Service Manual

FRIEDRICH

VRP® Series Air Conditioners
R-32 Refrigerant



Model	Voltage	BTU
VRP07K-C	230	7,000
VRP07R-C	265	7,000
VRP12K-C	230	12,000
VRP12R-C	265	12,000
VRP24K-C	230	24,000
VRP24R-C	265	24,000
VRP36K-C	230	36,000

THE EXPERTS IN ROOM AIR CONDITIONING

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INTRODUCTION

Important Safety Information

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

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

Maintenance is the responsibility of the owner. Failure to properly maintain or repair equipment may result in personal injury and/or various types of property damage (fire, flood, etc.).

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.

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

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

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

Installation procedures are not given in this manual. They are given in the Installation/Operation manual.

SAFETY IS 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 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.

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.

NOTICE Indicates property damage can occur if instructions are not followed.



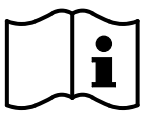
This symbol indicates that this appliance uses a flammable refrigerant. If the refrigerant is leaked and is exposed to an external ignition source, there is a risk of fire.



This symbol indicates that the Operation Manual should be read carefully.



This symbol indicates that service personnel should be handling this equipment with reference to the installation manual.



This symbol indicates that information is available such as the Installation and Operation manual, or the Service Manual.

INTRODUCTION

Important Safety Information

⚠WARNING: The manufacturer's warranty does not cover any damage or defect to the air conditioner caused by the attachment or use of any components, accessories or devices (other than those authorized by the manufacturer) into, onto or in conjunction with the air conditioner. You should be aware that the use of unauthorized components, accessories or devices may adversely affect the operation of the air conditioner and may also endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized components, accessories or devices.

⚠WARNING: This appliance is not intended for use by persons (Including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

⚠WARNING: The maximum altitude for this appliance is 2,000 meters(6,562 feet).

Do not use above 2,000 meters(6,562 feet).

⚠WARNING: Electrical Shock Hazard



Disconnect all power to the unit before starting maintenance. All electrical connections and wiring MUST be installed by a qualified electrician and conform to the National Code and all local codes which have jurisdiction. Failure to do so can result in property damage, severe electrical shock or death.

⚠WARNING: Read Installation Manual



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 70-2023 national electric code or current edition, International Mechanic code 2021 or current edition, and any other local or national codes.

⚠WARNING: Safety First

Do not remove, disable, or bypass this unit's safety devices. Doing so may cause fire, injuries, or death.

⚠WARNING: This Product uses R-32 Refrigerant

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.



Refrigerant Safety Group A2L

⚠WARNING: Refrigeration System under High pressure

Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R32 systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.



⚠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: Keep all air circulation and ventilation openings free from obstruction.

⚠WARNING: The unit should not be in contact with any equipment that will transmit vibration to the unit. Any excessive vibration or pulsation to the unit could result in damage to the refrigerant tubing.

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, 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:

- Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenance, or service.
- Make sure to follow proper lockout/tag out procedures.
- Always work in the company of a qualified assistant if possible.
- Capacitors, even when disconnected from the electrical power source, retain an electrical charge potential capable of causing electric shock or electrocution.
- Handle, discharge, and test capacitors according to safe, established, standards, and approved procedures.
- Extreme care, proper judgment, and safety procedures must be exercised if it becomes necessary to test or troubleshoot equipment with the power on to the unit.
- Do not spray water on the air conditioning unit while the power is on.
- Electrical component malfunction caused by water could result in electric shock or other electrically unsafe conditions when the power is restored and the unit is turned on, even after the exterior is dry.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- Follow all safety precautions and use proper and adequate protective safety aids such as: gloves, goggles, clothing, properly insulated tools, and testing equipment etc.
- Failure to follow proper safety procedures and/or these warnings can result in serious injury or death.

INTRODUCTION

Personal Injury Or Death Hazards

- **REFRIGERATION SYSTEM REPAIR HAZARDS:**
- Use approved standard refrigerant recovering procedures and equipment to relieve high pressure before opening system for repair. Reference EPA regulations (40 CFR Part 82, Subpart F) Section 608.
- Do not allow liquid refrigerant to contact skin. Direct contact with liquid refrigerant can result in minor to moderate injury.
- Be extremely careful when using an oxy-acetylene torch. Direct contact with the torch's flame or hot surfaces can cause serious burns.
- Make certain to protect personal and surrounding property with fire proof materials and have a fire extinguisher at hand while using a torch.
- Provide adequate ventilation to vent off toxic fumes, and work with a qualified assistant whenever possible.
- Always use a pressure regulator when using dry nitrogen to test the sealed refrigeration system for leaks, flushing etc.
- **MECHANICAL HAZARDS:**
- Extreme care, proper judgment and all safety procedures must be followed when testing, troubleshooting, handling, or working around unit with moving and/or rotating parts.
- Be careful when, handling and working around exposed edges and corners of the sleeve, chassis, and other unit components especially the sharp fins of the indoor and outdoor coils.
- Use proper and adequate protective aids such as: gloves, clothing, safety glasses etc.
- Failure to follow proper safety procedures and/or these warnings can result in serious injury or death.

- **PROPERTY DAMAGE HAZARDS**
- **FIRE DAMAGE HAZARDS:**
- Read the Installation/Operation Manual for the air conditioning unit prior to operating.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- Be extremely careful when using acetylene torch and protect surrounding property.
- Failure to follow these instructions can result in fire and minor to serious property damage.
- **WATER DAMAGE HAZARDS:**
- Improper installation, maintenance or servicing of the air conditioner unit can result in water damage to personal items or property.
- Insure that the unit has a sufficient pitch to the outside to allow water to drain from the unit.
- Do not drill holes in the bottom of the drain pan or the underside of the unit.
- Failure to follow these instructions can result in damage to the unit and/or minor to serious property damage.

INTRODUCTION

Operation of Equipment in During Construction

- **OPERATION OF EQUIPMENT MUST BE AVOIDED DURING CONSTRUCTION PHASES WHICH WILL PRODUCE AIRBORNE DUST OR CONTAMINANTS NEAR OR AROUND AIR INTAKE OPENINGS:**
- Wood or metal framing;
- Drywalling or sheathing,
- Spackling or applying joint compound.
- Sanding or grinding.
- Moulding or trim work.
- Concrete dust.
- Insulation .
- Spray foam.
- Stucco spray and mortar.
- Plastic sheathing.

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

INTRODUCTION

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

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

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

Installation procedures are not given in this manual. They are given in the Installation and Operation Manual.

