15CHAX SERIES UNITS

The 15CHAX packaged heat pump units are available in sizes ranging from 2 through 5 tons (7.0 through 17.6 kW). 15CHAX units are designed for R-410A refrigerant and 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 15CHAX 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.

⚠ IMPORTANT

Operating pressures of a R-410A unit are higher than pressures in R-22 units. Always use service equipment rated for R-410A.

⚠ 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 qualified installer or service agency.

⚠ 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.

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.

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SPECIFICATIONS

General Data		Model No.	15CHAXA -24	15CHAXA -30	15CHAXA -36	15CHAXA -42	15CHAXA -48	15CHAXA -60
		Nominal Tonnage	2	2.5	3	3.5	4	5
Cooling Performance		Total cooling capacity - Btuh	23,000	28,200	35,000	41,500	47,500	59,000
		Total unit watts	1850	2275	2820	3350	4030	5040
		[2] SEER (Btuh/Watt)	14.50	14.00	15.00	14.50	14.00	14.00
		EER (Btuh/Watt)	12.40	12.40	12.40	12.40	11.80	11.70
		Sound Rating Number (dB)	77	77	77	79	79	79
		Refrigerant Type	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
		Refrigerant Charge	7 lbs. 8 oz.	6 lbs. 10 oz.	7 lbs. 13 oz.	11 lbs. 5 oz.	11 lbs. 13 oz.	11 lbs. 12 oz.
Outdoor Coil		Net face area - sq. ft. (m^2)	15.1	15.1	15.1	22	22	22
		Tube dia. - in. (mm) & 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
Indoor Coil		Net face area - sq. ft. (m^2)	4.67	4.67	4.67	6	6	6
		Tube dia. - in. (mm) & No. of rows	3/8 - 2	3/8 - 2	3/8 - 4	3/8 - 2	3/8 - 3	3/8 - 4
		Fins per inch (m)	14	14	14	14	14	14
Condensate drain size (fpt) - in.			3/4	3/4	3/4	3/4	3/4	3/4
Outdoor Coil Fan		Motor horsepower	1/5	1/5	1/5	1/4	1/4	1/4
		Diameter - in. & No. of blades	22 - 3	22 - 3	22 - 3	26 - 3	26 - 3	26 - 3
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			370	370	390	500	510	510
Shipping weight of basic unit (1 Pkg.)			415	415	435	555	565	565
Electrical characteristics (60 hz)			208/230V-1ph-60hz					

OPTIONAL ACCESSORIES - MUST BE ORDERED EXTRA

Compressor Crankcase Heater		**93M04**	•	•	•	•	•	•
Compressor Hard Start Kit		**10J42**	•	•	•	•	•	
		81J69						•
Compressor Time-Off Control		**47J27**	•	•	•	•	•	•
Electric Heat Size 208/240V-1ph	5 kW - PHK05BP	**10W47**	•	•	•	•	•	•
	7.5 kW - PHK07BP	**10W48**	•	•	•	•	•	•
	10 kW - PHK10BP	**10W49**	•	•	•	•	•	•
	15 kW - PHK15CP	**10W50**			•	•	•	•
	20 kW - PHK20CP	**10W51**				•	•	•
[3] **Internal Filter Kit** (No.) and size of filters - in.		**92M54 -** (1) 20 x 25	•	•	•			
		92M55 - (2) 16 x 25				•	•	•
Lifting Brackets		**92M51**	•	•	•	•	•	•
Low Ambient Kit		**34M72**	•	•	•	•	•	•
PCO Accessory Kit		**92M53**	•	•	•	•	•	•
Roof Curbs	8 inch height	**92M99**	•	•	•			
		93M01				•	•	•
	14 inch height	**93M00**	•	•	•			
		93M02				•	•	•
SignatureStat™ Home Comfort Control		**81M27**	•	•	•	•	•	•
Single Point Power Kits	For 5 kW Electric Heat ASPWR813-01	**13W88**	•	•	•	•	•	•
	For 7.5 kW Electric Heat ASPWR814-01	**13W89**	•	•	•	•	•	•
	For 10 kW Electric Heat ASPWR815-01	**13W90**	•	•	•	•	•	•
	For 15-20 kW Electric Heat ASPWR816-01	**13W91**			•	•	•	•

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.	15CHAXA-24	15CHAXA-30	15CHAXA-36	15CHAXA-42	15CHAXA-48	15CHAXA-60
				Line voltage data - 60hz 1 phase	208/230V	208/230V	208/230V	208/230V	208/230V	208/230V
Compressor				Rated Load Amps	13.4	14.1	14.1	17.9	21.8	26.4
				Locked Rotor Amps	58	73	77	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	30	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	22	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.

