

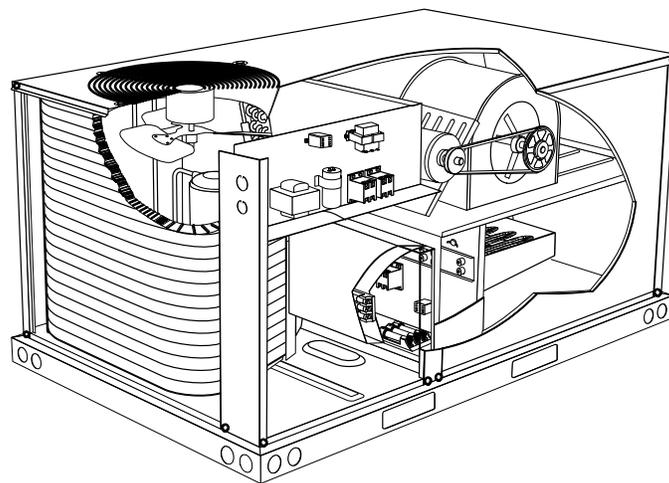
ZCA036, 048, 060

The ZCA packaged electric cooling units are available in standard cooling efficiency (036S, 048S, 060S). Cooling capacities are 3, 4 and 5 tons (10.6 to 17.6kW).

Optional electric heat is field-installed and is available in 5kW through 22.5kW. Electric heat operates in single stage only.

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. Stacking brackets can be removed or left on the unit permanently. If brackets are removed, any screws removed during installation must be replaced.



**ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures**

⚠ CAUTION

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

⚠ WARNING

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

⚠ 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

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

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OPTIONS / ACCESSORIES

Item		Catalog No.	036	048	060
COOLING SYSTEM					
Condensate Drain Trap	PVC - C1TRAP20AD2	76W26	X	X	X
	Copper - C1TRAP10AD2	76W27	X	X	X
Compressor Crankcase Heater	208/230V-1 or 3ph - Z1CCHT10A-1P	99W61	X		
	208/230V-1 or 3 ph - Z1CCHT11A-1P	99W64		X	X
	460V - 3 ph - Z1CCHT10A-1G	99W62	X		
	460V - 3 ph - Z1CCHT11A-1G	99W65		X	X
	575V - 3 ph - Z1CCHT10A-1J	99W63	X		
	575V - 3 ph - Z1CCHT11A-1J	99W66		X	X
Drain Pan Overflow Switch	Z1SNSR90A1	99W59	X	X	X
Low Ambient Kit	Z1SNSR33A-1	99W67	X	X	X
BLOWER - SUPPLY AIR					
Motors	¹ Belt Drive - 1 hp Standard Efficiency	Factory	O	O	O
	Belt Drive - 1.5 hp Standard Efficiency	Factory	O	O	O
Drive Kits See Blower Data Tables for selection	Kit #Z01 - 678-1035 rpm	Factory	O		
	Kit #Z02 - 803-1226 rpm	Factory		O	
	Kit #Z03 - 906-1383 rpm	Factory			O
	Kit #Z04 - 964-1471 rpm	Factory	O		
	² Kit #Z05 - 1098-1490 rpm	Factory		O	
	² Kit #Z06 - 1262-1634 rpm	Factory			O
CABINET					
Coil/Hail Guards	Z1GARD10A-1	97W53	X	X	X
Corrosion Protection		Factory	O	O	O
ELECTRICAL					
Voltage 60 hz	208/230V - 1 phase	Factory	O	O	O
	208/230V - 3 phase	Factory	O	O	O
	460V - 3 phase	Factory	O	O	O
	575V - 3 phase	Factory	O	O	O
Bottom Power Entry Kit	Z1PEKT01A-1	98W08	X	X	X
ELECTRIC HEAT					
5 kW	208/230V-1ph - Z1EH0050AN1P	98W96	X	X	X
	208/230V-3ph - Z1EH0050AN1Y	99W01	X	X	X
	460V-3ph - Z1EH0050AN1G	99W06	X	X	X
	575V-3ph - Z1EH0050AN1J	99W11	X	X	X
7.5 kW	208/230V-1ph - Z1EH0075AN1P	98W97	X	X	X
	208/230V-3ph - Z1EH0075AN1Y	99W02	X	X	X
	460V-3ph - Z1EH0075AN1G	99W07	X	X	X
	575V-3ph - Z1EH0075AN1J	99W12	X	X	X
10 kW	208/230V-1ph - Z1EH0100AN1P	98W98	X	X	X
	208/230V-3ph - Z1EH0100AN1Y	99W03	X	X	X
	460V-3ph - Z1EH0100AN1G	99W08	X	X	X
	575V-3ph - Z1EH0100AN1J	99W13	X	X	X
15 kW	208/230V-1ph - Z1EH0150AN1P	98W99	X	X	X
	208/230V-3ph - Z1EH0150AN1Y	99W04	X	X	X
	460V-3ph - Z1EH0150AN1G	99W09	X	X	X
	575V-3ph - Z1EH0150AN1J	99W14	X	X	X
22.5 kW	208/230V-1ph - Z1EH0225AN1P	99W00		X	X
	208/230V-3ph - Z1EH0225AN1Y	99W05		X	X
	460V-3ph - Z1EH0225AN1G	99W10		X	X
	575V-3ph - Z1EH0225AN1J	99W15		X	X
ELECTRIC HEAT ACCESSORIES					
Unit Fuse Block - See Electrical/Electric Heat Tables for Selection			X	X	X

¹ 1 hp blower motor is not available for 208/230V-1ph applications.

² 1.5 hp motor is required with Z05 and Z06 drive kits.

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

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

O - Configure to Order (Factory Installed)

X - Field Installed.

OPTIONS / ACCESSORIES

Item		Catalog No.	036	048	060
ECONOMIZER					
Economizer - With Barometric Relief Dampers and Exhaust Hood (Downflow)	Z1ECON30A-1	98W09	OX	OX	OX
Economizer - With Barometric Relief Dampers and Exhaust Hood (Horizontal)	Z1ECON16A-1	98W68	X	X	X
Economizer Controls					
Single Enthalpy Control	C1SNSR64FF1	53W64	X	X	X
OUTDOOR AIR					
Outdoor Air Dampers - Includes Outdoor Air Hood					
Motorized	Z1DAMP21A-1	95W74	X	X	X
Manual	Z1DAMP11A-1	95W73	X	X	X
POWER EXHAUST FAN					
Standard Static (Downflow)	208/230V-1 or 3ph - Z1PWRE10A-1P	21E01	X	X	X
	460V-3ph - Z1PWRE10A-1G	23E01	X	X	X
Standard Static (Horizontal)	208/230V-1 or 3ph - Z1PWRE15A-1P	24E01	X	X	X
	460V-3ph - Z1PWRE15A-1G	28E01	X	X	X
575V Transformer Kit	575V-3ph - Z1TRFM20A-1J	59E02	X	X	X

NOTE - Order 575V Transformer Kit with 208/230V Power Exhaust Fan for 575V applications.

INDOOR AIR QUALITY

Indoor Air Quality (CO₂) Sensors

Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AE1L	77N39	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0SNSR53AE1L	87N54	X	X	X
CO ₂ Sensor Duct Mounting Kit - for downflow applications	C0MISC19AE1	85L43	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO ₂ sensor (77N39)	C0MISC16AE1	90N43	X	X	X

ROOF CURBS - DOWNFLOW

Clip Curb

8 in. height	Z1CURB40A-1	95W18	X	X	X
14 in. height	Z1CURB41A-1	95W19	X	X	X
18 in. height	Z1CURB42A-1	95W20	X	X	X
24 in. height	Z1CURB43A-1	95W21	X	X	X

Standard Curb

14 in. height	Z1CURB10A-1	92W50	X	X	X
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CEILING DIFFUSERS

Step-Down - Order one	RTD9-65-R	27G87	X	X	X
Flush - Order one	FD9-65-R	27G86	X	X	X

NOTE - Ceiling Diffuser Transitions are not furnished and must be field fabricated.

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

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

O - Configure to Order (Factory Installed)

X - Field Installed.

SPECIFICATIONS

General Data		Nominal Tonnage	3 Ton	4 Ton	5 Ton
		Model No.	ZCA036S4B	ZCA048S4B	ZCA060S4B
		Efficiency Type	Standard	Standard	Standard
Cooling Performance	Gross Cooling Capacity - Btuh		36,100	47,000	58,900
	¹ Net Cooling Capacity - Btuh		34,600	45,000	57,000
	AHRI Rated Air Flow - cfm		1200	1550	1650
	² Sound Rating Number (SRN) (dBA)		77	80	83
	Total Unit Power - kW		3.0	4.3	5.3
	¹ SEER (Btuh/Watt)		13.00	13.00	13.00
	¹ EER (Btuh/Watt)		11.50	10.60	10.70
Refrigerant	Type		R-410A	R-410A	R-410A
	Charge Furnished		4 lbs. 1 oz.	4 lbs. 6 oz.	5 lbs. 6 oz.
Electric Heat Available - See page 2			5, 7.5, 10, 15 kW	5, 7.5, 10, 15, 22.5 kW	
Compressor Type (one per unit)			Scroll	Scroll	Scroll
Outdoor Coil	Net face area - sq. ft.		12.8	12.8	15.2
	Number of rows		1	1	1
	Fins / inch		23	23	23
Outdoor Coil Fan	Motor HP		(1) 1/6 (PSC)	(1) 1/4 (PSC)	(1) 1/3 (PSC)
	Motor rpm		825	825	1075
	Total motor watts		200	310	360
	Diameter - in.		(1) 22	(1) 22	(1) 22
	Number of blades		4	4	3
	Total air volume - cfm		2700	3300	3800
Indoor Coil	Net face area - sq. ft.		8.4	8.4	8.4
	Tube diameter - in.		3/8	3/8	3/8
	Number of rows		2	2	3
	Fins per inch		14	14	14
	Drain Connection (no. and size) - in.		(1) 1 NPT	(1) 1 NPT	(1) 1 NPT
	Expansion device type		Fixed Orifice	Fixed Orifice	Fixed Orifice
³ Indoor Blower & Drive Selection	Nominal Motor HP		⁴ 1 hp, 1.5 hp	⁴ 1 hp, 1.5 hp	⁴ 1 hp, 1.5 hp
	Maximum Usable Motor HP		1.15 hp, 1.7 hp	1.15 hp, 1.7 hp	1.15 hp, 1.7 hp
	Available Drive Kits		Kit #Z01 678-1035 rpm	Kit #Z02 803-1226 rpm	Kit #Z03 906-1383 rpm
			Kit #Z04 964-1471 rpm	⁵ Kit #Z05 1098-1490 rpm	⁵ Kit #Z06 1262-1634 rpm
Wheel nominal diameter x width - in.			10 x 10	10 x 10	10 x 10
Filters	Type		Disposable		
	Number and size - in.		(4) 14 x 20 x 2		
Electrical Characteristics - 60 Hz			208/230V 1 phase	208/230V, 1 phase	208/230V, 1 phase
			208/230V, 460V & 575V 3 phase	208/230V 460V & 575V 3 phase	208/230V 460V & 575V 3 phase

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

¹ AHRI Certified to AHRI Standard 210/240: 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure.

² Sound Rating Number (SRN) rated in accordance with test conditions included in ANSI/AHRI Standard 270-2008.

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

⁴ 1 hp blower motor is not available for 208/230V-1ph applications.

⁵ 1.5 hp motor is required with Z05 and Z06 drive kits.

BLOWER DATA - BELT DRIVE - ZCA036

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

FOR ALL UNITS ADD:

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

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

See page 8 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z01											
900	555	0.16	621	0.17	691	0.19	763	0.20	832	0.22	897	0.24	956	0.26	1010	0.29
1000	577	0.18	644	0.19	715	0.21	786	0.23	855	0.24	919	0.27	976	0.29	1028	0.32
1100	601	0.20	670	0.22	741	0.23	812	0.25	879	0.28	941	0.30	996	0.33	1047	0.37
1200	629	0.22	698	0.24	770	0.26	840	0.28	905	0.31	965	0.34	1018	0.38	1066	0.41
1300	659	0.25	729	0.27	800	0.30	869	0.32	932	0.35	989	0.39	1040	0.43	1087	0.47
1400	692	0.28	763	0.31	833	0.34	899	0.37	960	0.40	1014	0.44	1063	0.48	1108	0.52
1500	728	0.32	798	0.35	866	0.38	930	0.41	987	0.45	1039	0.50	1086	0.54	1130	0.58

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z04															
900	1060	0.31	1108	0.34	1154	0.37	1197	0.40	1239	0.44	1279	0.47	1319	0.51	1359	0.55
1000	1077	0.35	1123	0.38	1168	0.42	1211	0.45	1252	0.49	1291	0.52	1330	0.56	1370	0.60
1100	1094	0.40	1139	0.43	1183	0.46	1225	0.50	1266	0.54	1305	0.58	1343	0.62	1382	0.66
1200	1112	0.45	1156	0.48	1199	0.52	1241	0.55	1281	0.59	1319	0.64	1357	0.68	1394	0.72
1300	1131	0.50	1174	0.54	1216	0.57	1257	0.61	1296	0.66	1334	0.70	1371	0.74	1408	0.78
1400	1151	0.56	1193	0.60	1234	0.64	1274	0.68	1313	0.72	1351	0.77	1387	0.81	1423	0.86
1500	1172	0.62	1213	0.66	1253	0.71	1293	0.75	1331	0.79	1368	0.84	1404	0.89	1440	0.93

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z01										Kit Z04	
900	572	0.14	641	0.16	712	0.19	785	0.22	860	0.24	931	0.27	991	0.29	1039	0.32
1000	602	0.16	671	0.19	742	0.22	815	0.24	887	0.27	954	0.30	1010	0.33	1055	0.36
1100	636	0.19	706	0.22	776	0.25	847	0.28	916	0.31	977	0.34	1028	0.37	1070	0.41
1200	674	0.23	744	0.26	813	0.29	881	0.32	944	0.35	999	0.38	1045	0.42	1087	0.45
1300	716	0.26	784	0.29	851	0.33	914	0.36	971	0.40	1020	0.43	1064	0.47	1106	0.50
1400	759	0.30	824	0.34	888	0.37	946	0.41	998	0.45	1043	0.49	1086	0.52	1129	0.55
1500	803	0.35	865	0.39	925	0.43	979	0.47	1027	0.52	1070	0.55	1113	0.58	1156	0.61

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z04															
900	1085	0.35	1135	0.38	1183	0.40	1227	0.42	1268	0.45	1305	0.49	1342	0.53	1379	0.57
1000	1099	0.39	1148	0.42	1195	0.44	1239	0.47	1279	0.50	1316	0.54	1352	0.58	1389	0.62
1100	1114	0.44	1163	0.46	1210	0.49	1253	0.52	1292	0.55	1329	0.59	1364	0.64	1401	0.68
1200	1131	0.48	1180	0.51	1226	0.54	1269	0.57	1308	0.61	1343	0.66	1378	0.70	1414	0.75
1300	1151	0.53	1199	0.56	1245	0.59	1287	0.63	1324	0.68	1359	0.72	1394	0.77	1429	0.82
1400	1175	0.58	1222	0.62	1266	0.66	1306	0.70	1342	0.75	1376	0.80	1410	0.85	1446	0.89
1500	1201	0.65	1246	0.68	1289	0.73	1327	0.78	1362	0.83	1395	0.88	1429	0.93	1464	0.98

BLOWER DATA - BELT DRIVE - ZCA048

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

FOR ALL UNITS ADD:

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

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

See page 8 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit Z02									
1200	629	0.22	698	0.24	770	0.26	840	0.28	905	0.31	965	0.34	1018	0.38	1066	0.41
1300	659	0.25	729	0.27	800	0.30	869	0.32	932	0.35	989	0.39	1040	0.43	1087	0.47
1400	692	0.28	763	0.31	833	0.34	899	0.37	960	0.40	1014	0.44	1063	0.48	1108	0.52
1500	728	0.32	798	0.35	866	0.38	930	0.41	987	0.45	1039	0.50	1086	0.54	1130	0.58
1600	766	0.37	835	0.40	900	0.43	960	0.47	1015	0.51	1065	0.55	1110	0.60	1152	0.65
1700	806	0.42	871	0.45	934	0.48	991	0.52	1043	0.56	1091	0.61	1134	0.66	1176	0.71
1800	845	0.47	908	0.50	967	0.54	1021	0.58	1071	0.63	1117	0.68	1159	0.73	1200	0.78
1900	884	0.53	944	0.56	1000	0.60	1051	0.64	1099	0.69	1143	0.75	1185	0.80	1225	0.86
2000	923	0.59	979	0.63	1032	0.67	1082	0.72	1128	0.77	1171	0.83	1211	0.89	1251	0.95

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z02						Kit Z05									
1200	1112	0.45	1156	0.48	1199	0.52	1241	0.55	1281	0.59	1319	0.64	1357	0.68	1394	0.72
1300	1131	0.50	1174	0.54	1216	0.57	1257	0.61	1296	0.66	1334	0.70	1371	0.74	1408	0.78
1400	1151	0.56	1193	0.60	1234	0.64	1274	0.68	1313	0.72	1351	0.77	1387	0.81	1423	0.86
1500	1172	0.62	1213	0.66	1253	0.71	1293	0.75	1331	0.79	1368	0.84	1404	0.89	1440	0.93
1600	1193	0.69	1234	0.73	1273	0.78	1313	0.82	1350	0.87	1387	0.92	1422	0.97	1457	1.01
1700	1216	0.76	1255	0.81	1295	0.86	1333	0.90	1370	0.95	1406	1.00	1441	1.05	1475	1.10
1800	1239	0.84	1279	0.89	1317	0.94	1355	0.99	1391	1.04	1426	1.09	1461	1.14	1494	1.19
1900	1264	0.92	1303	0.98	1341	1.03	1378	1.08	1413	1.14	1448	1.19	1481	1.24	1514	1.29
2000	1290	1.01	1328	1.07	1366	1.13	1402	1.19	1436	1.24	1470	1.29	1503	1.35	1535	1.40

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit Z02									
1200	674	0.23	744	0.26	813	0.29	881	0.32	944	0.35	999	0.38	1045	0.42	1087	0.45
1300	716	0.26	784	0.29	851	0.33	914	0.36	971	0.40	1020	0.43	1064	0.47	1106	0.50
1400	759	0.30	824	0.34	888	0.37	946	0.41	998	0.45	1043	0.49	1086	0.52	1129	0.55
1500	803	0.35	865	0.39	925	0.43	979	0.47	1027	0.52	1070	0.55	1113	0.58	1156	0.61
1600	847	0.40	905	0.45	961	0.50	1013	0.54	1058	0.58	1100	0.62	1142	0.65	1185	0.68
1700	890	0.47	944	0.52	997	0.57	1047	0.62	1091	0.66	1132	0.69	1173	0.72	1216	0.76
1800	930	0.54	982	0.60	1033	0.65	1081	0.70	1124	0.74	1165	0.77	1206	0.80	1248	0.84
1900	970	0.62	1020	0.68	1069	0.73	1116	0.78	1158	0.81	1199	0.85	1239	0.89	1280	0.93
2000	1009	0.71	1058	0.76	1106	0.81	1151	0.86	1193	0.9	1233	0.94	1273	0.98	1312	1.04

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z02						Kit Z05									
1200	1131	0.48	1180	0.51	1226	0.54	1269	0.57	1308	0.61	1343	0.66	1378	0.70	1414	0.75
1300	1151	0.53	1199	0.56	1245	0.59	1287	0.63	1324	0.68	1359	0.72	1394	0.77	1429	0.82
1400	1175	0.58	1222	0.62	1266	0.66	1306	0.70	1342	0.75	1376	0.80	1410	0.85	1446	0.89
1500	1201	0.65	1246	0.68	1289	0.73	1327	0.78	1362	0.83	1395	0.88	1429	0.93	1464	0.98
1600	1229	0.72	1273	0.76	1313	0.81	1350	0.86	1384	0.92	1416	0.97	1450	1.02	1485	1.07
1700	1258	0.80	1300	0.85	1338	0.90	1374	0.96	1407	1.02	1440	1.07	1473	1.12	1508	1.17
1800	1289	0.89	1328	0.94	1365	1.00	1399	1.06	1432	1.13	1465	1.18	1498	1.23	1532	1.28
1900	1319	0.99	1357	1.05	1392	1.11	1426	1.18	1459	1.24	1491	1.30	1524	1.35	1558	1.39
2000	1350	1.10	1387	1.16	1421	1.23	1454	1.30	1486	1.36	1518	1.42	1551	1.47	1584	1.51

BLOWER DATA - BELT DRIVE - ZCA060

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

FOR ALL UNITS ADD:

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

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

See page 8 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z03											
1600	787	0.38	854	0.41	918	0.44	976	0.48	1030	0.52	1078	0.56	1123	0.61	1164	0.66
1700	827	0.43	892	0.46	952	0.49	1007	0.53	1058	0.58	1105	0.63	1148	0.68	1189	0.73
1800	868	0.48	929	0.52	986	0.55	1038	0.59	1087	0.64	1132	0.69	1174	0.75	1214	0.80
1900	907	0.54	966	0.58	1019	0.62	1069	0.66	1116	0.71	1160	0.77	1200	0.82	1240	0.88
2000	946	0.60	1001	0.65	1053	0.69	1101	0.74	1146	0.79	1188	0.85	1228	0.91	1267	0.98
2100	984	0.68	1037	0.72	1086	0.77	1132	0.83	1176	0.89	1217	0.95	1256	1.01	1295	1.08
2200	1021	0.75	1072	0.81	1120	0.86	1165	0.92	1207	0.99	1247	1.05	1286	1.12	1324	1.19
2300	1059	0.84	1108	0.90	1154	0.96	1197	1.03	1239	1.10	1278	1.17	1316	1.24	1354	1.32
2400	1097	0.95	1144	1.01	1188	1.08	1231	1.15	1271	1.22	1310	1.30	1348	1.38	1385	1.45

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z03								Kit Z06							
1600	1205	0.70	1245	0.75	1284	0.79	1323	0.84	1361	0.88	1397	0.93	1432	0.98	1467	1.03
1700	1228	0.78	1268	0.82	1307	0.87	1345	0.92	1382	0.97	1417	1.02	1452	1.07	1486	1.11
1800	1253	0.85	1292	0.91	1331	0.96	1368	1.01	1404	1.06	1439	1.11	1473	1.16	1506	1.21
1900	1279	0.94	1317	1.00	1355	1.05	1392	1.10	1427	1.16	1461	1.21	1494	1.26	1527	1.31
2000	1305	1.04	1343	1.10	1380	1.15	1416	1.21	1450	1.26	1484	1.32	1516	1.37	1549	1.42
2100	1333	1.14	1370	1.21	1407	1.26	1442	1.32	1475	1.38	1508	1.43	1540	1.48	1572	1.53
2200	1361	1.26	1398	1.32	1434	1.38	1468	1.44	1501	1.50	1533	1.55	1564	1.61	1596	1.66
2300	1391	1.39	1427	1.45	1462	1.51	1495	1.57	1527	1.63	1559	1.68	1590	1.73	1622	1.78
2400	1421	1.52	1456	1.59	1490	1.65	1523	1.71	1555	1.76	1586	1.82	1617	1.87	1649	1.92

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furn.				Kit Z03											
1600	864	0.42	921	0.46	976	0.51	1027	0.56	1072	0.60	1113	0.63	1155	0.66	1198	0.69
1700	907	0.48	961	0.53	1013	0.58	1061	0.63	1105	0.67	1146	0.70	1187	0.73	1230	0.77
1800	948	0.56	999	0.61	1049	0.66	1096	0.71	1139	0.75	1180	0.78	1221	0.82	1262	0.86
1900	987	0.64	1037	0.69	1086	0.74	1132	0.79	1174	0.83	1214	0.86	1255	0.90	1295	0.95
2000	1028	0.73	1076	0.78	1123	0.83	1168	0.87	1210	0.91	1250	0.96	1289	1.00	1328	1.06
2100	1071	0.81	1117	0.86	1163	0.91	1206	0.96	1247	1.01	1286	1.06	1324	1.12	1362	1.18
2200	1116	0.91	1160	0.96	1204	1.01	1245	1.07	1285	1.12	1323	1.18	1360	1.25	1396	1.31
2300	1161	1.02	1204	1.07	1245	1.13	1285	1.19	1323	1.25	1360	1.32	1396	1.38	1432	1.45
2400	1207	1.14	1248	1.20	1288	1.26	1326	1.32	1362	1.39	1398	1.46	1433	1.53	1468	1.60

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z03								Kit Z06							
1600	1242	0.73	1284	0.77	1324	0.82	1360	0.88	1394	0.93	1426	0.99	1460	1.04	1495	1.08
1700	1272	0.81	1312	0.86	1350	0.92	1385	0.98	1418	1.04	1451	1.09	1485	1.14	1519	1.19
1800	1302	0.90	1341	0.96	1377	1.02	1411	1.08	1444	1.15	1477	1.20	1510	1.25	1544	1.30
1900	1334	1.01	1371	1.07	1406	1.13	1439	1.20	1471	1.26	1504	1.32	1537	1.37	1571	1.41
2000	1365	1.12	1401	1.19	1435	1.25	1468	1.32	1500	1.38	1532	1.44	1565	1.49	1598	1.53
2100	1398	1.25	1433	1.31	1466	1.38	1497	1.45	1529	1.51	1561	1.56	1594	1.61	1626	1.65
2200	1431	1.38	1465	1.45	1497	1.52	1528	1.58	1560	1.64	1591	1.69	1623	1.73	1656	1.77
2300	1466	1.52	1498	1.59	1529	1.66	1560	1.72	1591	1.77	1623	1.82	1654	1.86	1686	1.90
2400	1500	1.67	1532	1.74	1563	1.80	1593	1.86	1624	1.91	1655	1.96	1686	2.00	1718	2.04

BLOWER DATA

DRIVE KIT SPECIFICATIONS

Model No.	Blower Motor Choice (HP)				Drive Kit No.	RPM Range
	Nominal	Maximum	Nominal	Maximum		
036	1	1.15	1.5	1.7	Z01	678 - 1035
					Z04	964 - 1471
048	1	1.15	1.5	1.7	Z02	803 - 1226
					¹ Z05	1098 - 1490
060	1	1.15	1.5	1.7	Z03	906 - 1383
					¹ Z06	1262 - 1634

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

¹ 1.5 hp motor is required with Z05 and Z06 drive kits.

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure - in. w.g.	Air Volume Exhausted cfm
0.00	1865
0.05	1785
0.10	1710
0.15	1630
0.20	1545
0.25	1450
0.30	1350
0.35	1240

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

Air Volume cfm	Wet Indoor Coil		Electric Heat	Economizer	
	036-048	060		Downflow	Horizontal
900	0.01	---	0.02	0.04	0.05
1000	0.01	---	0.04	0.04	0.05
1100	0.02	---	0.05	0.04	0.06
1200	0.02	---	0.06	0.05	0.06
1300	0.02	---	0.08	0.05	0.07
1400	0.03	---	0.09	0.06	0.07
1500	0.03	---	0.10	0.07	0.08
1600	0.03	0.04	0.12	0.08	0.09
1700	0.04	0.05	0.13	0.08	0.10
1800	0.04	0.05	0.15	0.09	0.11
1900	0.04	0.06	0.16	0.10	0.12
2000	0.05	0.06	0.17	0.12	0.13
2100	---	0.07	0.19	0.13	0.14
2200	---	0.08	0.20	0.14	0.15
2300	---	0.08	0.21	0.15	0.17
2400	---	0.09	0.23	0.17	0.18

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

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

CEILING DIFFUSER AIR THROW DATA

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

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

ELECTRICAL DATA

ZCA036S4

¹ Voltage - 60hz		208/230V - 1 Ph	208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	15.3	8.7		4		3.6	
	Locked Rotor Amps	70	70		31		27	
Outdoor Fan Motor	Full Load Amps	1	1		0.6		0.45	
Power Exhaust (1) 0.5 HP	Full Load Amps	1.5	1.5		0.6		0.6	
Indoor Blower Motor	Horsepower	1.5	1	1.5	1	1.5	1	1.5
	Full Load Amps	11	4.6	6.6	2.1	3	1.7	2.4
² Maximum Overcurrent Protection	Unit Only	45	25	25	15	15	15	15
	With (1) 0.5 HP Power Exhaust	45	25	25	15	15	15	15
³ Minimum Circuit Ampacity	Unit Only	32	17	19	8	9	7	8
	With (1) 0.5 HP Power Exhaust	33	18	20	9	10	8	8

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	600V	600V
² Maximum Overcurrent Protection	Unit+ Electric Heat	5 kW	45	45	25	25	25	25	15	15	15	15
		7.5 kW	50	60	30	30	30	35	15	20	15	15
		10 kW	60	70	35	40	35	40	20	20	15	20
		15 kW	90	100	45	60	50	60	30	30	25	25
³ Minimum Circuit Ampacity	Unit+ Electric Heat	5 kW	37	40	19	21	22	24	11	12	9	10
		7.5 kW	48	53	26	29	28	31	14	16	12	13
		10 kW	59	66	32	36	35	39	18	19	15	16
		15 kW	82	92	45	51	48	54	26	27	21	22
² Maximum Overcurrent Protection	Unit+ Electric Heat and (1) 0.5 HP Power Exhaust	5 kW	45	45	25	25	25	30	15	15	15	15
		7.5 kW	50	60	30	35	30	35	15	20	15	15
		10 kW	70	70	35	40	40	45	20	20	15	20
		15 kW	90	100	50	60	50	60	30	30	25	25
³ Minimum Circuit Ampacity	Unit+ Electric Heat and (1) 0.5 HP Power Exhaust	5 kW	39	42	21	23	24	26	11	13	9	10
		7.5 kW	50	55	28	31	30	33	15	16	12	13
		10 kW	61	68	34	38	37	41	19	20	15	16
		15 kW	84	94	47	53	50	56	26	28	21	22

ELECTRIC HEAT ACCESSORIES

Unit Fuse Block	Unit Only	10A26	10A27	10A27	10A29	10A29	10A29	10A29
	Unit + Power Exhaust	10A26	10A27	10A27	10A29	10A29	10A29	10A29

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

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

² HACR type breaker or fuse.

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

ELECTRICAL DATA

4 TON

ZCA048S4

¹ Voltage - 60hz		208/230V - 1 Ph	208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	20	11		5.5		4.7	
	Locked Rotor Amps	99	86		37		34	
Outdoor Fan Motor	Full Load Amps	1.7	1.7		0.9		0.7	
Power Exhaust (1) 0.5 HP	Full Load Amps	1.5	1.5		0.6		0.6	
Indoor Blower Motor	Horsepower	1.5	1	1.5	1	1.5	1	1.5
	Full Load Amps	11	4.6	6.6	2.1	3	1.7	2.4
² Maximum Overcurrent Protection	Unit Only	50	30	30	15	15	15	15
	With (1) 0.5 HP Power Exhaust	50	30	30	15	15	15	15
³ Minimum Circuit Ampacity	Unit Only	38	21	23	10	11	9	9
	With (1) 0.5 HP Power Exhaust	40	22	24	11	12	9	10

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	600V	600V
² Maximum Overcurrent Protection	Unit+ Electric Heat	5 kW	50	50	30	30	30	30	15	15	15	15
		7.5 kW	50	60	30	30	30	35	15	20	15	15
		10 kW	60	70	35	40	35	40	20	20	15	20
		15 kW	90	100	45	60	50	60	30	30	25	25
		22.5 kW	125	150	70	80	70	80	40	40	30	35
³ Minimum Circuit Ampacity	Unit+ Electric Heat	5 kW	38	40	21	21	23	24	11	12	9	10
		7.5 kW	48	53	26	29	28	31	14	16	12	13
		10 kW	59	66	32	36	35	39	18	19	15	16
		15 kW	82	92	45	51	48	54	26	27	21	22
		22.5 kW	116	131	65	74	67	76	37	38	30	31
² Maximum Overcurrent Protection	Unit+ Electric Heat and (1) 0.5 HP Power Exhaust	5 kW	50	50	30	30	30	30	15	15	15	15
		7.5 kW	50	60	30	35	30	35	15	20	15	15
		10 kW	70	70	35	40	40	45	20	20	15	20
		15 kW	90	100	50	60	50	60	30	30	25	25
		22.5 kW	125	150	70	80	70	80	40	40	30	35
³ Minimum Circuit Ampacity	Unit+ Electric Heat and (1) 0.5 HP Power Exhaust	5 kW	40	42	22	23	24	26	11	13	9	10
		7.5 kW	50	55	28	31	30	33	15	16	12	13
		10 kW	61	68	34	38	37	41	19	20	15	16
		15 kW	84	94	47	53	50	56	26	28	21	22
		22.5 kW	118	133	67	76	69	78	38	39	30	31

ELECTRIC HEAT ACCESSORIES

Unit Fuse Block	Unit Only	10A26	10A27	10A27	10A29	10A29	10A29	10A29
	Unit + Power Exhaust	10A26	10A27	10A27	10A29	10A29	10A29	10A29

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

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

ELECTRICAL DATA

5 TON

ZCA060S4

¹ Voltage - 60hz		208/230V - 1 Ph	208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Compressor	Rated Load Amps	22.1	13.5		8		5	
	Locked Rotor Amps	125	109		59		40	
Outdoor Fan Motor	Full Load Amps	1.7	1.7		1		0.9	
Power Exhaust (1) 0.5 HP	Full Load Amps	1.5	1.5		0.6		0.6	
Indoor Blower Motor	Horsepower	1.5	1	1.5	1	1.5	1	1.5
	Full Load Amps	11	4.6	6.6	2.1	3	1.7	2.4
² Maximum Overcurrent Protection	Unit Only	60	35	35	20	20	15	15
	With (1) 0.5 HP Power Exhaust	60	35	40	20	20	15	15
³ Minimum Circuit Ampacity	Unit Only	41	24	26	14	14	9	10
	With (1) 0.5 HP Power Exhaust	42	25	27	14	15	10	11

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	600V	600V
² Maximum Overcurrent Protection	Unit+ Electric Heat	5 kW	60	60	35	35	35	35	20	20	15	15
		7.5 kW	60	60	35	35	35	35	20	20	15	15
		10 kW	60	70	35	40	35	40	20	20	15	20
		15 kW	90	100	45	60	50	60	30	30	25	25
		22.5 kW	125	150	70	80	70	80	40	40	30	35
³ Minimum Circuit Ampacity	Unit+ Electric Heat	5 kW	41	41	24	24	26	26	14	14	9	10
		7.5 kW	48	53	26	29	28	31	14	16	12	13
		10 kW	59	66	32	36	35	39	18	19	15	16
		15 kW	82	92	45	51	48	54	26	27	21	22
		22.5 kW	116	131	65	74	67	76	37	38	30	31
² Maximum Overcurrent Protection	Unit+ Electric Heat and (1) 0.5 HP Power Exhaust	5 kW	60	60	35	35	40	40	20	20	15	15
		7.5 kW	60	60	35	35	40	40	20	20	15	15
		10 kW	70	70	35	40	40	45	20	20	15	20
		15 kW	90	100	50	60	50	60	30	30	25	25
		22.5 kW	125	150	70	80	70	80	40	40	30	35
³ Minimum Circuit Ampacity	Unit+ Electric Heat and (1) 0.5 HP Power Exhaust	5 kW	42	42	25	25	27	27	14	15	10	11
		7.5 kW	50	55	28	31	30	33	15	16	12	13
		10 kW	61	68	34	38	37	41	19	20	15	16
		15 kW	84	94	47	53	50	56	26	28	21	22
		22.5 kW	118	133	67	76	69	78	38	39	30	31

ELECTRIC HEAT ACCESSORIES

Unit Fuse Block	Unit Only	10A26	10A28	10A28	10A29	10A29	10A29	10A29
	Unit + Power Exhaust	10A26	10A28	10A28	10A29	10A29	10A29	10A29

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.

ELECTRIC HEAT CAPACITIES

Input Voltage	5 kW			7.5 kW			10 kW			15 kW			22.5 kW		
	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output	No of Stages	kW input	Btuh Output
208	1	3.8	12,800	1	5.6	19,200	1	7.5	25,600	1	11.2	38,400	1	16.9	57,700
220	1	4.2	14,300	1	6.3	21,500	1	8.4	28,700	1	12.6	43,000	1	18.9	64,500
230	1	4.6	15,700	1	6.9	23,500	1	9.2	31,400	1	13.8	47,000	1	20.7	70,700
240	1	5.0	17,100	1	7.5	25,600	1	10.0	34,200	1	15.0	51,200	1	22.5	76,800
440	1	4.2	14,300	1	6.3	21,500	1	8.4	28,700	1	12.6	43,000	1	18.9	64,500
460	1	4.6	15,700	1	6.9	23,500	1	9.2	31,400	1	13.8	47,000	1	20.7	70,700
480	1	5.0	17,100	1	7.5	25,600	1	10.0	34,200	1	15.0	51,200	1	22.5	76,800
550	1	4.2	14,300	1	6.3	21,500	1	8.4	28,700	1	12.6	43,000	1	18.9	64,500
575	1	4.6	15,700	1	6.9	23,500	1	9.2	31,400	1	13.8	47,000	1	20.7	70,700
600	1	5.0	17,100	1	7.5	25,600	1	10.0	34,200	1	15.0	51,200	1	22.5	76,800

ZCA PARTS ARRANGEMENT

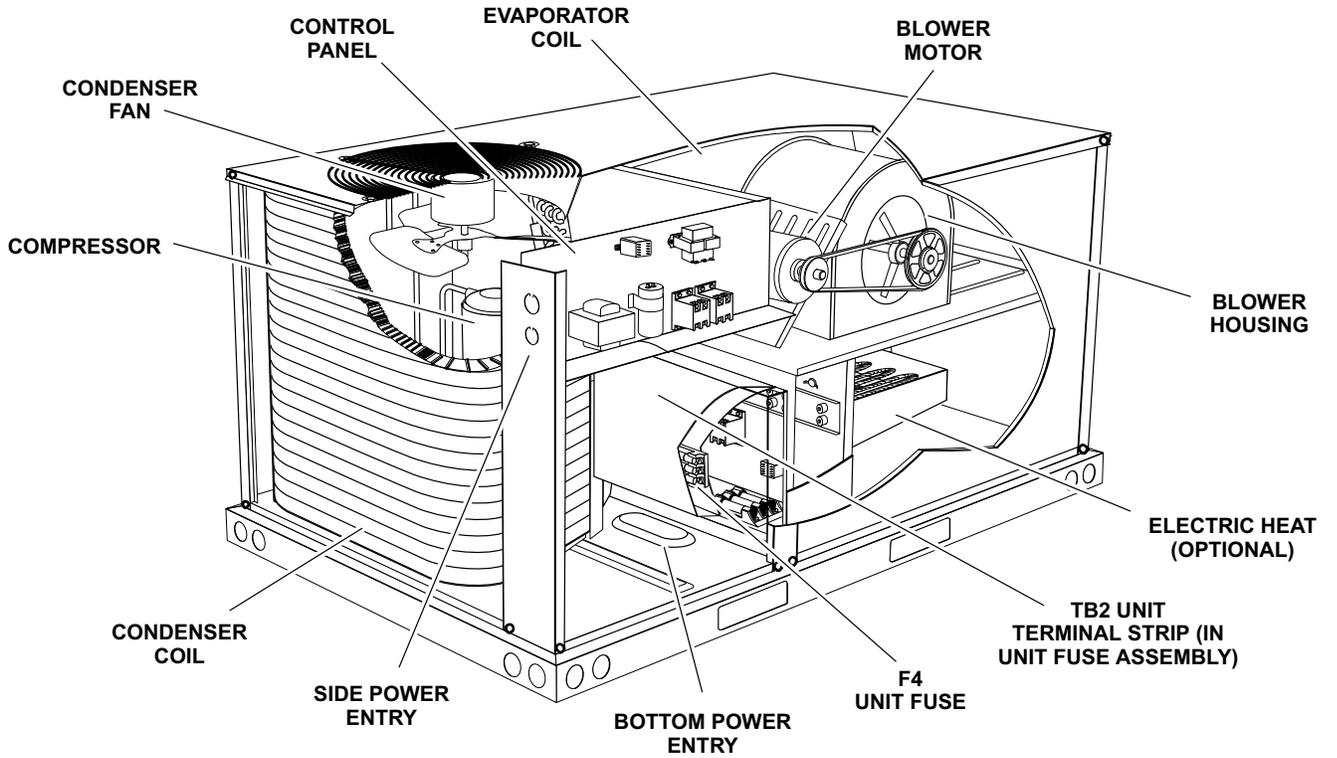


FIGURE 1

ZCA CONTROL BOX

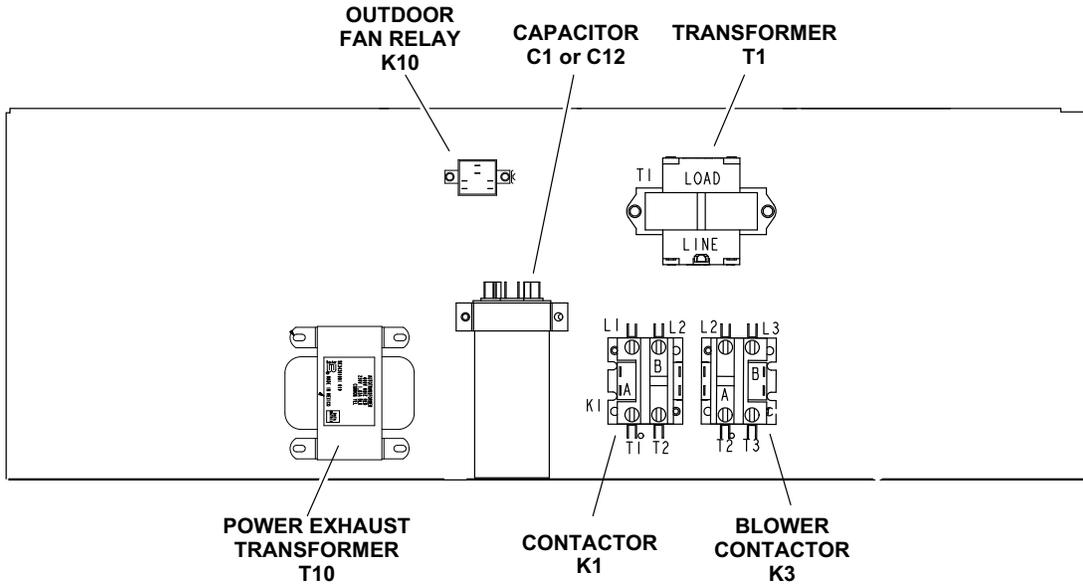


FIGURE 2

I-UNIT COMPONENTS

The ZCA 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

ZCA control box components are shown in figure 2. The control box is in the outdoor section to the left of the blower and heat section.

1-Control Transformer T1

All use a single line voltage to 24VAC transformer mounted in the control box. Transformer supplies power to control circuits in the unit. The transformer is rated at 70VA and is protected by a 3 amp (auto) fuse F1. The 208/230 (Y) voltage transformers use two primary voltage

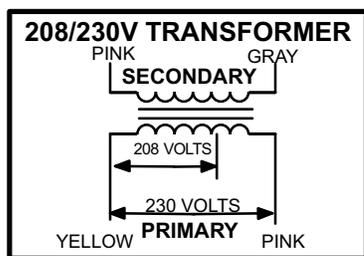


FIGURE 3

age taps as shown in figure 3, while 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

2-Fan Capacitor C1 (three phase)

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

3-Dual Capacitor C12 (single phase)

A single dual capacitor is used for both the outdoor fan and compressor (see unit diagram). The fan side and the compressor side have different MFD ratings. See side of capacitor for ratings.

4-Compressor Contactor K1

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

5-Blower Contactor K3

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

6-Outdoor Fan Relay K10 (G, J voltage)

Outdoor fan relay K10 is an optional, field-installed DPDT relay with a 24VAC coil. K10 relay coil is in series with S11 low ambient pressure switch and cycles B4 outdoor fan via K10-1 n.o. contacts.

7-Exhaust Fan Transformer T10 (J voltage)

Transformer T10 is a field-installed 600/230V transformer which provides power to the 208/230V power exhaust fan in 575V applications.

8-Compressor B1

! IMPORTANT

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

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

! WARNING

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

ZCA PLUMBING

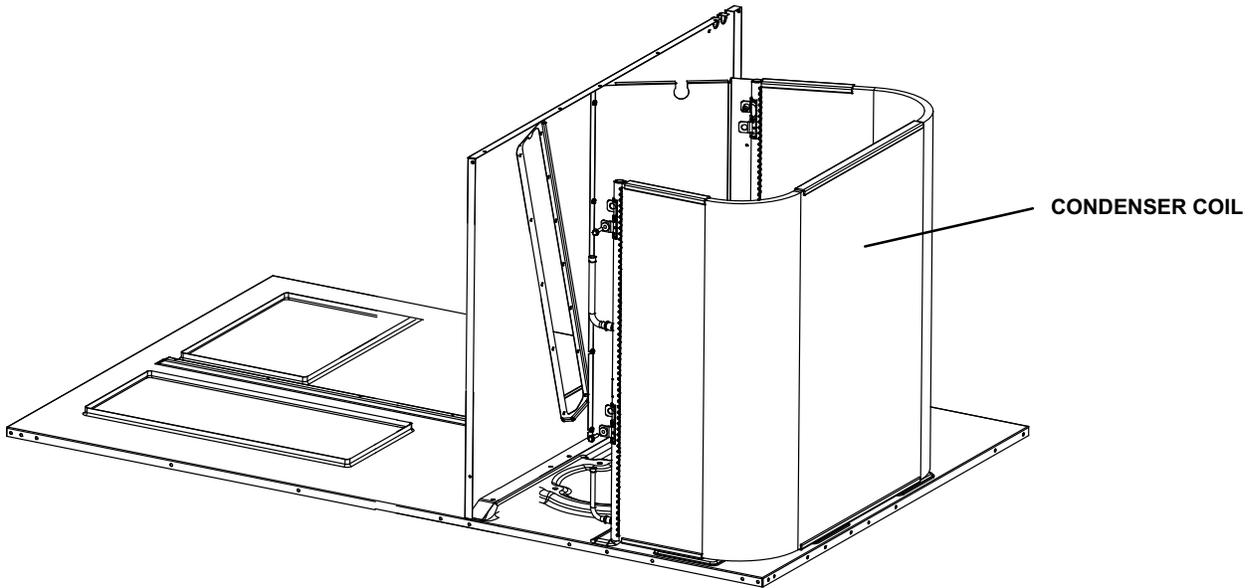
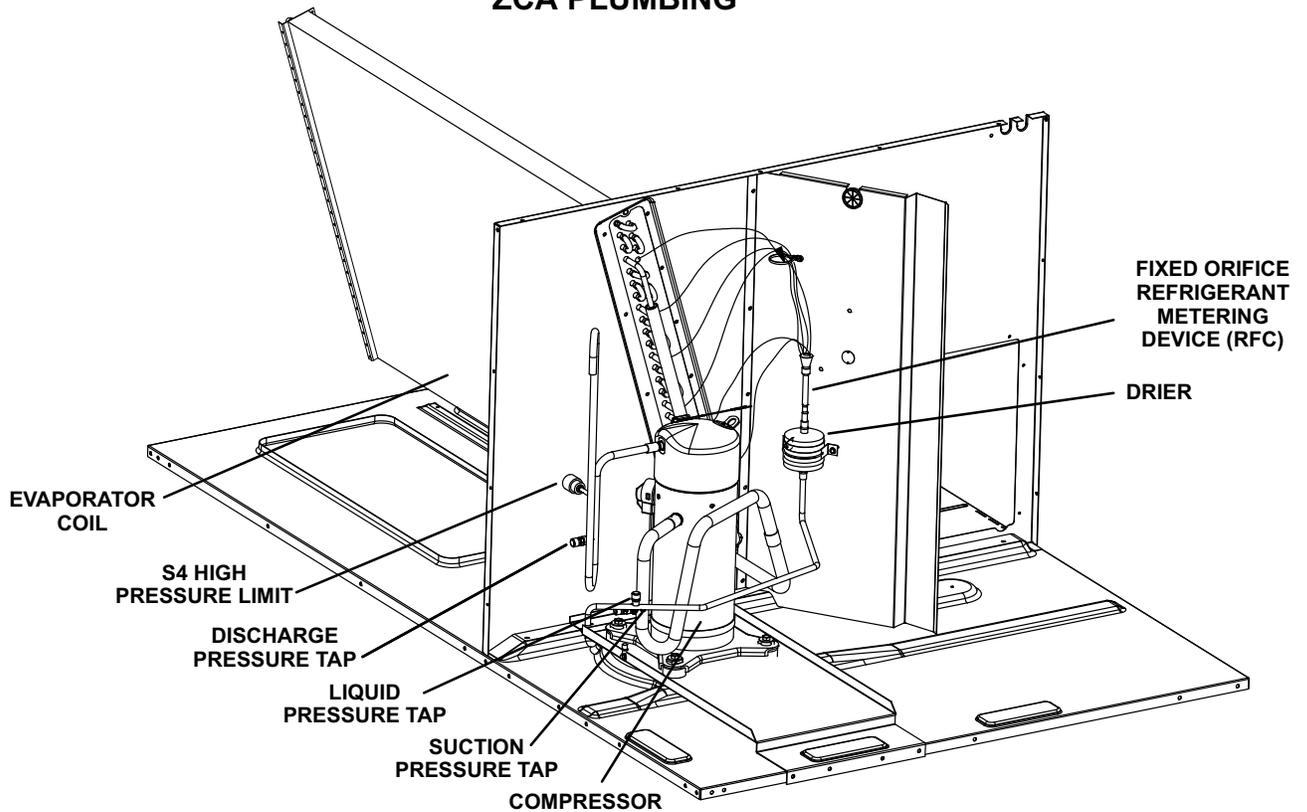


FIGURE 4

The compressor is energized by a compressor contactor.

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

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

⚠ IMPORTANT

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

9-High Pressure Switch S4

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

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

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

When discharge pressure drops to 475 ± 20 (3275 ± 138 kPa) psig, the switch closes and the compressor is energized. The CMC1 board monitors the pressure switch when the compressor demand Y1 is active, allowing five strike lockout. The compressor is shut down indefinitely in this condition. A pressure switch may open and close again four times during a current demand cycle without causing a lockout condition by resetting the count at the end of the demand cycle (CMC1 Y1 input OFF). The five-strike lockout can only be reset by one of the following actions:

- Power cycle the controller
- Apply the TEST mode

10-Low Ambient Switches S11 (field-installed option)

The low ambient switch is an auto-reset SPST N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. The switch is located in the liquid line in the compressor section.

On P and Y volt units, S11 is wired in series with the common (black) lead to K10 outdoor fan motor.

On G and J volt units, S11 is wired in series with outdoor fan relay K10 coil and when opened breaks 24 volts to the coil, de-energizing outdoor fan B4.

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

11-Compressor Low Discharge Temperature Limit S3 (field-supplied option)

S3 is a thermostat which opens on temperature drop. It is wired in line with the 24VAC compressor contactor.

12-Compressor High Temperature Limit S5

The compressor thermal protector is located on top of the compressor. S5 is wired in series with S4 high pressure limit. The protector opens at $248^{\circ}\text{F} \pm 9^{\circ}\text{F}$ ($120^{\circ}\text{C} \pm 5^{\circ}\text{C}$) and closes at $169^{\circ}\text{F} \pm 18^{\circ}\text{F}$ ($76^{\circ}\text{C} \pm 10^{\circ}\text{C}$).

B-Blower Compartment

All units are equipped with belt drive blowers. See unit nameplate for blower type.

1-Blower Wheels

ZCA belt drive units use 10" x 10" (254 mm x 254 mm) blower wheels.

2-Indoor Blower Motor B3

Belt drive units use single or three phase motors (same as supply voltage). 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 (see table of contents) section in the front of this manual. Units may be equipped with motors manufactured by various manufacturers, therefore electrical FLA and LRA specifications will vary. See unit rating plate for information specific to your unit.

IMPORTANT

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

A-Blower Operation

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

- 1- Blower operation is manually set at the thermostat sub-base 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.

B-Determining Unit CFM

- 1- The following measurements must be made with air filters in place and no cooling demand.
- 2- With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in figure 5.

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

- 3- Referring to the blower tables starting on Page 5, use static pressure and RPM readings to determine unit CFM. Use air resistance table when installing units with any of the options or accessories listed.
- 4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 6. Do not exceed minimum and maximum number of pulley turns as shown in table 1.

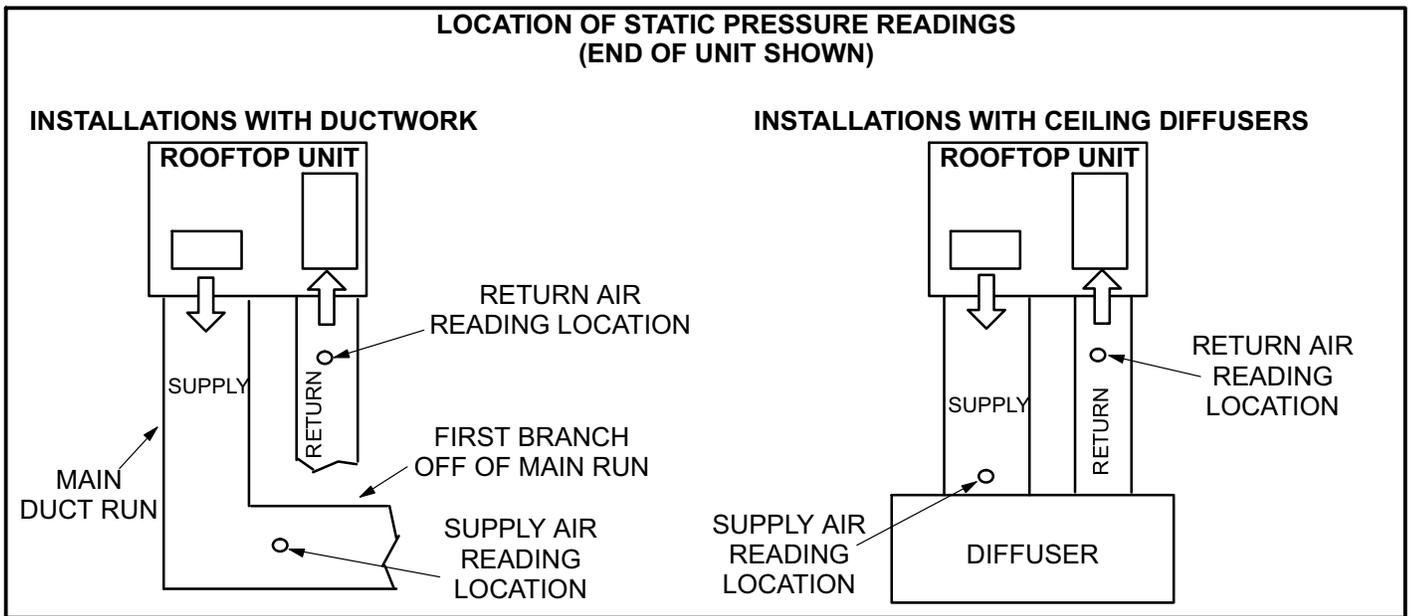


FIGURE 5

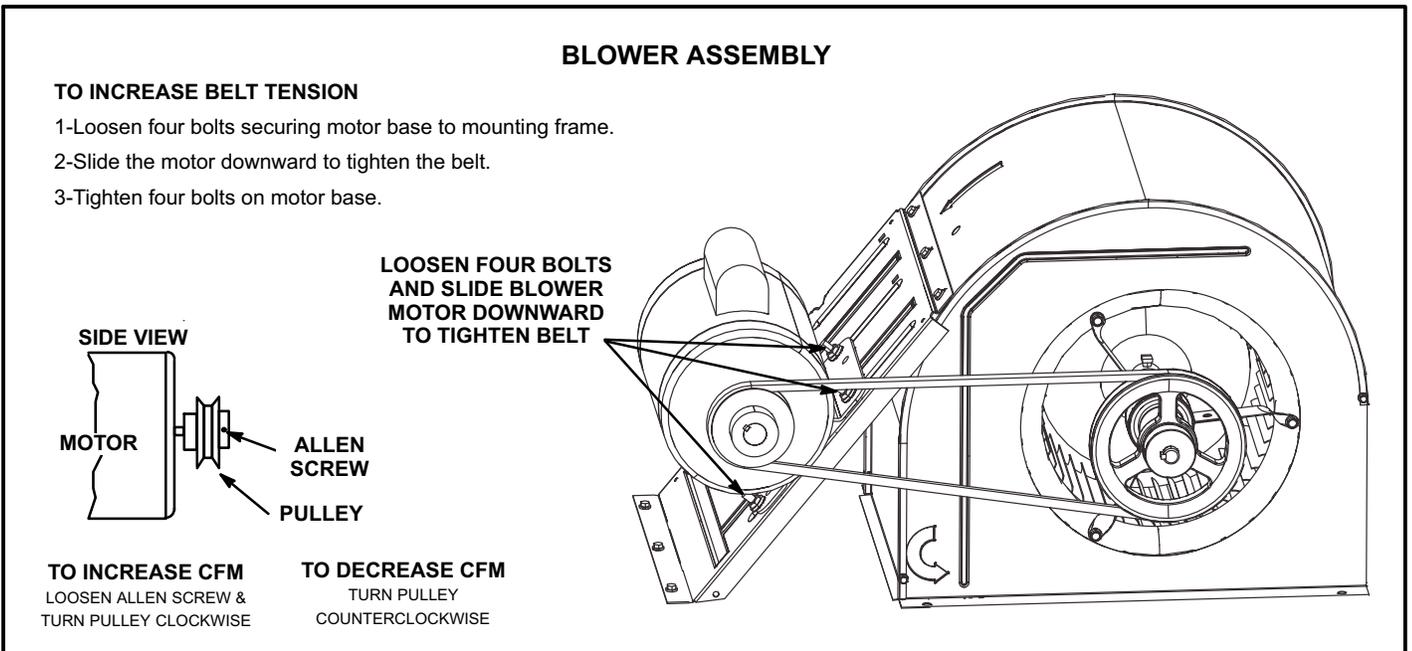


FIGURE 6

**TABLE 1
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Min. Turns Open	Maxi. Turns Open
A Section	No minimum	5

C-Blower Belt Adjustment

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

- 1- Loosen four bolts securing motor base to mounting frame. See figure 6.
- 2- *To increase belt tension* - Slide blower motor downward to tighten the belt. This increases the distance between the blower motor and the blower housing.
- 3- *To loosen belt tension* - Slide blower motor upward to loosen the belt. This decreases the distance between the blower motor and the blower housing.
- 4- Tighten four bolts securing motor base to the mounting frame.

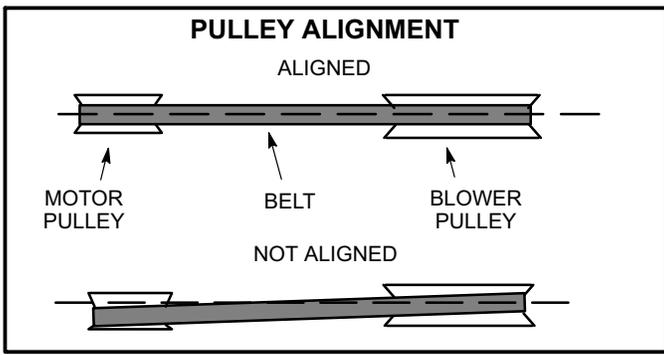


FIGURE 7

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

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

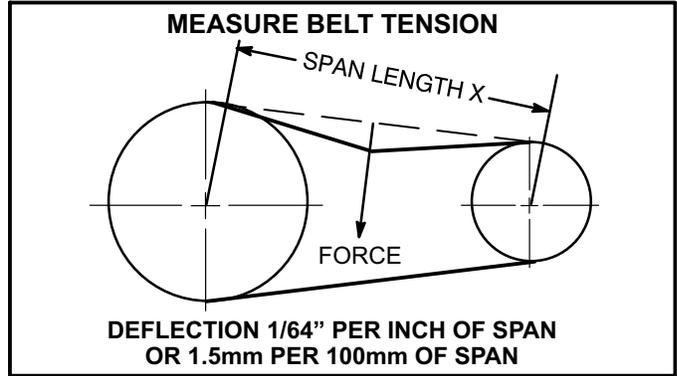


FIGURE 8

F-Field-Furnished Blower Drives

See blower data tables for field-furnished blower drives to determine BHP and RPM required. See table 2 for drive component manufacturers numbers.

**TABLE 2
DRIVE COMPONENT MANUFACTURER'S NUMBERS**

Drive No.	DRIVE COMPONENT PART NUMBERS					
	Motor Pulley		Blower Pulley		Belts	
	Browning	OEM	Browning	OEM	Browning	OEM
Z01	1VP34 X 7/8	31K6901	AK54 X 5/8	100244-30	A40	100245-17
Z02	1VP34 X 7/8	31K6901	AK46 X 5/8	100244-31	A39	100245-16
Z03	1VP34 X 7/8	31K6901	AK41 X 5/8	100244-28	A39	100245-16
Z04	1VP34 X 7/8	31K6901	AK39 X 5/8	100244-32	A38	100245-15
Z05	1VP44 X 7/8	P-8-1488	AK49 X 5/8	100244-26	A41	100245-18
Z06	1VP50 X 7/8	53J1501	AK51 X 5/8	100244-29	A42	100245-19

C-ELECTRIC HEAT COMPONENTS

Electric heat match-ups are found in the ELECTRICAL DATA tables. See table of contents.

All electric heat sections consist of electric heating elements exposed directly to the air stream. See figure 9. See figure 10 for vestibule parts arrangement.

1-Contactors K15, K16

All contactors are double break and either single, double or three pole (see diagram) and equipped with a 24VAC coil. The coils in the K15 and K16 contactors are energized by the indoor thermostat. In all units K15 energizes the heating elements, while in the 10 and 22.5 kW P volt units, K15 and K16 energize the heating elements simultaneously.

2-High Temperature Limits S15 (Primary)

S15 is a SPST N.C. auto-reset thermostat high temperature limit for the electric heat section. When S15 opens, indicating a problem in the system, contactor K15 is de-energized (including K16 in 10 and 22.5 kW P volt units). When K15 is de-energized, all stages of heat are de-energized. See table 3 for S15 set points. Set points are factory set and not adjustable.

3-Terminal Strip TB2

Terminal strip TB2 is used for single point power installations only. TB2 distributes power to TB3. Units with multi-point power connections will not use TB2.

4-Terminal Strip TB3

P and Y voltage units are equipped with terminal strip TB3. Electric heat line voltage connections are made to TB3, which distributes power to the electric heat components and is located on the vestibule. See figure 10.

5-High Temperature Limit S20, S157, S158 (Secondary)

Switches are SPST N.C. manual-reset thermostats. All are wired in series with the heating elements. See wiring diagrams. When either limit opens K15 and K16 are de-energized. When the contactors are de-energized, all stages of heat are de-energized. The thermostat is factory-set to open at $180^{\circ}\text{F} \pm 6^{\circ}\text{F}$ ($82^{\circ}\text{C} \pm 3.3^{\circ}\text{C}$) on a temperature rise and can be manually reset when temperature falls below 160°F (71.0°C). See figure 10 for location. On 22.5kW (P, G and J volt) units, S15 opens at $190^{\circ}\text{F} \pm 6^{\circ}\text{F}$ ($88^{\circ}\text{C} \pm 3.3^{\circ}\text{C}$).

