UNIT INFORMATION

ZHD SERIES
7.5 to 10 ton
26.3 to 35.2 kW

100189

Service Literature

ZHD092 through 120

The ZHD 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.

False ceilings or drop ceiling may be used as a return air plenum only if the unit being installed has a Refrigerant Detection System installed.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out with work in confined spaces being avoided.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

⚠ 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

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

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⚠ CAUTION

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

WARNING

Only manufacturer approved auxiliary devices are permitted to be installed in this unit.

⚠ CAUTION

The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction

⚠ CAUTION

Children should be supervised not to play with the appliance.

⚠ CAUTION

Any personnel installing, decommissioning, or performaing maintenance on the unit must be properly trained with A2L refrigerants.

⚠ CAUTION

Servicing shall be performed only as recommended by the manufacturer.

⚠ WARNING

•This appliance must be installed in accordance with local and national wiring regulations.

•If the appliance is not fitted with an option for full disconnection from power, a means of disconnection must be incorporated in the fixed wiring in accordance with national and local wiring regulations.

⚠ CAUTION

Leak Detection System installed. Unit must be powered except for service.

⚠ WARNING

Ducts connected to an appliance shall not contain a potential ignition source.

⚠ IMPORTANT

Pipe work, including piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

⚠ IMPORTANT

Refrigerant sensors for refrigerant detection systems shall only be replaced with sensors specified by the appliance manufacture.

⚠ CAUTION

This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

⚠ 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.

OPTIONS / ACCESSORIES

Item Description		Order Number	Size 092	Size 102	Size 120
COOLING/HEATING SYSTEM					
Condensate Drain Trap	PVC	**38R23**	X	X	X
	Copper	**38V21**	X	X	X
Corrosion Protection		Factory	O	O	O
Drain Pan Overflow Switch		**38A64**	X	X	X
Low Ambient Kit		**10Z34**	X	X	X
BLOWER - SUPPLY AIR					
Blower Motors	Two-Speed Belt Drive - 2 HP	Factory	O	O	
	MSAV® Belt Drive - 3 HP	Factory			O
Drive Kits	Kit #1 590-890 rpm	Factory	O	O	
See Blower Data Tables for selection	Kit #2 800-1105 rpm	Factory	O	O	
	Kit #3 795-1195 rpm	Factory	O	O	
	Kit #4 730-970 rpm	Factory			O
	Kit #5 940-1200 rpm	Factory			O
	Kit #6 1015-1300 rpm	Factory			O
CABINET					
Combination Coil/Hail Guards		**12X21**	X	X	X
CONTROLS					
NOTE - See Conventional Thermostat Control Systems on page 10 for Additional Options.					

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		Order Number	Size 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		**24C58**	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		**23V87**	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications		**23Y47**	X	X	X
Aspiration Box - For duct mounting non-plenum rated CO_2 sensors (**24C58**)		**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	**30V24**	X	X	
	460V-3ph	**30V25**	X	X	
	575V-3ph	**30V26**	X	X	
15 kW	208/240V-3ph	**30V30**	X	X	X
	460V-3ph	**30V31**	X	X	X
	575V-3ph	**30V32**	X	X	X
22.5 kW	208/240V-3ph	**30V36**	X	X	X
	460V-3ph	**30V37**	X	X	X
	575V-3ph	**30V38**	X	X	X
30 kW	208/240V-3ph	**30V42**	X	X	X
	460V-3ph	**30V43**	X	X	X
	575V-3ph	**30V44**	X	X	X
45 kW	208/240V-3ph	**30V48**	X	X	X
	460V-3ph	**30V49**	X	X	X
	575V-3ph	**30V50**	X	X	X
60 kW	208/240V-3ph	**30V54**			X
	460V-3ph	**30V55**			X
	575V-3ph	**30V56**			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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OPTIONS / ACCESSORIES

Item Description		Order Number	Size 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
Standard Static (Horizontal)	208/230V-3ph	**24E01**	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)

X = Field Installed

SPECIFICATIONS

Model		ZHD092S5T	ZHD102S5T	ZHD120S5M
Nominal Tonnage		7.5	8.5	10
Efficiency Type		Standard	Standard	Standard
Blower Type		Two Speed Belt Drive	Two Speed Belt Drive	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
	[1] AHRI Rated Air Flow (cfm)	2800	3200	3400
	[1] IEER (Btuh/Watt)	14.1	14.1	14.1
	[1] EER (Btuh/Watt)	11.0	11.0	11.0
	Total Unit Power (kW)	7.8	9.1	11.0
Heating Performance	[1] Total High Heating Capacity (Btuh)	83,000	100,000	116,000
	[1] AHRI Rated Air Flow (cfm)	2800	3200	3400
	[1] COP	3.4	3.4	3.4
	Total Unit Power (kW)	7.9	9.0	10.7
	[1] Total Low Heating Capacity (Btuh)	50,000	55,000	70,000
	[1] COP	2.25	2.25	2.25
	Total Unit Power (kW)	7.4	8.6	9.4
Sound Rating Number	dBA	88	88	88
Refrigerant	Refrigerant Type	R-454B	R-454B	R-454B
Charge	Circuit 1	14 lbs. 1oz.	14 lbs. 10 oz.	14 lbs. 3 oz.
	Circuit 2	14 lbs. 14 oz.	14 lbs. 13 oz.	12 lbs. 0 oz.
Electric Heat Available - See page 13		7.5, 15, 22.5, 30, 45 kW		7.5, 15, 22.5, 30, 45, 60 kW
Compressor Type (Number)		(1) Two-Stage Scroll, (1) Single-Stage Scroll		
Outdoor Coil	Net face area - ft.^{2}	26.2	26.2	26.2
	Tube diameter - in.	3/8	3/8	3/8
	Rows	3	3	3
	Fins - in.	20	20	20
Outdoor Coil Fans	Motor HP (number and type)	1/2 (2 PSC)	1/2 (2 PSC)	1/2 (2 PSC)
	Rpm	1075	1075	1075
	Watts	960	960	960
	Diameter (Number) - in.	(2) 24	(2) 24	(2) 24
	Blades	3	3	3
	Total air volume - cfm	9000	9000	9000
Indoor Coil	Net face area - ft.^{2}	13.54	13.54	13.54
	Tube diameter - in.	3/8	3/8	3/8
	Rows	4	4	4
	Fins - in.	14	14	14
	Condensate drain size (NPT) - in.	(1) 1	(1) 1	(1) 1
	Expansion device type	Balanced Port Thermostatic Expansion Valve		
[2] **Indoor Blower and Drive Selection**	Nominal Motor HP	2		3
	Motor - Drive Kit Number	Kit #1 590-890 rpm Kit #2 800-1105 rpm Kit #3 795-1195 rpm		Kit #4 730-970 rpm Kit #5 940-1200 rpm Kit #6 1015-1300 rpm
	Wheel (Number) diameter x width - in.	(1) 15 X 15		
Filters	Type	Disposable		
	Number and size - in.	(4) 20 x 24 x 2		
Line voltage data (Volts-Phase-Hz)		208/230V-3-60 460V-3-60 575V-3-60		

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 HP required. Maximum usable HP of motors furnished are shown. If motors of comparable HP are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

NOTE – Motor service factor limit - 1.0.

ZHD092S5T, ZHD102S5T − 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 21 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	535	0.28	596	0.49	660	0.69	724	0.87	788	1.00	851	1.11	913	1.23	971	1.37	1025	1.52	1076	1.69	1124	1.86	- - -	- - -	- - -	- - -
2250	552	0.43	613	0.63	675	0.81	738	0.98	802	1.11	864	1.22	925	1.36	982	1.51	1036	1.68	1085	1.85	1133	2.04	1180	2.23	1228	2.44
2500	570	0.57	630	0.76	692	0.94	754	1.10	817	1.22	879	1.35	939	1.51	995	1.67	1047	1.85	1096	2.04	1143	2.23	1190	2.43	1239	2.65
2750	589	0.72	648	0.91	709	1.08	772	1.22	833	1.36	894	1.50	954	1.67	1009	1.85	1059	2.04	1108	2.24	1154	2.44	1202	2.65	1251	2.87
3000	608	0.87	668	1.05	729	1.22	791	1.37	852	1.51	912	1.67	970	1.85	1023	2.05	1073	2.25	1120	2.46	1167	2.67	1215	2.89	1265	3.11
3250	629	1.03	688	1.21	749	1.37	811	1.52	871	1.68	930	1.86	987	2.06	1039	2.27	1088	2.49	1134	2.70	1181	2.92	1229	3.14	1279	3.37
3500	651	1.20	710	1.38	772	1.54	833	1.70	892	1.88	950	2.07	1004	2.28	1055	2.51	1103	2.74	1150	2.96	1196	3.19	1245	3.42	1295	3.65
3750	674	1.36	734	1.56	796	1.73	856	1.90	914	2.10	970	2.30	1023	2.53	1072	2.78	1120	3.02	1166	3.25	1213	3.47	1262	3.71	1313	3.95
4000	699	1.55	761	1.76	822	1.94	880	2.12	936	2.33	991	2.56	1042	2.81	1090	3.07	1137	3.31	1183	3.55	1231	3.78	1281	4.03	1333	4.28
4250	726	1.77	789	1.98	849	2.16	904	2.37	959	2.59	1012	2.84	1062	3.11	1109	3.38	1156	3.63	1202	3.87	1251	4.11	1302	4.37	1354	4.63
4500	756	2.01	818	2.22	875	2.41	929	2.63	983	2.88	1034	3.15	1082	3.44	1129	3.71	1175	3.96	1222	4.21	1271	4.46	1323	4.72	1376	5.00
4750	788	2.27	848	2.47	902	2.68	955	2.92	1006	3.20	1056	3.50	1104	3.79	1150	4.06	1196	4.32	1243	4.57	1293	4.83	1345	5.09	1399	5.37
5000	822	2.54	878	2.75	929	2.98	980	3.25	1031	3.56	1079	3.87	1126	4.16	1172	4.44	1218	4.70	1266	4.95	1315	5.20	1367	5.47	1421	5.74

ZHD120S5M − 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 21 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

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.

Size	RTD11 Step-Down Diffuser				FD11 Flush Diffuser
	Air Volume cfm	2 Ends Open	1 Side, 2 Ends Open	All Ends & Sides Open	
092	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	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

Size	Air Volume	[1] Effective Throw Range	
		RTD11 Step-Down	FD11 Flush
	cfm	ft.	ft.
092	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	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			ZHD092S5T		
[1] Voltage - 60Hz			208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor 1		Rated Load Amps	11.9	6.8	4.8
		Locked Rotor Amps	112	61.8	39
Compressor 2		Rated Load Amps	12.2	6.4	5.1
		Locked Rotor Amps	120	50	41
Outdoor Fan Motors (2)		Full Load Amps (2 Non-ECM)	3	1.5	1.2
		Total	6	3	2.4
Power Exhaust (2) 0.33 HP		Full Load Amps	2.4	1.3	1
		Total	4.8	2.6	2
Service Outlet 115V GFI (amps)			15	15	20
Indoor Blower Motor		Horsepower	2	2	2
		Full Load Amps	7.5	3.4	2.7
[2] Maximum Overcurrent Protection		Unit Only	50	25	20
		With (2) 0.50 HP Power Exhaust	50	30	20
[3] Minimum Circuit Ampacity		Unit Only	41	22	17
		With (2) 0.33 HP Power Exhaust	46	24	19

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	480V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**7.5 kW**	70	70	35	30
		15 kW	80	90	45	35
		22.5 kW	100	110	60	45
		30 kW	125	150	70	60
		45 kW	175	200	90	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**7.5 kW**	61	64	33	26
		15 kW	80	86	44	35
		22.5 kW	100	109	56	44
		30 kW	119	131	67	53
		45 kW	158	176	89	71
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**7.5 kW**	70	70	40	30
		15 kW	90	100	50	40
		22.5 kW	110	125	60	50
		30 kW	125	150	70	60
		45 kW	175	200	100	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**7.5 kW**	65	69	36	28
		15 kW	85	91	47	37
		22.5 kW	105	114	58	46
		30 kW	124	136	70	55
		45 kW	163	181	92	73

ELECTRIC HEAT ACCESSORIES

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

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		ZHD102S5T		
[1] Voltage - 60Hz		208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor 1	Rated Load Amps	13.8	6.9	5.8
	Locked Rotor Amps	150	58	47.8
Compressor 2	Rated Load Amps	12.2	6.4	5.1
	Locked Rotor Amps	120	50	41
Outdoor Fan Motors (2)	Full Load Amps (2 Non-ECM)	3	1.5	1.2
	Total	6	3	2.4
Power Exhaust (2) 0.33 HP	Full Load Amps	2.4	1.3	1
	Total	4.8	2.6	2
Service Outlet 115V GFI (amps)		15	15	20
Indoor Blower Motor	Horsepower	2	2	2
	Full Load Amps	7.5	3.4	2.7
[2] Maximum Overcurrent Protection	Unit Only	50	25	20
	With (2) 0.33 HP Power Exhaust	60	30	25
[3] Minimum Circuit Ampacity	Unit Only	43	22	18
	With (2) 0.33 HP Power Exhaust	48	25	20

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	480V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**7.5 kW**	70	70	35	30
		15 kW	90	90	45	40
		22.5 kW	110	125	60	45
		30 kW	125	150	70	60
		45 kW	175	200	90	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**7.5 kW**	63	66	33	27
		15 kW	83	89	44	36
		22.5 kW	102	111	56	45
		30 kW	122	134	67	54
		45 kW	161	179	90	72
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**7.5 kW**	70	80	40	30
		15 kW	90	100	50	40
		22.5 kW	110	125	60	50
		30 kW	150	150	70	60
		45 kW	175	200	100	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**7.5 kW**	68	71	36	29
		15 kW	87	93	47	38
		22.5 kW	107	116	58	47
		30 kW	126	138	70	56
		45 kW	166	184	92	74

ELECTRIC HEAT ACCESSORIES

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

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			ZHD120S5M		
[1] Voltage - 60Hz			208/230V - 3 Ph	460V - 3 Ph	575V - 3 Ph
Compressor 1		Rated Load Amps	13.8	6.9	5.8
		Locked Rotor Amps	150	58	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) 0.33 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	3	3	3
		Full Load Amps	10.6	4.8	3.9
[2] Maximum Overcurrent Protection		Unit Only	45	20	15
		With (2) 0.33 HP Power Exhaust	50	25	20
[3] Minimum Circuit Ampacity		Unit Only	34	17	14
		With (2) 0.33 HP Power Exhaust	39	20	16

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	480V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	80	80	40	35
		22.5 kW	100	110	60	45
		30 kW	125	125	70	50
		45 kW	175	175	90	70
		60 kW	175	200	90	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	73	79	39	32
		22.5 kW	93	102	51	41
		30 kW	113	125	62	50
		45 kW	152	170	85	68
		60 kW	159	179	89	72
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	80	90	45	35
		22.5 kW	100	110	60	45
		30 kW	125	150	70	60
		45 kW	175	175	90	70
		60 kW	175	200	100	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.33 HP Power Exhaust	**15 kW**	78	84	42	34
		22.5 kW	98	107	53	43
		30 kW	117	129	65	52
		45 kW	156	174	87	70
		60 kW	164	183	92	74

ELECTRIC HEAT ACCESSORIES

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

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

FIELD WIRING NOTES

- For use with copper wiring only
- Field wiring not furnished
- All wiring must conform to NEC or CEC and local electrical codes
- For specific wiring information, please refer to the installation instructions

Minimum R454B Space and CFM Requirements

Minimum Airflow[1]		
Unit	Q_{min}(CFM)	Q_{min}(m^3h)
ZHD092	394	669
ZHD102	392	666
ZHD120	376	638

*[1] **NOTE -** The minimum airflow is the lowest CFM allowed during venting operation (leak mitigation).*

Refrigerant Charge R-454B				
	Circuit 1		Circuit 2	
Unit	M_c(lbs)	M_c(kg)	M_c(lbs)	M_c(kg)
ZHD092	14.30	6.49	14.60	6.62
ZHD102	13.20	5.99	14.60	6.62
ZHD120	12.10	5.49	13.20	5.99

Minimum Room Area of Conditioned Space[2]		
Unit	TA_{min}(ft^2)	TA_{min}(m^2)
ZHD092	218	20.3
ZHD102	217	20.2
ZHD120	208	19.3

[2] NOTE - The minimum room area of conditioned space is the smallest area the unit can service.

Altitude Adjustment Factor[3]									
Halt	0	200	400	600	800	1000	1200	1400	1600
AF	1	1	1	1	1.02	1.05	1.04	1.1	1.12
Halt	1600	1800	2000	2200	2400	2600	2800	3000	3200
AF	1.12	1.15	1.18	1.21	1.25	1.28	1.32	1.36	1.4

*[3] **NOTE -** Use the Altitude Adjustment Factor to adjust the values in the tables above to different altitudes. Find the relevant altitude above sea level in the two "Halt" rows and then multiply the value needed from the tables above by the altitude factor number. Example: For the minimum airflow in CFM for* an ZHD092 at 1000 ft. above see level, multiply 394 by 1.05 to get 413.7 CFM *as the new* Q_{min}.