15CHAX PARTS ARRANGEMENT

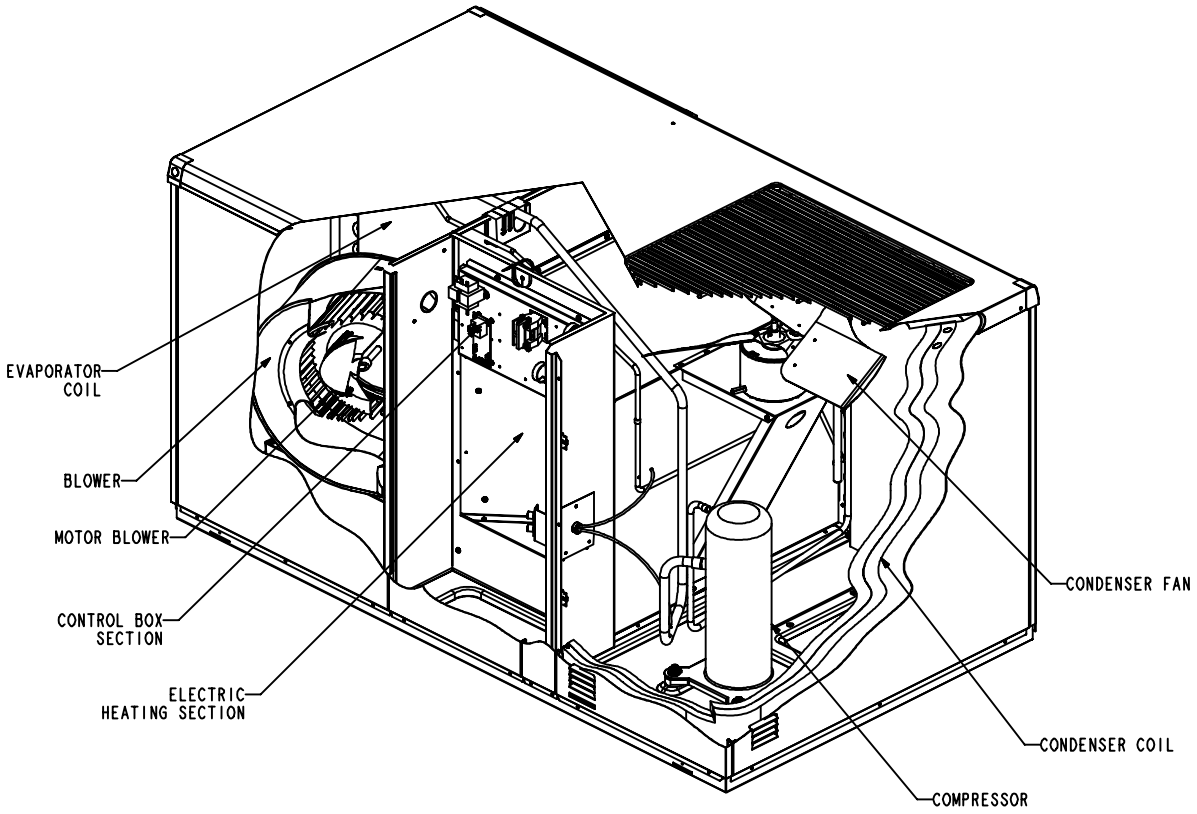


FIGURE 1

15CHAX CONTROL BOX

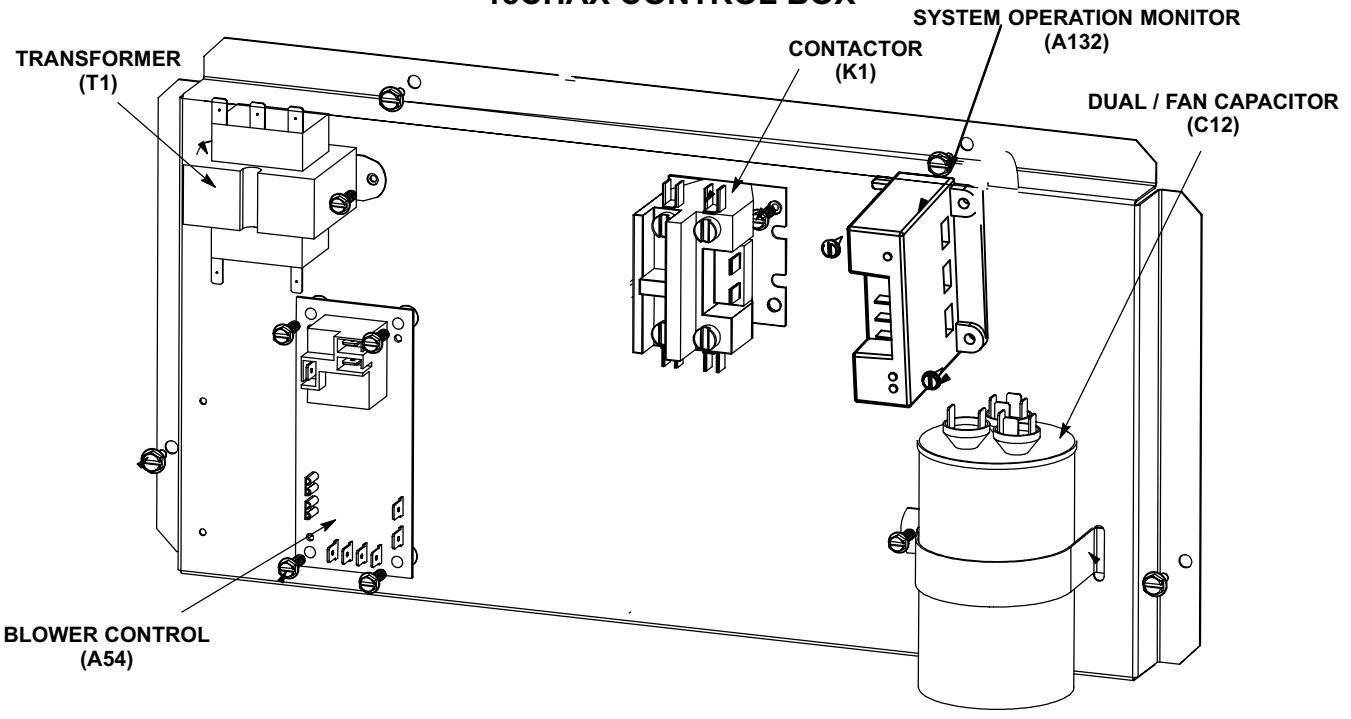


FIGURE 2

I-APPLICATION

15CHAX 2 through 5 ton (7.0 through 17.6kW) model units are single phase air conditioning units designed for outdoor installation on a slab or roof top.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

15CHAX 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 15CHAX 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.

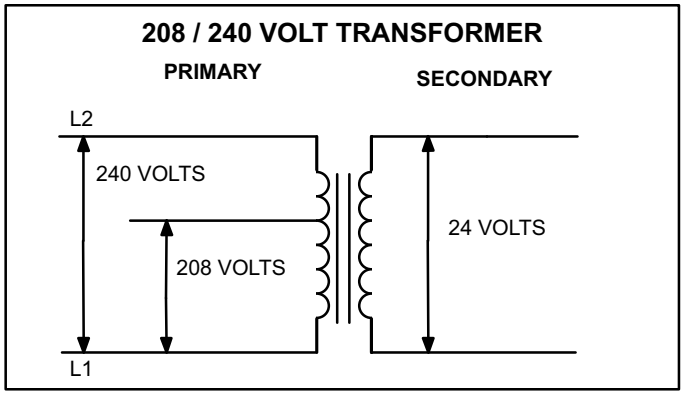


FIGURE 3

