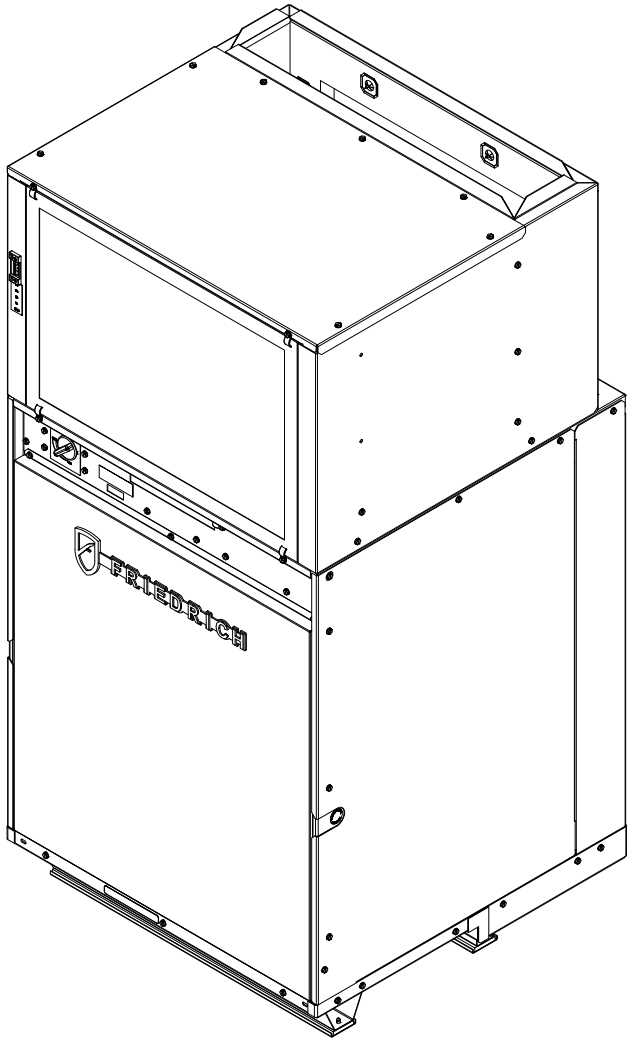
Service Manual

FRIEDRICH

VRP ® Studio Series Air Conditioners
R-410A Refrigerant



VRP07XXXXXXX
VRP07XXXXXXXA-A
VRP07XXXXXXXA-B
VRP07XXXXXXXB-A

THE EXPERTS IN ROOM AIR CONDITIONING

95261402_06

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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.

Due to continuing research in new energy-saving technology, all information in this manual is subject to change without notice.

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.

All safety messages will follow the safety alert symbol with the word "WARNING"

or "CAUTION". These words mean:

⚠WARNING 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.

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.

NOTICE Indicates property damage can occur if 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

Important Safety Information

CAUTION

DO NOT OPERATE EQUIPMENT DURING ACTIVE STAGES OF CONSTRUCTION

To ensure proper operation, Friedrich requires that all equipment is not operated during active construction phases. This includes active stages of completing framing, drywalling, spackling, sanding, painting, flooring, and moulding in the equipment's designated conditioning space. The use of this equipment during construction could result in premature failure of the components and/or system and is in violation of our standard warranty guidelines. The operation of newly installed equipment during construction will accelerate the commencement and/or termination of the warranty period.

⚠ WARNING

Please read this manual thoroughly prior to equipment installation or operation. It is the installer's responsibility to properly apply and install the equipment. Installation must be in conformance with the NFPA 70-2008 National Electric Code or current edition, International Mechanic code 2009 or current edition and any other applicable local
or national codes.

⚠ 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 R22 gauge sets. Failure to do so can result in property damage, personal injury, or death.

⚠ 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.

Your safety and the safety of others are 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 the safety Alert symbol.

This symbol alerts you to potential hazards that can kill or hurt you and others.
All safety messages will follow the safety alert symbol with the word "WARNING" or "CAUTION".

These words mean:

⚠ WARNING

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

NOTICE

Indicates property damage can occur if instructions are not followed.

INTRODUCTION

Personal Injury Or Death Hazards

	⚠ WARNING	⚠ AVERTISSEMENT	⚠ ADVERTENCIA
SAFETY FIRST	Do not remove, disable or bypass this unit's safety devices. Doing so may cause fire, Doing so may cause fire, injuries, or death.	Ne pas supprime, 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.

⚠ WARNING
ALWAYS USE INDUSTRY STANDARD PERSONAL PROTECTIVE EQUIPMENT (PPE)

ELECTRICAL HAZARDS:

- Shutdown 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. Wait a few minutes after shutdown to allow the capacitors to discharge the stored energy.
- 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 turned 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.
- Ensure the unit that the unit is properly grounded.
- Follow all safety precautions and use approved protective safety equipment such as: gloves, goggles, and clothing. Ensure that properly insulated tools, and testing equipment are used as well to protect against equipment damage and reduce the risk of injury.
- Failure to follow proper safety procedures and these warnings can result in serious injury or possibly death.

INTRODUCTION

Model and Serial Identification Guide

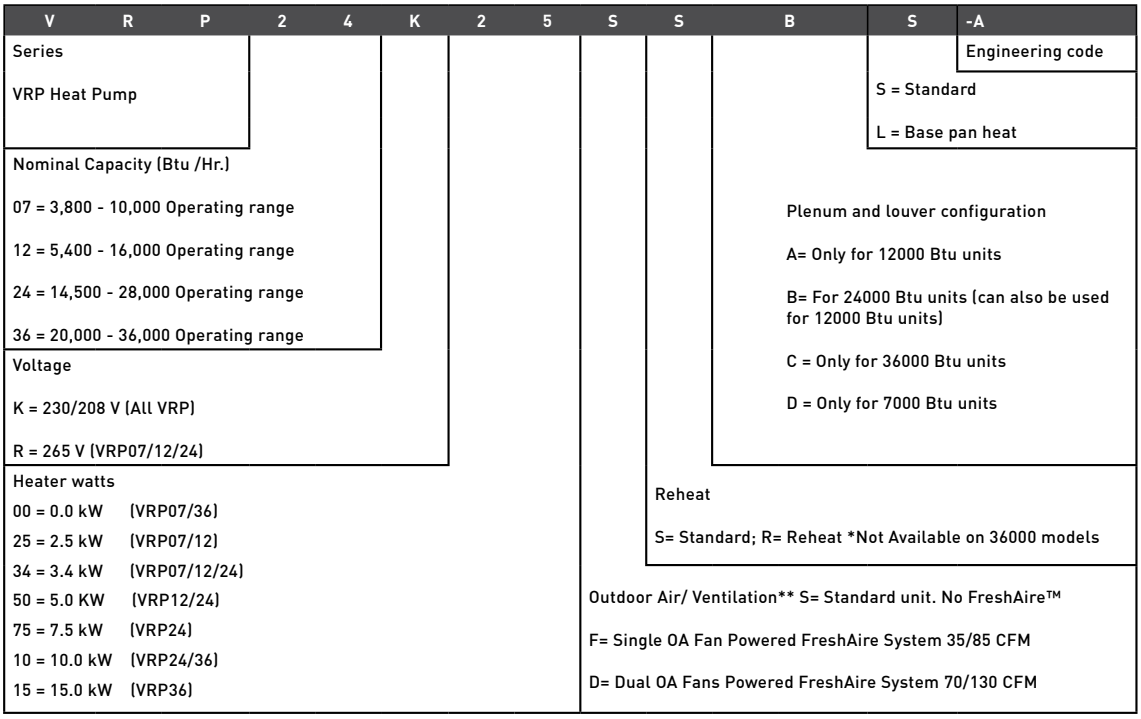


Figure 101 (Model Identification Guide for Models Produced in 2022 and Prior)

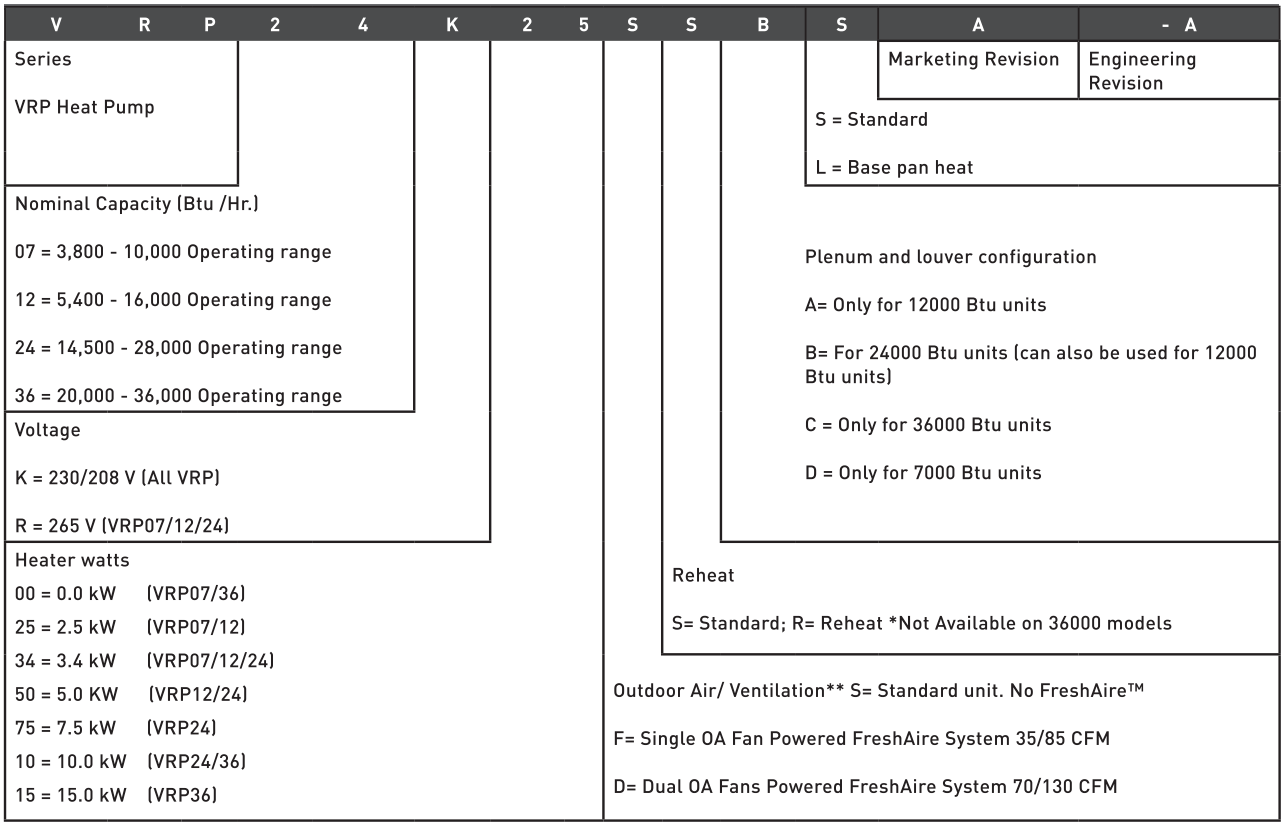


Figure 102 (Model Identification Guide for Models Produced in 2023 and Beyond)

INTRODUCTION

Model and Serial Number Identification Guides

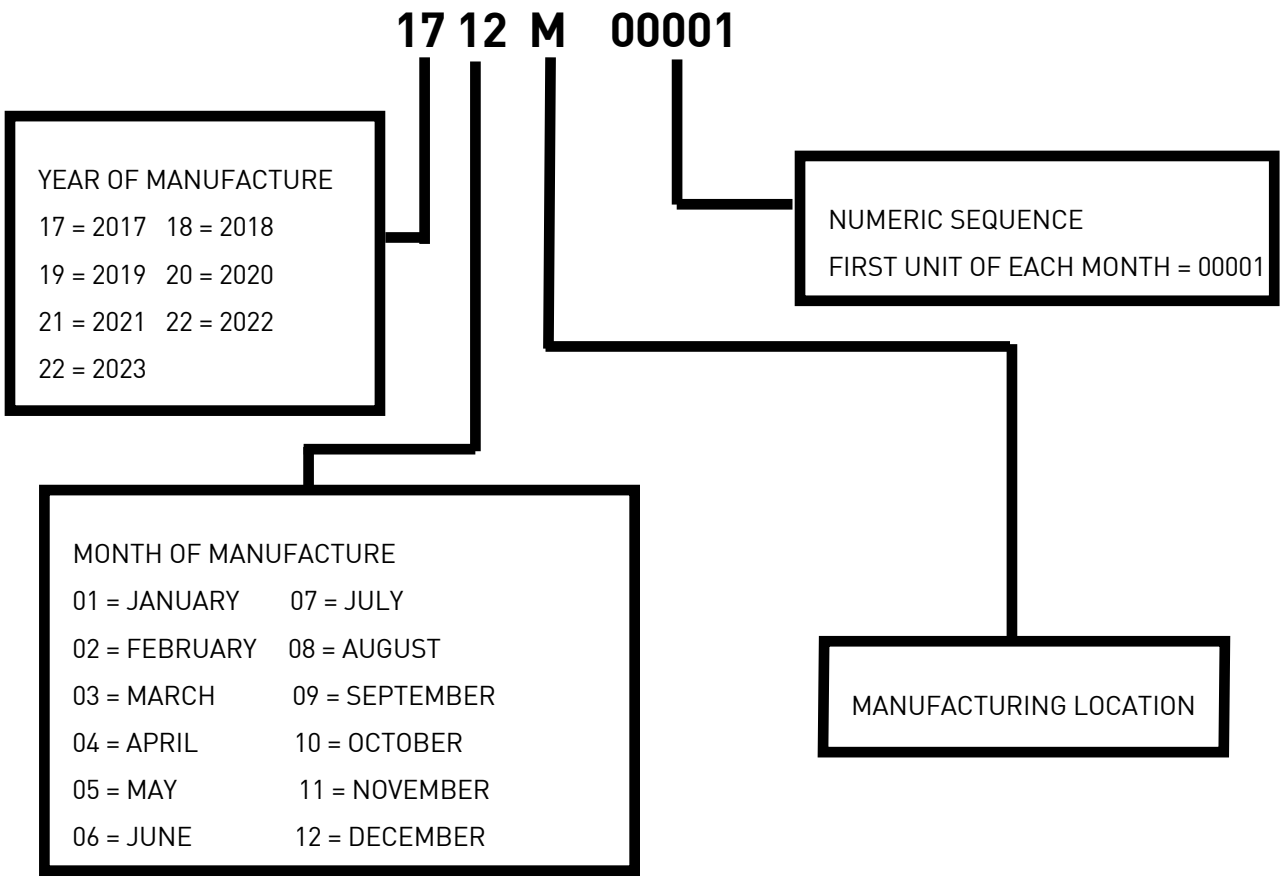


Figure 102 (Serial Number Identification)

INTRODUCTION

The Friedrich VRP® is a variable capacity system that utilizes Precision Inverter® technology to provide optimal space conditions.

While each VRP unit has a nominal capacity of 7,000, 12,000, 24,000, OR 36,000 Btus, every unit has the ability to adjust Btu output based on the actual room load. This equates to:

- Greater in-room dehumidification from longer compressor run time
- Lower energy costs by consuming less power
- Greater occupant comfort due to smaller swings in room temperature and humidity

The VRP accomplishes this by constantly monitoring various system and environmental inputs to vary the output of the unit.

The ability to vary compressor and blower speeds and the use of reheat coil enables the VRP to provide optimal comfort. With up to 20.0 SEER and 10.0 HSPF, the VRP provides a highly efficient solution. Further, the Precision Inverter technology allows the heat pump to operate at ambient conditions as low as 0˚F reducing the use of strip heat. This results in significant savings in operational costs.

An optional integrated FreshAire™ system delivers up to 35 CFM of conditioned fresh air into the space. The fresh air is filtered through a MERV 8 filter per ASHRAE 62.1-2013, and is then conditioned through the unit's primary DX coils backed by a reheat coil that augments the unit's dehumidification capability. This integrated fresh air solution provides the ability to potentially downsize or eliminate additional make up air and humidity control equipment.

Friedrich's wall controller is the main interface between conditioned space and the unit. The controller has seven back-lit segment displays that indicate the system mode (cool, heat, fan only), fan speed (low, high or auto), set point (°F or °C) or alternatively room temperature (°F or °C).

The controller has an integrated temperature and humidity sensor that sends room status to the main control unit (MCU) to determine operating modes and speeds of various components.

The unitary packaged design means easier installation or replacement. Because the VRP is a packaged unit, it is installed as a completely assembled refrigeration system. Unlike VRF or chilled water systems that require on-site wiring, piping and sealing of individual components, VRP units are assembled, charged and run tested under strict quality control guidelines in Friedrich's North American factory. Additionally, there is no need to locate the cooling tower or condensing units on the ground or rooftops where green spaces can exist instead.

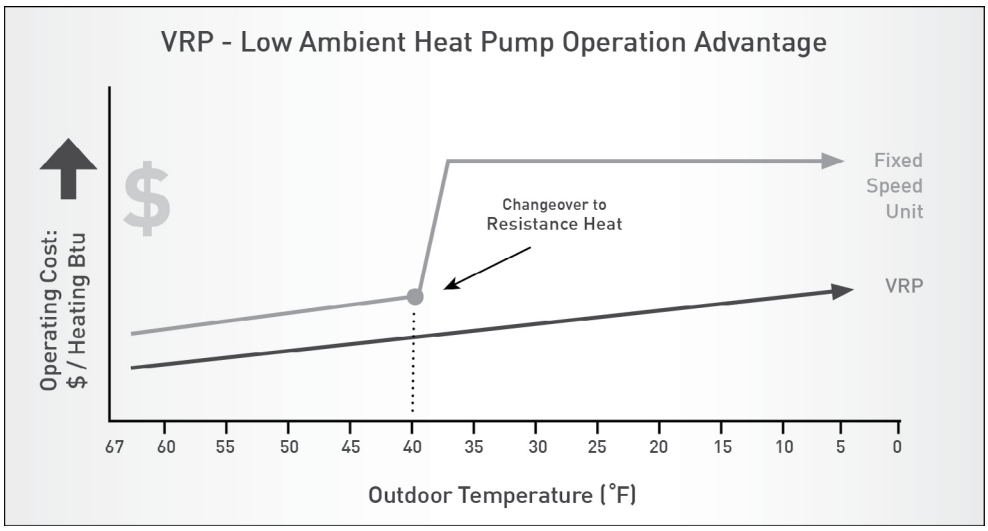
In sum, The Friedrich VRP offers a significant value to all parties involved in the design and construction of a new building.

Because of the simpler and more straightforward nature of the packaged design, and the ability to potentially downsize or eliminate additional make up air and humidity control equipment, the VRP reduces much of the headache and complexity facing the design engineer. Because the VRP is easy to install, with no complicated floor-to-floor piping and wiring involved, the contractor can be confident of a high-quality installation and get on and off the job more quickly. And finally, the owner gets the efficiency and performance of larger, more complex and costly equipment, with a lower overall installed cost; and he/she virtually eliminates the potential safety and service issues associated with systems that rely on thousands of feet of refrigerant or water piping running throughout the building, including occupied spaces.

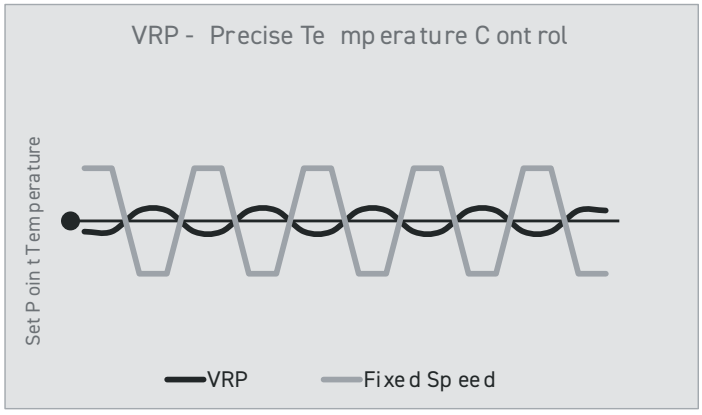
INTRODUCTION

VRP® Variable Speed System vs. Fixed-speed System

Low Ambient Heat Pump Performance: Variable speed technology enables VRP units to supply continuous hot air in heat pump mode even at low outdoor ambient temperatures. This reduces strip heat usage resulting in exceptional savings with VRP units when compared with traditional fixed-speed units which need to switch to strip heat at much higher ambient temperatures.



Precise Temperature & Humidity Control: VRP units not only help keep the air at the preferred temperature, but can more effectively remove moisture from the air. VRP units run longer cycles at lower pressures, helping to cool the air more evenly. The combination of variable speed compressor & blower motor and reheat coil in VRP units provide optimal comfort to the occupants. On the other hand, traditional fixed-speed systems tend to cool the air too fast without proper moisture removal increasing the risk of mold and other airborne problems.



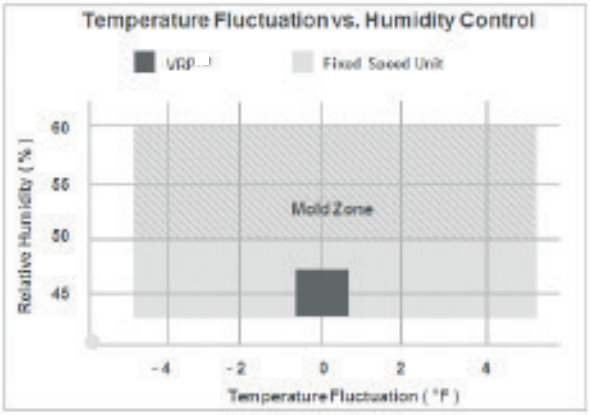


Figure 103

INTRODUCTION

FreshAire™ Conditioned Fresh Air

FreshAire, is a dedicated fresh air system that brings in up t o 35 CFM of outdoor air in to the VRP® unit. The FreshAire system uses one fan to bring in fresh outside air into the the unit. The outdoor air passes through dedicated 6"x 6"x1" MERV 8 filter that are easily replaceable from the front of the unit. This outdoor air is mixed with the return air inside the unit prior to the main evaporator coils, reheat coil and heater. Because of the variable speed of both the compressor and evaporator fan, the VRP can increase or decrease the unit's capacity to cool, heat or dehumidify the total supply air. The system uses a proprietary algorithm to measure the dew point of the leaving air. As the system nears the room set point, the system will throttle back both the compressor and the supply air volume in order to maximize the dwell time on the indoor coil to maximize dehumidification. (Single speed systems cycle on and off, providing less dehumidification capacity and run time as well as encounter condensate re-evaporation when cycled off.)

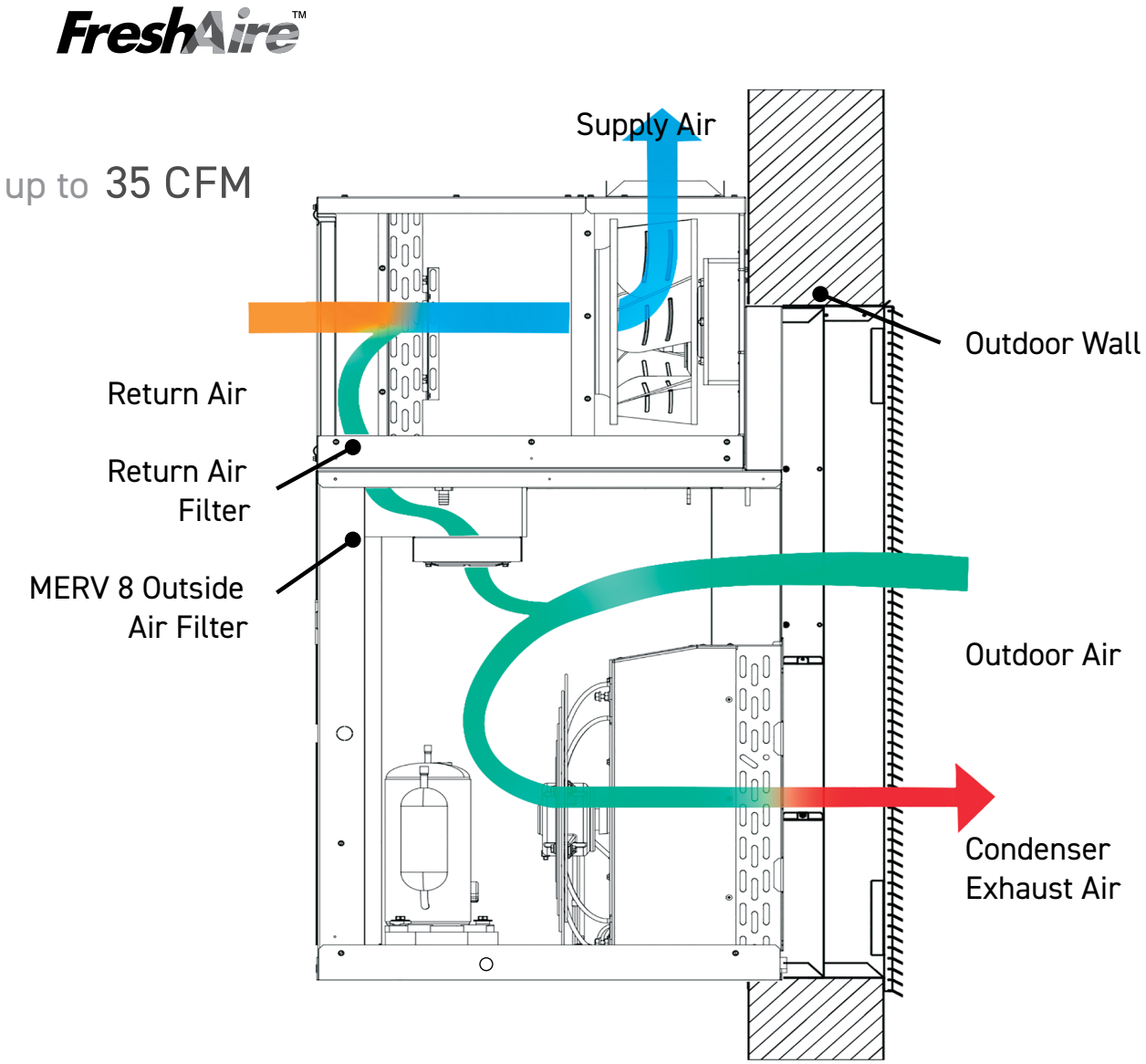


Figure 104

INTRODUCTION

Reheat Coil - Augments VRP's Dehumidification Capability

Temperature differences are not the only source of discomfort in a living space. Humidity also plays a big role — especially in climates that tend to be both hot and humid. The air conditioning industry's focus on humidity issues has elevated the importance of dehumidification. Air conditioning units operate in environments with varying indoor humidity levels. Therefore, the system should be able to adequately respond to the humidity changes by removing sufficient amounts of moisture in order to keep the conditioned space within the comfort zone.

Anytime the compressor is running in air conditioning mode, it will also be pulling humidity out of the space. Fixed-speed systems shut off after the desired set temperature is reached (i.e. when the sensible load is met). VRP® units run much longer at lower capacity and energy consumption than traditional systems. Humidity levels are reduced to more comfortable levels. The dehumidification capability of VRP units is enhanced through the use of a reheat coil that provides superior flexibility in satisfying a wide range of latent and sensible capacity demands. The reheat coil is placed behind the evaporator coil.

At relatively high ambient temperatures, both sensible and latent components of the system capacity are required to satisfy increased cooling and dehumidification demands. The VRP wall controller and other sensors in the unit combine to continuously monitor the space RH levels and when there is demand for extra dehumidification, the refrigerant exiting the condenser is rerouted to the reheat coil located behind the evaporator on the way to the indoor air stream supplied to the conditioned space.

Thus, cooled and dehumidified air exiting the evaporator coil is reheated to desirable comfort levels for the space.

SPECIFICATIONS

Performance A Model (2022 and Prior)

Model	**VRP7K / VRP7R**	
Cooling Performance Data (Cooling Standards: 95°F DB/75°F WB outdoor, 80°F DB/67°F WB indoor)		
Voltage	230/208	265
Cooling Btu (Rated)	7,000	
Cooling Btu (Min. – Max)	3,800-10,000	
Outdoor Operating Range (°F)	55 – 115	
Power (W)	636	
SEER	15.5	
EER	11.0	
Sensible Heat Ratio	0.77	
Cooling Amps	3.2	
Heat Pump Performance Data		
Heating Btu (Rated @ 47° F)	7,000	
Heating Btu (Rated @ 17° F)	3500	
Heat Pump Outdoor Operating Range (°F)*	0 – 70	
HSPF	8.6	
Heating Power (W)	621	
Heating Amps	3.2	3.2

Figure 201

SPECIFICATIONS

Model	VRP7K / VRP7R	
Cooling Performance Data (Cooling Standards: 95°F DB/75°F WB outdoor, 80°F DB/67°F WB indoor)		
Voltage	230/208	265
Cooling Btu (Rated)	7,000	
Cooling Btu (Min. – Max)	3,800-10,000	
Outdoor Operating Range (°F)	55 – 115	
Power (W)	636	
EER	11.0	
IEER	19.1	
Sensible Heat Ratio	0.77	
Cooling Amps	3.2	
Heat Pump Performance Data		
Heating Btu (Rated @ 47° F)	7,000	
Heating Btu (Rated @ 17° F)	3500	
Heating Btu (Min.-Max)	2,800-9000	
Heat Pump Outdoor Operating Range (°F)*	0 – 70	
COP (Rated @ 47°F)	3.3	
Heating Power (W)	621	
Ratings standard	AHRI 390	

Figure 202.1 (Performance A-A, A-B,

Model	VRP7K / VRP7R	
Cooling Performance Data (Cooling Standards: 95°F DB/75°F WB outdoor, 80°F DB/67°F WB indoor)		
Voltage	230/208	265
Cooling Btu (Rated)	7,000	
Cooling Btu (Min. – Max)	3,800-10,000	
Outdoor Operating Range (°F)	55 – 115	
Power (W)	673	
SEER2	15.2	
EER2	10.4	
Sensible Heat Ratio	0.77	
Cooling Amps	3.5	
Heat Pump Performance Data		
Heating Btu (Rated @ 47° F)	7,000	
Heating Btu (Rated @ 17° F)	3500	
Heating Btu (Min.-Max)	2,800-9000	
Heat Pump Outdoor Operating Range (°F)*	0 – 70	
COP	3.1	
HSPF2	7.2	
Heating Power (W)	662	
Heat Pump Amps	3.5	

Figure 202.2 (Performance B-A Models (2024)

SPECIFICATIONS

7k Performance Curves

Rounded Extended Performance Chart															
		70 °F WB			75 °F WB			80 °F WB			85 °F WB			90 °F WB		
		60 °F WB			63 °F WB			67 °F WB			71 °F WB			73 °F WB		
Outdoor Temperature Dry (°F)	(°F) DB	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)
	65	7790	450	2.3	8505	450	2.3	9220	450	2.3	9935	450	2.3	10655	455	2.3
	70	7480	475	2.4	8170	475	2.4	8850	480	2.4	9530	480	2.4	10220	480	2.4
	75	7175	505	2.6	7830	505	2.6	8480	510	2.6	9130	510	2.6	9785	510	2.6
	80	6870	540	2.6	7490	545	2.7	8110	545	2.7	8730	545	2.7	9350	550	2.7
	85	6565	570	2.8	7155	570	2.9	7740	575	2.9	8330	575	2.9	8915	580	2.9
	90	6250	595	3	6815	600	3	7370	605	3	7930	610	3	8490	610	3
	95	5940	625	3.2	6470	630	3.2	7000	635	3.2	7530	640	3.3	8060	640	3.3
	100	5620	655	3.3	6125	660	3.3	6630	665	3.4	7135	670	3.4	7640	675	3.4
	105	5305	685	3.4	5785	695	3.5	6260	700	3.5	6735	705	3.6	7215	710	3.6
	110	4990	715	3.5	5440	725	3.6	5890	730	3.7	6340	740	3.7	6790	745	3.8
	115	4675	745	3.7	5095	750	3.8	5520	760	3.8	5940	765	3.9	6365	775	3.9

Figure 203

Heating Rounded Version										
		60 °F WB			70 °F WB			80 °F WB		
Outdoor Temperature Dry (°F)	(°F) DB	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)
	17	3740	470	2.4	3500	500	2.6	3245	525	2.7
	25	5080	500	2.5	4435	530	2.7	4125	565	2.8
	35	5990	535	2.7	5600	570	2.9	5210	610	3
	47	7470	585	2.9	7000	620	3.1	6510	665	3.2
	55	8470	615	2.9	7935	655	3.2	7370	700	3.3
	62	9370	640	3.1	8750	685	3.4	8120	730	3.5

Figure 204

SPECIFICATIONS

Air Flow Data

Indoor CFM & External Static Pressure

Air Flow Data							
Model	Speed Select	Airflow Setting	Static Pressure (in. WC)				
			0.00	0.05	0.10	0.15	0.20
VRP07K/R*	1	High	380	360	340	310	280
		Low	330	305	285	255	230
	2	High	380	360	340	310	280
		Low	350	320	300	270	230
	3	High	380	360	340	310	280
		Low	365	335	310	280	230
	4	High	380	360	340	310	280
		Low	375	345	320	290	265
	5	High	380	360	340	310	280
		Low	380	360	340	310	280

* Rated to 0.1" ESP High and includes factory provided filter

Figure 205

VRP Configurator*

All units are shipped with Speed Select 1 High as the default airflow. In higher static applications, it is necessary to increase the airflow to a higher Speed Select setting. Using the VRP Configurator tool and associated instructions, the speed settings can be changed on units with a firmware 3.7.0.0 or later.

*VRP Configurator will be available later in the year.

Condenser CFM & External Static Pressure

VRP® is designed to mount through an exterior wall through a Friedrich wall plenum with an external louver. Building de - sign and applications may require different configurations of this external connection for aesthetic/architectural reasons. These different configurations may include custom louvers, plenums or special ducted returns. The following are guidelines for the design of these custom external configurations.

Condenser External Static Pressure			
Model	Design		Maximum
	CFM	ESP ("WC)	ESP ("WC)
VRP07	550	0.02	0.08

CAUTION: If the Friedrich designed plenum and louver combinations are not used, the louver/duct design must be evaluated to insure the total pressure drop does not exceed the maximum allowable limits.

Sound Data

Sound Data				
Model	Sound Power (dBA)		Transmission Class	
	Indoor	Outdoor	STC	OITC
VRP07	61.1	63.6	22	14

NOTE: Testing performed by 3rd party lab. The above values representative of an installation of the unit into an exterior wall through a wall-sleeve without a finished closet. Vert-I-Pak is typically installed in a finished closet. Friedrich recommends that closet wall construction include finished walls on both the interior and exterior sides for optimal sound attenuation.

Figure 206

SPECIFICATIONS

Electrical Data

Model	Voltage	Electric Heater Watts	Electric Heating BTUs	Total Electric Heating Amps	ID Blower Amps	OD Blower Amps	MCA	MOP/ MOCP
VRP 7K	230	0	0	3.2	0.7	0.5	8.1	15
	208	0	0	3.2	0.7	0.5		
	230	2500	8530	11.5	0.7	0.5	14.4	15
	208	2045	6980	10.6	0.7	0.5		
	230	3400	11600	15.4	0.7	0.5	19.3	20
	208	2780	9460	14.1	0.7	0.5		
VRP7R	265	0	0	4.8	0.5	0.5	7.9	15
		2500	8530	9.9	0.5	0.5	12.5	15
		3400	9490	13.3	0.5	0.5	16.7	20

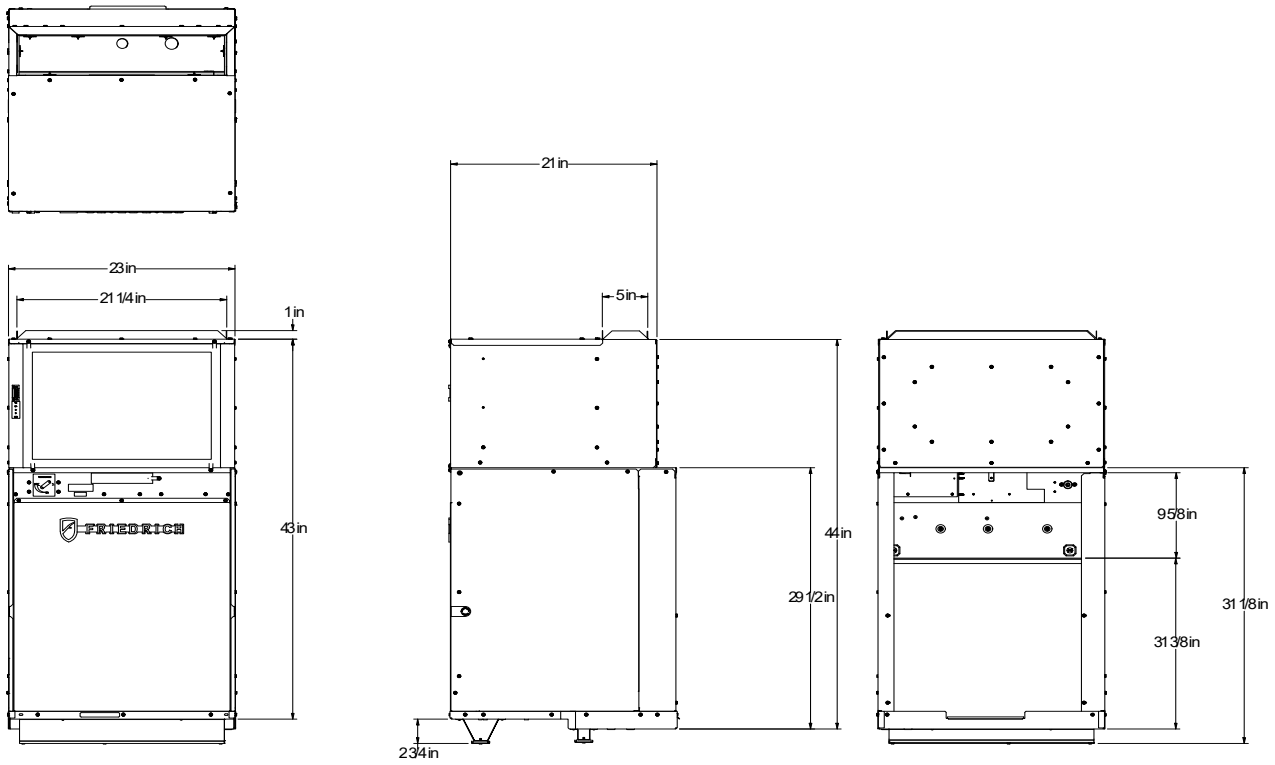
MCA= Minimum Circuit Ampacity

MOP/ MPOCP = Maximum Over current Protection / Breaker Size
Minimum Circuit Amps (MCA) and MOCP values in the above tables are calculated in accordance with NEC. Article 440

Figure 207

SPECIFICATIONS

7k Unit Installation Dimensional Data



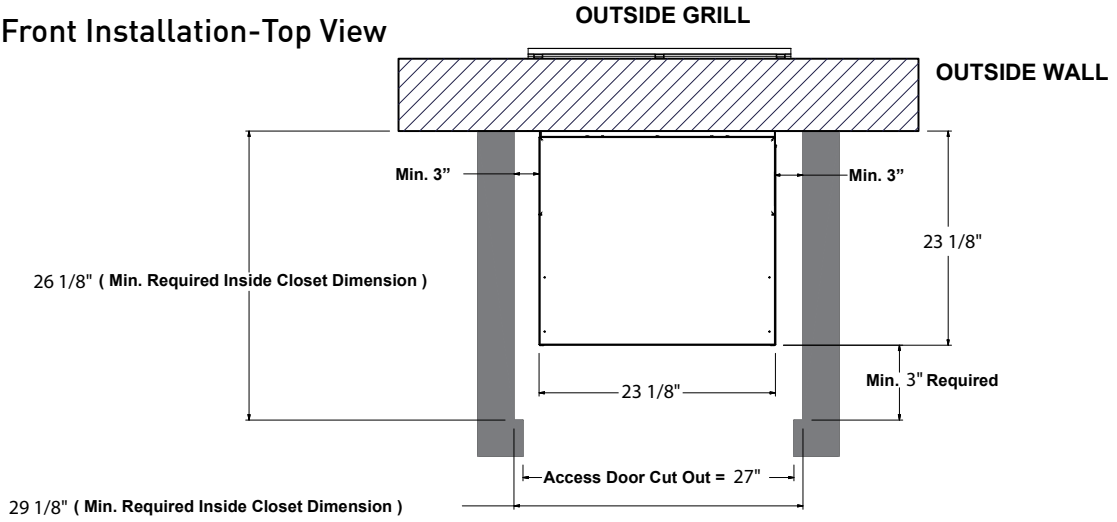
Model	VRP07	VRP07 With Reheat
Dimensions (W x D x H)	22 15/16" x 22 13/16" x 44 15/16"	
Shipping Dimensions (W x D x H)	25" x 25" x 48 1/4"	
Net Weight (lbs.)	161	
Shipping Weight (lbs.)	165	
R410A Charge (oz.)	31.0	33.0

