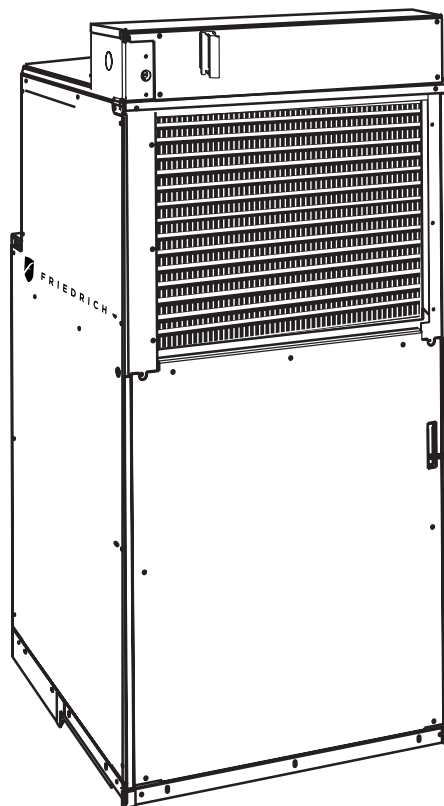
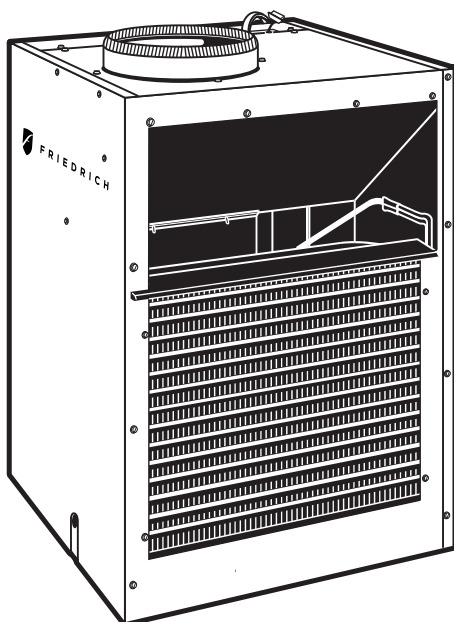




FRIEDRICH

VERT-I-PAK



Standard Chassis Models

9K

VHA - 09K25RTP, 09K34RTP, 09K50RTP
VHA - 09R25RTP, 09R34RTP, 09R50RTP

12K

VHA - 12K25RTP, 12K34RTP, 12K50RTP
VHA - 12R25RTP, 12R34RTP, 12R50RTP

18K

VHA - 18K25RTP, 18K34RTP, 18K50RTP, 18K75RTP
VHA - 18R25RTP, 18R34RTP, 18R50RTP, 18K75RTP

24K

VHA - 24K25RTP, 24K34RTP, 24K50RTP, 24K75RTP, 24K10RTP
VHA - 24R25RTP, 24R34RTP, 24R50RTP, 24R75RTP, 24R10RTP

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INTRODUCTION

Important Safety Information

The information in this manual is intended for use by a qualified technician who is familiar with the safety procedures required for installation and repair, and who is equipped with the proper tools and test instruments required to service this product.

Installation or repairs made by unqualified persons can result in subjecting the unqualified person making such repairs as well as the persons being served by the equipment to hazards resulting in injury or electrical shock which can be serious or even fatal.

Safety warnings have been placed throughout this manual to alert you to potential hazards that may be encountered. If you install or perform service on equipment, it is your responsibility to read and obey these warnings to guard against any bodily injury or property damage which may result to you or others.

Your safety and the safety of others is very important.

We have provided many important safety messages in this manual and on your appliance. Always read and obey all safety messages.



This is a safety Alert symbol.

This symbol alerts you to potential hazards that can kill or hurt you and others.



WARNING

All safety messages will follow the safety alert symbol with the word "WARNING" or "CAUTION". These words mean:

Indicates a hazard which, if not avoided, can result in severe personal injury or death and damage to product or other property.



CAUTION

Indicates a hazard which, if not avoided, can result in personal injury and damage to product or other property.

NOTICE

All safety messages will tell you what the potential hazard is, tell you how to reduce the chance of injury, and tell you what will happen if the instructions are not followed.



WARNING

Refrigeration system under high pressure



Do not puncture, heat, expose to flame or incinerate.

Only certified refrigeration technicians should service this equipment.




R410A systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.

Only use gauge sets designed for use with R410A.

Do not use standard R22 gauge sets.

INTRODUCTION

Personal Injury Or Death Hazards

SAFETY FIRST	 WARNING	 AVERTISSEMENT	 ADVERTENCIA
	Do not remove, disable or bypass this unit's safety devices. Doing so may cause fire, injuries, or death.	Ne pas supprimer, désactiver ou contourner cette l'unité des dispositifs de sécurité, faire vous risqueriez de provoquer le feu, les blessures ou la mort.	No eliminar, desactivar o pasar por alto los dispositivos de seguridad de la unidad. Si lo hace podría producirse fuego, lesiones o muerte.

ELECTRICAL HAZARDS:

- Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenance, or service.
- Make sure to follow proper lockout/tag out procedures.
- Always work in the company of a qualified assistant if possible.
- Capacitors, even when disconnected from the electrical power source, retain an electrical charge potential capable of causing electric shock or electrocution.
- Handle, discharge, and test capacitors according to safe, established, standards, and approved procedures.
- Extreme care, proper judgment, and safety procedures must be exercised if it becomes necessary to test or troubleshoot equipment with the power on to the unit.
- Do not spray water on the air conditioning unit while the power is on.
- Electrical component malfunction caused by water could result in electric shock or other electrically unsafe conditions when the power is restored and the unit is turned on, even after the exterior is dry.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- Use on a properly grounded outlet only.
- Do not cut or modify the power supply cord or remove the ground prong of the plug.
- Never operate the unit on an extension cord.
- Follow all safety precautions and use proper and adequate protective safety aids such as: gloves, goggles, clothing, properly insulated tools, and testing equipment etc.
- Failure to follow proper safety procedures and/or these warnings can result in serious injury or death.

INTRODUCTION

Personal Injury Or Death Hazards

- **REFRIGERATION SYSTEM REPAIR HAZARDS:**

- Use approved standard refrigerant recovering procedures and equipment to relieve high pressure before opening system for repair.
- Do not allow liquid refrigerant to contact skin. Direct contact with liquid refrigerant can result in minor to moderate injury.
- Be extremely careful when using an oxy-acetylene torch. Direct contact with the torch's flame or hot surfaces can cause serious burns.
- Make certain to protect personal and surrounding property with fire proof materials and have a fire extinguisher at hand while using a torch.
- Provide adequate ventilation to vent off toxic fumes, and work with a qualified assistant whenever possible.
- Always use a pressure regulator when using dry nitrogen to test the sealed refrigeration system for leaks, flushing etc.

- **MECHANICAL HAZARDS:**

- Extreme care, proper judgment and all safety procedures must be followed when testing, troubleshooting, handling, or working around unit with moving and/or rotating parts.
- Be careful when, handling and working around exposed edges and corners of the sleeve, chassis, and other unit components especially the sharp fins of the indoor and outdoor coils.
- Use proper and adequate protective aids such as: gloves, clothing, safety glasses etc.
- Failure to follow proper safety procedures and/or these warnings can result in serious injury or death.

- **PROPERTY DAMAGE HAZARDS**

- **FIRE DAMAGE HAZARDS:**

- Read the Installation/Operation Manual for the air conditioning unit prior to operating.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- Connect to a properly grounded outlet only.
- Do not remove ground prong of plug.
- Do not cut or modify the power supply cord.
- Do not use extension cords with the unit.
- Be extremely careful when using acetylene torch and protect surrounding property.
- Failure to follow these instructions can result in fire and minor to serious property damage.

- **WATER DAMAGE HAZARDS:**

- Improper installation, maintenance or servicing of the air conditioner unit can result in water damage to personal items or property.
- Insure that the unit has a sufficient pitch to the outside to allow water to drain from the unit.
- Do not drill holes in the bottom of the drain pan or the underside of the unit.
- Failure to follow these instructions can result in damage to the unit and/or minor to serious property damage.

INTRODUCTION

Operation of Equipment in During Construction

- **OPERATION OF EQUIPMENT MUST BE AVOIDED DURING CONSTRUCTION PHASES WHICH WILL PRODUCE AIRBORNE DUST OR CONTAMINATES NEAR OR AROUND AIR INTAKE OPENINGS:**
- Wood or metal framing;
- Drywalling or sheathing,
- Spackling or applying joint compound.
- Sanding or grinding.
- Moulding or trimwork.

NOTICE

Operating the equipment during any phase of active construction noted above can void the equipment's warranty, and also lead to poor performance and premature failure.

INTRODUCTION

This service manual is designed to be used in conjunction with the installation and operation manuals provided with each air conditioning system.

This service manual was written to assist the professional service technician to quickly and accurately diagnose and repair malfunctions.

Installation procedures are not given in this manual. They are given in the Installation and Operation Manual which can be aquired on the Friedrich [website \(www.friedrich.com\)](http://www.friedrich.com).

Equipment Identification


<p>MODEL NO SERIAL NO FRIEDRICH AIR CONDITIONING CO. SAN ANTONIO, TEXAS</p> <p>VOLTS: VOLTAGE RANGE: REFRIG CHARGE: DESIGN PRESSURE: COOLING: BTU/HR SEER: COP: HEAT PUMP BTU/HR: TOTAL COOLING AMPS: TOTAL ELEC. HEAT AMPS: ELECTRIC HEAT WATTS:</p> <p><u>FOR PERMANENTLY CONNECTED UNITS ONLY:</u> COMP: PLA LRA MOTOR: FLA HP HEATER AMPS: MIN. CKT AMP ~0 USE ~1 MAX. TIME DELAY FUSE OR HACR TYPE CIRCUIT BREAKER.</p> <p><u>GENERAL UNIT INFORMATION:</u> MAX OUTLET AIR TEMPERATURE: 200°F MAX EXTERNAL STATIC PRESSURE ELECTRIC HEAT: .5 IN. WATER "0" CLEARANCE TO COMBUSTIBLE MATERIAL</p> <p>USE ON SINGLE OUTLET CIRCUIT ONLY</p>	<p>WARNING</p> <p>ELECTRICAL SHOCK AND MOVING PARTS HAZARD CAN CAUSE INJURY OR DEATH PULL OUT DISCONNECT HEAD LOCATED ON THE FRONT OF THIS UNIT TO DISABLE POWER BEFORE SERVICING.</p> <p>↓</p>	<p> LISTED HEATING AND</p> <p>APPLICABLE PATENTS: US 6,065,296</p> <p>NY MEA NO.: 295-00-E USE ONE OF THE</p> <p>FROM EACH CATEGORY TO COMPLETE THE ASSEMBLY</p> <p>WALL PLENUM: VPAWP1 -8 VPAWP1 -14</p> <p>VPAL2</p> <p>VPRG1 VPRG2 VPRG5</p>
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Figure 101 (Equipment Identification Example)

Model and Serial Number Location

Model and Serial Number information is found on the Manufacturer's DATA TAG, located on the front or top.

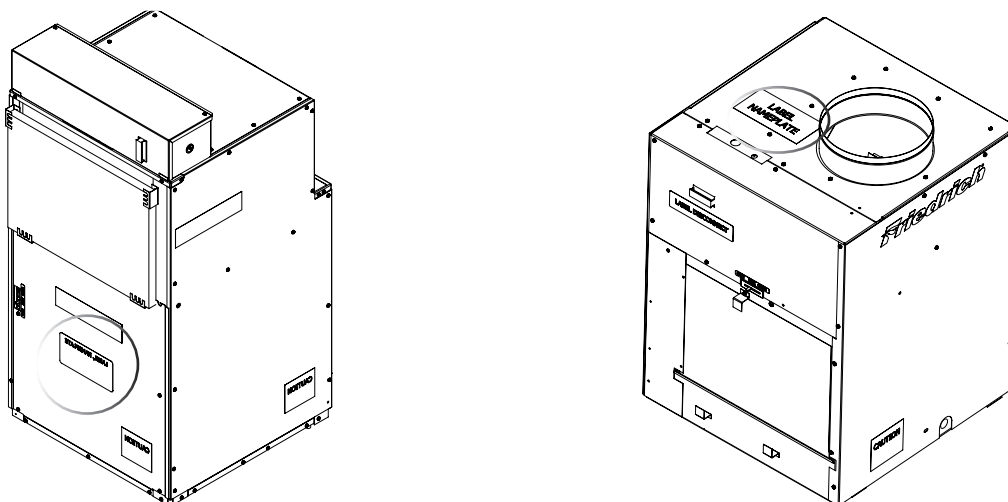
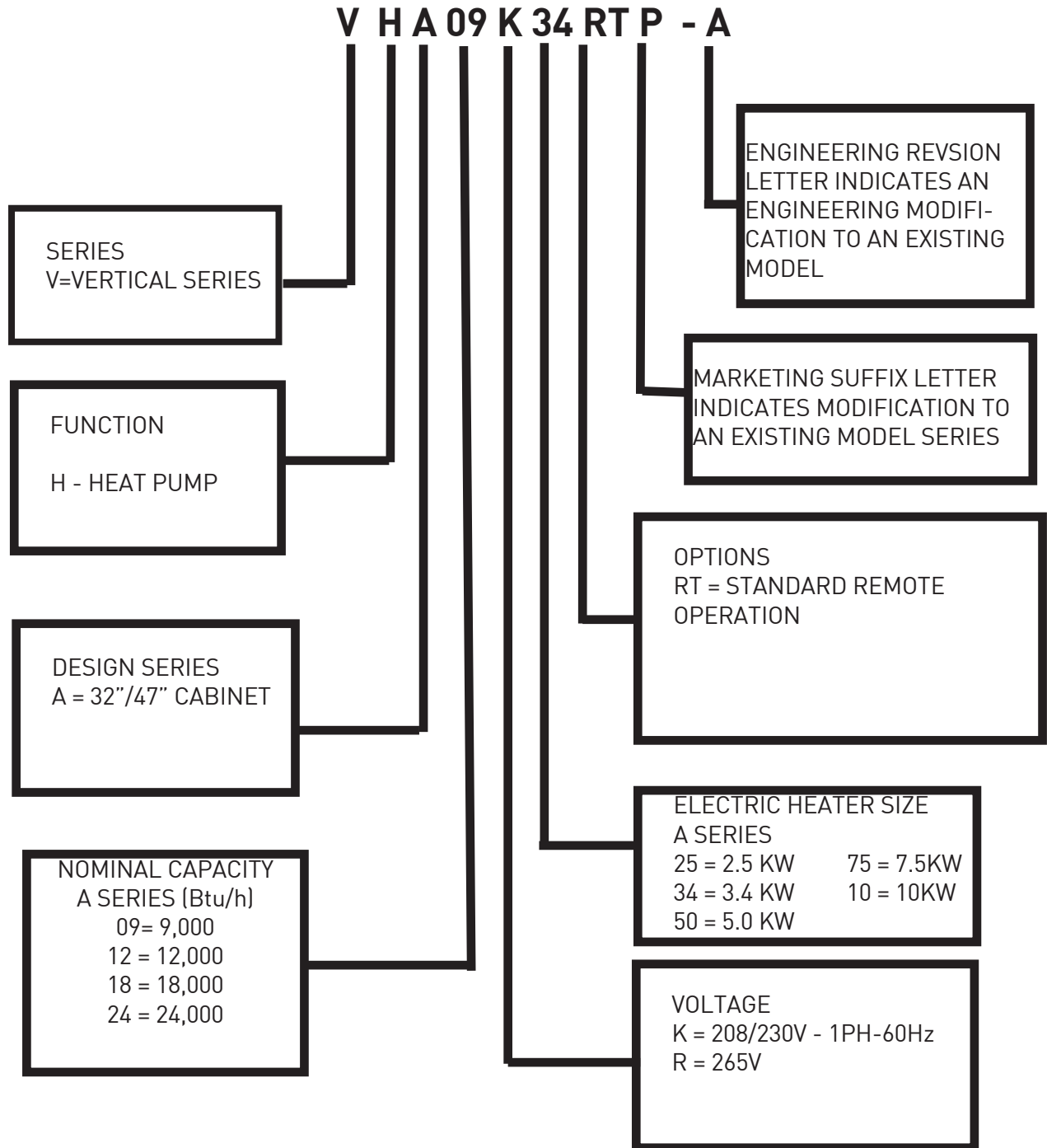


Figure 102 (Model and Serial Number Location)

INTRODUCTION

Model Number Reference Guide



IMPORTANT: It will be necessary for you to accurately identify the unit you are servicing, so you can be certain of a proper diagnosis and repair.

Figure 103

INTRODUCTION

Serial Number Reference Guide

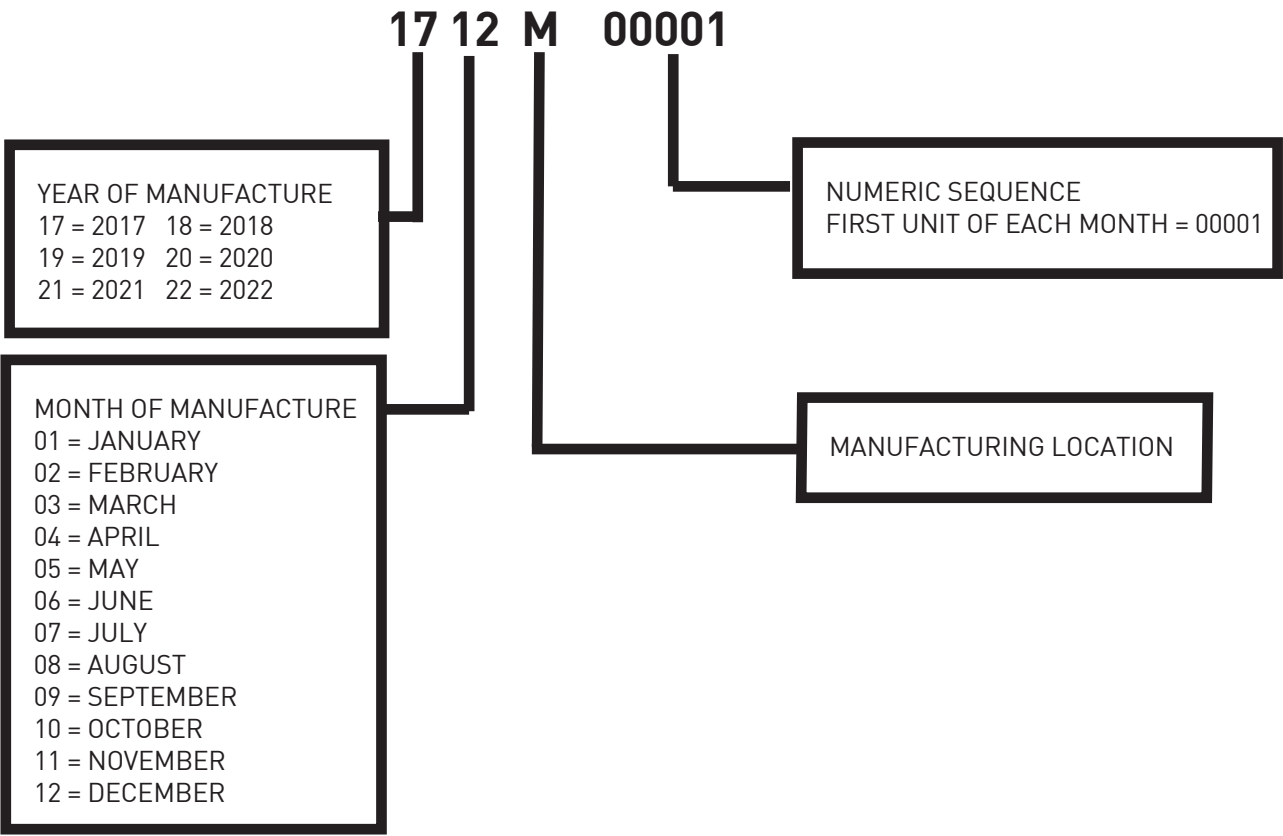


Figure 104

SPECIFICATIONS

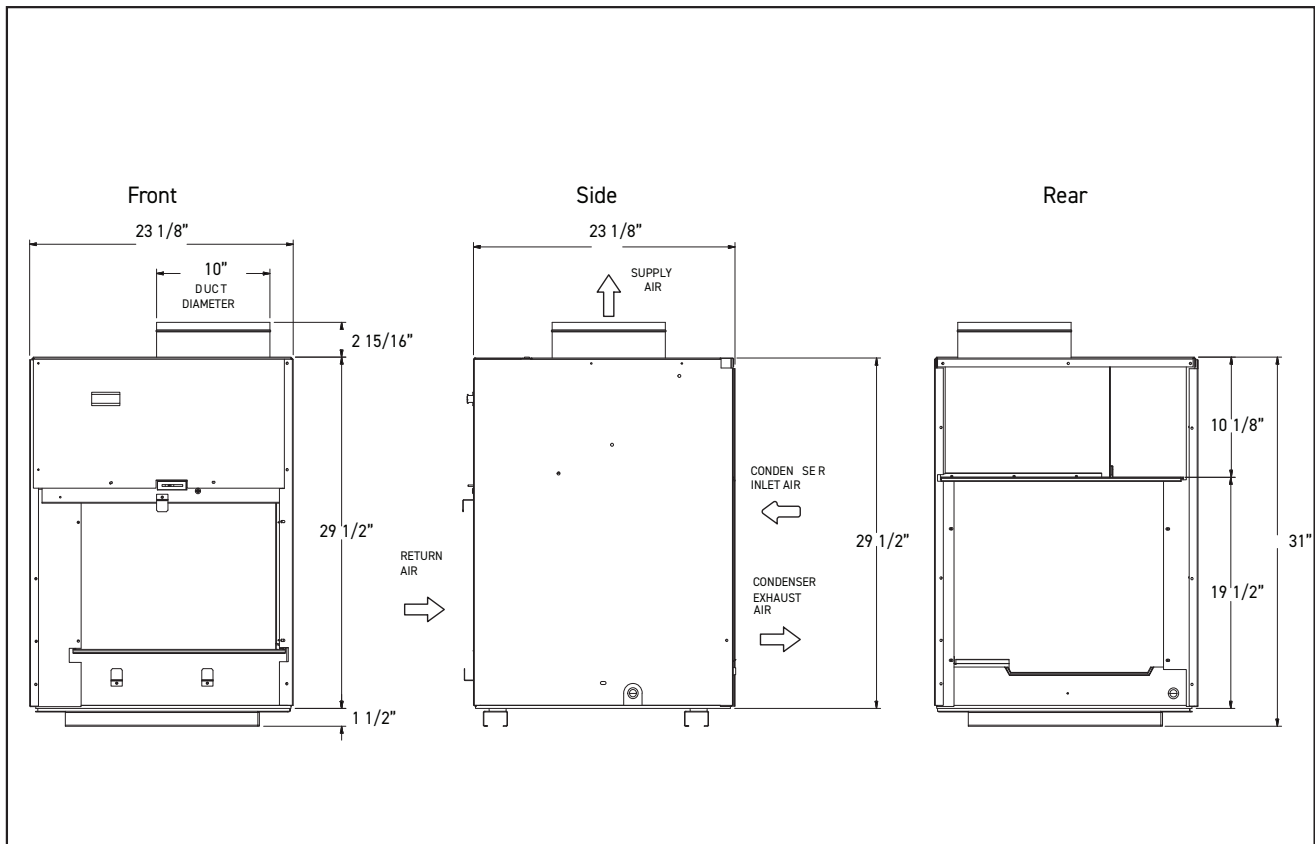
General Specifications

MODEL	VHA09K	VHA09R	VHA12K	VHA12R	VHA18K	VHA18R	VHA24K	VHA24R
COOLING DATA								
TOTAL COOLING CAP.	9300	9300	11500	11500	18400	18400	22500	22500
SENSIBLE COOL CAP.	7440	7440	9085	9085	13430	13430	15750	15750
POWER (W)	845	845	1045	1045	1670	1670	2045	2045
EER	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
HEATER SIZE (KW)	2.5/3.4/ 5.0	2.5/3.4/ 5.0	2.5/3.4/ 5.0	2.5/3.4/ 5.0	2.5/3.4/ 5.0/7.5	2.5/3.4/ 5.0/7.5	2.5/3.4/ 5.0/7.5/ 10.0	2.5/3.4/ 5.0/7.5/ 10.0
HEAT PUMP DATA								
REVERSE HEATING BTU	8300	8300	10600	10600	16700	16700	19500	19500
COP @ 47F	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
HEATING POWER (W)	730	730	940	940	1480	1480	1732	1732
HEATING CURRENT (A)	3.6	3.1	4.5	3.7	7.0	6.1	9.2	9.2
ELECTRICAL DATA								
VOLTAGE (1 PHASE, 60 HZ)	208-230	265	208-230	265	208-230	265	208-230	265
VOLT RANGE	197-253	239-292	197-253	239-292	197-253	239-292	197-253	239-292
COOLING CURRENT (A)	4.1	3.5	4.9	4.0	7.9	7.0	10.5	10.5
AMPS L.R	21.0	21.0	23.0	23.0	37.0	37.0	44.0	44.0
INDOOR MOTOR (HP)	1/4	1/4	1/4	1/4	1/4	1/4	1/5	1/5
INDOOR MOTOR (A)	1.2	1.2	1.2	1.2	0.42	0.42	1.4	1.4
OUTDOOR MOTOR (HP)	—	—	—	—	1/4	1/4	1/4	1/4
OUTDOOR MOTOR (A)	—	—	—	—	1.6	1.6	1.7	1.7
PHYSICAL								
DIMENSIONS (W X D X H)	23" X23" X32"	23"X 23"X32"	23"X 23"X32"	23"X 23"X32"	23"X 23"X47"	23"X 23"X47"	23"X 23"X52"	23"X 23"X52"
NET WEIGHT (LBS)	142	144	147	149	190	192	225	227
R410A CHARGE (OZ)	37.0	37.0	42.1	42.1	57	57	62	62
AIRFLOW DATA								
INDOOR CFM	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
.10" ESP	430	490	430	490	430	490	430	490
.15" ESP	410	470	410	470	410	470	410	470
.20" ESP	360	440	360	440	360	440	360	440
.25" ESP	310	400	310	400	310	400	310	400
.30" ESP	260	350	260	350	260	350	260	350
.35" ESP	-	-	-	-	-	-	-	-
.40" ESP	-	-	-	-	-	-	-	-
VENT CFM								
UP TO " " CFM	60	60	60	60	60	60	60	60

Figure 201 (General Specs)

SPECIFICATIONS

Chassis Specifications 9K, 12K



UNIT TOP VIEW DIMENSIONS

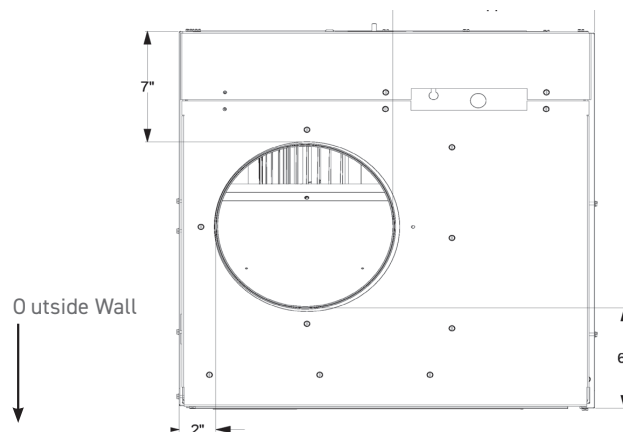
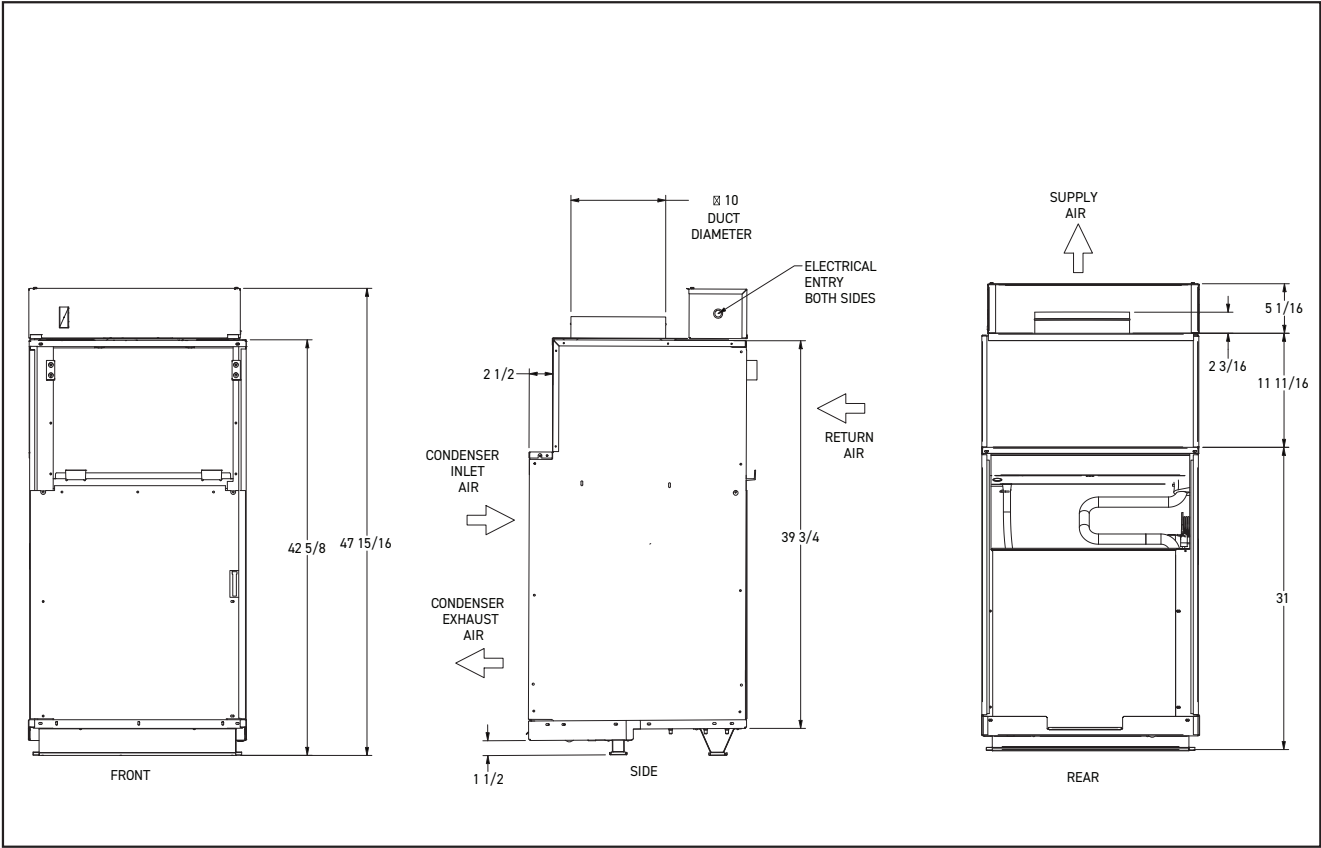


Figure 202 (9-12K Chassis Specs)

SPECIFICATIONS

18K Dimensions



UNIT TOP VIEW DIMENSIONS

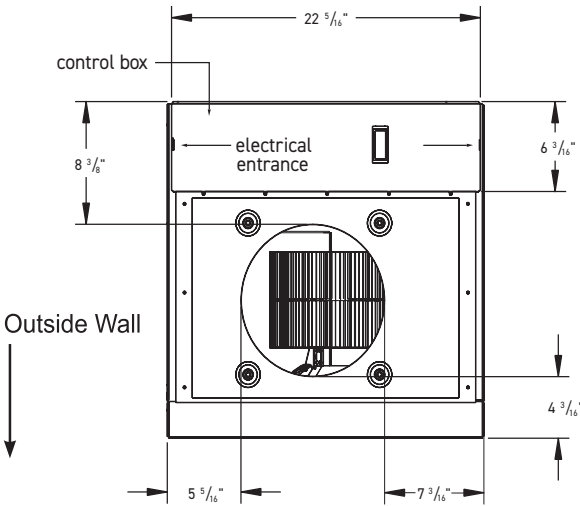
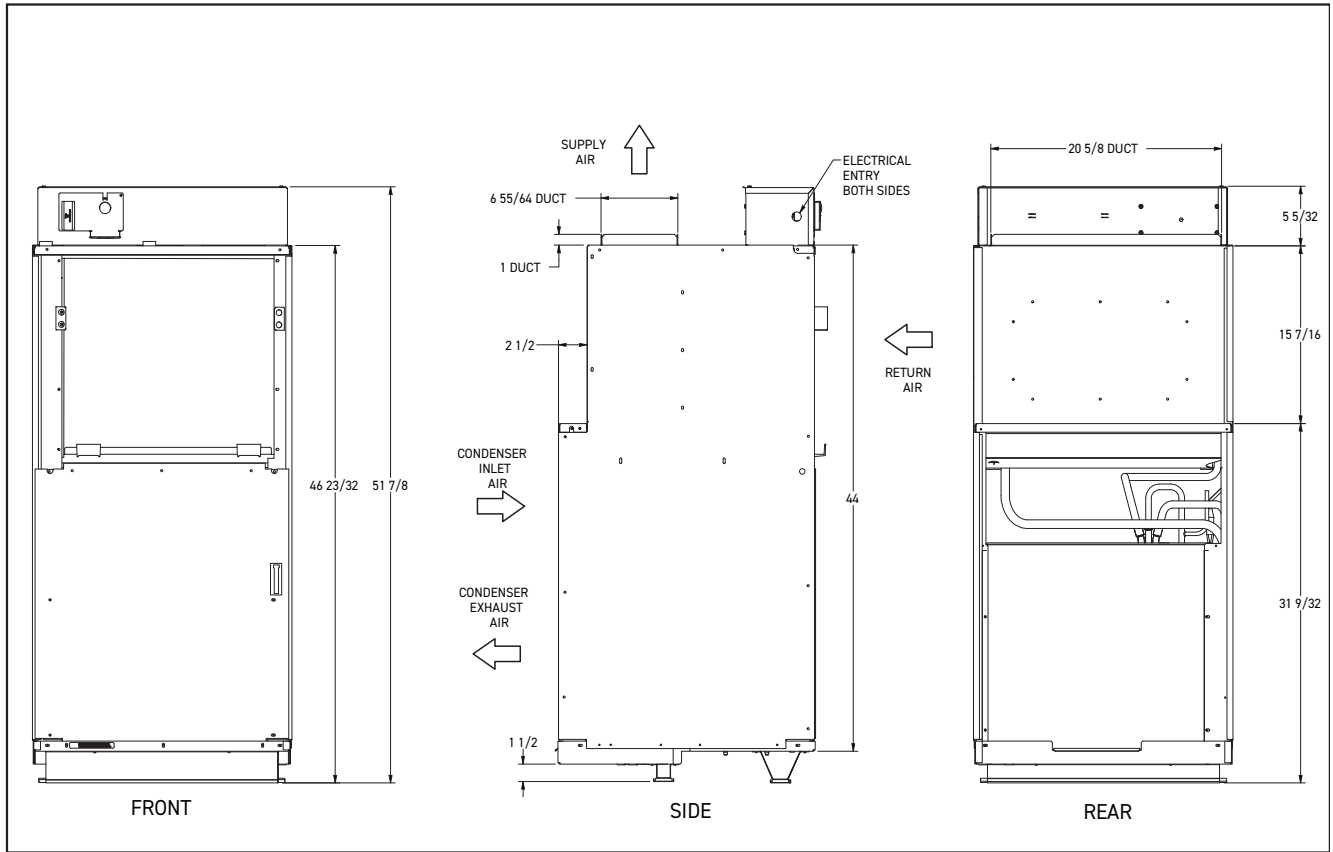


Figure 203 (18K Chassis Specs)

SPECIFICATIONS

24K Dimensions



UNIT TOP VIEW DIMENSIONS

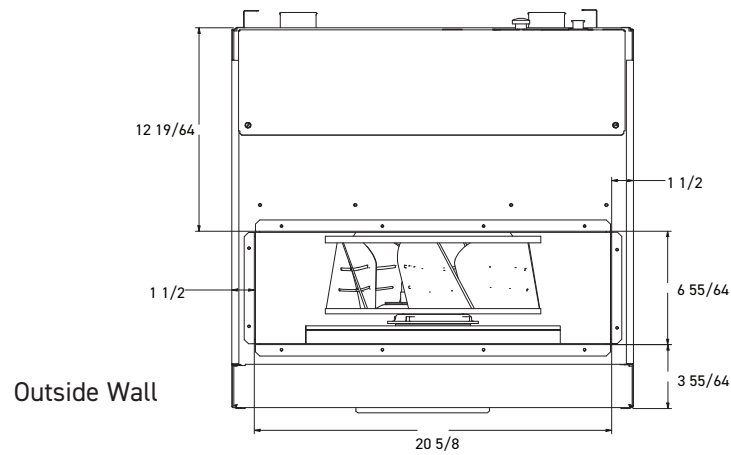


Figure 204 24K Chassis Specs)

