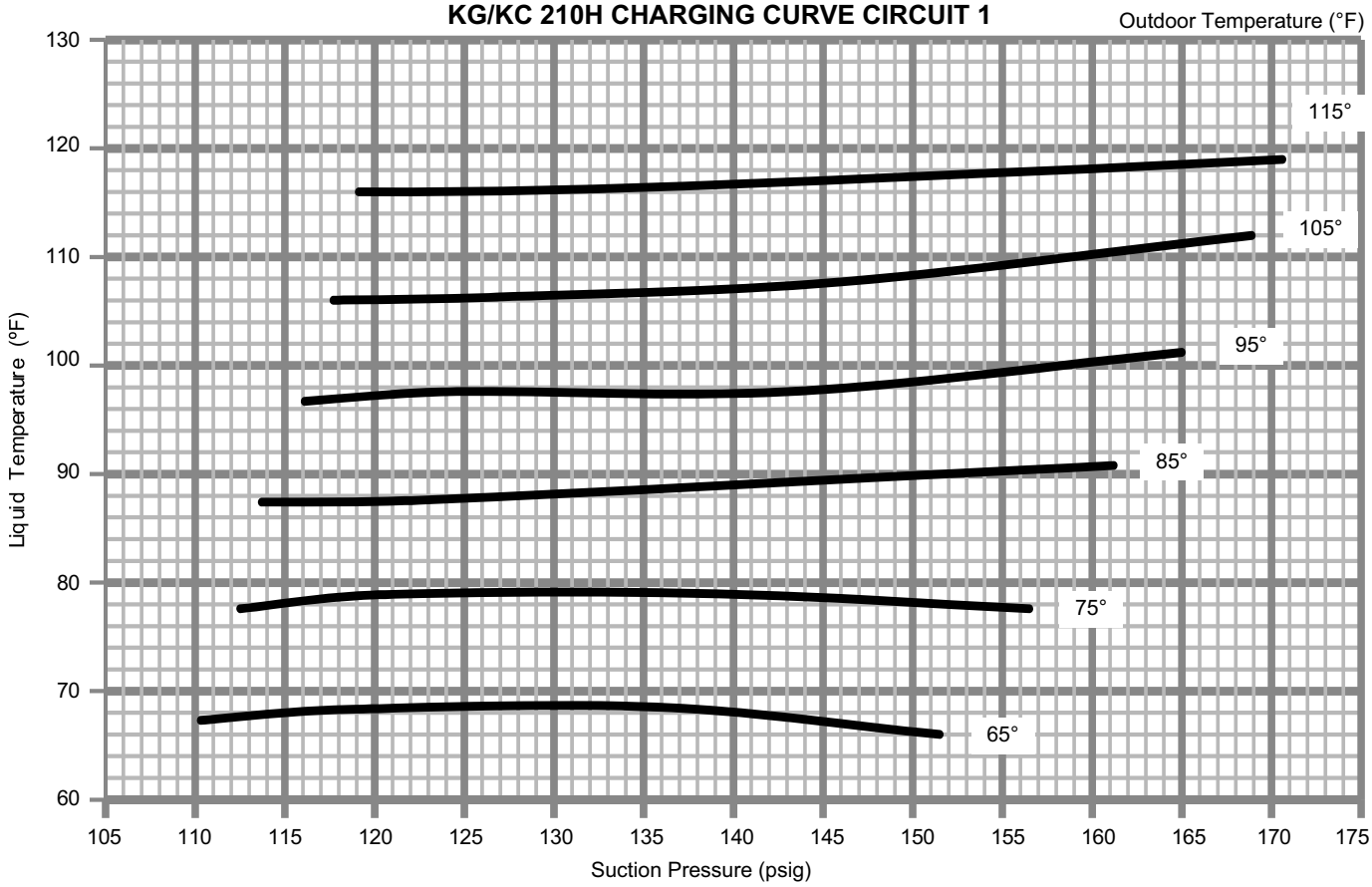

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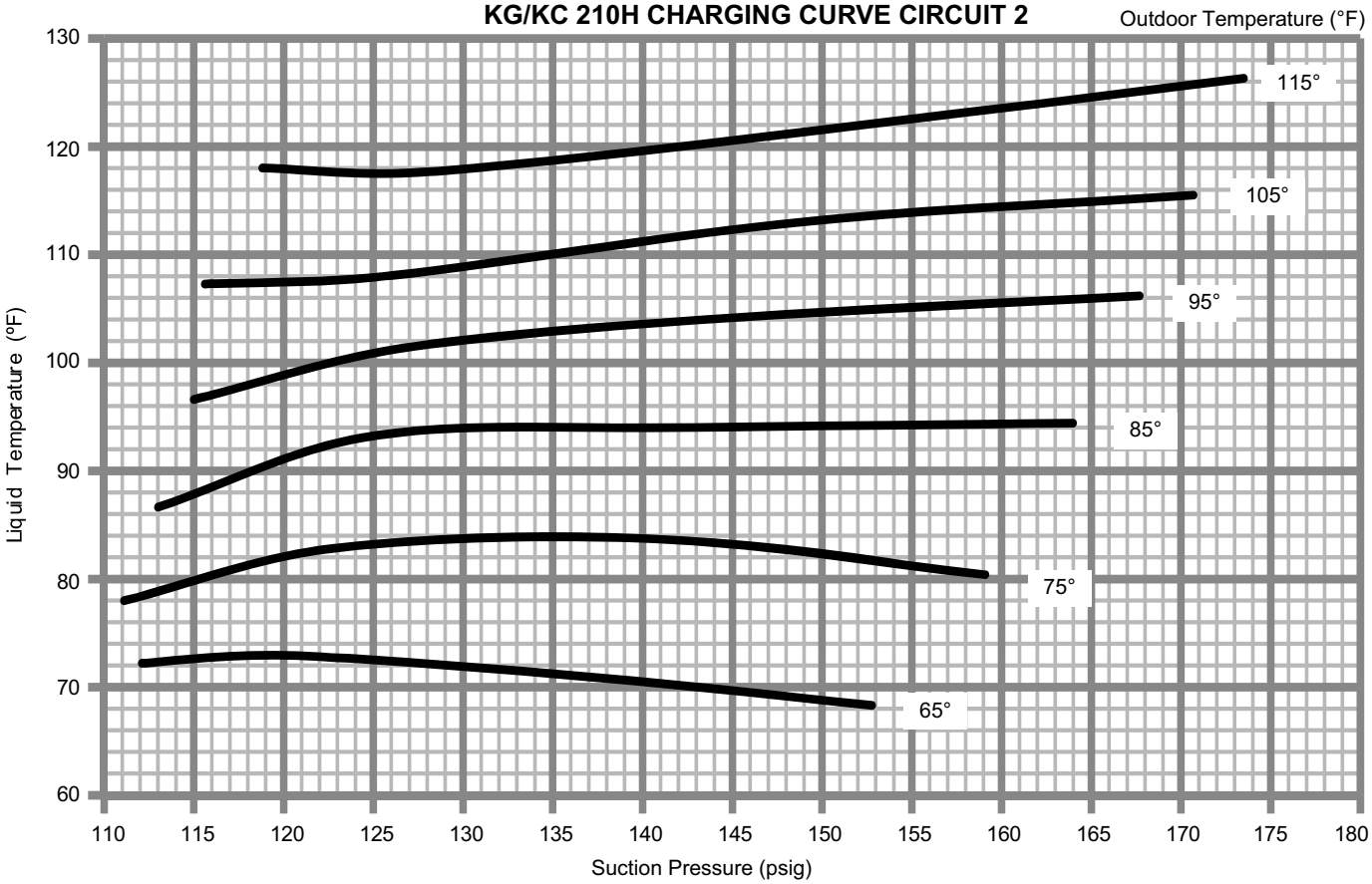

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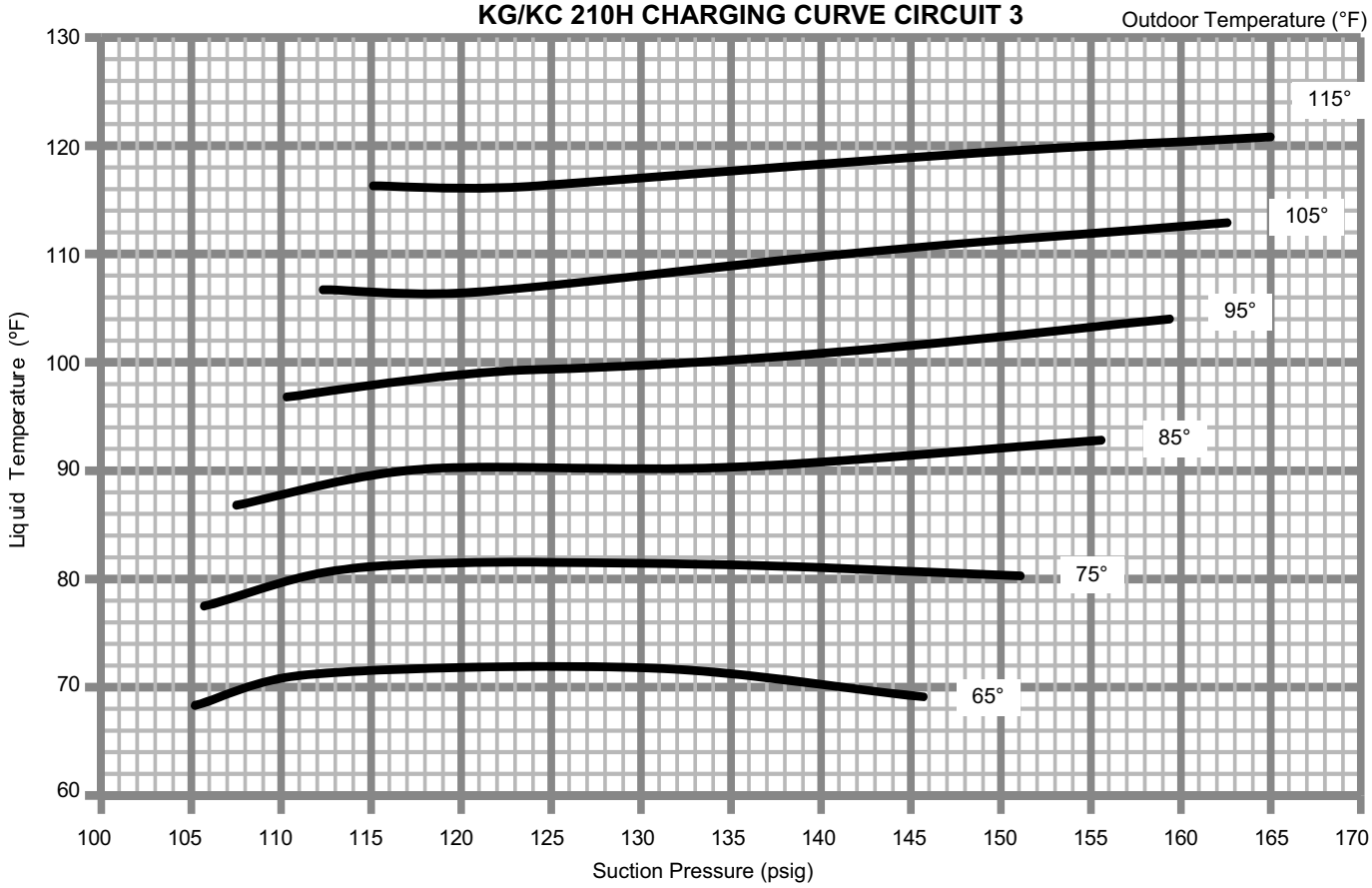

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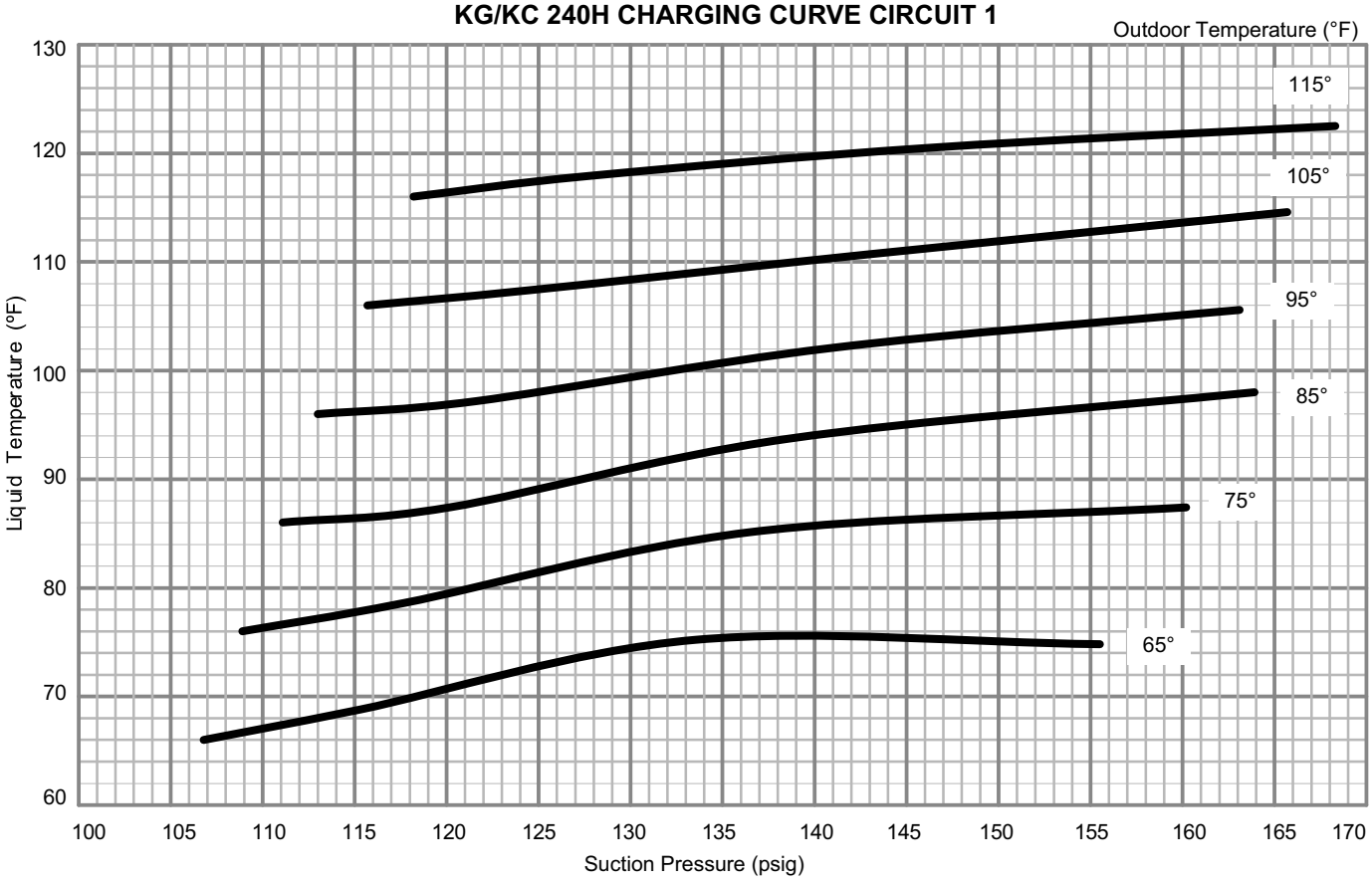