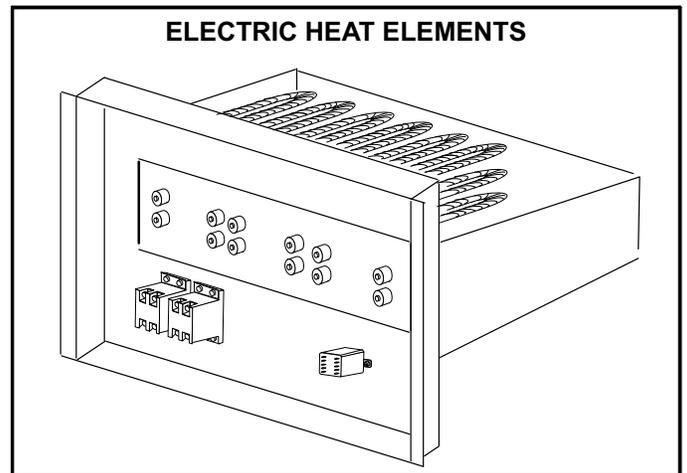


FIGURE 9

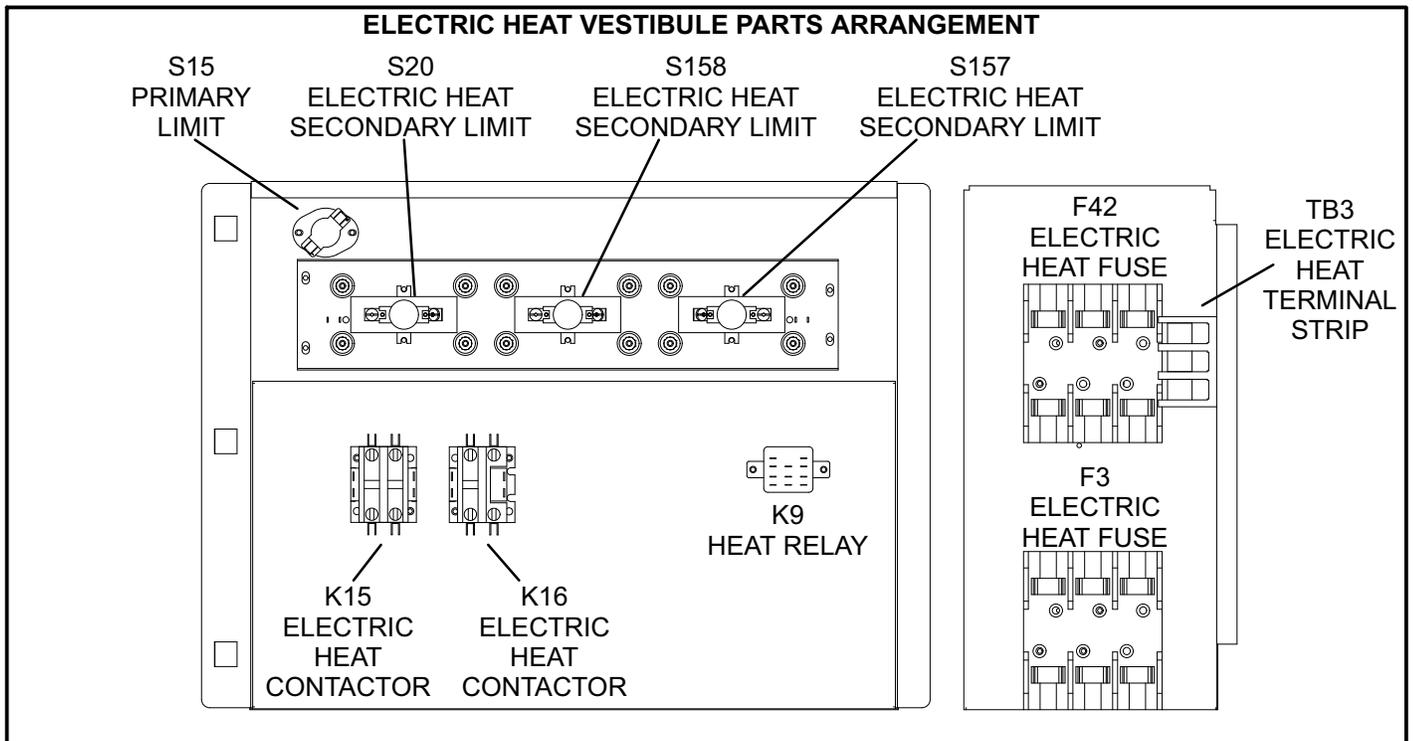


FIGURE 10

TABLE 3
S15 PRIMARY HIGH TEMPERATURE LIMIT SETPOINTS

Unit kW	Voltage	S15 Opens ° F	S15 Closes ° F
5.0, 7.5, 10.0, 15.0	P	160	120
7.5, 15.0	G		
5.0, 7.5, 10.0	J		
22.5	P	170	130
7.5, 10.0, 15.0, 22.5	Y		
5.0, 10.0	G		
15.0, 22.5	J		
5.0	Y	140	95
22.5	G	180	140

6-Heating Elements HE1 through HE3

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

7-Fuse F3 and F42

Fuse F3 and F42 are housed in a fuse block. Each fuse is connected in series with each leg of electric heat. Figure 10 and table 4 show the fuses used with each electric heat section.

8-Unit Fuse Block & Fuse F4

Line voltage fuses F4 provide short circuit and ground fault protection to all cooling components in ZCA units with electric heat. Single phase units are equipped with two fuses and three phase units are equipped with three fuses. The fuses are rated in accordance with the amperage of the cooling components. The F4 fuse block is located inside a sheet metal enclosure.

9-Electric Heat Relay K9

K9 is a SPDT pilot relay intended to energize blower contactor K3 and electrically isolate the unit's 24V circuit from the electric heat 24V circuit. K9 is energized by the indoor thermostat. K9-1 closes, energizing blower contactor K3.

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 (Z1CURB).

TABLE 4

kW	Voltage	Fuse F3	Qty
5.0	P	30A - 250V	2
7.5	P	40A - 250V	2
10*	P	35A - 250V	2
15	P	40A - 250V	4
22.5	P	40A - 250V	6
5.0	Y	20A - 250V	3
7.5	Y	25A - 250V	3
10	Y	35A - 250V	3
15	Y	50A - 250V	3
22.5	Y	40A - 250V	6
5.0	G	15A - 600V	3
7.5	G	15A - 600V	3
10	G	20A - 600V	3
15	G	25A - 600V	3
22.5	G	35A - 600V	3
5.0	J	15A - 600V	3
7.5	J	15A - 600V	3
10	J	15A - 600V	3
15	J	20A - 600V	3
22.5	J	30A - 600V	3

*This heater is equipped with two F42, 20A, 250V fuses.

III-START UP - OPERATION

A-Preliminary and Seasonal Checks

- 1- Make sure the unit is installed in accordance with the installation instructions and applicable codes.
- 2- Inspect all electrical wiring, both field and factory installed for loose connections. Tighten as required. Refer to unit diagram located on inside of control 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-Cooling Start-Up

A-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 the condenser fan. An increased cooling demand (Y2) will not change operation.
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 the condenser fan. When outdoor air is not acceptable unit will operate as though no economizer is installed.
- 3- Units contain one refrigerant circuit or stage.
- 4- Unit is charged with R-410A refrigerant. See unit rating plate for correct amount of charge.
- 5- Refer to Refrigerant Charge and Check section for proper method to check refrigerant charge.

B-Three Phase Scroll Compressor Voltage Phasing

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

- 1- Observe suction and discharge pressures and blower rotation on unit start-up.
- 2- Suction pressure must drop, discharge pressure must rise and blower rotation must match rotation marking.

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

- 3- Disconnect all remote electrical power supplies.
- 4- Reverse any two field-installed wires connected to the line side of K1 contactor. Do not reverse wires at blower contactor.
- 5- Make sure the connections are tight.

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

C-Safety or Emergency Shutdown

Turn off power to unit.

IV-CHARGING

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, re-claim 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 high stage only.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Compare the normal operating pressures (see tables 5 - 7) 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 ZC 036: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 102°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

**TABLE 5
ZC 036 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
112	242	115	281	117	327	121	375	119	421	125	490
118	244	121	283	125	326	128	375	132	429	134	488
132	254	137	293	140	338	145	387	149	442	147	499
147	269	152	308	157	351	161	400	166	454	170	516

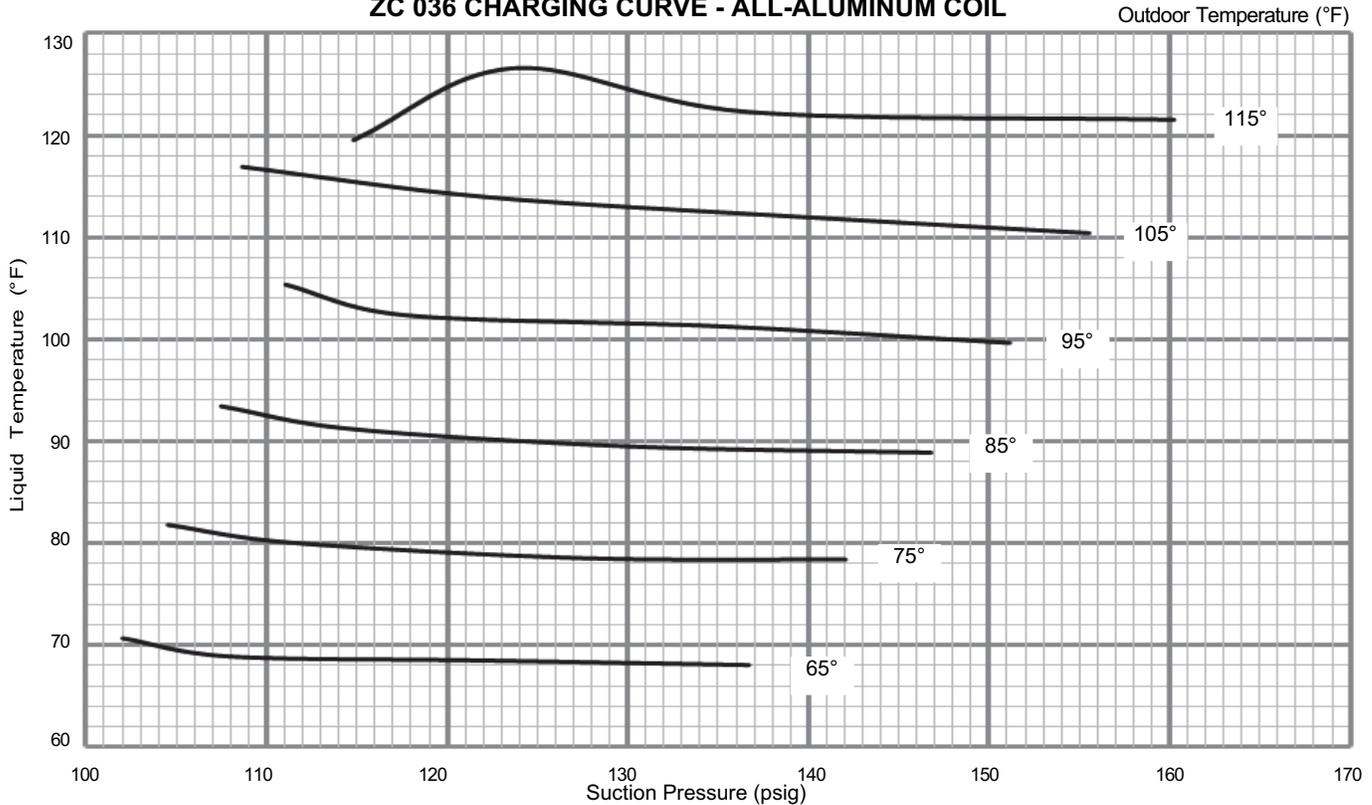
**TABLE 6
ZC 048 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
108	254	111	295	115	338	118	386	121	437	122	491
114	259	118	299	122	344	125	392	129	445	130	502
128	273	133	314	137	358	141	408	145	462	148	524
149	310	150	342	155	388	158	436	163	474	167	556

**TABLE 7
ZC 060 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

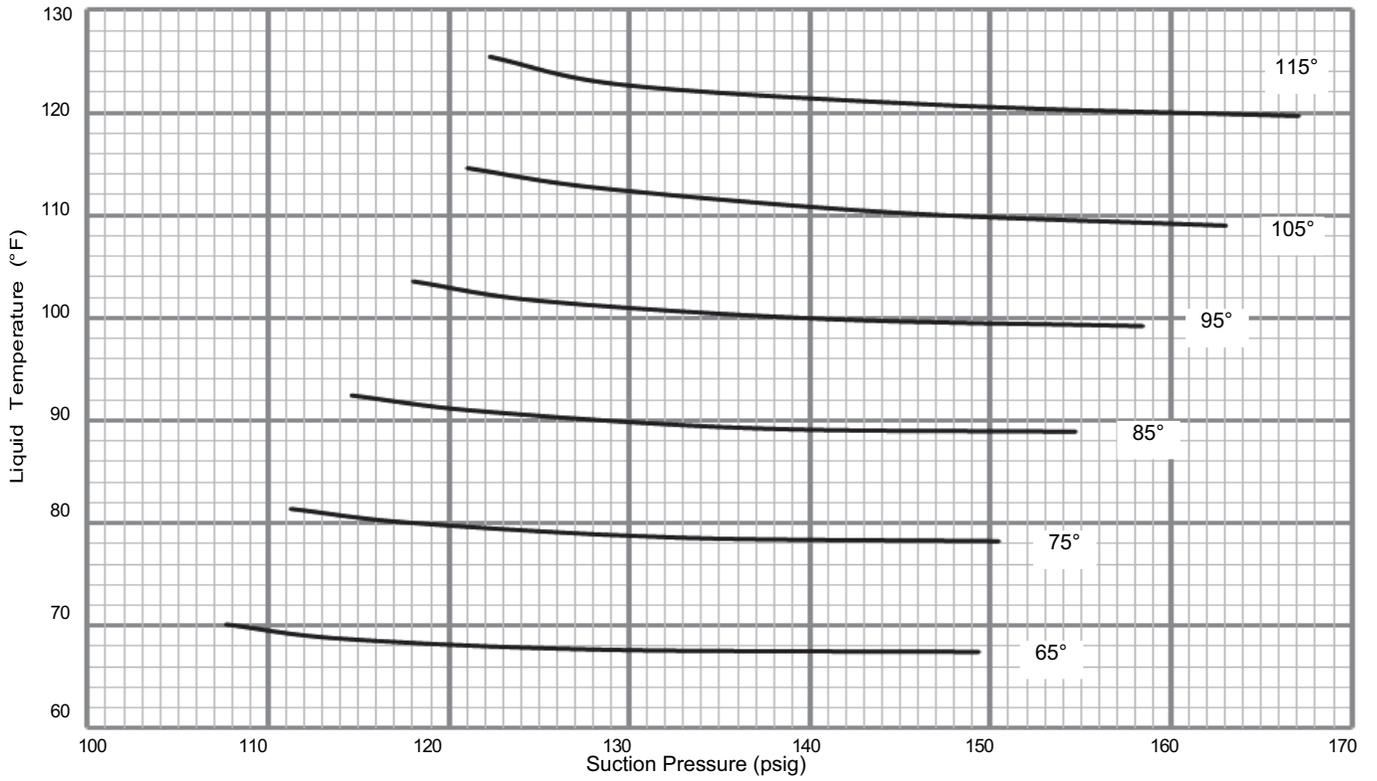
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
107	257	110	299	114	343	117	388	120	440	122	498
115	277	117	304	120	350	124	396	128	446	131	501
137	297	135	320	138	366	141	419	144	473	149	530
147	312	151	352	156	397	160	449	165	505	169	576

ZC 036 CHARGING CURVE - ALL-ALUMINUM COIL



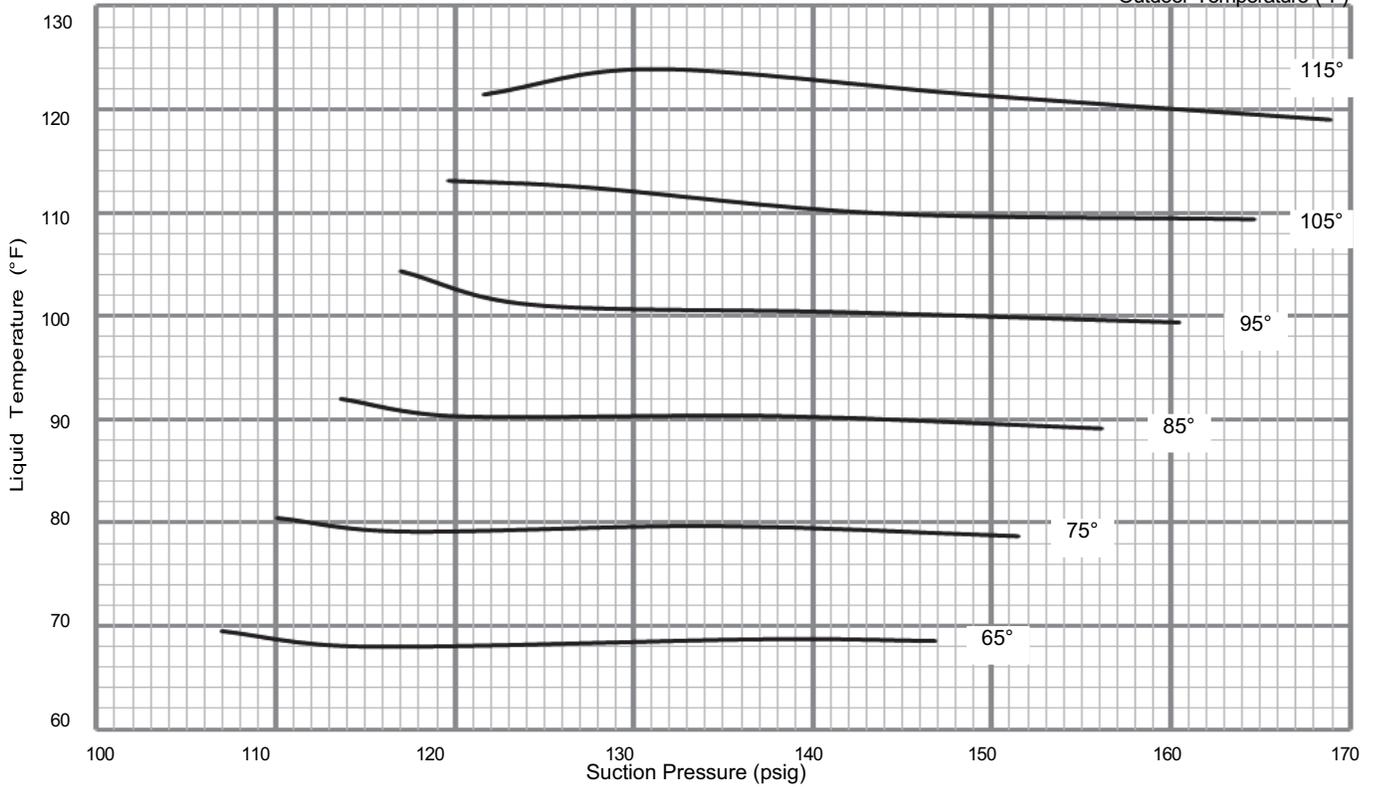
ZC 048 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



ZC 060 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



V- SYSTEM SERVICE CHECKS

A-Cooling System Service Checks

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

NOTE-When unit is properly charged discharge and suction pressures should approximate those in tables 5 through 7.

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.	

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

A-Filters

Units are equipped with temporary filters which must be replaced prior to building occupation. All units use 14 X 20 X 2" (352 X 508 X 51mm) filters. Refer to local codes or appropriate jurisdiction for approved filters. Filters should be checked monthly and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters.

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

To change filters, open filter access panel on back side of unit. See figure 11. Lift filter stop to remove filters. See figure 12.

⚠ 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.	

B-Lubrication

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

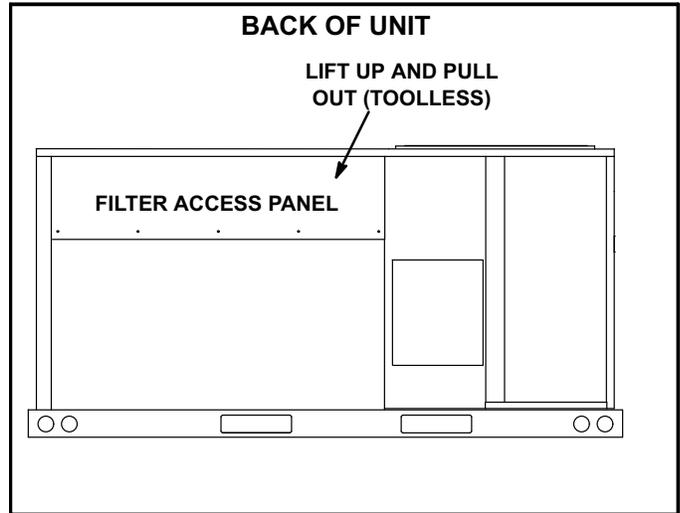


FIGURE 11

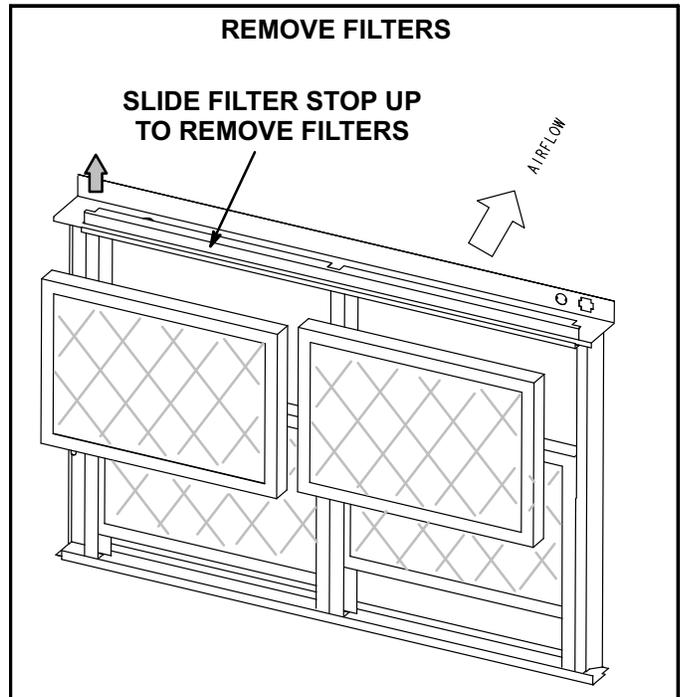


FIGURE 12

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-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 degree 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.

E-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 ZCA units.

A-Z1CURB

When installing the ZCA units on a combustible surface for downflow discharge applications, a Z1CURB 8-inch, 14-inch, 18-inch, or 24-inch height roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the ZCA units are not mounted on a flat (roof) surface, they MUST be supported under all edges and under the middle of the unit to prevent sagging. The units MUST be mounted level within 1/16" per linear foot or 5mm per meter in any direction.

The assembled mounting frame is shown in figure 13. 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 and block-off panels MUST be installed before the unit is set on the mounting frame. Typical roof curbing and flashing is shown in figure 14. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

B-Transitions

Supply/return transitions are field-provided.

C-Supply and Return Diffusers (all units)

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

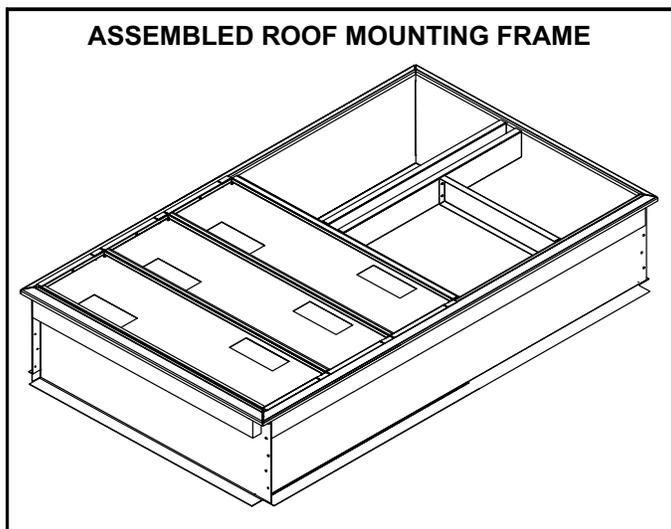


FIGURE 13

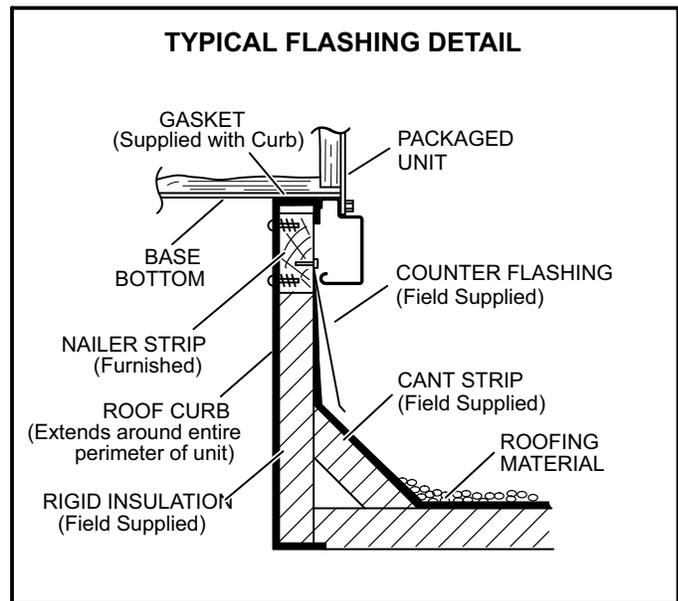


FIGURE 14

D-Economizer (Field or Factory Installed)

Downflow economizers are a factory-installed option. Downflow and horizontal air flow economizers are a factory- or field-installed option. Economizers are equipped with an A6 enthalpy control, an R1 mixed air sensor and an S175 outdoor sensible sensor. The modulating economizer opens fully to use outdoor air for free cooling when temperature is suitable and opens to minimum position during the occupied time period.

When A6 determines outdoor air is suitable (via input from S175 outdoor air sensor), dampers will modulate open (via B7 damper motor) to maintain 55°F (13°C) supply air (determined by input from R1 mixed/supply air sensor).

The A6 enthalpy control and B7 damper motor are shown in figure 15 for downflow air discharge and figure 16 for horizontal air discharge. The R1 mixed air sensor is shown in figure 17. An A7 outdoor enthalpy sensor is optional and replaces the S175 sensible sensor. See figure 18.

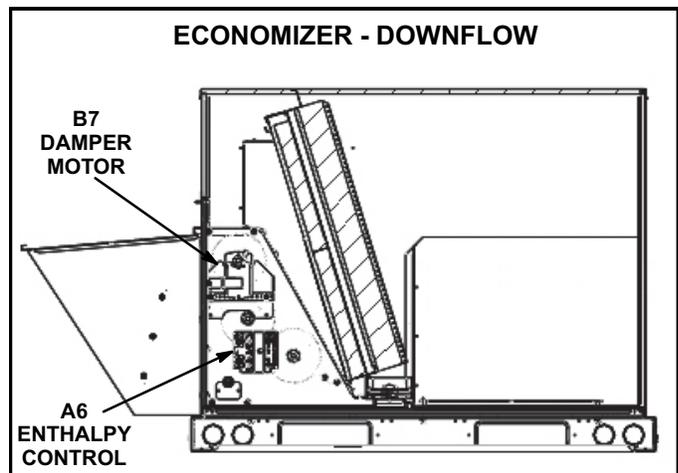


FIGURE 15

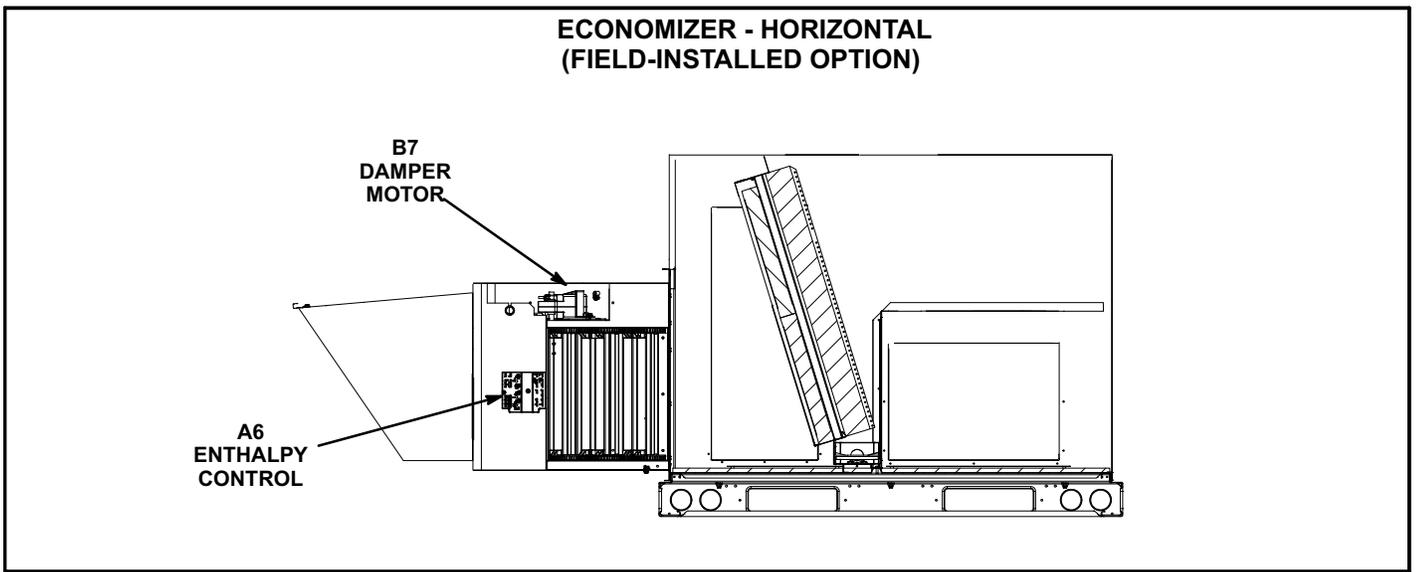


FIGURE 16

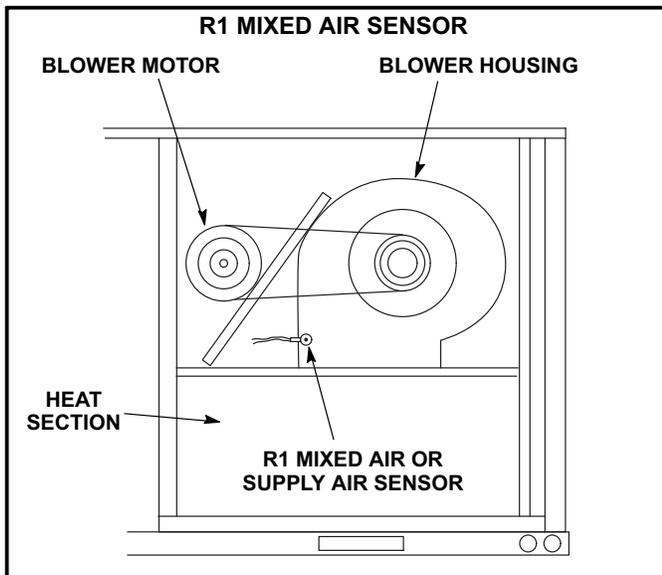


FIGURE 17

An optional IAQ sensor (A63) may be used to lower operating costs by controlling outdoor air based on CO₂ level or room occupancy (also called demand control ventilation or DCV). Damper minimum position can be set lower than traditional minimum air requirements; dampers open to traditional ventilation requirements when CO₂ level reaches DCV (IAQ) setpoint.

Refer to instructions provided with sensors for installation.

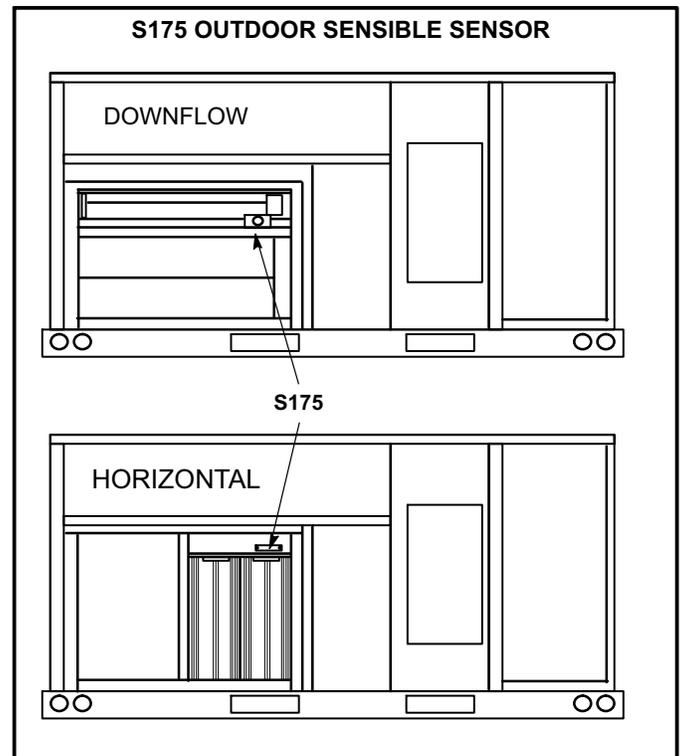


FIGURE 18

A6 Enthalpy Control LEDs

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

When an optional IAQ sensor is installed, a steady green DCV LED indicates that the IAQ reading is higher than setpoint requiring more fresh air. See figure 19.

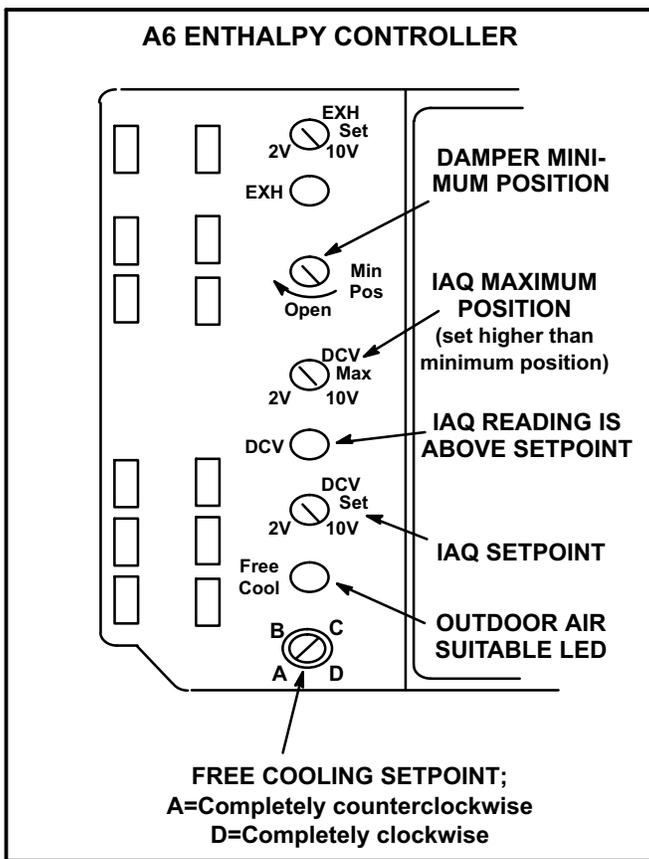


FIGURE 19

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 8. Setting A is recommended. See figure 19. 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 8
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

- 1- Set thermostat to occupied mode if the feature is available. Make sure unit 24V control leads R and OC are connected if using a thermostat which does not have the feature.
- 2- Rotate MIN POS SET potentiometer to approximate desired fresh air percentage.

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

- 3- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point "A" (40°F, 4°C shown).
- 4- Measure return air temperature. Mark that point on the top line of chart 1 and label the point "B" (74°F, 23°C shown).
- 5- Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point "C" (70°F, 21°C shown).
- 6- Draw a straight line between points A and B.
- 7- Draw a vertical line through point C.
- 8- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.
- 9- If fresh air percentage is less than desired, adjust MIN POS SET potentiometer higher. If fresh air percentage is more than desired, adjust MIN POS SET potentiometer lower. Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

DCV Set and Max Settings

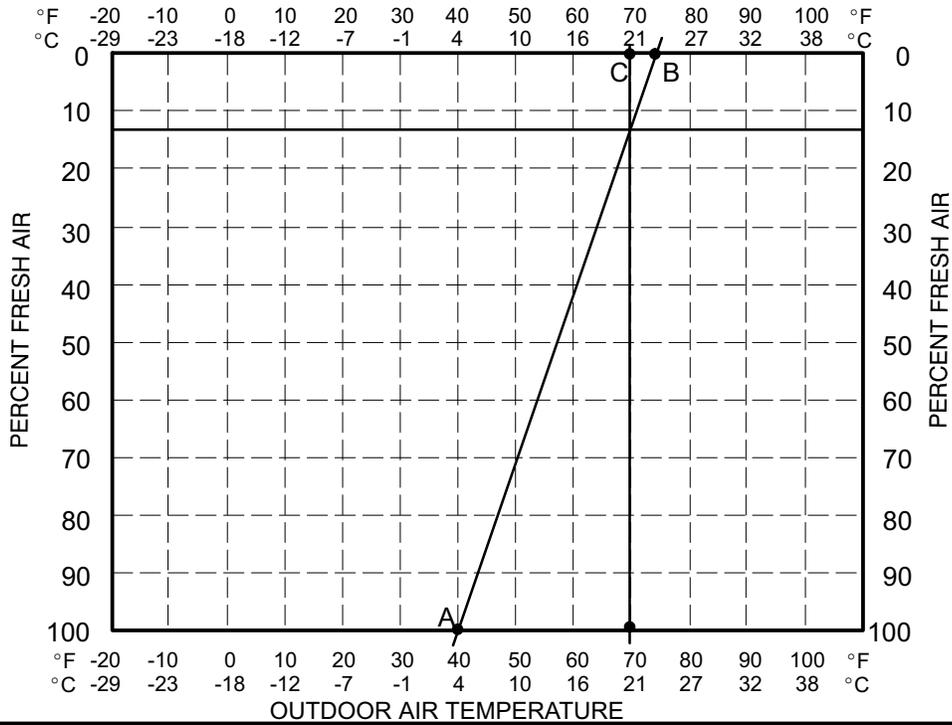
Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO₂ 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 19.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO₂ rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 19.

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

**CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE
MIXED AND RETURN AIR TEMPERATURE**



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 9 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 9
ECONOMIZER OPERATION**

OUTDOOR AIR IS SUITABLE FOR FREE COOLING – FREE COOL LED “ON”

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

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

E-Outdoor Air Dampers

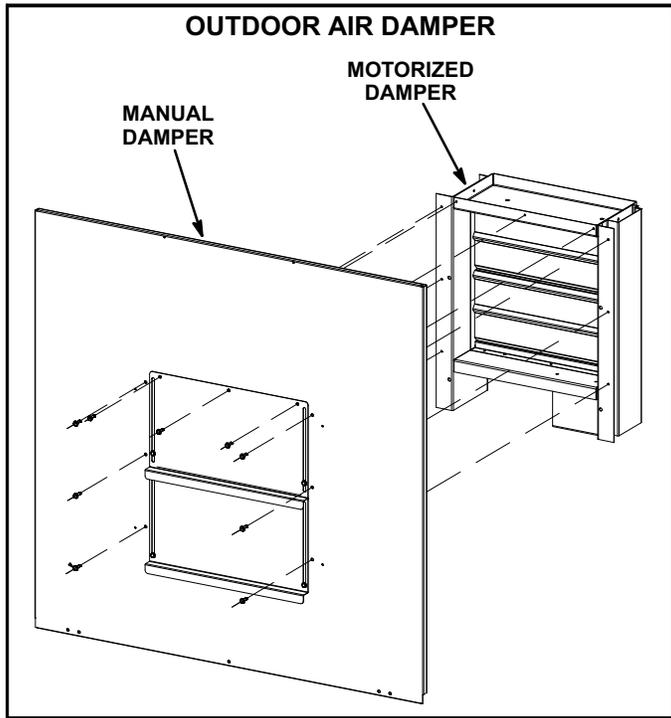


FIGURE 20

Z1DAMP21 is a motorized outdoor air damper and Z1DAMP11 is a manual outdoor air damper. See figure 20. Both sets include the outdoor air hood. The dampers provide motorized or manual operation to allow up to 35 percent outside air into the system at all times. Washable filter supplied with the outdoor air dampers can be cleaned with water and a mild detergent. It should be sprayed with Filter Handicoater when dry prior to reinstallation. Filter Handicoater is R.P. Products coating no. 418 and is available as Lennox Part No. P-8-5069.

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

Set damper minimum position in the same manner as economizer minimum position. Adjust motorized damper position as shown in figure 21. Manual damper fresh air intake percentage can be determined in the same manner.

F-Power Exhaust Relay K65 (power exhaust units)

Power exhaust relay K65 is a DPDT relay with a 24VAC coil. K65 is used in all ZCA 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.

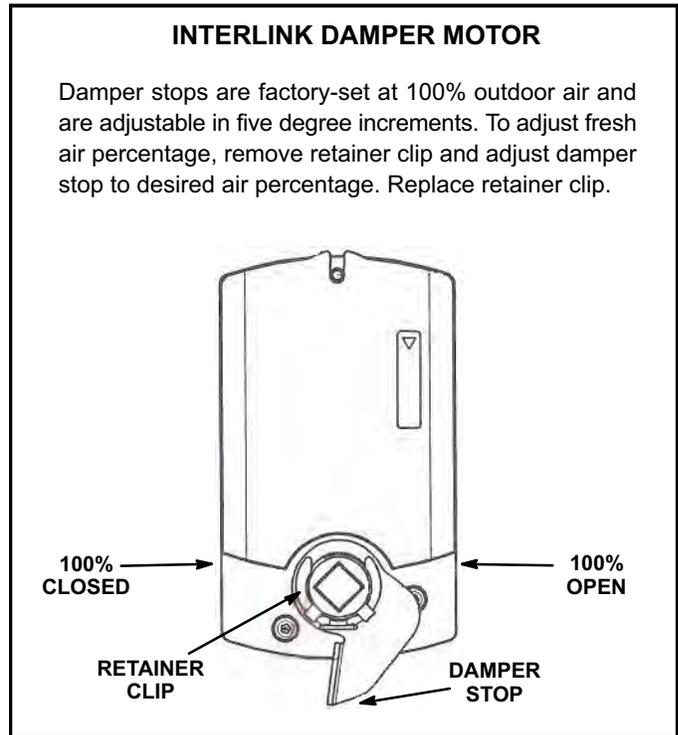


FIGURE 21

G-Power Exhaust Fans (Field-Installed)

Z1PWRE10 is available for downflow units and Z1PWRE15 is available for horizontal air flow units. Fans provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. See figure 22, 23 and installation instructions for more detail.

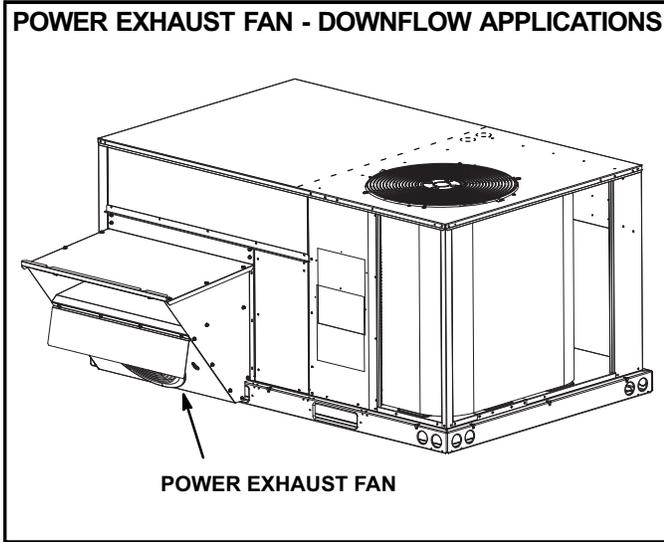


FIGURE 22

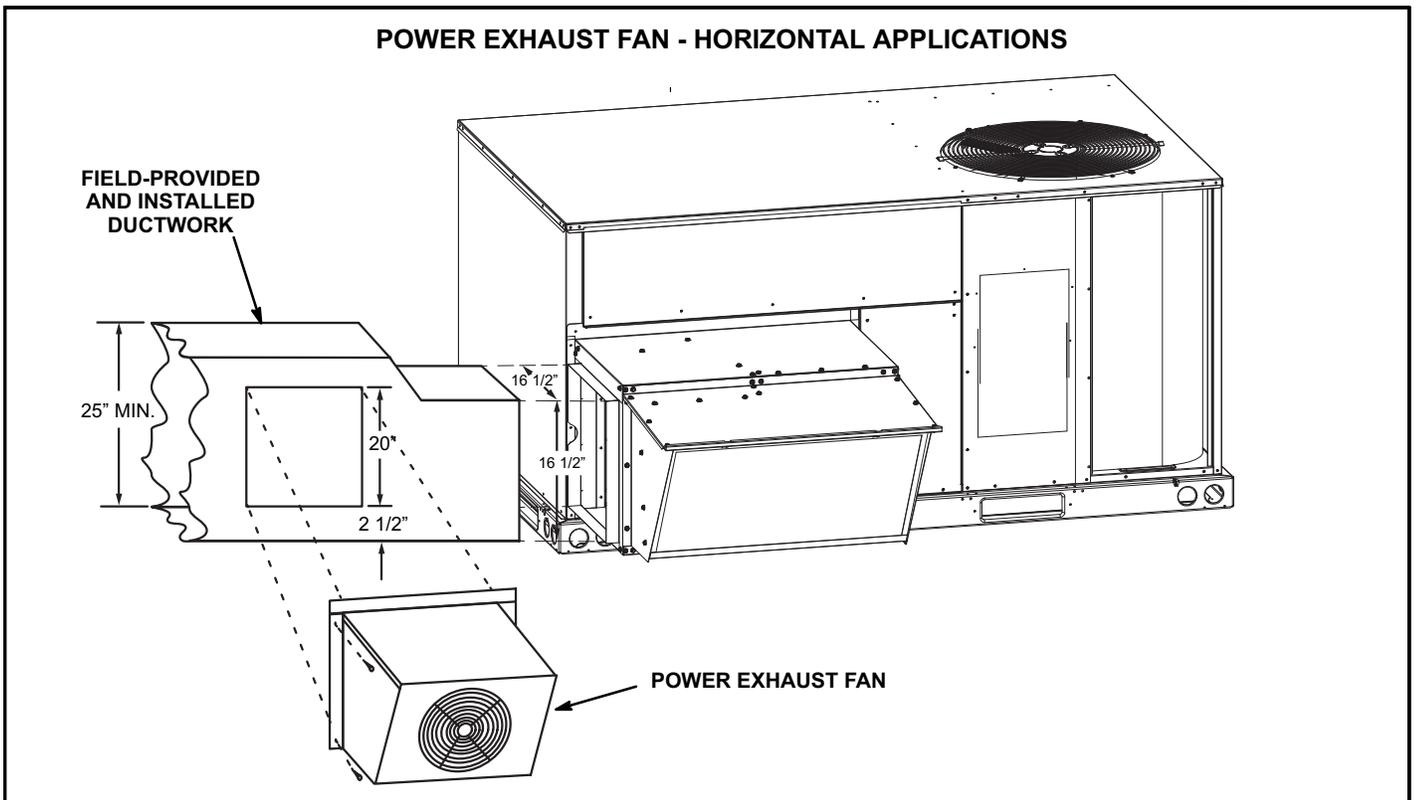


FIGURE 23

H-Control Systems

Different types of control systems may be used with the ZCA series units. All thermostat wiring is connected to low voltage pigtailed located in the control box. Each thermostat has additional control options available. See thermostat installation instructions for more detail.

1- Electro-mechanical thermostat (13F06)

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

2- Electronic thermostat (see price book)

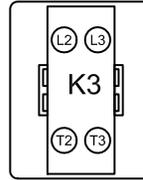
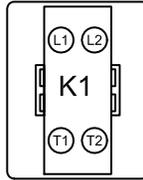
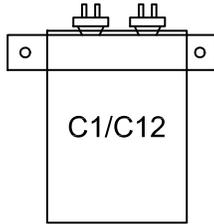
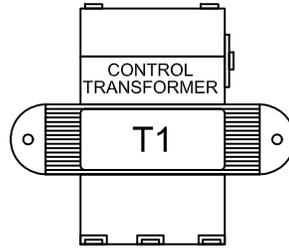
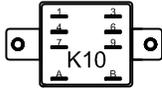
Any two stage heat / two stage cool electronic thermostat may be used.

I-Indoor Air Quality (CO₂) Sensor A63

The indoor air quality sensor monitors CO₂ levels and reports the levels to the economizer enthalpy control A6. Controller A6 adjusts the economizer dampers according to the CO₂ levels. The sensor is mounted next to the indoor thermostat or in the return air duct. Refer to the indoor air quality sensor installation instructions for proper adjustment.

ZCA CONTROL BOX ARRANGEMENT

OPTION FOR LOW AMBIENT KIT
460, 575, 380/420

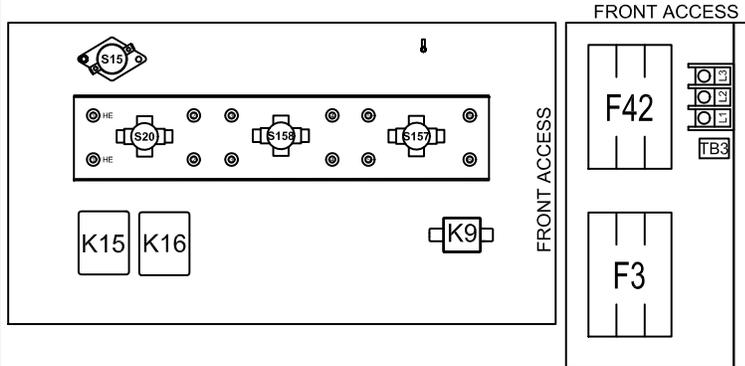


KEY	COMPONENT
A2	ELECTRONIC SENSOR
A6	SOLID STATE ENTHALPY CONTROL
A7	SOLID STATE ENTHALPY SENSOR
A63	CO2 SENSOR (IAQ)
B1	COMPRESSOR 1
B3	BLOWER MOTOR
B4	OUTDOOR FAN MOTOR
B7	ECONOMIZER OR DAMPER MOTOR
B10	EXHAUST FAN MOTOR
C1	OUTDOOR FAN CAPACITOR
C6	CAPACITOR, EXHAUST FAN 1
C7	COMPRESSOR 1 HARD START CAPACITOR
C12	DUAL CAPACITOR
CMC3	TIME CLOCK
F1	TRANSFORMER 1 FUSE
F3	ELECTRIC HEAT 1 FUSE
F4	UNIT FUSE
F42	ELECTRIC HEAT 2 FUSE
HE1	ELECTRIC HEAT ELEMENT 1
HE2	ELECTRIC HEAT ELEMENT 2
HE3	ELECTRIC HEAT ELEMENT 3
HR1	HEATER, COMPRESSOR 1
K1	COMPRESSOR 1 CONTACTOR
K3	BLOWER CONTACTOR
K9	HEAT RELAY
K10	OUTDOOR FAN RELAY
K15	ELECTRIC HEAT 1 CONTACTOR
K16	ELECTRIC HEAT 2 CONTACTOR
K31	HARD START RELAY
K65	EXHAUST FAN RELAY
R1	MIXED AIR OR SUPPLY SENSOR
R2	MINIMUM POSITION POTENTIOMETER
RT2	REMOTE THERMOSTAT SENSOR
S3	LOW DISCHARGE TEMP LIMIT, COMPRESSOR 1
S4	HIGH PRESSURE LIMIT, COMPRESSOR 1
S5	HIGH TEMPERATURE LIMIT, COMPRESSOR 1
S11	LOW AMBIENT LOW PRESSURE SWITCH
S15	ELECTRIC HEAT 1 PRIMARY LIMIT
S20	ELECTRIC HEAT 1 SECONDARY LIMIT
S149	OVERFLOW SWITCH
S157	ELECTRIC HEAT 2 SECONDARY LIMIT
S158	ELECTRIC HEAT 3 SECONDARY LIMIT
S175	SENSIBLE (55-70) TEMPERATURE THERMOSTAT
T1	TRANSFORMER, CONTROL
T10	EXHAUST FAN TRANSFORMER
TB2	UNIT TERMINAL STRIP
TB3	ELECTRIC HEAT 1 TERMINAL STRIP

KEY LIST

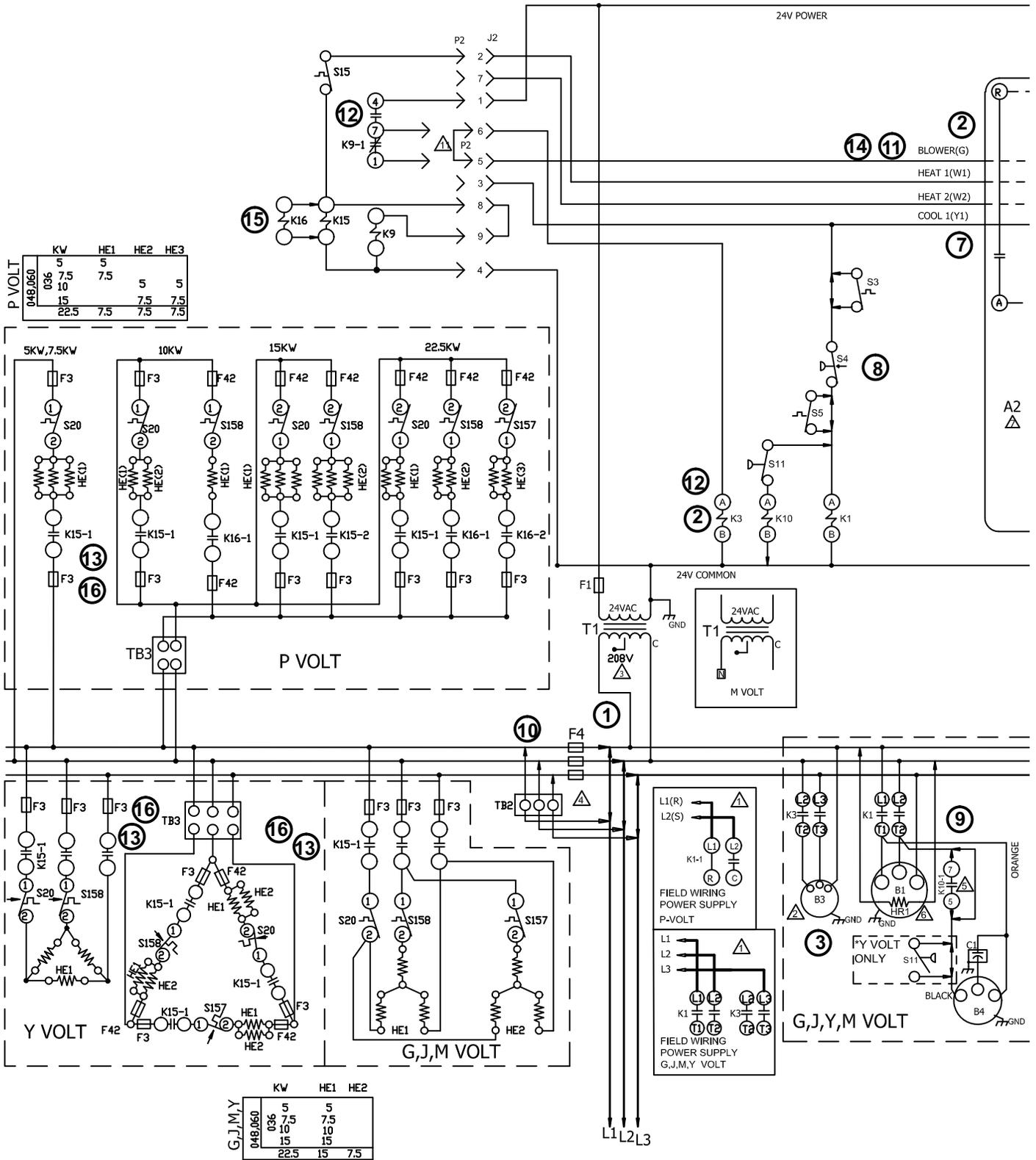
J/P #	JACK/PLUG DESCRIPTION
2	HEAT
3	ECONOMIZER
4	ECONOMIZER
9	ECONOMIZER
18	EXHAUST FAN
24	EXHAUST FAN
39	CONTROL INTERFACE

ELECTRIC HEAT SECTION

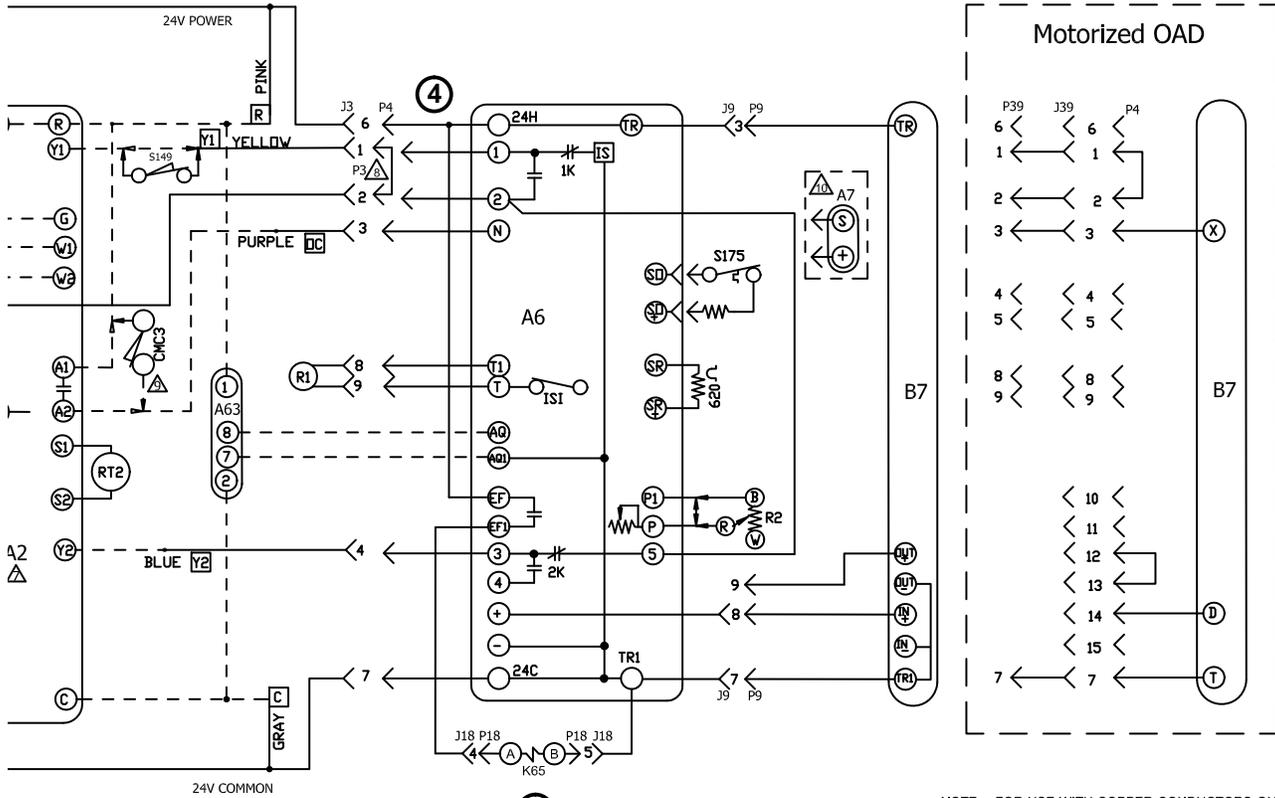


01/13		WIRING DIAGRAM 537583-01	01/13
KEY LIST			
ZC_KEY LIST AND COMPONENT ARRANGEMENT			
			Rev. 0
Supersedes		Form No.	537583-01

ZCA036, 048, 060 UNIT DIAGRAM

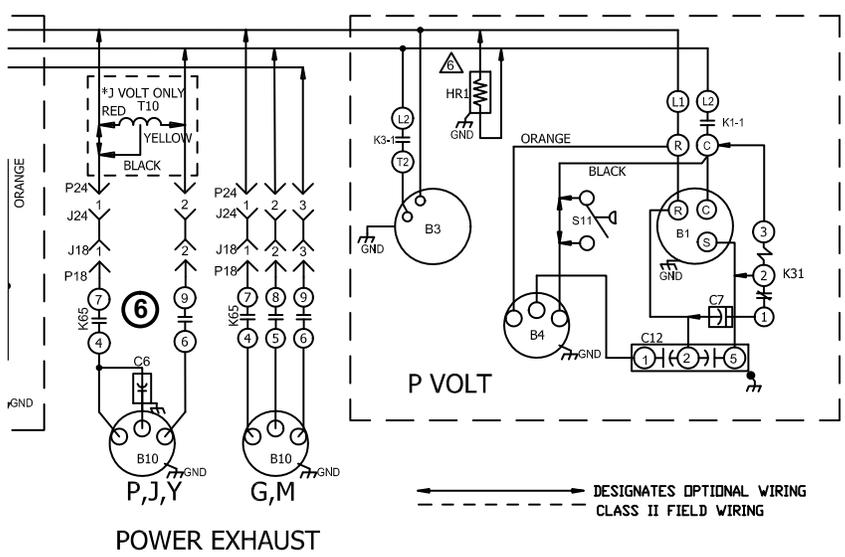


ZCA036, 048, 060 UNIT DIAGRAM



⑤

- NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
- ⚠ IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
 - ⚠ P, Y VOLT T1 WITH 208V TAP
 - ⚠ ELECTRIC HEAT FIELD OPTION
 - ⚠ LOW AMBIENT KIT
 - ⚠ HR1 FIELD INSTALLED
 - ⚠ THERMOSTAT/SENSOR SUPPLIED BY USER
 - ⚠ REMOVE P3 WHEN ECONOMIZER OR OADM IS USED
 - ⚠ TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED
 - ⚠ A7 ENTHALPY SENSOR MAY BE USED INSTEAD OF S175 TEMPERATURE SWITCH AND RESISTOR
 - ⚠ REMOVE P2 WHEN ELECTRIC HEAT IS USED



POWER EXHAUST

01/13	 WIRING DIAGRAM 537581-01	01/13
		UNIT DIAGRAM
ZC - 036, 048, 060		
SECTION ALL		REV. 0
Supersedes	New Form No.	537581-01

ZCA036, 048, 060 P, Y, G, J & M Voltage Sequence of Operation

Power:

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

Blower Operation:

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

Economizer Operation:

- 4- The A6 economizer control module receives a Y1 thermostat demand. If outdoor air is suitable, economizer modulates open (see table 9 in *VII-ACCESSORIES* section).

Power Exhaust Fan Operation:

- 5- The A6 economizer control module receives a Y1 thermostat demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).
- 6- N.O. K65-1 closes, energizing exhaust fan motor B10.

Cooling Demand

- 7- First stage cooling demand Y1 and G is energized by the thermostat. G energizes blower.
- 8- 24VAC is routed through low voltage Y1 lead to optional N.C. compressor low discharge temperature limit S3, N.C. high pressure switch S4 and N.C. compressor high temperature limit S5. Compressor contactor K1 is energized.
- 9- N.O. K1-1 close energizing compressor B1 and outdoor fan B4.

Heating Demand:

- 10- Terminal Strip TB2 is energized when the unit disconnect closes. TB2 supplies line voltage to TB3 or F3. Elements are protected by fuses F3 and F42.
- 11- Heating demand initiates at W1 in thermostat.
- 12- 24VAC is routed from the indoor thermostat through N.C. primary limit S15. Electric heat contactors K15, K16 (on P volt 10 and 22.5kW heaters) and heat relay K9 are energized. K9 energizes blower contactor K3 and economizer.
- 13- N.O. contacts K15-1, K15-2, K16-1 and K16-2 close energizing HE1, HE2 and HE3.

End of Heating Demand:

- 14- Heating demand is satisfied. Terminal W1 in the thermostat is de-energized.
- 15- Electric heat contactors K15 and K16 are de-energized.
- 16- N.O. contacts K15-1, K15-2, K16-1 and K16-2 open de-energizing HE1, HE2 and HE3.