Equipment Identification

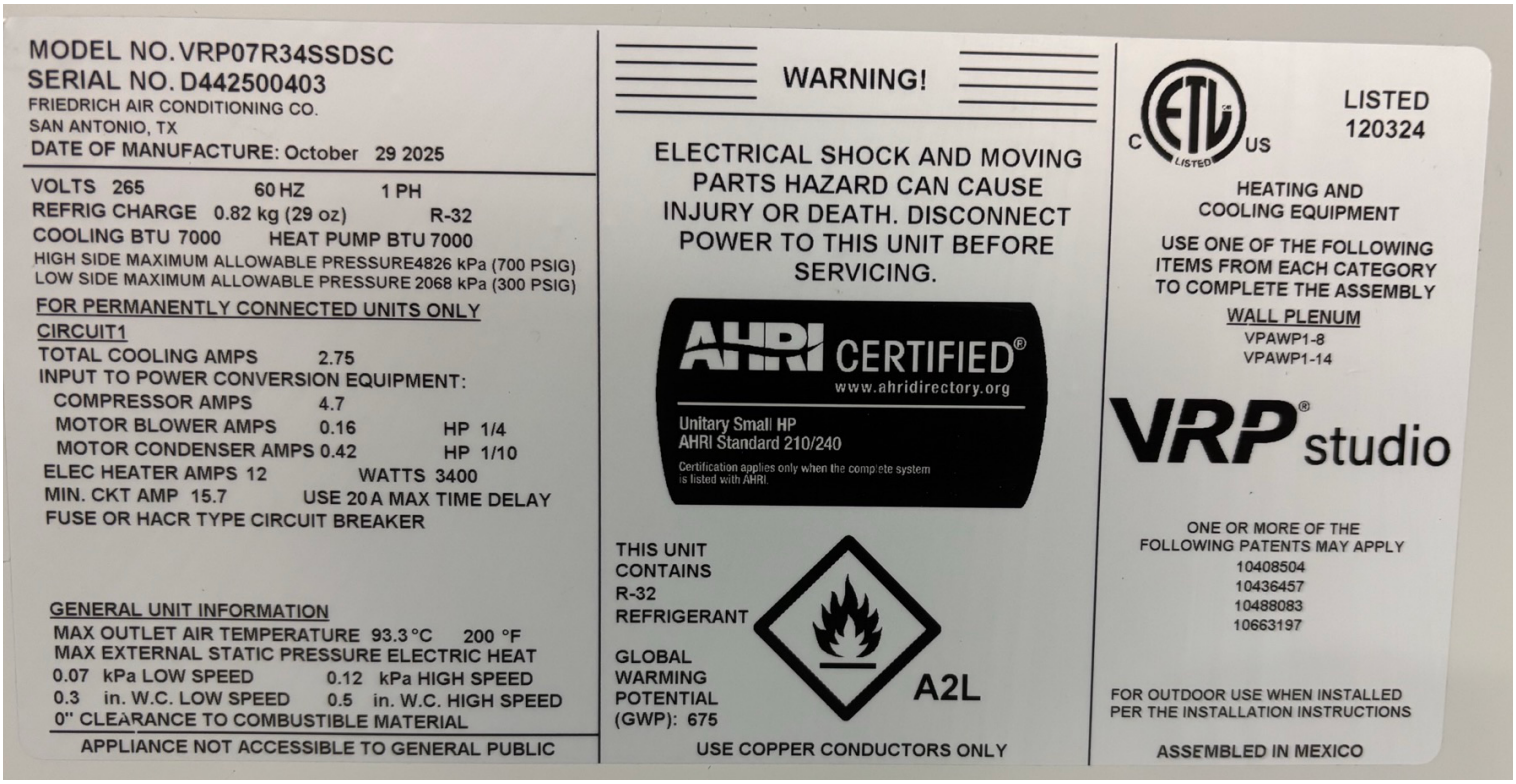


Figure 101 (Equipment Identification Example)

INTRODUCTION

Model and Serial Number Identification Guides

VRP	24	K	25	S	S	B	S	C
1-3	4-5	6	7-8	9	10	11	12	13

1-3 Series
Variable Refrigerant Packaged Heat Pump

4-5 Capacity (Btu /h)
07 = 3800-10,000 Operating Range
12 = 5400-16,000 Operating Range
24 = 14,500 - 28,000 Operating Range
36 = 21,400 - 38,4000 Operating Range

6 Voltage (Single Phase)
K = 230/208 V (All VRP)
R = 265 V (VRP07/12/24)

7-8 Heater Watts
00 = 0.0 kW
25 = 2.5 kW
34 = 3.4 kW
50 = 5.0 KW
75 = 7.5 kW
10 = 10.0 kW
15 = 15.0 kW

9 Outdoor Air/ Ventilation
S= Standard unit. No FreshAire™
F= Single Module FreshAire System 35 CFM (VRP07,12, 24)/80 CFM (VRP36)
D= Dual Module FreshAire System 70 CFM (VRP12, 24)/130 CFM (VRP36)

10 Reheat
S= Standard
R= Reheat

11 Plenum And Louver Configuration
A= Only for VRP12 units
B= For VRP24 (can also be used for VRP12 units)
C = Only for VRP36
D = Only for VRP07

12 Low Ambient
S = Standard
L = Low Ambient heat

13 Marketing Revision
C - A2L Version R32

NOTES:

1. 0 kW heat is only available with 7k BTU or 36K BTU models.
2. 2.5 kW heat is only available with 7k BTU or 12K BTU models.
3. 3.4 kW heat is only available with 7k BTU, 12K BTU, or 24K BTU models.
4. 5.0 kW heat is only available with 12K BTU, or 24K BTU models.
5. 7.5 kW heat is only available with 24K BTU models.
6. 10.0 kW heat is only available with 24K BTU or 36K BTU models.
7. 15.0 kW heat is only available with 36K BTU models.

Figure 102 (Model Number Identification)

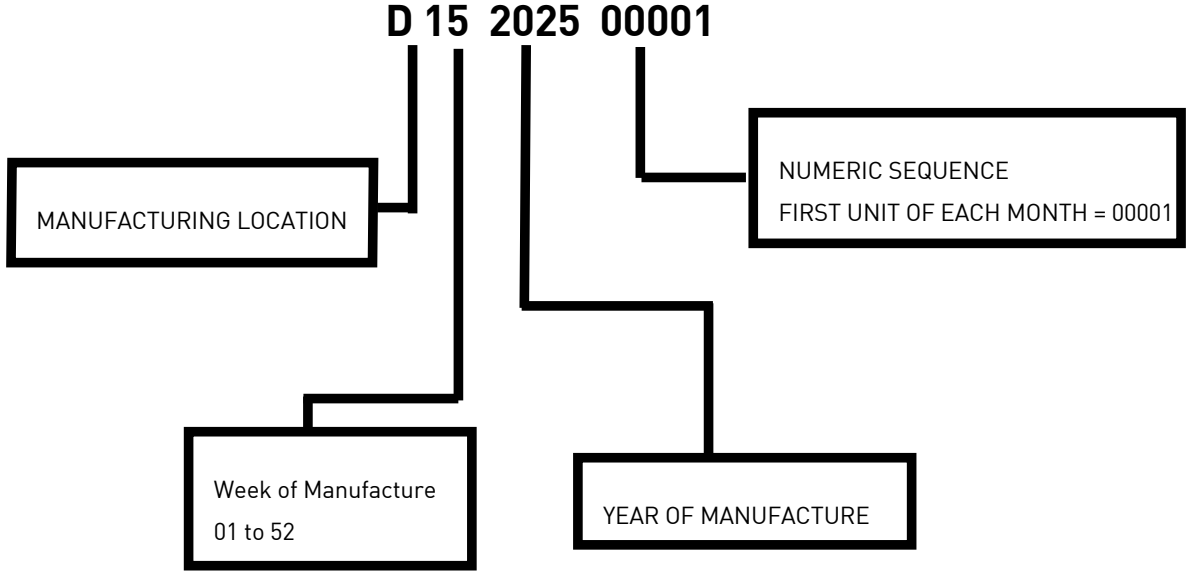


Figure 103 (Serial Number Identification)

INTRODUCTION

The Friedrich VRP® is a variable capacity system that utilizes Precision Inverter® technology to provide optimal space conditions. While each VRP unit has a nominal c apacity of 7,000, 12,000, 24,000, or 36,000 Btus, e very 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 18 SEER2 and 7.6 HSPF2, the VRP pr ovides 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 mor e 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.

SPECIFICATIONS

Cooling and Heating Performance Data

Model	VRP07K/VRP07R		VRP12K/VRP12R		VRP24K/VRP24R		VRP36K
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	230/208	265	230/208
Cooling Btu (Rated)	7,000		11,500		23,400		35,600
Cooling Btu (Min. - Max.)*	3,800 - 10,000		5,400 - 16,000		14,500 - 28,000		21,400 - 38,400
Outdoor Operating Range (°F)	55 - 120		55 - 120		55 - 120		55 - 120
Power (W)	636		1,000		2,166		3,390
SEER2	16.5		18.0		17.5		17.0
EER2	11.0		11.5		10.8		10.5
Sensible Heat Ratio	0.83		0.8		0.75		0.72
Cooling Amps	2.97	2.75	4.3	3.74	9	7.95	14.8
Heat Pump Performance Data							
Heating Btu (Rated @ 47° F)	7,000		11,500		22,000		33,000
Heating Btu (@ 17° F)	4,300		6,200		13,000		20,800
Heating Btu (Min. - Max.)	2,800 - 9,000		4,000 - 14,000		12,000 - 26,000		9,000 - 33,000
Heat Pump Outdoor Operating Range (°F)	0 - 70		0 - 70		0 - 70		0 - 70
COP (Rated @ 47° F)	3.2		3.4		3.4		3.3
HSPF2	7.2		8.0		8.0	8.0	7.8
Heating Power (W)	641		991		1,896		2,930
Heating Amps	2.9	2.69	4.3	3.48	9.0	7.7	12.8

*Units must be appropriately sized/selected based on accurate building /room load requirements and the rated capacity of the equipment.
Due to continuing research in technology, specifications are subject to change without notice.

