FRIEDRICH

VRP® Series Air Conditioners
R-410A Refrigerant

Service Manual

Model	Revision	Voltage	BTU
VRP12K	E	230	12,000
VRP12R	E	265	12,000
VRP12K-A	A	230	12,000
VRP12R-A	A	265	12,000
VRP24K-A	A	230	24,000
VRP24R-A	A	265	24,000
VRP24K-A	B	230	24,000
VRP24R-A	B	265	24,000

THE EXPERTS IN ROOM AIR CONDITIONING

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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 FreshAireTM system delivers conditioned fresh air into the space. The fresh air is filtered through a MERV 8 filter 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 wall controller also contains a motion sensor that wakes the wall controller from a sleep mode when not in use. This energy saving feature eliminates annoying glow from the controller and the need to turn on lights at night to operate it.

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 t o 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

Part Load Performance

Exceptional Efficiencies with VRP®: Partial load conditions prevail for the majority of the time. VRP's Precision Inverter® compressor can operate down to 40% of rated capacity or up to 120% matching the unit's output to the actual demand of the space and, therefore, only consumes the energy that is required. Because of this ability to modulate the capacity, VRP delivers significantly higher efficiencies than a fixed–speed unit resulting in huge savings in operational costs. Example of variable speed efficiency below.

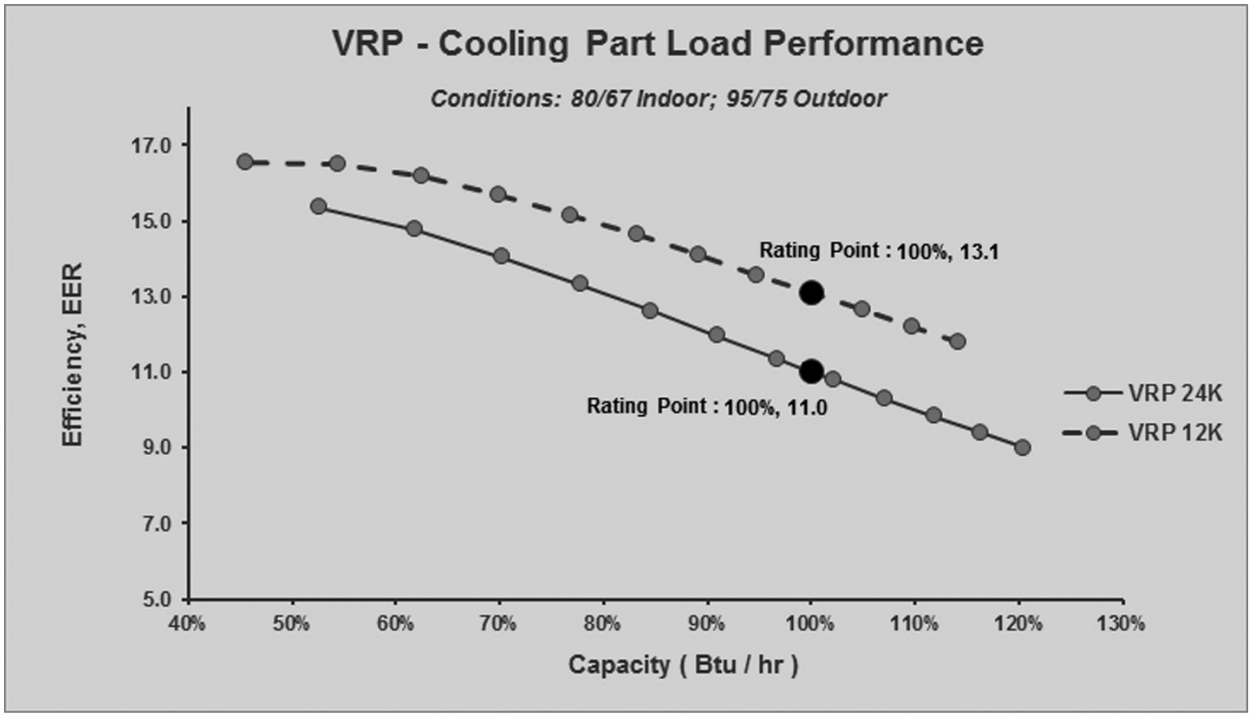


Figure 101 (Cooling Part Load Performance)

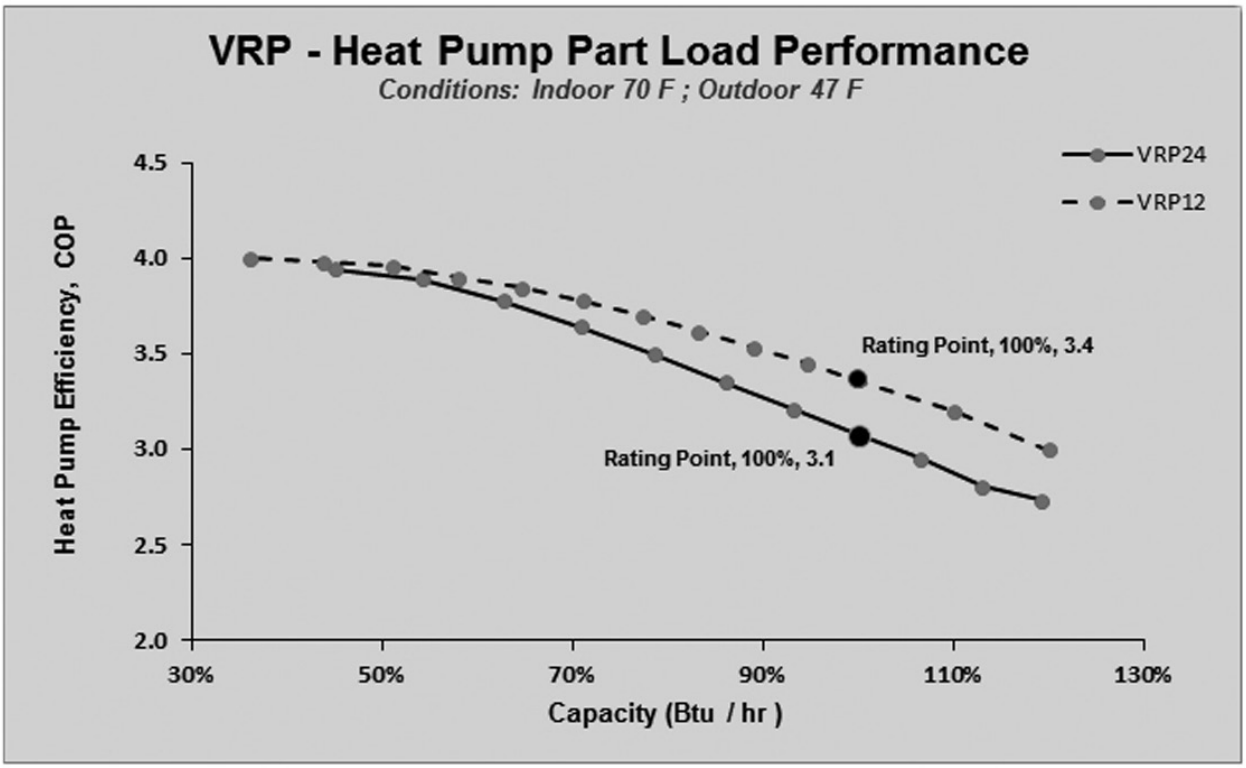


Figure 102 (Heating-Part Load Performance)

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.

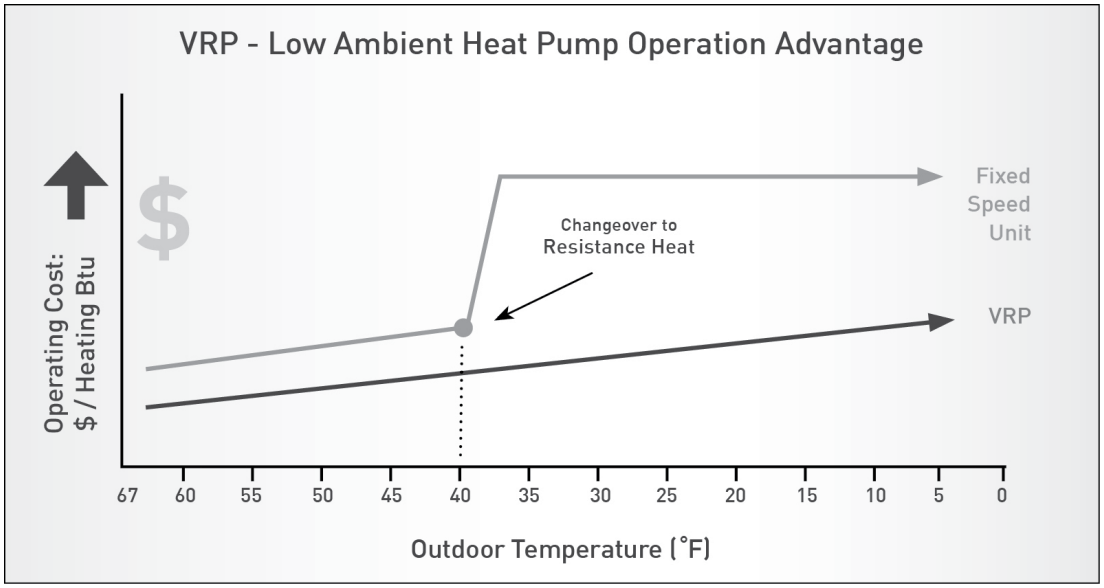


Figure 103 (Cost Savings)

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.

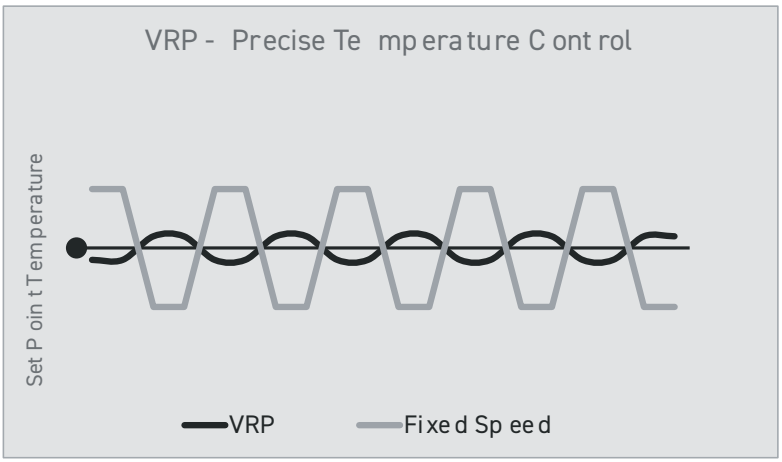


Figure 104 (Precision Temp Control)

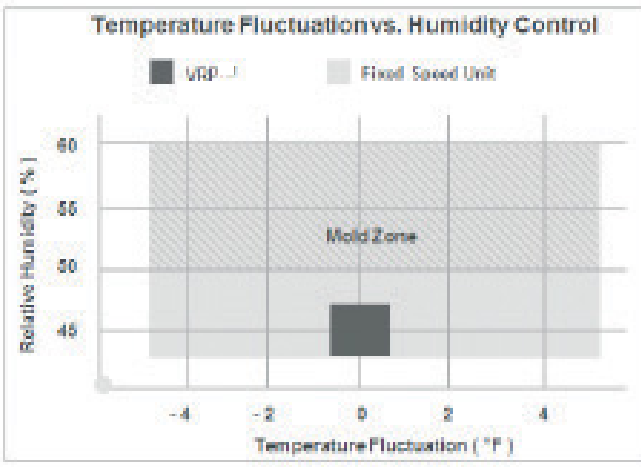


Figure 105 (Temp vs Humidity Control)

INTRODUCTION

FreshAire™ Conditioned Fresh Air

FreshAire is a dedicated fresh air system that brings in up to 70 CFM of outdoor air into the VRP® unit. The FreshAire system uses one fan (up to 35 CFM) or two fans (up to 70 CFM) (depending on outdoor air CFM volume requirements) to bring in fresh outside air into the the unit. The outdoor air passes through dedicated 6"x 6"x 1" MERV 8 filters 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 setpoint, 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.)

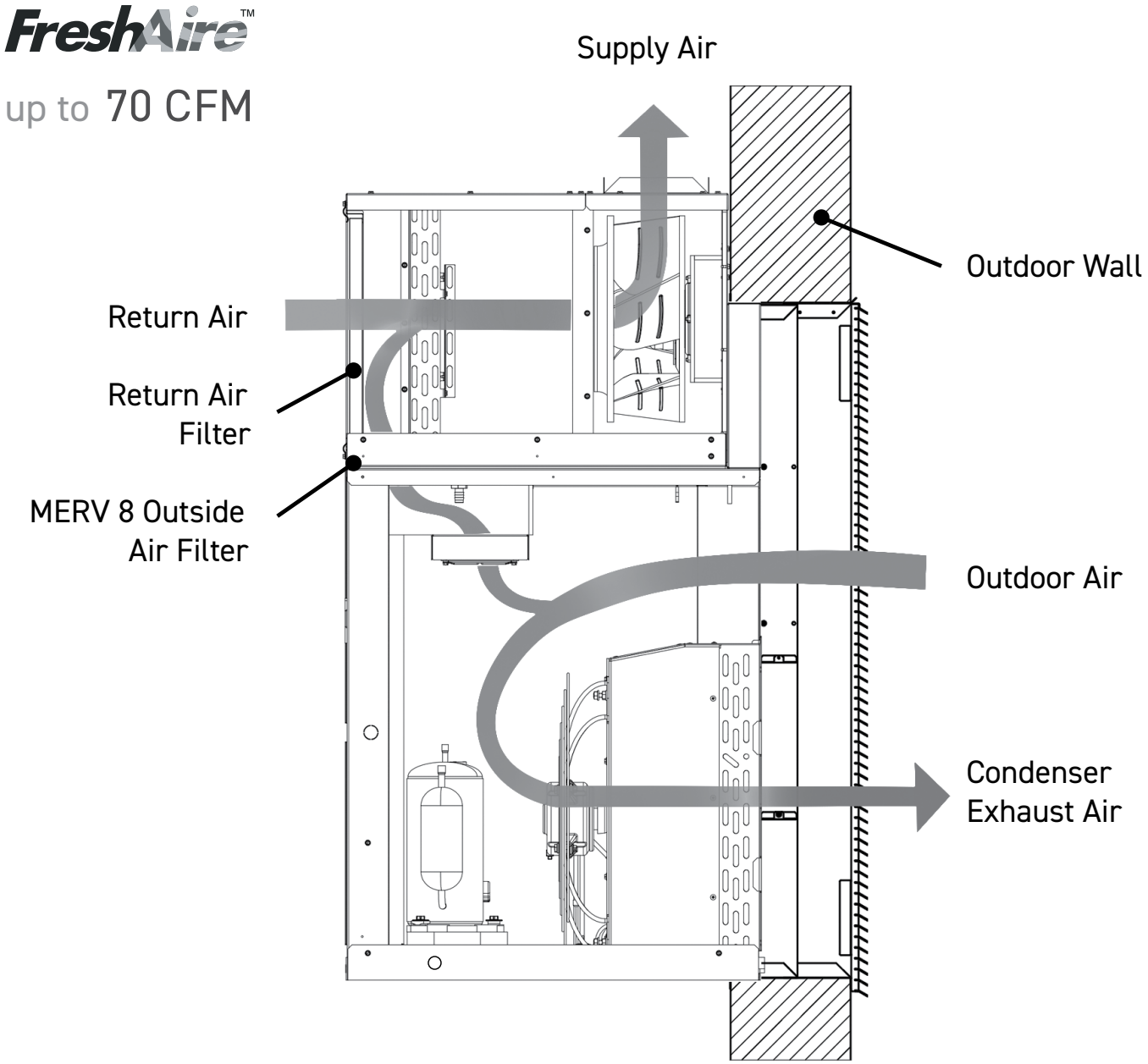


Figure 106 (FreshAire)

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.

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 70-2018 National Electric Code or current edition, International Mechanic code 2022 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 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 Number Identification Guides

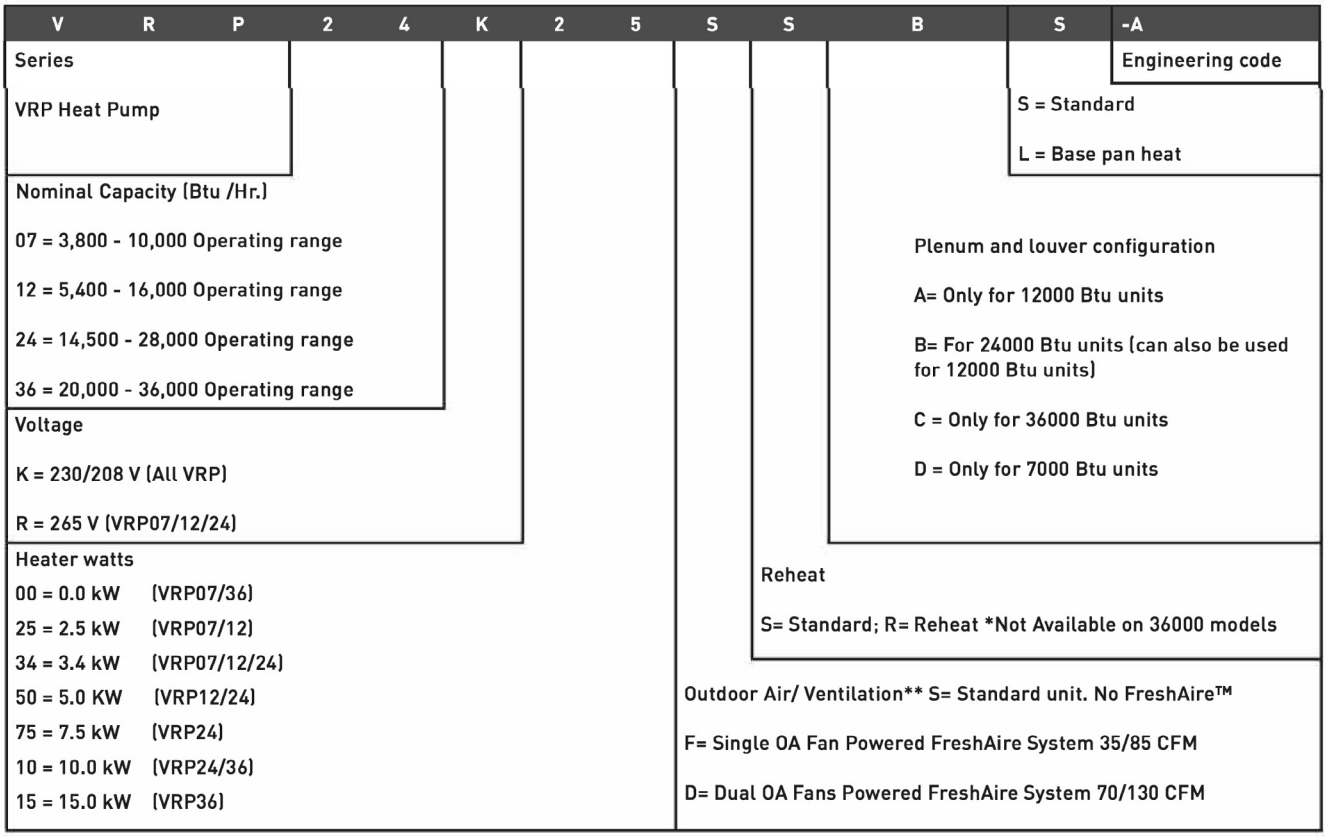


Figure 107 (Model Identification Guide 2022 and Prior)

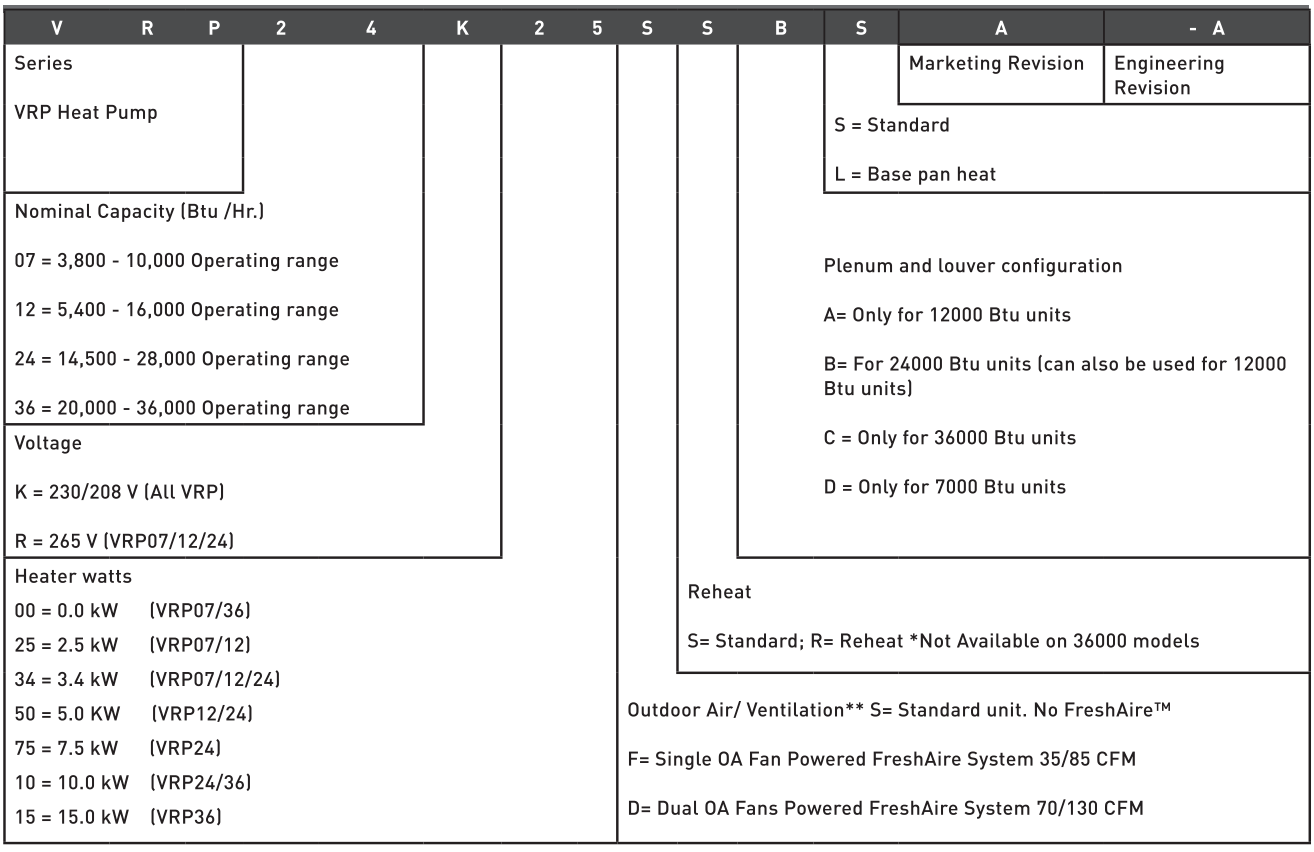


Figure 108 (Model Identification Guide 2023 and Beyond)

INTRODUCTION

Serial Number Identification Guides

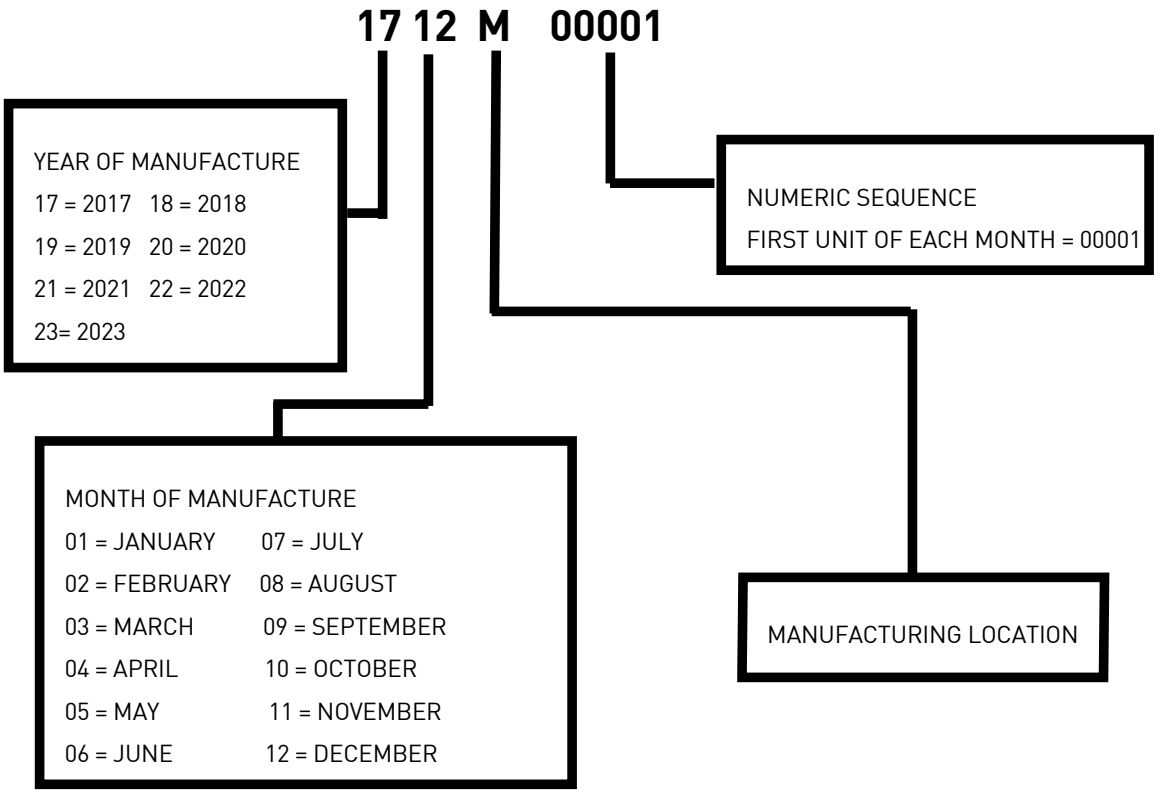


Figure 109 (Serial Number Identification)

SPECIFICATIONS

Cooling Performance - E Models

Model	VRP12K-E / VRP12R-E	
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)	11,500	
Cooling Btu (Min. – Max)	5,400– 16,000	
Outdoor Operating Range (°F)	55 – 115	
Power (W)	927	
SEER	17.4	
EER	12.4	
Sensible Heat Ratio	0.71	
Cooling Amps	5.3	4.6
Heat Pump Performance Data		
Heating Btu (Rated @ 47° F)	11,200	
Heating Btu (@ 17° F)	7,700	
Heating Btu (Min. – Max.)	4,000 – 14,000	
Heat Pump Outdoor Operating Range (°F)*	0 – 70	
COP (Rated @ 47° F)	3.4	
COP (@ 17° F)	2.2	
HSPF	10.0	
Heating Power (W)	1058	
Heating Amps	5.3	4.7
Rating Standard	AHRI 390	
Figure 201 (Cooling Performance 12E)		

SPECIFICATIONS

Cooling Performance A-A, A-B Models

Model	VRP12K A-A/ VRP12R A-A		VRP24K A-A, A-B/ VRP12R A-A, A-B	
Cooling Performance Data (Cooling Standards: 95°F DB/75°F WB outdoor, 80°F DB/67°F WB indoor)				
Voltage	230/208	265	230/208	265
Cooling Btu (Rated)	11,500		23,400	
Cooling Btu (Min. - Max)	5,400-16,000		14,500-28,000	
Outdoor Operating Range (˚F)	55-155		55-155	
Power (W)	1,106		2,925	
SEER2	15.1	14.7	13.7	
EER2	10.4		8.0	
Sensible Heat Ratio	0.74		0.74	
Cooling Amps	5.3	4.6	13.9	11.9
Heat Pump Performance Data				
Voltage	230/208	265	230/208	265
Heating Btu (Rated @ 47˚F)	11,200		21,000	
Heating Btu (@ 17˚F)	6,200		13,000	
Heating Btu (Min. - Max.)	4,000-14,000		12,000-26,000	
Heat Pump Outdoor Operating Range (˚F)	0-70		0-70	
COP (Rated @ 47˚F)	3.4		3.1	
HSPF2	7.1		6.7	
Heating Power(W)	1,189		2,800	
Rating Standard	AHRI 210/240		AHRI 210/240	

Figure 202 (Cooling Performance 12A-A, 24A-A, 24A-B)

SPECIFICATIONS

12k/24k Extended Cooling Performance Data

Model: VRP12		Indoor Temperature														
		70˚ FDB			75˚ FDB			**80˚ FDB**			85˚ FDB			90˚ FDB		
		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˚	11680	615	2.8	12755	615	2.8	13825	615	2.8	14900	615	2.8	15975	620	2.8
	70˚	11460	665	3.0	12510	665	3.0	13555	675	3.0	14600	675	3.0	15650	675	3.0
	75˚	11240	720	3.2	12260	720	3.2	13280	725	3.2	14300	725	3.2	15320	725	3.2
	80˚	10990	765	3.4	11980	775	3.5	12970	775	3.5	13965	775	3.5	14955	780	3.5
	85˚	10735	815	3.6	11700	820	3.7	12660	825	3.7	13625	825	3.7	14585	830	3.7
	90˚	10460	860	3.9	11400	870	3.9	12330	875	3.9	13270	880	3.9	14200	880	3.9
	95˚	10185	910	4.1	11090	920	4.1	12000	925	4.1	12910	930	4.2	13815	935	4.2
	100˚	9875	960	4.3	10760	970	4.3	11645	975	4.4	12530	985	4.4	13415	990	4.4
	105˚	9565	1010	4.5	10425	1020	4.6	11285	1030	4.6	12145	1040	4.7	13005	1045	4.7
	110˚	9265	1060	4.7	10100	1075	4.8	10940	1085	4.9	11775	1100	4.9	12610	1110	5.0
	115˚	8965	1120	5.0	9775	1130	5.1	10590	1145	5.1	11400	1155	5.2	12215	1170	5.2

Cooling Standards: 95°F DB/75°F WB outdoor, 80°F DB/67°F WB indoor. Values reflect performance at A2 rated compressor frequency.

Model: VRP24		Indoor Temperature														
		70˚ FDB			75˚ FDB			**80˚ FDB**			85˚ FDB			90˚ FDB		
		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˚	22875	1420	6.4	24980	1420	6.4	27075	1420	6.4	29180	1420	6.4	31285	1430	6.4
	70˚	22440	1535	6.8	24500	1535	6.8	26545	1560	6.8	28590	1560	6.8	30650	1560	6.8
	75˚	22010	1665	7.3	24010	1665	7.3	26005	1675	7.3	28005	1675	7.3	30000	1675	7.3
	80˚	21520	1765	7.7	23460	1790	7.9	25400	1790	7.9	27350	1790	7.9	29285	1800	7.9
	85˚	21025	1880	8.2	22910	1895	8.4	24795	1905	8.4	26680	1905	8.4	28560	1915	8.4
	90˚	20485	1985	8.8	22325	2010	8.8	24145	2020	8.8	25985	2030	8.8	27810	2030	8.8
	95˚	19945	2100	9.3	21720	2125	9.3	23500	2135	9.3	25280	2150	9.5	27055	2160	9.5
	100˚	19340	2215	9.8	21070	2240	9.8	22805	2250	10	24540	2275	10	26270	2285	10
	105˚	18730	2330	10.2	20415	2355	10.4	22100	2380	10.4	23785	2400	10.7	25470	2415	10.7
	110˚	18145	2450	10.7	19780	2480	10.9	21425	2505	11.1	23060	2540	11.1	24695	2565	11.3
	115˚	17555	2585	11.3	19145	2610	11.6	20740	2645	11.6	22325	2665	11.8	23920	2700	11.8

Figure 203 (12k/ 24k Extended Cooling Performance Data)

SPECIFICATIONS

12 and 24k Extended Heating Performance Data

		Indoor Temperature Dry Bulb (F)								
		60˚			**70˚**			80˚		
Model: VRP12		Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)
Outdoor Temperature Dry Bulb (F)	**(˚F) DB**									
	17˚	7551	866	3.0	7100	946	3.3	6609	1014	3.5
	25˚	8810	877	3.1	8273	958	3.4	7688	1031	3.7
	35˚	10384	890	3.3	9740	974	3.6	9036	1051	3.9
	47˚	12272	906	3.4	11400	992	3.8	10654	1077	4.1
	55˚	13531	916	3.6	12673	1004	4.0	11733	1093	4.3
	62˚	14633	925	3.7	13700	1015	4.1	12677	1108	4.4
Model: VRP24		Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)	Capacity (Btu/h)	Input (W)	Amps (A)
Outdoor Temperature Dry Bulb (F)	**(˚F) DB**									
	17˚	15208	1399	6.4	14299	1528	7	13310	1638	7.5
	25˚	17407	1473	6.7	16347	1610	7.4	15190	1732	7.9
	35˚	20156	1565	7.2	18907	1712	7.8	17541	1850	8.5
	47˚	23455	1675	7.7	21979	1835	8.4	20362	1991	9.1
	55˚	25654	1749	8	24027	1917	8.8	22243	2086	9.5
	62˚	27579	1813	8.3	25819	1989	9.1	23888	2168	9.9

Heating Standards: 47°F DB/43°F WB outdoor, 70°F DB/60°F WB indoor. Values reflect performance at $H1_{Full}$ compressor frequency.

Figure 204 (12 and 24k Extended Heating Performance Data)

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	0.25	0.30	0.35	0.40	0.45	0.50
VRP12K/R*	1	High	540	480	430	400	340	270	200	140	100		
		Low	350	290	220	120							
	2	High	630	580	535	480	420	370	330	290	240	180	100
		Low	390	330	260	200							
	3	High	650	620	575	540	490	455	420	355	330	280	200
		Low	425	370	315	260	195	130					
	4	High	710	670	610	580	535	490	470	440	415	320	240
		Low	490	430	400	320	290	220	120				
	5	High	780	750	700	655	620	570	540	515	470	440	400
		Low	540	480	430	400	340	270	200	140	100		
VRP24K/R*	1	High	780	750	710	670	635	610	580	550	510	460	415
		Low	585	540	490	460	420	370	310	260	200	130	
	2	High	810	770	740	710	670	640	615	580	555	510	480
		Low	630	580	535	480	420	370	330	290	240	180	100
	3	High	910	880	860	810	795	780	755	730	695	650	590
		Low	680	650	620	560	520	480	435	380	340	280	220
	4	High	980	940	915	890	860	835	805	790	770	750	705
		Low	770	740	690	650	610	560	530	500	460	420	390
	5	High	1060	1020	1000	980	965	940	925	900	880	845	800
		Low	810	770	740	710	670	640	615	580	555	510	480

* Rated to 0.5" ESP High and includes factory provided filter

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 pres- sure 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 205 (12K and 24K Air Flow Data)

SPECIFICATIONS

Electrical Data

VRP Model	Voltage	Heater Watts	Heating Btu	Heater Amps	ID Blower Amps	OD Blower Amps	MCA	MOP / MOCP
VRP12K-E	230	2500	8530	11.2	0.34	0.42	14.0	15
	208	2030	6980	10.2	0.38	0.42		
	230	3400	11601	15.1	0.34	0.42	18.9	20
	208	2780	9480	13.8	0.38	0.42		
	230	5000	17060	22	0.34	0.42	27.5	30
	208	4100	13980	20.1	0.38	0.42		
VRP12R-E	265	2500	8530	9.8	0.2	0.4	12.3	15
		3400	11601	13.2	0.2	0.4	16.5	20
		5000	17060	19.3	0.2	0.4	24.1	25
VRP12K A-A	230	225	7680	10.6	0.8	0.42	14.0	15
	208	1840	6280	9.6	0.8	0.42		
	230	2985	10180	13.8	0.8	0.42	18	20
	208	2441	8330	12.5	0.8	0.42		
	230	4362	14880	19.8	0.8	0.42	25.5	30
	208	3568	12170	18	0.8	0.42		
VRP12R A-A	265	2242	7650	9.1	0.6	0.4	11.7	15
		2975	10150	11.8	0.6	0.4	15.1	20
		4347	14830	17	0.6	0.4	21.6	25
VRP24K A-A, A-B	230	2985	10180	14.7	1.7	1.1	22.8	25
	208	2441	8330	13.4	1.7	1.1		
	230	4362	14880	20.7	1.7	1.1	26.7	30
	208	3568	12170	18.9	1.7	1.1		
	230	6888	23500	31.6	1.7	1.1	40.3	45
	208	5633	19220	28.8	1.7	1.1		
	230	9184	31340	41.6	1.7	1.1	52.8	60
	208	7511	25630	37.8	1.7	1.1		
VRP24R A-A, A-B	265	2975	10150	12.9	1.7	1.1	22.5	25
		4347	14830	18.1	1.7	1.1	23	25
		7500	25590	30	1.7	1.1	37.8	40
		10000	34120	39.4	1.7	1.1	49.6	50

MCA = Minimum Circuit Ampacity

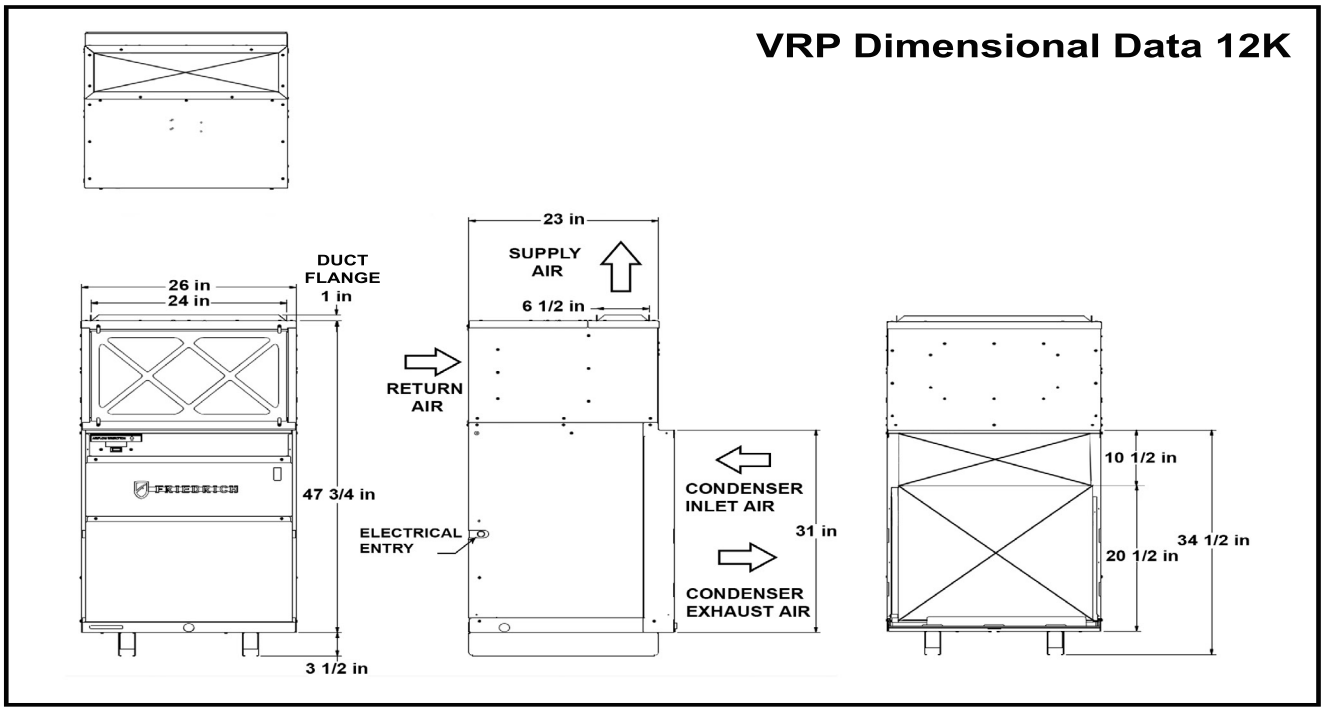
MOP / MOCP = Maximum Overcurrent Protection / Breaker Size

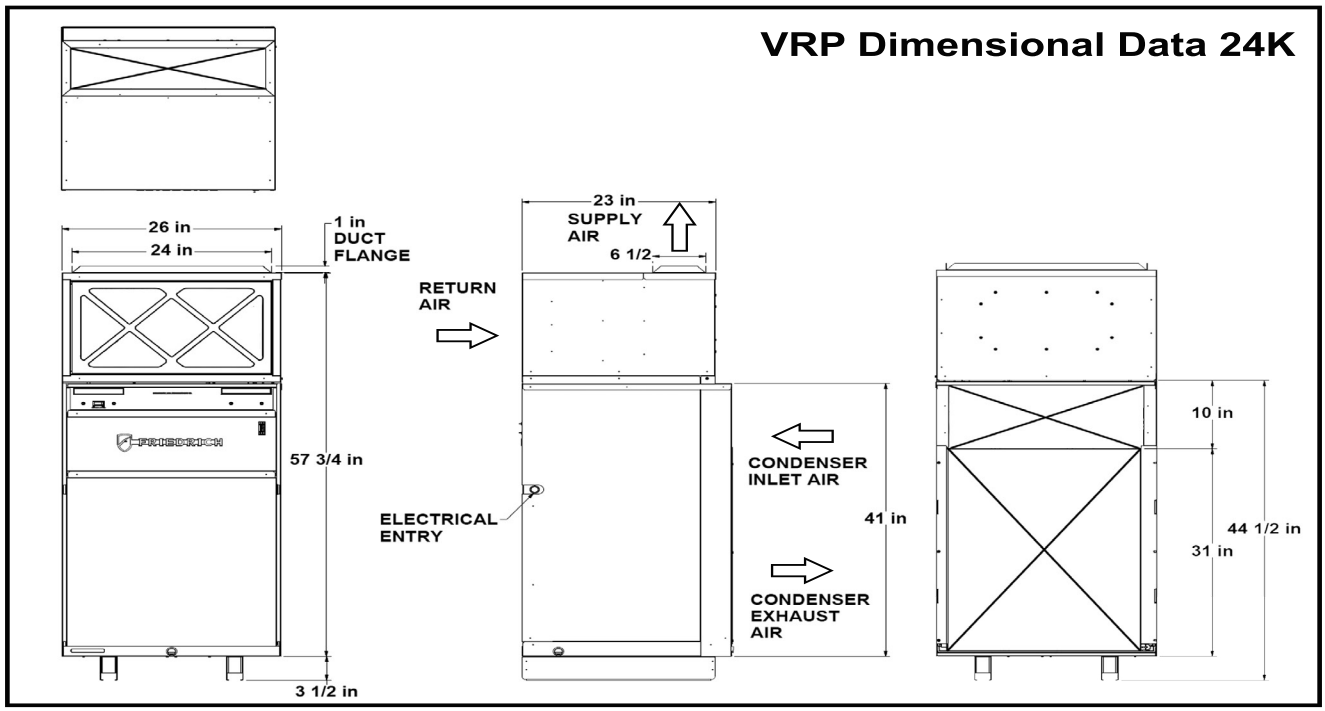
Minimum Circuit Amps (MCA) and MOCP values in the above table are calculated in accordance with The NEC. Article 440