3-Dual Capacitor C12

The compressor and condenser fan in the 15CHAX 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 A15

⚠ 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.

15CHAX 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 4.

Factory settings for the blower speed jumpers are given in the wiring diagram. Figure 4 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 4.

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.

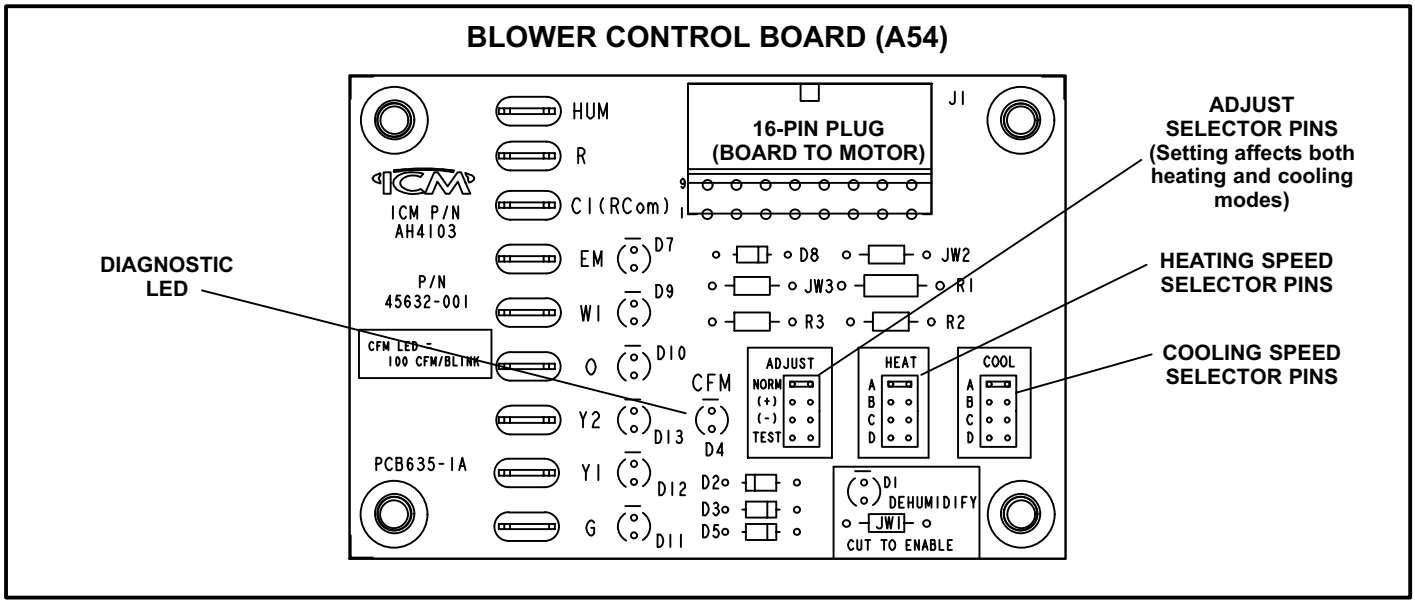


FIGURE 4

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.