SPECIFICATIONS

Electrical Data

MODEL	9K			12K		
HEATER WATTS	2050-2500	2780-3400	4090-5000	2050-2500	2780-3400	4090-5000
VOLTAGE	208-230					
ELECTRIC HEATING BTU	7000-8500	9500-11600	13900-17000	7000-8500	9500-11600	13900-17000
ELEC. HEATING CURRENT (AMPS)	11.1-12.0	14.6-16.0	20.9-22.9	11.1-12.0	14.6-16.0	20.9-22.9
MINIMUM CIRCUIT AMPACITY	15	20.0	29.2	15	20.0	29.2
BRANCH CIRCUIT FUSE (AMPS)	15	20	30	15	20	30
LRA - COMPRESSOR (AMPS)	21.0	21.0	21.0	23.0	23.0	23.0
BASIC HEATER SIZE	2.5 KW	3.4 KW	5.0 KW	2.5 KW	3.4 KW	5.0 KW
POWER CONNECTION	HARD WIRED					
RECOMMENDED BRANCH CIRCUIT WIRE SIZES* AWG-AMERICAN WIRE GAUGE	14	12	10	12	12	10

Figure 205 (9&12K 208/230V Electrical Data)

MODEL	9R			12R		
HEATER WATTS	2500	3400	5000	2500	3400	5000
VOLTAGE	265					
ELECTRIC HEATING BTU	8500	11600	17000	8500	11600	7000
ELEC. HEATING CURRENT (AMPS)	10.5	13.9	19.9	10.5	13.9	19.9
MINIMUM CIRCUIT AMPACITY	13.8	18.0	25.7	13.8	18.0	25.7
BRANCH CIRCUIT FUSE (AMPS)	15	20	30	15	20	30
LRA - COMPRESSOR (AMPS)	21.0	21.0	21.0	23.0	23.0	23.0
BASIC HEATER SIZE	2.5 KW	3.4 KW	5.0 KW	2.5 KW	3.4 KW	5.0 KW
POWER CONNECTION	HARD WIRED					
RECOMMENDED BRANCH CIRCUIT WIRE SIZES* AWG-AMERICAN WIRE GAUGE	14	12	10	12	12	10

Figure 206 (9&12K 265 Electrical Data)

SPECIFICATIONS

Electrical Data

MODEL	18K			24K				
HEATER WATTS	2050-2500	2780-3400	4090-5000	2050-2500	2780-3400	4090-5000	6135-7500	8180-10000
VOLTAGE	208-230							
ELECTIC HEATING BTU	7000-8500	9500-11600	13900-17000	7000-8500	9500-11600	13900-17000	20900-25600	27900-34100
ELEC. HEATING CURRENT (AMPS)	11.1-12.0	14.6-16.0	20.9-22.9	11.3-12.3	14.8-16.2	21.1-23.1	30.9-34.0	40.7-44.9
MINIMUM CIRCUIT AMPACITY	15.0	20.0	29.2	15.4	20.3	29.0	42.6	56.1
BRANCH CIRCUIT FUSE (AMPS)	15	20	30	20	25	30	45	60
LRA - COMPRESSOR (AMPS)	37.0	37.0	37.0	44.0	44.0	44.0	44.0	44.0
BASIC HEATER SIZE	2.5KW	3.4KW	5.0KW	2.5KW	3.4KW	5.0KW	7.5KW	10.0KW
POWER CONNECTION	HARD WIRED							
RECOMMENDED BRANCH CIRCUIT WIRE SIZES* AWG-AMERICAN WIRE GAUGE	14	12	10	12	10	10	6	4

Figure 207 (18&24K 208/230V Electrical Data)

MODEL	18R			24R				
HEATER WATTS	2500	3400	5000	2500	3400	5000	7500	10000
VOLTAGE	265							
ELECTIC HEATING BTU	8500	11600	17000	8500	11600	17000	25600	34100
ELEC. HEATING CURRENT (AMPS)	10.5	13.9	19.9	10.8	14.2	20.3	29.7	39.1
MINIMUM CIRCUIT AMPACITY	13.8	18.0	25.7	13.6	17.8	25.4	37.2	49.0
BRANCH CIRCUIT FUSE (AMPS)	15	20	30	20	20	30	40	50
LRA - COMPRESSOR (AMPS)	37.0	37.0	37.0	44.0	44.0	44.0	44.0	44.0
BASIC HEATER SIZE	2.5KW	3.4KW	5.0KW	2.5KW	3.4KW	5.0KW	7.5KW	10.0KW
POWER CONNECTION	HARD WIRED							
RECOMMENDED BRANCH CIRCUIT WIRE SIZES* AWG-AMERICAN WIRE GAUGE	14	12	10	12	12	10	6	4

Figure 208 (18&24K 265V Electrical Data)

SPECIFICATIONS

Electrical Requirements

ELECTRICAL REQUIREMENTS	
WIRE SIZE	USE ONLY WIRE SIZE RECOMMENDED FOR SINGLE OUTLET BRANCH CIRCUIT.
FUSE/CIRCUIT BREAKER	USE ONLY TYPE AND SIZE FUSE OR HACR CIRCUIT BREAKER INDICATED ON UNIT'S RATING GUIDE. PROPER OVER CURRENT PROTECTION TO THE UNITS IS THE RESPONSIBILITY OF THE OWNER.
GROUNDING	UNIT MUST BE GROUNDED FROM BRANCH CIRCUIT TO UNIT, OR THROUGH SEPARATE GROUND WIRE PROVIDED ON PERMANENTLY CONNECTED UNITS. ENSURE THAT BRANCH CIRCUIT OR GENERAL PURPOSE OUTLET IS GROUNDED.
WIRE SIZING	USE RECOMMENDED WIRE SIZE GIVEN IN TABLES AND INSTALL A SINGLE BRANCH CIRCUIT. ALL WIRING MUST COMPLY WITH LOCAL AND NATIONAL CODES. NOTE: USE COPPER CONDUCTORS ONLY.

Electrical Ratings Table


Recommended Branch Circuit Sizes*	
Nameplate Maximum Circuit Breaker Size	AWG Wiring Size**
15A	14
20A	12
30A	10
45A	6
60A	4


NOTE: Use copper conductors ONLY. Wire sizes are per NEC.

AWG - American Wire Gauge

* Single circuit from main box.

** Based on 100' or less of copper, single insulated conductor at 60° C


WARNING



Electrical Shock Hazard.

Turn OFF electric power before service or installation.

Unit must be properly grounded.

Unit must have correct fuse or circuit breaker protection. Unit's supply circuit must have the correct wire conductor size. All electrical connections and wiring must be installed by a qualified electrician and conform to the National Electrical Code and all local codes which have jurisdiction. Failure to do so can result in property damage, personal injury and/or death.

NOTE: ALL 230/208 CHASSIS MUST BE HARD WIRED WITH A PROPERLY SIZED BREAKER. SEE UNIT NAMEPLATE FOR SPECIFIC ELECTRICAL REQUIREMENTS.

USE HACR TYPE BREAKERS TO AVOID NUISANCE TRIPS. ALL FIELD WIRING MUST BE DONE IN ACCORDANCE WITH NEC AND LOCAL CODES. IT IS THE INSTALLER'S RESPONSIBILITY TO ENSURE THAT THE ELECTRICAL CODES ARE MET.

SPECIFICATIONS

Sound Data

Sound Power and STC					
MODEL		INDOOR (DBA)		OUTDOOR (DBA)	
	STC	HIGH COOL	LOW COOL	HIGH COOL	LOW COOL
VHA09	23	63.6	61.4	75.4	72.9
VHA12	23	63.0	60.8	75.3	72.7
VHA18	24	67.2	65.7	74.9	74.8
VHA24	25	67.8	66.4	78.5	72.7

Figure 209 (Sound Data)

SPECIFICATIONS

Supply Air Flow and Data

	MODEL					
	VHA 09/12		VHA 18		VHA 24	
FAN SPEED	LOW	HIGH	LOW	HIGH	LOW	HIGH
ESP (")	CFM					
0.0"	470	520	730	800	755	805
0.05"	460	510	670	735	700	750
0.10"	430	490	630	675	660	700
0.15"	410	470	595	640	615	665
0.20"	360	440	550	600	575	625
0.25"	310	400	505	550	525	580
0.30"	260	350	455	500	485	540
0.35"	--	--	400	445	450	500
0.40"	--	--	345	400	415	465

Figure 210 (Indoor CFM & External Static Pressure)

Indoor air flow may be determined by measuring the external static pressure (ESP) of the duct system using an inclined manometer or magnahelic gauge and consulting the above chart to derive actual air flow. Under no circumstances should the large chassis Vert-I-Pak equipment be operated at an external static pressure in excess of 0.4" W.C. Operation of the Vert-I-Pak under these conditions will result in inadequate air flow, leading to poor performance and/or premature component failure.

Control

For LOW speed only operation, connect the fan output terminal from the thermostat to the GL terminal of the electronic control.

For HIGH speed only operation, connect the fan output terminal from the thermostat to the GH terminal of the electronic control.

For thermostats with two-speed capability, connect the LOW speed output to the GL terminal and the HIGH speed output to the GH terminal.

Condenser CFM & External Static Pressure

VPAK is designed to install through an exterior wall with a plenum (VPAWP-8, VPAWP-14) and a Friedrich external louver .

NOTE: If the Friedrich designed plenum and louver combinations are not used, the selections and design must be evaluated by Friedrich to ensure the total pressure drop does not exceed the maximum allowable limits.

Condenser External Static Pressure			
Model	Design		Maximum
	CFM	ESP ("WC)	ESP ("WC)
VHA09	650	0.03	0.12
VHA12	650	0.03	0.12
VHA18	950	0.03	0.12
VHA24	980	0.03	0.12

Figure 211 (Condenser CFM & External Static Pressure)

SPECIFICATIONS

Required Minimum Clearances

Building Exterior Unit Opening Requirements

VPAK units must be installed on an outside wall. Confined spaces and/or covered areas should be avoided. Units must be installed no closer than 12" apart when two units are side by side. If three or more units are to operate next to one another, maintain a minimum of 60" between units or pairs of units (Figure B). If more than two units are sharing a floor with adjacent, outset units, a minimum distance of 64" must be kept between units (Figure C). Also, a vertical clearance of 60" must be maintained (Figure A) between units. Units installed on the bottom floor must be mounted at least 6" off of the ground.

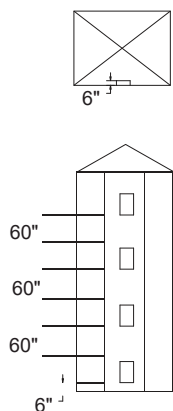


Figure A

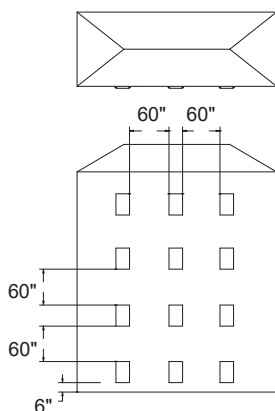


Figure B

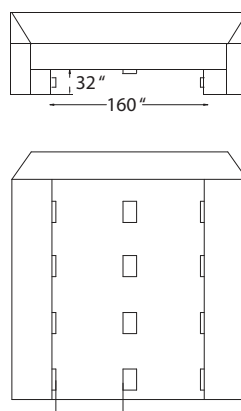


Figure C

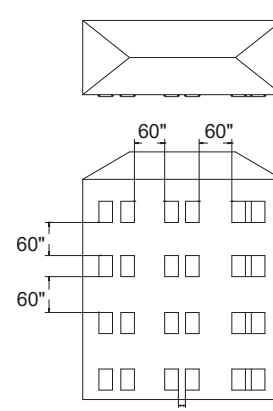


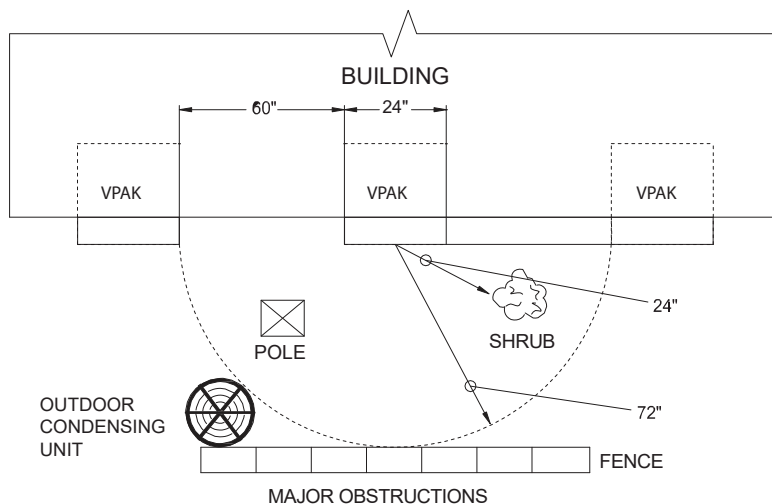
Figure D

Grill Clearance Requirements

Where obstructions are present use the following guidelines for proper spacing from the VPAK exterior louvered grill. Friedrich recommends that ALL obstructions are a minimum of 72" from the exhaust.

For minor obstruction(s) such as lamp poles or small shrubbery, a clearance of 24" from the outdoor louver must be maintained.

For major obstructions such as a solid fence, wall, or other heat rejecting devices like a condensing unit, a minimum distance of 72" must be kept.



The example pictured above is for reference only and does not represent all possible installations. Please contact Friedrich Air Conditioning for information regarding effects of other installation arrangements.

Figure 212

OPERATION

Electronic Control Board Features

The Friedrich Vert-I-Pak has state of the art features to improve guest comfort and conserve energy. Below is a list of standard features on every Friedrich VPAK and their benefit to the owner.

Quiet Start/ Stop Fan Delay	The fan start and stop delays prevent abrupt changes in room acoustics due to the compressor energizing or stopping immediately. Upon call for cooling or heating the unit fan will run for five seconds prior to energizing the compressor. Also, the fan off delay allows for "free cooling" by utilizing the already cool indoor coil to its maximum capacity by running for 30 seconds after the compressor.
Remote Thermostat Operation	VPAK units can be configured to be set up with a wired thermostat, wireless thermostat, or an energy management thermostat.
Internal Diagnostic Program	The VPAK features a self diagnostic program that can alert maintenance to component failures or operating problems. The internal diagnostic program saves properties valuable time when diagnosing running problems.
Service Error Code Storage	The self diagnosis program will also store error codes in memory if certain conditions occur and correct themselves such as extreme high or low operating conditions or activation of the room freeze protection feature. Storing error codes can help properties determine if the unit faced obscure conditions or if an error occurred and corrected itself.
Random Compressor Restart	Multiple compressors starting at once can often cause electrical overloads and premature unit failure. The random restart delay eliminates multiple units from starting at once following a power outage or initial power up. The compressor delay will range from 180 to 240 seconds.
Heat Pump Units Digital Defrost Thermostat	The VPAK uses a digital thermister to accurately monitor the outdoor coil conditions to allow the heat pump to run whenever conditions are correct. Running the VPAK in heat pump mode save energy and reduces operating costs. The digital thermostat allows maximization of heat pump run time.
Instant Heat Heat Pump Mode	Heat pump models will automatically run the electric heater during compressor lock-out to quickly provide heat when initially energized, then return to heat pump mode. This ensures that the room is heated quickly without the usual delay associated with heat pump units.
Room Air Sampling Feature	The room air sampling feature maintains a balanced temperature throughout the room by circulating the air for 90 seconds once every 9 minutes that the unit is not running when it is set to cooling or heating mode. By circulating the air, the unit can detect hot or cold areas in the room and operate the unit to cool or warm the room as necessary. This function is only available when the fan mode is set to 'AUTO' during COOL or HEAT Mode.
Desk Control Ready	All electronic VPAK units have low voltage terminals ready to connect a desk control energy management system. Controlling the unit's on/off operation from a remote location like the front desk can reduce energy usage and requires no additional accessories at the VPAK.
Indoor Coil Frost Sensor	The frost sensor protects the compressor from damage in the event that airflow is reduced or low outdoor temperatures cause the indoor coil to freeze. When the indoor coil reaches 30°F the compressor is disabled and the fan continues to operate based on demand. Once the coil temperature returns to 45°F the compressor returns to operation.
Auxiliary Fan Ready	The VPAK features a 24V AC terminal for connection to a relay that may be used to operate an auxiliary fan to transfer air to adjoining rooms. Auxiliary fans can provide air conditioning to odd shaped rooms.

Operation

Electronic Sequence of Operation

Compressor and Reversing Valve Control

Active Mode	Compressor	Reversing Valve
Cooling	On	De-Energized
Heat - Pump	On	Energized
Heat - Electric	Off	
Fan Only	Off	

Reversing Valve

The reversing valve stays in the last state until a call for heat or cooling.

The reversing valve only changes when required to provide cooling or heat pump. Leave the reversing valve in it's last state until it's required to change.

Unit Cooling Mode

Once the ambient temperature rises past the cool demand set point of the t-stat (see figure below), and the compressor is not locked out, the cooling cycle begins. As shown in the figure below, the fan is started 5 seconds prior to the compressor. Once the ambient temperature has been lowered to the cool set point, the cooling cycle starts to terminate by shutting off the compressor. After a 30 seconds delay, the fan is shut off.

Heating Mode Control Operation

There are two heating methods: Heat Pump and Electric Resistance Heat.

There are 2 Types of units that provide heating:

Cool / Heat Pump with Electric Heat and Cool with Electric heat.

Heat Mode in Cool with Electric Heat Units

When the t-stat is in the Heat Mode, if the indoor ambient temperature is below the heat set point, the fan turns on 5 seconds prior then the electric heat will turn on. When the t-stat is satisfied, the electric heat will turn off. The fan turns off 15 seconds later.

Heat Pump With Electric Heat Operation

This heating has two heating methods. If the ambient indoor temperature is below the heat set point and the compressor is not locked out, the compressor turns on. If the ambient temperature rises above the t-stat's heat set point, the compressor turns off.

If the Compressor is Locked Out on the 3 Minute Time Delay and Electric Heat is Available

1. The control turns on the electric heat until the compressor is not locked out.
2. After lockout, the control turns off the electric heat, waits 5 seconds, then turns on the compressor.(The wired remote wall t-stat's time delay may override this feature).

Condition 1

If the outdoor coil temperature sensor drops to 30 degrees F for less than 2 consecutive minutes, the unit will switch to electric heat if available. Thereafter, the unit will switch back to Heat Pump heat until the outdoor coil temperature sensor rises to 45 degrees F or greater.

OPERATION

Compressor Lock Out Time

The lockout feature ensures that the compressor is de-energized for a period of time. The timer varies randomly from 180 to 240 seconds.

The compressor lockout is initiated every time the compressor is “off” due to:

- (1) Satisfying the T-stat temperature set point
- (2) Changing mode to fan only or heat
- (3) Turning the unit off
- (4) Power is restored after failure
- (5) Line power is restored from a brown out condition

Cooling Fan Delay

This is only for t-stat Fan Auto Mode only.

When unit cycles cooling ON – starts the fan 5 seconds EARLY. When unit cycles cooling OFF – DELAYS the fan off for 30 seconds

Heating Fan Delay

This is only for Fan Auto Mode (Fan cycles with cool/heat operation) and not for continuous fan mode. When unit cycles Heating ON – starts the fan 5 seconds EARLY. When unit cycles Heating OFF – DELAYS the fan off for 15 seconds.

Continuous fan operation enables fan to run continuously.

Fan Speed Change Delay

Relay activation is delayed by a minimum number of seconds. The default for this value is 2 seconds and is used to eliminate relay chatter.

Room Air Sampling Feature

The room air sampling feature maintains a balanced temperature throughout the room by circulating the air for 90 seconds once every 9 minutes that the unit is not running when it is set to cooling or heating mode. By circulating the air, the unit can detect hot or cold areas in the room and operate the unit to cool or warm the room as necessary. This function is only available when the fan mode is set to 'AUTO' during COOL or HEAT Mode.

Low Voltage Interface Connections

All Vert-I-Pak units have a low voltage interface connector through which a Remote Wall Thermostat, Desk Control and Auxiliary Fan's Relay can be connected. The interface connector is located on the electronic control board.

Interface Connector Definitions	
FP	Factory use only. (Ensure there is no jumper at FP an F2)
F2	Used with F1 to provide 24 VAC to external fan relay. (Ensure there is no jumper at FP an F2)
F1	Used with F2 to provide 24 VAC to external fan relay.
D2	Used with D1 for desk control on or off operation.
D1	Used with D2 for desk control on or off operation.
C	Common Ground Terminal
GH	Call for high fan
GL	Call for low fan
B	Call for heat pump reversing valve
Y	Call for compressor
W	Call for heating
R	24V Power from Electronic Control to Wall

Figure 301 (Interface Connections)

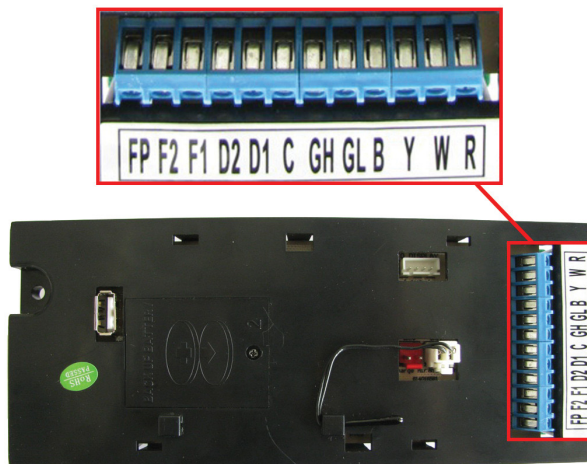


Figure 302 (Interface Connections)

OPERATION

Remote Wall Thermostat

All Friedrich Vert-I-Pak units are factory configured to be controlled by using a single stage heat/cool remote wired wall mounted thermostat.

Thermostat Selection

SINGLE STAGE THERMOSTATS

RT7P

Wired, single stage, wall-mounted programmable thermostat with two fan speeds and backlight. Controls Friedrich VERT-I-PAK.

RT7

Wired, single stage, wall-mounted digital thermostat with two fan speeds and backlight. Controls Friedrich VERT-I-PAK.

WRT2

Wireless, single stage, wall-mounted programmable thermostat with two fan speeds and backlight. Controls Friedrich VERT-I-PAK.

ENERGY MANAGEMENT THERMOSTATS

EMRT2/EMWRT2

Wired/Wireless thermostat with occupancy sensor

Thermostat terminals requirements:

C, R, G, Y, W, B.



For two fan speeds, thermostat must have 2 fan speed selection.



During Heat Mode:

The B terminal must be continuously energized. The W terminal must have 24 VAC output to call for heat. The control board decides on whether to turn on the Heat Pump Heat (compressor) or Electric Heat. The Y terminal should not have 24 VAC output during heat mode.

Connecting a Remote Wall Thermostat

CONNECT THERMOSTAT USING FIGURES 301, 302, and 303. Refer to thermostats Manuals for installation. Current thermostat manuals may be obtained online at www.friedrich.com.

 WARNING	
	ELECTRIC SHOCK HAZARD Disconnect power to the unit before servicing. Failure to follow this warning could result in serious injury or death.

 CAUTION	
	<p>It is the installer's responsibility to ensure that all control wiring connections are made in accordance with the installation instructions.</p> <p>Improper connection of the thermostat control wiring and/or tampering with the unit's internal wiring can void the equipment warranty.</p> <p>Failure to follow these instructions can result in personal injury and damage to product or other property.</p>

- 1) Ensure jumper is not installed at FP and F2
- 2) Disconnect power to the unit.
- 3) Unscrew and remove the electrical control box's cover.
- 4) Locate the Interface Connector (24 VAC terminal strip) (See figure 1 at left).
- 5) Make the wire connections according to the configuration needed for your unit. Use #18 gauge wire size.
- 6) Once each wire is matched and connected, the unit is now ready to be controlled by the thermostat.
- 7) Reattach the electrical control box's cover.

OPERATION

Remote Wall Thermostat Location

The thermostat should not be mounted where it may be affected by drafts, discharge air from registers (hot or cold), or heat radiated from the sun appliances, windows etc.. The thermostat should be located about 5 Ft. above the floor in an area of average temperature, with good air circulation. Mercury bulb type thermostats **MUST** be level to control temperature accurately to the desired set-point. Electronic digital type thermostats should be level for aesthetics.

Note: An improperly operating or poorly located remote wall thermostat can be the source of perceived equipment problems. A careful check of the thermostat's location and wiring must be made then to ensure that it is not the source of problems.

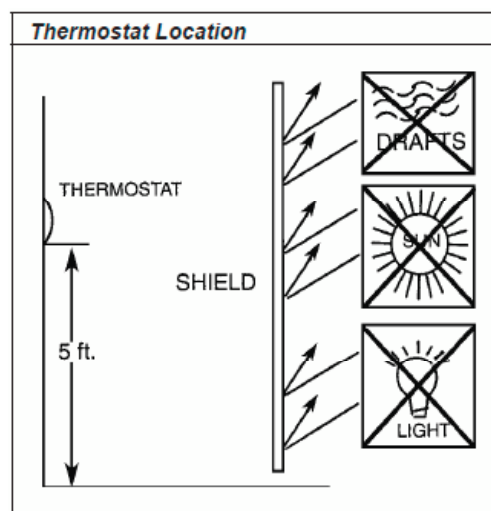


Figure 303 (Thermostat Locations)

Desk Control

The unit's electronic control has built-in provisions for connection to an external switch to control power to the unit. The switch can be a central desk control system or even a normally open door switch.

For desk control operation, connect one side of the switch to the D1 terminal and the other to the D2 terminal (See page 12). Whenever the switch closes, the unit operation will stop.

Maximum wire Length for Desk Control Switch	
Wire Size	Maximum Length
#24	400 ft.
#22	600 ft.
#20	900 ft.
#18	1500 ft.
#16	2000 ft.

Auxiliary Fan Control

The electronic control also has the ability to control a 24 VAC relay to activate an auxiliary, or transfer fan. The outputs are listed as F1 and F2 on the interface connector (See page 12).

To connect the relay, simply wire one side of the relay to F1 and the other side to F2. Anytime that the fan runs, the terminals will send a 24 VAC signal to the relay. The relay must be 24 VAC, 50mA or less.

Note: The Desk Control, Auxiliary Fan relay and wires must be field supplied.

OPERATION

Unit Heat Control Operation - Heat Pump With Electric Heat

Automatic Emergency Heat

If the sealed system fails with a bad reversing valve or anything that causes the indoor coil to get colder than the indoor ambient temperature:

- 1) If the indoor coil thermistor senses a 5 degree temperature drop as compared to the ambient temperature thermistor and this lasts up to 5 minutes, the control board will switch the unit to electric heat and continue heating with it.
- 2) At this point, error code 15 is generated; heat pump failure. Indoor coil temperature lower than indoor ambient temperature for 5 or more degrees for 5 consecutive minutes.

Note: It is Ok to continue to use the unit with the electric heater until the heat pump is repaired.

Heat Control Operation - Electric Heat Only

When in the Heat mode, with and without Fan Mode Auto (Fan cycling):

If the indoor ambient temperature is below the Heat Demand Threshold (Heat Set Point minus 1.5 °F), turn on electric heat. If Ambient is 0.3 °F above the Heat Set Point turn off the electric heat.

System Mode Auto

This mode provides automatic change over between cool and heat. The auto mode runs based on the room ambient temperature vs. the Demand Thresholds. It is only available in Heat-Cool Unit.

Notes:

There is a buffer zone between the cool and heat set points where no heating or cooling is allowed to occur. It is critical that the Cool Demand Threshold be greater than the Heat Demand Threshold by a minimum of 3° while in the Auto System Mode. For example, if a user enters a value for the Auto Cooling Set Point that violates the minimum delta 3° rule, the Auto Heating Set Point will adjust accordingly.

Automatic Change Over Delay (Cool with Heat Units)

The change over delay ensures that any system heating or cooling over shoot does not trigger an opposite demand cycle. The change over delay = 15 min. This timer blocks the opposite demand cycle from running until the timer expires. As an example, if the last demand was a cool cycle, and another cool cycle is requested, the timer will not block the request. However, if the last demand cycle was a cool cycle, and heat cycle is requested, the timer will block the request until the change over delay is expired.

Compressor Lock Out Time

The lockout feature ensures that the compressor is de-energized for a period of time. The timer varies randomly from 180 to 240 seconds

The compressor lockout is initiated every time the compressor is "off" due to:

- (1) Satisfying the temperature set point
- (2) Changing mode to fan only or heat
- (3) Turning the unit off
- (4) Control is first plugged in or power is restored after failure
- (5) Line power is restored from a brown out condition

Cooling Fan Delay

Fan cycle/Auto mode only

When unit cycles cooling ON – starts the fan 5 seconds EARLY. When unit cycles cooling OFF – DELAYS the fan off for 30 seconds.

OPERATION

Refrigeration Sequence Of Operation

A good understanding of the basic operation of the refrigeration system is essential for the service technician. Without this understanding, accurate troubleshooting of refrigeration system problems will be more difficult and time consuming, if not (in some cases) entirely impossible. The refrigeration system uses four basic principles in its operation which are as follows:

1. "Heat always flows from a warmer body to a cooler body."
2. "Heat must be added to or removed from a substance before a change in state can occur"
3. "Flow is always from a higher pressure area to a lower pressure area."
4. "The temperature at which a liquid or gas changes state is dependent upon the pressure."

The refrigeration cycle begins at the compressor when a demand is received from the thermostat. Starting the compressor creates a low pressure in the suction line which draws refrigerant gas (vapor) into the compressor. The compressor then "compresses" this refrigerant vapor, raising its pressure and its (heat intensity) temperature.

The refrigerant leaves the compressor through the discharge line as a hot high pressure gas (vapor). The refrigerant enters the condenser coil where it gives up some of its heat. The condenser fan moving air across the coil's finned surface facilitates the transfer of heat from the refrigerant to the relatively cooler outdoor air.

When a sufficient quantity of heat has been removed from the refrigerant gas (vapor), the refrigerant will "condense" (i.e. change to a liquid). Once the refrigerant has been condensed (changed) to a liquid it is cooled even further by the air that continues to flow across the condenser coil.

The design determines at exactly what point (in the condenser) the change of state (i.e. gas to a liquid) takes place. In all cases, however, the refrigerant must be totally condensed (changed) to a liquid before leaving the condenser coil.

The refrigerant leaves the condenser coil through the liquid line as a warm high pressure liquid. It next will pass through the refrigerant drier (if equipped). It is the function of the drier to trap any moisture present in the system, contaminants, and large particulate matter.

The liquid refrigerant next enters the metering device. The metering device is called a capillary tube. The purpose of the metering device is to "meter" (i.e. control or measure) the quantity of refrigerant entering the evaporator coil. In the case of the capillary tube this is accomplished (by design) through size (and length) of device, and the pressure difference present across the device. Since the evaporator coil is under a lower pressure (due to the suction created by the compressor) than the liquid line, the liquid refrigerant leaves the metering device entering the evaporator coil. As it enters the evaporator coil, the larger area and lower pressure allows the refrigerant to expand and lower its temperature (heat intensity). This expansion is often referred to as "boiling" or atomizing. Since the unit's blower is moving indoor air across the finned surface of the evaporator coil, the expanding refrigerant absorbs some of that heat. This results in a lowering of the indoor air temperature, or cooling.

The expansion and absorbing of heat cause the liquid refrigerant to evaporate (i.e. change to a gas). Once the refrigerant has been evaporated (changed to a gas), it is heated even further by the air that continues to flow across the evaporator coil.

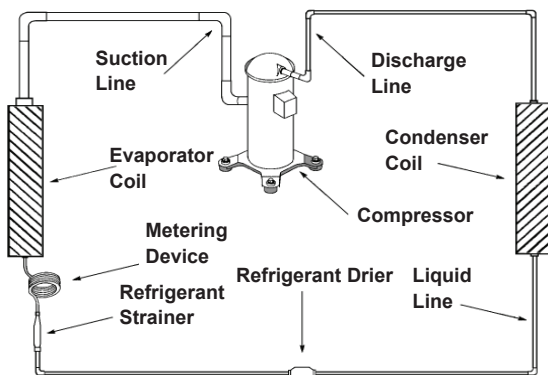


Figure 304 (Sequence of Operation)

The particular system design determines at exactly what point (in the evaporator) the change of state (i.e. liquid to a gas) takes place. In all cases, however, the refrigerant must be totally evaporated (changed) to a gas before leaving the evaporator coil.

The low pressure (suction) created by the compressor causes the refrigerant to leave the evaporator through the suction line as a cool low pressure vapor. The refrigerant then returns to the compressor, where the cycle is repeated.

Routine Maintenance

Coils & Chassis

NOTE: Do not use a caustic cleaning agent on coils or base pan. Use a biodegradable cleaning agent and degreaser. The use of harsh cleaning materials may lead to deterioration of the aluminum fins or the coil end plates.

The indoor coil and outdoor coils and base pan should be inspected periodically (annually or semi-annually) and cleaned of all debris (lint, dirt, leaves, paper, etc.) as necessary. Under extreme conditions, more frequent cleaning may be required. Clean the coils with and base pan with a coil comb or soft brush and compressed air or vacuum. A low pressure washer device may also be used; however, you must be careful not to bend the aluminum fin pack. Use a sweeping up and down motion in the direction of the vertical aluminum fin pack when pressure cleaning coils.

NOTE: It is extremely important to insure that none of the electrical and/or electronic parts of the unit get wet when cleaning. Be sure to cover all electrical components to protect them from water or spray.

NOTE: When installed on or near sea coast environments, it recommended that all coils be cleaned at minimum biannually.

Decorative Front

Use a damp (not wet) cloth when cleaning the control area to prevent water from entering the unit, and possibly damaging the electronic control.

The decorative front and the cabinet can be cleaned with warm water and a mild liquid detergent. Do NOT use solvents or hydrocarbon based cleaners such as acetone, naphtha, gasoline, benzene, etc.

The indoor coil can be vacuumed with a dusting attachment if it appears to be dirty. DO NOT BEND FINS. The outdoor coil can be gently sprayed with a garden hose.

The air filter should be inspected weekly and cleaned if needed by vacuuming with a dust attachment or by cleaning in the sink using warm water and a mild dishwashing detergent. Dry the filter thoroughly before reinstalling. Use caution, the coil surface can be sharp.

Fan Motor & Compressor

The fan motor & compressor are permanently lubricated and require no additional lubrication.

Wall Sleeve

Inspect the inside of the wall sleeve and drain system periodically (annually or semi-annually) and clean as required. Under extreme conditions, more frequent cleaning may be necessary. Clean both of these areas with an antibacterial and antifungal cleaner. Rinse both items thoroughly with water and ensure that the drain outlets are operating correctly. Check the sealant around the sleeve and reseal areas as needed.

Inspect for mold or mildew periodically. If present, ensure the sealing gasket around the unit is in good condition and not allowing outside air (or light) through the gasket.

Blower Wheel / Housing / Condensor Fan / Shroud

Inspect the indoor blower and its housing, evaporator blade, condenser fan blade and condenser shroud periodically (yearly or bi-yearly) and clean of all debris (lint, dirt, mold, fungus, etc.). Clean the blower housing area and blower wheel with an antibacterial / antifungal cleaner. Use a biodegradable cleaning agent and degreaser on condenser fan and condenser shroud. Use warm or cold water when rinsing these items. Allow all items to dry thoroughly before reinstalling them.

Electrical / Electronic



Periodically (at least yearly or bi-yearly) inspect all control components: electronic, electrical and mechanical, as well as the power supply. Use proper testing instruments (voltmeter, ohmmeter, ammeter, wattmeter, etc.) to perform electrical tests. Use an air conditioning or refrigeration thermometer to check room, outdoor and coil operating temperatures.



Air Filter

To ensure proper unit operation, the air filter should be cleaned at least monthly, and more frequently if conditions warrant. The unit must be turned off before the filter is cleaned.

REMOVE AND INSTALL THE CHASSIS

Remove The Chassis

 WARNING	
	ELECTRIC SHOCK HAZARD
	Turn off electric power before service or installation.
	All electrical connections and wiring MUST be installed by a qualified electrician and conform to the National Electrical Code and all local codes which have jurisdiction. Failure to do so can result in personal injury or death.

 WARNING	
	CUT/SEVER HAZARD
	Be careful with the sharp edges and corners. Wear protective clothing and gloves, etc.
	Failure to do so could result in serious injury.