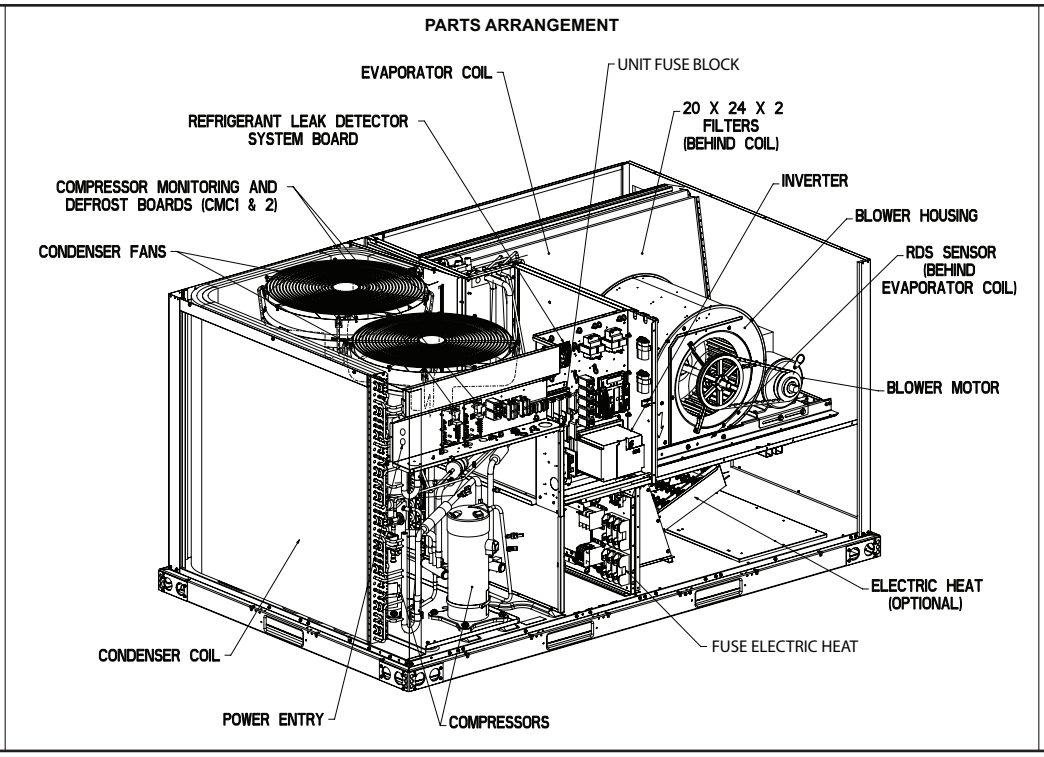


FIGURE 1

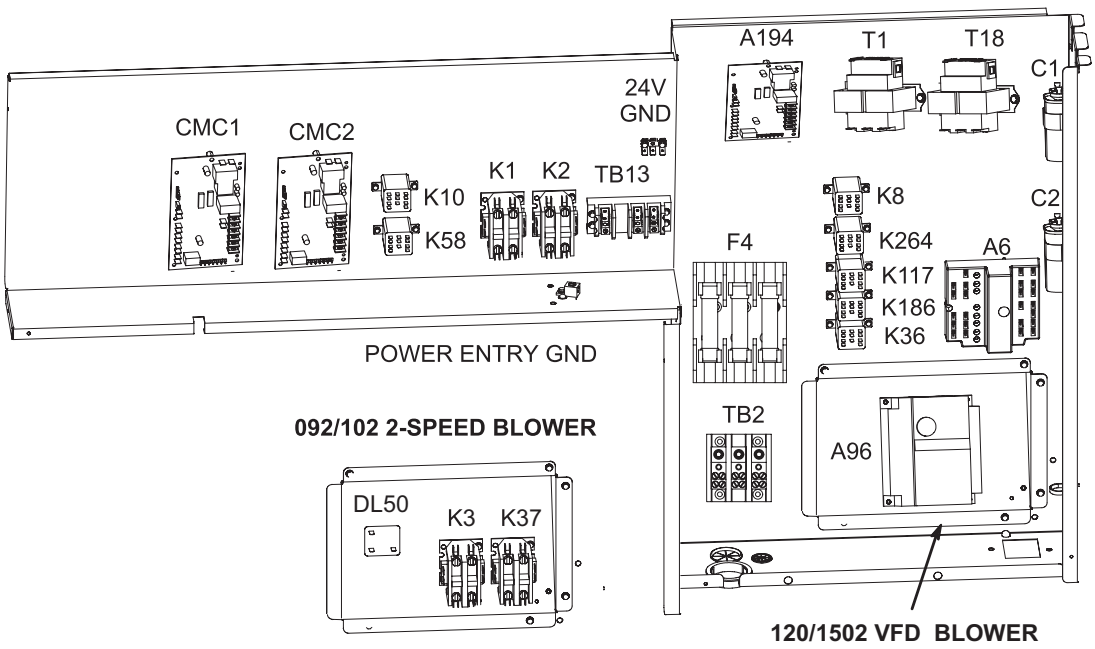


FIGURE 2

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.

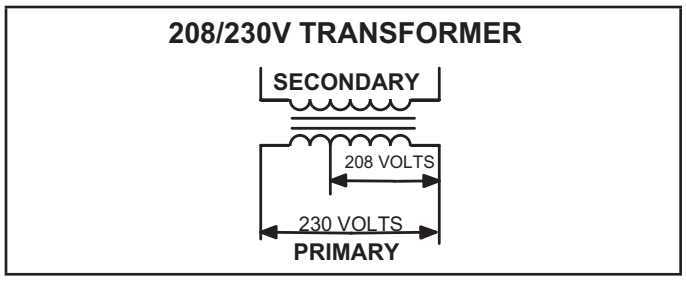


FIGURE 3

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-Terminal Block TB13

TB13 terminal block distributes line voltage power to the line voltage items in the unit.

8-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.

9-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.

10-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.

11-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.

12-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.

13-Refrigerant Detection Board (A194) and Sensor (RT58)

All units are equipped with a Refrigerant Leak Detection System. The system consists of the RDS Non-Communicating Blower Control Board (A194) in the control compartment and a R454B Refrigerant Sensor (RT58) near the coil.13-Enthalpy Control (A6). Refer to description in economizer section.

14-Relay K239 (-092/102 Units)

Relay K239 sends the Y1 demand “G” signal to K3 (through K250) to energize the blower on low speed and also sends the “W1” demand “G” signal to K37 (through K250) to energize the blower on high speed.

15- Relay K250 (-092/102 Units)

Relay K250 passes the “G” signal to contactor K3 energizing the blower on low speed. On a Y2 call K250 passes the signal to K37 (energizing the blower on high speed) and internal solenoid L34 (energizing the compressor on high speed).

16-Blower Contactor K3 &K37 (-92/102 Units)

On two-speed operation K37 acts as the high speed blower contactor and K3 acts as the low speed contactor in response to blower demand.

17-Blower Delay DL50 (-092/102 Units)

DL50 causes a 1.5 second delay switching from high speed to low speed.

18-Compressor Monitoring Control Boards CMC1 & CMC2

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

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 90 minutes (default). The run time interval can be changed by moving the jumper on the CMC1 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 90-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval.

Defrost Test Option

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

Diagnostic LEDs

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

TABLE 1

Defrost Control Board Diagnostic LED

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

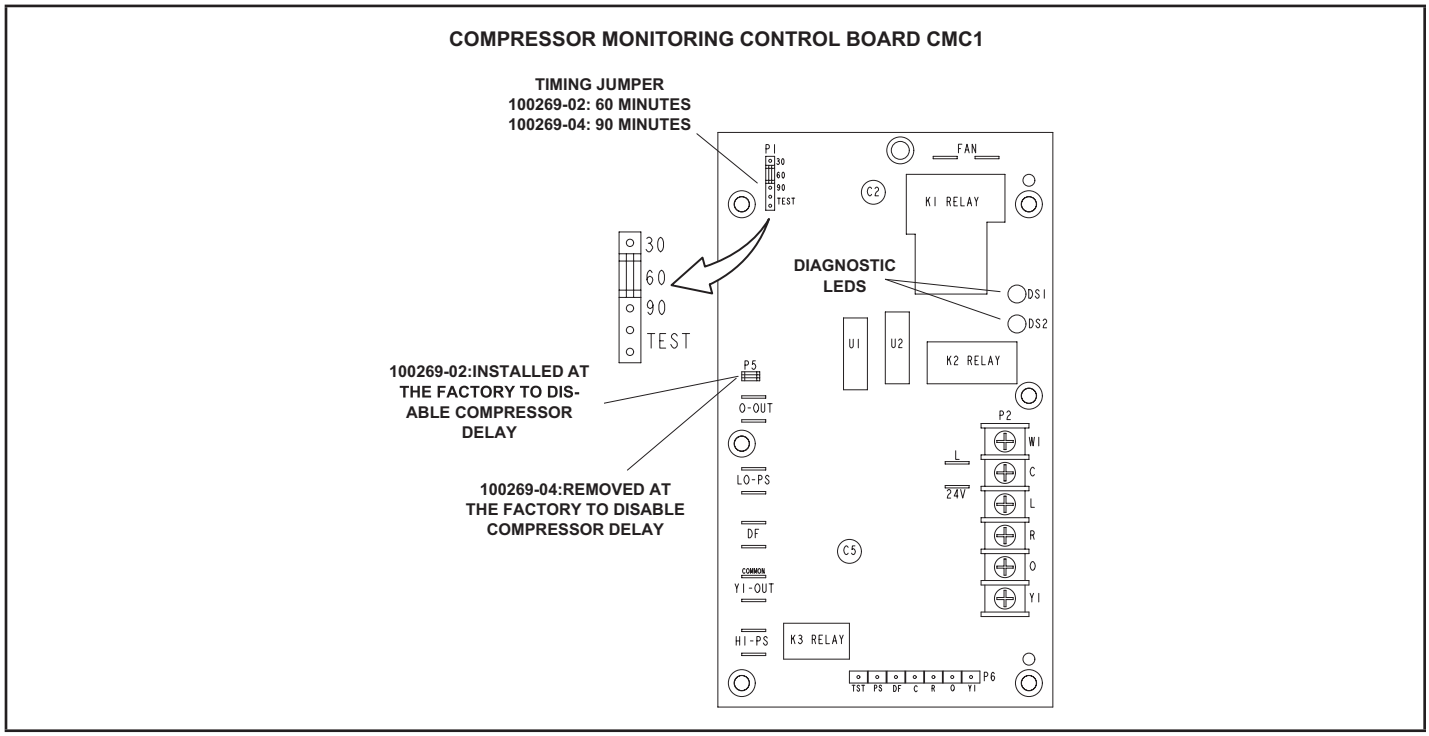
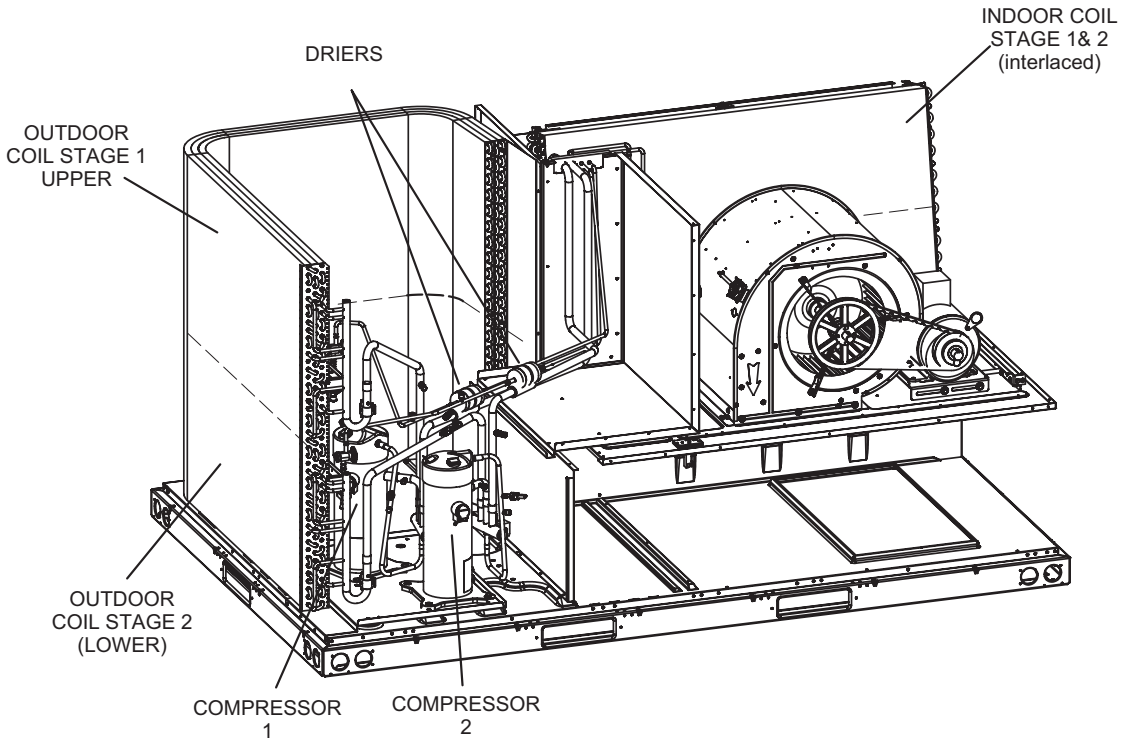


FIGURE 4

ZHD092,102, 120 PLUMBING AND COMPRESSOR CIRCUITS DETAIL



Pressure Switches

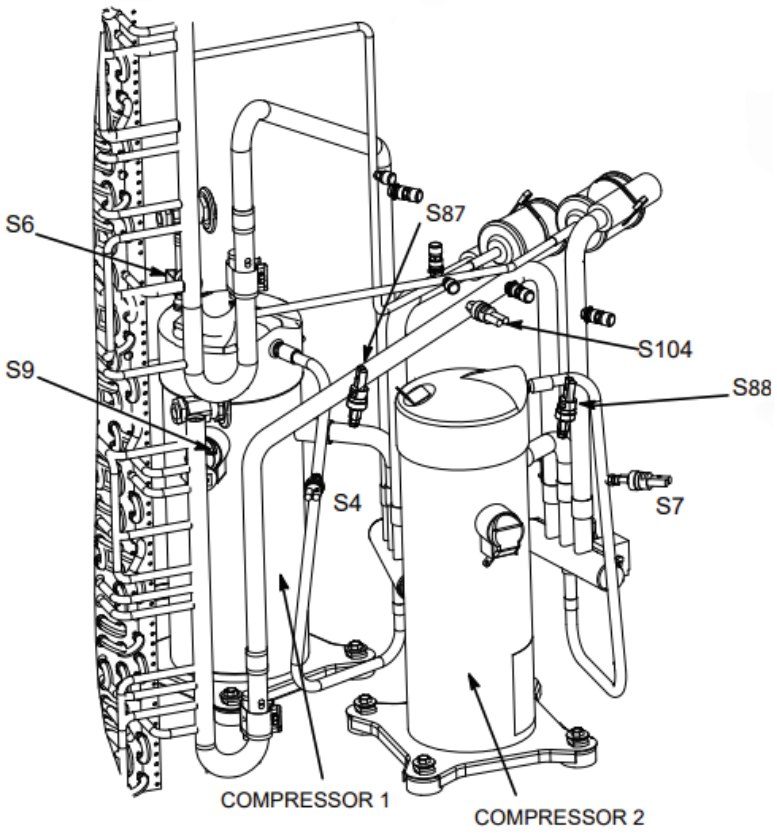


FIGURE 5

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 $\pm$ 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 $\pm$ 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 ± 5ºF (15.6ºC ± 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.

9-Low Pressure Switch (S87, S88)

The compressor circuit is protected by a loss of charge switch. Switch opens at 40 psig ± 5 psig (276 ± 34 kPa) and automatically resets at 90 psig ± 5 psig (621 kPa ± 34 kPa).

10-Compressor Monitoring (CMC1 & CMC2)

The unit is equipped with two CMC control boards (CMC1 & CMC2 for compressors B1 and B2 respectively). Inputs will include cooling commands, and pressure controls.

Integral features include:

- Anti-short cycle timed-off control with compressor contactor driver.
- High- and low-pressure switch monitoring, with 5-strike lockout.

CMC1 & CMC2 will be engaged monitoring compressors B1 and B2.

See TABLE 1 for a listing of LED alerts.

TABLE 2

CMC1/CMC2 Control Board Diagnostic LED's

DS2 Green	DS1 Red	Condition
OFF	OFF	Power Problem
Simultaneous Slow Flash		Normal Operation
Alternating Slow Flash		5-min. anti-short cycle delay
Fault and Lockout Codes		
OFF	Slow Flash	Loss of Charge Fault
OFF	ON	Loss of Charge Fault
Slow (Flash)	OFF	High Pressure Fault
ON	OFF	High Pressure Lockout

11-Refrigerant Leak Detection System

This unit is equipped with a Refrigerant Leak Detection System. The system consists of the RDS Non-Communicating Blower Control Board (RDSC) in the control compartment and a R454B Refrigerant Sensor near the coil. The Modes of Operation for the RDS Non-Communicating Blower Control Board are Initializing, Normal, Leak Detected, and Fault.

MODES OF OPERATION

Initializing

The RDS Non-Communicating Blower Control Board is establishing connection with the refrigerant detection sensor and sensor is "warming up".

Normal

The HVAC system is functioning normally, i.e., responding to thermostat demand signals. The RDS Non-Communicating Blower Control Board has not detected a refrigerant leak.

