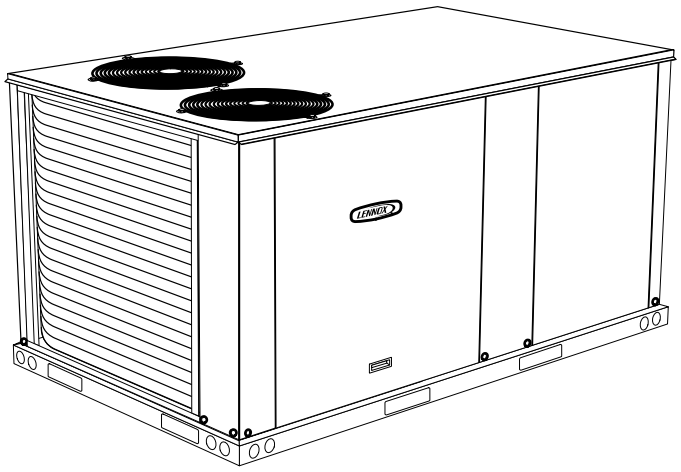
ZHA092 through 120

The ZHA commercial heat pump is available in 7.5, 8.5 and 10 ton capacities. The refrigerant systems utilize two compressors, two reversing valves, two accumulators, and other parts common to a heat pump. Optional auxiliary electric heat is factory or 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 accept any of several different energy management thermostat control systems with minimum field wiring.

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

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



⚠WARNING

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

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ CAUTION

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

⚠CAUTION

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

⚠WARNING

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

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No 092	102	120
COOLING SYSTEM					
Condensate Drain Trap	PVC - C1TRAP20AD2	**76W26**	X	X	X
	Copper - C1TRAP10AD2	**76W27**	X	X	X
Corrosion Protection		Factory	O	O	O
Drain Pan Overflow Switch	Z1SNSR90A1	**99W59**	X	X	X
Low Ambient Kit	Z1SNSR33B-1	**10Z34**	X	X	X
Refrigerant Type		R-410A	O	O	O
BLOWER - SUPPLY AIR					
Blower Option	CAV (Constant Air Volume)	Factory	O	O	O
	MSAV (Multi-Stage Air Volume)	Factory	O	O	O
Blower Motors	Belt Drive - 2 hp	Factory	O	O	O
	Belt Drive - 3 hp	Factory	O	O	O
	Belt Drive - 5 hp	Factory	O	O	O
Drive Kits	Kit #1 590-890 rpm	Factory	O	O	O
See Blower Data Tables for selection	Kit #2 800-1105 rpm	Factory	O	O	O
	Kit #3 795-1195 rpm	Factory	O	O	O
	Kit #4 730-970 rpm	Factory	O	O	O
	Kit #5 940-1200 rpm	Factory	O	O	O
	Kit #6 1015-1300 rpm	Factory	O	O	O
	Kit #10 900-1135 rpm	Factory	O	O	O
	Kit #11 1040-1315 rpm	Factory	O	O	O
	Kit #12 1125-1425 rpm	Factory	O	O	O
CABINET					
Coil/Hail Guards	Z1GARD10B-1	**10Y09**	X	X	X
CONTROLS					
	L Connection® Building Automation System	- - -	X	X	X
BACnet®	K0CTRL31B-1	**96W15**	OX	OX	OX
BACnet® Thermostat with Display	K0SNSR01FF1	**97W23**	X	X	X
BACnet® Thermostat without Display	K0SNSR00FF1	**97W24**	X	X	X
Novar® 2051	K0CTRL30B-1	**96W12**	OX	OX	OX
Plenum Cable (75 ft.)	K0MISC00FF1	**97W25**	X	X	X

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

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

O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No 092	102	120
INDOOR AIR QUALITY					
Air Filters					
Healthy Climate® High Efficiency Air Filters	MERV 8 - Z1FLTR15B-1	**11H62**	X	X	X
20 x 24 x 2 in. (Order 4 per unit)	MERV 13 - Z1FLTR40B-1	**11H63**	X	X	X
Replacement Media Filter With Metal Mesh Frame (includes non-pleated filter media)	C1FLTR30B-1-	**Y3063**	X	X	X
Indoor Air Quality (CO_2) Sensors					
Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AE1L	**77N39**	X	X	X
Sensor - Wall-mount, off-white plastic cover, no display	C0SNSR52AE1L	**87N53**	X	X	X
Sensor - Black plastic case with LCD display, rated for plenum mounting	C0SNSR51AE1L	**87N52**	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0MISC19AE1	**87N54**	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications	C0MISC19AE1-	**85L43**	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO_2 sensors (**87N53** or **77N39**)	C0MISC16AE1-	**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	Z1PEKT01B-1	**11H66**	X	X	X
ELECTRIC HEAT					
7.5 kW	208/230V-3ph - Z1EHO075B-1Y	**10Y97**	X	X	
	460V-3ph - Z1EHO075B-1G	**10Y98**	X	X	
	575V-3ph - Z1EHO075B-1J	**10Y99**	X	X	
15 kW	208/230V-3ph - Z1EHO150B-1Y	**10Z01**	X	X	X
	460V-3ph - Z1EHO150B-1G	**10Z03**	X	X	X
	575V-3ph - Z1EHO150B-1J	**10Z04**	X	X	X
22.5 kW	208/230V-3ph - Z1EHO225B-1Y	**10Z05**	X	X	X
	460V-3ph - Z1EHO225B-1G	**10Z06**	X	X	X
	575V-3ph - Z1EHO225B-1J	**10Z07**	X	X	X
30 kW	208/230V-3ph - Z1EHO300B-1Y	**10Z08**	X	X	X
	460V-3ph - Z1EHO300B-1G	**10Z09**	X	X	X
	575V-3ph - Z1EHO300B-1J	**10Z10**	X	X	X
45 kW	208/230V-3ph - Z1EHO450B-1Y	**10Z11**	X	X	X
	460V-3ph - Z1EHO450B-1G	**10Z12**	X	X	X
	575V-3ph - Z1EHO450B-1J	**10Z13**	X	X	X
60 kW	208/230V-3ph - Z1EHO600B-1Y	**10Z14**			X
	460V-3ph - Z1EHO600B-1G	**10Z15**			X
	575V-3ph - Z1EHO600B-1J	**10Z16**			X
ELECTRIC HEAT ACCESSORIES					
Unit Fuse Block (required) - See Electrical/Electric Heat Tables for Selection			X	X	X

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

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

O = Configure To Order (Factory Installed)

X = Field Installed

OPTIONS / ACCESSORIES

Item Description	Model Number	Catalog Number	Unit Model No 092	102	120
ECONOMIZER					
Standard Economizer (Not for Title 24)					
Standard Downflow Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON30B-1	**10Z29**	OX	OX	OX
Standard Horizontal Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON16B-1	**11G98**	X	X	X
Standard Economizer Controls (Not for Title 24)					
Single Enthalpy Control	C1SNSR64FF1	**53W64**	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR64FF1	**53W64**	X	X	X
High Performance Economizer (Approved for California Title 24 Building Standards)					
High Performance Downflow Economizer with Single Temperature Control - With Barometric Relief Dampers and Air Hoods	Z1ECON32B-1	**12B44**	OX	OX	OX
Economizer Controls (Not for Title 24)					
Single Enthalpy Control	C1SNSR61FF1	**11G21**	OX	OX	OX
Differential Enthalpy Control (order 2)	C1SNSR61FF1	**11G21**	X	X	X
Horizontal Low Profile Barometric Relief Dampers With Exhaust Hood					
Horizontal Low Profile Barometric Relief Dampers With Exhaust Hood	LAGEDH03/15	**53K04**	X	X	X
OUTDOOR AIR					
Outdoor Air Dampers					
Motorized Dampers with outdoor air hood	Z1DAMP20B-1	**10Z33**	X	X	X
Manual Dampers with outdoor air hood	Z1DAMP10B-1	**10Z32**	X	X	X
POWER EXHAUST					
Standard Static (Downflow)	208/230V-3ph - Z1PWRE10B-1Y	**10Z70**	X	X	X
	460V-3ph - Z1PWRE10B-1G	**10Z71**	X	X	X
Standard Static (Horizontal)	208/230V-3ph - Z1PWRE15A-1P	**24E01**	X	X	X
	460V-3ph - Z1PWRE15A-1G	**28E01**	X	X	X
575V Transformer Kit	575V-3ph - Z1TRFM20A-1J	**59E02**	X	X	X
NOTE - Order 575V Transformer Kit with 208/230V Power Exhaust Fan for 575V applications. Order two kits for downflow models, order one kit for horizontal models.					
ROOF CURBS					
Hybrid Roof Curbs, Downflow					
8 in. height	Z1CURB40B-1	**10Z25**	X	X	X
14 in. height	Z1CURB41B-1	**10Z26**	X	X	X
18 in. height	Z1CURB42B-1	**10Z27**	X	X	X
24 in. height	Z1CURB43B-1	**10Z28**	X	X	X
CEILING DIFFUSERS					
Step-Down - Order one	RTD11-95	**29G04**	X		
	RTD11-135	**29G05**		X	X
Flush - Order one	FD11-95	**29G08**	X		
	FD11-135	**29G09**		X	X
NOTE - Ceiling Diffuser Transitions are not furnished and must be field fabricated.					

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

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

O = Configure To Order (Factory Installed)

X = Field Installed

SPECIFICATIONS — 7.5 - 8.5 TON

General Data		Nominal Tonnage	7.5 Ton	7.5 Ton	8.5 Ton	8.5 Ton
		Model Number	**ZHA092S4B**	**ZHA092S4M**	**ZHA102S4B**	**ZHA102S4M**
		Efficiency Type	**Standard**	**Standard**	**Standard**	**Standard**
		Blower Type	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh		89,400	89,400	103,200	103,200
	[1] Net Cooling Capacity - Btuh		87,000	87,000	100,000	100,000
	AHRI Rated Air Flow - cfm		2800	2800	3150	3150
	Total Unit Power - kW		7.9	7.9	9.1	9.1
	[1] EER (Btuh/Watt)		11.0	11.0	11.0	11.0
	[1] IEER (Btuh/Watt)		12.2	12.5	12.2	12.5
	Refrigerant Type		R-410A	R-410A	R-410A	R-410A
Refrigerant Charge Furnished		Circuit 1	11 lbs. 12 oz.	11 lbs. 12 oz.	11 lbs. 10 oz.	11 lbs. 10 oz.
		Circuit 2	10 lbs. 8 oz.	10 lbs. 8 oz.	9 lbs. 14 oz.	9 lbs. 14 oz.
Heating Performance	[1] Total High Heat Capacity - Btuh		89,000	89,000	100,000	100,000
	Total Unit Power - kW		7.9	7.9	8.9	8.9
	[1] C.O.P.		3.3	3.3	3.3	3.3
	[1] Total Low Heat Capacity - Btuh		53,000	53,000	55,000	55000
	Total Unit Power (kW)		6.9	6.9	7.2	7.2
	[1] C.O.P.		2.25	2.25	2.25	2.25
Electric Heat Available - See page 3			7.5,15,22.5,30 & 45 kW			
Compressor Type (number)			Scroll (2)	Scroll (2)	Scroll (2)	Scroll (2)
Outdoor Coils	Net face area (total) - sq. ft.		26.2	26.2	26.2	26.2
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		2	2	2	2
	Fins per inch		20	20	20	20
	Expansion device type		Balance port TXV, removable head			
Outdoor Coil Fans	Motor - (No.) hp		(2) 1/3	(2) 1/3	(2) 1/3	(2) 1/3
	Motor rpm		1075	1075	1075	1075
	Total Motor watts		650	650	650	650
	Diameter - (No.) in.		(2) 24	(2) 24	(2) 24	(2) 24
	Number of blades		3	3	3	3
	Total Air volume - cfm		8800	8800	8800	8800
Indoor Coils	Net face area (total) - sq. ft.		12.8	12.8	12.8	12.8
	Tube diameter - in.		3/8	3/8	3/8	3/8
	Number of rows		3	3	4	4
	Fins per inch		14	14	14	14
	Drain connection - Number and size		(1) 1 in. NPT coupling			
	Expansion device type		Refrigerant Metering Orifice (RFC)			
[2] **Indoor Blower and Drive Selection**	Nominal motor output		2 hp, 3 hp, 5 hp			
	Maximum usable motor output (US Only)		2.3 hp, 3.45 hp, 5.75 hp			
	Motor - Drive kit number		2 hp **Kit 1** 590-890 rpm **Kit 2** 800-1105 rpm **Kit 3** 795-1195 rpm 3 hp **Kit 4** 730-970 rpm **Kit 5** 940-1200 rpm **Kit 6** 1015-1300 rpm 5 hp **Kit 10** 900-1135 rpm **Kit 11** 1040-1315 rpm **Kit 12** 1125-1425 rpm			
	Blower wheel nominal diameter x width - in.		(1) 15 X 15	(1) 15 X 15	(1) 15 X 15	(1) 15 X 15
Filters	Type of filter		Disposable			
	Number and size - in.		(4) 20 x 24 x 2			
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase			

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

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

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

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

SPECIFICATIONS			10 TON
General Data	**Nominal Tonnage**	**10 Ton**	**10 Ton**
	Model Number	**ZHA120S4B**	**ZHA120S4M**
	Efficiency Type	**Standard**	**Standard**
	Blower Type	Constant Air Volume (CAV)	MSAV (Multi-Stage Air Volume)
Cooling Performance	Gross Cooling Capacity - Btuh	121,900	121,900
	[1] Net Cooling Capacity - Btuh	118,000	118,000
	AHRI Rated Air Flow - cfm	3600	3600
	Total Unit Power - kW	10.7	10.7
	[1] EER (Btuh/Watt)	11.0	11.0
	[1] IEER (Btuh/Watt)	11.3	12.5
	Refrigerant Type	R-410A	R-410A
Refrigerant Charge Furnished	Circuit 1	16 lbs. 0 oz.	16 lbs. 0 oz.
	Circuit 2	14 lbs. 12 oz.	14 lbs. 12 oz.
Heating Performance	[1] Total High Heat Capacity - Btuh	116,000	116,000
	Total Unit Power - kW	10.3	10.3
	[1] C.O.P.	3.3	3.3
	[1] Total Low Heat Capacity - Btuh	70,000	70,000
	Total Unit Power (kW)	9.1	9.1
	[1] C.O.P.	2.25	2.25
Electric Heat Available - See page 3		15, 22.5, 30, 45 and 60 KW	
Compressor Type (number)		Scroll (2)	Scroll (2)
Outdoor Coils	Net face area (total) - sq. ft.	26.2	26.2
	Tube diameter - in.	3/8	3/8
	Number of rows	3	3
	Fins per inch	20	20
	Expansion device type	Balance port TXV, removable head	
Outdoor Coil Fans	Motor - (No.) hp	(2) 1/2	(2) 1/2
	Motor rpm	1075	1075
	Total Motor watts	960	960
	Diameter - (No.) in.	(2) 24	(2) 24
	Number of blades	3	3
	Total Air volume - cfm	9000	9000
Indoor Coils	Net face area (total) - sq. ft.	13.54	13.54
	Tube diameter - in.	3/8	3/8
	Number of rows	4	4
	Fins per inch	14	14
	Drain connection - Number and size	(1) 1 in. NPT coupling	
	Expansion device type	Refrigerant Metering Orifice (RFC)	
[2] **Indoor Blower and Drive Selection**	Nominal motor output	2 hp, 3 hp, 5 hp	
	Maximum usable motor output (US Only)	2.3 hp, 3.45 hp, 5.75 hp	
	Motor - Drive kit number	2 hp **Kit 1** 590-890 rpm **Kit 2** 800-1105 rpm **Kit 3** 795-1195 rpm 3 hp **Kit 4** 730-970 rpm **Kit 5** 940-1200 rpm **Kit 6** 1015-1300 rpm 5 hp **Kit 10** 900-1135 rpm **Kit 11** 1040-1315 rpm **Kit 12** 1125-1425 rpm	
	Blower wheel nominal diameter x width - in.	(1) 15 X 15	(1) 15 X 15
Filters	Type of filter	Disposable	
	Number and size - in.	(4) 20 x 24 x 2	
Electrical characteristics		208/230V, 460V or 575V - 60 hertz - 3 phase	

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

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

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

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

BLOWER DATA

092S STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

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

1 − Wet indoor coil air resistance of selected unit.