Figure 208

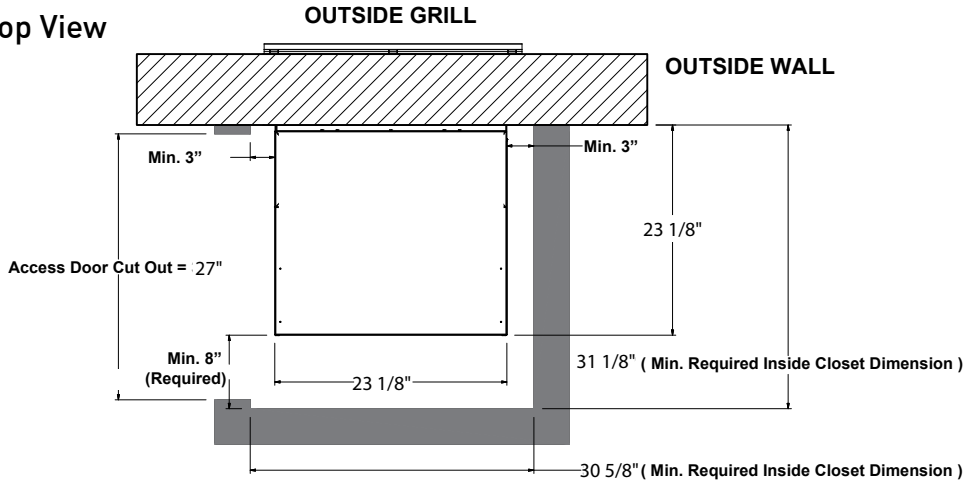
SPECIFICATIONS

7k Installation Types

Front Installation-Top View



Left Installation-Top View



Right Installation-Top View

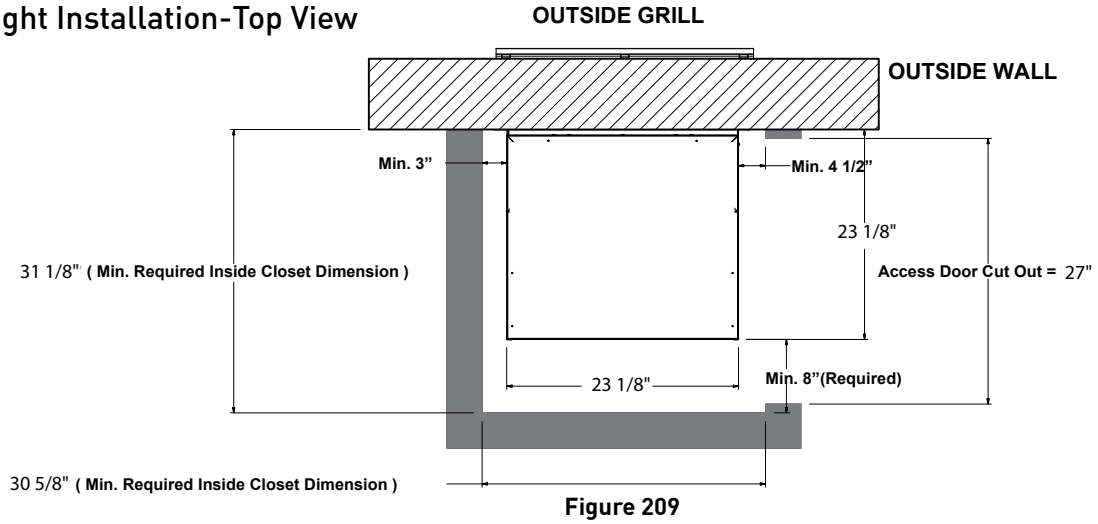


Figure 209

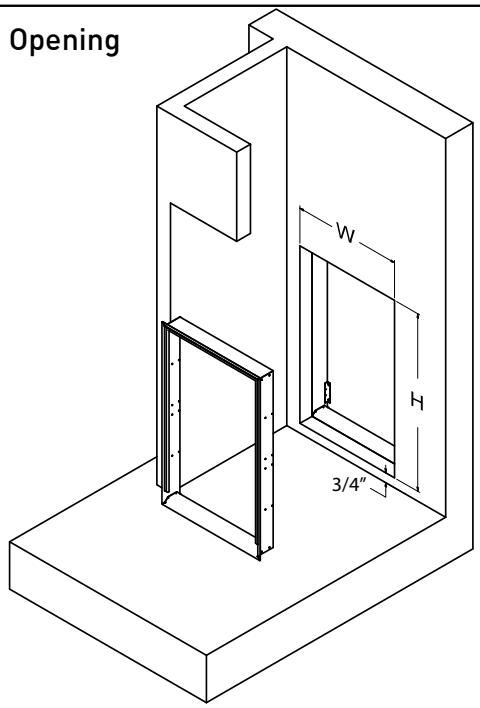
SPECIFICATIONS

7k Wall Opening Dimensions

EXTERIOR WALL OPENING DIMENSIONS		
Unit	W	H
07K	24 5/8"	30 7/8"

NOTE: The distance between the rough opening and the finished floor/platform must be 3/4"

Exterior Rough Opening



INTERIOR WALL OPENING DIMENSIONS		
Unit	W	H
07K	27"	55 3/4"

Interior (Access Door) Rough Opening

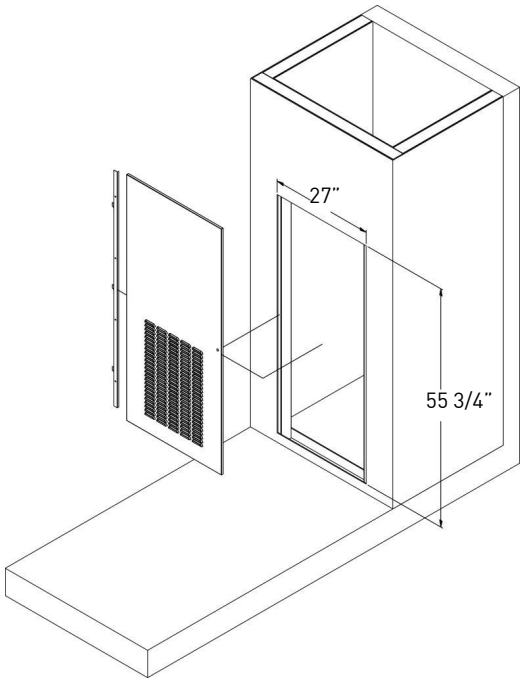
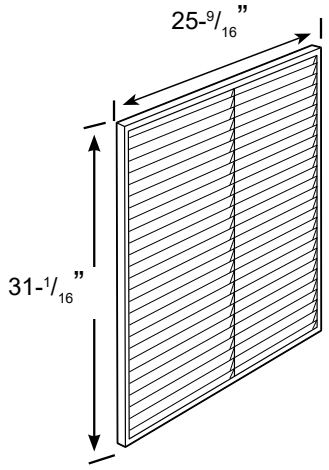


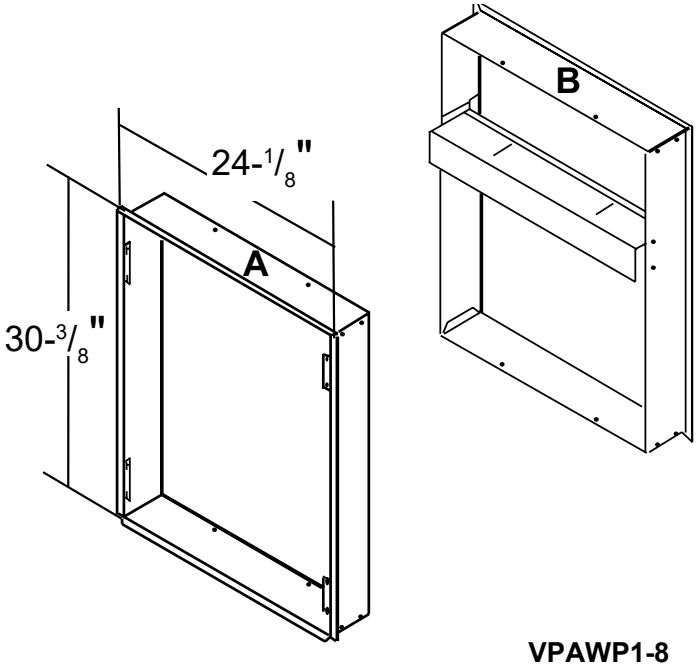
Figure 210

SPECIFICATIONS

7k Accessories Dimensional Data-Louvers & Wall-Plenums



Architectural Louver
VPAL2/VPSC2



Wall Plenum

VPAWP1-8 - telescopes from 4" to 8”
VPAWP1-14 - telescopes from 8” to 14”

Figure 211

OPERATION

Sequence Of Operations

Cooling Sequence:

The wall thermostat provides the temperature set point as well as the current dry bulb temperature and relative humidity. Upon a call for cooling, the compressor modulates based on the difference between room temperature and set point. As cooling demand decreases the compressor will modulate to a minimum speed. If the room temperature drops 2 °F below set point the compressor will cycle off.

Heating Sequence:

The wall thermostat provides the temperature set point as well as the current dry bulb temperature and relative humidity. Upon a call for heating, the compressor modulates based on the difference between room temperature and set point. As Heating demand decreases the compressor will modulate to a minimum speed. If the room temperature raises 2 °F above set point the compressor will cycle off.

Main Supply Fan Sequence:

Option 1: (ON/Continuous) The Supply fan runs continuously

Option 2: (Auto) The Supply fan cycles with the compressor.

Option 3: (Smart Fan) The Supply fan cycles with the compressor. The fan will modulate based on the difference between the space temperature and space set point.

IAQ Ventilation Fan Sequence:

Option 1: (ON) The fan(s) run when occupancy is sensed, and the indoor blower is running.

Option 2: (OFF) The OSA fan(s) do not run.

Hot Gas Reheat Coil Sequence:

Once the sensible load of the space is satisfied, and if the relative humidity of the space is above 55%, the hot gas reheat coil will be activated. The hot gas reheat coil will remain activated until the relative humidity drops below 50% or if the room temperature creeps too far away from set point.

Auxiliary Electric Heat Sequence:

Auxiliary Heat is activated on a sliding scale based on outdoor ambient temperature and the difference between set point and room temperature. During mild ambient conditions, the large difference between set point and actual room temperature is permitted. In extreme low temperatures a smaller difference between the two are permitted energizing the auxiliary heat sooner.

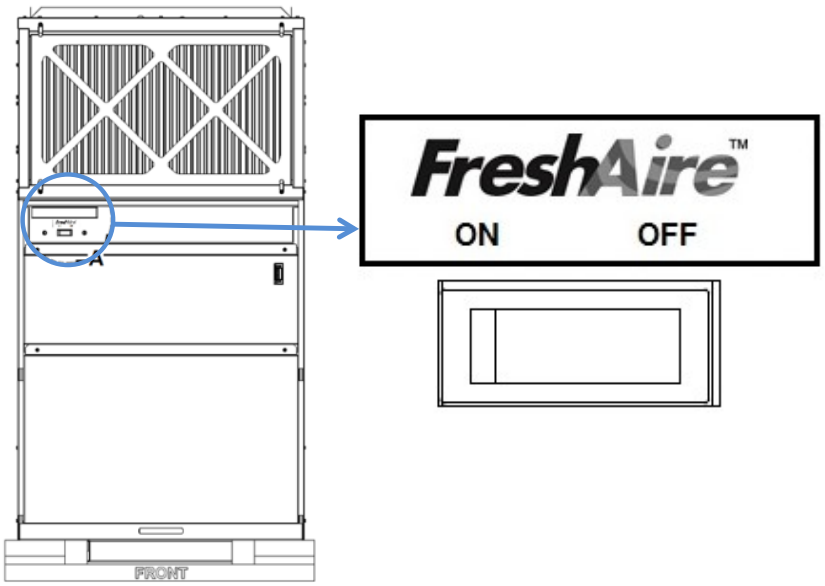
Defrost:

The electric heat for the VRP is to be considered “backup” and not “supplemental”. At no point in time will the pump and electric heat operate simultaneous. Normally, and in a vast majority of heating conditions, the heat pump will be the primary source of heat (down to 0°F). Eventually, the outdoor coil may accumulate frost and the unit will require a defrost cycle. If the space is still 1 **°**F or more below set point, the VRP will stop heat pump operation and satisfy the space with electric heat. Once the room is satisfied the VRP will operate the blower and condenser fans at their lowest speeds and run the compressor in the cooling cycle to defrost the outdoor coil. The blower fan operates to help prevent the indoor coil from freezing during this process. Once the outdoor coil rises above 46 degrees Fahrenheit, the defrost cycle will end and the unit will continue with normal operation based on the space conditions and settings.

OPERATION

FreshAire Control

- To engage the FreshAire system, flip the switch into the ‘ON’ position.



INSTALLATION

VRP Required Minimum Clearances

Building Exterior Unit Opening Requirements

VRP 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.

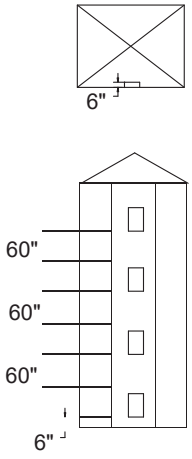


Figure A

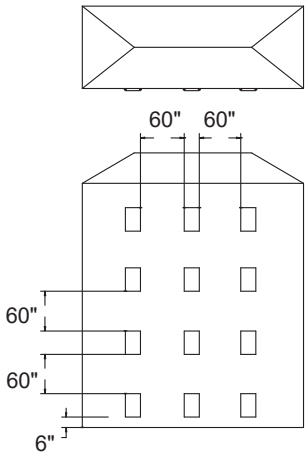


Figure B

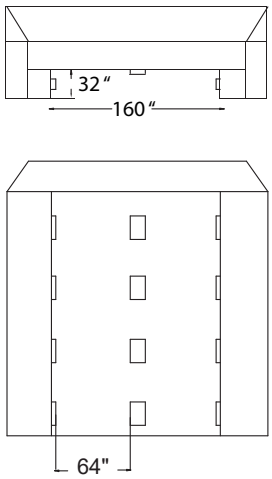


Figure C

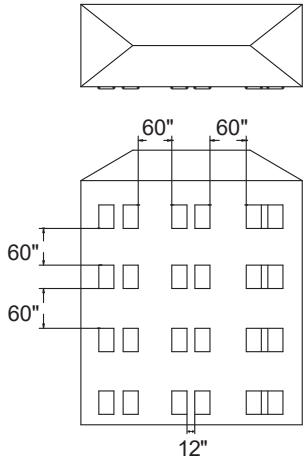


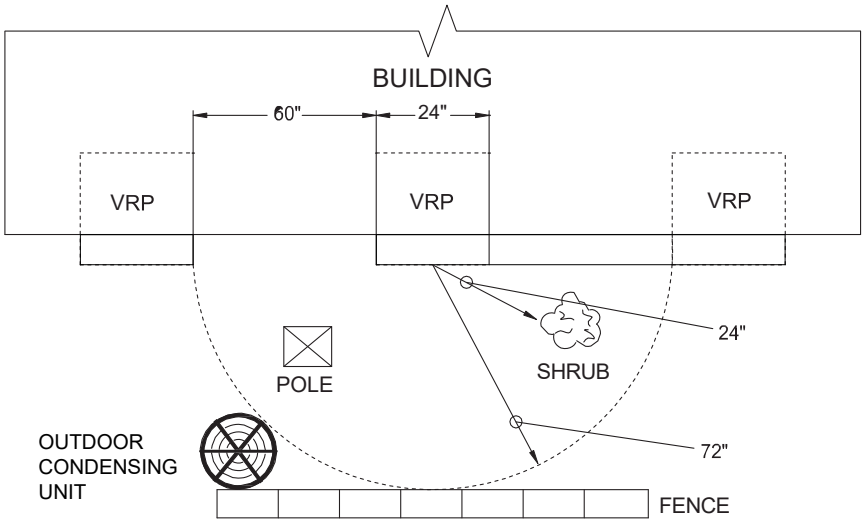
Figure D

Grill Clearance Requirements

Where obstructions are present use the following guidelines for proper spacing from the VRP 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.

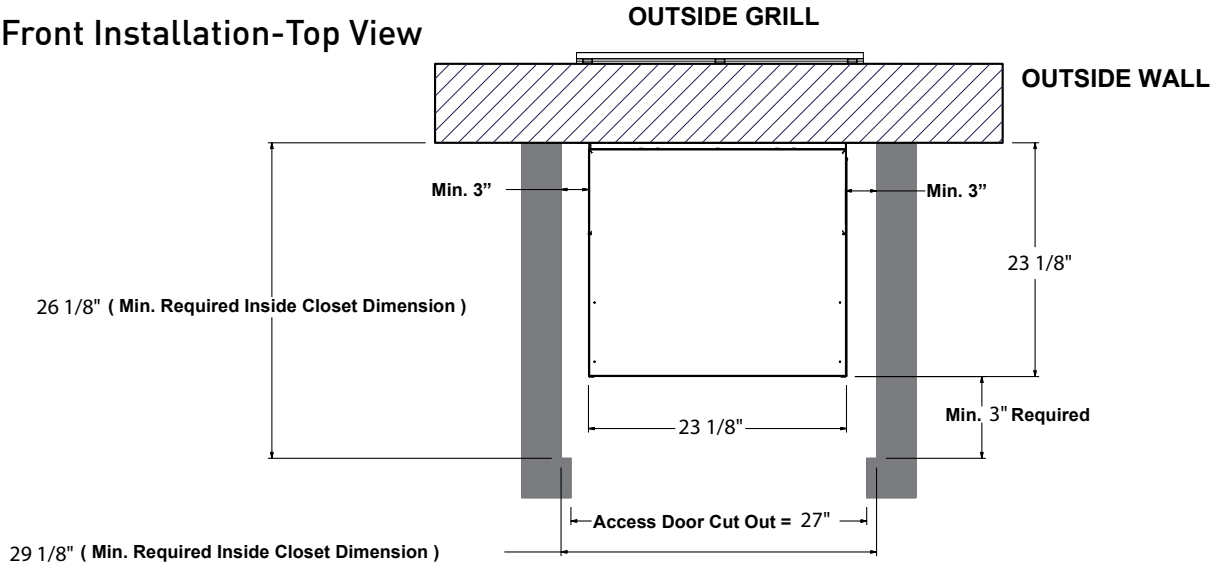


The the example pictured above is for reference only and does not represent all possible installations. Please contact Friedrich Air Conditioning for information regarding effects of other installation arrangements.

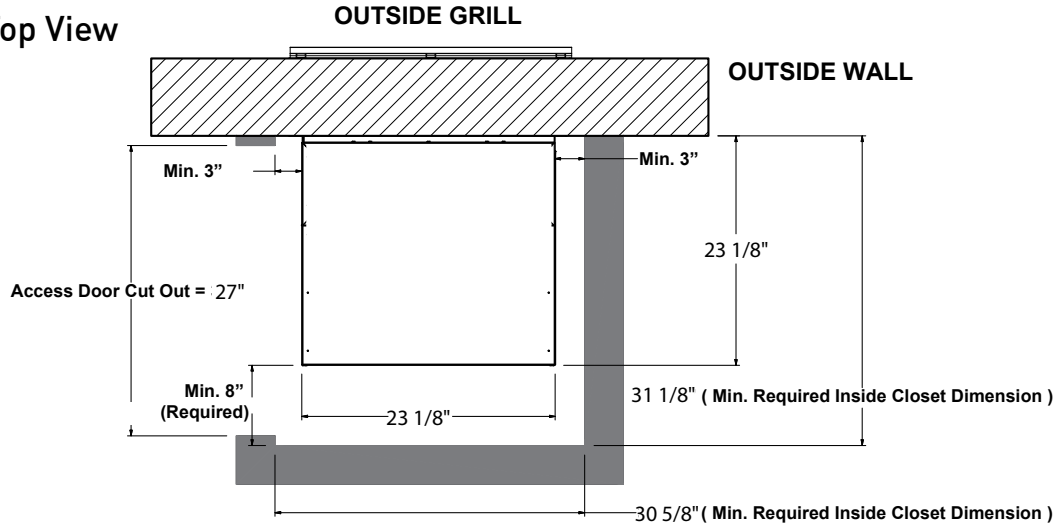
INSTALLATION

Installation Orientation

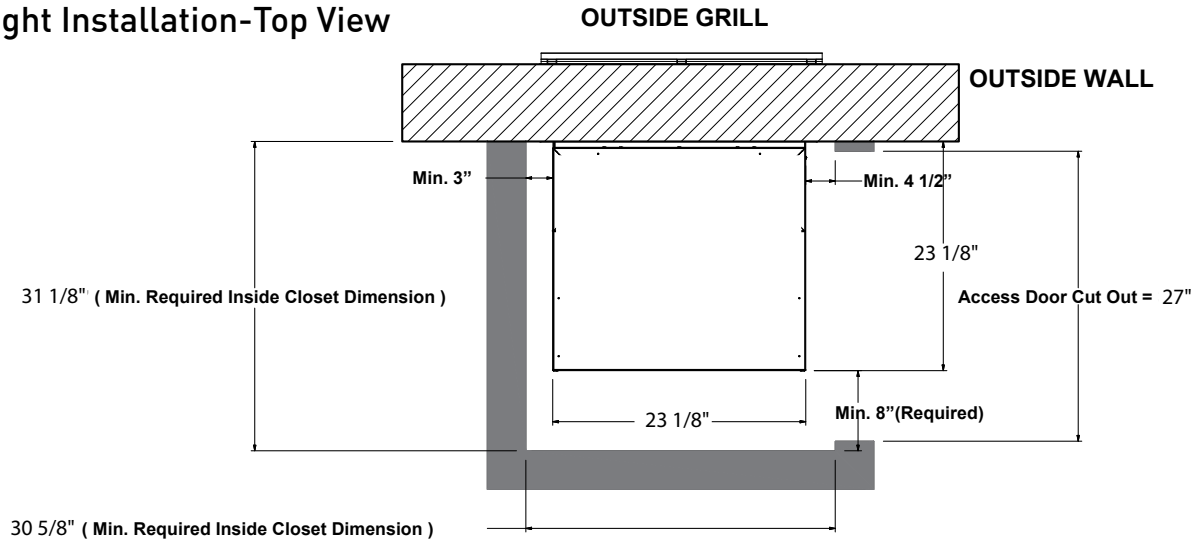
Front Installation-Top View



Left Installation-Top View



Right Installation-Top View

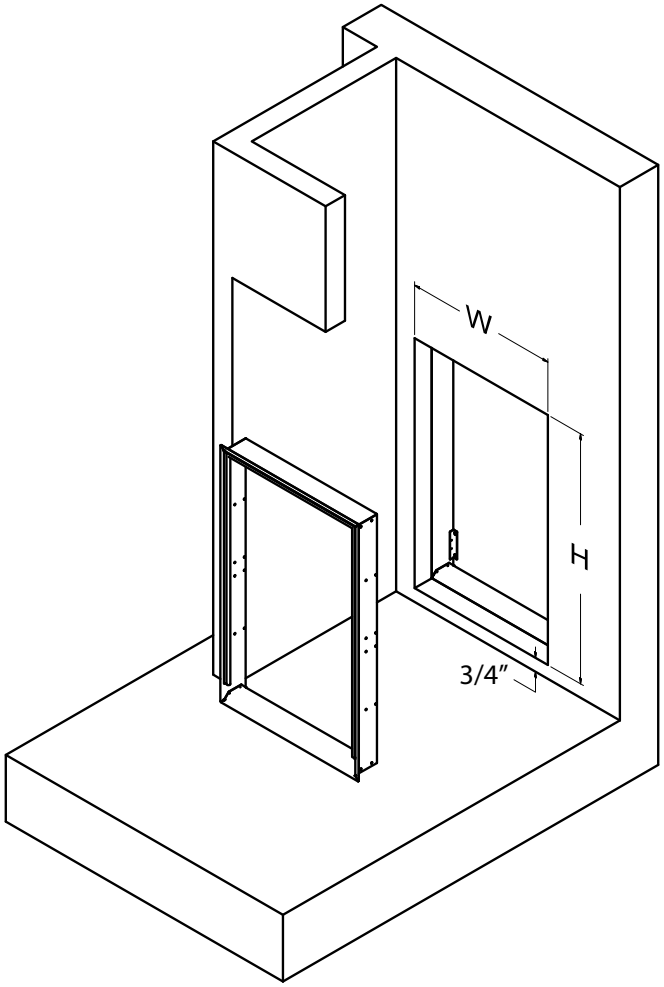


INSTALLATION

Exterior Wall Opening Dimensions

Exterior Wall Rough Opening Dimensions		
Unit	Width	Heigth
VPAWP1-*	24 5/8"	30 7/8"

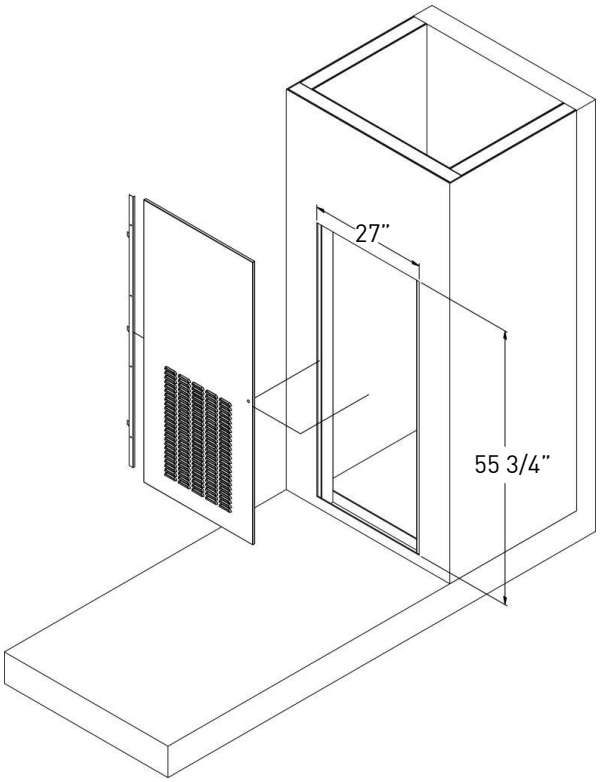
NOTE: The distance between the rough opening and the finished floor/platform must be 3/4”.



INSTALLATION

Interior(Closet) Wall Opening Dimensions

Return Air Access Door Wall Cut-Out



NOTE: To maintain ease of removal and serviceability, if the unit is installed on a platform ensure that the total height of the unit from the floor does not exceed the height of the interior rough opening.

INSTALLATION

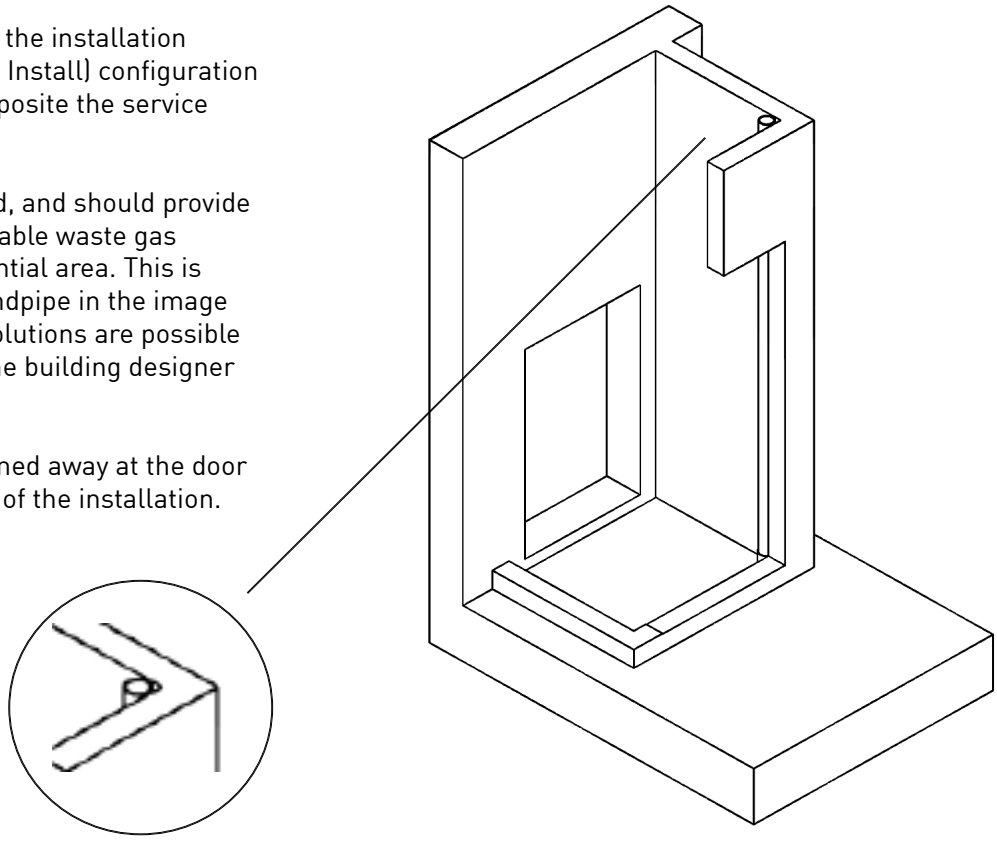
Preliminary Plumbing

Standard (Front Install)

The image to the right shows the installation closet for the standard (Front Install) configuration (where the wall plenum is opposite the service access door).

A drainage system is required, and should provide a "P-trap" to prevent undesirable waste gas from entering into the residential area. This is represented by a vertical standpipe in the image shown (Detail A), but other solutions are possible and are at the discretion of the building designer and contractor.

The near wall has been trimmed away at the door centerline to permit full view of the installation.



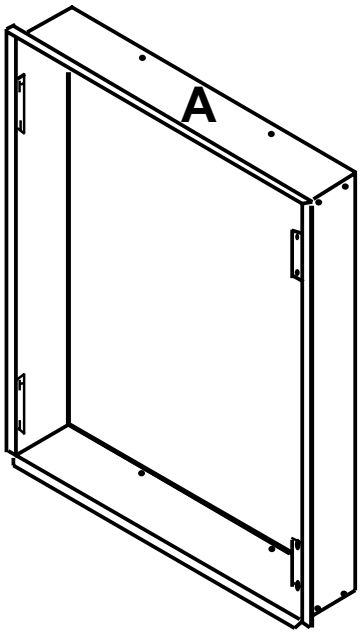
Detail A

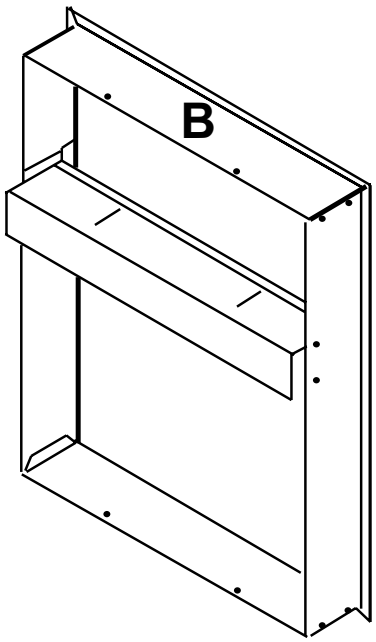
INSTALLATION

Wall Plenum Installation

Parts included in Plenum kit:

Outside Plenum Half (Part A)
Inside Plenum Half (Part B)





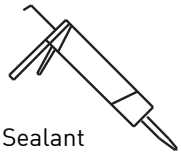
Field Supplied Parts:

Sealant, attachment screws, and flashing
are field supplied. Silicone sealant is recommended.

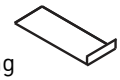
VPAWP1-8 adjusts for walls up to 4”- 8” thick.

VPAWP1-14 adjust for walls up to 8” - 14” thick

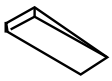
All installations are similar.



Sealant



Flashing



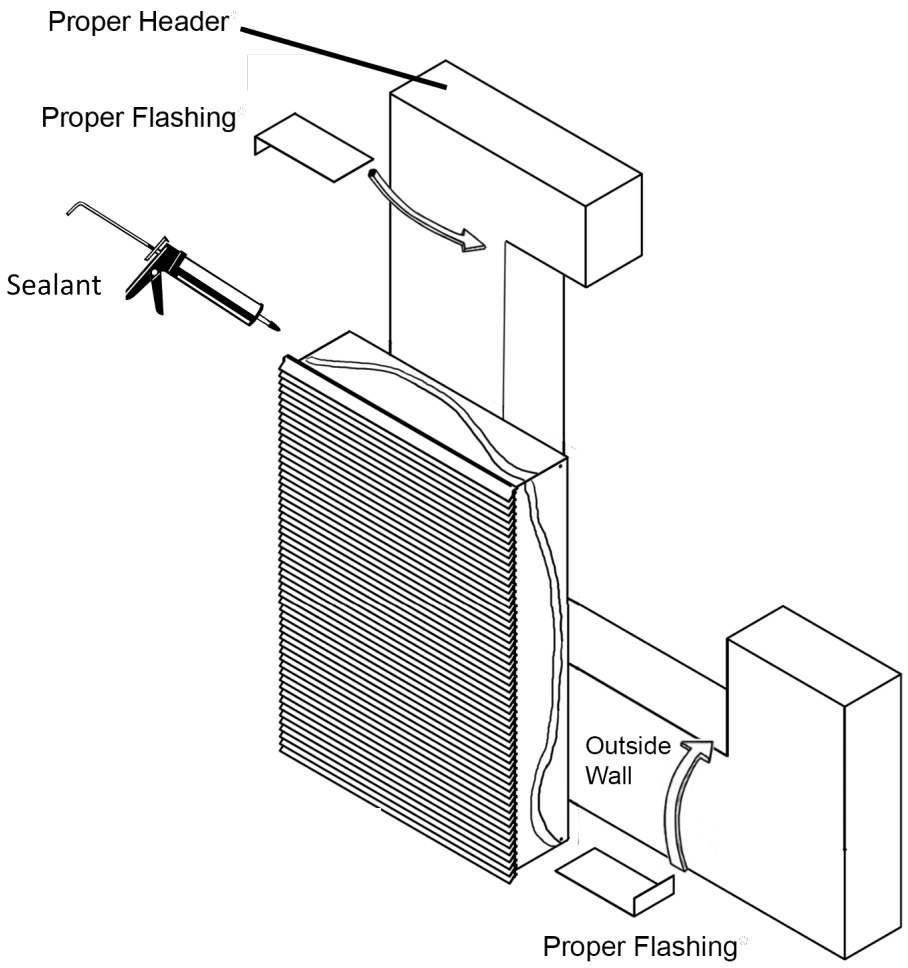
Shim

1”-3” Screws to attach the plenum assembly to the wall studs

INSTALLATION

Wall Plenum Installation

Step 1 - Outside Wall Plenum Half



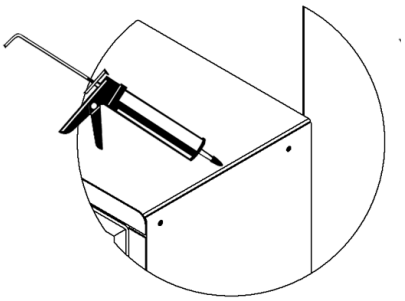
Note: The wall plenum is not designed to carry any structural load. A load bearing header must be built above the rough opening.

1) Prepare the rough opening. The rough opening should be lined with metal or wood. The plenum will warp if sealed against concrete or brick.
2) Dry fit the outside plenum half into the rough opening and check the fit and level.
3) Remove the outside plenum half, flash the rough opening to ensure proper fit and level.
4) Pre-installing the exterior louver (VPAL2) as shown above is optional (See Page 17).
5) Apply sealant to the outside plenum half and insert into the rough opening to ensure a water-tight seal. Ensure that the outside plenum half is securely attached to the framed opening.

INSTALLATION

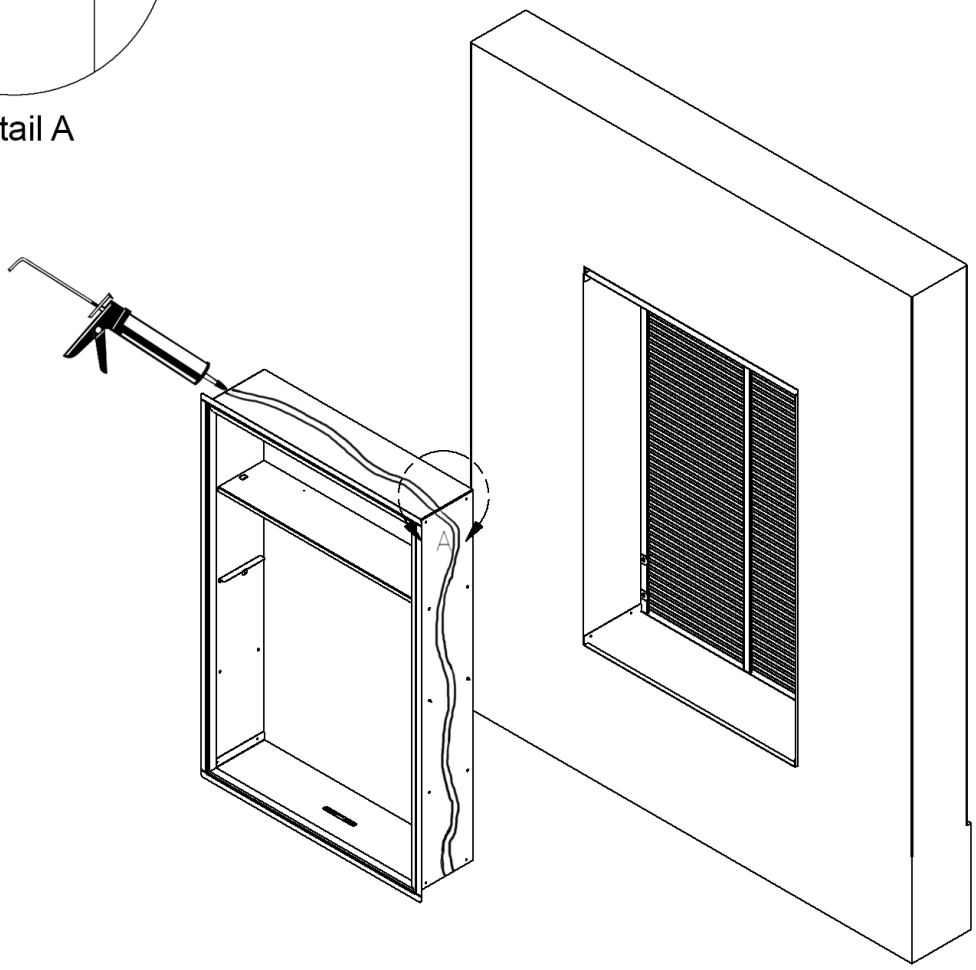
Wall Plenum Installation

Step 2 - Inside Wall Plenum Half



Apply Sealant to all
4 flange corners and
unused holes.

Detail A

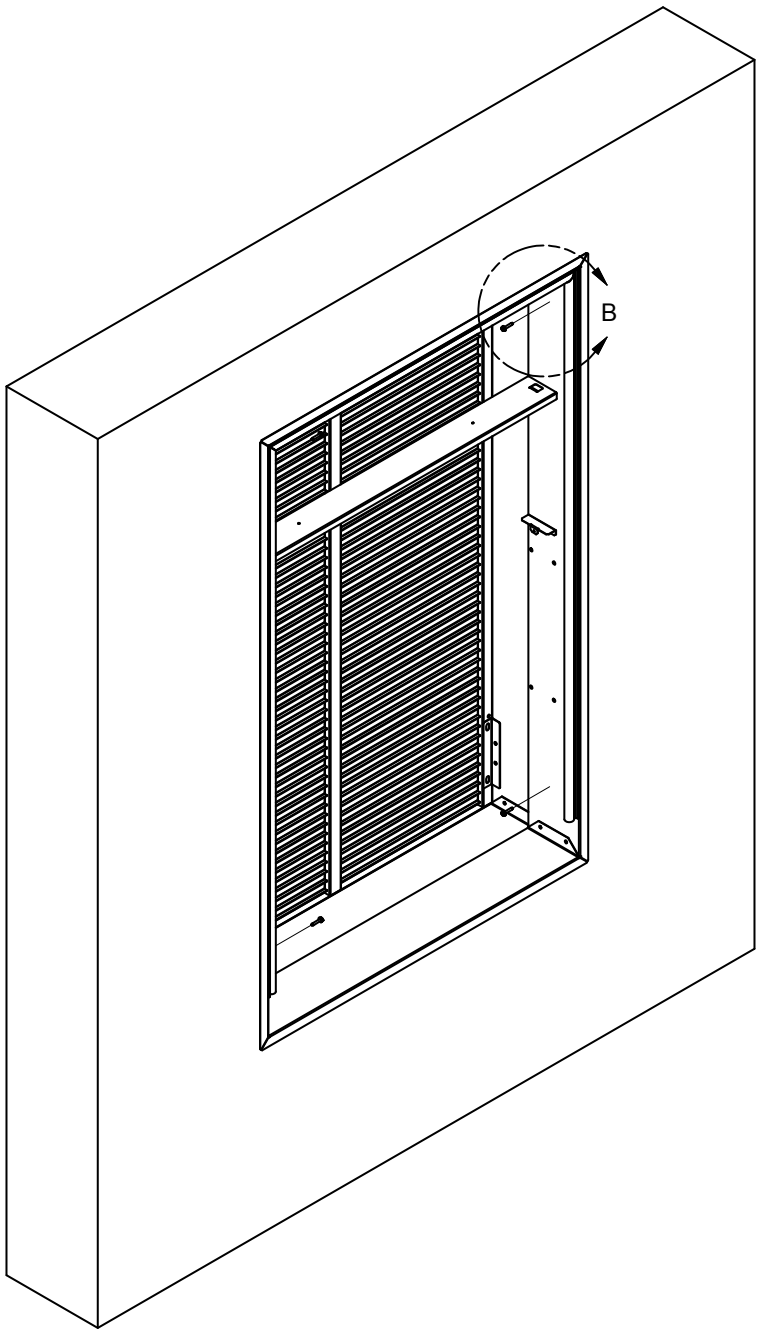


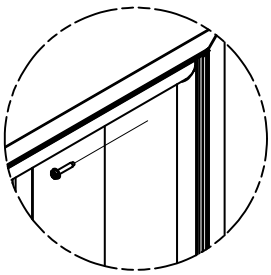
1) Apply sealant to all 4 flange corners and unused holes. See Detail A.
2) Flash the inside of the rough opening to ensure the proper fit and level.
3) Insert inside plenum half (Part B) into Outside Plenum Half (Part A). Ensure that Part A does not back out of the rough opening.
4) Remove the inside plenum half.
5) Apply sealant to the outside plenum half and insert into the rough opening to ensure a water-tight seal.

INSTALLATION

Wall Plenum Installation

Step 3 - Inside Wall Plenum (cont.)