Servicing / Chassis Quick Changeouts

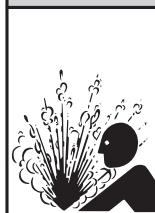
The chassis is designed for quick disconnect and change out. For minor electrical service, the control box cover lifts straight up after the screws & disconnect head are removed. For major electrical, refrigeration and fan service the chassis may be removed from utility closet.

To Remove the Chassis from the Closet:

- A. Disconnect the power coming into the unit from the main breaker panel or the closet mounted disconnect.
- B. Switch the wall Thermostat off.
- C. Pull the Power Disconnect located in the front of the chassis.
- D. Disconnect the electrical connection.
- E. Disconnect the duct work.
- F. Disconnect condensate drain on 9-18,000 BTU models (2018 18,000 BTU models excluded).
- G. Slide the chassis out of the wall plenum.
- H. Lift the chassis out of the utility closet.

R-410A SEALED SYSTEM REPAIR

WARNING



Refrigeration system under high pressure

Do not puncture, heat, expose to flame or incinerate.

Only certified refrigeration technicians should service this equipment.

R410A systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.

Only use gauge sets designed for use with R410A. Do not use standard R22 gauge sets.

The following is a list of important considerations when working with R-410A equipment

1. R-410A pressure is approximately 60% higher than R-22 pressure.
2. R-410A cylinders must not be allowed to exceed 125 F, they may leak or rupture.
3. R-410A must never be pressurized with a mixture of air, it may become flammable.
4. Servicing equipment and components must be specifically designed for use with R-410A and dedicated to prevent contamination.
5. Manifold sets must be equipped with gauges capable of reading 750 psig (high side) and 200 psig (low side), with a 500-psig low-side retard.
6. Gauge hoses must have a minimum 750-psig service pressure rating
7. Recovery cylinders must have a minimum service pressure rating of 400 psig, (DOT 4BA400 and DOT BW400 approved cylinders).
8. POE (Polyol-Ester) lubricants must be used with R-410A equipment.
9. To prevent moisture absorption and lubricant contamination, do not leave the refrigeration system open to the atmosphere longer than 1 hour.
10. Weigh-in the refrigerant charge into the high side of the system.
11. Introduce liquid refrigerant charge into the high side of the system.
12. For low side pressure charging of R-410A, use a charging adaptor.
13. Use industry standard R-410A filter dryers.

WARNING

EPA 608 Warning:

It is a violation of the environmental Protection Agency, Claus608A, to service refrigeration systems without proper certification

IMPORTANT

SEALED SYSTEM REPAIRS TO COOL-ONLY MODELS REQUIRE THE INSTALLATION OF A LIQUID LINE DRIER.


EQUIPMENT REQUIRED:


1. Electrical Multimeter
2. E.P.A. Approved Refrigerant Recovery System
3. Vacuum Pump (capable of 200 microns or less vacuum.)
4. Acetylene Welder
5. Electronic Halogen Leak Detector capable of detecting HFC (Hydrofluorocarbon) refrigerants.
6. R410A Refrigerant Manifold
7. 1/4" Braze-type Access Ports
8. Pinch Tool
9. Refrigerant Scale
10. Vacuum Gauge - (0 - 1000 microns)
11. Facilities for flowing nitrogen through refrigeration tubing during all brazing processes.

EQUIPMENT MUST BE CAPABLE OF:

1. Recovering refrigerant to EPA required levels.
2. Evacuation from both the high side and low side of the system simultaneously.
3. Introducing refrigerant charge into high side of the system.
4. Accurately weighing the refrigerant charge introduced into the system.

R-410A SEALED SYSTEM REPAIRS

⚠ WARNING	
	RISK OF ELECTRIC SHOCK Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenances or service. Failure to do so could result in electric shock, serious injury or death.

⚠ WARNING	
	HIGH PRESSURE HAZARD Sealed Refrigeration System contains refrigerant and oil under high pressure. Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants. Failure to follow these procedures could result in serious injury or death.

Refrigerant Charging

NOTE: Because the refrigerant system is a sealed system, service process tubes will have to be installed. First install a line tap and remove refrigerant from system. Make necessary sealed system repairs and vacuum system. Crimp process tube line and solder end shut. Do not leave a service valve in the sealed system.


Proper refrigerant charge is essential to proper unit operation. Operating a unit with an improper refrigerant charge will result in reduced performance (capacity) and/or efficiency. Accordingly, the use of proper charging methods during servicing will insure that the unit is functioning as designed and that its compressor will not be damaged.


Too much refrigerant (overcharge) in the system is just as bad (if not worse) than not enough refrigerant (undercharge). They both can be the source of certain compressor failures if they remain uncorrected for any period of time. Quite often, other problems (such as low air flow across evaporator, etc.) are misdiagnosed as refrigerant charge problems. The refrigerant circuit diagnosis chart will assist you in properly diagnosing the systems.

An overcharged unit will return liquid refrigerant (slugging) back to the suction side of the compressor eventually causing a mechanical failure within the compressor. This mechanical failure can manifest itself as valve failure, bearing failure, and/or other mechanical failure. The specific type of failure will be influenced by the amount of liquid being returned, and the length of time the slugging continues.

Not enough refrigerant (undercharge) on the other hand, will cause the temperature of the suction gas to increase to the point where it does not provide sufficient cooling for the compressor motor. When this occurs, the motor winding temperature will increase causing the motor to overheat and possibly cycle open the compressor overload protector. Continued overheating of the motor windings and/or cycling of the overload will eventually lead to compressor motor or overload failure.

R-410A SEALED SYSTEM REPAIRS

⚠ WARNING	
	RISK OF ELECTRIC SHOCK
	Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenances or service.
	Failure to do so could result in electric shock, serious injury or death.

⚠ WARNING	
	HIGH PRESSURE HAZARD
	Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants.
	Failure to follow these procedures could result in serious injury or death.

Undercharged Refrigerant Systems

An undercharged system will result in poor performance (low pressures, etc.) in both the heating and cooling cycle.

Whenever you service a unit with an undercharge of refrigerant, always suspect a leak. The leak must be repaired before charging the unit.

To check for an undercharged system, turn the unit on, allow the compressor to run long enough to establish working pressures in the system (15 to 20 minutes).

During the cooling cycle you can listen carefully at the exit of the metering device into the evaporator; an intermittent hissing and gurgling sound indicates a low refrigerant charge. Intermittent frosting and thawing of the evaporator is another indication of a low charge, however, frosting and thawing can also be caused by insufficient air over the evaporator or partial restriction in the refrigeration system besides the metering device..

Checks for an undercharged system can be made at the compressor. If the compressor seems quieter than normal, it is an indication of a low refrigerant charge.

A check of the amperage drawn by the compressor motor should show a lower reading. (Check the Unit Specification.) After the unit has run 10 to 15 minutes, check the gauge pressures. Gauges connected to system with an undercharge will have low head pressures and substantially low suction pressures.

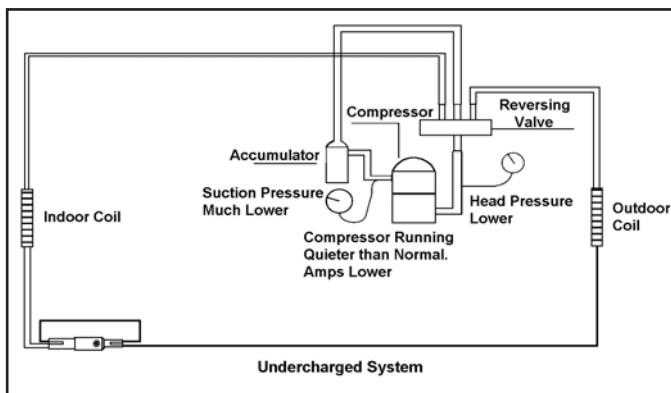



Figure 601 (Undercharged System)


R-410A SEALED SYSTEM REPAIRS

⚠ WARNING	
	RISK OF ELECTRIC SHOCK
	Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenances or service.
	Failure to do so could result in electric shock, serious injury or death.

Overcharged Refrigerant Systems

Whenever an overcharged system is indicated, always make sure that the problem is not caused by air flow problems. Improper air flow over the evaporator coil may indicate some of the same symptoms as an over charged system.

An overcharge can cause the compressor to fail, since it would be “slugged” with liquid refrigerant. The charge for any system is critical. When the compressor is noisy, suspect an overcharge, when you are sure that the air quantity over the evaporator coil is correct. Icing of the evaporator will not be encountered because the refrigerant will boil later if at all. Gauges connected to system will usually have higher head pressure (depending upon amount of over charge). Suction pressure should be slightly higher.

⚠ WARNING	
	HIGH PRESSURE HAZARD
	Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants.
Failure to follow these procedures could result in serious injury or death.	

Compressor amps will be near normal or higher. Noncondensables can also cause these symptoms. To confirm, reclaim some of the charge, if conditions improve, system may be overcharged. If conditions don't improve, Noncondensables are indicated.

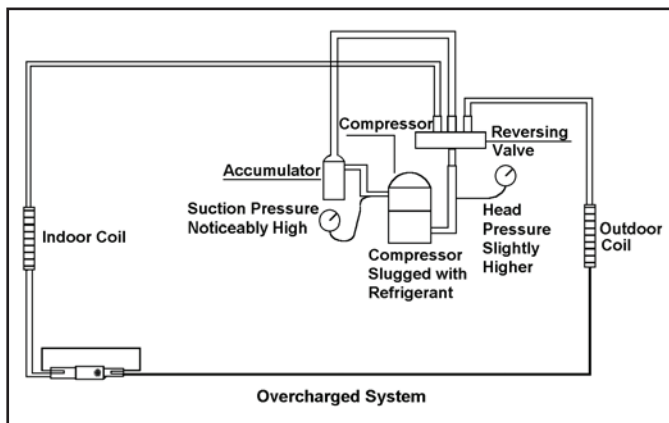


Figure 602 (Overcharged System)

R-410A SEALED SYSTEM REPAIRS

Restricted Refrigerant System

Troubleshooting a restricted refrigerant system can be difficult. The following procedures are the more common problems and solutions to these problems. There are two types of refrigerant restrictions: Partial restrictions and complete restrictions.

A partial restriction allows some of the refrigerant to circulate through the system.

With a complete restriction there is no circulation of refrigerant in the system.
Restricted refrigerant systems display the same symptoms as a "low-charge condition."

When the unit is shut off, or the compressor disengages, the gauges may equalize very slowly.

A quick check for either condition begins at the evaporator. With a partial restriction, there may be gurgling sounds at the metering device entrance to the evaporator. The evaporator in a partial restriction could be partially frosted or have an ice ball close to the entrance of the metering device. Frost may continue on the suction line back to the compressor.

Often a partial restriction of any type can be found by feel, as there is a temperature difference from one side of the restriction to the other.

With a complete restriction, there will be no sound at the metering device entrance. An amperage check of the compressor with a partial restriction may show normal current when compared to the unit specification. With a complete restriction the current drawn may be considerably less than normal, as the compressor is running in a deep vacuum (no load.) Much of the area of the condenser will be relatively cool since most or all of the liquid refrigerant will be stored there.

The following conditions are based primarily on a system in the cooling mode.

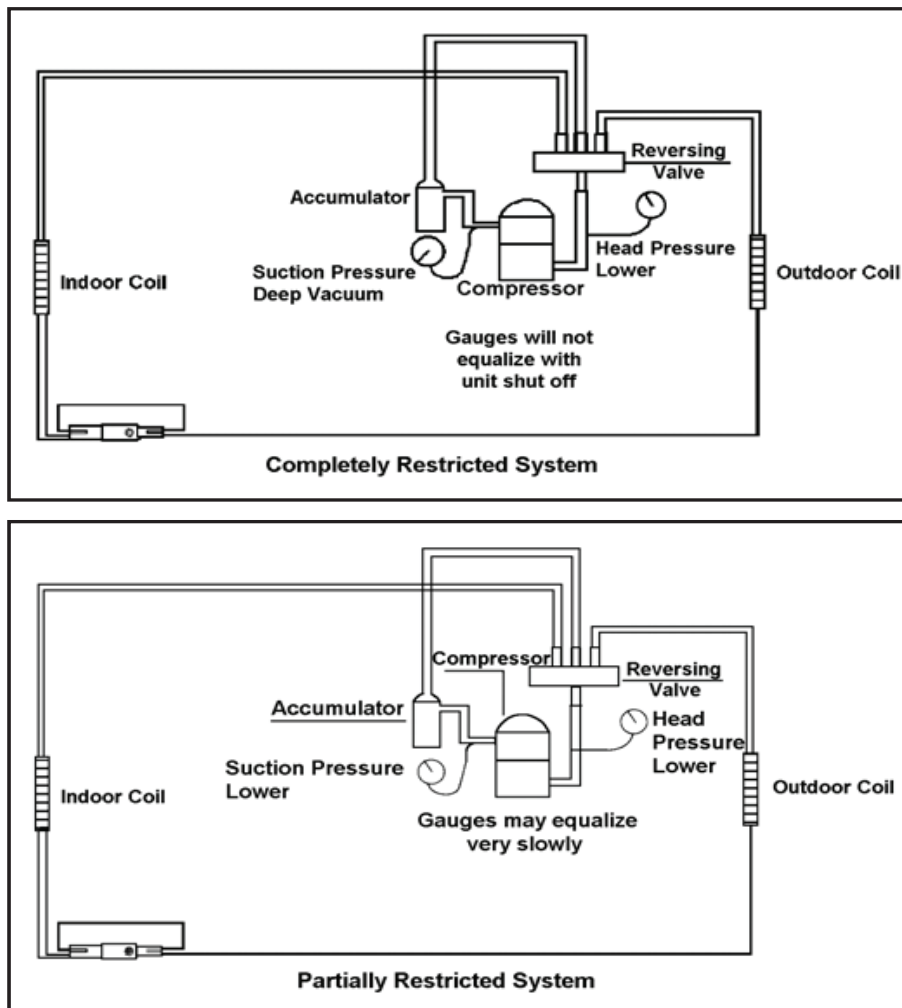






Figure 603 (Restricted System)

R-410A SEALED SYSTEM REPAIRS

Sealed System Method of Charging/ Repairs

 WARNING		 CAUTION	
	BURN HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with a torch.		FREEZE HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with liquid refrigerant.
	Failure to follow these procedures could result in moderate or serious injury.		Failure to follow these procedures could result in minor to moderate injury.

The refrigerant cycle is critically charged. The only acceptable method for charging the sealed system is the Weighed in Charge Method.

The weighed in method should always be used whenever a charge is removed from a unit such as for a leak repair, compressor replacement, or when there is no refrigerant charge left in the unit. To charge by this method, requires the following steps:

1. Install a piercing valve to remove refrigerant from the sealed system. (Piercing valve must be removed from the system before recharging.)
2. Recover Refrigerant in accordance with EPA regulations.
3. Install a process tube to sealed system.
4. Make necessary repairs to system.
5. Evacuate system to 200 microns or less.
6. Weigh in refrigerant with the property quantity of R-410A refrigerant.
7. Start unit, and verify performance.
8. Crimp the process tube and solder the end shut.

EXTERNAL STATIC PRESSURE

External Static Pressure can best be described as the pressure difference (drop) between the Positive Pressure (discharge) and the Negative Pressure (intake) sides of the blower. External Static Pressure is developed by the blower as a result of resistance to airflow (Friction) in the air distribution system EXTERNAL to the VERT-I-PAK cabinet.

Resistance applied externally to the VERT-I-PAK (i.e. duct work, filters, etc.) on either the supply or return side of the system causes an INCREASE in External Static Pressure accompanied by a REDUCTION in airflow.

External Static Pressure is affected by two factors.

1. Resistance
2. Blower Speed (Changing to a higher or lower blower speed will raise or lower the External Static Pressure accordingly).

These affects must be understood and taken into consideration when checking External Static Pressure/Airflow to insure that the system is operating within design conditions.

Operating a system with insufficient or excessive airflow can cause a variety of different operating problems. Among these are problems such as, reduced capacity, freezing evaporator coils, premature compressor heating component failures, and/or other air local distribution issues..

System airflow should always be verified upon completion of a new installation, or before a change-out, compressor replacement, or in the case of heat strip failure to insure that the failure was not caused by improper airflow.

Checking External Static Pressure

The airflow through the unit can be determined by measuring the external static pressure of the system, and consulting the blower performance data for the specific VERT-I-PAK.

1. Set up to measure external static pressure at the supply and return air.
2. Ensure the coil and filter are clean, and that all the registers are open.
3. Determine the external static pressure with the blower operating.

Use an incline or dual port manometer to measure. Measurement should be taken roughly 3-6" from the Vert-I-Pak collar and the center of the indoor coil with the filter installed.

4. Refer to the Air Flow Data for your VERT-I-PAK system to find the actual airflow for factory-selected fan speeds.
5. If the actual airflow is either too high or too low, the blower speed will need to be changed to appropriate setting or the ductwork will need to be reassessed and corrections made as required.
6. Select a speed, which most closely provides the required airflow for the system.
7. Recheck the external static pressure with the new speed. External static pressure (and actual airflow) will have changed to a higher or lower value depending upon speed selected. Recheck the actual airflow (at this "new" static pressure) to confirm speed selection.
8. Repeat steps 8 and 9 (if necessary) until proper airflow has been obtained.

EXAMPLE: Airflow requirements are calculated as follows: (Having a wet coil creates additional resistance to airflow. This additional resistance must be taken into consideration to obtain accurate airflow information.

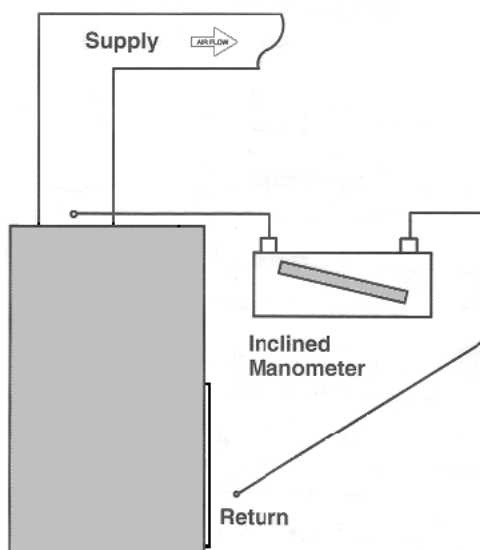


Figure 604

External Static Pressure

Determining the Indoor CFM						
MODEL	VHA 09/12		VHA 18		VHA 24	
FAN SPEED	LOW	HIGH	LOW	HIGH	LOW	HIGH
ESP (")	CFM					
0.0"	470	520	730	800	755	805
0.05"	460	510	670	735	700	750
0.10"	430	490	630	675	660	700
0.15"	410	470	595	640	615	665
0.20"	360	440	550	600	575	625
0.25"	310	400	505	550	525	580
0.30"	260	350	455	500	485	540
0.35"	--	--	400	445	450	500
0.40"	--	--	345	400	415	465

* values indicate rated performance point
Table XXX (determining Indoor CFM)

Correct CFM (if needed): Correction Multipliers	
230V	1.00
208V	0.97
265V	
Heating	1.00
Cooling	0.95

Explanation of charts

Chart A is the nominal dry coil VERT-I-PAK CFMs. Chart B is the correction factors beyond nominal conditions.
1 ½ TON SYSTEM (18,000 Btu)

Operating on high speed @ 230 volts with dry coil
measured external static pressure .10

Air Flow = 450 CFM

In the same SYSTEM used in the previous example but having a WET coil you must use a correction factor of .95 (i.e. 450 x .95=428 CFM) to allow for the resistance (internal) of the condensate on the coil.

It is important to use the proper procedure to check external Static Pressure and determine actual airflow. Since in the case of the VERT-I-PAK, the condensate will cause a reduction in measured External Static Pressure for the given airflow.

It is also important to remember that when dealing with VERT-I-PAK units that the measured External Static Pressure increases as the resistance is added externally to the cabinet. Example: duct work, filters, grilles.

Indoor Airflow Data

The Vert-I-Pak A series units must be installed with a free return air configuration. The table below lists the indoor airflow at corresponding static pressures. All units are rated at low speed.

The Vert-I-Pak units are designed for either single speed or two fan speed operation. For single speed operation refer to the airflow table below and select the most appropriate CFM based on the ESP level. Connect the fan output from the thermostat to the unit on either the GL terminal for low speed or to the GH terminal for high speed operation.

For thermostats with two-speed fan outputs connect the low speed output to the unit GL terminal and the high speed output to the GH terminal.

Ductwork Preparation

If flex duct is used, be sure all the slack is pulled out of the flex duct. Flex duct ESP can increase considerably when not fully extended. DO NOT EXCEED a total of .30 ESP, as this is the MAXIMUM design limit for the VERT-I-PAK A-Series unit.

IMPORTANT: FLEX DUCT CAN COLLAPSE AND CAUSE AIRFLOW RESTRICTIONS. DO NOT USE FLEX DUCT FOR: 90 DEGREE BENDS, OR UNSUPPORTED RUNS OF 5 FT. OR MORE.

External Static Pressure

Fresh Air Door

The Fresh Air Door is an "intake" system. The fresh air door opened via a slide on the front of the chassis located just above the indoor coil. Move the slide left to open and right to close the fresh air door. The system is capable of up to 60 CFM of fresh air @ ~.3" H2O internal static pressure.

Checking Approximate Airflow

If an inclined manometer or Magnehelic gauge is not available to check the External Static Pressure, or the blower performance data is unavailable for your unit, approximate air flow can be calculated by measuring the temperature rise, then using the following criteria.

$$CFM = \frac{\text{Kilowatts} \times 3413}{\text{Temp Rise} \times 1.08}$$

Electric Heat Strips

The approximate CFM actually being delivered can be calculated by using the following formula:

DO NOT simply use the Kilowatt Rating of the heater (i.e. 2.5, 3.4, 5.0) as this will result in a less-than-correct airflow calculation. Kilowatts may be calculated by multiplying the measured voltage to the unit (heater) times the measured current draw of all heaters (ONLY) in operation to obtain watts. Kilowatts are then obtained by dividing by 1000.

EXAMPLE: Measured voltage to unit (heaters) is 230 volts. Measured Current Draw of strip heaters is 11.0 amps.

$$230 \times 11.0 = 2530$$

$$2530/1000 = 2.53 \text{ Kilowatts}$$

$$2.53 \times 3413 = 8635$$

$$\text{Supply Air} = 95^{\circ}\text{F}$$

$$\text{Return Air} = 75^{\circ}\text{F}$$

$$\text{Temperature Rise} = 20^{\circ}\text{F}$$


$$20 \times 1.08 = 21.6$$

$$\frac{8635}{21.6} = 400 \text{ CFM}$$

COMPONENT TESTING

Hermetic Components Check

⚠ WARNING	
	BURN HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with a torch. Failure to follow these procedures could result in moderate or serious injury.

⚠ WARNING	
	CUT/SEVER HAZARD Be careful with the sharp edges and corners. Wear protective clothing and gloves, etc. Failure to do so could result in serious injury.

Metering Device - Capillary Tube Systems

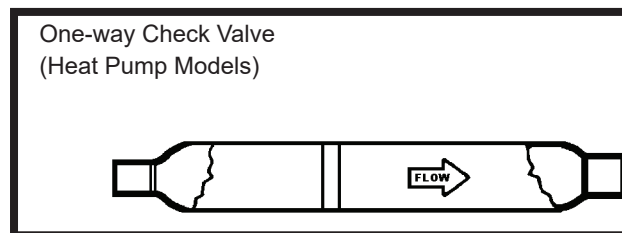
All units are equipped with capillary tube metering devices. Checking for restricted capillary tubes.

1. Connect pressure gauges to unit.
2. Start the unit in the cooling mode. If after a few minutes of operation the pressures are normal, the check valve and the cooling capillary are not restricted.
3. Switch the unit to the heating mode and observe the gauge readings after a few minutes running time. If the system pressure is lower than normal, the heating capillary is restricted.
4. If the operating pressures are lower than normal in both the heating and cooling mode, the cooling capillary is restricted.

Check Valve

A unique two-way check valve is used on the reverse cycle heat pumps. It is pressure operated and used to direct the flow of refrigerant through a single filter drier and to the proper capillary tube during either the heating or cooling cycle.

NOTE: The slide (check) inside the valve is made of teflon. Should it become necessary to replace the check valve, place a wet cloth around the valve to prevent overheating during the brazing operation.



One-way Check Valve
(Heat Pump Models)

Figure 701 (Check Valve)

CHECK VALVE OPERATION

In the cooling mode of operation, high pressure liquid enters the check valve forcing the slide to close the opposite port (liquid line) to the indoor coil. Refer to refrigerant flow chart. This directs the refrigerant through the filter drier and cooling capillary tube to the indoor coil.

In the heating mode of operation, high pressure refrigerant enters the check valve from the opposite direction, closing the port (liquid line) to the outdoor coil. The flow path of the refrigerant is then through the filter drier and heating capillary to the outdoor coil.

Failure of the slide in the check valve to seat properly in either mode of operation will cause flooding of the cooling coil. This is due to the refrigerant bypassing the heating or cooling capillary tube and entering the liquid line.

COOLING MODE

In the cooling mode of operation, liquid refrigerant from condenser (liquid line) enters the cooling check valve forcing the heating check valve shut. The liquid refrigerant is directed into the liquid dryer after which the refrigerant is metered through cooling capillary tubes to evaporator. (Note: liquid refrigerant will also be directed through the heating capillary tubes in a continuous loop during the cooling mode).

HEATING MODE

In the heating mode of operation, liquid refrigerant from the indoor coil enters the heating check valve forcing the cooling check valve shut. The liquid refrigerant is directed into the liquid dryer after which the refrigerant is metered through the heating capillary tubes to outdoor coils. (Note: liquid refrigerant will also be directed through the cooling capillary tubes in a continuous loop during the heating mode).

COMPONENT TESTING

Reversing Valve Description And Operation

The Reversing Valve controls the direction of refrigerant flow to the indoor and outdoor coils. It consists of a pressure-operated, main valve and a pilot valve actuated by a solenoid plunger. The solenoid is energized during the heating cycle only. The reversing valves used in the RAC system is a 2-position, 4-way valve.

The single tube on one side of the main valve body is the high-pressure inlet to the valve from the compressor. The center tube on the opposite side is connected to the low pressure (suction) side of the system. The other two are connected to the indoor and outdoor coils. Small capillary tubes connect each end of the main valve cylinder to the "A" and "B" ports of the pilot valve. A third capillary is a common return line from these ports to the suction tube on the main valve body. Four-way reversing valves also have a capillary tube from the compressor discharge tube to the pilot valve.

The piston assembly in the main valve can only be shifted by the pressure differential between the high and low sides of the system. The pilot section of the valve opens and closes ports for the small capillary tubes to the main valve to cause it to shift.

NOTE: System operating pressures must be near normal before valve can shift.

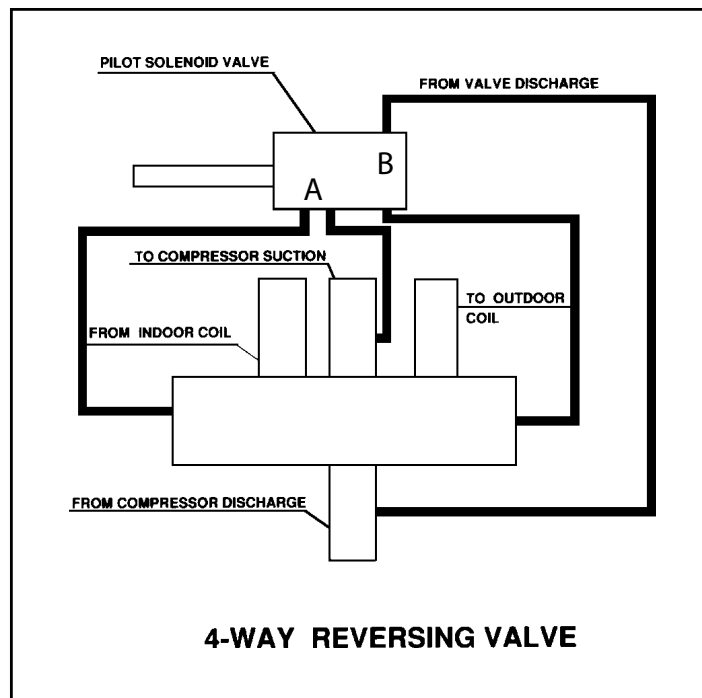


Figure 702 (Reversing Valve)

COMPONENT TESTING

Testing The Reversing Valve Solenoid Coil

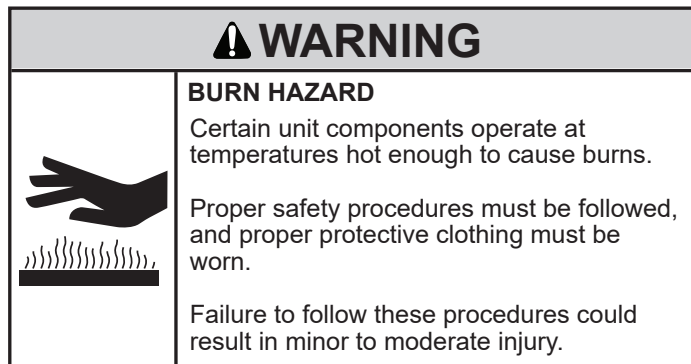


The solenoid coil is an electromagnetic type coil mounted on the reversing valve and is energized during the operation of the compressor in the heating cycle.

1. Turn off high voltage electrical power to unit.
2. Unplug line voltage lead from reversing valve coil.
3. Check for electrical continuity through the coil. If you do not have continuity replace the coil.
4. Check from each lead of coil to the copper liquid line as it leaves the unit or the ground lug. There should be no continuity between either of the coil leads and ground; if there is, coil is grounded and must be replaced.
5. If coil tests okay, reconnect the electrical leads.
6. Make sure coil has been assembled correctly.

NOTE: Do not start unit with solenoid coil removed from valve, or do not remove coil after unit is in operation. This will cause the coil to burn out.

Touch Test in Heating/Cooling Cycle




The only definite indications that the slide is in the mid-position is if all three tubes on the suction side of the valve are hot after a few minutes of running time.

NOTE: If both tubes shown as hot or cool are not the same corresponding temperature, refer to figure 703, then the reversing valve is not shifting properly.

COMPONENT TESTING

Checking The Reversing Valve

⚠ WARNING	
	HIGH PRESSURE HAZARD
	Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants.
	Failure to follow these procedures could result in serious injury or death.

NOTE: You must have normal operating pressures before the reversing valve can shift.

Check the operation of the valve by starting the system and switching the operation from “Cooling” to “Heating” and then back to “Cooling”. Rapidly cycle. Do not hammer on valve.

Occasionally, the reversing valve may stick in the heating or cooling position or in the mid-position. When sluggish or stuck in the mid-position, part of the discharge gas from the compressor is directed back to the suction side, resulting in excessively high suction pressure.

Should the valve fail to shift from cooling to heating, block the air flow through the outdoor coil and allow the discharge pressure to build in the system. Then switch the system from heating to cooling.

If the valve is stuck in the heating position, block the air flow through the indoor coil and allow discharge pressure to build in the system. Then switch the system from heating to cooling.

Should the valve fail to shift in either position after increasing the discharge pressure, replace the valve.

Dented or damaged valve body or capillary tubes can prevent the main slide in the valve body from shifting. If you determine this is the problem, replace the reversing valve.

After all of the previous inspections and checks have been made and determined correct, then perform the “Touch Test” on the reversing valve.

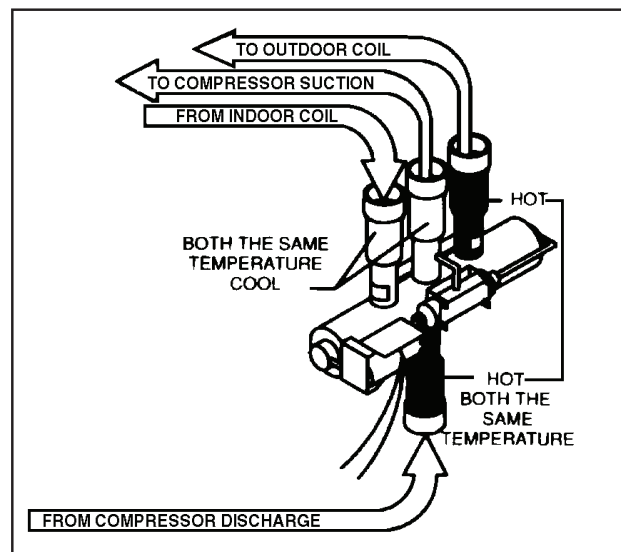
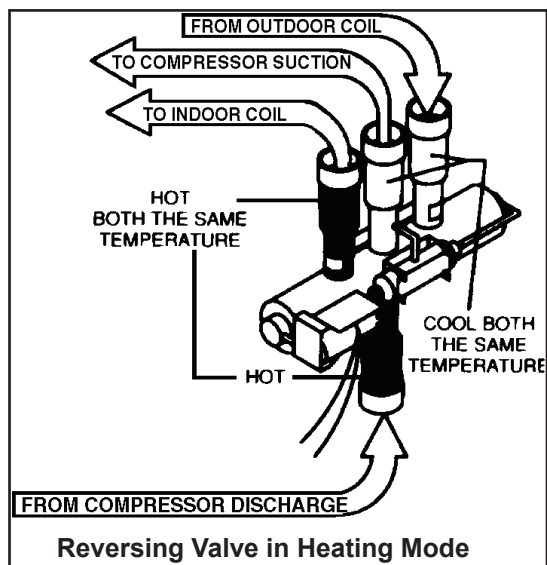



Figure 703 (Checking The Reversing Valve)


COMPONENT TESTING

Replace The Reversing Valve

⚠ WARNING	
	HIGH PRESSURE HAZARD Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants.
	Failure to follow these procedures could result in serious injury or death.

NOTICE
FIRE HAZARD The use of a torch requires extreme care and proper judgment. Follow all safety recommended precautions and protect surrounding areas with fire proof materials. Have a fire extinguisher readily available. Failure to follow this notice could result in moderate to serious property damage.

1. Install Process Tubes. Recover refrigerant from sealed system. PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED.
2. Remove solenoid coil from reversing valve. If coil is to be reused, remove solenoid and protect from heat while changing valve.
3. Unbrazed all lines from reversing valve.
4. Clean all excess braze from all tubing so that they will slip into fittings on new valve.
5. Remove solenoid coil from new valve.
6. Protect new valve body from heat while brazing with plastic heat sink (Thermo Trap) or wrap valve body with wet rag.
7. Fit all lines into new valve and braze lines into new valve.

⚠ WARNING	
	EXPLOSION HAZARD The use of nitrogen requires a pressure regulator. Follow all safety procedures and wear protective safety clothing etc.
	Failure to follow proper safety procedures could result in serious injury or death.

8. Pressurize sealed system with a combination of R-410A and nitrogen. Pressurize system to 550 psi and triple evacuate. Check for leaks, using a suitable leak detector. Recover refrigerant per EPA guidelines.
9. Once the sealed system is leak free, install solenoid coil on new valve and charge the sealed system by weighing in the proper amount and type of refrigerant as shown on rating plate. Crimp the process tubes and solder the ends shut. Do not leave Schrader or piercing valves in the sealed system.

NOTE: When brazing a reversing valve into the system, it is of extreme importance that the temperature of the valve does not exceed 250°F at any time.

Wrap the reversing valve with a large rag saturated with water. "Re-wet" the rag and thoroughly cool the valve after each brazing operation of the four joints involved.

The wet rag around the reversing valve will eliminate conduction of heat to the valve body when brazing the line connection.