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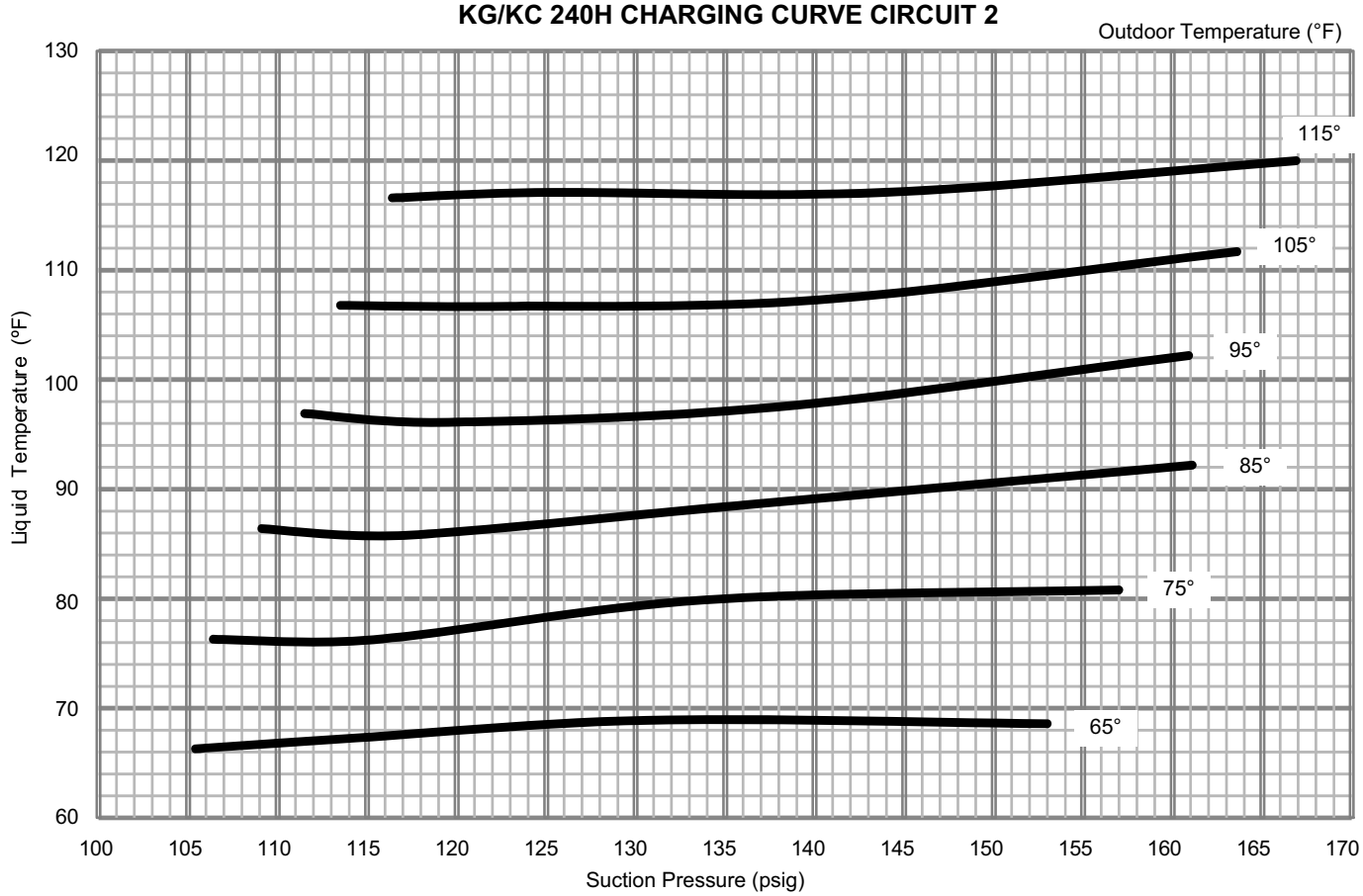

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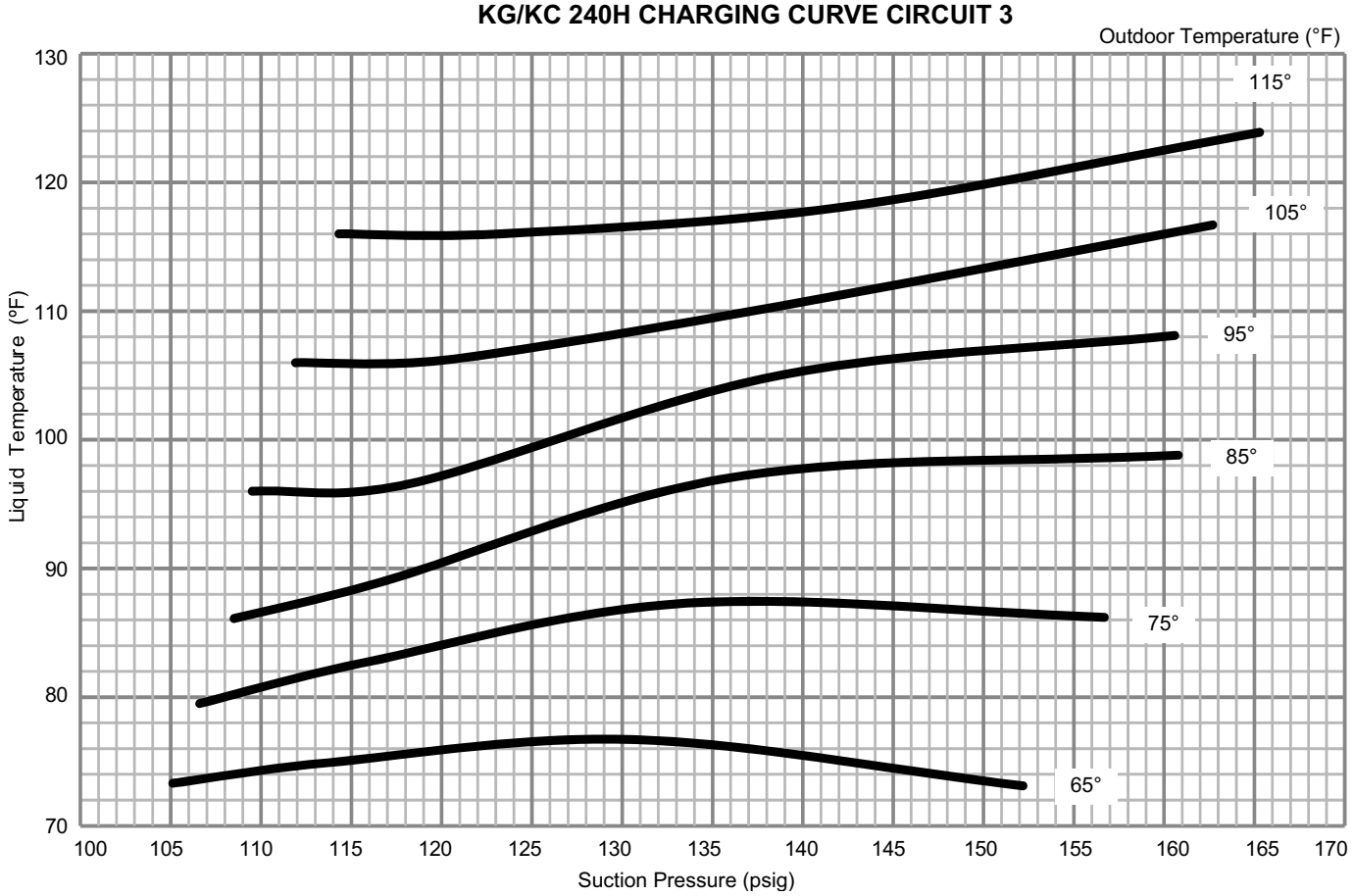

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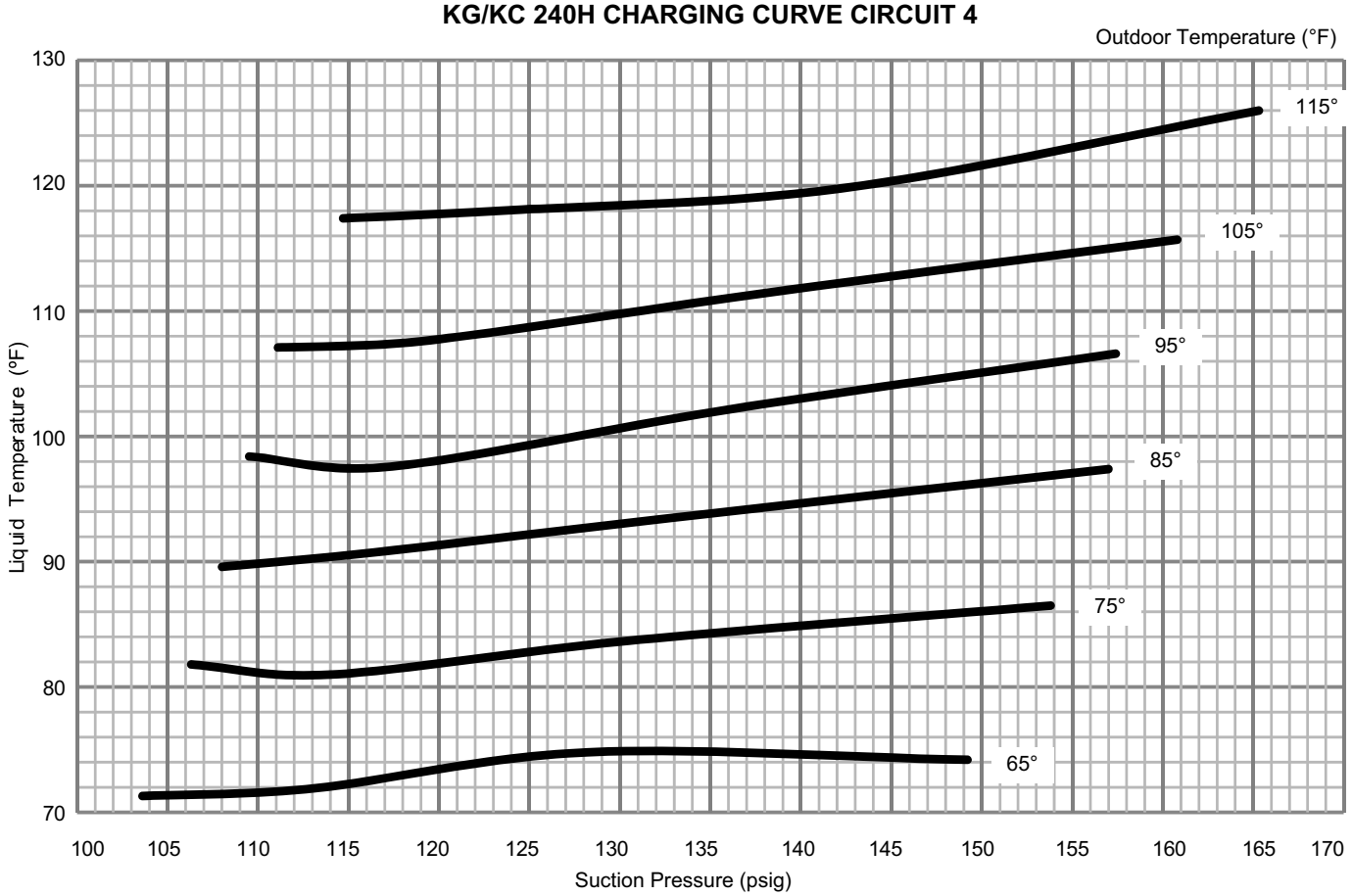

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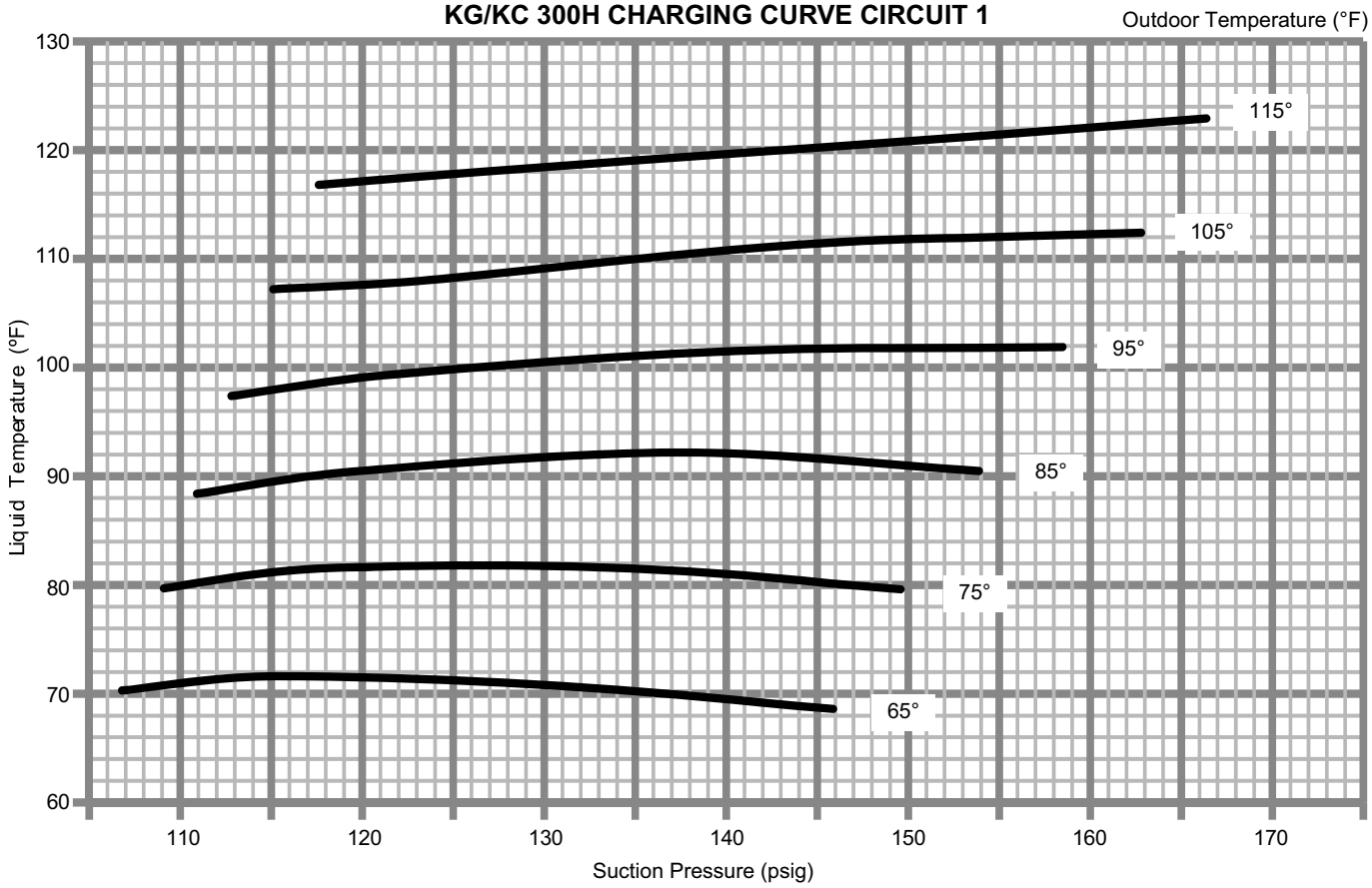

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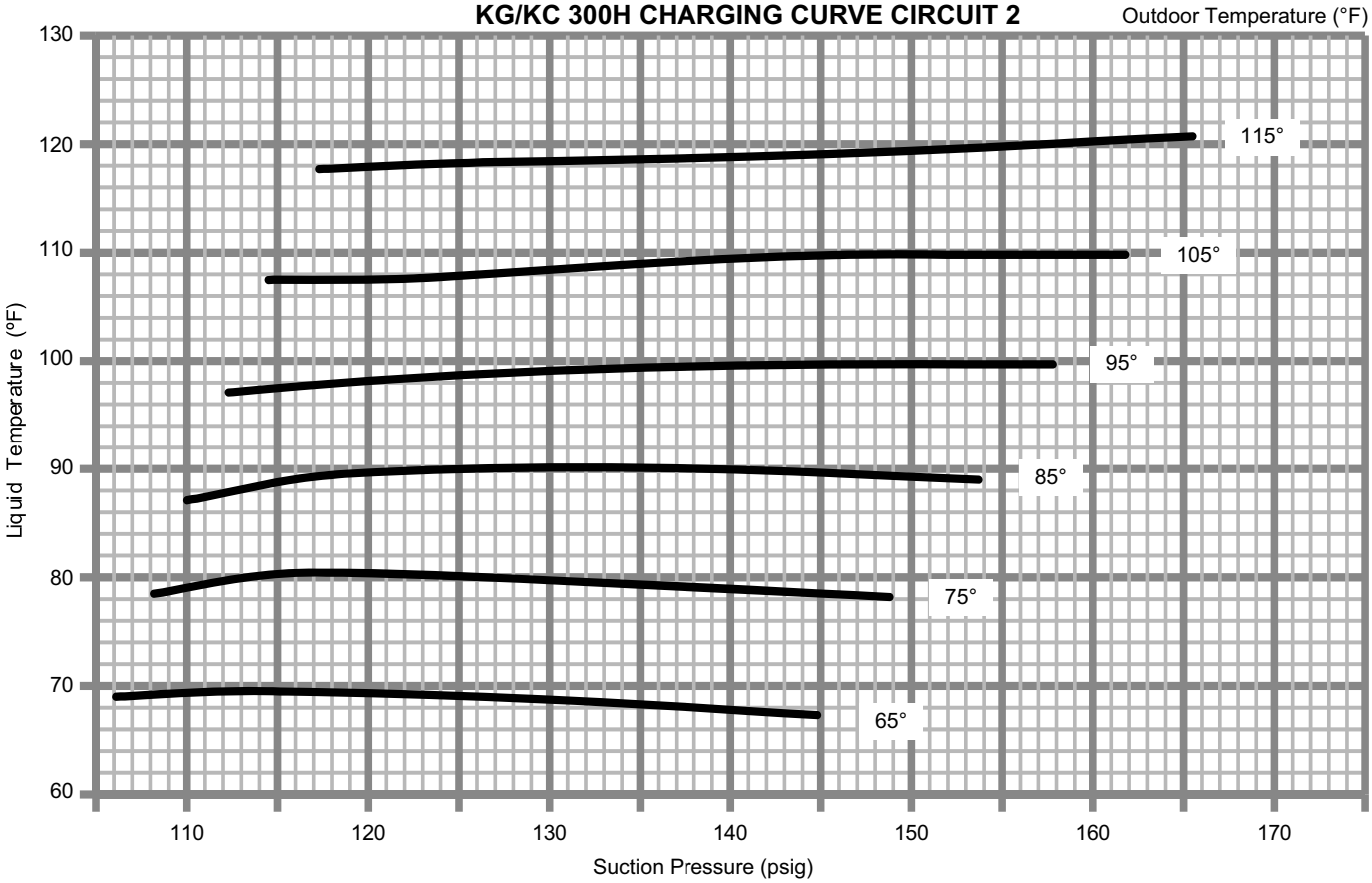

