UNIT INFORMATION

ZHC SERIES
7.5 to 10 ton
26.3 to 35.2 kW

100080

Service Literature

ZHC092 through 120

The ZHC commercial heat pump is available in 7.5, 8.5 and 10 ton capacities. The refrigerant systems utilize one two-step compressor, one fixed capacity compressor, two reversing valves and other parts common to a heat pump.

Optional auxiliary electric heat is field installed. Electric heat operates in single or multiple stages depending on the kW input size. 7.5kW through 60kW heat sections are available.

Units are designed to deliver 3-Stages of cooling capacity and one stage of heatpump capacity with second heating stage provided by electric heat. The unit is designed to operate with standard 3-cool 2-heat energy management thermostat control systems with minimum field wiring.

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

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

⚠ WARNING

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

⚠ WARNING

To prevent serious injury or death:

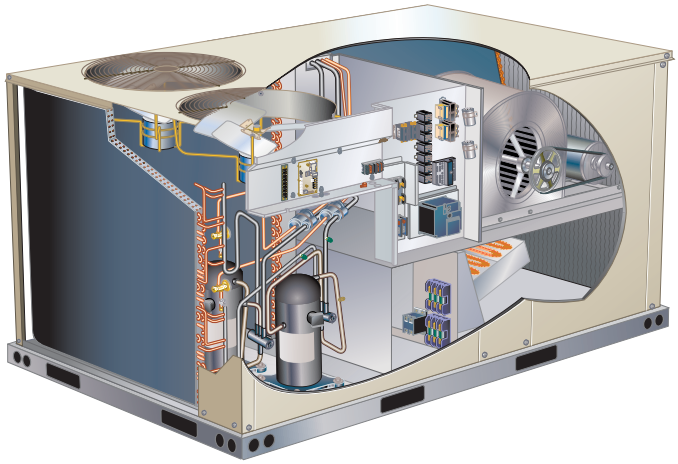
1- Lock-out/tag-out before performing maintenance.

2- If system power is required (e.g., smoke detector maintenance), disable power to blower, remove fan belt where applicable, and ensure all controllers and thermostats are set to the "OFF" position before performing maintenance.

3- Always keep hands, hair, clothing, jewelry, tools, etc., away from moving parts.

⚠ CAUTION

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



⚠ WARNING

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

Table of Contents

OPTIONS / ACCESSORIES

Item Description		Catalog Number	Unit Model No 092	102	120
COOLING/HEATING SYSTEM					
Condensate Drain Trap	PVC	**22H54**	X	X	X
	Copper	**76W27**	X	X	X
Corrosion Protection		Factory	O	O	O
Drain Pan Overflow Switch		**99W59**	X	X	X
Low Ambient Kit		**10Z34**	X	X	X
Refrigerant Type		R-410A	O	O	O
BLOWER - SUPPLY AIR					
Blower Motors	Belt Drive - 2 hp	Factory	O	O	O
	Belt Drive - 3 hp	Factory	O	O	O
	Belt Drive - 5 hp	Factory	O	O	O
Drive Kits	Kit #1 590-890 rpm	Factory	O	O	O
See Blower Data Tables for selection	Kit #2 800-1105 rpm	Factory	O	O	O
	Kit #3 795-1195 rpm	Factory	O	O	O
	Kit #4 730-970 rpm	Factory	O	O	O
	Kit #5 940-1200 rpm	Factory	O	O	O
	Kit #6 1015-1300 rpm	Factory	O	O	O
	Kit #10 900-1135 rpm	Factory	O	O	O
	Kit #11 1040-1315 rpm	Factory	O	O	O
	Kit #12 1125-1425 rpm	Factory	O	O	O
CABINET					
Combination Coil/Hail Guards		**12X21**	X	X	X
CONTROLS					

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

OPTIONS / ACCESSORIES

Item Description		Catalog Number	Unit Model No 092	102	120
INDOOR AIR QUALITY					
Air Filters					
Replacement Media Filter With Metal Mesh Frame (includes non-pleated filter media)		**Y3063**	X	X	X
Indoor Air Quality (CO_2) Sensors					
Sensor - Wall-mount, off-white plastic cover with LCD display		**77N39**	X	X	X
Sensor - Wall-mount, off-white plastic cover, no display		**23V86**	X	X	X
Sensor - Black plastic case with LCD display, rated for plenum mounting		**87N52**	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting		**87N54**	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications		**85L43**	X	X	X
Aspiration Box - For duct mounting non-plenum rated CO_2 sensors (**77N39**)		**90N43**	X	X	X
ELECTRICAL					
Voltage 60 Hz	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		**11H66**	X	X	X
ELECTRIC HEAT					
7.5 kW	208/240V-3ph	**10Y97**	X	X	
	460V-3ph	**10Y98**	X	X	
	575V-3ph	**10Y99**	X	X	
15 kW	208/240V-3ph	**10Z01**	X	X	X
	460V-3ph	**10Z03**	X	X	X
	575V-3ph	**10Z04**	X	X	X
22.5 kW	208/240V-3ph	**10Z05**	X	X	X
	460V-3ph	**10Z06**	X	X	X
	575V-3ph	**10Z07**	X	X	X
30 kW	208/240V-3ph	**10Z08**	X	X	X
	460V-3ph	**10Z09**	X	X	X
	575V-3ph	**10Z10**	X	X	X
45 kW	208/240V-3ph	**10Z11**	X	X	X
	460V-3ph	**10Z12**	X	X	X
	575V-3ph	**10Z13**	X	X	X
60 kW	208/240V-3ph	**10Z14**			X
	460V-3ph	**10Z15**			X
	575V-3ph	**10Z16**			X
ELECTRIC HEAT ACCESSORIES					
Unit Fuse Block (required) - See Electrical/Electric Heat Tables for Selection			X	X	X

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

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X = Field Installed

OPTIONS / ACCESSORIES

Item Description		Catalog Number	Unit Model No 092	102	120
ECONOMIZER					
Standard Economizer (Not for Title 24)					
Standard Downflow Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods		**24K57**	X	X	X
Standard Horizontal Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods		**24K58**	X	X	X
Standard Economizer Controls (Not for Title 24)					
Single Enthalpy Control		**21Z09**	X	X	X
Differential Enthalpy Control (order 2)		**21Z09**	X	X	X
High Performance Economizer (Approved for California Title 24 Building Standards / AMCA Class 1A Certified)					
High Performance Downflow Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods		**24F99**	OX	OX	OX
High Performance Horizontal Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods		**24G01**	X	X	X
High Performance Economizer Controls					
Single Enthalpy Control		**24G11**	X	X	X
Differential Enthalpy Control (order 2) (Not for Title 24)		**24G11**	X	X	X
Economizer Accessories					
WLAN Stick (For High Performance Economizer only)		**23K58**	X	X	X
OUTDOOR AIR					
Outdoor Air Dampers					
Motorized Dampers with outdoor air hood		**14G36**	X	X	X
Manual Dampers with outdoor air hood		**14G37**	X	X	X
POWER EXHAUST					
Standard Static (Downflow)	208/230V-3ph	**10Z70**	X	X	X
	460V-3ph	**10Z71**	X	X	X
Standard Static (Horizontal)	208/230V-3ph	**24E01**	X	X	X
	460V-3ph	**28E01**	X	X	X
575V Transformer Kit		**59E02**	X	X	X
NOTE - Order 575V Transformer Kit with 208/230V Power Exhaust Fan for 575V applications. Order two kits for downflow models, order one kit for horizontal models.					
ROOF CURBS					
Hybrid Roof Curbs, Downflow					
8 in. height		**10Z25**	X	X	X
14 in. height		**10Z26**	X	X	X
18 in. height		**10Z27**	X	X	X
24 in. height		**10Z28**	X	X	X
CEILING DIFFUSERS					
Step-Down - Order one	RTD11-95S	**13K61**	X		
	RTD11-135S	**13K62**		X	X
Flush - Order one	FD11-95S	**13K56**	X		
	FD11-135S	**13K57**		X	X
NOTE - Ceiling Diffuser Transitions are not furnished and must be field fabricated.					

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

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

O = Configure To Order (Factory Installed)

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SPECIFICATIONS

General Data		Nominal Tonnage	7.5 Ton	8.5 Ton	10 Ton
		Model Number	**ZHC092S4M**	**ZHC102S4M**	**ZHC120S4M**
		Efficiency Type	**Standard**	**Standard**	**Standard**
		Blower Type	MSAV Multi-Stage Air Volume	MSAV Multi-Stage Air Volume	MSAV Multi-Stage Air Volume
Cooling Performance	Gross Cooling Capacity - Btuh		89,400	103,200	121,900
	[1] Net Cooling Capacity - Btuh		87,000	100,000	118,000
	AHRI Rated Air Flow - cfm		3000	3200	3400
	Total Unit Power - kW		7.9	9.1	10.7
	[1] EER (Btuh/Watt)		11.0	11.0	11.0
	[1] IEER (Btuh/Watt)		14.1	14.1	14.1
Refrigerant Charge Furnished	Refrigerant Type		R-410A	R-410A	R-410A
	Circuit 1		11 lbs. 12 oz.	11 lbs. 10 oz.	15 lbs. 0 oz.
	Circuit 2		10 lbs. 8 oz.	9 lbs. 14 oz.	14 lbs. 0 oz.
Heating Performance	[1] Total High Heat Capacity - Btuh		83,000	100,000	116,000
	Total Unit Power - kW		7.1	8.6	10.0
	[1] C.O.P.		3.4	3.4	3.4
	[1] Total Low Heat Capacity - Btuh		50,000	55000	70,000
	Total Unit Power (kW)		6.6	7.2	9.1
	[1] C.O.P.		2.25	2.25	2.25
Electric Heat Available			7.5,15,22.5,30 & 45 kW		15, 22.5, 30, 45 and 60 KW
Compressor Type (number)			(1) Two-Stage Scroll, (1) Single-Stage Scroll		
Outdoor Coils	Net face area (total) - sq. ft.		26.2	26.2	26.2
	Tube diameter - in.		3/8	3/8	3/8
	Number of rows		2	3	3
	Fins per inch		20	20	20
	Expansion device type		Balance port TXV, removable head		
Outdoor Coil Fans	Motor - (No.) hp		(2) 1/3	(2) 1/3	(2) 1/2
	Motor rpm		1075	1075	1075
	Total Motor watts		650	960	960
	Diameter - (No.) in.		(2) 24	(2) 24	(2) 24
	Number of blades		3	3	3
	Total Air volume - cfm		8800	8800	9000
Indoor Coils	Net face area (total) - sq. ft.		13.54	13.54	13.54
	Tube diameter - in.		3/8	3/8	3/8
	Number of rows		4	4	4
	Fins per inch		14	14	14
	Drain connection - Number and size		(1) 1 in. NPT coupling		
	Expansion device type		Balanced Port Thermostatic Expansion Valve (removable power element)		
[2] **Indoor Blower and Drive Selection**	Nominal motor output		2 hp, 3 hp, 5 hp		
	Motor - Drive kit number		2 hp **Kit 1** 590-890 rpm **Kit 2** 800-1105 rpm **Kit 3** 795-1195 rpm 3 hp **Kit 4** 730-970 rpm **Kit 5** 940-1200 rpm **Kit 6** 1015-1300 rpm 5 hp **Kit 10** 900-1135 rpm **Kit 11** 1040-1315 rpm **Kit 12** 1125-1425 rpm		
	Blower wheel nominal diameter x width - in.		(1) 15 X 15		
Filters	Type of filter		Disposable		
	Number and size - in.		(4) 20 x 24 x 2		
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase		

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

[1] AHRI Certified to AHRI Standard 340/360:
Cooling Ratings - 95°F outdoor air temperature and 80°F db/67°F wb entering indoor coil air.
High Temperature Heating Ratings - 47°F db/43°F wb outdoor air temperature and 70°F entering indoor coil air.
Low Temperature Heating Ratings - 17°F db/15°F wb outdoor air temperature and 70°F entering indoor coil air.

[2] 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. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

NOTE – Motor service factor limit - 1.0.

ZHC092S4M, ZHC102S4M, ZHC120S4M − 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 7 for blower motors and drives and air resistance for wet coil and options/accessories.

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 - 3000 cfm; 60 kW - 4000 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
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	Drive Kit Number	RPM Range
2	1	590 - 890
2	2	800 - 1105
2	3	795 - 1195
3	4	730 - 970
3	5	940 - 1200
3	6	1015 - 1300
5	10	900 - 1135
5	11	1040 - 1315
5	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. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

NOTE – Motor service factor limit - 1.0.

POWER EXHAUST FAN PERFORMANCE

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

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

Air Volume cfm	Wet Indoor Coil	Electric Heat	Economizer	Filters	
				MERV 8	MERV 13
1750	0.04	0.03	0.03	0.01	0.03
2000	0.05	0.03	0.05	0.01	0.03
2250	0.06	0.04	0.06	0.01	0.04
2500	0.07	0.04	0.08	0.01	0.05
2750	0.08	0.05	0.09	0.02	0.05
3000	0.09	0.06	0.11	0.02	0.06
3250	0.10	0.06	0.13	0.02	0.06
3500	0.11	0.09	0.15	0.03	0.07
3750	0.13	0.09	0.17	0.03	0.08
4000	0.14	0.09	0.19	0.04	0.08
4250	0.15	0.13	0.21	0.04	0.09
4500	0.17	0.14	0.24	0.04	0.09
4750	0.18	0.17	0.26	0.05	0.10
5000	0.20	0.20	0.29	0.06	0.10
5250	0.22	0.22	0.32	0.06	0.11
5500	0.23	0.25	0.34	0.07	0.12
5750	0.25	0.31	0.37	0.07	0.12
6000	0.27	0.33	0.40	0.08	0.13

BLOWER DATA

CEILING DIFFUSERS AIR RESISTANCE - in. w.g.

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

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume	[1] Effective Throw Range	
		RTD11 Step-Down	FD11 Flush
	cfm	ft.	ft.
092 Models	2600	24 - 29	19 - 24
	2800	25 - 30	20 - 28
	3000	27 - 33	21 - 29
	3200	28 - 35	22 - 29
	3400	30 - 37	22 - 30
102, 120 Models	3600	25 - 33	22 - 29
	3800	27 - 35	22 - 30
	4000	29- 37	24 - 33
	4200	32 - 40	26 - 35
	4400	34 - 42	28 - 37

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

ELECTRICAL/ELECTRIC HEAT DATA — 7.5 TON

		Model No.	ZHC092S4M								
[1] Voltage - 60Hz			208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1		Rated Load Amps	12.9			7.1			4.6		
		Locked Rotor Amps	105			62			39		
Compressor 2		Rated Load Amps	13.7			6.1			4.8		
		Locked Rotor Amps	83.1			43			33		
Outdoor Fan Motors (2)	Full Load Amps (2 Non-ECM)		2.4			1.3			1		
		Total	4.8			2.6			2		
Power Exhaust (2) 0.5 HP		Full Load Amps	4.4			1.7			1.7		
		Total	8.8			3.4			3.4		
Service Outlet 115V GFI (amps)			15			15			20		
Indoor Blower Motor		Horsepower	2	3	5	2	3	5	2	3	5
		Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection		Unit Only	50	50	60	25	25	30	20	20	25
		With (2) 0.5 HP Power Exhaust	60	60	70	30	30	35	20	20	25
[3] Minimum Circuit Ampacity		Unit Only	43	46	53	21	23	26	16	17	20
		With (2) 0.5 HP Power Exhaust	52	55	62	25	26	29	19	20	23

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**7.5 kW**	70	70	70	70	80	80	35	35	40	25	30	30
		15 kW	90	90	90	100	100	100	45	45	50	35	35	40
		22.5 kW	110	110	110	125	125	125	60	60	60	45	45	50
		30 kW	125	150	125	150	150	150	70	70	80	60	60	60
		45 kW	175	200	175	200	175	200	90	100	100	70	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**7.5 kW**	62	65	65	68	72	75	33	34	37	25	26	29
		15 kW	82	88	85	91	92	98	44	45	48	34	35	38
		22.5 kW	101	110	105	114	111	120	55	57	60	43	44	47
		30 kW	121	133	124	136	131	143	67	68	71	52	53	56
		45 kW	160	178	163	181	170	188	89	91	93	70	71	74
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	80	80	80	80	90	90	40	40	45	30	30	35
		15 kW	100	100	100	100	110	110	50	50	60	40	40	45
		22.5 kW	110	125	125	125	125	150	60	60	70	50	50	50
		30 kW	150	150	150	150	150	175	70	80	80	60	60	60
		45 kW	175	200	175	200	200	200	100	100	100	80	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	71	74	74	77	81	84	36	38	40	28	29	32
		15 kW	91	97	94	100	101	107	47	49	52	37	38	41
		22.5 kW	110	119	113	122	120	129	59	60	63	46	47	50
		30 kW	130	142	133	145	140	152	70	71	74	55	56	59
		45 kW	169	187	172	190	179	197	93	94	97	73	75	77

ELECTRIC HEAT ACCESSORIES

Unit Fuse Block	Unit Only	**11M12**	**11M12**	**11M12**	**11M12**	**11M12**	**11M12**	**11M10**	**11M10**	**11M10**	**11M09**	**11M09**	**11M09**
	Unit + Power Exhaust	**11M12**	**11M12**	**11M12**	**11M12**	**11M13**	**11M13**	**11M10**	**11M10**	**11M11**	**11M09**	**11M09**	**11M10**

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL/ELECTRIC HEAT DATA — 8.5 TON

		Model No.	ZHC102S4M								
[1] Voltage - 60Hz			208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1		Rated Load Amps	16.7			7.1			5.7		
		Locked Rotor Amps	110			54.7			47.8		
Compressor 2		Rated Load Amps	13.7			6.1			4.8		
		Locked Rotor Amps	83.1			43			33		
Outdoor Fan Motors (2)	Full Load Amps (2 Non-ECM)		2.4			1.3			1		
	Total		4.8			2.6			2		
Power Exhaust (2) 0.5 HP	Full Load Amps		4.4			1.7			1.7		
	Total		8.8			3.4			3.4		
Service Outlet 115V GFI (amps)			15			15			20		
Indoor Blower Motor		Horsepower	2	3	5	2	3	5	2	3	5
		Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection		Unit Only	60	60	70	25	25	30	20	20	25
		With (2) 0.5 HP Power Exhaust	70	70	80	30	30	35	25	25	25
[3] Minimum Circuit Ampacity		Unit Only	47	50	57	21	23	26	17	18	21
		With (2) 0.5 HP Power Exhaust	56	59	65	25	26	29	21	22	24

