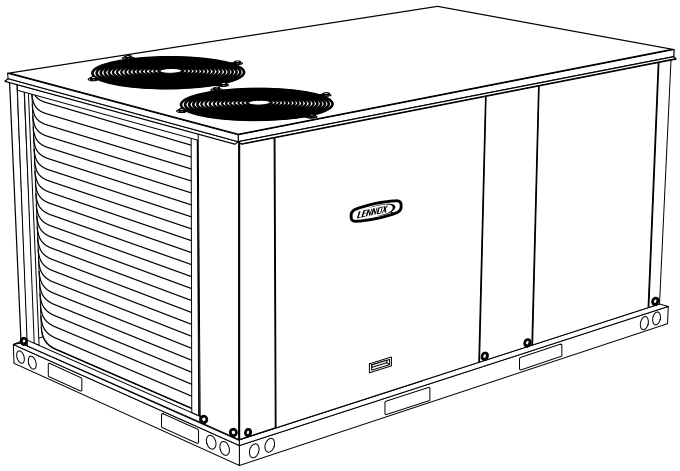
ZGA/ZGB092 through 150

The ZGA/ZGB 7.5, 8.5, 10 and 12.5 ton (092, 102, 120, 150) packaged gas units are available in standard cooling efficiency. Units are available in 130,000, 180,000 or 240,000Btuh (38.1, 52.7 or 70.3 kW) heating inputs. Gas heat sections are designed with aluminized steel tube heat exchangers.

All ZGA/ZGB units are designed to accept any of several different energy management thermostat control systems with minimum field wiring. Factory or field provided control options connect to the unit with jack plugs. When ”plugged in” the controls become an integral part of the unit wiring.

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

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



⚠WARNING

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

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠CAUTION

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

⚠CAUTION

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

⚠WARNING

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

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OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No 092	102	120	150
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	Z1SNSR90A1	99W59	X	X	X	X
Low Ambient Kit (Includes Compressor Crankcase Heater)	208/230V-3ph - Z1LOAM02B-1Y	10Z35	X	X		
	460V-3ph - Z1LOAM02B-1G	10Z36	X	X		
	575V-3ph - Z1LOAM02B-1J	10Z37	X	X		
	208/230V-3ph - Z1LOAM12B-1Y	10Z50			X	X
	460V-3ph - Z1LOAM12B-1G	10Z51			X	X
	575V-3ph - Z1LOAM12B-1J	10Z52			X	X
Refrigerant Type		R-410A	O	O	O	O
HEATING SYSTEM						
Combustion Air Intake Extensions	T1EXTN10AN1	19W51	X	X	X	X
Gas Heat Input	130,000 Btuh	Factory	O	O	O	O
	180,000 Btuh	Factory	O	O	O	O
	240,000 Btuh	Factory	O	O	O	O
LPG/Propane Conversion Kits	Standard Heat - C1PROP23BS1	14N22	X	X	X	X
	Medium Heat - Z1PROP24RS1	14N27	X	X	X	X
	High Heat - C1PROP21BS1	14N25	X	X	X	X
Stainless Steel Heat Exchanger		Factory	O	O	O	O
Vertical Vent Extension Kit	C1EXTN20FF1	31W62	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
Blower Motors	Belt Drive - 2 hp	Factory	O	O	O	O
	Belt Drive - 3 hp	Factory	O	O	O	O
	Belt Drive - 5 hp	Factory	O	O	O	O
Drive Kits	Kit #1 590-890 rpm	Factory	O	O	O	O
See Blower Data Tables for selection	Kit #2 800-1105 rpm	Factory	O	O	O	O
	Kit #3 795-1195 rpm	Factory	O	O	O	O
	Kit #4 730-970 rpm	Factory	O	O	O	O
	Kit #5 940-1200 rpm	Factory	O	O	O	O
	Kit #6 1015-1300 rpm	Factory	O	O	O	O
	Kit #10 900-1135 rpm	Factory	O	O	O	O
	Kit #11 1040-1315 rpm	Factory	O	O	O	O
	Kit #12 1125-1425 rpm	Factory	O	O	O	O
CABINET						
Combination Coil/Hail Guards	Z1GARD52B-1	12X21	X	X	X	X
CONTROLS						
	L Connection® Building Automation System	- - -	X	X	X	X
BACnet®	K0CTRL31B-1	96W15	X	X	X	X
BACnet® Thermostat with Display	K0SNSR01FF1	97W23	X	X	X	X
BACnet® Thermostat without Display	K0SNSR00FF1	97W24	X	X	X	X
Novar® 2051	K0CTRL30B-1	96W12	OX	OX	OX	OX
Plenum Cable (75 ft.)	K0MISC00FF1	97W25	X	X	X	X

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

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

O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No 092	102	120	150
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
Bottom Power Entry Kit	Z1PEKT01B-1	11H66	X	X	X	X
INDOOR AIR QUALITY						
Air Filters						
Healthy Climate® High Efficiency Air Filters	MERV 8 - Z1FLTR15B-1	14C35	X	X	X	X
20 x 24 x 2 (Order 4 per unit)	MERV 13 - Z1FLTR40B-1	14C36	X	X	X	X
Replacement Media Filter With Metal Mesh Frame (includes non-pleated filter media)	C1FLTR30B-1-	Y3063	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, 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
ECONOMIZER						
Standard Economizer (Not for Title 24)						
Standard Downflow Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON30B-1	10Z29	OX	OX	OX	OX
Standard Horizontal Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON16B-1	11G98	X	X	X	X
Standard Economizer Controls (Not for Title 24)						
Single Enthalpy Control	C1SNSR64FF1	53W64	X	X	X	X
Differential Enthalpy Control (order 2)	C1SNSR64FF1	53W64	X	X	X	X
High Performance Economizer (Approved for California Title 24 Building Standards / AMCA Class 1A Certified)						
High Performance Downflow Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON32B-1	12B44	OX	OX	OX	OX
High Performance Horizontal Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON33B-1	12B46	X	X	X	X
High Performance Economizer Controls (Not for Title 24)						
Single Enthalpy Control	C1SNSR61FF1	11G21	X	X	X	X
Differential Enthalpy Control (order 2)	C1SNSR61FF1	11G21	X	X	X	X
Horizontal Low Profile Barometric Relief Dampers With Exhaust Hood						
Horizontal Low Profile Barometric Relief Dampers With Exhaust Hood	LAGEDH03/15	53K04	X	X	X	X
OUTDOOR AIR						
Outdoor Air Dampers						
Motorized Dampers with outdoor air hood	Z1DAMP20B-2	14G36	X	X	X	X
Manual Dampers with outdoor air hood	Z1DAMP10B-2	14G37	X	X	X	X

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

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

O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No 092	102	120	150
POWER EXHAUST						
Standard Static (Downflow)	208/230V-3ph - Z1PWRE10B-1Y	10Z70	X	X	X	X
	460V-3ph - Z1PWRE10B-1G	10Z71	X	X	X	X
Standard Static (Horizontal)	208/230V-3ph - Z1PWRE15A-1P	24E01	X	X	X	X
	460V-3ph - Z1PWRE15A-1G	28E01	X	X	X	X
575V Transformer Kit	575V-3ph - Z1TRFM20A-1J	59E02	X	X	X	X
NOTE - Order 575V Transformer Kit with 208/230V Power Exhaust Fan for 575V applications. Order two kits for downflow models, order one kit for horizontal models.						
ROOF CURBS						
Hybrid Roof Curbs, Downflow						
8 in. height	Z1CURB40B-1	10Z25	X	X	X	X
14 in. height	Z1CURB41B-1	10Z26	X	X	X	X
18 in. height	Z1CURB42B-1	10Z27	X	X	X	X
24 in. height	Z1CURB43B-1	10Z28	X	X	X	X
CEILING DIFFUSERS						
Step-Down - Order one	RTD11-95S	13K61	X			
	RTD11-135S	13K62		X	X	
	RTD11-185S	13K63				X
Flush - Order one	FD11-95S	13K56	X			
	FD11-135S	13K57		X	X	
	FD11-185S	13K58				X
NOTE - Ceiling Diffuser Transitions are not furnished and must be field fabricated.						

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 — 7.5 - 8.5 TON

General Data	Nominal Tonnage	7.5 Ton	7.5 Ton	8.5 Ton	8.5 Ton
	Model Number	ZGB092S4B	ZGA092S4M	ZGB102S4B	ZGA102S4M
	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	91,100	88,200	99,000	99,900
	[1] Net Cooling Capacity - Btuh	88,000	86,000	97,000	97,000
	AHRI Rated Air Flow - cfm	2750	2800	3250	3250
	Total Unit Power - kW	8.0	7.8	10.3	8.8
	[1] EER (Btuh/Watt)	11.0	11.0	11.0	11.0
	[1] IEER (Btuh/Watt)	12.7	13.0	12.7	13.0
	Refrigerant Type	R-410A	R-410A	R-410A	R-410A
Refrigerant Charge Furnished	Circuit 1	4 lbs. 7 oz.	4 lbs. 7 oz.	4 lbs. 13 oz.	4 lbs. 13 oz.
	Circuit 2	3 lbs. 1 oz.	3 lbs. 1 oz.	4 lbs. 10 oz.	4 lbs. 10 oz.
Gas Heating Options Available - See page 7		Standard (2 stage), Medium (2 Stage), High (2 Stage)			
Compressor Type (number)		Scroll (2)	Scroll (2)	Scroll (2)	Scroll (2)
Outdoor Coils	Net face area (total) - sq. ft.	20.9	20.9	20.9	20.9
	Number of rows	1	1	1	1
	Fins per inch	23	23	23	23
Outdoor Coil Fans	Motor - (No.) hp	(2) 1/3	(2) 1/3	(2) 1/3	(2) 1/3
	Motor rpm	1075	1075	1075	1075
	Total Motor watts	740	740	740	740
	Diameter - (No.) in.	(2) 24	(2) 24	(2) 24	(2) 24
	Number of blades	3	3	3	3
	Total Air volume - cfm	8800	8800	8800	8800
Indoor Coils	Net face area (total) - sq. ft.	12.78	12.78	12.78	12.78
	Tube diameter - in.	3/8	3/8	3/8	3/8
	Number of rows	2	2	3	3
	Fins per inch	14	14	14	14
	Drain connection - Number and size	(2) 1 in. NPT coupling			
	Expansion device type	Refrigerant Metering Orifice (RFC)			
[2] Indoor Blower and Drive Selection	Nominal motor output	2 hp, 3 hp, 5 hp			
	Maximum usable motor output (US Only)	2.3 hp, 3.45 hp, 5.75 hp			
	Motor - Drive kit number	2 hp **Kit 1** 590-890 rpm **Kit 2** 800-1105 rpm **Kit 3** 795-1195 rpm 3 hp **Kit 4** 730-970 rpm **Kit 5** 940-1200 rpm **Kit 6** 1015-1300 rpm 5 hp **Kit 10** 900-1135 rpm **Kit 11** 1040-1315 rpm **Kit 12** 1125-1425 rpm			
	Blower wheel nominal diameter x width - in.	(1) 15 X 15	(1) 15 X 15	(1) 15 X 15	(1) 15 X 15
Filters	Type of filter	Disposable			
	Number and size - in.	(4) 20 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] 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					10 - 12.5 TON
General Data	Nominal Tonnage	10 Ton	10 Ton	12.5 Ton	12.5 Ton
	Model Number	ZGB120S4B	ZGA120S4M	ZGB150S4B	ZGA150S4M
	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	119,000	118,400	143,000	142,000
	[1] Net Cooling Capacity - Btuh	115,000	115,000	136,000	136,000
	AHRI Rated Air Flow - cfm	3100	3800	3800	4400
	Total Unit Power - kW	10.3	10.5	12.7	12.6
	[1] EER (Btuh/Watt)	11.0	11.0	10.8	10.8
	[1] IEER (Btuh/Watt)	12.7	13.0	12.2	12.0
	Refrigerant Type	R-410A	R-410A	R-410A	R-410A
Refrigerant Charge Furnished	Circuit 1	6 lbs. 4 oz.	5 lbs. 0 oz.	12 lbs. 6 oz.	7 lbs. 0 oz.
	Circuit 2	5 lbs. 7 oz.	5 lbs. 4 oz.	13 lbs. 6 oz.	6 lbs. 12 oz.
Gas Heating Options Available - See page 7		Standard (2 stage), Medium (2 Stage), High (2 Stage)			
Compressor Type (number)		Scroll (2)	Scroll (2)	Scroll (2)	Scroll (2)
Outdoor Coils	Net face area (total) - sq. ft.	28.0	28.0	27.8	28.0
	Number of rows	1	1	3	1
	Fins per inch	23	23	20	20
Outdoor Coil Fans	Motor - (No.) hp	(2) 1/3	(2) 1/3	(2) 1/2	(2) 1/2
	Motor rpm	1075	1075	1075	1075
	Total Motor watts	700	700	910	950
	Diameter - (No.) in.	(2) 24	(2) 24	(2) 24	(2) 24
	Number of blades	3	3	3	3
	Total Air volume - cfm	9000	9000	9000	9600
Indoor Coils	Net face area (total) - sq. ft.	13.54	13.54	13.54	13.54
	Tube diameter - in.	3/8	3/8	3/8	3/8
	Number of rows	4	3	4	4
	Fins per inch	14	14	14	14
	Drain connection - Number and size	(2) 1 in. NPT coupling			
	Expansion device type	Refrigerant Metering Orifice (RFC)			
[2] Indoor Blower and Drive Selection	Nominal motor output	2 hp, 3 hp, 5 hp			
	Maximum usable motor output (US Only)	2.3 hp, 3.45 hp, 5.75 hp			
	Motor - Drive kit number	2 hp **Kit 1** 590-890 rpm **Kit 2** 800-1105 rpm **Kit 3** 795-1195 rpm 3 hp **Kit 4** 730-970 rpm **Kit 5** 940-1200 rpm **Kit 6** 1015-1300 rpm 5 hp **Kit 10** 900-1135 rpm **Kit 11** 1040-1315 rpm **Kit 12** 1125-1425 rpm			
	Blower wheel nominal diameter x width - in.	(1) 15 X 15	(1) 15 X 15	(1) 15 X 15	(1) 15 X 15
Filters	Type of filter	Disposable			
	Number and size - in.	(4) 20 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] 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)MSAV® (Multi-Stage Air Volume) option are limited to a motor service factor of 1.0.

SPECIFICATIONS - GAS HEAT

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

HIGH ALTITUDE DERATE

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

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

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

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

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

092S STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

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

1 − Wet indoor coil air resistance of selected unit.

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

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

Then determine from blower table blower motor output required.

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

Total Air Volume cfm	Total Static Pressure − in. w.g.																									
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2		2.2		2.4		2.6	
	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
1750	498	0.08	565	0.25	633	0.50	701	0.71	768	0.87	830	0.99	890	1.08	946	1.16	998	1.27	1049	1.41	1098	1.58	- - -	- - -	- - -	- - -
2000	512	0.12	578	0.37	645	0.60	713	0.81	780	0.97	842	1.10	901	1.19	955	1.28	1007	1.40	1057	1.56	1105	1.74	1153	1.94	1201	2.16
2250	527	0.24	592	0.49	659	0.72	727	0.92	793	1.08	855	1.21	913	1.32	966	1.42	1017	1.55	1066	1.72	1114	1.92	1162	2.13	1210	2.35
2500	543	0.37	608	0.61	675	0.84	743	1.04	809	1.21	869	1.35	926	1.45	978	1.57	1028	1.72	1076	1.90	1124	2.11	1171	2.33	1221	2.57
2750	560	0.51	625	0.75	693	0.98	761	1.18	826	1.35	885	1.49	939	1.60	990	1.73	1039	1.90	1087	2.10	1135	2.32	1183	2.55	1232	2.80
3000	579	0.66	645	0.90	713	1.13	781	1.34	844	1.51	901	1.65	954	1.77	1004	1.92	1052	2.11	1100	2.32	1147	2.56	1195	2.80	1245	3.05
3250	600	0.82	666	1.06	735	1.30	803	1.51	864	1.69	918	1.82	969	1.95	1018	2.12	1066	2.34	1113	2.57	1161	2.81	1209	3.06	1259	3.31
3500	622	0.98	690	1.24	760	1.49	826	1.70	883	1.87	936	2.01	985	2.16	1033	2.35	1081	2.59	1128	2.84	1176	3.09	1224	3.34	1275	3.60
3750	646	1.17	716	1.45	786	1.70	849	1.91	903	2.07	953	2.21	1002	2.38	1049	2.61	1097	2.87	1144	3.12	1192	3.38	1241	3.64	1292	3.91
4000	674	1.38	746	1.68	814	1.93	872	2.12	923	2.28	971	2.43	1019	2.64	1067	2.90	1114	3.17	1161	3.43	1209	3.69	1259	3.96	1311	4.24
4250	705	1.63	777	1.94	841	2.17	894	2.34	943	2.50	990	2.69	1038	2.93	1085	3.21	1132	3.49	1179	3.76	1228	4.03	1279	4.31	1332	4.60

102S STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

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

1 − Wet indoor coil air resistance of selected unit.

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

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

Then determine from blower table blower motor output required.

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

Total Air Volume cfm	Total Static Pressure − in. w.g.																									
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2		2.4		2.6	
	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
1750	494	0.11	562	0.34	632	0.56	702	0.74	771	0.85	838	0.96	902	1.07	961	1.19	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
2000	514	0.26	581	0.49	650	0.70	719	0.87	786	0.98	852	1.09	915	1.20	972	1.32	1026	1.47	1076	1.65	- - -	- - -	- - -	- - -	- - -	- - -
2250	533	0.41	599	0.62	667	0.82	735	0.99	802	1.10	866	1.21	928	1.33	984	1.46	1037	1.63	1085	1.81	1132	2.01	1178	2.21	1226	2.43
2500	553	0.55	619	0.76	685	0.95	753	1.10	818	1.22	881	1.34	942	1.47	997	1.62	1048	1.80	1096	1.99	1142	2.20	1188	2.41	1237	2.64
2750	573	0.70	638	0.90	705	1.08	771	1.22	835	1.35	897	1.49	957	1.63	1011	1.80	1061	1.99	1108	2.19	1154	2.41	1200	2.63	1249	2.87
3000	594	0.85	659	1.05	725	1.22	791	1.36	853	1.50	915	1.65	973	1.81	1026	1.99	1075	2.20	1121	2.42	1167	2.64	1213	2.87	1262	3.12
3250	617	1.01	682	1.20	747	1.37	812	1.52	873	1.67	934	1.83	990	2.01	1042	2.21	1089	2.43	1135	2.66	1181	2.90	1228	3.13	1277	3.38
3500	640	1.17	706	1.36	771	1.53	834	1.70	895	1.86	954	2.03	1008	2.23	1058	2.46	1105	2.69	1150	2.93	1196	3.17	1243	3.41	1293	3.65
3750	665	1.34	731	1.54	796	1.72	857	1.89	917	2.07	975	2.26	1027	2.48	1076	2.72	1121	2.97	1166	3.22	1212	3.46	1261	3.71	1311	3.96
4000	692	1.54	758	1.75	822	1.93	882	2.11	940	2.30	996	2.51	1047	2.76	1094	3.02	1139	3.27	1184	3.52	1230	3.77	1280	4.03	1330	4.29
4250	722	1.76	787	1.97	849	2.15	908	2.35	965	2.56	1018	2.79	1067	3.06	1113	3.33	1157	3.59	1202	3.85	1250	4.11	1300	4.38	1352	4.65

120S4M STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

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

1 − Wet indoor coil air resistance of selected unit.

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

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

Then determine from blower table blower motor output required.

See page 8 for blower motors and drives.

See page 8 for wet coil and option/accessory air resistance data.