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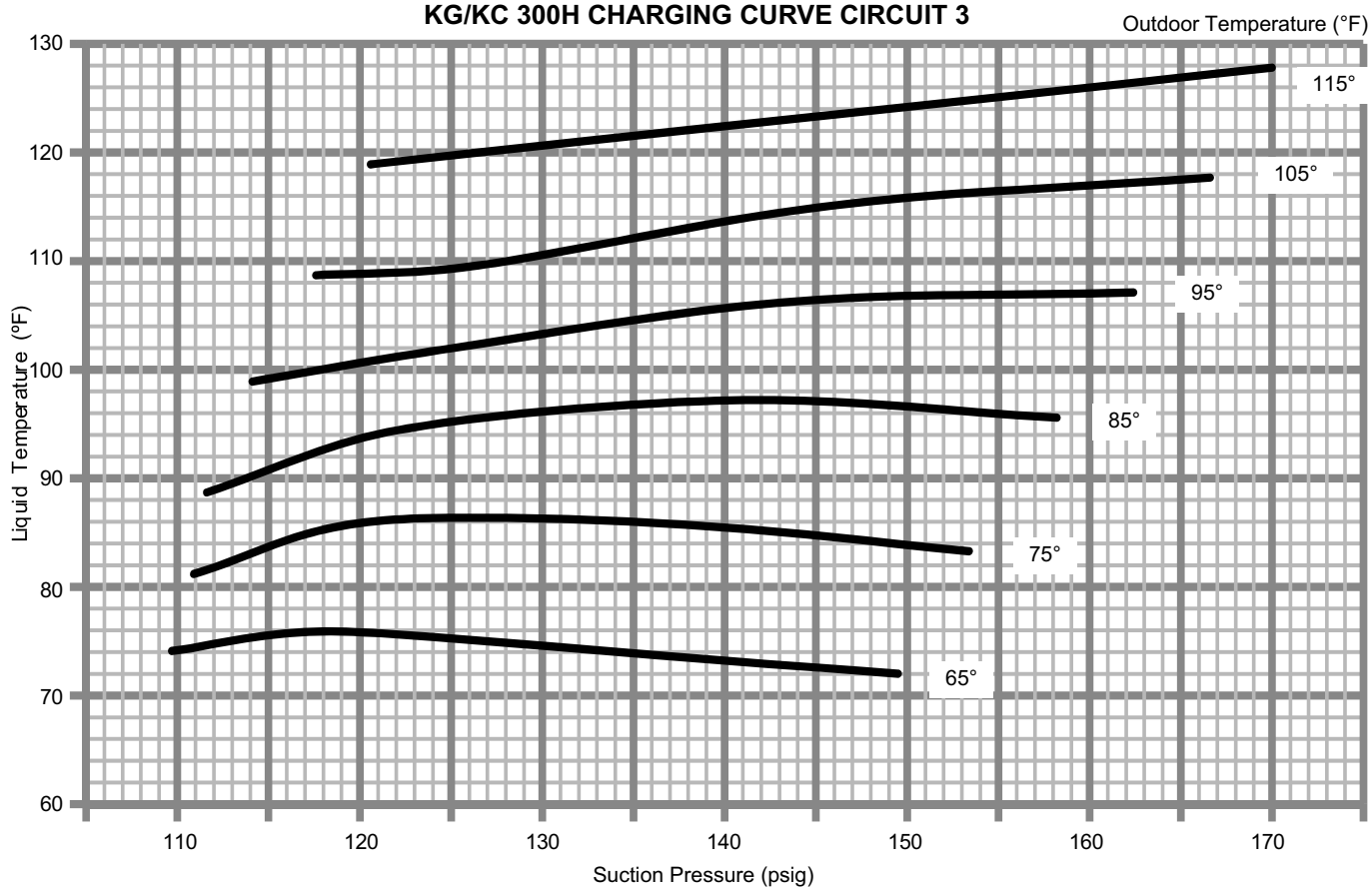

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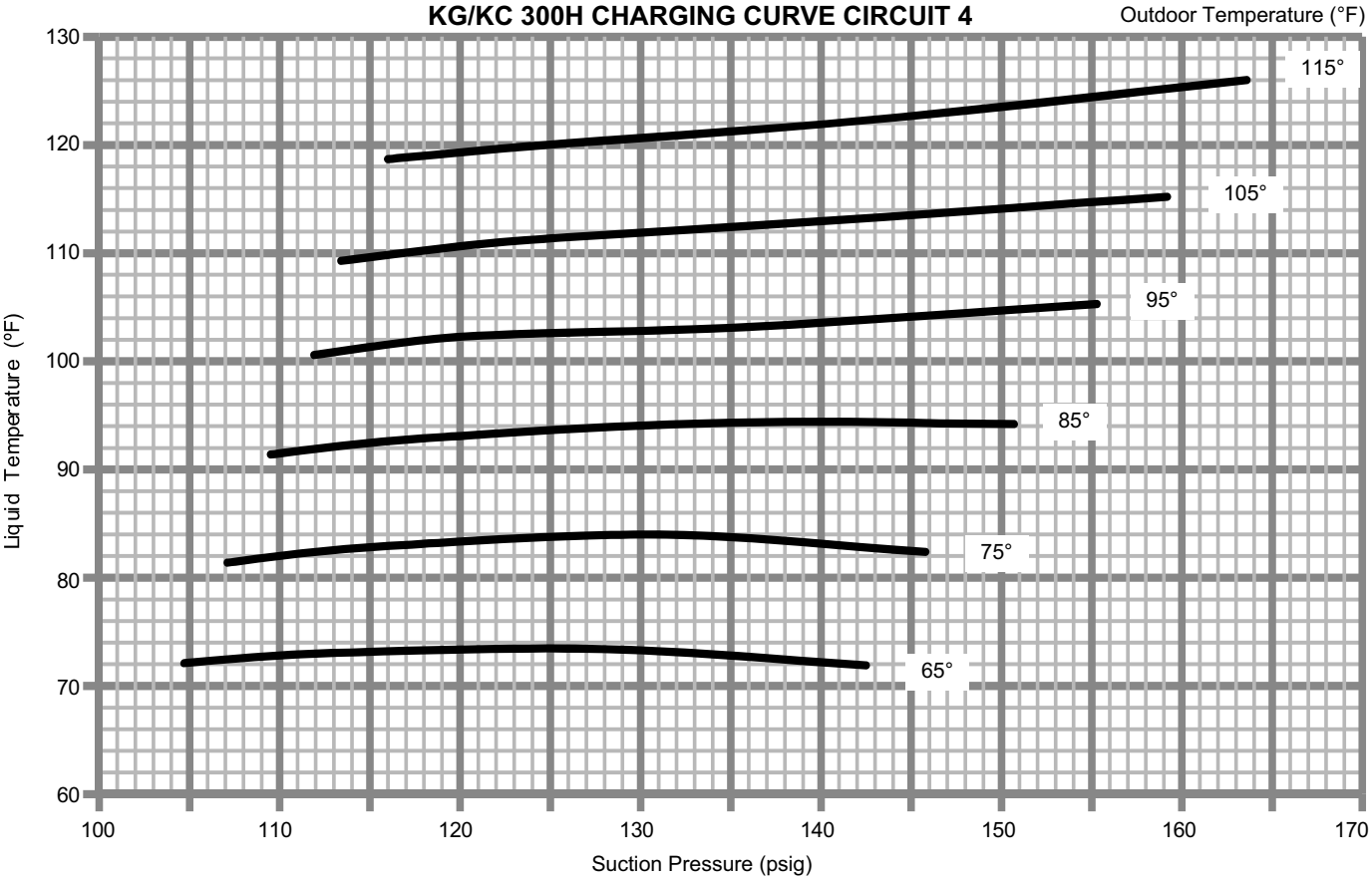


V- SYSTEMS SERVICE CHECKS

A-Heating System Service Checks

All KGA units are C.S.A. design certified without modification.

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

1-Gas Piping

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

2-Testing Gas Piping

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

When pressure testing gas lines, the gas valve must be disconnected and isolated. **Gas valves can be damaged if subjected to more than 0.5 psig [14"W.C. (3481 Pa)]**. See figure 25.

When checking piping connection for gas leaks, use the preferred means. Common kitchen detergents can cause harmful corrosion on various metals used in gas piping. The use of specialty Gas Leak Detector is strongly recommended. It is available as part number 31B2001. See CORP 8411-L10, for further details.

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

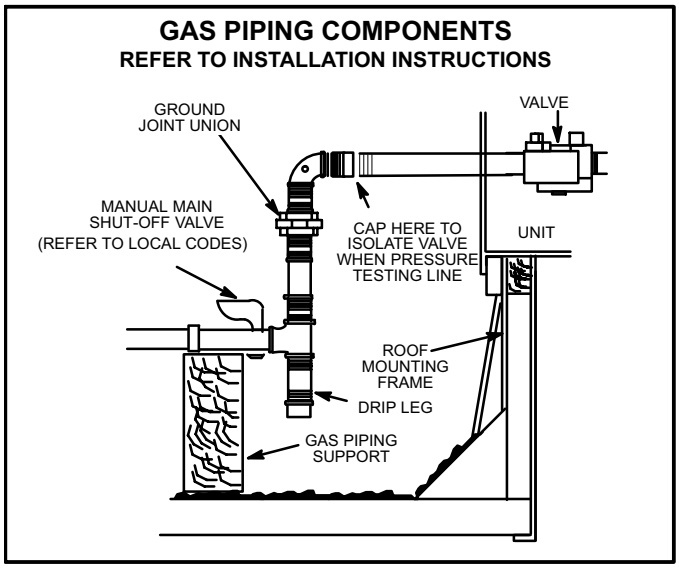


FIGURE 25

3-Testing Gas Supply Pressure

When testing gas supply pressure, connect test gauge to the inlet pressure tap located on unit gas valve GV1 and or GV3. Test supply gas pressure with unit firing at maximum rate (both stages energized). Make sure the reading falls within the range of the following values. Low pressure may result in erratic operation or "underfire." High pressure can result in permanent damage to the gas valve or "overfire." For natural gas units, operating pressure at the unit gas connection must be between 4.7"W.C. and 11.0"W.C. (1168 Pa and 2735 Pa). For L.P. gas units, operating pressure at the unit gas connection must be between 11.0"W.C. and 13.0"W.C. (2735 Pa and 3232 Pa).

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

4-Check and Adjust Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move test gauge to the outlet pressure tap located on unit gas valve GV1 and or GV3. See figure 17 for location of pressure tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See figure 17 for location of gas valve (manifold pressure) adjustment screw.

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

⚠ CAUTION

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

Manifold Adjustment Procedure

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

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

3- After allowing the unit to stabilize for five minutes, record the manifold pressure and compare to the values given in table 8.

5-High Altitude

Locate the high altitude conversion sticker in the unit literature bag. Fill out the conversion sticker and affix next to the unit nameplate.

Refer to table 23 for high altitude adjustments.

TABLE 23
HIGH ALTITUDE DERATE

Altitude Ft.*	Gas Manifold Pressure
2000-4500	See Unit Nameplate
4500 And Above	Derate 2% / 1000 Ft. Above Sea Level

*Units installed at 0-2000 feet do not need to be modified.

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

6-Proper Gas Flow

To check for proper gas flow to burners, determine Btuh input from unit rating plate or the gas heating capacity in the SPECIFICATIONS tables. Divide this input rating by the Btuh per cubic foot of available gas. Result is the number of cubic feet per hour required. Determine the flow of gas through gas meter for two minutes and multiply by 30 to get hourly flow of gas to the burners.

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

TABLE 24

Unit (BTU)	Seconds for Natural	Seconds for Propane
260,000	14	35
360,000	10	30
480,000	8	19

7-Heat Exchanger

To Access or Remove Heat Exchanger From Unit:

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

8-Flame Sensing

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

⚠ CAUTION

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

1- Disconnect power to unit.
2- Remove lead from sensing electrode and install a 0-50DC microamp meter in series between the sensing electrode and the sensing lead.
3- Reconnect power and adjust thermostat for heating demand.
4- When flame is established, compare reading to table 25. Do not bend electrodes.
5- Disconnect power to unit before disconnecting meter. Make sure sensor wire is securely reconnected before reconnecting power to unit.

TABLE 25

Manufacturer	Nominal Signal Microamps	Drop Out
JOHNSON	0.5 - 1.0	.09

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

B-Cooling System Service Checks

KGA 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 9 through 12.

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 26.

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

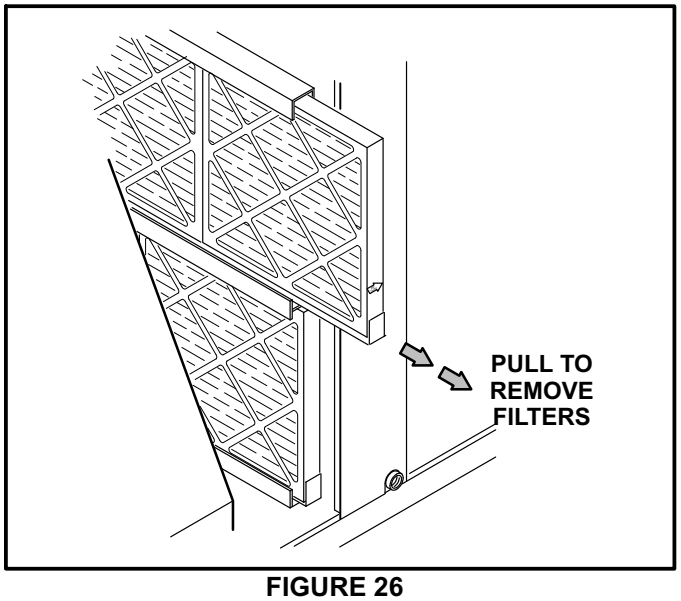


FIGURE 26

B-Lubrication

All motors used in KGA 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.

C-Burners

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

Clean burners as follows:

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

2- Remove burner compartment access panel.

3- Remove two screws securing burners to burner support and lift the burners from the orifices. See figure 27. Clean as necessary.

4- Locate the ignitor under the left burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 28.

5- Check the alignment of the ignitor and the sensor as shown in figure 29 and table 26.

6- Replace burners and screws securing burner.

7- Replace access panel.

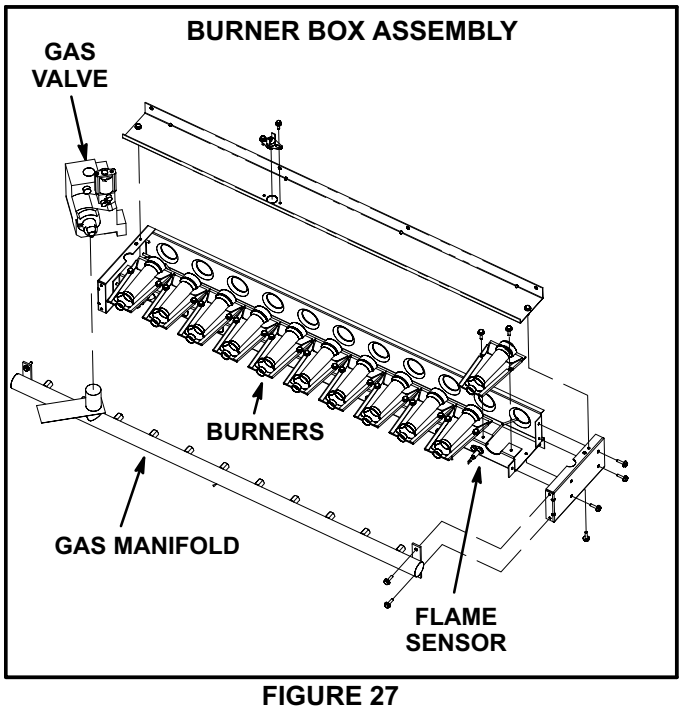


FIGURE 27

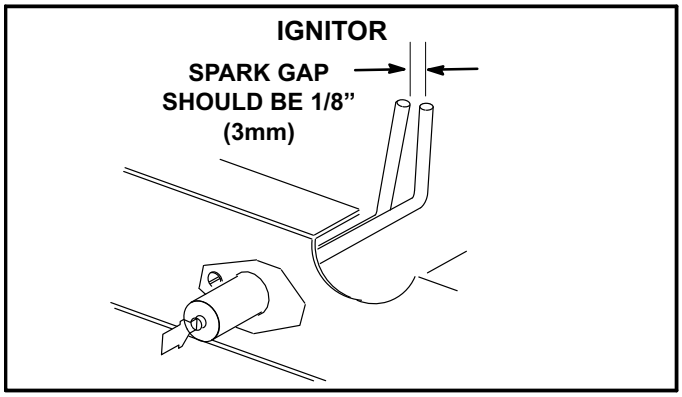


FIGURE 28

TABLE 26
IGNITOR AND SENSOR POSITION

Dimension	Unit Btuh Input	Length - in. (mm)	
		Ignitor	Sensor
A	260K	7-3/4 (197)	11 (279)
B	360K	5 (127)	5-1/2 (140)
C	480K	2-1/4 (57)	2-3/4 (70)

⚠WARNING

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

8- Restore electrical power and gas supply. Follow lighting instructions attached to unit and use inspection port in access panel to check flame.