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**7.5 kW**	70	80	80	80	80	90	35	35	40	30	30	30
		15 kW	90	100	90	100	100	110	45	45	50	35	40	40
		22.5 kW	110	125	110	125	125	125	60	60	60	45	45	50
		30 kW	150	150	150	150	150	150	70	70	80	60	60	60
		45 kW	175	200	175	200	175	200	90	100	100	80	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**7.5 kW**	67	70	70	73	76	79	33	34	37	26	27	30
		15 kW	86	92	90	96	96	102	44	45	48	35	36	39
		22.5 kW	106	115	109	118	115	124	55	57	60	44	45	48
		30 kW	126	138	129	141	135	147	67	68	71	53	54	57
		45 kW	165	183	168	186	174	192	89	91	93	71	72	75
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	80	90	90	90	90	90	40	40	45	30	35	35
		15 kW	100	110	100	110	110	110	50	50	60	40	40	45
		22.5 kW	125	125	125	150	125	150	60	60	70	50	50	60
		30 kW	150	150	150	150	150	175	70	80	80	60	60	60
		45 kW	175	200	200	200	200	225	100	100	100	80	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	76	79	79	82	85	88	36	38	40	30	31	33
		15 kW	95	101	98	104	104	110	47	49	52	39	40	42
		22.5 kW	115	124	118	127	124	133	59	60	63	48	49	51
		30 kW	134	146	137	149	144	156	70	71	74	57	58	60
		45 kW	173	191	177	195	183	201	93	94	97	75	76	78

ELECTRIC HEAT ACCESSORIES

Unit Fuse Block	Unit Only	**11M12**	**11M12**	**11M12**	**11M12**	**11M12**	**11M12**	**11M10**	**11M10**	**11M10**	**11M09**	**11M09**	**11M09**
	Unit + Power Exhaust	**11M12**	**11M12**	**11M12**	**11M12**	**11M13**	**11M13**	**11M10**	**11M10**	**11M11**	**11M09**	**11M09**	**11M10**

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL/ELECTRIC HEAT DATA — 10 TON

		Model No.	ZHC120S4M								
[1] Voltage - 60Hz			208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1		Rated Load Amps	16.7			7.1			5.7		
		Locked Rotor Amps	110			54.7			47.8		
Compressor 2		Rated Load Amps	19.6			8.2			6.6		
		Locked Rotor Amps	136			66.1			55.3		
Outdoor Fan Motors (2)		Full Load Amps (2 Non-ECM)	3			1.5			1.2		
		Total	6			3			2.4		
Power Exhaust (2) 0.5 HP		Full Load Amps	4.4			1.7			1.7		
		Total	8.8			3.4			3.4		
Service Outlet 115V GFI (amps)			15			15			20		
Indoor Blower Motor		Horsepower	2	3	5	2	3	5	2	3	5
		Full Load Amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection		Unit Only	70	70	80	30	30	35	25	25	25
		With (2) 0.5 HP Power Exhaust	80	80	90	35	35	35	25	30	30
[3] Minimum Circuit Ampacity		Unit Only	55	58	64	24	26	28	20	21	23
		With (2) 0.5 HP Power Exhaust	64	67	73	28	29	32	23	24	26

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	100	110	100	110	110	110	50	50	60	40	40	45
		22.5 kW	125	125	125	150	125	150	60	60	70	50	50	50
		30 kW	150	150	150	150	150	175	70	80	80	60	60	60
		45 kW	175	200	200	200	200	200	100	100	100	80	80	80
		60 kW	200	200	200	225	200	225	100	100	110	80	80	90
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	94	100	97	103	103	110	47	48	51	38	39	41
		22.5 kW	114	123	117	126	123	132	58	59	62	47	48	50
		30 kW	133	145	136	149	143	155	69	71	74	56	57	59
		45 kW	172	191	176	194	182	200	92	93	96	74	75	77
		60 kW	180	200	183	203	189	209	96	98	101	77	78	81
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**15 kW**	110	110	110	125	125	125	50	60	60	45	45	45
		22.5 kW	125	150	150	150	150	150	70	70	70	50	60	60
		30 kW	150	175	150	175	175	175	80	80	80	60	60	70
		45 kW	200	200	200	225	200	225	100	100	100	80	80	80
		60 kW	200	225	200	225	200	225	100	110	110	90	90	90
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**15 kW**	103	109	106	112	112	118	50	52	54	41	42	44
		22.5 kW	123	132	126	135	132	141	61	63	66	50	51	53
		30 kW	142	154	145	157	151	163	73	74	77	59	60	62
		45 kW	181	199	184	202	190	209	95	97	100	77	78	80
		60 kW	189	208	192	211	198	218	100	101	104	81	82	84

ELECTRIC HEAT ACCESSORIES

Unit Fuse Block	Unit Only	**11M12**	**11M12**	**11M12**	**11M12**	**11M12**	**11M12**	**11M10**	**11M10**	**11M10**	**11M09**	**11M09**	**11M09**
	Unit + Power Exhaust	**11M12**	**11M12**	**11M12**	**11M12**	**11M13**	**11M13**	**11M10**	**11M10**	**11M11**	**11M09**	**11M09**	**11M10**

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

Volts Input	7.5 kW			15 kW			22.5 kW			30 kW			45 kW			60 kW		
	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages	kW Input	Btuh Output	No. of Stages
208	5.6	19,100	1	11.3	38,600	1	16.9	57,700	1	22.5	76,800	1	33.8	115,300	1	45.0	153,600	1
220	6.3	21,500	1	12.6	43,000	1	18.9	64,500	1	25.2	86,000	1	37.8	129,000	1	50.4	172,000	1
230	6.9	23,600	1	13.8	47,100	1	20.7	70,700	1	27.5	93,900	1	41.3	141,000	1	55.1	188,000	1
240	7.5	25,600	1	15.0	51,200	1	22.5	76,800	1	30.0	102,400	1	45.0	153,600	1	60.0	204,800	1
440	6.9	21,500	1	12.6	43,000	1	18.9	64,500	1	25.2	86,000	1	37.8	129,000	1	50.4	172,000	1
460	6.9	23,600	1	13.8	47,100	1	20.7	70,700	1	27.5	93,900	1	41.3	141,000	1	55.1	188,000	1
480	7.5	25,600	1	15.0	51,200	1	22.5	76,800	1	30.0	102,400	1	45.0	153,600	1	60.0	204,800	1
550	6.3	21,500	1	12.6	43,000	1	18.9	64,500	1	25.2	86,000	1	37.8	129,000	1	50.4	172,000	1
575	6.9	23,600	1	13.8	47,100	1	20.7	70,700	1	27.5	93,900	1	41.3	141,000	1	55.1	188,000	1
600	7.5	25,600	1	15.0	51,200	1	22.5	76,800	2	30.0	102,400	2	45.0	153,600	2	60.0	204,800	1

ZHC PARTS ARRANGEMENT

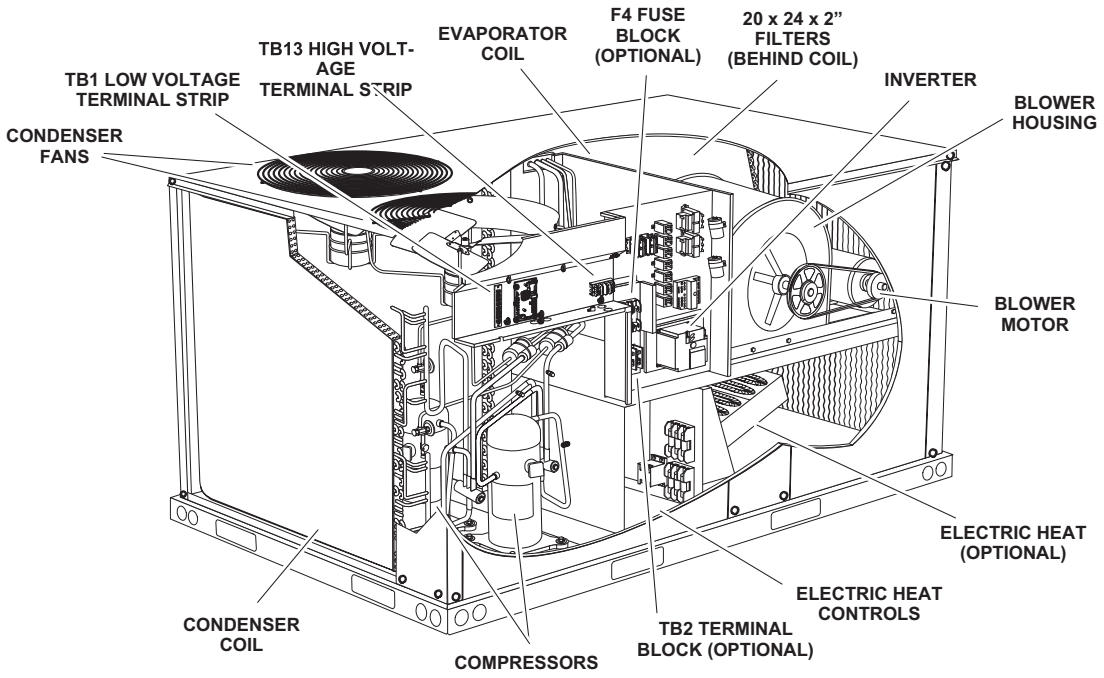


FIGURE 1

ZHC CONTROL BOX

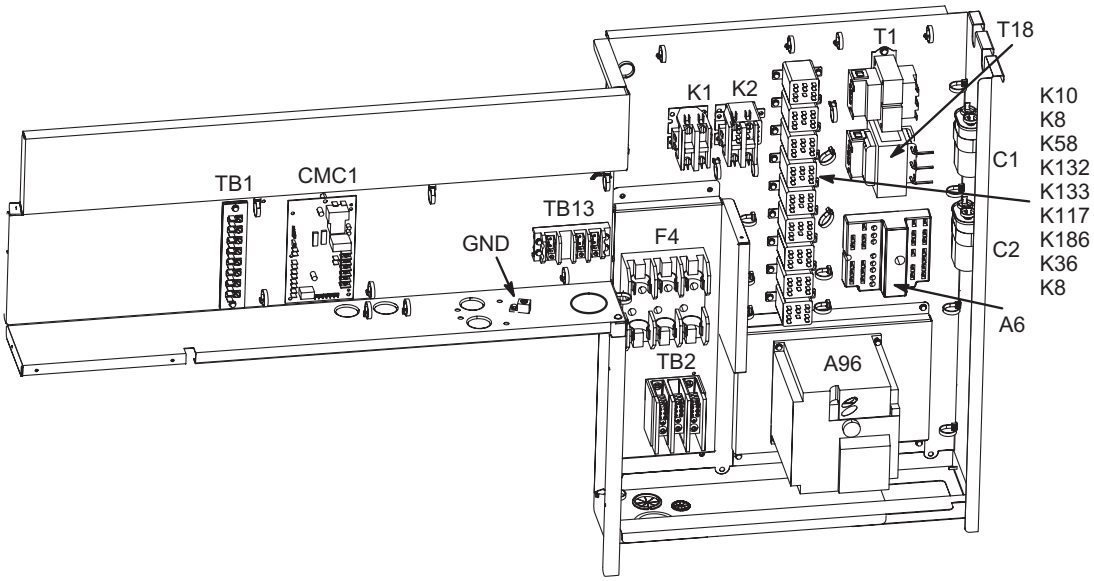


FIGURE 2

I-UNIT COMPONENTS

The unit parts arrangement is shown in figure 1. All L1, L2, and L3 wiring is color coded; L1 is red, L2 is yellow, and L3 is blue. See wiring diagrams in the back of this manual for complete call out of components.

A-Control Box Components

Control box components are shown in FIGURE 2. The control box is located in the upper portion of the compressor compartment.

1-Disconnect Switch S48 (field installed)

Units may be equipped with an optional disconnect switch S48. S48 is a toggle switch, which can be used by the service technician to disconnect power to the unit.

2-Transformer T1

Units use a single line voltage to 24VAC transformer mounted in the control box. Transformer supplies power to CMC1 and control circuits in the unit. The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker (CB8). The 208/230 (Y) voltage transformers use two primary voltage taps as shown in FIGURE 3, while 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

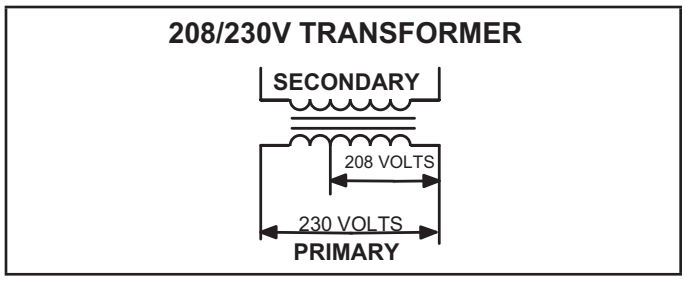


FIGURE 3

3-Transformer T18

T18 is a single line voltage to 24VAC transformer. T18 is identical to T1 and is protected by a 3.5 amp circuit breaker (CB18). T18 provides 24VAC to K1 and K2 coil and reversing valve L1 and L2 (via K58-1 contacts).

4-Outdoor Fan Capacitor C1, C2, and C18

Fan capacitors C1, C2, and C18 are 370V/10MF capacitors used to assist in the start up of condenser fan motors B4, B5, and B21. Capacitor ratings will be on outdoor fan motor nameplate.

5-Compressor Contactor K1 & K2

All compressor contactors are three-pole-double-break contactors with a 24VAC coil. K1and K2 energize compressors B1 and B2 respectively in response to first or second stage cooling demands. On CE M-volt units, contactor is CE approved by manufacturer (Siemens).

6-Outdoor Fan Relay K10

Outdoor fan relay K10 is a DPDT relay with a 24VAC coil. K10 energizes condenser fan motors B4, B5, and B21 (150 only) in response to a W1 heating or Y1 cooling demand.

7-Power Exhaust Relay K65 (PED units)

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

8-Compressor On Relays (K132 & K133)

K132 and K133 are two-pole relays with a 24V coil used to energize compressor contactor coils. K1 is energized by K132 with a Y1 demand. K2 is energized by K133 with a Y2 demand. Both K1 and K2 are energized by K132 and K133 with a W1 demand.

9-Transfer Relay (K8)

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

10-Variable Speed Drive VFD A96

Units are equipped with a factory-installed supply air inverter (VFD). During cooling, the blower will operate at one of three speeds depending on the demand. When demand is low, the blower will operate at low speed. When demand is higher, the blower will operate at either medium or high speed depending on the cooling demand.

11-Low Ambient Kit Relay (K58)

Low ambient relay K58 is a DPDT relay with a 24V coil energized by a CMC1 output in the heating cycle. K58-1 closes to allow power to reversing valves L1 and L2. K58-2 closes to bypass S11 and S84. This allows the fan to operate during the heating demand and cycle during the cooling demand.

12-Terminal Block (TB1)

TB1 provides 24VAC field connections. All indoor thermostat connections are connected to TB1 located in the control box.

13-Enthalpy Control (A6)

Refer to description in economizer section.

13-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 4.

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 1

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	

DEFROST CONTROL BOARD CMC1

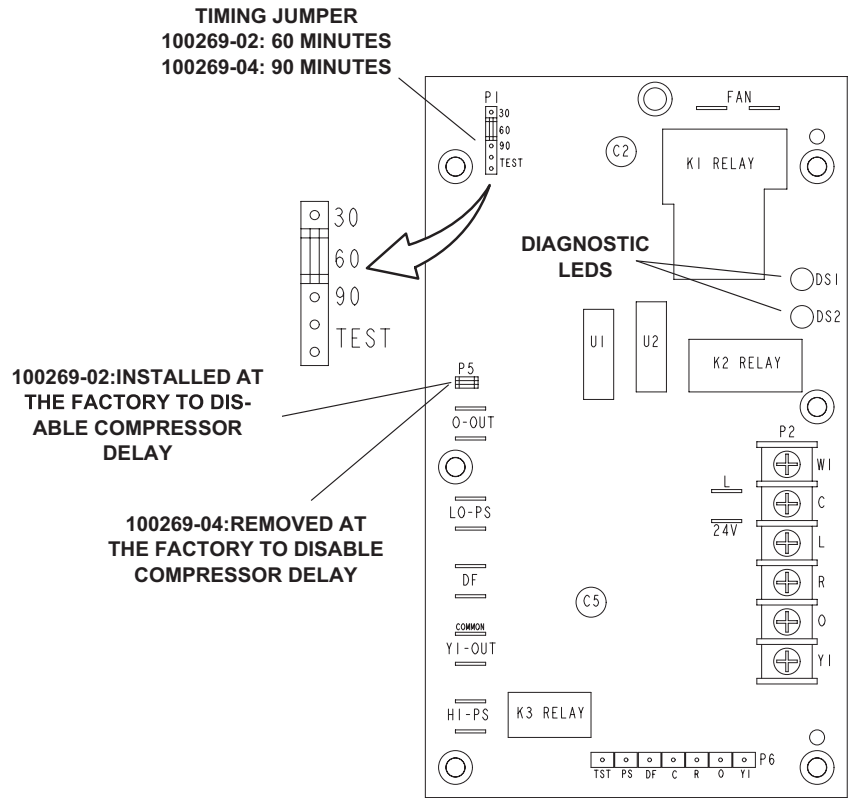
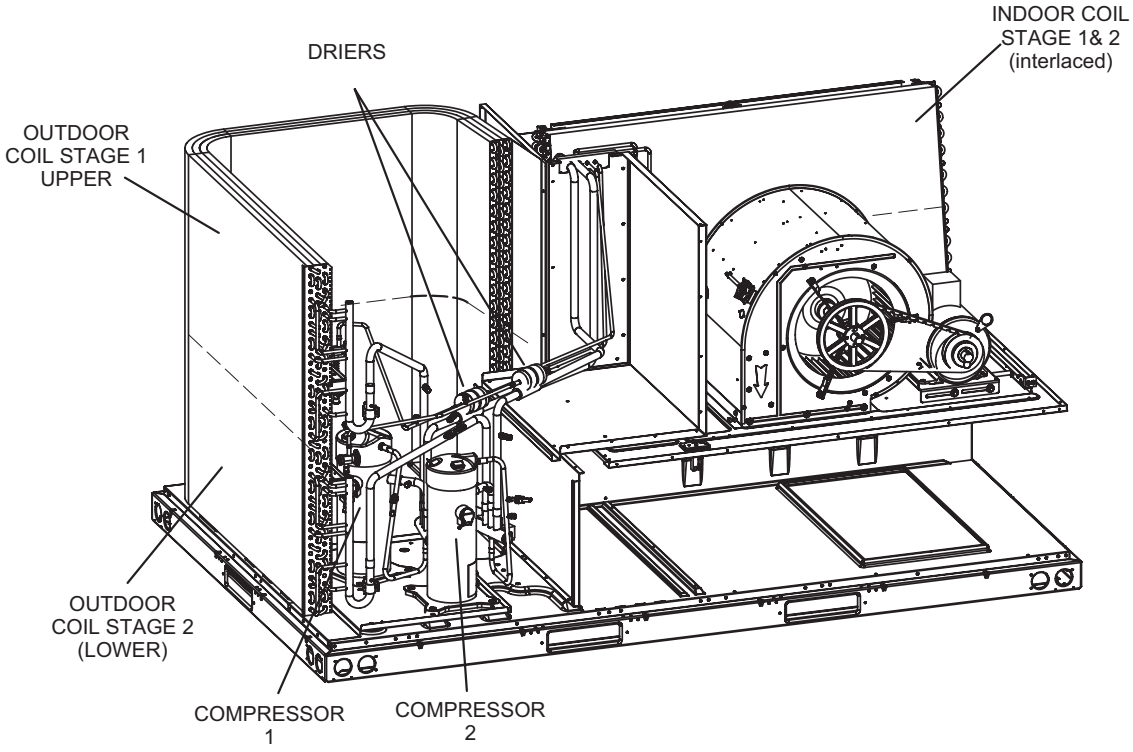