TABLE 1
15CHAX-24, 15CHAX-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
15CHAX-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
15CHAX-42, 15CHAX-48, 15CHAX-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

5-Lennox System Operation Monitor (A132)

⚠ IMPORTANT

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

The Lennox system operation monitor (LSOM) 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 5 for the system operation monitor.

Lennox System Operation Monitor (A132)

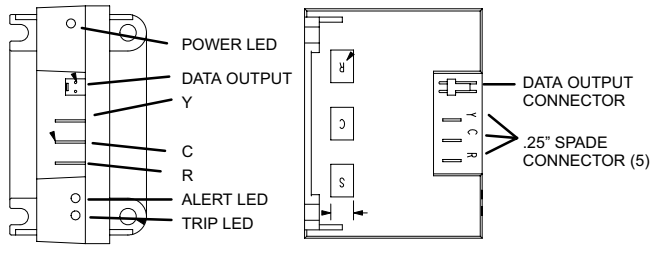


FIGURE 5

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.

TABLE 4

System Operation Monitor LED Troubleshooting Codes		
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.		

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)

15CHAX units use a three-phase, electronically controlled D.C. brushless motor (controller converts single phase a.c. to three phase D.C.), with a permanent-magnet-type rotor (figure 6). Because this motor has a permanent magnet rotor it does not need brushes like conventional D.C. motors.
Internal components are shown in figure 7. 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).

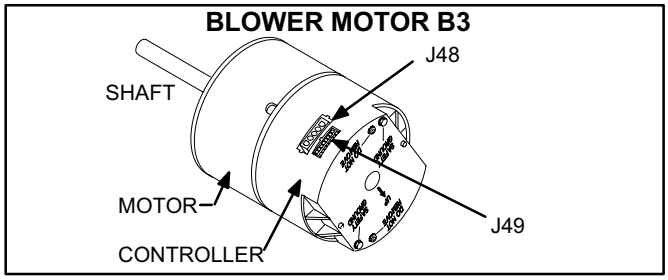


FIGURE 6

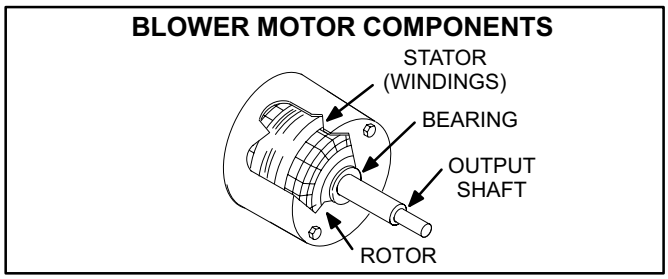


FIGURE 7

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 7) 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 4). 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 8 shows the two quick-connect jacks (J48 and J49) which connect the motor to the 15CHAX. 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

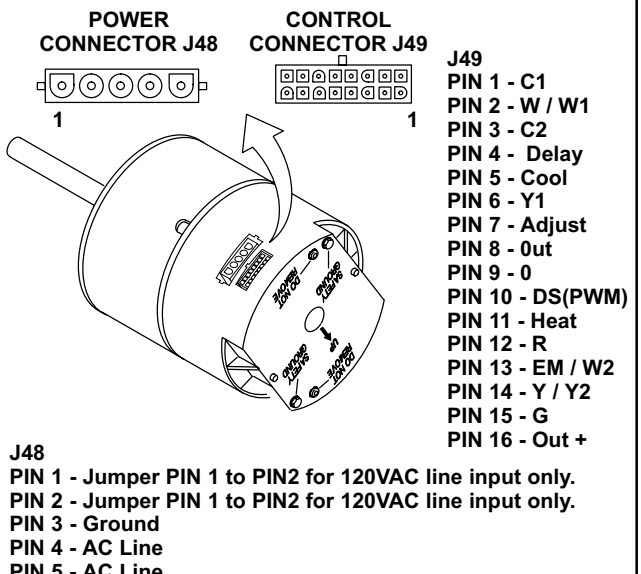


FIGURE 8

Precautions

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

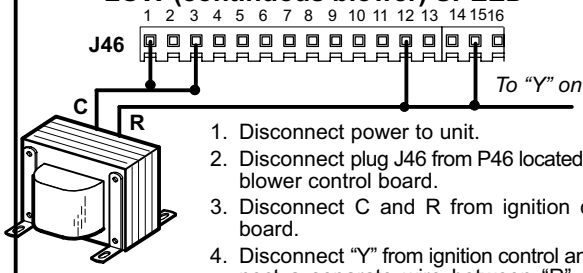
This interference is caused by internal switching frequencies of the motor controller. TV interference may show up as small specks or lines which randomly appear on the TV screen accompanied by pops or clicks in the sound. Before attempting any service, make sure the indoor unit is causing the interference. 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 15CHAX. Also make sure affected appliances are connected to a separate electrical circuit.