D-Combustion Air Inducer

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

Under normal operating conditions, the combustion air inducer wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule. With power supply disconnected, the condition of the inducer wheel can be determined by looking through the vent opening.

Clean combustion air inducer as follows:

1- Shut off power supply and gas to unit.

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

3- Remove and retain screws securing combustion air inducer to flue box. Remove and retain two screws from bracket supporting vent connector. See figure 30.

4- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Clean accumulated dust from front of flue box cover

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

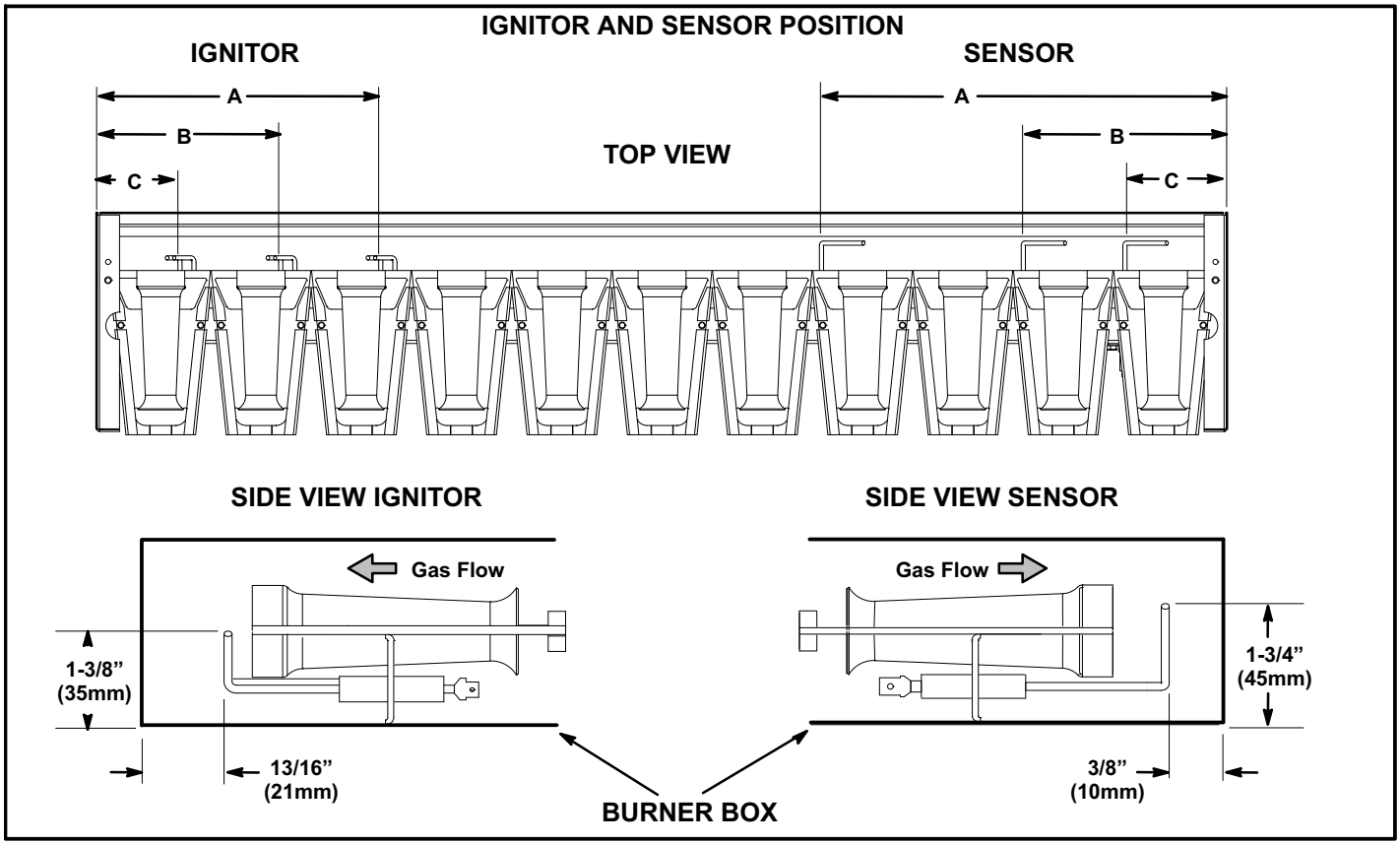


FIGURE 29

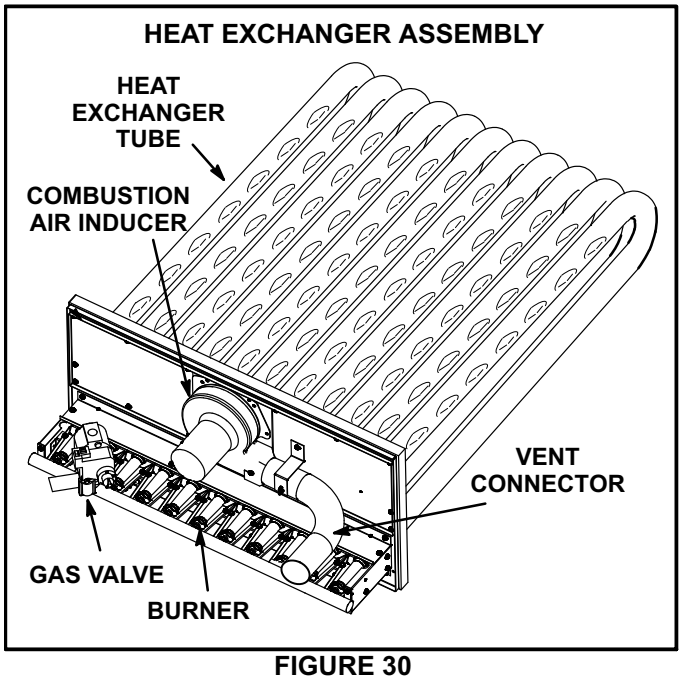


FIGURE 30

E-Flue Passageway and Flu Box

1- Remove combustion air inducer assembly as described in section D.

2- Remove flue box cover. Clean with a wire brush as required.

3- Clean tubes with a wire brush.

4- Reassemble the unit. The flue box cover gasket and combustion air inducer gasket should also be replaced during reassembly.

F-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.

G-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.

H-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.

I-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 KGA units.

A-C1CURB Mounting Frames

When installing the KGA units on a combustible surface for downflow discharge applications, the C1CURB70C-1 (8-inch), C1CURB71C-1 (14-inch), C1CURB72C-1 (18-inch) or C1CURB73C-1 (24-inch) roof mounting frames are used. For horizontal discharge applications, use C1CURB14C-1 (26-inch) or C1CURB15C-1 (30-inch) roof mounting frames when the unit is installed on a slab. Use C1CURB16C-1 (37-inch) or C1CURB17C-1 (41-inch) roof mounting frames for horizontal rooftop applications. These frames convert the unit from downflow to horizontal air flow. The rooftop frames meet National Roofing Code requirements. The roof mounting frames are recommended in all other applications but not required. If the KGA 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 31. Refer to the roof mounting frame installation instructions for details of proper assembly and installation. The roof mounting frame MUST be squared to the roof and leveled before the unit is set on the frame. The plenum system MUST also be installed before the unit is set on the mounting frame. Typical roof curbing and flashing is shown in figure 32. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

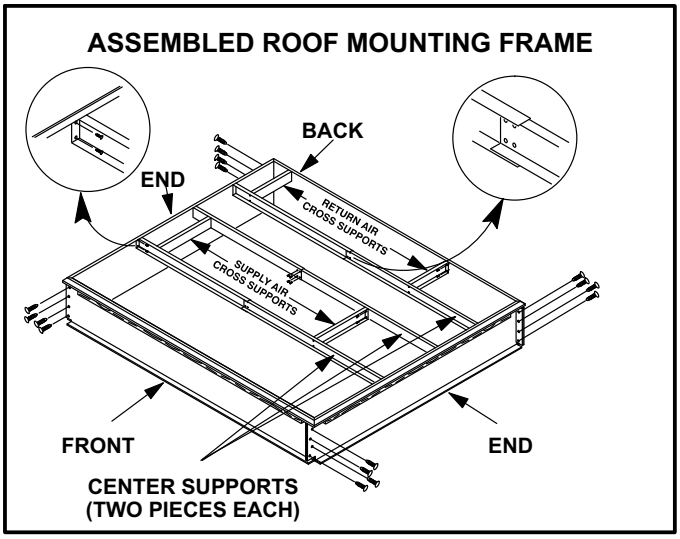


FIGURE 31

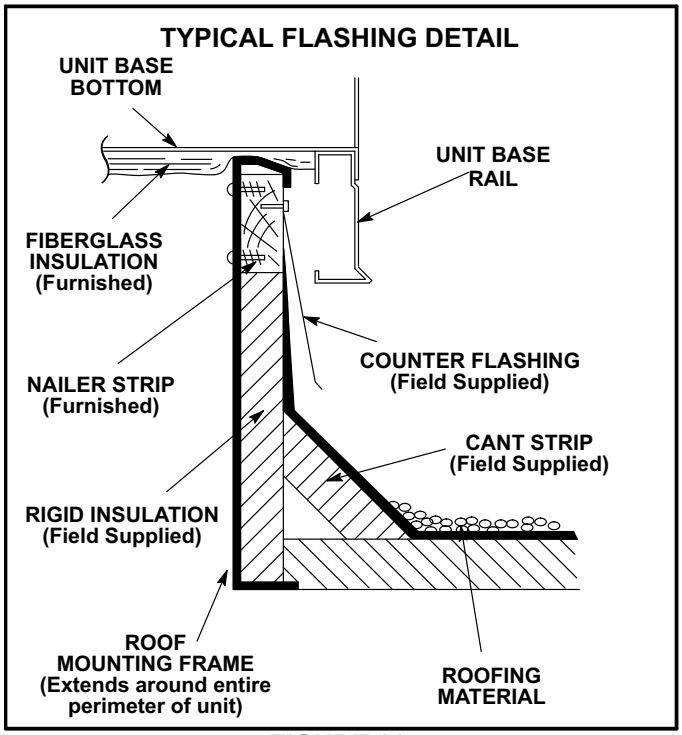


FIGURE 32

B-Transitions

Optional supply/return transitions are available for use with KGA series units installed with the roof mounting frame. Transition C1DIFF33CC-1 is used with the 13-ton and 15-ton units. C1DIFF34CC-1 is used with the 17.5-ton, 20-ton and 25-ton units. The 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 KGA units. Refer to manufacturer's instructions included with transition for detailed installation procedures.

D-K1ECON

Unit may contain an optional modulating economizer equipped with an A6 enthalpy control and an S175 outdoor temperature sensor or A7 enthalpy sensor. The economizer modulates to use outdoor air for free cooling when temperature is suitable.

The A6 enthalpy control is located in the economizer access area. See figure 33. The S175 temperature sensor or A7 enthalpy sensor is located on the division panel between horizontal supply and return air sections.

Optional Sensors

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

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

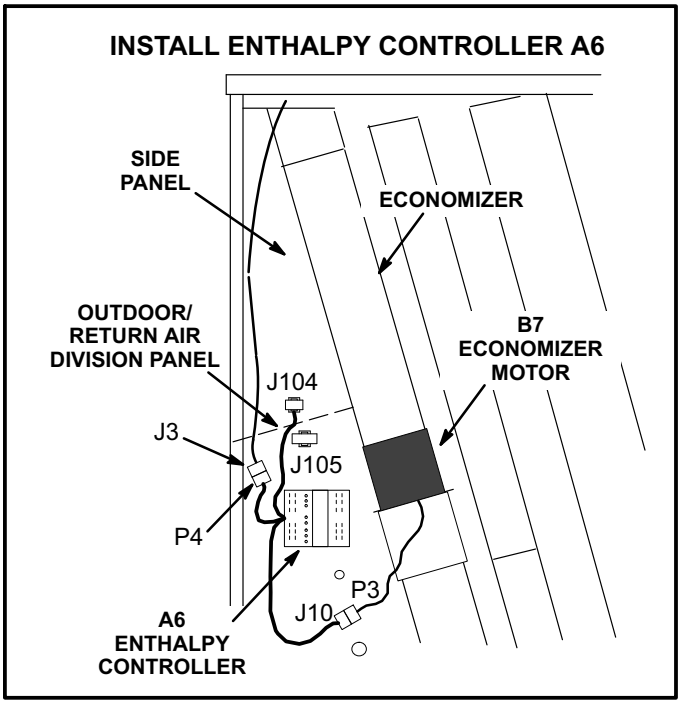


FIGURE 33

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 34.

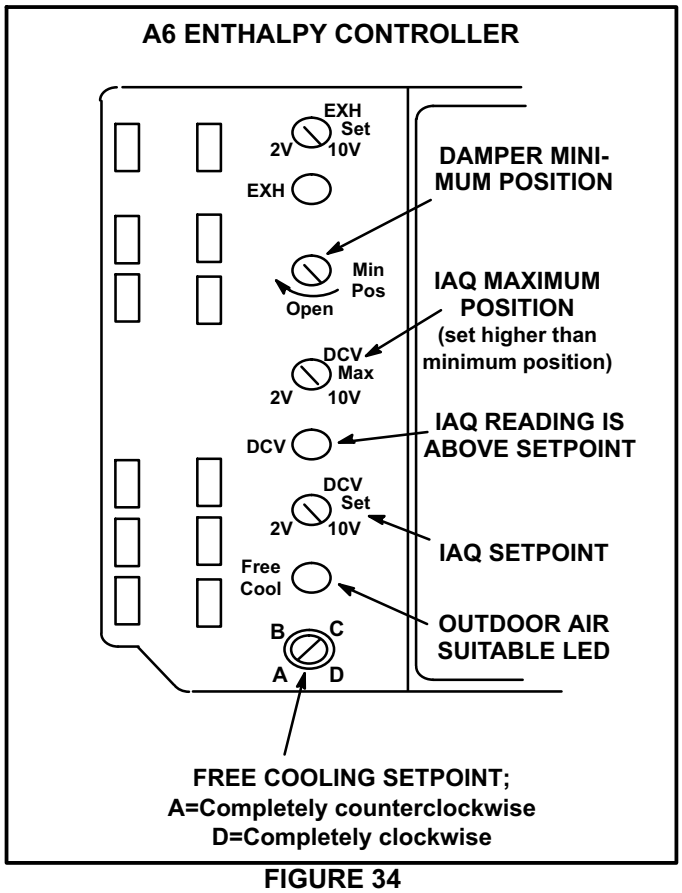


FIGURE 34

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 34.

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 27 shows the free cooling setpoints for enthalpy sensors. Use the recommended setpoint and adjust as necessary.

For example: At setting A (table 27), 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 27
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 35. 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.

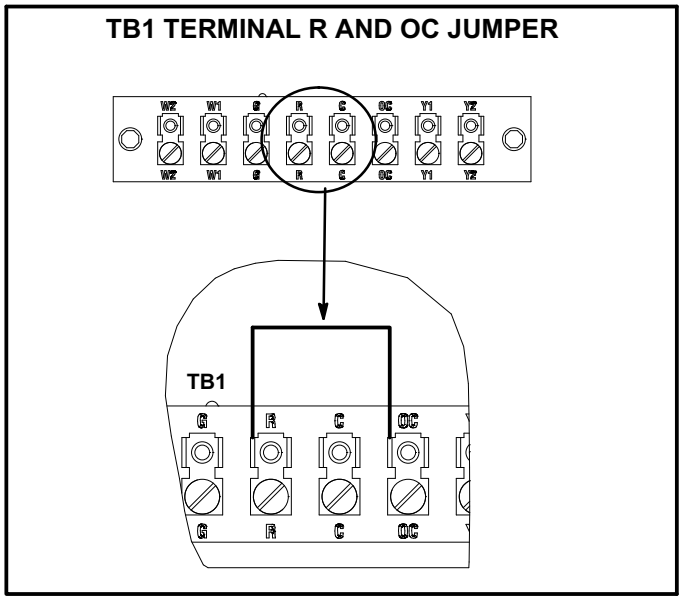


FIGURE 35

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.