FIGURE 4

ZHC 092,102, 120 PLUMBING AND COMPRESSOR CIRCUITS DETAIL



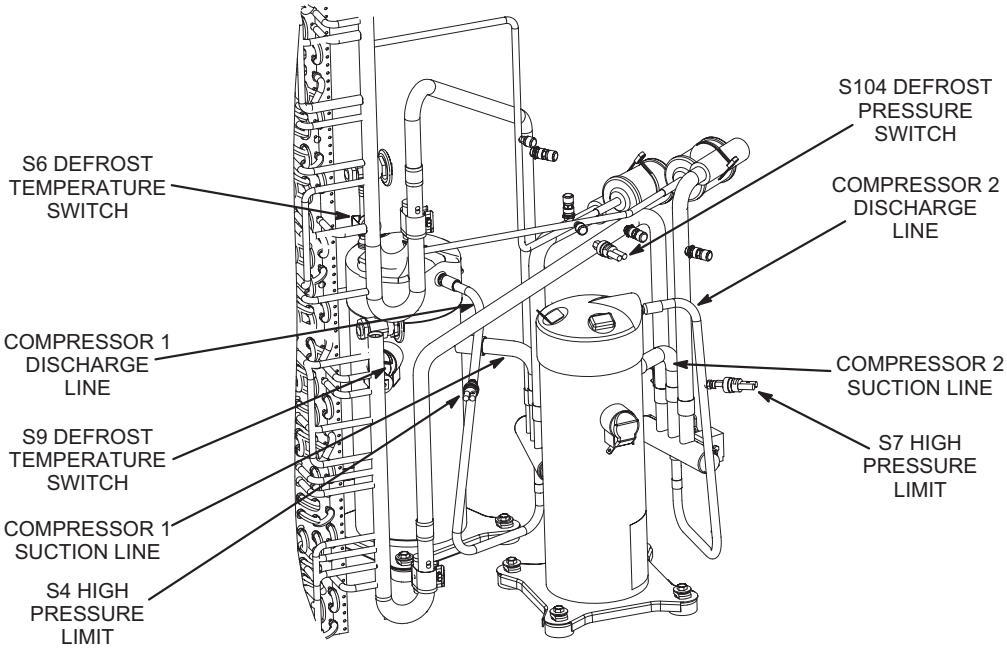


FIGURE 5

B-Cooling Components

Units use independent cooling circuits consisting of separate compressors, outdoor coils and indoor coil (with 2 separate stages). See FIGURE 5. Units are equipped with two draw-through type condenser fans. All units are equipped with belt-drive blowers which draw air across the indoor coil during unit operation.

Cooling may be supplemented by a factory- or field installed economizer. The indoor coils are slab type and are interlaced for stage 1 and stage 2. Each indoor coil uses a thermostatic expansion valve as the primary expansion device. Each indoor coil is also equipped with enhanced fins and rifled tubing. In all units each compressor is protected a high pressure switch (S4, S7). Low ambient switches (S11, S84) are available as an option for additional compressor protection.

1-Compressors B1 and B2

Units use one 2-step scroll compressor and one fixed-capacity scroll compressor to deliver 3-stages of cooling. All compressors are equipped with independent cooling circuits. Compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications.

⚠ WARNING

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

Each compressor is energized by a corresponding compressor contactor.

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

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

⚠ IMPORTANT

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

2-High Pressure Switches S4 and S7

The high pressure switch is an auto-reset SPST N.C switch which opens on a pressure rise. The switch is located in the compressor discharge line and is wired in series with the compressor contactor coil. Units are equipped with two switches.

S4 (first circuit) and S7 (second circuit) are wired in series with the respective compressor contactor coils. When discharge pressure rises to 640 ± 10 psig (4413 ± 69 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate).

3-Low Ambient Switches S11 & S84 (optional)

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

S11 and S84 wired in parallel are wired in series with outdoor fan relay K10.

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

4-Reversing Valve L1 and L2

A refrigerant reversing valve with a 24 volt solenoid coil is used to reverse refrigerant flow during unit operation. The reversing valve is connected in the vapor line of the refrigerant circuit. The reversing valve coil is energized during cooling demand and during defrost.

Reversing valve L1 and L2 are controlled by the defrost control board CMC1 in response to cooling demand or by defrost.

5-Defrost Pressure Switch S104

The defrost pressure switch S104 is an auto-reset SPST N.C. pressure switch which opens on a pressure rise. The switch is located on the discharge line and is wired in series with the CMC1 control board.

When discharge pressure reaches 450 ± 10 psig (3102 69 kPa) in either circuit (indicating defrost is completed) the appropriate switch opens. The switches automatically reset when pressure in the suction line drops to 300 ± 20 psig (2068 138 kPa).

6-Defrost Temperature Switch S6 and S9

Defrost thermostat switches S6 and S9 have S.P.S.T. N.O. contacts which close on a temperature fall (initiating defrost). The switches are located on the expansion valve distributor assembly at the inlet to the outdoor coil. The switch monitors the outdoor coil suction temperature to determine when defrost is needed. When the outdoor coil suction temperature falls to 35^0F $\pm$ 4ºF (1.7ºC $\pm$ 2.2ºC) the switch closes (initiating defrost after minimum run time of 30, 60, or 90 minutes). When the temperature rises to 60ºF $\pm$ 5ºF (15.6ºC $\pm$ 2.8ºC) the switch opens.

7-Filter Drier (all units)

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

8-Condenser Fan Motors B4 and B5

See specifications section of this manual for specifications of condenser fans B4 and B5. All motors are ball bearing type single-phase motors. The fans may be removed for servicing and cleaning by removing the fan grilles.

C-Blower Compartment

All units are equipped with belt drive blowers.

1-Blower Wheels

All units have one 15 in. x 15 in. (381 mm x 381 mm) blower wheel.

2-Indoor Blower Motor B3

All units use three-phase single-speed blower motors. CFM adjustments are made by adjusting the motor pulley (sheave). Motors are equipped with sealed ball bearings. All motor specifications are listed in the SPECIFICATIONS(table of contents) in the front of this manual.

C-Blower Compartment

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All units use three-phase single-speed blower motors. CFM adjustments are made by adjusting the motor pulley (sheave). Motors are equipped with sealed ball bearings. All motor specifications are listed in the SPECIFICATIONS(table of contents) in the front of this manual.

Units may be equipped with motors manufactured by various manufacturers, therefore electrical FLA and LRA specifications will vary. See unit rating plate for information specific to your unit.

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.

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 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.

C-Determining Unit CFM

1 - The following measurements must be made with a dry indoor coil and air filters in place. Initiate high speed blower without a cooling demand. Disconnect high pressure switches S4 and S7. Run the blower with Y1, Y2, and Y3 demands.

2 - Measure the indoor blower shaft RPM.

3 - With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in FIGURE 6.

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

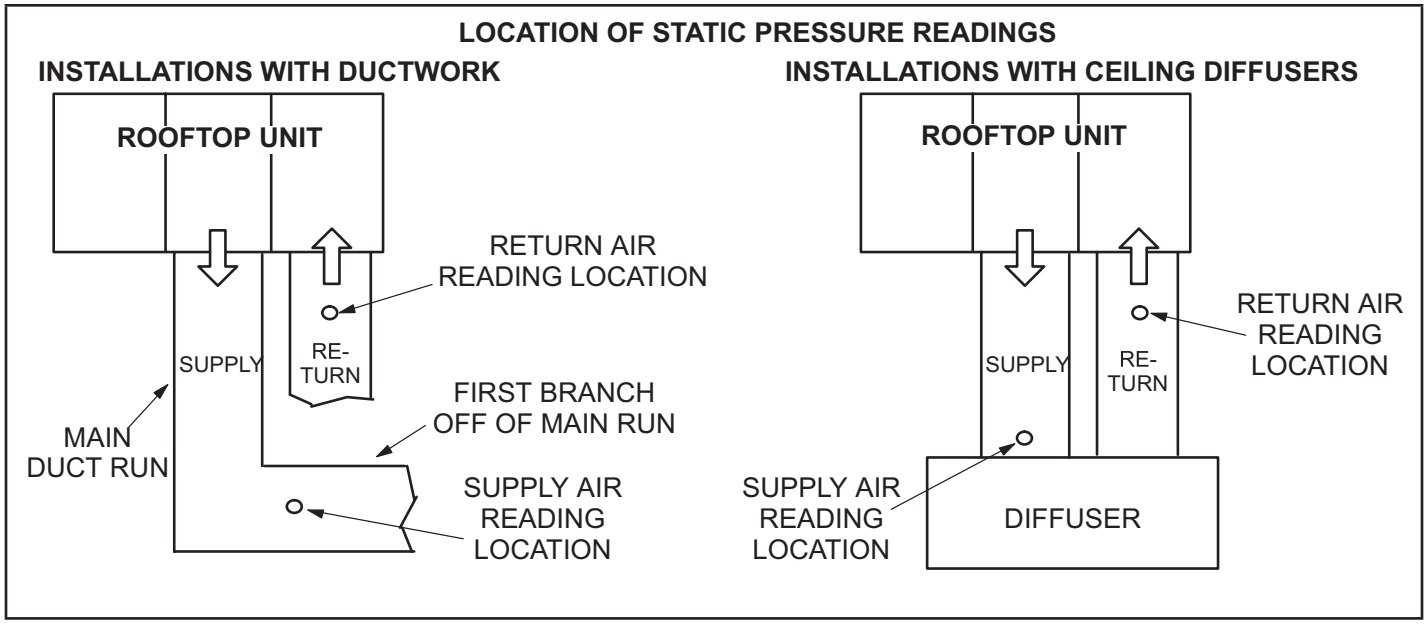


FIGURE 6

4 - See blower data pages (Table of Contents) use static pressure and RPM readings to determine unit CFM. .

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 7. 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	Minimum Turns Open
A Section	No Minimum	5
B Section	1*	6

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

D-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat in the pulley grooves. Make sure blower and motor pulleys are aligned as shown in FIGURE 8.

1 - Loosen four bolts securing motor base to mounting frame. See FIGURE 7.

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.

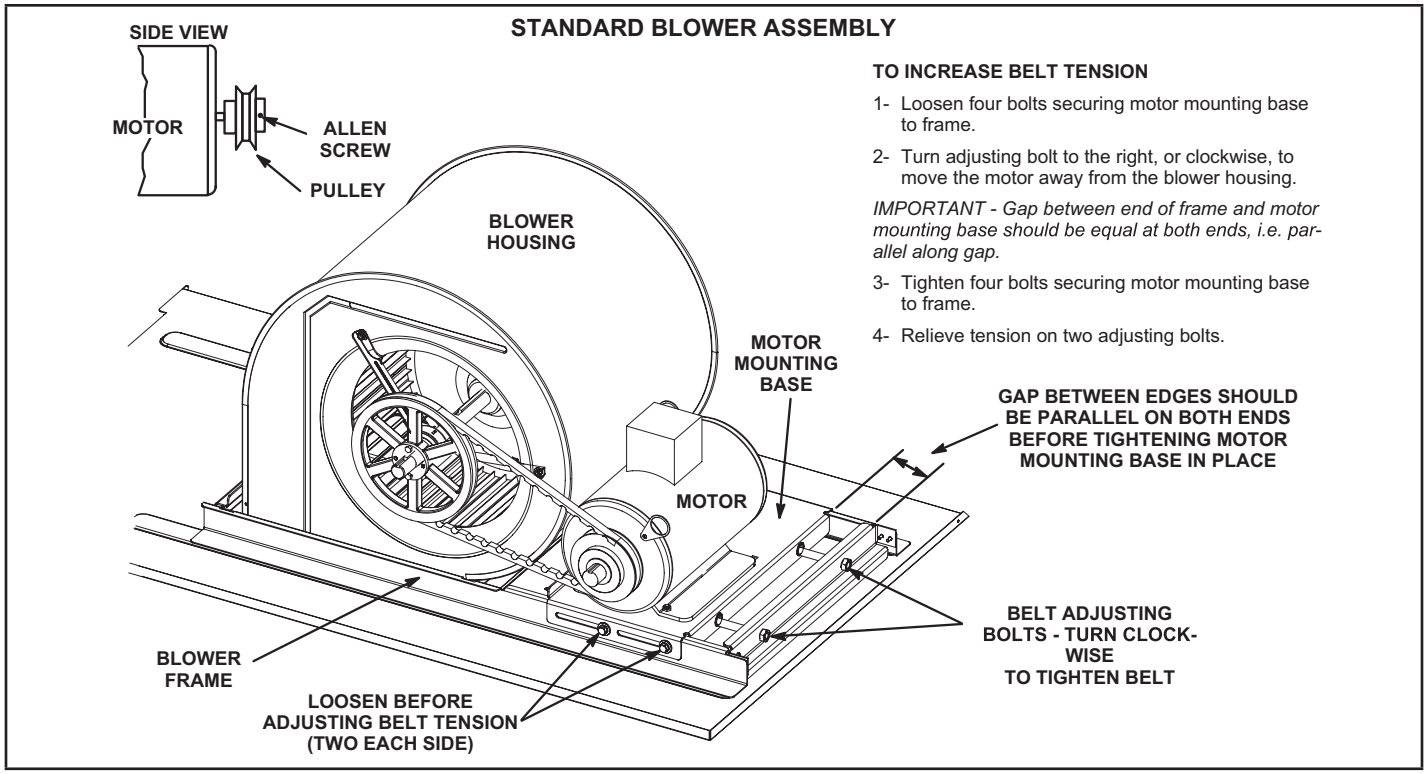


FIGURE 7

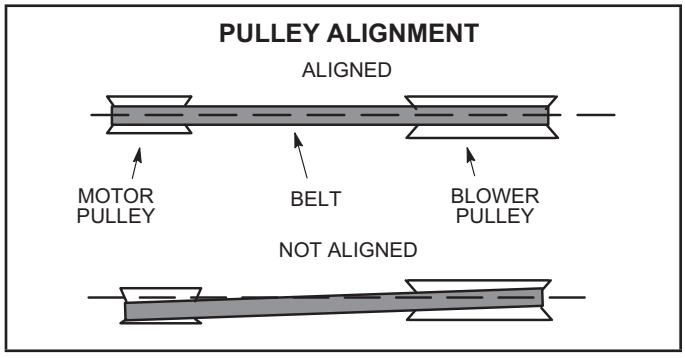


FIGURE 8

E-Check Belt Tension

Over tensioning 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 under tensioned belt. A force above these values indicates an overtensioned belt.

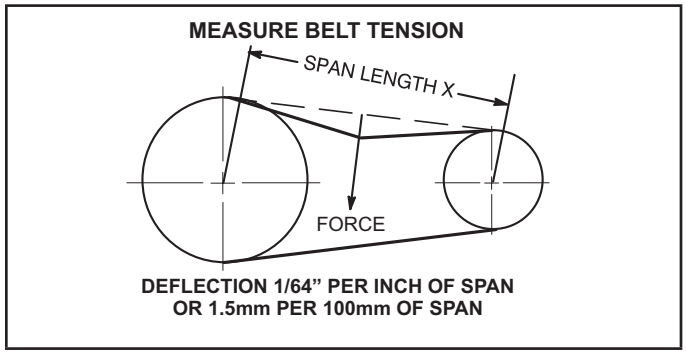


FIGURE 9

F-Field-Furnished Blower Drives

For field-furnished blower drives, use blower data (Table of Contents) to determine BHP and RPM required. Reference TABLE 3 for drive component manufacturer's numbers.

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

D-Optional Electric Heat Components

TABLE 4 shows electric heat fuse ratings. See Options/ Accessories section (see table of contents) for ZHC to EHA match-ups. See Electrical/Electric Heat Data section (see table of contents) of this manual for electrical ratings and capacities.

All electric heat sections consist of electric heating elements exposed directly to the air stream. See FIGURE 13.

EHA parts arrangement is shown in FIGURE 12 and FIGURE 13. Multiple-stage elements are sequenced on and off in response to thermostat demand.

1-Contactors K15, K16

Contactors K15 and K16 are three-pole double-break contactors located on the electric heat vestibule. All contactors are equipped with a 24VAC coil. The coils in the K15 and K16 contactors are energized by a W2 thermostat demand and K9. Contactor K15 energizes the first stage heating elements, while K16 energizes the second stage heating elements.

2-High Temperature Limits S15 (Primary)

S15 is a SPST normally closed auto-reset thermostat located on the back panel of the electric heat section below the heating elements. S15 is the high temperature limit for the electric heat section. When S15 opens, indicating a problem in the system, contactor K15 is de-energized.