Figure 206 (Electrical Data)

SPECIFICATIONS

12k and 24k Unit Dimensional Data



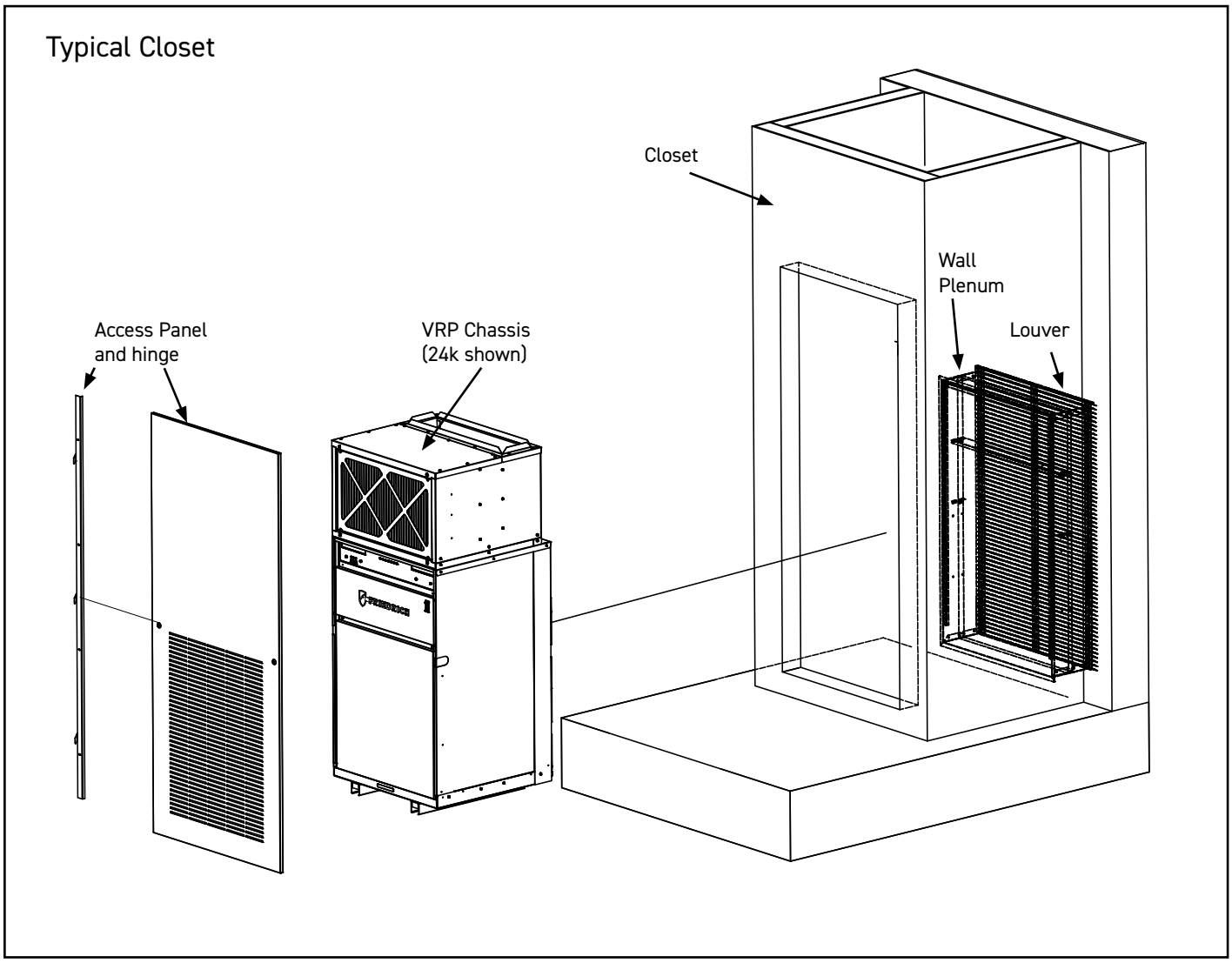


Model	VRP12K	VRP12R	VRP24K	VRP24R
Dimensions (W x D x H)	26 1/8" x 25 1/8" x 52"		26 1/8" x 25 1/8" x 62"	
Shipping Dimensions (W x D x H)	28 1/8" x 27 3/8" x 54 1/2"		28 1/8" x 27 3/8" x 64 1/2"	
Net Weight (lbs.)	215	215	255	255
Shipping Weight (lbs.)	276	276	316	316
R410A Charge (oz.)	49.8	49.8	68.3	68.3

Figure 207 (12k and 24k Unit Dimensional Data)

SPECIFICATIONS

12k and 24k Unit Installation Dimensional Data



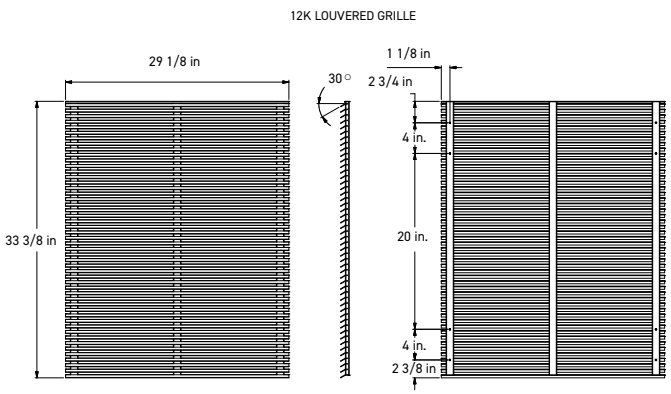
Model	VRP12K	VRP12R	VRP24K	VRP24R
Outside Wall- Cut Out Dimensions				
Dimensions (W x H) For VRPXWPA-8 or VRPXWPA-14 Plenum	28 1/8" x 32 1/4"		NA	
Dimensions (W x H) For VRPXWPB-8 or VRPXWPB-14 Plenum	28 1/8" x 42 1/4"		28 1/8" x 42 1/4"	
Access Door- Cut Out Dimensions (W x H)	30" x 70"			
Minimum Closet Dimensions (W x D)	See Installation Types			

Figure 208 (12k and 24k Unit Dimensional Data)

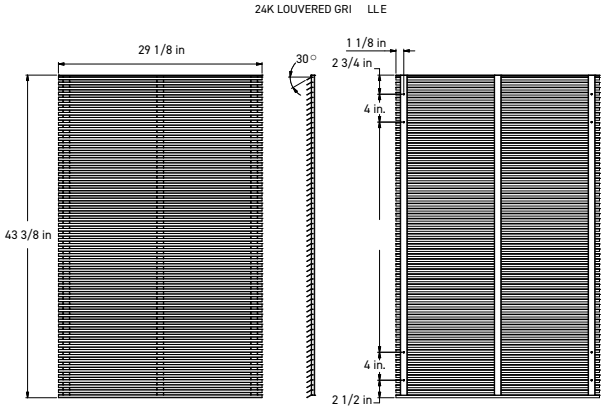
SPECIFICATIONS

12k and 24k Accessories Dimensional Data-Louvers & Return Access Door

12K Louvered Grille



24K Louvered Grille



Accessory	Description	Outer Dimensions
VRPXALA	Architectural louver (VRP12 only) (30 ° Blade angle)	29 1/8" W x 33 3/8" H
VRPXALB	Architectural louver (VRP24) (30 ° Blade angle) (Can also be used for VRP12)	29 1/8" W x 43 3/8" H
VRPXSCA	Architectural louver (VRP12 only) Custom Color - Special Order (30 ° Blade angle)	29 1/8" W x 33 3/8" H
VRPXSCB	Architectural louver (VRP24) Custom Color - Special Order (30 ° Blade angle) (Can also be used for VRP12)	29 1/8" W x 43 3/8" H

42° blade angle louvers available by special order.

Return Air Access Panel

Return Air Access Panel	VRPXAP1	32" x 72"

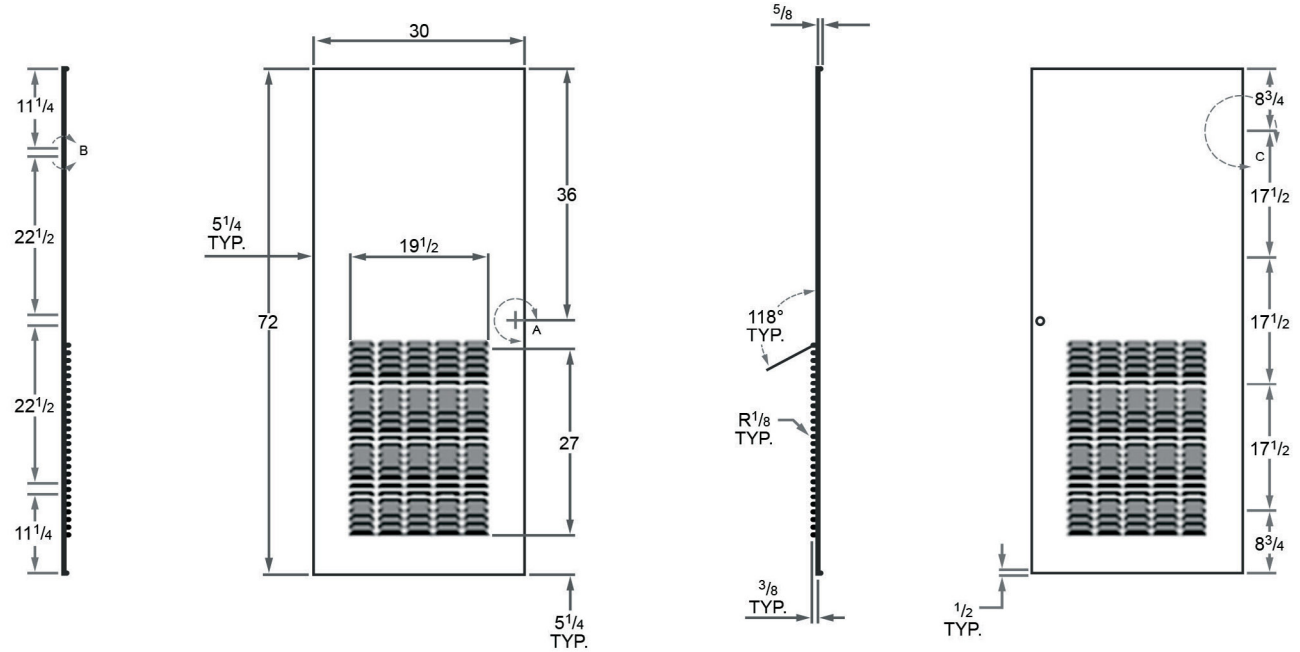


Figure 209 (12k and 24k Accessories Dimensional Data-Louvers & Return Access Door)

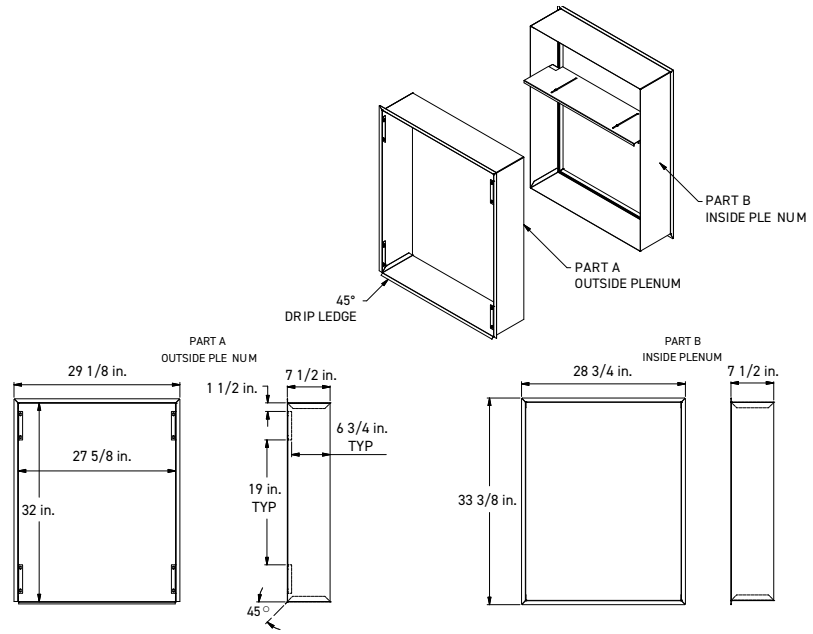
SPECIFICATIONS

12k and 24k Accessories Dimensional Data - Wall Plenums

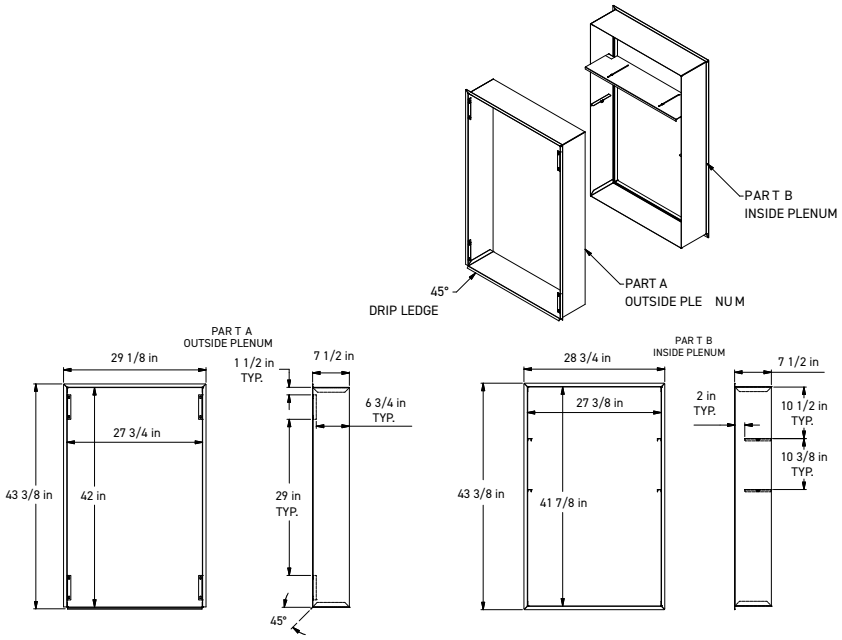
Installation Guidelines

- Chassis is to be installed against an exterior wall. Refer to page 11 for wall cut out dimensions
- 32" x 32" recommended minimum closet dimensions for return air, drain connections and change outs
- Minimum recommended access door rough-in measurements: 30" wide by 69 3/4" high
- The use of a Friedrich wall plenum is required for installation. Refer to this page for different sizes and selection guide
- Plenum opening minimum distance from floor to lower edge of outside wall cut out should be 3"
- Wall plenum allows chassis to be inserted 2 3/8" into plenum
- Return air is accommodated with a return air filter attached to the unit or through the use of a return air filter grille. (VRPXAP1).
- Exterior louvers are available in anodized aluminum or in custom painted colors and two different sizes: One for only 12K Btu units and the other that can be used with either 12K or 24K units. Refer to page 12 for details
- Unit is controlled by a remote wall-mounted 'Controller'

Wall Plenum for VRP12 with VRPXWPA-8/14 "



Wall Plenum for VRP24 with VRPXWPB-8/14 "



Accessory	Description	Outer Dimensions
VRPXWPA-8	Compact Wall Plenum for 4" to 8" thick wall	28 7/8" (W) x 33 3/8" (H)
VRPXWPB-8	Standard Wall Plenum for 4" to 8" thick wall	28 7/8" (W) x 43 3/8" (H)
VRPXWPA-14	Compact Wall Plenum for 8" to 14" thick wall	28 7/8" (W) x 33 3/8" (H)
VRPXWPB-14	Standard Wall Plenum for 8" to 14" thick wall	28 7/8" (W) x 43 3/8" (H)

Figure 209 (12k and 24k Accessories Dimensional Data - Wall Plenums)

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) Occupancy must be sensed, and the blower must be running for IAQ Ventilation to be active.

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 Farenheit, 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.

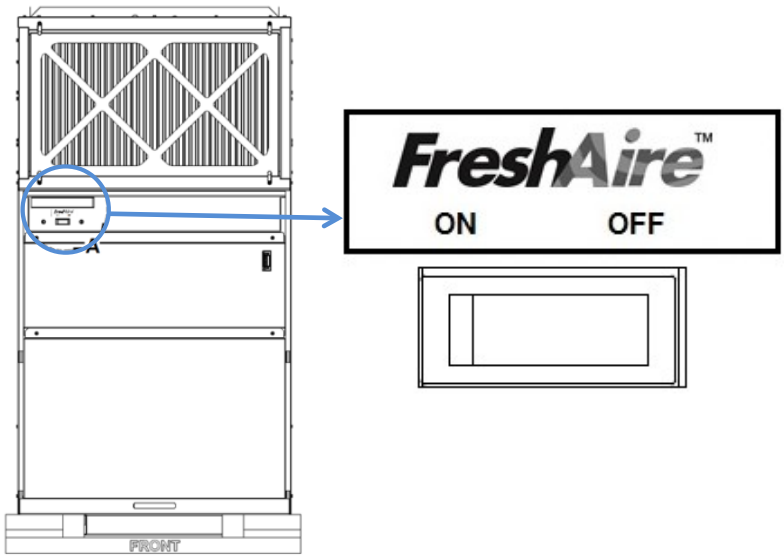


FIGURE 301 (FRESH AIR CONTROL)

OPERATION

Component Identification

- Indoor Coil
- Indoor Blower
- Outdoor Coil
- Outdoor Fan
- Compressor
- Electric Heater
- Electronic Expansion Valve (EEV)
- 4-Way Reversing Valve
- Reheat Solenoid
- FreshAire Fan
- Pressure Switches
- Condensate Base Pan Heaters (optional)

FIGURE 302 (COMPONENT IDENTIFICATION)

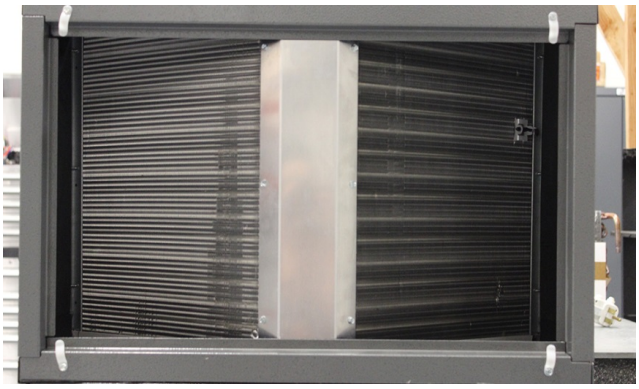
OPERATION

Component Identification

Indoor Coil 12 & 24k

12k (1 ton)
Slab coil

24k (2 ton)
“A” frame coil



Monitored by 2 thermistors

FIGURE 303 (COMPONENT IDENTIFICATION-INDOOR COIL)

OPERATION

Component Identification

Indoor Blower

- BLDC
- Counter Clockwise Impeller
- 600-1300 RPM

FIGURE 304 (COMPONENT IDENTIFICATION-INDOOR BLOWER)

OPERATION

Component Identification

Outdoor Coil

- Monitored by 1 thermistor

FIGURE 305 (COMPONENT IDENTIFICATION-OUTDOOR COIL)

OPERATION

Component Identification

Outdoor Fan

- BLDC
- Variable Speed= 600-1000 RPM

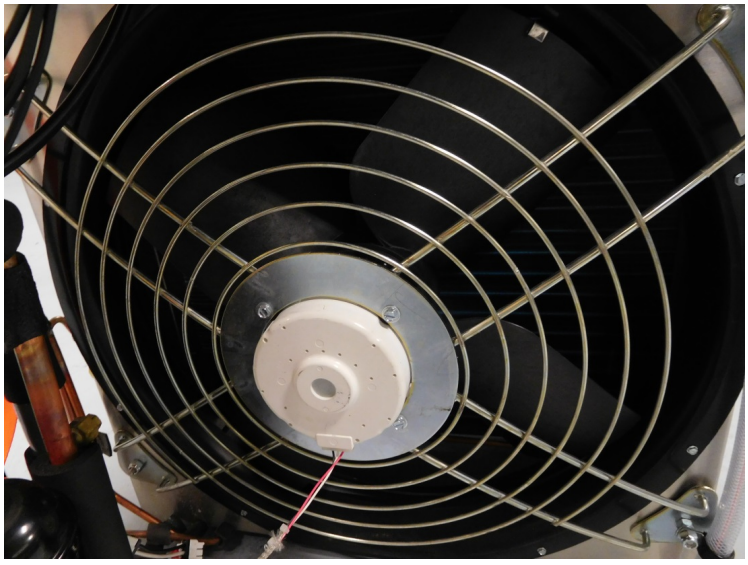


FIGURE 306 (COMPONENT IDENTIFICATION-OUTDOOR FAN)

OPERATION

Component Identification

Compressor

- 12k (1 Ton)
  - Inverter Rotary
  - Single Rotor
- 24k (2 Ton)
  - Inverter Rotary
  - Dual Rotor

FIGURE 307 (COMPONENT IDENTIFICATION-COMPRESSOR)

OPERATION

Component Identification

Electric Heater

- 2.5 / 3.4 / 5.0 / 7.5 / 10.0 Kilowatt variations
- Located directly behind the indoor coil and in front of the indoor blower

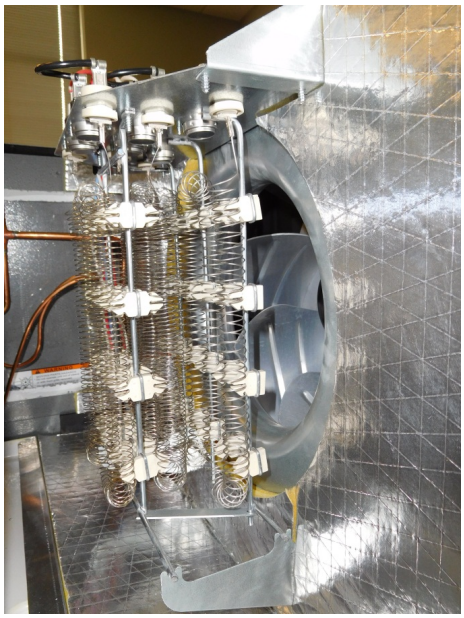


FIGURE 308 (COMPONENT IDENTIFICATION-ELECTRIC HEATER)

OPERATION

Component Identification

Electronic Expansion Valve

- Used to control superheat
- Controlled by magnetic pulse

FIGURE 309 (COMPONENT IDENTIFICATION-ELECTRONIC EXPANSION VALVE)

OPERATION

Component Identification

4-Way Reversing Valve

- 208/230v
- Reversing valve assembly

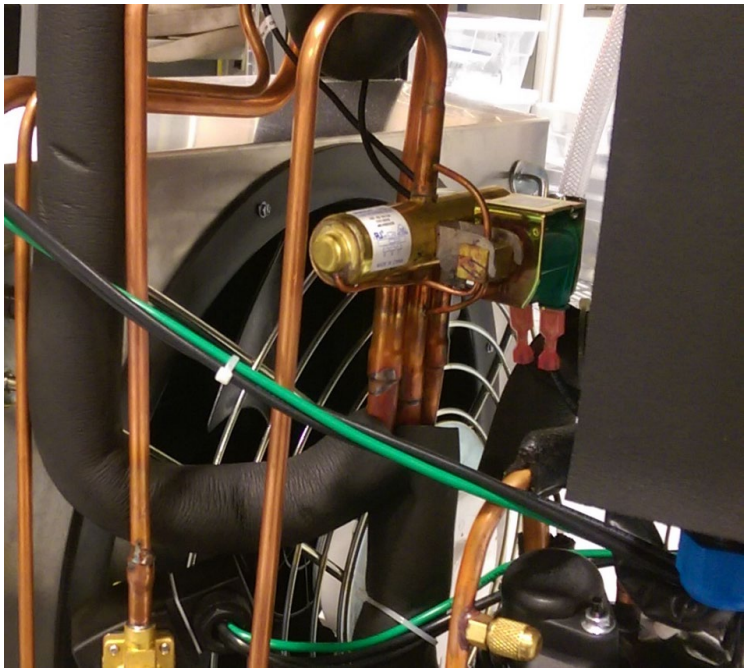


FIGURE 310 (COMPONENT IDENTIFICATION-4-WAY REVERSING VALVE)

OPERATION

Component Identification

Remaining Components (Side View)

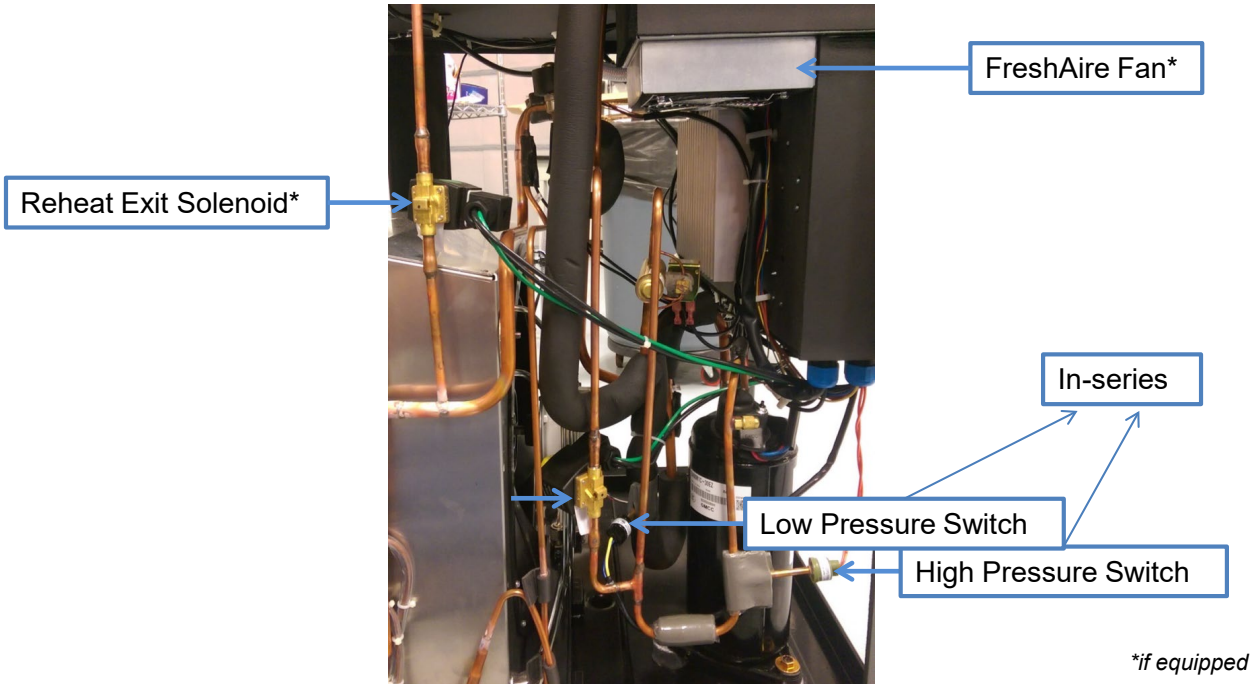


FIGURE 311 (COMPONENT IDENTIFICATION-REMAINING COMPONENTS)

OPERATION

Component Identification

VRP Control Boards

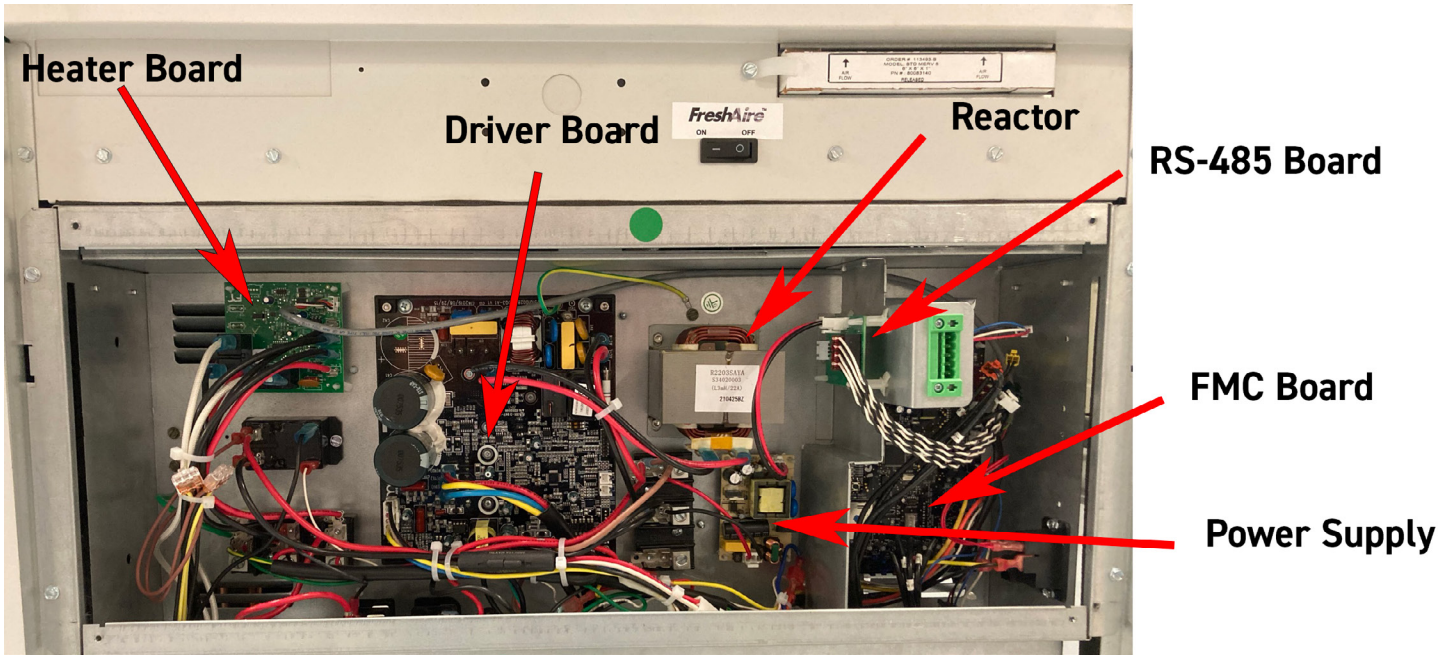


FIGURE 312 (12k) VRP CONTROL BOARDS)

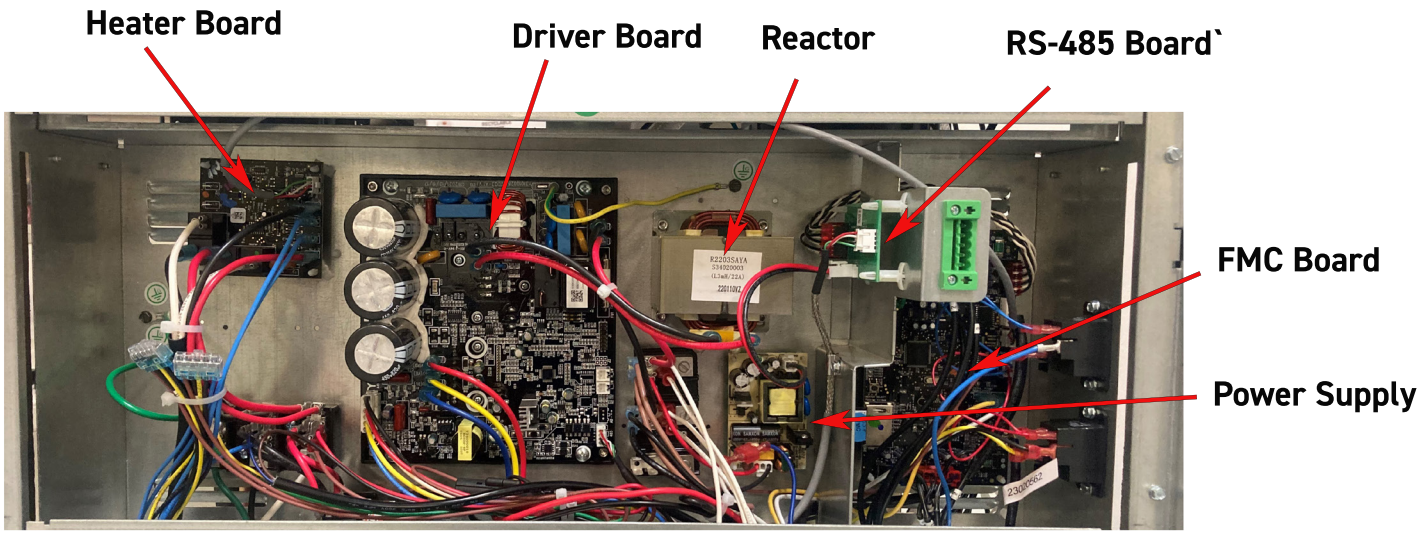


FIGURE 313 (24k) VRP CONTROL BOARDS)

OPERATION

Component Identification

Main Controller

- **Relay and Control Logic (VRP Brain)**
  - Diagnostic Logic
- **Communicates with:**
  - Wall Controller (WC)
  - Heater Board
  - Driver Board
- **Handles/Controls:**
  - Electronic Expansion Valve (EEV)
  - Pressure Switches
  - Indoor Blower
  - Reheat and FreshAire Relays
- **Upgradeable**
  - Manual via SD card

FIGURE 314 (FMC-MAIN CONTROLLER)

OPERATION

Component Identification

Compressor Control

- The rate of change of the space conditions is assessed periodically and the compressor frequency is changed accordingly.
- Unless diagnostically conflicted, the compressor will operate in some capacity any time there is a cooling or heat pump demand.

FIGURE 315 (COMPRESSOR CONTROL)

OPERATION

Component Identification

EEV Control

- The Electronic Expansion Valve is used to maintain superheat during both cooling and heat pump operation.
- Superheat (cooling) = Compressor Suction (T3) – IDC Cool Inlet (T1)
- Superheat (heat pump) = Compressor Suction (T3) – ODC Heat Inlet (T7)
- The EEV will open if the super heat is too high and will meter if the super heat is too low.

FIGURE 316 (EEV CONTROL)

OPERATION

Component Identification

Reheat Control

- The VRP models, when equipped with the reheat option, increase room dehumidification capability.
- The reheat option has a coil installed downstream of the main indoor evaporator coil.
- When activated, a portion of the compressor discharge gas is routed through the reheat coil.
- This coil “reheats” the air leaving the evaporator and allows longer run times for additional dehumidification without over-cooling the room.

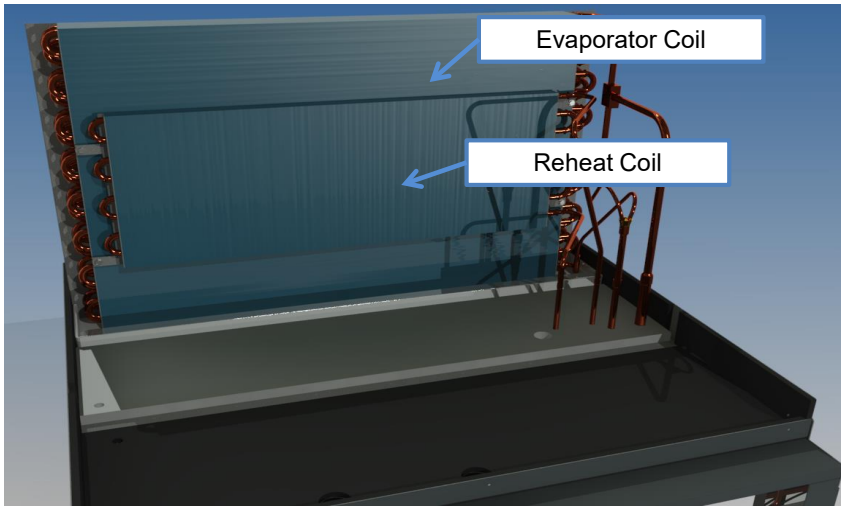


FIGURE 317 (REHEAT CONTROL)

INSTALLATION

The Friedrich VRP has been carefully engineered and manufactured to provide many years of dependable, efficient operation while maintaining a comfortable temperature and humidity level. Many extra features have been built into the unit to ensure quiet operation, optimal circulation of cool, dry air, and the most economic operation.

Please carefully read and follow the installation instructions and safety warnings detailed in this manual. All applicable national and local mechanical and electrical codes should be followed and take precedence over any Friedrich requirements or recommendations regarding installation applications detailed in this manual.

⚠ 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

Indications property damage can occur if instructions are not followed.

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.

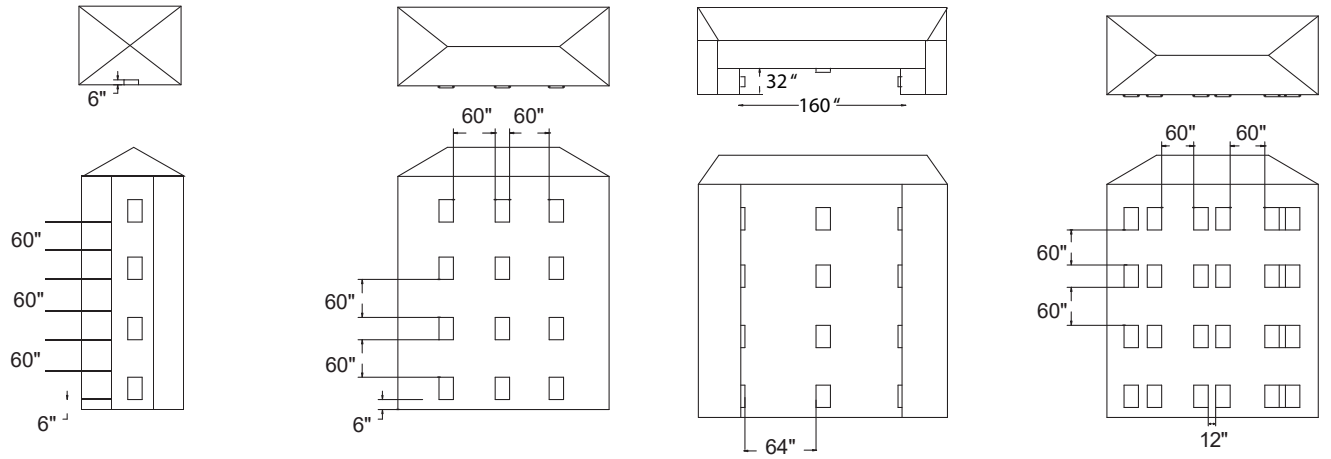


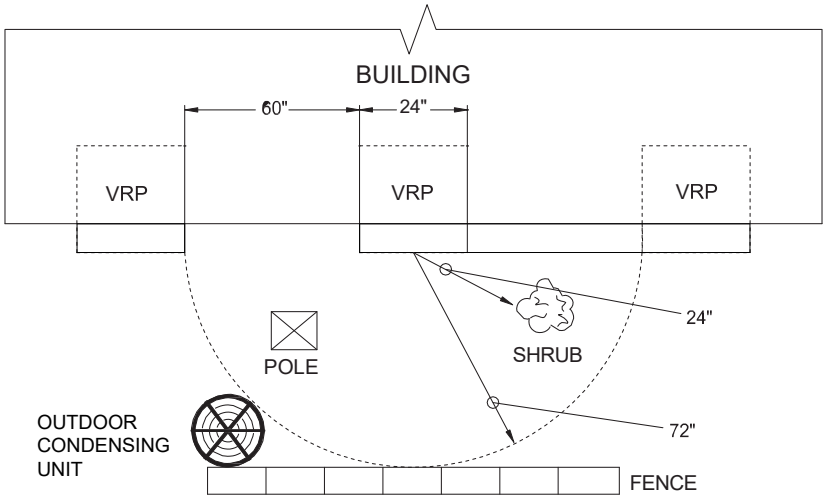
Figure A Figure B Figure C Figure D

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.

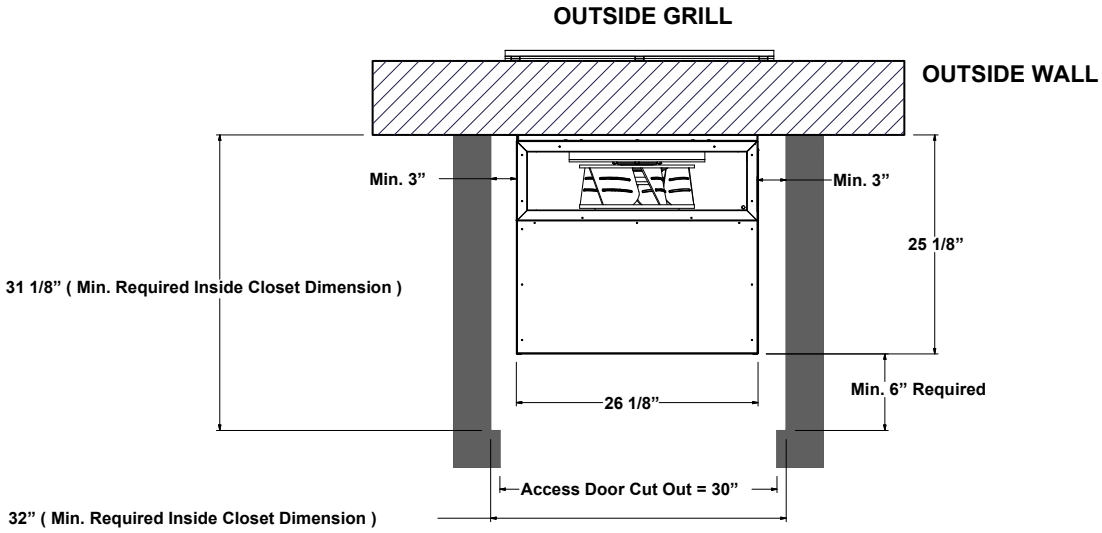


The the example pictured above is for reference only and does not represent all possible installations. Please contact Friedrich Air Conditioning for information regarding effects of other installation arrangements.

