LENNOX Service Literature®

UNIT INFORMATION
Corp. 0635-L6
Revised August 2015

15CHPX
2 to 5 Ton (7.0 to 17.6 kW)

15CHPX SERIES UNITS

The 15CHPX packaged heat pump units are available in sizes ranging from 2 through 5 tons (7.0 through 17.6 kW). The 15CHPX unit is designed for HFC-410A refrigerant and for outdoor residential use only. Units can be installed at ground level or rooftop applications. Optional field installed supplemental electric heat is available in 5, 7.5, 10, 15 and 20 kW.

The 15CHPX units utilize a scroll compressor. It operates much like a standard compressor, but the scroll compressor is unique in the way that it compresses refrigerant. The compressor has overload protection.

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.

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause personal injury, loss of life, or damage to property.

Installation and service must be performed by a licensed professional installer (or equivalent), service agency or the gas supplier.

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 unit, the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface before performing any service procedure.

⚠ IMPORTANT

Operating pressures and pressure switch settings in HFC-410A units are higher than pressures and switch settings in HCFC-22 units. Always use service equipment rated for HFC-410A if servicing a HFC-410A unit.

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SPECIFICATIONS

General Data		Model No.	15CHPXA -24	15CHPXA -30	15CHPXA -36	15CHPXA -42	15CHPXA -48	15CHPXA -60
		Nominal Tonnage	2	2.5	3	3.5	4	5
Cooling/ Heating Performance	Cooling	Total Capacity - Btuh	24,000	29,000	36,000	40,000	51,000	59,500
		Total unit watts	1905	2415	3000	3200	4250	5130
		[1] SEER (Btuh/Watt)	15.0	14.0	14.0	15.0	14.0	14.0
		EER (Btuh/Watt)	12.6	12.0	12.0	12.5	12.0	11.6
	High Temp Heat	Total Capacity - Btuh	23,200	30,000	33,800	40,500	49,000	59,000
		Total unit watts	1890	2475	2750	3390	4225	5085
		COP	3.6	3.55	3.6	6.5	3.4	3.4
		HSPF - Region IV / Region V	8.0 / 6.96	8.0 / 6.96	8.0 / 6.96	8.0 / 6.96	8.0 / 6.96	8.0 / 6.96
	Low Temp Heat	Total Capacity - Btuh	14,000	17,500	20,200	24,800	29,000	36,000
		Total unit watts	1785	2185	2520	3230	3695	4490
		COP	2.3	2.35	2.35	2.25	2.3	2.35
		[2] Sound Rating Number	78	78	78	79	79	79
		Refrigerant Type	HFC-410A	HFC-410A	HFC-410A	HFC-410A	HFC-410A	HFC-410A
		Refrigerant Charge	8 lbs. 2 oz.	8 lbs. 1 oz.	8 lbs. 8 oz.	11 lbs. 12 oz.	12 lbs. 9 oz.	10 lbs. 10oz.
Outdoor Coil		Net face area - sq. ft.	15.1	15.1	15.1	22	22	22
		Tube dia. - in. & No. of rows	5/16 - 2	5/16 - 2	5/16 - 2	5/16 - 2	5/16 - 2	5/16 - 2
		Fins per inch (m)	22	22	22	22	22	22
Outdoor Coil Fan		Diameter - in. & No. of blades	22 - 3	22 - 3	22 - 3	22 - 3	22 - 3	22 - 3
		Motor horsepower	1/5	1/5	1/5	1/4	1/4	1/4
		Air Volume - cfm	2300	2300	2300	3900	3900	3900
		Motor watts	175	175	175	295	295	295
Indoor Coil		Net face area - sq. ft.	4.67	4.67	4.67	6.0	6.0	6.0
		Tube dia. - in. & No. of rows	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 3	3/8 - 4	3/8 - 4
		Fins per inch	14	14	14	14	14	14
Indoor Blower		Blower wheel size dia. x width - in.	10 x 6	10 x 6	10 x 8	10 x 10	10 x 10	10 x 10
		Motor horsepower	1/2	1/2	1/2	3/4	3/4	3/4
Net weight of basic unit			360	360	385	510	520	545
Shipping weight of basic unit (1 Pkg.)			410	410	440	550	570	600
Electrical characteristics (60 hz)			208/230V-1ph-60hz					

NOTE - Extremes of operating range are plus and minus 10% of line voltage.
[1] Annual Fuel Utilization Efficiency based on U.S. DOE test procedures and FTC labeling regulations.
[2] Rated in accordance with ARI Standard 210/240; 95°F outdoor air temperature, 80°F db / 67°F wb entering evaporator air.
[3] Filters are not furnished and must be field provided. 1, 2 or 4 inch thick filters can be used.
[4] HACR type circuit breaker or fuse.
[5] Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRIC HEAT CAPACITIES

Input Voltage	5 kW			7.5 kW			10 kW			15 kW			20 kW		
	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output	No of Steps	kW input	Btuh Output
208	1	3.8	12,800	1	5.6	19,200	1	7.5	17,900	1	11.2	38,200	1	15.0	51,200
220	1	4.2	14,300	1	6.3	21,500	1	8.4	20,100	1	12.6	43,000	1	16.8	57,300
230	1	4.6	15,700	1	6.9	23,500	1	9.2	21,900	1	13.8	47,000	1	18.4	62,700
240	1	5.0	17,100	1	7.5	25,600	1	10.0	23,900	1	15.0	51,200	1	20.0	68,200

ELECTRICAL/ELECTRIC HEAT DATA

				Model No.	15CHPXA-24	15CHPXA-30	15CHPXA-36	15CHPXA-42	15CHPXA-48	15CHPXA-60
				Line voltage data - 60hz 1 phase	208/230V	208/230V	208/230V	208/230V	208/230V	208/230V
Compressor				Rated Load Amps	13.5	14.1	16.6	17.9	21.8	26.4
				Locked Rotor Amps	59	73	79	112	117	134
Outdoor Fan Motor				Full Load Amps	1.1	1.1	1.1	1.7	1.7	1.7
				Locked Rotor Amps	2.2	2.2	2.2	4	4	4
Indoor Blower Motor				Rated Load Amps	1.5	1.5	1.5	2.7	2.7	2.7
				Locked Rotor Amps	3	3	4	5	5	5
[1] Maximum Overcurrent Protection				Unit only, no electric heat	30	30	35	40	50	60
	Electric Heat & Blower Motor Circuit		**5 kW**		35	35	35	35	35	35
			7.5 kW		45	45	45	50	50	50
			10 kW		60	60	60	60	60	60
		15 kW		Circuit 1	- - -	- - -	60	60	60	60
				Circuit 2	- - -	- - -	30	30	30	30
		20 kW		Circuit 1	- - -	- - -	- - -	60	60	60
				Circuit 2	- - -	- - -	- - -	60	60	60
[2] Minimum Circuit Ampacity				Unit only, no electric heat	21	22	25	29	34	39
	Electric Heat & Blower Motor Circuit		**5 kW**		31.3	31.3	31.3	33.0	33.0	33.0
			7.5 kW		44.3	44.3	44.3	46.1	46.1	46.1
			10 kW		57.3	57.3	57.3	59.1	59.1	59.1
		15 kW		Circuit 1	- - -	- - -	57.3	59.1	59.1	59.1
				Circuit 2	- - -	- - -	26.0	26.0	26.0	26.0
		20 kW		Circuit 1	- - -	- - -	- - -	59.1	59.1	59.1
				Circuit 2	- - -	- - -	- - -	52.1	52.1	52.1

NOTE - Circuit 1 Minimum Circuit Ampacity includes the Blower Motor Full Load Amps.
NOTE - Extremes of operating range are plus and minus 10% of line voltage.
1 HACR type breaker or fuse.
2 Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