COMPONENT TESTING



Touch Test Chart : To Service Reversing Valves

NORMAL FUNCTION OF VALVE							
VALVE OPERATING CONDITION	DISCHARGE TUBE from Compressor	SUCTION TUBE	COIL	Tube to OUTSIDE COIL	LEFT Pilot	RIGHT Pilot	NOTES:
	1	2	3	4	5	6	* TEMPERATURE OF VALVE BODY ** WARMER THAN VALVE BODY
							POSSIBLE CAUSES CORRECTIONS
Normal Cooling	Hot	Cool	Cool as (2)	Hot as (1)	*TVB	TVB	
Normal Heating	Hot	Cool	Hot as (1)	Cool as (2)	*TVB	TVB	
MALFUNCTION OF VALVE							
Valve will not shift from cool to heat.	Check Electrical circuit and coil					No voltage to coil.	Repair electrical circuit.
						Defective coil.	Replace coil.
	Check refrigeration charge					Low charge.	Repair leak, recharge system.
						Pressure differential too high.	Recheck system.
	Hot	Cool	Cool, as (2)	Hot, as (1)	*TVB	Hot	Pilot valve okay. Dirt in one bleeder hole.
							Deenergize solenoid, raise head pressure, reenergize solenoid to break dirt loose. If unsuccessful, remove valve, wash out. Check on air before installing. If no movement, replace valve, add strainer to discharge tube, mount valve horizontally.
Valve will not shift from cool to heat.							Piston cup leak
							Stop unit. After pressures equalize, restart with solenoid energized. If valve shifts, reattempt with compressor running. If still no shift, replace valve.
Valve will not shift from cool to heat.	Hot	Cool	Cool, as (2)	Hot, as (1)	*TVB	*TVB	Clogged pilot tubes.
							Raise head pressure, operate solenoid to free. If still no shift, replace valve.
	Hot	Cool	Cool, as (2)	Hot, as (1)	Hot	Hot	Both ports of pilot open. (Back seat port did not close).
Starts to shift but does not complete reversal.							Raise head pressure, operate solenoid to free partially clogged port. If still no shift, replace valve.
	Warm	Cool	Cool, as (2)	Hot, as (1)	*TVB	Warm	Defective Compressor.
							Replace compressor
	Hot	Warm	Warm	Hot	*TVB	Hot	Not enough pressure differential at start of stroke or not enough flow to maintain pressure differential.
							Check unit for correct operating pressures and charge. Raise head pressure. If no shift, use valve with smaller port.
							Body damage.
Apparent leap in heating.							Replace valve
	Hot	Warm	Warm	Hot	Hot	Hot	Both ports of pilot open.
							Raise head pressure, operate solenoid. If no shift, use valve with smaller ports.
	Hot	Hot	Hot	Hot	*TVB	Hot	Body damage.
							Replace valve
							Valve hung up at mid-stroke. Pumping volume of compressor not sufficient to maintain reversal.
Will not shift from heat to cool.	Hot	Hot	Hot	Hot	Hot	Hot	Raise head pressure, operate solenoid. If no shift, use valve with smaller ports.
							Raise head pressure, operate solenoid. If no shift, replace valve.
	Hot	Cool	Hot, as (1)	Cool, as (2)	*TVB	*TVB	Piston needle on end of slide leaking.
							Operate valve several times, then recheck. If excessive leak, replace valve.
	Hot	Cool	Hot, as (1)	Cool, as (2)	**WVB	**WVB	Pilot needle and piston needle leaking.
							Operate valve several times, then recheck. If excessive leak, replace valve.
Will not shift from heat to cool.	Hot	Cool	Hot, as (1)	Cool, as (2)	*TVB	*TVB	Pressure differential too high.
							Stop unit. Will reverse during equalization period. Recheck system
							Clogged pilot tube.
							Raise head pressure, operate solenoid to free dirt. If still no shift, replace valve.
	Hot	Cool	Hot, as (1)	Cool, as (2)	Hot	*TVB	Dirt in bleeder hole.
							Raise head pressure, operate solenoid. Remove valve and wash out. Check on air before reinstalling, if no movement, replace valve. Add strainer to discharge tube. Mount valve horizontally.
Will not shift from heat to cool.	Hot	Cool	Hot, as (1)	Cool, as (2)	Hot	*TVB	Piston cup leak.
							Stop unit. After pressures equalize, restart with solenoid deenergized. If valve shifts, reattempt with compressor running. If it still will not reverse while running, replace the valve.
	Hot	Cool	Hot, as (1)	Cool, as (2)	Hot	Hot	Defective pilot.
							Replace valve.
Warm	Cool	Warm, as (1)	Cool, as (2)	Warm	*TVB	Defective compressor.	Replace compressor

Figure 704 (Touch Test Chart)

COMPONENT TESTING

Compressor Checks

 WARNING	
	ELECTRIC SHOCK HAZARD
	Turn off electric power before service or installation.
	All electrical connections and wiring MUST be installed by a qualified electrician and conform to the National Electrical Code and all local codes which have jurisdiction. Failure to do so can result in personal injury or death.

 WARNING	
	BURN HAZARD
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with a torch.
	Failure to follow these procedures could result in moderate or serious injury.

Locked Rotor Voltage (L.R.V.) Test

Locked rotor voltage (L.R.V.) is the actual voltage available at the compressor under a stalled condition.

Single Phase Connections

Disconnect power from unit. Using a voltmeter, attach one lead of the meter to the run “R” terminal on the compressor and the other lead to the common “C” terminal of the compressor. Restore power to unit.

Determine L.R.V.

Start the compressor with the volt meter attached; then stop the unit. Attempt to restart the compressor within a couple of seconds and immediately read the voltage on the meter. The compressor under these conditions will not start and will usually kick out on overload within a few seconds since the pressures in the system will not have had time to equalize. Voltage should be at or above minimum voltage of 197 VAC, as specified on the rating plate. If less than minimum, check for cause of inadequate power supply; i.e., incorrect wire size, loose electrical connections, etc.

Amperage (R.L.A) Test

The running amperage of the compressor is the most important of these readings. A running amperage higher than that indicated in the performance data indicates that a problem exists mechanically or electrically.

Single Phase Running and L.R.A. Test

NOTE: Consult the specification and performance section for running amperage. The L.R.A. can also be found on the rating plate.

Select the proper amperage scale and clamp the meter probe around the wire to the “C” terminal of the compressor.

Turn on the unit and read the running amperage on the meter. If the compressor does not start, the reading will indicate the locked rotor amperage [L.R.A.].

Overloads

The compressor is equipped with either an external or internal overload which senses both motor amperage and winding temperature. High motor temperature or amperage heats the overload causing it to open, breaking the common circuit within the compressor. Heat generated within the compressor shell, usually due to recycling of the motor, is slow to dissipate. It may take anywhere from a few minutes to several hours for the overload to reset.

Checking the Overloads

External Overloads VPAK 9, 12, and 18K Btus

With power off, remove the leads from compressor terminals. If the compressor is hot, allow the overload to cool before starting check. Using an ohmmeter, test continuity across the terminals of the external overload. If you do not have continuity; this indicates that the overload is open and must be replaced.

Internal Overloads VPAK 24k Btus

The overload is embedded in the motor windings to sense the winding temperature and/or current draw. The overload is connected in series with the common motor terminal.


Should the internal temperature and/or current draw become excessive, the contacts in the overload will open, turning off the compressor. The overload will automatically reset, but may require several hours before the heat is dissipated.


Checking the Internal Overload

1. With no power to unit, remove the leads from the compressor terminals.
2. Using an ohmmeter, test continuity between terminals C-S and C-R. If no continuity, the compressor overload is open and the compressor must be replaced.

COMPONENT TESTING

Compressor Checks

⚠ WARNING	
	ELECTRIC SHOCK HAZARD
	Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

⚠ WARNING	
	HIGH PRESSURE HAZARD
	Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants. Failure to follow these procedures could result in serious injury or death.

Single Phase Resistance Test

Remove the leads from the compressor terminals and set the ohmmeter on the lowest scale (R x 1).

Touch the leads of the ohmmeter from terminals common to start ("C" to "S"). Next, touch the leads of the ohmmeter from terminals common to run ("C" to "R").

Add values "C" to "S" and "C" to "R" together and check resistance from start to run terminals ("S" to "R"). Resistance "S" to "R" should equal the total of "C" to "S" and "C" to "R."

In a single phase PSC compressor motor, the highest value will be from the start to the run connections ("S" to "R"). The next highest resistance is from the start to the common connections ("S" to "C"). The lowest resistance is from the run to common. ("C" to "R") Before replacing a compressor, check to be sure it is defective.

GROUND TEST

Use an ohmmeter set on its highest scale. Touch one lead to the compressor body (clean point of contact as a good connection is a must) and the other probe in turn to each compressor terminal. If a reading is obtained the compressor is grounded and must be replaced.

Check the complete electrical system to the compressor and compressor internal electrical system, check to be certain that compressor is not out on internal overload.

Complete evaluation of the system must be made whenever you suspect the compressor is defective. If the compressor has been operating for sometime, a careful examination must be made to determine why the compressor failed.

Many compressor failures are caused by the following conditions:

- 1.Improper air flow over the evaporator.
- 2.Overcharged refrigerant system causing liquid to be returned to the compressor.
- 3.Restricted refrigerant system.
- 4.Lack of lubrication.
- 5.Liquid refrigerant returning to compressor causing oil to be washed out of bearings.
- 6.Noncondensables such as air and moisture in the system. Moisture is extremely destructive to a refrigerant system.
- 7.Capacitor.

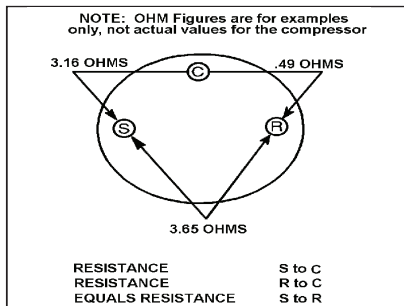


Figure 705 (Resistance Chart)

CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is normally due to broken or damaged suction and/or discharge valves, reducing the ability of the compressor to pump refrigerant gas.



This condition can be checked as follows:



1. Install a piercing valve on the suction and discharge or liquid process tube.
2. Attach gauges to the high and low sides of the system.-
3. Start the system to operate the compressor and run a "cooling or heating performance test." If test shows:
 - A. Below normal high side pressure
 - B. Above normal low side pressure
 - C. Low temperature difference across coil



The compressor valves are faulty - replace the compressor.



COMPONENT TESTING

Compressor Replacement

 WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied. Failure to do so could result in serious injury or death.

 WARNING	
	HIGH PRESSURE HAZARD Sealed Refrigeration System contains refrigerant and oil under high pressure. Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants. Failure to follow these procedures could result in serious injury or death.

 WARNING	
	EXPLOSION HAZARD The use of nitrogen requires a pressure regulator. Follow all safety procedures and wear protective safety clothing etc. Failure to follow proper safety procedures could result in serious injury or death.

 CAUTION	
	FREEZE HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with liquid refrigerant. Failure to follow these procedures could result in minor to moderate injury.

1. Be certain to perform all necessary electrical and refrigeration tests to be sure the compressor is actually defective before replacing.

2. Recover all refrigerant from the system through the process tubes. **PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED.** Do not use gauge manifold for this purpose if there has been a burnout. You will contaminate your manifold and hoses. Use a Schrader valve adapter and copper tubing for burnout failures.

3. After all refrigerant has been recovered, disconnect suction and discharge lines from the compressor and remove compressor. Be certain to have both suction and discharge process tubes open to atmosphere.

4. Carefully pour a small amount of oil from the suction stub of the defective compressor into a clean container.

5. Using an acid test kit (one shot or conventional kit), test the oil for acid content according to the instructions with the kit.

6. If any evidence of a burnout is found, no matter how slight, the system will need to be cleaned up following proper procedures.

7. Install the replacement compressor.

8. Pressurize with a combination of R-410A and nitrogen and leak test all connections with a leak detector. Recover refrigerant and repair any leaks found.

8a. If leak detector is unavailable remove all refrigerant from system and pressurize with nitrogen to 550 psi. Check that system holds pressure.



Repeat Step 8 to insure no more leaks are present



9. Evacuate the system with a good vacuum pump capable of a final vacuum of 500 microns or less. The system should be evacuated through both liquid line and suction line gauge ports. While the unit is being evacuated, seal all openings on the defective compressor. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.



10. Recharge the system with the correct amount of refrigerant. The proper refrigerant charge will be found on the unit rating plate. The use of an accurate measuring device, such as a charging cylinder, electronic scales or similar device is necessary.



COMPONENT TESTING

Compressor Replacement -Special Procedure in Case of Compressor Burnout

 WARNING	
	HIGH PRESSURE HAZARD Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants.
	Failure to follow these procedures could result in serious injury or death.

 WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

 WARNING	
	EXPLOSION HAZARD The use of nitrogen requires a pressure regulator. Follow all safety procedures and wear protective safety clothing etc.
	Failure to follow proper safety procedures could result in serious injury or death.

 WARNING	
	NEVER , under any circumstances, liquid charge a rotary-compressor through the LOW side. Doing so would cause permanent damage to the new compressor. Use a charging adapter.

1. Recover all refrigerant and oil from the system.
2. Remove compressor, capillary tube and filter drier from the system.
3. Flush evaporator condenser and all connecting tubing with dry nitrogen or equivalent. Use approved flushing agent to remove all contamination from system. Inspect suction and discharge line for carbon deposits. Remove and clean if necessary. Ensure all acid is neutralized.
4. Reassemble the system, including new drier strainer and capillary tube.
5. Pressurize with a combination of R-410A and nitrogen and leak test all connections with a leak detector. Recover refrigerant and repair any leaks found.
- 5a. If leak detector is unavailable remove all refrigerant from system and pressurize with nitrogen to 550 psi. Check that system holds pressure.

Repeat Step 5 to insure no more leaks are present

6. Evacuate the system with a good vacuum pump capable of a final vacuum of 500 microns or less. The system should be evacuated through both liquid line and suction line gauge ports. While the unit is being evacuated, seal all openings on the defective compressor. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.

7. Recharge the system with the correct amount of refrigerant. The proper refrigerant charge will be found on the unit rating plate. The use of an accurate measuring device, such as a charging cylinder, electronic scales or similar device is necessary.


ROTARY AND SCROLL COMPRESSOR SPECIAL TROUBLESHOOTING AND SERVICE

Troubleshooting and servicing rotary compressors is basically the same as on the reciprocating compressor with only one main exception:

COMPONENTS TESTING

Fan Motor

A single phase permanent split capacitor motor is used to drive the evaporator blower and condenser fan. A self-resetting overload is located inside the motor to protect against high temperature and high amperage conditions.

⚠ WARNING	
	ELECTRIC SHOCK HAZARD
	Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

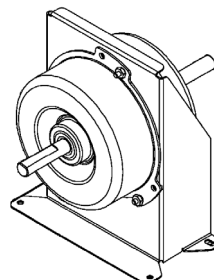



Figure 706 (Blower/ Fan Motor)

Blower / Fan Motor Test

1. Visually inspect the motor's wiring, housing etc., and determine that the capacitor is serviceable.
2. Make sure the motor has cooled down.
3. Disconnect the fan motor wires from the control board.
4. Test for continuity between the windings also, test to ground.
5. If any winding is open or grounded replace the motor.
6. Apply "live" test cord probes on black wire and common terminal of capacitor. Motor should run at high speed.
7. Apply "live" test cord probes on red wire and common terminal of capacitor. Motor should run at low speed.
8. Apply "live" test cord probes on each of the remaining wires from the speed switch or system switch to test intermediate speeds.

Capacitors

⚠ WARNING	
	ELECTRIC SHOCK HAZARD
	Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

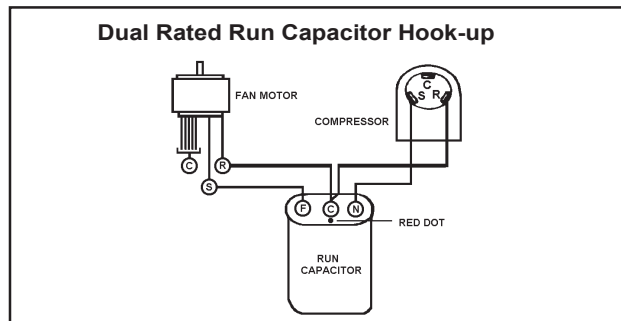


Figure 707 Dual Rated Capacitor Hook-Up

Many motor capacitors are internally fused. Shorting the terminals will blow the fuse, ruining the capacitor. A 20,000 ohm 2 watt resistor can be used to discharge capacitors safely. Remove wires from capacitor and place resistor across terminals. When checking a dual capacitor with a capacitor analyzer or ohmmeter, both sides must be tested.

Capacitor Check

The meter will show whether the capacitor is "open" or "shorted." It will tell whether the capacitor is within its micro farads rating and it will show whether the capacitor is operating at the proper power-factor percentage. The instrument will automatically discharge the capacitor when the test switch is released.

Capacitor Connections


The starting winding of a motor can be damaged by a shorted and grounded running capacitor. This damage usually can be avoided by proper connection of the running capacitor terminals.

From the supply line on a typical 230 volt circuit, a 115 volt potential exists from the "R" terminal to ground through a possible short in the capacitor. However, from the "S" or start terminal, a much higher potential, possibly as high as 400 volts, exists because of the counter EMF generated in the start winding. Therefore, the possibility of capacitor failure is much greater when the identified terminal is connected to the "S" or start terminal. The identified terminal should always be connected to the supply line, or "R" terminal, never to the "S" terminal.

When connected properly, a shorted or grounded running capacitor will result in a direct short to ground from the "R" terminal and will blow the line fuse. The motor protector will protect the main winding from excessive temperature.

COMPONENTS TESTING

Heating Element and Limit Switch

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

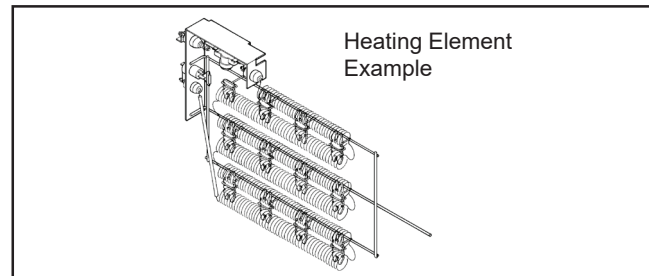


Figure 708 (Heating Element)

All heat pumps and electric heat models are equipped with a heating element and a limit switch (bimetal thermostat). The limit switches are in series with the element and will interrupt the power at a designed temperature. Should the blower motor fail, filter become clogged or air-flow be restricted etc., the high limit switch will open and interrupt the power to the heater before reaching an un-safe temperature condition.

Heater Elements And Limit Switches' Specifications

VPAK 9K, 12K and 18K BTUs Models:

2.5 KW, 230 V, Resistance 18.61 Ohms + - 5%.

Has 1 Limit Switch, Opens at 120° F, Closes at 90° F,

It has a One Time Open Temp. of 145° F.

3.4 KW, 230 V, Resistance 13.68 Ohms + - 5%.

Has 1 Limit Switch, Opens at 120° F, Closes at 90° F,

It has a One Time Open Temp. of 145° F.

5 KW, 230 V, Resistance 9.31 Ohms + - 5%.

Has 1 Limit Switch, Opens at 130° F, Closes at 100° F, It has a One Time Open Temp. of 155° F.

VPAK 24K BTUs Models:

2.5 KW, 265 V, Resistance 24.86 Ohms + - 5%.

Has 2 Limit Switches, Primary Opens at 120° F,

Closes at 90° F, Secondary's Open Temp. is 145° F.

3.4 KW, 265 V, Resistance 13.68 Ohms + - 5%.

Has 2 Limit Switches, Primary Opens at 120° F,

Closes at 90° F, Secondary's Open Temp. is 145° F.

5 KW, 265 V, Resistance 9.31 Ohms + - 5%.

Has 2 Limit Switches, Primary Opens at 130° F,

Closes at 100° F, Secondary's Open Temp. is 155° F.

7.5 KW, 265 V (composed of 2, 3.7 KW Elements) Each Has a Resistance of 16.47 Ohms + - 5%.

Each Has 2 Limit Switches, Primary Opens at 155° F, Closes at 125° F With a 1 time Open Temp. of 200° F. Secondary Limit's Open Temp. is 200° F.

COMPONENTS TESTING

Heating Element and Limit Switch

VPAk 24K models

2.5 KW, 230 V, Resistance 18.61 Ohms + - 5%.

Has 1 Limit Switch, Opens at 155° F, Closes at 125° F,

It has a One Time Open Temp. of 200° F.

3.4 KW, 230 V, Resistance 13.68 Ohms + - 5%.

Has 1 Limit Switch, Opens at 155° F, Closes at 125° F,

It has a One Time Open Temp. of 200° F.

5 KW, 230 V, Resistance 9.31 Ohms + - 5%.

Has 1 Limit Switch, Opens at 155° F, Closes at 125° F, It has a One Time Open Temp. of 200° F.

VPAK 24K BTUs Models:

7.5 KW, 230 V (composed of 2, 3.7 KW Elements) Each Has a Resistance of 12.41 Ohms + - 5%.

Each Has 2 Limit Switches, Primary Opens at 165° F, Closes at 135° F With a 1 time Open Temp. of 210° F. Secondary Limit's Open Temp. is 200° F.

10 KW, 230 V (composed of 2, 5 KW Elements)

Each Has a Resistance of 9.31 Ohms + - 5%.

Each Has 2 Limit Switches, Primary Opens at 165° F, Closes at 135° F With a 1 time Open Temp. of 210° F. Secondary Limit's Open Temp. is 200° F.

2.5 KW, 265 V, Resistance 24.71 Ohms + - 5%.

Has 2 Limit Switches, Primary Opens at 155° F,
Closes at 125° F, Secondary's Open Temp. is 200° F.

3.4 KW, 265 V, Resistance 18.17 Ohms + - 5%.

Has 2 Limit Switches, Primary Opens at 155° F,
Closes at 125° F, Secondary's Open Temp. is 200° F.

5 KW, 265 V, Resistance 12.35 Ohms + - 5%.

Has 2 Limit Switches, Primary Opens at 165° F,
Closes at 135° F, Secondary's Open Temp. is 200° F.

7.5 KW, 265 V (composed of 2, 3.7 KW Elements) Each Has a Resistance of 16.47 Ohms + - 5%.

Each Has 2 Limit Switches, Primary Opens at 155° F, Closes at 125° F With a 1 time Open Temp. of 200° F. Secondary Limit's Open Temp. is 200° F.

10 KW, 265 V (composed of 2, 5 KW Elements)

Each Has a Resistance of 12.35 Ohms + - 5%.

Each Has 2 Limit Switches, Primary Opens at 155° F, Closes at 125° F With a 1 time Open Temp. of 200° F. Secondary Limit's Open Temp. is 200° F.

NOTE: Always replace with an exact replacement.

Testing The Heating Element

Testing of the elements can be made with an ohmmeter across the terminals after the connecting wires have been removed.

COMPONENTS TESTING

⚠ WARNING



ELECTRIC SHOCK HAZARD

Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.

Failure to do so could result in serious injury or death.

Drain Pan Valve

During the cooling mode of operation, condensate which collects in the drain pan is picked up by the condenser fan blade and sprayed onto the condenser coil. This assists in cooling the refrigerant plus evaporating the water.

During the heating mode of operation, it is necessary that water be removed to prevent it from freezing during cold outside temperatures. This could cause the condenser fan blade to freeze in the accumulated water and prevent it from turning.

To provide a means of draining this water, a bellows type drain valve is installed over a drain opening in the base pan.

This valve is temperature sensitive and will open when the outside temperature reaches 40°F. The valve will close gradually as the temperature rises above 40°F to fully close at 60°F.

To test the drain pan valve;

- 1) Place a pack of ice on the capillary
- 2) Ensure that the valve opens as it cools down.
- 3) remove the pack of ice.
- 4) Ensure that the valve closes fully as the valve warms back up.

Bellows Assembly
Drain Pan Valve

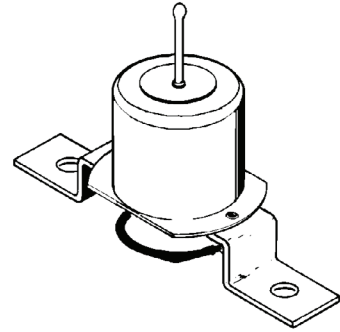


Figure 709 Drain Pan Valve

COMPONENTS TESTING

Thermistor Resistance Values (This Table Applies to All Thermistors)


TEMP	RESISTANCE (K Ohms)			RESISTANCE TOLERANCE %	
	MIN	CENTR	MAX	MIN	MAX
F					
-25	210.889	225.548	240.224	6.50	6.51
-20	178.952	190.889	202.825	6.25	6.25
-15	151.591	161.325	171.059	6.03	6.03
-10	128.434	136.363	144.292	5.81	5.81
-5	108.886	115.340	121.794	5.60	5.60
0	92.411	97.662	102.912	5.38	5.38
5	78.541	82.812	87.083	5.16	5.16
10	66.866	70.339	73.812	4.94	4.94
15	57.039	59.864	62.688	4.72	4.72
20	48.763	51.060	53.357	4.50	4.50
25	41.786	43.654	45.523	4.28	4.28
30	35.896	37.415	38.934	4.06	4.06
31	34.832	36.290	37.747	4.02	4.02
32	33.803	35.202	36.601	3.97	3.97
33	32.808	34.150	35.492	3.93	3.93
34	31.846	33.133	34.421	3.89	3.89
35	30.916	32.151	33.386	3.84	3.84
36	30.016	31.200	32.385	3.80	3.80
37	29.144	30.281	31.418	3.75	3.75
38	28.319	29.425	30.534	3.76	3.77
39	27.486	28.532	29.579	3.67	3.67
40	26.697	27.701	28.704	3.62	3.62
45	23.116	23.931	24.745	3.40	3.40
50	20.071	20.731	21.391	3.18	3.18
55	17.474	18.008	18.542	2.96	2.96
60	15.253	15.684	16.115	2.75	2.75
65	13.351	13.697	14.043	2.53	2.53
66	13.004	13.335	13.666	2.48	2.48
67	12.668	12.984	13.301	2.44	2.44
68	12.341	12.644	12.947	2.39	2.39
69	12.024	12.313	12.603	2.35	2.35
70	11.716	11.993	12.269	2.31	2.31
71	11.418	11.682	11.946	2.26	2.26
72	11.128	11.380	11.633	2.22	2.22
73	10.846	11.088	11.329	2.18	2.18
74	10.574	10.804	11.034	2.13	2.13
75	10.308	10.528	10.748	2.09	2.09
76	10.051	10.260	10.469	2.04	2.04
77	9.800	10.000	10.200	2.00	2.00
78	9.550	9.748	9.945	2.03	2.03
79	9.306	9.503	9.699	2.07	2.07
80	9.070	9.265	9.459	2.10	2.10
81	8.841	9.033	9.226	2.13	2.13
82	8.618	8.809	9.000	2.17	2.17
83	8.402	8.591	8.780	2.20	2.20
84	8.192	8.379	8.566	2.23	2.23
85	7.987	8.172	8.358	2.27	2.27
86	7.789	7.972	8.155	2.30	2.30
87	7.596	7.778	7.959	2.33	2.33
88	7.409	7.589	7.768	2.37	2.37
89	7.227	7.405	7.583	2.40	2.40
90	7.050	7.226	7.402	2.43	2.43
91	6.878	7.052	7.226	2.47	2.47
92	6.711	6.883	7.055	2.50	2.50
93	6.548	6.718	6.889	2.53	2.53
94	6.390	6.558	6.727	2.57	2.57
95	6.237	6.403	6.569	2.60	2.60
96	6.087	6.252	6.417	2.63	2.63
97	5.942	6.105	6.268	2.67	2.67
98	5.800	5.961	6.122	2.70	2.70
99	5.663	5.822	5.981	2.73	2.73
100	5.529	5.686	5.844	2.77	2.77
105	4.912	5.060	5.208	2.93	2.93
110	4.371	4.511	4.651	3.10	3.10
115	3.898	4.030	4.161	3.27	3.27
120	3.482	3.606	3.730	3.43	3.43

Figure 710 Thermistor Values

COMPONENTS TESTING

Testing the Diagnostic Service Module

Testing the Electronic Control Board

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied. Failure to do so could result in serious injury or death.

If the Diagnostic Service Module does not turn on:

1. Make sure there is 208/230 VAC to the unit and that it is turned on.
2. Disconnect the diagnostic service module's wire harness on the control board.
3. Using a voltmeter, check the first two pins to the left of the female connector (see picture below).
There should be up to 5VDC.
4. If there is no voltage, replace the electronic control board.
5. If there is voltage, check the wire harness and connections at the electronic control board and the diagnostic service module.
6. IF THE CONNECTIONS AND THE WIRE HARNESS ARE GOOD, REPLACE THE DIAGNOSTIC SERVICE MODULE.

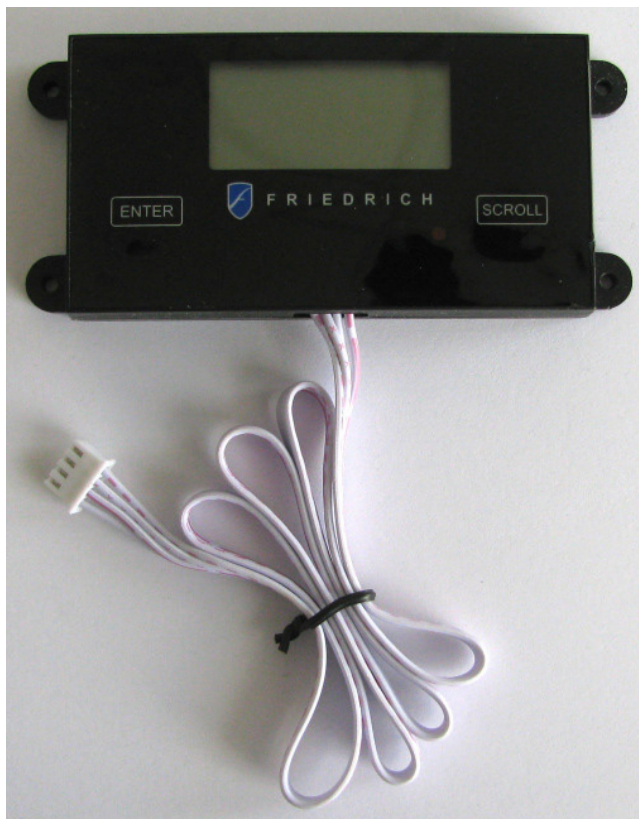


FIGURE 711 (DIAGNOSTIC SERVICE MODULE)

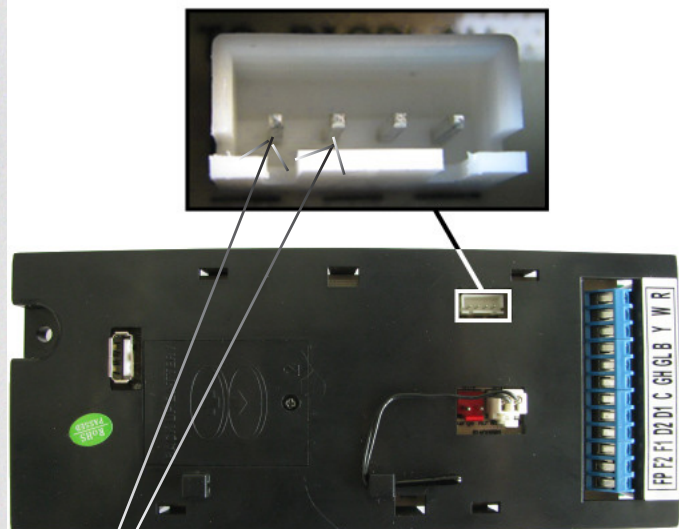


FIGURE 712 (SERVICE MODULE CONNECTOR)

TEST HERE UP TO 5VDC.
IF NO VOLTAGE, REPLACE BOARD.
IF THERE IS 5VDC, CHECK CONNECTIONS AND CABLE.
IF OK, REPLACE SERVICE MODULE.

COMPONENT TESTING

Electronic Control Board Components Identification And Testing

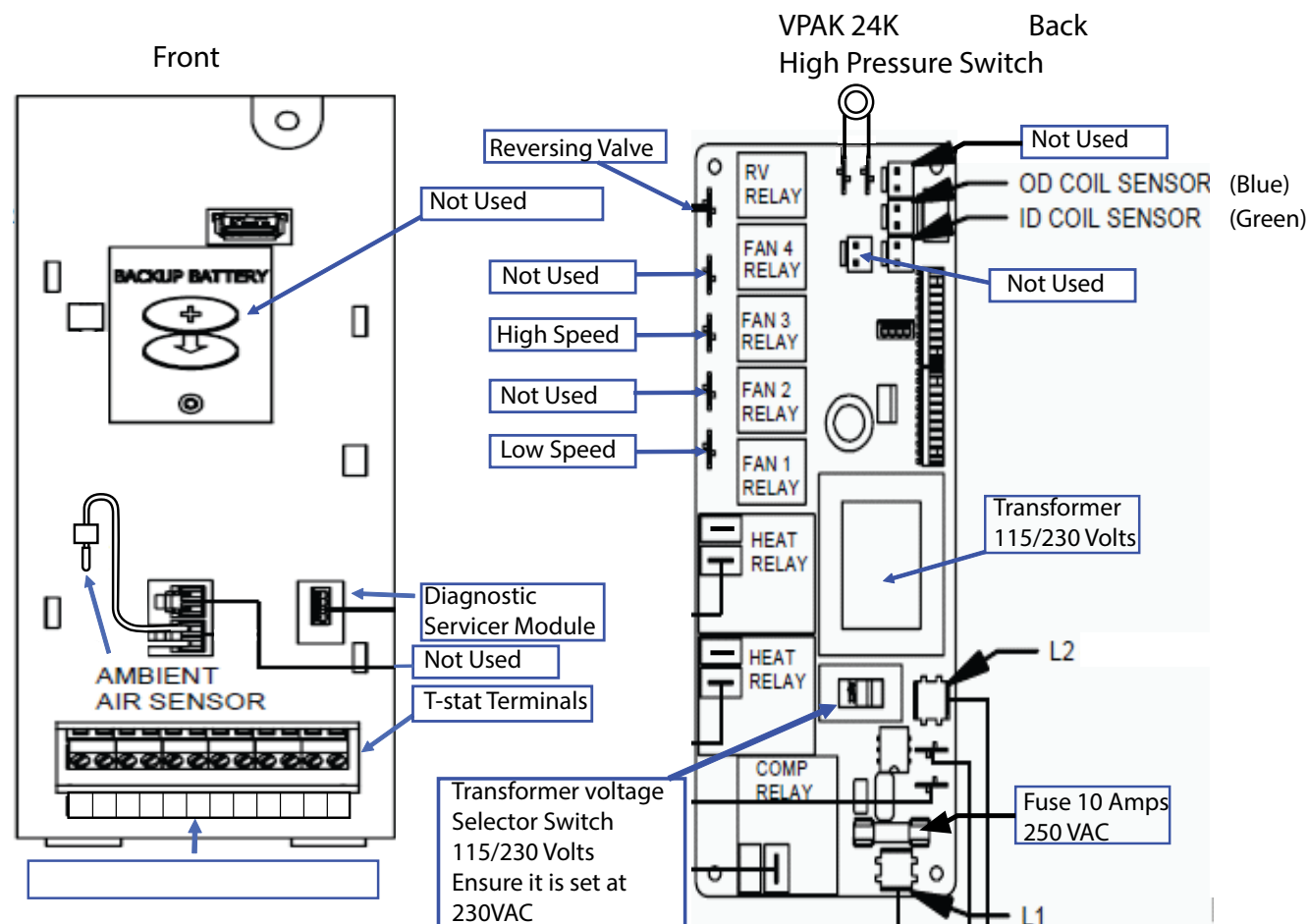


FIGURE 713 (ECB ID AND TESTING)

1. Test for power at L1 and L2 for 208/230 VAC. (Ensure the transformer voltage selector switch is set for 230 VAC)
2. TEST THE 10 AMP/250 VAC FUSE FOR CONTINUITY.

FOR THE FOLLOWING TESTS, ENSURE THE UNIT IS IN THE APPROPRIATE SETTINGS FOR THE TEST BEING PERFORMED. ENSURE THERE ARE NO ERROR CODES ACTIVE.

3. Testing the compressor relay and heat relays:

Test for power in and power out. If there is power in and no power out, replace the electronic control board.(208/230 to L2)

4. Testing the fan and reversing valve relays:

Test for power at the reversing valve and fan relays 1 or 3. (208/230 to L2)

5. Testing the transformer:

Test the low voltage terminal strip at:

R and C for 24 VAC

F2 and F1 for 24 VAC

D2 and D1 for 24 VAC

Test the service module connector for 5 VDC (see prior page)

Test the connectors for the thermistors for up to 5 VDC

If there is no voltage at any of the above, replace electronic control board.

6. Testing the thermistors:

Disconnect the thermistor and test for resistance value (see figure 710).

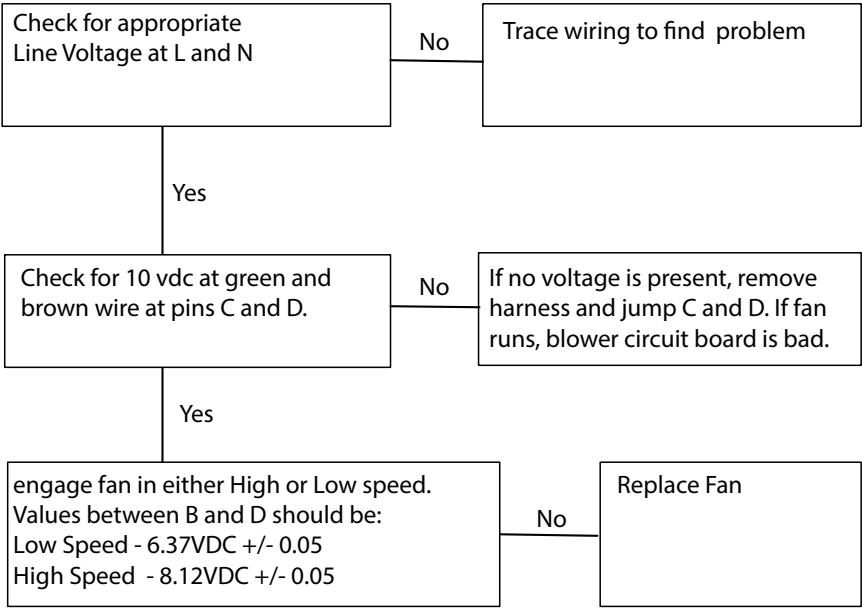
7. Testing the high pressure switch (VPAK 18K, 24K only).