Detail B

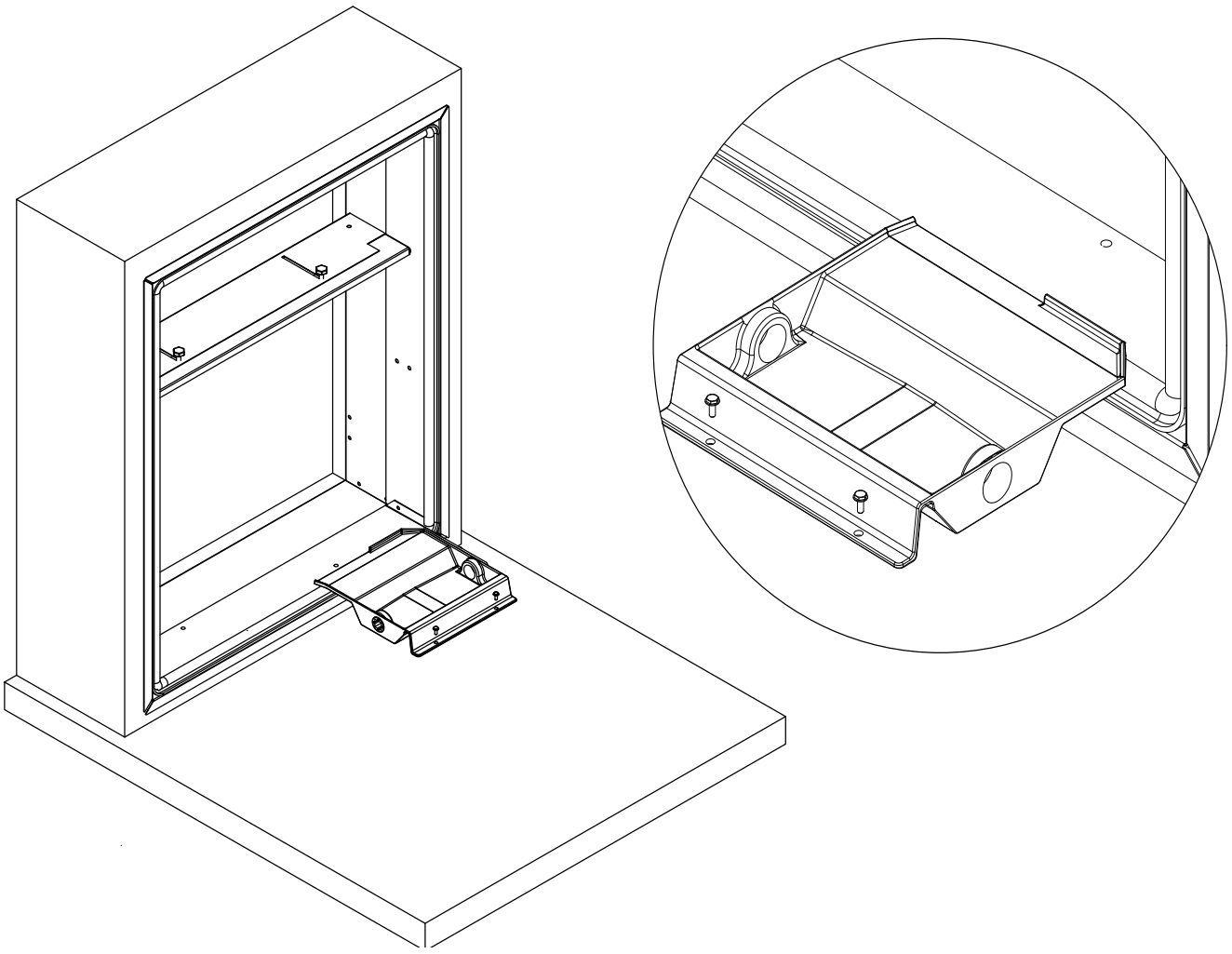
Note: Do not place any screws, fasteners, or penetrating holes through the top or bottom of the plenum assembly.

1) Drill pilot holes on the interior of the inside plenum half (Part B) as show in Detail B. Pilot holes should be located approximately 4" from the top and bottom of the inside plenum half, on both the left and right sides.

2) Install fasteners through each pilot hole. Fastener must pass through both Part A and Part B. If the inside and outside plenum halves do not overlap at fastening point, be certain to drill extra holes where needed to secure both Part A and Part B to the rough opening.

INSTALLATION

VPDP2 Drain Kit Installation



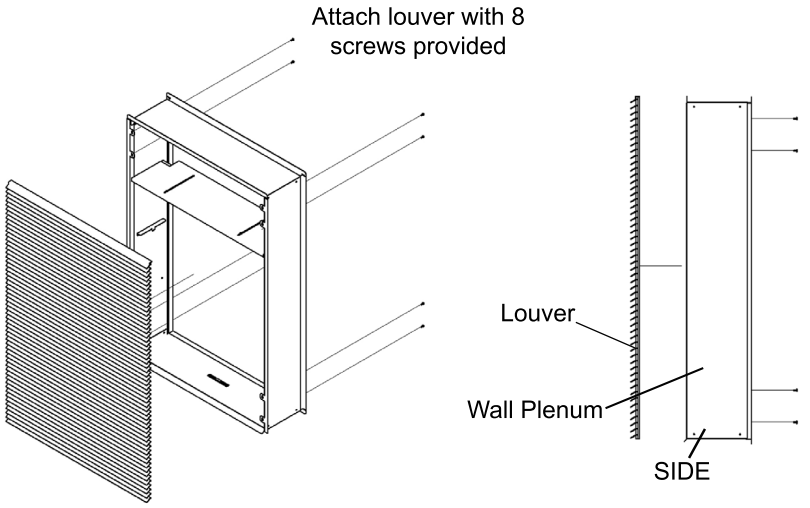
Note: VRP07 models require installation of the VPDP2 drain kit. Please reference the VPDP2 installation manual for more detailed instructions.

1) Cut away gasket from the of the base of the inside wall plenum half the length of the drain kit beginning from the bottom right corner.
2) Place the VPDP2 where the gasket has been removed as shown above.
3) Ensure that the back lip of the VPDP2 is inserted no deeper than 1.5" into the exterior opening.
4) Secure the VPDP2 to the finished floor or platform.

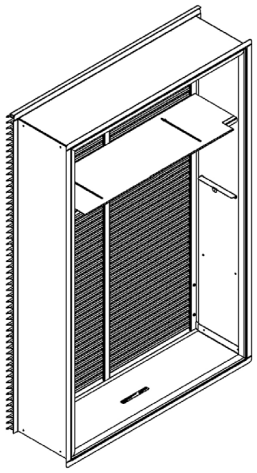
INSTALLATION

Louver Installation

Installation of the louver PRIOR to Wall Plenum Installation



NOTE: Louvers & Drip Ledge orientation is down



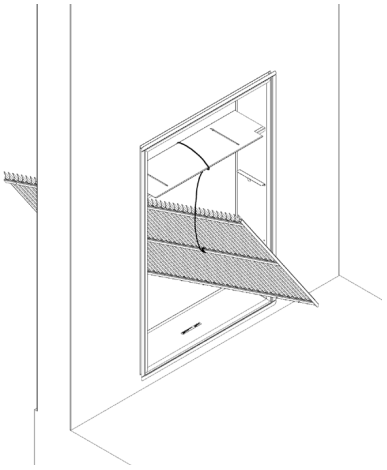
Optional Pre-assembled Outside Element (Grill and Plenum)

1) Hold the louver up to the outside plenum half (Part A) and line up the louver top with the very top edge of the ¾" flange.
2) Line up the wall plenum holes with the threaded holes in the louver and securely tighten fasteners.

Installation of the louver AFTER the installation of wall plenum on elevated floors

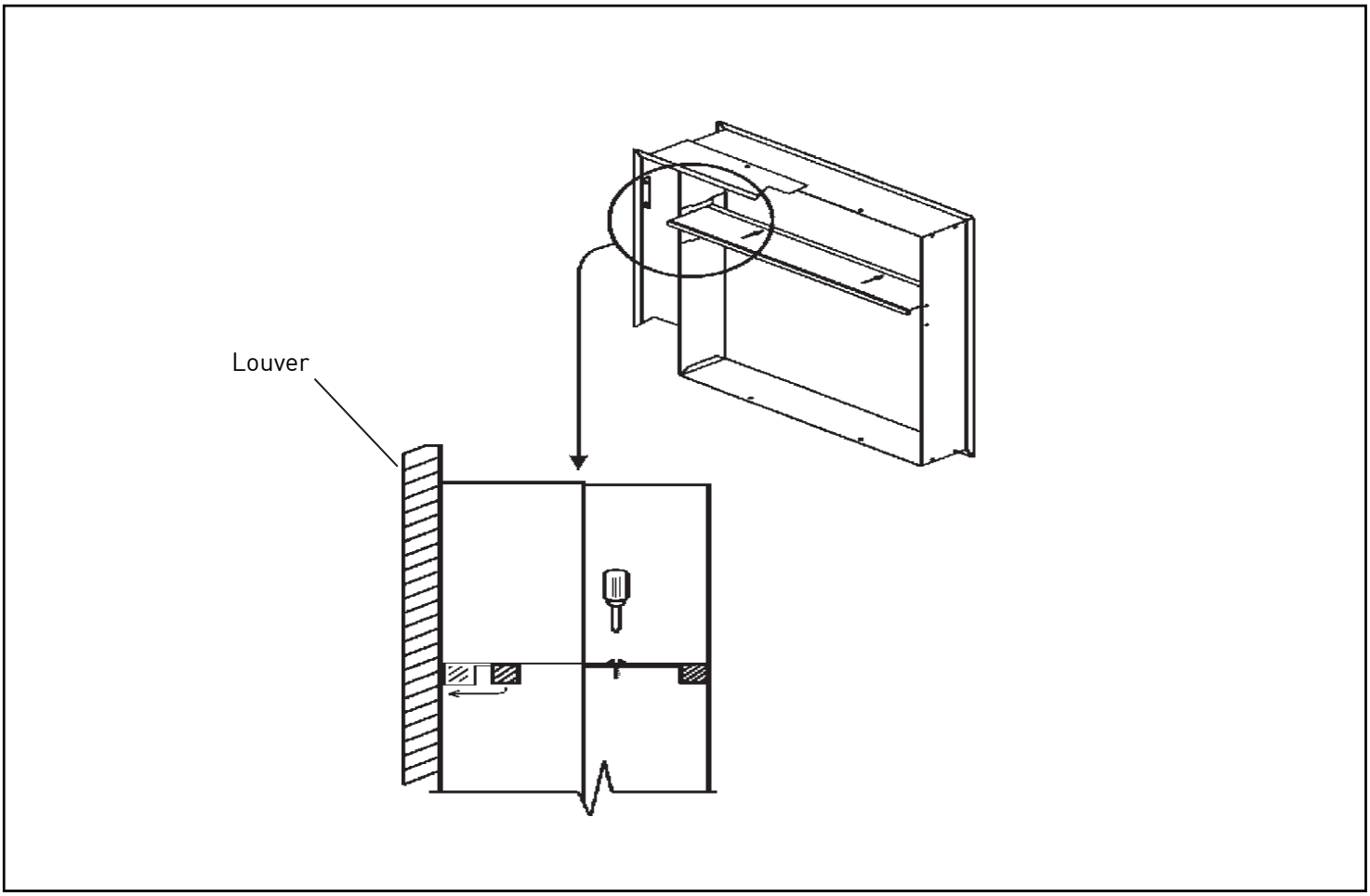
From the interior of the utility closet:

1) Tie a rope or tether to the architectural louver and the divider in the wall plenum to prevent it from falling if dropped.
3) Turn the louver sideways and push the louver out below the divider in the wall plenum.
4) Pull the louver back against the wall plenum and align the holes.
5) Insert and tighten all eight provided fasteners. When the louver is secured, remove the safety tether.



INSTALLATION

Final Wall Plenum And Architectural Louver Installation



NOTE: Ensure that the weather strip is undamaged and provides a continuous seal around the inner perimeter of the plenum.

Apply silicone grease or other non-petroleum-based lubricants to the weather strip to enhance the sealing capability of the weather strip and ease installation of the air conditioner chassis.

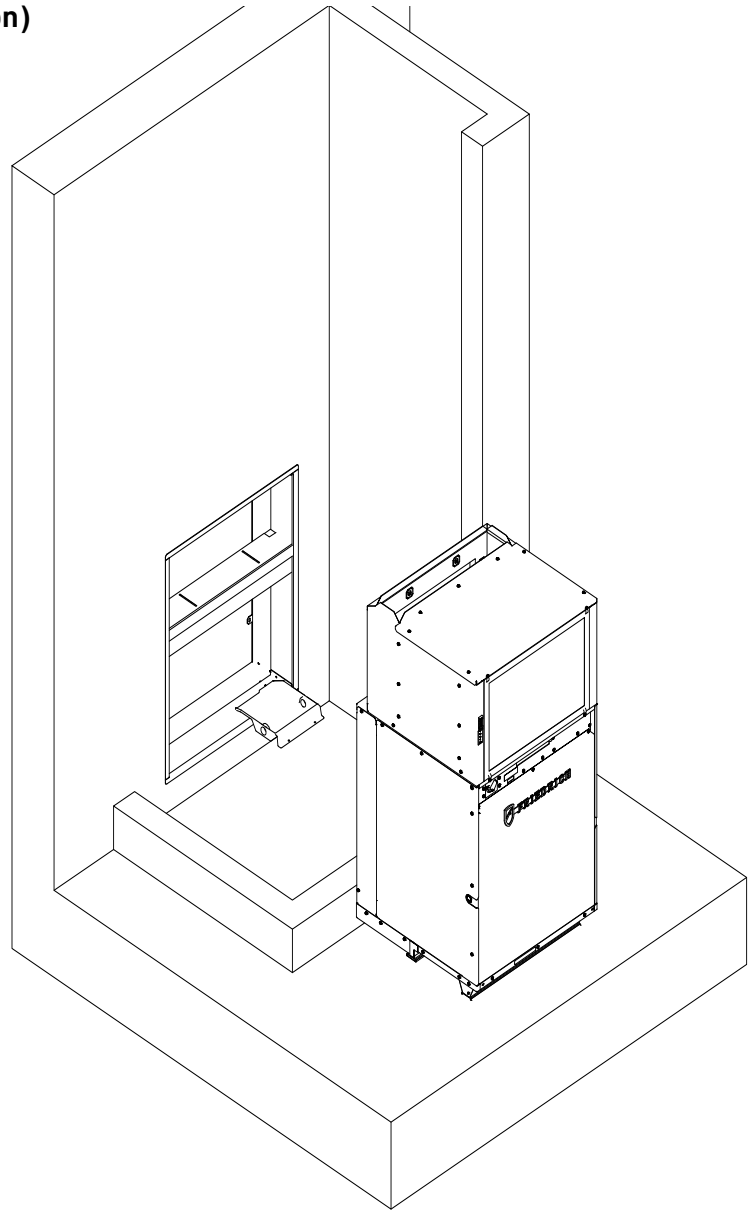
1) Loosen the two set screws located on the top side of the divider.
2) Slide the top part of the divider toward the outside until the sealing strip makes contact with the exterior louver.
3) Tighten the set screws to complete the adjustment.

NOTE: Let all flashing cure completely before installing the chassis.

INSTALLATION

Unit Installation

Unit Placement Prior to Installation (Front-Install Configuration)

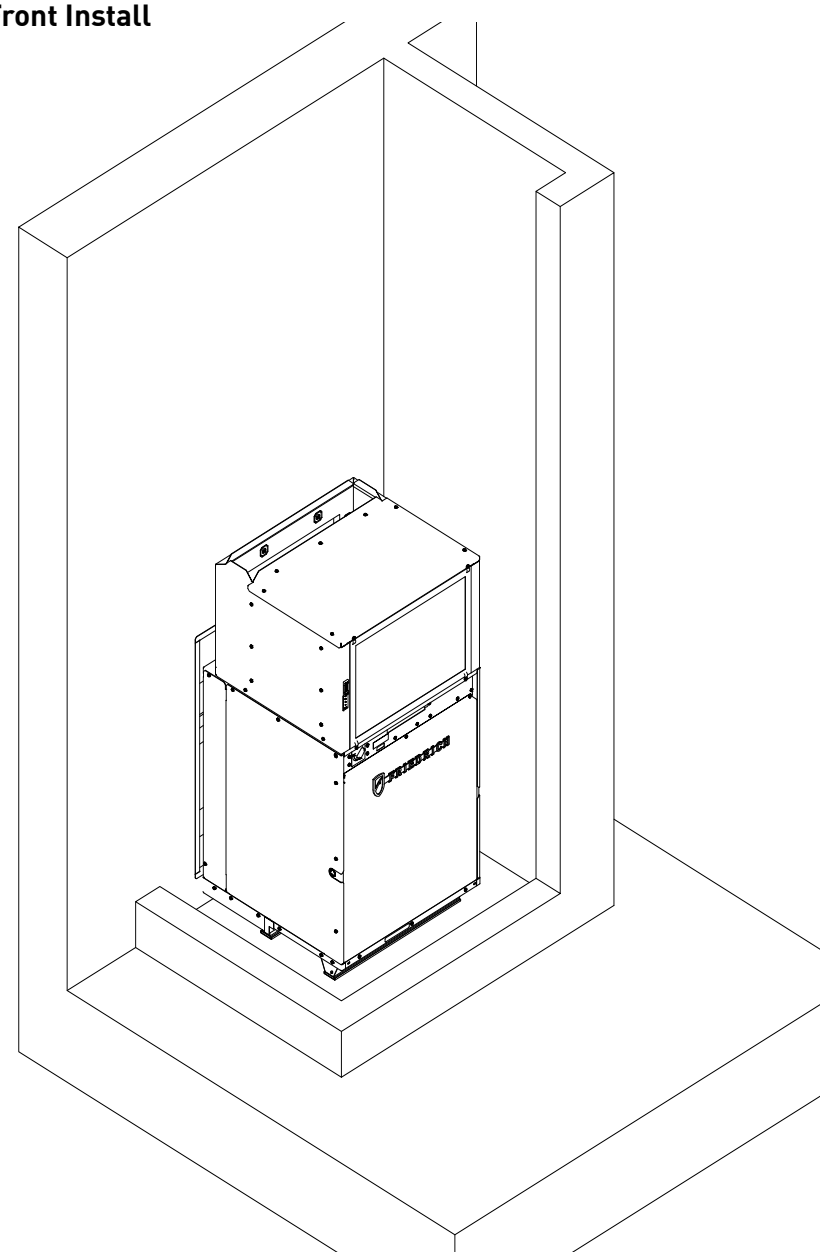


All louver, plenum, rough plumbing, and rough wiring steps must be complete prior to final installation of the air conditioning chassis.

INSTALLATION

Final Unit Installation Overview

Unit Final Placement - Front Install

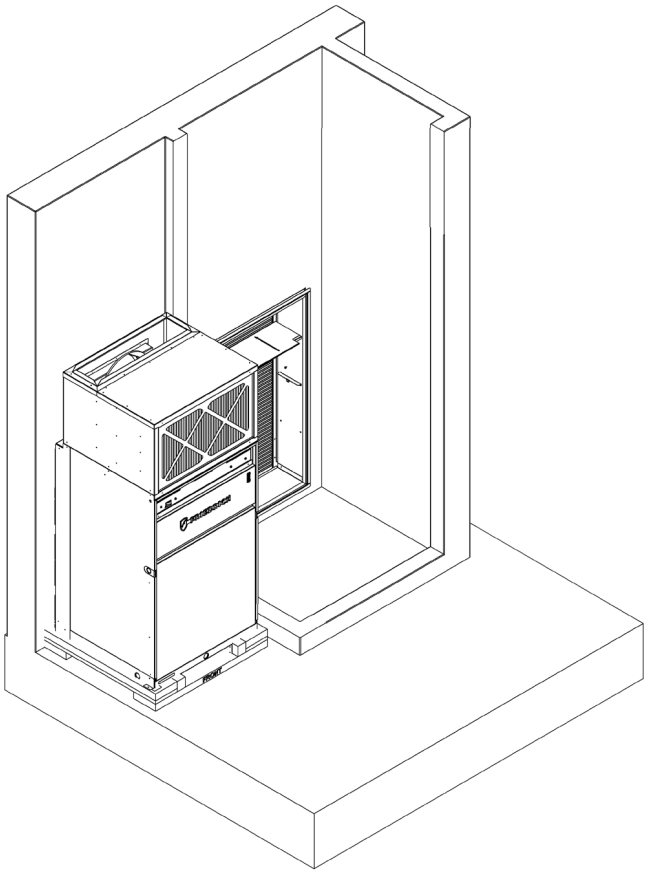


1) Ensure that power if off at the junction box feeding power to the air conditioner until all process steps are completed.
2) Move the unit from the shipping base and onto the installation site.
3) Insert the unit's rear extension into the wall plenum. There should be approximately 2" of penetration of the unit into the wall plenum, resulting in a complete seal all around.
4) Identify the appropriate drain port to use and complete plumbing.
5) Attach the ductwork to the unit at the supply-air outlet and ensure the seal is air tight.
6) Wire and connect the wall controller.
7) Connect the main power.

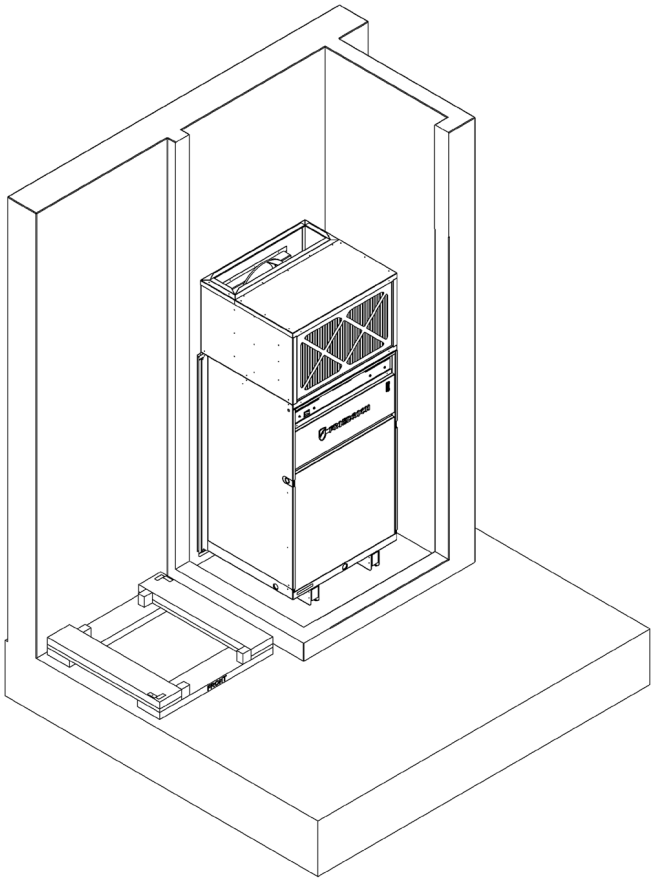
INSTALLATION

Side Configuration Installation

Left Install VRP Unit
Prepared for Installation



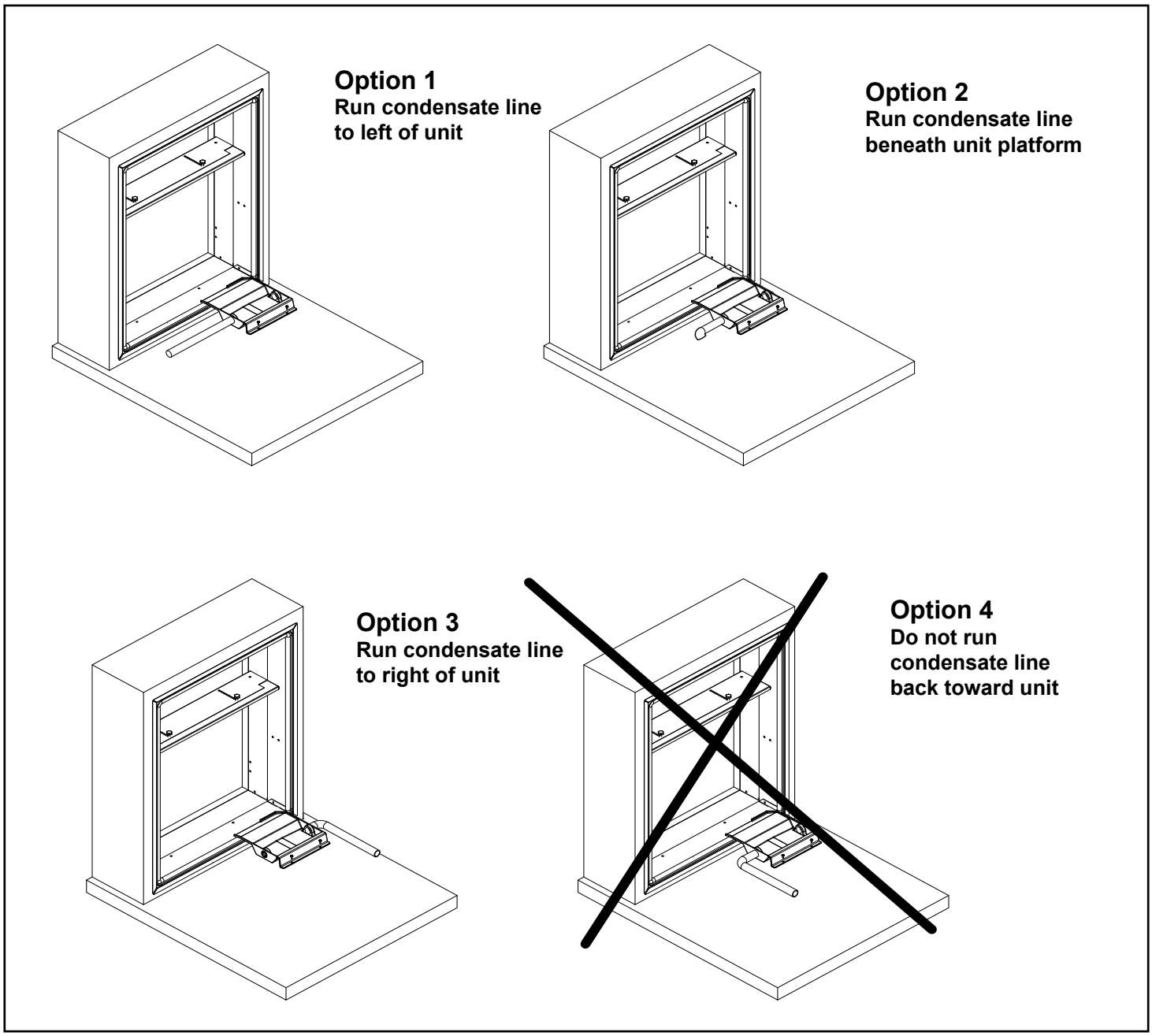
Left Install VRP Unit
in Closet (Fully Installed)



For side-install applications, place the unit adjacent to the closet and slide it in. Then, slide the unit backwardward into the plenum.

INSTALLATION

Final Drain Installation



NOTE: Failure to follow the following procedures may result in serious property damage. A field supplied secondary condensate pan may be required. Check with local codes. In case of drainage system blockage, the unit base will allow excess water to flow out of the unit through the plenum and the architectural louver. It is critical to ensure that the drainage path is not blocked or obstructed in any way during installation.

1) Ensure the drain pan is not inserted beyond 1.5 inches into the sleeve.

2) Attach the drain pan to the closet floor with the appropriate field supplied hardware.

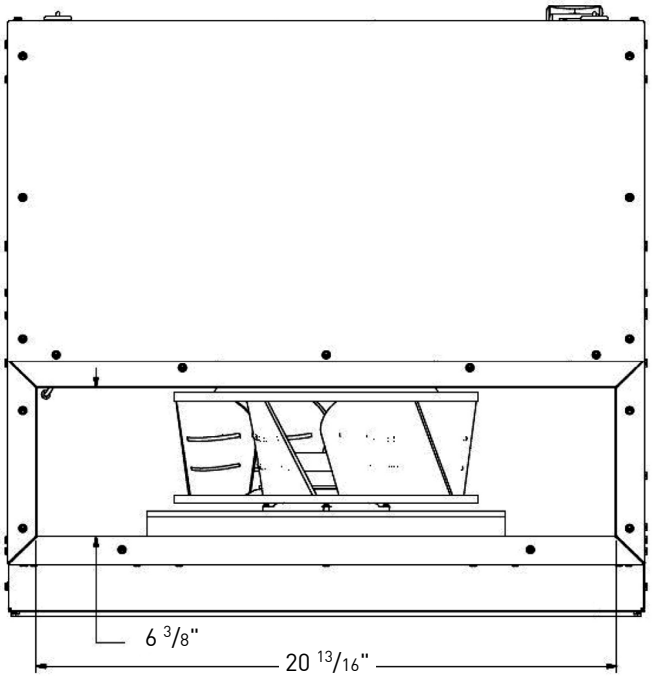
3) Use the supplied drain plug to plug the unused port on the VPDP2. Proper sealant must be applied to prevent leaks.

4) Use one of the first three options above for routing of the drain line.

5) Check the system for leaks.

INSTALLATION

Ductwork Installation



Supply air duct connection is the responsibility of the installer and should be installed per industry best practices.

Sheet metal or duct board may be used for the transition from the discharge to 10" or larger diameter flexible ducting.

Avoid sharp transitions in the ductwork to ensure optimal indoor blower performance.

Allow at least 12" (18" preferred) from the discharge of the unit to the final reduced-size transition to support optimal efficiency of the blower system.

INSTALLATION

Wall Controller Installation

Proper Wiring of VRP unit to Wall Controller

Use shielded and stranded CAT 6 cable with twisted pairs to wire the wall controller. Use the wire colors with the corresponding terminals on the wall controller to the VRP unit as shown in the table below.

Wire Color		Label
Orange / Green / White		V +
Brown / Blue / White		D +
Blue / Brown / White		D -
Green / Orange / White		V -
Ground Shield Wire		GND

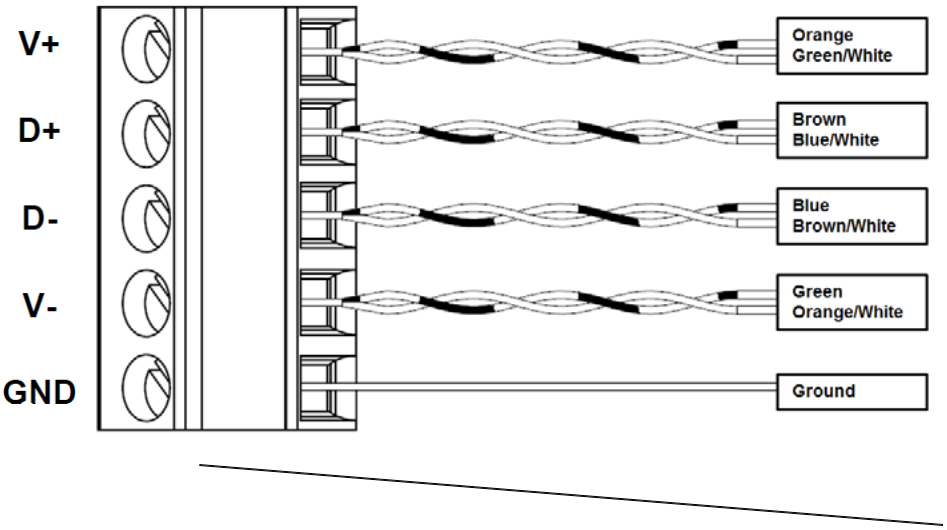
Table shows which wire pairs go with which screw terminal.

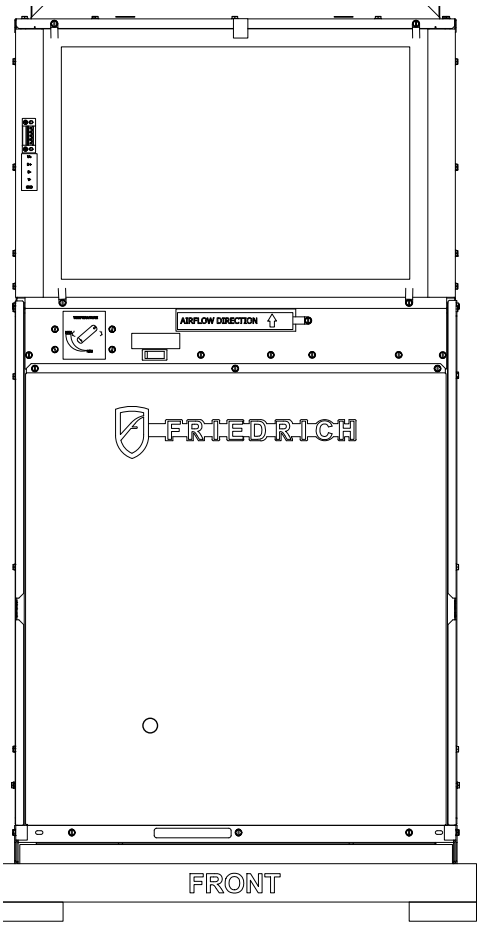
Refer to the Accessory Section of this manual for the different types of wall controllers and accessories offered to you.

For detailed instructions on your wall controller, please go to www.Friedrich.com/accessories to locate the accessory manual.

INSTALLATION

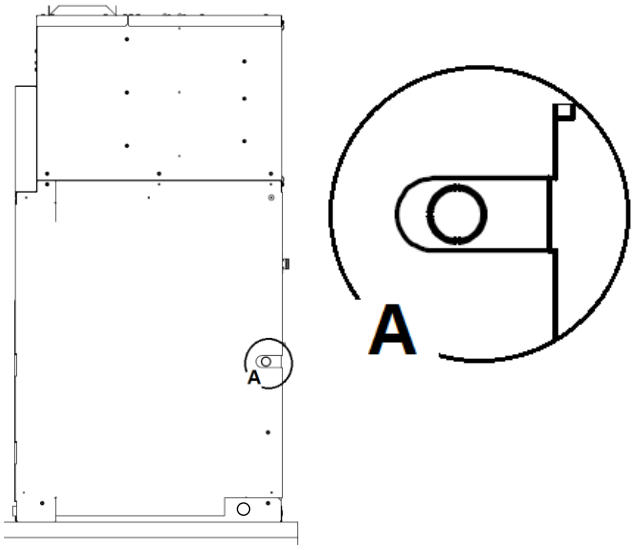
Wall Controller Installation





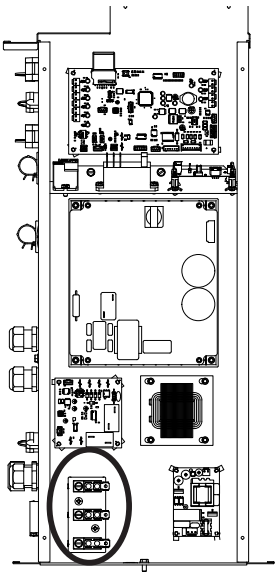
INSTALLATION

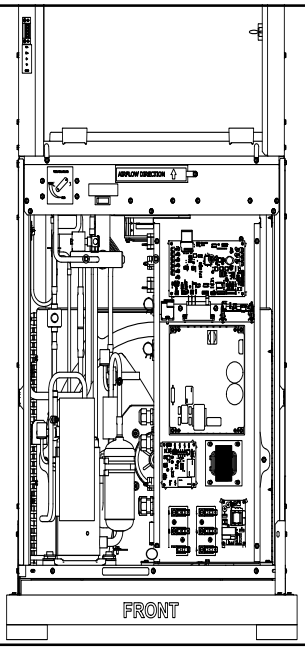
Electrical Installation

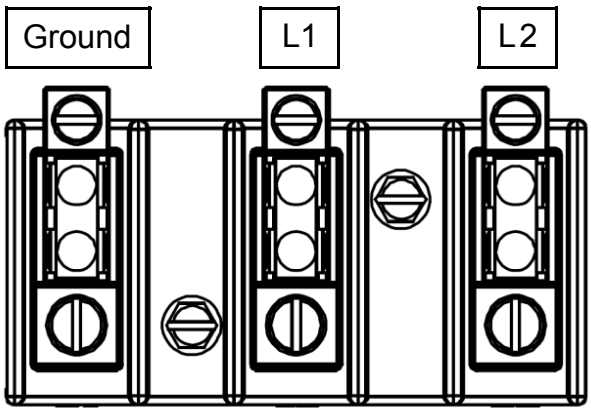


Remove and discard hole knock-out from the side of the unit (Detail A)

Remove the front unit panel to expose the incoming power terminal block (Detail, see below)





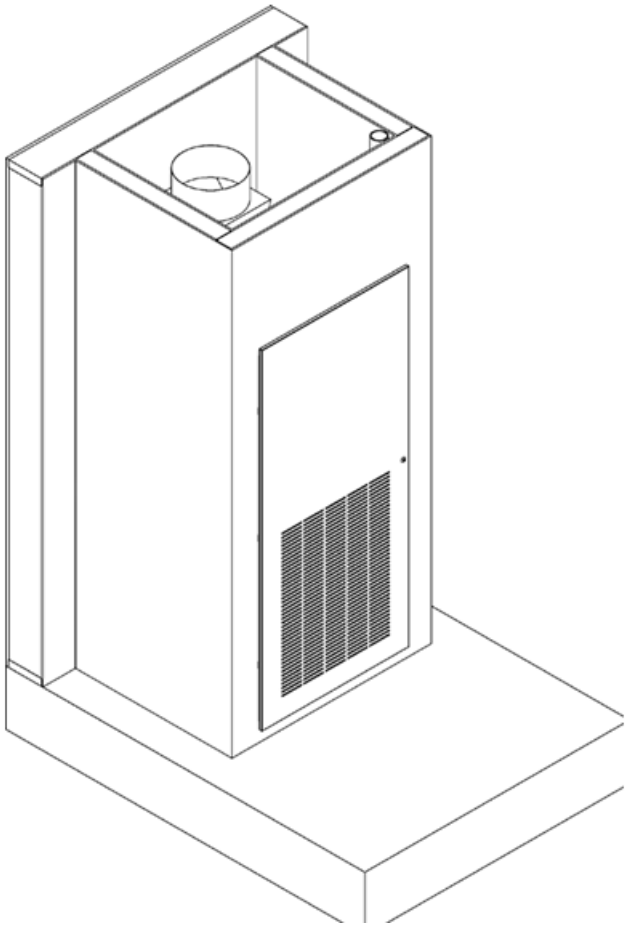


Insert all wires through the punched out hole and fasten wires.

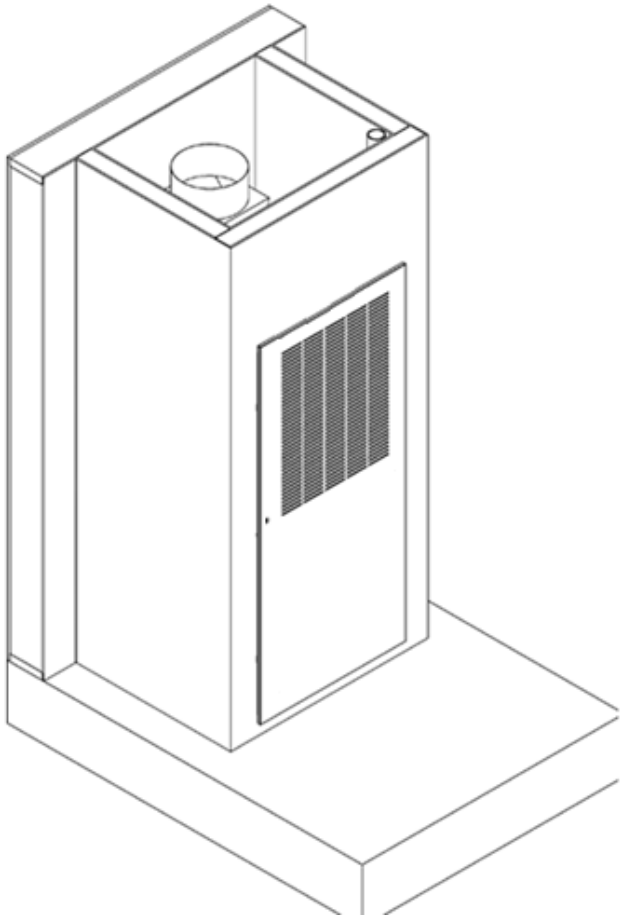
INSTALLATION

Return Air Door Installation

Option 1



Option 2



The door panel is supported along one edge by the provided hinge. The opposite edge has a latch which secures the panel to the adjacent framed structure.

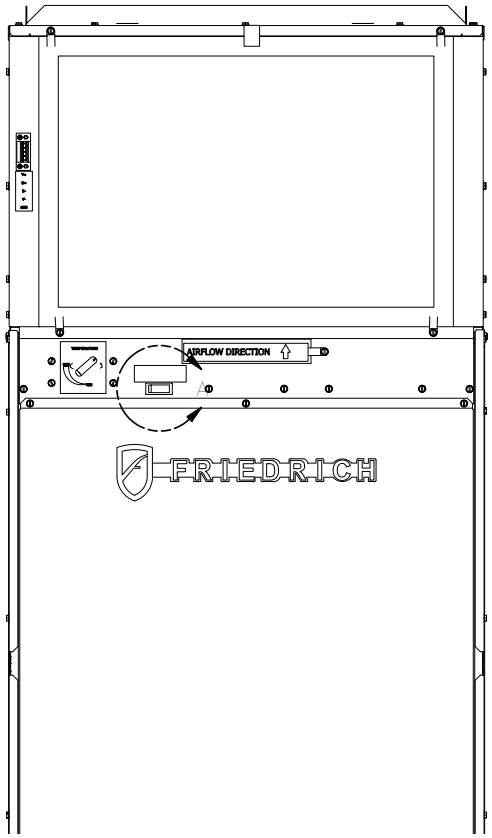
The kit contains hinge bracket for mounting the door with the return air openings low (shown in option 1) or high (shown in Option 2) on the door. For increased sound reduction, it is recommended to install the door with the return air opening in the high position.