15CHPX PARTS ARRANGEMENT

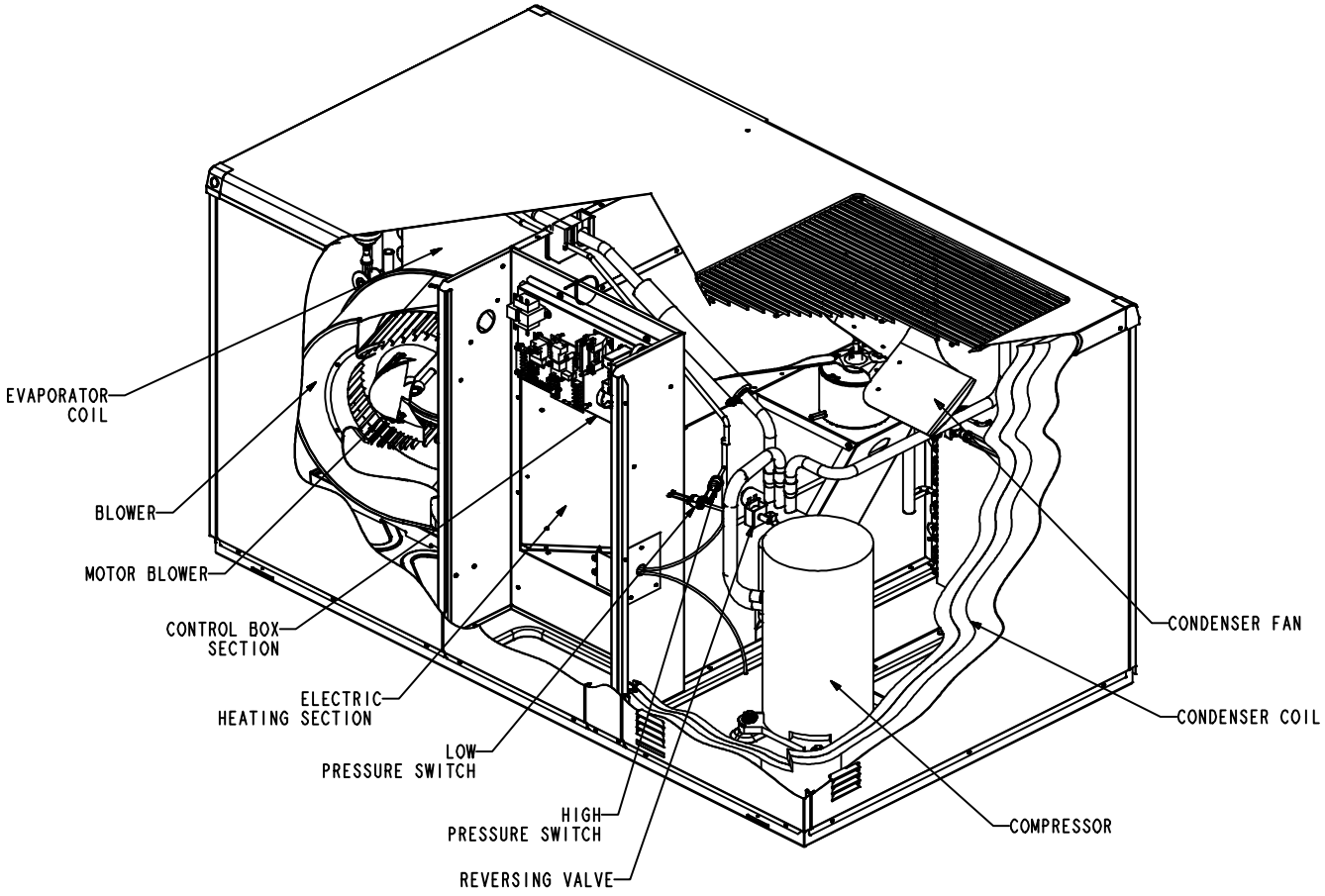


FIGURE 1

15CHPX CONTROL BOX

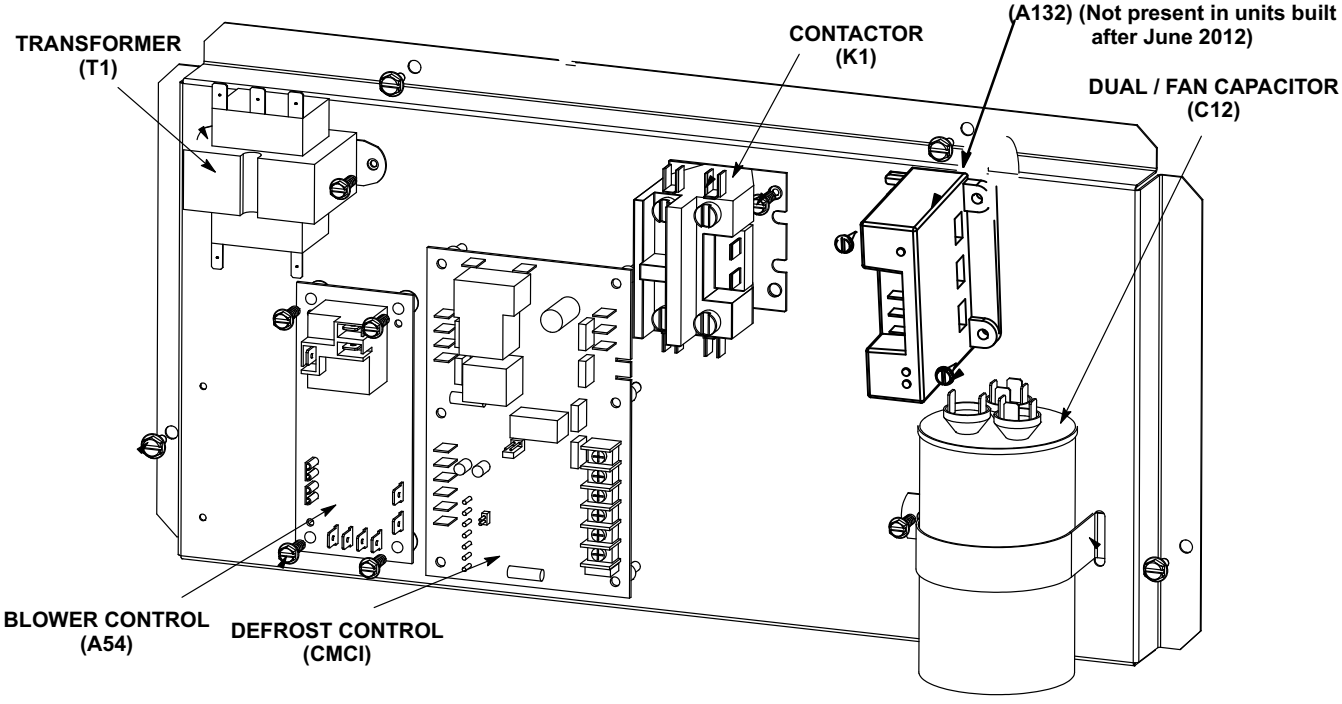


FIGURE 2

I-APPLICATION

15CHP(X)2 through 5 ton (7.0 through 17.6kW) model units are single phase packaged heat pump units designed for outdoor installation on a slab or rooftop. The units are available in two cabinet sizes. Electric heat can be factory or field installed if required. Refer to the Engineering Handbook for more specific application data.

II-UNIT COMPONENTS

15CHP(X) components are shown in figure 1. Control box components are shown in figure 2.

A-Control Box Components

1-Compressor Contactor K1

K1 is a 24VAC to line voltage s ingle pole double break contactor, which energizes the compressor in response to thermostat demand.

2-Control Transformer T1

All 15CHPX series units use line voltage to 24VAC transformer mounted in the control box. The transformer supplies power to control circuits in the unit. Transformers use two primary voltage taps as shown in figure 3.

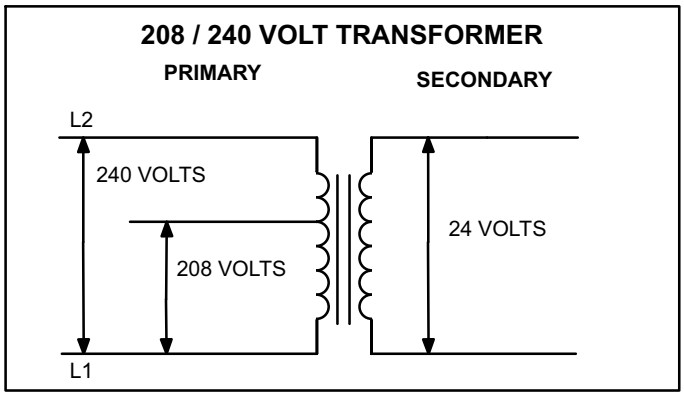


FIGURE 3

3-Dual Capacitor C12

The compressor and condenser fan in the 15CHPX series units use permanent split capacitor motors. The capacitor is located in the control box. A dual rated capacitor is used for both the condenser fan motor and the compressor (see unit wiring diagram per respective unit). The fan side and the compressor side of the capacitor have different MFD ratings. See side of capacitor for ratings.

4- Blower Control A54

⚠ 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.

15CHPX units are equipped with a variable speed motor that is capable of maintaining a specified CFM throughout the external static range. A particular CFM can be obtained by positioning jumpers (**COOL**, **HEAT**, and **ADJUST**) on the blower control board. The HEAT and COOL jumpers are labeled A, B, C and D. Each of the numbers corresponds with an air volume (CFM) setting. The **ADJUST** jumper is labeled Test, -, +, and Norm. The + and - pin settings are used to add or subtract a percentage of the CFM selected. The Test jumper is used to operate the motor in the test mode. See figure 5.

Factory settings for the blower speed jumpers are given in the wiring diagram. Figure 5 shows the blower control board. Use tables 1, 2 and 3 to determine the correct air volume for operation in heat and cool mode.

The CFM LED located on the blower control board flashes one time per 100 cfm to indicate selected blower speed. For example, if the unit is operating at 1000 CFM, **CFM** LED will flash 10 times. If the CFM is 1150, **CFM** LED will flash 11 full times plus one fast or half flash.

At times the light may appear to flicker or glow. This takes place when the control is communicating with the motor between cycles. This is normal operation.

Read through the jumper settings section before adjusting the jumper to obtain the appropriate blower speed.

To change jumper positions, gently pull the jumper off the pins and place it on the desired set of pins. The following section outlines the different jumper selections available and conditions associated with each one. Refer to figure 5.

After the CFM for each application has been determined, the jumper settings must be adjusted to reflect those given in tables 1, 2 and 3. From the tables, determine which row most closely matches the desired CFM. Once a specific row has been chosen (+, NORMAL, or -), CFM volumes from other rows cannot be used. Below are descriptions of the jumper selections.

The variable speed motor slowly ramps up to and down from the selected air flow during both cooling and heating demand. This minimizes noise and eliminates the initial blast of air when the blower is initially energized.

ADJUST

The **ADJUST** pins allow the motor to run at normal speed, approximately 15 percent higher, or approximately 15 percent lower than normal speed. Tables 1, 2 and 3 give three rows (+, NORMAL, and -) with their respective CFM volumes. Notice that the normal adjustment setting for cool speed position D in table 1 is 900 CFM. The + adjustment setting for that position is 1035 CFM and for the - adjustment setting is 765 CFM. After the adjustment setting has been determined, choose the remaining speed settings from those offered in the table in that row.

The TEST pin is available to bypass the blower control and run the motor at approximately 70 percent to make sure that the motor is operational. This is used mainly in troubleshooting. The G terminal must be energized for the motor to run.

COOL

The **COOL** jumper is used to determine the CFM during cooling operation. This jumper selection is activated for cooling when Y1 is energized.

The blower motor runs at 80 percent of the selected air flow for the first 7-1/2 minutes of each cooling demand. This feature allows for greater humidity removal and saves energy.

In the cooling mode, the blower control board delays blower operation for 5 seconds after the compressor starts. The blower continues to operate for 90 seconds after the compressor is de-energized.

HEAT

The **HEAT** jumper is used to determine CFM during backup electric heat operation only. These jumper selections are activated only when W is energized.

In the backup heat mode, the blower continues to operate for 2 minutes after the heating demand is satisfied.

NOTE - Due to the nature of electric heat, CFM settings are limited.