Test for 24 VAC at board, if there is no voltage, replace the electronic control.

Test the pressure switch for continuity, if none, replace it (switch is normally closed).

COMPONENT TESTING

24k Indoor Blower Motor



Indoor Blower Circuit Board

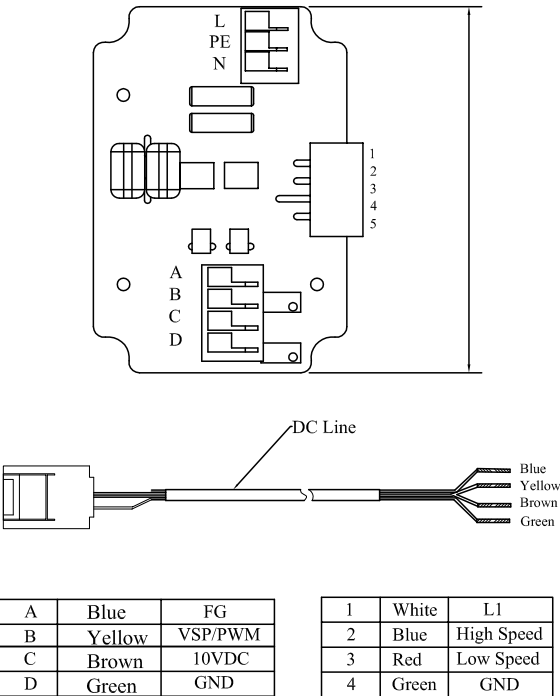


FIGURE 714 (INDOOR BLOWER MOTOR TESTING)

TROUBLESHOOTING

Error Codes and Alarm Status

Unit Control Panel

The display shown below has four digits. The left two digits indicate the error code # (1 to 24), The On/Off icons above these two digits indicate the current state of the error code. The right two digits show the history count (up to 99) of the associated ERROR CODE. THE DISPLAY CONTAINS A MAINTENANCE ICON (WRENCH) THAT WILL ILLUMINATE TO INDICATE WHEN THE UNIT NEEDS SERVICE.

THIS WRENCH INDICATES AN ERROR CODE # IS ON (ACTIVE). TO FIND OUT WHICH ONE, CHECK ALL ERROR CODES.



FIGURE 715 (SERVICE MODULE CONNECTOR)

CHECK ERROR CODES

1. Press the Enter key to activate the display.
2. Each press of the scroll key display the next error code.

Clear History Counters

1. Press & hold the Enter key and the Scroll Key for 6 seconds.

TROUBLESHOOTING

Error Codes and Alarm Status

DIAG CODE	PROBLEM	CONTROL BOARD'S ACTION
1	Front Panel Button Stuck For More Than 20 Seconds	Continue to monitor for "OPEN" (Unstuck) switch. Do not process switch input.
2	Input Voltage Out of Specification (187 - 253)	Unit stops, open all relays until voltage is back within specs then resume operation.
3	Indoor Temperature Sensor is Open or Shorted	Unit defaults to 75°F in COOLING or 68°F in HEATING and will continue to operate if setting is below 75°F in cool mode or if above 68°F in heat mode.
4	Indoor Coil Temperature Sensor is Open or Shorted	The unit's control board defaults to 40°F. It will override the sensor and the unit will continue to operate.
5	Outdoor Coil Temperature Sensor is Open or Shorted	The unit defaults to 20°F, overriding the sensor. The unit will continue to operate. Using Elec Heat if available for HEATING. If not available, it will use HEAT PUMP if the outdoor temperature allows.
6	Outdoor Coil > (grater than) 175 F	The unit will shut down for 5 minutes. resume operation for 3 minutes. If test fails 3 times, the unit operation is locked out. See troubleshooting figure 715. To reset, turn power off and on.
7	Indoor Coil < (less than) 30 F for 2 consecutive minutes	The compressor will turn off and the High Fan speed will run. When coil temp reaches 45°F the unit will resume operation after lockout time.
8	Unit Cycles > (greater than) 9 Times per hour	The unit will continue to operate and be monitored.
9	Unit Cycles < (less than) 3 Times per Hour	The unit will continue to operate and be monitored.
11	WallStat Problem or Connection Issue	The unit will not operate.
13	VPAK 18K, 24K Unit Only High Pressure Limit Switch is Open	If unit is cooling or heat pump is on, shut down compressor. Run high fan until switch closes, then resume operation. The third occurrence in 1 hour locks unit out. Applicable to 24K unit only. To reset, turn power off and on.
15	Heat Pump Error	If indoor coil temperature is less than ambient temperature for 3 minutes, the unit will use electric heat to satisfy the heating demand. Causes could be bad reversing valve, heat load too high.
16	Temperature beyond operating limits	Occurs if the indoor ambient temperature range falls below 0°F or greater than 130°F. The error code will remain on until the temperature reaches the operating range and then the unit will return to normal operation.
17	Equipment Doesn't Meet Minimum Configuration	The compressor must be enabled and have at least 2 fan speeds.
22	(Not an error code) Outdoor Coil Temperature < 30 F for 2 consecutive minutes	Unit will use electric heat to satisfy heating demands until the temperature equals or exceeds 45°F. Applicable for Heat Pump models only.

FIGURE 715 (ERROR CODES AND ALARM STATUS)

TROUBLESHOOTING

Electrical Troubleshooting Chart - Cooling

9K Btu, 12K Btu, & 18K Btu

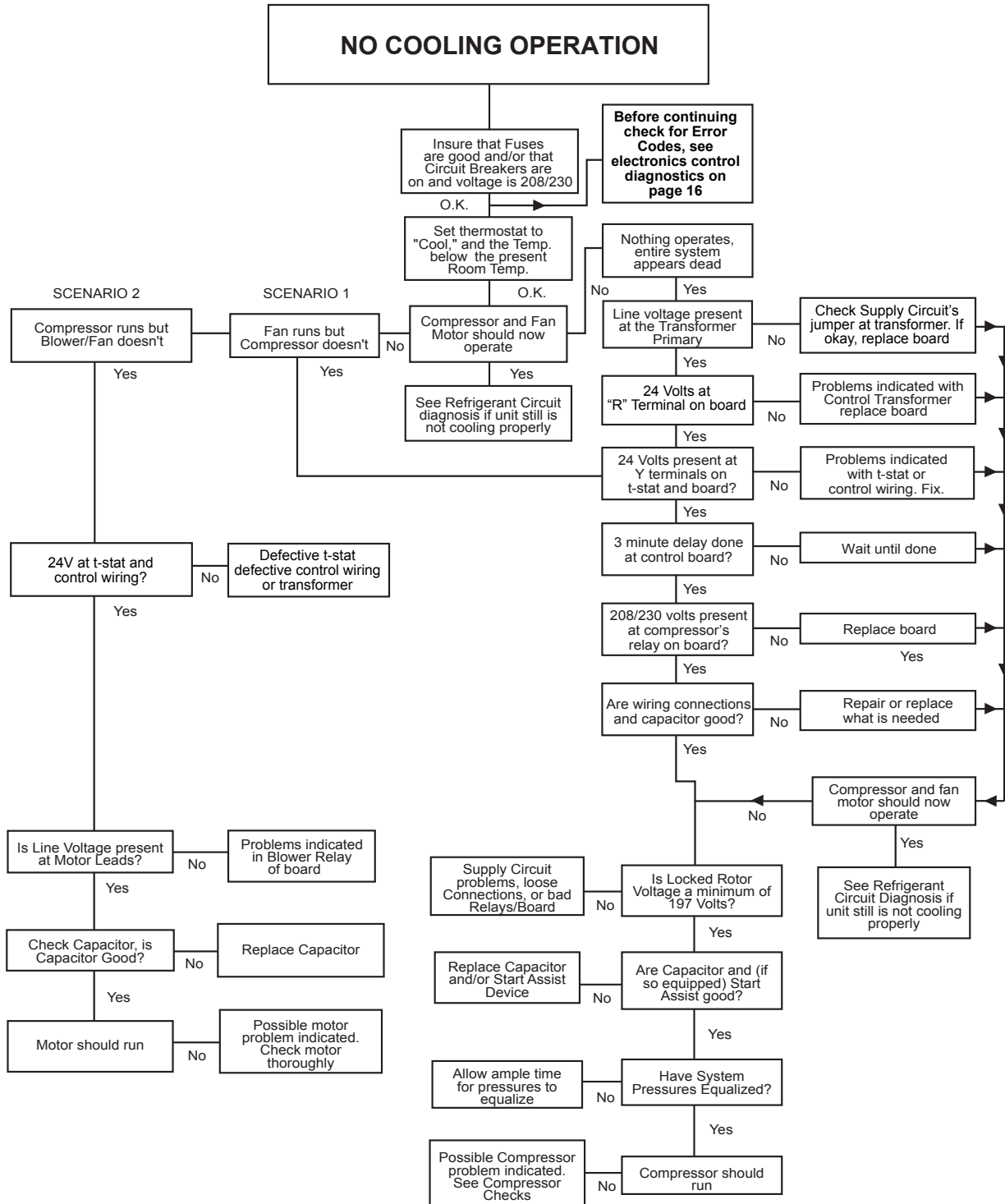


FIGURE 716 (TROUBLESHOOTING)

TROUBLESHOOTING

Electrical Troubleshooting Chart - Cooling

24K Btu

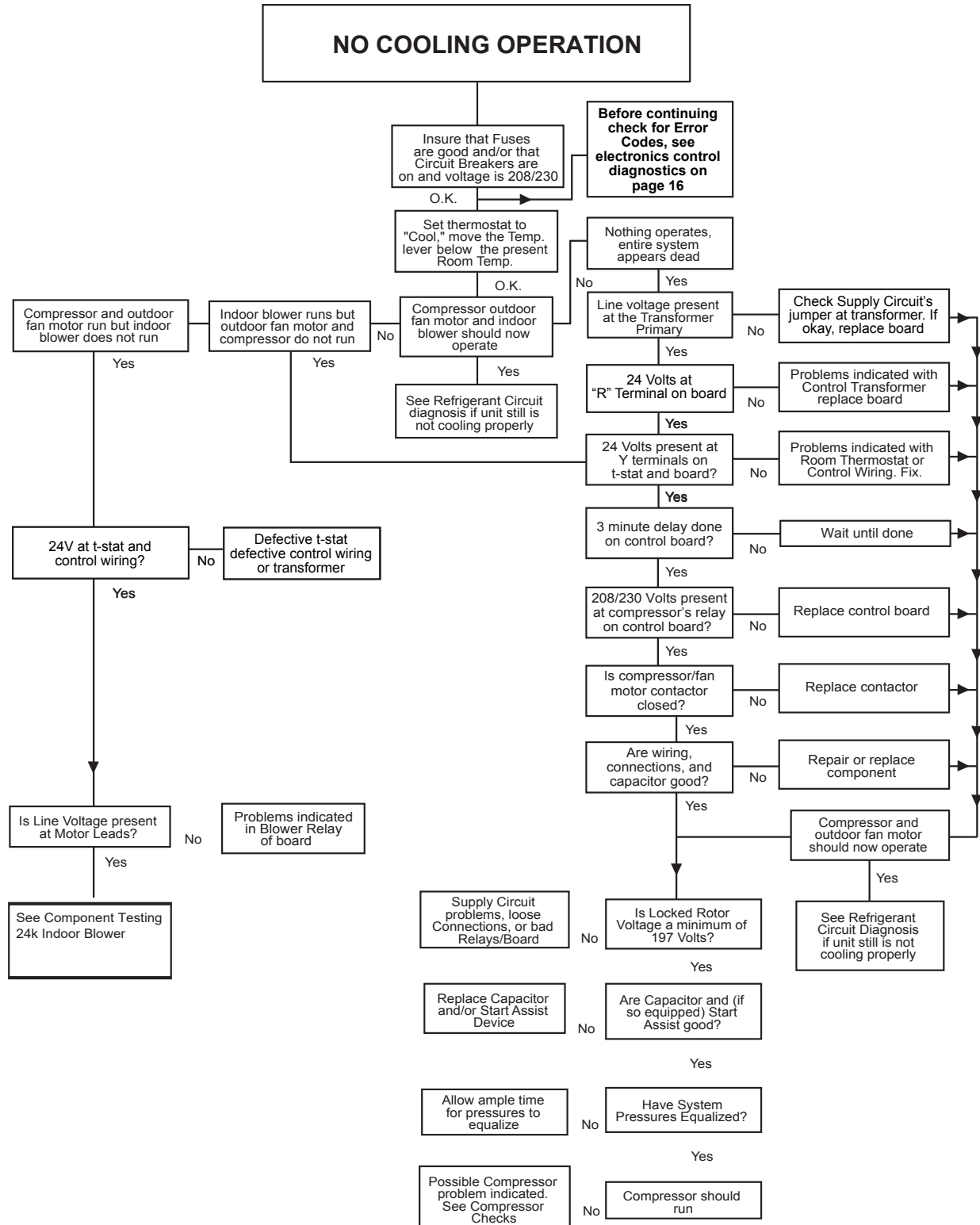


FIGURE 717 (TROUBLESHOOTING)

TROUBLESHOOTING

Electrical Troubleshooting Chart - Heat Pump

HEAT PUMP MODE

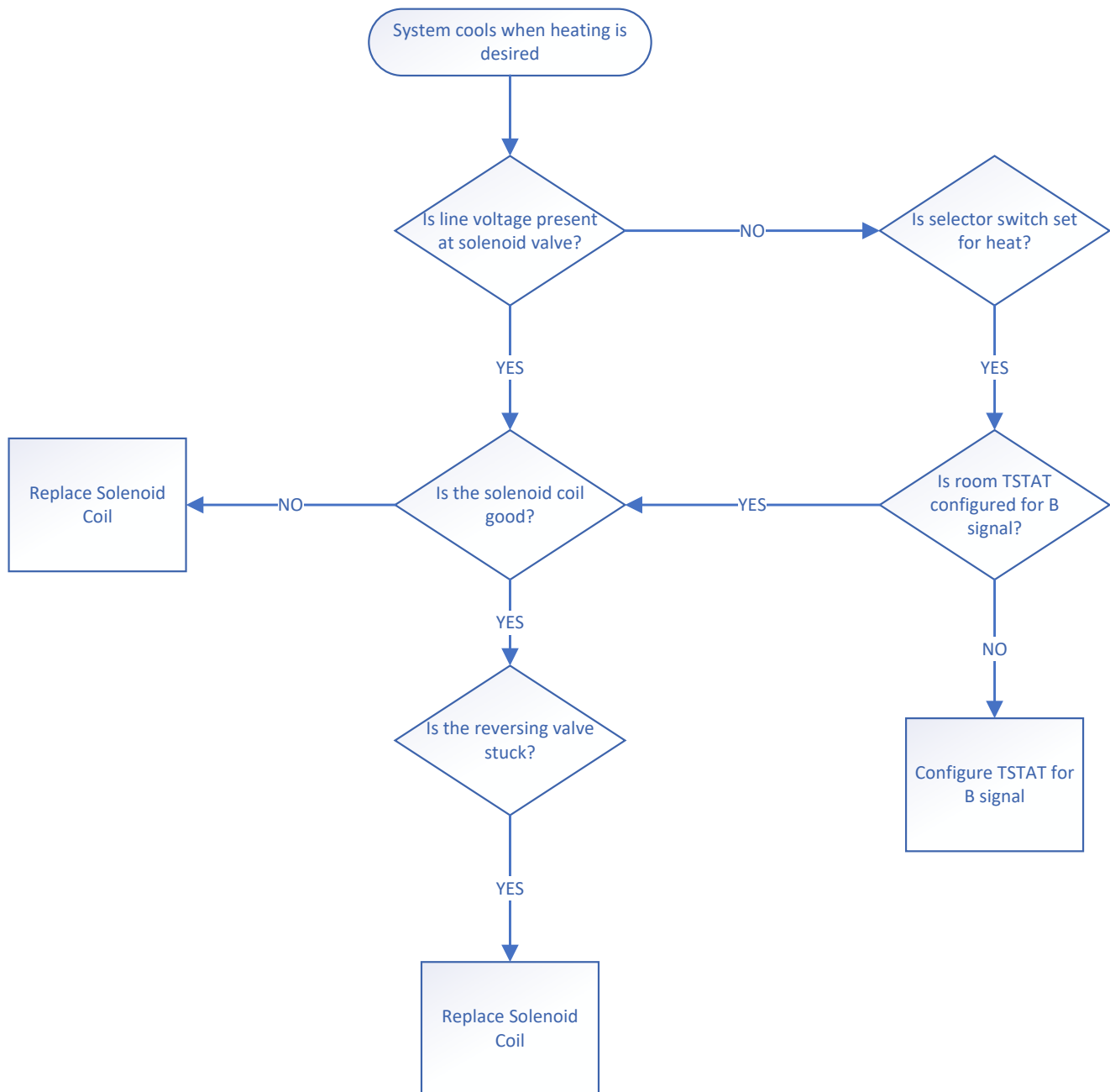
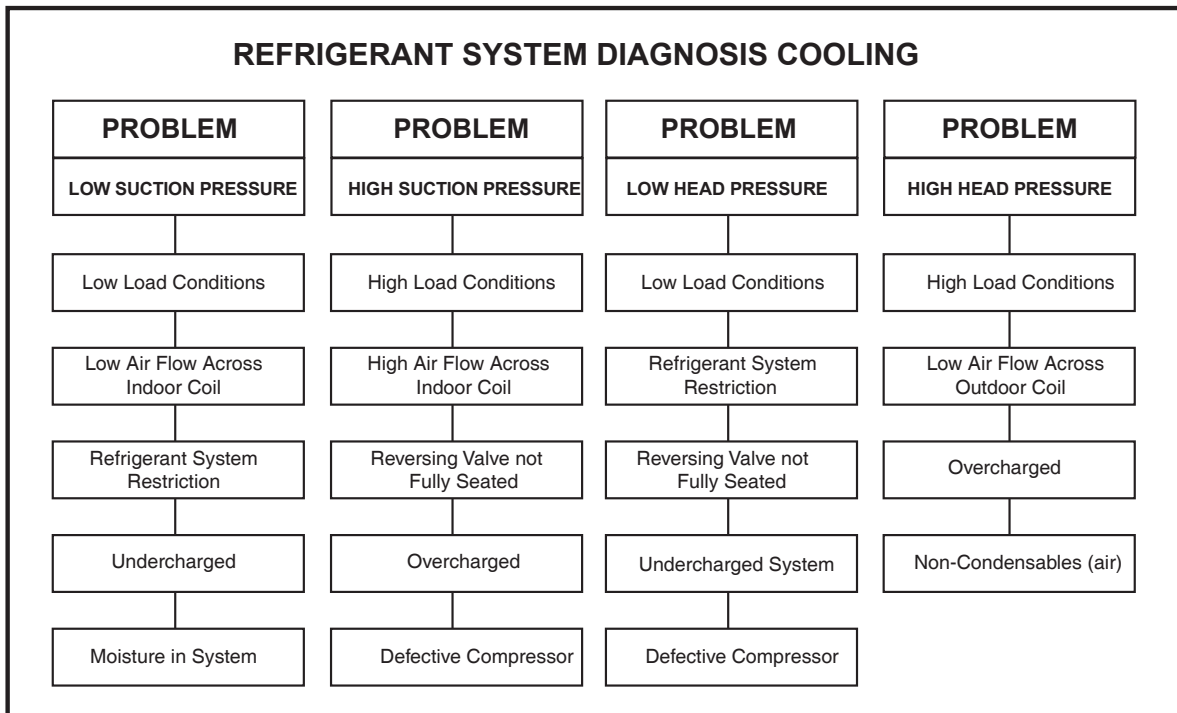


FIGURE 718 (TROUBLESHOOTING)

TROUBLESHOOTING

Troubleshooting Chart - Cooling



TROUBLESHOOTING CHART - HEATING (HEAT PUMP)

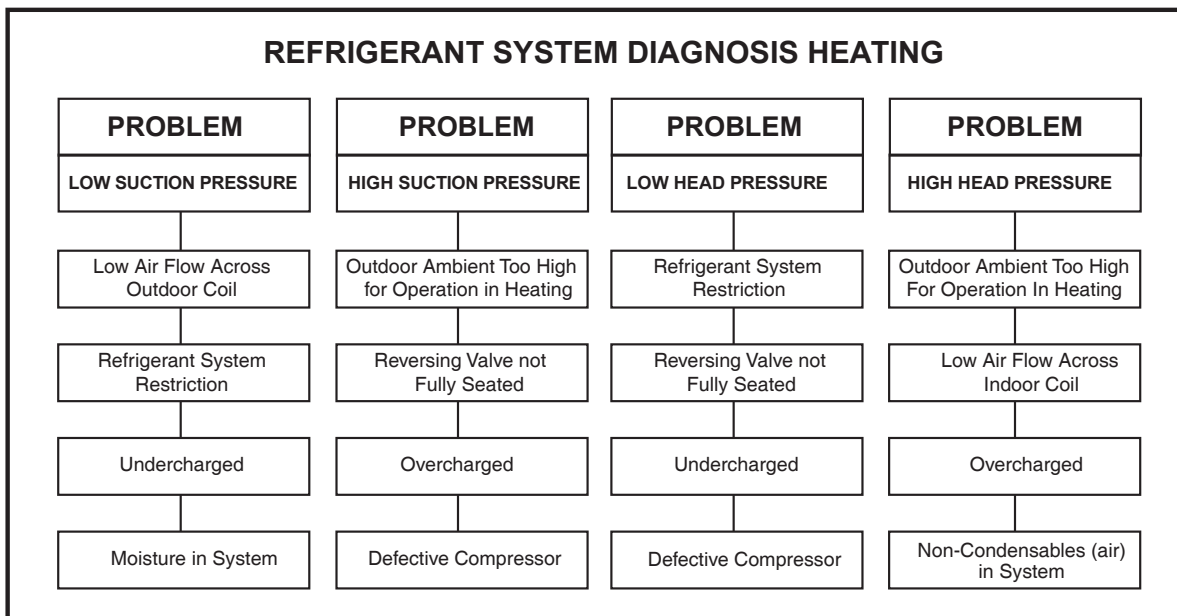


FIGURE 719 (TROUBLESHOOTING)

WIRING DIAGRAMS

9-12K 208/230V

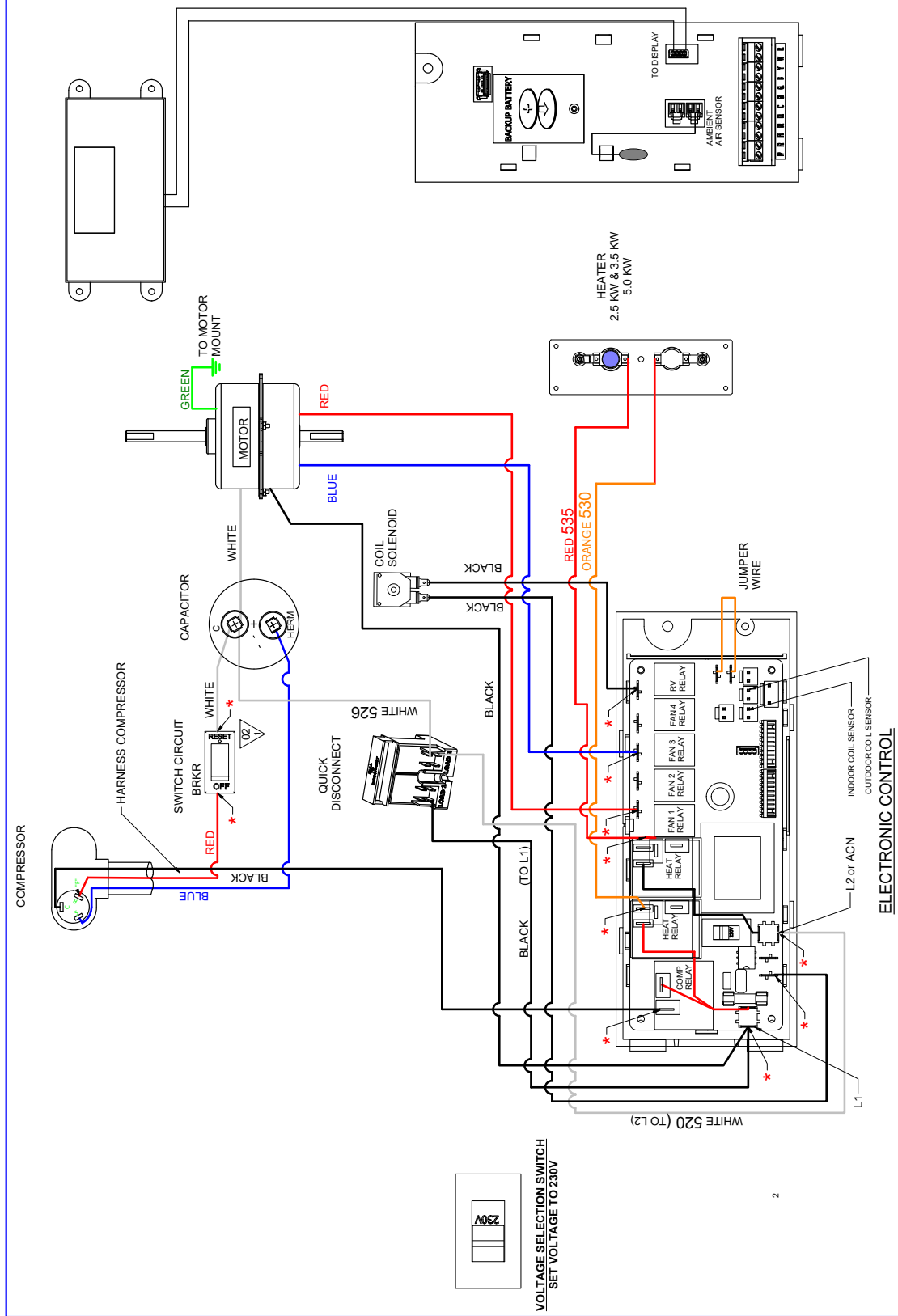


Figure 801 (80062106)

WIRING DIAGRAMS

9-12K 265V

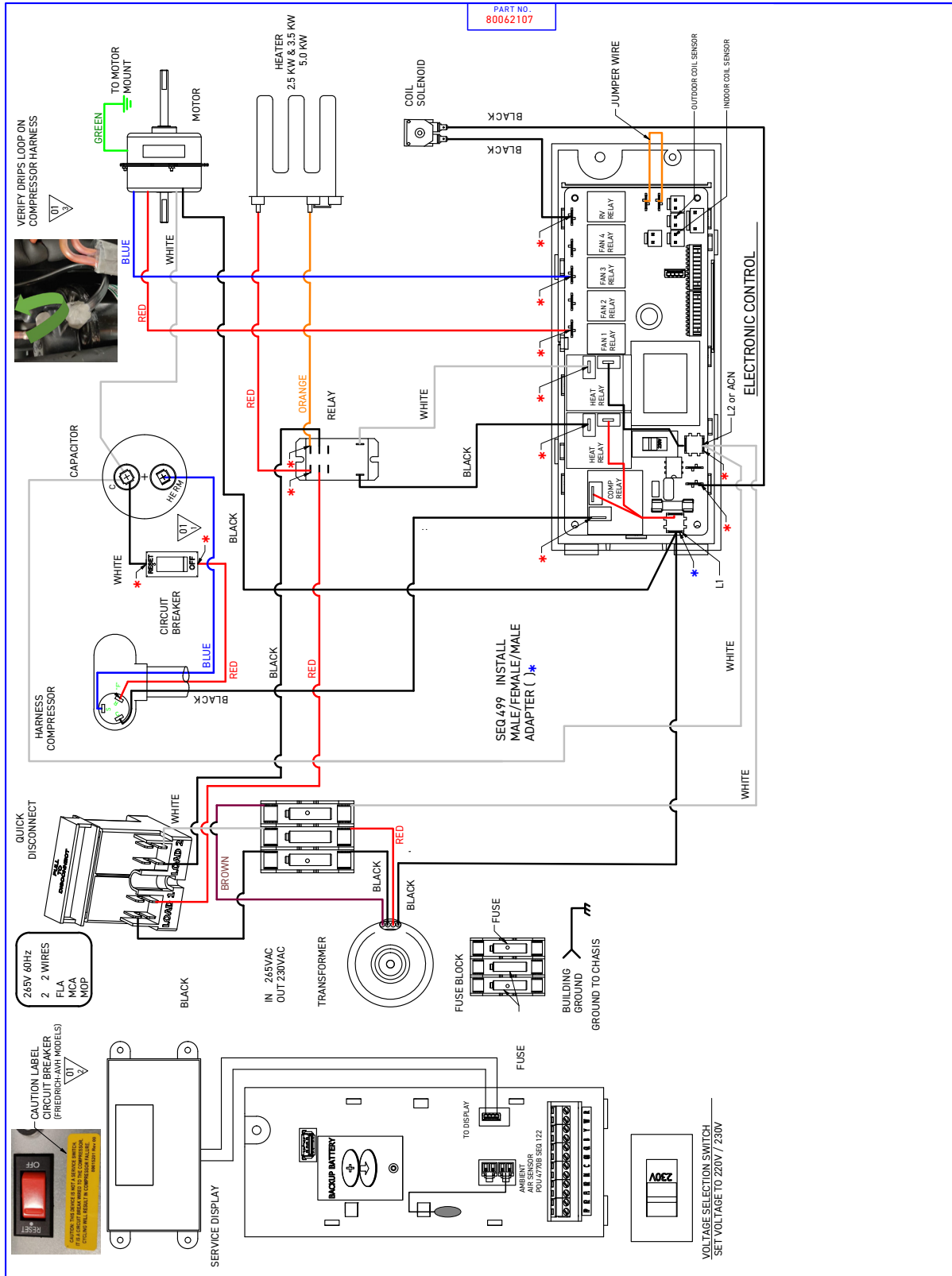


Figure 802 (80062107)

WIRING DIAGRAMS

18K 208/230V (2.5KW, 3.5KW, 5KW)

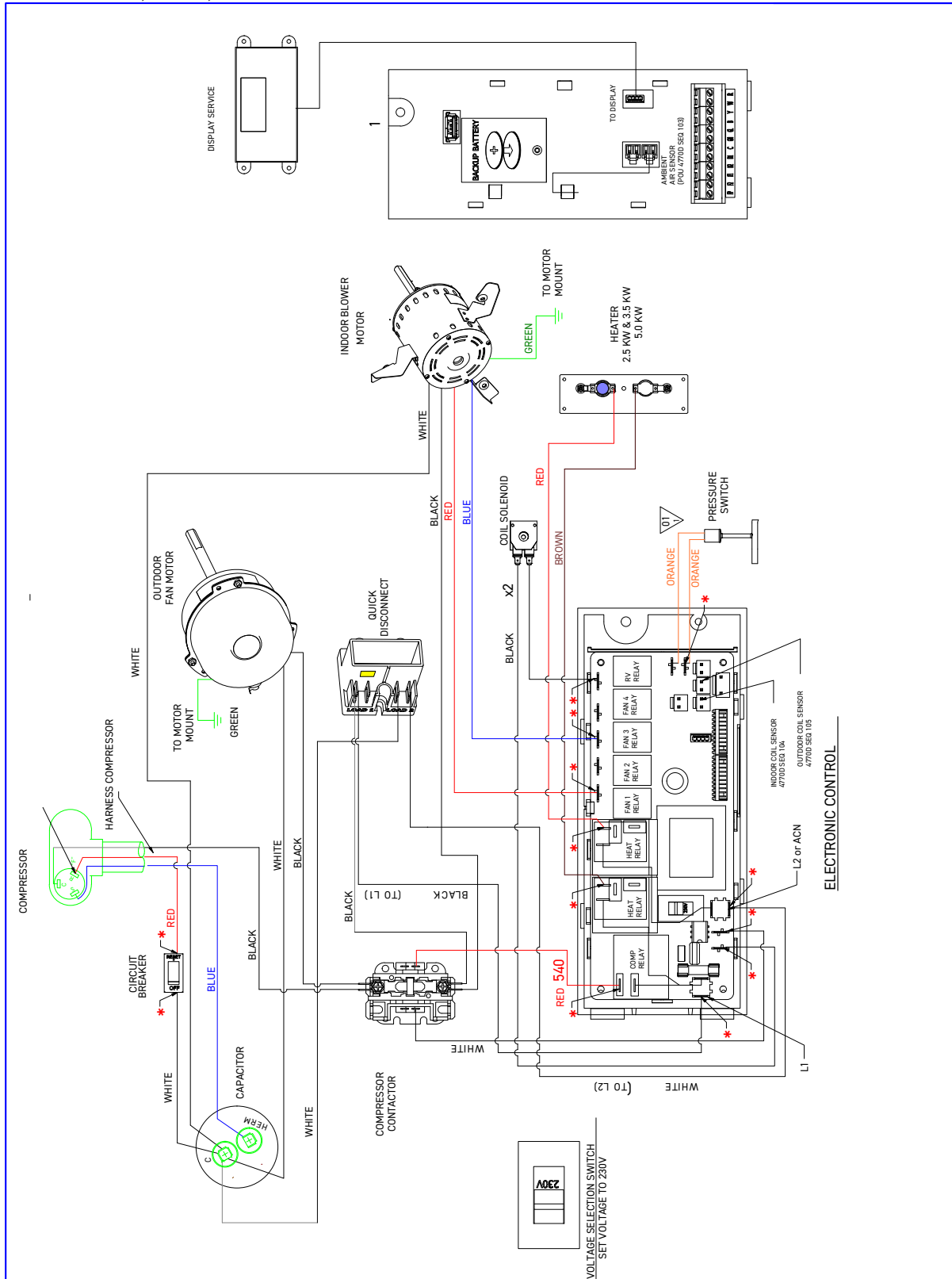


Figure 803 (80126039)

WIRING DIAGRAMS

18K 265V (2.5KW, 3.5KW, 5.0KW)