INSTALLATION INSTRUCTIONS

⚠ 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

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ZGA/ZCA036	3-Ton
ZGB/ZCB036	3-Ton
ZGA/ZCA048	4-Ton
ZGB/ZCB048	4-Ton
ZGA/ZCA060	5-Ton
ZGB/ZCB060	5-Ton
ZGA/ZCA072	6-Ton

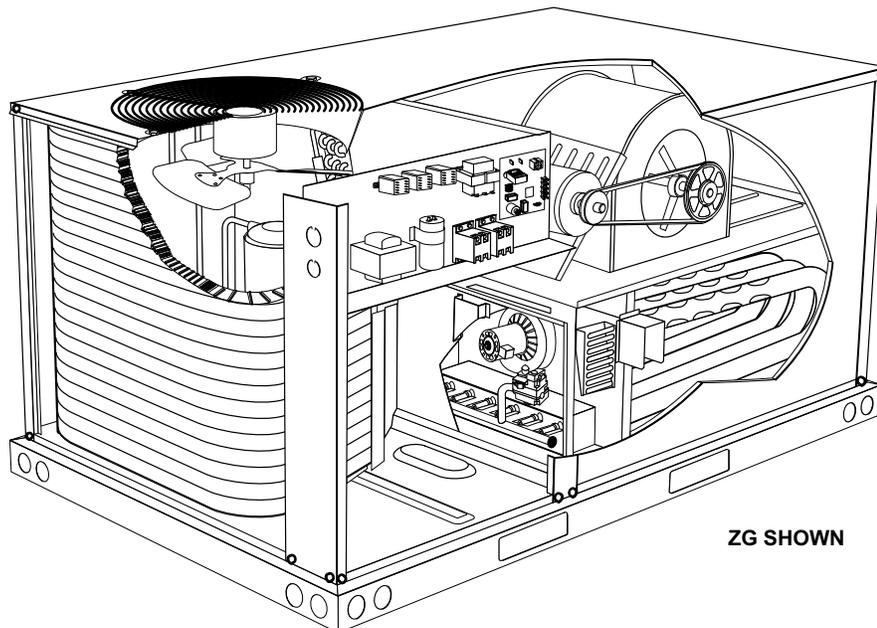
GAS AND COOLING PACKAGED UNITS
507252-02
2/2015
Supersedes 507252-01

Heating Operation and Adjustments	Page 36
Electric Heat Start-Up	Page 36
Service	Page 37

⚠ CAUTION

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

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

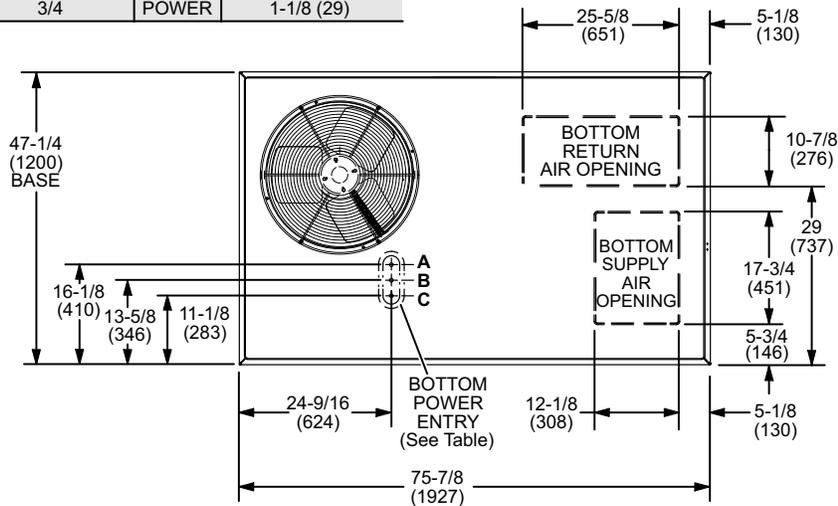


ZG SHOWN

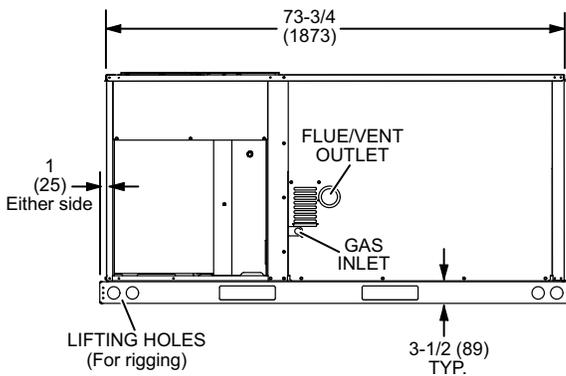
ZG/ZC 036, 048, 060, 072 DIMENSIONS in. - Gas heat section shown

BOTTOM POWER ENTRY
Holes required for Optional Bottom Power Entry Kit

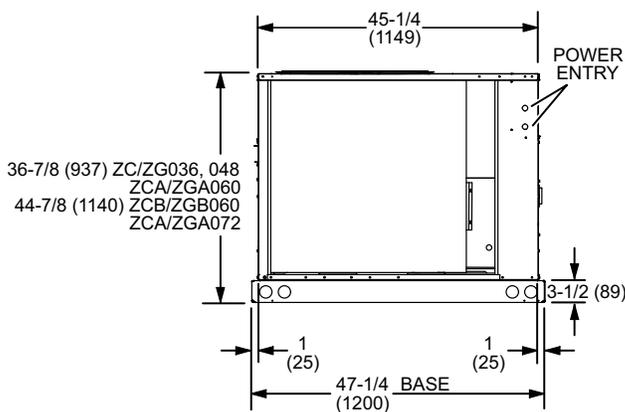
	Threaded Conduit Fittings (Provided in Kit)	Wire Use	Hole Diameter Required in Unit Base (Max.)
A	1/2	ACC.	7/8 (23)
B	1/2	24V	7/8 (23)
C	3/4	POWER	1-1/8 (29)



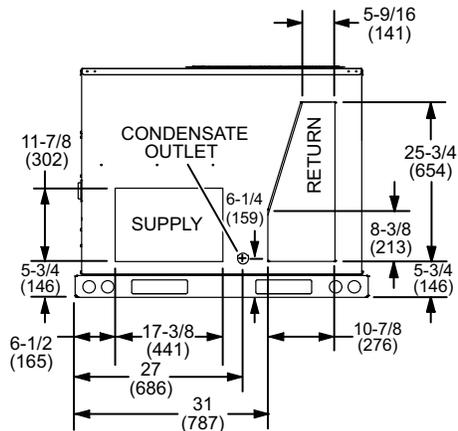
TOP VIEW (Base)



FRONT VIEW

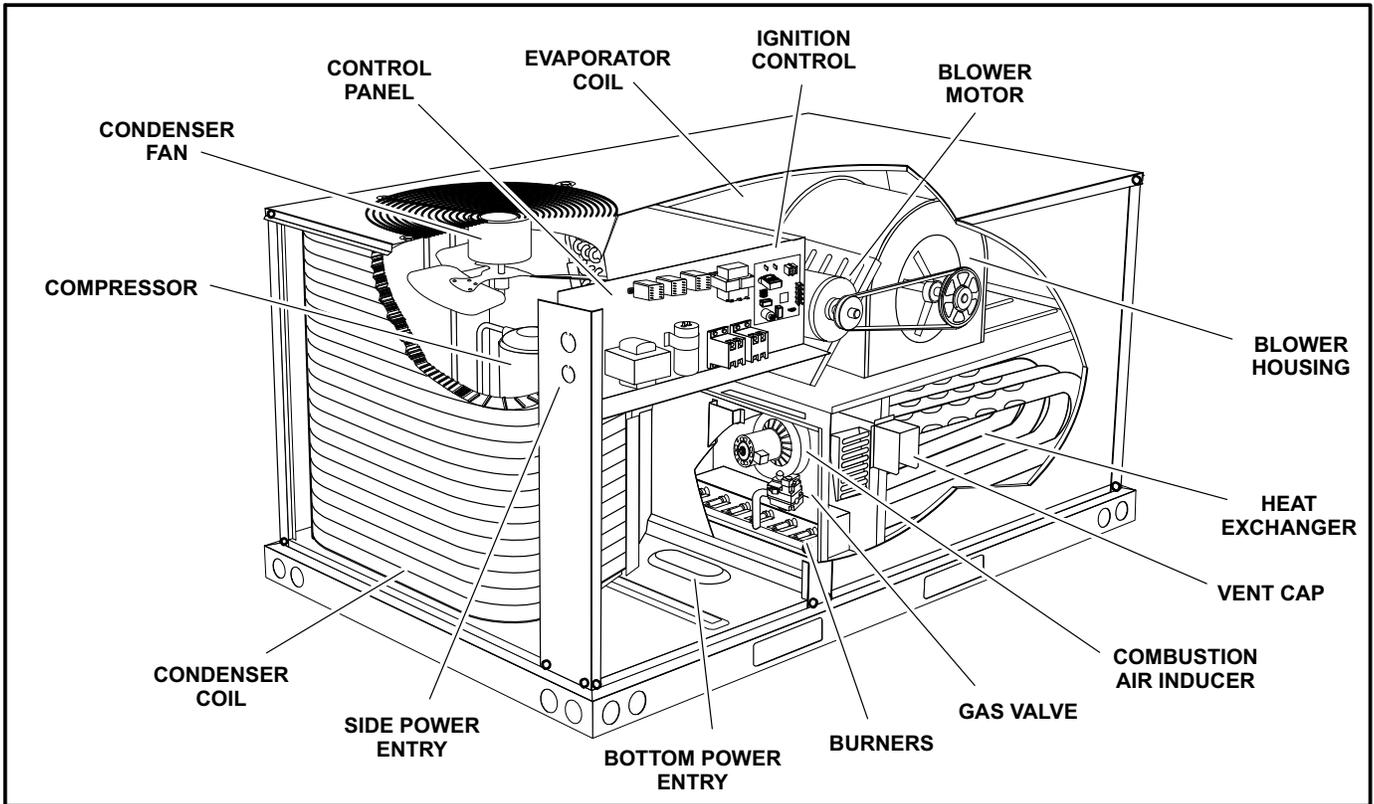


END VIEW

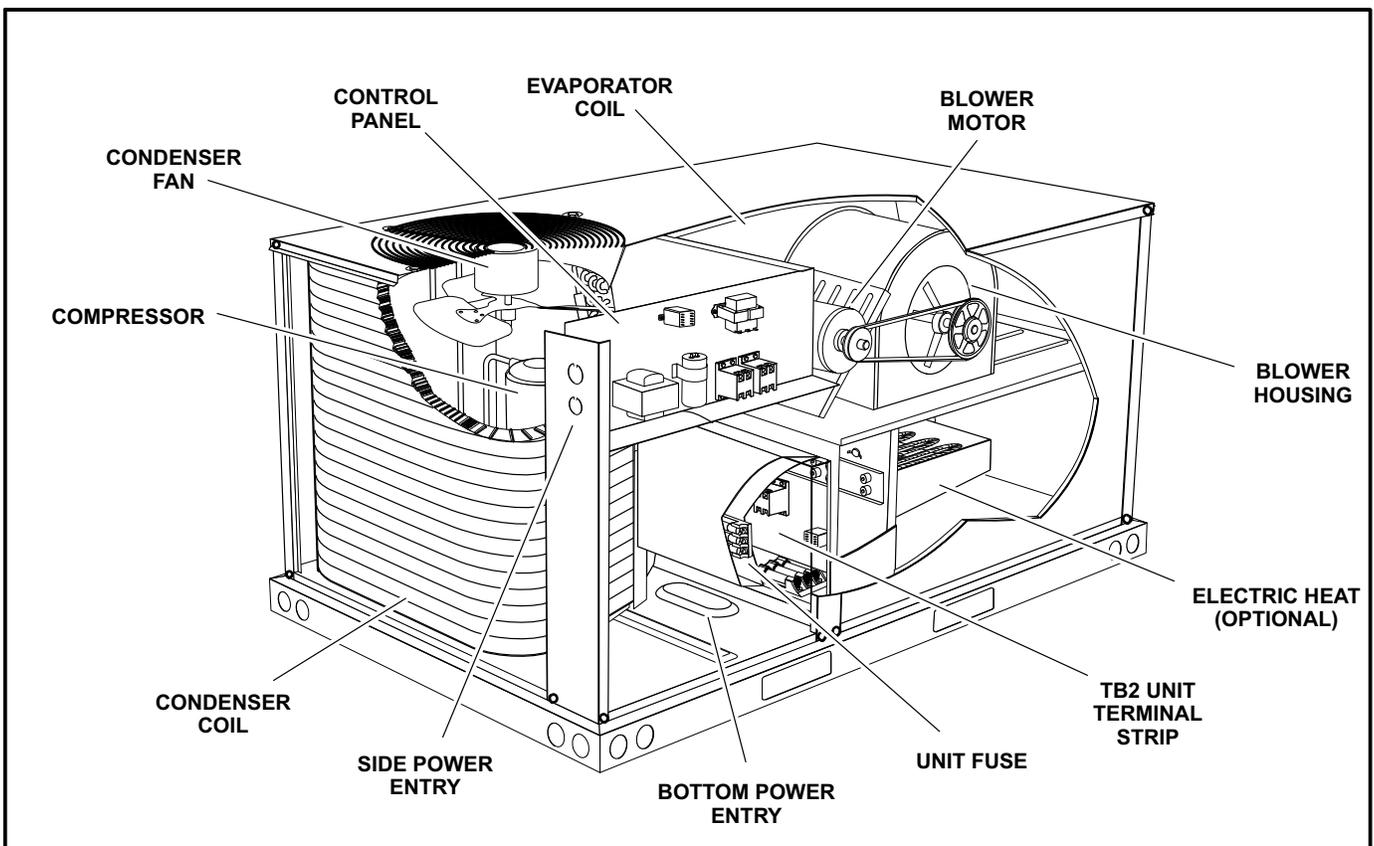


END VIEW

ZG 036, 048, 060, 072 PARTS ARRANGEMENT



ZC 036, 048, 060, 072 PARTS ARRANGEMENT



Shipping and Packing List

Package 1 of 1 contains:

1- Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

The ZG units are available in three heating inputs. The ZC cooling packaged rooftop unit is the same basic design as the ZG unit except for the heating section. Optional electric heat is available for ZC units. ZG and ZC units have identical refrigerant circuits with respective 3-, 4- 5- and 6-ton cooling capacities.

Availability of units and options varies by brand.

Requirements

See figure 1 for unit clearances.

⚠ NOTICE

Roof Damage!
 This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

⚠ WARNING



Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

⚠ 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.

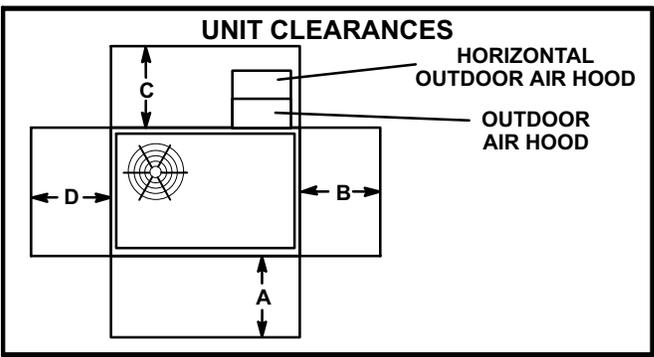


FIGURE 1

¹ Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	36 (914)	36 (914)	36* (914)	36 (914)	Unob- structed
Clearance to Combustibles	36 (914)	1 (25)	1 (25)	1 (25)	Unob- structed
Minimum Operation Clearance	36 (914)	36 (914)	36* (914)	36 (914)	Unob- structed

*Clearance is 60 in. (1524mm) in horizontal air flow applications.
 Note - Entire perimeter of unit base requires support when elevated above mounting surface.

¹ **Service Clearance** - Required for removal of serviceable parts.
Clearance to Combustibles - Required clearance to combustible material (gas units).

Minimum Operation Clearance - Required clearance for proper unit operation. Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filters must be removed upon construction completion.
- The input rate and temperature rise must be set per the unit rating plate.
- The heat exchanger, components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

Horizontal Air Discharge

Unit is shipped with panels covering the horizontal supply and return air openings. See figure 3.

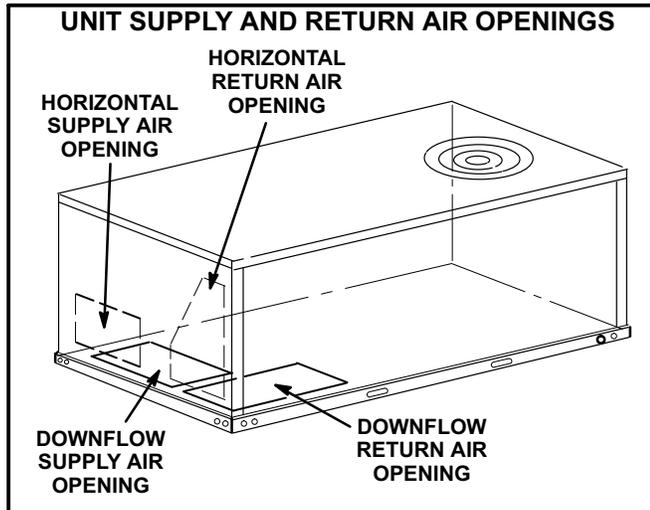


FIGURE 3

- 1- Remove horizontal covers and place a bead of silicone sealant on the underside of the duct cover flanges. See figure 4.
- 2- Position covers over downflow openings. Secure covers with self-drilling screws in at least two places on each cover. Drill through duct cover side into flange of base pan.
- 3- Place a bead of silicone between insulation and duct cover to seal in insulation edges. Let silicone dry before running gas or electric heat.

Units Equipped With An Optional Horizontal Economizer

- 1- Install the horizontal supply air cover over the down flow supply air opening as described above.
- 2- Leave the horizontal return air cover in place.
- 3- Locate the extra horizontal return cover that is included with the horizontal economizer kit. Install as described in previous section.

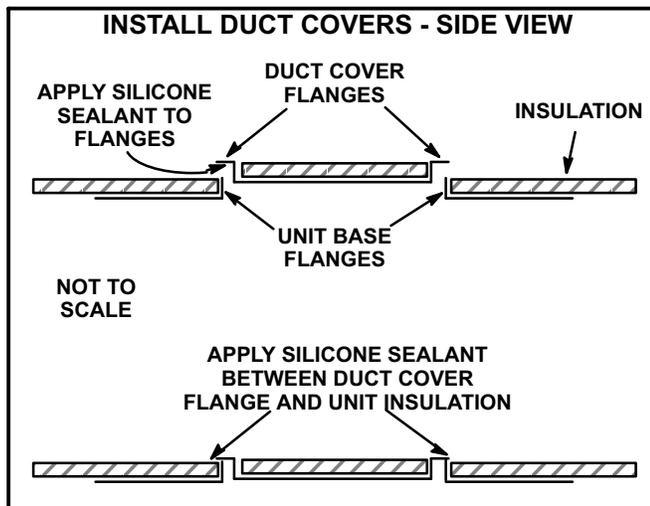


FIGURE 4

- 4- Install return air duct on the intake air side of the horizontal economizer. See figure 5.
- 5- Horizontal economizer and return air duct must be field-supported.

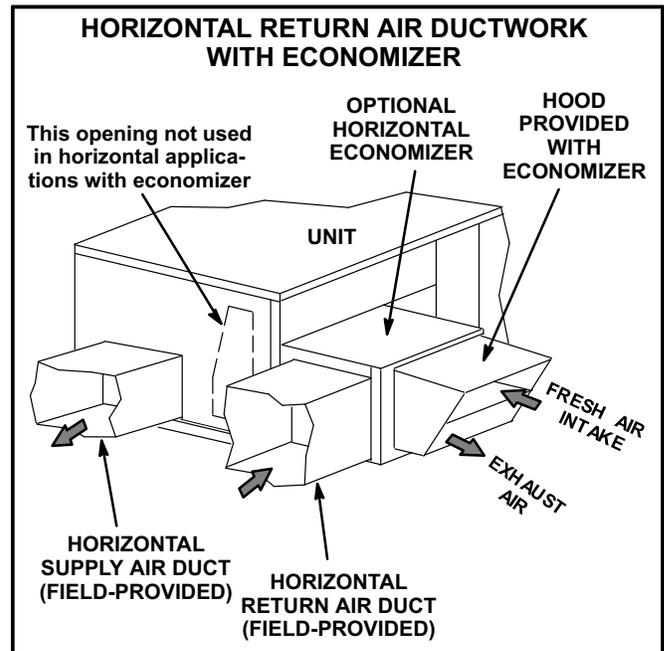


FIGURE 5

Condensate Drains

Make drain connection to the 1" N.P.T. drain coupling provided on unit.

Note - The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.

A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 6. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to page 2 for condensate drain location.

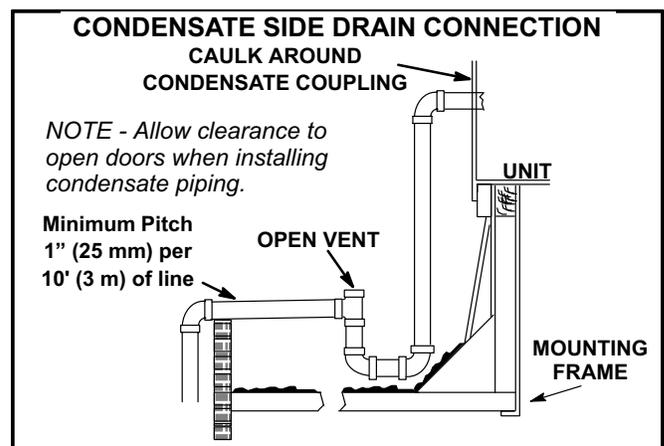


FIGURE 6

Connect Gas Piping (Gas Units)

Before connecting field-provided piping, check with gas company or authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5" w.c. (.12kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. Operating pressures at the unit gas connection must be as shown in table 1.

TABLE 1
OPERATING PRESSURE AT GAS CONNECTION "w.c."

	Natural Gas		LP / Propane Gas	
	Min.	Max.	Min.	Max.
036-072	4.5	10.5	11	13

When making piping connections a drip leg should be installed on vertical pipe runs to serve as a trap for sediment or condensate. A 1/8" N.P.T. plugged tap is located on gas valve for test gauge connection. Refer to Heating Start-Up section for tap location. Install a ground joint union between the gas control manifold and the main manual shut-off valve. See figure 7 for gas supply piping entering outside the unit. Piping must be installed according to figure 7 and 8 to allow the door to open properly.

Compounds used on threaded joints of gas piping shall be resistant to the action of liquified petroleum gases.

Pressure Test Gas Piping (Gas Units)

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 (3.48kPa). See figure 9.

NOTE-Codes may require that manual main shut-off valve and union (furnished by installer) be installed in gas line external to unit. Union must be of the ground joint type.

After all connections have been made, check all piping connections for gas leaks. Also check existing unit gas connections up to the gas valve; loosening may occur during installation. Use a leak detection solution or other preferred means. Do not use matches candles or other sources of ignition to check for gas leaks.

CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or othe sources of ignition to check for gas leaks.

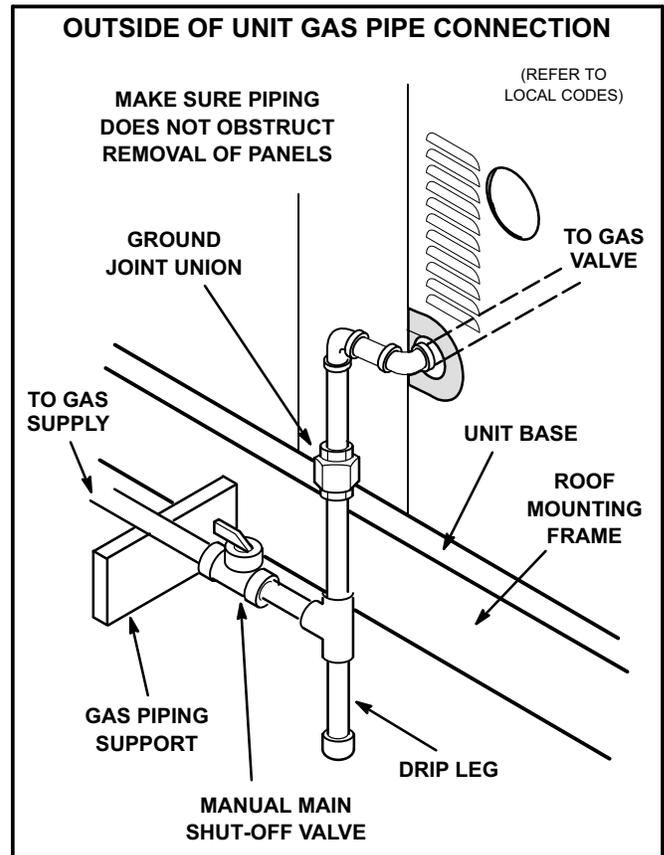


FIGURE 7

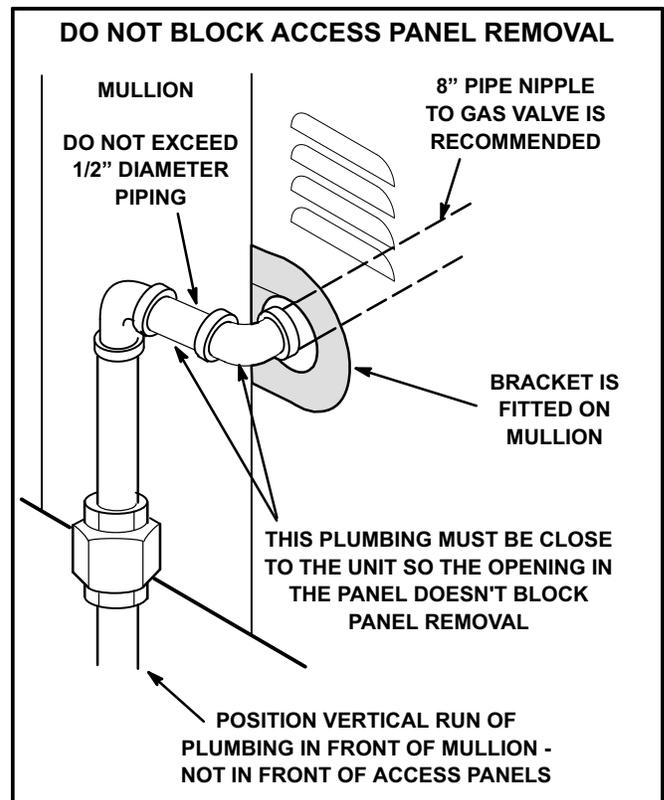


FIGURE 8

⚠ WARNING



Danger of explosion. Can cause injury or product or property damage. Do not use matches, candles, flame or other sources of ignition to check for leaks.

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

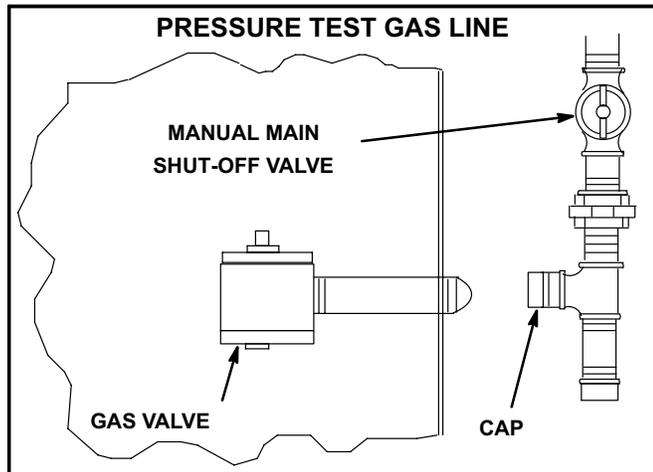


FIGURE 9

Install Vent Cap

Remove the vent cap from the shipping location and use existing screws to install the vent cap over the flue outlet. See figure 10. The installed vent cap is shown in the Parts Arrangement in the front of this manual.

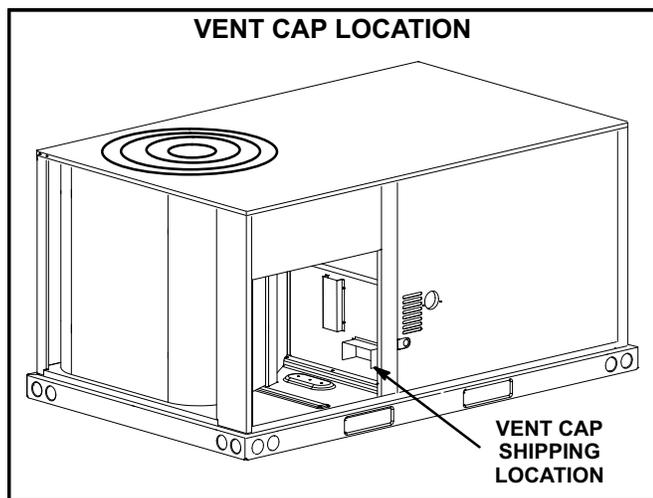


FIGURE 10

High Altitude Derate

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

Refer to table 2 for high altitude adjustments.

**TABLE 2
HIGH ALTITUDE DERATE**

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

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

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

Electrical Connections

POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- 1- 1-Units are factory-wired for 230, 460, or 575 volt supply. **For 208V supply**, remove the insulated terminal cover from the 208V terminal on the control transformer. Move the wire from the transformer 240V terminal to the 208V terminal. Place the insulated terminal cover on the unused 240V terminal.
- 2- Route power through the side or bottom power entry area. For bottom power entry, a bottom power entry kit must be used. Connect power wiring to K1/K3 contactors in the control box. See figure 11. On ZC units equipped with electric heat, route power wiring to TB2; see parts arrangement for location. See unit wiring diagram.

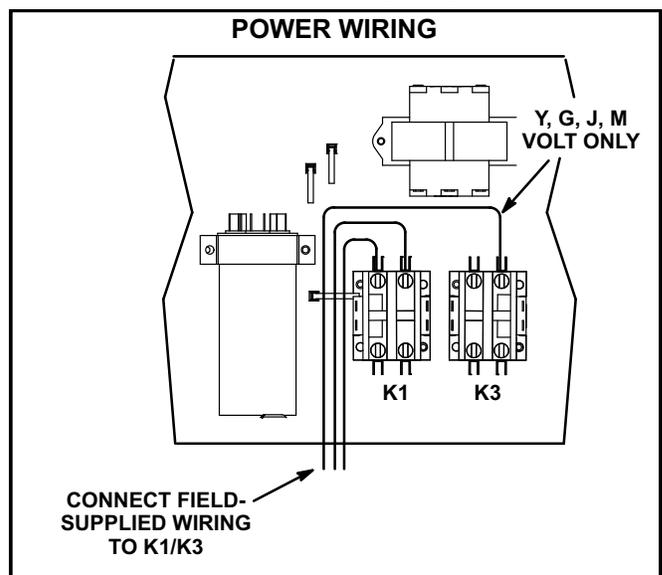


FIGURE 11

CONTROL WIRING

A-Thermostat Location

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

B-Control Wiring

- 1- Route thermostat cable or wires from subbase to control panel (refer to unit dimensions to locate bottom and side power entry).

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring.

Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

- 2- Install thermostat assembly in accordance with instructions provided with thermostat.
- 3- Connect thermostat wiring to leads in control panel. Wire as shown in figure 12 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

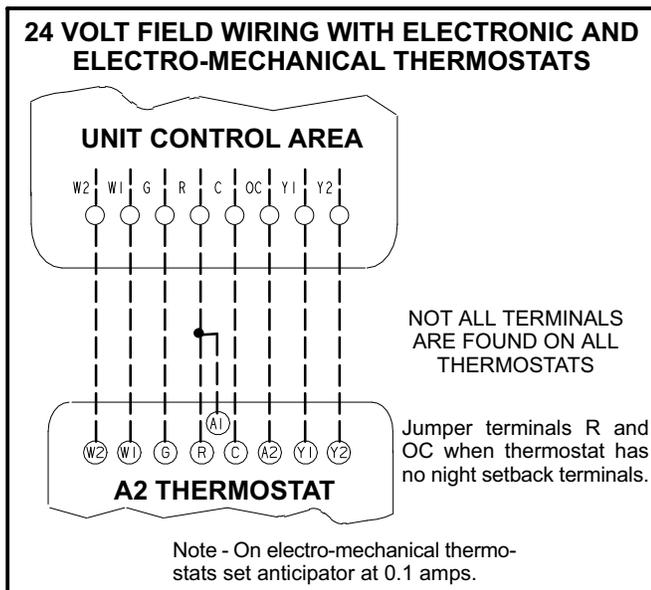


FIGURE 12

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

Blower Operation and Adjustments

▲ IMPORTANT

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

A-Blower Operation

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

- 1- Blower operation is manually set at the thermostat subbase fan switch. With fan switch in **ON** position, blowers will operate continuously.
- 2- With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

B-Determining Unit CFM - Belt Drive Blowers

- 1- The following measurements must be made with air filters in place.
- 2- With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in figure 13.

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

- 3- Referring to pages 12 through 25, use static pressure and RPM readings to determine unit CFM. Use page 27 when installing units with any of the options or accessories listed. Refer to table 5 for minimum airflow when electric heat is installed.
- 4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 14. Do not exceed minimum and maximum number of pulley turns as shown in table 3.

**TABLE 3
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Min. Turns Open	Maxi. Turns Open
A Section	No minimum	5

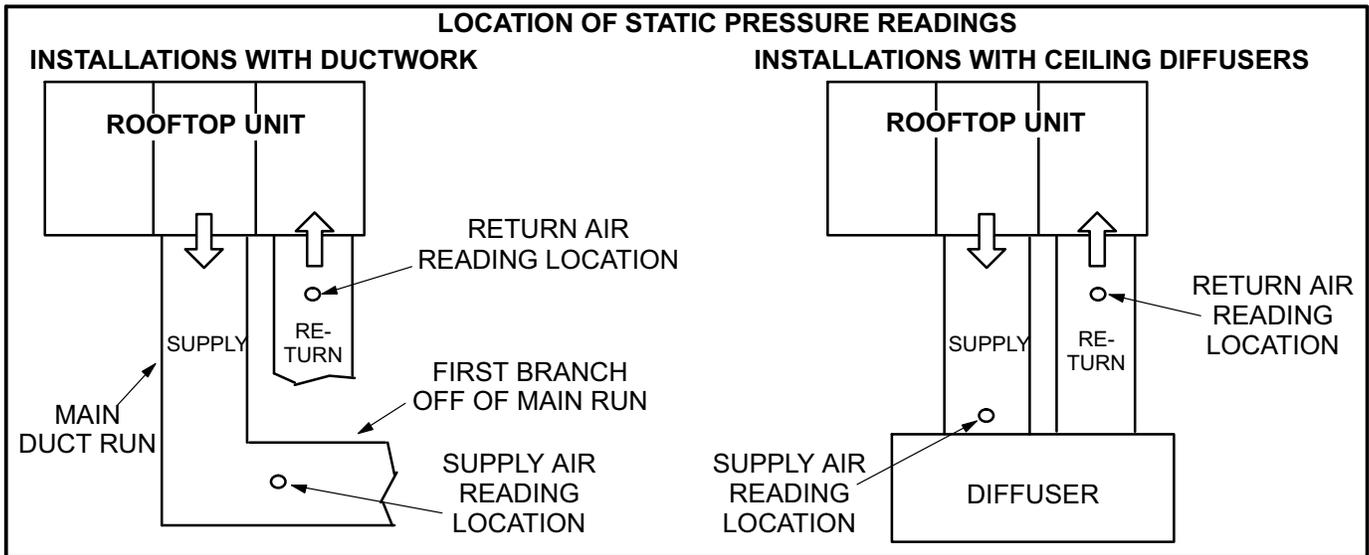


FIGURE 13

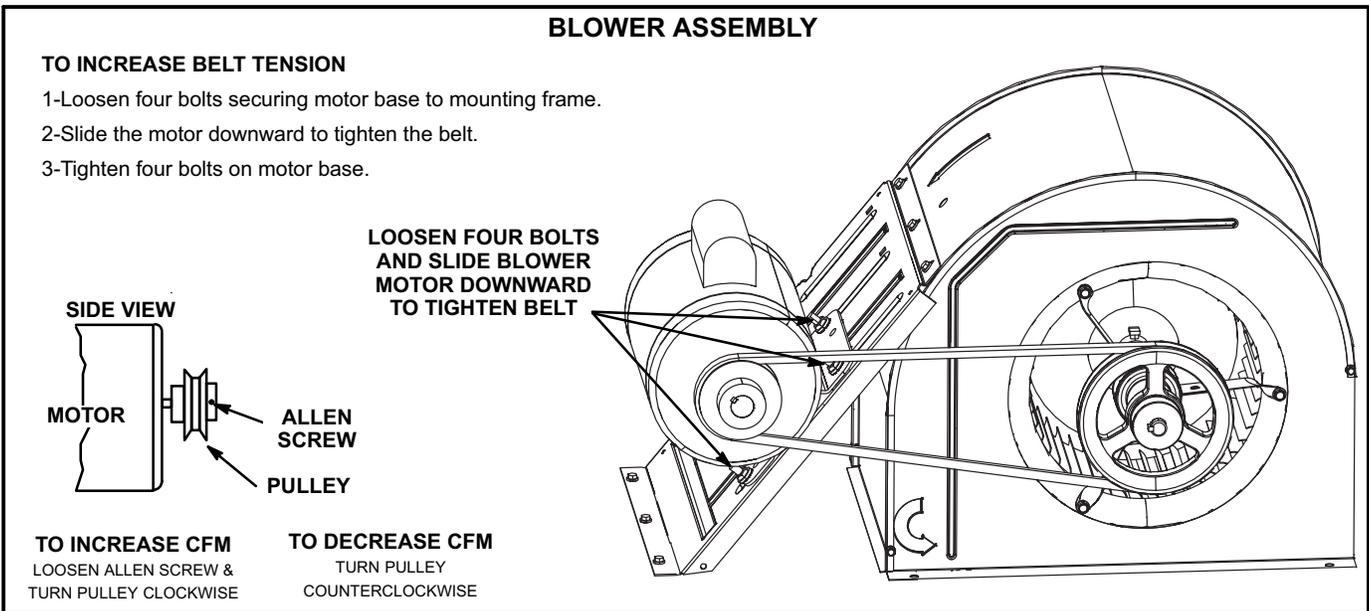


FIGURE 14

C-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 into grooves. Make sure blower and motor pulley are aligned as shown in figure 15.

- 1- Loosen four bolts securing motor base to mounting frame. See figure 14.
- 2- *To increase belt tension -*
Slide blower motor downward to tighten the belt. This increases the distance between the blower motor and the blower housing.
- 3- *To loosen belt tension -*
Slide blower motor upward to loosen the belt. This

decreases the distance between the blower motor and the blower housing.

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

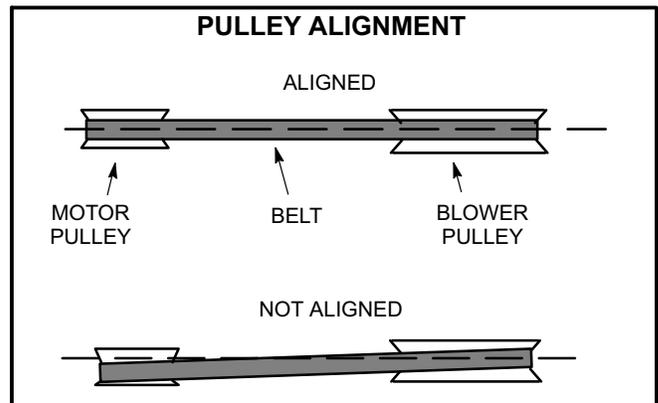


FIGURE 15

D-Check Belt Tension

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

- 1- Measure span length X. See figure 16.

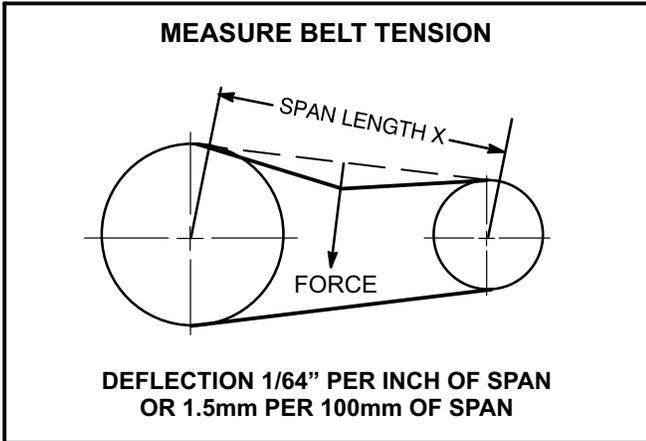


FIGURE 16

- 2- Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length. Example: Deflection distance of a 40" span would be 40/64" or 5/8".

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

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

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

E-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 12 through 25 to determine BHP and RPM required. Reference page 27 for additional air resistance and page 26 to determine the drive kit number. See table 4 for drive component manufacturers numbers.

BLOWER DATA - BELT DRIVE - ZGA036

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z01											
900	566	0.16	631	0.18	699	0.19	768	0.21	836	0.22	901	0.25	961	0.27	1016	0.29
1000	591	0.18	656	0.20	724	0.21	793	0.23	859	0.25	922	0.27	979	0.30	1032	0.33
1100	618	0.20	684	0.22	752	0.24	819	0.26	883	0.28	944	0.31	998	0.34	1049	0.37
1200	648	0.23	715	0.25	782	0.27	847	0.29	910	0.32	967	0.35	1020	0.38	1068	0.42
1300	681	0.26	748	0.28	814	0.30	878	0.33	937	0.36	992	0.39	1043	0.43	1089	0.47
1400	718	0.29	783	0.32	848	0.34	909	0.37	966	0.41	1018	0.44	1067	0.48	1112	0.52
1500	757	0.33	821	0.36	883	0.39	941	0.42	995	0.46	1046	0.50	1092	0.54	1136	0.57

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z04															
900	1067	0.32	1115	0.35	1161	0.37	1205	0.40	1247	0.43	1287	0.47	1326	0.50	1365	0.53
1000	1081	0.36	1128	0.39	1173	0.41	1216	0.44	1258	0.48	1297	0.51	1336	0.54	1374	0.58
1100	1097	0.40	1143	0.43	1187	0.46	1229	0.49	1270	0.52	1309	0.56	1347	0.59	1384	0.63
1200	1115	0.45	1159	0.48	1202	0.51	1244	0.54	1284	0.58	1323	0.61	1360	0.65	1397	0.69
1300	1134	0.50	1177	0.53	1219	0.56	1260	0.60	1300	0.63	1338	0.67	1375	0.71	1411	0.75
1400	1155	0.55	1197	0.59	1238	0.62	1278	0.66	1317	0.70	1354	0.74	1391	0.78	1426	0.82
1500	1177	0.61	1218	0.65	1258	0.68	1298	0.72	1336	0.76	1373	0.81	1409	0.85	1443	0.89

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z01											
900	566	0.13	634	0.16	704	0.18	773	0.20	839	0.23	902	0.25	961	0.28	1016	0.31
1000	590	0.16	658	0.18	728	0.20	795	0.23	860	0.25	920	0.28	977	0.31	1030	0.34
1100	615	0.18	685	0.20	754	0.23	820	0.26	883	0.29	941	0.32	995	0.35	1046	0.38
1200	644	0.21	714	0.23	782	0.26	847	0.29	908	0.33	963	0.36	1015	0.39	1064	0.42
1300	676	0.24	746	0.27	814	0.30	876	0.33	934	0.37	987	0.41	1037	0.44	1083	0.47
1400	713	0.28	782	0.31	847	0.35	907	0.38	962	0.42	1013	0.45	1060	0.49	1105	0.52
1500	755	0.33	821	0.36	883	0.39	939	0.43	991	0.47	1039	0.50	1085	0.54	1128	0.57

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z04															
900	1068	0.33	1118	0.36	1165	0.38	1211	0.41	1254	0.44	1294	0.47	1332	0.50	1369	0.54
1000	1080	0.37	1128	0.39	1175	0.42	1219	0.45	1262	0.48	1302	0.51	1340	0.55	1377	0.58
1100	1094	0.41	1141	0.43	1186	0.46	1230	0.49	1272	0.52	1311	0.56	1349	0.60	1386	0.64
1200	1110	0.45	1155	0.48	1200	0.51	1243	0.54	1284	0.58	1323	0.61	1361	0.66	1398	0.70
1300	1128	0.50	1172	0.53	1215	0.56	1258	0.59	1298	0.63	1337	0.67	1375	0.72	1411	0.76
1400	1148	0.55	1191	0.58	1233	0.62	1274	0.65	1314	0.69	1353	0.74	1391	0.79	1427	0.83
1500	1170	0.61	1211	0.64	1252	0.68	1293	0.72	1333	0.76	1371	0.81	1408	0.86	1444	0.91

BLOWER DATA - BELT DRIVE - ZGA048

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit Z02									
1200	648	0.23	715	0.25	782	0.27	847	0.29	910	0.32	967	0.35	1020	0.38	1068	0.42
1300	681	0.26	748	0.28	814	0.30	878	0.33	937	0.36	992	0.39	1043	0.43	1089	0.47
1400	718	0.29	783	0.32	848	0.34	909	0.37	966	0.41	1018	0.44	1067	0.48	1112	0.52
1500	757	0.33	821	0.36	883	0.39	941	0.42	995	0.46	1046	0.50	1092	0.54	1136	0.57
1600	798	0.38	860	0.41	919	0.44	974	0.47	1026	0.51	1074	0.55	1119	0.59	1161	0.63
1700	840	0.43	899	0.46	955	0.49	1007	0.53	1057	0.57	1103	0.61	1146	0.66	1187	0.70
1800	882	0.48	938	0.51	991	0.55	1041	0.59	1088	0.63	1132	0.68	1174	0.72	1214	0.77
1900	924	0.54	977	0.58	1027	0.62	1075	0.66	1120	0.70	1163	0.75	1203	0.80	1242	0.85
2000	965	0.61	1016	0.65	1064	0.69	1110	0.74	1153	0.79	1194	0.84	1233	0.89	1271	0.95

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z02						Kit Z05									
1200	1115	0.45	1159	0.48	1202	0.51	1244	0.54	1284	0.58	1323	0.61	1360	0.65	1397	0.69
1300	1134	0.50	1177	0.53	1219	0.56	1260	0.60	1300	0.63	1338	0.67	1375	0.71	1411	0.75
1400	1155	0.55	1197	0.59	1238	0.62	1278	0.66	1317	0.70	1354	0.74	1391	0.78	1426	0.82
1500	1177	0.61	1218	0.65	1258	0.68	1298	0.72	1336	0.76	1373	0.81	1409	0.85	1443	0.89
1600	1201	0.68	1241	0.71	1280	0.75	1319	0.80	1357	0.84	1393	0.88	1428	0.93	1462	0.97
1700	1226	0.74	1265	0.79	1304	0.83	1342	0.87	1378	0.92	1414	0.96	1448	1.01	1482	1.05
1800	1253	0.82	1291	0.87	1329	0.91	1366	0.96	1402	1.01	1436	1.05	1469	1.10	1502	1.14
1900	1280	0.90	1318	0.95	1355	1.00	1391	1.05	1426	1.10	1459	1.15	1492	1.20	1524	1.24
2000	1309	1.00	1346	1.05	1382	1.10	1417	1.16	1451	1.21	1484	1.25	1515	1.30	1547	1.35

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit Z02									
1200	644	0.21	714	0.23	782	0.26	847	0.29	908	0.33	963	0.36	1015	0.39	1064	0.42
1300	676	0.24	746	0.27	814	0.3	876	0.33	934	0.37	987	0.41	1037	0.44	1083	0.47
1400	713	0.28	782	0.31	847	0.35	907	0.38	962	0.42	1013	0.45	1060	0.49	1105	0.52
1500	755	0.33	821	0.36	883	0.39	939	0.43	991	0.47	1039	0.5	1085	0.54	1128	0.57
1600	798	0.38	860	0.41	918	0.45	971	0.48	1020	0.52	1067	0.55	1110	0.59	1152	0.63
1700	842	0.43	900	0.47	954	0.5	1004	0.54	1051	0.57	1095	0.61	1137	0.65	1177	0.69
1800	885	0.49	940	0.53	990	0.56	1037	0.6	1081	0.63	1124	0.67	1164	0.72	1204	0.76
1900	928	0.56	979	0.59	1026	0.63	1070	0.67	1113	0.71	1153	0.75	1193	0.79	1231	0.84
2000	969	0.63	1017	0.67	1062	0.7	1104	0.74	1145	0.79	1184	0.83	1222	0.88	1259	0.94

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z02						Kit Z05									
1200	1110	0.45	1155	0.48	1200	0.51	1243	0.54	1284	0.58	1323	0.61	1361	0.66	1398	0.7
1300	1128	0.5	1172	0.53	1215	0.56	1258	0.59	1298	0.63	1337	0.67	1375	0.72	1411	0.76
1400	1148	0.55	1191	0.58	1233	0.62	1274	0.65	1314	0.69	1353	0.74	1391	0.79	1427	0.83
1500	1170	0.61	1211	0.64	1252	0.68	1293	0.72	1333	0.76	1371	0.81	1408	0.86	1444	0.91
1600	1193	0.67	1233	0.71	1273	0.75	1313	0.79	1352	0.84	1390	0.89	1427	0.94	1463	1
1700	1217	0.73	1256	0.78	1296	0.82	1335	0.87	1374	0.93	1411	0.98	1447	1.03	1482	1.09
1800	1242	0.81	1281	0.86	1320	0.91	1359	0.96	1396	1.02	1433	1.07	1468	1.13	1503	1.18
1900	1269	0.9	1307	0.95	1346	1.01	1383	1.06	1420	1.12	1456	1.18	1491	1.23	1525	1.29
2000	1297	0.99	1334	1.05	1372	1.11	1409	1.17	1445	1.23	1480	1.29	1514	1.34	1547	1.4

BLOWER DATA - BELT DRIVE - ZGA060

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z03											
1600	817	0.39	877	0.42	935	0.45	989	0.48	1040	0.52	1087	0.56	1131	0.60	1173	0.65
1700	859	0.44	917	0.47	972	0.50	1023	0.54	1071	0.58	1117	0.62	1159	0.67	1199	0.71
1800	902	0.49	957	0.53	1008	0.56	1057	0.60	1103	0.64	1147	0.69	1188	0.74	1227	0.79
1900	944	0.56	996	0.59	1045	0.63	1092	0.68	1136	0.72	1178	0.77	1218	0.82	1257	0.87
2000	986	0.63	1035	0.67	1083	0.71	1127	0.76	1170	0.81	1210	0.86	1249	0.91	1287	0.97
2100	1027	0.71	1075	0.75	1120	0.80	1163	0.85	1204	0.90	1243	0.96	1281	1.02	1318	1.07
2200	1069	0.80	1115	0.84	1158	0.90	1200	0.95	1239	1.01	1277	1.07	1314	1.13	1350	1.19
2300	1111	0.90	1155	0.95	1197	1.01	1237	1.07	1275	1.13	1312	1.19	1348	1.25	1383	1.31
2400	1154	1.01	1196	1.07	1236	1.13	1274	1.19	1311	1.25	1347	1.32	1382	1.38	1417	1.45

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z03								Kit Z06							
1600	1213	0.69	1252	0.73	1292	0.77	1330	0.81	1367	0.85	1403	0.89	1438	0.94	1472	0.98
1700	1239	0.76	1278	0.80	1316	0.84	1354	0.89	1390	0.93	1425	0.98	1459	1.02	1492	1.07
1800	1266	0.83	1304	0.88	1342	0.93	1378	0.98	1414	1.02	1448	1.07	1481	1.12	1514	1.16
1900	1294	0.92	1332	0.97	1369	1.02	1404	1.07	1439	1.12	1472	1.17	1504	1.21	1536	1.26
2000	1324	1.02	1360	1.07	1396	1.13	1431	1.18	1465	1.23	1497	1.27	1529	1.32	1560	1.37
2100	1354	1.13	1390	1.18	1425	1.24	1459	1.29	1491	1.34	1523	1.39	1554	1.43	1585	1.48
2200	1385	1.25	1420	1.30	1454	1.36	1487	1.41	1519	1.46	1550	1.51	1581	1.55	1611	1.60
2300	1418	1.37	1452	1.43	1485	1.48	1517	1.53	1548	1.58	1578	1.63	1608	1.68	1639	1.72
2400	1451	1.51	1484	1.56	1516	1.62	1547	1.67	1578	1.72	1607	1.76	1637	1.81	1667	1.85

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit Z03											
1600	817	0.39	878	0.42	934	0.46	985	0.49	1034	0.53	1080	0.56	1123	0.60	1164	0.64
1700	861	0.45	918	0.48	970	0.51	1018	0.55	1065	0.58	1108	0.62	1150	0.66	1190	0.70
1800	904	0.51	957	0.54	1006	0.57	1052	0.61	1096	0.65	1138	0.69	1178	0.73	1217	0.78
1900	946	0.57	996	0.61	1042	0.64	1086	0.68	1128	0.72	1168	0.76	1207	0.81	1245	0.86
2000	988	0.64	1035	0.68	1079	0.72	1120	0.76	1161	0.81	1199	0.85	1237	0.90	1275	0.96
2100	1028	0.72	1073	0.76	1115	0.81	1155	0.85	1194	0.90	1231	0.95	1268	1.01	1305	1.07
2200	1068	0.81	1111	0.86	1151	0.90	1190	0.95	1227	1.00	1263	1.06	1299	1.12	1336	1.18
2300	1108	0.91	1149	0.96	1188	1.01	1225	1.06	1261	1.12	1296	1.18	1332	1.24	1367	1.31
2400	1148	1.02	1187	1.07	1224	1.13	1260	1.18	1295	1.25	1330	1.31	1365	1.38	1400	1.45

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit Z03								Kit Z06							
1600	1204	0.68	1245	0.72	1285	0.76	1325	0.81	1363	0.86	1401	0.91	1437	0.96	1473	1.01
1700	1229	0.75	1269	0.79	1309	0.84	1348	0.89	1386	0.94	1423	1.00	1458	1.05	1493	1.10
1800	1256	0.83	1295	0.88	1334	0.93	1372	0.98	1409	1.04	1445	1.09	1481	1.15	1515	1.20
1900	1283	0.92	1322	0.97	1360	1.03	1397	1.08	1434	1.14	1469	1.20	1504	1.25	1537	1.31
2000	1312	1.02	1350	1.07	1387	1.13	1424	1.19	1459	1.25	1494	1.31	1528	1.37	1561	1.42
2100	1342	1.13	1378	1.19	1415	1.25	1451	1.31	1486	1.37	1519	1.43	1553	1.49	1586	1.54
2200	1372	1.25	1408	1.31	1444	1.37	1479	1.44	1513	1.50	1546	1.56	1579	1.61	1611	1.67
2300	1403	1.38	1438	1.44	1473	1.51	1507	1.57	1541	1.63	1573	1.69	1606	1.75	1638	1.80
2400	1434	1.52	1469	1.58	1503	1.65	1537	1.71	1569	1.77	1601	1.83	1633	1.88	1665	1.94

BLOWER DATA - BELT DRIVE - ZGA072

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

FOR ALL UNITS ADD:

- 1 - Any factory installed options air resistance (heat section, economizer, wet coil, etc.).
- 2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.																
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	
	Field Furn.				Kit ZAA02												
1900	600	0.51	637	0.55	676	0.6	714	0.65	752	0.69	788	0.75	823	0.80	856	0.86	
2000	627	0.57	663	0.62	701	0.67	738	0.72	775	0.77	810	0.82	844	0.88	875	0.94	
2100	654	0.64	690	0.69	727	0.74	763	0.79	798	0.85	832	0.9	864	0.96	894	1.03	
2200	682	0.71	717	0.76	753	0.82	788	0.87	822	0.93	854	0.99	885	1.06	914	1.12	
2300	709	0.79	744	0.85	779	0.9	813	0.96	846	1.02	877	1.09	906	1.15	934	1.22	
2400	737	0.87	771	0.93	805	0.99	838	1.06	870	1.12	899	1.19	928	1.26	954	1.33	
2500	766	0.97	799	1.03	832	1.09	864	1.16	894	1.23	922	1.30	950	1.38	976	1.45	
2600	794	1.07	827	1.14	859	1.21	889	1.28	918	1.35	946	1.43	972	1.50	997	1.58	
2700	823	1.18	855	1.25	885	1.33	915	1.40	943	1.48	969	1.56	995	1.64	1019	1.71	
2800	852	1.30	882	1.38	912	1.46	940	1.54	967	1.62	993	1.70	1018	1.78	1041	1.86	
2900	881	1.44	911	1.52	939	1.60	967	1.68	992	1.76	1017	1.85	1041	1.93	1064	2.01	

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA03															
1900	886	0.92	914	0.99	940	1.06	965	1.12	991	1.19	1017	1.25	1043	1.32	1070	1.38
2000	904	1.01	930	1.08	956	1.15	981	1.21	1006	1.28	1032	1.35	1058	1.41	1084	1.47
2100	922	1.10	948	1.17	973	1.24	997	1.31	1022	1.38	1047	1.44	1073	1.51	1099	1.57
2200	941	1.20	966	1.27	990	1.34	1015	1.41	1039	1.48	1064	1.55	1089	1.61	1114	1.68
2300	960	1.30	984	1.37	1008	1.45	1032	1.52	1056	1.59	1081	1.66	1106	1.72	1131	1.79
2400	980	1.41	1004	1.49	1027	1.56	1051	1.63	1075	1.7	1099	1.77	1123	1.84	1148	1.91
2500	1000	1.53	1023	1.60	1046	1.68	1070	1.75	1093	1.83	1117	1.90	1142	1.97	1166	2.04
2600	1021	1.66	1043	1.73	1066	1.81	1089	1.88	1113	1.96	1137	2.03	1161	2.10	1185	2.17
2700	1042	1.79	1064	1.87	1087	1.95	1110	2.02	1133	2.09	1157	2.17	1181	2.24	1205	2.32
2800	1063	1.94	1086	2.01	1108	2.09	1131	2.17	1154	2.24	1177	2.32	1201	2.39	1225	2.47
2900	1086	2.09	1107	2.17	1130	2.24	1152	2.32	1175	2.40	1198	2.48	1222	2.55	1245	2.62

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZAA02											
1900	555	0.41	593	0.47	633	0.52	673	0.57	713	0.63	752	0.68	789	0.74	824	0.80
2000	573	0.46	612	0.52	652	0.58	692	0.63	731	0.69	769	0.75	805	0.81	839	0.87
2100	592	0.52	632	0.58	671	0.64	711	0.70	750	0.76	787	0.82	822	0.88	855	0.95
2200	613	0.59	652	0.65	692	0.71	731	0.77	769	0.83	804	0.89	838	0.96	870	1.03
2300	635	0.66	674	0.72	713	0.79	751	0.85	788	0.91	823	0.97	855	1.04	887	1.12
2400	658	0.73	697	0.80	735	0.86	772	0.93	808	0.99	841	1.06	873	1.13	903	1.21
2500	682	0.81	720	0.88	757	0.95	793	1.01	827	1.08	859	1.15	890	1.23	919	1.31
2600	706	0.90	743	0.97	779	1.04	814	1.11	847	1.18	878	1.25	907	1.33	936	1.41
2700	731	0.99	767	1.06	802	1.13	835	1.21	866	1.28	896	1.36	925	1.44	953	1.52
2800	756	1.09	790	1.16	824	1.24	856	1.31	886	1.39	915	1.47	943	1.56	970	1.64
2900	780	1.19	814	1.27	846	1.35	876	1.43	906	1.51	934	1.59	961	1.68	987	1.77

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	ZAA02				Kit ZAA03											
1900	857	0.87	889	0.93	919	1.00	949	1.06	977	1.13	1003	1.20	1029	1.26	1054	1.33
2000	872	0.94	903	1.01	932	1.08	961	1.15	988	1.21	1015	1.28	1040	1.35	1064	1.42
2100	886	1.02	917	1.09	946	1.16	974	1.23	1000	1.30	1026	1.37	1051	1.44	1074	1.51
2200	901	1.11	931	1.18	959	1.25	987	1.32	1013	1.40	1038	1.46	1062	1.53	1085	1.60
2300	917	1.19	945	1.27	973	1.35	1000	1.42	1026	1.49	1050	1.56	1074	1.63	1096	1.70
2400	932	1.29	960	1.37	987	1.44	1014	1.52	1039	1.60	1063	1.67	1085	1.74	1107	1.81
2500	948	1.39	975	1.47	1002	1.55	1027	1.63	1052	1.70	1075	1.78	1098	1.85	1119	1.92
2600	964	1.49	991	1.58	1017	1.66	1041	1.74	1065	1.82	1088	1.89	1110	1.97	1131	2.04
2700	980	1.61	1006	1.69	1031	1.78	1056	1.86	1079	1.94	1102	2.02	1123	2.09	1144	2.16
2800	996	1.73	1022	1.82	1047	1.90	1071	1.99	1093	2.07	1115	2.15	1136	2.22	1157	2.29
2900	1013	1.86	1038	1.95	1062	2.03	1086	2.12	1108	2.20	1129	2.28	1150	2.36	1171	2.43

BLOWER DATA - BELT DRIVE - ZGB036

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	573	0.16	639	0.18	707	0.19	776	0.21	844	0.23	908	0.25	967	0.27	1022	0.30
1000	600	0.18	665	0.20	733	0.22	802	0.23	868	0.25	930	0.28	986	0.31	1038	0.33
1100	628	0.21	695	0.22	762	0.24	829	0.26	893	0.29	953	0.31	1007	0.35	1057	0.38
1200	660	0.23	727	0.25	794	0.27	859	0.29	921	0.32	977	0.36	1029	0.39	1077	0.42
1300	695	0.26	761	0.28	827	0.31	890	0.33	949	0.37	1003	0.40	1053	0.44	1099	0.47
1400	734	0.30	799	0.32	862	0.35	923	0.38	978	0.41	1030	0.45	1078	0.49	1122	0.53
1500	775	0.34	837	0.37	898	0.40	955	0.43	1009	0.46	1058	0.50	1104	0.54	1147	0.58

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1072	0.32	1120	0.35	1166	0.38	1210	0.41	1252	0.44	1292	0.47	1331	0.5	1370	0.54
1000	1087	0.36	1134	0.39	1179	0.42	1222	0.45	1263	0.48	1303	0.51	1341	0.55	1379	0.58
1100	1104	0.40	1150	0.43	1194	0.46	1236	0.49	1277	0.53	1315	0.56	1353	0.60	1390	0.64
1200	1123	0.45	1167	0.48	1210	0.51	1251	0.55	1291	0.58	1330	0.62	1367	0.66	1403	0.70
1300	1143	0.50	1186	0.54	1228	0.57	1268	0.60	1308	0.64	1346	0.68	1382	0.72	1418	0.76
1400	1165	0.56	1206	0.59	1247	0.63	1287	0.67	1326	0.70	1363	0.75	1399	0.79	1435	0.83
1500	1188	0.62	1229	0.66	1269	0.69	1308	0.73	1346	0.77	1382	0.82	1418	0.86	1453	0.90

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	573	0.14	642	0.16	712	0.18	780	0.21	846	0.23	909	0.26	967	0.28	1022	0.31
1000	599	0.16	668	0.18	737	0.21	804	0.23	868	0.26	928	0.29	984	0.32	1037	0.35
1100	626	0.18	695	0.21	764	0.24	830	0.26	892	0.29	950	0.32	1003	0.36	1053	0.39
1200	656	0.21	726	0.24	794	0.27	858	0.30	918	0.33	973	0.37	1024	0.40	1072	0.43
1300	691	0.25	761	0.28	827	0.31	889	0.34	945	0.38	998	0.41	1047	0.45	1093	0.48
1400	731	0.29	798	0.32	862	0.35	920	0.39	974	0.42	1024	0.46	1071	0.49	1115	0.53
1500	773	0.34	838	0.37	898	0.40	952	0.44	1004	0.47	1051	0.51	1096	0.55	1139	0.58