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

Total Air Volume cfm	Total Static Pressure − in. w.g.																									
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2		2.2		2.4		2.6	
	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
2000	535	0.28	596	0.49	660	0.69	724	0.87	788	1.00	851	1.11	913	1.23	971	1.37	1025	1.52	1076	1.69	1124	1.86	- - -	- - -	- - -	- - -
2250	552	0.43	613	0.63	675	0.81	738	0.98	802	1.11	864	1.22	925	1.36	982	1.51	1036	1.68	1085	1.85	1133	2.04	1180	2.23	1228	2.44
2500	570	0.57	630	0.76	692	0.94	754	1.10	817	1.22	879	1.35	939	1.51	995	1.67	1047	1.85	1096	2.04	1143	2.23	1190	2.43	1239	2.65
2750	589	0.72	648	0.91	709	1.08	772	1.22	833	1.36	894	1.50	954	1.67	1009	1.85	1059	2.04	1108	2.24	1154	2.44	1202	2.65	1251	2.87
3000	608	0.87	668	1.05	729	1.22	791	1.37	852	1.51	912	1.67	970	1.85	1023	2.05	1073	2.25	1120	2.46	1167	2.67	1215	2.89	1265	3.11
3250	629	1.03	688	1.21	749	1.37	811	1.52	871	1.68	930	1.86	987	2.06	1039	2.27	1088	2.49	1134	2.70	1181	2.92	1229	3.14	1279	3.37
3500	651	1.20	710	1.38	772	1.54	833	1.70	892	1.88	950	2.07	1004	2.28	1055	2.51	1103	2.74	1150	2.96	1196	3.19	1245	3.42	1295	3.65
3750	674	1.36	734	1.56	796	1.73	856	1.90	914	2.10	970	2.30	1023	2.53	1072	2.78	1120	3.02	1166	3.25	1213	3.47	1262	3.71	1313	3.95
4000	699	1.55	761	1.76	822	1.94	880	2.12	936	2.33	991	2.56	1042	2.81	1090	3.07	1137	3.31	1183	3.55	1231	3.78	1281	4.03	1333	4.28
4250	726	1.77	789	1.98	849	2.16	904	2.37	959	2.59	1012	2.84	1062	3.11	1109	3.38	1156	3.63	1202	3.87	1251	4.11	1302	4.37	1354	4.63
4500	756	2.01	818	2.22	875	2.41	929	2.63	983	2.88	1034	3.15	1082	3.44	1129	3.71	1175	3.96	1222	4.21	1271	4.46	1323	4.72	1376	5.00
4750	788	2.27	848	2.47	902	2.68	955	2.92	1006	3.20	1056	3.50	1104	3.79	1150	4.06	1196	4.32	1243	4.57	1293	4.83	1345	5.09	1399	5.37
5000	822	2.54	878	2.75	929	2.98	980	3.25	1031	3.56	1079	3.87	1126	4.16	1172	4.44	1218	4.70	1266	4.95	1315	5.20	1367	5.47	1421	5.74

120S4B AND 150S STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

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

1 − Wet indoor coil air resistance of selected unit.

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

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

Then determine from blower table blower motor output required.

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

Total Air Volume cfm	Total Static Pressure − in. w.g.																									
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2		2.4		2.6	
	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
2000	542	0.43	602	0.60	664	0.75	732	0.89	802	1.02	869	1.15	927	1.27	979	1.41	1029	1.57	1079	1.75	1129	1.95	1179	2.15	1230	2.37
2250	560	0.55	619	0.71	681	0.86	748	1.00	817	1.14	882	1.27	939	1.41	991	1.57	1041	1.74	1090	1.93	1140	2.13	1190	2.35	1241	2.57
2500	579	0.68	637	0.83	699	0.98	766	1.12	834	1.26	897	1.41	953	1.57	1005	1.74	1054	1.92	1103	2.12	1152	2.33	1202	2.55	1254	2.79
2750	599	0.81	657	0.97	719	1.11	785	1.25	851	1.41	913	1.57	968	1.74	1020	1.93	1068	2.13	1116	2.34	1165	2.56	1215	2.78	1268	3.01
3000	620	0.95	678	1.11	741	1.25	806	1.40	870	1.58	930	1.75	985	1.94	1036	2.14	1084	2.36	1131	2.58	1180	2.80	1230	3.02	1283	3.26
3250	643	1.10	701	1.26	764	1.41	828	1.57	891	1.76	950	1.95	1003	2.16	1053	2.38	1100	2.61	1148	2.83	1196	3.06	1246	3.29	1299	3.52
3500	667	1.26	726	1.43	788	1.58	851	1.77	913	1.97	970	2.17	1023	2.41	1071	2.65	1118	2.88	1165	3.11	1213	3.33	1264	3.57	1317	3.81
3750	693	1.44	752	1.61	813	1.78	876	1.98	936	2.20	992	2.43	1043	2.68	1091	2.93	1137	3.17	1183	3.40	1232	3.64	1284	3.88	1338	4.13
4000	720	1.65	779	1.82	840	2.00	902	2.22	961	2.46	1015	2.71	1064	2.98	1111	3.24	1156	3.48	1203	3.72	1253	3.96	1305	4.22	1359	4.48
4250	748	1.86	807	2.04	868	2.24	929	2.48	986	2.75	1038	3.02	1086	3.30	1132	3.57	1177	3.81	1224	4.05	1274	4.31	1327	4.57	1382	4.85
4500	778	2.09	837	2.28	898	2.51	957	2.78	1012	3.07	1062	3.37	1108	3.65	1154	3.92	1199	4.17	1247	4.41	1297	4.67	1350	4.94	1405	5.22
4750	809	2.34	868	2.56	929	2.82	986	3.12	1038	3.43	1087	3.74	1132	4.03	1177	4.29	1223	4.54	1270	4.79	1321	5.04	1374	5.31	1428	5.58
5000	841	2.62	901	2.87	960	3.17	1015	3.50	1065	3.83	1112	4.14	1157	4.43	1201	4.69	1247	4.94	1295	5.18	1345	5.42	1398	5.68	---	---
5250	875	2.93	935	3.23	992	3.56	1044	3.91	1092	4.26	1138	4.57	1182	4.85	1226	5.10	1272	5.34	1320	5.57	---	---	---	---	---	---
5500	911	3.30	969	3.63	1024	4.00	1074	4.37	1120	4.71	1165	5.02	1208	5.29	1253	5.53	---	---	---	---	---	---	---	---	---	---
5750	948	3.71	1004	4.08	1056	4.48	1104	4.85	1148	5.19	1192	5.49	1235	5.74	---	---	---	---	---	---	---	---	---	---	---	---
6000	985	4.18	1039	4.59	1088	5.00	1134	5.37	1177	5.69	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6250	1022	4.70	1073	5.14	1120	5.54	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

BLOWER DATA

FACTORY INSTALLED BELT DRIVE KIT SPECIFICATIONS

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

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

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

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure	Air Volume Exhausted
in. w.g.	cfm
0	3575
0.05	3405
0.10	3550
0.15	3245
0.20	3115
0.25	3020
0.30	2900
0.35	2785

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

Air Volume cfm	Wet Indoor Coil			Gas Heat Exchanger			Economizer	Filters	
	092	102, 120S4M	120/S4B, 150	Standard Heat	Medium Heat	High Heat		MERV 8	MERV 13
1750	0.02	0.03	0.04	0.06	0.02	0.02	0.03	0.01	0.03
2000	0.02	0.04	0.05	0.07	0.05	0.06	0.05	0.01	0.03
2250	0.03	0.05	0.06	0.07	0.07	0.08	0.06	0.01	0.04
2500	0.03	0.05	0.07	0.09	0.10	0.11	0.08	0.01	0.05
2750	0.04	0.06	0.08	0.09	0.11	0.12	0.09	0.02	0.05
3000	0.05	0.07	0.09	0.11	0.12	0.13	0.11	0.02	0.06
3250	0.05	0.08	0.10	0.12	0.15	0.16	0.13	0.02	0.06
3500	0.06	0.09	0.11	0.12	0.16	0.17	0.15	0.03	0.07
3750	0.07	0.10	0.13	0.14	0.19	0.20	0.17	0.03	0.08
4000	0.07	0.11	0.14	0.14	0.21	0.22	0.19	0.04	0.08
4250	0.08	0.13	0.15	0.14	0.24	0.28	0.21	0.04	0.09
4500	0.09	0.14	0.17	0.15	0.26	0.32	0.24	0.04	0.09
4750	0.10	0.15	0.18	0.16	0.29	0.37	0.26	0.05	0.10
5000	0.10	0.16	0.20	0.16	0.34	0.43	0.29	0.06	0.10
5250	0.11	0.17	0.22	0.16	0.37	0.47	0.32	0.06	0.11
5500	0.12	0.19	0.23	0.18	0.44	0.54	0.34	0.07	0.12
5750	0.13	0.20	0.25	0.19	0.49	0.59	0.37	0.07	0.12
6000	0.14	0.22	0.27	0.20	0.54	0.64	0.40	0.08	0.13

BLOWER DATA

CEILING DIFFUSERS AIR RESISTANCE - in. w.g.

Unit Size	RTD11 Step-Down Diffuser				FD11 Flush Diffuser
	Air Volume cfm	2 Ends Open	1 Side, 2 Ends Open	All Ends & Sides Open	
092 Models	2400	0.21	0.18	0.15	0.14
	2600	0.24	0.21	0.18	0.17
	2800	0.27	0.24	0.21	0.20
	3000	0.32	0.29	0.25	0.25
	3200	0.41	0.37	0.32	0.31
	3400	0.50	0.45	0.39	0.37
	3600	0.61	0.54	0.48	0.44
	3800	0.73	0.63	0.57	0.51
102 & 120S4M Models	3600	0.36	0.28	0.23	0.15
	3800	0.40	0.32	0.26	0.18
	4000	0.44	0.36	0.29	0.21
	4200	0.49	0.40	0.33	0.24
	4400	0.54	0.44	0.37	0.27
	4600	0.60	0.49	0.42	0.31
	4800	0.65	0.53	0.46	0.35
	5000	0.69	0.58	0.50	0.39
	5200	0.75	0.62	0.54	0.43
120S4B & 150 Models	4200	0.22	0.19	0.16	0.10
	4400	0.28	0.24	0.20	0.12
	4600	0.34	0.29	0.24	0.15
	4800	0.40	0.34	0.29	0.19
	5000	0.46	0.39	0.34	0.23
	5200	0.52	0.44	0.39	0.27
	5400	0.58	0.49	0.43	0.31
	5600	0.64	0.54	0.47	0.35
	5800	0.70	0.59	0.51	0.39

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume	[1] Effective Throw Range	
		RTD11 Step-Down	FD11 Flush
	cfm	ft.	ft.
092 Models	2600	24 - 29	19 - 24
	2800	25 - 30	20 - 28
	3000	27 - 33	21 - 29
	3200	28 - 35	22 - 29
	3400	30 - 37	22 - 30
102, 120 Models	3600	25 - 33	22 - 29
	3800	27 - 35	22 - 30
	4000	29- 37	24 - 33
	4200	32 - 40	26 - 35
	4400	34 - 42	28 - 37
150 Models	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 air stream travels on leaving the outlet or diffuser before the maximum velocity is reduced to 50 ft. per minute. Four sides open.

ELECTRICAL DATA — 7.5 TON

7.5 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME — ZGB092S4B

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	8.7			4			3.6		
	Locked Rotor Amps	70			31			27		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	25	30	15	20	20
	With (2) 0.5 HP Power Exhaust	50	50	60	25	30	30	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	38	41	48	20	22	25	15	16	19
	With (2) 0.5 HP Power Exhaust	41	44	51	22	23	26	16	17	20

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 — 7.5 TON

7.5 TON STANDARD EFFICIENCY - Msav® (Multi-Stage Air Volume) Supply Air — ZGA092S4M

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	8.7			4			3.6		
	Locked Rotor Amps	70			31			27		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	25	30	15	20	20
	With (2) 0.5 HP Power Exhaust	50	50	60	25	30	30	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	38	41	48	20	22	25	15	16	19
	With (2) 0.5 HP Power Exhaust	41	44	51	22	23	26	16	17	20

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL DATA — 8.5 TON

8.5 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME — ZGB102S4B

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	11			5.5			4.7		
	Locked Rotor Amps	86			37			34		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	30	30	20	20	25
	With (2) 0.5 HP Power Exhaust	50	50	60	30	30	30	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	41	44	51	22	23	26	16	17	20
	With (2) 0.5 HP Power Exhaust	44	47	54	23	25	27	17	19	21

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL DATA — 8.5 TON

8.5 TON STANDARD EFFICIENCY - Msav® (Multi-Stage Air Volume) Supply Air — ZGA102S4M

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	11			5.5			4.7		
	Locked Rotor Amps	86			37			34		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	30	30	20	20	25
	With (2) 0.5 HP Power Exhaust	50	50	60	30	30	30	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	41	44	51	22	23	26	16	17	20
	With (2) 0.5 HP Power Exhaust	44	47	54	23	25	27	17	19	21

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL DATA — 10 TON

10 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME — ZGB120S4B

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	30	30	35	20	20	25
	With (2) 0.5 HP Power Exhaust	50	60	70	30	30	35	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	43	46	53	24	26	29	16	18	20
	With (2) 0.5 HP Power Exhaust	46	49	56	26	27	30	18	19	21

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL DATA — 10 TON

10 TON STANDARD EFFICIENCY - Msav® (Multi-Stage Air Volume) Supply Air — ZGA120S4M

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Outdoor Fan Motors (2)	Full Load Amps (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	30	30	35	20	20	25
	With (2) 0.5 HP Power Exhaust	50	60	70	30	30	35	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	43	46	53	24	26	29	16	18	20
	With (2) 0.5 HP Power Exhaust	46	49	56	26	27	30	18	19	21

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 — 12.5 TON

12.5 TON STANDARD EFFICIENCY - CONSTANT AIR VOLUME — ZGB150S4B

[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	22.4			10.6			7.7		
	Locked Rotor Amps	149			75			54		
Outdoor Fan Motors (2)	Full Load Amps (total)	3.0 (6.0)			1.5 (3.0)			1.2 (2.4)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
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	80	80	90	35	35	40	25	30	30
	With (2) 0.5 HP Power Exhaust	80	80	90	35	40	40	30	30	30
[3] Minimum Circuit Ampacity	Unit Only	62	65	71	28	30	33	22	23	25
	With (2) 0.5 HP Power Exhaust	65	68	74	30	31	34	23	24	26

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 — 12.5 TON

12.5 TON STANDARD EFFICIENCY - Msav® (Multi-Stage Air Volume) Supply Air — ZGA150S4M

[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		
Outdoor Fan Motors (2)	Full Load Amps (total)	3.0 (6.0)			1.5 (3.0)			1.2 (2.4)		
Power Exhaust (2) 0.5 HP	Full Load Amps (total)	1.5 (3.0)			0.6 (1.2)			0.6 (1.2)		
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	80	80	30	30	35	25	25	25
	With (2) 0.5 HP Power Exhaust	80	80	80	30	35	35	25	25	30
[3] Minimum Circuit Ampacity	Unit Only	58	61	67	25	27	30	20	22	24
	With (2) 0.5 HP Power Exhaust	61	64	70	27	28	31	22	23	25

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.

ZGA/ZGB PARTS ARRANGEMENT

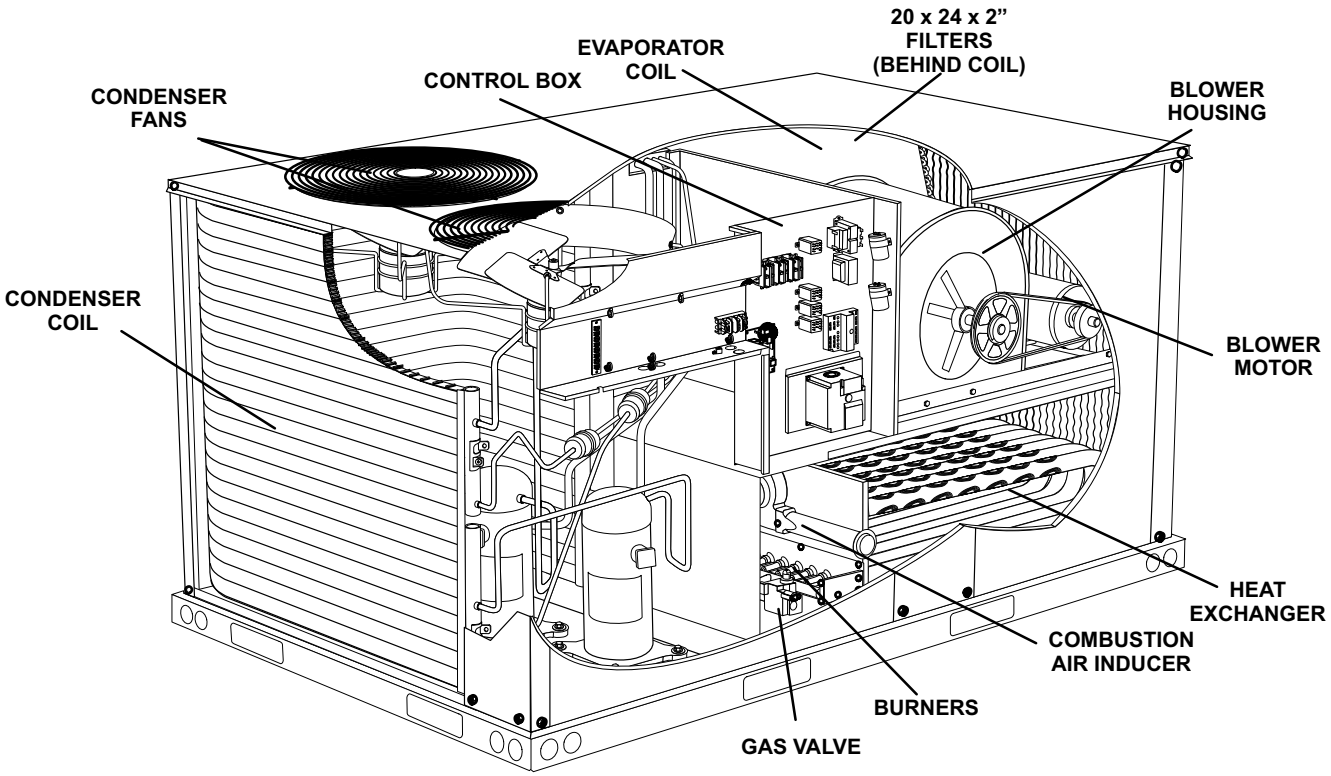


FIGURE 1

ZGA/ZGB CONTROL BOX

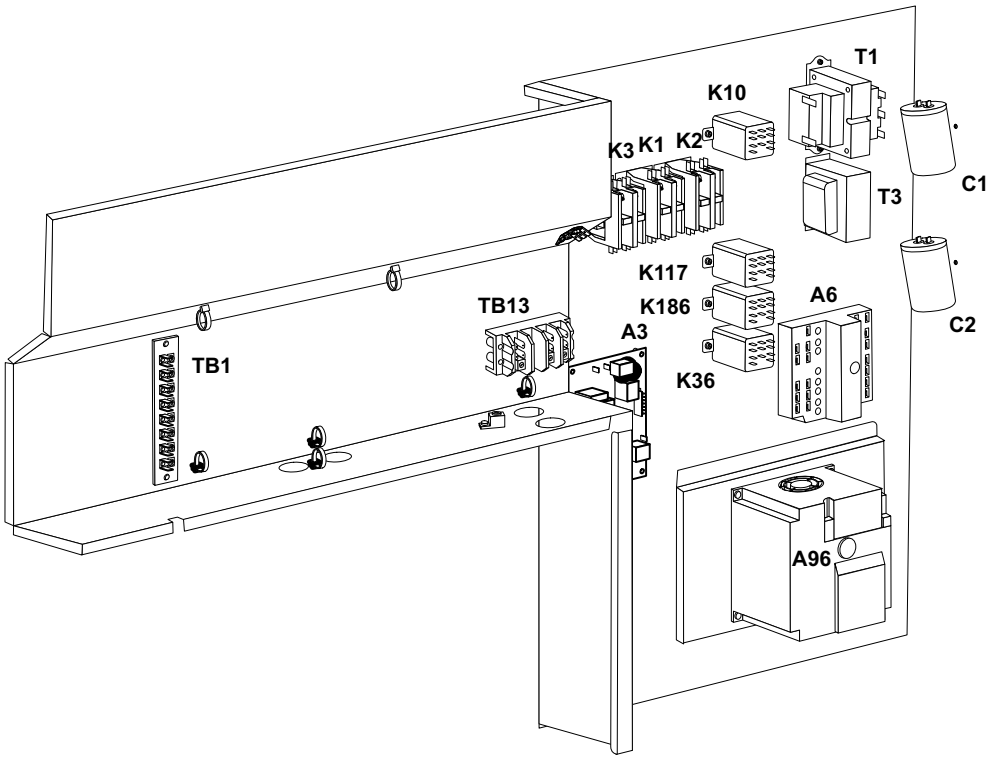


FIGURE 2

I-UNIT COMPONENTS

All 7.5 through 12.5 ton (26.3 through 44 kW) units are configure to order units (CTO). The ZGA/ZGB unit components are shown in figure 1. All units come standard with removable unit panels. All L1, L2 and L3 wiring is color coded; L1 is red, L2 is yellow and L3 is blue.