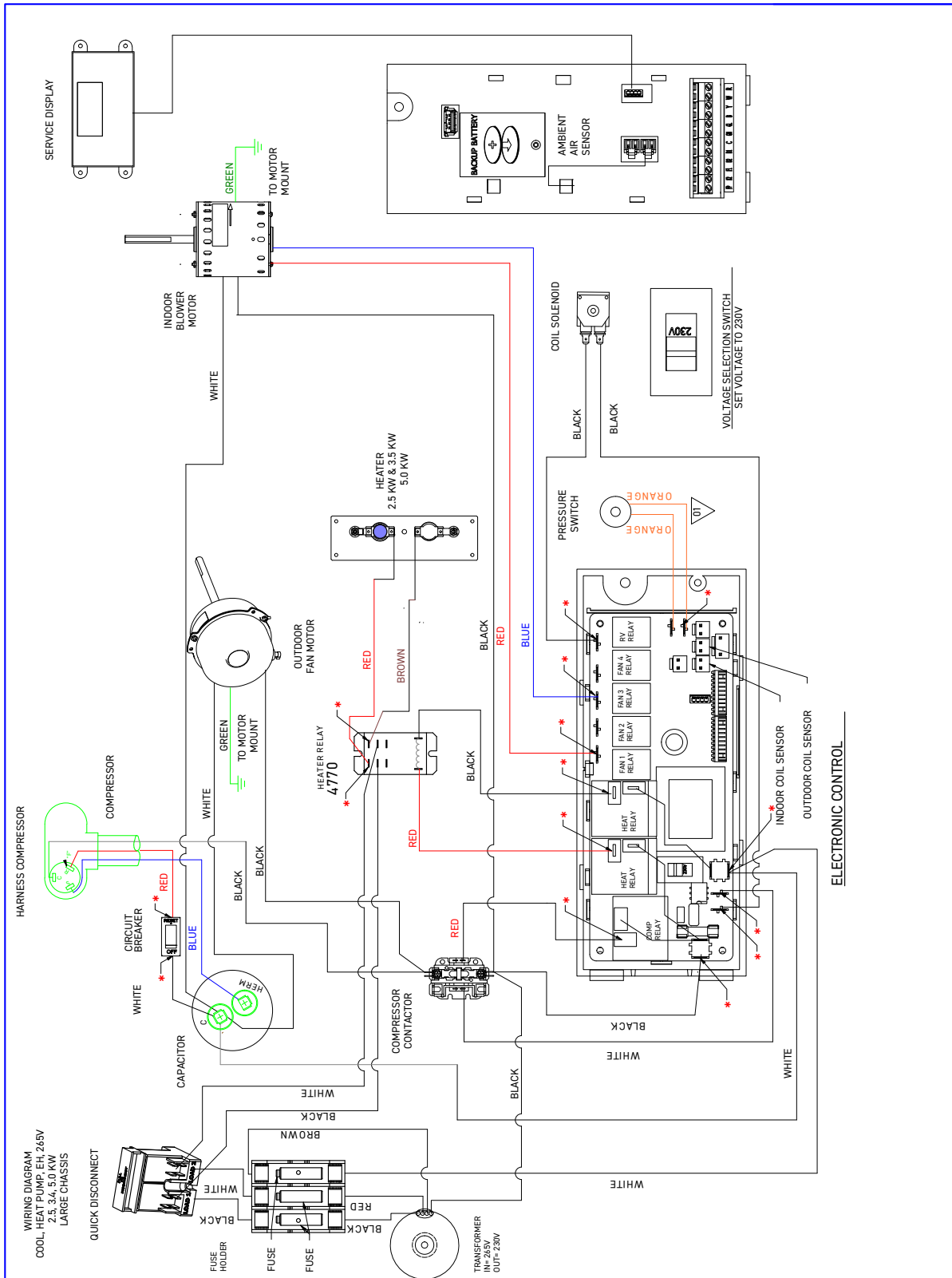
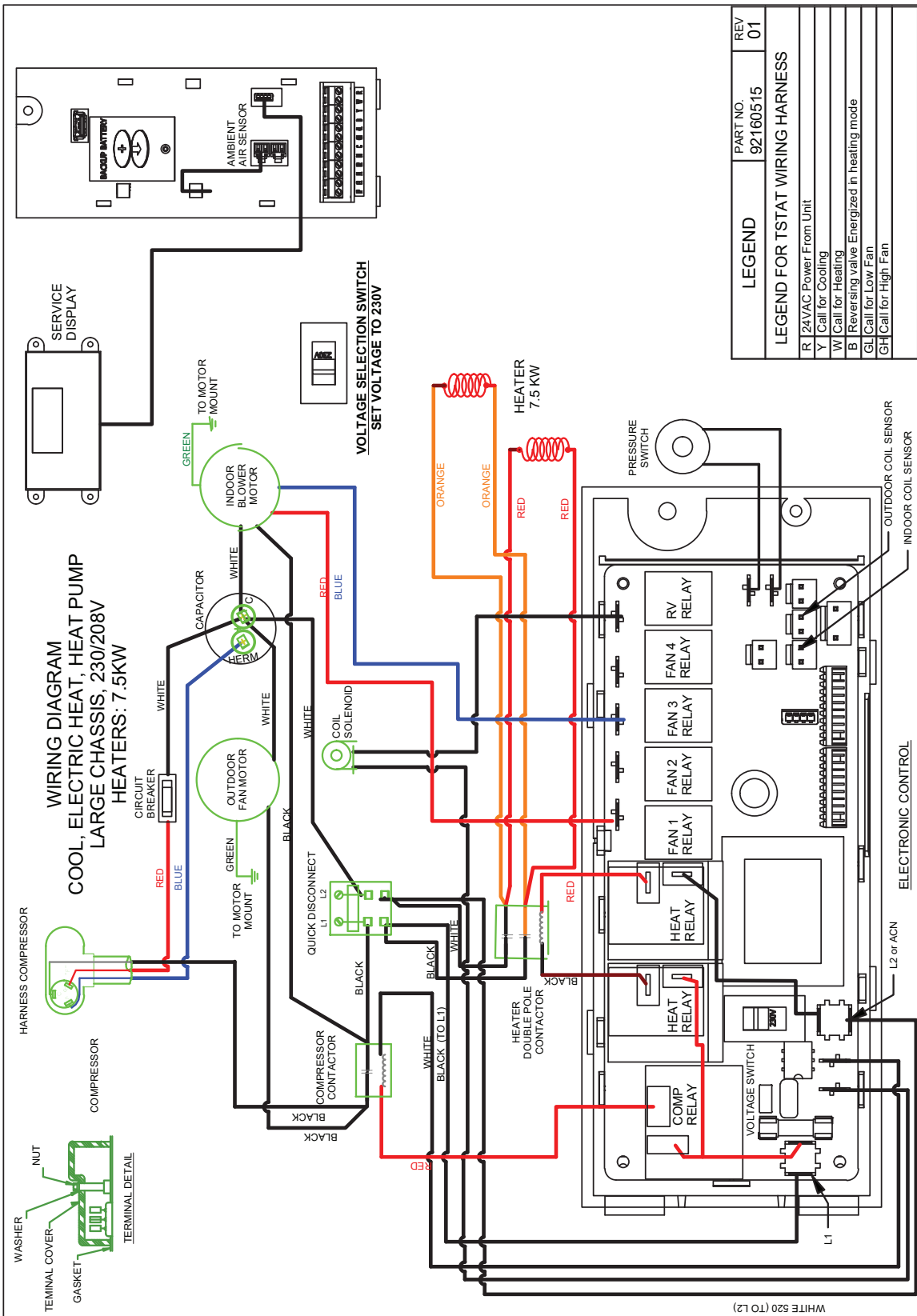


Figure 804 (80126310)

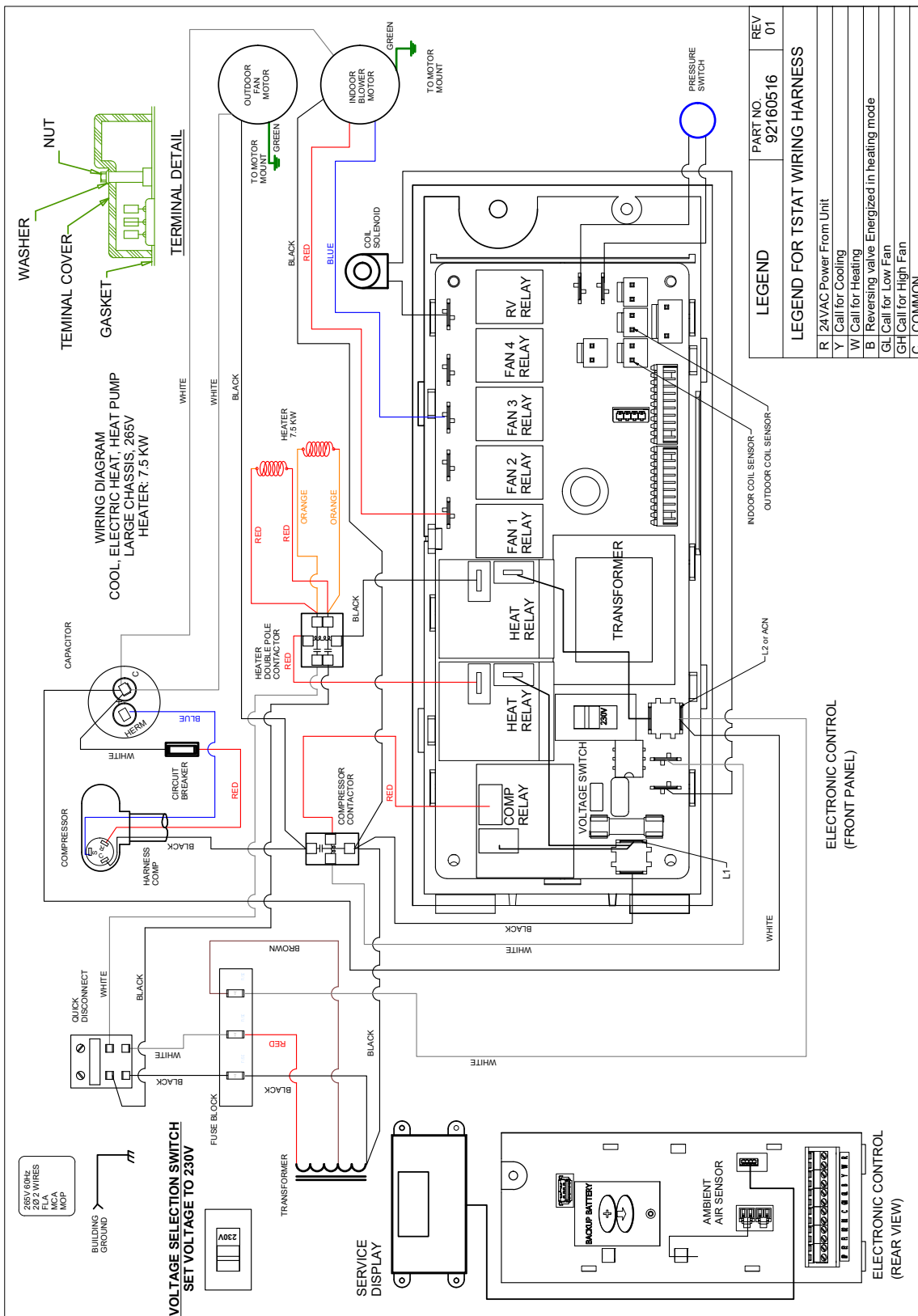
WIRING DIAGRAMS

18K 208/230V (7.5KW)



WIRING DIAGRAMS

18K 265V (7.5KW)



WIRING DIAGRAMS

24K 208/230V (2.5KW, 3.5KW, 5KW)

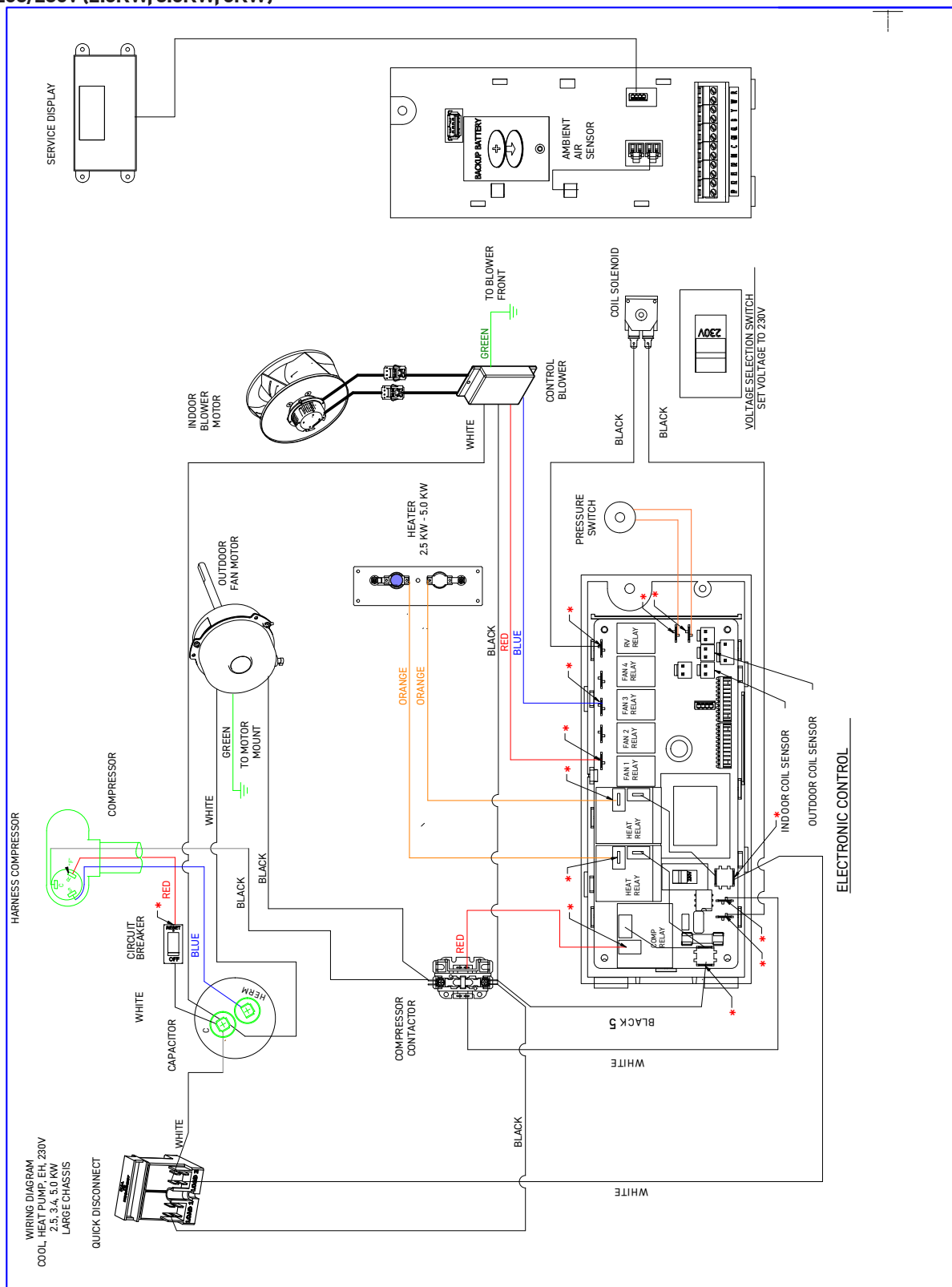


Figure 805 (80126405)

WIRING DIAGRAMS

24K 208/230V (7.5KW AND 10KW)

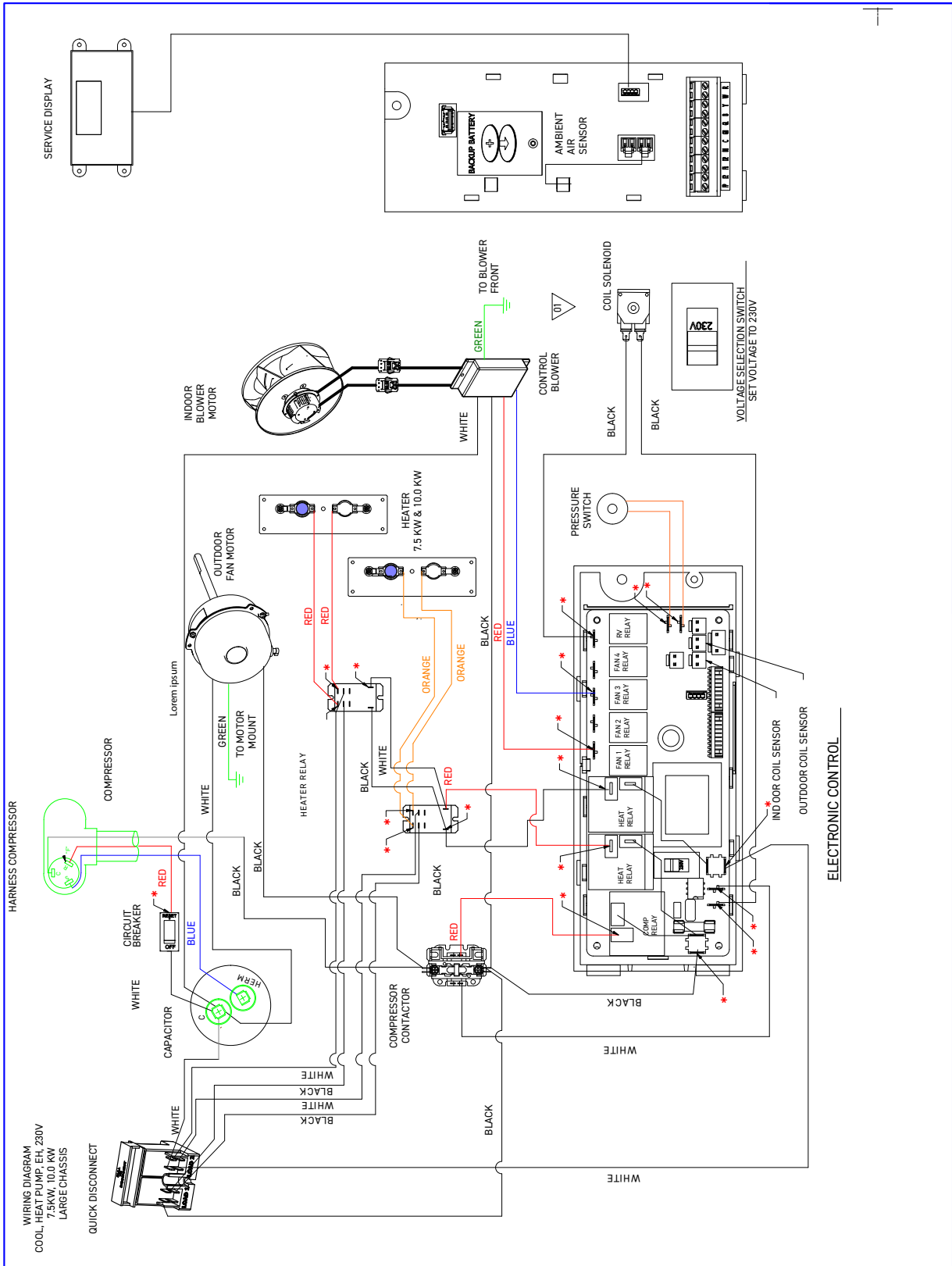


Figure 806 (80126403)

WIRING DIAGRAMS

24K 265V (2.5KW, 3.5KW, 5KW)

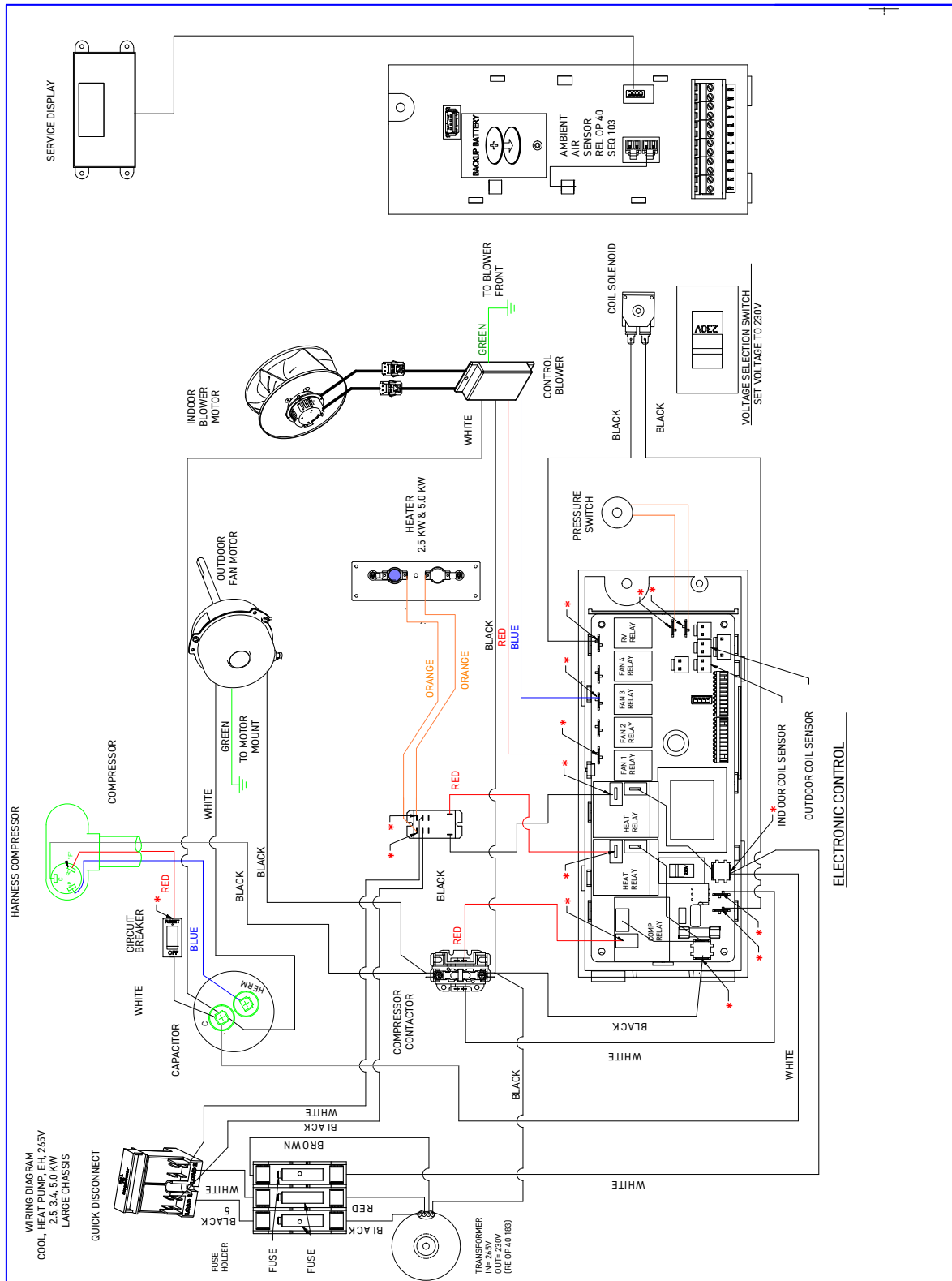


Figure 807 (80126406)

WIRING DIAGRAMS

24K 265V (7.5KW and 10KW)

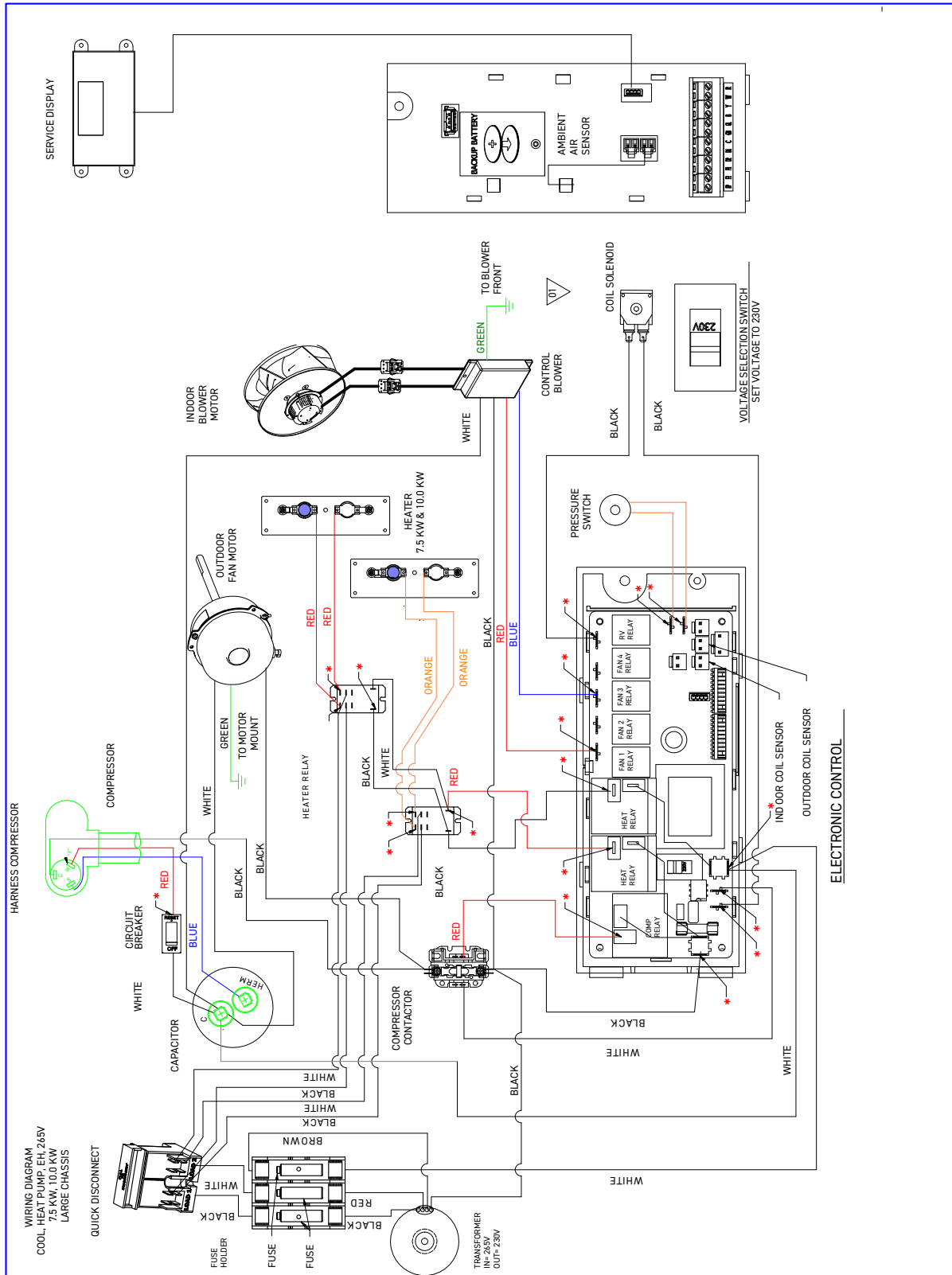
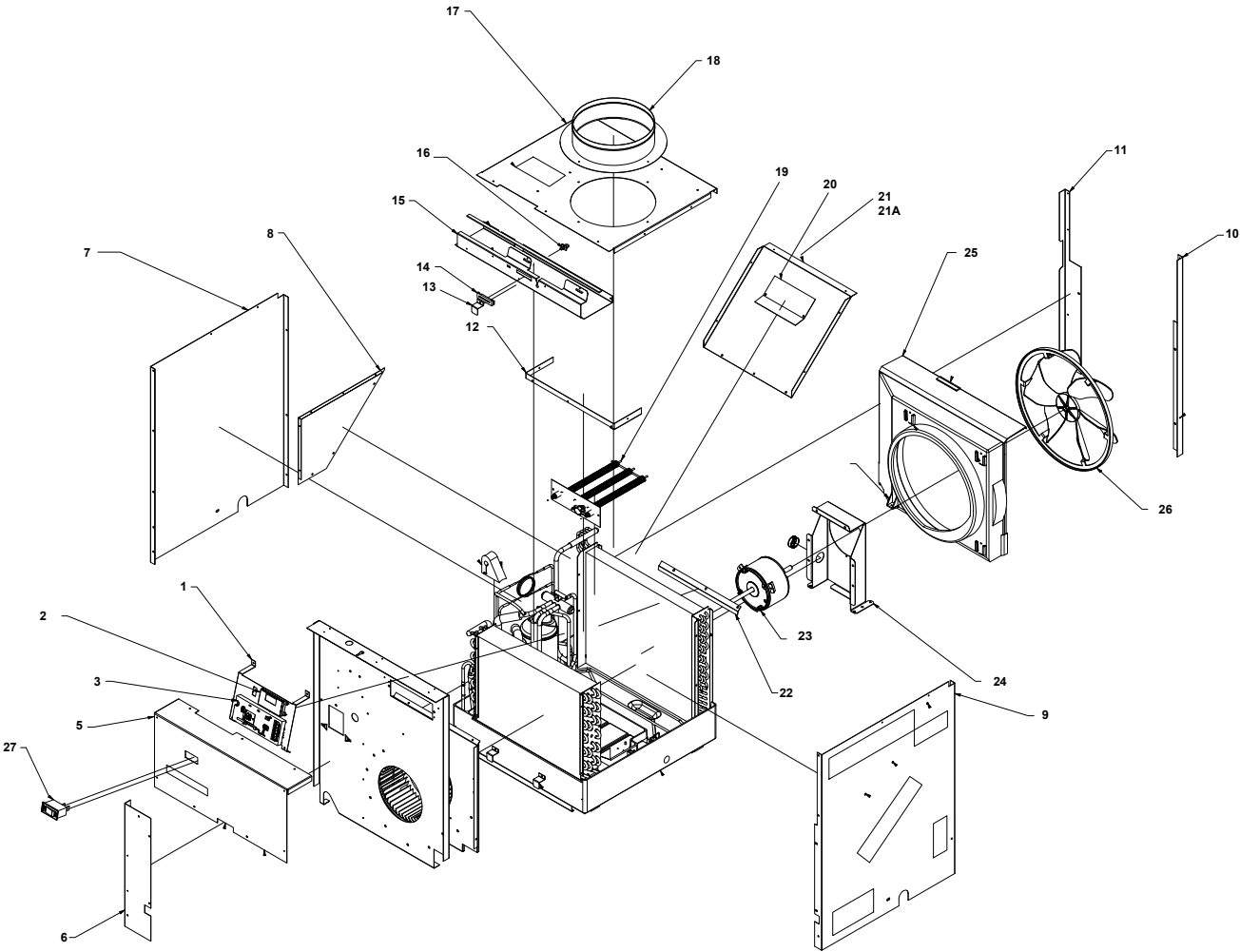


Figure 808 (80126404)

PARTS CATALOG

9K, 12K Unit Assembly

Figure 901



PARTS CATALOG

9K, 12K Unit Assembly

Figure 901

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80050636	BRACKET ELECT CNTRL VPAK SMALL CIRC-BREAKER	ALL	1
2	62600601	DISPLAY SERVICE VPAK GE	ALL	1
3	62601009	KIT E-CNTL SERV COOL HP VHA	ALL	1
-4	62600118	ASSY E-CNTRL COOL/EH AMP JMPR	ALL	1
5	80015705	PANEL CONTROL BOX PREPNTD	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA12K25RTP, VHA12K34RTP, VHA12K50RTP	1
5	80015706	PANEL CONTROL BOX PREPAINTED 18K265	VHA09R25RTP, VHA09R34RTP, VHA09R50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
6	80049601	ASSY PANEL UFRONT INSUL	ALL	1
7	80013809	ASSY INSUL LEFT SIDE PANEL	ALL	1
8	80027701	INSUL ASSY BLWR SIDE PANEL	ALL	1
9	80013808	ASSY INSUL RIGHT SIDE PANEL	ALL	1
10	80049100	UPRIGHT RIGHT REAR	ALL	1
11	80049200	UPRIGHT LEFT REAR	ALL	1
12	80049000	INSULATION RETAINER	ALL	1
13	80037403	CLIP FILTER CHAMFERED	ALL	1
14	61656200	CHANNEL EXHAUST DOOR	ALL	1
15	80005903	ASSY CONT BOX BOTTOM INSUL	ALL	1
16	61656201	SLIDE EXHAUST DOOR	ALL	1
17	80013503	ASSY INSULATION TOP COVER PREPAI	ALL	1
18	80001800	COLLAR 24 GA	ALL	1
19	80017090	HEATER VPAK-A NXT 2.5KW 230V	VHA09K25RTP, VHA12K25RTP	1
19	80017091	HEATER VPAK-A NXT 3.4KW 230V	VHA09K34RTP, VHA12K34RTP	1
19	80017092	HEATER VPAK-A NXT 5.0KW 230V	VHA09K50RTP, VHA12K50RTP	1
19	80017102	HEATER VPAK-A NXT 2.5KW 265V	VHA09R25RTP, VHA12R25RTP	1
19	80017101	HEATER VPAK-A NXT 3.4KW 265V	VHA09R34RTP, VHA12R34RTP	1
19	80017100	HEATER VPAK-A NXT 5.0KW 265V	VHA09R50RTP, VHA12R50RTP	1
20	80023401	SUPPORT HEATER	ALL	1
21	80018736	ASSY INSUL BLOWER FRONT 230V	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA12K25RTP, VHA12K34RTP, VHA12K50RTP	1
21	80018737	ASSY INSUL BLOWER FRONT 265V	VHA09R25RTP, VHA09R34RTP, VHA09R50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
21A	80014102	ASSY BLWR PANEL INSUL	ALL	1
22	80000900	RETAINER INSUL	ALL	1
23	80006873	MTR 1/4 4 10P CW 2 BLDC VPAK	ALL	1
24	61776906	MOTOR MOUNT	ALL	1
25	61804901	SHROUD MED W/FD RESTRAINT	ALL	1
26	60542004	FAN PLASTIC 14.5" TA1004	ALL	1

PARTS CATALOG

9K, 12K Unit Assembly

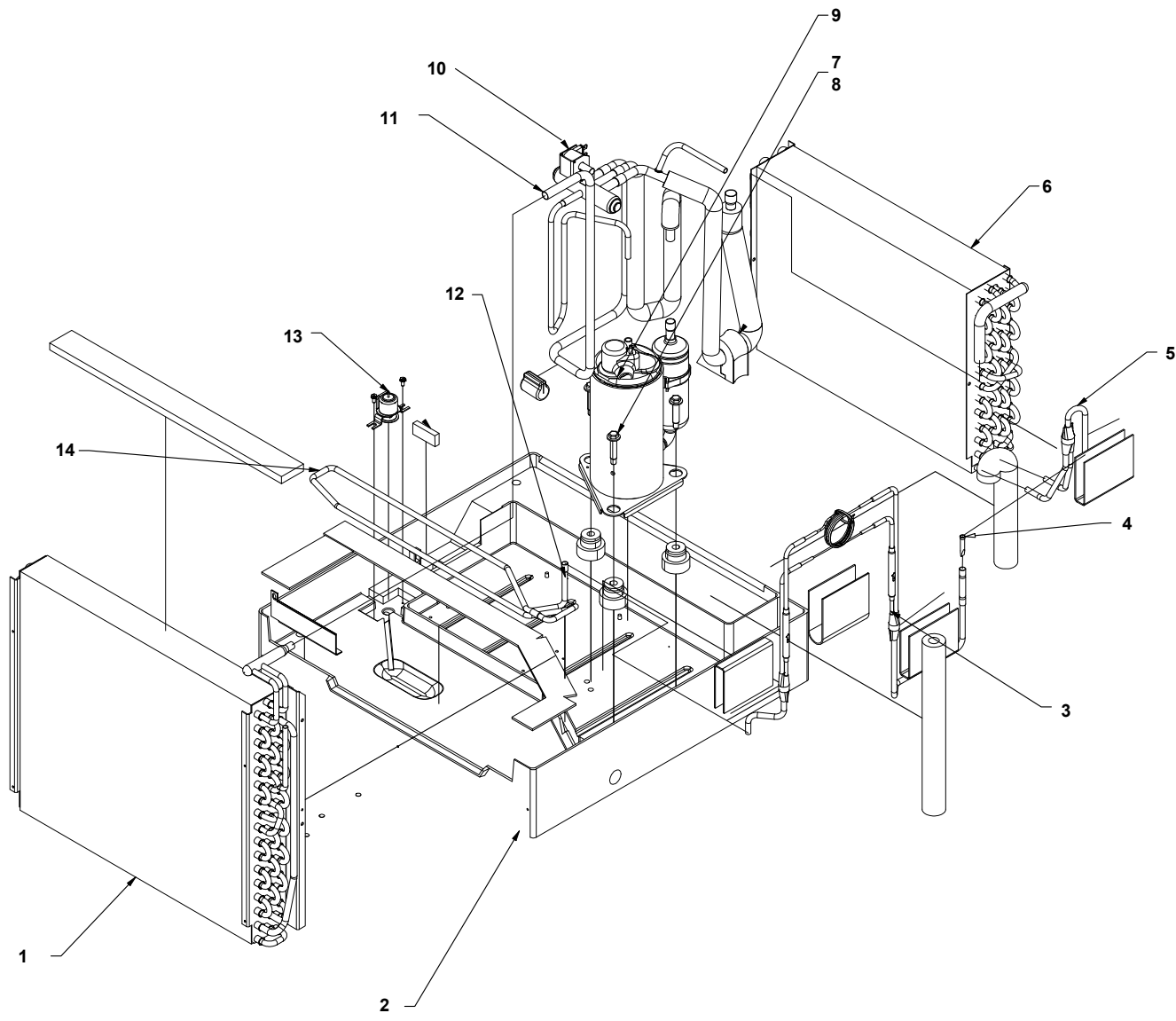
Figure 901

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
27	61773324	SWITCH CIRCUIT BRKR 20A 230V CITR220Q2NS	ALL	1
-ITEMS ARE NON- ILLUSTRATED *ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