SPECIFICATIONS

Condenser CFM and External Static Pressure

Condenser CFM & External Static Pressure

VRP® is designed to mount through an exterior wall through a Friedrich wall plenum with an external louver. Building design and applications may require different configurations of this external connection for aesthetic/architectural reasons. These different configurations may include custom louvers or plenums. 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
VRP12	700	0.03	0.1
VRP24	1150	0.017	0.11
VRP36	2030	0.03	0.20

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

Figure 202 (Condenser CFM and ESP)

Sound Data

Sound Data				
Model	Sound Power (dBA)		Transmission Class	
	Indoor	Outdoor	STC	OITC
VRP07**A	61.1	63.6	22	14
VRP12**A	56.9	65.8	27	17
VRP24**A	65.7	77.0	27	17
VRP36**A	68.0	79.4	25	18

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. VRP is typically installed in a finished closet. Friedrich reccomends that closet wall construction include finished walls on both the interior and exterior sides for optimal sound attenuation.

Figure 203 (Sound Data)

SPECIFICATIONS

Electrical Data

VRP Model	Electric Heater Size	Voltage	Electric Heater Watts	Electric Heating Btu	Total Electric Heating Amps	ID Blower Amps	OD Blower Amps	MCA	MOP / MOCP
VRP07K	0 kW	230	0	0	0	0.16	0.42	8.5	15
	0kW	208	0	0	0	0.23	0.49		
	2.5 kW	230	2500	8530	11	0.16	0.42	14.4	15
	2.5 kW	208	2044	6980	10	0.23	0.49		
	3.4 kW	230	3400	11600	15	0.16	0.42	19.2	20
	3.4 kW	208	3021	10302	14	0.23	0.49		
VRP07R	0 kW	265	0	0	0	0.16	0.42	8.5	15
	2.5 kW		2500	8525	9.2	0.16	0.42	12	15
	3.4 kW		3400	11594	12	0.16	0.42	15.7	20
VRP12K	2.5 kW	230	2500	8525	10.6	0.52	0.40	14.7	15
	2.5 kW	208	2261	7710	9.6	0.57	0.47		
	3.4 kW	230	3340	11389	14.5	0.52	0.40	19.5	20
	3.4 kW	208	3021	10302	13.1	0.57	0.47		
	5.0 kW	230	4940	16845	21.5	0.52	0.40	28.3	30
	5.0 kW	208	4467	15232	19.4	0.57	0.47		
VRP12R	2.5 kW	265	2500	8525	9.2	0.6	0.4	13	15
	3.4 kW		3400	11594	12.8	0.6	0.4	17.1	20
	5.0 kW		4800	16368	18.1	0.6	0.4	23.7	25
VRP24K	3.4 kW	230	3340	11389	14.5	1.13	1.10	24.3	25
	3.4 kW	208	3021	10302	13.1	1.16	1.19		
	5.0 kW	230	5000	17050	21.7	1.13	1.10	29.9	30
	5.0 kW	208	4522	15420	19.6	1.16	1.19		
	7.5 kW	230	7500	25575	32.6	1.13	1.10	43.5	45
	7.5 kW	208	6783	23130	29.5	1.16	1.19		
	10.0 kW	230	9800	33418	42.6	1.13	1.10	56	60
	10.0 kW	208	8863	30223	38.5	1.16	1.19		
VRP24R	3.4 kW	265	3400	11594	12.8	0.95	1	19.6	25
	5.0 kW		5000	17050	18.86	0.95	1	25.1	30
	7.5 kW		7500	25575	28.3	0.95	1	36.9	40
	10.0 kW		10000	34100	37.7	0.95	1	48.7	50
VRP36K	0.0 kW	230	0	0	0	1.09	1.34	22	30
	0.0 kW	208	0	0	0	1.09	1.34		
	10.0 kW	230	8820	30090	39.4	1.09	1.34	49.9	50
	10.0 kW	208	7210	24600	35.9	1.09	1.34		
	15.0 kW	230	8820/4410	45120	39.4/19.2	1.09	1.34	49.9/24.0	50/25
	15.0 kW	208	7210/3610	36900	35.9/17.4	1.09	1.34		

Due to continuing research in technology, specifications are subject to change without notice

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

VRP36K15 requires a dual electrical service (50A + 25A)

THERMOSTATS

Energy Management Thermostat - Wired- Quick Start

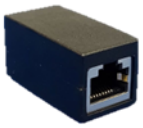


VRPXEMRTA(B)X



WIRE HARNESS

1. Connect the wiring harness to the thermostat.



RJ45 Coupler



Cat 5/6 Cable

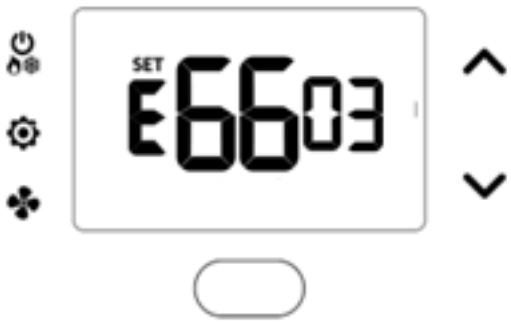
2. Connect the wiring harness to the RJ45 coupler.