A-Control Box Components

ZGA/ZGB control box components are shown in figure 2

1-Control Transformer T1 all units

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

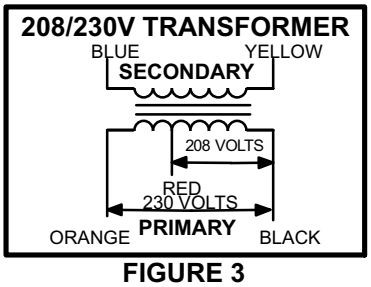


FIGURE 3

2-C. A. I. Transformers T3 575V units

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

3-Terminal Strip TB1

All indoor thermostat connections will be to TB1 located in the control area. For thermostats without “occupied “ and “unoccupied” modes, a factory installed jumper across terminals R and OC should be in place.

4-Condenser Fan Capacitors C1 & C2

Fan capacitors C1 and C2 are used to assist in the start up of condenser fans B4 and B5. Ratings will be on side of capacitor or outdoor fan motor nameplate.

5-Compressor Contactor K1 & K2

All compressor contactors are two-pole, double-break contactors with 24VAC coils. In all ZGA/ZGB units, K1 and K2 energize compressors B1 and B2 in response to thermostat demand.

6-Blower Contactor K3

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

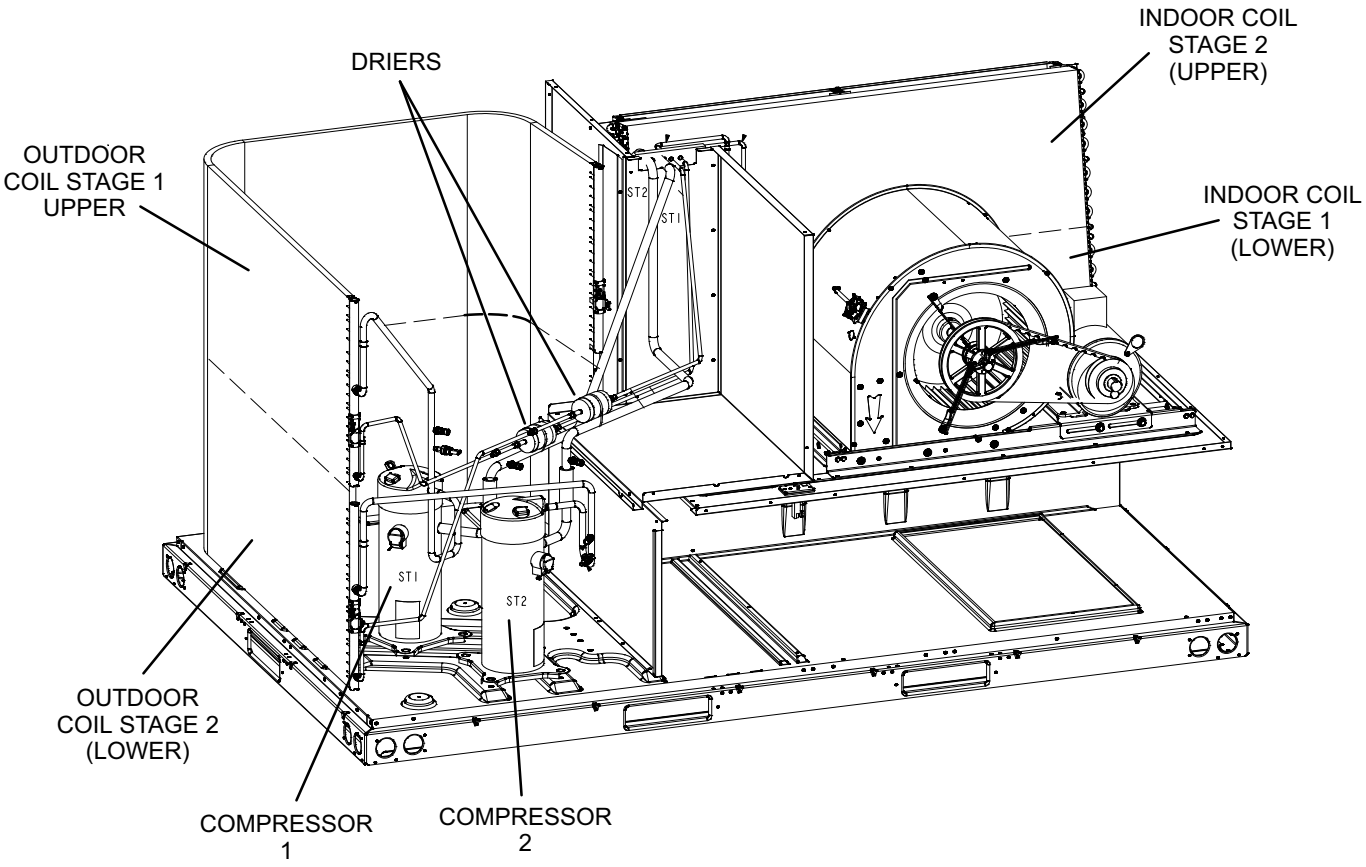
7-Condenser Fan Relay K10

Outdoor fan relay K10 is a DPDT relay with a 24VAC coil. K10 energizes condenser fans B4 and B5.

8-Power Exhaust Relay K65 (PED units)

Power exhaust relay K65 is a DPDT relay with a 24VAC coil. K65 is used in all ZGA/ZGB units equipped with the optional power exhaust dampers. K65 is energized by the economizer enthalpy control A6, after the economizer dampers reach 50% open (adjustable) When K65 closes, exhaust fan B10 is energized.

ZGA/ZGB092,102, 120, 150 PLUMBING AND COMPRESSOR CIRCUITS DETAIL



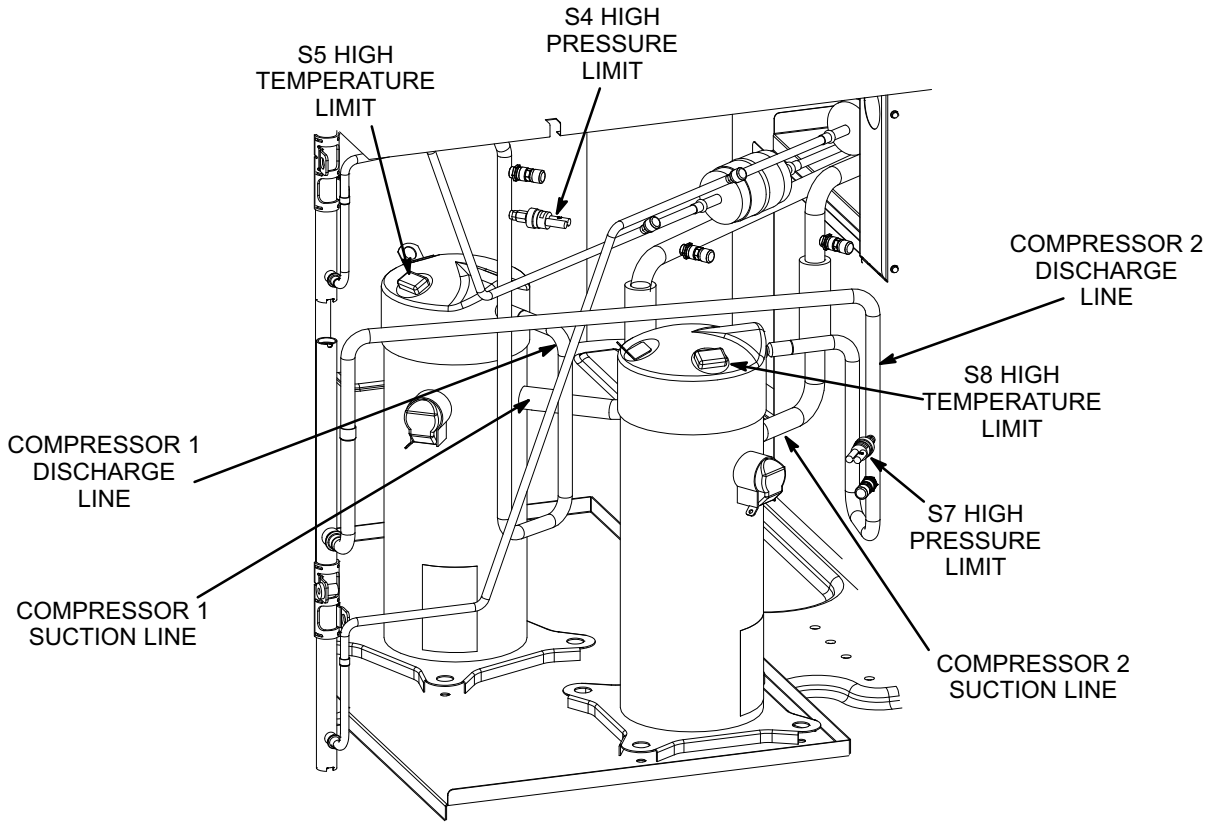


FIGURE 4

B-Cooling Components

All units use independent cooling circuits consisting of separate compressors, condenser coils and evaporator coils. See figure 4. Two draw-through type condenser fans are used in ZGA/ZGB092/150 units. All units are equipped with belt-drive blowers which draw air across the evaporator during unit operation.

Cooling may be supplemented by a factory- or field-installed economizer. The evaporators are slab type and are stacked. Each evaporator uses a refrigerant metering orifice as the primary refrigerant metering device. Each evaporator is also equipped with enhanced fins and rifled tubing.

In all units each compressor is protected by S49 and S50 freezestats and S4 and S7 high pressure switches (on each evaporator). Low ambient switches (S11, S84) are available as an option for additional compressor protection. On 150 units, each compressor is protected by a crankcase heater.

1-Compressors B1 and B2

All ZGA/ZGB092/150 units use two scroll compressors. 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.

If Interlink compressor replacement is necessary, call 1-800-453-6669.

⚠ IMPORTANT

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

2-Thermal Protectors S5, S8

Some compressors have thermal protectors located on top of the compressor. The protectors open at 248°F ± 9°F (120°C ± 5°C) and close at 169°F ± 18°F (76°C ± 10°C).

3-High Pressure Switches S4 and S7

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

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

When discharge pressure rises to 640 ± 10 psig (4413 ± 69 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate).

4-Low Ambient Switches S11 & S84 (optional)

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

In the ZGA/ZGB092/150, S11 and S84 are wired in parallel with outdoor fan relay K10.

When liquid pressure rises to 450 ± 10 psig (3102 ± 69 kPa), the switch closes and the condenser fans are energized. When liquid pressure in both refrigerant circuits drops to 240 ± 10 psig (1655 ± 69 kPa), the switches open and the condenser fans are de-energized. This intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the evaporator coil and losing capacity.

5-Crankcase Heaters HR1, HR2 (optional)

092-150S units use belly band heaters. Heater HR1 is installed around compressor B1 and heater HR2 is installed around compressor B2. Crankcase heater wattage varies by compressor manufacturer.

C-Blower Compartment

All units are equipped with belt drive blowers.

1-Blower Wheels

All ZGA/ZGB092/150 units have one 15 in. x 15 in. (381 mm x 381 mm) blower wheel.

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

A-Three 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.

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

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

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of K3, TB2 or F4. Do not reverse wires at blower contactor or compressors.

5- Make sure the connections are tight.

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

B-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.

C-Blower Access

The blower assembly is secured to a sliding frame which allows the blower motor to be pulled out of the unit. See figure 5.

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

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

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

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

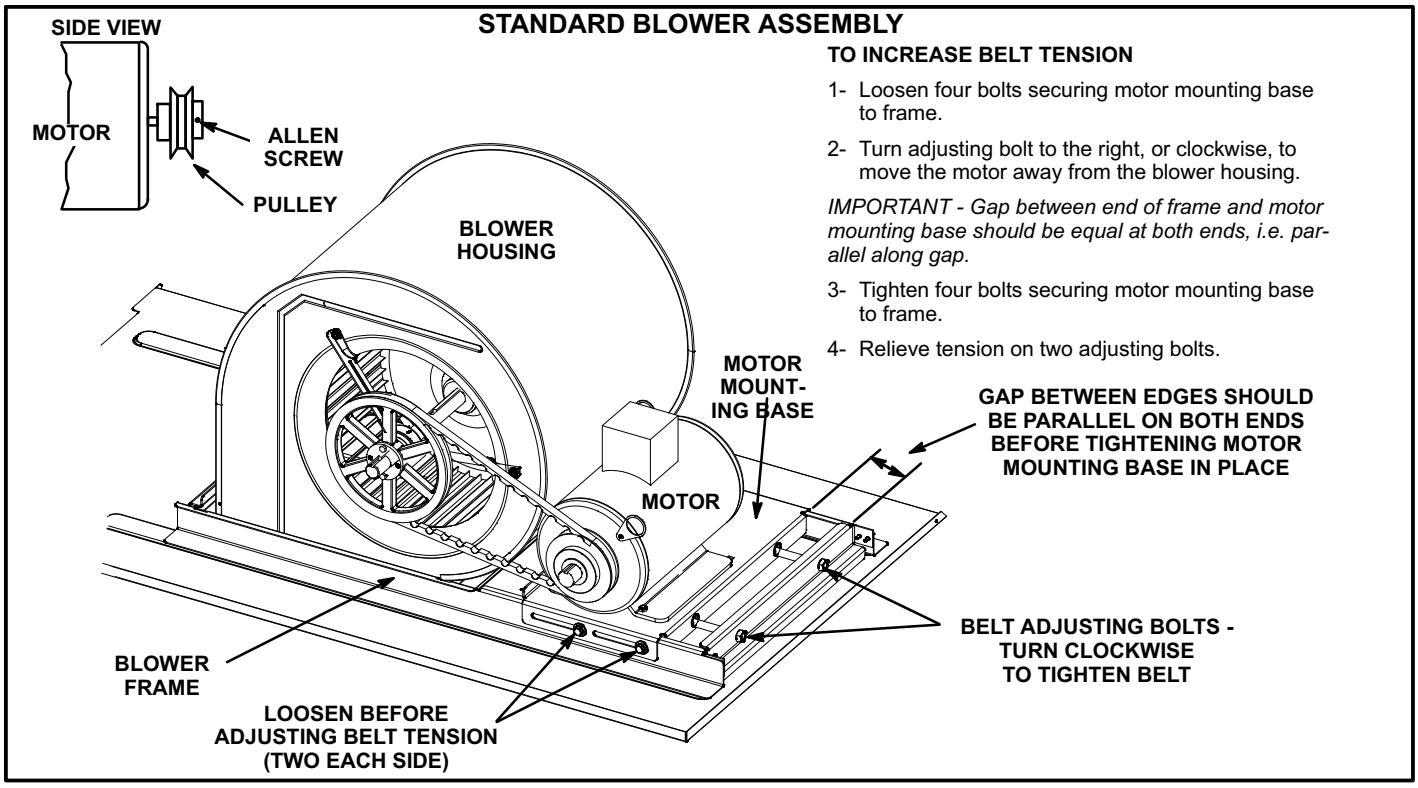


FIGURE 5

D-Determining Unit CFM

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*.

1- The following measurements must be made with a dry indoor coil and air filters in place.

*Units **Not** Equipped With An Inverter -*
Run blower without a cooling demand.

Units Equipped With An Inverter -
Initiate high speed blower without a cooling demand. Disconnect high pressure switches S4 and S7. Run the blower with Y1 **and** Y2 demands.

2- Measure the indoor blower shaft RPM.

3- 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 6.

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

4- Referring to page 13, 14, or 15, use static pressure and RPM readings to determine unit CFM. Use pages 16 and 17 when installing units with any of the optional accessories listed.

5- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 5. Do not exceed minimum and maximum number of pulley turns as shown in table 1.

6- *Units Equipped With An Inverter -*
Reconnect high pressure switches S4 and S7.

TABLE 1
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum Turns Open
A Section	0	5
B Section	1*	6

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

E-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat in the pulley grooves. Make sure blower and motor pulleys are aligned as shown in figure 7.

1- Loosen four bolts securing motor base to mounting frame. See figure 5.

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

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

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

3- Tighten two bolts on each side of the motor mounting base. This secures the mounting base to the frame.

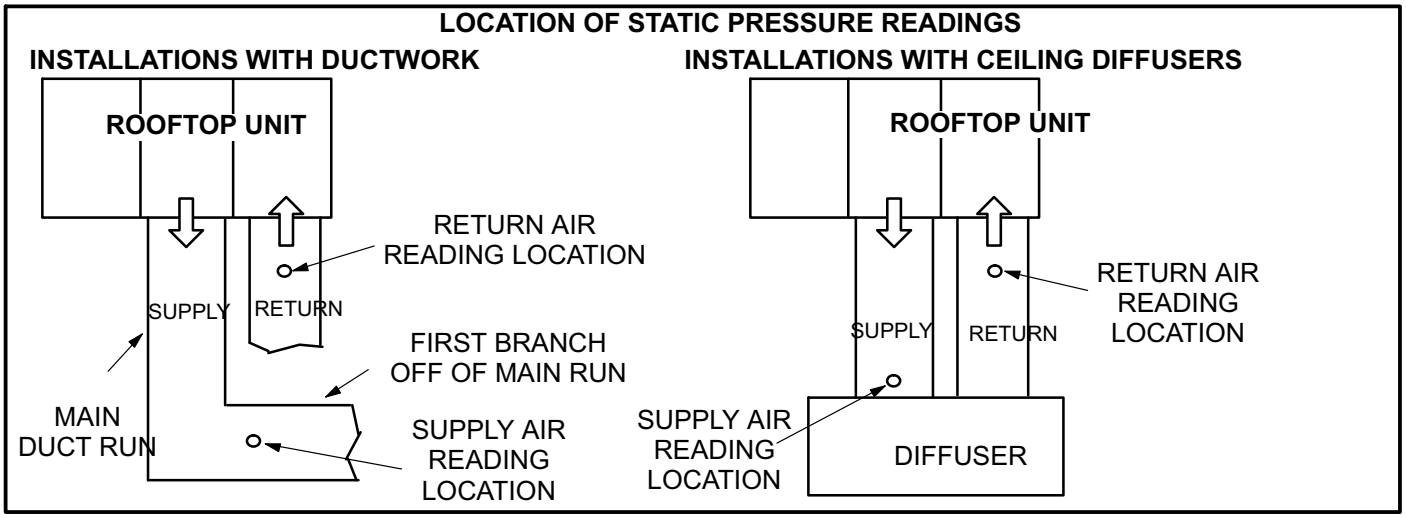


FIGURE 6

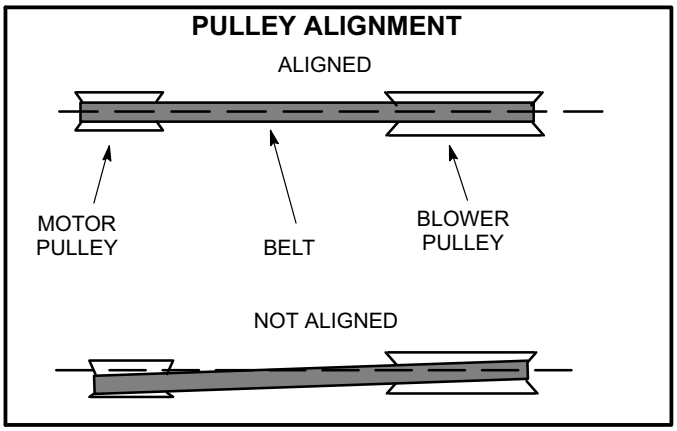


FIGURE 7

F-Check Belt Tension

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

1- Measure span length X. See figure 8.

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

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

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

3- Measure belt deflection force. For a new 2 and 3hp belt, the deflection force should be 5.0-7.0 lbs. (35-48kPa). For a new 5hp belt, the deflection force should be 7-10lbs. (48-69kPa).

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

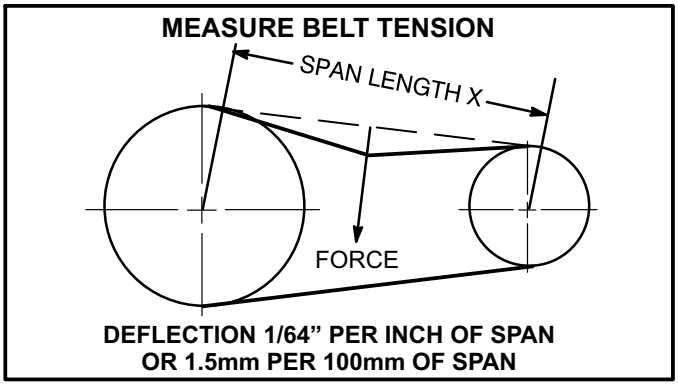


FIGURE 8

F-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 13 through 17 to determine BHP and RPM required. Reference table 2 for drive component manufacturer's numbers.