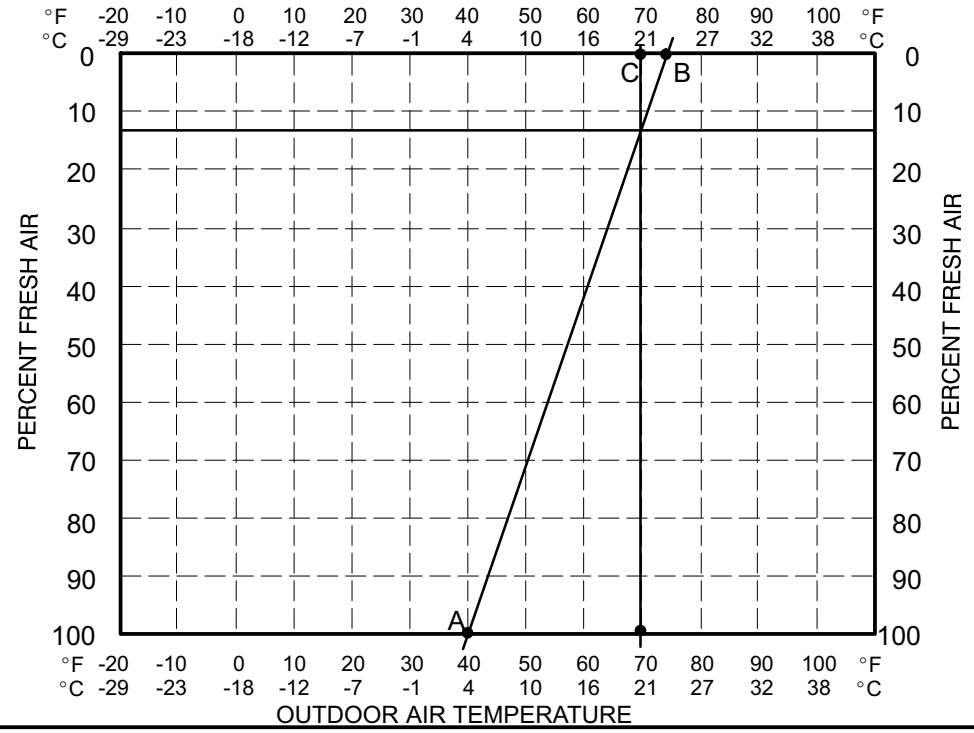
2- Rotate MIN POS SET potentiometer to approximate desired fresh air percentage.

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 and label the point "B" (74°F, 23°C shown).

CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE



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.

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 34.

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 34.

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 28 for economizer operation when outdoor air is suitable. See table 29 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 28

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 29

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.

E-Outdoor Air Dampers

Outdoor air dampers used on KGA units consist of a set of dampers which may be manually operated (C1DAMP10C-1) or motorized (K1DAMP20C-1) to allow outside air into the system (see figure 36). Either air damper can be installed in KGA units. The motorized damper assembly opens to minimum position during the occupied time period and remains closed during the unoccupied period. Manual damper assembly is set at installation and remains in that position. See figure 37. 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.

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

Follow the steps to determine fresh air percentage

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

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

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

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

5- Draw a vertical line through point C.

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

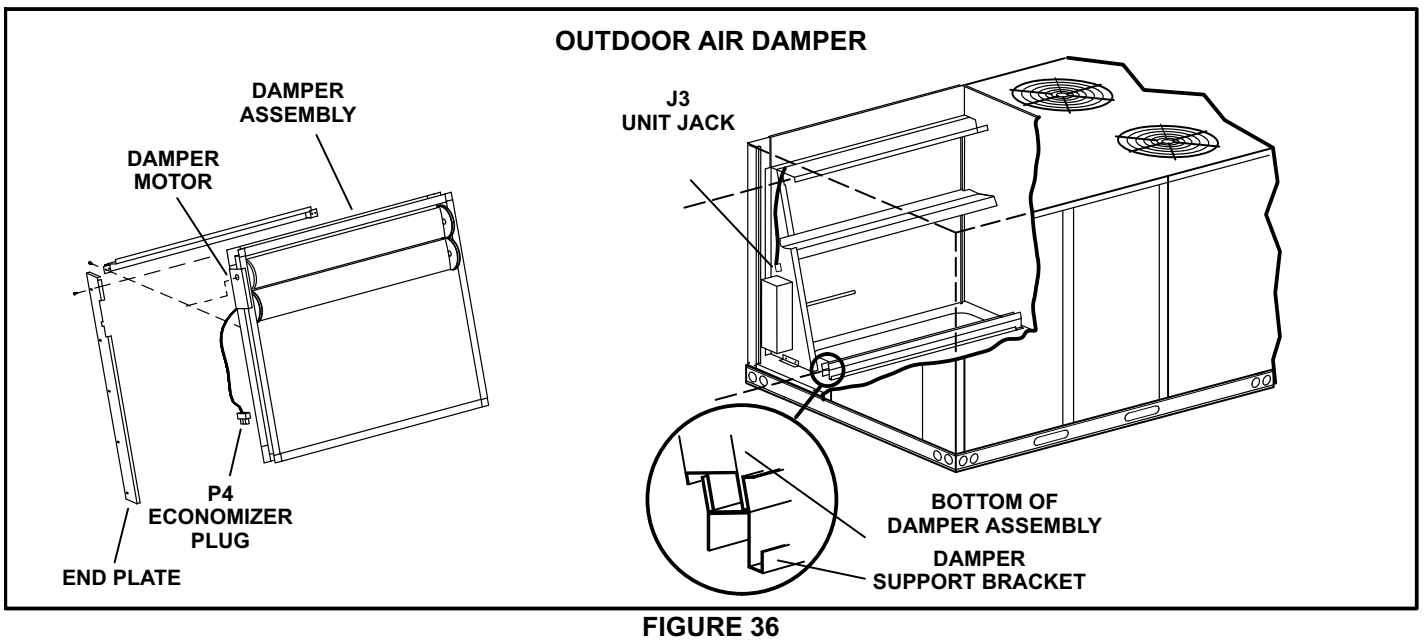


FIGURE 36

7- If fresh air percentage is less than desired, adjust thumbwheel higher. If fresh air percentage is more than desired, adjust thumbwheel lower. Repeat steps until calculation reads desired fresh air percentage. See figure 38.

Set damper minimum position in the same manner as economizer minimum position. Adjust motorized damper position using the thumbwheel on the damper motor. See figure 38. Manual damper fresh air intake percentage can be determined in the same manner.

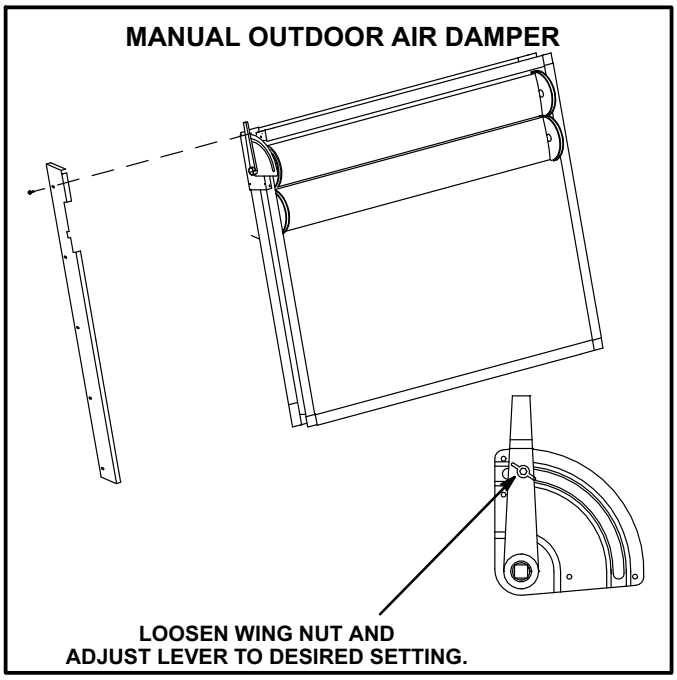


FIGURE 37

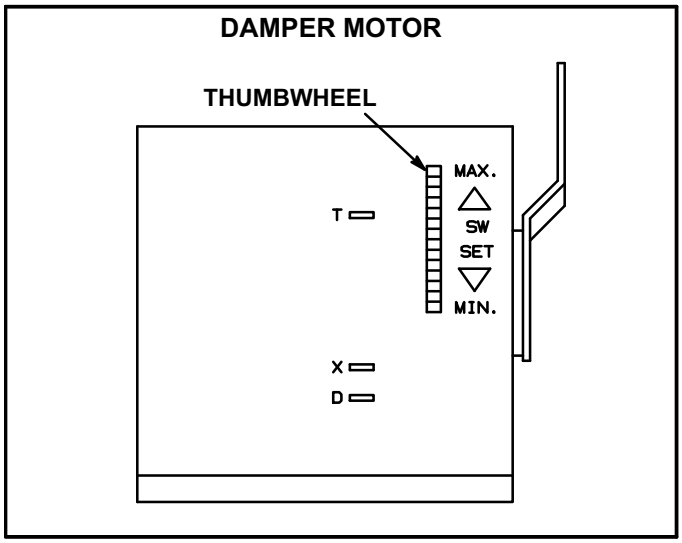


FIGURE 38

F-Barometric Relief Dampers

C1DAMP50 dampers (figure 39) are used in downflow and LAGED(H)18/24 are used in horizontal air discharge applications. LAGED(H) gravity exhaust dampers are installed in the return air plenum . The dampers must be used any time an economizer or power exhaust fans are applied to KGA series units.

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

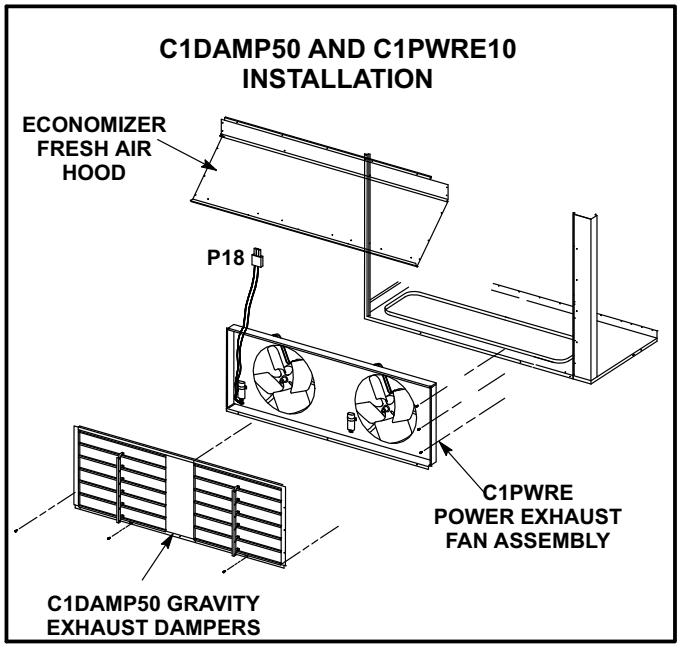


FIGURE 39

G-C1PWRE10C Power Exhaust Fans

Power exhaust fans are used in downflow applications only. The fans require optional downflow barometric relief 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 39 shows the location of the C1PWRE. See installation instructions for more detail.

H-Indoor Air Quality (CO_2) Sensor A63

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

I- Cold Weather Kit (Canada only)

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

The kit includes the following parts:

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

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

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

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

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

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

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

J-Smoke Detectors A17 and A64

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

K-Control Systems

Three different types of control systems may be used with the KGA 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.

1- Electro-mechanical thermostat (13F06)

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

2- Electronic thermostat (see price book)

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

3- Honeywell T7300 thermostat (81G59)

The Honeywell T7300 thermostat is a programmable, internal or optional remote temperature sensing thermostat. The T7300 provides occupied and unoccupied changeover control.

L-LP / Propane Kit

Units require two (one for each gas heat section) LP kits. The kit includes one gas valve, eleven burner orifices and three stickers. For more detail refer to the natural to LP gas changeover kit installation instructions.

M-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.

N-Drain Pan Overflow Switch S149 (optional)

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

O-Multi-Stage Air Volume Start-Up

NOTE - *Units equipped a Variable Frequency Drive (VFD) are designed to operate on balanced, three-phase power. Operating units on unbalanced three-phase power will reduce the reliability of all electrical components in the unit. Unbalanced power is a result of the power delivery system supplied by the local utility company. Factory-installed inverters are sized to drive blower motors with an equivalent current rating using balanced three-phase power. If unbalanced three-phase power is supplied; the installer must replace the existing factory-installed inverter with an inverter that has a higher current rating to allow for the imbalance. Refer to the installation instructions for additional information and available replacements*.

A-General

The optional Multi-Stage Air Volume units provide two blower speeds. The blower operates at lower speeds when cooling demand is low and at higher speeds when cooling demand is high. This results in lower energy consumption.

The multi-stage air volume units are set to operate at high speed during ventilation (blower “G” only signal); however, the unit 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 40.

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 40.

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.

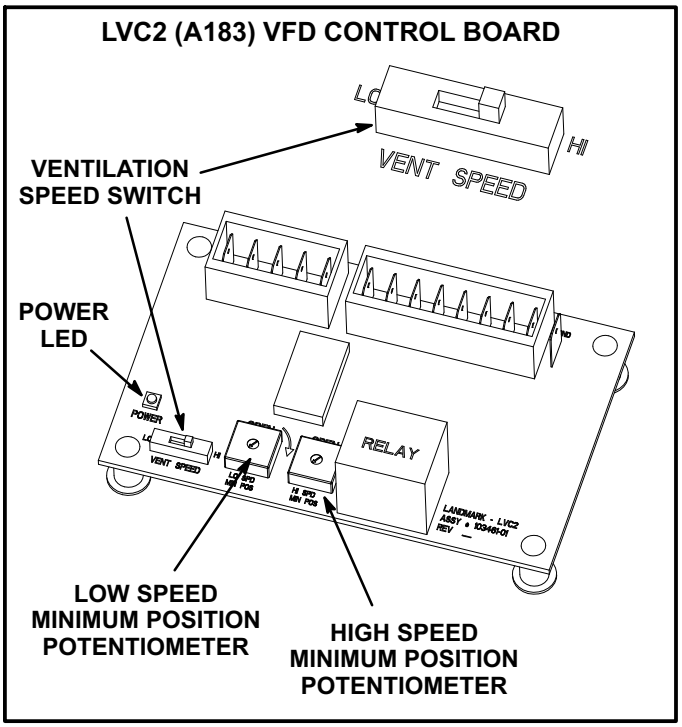


FIGURE 40

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 41.

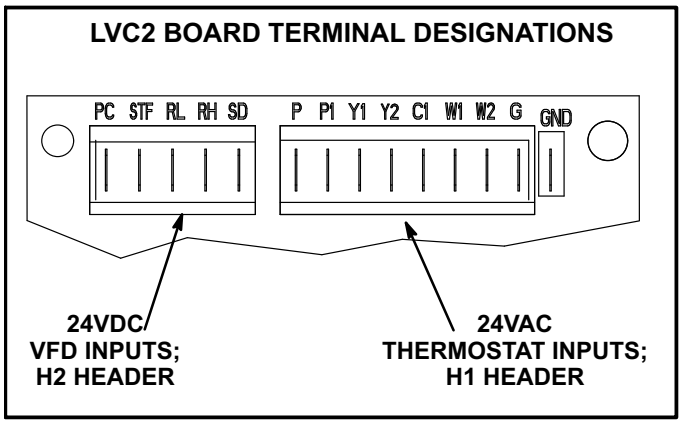


FIGURE 41

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

5- Check the power LED on the board. See figure 40.

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.