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1074	0.33	1123	0.36	1171	0.39	1216	0.41	1260	0.44	1301	0.47	1340	0.49	1378	0.52
1000	1087	0.37	1135	0.40	1181	0.42	1226	0.45	1269	0.48	1310	0.51	1350	0.54	1388	0.57
1100	1101	0.41	1148	0.44	1193	0.47	1237	0.49	1279	0.52	1321	0.55	1360	0.59	1398	0.62
1200	1118	0.46	1163	0.48	1208	0.51	1251	0.54	1293	0.58	1334	0.61	1375	0.64	1414	0.68
1300	1137	0.51	1181	0.53	1224	0.57	1267	0.60	1309	0.63	1350	0.67	1391	0.71	1432	0.75
1400	1158	0.56	1200	0.59	1242	0.62	1284	0.66	1326	0.70	1367	0.74	1407	0.79	1448	0.83
1500	1180	0.61	1222	0.65	1263	0.69	1304	0.73	1345	0.77	1386	0.82	1427	0.87	1467	0.92

BLOWER DATA - BELT DRIVE - ZGB048

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	660	0.23	727	0.25	794	0.27	859	0.29	921	0.32	977	0.36	1029	0.39	1077	0.42
1300	695	0.26	761	0.28	827	0.31	890	0.33	949	0.37	1003	0.40	1053	0.44	1099	0.47
1400	734	0.30	799	0.32	862	0.35	923	0.38	978	0.41	1030	0.45	1078	0.49	1122	0.53
1500	775	0.34	837	0.37	898	0.40	955	0.43	1009	0.46	1058	0.50	1104	0.54	1147	0.58
1600	817	0.39	877	0.42	935	0.45	989	0.48	1040	0.52	1087	0.56	1131	0.60	1173	0.65
1700	859	0.44	917	0.47	972	0.50	1023	0.54	1071	0.58	1117	0.62	1159	0.67	1199	0.71
1800	902	0.49	957	0.53	1008	0.56	1057	0.60	1103	0.64	1147	0.69	1188	0.74	1227	0.79
1900	944	0.56	996	0.59	1045	0.63	1092	0.68	1136	0.72	1178	0.77	1218	0.82	1257	0.87
2000	986	0.63	1035	0.67	1083	0.71	1127	0.76	1170	0.81	1210	0.86	1249	0.91	1287	0.97

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1123	0.45	1167	0.48	1210	0.51	1251	0.55	1291	0.58	1330	0.62	1367	0.66	1403	0.70
1300	1143	0.50	1186	0.54	1228	0.57	1268	0.60	1308	0.64	1346	0.68	1382	0.72	1418	0.76
1400	1165	0.56	1206	0.59	1247	0.63	1287	0.67	1326	0.70	1363	0.75	1399	0.79	1435	0.83
1500	1188	0.62	1229	0.66	1269	0.69	1308	0.73	1346	0.77	1382	0.82	1418	0.86	1453	0.90
1600	1213	0.69	1252	0.73	1292	0.77	1330	0.81	1367	0.85	1403	0.89	1438	0.94	1472	0.98
1700	1239	0.76	1278	0.80	1316	0.84	1354	0.89	1390	0.93	1425	0.98	1459	1.02	1492	1.07
1800	1266	0.83	1304	0.88	1342	0.93	1378	0.98	1414	1.02	1448	1.07	1481	1.12	1514	1.16
1900	1294	0.92	1332	0.97	1369	1.02	1404	1.07	1439	1.12	1472	1.17	1504	1.21	1536	1.26
2000	1324	1.02	1360	1.07	1396	1.13	1431	1.18	1465	1.23	1497	1.27	1529	1.32	1560	1.37

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	656	0.21	726	0.24	794	0.27	858	0.30	918	0.33	973	0.37	1024	0.40	1072	0.43
1300	691	0.25	761	0.28	827	0.31	889	0.34	945	0.38	998	0.41	1047	0.45	1093	0.48
1400	731	0.29	798	0.32	862	0.35	920	0.39	974	0.42	1024	0.46	1071	0.49	1115	0.53
1500	773	0.34	838	0.37	898	0.40	952	0.44	1004	0.47	1051	0.51	1096	0.55	1139	0.58
1600	817	0.39	878	0.42	934	0.46	985	0.49	1034	0.53	1080	0.56	1123	0.60	1164	0.64
1700	861	0.45	918	0.48	970	0.51	1018	0.55	1065	0.58	1108	0.62	1150	0.66	1190	0.70
1800	904	0.51	957	0.54	1006	0.57	1052	0.61	1096	0.65	1138	0.69	1178	0.73	1217	0.78
1900	946	0.57	996	0.61	1042	0.64	1086	0.68	1128	0.72	1168	0.76	1207	0.81	1245	0.86
2000	988	0.64	1035	0.68	1079	0.72	1120	0.76	1161	0.81	1199	0.85	1237	0.90	1275	0.96

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1118	0.46	1163	0.48	1208	0.51	1251	0.54	1293	0.58	1334	0.61	1375	0.64	1414	0.68
1300	1137	0.51	1181	0.53	1224	0.57	1267	0.60	1309	0.63	1350	0.67	1391	0.71	1432	0.75
1400	1158	0.56	1200	0.59	1242	0.62	1284	0.66	1326	0.70	1367	0.74	1407	0.79	1448	0.83
1500	1180	0.61	1222	0.65	1263	0.69	1304	0.73	1345	0.77	1386	0.82	1427	0.87	1467	0.92
1600	1204	0.68	1245	0.72	1285	0.76	1325	0.80	1366	0.85	1406	0.90	1447	0.96	1487	1.02
1700	1229	0.75	1269	0.79	1309	0.84	1348	0.89	1388	0.94	1428	1.00	1468	1.06	1508	1.12
1800	1256	0.83	1295	0.88	1334	0.93	1373	0.98	1412	1.04	1451	1.10	1490	1.16	1529	1.23
1900	1283	0.92	1322	0.97	1360	1.03	1398	1.09	1436	1.15	1474	1.21	1511	1.27	1549	1.34
2000	1312	1.02	1350	1.07	1387	1.13	1424	1.20	1461	1.26	1498	1.32	1535	1.38	1571	1.45

BLOWER DATA - BELT DRIVE - ZGB060

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA03											
1600	848	0.48	905	0.53	961	0.57	1015	0.61	1064	0.66	1107	0.69	1148	0.73	1189	0.76
1700	898	0.56	952	0.60	1005	0.65	1054	0.69	1099	0.73	1140	0.77	1180	0.80	1221	0.83
1800	948	0.63	998	0.68	1047	0.73	1093	0.78	1136	0.82	1175	0.85	1214	0.88	1255	0.91
1900	996	0.72	1042	0.77	1088	0.82	1132	0.86	1173	0.90	1211	0.94	1250	0.97	1290	1.00
2000	1041	0.81	1084	0.86	1128	0.91	1170	0.95	1210	0.99	1249	1.03	1287	1.06	1326	1.10
2100	1084	0.91	1126	0.95	1168	1.00	1209	1.04	1249	1.08	1287	1.12	1324	1.17	1362	1.21
2200	1128	1.01	1169	1.05	1210	1.10	1250	1.14	1288	1.19	1326	1.23	1363	1.28	1399	1.34
2300	1173	1.11	1214	1.16	1253	1.20	1292	1.25	1329	1.30	1366	1.36	1402	1.42	1437	1.48
2400	1220	1.23	1259	1.28	1297	1.33	1335	1.38	1371	1.44	1406	1.50	1442	1.57	1476	1.63

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03								Kit ZA06							
1600	1232	0.79	1274	0.82	1316	0.86	1356	0.90	1395	0.94	1433	0.99	1470	1.04	1506	1.09
1700	1263	0.86	1304	0.90	1344	0.94	1383	0.99	1421	1.04	1458	1.09	1494	1.14	1530	1.19
1800	1295	0.95	1335	0.99	1374	1.04	1412	1.09	1448	1.14	1484	1.20	1520	1.25	1556	1.30
1900	1329	1.04	1368	1.09	1405	1.15	1441	1.20	1477	1.26	1513	1.31	1548	1.37	1583	1.42
2000	1364	1.15	1401	1.21	1437	1.27	1472	1.33	1507	1.38	1543	1.44	1578	1.49	1613	1.54
2100	1399	1.27	1435	1.33	1470	1.40	1505	1.46	1539	1.51	1574	1.56	1609	1.61	1645	1.66
2200	1435	1.40	1470	1.47	1504	1.53	1538	1.59	1573	1.65	1608	1.70	1642	1.74	1678	1.79
2300	1472	1.54	1506	1.61	1540	1.67	1574	1.73	1608	1.78	1642	1.83	1677	1.88	1712	1.93
2400	1510	1.7	1544	1.76	1577	1.82	1610	1.88	1644	1.93	1678	1.97	1713	2.02	1748	2.07

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA03											
1600	761	0.43	820	0.47	879	0.52	937	0.56	994	0.61	1045	0.65	1090	0.69	1132	0.72
1700	803	0.49	861	0.53	918	0.58	973	0.63	1025	0.67	1072	0.72	1114	0.75	1155	0.78
1800	846	0.56	901	0.60	955	0.65	1008	0.70	1056	0.75	1099	0.79	1140	0.82	1181	0.85
1900	889	0.63	941	0.68	993	0.73	1042	0.78	1087	0.83	1129	0.87	1168	0.90	1209	0.93
2000	933	0.71	981	0.76	1030	0.81	1076	0.86	1119	0.91	1159	0.95	1198	0.98	1238	1.01
2100	974	0.79	1020	0.85	1065	0.90	1109	0.96	1151	1.00	1190	1.04	1229	1.07	1268	1.11
2200	1013	0.89	1057	0.94	1100	0.99	1143	1.05	1183	1.09	1222	1.13	1261	1.17	1299	1.21
2300	1050	0.99	1093	1.04	1135	1.09	1177	1.14	1217	1.18	1255	1.23	1293	1.27	1331	1.32
2400	1088	1.09	1129	1.14	1170	1.19	1211	1.23	1250	1.28	1289	1.33	1326	1.38	1363	1.44

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03								Kit ZA06							
1600	1175	0.76	1218	0.79	1260	0.82	1302	0.85	1343	0.89	1383	0.93	1421	0.98	1458	1.03
1700	1198	0.82	1241	0.85	1283	0.89	1324	0.93	1364	0.97	1402	1.02	1439	1.07	1476	1.12
1800	1223	0.89	1265	0.92	1307	0.96	1347	1.01	1386	1.06	1423	1.11	1459	1.16	1495	1.21
1900	1250	0.96	1292	1.01	1332	1.05	1371	1.10	1408	1.15	1445	1.21	1481	1.27	1516	1.32
2000	1279	1.05	1319	1.10	1358	1.15	1396	1.20	1432	1.26	1468	1.32	1504	1.38	1539	1.44
2100	1308	1.15	1347	1.20	1385	1.26	1421	1.32	1457	1.38	1493	1.44	1528	1.50	1563	1.56
2200	1338	1.26	1376	1.31	1412	1.38	1448	1.45	1483	1.51	1518	1.57	1553	1.63	1588	1.68
2300	1368	1.37	1405	1.44	1441	1.51	1476	1.58	1510	1.64	1545	1.70	1580	1.76	1615	1.81
2400	1400	1.50	1435	1.57	1470	1.65	1505	1.72	1539	1.78	1573	1.84	1608	1.89	1643	1.94

BLOWER DATA - BELT DRIVE - ZCA036

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	555	0.16	621	0.17	691	0.19	763	0.20	832	0.22	897	0.24	956	0.26	1010	0.29
1000	577	0.18	644	0.19	715	0.21	786	0.23	855	0.24	919	0.27	976	0.29	1028	0.32
1100	601	0.20	670	0.22	741	0.23	812	0.25	879	0.28	941	0.30	996	0.33	1047	0.37
1200	629	0.22	698	0.24	770	0.26	840	0.28	905	0.31	965	0.34	1018	0.38	1066	0.41
1300	659	0.25	729	0.27	800	0.30	869	0.32	932	0.35	989	0.39	1040	0.43	1087	0.47
1400	692	0.28	763	0.31	833	0.34	899	0.37	960	0.40	1014	0.44	1063	0.48	1108	0.52
1500	728	0.32	798	0.35	866	0.38	930	0.41	987	0.45	1039	0.50	1086	0.54	1130	0.58

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1060	0.31	1108	0.34	1154	0.37	1197	0.40	1239	0.44	1279	0.47	1319	0.51	1359	0.55
1000	1077	0.35	1123	0.38	1168	0.42	1211	0.45	1252	0.49	1291	0.52	1330	0.56	1370	0.60
1100	1094	0.40	1139	0.43	1183	0.46	1225	0.50	1266	0.54	1305	0.58	1343	0.62	1382	0.66
1200	1112	0.45	1156	0.48	1199	0.52	1241	0.55	1281	0.59	1319	0.64	1357	0.68	1394	0.72
1300	1131	0.50	1174	0.54	1216	0.57	1257	0.61	1296	0.66	1334	0.70	1371	0.74	1408	0.78
1400	1151	0.56	1193	0.60	1234	0.64	1274	0.68	1313	0.72	1351	0.77	1387	0.81	1423	0.86
1500	1172	0.62	1213	0.66	1253	0.71	1293	0.75	1331	0.79	1368	0.84	1404	0.89	1440	0.93

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											Kit ZA04
900	572	0.14	641	0.16	712	0.19	785	0.22	860	0.24	931	0.27	991	0.29	1039	0.32
1000	602	0.16	671	0.19	742	0.22	815	0.24	887	0.27	954	0.30	1010	0.33	1055	0.36
1100	636	0.19	706	0.22	776	0.25	847	0.28	916	0.31	977	0.34	1028	0.37	1070	0.41
1200	674	0.23	744	0.26	813	0.29	881	0.32	944	0.35	999	0.38	1045	0.42	1087	0.45
1300	716	0.26	784	0.29	851	0.33	914	0.36	971	0.40	1020	0.43	1064	0.47	1106	0.50
1400	759	0.30	824	0.34	888	0.37	946	0.41	998	0.45	1043	0.49	1086	0.52	1129	0.55
1500	803	0.35	865	0.39	925	0.43	979	0.47	1027	0.52	1070	0.55	1113	0.58	1156	0.61

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1085	0.35	1135	0.38	1183	0.40	1227	0.42	1268	0.45	1305	0.49	1342	0.53	1379	0.57
1000	1099	0.39	1148	0.42	1195	0.44	1239	0.47	1279	0.50	1316	0.54	1352	0.58	1389	0.62
1100	1114	0.44	1163	0.46	1210	0.49	1253	0.52	1292	0.55	1329	0.59	1364	0.64	1401	0.68
1200	1131	0.48	1180	0.51	1226	0.54	1269	0.57	1308	0.61	1343	0.66	1378	0.70	1414	0.75
1300	1151	0.53	1199	0.56	1245	0.59	1287	0.63	1324	0.68	1359	0.72	1394	0.77	1429	0.82
1400	1175	0.58	1222	0.62	1266	0.66	1306	0.70	1342	0.75	1376	0.80	1410	0.85	1446	0.89
1500	1201	0.65	1246	0.68	1289	0.73	1327	0.78	1362	0.83	1395	0.88	1429	0.93	1464	0.98

BLOWER DATA - BELT DRIVE - ZCA048

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	629	0.22	698	0.24	770	0.26	840	0.28	905	0.31	965	0.34	1018	0.38	1066	0.41
1300	659	0.25	729	0.27	800	0.30	869	0.32	932	0.35	989	0.39	1040	0.43	1087	0.47
1400	692	0.28	763	0.31	833	0.34	899	0.37	960	0.40	1014	0.44	1063	0.48	1108	0.52
1500	728	0.32	798	0.35	866	0.38	930	0.41	987	0.45	1039	0.50	1086	0.54	1130	0.58
1600	766	0.37	835	0.40	900	0.43	960	0.47	1015	0.51	1065	0.55	1110	0.60	1152	0.65
1700	806	0.42	871	0.45	934	0.48	991	0.52	1043	0.56	1091	0.61	1134	0.66	1176	0.71
1800	845	0.47	908	0.50	967	0.54	1021	0.58	1071	0.63	1117	0.68	1159	0.73	1200	0.78
1900	884	0.53	944	0.56	1000	0.60	1051	0.64	1099	0.69	1143	0.75	1185	0.80	1225	0.86
2000	923	0.59	979	0.63	1032	0.67	1082	0.72	1128	0.77	1171	0.83	1211	0.89	1251	0.95

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1112	0.45	1156	0.48	1199	0.52	1241	0.55	1281	0.59	1319	0.64	1357	0.68	1394	0.72
1300	1131	0.50	1174	0.54	1216	0.57	1257	0.61	1296	0.66	1334	0.70	1371	0.74	1408	0.78
1400	1151	0.56	1193	0.60	1234	0.64	1274	0.68	1313	0.72	1351	0.77	1387	0.81	1423	0.86
1500	1172	0.62	1213	0.66	1253	0.71	1293	0.75	1331	0.79	1368	0.84	1404	0.89	1440	0.93
1600	1193	0.69	1234	0.73	1273	0.78	1313	0.82	1350	0.87	1387	0.92	1422	0.97	1457	1.01
1700	1216	0.76	1255	0.81	1295	0.86	1333	0.90	1370	0.95	1406	1.00	1441	1.05	1475	1.10
1800	1239	0.84	1279	0.89	1317	0.94	1355	0.99	1391	1.04	1426	1.09	1461	1.14	1494	1.19
1900	1264	0.92	1303	0.98	1341	1.03	1378	1.08	1413	1.14	1448	1.19	1481	1.24	1514	1.29
2000	1290	1.01	1328	1.07	1366	1.13	1402	1.19	1436	1.24	1470	1.29	1503	1.35	1535	1.40

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	674	0.23	744	0.26	813	0.29	881	0.32	944	0.35	999	0.38	1045	0.42	1087	0.45
1300	716	0.26	784	0.29	851	0.33	914	0.36	971	0.40	1020	0.43	1064	0.47	1106	0.50
1400	759	0.30	824	0.34	888	0.37	946	0.41	998	0.45	1043	0.49	1086	0.52	1129	0.55
1500	803	0.35	865	0.39	925	0.43	979	0.47	1027	0.52	1070	0.55	1113	0.58	1156	0.61
1600	847	0.40	905	0.45	961	0.50	1013	0.54	1058	0.58	1100	0.62	1142	0.65	1185	0.68
1700	890	0.47	944	0.52	997	0.57	1047	0.62	1091	0.66	1132	0.69	1173	0.72	1216	0.76
1800	930	0.54	982	0.60	1033	0.65	1081	0.70	1124	0.74	1165	0.77	1206	0.80	1248	0.84
1900	970	0.62	1020	0.68	1069	0.73	1116	0.78	1158	0.81	1199	0.85	1239	0.89	1280	0.93
2000	1009	0.71	1058	0.76	1106	0.81	1151	0.86	1193	0.9	1233	0.94	1273	0.98	1312	1.04

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1131	0.48	1180	0.51	1226	0.54	1269	0.57	1308	0.61	1343	0.66	1378	0.70	1414	0.75
1300	1151	0.53	1199	0.56	1245	0.59	1287	0.63	1324	0.68	1359	0.72	1394	0.77	1429	0.82
1400	1175	0.58	1222	0.62	1266	0.66	1306	0.70	1342	0.75	1376	0.80	1410	0.85	1446	0.89
1500	1201	0.65	1246	0.68	1289	0.73	1327	0.78	1362	0.83	1395	0.88	1429	0.93	1464	0.98
1600	1229	0.72	1273	0.76	1313	0.81	1350	0.86	1384	0.92	1416	0.97	1450	1.02	1485	1.07
1700	1258	0.80	1300	0.85	1338	0.90	1374	0.96	1407	1.02	1440	1.07	1473	1.12	1508	1.17
1800	1289	0.89	1328	0.94	1365	1.00	1399	1.06	1432	1.13	1465	1.18	1498	1.23	1532	1.28
1900	1319	0.99	1357	1.05	1392	1.11	1426	1.18	1459	1.24	1491	1.30	1524	1.35	1558	1.39
2000	1350	1.10	1387	1.16	1421	1.23	1454	1.30	1486	1.36	1518	1.42	1551	1.47	1584	1.51

BLOWER DATA - BELT DRIVE - ZCA060

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA03											
1600	787	0.38	854	0.41	918	0.44	976	0.48	1030	0.52	1078	0.56	1123	0.61	1164	0.66
1700	827	0.43	892	0.46	952	0.49	1007	0.53	1058	0.58	1105	0.63	1148	0.68	1189	0.73
1800	868	0.48	929	0.52	986	0.55	1038	0.59	1087	0.64	1132	0.69	1174	0.75	1214	0.80
1900	907	0.54	966	0.58	1019	0.62	1069	0.66	1116	0.71	1160	0.77	1200	0.82	1240	0.88
2000	946	0.60	1001	0.65	1053	0.69	1101	0.74	1146	0.79	1188	0.85	1228	0.91	1267	0.98
2100	984	0.68	1037	0.72	1086	0.77	1132	0.83	1176	0.89	1217	0.95	1256	1.01	1295	1.08
2200	1021	0.75	1072	0.81	1120	0.86	1165	0.92	1207	0.99	1247	1.05	1286	1.12	1324	1.19
2300	1059	0.84	1108	0.90	1154	0.96	1197	1.03	1239	1.10	1278	1.17	1316	1.24	1354	1.32
2400	1097	0.95	1144	1.01	1188	1.08	1231	1.15	1271	1.22	1310	1.30	1348	1.38	1385	1.45

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03								Kit ZA06							
1600	1205	0.70	1245	0.75	1284	0.79	1323	0.84	1361	0.88	1397	0.93	1432	0.98	1467	1.03
1700	1228	0.78	1268	0.82	1307	0.87	1345	0.92	1382	0.97	1417	1.02	1452	1.07	1486	1.11
1800	1253	0.85	1292	0.91	1331	0.96	1368	1.01	1404	1.06	1439	1.11	1473	1.16	1506	1.21
1900	1279	0.94	1317	1.00	1355	1.05	1392	1.10	1427	1.16	1461	1.21	1494	1.26	1527	1.31
2000	1305	1.04	1343	1.10	1380	1.15	1416	1.21	1450	1.26	1484	1.32	1516	1.37	1549	1.42
2100	1333	1.14	1370	1.21	1407	1.26	1442	1.32	1475	1.38	1508	1.43	1540	1.48	1572	1.53
2200	1361	1.26	1398	1.32	1434	1.38	1468	1.44	1501	1.50	1533	1.55	1564	1.61	1596	1.66
2300	1391	1.39	1427	1.45	1462	1.51	1495	1.57	1527	1.63	1559	1.68	1590	1.73	1622	1.78
2400	1421	1.52	1456	1.59	1490	1.65	1523	1.71	1555	1.76	1586	1.82	1617	1.87	1649	1.92

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furn.		Kit ZA03													
1600	864	0.42	921	0.46	976	0.51	1027	0.56	1072	0.60	1113	0.63	1155	0.66	1198	0.69
1700	907	0.48	961	0.53	1013	0.58	1061	0.63	1105	0.67	1146	0.70	1187	0.73	1230	0.77
1800	948	0.56	999	0.61	1049	0.66	1096	0.71	1139	0.75	1180	0.78	1221	0.82	1262	0.86
1900	987	0.64	1037	0.69	1086	0.74	1132	0.79	1174	0.83	1214	0.86	1255	0.90	1295	0.95
2000	1028	0.73	1076	0.78	1123	0.83	1168	0.87	1210	0.91	1250	0.96	1289	1.00	1328	1.06
2100	1071	0.81	1117	0.86	1163	0.91	1206	0.96	1247	1.01	1286	1.06	1324	1.12	1362	1.18
2200	1116	0.91	1160	0.96	1204	1.01	1245	1.07	1285	1.12	1323	1.18	1360	1.25	1396	1.31
2300	1161	1.02	1204	1.07	1245	1.13	1285	1.19	1323	1.25	1360	1.32	1396	1.38	1432	1.45
2400	1207	1.14	1248	1.20	1288	1.26	1326	1.32	1362	1.39	1398	1.46	1433	1.53	1468	1.60

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03								Kit ZA06							
1600	1242	0.73	1284	0.77	1324	0.82	1360	0.88	1394	0.93	1426	0.99	1460	1.04	1495	1.08
1700	1272	0.81	1312	0.86	1350	0.92	1385	0.98	1418	1.04	1451	1.09	1485	1.14	1519	1.19
1800	1302	0.90	1341	0.96	1377	1.02	1411	1.08	1444	1.15	1477	1.20	1510	1.25	1544	1.30
1900	1334	1.01	1371	1.07	1406	1.13	1439	1.20	1471	1.26	1504	1.32	1537	1.37	1571	1.41
2000	1365	1.12	1401	1.19	1435	1.25	1468	1.32	1500	1.38	1532	1.44	1565	1.49	1598	1.53
2100	1398	1.25	1433	1.31	1466	1.38	1497	1.45	1529	1.51	1561	1.56	1594	1.61	1626	1.65
2200	1431	1.38	1465	1.45	1497	1.52	1528	1.58	1560	1.64	1591	1.69	1623	1.73	1656	1.77
2300	1466	1.52	1498	1.59	1529	1.66	1560	1.72	1591	1.77	1623	1.82	1654	1.86	1686	1.90
2400	1500	1.67	1532	1.74	1563	1.80	1593	1.86	1624	1.91	1655	1.96	1686	2.00	1718	2.04

BLOWER DATA - BELT DRIVE - ZCA072

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZAA02											
1900	578	0.44	610	0.49	643	0.54	678	0.60	714	0.65	749	0.70	785	0.76	819	0.82
2000	600	0.50	632	0.56	665	0.61	699	0.66	734	0.71	769	0.77	803	0.83	837	0.9
2100	623	0.57	655	0.62	688	0.68	721	0.73	755	0.79	789	0.84	822	0.91	854	0.98
2200	647	0.65	678	0.70	711	0.75	743	0.81	776	0.86	809	0.93	841	1.00	872	1.06
2300	671	0.73	702	0.78	734	0.83	766	0.89	798	0.95	829	1.02	860	1.09	890	1.16
2400	696	0.81	726	0.87	757	0.92	788	0.98	819	1.04	850	1.11	880	1.19	909	1.26
2500	720	0.90	750	0.95	780	1.01	811	1.07	841	1.14	871	1.22	900	1.30	929	1.37
2600	745	0.99	774	1.05	804	1.11	834	1.17	864	1.25	893	1.33	921	1.41	949	1.49
2700	770	1.09	799	1.15	828	1.21	858	1.28	887	1.36	916	1.44	943	1.53	969	1.61
2800	795	1.19	824	1.25	853	1.33	882	1.40	911	1.48	939	1.56	965	1.65	990	1.73
2900	820	1.30	849	1.37	878	1.45	907	1.53	935	1.61	962	1.70	988	1.78	1012	1.86

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA03															
1900	853	0.88	885	0.94	915	0.99	944	1.05	971	1.11	996	1.17	1021	1.23	1045	1.29
2000	869	0.96	899	1.01	929	1.07	957	1.13	984	1.19	1009	1.25	1033	1.31	1058	1.38
2100	885	1.04	915	1.10	944	1.15	971	1.22	997	1.28	1022	1.34	1046	1.40	1070	1.46
2200	902	1.13	931	1.19	959	1.24	986	1.31	1012	1.37	1036	1.43	1060	1.50	1084	1.56
2300	920	1.23	948	1.29	975	1.35	1001	1.41	1027	1.47	1051	1.53	1075	1.60	1098	1.66
2400	938	1.33	965	1.39	992	1.45	1017	1.52	1042	1.58	1066	1.64	1090	1.70	1113	1.77
2500	956	1.44	983	1.51	1009	1.57	1034	1.63	1059	1.69	1082	1.75	1105	1.82	1128	1.88
2600	975	1.56	1001	1.63	1026	1.69	1051	1.75	1075	1.81	1098	1.87	1121	1.93	1143	2.00
2700	995	1.68	1020	1.75	1044	1.81	1069	1.87	1092	1.93	1114	1.99	1136	2.06	1158	2.13
2800	1015	1.81	1039	1.87	1063	1.94	1086	2.00	1109	2.06	1131	2.12	1152	2.19	1174	2.26
2900	1035	1.94	1058	2.00	1081	2.07	1104	2.13	1126	2.19	1147	2.26	1168	2.33	1189	2.40

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZAA02											
1900	581	0.44	618	0.49	655	0.54	692	0.59	729	0.64	765	0.69	800	0.75	833	0.80
2000	602	0.50	639	0.55	676	0.61	713	0.66	749	0.71	784	0.76	818	0.82	850	0.88
2100	625	0.57	661	0.62	698	0.67	735	0.73	770	0.78	804	0.84	837	0.90	868	0.96
2200	648	0.64	685	0.69	721	0.75	757	0.80	791	0.86	824	0.92	856	0.98	886	1.05
2300	673	0.71	709	0.77	745	0.83	780	0.88	813	0.94	845	1.01	876	1.08	905	1.15
2400	699	0.79	734	0.85	769	0.91	803	0.97	835	1.04	866	1.11	896	1.18	924	1.25
2500	725	0.88	759	0.94	793	1.00	826	1.07	857	1.14	887	1.21	916	1.28	944	1.36
2600	752	0.97	785	1.04	818	1.10	850	1.17	880	1.25	909	1.32	937	1.40	964	1.48
2700	779	1.07	811	1.14	843	1.21	873	1.29	902	1.37	931	1.44	958	1.52	984	1.60
2800	805	1.18	837	1.26	868	1.33	897	1.41	925	1.49	952	1.57	979	1.66	1004	1.74
2900	832	1.30	863	1.38	892	1.46	921	1.54	948	1.63	974	1.71	1000	1.80	1024	1.88

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA03															
1900	864	0.87	895	0.93	924	0.99	953	1.06	980	1.12	1007	1.18	1032	1.25	1056	1.31
2000	881	0.95	911	1.01	940	1.08	967	1.14	994	1.21	1020	1.27	1044	1.34	1068	1.40
2100	898	1.03	927	1.10	955	1.17	982	1.23	1008	1.30	1033	1.37	1057	1.43	1080	1.50
2200	916	1.12	944	1.19	971	1.26	998	1.33	1023	1.40	1047	1.47	1071	1.54	1093	1.60
2300	934	1.22	961	1.29	988	1.36	1014	1.43	1038	1.50	1062	1.58	1085	1.65	1107	1.71
2400	952	1.32	979	1.40	1005	1.47	1030	1.54	1054	1.62	1077	1.69	1099	1.76	1121	1.83
2500	971	1.43	997	1.51	1022	1.59	1046	1.66	1069	1.74	1092	1.81	1114	1.88	1135	1.95
2600	990	1.55	1015	1.63	1039	1.71	1063	1.79	1086	1.86	1108	1.94	1129	2.01	1150	2.07
2700	1009	1.68	1034	1.76	1057	1.84	1080	1.92	1102	1.99	1124	2.07	1145	2.14	1166	2.21
2800	1028	1.82	1052	1.9	1075	1.98	1097	2.06	1119	2.13	1140	2.21	1161	2.28	1182	2.34
2900	1048	1.96	1071	2.04	1093	2.12	1115	2.20	1136	2.28	1157	2.35	1177	2.42	1198	2.48

BLOWER DATA - BELT DRIVE - ZCB036

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	562	0.16	629	0.18	699	0.19	771	0.20	840	0.22	904	0.24	962	0.26	1015	0.29
1000	586	0.18	654	0.20	725	0.21	796	0.23	864	0.25	927	0.27	983	0.30	1034	0.33
1100	612	0.20	681	0.22	752	0.24	823	0.26	890	0.28	950	0.31	1004	0.34	1054	0.37
1200	641	0.23	711	0.25	783	0.27	852	0.29	917	0.32	975	0.35	1027	0.39	1074	0.42
1300	673	0.25	744	0.28	815	0.30	882	0.33	944	0.36	1000	0.40	1050	0.44	1096	0.48
1400	709	0.29	779	0.32	849	0.34	914	0.37	973	0.41	1026	0.45	1074	0.49	1118	0.53
1500	747	0.33	816	0.36	883	0.39	945	0.42	1001	0.46	1052	0.51	1098	0.55	1141	0.59

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1065	0.32	1112	0.35	1158	0.38	1202	0.41	1243	0.44	1284	0.48	1323	0.52	1364	0.55
1000	1082	0.36	1128	0.39	1173	0.42	1216	0.45	1257	0.49	1297	0.53	1336	0.57	1375	0.60
1100	1100	0.40	1145	0.44	1189	0.47	1231	0.51	1272	0.54	1311	0.58	1349	0.62	1388	0.66
1200	1119	0.45	1163	0.49	1206	0.52	1247	0.56	1287	0.60	1326	0.64	1364	0.68	1402	0.72
1300	1139	0.51	1182	0.55	1224	0.58	1265	0.62	1304	0.66	1342	0.71	1379	0.75	1416	0.79
1400	1160	0.57	1202	0.61	1243	0.65	1283	0.69	1322	0.73	1359	0.78	1396	0.82	1432	0.87
1500	1182	0.64	1223	0.68	1263	0.72	1303	0.76	1341	0.81	1378	0.85	1414	0.90	1449	0.94

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01										Kit ZA04	
900	580	0.14	649	0.17	721	0.19	794	0.22	868	0.24	938	0.27	998	0.30	1045	0.33
1000	612	0.17	681	0.19	752	0.22	825	0.25	897	0.27	963	0.30	1017	0.33	1061	0.37
1100	647	0.20	717	0.23	788	0.26	858	0.28	926	0.31	986	0.34	1036	0.38	1077	0.41
1200	687	0.23	757	0.26	826	0.29	893	0.32	955	0.35	1008	0.39	1054	0.42	1095	0.46
1300	730	0.27	798	0.30	864	0.33	926	0.37	982	0.40	1030	0.44	1073	0.47	1116	0.51
1400	775	0.31	840	0.34	902	0.38	959	0.42	1009	0.46	1054	0.50	1096	0.53	1140	0.56
1500	820	0.36	881	0.40	939	0.44	993	0.49	1039	0.53	1082	0.56	1124	0.59	1168	0.62

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1091	0.36	1140	0.38	1188	0.40	1232	0.43	1272	0.46	1309	0.49	1346	0.53	1383	0.57
1000	1105	0.40	1154	0.42	1201	0.45	1245	0.47	1284	0.50	1321	0.54	1357	0.58	1394	0.62
1100	1121	0.44	1169	0.47	1216	0.49	1259	0.52	1298	0.56	1335	0.60	1370	0.64	1406	0.69
1200	1139	0.49	1187	0.52	1234	0.54	1276	0.58	1314	0.62	1350	0.66	1385	0.71	1421	0.75
1300	1161	0.54	1208	0.57	1254	0.60	1295	0.64	1332	0.69	1366	0.73	1401	0.78	1436	0.83
1400	1185	0.59	1232	0.63	1276	0.67	1315	0.71	1351	0.76	1384	0.81	1419	0.86	1454	0.90
1500	1212	0.66	1257	0.70	1299	0.74	1337	0.79	1371	0.84	1404	0.89	1438	0.94	1473	0.99

BLOWER DATA - BELT DRIVE - ZCB048

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	641	0.23	711	0.25	783	0.27	852	0.29	917	0.32	975	0.35	1027	0.39	1074	0.42
1300	673	0.25	744	0.28	815	0.30	882	0.33	944	0.36	1000	0.40	1050	0.44	1096	0.48
1400	709	0.29	779	0.32	849	0.34	914	0.37	973	0.41	1026	0.45	1074	0.49	1118	0.53
1500	747	0.33	816	0.36	883	0.39	945	0.42	1001	0.46	1052	0.51	1098	0.55	1141	0.59
1600	787	0.38	854	0.41	918	0.44	976	0.48	1030	0.52	1078	0.56	1123	0.61	1164	0.66
1700	827	0.43	892	0.46	952	0.49	1007	0.53	1058	0.58	1105	0.63	1148	0.68	1189	0.73
1800	868	0.48	929	0.52	986	0.55	1038	0.59	1087	0.64	1132	0.69	1174	0.75	1214	0.80
1900	907	0.54	966	0.58	1019	0.62	1069	0.66	1116	0.71	1160	0.77	1200	0.82	1240	0.88
2000	946	0.60	1001	0.65	1053	0.69	1101	0.74	1146	0.79	1188	0.85	1228	0.91	1267	0.98

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1119	0.45	1163	0.49	1206	0.52	1247	0.56	1287	0.60	1326	0.64	1364	0.68	1402	0.72
1300	1139	0.51	1182	0.55	1224	0.58	1265	0.62	1304	0.66	1342	0.71	1379	0.75	1416	0.79
1400	1160	0.57	1202	0.61	1243	0.65	1283	0.69	1322	0.73	1359	0.78	1396	0.82	1432	0.87
1500	1182	0.64	1223	0.68	1263	0.72	1303	0.76	1341	0.81	1378	0.85	1414	0.9	1449	0.94
1600	1205	0.70	1245	0.75	1284	0.79	1323	0.84	1361	0.88	1397	0.93	1432	0.98	1467	1.03
1700	1228	0.78	1268	0.82	1307	0.87	1345	0.92	1382	0.97	1417	1.02	1452	1.07	1486	1.11
1800	1253	0.85	1292	0.91	1331	0.96	1368	1.01	1404	1.06	1439	1.11	1473	1.16	1506	1.21
1900	1279	0.94	1317	1.00	1355	1.05	1392	1.10	1427	1.16	1461	1.21	1494	1.26	1527	1.31
2000	1305	1.04	1343	1.10	1380	1.15	1416	1.21	1450	1.26	1484	1.32	1516	1.37	1549	1.42

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	687	0.23	757	0.26	826	0.29	893	0.32	955	0.35	1008	0.39	1054	0.42	1095	0.46
1300	730	0.27	798	0.30	864	0.33	926	0.37	982	0.40	1030	0.44	1073	0.47	1116	0.51
1400	775	0.31	840	0.34	902	0.38	959	0.42	1009	0.46	1054	0.50	1096	0.53	1140	0.56
1500	820	0.36	881	0.40	939	0.44	993	0.49	1039	0.53	1082	0.56	1124	0.59	1168	0.62
1600	864	0.42	921	0.46	976	0.51	1027	0.56	1072	0.6	1113	0.63	1155	0.66	1198	0.69
1700	907	0.48	961	0.53	1013	0.58	1061	0.63	1105	0.67	1146	0.70	1187	0.73	1230	0.77
1800	948	0.56	999	0.61	1049	0.66	1096	0.71	1139	0.75	1180	0.78	1221	0.82	1262	0.86
1900	987	0.64	1037	0.69	1086	0.74	1132	0.79	1174	0.83	1214	0.86	1255	0.90	1295	0.95
2000	1028	0.73	1076	0.78	1123	0.83	1168	0.87	1210	0.91	1250	0.96	1289	1.00	1328	1.06

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1139	0.49	1187	0.52	1234	0.54	1276	0.58	1314	0.62	1350	0.66	1385	0.71	1421	0.75
1300	1161	0.54	1208	0.57	1254	0.60	1295	0.64	1332	0.69	1366	0.73	1401	0.78	1436	0.83
1400	1185	0.59	1232	0.63	1276	0.67	1315	0.71	1351	0.76	1384	0.81	1419	0.86	1454	0.90
1500	1212	0.66	1257	0.70	1299	0.74	1337	0.79	1371	0.84	1404	0.89	1438	0.94	1473	0.99
1600	1242	0.73	1284	0.77	1324	0.82	1360	0.88	1394	0.93	1426	0.99	1460	1.04	1495	1.08
1700	1272	0.81	1312	0.86	1350	0.92	1385	0.98	1418	1.04	1451	1.09	1485	1.14	1519	1.19
1800	1302	0.90	1341	0.96	1377	1.02	1411	1.08	1444	1.15	1477	1.20	1510	1.25	1544	1.30
1900	1334	1.01	1371	1.07	1406	1.13	1439	1.20	1471	1.26	1504	1.32	1537	1.37	1571	1.41
2000	1365	1.12	1401	1.19	1435	1.25	1468	1.32	1500	1.38	1532	1.44	1565	1.49	1598	1.53

BLOWER DATA - BELT DRIVE - ZCB060

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

FOR ALL UNITS ADD:

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

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

See page 27 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA03									
1600	764	0.46	823	0.51	882	0.56	940	0.60	997	0.65	1048	0.69	1094	0.72	1140	0.75
1700	806	0.53	863	0.58	919	0.62	975	0.67	1028	0.71	1075	0.75	1119	0.78	1164	0.81
1800	849	0.60	903	0.65	957	0.69	1010	0.74	1058	0.78	1102	0.82	1145	0.85	1189	0.88
1900	892	0.68	944	0.72	995	0.77	1045	0.82	1089	0.86	1131	0.89	1174	0.92	1217	0.95
2000	935	0.76	984	0.81	1033	0.86	1079	0.91	1122	0.95	1163	0.97	1204	1.00	1247	1.03
2100	977	0.85	1024	0.90	1070	0.95	1114	1.00	1155	1.03	1196	1.06	1237	1.09	1278	1.12
2200	1018	0.95	1063	0.99	1107	1.04	1149	1.09	1190	1.12	1230	1.15	1270	1.18	1310	1.22
2300	1057	1.04	1100	1.09	1143	1.14	1185	1.18	1225	1.22	1264	1.25	1303	1.29	1342	1.33
2400	1096	1.14	1137	1.18	1179	1.23	1220	1.27	1260	1.31	1299	1.35	1337	1.40	1375	1.45

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03						Kit ZA06									
1600	1185	0.79	1229	0.81	1271	0.84	1313	0.86	1354	0.90	1393	0.94	1431	0.98	1468	1.03
1700	1208	0.84	1252	0.87	1294	0.90	1335	0.94	1375	0.98	1413	1.02	1449	1.07	1485	1.12
1800	1233	0.91	1276	0.94	1318	0.98	1358	1.02	1397	1.06	1434	1.11	1469	1.16	1504	1.21
1900	1261	0.98	1303	1.02	1343	1.06	1382	1.11	1420	1.16	1455	1.21	1490	1.26	1525	1.31
2000	1289	1.07	1330	1.11	1370	1.16	1407	1.21	1444	1.27	1478	1.32	1513	1.37	1547	1.42
2100	1319	1.16	1359	1.21	1397	1.27	1433	1.32	1468	1.38	1502	1.44	1536	1.49	1570	1.53
2200	1350	1.27	1388	1.32	1424	1.38	1459	1.45	1494	1.51	1527	1.56	1561	1.61	1594	1.65
2300	1380	1.38	1417	1.45	1452	1.51	1486	1.58	1520	1.63	1553	1.68	1587	1.73	1620	1.78
2400	1411	1.51	1446	1.58	1480	1.65	1514	1.71	1547	1.77	1580	1.81	1614	1.86	1648	1.90

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA03									
1600	752	0.40	818	0.45	882	0.50	943	0.55	999	0.59	1050	0.62	1097	0.66	1142	0.69
1700	792	0.46	855	0.52	917	0.56	975	0.61	1028	0.64	1077	0.68	1123	0.72	1166	0.75
1800	832	0.53	894	0.58	952	0.63	1007	0.67	1058	0.70	1105	0.74	1149	0.78	1192	0.82
1900	873	0.60	932	0.65	988	0.69	1040	0.73	1088	0.77	1134	0.81	1177	0.85	1219	0.90
2000	914	0.67	970	0.72	1023	0.76	1073	0.80	1120	0.85	1163	0.89	1205	0.94	1246	0.99
2100	955	0.74	1009	0.79	1059	0.84	1107	0.89	1152	0.93	1194	0.98	1235	1.03	1275	1.09
2200	995	0.83	1047	0.88	1095	0.93	1141	0.98	1184	1.03	1225	1.08	1265	1.14	1304	1.20
2300	1036	0.92	1085	0.97	1132	1.02	1175	1.08	1217	1.13	1257	1.19	1296	1.26	1334	1.32
2400	1077	1.01	1124	1.07	1168	1.13	1210	1.19	1251	1.25	1290	1.32	1328	1.39	1365	1.46

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03						Kit ZA06									
1600	1185	0.72	1228	0.75	1270	0.79	1310	0.83	1349	0.88	1387	0.93	1423	0.98	1459	1.03
1700	1209	0.78	1251	0.82	1292	0.87	1331	0.92	1370	0.97	1407	1.02	1443	1.07	1478	1.12
1800	1234	0.86	1275	0.91	1315	0.96	1354	1.01	1391	1.06	1428	1.11	1463	1.17	1498	1.22
1900	1260	0.95	1300	1.00	1340	1.05	1377	1.11	1414	1.16	1450	1.22	1485	1.27	1519	1.32
2000	1287	1.04	1326	1.10	1365	1.16	1402	1.21	1437	1.27	1472	1.33	1507	1.38	1541	1.43
2100	1314	1.15	1353	1.21	1391	1.27	1427	1.33	1462	1.39	1496	1.44	1530	1.50	1564	1.55
2200	1343	1.26	1381	1.33	1417	1.39	1453	1.45	1487	1.51	1521	1.56	1555	1.62	1589	1.67
2300	1372	1.39	1409	1.45	1445	1.52	1480	1.58	1513	1.64	1547	1.69	1580	1.75	1614	1.80
2400	1402	1.52	1438	1.59	1473	1.65	1507	1.71	1541	1.77	1574	1.83	1607	1.88	1641	1.93

BLOWER DATA

DRIVE KIT SPECIFICATIONS

Model No.	Blower Motor Choice (HP)						Drive Kit No.	RPM Range
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum		
036	¹ 1	¹ 1.15	1.5	1.7	-	-	ZA01	678 - 1035
							ZA04	964 - 1471
048	¹ 1	¹ 1.15	1.5	1.7	-	-	ZA02	803 - 1226
							² ZA05	1098 - 1490
060	¹ 1	¹ 1.15	1.5	1.7	-	-	ZA03	906 - 1383
							² ZA06	1262 - 1634
072	¹ 1	¹ 1.5	1.5	1.7	2	2.3	ZAA02	632 - 875
							² ZAA03	798 - 1105
							³ ZAA04	921 - 1228

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

¹ 1 hp blower motor is not available for 208/230V-1ph applications.

² 1.5 hp motor is required with ZA05, ZA06 and ZAA03 drive kits.

³ 2 hp blower motor is required with ZAA04 drive kits.

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure - in. w.g.	Air Volume Exhausted cfm
0.00	1865
0.05	1785
0.10	1710
0.15	1630
0.20	1545
0.25	1450
0.30	1350
0.35	1240

BLOWER DATA

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

Air Volume cfm	Wet Indoor Coil				Gss Heat Exchanger		Electric Heat	Economizer	
	ZGA/ZCA036 ZGA/ZCA048	ZGB/ZCB036 ZGB/ZCB048	ZGA060 ZCA060	ZGB/ZCB060, ZGA/ZCA072	Medium	High		Downflow	Horizontal
900	0.01	0.01	---	---	0.05	0.06	0.05	0.03	0.04
1000	0.01	0.02	---	---	0.06	0.06	0.06	0.03	0.05
1100	0.02	0.02	---	---	0.06	0.07	0.08	0.04	0.05
1200	0.02	0.02	---	---	0.06	0.07	0.09	0.05	0.06
1300	0.02	0.03	---	---	0.07	0.07	0.12	0.05	0.07
1400	0.03	0.03	---	---	0.07	0.08	0.17	0.06	0.08
1500	0.03	0.04	---	---	0.07	0.08	0.22	0.07	0.08
1600	0.03	0.04	0.04	0.03	0.07	0.08	0.26	0.08	0.09
1700	0.04	0.05	0.05	0.03	0.07	0.08	0.30	0.09	0.10
1800	0.04	0.05	0.05	0.03	0.06	0.08	0.33	0.10	0.11
1900	0.04	0.06	0.06	0.04	0.06	0.08	0.33	0.11	0.12
2000	0.05	0.06	0.06	0.04	0.07	0.09	0.31	0.12	0.13
2100	---	---	0.07	0.05	0.08	0.10	0.27	0.13	0.14
2200	---	---	0.08	0.05	0.10	0.12	0.29	0.14	0.15
2300	---	---	0.08	0.05	0.11	0.14	0.31	0.15	0.16
2400	---	---	0.09	0.06	0.11	0.13	0.32	0.16	0.18
2500	---	---	---	0.06	0.11	0.15	0.34	0.18	0.19
2600	---	---	---	0.07	0.13	0.16	0.38	0.19	0.20
2700	---	---	---	0.07	0.15	0.18	0.42	0.20	0.21
2800	---	---	---	0.07	0.13	0.16	0.45	0.22	0.23
2900	---	---	---	0.08	0.13	0.18	0.49	0.23	0.24

**TABLE 4
DRIVE COMPONENT MANUFACTURER'S NUMBERS**

Drive No.	DRIVE COMPONENT PART NUMBERS					
	Motor Pulley		Blower Pulley		Belts	
	Browning	OEM	Browning	OEM	Browning	OEM
Z01	1VP34 X 7/8	31K6901	AK54 X 5/8	100244-30	A40	100245-17
Z02	1VP34 X 7/8	31K6901	AK46 X 5/8	100244-31	A39	100245-16
Z03	1VP34 X 7/8	31K6901	AK41 X 5/8	100244-28	A39	100245-16
Z04	1VP34 X 7/8	31K6901	AK39 X 5/8	100244-32	A38	100245-15
Z05	1VP44 X 7/8	P-8-1488	AK49 X 5/8	100244-26	A41	100245-18
Z06	1VP50 X 7/8	53J1501	AK51 X 5/8	100244-29	A42	100245-19
ZAA02	1VP40 X 7/8	79J03	BK80H	100788-03	A53	100245-40
ZAA03	1VP40 X 7/8	79J03	AK59 X 1	31K68	A50	100245-29
ZAA04	1VP44 X 7/8	P-8-1488	AK59 X 1	31K68	AX51	13H01

**TABLE 5
MINIMUM AIRFLOW
ZC UNITS WITH ELECTRIC HEAT**

kW	CFM - Downflow and Horizontal	
	036-060	072
5	960	NA
7.5	960	1500
10	960	1500
15	960	1500
22.5	1280	1500
30	NA	2100

Units with electric heat (5-30kW) can operate up to 1.6"wg. maximum static pressure.

Cooling Start-Up

▲ IMPORTANT

This unit is equipped with a crankcase heater. Make sure heater is energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

A-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 the condenser fan. An increased cooling demand (Y2) will not change operation.
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 the condenser fan. When outdoor air is not acceptable unit will operate as though no economizer is installed.

3- Units contain one refrigerant circuit or stage.

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

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

B-Three Phase Scroll Compressor Voltage Phasing

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

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

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

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

3- Disconnect all remote electrical power supplies.

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

5- Make sure the connections are tight.

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

C-Refrigerant Charge and Check

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 high stage only.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Compare the normal operating pressures (see tables 6 - 12) 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 ZGA/ZCA036: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 102°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

**TABLE 6
ZGA/ZCA036 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
112	242	115	281	117	327	121	375	119	421	125	490
118	244	121	283	125	326	128	375	132	429	134	488
132	254	137	293	140	338	145	387	149	442	147	499
147	269	152	308	157	351	161	400	166	454	170	516

**TABLE 7
ZGA/ZCA048 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
108	254	111	295	115	338	118	386	121	437	122	491
114	259	118	299	122	344	125	392	129	445	130	502
128	273	133	314	137	358	141	408	145	462	148	524
149	310	150	342	155	388	158	436	163	474	167	556

**TABLE 8
ZGA/ZCA060 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
107	257	110	299	114	343	117	388	120	440	122	498
115	277	117	304	120	350	124	396	128	446	131	501
137	297	135	320	138	366	141	419	144	473	149	530
147	312	151	352	156	397	160	449	165	505	169	576

**TABLE 9
ZGB/ZCB036 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
116	231	119	269	122	311	126	356	129	405	132	458
123	234	127	271	130	313	133	359	137	408	140	462
140	245	144	280	147	321	151	368	155	417	159	471
156	261	160	297	167	338	170	383	173	433	178	489

**TABLE 10
ZGB/ZCB048 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
112	244	115	283	118	326	121	373	124	423	127	480
118	248	122	288	126	331	130	379	133	429	136	477
135	258	138	298	142	341	145	389	150	441	153	496
149	272	154	311	158	355	162	402	166	455	171	493

**TABLE 11
ZGB/ZCB060 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

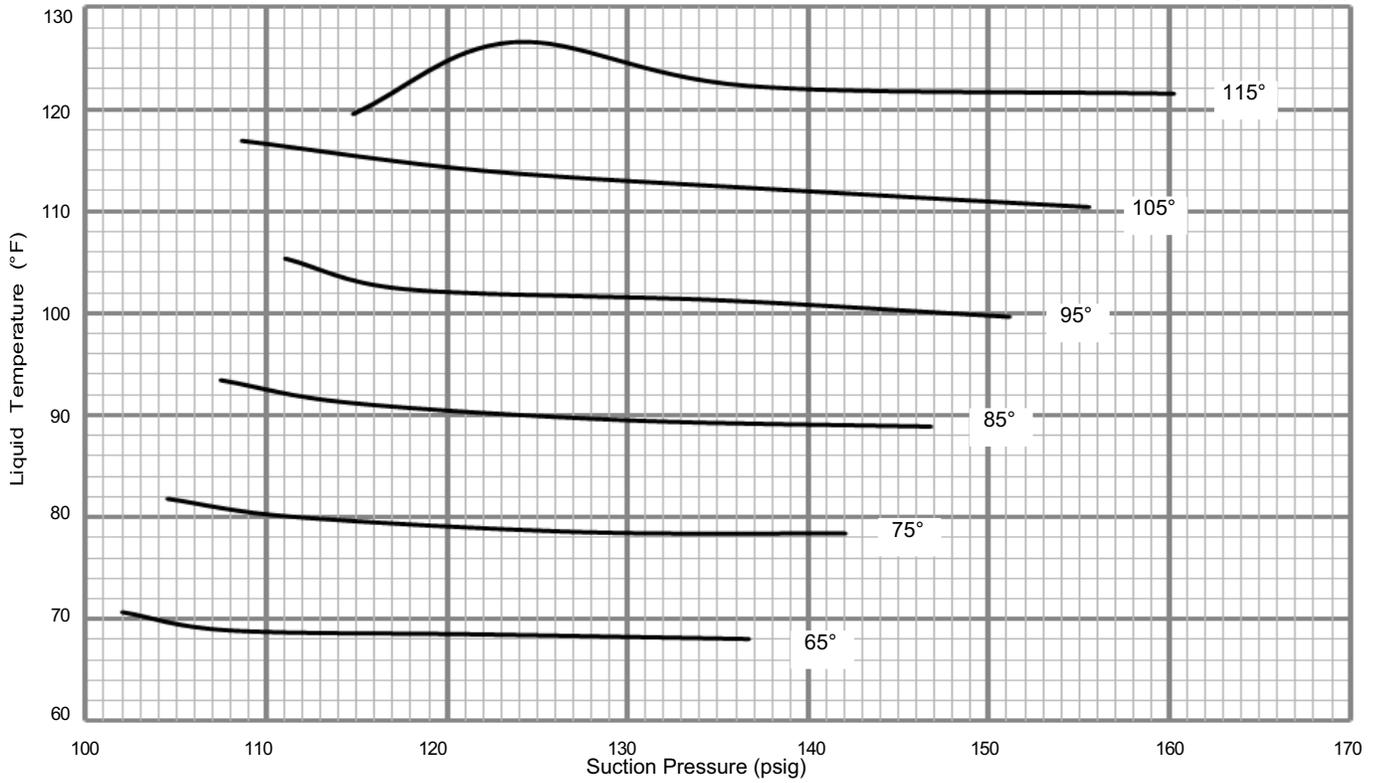
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
106	248	110	288	114	331	118	378	123	428	126	483
114	254	118	292	122	336	125	384	129	435	133	493
130	267	134	308	138	353	142	401	146	455	151	511
147	290	151	329	155	372	159	420	164	477	169	533

**TABLE 12
ZGA/ZCA072 NORMAL OPERATING PRESSURES - ALL-ALUMINUM COIL**

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)
108	259	111	299	116	334	118	391	120	440	123	498
114	266	119	306	123	351	126	397	129	448	131	508
129	283	134	323	138	368	142	415	145	465	148	516
145	302	151	344	155	390	159	436	163	490	167	543

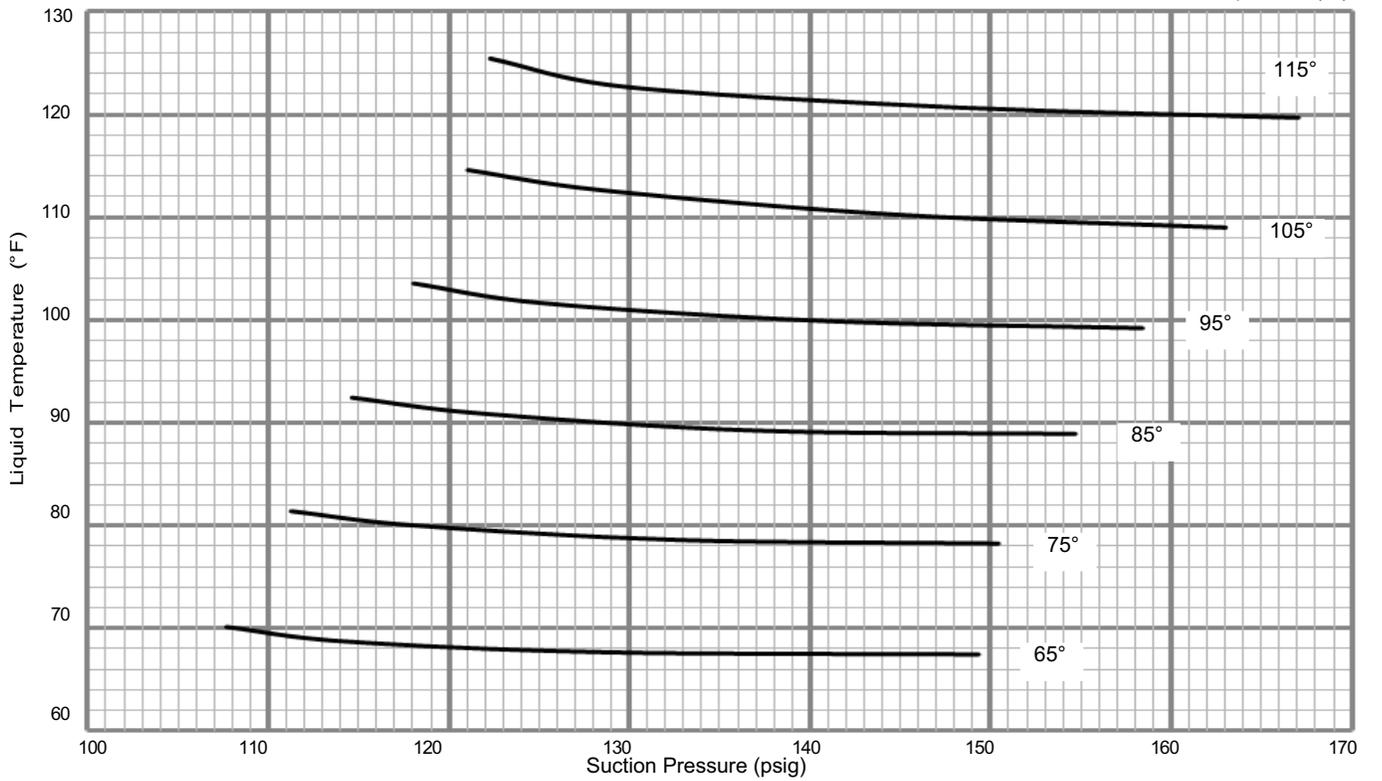
ZGA/ZCA036 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



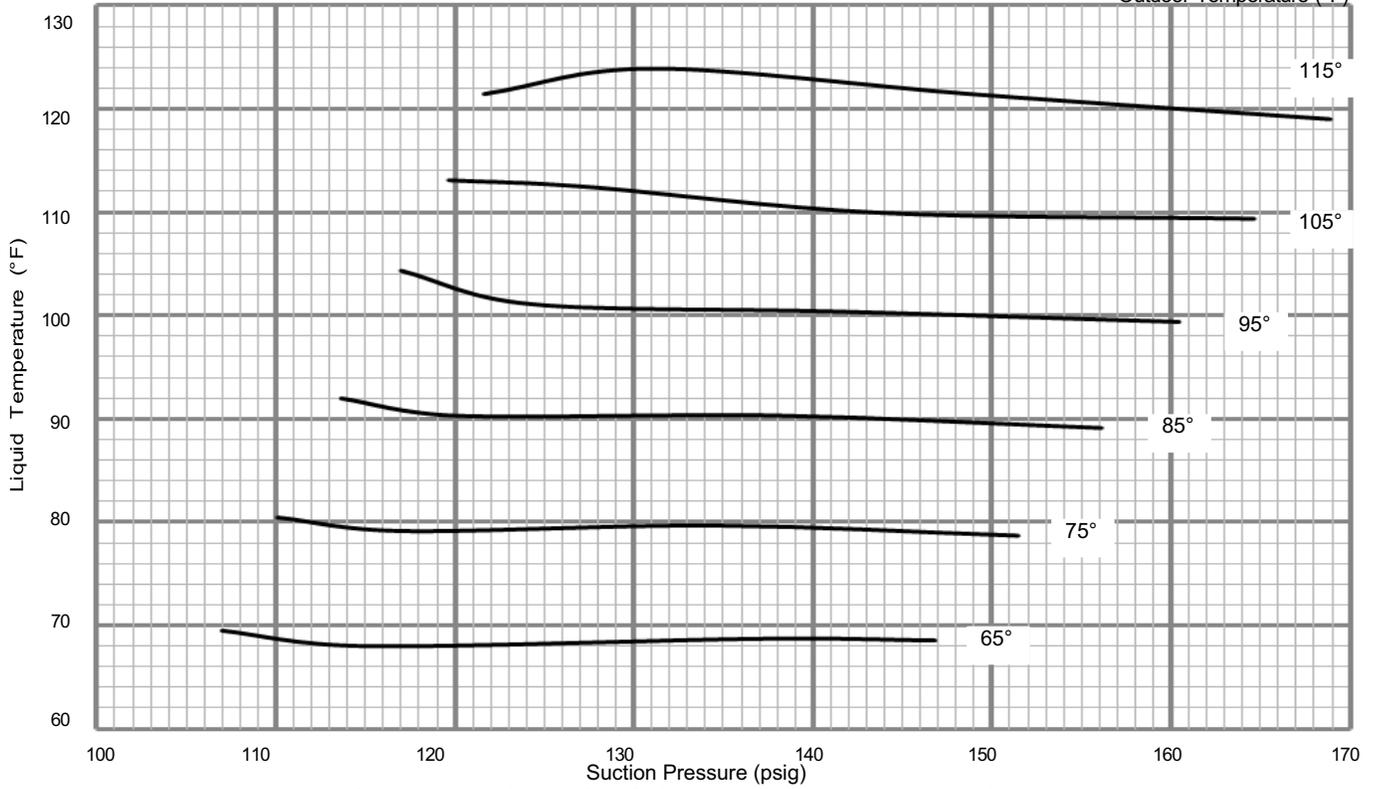
ZGA/ZCA048 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