TABLE 2
MANUFACTURER'S NUMBERS

DRIVE NO.	DRIVE COMPONENTS					
	ADJUSTABLE SHEAVE		FIXED SHEAVE		BELT	
	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.
1	1VP34x7/8	31K6901	AK61x1	100244-20	A44	44L5501
2	1VP40x7/8	79J0301	AK59x1	31K6801	AX45	100245-23
3	1VP34x7/8	31K6901	AK46x1	100244-17	A41	100245-18
4	1VP44x7/8	P-8-1488	AK74x1	100244-21	AX48	100245-50
5	1VP50x7/8	P-8-2187	AK69x1	37L4701	AX48	100245-50
6	1VP50x7/8	P-8-2187	AK64x1	12L2501	AX46	31K7101
10	1VP50x1-1/8	P-8-1977	BK77x1	49K4001	BX50	100245-49
11	1VP50x1-1/8	P-8-1977	BK67x1	100244-24	BX46	100245-48
12	1VP50x1-1/8	P-8-1977	BK62x1	100244-23	BX46	100245-48

D-GAS HEAT COMPONENTS

ZGA/ZGB092/150 units are available in 130,000 BTUH (38.1 kW), 180,000 BTUH (52.7 Kw) or 240,000 BTUH (70.3 kW) heat sizes.

1-Heat Exchanger Figure 9

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

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

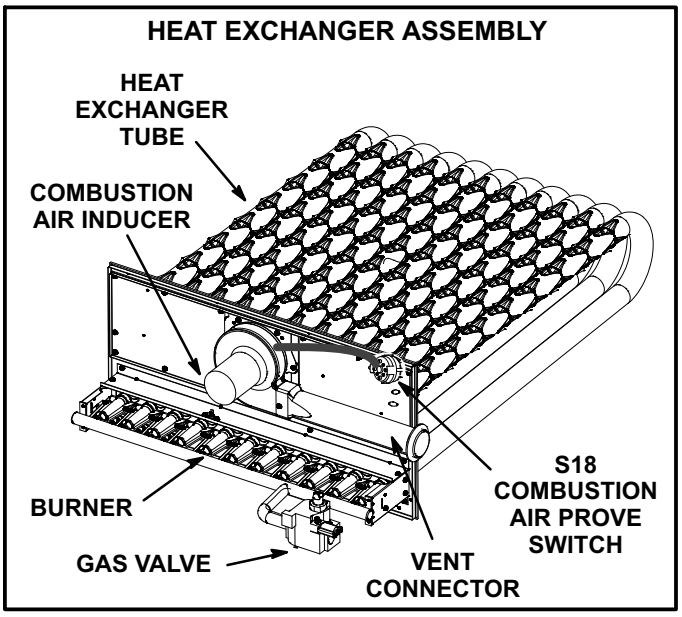


FIGURE 9

2-Burner Box Assembly (Figure 10)

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

Burners

Units are equipped with either aluminized steel inshot burners or a one piece aluminized burner cluster. Burners are factory set and do not require adjustment. A peep hole with cover is furnished in the heating access panel for flame viewing. Always operate the unit with the access panel in place.

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

Orifice

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

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

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

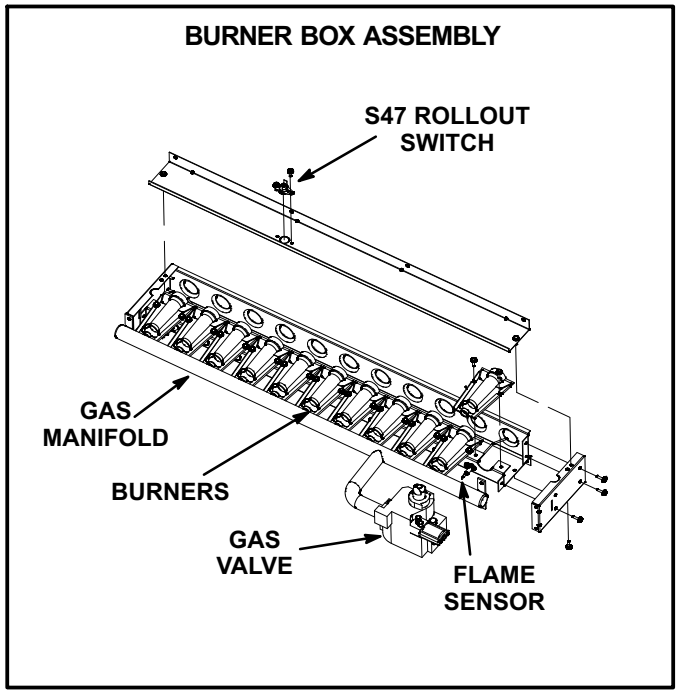


FIGURE 10

3-Primary High Temperature Limit S10

S10 is a SPST N.C. high temperature primary limit for gas heat in ZGA/ZGB092/150 units. S10 is located in the bottom right corner of the control box. See figure 11.

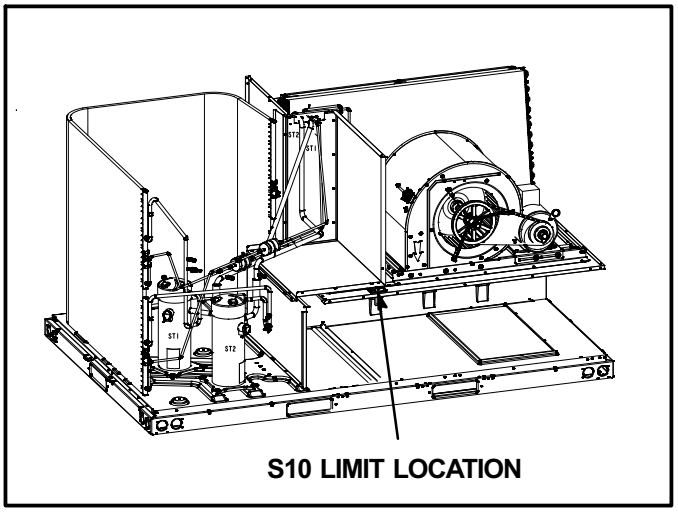


FIGURE 11

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

4-Flame Rollout Limit Switch S47

Flame rollout limit switch S47 is a SPST N.C. high temperature limit located just above the burner air intake opening in the burner enclosures (see figure 10). S47 is wired to the ignition control A3. When S47 senses flame rollout (indicating a blockage in the combustion air passages), the flame rollout limit trips and the ignition control immediately closes the gas valve.

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

5-Combustion Air Prove Switch S18

Prove switch S18 is a SPST N.O. switch located to the right of the induced draft assembly. S18 monitors combustion air inducer operation. Switch S18 is wired to the ignition control A3. The switch closes 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 3 shows prove switch settings.

TABLE 3
S18 Prove Switch Settings

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

6-Combustion Air Inducer B6

Combustion air inducers on ZGA/ZGB092/150 units provide air to the corresponding burners while clearing the combustion chamber of exhaust gases. The inducer begins operating immediately upon receiving a thermostat demand and is de-energized when thermostat demand is satisfied.

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

On a heating demand (W1), the ignition control A3 initiates the heating cycle. A3 then allows 30 to seconds for the combustion air inducer to vent exhaust gases from the burners. When the combustion air inducer is purging the exhaust gases, the combustion air prove switch closes, proving that the combustion air inducer is operating before allowing the ignition sequence to continue. When the combustion air prove switch is closed and the delay is over, the ignition control activates the first stage operator of the gas valve (low fire), the spark and the flame sensing electrode. Sparking stops immediately after flame is sensed or at the end of the eight second trial for ignition.

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

7-Combustion Air Motor Capacitor C3

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

8-Gas Valves GV1

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

On the White-Rodgers valve second stage is slow opening (on to high fire pressure in 40 seconds and off to low fire pressure in 30 seconds). The White-Rodgers valve is adjustable for high fire only. Low fire is not adjustable. On the Honeywell valve second stage is quick opening. The Honeywell valve is adjustable for both low fire and high fire. Figure NO TAG shows gas valve components. Table 4 shows factory gas valve regulation for ZGA/ZGB series units.

TABLE 4

GAS VALVE REGULATION				
Max. Inlet Pressure	Operating Manifold Pressure			
13.0" W.C.	Natural		L.P.	
	Low	High	Low	High
	1.6 ± 0.2" W.C.	3.7 ± 0.3" W.C.	5.5" ± 0.3" W.C	10.5" ± 0.5" W.C.

9-Spark Electrode Figure 13

An electrode assembly is used for ignition spark. The electrode is mounted through holes under the left most burner location. The electrode tip protrudes into the flame envelope of the adjacent burner. The electrode assembly is fastened to burner supports and can be removed for service without removing any part of the burners. See figure 12 for location of ignitor and sensor.

During ignition, spark travels through the spark electrode (figure 13) and ignites the left burner. Flame travels from burner to burner until all are lit.

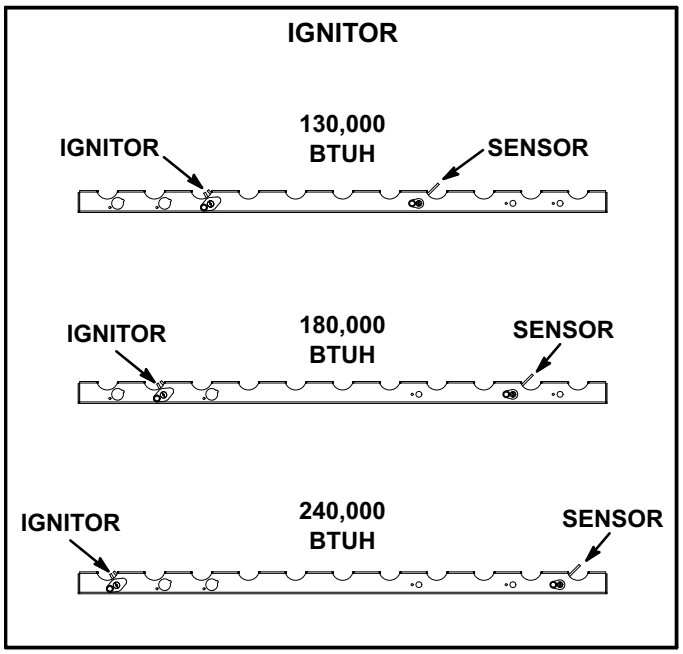


FIGURE 12

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

NOTE - *If electrode wire is replace, wire and suppression must be same type cable. See Product Zone@www.davenet.com for replacement.*

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

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

Spark gap may be checked with appropriately sized twist drills or feeler gauges. Disconnect power to the unit and remove electrode assembly. The gap should be between 0.125" ± 0.015" (3.2 mm ± .4 mm). See figure 13.

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

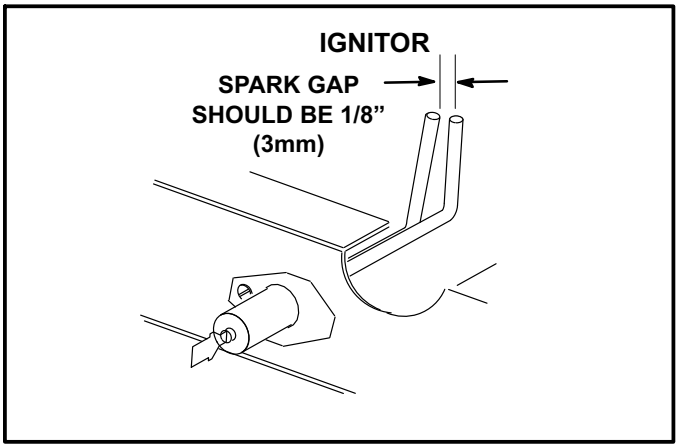


FIGURE 13

10-Flame Sensor Figure 14

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

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

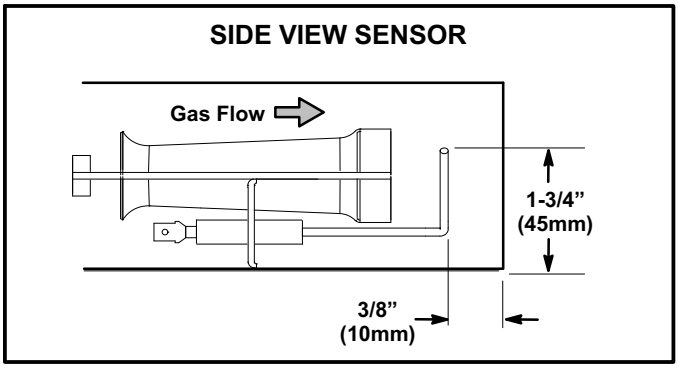


FIGURE 14

11-Burner Control A3

⚠WARNING

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

The burner control A3 is located in the gas heat section. See figures 1 and 15.

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 5). The unit will usually ignite on the first trial and A3 allows three trials for ignition before locking out. The lockout time is 1 hour . After lockout, the ignition control automatically resets and provides three more attempts at ignition. Manual reset after lockout requires removing power from the control for more than 1 second or removing the thermostat call for heat for more than 1 second but no more than 20 seconds. 24 volt thermostat connections (P2) and heating component connections (J1) are made through separate jackplugs. See table 6 for thermostat terminations and table 7 for heating component terminations.

TABLE 5

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 6

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 7

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

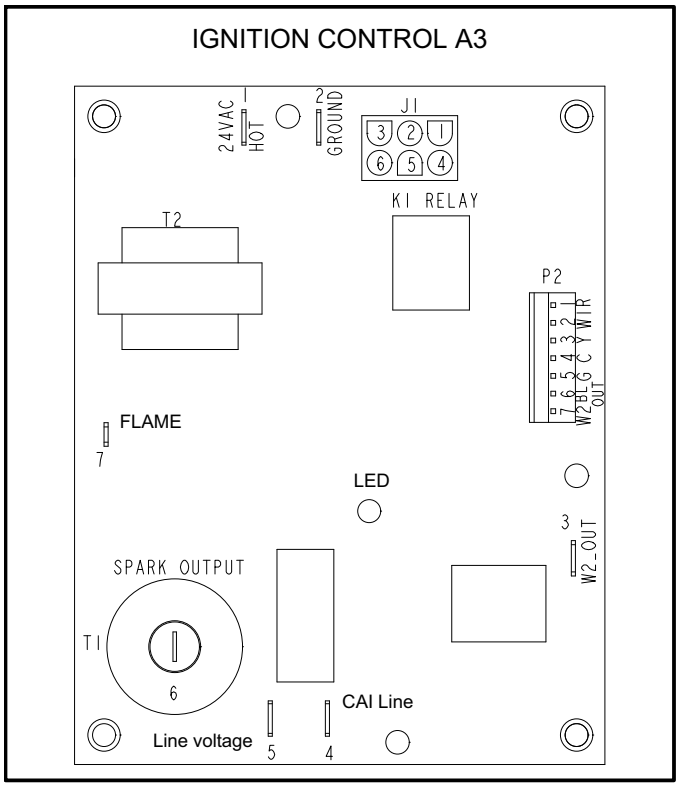


FIGURE 15

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

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

Operation

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

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

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 (Z1CURB40B-1, Z1CURB41B-1, Z1CURB42B-1, or Z1CURB43B-1).

III-STARTUP - OPERATION

A-Preliminary and Seasonal Checks

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

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

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

4- Check voltage at the disconnect switch. Voltage must be within the range listed on the nameplate. If not, consult the power company and have the voltage corrected before starting the unit.

5- Recheck voltage and amp draw with unit running. If voltage is not within range listed on unit nameplate, stop unit and consult power company. Refer to unit nameplate for maximum rated load amps.

6- Inspect and adjust blower belt (see section on Blower Compartment - Blower Belt Adjustment).

B-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 for Honeywell VR8305Q or White Rodgers 36H54 (figure 16 or 17)

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.

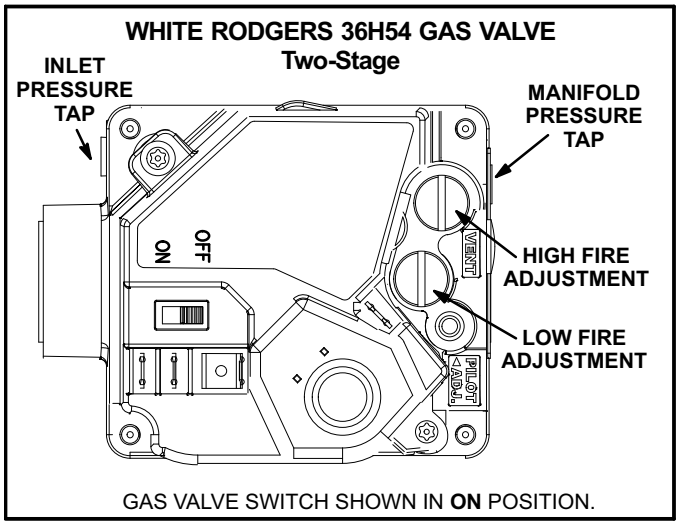


FIGURE 16

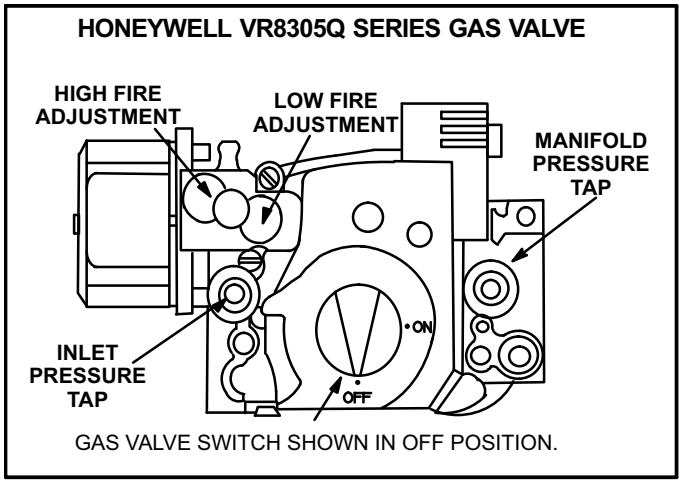


FIGURE 17

5- Turn gas valve switch to **OFF**. See figure 16. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise to **"OFF"**. Do not force. See figure 17.

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 gas valve switch to **ON**. See figure 16. On Honeywell VR8305Q gas valves, turn the knob on the gas valve counterclockwise to **"ON"**. Do not force. See figure 17.

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

5- Close or replace the heat section access panel.

⚠WARNING

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

C-Cooling Startup

Operation

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

2- *No Economizer Installed in Unit -*
A first-stage cooling demand (Y1) will energize compressor 1 and both condenser fans. An increased cooling demand (Y2) will energize compressor 2.

Units Equipped With Economizer -
When outdoor air is acceptable, a first-stage cooling demand (Y1) will energize the economizer. An increased cooling demand (Y2) will energize compressor 1 and both condenser fans. When outdoor air is not acceptable unit will operate as though no economizer is installed.

3- Units contain two refrigerant circuits or stages. See figure 18 or 19.

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

5- Refer to section IV CHARGING for proper method to check refrigerant charge.

D-Safety or Emergency Shutdown

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

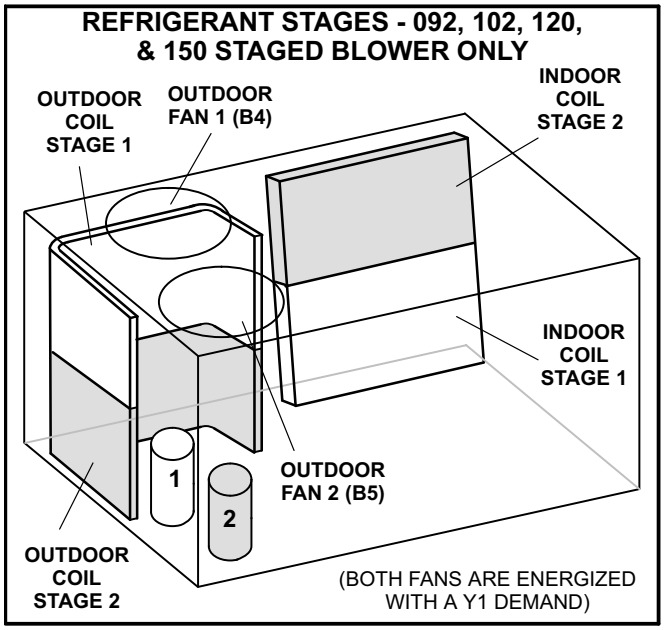


FIGURE 18

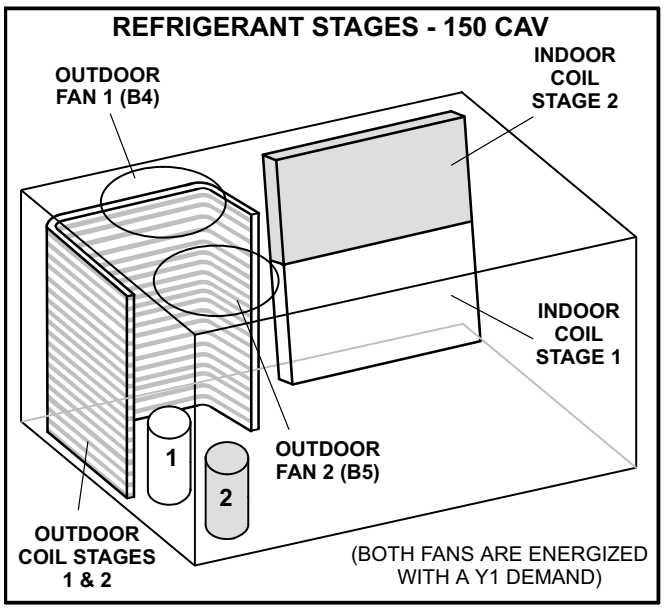


FIGURE 19

IV-CHARGING

⚠ 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:

IMPORTANT - Charge unit in standard cooling mode.