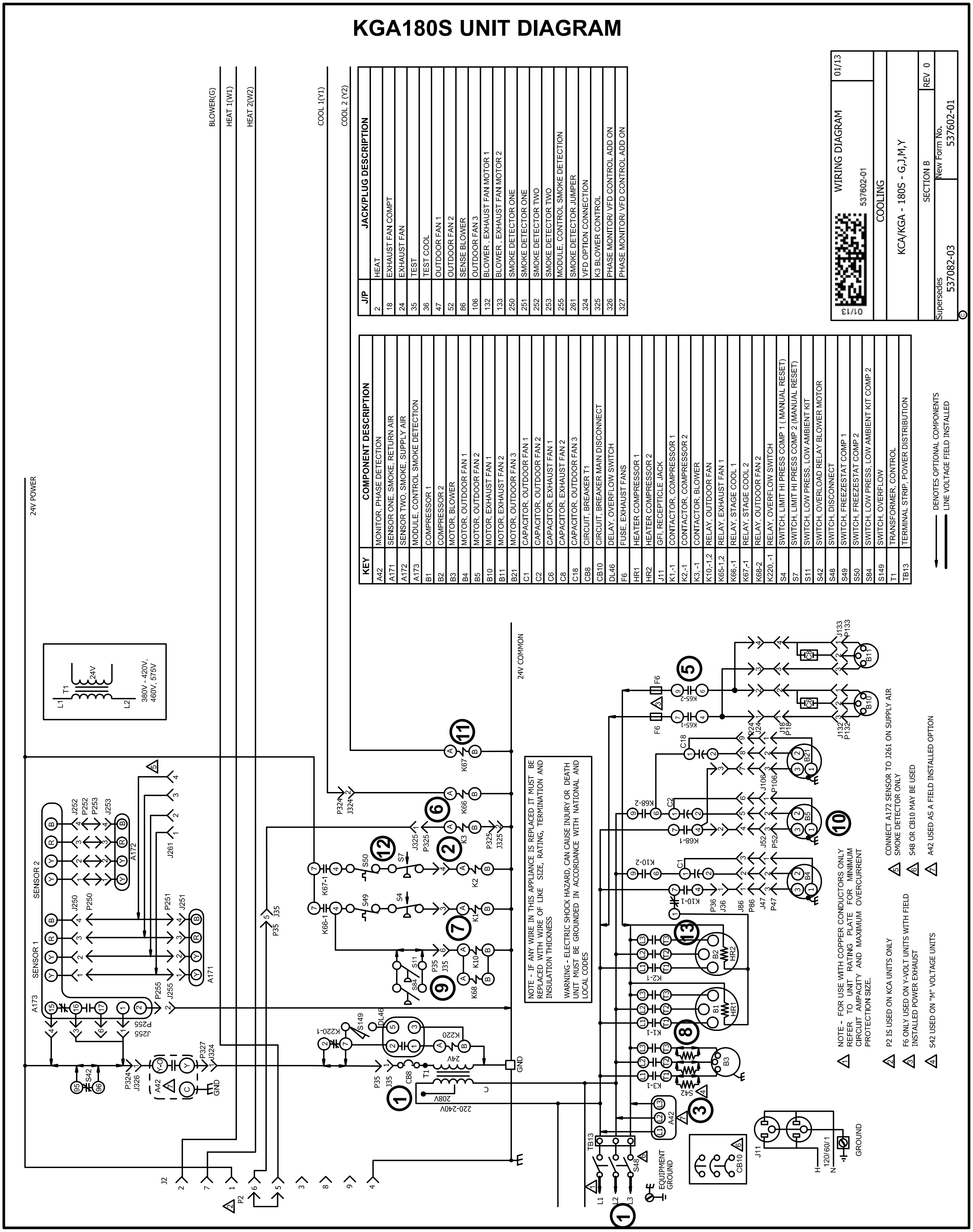
8- When LVC2 24VAC thermostat blower (G) input and 24VDC power are present, check the LVC2 low and high speed outputs. The LVC2 uses inverse logic to enable the blower; 1VDC will be read at the enabled blower speed terminal. See table 30.

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

TABLE 30
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	

KGA180S UNIT DIAGRAM



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
B21	MOTOR, OUTDOOR FAN 3
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
CB8	CIRCUIT, BREAKER T1
CB10	CIRCUIT, BREAKER MAIN DISCONNECT
DL46	DELAY, OVERFLOW SWITCH
F6	FUSE, EXHAUST FANS
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
J11	GFI, RECEPTICLE JACK
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3,-1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K65-1,2	RELAY, EXHAUST FAN 1
K66,-1	RELAY, STAGE COOL 1
K67,-1	RELAY, STAGE COOL 2
K68-2	RELAY, OUTDOOR FAN 2
K220, -1	RELAY, OVERFLOW SWITCH
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
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S48	SWITCH, DISCONNECT
S49	SWITCH, FREEZESTAT COMP 1
S50	SWITCH, FREEZESTAT COMP 2
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S149	SWITCH, OVERFLOW
T1	TRANSFORMER, 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	SENSE BLOWER
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
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

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

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

2 P2 IS USED ON KCA UNITS ONLY

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

4 S42 USED ON "M" VOLTAGE UNITS

5 CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY

6 S48 OR CB10 MAY BE USED

7 A42 USED AS A FIELD INSTALLED OPTION

DENOTES OPTIONAL COMPONENTS

LINE VOLTAGE FIELD INSTALLED

WIRING DIAGRAM 01/13

537602-01

COOLING

KCA/KGA - 180S - G,J,M,Y

SECTION B

Supersedes 537082-03

New Form No. 537602-01

REV 0

KGA180S SEQUENCE OF OPERATION

Power:

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

Blower Operation:

2- TB1 receives a demand from thermostat terminal and energizes blower contactor K3 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)

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

7- 24VAC is routed from T1 through N.C. freezestat S49 and N.C. high pressure switch S4 to energize compressor contactor K1.

8- N.O. contacts K1-1 close energizing compressor B1.

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

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

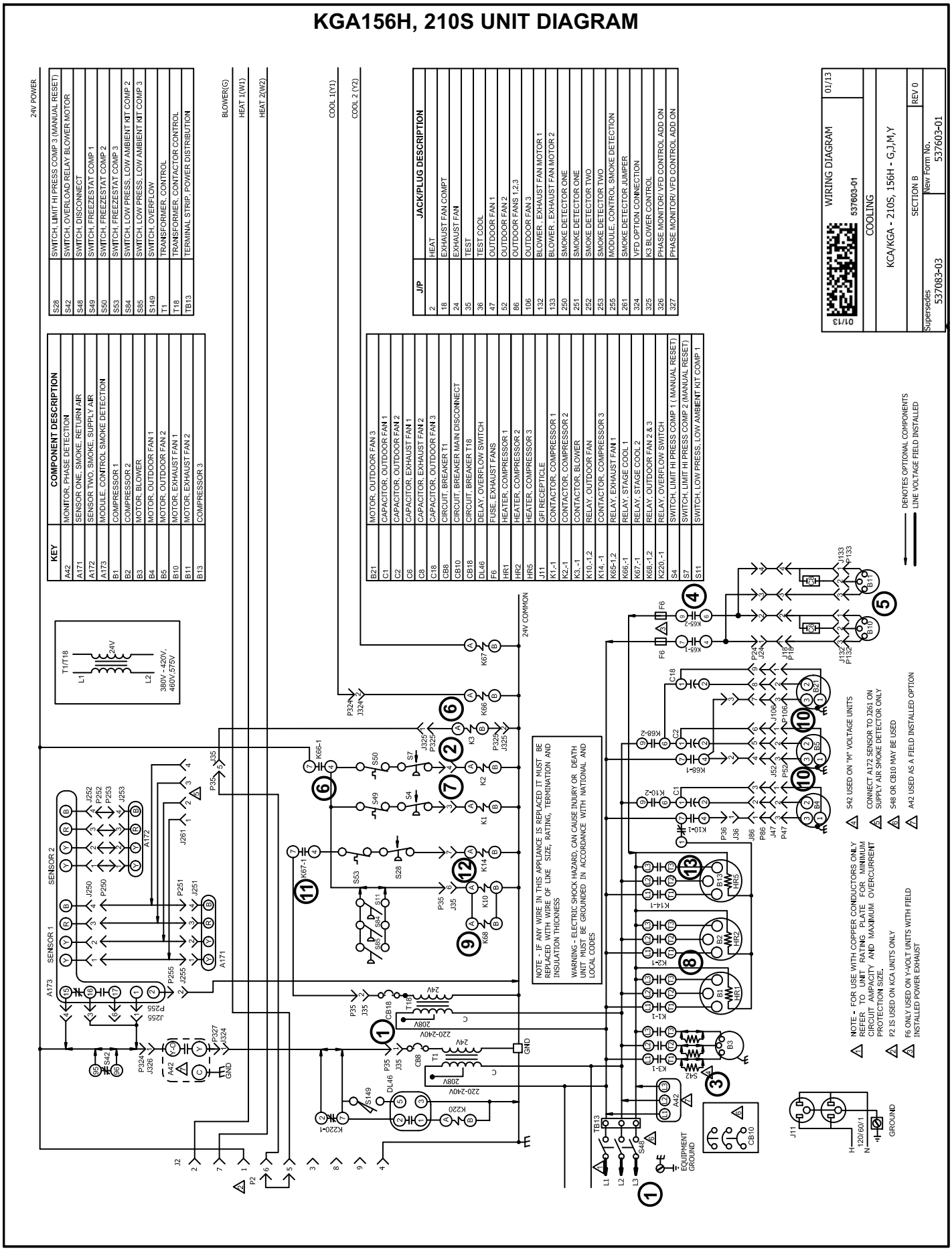
2nd Stage Cooling (compressor B2 is energized)

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

12- 24VAC is routed from T1 through N.C. freezestat S50 and N.C. high pressure switch S7 to energize compressor contactor K2.

13- N.O. K2 closes energizing compressor B2.

KGA156H, 210S UNIT DIAGRAM



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 (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

B21	MOTOR, OUTDOOR FAN 3
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
CB8	CIRCUIT, BREAKER T1
CB10	CIRCUIT, BREAKER MAIN DISCONNECT
CB18	CIRCUIT, BREAKER T18
DL46	DELAY, OVERFLOW SWITCH
F6	FUSE, EXHAUST FANS
HR1	HEATER, COMPRESSOR 1
HR2	HEATER, COMPRESSOR 2
HR5	HEATER, COMPRESSOR 3
J11	GFI RECEPTICLE
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3,-1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K14,-1	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
K220,-1	RELAY, OVERFLOW SWITCH
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

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
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

KGA156H, 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.

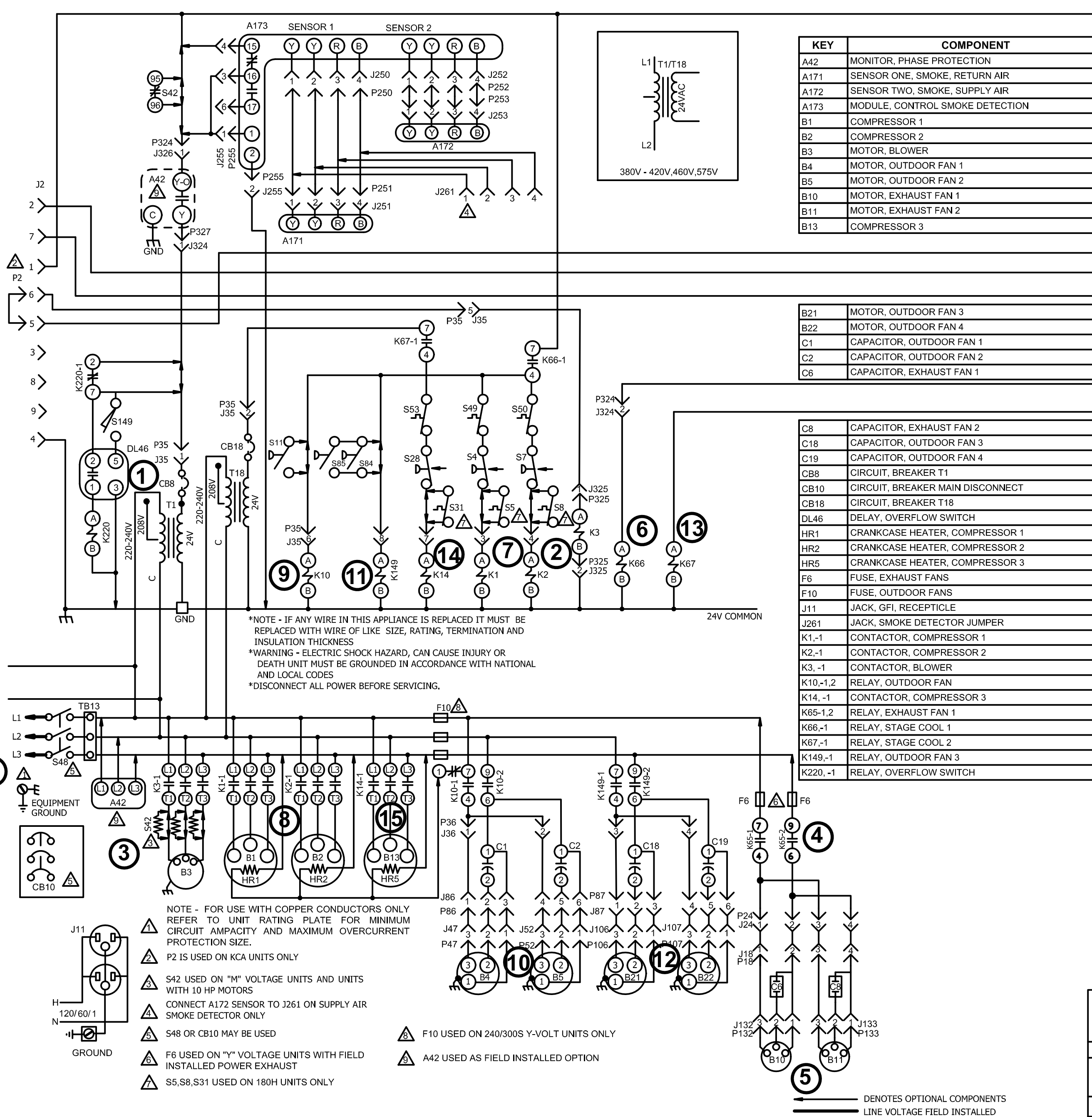
2nd Stage Cooling (compressor B13 is energized)

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.

KGA180H, 240S & 300S 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	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3, -1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K14, -1	CONTACTOR, COMPRESSOR 3
K65-1,2	RELAY, EXHAUST FAN 1
K66,-1	RELAY, STAGE COOL 1
K67,-1	RELAY, STAGE COOL 2
K149,-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

*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.

2. P2 IS USED ON KCA UNITS ONLY
3. S42 USED ON "M" VOLTAGE UNITS AND UNITS WITH 10 HP MOTORS
4. CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY
5. S48 OR CB10 MAY BE USED
6. F6 USED ON "Y" VOLTAGE UNITS WITH FIELD INSTALLED POWER EXHAUST
7. S5,S8,S31 USED ON 180H UNITS ONLY
8. F10 USED ON 240/300S Y-VOLT UNITS ONLY
9. A42 USED AS FIELD INSTALLED OPTION

01/13 537586-01	WIRING DIAGRAM	01/13
COOLING		
KCA/KGA - 240/300S, 180H - G,J,M,Y		
SECTION B		REV 0
Supersedes 537084-03	New Form No. 537586-01	

KGA180H, 240S, 300S 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.

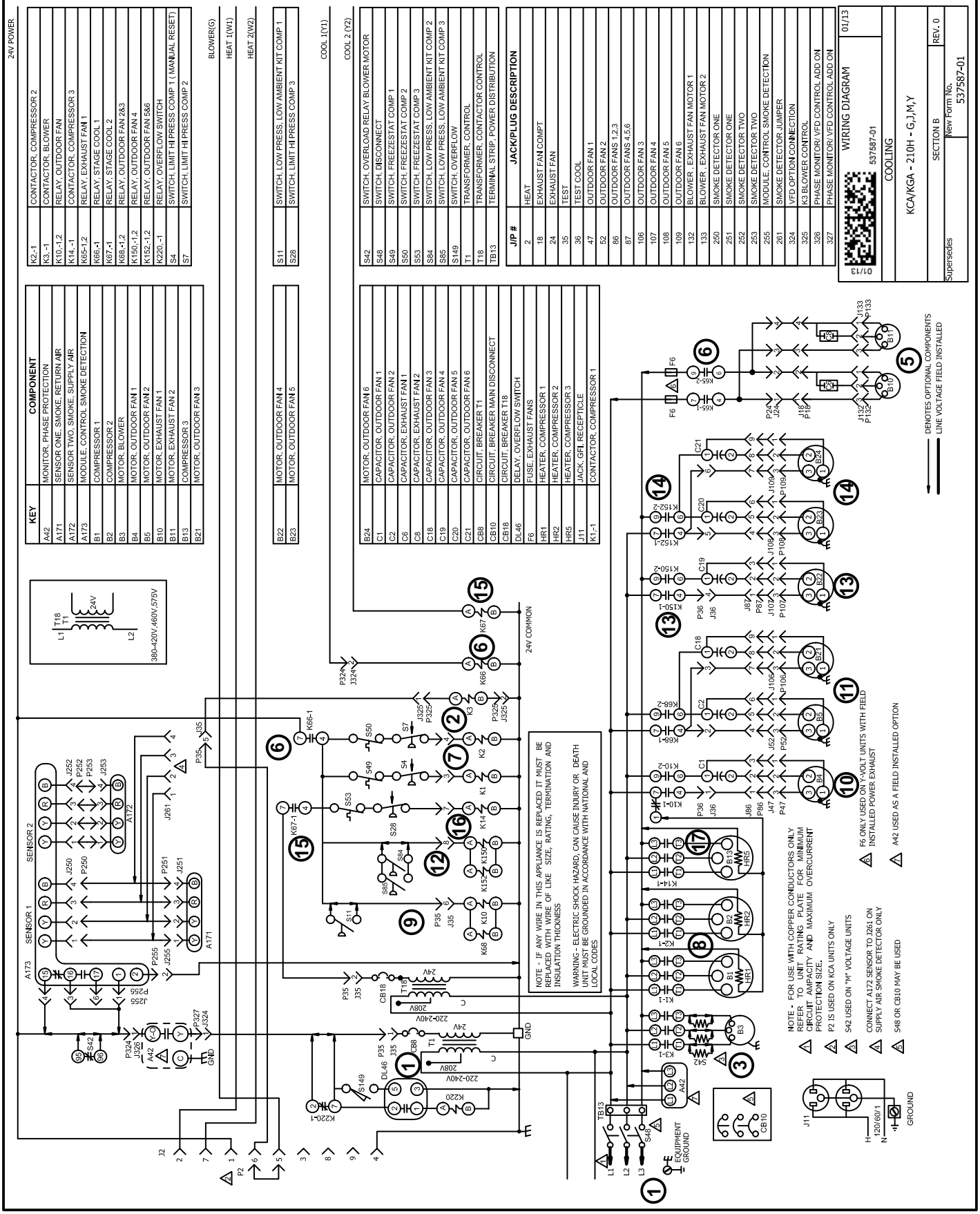
2nd Stage Cooling (compressor B13 is energized)

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.