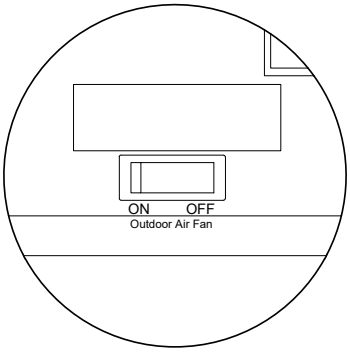
The door panel has a provision for filter installation on the door. This feature is only usable when the door is installed in the lower orientation (Option 1) and the unit filter has been removed.

The unit should not be operated with both the unit filter and the door filter installed.

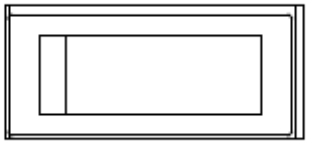
INSTALLATION

FreshAire™ System Set-Up and Operation



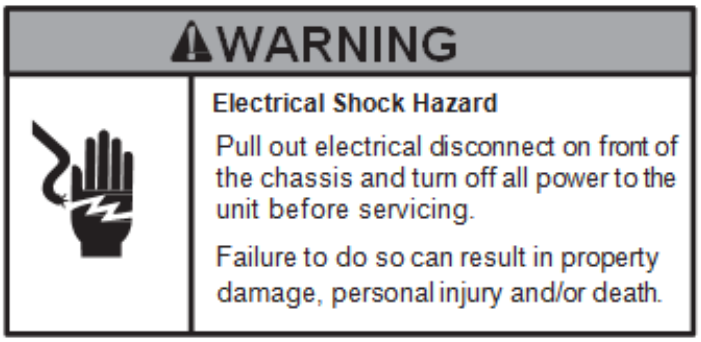


To engage the FreshAire™ System, flip the switch into the On Position.



INSTALLATION

Final Installation Checklist



- Inspect and ensure that all components and accessories have been installed properly and that they have not been damaged during the installation process.
- Ensure that all installation instructions concerning clearances around the unit have been adhered to.
- Check to ensure that the unit air filter, indoor coil, and outdoor coil are free from any obstructions.
- Ensure that the circuit breaker(s) or fuse(s) and supply circuit wire size have been sized correctly.
- Check the condensate water drain(s) to ensure that they are adequate for the removal of condensate water and that they meet approval of the end user.
- Ensure that the entire installation is in compliance with all applicable national and local codes and ordinances having jurisdiction.
- **ENSURE THAT THE SUPPLY VOLTAGE TO THE UNIT IS WITHIN THE OPERATING RANGE**
- Secure all access panels (i.e. front cover and/or control box), apply power to the unit.
  The unit commissioning should be done at this time to ensure unit function.

  NOTE: Maintaining a log for recording the dates of maintenance and/or service is recommended, and should be suggested to the owner or operator of the equipment.

- Present the owner or operator of the equipment with the Installation & Operation Manual, all accessory installation instructions, and the name, address and telephone number of the Authorized Friedrich Warranty Service Company in the area for future reference if necessary.

Chassis Operation

Cooling Operation

The set point must be at least 3°F below room temperature to ensure compressor operation.
In the cooling mode, when demand is present, the indoor blower and outdoor fan will operate. The compressor will vary operating speed to maintain desired set point.

Heat Pump Operation

The set point must be greater than 3°F but not greater than 6°F above room temperature to ensure compressor operation.
In the heating mode, when demand is present, the indoor blower and outdoor fan will operate. The compressor will vary operating speed to maintain desired set point.

Electric Heat Operation

If the set-point is greater than 5°F - 15°F (depending on outdoor conditions) above room temperature, the heat pump operation will be terminated and the electric heater will be energized to satisfy the heating demand.
If heat pump operation is not available due to defrost or error, the electric heater will be used to satisfy heating demand.

FreshAire™

The FreshAire™ System (optional) delivers outside air to the indoor space. The system has a fan that draws outdoor air into the system. The outdoor air leaves the system through a filter and enters the indoor space in front of the indoor conditioning coil. The outdoor air mixes with the return air and is drawn through the indoor conditioning coil.

The FreshAire™ System uses one 6 x 6 x 1 filter. The filter is accessed through the front of the unit just below the main unit filter. Slide the filter straight out to remove and straight in to replace.

MAINTENANCE

Servicing / Chassis Quick Change Outs

The chassis is designed for quick disconnect and change out. For minor electrical service, the Electrical Access Panel is easily removable once the screws are removed. For major electrical,refrigeration and fan service the chassis may be removed from utility closet.

⚠WARNING

Electrical Shock Hazard
Pull out electrical disconnect on front of the chassis and turn off all power to unit before servicing.
Failure to do so can result in property damage, personal injury and/or death.

Performing Routine Maintenance

With proper maintenance and care, your system will operate economically and dependably. Maintenance can be accomplished easily by referring to the following directions. However, before performing any maintenance, see above stated WARNING.

⚠ 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.

Replace Air Filter

A dirty air filter reduces the efficiency of your VRP unit and allows lint and dirt to accumulate on the indoor-air coil. Lint and dirt on the indoor- air coil can damage your unit.
The air filter should be replaced as it becomes dirty. To replace the chassis mounted return air filter:

1. Slide the holders away from the filter.
2. Remove the filter.
3. Install a new disposable filter.
4. The unit filter size is 14" x 20" x 1"

NOTE: DO NOT OPERATE YOUR SYSTEM
WITHOUT A FILTER IN PLACE OR BLOCK THE FRONT OF THE UNIT RETURN AIR OPENING.

To Remove the Chassis from the Closet:

1. Switch the wall controller off.
2. Disconnect the power coming into the unit from the main breaker panel or the closet mounted disconnect.
3. Disconnect the electrical connection.
4. Disconnect the duct work.
5. Slide the chassis out of the wall plenum.
6. Slide and slightly lift the chassis out of the utility closet.

Inspect and Clean Indoor Air Coil

Eventually, minor amounts of lint and dirt may pass through the filter and collect on the indoor-air coil. These minor accumulations can be carefully vacuumed away with a brush attachment on a vacuum cleaner. Care must be taken to avoid bending the aluminum fins on the coil. Bent fins should be straightened using a special fin tool available from most HVAC supply depots.

Inspect Outdoor Air (OA) Intake and Exhaust

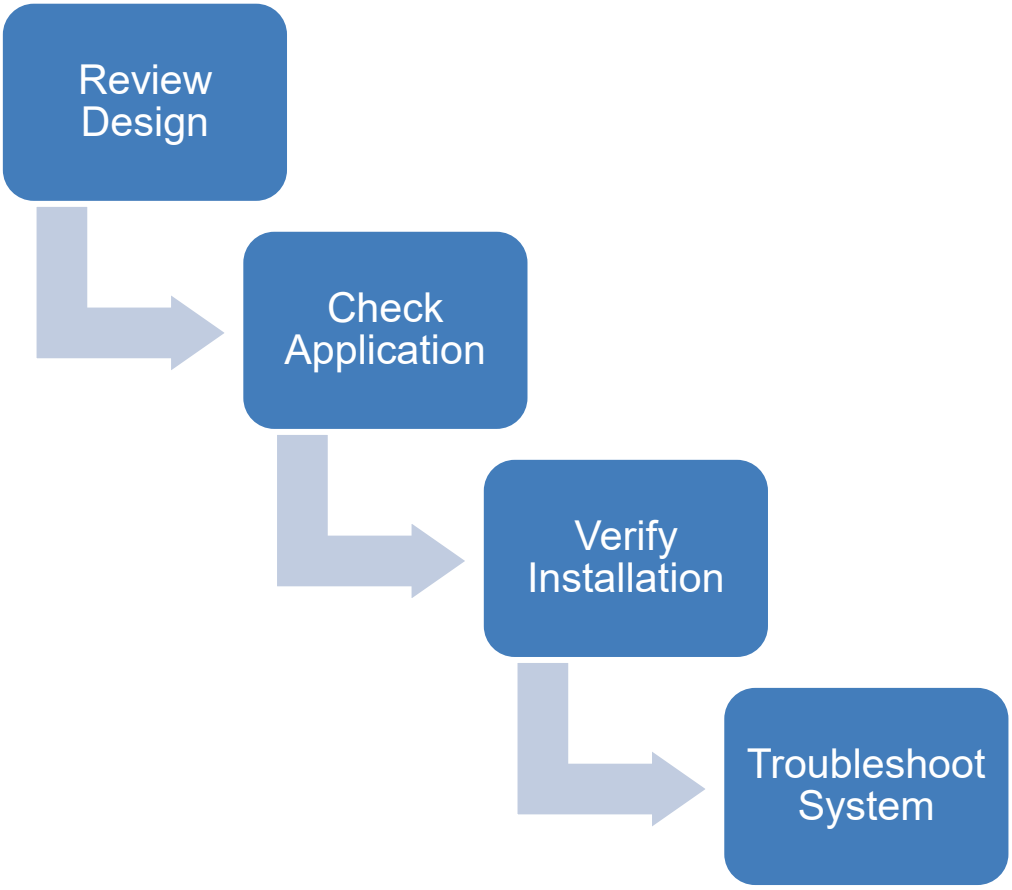
The unit's outdoor-air intake and outdoor-air exhaust paths must remain clear. Keep it free of all debris, snow, or ice. The OA intake should also be kept free of obstructions. Blocking the OA exhaust or OA intake opening will reduce the efficiency of your unit and could damage it.

Inspect and Clean Condensate Drain

The condensate drain must be routed to a suitable drainage area. Check the unit condensate drain periodically. Keep it free of anything that may block or impede the flow of condensate water. If there is any accumulation of foreign matter in the drain pipe, it should be removed and cleaned. The entire drain line must be protected from freezing.

TROUBLESHOOTING

VRP Troubleshooting Map



TROUBLESHOOTING

Required Tools

Meters = Need to Read

- Volts A/C – 500
- Volts D/C – 600
- Ohms – 10k Megaohms.

Test Leads:

- Needle Point
- 1000V/20A Rated

410a Gauge Manifold

TROUBLESHOOTING

Required Skills

1. Patience – Revolutionary digital communicating technology has replaced older analog components.

2. Patience – Needle point leads will save you time when backprobing molex connectors.

3. Patience – Know who to call when you need help.

4. Observation – There are many LED indicators on the MCS and FMC which all correspond to unit operation.

5. Electrical tracing – 24V AC systems have replaced low (5-10V) DC voltage.

6. DC Communication – The interpretation of values and commands transmitted by VDC.

Troubleshooting by Rule Out Methodology

Probability Diagnosis:

- The act of ruling out and understanding certain components operation *based on experience* and simply watching and observing the system operate.

Rule Out:

- The act of understanding how components operate to *maintain their logical sequence of operation* where failure to produce expected results occurs.

True Certainty Diagnosis:

- The act of proving a condition exists, or existed, by testing and acquiring physical and empirical evidence which caused, or is the result, of that condition.

TROUBLESHOOTING

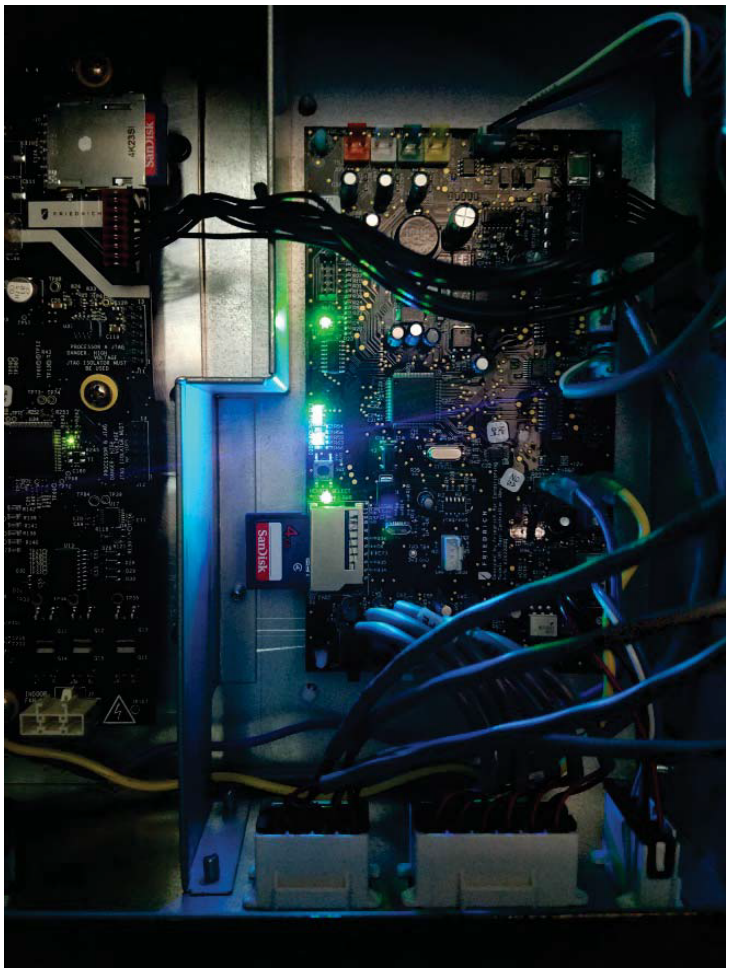
Diagnostic Code Check at FMC Board

The FMC will have green lights, but if an error code occurs, a blue and/or red light will flash.

The blue LED is the 10 digit and the red LED is the singles digit.

For example, 4 blue flashes and 3 red flash would be a code 43.

If more than one code is active, the FMC will cycle through the codes in active numeric order, one at a time, then return to the first code.



TROUBLESHOOTING

FMC Diagnostic Codes

Diag	Description	Diagnostic Check point	Solution
3	Return Air sensor (T8) is open or shorted	1. An open or shorted sensor is detected by the A/D conversion value residing at the upper or lower end of the conversion range. 2. The Ambient Indoor Temperature Sensor(T8) is open or shorted 3. Defective contact between male and female electrical molex connectors. 4. The sensor is not properly connected to the FMC.	1. Disconnect the sensor at the FMC then reconnect. 2. Ohm out the sensor to determine the failure point and correct as needed. Refer to Component Testing (Thermistor Values) 3. Replace the FMC board.
4	Indoor Coil Cool Inlet sensor (T1) is open or shorted		
5	Outdoor Coil Heat Inlet sensor (T7) is open or shorted		
6	Discharge Air sensor (T9) is open or shorted		
7	Outdoor Ambient Air sensor (T10) is open or shorted.		
8	Indoor Coil Heat Cond. sensor (T5) is open or shorted.		
9	Compressor Discharge sensor (T4) is open or shorted.		
10	Compressor Suction sensor (T3) is open or shorted.		
11	Liquid Cool sensor (T6) is open or shorted		
12	Liquid Heat sensor (T2) is open or shorted		
13	Humidity sensor is open or shorted.	1. The wall controller is not properly connected to the FMC. 2. There is an issue with the sensor itself.	1. Verify that the wall controller is correctly connected to the unit, if it is and the problem persists, replace the wall controller.
14	High or Low Pressure Limit Switch Open Black FMC Board Only	1. Pressure of suction line is too low. 2. Pressure of discharge line is too high. 3. Quick connects on FMC board are loose or damaged. 4. Faulty high or low pressure switch. 5. In Heating mode check indoor coil restriction(High Pressure). 6. In Cooling mode check outdoor coil restriction(High Pressure). 7. Outdoor fan not running.(High Pressure)	1. Check high and low pressure switches per procedure located in the component testing section of this manual. 2. Check EEV per procedure located in the component testing section of this manual. 3. Determine cause of leak or restriction in sealed system and repair.
14	High Pressure Limit Switch Open Blue FMC Board Only	1. Pressure of discharge line is too high. 2. Quick connects on FMC board are loose or damaged. 3. Faulty high pressure switch. 4. Overcharged unit. 5. In Heating mode check indoor coil restriction. 6. In Cooling mode check outdoor coil restriction. 7. Outdoor fan not running.	1. Check high pressure switch per procedure located in the component testing section of this manual. 2. Check EEV per procedure located in the component testing section of this manual. 3. Determine cause of leak or restriction in sealed system and repair.
15	Low Pressure Limit Switch Open Blue FMC Board Only	1. Pressure of suction line is too low. 2. Quick connects on FMC board are loose or damaged. 3. Faulty low pressure switch. 4. Undercharged or leaking unit.	1. Check low pressure switch per procedure located in the component testing section of this manual. 2. Check EEV per procedure located in the component testing section of this manual. 3. Determine cause of leak or restriction in sealed system and repair.
16	Compressor Model Code Error	Driver board does not recognize the model code that is sent by the FMC.	1. Replace the driver board.

TROUBLESHOOTING

FMC Diagnostic Codes

Diag	Description	Diagnostic Check point	Solution
17	Compressor Output Phase Loss	When the motor board sees an issue with at least one of the compressor wire outputs.	1. Check compressor wires for any damage. 2. Verify connection of the compressor wires. 3. Replace the driver board.
18	Float Switch Open Blue FMC Board Only	1. Open circuit on float switch port. 2. Board failure.	
19	Outdoor Coil > 175°F	1. The Outdoor Coil reaches a temperature greater than 175°F 2. Outdoor fan is not running when the compressor is on in cool. 3. EEV malfunction 4. Sealed system restriction. 5. Improper installation causing outdoor air recirculation.	1. Ensure that the Outdoor fan is properly connected and operational 2. Check EEV per procedure located in the component testing section of this manual. 3. Repair sealed system restriction problem. 4. Outdoor Fan replacement. 5. Ensure proper installation of unit and baffle per Installation section of this manual.
20	The Indoor Coil at sensor T1's location reaches a temperature < 30°F and remains there for 5 consecutive minutes	1. Lower than usual Indoor blower speeds. 2. Low refrigerant charge. 3. Low Ambient.	1. Ensure that the Indoor blower is connected properly and is operational. 2. Check that there is no blockage in the duct work. 3. Check the filter. 4. Check for refrigerant leaks and reprocess.
21	Unit cycles (heat or cool demand) > 9 times per hour	1. Unit is oversized for the space 2. Wall controller is placed in a position where the temperature is grossly off of the actual room condition.	1. Ensure that the wall controller's placement is "correct" based on room air flow
22	Unit cycles (heat or cool demand) < 3 times per hour.	This diagnostic test is used for testing and non-critical analysis only	
		The unit cycles heating or cooling demand less than 3 times within an hour	
23	Room Freeze Protection	1. The Indoor Ambient temperature is below 40°F. 2. Inadequate insulation in room or closet. 3. Wall Controller sensor is bad. 4. T8 Sensor is bad.	1. Make sure the room is properly insulated. 2. Ohm out T8 sensor and replace if necessary. Refer to thermistor values chart. 3. Replace Wall Controller
24	The Discharge Air sensor is reading above 185°F	1. Indoor blower is not operating when electric heat is on. 2. Electric heat limit switches are failing.	1. Replace Electric Heat Element. 2. Verify operation of Indoor Blower, replace if necessary
25	Indoor Coil Restriction	If one thermistor coil is reading frozen while another thermistor coil is not.	
26	Temperature is Beyond Operating Limits	The T8 (Indoor Ambient) sensor reads less than 0°F or greater than 130°F	1. Make sure diagnostic 23 is activated and perform solutions. 2. Make sure the room is properly insulated.
27	Minimum Configuration not Met	At least 1 of the following 1. Unit not provisioned. 2. Heater boad communication issue. 3. Driver board communication issue. 4. RS-485 board communication issue.	1. Unplug, do continuity check on cable, and replug Heater Board communication cable 2. Check Heater board. 3. Unplug,do continuity check on cable, and replug RS485 board cable 4. Check RS-485 board. 5. Replace FMC board

TROUBLESHOOTING

FMC Diagnostic Codes

Diag	Description	Diagnostic Check point	Solution
28	Driver board Critical Failure	A circuit error occurred on the board where it is unable to continue safe operation. Multiple circuit errors can cause this one error.	Make sure to check the Driver board error on the Driver Board (blinky lights) Replace the driver board.
29	Bad Heater Board Revision	Heater board firmware does not allow simultaneous heat operation (Only applicable to 3 ton)	
30	Driver board Indoor Fan Port Over Current Protection	N/A.	Diagnostic disabled.
31	Driver board Indoor Fan Port Over Current Protection	N/A.	Diagnostic disabled.
32	Driver board Compressor Port Over Current Protection	Instantaneous phase over current protection on the compressor axis.	This error should automatically correct itself. If error persists: 1. Check compressor wires for any damage. 2. Verify resistance of compressor (leg-leg and leg-chassis). 3. Replace the driver board. 4. Replace compressor.
33	Compressor Lubrication	1. The Compressor has run at low frequency (less than 35 Hz) for 200 consecutive minutes and requires lubrication	Normal Operation.
34	Unit Not Provisioned	Provisioned is defined as both switch and “provision” data has been set	Replace with provisioned the FMC
35	Driver board DC Bus Over Voltage	The bus voltage on the driver board is too high. (> 420VDC)	This error should automatically correct itself. If error persists: 1. Verify input voltage to step down transformer (265V models only) 2. Verify input voltage to the driver board. 3. Attempt to reboot the unit. 4. Replace the driver board.
36	Driver board DC Bus Under Voltage	The bus voltage on the driver board is too low. (< 200VDC)	This error should automatically correct itself. If error persists: 1. Verify input voltage to the driver board. 2. Attempt to reboot the unit. 3. Replace the driver board.
37	Driver board PCB Over Temperature	The temperature on the PCB is too high to continue operation. (IPM temperatures > 96°C)	This error should automatically correct itself. If error persists; 1. Verify that no air recirculation is happening in the outdoor section of the unit. 2. Attempt to reboot the unit. 3. Replace the driver board. 4. Replace compressor.
39	PSC Fan Low RPM	The Indoor Fan's RPM is less than 60% of its commanded RPM for 5 minutes	Check Indoor Fan Motor
40	Wall Controller not Connected	The FMC determines the Wall Controller is not connected	Check all wiring between the FMC and Wall Controller
41	EEV Fault	The EEV returns a fault status in the FMC	1. Power cycle unit. 2. See EEV testing. 3. Check EEV wires and motor. 4. Check voltage and ohms readings. 5. Replace EEV Stepper Motor

TROUBLESHOOTING

FMC Diagnostic Codes

Diag	Description	Diagnostic Check point	Solution
42	Compressor Speed Sync Error	The compressor speed feedback does not match what the drive expects the speed should be.	This error should automatically correct itself. If error persists: 1. Check compressor wires for damage. 2. Verify connection of the compressor wires. 3. Verify indoor/outdoor fan operation. 4. Verify system pressures. 5. Replace the driver board.
43	Driver board Communication Issue	FMC not receiving feedback information from the motor board.	1. Verify wiring from FMC to RS-485 board. 2. Verify wiring from RS-485 board to driver board. 3. Check for visible damage on RS-485 board. Replace if damaged. 4. Check for visible damage on driver board. Replace if damaged. 5. Check for visible damage on the FMC. Replace if damaged. 6. Check the driver board for the following LED sequence RED: off, YELLOW: blinking, GREEN: blinking. If LED sequence is active, replace the driver board, else replace the FMC."
44	Compressor Start Failure	Compressor speed synchronization issue for 10 consecutive seconds.	1. Check compressor wires for damage. 2. Verify connection of the compressor wires. 3. Replace driver board. 4. Replace compressor.
45	Compressor Current Limiter	The total compressor current exceeds a set limit.	5. Replace EEV Stepper Motor
46	Indoor Coil > 175°F for 5 consecutive minutes	The T5 sensor reads a temperature greater than 175°F for 5 consecutive minutes	Check the indoor fan for operation and ensure the electric heater is not stuck turned on.
51	Driver board DC Bus Over Current	The DC bus circuit sensed that the current is too high.	This error should automatically correct itself. If error persists: 1. Replace the driver board.
53	Driver board AC Line Under Voltage	The AC input voltage is too low. (< 176 VAC)	This error should automatically correct itself. If error persists: 1. Verify input voltage to step down transformer (265V models only) 2. Verify the input voltage to the driver board. 3. Replace the driver board.
54	Driver board AC Line Over Voltage	The AC input voltage is too high. (> 264 VAC)	This error should automatically correct itself. If error persists: 1. Verify input voltage to step down transformer (265V models only) 2. Verify the input voltage to the driver board. 3. Replace the driver board.

TROUBLESHOOTING

Driver Board Diagnostic Codes

In addition to the diagnostic codes that can be read from the FMC board, fault codes can also be read off of the Driver Board. Driver Board will display one of 3 modes;

1. Running Mode: In Running mode the red will be blinking, the yellow light will be off, and the green light will be off. The blinking rate is 4 times per second.

2. Standy Mode: In Standby mode the red will be blinking, the yellow light will be off, and the green light will be off. The blinking rate is 1 time per second.

3. Reset Mode: In Reset mode the red will be off, the yellow light will be on, and the green light will be off.

There are 3 types of status Codes;

1. **Recoverable Codes** occur while the unit is running and the system is out of the defined parameters. As soon as the system parameters return to within the normal range, the code will go away.

DC Bus Voltage Issue (< 200 or > 420): the red light will be blinking, the yellow light will be blinking, and the green light will be off.

DC Bus Input Over Current Protection: the red light will be on, the yellow light will be off, and the green light will be off.

Compressor IPM Current Protection: the red light will be blinking, the yellow light will be off, and the green light will be blinking.

Compressor IPM Over Temperature Protection (> 205°F): the red light will be on, the yellow light will be off, and the green light will be on.

2. **Semi-Recoverable Codes** occur while the unit is running and the system is out of the defined parameters. These codes will usually go away as the system parameters return to within the normal range, however, there may be instances where the board does not recover. Try resetting the board by removing power from the unit for a few minutes.

Communication Failure to Controller (FMC): the red light will be off, the yellow light will be blinking, and the green light will be blinking.

DC Bus IGBT Over Current Protection: the red light will be on, the yellow light will be off, and the green light will be blinking.

Compressor Over Current Protection: the red light will be blinking, the yellow light will be blinking, and the green light will be blinking.

Compressor Start Failure: the red light will be on, the yellow light will be blinking, and the green light will be off.

Compressor Speed Synchronization Error: the red light will be blinking, the yellow light will be off, and the green light will be on.

Dip Switch Circuit Issue: the red light light will be on, the yellow light will be off, and the green light will be off.

High Pressure Switch Protection: the red light will be off, the yellow light will be off, and the green light will be on.

Low Pressure Switch Protection: the red light will be off, the yellow light will be blinking, and the green light will be off.

3. **Non-Recoverable Codes** occur while the unit is running and the system is out of the defined parameters. These codes will not go away even if parameters return to within the normal range. The board may need to be replaced.

Charging Circuit Issue: the red light will be blinking the yellow light will be blinking, and the green light will be on.

DC Bus Current Sensing Circuit Issue: the red light will be on, the yellow light will be off, and the green light will be blinking.

Compressor Current Sensing Circuit Issue: the red light will be off, the yellow light will be off, and the green light will be blinking.

Compressor IPM Temperature Sensor Circuit Issue: the red light will be off, the yellow light will be blinking, and the green light will be on.

EEPROM Error: the red light will be on, the yellow light will be off, and the green light will be on.

EEPROM Error: the red light will be on, the yellow light will be on, and the green light will be on.

TROUBLESHOOTING

Driver Board Diagnostic Codes

Type	Red	Yellow	Green	Description	Action
Mode	○	●	○	Reset Mode	N/A
Mode	✳	○	○	Standby Mode (Blink rate is once per second)	N/A
Mode	✳	○	○	Running Mode (Blink rate is 4 times per second)	N/A
Recoverable	✳	✳	○	DC Bus Voltage Issue (< 200 or > 420)	This error should automatically correct itself. If error persists: 1. Attempt to reboot the unit. 2. Verify input voltage to step down transformer (265V models only) 3. Verify input voltage to the driver board. 4. Attempt to reboot the unit. 5. Replace the driver board.
Recoverable	●	●	✳	DC Bus Input Over Current Protection	This error should automatically correct itself. If error persists: 1. Attempt to reboot the unit. 2. Verify input voltage to step down transformer (265V models only) 3. Verify input voltage to the driver board. 4. Attempt to reboot the unit. 5. Replace the driver board.
Recoverable	✳	○	✳	Compressor IPM Current Protection	This error should automatically correct itself. If error persists: 1. Attempt to reboot the unit. 2. Check compressor wires for any damage. 3. Check compressor per component testing section of this manual. 4. Replace the driver board. 5. Replace compressor.
Recoverable	●	○	●	Compressor IPM Over Temperature Protection (> 96C)	This error should automatically correct itself. If error persists: 1. Attempt to reboot the unit. 2. Verify that no air recirculation is happening in the outdoor section of the unit. 3. Attempt to reboot the unit. 4. Replace the driver board. 5. Replace compressor.
Recoverable	✳	●	●	Outdoor Motor Low RPM	This error should automatically correct itself. If error persists: 1. Check outdoor motor fuse. 2. Check for blockage/ restriction on fan blade motor or shaft. Inspect harness for damage. 3. Replace outdoor motor.
Semi-Recoverable	○	✳	✳	Communication Failure to Controller (FMC)	1. Attempt to reboot the unit. 2. Verify wiring from FMC to RS-485 board. 3. Verify wiring from RS-485 board to driver board. 4. Check for visible damage on RS-485 board. Replace if damaged. 5. Check for visible damage on driver board. Replace if damaged. 6. Check for visible damage on the FMC. Replace if damaged. 7. Check the driver board for the following LED sequence RED: off, YELLOW: blinking, GREEN: blinking. If LED sequence is active, replace the driver board, else replace the FMC.
Semi-Recoverable	●	○	✳	DC Bus IGBT Over Current Protection	1. Attempt to reboot the unit. 2. Replace the driver board.
Semi-Recoverable	✳	✳	✳	Compressor Over Current Protection	1. Attempt to reboot the unit. 2. Check compressor per procedure located in the component testing section of this manual. 3. Replace the driver board. 4. Replace compressor.
Semi-Recoverable	●	✳	○	Compressor Start Failure	1. Attempt to reboot the unit. 2. Check compressor procedure located in the per component testing section of this manual. 3. Replace the driver board. 4. Replace compressor.
Semi-Recoverable	✳	○	●	Compressor Speed Synchronization Error	1. Attempt to reboot the unit. 2. Check compressor per procedure located in the component testing section of this manual. 3. Replace the driver board. 4. Replace compressor.

TROUBLESHOOTING

Driver Board Diagnostic Codes

Semi-Recoverable	●	○	○	Dip Switch Circuit Issue	1. Attempt to reboot the unit. 2. Check that dip switches are in the off position.
Semi-Recoverable	○	○	●	High Pressure Switch Protection (N/A)	1. Check that dip switches are in the off position.
Semi-Recoverable	○	☀	○	Low Pressure Switch Protection (N/A)	1. Check that dip switches are in the off position.
Non-Recoverable	☀	☀	●	Charging Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver board.
Non-Recoverable	●	○	☀	DC Bus Current Sensing Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver board.
Non-Recoverable	○	○	☀	Compressor Current Sensing Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver board.
Non-Recoverable	○	☀	●	Compressor IPM Temperature Sensor Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver board.
Non-Recoverable	●	○	●	EEPROM Error	1. Attempt to reboot the unit. 2. Replace the driver board.
Non-Recoverable	●	●	●	Compressor Model Code Error	This code should never appear once a unit is in production. If it appears please contact technical support .

TROUBLESHOOTING

Diagnostic Code (Temperature Based)

Temperature Based:

Thermistors (sensors) modify VDC and are interpreted through the FMC.
Errors indicate a possible issue with the sensor, FMC, or the sensor has detected an abnormal condition (or an out of parameter value).
Solution: Sensor error, FMC error, or abnormal condition.

VRP Sensor Bank contains 10 sensors for air and coil temperature. Each is 10k Ohm and must be unplugged from the FMC to test against a resistance chart. The sensors have a two-port molex connected to the FMC. They all share a common power supply which can be checked against the other connectors for continuity and rule out the FMC.

Rule Out Thermistors:

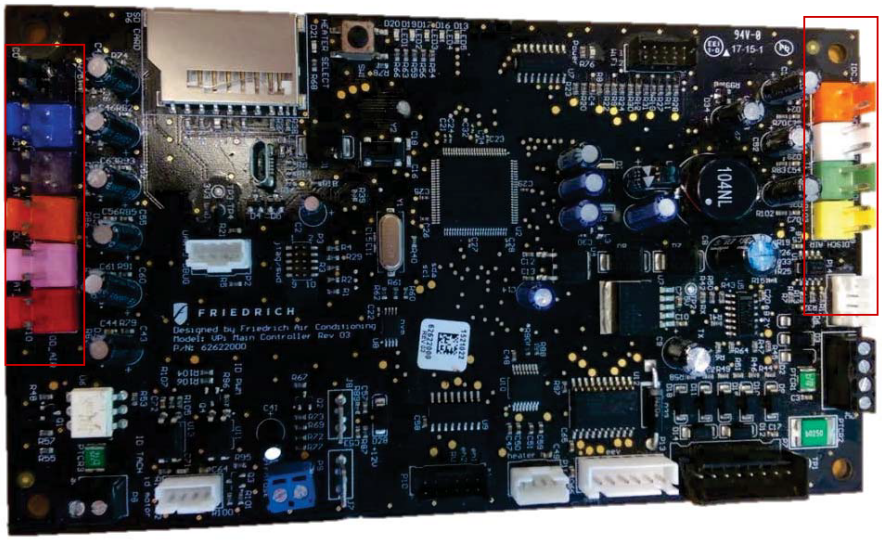
A thermistor will only give an error code if the thermistor is shorted, 0 ohms, or opened, O/L. If the thermistor is out of range, it may not give an error code and the system may not operate correctly.

Make sure your meter has a high enough range to read the sensor. If your meter only goes to 2k ohms and you're trying to read 10k ohms, it will read O/L.

Refer to Thermistor Values chart in Component Testing section

Rule out FMC - Continuity Check

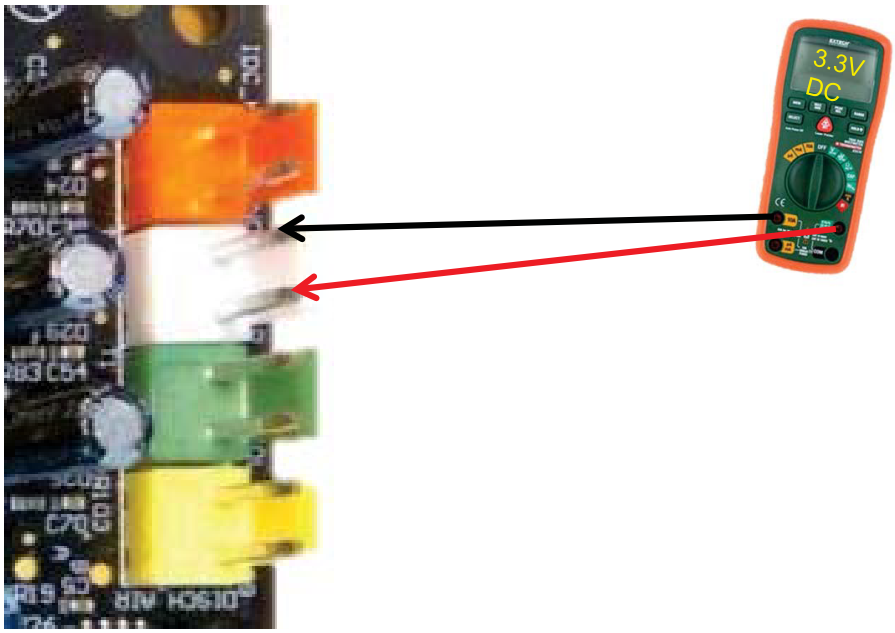
The first pin in each set can be checked against the others to make sure voltage has the ability to flow through that thermistor port.



Rule out FMC - Voltage Check

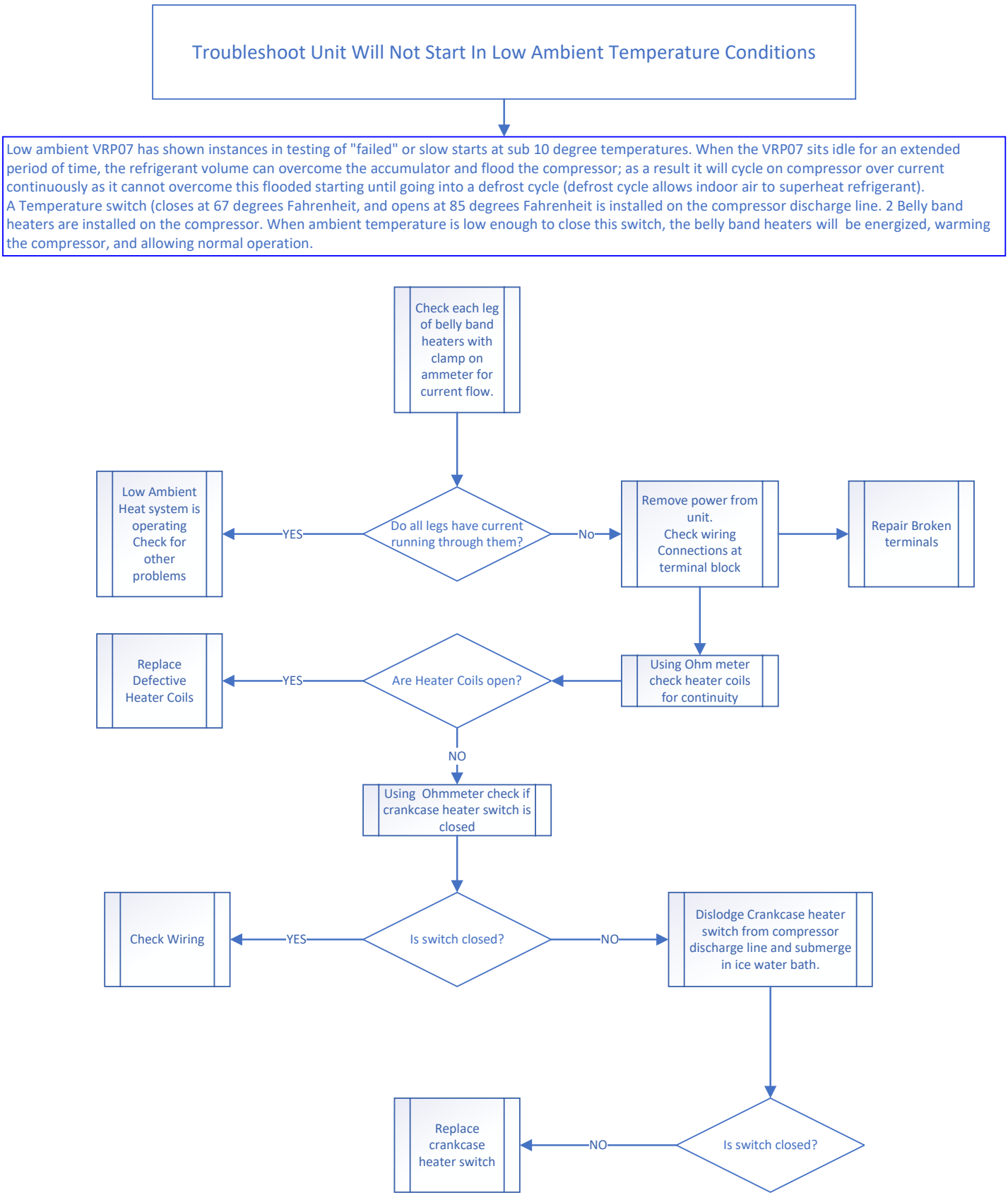
The Thermistor port can be checked without the sensor attached to verify proper voltage is being passed through the molex.