1- Make sure outdoor coil is clean. Attach gauge manifolds and fit access panel in place with manifold tubing routed outside of unit near bottom corner of panel. 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 8 - 13) to the pressures obtained from the gauges. Check unit components if there are significant differences.

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

Note - Pressures are listed for sea level applications.

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

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

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

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

7- Example ZG 092S Circuit 1: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 100.5°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 8

ZGA092S4M (Staged) & ZGB092S4B (CAV) 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	102	250	106	287	107	329	112	373	111	423	115	477
	108	253	111	291	114	333	118	380	122	431	123	486
	120	265	125	300	129	344	134	393	138	443	137	500
	134	280	138	318	144	362	148	410	153	462	155	517
Circuit 2	94	248	97	283	98	323	103	370	108	412	110	453
	98	249	101	287	104	329	109	373	115	423	119	474
	112	260	117	297	120	341	124	386	129	435	135	487
	125	275	129	312	134	354	139	403	144	452	148	501

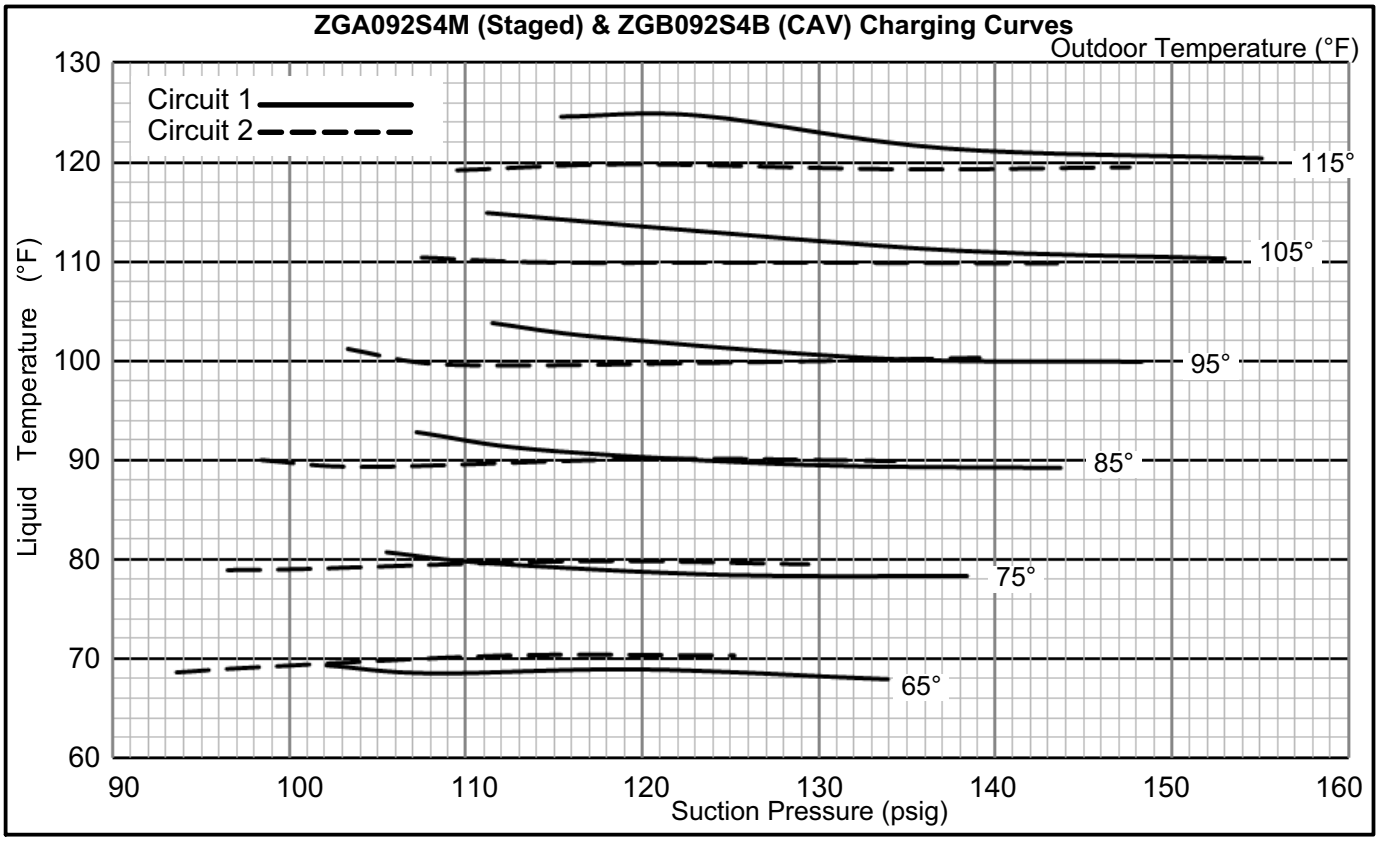


TABLE 9

ZGA102S4M (Staged) & ZGB102S4B (CAV) 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	108	250	110	284	113	328	116	371	119	423	123	478
	114	252	118	290	121	334	124	382	127	432	131	484
	128	267	132	305	137	347	140	392	145	445	148	500
	143	285	146	322	151	363	156	411	160	461	166	517
Circuit 2	107	273	109	310	112	353	114	398	118	448	121	498
	114	277	117	315	120	357	123	403	125	447	129	496
	128	289	133	331	137	375	140	417	144	471	148	525
	144	303	148	344	153	391	157	438	162	489	166	545

ZGA102S4M (Staged) & ZGB102S4B (CAV) Charging Curves

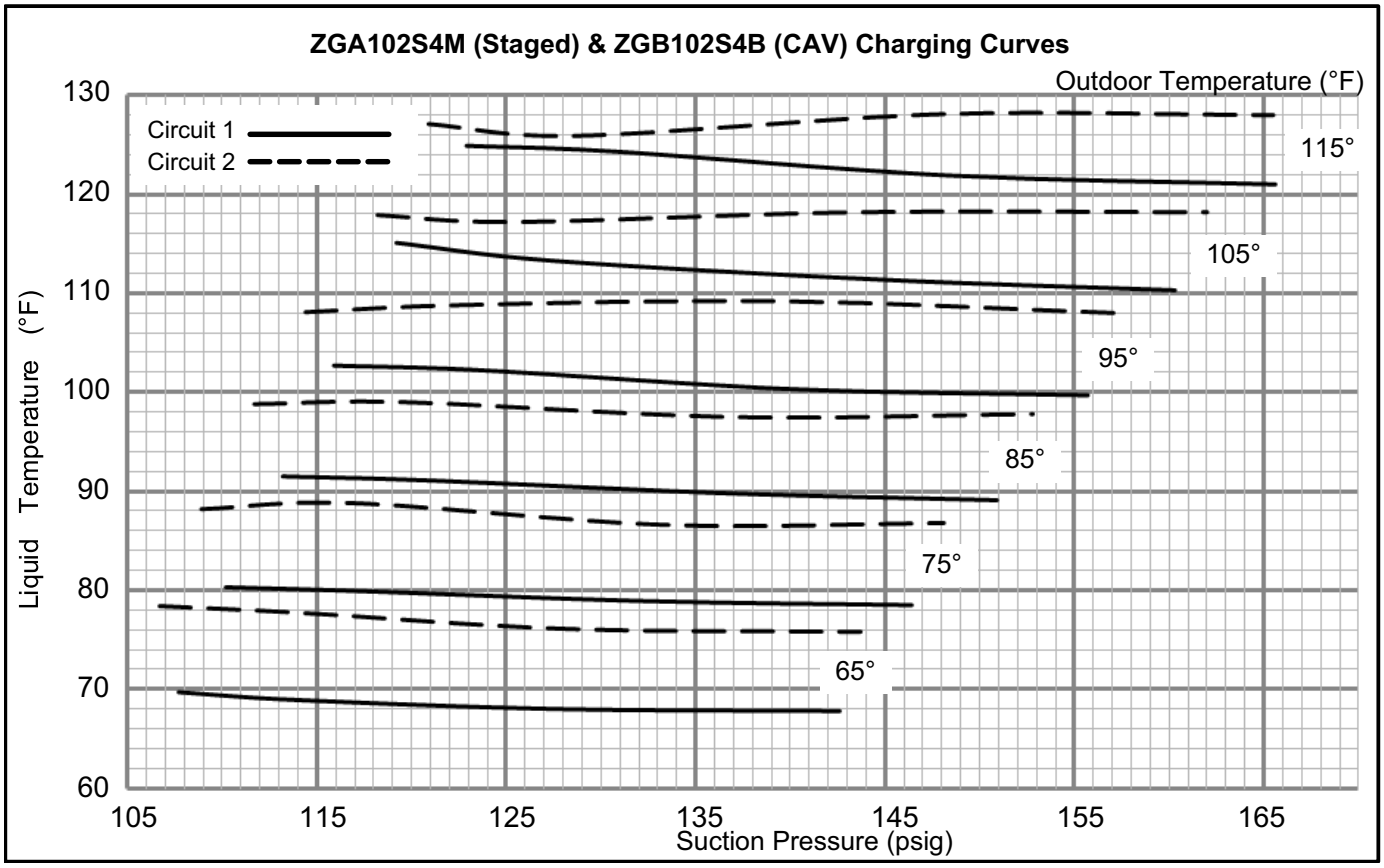


TABLE 10

ZGA120S4M (Staged) 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	245	111	286	114	330	117	380	119	433	121	492
	113	249	117	252	121	333	125	382	128	440	129	501
	128	269	133	307	138	350	141	398	146	455	145	521
	140	284	145	321	151	363	157	413	162	470	163	539
Circuit 2	110	254	114	296	117	342	120	391	121	444	126	507
	117	259	121	300	125	345	128	396	130	454	133	515
	133	281	138	321	142	365	145	414	149	472	151	537
	144	289	149	328	155	371	160	423	165	481	170	546

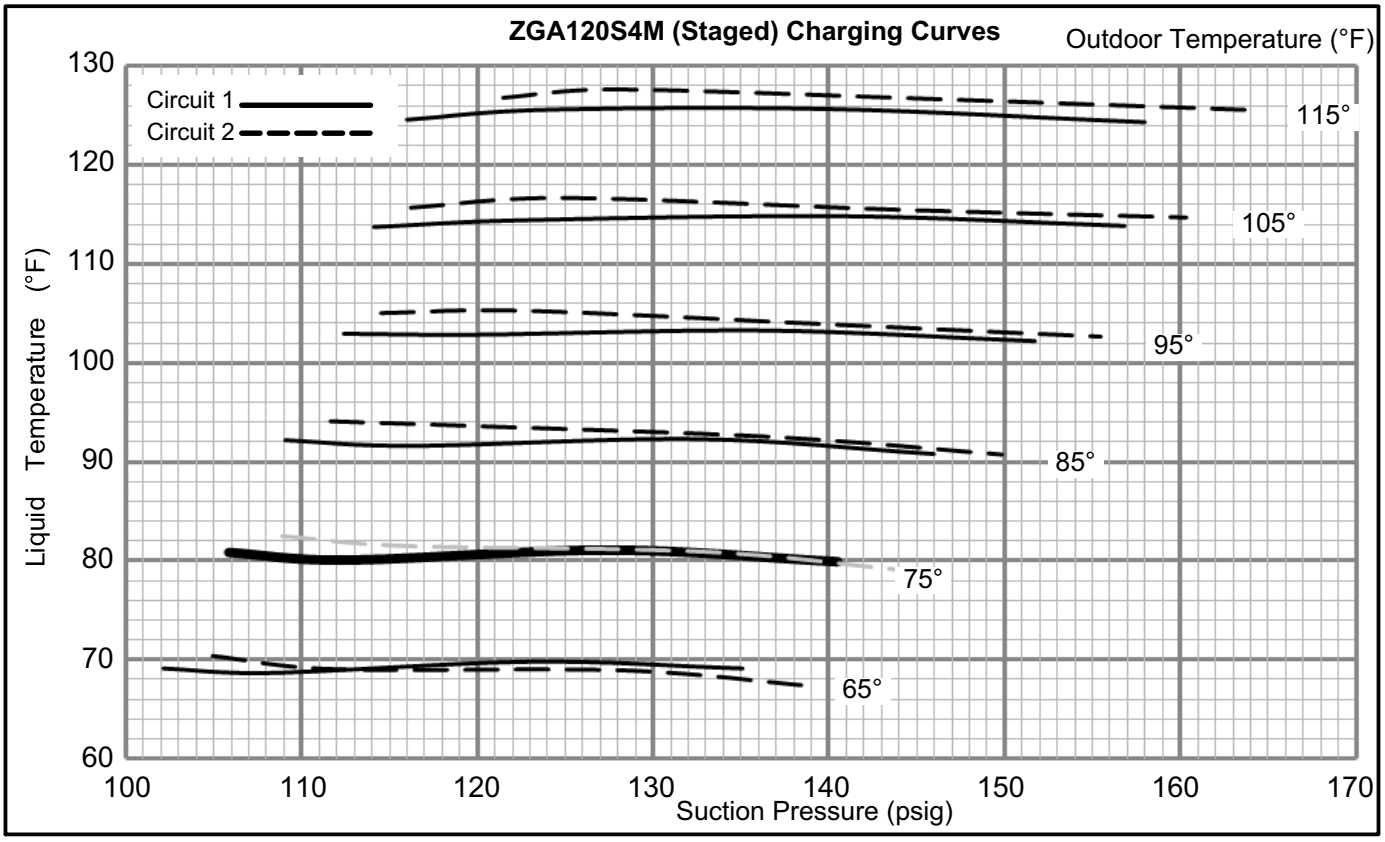


TABLE 11

ZGB120S4B (CAV) 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	253	109	290	111	333	114	379	118	428	121	482
	115	260	117	297	120	340	124	386	127	436	130	490
	130	278	134	316	137	357	141	404	145	454	146	509
	146	302	152	341	155	383	159	430	164	482	167	537
Circuit 2	107	262	109	301	112	344	115	390	119	440	121	494
	115	268	118	307	121	350	124	398	127	449	129	504
	128	275	133	320	137	363	141	412	144	462	146	521
	145	303	150	342	155	383	160	429	164	480	166	539

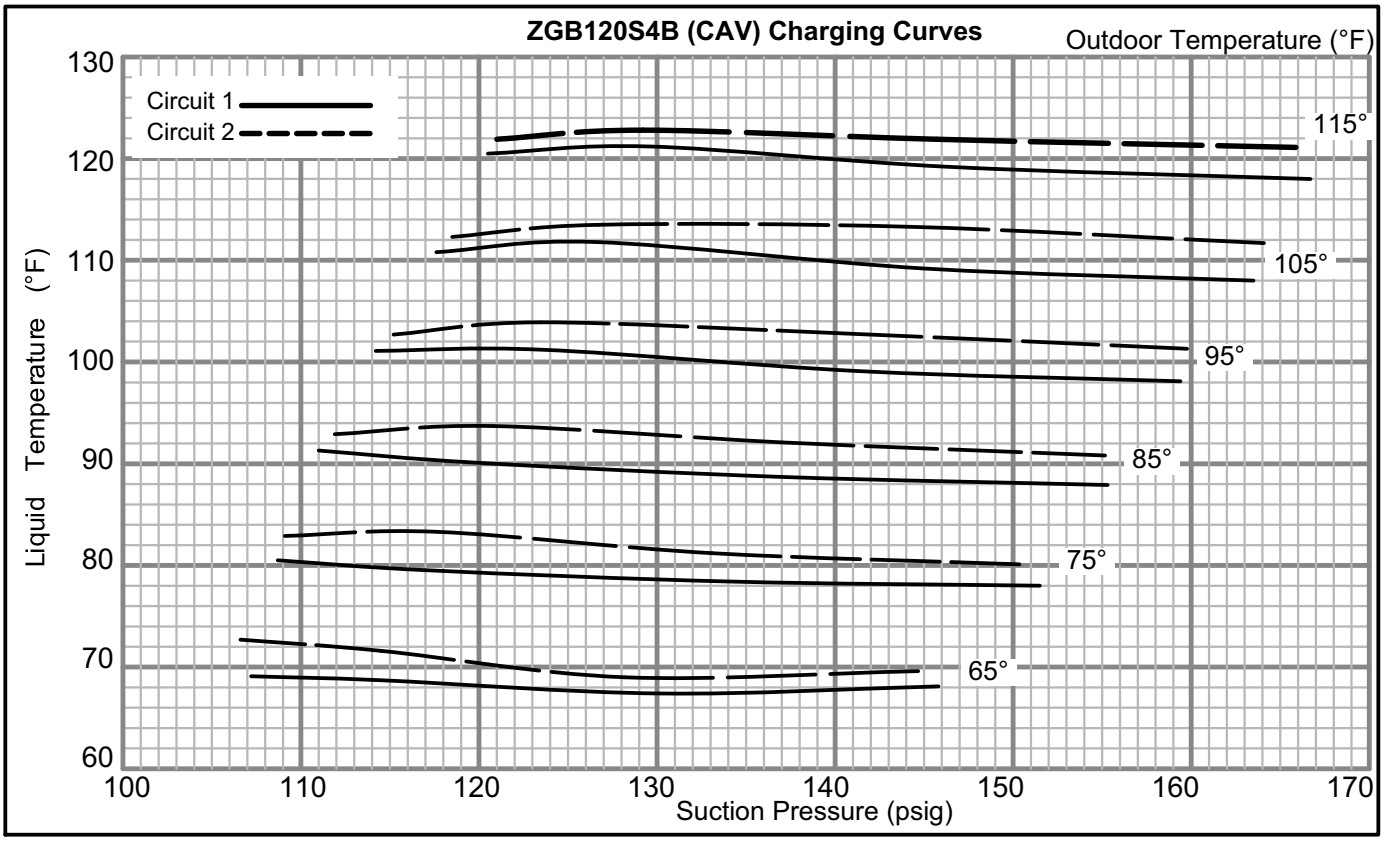


TABLE 12

ZGA150S4M (Staged) 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	108	251	112	291	114	337	117	385	118	440	122	501
	114	254	118	293	122	338	124	385	127	440	129	496
	129	268	133	308	137	351	141	401	145	459	146	521
	144	290	148	326	154	373	159	423	163	479	167	538
Circuit 2	110	258	113	298	116	344	118	390	122	448	125	507
	116	261	120	302	123	347	126	395	127	449	131	507
	130	275	134	315	138	360	142	410	147	467	149	526
	145	294	150	332	155	379	160	429	164	484	167	542