Leak Detected (Mitigation)

When the RDS Non-Communicating Blower Control Board detects a refrigerant leak:

1 - The RDS Non-Communicating Blower Control Board shuts off the (R) output (24VAC power) to the thermostat, which de-energizes the outdoor unit compressor and heat sources, such as gas and/or electric strip heat. No heating or cooling demands will be met.

2 - The RDS Non-Communicating Blower Control Board activates the blower ventilation speed (G). The blower purges refrigerant from the cabinet, plenum, and ductwork.

3 - After the RDS Non-Communicating Blower Control Board determines the refrigerant levels are below the safety threshold, the blower will continue to function for an additional seven (7) minutes.

4 - After the blower sequence is complete, the HVAC system resumes normal operation.

NOTE - *The HVAC system may not maintain a cooling or heating setpoint if a significant leak exists. Any refrigerant leaks that remain unaddressed for an extended time may cause the HVAC system to shut down on a low refrigerant pressure limit condition.*

Fault/Service

When a fault is detected within the RDS Non-Communicating Blower Control Board, the indoor blower engages and remains engaged at a constant output until the fault is cleared.

DIAGNOSTIC CODES / TROUBLESHOOTING

The RDS Non-Communicating Blower Control Board is equipped with a multicolor LED. The LED signals the operational state of the RDS Non-Communicating Blower Control Board. To review the operational states, refer to TABLE 3, LED Operational Modes / Troubleshooting, for details.

Red diagnostic codes indicate a specific RDS Non-Communicating Blower Control Board issue. To determine the issue and possible troubleshooting actions, refer to TABLE 4, Red LED Diagnostic Codes / Troubleshooting.

The RDS Non-Communicating Blower Control Board is equipped with a Test/Reset button. The Test button can be used to complete several functions, depending on the mode of operation of the RDS Non-Communicating Blower Control Board. TABLE 5 lists the functions of the Test button during each mode of operation.

TABLE 3

LED Operational Modes / Troubleshooting

Operating Mode	LED Status	Action
Initializing	Flashing green	None
Monitoring	Solid green*	None
Mitigation (Leak Detected)	Flashing blue	Check coil tubes for leak. Repair the issue and restart the equipment.
Fault / Service	Solid blue, interrupted by red flash code	Refer to table for troubleshooting guidance.

*Solid green interrupted by a blue flash indicates the mitigation process has previously occurred.

TABLE 4

Red LED Diagnostic Codes / Troubleshooting

Red Wink	Applies to Individual Sensor(s)	Issue	Action
1	Yes	RDS Sensor Fault	Replace sensor
2	No	VFD alarm / Drain pan overflow	Check VFD for alarms, remedy alarms present. If float switch is installed, verify proper switch mounting location, depth in pan, unobstructed condensate drain line; correct as needed.
3	Yes	Incompatible sensor installed	Replace sensor
4	Yes	Sensor communication issue	Check sensor connection. Ensure connection is clean and tight
5	No	R-input not available	Check for 24VAC power connected to thermostat R terminal on the RDSC. 24VAC power should only be provided at A194-R quick connection for the RDSC to function.
6	No	Invalid configuration of sensor count	Not applicable

TABLE 5

Test Button Functions

Operation Mode	Press the Test button to...	Press	Action
Monitoring	Trigger a leak detection response. Verify all equipment is wired correctly into the RDSC (after installation).	Short	Clear purge-counter if prior mitigation has occured; test mitigation.
		Long	Reset control.
Mitigating (Leak Detected)	Reset the RDSC to a normal mode of operation after a previous leak has been detected and purged from the HVAC system.	Short	If testing mitigation, end test.
Fault/Service	Reset the RDSC after troubleshooting and resolving a fault condition. If the fault is not resolved, the RDSC will enter the Fault mode again.	Short	Reevaluate fault condition - if cleared, return to monitoring, otherwise update indicator.
		Long	Reset control.

RDS SENSORS

Units are equipped with factory-installed RDS Sensors located on different points on the unit. The RDS sensors provide the Unit Controller with continuous readings for leaked refrigerant concentration levels and sensor health status (Good or Fault). These readings are used to modify unit operation to disperse the leaked refrigerant and to remove possible ignition sources. In addition, the Unit Controller uses these readings to initiate alarms to alert the operator of a refrigerant leak or faulty sensor(s).

Each sensor must be specifically placed for proper unit operation and to initiate valid alarms. To identify sensor locations see TABLE 6.

TABLE 6

RDS Sensor Figures

Model	Qty.	Type	Figure
ZHD092-120	1 sensor	INDOOR SENSOR	FIGURE 6

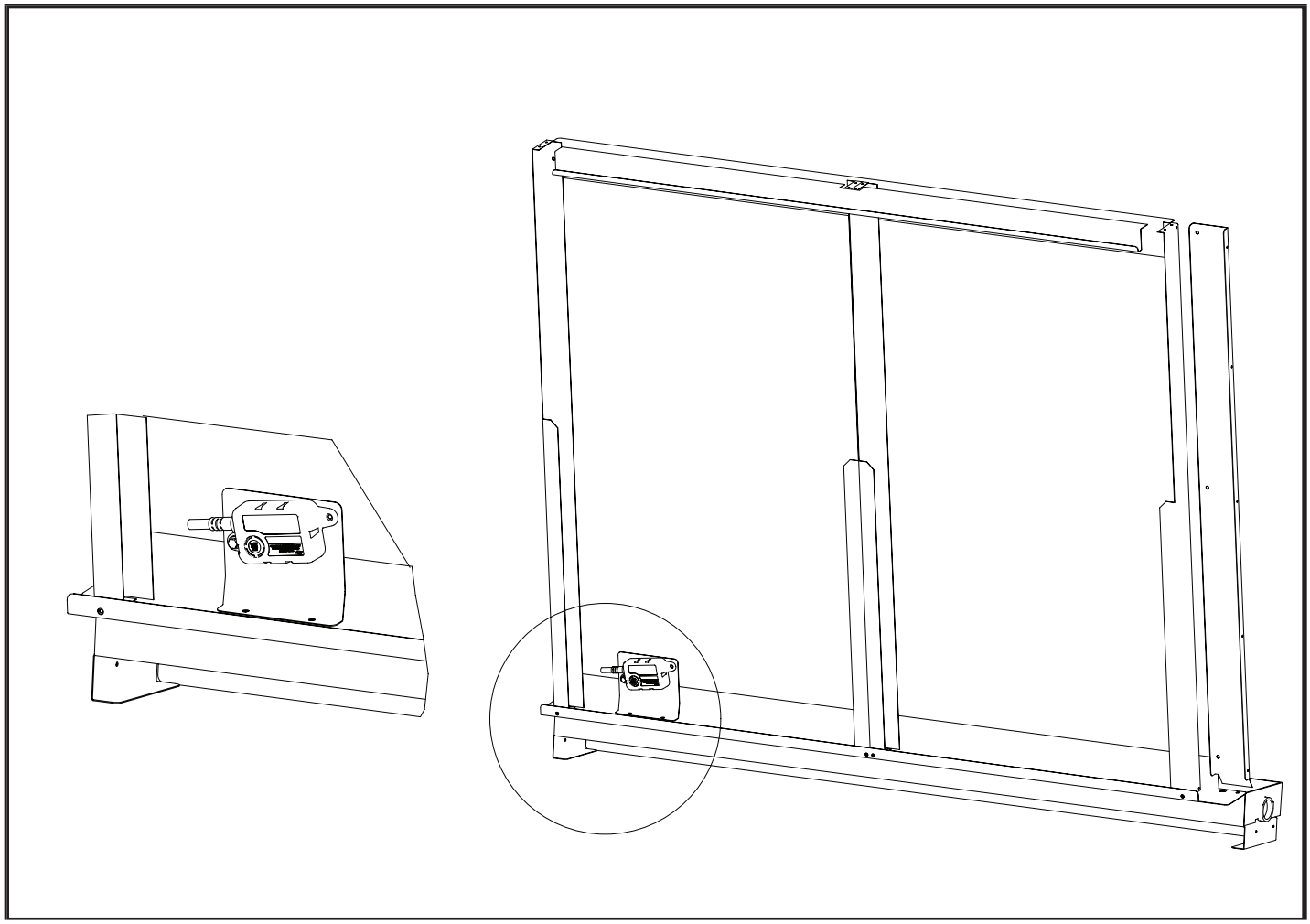


FIGURE 6

SENSOR MAINTENANCE

It is recommended to check the state of the sensor every 6 months, at the beginning of each cooling and heating season.

- Check that the sensor cable is in good condition.
- Ensure that the sensor opening is clear and free of debris.
  - DO NOT use abrasive cleaning solutions or detergents to clean sensor opening.
  - DO NOT use flammable compressed air solutions to clean the sensor opening.
  - DO NOT vacuum sensor inlet opening, as this could cause damage to the sensor internal components.
- Replace sensor if the opening is not clean or free of debris.

NOTE - *When cleaning the evaporator coil, remove the sensor from the coil. Recommended method is removal of bracket with sensor attached.*

See FIGURE 7 for an example of a clear, unobstructed sensor inlet.

FIGURE 7

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.

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- G/Y1 = 40Hz
- Y2 = 55Hz
- Y3/W1/W2 = 60Hz.

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.

NOTE - *ZHD092-102 units are equipped with two-stage blowers. The blower will operate at high speed with a Y3 thermostat demand and low speed with a Y2 or Y1 thermostat demand. Low speed operation delivers approximately ⅔ of the air volume of high speed. The blower will run on Low-Speed with a G thermostat demand. The blower will run on High-Speed with a W1 and/or W2 thermostat demand. Two-speed blower operation results in lower energy consumption.*

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 8.

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

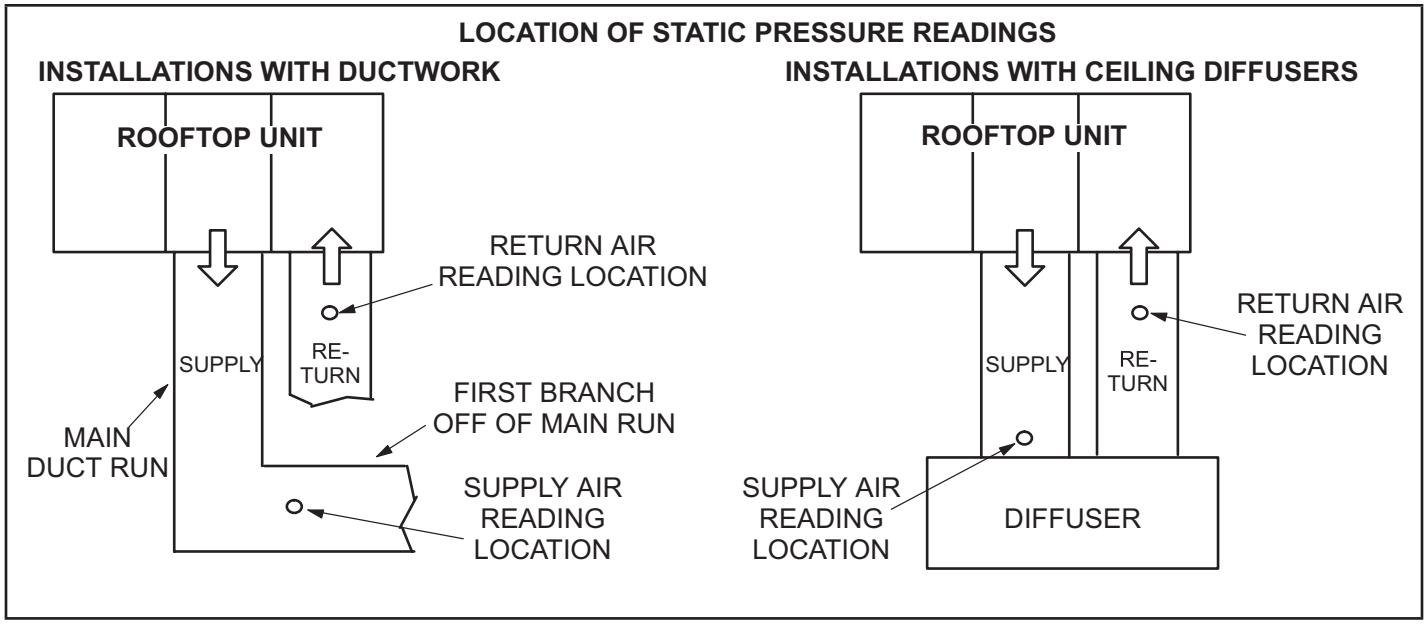


FIGURE 8

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 9. Do not exceed minimum and maximum number of pulley turns as shown in TABLE 7.

6 - Units Equipped With An Inverter -

Reconnect high pressure switches S4 and S7.

TABLE 7

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 10.

1 - Loosen four bolts securing motor base to mounting frame. See FIGURE 9.

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.

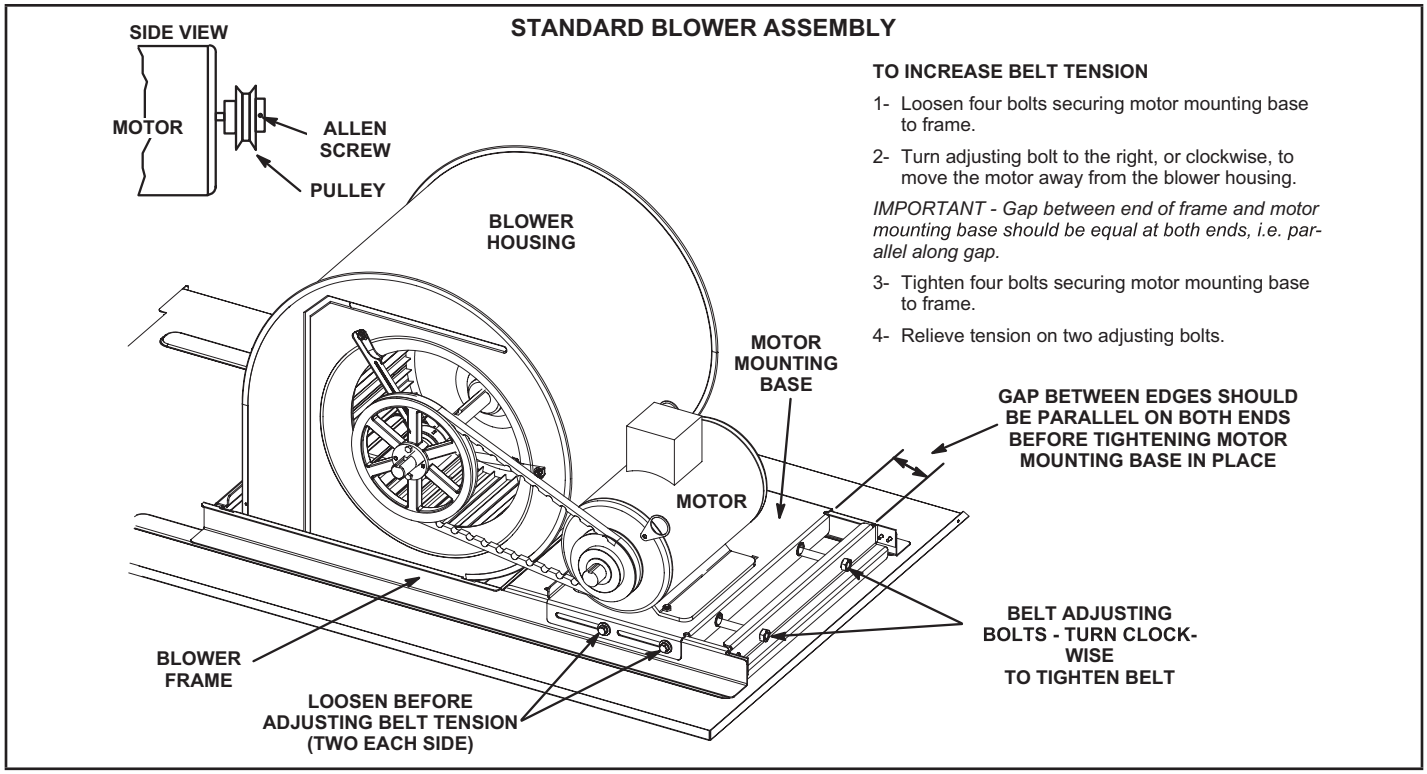


FIGURE 9

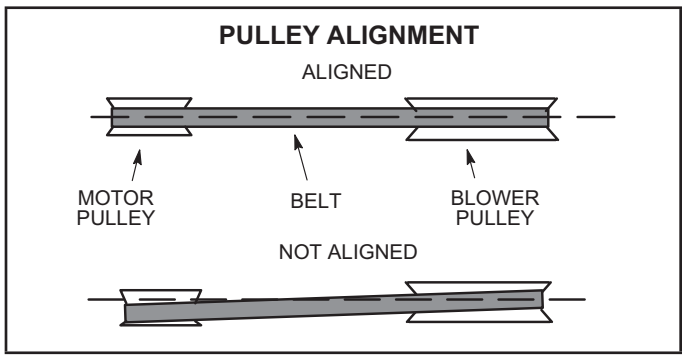


FIGURE 10

E-Check Belt Tension

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

1 - Measure span length X. See FIGURE 11.

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

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

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

3 - Measure belt deflection force. For a 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.