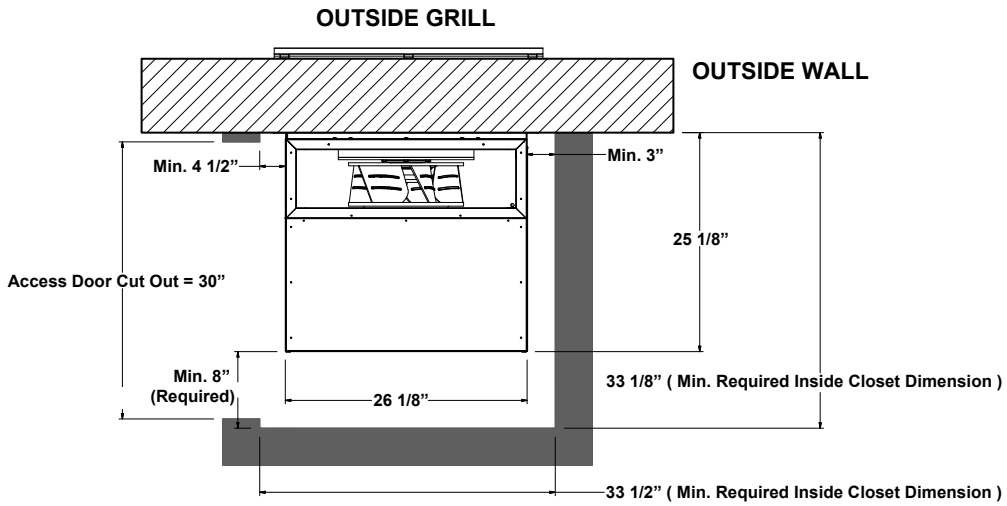
FIGURE 401 (INSTALLATION CLEARANCE)

INSTALLATION

Installation Orientations 12&24k



Front Installation-Top View



Left Installation-Top View

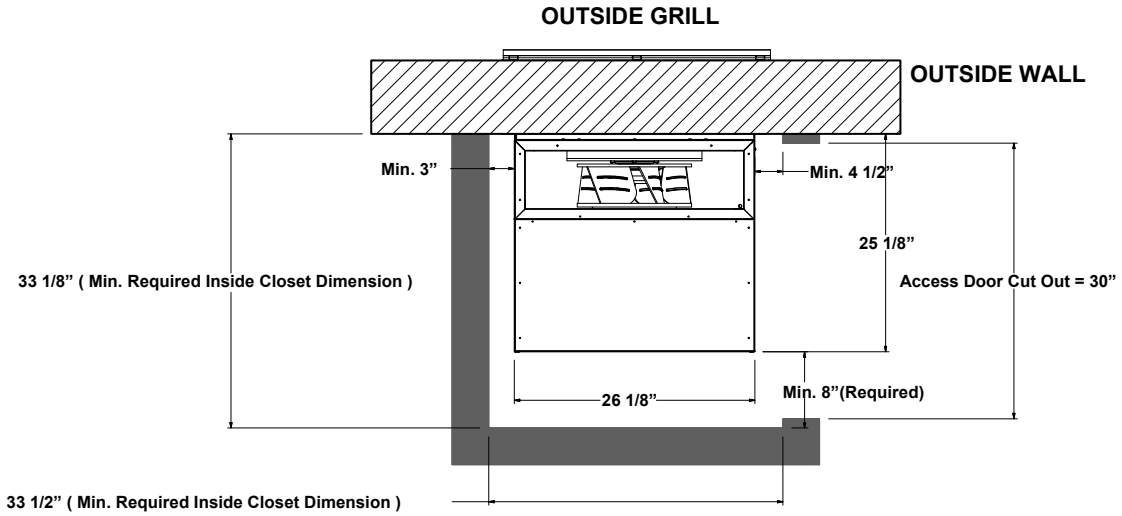


FIGURE 402 (INSTALLATION ORIENTATION)

INSTALLATION

Exterior Wall Opening Dimensions 12 &24k

Exterior Wall Rough Opening Dimensions		
Unit	Width	Heigth
Compact (VRPXWPA-*)	28 1/8"	32 1/4"
Standard (VRPXWPB-*)	28 1/8"	42 1/4"

Compact (A) configuration is for 12000 BTU units only. Standard (B) configuration is for 24000 BTU and 12000 BTU units. A compact 12000 BTU unit can be converted to standard dimensions with a factory provided adapter. Ensure that the correct wall plenum is selected based on unit configuration.

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

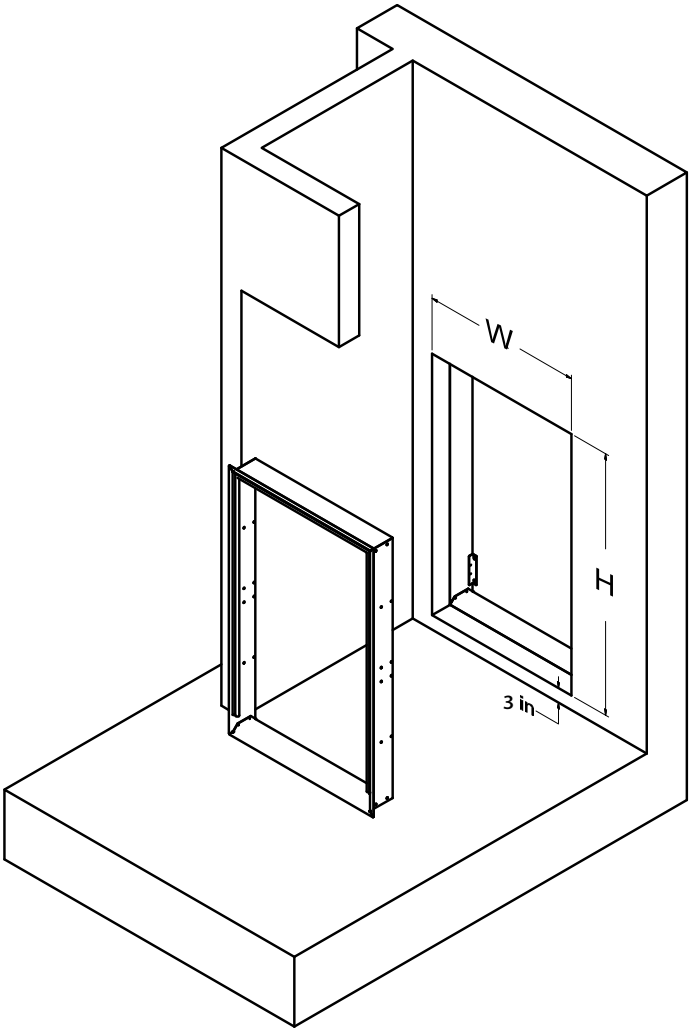
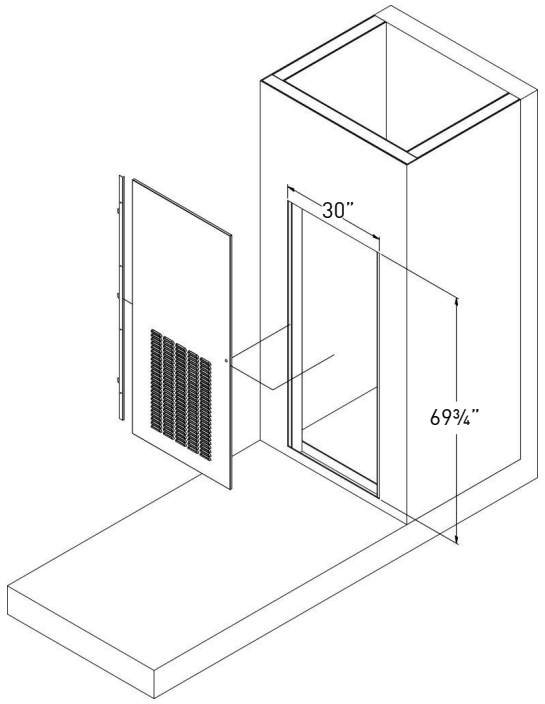


FIGURE 403 Exterior Wall Opening Dimensions 12 &24k)

INSTALLATION

Interior(Closet) Wall Opening Dimensions 12 & 24k

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.

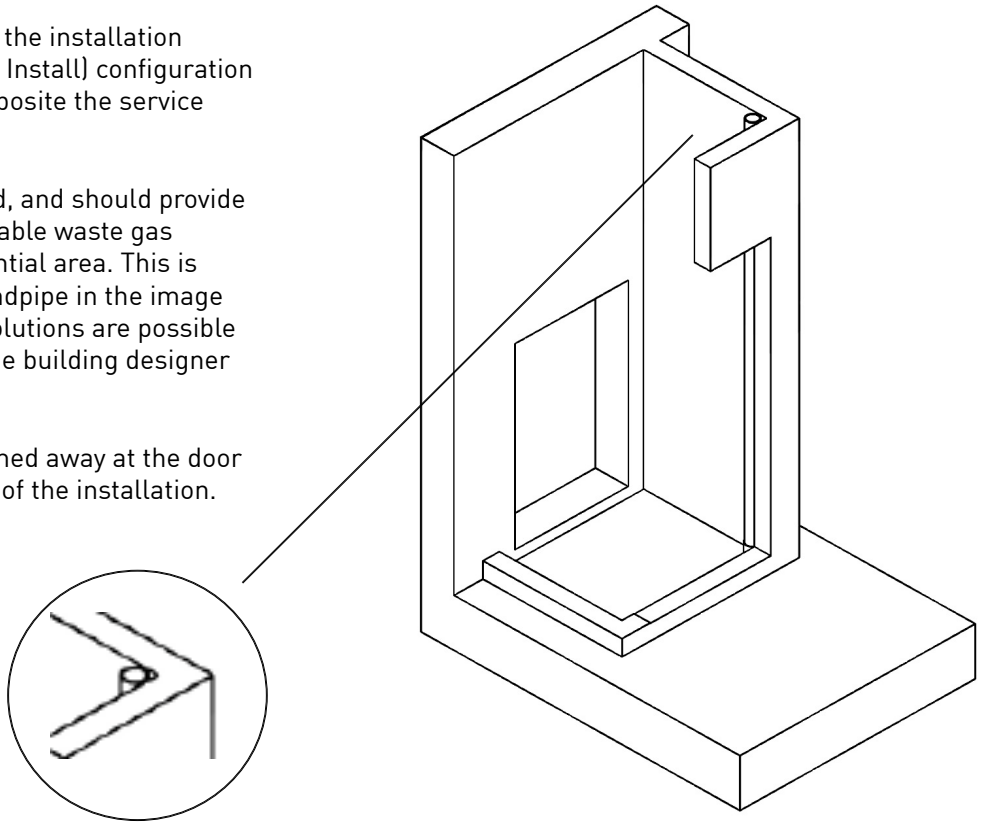
FIGURE 404 Exterior Wall Opening Dimensions 12 &24k)

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

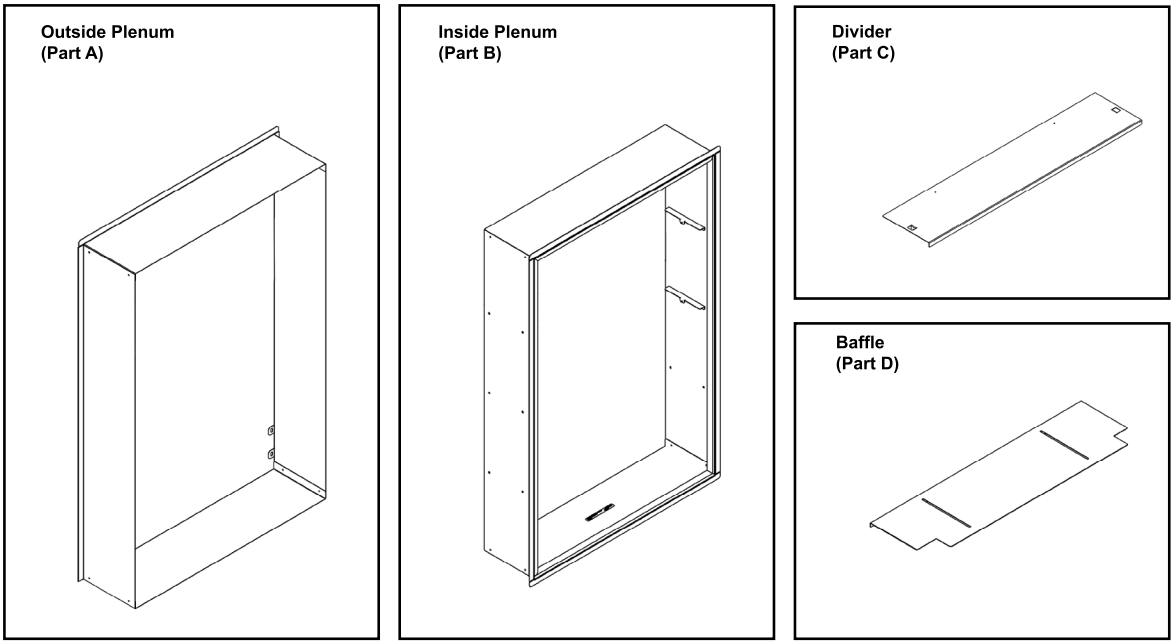
FIGURE 405 (PRELIMANARY PLUMBING)

INSTALLATION

Wall Plenum Installation 12 & 24k

Parts included in Plenum kit:

Outside Plenum (Part A)
Inside Plenum (Part B)
Divider (Part C)
Baffle (Part D)



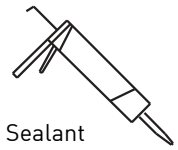
Field Supplied Parts:

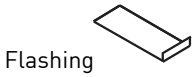
Sealant, attachment screws, and flashing
are field supplied. Silicone sealant is recommended.

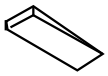
VRPXWPA-8, VRPXWPB-8 adjust for walls up to 4"- 8" thick.

VRPXWPA-14, VRPXWPB-14 adjust for walls up to 8" - 14" thick

All installations are similar.


Sealant


Flashing


Shim

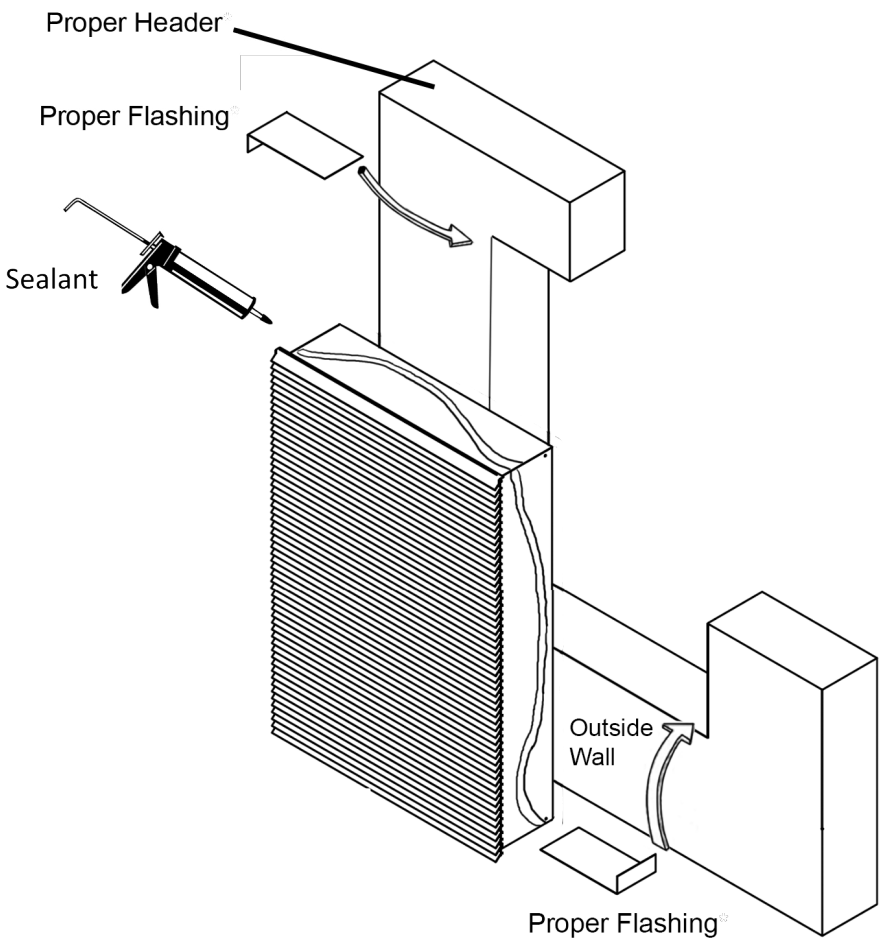

1"-3" Screws to attach the plenum assembly to the wall studs

FIGURE 405 (Wall Plenum Installation)

INSTALLATION

Wall Plenum Installation 12 & 24k

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.

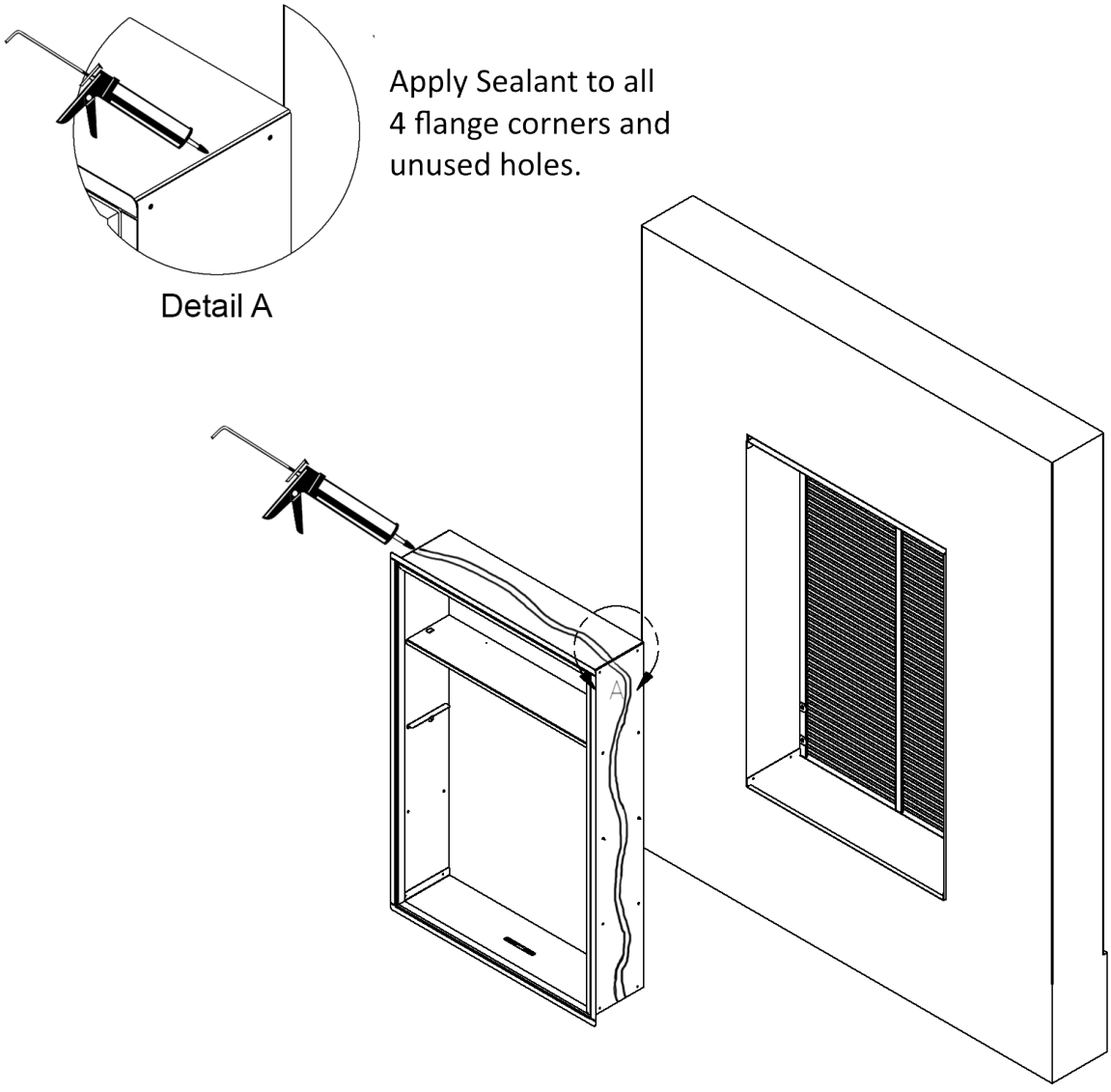
1) Prepare the rough opening. The rough opening should be lined with metal or wood. The plenum will warp if sealed against concrete or brick.
2) Dry fit the outside plenum half into the rough opening and check the fit and level.
3) Remove the outside plenum half, flash the rough opening to ensure proper fit and level.
4) Pre-installing the exterior louver (VRPXALA/B) 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 watertight seal. Ensure that the outside plenum half is securely attached to the framed opening.
6) Place the plenum divider (Part C) on the appropriate divider mounting tabs located on the inner perimeter of the outside plenum half based on unit size (Compact/Standard).

FIGURE 406 (Wall Plenum Installation)

INSTALLATION

Wall Plenum Installation 12 & 24k

Step 2 - Inside Wall Plenum Half



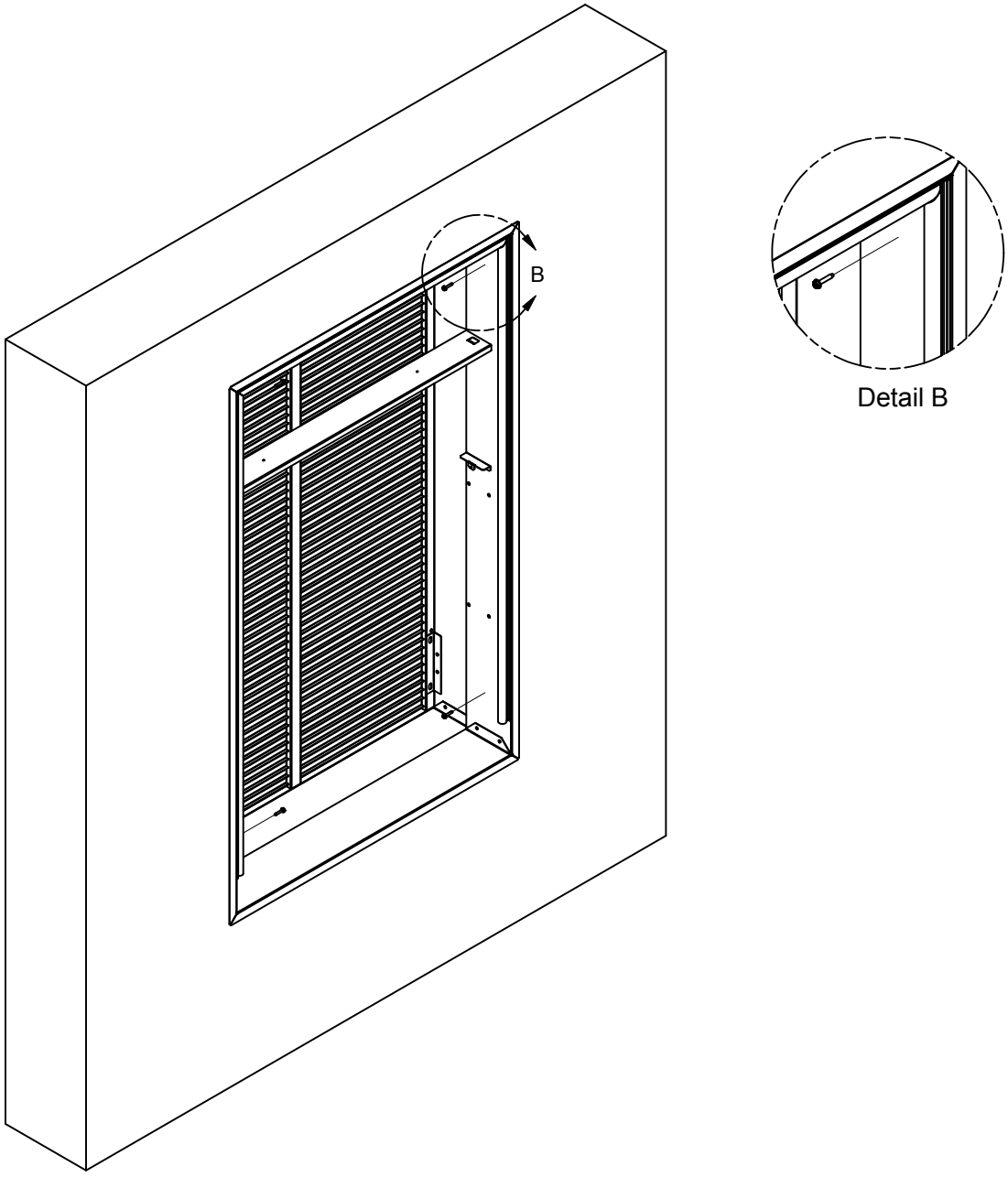
1) Apply sealant to all 4 flange corners and unused holes. See Detail A.
2) Place the baffle (Part D) on the appropriate baffle mounting tabs located on the inner perimeter of the inside plenum half based on unit size (Compact/Standard).
3) Flash the inside of the rough opening to ensure the proper fit and level.
4) Insert inside plenum half (Part B) into Outside Plenum Half (Part A). Ensure that Part A does not back out of the rough opening.
5) Remove the inside plenum half.
6) Apply sealant to the outside plenum half and insert into the rough opening to ensure a watertight seal.

FIGURE 407 (Wall Plenum Installation)

INSTALLATION

Wall Plenum Installation 12 & 24k

Step 3 - Inside Wall Plenum (cont.)



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.

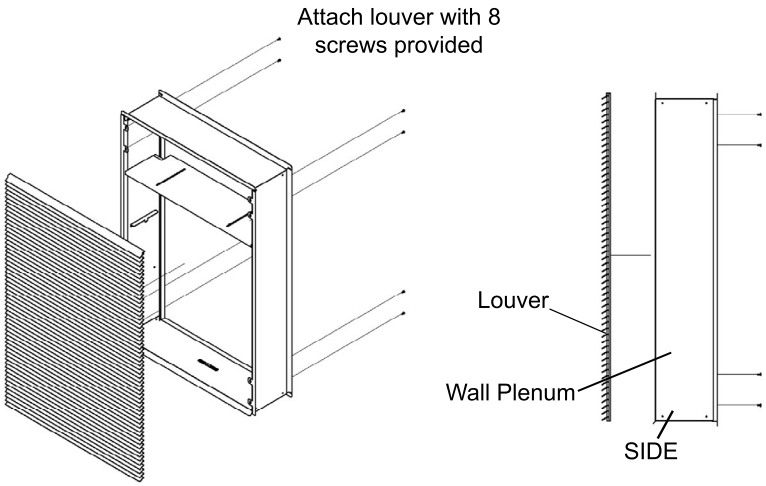
2) Install fasteners through each pilot hole. Fastener must pass through both Part A and Part B. If the inside and outside plenum halves do not overlap at fastening point, be certain to drill extra holes where needed to secure both Part A and Part B to the rough opening.

FIGURE 408 (Wall Plenum Installation)

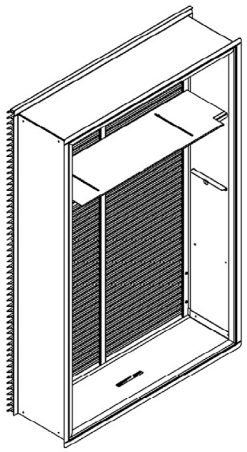
INSTALLATION

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.

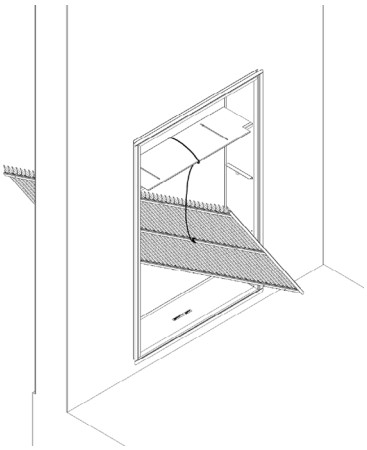
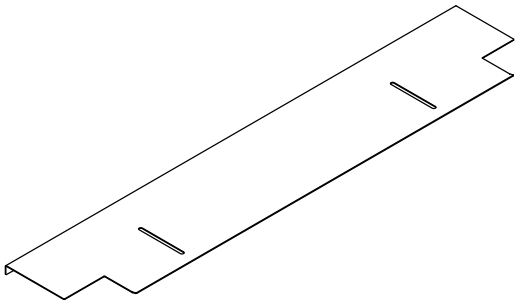


FIGURE 409 (Louver Installation)

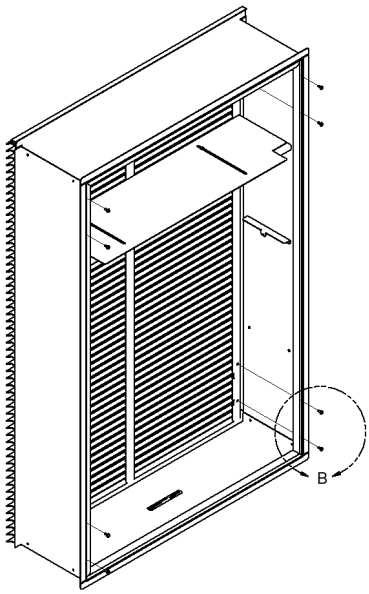
INSTALLATION

Final Wall Plenum And Architectural Louver Installation

Plenum Divider Extension Plate (Baffle)



Plenum Divider Extension Plate Installed into Full Plenum Assembly



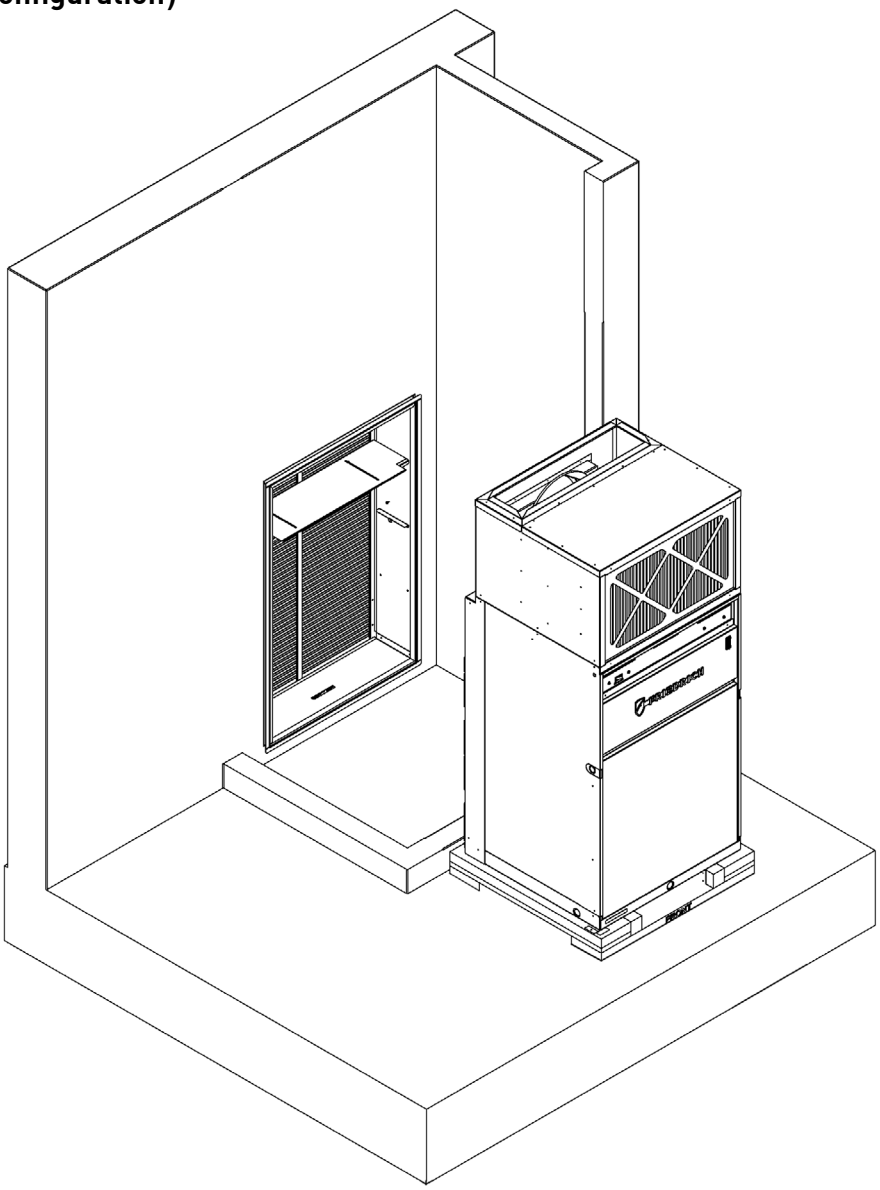
Ensure that the weather strip is undamaged and provides a continuous seal around the inner perimeter of the plenum.

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) Install the plenum adjuster plate. Ensure the exterior edge is seated against the inside of the architectural louver.
2) Secure the plenum divider extension plate to the architectural louver using the two provided screws.
3) Use tape and sealant to seal any gaps.

FIGURE 410 (Final Wall Plenum And Architectual Louver Installation)

Unit Placement Prior to Installation (Front-Install Configuration)



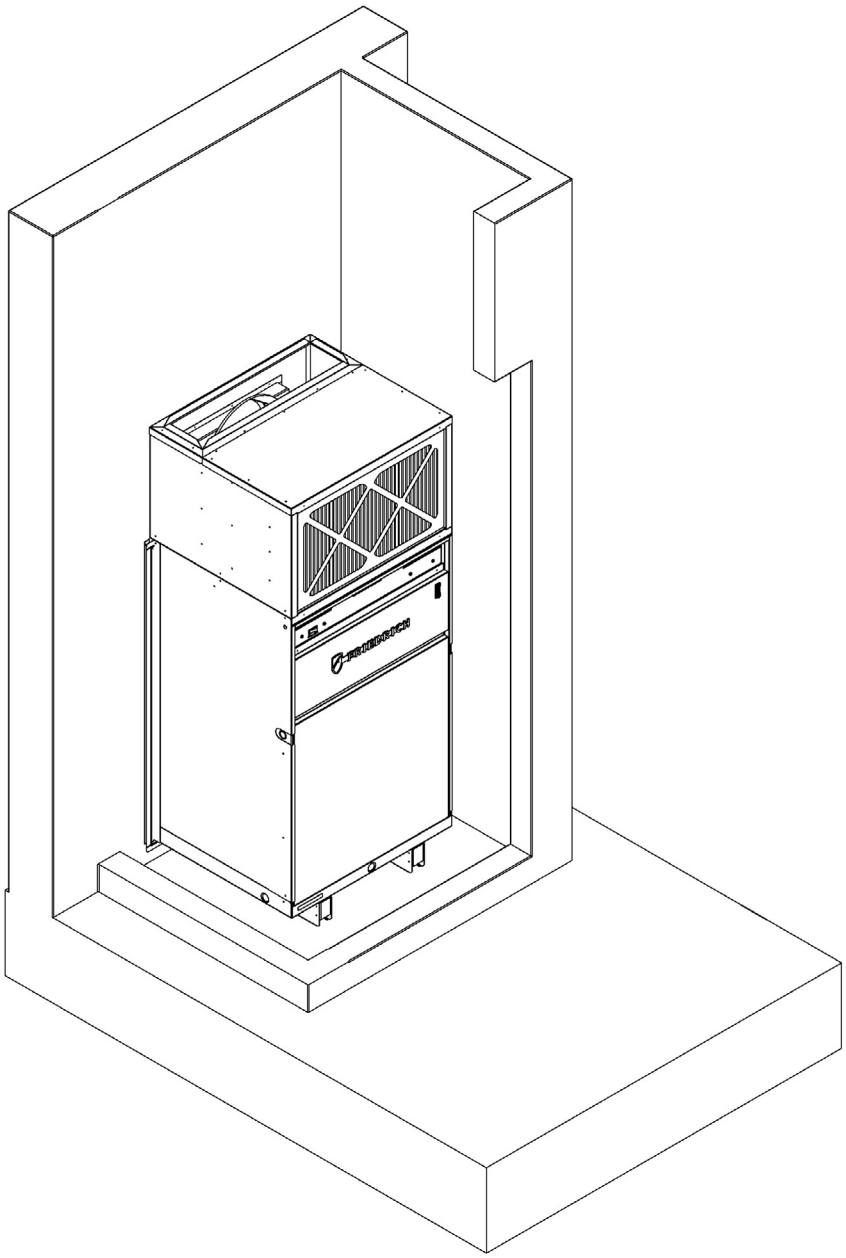
louver, plenum, rough plumbing, and rough wiring steps must be complete prior to final installation of the air

FIGURE 411 (Unit Installation)

INSTALLATION

Final Unit Installation Overview

Unit Final Placement - Front Install



Ensure that power if off at the junction box feeding power to the air conditioner until all process steps are completed.

Move the unit from the shipping base and onto the installation site.

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.

Identify the appropriate drain port to use and complete plumbing.

Attach the ductwork to the unit at the supply-air outlet and ensure the seal is airtight.

Wire and connect the wall controller.

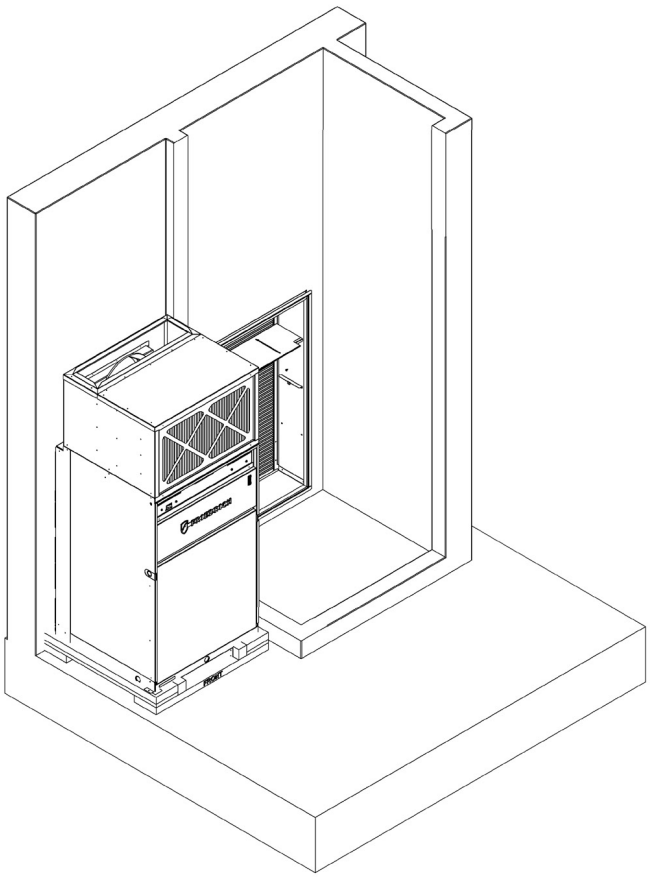
Connect the main power.

FIGURE 412 (Final Unit Installation Overview)

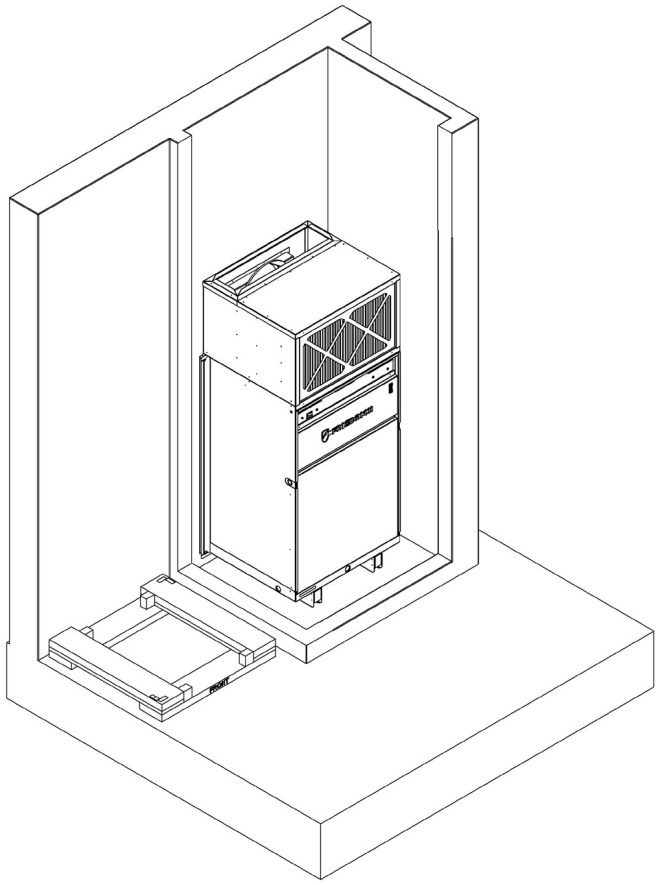
INSTALLATION

Side Configuration Installation

Left Install VRP Unit Prepared for Installation



Left Install VRP Unit in Closet (Fully Installed)



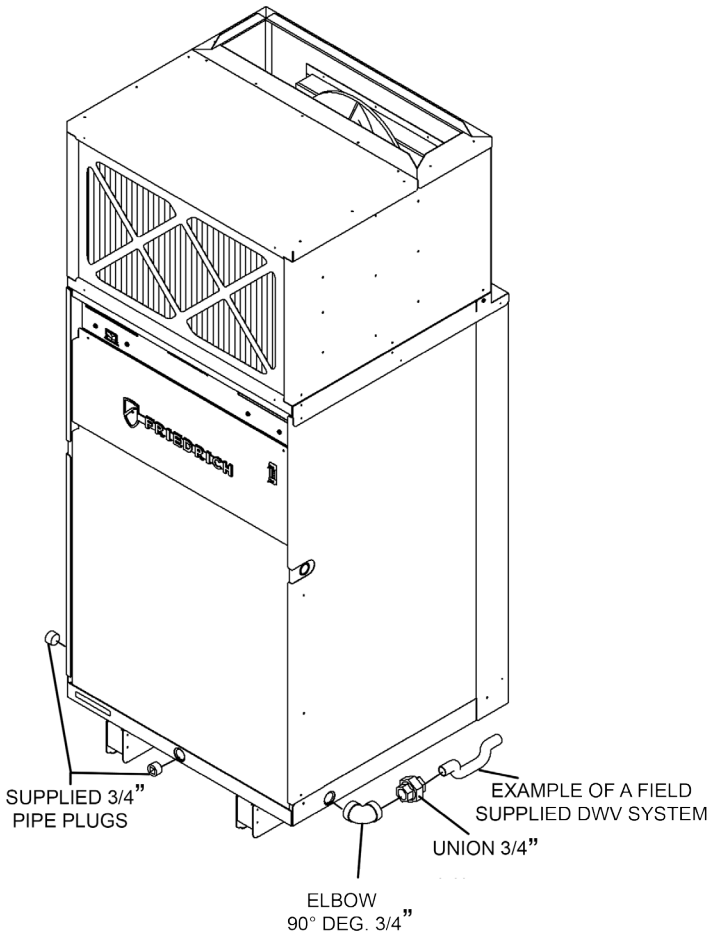
For side-install applications, place the unit adjacent to the closet and slide it in. Then, slide the unit backward into the plenum.