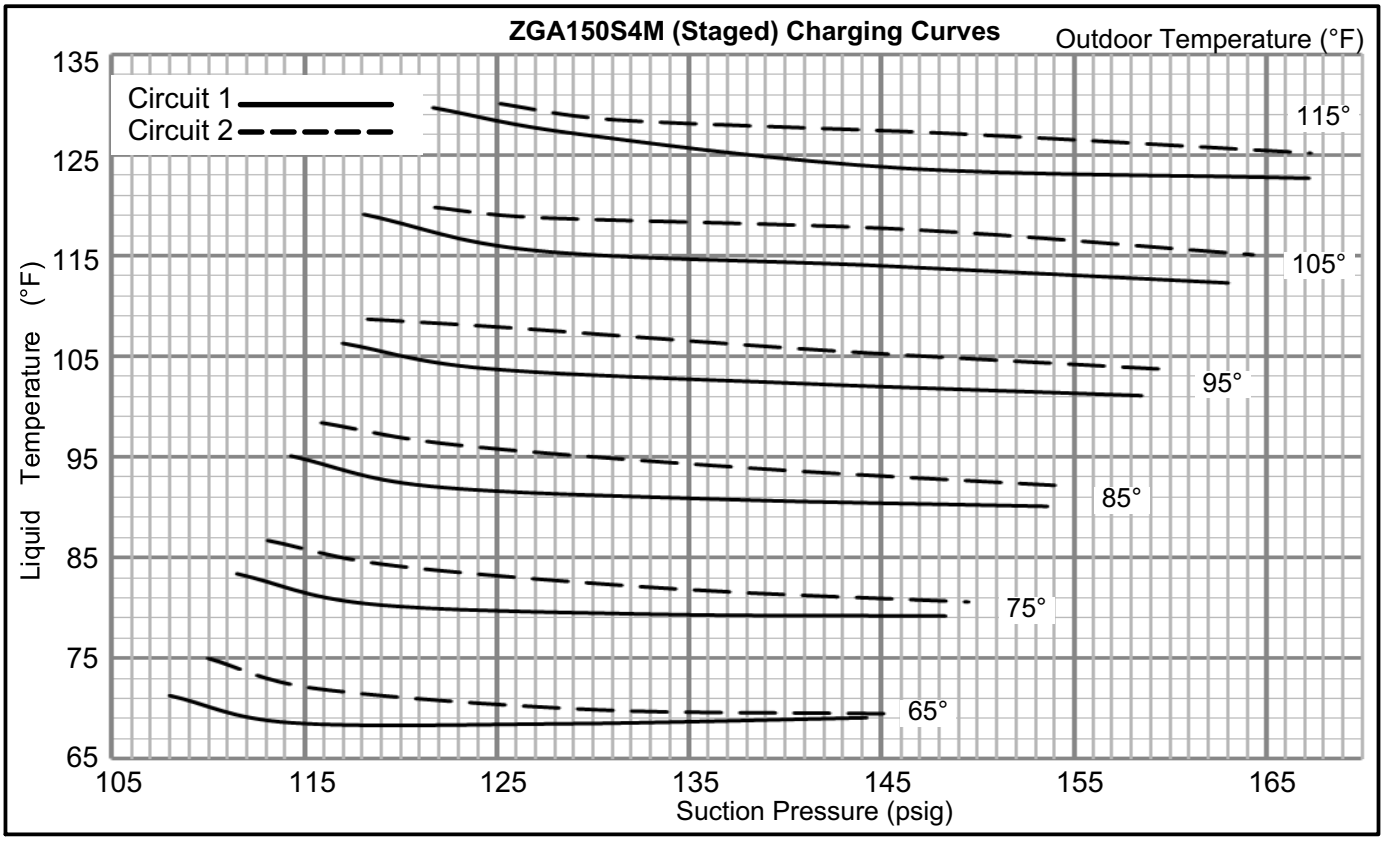
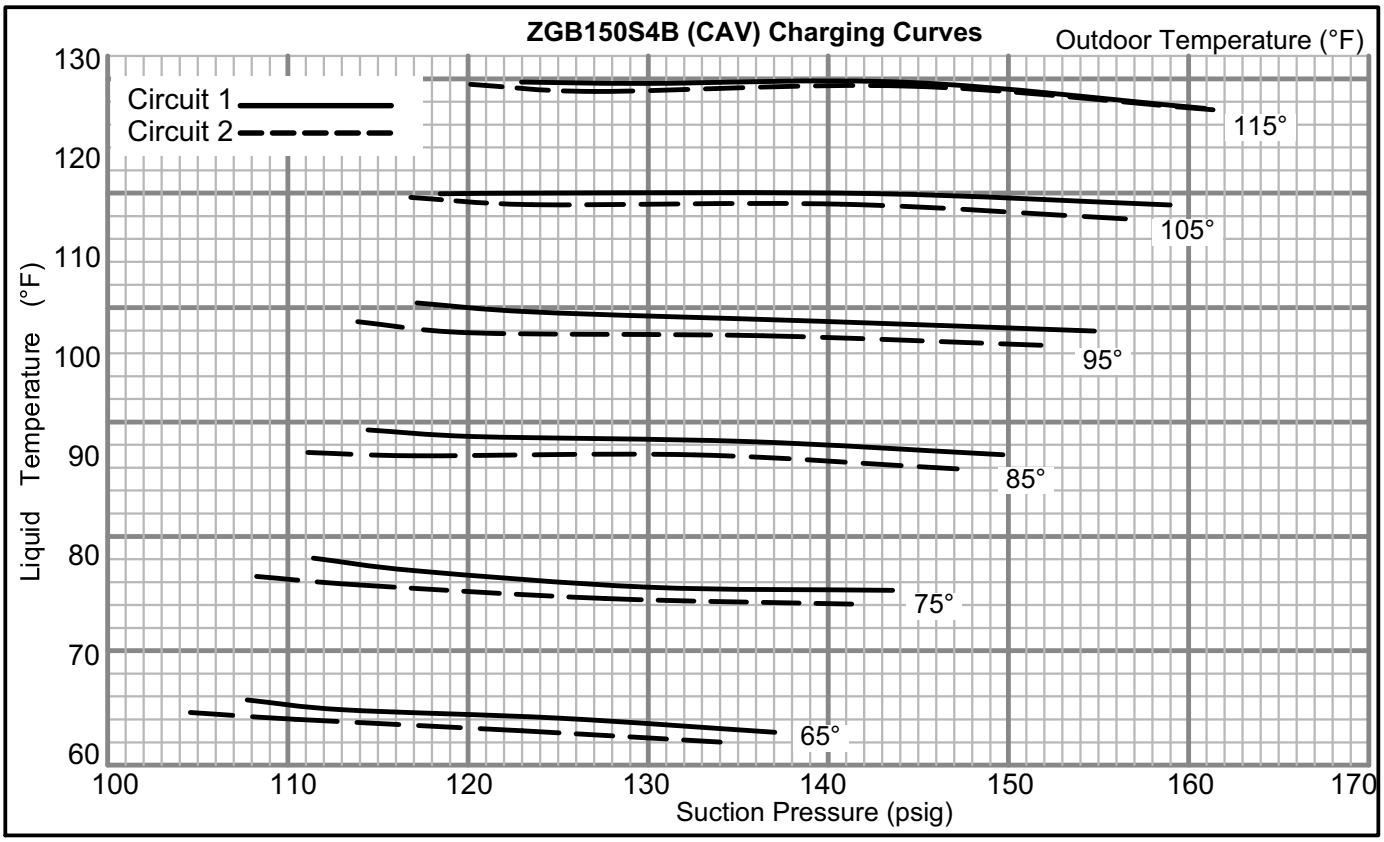


TABLE 13

ZGB150S4B (CAV) 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	108	261	111	303	114	343	117	391	118	441	123	495
	113	264	117	305	120	349	124	394	124	443	130	498
	125	271	130	312	136	361	139	407	143	464	145	519
	137	277	144	322	150	370	155	418	159	471	161	524
Circuit 2	105	261	108	304	111	344	114	392	117	442	120	495
	110	263	114	306	117	351	120	396	124	445	127	500
	123	270	128	312	133	361	136	409	141	465	144	520
	134	277	141	323	147	372	152	420	157	473	161	524



V- SYSTEMS SERVICE CHECKS

A-Heating System Service Checks

All ZGA/ZGB units are ETL/CSA design certified without modification.

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

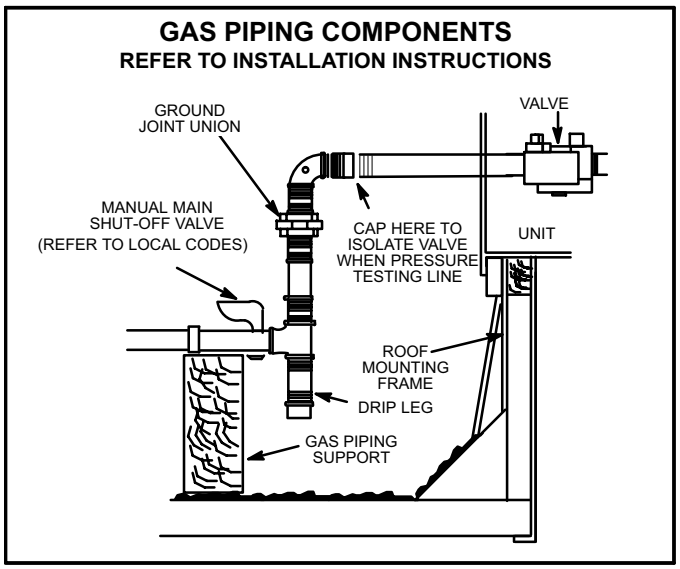


FIGURE 20

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 20.

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.

3-Testing Gas Supply Pressure

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

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

4-Check and Adjust Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move test gauge to the manifold pressure tap located on unit gas valve GV1. See figures 16 and 17 for location of manifold tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. See table 14. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See figures 16 and 17 for location of gas valve (manifold pressure) adjustment screw.

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

⚠ CAUTION

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

Manifold Adjustment Procedure

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

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

3- After allowing the unit to stabilize for five minutes, record the manifold pressure and compare to the values given in table 4.

5-High Altitude

Units may be installed at altitudes up to 2000 feet (610 m) above sea level without any modification. At altitudes above 2000 feet (610 m), units must be derated to match the gas manifold pressures shown in table 14.

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

TABLE 14

Altitude Ft.*	Gas Manifold Pressure
2001-4500	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.

⚠ IMPORTANT

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

6-Proper Gas Flow

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in table 15. Seconds in table 15 are based on a 1 cu.ft. dial and gas value of 1000 btu's for natural and 2500 btu's for LP. Adjust manifold pressure on gas valve to match time needed.

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

TABLE 15

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

7-Heat Exchanger

To Access or Remove Heat Exchanger From Unit:

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

8-Flame Sensing

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

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

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

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

B-Cooling System Service Checks

ZGA/ZGB 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 8 through 13.*

VI-MAINTENANCE

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

⚠WARNING

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

⚠CAUTION

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

⚠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.

A-Filters

Units are equipped with 20 X 24 X 2" temporary filters which must be replaced prior to building occupation. Refer to local codes or appropriate jurisdiction for approved filters.

To change filters, open filter access panel on back side of unit. See figure 21. Lift filter stop to remove filters. See figure 22.

⚠WARNING

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

Approved filters should be checked monthly and replaced when necessary. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 22.

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

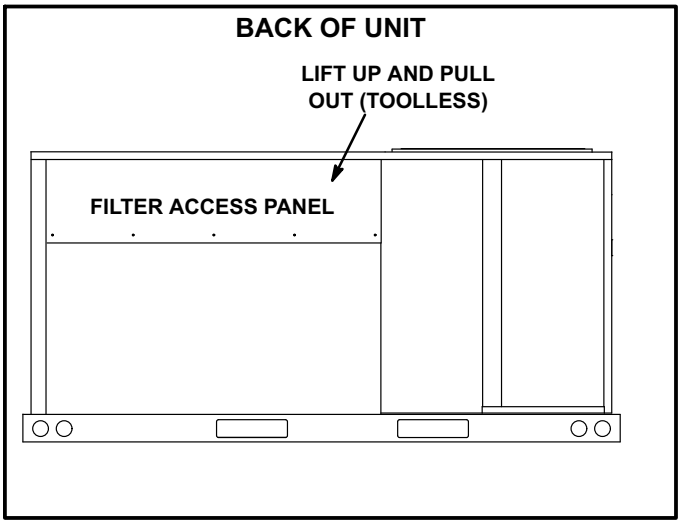


FIGURE 21

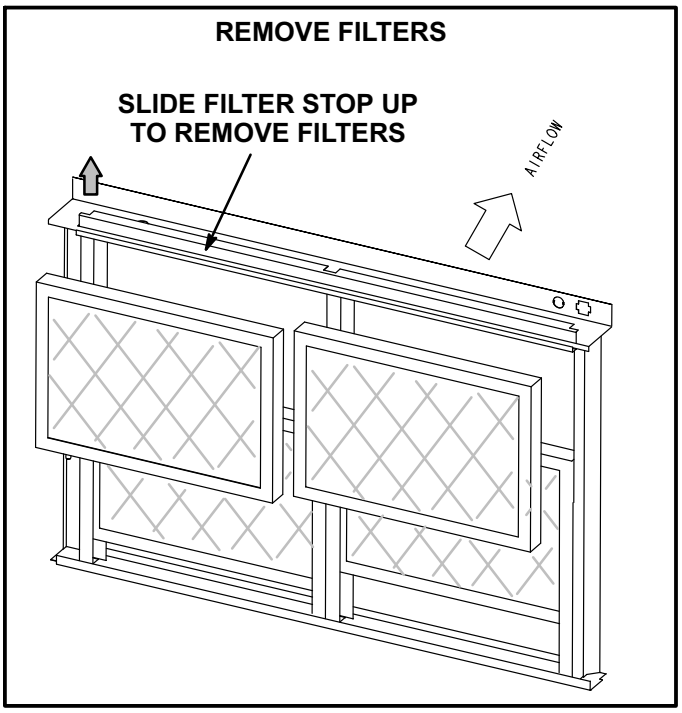


FIGURE 22

B-Lubrication

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

C-Evaporator Coil

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

D-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 10. Clean as necessary. **Note -** *Some units have inshot burners and can be removed individually. Some units have a one piece burner cluster and can removed as an assembly.*

4- Locate the ignitor under the left burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 13.

5- Replace burners and screws securing gas manifold.

⚠WARNING

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

7- Replace access panel.

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

E-Combustion Air Inducer

A combustion air proving switch checks combustion air inducer operation before allowing heating sequence to continue. The sequence will not be allowed to continue if inducer is obstructed.

The combustion air inducer wheel should be checked and cleaned prior to the heating season. 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 removing the vent pipe and inspecting the wheel through the outlet 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 9.

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.

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

F-Flue Passageway and Flue 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.

G-Condenser Coil

Clean condenser coil annually with water and inspect monthly during the cooling season.

Note - Do not use commercial coil cleaner on the all aluminum coil. Using anything other than water could result in corrosion and/or leaks.

Clean the all-aluminum coil by spraying the coil steadily and uniformly from top to bottom. Do not exceed 900 psi or a 45° angle; nozzle must be at least 12 inches from the coil face. Take care not to fracture the braze between the fins and refrigerant tubes. Reduce pressure and work cautiously to prevent damage.

H-Supply Blower Wheel

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

VII-ACCESSORIES

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

A-Mounting Frames

When installing units on a combustible surface for downflow discharge applications, the Z1CURB roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the ZGA/ZGB 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 Z1CURB mounting frame is shown in figure 23. Refer to the roof mounting frame installation instructions for details of proper assembly and mounting. The roof mounting frame MUST be squared to the roof and level before mounting. Plenum system MUST be installed before the unit is set on the mounting frame. Typical roof curbing and flashing is shown in figure 24. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

B-Transitions

Transitions are field-provided.

C-Supply and Return Diffusers

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

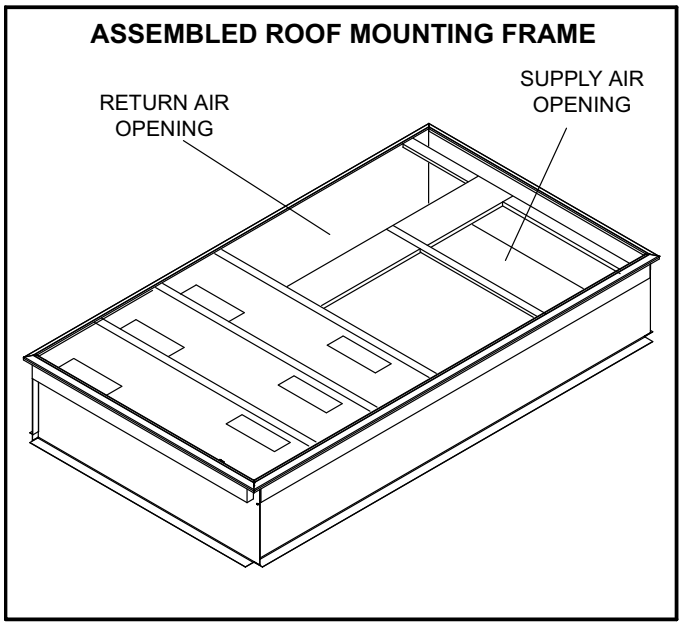


FIGURE 23

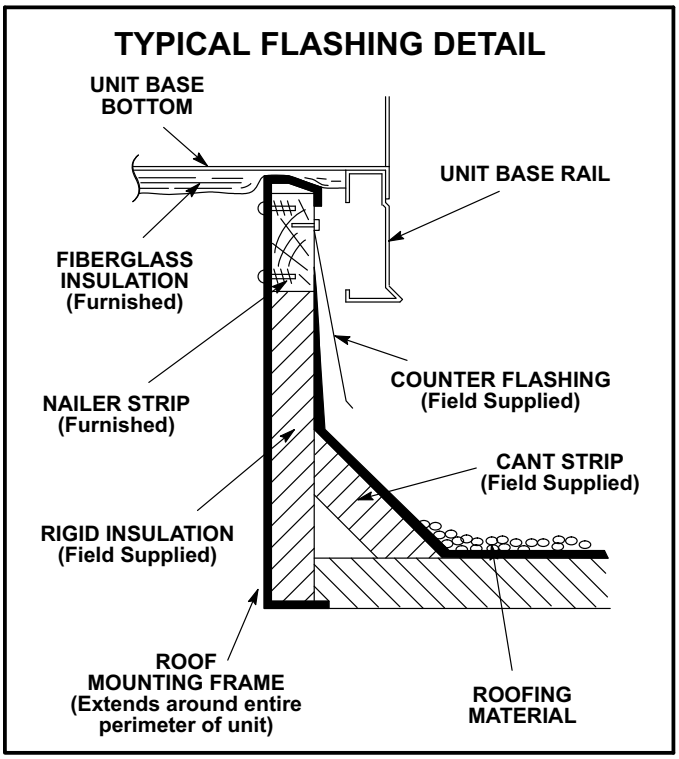


FIGURE 24

D-Horizontal Air Discharge

Units are shipped ready for downflow air discharge. An additional kit is not required to change the unit to horizontal air discharge. Remove the horizontal duct covers and place over the downflow air openings. See figures 25 and 26.

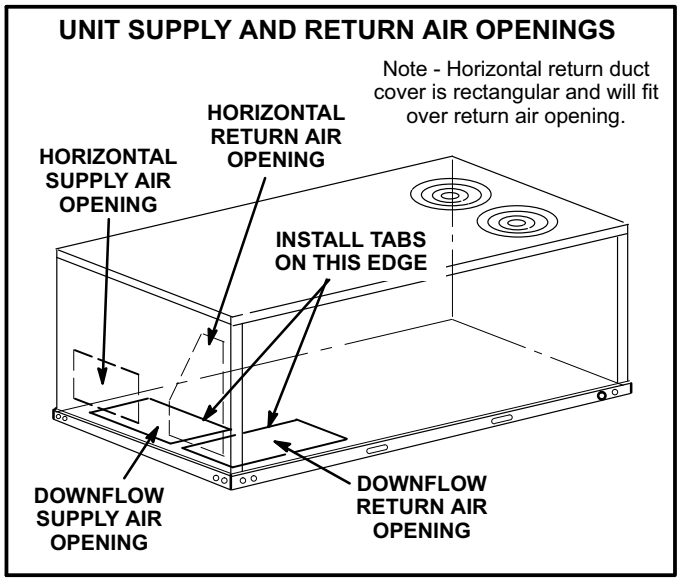


FIGURE 25

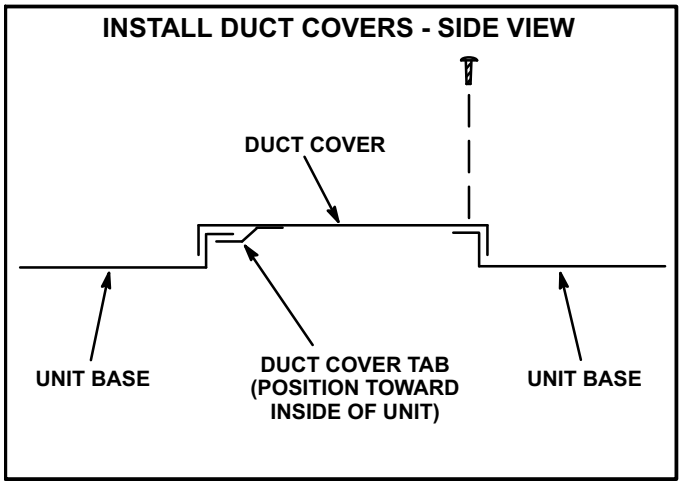


FIGURE 26

E- Economizer

(Field or Factory Installed)

NOTE - *The following is an example of one economizer used. See Engineering Handbook for other economizers used and refer to the applicable economizer installation instruction for more detail.*

Economizers use outdoor air for free cooling when temperature and/or humidity is suitable. See figure 28.