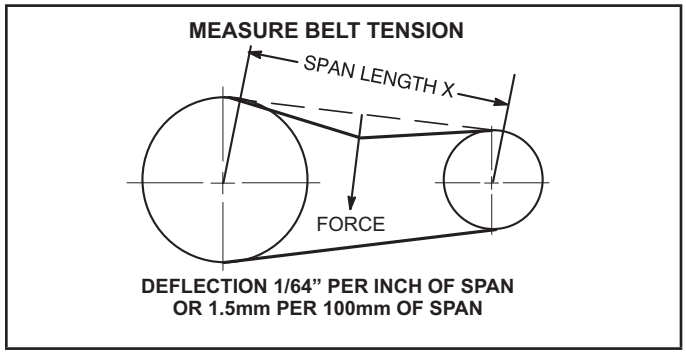


FIGURE 11

F-Field-Furnished Blower Drives

For field-furnished blower drives, use blower data (Table of Contents) to determine BHP and RPM required. Reference TABLE 8 for drive component manufacturer's numbers.

TABLE 8
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

D-Optional Electric Heat Components

TABLE 9 shows electric heat fuse ratings. See Options/Accessories section (see table of contents) for ZHD 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 15.

EHA parts arrangement is shown in FIGURE 14 and FIGURE 15. 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 14 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 ZHD 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 ZHD 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 A194-W1 AND A194-W2 signals on ZHD and by CMC1 Defrost control and A194 board on ZHD units. See FIGURE 12 and FIGURE 13 location of the J2/P2 harness and FIGURE 14 for location of the K9 relay on the electric heat vest-panel.

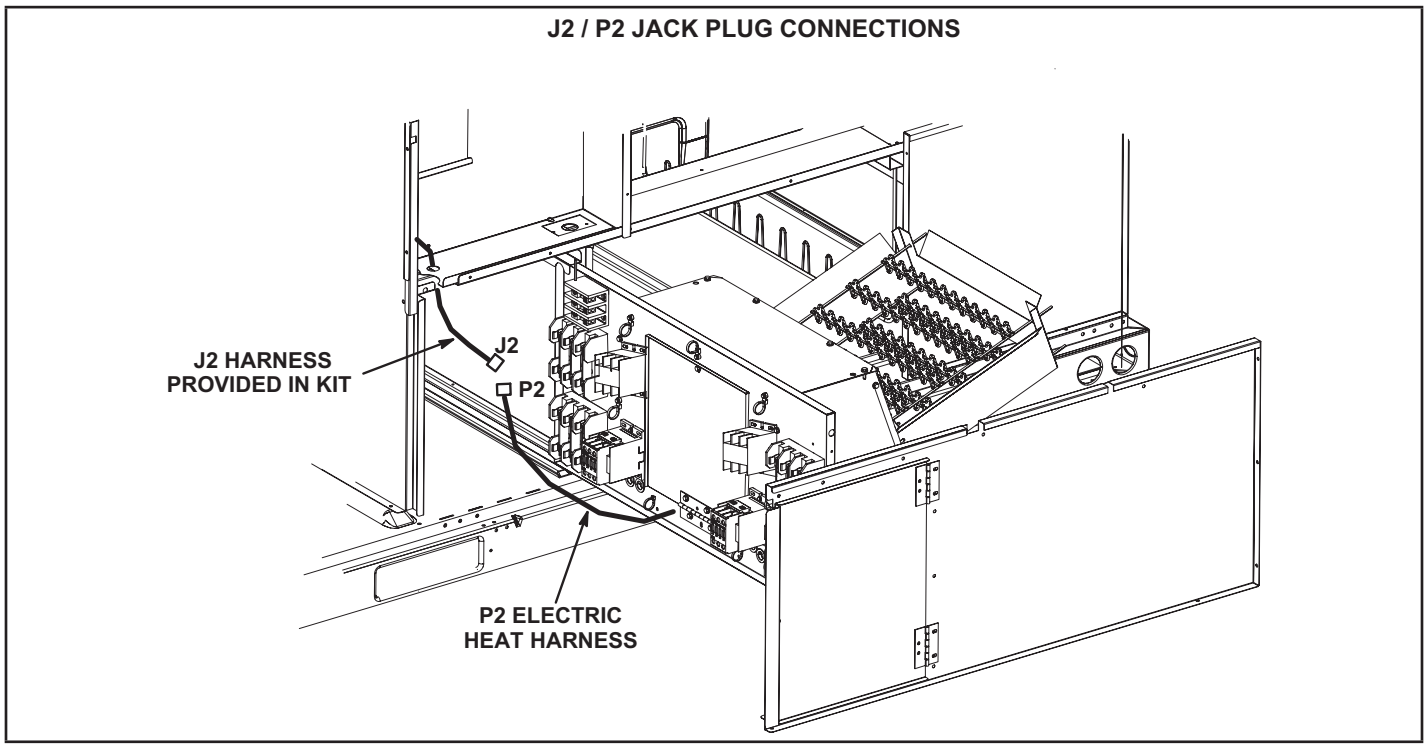


FIGURE 12

SINGLE DISCONNECT INSTALLATIONS

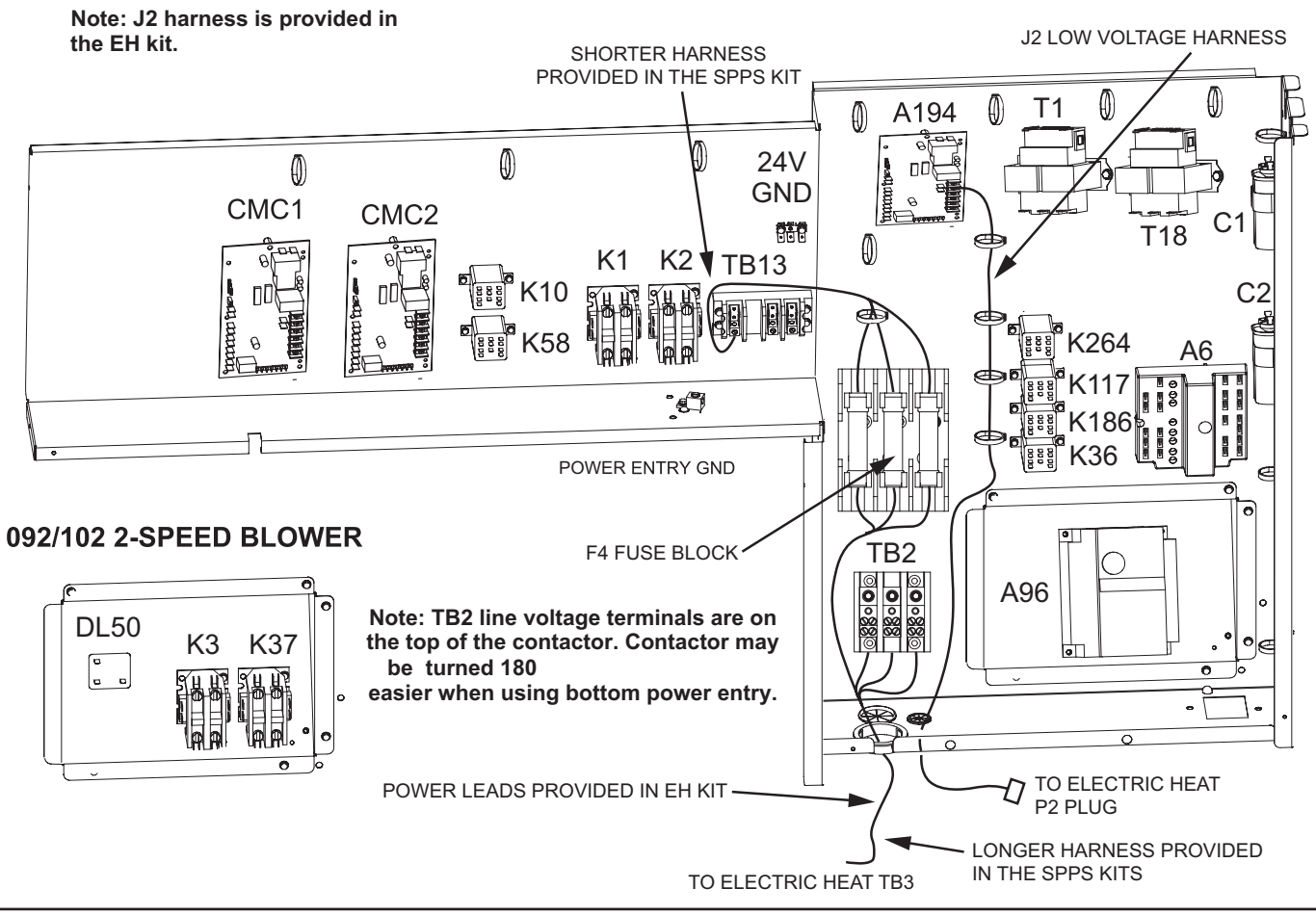


FIGURE 13

ELECTRIC HEAT VESTIBULE PARTS ARRANGEMENT

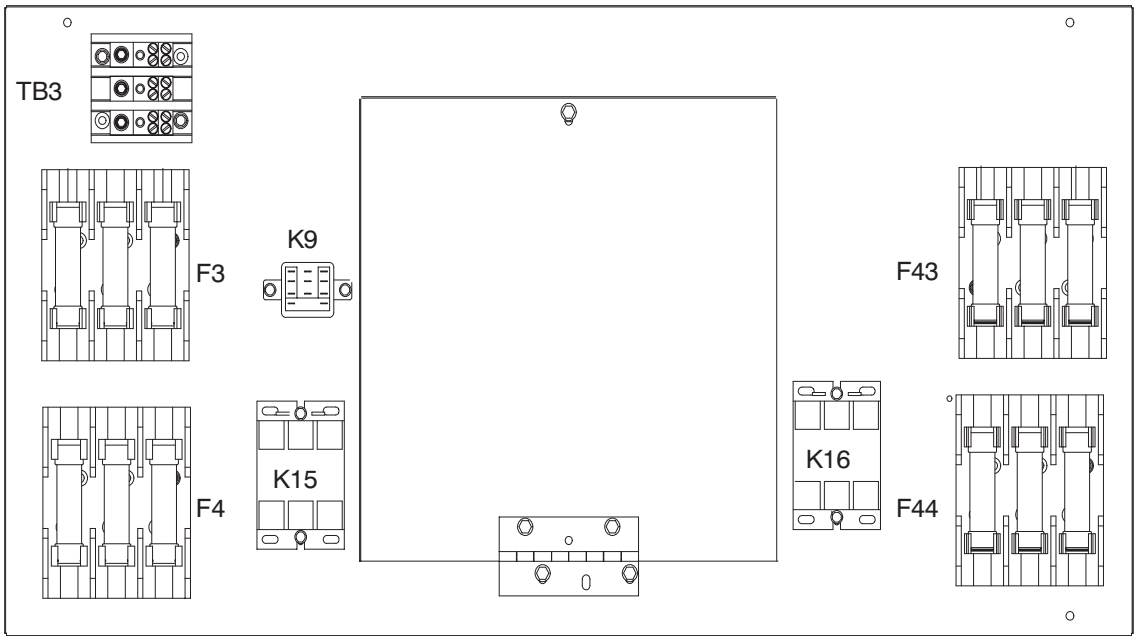


FIGURE 14

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

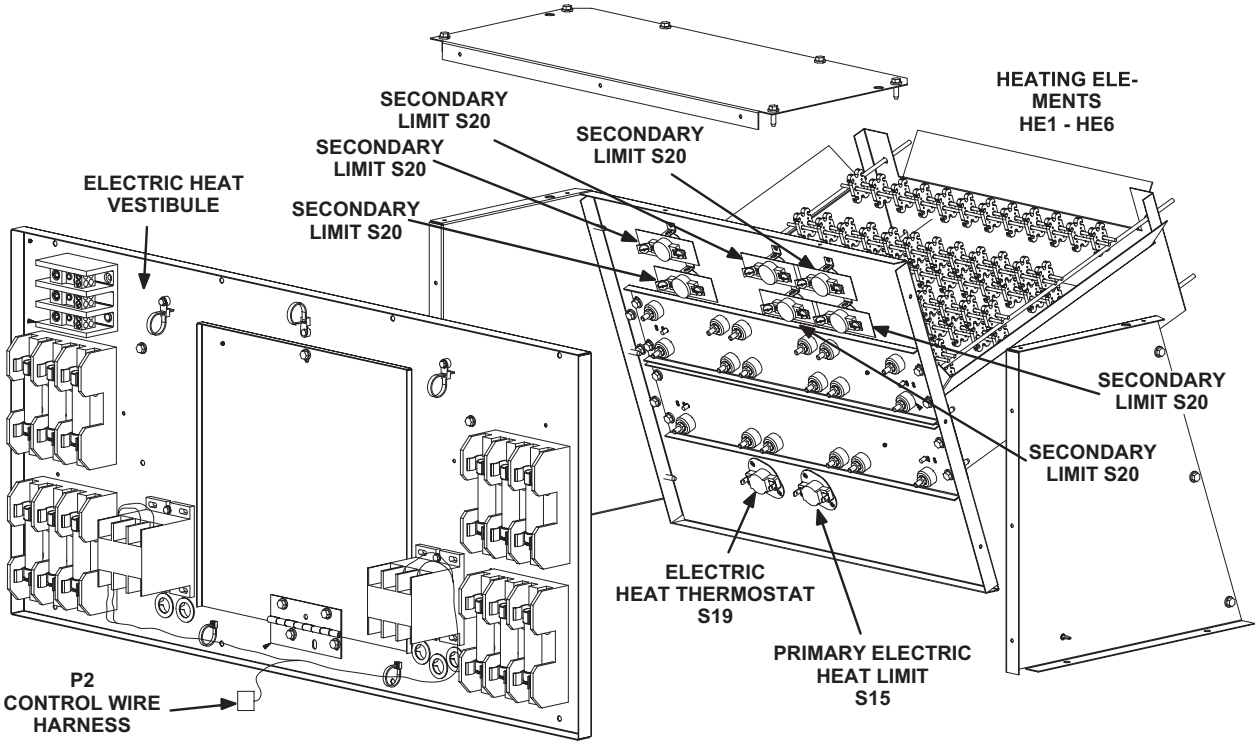


FIGURE 15

TABLE 9

ZCD/ZHD 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 16.

4 - Each refrigerant circuit is separately charged with R-454B 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.*

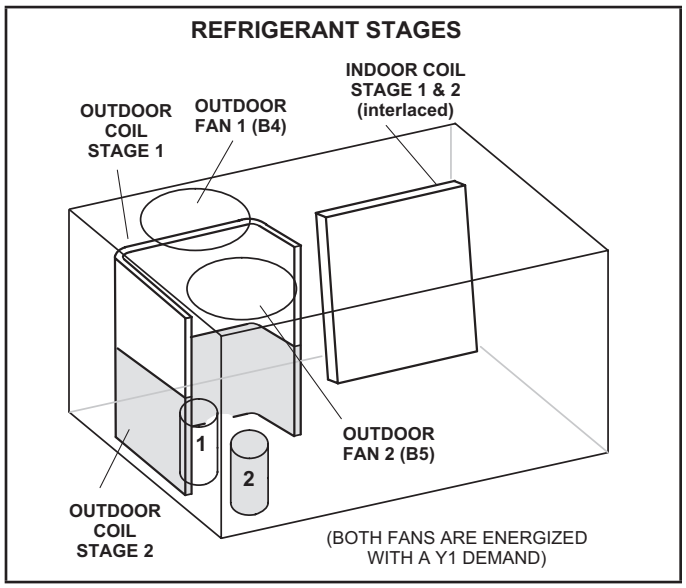


FIGURE 16

IV-CHARGING

A-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.

Refrigerant Charge R-454B				
	Circuit 1		Circuit 2	
Unit	M_c(lbs)	M_c(kg)	M_c(lbs)	M_c(kg)
ZHD092	14.30	6.49	14.60	6.62
ZHD102	13.20	5.99	14.60	6.62
ZHD120	12.10	5.49	13.20	5.99

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed and, since flammability is a consideration, the following procedure shall be adhered to:

- Safely remove refrigerant following local and national regulations,
- Evacuate the circuit,
- Purge the circuit with inert gas,
- Evacuate,
- Purge with inert gas,
- Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. Refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating unit is earthed prior to charging the system with refrigerant.
  - Label the system when charging is complete (if not already).
  - Extreme care shall be taken not to overfill the refrigerating unit.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

- When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, en-

sure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i. e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure- relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants includ-ing, when applicable, flammable refrigerants. In ad-dition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manu-facturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

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

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

IMPORTANT - Charge unit in standard cooling mode.

1 - Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed. operate the unit in cooling mode at high speed using the following mobile service app menu path:

RTU MENU > COMPONENT TEST > COOLING > COOLING STAGE 3

2 - Compare the normal operating pressures to the pressures obtained from the gauges. Check unit components if there are significant differences.