3. Connect Cat 5/6 cable to the RJ45 coupler.



VRP RJ-45 Connector

4. Connect the Cat 5/6 cable to the VRP RJ45 connector.



Equipment Code

5. Input code 6603 in the configuring equipment settings.

6. See thermostat Installation and Operation Manual for details.

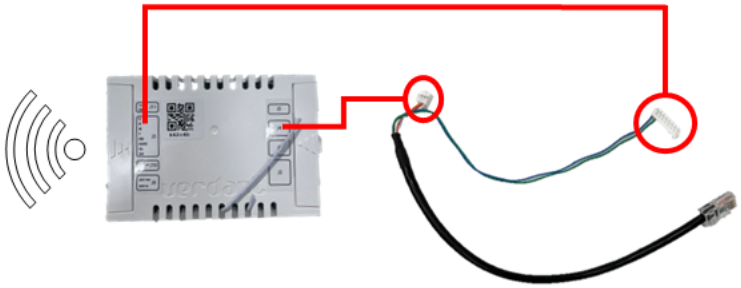
THERMOSTATS

Energy Management Thermostat - Wireless- Quick Start



VRPXEMRTA(B)X

1. Connect the wiring harness to ports J2 and J3 on the HVAC Controller, and to the RJ45 connector on the VRP.



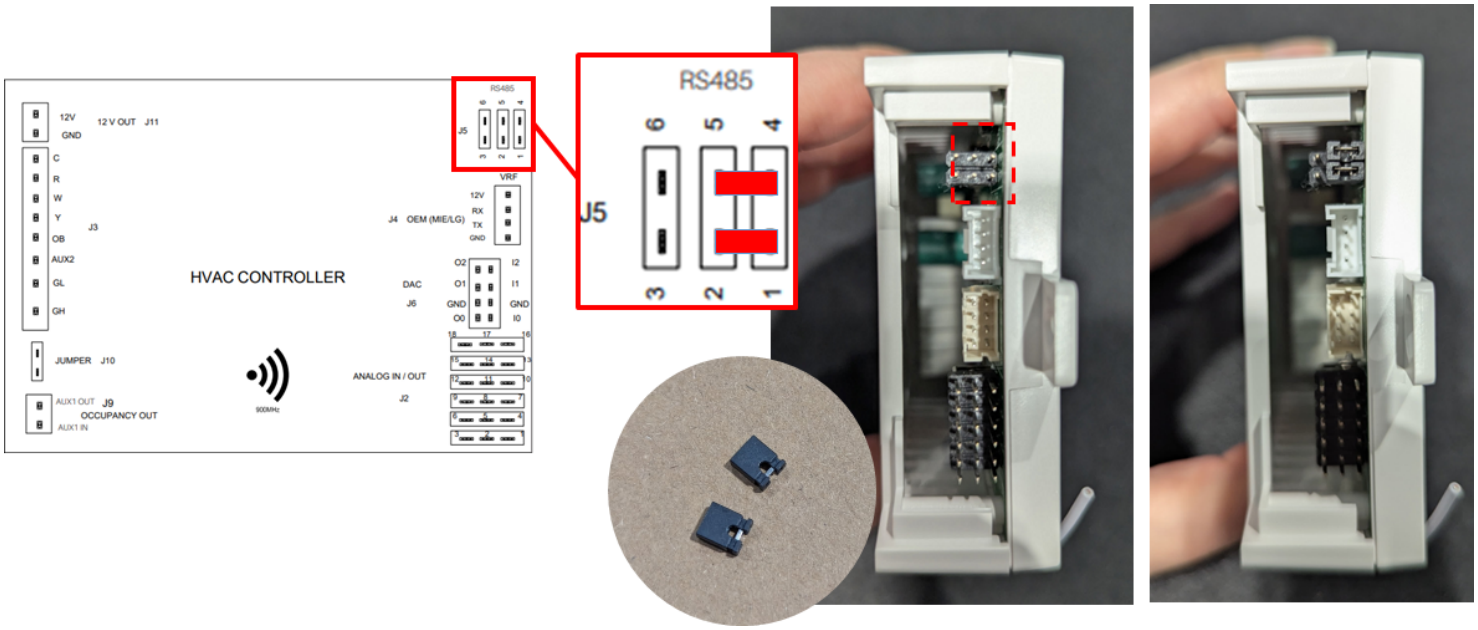
HVAC Controller



VRP RJ-45 Connector

THERMOSTATS

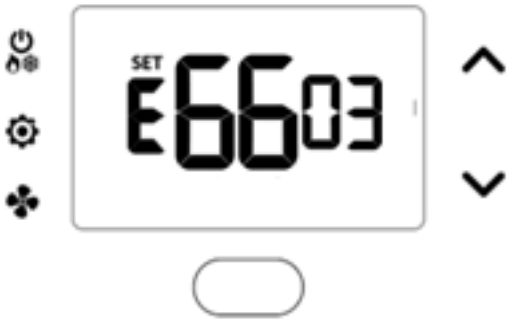
Energy Management Thermostat - Wireless- Quick Start



Installing The HVAC Controller Jumpers

2. Insert two of the provided jumpers into pin terminals 1 and 2 AND 4 and 5 of the J5 (RS485) port of the HVAC Controller.

3. Input code 6603 in the configuring equipment settings.



Equipment Code

4. See thermostat Installation and Operation Manual for details.

TROUBLESHOOTING

Overview

Troubleshoot 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.

The logic PCB has has an amber status LED light will be flashing in normal operation. If the Amber light is ON steady, or OFF, the Logic PCB has malfunctioned and should be replaced. It does not have anything to do with the fault codes.

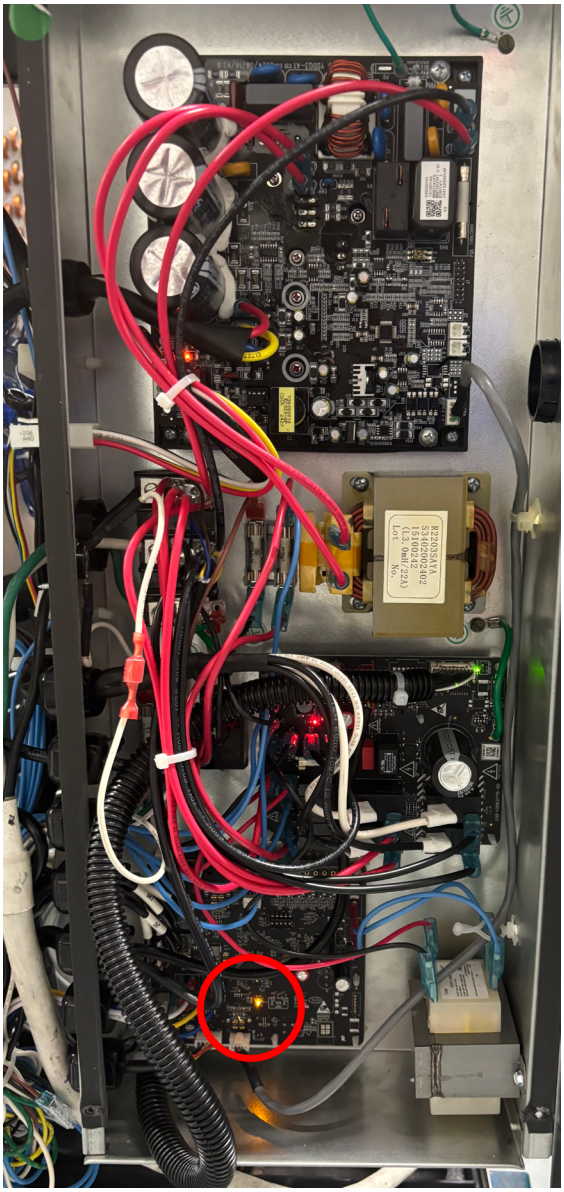


Figure 301 (Amber Status Light)

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

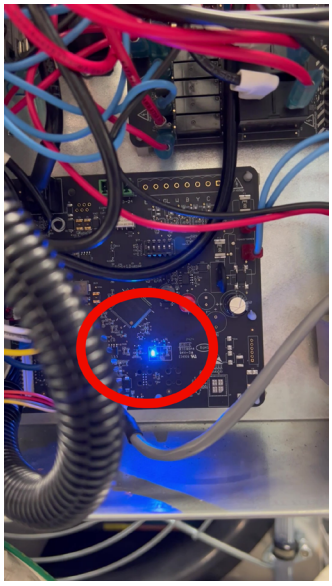


Figure 302 (Blue Status Light)

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

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

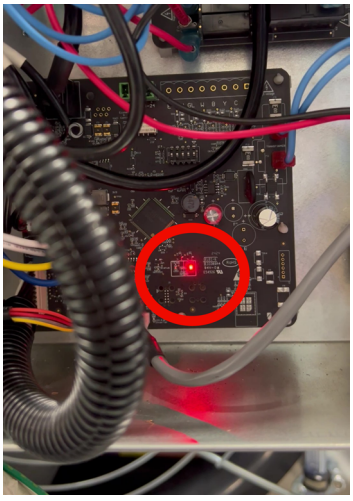


Figure 303 (Red Status Light)

TROUBLESHOOTING

Diagnostic Code Check at Logic PCB

The logic PCB has has an amber status LED light will be flashing in normal operation.

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 logic PCB will cycle through the codes in active numeric order, one at a time, then return to the first code.

It is the function of the Logic PCB, to monitor paramters (Which are provide by the various sensors and switches on the unit), and to report an error code when abnormal conditions exist.

Code	Logic PCB Description	EcoNet Alarm	EcoNet Alarm Description	Diagnostic Check Point	Solution
3	Return Air Sensor (T6) is open or shorted.	RAT_TEMP_ALARM	A003 Return Air Sensor Fault	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 Sensor is open or shorted 3. Defective contact between male and female electrical molex connectors. 4. The sensor is not properly connected to the Logic PCB.	1. Disconnect the sensor at the Logic PCB 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 Logic PCB.
4	Indoor Coil Cool Inlet sensor (T2) is open or shorted	IDC_TEMP_ALARM	A004 Indoor Coil Temp Sensor Fault		
5	Outdoor Coil Heat Inlet sensor (T1) is open or shorted	ODC_TEMP_ALARM	A005 Outdoor Coil Temp Thermistor Failure		
6	Discharge Air sensor (T5) is open or shorted	DAT_TEMP_ALARM	A006 Discharge Temp Sensor Fault		
7	Outdoor Ambient Air sensor (T7) is open or shorted.	OAT_TEMP_ALARM	A007 Outdoor Air Sensor Fault		
9	Compressor Discharge sensor (T4) is open or shorted.	CDT_TEMP_ALARM	A009 Compressor Discharge Temp Sensor Fault		
10	Compressor Suction sensor (T3) is open or shorted.	CST_TEMP_ALARM	A010 Suction Line Temp Sensor Fault		
13	The Wall Controller is not communicating the current humidity levels.	WC_RHMD_ALARM	A013 Humidity Sensor Communication Error	1. The wall controller is not properly connected to the Logic PCB 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	Low Pressure Limit Switch Open	LO_PR_SW_ALARM	A014 Low Pressure Limit Switch Open	1. Pressure of suction line is too low. 2. Quick connects on Logic PCB 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	HI_PR_SW_ALARM	A015 High Pressure Limit Switch Open	1. Pressure of discharge line is too high. 2. Quick connects on Logic PCB 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	INV_CMDL_ALARM	A016 Compressor Model Code Error	Driver PCB does not recognize the model code that is sent by the Logic PCB.	Replace the Driver PCB.
17	Compressor Output Phase Loss	COMP_OPL_ALARM	A017 Compressor Output Phase Loss	When the Driver PCB 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 PCB board.
18	FD Active	ALARM	A018 Front Desk Active	1. Open circuit on float switch port. 2. Logic PCB failure.	