FIGURE 413 (Side Configuration Installation)

INSTALLATION

Unit Drain Installation

Unit Drain Installation



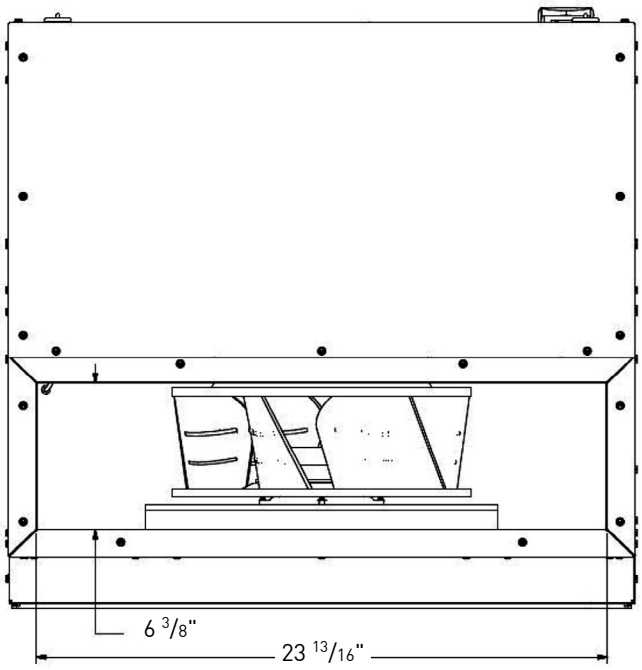
NOTE: Failure to follow the following procedures may result in serious property damage. A field supplied secondary condensate pan may be required. Check with local codes. In case of drainage system blockage, the unit base will allow excess water to flow out of the unit through the plenum and the architectural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

1) Connect the supplied drain kit must be connected to one of the three (left, right or rear) 3/4" FPT connections on the unit basepan. Use of rear fitting without connection to DWV system (drain, waste, vent) may result in staining of the outside wall.
2) Insert the provided 3/4" nipple into the determined connection using field-supplied Teflon tape or pipe joint compound.
3) With the slip end of a 3/4" union, connect to the nipple with Teflon tape or pipe joint compound.
4) Hand-tighten all fittings to prevent damage to unit or fittings.
5) Install a field-supplied drain system to the slip end of the union. A trap is required and drain connections should be connected to building DWV system. Pitch the drain line of a 1/4" downward slope for every foot (1') of lateral horizontal run to the DWV.
6) Plug the two unused connection ports with the two provide 3/4" pipe plugs and field-supplied Teflon tape or pipe joint compound. High tighten to prevent damage to the unit or fittings. Do not thread metal or copper pipe fittings directly into unit.
7) Check the system for leaks.

FIGURE 414 (Unit Drain Installation)

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.

FIGURE 415 (Ductwork Installation)

INSTALLATION

Wall Controller Installation 12 & 24k

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.

FIGURE 416 (Wall Controller Installation)

INSTALLATION

Wall Controller Installation 12 & 24k

Wiring to the VRP Unit

A. Strip the wire ends to 9/16" (15 mm).
B. Insert the wire pairs into terminals as shown below.
C. Insert ground shield wire into ground terminal (marked with a ground symbol).
D. Tighten the screws to secure the wires to the corresponding terminals.
E. Pull the wires to check that they are securely affixed to the terminal block.

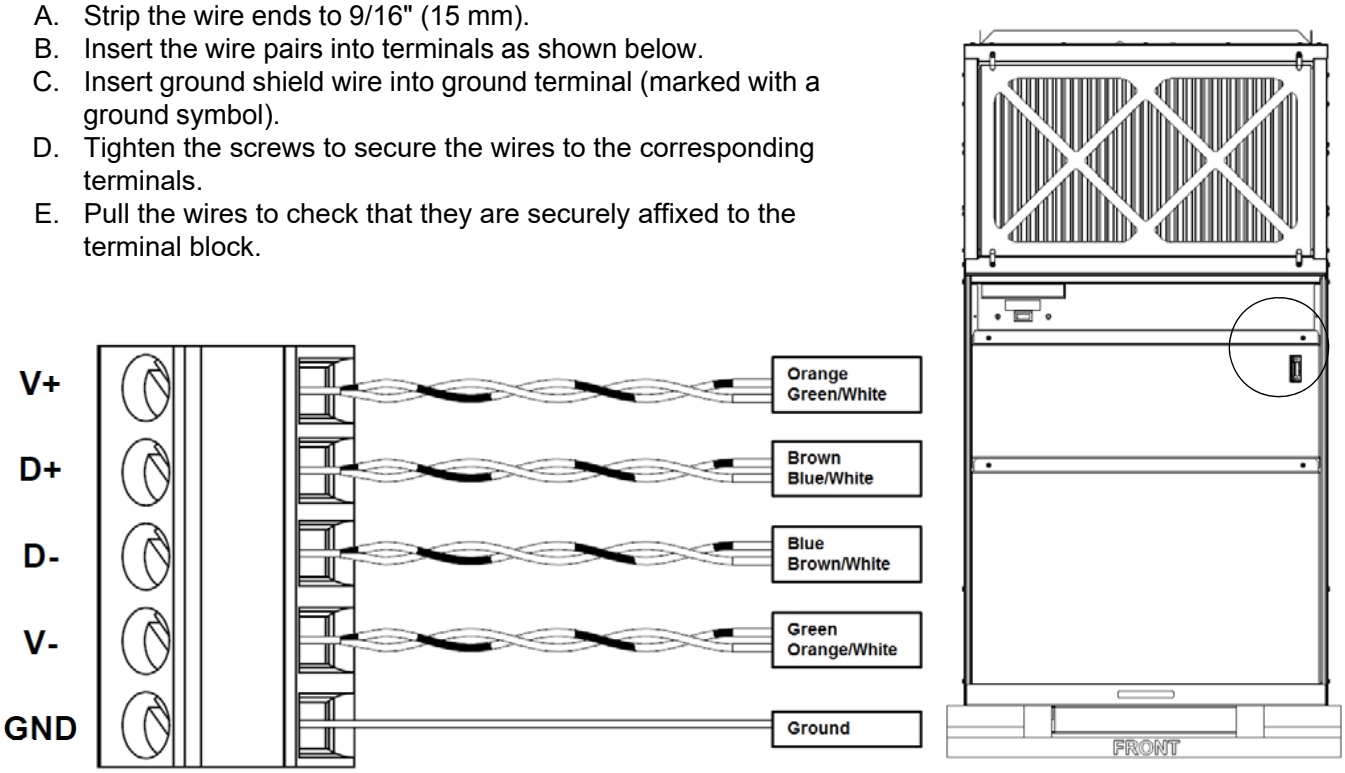
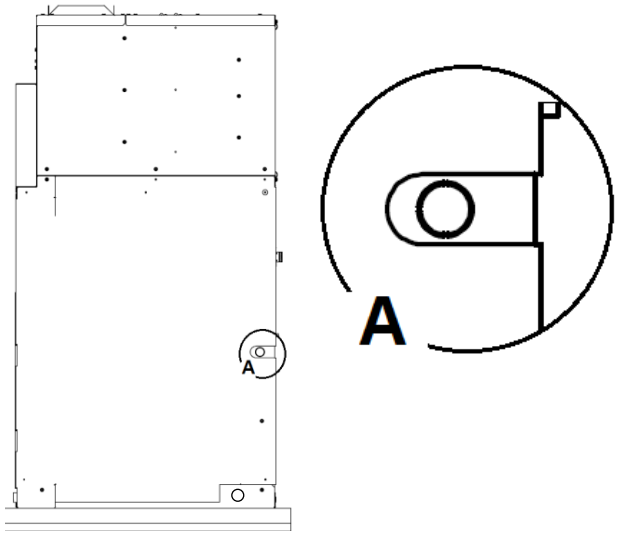


FIGURE 417 (Wall Controller Installation)

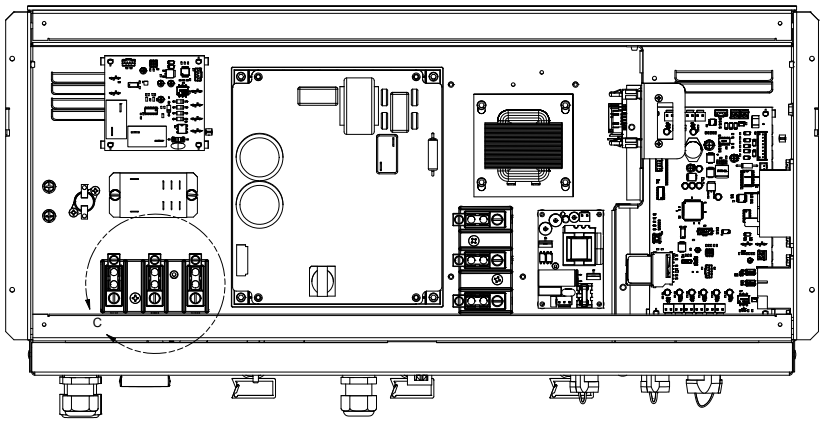
INSTALLATION

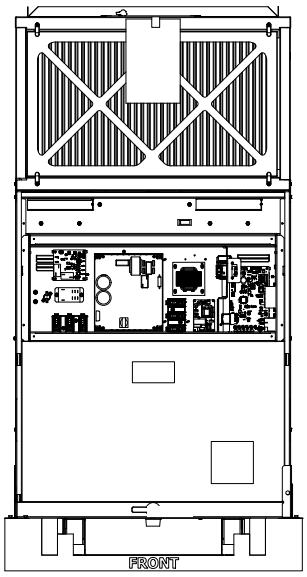
Electrical Installation 12 & 24k

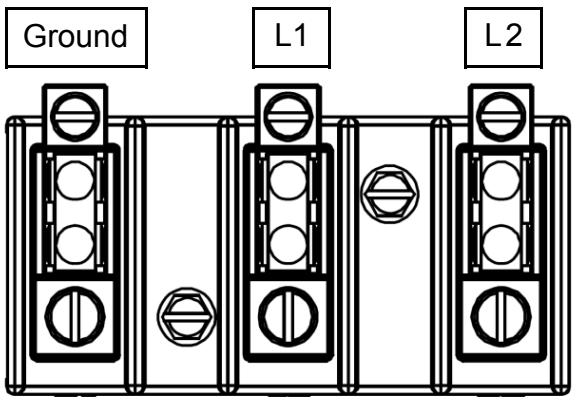


Remove and discard hole knock-out from the side of the unit (Detail A)

Remove the electrical access panel to expose the incoming Ppwer terminal block (Detail C, see below)





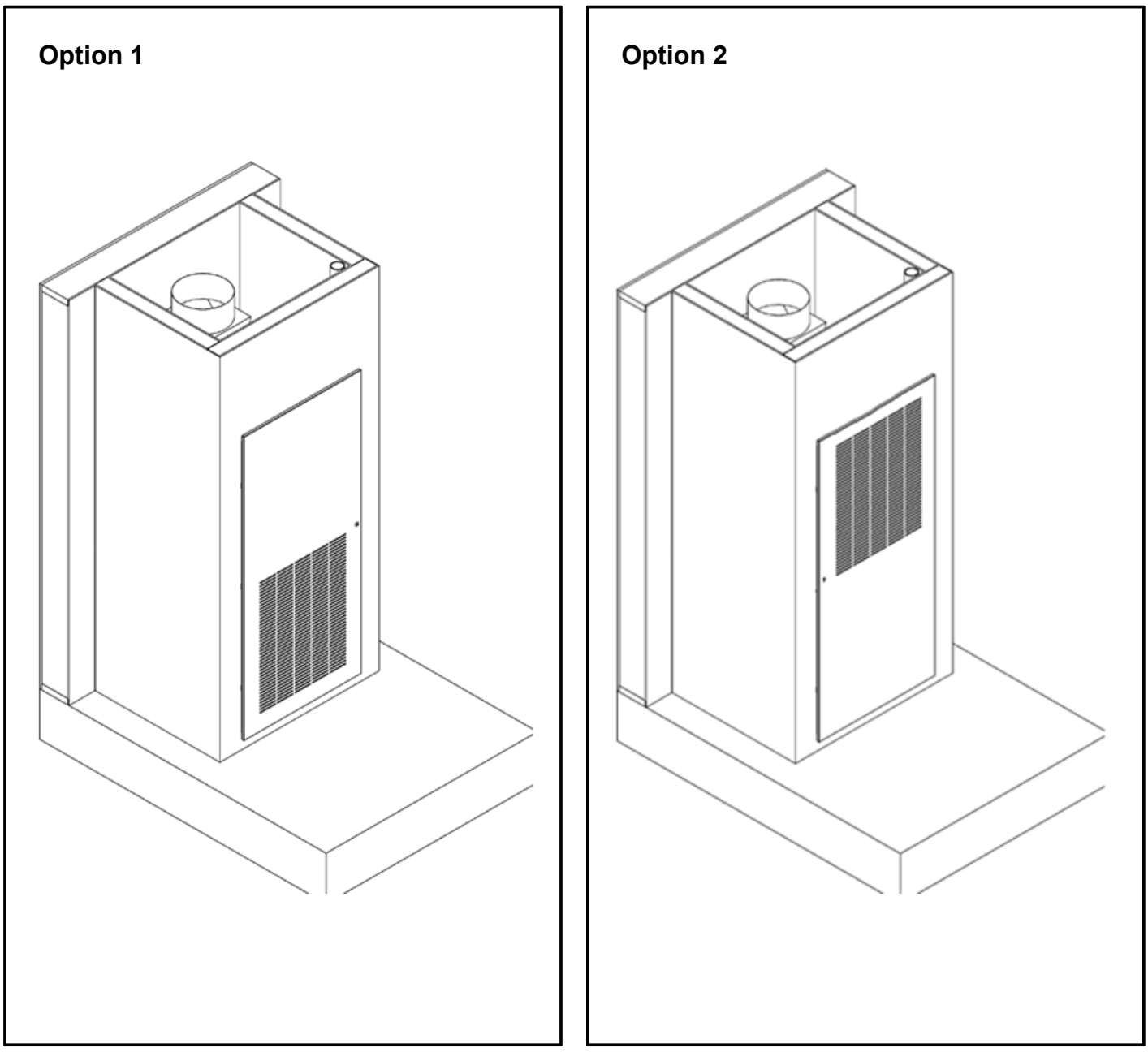


Insert all wires through the punched out hole and fasten wires as follows:

FIGURE 418 (Electrical Installation)

INSTALLATION

Return Air Door Installation12 & 24k



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.

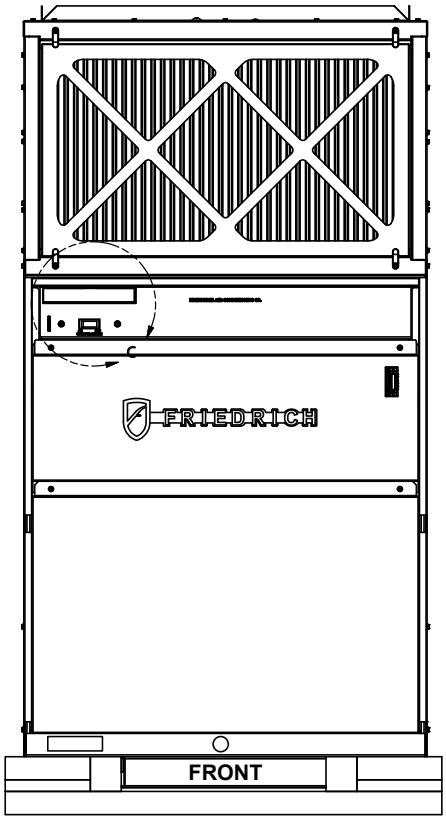
The door panel has a provision for filter installation on the door. This feature is only usable when the door is installed in the lower orientation (Option 1) and the unit filter has been removed.

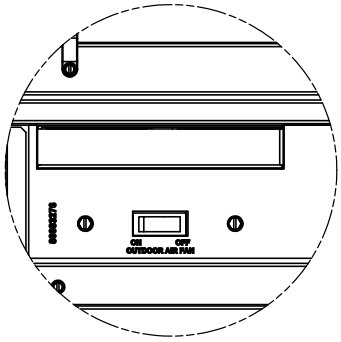
The unit should not be operated with both the unit filter and the door filter installed.

FIGURE 419 (Return Air Door Installation)

INSTALLATION

FreshAire System Set-up and Operation





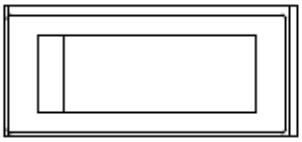
DETAIL C

If equipped with the FreshAire™ System, the unit will come with a FreshAire filter and blank-off plate.

Remove the blank-off plate prior to turning the unit on.

To remove the blank off plate, pull the attached tab shown in Detail A. The blank-off plate can be discarded or retained for future use.

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

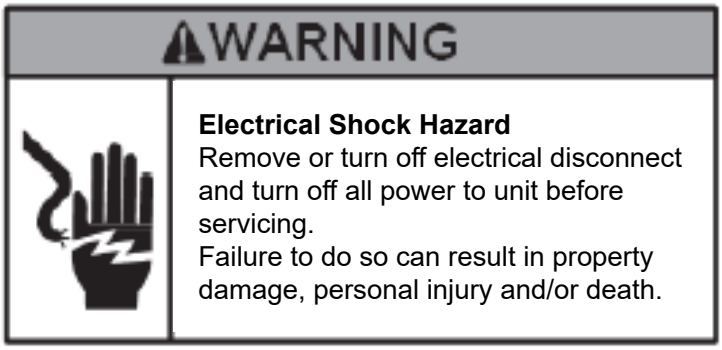


ON OFF
OUTDOOR AIR FAN

FIGURE 420 (FreshAire System Set-up and Operation)

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 optional system can be configured to have either a single (F option) outdoor air fan and filter, or dual (D option) outdoor air fans and filters.

The FreshAire™ System uses a 6 x 6 x 1 filter (quantity of 1 for option F and 2 for option D). The filters are 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.

FIGURE 421 (Final Installation Checklist)

TROUBLESHOOTING

VRP Troubleshooting Map

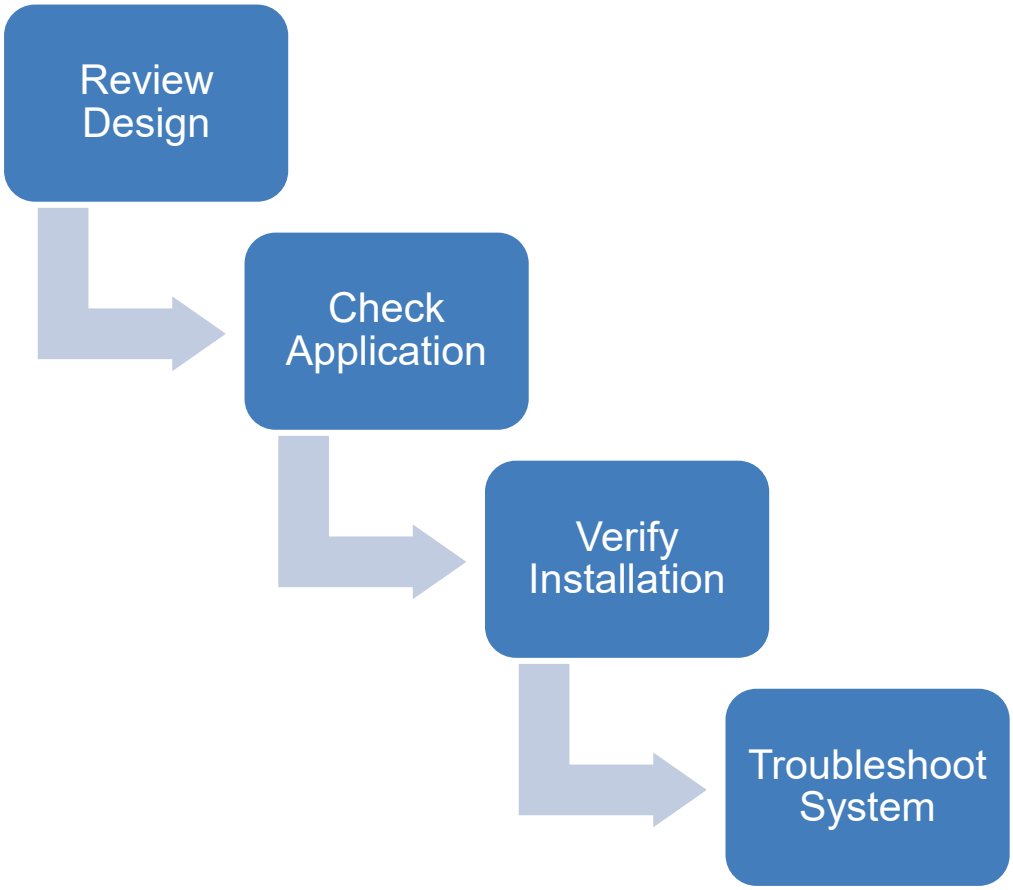


Figure 501 (Troubleshooting Map)

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

Figure 502 (Troubleshooting Tools)

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

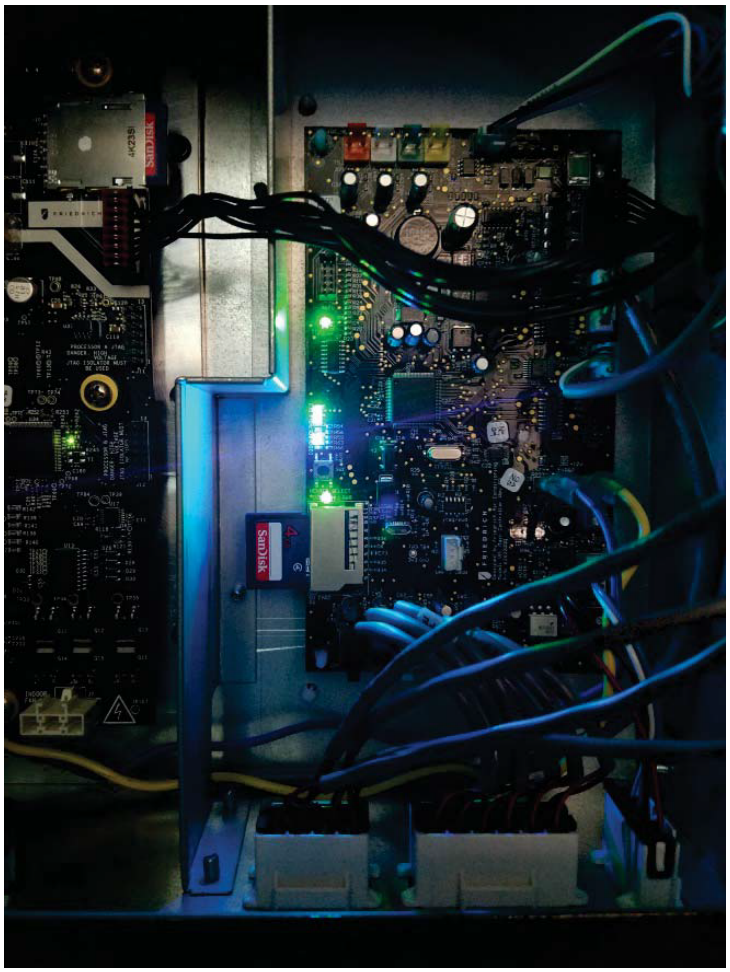
Diagnostic Code Check at FMC Board

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. 6. In Cooling mode check outdoor coil restriction. 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	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.
15	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.
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 boad 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 IDB speeds. 2. Low refrigerant charge. 3. Low Ambient temperature.	1. Ensure that the IDB 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. IDB is not operating when electric heat is on. 2. Electric heat limit switches are failing.	1. Replace Electric Heat Element. 2. Verify operation of IDB, replace if necessary
25	Indoor Coil Restriction	If one thermistor coil is frozen while another thermistored 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 board communication issue. 3. Driver board communication issue. 4. RS-485 board communication issue.	1. Unplug, do continuity check on cable, and re-plug Heater Board communication cable 2. Check Heater board. 3. Unplug, do continuity check on cable, and re-plug RS-485 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.	Replace the driver board. Make sure to check the ADEN board error (blinky lights)
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 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 boad.	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.	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.
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."
52	Driver board DC Axix Over Voltage	N/A.	Diagnostic disabled.
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. Standby 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. 3. Inspect harness for damage. 4. 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.

TROUBLESHOOTING

Driver Board Diagnostic Codes

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.
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

Check For Power

1. If the wall controller does not light up, ensure the unit has power.

2. Check the electrical circuit breaker.

3. Check the units disconnect.

4. Check power at L1 and L2.

TROUBLESHOOTING

Diagnostic Code (Temperature Based)

Temperature Based:

Thermistors (sensors) modify VDC and is 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.

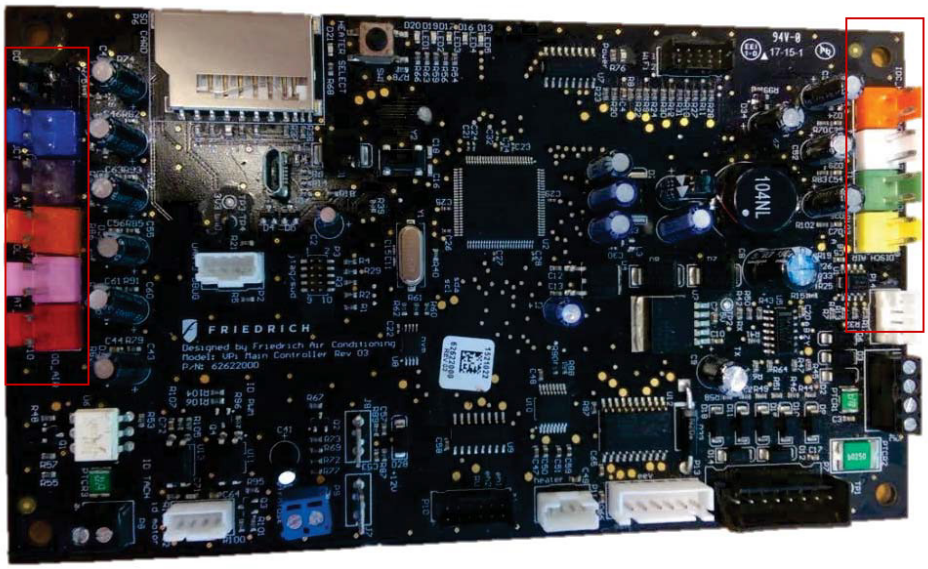


Figure 503

(Continuity check)

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

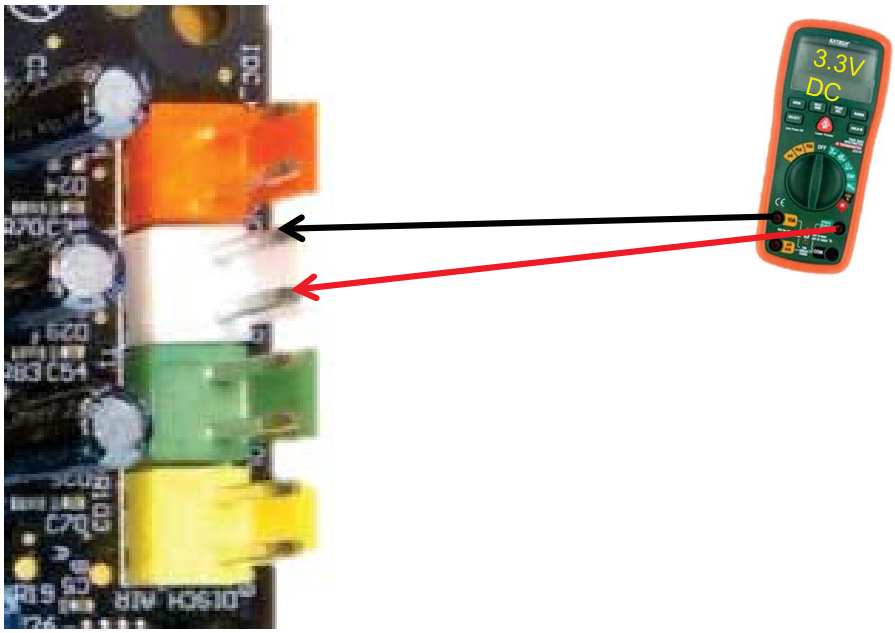


Figure 504

(Voltage check)

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 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:

1. Initial installation of equipment or a valve replacement. When installing the air handler, evaporator coil case, or an expansion valve, always protect the sensor (EEV) from the heat of the pipe as you braze in the suction line. Do this by either wrapping the sensor in rag soaked in cold water or simply remove the sensor from the line before you solder (this is the best way to insure no damage to the sensor). Many sensors have been damaged on install by not removing them (they are hiding behind the equipment panel within inches from the suction line stub out). The EEV sensor will usually not fail completely but will be out of calibration and produce an incorrect temperature reading which results in an incorrect super heat control. The repair on a brand new unit or replacement valve will cost the hvac company time, money and not to mention major frustration to the technician and customer. PLUS the customer's confidence in the technician and the equipment fails too, and that is more devastating to the company than anything else!

2. 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

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 VRP system is a 2-position, 4-way valve.

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

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

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

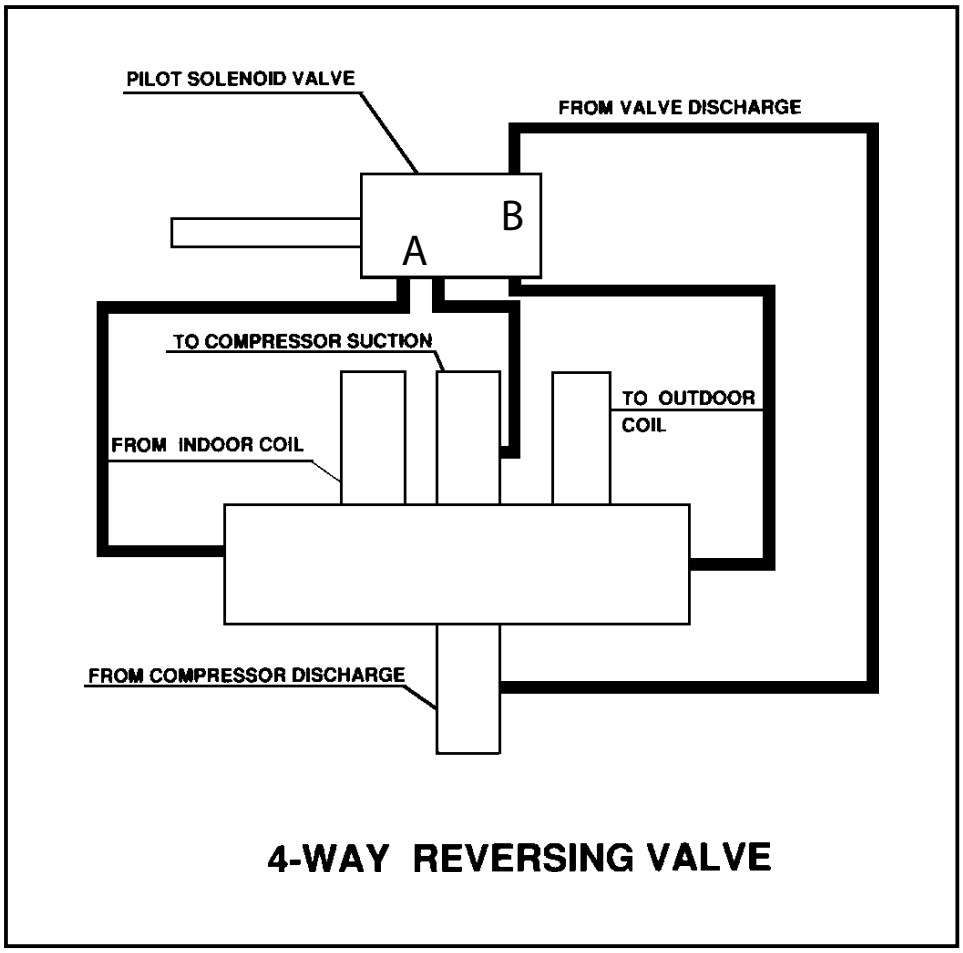


Figure 601 (Reserving Valve)

COMPONENT TESTING

Testing The Reversing Valve Solenoid Coil

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

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

⚠ 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.

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

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

COMPONENT TESTING

Checking The Reversing Valve

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants.

Failure to follow these procedures could result in serious injury or death.

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

Check the operation of the valve by starting the system and switching the operation from "Cooling" to "Heating" and then back to "Cooling". 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.

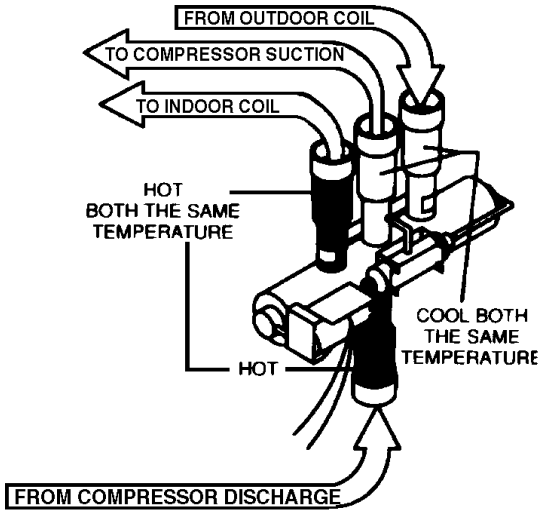
If the valve is stuck in the heating position, block the air flow through the indoor coil and allow discharge pressure to build in the system. Then switch the system from heating to cooling.

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

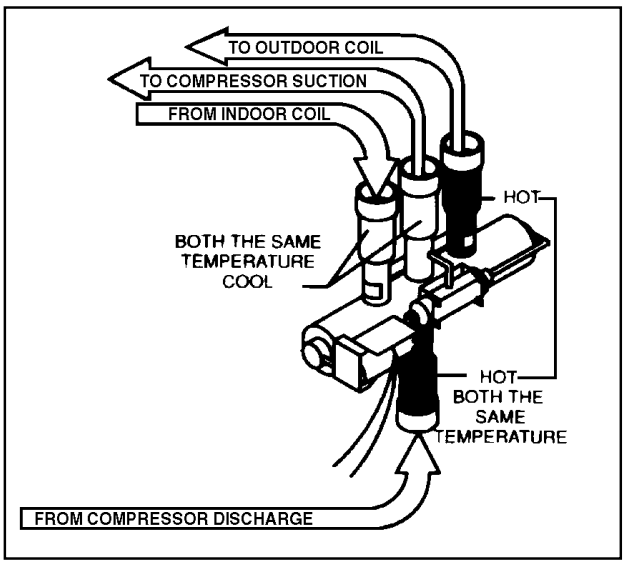


Figure 602 (Reserving Valve)

COMPONENT TESTING

Testing The Reheat Valve Solenoid Coils

Check the Reheat Valve:

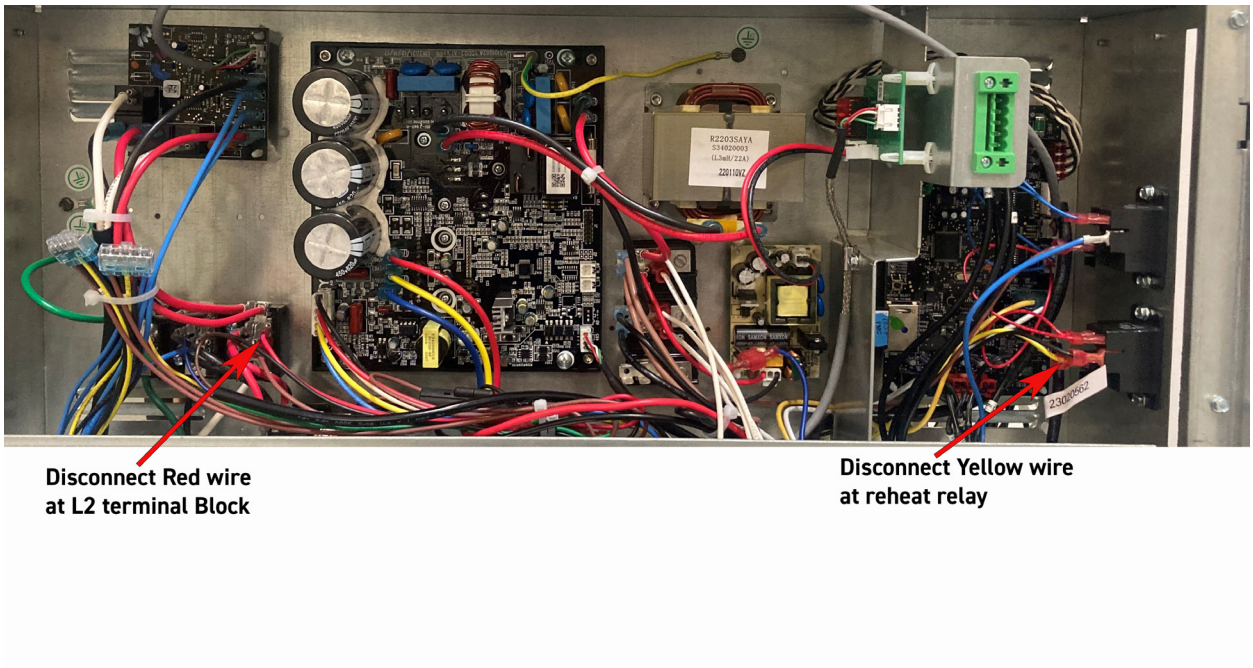
1. Turn off high voltage electrical power to unit.

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.



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

Figure 603 (Reserving Valve)

COMPONENT TESTING

Compressor checks

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

⚠ WARNING

BURN HAZARD

Proper safety procedures must be followed, and proper protective clothing must be worn when working with a torch.

Failure to follow these procedures could result in moderate or serious injury.

Caution: After disconnecting power from unit, allow 2 minutes for capacitors to discharge before handling MCS 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 01. 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.

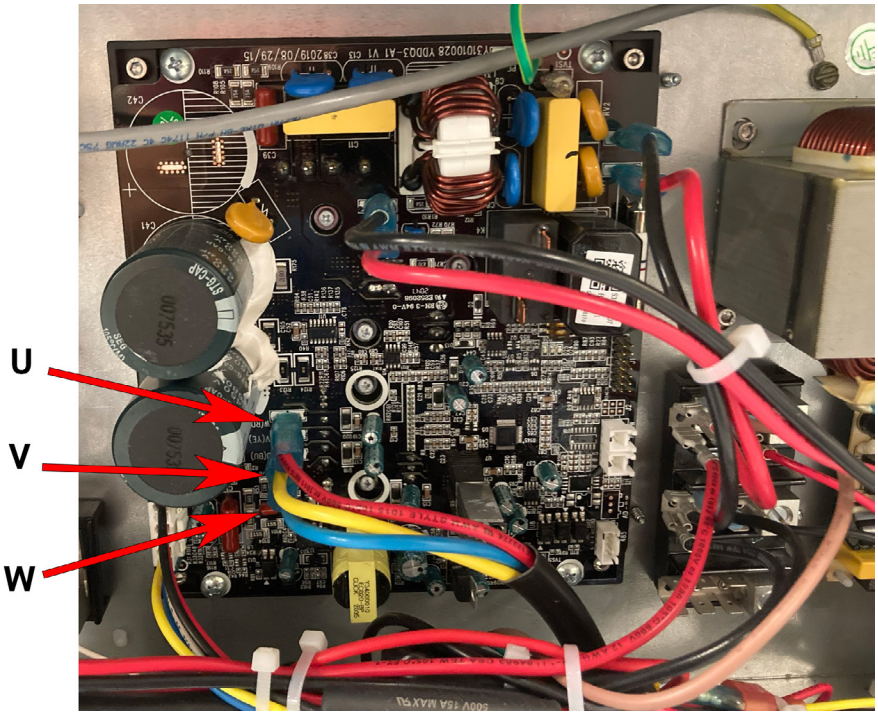


Figure 604 (Compressor Checks)

COMPONENT TESTING

Check the Outdoor Fan 12k/24k

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 on driver Board Plug J8 as shown in figure below.

   There are 4 wires:

   Voltage for Power (Red) to Ground (Black) = 310VDC

   Motor Return Voltage (White) to Ground (Black) = 15VDC

   PWM (Yellow) to Ground (Black) = 0-6.5VDC (Oscillating)

   Feedback (Blue) to Ground (Black) = VDC (Oscillating)

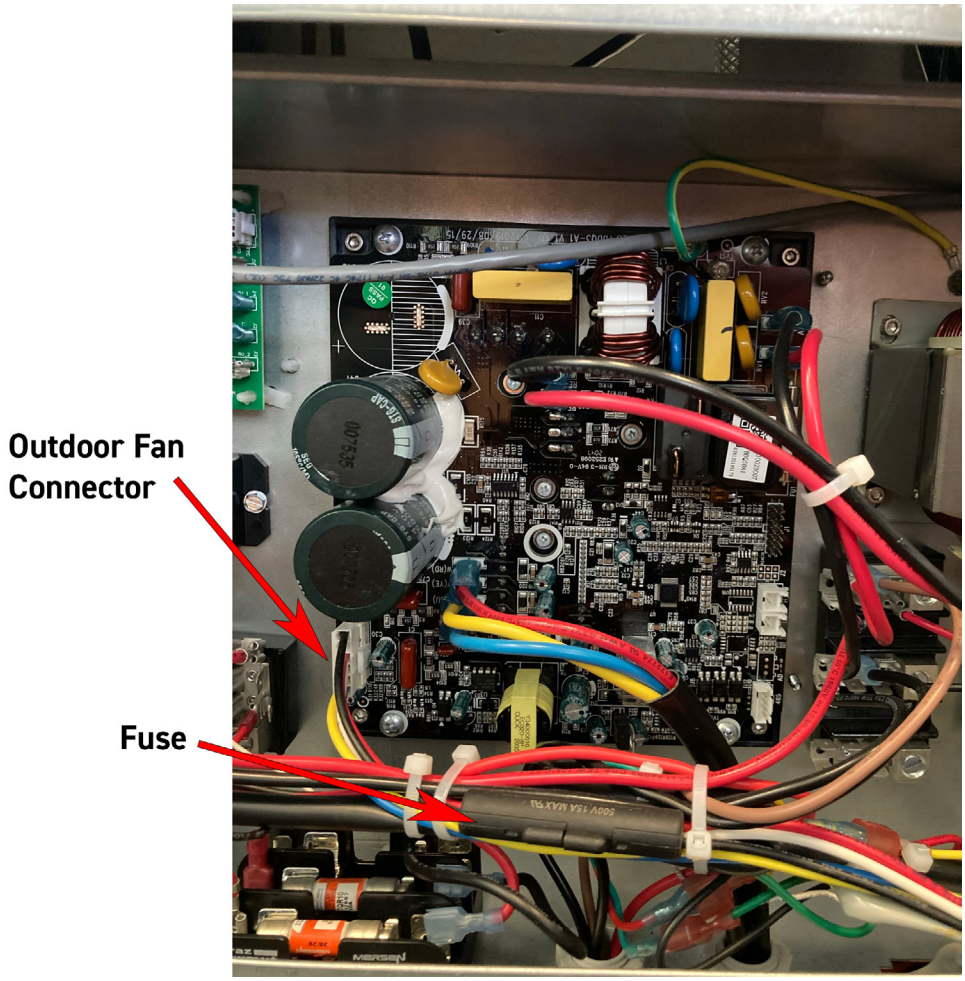


Figure 605 (Outdoor Fan)

COMPONENT TESTING

Replace the Outdoor Fan 12k

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

1. Remove unit from closet.
2. Remove front, left and right side access panels.
3. Unplug molex harness from cabinet junction (white 6 pin plug)
4. Remove nuts from fan motor mount at 4 places.
5. Remove 8 screws from fan inlet ring.
6. Fan assembly can be removed through the right side of the unit.
7. Remove fan blade from motor shaft.
8. Remove motor from mount.
9. Install new fan motor in reverse sequence.