VARIABLE SPEED CHECKOUT

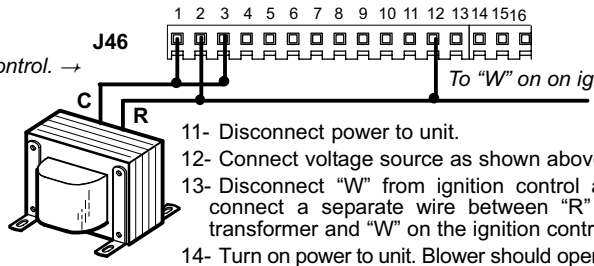
Using the transformer in the unit, test motor operation by jumping 24 volts into the terminals illustrated below for the desired speed.

LOW (continuous blower) SPEED



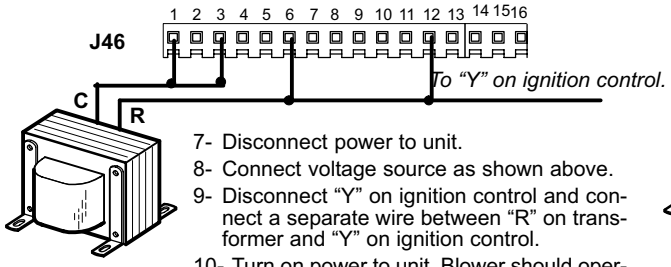
1. Disconnect power to unit.
2. Disconnect plug J46 from P46 located on the blower control board.
3. Disconnect C and R from ignition control board.
4. Disconnect "Y" from ignition control and connect a separate wire between "R" on the transformer and "Y" on the ignition control.
5. Connect voltage source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

HEATING SPEED



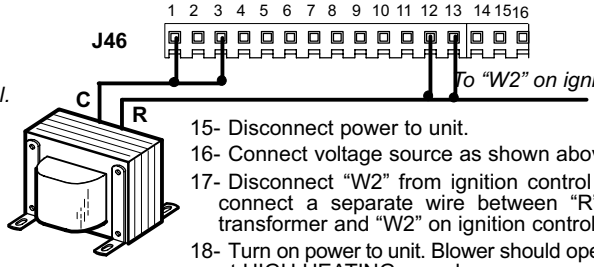
11- Disconnect power to unit.
12- Connect voltage source as shown above.
13- Disconnect "W" from ignition control and connect a separate wire between "R" on transformer and "W" on the ignition control.
14- Turn on power to unit. Blower should operate at HEATING speed.

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

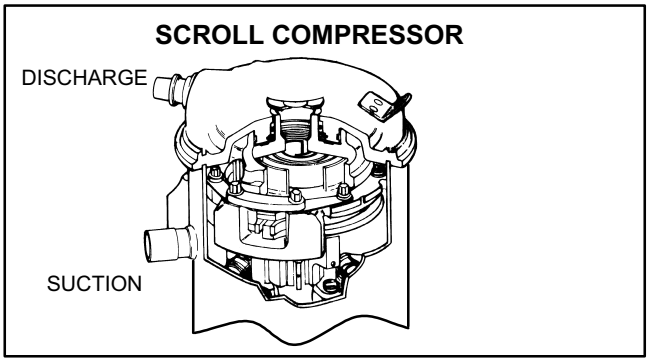


FIGURE 9

The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 9. 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 10). One scroll remains stationary, while the other is allowed to "orbit" (figure 11). 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.

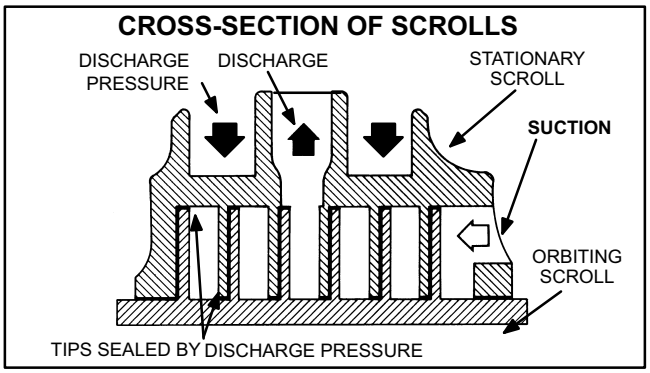


FIGURE 10

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure (figure 11 - 1). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 11 - 2). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 11 - 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 9). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 10). 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.