KGA210H 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
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 FANS
HR1	HEATER, COMPRESSOR 1
HR2	HEATER, COMPRESSOR 2
HR5	HEATER, COMPRESSOR 3
J11	JACK, GFI, RECEPTICLE
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3,-1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K14,-1	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
S4	SWITCH, LIMIT-HI PRESS COMP 1 (MANUAL RESET)
S7	SWITCH, LIMIT-HI PRESS COMP 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 1
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
87	OUTDOOR FANS 4,5,6
106	OUTDOOR FAN 3
107	OUTDOOR FAN 4
108	OUTDOOR FAN 5
109	OUTDOOR FAN 6
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
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

KGA210H 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 switch S11 closes 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.

12- Optional N.O. low ambient switch S84 and/or S85 close to energize condenser fan relay K150 and K152.

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

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

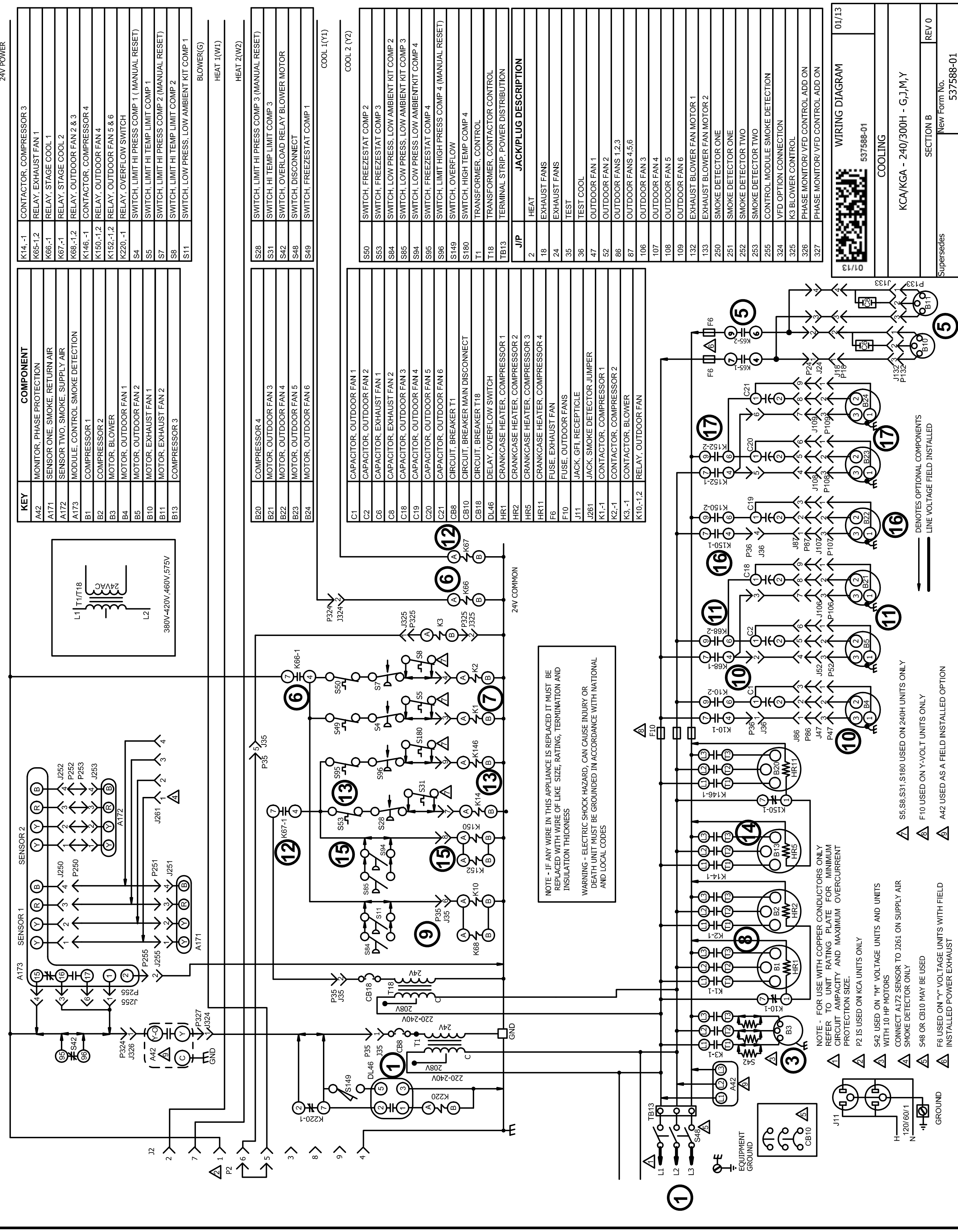
2nd Stage Cooling (compressor B13 is energized)

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

16- 24VAC is routed from T18 to N.C. freezestat S53 and N.C. high pressure switch S28. Compressor contactor K14 is energized.

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

KGA240H, 300H UNIT DIAGRAM



KGA240H, 300H 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. freezestats S53, S95 and N.C. high pressure switch S28 and S96. Compressor contactors K14 and K146 are energized.

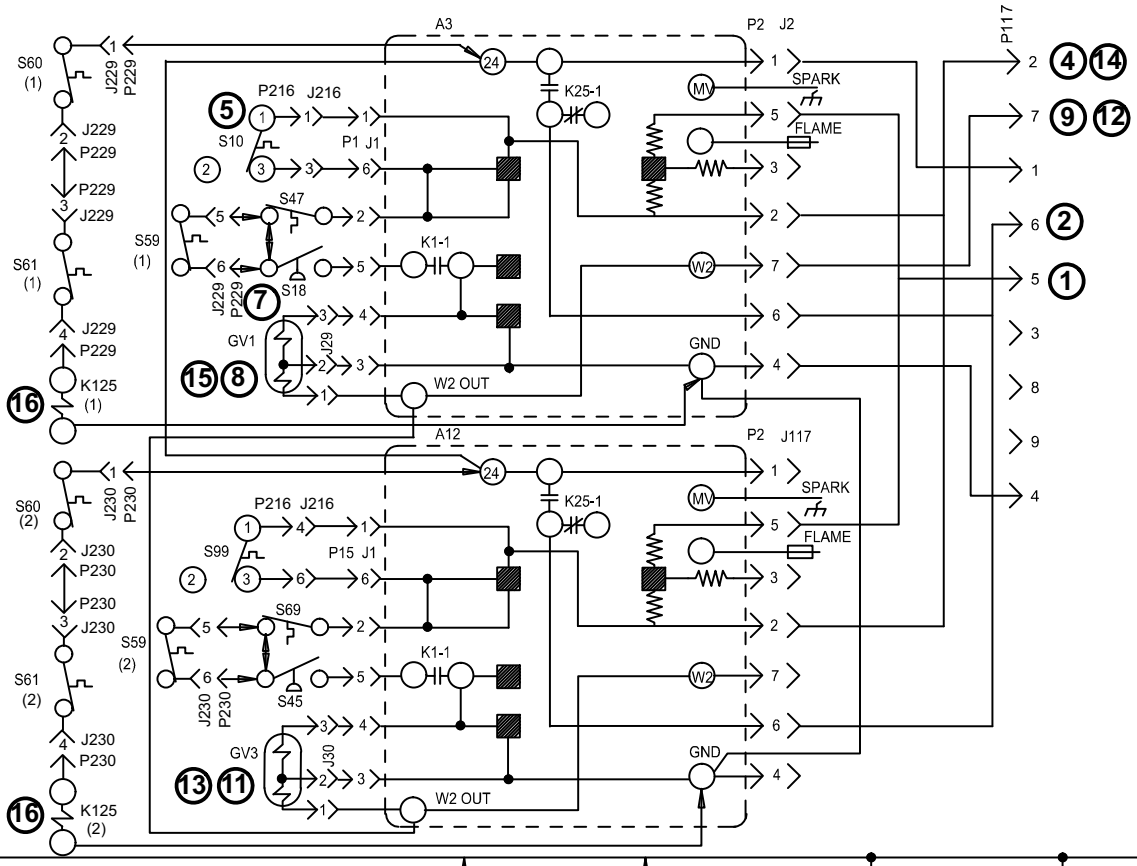
14- N.O. Contacts K14-1 close energizing compressor B13. N.O. Contacts K146-1 close energizing compressor B20.

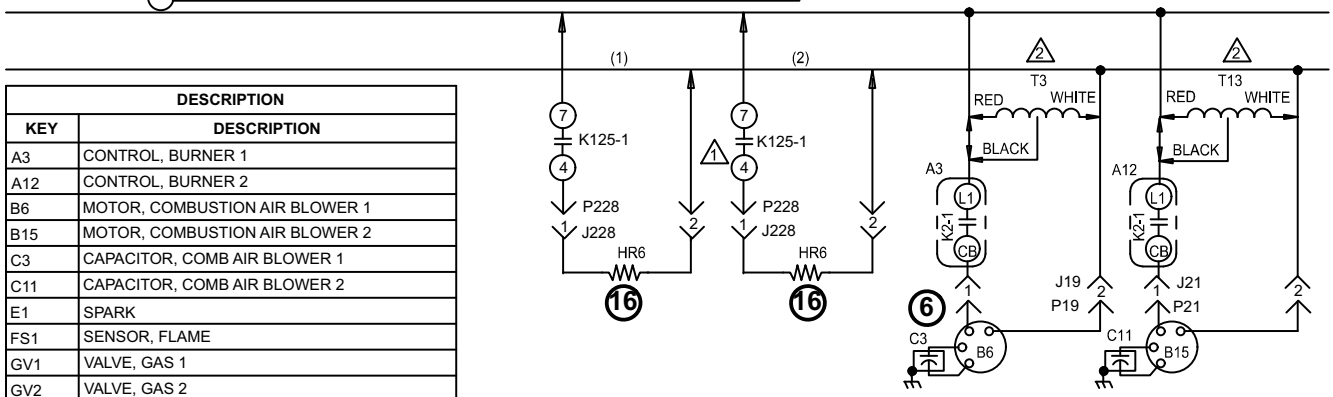
15- Optional N.O. low ambient switches S85 and/or S94 close to energize condenser fan relay K150 and K152.

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.

GAS HEAT FOR KGA156H-300





DESCRIPTION	
KEY	DESCRIPTION
A3	CONTROL, BURNER 1
A12	CONTROL, BURNER 2
B6	MOTOR, COMBUSTION AIR BLOWER 1
B15	MOTOR, COMBUSTION AIR BLOWER 2
C3	CAPACITOR, COMB AIR BLOWER 1
C11	CAPACITOR, COMB AIR BLOWER 2
E1	SPARK
FS1	SENSOR, FLAME
GV1	VALVE, GAS 1
GV2	VALVE, GAS 2
HR6	HEATER, -50C LOW AMBIENT KIT
J1	JACK, GAS LIMIT
J2	HJACK, HEAT
J19	JACK, COMBUSTION AIR BLOWER 1
J21	JACK, COMBUSTION AIR BLOWER 2
J29	JACK, GAS 1
J30	JACK, GAS 2
J117	JACK, GAS 2 CONTROL
J216	JACK, PRIMARY LIMIT
J228	JACK, VESTIBULE HEATER
J229	JACK, VESTIBULE HEATER CONTROL 1
J230	JACK, VESTIBULE HEATER CONTROL 2
K125,-1	RELAY, HEAT SHUT OFF
P1	PLUG, GAS LIMIT
P2	PLUG, HEAT
P15	PLUG, F.A.T SHIFT
P19	PLUG, COMB AIR BLOWER
P21	PLUG, COMB AIR BLOWER 2
P117	PLUG, GAS 2 CONTROL
P216	PLUG, PRIMARY LIMIT
P228	PLUG, VESTIBULE HEATER
P229	PLUG, VESTIBULE HEATER, CONTROL 1
P230	PLUG, VESTIBULE HEATER, CONTROL 2
S10	SWITCH, LIMIT PRIMARY BURNER 1
S18	SWITCH, COMB AIR BLOWER, PROVE 1
S45	SWITCH, COMB AIR BLOWER, PROVE 2
S47	SWITCH, FLAME ROLLOUT BURNER 1
S59	TSTAT, OPEN -35C, CLOSE -50C
S60	TSTAT, -23C CL, -7C OP, -50C LOW AMB KIT
S61	TSTAT, +24C OPEN, -50C LOW AMB KIT
S69	SWITCH, FLAME ROLLOUT BURNER 2
S99	SWITCH, LIMIT PRIMARY BURNER 2
T3	TRANSFORMER, COMBUSTION AIR BLOWER 1
T13	TRANSFORMER, COMBUSTION AIR BLOWER 2

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

2 T3 & T13 USED ON 575V UNITS ONLY

INDICATES MICRO PROCESSER

DENOTES OPTIONAL COMPONENTS

	WIRING DIAGRAM	12/09
HEATING		
GAS HEAT FOR KGA 260, 360 AND 480 UNITS		
SECTION A		REV. 2.0
Supersedes 537054-01	New Form No. 537056-01	

GAS HEAT FOR KGA156H-300 UNITS

Blower Operation:

1- 24VAC is routed from the thermostat G terminal through P117-5 to A3 and A12 ignition controls.

2- A3 and A12 N.O. K25-1 contacts close and 24VAC is routed through P117-6.

3- On non-MSAV units, the blower is energized via K3 contactor as shown in unit diagrams and sequence of operations. On MSAV units, the A183 VFD control board determines blower speed as shown in MSAV sequence of operation.

First Stage Heat:

4- The thermostat initiates W1 heating demand.

5- 24VAC is routed from TB1 to ignition controls A3 and A12 through P117. A3 proves N.C. primary limit S10 and N.C. rollout switch S47. A12 proves N.C. primary limit S99 and N.C. rollout switch S69.

6- Combustion air inducer blowers B6 and B15 are energized.

7- After combustion air inducers B6 and B15 have reached full speed, combustion air proving switch S18 and S45 contacts close.

8- After a 30 second delay, A3 and A12 energize the ignitor and LO terminal (low fire) of GV1 and GV3 gas valves.

Second Stage Heat:

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

10- The second stage heat signal passes from TB1 to A3 and A12.

11- A3 and A12 energize HI terminal (high fire) of GV1 and GV3 gas valves.

End of Second Stage Heat:

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

13- Terminal HI of GV1 and GV3 is de-energized by A3 and A12 control modules.

End of First Stage Heat:

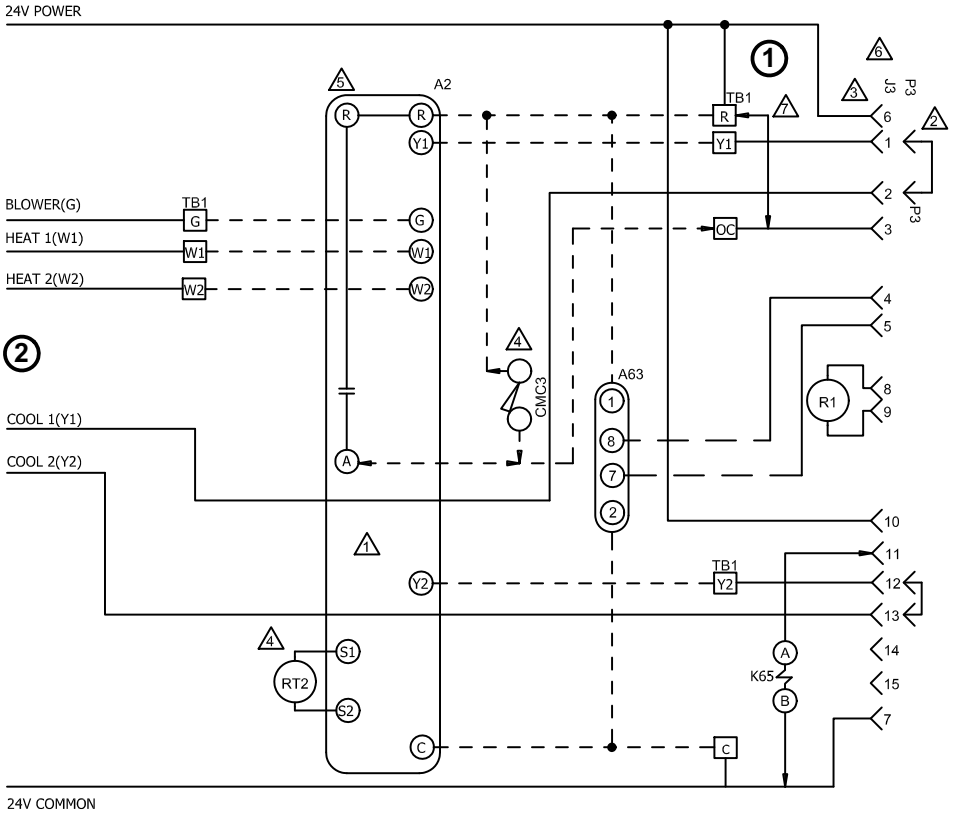
14- Heating demand is satisfied. Terminal W1 (low fire) is de-energized.