Figure 606 (Outdoor Fan)

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 the indoor fan connector on the 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.

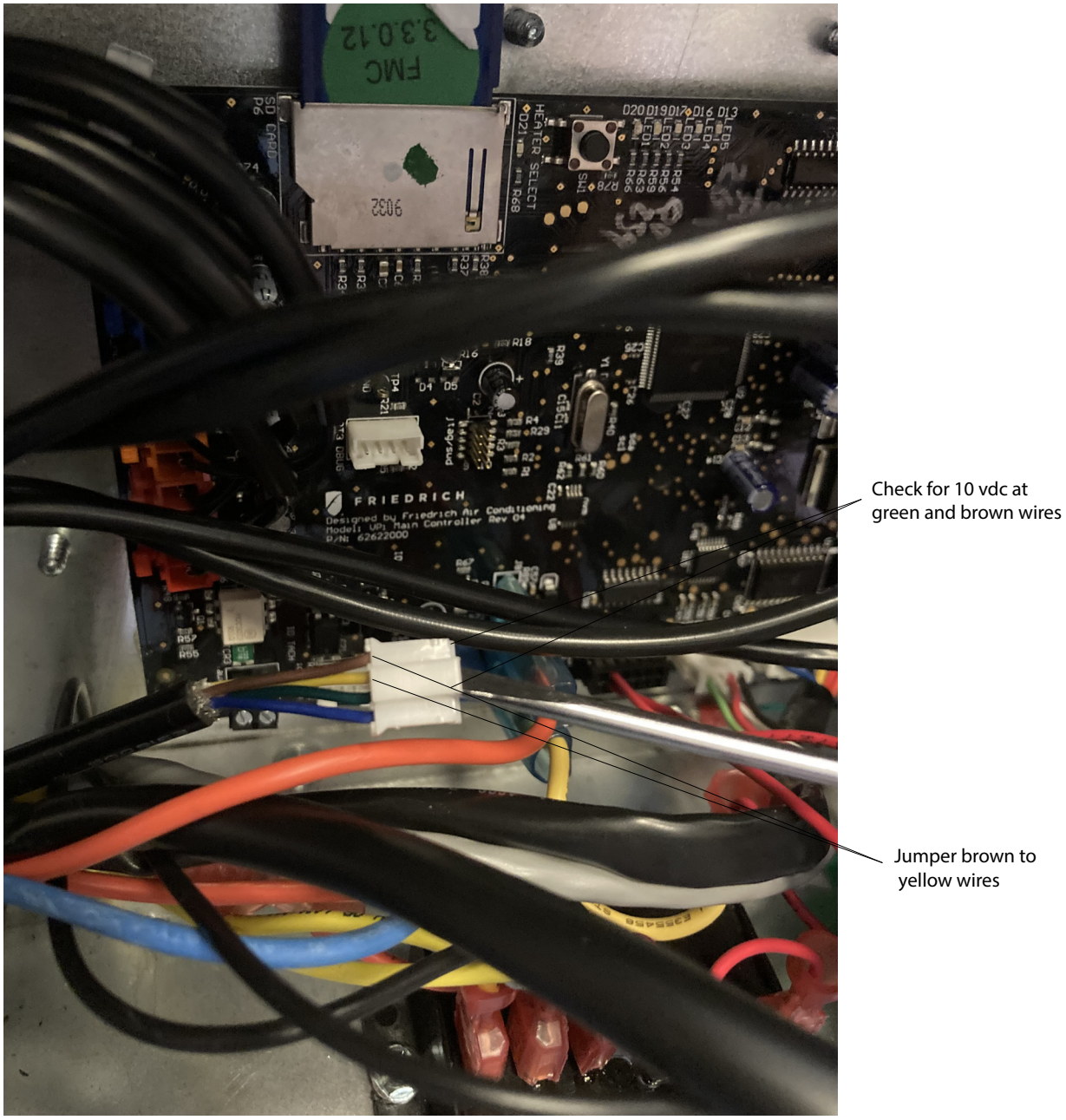


Figure 607 (Indoor Fan)

COMPONENT TESTING

Replace the Indoor Fan 12k/24k

1. Remove unit from closet.
2. Unplug indoor fan connector at FMC board,
3. Cut zips on wiring from indoor fan motor to line voltage terminal blocks and trace back wires to identify and disconnect-
4. Remove duct collar.
5. Remove rear panel by removing perimeter screws.

6. Remove rear panel from fan by removing 10 fan attachment screws.

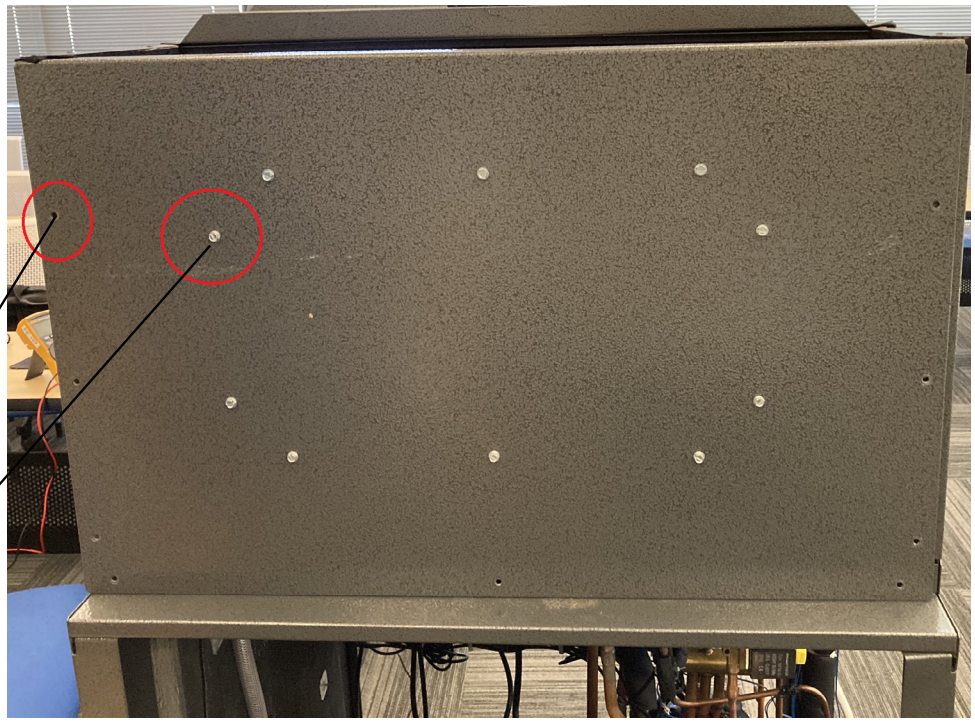


Figure 608 (Indoor Fan)

7. Remove fan mount bolts (Allen Head bolts (4 places).)

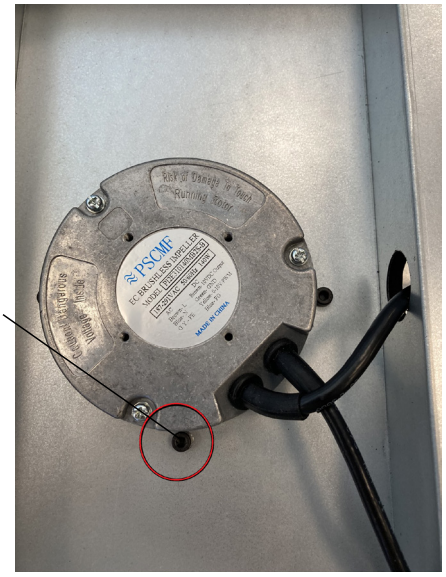


Figure 609 (Fan Mounting Bolts)

8. Install new fan motor in reverse sequence.

COMPONENT TESTING

Check the Heating Elements

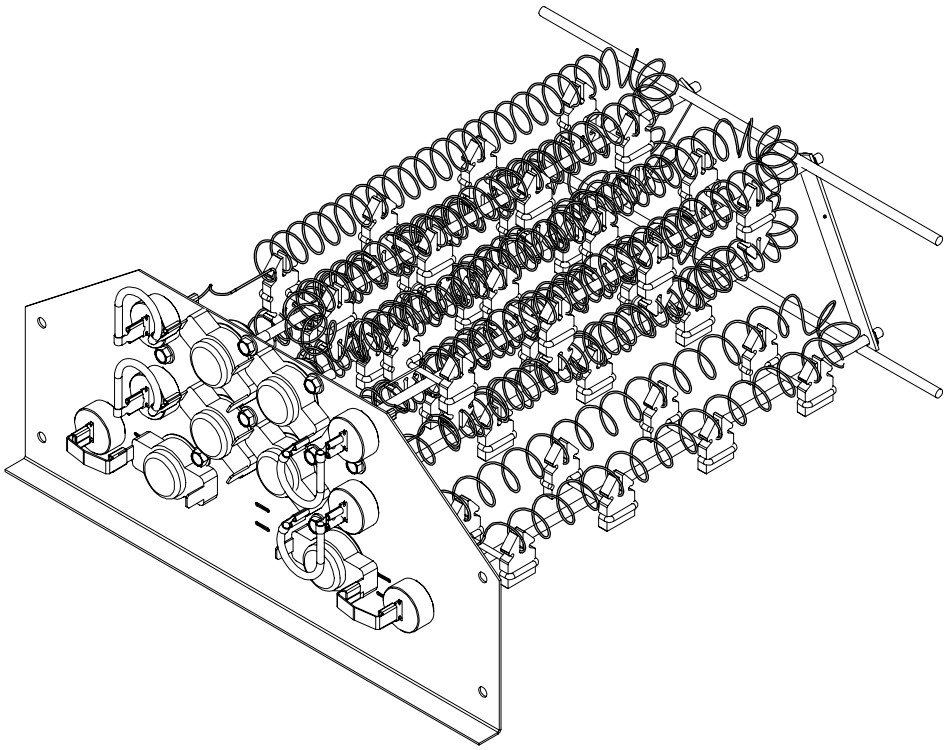


Figure 611 (Heating Elements)

COIL 1	COIL 2	COIL 3	THERMAL DISC LIMITER	THERMAL DISC FUSE
265V 10 KW MULTI				
5000KW 12.35 OHMS +-5%	2500 KW 24.71 OHMS +- 5%	2500 KW 24.71 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 240°F
265V 5 KW MULTI				
2450KW 27.54 OHMS +-5%	800 KW 84.35 OHMS +- 5%	1500 KW 44.99 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 240°F
230V 10 KW MULTI				
5000KW 10.13 OHMS +-5%	2500 KW 20.26 OHMS +- 5%	2500 KW 20.26 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 240°F
230V 5 KW MULTI				
2450KW 20.68 OHMS +-5%	800 KW 63.32 OHMS +- 5%	1500 KW 33.77 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 240°F

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 (4 places).
5. Lift heater element assembly straight up and out of unit.

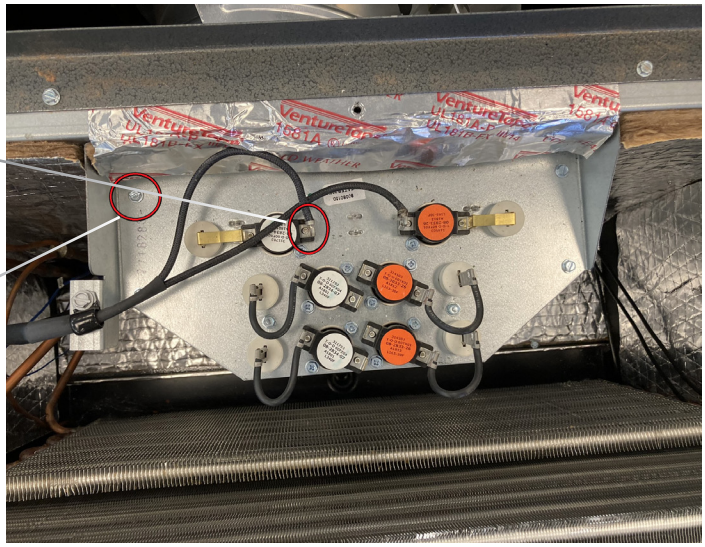
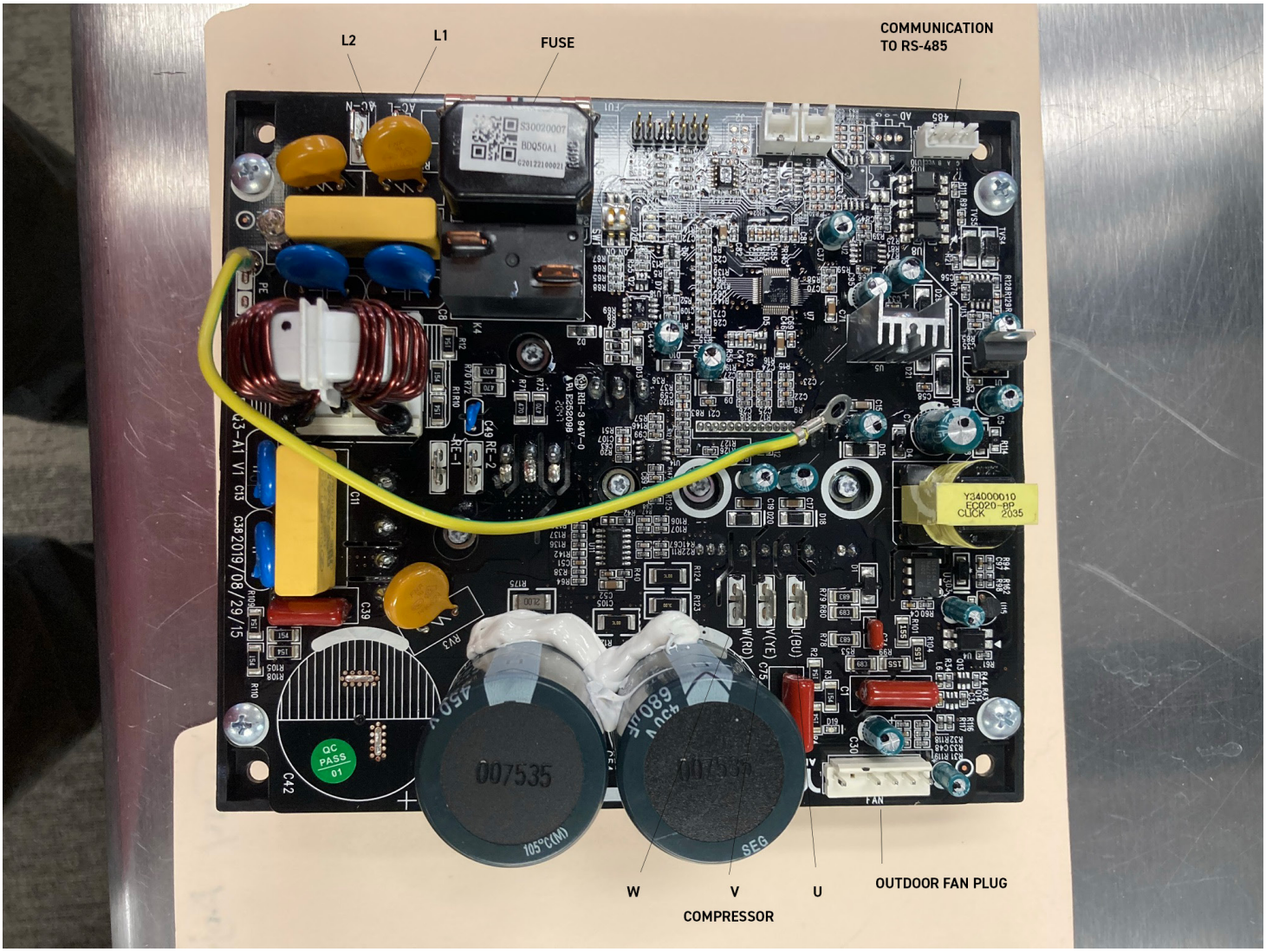


Figure 612 (Heating Elements)

COMPONENTS TESTING

Driver Board Pin out



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.

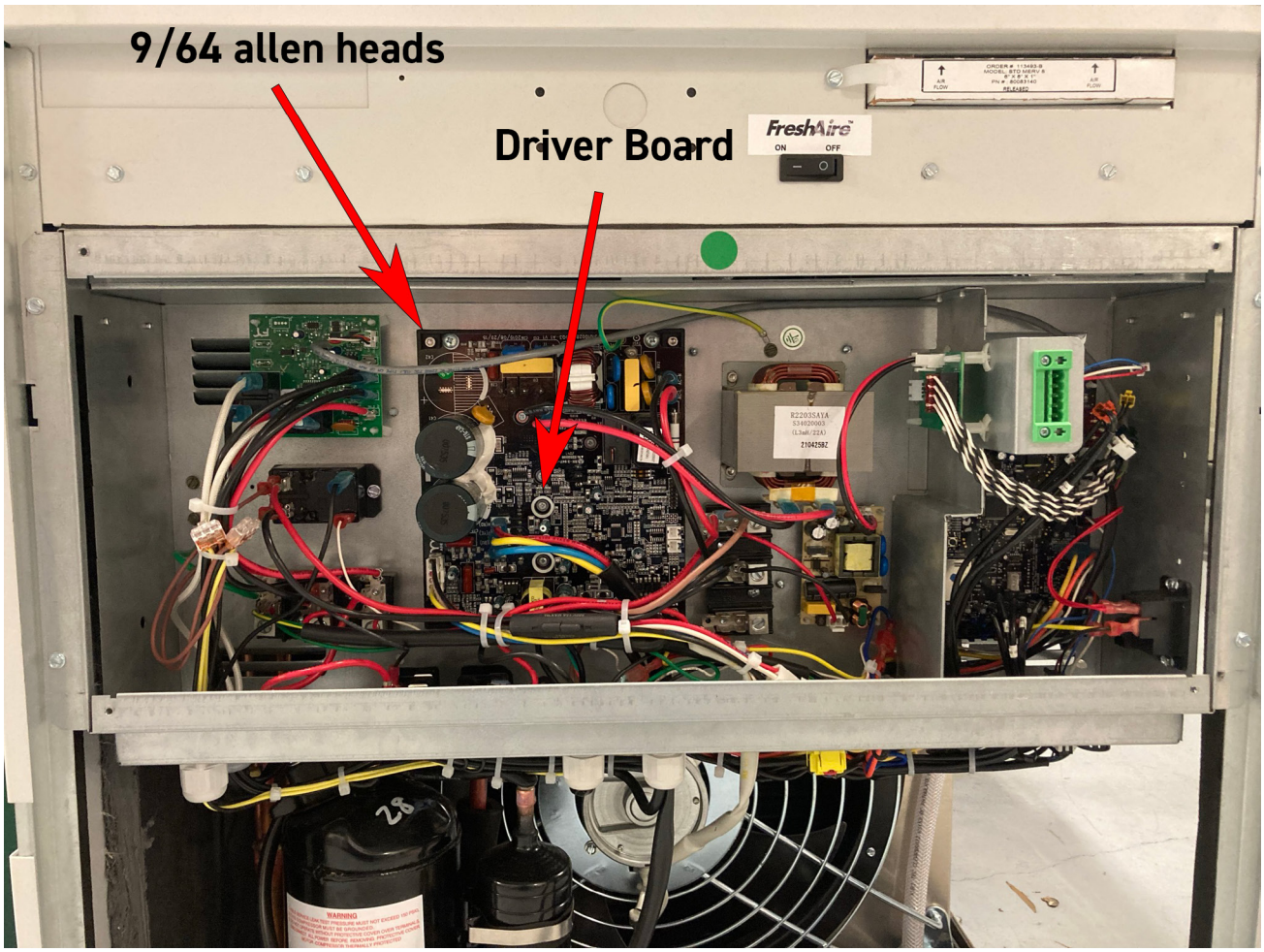


Figure 614 (Driver Board)

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.

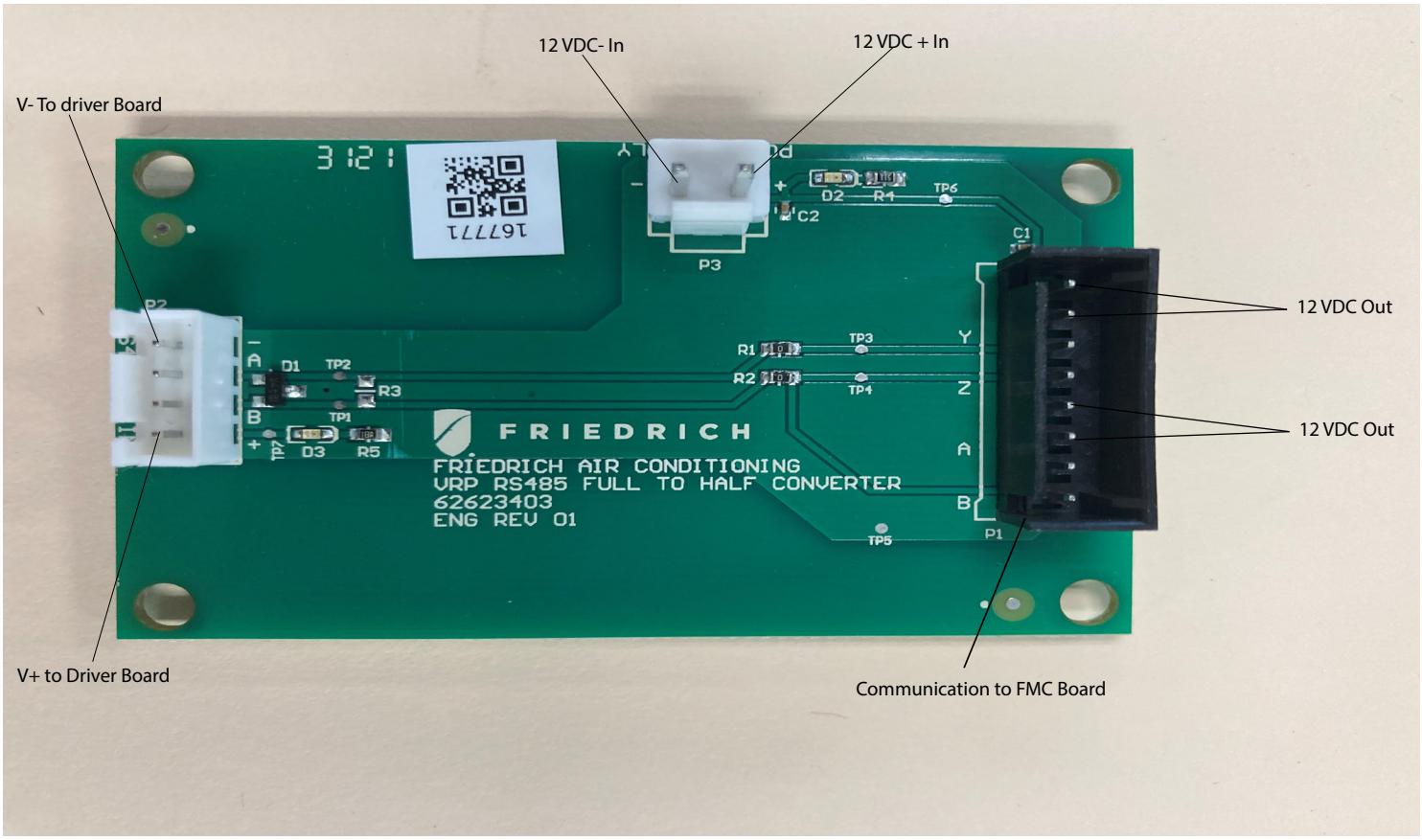


Figure 615 (RS-485 Board)

COMPONENTS TESTING

Fmc Board Pin Out -Black Board

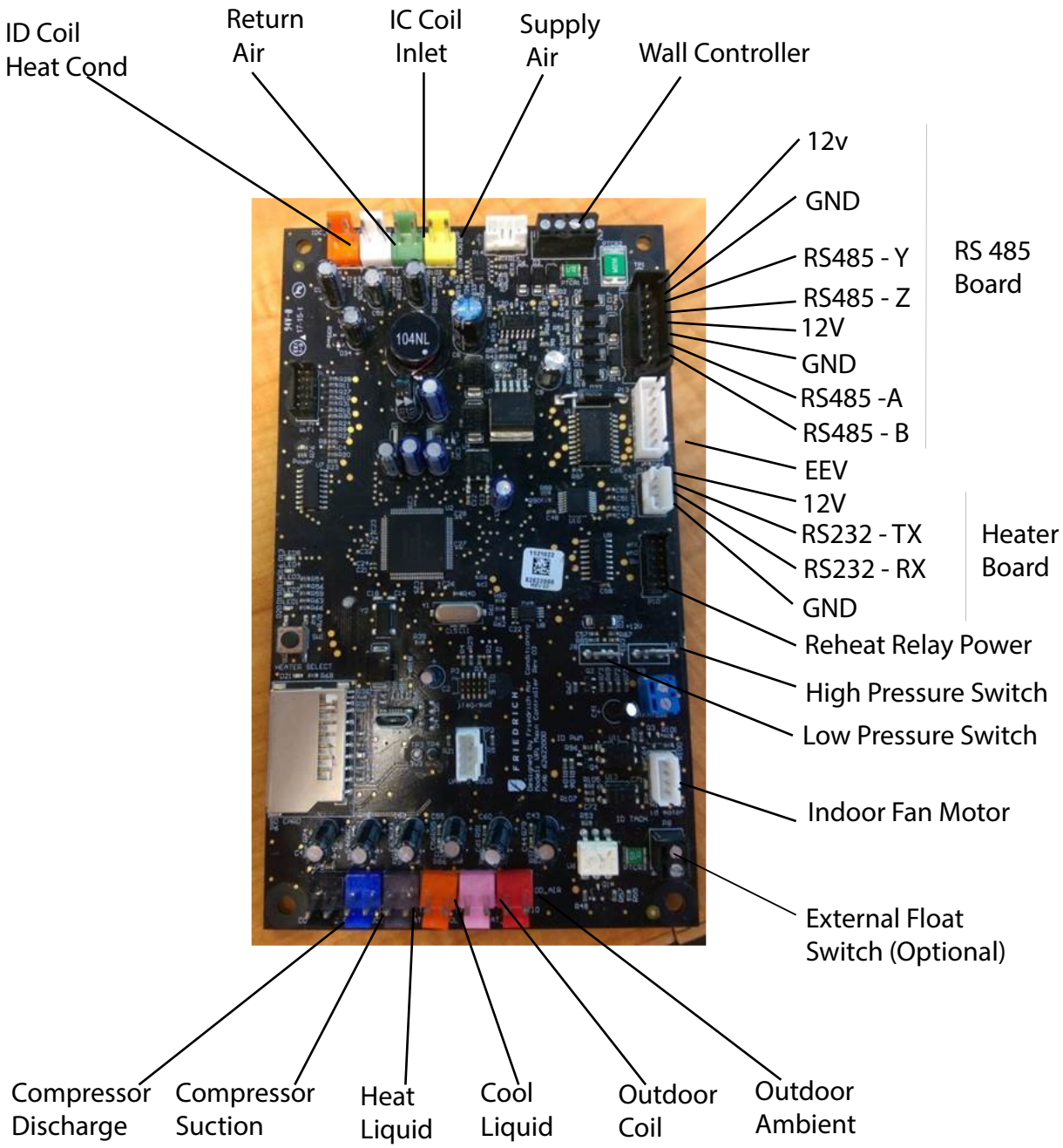


Figure 616.1 (FMC Board) (Black Board)

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

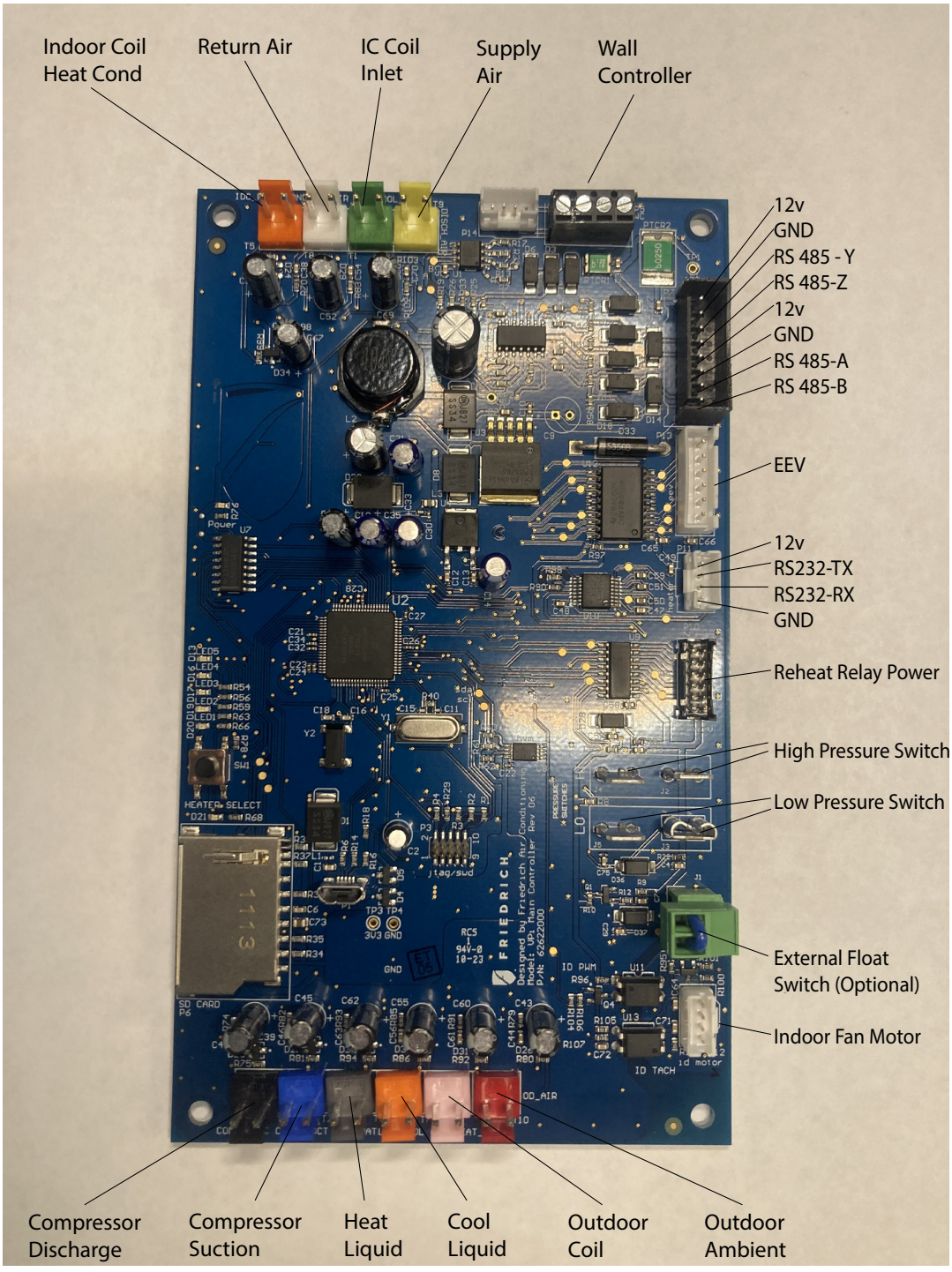


Figure 616.2 (FMC Board) (Blue Board)

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 (Figure 630).

COMPONENTS TESTING

FMC Board Replacement

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

1. Disconnect all electrical connections, tag and identify wires.
2. Carefully compress pcb standoffs and remove board.
3. Install new board.

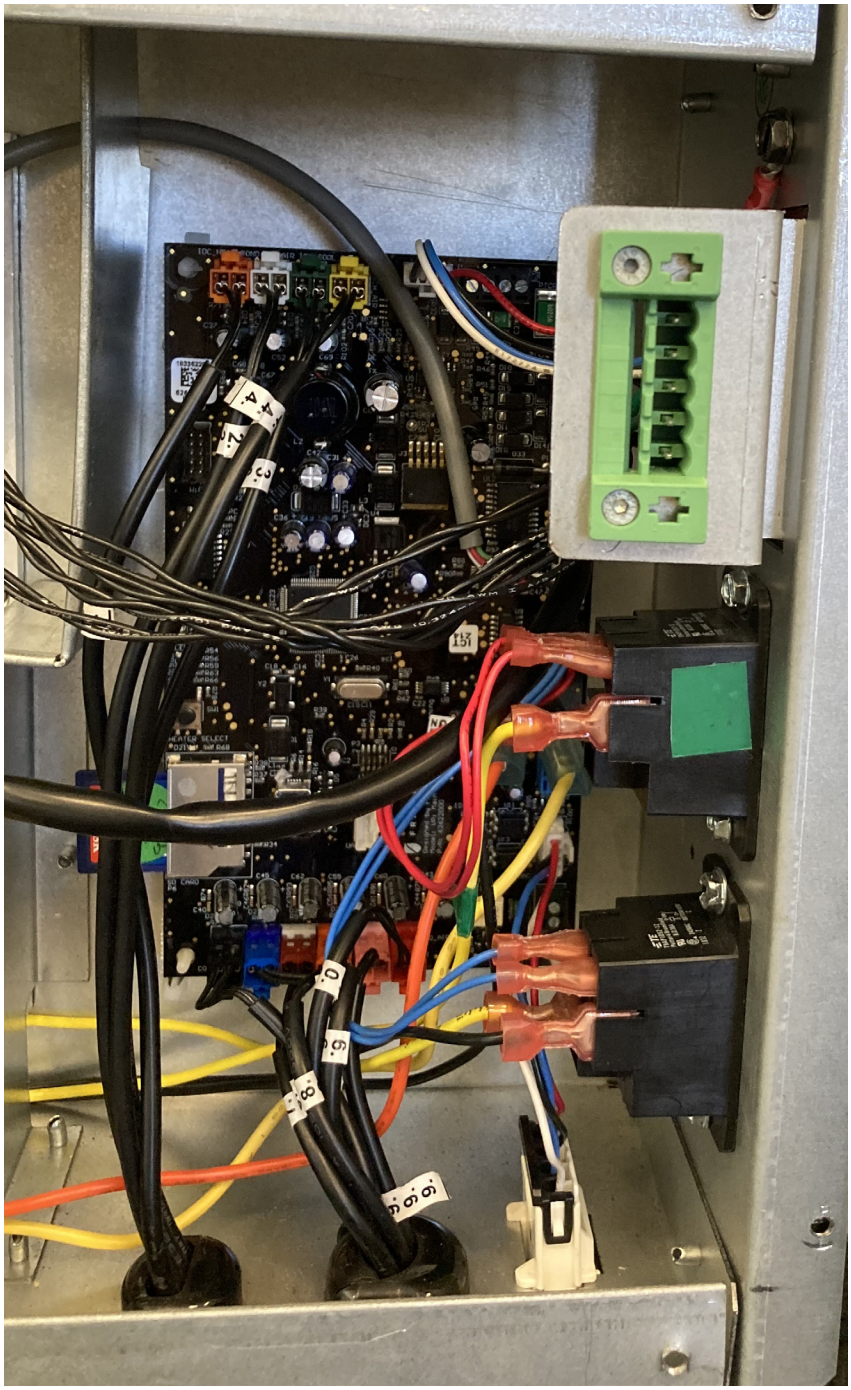


Figure 617 (FMC Board)

COMPONENTS TESTING

Heater Board Pin Out

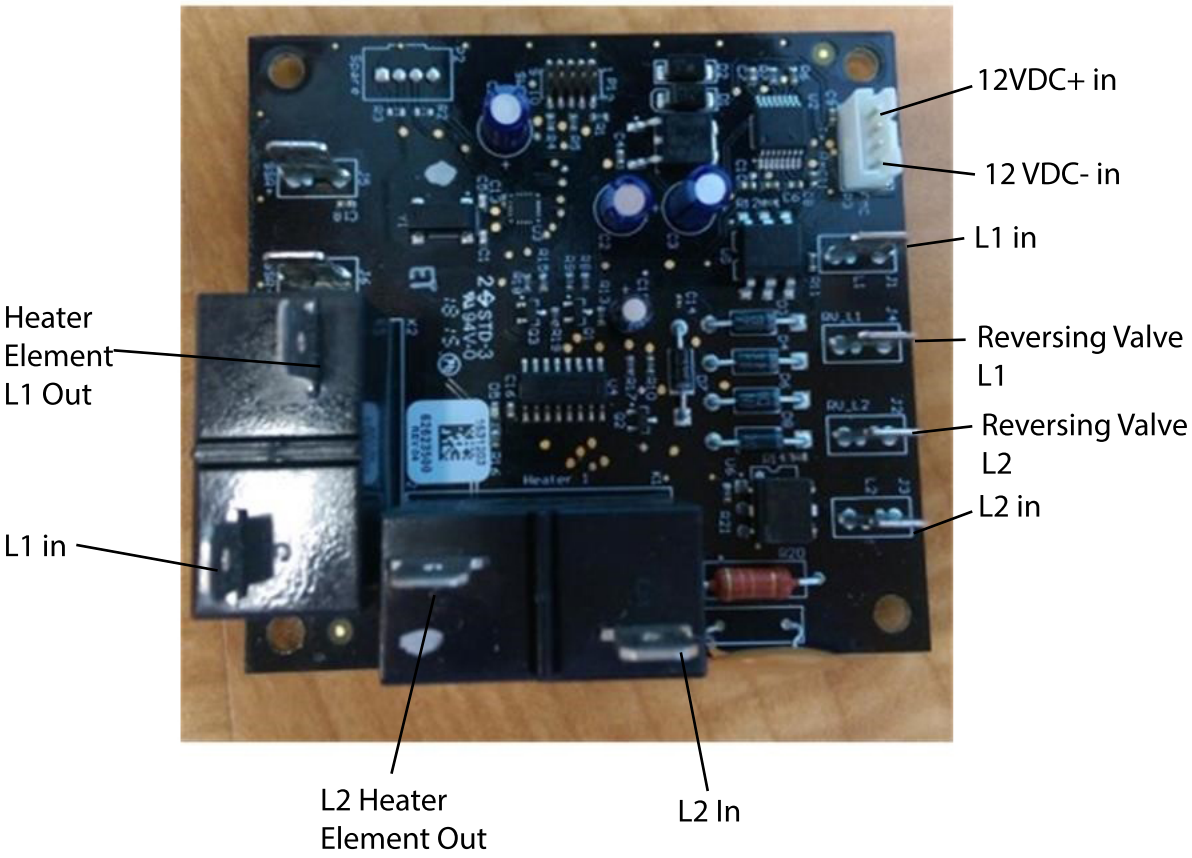


Figure 618 (Heater Board)

Is the green light on the board illuminated?

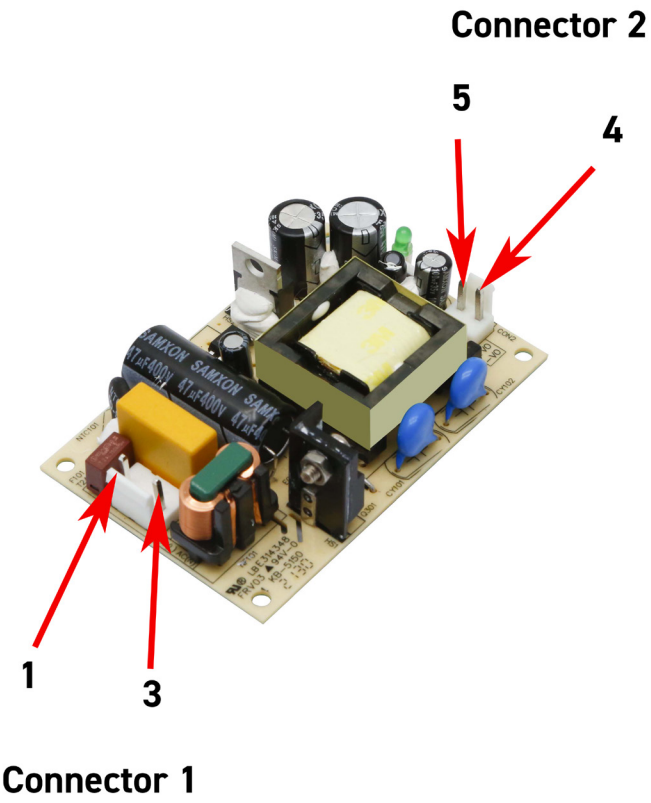
1. If not check connecting cable by unplugging and re-seating at both ends of cable.

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

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 618.1 (Power Supply Board)

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.