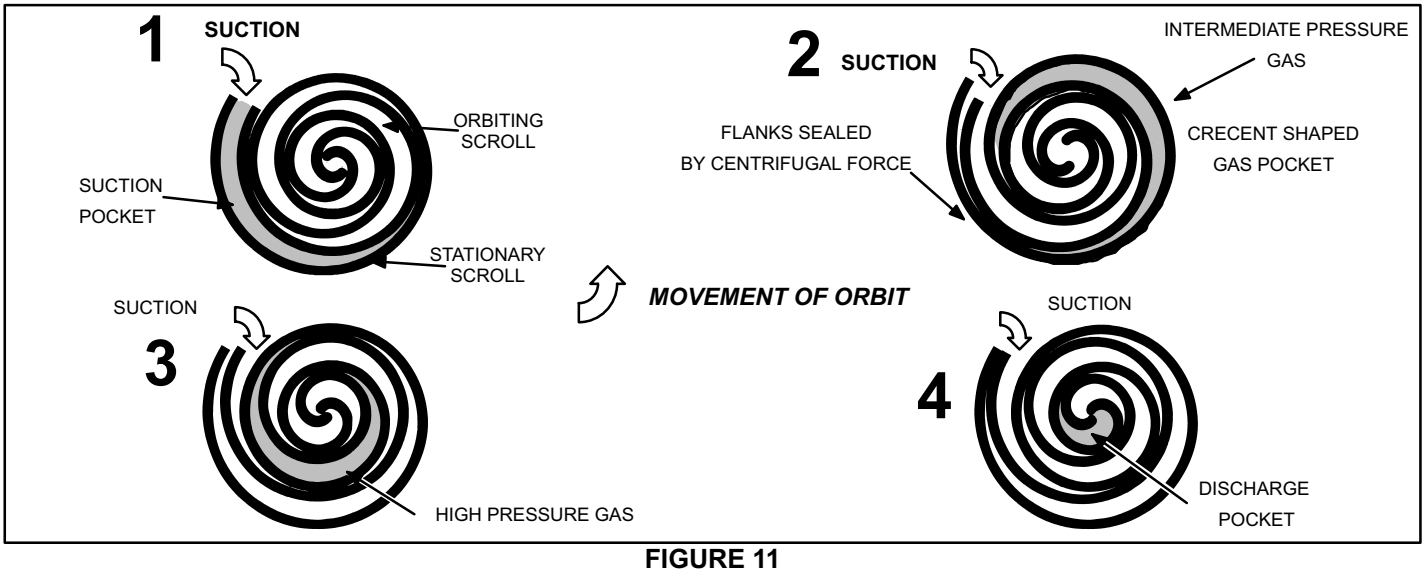


FIGURE 11

1-Condenser Fan

All 15CHAX units use single phase condenser fans. Specifications for the condenser fans are at the front of this manual. See figure 12 for fan and motor replacement.

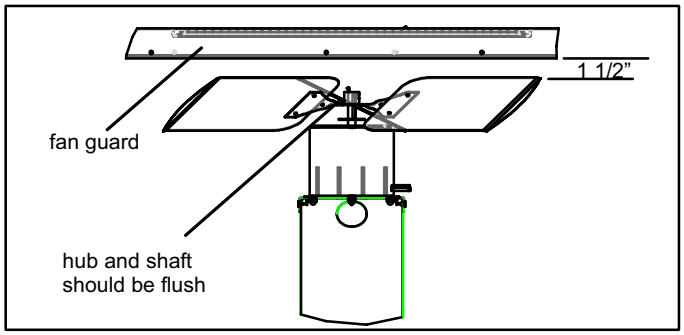


FIGURE 12

2-High Pressure Switch S4

S4 is a N.C. auto-reset high pressure switch located on the liquid line. The switch shuts off the compressor when liquid pressure rises above the factory setting. The switch on 15CHAX units is set to open at 590 ± 10 psi and close at 418 ± 10 psi.

3-Low Pressure Switch (S79)

The low pressure switch is an auto-reset N.C. switch that opens on pressure drop. The switch is wired in series with the high pressure switch S4 and compressor contactor K1 and is located on the suction line . When suction pressure drops to 10 psig (68.95kPa) the switch opens and the compressor is de-energized. When suction pressure rises to 30 psig (206.85 kPa) the pressure switch will close.

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 13 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.

PHK VESTIBULE PARTS ARRANGEMENT (PHK-10)

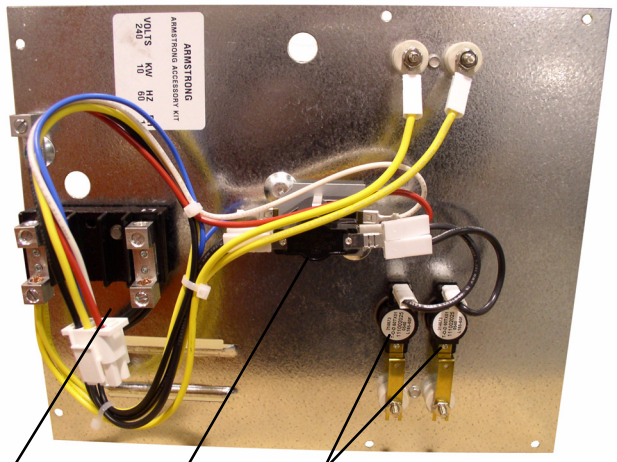


FIGURE 13

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 1 and 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 5 shows amp rating for each circuit breaker used. Two-pole circuit breakers are used.

TABLE 5

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

IV-Charging

System Performance

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. If subcooling measured deviates from values in table 6, refrigerant charge should be adjusted accordingly for maximum performance.