CONTINUOUS FAN

When the thermostat is set for “Continuous Fan” operation and there is no demand for heating or cooling, the blower control will provide 50 percent of the **COOL** CFM selected.

NOTE - With the proper thermostat and subbase, continuous blower operation is possible by closing the R to G circuit. Cooling blower delay is also functional in this mode.

DEHUMIDIFICATION

The blower control board includes an HUM terminal which provides for connection of a humidistat. The JV1 resistor on the blower control board must be cut to activate the HUM terminal. The humidistat must be wired to open on humidity rise. When the dehumidification circuit is used, the variable speed motor will reduce the selected air flow rate by 25 percent when humidity levels are high. An LED (D1) lights when the blower is operating in the dehumidification mode.

5- System Operation Monitor (LSOM) (Not present in units built after June 2012)

The system operation monitor (A132) detects the most common fault conditions in the air conditioning system. When an abnormal condition is detected, the module communicates the specific condition through its ALERT and TRIP lights. The module is capable of detecting both mechanical and electrical system problems. See figure 4 for the system operation monitor.

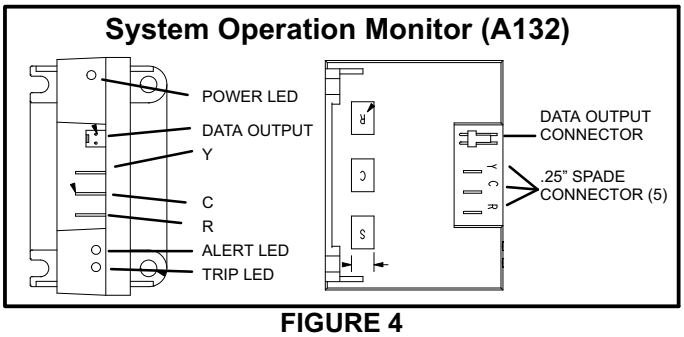


FIGURE 4

⚠ IMPORTANT

This monitor does not provide safety protection. The monitor is a monitoring device only and cannot control or shut down other devices.

LSOM LED Functions

Power LED (green) -- Voltage within the range of 19-28VAC is present at the system monitor power connection.

Alert LED (yellow) -- Communicates an abnormal system condition through a unique flash code. The alert LED flashes a number of times consecutively; then pauses; then repeats the process. This consecutive flashing corresponds with a particular abnormal condition.

Trip LED (red) -- Indicates a demand signal from the thermostat; but detects no current to the compressor.

Flash code number -- Corresponds to a number of LED flashes, followed by a pause, and then repeated.

Trip & Alert LEDs flashing simultaneously -- Indicates that the control circuit voltage is too low for operation.

Reset ALERT flash code by removing 24VAC power from monitor. Last ALERT flash code will display for 1 minute after monitor is powered on.

LSOM codes are given in table 4.

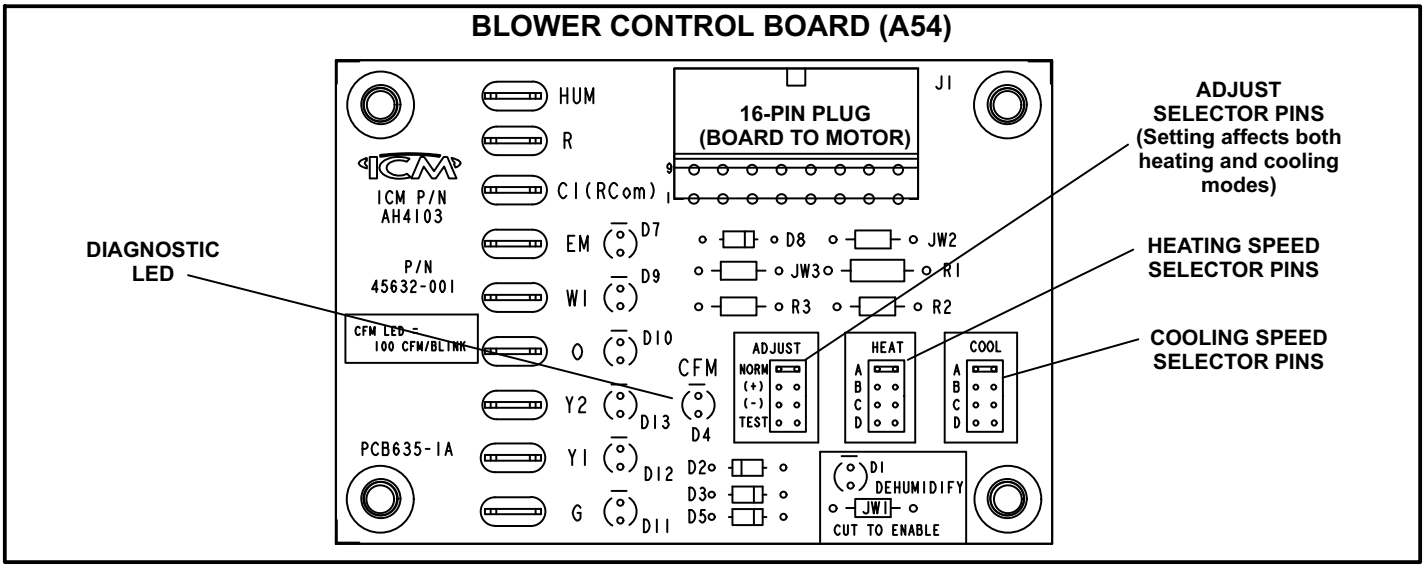


FIGURE 5

TABLE 1
15CHPX-24, 15CHPX-30 Blower Performance
0 through 0.80 in. w.g. (0 through 200 Pa) External Static Pressure Range

"ADJUST" Jumper Setting	Jumper Speed Positions																			
	"COOL" Speed								"HEAT" Speed								"CONTINUOUS FAN" Speed							
	A		B		C		D		A		B		C		D		A		B		C		D	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
+	1150	545	920	435	690	325	1035	490	1150	545	1150	545	1150	545	1150	545	575	270	460	215	345	165	520	245
NORM	1000	470	800	380	600	285	900	425	1000	470	1000	470	1000	470	1000	470	500	235	400	190	300	140	450	210
-	850	400	680	320	510	240	765	360	1000	470	1000	470	1000	470	1000	470	425	200	340	160	300	140	385	180

TABLE 2
15CHPX-36 Blower Performance
0 through 0.80 in. w.g. (0 through 200 Pa) External Static Pressure Range

"ADJUST" Jumper Setting	Jumper Speed Positions																			
	"COOL" Speed								"HEAT" Speed								"CONTINUOUS FAN" Speed							
	A		B		C		D		A		B		C		D		A		B		C		D	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
+	1380	650	1150	545	920	435	1265	575	1380	650	1380	650	1150	545	1150	545	690	325	575	270	460	215	635	300
NORM	1200	565	1000	470	800	380	1100	520	1200	565	1200	565	1000	470	1000	470	600	285	500	235	400	190	550	260
-	1020	480	850	400	680	320	935	440	1200	565	1200	565	1000	470	1000	470	510	240	425	200	350	165	470	220

TABLE 3
15CHPX-42, 15CHPX-48, 15CHPX-60, Blower Performance
0 through 0.80 in. w.g. (0 through 200 Pa) External Static Pressure Range

"ADJUST" Jumper Setting	Jumper Speed Positions																			
	"COOL" Speed								"HEAT" Speed								"CONTINUOUS FAN" Speed							
	A		B		C		D		A		B		C		D		A		B		C		D	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
+	2070	975	1840	870	1610	760	1380	650	1610	760	1610	760	1610	760	1610	760	1035	490	920	435	805	380	690	325
NORM	1800	850	1600	755	1400	660	1200	565	1400	660	1400	660	1400	660	1400	660	900	425	800	380	700	330	600	285
-	1530	720	1360	640	1190	560	1020	480	1400	660	1400	660	1400	660	1400	660	765	360	680	320	595	280	510	240

TABLE 4

Lennox System Operation Monitor LED Troubleshooting Codes (Not present in units built after June 2012)		
Status LED Condition	**Status LED Description**	**Status LED Troubleshooting Information**
Green "Power" LED ON	Module has power	24VAC control power is present at the module terminal.
Green "Power" LED OFF	Module not powering up	Determine/verify that both R and C module terminals are connected and voltage is present at both terminals.
Red "Trip" LED ON	System and compressor check out OK	1. Verify Y terminal is connected to 24VAC at contactor coil. 2. Verify voltage at contactor coil falls below 0.5VAC when off. 3. Verify 24VAC is present across Y and C when thermostat demand signal is present; if not present, R and C wires are reversed.
	Thermostat demand signal Y1 is present, but compressor not running	1. Compressor protector is open. 2. Outdoor unit power disconnect is open. 3. Compressor circuit breaker or fuse(s) is open. 4. Broken wire or connector is not making contact. 5. Low pressure switch open if present in the system. 6. Compressor contactor has failed to close.
Red "Trip" & Yellow "Alert" LEDs Flashing	Simultaneous flashing.	Indicates that the control circuit voltage is too low for operation.
Yellow "Alert" Flash Code 1*	**Long Run Time** - Compressor is running extremely long run cycles	1. Low refrigerant charge. 2. Evaporator blower is not running. 3. Evaporator coil is frozen. 4. Faulty metering device. 5. Condenser coil is dirty. 6. Liquid line restriction (filter drier blocked if present). 7. Thermostat is malfunctioning.
Yellow "Alert" Flash Code 2*	**System Pressure Trip** - Discharge or suction pressure out of limits or compressor overloaded	1. High head pressure. 2. Condenser coil poor air circulation (dirty, blocked, damaged). 3. Condenser fan is not running. 4. Return air duct has substantial leakage. 5. If low pressure switch is present, see Flash Code 1 info.
Yellow "Alert" Flash Code 3*	**Short Cycling** - Compressor is running only briefly	1. Thermostat demand signal is intermittent. 2. Time delay relay or control board is defective. 3. If high pressure switch is present, see Flash Code 2 info. 4. If low pressure switch is present, see Flash Code 1 info.
Yellow "Alert" Flash Code 4*	**Locked Rotor**	1. Run capacitor has failed. 2. Low line voltage (contact utility). 3. Excessive liquid refrigerant in the compressor. 4. Compressor bearings are seized.
Yellow "Alert" Flash Code 5*	**Open Circuit**	1. Outdoor unit power disconnect is open. 2. Unit circuit breaker or fuse(s) is open. 3. Unit contactor has failed to close. 4. High pressure switch is open and requires manual reset. 5. Open circuit in compressor supply wiring or connections. 6. Unusually long compressor protector reset time due to extreme ambient temperature. 7. Compressor windings are damaged.
Yellow "Alert" Flash Code 6*	**Open Start Circuit** - Current only in run circuit	1. Run capacitor has failed. 2. Open circuit in compressor start wiring or connections. 3. Compressor start winding is damaged.
Yellow "Alert" Flash Code 7*	**Open Run Circuit** - Current only in start circuit	1. Open circuit in compressor start wiring or connections. 2. Compressor start winding is damaged.
Yellow "Alert" Flash Code 8*	**Welded Contactor** - Compressor always runs	1. Compressor contactor failed to open. 2. Thermostat demand signal not connected to module.
Yellow "Alert" Flash Code 9*	**Low Voltage** - Control circuit <17VAC	1. Control circuit transformer is overloaded. 2. Low line voltage (contact utility).
*Flash code number corresponds to a number of LED flashes, followed by a pause, and then repeated. Reset ALERT flash code by removing 24VAC power from monitor; last code will display for 1 minute after monitor is powered on.		