When K15 is de-energized, first stage and all subsequent stages of heat are de-energized. For EHA102/150 units, the electric heat section thermostat is factory set to open at 170ºF ± 5ºF (76ºC ± 2.8ºC) on a temperature rise and automatically reset at 130ºF ± 6ºF (54.4ºC ± 3.3ºC) on a temperature fall. For EHA100 units, the electric heat section thermostat is factory set to open at 160ºF ± 5ºF (71.0ºC ± 2.8ºC) on a temperature rise and automatically reset at 120ºF ± 6F (49.0C ± 3.3ºC) on a temperature fall. The thermostat is not adjustable.

3-High Temperature Limit S20, S157, S158, S15, S160 & S161 (Secondary)

Limits are SPST normally closed manual-reset thermostat Like the primary temperature limit, S20 is wired in series with the first stage contactor coil (K15) and second stage contactor coil (K16). When S20 opens, contactors K15, K16) are de-energized. When the contactors are de-energized, first stage and all subsequent stages of heat are de-energized. The thermostat is factory set to open at 220ºF ± 6ºF (104ºC ± 3.3ºC) on a temperature rise and can be manually reset when temperature falls below 160ºF (71.0ºC).

4-Terminal Block TB2

Terminal block TB2 is used for single point power installations only. TB2 distributes L1, L2 and L3 power to TB3. Units with multi-point power connections will not use TB2.

5-Terminal Block TB3

Electric heat line voltage connections are made to terminal block TB3 located in the upper left corner of the electric heat vestibule. TB3 distributes power to the electric heat components.

6-Heating Elements HE1 through HE6

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

Fuse F3, is housed in a fuse block which holds three fuses. Each fuse is connected in series with each leg of electric heat. FIGURE 12 and table 4 show the fuses used with each electric heat section. For simplicity, the service manual labels the fuses F3 - 1, 2 and F4 - 1, 2.

8-Unit Fuse Block F4

Three line voltage fuses F4 provide short circuit and ground fault protection to all cooling components in the ZHC units with electric heat. The fuses are rated in accordance with the amperage of the cooling components.

ELECTRIC HEAT CONTROL ASSEMBLY

1-Electric Heat Relay K9

All ZHC series units with electric heat use an electric heat relay K9. K9 is a N.O. DPDT pilot relay intended to electrically isolate the unit's 24V circuit from the electric heat 24V circuit. K9 is energized by the thermostat TB1-W1 AND TB1-W2 signals on ZHC and by CMC1 Defrost control and TB1 on ZHC units. See FIGURE 10 and FIGURE 11 location of the J2/P2 harness and FIGURE 12 for location of the K9 relay on the electric heat vest-panel.

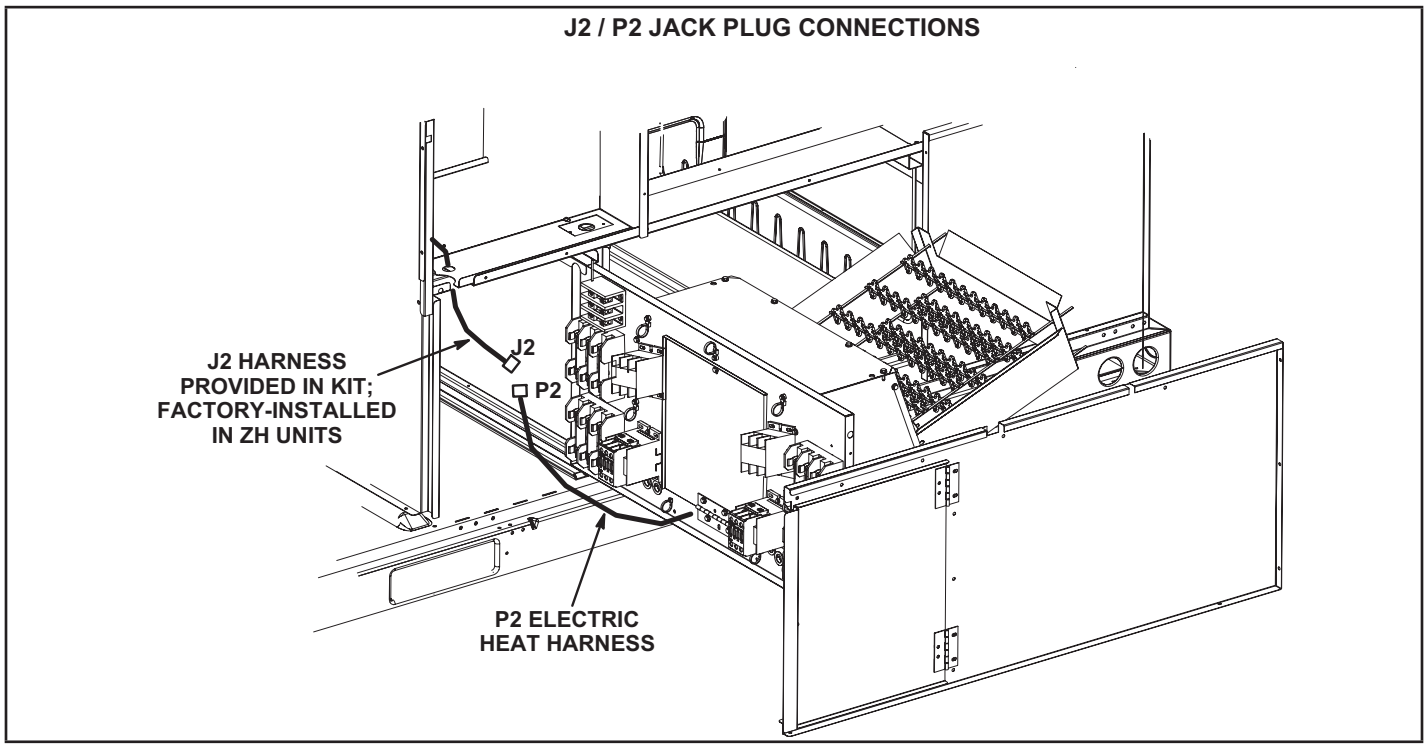


FIGURE 10

SINGLE DISCONNECT INSTALLATIONS

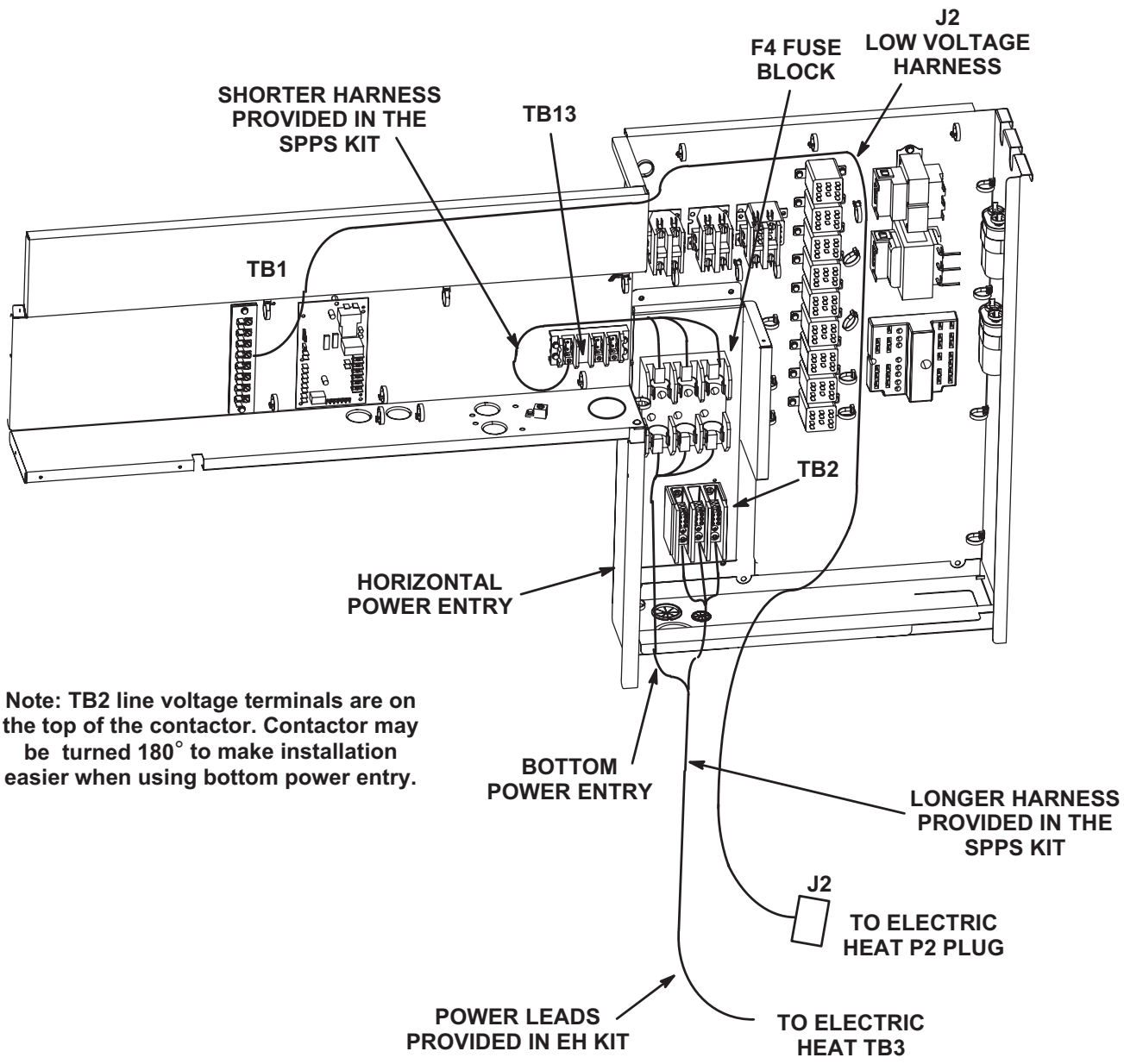


FIGURE 11

ELECTRIC HEAT VESTIBULE PARTS ARRANGEMENT

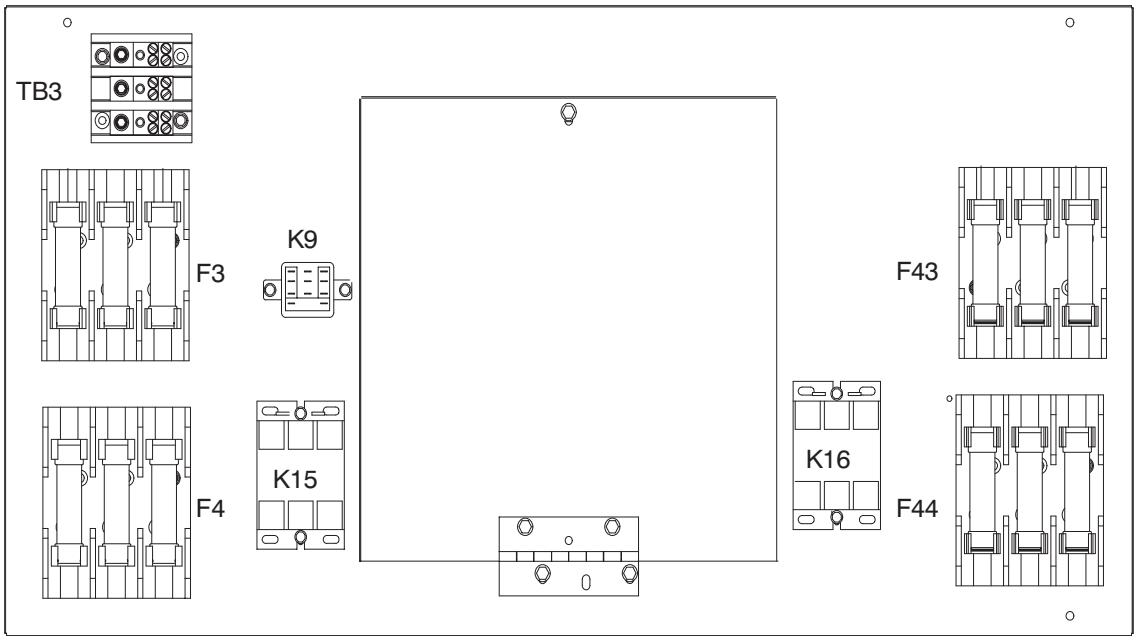


FIGURE 12

EHA 7.5, 15, 22.5, 30, 45, 60KW
ELECTRIC HEAT SECTION PARTS ARRANGEMENT

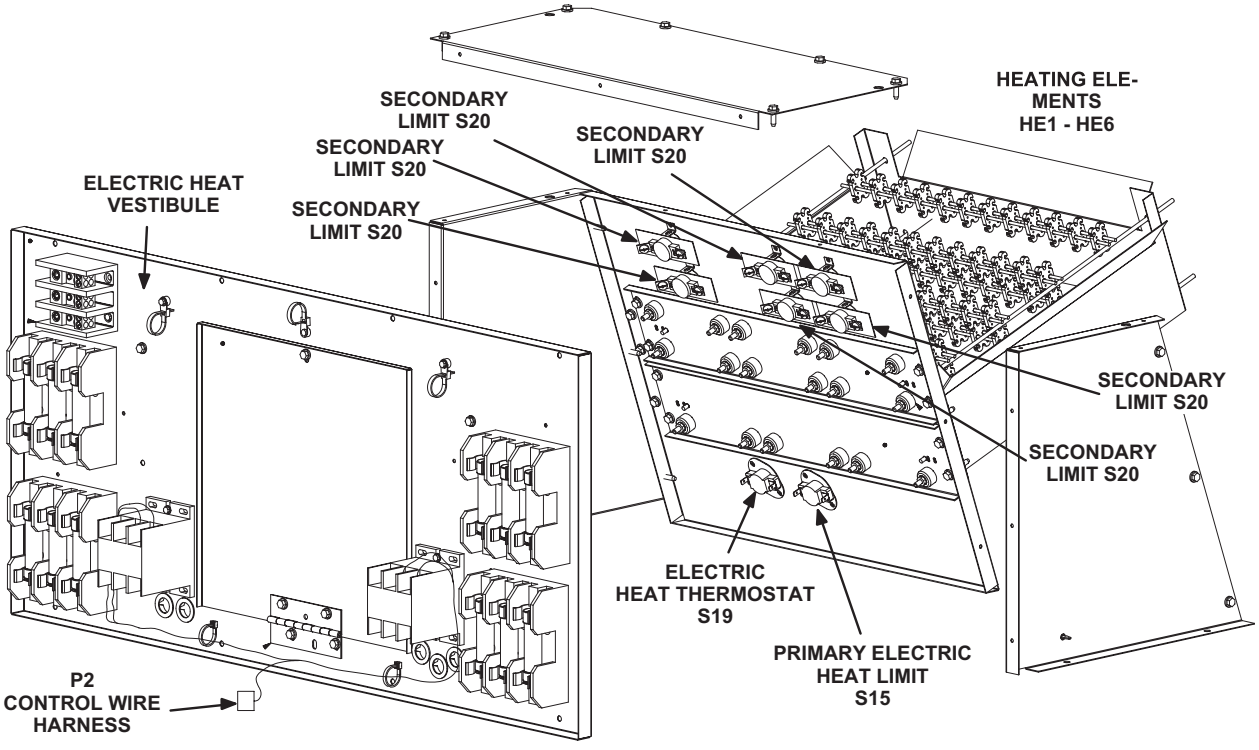


FIGURE 13

TABLE 4

ZCC/ZHC ELECTRIC HEAT SECTION FUSE RATING					
EHA QUANTITY & SIZE	VOLTAGES	FUSE (3 each)			
		F3 - 1	F3 - 2	F3 - 3	F3 - 4
EHO075-7.5	208/230V	25 Amp 250V	-----	-----	-----
	460V	15 Amp 600V	-----	-----	-----
	575V	10 Amp 600V	-----	-----	-----
EHO150-1	208/230V	50 Amp 250V	-----	-----	-----
	460V	25 Amp 600V	-----	-----	-----
	575V	20 Amp 600V	-----	-----	-----
EHO225-1	208/230V	50 Amp250V	-----	-----	25 Amp 250V
	460V	25 Amp 600V	-----	-----	15 Amp 600V
	575V	20 Amp 600V	-----	-----	10 Amp 600V
EHO300-1	208/230V	50 Amp 250V	-----	-----	50 Amp 250V
	460V	25 Amp 600V	-----	-----	25 Amp 600V
	575V	20 Amp 600V	-----	-----	20 Amp 600V
EHO450-1	208/230V	50 Amp 250V	-----	60 Amp 250V	60 Amp 250V
	460V	25 Amp 600V	-----	-----	50 Amp 600V
	575V	20 Amp 600V	-----	-----	40 Amp 600V
EHO600-1	208/230V	60 Amp 250V	60 Amp 250V	60 Amp 250V	60 Amp 250V
	460V	50 Amp 600V	-----	-----	50 Amp 600V
	575V	40 Amp 600V	-----	-----	40 Amp 600V

II-PLACEMENT AND INSTALLATION

Make sure the unit is installed in accordance with the installation instructions and all applicable codes. See accessories section for conditions requiring use of the optional roof mounting frame (Z1CURB40B, Z1CURB41B, Z1CURB42B, or Z1CURB43B).

III-STARTUP - OPERATION

A-Preliminary and Seasonal Checks

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

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

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

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

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

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

B-Heating Startup

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.*

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.

C-Cooling Startup

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 14.

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 60F (15C). In temperatures below 60F (15C), the charge* ***must*** *be weighed into the system.*

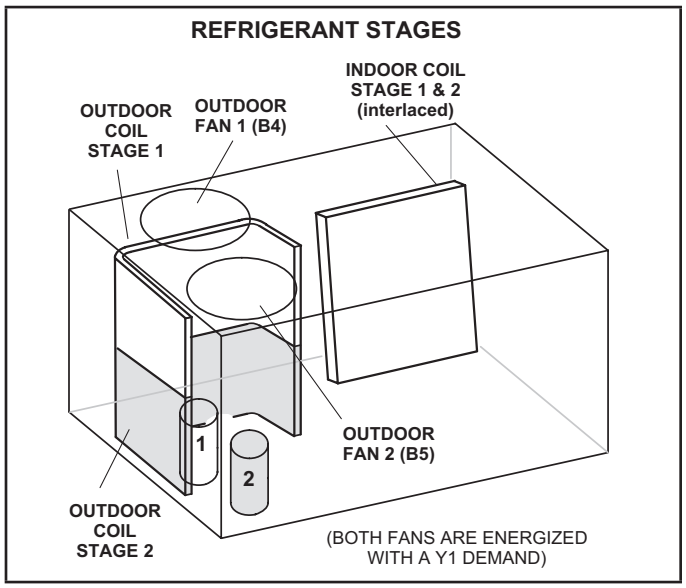


FIGURE 14

IV-CHARGING

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:

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

2 - Check each system separately with all stages operating.