TABLE 6
Subcooling Values

Unit Model No.	82°F OD / 80°F IDDB / 67°F IDWB
15CHAX-24 15CHAX-30	12°
15CHAX-36	15°
15CHAX-42 15CHAX-48 15CHAX-60	10°

Verify system performance using table 7 as a general guide. Table 7 should not be used for charging unit. 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, this table 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 7
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
15CHAX-24	Suction	142	143	144	146	146	147	148	149	150	151	152	153
15CHAX-30		134	136	138	140	141	142	144	146	148	149	151	152
15CHAX-36		143	144	146	147	148	149	151	152	155	155	157	157
15CHAX-42		140	140	140	141	141	141	142	142	143	144	145	147
15CHAX-48		140	141	142	144	144	145	146	147	148	149	150	151
15CHAX-60		143	144	145	146	146	147	147	148	149	150	151	152
15CHAX-24	Liquid	219	242	264	287	296	310	333	355	379	398	430	457
15CHAX-30		232	255	277	300	309	323	345	368	390	408	440	470
15CHAX-36		244	268	292	316	326	340	363	369	410	429	461	493
15CHAX-42		225	247	269	291	300	314	337	357	383	402	434	457
15CHAX-48		243	264	285	307	315	328	349	370	391	408	440	470
15CHAX-60		257	280	303	326	335	349	372	395	418	436	468	497

V-Maintenance

At the start of each cooling season, this equipment should be serviced by a qualified technician. Periodic inspection and maintenance normally consists of changing or cleaning filters.

Filters

Not supplied. Inspect once a month. Replace disposable or clean permanent type as necessary. DO NOT replace permanent type with disposable.

Motors

Indoor, outdoor fan and vent 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.

Coil

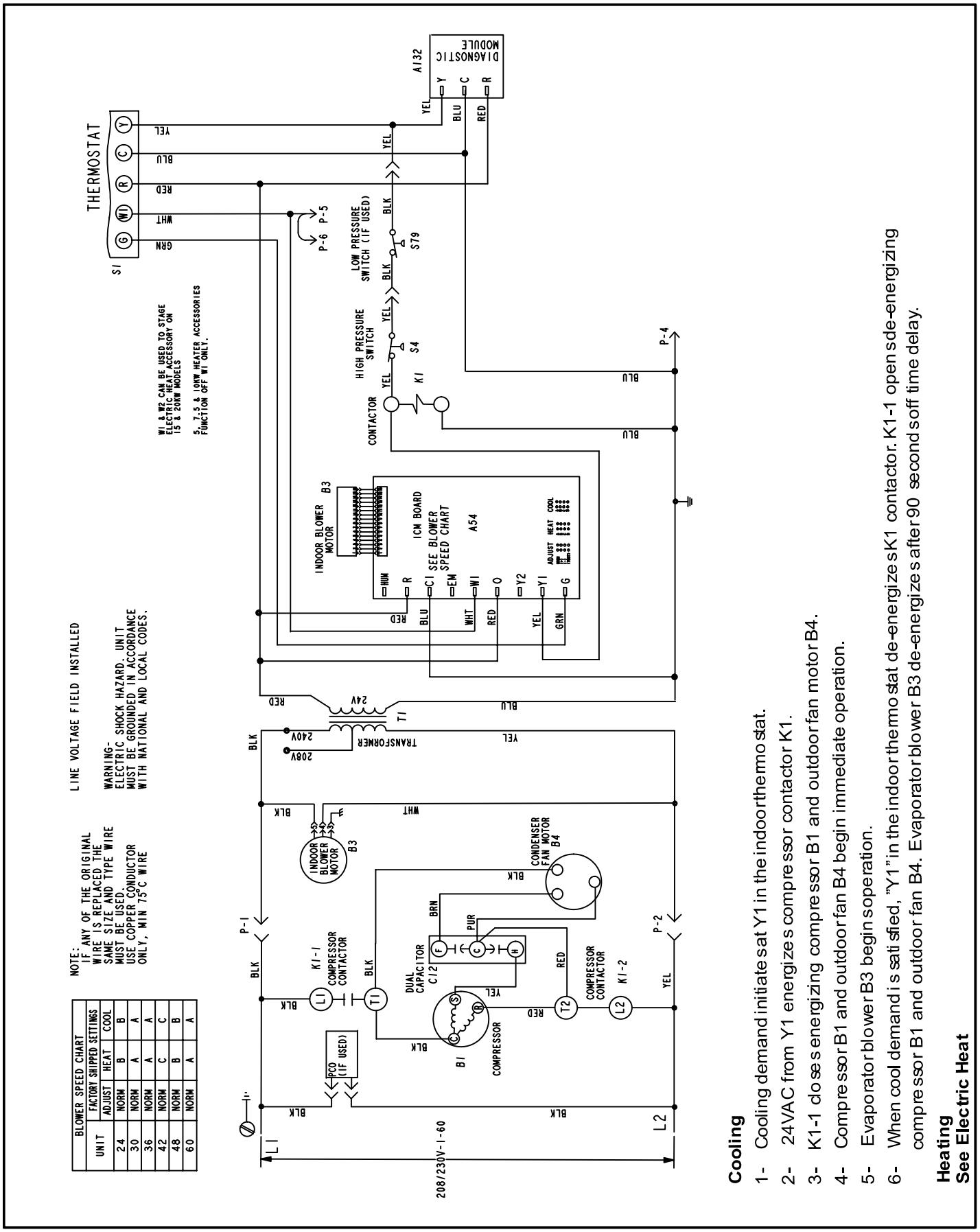
Dirt and debris should not be allowed to accumulate on the coil surfaces or other parts in the air conditioning circuit. Cleaning should be performed as often as necessary. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean the coil, be sure the power to unit is 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 hot condenser air discharge to be obstructed by overhanging structures or shrubs.