Voltage should be ~3.3VDC



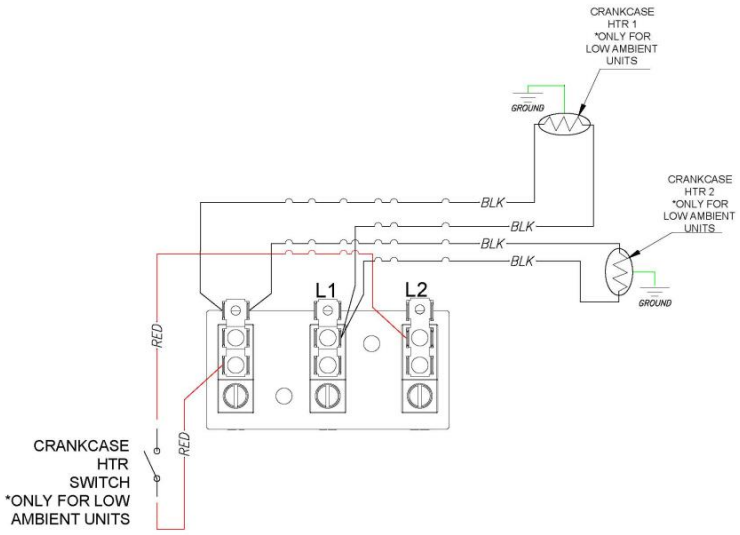
TROUBLESHOOTING

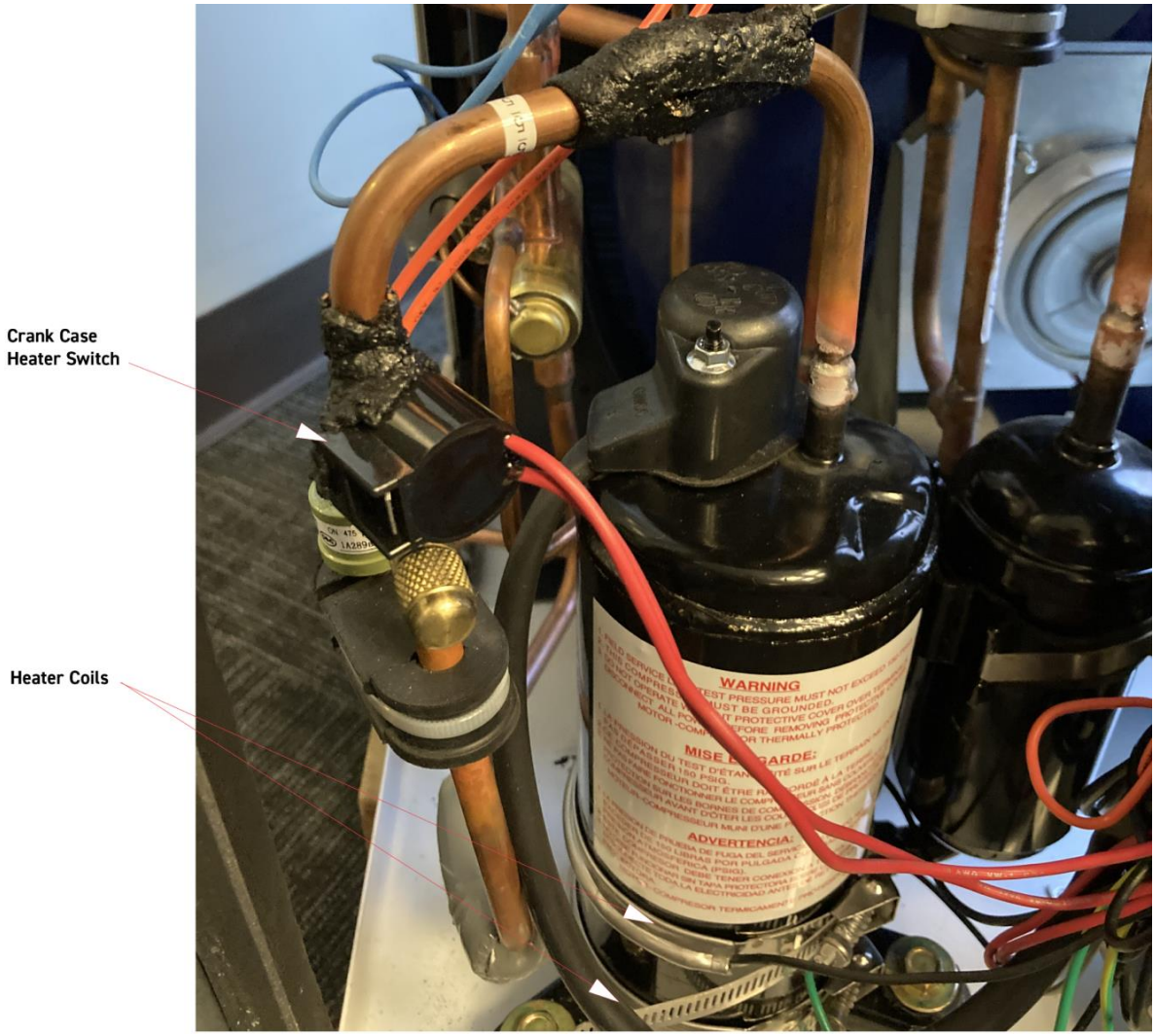
Low Ambient Crankcase Heater



TROUBLESHOOTING

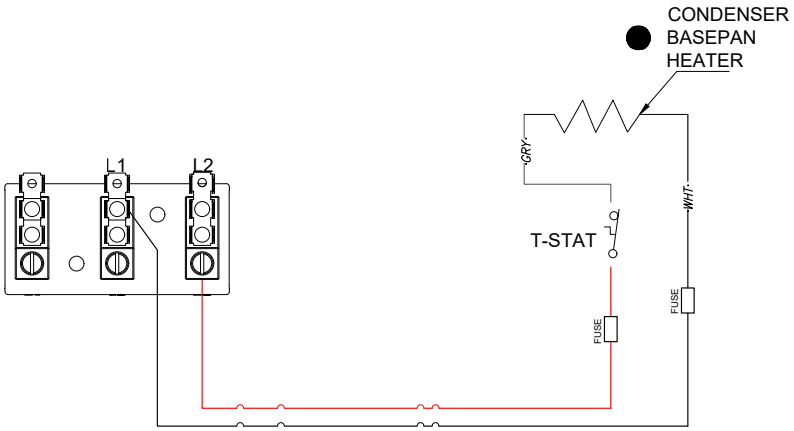
Low Ambient Crankcase Heater





TROUBLESHOOTING

Basepan Heater



1. Remove power from unit.
2. Check fuses for continuity. Replace fuses as required.
3. Check Basepan in-line TSTAT (Located in electrical control box).

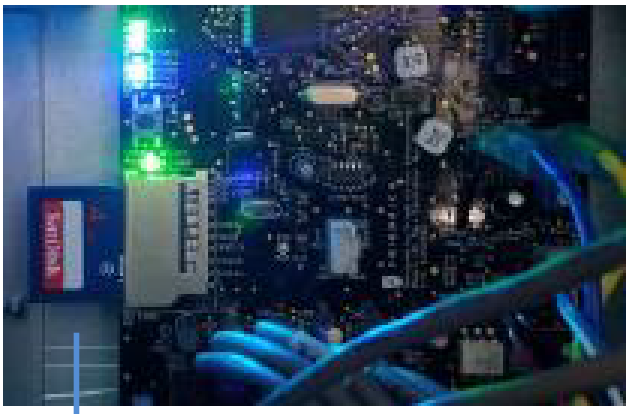
Open On Rise (Normally Closed)Open Temperature: 50°F ± 5°F Close Temperature: 32°F ± 11°F.

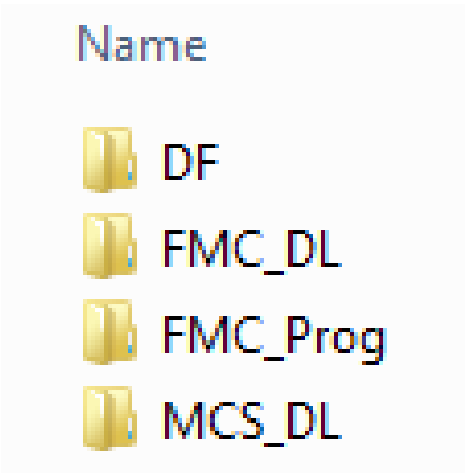
Strip back heat shrink and check that switch is closed if below 32 degrees and open if above 50 degrees,

4. Reinstall heat shrink.
5. OHM out basepan heater element for resistance. If element is open, replace heater.

Retrieving VRP Data

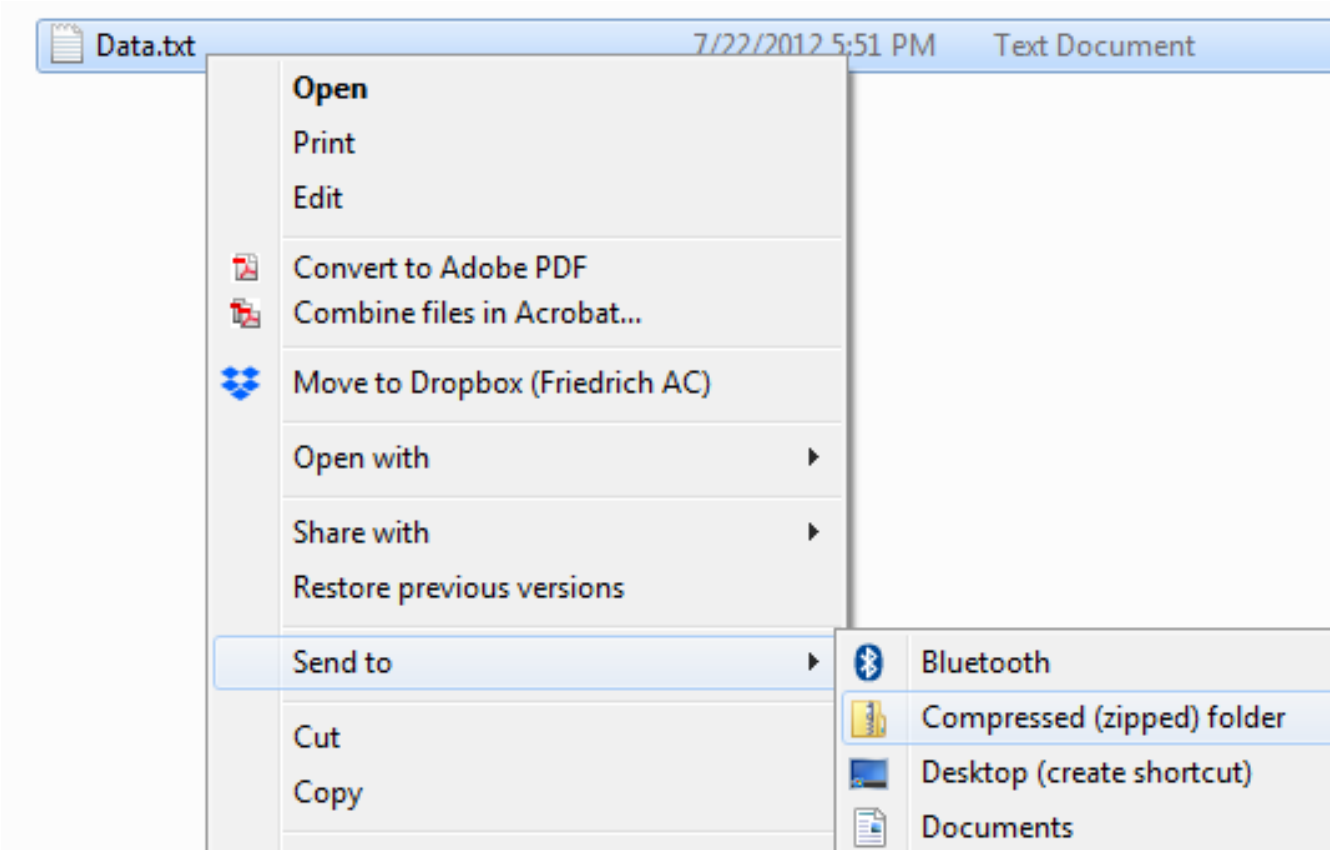
Remove SD Card from FMC and Locate “DF” Folder





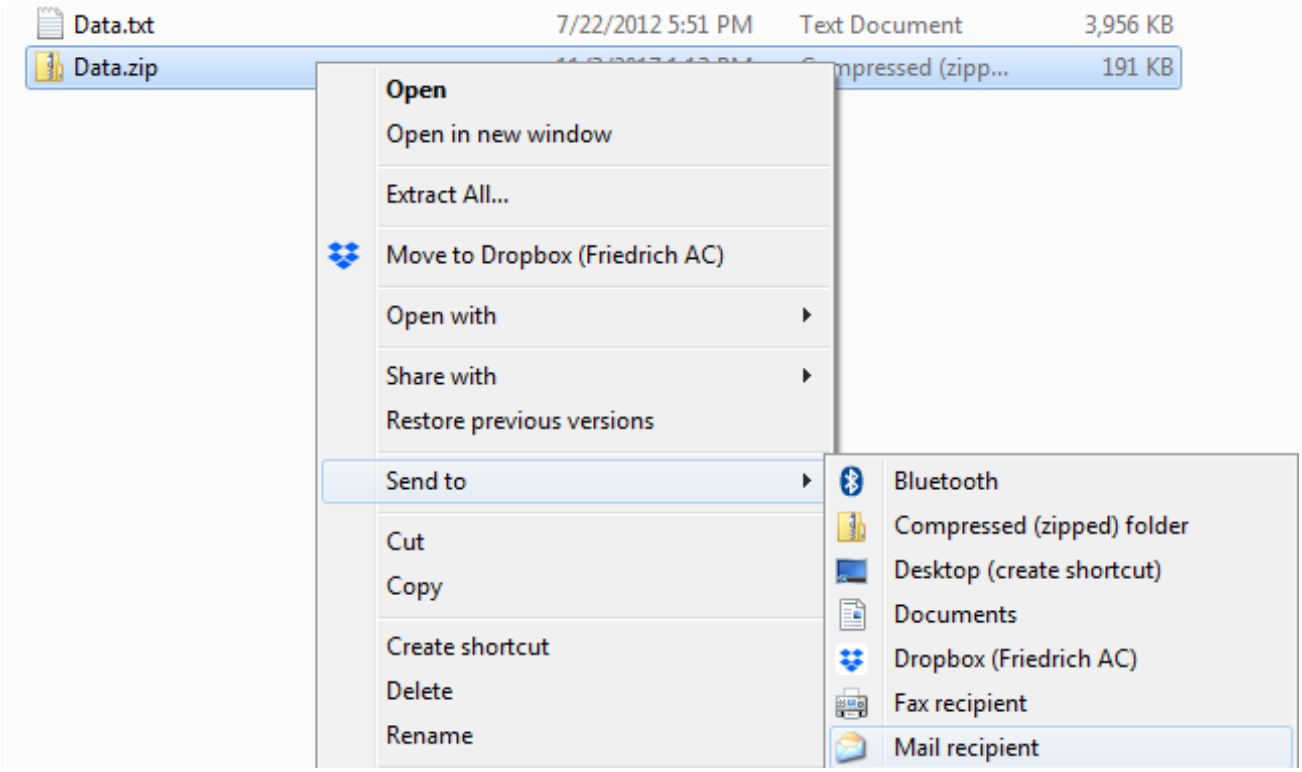
Retrieving VRP Data

Right Click “Data.txt.” Send to: Compressed (zipped) folder

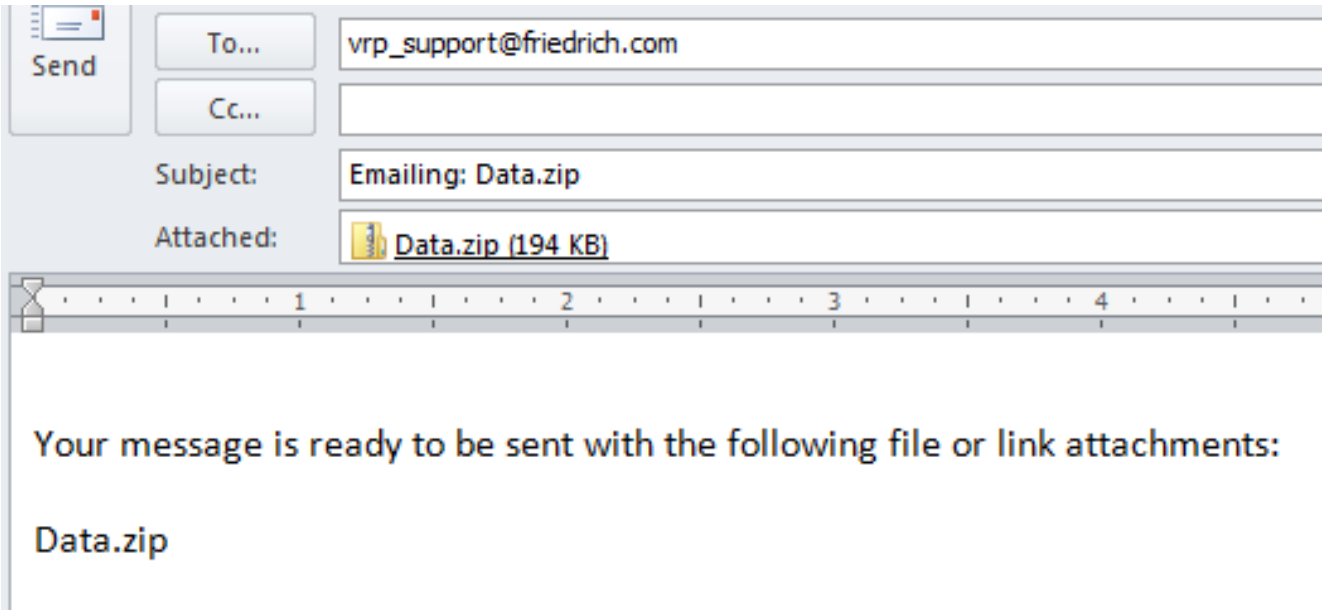


Retrieving VRP Data

Right Click “Data.ZIP.” Send to: Mail Recipient



Email Data.ZIP to VRP_Support@Friedrich.com !! FILE SIZE WILL VARY !!



COMPONENT TESTING

Electronic Expansion Valve (EEV)

⚠ 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.

All units are equipped with Electronic Expansion Valve (EEV) metering devices.

The electronic expansion valve (EEV) operates with a much more sophisticated design than Capillary tube metering devices. EEVs control the flow of refrigerant entering a direct expansion evaporator. They do this in response to signals sent to them by an electronic controller. A small motor is used to open and close the valve port.

Check Stepper Motor

1. To remove the stepper motor from the valve body, rotate the stepper motor approximately 30 degrees to unlock the locking tabs, and then lift straight up.

2. Check that the stepper motor is plugged into the FMC (EEV, P13).

3. Verify wires are connected and intact on stepper motor.

4. Check the resistance of the stepper motor by ohming out all of the wires to each other.

5. The resistance of the blue wire to the either the yellow, orange, black, or red wire should be 46 ohms.

6. The resistance of the yellow, orange, black, or red wires to each other should be 93 ohms.

Checking for restrictions

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 EEV is 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 normal, the EEV is not restricted.

4. If the operating pressures are lower than normal in both the heating and cooling mode, or the system pressure is very high (over 575psi) on the liquid side and very low (or vacuum) on the low side, the EEV may be restricted.

5. Inspect and examine the EEV stepper motor first! Then Verify the unit has proper refrigerant charge and no leaks prior to continuing diagnosis of bad Valve body.

Possible causes for expansion valve failures:

Low air flow or turbulent air flow (i.e. short plenum distribution boxes or bull head T fittings. These conditions can cause the EEV valve to shut down due to a very cold coil and the valve is incorrectly replaced as failed shut.

COMPONENT TESTING

Compressor checks

⚠WARNING

Electrical Shock Hazard
Pull out electrical disconnect on front of the chassis and turn off all power to unit before servicing.
Failure to do so can result in property damage, personal injury and/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.

Caution: After disconnecting power from unit, allow 2 minutes for capacitors to discharge before handling Driver Board, disconnecting leads, or taking readings with a meter.

1. Remove front panel from unit and gain access to the Driver board.
2. Locate and disconnect the motor winding leads shown in the figure below.
   U= Red V= Blue W= Black
3. Using an OHM Meter, check resistance from U to V, U to W, and V to to W.
   All of the readings should be within 0.1 ohms of each other.
   A difference of more than 0.1 ohms indicates that windings may be damaged and the compressor should be replaced.
   NOTE: Actual OHM values may vary due to temperature of the compressor.
4. Using a MegOhm Meter, check the motor windings for a short to ground.
   Measure the resistance of each winding to ground.
   A reading of less than 10 Megohms indicates that the motor windings may be damaged and the compressor should be replaced..

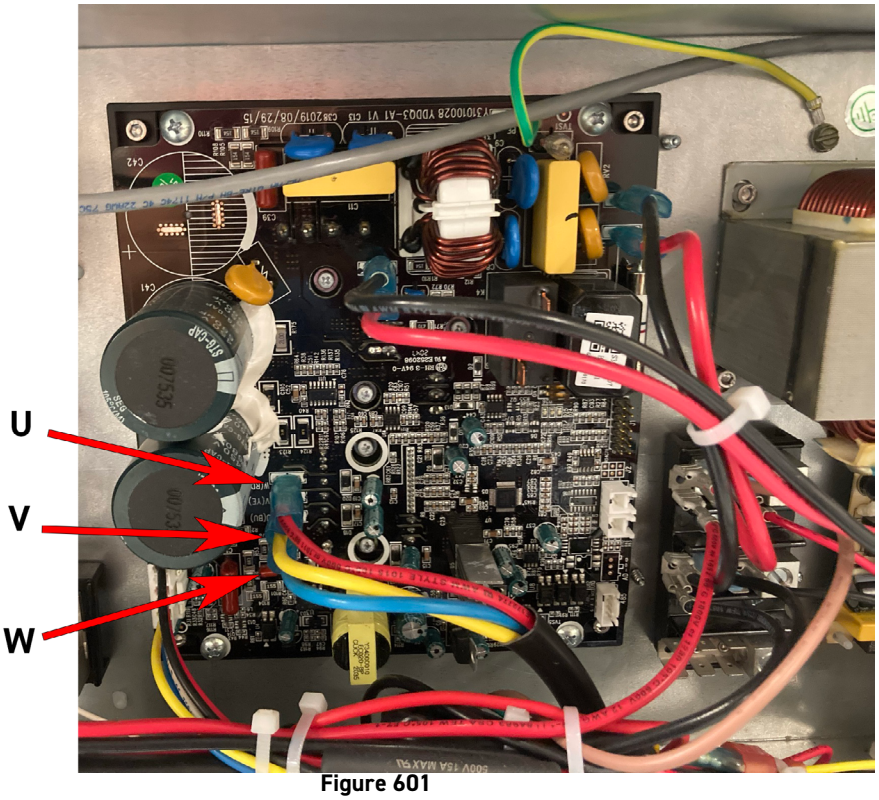


Figure 601

COMPONENT TESTING

Check the Outdoor Fan 7k

Caution: Wait for 2 minutes after removing power from the unit to allow capacitors to discharge before handling the Inverter Board, disconnecting leads or connectors, or taking ohm readings.

1. Remove Power from the Unit.
2. Check Fuse located in wiring between the Inverter Board and Outdoor Fan Motor. Replace fuse if open.
3. Turn unit on.
4. Check outdoor fan connector from Driver at J8 as shown in figure below.

    There are 4 wires:

    Voltage for Power (Red) = 310VDC

    Motor Return Voltage (White) = 15VDC

    Pulse Width Modulation (Yellow) = 0-6.5VDC (Oscillating)

    Feedback (Blue) = VDC (Oscillating)

    Ground (Black).

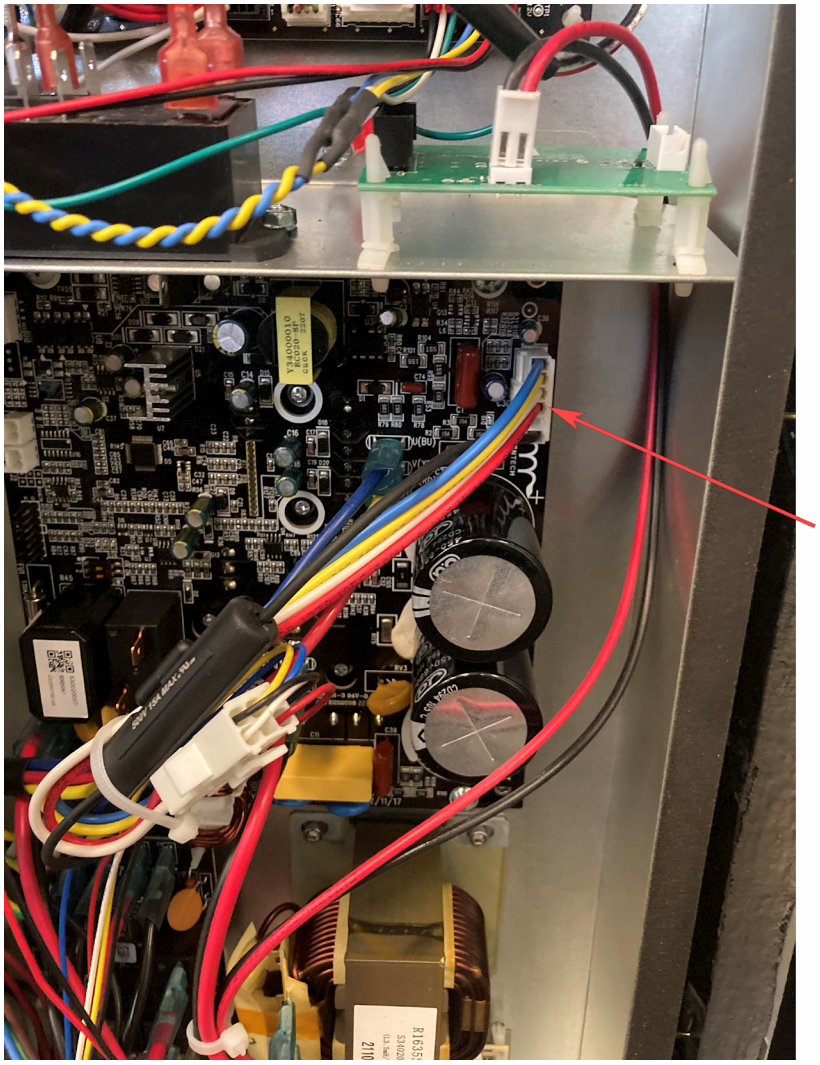


Figure 602

COMPONENT TESTING

Replace the Outdoor Fan 7k

Caution: Wait for 2 minutes after removing power from the unit to allow capacitors to discharge before handling the Driver board, disconnecting leads or connectors, or taking ohm readings.

1. Remove 6 screws securing electrical box to chassis and swing out of the way. Secure box with string or wire to prevent damage.
2. Remove unit from closet if necessary.
3. Remove front and right side lower access panels.
4. Disconnect white molex connector inside electrical box.
5. Remove 4 screws to disconnect motor mount from chassis. (See Figure 601)
6. Carefully remove fan assembly from shroud.
7. To replace fan blade, remove nut and replace blade. (See Figure 602)
8. To replace motor, remove blade.
9. Remove nuts from fan motor mount at 4 places. (See Figure 603)
10. Remove motor from mount.
11. Install new fan motor in reverse sequence.

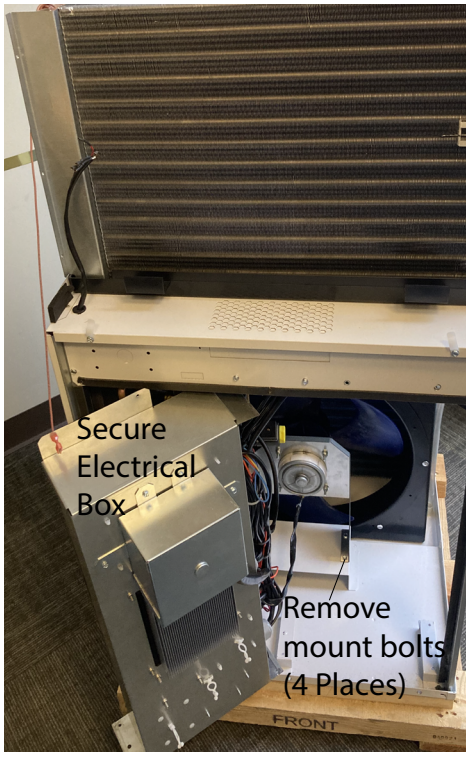


Figure 603

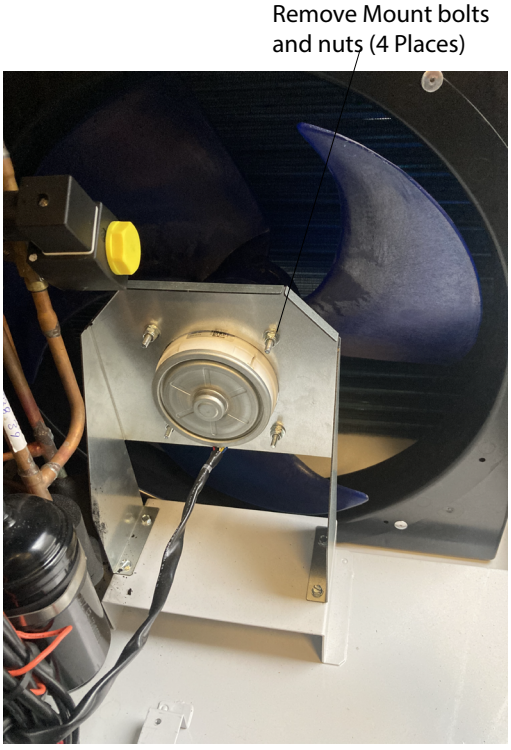


Figure 604

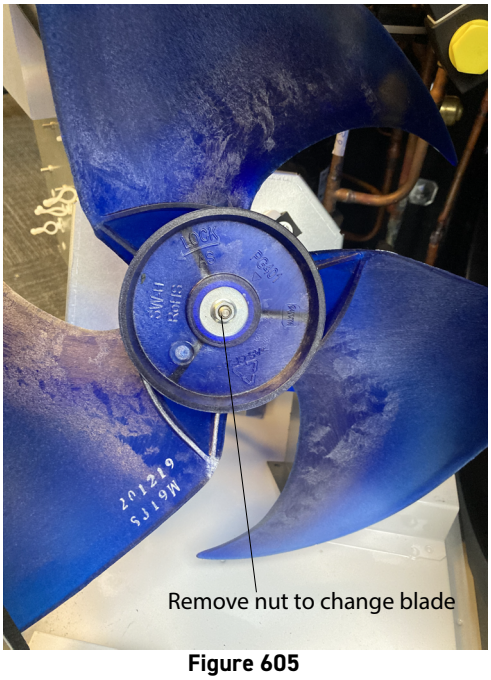


Figure 605

COMPONENT TESTING

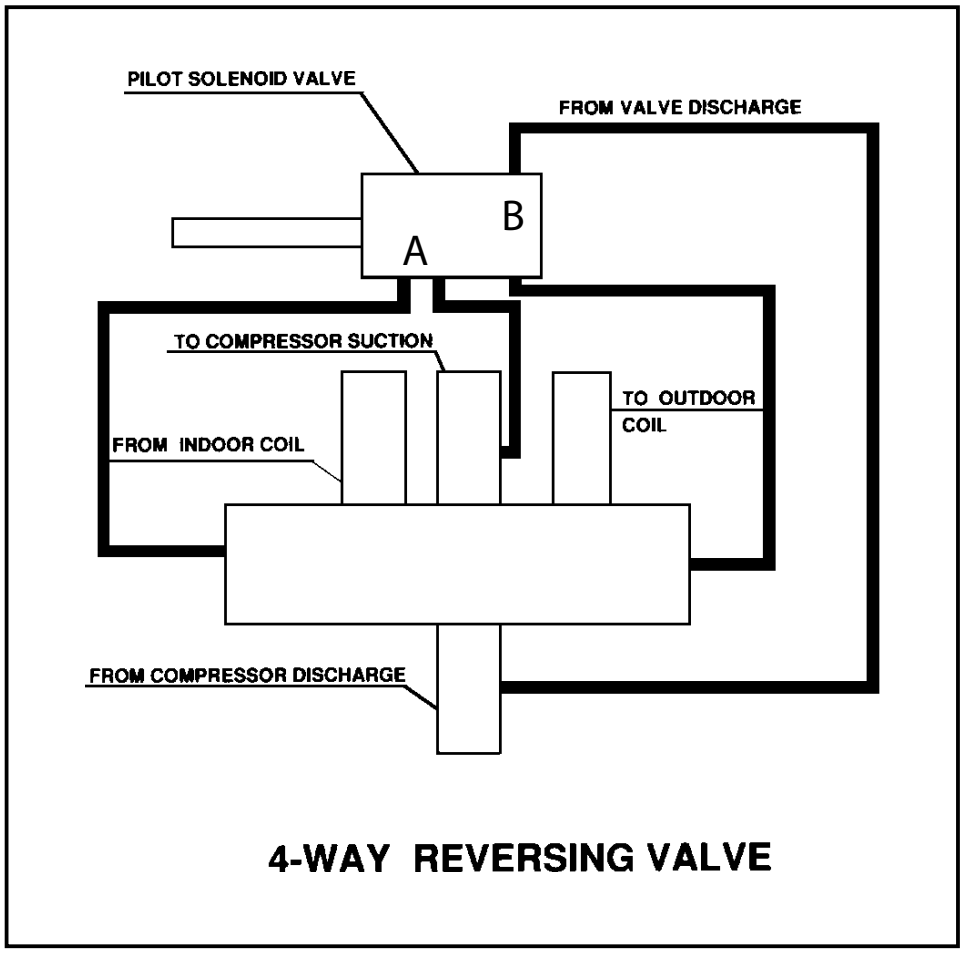
Reversing Valve Description And Operation

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.

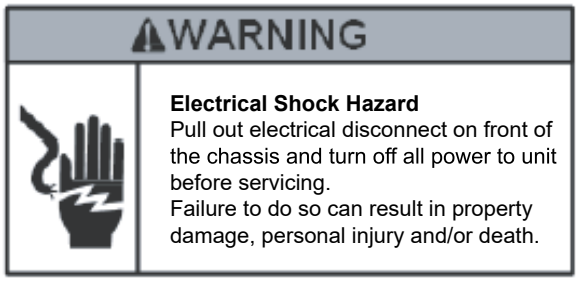
NOTE: System operating pressures must be near normal before valve can shift.



4-WAY REVERSING VALVE

COMPONENT TESTING

Testing The Reversing Valve Solenoid Coil

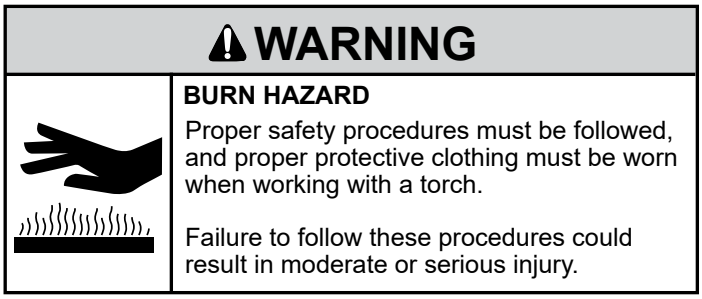


The solenoid coil is an electromagnetic type coil mounted on the reversing valve and is energized during the operation of the compressor in the heating cycle.

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, then the reversing valve is not shifting properly.

COMPONENT TESTING

Testing The Reheat System

The Reheat system on the 7k BTU VRP contains a solenoid operated shutoff valve, two solenoid operated bleeder valves, a relay , and associated wiring. The reheat relay energizes the solenoids based on inputs from the defined parameters on the FMC board.

Test the reheat solenoid circuit

1. Jump 12 vdc to control terminals on the relay to V+ V- terminals on the wall controller terminal block.

2. Listen for an audible click on the relay. If relay does not energize replace the relay.

3. Check for temp change on valves after energizing the relay. If there is no temp change verify that there is power on the relays. If no power is available to the relays, trace back problem to source and correct any wiring issues.

4. If power is available at relay check applicable solenoids per component testing section.

5. If solenoids check good replace the applicable valve.

6. If reheat system is still not operating correctly when relay is energized with 12 vdc, check harness and then call tech support for assistance. The data file on the unit can be read. Work with customer support to determine if a faulty FMC board or wall controller is an issue.

COMPONENT TESTING

Testing The Reheat Valve Solenoid Coils
Models Produced In 2022 or prior and A-A Models

Check the Reheat Valve:

1. Turn off high voltage electrical power to unit.

2. Disconnect blue wire from Rehest Solenoid relay and blue wire from L2 Terminal block.

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.

Check the Reheat (Solenoid) Valve:

1. Turn off high voltage electrical power to unit.

2. Disconnect yellow wire from Reheat Solenoid relay and red wire from L2 Terminal block.

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.

Check the Bleeder Valve:

1. Turn off high voltage electrical power to unit.

2. Disconnect yellow wire from Rehest Solenoid relay and red wire from L2 Terminal block.

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.

COMPONENT TESTING

Testing The Reheat Valve Solenoid Coil A-B, B-A Models

Check the Reheat Valve:

1. Turn off high voltage electrical power to unit.

2. Disconnect blue wire from Rehest Solenoid relay and blue wire from L2 Terminal block.

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.

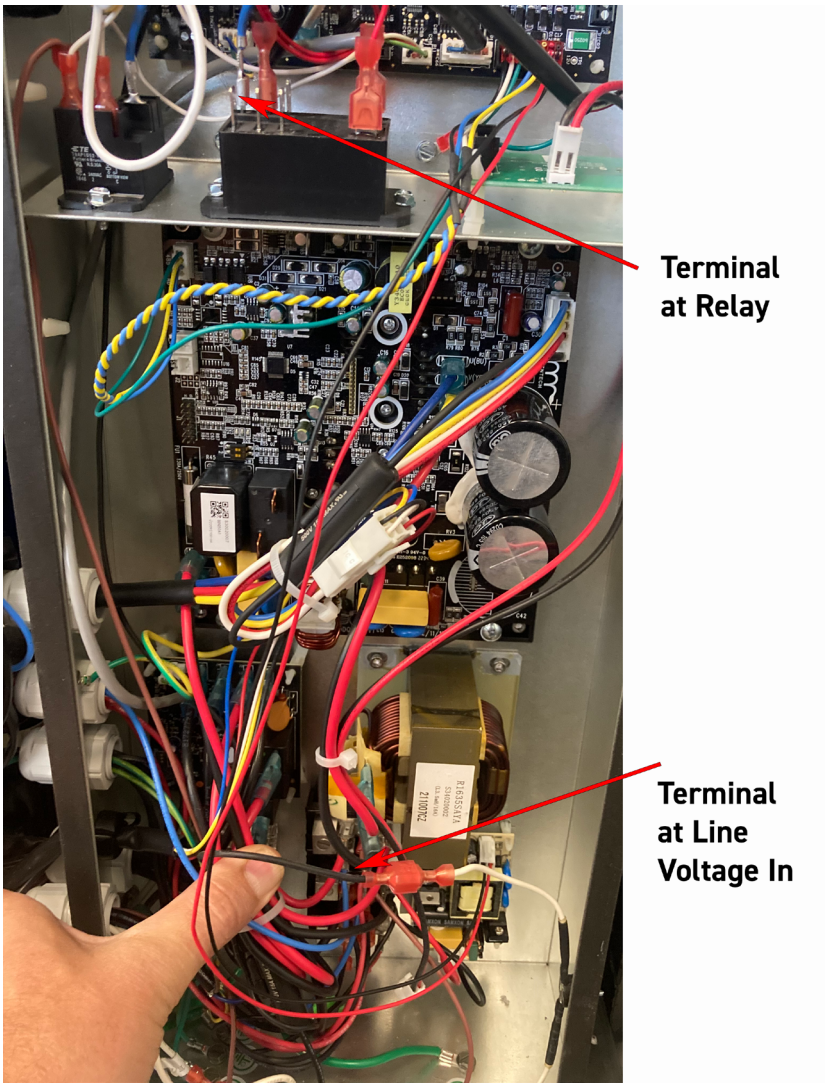


Figure 606

COMPONENT TESTING

Check the Indoor Fan

1. Check terminals at terminal block for secure connection/ broken terminals.
3. Check for 10 vdc at green and brown wires at white molex connector for indoor fan motor next fmc board.
4. If line voltage is present at terminal block, but 10 vdc is not present at white connector, indoor fan motor is bad.
5. If 10 vdc is present at white molex connector, jump from brown wire to yellow wire.

If fan does not run at full speed, fan is bad.

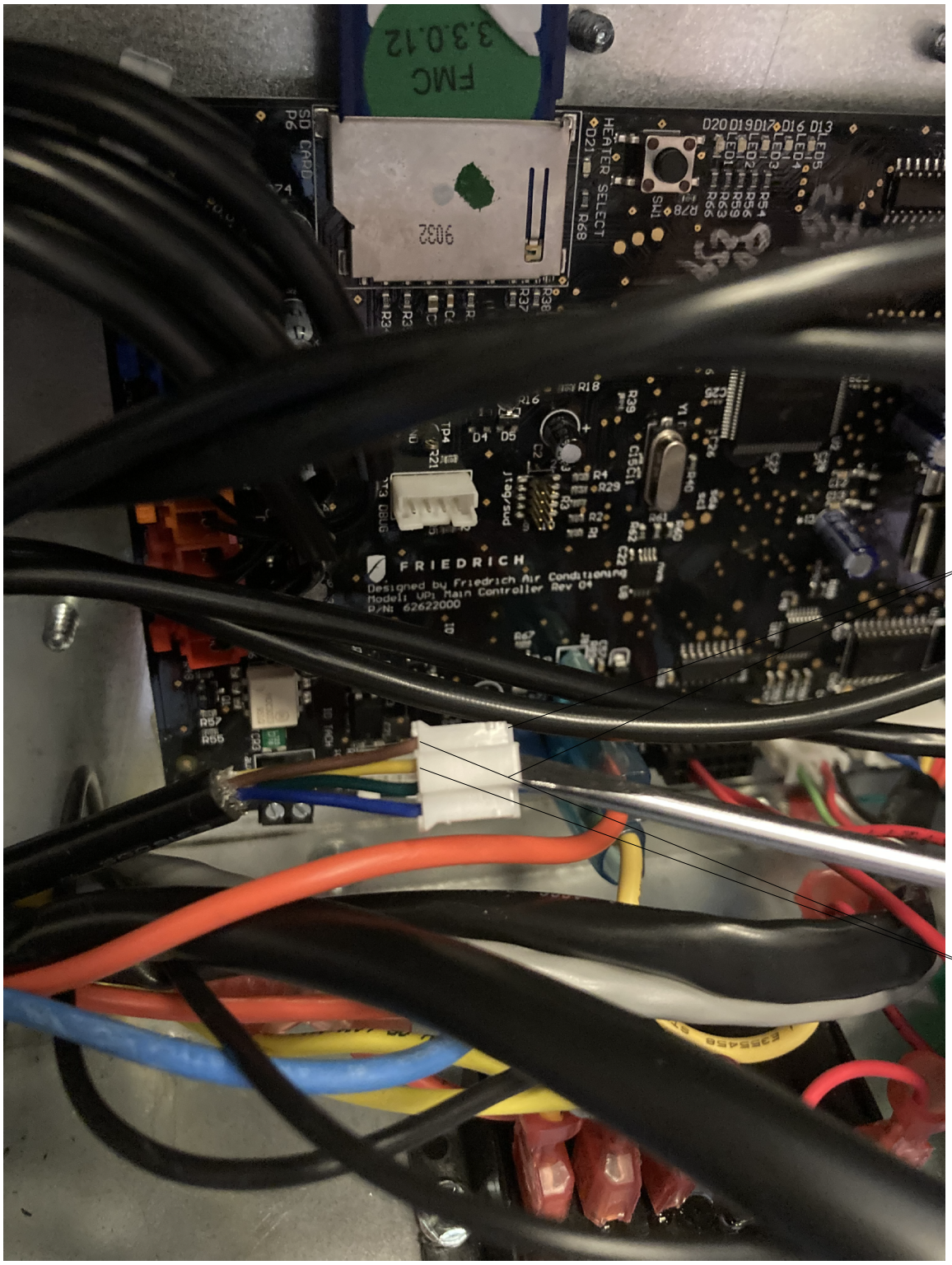


Figure 607

COMPONENT TESTING

Replace the Indoor Fan

1. Remove unit from closet.
2. Disconnect disconnect plug at fmc board.
3. Remove wires from clips back to fan
4. Disconnect power wires from terminal blocks.
5. Remove duct collar by removing screws
6. Remove rear panel by removing perimeter screws.
7. Remove rear panel from fan by removing 10 screws.
8. Remove fan mount bolts (Allen Head bolts (4 places).)
9. Install new fan motor in reverse sequence.