Figure 304 (Logic PCB Fault Codes)

TROUBLESHOOTING

Logic PCB Diagnostic Codes

Code	Logic PCB Description	EcoNet Alarm	EcoNet Alarm Description	Diagnostic Check Point	Solution
19	Outdoor Coil > 190°F	ODC_OT_ALARM	A019 Outdoor Coil Temperature Above 190F	1. The Outdoor Coil reaches a temperature greater than 190°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 T2's location reaches a temperature < 30°F and remains there for 5 consecutive minutes	IDC_BT_ALARM	A020 Indoor Coil Temperature Below 30F	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.
23	Room Freeze Protection This fault activates to prevent a room from freezing. The unit will run electric heat regardless of whether the unit is in standby or not. If the unit is already heating and the other conditions are true, it will not trigger. If the room gets below 40F the Electric Heat will run until the room reaches 46F.	ROOMFRZE_ALARM	A023 Room Freeze Protection Active	1. The Indoor Ambient temperature is below 40°F 2. Inadequate insulation in room or closet. 3. Wall Controller sensor is bad 4. T6 Sensor is bad	1. Make sure the room is properly insulated. 2. Ohm out T6 sensor and replace if necessary. Refer to thermistor values chart. 3. Replace Wall Controller
24	The Discharge Air sensor is reading above 185°F	DAT_OT_ALARM	A024 Discharge Air Temperature Above 185F	1. IDB is not operating when electric heat is on.	1. Verify proper operation of IDB, repair if necessary. 2. Verify proper operation of Electric heat, repair if necessary.
27	Minimum Configuration not Met	MINCONFG_ALARM	A027 Minimum Configuration Not Met	At least 1 of the following 1. Unit not provisioned. 2. Relay PCB communication issue. 3. Driver PCB communication issue.	1. Unplug, do continuity check on cable, and re-plug Variable Board communication cable . 2. Check Relay PCB. 3. Check Logic PCB
28	Inverter Board Critical Failure	INV_CRIT_ALARM	A028 Inverter 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 PCB. (Refer to Driver PCB diagnostic codes)
32	Inverter board Compressor Port Over Current Protection	COMP_IOC_ALARM	A032 Compressor Instant Over Current Error	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 PCB. 4. Replace compressor.
34	Unit Not Provisioned	UNITPROV_ALARM	A034 Unit not Provisioned	Provisioned is defined as both switch and “provision” data has been set.	Replace with provisioned Logic PCB.
35	Inverter board DC Bus Over Voltage	DCBUS_OV_ALARM	A035 DC BUS Over Voltage Error	The bus voltage on the Driver PCB 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~~ inverter board. 3. Attempt to reboot the unit. 4. Replace the Driver PCB.
36	Inverter board DC Bus Under Voltage	DCBUS_UV_ALARM	A036 DC BUS Under Voltage Error	The bus voltage on the Driver PCB is too low. (< 200VDC)	This error should automatically correct itself. If error persists: 1. Verify input voltage to the Driver PCB. 2. Attempt to reboot the unit. 3. Replace the Driver PCB.
37	Inverter board PCB Over Temperature	INV_OH_ALARM	A037 Inverter Board Over Heat Error	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 PCB. 4. Replace compressor.

Figure 304 (Logic PCB Fault Codes)

TROUBLESHOOTING

Logic PCB Diagnostic Codes

Code	Logic PCB Description	EcoNet Alarm	EcoNet Alarm Description	Diagnostic Check Point	Solution
39	PSC fan low RPM	IDF_ERR_Alarm	A039 Indoor Fan Speed Error	The Indoor Fan's RPM is less than 80% of its commanded RPM for 5 minutes.	Check Indoor Fan Motor.
40	Wall Controller Disconnected	WC_COMM_ALARM	A040 Wall Controller Disconnected Error	The Logic PCB determines the Wall Controller is not connected	Check all wiring between the Logic PCB and Wall Controller
42	Compressor Speed Sync Error	COMPSYNC_ALARM	A042 Inverter Compressor Speed Sync Errors	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 pcb.
43	Inverter board Communication Issue	INV_COMM_ALARM	A043 Inverter Communication Failure	Logic PCB not receiving feedback information from the Driver PCB.	1. Verify wiring from Logic PCB to Driver PCB. 2. Check for visible damage on driver PCB. Replace if damaged. 5. Check for visible damage on the Logic PCB. Replace if damaged. 6. Check the driver PCB for the following LED sequence RED: off, YELLOW: blinking, GREEN: blinking. If LED sequence is active, replace the driver PCB, if else replace the Logic PCB.
44	Compressor Start Failure	INV_CSE_ALARM	A044 Inverter Compressor Start Error	Compressor speed synchronization issue for 10 consecutive seconds.	1. Check compressor wires for damage. 2. Verify connection of the compressor wires. 3. Replace Driver PCB. 4. Replace compressor.
45	Compressor Current Limiter	INV_CCL_ALARM	A045 Inverter Compressor Current Limiter Error	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 PCB. 4. Replace compressor.
46	Indoor Coil > 175°F for 5 consecutive minutes	IDC_OT_ALARM	A046 Indoor Coil Temperature Over 175F	The T2 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.
47	Inverter Generic Error	INV_FALT_ALARM	A047 Inverter Generic Fault		
48	Outdoor Fan Malfunction Error	ODF_MAL_ALARM	A048 Outdoor Fan Malfunction Error		
51	Driver PCB DC Bus Over Current	I_PFC_OC_ALARM	A051 Inverter PFC Over Current Error	The DC bus circuit sensed that the current is too high.	This error should automatically correct itself. If error persists: 1. Replace the Driver PCB.
53	Inverter board DC Bus Over Voltage	DCBUS_OV_ALARM	A035 DC BUS Over Voltage Error	The bus voltage on the Driver PCB 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~~ inverter board. 3. Attempt to reboot the unit. 4. Replace the Driver PCB.
54	Inverter board DC Bus Under Voltage	DCBUS_UV_ALARM	A036 DC BUS Under Voltage Error	The bus voltage on the Driver PCB is too low. (< 200VDC)	This error should automatically correct itself. If error persists: 1. Verify input voltage to the Driver PCB. 2. Attempt to reboot the unit. 3. Replace the Driver PCB.

Figure 304 (Logic PCB Fault Codes)

TROUBLESHOOTING

Driver PCB Diagnostic Codes

In addition to the diagnostic codes that can be read from the Logic PCB, fault codes can also be read off of the Driver PCB. Driver PCB 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 PCB. 4. Attempt to reboot the unit. 5. Replace the driver PCB
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 PCB. 4. Attempt to reboot the unit. 5. Replace the driver PCB.
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 PCB. 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 PCB. 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 Logic PCB to Driver PCB. 5. Check for visible damage on driver PCB. Replace if damaged. 6. Check for visible damage on the Logic PCB. Replace if damaged. 7. Check the driver PCB for the following LED sequence RED: off, YELLOW: blinking, GREEN: blinking. If LED sequence is active, replace the driver PCB, else replace the FMC.
Semi-Recoverable	●	○	✳	DC Bus IGBT Over Current Protection	1. Attempt to reboot the unit. 2. Replace the driver PCB.
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 PCB. 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 PCB. 4. Replace compressor.

Figure 305 (Driver PCB Fault Codes)

TROUBLESHOOTING

Driver Board Diagnostic Codes

Type	Red	Yellow	Green	Description	Action
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 PCB. 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 PCB.
Non-Recoverable	●	○		DC Bus Current Sensing Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver PCB.
Non-Recoverable	○	○		Compressor Current Sensing Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver PCB.
Non-Recoverable	○		●	Compressor IPM Temperature Sensor Circuit Issue	1. Attempt to reboot the unit. 2. Replace the driver PCB.
Non-Recoverable	●	○	●	EEPROM Error	1. Attempt to reboot the unit. 2. Replace the driver PCB.
Non-Recoverable	●	●	●	Compressor Model Code Error	This code should never appear once a unit is in production. If it appears please contact technical support .

Figure 305 (Driver PCB Fault Codes)

DESCRIPTION, OPERATION, AND TESTING

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.

Defrost:

The electric heat for the VRP is to be considered "backup" and not "supplemental". At no point in time will the compressor 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, and the outdoor temp is below the derost start temp, the unit 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 the target temp., the defrost cycle will end and the unit will continue with normal operation based on the space conditions and settings.

	VRP07	VRP12	VRP24	VRP36
Defrost Start Target Temp °F	28	28	28	28
Defrost Exit Target Temp °F	56	56	56	80
Electric Heat Cut Over Temp °F	0	0	0	0
Maximum Defrost Time (Minutes)	3	3	3	3

Wall controller

The wall controller will transmit a set of data every 5 seconds to the logic PCB. The data includes system mode, fan mode, fan speed room, temperature, relative humidity, and room occupancy.