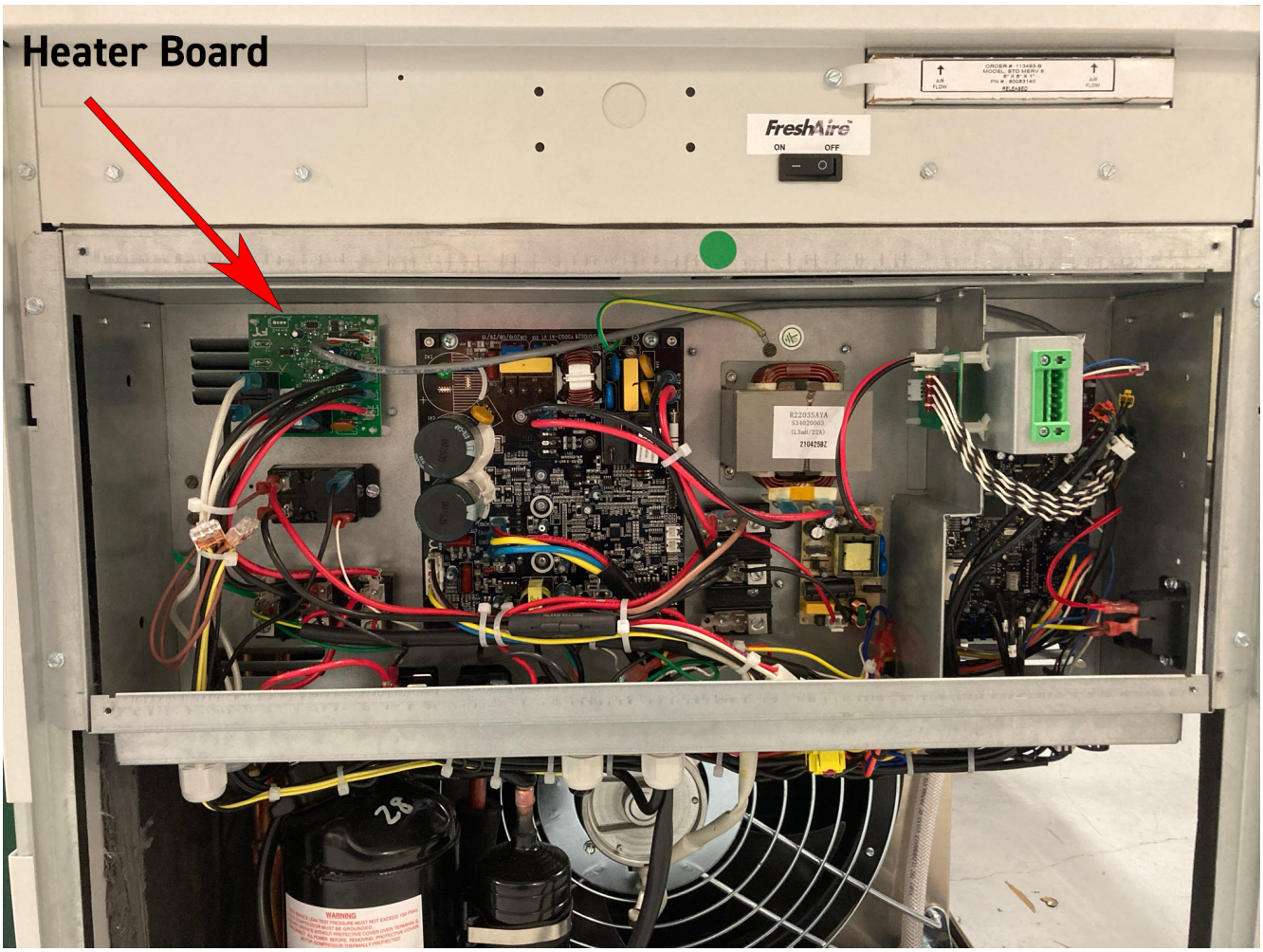


Figure 619 (Heater Board)

COMPONENTS TESTING

Thermistor Locations
T8 (Return Air Sensor)

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

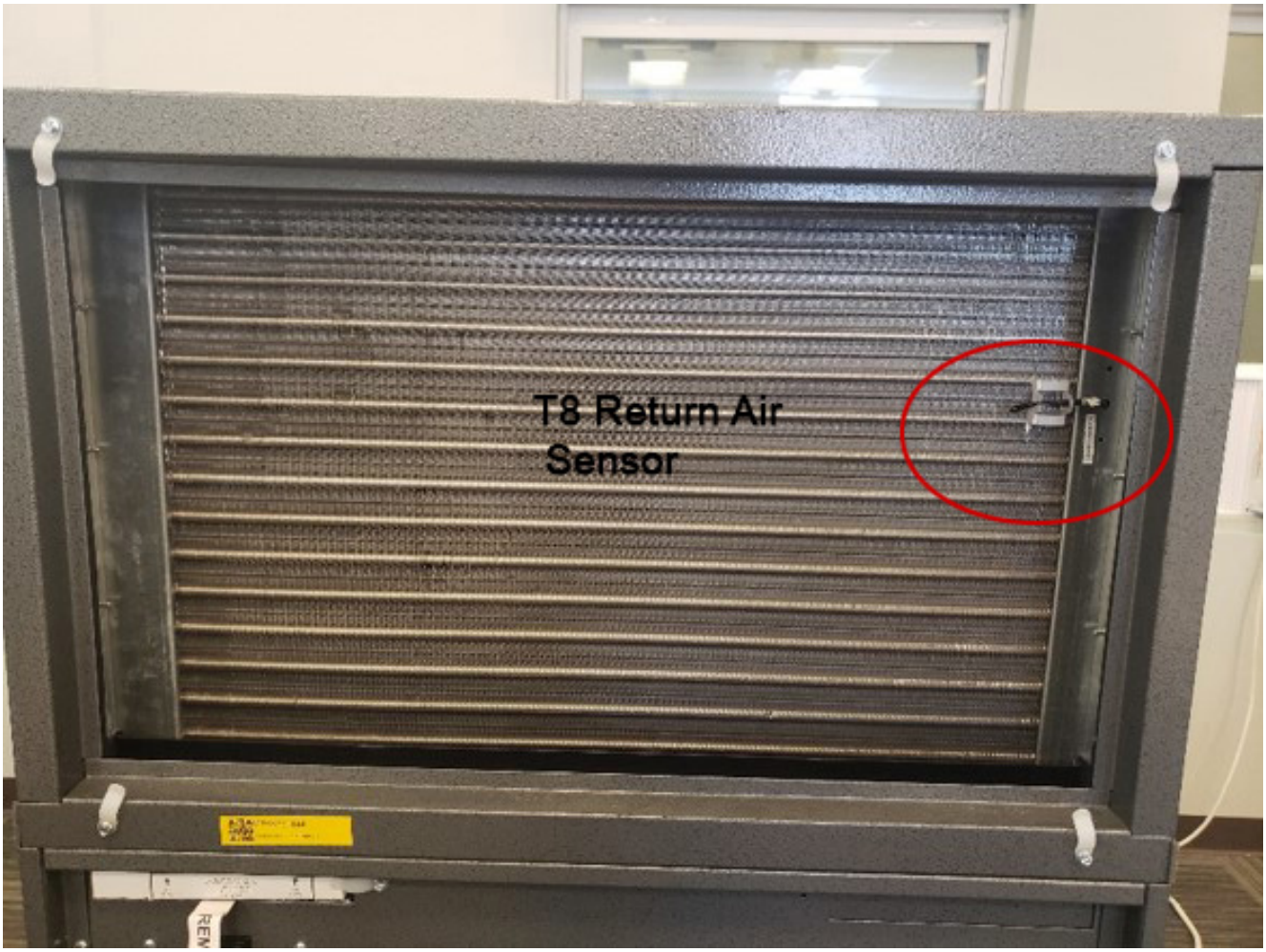


Figure 620 (Thermistor Locations)

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.)

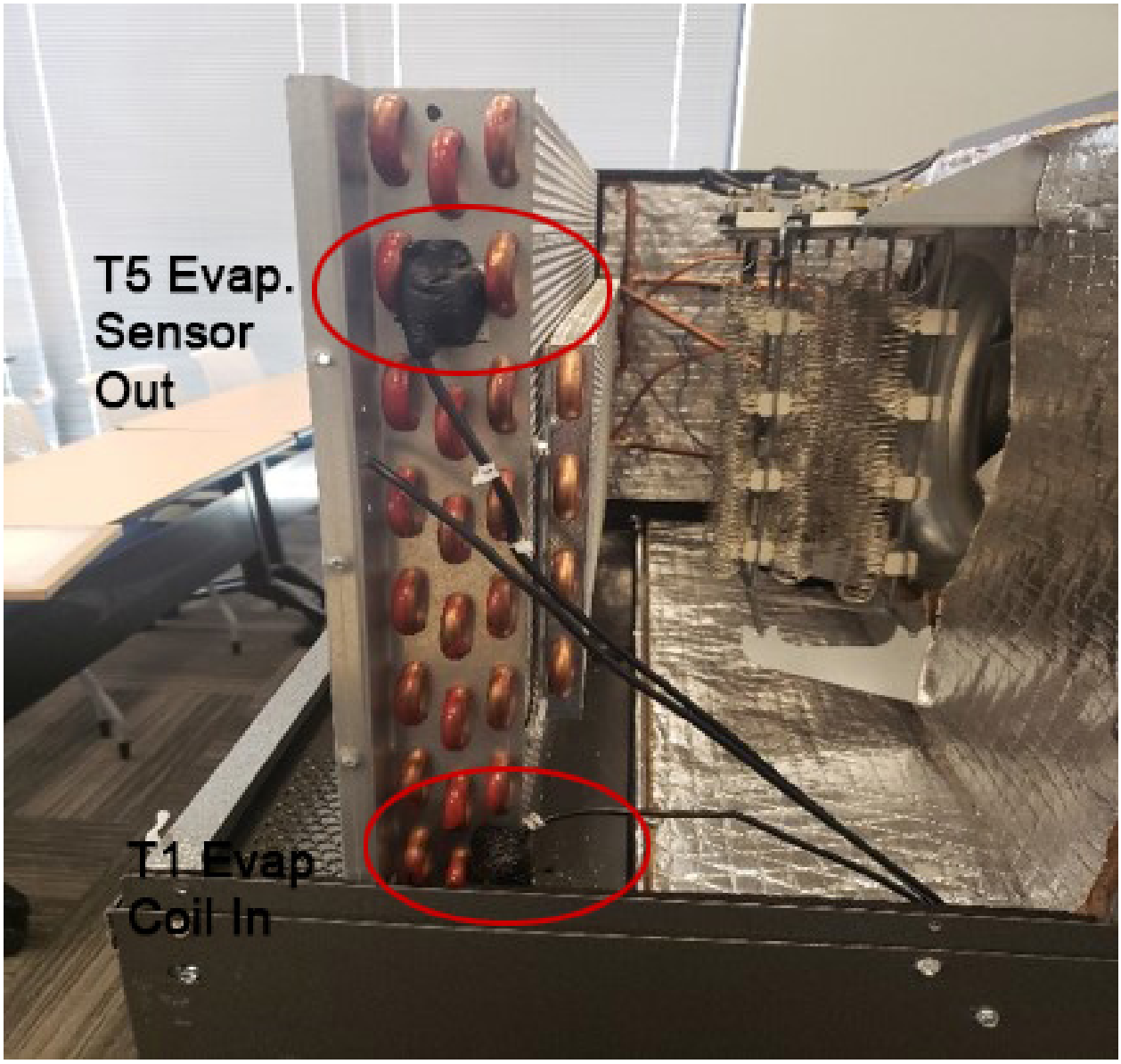


Figure 621 (Thermistor Locations)

COMPONENTS TESTING

Thermistor Locations

T9 (Discharge Air Sensor)

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

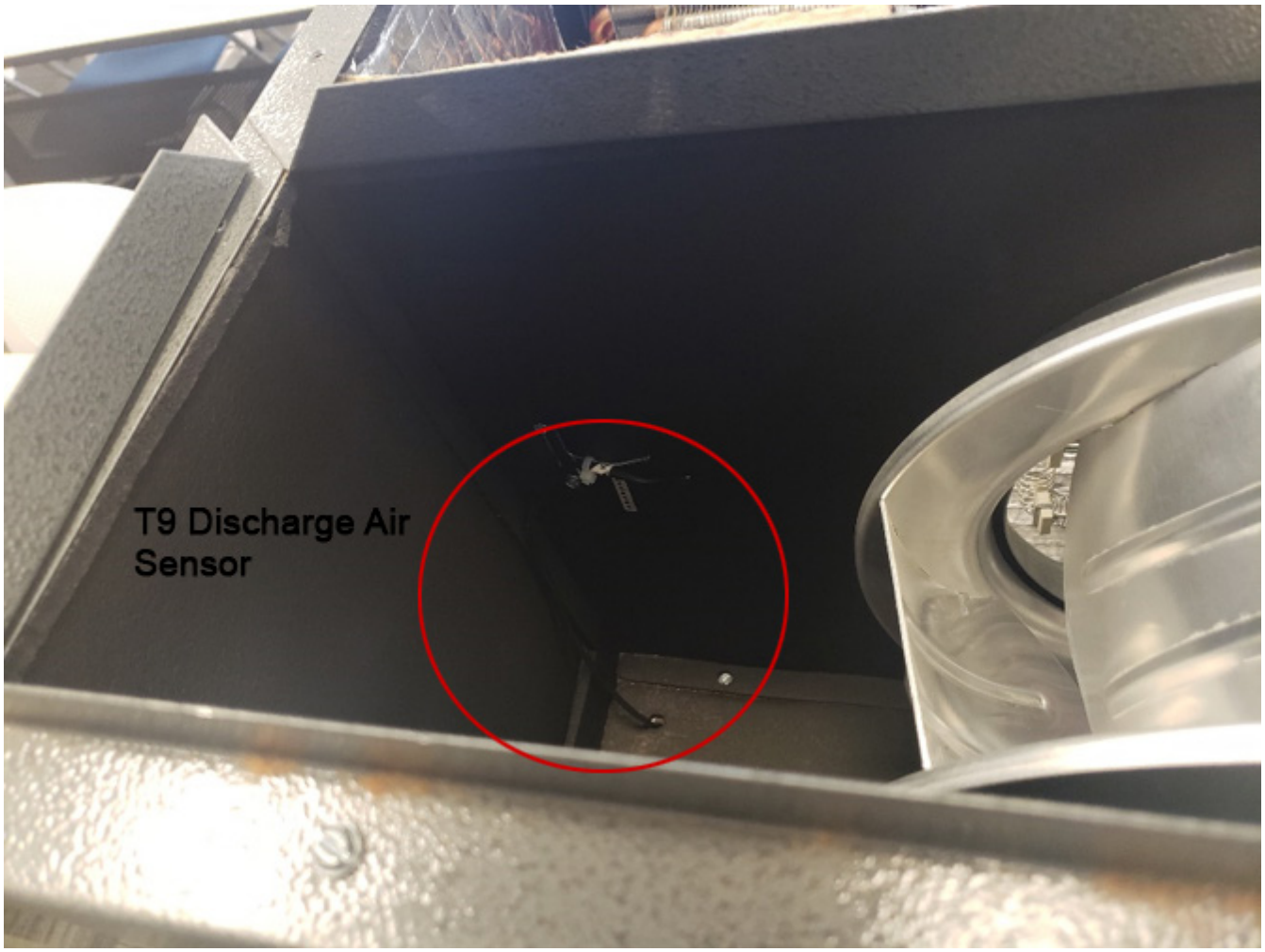


Figure 622 (Thermistor Locations)

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).

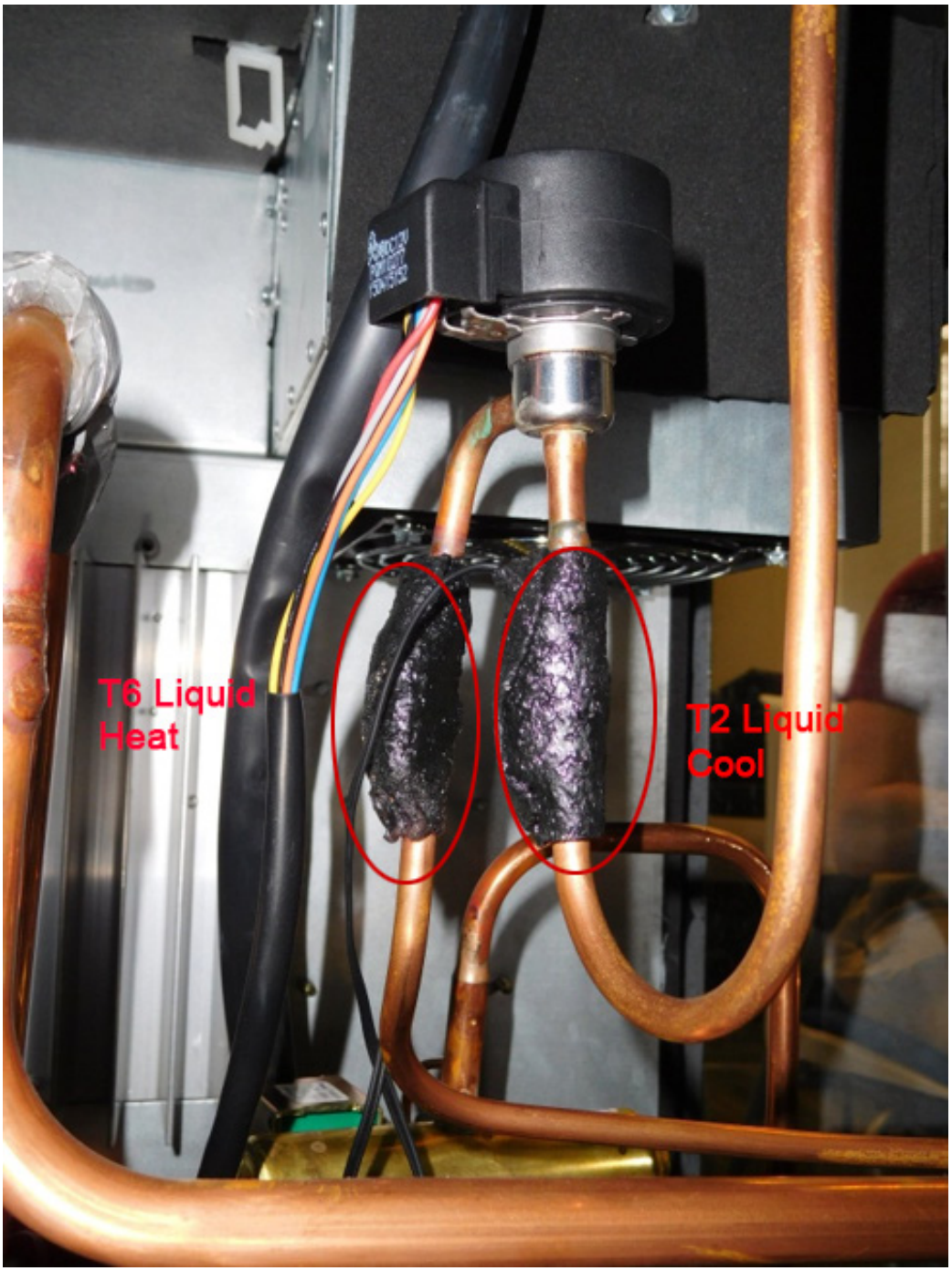


Figure 623 (Thermistor Locations)

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.

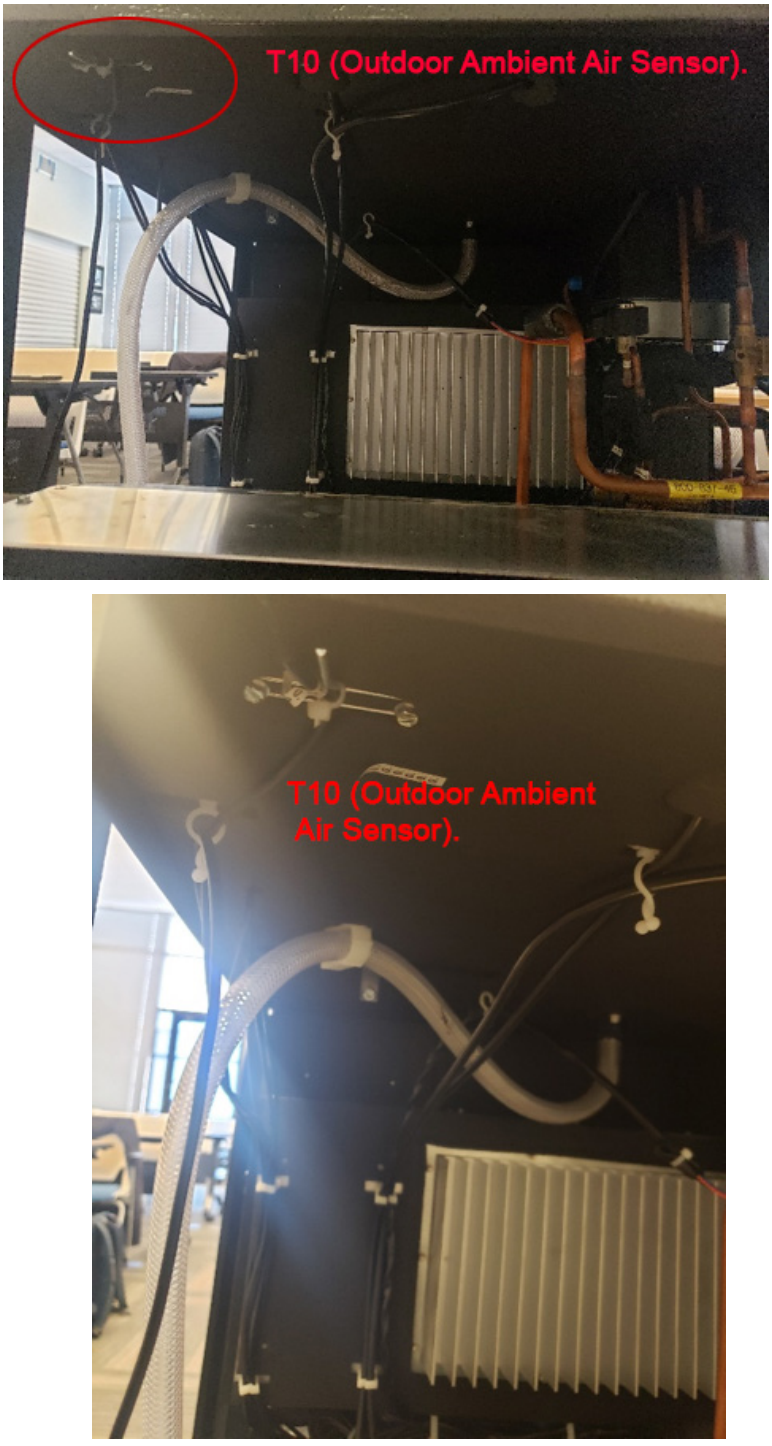


Figure 624 (Thermistor Locations)

COMPONENTS TESTING

Thermistor Locations

T7 (Condenser Coil Sensor)

T7 (Condenser 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.

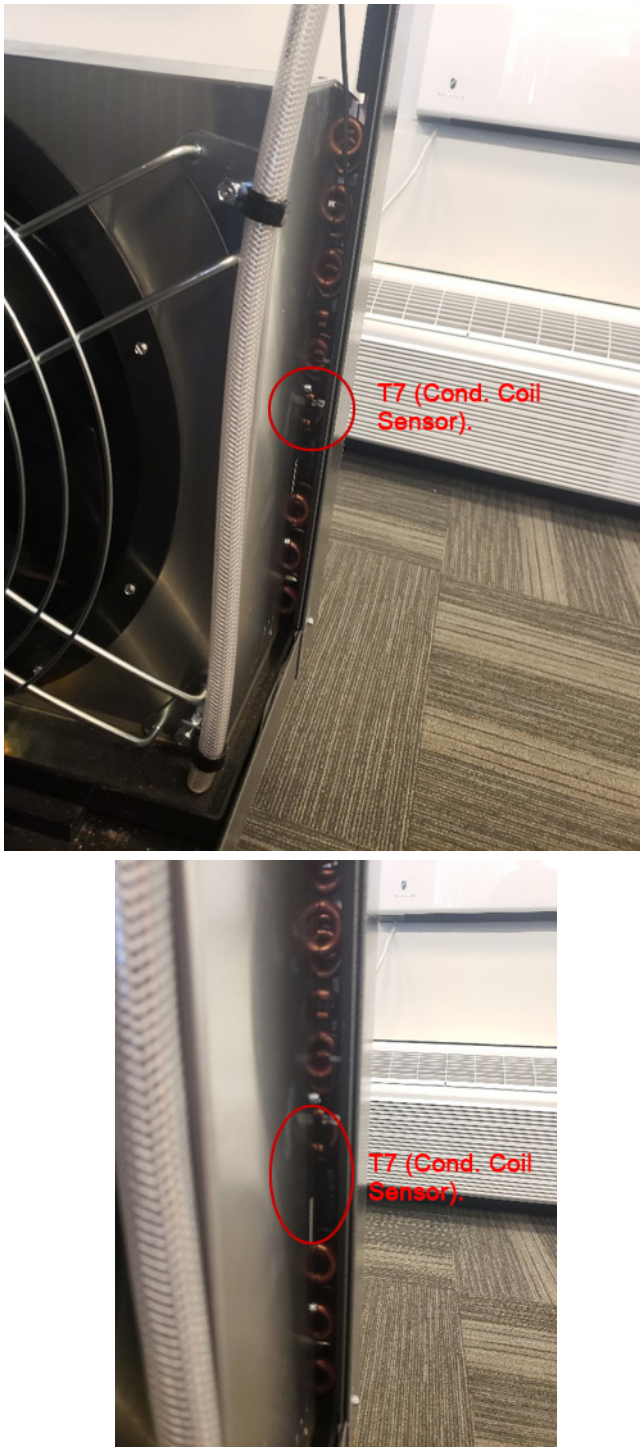


Figure 625 (Thermistor Locations)

COMPONENTS TESTING

Thermistor Locations

T4 (Compressor Discharge).

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

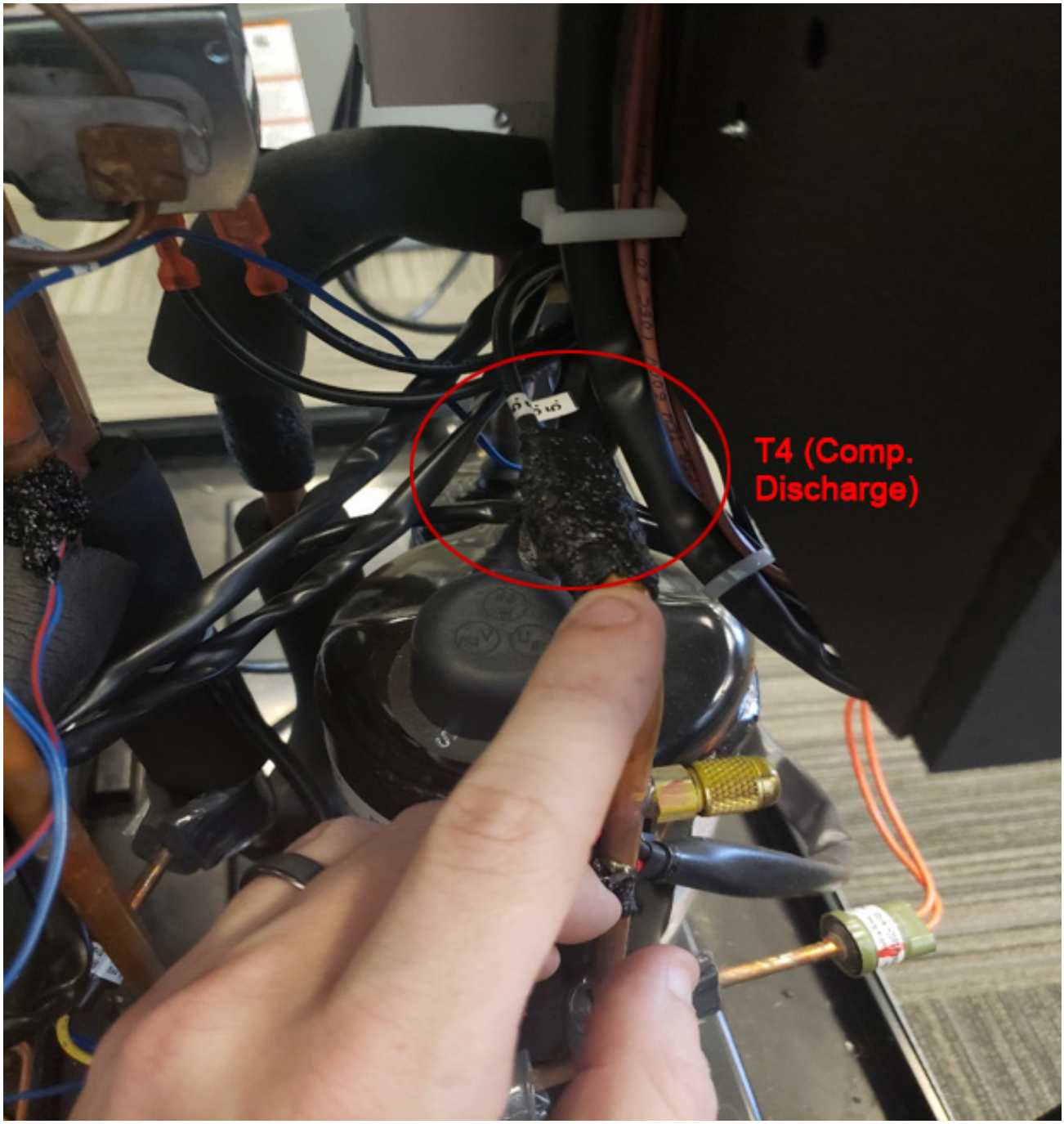


Figure 626 (Thermistor Locations)

COMPONENTS TESTING

Thermistor Locations

T3 (Compressor Suction).

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

Figure 627 (Thermistor Locations)

COMPONENTS TESTING

Thermistor Part numbers

VPH and VRP revision –A/B models used a sensor pack for the indoor and outdoor sensors.

VRP revision –C and newer all use single sensors.

The Single sensors are compatible with the sensor pack.

The sensor packs are no longer available and all VRP/VPH models will use the single sensors going forward.

The part numbers for the individual sensors are listed here.

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

Replace Transformer (265 V units Only)

1. Remove Unit from closet if required.
2. Remove right side panel (12k) or front panel for 24k.
3. Remove 4 screws from transformer box.
4. Trace wiring back to fuse block located on the bottom of the control box.
5. Remove wire ties as necessary and disconnect wires from fuse block.
6. Install new transformer, retie, and connect.

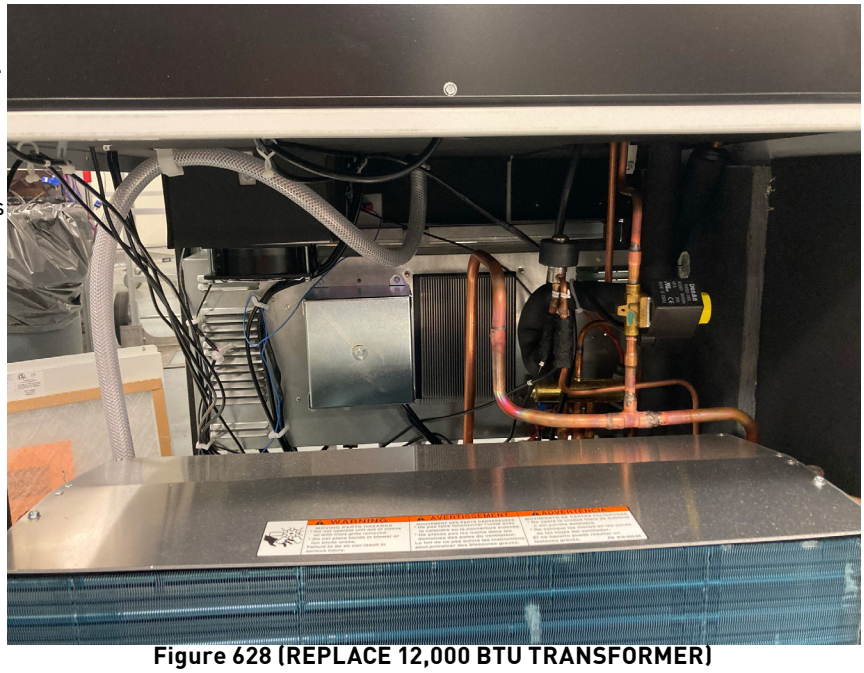


Figure 628 (REPLACE 12,000 BTU TRANSFORMER)

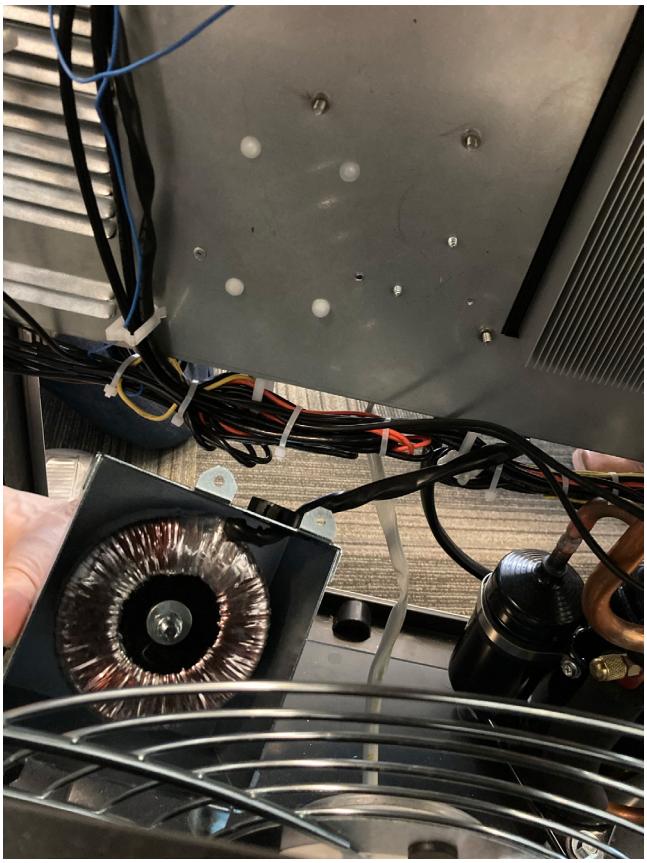


Figure 629 (REPLACE 12,000 BTU TRANSFORMER)

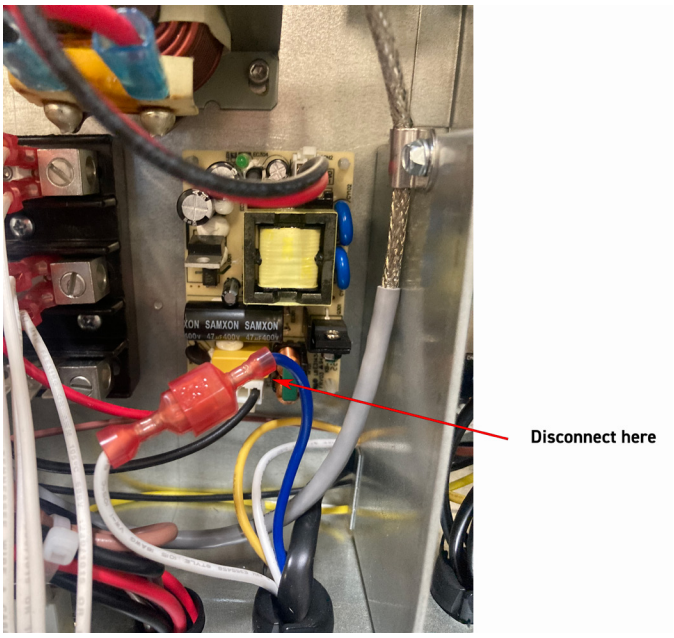
Figure 630 (REPLACE 24,000 BTU TRANSFORMER)

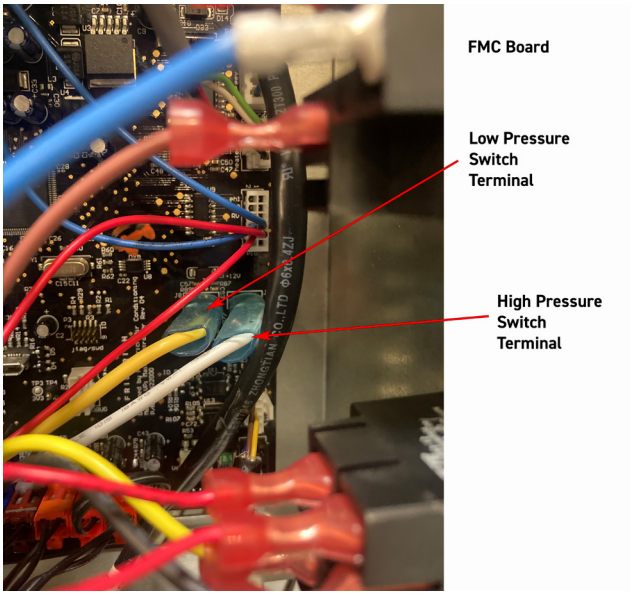
COMPONENTS TESTING

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 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. Ensure power is removed from the unit.
2. At fmc board disconnect the (J8) and(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 upper cabinet and locate disconnect point.
5. Disconnect white and blue wire at connector.
6. Check white to white(HP Switch may have orange wires) 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 low refrigerant pressure.





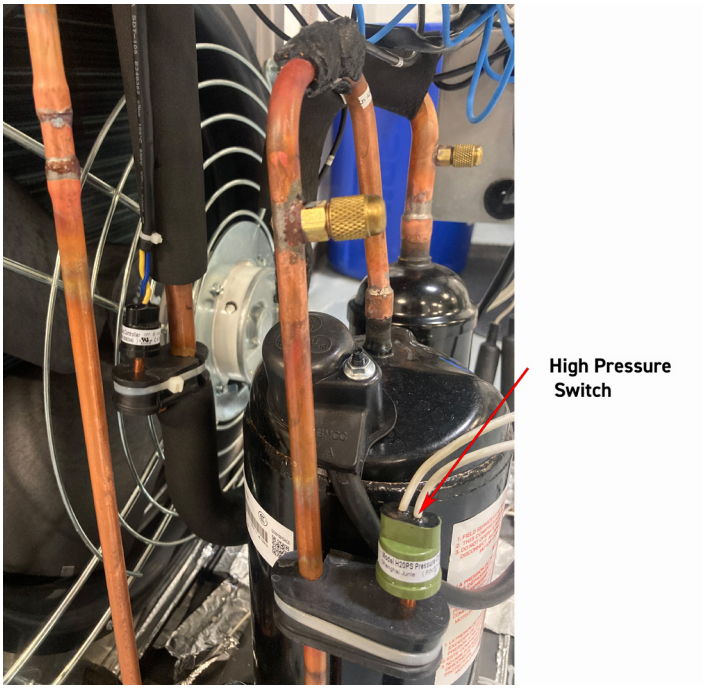
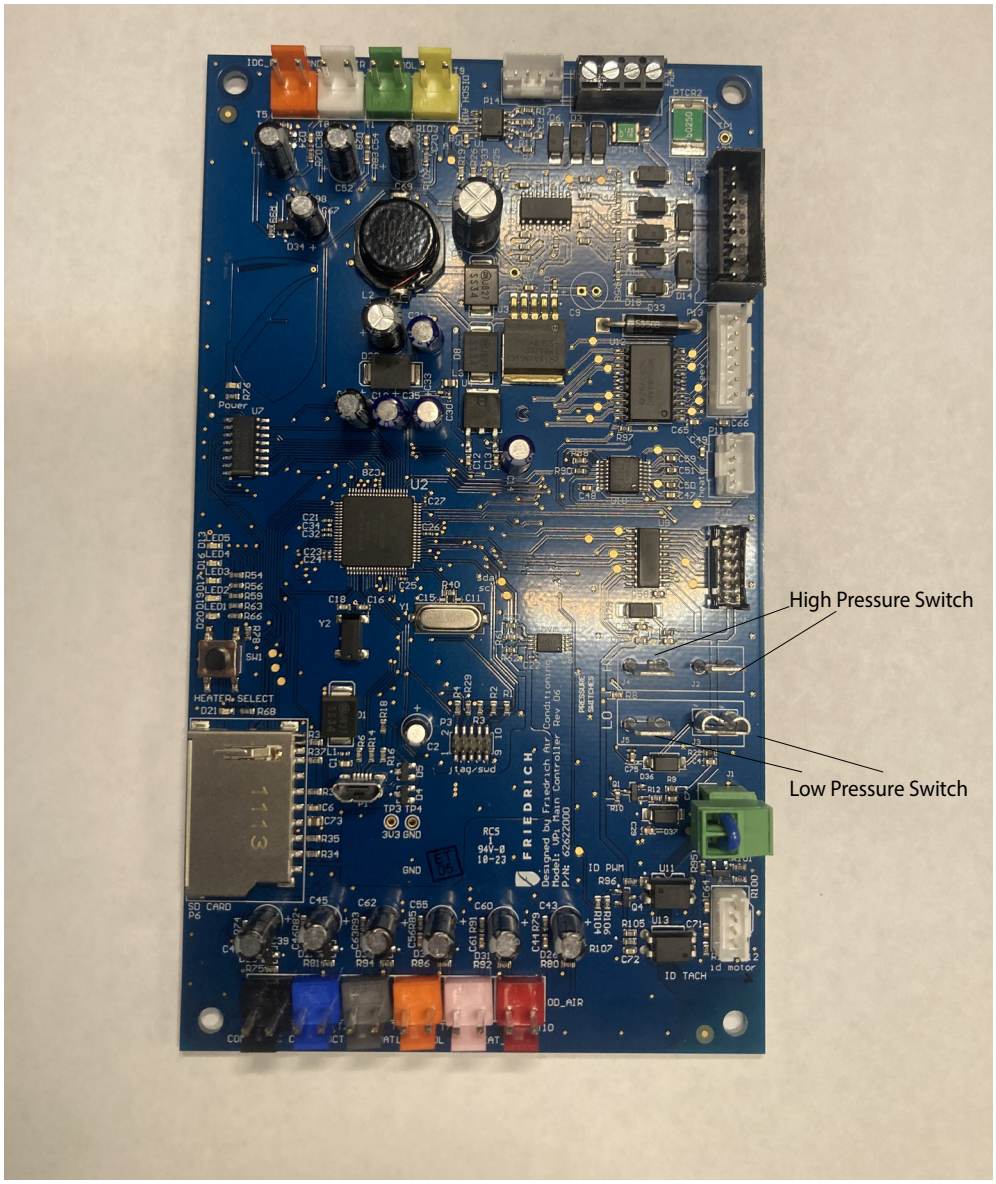


Figure 631 (Pressure Limit Switches)

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 616.1 if the unit has a black FMC board installed and Figure 616.2 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.

COMPONENTS TESTING

Replace High Pressure Limit Switch

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

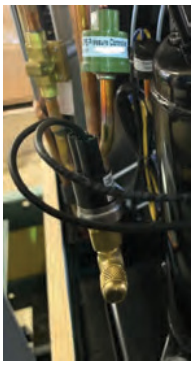
Step 1. Attention! Please read these instructions before attempting installation. Always turn off all the power to the unit.

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

COMPONENTS TESTING

Replace High Pressure Limit Switch

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 Switch

Installation Instructions

Low Pressure Switch Replacement

Please read these instructions completely before attempting installation.

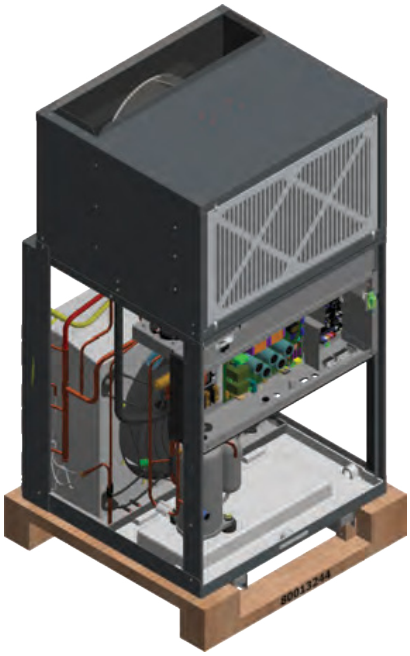
DISCONNECT POWER AND FOLLOW ALL LABELED WARNINGS.