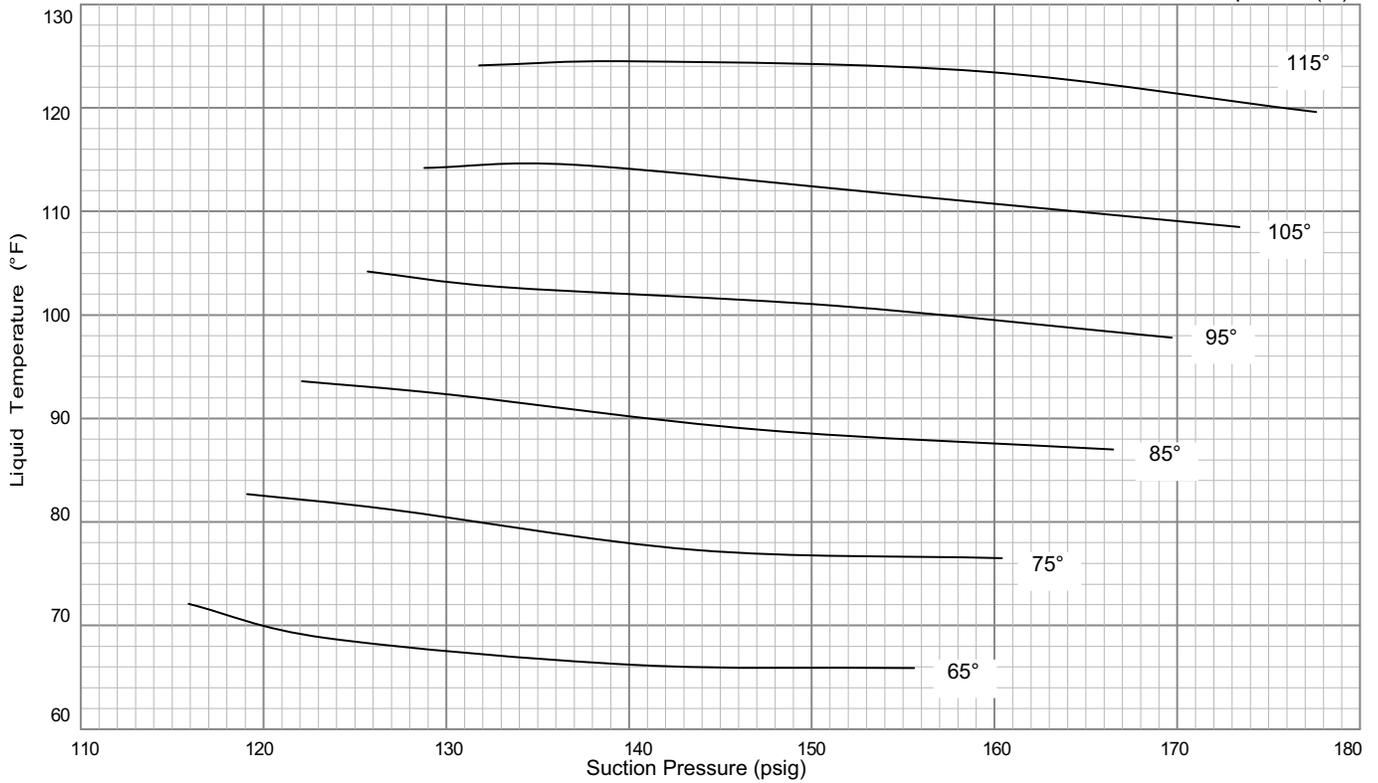
ZGA/ZCA060 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



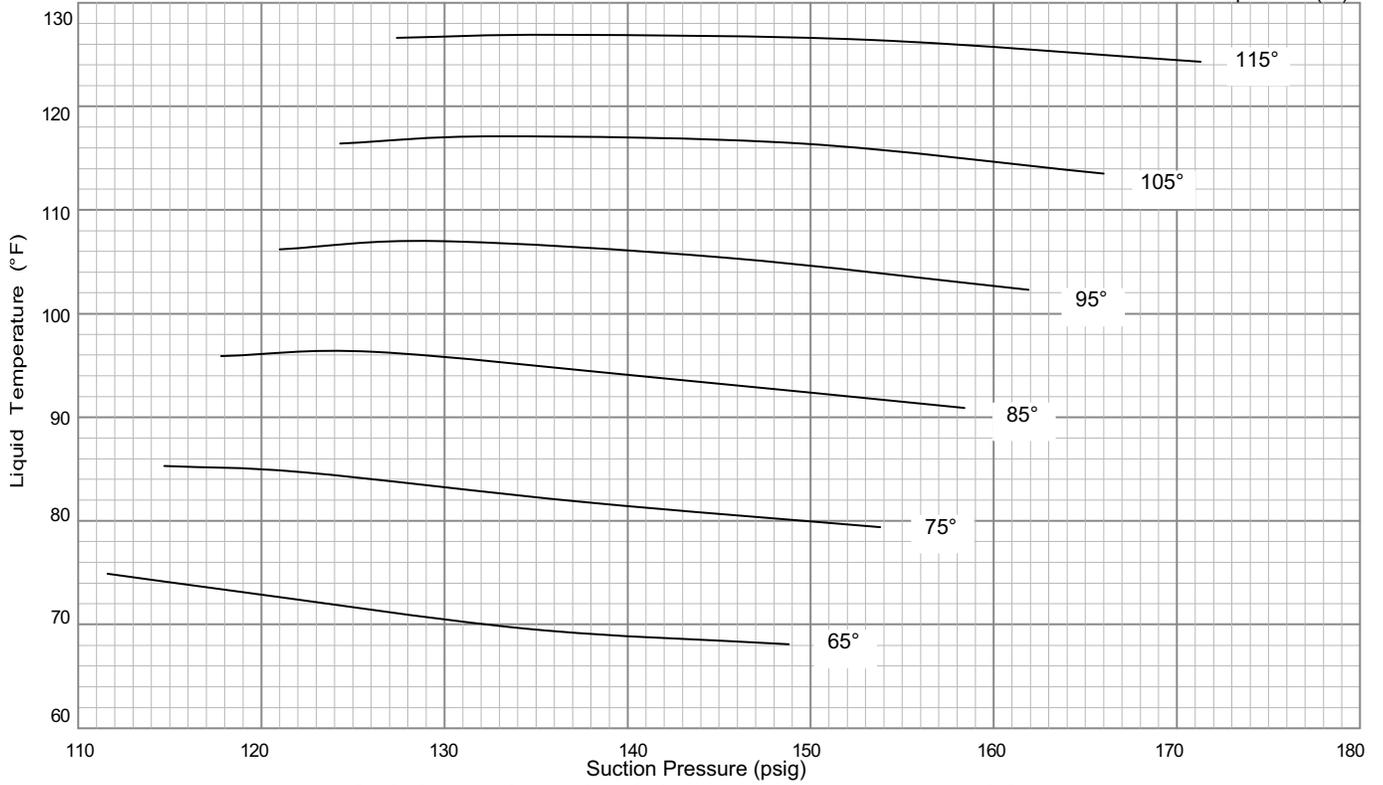
ZGB/ZCB036 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



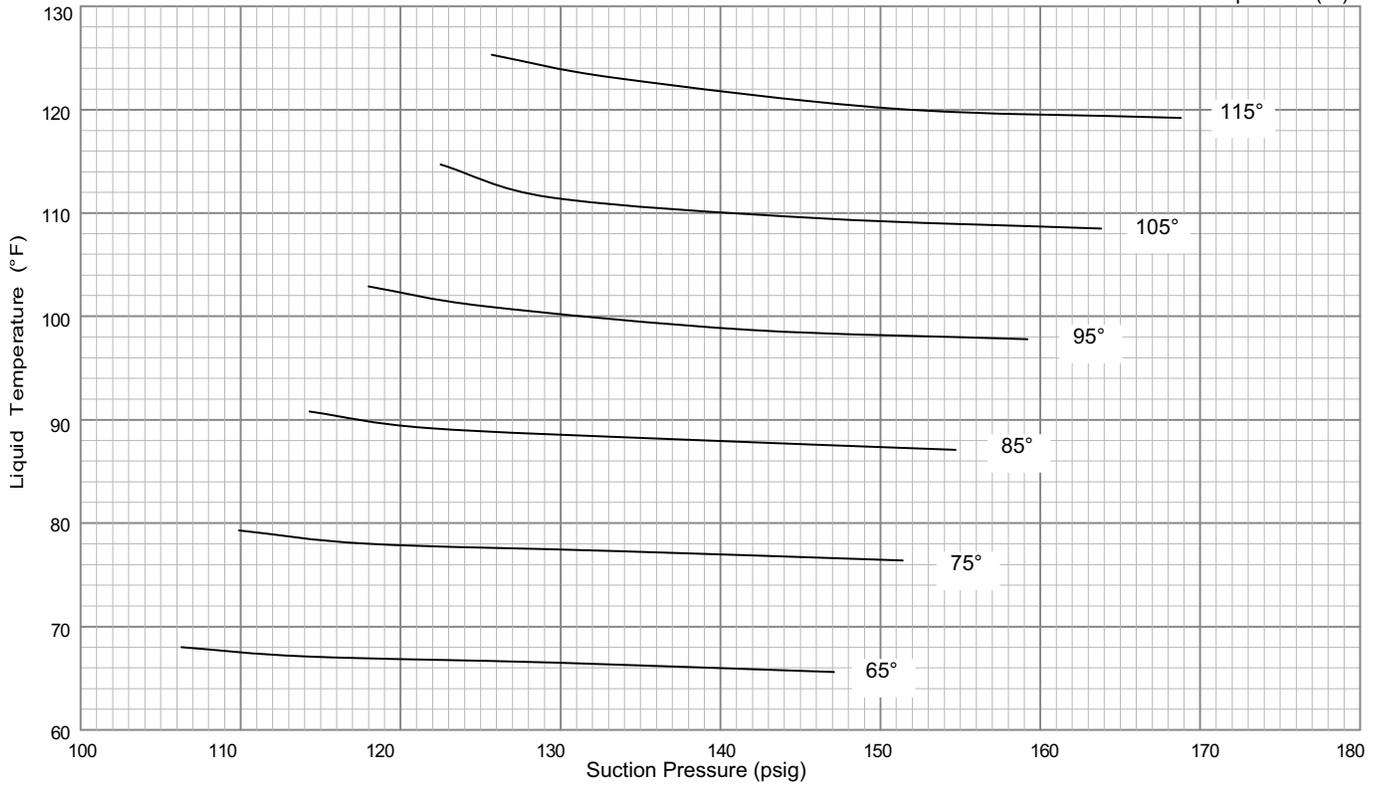
ZGB/ZCB048 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



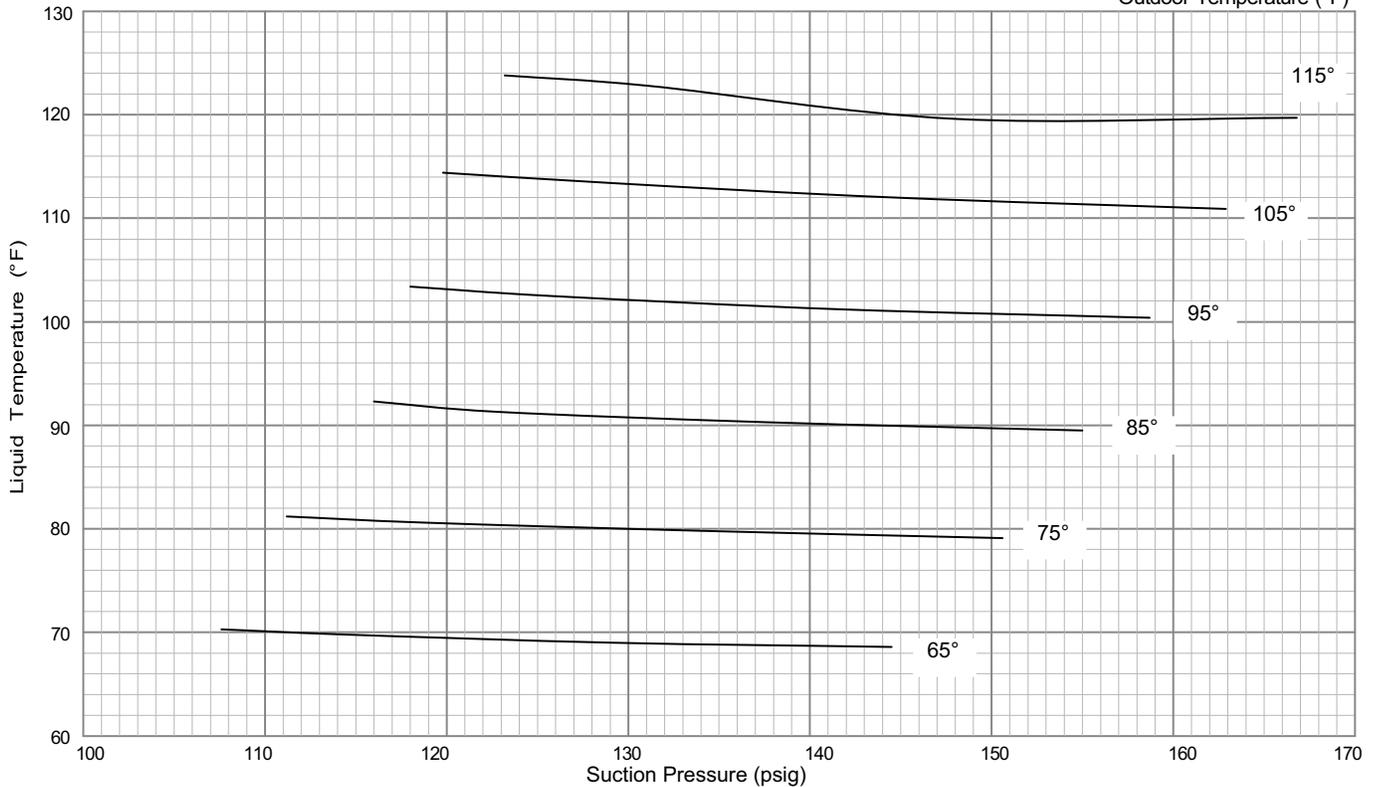
ZGB/ZCB060 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



ZGA/ZCA072 CHARGING CURVE - ALL-ALUMINUM COIL

Outdoor Temperature (°F)



D-Compressor Controls

See unit wiring diagram to determine which controls are used on each unit. Optional controls are identified on wiring diagrams by arrows at junction points.

1- High Pressure Switch (S4)

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

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

When discharge pressure rises to 640 ± 10 psig (4412 ± 69 kPa), indicating a problem with the system, the switch opens. The respective compressor is de-energized but the economizer can continue to operate. Auto-reset switches close at 475 ± 20 psig (3275 ± 138 kPa).

2- Compressor High Temperature Limit (S5)

The temperature limit switch S5 is located on the top of Interlink compressors and is wired in series with the high pressure switch S4.

Gas Heat Start-Up (Gas Units)

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠ WARNING



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

⚠ WARNING



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

⚠ WARNING



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

⚠️ WARNING

SMOKE POTENTIAL

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

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

The gas valve may be equipped with either a gas control lever or gas control knob. Use only your hand to push the lever or turn the gas control knob. Never use tools. If the the lever will not move or the knob will not push in or turn by hand, do not try to repair it. Call a qualified service technician. Force or attempted repair may result in a fire or explosion.

⚠️ WARNING



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

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

A-Placing Unit In Operation

⚠️ WARNING



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

Gas Valve Operation (figure 17 and 18)

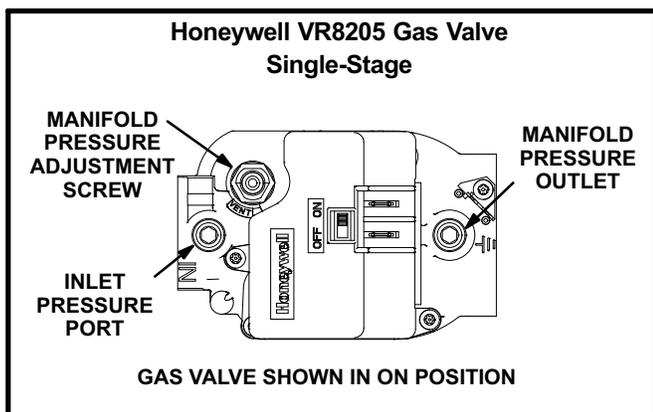


FIGURE 17

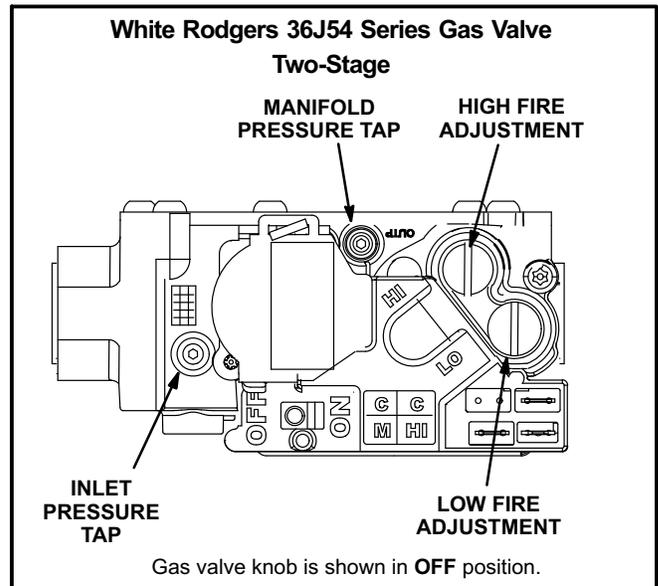


FIGURE 18

- 1- Set thermostat to lowest setting.
- 2- Turn off all electrical power to appliance.
- 3- This appliance is equipped with an ignition device which automatically lights the burner. Do **not** try to light the burner by hand.
- 4- Open or remove the heat section access panel.
- 5- *Honeywell VR8205 Gas Valve* - Switch gas valve lever to **OFF**. See figure 17.
White Rodgers 36J54 Gas Valve - Turn knob on gas valve dockwise  to **OFF**. Do not force. See figure 18.
- 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- *Honeywell VR8205 Gas Valve* - Switch gas valve lever to **ON**. See figure 17.
White Rodgers 36J54 Gas Valve - Turn knob on gas valve counterclockwise  to **ON**. Do not force. See figure 18.
- 8- Close or replace the heat section access panel.
- 9- Turn on all electrical power to appliance.
- 10- Set thermostat to desired setting.
NOTE - When unit is initially started, steps 1 through 9 may need to be repeated to purge air from gas line.
- 11- The ignition sequence will start.
- 12- If the furnace 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- *Honeywell VR8205 Gas Valve* - Switch gas valve lever to **OFF**.
White Rodgers 36J54 Gas Valve - Turn knob on 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.

Heating Operation and Adjustments

(Gas Units)

A-Heating Sequence of Operation

- 1- On a heating demand the combustion air inducer starts immediately.
- 2- Combustion air pressure switch proves inducer operation. After a 30-second pre-purge, power is allowed to ignition control. Switch is factory set and requires no adjustment.
- 3- Spark ignitor energizes and gas valve solenoid opens.
- 4- Spark ignites gas, ignition sensor proves the flame and combustion continues.
- 5- If flame is not detected after first ignition trial, ignition control will repeat steps 3 and 4 two more times before locking out the gas valve.
- 6- For troubleshooting purposes, an ignition attempt after lock out may be re-established manually. Move thermostat to "OFF" and return thermostat switch to "HEAT" position.

B-Ignition Control Diagnostic LED's

**TABLE 13
IGNITION CONTROL HEARTBEAT LED STATUS**

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

C-Limit Controls

Limit controls are factory-set and are not adjustable. The primary limit is located to the right of the combustion air inducer. See figure 24.

If the primary limit trips three times in the same heating cycle, heating operation will de-energize. Heating will automatically restart after one hour if a heating demand is present. To initiate heating during the one hour timed-off interval, reset the thermostat.

D-Heating Adjustment

Main burners are factory-set and do not require adjustment.

The following manifold pressures are listed on the gas valve.

- Natural Gas Units - Low Fire - 2.0" w.c.
- Natural Gas Units - High Fire - 3.5" w.c.
- LP Gas Units - Low Fire - 5.9" w.c.
- LP Gas Units - High Fire - 10.5" w.c.

Electric Heat Start-Up (ZC Units)

Optional electric heat will stage on and cycle with thermostat demand. See electric heat wiring diagram on unit for sequence of operation.

Service

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

⚠ CAUTION

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

⚠ WARNING

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

A-Filters

Units are equipped with temporary filters which must be replaced prior to building occupation. See table 14 for correct filter size. Refer to local codes or appropriate jurisdiction for approved filters.

**TABLE 14
UNIT FILTERS**

Unit	Filter Size - inches (mm)
ZCA/ZGA036, 048, 060 ZCB/ZGB036, 048	4 - 14 X 20 X 2 (352 X 508 X 51)
ZCB/ZGB060 ZCA/ZGA072	2 - 16 X 20 X 2 (406 X 508 X 51) 2 - 20 X 20 X 2 (508 X 508 X 51)

To change filters, open filter access panel on back side of unit. See figure 19. Lift filter stop to remove filters. See figure 20.

⚠ 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 20.

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

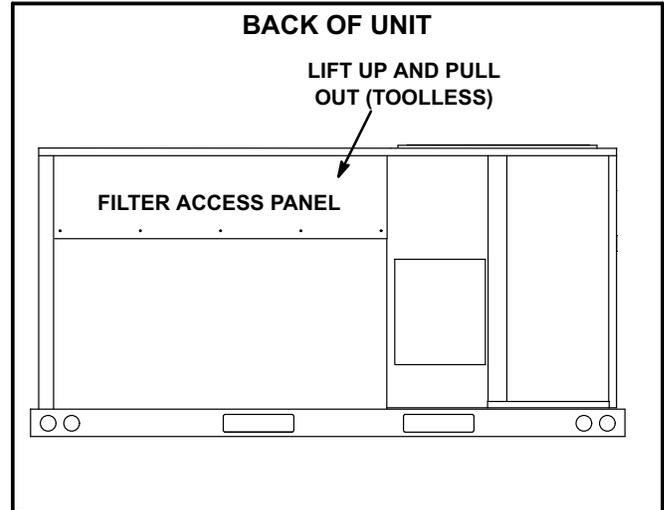


FIGURE 19

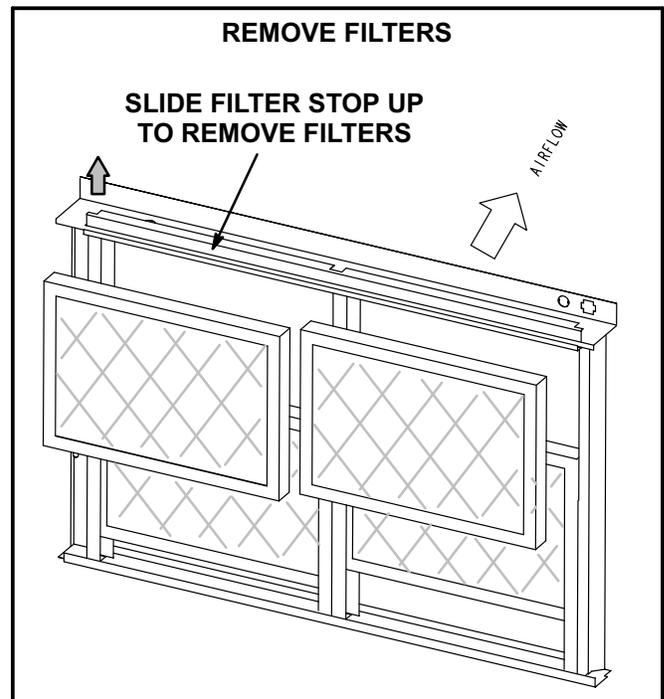


FIGURE 20

B-Lubrication

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

C-Burners (Gas Units)

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

Clean burners as follows:

- 1- Turn off both electrical power and gas supply to unit.
- 2- Remove burner compartment access panel.
- 3- Remove top burner box panel.

- Remove two screws securing burners to burner support and lift the burners from the orifices. See figure 21. Clean as necessary.

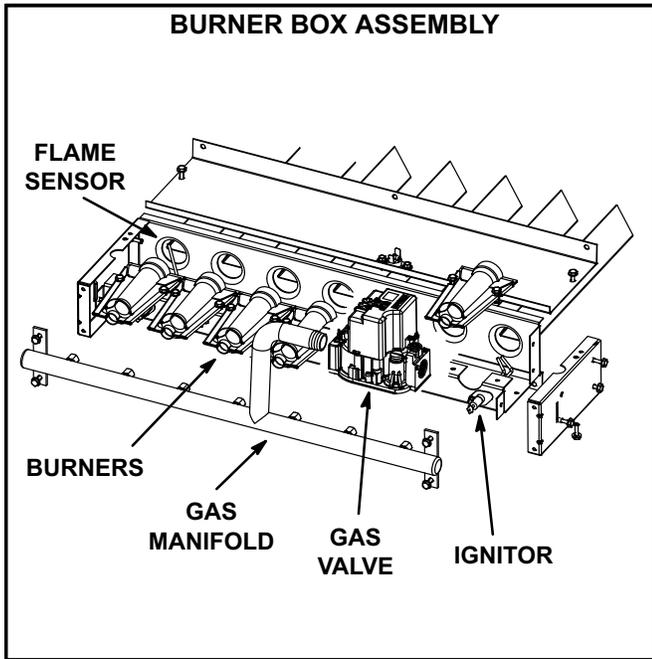


FIGURE 21

- Locate the ignitor under the right burner. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 22.

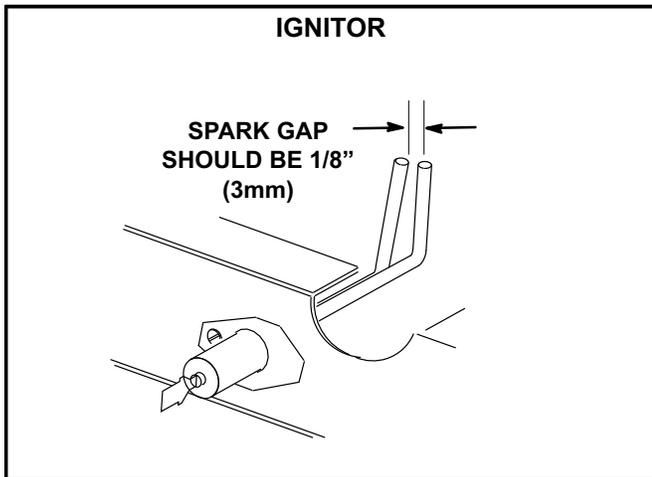


FIGURE 22

- Replace burners and screws securing burner. See figure 23.

⚠ WARNING

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

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

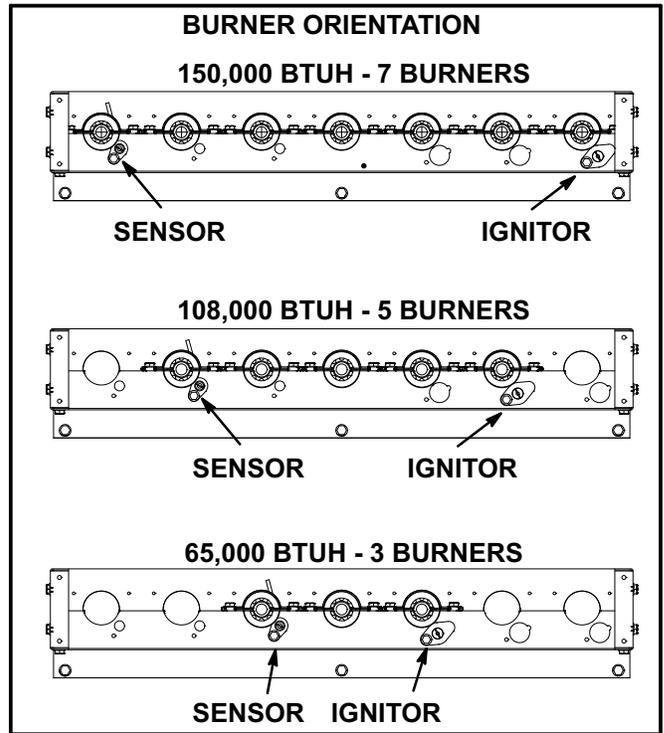


FIGURE 23

D-Combustion Air Inducer (Gas Units)

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

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

Clean combustion air inducer as follows:

- Shut off power supply and gas to unit.
- Remove the access panel located on the right side of the outdoor section under the control box.
- Remove and retain screws securing combustion air inducer to flue box. Remove vent connector. See figure 24.

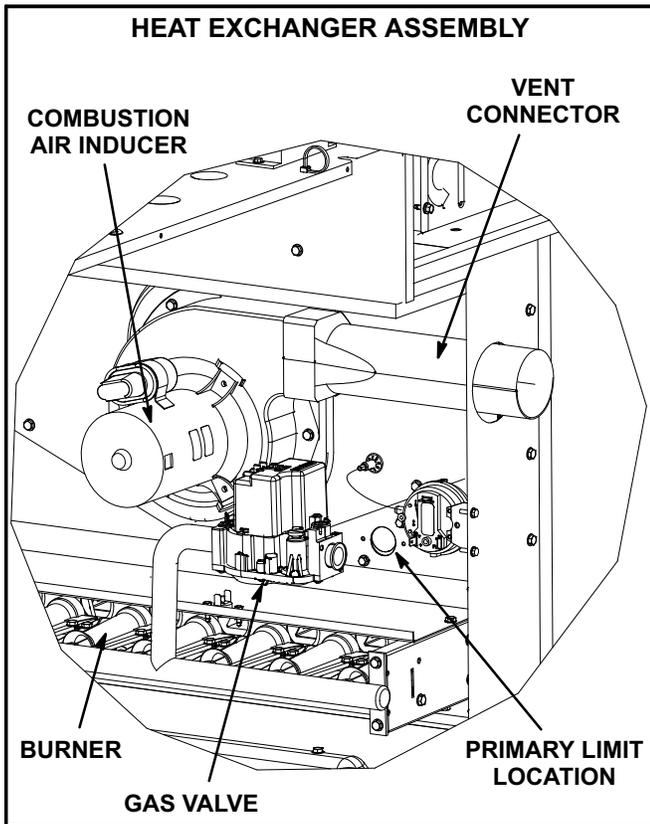


FIGURE 24

- 4- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Take care not to damage exposed fan blades. Clean accumulated dust from front of flue box cover.
- 5- Return combustion air inducer motor and vent connector to original location and secure with retained screws. It is recommended that gaskets be replaced during reassembly.
- 6- Replace the access panel.
- 7- Clean combustion air inlet louvers on heat access panel using a small brush.

E-Flue Box (Gas Units)

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

F-Evaporator Coil

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

G-Condenser Coil

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

Clean the all-aluminum coil by spraying the coil steadily and uniformly from top to bottom. Do not exceed 900 psi or a 45 degree 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-Compressor

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

▲ IMPORTANT

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

J-Supply Air Blower Wheel

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

INSTALLATION INSTRUCTIONS

⚠ WARNING

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

⚠ CAUTION

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

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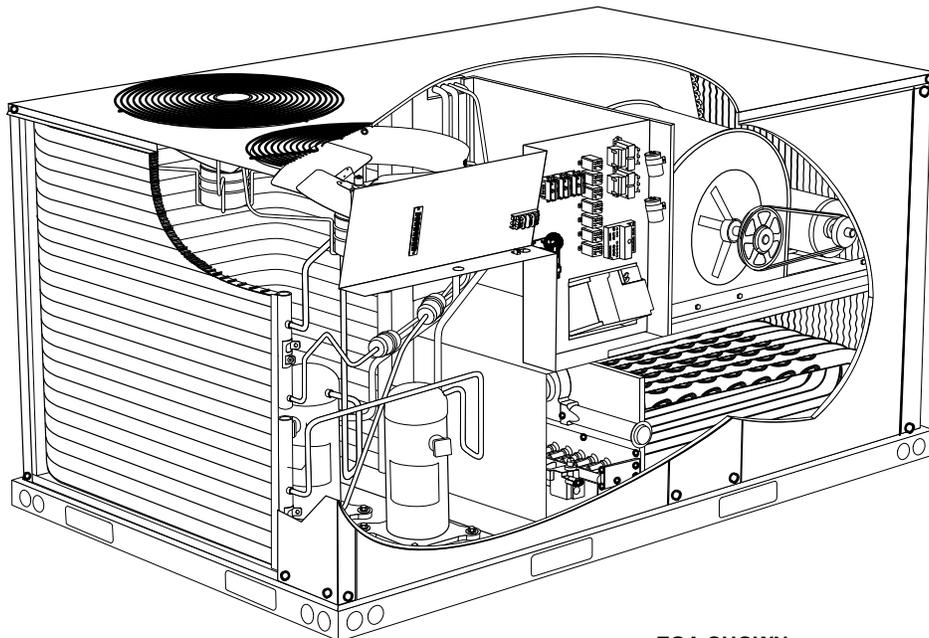
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ZGA/ZCA092	(7.5 Ton)
ZGA/ZCA102	(8.5 Ton)
ZGA/ZCA120	(10 Ton)
ZGA/ZCA150	(12-1/2 Ton)

GAS AND COOLING PACKAGED UNITS
507256-02
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RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE



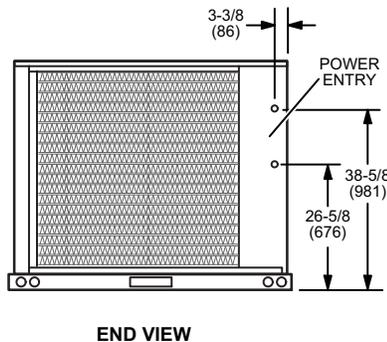
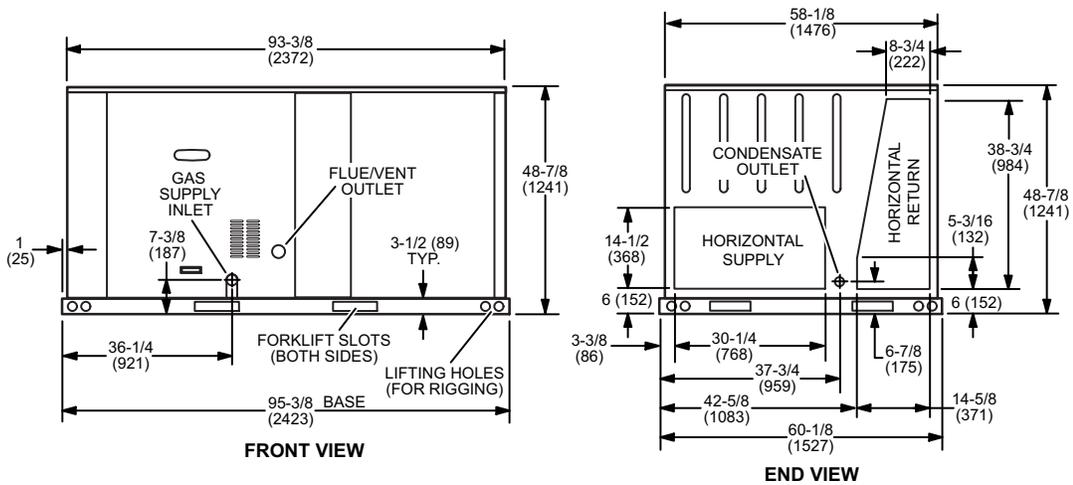
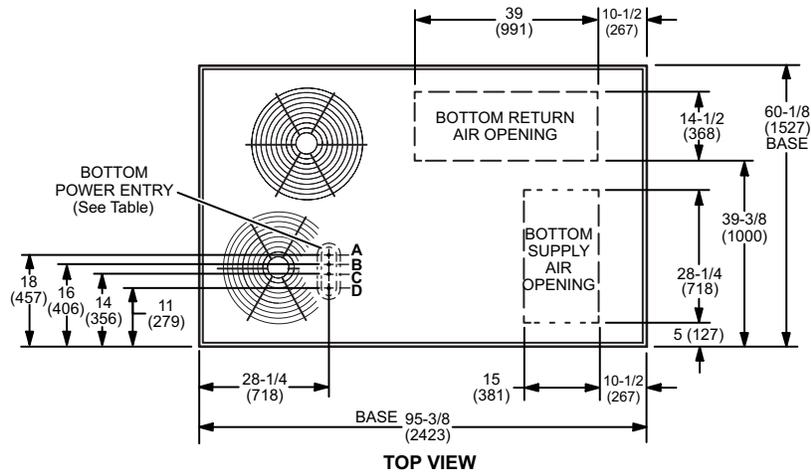
ZGA SHOWN

ZGA/ZCA092, 102, 120, & 150 DIMENSIONS - Gas heat section shown

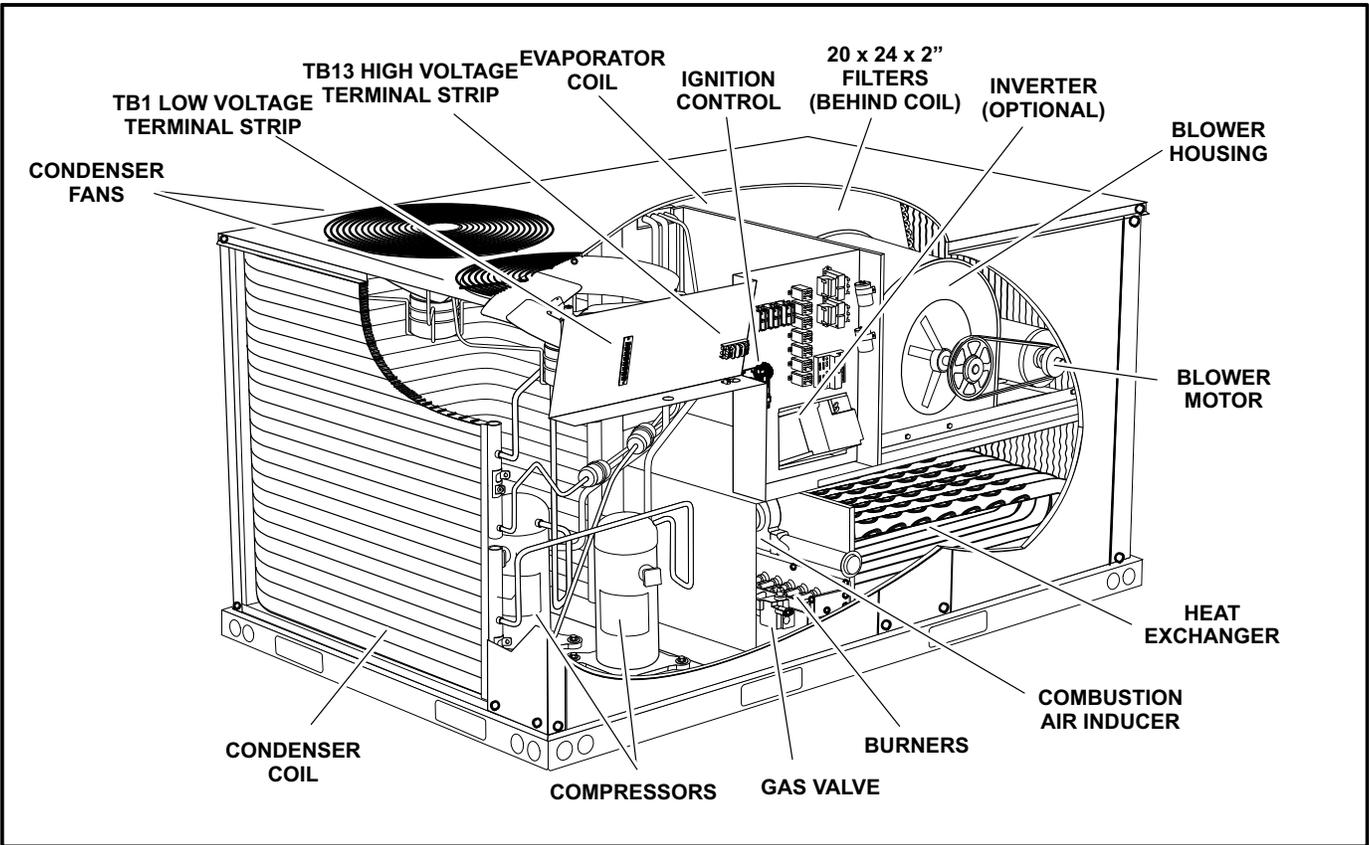
BOTTOM POWER ENTRY

Holes required for Optional Bottom Power Entry Kit

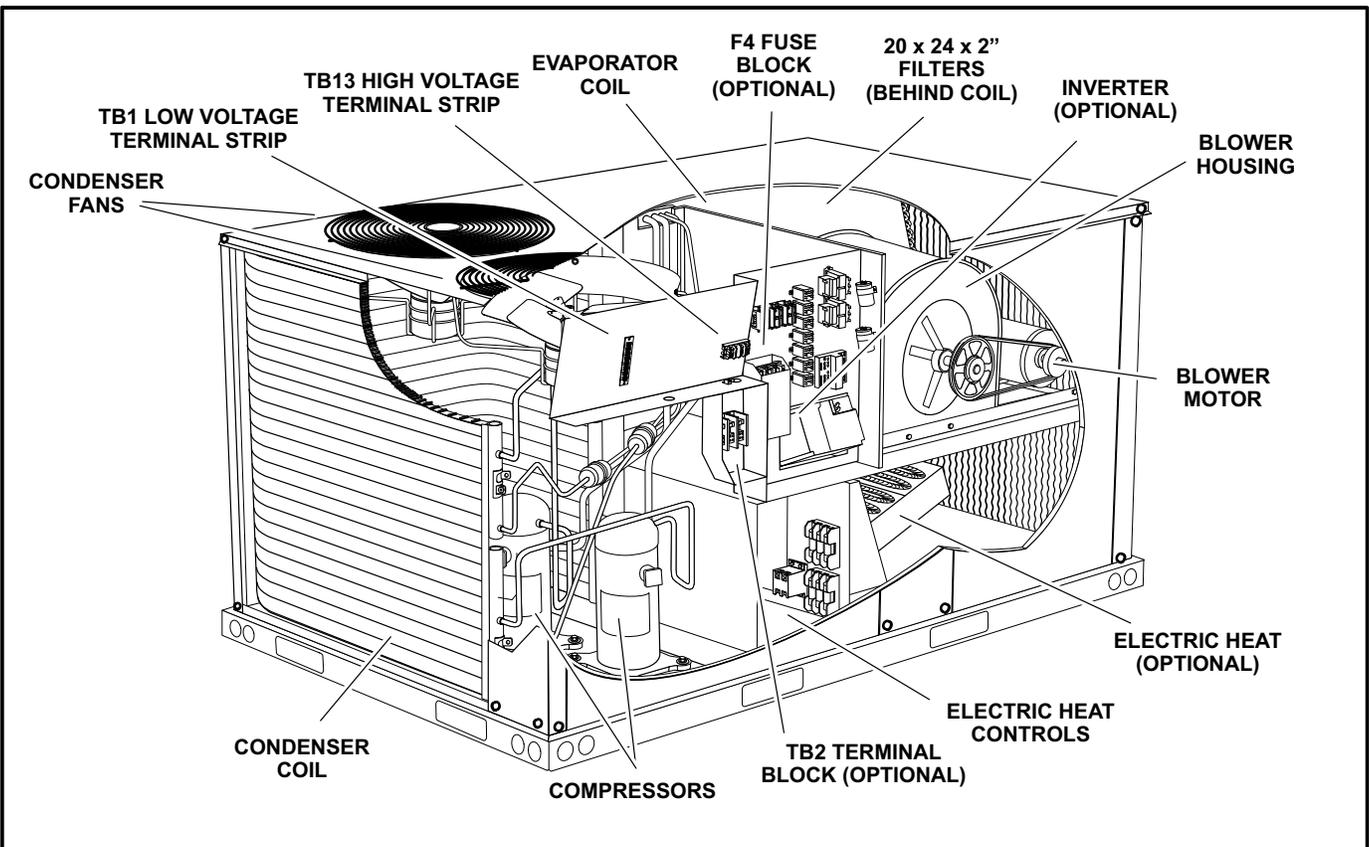
	Threaded Conduit Fittings (Provided in Kit)	Wire Use	Hole Diameter Required in Unit Base (Max.)
A	1/2	ACC.	7/8 (23)
B	1/2	24V	7/8 (23)
C	1-1/4	POWER	1-3/4 (44)
D	3/4	AUX	1-3/4 (44)



ZGA092, 102, 120, & 150 PARTS ARRANGEMENT



ZCA092, 102, 120, & 150 PARTS ARRANGEMENT



Shipping and Packing List

Package 1 of 1 contains:

1- Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

The ZGA units are available in three heating inputs. The ZCA cooling packaged rooftop unit is the same basic design as the ZGA unit except for the heating section. Optional electric heat is available for ZCA units. ZGA and ZCA units have identical refrigerant circuits with respective 7-1/2, 8-1/2, 10, and 12-1/2 ton cooling capacities.

Units are available with an optional supply air inverter. During cooling, the blower will operate at lower speeds when demand is low and increase to higher speeds when demand is high. During a blower only demand, the blower will operate at low speed. During a heating demand, the blower will operate at high speed.

Availability of units and options varies by brand.

Safety

See figure 1 for unit clearances.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

⚠️ IMPORTANT

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

⚠️ WARNING



Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

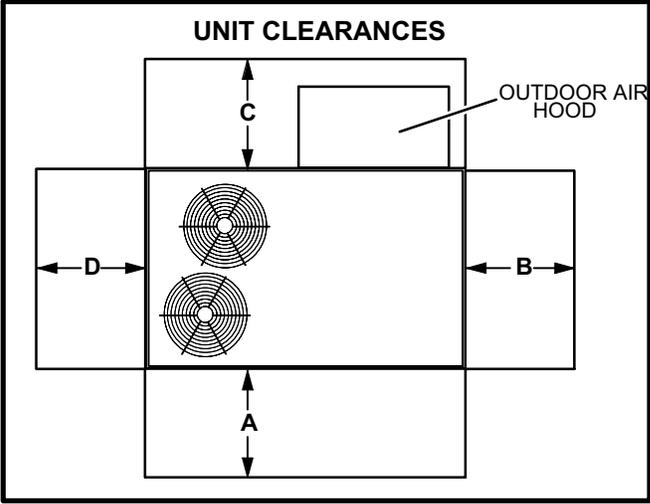


FIGURE 1

¹ Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	36 (914)	36 (914)	60 (1524)	36 (914)	Unob- structed
Clearance to Combustibles*	36 (914)	1 (25)	1 (25)	1 (25)	Unob- structed
Minimum Operation Clearance	36 (914)	36 (914)	60 (1524)	36 (914)	Unob- structed

Note - Entire perimeter of unit base requires support when elevated above mounting surface.

¹ **Service Clearance** - Required for removal of serviceable parts.

Clearance to Combustibles* - Required clearance to combustible material.

Minimum Operation Clearance - Required clearance for proper unit operation.

*Gas units.

⚠️ NOTICE

Roof Damage!
This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filters must be removed upon construction completion.
- The input rate and temperature rise must be set per the unit rating plate.

- The heat exchanger, components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

Unit Support

In downflow discharge installations, install the unit on a non-combustible surface only. Unit may be installed on combustible surfaces when used in horizontal discharge applications or in downflow discharge applications when installed on an Z1CURB roof mounting frame.

NOTE - Securely fasten roof frame to roof per local codes.

⚠ CAUTION

To reduce the likelihood of supply / return air bypass and promote a proper seal with the RTU, duct work / duct drops / diffuser assemblies must be supported independently to the building structure.

A-Downflow Discharge Application

Roof Mounting with Z1CURB

- 1- The Z1CURB roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2- The Z1CURB roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

Installer's Roof Mounting Frame

Many types of roof frames can be used to install the unit depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

- 1- The base is fully enclosed and insulated, so an enclosed frame is not required.
- 2- The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).

- 4- Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.
- 5- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

NOTE-When installing a unit on a combustible surface for downflow discharge applications, an Z1CURB roof mounting frame is required.

B-Horizontal Discharge Applications

- 1- Specified installation clearances must be maintained when installing units. Refer to figure 1.
- 2- Top of support slab should be approximately 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.
- 3- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

Horizontal Air Discharge

Unit is shipped with panels covering the horizontal supply and return air openings. Remove horizontal covers and place over downflow opening for horizontal air discharge. See figure 2. Secure in place with sheet metal screws.

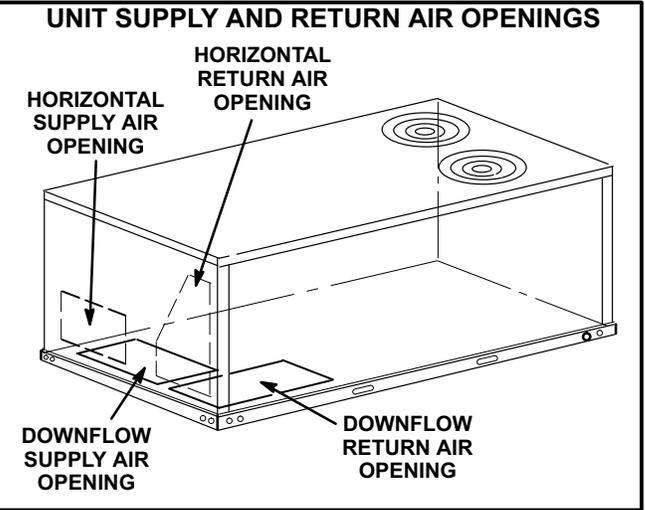


FIGURE 2

Units Equipped With An Optional Horizontal Economizer

- 1- Install the horizontal supply and return air covers over the down flow air openings as described above.
- 2- Install supply and return air ducts on the horizontal supply and return air openings on the unit. See figure 3.
- 3- Horizontal economizer and supply and return air duct must be field-supported.

3- Horizontal economizer and supply and return air duct must be field-supported.

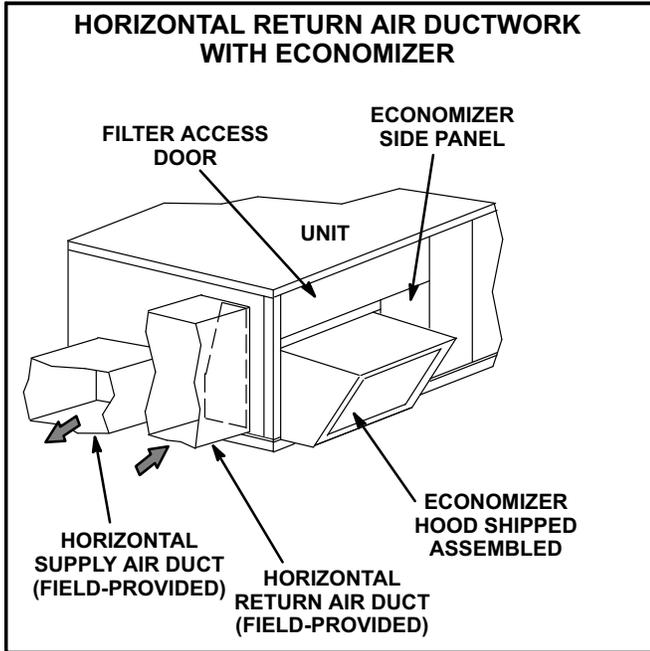


FIGURE 3

Duct Connection

All exterior ducts, joints and openings in roof or building walls must be insulated and weather-proofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

Rigging Unit For Lifting

Rig unit for lifting by attaching four cables to holes in unit base rail. See figure 4.

- 1- Detach wooden base protection before rigging.
- 2- Connect rigging to the unit base using both holes in each corner.
- 3- All panels must be in place for rigging.
- 4- Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)
- 5- **All Units** - Partially lift unit and remove five (5) L-brackets which secure the protective base board. See figure 4.

Important - Protective wooden base board must be removed before setting unit.

6- **New roof curbs (89-3/8" in length)** -

Remove the three alignment brackets shown in figure 5.

7- **Existing roof curbs (81-3/4" in length)** -

Set unit on roof curb positioning alignment brackets as shown in figure 5.

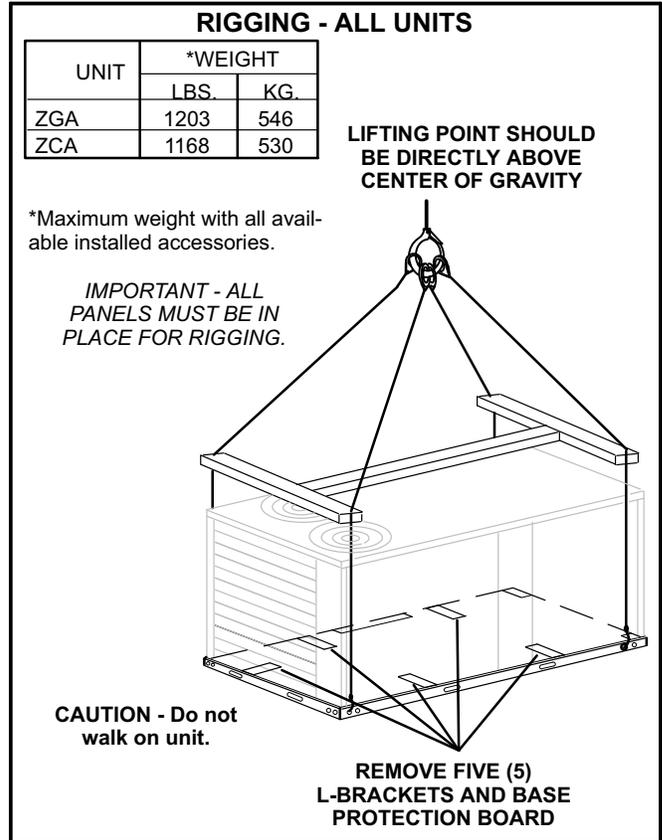


FIGURE 4

UNIT ALIGNMENT BRACKETS

NEW ROOF CURBS (89-3/8" IN LENGTH):
Remove all three brackets.

EXISTING ROOF CURBS (81-3/4" LONG):
Set unit on roof curb positioning alignment brackets as shown.

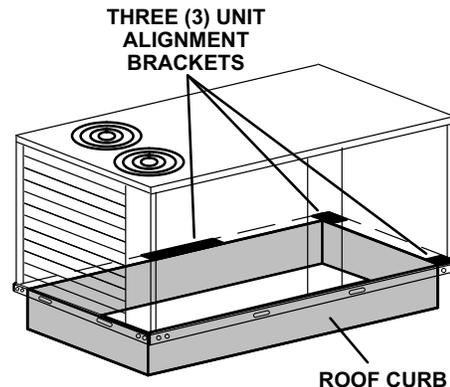


FIGURE 5

Condensate Drains

Make drain connection to the 1" N.P.T. drain coupling provided on unit.

Note - The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.

A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 6. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to page 2 for condensate drain location.

Units are shipped with the drain coupling facing the right side of the unit. The unit can be installed in either downflow or horizontal air discharge regardless of condensate drain location.

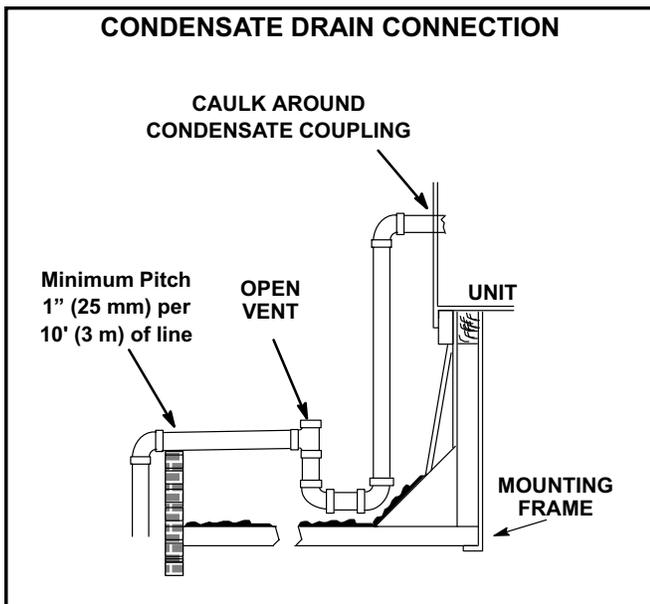


FIGURE 6

Connect Gas Piping (Gas Units)

Before connecting field-provided piping, check with gas company or authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5" w.c. (.12kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. For natural gas units, operating pressure at the unit gas connection must be a minimum of 4.7" w.c. (1.19kPa) and a maximum of 10.5" (2.60kPa) w.c. For LP/propane gas units, operating pressure at the unit gas connection must be a minimum of 11" w.c. (2.74kPa) and a maximum of 13.0" w.c. (3.23kPa).

When making piping connections a drip leg should be installed on vertical pipe runs to serve as a trap for sediment or condensate. A 1/8" N.P.T. plugged tap is located on gas valve for test gauge connection. Refer to Heating Start-Up section for tap location. Install a ground joint union between the gas control manifold and the main manual shut-off valve. See figure 7 for gas supply piping entering outside the unit. Figure 8 shows bottom gas entry piping through the curb.

Compounds used on threaded joints of gas piping shall be resistant to the action of liquified petroleum gases.

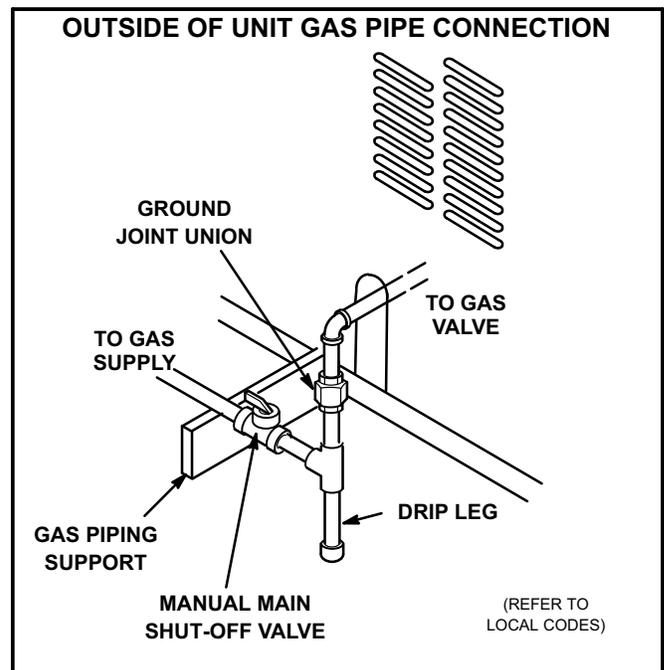


FIGURE 7

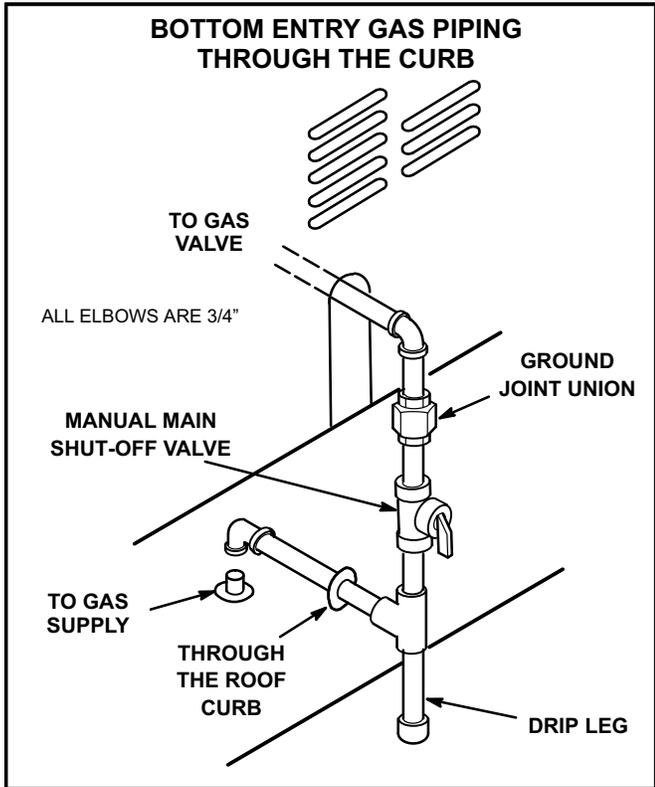


FIGURE 8

Pressure Test Gas Piping (Gas Units)

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 (3.48kPa). See figure 9.

NOTE-Codes may require that manual main shut-off valve and union (furnished by installer) be installed in gas line external to unit. Union must be of the ground joint type.

After all connections have been made, check all piping connections for gas leaks. Also check existing unit gas connections up to the gas valve; loosening may occur during installation. Use a leak detection solution or other preferred means. Do not use matches candles or other sources of ignition to check for gas leaks.

CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or othe sources of ignition to check for gas leaks.

WARNING



Danger of explosion. Can cause injury or product or property damage. Do not use matches, candles, flame or other sources of ignition to check for leaks.

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

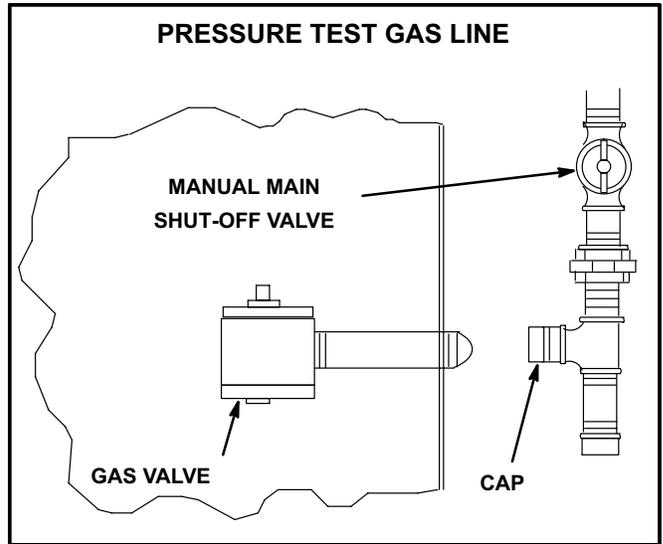


FIGURE 9

High Altitude Derate

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

Refer to table 1 for high altitude adjustments.

**TABLE 1
HIGH ALTITUDE DERATE**

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

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

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

Electrical Connections

POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- 1- 230/460/575 volt units are factory wired. **For 208V supply**, disconnect the pink wire (230V) at all control power transformer(s). Reconnect the pink wire (208V). Tape the exposed end of the 230V pink wire.
- 2- Route power through the bottom power entry area and connect to L1, L2, and L3 on the bottom of TB13 in control box. Route power to S48 disconnect switch when the option is factory-installed. See unit wiring diagram.

CONTROL WIRING

A-Thermostat Location

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

B-Control Wiring

- 1- Route thermostat cable or wires from subbase to control box (refer to unit dimensions to locate bottom and side power entry).

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring. Use wire ties located near the lower left corner of the controls hat section to secure thermostat cable.

Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

- 2- Install thermostat assembly in accordance with instructions provided with thermostat.

- 3- Connect thermostat wiring to TB1 terminal board on the left side of the controls area. Wire as shown in figure 10 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

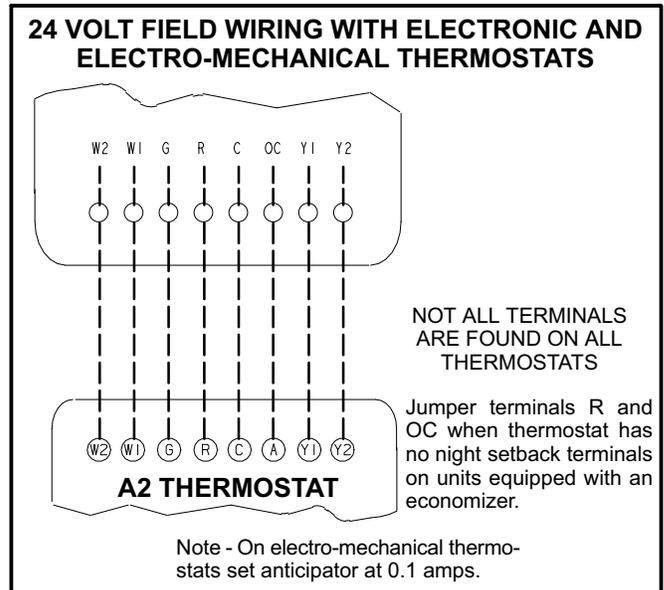


FIGURE 10

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

Unit Power-Up

A-General

- 1- Make sure that 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.
- 3- Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.
- 4- Check voltage at main unit power connection. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.
- 5- Make sure filters are in place before start-up.
- 6- Make sure there is no heating, cooling, or blower demand from thermostat. Apply power to unit.

Blower Operation and Adjustments

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 11.

- 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.