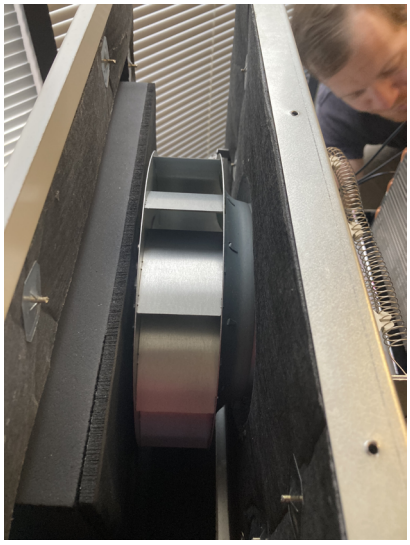


Figure 608

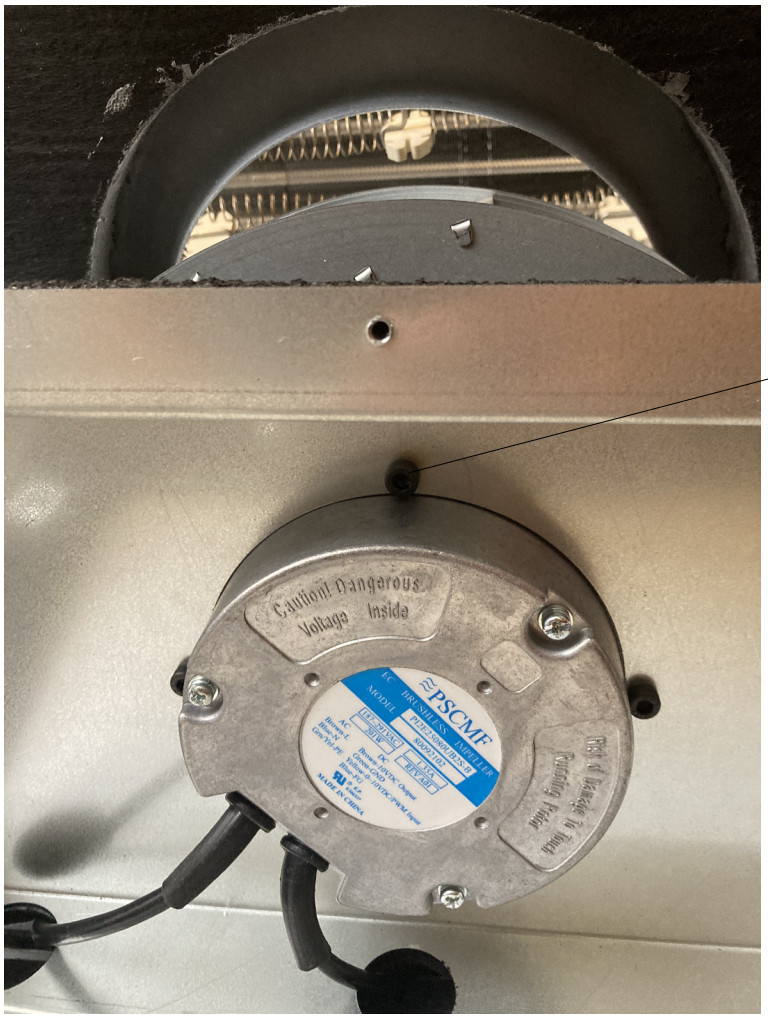


Figure 609

COMPONENTS TESTING

Driver Board Pin out

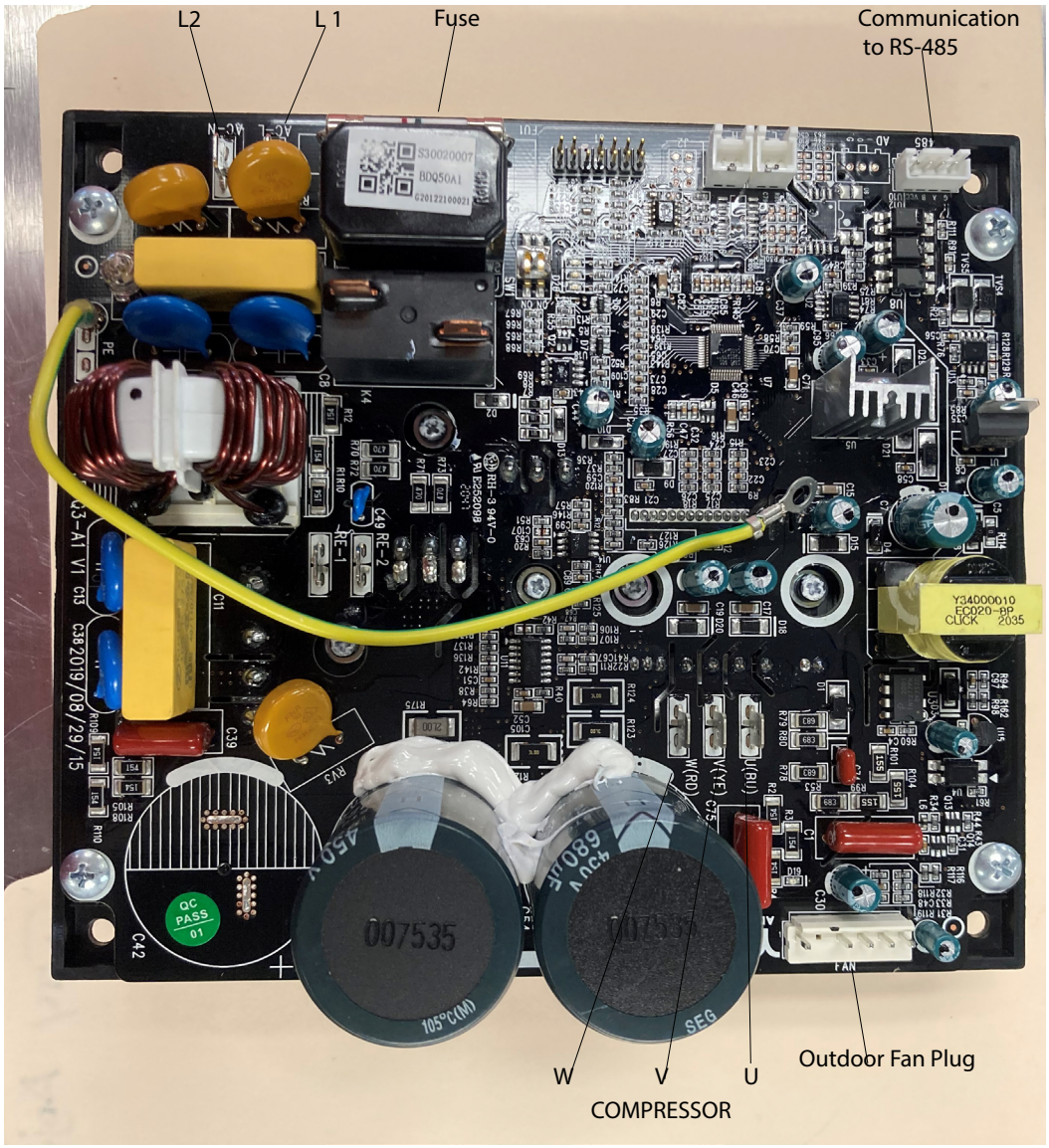


Figure 610

1. Check power in L1 and L2.
2. Communication to RS-485 board.
3. Power and signal out.
4. Compressor UVW out.

5. Remove power from the unit and allow two minutes for capacitors to discharge before attempting to take continuity readings.
6. Check for continuity on the fuses. If fuses are blown, replace driver board.
7. DIP SWITCH 1: OFF
8. DIP SWITCH 2 : OFF

COMPONENTS TESTING

Driver Board Replacement

1. Remove power from the unit and wait 2 minutes for capacitor bleed off before removing leads or handling the Driver board.
2. Remove front panel.
3. Disconnect electrical connections and tag wires.
4. Remove 4 9/64 allen head bolts.
5. Tap from the back to dislodge the board.

Caution: when reinstalling bolts use hand tools and hand tighten. Cross threading the bolts may cause the need for high level repairs.

6. Install new board into unit.

COMPONENT TESTING

Check RS-485 Converter Board

1. Check for 12vdc coming in from power supply board.
2. Check for V+ and V- signals ON PINS 1 AND 4 going to Driver Board.
3. Check for 12vdc going to FMC board on pins 1 and, and 5 and 6.

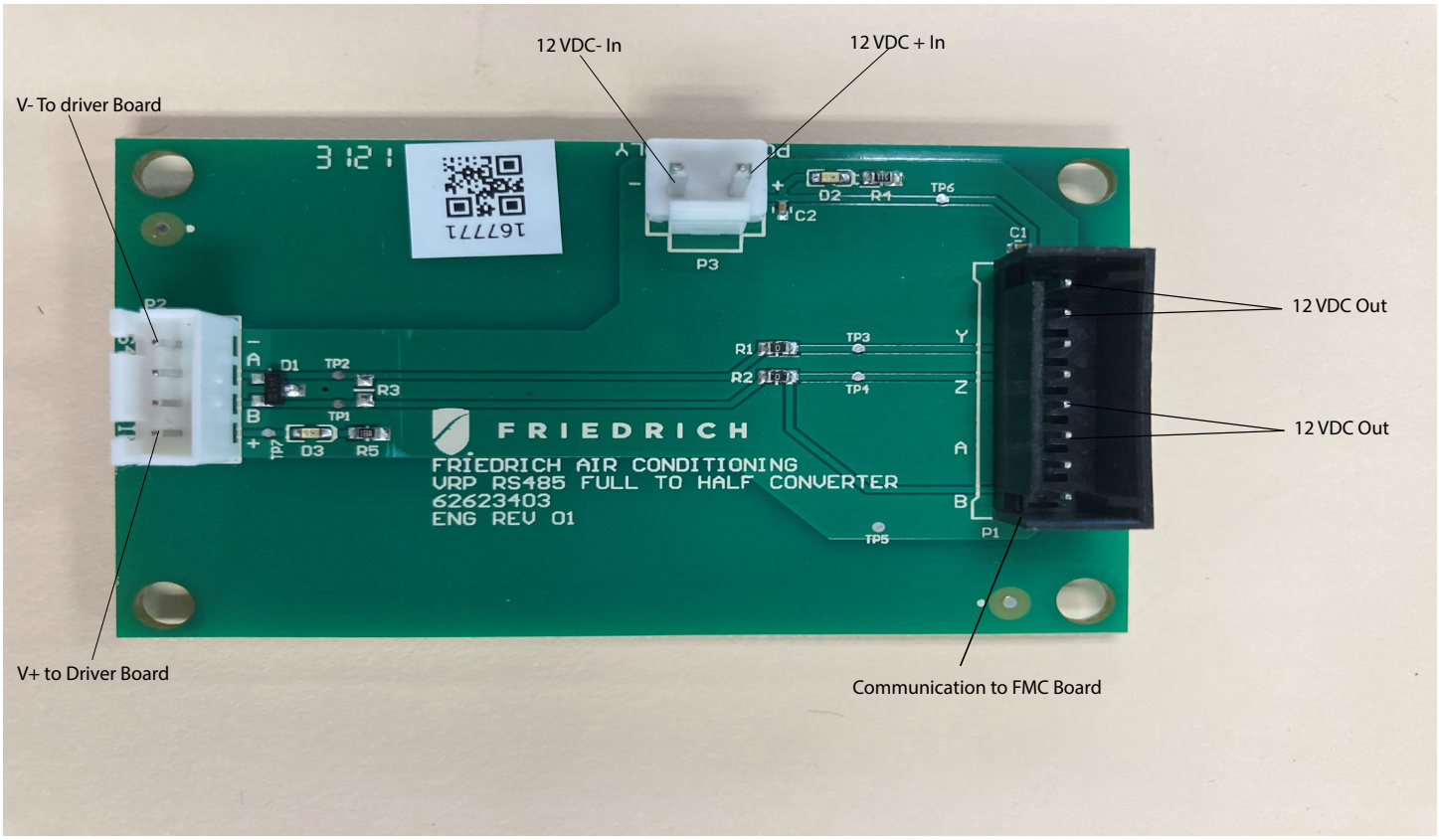


Figure 611

COMPONENTS TESTING

FMC Board Pin Out -Black Board

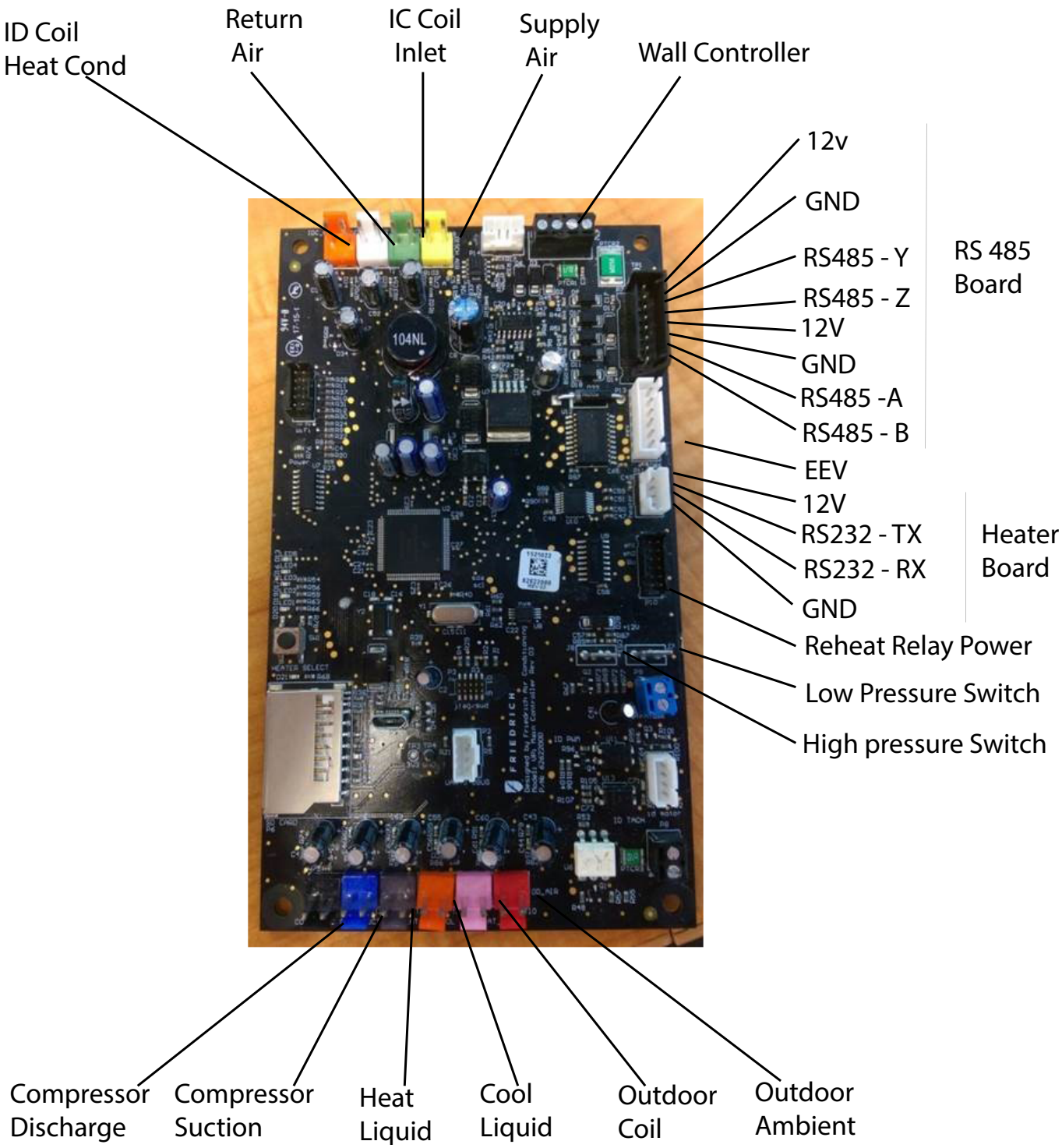


Figure 612. 1 (FMC Board) (Black Board)

NOTE: Depending on the date of production - this model may have different configuration for the FMC board. Refer to Figure 616.1 if the unit has a black FMC board installed and Figure 616.2 if the unit has a blue FMC board installed.

1. Check for 12 v to ground 3 places.
2. Check for 3.3 volts across thermistor pins.
3. Check resistance of thermistors (10 places). Refer to thermistor values (Figure 630).

COMPONENTS TESTING

Fmc Board Pin Out -Blue Board

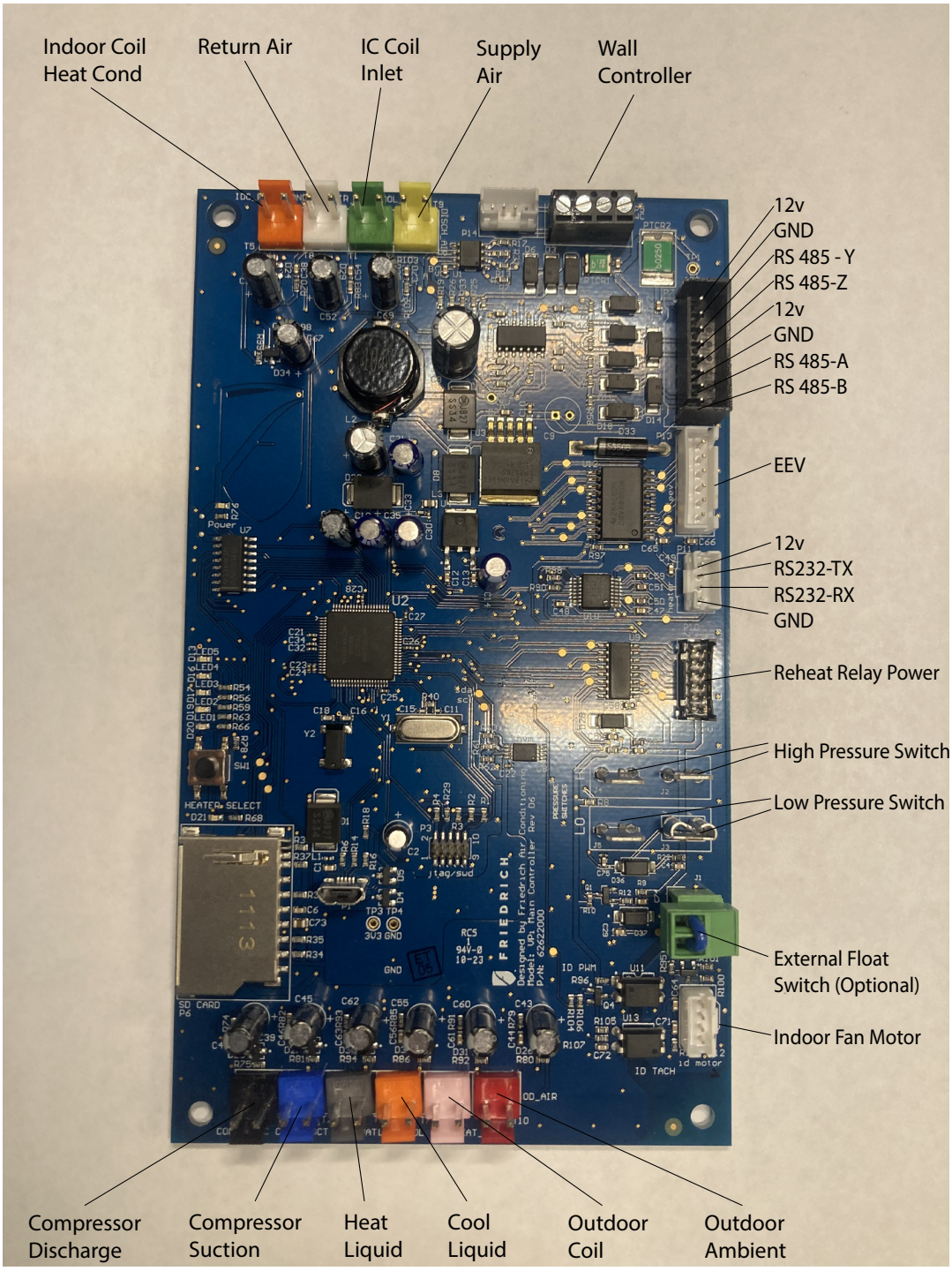


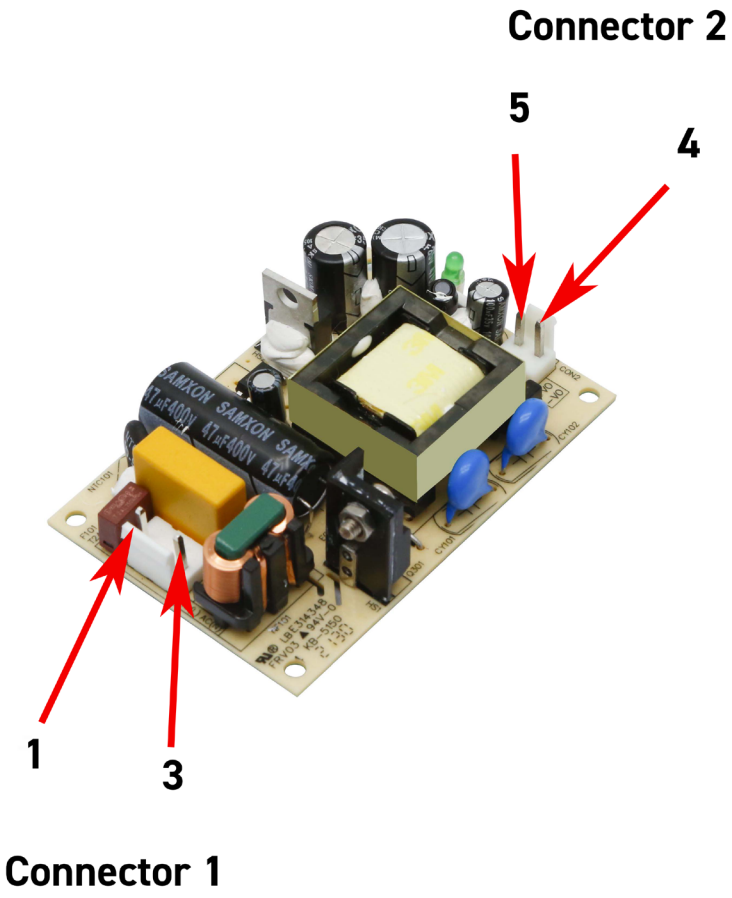
Figure 612.2 (FMC Board) (Blue Board)

NOTE: Depending on the date of production - this model may have different configuration for the FMC board. Refer to Figure 616.1 if the unit has a black FMC board installed and Figure 616.2 if the unit has a blue FMC board installed.

1. Check for 12 v to ground 3 places.
2. Check for 3.3 volts across thermistor pins.
3. Check resistance of thermistors (10 places). Refer to thermistor values (See Appendix)

COMPONENTS TESTING

Power Supply Pin Out



Power Supply Pin-Out		
Connector	Pin	Reading
Connector 1	1	AC(L1) 230 VAC+- %10
	2	No Pin
	3	AC(L2) 230 VAC+- %10
Connector 2	4	-Vo (12VDC) +- %10
	5	+Vo (12VDC) +- %10

Figure 613 (Power Supply Board)

Thermistor Locations
T8 (Return Air Sensor)

The T8 (Return Air Sensor) is located behind the Air Filter.

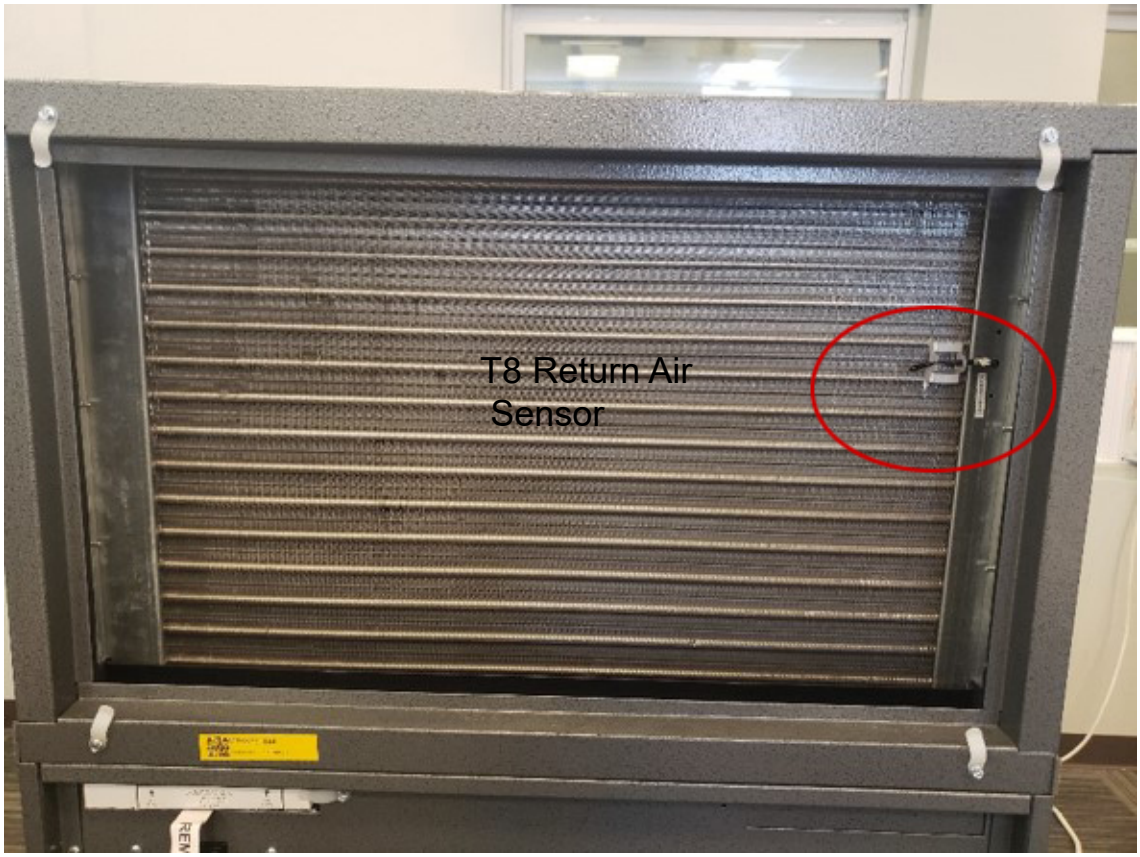


Figure 614

COMPONENTS TESTING

Thermistor Locations

T1 (Evaporator Coil In Sensor)
T5 (Evaporator Coil Out Sensor)

To access the evaporator coil sensors remove the top panel and right side upper panel.
The top sensor is T5 (Evap. Coil Out)
The lower sensor is T1 (Evap. Coil In.)

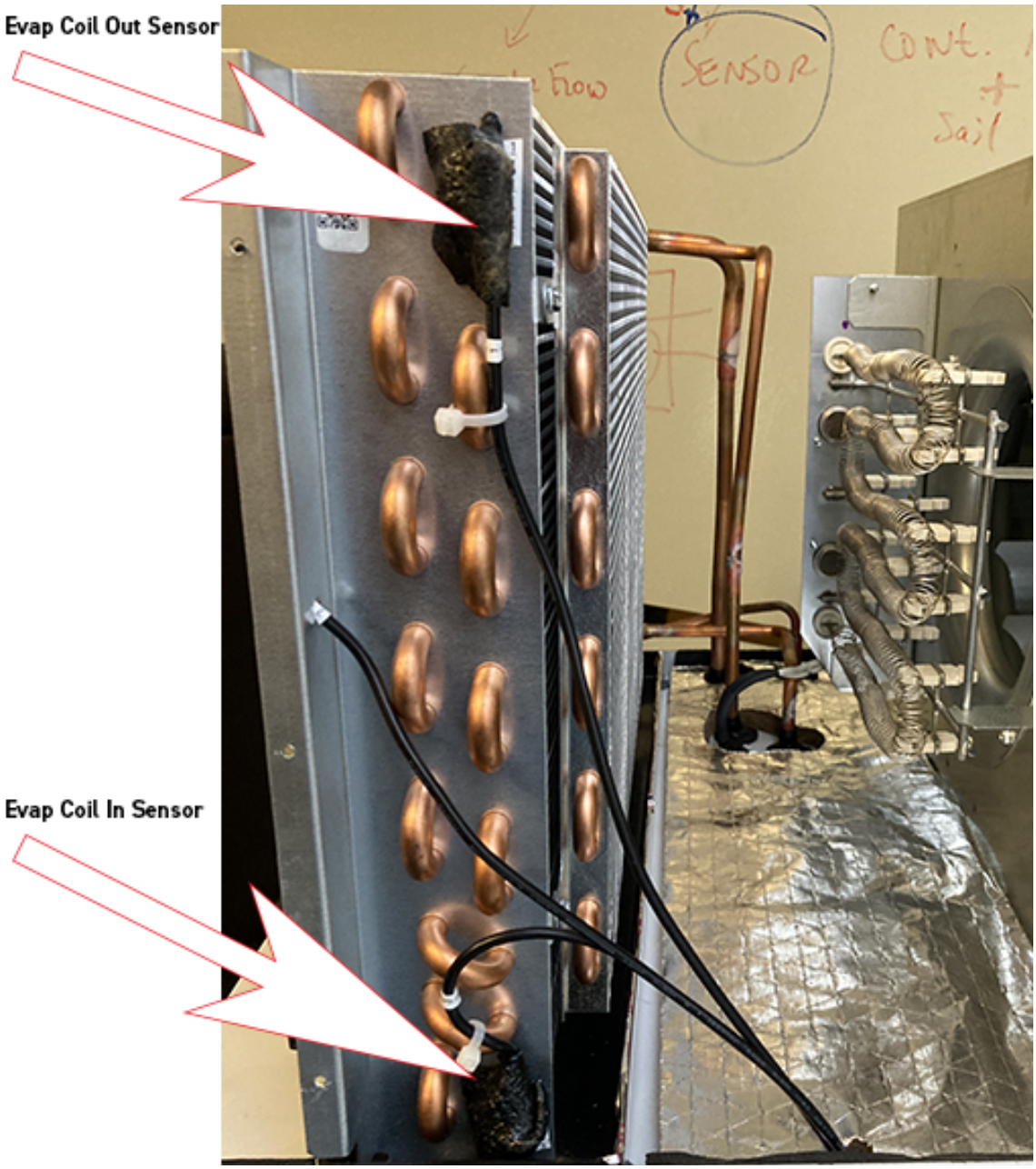


Figure 615

COMPONENTS TESTING

Thermistor Locations

T9 (Discharge Air Sensor)

The T9 discharge air sensor is located inside the blower housing.

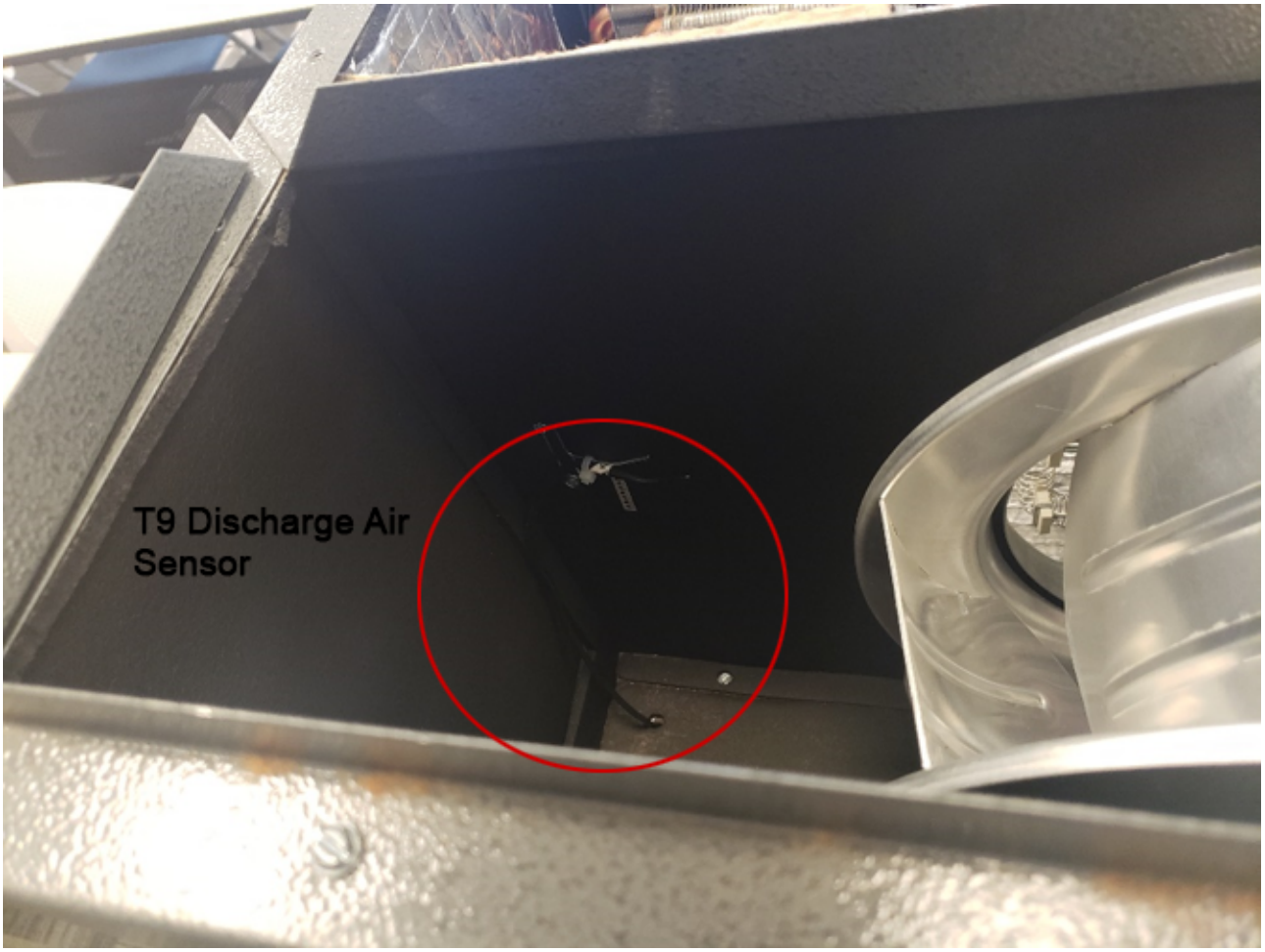


Figure 616

COMPONENTS TESTING

Thermistor Locations

T2 (Liquid Heat)
T6 (Liquid Cool)

The T2 and T6 Sensors are located in the outdoor section attached to the EEV (Electronic Expansion Valve).
The pipe going into the bottom of the EEV is T2 (Liquid Heat).
The one on the pipe leaving the side of the EEV is T6 (Liquid Cool).

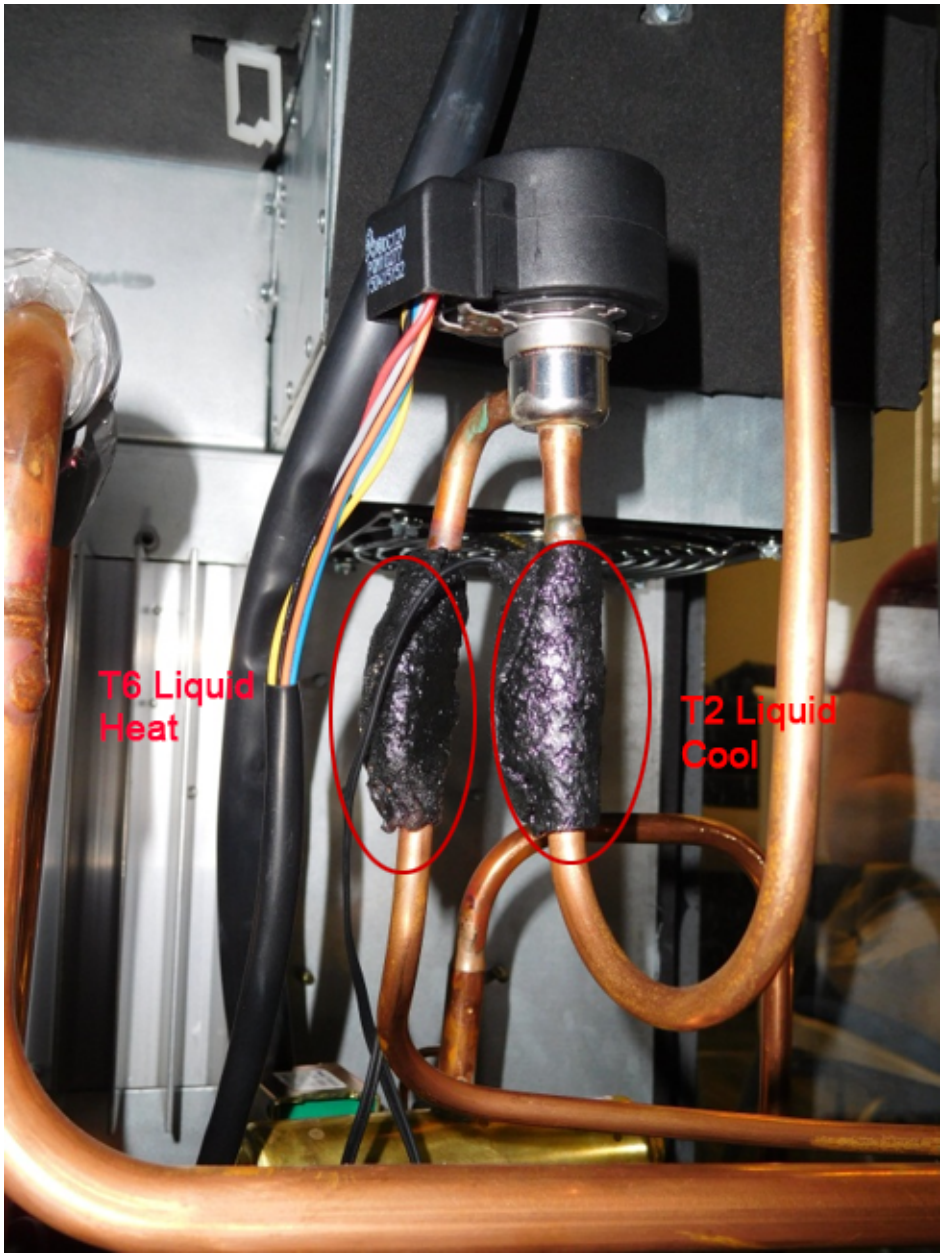


Figure 617

COMPONENTS TESTING

Thermistor Locations

T10 (Outdoor Ambient Air Sensor)

The T10 (Outdoor Ambient Air Sensor) is located in the outdoor section, mounted on the bottom of the indoor blower housing.

Figure 618

COMPONENTS TESTING

Thermistor Locations

T7 (Cond. Coil Sensor)

T7 (Cond. Coil Sensor is attached to the outdoor coil on the right hand side.
This sensor is attached to the coil roughly halfway down on one of the return bends.

Figure 619

COMPONENTS TESTING

Thermistor Locations

T4 (Comp. Discharge).

The T4 (Comp. Discharge) is attached to the compressor discharge line.

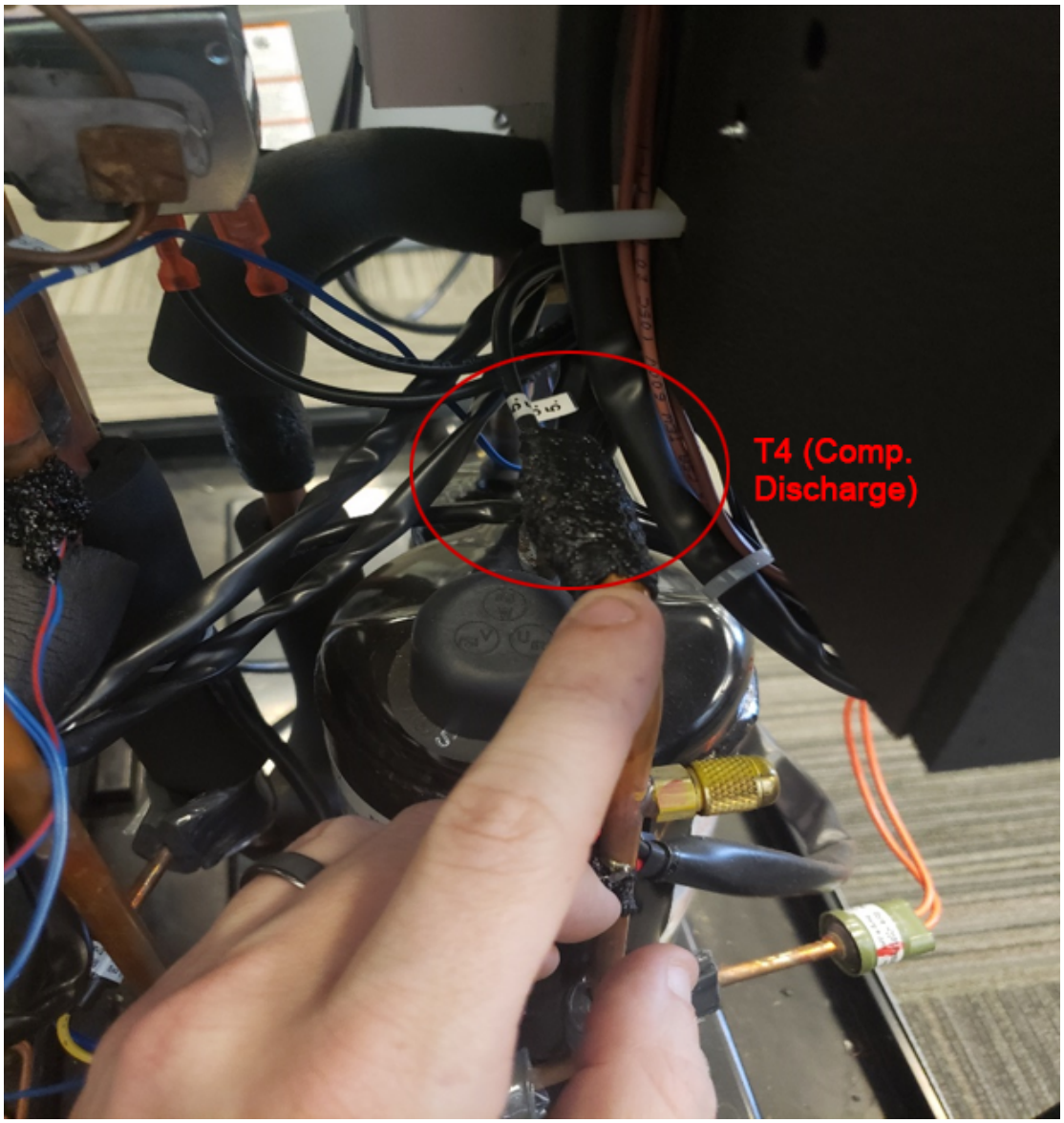


Figure 620

COMPONENTS TESTING

Thermistor Locations

T3 (Comp. Suction).