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

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

Then determine from blower table blower motor output required.

See page 9 for blower motors and drives.

See page 9 for wet coil and option/accessory air resistance data.

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

7.5 kW, 15 kW, 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 3000 cfm

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

BLOWER DATA

102 AND 120S STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

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

1 − Wet indoor coil air resistance of selected unit.

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

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

Then determine from blower table blower motor output required.

See page 9 for blower motors and drives.

See page 9 for wet coil and option/accessory air resistance data.

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

15 kW, 22.5 kW- 2065 cfm

30 kW - 2250 cfm

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

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

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

POWER EXHAUST FAN PERFORMANCE

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

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

Air Volume cfm	Wet Indoor Coil		Electric Heat	Economizer	Filters	
	092	102, 120			MERV 8	MERV 13
1750	0.03	0.04	0.03	0.03	0.01	0.03
2000	0.04	0.05	0.03	0.05	0.01	0.03
2250	0.05	0.06	0.04	0.06	0.01	0.04
2500	0.05	0.07	0.04	0.08	0.01	0.05
2750	0.06	0.08	0.05	0.09	0.02	0.05
3000	0.07	0.09	0.06	0.11	0.02	0.06
3250	0.08	0.10	0.06	0.13	0.02	0.06
3500	0.09	0.11	0.09	0.15	0.03	0.07
3750	0.10	0.13	0.09	0.17	0.03	0.08
4000	0.11	0.14	0.09	0.19	0.04	0.08
4250	0.13	0.15	0.13	0.21	0.04	0.09
4500	0.14	0.17	0.14	0.24	0.04	0.09
4750	0.15	0.18	0.17	0.26	0.05	0.10
5000	0.16	0.20	0.20	0.29	0.06	0.10
5250	0.17	0.22	0.22	0.32	0.06	0.11
5500	0.19	0.23	0.25	0.34	0.07	0.12
5750	0.20	0.25	0.31	0.37	0.07	0.12
6000	0.22	0.27	0.33	0.40	0.08	0.13

BLOWER DATA

CEILING DIFFUSERS AIR RESISTANCE - in. w.g.

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

CEILING DIFFUSER AIR THROW DATA

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

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

ELECTRICAL/ELECTRIC HEAT DATA — 7.5 TON

7.5 TON STANDARD EFFICIENCY — ZHA 092S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	8.7			4			3.6		
	Locked Rotor Amps	70			31			27		
Outdoor Fan Motors (2)	Full Load Amps	2.4			1.3			1		
	(total)	(4.8)			(2.6)			(2)		
Power Exhaust (2) 0.5 HP	Full Load Amps	3			1.5			1.2		
	(total)	(6)			(3)			(2.4)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.5	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	25	30	15	20	20
	With (2) 0.5 HP Power Exhaust	50	60	70	30	30	35	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	38	41	48	20	22	25	15	16	19
	With (2) 0.5 HP Power Exhaust	44	47	54	23	25	28	17	19	21

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**7.5 kW**	60	70	70	70	80	80	35	35	40	25	25	30
		15 kW	80	90	90	90	90	100	45	45	50	35	35	40
		22.5 kW	100	110	100	110	110	125	60	60	60	45	45	50
		30 kW	125	150	125	150	150	150	70	70	70	60	60	60
		45 kW	175	175	175	200	175	200	90	90	100	70	70	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**7.5 kW**	58	61	61	64	68	71	32	33	36	24	25	28
		15 kW	77	83	81	87	87	93	43	44	47	33	34	37
		22.5 kW	97	106	100	109	107	116	54	56	59	42	43	46
		30 kW	117	129	120	132	127	139	66	67	70	51	52	55
		45 kW	156	174	159	177	166	184	88	90	92	69	70	73
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	70	70	70	70	80	80	40	40	40	30	30	30
		15 kW	90	90	90	100	100	100	50	50	50	35	40	40
		22.5 kW	110	125	110	125	125	125	60	60	70	45	50	50
		30 kW	125	150	150	150	150	150	70	70	80	60	60	60
		45 kW	175	200	175	200	175	200	100	100	100	80	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	64	67	67	70	74	77	35	36	39	26	28	30
		15 kW	83	89	87	93	93	99	46	47	50	35	37	39
		22.5 kW	103	112	106	115	113	122	57	59	62	45	46	48
		30 kW	123	135	126	138	133	145	69	70	73	54	55	57
		45 kW	162	180	165	183	172	190	91	93	95	72	73	75

ELECTRIC HEAT ACCESSORIES

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

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL/ELECTRIC HEAT DATA — 8.5 TON

8.5 TON STANDARD EFFICIENCY — ZHA102S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	13.5			8			5		
	Locked Rotor Amps	109			59			40		
Compressor 2	Rated Load Amps	11			5.5			4.7		
	Locked Rotor Amps	86			37			34		
Outdoor Fan Motors (2)	Full Load Amps	2.4			1.3			1		
	(total)	(4.8)			(2.6)			(2)		
Power Exhaust (2) 0.5 HP	Full Load Amps	3			1.5			1.2		
	(total)	6			3			2.4		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.5	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	50	50	60	25	30	30	20	20	25
	With (2) 0.5 HP Power Exhaust	50	60	70	30	30	35	20	20	25
[3] Minimum Circuit Ampacity	Unit Only	41	44	51	22	23	26	16	17	20
	With (2) 0.5 HP Power Exhaust	47	50	57	25	26	29	19	20	22

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**7.5 kW**	60	70	70	70	80	80	35	35	40	25	30	30
		15 kW	80	90	90	90	90	100	45	50	50	35	35	40
		22.5 kW	100	110	110	125	110	125	60	60	60	45	45	50
		30 kW	125	150	125	150	150	150	70	70	80	60	60	60
		45 kW	175	200	175	200	175	200	90	100	100	70	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**7.5 kW**	60	63	63	66	70	73	33	35	37	25	26	29
		15 kW	80	86	83	89	90	96	45	46	49	34	35	38
		22.5 kW	99	108	102	111	109	118	56	57	60	43	44	47
		30 kW	119	131	122	134	129	141	67	69	71	52	53	56
		45 kW	158	176	161	179	168	186	90	91	94	70	71	74
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	70	70	70	80	80	90	40	40	45	30	30	35
		15 kW	90	100	90	100	100	110	50	50	60	40	40	40
		22.5 kW	110	125	110	125	125	125	60	60	70	50	50	50
		30 kW	125	150	150	150	150	150	70	80	80	60	60	60
		45 kW	175	200	175	200	175	200	100	100	100	80	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**7.5 kW**	66	69	69	72	76	79	36	38	40	28	29	31
		15 kW	86	92	89	95	96	102	48	49	52	37	38	40
		22.5 kW	105	114	108	117	115	124	59	60	63	46	47	49
		30 kW	125	137	128	140	135	147	70	72	74	55	56	58
		45 kW	164	182	167	185	174	192	93	94	97	73	74	76

ELECTRIC HEAT ACCESSORIES

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

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

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

[2] HACR type breaker or fuse.

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

ELECTRICAL/ELECTRIC HEAT DATA — 10 TON

10 TON STANDARD EFFICIENCY — ZHA120S4

[1] Voltage - 60hz		208/230V - 3 Ph			460V - 3 Ph			575V - 3 Ph		
Compressor 1	Rated Load Amps	15.6			7.8			5.8		
	Locked Rotor Amps	110			52			38.9		
Compressor 2	Rated Load Amps	15.6			7.8			5.8		
	Locked Rotor Amps	110			52			38.9		
Outdoor Fan Motors (2)	Full Load Amps	3			1.5			1.2		
	(total)	(6)			(3)			(2.4)		
Power Exhaust (2) 0.5 HP	Full Load Amps	3			1.5			1.2		
	(total)	(6)			(3)			(2.4)		
Indoor Blower Motor	Horsepower	2	3	5	2	3	5	2	3	5
	Full Load Amps	7.5	10.5	16.7	3.4	4.8	7.6	2.7	3.9	6.1
[2] Maximum Overcurrent Protection	Unit Only	60	60	70	30	30	35	20	25	25
	With (2) 0.5 HP Power Exhaust	70	70	80	30	35	35	25	25	30
[3] Minimum Circuit Ampacity	Unit Only	49	52	59	24	26	29	19	20	22
	With (2) 0.5 HP Power Exhaust	55	58	65	27	29	32	21	22	25

ELECTRIC HEAT DATA

Electric Heat Voltage			208V	240V	208V	240V	208V	240V	480V	480V	480V	600V	600V	600V
[2] Maximum Overcurrent Protection	Unit+ Electric Heat	**15 kW**	90	100	100	100	100	110	50	50	60	40	40	40
		22.5 kW	110	125	125	125	125	150	60	60	70	50	50	50
		30 kW	150	150	150	150	150	150	70	80	80	60	60	60
		45 kW	175	200	175	200	200	200	100	100	100	80	80	80
		60 kW	175	200	200	200	200	225	100	100	110	80	80	80
[3] Minimum Circuit Ampacity	Unit+ Electric Heat	**15 kW**	88	94	91	97	98	104	47	48	51	37	38	40
		22.5 kW	108	117	111	120	117	126	58	60	62	46	47	49
		30 kW	127	139	130	142	137	149	70	71	74	55	56	58
		45 kW	166	184	169	188	176	194	92	94	96	73	74	76
		60 kW	174	193	177	197	184	203	97	98	101	76	78	80
[2] Maximum Overcurrent Protection	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**15 kW**	100	100	100	110	110	110	50	60	60	40	40	45
		22.5 kW	125	125	125	150	125	150	70	70	70	50	50	60
		30 kW	150	150	150	150	150	175	80	80	80	60	60	70
		45 kW	175	200	175	200	200	200	100	100	100	80	80	80
		60 kW	200	200	200	225	200	225	100	110	110	80	80	90
[3] Minimum Circuit Ampacity	Unit+ Electric Heat and (2) 0.5 HP Power Exhaust	**15 kW**	94	100	97	103	104	110	50	51	54	39	40	43
		22.5 kW	114	123	117	126	123	132	61	63	65	48	49	52
		30 kW	133	145	136	148	143	155	73	74	77	57	58	61
		45 kW	172	190	175	194	182	200	95	97	99	75	76	79
		60 kW	180	199	183	203	190	209	100	101	104	79	80	82

ELECTRIC HEAT ACCESSORIES

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

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

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

[2] HACR type breaker or fuse.

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

ELECTRIC HEAT CAPACITIES

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

ZHA PARTS ARRANGEMENT

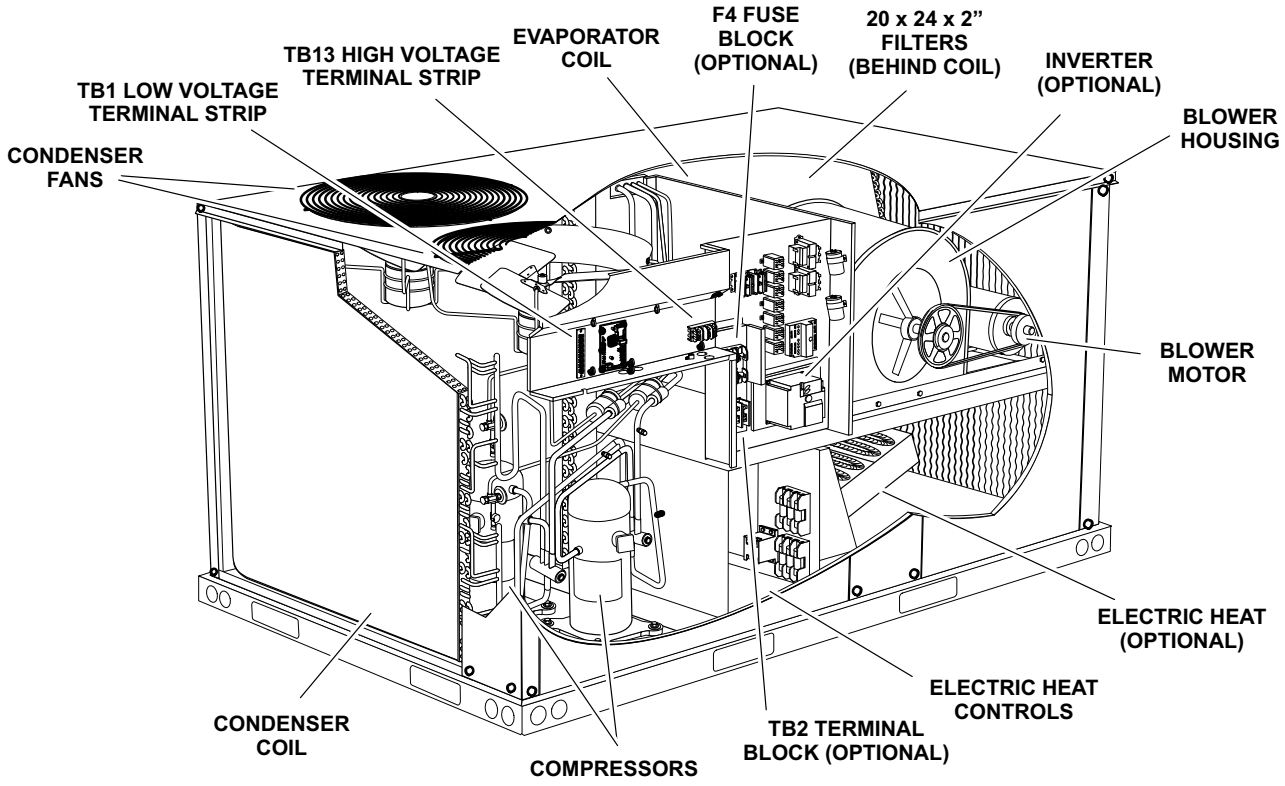


FIGURE 1

ZHA CONTROL BOX

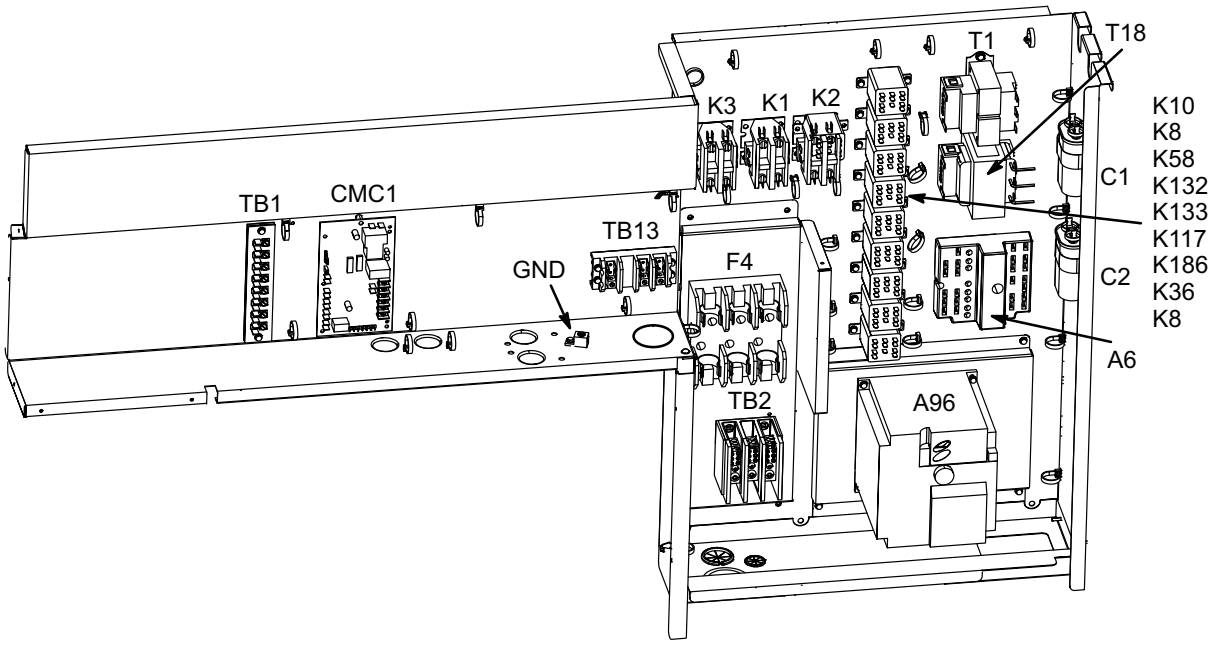


FIGURE 2

I-UNIT COMPONENTS

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

A-Control Box Components

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

1-Disconnect Switch S48 (field installed)