The mixed air temperature sensor (R1) measures the supply air sensible temperature. See figure 27. The outdoor air sensible control is the default economizer control. An outdoor air single sensible sensor, S175, is also provided. See table 16 for outdoor and return air (OA and RA) sensor options. Refer to instructions provided with sensors for installation.

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

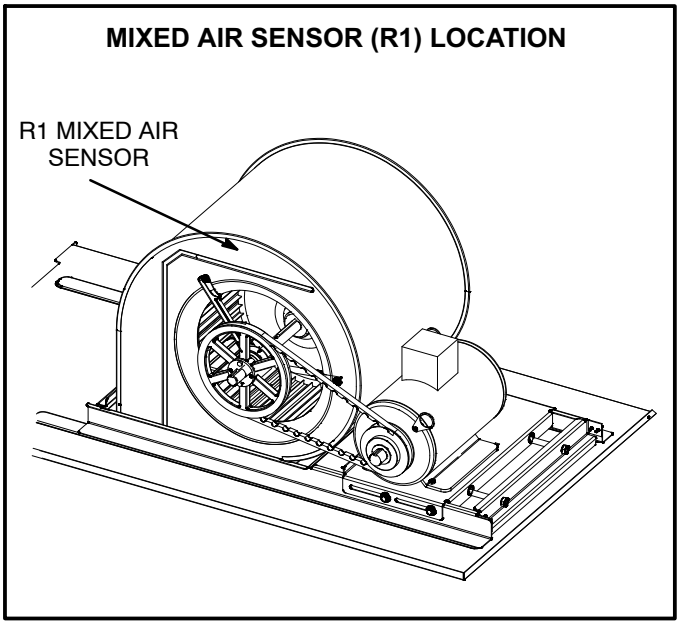


FIGURE 27

TABLE 16

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

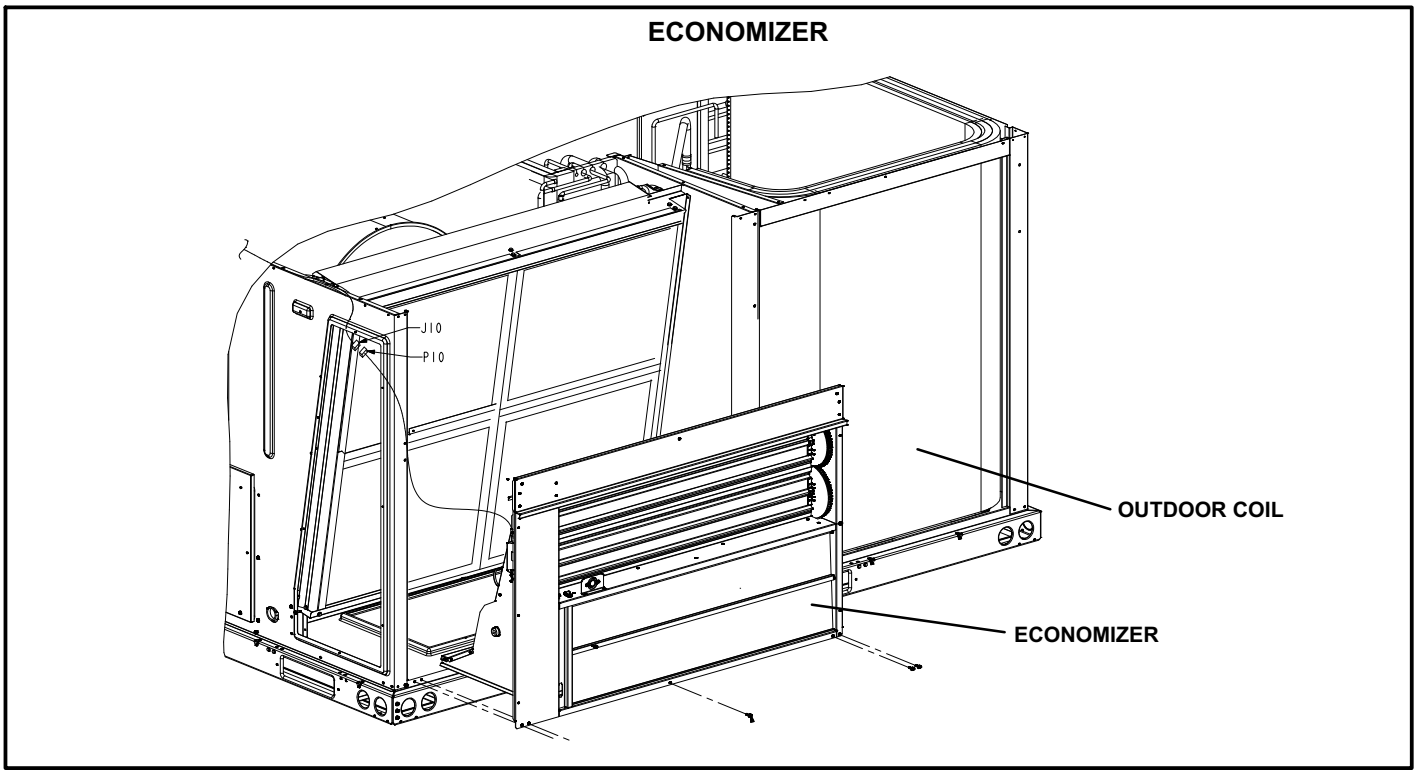


FIGURE 28

A6 Enthalpy Control LED'S

A steady green Free Cool LED indicates that outdoor air is suitable for free cooling.

When an optional IAQ sensor is installed, a steady green DCV LED indicates that the IAQ reading is higher than setpoint requiring more fresh air. See figure 29.

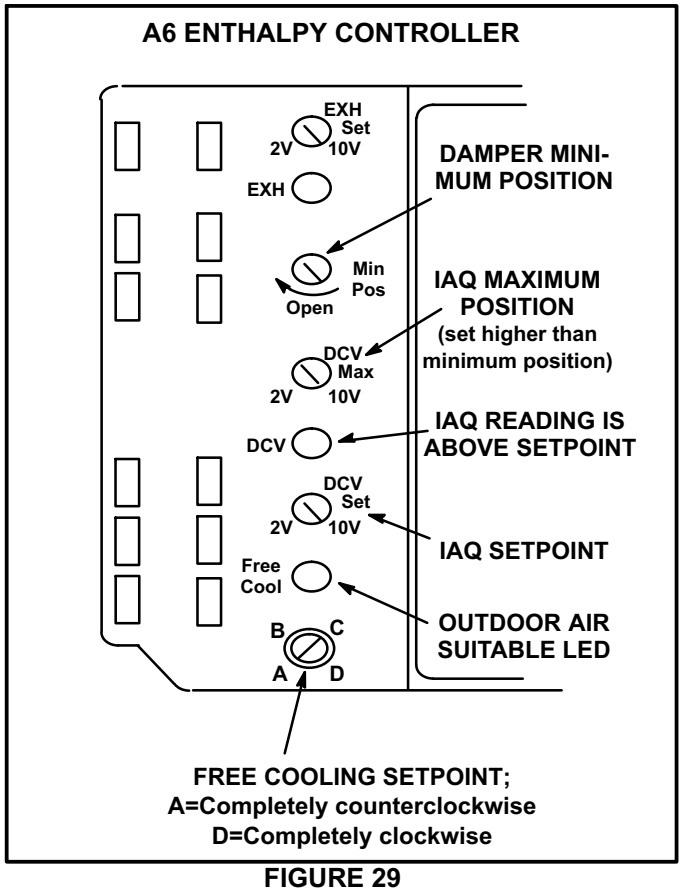


FIGURE 29

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 17. Setting A is recommended. See figure 29. At setting A, free cooling will be energized when outdoor air is approximately 73°F (23°C) and 50% relative humidity. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be energized at 70°F (21°C) and 50% relative humidity.

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

TABLE 17
ENTHALPY CONTROL SETPOINTS

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

Damper Minimum Position

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

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

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

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

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

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

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

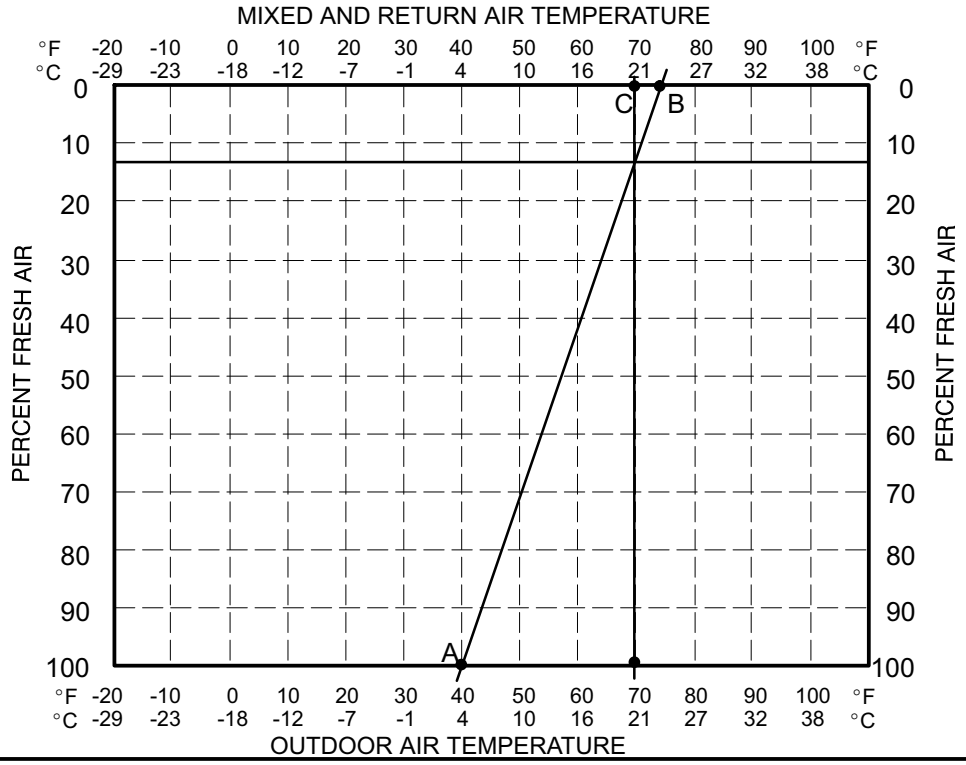
6- Draw a straight line between points A and B.

7- Draw a vertical line through point C.

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

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

CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE



DCV Set and Max Settings

Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO_2 sensor, dampers will start to open when the IAQ sensor reads approximately 1000ppm. Adjust the DCV SET potentiometer to the approximate setting specified by the controls contractor. Refer to figure 29.

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 29.

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

Economizer Operation

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

Outdoor Air Not Suitable:
During the unoccupied time period dampers are closed.

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

During the occupied time period dampers will open to DCV MAX when IAQ reading is above setpoint (regardless of thermostat demand or outdoor air suitability).

Outdoor Air Suitable:

See table 18 for economizer operation with a standard two-stage thermostat.

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

TABLE 18

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

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

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

POWER EXHAUST FANS

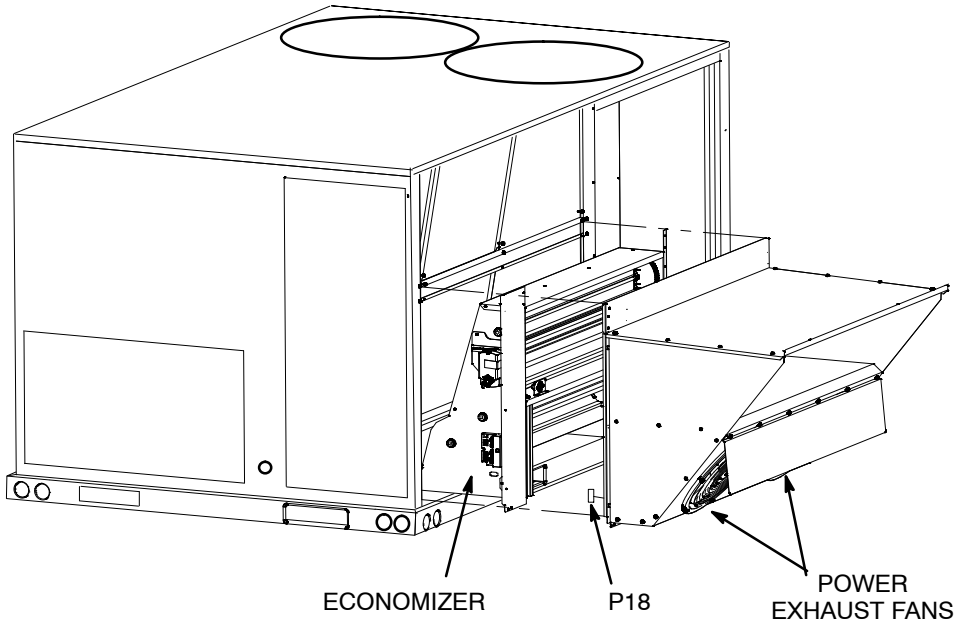


FIGURE 30

F-Power Exhaust Fan

The power exhaust fan (PEF) requires an optional gravity exhaust damper and economizer and is used in downflow applications only. See figure 30. The PEF provides exhaust air pressure relief and also runs when return air dampers are closed and the supply air blower is operating. See installation instructions for more detail.

Power Exhaust Setpoint Adjustment

Locate the A6 enthalpy control in the control area. The EXH SET potentiometer is factory-set at approximately 50% of the dial range. See figure 31. Power exhaust fans will be energized 30 seconds after dampers are 50% open. Adjust the EXH SET potentiometer higher (clockwise toward 10V) to energize fans when dampers are further open. Adjust the EXH SET potentiometer lower (counterclockwise toward 2V) to energize fans when dampers are further closed. (Thirty-second delay allows dampers to partially open before exhaust fan starts.)

G-LP / Propane Kit

ZGA/ZGB092/150 units require a natural to LP /propane kit. The kit includes one LP spring conversion kit, up to eleven burner orifices and three stickers. For more detail refer to the natural to LP gas changeover kit installation instructions.

H-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.

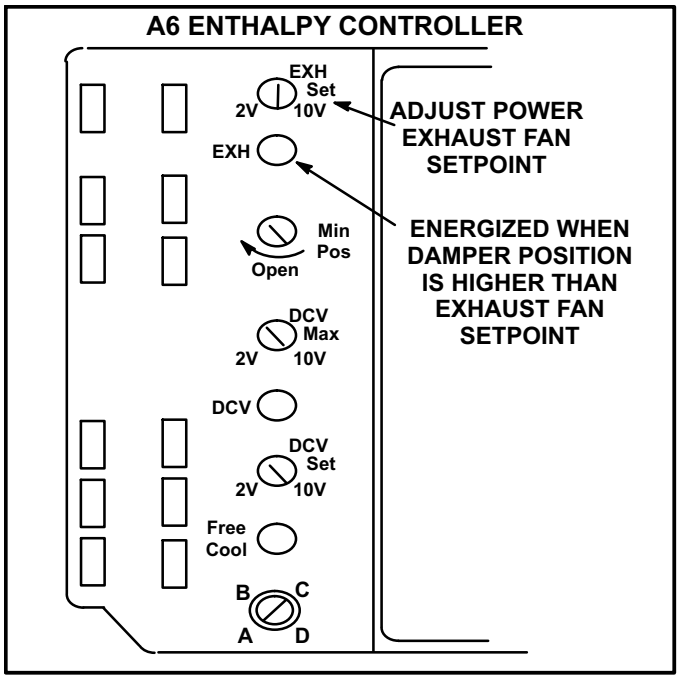
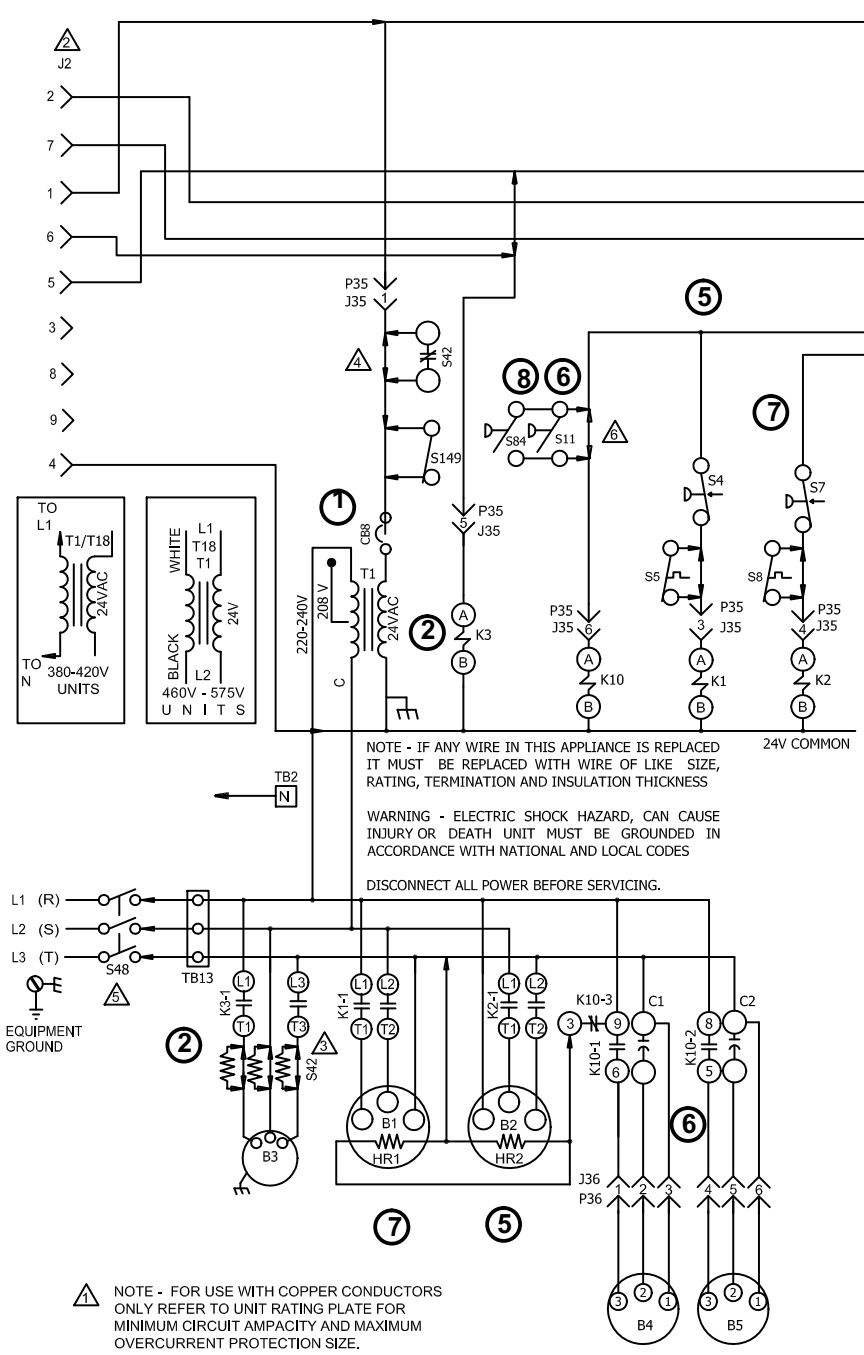


FIGURE 31

ZGA/ZGB092/150 UNIT DIAGRAM



KEY	COMPONENT
A42	MONITOR, PHASE PROTECTION
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CB8	CIRCUIT, BREAKER T1
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3, -1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
S4	SWITCH, LIMIT HI PRESS COMP 1
S5	SWITCH, LIMIT HI TEMP COMPRESSOR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S8	SWITCH, LIMIT HI TEMP COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S48	SWITCH, DISCONNECT
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
J2	JACK, HEAT
35	TEST
36	TEST COOL

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. J2 IS USED ON ZGA UNITS OR FIELD INSTALLED ZCA WITH ELECTRICAL HEAT
3. IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
4. S42 USED ON "M" VOLTAGE UNITS
5. S48 OR CB8 MAY BE USED
6. JUMPER WHEN S11 AND S84 ARE NOT USED

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

04/14	WIRING DIAGRAM 537671-01	04/14
COOLING - CAV		
ZCA, ZGA - 092, 102, 120, 150 - G, J, M, Y		
SECTION B		REV. 0
Supersedes	New Form No. 537671-01	

ZGA/ZGB092/150 Sequence of Operation

Power:

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

Blower Operation:

2- Indoor thermostat terminal G energizes blower contactor K3 with 24VAC. N.O. K3 closes, energizing blower B3.