6-Defrost Control CMC1

15CHPX units are equipped with a defrost control board that includes the combined functions of time/temperature defrost control, defrost relay, diagnostic LEDs and a low voltage terminal strip. See figure 6.

The control provides automatic switching from call for heating to defrost mode and back. During the compressor cycle (call for defrost), the control accumulates compressor run time at 30, 60 or 90-minute field-adjustable intervals. If the defrost thermostat is closed when the selected compressor run time interval ends, the defrost relay is energized and the defrost begins.

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. The maximum defrost period is 14 minutes and is not adjustable. See figure 6 for the location of the defrost interval timing pins.

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 jumper is in the TEST position at power up, the control will ignore the test pins. When the jumper is placed across the TEST pins for 2 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 thermostat 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 reapplied.

The defrost control board includes a **compressor delay** function which cycles the compressor off for 30 seconds while going into and coming out of the defrost cycle. This function is activated when the jumper is removed from the compressor delay pins.

NOTE -- The 30-second compressor delay is not functional when the TEST pins are jumpered.

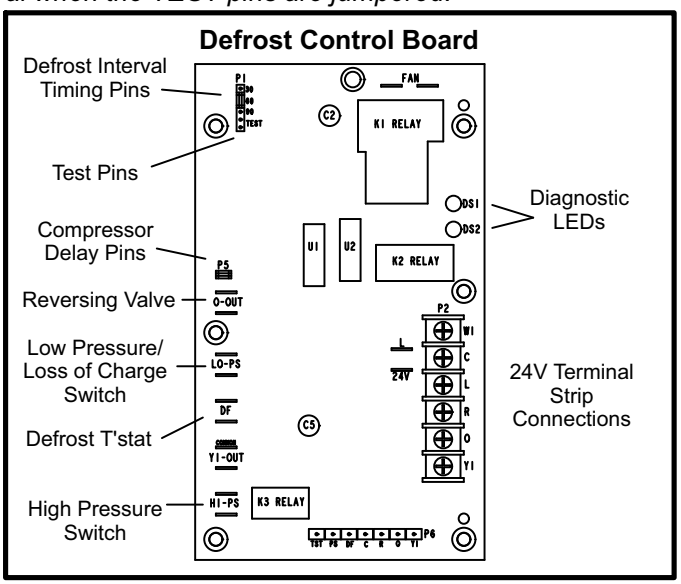


FIGURE 6

The **defrost thermostat** is located on the liquid line between the check/expansion valve and the distributor. When the defrost thermostat senses a liquid line temperature of 42°F or cooler, the thermostat contacts close and send a signal to the defrost control board to begin the defrost timing. The defrost thermostat also terminates the defrost when the liquid line temperature warms to 70°F.

The defrost control board includes **HI-PS and LO-PS terminals** to receive signals from the unit high pressure switch and loss of charge switch.

During a single demand cycle, the defrost control locks out compressor operation after the fifth time that the circuit is interrupted by any pressure switch wired to the control board. In addition, the diagnostic LEDs indicate a locked-out pressure switch after the fifth open pressure switch occurrence. Compressor operation remains locked out until power to the board is interrupted, then re-established, or until the jumper is applied to the TEST pins for 0.5 seconds.

NOTE -- The defrost control board ignores input from the loss of charge switch terminals as follows:

During the test mode;

During the defrost cycle;

During the 90-second start-up period;

During the first 90 seconds following a reversing valve switch between the heating and cooling modes.

EXCEPTION -- If the TEST pins are jumpered and the 5-minute delay is being bypassed, the LO-PS terminal signal is not ignored during the 90-second start-up period.

The **defrost control board includes two diagnostic LEDs. LED codes indicate operating status. The diagnostics codes are given in table 5.**

TABLE 5
Defrost Control Board Diagnostic LEDs

Mode	Green LED (DS2)	Red LED (DS1)
No power to board	OFF	OFF
Normal Operation / Power to Board	Simultaneous Slow Flash	
Anti-Short Cycle Lockout	Alternating Slow Flash	
Low Pressure Switch Fault	OFF	Slow Flash
Low Pressure Switch Lockout	OFF	ON
High Pressure Switch Fault	Slow Flash	OFF
High Pressure Switch Lockout	ON	OFF

B-Blower Compartment

Access panels can easily be removed for service.

1-Blower Wheel

Blower wheel size varies between models. See SPECIFICATIONS.

2-Variable Speed Motor (B3)

15CHPX units use a three-phase, electronically controlled D.C. brush-less motor (controller converts single phase a.c. to three phase D.C.), with a permanent-magnet-type rotor (figure 7). Because this motor has a permanent magnet rotor it does not need brushes like conventional D.C. motors.
Internal components are shown in figure 8. The stator windings are split into three poles which are electrically connected to the controller. This arrangement allows motor windings to turn on and off in sequence by the controller.

A solid-state controller is permanently attached to the motor. The controller is primarily an A.C. to D.C. converter. Converted D.C. power is used to drive the motor. The controller contains a microprocessor which monitors varying conditions inside the motor (such as motor workload).

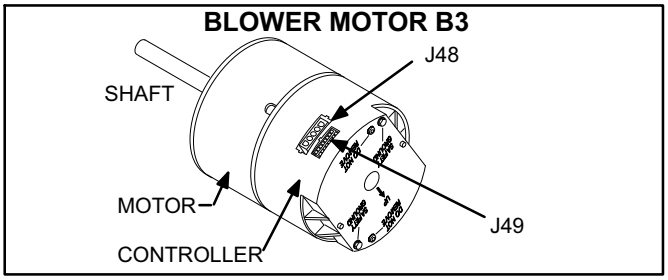


FIGURE 7

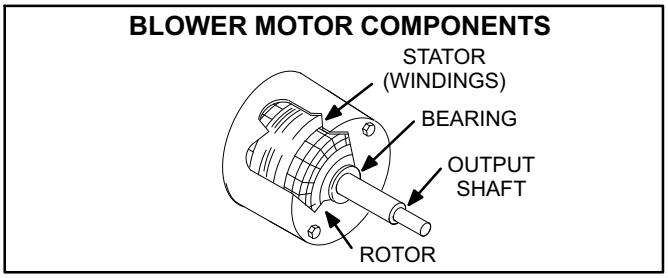


FIGURE 8

The controller uses sensing devices to sense what position the rotor is in at any given time. By sensing the position of the rotor and then switching the motor windings on and off in sequence, the rotor shaft turns the blower.

All blower motors use single phase power. An external run capacitor is not used. The motor uses permanently lubricated ball-type bearings.

Internal Operation

Each time the controller switches a stator winding (figure 8) on and off, it is called a “pulse.” The length of time each pulse stays on is called the “pulse width.” By varying the pulse width , the controller varies motor speed (called “pulse-width modulation”). This allows for precise control of motor speed and allows the motor to compensate for varying load conditions as sensed by the controller. In this case, the controller monitors the static workload on the motor and varies motor rpm in order to maintain constant airflow (cfm).

The motor controller is driven by the blower control board (figure 5). The board receives its demand (PWM signal or fixed 24 VAC or VDC signal) from optional controls such as the Harmony zone control system, Lennox SignatureStat™ or a conventional thermostat.

Motor rpm is continually adjusted internally to maintain constant static pressure against the blower wheel. The controller monitors the static work load on the motor and motor amp-draw to determine the amount of rpm adjustment. Blower rpm may be adjusted any amount in order to maintain a constant cfm as shown in Blower Ratings Tables (1, 2 and 3). The cfm remains relatively stable over a broad range of static pressure. Since the blower constantly adjusts rpm to maintain a specified cfm, motor rpm is not rated. Hence, the terms “cool speed” , “heat speed ” or “speed tap” if used in this manual, on the unit wiring diagram and on blower B3, refer to blower cfm regardless of motor rpm.

When Harmony is used, speed taps are overridden and a PWM signal generated by the Harmony controller continuously varies motor speed based upon zone demands.

Initial Power Up

When line voltage is applied to B3, there will be a large inrush of power lasting less than 1/4 second. This inrush charges a bank of DC filter capacitors inside the controller. If the disconnect switch is bounced when the disconnect is closed, the disconnect contacts may become welded. Try not to bounce the disconnect switch when applying power to the unit.