9K, 12K Refrigeration Assy

Figure 902



PARTS CATALOG

9K, 12K Refrigeration Assy

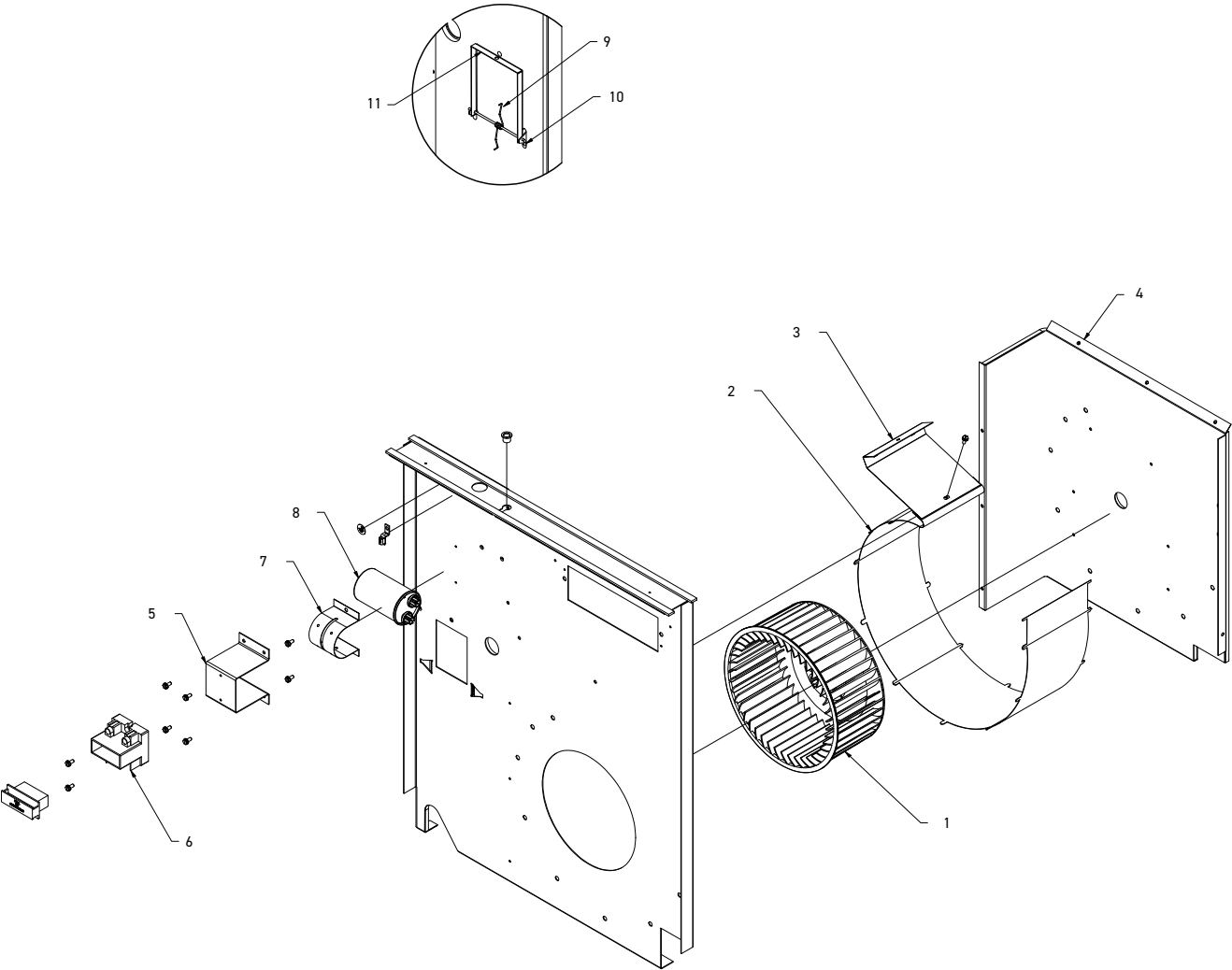
Figure 902

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80048057	CONDENSER COIL COIL VCS.375X3X18RC2V45B19X17H3	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP,	1
1	80101265	CONDENSER COIL VCS .250X4X16XC9K45A17X15H3	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP,	1
2	80023703	BASEPAN VPAK	ALL	1
3	80044909	ASSY TUBE CHECK VALVE	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP	1
3	80042925	ASSY TUBE CHECK VALVE VHA12K	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
4	61834800	STRAINER .312 COIL	ALL	1
5	80044903	ASSY TUBE CHECK VALVE TO EVAP	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP	1
5	80042954	ASSY TUBE EVAP TO CHECK VALVE	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
6	80041762	EVAPORATOR COIL, COIL VES.312X4X16XU9V45A18X13H5	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
7	91400402	STUD COMPR MTG	ALL	3
8	61028904	GROMMET COMPR LOW DENSITY	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP	3
8	61028904	GROMMET COMP LOW DENSITY	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	3
9	61718146	KIT COMPR REPLMT 62200507	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP	1
9	61717190	KIT COMPR REPLACMNT 62200509	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
10	25063606	COIL SOLENOID 208/230VAC DUNAN	ALL	1
11	25018305	ASSY VALVE REVERSING	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP, VHA09R25RTP, VHA09R34RTP, VHA09R50RTP VHA12K25RTP, VHA12K34RTP, VHA12K50RTP, VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
-11.5	80112504	SWITCH HIGH PRESSURE HAZ	VHA12K25RTP-B, VHA12K34RTP-B, VHA12K50RTP-B, VHA12R25RTP-B, VHA12R34RTP-B, VHA12R50RTP-B	1
12	61834800	STRAINER .312 COIL	ALL	1
13	60179904	CONDENSATE DRAIN VALVE	ALL	1
14	80042938	TUBE SUMP VPAK 09-12K	ALL	1
-ITEMS ARE NON- ILLUSTRATED				
*ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

9K, 12K 208/230V

Figure 903



PARTS CATALOG

9K, 12K 208/230V

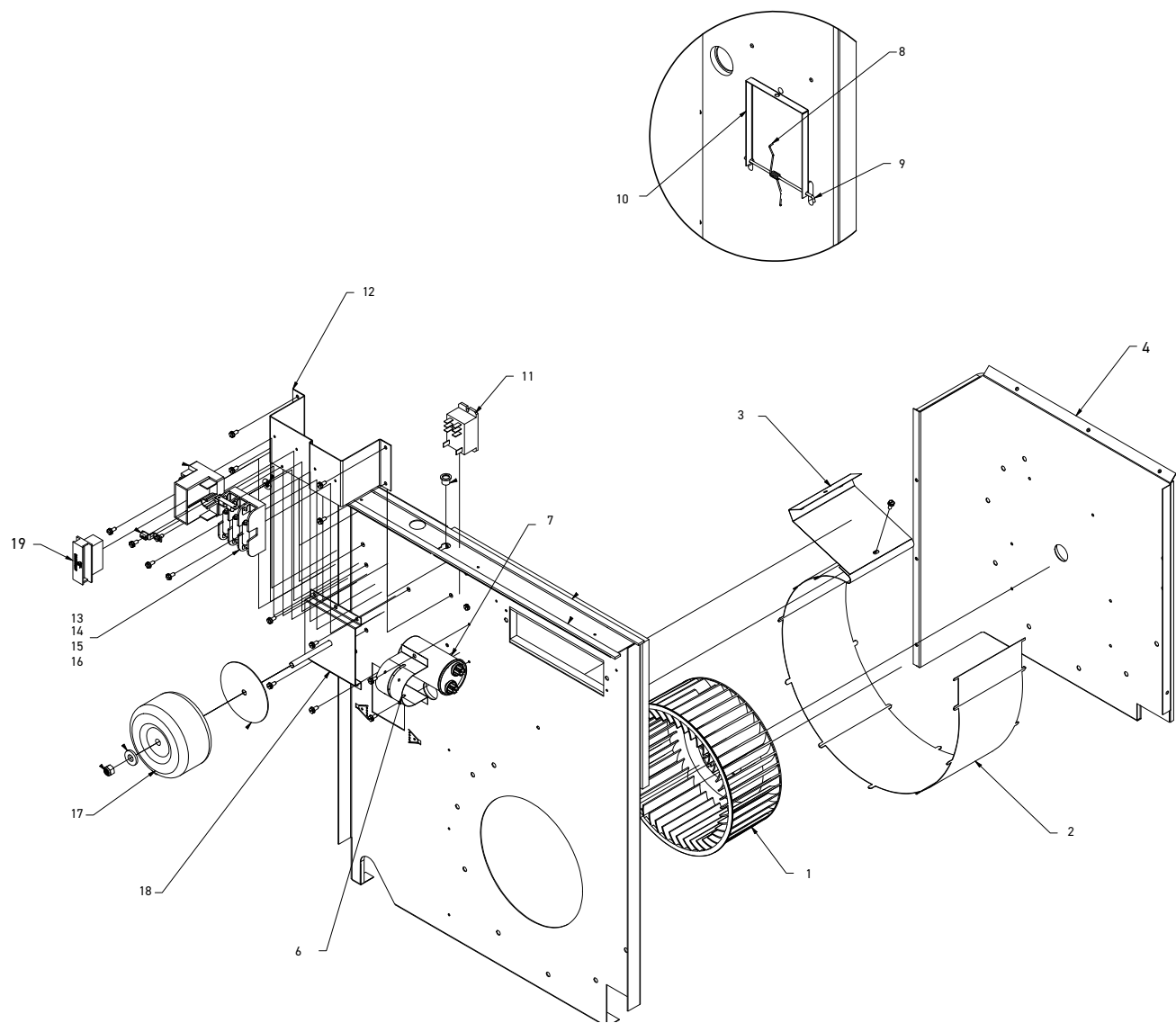
Figure 903

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	60610616	WHEEL BLOWER TA0755	ALL	1
2	80010302	WRAPPER ASSY, INSULATED	ALL	1
3	80018403	PLATE SCROLL	ALL	1
4	80019002	ASSY INSUL INNERWALL BLOWER 144mm	ALL	1
5	80002100	BRACKET DISCONNECT	ALL	1
6	80007600	NONFUSED DISCONNECT	ALL	1
7	20709185	CLAMP, CAPACITOR	ALL	1
8	61080702	CAPCTR 25 MF 450V 2.0	ALL	1
9	61613600	SPRING .043 MUSIC WIRE	ALL	1
10	61610400	PIN HINGE	ALL	1
11	61610300	EXHAUST AIR DOOR	ALL	1
-12	03760451	TUBE CAP .049 IDX.0990DX19.5" RED	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP,	1
-13	03760452	TUBE CAP .049 X .0990D X 35 RED	VHA09K25RTP, VHA09K34RTP, VHA09K50RTP,	1
-14	3760547	TUBE CAP .054 X .1060D X 23.5 WHITE	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP,	1
-15	3760513	TUBE CAP .0X .099 OD X 30 RED	VHA12K25RTP, VHA12K34RTP, VHA12K50RTP,	1
-16	61814800	CONNECTOR FRESH AIR S/M	ALL	1
-17	61764607	OLP B180-140B-241C 60343539	ALL	1
-18	62600203	SENSOR ID RIA TEMPERATURE (WHITE)	ALL	1
-19	62600205	SENSOR ID COIL TEMPERATURE (GREEN)	ALL	1
-20	62600206	SENSOR OD COIL TEMPERATURE (BLUE)	ALL	1
-ITEMS ARE NON- ILLUSTRATED				
*ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

9K, 12K 265V

Figure 904



PARTS CATALOG

VHA9K, 12K 265V

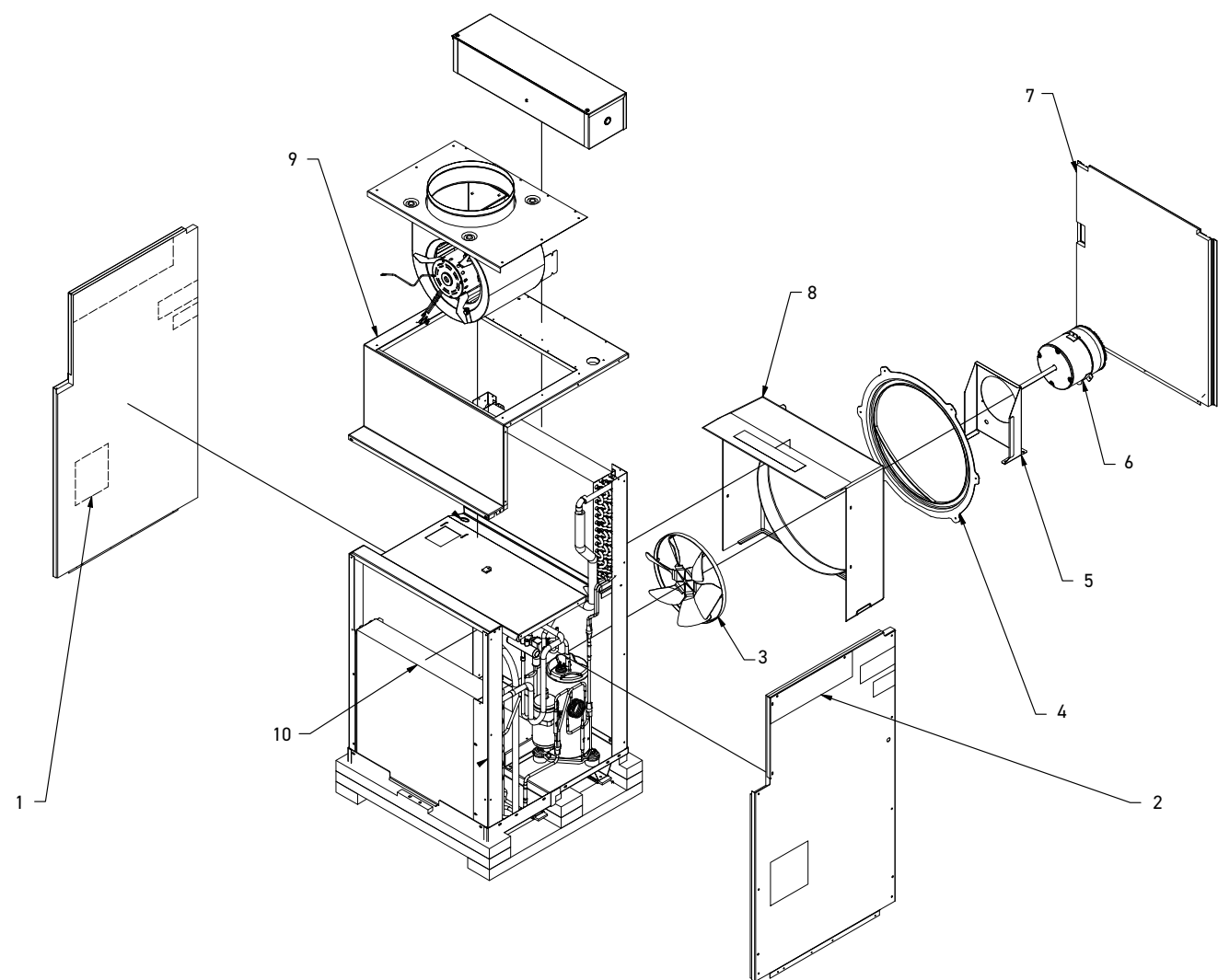
Figure 904

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	60610616	WHEEL BLOWER TA0755	ALL	1
2	80010302	WRAPPER ASSY, INSULATED	ALL	1
3	80018403	PLATE SCROLL	ALL	1
4	80019002	ASSY INSUL INNERWALL BLOWER 144mm	ALL	1
6	20709185	CLAMP, CAPACITOR	ALL	1
7	61080702	CAPCTR 25 MF 450V 2.0	ALL	1
8	61613600	SPRING .043 MUSIC WIRE	ALL	1
9	61610400	PIN HINGE	ALL	1
10	61610300	EXHAUST AIR DOOR	ALL	1
11	61643311	RELAY 230V COIL DPDT 30A 208/240VAC	ALL	1
12	80118502	BRACKET FUSE HOLDER	ALL	1
13	61776111	FUSE BLOCK 3 POLES 30 AMP	ALL	1
14	21058443	FUSE HOLDER 20A HPF 13/32 X 1-1/2	ALL	1
15	61773319	FUSE 600V 15A CC TD	ALL	2
16	61773317	FUSE 600V 20A CC TD	ALL	1
17	61670803	TRANSFORMER IN 265V OUT 235V	ALL	1
18	80018702	ASSY MOUNTING BKT TOROIDAL TNSFR	ALL	1
19	80007600	NONFUSED DISCONNECT	ALL	1
-20	03760451	TUBE CAP .049 IDX.0990DX19.5" RED	VHA09R25RTP, VHA09R34RTP, VHA09R50RTP	1
-21	03760452	TUBE CAP .049 X .0990D X 35 RED	VHA09R25RTP, VHA09R34RTP, VHA09R50RTP	1
-22	3760547	TUBE CAP .054 X .1060D X 23.5 WHITE	VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
-23	3760513	TUBE CAP .0X .099 OD X 30 RED	VHA12R25RTP, VHA12R34RTP, VHA12R50RTP	1
-24	61814800	CONNECTOR FRESH AIR S/M	ALL	1
-25	61764607	OLP B180-140B-241C 60343539	ALL	1
-26	62600203	SENSOR ID RIA TEMPERATURE (WHITE)	ALL	1
-27	62600205	SENSOR ID COIL TEMPERATURE (GREEN)	ALL	1
-28	62600206	SENSOR OD COIL TEMPERATURE (BLUE)	ALL	1
-ITEMS ARE NON- ILLUSTRATED				
*ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

18K Unit Assembly

Figure 905



PARTS CATALOG

18K Unit Assembly

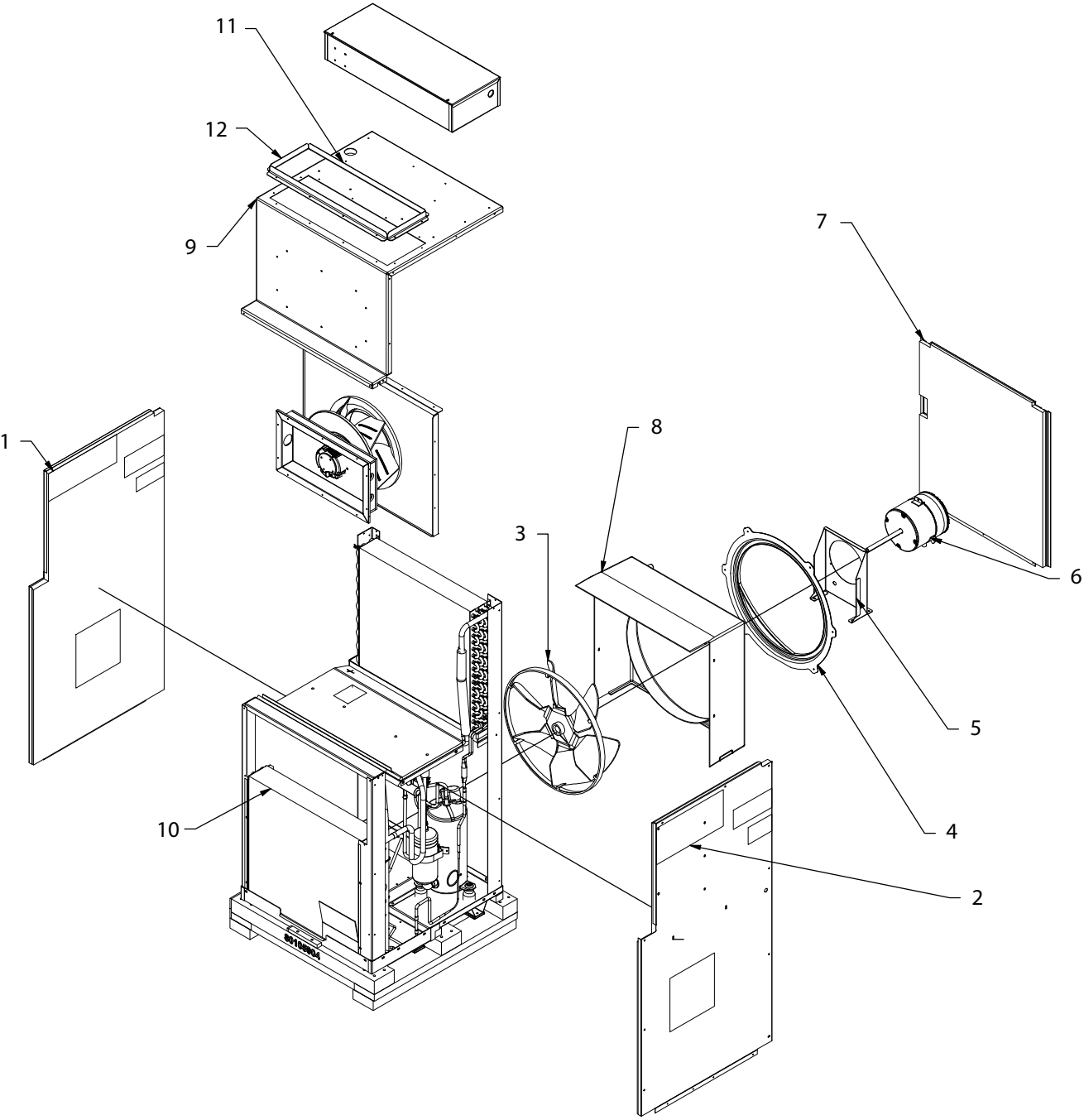
Figure 905

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80106501	ASSY LEFT PANEL INSUL PREPNTD	ALL	1
2	80106401	ASSY RIGHT PANEL INSUL PREPNTD	ALL	1
3	60542007	FAN PLASTIC 16" LRG; VPAC	ALL	1
4	80101011	SHROUD RING WATER TRAP	ALL	1
5	61776905	MTR MOUNT LARGE (144mm)	ALL	1
6	80102172	MTR 1/4 10P CCW FAN BLCD NAN-FENG	ALL	1
7	80106601	ASSY REAR PANEL INSUL PREPNTD	ALL	1
8	80114102	SHROUD, VPAK LARGE FOR RING	ALL	1
9	80106702	ASY TOP PANEL INSUL PREPNTD	ALL	1
10	80113900	SUPPORT VPAK 24	ALL	1
-11	61814801	CONNECTOR FRESH AIR LRG	ALL	1
-12	61656200	CHANNEL EXHAUST DOOR	ALL	1
-13	61656201	SLIDE EXHAUST DOOR	ALL	1
-ITEMS ARE NON- ILLUSTRATED *ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

24K Unit Assembly

Figure 906



PARTS CATALOG

24K Unit Assembly

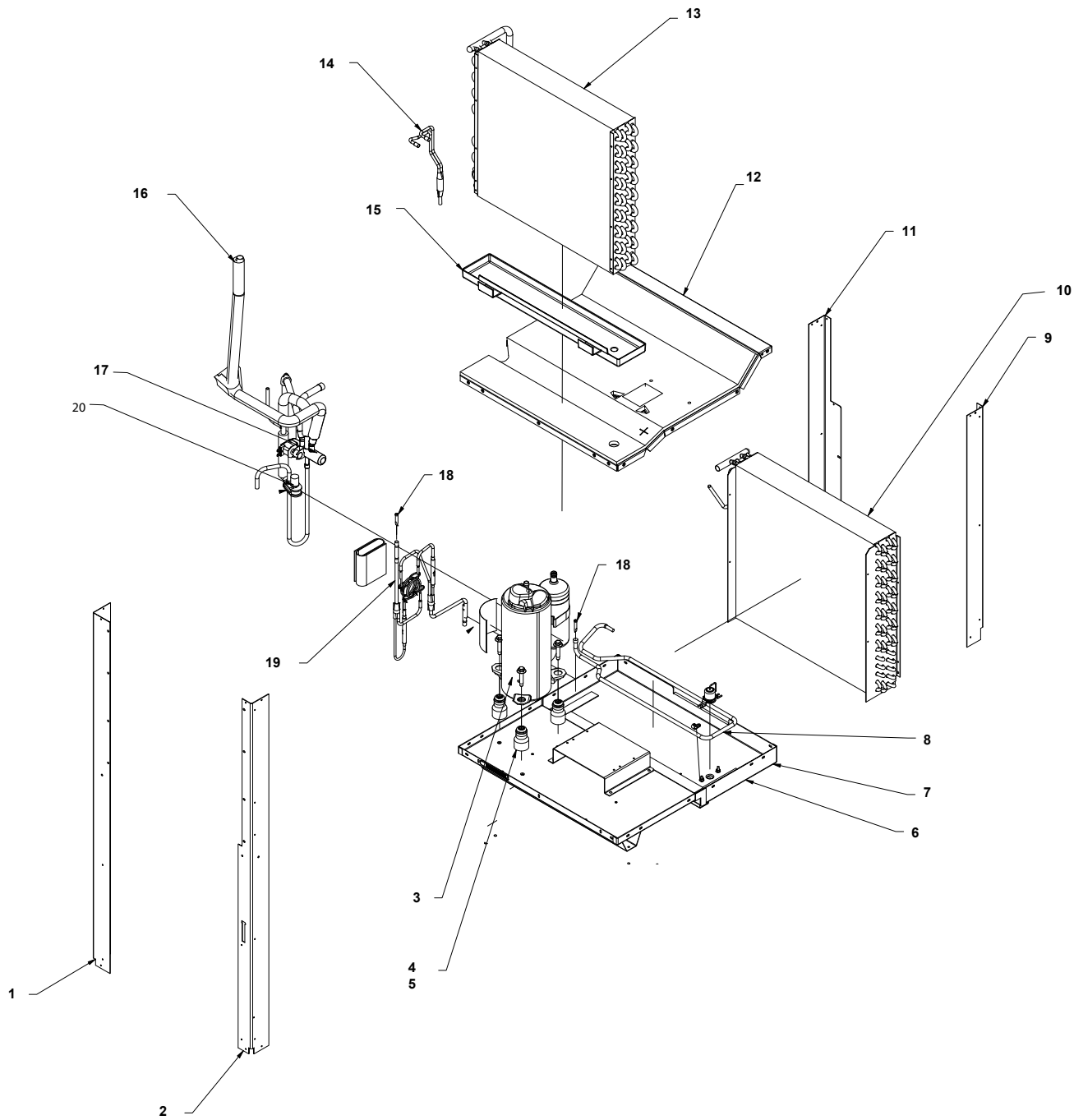
Figure 906

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80102010	ASSY PANEL SIDE BL-24 LF	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
2	80103010	ASSY PANEL SIDE BL-24 RT	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
3	60542007	FAN PLASTIC 16" LRG; VPAC	ALL	1
4	80101011	SHROUD RING WATER TRAP	ALL	1
5	61776907	BRACKET MOTOR MOUNT VPAK LARGE	VHA24RK25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP	1
6	80102173	MTR 1/4 6P CCW FAN BLCD NAN-FENG S-1250 VHA24	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP	1
7	80106601	ASSY REAR PANEL INSUL PREPNTD	ALL	1
8	80114102	SHROUD, VPAK LARGE FOR RING	ALL	1
9	80106708	ASY TOP PANEL INSUL PREPNTD	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
10	80113900	SUPPORT VPAK 24	ALL	1
11	80106707	BRACKET, TOP FRAME	ALL	
12	80106706	BRACKET TOP DUCT	ALL	
-13	61814801	CONNECTOR FRESH AIR LRG	ALL	1
-14	61656200	CHANNEL EXHAUST DOOR	ALL	1
-15	61656201	SLIDE EXHAUST DOOR	ALL	1
-ITEMS ARE NON- ILLUSTRATED				
*ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

18K, 24K Refrigeration Assembly

Figure 907



PARTS CATALOG

18K, 24K Refrigeration Assembly

Figure 907

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80101600	UPPER RIGHT POST	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	1
1	80101601	UPPER RIGHT POST	VHA24RK25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP	1
2	80101500	UPPER LEFT POST	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	1
2	80101501	UPPER LEFT POST BL-24	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
3	61717188	KIT COMPR REPLACMNT 62200317	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	1
3	61717191	KIT COMPR REPLACMNT 62200512	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
4	91400402	STUD COMPR MTG	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	3
4	91400403	STUD COMPR MTG	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	3
5	01150941	GROMMET COMP HI DENSITY	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	3
5	61028905	GROMMET COMP 3/8" X 60.5MM RAC	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	3
6	80115401	INSULATION BASEPAN RETROFIT	ALL	1
7	80115225	ASSY BASEPAN DRAIN	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	1
7	80115227	BASEPAN VPAK LARGE CAULKED DBL-DRAIN	VHA24RK25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP	1
8	80105603	ASSY SUMP TUBE	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	
8	80109315	ASSY TUBE SUBCOOLING LOOP	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	
9	80101300	LOWER LEFT POST	ALL	1
10	80101261	COIL, CONDENSOR VCS.312X4X14RC2V45A20X19H6	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
10	80101279	COIL VCS.312X4X14RC2V45A20X19H6	VHA18K75RTP, VHA18R75RTP	
11	80101400	LOWER RIGHT POST	ALL	1
12	80106201	ASSY INNERWALL INSULATION	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18K75RTP, VHA18R75RTP	1

PARTS CATALOG

18K, 24K Refrigeration Assembly

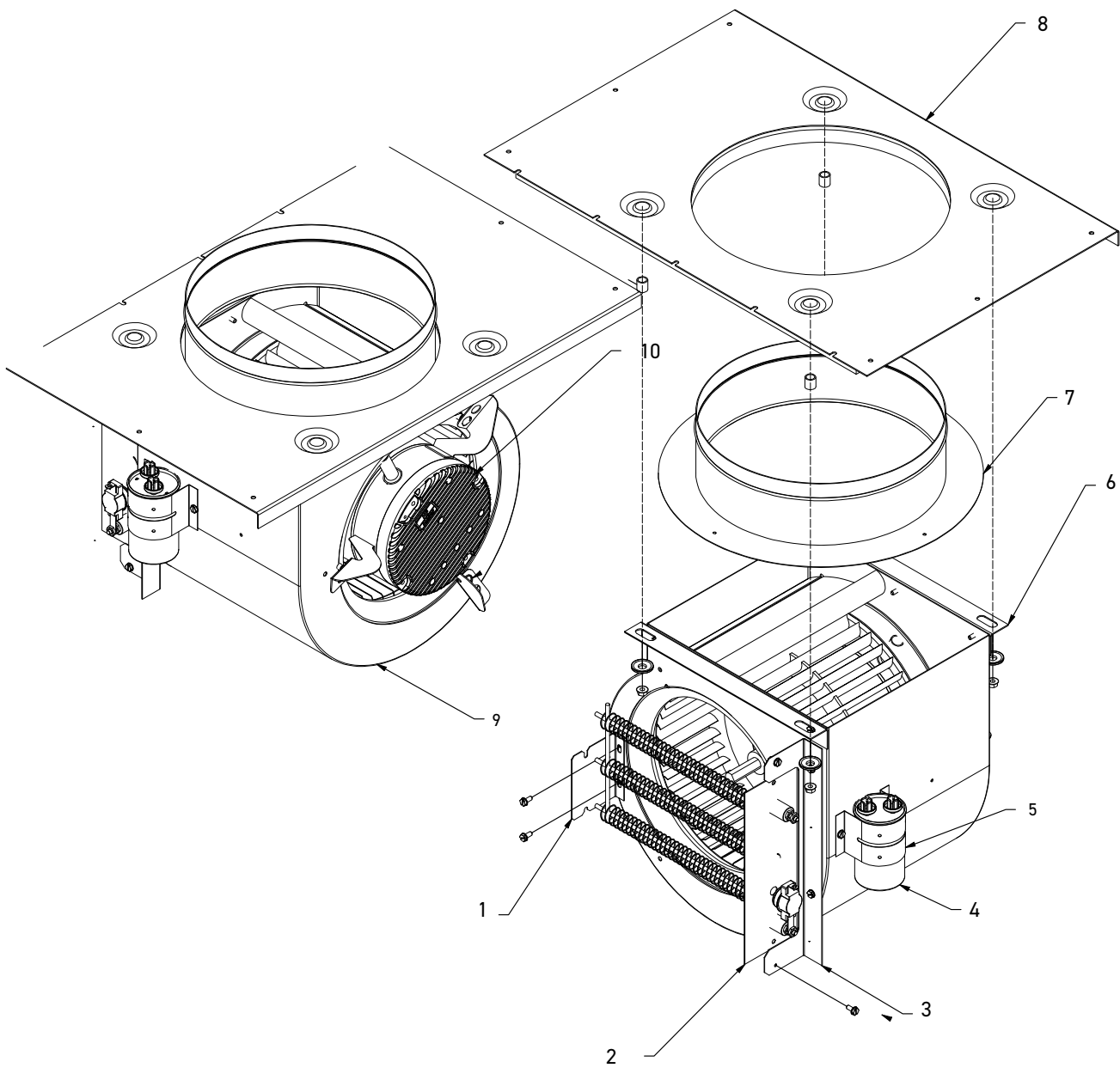
Figure 907

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
12	80106202	ASSY INNERWALL INSULATION BL-24	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
13	62050004	COIL, EVAPORATOR LES.375X4X14RC2V45A20X14H6	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP	1
13	62050008	COIL LES.375X4X14RC2V45A20X14H6	VHA18K75RTP, VHA18R75RTP	
13	62050007	COIL, EVAPORATOR VES.375X4X14RC2V45A20X18H6	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
14	80042958	ASSY TUBE CHECK VALVE TO EVAP	ALL	1
15	80100301	EVAP DRAINPAN, VPAK LARGE	ALL	1
16	25018705	ASSY REVERSING VALVE	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18K75RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18R75RTP	1
16	25018705	ASSY REVERSING VALVE	VHA24RK25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP	1
17	25063606	COIL SOLENOID 208/230VAC DUNAN	ALL	1
18	61834800	STRAINER .312 COIL	ALL	2
19	80109309	ASSY TUBE CHECK VALVE	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP	1
19	80109332	ASSY TUBE, CHECK VALVE VHA18 SL	VHA18K75RTP, VHA18R75RTP	
19	80109323	ASSY TUBE CAPILLARY VHA24K	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
20	80112501	HIGH PRESSURE SWITCH	VHA18K25RTP-A, VHA18K34RTP-A, VHA18K50RTP-A, VHA18R25RTP-A, VHA18R34RTP-A, VHA18R50RTP-A, VHA18K25RTP-C, VHA18K34RTP-C, VHA18K50RTP-C, VHA18K75RTP-C, VHA18R25RTP-C, VHA18R34RTP-C, VHA18R50RTP-C, VHA18R75RTP-C	
20	80112504	HIGH PRESSURE SWITCH	VHA18K25RTP-B, VHA18K34RTP-B, VHA18K50RTP-B, VHA18R25RTP-B, VHA18R34RTP-B, VHA18R50RTP-B, VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	
-21	03760511	TUBE CAP .059X.1120D X 23.25 BLUE	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18K75RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP, VHA18R75RTP	1
-22	03760501	TUBE CAP .064 X .125 OD X 30.25 YEL	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP, VHA18R25RTP, VHA18R34RTP, VHA18R50RTP	1
-22	1390005	TUBE CAP .064 X .1250DX23.5 YELLOW	VHA18K75RTP, VHA18R75RTP	
-23	3760394	TUBE CAP .064 X .1250DX18.00 YELLOW	VHA24K25RTP, VHA24K34RTP, VHA24K50RTP, VHA24K75RTP, VHA24K10RTP, VHA24R25RTP, VHA24R34RTP, VHA24R50RTP, VHA24R75RTP, VHA24R10RTP	1
-ITEMS ARE NON- ILLUSTRATED				
*ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