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

Note - *Pressures are listed for sea level applications.*

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

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

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

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

TABLE 10 581375-01
ZHD092 NORMAL OPERATION PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1			CIRCUIT 2		
	Dis-charge ±10 psig	Suc-tion ±5 psig	Appr. Temp +1°F	Dis charge ±10 psig	Suc-tion ±5 psig	Appr. Temp +1°F
65°F	229	122	6.9	233	123	6.8
75°F	271	127	6.9	271	126	6.8
85°F	315	130	6.9	309	127	6.8
95°F	361	132	6.9	354	129	6.8
105°F	410	135	6.9	403	131	6.8
115°F	460	139	6.9	458	133	6.8

TABLE 11 581376-01
ZHD102 NORMAL OPERATION PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1			CIRCUIT 2		
	Dis-charge ±10 psig	Suc-tion ±5 psig	Appr. Temp +1°F	Dis charge ±10 psig	Suc-tion ±5 psig	Appr. Temp +1°F
65°F	243	119	9.7	232	121	6.9
75°F	285	123	9.7	270	125	6.9
85°F	329	127	9.7	311	128	6.9
95°F	378	130	9.7	358	132	6.9
105°F	430	134	9.7	408	135	6.9
115°F	483	136	9.7	462	138	6.9

TABLE 12 581377-01
ZHD120 NORMAL OPERATION PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1			CIRCUIT 2		
	Dis-charge ±10 psig	Suc-tion ±5 psig	Appr. Temp +1°F	Dis charge ±10 psig	Suc-tion ±5 psig	Appr. Temp +1°F
65°F	237	118	11.6	247	114	13.1
75°F	273	122	11.6	284	117	13.1
85°F	316	126	11.6	328	120	13.1
95°F	361	128	11.6	372	121	13.1
105°F	413	130	11.6	424	124	13.1
115°F	467	132	11.6	480	128	13.1

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 13. 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 13 as a guide for typical operating pressures.

TABLE 13
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 10 - TABLE 12.*

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.

⚠ IMPORTANT

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

⚠ WARNING

Any service personnel installing, decommissioning, or performing maintenance on the unit must be properly trained with A2L refrigerants

Prior to beginning work on systems containing refrigerant to ensure the risk of ignition is minimized:

- All work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i. e. non-sparking, adequately sealed or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, the appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system

or conducting any hot work.

A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

- Where electrical components are being changed, service technicians shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations using flameable refrigerants as applicable:

1 - The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed.

2 - The ventilation machinery and outlets are operating adequately and are not obstructed.

3 - If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.

4 - Markings on the equipment should be visible and legible. Markings and signs that are illegible shall be corrected.

5 - Refrigerating pipes or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.For systems containing refigerant all repair and maintenance to electrical components shall include initial safety checks and component inspection procedures such as that capacitors are discharged in a safe manner to avoid possibility of sparking, that no live electrical components and wiring are exposed while charging, recovering, or purging the system, and that there is continuity of earth bonding. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used that is reported to the owner of the equipment, so all parties are advised.

NOTE - *Sealed electrical components shall be replaced, not repaired.*

NOTE - *Intrinsically safe components must be replaced, not repaired.*

- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

- When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

  a. Safely remove refrigerant following local and national regulations,

  b. Evacuate the circuit,

  c. Purge the circuit with inert gas,

  d. Evacuate,

  e. Purge with inert gas,

  f. Open the circuit.

- The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. Refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

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 17. Lift filter stop to remove filters. See FIGURE 18.

⚠ 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 18.

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

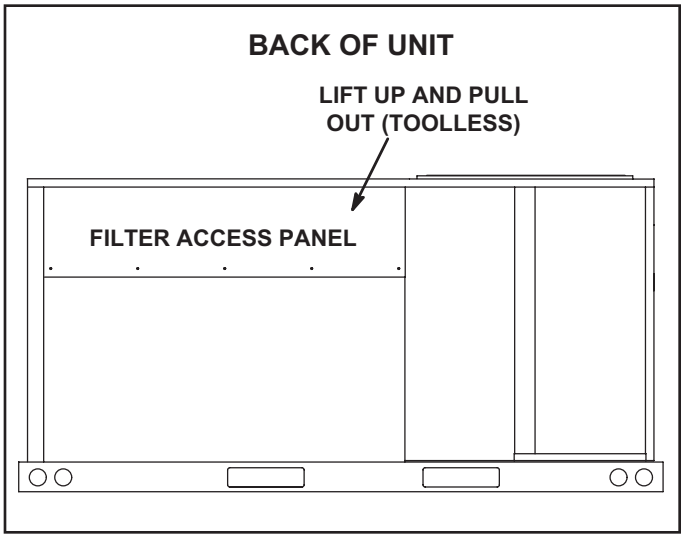


FIGURE 17

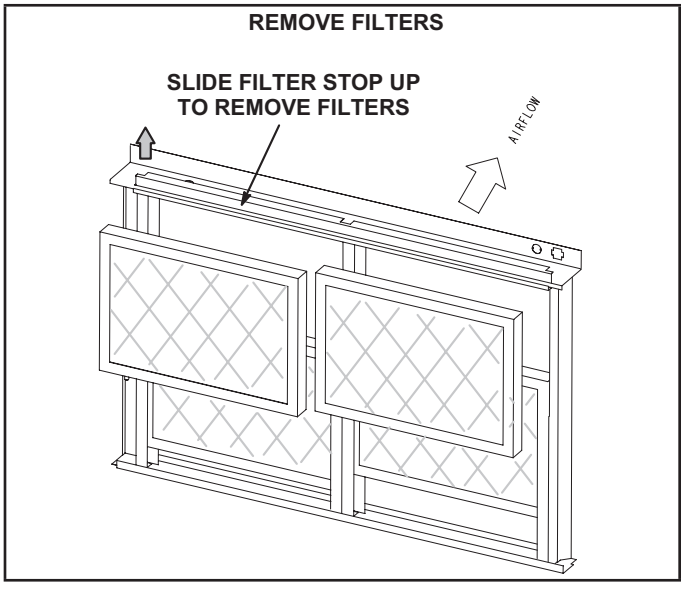


FIGURE 18

B-Compressor

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.

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 ZHD 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 ZHD 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 19. Refer to the roof mounting frame installation instructions for details of proper assembly and mounting.

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

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 ZHD units. Refer to manufacturer's instructions included with transition for detailed installation procedures.

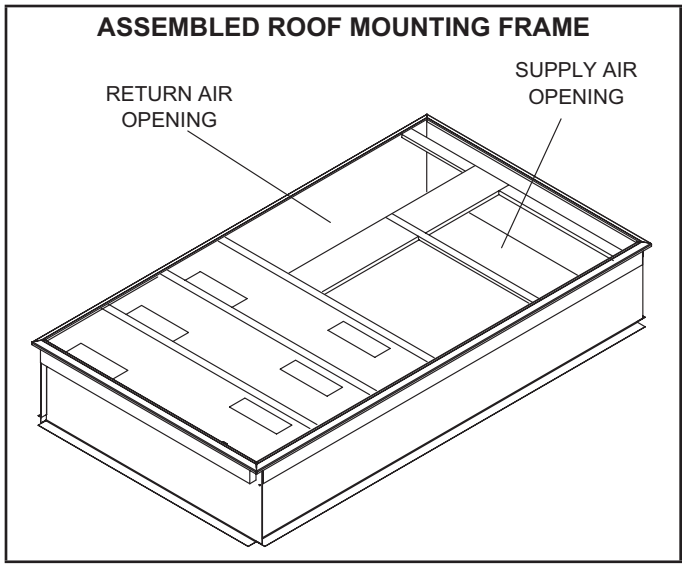


FIGURE 19

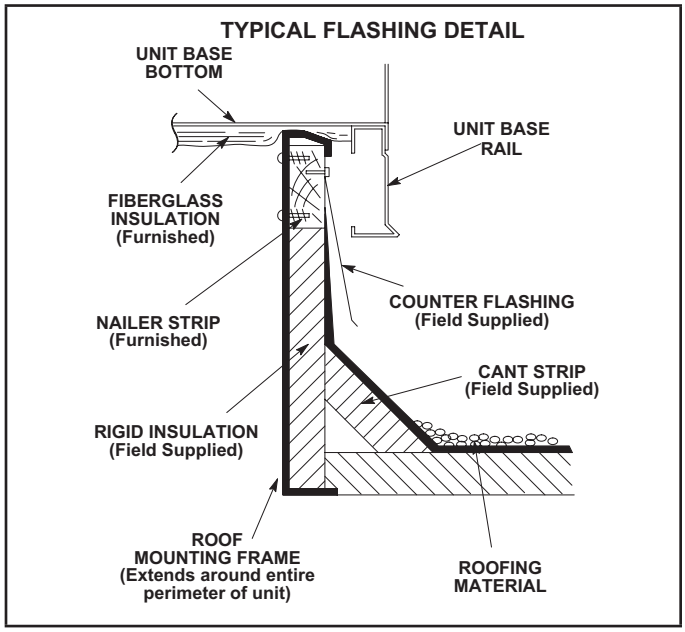


FIGURE 20

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 21.

The mixed air temperature sensor (R1) measures the supply air sensible temperature. See FIGURE 22. The outdoor air sensible control is the default economizer control. An outdoor air single sensible sensor, S175, is also provided. See TABLE 14 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 14

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

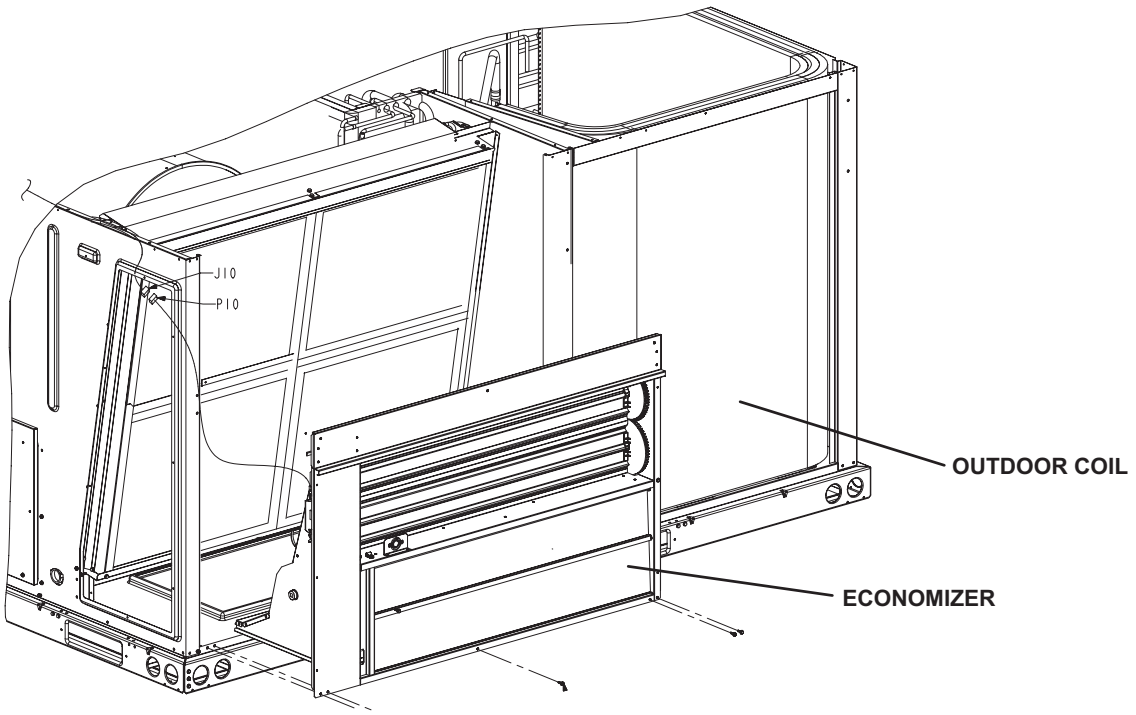


FIGURE 21

MIXED AIR SENSOR (R1) LOCATION

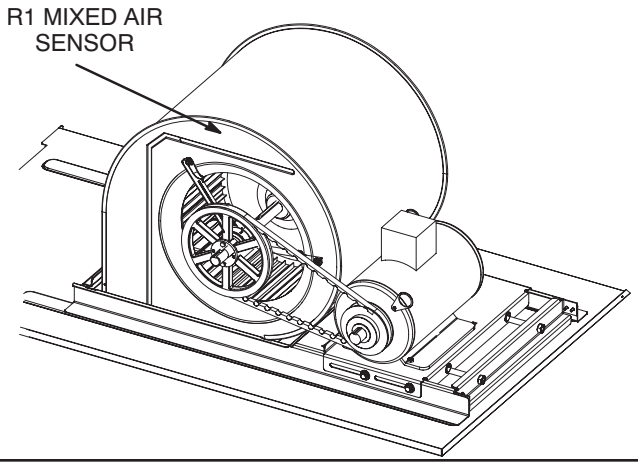


FIGURE 22

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 23.

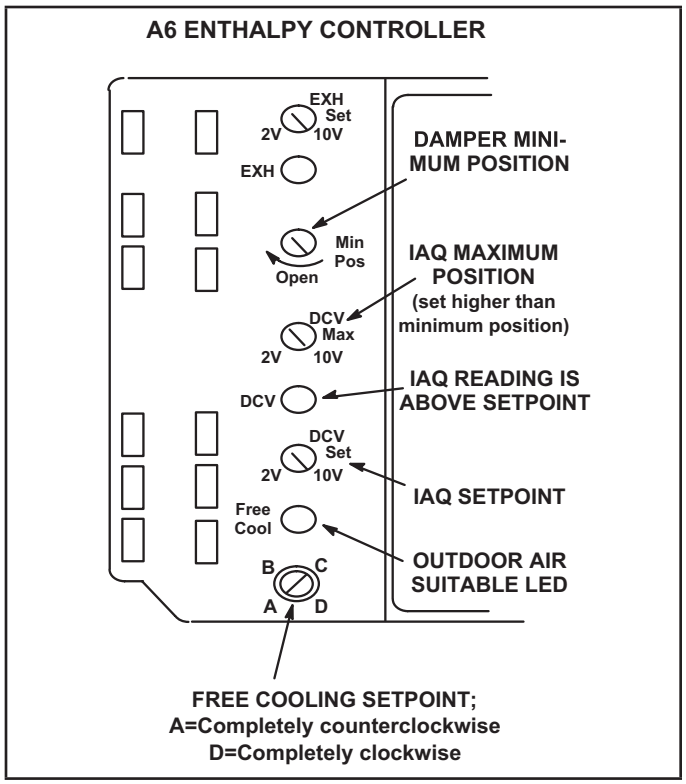


FIGURE 23

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in TABLE 15. Setting A is recommended. See FIGURE 23. 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 15

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 the A194 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 the A194 board 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).

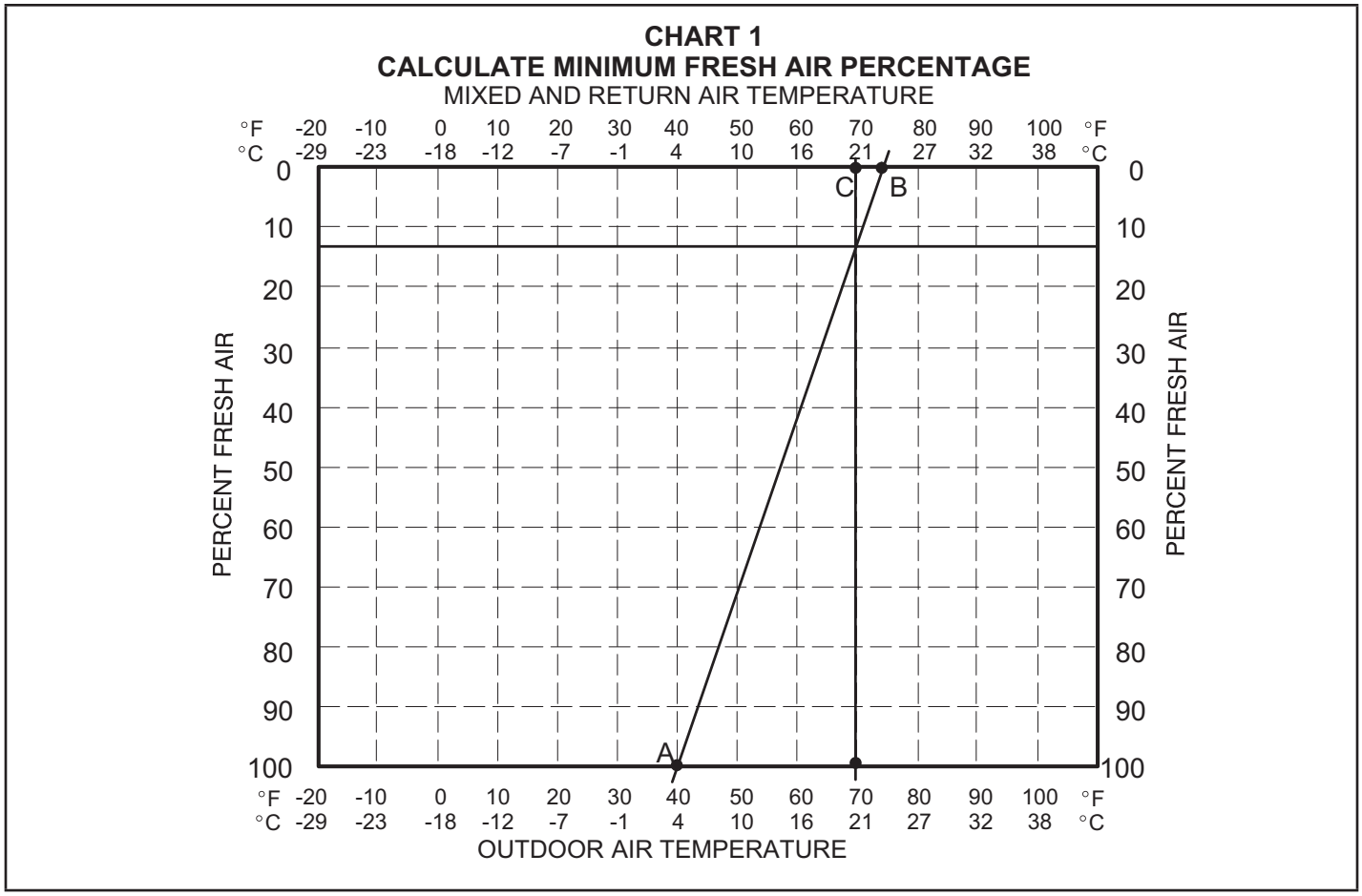
5 - Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point "C" (70^0F, 21^0C shown).