Motor Start-Up

When B3 begins start-up, the motor gently vibrates back and forth for a moment. This is normal. During this time the electronic controller is determining the exact position of the rotor. Once the motor begins turning, the controller slowly eases the motor up to speed (this is called “soft-start”). The motor may take as long as 10-15 seconds to reach full speed. If the motor does not reach 200rpm within 13 seconds, the motor shuts down. Then the motor will immediately attempt a restart. The shutdown feature provides protection in case of a frozen bearing or blocked blower wheel. The motor may attempt to start eight times. If the motor does not start after the eighth try, the controller locks out. Reset controller by momentarily turning off power to unit.

The DC filter capacitors inside the controller are connected electrically to the speed tap wires. The capacitors take approximately 5 minutes to discharge when the disconnect is opened. For this reason it is necessary to wait at least 5 minutes after turning off power to the unit before attempting to change speed taps.

⚠ DANGER

Disconnect power from unit and wait at least five minutes to allow capacitors to discharge before attempting to adjust motor speed tap settings. Failure to wait may cause personal injury or death.

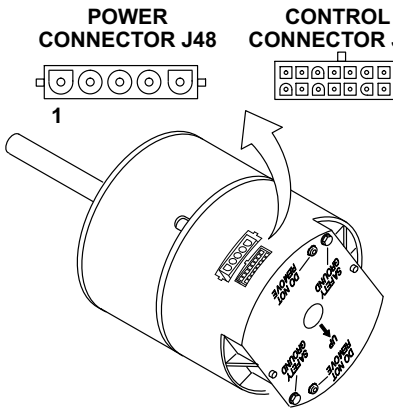
External Operation (Speed Tap Priority)

Figure 9 shows the two quick-connect jacks (J48 and J49) which connect the motor to the 15CHPX. Jack J48 is the power plug and jack J49 connects the unit controls to the motor.

Line voltage must be applied to J48 pin 5 in order for the motor to operate. When using 120VAC pins 1 and 2 must be jumpered. When control voltage is applied to J49 pin 3 and 15, the motor is energized on the continuous fan mode.

When voltage is applied to J49 pin 2 in addition to pin 3 and 15 (first stage heating), the blower is energized on the low speed heating tap. When voltage is applied to J49 pin 13 in addition to pin 3 and 15 (second stage heating), the blower is energized on the high speed heating tap. The motor assigns priority to J49 pin 2 so that if a call for cooling and a call for heating are concurrent, heating call overrides and the blower operates on high speed heating tap.

BLOWER B3 HARNESS CONNECTORS



J49
PIN 1 - C1
PIN 2 - W / W1
PIN 3 - C2
PIN 4 - Delay
PIN 5 - Cool
PIN 6 - Y1
PIN 7 - Adjust
PIN 8 - 0ut
PIN 9 - 0
PIN 10 - DS(PWM)
PIN 11 - Heat
PIN 12 - R
PIN 13 - EM / W2
PIN 14 - Y / Y2
PIN 15 - G
PIN 16 - Out +

J48
PIN 1 - Jumper PIN 1 to PIN2 for 120VAC line input only.
PIN 2 - Jumper PIN 1 to PIN2 for 120VAC line input only.
PIN 3 - Ground
PIN 4 - AC Line
PIN 5 - AC Line

FIGURE 9

Precautions

If the 15CHPX or its electronically controlled blower motor is improperly or inadequately grounded, it may cause television interference (commonly known as RFI or radio frequency interference).

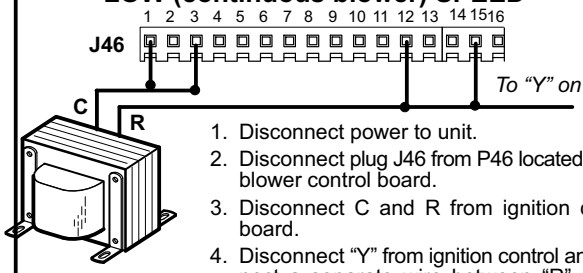
This interference is caused by internal switching frequencies of the motor controller. TV interference may show up as small specks or lines which randomly appear on the TV screen accompanied by pops or clicks in the sound. Before attempting any service, make sure the indoor unit is causing the interference. To check, disconnect power to indoor unit then check TV for continued signs of interference.

TV interference may be stopped by making sure the motor is solidly grounded to the cabinet (metal to metal) and by making sure the cabinet is solidly grounded. If TV interference persists, make sure the television (and all affected RF appliances) are moved away from the 15CHPX. Also make sure affected appliances are connected to a separate electrical circuit.

VARIABLE SPEED CHECKOUT

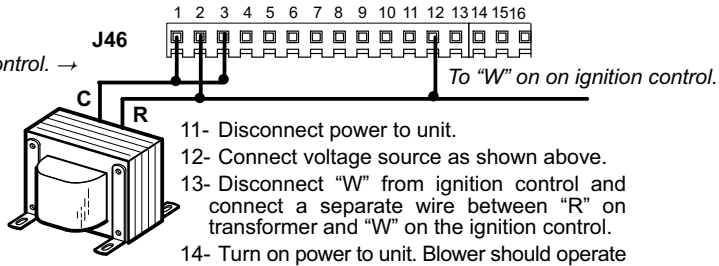
Using the transformer in the unit, test motor operation by jumping 24 volts into the terminals illustrated below for the desired speed.

LOW (continuous blower) SPEED



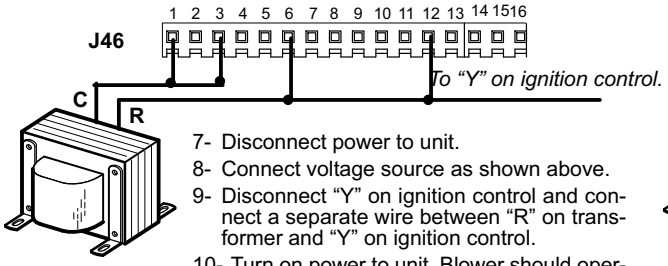
1. Disconnect power to unit.
2. Disconnect plug J46 from P46 located on the blower control board.
3. Disconnect C and R from ignition control board.
4. Disconnect "Y" from ignition control and connect a separate wire between "R" on the transformer and "Y" on the ignition control.
5. Connect voltage source as shown above.
6. Turn on power to unit. Blower should operate at LOW speed.

HEATING SPEED



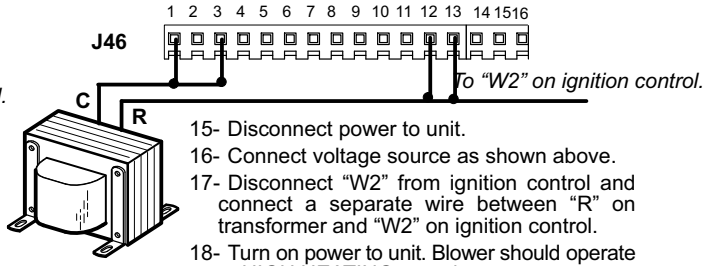
11- Disconnect power to unit.
12- Connect voltage source as shown above.
13- Disconnect "W" from ignition control and connect a separate wire between "R" on transformer and "W" on the ignition control.
14- Turn on power to unit. Blower should operate at HEATING speed.

COOLING SPEED



7- Disconnect power to unit.
8- Connect voltage source as shown above.
9- Disconnect "Y" on ignition control and connect a separate wire between "R" on transformer and "Y" on ignition control.
10- Turn on power to unit. Blower should operate at COOLING speed.

HIGH HEATING SPEED



15- Disconnect power to unit.
16- Connect voltage source as shown above.
17- Disconnect "W2" from ignition control and connect a separate wire between "R" on transformer and "W2" on ignition control.
18- Turn on power to unit. Blower should operate at HIGH HEATING speed.

J49 CONTROL CONNECTOR		VOLTAGE	WHEN VOLTAGE IS PRESENT
PIN 1	C1	Common	Low voltage transformer is powered
PIN 2	W / W1	24VAC	W1 (1st stage heating) call from thermostat
PIN 3	C2	Common	Low voltage transformer is powered
PIN 4	Delay	see note [1]	Low voltage transformer is powered
PIN 5	Cool	see note [1]	Low voltage transformer is powered
PIN 6	Y1	24VAC	Y (cooling) call from thermostat
PIN 7	Adjust	see note [1]	Low voltage transformer is powered
PIN 8	Out		Motor sends pulse signals between pin 8 and pin 16 to signal CFM
PIN 9	O	24VAC	From thermostat (in heat pump application)
PIN 10	DS / PWM	0 / 24 VAC	Low voltage is transformer is powered and humidistat operation: 24VAC = normal humidity, 0VAC = high humidity (reduced CFM)
PIN 11	Heat	see note [1]	Low voltage transformer powered
PIN 12	R	24VAC	Low voltage transformer is powered
PIN 13	EM / W2	24VAC	W2 (2nd stage heating) call from thermostat
PIN 14	Y / Y2		Not used on single stage cooling
PIN 15	G	24VAC	G is present from thermostat
PIN 16	Out		Motor sends pulse signals between pin 8 and 16 to signal CFM

[1] signal from selection taps - A tap = 0 volts, B and C taps = half wave, D tap = 24VAC

C-Cooling Components

1-Compressor B1

All 15CHPX units utilize a scroll compressor. Compressors are energized by contactors found in unit control box. Compressor specifications are found in the "ELECTRICAL DATA" section in this manual.

⚠ 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.

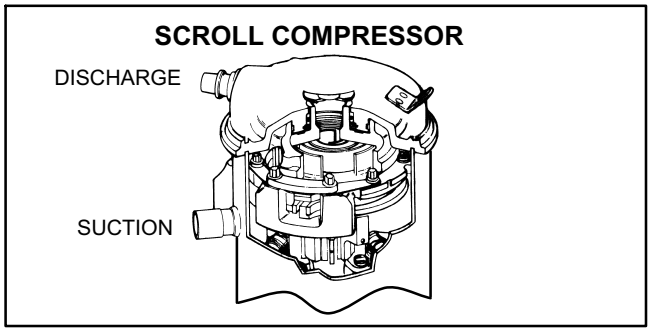


FIGURE 10

The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 10. The scrolls are located in the top of the compressor can and the motor is located in the bottom of the compressor can. The oil level is immediately below the motor.