For additional details on the sequence of operation on the various components and unit systems, please follow the links below.

Logic PCB (Brain Board)

Relay PCB (Variable Board)

Driver PCB

Temperature Sensors

Reversing Valve

Reheat

Compressor

Electronic Expansion Valve

High and Low Pressure Switched

Indoor Blower

Outdoor Fan

Electric Heater

Basepan Heat

Freshaire

DESCRIPTION, OPERATION, AND TESTING

Electrical Control Box (7-24k BTU)

Note: Exact position of components may vary depending on the model. Refer to Wiring Diagrams for actual wiring. Wiring may vary.

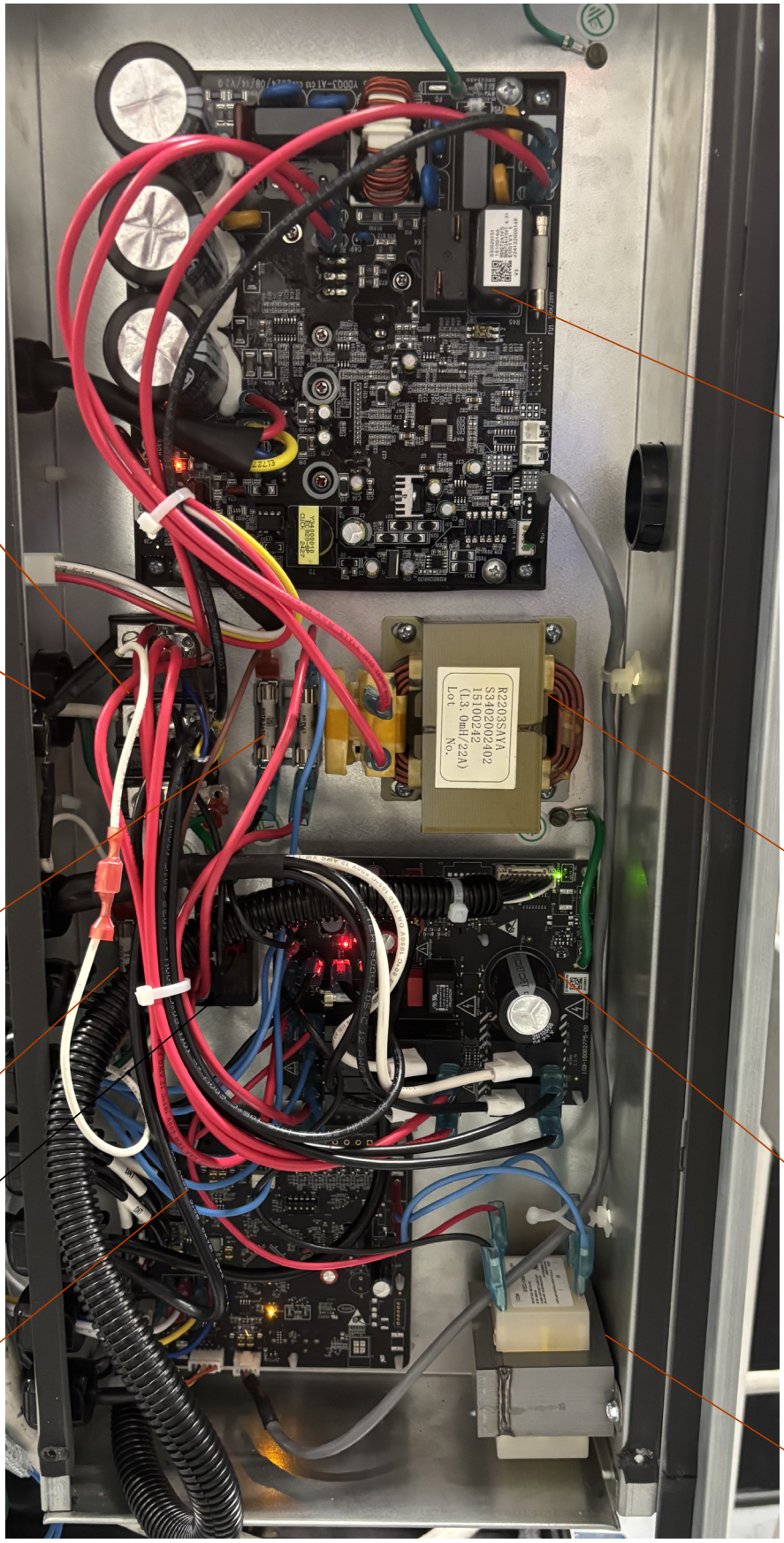


Figure 401 (Electrical Control Box)

DESCRIPTION, OPERATION, AND TESTING

Electrical Control Box (36k BTU)

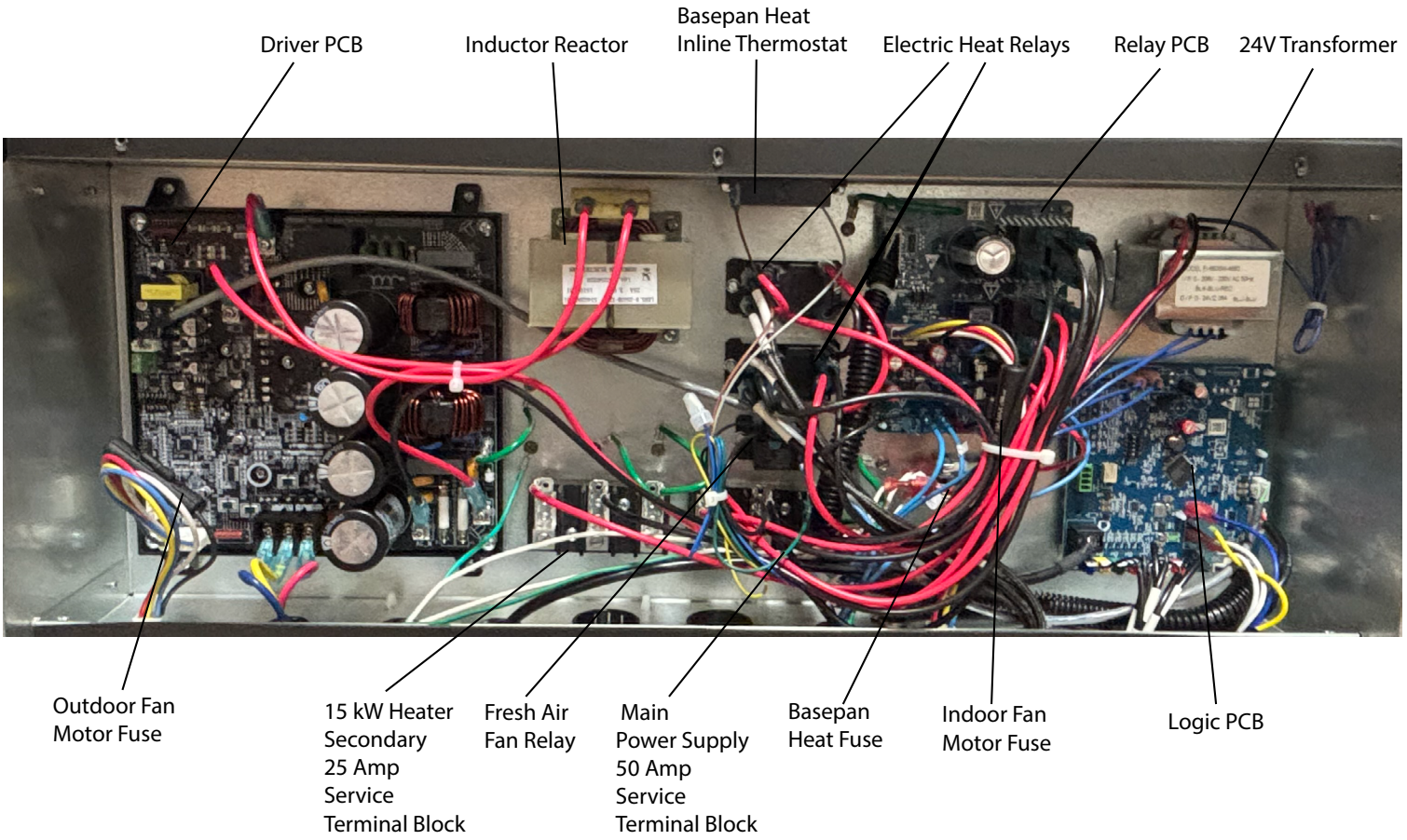


Figure 401.1 (Heater)

DESCRIPTION, OPERATION, AND TESTING

Logic PCB

The Logic PCB is powered the 24 vac transformer.