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 23.

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 23.

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 16 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 16

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

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 25.

2 - Route the control wires to the refrigerant detection board (A194) and connect these wires to the A194 board as following (see FIGURE 25):

- Connect all female terminals to the A194 board - 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 the A194 board, 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 21.

5 - Connect any optional sensors as shown in FIGURE 24.

6 - If optional power exhaust is used, wire according to instructions provided with power exhaust. See FIGURE 24.

7 - Apply wiring diagram to the control panel.

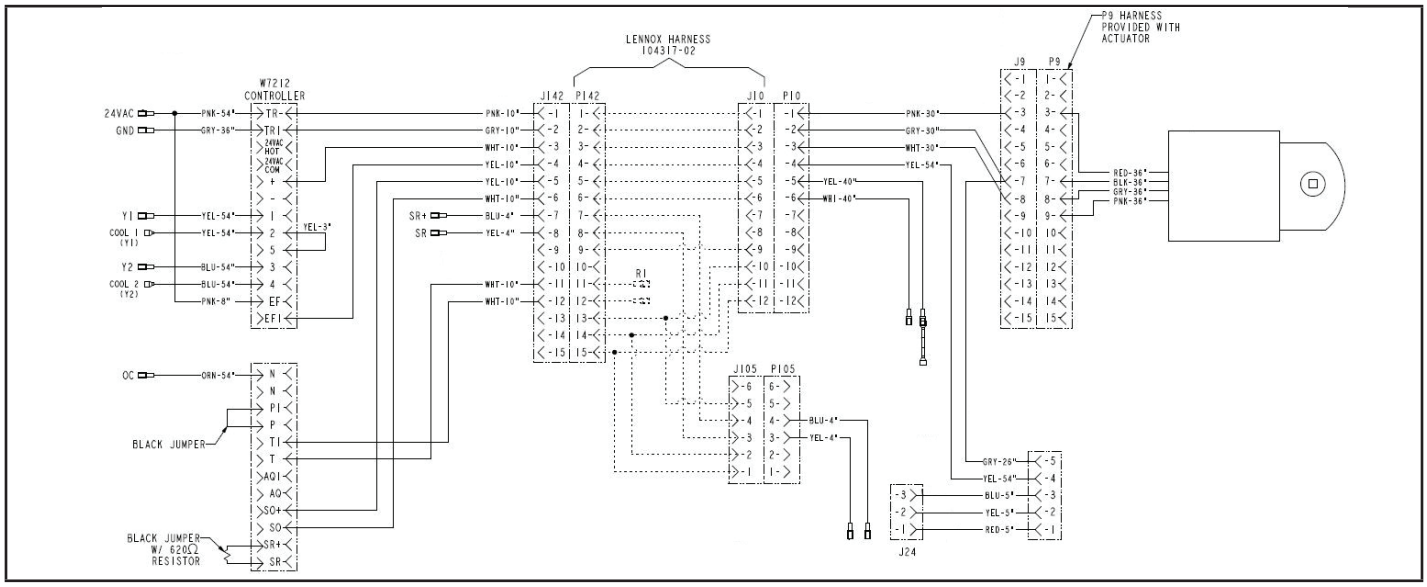


FIGURE 24

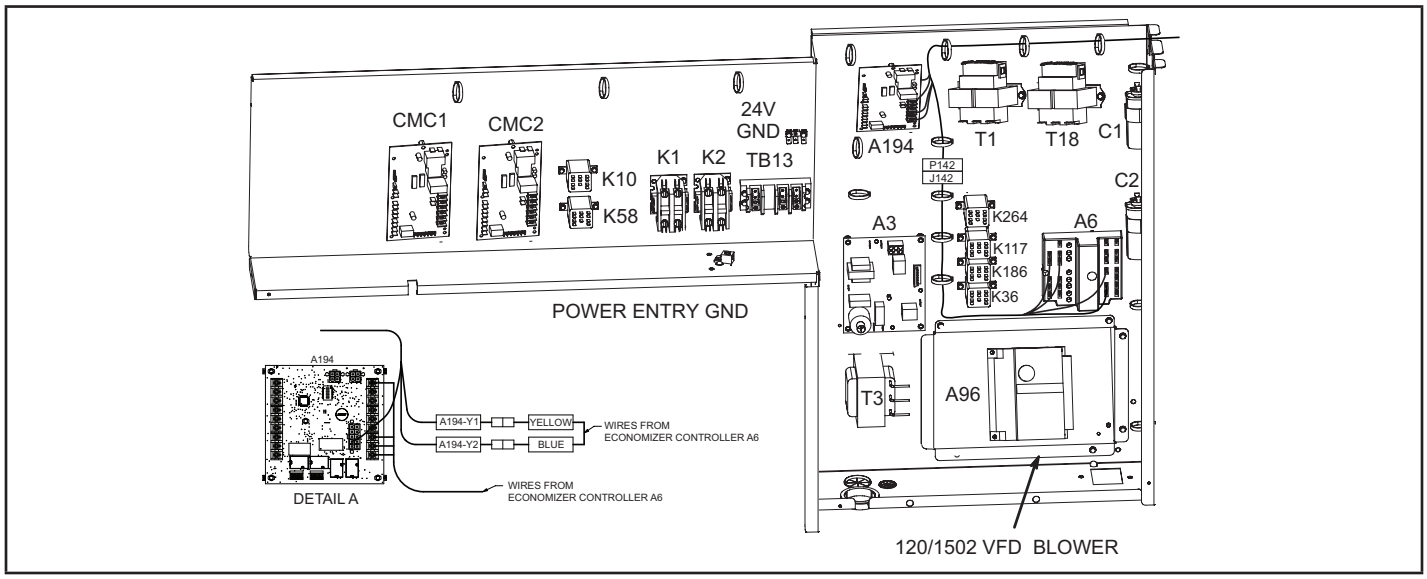


FIGURE 25

High Performance Economizer

USER INTERFACE

See FIGURE 26.

1 - One-line LCD. After a period of inactivity, the controller displays the default HMI screen (free cooling status: “1FREECOOL YES” or “1FREECOOL NO”).

2 - Operation button (Up button) - Move to the previous value, step or category.

3 - Operation button (Down button)- Move to the next value, step or category.

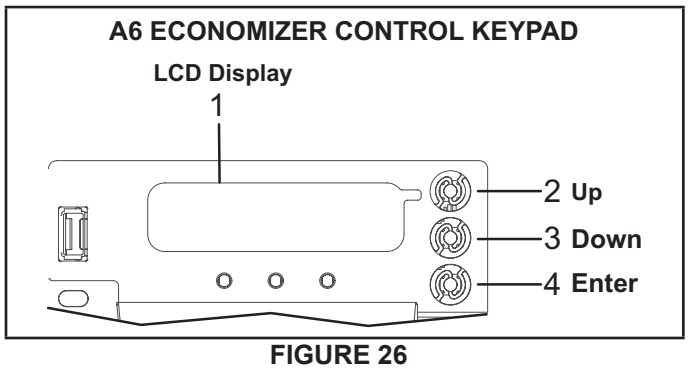


FIGURE 26

Operation button (Enter button):

- Press to edit the current value or option.
- Press to confirm a newly selected value or option.
- Press Enter + Up to jump up one entire category.
- Press Enter + Down to jump down one entire category.

MENU STRUCTURE

See FIGURE 27.

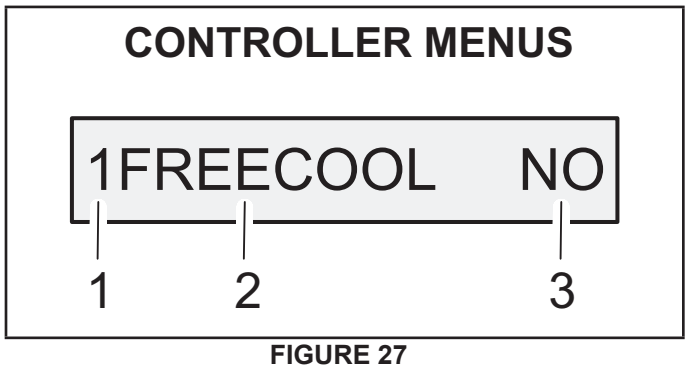


FIGURE 27

1 - Menus are displayed in the Economizer Controller as per categories. There are eight first-level menus. Each menu is represented by a number at the beginning of the line on the LCD. Press Enter + Up or Down to toggle between different first-level menus.

- 1: Status Display
- 2: Basic Settings
- 3: Advanced Settings
- 4: Alarms
- 5: Enter Configuration State and Reset
- 6: I/O Config.
- 7: Testing
- 8: Enter Running State

2 - Sub-menus follow the numbered first-level menus closely. Pressing Up or Down can toggle between different sub-menus.

3 - At the end of the line, the LCD displays the value of the current sub-menu (if any). Enter the Edit mode by pressing Enter (if the value is editable). Press Up or Down to change the highlighted value. Press Enter to confirm the change and exit the Edit mode. For a complete list of parameters refer to the Siemens installation manual provided in this kit.

FREE COOLING SETPOINT

Single OA Sensible Sensing (Default)

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

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

- The climate zone where the unit is installed. See TABLE 17.
- The setpoint requirement published by the California Energy Commission. See Section 140.4 - Prescriptive Requirements for Space Conditioning Systems of the 2013 Building Energy Efficiency Standards.

NOTE - *Values in the referenced standard will supersede values listed in TABLE 17.*

TABLE 17

FREE COOLING SETPOINT - SINGLE SENSIBLE

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

To adjust the setpoint, navigate to the “BASIC SETTINGS” menu and change the “2TEMP OFF” parameter accordingly.

Single OA Enthalpy Sensing (Optional) -

To adjust the enthalpy setpoint, navigate to the “BASIC SETTINGS” menu and change the “2ENTH OFF” parameter accordingly.

Differential Sensing (Optional) -

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

SETUP AND CONFIGURATION - FACTORY-INSTALLED ECONOMIZER

Program the following parameters into the controller. Navigate to the specific menus to make the changes required.

1INS	(MM/DD/YY) enter installation date
2FAN L ACT	( ) adjust VDC value until desired fresh air set point is reached when fan runs at low speed (**Appears only if unit is configured as 2SPEED*)
2FAN H ACT	( ) adjust VCD value until desired fresh air set point is reached

SETUP AND CONFIGURATION - FIELD-INSTALLED ECONOMIZER

Program the following parameters into the controller. Navigate to the specific menus to make the changes required.

IMPORTANT - Before setup and configuration, it is recommended to obtain some location-based values such as shutoff points or utilize the location services in the Climatix mobile application.

Menus are displayed in the Economizer Controller as per categories. There are eight first-level menus. Each of them is represented by a number at the beginning of the line on the LCD. Press Enter + Up or Down to toggle between different first-level menus.

Navigate to the applicable menus and set the following parameters based on the unit configuration:

1INS	(MM/DD/YY) enter installation date
2FAN L ACT	( ) adjust VDC value until desired fresh air set point is reached when fan runs at low speed (**Appears only if unit is configured as 2SPEED*)
2FAN H ACT	( ) adjust VCD value until desired fresh air set point is reached
3DIF T LOC	(LAT)
3STG3 DLY	(120)
6Y2O	(NONE) For single-stage units (COOL 2) For 2-stage units
6FAN	(1 SPEED) For CAV units (2 SPEED) For MSAV units

ALARM MONITORING

The controller is equipped with a 24V output signal that can be configured for remote alarm monitoring. Field-wire to provided blue wire marked “Aux2-O” near the controller for remote alarm monitoring.

NOTE - *Newer units are factory-wired to facilitate feedback wiring connections when a BACnetTM option is installed. Newer units can be identified by a P372 plug located near the A194 board in the control box. One white and one gray wire are connected to P372. On older units, call 1-800-453-6669 for wiring assistance.*

DEMAND CONTROL VENTILATION (DCV)

When a 010VDC CO2 sensor is wired to the POL224.00 economizer control A6 (leads provided), the 2DCV, 2VENTMAX L, 2VENTMAX H, 2 VENTMIN L and 2VENTMIN H parameters will appear under “BASIC SETTINGS“ menu. Navigate to the “BASIC SETTINGS“ menu to adjust setpoints as desired. Refer to the Siemens manual provided for more details.

For proper operation, the IAQ sensor must provide a 0-10VDC signal. Connect sensor leads to the provided white wire marked “AUX-AI” located near the A6 economizer control located in the filter section.

CO2 Sensor Used With High Performance Economizers-

When using any 0-10VDC sensor, set the ppm range using the POL224.00 economizer control A6 menu. Set the 6CO2 Rng L to 400 ppm and the 6CO2 Rng H to 1600 ppm.

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 29. 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 28. 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.