18K Blower Assembly

Figure 908



PARTS CATALOG

18K Blower Assembly

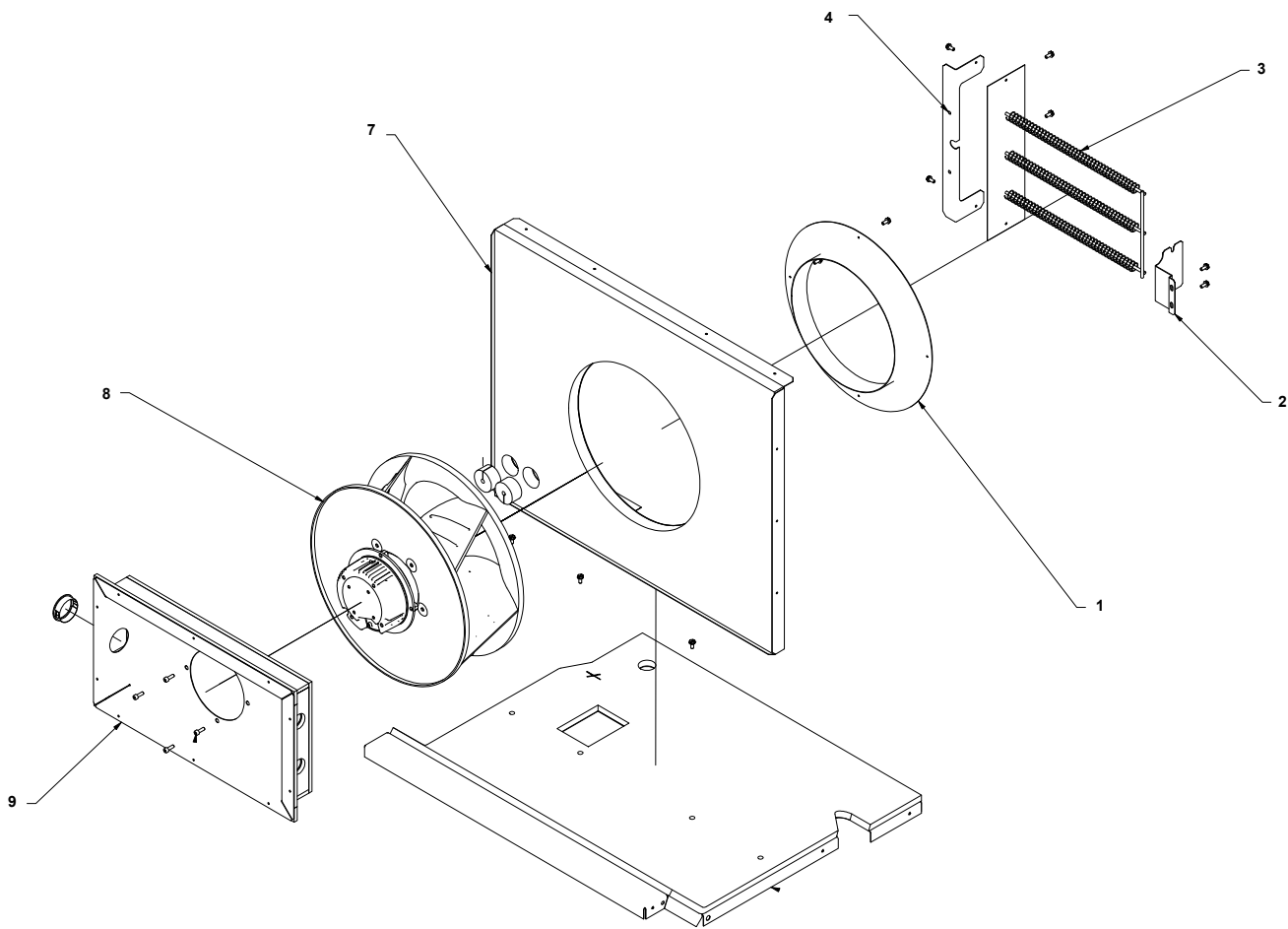
Figure 908

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80113300	HEATER HOLDING BRACKET VPAK 24	VHA18K25RTP-A, VHA18K34RTP-A, VHA18K50RTP-A, VHA18R25RTP-A, VHA18R34RTP-A, VHA18R50RTP-A, VHA18K25RTP-B, VHA18K34RTP-B, VHA18K50RTP-B, VHA18R25RTP-B, VHA18R34RTP-B, VHA18R50RTP-B	1
1	80102606	HEATER HOLDING BRACKET AIRFLOW INSCREASE	VHA18K25RTP-C, VHA18K34RTP-C, VHA18K50RTP-C, VHA18K75RTP-C, VHA18R25RTP-C, VHA18R34RTP-C, VHA18R50RTP-C, VHA18R75RTP-C	1
2	80102290	HEATER VPAK-A24 NXT 2.5KW 230V	VHA18K25RTP	1
2	80102291	HEATER VPAK-A24 NXT 3.4KW 230V	VHA18K34RTP	1
2	80102292	HEATER VPAK-A24 NXT 5.0KW 230V	VHA18K50RTP	1
2	80102306	HEATER VPAK-LARGE 0.4MS 7.5KW 230V	VHA18K75RTP	1
2	80102295	HEATER VPAK-A NXT 2.5KW 265V	VHA18R25RTP	1
2	80102296	HEATER VPAK-A NXT 3.4KW 265V	VHA18R34RTP	1
2	80102297	HEATER VPAK-A NXT 5.0KW 265V	VHA18R50RTP	1
2	80102307	HEATER VPAK-LARGE 0.4MS 7.5KW 265V	VHA18R75RTP	1
3	80102600	BRACKET HEATER BL-24	VHA18K25RTP-A, VHA18K34RTP-A, VHA18K50RTP-A, VHA18R25RTP-A, VHA18R34RTP-A, VHA18R50RTP-A, VHA18K25RTP-B, VHA18K34RTP-B, VHA18K50RTP-B, VHA18R25RTP-B, VHA18R34RTP-B, VHA18R50RTP-B	1
3	80102607	BRACKET HEATER HOLDER AIRFLOW INCREASE	VHA18K25RTP-C, VHA18K34RTP-C, VHA18K50RTP-C, VHA18K75RTP-C, VHA18R25RTP-C, VHA18R34RTP-C, VHA18R50RTP-C, VHA18R75RTP-C	1
4	61080700	CAPCTR 35 MF 370V 2.0	ALL	1
5	20709185	CLAMP, CAPACITOR	ALL	1
6	80103600	BLOWER BRACKET	ALL	1
7	80001800	COLLAR 24 GA	ALL	1
8	80113200	TOP COVER INSUL ASSY	ALL	1
9	80103200	BLOWER HOUSING	ALL	1
10	80106973	MTR 1/4 4 10P CW 1 BLDC VPAK LRG	ALL	1
-ITEMS ARE NON- ILLUSTRATED				
*ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

24K Blower Assembly

Figure 909



PARTS CATALOG

24K Blower Assembly

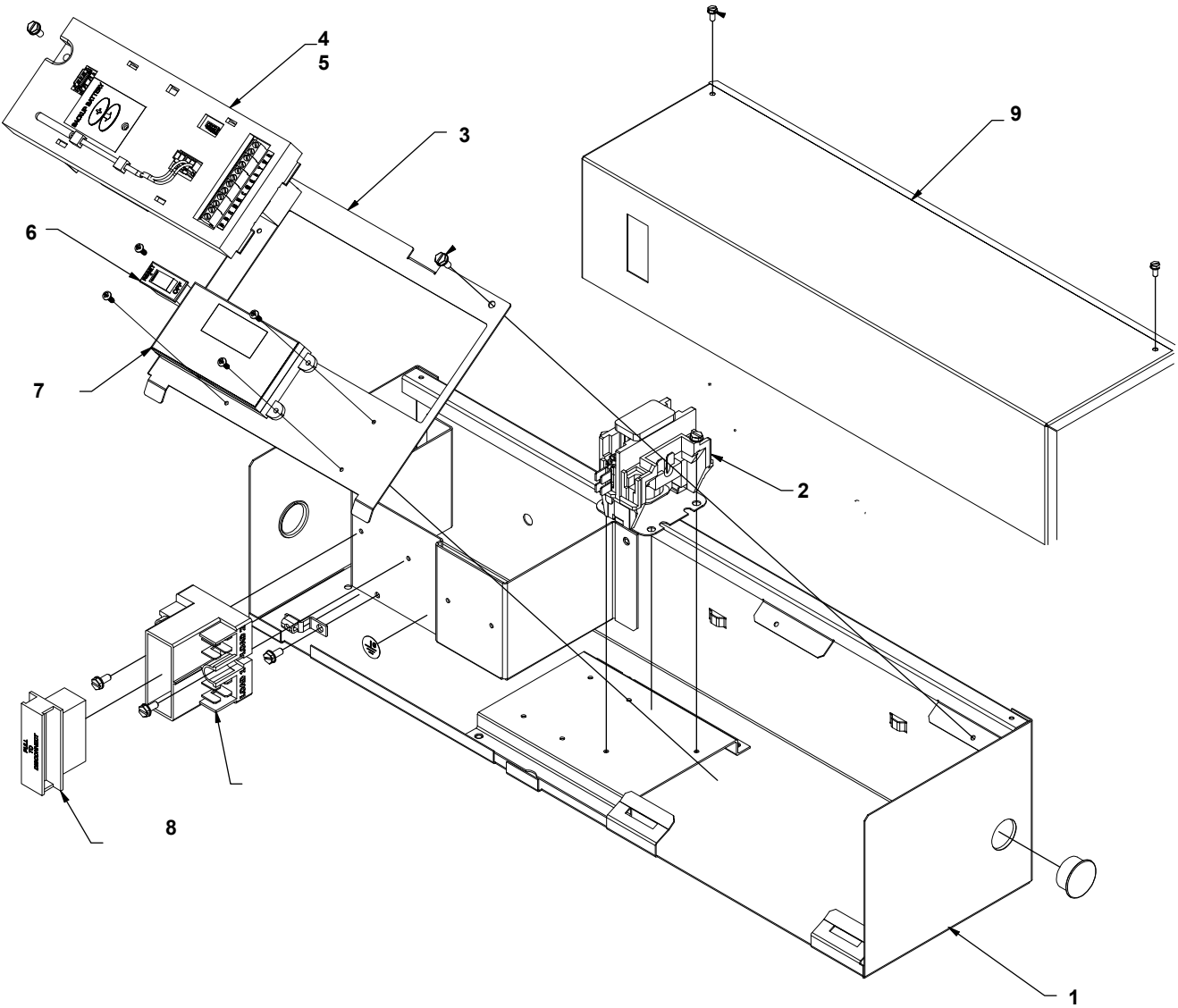
Figure 909

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80080171	IR-310 INLET RING EVAP BLOWER PSC DIA 12"	ALL	1
2	80102601	BRACKET HEATER HOLDER	ALL	1
3	80102290	HEATER VPAK-A24 NXT 2.5KW 230V	VHA24K25RTP	1
3	80102291	HEATER VPAK-A24 NXT 3.4KW 230V	VHA24K34RTP	1
3	80102292	HEATER VPAK-A24 NXT 5.0KW 230V	VHA24K50RTP	1
3	80102305	HEATER VPAK-A24 NXT 7.5KW 230V	VHA24K75RTP	1
3	80102294	HEATER VPAK-A24 NXT 10.0KW 230V	VHA24K10RTP	1
3	80102295	HEATER VPAK-A NXT 2.5KW 265V	VHA24R25RTP	1
3	80102296	HEATER VPAK-A NXT 3.4KW 265V	VHA24R34RTP	1
3	80102297	HEATER VPAK-A NXT 5.0KW 265V	VHA24R50RTP	1
3	80102303	HEATER VPAK-A24 NXT 7.5KW 265V	VHA24R75RTP	1
3	80102304	HEATER VPAK-A24 NXT 10.0KW 265V	VHA24R10RTP	1
4	80102603	BRACKET HEATER BL-24	ALL	1
7	80081517	ASSY BLOWER FRONT BL-24	ALL	1
8	80083150	BLOWER MOTOR 310X140 PI2E310140MB2M	ALL	1
9	80081024	ASSY INSUL BLOWER MOUNT VPAK24	ALL	1
-ITEMS ARE NON- ILLUSTRATED *ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

18K 230V Control Box

Figure 910



PARTS CATALOG

18K 230V Control Box

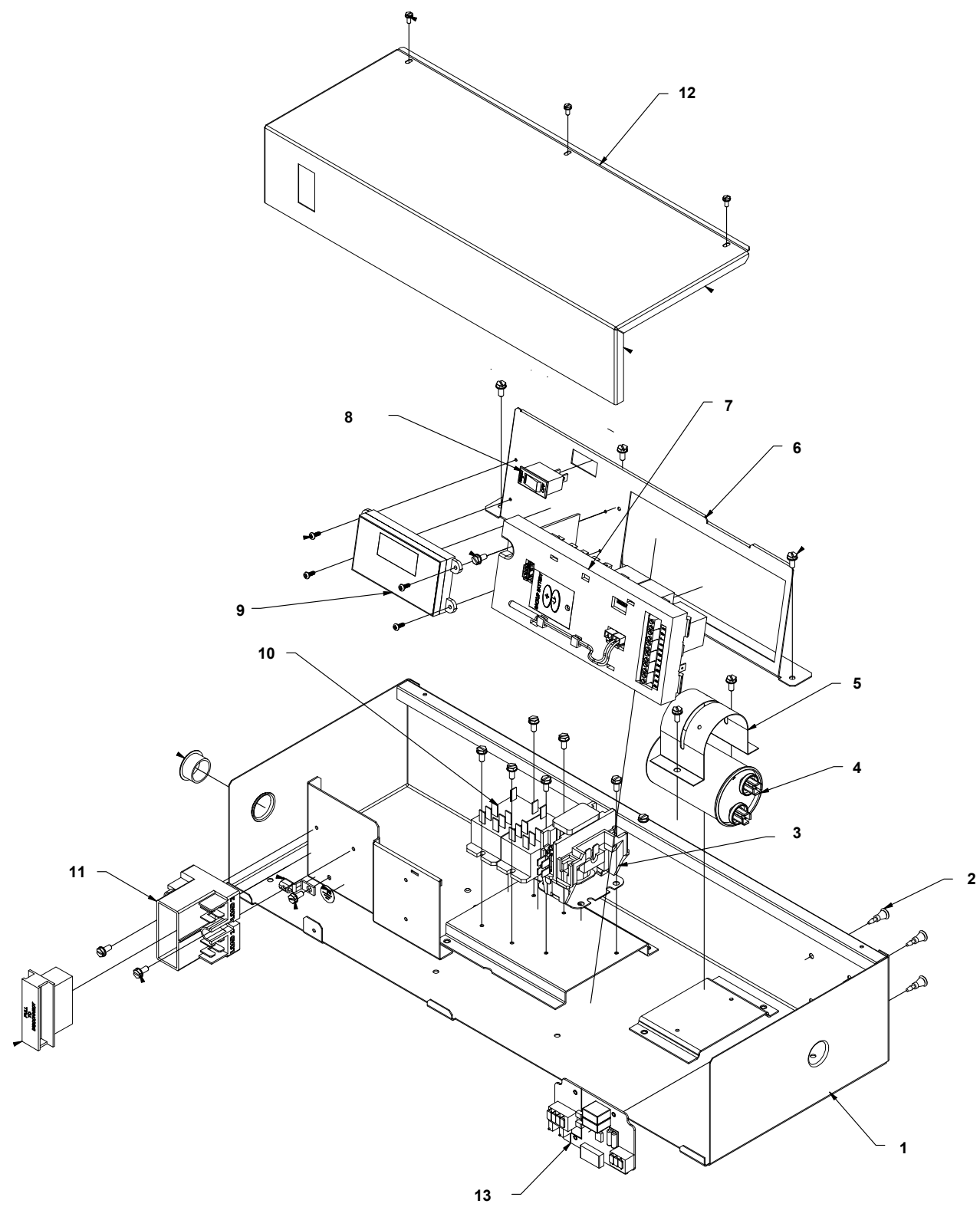
Figure 910

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80118402	ASSY C-BOX LARGE 230-265V	ALL	1
2	80118601	CONTACTOR 240VAC HCL-1NU01AAC	VHA18K25RTP, VHA18K34RTP, VHA18K50RTP	1
2	80118602	CONTACTOR 240/277 2 POLES HCC-2XU04GG	VHA18K75RTP	
3	80116907	BRACKET ELECT CNTRL VPAK LARGE CIRC-BREAKER	ALL	1
4	62601009	KIT E-CNTL SERV COOL HP VHA	ALL	1
5	62600118	ASSY E-CNTRL COOL/EH AMP JMPR	ALL	1
6	61773324	SWITCH CIRCUIT BRKR 20A 230V CITR220Q2NS	ALL	1
7	62600601	DISPLAY SERVICE VPAC KUHL	ALL	1
8	80007600	NONFUSED DISCONNECT	ALL	1
9	80116606	CONTROL BOX LID PREPNTD	ALL	1
-10	62600203	SENSOR ID R/A TEMPERATURE (WHITE)	ALL	1
-11	62600205	SENSOR ID COIL TEMPERATURE (GREEN)	ALL	1
-12	62600206	SENSOR OD COIL TEMPERATURE (BLUE)	ALL	1
-ITEMS ARE NON-ILLUSTRATED *ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

24K 230V Control Box

Figure 911



PARTS CATALOG

24K 230V Control Box

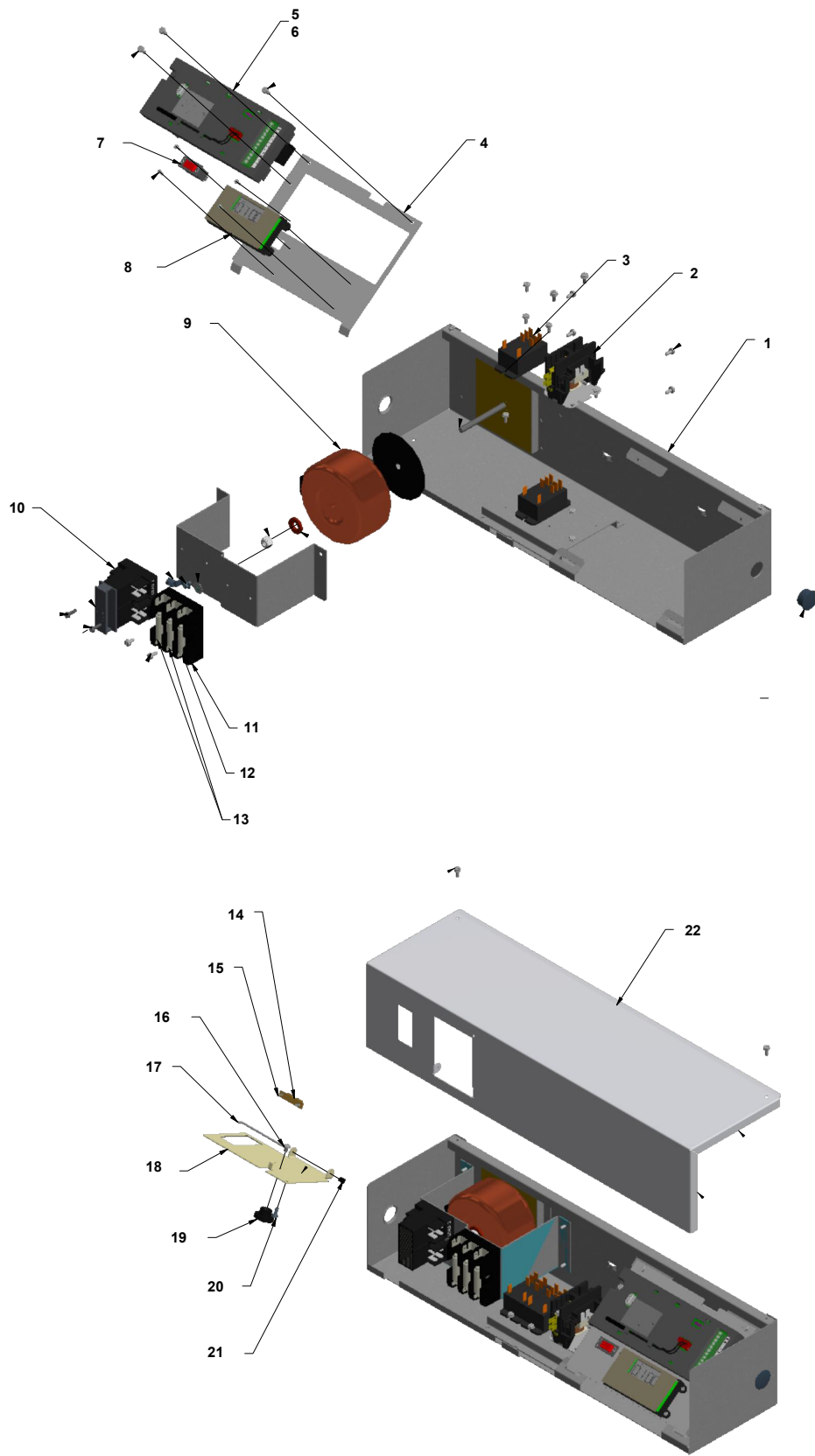
Figure 911

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80032809	ASSY CONTROL BOX VPAK 24 XL 230V	ALL	1
2	61600532	STAND OFF - PCB DIA .125	ALL	4
3	80118601	CONTACTOR 240VAC HCL-1NU01AAC	ALL	1
4	61080703	CAPCTR 40 MF 450V 2.0" X 3.75"	ALL	1
2	80118602	CONTACTOR 240/277 2 POLES HCC-2XU04GG	ALL	1
5	20709185	CLAMP, CAPACITOR	ALL	1
6	80032805	BRACKET E-CTRL VPAK 24 XL	ALL	1
7	62601009	KIT E-CNTL SERV COOL HP VHA	ALL	1
8	61773324	SWITCH CIRCUIT BRKR 20A 230V CITR220Q2NS	ALL	1
9	62600601	DISPLAY SERVICE VPAC KUHL	ALL	1
10	61643311	RELAY 230V COIL DPDT 30A 208/240VAC	ALL	1
11	80007600	NONFUSED DISCONNECT	ALL	1
12	80116606	CONTROL BOX LID PREPNTD	ALL	1
13	80106975	CONTROL BLOWER MTR PSC ESM14165	ALL	1
-14	62600203	SENSOR ID R/A TEMPERATURE (WHITE)	ALL	1
-15	62600205	SENSOR ID COIL TEMPERATURE (GREEN)	ALL	1
-16	62600206	SENSOR OD COIL TEMPERATURE (BLUE)	ALL	1
-ITEMS ARE NON- ILLUSTRATED *ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

PARTS CATALOG

18K 265V Control Box

Figure 912



PARTS CATALOG

18K 265V Control Box

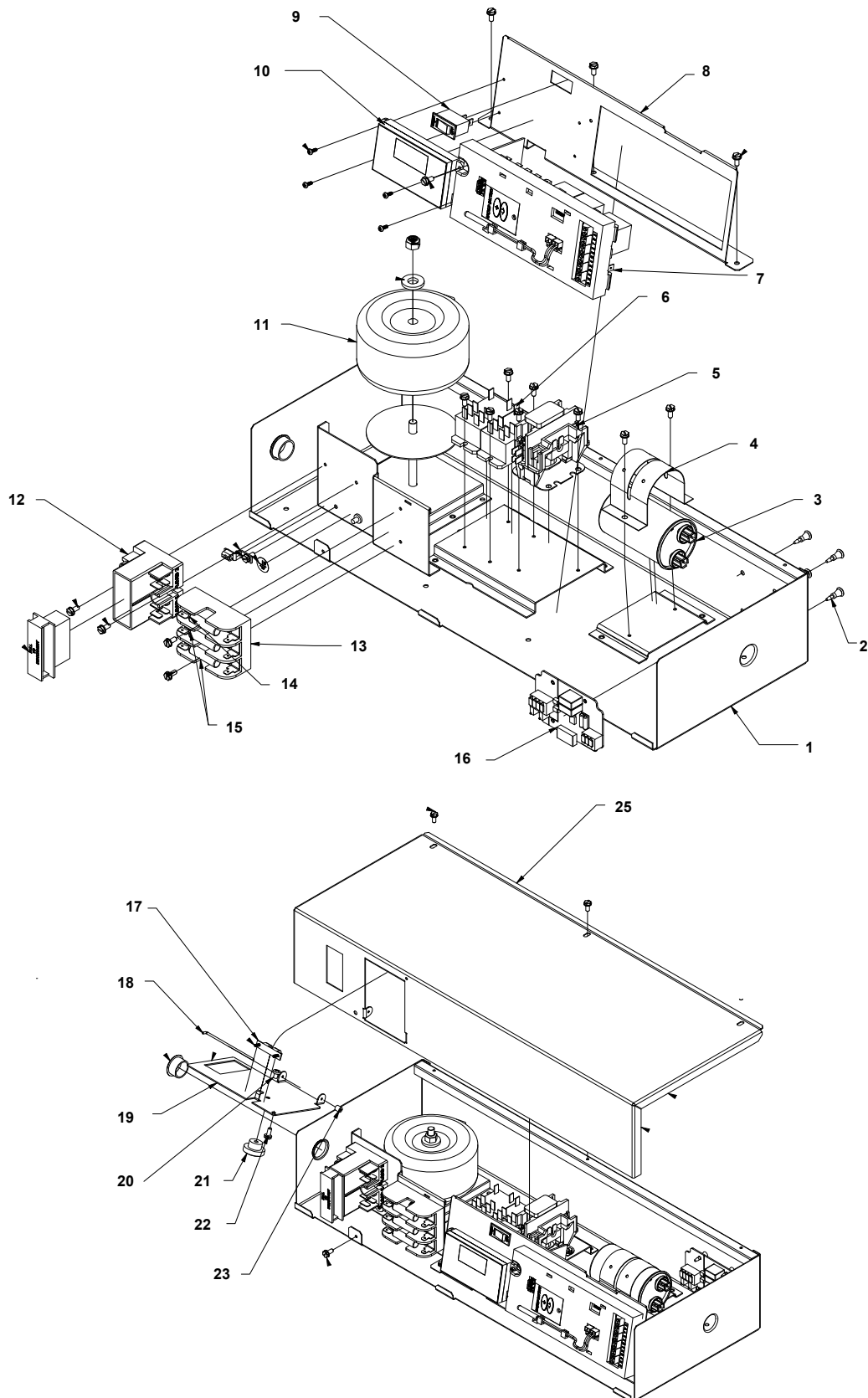
Figure 912

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80118402	ASSY C-BOX LARGE 230-265V	ALL	1
2	80118601	CONTACTOR 240VAC HCL-1NU01AAC	VHA18R35RTP, VHA18R34RTP, VHA18R50RTP	1
2	80118602	CONTACTOR 240/277 2 POLES HCC-2XU04GG	VHA18R75RTP	1
3	61643311	RELAY 230V COIL DPDT 30A 208/240VAC	ALL	1
4	80116907	BRACKET ELECT CNTRL VPAK LARGE CIRC-BREAKER	ALL	1
5	62601009	KIT E-CNTL SERV COOL HP VHA	ALL	1
6	62600118	ASSY E-CNTRL COOL/EH AMP JMPR	ALL	1
7	61773324	SWITCH CIRCUIT BRKR 20A 230V CTR220Q2NS	ALL	1
8	62600601	DISPLAY SERVICE VPAC KUHL	ALL	1
9	61670803	TRANSFORMER IN 265V OUT 235V	ALL	1
10	80007600	NONFUSED DISCONNECT	ALL	1
11	61776111	FUSE BLOCK 3 POLES 30 AMP	ALL	1
12	61773317	FUSE 600V 20A CC TD	ALL	1
13	61773319	FUSE 600V 15A CC TD	ALL	2
14	80117001	LOCK MECHANISM BALL BEARING	ALL	1
15	90603405	SCREW 4F-40X3/8 ROUND PAN PHILL ZIN	ALL	1
16	90605602	SCREW PHILLIPS #10-32 X .250	ALL	1
17	61610400	PIN HINGE	ALL	1
18	80015707	COVER CONTROL BOX DOOR	ALL	1
19	80086100	KNOB KNURLED	ALL	1
20	90605301	SCREW #8 SG X 3/8 HWH B PT	ALL	1
21	91201202	RIVET ID .093 PLASTIC	ALL	1
22	80116603	CONTROL BOX LID PREPNTD	ALL	1
-23	62600203	SENSOR ID R/A TEMPERATURE (WHITE)	ALL	1
-24	62600205	SENSOR ID COIL TEMPERATURE (GREEN)	ALL	1
-25	62600206	SENSOR OD COIL TEMPERATURE (BLUE)	ALL	1

PARTS CATALOG

24K 265V Control Box

Figure 913



PARTS CATALOG

24K 265V Control Box

Figure 913

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	80032802	ASSY CONTROL BOX VPAK 24 XL 265V	ALL	1
2	61600532	STAND OFF - PCB DIA .125	ALL	4
3	61080703	CAPCTR 40 MF 450V 2.0" X 3.75"	ALL	1
4	20709185	CLAMP, CAPACITOR	ALL	1
5	80118601	CONTACTOR 240VAC HCL-1NU01AAC	ALL	1
6	61643311	RELAY 230V COIL DPDT 30A 208/240VAC	ALL	1
7	62601009	KIT E-CNTL SERV COOL HP VHA	ALL	1
8	80032805	BRACKET E-CTRL VPAK 24 XL	ALL	1
9	61773324	SWITCH CIRCUIT BRKR 20A 230V CTR220Q2NS	ALL	1
10	62600601	DISPLAY SERVICE VPAC KUHL	ALL	1
11	61670803	TRANSFORMER IN 265V OUT 235V	ALL	1
12	80007600	NONFUSED DISCONNECT	ALL	1
13	61776111	FUSE BLOCK 3 POLES 30 AMP	ALL	1
14	61773317	FUSE 600V 20A CC TD	ALL	1
15	61773319	FUSE 600V 15A CC TD	ALL	2
16	80106975	CONTROL BLOWER MTR PSC ESM14165	ALL	1
17	80117001	LOCK MECHANISM BALL BEARING	ALL	1
18	61610400	PIN HINGE	ALL	1
19	80015707	COVER CONTROL BOX DOOR	ALL	1
20	90603405	SCREW 4F-40X3/8 ROUND PAN PHILL ZIN	ALL	1
21	80086100	KNOB KNURLED	ALL	1
22	90605602	SCREW PHILLIPS #10-32 X .250	ALL	1
24	91201202	RIVET ID .093 PLASTIC	ALL	1
25	80032807	CTRL BOX LID VPAK 24 XL 265V 20GA PREPAINTED	ALL	1
-26	62600203	SENSOR ID R/A TEMPERATURE (WHITE)	ALL	1
-27	62600205	SENSOR ID COIL TEMPERATURE (GREEN)	ALL	1
-28	62600206	SENSOR OD COIL TEMPERATURE (BLUE)	ALL	1
-ITEMS ARE NON- ILLUSTRATED *ITEMS ARE NON-STOCKED, WILL NORMALLY REQUIRE 2-3 WEEKS LEAD TIME				

AVAILABLE ACCESSORIES

ACCESSORIES

ARCHITECTURAL LOUVER

VPAL2 and VPSC2

Extruded aluminum grille that attaches to the outdoor section of the wall plenum. VPSC2 can be ordered in custom colors.

DIMENSIONS: 25 9/16" W x 31 1/16" H



VPAL2



VPAWP1-8/14

WALL PLENUM (Required)

VPAWP1-8, VPAWP1-14

Two-part sleeve that telescopes in and out; sits inside the exterior wall penetration.

VPAWP1-8 telescopes from 5 1/2" – 8"

VPAWP1-14 telescopes from 8" – 14"

DIMENSIONS : 24 1/8" W x 30 3/8" H

CUTOUT DIMENSIONS: 24 5/8" W x 30 7/8" H

RETURN AIR GRILLE/ ACCESS PANEL/SOLID DOOR ACCESS PANEL

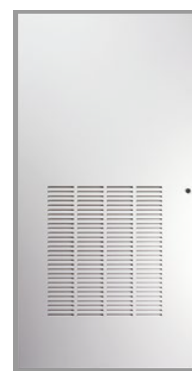
VPRG4/VPRG4R/VPRG4SD

Hinged panel allows access to unit and return air filter.

A field-supplied filter (25" x 20") should be mounted on the inside grille. Panel can be mounted with return air openings high or low on the door for optimum sound attenuation. VPRG4SD is a solid door panel. VPRG4 is a default left in-swing, the VPRG4R is a right in-swing.

DIMENSIONS: 29" W x 58" H

CUTOUT DIMENSIONS: 27" W x 55 3/4" H



VPRG4/VPRG4R



VPRG4SD

FIRST COMPANY SLEEVE ADAPTER

VPASA1

Single piece, welded adapter allows retrofit into existing First Company® SPXR-series single package vertical unit wall sleeve and louver. Easily connects to Friedrich chassis. Only compatible with Friedrich's smaller sized VPAK 9k and 12k units.



VPASA1

SINGLE STAGE THERMOSTATS

RT7P

Wired, single stage, wall-mounted programmable thermostat with two fan speeds and backlight. Controls Friedrich VERT-I-PAK.

RT7

Wired, single stage, wall-mounted digital thermostat with two fan speeds and backlight. Controls Friedrich VERT-I-PAK.

WRT2

Wireless, single stage, wall-mounted programmable thermostat with two fan speeds and backlight. Controls Friedrich VERT-I-PAK.



RT7



RT7P



WRT2



EMRT2, EMWRT2

ENERGY MANAGEMENT THERMOSTATS

EMRT2/EMWRT2

Wired/Wireless thermostat with occupancy sensor.

EMOCT

EMRAF

EMROS

Online connection kit.

Remote access fee.

Remote Occupancy Sensor

EMRTS

EMRDS

EMCWP

EMRWOS

Remote Temperature

SensorDoor Switch

Wall Plate

Wireless Occ. Sensor

DRAIN PAN (Required for VHA18 and VHA24 models)

VPDP2

For VHA18 & VHA24 models. Must be installed prior to chassis for easy installation/removal.



VPDP2

WARRANTY


Friedrich Air Conditioning Co.
10001 Reunion Place, San Antonio, TX 78216
800.541.6645
www.friedrich.com

VERT-I-PAK® A SERIES SINGLE PACKAGED VERTICAL AIR CONDITIONERS LIMITED WARRANTY

SAVE THIS CERTIFICATE. It gives you specific rights. You may also have other rights which may vary from state to state and province to province

In the event that your unit needs servicing, contact your nearest authorized service center. If you do not know the nearest service center, ask the company that installed your unit or contact us - see address and telephone number above. To obtain service and/or warranty parts replacement, you must notify an authorized FRIEDRICH Air Conditioning Co. service center, distributor, dealer, or contractor of any defect within the applicable warranty period.

When requesting service: please have the model and serial number from your unit readily available.

Unless specified otherwise herein, the following applies:

FRIEDRICH VERT-I-PAK A SERIES AIR CONDITIONERS AND HEAT PUMPS

LIMITED WARRANTY – FIRST YEAR (Twelve (12) months from the date of installation). Any part found to be defective in the material or workmanship will be repaired or replaced free of charge by our authorized service center during the normal working hours; and

LIMITED WARRANTY - SECOND THROUGH FIFTH YEAR (Sixty (60) months from the date of installation). ON THE SEALED REFRIGERATION SYSTEM. Any part of the sealed refrigeration system that is defective in material or workmanship will be repaired or replaced free of charge (excluding freight charges) by our authorized service center during normal working hours. The sealed refrigeration system consists of the compressor, metering device, evaporator, condenser, reversing valve, check valve, and the interconnecting tubing.

These warranties apply only while the unit remains at the original site and only to units installed inside the continental United States, Alaska, Hawaii, Puerto Rico, Mexico and Canada. The warranty applies only if the unit is installed and operated in accordance with the printed instructions and in compliance with applicable local installation and building codes and good trade practices. For international warranty information, contact the Friedrich Air Conditioning Company - International Division.

Any defective part to be replaced must be made available to FRIEDRICH in exchange for the replacement part. Reasonable proof must be presented to establish the date of install, otherwise the beginning date of this certificate will be considered to be our shipment date plus sixty days. Replacement parts can be new or remanufactured. Replacement parts and labor are only warranted for any unused portion of the unit's warranty.

We will not be responsible for and the user will pay for:

1. Service calls to:
 - A) Instruct on the unit operation. B) Replace house fuses or correct house wiring. C) Clean or replace filters. D) Remove the unit from its installed location when not accessible for service required. E) Correct improper installations.
2. Parts or labor provided by anyone other than an authorized service center.
3. Damage caused by:
 - A) Accident, abuse, negligence, misuse, riot, fire, flood, or acts of God. B) Operating the unit where there is a corrosive atmosphere containing Chlorine, Fluorine, or any damaging chemicals (other than in a normal residential environment). C) Unauthorized alteration or repair of the unit, which in turn affects its stability or performance. D) Failing to provide proper maintenance and service. E) Using an incorrect power source. F) Faulty installation or application of the unit. G) Operation of the unit during construction.

We shall not be liable for any incidental, consequential, or special damages or expenses in connection with any use or failure of this unit. We have not made and do not make any representation or warranty of fitness for a particular use or purpose and there is no implied condition of fitness for a particular use or purpose. We make no expressed warranties except as stated in this certificate. No one is authorized to change this certificate or to create for us any other obligation or liability in connection with this unit. Any implied warranties shall last for one year after the original purchase date. Some states and provinces do not allow limitations on how long an implied warranty or condition lasts, so the above limitations or other rights and remedies provided by law.

Performance of Friedrich's Warranty obligation is limited to one of the following methods:

1. Repair of the unit
2. A refund to the customer for the prorated value of the unit based upon the remaining warranty period of the unit.
3. Providing a replacement unit of equal value

The method of fulfillment of the warranty obligation is at the sole discretion of Friedrich Air Conditioning.

In case of any questions regarding the provisions of this warranty, the English version will govern.

(11-2019)

CUSTOMER SATISFACTION and QUALITY ASSURANCE

Friedrich is a conscientious manufacturer, concerned about customer satisfaction, product quality, and controlling warranty costs. As an Authorized Service Provider you play a vital role in these areas. By adhering to the policies and procedures you provide us with vital information on each warranty repair you complete. This information is used to identify product failure trends, initiate corrective action, and improve product quality, thereby further reducing warranty expenses while increasing customer satisfaction levels.

FRIEDRICH AUTHORIZED PARTS DEPOTS

AAA Refrigeration Service

1322 24th Street, Suite B
Kenner, Louisiana 70062

504-464-7444
877-813-7444

The Gabbert Company

6868 Ardmore
Houston, Texas 77054

713-747-4110
800-458-4110

Reeve Air Conditioning, Inc.

2501 South Park Road
Hallandale, Florida 33009

954-962-0252
800-962-3383

Johnstone Supply of Woodside

27-01 Brooklyn Queens Expway
Woodside, New York 11377

718-545-5464
800-431-1143



FRIEDRICH

TECHNICAL SUPPORT CONTACT INFORMATION

Friedrich Air Conditioning Co.
10001 Reunion Place, Suite 500 • San Antonio, Texas 78216
1-800-541-6645
www.friedrich.com