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 Switch

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

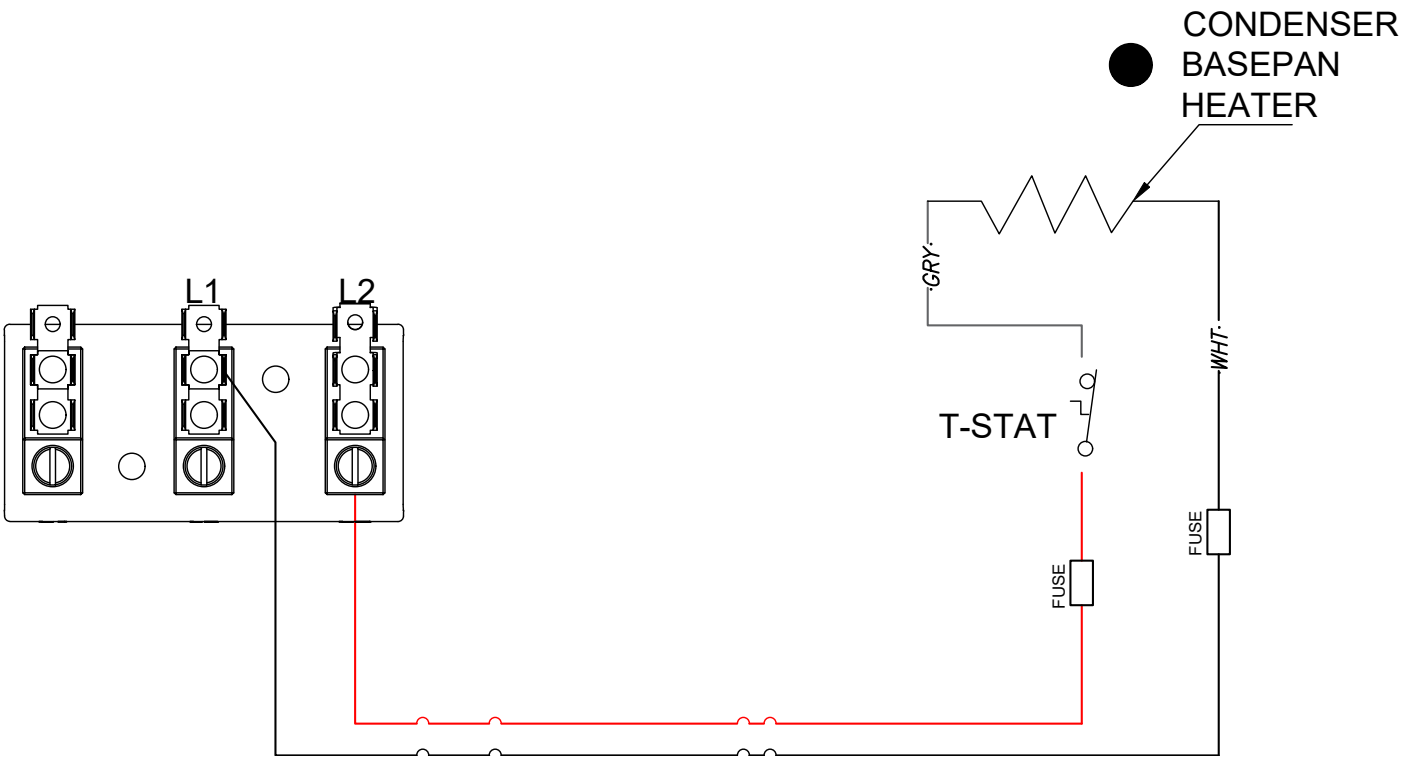
Step 4. Cut the wires off old pressure switch and strip them. Attach to existing wire to new pressure switch wires with the two wire nuts supplied in kit. You can't miss wire it.

Step 5. Collect all loose wiring and zip tie together, remove any remaining 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

Check Basepan Heater



1. Remove power from unit.
2. Check fuses for continuity. Replace fuses as required.
3. Check Basepan inline TSTAT.

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

Strip back heatshrink and check that switch is closed if below 32 degrees and open if above 50 degrees

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

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 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.

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 (Hydro fluorocarbon) refrigerants.
6. R410A Refrigerant Manifold
7. 1/4" Braze-type Access Ports
8. Pinch Tool
9. Refrigerant Scale
10. Vacuum Gauge - (0 - 1000 microns)
11. Facilities for flowing nitrogen through refrigeration tubing during all brazing processes.

EQUIPMENT MUST BE CAPABLE OF:

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

R-410A SEALED SYSTEM REPAIR

Refrigerant Charging

⚠ WARNING

RISK OF ELECTRIC SHOCK

Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenances or service.

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

⚠ WARNING

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.

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.

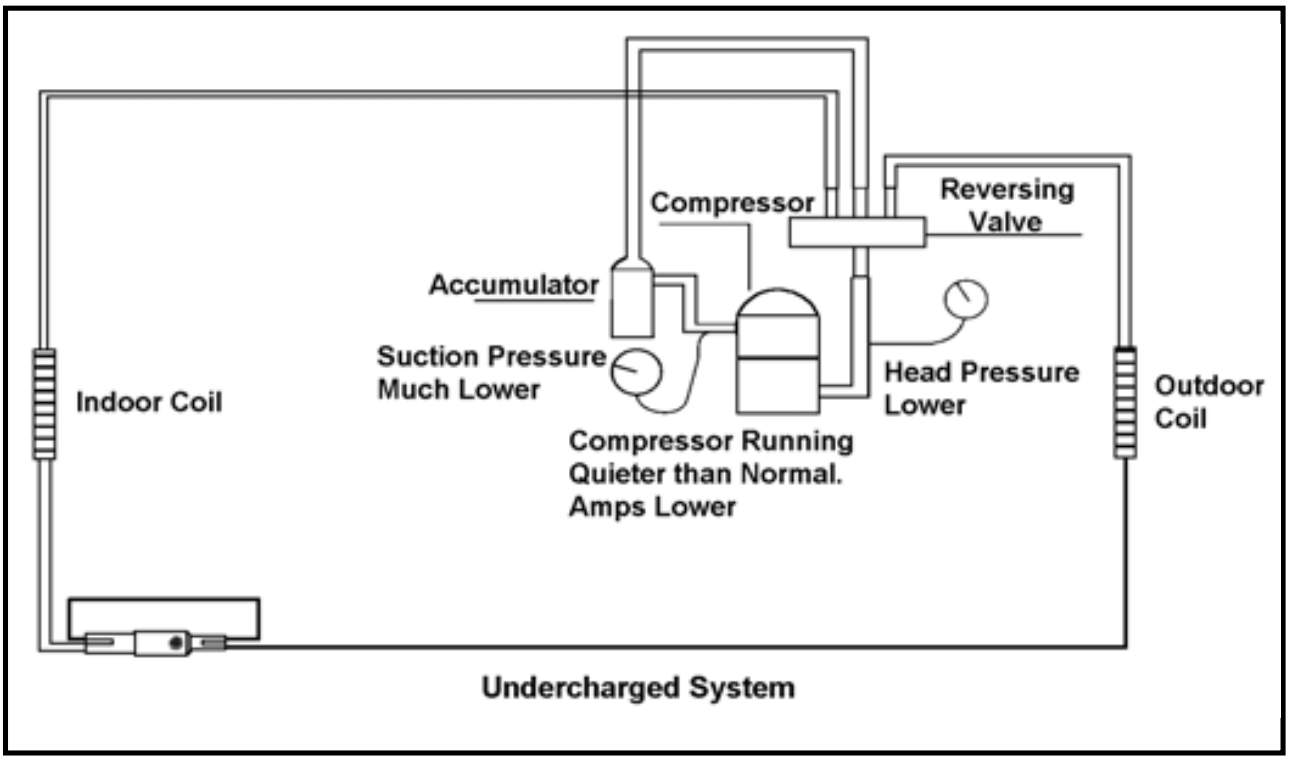


Figure 505(Undercharged System)

R-410A SEALED SYSTEM REPAIR

Overcharged Refrigerant Systems

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

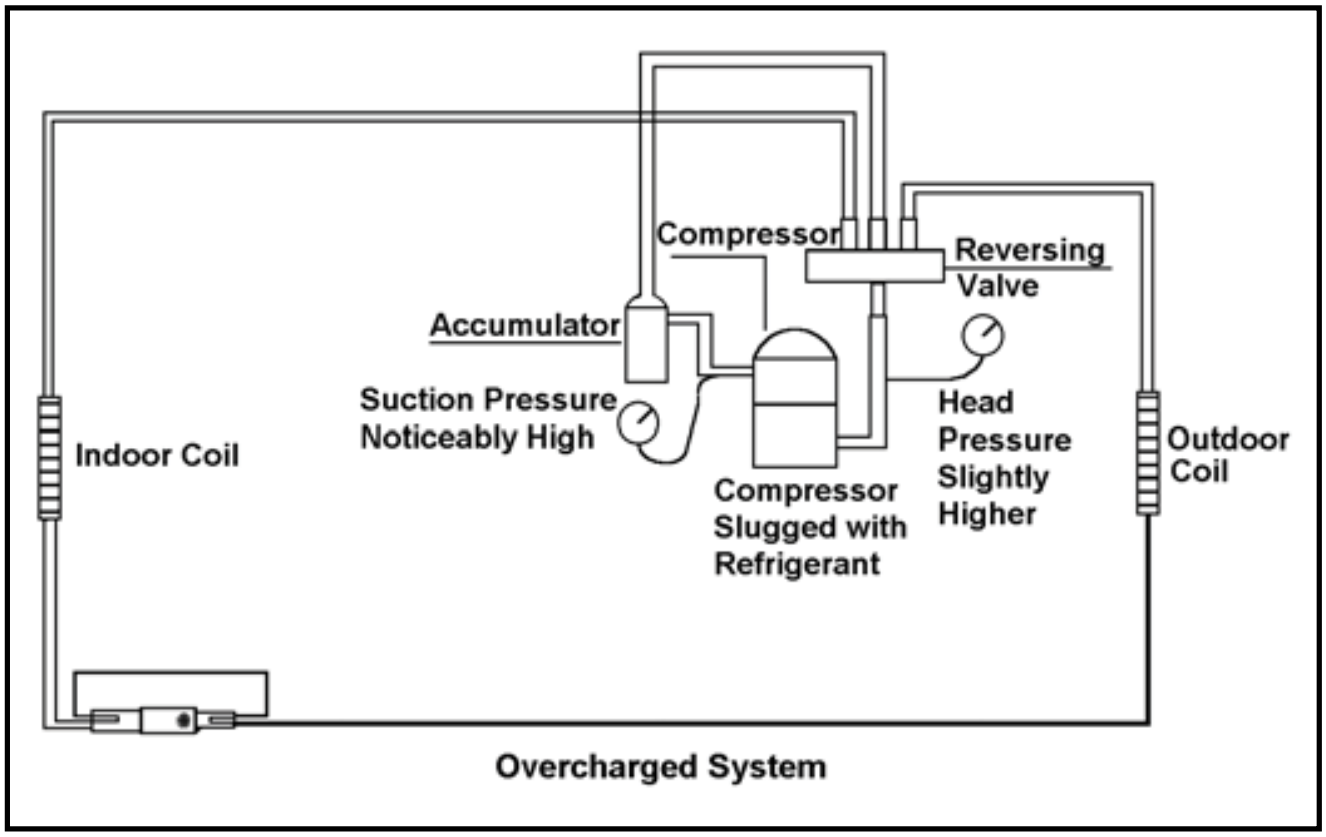


Figure 506 (Overcharged System)

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.

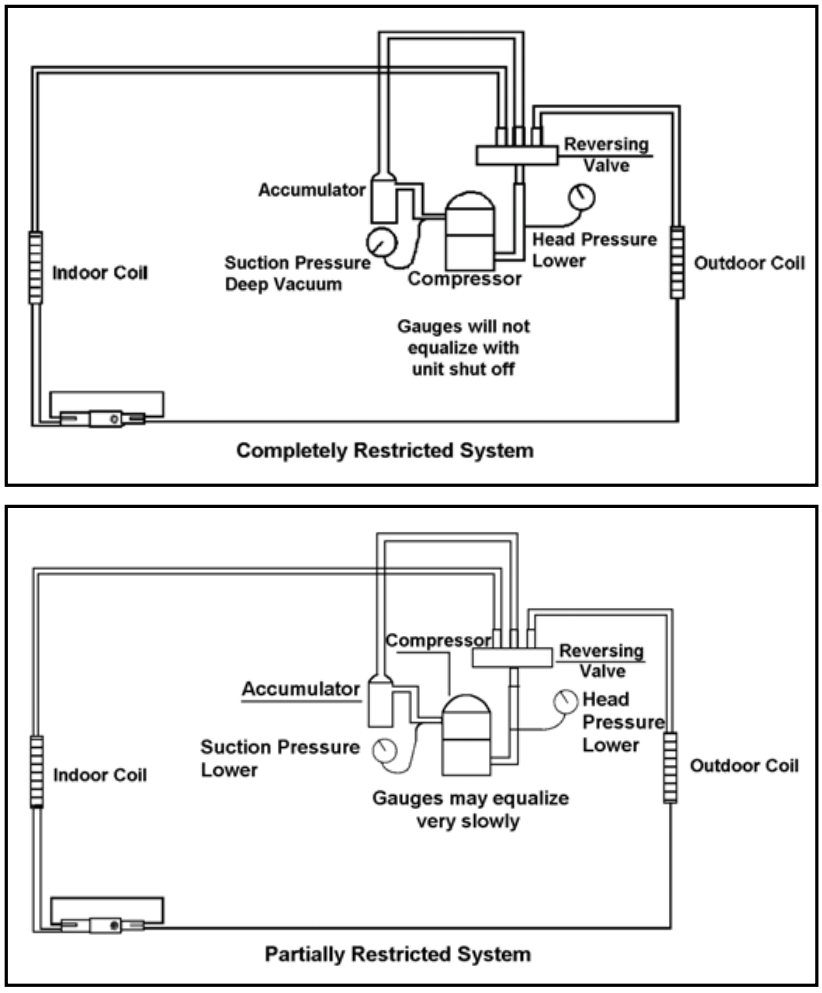


Figure 507 (Restricted System)

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.
4. Make necessary repairs to system.

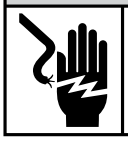
NOTE: When brazing, ensure to flow nitrogen to reduce contamination of capillaries and valves.

5. Evacuate system and hold at or below 500 microns.
6. Weigh in refrigerant with the proper 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

⚠ WARNING



ELECTRIC SHOCK HAZARD

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

⚠ CAUTION

FREEZE HAZARD

Proper safety procedures must be followed, and proper protective clothing must be worn when working with liquid refrigerant.

Failure to follow these procedures could result in minor to moderate injury.

⚠ 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

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 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.

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.

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.

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

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 electically 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 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.

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 12k/24k

1. Remove unit from the closet.
2. Ensure no charge is left in the system, evacuating according to EPA standards.
3. Remove the lower left panel.
4. Remove six mount screws on rear of condenser coil.
5. Detach one thermistor from coil.
6. Sweat out tubing connections to condenser coil as required
7. Slide coil and shroud assembly out of the rear of the unit to access the 6 screws attaching the shroud to the outdoor coil.
8. Remove coil from shroud and reinstall condenser coil in reverse sequence.
9. 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.
10. 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.

10. 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.

11. 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 12k/24k

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 left side upper panel.

NOTE: The 24k units utilize 2 evaporator coils and 2 reheat coils if applicable. The replacement varies from 12k unit. Additional panels may need to be removed depending on which coil or coils are being replaced.

6. Detach 2 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. Remove 3 screws on right hand side end plate.

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

11. 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.

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 11 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.

Figure 508 (12k Evaporator coil)

Figure 509 (24k Evaporator coil)

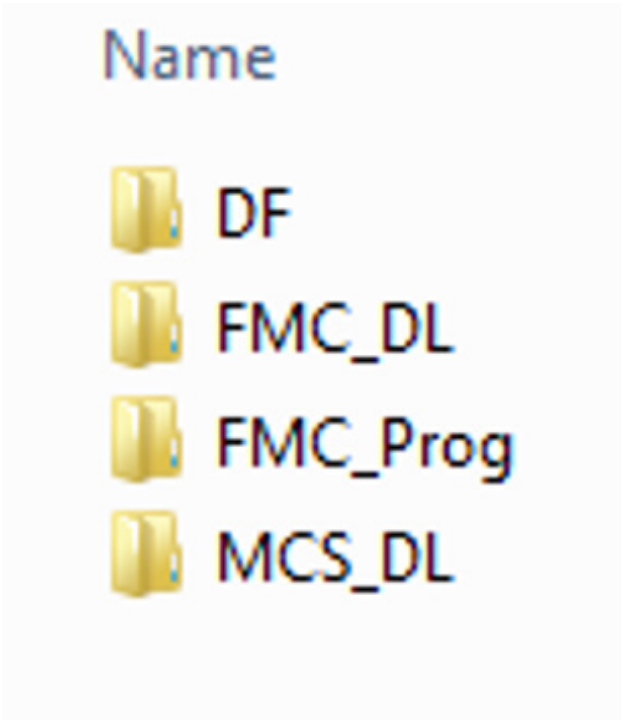
R-410A SEALED SYSTEM REPAIR

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.

UPDATING VRP FIRMWARE

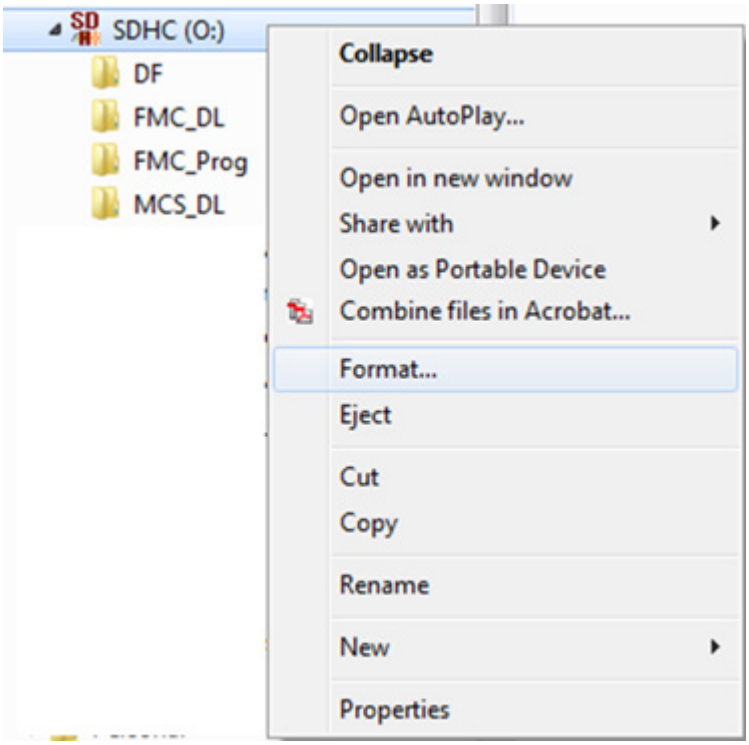
FMC Manual Update Process - Remove SD Card from FMC load on a PC or Laptop



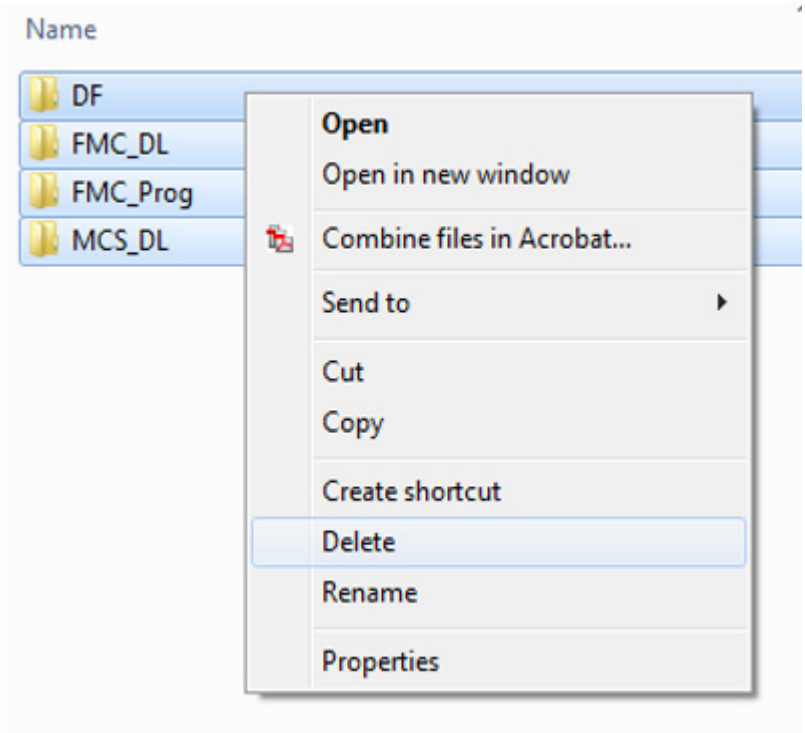
NOTE: Ensure Power is OFF! You will need an SD Card Reader to complete this step

UPDATING VRP FIRMWARE

FMC Update Process – Delete Current Files or Format SD Card



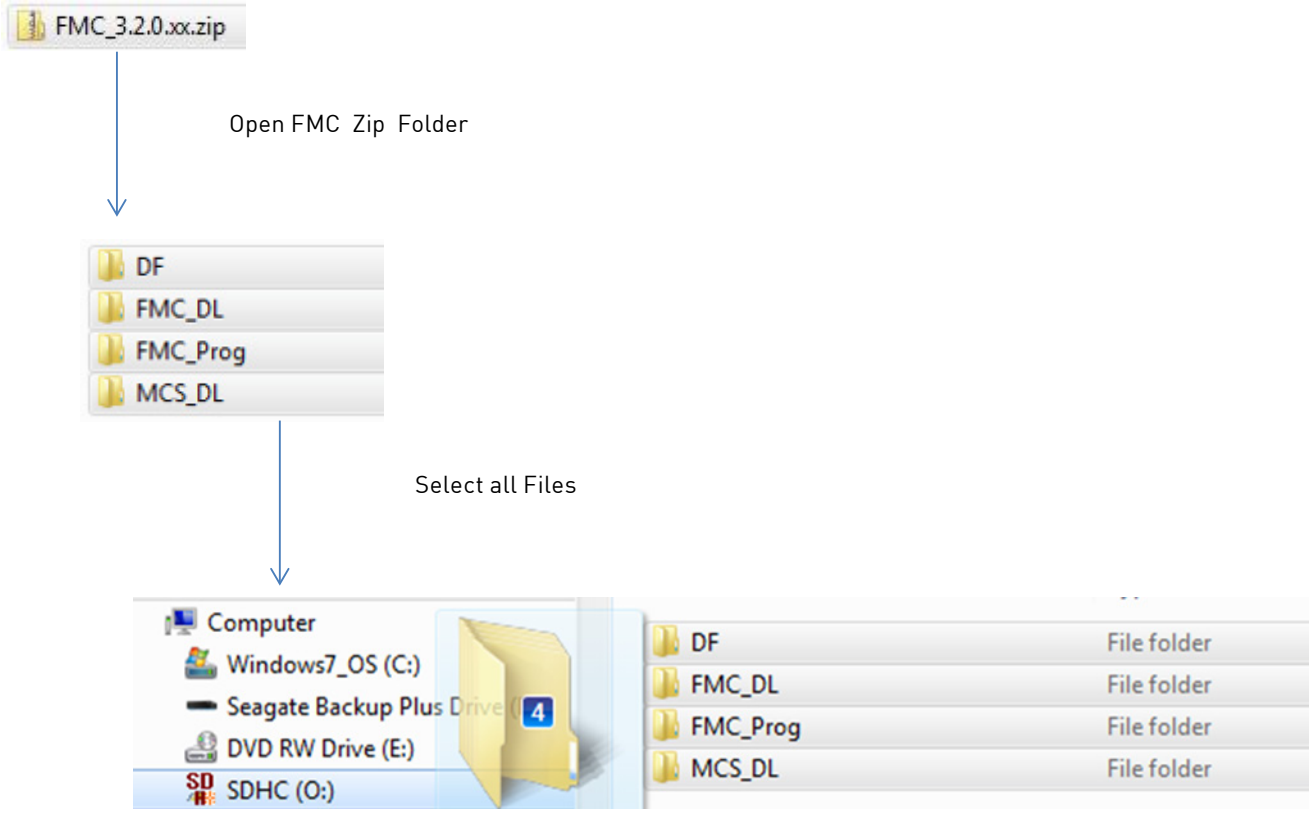
Or



UPDATING VRP FIRMWARE

FMC Update Process – Unzip Files to Blank or Formatted SD Card

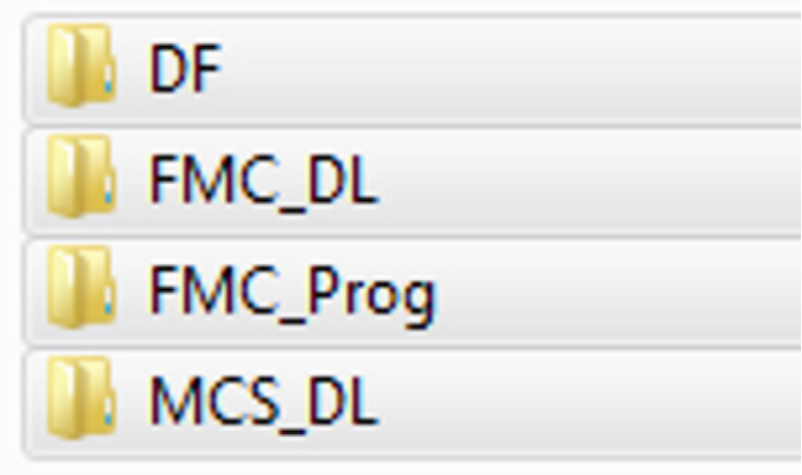
"xx" will be replaced by two numbers, indicating the software version. Example: 3.2.0.55 – Version 55



Copy to your SD Card Drive

UPDATING VRP FIRMWARE

FMC Update Process – Verify Files on SD Card Drive



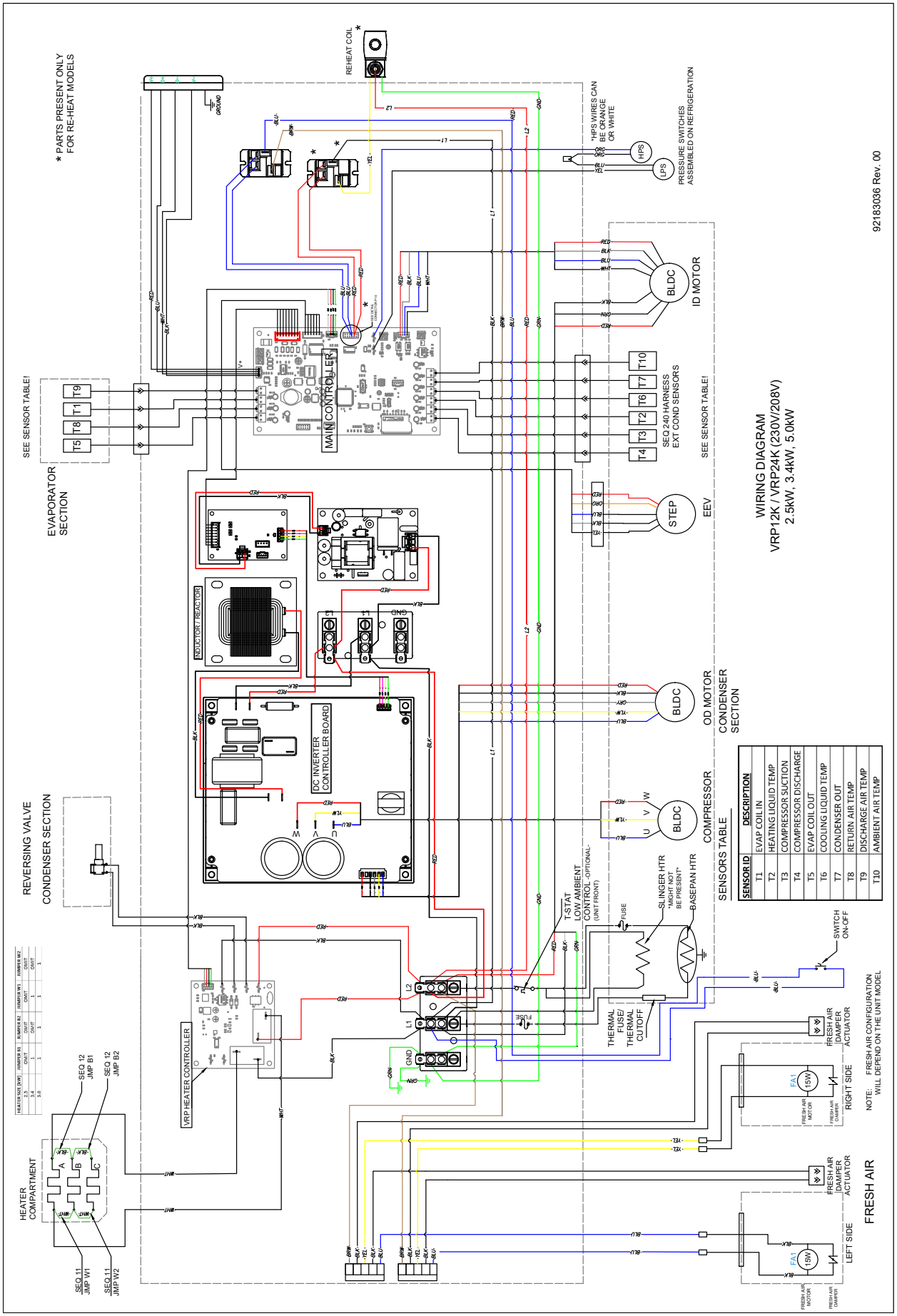
FMC Update Process – Loading new Firmware

Insert SD Card into FMC and apply power. The FMC Firmware load will confirm by showing three green downward cascading LEDs:

WIRING DIAGRAMS

12K BTU (E MODELS) (208/230V 2.5, 3.4, & 5.0 KW)

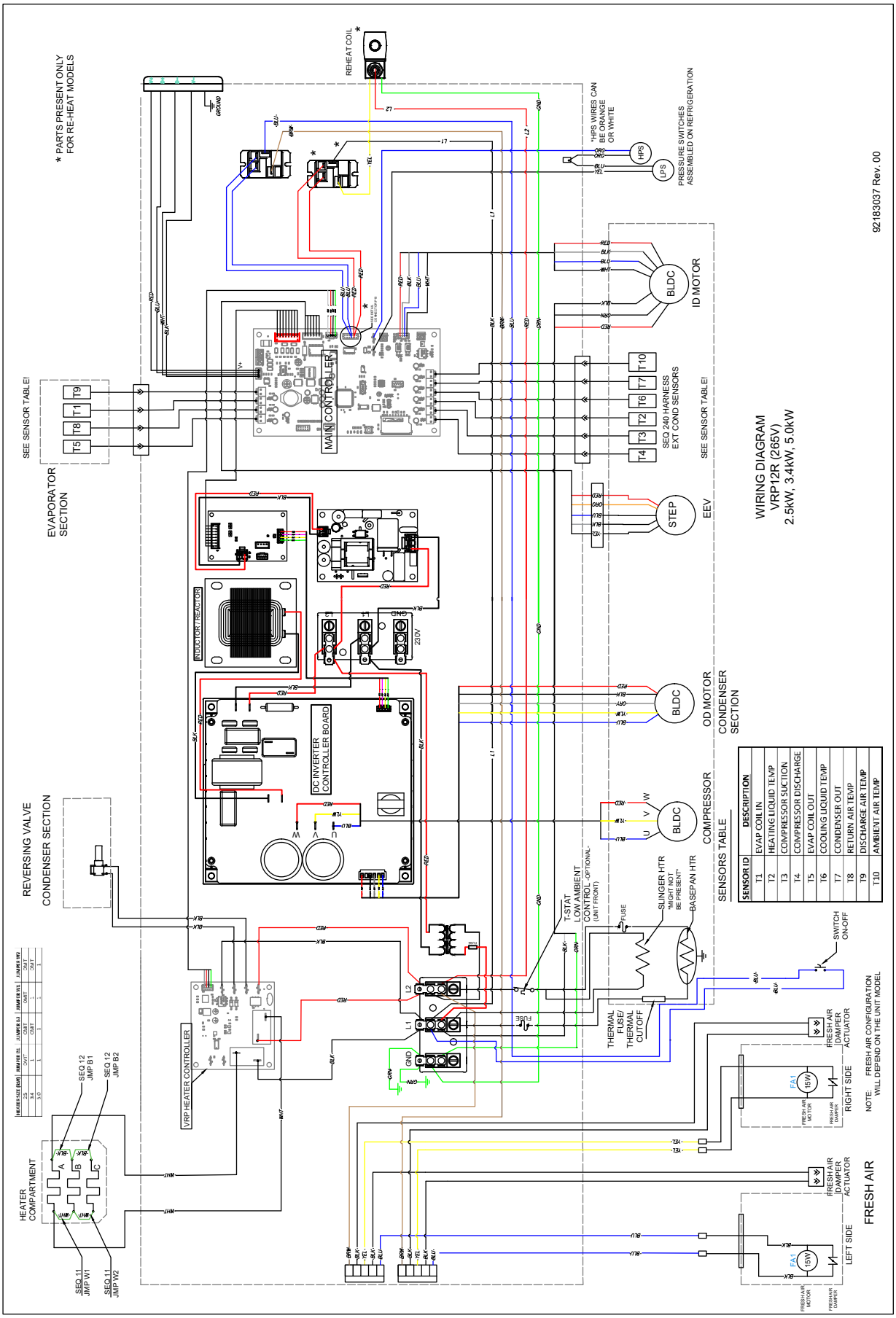
Figure 801 (Wiring Diagram)



WIRING DIAGRAMS

12K BTU (E MODELS) (265V 2.5, 3.4, & 5.0 kW)

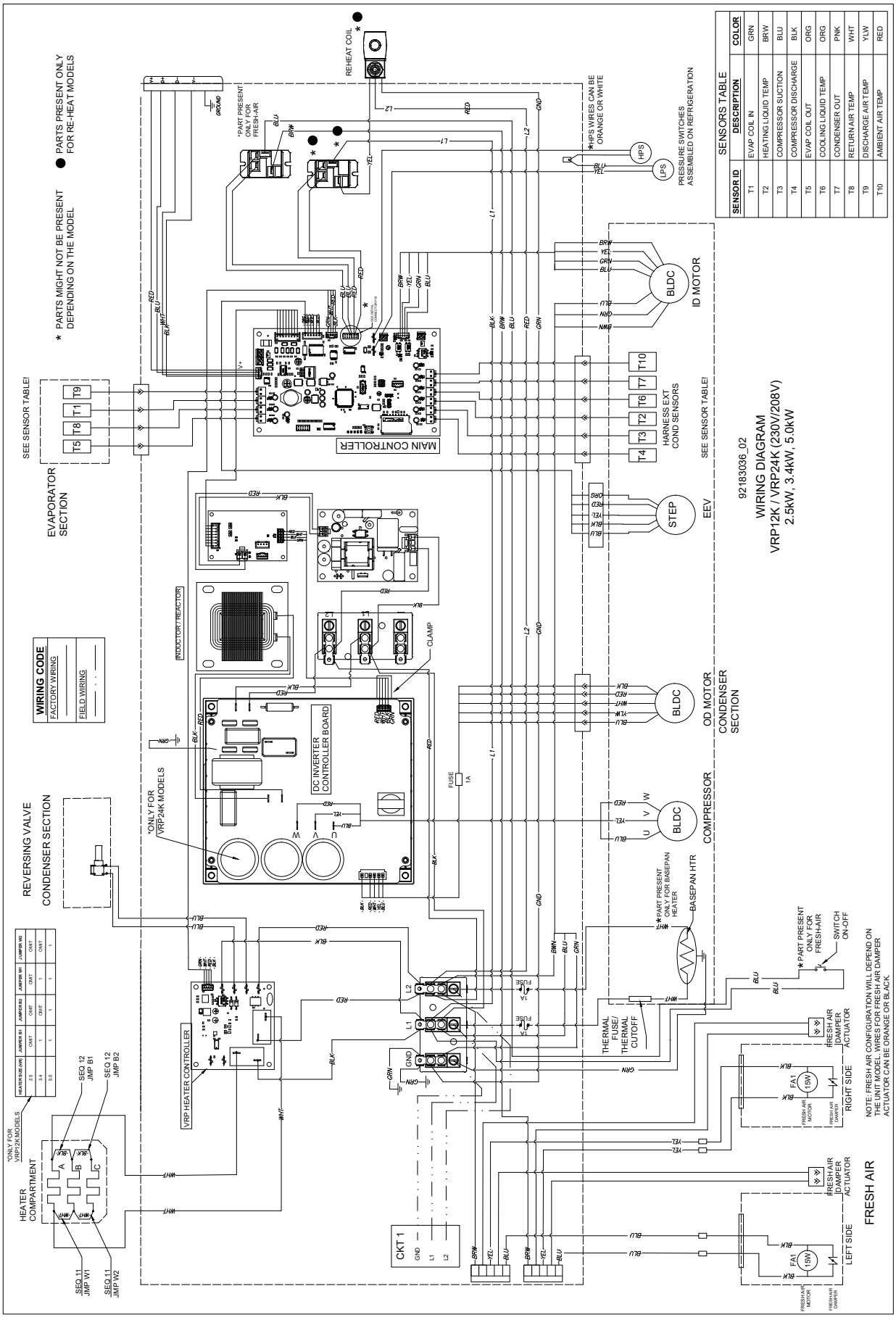
Figure 802 (Wiring Diagram)



WIRING DIAGRAMS

12K BTU (A-A MODELS) (208/230V 2.5, 3.4, & 5.0 KW) (Black FMC Board)

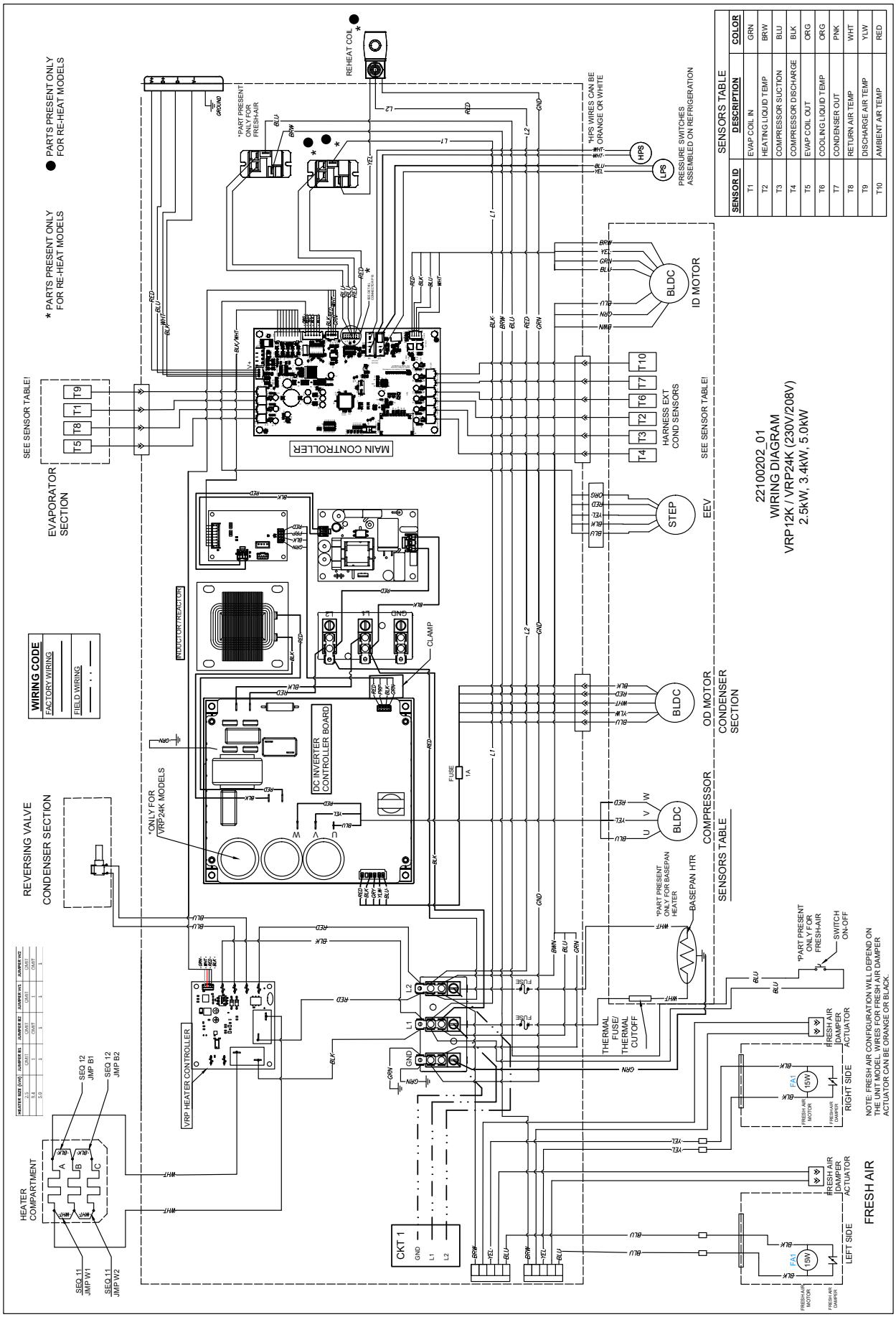
Figure 803.1 (Wiring Diagram)



WIRING DIAGRAMS

12K BTU (A-A MODELS) (208/230V 2.5, 3.4, & 5.0 KW) (Blue FMC Board)