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

4 - Apply the outdoor temperature to TABLE 5 - TABLE 7 to determine normal operating pressures. Pressures are listed for sea level applications at 80°F dry bulb and 67°F wet bulb return air.

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

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

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

TABLE 5

ZHC092 NORMAL OPERATING PRESSURES 581156-01

Outdoor Coil Entering Air Temp ºF	CIRCUIT 1		CIRCUIT 2	
	Disch. ±10 psig	Suction ±5 psig	Disch. ±10 psig	Suction ±5 psig
65	254	150	264	140
75	298	151	305	141
85	344	152	351	143
95	396	153	400	143
105	461	157	459	147
115	526	158	519	152

TABLE 6

ZHC102 NORMAL OPERATING PRESSURES 581157-01

Outdoor Coil Entering Air Temp ºF	CIRCUIT 1		CIRCUIT 2	
	Disch. ±10 psig	Suction ±5 psig	Disch. ±10 psig	Suction ±5 psig
65	277	138	263	138
75	319	140	304	139
85	366	143	349	141
95	418	145	399	143
105	475	149	455	145
115	535	153	515	148

TABLE 7

ZHC120 NORMAL OPERATING PRESSURES 5811587-01

Outdoor Coil Entering Air Temp ºF	CIRCUIT 1		CIRCUIT 2	
	Disch. ±10 psig	Suction ±5 psig	Disch. ±10 psig	Suction ±5 psig
65	257	132	270	124
75	297	138	310	128
85	342	141	353	130
95	390	144	401	133
105	444	146	454	137
115	501	149	512	141

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

CHARGE VERIFICATION - APPROACH METHOD - AHRI TESTING

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

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

3 - Approach temperature should match values in TABLE 8. An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.

4 - The approach method is not valid for grossly over or undercharged systems. Use TABLE 8 as a guide for typical operating pressures.

TABLE 8

APPROACH TEMPERATURE

Unit	Liquid Temp. Minus Ambient Temp.	
	1st Stage	2nd Stage
092S	5°F + 1 (2.8°C ± 0.5)	4°F + 1 (2.2°C ± 0.5)
102S	5°F + 1 (2.8°C ± 0.5)	5°F + 1 (2.8°C ± 0.5)
120S	4°F + 1 (2.2°C ± 0.5)	7°F + 1 (3.9°C ± 0.5)

V- SYSTEMS SERVICE CHECKS

A-Cooling System Service Checks

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

NOTE-*When unit is properly charged discharge line pressures should approximate those in TABLE 5 - TABLE 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.

⚠ IMPORTANT

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

A-Filters

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

To change filters, open filter access panel on back side of unit. See FIGURE 15. Lift filter stop to remove filters. See FIGURE 16.

⚠ 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 16.

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

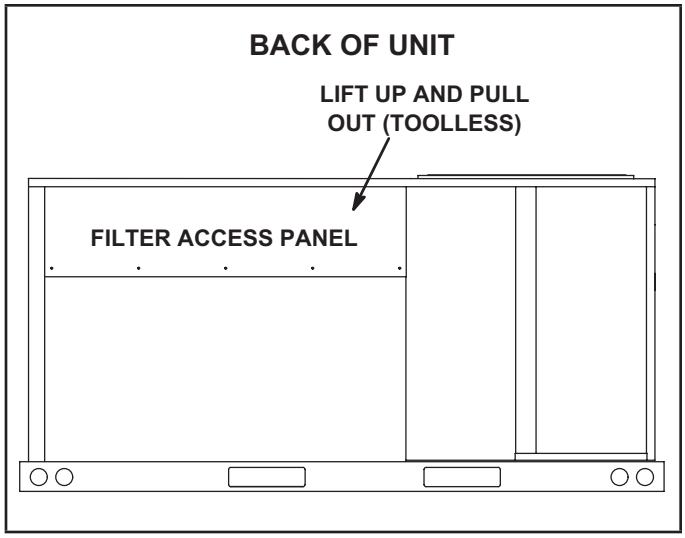


FIGURE 15

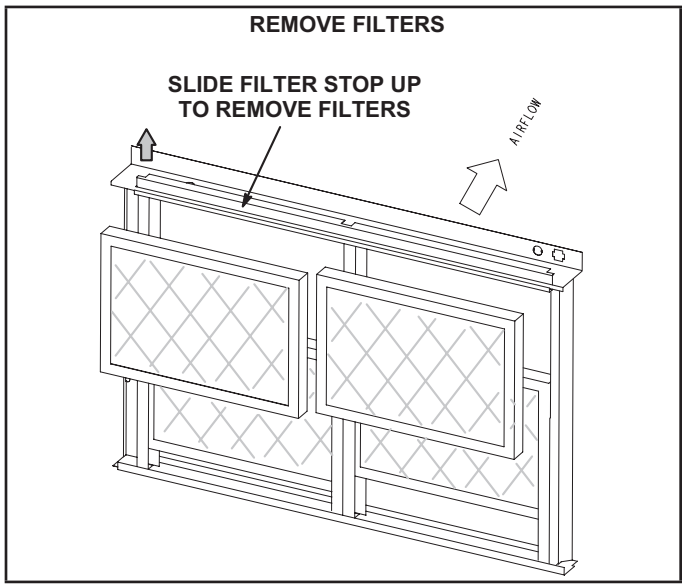


FIGURE 16

B-Compressor

If Interlink compressor replacement is necessary, call 1 - 8 0 0 - 4 5 3 - 6 6 6 9 .

⚠ 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-Lubrication

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

D-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.

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.

F-Filter Drier

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

G-Condenser Coil

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

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

VII-ACCESSORIES

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

A-Mounting Frames

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

The assembled Z1CURB mounting frame is shown in FIGURE 17. Refer to the roof mounting frame installation instructions for details of proper assembly and mounting. The roof mounting frame MUST be squared to the roof and level before mounting. Plenum system MUST be installed before the unit is set on the mounting frame. Typical roof curbing and flashing is shown in FIGURE 18. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

B-Transitions

Transitions are field-provided.

C-Supply and Return Diffusers

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

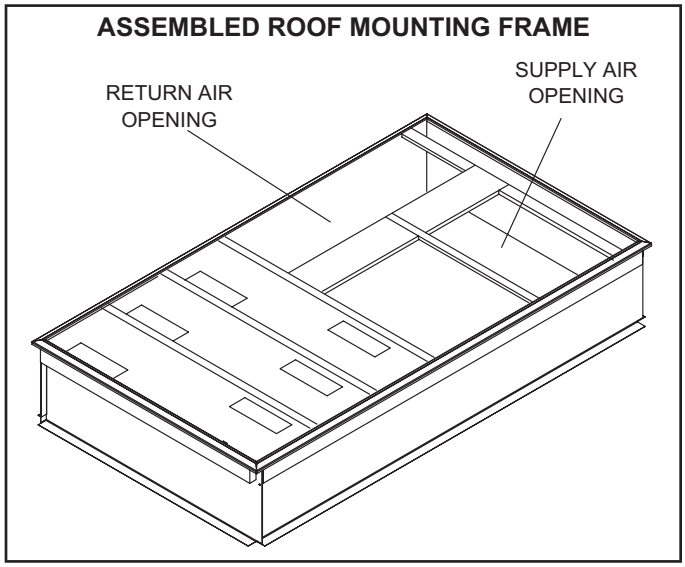


FIGURE 17

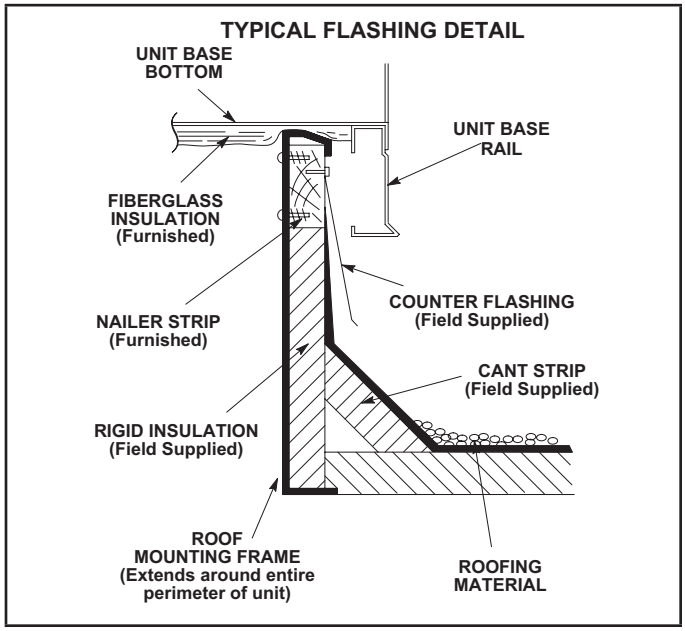


FIGURE 18

D-Economizer (Field or Factory Installed)

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

Economizers use outdoor air for free cooling when temperature and/or humidity is suitable. See FIGURE 19.

The mixed air temperature sensor (R1) measures the supply air sensible temperature. See FIGURE 20. The outdoor air sensible control is the default economizer control. An outdoor air single sensible sensor, S175, is also provided. See TABLE 9 for outdoor and return air (OA and RA) sensor options.

Refer to instructions provided with sensors for installation. An IAQ sensor is used when demand control ventilation (DCV) is specified. Damper minimum position can be set lower than traditional minimum air requirements resulting in cost savings. The IAQ sensor allows the A6 to open dampers to traditional ventilation requirements as room occupancy (CO2) increases.

TABLE 9

Sensors	**Dampers will modulate to 55°F discharge air (RT6) when:**
Single OA Sensible	OA temperature (S175) is lower than free cooling setpoint.
Single OA Sensible	OA temperature and humidity (A7) is lower than free cooling set point.
Differential Enthalpy - 1 in OA and 1 in RA	OA temperature and humidity (A7) is lower than RA temperature and humidity (A62).
IAQ Sensor	CO2 sensed (A63) is higher than CO2 setpoint.

ECONOMIZER

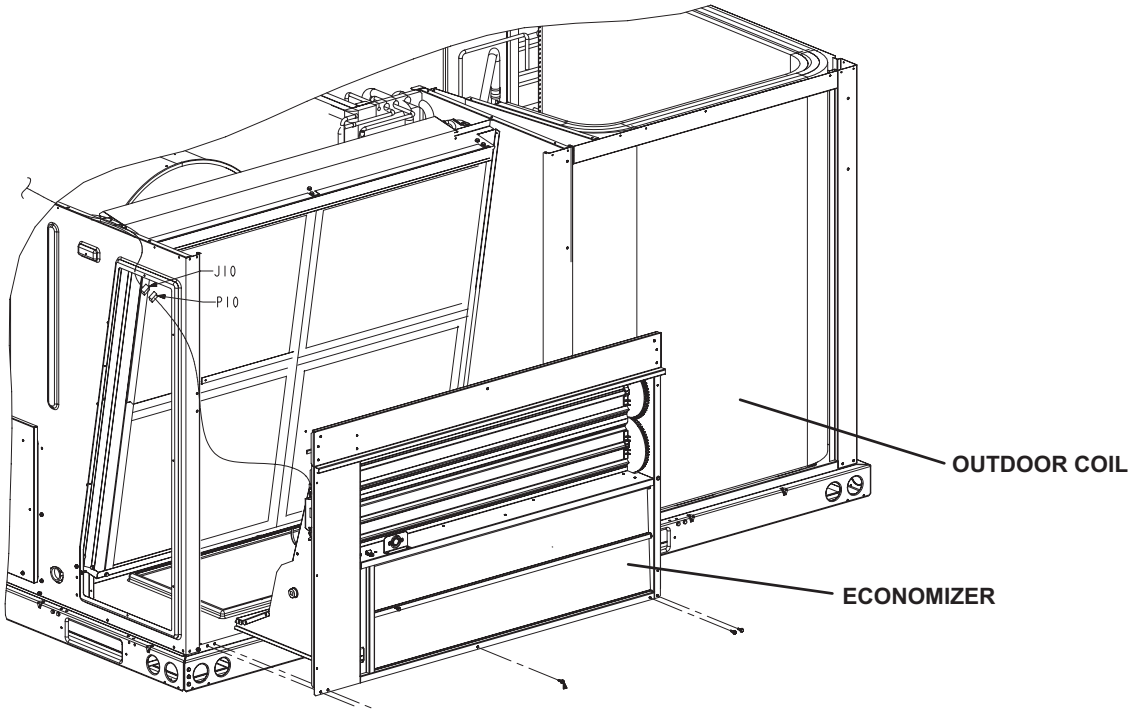


FIGURE 19

MIXED AIR SENSOR (R1) LOCATION

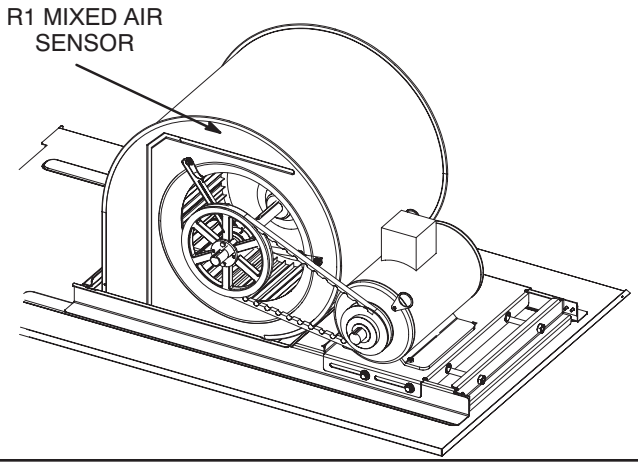


FIGURE 20

A6 Enthalpy Control LED'S

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

When an optional IAQ sensor is installed, a steady green DCV LED indicates that the IAQ reading is higher than setpoint requiring more fresh air. See FIGURE 21.

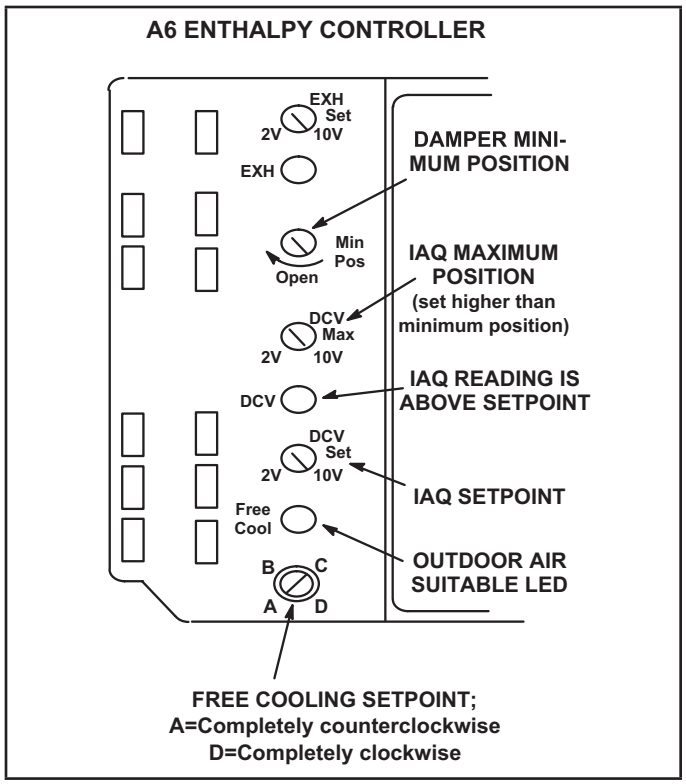


FIGURE 21

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in TABLE 10. Setting A is recommended. See FIGURE 21. 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 10

ENTHALPY CONTROL SETPOINTS

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

Damper Minimum Position

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

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

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

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

3 - Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point "A" (40^0F, 4^0C shown).

4 - Measure return air temperature. Mark that point on the top line of chart 1 and label the point "B" (74^0F, 23^0C shown).

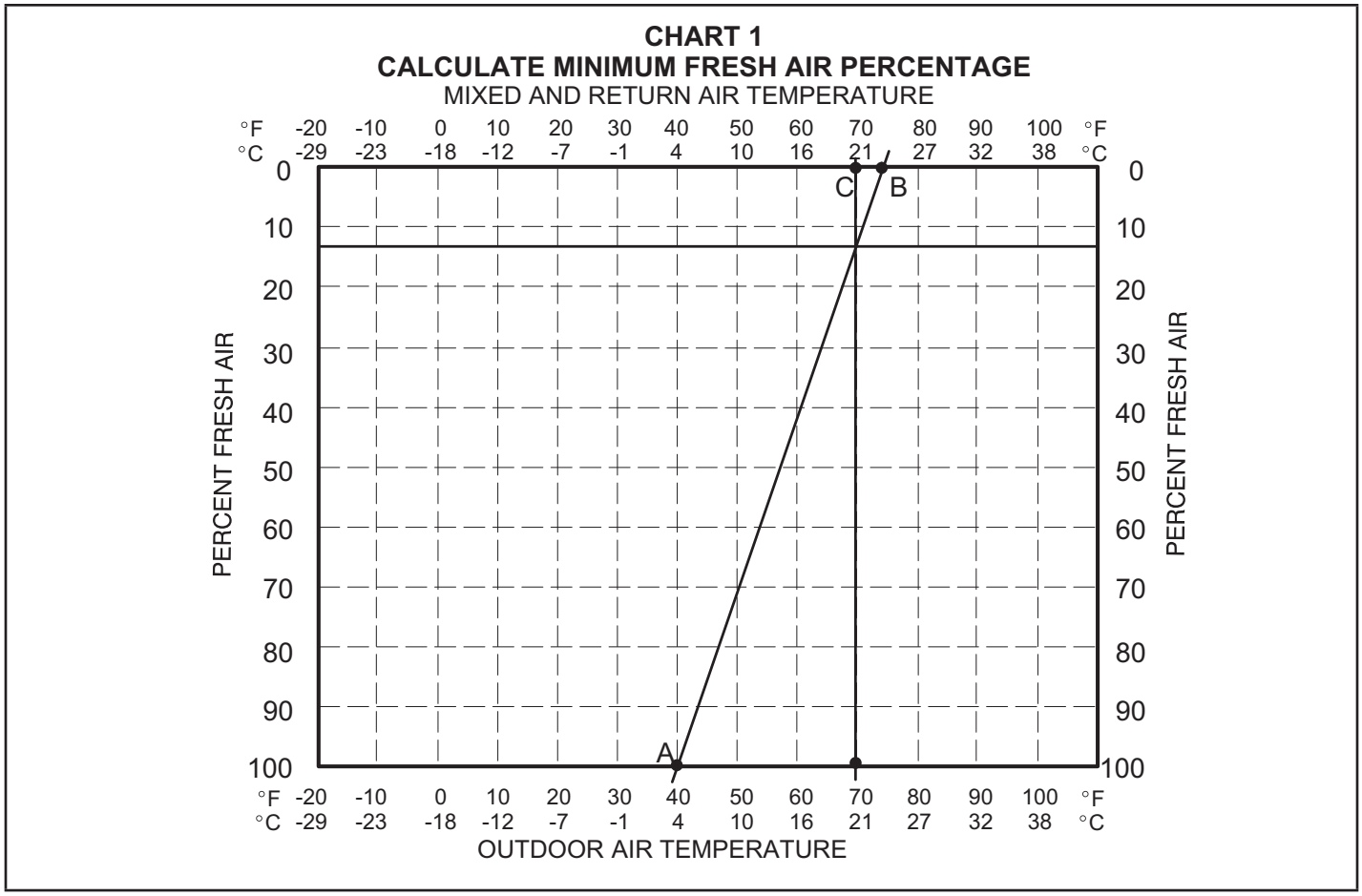
5 - Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point "C" (70^0F, 21^0C shown).