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

2-Transformer T1

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

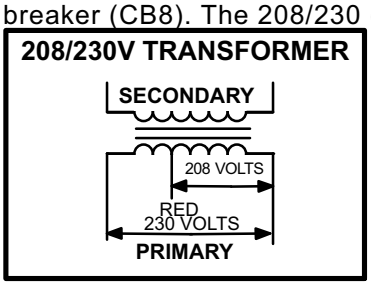


FIGURE 3

3-Transformer T18

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

4-Outdoor Fan Capacitor C1, C2, and C18

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

5-Compressor Contactor K1 & K2

All compressor contactors are three-pole-double-break contactors with a 24VAC coil. K1and K2 energize compressors B1 and B2 respectively in response to first or second stage cooling demands. On CE M-volt units, contactor is CE approved by manufacturer (Siemens). See figure 4.

6-Blower Contactor K3

Blower contactor K3, used in all units, is a three-pole-double-break contactor with a 24VAC coil used to energize the indoor blower motor B3 in response to blower demand. K3 is energized by a thermostat cooling demand. On M-volt CE units, the contactor is CE approved by manufacturer (Siemens). See figure 4.

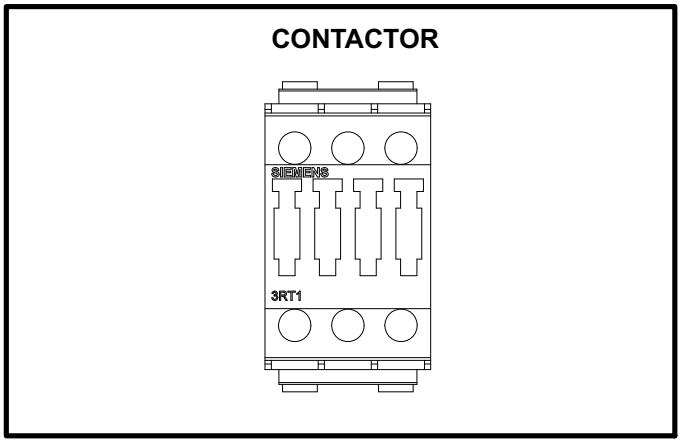


FIGURE 4

7-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.

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-Low Ambient Kit Relay (K58)

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

12-Blower Motor Overload Relay Switch (S42)

The blower motor overload relay is used in all units equipped with high efficiency motors. The relay (S42) is connected in line with the blower motor to monitor the current flow to the motor. When the relay senses and overload condition, a set of normally closed contacts open to de-energize 24VAC power T1 transformer.

13-Terminal Block (TB1)

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

14-Compressor Overload Relays S176, S177 (M-volt CE units)

Relays are wired in series with the appropriate compressor contactor and monitor the current flow to the compressor motor. When the relay senses an overload condition, N.C. contacts open to de-energize the compressor. Relays are manufactured by Siemens; see figure 5.

15-Enthalpy Control (A6)

Refer to description in economizer section.

COMPRESSOR OVERLOAD RELAYS

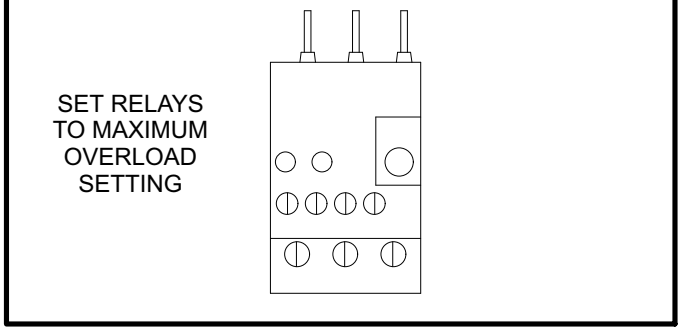


FIGURE 5

Defrost Control Board

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

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 60 minutes (default) on 100269-02 boards; 90 minutes (default) on 100269-04 boards. The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 6.

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

Defrost Test Option

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

Diagnostic LEDs

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

TABLE 1

Defrost Control Board Diagnostic LED		
Indicates	**LED 1**	**LED 2**
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure / no power	Off	Off
Board failure	On	On
Anti-short cycle lockout	Alternating slow flash	

DEFROST CONTROL BOARD CMC1

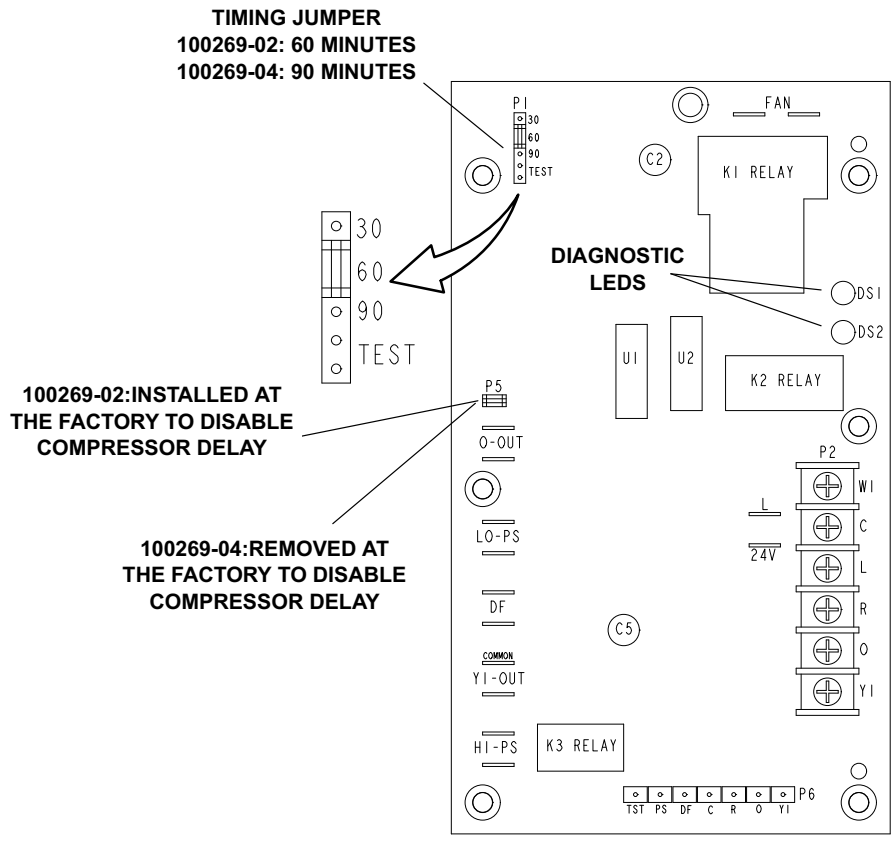
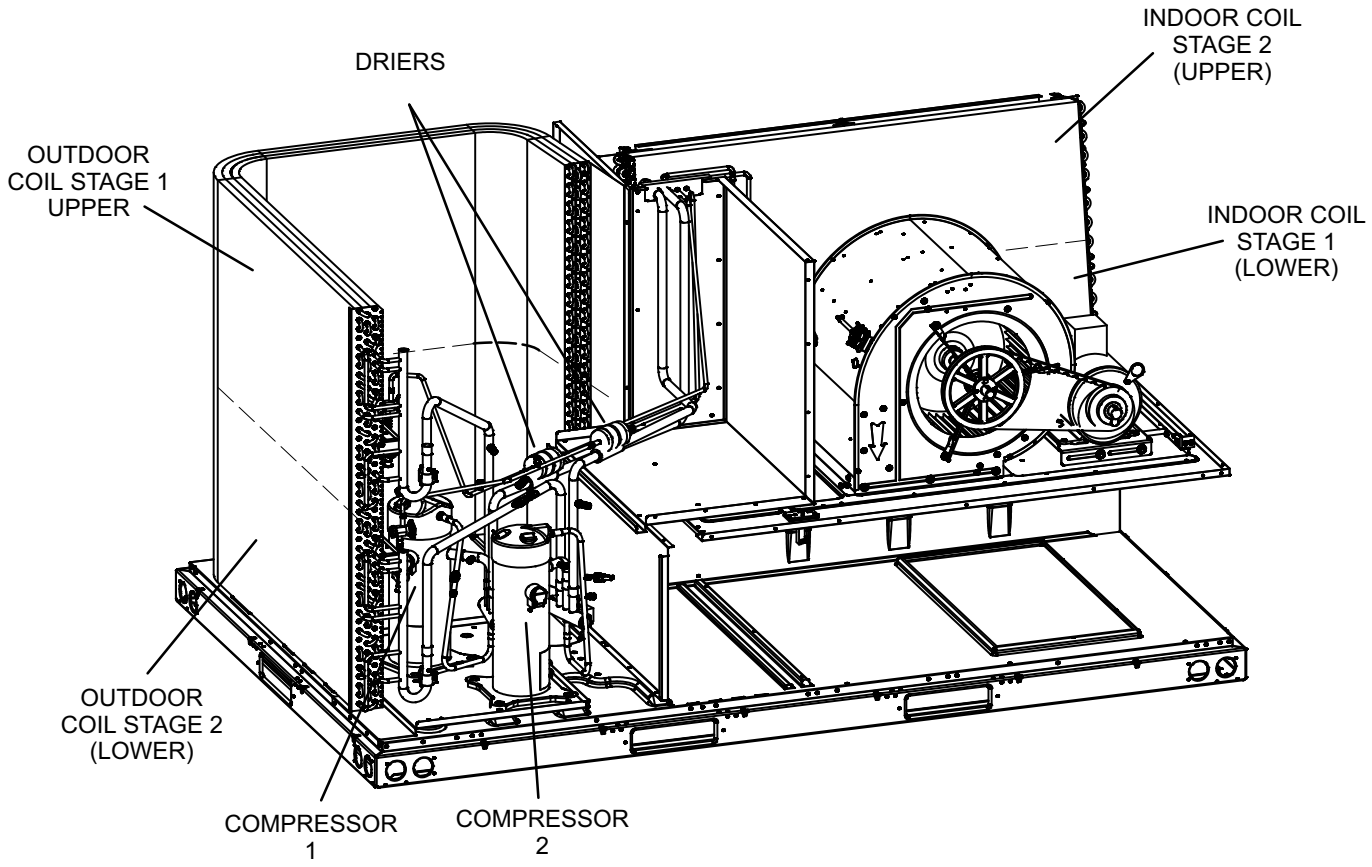


FIGURE 6

ZHA 092,102, 120 PLUMBING AND COMPRESSOR CIRCUITS DETAIL



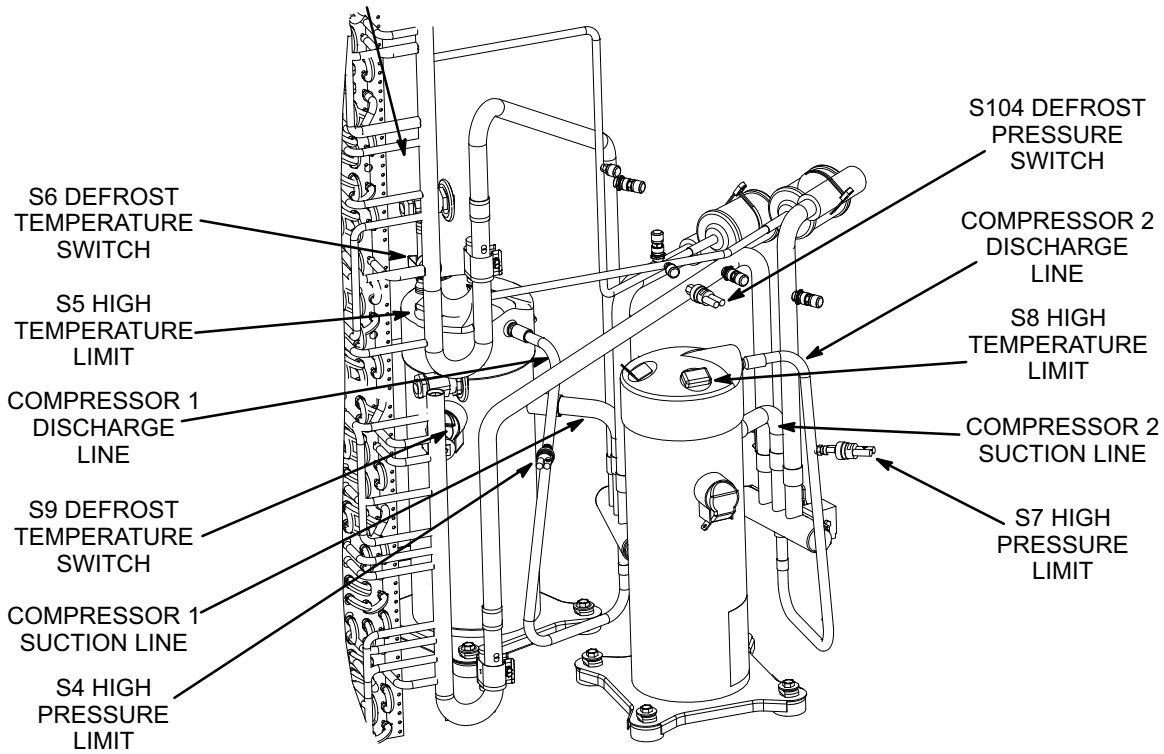


FIGURE 7

B-Cooling Components

Units use independent cooling circuits consisting of separate compressors, outdoor coils and indoor coil (with 2 separate stages). See figure 7. 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 stacked. 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 by a freezestat (on each indoor coil) and 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 two scroll compressors. All compressors are equipped with independent cooling circuits. Compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications.

⚠WARNING

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

Each compressor is energized by a corresponding compressor contactor.