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Two identical scrolls are mated together forming concentric spiral shapes (figure 11). One scroll remains stationary, while the other is allowed to "orbit" (figure 12). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

NOTE - The head of a scroll compressor may be hot since it is in constant contact with discharge gas.

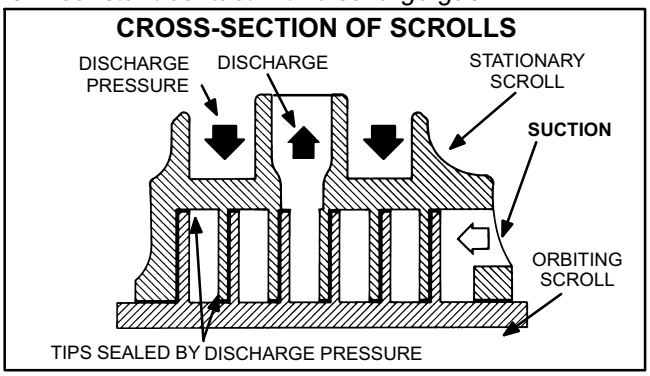


FIGURE 11

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure (figure 12 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 12 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 12 - 3). When the compressed gas reaches the center, it is discharged vertically into a chamber and discharge port in the top of the compressor (figure 10). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 11). During a single orbit, several pockets of gas are compressed simultaneously providing smooth continuous compression.

The scroll compressor is tolerant to the effects of liquid return. If liquid enters the scrolls, the orbiting scroll is allowed to separate from the stationary scroll. Continued slugging of liquid will cause damage to the scroll and replacement will be necessary. The liquid is worked toward the center of the scroll and is discharged. If the compressor is replaced, conventional Lennox cleanup practices must be used.

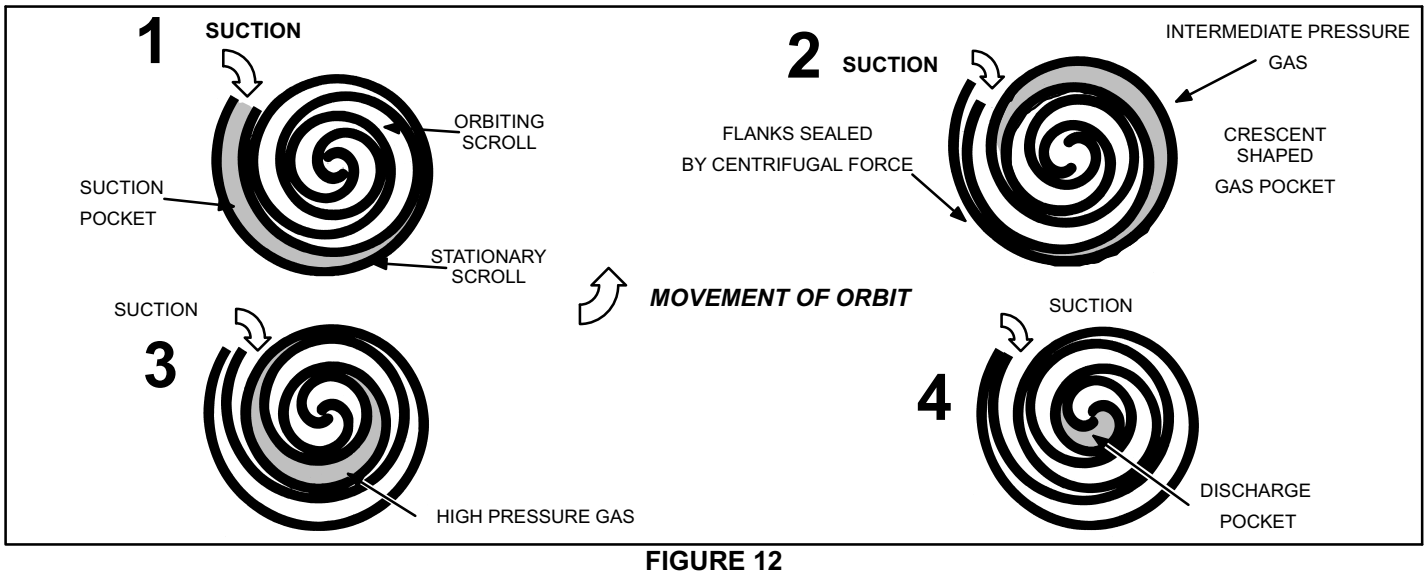


FIGURE 12

2-Condenser Fan

All 15CHP (X) units use single phase condenser fans. Specifications for the condenser fans are at the front of this manual. See figure 13 for fan and motor replacement dimensions.

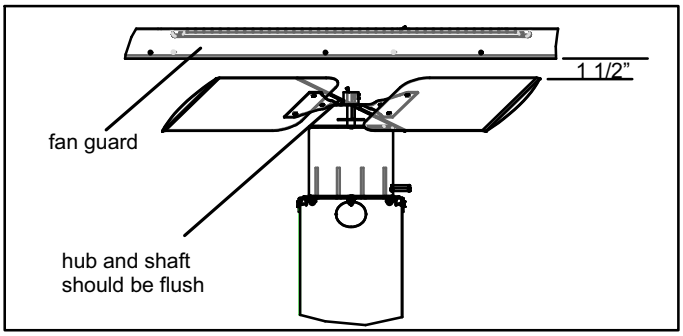


FIGURE 13

3-Reversing Valve L1

Reversing valve L1 has a 24 volt solenoid coil which reverses refrigerant flow during unit operation in all 15CHPX units. The reversing valve is in the refrigerant circuit vapor line. The reversing valve coil is energized during cooling demand and during defrost.

4-Low Pressure Switch S79

S79 is a N.C. auto-reset low pressure switch located on the suction line. The switch shuts off the compressor when suction pressure falls below the factory setting. The switch is ignored during the first 90 seconds of compressor start up and during defrost operation. On the 15CHPX the switch is set to open at 10 psi and close at 30 psi. S79 is not adjustable.

5-High Pressure Switch S4

S4 is a N.C. auto-reset high pressure switch located on the discharge line. The switch shuts off the compressor when discharge pressure rises above the factory setting. The switch on 15CHPX units is set to open at 590 ± 10 psi and close at 418 ± 10 psi. S4 is not adjustable.

III-Electric Heat

A-Matchups and Ratings

Matchups and ratings are listed with "ELECTRICAL DATA" See table of contents.

B-Electric Heat Components

See figure 14 for electric heat parts arrangement.

1- Limit Switches 1, 2, 3 and 4

Limit switches 1, 2, 3and 4 are N.C. auto-reset high temperature limits located on the electric heat vest panel. Each heating element is wired in series with a high temperature limit. When the limit opens the corresponding heating element is de-energized. All other heating elements remain energized. The limits will automatically close when temperatures return to normal. Limit rating will be on front side.

2-Heating Element HE1 through HE4

Heating elements are composed of helix-wound bare nichrome wire exposed directly to the air stream. The elements are supported by insulators mounted to the wire frame. Each element is energized independently by a corresponding relay located on the heat vest panel. Once energized, heat transfer is instantaneous.

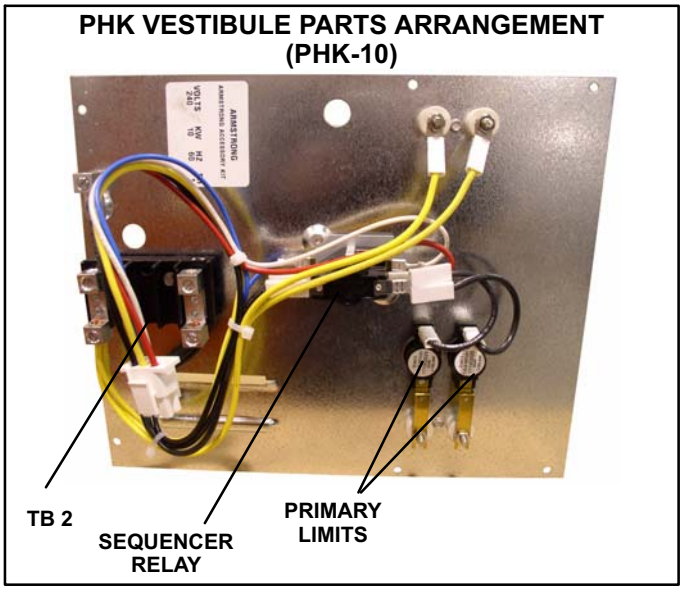


FIGURE 14

3-Terminal Strip TB2 PHK-05, -07, -10

For electric heat sections without circuit breakers or fuses, line voltage connections are made to terminal strip TB2.

4- Sequencer Relays 1 and 2

Relays 1and 2 are N.O. sequencer relays with a resistive element for a coil and bi-metal disk which actuates the contacts. The relays are located on the electric heat vest panel and are energized by a 24V heating demand (W1 and W2) via jack/plug P2 which is used to connect electric heat to the blower control circuit. When energized, the internal resistance heats the bi-metal disk causing the contacts to close. When the relay is de-energized the disk cools and the contacts open. The relays energize different stages of heat, as well as the blower. The blower is always first on and last off.

5-Circuit Breaker CB1 and CB2 (option)

PHK-15, -20,

Line voltage connections are made to circuit breakers CB1 and CB2 in electric heat sections with circuit breakers. Table 6 shows amp rating for each circuit breaker used. Two-pole circuit breakers are used.

TABLE 6

Circuit Breakers		
UNIT	CB1 AMPS	CB2 AMPS
PHK15CP	60 AMPS	30 AMPS
PHK20CP	60 AMPS	60 AMPS

IV-Charging

For maximum performance of this *cooling system,* the operating temperatures and pressure should be checked and subcooling determined at Standard ARI test conditions of 82° F outdoor temperature / 80° F indoor dry bulb / 67° F indoor wet bulb.

For maximum performance of this *heating system,* the operating temperatures and pressure should be checked and subcooling determined at Standard ARI test conditions of 43° F outdoor temperature / 70° F indoor dry bulb / 47° F indoor wet bulb.