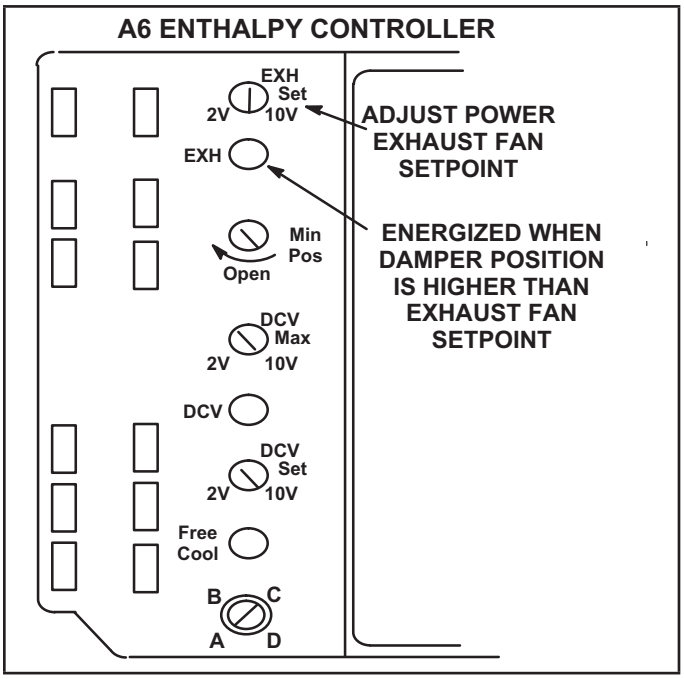


FIGURE 28

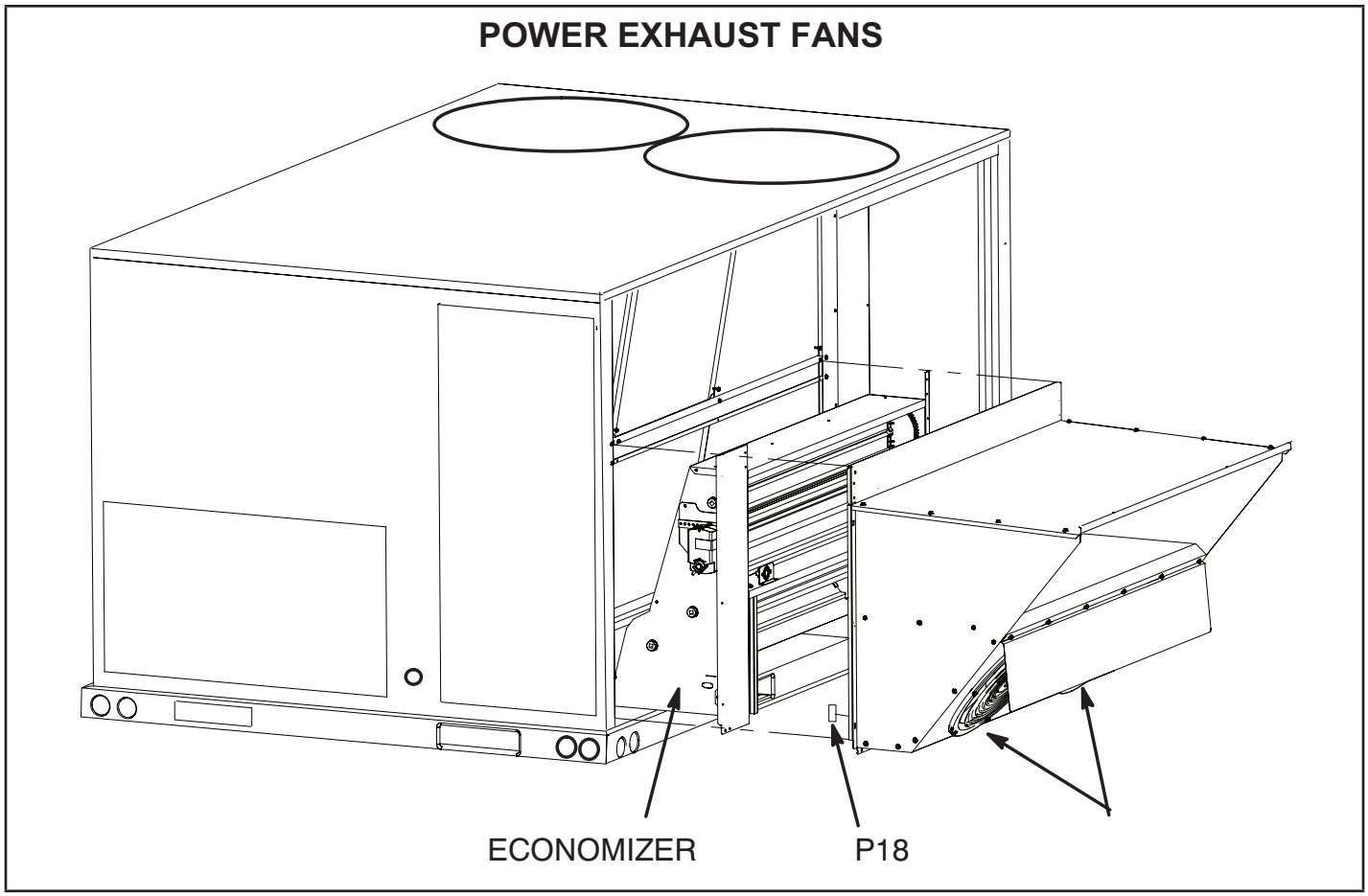
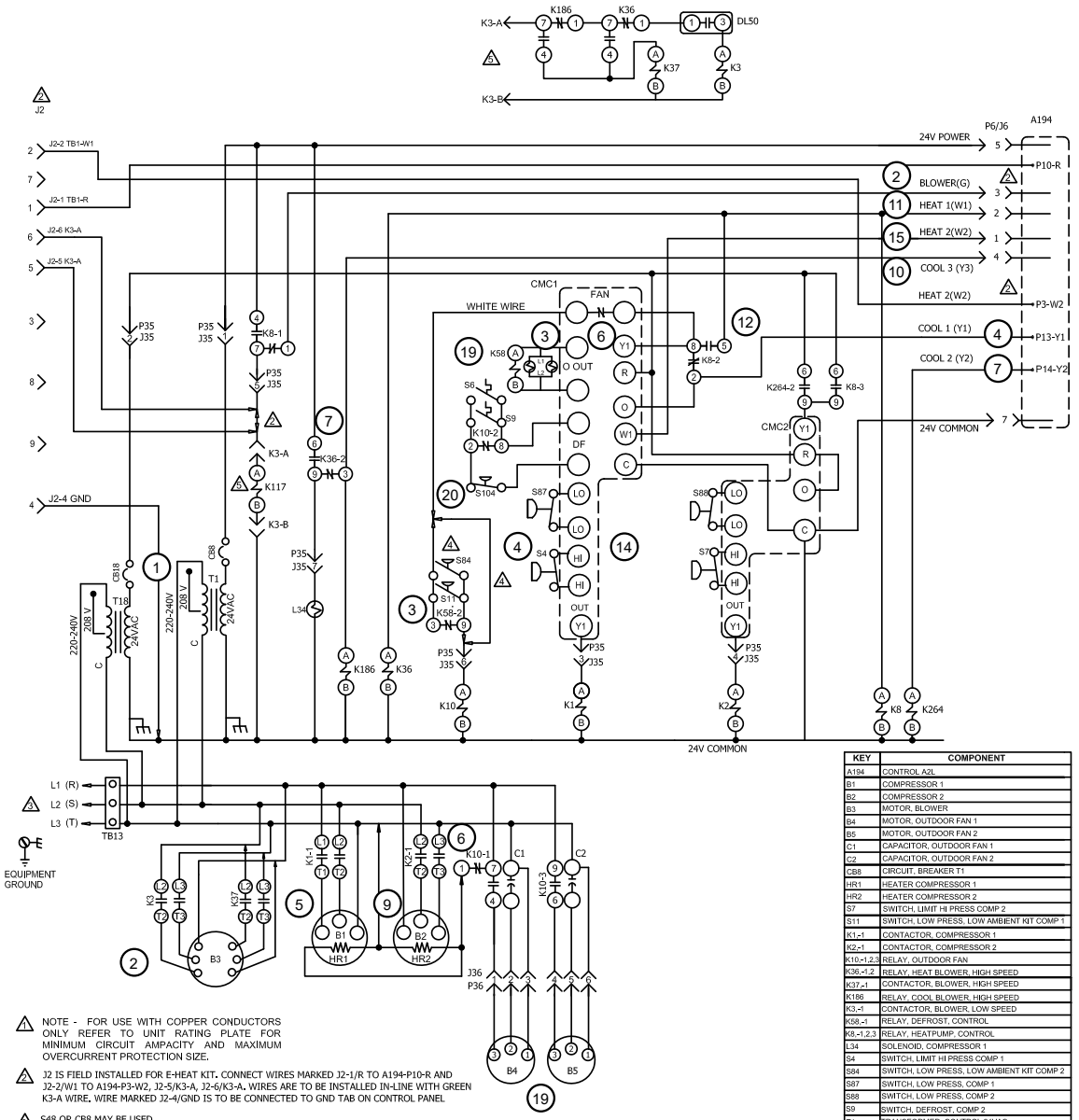


FIGURE 29

ZHD 092 & 102 UNIT DIAGRAM



KEY	COMPONENT
A194	CONTROL A2L
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CB8	CIRCUIT, BREAKER T1
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
S7	SWITCH, LIMIT HI PRESS COMP 2
S11	SWITCH, LOW PRESS. LOW AMBIENT KIT COMP 1
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K10-1,2,3	RELAY, OUTDOOR FAN
K36,-1,2	RELAY, HEAT BLOWER, HIGH SPEED
K37,-1	CONTACTOR, BLOWER, HIGH SPEED
K186	RELAY, COOL BLOWER, HIGH SPEED
K3,-1	CONTACTOR, BLOWER, LOW SPEED
K58,-1	RELAY, DEFROST, CONTROL
K8,-1,2,3	RELAY, HEATPUMP, CONTROL
L34	SOLENOID, COMPRESSOR 1
S4	SWITCH, LIMIT HI PRESS COMP 1
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S87	SWITCH, LOW PRESS, COMP 1
S88	SWITCH, LOW PRESS, COMP 2
S9	SWITCH, DEFROST, COMP 2
T1	TRANSFORMER, CONTROL 24VAC
TB13	TERMINAL STRIP, POWER DISTRIBUTION
CMC1	DEFROST CONTROL COMP1,2 & C.MONITOR COMP1
CMC2	COMPRESSOR MONITORY CONTROL COMP 2
T18	TRANSFORMER - CMC1 & CMC2, L1, L2 24VAC
CB18	SWITCH, BREAKER T18
DL50	TIMER, ON-DELAY, BLOWER CONTROL
S6	SWITCH, DEFROST, COMP 1
S104	SWITCH, DEFROST TERMINATION, COMP 2
K264-2	RELAY, COOL, COMP 2

J/P	JACK/PLUG DESCRIPTION
J2	JACK, HEAT
P35/J35	UNIT TEST
P36/J36	OD FAN POWER EXTENSION
P6	A2L UNIT CONTROL

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. J2 IS FIELD INSTALLED FOR E-HEAT KIT. CONNECT WIRES MARKED J2-1/R TO A194-P10-R AND J2-2/W1 TO A194-P3-W2, J2-5/K3-A, J2-6/K3-A. WIRES ARE TO BE INSTALLED IN-LINE WITH GREEN K3-A WIRE. WIRE MARKED J2-4/GND IS TO BE CONNECTED TO GND TAB ON CONTROL PANEL
3. S48 OR CB8 MAY BE USED
4. S11/S48 USED IN LOW-AMBIENT KIT. CMC1-FAN / K58-3-9/S11 HARNESS AND S11/S11-S84 ARE INCLUDED IN LOW-AMBIENT KIT. CONNECT HARNESS BETWEEN CMC1-FAN/P35-6 WIRE AND S11/S84
5. 2-SPEED BLOWER CONTROL

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

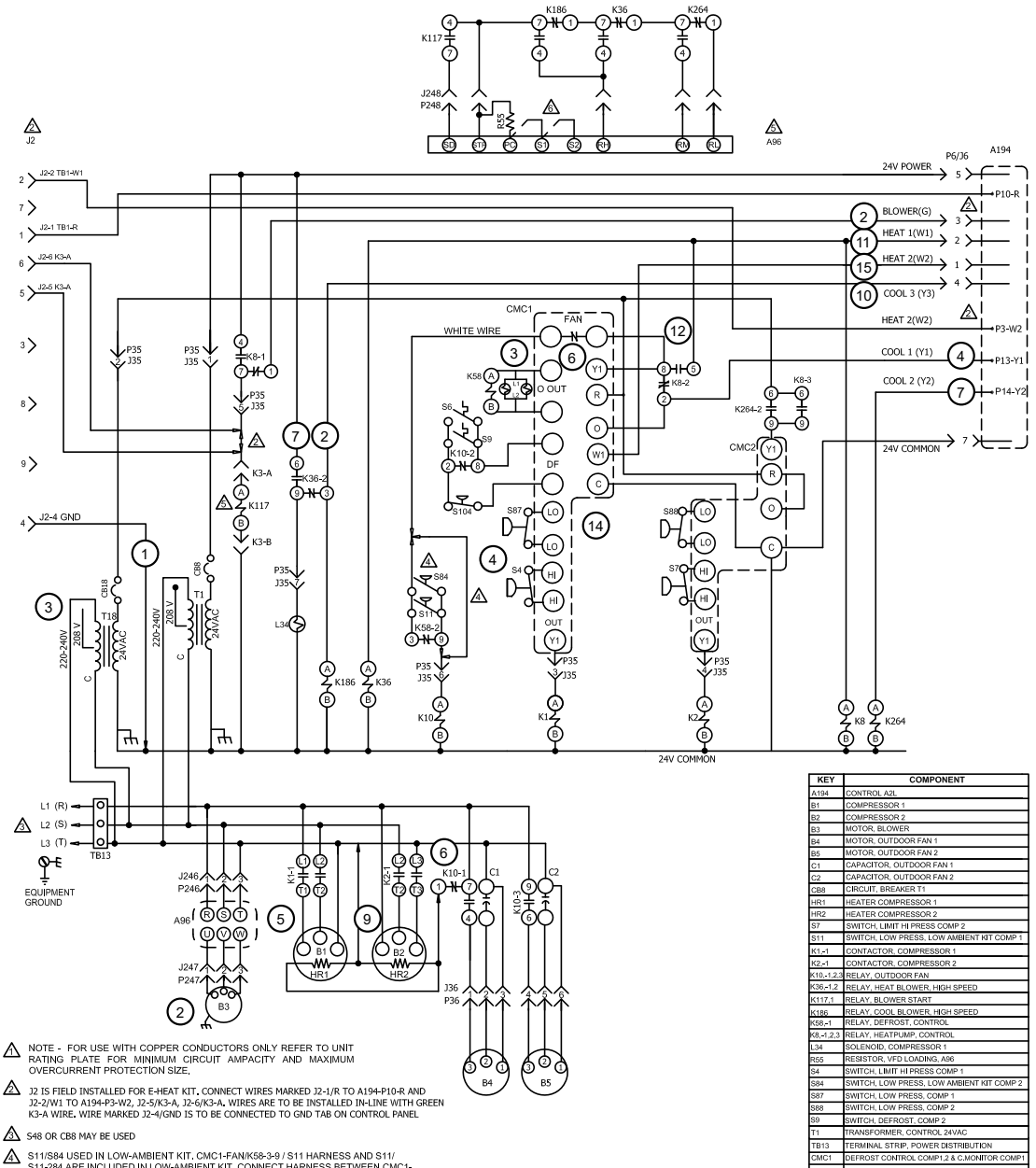
WARNING - ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

DISCONNECT ALL POWER BEFORE SERVICING.

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

2025/04	WIRING DIAGRAM 538552-01	04/25
	HEATPUMP-MSAV-2 - SPEED	
	ZHD-092,102	
	SECTION B	REV 1
Supersedes	New Form No. 538552-01	

ZHD 120 UNIT DIAGRAM



KEY	COMPONENT
A194	CONTROL A2L
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CB8	CIRCUIT, BREAKER T1
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
S7	SWITCH, LIMIT HI PRESS COMP 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 1
K1-1	CONTACTOR, COMPRESSOR 1
K2-1	CONTACTOR, COMPRESSOR 2
K10,-1,2,3	RELAY, OUTDOOR FAN
K36-1,2	RELAY, HEAT BLOWER, HIGH SPEED
K117,1	RELAY, BLOWER START
K186	RELAY, COOL BLOWER, HIGH SPEED
K58,-1	RELAY, DEFROST, CONTROL
K8,-1,2,3	RELAY, HEATPUMP, CONTROL
L34	SOLENOID, COMPRESSOR 1
R55	RESISTOR, VFD LOADING, A96
S4	SWITCH, LIMIT HI PRESS COMP 1
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT COMP 2
S87	SWITCH, LOW PRESS, COMP 1
S88	SWITCH, LOW PRESS, COMP 2
S9	SWITCH, DEFROST, COMP 2
T1	TRANSFORMER, CONTROL 24VAC
TB13	TERMINAL STRIP, POWER DISTRIBUTION
CMC1	DEFROST CONTROL COMP1,2 & C.MONITOR COMP1
CMC2	COMPRESSOR MONITORY CONTROL COMP 2
T18	TRANSFORMER - CMC1 & CMC2, L1, L2 24VAC
CB18	SWITCH, BREAKER T18
S6	SWITCH, DEFROST, COMP 1
S104	SWITCH, DEFROST TERMINATION, COMP 2
K264-2	RELAY, COOL, COMP 2

J/P	JACK/PLUG DESCRIPTION
J2	JACK, HEAT
P35/J35	UNIT TEST
P36/J36	OD FAN POWER EXTENSION
P6/J6	A2L UNIT CONTROL

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. J2 IS FIELD INSTALLED FOR E-HEAT KIT. CONNECT WIRES MARKED J2-1/R TO A194-P10-R AND J2-2/W1 TO A194-P3-W2, J2-5/K3-A, J2-6/K3-A. WIRES ARE TO BE INSTALLED IN-LINE WITH GREEN K3-A WIRE. WIRE MARKED J2-4/GND IS TO BE CONNECTED TO GND TAB ON CONTROL PANEL
3. S48 OR CB8 MAY BE USED
4. S11/S84 USED IN LOW-AMBIENT KIT. CMC1-FAN/K58-3-9 / S11 HARNESS AND S11/S11-284 ARE INCLUDED IN LOW-AMBIENT KIT. CONNECT HARNESS BETWEEN CMC1-FAN/P35-6 WIRE AND S11/S84
5. MITSUBISHI VFD A96
6. RESTORE JUMPER WIRING IF PREVIOUSLY USED

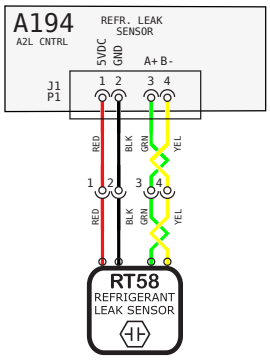
NOTE - IF ANY WIRE IN THIS APPLIANCE IS REPLACED IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, TERMINATION AND INSULATION THICKNESS

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.

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

2025/04	WIRING DIAGRAM 538557-01	04/25
HEATPUMP-MSAV-VFD		
ZHD-120		
SECTION B		REV 1
Supersedes	New Form No. 538557-01	



KEY LIST	
COMPONENT	**DESCRIPTION**
A194	CONTROL, REFR. LEAK DETECTION
RT58	SENSOR, REFR. LEAK DETECTION

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

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

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

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

MODEL: ZC/ZG/ZH
A2L SENSOR DIAGRAM
VOLT: All
SUPSDS: N/A NO: 538618-01

Rev 0

3 x 7
CUT SIZE

REV	EC NO.	DATE	BY	APVD	REVISION NOTE
---	CN-012849P	04-23-2025	ZN	STT	ORIGINATED AT PD&R CARROLLTON, TX

ZHD Sequence of Operation

Power:

1 - Line voltage from unit disconnect energizes transformer T1 and T18. T1 provides 24VAC power to terminal strip TB1 on the A194 board. TB1 on the A194 board 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:

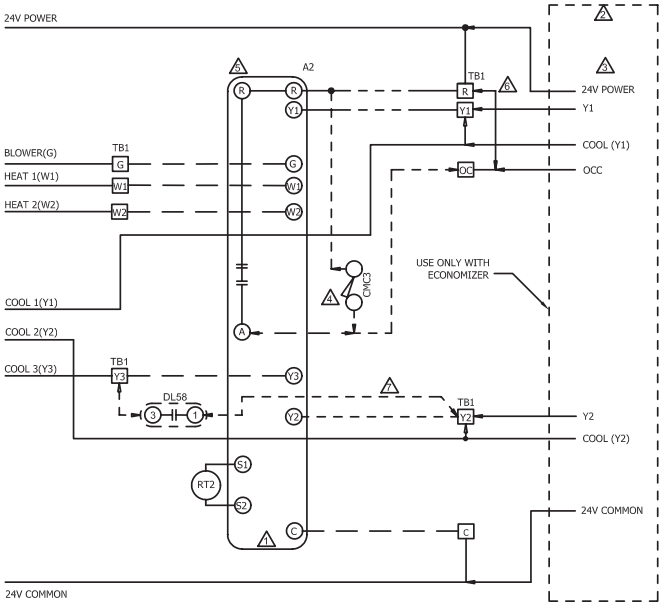
5 - K186 relay is energized and K186 N.O. contacts close.