VI-Wiring Diagram and Sequence of Operation

A-Unit Diagram



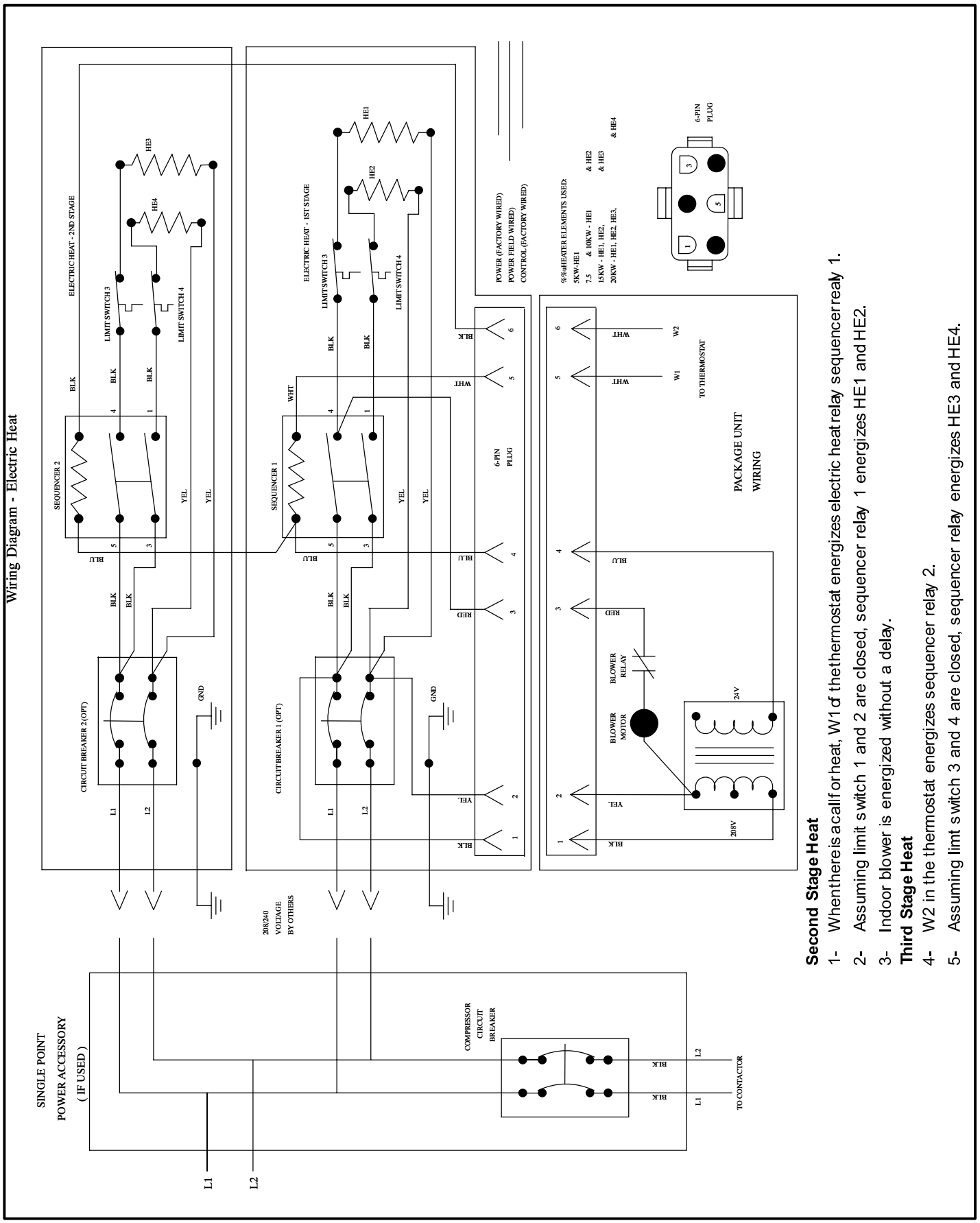
BLOWER SPEED CHART			
UNIT	FACTORY SHIPPED SETTINGS		
	ADJUST	HEAT	COOL
24	NORM	B	B
30	NORM	A	A
36	NORM	A	A
42	NORM	C	C
48	NORM	B	B
60	NORM	A	A

Cooling

1- Cooling demand initiates at Y1 in the indoor thermostat.
2- 24VAC from Y1 energizes compressor contactor K1.
3- K1-1 closes energizing compressor B1 and outdoor fan motor B4.
4- Compressor B1 and outdoor fan B4 begin immediate operation.
5- Evaporator blower B3 begin operation.
6- 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 second soff time delay.

Heating
See Electric Heat

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.