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

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

⚠IMPORTANT

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

2-Thermal Protectors S5, S8

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

3-High Pressure Switches S4 and S7

The high pressure switches is a manual 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.

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 (4412 ± 69 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate).

4-Low Ambient Switches S11 & S84 (optional)

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

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.

5-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.

6-Defrost Pressure Switch S104

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

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

7-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°F ± 4°F (1.7°C ± 2.2°C) the switch closes (initiating defrost after minimum run time of 30, 60, or 90 minutes). When the temperature rises to 60°F ± 5°F (15.6°C ± 2.8°C) the switch opens.

8-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.

9-Condenser Fan Motors B4 and B5

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

C-Blower Compartment

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

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

OPERATION / ADJUSTMENT

Blower Operation

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

1- Blower operation is manually set at the thermostat subbase fan switch. With fan switch in **ON** position, blowers will operate continuously.

2- With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

Determining Unit CFM

1- The following measurements must be made with a dry indoor coil. Run blower **without** a cooling demand. Measure the indoor blower shaft RPM. Air filters must be in place when measurements are taken.

Units equipped with VFD -
Initiate high speed blower without cooling demand. Disconnect high pressure switches S4 and S7. Run the blower with Y1 and Y2 demands.

2- With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in figure 9.

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

3- Refer to blower tables in BLOWER DATA (table of contents) in the front of this manual. Use static pressure and RPM readings to determine unit air volume.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 8. Do not exceed minimum and maximum number of pulley turns as shown in table 2.

TABLE 2
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum 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.

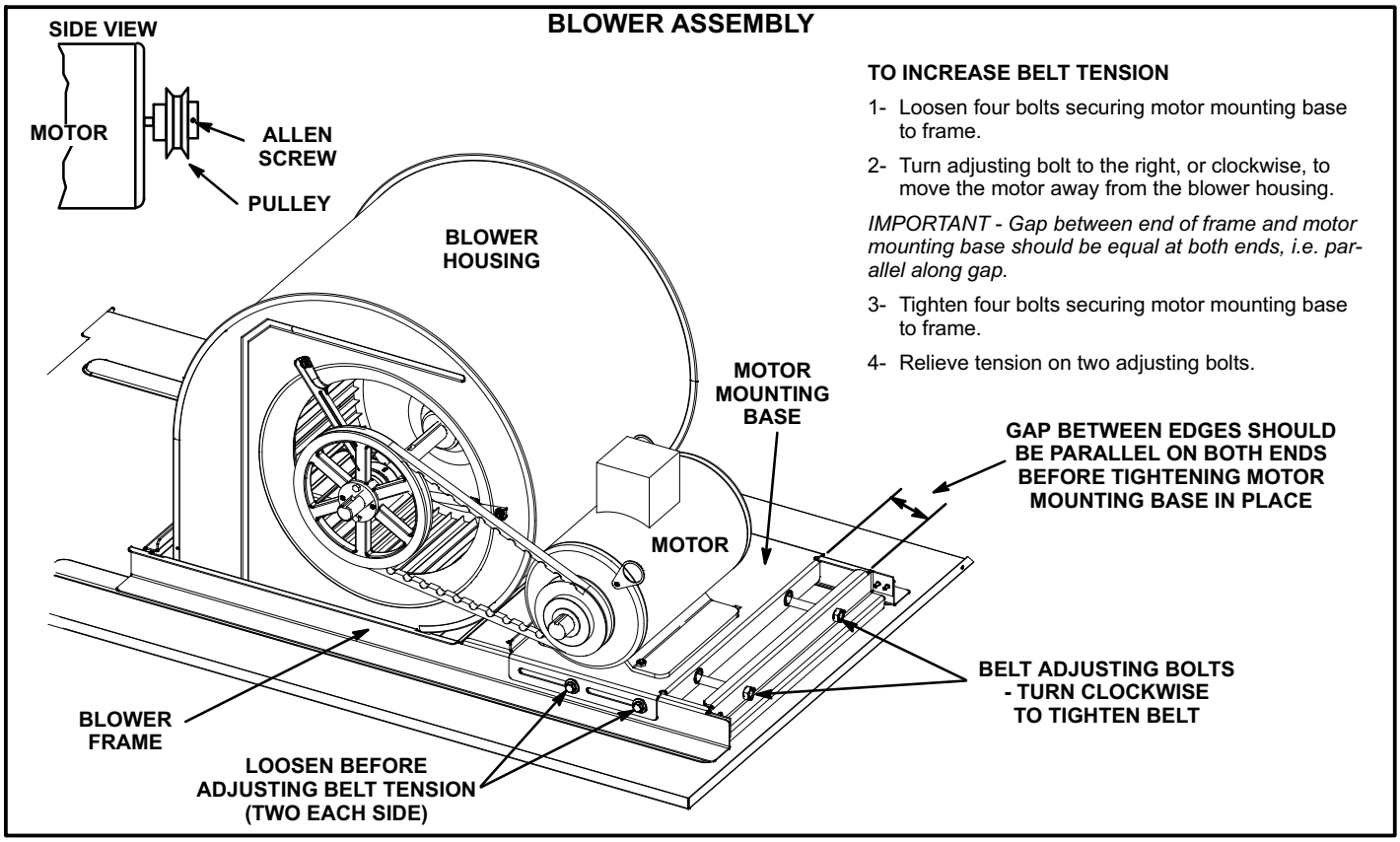

BLOWER ASSEMBLY
SIDE VIEW
MOTOR
ALLEN SCREW
PULLEY
BLOWER HOUSING
MOTOR MOUNTING BASE
MOTOR
BLOWER FRAME
LOOSEN BEFORE ADJUSTING BELT TENSION (TWO EACH SIDE)
GAP BETWEEN EDGES SHOULD BE PARALLEL ON BOTH ENDS BEFORE TIGHTENING MOTOR MOUNTING BASE IN PLACE
BELT ADJUSTING BOLTS - TURN CLOCKWISE TO TIGHTEN BELT
TO INCREASE BELT TENSION
1- Loosen four bolts securing motor mounting base to frame.
2- Turn adjusting bolt to the right, or clockwise, to move the motor away from the blower housing.
IMPORTANT - Gap between end of frame and motor mounting base should be equal at both ends, i.e. parallel along gap.
3- Tighten four bolts securing motor mounting base to frame.
4- Relieve tension on two adjusting bolts.

FIGURE 8

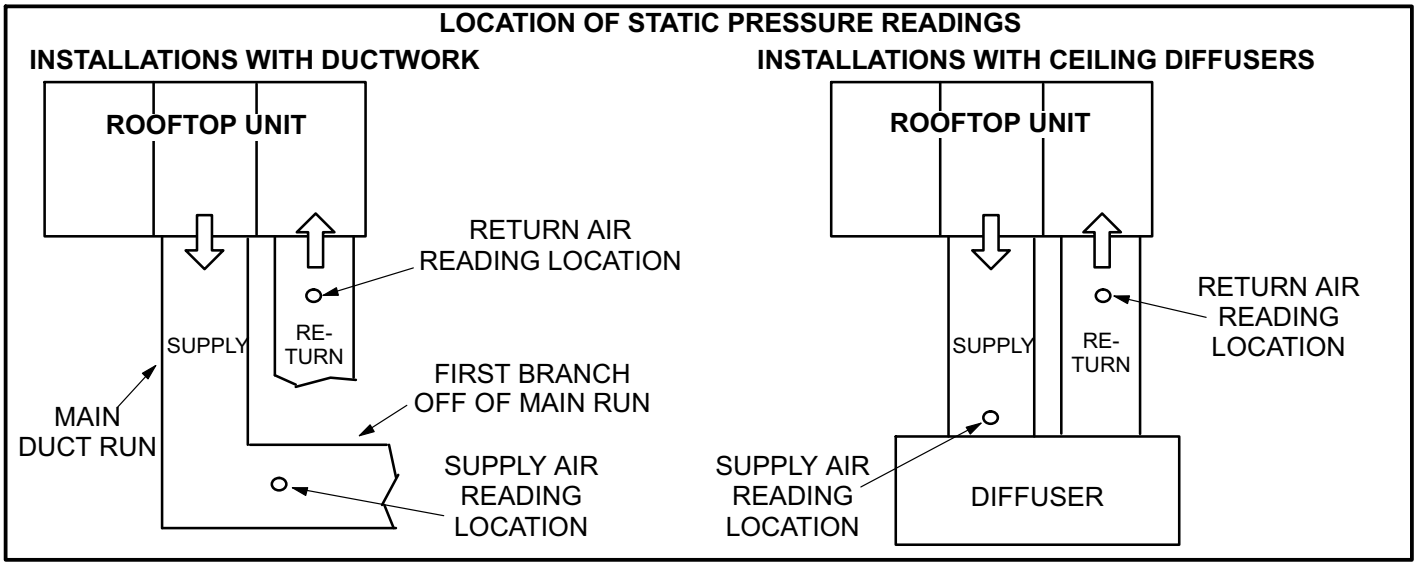


FIGURE 9

Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat grooves. Make sure blower and motor pulley are aligned as shown in figure 10.

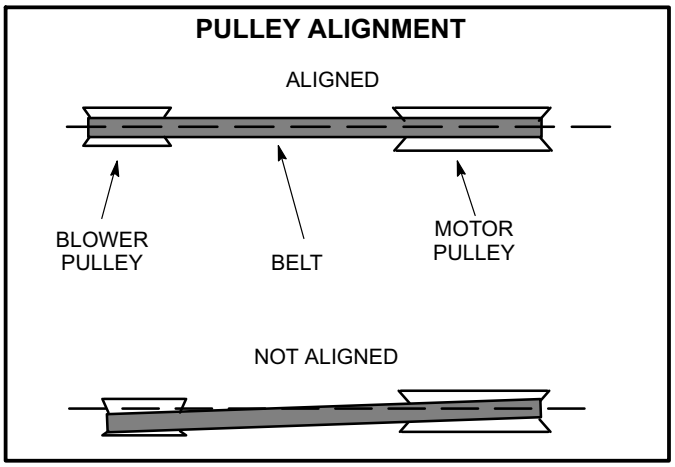


FIGURE 10

1- Loosen four bolts securing motor base to mounting frame. See figure 8.

2- *To increase belt tension -*
Turn adjusting bolt 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 bolt 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 bolts on side of base.

Check Belt Tension

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

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

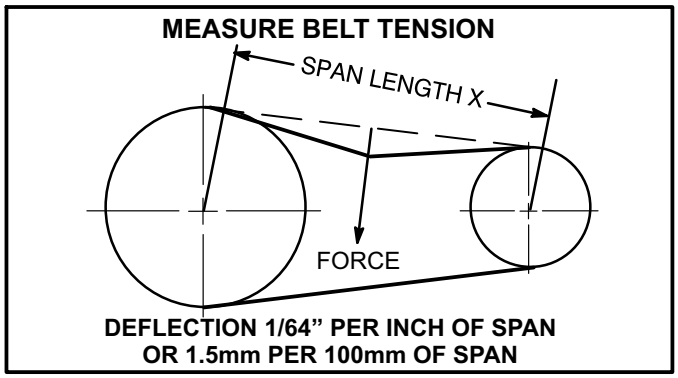


FIGURE 11

Field-Furnished Blower Drives

For field-furnished blower drives, use the blower tables in this manual to determine BHP and RPM required. Reference table 3 for drive component manufacturer's numbers.

TABLE 3
MANUFACTURER'S NUMBERS

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

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

Supply Air Inverter Units - Refer to the Supply Air Inverter Start-Up section.

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

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

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

3- Units contain two refrigerant circuits or stages. See figure 12.

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

5- Refer to Cooling Operation and Adjustment section for proper method to check refrigerant charge.

B-Refrigerant Charge and Check - Fin/Tube Coil

WARNING-Do not exceed nameplate charge under any condition.

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

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

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

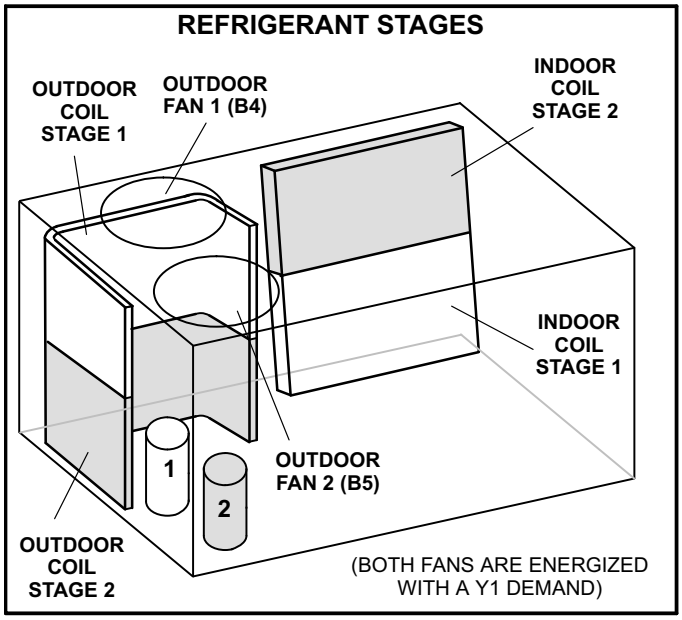


FIGURE 12

IV-CHARGING

⚠ WARNING

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

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

WARNING-Do not exceed nameplate charge under any condition.

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

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

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

IMPORTANT - Charge unit in standard cooling mode.

1- Make sure outdoor coil is clean. Attach gauge manifolds and fit access panel in place with manifold tubing routed outside of unit near bottom corner of panel. Operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.

2- Check each system separately with all stages operating. Compare the normal operating pressures (see tables 4 - 6) to the pressures obtained from the gauges. Check unit components if there are significant differences.

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

Note - Pressures are listed for sea level applications.