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 21.

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 21.

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

Economizer Operation

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

Outdoor Air Not Suitable:

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

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

Outdoor Air Suitable:

See TABLE 11 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 45^0F (7^0C), dampers will move to minimum position until discharge air temperature rises to 48^0F (9^0C).

TABLE 11

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

Thermostat Demand	Damper Position		Mechanical Cooling
	Unoccupied	**Occupied**	
Off	Closed	Closed	No
G	Closed	Minimum	No
Y1	Open	Open	No
Y2	Open	Open	Stage 1

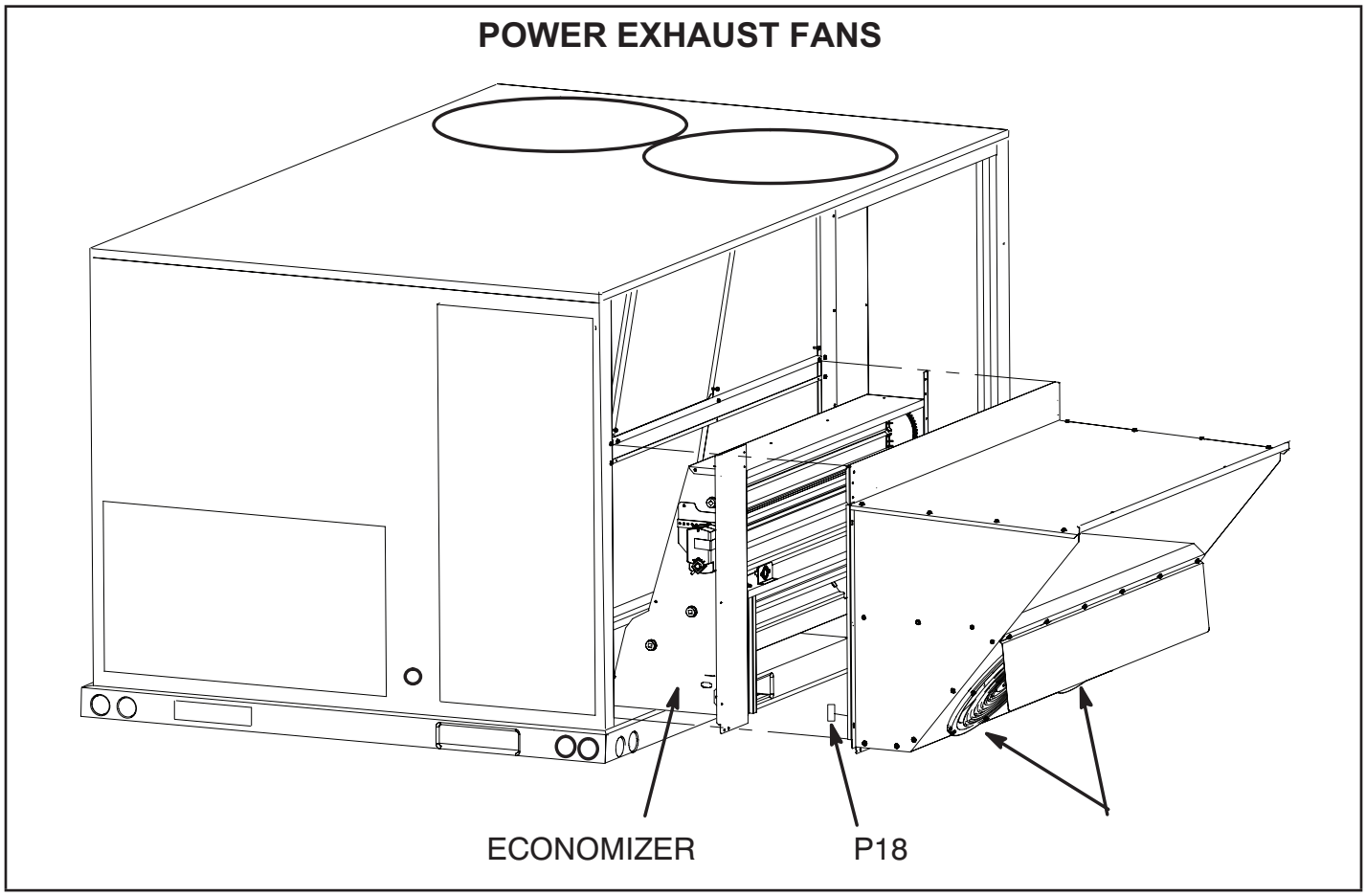


FIGURE 22

Standard Economizer Down Flow and Horizontal

The standard economizer is used with ZC,ZG,ZH 092-150 units in downflow air discharge applications. Economizer dampers will modulate to maintain 55°F (13°C) supply air when outdoor air is suitable. The mixed air temperature sensor measures the supply air sensible temperature. An outdoor air sensor is used to determine whether outdoor air is suitable for free cooling. The outdoor air sensor is factory installed in all economizers. Other outdoor and return air (OA and RA) sensor options are available to determine whether outdoor air is suitable for free.

Wiring

1 - The economizer control module is located below the actuator for shipping. Relocate the control to the unit control box, see FIGURE 24.

2 - Route the control wires to unit terminal block (TB1) and connect these wires to TB1 as following (see FIGURE 24):

- Connect all female terminals to TB1 - Pink (24V) to R; Grey (GND) to ground; Yel (Cool 1) to Y1; and Blue (Cool 2) to Y2.
- Disconnect the factory installed terminals at TB1, Y1 and Y2. Connect these terminals to control male terminal Y1 and Y2

3 - Attach the control harness jack (J142) to pre-wired harness plug (P142).

4 - At economizer/filter compartment, attach economizer plug(P10) to pre-wired harness jack (J10). See FIGURE 19.

5 - Connect any optional sensors as shown in FIGURE 23.

6 - If optional power exhaust is used, wire according to instructions provided with power exhaust. See FIGURE 23.

7 - Apply wiring diagram to the control panel.

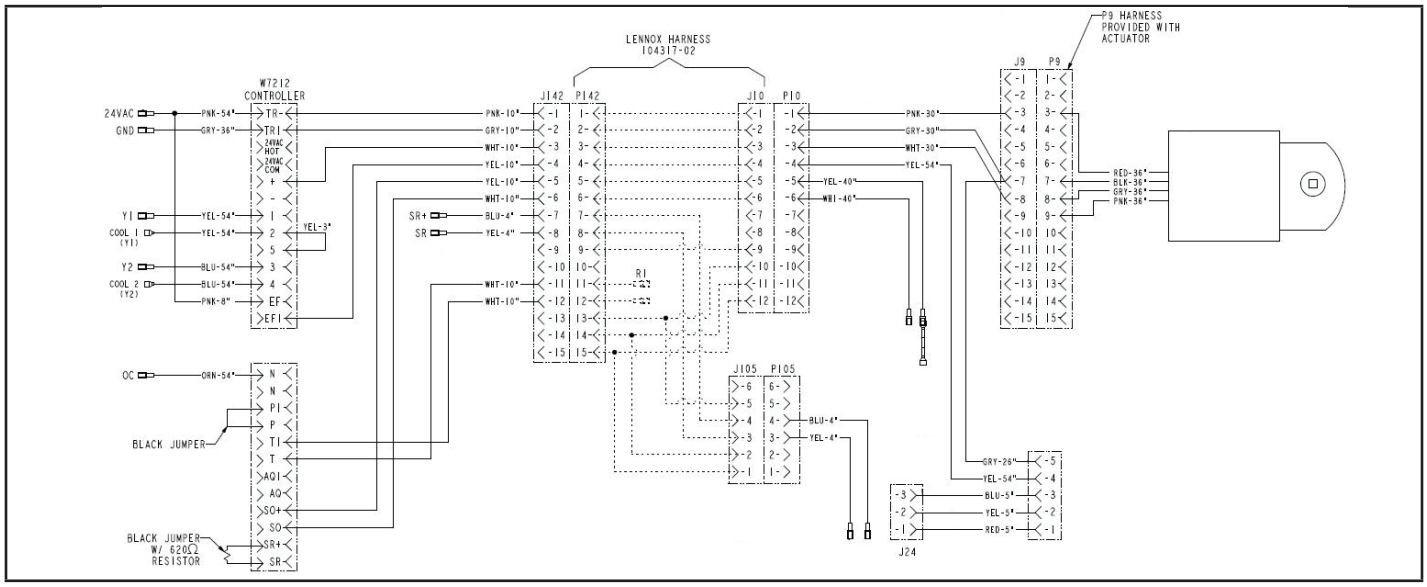


FIGURE 23

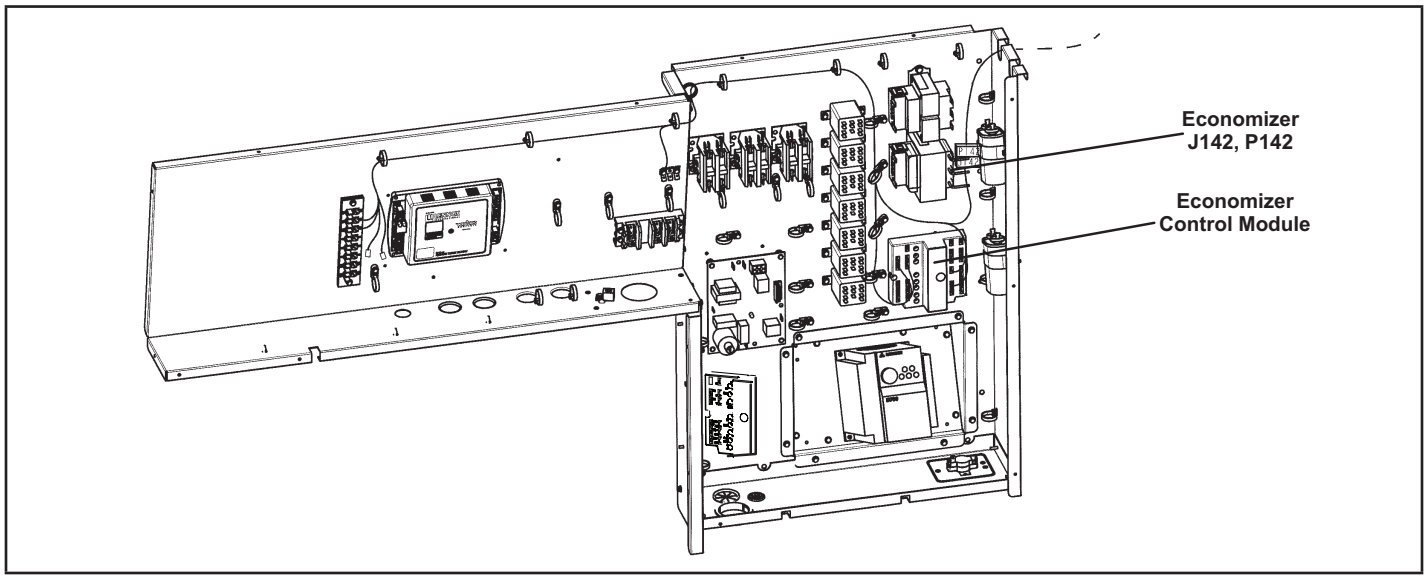


FIGURE 24

E-Power Exhaust Fan

The power exhaust fan (PEF) requires an optional gravity exhaust damper and economizer and is used in downflow applications only. See FIGURE 22. The PEF provides exhaust air pressure relief and also runs when return air dampers are closed and the supply air blower is operating. See installation instructions for more detail.

Power Exhaust Setpoint Adjustment

Locate the A6 enthalpy control in the control area. The EXH SET potentiometer is factory-set at approximately 50% of the dial range. See FIGURE 25. Power exhaust fans will be energized 30 seconds after dampers are 50% open. Adjust the EXH SET potentiometer higher (clockwise toward 10V) to energize fans when dampers are further open. Adjust the EXH SET potentiometer lower (counterclockwise toward 2V) to energize fans when dampers are further closed. (Thirty-second delay allows dampers to partially open before exhaust fan starts.)

F-Drain Pan Overflow Switch S149 (option)

The overflow switch is used to interrupt cooling operation when excessive condensate collects in the drain pan. The N.O. overflow switch is controlled by K220 and DL46 relays, located in the unit control panel.

When the overflow switch closes, 24VAC power is interrupted and after a five second delay unit compressors are de-energized. Once the condensate level drops below the set level, the switch will open. After a five-minute delay the compressor will be energized.

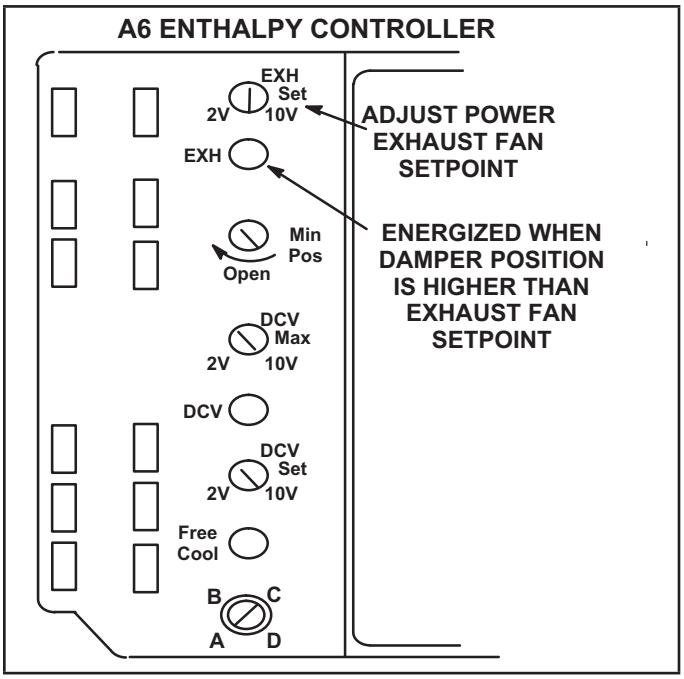
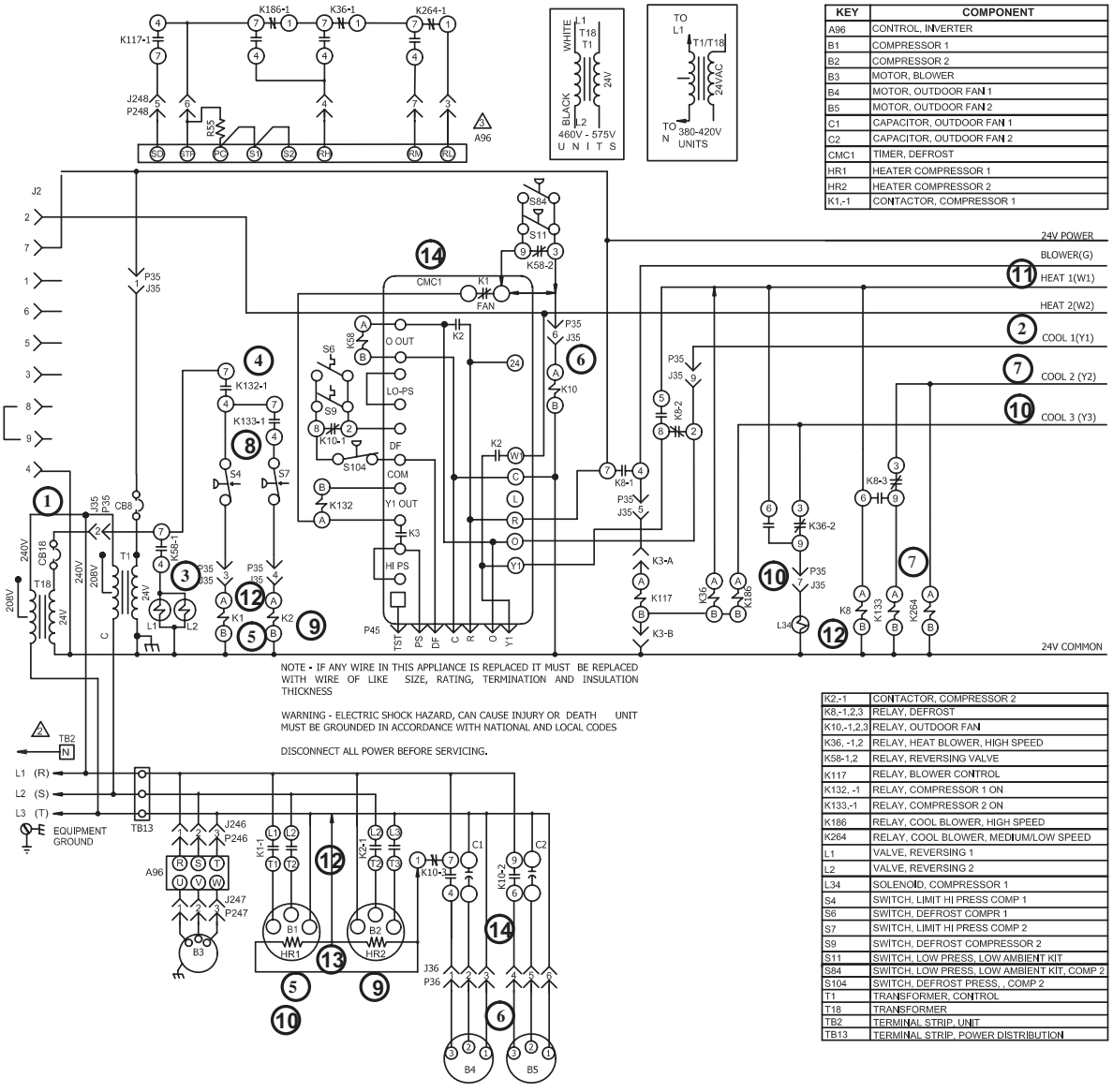