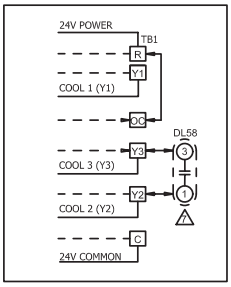
6 - The blower demand closes K117 N.O. contacts. 24VDC is routed through K117 and K186 closed contacts to A96 inverter terminal RH. Blower operates in high speed.

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	

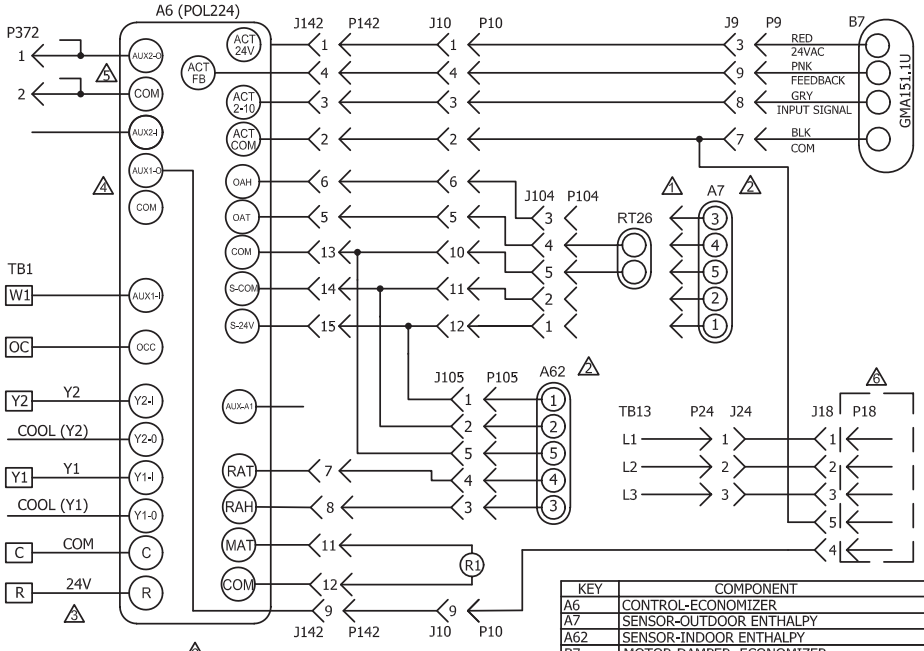
POWER:

1- Terminal strip TB1 on the A194 board energizes thermostat components with 24VAC.

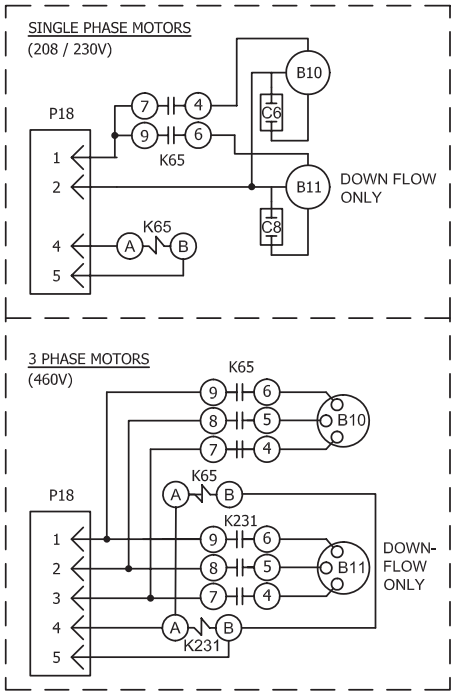
OPERATION:

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



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

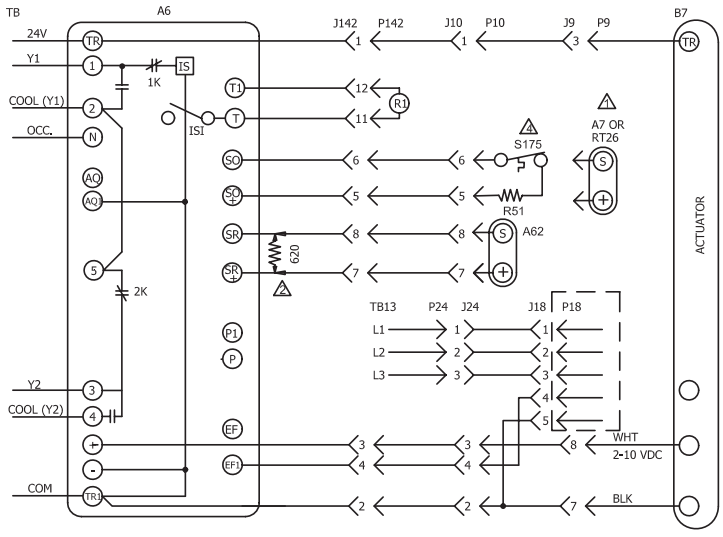
6 POWER EXHAUST OPTION

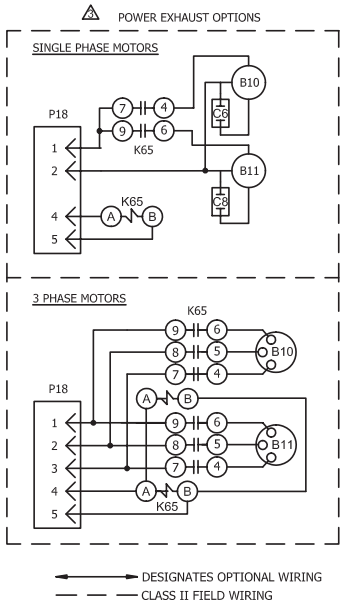
DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

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 on A194 board energizes the economizer components with 24VAC.

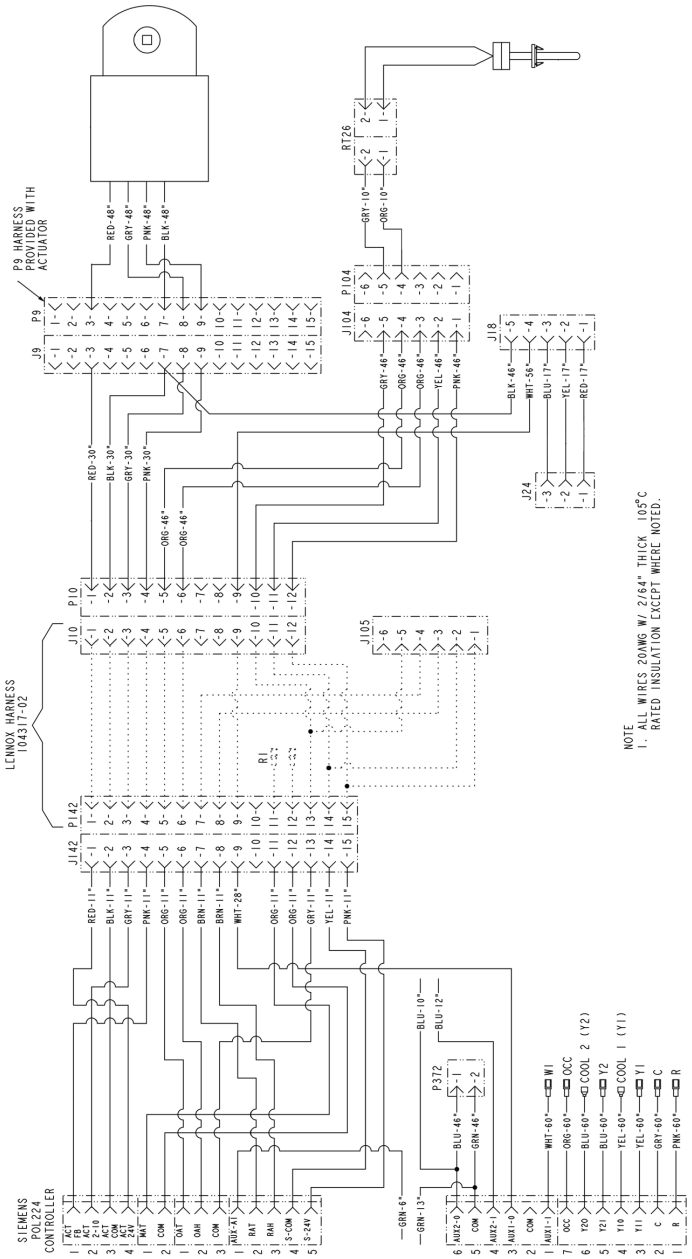
OPERATION:

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



SEQUENCE OF OPERATION

POWER:

1- Terminal strip TB1 on A194 board energizes the economizer components with 24VAC.

OPERATION:

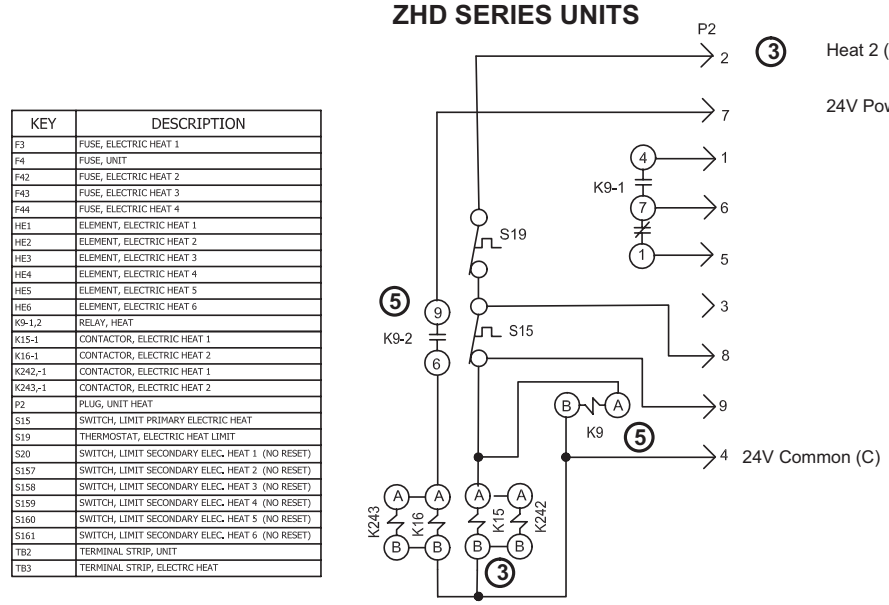
2- Enthalpy sensor A7 and A62 (if differential enthalpy is used) communicates to the economizer control module A6 when to power the damper motor B7.

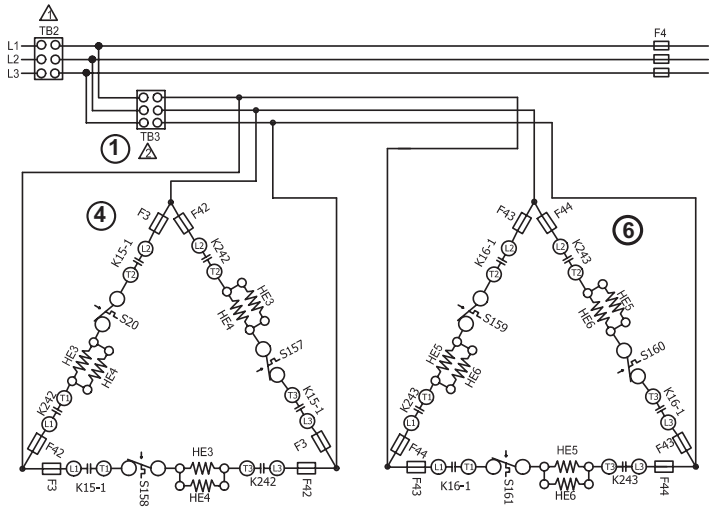
3- Economizer control module A6 supplies B7 with 0 - 10 VDC to control the positioning of economizer.

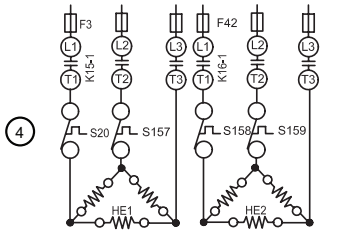
4- The damper actuator provides 2 to 10 VDC position feedback.

EHA-7.5, 15, 22.5, 30, 45 & 60kW Y VOLTAGE
ZHD 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







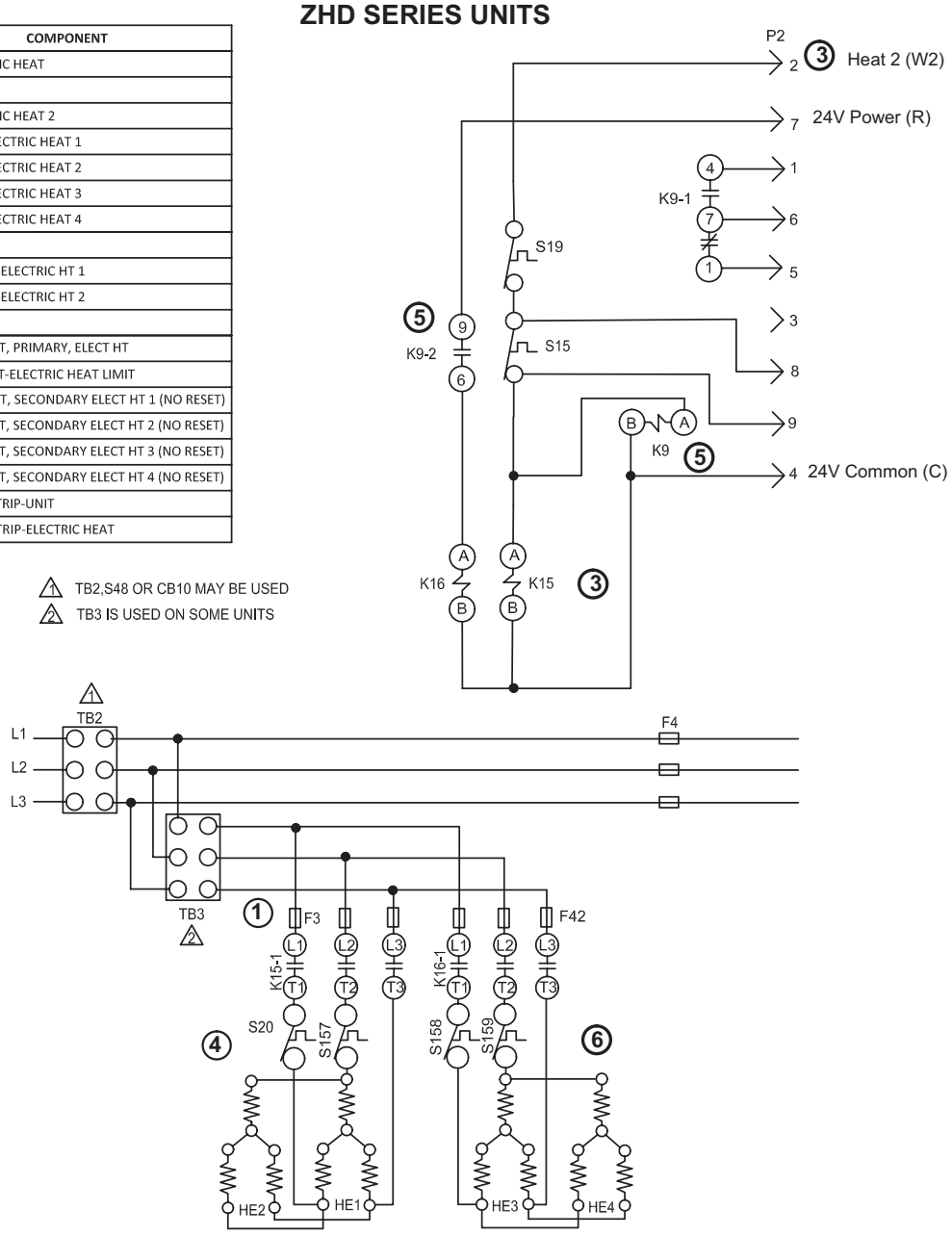
⚠1 TB2,S48 OR CB10 MAY BE USED
⚠2 TB3 IS USED ON SOME UNITS

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
ZHD 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

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 A194 board 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 A194 board and P2-7.

7 - Electric heat contactor K16 is energized.

8 - 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.

IX-Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely.

Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before starting decommissioning.

a) Become familiar with the equipment and its operation.

b) Isolate system electrically.

c) Before attempting the procedure, ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders;
- all personal protective equipment is available and being used correctly;
- the recovery process is supervised at all times by a competent person;
- recovery equipment and cylinders conform to the appropriate standards.

d) Pump down refrigerant system, if possible.

e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

f) Make sure that cylinder is situated on the scales before recovery takes place.

g) Start the recovery machine and operate in accordance with instructions.

h) Do not overfill cylinders (no more than 80% volume liquid charge).

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

k) Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

⚠ IMPORTANT

Equipment shall be labelled stating that it has been decommissioned and emptied of refrigerant. The label shall be signed and dated. Ensure that there are labels on the equipment that state the flammability of the refrigerant used.