The T3 (Comp. Suction) is attached to the compressor suction line.

Figure 621

COMPONENTS TESTING

Thermistor Part numbers

Part Number	Sensor
80083701	SENSOR EVAP COIL OUT ORG (T5)
80083702	SENSOR RETURN AIR TEMP WHT (T8)
80083703	SENSOR EVAP COIL IN GRN (T1)
80083704	SENSOR DISCHARGE AIR YEL (T9)
80083705	SENSOR COMPRESSOR DISCHARGE BLK (T4)
80083706	SENSOR COMPRESSOR SUCTION BLU (T3)
80083707	SENSOR HEATING LIQUID BRW (T2)
80083708	SENSOR COOLING LIQUID ORG (T6)
80083709	SENSOR CONDENSER OUT PNK (T7)
80083710	SENSOR AMBIENT RED (T10)

COMPONENTS TESTING

Check High and Low Pressure Limit Switches (Black FMC Board Installed)

NOTE: Depending on the date of production - this model may have different configuration for the FMC board. Refer to Figure 612.1 if the unit has a black FMC board installed and Figure 612.2 if the unit has a blue FMC board installed.

1. Ensure power is removed from the unit.
2. At fmc board disconnect the orange(Sometimes white) (J8) and yellow (J7) wires.
3. The switches are wired together in series and if either switch is faulty you will get an error code 14.
4. Trace high pressure switch wires through grommet into electrical control box and locate disconnect point.
5. Disconnect orange (sometimes white) and blue wire.
6. Check orange (White) to orange (White) to check high pressure switch.
7. Check yellow to blue for low pressure switch.
8. An ohms reading of open indicates a faulty switch or refrigerant pressure.

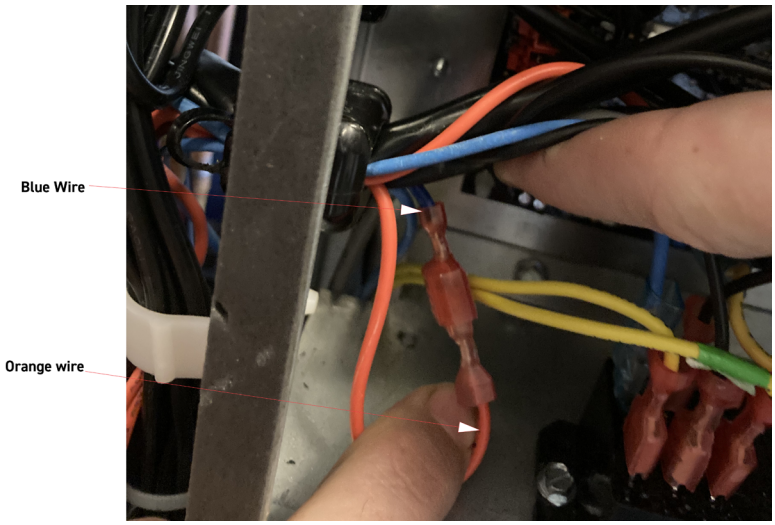


Figure 622

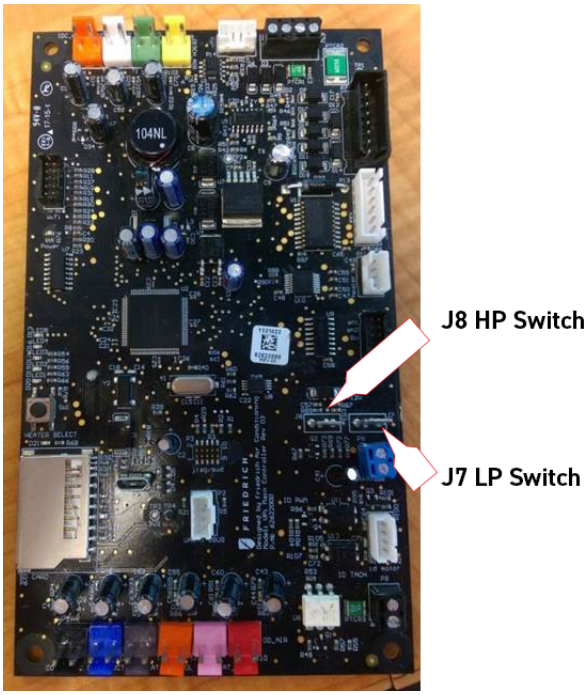
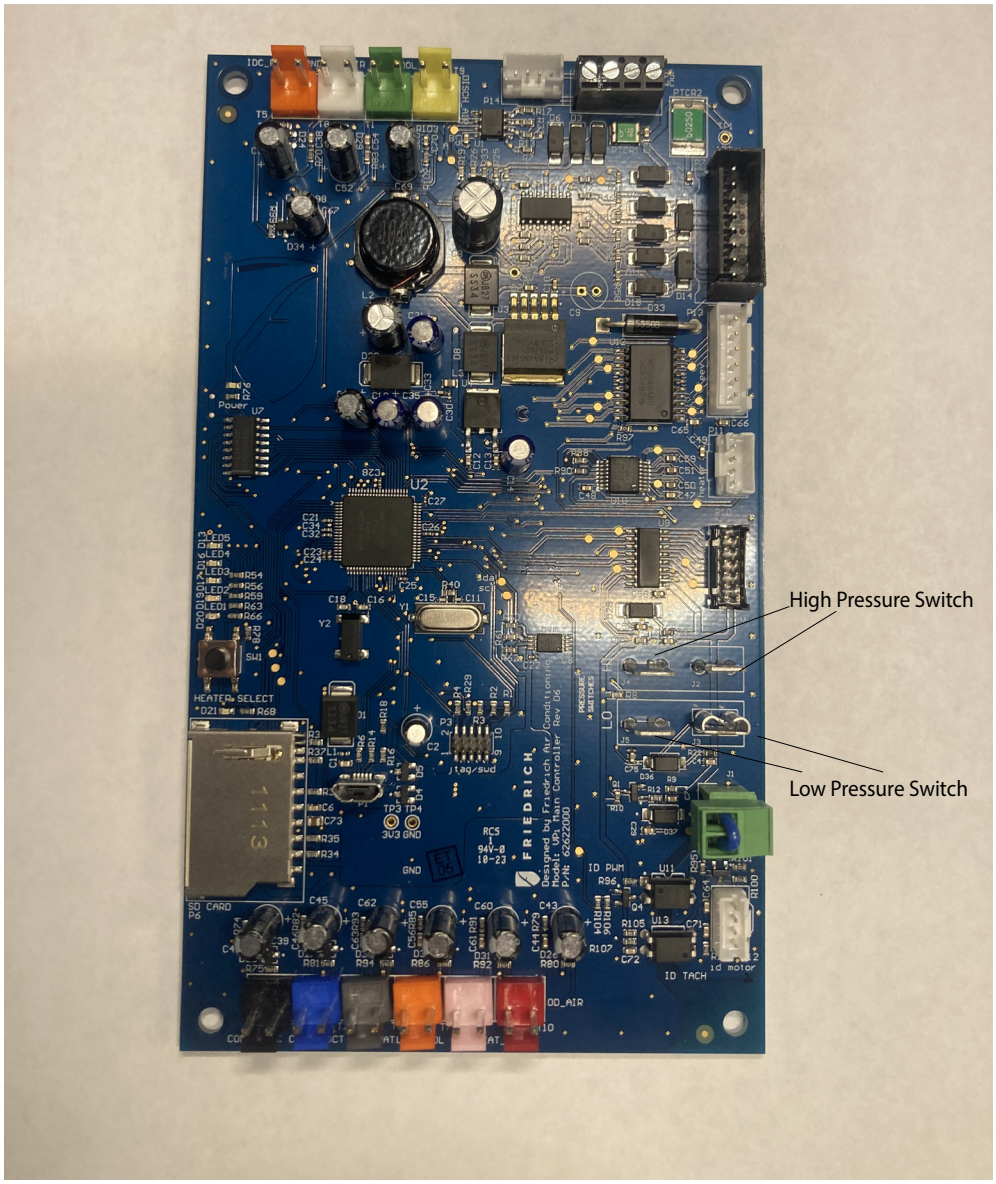


Figure 623

COMPONENTS TESTING

Check High and Low Pressure Limit Switches (Blue FMC Board Installed)

NOTE: Depending on the date of production - this model may have different configuration for the FMC board. Refer to Figure 612.1 if the unit has a black FMC board installed and Figure 612.2 if the unit has a blue FMC board installed.



CAUTION: Ensure power is removed from the unit.

1. Check High Pressure Switch
    - 1.1 At fmc board disconnect the (J2) and(J4) wires.
    - 1.2 Measure resistance across the wires
    - 1.3 An ohms reading of open indicates a faulty switch or high refrigerant pressure.
2. Check Low Pressure Switch
    - 1.1 At fmc board disconnect the (J3) and(J5) wires.
    - 1.2 Measure resistance across the wires
    - 1.3 An ohms reading of open indicates a faulty switch or low refrigerant pressure.

Installation Instructions

High Pressure Switch Replacement

Please read these instructions completely before attempting installation.

DISCONNECT POWER AND FOLLOW ALL LABELED WARNINGS.

Kit Contents:

DESCRIPTION	QTY
FIELD HIGH PRESSURE SWITCH	1
SWIVEL TEE WITH NUT	1
WIRE WITH TERMINAL ENDS	2
BLACK ZIP TIE	1
WHITE BLOCK ZIP BAG	1
SHEET OF INSTRUCTIONS	1

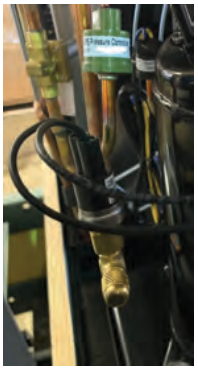
Step 1. Attention! Please read these instructions before attempting installation. Always turn off all the power to the unit.

Step 2. Remove front and side panels for a better access.

COMPONENTS TESTING

Replace High Pressure Limit Switches

Step 3. Install pressure switch to discharge tube service port. To minimize refrigerant loss, install assembly quickly.



Step 4. Cut the wires off old pressure switch and strip them. Attach wire and terminals provided in kit to new pressure switch and existing wire. Switch will function properly with wiring connected in either order.

Step 5. Collect all loose wiring and zip tie together, remove any reaming wire from old pressure switch.

Step 6. New switch is complete. Reinstall all panels and power up unit to make sure all repairs were completed.

COMPONENTS TESTING

Replace Low Pressure Limit Switches

Installation Instructions

Low Pressure Switch Replacement

Please read these instructions completely before attempting installation.

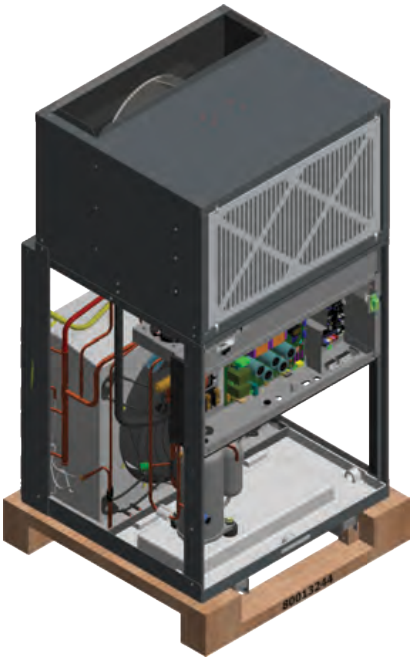
DISCONNECT POWER AND FOLLOW ALL LABELED WARNINGS.

Kit Contents:

DESCRIPTION	QTY
FIELD LOW PRESSURE SWITCH	1
SWIVEL TEE WITH NUT	1
BLACK ZIP TIE	1
TWIST-ON WIRE CONNECTOR	2
WHITE BLOCK ZIP BAG	1
SHEET OF INSTRUCTIONS	1

Step 1. Attention! Please read these instructions before attempting installation. Always turn off all the power to the unit.

Step 2. Remove front and side panels for a better access.



COMPONENTS TESTING

Replace Low Pressure Limit Switches

Step 3. Install pressure switch to suction tube service port. To minimize refrigerant loss, install assembly quickly.

Step 4. Cut the wires off old pressure switch and strip them. Attach to existing wire to new pressure switch wires with the two wire nuts supplied in kit. You can't miss wire it.

Step 5. Collect all loose wiring and zip tie together, remove any reaming wire from old pressure switch.

Step 6. New switch is complete. Reinstall all panels and power up unit to make sure all repairs were complet

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". 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.

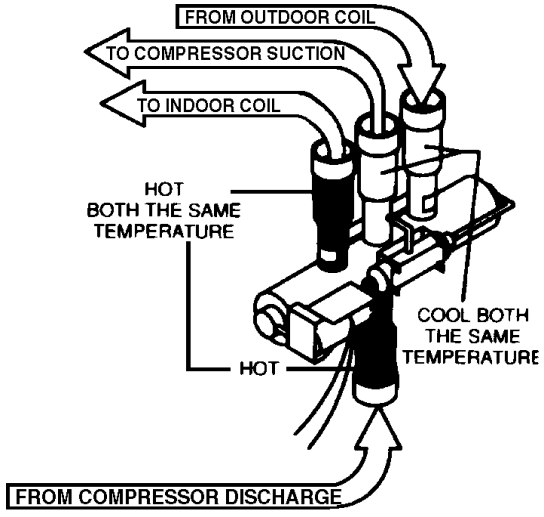
If the valve is stuck in the heating position, block the air flow through the indoor coil and allow discharge pressure to build in the system. Then switch the system from heating to cooling.

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

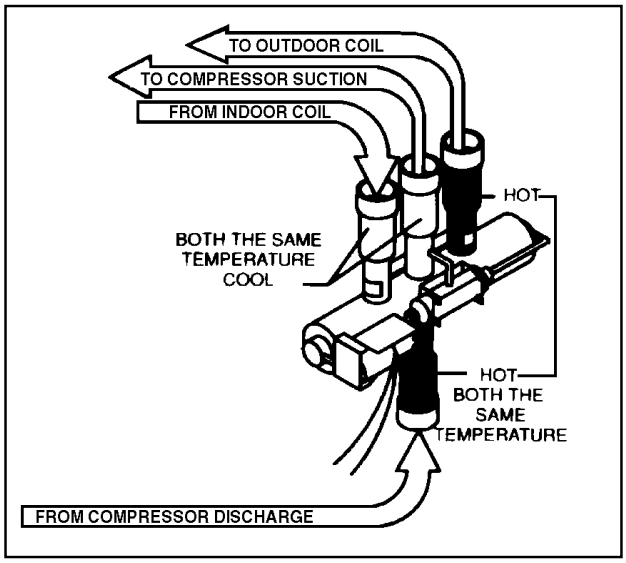
Dented or damaged valve body or capillary tubes can prevent the main slide in the valve body from shifting.

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.



Reversing Valve in Heating Mode



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

Not following the above WARNING could result in fire or electrically unsafe conditions which could cause moderate or serious property damage.
Read, understand and follow the above warning.

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, protect from heat while changing valve.
3. Unbraze 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 and 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.

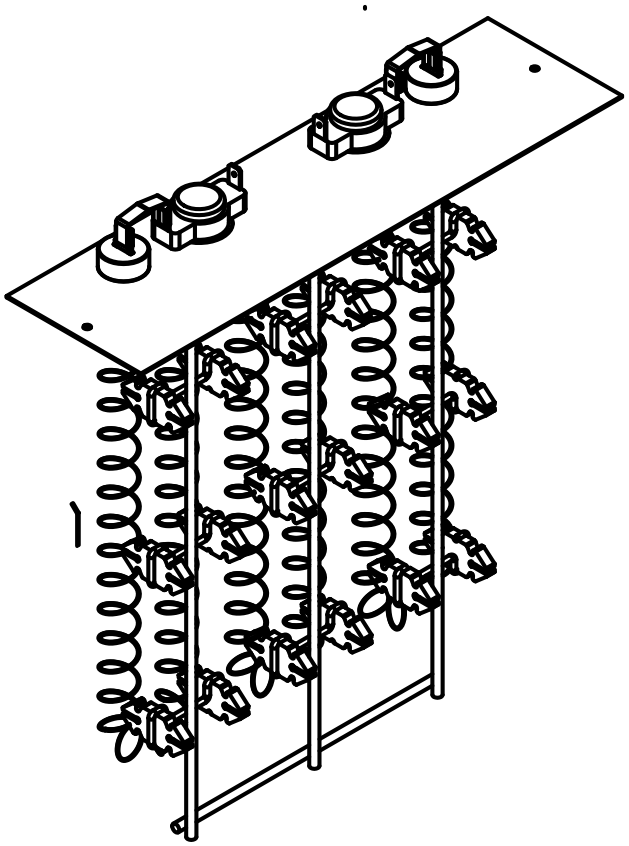
COMPONENT TESTING

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: * TEMPERATURE OF VALVE BODY ** WARMER THAN VALVE BODY	
	1	2	3	4	5	6	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.
							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).	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
Starts to shift but does not complete reversal.	Hot	Warm	Warm	Hot	*TVB	Hot	Not enough pressure differential at start of stroke or not enough fl ow to maintain pressure differential.	Check unit for correct operating pressures and charge. Raise head pressure. If no shift, use valve with smaller port.
							Body dama ge.	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 suf fi cient to maintain reversal.	Raise head pressure, operate solenoid. If no shift, use valve with smaller ports.
	Hot	Hot	Hot	Hot	Hot	Hot	Both ports of pilot open.	Raise head pressure, operate solenoid. If no shift, replace valve.
Apparent leap in heating.	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.
	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

COMPONENT TESTING

Heating Elements



Part Number	Coil Resistance	Thermal Disc Limiter	Thernal Disc Fuse	specs
80102291	13.68 Ohms +- 5%	Open 155°F Close 125°F	08-2834-09 Open 200°F	3.4 kw 230v
80102290	18.61 Ohms +- 5%	Open 155°F Close 125°F	08-2834-09 Open 200°F	2.5 kw 230v
80102295	24.71 Ohms +-5%	Open 155°F Close 125°F	08-2834-09 Open 200°F	2.5 kw 265v
80102296	18.17 Ohms +-5%	Open 155°F Close 125°F	08-2834-09 Open 200°F	3.4 kw 265v

COMPONENT TESTING

Replace the Heating Elements

1. Remove duct work as necessary to gain access to top panel.

2. Remove top panel.

3. Disconnect input wires (2 places)

4. Remove Mounting screws (2 places).

5. Lift heater element assembly straight up and out of unit.

Figure 624

COMPONENTS TESTING

Heater Board Pin Out

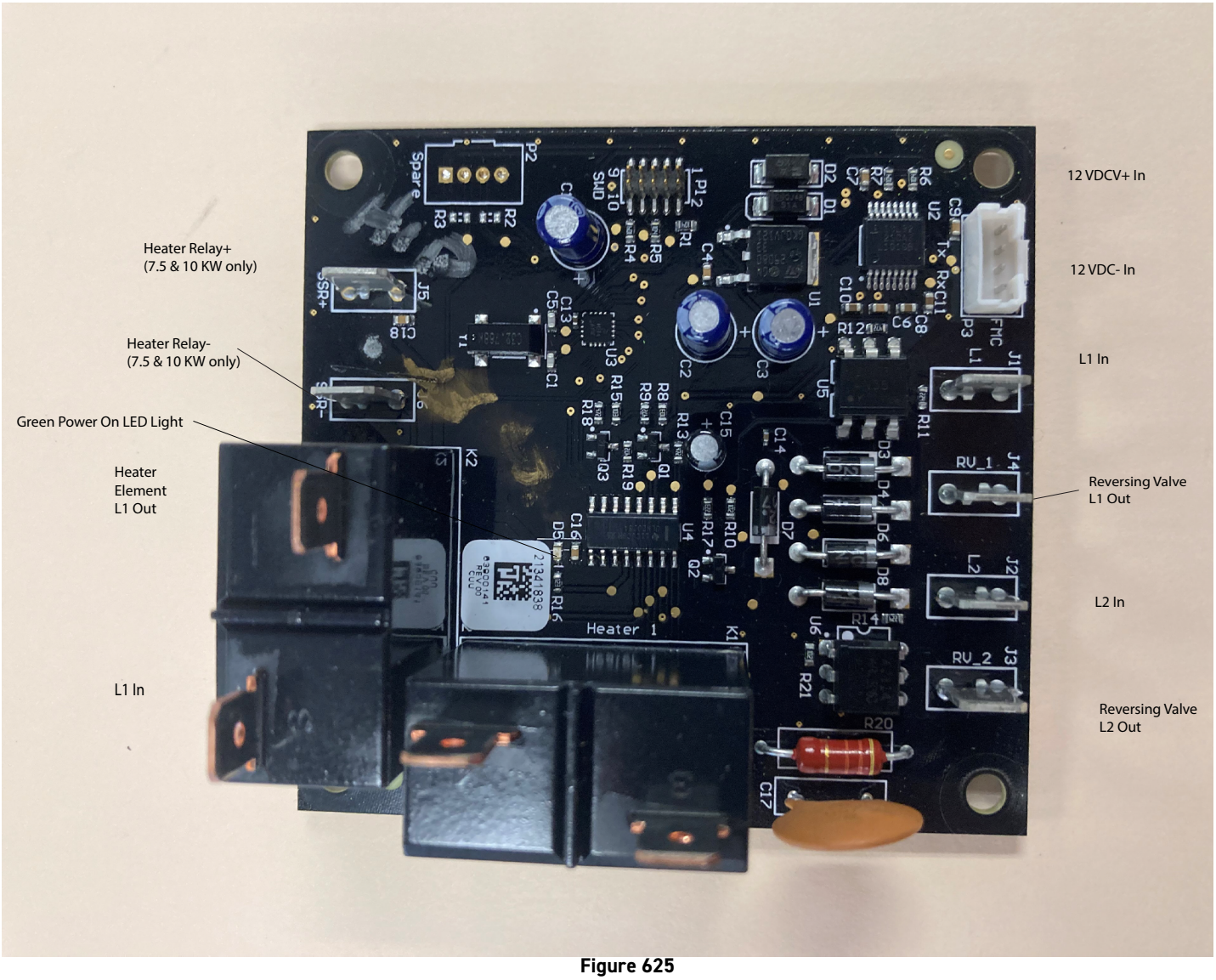


Figure 625

Is the green light on the board illuminated?

1. If not check connecting cable by unplugging and re-seating at both ends of cable.

Still no light?

2. Check for 12 vdc on outside pins (1 and 4) on plug P3.
3. Check continuity through the cable from the FMC board.
4. Check for line voltage at L1 and L2.
5. With demand for electric heat on check for voltage at L1 and L2 out.

COMPONENTS TESTING

Heater Board Replacement

1. Ensure power is removed from the unit.
2. Disconnect all wires and identify.
3. Remove board by carefully compressing standoffs.
4. Install new board.

Note: When ordering the part, the model and serial number must be supplied for flashing of board.

R-410A SEALED SYSTEM REPAIR

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.

⚠ 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.

⚠ WARNING

EPA 608 Warning:
It is a violation of the environmental Protection Agency, Claus608A, to service refrigeration systems without proper certification

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 Friedrich approved R-410A filter dryers only.

IMPORTANT

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

EQUIPMENT REQUIRED:

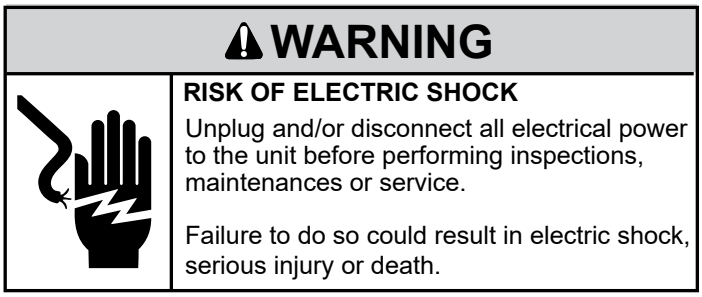
1. Electrical Multimeter
2. E.P.A. Approved Refrigerant Recovery System
3. Vacuum Pump (capable of 200 microns or less vacuum.)
4. Acetylene Welder
5. Electronic Halogen Leak Detector capable of detecting HFC (Hydrofluorocarbon) refrigerants.
6. R-410A Refrigerant Manifold
7. 1/4" Braze-type Access Ports
8. Pinch Tool
9. Refrigerant Scale
10. Vacuum Gauge - (0 - 1000 microns)
11. Facilities for flowing nitrogen through refrigeration tubing during all brazing processes.

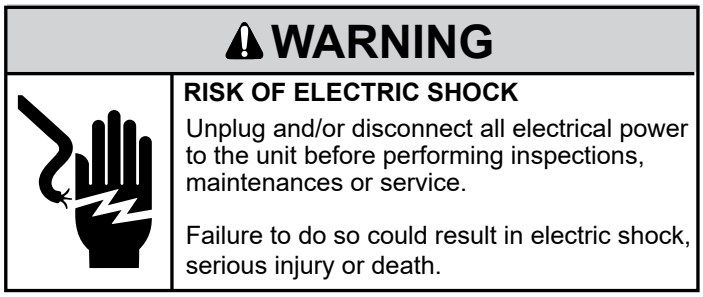
EQUIPMENT MUST BE CAPABLE OF:

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 REPAIR

Refrigerant Charging





Proper refrigerant charge is essential to 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.

NOTE:Factory sealed units will not be overcharged

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 these systems.

An overcharged unit will at times 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 REPAIR

Undercharged Refrigerant Systems

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

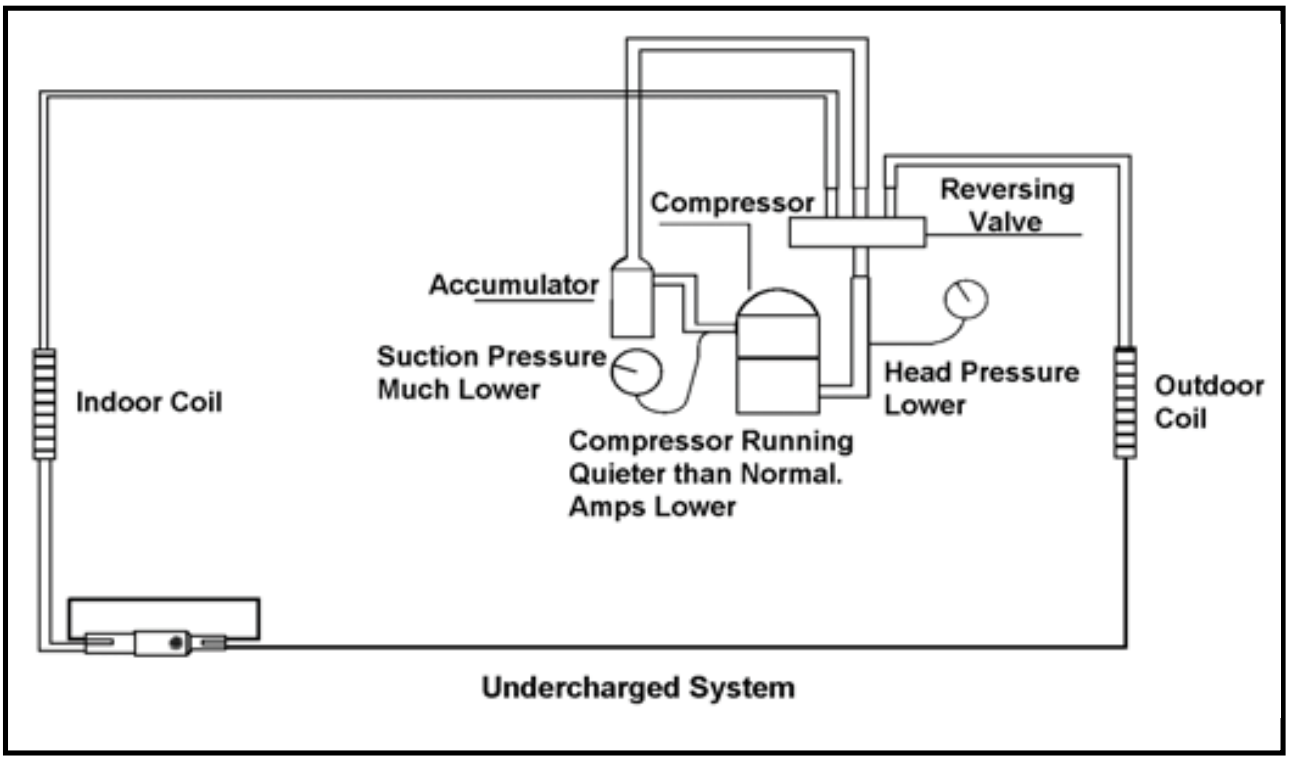
Whenever you service a unit with an undercharge of refrigerant, always suspect a leak. The leak must be repaired before charging the unit.

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.

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.



R-410A SEALED SYSTEM REPAIR

Overcharged Refrigerant Systems

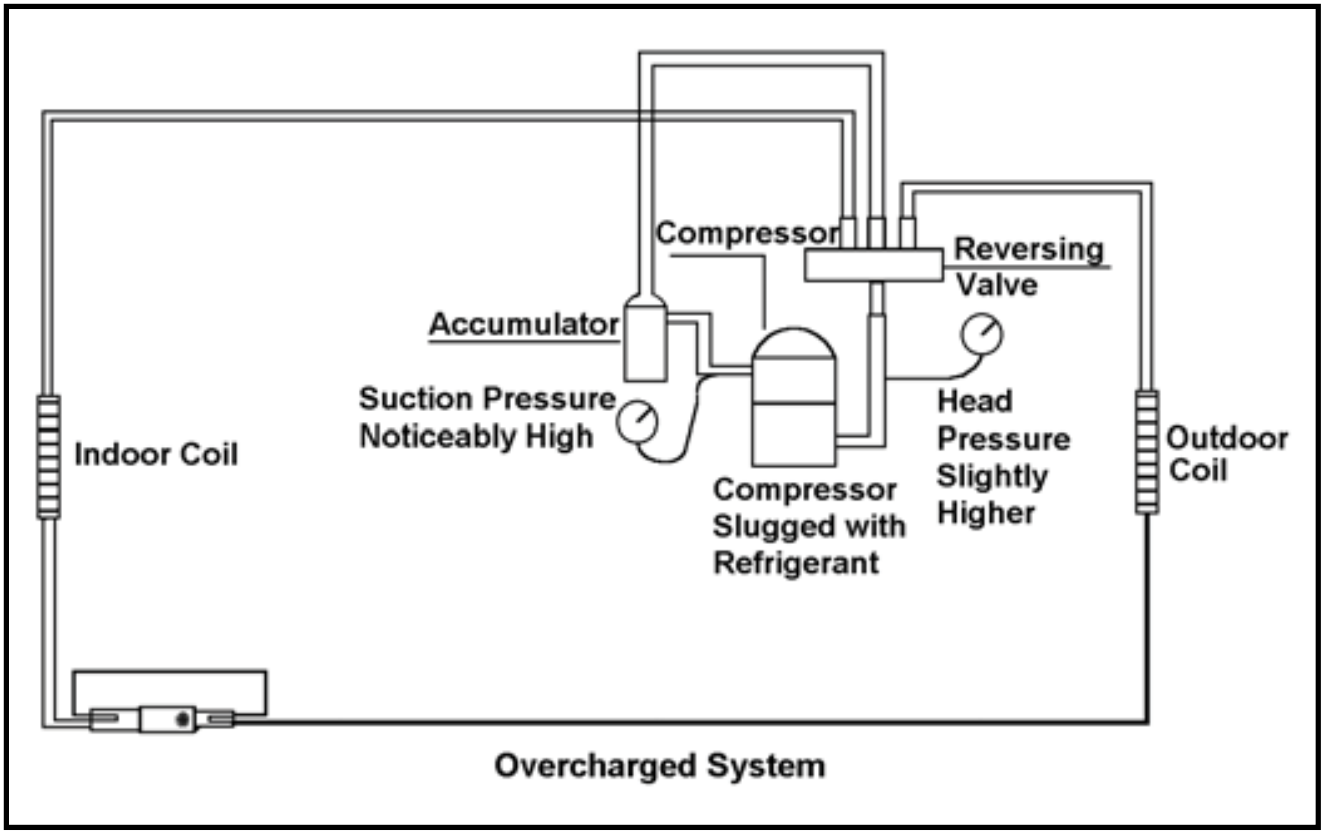
Compressor amps will be near normal or higher. Non-condensables can also cause these symptoms. To confirm, remove some of the charge, if conditions improve, system may be overcharged. If conditions don't improve, Non-condensables are indicated.

NOTE:Factory sealed units will not be overcharged

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.



R-410A SEALED SYSTEM REPAIR

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."

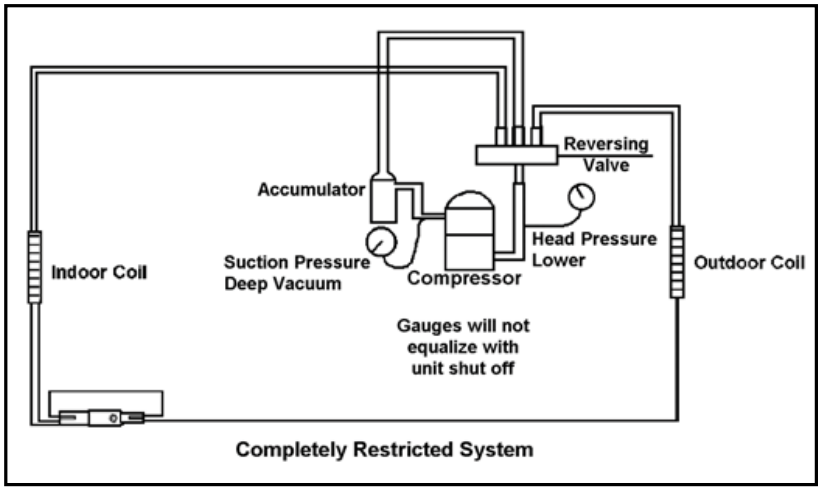
When the unit is shut off, the gauges may equalize very slowly.

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.

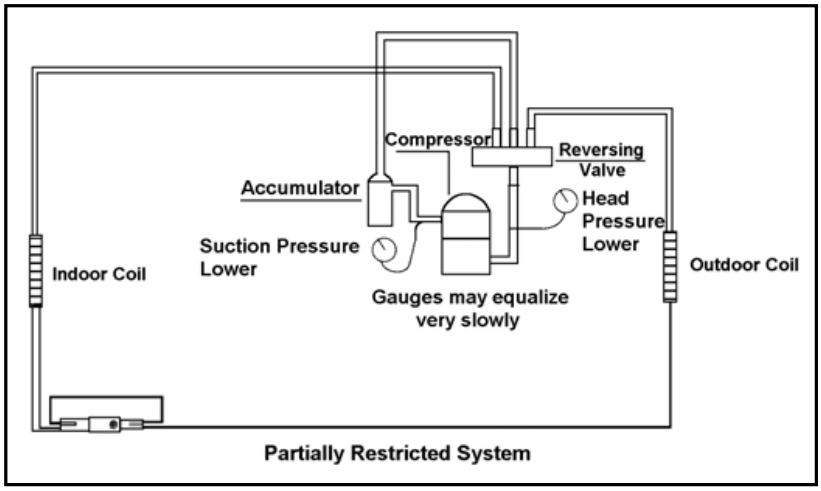
Often a partial restriction of any type can be found by feel, as there is a temperature difference from one side of the restriction to the other.

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.



Completely Restricted System



Partially Restricted System

R-410A SEALED SYSTEM REPAIR

Sealed System Method of Charging/ Repairs

⚠ 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.

⚠ 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.

The only acceptable method for charging the sealed system is the Weighed in Charge Method. The weighed in charge method is applicable to all units. It is the preferred method to use, as it is the most accurate.

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. Connect your EPA approved gauges to the proper valves with 750 psig rated pressure hoses.
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. Remove hoses and ensure valves are tight and sealed to the O-ring in the valve cap.

R-410A SEALED SYSTEM REPAIR

Compressor Replacement

⚠ 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.

⚠ 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

Electrical Shock Hazard

Pull out electrical disconnect on front of the chassis and turn off all power to unit before servicing.

Failure to do so can result in property damage, personal injury and/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.

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 though 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 trace amounts of R-410A and nitrogen and leak test all connections. Sweep with with an electronic or Halide leak detector. 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 200 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.

9a. Evacuate the system to 1500 microns.

9b. Repressurize to 50 PSI with nitrogen.

9c. Evacuate the system to 1000 microns.

9d. Repressurize to 50 PSI with nitrogen.

9e. Evacuate the system to below 500 microns.

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.

R-410A SEALED SYSTEM REPAIR

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,and EEV.

3. Flush evaporator, condenser and all connecting tubing with dry nitrogen or equivalent. Use standard 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.

5. Pressurize with a combination of R-410A and nitrogen and leak test all connections. If a leak cannot be found, pressurize with a combination of Nitrogen and a trace charge of R-410A and sweep with with an electronic or Halide 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 200 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.

6a. Evacuate the system to 1500 microns.

6b. Repressurize to 50 PSI with nitrogen.

6c. Evacuate the system to 1000 microns.

6d. Repressurize to 50 PSI with nitrogen.

6e. Evacuate the system to below 500 microns.

7. Recharge the system with the correct amount of refrigerant using digital scale. The proper refrigerant charge will be found on the unit rating plate.

R-410A SEALED SYSTEM REPAIR

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

Not following the above WARNING could result in fire or electrically unsafe conditions which could cause moderate or serious property damage.
Read, understand and follow the above warning.

1. 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, protect from heat while changing valve.
3. Unbraze 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 Trace of R-410A and nitrogen and check for leaks, using a suitable leak detector.
9. Once the sealed system is leak free, install solenoid coil on new valve. Evacuate system using triple evacuation process 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.

R-410A SEALED SYSTEM REPAIR

Replace The Condenser Coil 7k

1. Remove unit from the closet.

2. Ensure no charge is left in the system, evacuating according to EPA standards.

3. Remove the lower side panels.

4. Brace upper section as necessary to remove rear corner posts.

5. Removes screws from posts and remove rear posts

6. Remove 4 screws attaching fan shroud to condenser.

7. Detach one thermistor from coil.

8. Sweat out tubing connections to condenser coil as required

9. Slide coil out of rear of the unit .

10. Reinstall evaporator coil in reverse sequence.

11. Pressurize with a combination of R-410A and nitrogen. Leak test all connections. If a leak cannot be found, pressurize with a combination of Nitrogen and a trace charge of R-410A and sweep with with an electronic or Halide leak detector. Recover refrigerant and repair any leaks found.

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

Repeat Step 9 to insure no more leaks are present.

13. Evacuate the system with a good vacuum pump capable of a final vacuum of 200 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.

14. 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.

R-410A SEALED SYSTEM REPAIR

Replace The Evaporator Coil 7k

1. Remove unit from closet.

2. Ensure no charge in the system, evacuating according to EPA standards.

3. Remove top panel.

4. Remove duct collar.

5. Remove upper side upper panel.

NOTE: LH upper side panel has low voltage wiring terminal attached to it. Secure panel (or disconnect wires) when removing to prevent stress and/ or damge to wiring.

6. Detach 3 thermistors from coil.

7. If Unit has a reheat coil;

Reheat coil can be removed from evaporator coil by removing 4 screws.

Caution: reheat coil will need to be supported to prevent damage to tubing.

Alternatively, the tube to reheat coil can either be sweated off and rebrazed or cut and swedged.

8. Sweat out evaporator coil tubing connections.

9. Lift coil up and out and replace evaporator coil in reverse sequence. Reinstall reheat coil if applicable.

10. Pressurize with a combination of R-410A and nitrogen and leak test all connections . If a leak cannot be found, pressurize with a combination of Nitrogen and a trace charge of R-410A and sweep with with an electronic or Halide leak detector. Recover refrigerant and repair any leaks found.

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

Repeat Step 11 to insure no more leaks are present

12. Evacuate the system with a good vacuum pump capable of a final vacuum of 200 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.

13. 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.