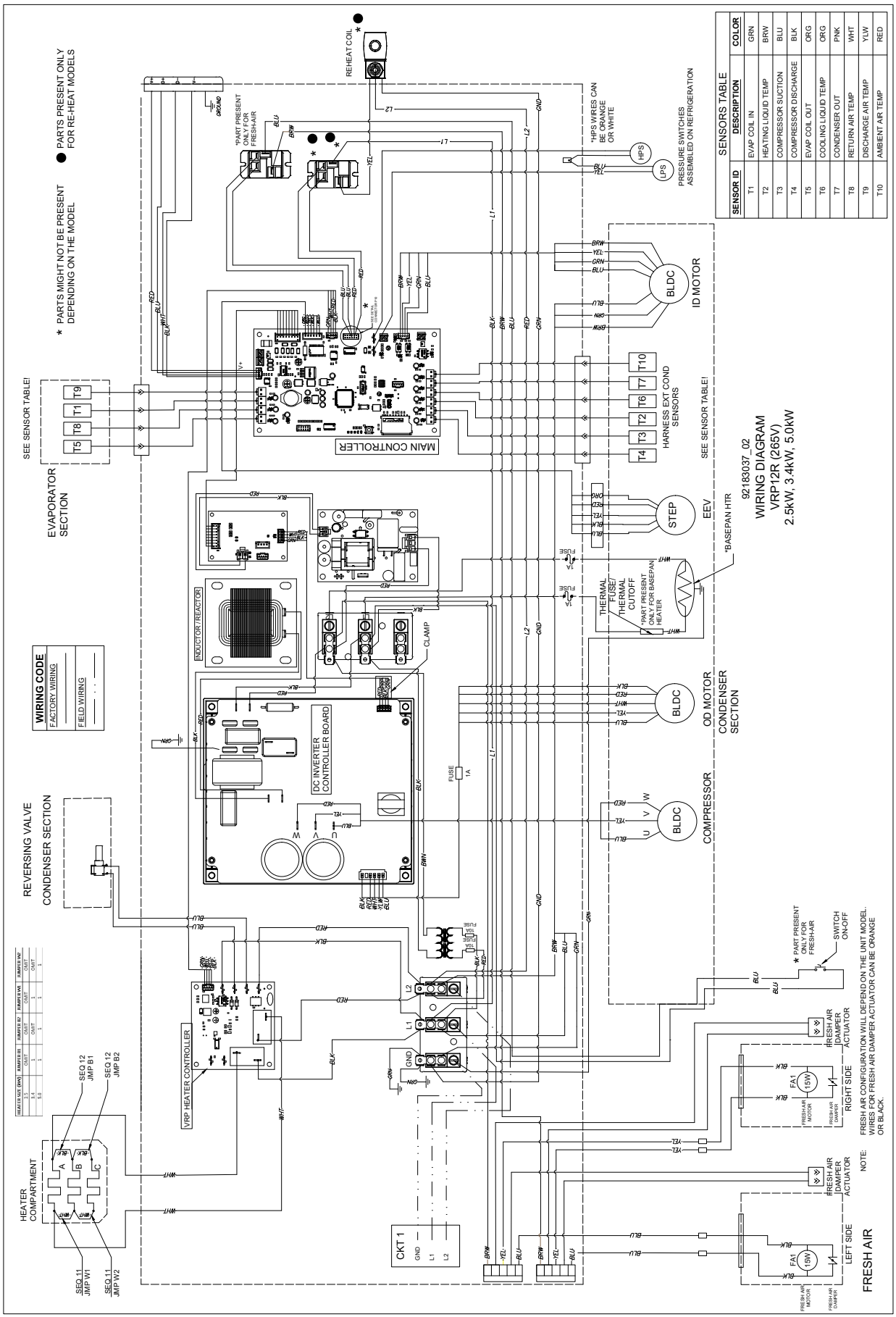
Figure 803.2 (Wiring Diagram)



WIRING DIAGRAMS

12K BTU (A-A MODELS) (265V 2.5, 3.4, & 5.0 kW) (Black FMC Board)

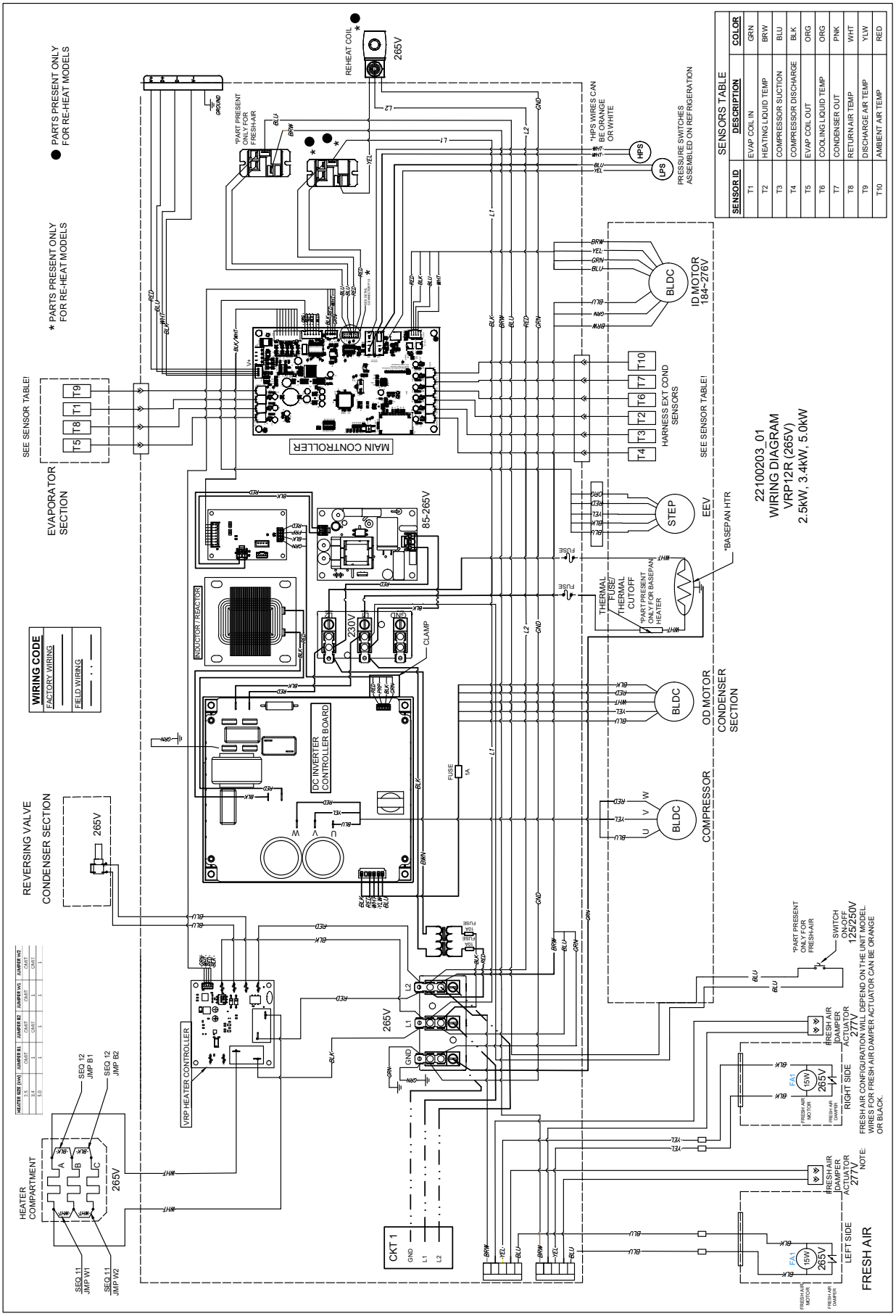
Figure 804.1 (Wiring Diagram)



WIRING DIAGRAMS

12K BTU (A-A MODELS) (265V 2.5, 3.4, & 5.0 kW) (Blue FMC Board)

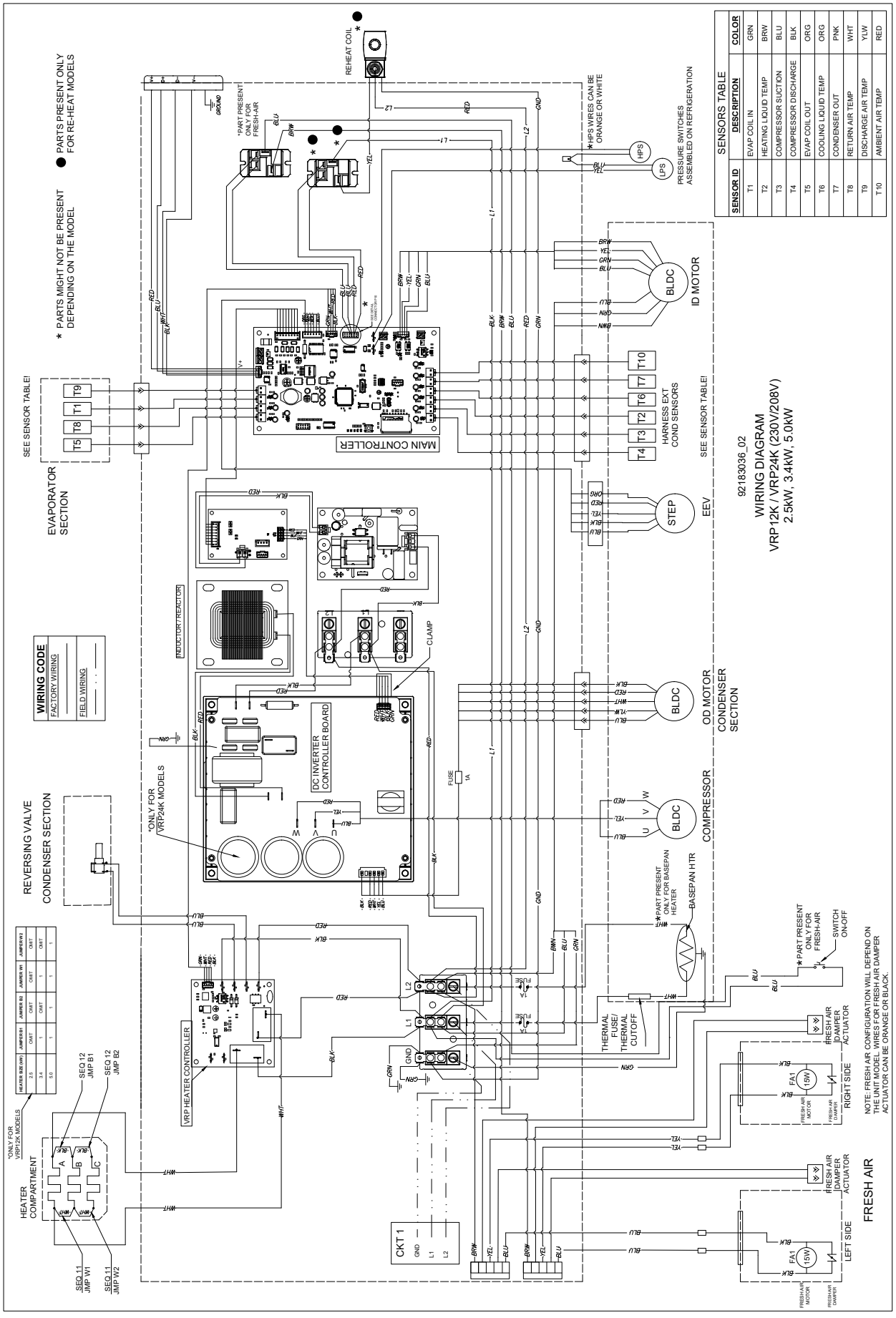
Figure 804.2 (Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (230V 2.5, 3.4, & 5.0 kW) (Black FMC Board)

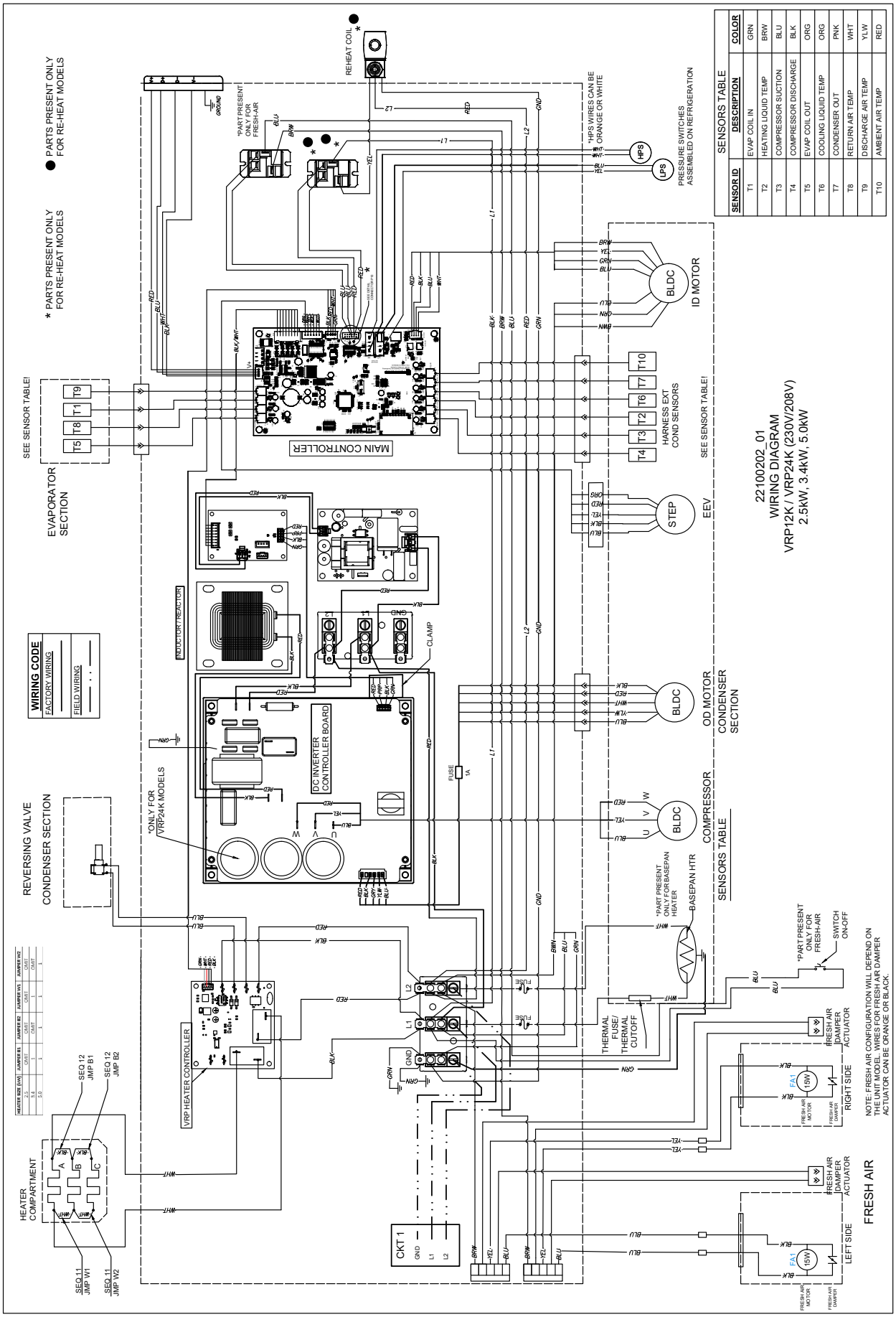
Figure 805.1(Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (230V 2.5, 3.4, & 5.0 kW) (Blue FMC Board)

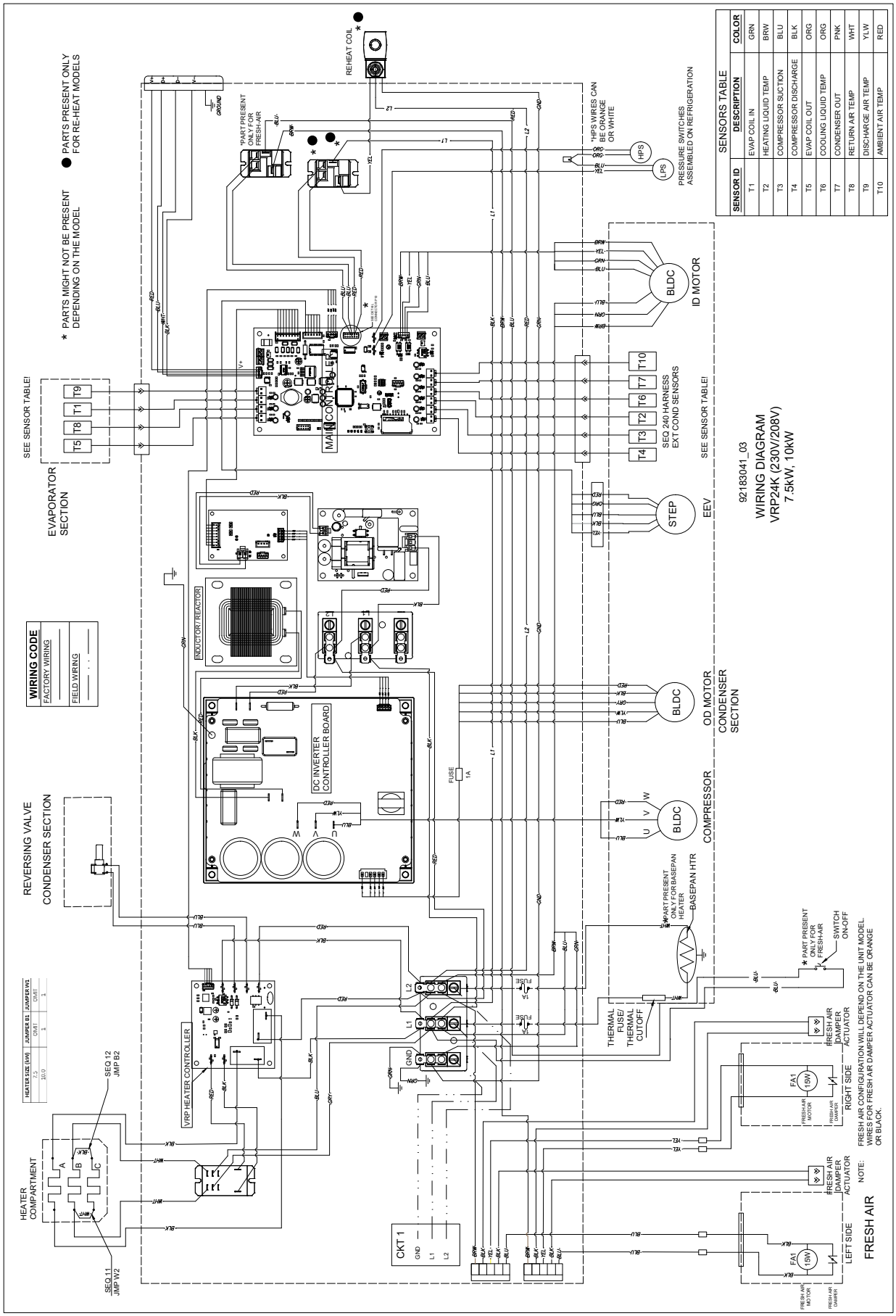
Figure 805.2(Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (230V 7.5, & 10 kW) (Black Board)

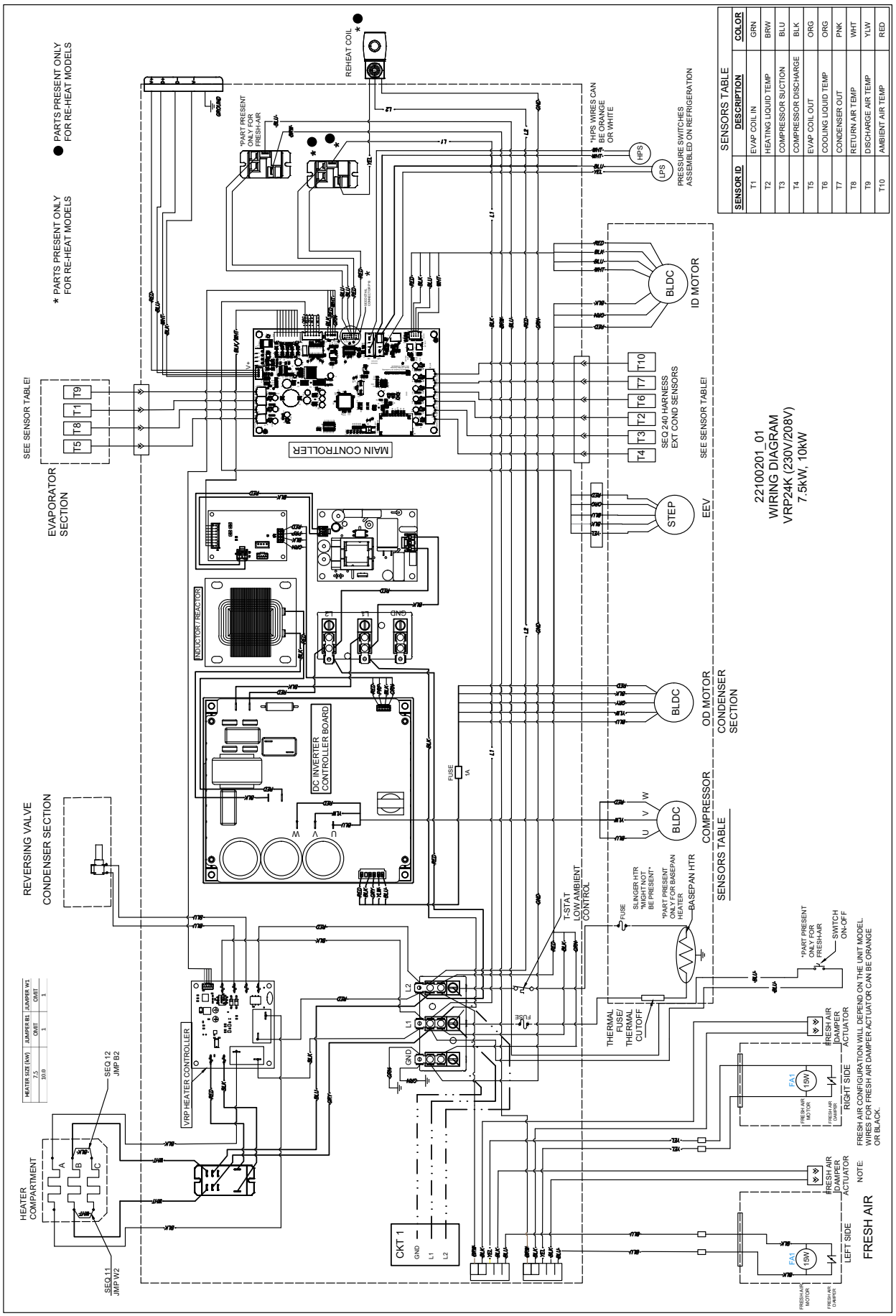
Figure 806.1 (Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (230V 7.5, & 10 kW) (Blue FMC Board)

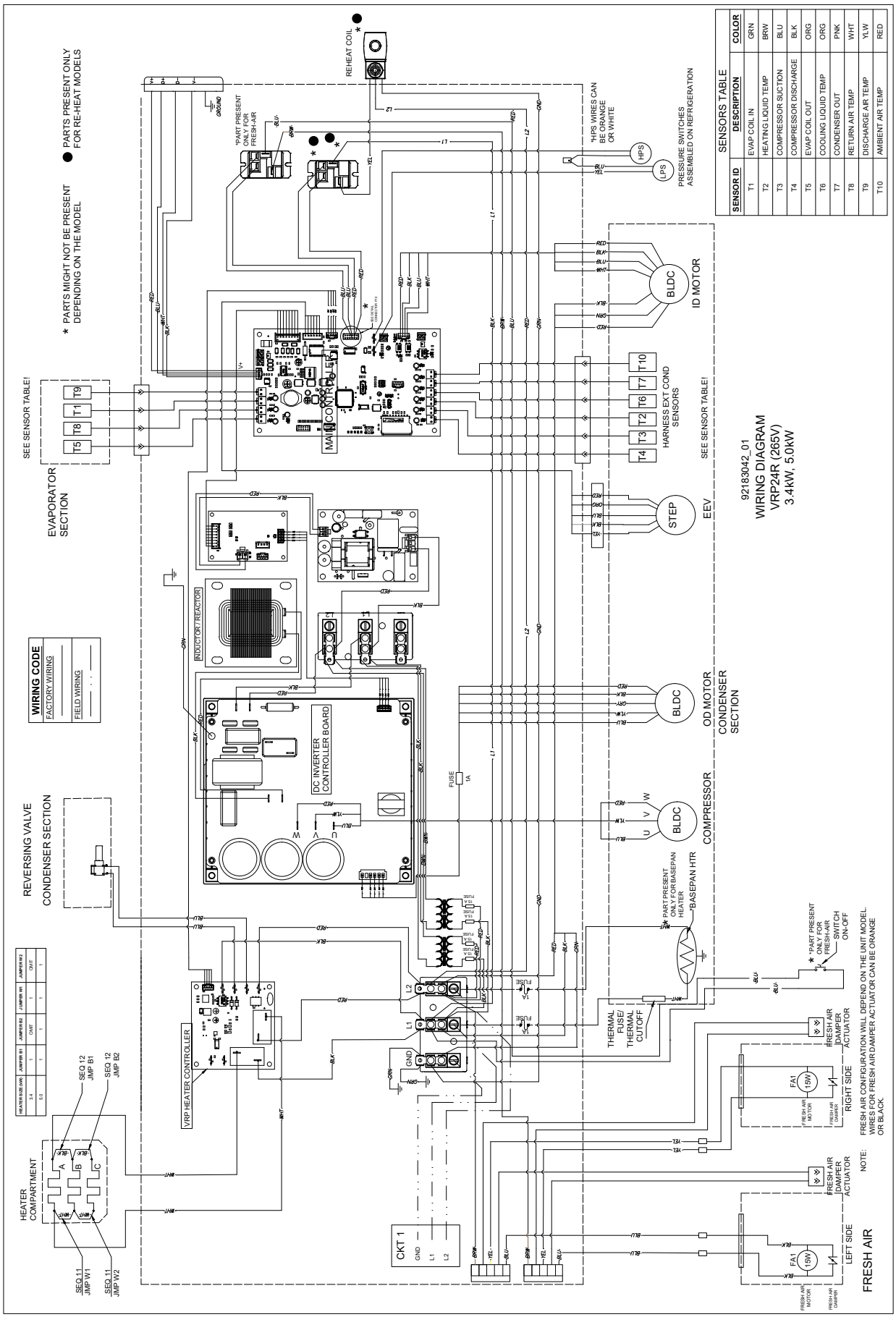
Figure 806.2 (Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (265V 2.5, 3.4, & 5.0 kW) (Black FMC Board)

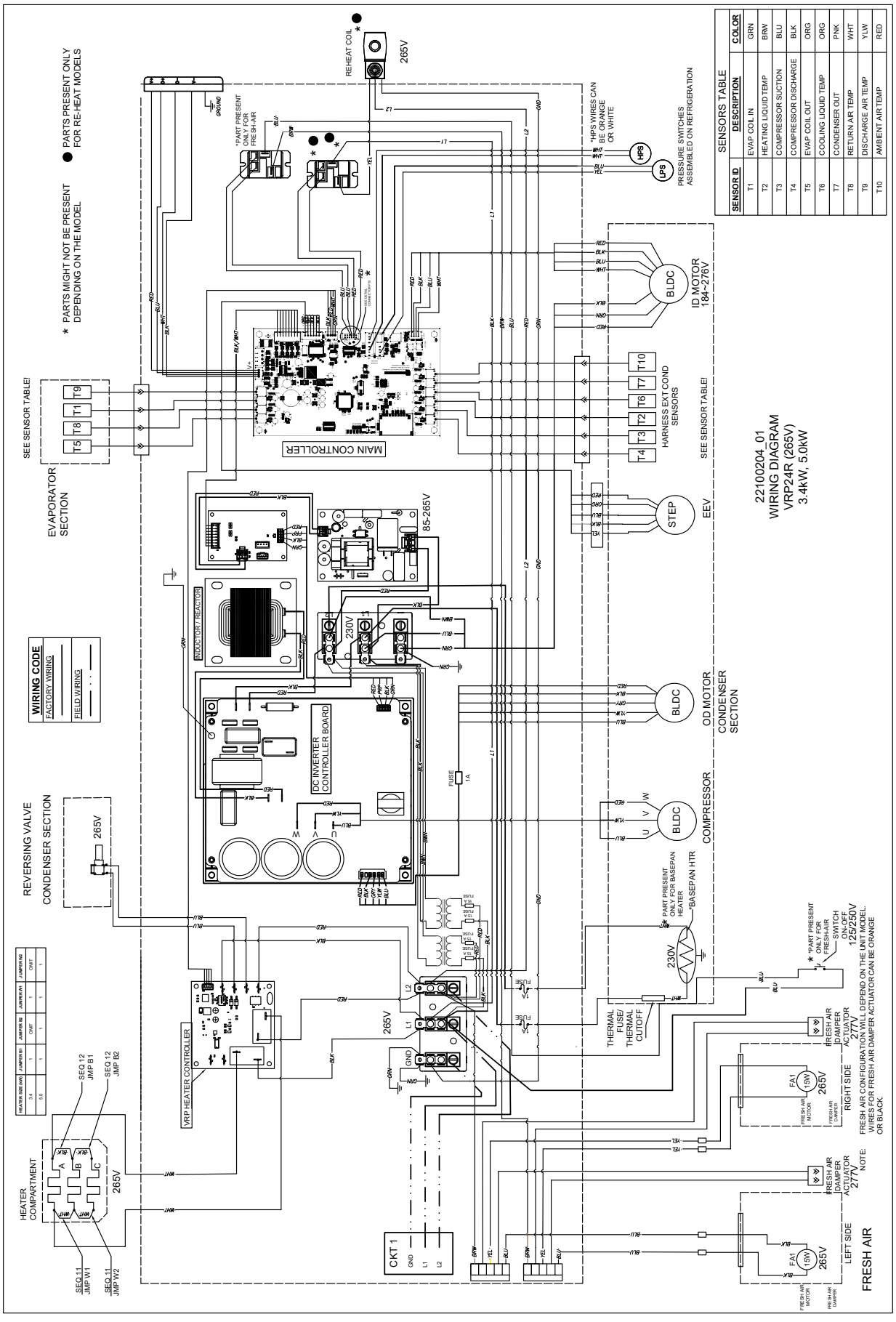
Figure 807.1 (Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (265V 2.5, 3.4, & 5.0 kW) (Blue FMC Board)

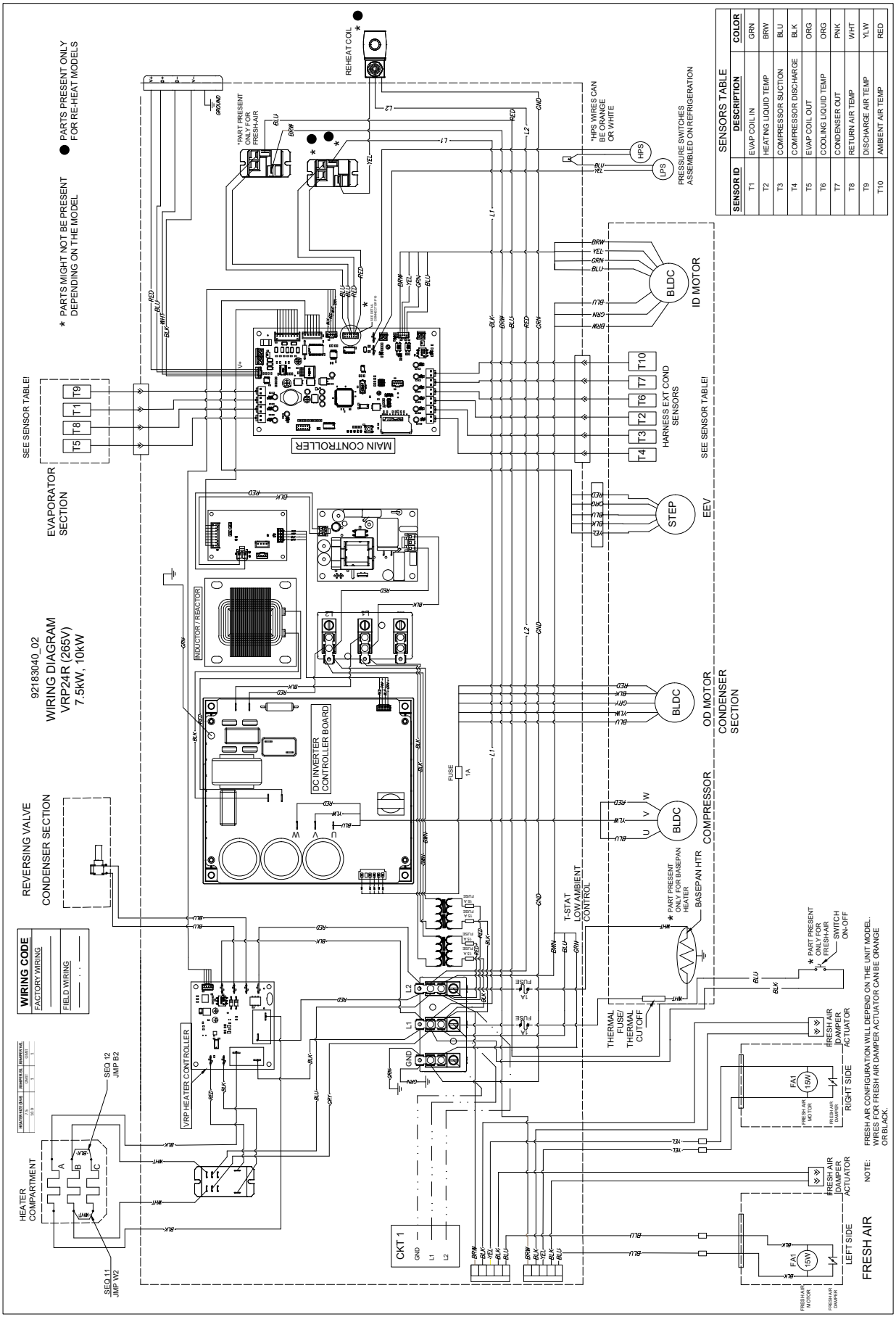
Figure 807.2 (Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (265V 7.5 &10 kW) (Black FMC Board)

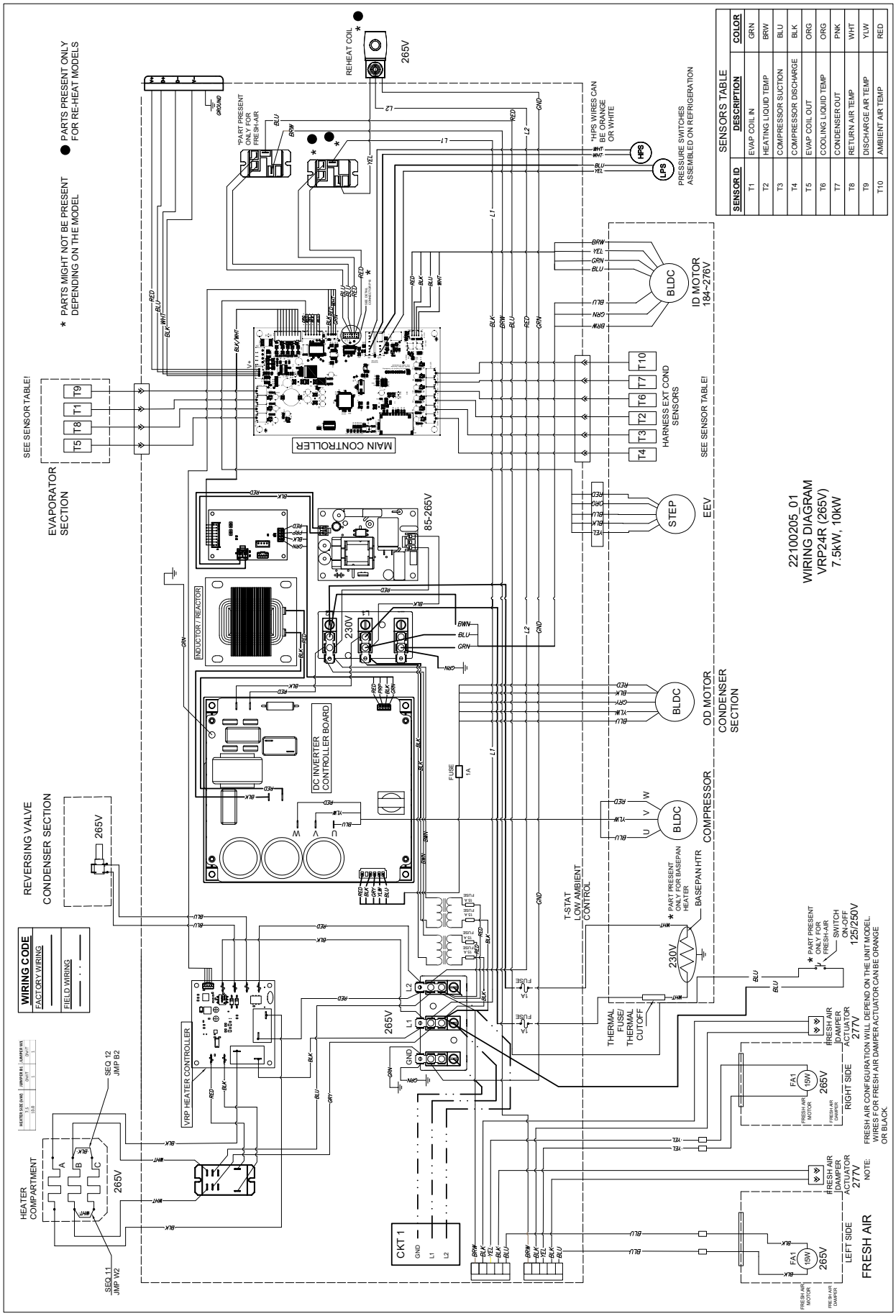
Figure 808.1 (Wiring Diagram)



WIRING DIAGRAMS

24K BTU (A-A, A-B MODELS) (265V 7.5 &10 kW) (Blue FMC Board)

Figure 808.2 (Wiring Diagram)



ACCESSORIES

Part Numbers

ITEM	PART NUMBER	PART DESCRIPTION	USED ON MODEL	QTY
1	VRPXWPA-8	Wall Plenum with VRPXALA for 4" to 8" thick wall	VRP12	1
2	VRPXWPB-8	Wall Plenum with VRPXALB for 4" to 8" thick wall	VRP12, VRP24	1
3	VRPXWPA-14	Wall Plenum for with VRPXALA for 8" to 14" thick wall	VRP12	1
4	VRPXWPB-14	Wall Plenum with VPXALB for 8" to 14" thick wall	VRP12, VRP24	1
5	VRPXALA	Architectural louver - 30° Blade angle	VRP12	1
6	VRPXALB	Architectural louver - 30° Blade angle	VRP12, VRP24	1
7	VRPXSCA	Architectural louver - 30° Blade angle - Custom color (Special order)	VRP12	1
-7a	VRPXSCB	Architectural louver - 30° Blade angle - Custom color (Special order)	VRP12, VRP24	1
11	VRPXAP1	VRP louvered access panel (left and right in-swing)	VRP12, VRP24	1
12	VRPXAPPR1	VRP hanging perimeter return access panel	VRP12, VRP24	1
13	VRPXWC1	Wired standard VRP wall controllerr	VRP12, VRP24	1
14	VRPXEMRT2	VRP Energy Management Wired Wall Controller with Occupancy Sensor	VRP12, VRP24	1
16	VRPXEMWRT2	VRP Energy Management Wireless Wall Controller with Occupancy Sensor	VRP12, VRP24	1
18	VRPXEMRT2LC	Wired energy management wall controller with lighting control (Requires EMROS)	VRP12, VRP24	1
19	VRPXEMRT2HC	Wired energy management wall controller with Hilton Connect Room (RTM) compatibility	VRP12, VRP24	1
20	EMOCT	Energy management online connection kit	VRP12, VRP24	1
21	EMRAF	Energy management online remote access fee	VRP12, VRP24	1
22	EMROS	Energy management wired remote occupancy sensor	VRP12, VRP24	1
23	EMRTS	Energy management remote temperature sensor	VRP12, VRP24	1
24	EMRDS	Energy management door switch	VRP12, VRP24	1
25	EMCWP	Energy management J-box wall-plate	VRP12, VRP24	1
26	EMRWOS	Energy management wireless remote occupancy sensor	VRP12, VRP24	1
27	VRPXFK-2	Filter bracket kit for 2" deep filters (up to MERV 13) - includes gasket	VRP12, VRP24	1
28	VPFKU	Telescoping filter bracket kit for 2" - 4" deep filters (up to MERV 13) - includes gasket	VRP12, VRP24	1

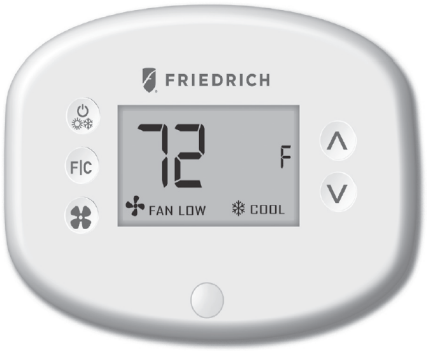
ACCESSORIES

Wall Controller/ Thermostat

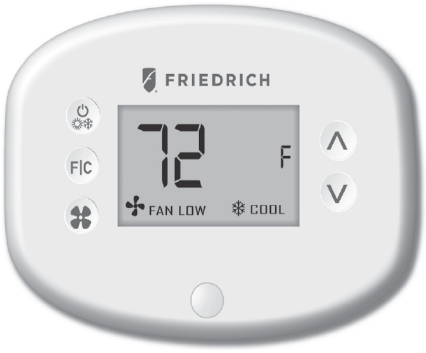
VRP Wall Controller / Thermostat Options

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

Installation Accessories and Descriptions

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

Installation Accessories and Descriptions

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

Decommissioning Of Units

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely and tested prior to re-use.

NOTE: When breaking into the refrigerant circuit to make repairs or for any other purpose, conventional procedures shall be used. However, for FLAMMABLE REFRIGERANTS (R-32 is classified in the A2L group for mildly flammable refigerants) it is important that best practice is followed since flammability is a consideration.

⚠ **Warning:** Ensure sufficient ventilation at the repair place.

⚠ **Warning:** Ensure there are no open flame sources or hot surfaces that exceed 1200˚F in the work area.

⚠ **Warning:** Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that:
    - mechanical handling equipment is available, if required, for handling refrigerant cylinders.
    - all personal protective equipment is available and being used correctly.
    - the recovery process is supervised at all times by a competent person.
    - recovery equipment and cylinders conform to the appropriate standards.
4. Install a piercing valve to remove refrigerant from the sealed system.
5. Safely remove refrigerant following local and national regulations. Refer to refrigerant removal, recovery, and evacuation section of this manual.

6. Labelling

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

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

Figure 1000 (Thermistor Values)

APPENDIX

FRIEDRICH AUTHORIZED PARTS DEPOTS

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

NEUCO Inc.

515 W Crossroads Parkway
Bolingbrook, IL 60440

312.809.1418

borr@neuco.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

Friedrich Air Conditioning Co.

10001 Reunion Place, Suite 500 • San Antonio, Texas 78216

1-800-541-6645

www.friedrich.com