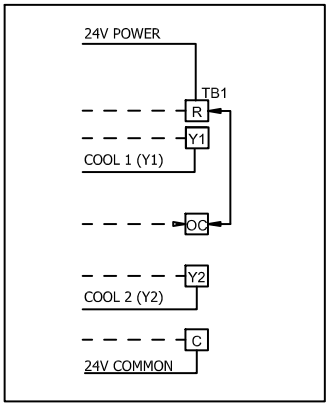
15- A3 and A12 are de-energized by TB1 in turn de-energizing terminal LO of GV1 and GV3.

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

16- Line voltage (or transformer T20 in 460V and 575V only) is routed through the low ambient kit fuses F20 and N.C. low ambient kit thermostats S60 and S61, to energize low ambient kit heater HR6.

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	

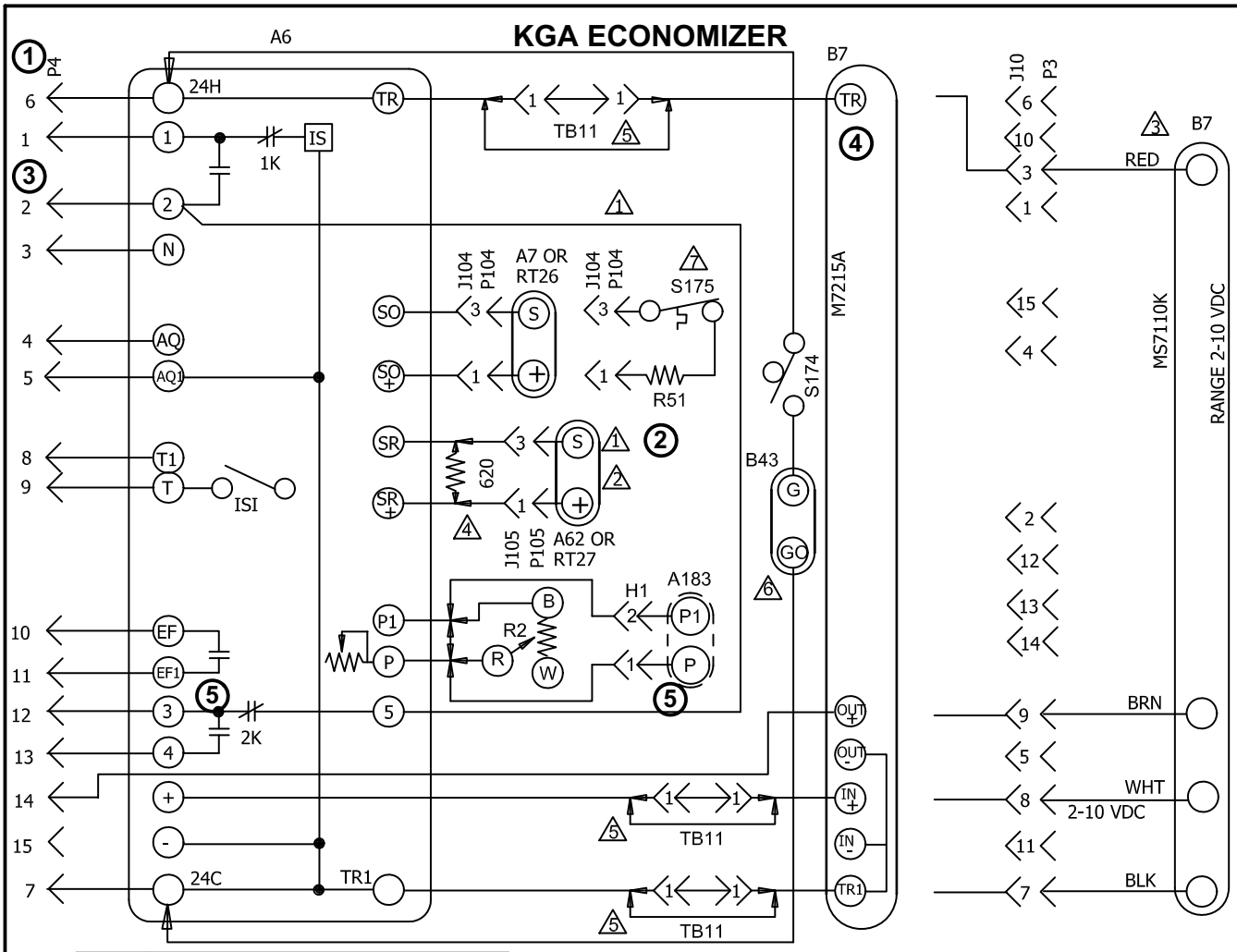
POWER:

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.

KGA 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

⟷ DESIGNATES OPTIONAL WIRING

— — — CLASS II FIELD WIRING

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

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

SEQUENCE OF OPERATION

POWER:

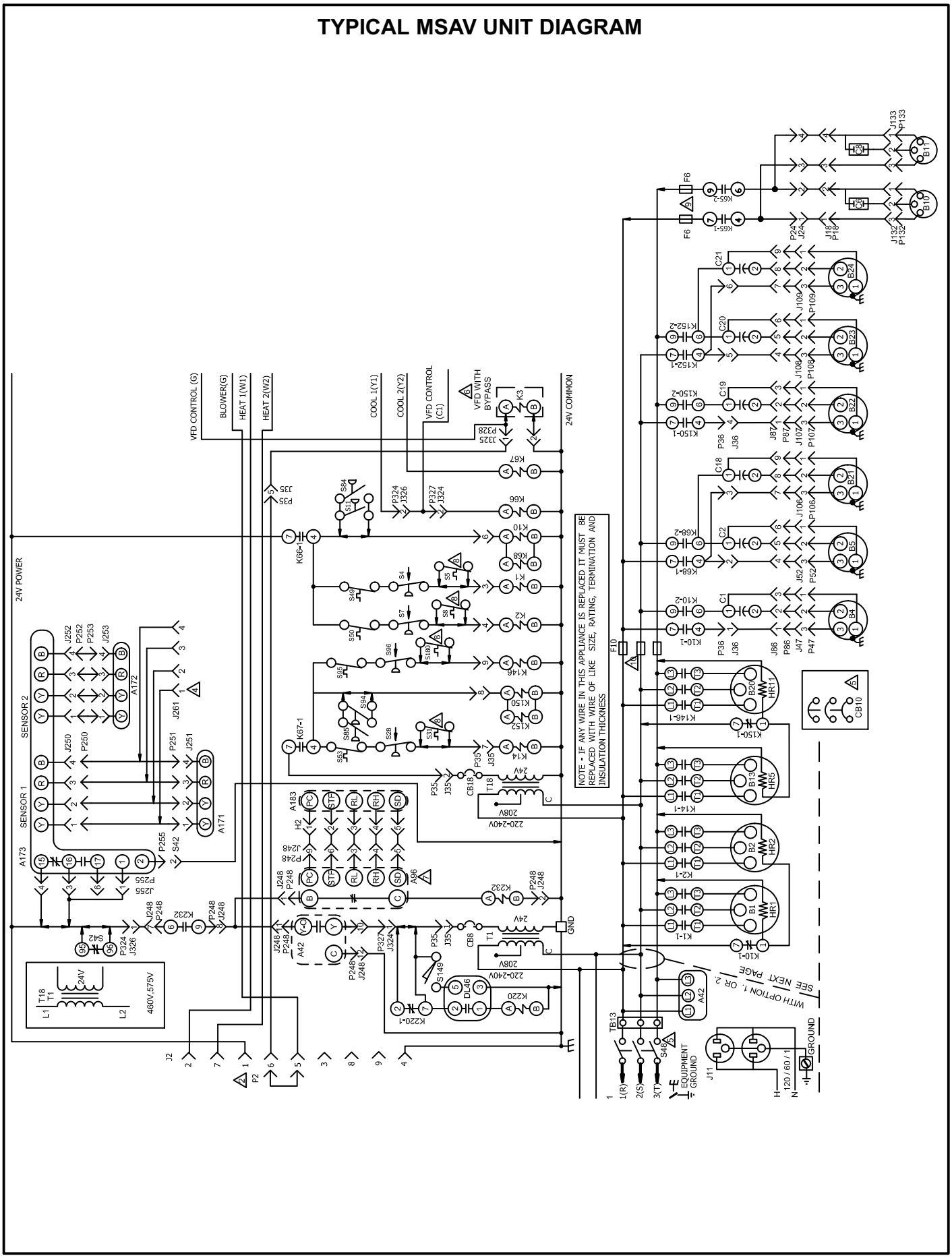
1- Economizer control module A6 is energized through P4-6.

OPERATION:

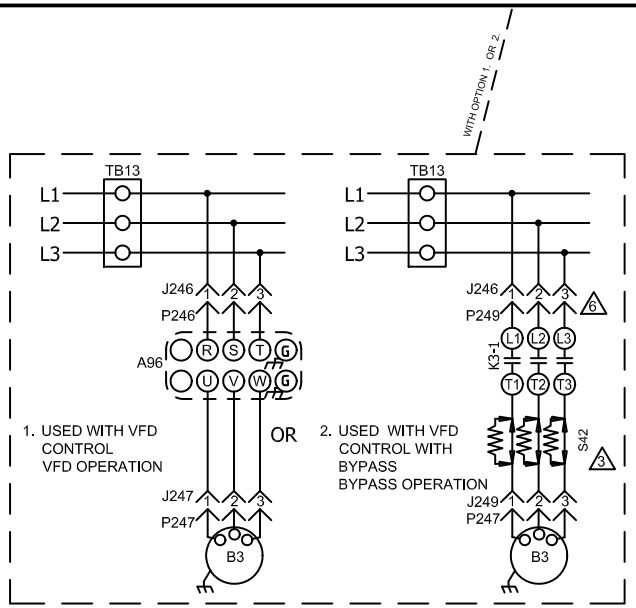
2- Temperature sensor S175 or enthalpy sensor A7 and A62 (if differential enthalpy is used) communicates to the economizer control module A6 when outdoor air is suitable for free cooling.

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.

TYPICAL MSAV UNIT DIAGRAM



TYPICAL MSAV UNIT DIAGRAM (continued)



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
B20	COMPRESSOR 4
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 FANS
F10	FUSE, OUTDOOR FANS
H2	HEADER 2, LVC1
HR1	HEATER, COMPRESSOR 1
HR2	HEATER, COMPRESSOR 2
HR5	HEATER, COMPRESSOR 3
HR11	HEATER, COMPRESSOR 4
J11	JACK, GFI, RECEPTICLE
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3,-1	CONTACTOR, BLOWER

K10,-1,2	RELAY, OUTDOOR FAN
K14, -1	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
K146-1	CONTACTOR, COMPRESSSOR 4
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
S94	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 4
S95	SWITCH, FREEZESTAT COMP 4
S96	SWITCH, LIMIT HI PRESS COMP 4 (MANUAL RESET)
S149	SWITCH, OVERFLOW
T1	TRANSFORMER, CONTROL
T18	TRANSFORMER, CONTACTOR CONTROL
TB13	TERMINAL STRIP, POWER DISTRIBUTION

7 MITSUBISHI VFD

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

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

10 F10 USED ON Y-VOLT UNITS ONLY

DENOTES OPTIONAL COMPONENTS

LINE VOLTAGE FIELD INSTALLED

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

2 P2 IS USED ON KCA UNITS ONLY

3 S42 USED ON UNIT WITH 10 HP MOTOR AND VFD BYPASS

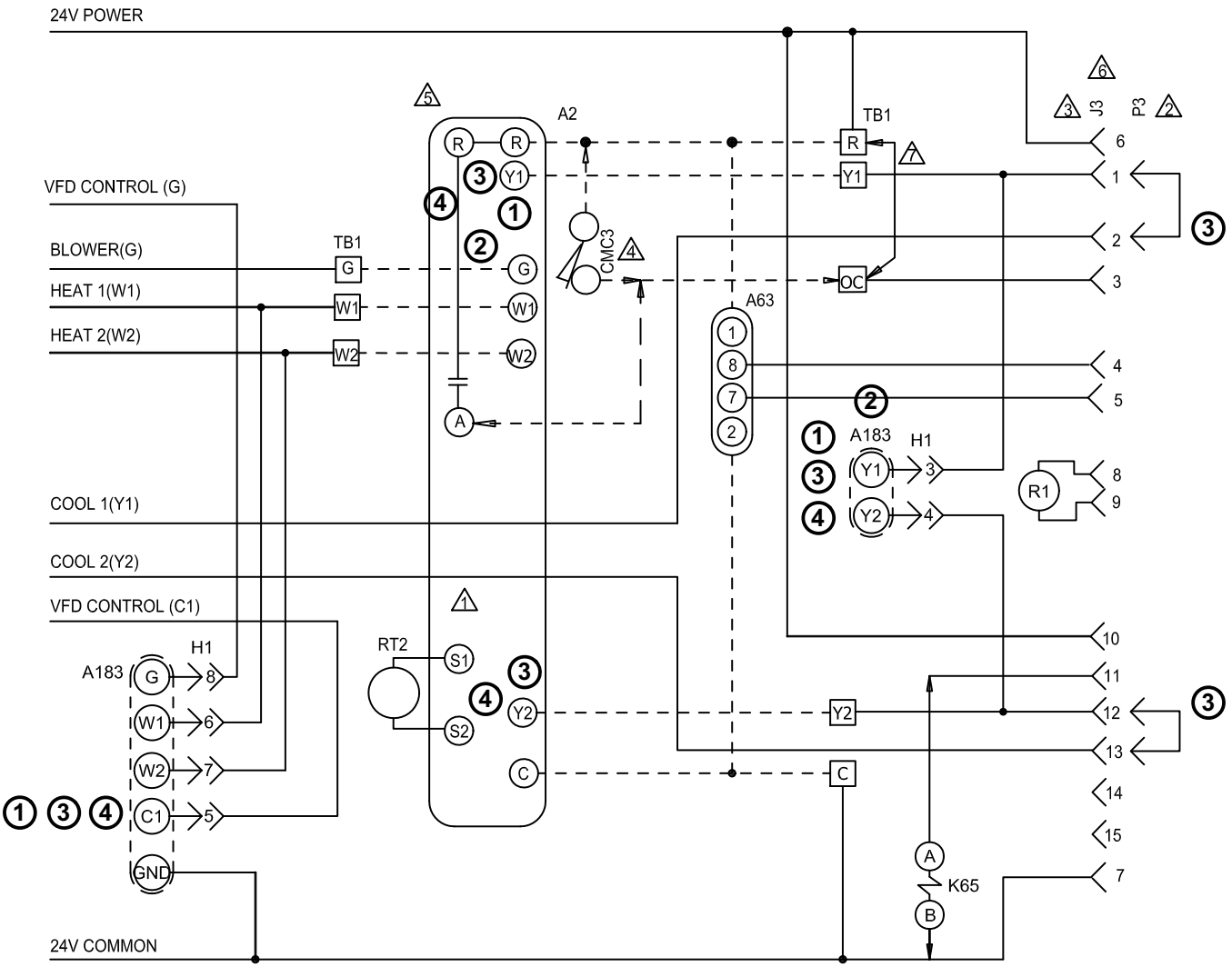
4 CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY

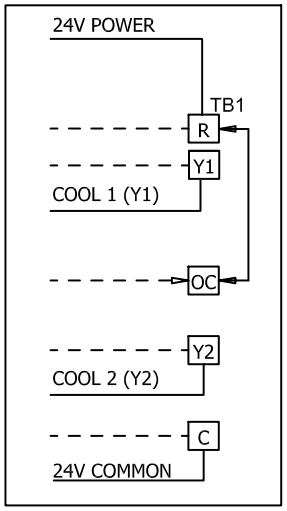
5 S48 OR CB10 MAY BE USED

6 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

02/13	WIRING DIAGRAM 537608-01	02/13
COOLING		
KCA/KGA - 240/300H - G,J,Y - VFD		
SECTION B		REV 0
Supersedes	New Form No. 537608-01	

ELECTROMECHANICAL OR ELECTRONIC THERMOSTAT WITH MSAV





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	

MSAV BLOWER OPERATION

Cooling and heating operate the same as non-MSAV 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 31 for blower speed during cooling.

TABLE 31

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.