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

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

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

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

7- Example ZHA092S Circuit 1: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 103°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 4

092S Normal Operating Pressures

	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	95	244	98	285	100	325	104	372	108	424	113	485
	105	251	108	289	112	337	115	385	118	436	121	492
	110	253	118	297	126	346	128	398	136	450	135	505
	113	260	122	302	130	351	137	404	144	458	143	515
Circuit 2	119	240	124	281	128	322	131	368	135	419	138	473
	124	244	127	281	131	325	134	371	139	422	144	477
	133	241	142	293	149	338	152	387	158	436	159	488
	136	253	144	291	154	336	162	386	169	436	174	492

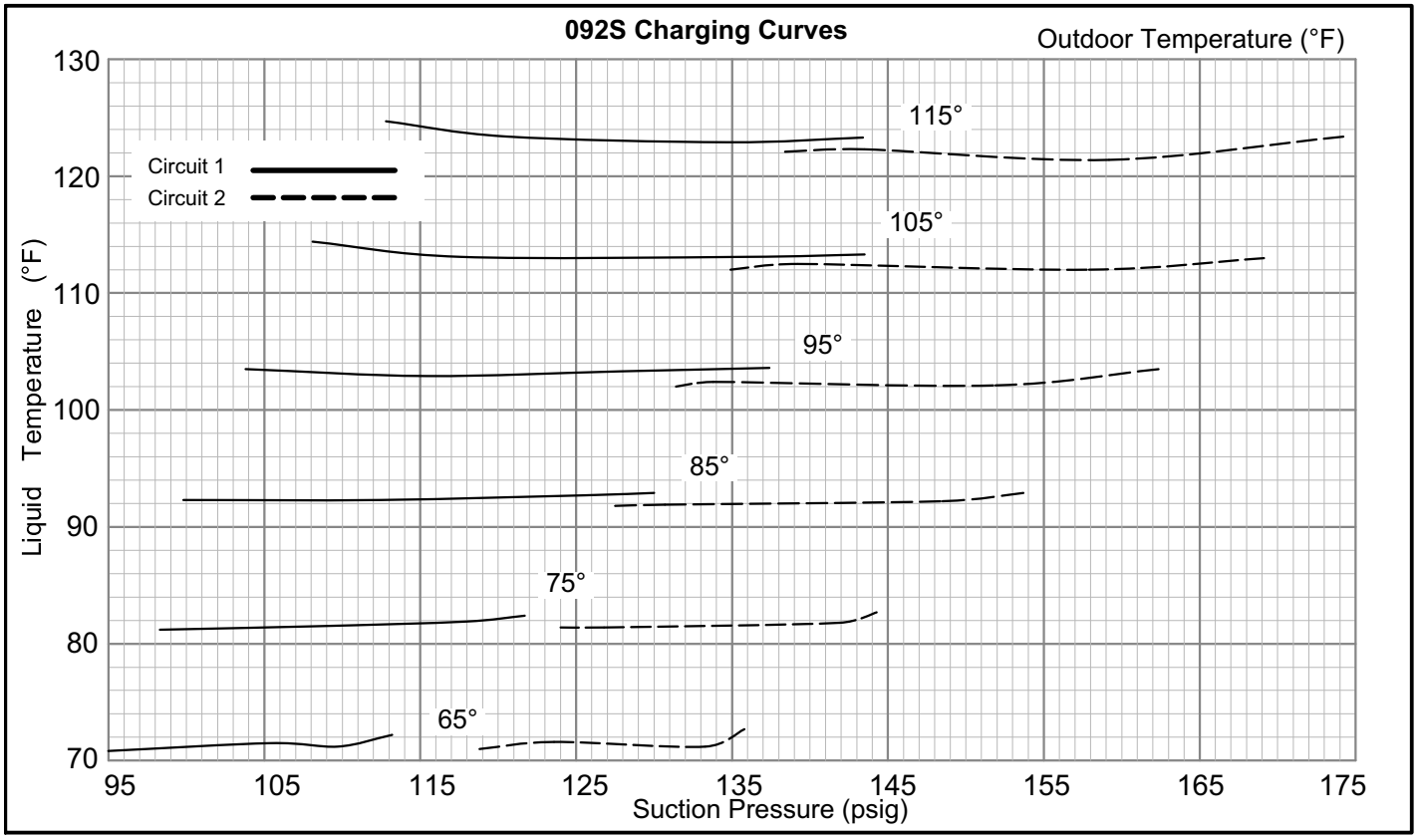


TABLE 5

102S Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	105	250	107	287	111	330	114	375	116	425	120	487
	113	256	117	296	119	337	120	383	121	430	127	491
	124	265	132	309	137	355	141	405	145	459	145	515
	129	268	138	312	146	363	153	415	159	472	160	530
Circuit 2	116	260	119	298	123	340	126	385	131	437	136	405
	125	266	128	306	131	347	137	398	140	447	145	503
	136	271	142	313	148	359	152	409	155	462	157	519
	144	271	152	321	159	370	166	421	171	477	172	534

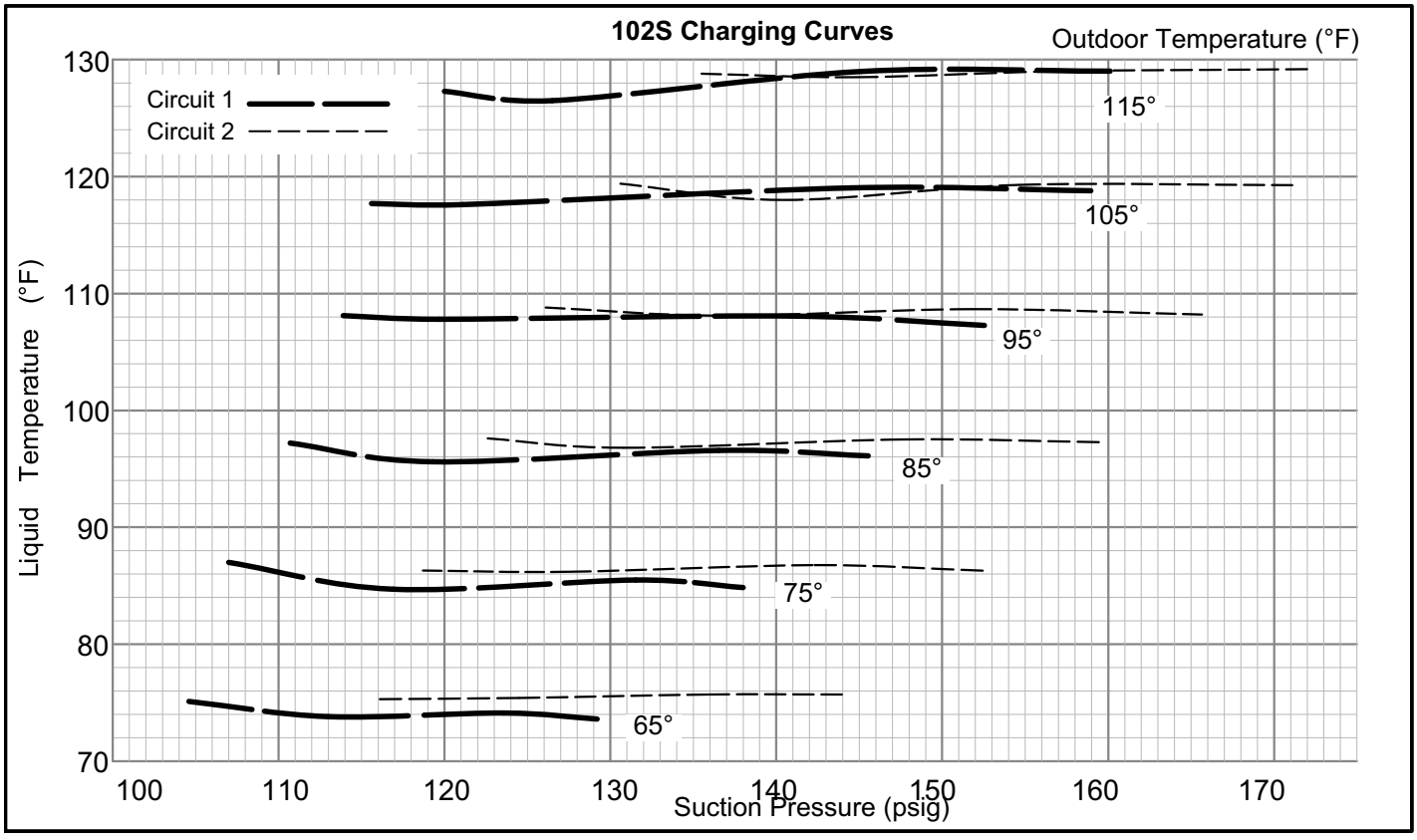
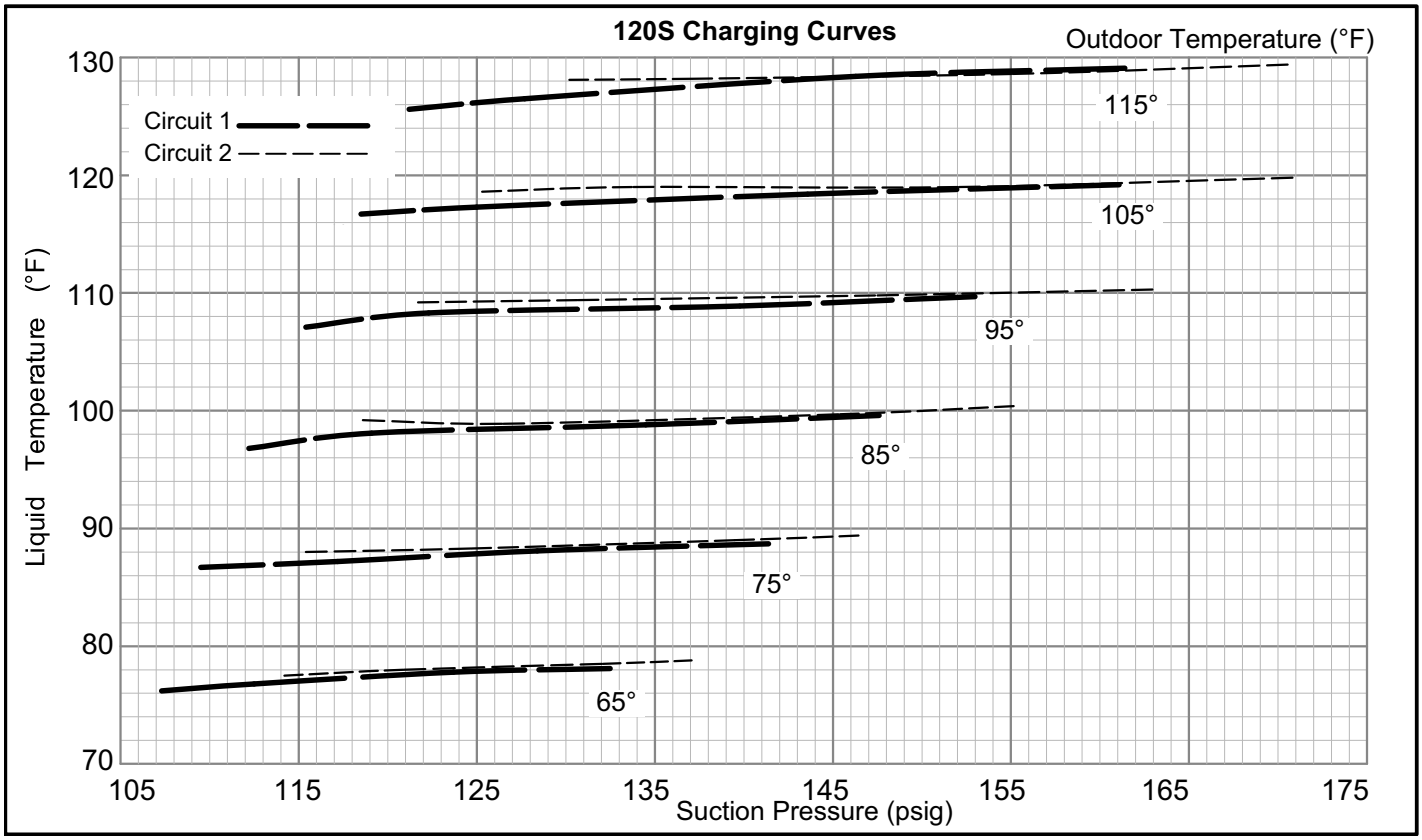


TABLE 6

120S Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	107	257	110	294	112	338	115	384	119	436	121	493
	113	261	117	302	119	342	122	387	125	438	128	492
	124	268	128	309	135	356	140	406	144	458	146	512
	133	274	141	319	148	366	153	417	161	474	161	531
Circuit 2	114	265	115	302	119	345	122	390	125	443	130	496
	121	269	125	310	127	354	131	401	134	448	137	498
	132	279	140	319	145	365	148	414	152	469	155	524
	137	284	147	329	155	379	163	430	171	486	171	539



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 tables 4 through 6.

VI-MAINTENANCE

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

⚠WARNING

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

⚠CAUTION

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

⚠IMPORTANT

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

A-Filters

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

To change filters, open filter access panel on back side of unit. See figure 13. Lift filter stop to remove filters. See figure 14.

⚠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 14.

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

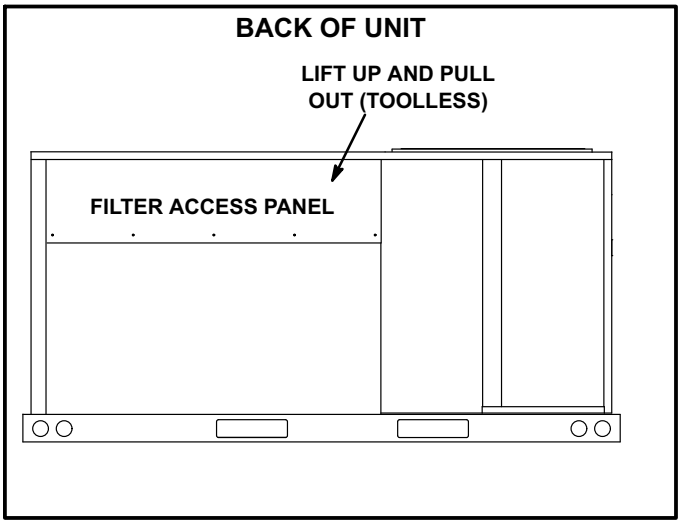


FIGURE 13

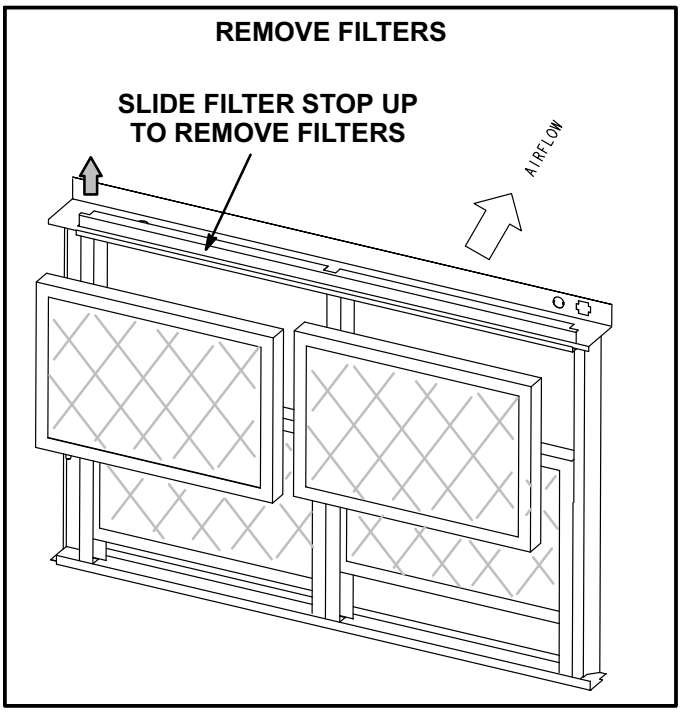


FIGURE 14

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.

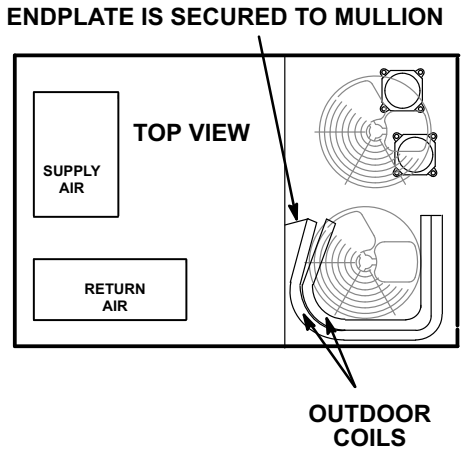
G-Outdoor Coil

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

Outdoor coils are made of single and two formed slabs. On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 15. Flush coils with water following cleaning.

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

CLEAN OUTDOOR COIL



1- Remove screws securing coil end plate to mullion.
2- Remove wire ties connecting coils slabs and separate slabs 3-4” (76-102mm).
3- Clean coils with detergent or commercial coil cleaner.
4- Rinse thoroughly with water and reassemble.
5- Secure coil slabs together using field-provided wire ties.

FIGURE 15

VII-ACCESSORIES

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

A-LARMF 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 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 16. 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 17. 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. Refer to manufacturer's instructions included with transition for detailed installation procedures.