R-410A SEALED SYSTEM REPAIR

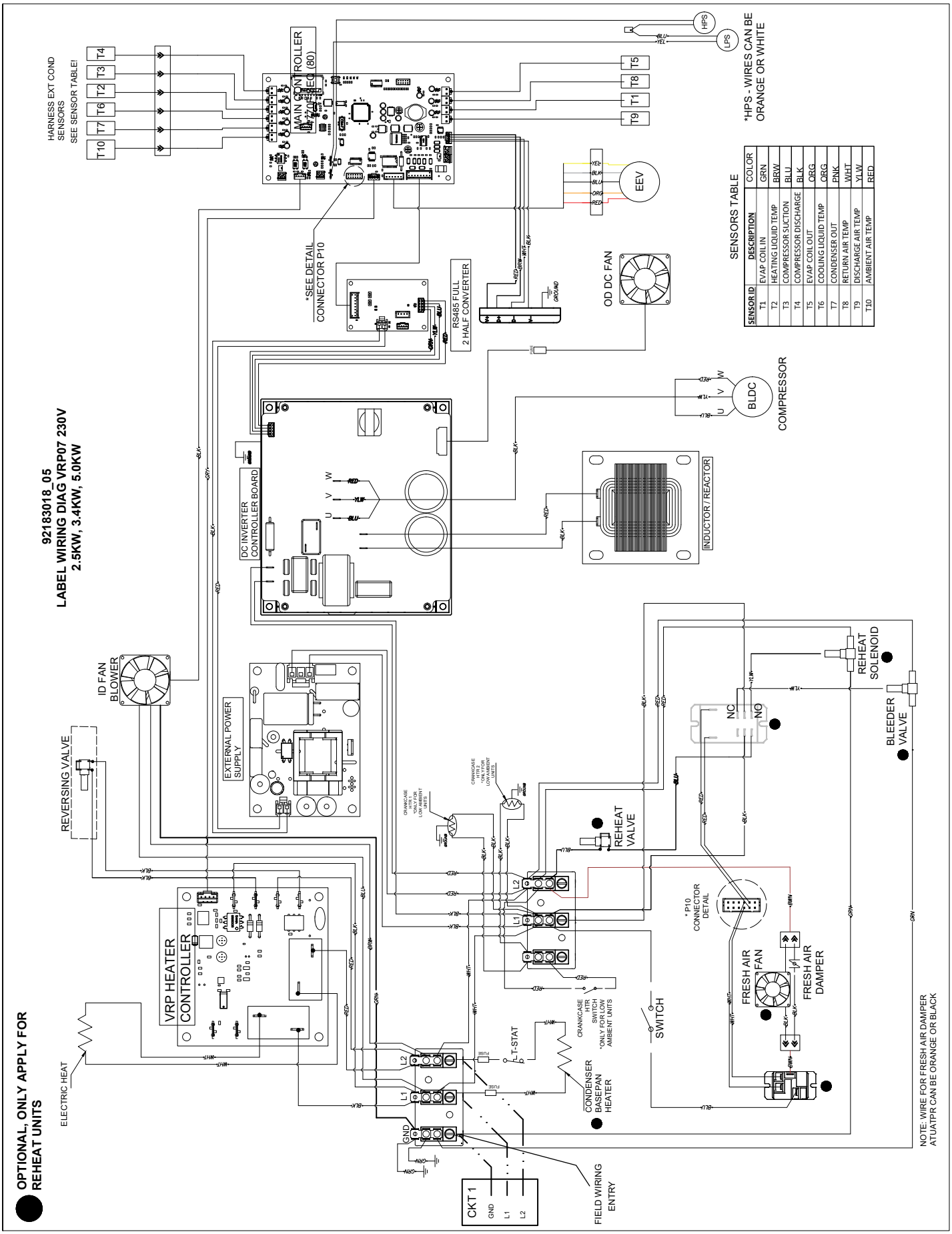
Replace The Evaporator Coil Drain Pan

1. Remove unit from the closet.
2. Remove top panel.
3. Remove filter.
4. Remove left and right upper side panels
5. Carefully lift coil up a few inches and support to avoid damage to tubing.
6. Pry up plastic drain pan using putty knife or other suitable tool.
7. Scape off any glue or sealant remaining on the unit using putty knife or other suitable tool.
8. Install new pan, evaporator coil, and panels.

WIRING DIAGRAMS

A Model 208/230V 2.5 & 3.4 kW

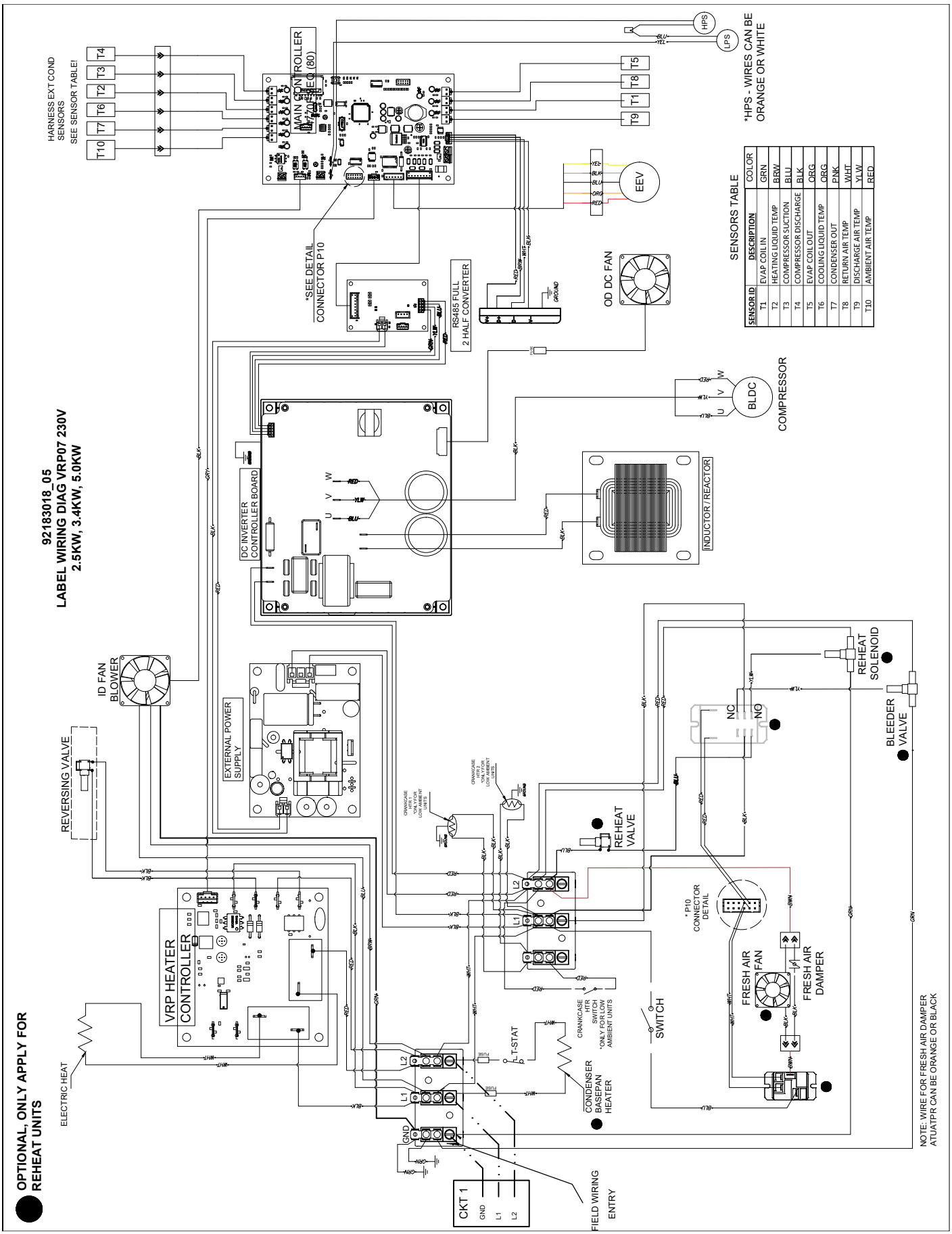
Figure 801



WIRING DIAGRAMS

Figure 802

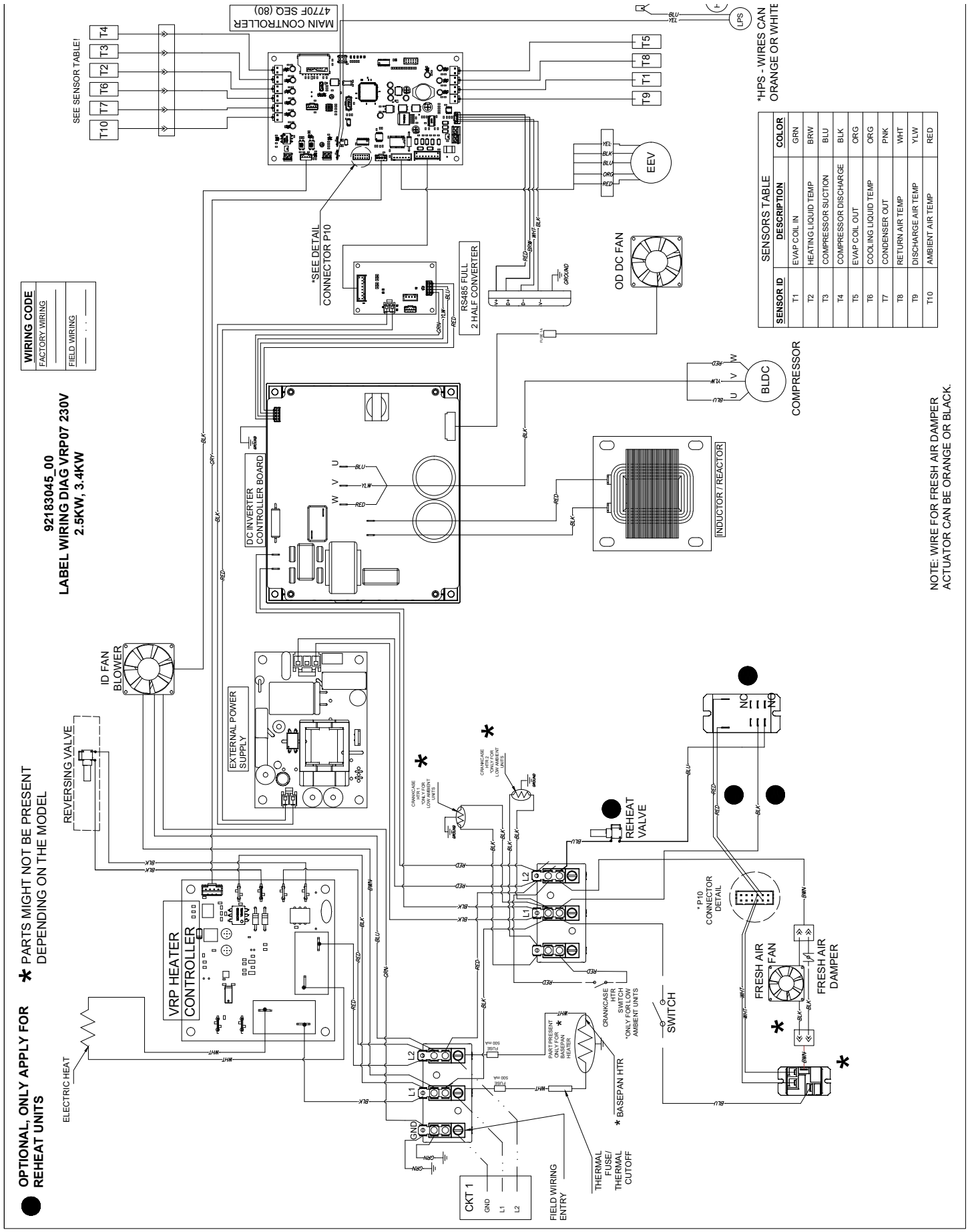
A-A Model 208/230V 2.5 & 3.4 kW



WIRING DIAGRAMS

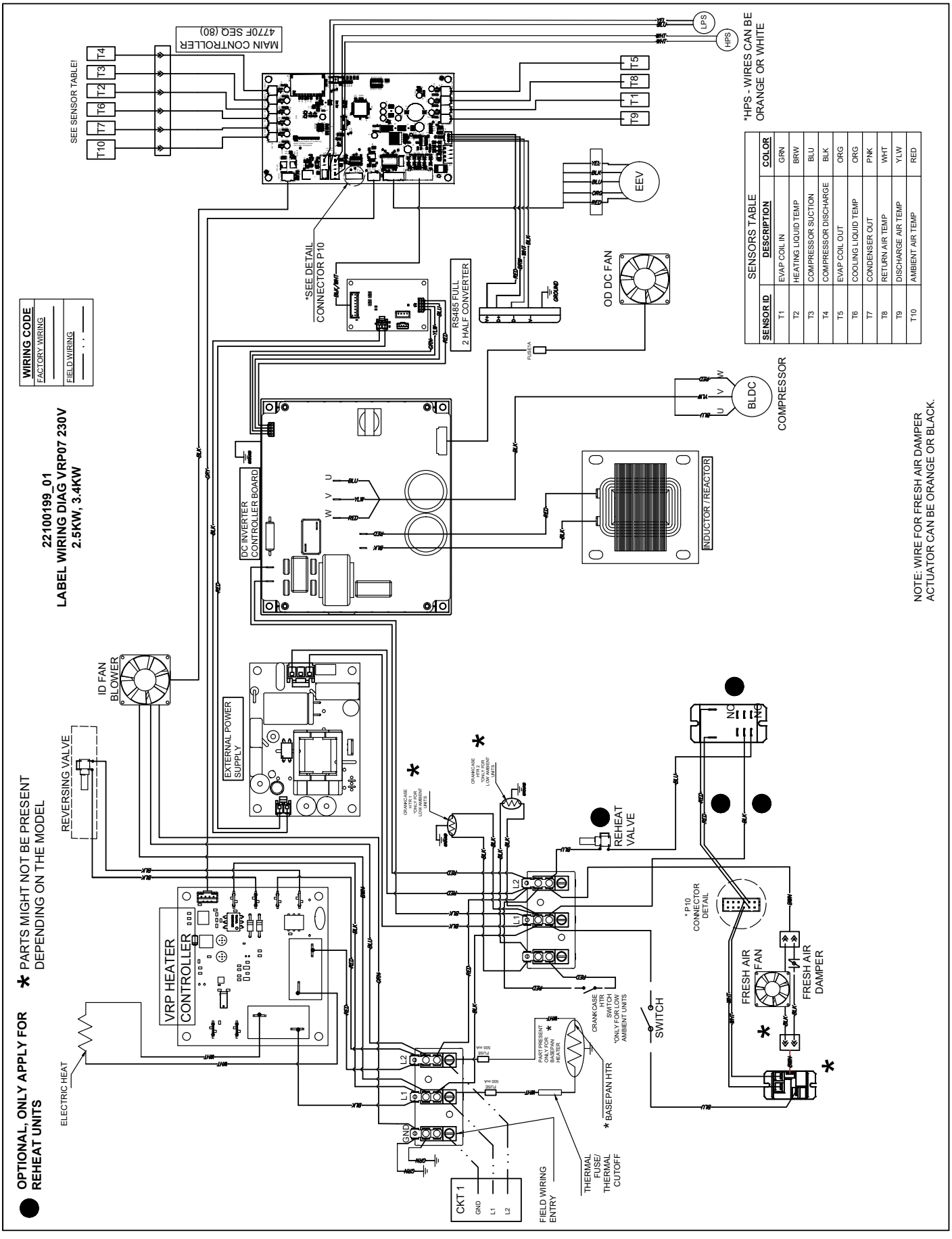
Figure 803

A-B Model 208/230V 2.5 & 3.4 kW



WIRING DIAGRAMS

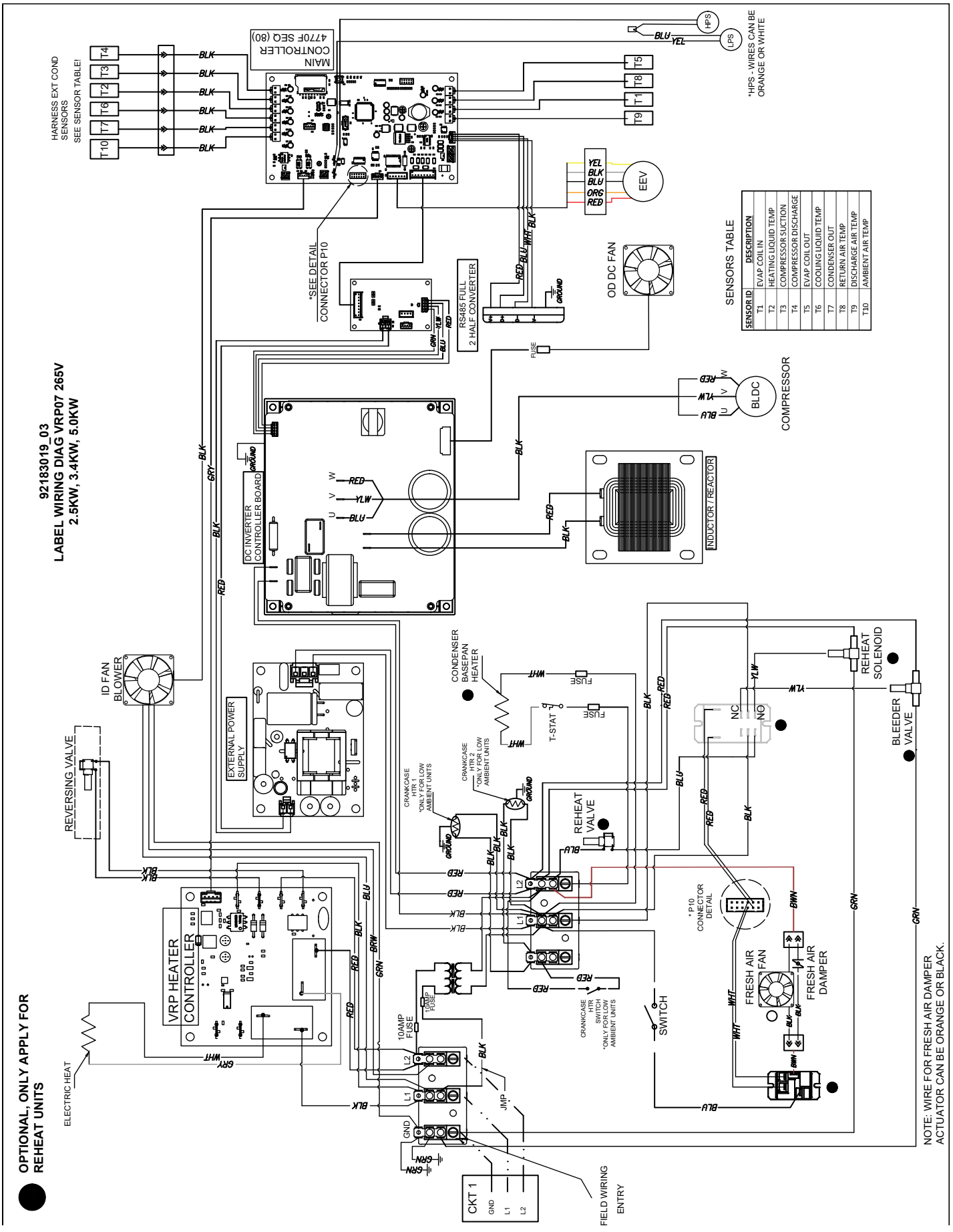
B-A Model 208/230V 2.5 & 3.4 kW



WIRING DIAGRAMS

A Model 265V 2.5 & 3.4 kW

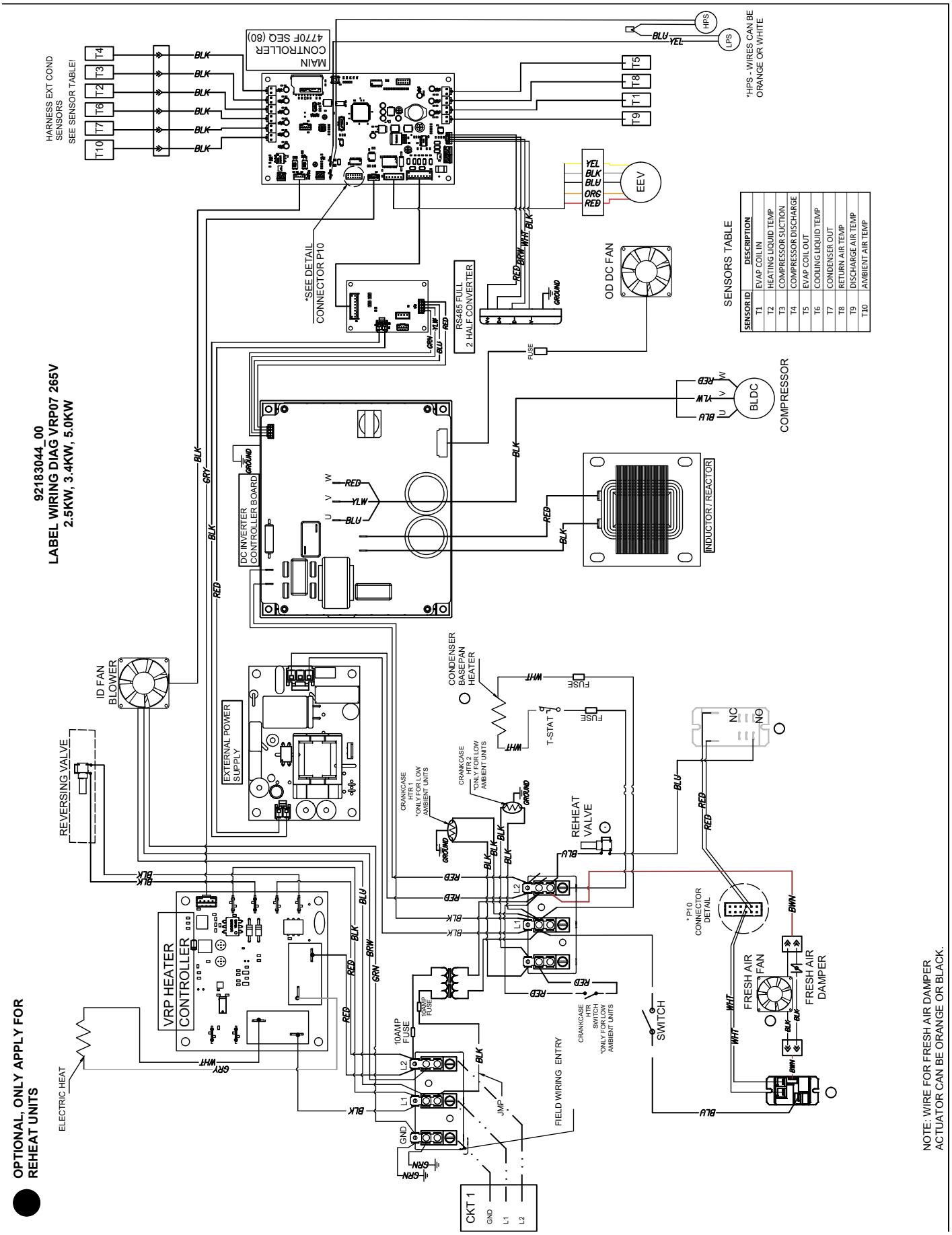
Figure 804



WIRING DIAGRAMS

Figure 805

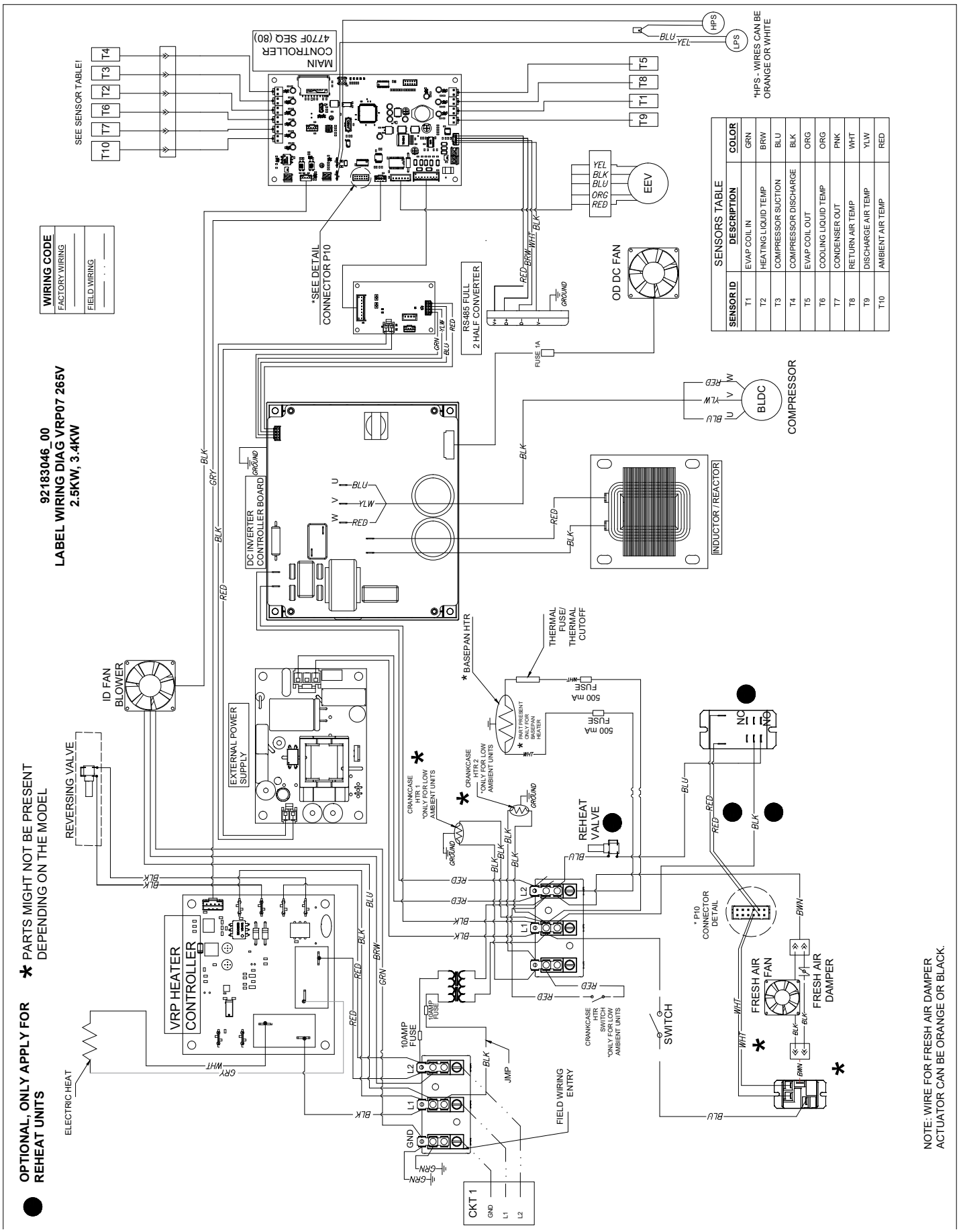
A -A Model 265V 2.5 & 3.4 kW



WIRING DIAGRAMS

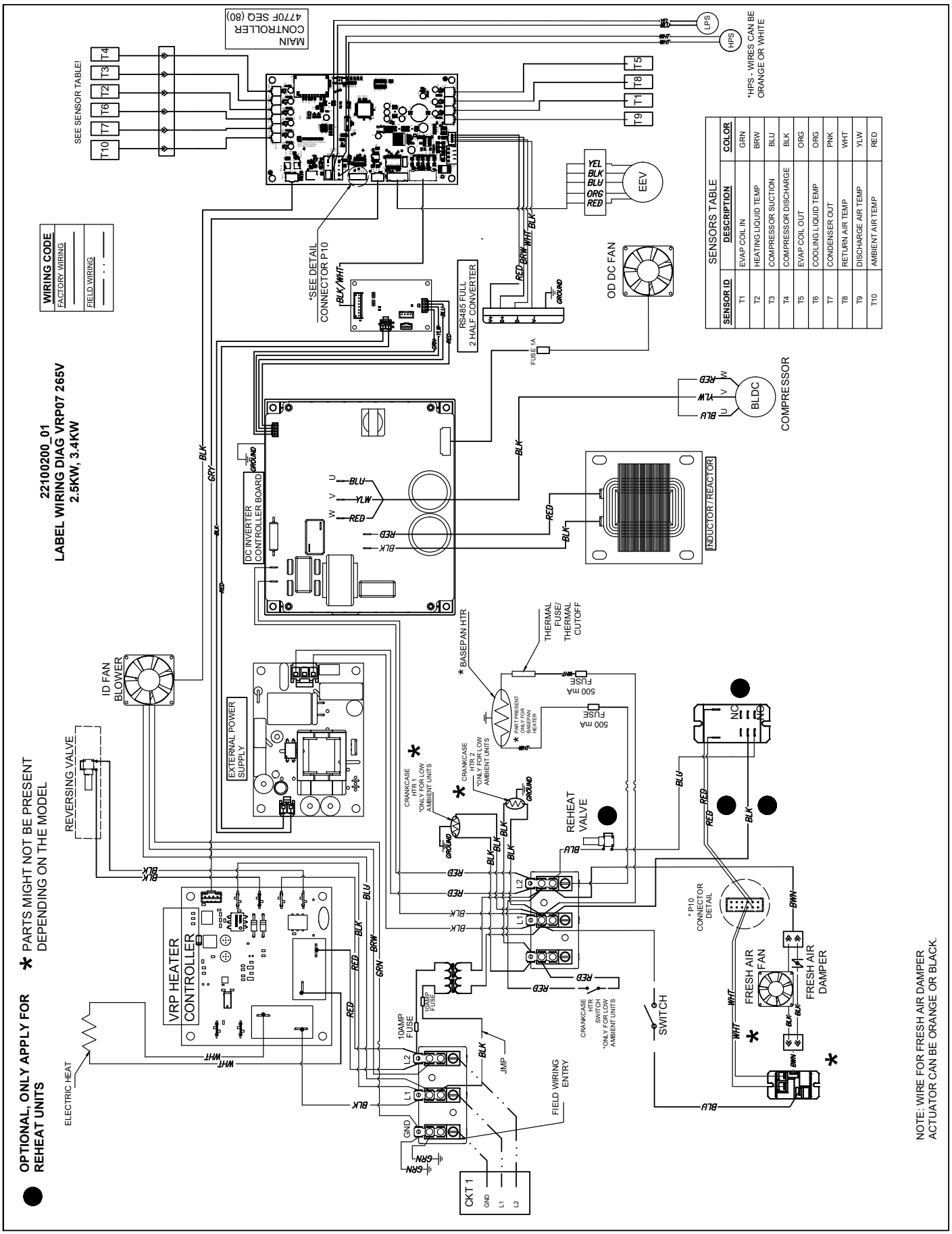
A -B Model 265V 2.5 & 3.4 kW

Figure 806

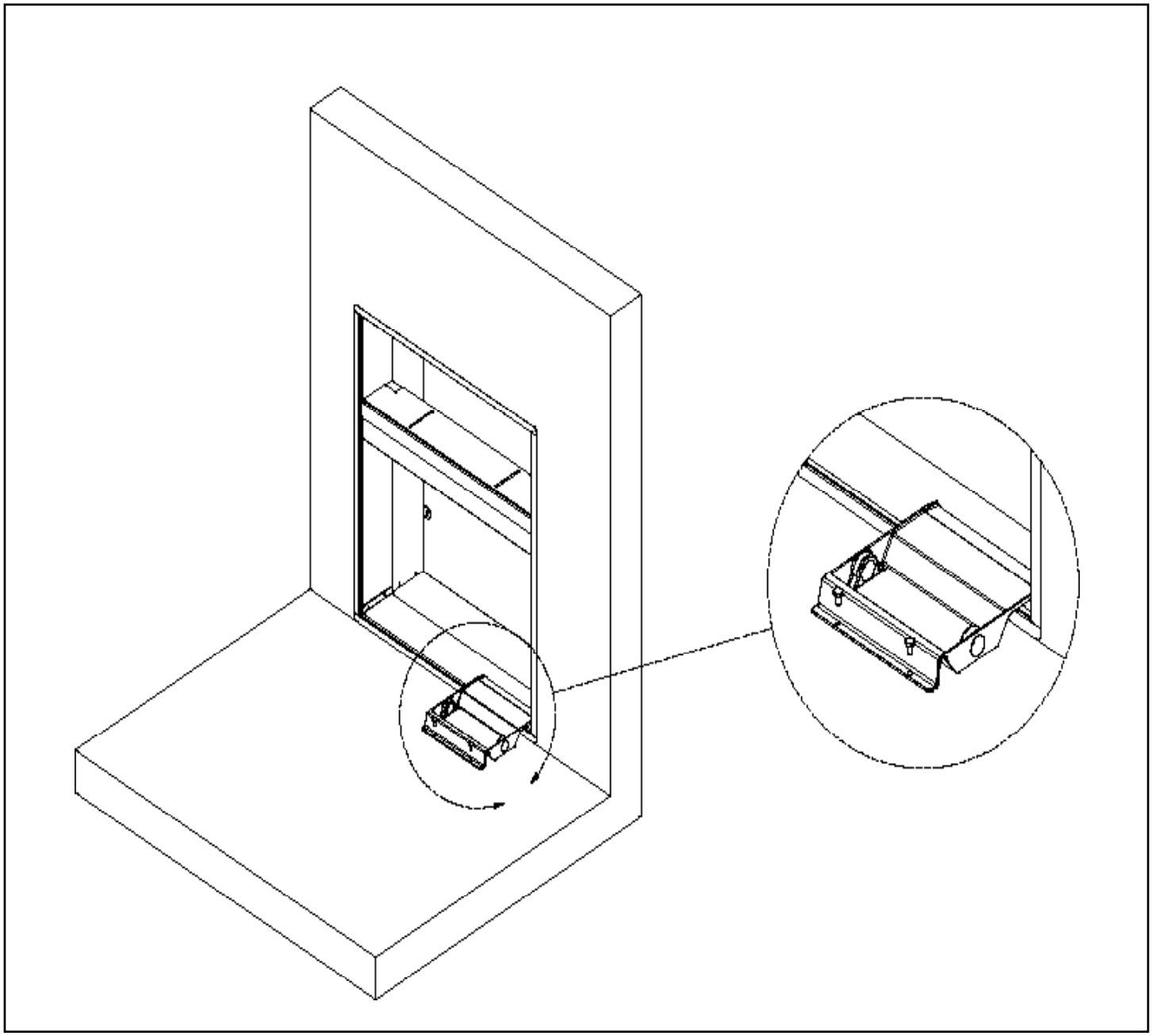


WIRING DIAGRAMS

B-A Model 265V 2.5 & 3.4 kW



ACCESSORIES



VPDP2 Drain Kit

The 7000 BTU VRP® is designed to install through the VPAWP* wall plenum that has a VPDP2 drain kit attached. The VPDP2 is required for all installations.

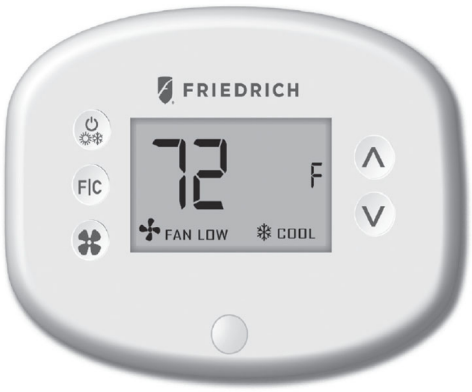
The VPDP2 has the option to connect the primary condensate using one of the left or right 3/4" threaded connection ports.

ACCESSORIES

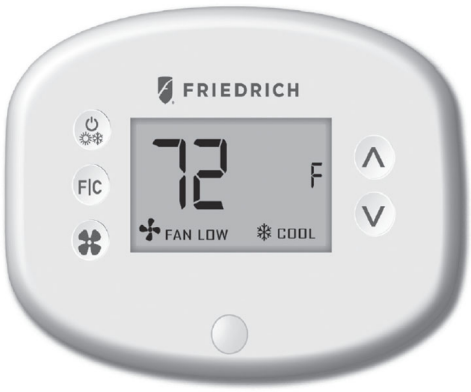
Visit www.Friedrich.com/accessories to find Accessory Product Manuals

Friedrich offers two types of control options for VRP units:

- Standard Wall Controller (Wired), VRPXWCT
- Energy Management Wall Controller with an Occupancy Sensor
  - Wired, VRPXEMRT2
  - Wireless, VRPXEMWRT2



VRPXWCT



VRPXEMRT2 / VRPXEMWRT2

- Real time motion and thermal occupancy sensor
- Wired or wireless installation
- 5 energy savings presets
- Remote monitoring

ACCESSORIES

Louvers

Accessory	Description	Compatible Model(s)
VPAL2	Architectural louver - 30˚ Blade angle	VRP07
VRSC2	Architectural louver - 30˚ Blade angle - Custom color (Special order)	VRP07
VRPXALA	Architectural louver - 30˚ Blade angle	VRP12
VRPXSCA	Architectural louver - 30˚ Blade angle - Custom color (Special order)	VRP12
VRPXALB	Architectural louver - 30˚ Blade angle	VRP12 & VRP24
VRPXSCB	Architectural louver - 30˚ Blade angle - Custom color (Special order)	VRP12 & VRP24
VRPXALC	Architectural louver - 30˚ Blade angle	VRP36
VRPXSCC	Architectural louver - 30˚ Blade angle - Custom color (Special order)	VRP36

42˚ blade angle louvers available by special order.

Wall Plenums

Accessory	Description	Compatible Model(s)
VPAWP1-8	Vert-I-Pak/VRP floating chassis, telescoping wall plenum - 4”-8” wall depth	VRP07
VPAWP1-14	Vert-I-Pak/VRP floating chassis, telescoping wall plenum - 8”-14” wall depth	VRP07
VRPXWPA-8	VRP floating chassis, telescoping wall plenum - 4”-8” wall depth	VRP12
VRPXWPA-14	VRP floating chassis, telescoping wall plenum - 8”-14” wall depth	VRP12
VRPXWPB-8	VRP floating chassis, telescoping wall plenum - 4”-8” wall depth	VRP12 & VRP24
VRPXWPB-14	VRP floating chassis, telescoping wall plenum - 8”-14” wall depth	VRP12 & VRP24
VRPXWPC-8	VRP telescoping wall plenum - 4”-8” wall depth	VRP36
VRPXWPC-14	VRP telescoping wall plenum - 8”-14” wall depth	VRP36

Access Panels

Accessory	Description	Compatible Model(s)
VPRG4	Vert-I-Pak/VRP louvered access panel - left in-swing	VRP07
VPRG4R	Vert-I-Pak/VRP louvered access panel - right in-swing	VRP07
VRPXAP1	VRP louvered access panel (left and right in-swing)	VRP07, VRP12, VRP24
VRPXAPPR1	VRP hanging perimeter return access panel	VRP07, VRP12, VRP24

Pre-primed (paintable) panels available by special order

Miscellaneous

Accessory	Description	Compatible Model(s)
VPDP2	VRP07 auxiliary drain pan (Required)	VRP07
VRPXFK-2	Filter bracket kit for 2” deep filters (up to MERV 13) - includes gasket	VRP07, VRP12, VRP24, VRP36
VPFKU	Telescoping filter bracket kit for 2” - 4” deep filters (up to MERV 13) - includes gasket	VRP07, VRP12, VRP24, VRP36

ACCESSORIES

Wall Controllers and Accessories

Accessory	Description	Compatible Model(s)
VRPXWCT	Wired standard VRP wall controller	VRP07, VRP12, VRP24, VRP36
VRPXEMRT2	Wired energy management wall controller	
VRPXEMWRT2	Wireless (to the unit) energy management controller	
VRPXEMRT2LC	Wired energy management wall controller with lighting control (Requires EMROS)	
VRPXEMRT2HC	Wired energy management wall controller with Hilton Connect Room (RTM) compatibility	
EMOCT	Energy management online connection kit	
EMRAF	Energy management online remote access fee	
EMROS	Energy management wired remote occupancy sensor	
EMRTS	Energy management remote temperature sensor	
EMRDS	Energy management door switch	
EMCWP	Energy management J-box wall-plate	
EMRWOS	Energy management wireless remote occupancy sensor	

APPENDIX

Interactive Parts Viewer

All Friedrich Service Parts can be found on our online interactive parts viewer.

Please click on the link below:

Interactive Parts Viewer

For Further Assistance contact Friedrich customer service at **(1-800-541-6645)**.

Limited Warranty

Current warranty information can be obtained by referring to https://www.friedrich.com/professional/support/product-resources

APPENDIX

Thermistor Values

All thermistors in the VRP units have a 10k ohm Resistance at 77° F.

The chart below shows the value vs. temperature

If the sensor reads O/L (open) or 0 OHM (short) it is a bad sensor and should be replaced.

If the sensors OHM value equates to a temperature that is incorrect, i.e. room temperature is 65 ° but the sensor reads 6 OHM (97°), then the sensor is out of calibration and needs to be replaced.

TEMP	RESISTENCE (K Ohms)			RESISTANCE TOLERANCE %	
F	MIN	CENTR	MAX	MIN	MAX
-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

APPENDIX

Friedrich Authorized Parts Depots

NEUCO Inc.

515 W Crossroads Parkway
Bolingbrook, IL 60440

312.809.1418

borr@neuco.com

United Products Distributors Inc.

4030A Benson Ave

Halethorpe, MD 21227

888-907-9675

c.businsky@updinc.com

Shivani Refigeration & Air Conditioning Inc.

2259 Westchester Ave.

Bronx, NY 10462

sales@shivanionline.com

The Gabbert Company
6868 Ardmore
Houston, Texas 77054

713-747-4110
800-458-4110

Johnstone Supply of Woodside

27-01 Brooklyn Queens Expway
Woodside, New York 11377

718-545-5464
800-431-1143

Reeve Air Conditioning, Inc.

2501 South Park Road

Hallandale, Florida 33009

954-962-0252
800-962-3383

Total Home Supply

26 Chapin Rd Ste 1109

Pine Brook, NJ 07058

877-847-0050

support@totalhomesupply.com

https://www.totalhomesupply.com/brands/Friedrich.html

FRIEDRICH

TECHNICAL SUPPORT CONTACT INFORMATION

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1-800-541-6645

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