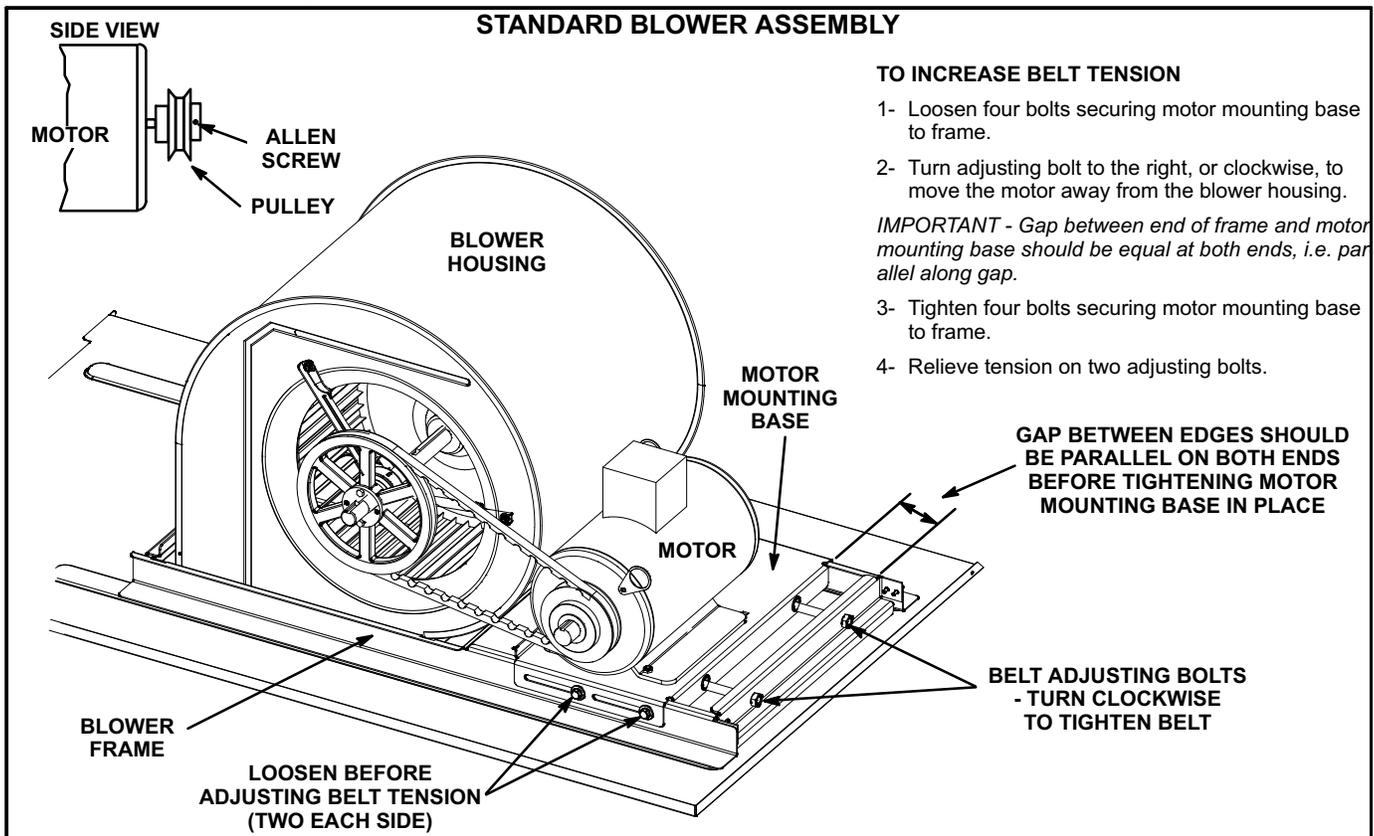


FIGURE 11

D-Determining Unit CFM

- 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 12.

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 11. Do not exceed minimum and maximum number of pulley turns as shown in table 2.
- 6- *Units Equipped With An Inverter -*
Reconnect high pressure switches S4 and S7.

TABLE 2
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 13.

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

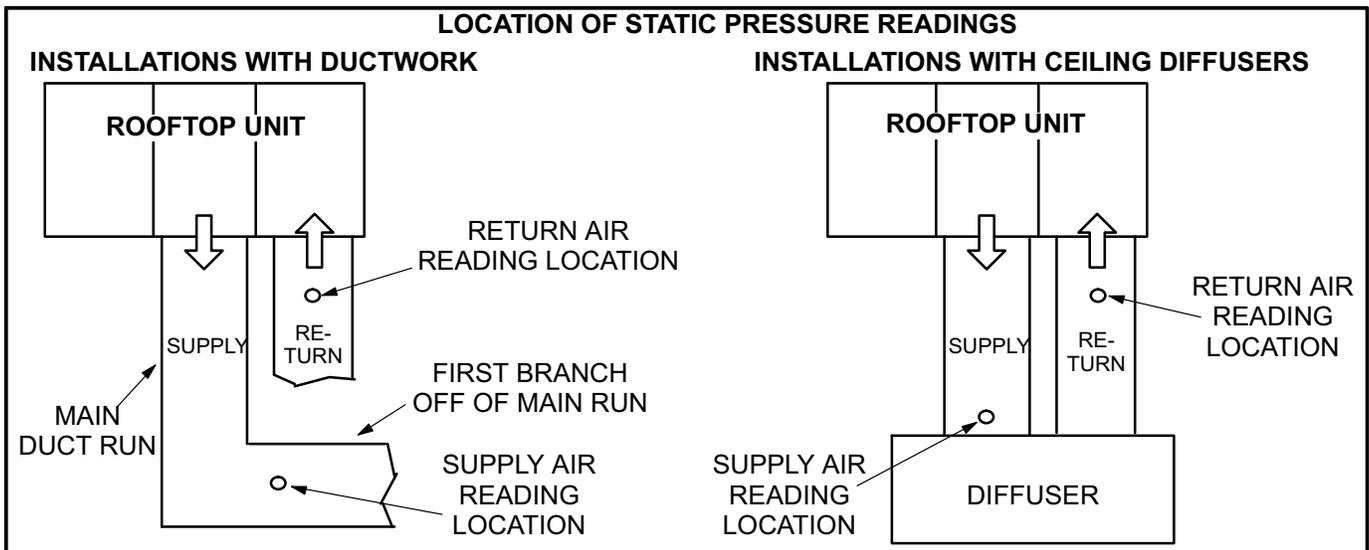


FIGURE 12

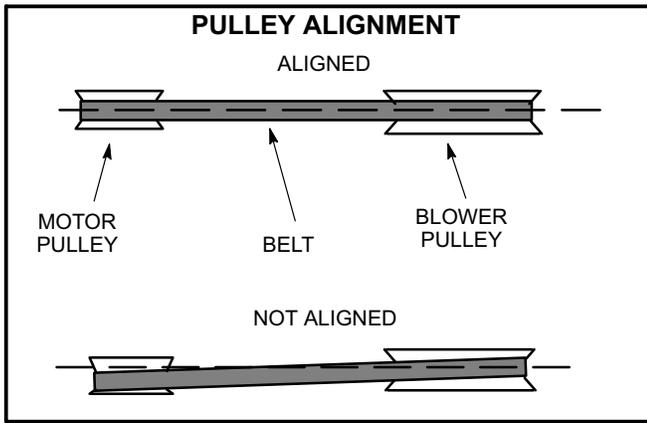


FIGURE 13

F-Check Belt Tension

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

- 1- Measure span length X. See figure 14.
- 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.

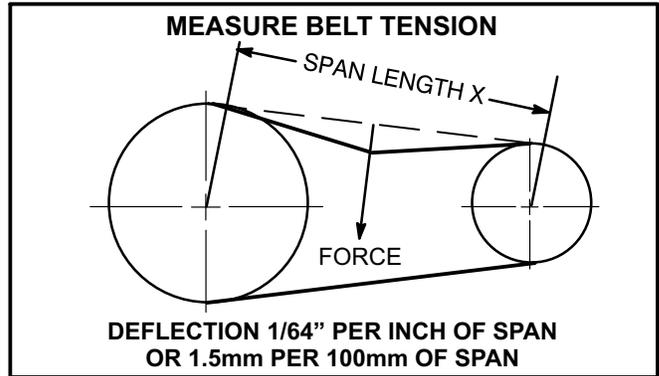


FIGURE 14

F-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 13 through 17 to determine BHP and RPM required. Reference table 3 for drive component manufacturer's numbers.

BLOWER DATA

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.

See page 17 for blower motors and drives.

See page 17 for wet coil and option/accessory air resistance data.

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

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.)

7.5kW, 15 kW, 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

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

BLOWER DATA

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.

See page 17 for blower motors and drives.

See page 17 for wet coil and option/accessory air resistance data.

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

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.)

7.5kW, 15 kW, 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

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

BLOWER DATA

120S 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 17 for blower motors and drives.

See page 17 for wet coil and option/accessory air resistance data.

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

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.)

15 kW - 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

60 kW - 3500 cfm

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	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		

BLOWER DATA

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.

See page 17 for blower motors and drives.

See page 17 for wet coil and option/accessory air resistance data.

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

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.)

15 kW, 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

60 kW - 3500 cfm

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	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 option are limited to a motor service factor of 1.0.

POWER EXHAUST FAN PERFORMANCE

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

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

Air Volume cfm	Wet Indoor Coil			Gas Heat Exchanger			Electric Heat	Economizer	Filters	
	092	102, 120	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	0.03	0.01	0.03
2000	0.02	0.04	0.05	0.07	0.05	0.06	0.03	0.05	0.01	0.03
2250	0.03	0.05	0.06	0.07	0.07	0.08	0.04	0.06	0.01	0.04
2500	0.03	0.05	0.07	0.09	0.10	0.11	0.04	0.08	0.01	0.05
2750	0.04	0.06	0.08	0.09	0.11	0.12	0.05	0.09	0.02	0.05
3000	0.05	0.07	0.09	0.11	0.12	0.13	0.06	0.11	0.02	0.06
3250	0.05	0.08	0.10	0.12	0.15	0.16	0.06	0.13	0.02	0.06
3500	0.06	0.09	0.11	0.12	0.16	0.17	0.09	0.15	0.03	0.07
3750	0.07	0.10	0.13	0.14	0.19	0.20	0.09	0.17	0.03	0.08
4000	0.07	0.11	0.14	0.14	0.21	0.22	0.09	0.19	0.04	0.08
4250	0.08	0.13	0.15	0.14	0.24	0.28	0.13	0.21	0.04	0.09
4500	0.09	0.14	0.17	0.15	0.26	0.32	0.14	0.24	0.04	0.09
4750	0.10	0.15	0.18	0.16	0.29	0.37	0.17	0.26	0.05	0.10
5000	0.10	0.16	0.20	0.16	0.34	0.43	0.20	0.29	0.06	0.10
5250	0.11	0.17	0.22	0.16	0.37	0.47	0.22	0.32	0.06	0.11
5500	0.12	0.19	0.23	0.18	0.44	0.54	0.25	0.34	0.07	0.12
5750	0.13	0.20	0.25	0.19	0.49	0.59	0.31	0.37	0.07	0.12
6000	0.14	0.22	0.27	0.20	0.54	0.64	0.33	0.40	0.08	0.13

**TABLE 3
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

Cooling Start-Up

A-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 15.
- 4- Each refrigerant circuit is separately charged with R-410A refrigerant. See unit rating plate for correct amount of charge.
- 5- Refer to Cooling Operation and Adjustment section for proper method to check refrigerant charge.

B-Refrigerant Charge and Check - All-Aluminum Coil

WARNING-Do not exceed nameplate charge under any condition.

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

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

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

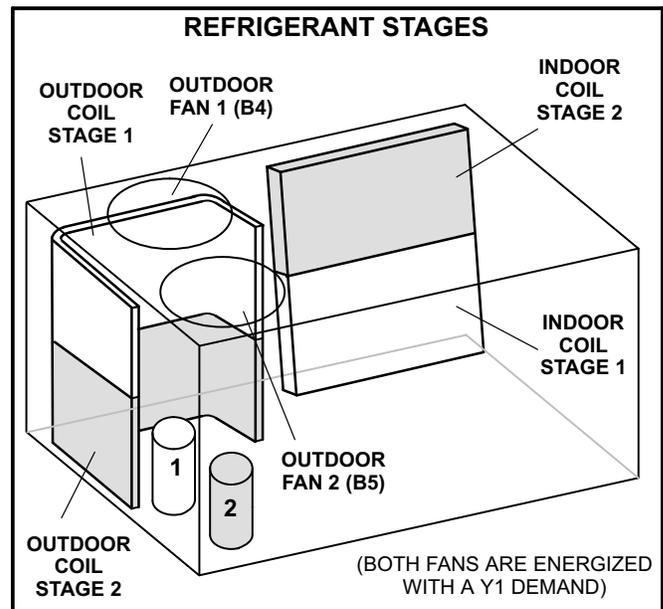


FIGURE 15

IMPORTANT - Charge unit in standard cooling mode.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Check each system separately with all stages operating. Compare the normal operating pressures (see tables 4 - 7) 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/ZC 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 4

092S 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

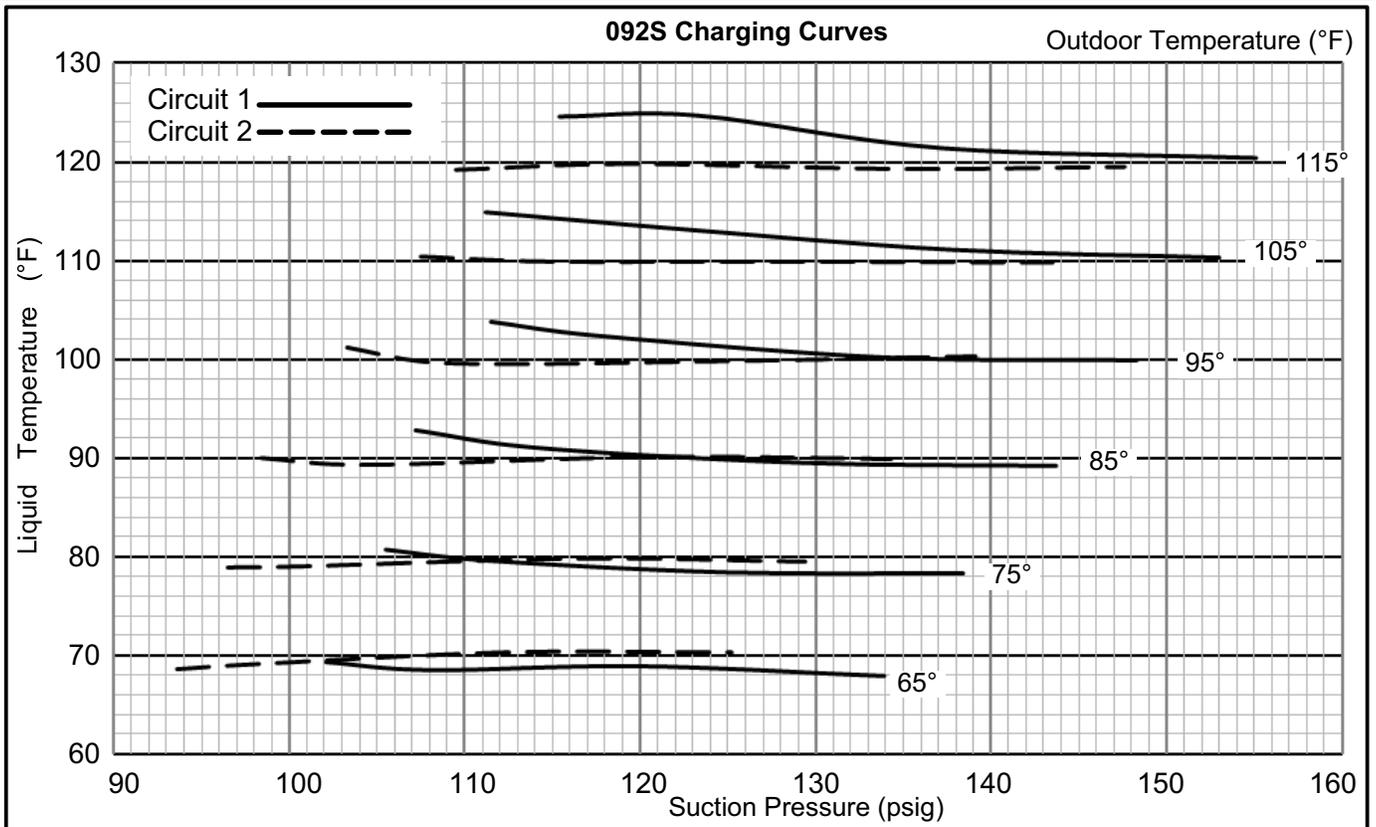


TABLE 5

102S 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

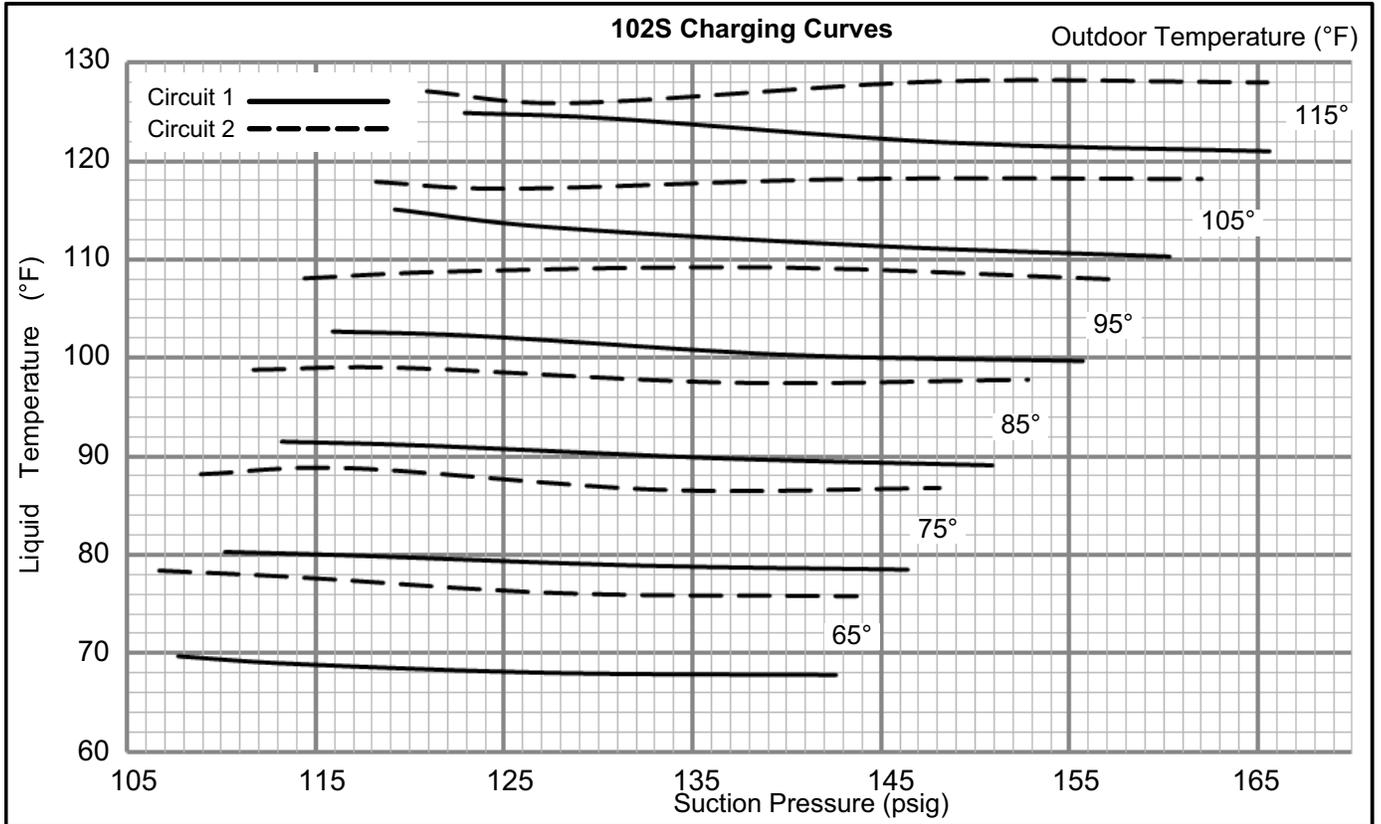


TABLE 6

120S 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

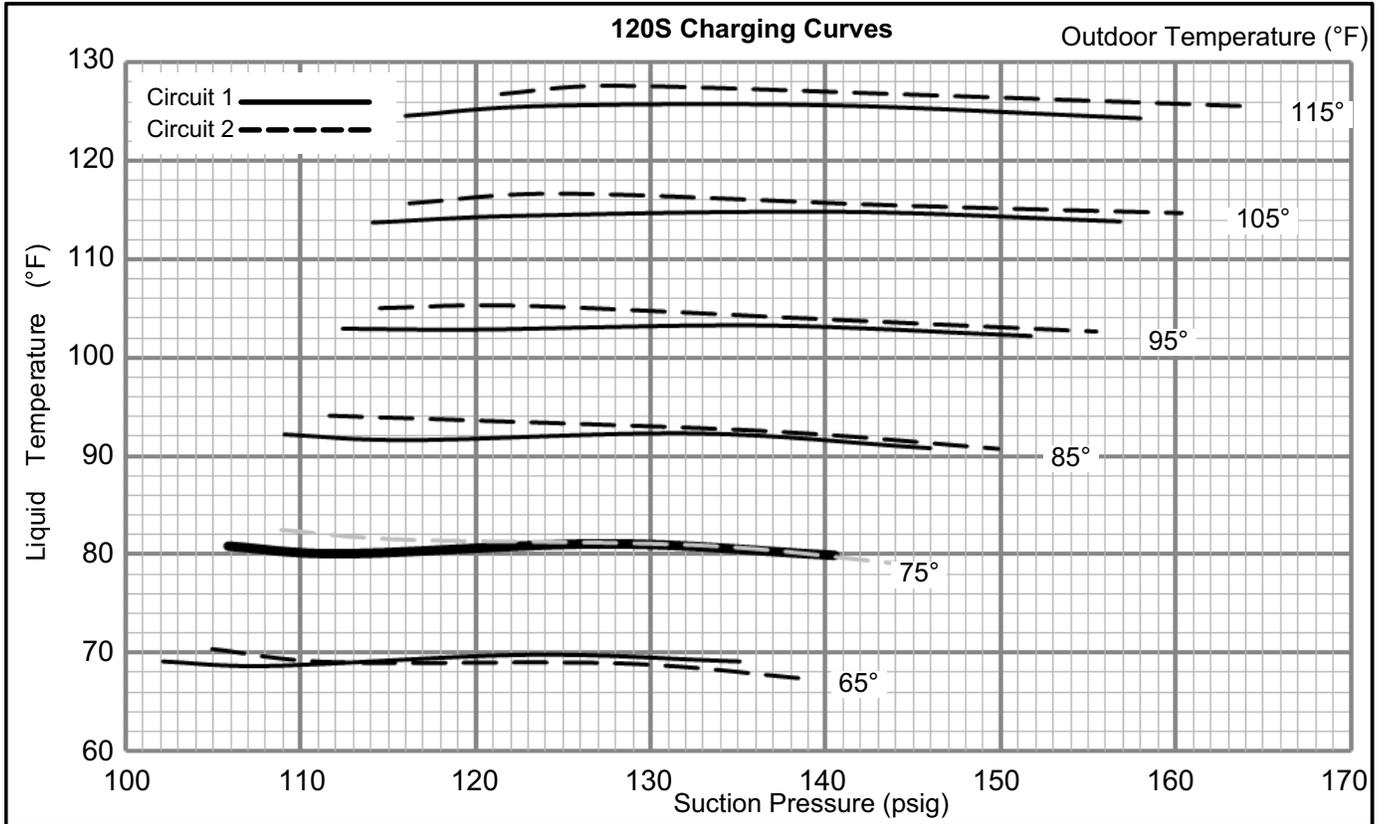
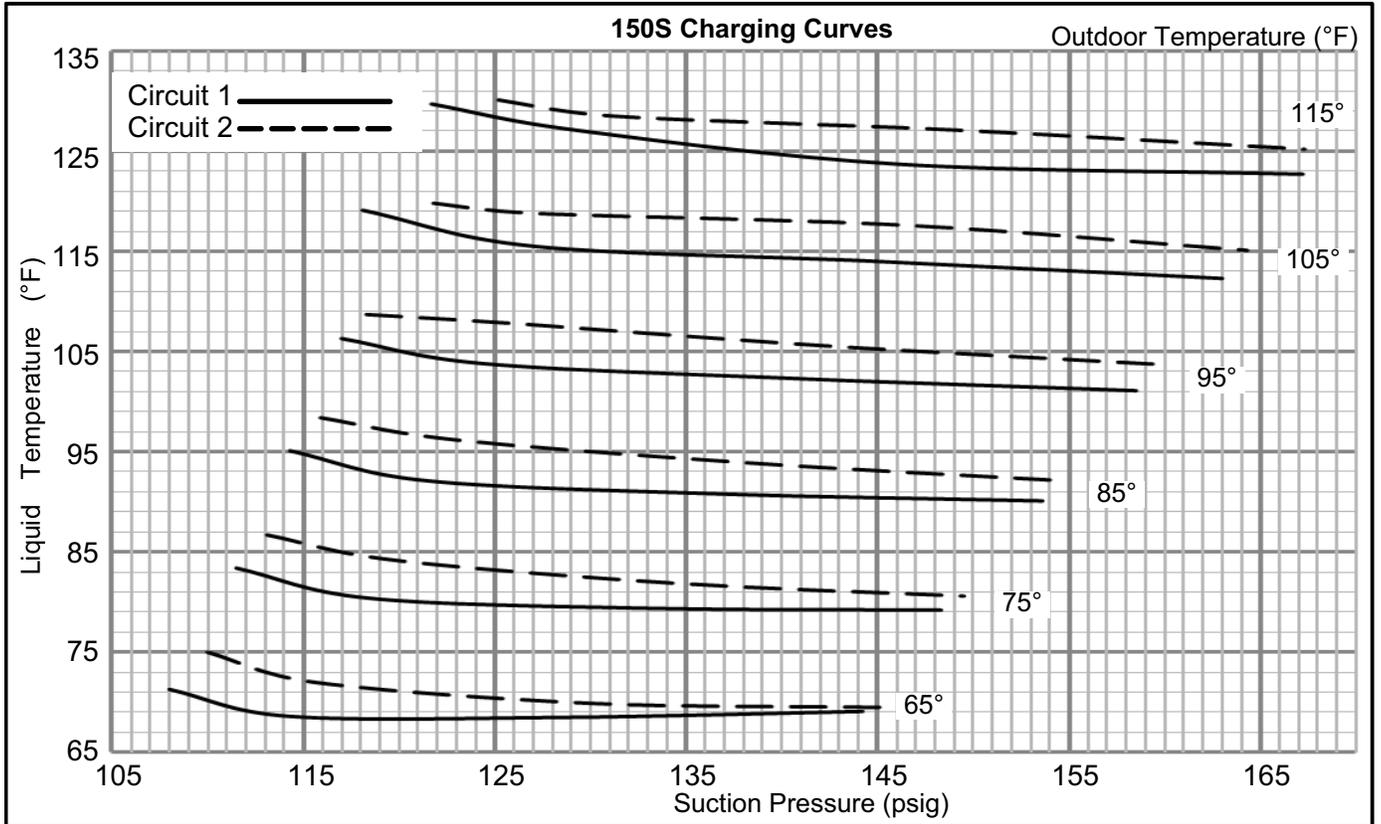


TABLE 7

150S 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



Gas Heat Start-Up (Gas Units)

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.

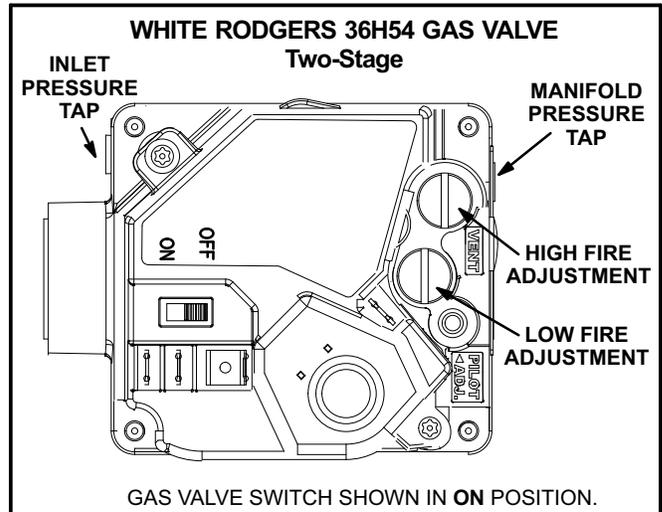


FIGURE 16

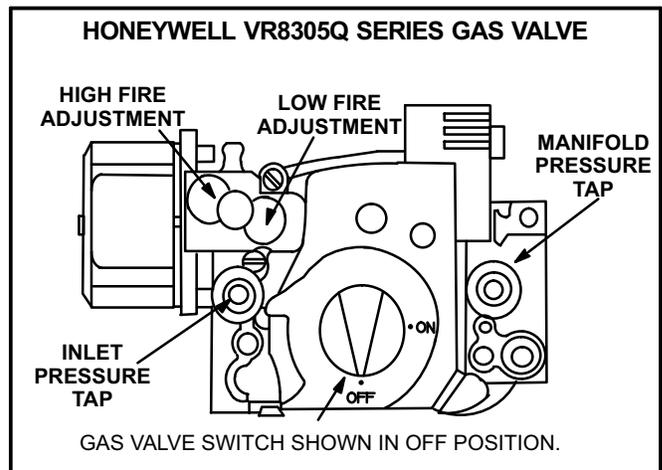


FIGURE 17

- 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.

Heating Operation and Adjustments

(Gas Units)

A-Heating Sequence of Operation

- 1- On a heating demand the combustion air inducer starts immediately.
- 2- Combustion air pressure switch proves inducer operation. After a 30-second pre-purge, power is

allowed to ignition control. Switch is factory set and requires no adjustment.

- 3- Spark ignitor energizes and gas valve solenoid opens.
- 4- Spark ignites gas, ignition sensor proves the flame and combustion continues.
- 5- If flame is not detected after first ignition trial, ignition control will repeat steps 3 and 4 two more times before locking out the gas valve.
- 6- For troubleshooting purposes, an ignition attempt after lock out may be re-established manually. Move thermostat to “OFF” and return thermostat switch to “HEAT” position.

B-Ignition Control Diagnostic LED's

**TABLE 8
IGNITION CONTROL HEARTBEAT LED STATUS**

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

C-Limit Controls

Limit controls are factory-set and are not adjustable. The primary limit is located on the bottom right of the control box.

D-Heating Adjustment

Main burners are factory-set and do not require adjustment.

The following manifold pressures are listed on the gas valve.

- Natural Gas Units - Low Fire - 1.6” w.c. (not adjustable)
- Natural Gas Units - High Fire - 3.7” w.c.
- LP Gas Units - Low Fire - 5.5” w.c. (not adjustable)
- LP Gas Units - High Fire - 10.5” w.c.

Electric Heat Start-Up (ZCA Units)

Optional electric heat will stage on and cycle with thermostat demand. Number of stages of electric heat will vary depending on electric heat assembly. See electric heat wiring diagram on unit for sequence of operation.

Service

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

⚠ CAUTION

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

⚠ WARNING

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

A-Filters

Units are equipped with 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 18. Lift filter stop to remove filters. See figure 19.

⚠ 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 19.

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

B-Compressor

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

⚠ IMPORTANT

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

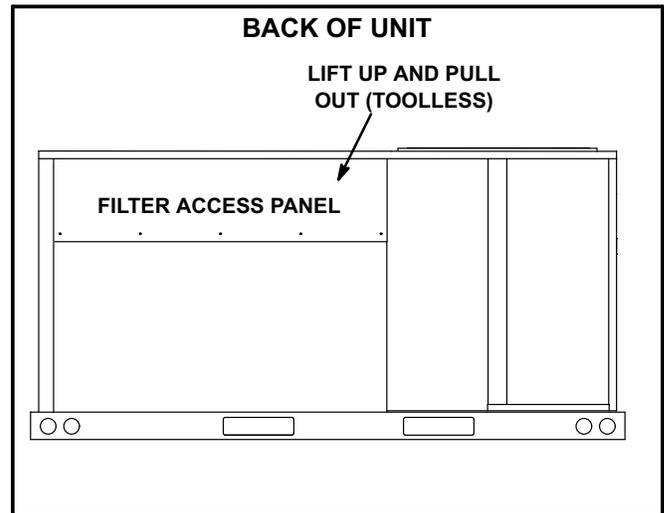


FIGURE 18

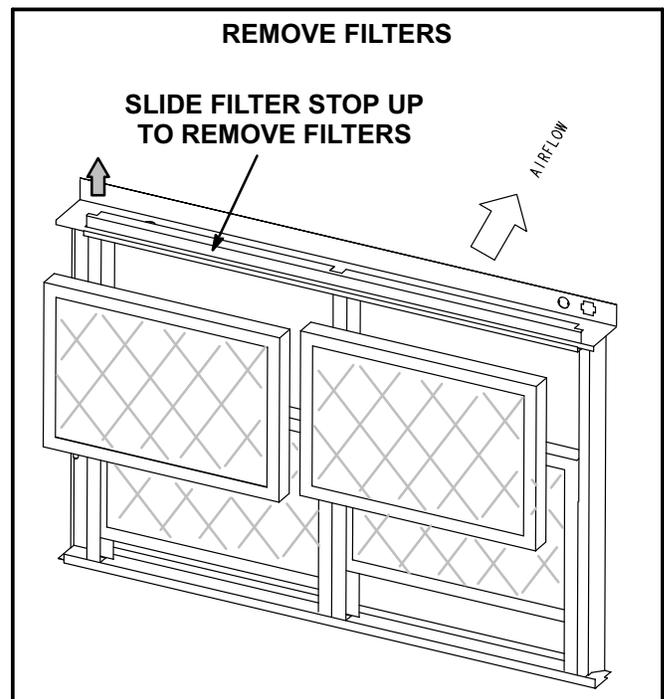


FIGURE 19

C-Lubrication

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

D-Burners (Gas Units)

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 20. Clean as necessary.

4- Locate the ignitor under the left burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 21.

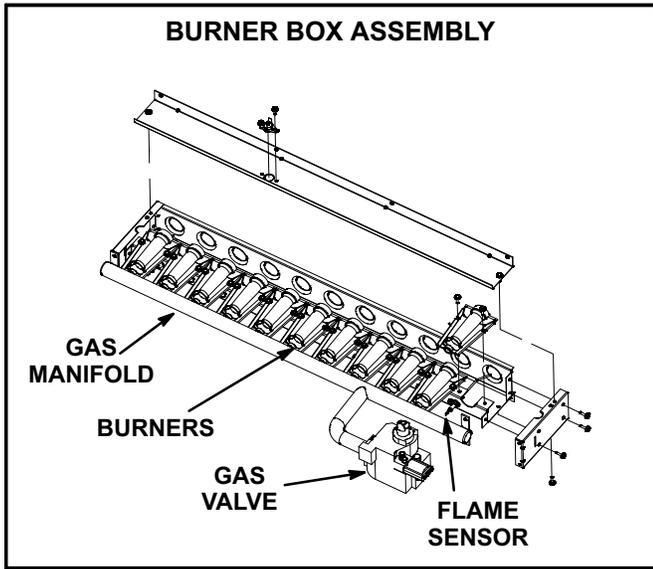


FIGURE 20

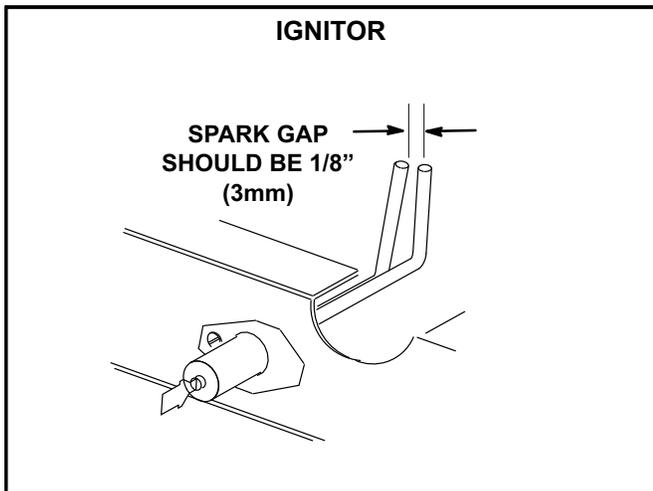


FIGURE 21

5- Check the alignment of the ignitor and the sensor as shown in figure 22 and table 9.

6- Replace burners and screws securing burner.

⚠ WARNING

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

TABLE 9

Dimension	Unit Btuh Input	Length - in. (mm)	
		Ignitor	Sensor
A	130K	7-3/4 (197)	11 (279)
B	180K	5 (127)	5-1/2 (140)
C	240K	2-1/4 (57)	2-3/4 (70)

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 (Gas Units)

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

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

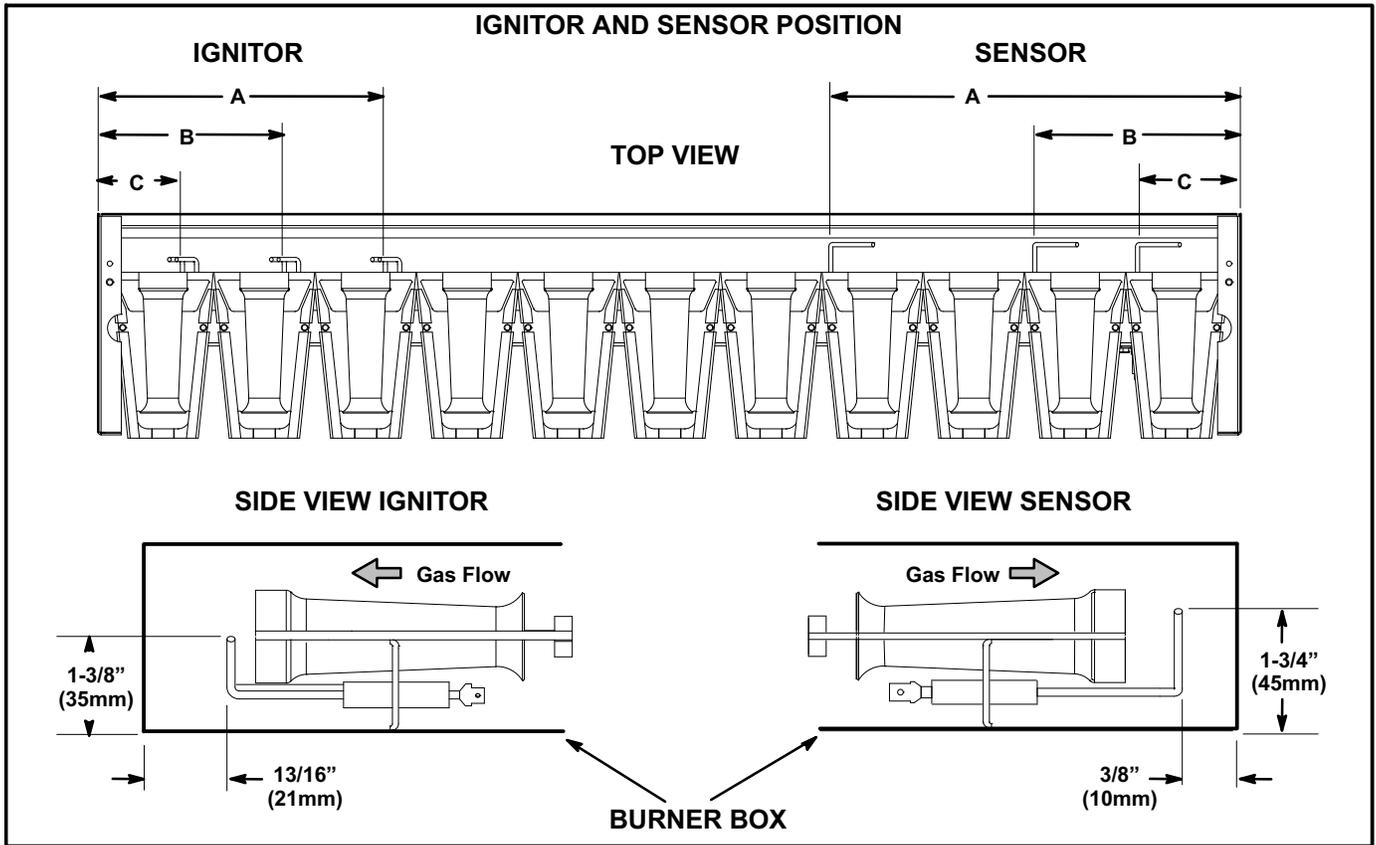


FIGURE 22

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 vent connector. See figure 23.

- 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 (Gas Units)

- 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.

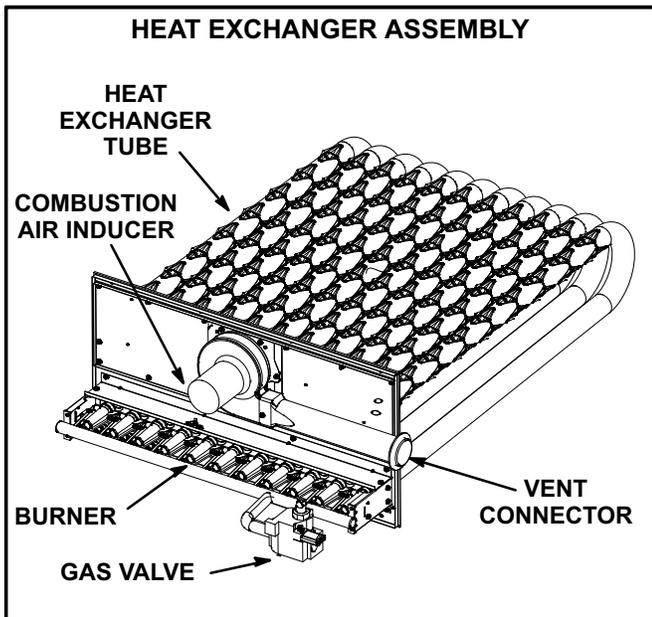


FIGURE 23

G-Evaporator Coil

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

H-Condenser Coil

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

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.

J-Supply Air Blower Wheel

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

INSTALLATION INSTRUCTIONS

⚠ WARNING

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

⚠ CAUTION

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

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

ZHA036 (3 TON)
ZHB036 (3 TON)
ZHA048 (4 TON)
ZHB048 (4 TON)
ZHA060 (5 TON)
ZHB060 (5 TON)

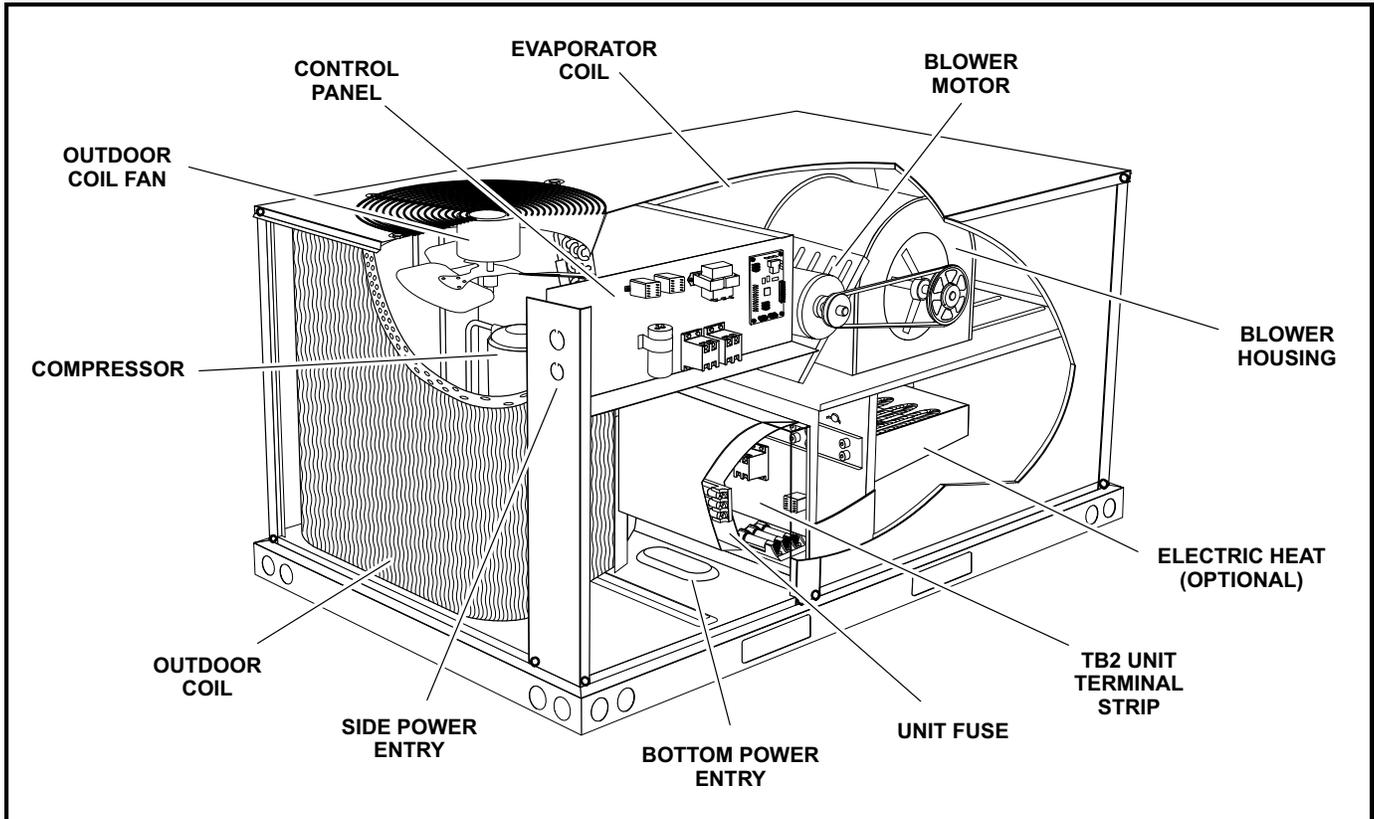
HEAT PUMP PACKAGED UNITS
 507111-02
 2/2015
 Supersedes 507111-01

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ZH 036, 048, 060 PARTS ARRANGEMENT

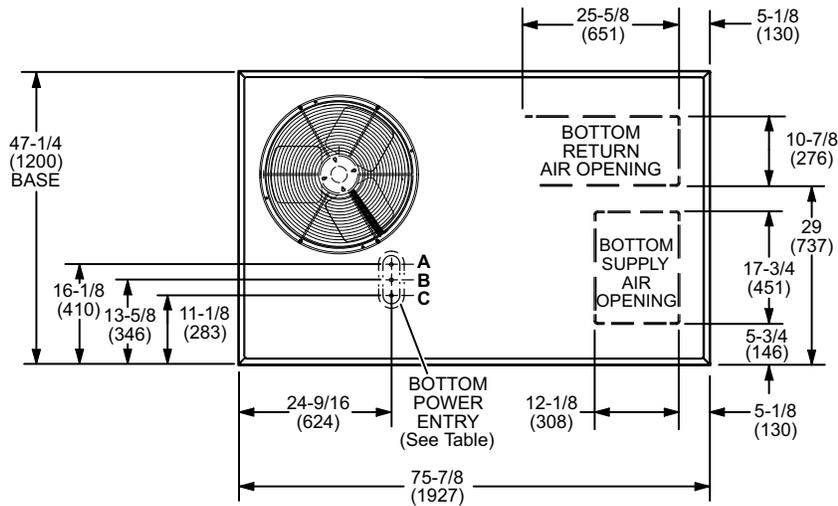


ZH 036, 048, 060, DIMENSIONS in (mm)

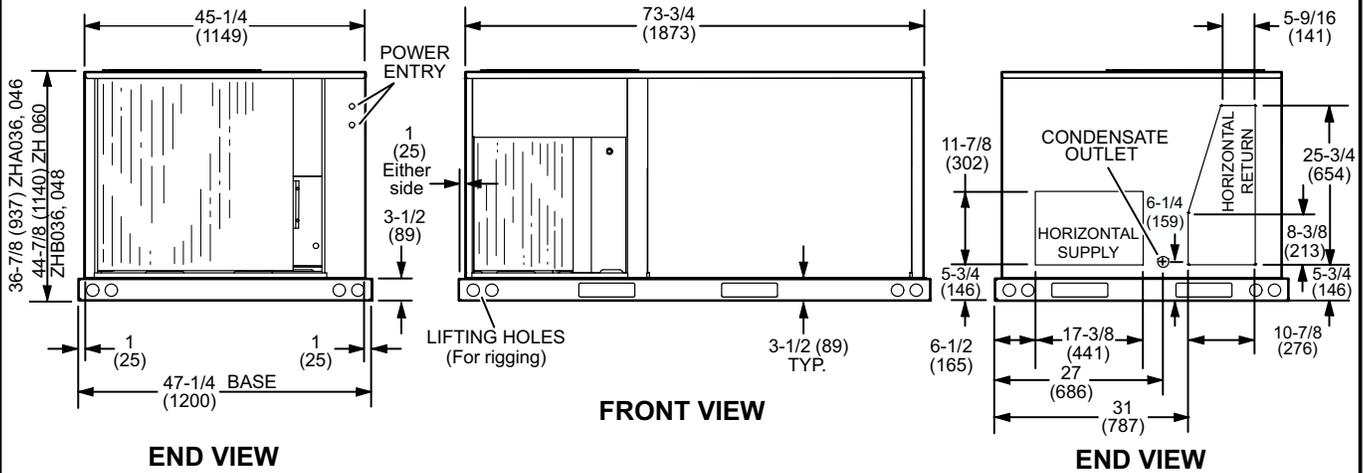
BOTTOM POWER ENTRY

Holes required for Optional Bottom Power Entry Kit

	Threaded Conduit Fittings (Provided in Kit)	Wire Use	Hole Diameter Required in Unit Base (Max.)
A	1/2	ACC.	7/8 (23)
B	1/2	24V	7/8 (23)
C	3/4	POWER	1-1/8 (29)



TOP VIEW (Base)



END VIEW

FRONT VIEW

END VIEW

Shipping and Packing List

Package 1 of 1 contains:

1 - Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

Availability of units and options varies by brand.

Requirements

The ZH unit is CSA certified as a heat pump with cooling and with or without auxiliary electric heat for non-residential use only at the clearances to combustible materials as listed on the unit nameplate and in figure 1.

Installation of ZH heat pumps must conform with standards in National Fire Protection Association (NFPA) "Standard for Installation of Air Conditioning and Ventilating Systems NFPA No. 90A," "Standard for Installation of Residence Type Warm Air Heating and Air conditioning Systems NFPA No. 90B," local municipal building codes and manufacturer's installation instructions.

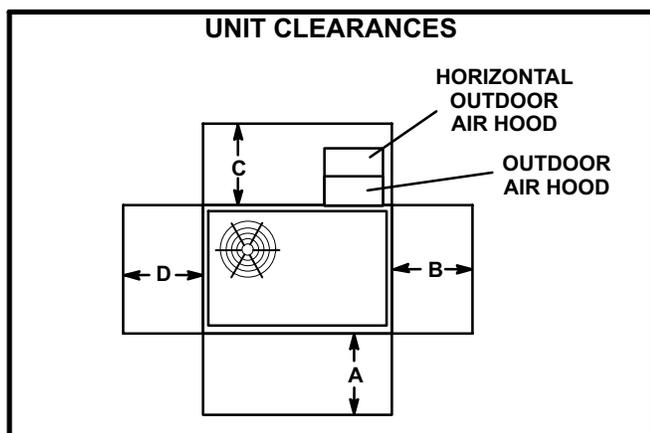


FIGURE 1

¹ Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	36 (914)	36 (914)	36* (914)	36 (914)	Unob- structed
Minimum Operation Clearance	36 (914)	36 (914)	36* (914)	36 (914)	Unob- structed

*Clearance is 60 in. (1524mm) in horizontal air flow applications.

Note - Entire perimeter of unit base requires support when elevated above mounting surface.

¹ **Service Clearance** - Required for removal of serviceable parts.

Minimum Operation Clearance - Required clearance for proper unit operation.

⚠ NOTICE

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

The National Electric Code (ANSI/NFPA No. 70-1984) is available from:

National Fire Protection Association
1 Batterymarch Park
PO Box 9101
Quincy, MA 02269-9101

Installation of CSA certified units must also conform with current standard C273.5 "Installation Requirements for Heat Pumps" and applicable local codes. Authorities having jurisdiction should be consulted before installation.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filter must be removed upon construction completion.
- The unit components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, and heating operation) must be verified according to these installation instructions.

⚠ WARNING



Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off electrical power to unit before performing any maintenance or servicing operations on the unit.

⚠ 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.

Unit Support

NOTE - Securely fasten roof frame to roof per local codes.

ZH 036, 048, 060 units are installed on Z1CURB frames.

A - Downflow Discharge Application

Roof Mounting with Z1CURB

- 1- The Z1CURB roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2- The Z1CURB roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

Installer's Roof Mounting Frame

Many types of roof frames can be used to install the unit, depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

- 1- The unit base is fully enclosed and not insulated, so an enclosed, insulated frame is required.
- 2- The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).
- 4- Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.
- 5- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

NOTE-When installing unit on a combustible surface for downflow discharge applications, the Z1CURB roof mounting frame is required.

B - Horizontal Discharge Applications

- 1- Specified installation clearances must be maintained when installing units. Refer to figure 1.
- 2- Top of support slab should be at least 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.
- 3- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

Duct Connection

All exterior ducts, joints, and openings in roof or building walls must be insulated and weatherproofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

⚠ CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

Rigging Unit For Lifting

- 1- Connect rigging to the unit base using both holes in each corner. See figure 2.
- 2- All panels must be in place for rigging.
- 3- Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)

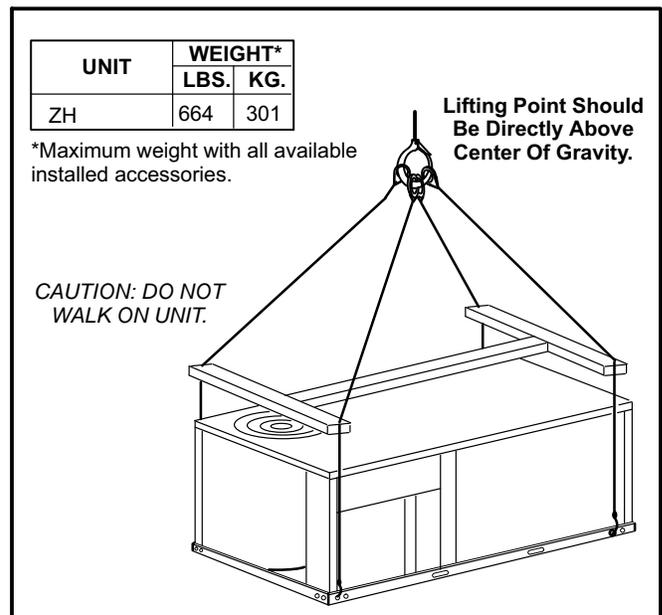


FIGURE 2

Horizontal Air Discharge

Unit is shipped with panels covering the horizontal supply and return air openings. See figure 3.

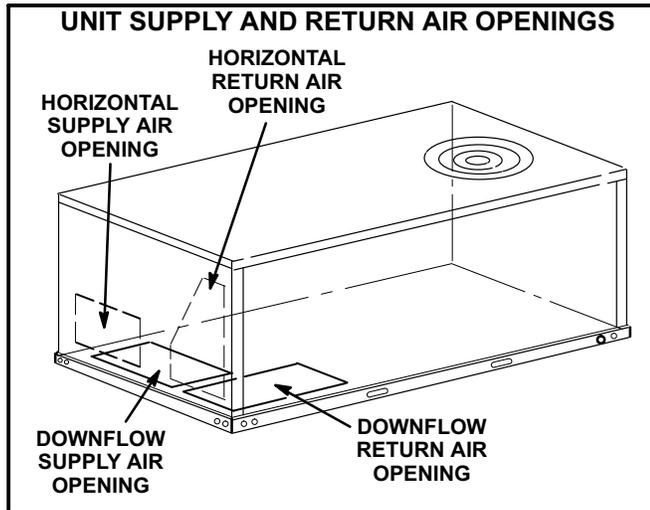


FIGURE 3

- 1- Remove horizontal covers and place a bead of silicone sealant on the underside of the duct cover flanges. See figure 4.
- 2- Position covers over downflow openings. Secure covers with self-drilling screws in at least two places on each cover. Drill through duct cover side into flange of base pan.
- 3- Place a bead of silicone between insulation and duct cover to seal in insulation edges. Let silicone dry before running gas or electric heat.

Units Equipped With An Optional Horizontal Economizer

- 1- Install the horizontal supply air cover over the down flow supply air opening as described above.
- 2- Leave the horizontal return air cover in place.
- 3- Locate the extra horizontal return cover that is included with the horizontal economizer kit. Install as described in previous section.

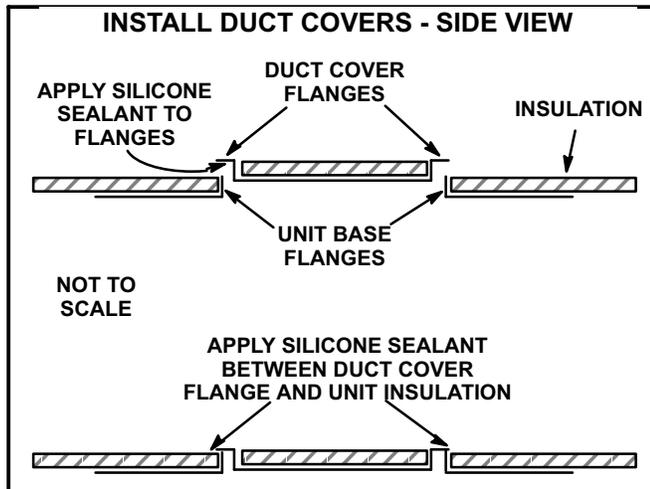


FIGURE 4

- 4- Install return air duct on the intake air side of the horizontal economizer. See figure 5.
- 5- Horizontal economizer and return air duct must be field-supported.

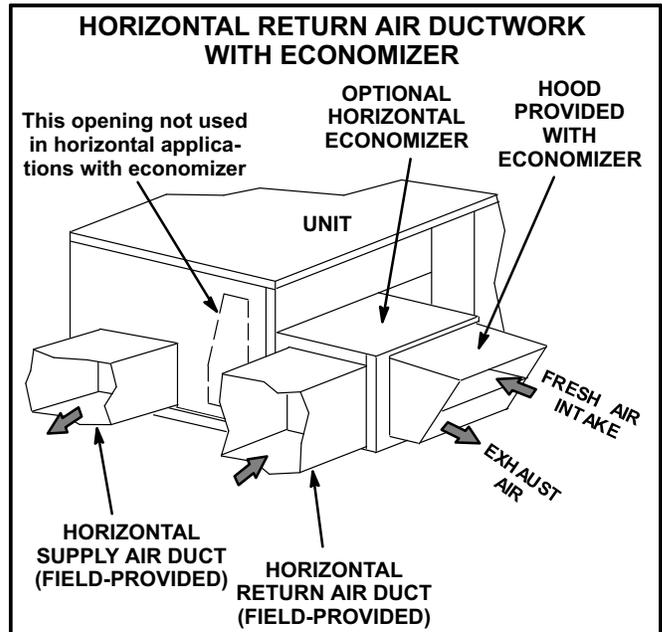


FIGURE 5

Condensate Drains

Make drain connection to the drain coupling provided on unit.

Note - The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.

A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 6. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to pages 1 and 2 for condensate drain location.

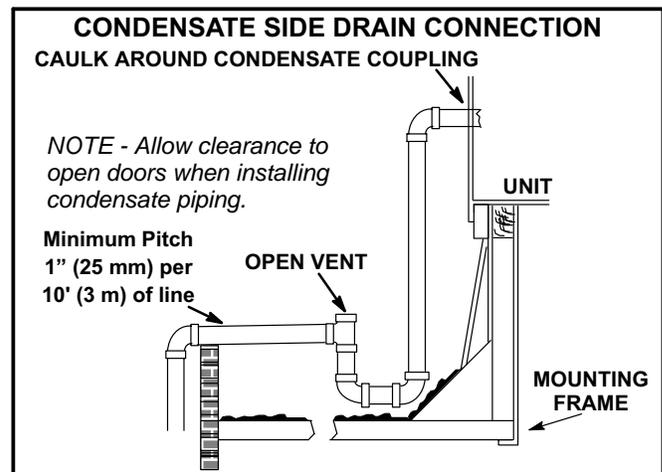


FIGURE 6

Electrical Connections

POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- Units are factory-wired for 240, 460, or 575 volt supply. **For 208V supply**, remove the insulated terminal cover from the 208V terminal on the control transformer. Move the wire from the transformer 240V terminal to the 208V terminal. Place the insulated terminal cover on the unused 240V terminal.
- Route power through the side or bottom power entry area. For bottom power entry, a bottom power entry kit must be used. Connect power wiring to K1/K3 contactors in control box. See figure 7. On units equipped with electric heat, route power wiring to TB2; see parts arrangement for location. See unit wiring diagram.

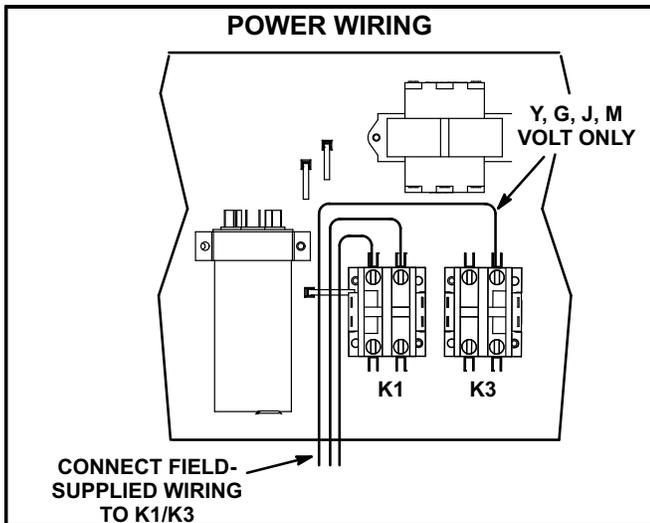


FIGURE 7

CONTROL WIRING

A - Thermostat Location

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524 mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring.

B - Control Wiring

- Route thermostat cable or wires from subbase to control panel (refer to unit dimensions to locate bottom and side power entry).
Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.
- Install thermostat assembly in accordance with instructions provided with thermostat.
- Connect thermostat wiring to low voltage leads in control box. Wire as shown in figure 8 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

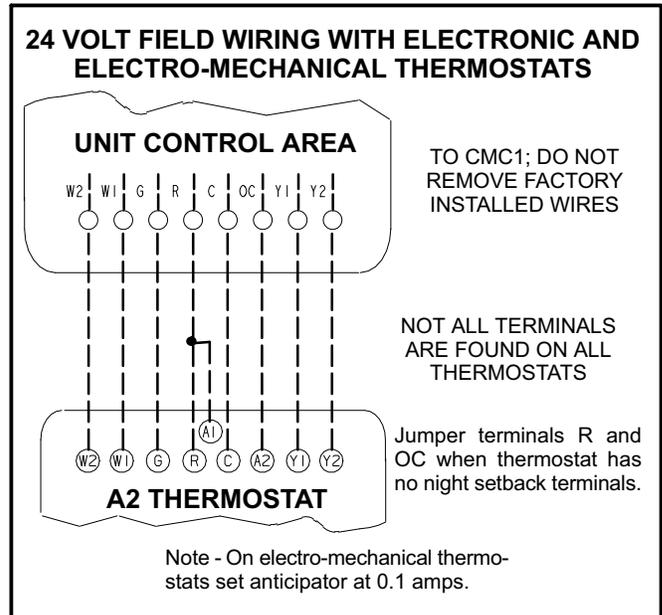


FIGURE 8

Blower Operation and Adjustments

Units are equipped with belt drive blowers; available drive varies by model.