To confirm the board has power the amber status LED should be flashing. The logic PCB provides control function as follows.

1. Receives and interprets data receives the following data from the wall controller every 5 seconds. The wall controller is connected through the RJ -45 port.

    a. System mode.

    b. Fan mode.

    c. Fan speed.

    d. Room temperature.

    e. Relative humidity.

2. Front Desk/ Float Switch/ Fire control external connection.

    FD-24 / Float Switch Normally closed relay. When switch opens a signal will shut down selected circuitry.

    Dip Switch 1 in the OFF position will shut off all power relays, including electric heat, fan motors, and compressor with a signal from float switch.

    Dip Switch 1 in the ON will shut down the compressor with a signal from float switch.

    Dip Switch 2 in the OFF position will disables FD-24 switch protection.

    Dip switch 2 in the ON position will enables FD-24 switch protection.

3. Auxiliary will send 24 vac out of the aux terminals when unit blower is running.

CAUTION: The auxiliary terminals can be used to activate a relay or send a signal. They can not be used to bear the load of an external device.

4. 7 temp sensor connections. See Temp sensor Component ID and testing.

⚠ WARNING

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

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

5. Communication to Relay PCB. See Figure 402.1.

    a. Check for 24vdc across pins 1 or 2 (top left and right pins 24vdc) and pins 21 or 22 (bottom left and right pins, ground).

    b. Check for 3.3vdc across pins 3 or 4 (top left and right pins 3.3v) and 21 or 22 (bottom left and right pins, ground).

6. Communication to EEV. See EEV component ID and testing.

7. Communication to Driver PCB.

    a. Check for proper communication to driver PCB by checking output on pins 1 and 4 for 3.3 vdc.

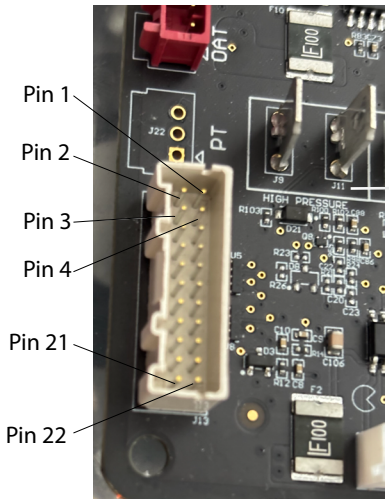


Figure 402.1 Check Communication cable)

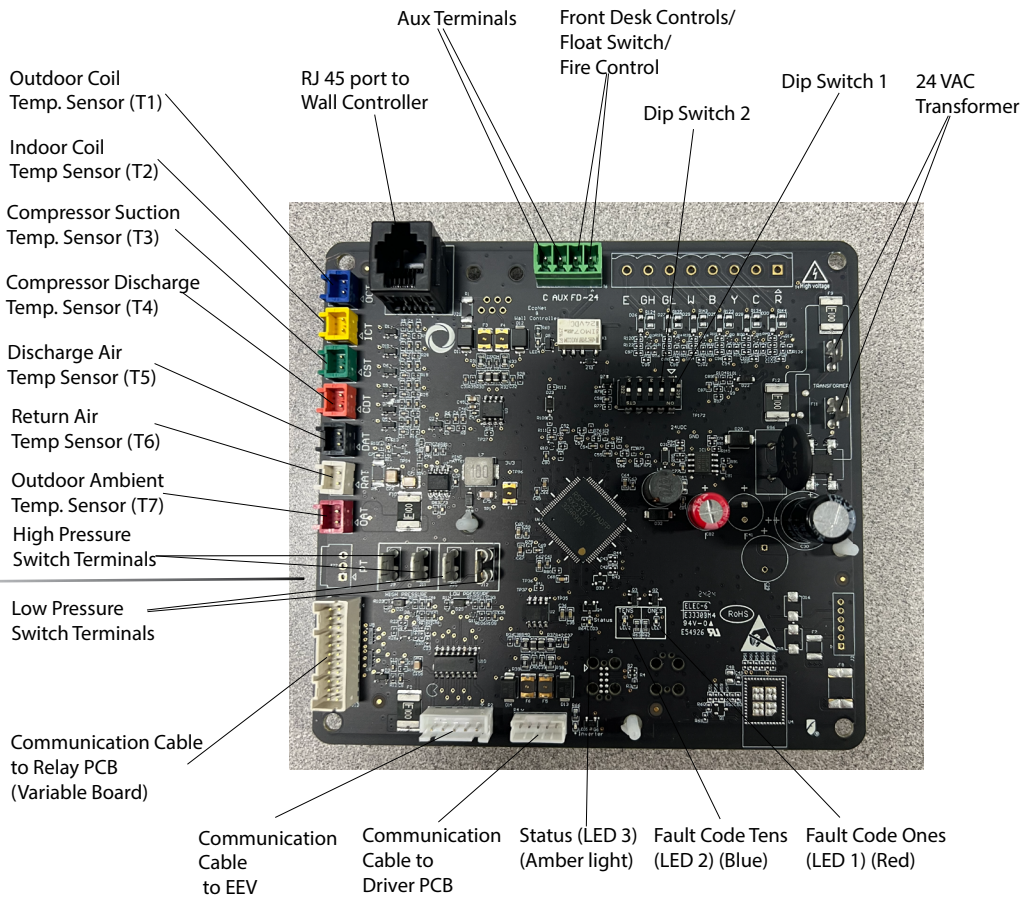


Figure 402 (Logic PCB)

DESCRIPTION, OPERATION, AND TESTING

Relay PCB (Variable Board)

The Relay Board is the power center of the unit as well as handling the Indoor fan control. The board is powered by line voltage and distributes power to the freshair fan and damper motor, reversing valve, reheat valve, basepan heat, 24 VAC transformer, and electrical heater.

The relays on the board are activated based on demand which is communicated through the communication cable to the Logic PCB (Brain Board). One leg of each connection needs to be connected to the appropriate relay. The relays will switch the L1 voltage to the component that is connected. The corresponding L2 can be found on the right side,

The PCB is powered by 24 VDC that is supplied by the Logic PCB through the communication cable. If the green LED is not illuminated it indicates a problem with the logic PCB. Check the communication cable and logic PCB for proper power.

Some VRP models have the Indoor fan motor (ECAC) powered by direct AC line voltage and controlled by pins 4,5,6 of the indoor fan connector.

If the model has a DC PWM motor installed, DC power will be supplied by pins 1 and 3 of the indoor fan connector. The board converts 208-265VAC to 310-380 VDC and then reduces the voltage down to 15 VDC to supply power to the fan. The red LED indicates that 15 VDC is present to power the motor.

If the red LED light is not on, check for correct line voltage power supply.

Two Electric Heater banks that can control up to 5kW each. The banks are each controlled by 1 signal from the logic PCB, which energizes the L1 and L2 relay simultaneously. Each bank is paired vertically with the L2 relays being the bottom two and the L1 relays being the top two. This means the two relays on the left are the “Primary Electric Heater Bank” and the two right relays are the “Secondary Electric Heater Bank”.

The relays are powered directly from the electrical box line voltage terminal blocks..

If the Unit heater is 5kW or less, it will only use the two left relays. 7.5 or 10kW heater utilize both heater banks . For heaters greater than 10 kW (36k BTU only), the relay output will connect to the external relays for the heater.

To check board:

⚠ WARNING

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

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

1 Check that red LED and Green LED are illuminated.

2. Check line voltage is correct at the L1/L2 input terminals.

3. Check that he board is properly grounded.

4. Check power and communication from the Logic PCB.

   a. Check for 24vdc across pins 1 or 2 (top left and right pins 24vdc) and 21 or 22 (bottom left and right pins, ground).

   b. Check for 3.3vdc across pins 3 or 4 (top left and right pins 3.3v) and 21 or 22 (bottom left and right pins, ground).