If subcooling measured deviates from values in table 7, refrigerant charge should be adjusted accordingly for maximum performance.

TABLE 7
Subcooling Values

Unit Model No.	Cooling Mode F°	Heating Mode F°
15CHPX-24	10	25
15CHPX-30	10	20
15CHPX-36	10	15
15CHPX-42	7	30
15CHPX-48	7	15
15CHPX-60	10	30

Verify system performance using table 8 and table 9 as a general guide. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system.

Used carefully, these tables could serve as a useful service guide. Data is based on 80°F dry bulb / 67°F wet bulb return air. Allow unit operation to stabilize before taking pressure readings.

TABLE 8
Cooling Mode -- Normal Operating Pressures

80°F db / 67°F wb RETURN AIR		**Air Temperature Entering Outdoor Coil (°F)**											
UNIT	PRESSURE	65	70	75	80	82	85	90	95	100	105	110	115
15CHPX-24	Suction	143	144	146	147	148	149	150	152	153	154	156	157
15CHPX-30		140	141	142	144	144	145	146	147	149	150	152	153
15CHPX-36		142	143	144	145	145	146	146	147	148	149	150	151
15CHPX-42		135	136	138	139	140	141	143	144	147	149	151	154
15CHPX-48		142	143	145	146	147	148	149	151	152	153	155	156
15CHPX-60		137	138	140	141	142	143	145	146	148	149	151	153
15CHPX-24	Liquid	222	244	265	288	297	311	333	354	379	397	424	447
15CHPX-30		229	251	273	295	304	318	341	361	387	406	434	457
15CHPX-36		246	269	291	314	323	337	360	382	407	426	454	478
15CHPX-42		231	251	271	291	299	313	335	351	380	398	425	448
15CHPX-48		236	259	282	305	314	328	351	374	397	415	443	466
15CHPX-60		246	271	296	322	332	347	373	398	424	444	475	500

TABLE 9
Heating Mode -- Normal Operating Pressures

70°F RETURN AIR		**Air Temperature Entering Outdoor Coil (°F)**												
UNIT	PRESSURE	0	5	10	15	20	25	30	35	40	45	50	55	60
15CHPX-24	Suction	37	44	52	62	66	74	81	88	96	106	110	118	125
15CHPX-30		32	40	47	58	63	70	78	86	93	104	109	116	124
15CHPX-36		32	39	47	57	61	69	76	83	91	101	105	113	120
15CHPX-42		33	41	49	60	65	73	80	88	96	107	112	120	127
15CHPX-48		32	39	47	57	62	69	77	84	92	102	107	114	122
15CHPX-60		30	37	44	54	58	65	73	80	87	97	101	108	116
15CHPX-24	Liquid	283	291	300	312	317	326	335	343	352	364	369	378	387
15CHPX-30		273	281	290	301	306	314	322	330	339	350	355	363	371
15CHPX-36		259	266	273	283	287	294	302	309	316	326	330	337	345
15CHPX-42		300	309	319	332	338	347	357	366	376	389	395	404	414
15CHPX-48		279	284	291	302	307	314	322	330	337	348	353	360	368
15CHPX-60		318	328	339	353	359	370	380	390	401	415	421	432	442

V-Maintenance

Once a year this equipment should be serviced by a qualified technician. Service should include cleaning of outdoor coil and motors, as well as system operation check. In addition, equipment should be checked periodically during the year sure that it remains clear of shrubbery and debris and to make sure that filters are clean.

Coil

Dirt and debris should not be allowed to accumulate on the coil surfaces or other parts in the air conditioning circuit. Cleaning should be performed as often as necessary. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean the coil, be sure the power to unit is shut off prior to cleaning.

NOTE - Care should be used when cleaning the coil so that the coil fins are not damaged.

Do not permit the condenser air discharge to be obstructed by overhanging structures or shrubs.

Motors

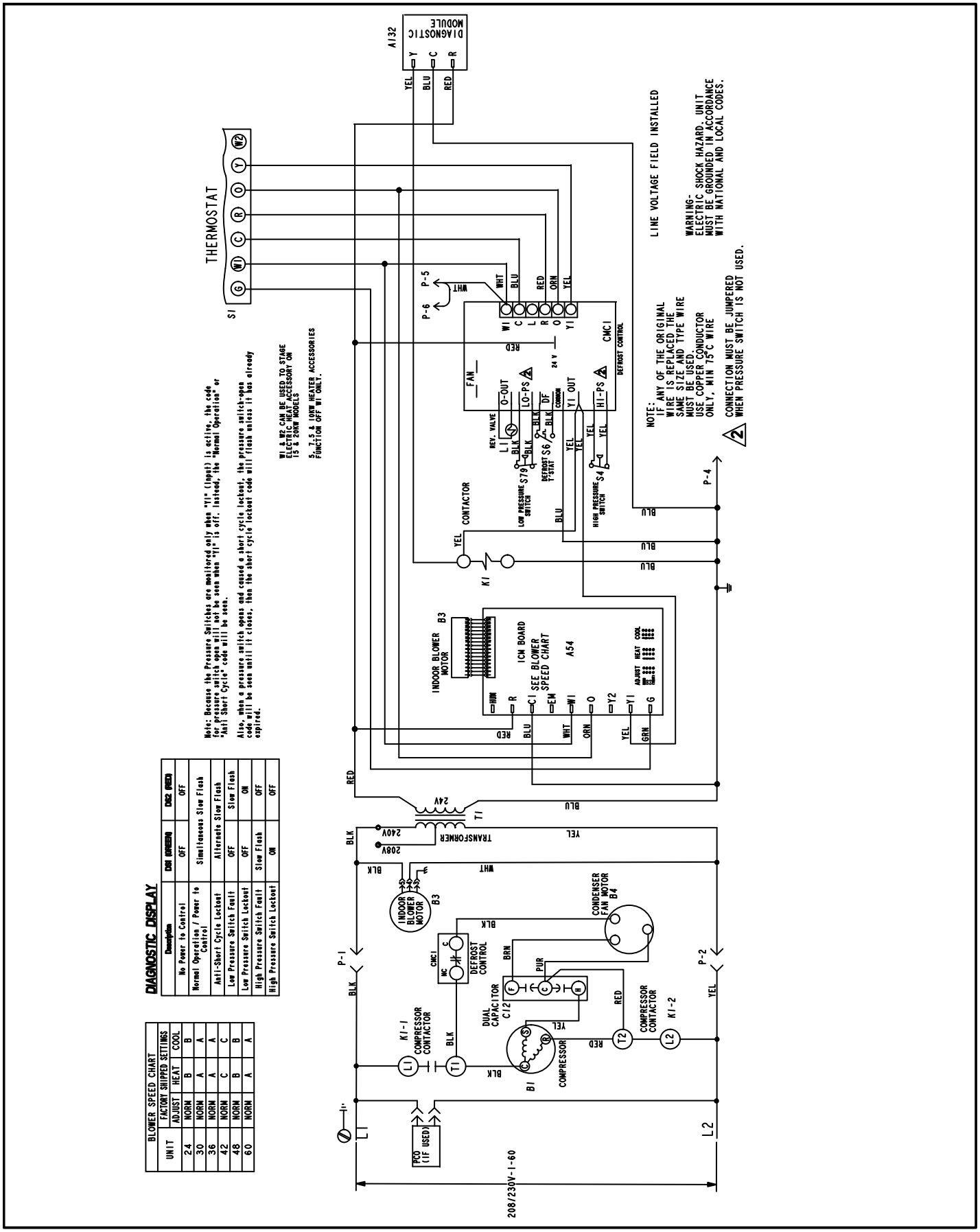
The indoor and outdoor fan motors are permanently lubricated and require no further lubrication. Motors should be cleaned yearly to prevent the accumulation of dust and dirt on the windings or motor exterior.

Filters

Filters are field-supplied and installed. Inspect the filter once a month. Replace disposable filters or clean permanent-type filters as necessary. Dirty filters are the most common cause of inadequate heating or cooling performance. Replace existing filter with a filter of like type and size. DO NOT replace a permanent-type filter with a disposable filter. Install new/clean filters with the arrows on the edge pointing in the direction of airflow.