⚠️ IMPORTANT

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

A - Blower Operation

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

- 1- Set thermostat or temperature control device fan switch to **AUTO** or **ON**. With fan switch in **ON** position, blower will operate continuously. With fan switch in **AUTO** position, the blower will cycle with demand.
- 2- Blower and entire unit will be off when thermostat or temperature control device system switch is in **OFF** position.

B - Determining Unit CFM

- 1- The following measurements must be made with air filters in place.
- 2- With all access panels in place, measure static pressure external to unit (from supply to return).

Blower performance data is based on static pressure readings taken in locations shown in figure 9.

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

- 3- Measure the indoor blower wheel RPM.
- 4- Referring to pages 9-14, use static pressure and RPM readings to determine unit CFM. Use option/accessory air resistance table on page 15 when installing units with any of the options or accessories listed. Refer to table 3 for minimum airflow when electric heat is installed.
- 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 10. Do not exceed minimum and maximum number of pulley turns as shown in table 1.

**TABLE 1
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Min. Turns Open	Maxi. Turns Open
A Section	No minimum	5

C - Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat grooves. Make sure blower and motor pulley are aligned as shown in figure 11.

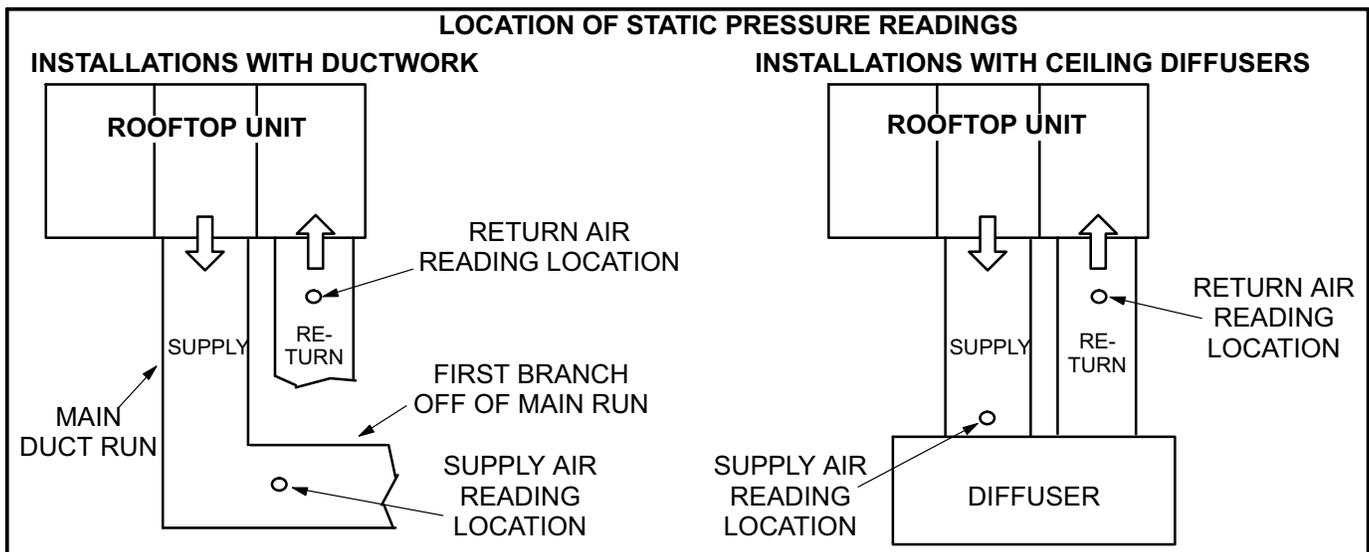


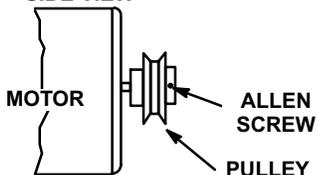
FIGURE 9

BLOWER ASSEMBLY

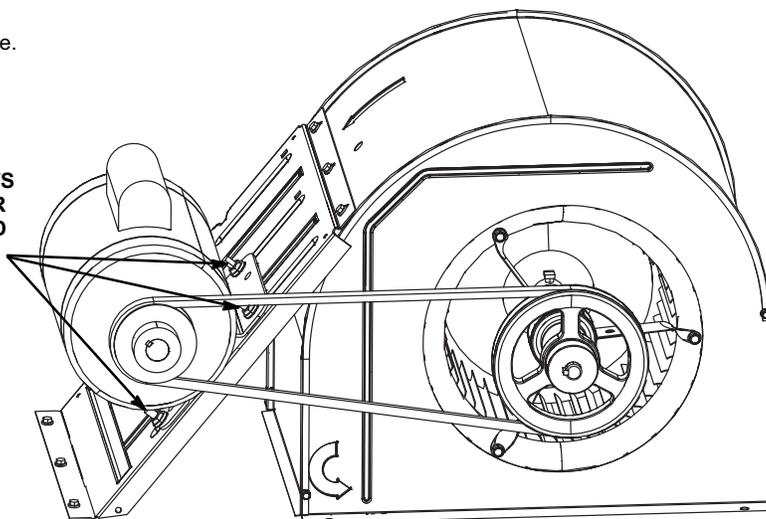
TO INCREASE BELT TENSION

- 1-Loosen four bolts securing motor base to mounting frame.
- 2-Slide the motor downward to tighten the belt.
- 3-Tighten four bolts on motor base.

SIDE VIEW



LOOSEN FOUR BOLTS AND SLIDE BLOWER MOTOR DOWNWARD TO TIGHTEN BELT



TO INCREASE CFM
LOOSEN ALLEN SCREW &
TURN PULLEY CLOCKWISE

TO DECREASE CFM
TURN PULLEY
COUNTERCLOCKWISE

FIGURE 10

PULLEY ALIGNMENT

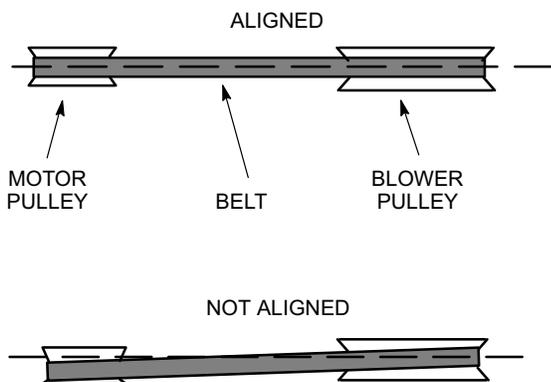


FIGURE 11

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

2- To increase belt tension -

Slide blower motor downward to tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -

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

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

D - Check Belt Tension

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

- 1- Measure span length X. See figure 12.

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

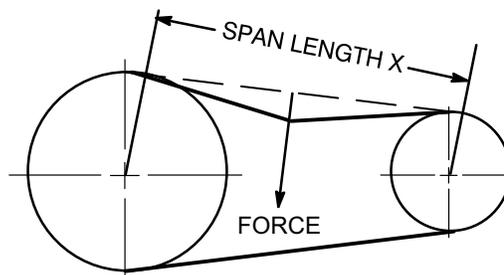
Example: Deflection distance of a 40" span would be 40/64" or 5/8".

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

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

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

MEASURE BELT TENSION



DEFLECTION 1/64" PER INCH OF SPAN
OR 1.5mm PER 100mm OF SPAN

FIGURE 12

E-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 9-14 to determine BHP and RPM required. Reference page 15 for additional air resistance and drive kit numbers. See table 2 for drive component manufacturer's numbers.

BLOWER DATA - BELT DRIVE - ZHA036

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

FOR ALL UNITS ADD:

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

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

See page 15 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	562	0.16	629	0.18	699	0.19	771	0.2	840	0.22	904	0.24	962	0.26	1015	0.29
1000	586	0.18	654	0.2	725	0.21	796	0.23	864	0.25	927	0.27	983	0.3	1034	0.33
1100	612	0.2	681	0.22	752	0.24	823	0.26	890	0.28	950	0.31	1004	0.34	1054	0.37
1200	641	0.23	711	0.25	783	0.27	852	0.29	917	0.32	975	0.35	1027	0.39	1074	0.42
1300	673	0.25	744	0.28	815	0.3	882	0.33	944	0.36	1000	0.4	1050	0.44	1096	0.48
1400	709	0.29	779	0.32	849	0.34	914	0.37	973	0.41	1026	0.45	1074	0.49	1118	0.53
1500	747	0.33	816	0.36	883	0.39	945	0.42	1001	0.46	1052	0.51	1098	0.55	1141	0.59

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1065	0.32	1112	0.35	1158	0.38	1202	0.41	1243	0.44	1284	0.48	1323	0.52	1364	0.55
1000	1082	0.36	1128	0.39	1173	0.42	1216	0.45	1257	0.49	1297	0.53	1336	0.57	1375	0.6
1100	1100	0.4	1145	0.44	1189	0.47	1231	0.51	1272	0.54	1311	0.58	1349	0.62	1388	0.66
1200	1119	0.45	1163	0.49	1206	0.52	1247	0.56	1287	0.6	1326	0.64	1364	0.68	1402	0.72
1300	1139	0.51	1182	0.55	1224	0.58	1265	0.62	1304	0.66	1342	0.71	1379	0.75	1416	0.79
1400	1160	0.57	1202	0.61	1243	0.65	1283	0.69	1322	0.73	1359	0.78	1396	0.82	1432	0.87
1500	1182	0.64	1223	0.68	1263	0.72	1303	0.76	1341	0.81	1378	0.85	1414	0.9	1449	0.94

HORIZONTAL

Air Volume cfm	External Static - in. w.g.																
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	
	Field Furnished				Kit ZA01												Kit ZA04
900	580	0.14	649	0.17	721	0.19	794	0.22	868	0.24	938	0.27	998	0.3	1045	0.33	
1000	612	0.17	681	0.19	752	0.22	825	0.25	897	0.27	963	0.3	1017	0.33	1061	0.37	
1100	647	0.2	717	0.23	788	0.26	858	0.28	926	0.31	986	0.34	1036	0.38	1077	0.41	
1200	687	0.23	757	0.26	826	0.29	893	0.32	955	0.35	1008	0.39	1054	0.42	1095	0.46	
1300	730	0.27	798	0.3	864	0.33	926	0.37	982	0.4	1030	0.44	1073	0.47	1116	0.51	
1400	775	0.31	840	0.34	902	0.38	959	0.42	1009	0.46	1054	0.5	1096	0.53	1140	0.56	
1500	820	0.36	881	0.4	939	0.44	993	0.49	1039	0.53	1082	0.56	1124	0.59	1168	0.62	

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1091	0.36	1140	0.38	1188	0.4	1232	0.43	1272	0.46	1309	0.49	1346	0.53	1383	0.57
1000	1105	0.4	1154	0.42	1201	0.45	1245	0.47	1284	0.5	1321	0.54	1357	0.58	1394	0.62
1100	1121	0.44	1169	0.47	1216	0.49	1259	0.52	1298	0.56	1335	0.6	1370	0.64	1406	0.69
1200	1139	0.49	1187	0.52	1234	0.54	1276	0.58	1314	0.62	1350	0.66	1385	0.71	1421	0.75
1300	1161	0.54	1208	0.57	1254	0.6	1295	0.64	1332	0.69	1366	0.73	1401	0.78	1436	0.83
1400	1185	0.59	1232	0.63	1276	0.67	1315	0.71	1351	0.76	1384	0.81	1419	0.86	1454	0.9
1500	1212	0.66	1257	0.7	1299	0.74	1337	0.79	1371	0.84	1404	0.89	1438	0.94	1473	0.99

BLOWER DATA - BELT DRIVE - ZHA048

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

FOR ALL UNITS ADD:

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

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

See page 15 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	641	0.23	711	0.25	783	0.27	852	0.29	917	0.32	975	0.35	1027	0.39	1074	0.42
1300	673	0.25	744	0.28	815	0.30	882	0.33	944	0.36	1000	0.40	1050	0.44	1096	0.48
1400	709	0.29	779	0.32	849	0.34	914	0.37	973	0.41	1026	0.45	1074	0.49	1118	0.53
1500	747	0.33	816	0.36	883	0.39	945	0.42	1001	0.46	1052	0.51	1098	0.55	1141	0.59
1600	787	0.38	854	0.41	918	0.44	976	0.48	1030	0.52	1078	0.56	1123	0.61	1164	0.66
1700	827	0.43	892	0.46	952	0.49	1007	0.53	1058	0.58	1105	0.63	1148	0.68	1189	0.73
1800	868	0.48	929	0.52	986	0.55	1038	0.59	1087	0.64	1132	0.69	1174	0.75	1214	0.80
1900	907	0.54	966	0.58	1019	0.62	1069	0.66	1116	0.71	1160	0.77	1200	0.82	1240	0.88
2000	946	0.60	1001	0.65	1053	0.69	1101	0.74	1146	0.79	1188	0.85	1228	0.91	1267	0.98

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1119	0.45	1163	0.49	1206	0.52	1247	0.56	1287	0.60	1326	0.64	1364	0.68	1402	0.72
1300	1139	0.51	1182	0.55	1224	0.58	1265	0.62	1304	0.66	1342	0.71	1379	0.75	1416	0.79
1400	1160	0.57	1202	0.61	1243	0.65	1283	0.69	1322	0.73	1359	0.78	1396	0.82	1432	0.87
1500	1182	0.64	1223	0.68	1263	0.72	1303	0.76	1341	0.81	1378	0.85	1414	0.90	1449	0.94
1600	1205	0.70	1245	0.75	1284	0.79	1323	0.84	1361	0.88	1397	0.93	1432	0.98	1467	1.03
1700	1228	0.78	1268	0.82	1307	0.87	1345	0.92	1382	0.97	1417	1.02	1452	1.07	1486	1.11
1800	1253	0.85	1292	0.91	1331	0.96	1368	1.01	1404	1.06	1439	1.11	1473	1.16	1506	1.21
1900	1279	0.94	1317	1.00	1355	1.05	1392	1.10	1427	1.16	1461	1.21	1494	1.26	1527	1.31
2000	1305	1.04	1343	1.10	1380	1.15	1416	1.21	1450	1.26	1484	1.32	1516	1.37	1549	1.42

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	687	0.23	757	0.26	826	0.29	893	0.32	955	0.35	1008	0.39	1054	0.42	1095	0.46
1300	730	0.27	798	0.30	864	0.33	926	0.37	982	0.40	1030	0.44	1073	0.47	1116	0.51
1400	775	0.31	840	0.34	902	0.38	959	0.42	1009	0.46	1054	0.50	1096	0.53	1140	0.56
1500	820	0.36	881	0.40	939	0.44	993	0.49	1039	0.53	1082	0.56	1124	0.59	1168	0.62
1600	864	0.42	921	0.46	976	0.51	1027	0.56	1072	0.60	1113	0.63	1155	0.66	1198	0.69
1700	907	0.48	961	0.53	1013	0.58	1061	0.63	1105	0.67	1146	0.70	1187	0.73	1230	0.77
1800	948	0.56	999	0.61	1049	0.66	1096	0.71	1139	0.75	1180	0.78	1221	0.82	1262	0.86
1900	987	0.64	1037	0.69	1086	0.74	1132	0.79	1174	0.83	1214	0.86	1255	0.90	1295	0.95
2000	1028	0.73	1076	0.78	1123	0.83	1168	0.87	1210	0.91	1250	0.96	1289	1.00	1328	1.06

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1139	0.49	1187	0.52	1234	0.54	1276	0.58	1314	0.62	1350	0.66	1385	0.71	1421	0.75
1300	1161	0.54	1208	0.57	1254	0.60	1295	0.64	1332	0.69	1366	0.73	1401	0.78	1436	0.83
1400	1185	0.59	1232	0.63	1276	0.67	1315	0.71	1351	0.76	1384	0.81	1419	0.86	1454	0.90
1500	1212	0.66	1257	0.70	1299	0.74	1337	0.79	1371	0.84	1404	0.89	1438	0.94	1473	0.99
1600	1242	0.73	1284	0.77	1324	0.82	1360	0.88	1394	0.93	1426	0.99	1460	1.04	1495	1.08
1700	1272	0.81	1312	0.86	1350	0.92	1385	0.98	1418	1.04	1451	1.09	1485	1.14	1519	1.19
1800	1302	0.90	1341	0.96	1377	1.02	1411	1.08	1444	1.15	1477	1.20	1510	1.25	1544	1.30
1900	1334	1.01	1371	1.07	1406	1.13	1439	1.20	1471	1.26	1504	1.32	1537	1.37	1571	1.41
2000	1365	1.12	1401	1.19	1435	1.25	1468	1.32	1500	1.38	1532	1.44	1565	1.49	1598	1.53

BLOWER DATA - BELT DRIVE - ZHA060

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

FOR ALL UNITS ADD:

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

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

See page 15 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA03									
1600	764	0.35	822	0.39	880	0.42	936	0.46	991	0.51	1042	0.55	1091	0.60	1136	0.64
1700	801	0.40	857	0.44	913	0.48	968	0.52	1020	0.57	1070	0.61	1117	0.66	1162	0.71
1800	838	0.46	893	0.50	947	0.54	1000	0.58	1051	0.63	1099	0.68	1145	0.73	1188	0.78
1900	876	0.52	929	0.56	982	0.61	1033	0.65	1082	0.70	1129	0.75	1173	0.80	1215	0.85
2000	914	0.59	966	0.63	1017	0.68	1067	0.72	1115	0.77	1160	0.83	1203	0.88	1244	0.94
2100	953	0.66	1004	0.71	1054	0.76	1102	0.81	1148	0.86	1192	0.92	1233	0.98	1273	1.04
2200	993	0.74	1042	0.79	1090	0.85	1137	0.90	1181	0.96	1224	1.02	1264	1.09	1303	1.15
2300	1033	0.83	1081	0.89	1128	0.94	1173	1.01	1216	1.07	1257	1.14	1296	1.20	1334	1.27
2400	1074	0.93	1120	0.99	1166	1.05	1209	1.12	1251	1.19	1291	1.26	1329	1.33	1366	1.41

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03										Kit ZA06					
1600	1180	0.68	1222	0.72	1263	0.76	1303	0.80	1341	0.85	1378	0.90	1414	0.94	1449	0.99
1700	1204	0.75	1245	0.79	1285	0.84	1325	0.88	1362	0.93	1398	0.98	1434	1.03	1468	1.08
1800	1229	0.83	1270	0.87	1309	0.92	1347	0.97	1384	1.02	1420	1.07	1454	1.12	1488	1.17
1900	1256	0.91	1296	0.96	1334	1.01	1371	1.07	1407	1.12	1442	1.17	1476	1.23	1509	1.28
2000	1284	1.00	1322	1.06	1360	1.11	1396	1.17	1431	1.23	1465	1.28	1498	1.33	1531	1.38
2100	1312	1.10	1350	1.16	1386	1.22	1422	1.28	1456	1.34	1489	1.40	1521	1.45	1554	1.50
2200	1341	1.22	1378	1.28	1414	1.34	1448	1.41	1481	1.46	1513	1.52	1546	1.57	1578	1.62
2300	1371	1.34	1407	1.41	1442	1.47	1475	1.54	1507	1.59	1539	1.65	1571	1.70	1602	1.75
2400	1402	1.48	1436	1.55	1470	1.61	1503	1.67	1535	1.73	1566	1.79	1597	1.84	1628	1.89

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA03									
1600	783	0.38	844	0.41	902	0.44	957	0.48	1008	0.52	1056	0.56	1100	0.60	1142	0.64
1700	825	0.44	882	0.47	938	0.50	989	0.54	1038	0.57	1083	0.62	1126	0.66	1166	0.71
1800	866	0.50	921	0.53	973	0.56	1021	0.60	1067	0.64	1111	0.68	1152	0.73	1191	0.78
1900	907	0.56	959	0.59	1008	0.63	1054	0.66	1098	0.71	1139	0.75	1179	0.80	1217	0.86
2000	948	0.63	996	0.66	1042	0.70	1086	0.74	1128	0.78	1168	0.83	1207	0.89	1244	0.94
2100	987	0.70	1033	0.74	1077	0.78	1119	0.82	1159	0.87	1198	0.93	1235	0.99	1272	1.05
2200	1026	0.78	1070	0.82	1112	0.87	1152	0.92	1191	0.98	1228	1.03	1265	1.10	1301	1.16
2300	1064	0.88	1106	0.92	1147	0.97	1186	1.03	1223	1.09	1260	1.15	1295	1.22	1331	1.28
2400	1102	0.98	1143	1.03	1182	1.08	1220	1.15	1256	1.21	1292	1.28	1327	1.35	1362	1.42

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA03										Kit ZA06					
1600	1183	0.68	1223	0.72	1263	0.76	1302	0.81	1340	0.86	1377	0.91	1413	0.95	1448	1.00
1700	1205	0.75	1245	0.79	1284	0.84	1322	0.89	1360	0.94	1396	0.99	1431	1.04	1465	1.09
1800	1230	0.83	1268	0.87	1306	0.92	1344	0.98	1380	1.03	1416	1.08	1450	1.13	1483	1.19
1900	1255	0.91	1292	0.96	1330	1.02	1367	1.07	1402	1.13	1437	1.18	1470	1.24	1503	1.29
2000	1281	1.00	1318	1.06	1355	1.12	1391	1.18	1425	1.23	1459	1.29	1492	1.35	1524	1.40
2100	1308	1.11	1345	1.17	1381	1.23	1416	1.29	1450	1.35	1482	1.41	1514	1.46	1546	1.52
2200	1337	1.23	1372	1.29	1408	1.35	1442	1.42	1475	1.47	1507	1.53	1538	1.59	1569	1.64
2300	1366	1.35	1401	1.42	1435	1.49	1469	1.55	1501	1.61	1532	1.67	1563	1.72	1594	1.77
2400	1396	1.49	1431	1.56	1464	1.63	1496	1.69	1528	1.75	1559	1.81	1589	1.86	1619	1.91

BLOWER DATA - BELT DRIVE - ZHB036

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

FOR ALL UNITS ADD:

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

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

See page 15 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	562	0.11	621	0.13	685	0.16	752	0.18	818	0.21	883	0.24	944	0.27	1001	0.30
1000	584	0.13	644	0.16	707	0.18	773	0.21	838	0.24	901	0.27	960	0.3	1015	0.33
1100	609	0.16	669	0.18	732	0.21	796	0.24	860	0.27	921	0.30	978	0.34	1031	0.37
1200	635	0.19	696	0.21	758	0.24	821	0.27	883	0.31	942	0.34	997	0.38	1049	0.42
1300	664	0.22	725	0.25	786	0.28	848	0.31	908	0.35	965	0.39	1018	0.43	1068	0.47
1400	696	0.26	756	0.29	816	0.32	876	0.36	935	0.40	989	0.44	1041	0.48	1089	0.52
1500	729	0.30	788	0.33	848	0.37	906	0.41	962	0.45	1015	0.50	1065	0.54	1112	0.58

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1053	0.32	1103	0.35	1149	0.38	1193	0.41	1234	0.43	1274	0.47	1312	0.50	1351	0.53
1000	1066	0.36	1114	0.39	1160	0.42	1204	0.45	1245	0.48	1284	0.51	1322	0.54	1361	0.58
1100	1081	0.40	1128	0.43	1173	0.46	1216	0.49	1257	0.53	1296	0.56	1334	0.60	1372	0.63
1200	1097	0.45	1144	0.48	1188	0.51	1231	0.54	1271	0.58	1310	0.62	1347	0.66	1385	0.69
1300	1115	0.50	1161	0.53	1204	0.56	1246	0.60	1286	0.64	1325	0.68	1362	0.72	1399	0.76
1400	1135	0.56	1179	0.59	1222	0.62	1264	0.66	1303	0.70	1341	0.75	1378	0.79	1415	0.83
1500	1157	0.62	1200	0.65	1242	0.69	1282	0.73	1321	0.77	1359	0.82	1396	0.86	1431	0.91

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished				Kit ZA01											
900	560	0.16	624	0.18	692	0.20	761	0.21	830	0.23	896	0.25	956	0.27	1012	0.29
1000	583	0.18	647	0.20	715	0.22	783	0.24	850	0.25	914	0.27	972	0.30	1025	0.33
1100	609	0.20	673	0.22	740	0.24	808	0.26	873	0.28	934	0.31	990	0.34	1041	0.37
1200	637	0.23	702	0.25	769	0.27	835	0.29	898	0.32	956	0.35	1009	0.38	1058	0.41
1300	669	0.26	734	0.28	800	0.30	863	0.33	924	0.36	979	0.39	1030	0.43	1077	0.46
1400	704	0.29	768	0.32	832	0.35	894	0.37	951	0.41	1004	0.44	1052	0.48	1097	0.52
1500	742	0.33	805	0.36	867	0.39	925	0.42	980	0.46	1030	0.50	1076	0.54	1119	0.58

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA04															
900	1064	0.32	1114	0.35	1162	0.38	1208	0.41	1251	0.45	1293	0.49	1333	0.52	1373	0.56
1000	1076	0.36	1124	0.39	1170	0.42	1216	0.46	1259	0.49	1300	0.53	1340	0.57	1379	0.61
1100	1089	0.40	1136	0.43	1181	0.46	1225	0.50	1268	0.54	1308	0.58	1347	0.62	1386	0.66
1200	1104	0.45	1150	0.48	1194	0.51	1237	0.55	1279	0.59	1319	0.63	1357	0.67	1394	0.71
1300	1121	0.5	1165	0.53	1209	0.57	1251	0.61	1292	0.65	1331	0.69	1368	0.73	1405	0.78
1400	1140	0.56	1183	0.59	1225	0.63	1266	0.67	1306	0.71	1345	0.76	1382	0.8	1417	0.85
1500	1161	0.62	1202	0.65	1243	0.69	1284	0.73	1323	0.78	1360	0.83	1396	0.87	1432	0.92

BLOWER DATA - BELT DRIVE - ZHBO48

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

FOR ALL UNITS ADD:

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

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

See page 15 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	620	0.23	681	0.29	744	0.34	809	0.39	875	0.43	941	0.47	1004	0.51	1060	0.54
1300	652	0.28	713	0.34	775	0.39	839	0.44	903	0.48	967	0.51	1025	0.55	1078	0.59
1400	687	0.33	747	0.39	809	0.44	871	0.49	934	0.53	994	0.57	1048	0.61	1098	0.64
1500	724	0.40	784	0.45	844	0.50	905	0.54	965	0.59	1021	0.62	1071	0.66	1118	0.70
1600	764	0.46	823	0.51	882	0.56	940	0.60	997	0.65	1048	0.69	1094	0.72	1140	0.75
1700	806	0.53	863	0.58	919	0.62	975	0.67	1028	0.71	1075	0.75	1119	0.78	1164	0.81
1800	849	0.60	903	0.65	957	0.69	1010	0.74	1058	0.78	1102	0.82	1145	0.85	1189	0.88
1900	892	0.68	944	0.72	995	0.77	1045	0.82	1089	0.86	1131	0.89	1174	0.92	1217	0.95
2000	935	0.76	984	0.81	1033	0.86	1079	0.91	1122	0.95	1163	0.97	1204	1.00	1247	1.03

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1111	0.58	1156	0.60	1199	0.62	1241	0.63	1284	0.65	1326	0.67	1367	0.71	1408	0.74
1300	1127	0.62	1172	0.65	1214	0.66	1256	0.68	1299	0.70	1341	0.73	1381	0.77	1421	0.81
1400	1145	0.68	1189	0.70	1231	0.72	1274	0.74	1316	0.76	1357	0.79	1397	0.83	1436	0.88
1500	1164	0.73	1208	0.75	1251	0.78	1293	0.80	1334	0.83	1374	0.86	1413	0.91	1451	0.95
1600	1185	0.79	1229	0.81	1271	0.84	1313	0.86	1354	0.90	1393	0.94	1431	0.98	1468	1.03
1700	1208	0.84	1252	0.87	1294	0.90	1335	0.94	1375	0.98	1413	1.02	1449	1.07	1485	1.12
1800	1233	0.91	1276	0.94	1318	0.98	1358	1.02	1397	1.06	1434	1.11	1469	1.16	1504	1.21
1900	1261	0.98	1303	1.02	1343	1.06	1382	1.11	1420	1.16	1455	1.21	1490	1.26	1525	1.31
2000	1289	1.07	1330	1.11	1370	1.16	1407	1.21	1444	1.27	1478	1.32	1513	1.37	1547	1.42

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Furnished						Kit ZA02									
1200	614	0.21	681	0.25	752	0.30	821	0.34	888	0.39	950	0.43	1006	0.46	1057	0.49
1300	644	0.24	712	0.29	782	0.34	850	0.39	915	0.43	974	0.47	1027	0.51	1076	0.53
1400	677	0.29	746	0.34	814	0.39	880	0.44	942	0.48	998	0.52	1049	0.55	1097	0.58
1500	714	0.34	781	0.40	848	0.45	911	0.49	970	0.53	1023	0.57	1072	0.60	1119	0.63
1600	752	0.40	818	0.45	882	0.50	943	0.55	999	0.59	1050	0.62	1097	0.66	1142	0.69
1700	792	0.46	855	0.52	917	0.56	975	0.61	1028	0.64	1077	0.68	1123	0.72	1166	0.75
1800	832	0.53	894	0.58	952	0.63	1007	0.67	1058	0.70	1105	0.74	1149	0.78	1192	0.82
1900	873	0.60	932	0.65	988	0.69	1040	0.73	1088	0.77	1134	0.81	1177	0.85	1219	0.90
2000	914	0.67	970	0.72	1023	0.76	1073	0.80	1120	0.85	1163	0.89	1205	0.94	1246	0.99

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZA02						Kit ZA05									
1200	1105	0.51	1152	0.53	1197	0.55	1240	0.58	1280	0.61	1320	0.64	1358	0.68	1395	0.72
1300	1123	0.55	1169	0.57	1213	0.60	1255	0.63	1295	0.67	1334	0.70	1372	0.74	1409	0.79
1400	1142	0.60	1187	0.63	1230	0.66	1272	0.69	1312	0.73	1350	0.77	1388	0.82	1424	0.86
1500	1163	0.66	1207	0.69	1249	0.72	1290	0.76	1330	0.80	1368	0.85	1405	0.90	1441	0.94
1600	1185	0.72	1228	0.75	1270	0.79	1310	0.83	1349	0.88	1387	0.93	1423	0.98	1459	1.03
1700	1209	0.78	1251	0.82	1292	0.87	1331	0.92	1370	0.97	1407	1.02	1443	1.07	1478	1.12
1800	1234	0.86	1275	0.91	1315	0.96	1354	1.01	1391	1.06	1428	1.11	1463	1.17	1498	1.22
1900	1260	0.95	1300	1.00	1340	1.05	1377	1.11	1414	1.16	1450	1.22	1485	1.27	1519	1.32
2000	1287	1.04	1326	1.10	1365	1.16	1402	1.21	1437	1.27	1472	1.33	1507	1.38	1541	1.43

BLOWER DATA - BELT DRIVE - ZHB060

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

FOR ALL UNITS ADD:

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

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

See page 15 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA01								Kit ZAA02							
1600	522	0.27	552	0.32	585	0.37	619	0.43	656	0.48	693	0.53	732	0.59	771	0.64
1700	539	0.32	570	0.37	603	0.43	638	0.48	674	0.53	711	0.59	749	0.64	787	0.69
1800	558	0.38	589	0.43	623	0.48	658	0.54	694	0.59	730	0.64	767	0.70	803	0.75
1900	578	0.44	610	0.49	643	0.54	678	0.60	714	0.65	749	0.70	785	0.76	819	0.82
2000	600	0.50	632	0.56	665	0.61	699	0.66	734	0.71	769	0.77	803	0.83	837	0.90
2100	623	0.57	655	0.62	688	0.68	721	0.73	755	0.79	789	0.84	822	0.91	854	0.98
2200	647	0.65	678	0.70	711	0.75	743	0.81	776	0.86	809	0.93	841	1.00	872	1.06
2300	671	0.73	702	0.78	734	0.83	766	0.89	798	0.95	829	1.02	860	1.09	890	1.16
2400	696	0.81	726	0.87	757	0.92	788	0.98	819	1.04	850	1.11	880	1.19	909	1.26

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA02								Kit ZAA03							
1600	809	0.69	844	0.74	877	0.80	908	0.85	936	0.91	963	0.97	989	1.02	1014	1.08
1700	823	0.75	857	0.80	889	0.86	919	0.92	947	0.97	973	1.03	999	1.09	1024	1.14
1800	838	0.81	870	0.87	901	0.92	931	0.98	958	1.04	984	1.10	1009	1.16	1034	1.22
1900	853	0.88	885	0.94	915	0.99	944	1.05	971	1.11	996	1.17	1021	1.23	1045	1.29
2000	869	0.96	899	1.01	929	1.07	957	1.13	984	1.19	1009	1.25	1033	1.31	1058	1.38
2100	885	1.04	915	1.10	944	1.15	971	1.22	997	1.28	1022	1.34	1046	1.40	1070	1.46
2200	902	1.13	931	1.19	959	1.24	986	1.31	1012	1.37	1036	1.43	1060	1.50	1084	1.56
2300	920	1.23	948	1.29	975	1.35	1001	1.41	1027	1.47	1051	1.53	1075	1.60	1098	1.66
2400	938	1.33	965	1.39	992	1.45	1017	1.52	1042	1.58	1066	1.64	1090	1.70	1113	1.77

HORIZONTAL

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA01								Kit ZAA02							
1600	525	0.30	561	0.34	597	0.39	635	0.43	673	0.47	711	0.51	748	0.56	784	0.61
1700	543	0.34	578	0.39	615	0.43	653	0.48	691	0.52	728	0.57	765	0.62	800	0.67
1800	561	0.39	597	0.44	635	0.49	672	0.53	710	0.58	746	0.63	782	0.68	816	0.73
1900	581	0.44	618	0.49	655	0.54	692	0.59	729	0.64	765	0.69	800	0.75	833	0.80
2000	602	0.50	639	0.55	676	0.61	713	0.66	749	0.71	784	0.76	818	0.82	850	0.88
2100	625	0.57	661	0.62	698	0.67	735	0.73	770	0.78	804	0.84	837	0.90	868	0.96
2200	648	0.64	685	0.69	721	0.75	757	0.80	791	0.86	824	0.92	856	0.98	886	1.05
2300	673	0.71	709	0.77	745	0.83	780	0.88	813	0.94	845	1.01	876	1.08	905	1.15
2400	699	0.79	734	0.85	769	0.91	803	0.97	835	1.04	866	1.11	896	1.18	924	1.25

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Kit ZAA02								Kit ZAA03							
1600	819	0.66	851	0.72	883	0.77	913	0.83	943	0.89	971	0.95	998	1.01	1024	1.07
1700	833	0.72	865	0.78	896	0.84	926	0.90	954	0.96	982	1.02	1009	1.08	1034	1.14
1800	848	0.79	880	0.85	910	0.92	939	0.98	967	1.04	994	1.10	1020	1.16	1045	1.23
1900	864	0.87	895	0.93	924	0.99	953	1.06	980	1.12	1007	1.18	1032	1.25	1056	1.31
2000	881	0.95	911	1.01	940	1.08	967	1.14	994	1.21	1020	1.27	1044	1.34	1068	1.40
2100	898	1.03	927	1.10	955	1.17	982	1.23	1008	1.30	1033	1.37	1057	1.43	1080	1.50
2200	916	1.12	944	1.19	971	1.26	998	1.33	1023	1.40	1047	1.47	1071	1.54	1093	1.60
2300	934	1.22	961	1.29	988	1.36	1014	1.43	1038	1.50	1062	1.58	1085	1.65	1107	1.71
2400	952	1.32	979	1.40	1005	1.47	1030	1.54	1054	1.62	1077	1.69	1099	1.76	1121	1.83

BLOWER DATA

DRIVE KIT SPECIFICATIONS

Model No.	Blower Motor Choice (HP)				Drive Kit No.	RPM Range
	Nominal	Maximum	Nominal	Maximum		
ZHA/ZHB036	1 1	1 1.15	1.5	1.7	ZA01	678 - 1035
					ZA04	964 - 1471
ZHA/ZHB048	1 1	1 1.15	1.5	1.7	ZA02	803 - 1226
					² ZA05	1098 - 1490
ZHA060	1 1	1 1.15	1.5	1.7	ZA03	906-1383
					² ZA06	1262-1634
ZHB060	1 1	1 1.15	1.5	1.7	ZAA01	522 - 784
					ZAA02	632 - 875
					² ZAA03	798 - 1105

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

¹ 1 hp blower motor is not available for 208/230V-1ph applications. ² 1.5 hp motor is required with ZA05, ZA06 and ZAA03 drive kits.

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure - in. w.g.	Air Volume Exhausted cfm
0.00	1865
0.05	1785
0.10	1710
0.15	1630
0.20	1545
0.25	1450
0.30	1350
0.35	1240

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

Air Volume cfm	Wet Indoor Coil			Electric Heat	Economizer	
	ZHA036, ZHA048	ZHA060, ZHB036	ZHB048, ZHB060		Downflow	Horizontal
900	0.01	0.01	---	0.05	0.03	0.04
1000	0.02	0.01	---	0.06	0.03	0.05
1100	0.02	0.02	---	0.08	0.04	0.05
1200	0.02	0.02	0.01	0.09	0.05	0.06
1300	0.03	0.02	0.02	0.12	0.05	0.07
1400	0.03	0.03	0.02	0.17	0.06	0.08
1500	0.04	0.03	0.02	0.22	0.07	0.08
1600	0.04	0.03	0.03	0.26	0.08	0.09
1700	0.05	0.04	0.03	0.30	0.09	0.10
1800	0.05	0.04	0.03	0.33	0.10	0.11
1900	0.06	0.05	0.04	0.33	0.11	0.12
2000	0.06	0.05	0.04	0.31	0.12	0.13
2100	---	0.06	0.05	0.27	0.13	0.14
2200	---	0.06	0.05	0.29	0.14	0.15
2300	---	0.07	0.05	0.31	0.15	0.16
2400	---	0.07	0.06	0.32	0.16	0.18

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

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

CEILING DIFFUSER AIR THROW DATA

Air Volume - cfm	¹ Effective Throw - ft.	
	RTD9-65	FD9-65
800	10 - 17	14 - 18
1000	10 - 17	15 - 20
1200	11 - 18	16 - 22
1400	12 - 19	17 - 24
1600	12 - 20	18 - 25
1800	13 - 21	20 - 28
2000	14 - 23	21 - 29
2200	16 - 25	22 - 30

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

**TABLE 2
DRIVE COMPONENT MANUFACTURER'S NUMBERS**

Drive No.	DRIVE COMPONENT PART NUMBERS					
	Motor Pulley		Blower Pulley		Belts	
	Browning	OEM	Browning	OEM	Browning	OEM
Z01	1VP34 X 7/8	31K6901	AK54 X 5/8	100244-30	A40	100245-17
Z02	1VP34 X 7/8	31K6901	AK46 X 5/8	100244-31	A39	100245-16
Z03	1VP34 X 7/8	31K6901	AK41 X 5/8	100244-28	A39	100245-16
Z04	1VP34 X 7/8	31K6901	AK39 X 5/8	100244-32	A38	100245-15
Z05	1VP44 X 7/8	P-8-1488	AK49 X 5/8	100244-26	A41	100245-18
Z06	1VP50 X 7/8	53J1501	AK51 X 5/8	100244-29	A42	100245-19
ZAA01	1VP34 X 7/8	31K69	AK69 X 1	37L47	AX51	13H01
ZAA02	1VP40 X 7/8	79J03	BK80H	100788-03	A53	100245-40
ZAA03	1VP40 X 7/8	79J03	AK59 X 1	31K68	A50	100245-29

**TABLE 3
MINIMUM AIRFLOW - UNITS WITH ELECTRIC HEAT**

kW	CFM - Downflow and Horizontal	
	ZHA036-060, ZHB036-048	ZHB060
5	960	1750
7.5	960	1750
10	960	1750
15	960	1750
22.5	1280	1750

Units with electric heat (5-22.5kW) can operate up to 1.6" w.g. maximum static pressure.

Start-Up

▲ IMPORTANT

This unit is equipped with a crankcase heater. Make sure heater is energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

A-Start-Up

Heating

- 1- Set thermostat or temperature control device to initiate a first-stage heating demand.
- 2- A first-stage heating demand (W1) will energize compressors 1 and the outdoor fan.

Note - L1 reversing valve is de-energized in the heating mode.

ZH Units With Optional Electric Heat -

An increased heating demand (W2) will energize electric heat. Electric heat is also energized during the defrost cycle (W1) to maintain discharge air temperature.

Cooling

- 1- Set thermostat or temperature control device fan switch to **AUTO** or **ON**. Set thermostat or temperature control device to initiate a first-stage cooling demand.

A first-stage Y1 cooling demand will energize L1 reversing valve solenoid and compressor 1.

Units With Optional Economizer -

The optional economizer will start on a first stage (Y1) cooling demand when outdoor air is suitable. An increased cooling demand (Y2) will energize compressor 1.

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

B-Three Phase Scroll Compressor Voltage Phasing

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

- 1- Observe suction and discharge pressures and blower rotation on unit start-up.
- 2- Suction pressure must drop, discharge pressure must rise, and blower rotation must match rotation marking.

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

- 3- Disconnect all remote electrical power supplies.
- 4- Reverse any two field-installed wires connected to the line side of K1 contactor. Do not reverse wires at blower contactor.

Make sure the connections are tight.

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

C - Refrigerant Charge and Check

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 high stage only.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Compare the normal operating pressures (see tables 4 - 9) 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 ZHA036: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 105.5°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

D - Compressor Controls

See unit wiring diagram to determine which controls are used in each unit. Optional controls are identified on wiring diagrams by arrows at junction points.

- 1- Defrost Switch (S6)
Defrost switch closes to initiate defrost when liquid line temperature falls to 42°F (5.6°C). Defrost switch opens when liquid line temperature reaches 70°F (21°C) to terminate defrost. If the liquid line temperature does not rise above 70°F (21°C), the CMC1 will terminate defrost after 14 minutes. The defrost switch is located on the liquid line between the outdoor expansion valve and the distributor
- 2- Defrost Control (CMC1)
Defrost is liquid line temperature initiated and operates for 14 minutes unless terminated by liquid line temperature.

When the liquid line temperature drops below 42°F (5.6°C), the defrost switch closes and signals the **defrost control** that a defrost cycle is needed. If the defrost switch is still closed after 90 minutes (default), a defrost cycle begins and operates for up to 14 minutes. The defrost switch can terminate the defrost cycle before the 14 minutes elapses if liquid line temperature reaches 70°F (21°C)

Electric heat is energized during defrost to maintain discharge air temperature.

**TABLE 4
ZHA036 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)
119	235	122	272	124	314	126	359	129	409	132	461
128	241	130	279	132	319	136	364	146	421	140	470
139	245	146	285	151	331	155	377	155	428	159	482
145	248	154	290	163	335	170	384	174	438	179	498

**TABLE 5
ZHA048 NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
113	253	116	293	119	336	122	383	125	435	128	492
121	258	123	297	126	341	129	387	133	440	137	498
133	267	138	308	143	354	146	401	151	459	154	516
140	273	148	317	155	366	161	418	167	475	172	536

**TABLE 6
ZHA060 NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
113	254	115	292	119	335	122	380	125	430	128	487
121	260	123	299	126	343	130	391	134	440	137	496
130	265	138	308	143	354	147	404	151	456	154	513
136	270	145	315	153	364	160	414	167	471	172	529

**TABLE 7
ZHB036 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)
119	236	122	274	125	315	128	361	130	410	133	464
126	239	128	278	132	320	136	366	138	416	141	471
135	245	144	285	151	330	153	380	158	429	161	487
140	250	151	290	159	335	167	385	174	440	178	498

**TABLE 8
ZHB048 NORMAL OPERATING PRESSURES**

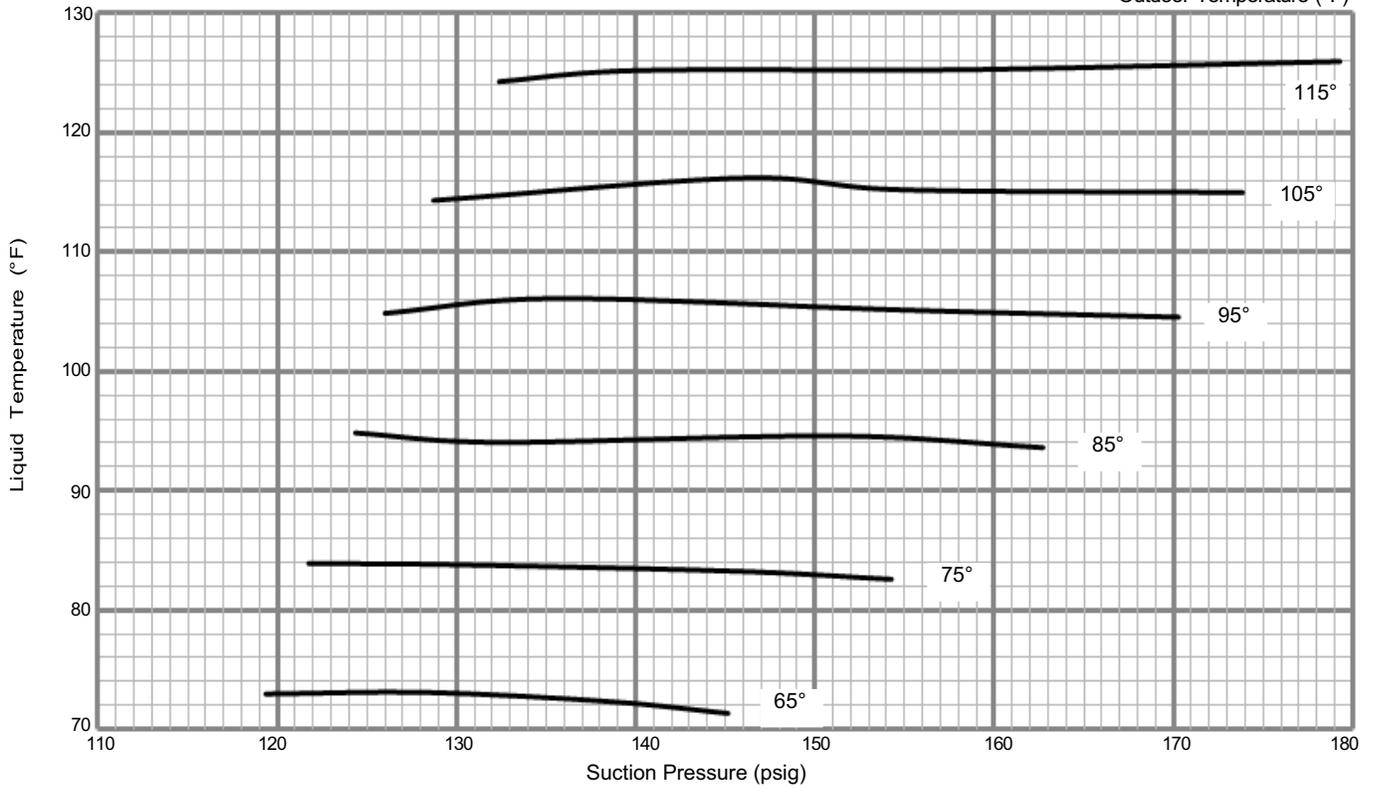
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
116	248	119	287	121	328	123	374	126	423	128	477
123	252	127	292	129	336	132	382	135	433	137	487
133	260	140	302	145	347	148	395	152	451	156	505
137	264	146	308	154	357	162	409	168	464	173	523

**TABLE 9
ZHB060 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)
114	255	118	297	120	338	123	387	126	433	130	487
121	257	125	298	131	350	131	389	134	443	137	504
131	267	138	311	144	362	148	410	152	457	153	524
137	269	143	315	154	364	162	417	167	474	169	534

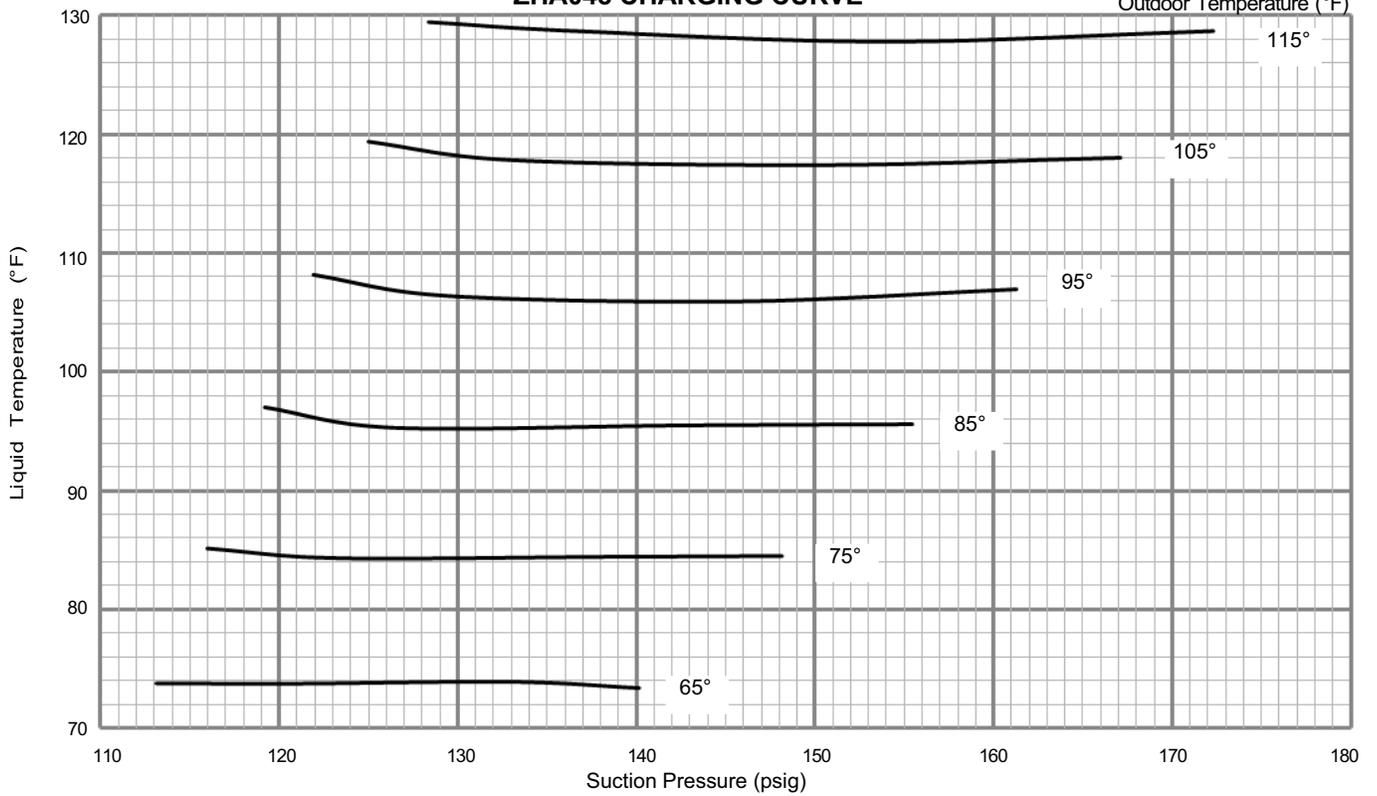
ZHA 036 CHARGING CURVE

Outdoor Temperature (°F)



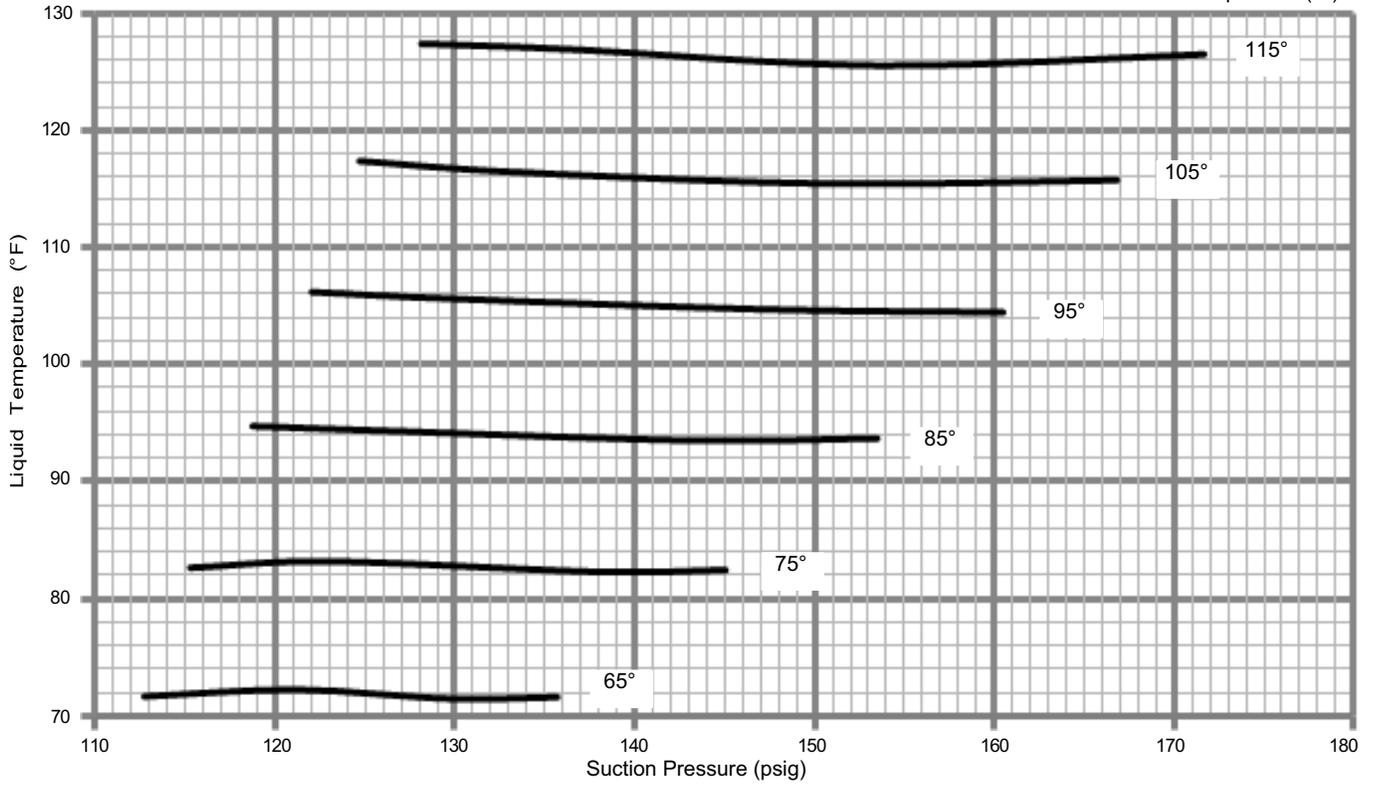
ZHA048 CHARGING CURVE

Outdoor Temperature (°F)



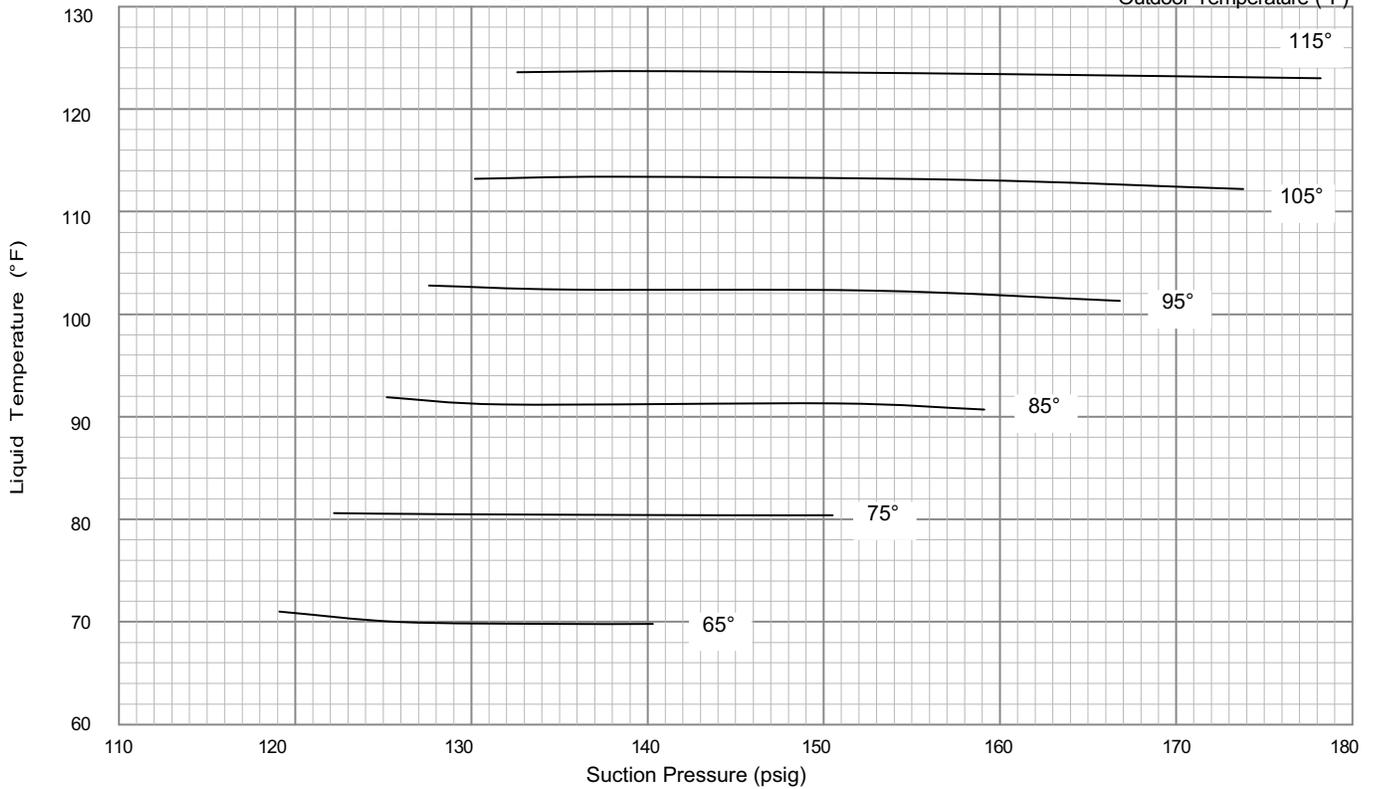
ZHA060 CHARGING CURVE

Outdoor Temperature (°F)



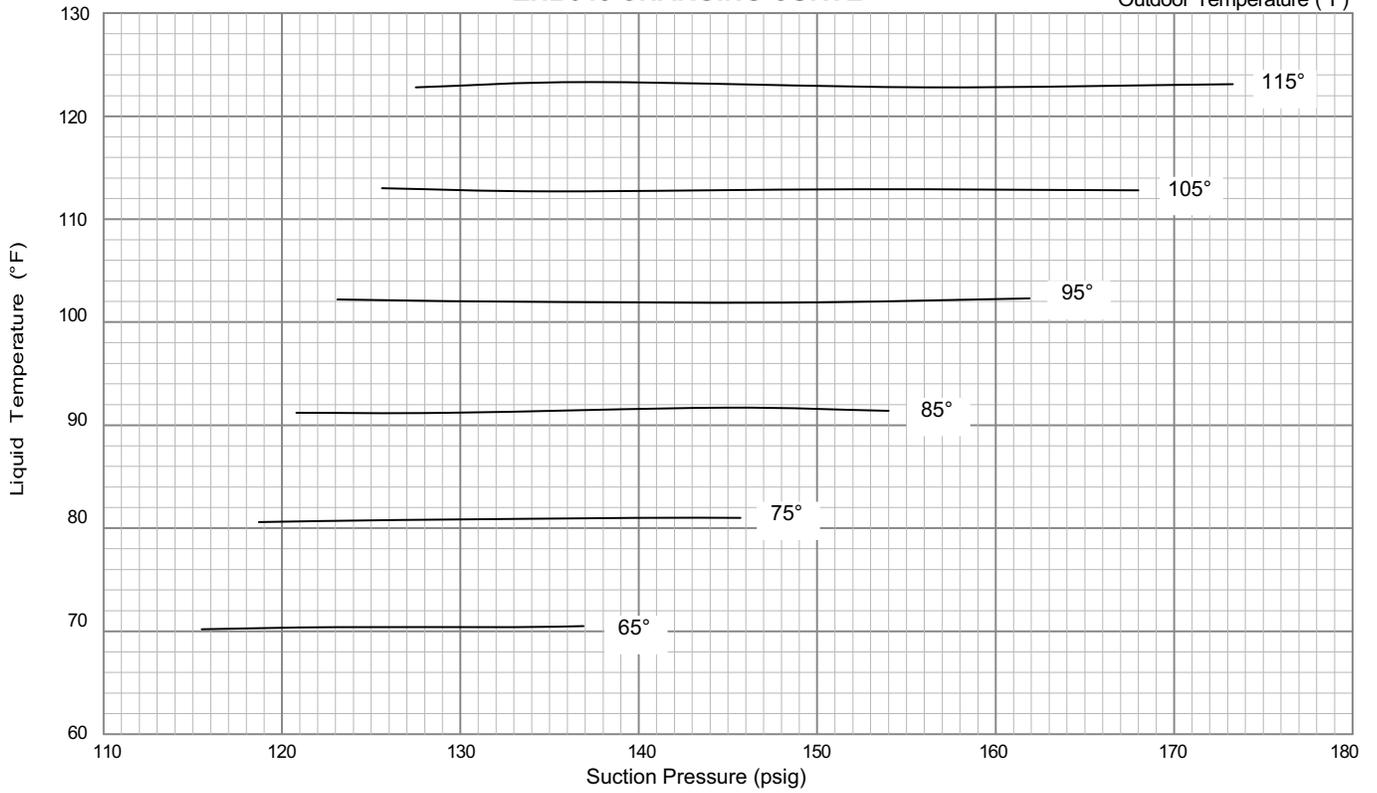
ZHB 036 CHARGING CURVE

Outdoor Temperature (°F)



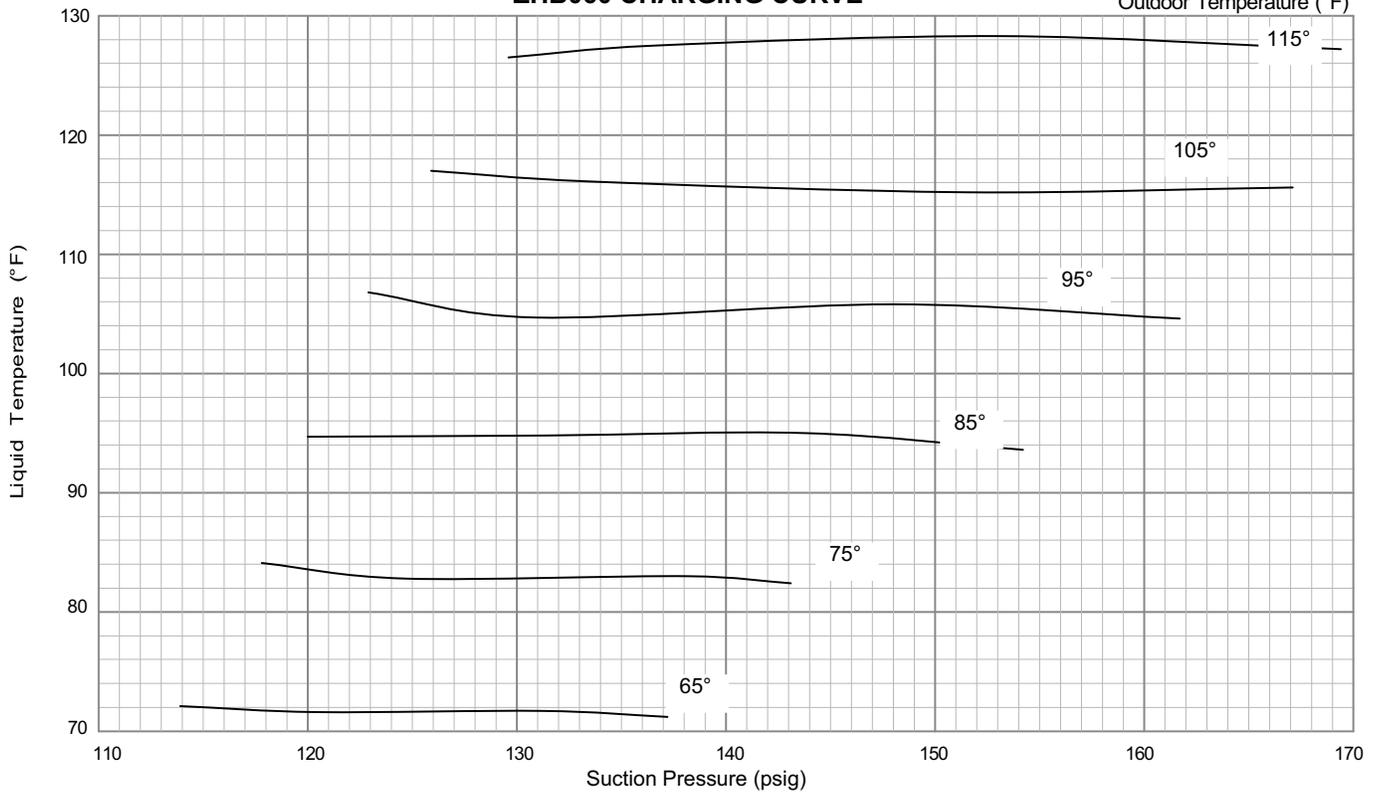
ZHB048 CHARGING CURVE

Outdoor Temperature (°F)



ZHB060 CHARGING CURVE

Outdoor Temperature (°F)



Defrost Control Board

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

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 90 minutes (default). The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 13.