1st Stage Cooling (compressor B1)

3- First stage cooling demand Y1 and G are energized by the thermostat. G energizes blower. 24VAC is routed through TB1 passing N.C. high pressure switch S4. Compressor contactor K1 is energized. N.O. contacts K1 close energizing compressor B1.

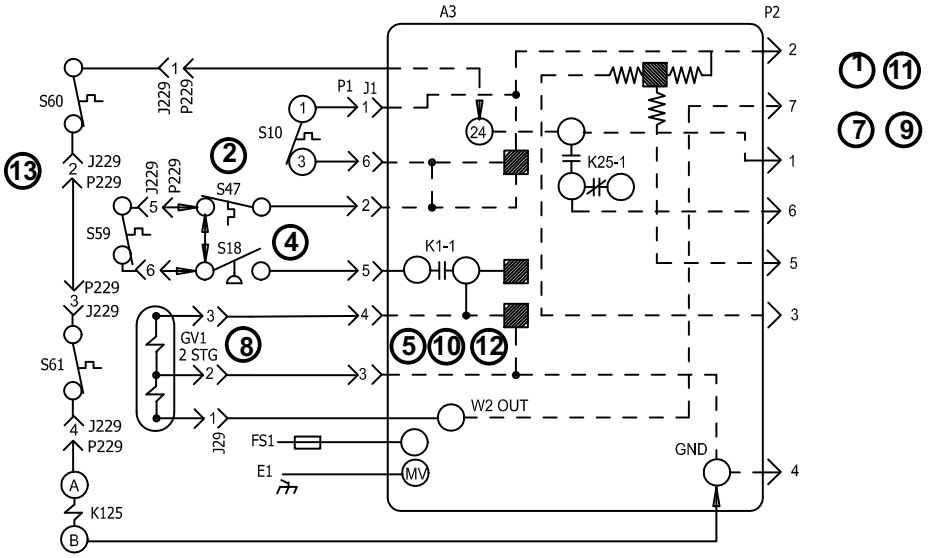
4- Optional N.O. low ambient switch S11 closes to energize condenser fan relay K10. N.O. contacts K10-1 and K10-2 close energizing condenser fans B4 and B5. N.C. contacts K10-3 open de-energizing crankcase heaters HR1 and HR2.

2nd Stage Cooling (compressor B2 is energized)

5- 24VAC is routed through TB1 and proves N.C. high pressure switch S7. Compressor contactor K2 is energized. N.O. K2 contacts close energizing compressor B2.

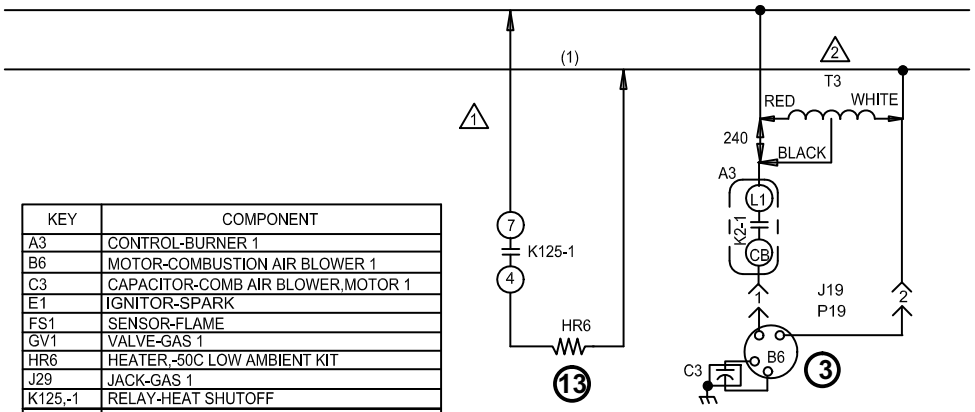
6- Optional N.O. low ambient switch S84 closes to energizing condenser fan relay K10. N.O. contacts K10-1 and K10-2 close energizing condenser fans B4 and B5. N.C. contacts K10-3 open de-energizing crankcase heaters HR1 and HR2.

GAS HEAT FOR ZGA/ZGB092/150 UNITS



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

2 T3 USED ON 480V AND 600V UNITS



KEY	COMPONENT
A3	CONTROL-BURNER 1
B6	MOTOR-COMBUSTION AIR BLOWER 1
C3	CAPACITOR-COMB AIR BLOWER,MOTOR 1
E1	IGNITOR-SPARK
FS1	SENSOR-FLAME
GV1	VALVE-GAS 1
HR6	HEATER,-50C LOW AMBIENT KIT
J29	JACK-GAS 1
K125,-1	RELAY-HEAT SHUTOFF
P2	PLUG-HEAT
S10	SWITCH-LIMIT, PRIMARY GAS
S18	SWITCH-COMB AIR BLOWER, PROVE
S47	SWITCH-FLAME ROLLOUT, BURNER 1
S59	THERMOSTAT-OPEN -20F, CLOSE 10F
S60	THERMOSTAT-OPEN 20F, CLOSE -10F
S61	THERMOSTAT-OPEN 50F, CLOSE 20F
T3	TRANSFORMER-COMB AIR BLOWER 1

INDICATES MICRO PROCESSER

DENOTES OPTIONAL COMPONENTS

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

04/14	WIRING DIAGRAM 537063-02	04-14
HEATING - GAS		
ZGA/KGA UNITS - 130 THRU 240		
SECTION A		REV 1
Supersedes 537063-01	New Form No. 537063-02	

GAS HEAT SEQUENCE OF OPERATION

First Stage Heat:

1- The thermostat initiates W1 heating demand.

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

3- Combustion air inducer blower B6 is energized.

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

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

Second Stage Heat:

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

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

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

End of Second Stage Heat:

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

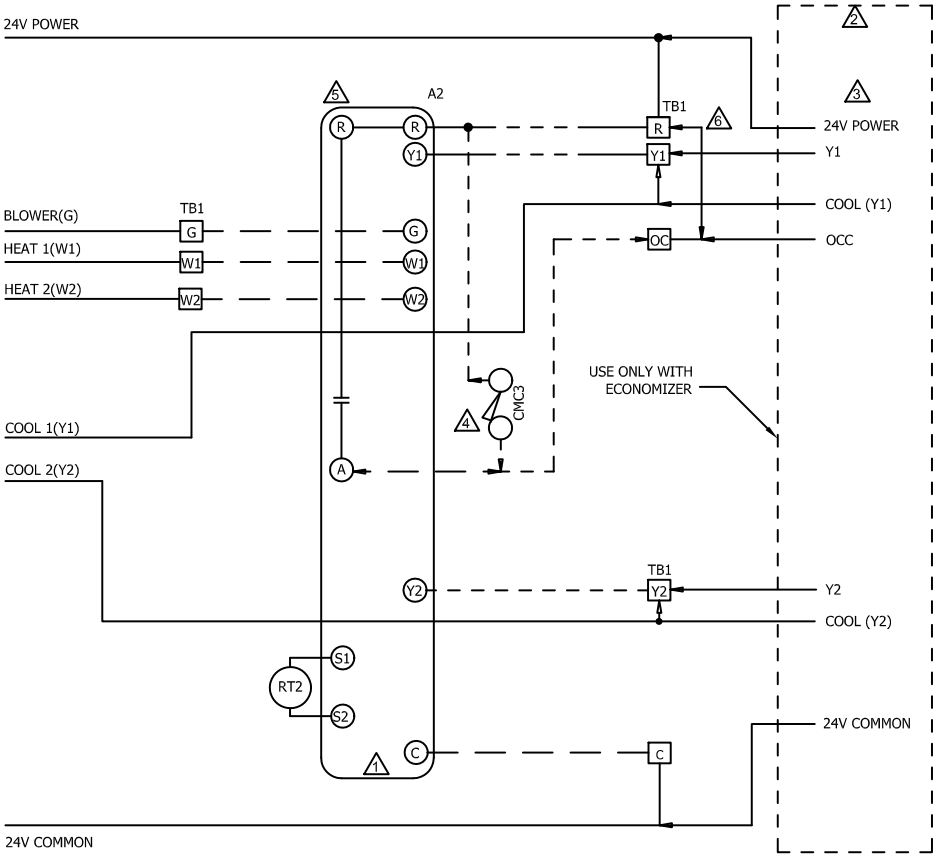
10- Terminal HI of GV1 is de-energized by A3 control module.

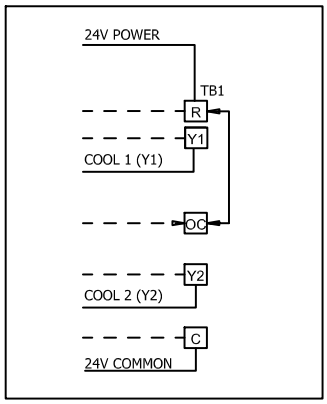
End of First Stage Heat:

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

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

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT





CONNECTION SCHEME FOR ZCA, ZGA AND ZHA 092 THROUGH 150 UNITS WITHOUT ECONOMIZER ONLY

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

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

DENOTES OPTIONAL COMPONENTS
CLASS II FIELD WIRING

04/14	WIRING DIAGRAM 537673-01	04/14
CONTROL		
ELECTRONIC/ELECTROMECHANICAL THERMOSTAT (RAIDER B)		
SECTION C		REV 0
Supersedes	New Form No. 537673-01	

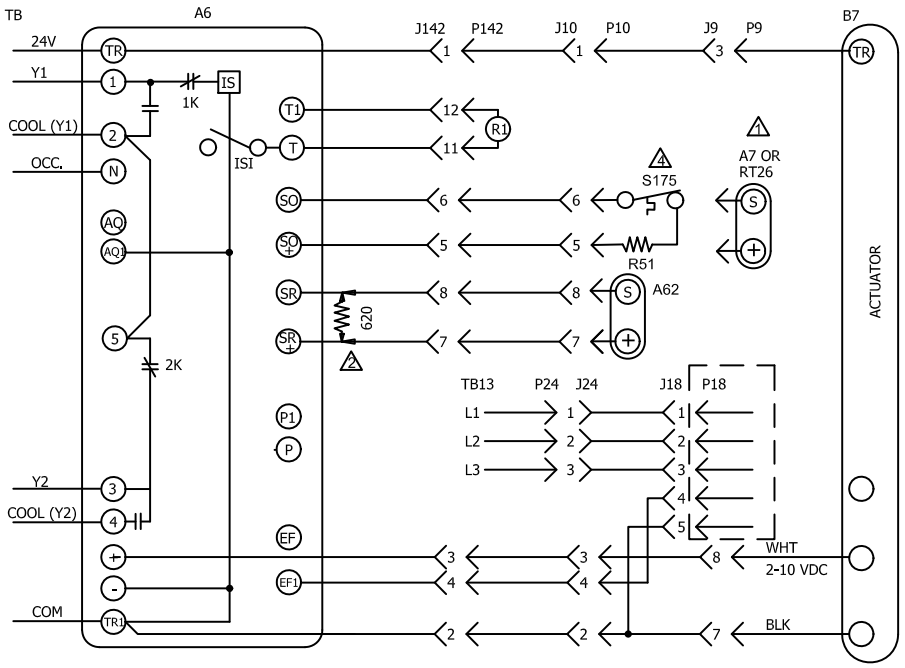
POWER:

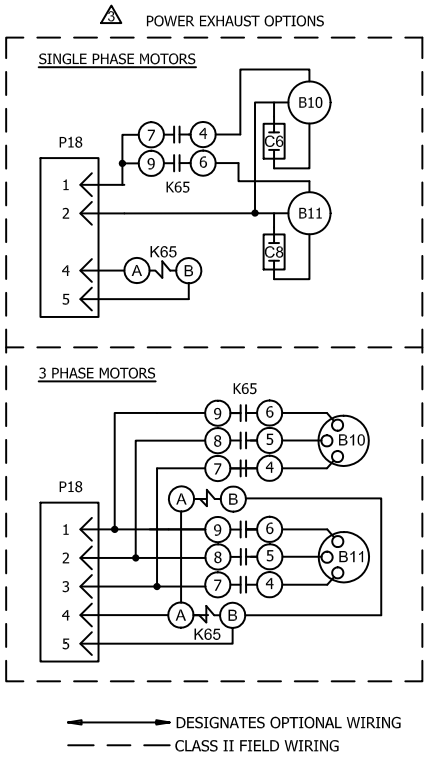
1- Terminal strip TB1 energizes thermostat components with 24VAC.

OPERATION:

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

ECONOMIZER





KEY	COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
B7	MOTOR-DAMPER, ECONOMIZER
B10	POWER EXHAUST FAN 1
B11	POWER EXHAUST FAN 2
B43	MOTOR-EXHAUST DAMPER
C6	CAPACITOR, EXHAUST FAN 1
C8	CAPACITOR, EXHAUST FAN 2
K65	RELAY, EXHAUST FAN
R1	MIXED AIR SENSOR
R51	RESISTOR-SENSIBLE 820 OHM
RT26	SENSOR-OUTDOOR AIR TEMP
S175	THERMOSTAT-SENSIBLE TEMP 55-70F
TB13	TERMINAL STRIP, POWER DISTRIBUTION

J/P	DESCRIPTION
9	ECONOMIZER, MOTOR
10	ECONOMIZER
18	EXHAUST FAN COMPT.
24	EXHAUST FAN
142	ECONOMIZER HARNESS

1. RT26 OR A7 CAN BE USED IN PLACE OF S175 SENSOR. REMOVE R51 RESISTOR IF REPLACING S175 WITH RT26 OR A7
2. IF USING A DIFFERENTIAL ENTHALPY SENSOR, REMOVE 620 OHM RESISTOR
3. OPTION: POWER EXHAUST
4. REPLACE S175 WITH A7 OR RT26 AS OPTIONAL.

04/14	WIRING DIAGRAM 537674-01	04/14
ACCESSORIES		
ECONOMIZER		
SECTION D		REV. 0
Supersedes	New Form No. 537674-01	

SEQUENCE OF OPERATION

POWER:

1- Terminal strip TB1 energizes the economizer components with 24VAC.

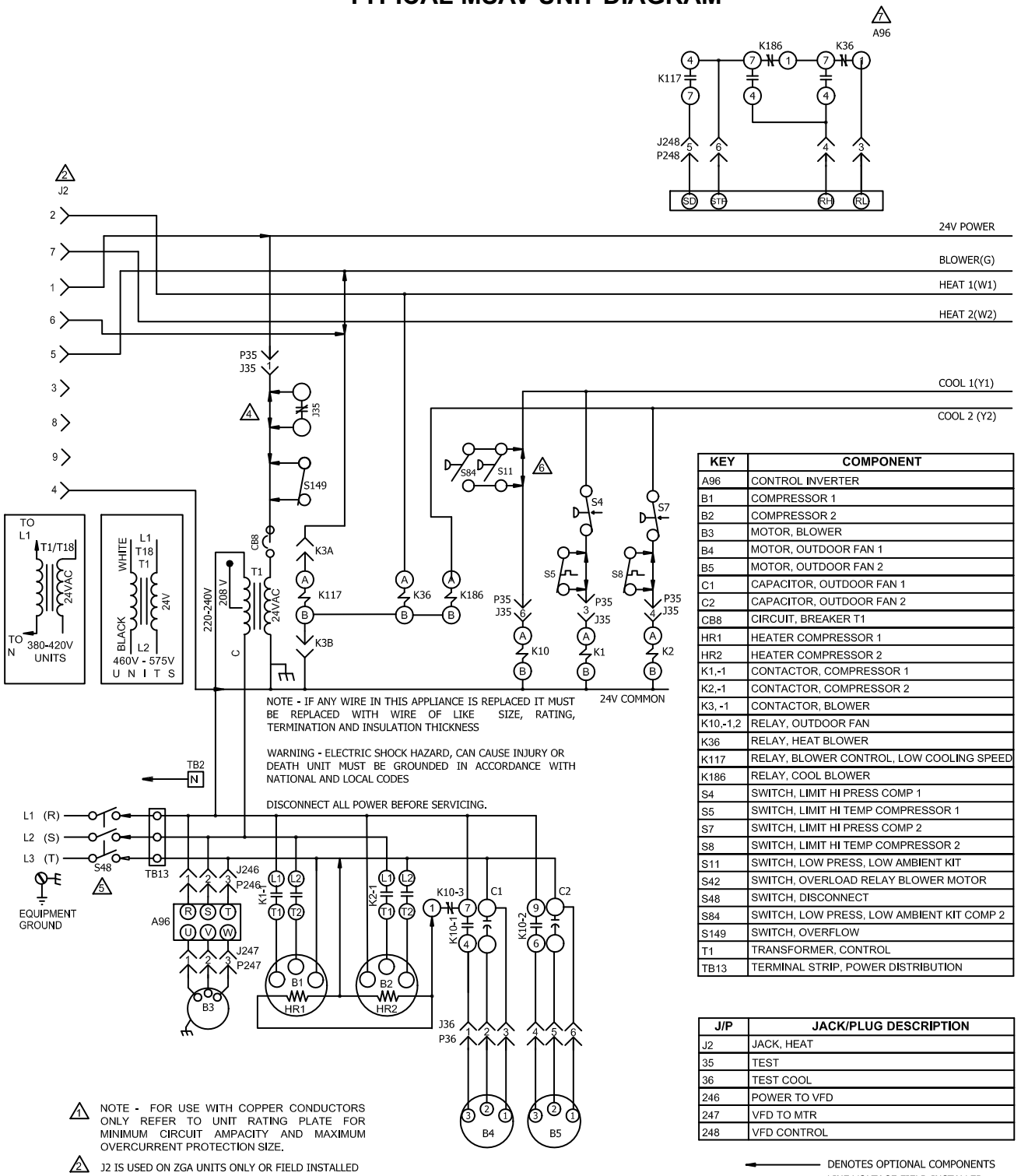
OPERATION:

2- Enthalpy sensor A7 and A62 (if differential enthalpy is used) communicates to the economizer control module A6 when to power the damper motor B7.

3- Economizer control module A6 supplies B7 with 0 - 10 VDC to control the positioning of economizer.

4- The damper actuator provides 2 to 10 VDC position feedback.

TYPICAL MSAV UNIT DIAGRAM



KEY	COMPONENT
A96	CONTROL INVERTER
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CB8	CIRCUIT, BREAKER T1
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K3, -1	CONTACTOR, BLOWER
K10,-1,2	RELAY, OUTDOOR FAN
K36	RELAY, HEAT BLOWER
K117	RELAY, BLOWER CONTROL, LOW COOLING SPEED
K186	RELAY, COOL BLOWER
S4	SWITCH, LIMIT HI PRESS COMP 1
S5	SWITCH, LIMIT HI TEMP COMPRESSOR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S8	SWITCH, LIMIT HI TEMP COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S48	SWITCH, DISCONNECT
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
J2	JACK, HEAT
35	TEST
36	TEST COOL
246	POWER TO VFD
247	VFD TO MTR
248	VFD CONTROL

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. J2 IS USED ON ZGA UNITS ONLY OR FIELD INSTALLED
3. IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
4. S42 USED ON "M" VOLTAGE UNITS
5. S48 OR CB8 MAY BE USED
6. JUMPER WHEN S11 AND S84 ARE NOT USED
7. MITSUBISHI VFD

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

04/14	WIRING DIAGRAM 537722-01	04/14
COOLING - MSAV		
ZCA, ZGA - 092, 102, 120, 150 - G, J, M, Y		
SECTION B		REV. 0
Supersedes	New Form No. 537722-01	

MSAV BLOWER OPERATION

G Blower Demand:

1- 24VAC is routed through J/P2-5 to the A3 ignition control.

2- When heating proves, 24VAC is routed from A3 ignition control, through J/P2-6 and K117 relay is energized. K117 N.O. contacts close and 24VAC is routed through K186 and K36 N.C. contacts to A96 inverter terminal RL. Blower operates in low speed.

Y1 Cooling Demand:

1- Blower demand initiates low speed in the same manner as G Blower Demand.

Y2 Cooling Demand:

1- K186 relay is energized and K186 N.O. contacts close.

2- The blower demand closes K117 N.O. contacts. 24VAC is routed through K117 and K186 closed contacts to A96 inverter terminal RH. Blower operates in high speed.

W1 Heating Demand:

1- K36 relay is energized and K36 N.O. contacts close. The blower demand closes K117 N.O. contacts. 24VAC is routed through K117 and K36 closed contacts to A96 inverter terminal RH. Blower operates in high speed.

W2 Heating Demand:

1- K36 relay is energized and K36 N.O. contacts close.

2- The blower demand closes K117 N.O. contacts. 24VAC is routed through K117 and K36 closed contacts to A96 inverter terminal RH. Blower operates in high speed.