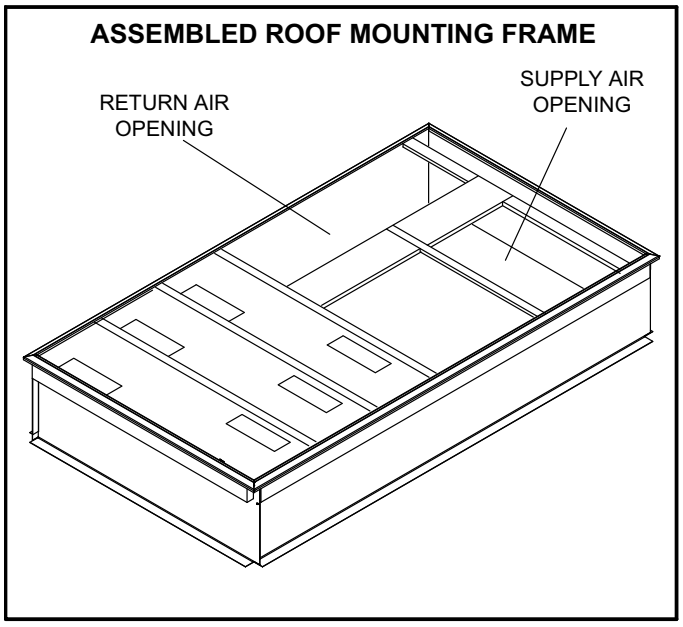


FIGURE 16

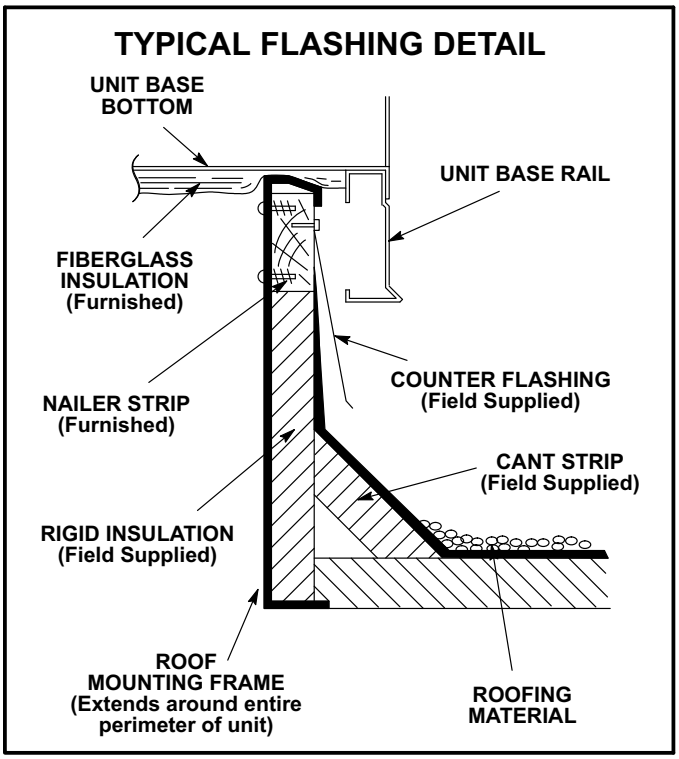


FIGURE 17

D-Z1ECON16/20B Economizer

(Field or Factory Installed)

Economizers use outdoor air for free cooling when temperature and/or humidity is suitable. See figure 18.

The mixed air temperature sensor (R1) measures the supply air sensible temperature. See figure 19. The outdoor air sensible control is the default economizer control. An outdoor air single sensible sensor, S175, is also provided. See table 7 for outdoor and return air (OA and RA) sensor options. Refer to instructions provided with sensors for installation.

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

TABLE 7

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

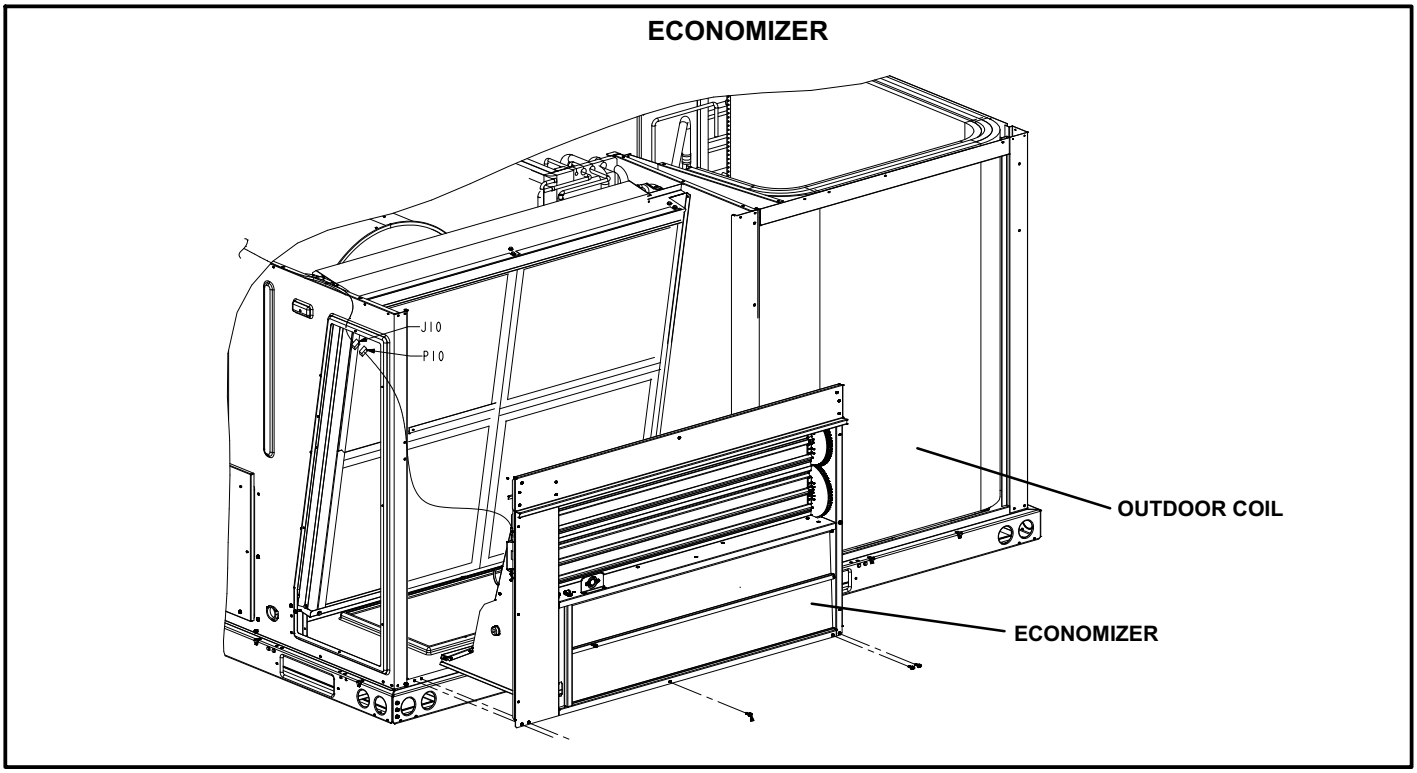


FIGURE 18

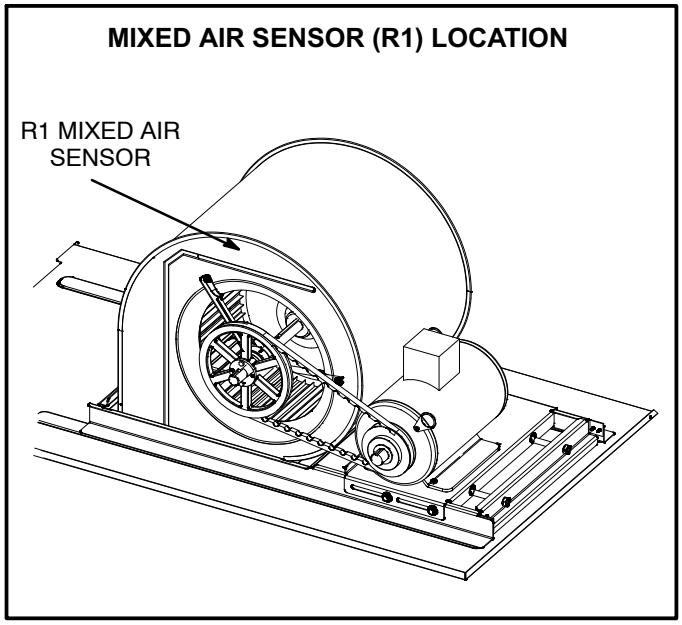


FIGURE 19

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 set-point requiring more fresh air. See figure 20.

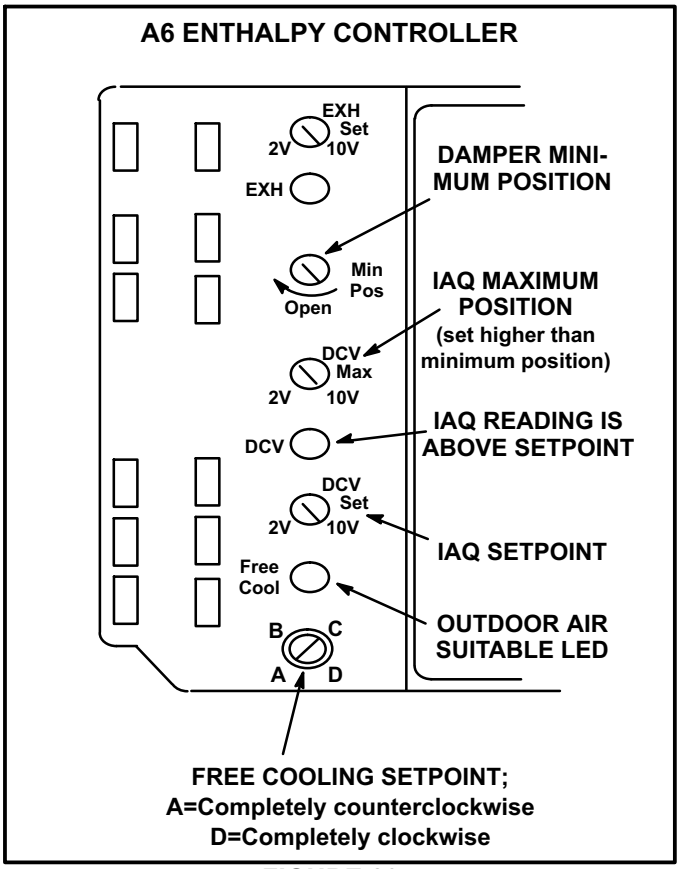


FIGURE 20

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 8. Setting A is recommended. See figure 20. At setting A, free cooling will be energized when outdoor air is approximately 73°F (23°C) and 50% relative humidity. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be energized at 70°F (21°C) and 50% relative humidity.

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

TABLE 8
ENTHALPY CONTROL SETPOINTS

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

Damper Minimum Position

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

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

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

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

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

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

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

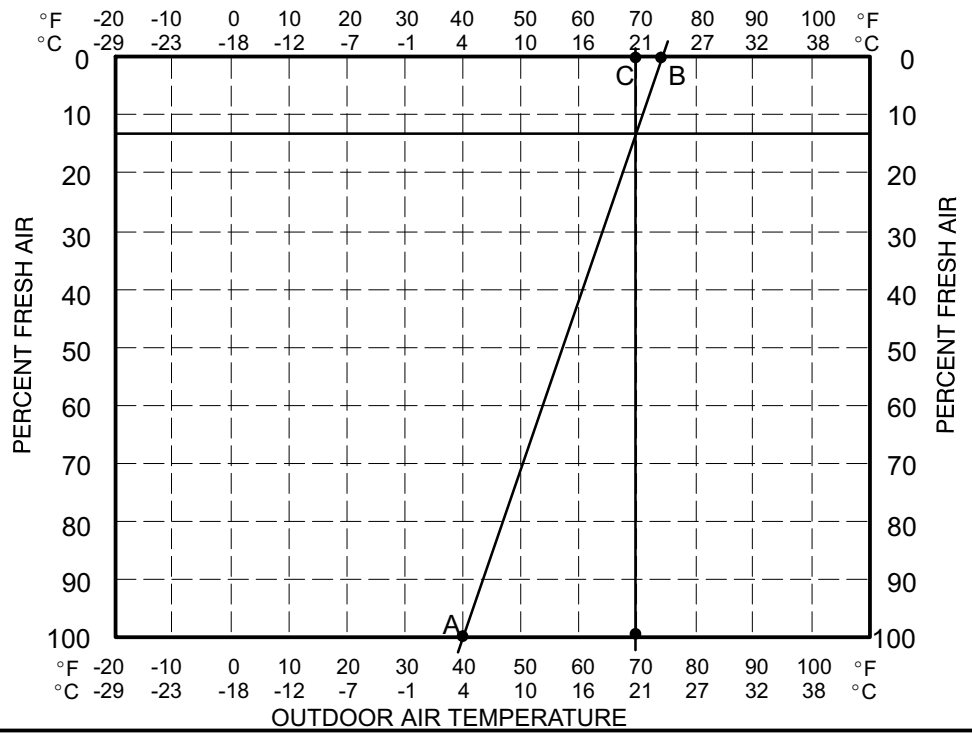
6- Draw a straight line between points A and B.

7- Draw a vertical line through point C.

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

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

CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE



DCV Set and Max Settings

Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO_2 sensor, dampers will start to open when the IAQ sensor reads approximately 1000ppm. Adjust the DCV SET potentiometer to the approximate setting specified by the controls contractor. Refer to figure 20.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO_2 rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 20.

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 9 for economizer operation with a standard two-stage thermostat.

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

TABLE 9

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

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

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

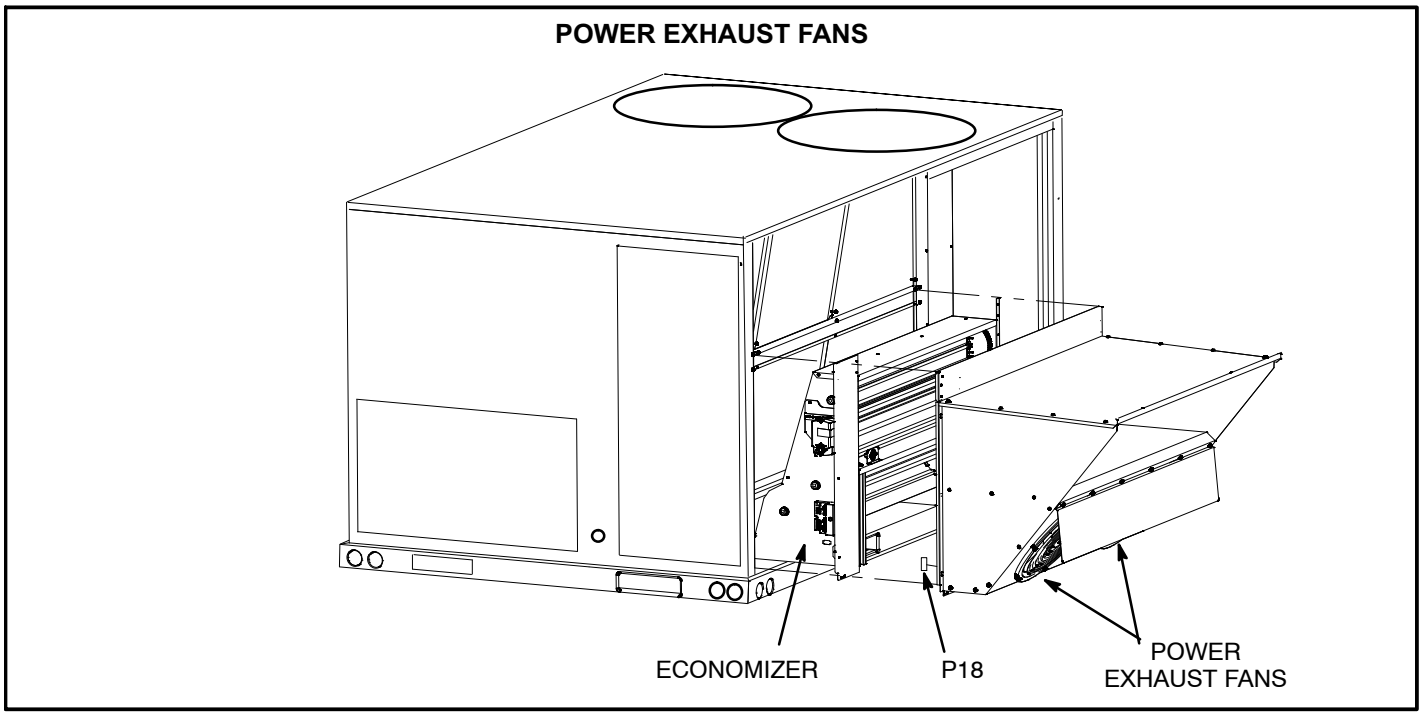


FIGURE 21

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 21. 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 22. 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.)