VI-Wiring Diagram and Sequence of Operation

A-15CHPX Unit Diagrams

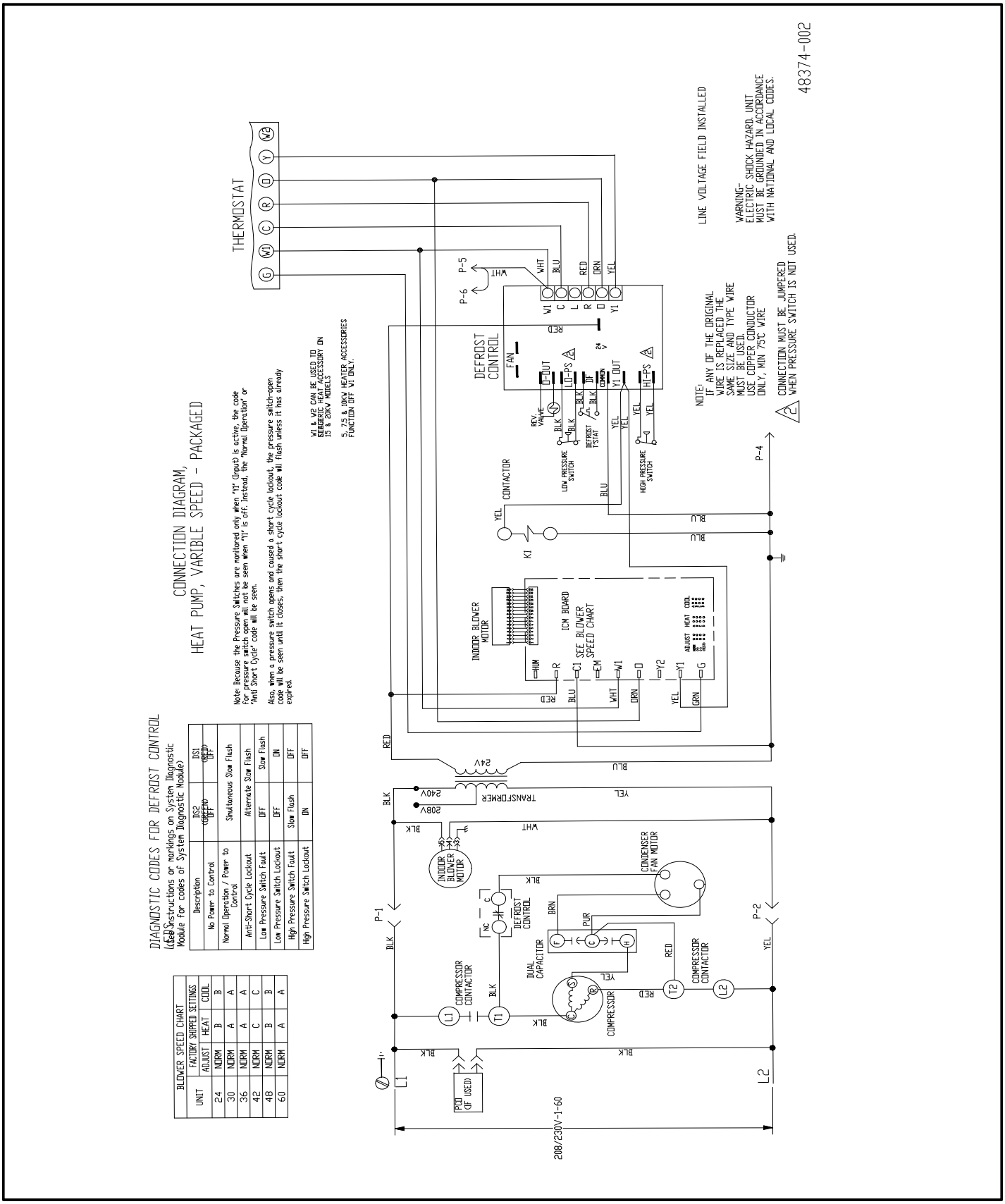


DIAGNOSTIC DISPLAY

Description	DS1 (GREEN)	DS2 (RED)
No Power to Control	OFF	OFF
Normal Operation / Power to Control	Simultaneous Slow Flash	
Anti-Short Cycle Lockout	Alternate Slow Flash	
Low Pressure Switch Fault	OFF	Slow Flash
Low Pressure Switch Lockout	OFF	ON
High Pressure Switch Fault	Slow Flash	OFF
High Pressure Switch Lockout	ON	OFF

BLOWER SPEED CHART

UNIT	FACTORY SHIPPED SETTINGS		
	ADJUST	HEAT	COOL
24	NORM	B	B
30	NORM	A	A
36	NORM	A	A
42	NORM	C	C
48	NORM	B	B
60	NORM	A	A



DIAGNOSTIC CODES FOR DEFROST CONTROL
(LED Instructions or markings on System Diagnostic Module for codes of System Diagnostic Module)

Description	DS2 (GREEN)	DS1 (RED)
No Power to Control	OFF	OFF
Normal Operation / Power to Control	Simultaneous Slow Flash	
Anti-Short Cycle Lockout	Alternate Slow Flash	
Low Pressure Switch Fault	OFF	Slow Flash
Low Pressure Switch Lockout	OFF	ON
High Pressure Switch Fault	Slow Flash	OFF
High Pressure Switch Lockout	ON	OFF

BLOWER SPEED CHART

UNIT	FACTORY SHIPPED SETTINGS		
	ADJUST	HEAT	COOL
24	NORM	B	B
30	NORM	A	A
36	NORM	A	A
42	NORM	C	C
48	NORM	B	B
60	NORM	A	A

FIGURE 15
(Units Built after June 2012)

Cooling

1- Internal thermostat wiring energizes terminal ”O” by cooling mode selection, energizing reversing valve L1.
2- Cooling demand initiates at Y1 in the indoor thermostat.
3- 24VAC from Y1 energizes compressor contactor K1.
4- K1-1 closes energizing compressor B1 and outdoor fan motor B4.
5- Compressor B1 and outdoor fan B4 begin immediate operation.
6- Evaporator blower B3 begins operation.
7- When cool demand is satisfied, ”Y1” in the indoor thermostat de-energizes K1 contactor. K1-1 opens de-energizing compressor B1 and outdoor fan B4. Evaporator blower B3 de-energizes after 90 seconds off time delay.
8- Terminal ”O” is de-energized when internal thermostat is out of cool mode, de-energizing reversing valve L1.

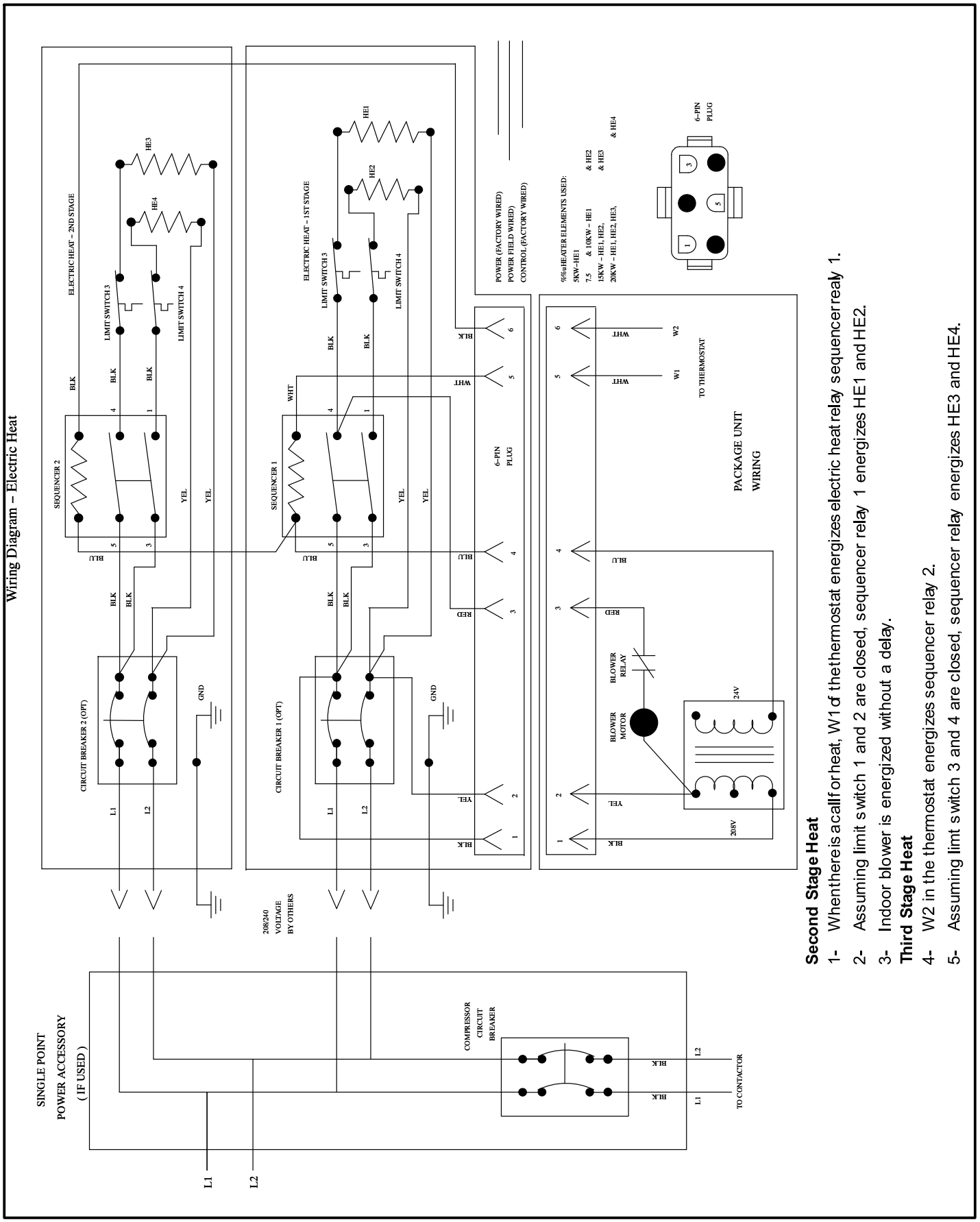
First Stage Heat

9- Heating demand initiates at ”Y1” in the thermostat.
10- 24VAC energizes compressor contactor K1.
11- K1-1 closes energizing compressor B1 and outdoor fan B4.
12- Evaporator blower B3 energizes after 5 seconds.
13- When heat demand is satisfied, Y1 in the indoor thermostat de-energizes K1. K1-1 and K1-2 open and de-energizes compressor B1 and outdoor fan B4.
14- Evaporator blower B3 de-energizes after 90 seconds.

Defrost Mode

15- During heating operation when liquid line temperature drops to 42°F or lower defrost switch S6 closes.
16- Defrost control CMC1 begins timing. If defrost thermostat S6 remains closed at the end of 30, 60 or 90 minute period, defrost control energizes and defrost begins
17- During defrost CMC1 energizes the reversing valve L1 and de-energizes the outdoor fan B4.
18- Defrost continues 10 minutes or until defrost thermostat switch S6 opens (S6 will open when liquid line temperature reaches 70°). When defrost thermostat switch opens, defrost control CMC1 loses power and resets.
19- When CMC1 resets, reversing valve L1 is de-energized while outdoor fan B4 is energized.

B-PHK Electric Heat



Second Stage Heat

1- When there is a call for heat, W1 of the thermostat energizes electric heat relay sequencer relay 1.

2- Assuming limit switch 1 and 2 are closed, sequencer relay 1 energizes HE1 and HE2.

3- Indoor blower is energized without a delay.

Third Stage Heat

4- W2 in the thermostat energizes sequencer relay 2.

5- Assuming limt switch 3 and 4 are closed, sequencer relay energizes HE3 and HE4.