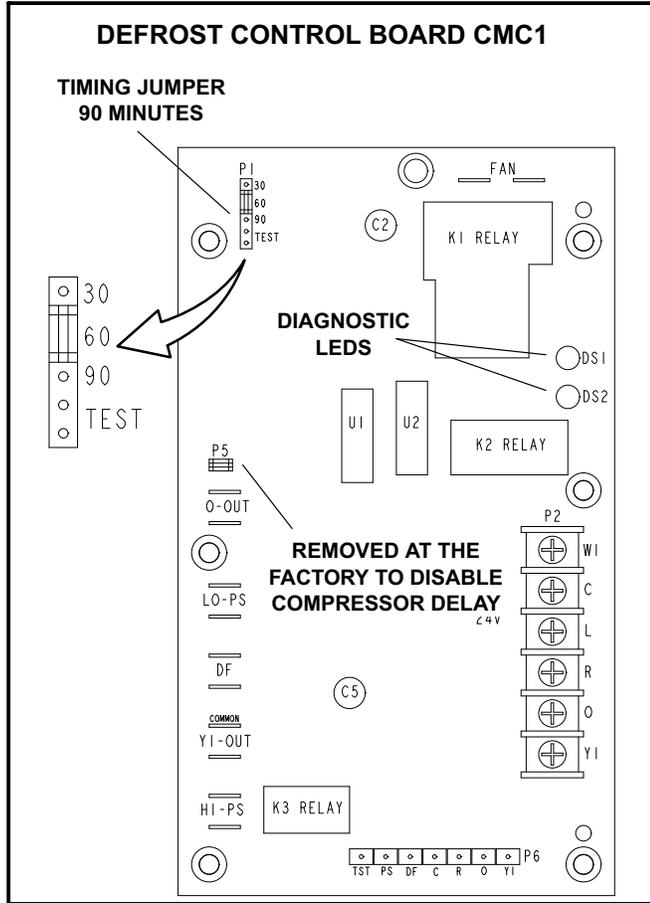


FIGURE 13

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

Defrost Test Option

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

Diagnostic LEDs

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

TABLE 10

Defrost Control Board Diagnostic LED		
Mode	Green LED (DS2)	Red LED (DS1)
No power to control	OFF	OFF
Normal operation / power to control	Simultaneous Slow FLASH	
Anti-short cycle lockout	Alternating Slow FLASH	
High pressure switch fault	Slow FLASH	OFF
High pressure switch lockout	ON	OFF

Service

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

⚠ CAUTION

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

⚠ WARNING

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

A - Lubrication

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

B-Compressor

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

⚠ IMPORTANT

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

C - Filters

Units are equipped with temporary filters which must be replaced prior to building occupation. See table 11 for correct filter size. Refer to local codes or appropriate jurisdiction for approved filters.

To change filters, open filter access panel on back side of unit. See figure 14. Lift filter stop to remove filters. See figure 15.

⚠ 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 15.

**TABLE 11
UNIT FILTERS**

Unit	Qty	Filter Size - inches (mm)
ZHA036, 048	4	14 X 20 X 2 (352 X 508 X 51)
ZHA060, ZHB036	4	16 X 20 X 2 (406 X 508 X 51)
ZHB048, 060	2 Each	16 X 20 X 2 (406 X 508 X 51) 20 X 20 X 2 (508 X 508 X 51)

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

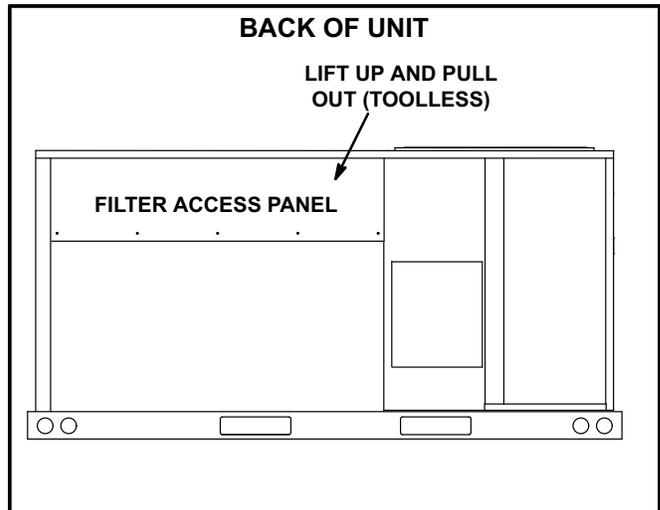


FIGURE 14

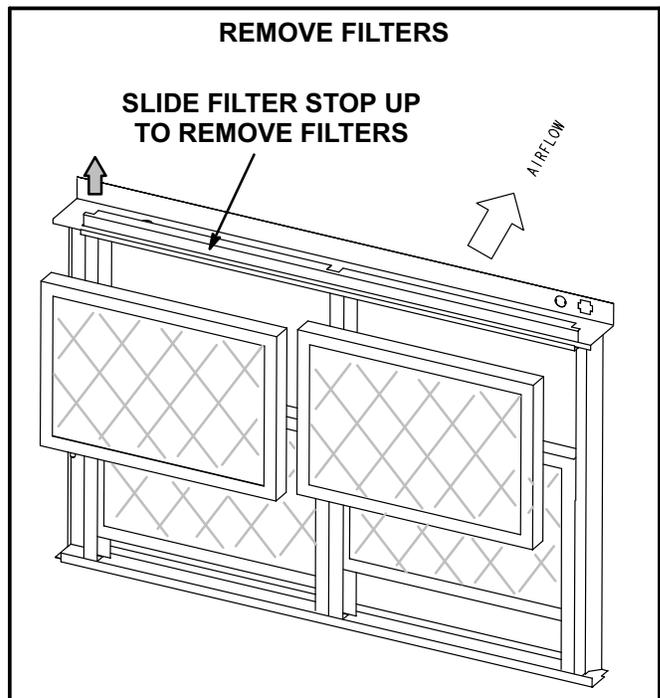


FIGURE 15

D - Supply Air Blower Wheel

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

E - Indoor Coil

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

F - Outdoor Coil

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

Outdoor coils are made of single and two formed slabs. On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 16. Flush coils with water following cleaning.

Note - Remove all screws and gaskets prior to cleaning procedure and replace upon completion.

G - Filter Drier

The unit is equipped with a biflow filter drier. if replacement is necessary, order another of like design.

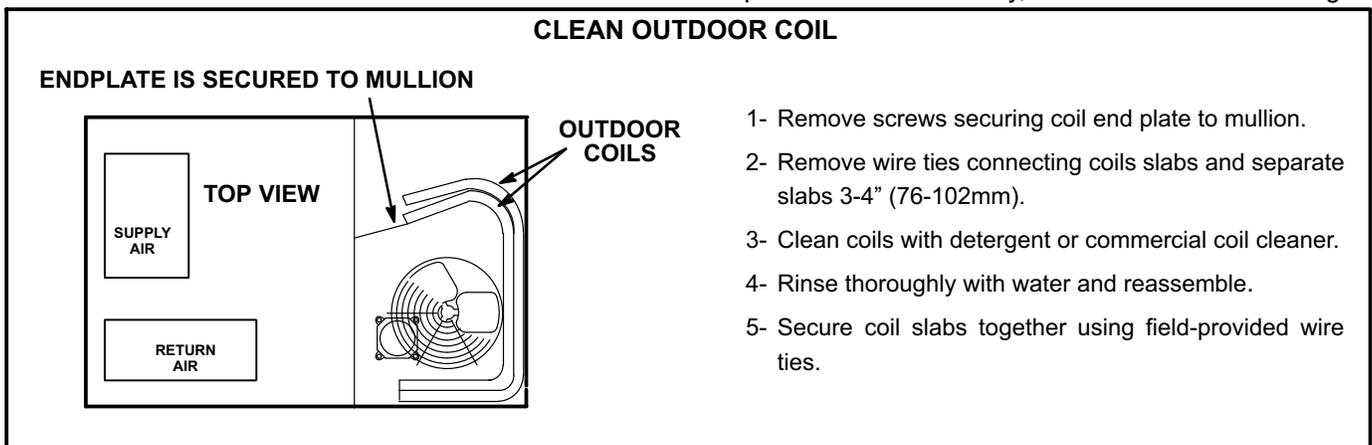


FIGURE 16

INSTALLATION INSTRUCTIONS

⚠ WARNING

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

ZHA092 (7.5- Ton)

ZHA102 (8.5 -Ton)

ZHA120 (10 -Ton)

HEAT PUMP PACKAGED UNITS

507257-01

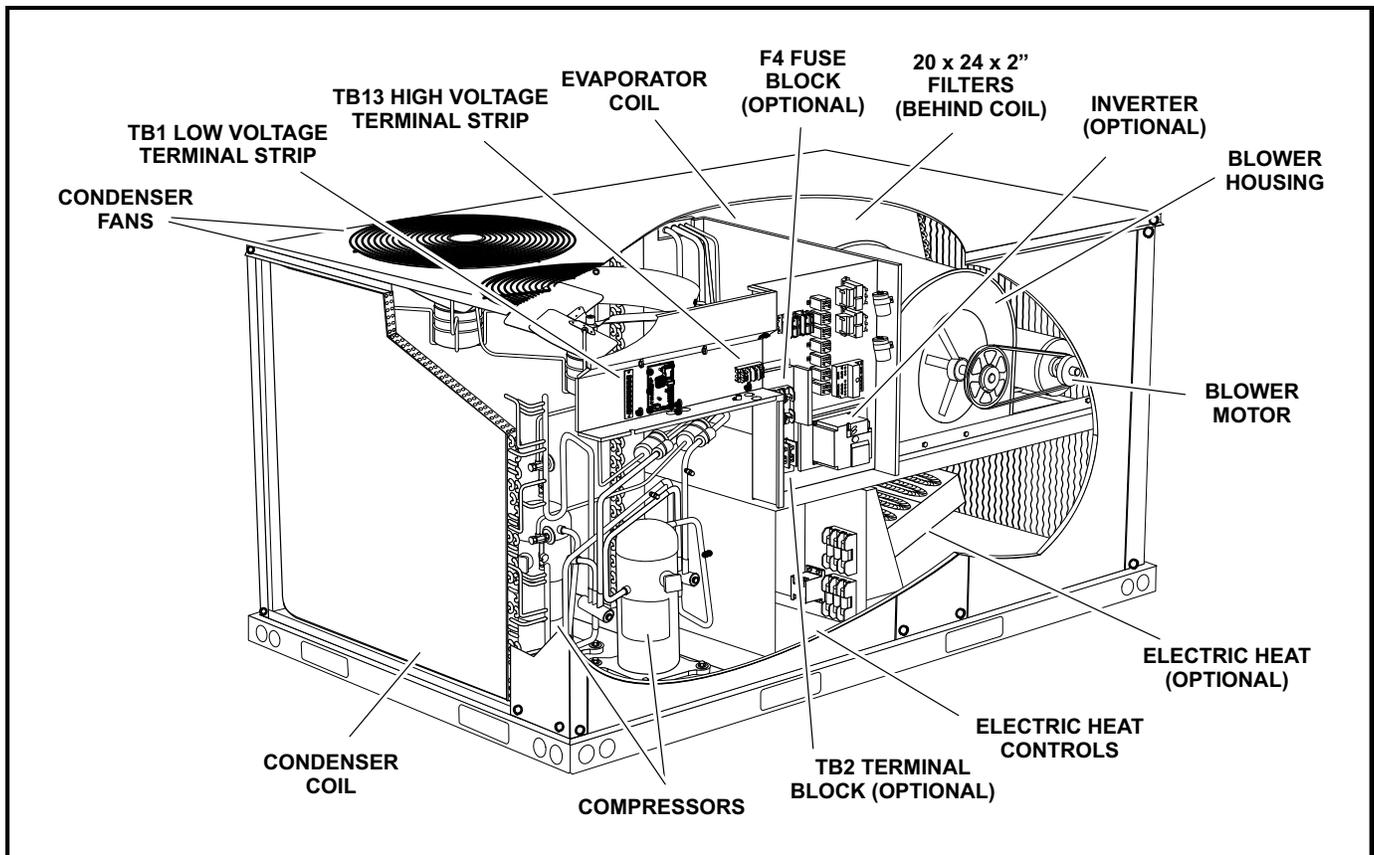
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RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

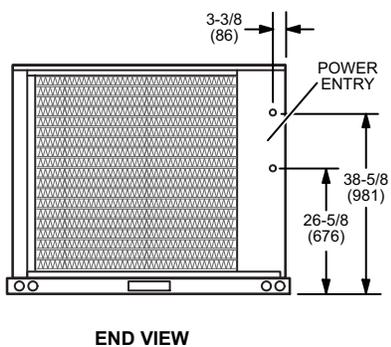
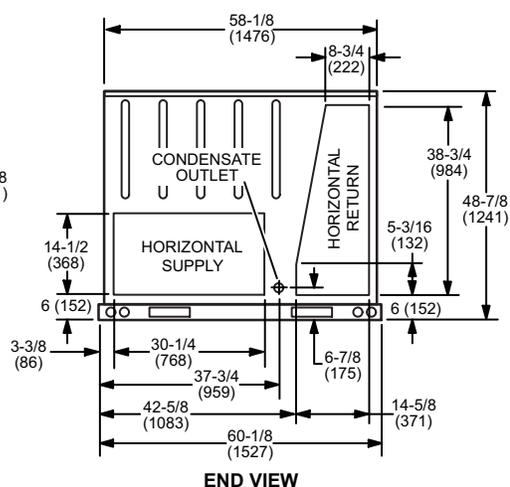
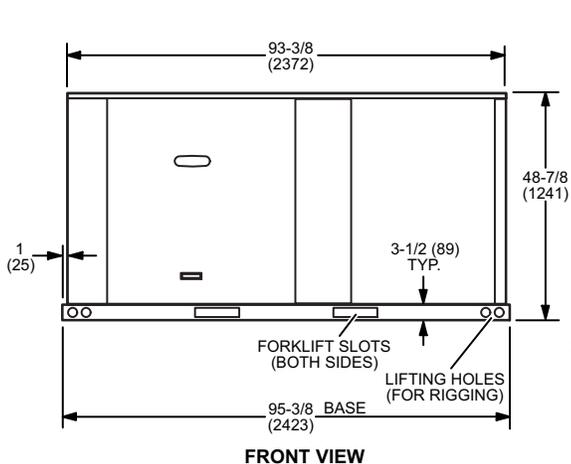
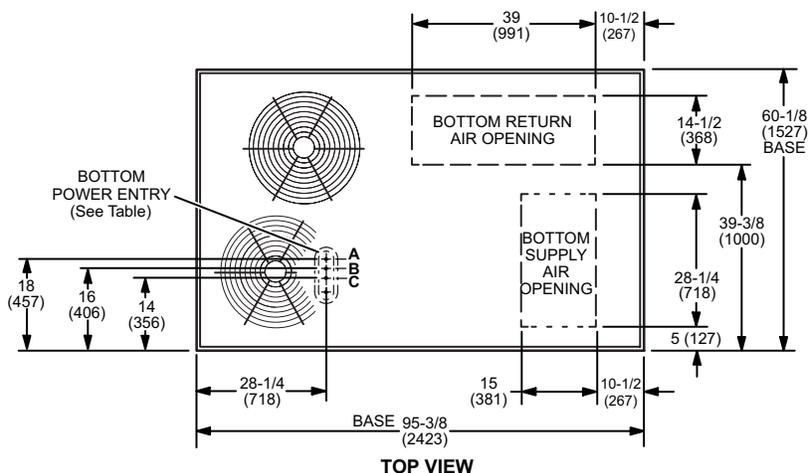


ZH 092, 102 & 120 DIMENSIONS

BOTTOM POWER ENTRY

Holes required for Optional Bottom Power Entry Kit

	Threaded Conduit Fittings (Provided in Kit)	Wire Use	Hole Diameter Required in Unit Base (Max.)
A	1/2	ACC.	7/8 (23)
B	1/2	24V	7/8 (23)
C	1-1/4	POWER	1-3/4 (44)



⚠ CAUTION

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

Shipping and Packing List

Package 1 of 1 contains:

1- Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

The ZH packaged rooftop units are available in 7-1/2, 8-1/2 and 10 ton cooling capacities. Optional electric heat is available.

Units are available with an optional supply air inverter. During cooling, the blower will operate at lower speeds when demand is low and increase to higher speeds when demand is high. During a blower only demand, the blower will operate at low speed. During a heating demand, the blower will operate at high speed.

Availability of units and options varies by brand.

Safety

See figure 1 for unit clearances.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

⚠ IMPORTANT

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

⚠ WARNING



Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

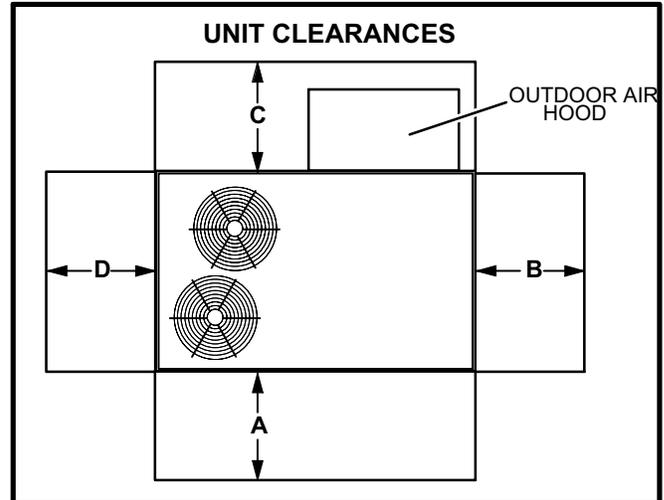


FIGURE 1

¹ Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	36 (914)	36 (914)	60 (1524)	36 (914)	Unob- structed
Minimum Opera- tion Clearance	36 (914)	36 (914)	60 (1524)	36 (914)	Unob- structed

Note - Entire perimeter of unit base requires support when elevated above mounting surface.

¹ **Service Clearance** - Required for removal of serviceable parts.

Minimum Operation Clearance - Required clearance for proper unit operation.

⚠ NOTICE

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filters must be removed upon construction completion.
- The input rate and temperature rise must be set per the unit rating plate.
- The heat exchanger, components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

Unit Support

In downflow discharge installations, install the unit on a non-combustible surface only. Unit may be installed on combustible surfaces when used in horizontal discharge applications or in downflow discharge applications when installed on an Z1CURB roof mounting frame.

NOTE - Securely fasten roof frame to roof per local codes.

A-Downflow Discharge Application

Roof Mounting with Z1CURB

- 1- The Z1CURB roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2- The Z1CURB roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

Installer's Roof Mounting Frame

Many types of roof frames can be used to install the unit depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

- 1- The base is fully enclosed and insulated, so an enclosed frame is not required.
- 2- The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).
- 4- Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.
- 5- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

NOTE-When installing a unit on a combustible surface for downflow discharge applications, an Z1CURB roof mounting frame is required.

B-Horizontal Discharge Applications

- 1- Specified installation clearances must be maintained when installing units. Refer to figure 1.
- 2- Top of support slab should be approximately 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.
- 3- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

Duct Connection

All exterior ducts, joints and openings in roof or building walls must be insulated and weather-proofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

Rigging Unit For Lifting

Rig unit for lifting by attaching four cables to holes in unit base rail. See figure 2.

- 1- Detach wooden base protection before rigging.
- 2- Connect rigging to the unit base using both holes in each corner.
- 3- All panels must be in place for rigging.
- 4- Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)
- 5- **All Units** - Partially lift unit and remove five (5) L-brackets which secure the protective base board. See figure 2.

Important - Protective wooden base board must be removed before setting unit.

- 6- **New roof curbs (89-3/8" in length)** - Remove the three alignment brackets shown in figure 3.
- 7- **Existing roof curbs (81-3/4" in length)** - Set unit on roof curb positioning alignment brackets as shown in figure 3.

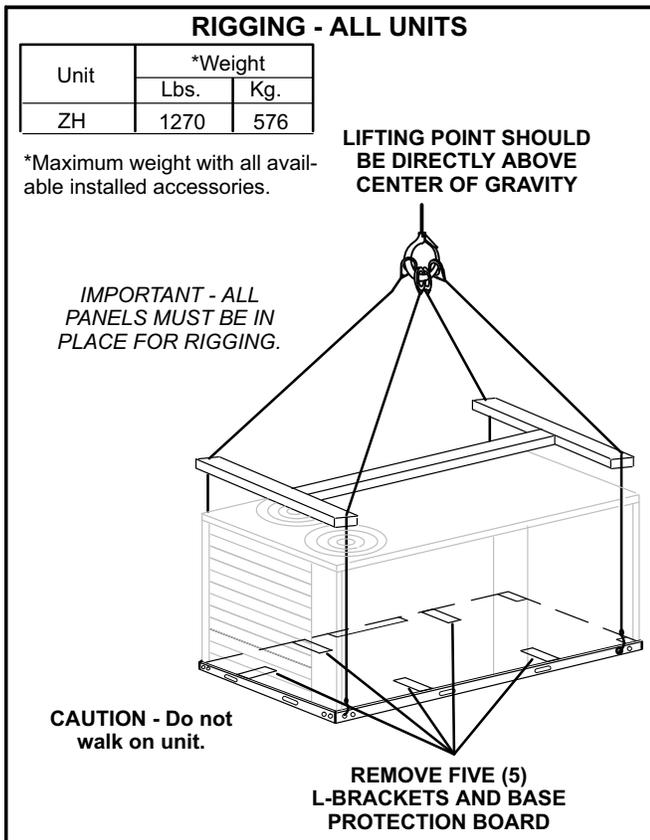


FIGURE 2

UNIT ALIGNMENT BRACKETS

NEW ROOF CURBS (89-3/8" IN LENGTH):

Remove all three brackets.

EXISTING ROOF CURBS (81-3/4" LONG):

Set unit on roof curb positioning alignment brackets as shown.

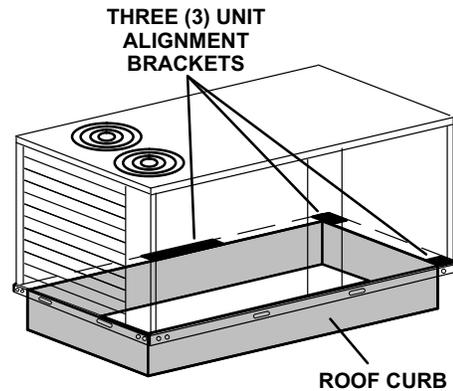


FIGURE 3

Condensate Drains

Make drain connection to the 1" N.P.T. drain coupling provided on unit.

Note - The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.

A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 4. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to page 2 for condensate drain location.

Units are shipped with the drain coupling facing the right side of the unit. The unit can be installed in either downflow or horizontal air discharge regardless of condensate drain location.

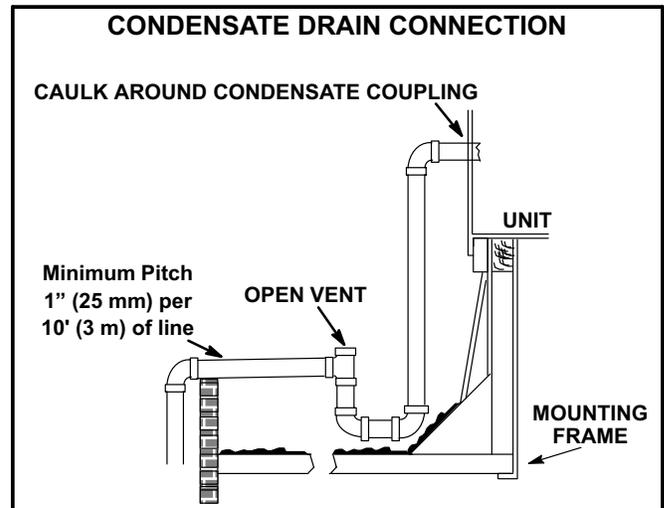


FIGURE 4

Electrical Connections

POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- 1- 230/460/575 volt units are factory wired. **For 208V supply**, disconnect the pink wire (230V) at all control power transformer(s). Reconnect the pink wire (208V). Tape the exposed end of the 230V pink wire.
- 2- Route power through the bottom power entry area and connect to L1, L2, and L3 on the bottom of TB13 in control box. Route power to S48 disconnect switch when the option is factory-installed. See unit wiring diagram.

CONTROL WIRING

A-Thermostat Location

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

B-Control Wiring

- 1- Route thermostat cable or wires from subbase to control box (refer to unit dimensions to locate bottom and side power entry).

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring. Use wire ties located near the lower left corner of the controls hat section to secure thermostat cable.

Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

- 2- Install thermostat assembly in accordance with instructions provided with thermostat.

- 3- Connect thermostat wiring to TB1 terminal board on the left side of the controls area. Wire as shown in figure 5 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

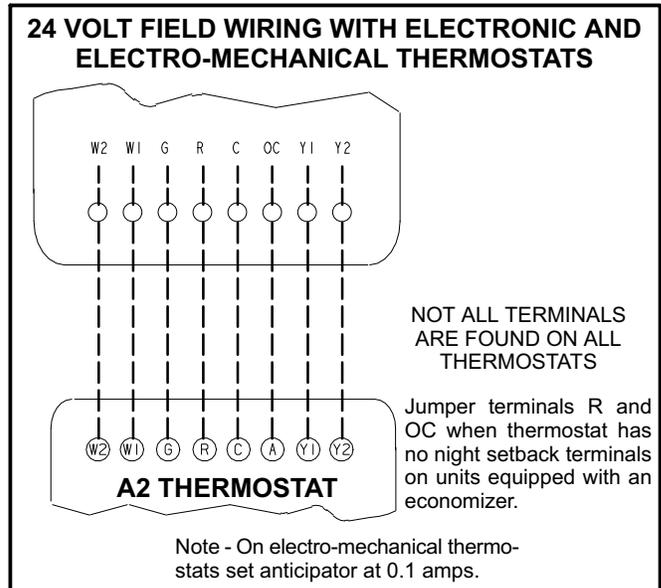


FIGURE 5

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

Unit Power-Up

A-General

- 1- Make sure that 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.
- 3- Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.
- 4- Check voltage at main unit power connection. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.
- 5- Make sure filters are in place before start-up.
- 6- Make sure there is no heating, cooling, or blower demand from thermostat. Apply power to unit.

Blower Operation and Adjustments

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 6.

- 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.

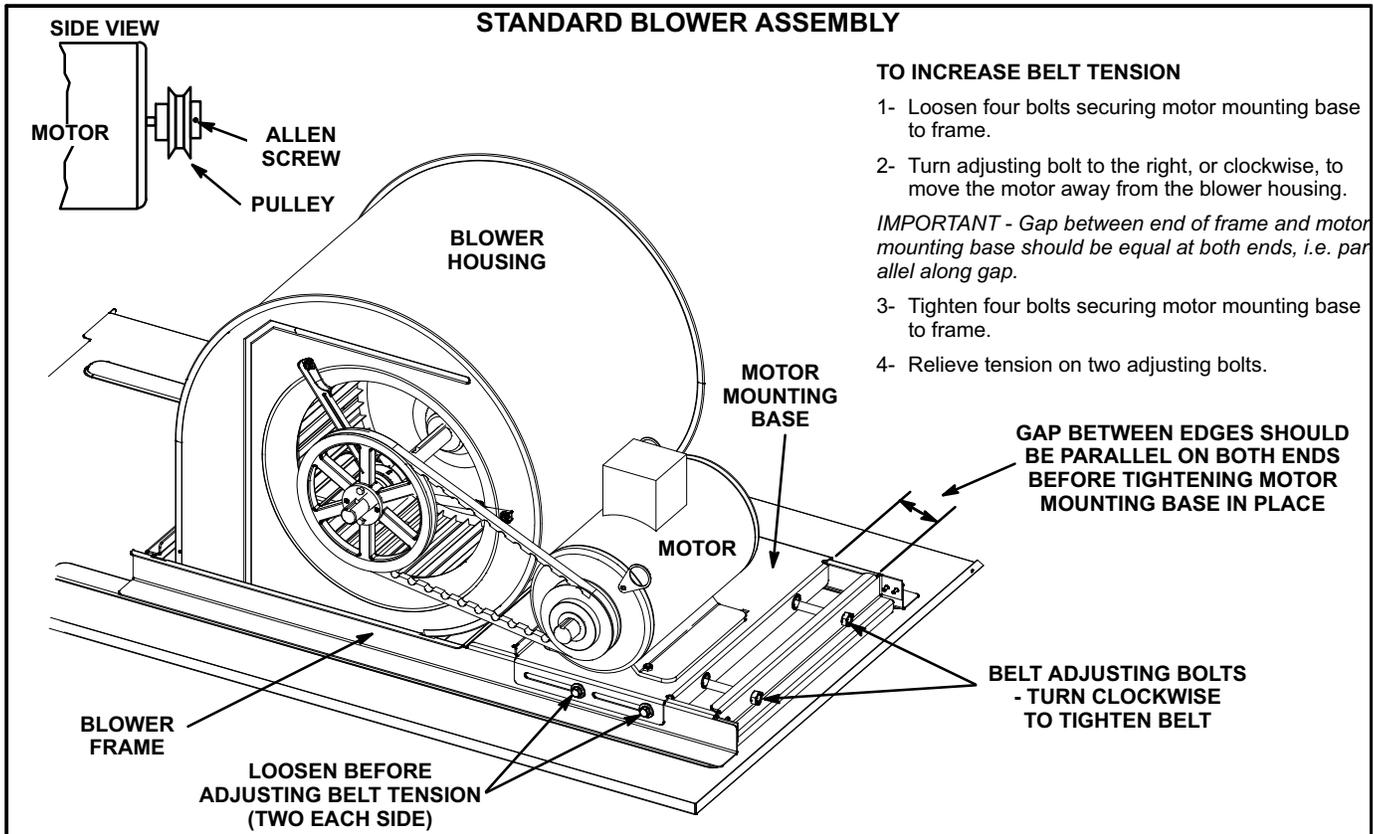


FIGURE 6

D-Determining Unit CFM

- 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 7.

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

- 4- Referring to page 10 or 11, use static pressure and RPM readings to determine unit CFM. Use page 12 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 6. 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 8.

- 1- Loosen four bolts securing motor base to mounting frame. See figure 6.
- 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.

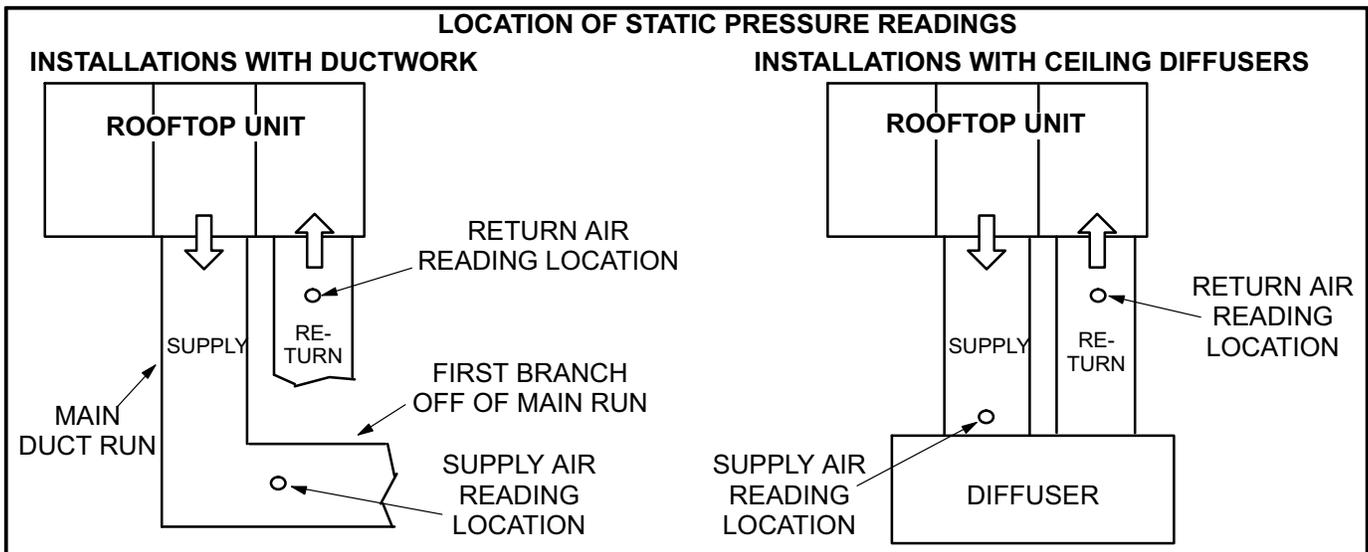


FIGURE 7

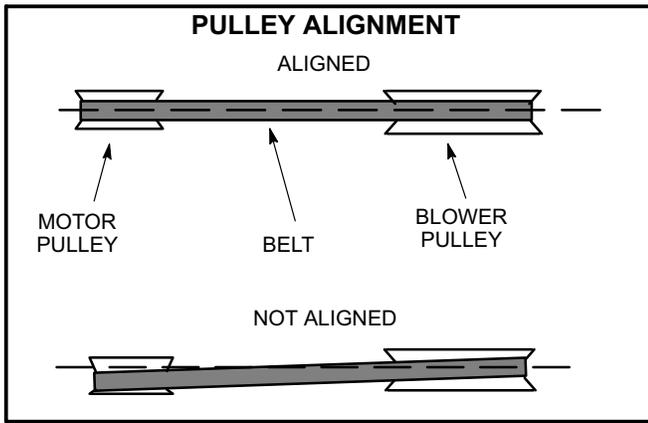


FIGURE 8

F-Check Belt Tension

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

- 1- Measure span length X. See figure 9.
- 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.

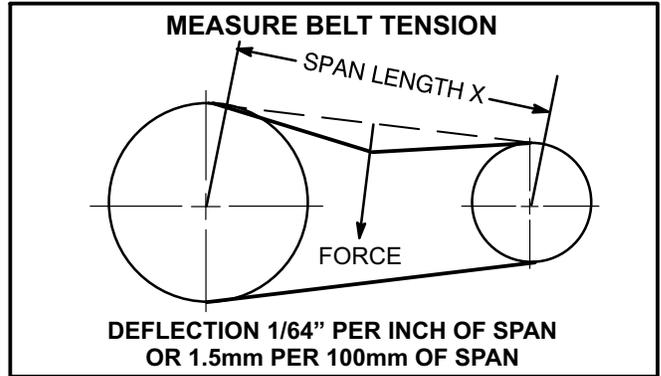


FIGURE 9

F-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 10 through 12 to determine BHP and RPM required. Reference table 2 for drive component manufacturer's numbers.

BLOWER DATA

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.

See page 12 for blower motors and drives.

See page 12 for wet coil and option/accessory air resistance data.

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.)

7.5kW, 15 kW, 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

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

BLOWER DATA

102S, 120S 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 12 for blower motors and drives.

See page 12 for wet coil and option/accessory air resistance data.

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.)

15 kW - 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

60 kW - 3500 cfm

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	RPM
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 option are limited to a motor service factor of 1.0.

POWER EXHAUST FAN PERFORMANCE

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

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

Air Volume cfm	Wet Indoor Coil		Electric Heat	Economizer	Filters		Return Air Adaptor Plate
	092	102, 120			MERV 8	MERV 13	
1750	0.04	0.04	0.03	0.05	0.01	0.03	0.00
2000	0.05	0.05	0.03	0.06	0.01	0.03	0.00
2250	0.06	0.06	0.04	0.08	0.01	0.04	0.00
2500	0.07	0.07	0.04	0.11	0.01	0.05	0.00
2750	0.08	0.08	0.05	0.12	0.02	0.05	0.00
3000	0.10	0.09	0.06	0.13	0.02	0.06	0.02
3250	0.11	0.10	0.06	0.15	0.02	0.06	0.02
3500	0.12	0.11	0.09	0.15	0.03	0.07	0.04
3750	0.14	0.13	0.09	0.15	0.03	0.08	0.07
4000	0.15	0.14	0.09	0.19	0.04	0.08	0.09
4250	0.17	0.15	0.13	0.19	0.04	0.09	0.11
4500	0.19	0.17	0.14	0.22	0.04	0.09	0.12
4750	0.20	0.18	0.17	0.25	0.05	0.10	0.16
5000	0.22	0.20	0.20	0.29	0.06	0.10	0.18
5250	0.24	0.22	0.22	0.32	0.06	0.11	0.19
5500	0.25	0.23	0.25	0.34	0.07	0.12	0.22
5750	0.27	0.25	0.31	0.45	0.07	0.12	0.25
6000	0.29	0.27	0.33	0.52	0.08	0.13	0.27

**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

Heating Start-Up

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

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

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

KHA Units With Optional Electric Heat -

An increased heating demand (W2) will energize electric heat. Electric heat is also energized during the defrost cycle (W1) to maintain discharge air temperature.

Cooling Start-Up

A-Operation

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

- 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 10.

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

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

B-Refrigerant Charge and Check - Fin/Tube Coil

WARNING-Do not exceed nameplate charge under any condition.

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

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

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

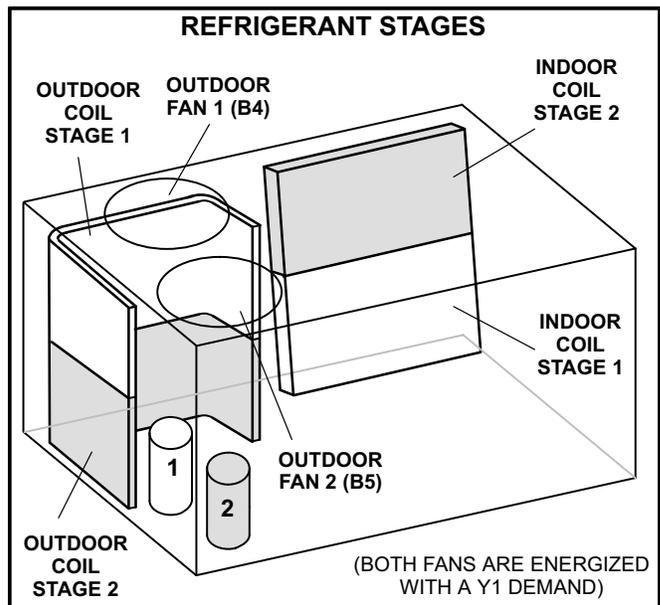


FIGURE 10

IMPORTANT - Charge unit in standard cooling mode.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Check each system separately with all stages operating. Compare the normal operating pressures (see tables 3 - 5) 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 ZH 092S Circuit 1: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 103°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

C-Compressor Controls

- 1- High Pressure Switches (S4, S7)
Compressor circuits are protected by a high pressure switch which cuts out at 640 psig \pm 10 psig (4413 kPa \pm 70 kPa).
- 2- High Temperature Limit Switches (S5, S8)
Switches de-energize compressors when the temperature on top of the compressor exceeds 248°F (120°C). Switches reset when temperature cools to 169°F (76°C).
- 3- Defrost Switches (S6, S9)
Defrost switches close to initiate defrost when liquid line temperature falls to 35°F (1.7°C). The defrost switch is located on the liquid line between the outdoor expansion valve and the distributor
- 4- Defrost Termination Switch (S104)
Defrost pressure switch opens to terminate defrost when vapor (discharge pressure during cooling and defrost) pressure reaches 450 psig (3103 kPa).
- 5- Defrost Controls (CMC1)
Defrost is liquid line temperature initiated and operates for 14 minutes unless terminated by vapor line pressure drop.

When the liquid line temperature drops below 35°F, the defrost switch closes and signals the **defrost control** that a defrost cycle is needed. If the defrost switch is still closed after 60 minutes (default), a defrost cycle begins and operates for 14 minutes. The defrost pressure switch can terminate the defrost cycle before the 14 minutes elapses if vapor pressure reaches 450 \pm 10 psi.

Electric heat is energized during defrost to maintain discharge air temperature.

TABLE 3

092S 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	95	244	98	285	100	325	104	372	108	424	113	485
	105	251	108	289	112	337	115	385	118	436	121	492
	110	253	118	297	126	346	128	398	136	450	135	505
	113	260	122	302	130	351	137	404	144	458	143	515
Circuit 2	119	240	124	281	128	322	131	368	135	419	138	473
	124	244	127	281	131	325	134	371	139	422	144	477
	133	241	142	293	149	338	152	387	158	436	159	488
	136	253	144	291	154	336	162	386	169	436	174	492

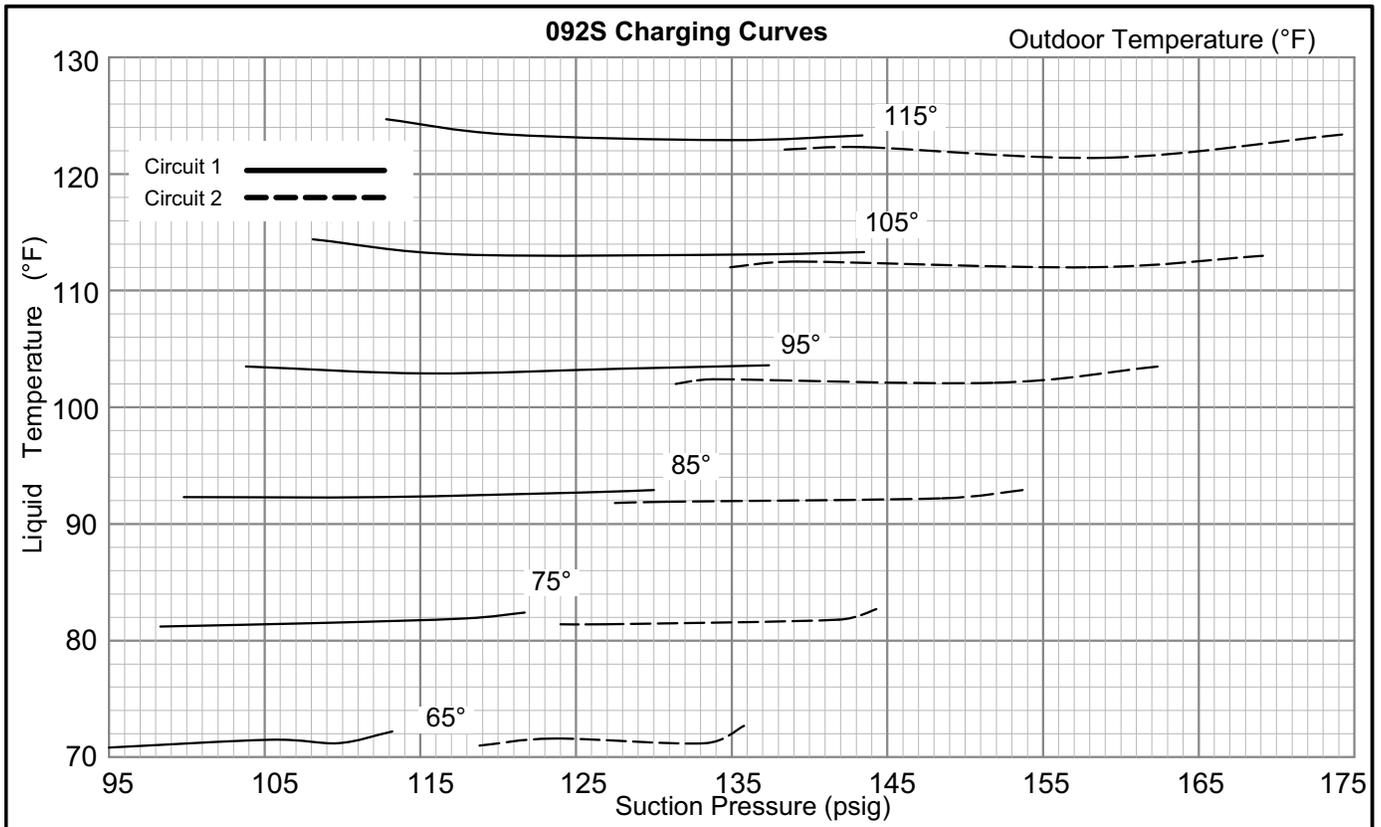


TABLE 4

102S Normal Operating Pressures

	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	105	250	107	287	111	330	114	375	116	425	120	487
	113	256	117	296	119	337	120	383	121	430	127	491
	124	265	132	309	137	355	141	405	145	459	145	515
	129	268	138	312	146	363	153	415	159	472	160	530
Circuit 2	116	260	119	298	123	340	126	385	131	437	136	405
	125	266	128	306	131	347	137	398	140	447	145	503
	136	271	142	313	148	359	152	409	155	462	157	519
	144	271	152	321	159	370	166	421	171	477	172	534

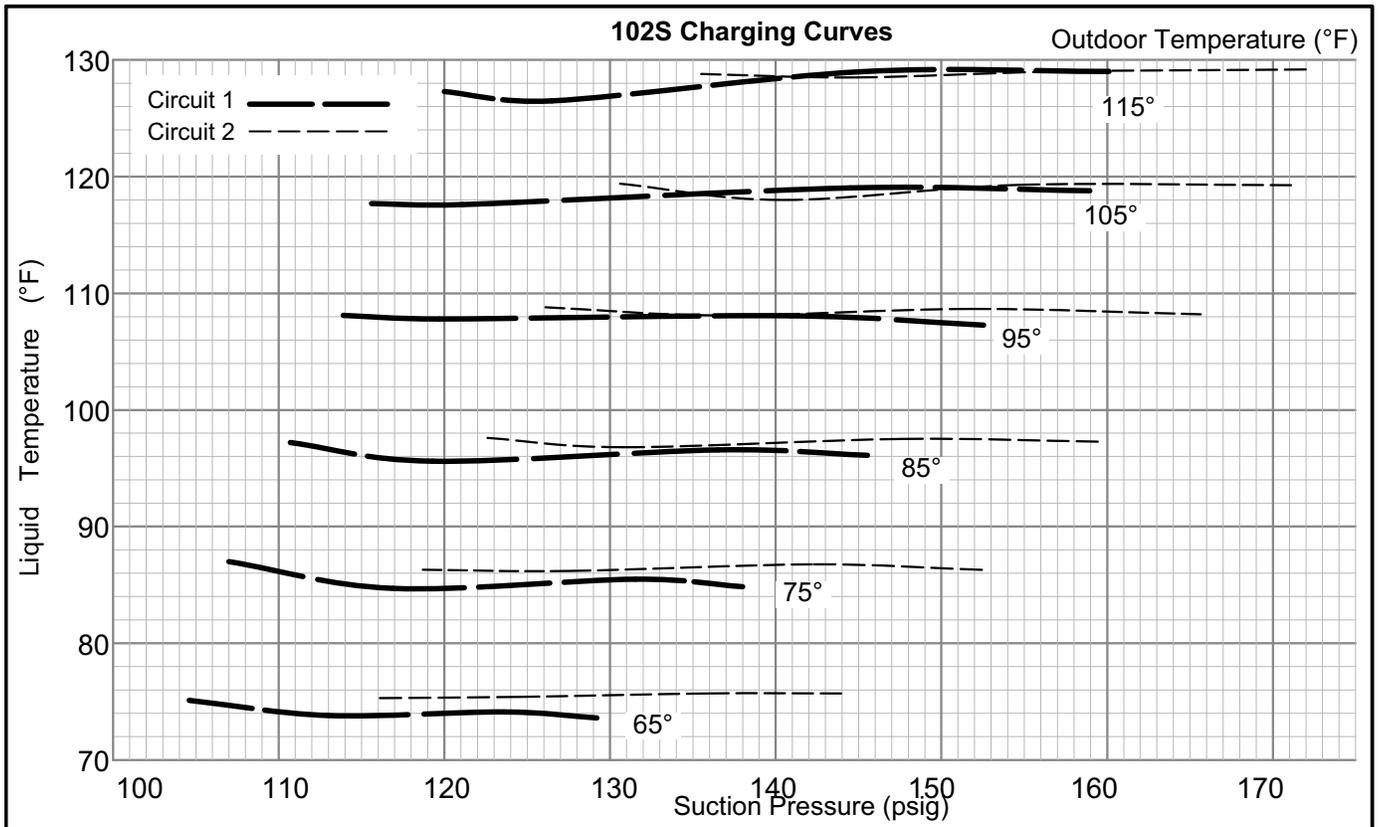
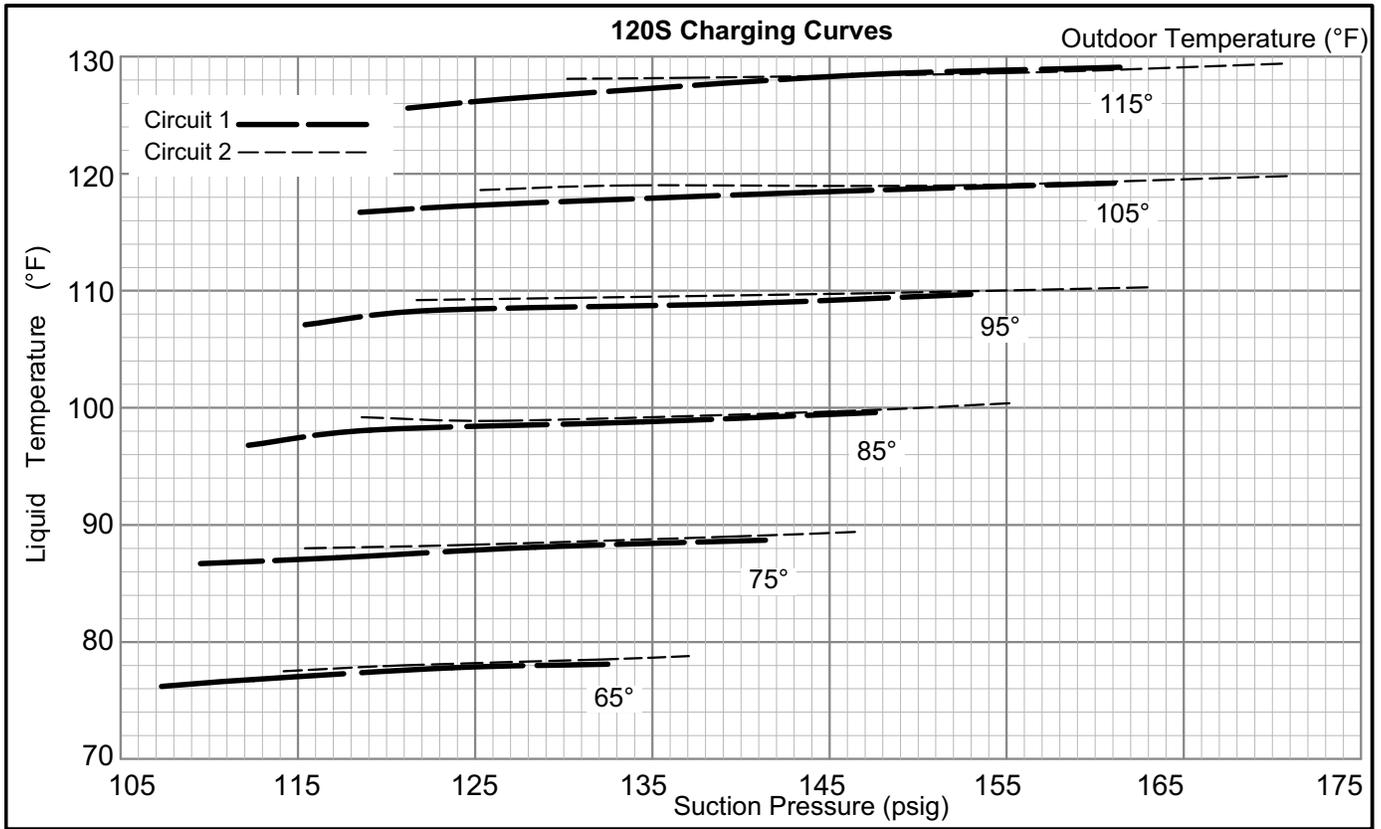


TABLE 5

120S 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	257	110	294	112	338	115	384	119	436	121	493
	113	261	117	302	119	342	122	387	125	438	128	492
	124	268	128	309	135	356	140	406	144	458	146	512
	133	274	141	319	148	366	153	417	161	474	161	531
Circuit 2	114	265	115	302	119	345	122	390	125	443	130	496
	121	269	125	310	127	354	131	401	134	448	137	498
	132	279	140	319	145	365	148	414	152	469	155	524
	137	284	147	329	155	379	163	430	171	486	171	539



Electric Heat Start-Up

Optional electric heat will stage on and cycle with thermostat demand. Number of stages of electric heat will vary depending on electric heat assembly. See electric heat wiring diagram on unit for sequence of operation.

Defrost Control Board

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

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 60 minutes (default) on 100269-02 boards; 90 minutes (default) on 100269-04 boards. The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 11.

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

Defrost Test Option

A TEST option is provided for troubleshooting. The TEST mode may be started any time the unit is in the heating mode and the defrost thermostat is closed or jumpered. If the timing jumper is in the TEST position at power-up, the

defrost control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost pressure switch opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

Diagnostic LEDs

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

TABLE 6

Defrost Control Board Diagnostic LED		
Indicates	LED 1	LED 2
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure / no power	Off	Off
Board failure	On	On
Anti-short cycle lockout	Alternating slow flash	

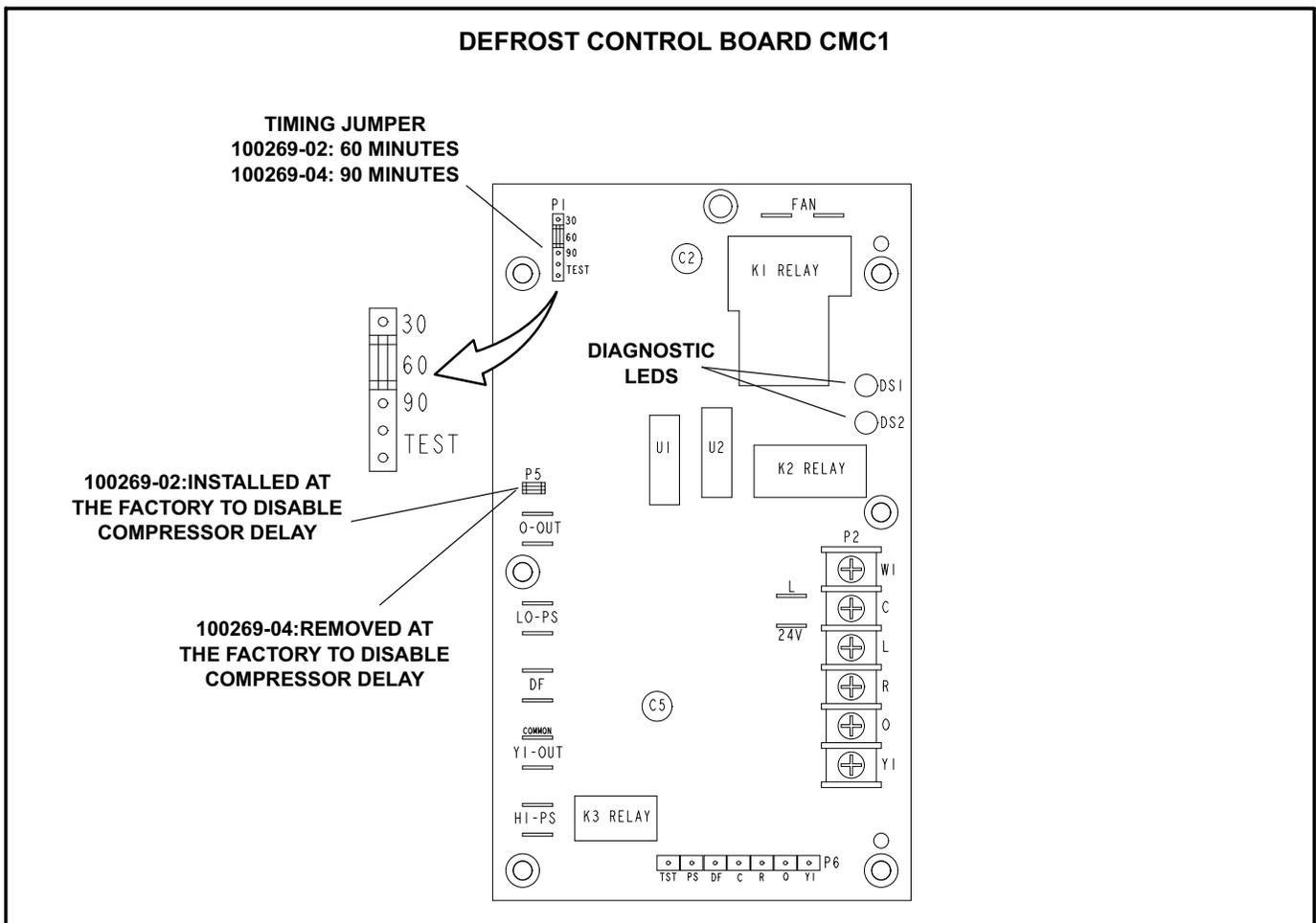


FIGURE 11

Service

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

⚠ CAUTION

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

⚠ WARNING

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

A-Filters

Units are equipped with 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 12. Lift filter stop to remove filters. See figure 13.

⚠ 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 13.

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

B-Compressor

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

⚠ IMPORTANT

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

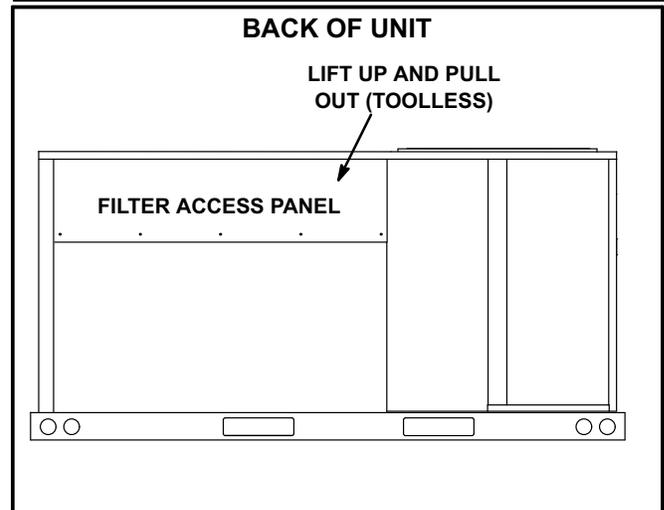


FIGURE 12

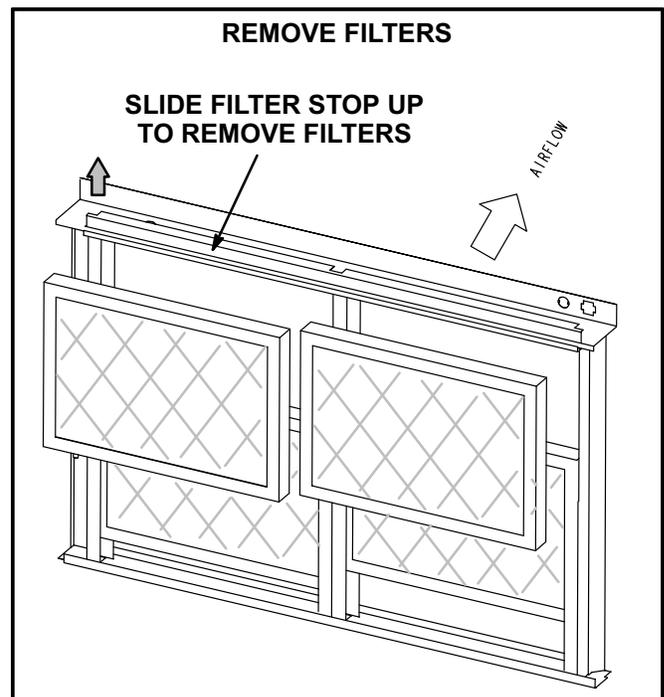


FIGURE 13

C-Lubrication

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

G-Indoor Coil

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

H-Outdoor Coil

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

Outdoor coils are made of single and two formed slabs.

On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 14. Flush coils with water following cleaning.

Note - Remove all screws and gaskets prior to cleaning procedure and replace upon completion.

J-Supply Air Blower Wheel

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

K-Filter Drier

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

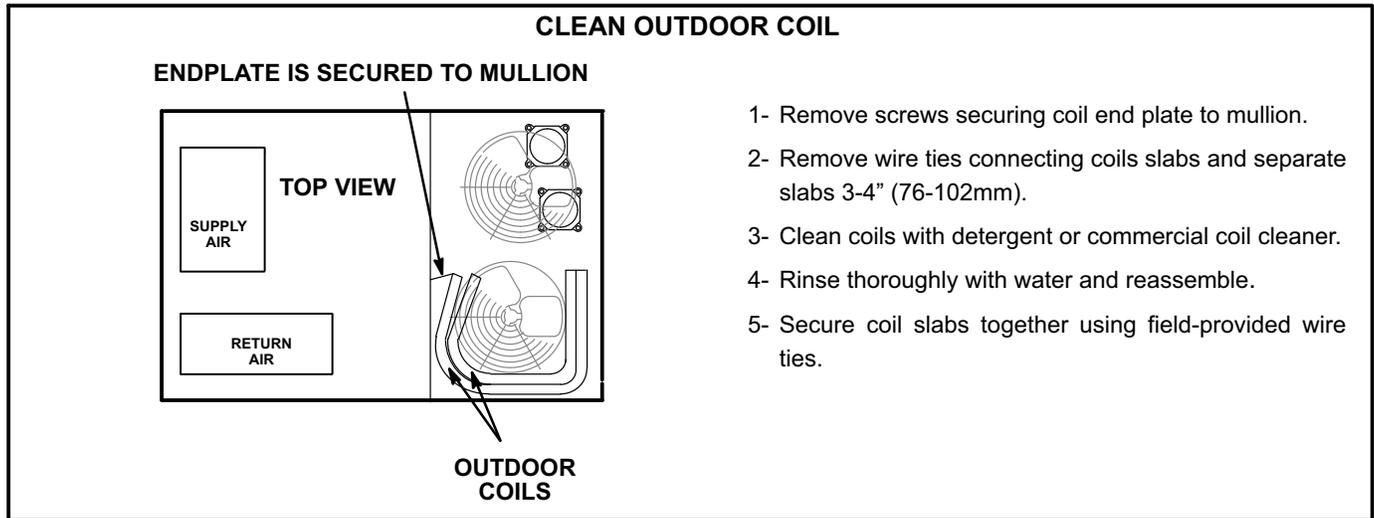


FIGURE 14