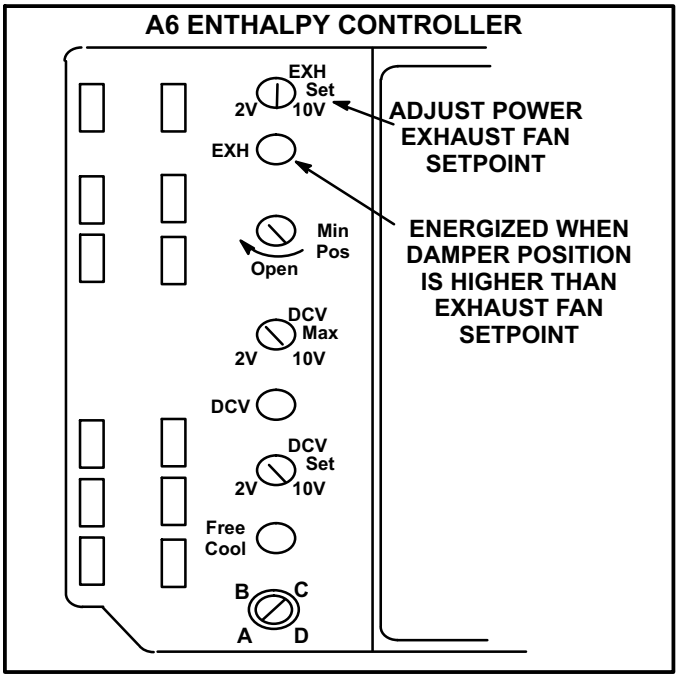
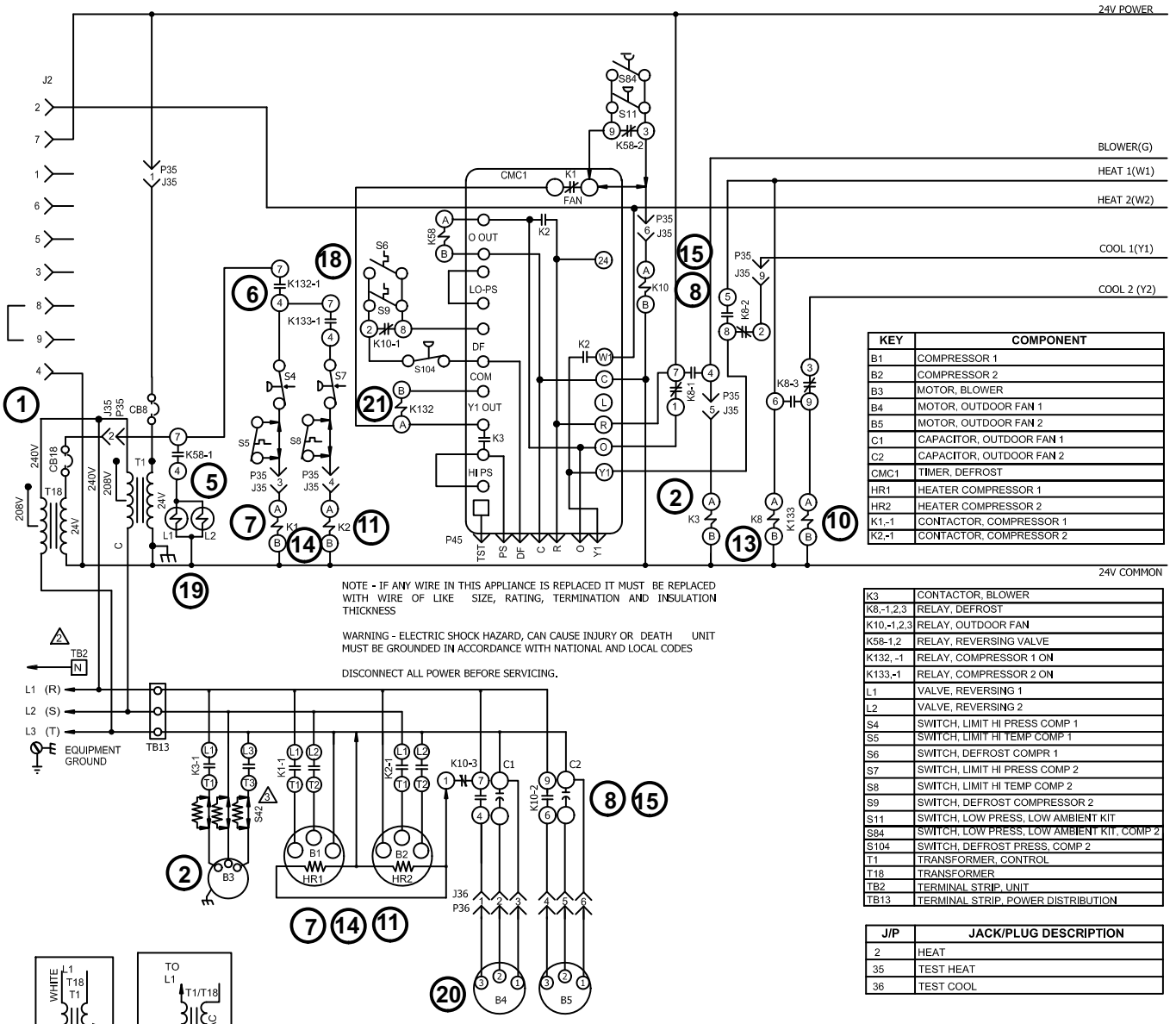


FIGURE 22

F-Drain Pan Overflow Switch S149 (optional)

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

ZHA UNIT DIAGRAM



KEY	COMPONENT
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CMC1	TIMER, DEFROST
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2

K3	CONTACTOR, BLOWER
K8,-1,2,3	RELAY, DEFROST
K10,-1,2,3	RELAY, OUTDOOR FAN
K58-1,2	RELAY, REVERSING VALVE
K132, -1	RELAY, COMPRESSOR 1 ON
K133,-1	RELAY, COMPRESSOR 2 ON
L1	VALVE, REVERSING 1
L2	VALVE, REVERSING 2
S4	SWITCH, LIMIT HI PRESS COMP 1
S5	SWITCH, LIMIT HI TEMP COMP 1
S6	SWITCH, DEFROST COMPR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S8	SWITCH, LIMIT HI TEMP COMP 2
S9	SWITCH, DEFROST COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT, COMP 2
S104	SWITCH, DEFROST PRESS, COMP 2
T1	TRANSFORMER, CONTROL
T18	TRANSFORMER
TB2	TERMINAL STRIP, UNIT
TB13	TERMINAL STRIP, POWER DISTRIBUTION

J/P	JACK/PLUG DESCRIPTION
2	HEAT
35	TEST HEAT
36	TEST COOL

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.

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. TB2 IS USED ON "M" VOLTAGE UNITS ONLY
3. IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

08/14	WIRING DIAGRAM 537672-01	08/14
HEAT PUMP - CAV		
ZHA - 092, 102, 120 - G, J, M, Y		
SECTION B		REV. 0
Supersedes	New Form No. 537672-01	

ZHA Sequence of Operation

Power:

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

Blower Operation:

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

First Stage Cooling Demand (compressor B1)

3- First stage cooling demand energizes Y1 and G in the thermostat. G energizes blower (see step 2)

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

5- Y1 demand energizes K132 relay coil which closes K132-1 N.O. contacts and routes 24VAC to S4 and S5 N.C. high pressure switches. Compressor contactor K1 is energized.

6- K1 closes energizing compressor B1.

7- 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)

8- Second stage cooling demand energizes Y2.

9- Y2 demand energizes relay K133 relay coil which closes K133-1 N.O. contacts. 24VAC is routed to S7 and S8 N.C. high pressure switches. Compressor contactor K2 is energized.

10- K2 closes energizing compressor B2.

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:

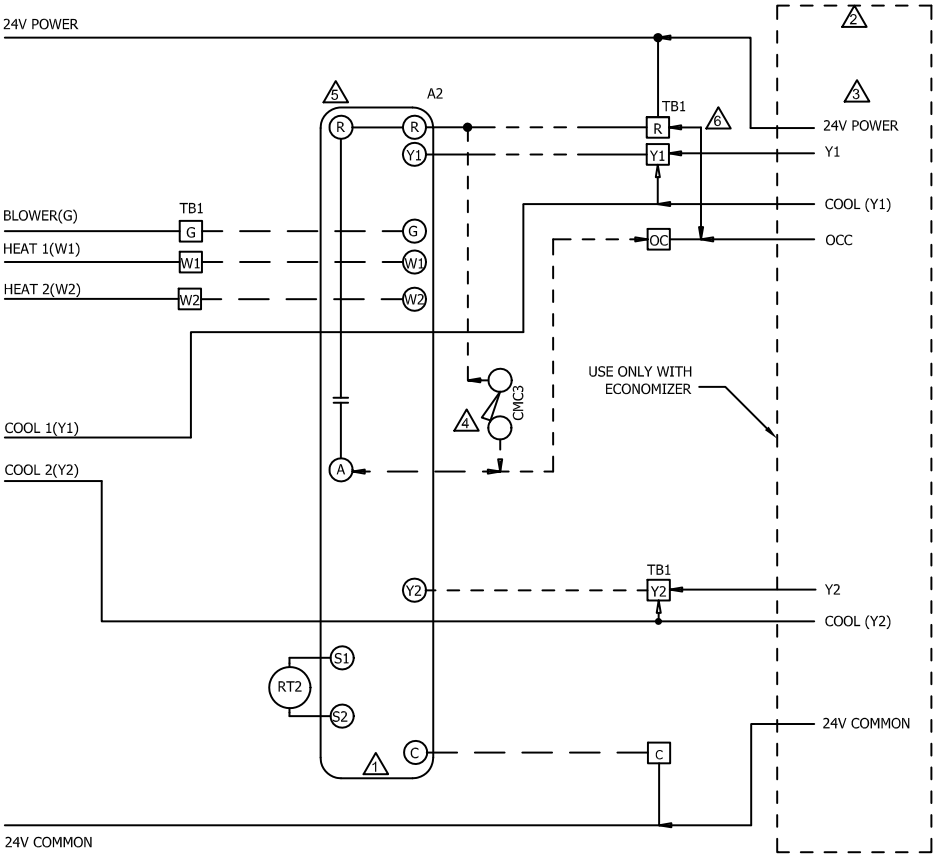
17- During heating operation, when outdoor coil drops to 35 ± 4° the defrost thermostat S6 or S9 closes initiating defrost (after minimum run time of 30, 60 or 90 minutes).

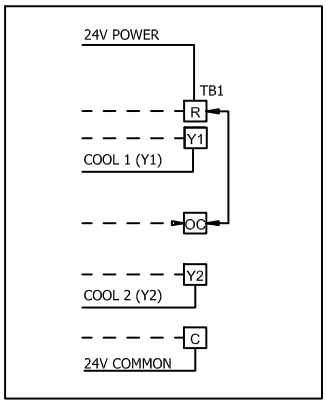
18- When defrost begins, the reversing valve L1 or L2 is energized. Supplemental electric heat (W2) is energized.

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.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT





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

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

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

DENOTES OPTIONAL COMPONENTS
CLASS II FIELD WIRING

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

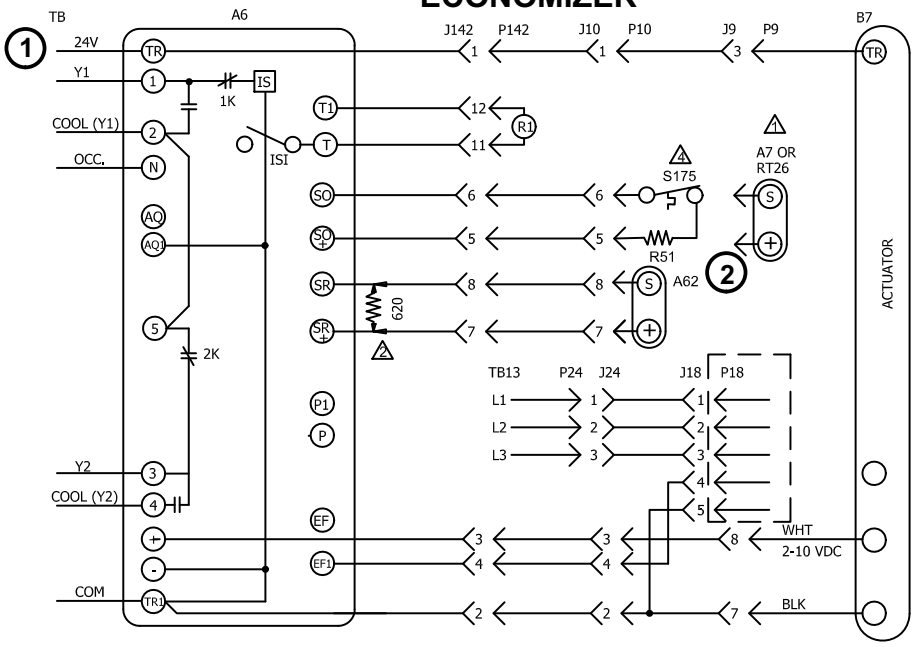
POWER:

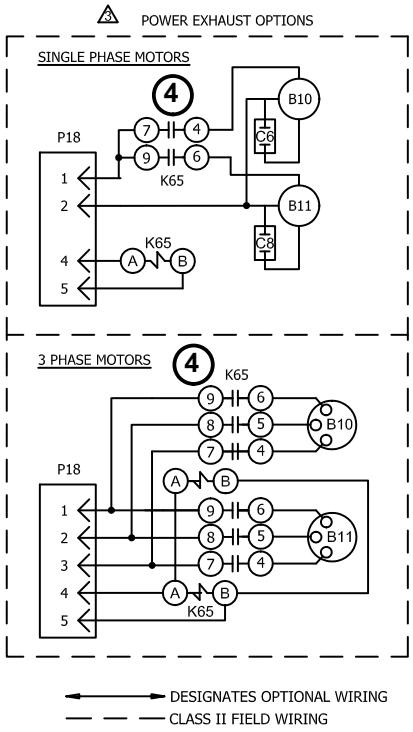
1- Terminal strip TB1 energizes thermostat components with 24VAC.