FIGURE 25

VIII-Wiring Diagrams and Sequence of Operation

ZHC UNIT DIAGRAM



KEY	COMPONENT
A96	CONTROL, INVERTER
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CMC1	TIMER, DEFROST
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K8,-1,2,3	RELAY, DEFROST
K10,-1,2,3	RELAY, OUTDOOR FAN
K36, -1,2	RELAY, HEAT BLOWER, HIGH SPEED
K58-1,2	RELAY, REVERSING VALVE
K117	RELAY, BLOWER CONTROL
K132, -1	RELAY, COMPRESSOR 1 ON
K133,-1	RELAY, COMPRESSOR 2 ON
K186	RELAY, COOL BLOWER, HIGH SPEED
K264	RELAY, COOL BLOWER, MEDIUM/LOW SPEED
L1	VALVE, REVERSING 1
L2	VALVE, REVERSING 2
L34	SOLENOID, COMPRESSOR 1
S4	SWITCH, LIMIT HI PRESS COMP 1
S6	SWITCH, DEFROST COMPR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S9	SWITCH, DEFROST COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT, COMP 2
S104	SWITCH, DEFROST PRESS, , COMP 2
T1	TRANSFORMER, CONTROL
T18	TRANSFORMER
TB2	TERMINAL STRIP, UNIT
TB13	TERMINAL STRIP, POWER DISTRIBUTION

NOTE - IF ANY WIRE IN THIS APPLIANCE IS REPLACED IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, TERMINATION AND INSULATION THICKNESS

WARNING - ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

DISCONNECT ALL POWER BEFORE SERVICING.

J/P	JACK/PLUG DESCRIPTION
2	HEAT
35	TEST HEAT
36	TEST COOL
172	JACK, G BLOWER
246	POWER TO VFD
247	VFD TO MTR
248	VFC CONTROL

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

⚠2 TB2 IS USED ON "M" VOLTAGE UNITS ONLY

⚠3 MITSUBISHI VFD

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

2022/10	WIRING DIAGRAM 538304-01	10/22
HEAT PUMP - MSAV		
ZHC - 092, 102, 120, 150 - G, J, Y		
SECTION B		REV. 0
Supersedes 537723-01	New Form No. 538304-01	

ZHC Sequence of Operation

Power:

1 - Line voltage from unit disconnect energizes transformer T1 and T18. T1 provides 24VAC power to terminal strip TB1. TB1 provides 24VAC to the unit cooling, heating and blower controls and thermostat. T18 provides 24VAC to K1 and K2 relay coils and L1 and L2 reversing valves.

First Stage Cooling Demand (compressor B1)

2 - First stage cooling demand energizes Y1 and G in the thermostat. G energizes blower.

3 - Transformer T18 energizes reversing valves L1 and L2 via K58-1.

4 - Y1 demand energizes K132 relay coil which closes K132-1 N.O. contacts and routes 24VAC to S4 N.C. high pressure switch. Compressor contactor K1 is energized.

5 - K1 closes energizing compressor B1.

6 - Y1 signal from CMC1 module energizes K10 relay coil. K10-3 N.C. and K10-2 N.O. contacts close energizing outdoor fan B4 and B5.

Second Stage Cooling Demand (compressor B2)

7 - Second stage cooling demand energizes Y2.

8 - Y2 demand energizes relay K133 relay coil which closes K133-1 N.O. contacts. 24VAC is routed to S7 N.C. high pressure switch.. Compressor contactor K2 is energized.

9 - K2 closes energizing compressor B2.

Third Stage Cooling Demand (compressor B1 -high)

10 - Third stage cooling demand energizes Y3. Y3 passes through N.C closed contacts on K36-2, and energizes the L34 B1 compressor solenoid. Compressor B1 switches to high stage. **First Stage Heat (compressors B1 and B2)**

11 - Heating demand energizes W1 in the thermostat.

12 - W1 demand energizes K8 relay coil which closes K8-2 and K8-3 N.O. contacts and K132 and K133 coils. 24VAC is routed to K1 and K2 contactors

13 - K1 and K2 close energizing compressor B1 and B2.

14 - 24VAC from CMC1 module energizes K10 relay coil. K10-3 N.O. contacts and K10-2 N.O. contacts close energizing outdoor fans B4 and B5.

Second Stage Heat (electric heat):

15 - Second stage heat demand energizes W2 in the thermostat.

16 - See sequence of operation for electric heat.

Defrost Mode:

17 - During heating operation, when outdoor coil drops to 35 ± 4° the defrost thermostat S6 or S9 closes initiating defrost (after minimum run time of 30, 60 or 90 minutes).

18 - When defrost begins, the reversing valve L1 or L2 is energized. Supplemental electric heat (W2) is energized.

19 - When L1 energizes, outdoor fan relay K10 and outdoor fans B4 and B5 are de-energized.

20 - Defrost terminates when the pressure switch for the circuit S104 opens, or when 15 minutes has elapsed. The defrost cycle is not terminated when thermostat demand ends.

MSAV BLOWER OPERATION

G Blower Demand:

1 - 24VAC is routed from thermostat blower G.

2 - K117 relay is energized. K117 N.O. contacts close and 24VDC is routed through K186 and K36 N.C. contacts to A96 inverter terminal RL. Blower operates in low speed.

Y1 Cooling Demand:

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

Y2 Cooling Demand:

4 - K264 relay is energized and K264 N.O. contacts close, connecting the A96 inverter SD 24VDC signal to RM. Blower operates in medium speed.

Y3 Cooling Demand:

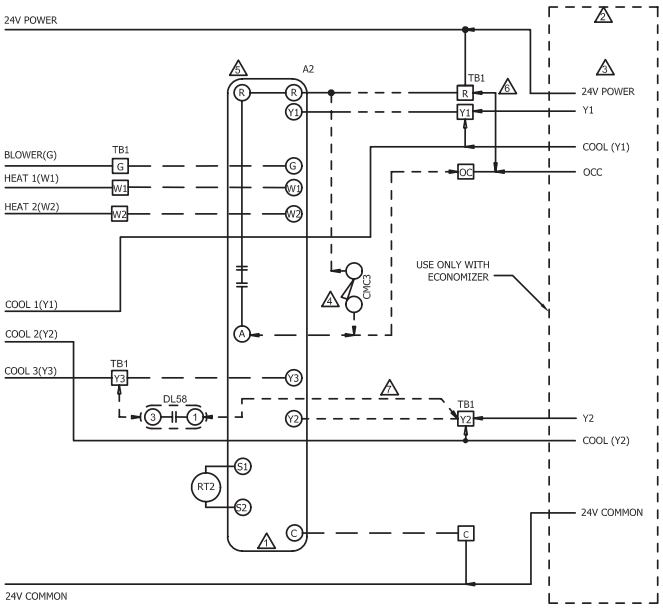
5 - K186 relay is energized and K186 N.O. contacts close.

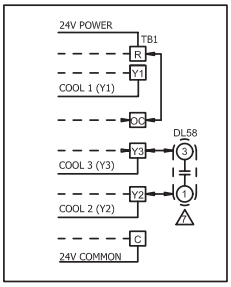
6 - The blower demand closes K117 N.O. contacts. 24VDC is routed through K117 and K186 closed contacts to A96 inverter terminal RH. Blower operates in high speed.

W1 Heating Demand:

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

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT





CONNECTION SCHEME FOR ZCC, ZGC AND ZHC 092 THROUGH 150 UNITS WITHOUT ECONOMIZER ONLY

KEY	COMPONENT
A2	SENSOR, ELECTRONIC THERMOSTAT
A63	SENSOR, CO2
CMC3	CLOCK, TIME
DL58	ADJUSTABLE TIMER, STAGE UP
K65	RELAY, EXHAUST FAN
R1	SENSOR, MIXED AIR OR SUPPLY AIR
RT2	SENSOR, REMOTE THERMOSTAT
TB1	TERMINAL STRIP, CLASS II VOLTAGE

1. THERMOSTAT SUPPLIED BY USER
2. OPTIONAL WIRING FOR UNITS WITH ECONOMIZER
3. J3 MAXIMUM LOAD 20VA 24VAC CLASS II
4. TIME CLOCK CONTACTS (OPT) CLOSED OCCUPIED
5. TOUCHSCREEN THERMOSTAT
6. REMOVE JUMPER BETWEEN TB1-R AND TB1-OCP WHEN USING A NITE SETBACK THERMOSTAT
7. INSTALL DL58 ADJUSTABLE STAGE UP TIMER AS SHOWN BETWEEN Y2 AND Y3 IF THERMOSTAT DOES NOT HAVE A COOL 3. TYPICAL TIME DELAY IS 15-30 MINUTES

DENOTES OPTIONAL COMPONENTS
CLASS II FIELD WIRING

2022/09	WIRING DIAGRAM 538308-01	09/22
CONTROL		
ELECTRONIC/ELECTROMECHANICAL THERMOSTAT (RAIDER B)		
SECTION C		REV 0
Supersedes 537673-01	New Form No. 538308-01	

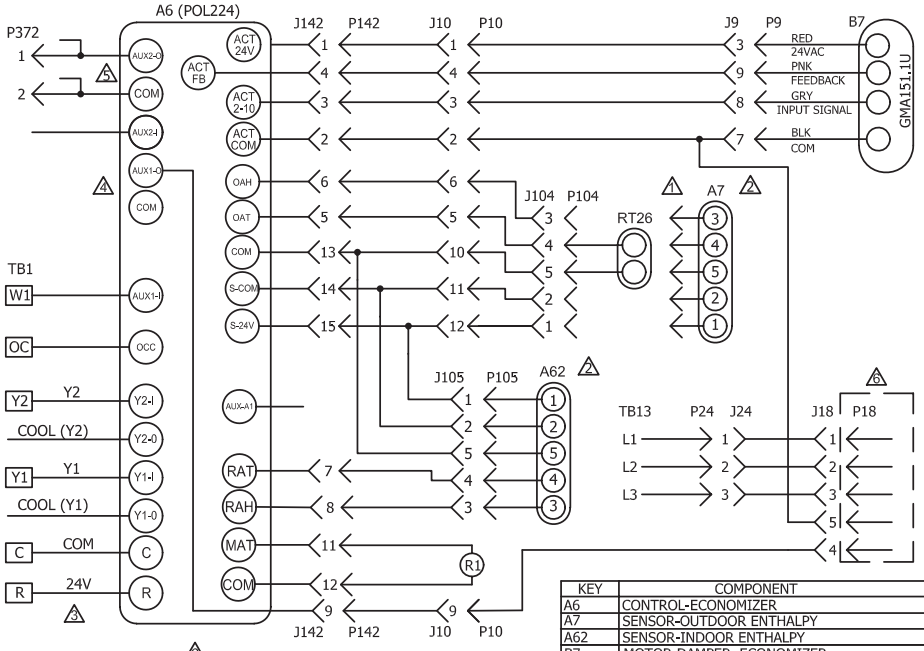
POWER:

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

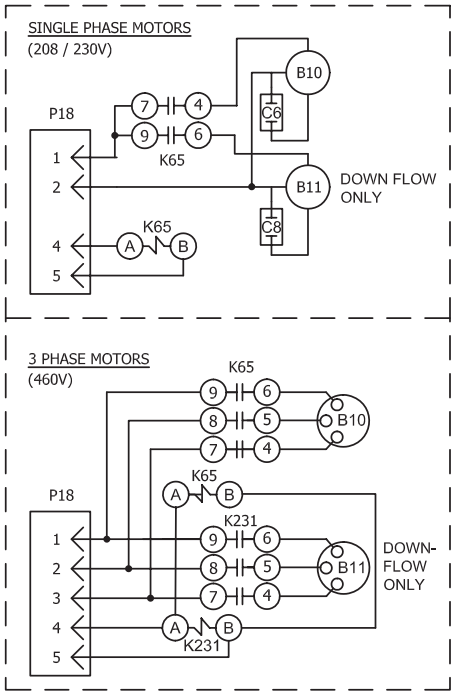
OPERATION:

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

SIEMENS ECONOMIZER



6 POWER EXHAUST OPTIONS



DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

KEY	COMPONENT
A6	CONTROL-ECONOMIZER
A7	SENSOR-OUTDOOR ENTHALPY
A62	SENSOR-INDOOR ENTHALPY
B7	MOTOR-DAMPER, ECONOMIZER
B10	POWER EXHAUST FAN 1
B11	POWER EXHAUST FAN 2 (DOWNFLOW ONLY)
C6	CAPACITOR, EXHAUST FAN 1
C8	CAPACITOR, EXHAUST FAN 2 (DOWNFLOW ONLY)
K65	RELAY, EXHAUST FAN
K231	RELAY, EXHAUST FAN 2
R1	MIXED AIR SENSOR
RT26	SENSOR-OUTDOOR AIR TEMP
TB1	TERMINAL STRIP, CLASS II VOLTAGE
TB13	TERMINAL STRIP, POWER DISTRIBUTION

J/P	JACK/PLUG DESCRIPTION
9	ECONOMIZER, MOTOR
10	ECONOMIZER
18	EXHAUST FAN COMPT.
24	EXHAUST FAN
104	SENSOR OUTDOOR
105	SENSOR RETURN AIR
142	ECONOMIZER HARNESS

1 OUTDOOR AIR TEMP SENSOR RT26 OR OUTDOOR AIR ENTHALPY SENSOR A7 MAY BE USED.

2 FOR DIFFERENTIAL ENTHALPY SENSING USE OUTDOOR ENTHALPY SENSOR A7 AND INDOOR ENTHALPY SENSOR A62

3 REFER ALSO TO MAIN UNIT WIRING DIAGRAM SECTION B

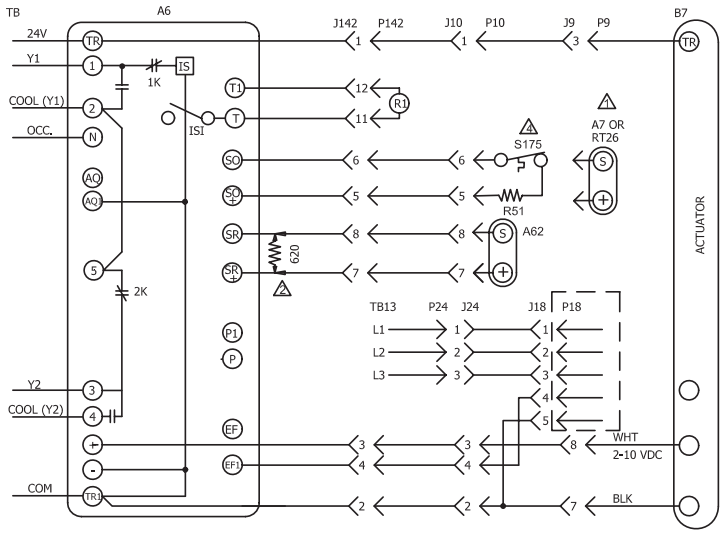
4 PROGRAMMABLE, USE FOR EXHAUST FAN 2 OUTPUT

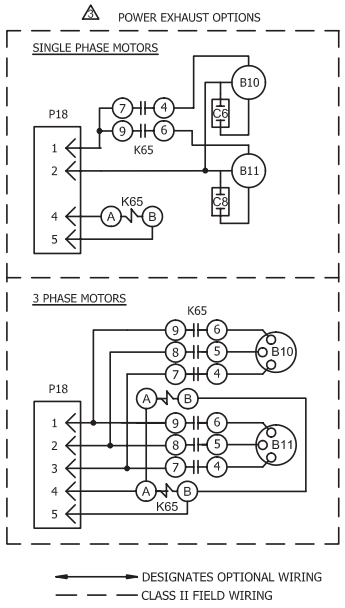
5 PROGRAMMABLE, USE FOR SYSTEM ALARM OUTPUT

6 POWER EXHAUST OPTION

2022/09	WIRING DIAGRAM 538309-01	09/22
ACCESSORIES		
SIEMENS CONTROL ECONOMIZER (RAIDER B-BOX)		
SECTION D		REV. 0
Supersedes	New Form No. 538309-01	

ECONOMIZER STANDARD EFFICIENCY





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

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

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

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

SEQUENCE OF OPERATION

POWER:

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

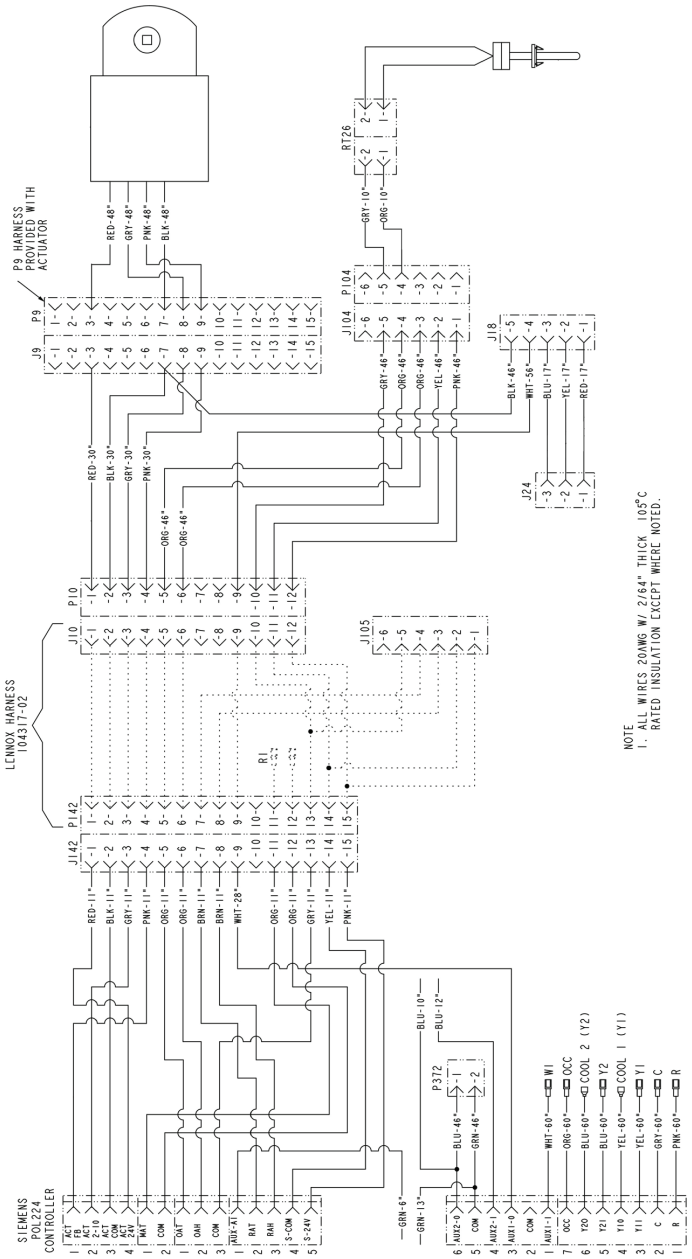
OPERATION:

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

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

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

ECONOMIZER HIGH PERFORMANCE / LOW LEAK



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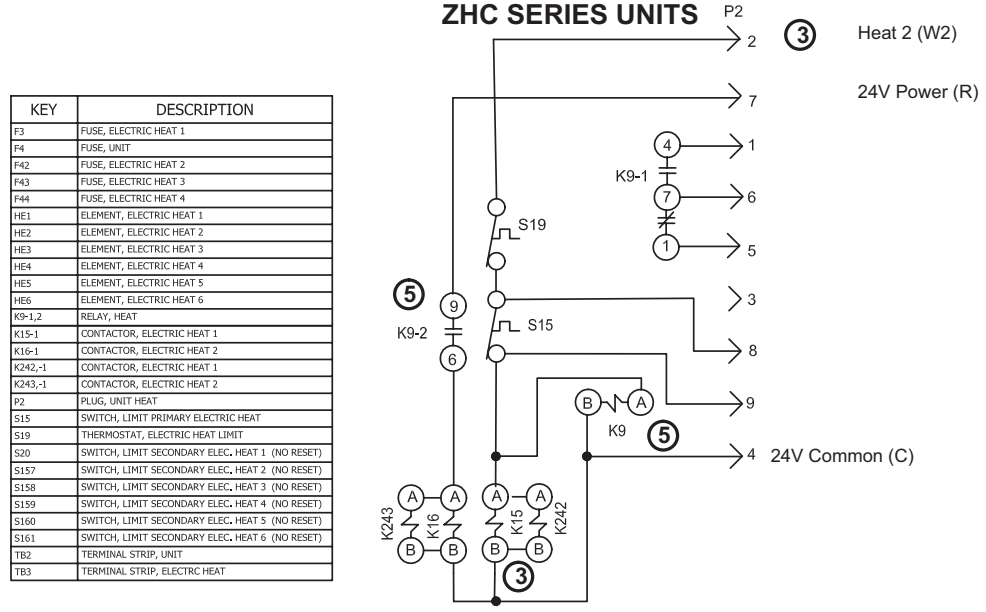
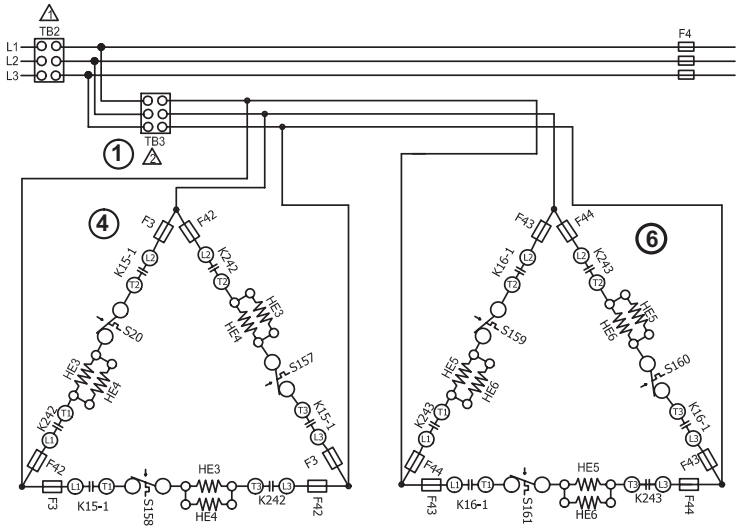
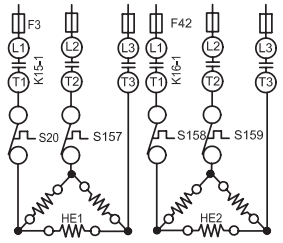
EHA-7.5, 15, 22.5, 30, 45 & 60kW Y VOLTAGE
ZHC SERIES UNITS

KEY	DESCRIPTION
F3	FUSE, ELECTRIC HEAT 1
F4	FUSE, UNIT
F42	FUSE, ELECTRIC HEAT 2
F43	FUSE, ELECTRIC HEAT 3
F44	FUSE, ELECTRIC HEAT 4
HE1	ELEMENT, ELECTRIC HEAT 1
HE2	ELEMENT, ELECTRIC HEAT 2
HE3	ELEMENT, ELECTRIC HEAT 3
HE4	ELEMENT, ELECTRIC HEAT 4
HE5	ELEMENT, ELECTRIC HEAT 5
HE6	ELEMENT, ELECTRIC HEAT 6
K9-1,2	RELAY, HEAT
K15-1	CONTACTOR, ELECTRIC HEAT 1
K16-1	CONTACTOR, ELECTRIC HEAT 2
K242,-1	CONTACTOR, ELECTRIC HEAT 1
K243,-1	CONTACTOR, ELECTRIC HEAT 2
P2	PLUG, UNIT HEAT
S15	SWITCH, LIMIT PRIMARY ELECTRIC HEAT
S19	THERMOSTAT, ELECTRIC HEAT LIMIT
S20	SWITCH, LIMIT SECONDARY ELEC. HEAT 1 (NO RESET)
S157	SWITCH, LIMIT SECONDARY ELEC. HEAT 2 (NO RESET)
S158	SWITCH, LIMIT SECONDARY ELEC. HEAT 3 (NO RESET)
S159	SWITCH, LIMIT SECONDARY ELEC. HEAT 4 (NO RESET)
S160	SWITCH, LIMIT SECONDARY ELEC. HEAT 5 (NO RESET)
S161	SWITCH, LIMIT SECONDARY ELEC. HEAT 6 (NO RESET)
TB2	TERMINAL STRIP, UNIT
TB3	TERMINAL STRIP, ELECTRC HEAT







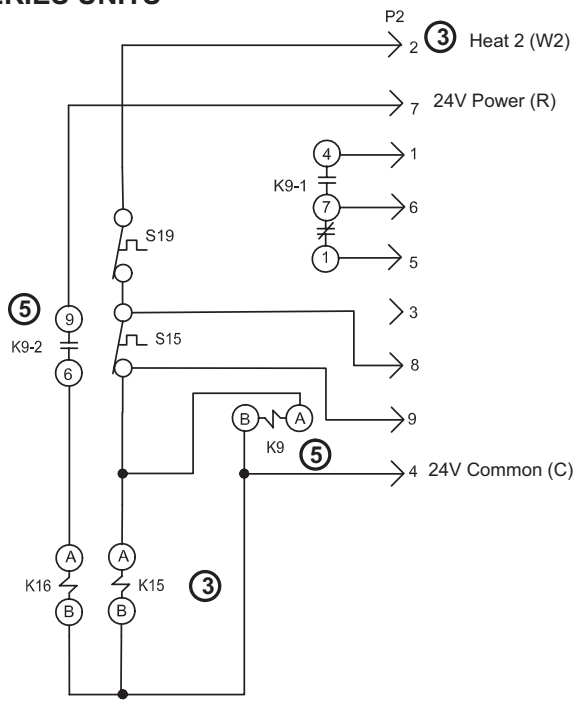
⚠1 TB2,S48 OR CB10 MAY BE USED
⚠2 TB3 IS USED ON SOME UNITS

KW	HE1	HE2	HE3	HE4	HE5	HE6
7.5	7.5					
15	15					
22.5	15	7.5				
30	15	15				
45	15				15	15
60			15	15	15	15

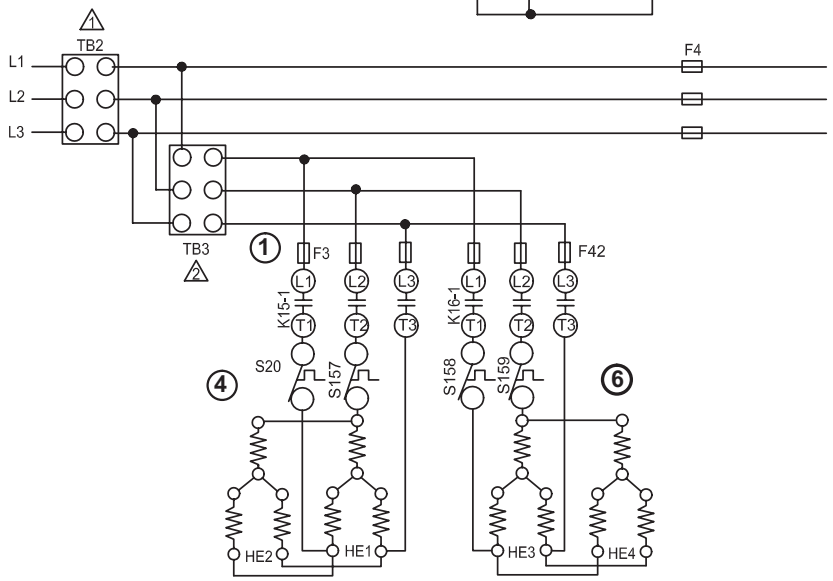
11/14	WIRING DIAGRAM 537690-01	11/14
HEATING - ELECTRIC		
7.5, 15, 22.5, 30, 45, 60 - Y		
SECTION A		REV 1
Supersedes	New Form No. 537690-01	

EHA-7.5, 15, 22.5, 30, 45 & 60kW G, J VOLTAGE
ZHC SERIES UNITS

KEY	COMPONENT
F3	FUSE-ELECTRIC HEAT
F4	FUSE-UNIT
F42	FUSE-ELECTRIC HEAT 2
HE1	ELEMENT-ELECTRIC HEAT 1
HE2	ELEMENT-ELECTRIC HEAT 2
HE3	ELEMENT-ELECTRIC HEAT 3
HE4	ELEMENT-ELECTRIC HEAT 4
K9,-1, 2	RELAY-HEAT
K15,-1	CONTACTOR-ELECTRIC HT 1
K16,-1	CONTACTOR-ELECTRIC HT 2
P2	PLUG-HEAT
S15	SWITCH LIMIT, PRIMARY, ELECT HT
S19	THERMOSTAT-ELECTRIC HEAT LIMIT
S20	SWITCH-LIMIT, SECONDARY ELECT HT 1 (NO RESET)
S157	SWITCH LIMIT, SECONDARY ELECT HT 2 (NO RESET)
S158	SWITCH LIMIT, SECONDARY ELECT HT 3 (NO RESET)
S159	SWITCH LIMIT, SECONDARY ELECT HT 4 (NO RESET)
TB2	TERMINAL STRIP-UNIT
TB3	TERMINAL STRIP-ELECTRIC HEAT



1 TB2,S48 OR CB10 MAY BE USED
2 TB3 IS USED ON SOME UNITS



KW	HE1	HE2	HE3	HE4
7.5	7.5			
15	15			
22.5	15		7.5	
30	15		15	
45	15		15	15
60	15	15	15	15

04/14	WIRING DIAGRAM 537691-01	04/14
HEATING-ELECTRIC		
7.5, 15, 22.5, 30, 45, 60 - G, J		
SECTION A		REV. 0
Supersedes	New Form No. 537691-01	

Sequence of Operation - EHA 7.5, 15, 22.5, 30, 45, 60 kW - Y and G, J, M

NOTE: *This sequence of operation is for all Electric Heat kW ratings Y through J voltages. Each step of operation is numbered and can be followed in sequence on the diagrams. Operation for G, J, and M voltages will be the same.*

HEATING ELEMENTS:

1 - Terminal Strip TB3 is energized when the unit disconnect closes. TB3 supplies line voltage to electric heat elements HE1 through HE6. Each element is protected by fuse F3, F42, F43, or F44.

FIRST STAGE HEAT:

2 - Heating demand initiates at W1 in thermostat.

3 - 24VAC W1 signal is routed from the thermostat through TB1 and P2-2. After S15 N.C. primary limit and S19 limit is proved, the electric heat 1 contactor K15 is energized.

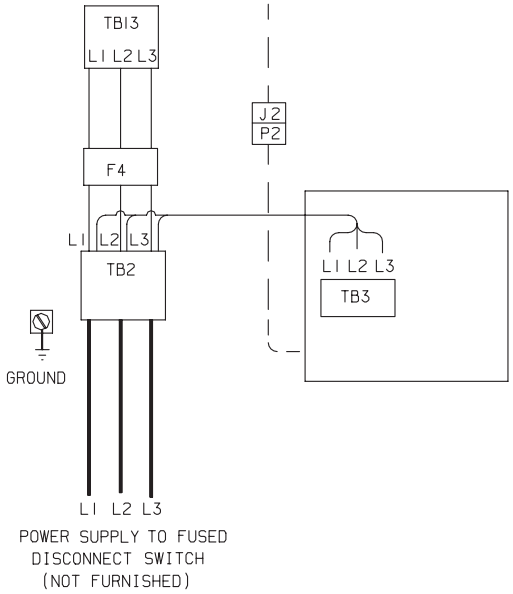
4 - If S20 and S157 (S158 on Y-volt units) secondary electric heat limits remain closed, HE1 and HE2 (HE3 and HE4 on Y-volt units) electric heat is energized.

SECOND STAGE HEAT:

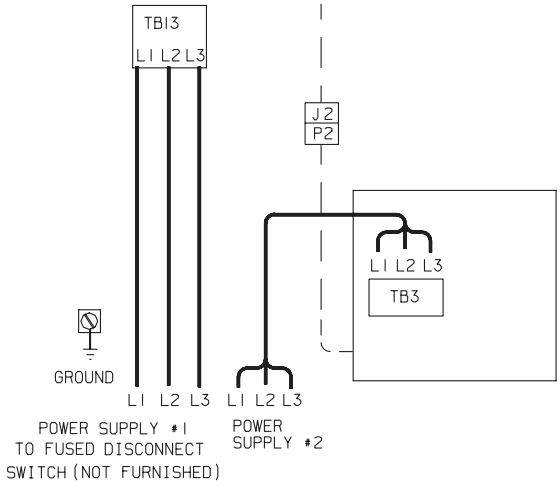
5 - Heating demand initiates at W2 in thermostat.

6 - 24VAC W2 signal is routed from the thermostat through TB1 and P2-7. Electric heat contactor K16 is energized.

7 - If S158 and S159 (S159, S160 and S161 on Y-volt units) secondary electric heat limits remain closed, HE3 and HE4 electric heat is energized.

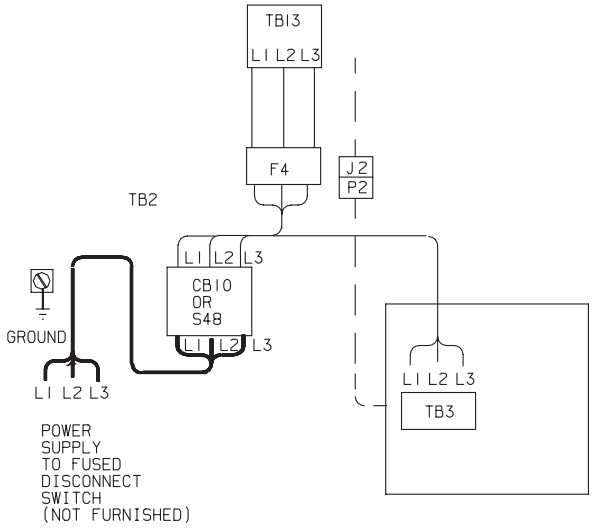


SINGLE POWER SUPPLY - NO CB10 OR S48

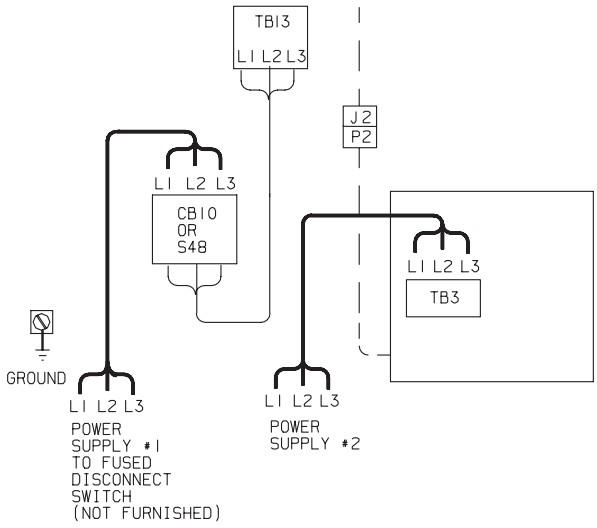


MULTIPLE POWER SUPPLY - NO CB10/S48

CB10-Circuit Breaker
F4- SPPS Terminal Block
J2- Low Voltage Control Harness
J3- Electric Heat Control Harness
S48- Disconnect
TB2- SPPS Terminal Block
TB3- Electric Heat Terminal Block
TB13- Unit Terminal Block



SINGLE POWER SUPPLY WITH CB10/S48



MULTIPLE POWER SUPPLY WITH CB10/S48