OPERATION:

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

ECONOMIZER





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

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

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

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

SEQUENCE OF OPERATION

POWER:

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

OPERATION:

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

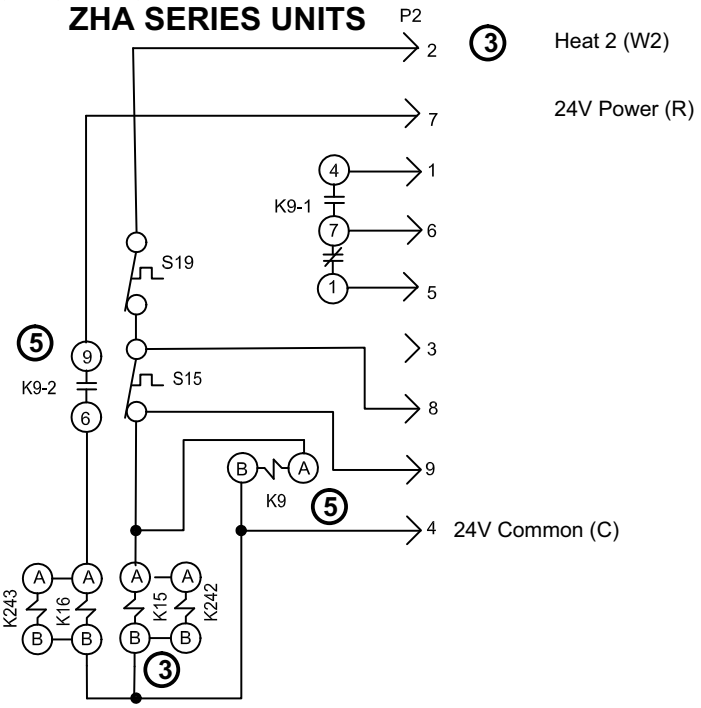
3- Economizer control module A6 supplies B7 with 0 - 10 VDC to control the positioning of economizer.

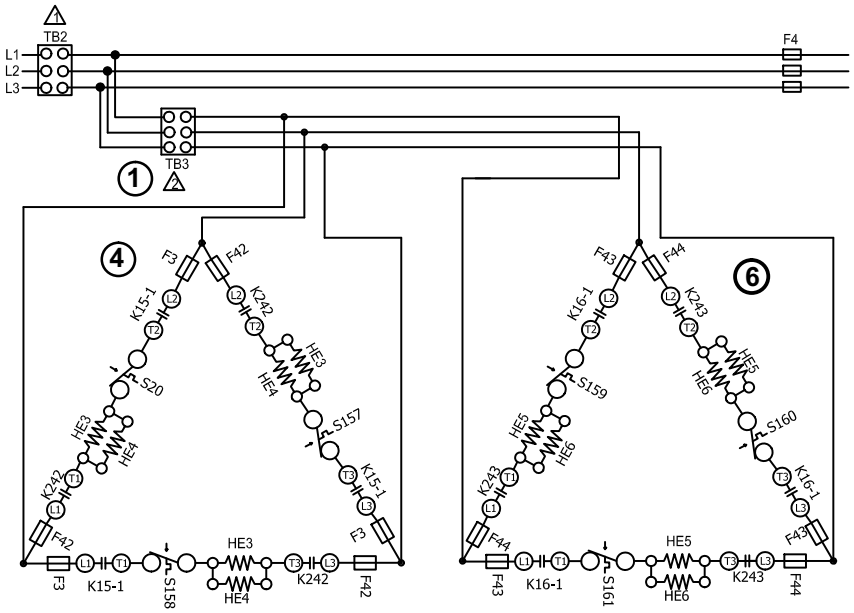
4- The EXH (power exhaust set point) found on the face of A6, is factory set at approximate 50% of the dial range. Economizer control module A6 receives a demand and opens outside dampers 50%. Power exhaust fan relay K65 is energized 30 seconds after dampers are 50% open. K65-1 and K65-2 close, energizing power exhaust fan B10.

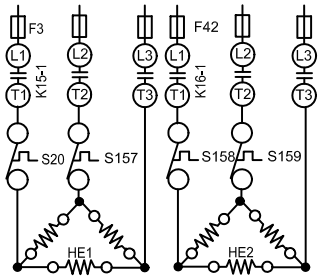
5- The damper actuator provides 2 to 10 VDC position feedback.

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







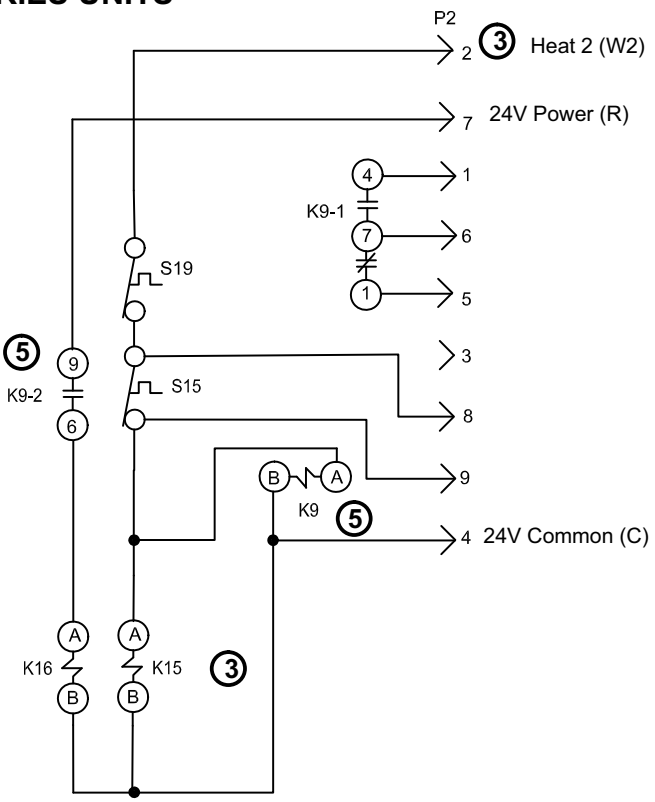
1 TB2,S48 OR CB10 MAY BE USED
2 TB3 IS USED ON SOME UNITS

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

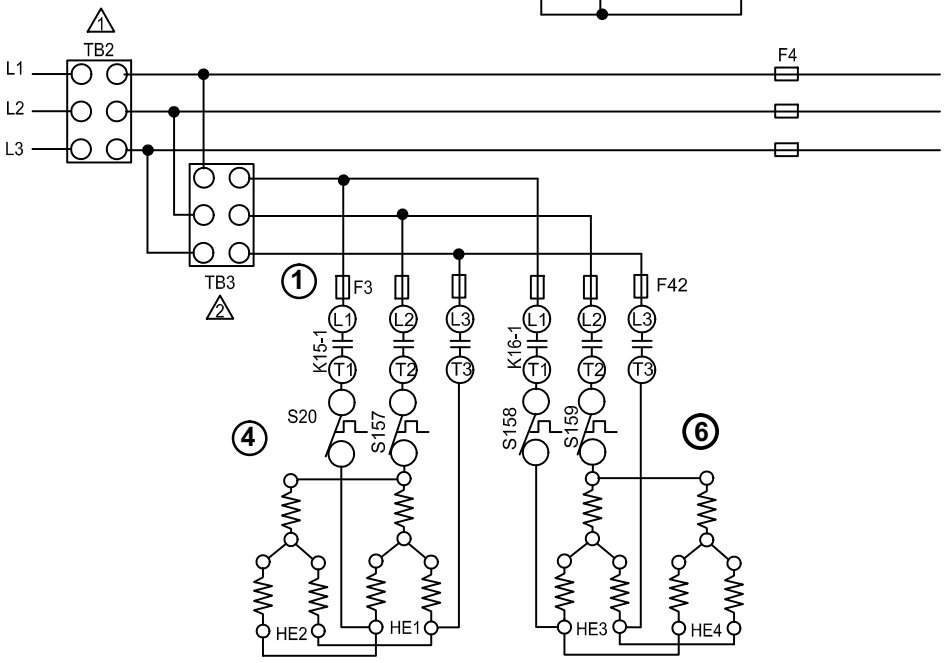
11/14	WIRING DIAGRAM 537690-01	11/14
HEATING - ELECTRIC		
7.5, 15, 22.5, 30, 45, 60 - Y		
SECTION A		REV 1
Supersedes	New Form No. 537690-01	

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

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



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



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

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

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

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

HEATING ELEMENTS:

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

2- Heating demand initiates at W2 in thermostat or when the unit goes into defrost mode.

3- 24VAC W2 signal is routed from the thermostat through TB1 to P2-2. After S15 N.C. primary limit and S19 secondary limit is proved, the electric heat contactor K15 is energized.

4- N.O. contacts K15-1 close allowing the first bank of elements to be energized.

5- Relay K9 is energized. N.O. contacts K9-2 close energizing K16.

6- N.O. contacts K16-1 close allowing the second bank of elements to be energized.

END OF SECOND STAGE HEAT:

7- Heating demand is satisfied. Terminal W2 in the thermostat is de-energized or defrost cycle is completed.

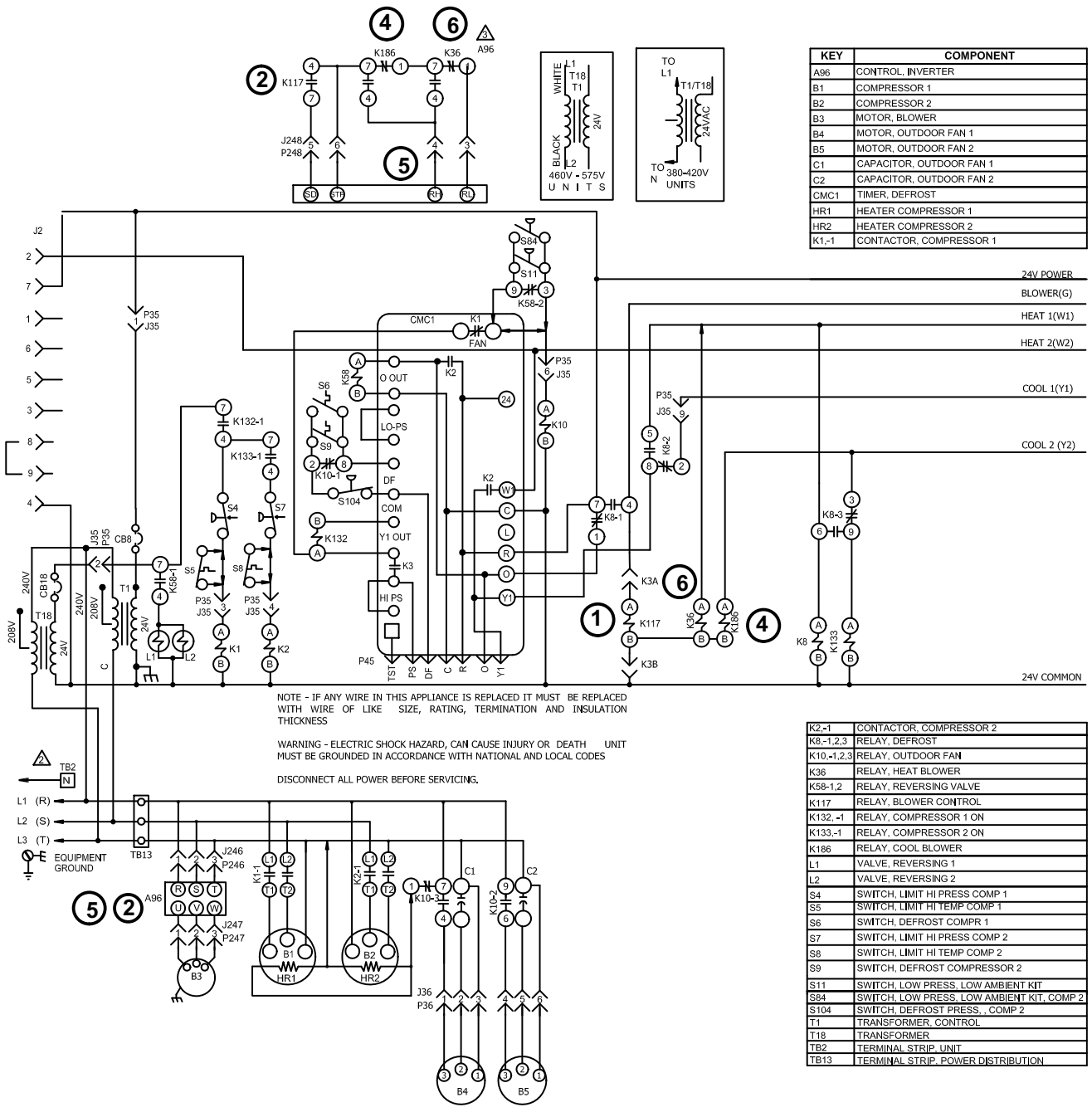
8- Electric heat contactor K16 is de-energized.

9- The second set of electric heat elements are de-energized.

10- Electric heat contactor K15 is de-energized.

11- The first set of electric heat elements are de-energized.

TYPICAL MSAV UNIT DIAGRAM



KEY	COMPONENT
A96	CONTROL, INVERTER
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN 1
B5	MOTOR, OUTDOOR FAN 2
C1	CAPACITOR, OUTDOOR FAN 1
C2	CAPACITOR, OUTDOOR FAN 2
CMC1	TIMER, DEFROST
HR1	HEATER COMPRESSOR 1
HR2	HEATER COMPRESSOR 2
K1,-1	CONTACTOR, COMPRESSOR 1
K2,-1	CONTACTOR, COMPRESSOR 2
K8,-1,2,3	RELAY, DEFROST
K10,-1,2,3	RELAY, OUTDOOR FAN
K36	RELAY, HEAT BLOWER
K58-1,2	RELAY, REVERSING VALVE
K117	RELAY, BLOWER CONTROL
K132, -1	RELAY, COMPRESSOR 1 ON
K133,-1	RELAY, COMPRESSOR 2 ON
K186	RELAY, COOL BLOWER
L1	VALVE, REVERSING 1
L2	VALVE, REVERSING 2
S4	SWITCH, LIMIT HI PRESS COMP 1
S5	SWITCH, LIMIT HI TEMP COMP 1
S6	SWITCH, DEFROST COMPR 1
S7	SWITCH, LIMIT HI PRESS COMP 2
S8	SWITCH, LIMIT HI TEMP COMP 2
S9	SWITCH, DEFROST COMPRESSOR 2
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S84	SWITCH, LOW PRESS, LOW AMBIENT KIT, COMP 2
S104	SWITCH, DEFROST PRESS, , COMP 2
T1	TRANSFORMER, CONTROL
T18	TRANSFORMER
TB2	TERMINAL STRIP, UNIT
TB13	TERMINAL STRIP, POWER DISTRIBUTION

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

1. NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
2. TB2 IS USED ON "M" VOLTAGE UNITS ONLY
3. MITSUBISHI VFD

08/14	WIRING DIAGRAM	08/14
	537723-01	
HEAT PUMP - MSAV		
ZHA - 092, 102, 120 - G, J, M, Y		
	SECTION B	REV. 0
Supersedes	New Form No. 537723-01	

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 24VAC 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- K186 relay is energized and K186 N.O. contacts close.

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

W1 Heating Demand:

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