To Replace the Board:

1. Remove power from the unit.

2. Depress the standoffs to separate the board from the control box.

3. Swap over wires and connectors one for one to ensure correct placement of wires.

4. Power up unit and ensure proper operation.

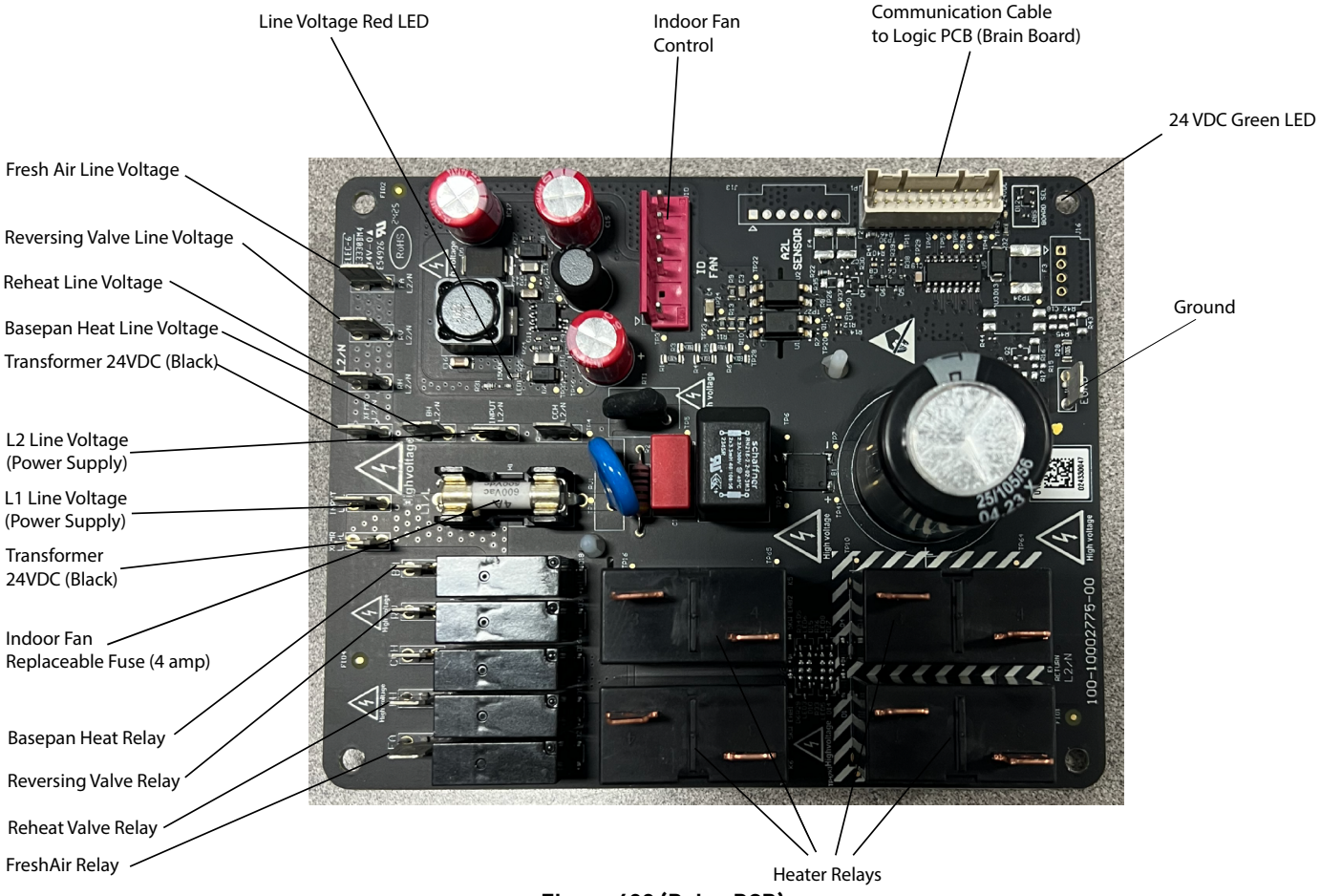


Figure 403 (Relay PCB)

DESCRIPTION, OPERATION, AND TESTING

Driver PCB

The Driver PCB is used to supply DC bus Voltage to both the compressor and outdoor Fan. Line voltage is supplied directly from the main power supply terminal block. Communication is received from the Logic PCB via the logic PCB- Driver PCB communication cable.

If the Driver PCB is suspected to be faulty, always check the communication cable prior to replacement,

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

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

1. Check power in (Line Voltage) at L1 and L2.

2. Check for proper communication to driver PCB by checking output on pins 1 and 4 for 3.3 vdc

3. Check for DC Voltage on Compressor UVW out.

4. Remove power from the unit and allow two minutes for capacitors to discharge before attempting to take continuity readings.

5. Check for continuity on the fuses. If fuses are blown, replace driver board.

6. DIP SWITCH 1: OFF

7. DIP SWITCH 2 : OFF

To Replace Driver Board:

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.

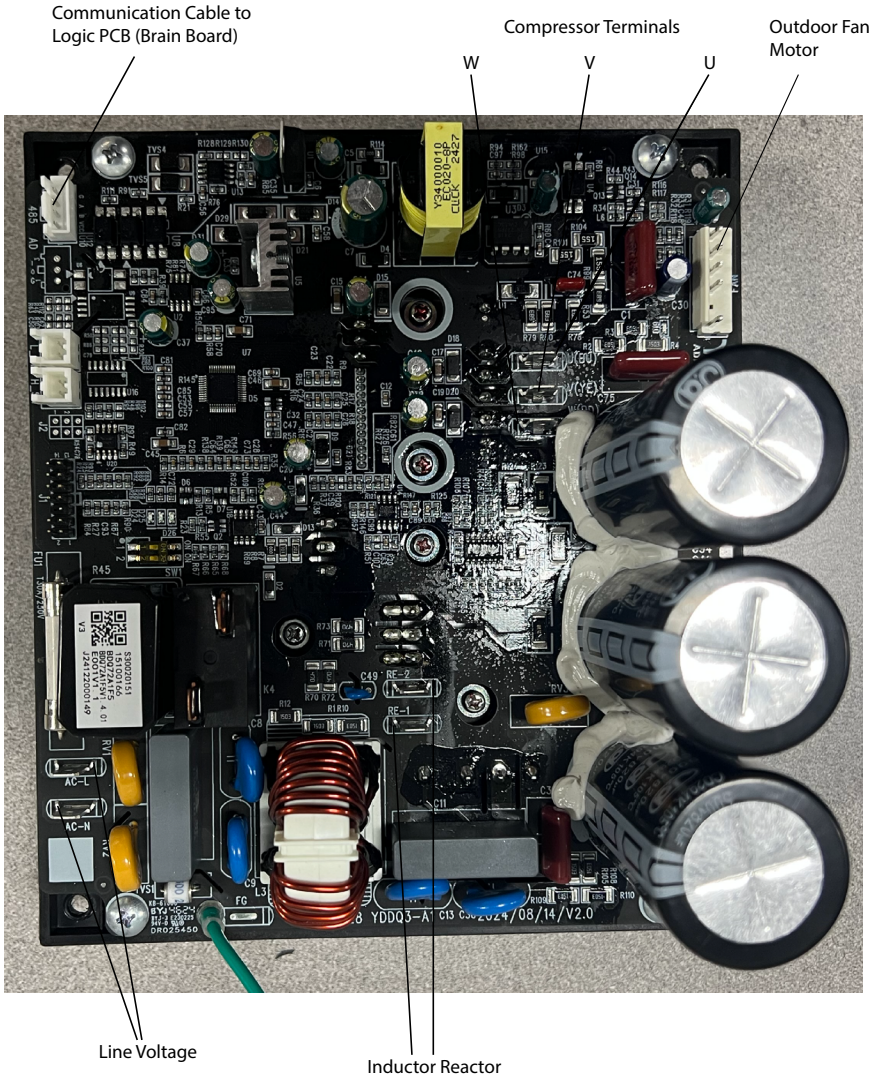


Figure 404 (Driver PCB)

DESCRIPTION, OPERATION, AND TESTING

Temperature Sensors

Temperature Based:

Thermistors (sensors) modify VDC and are interpreted through the Logic PCB.
Errors indicate a possible issue with the sensor or Logic PCB..
Solution: Sensor error, or Logic PCB error.

VRP Sensor Bank contains 7 sensors for air and coil temperature. Each is 10k Ohm and must be unplugged from the Logic PCB to test against a resistance chart (See appendix).The sensors have a two-port molex connected to the Logic PCB. They all share a common power supply which can be checked against the other connectors for continuity and rule out the Logic PCB.



Figure 405 (Outdoor Ambient Air Sensor, T7) is located in the outdoor section, mounted on the bottom of the indoor blower housing. This sensor will lockout heat pump operatioon when the outside temperture is below 0° F or above 75 °F.

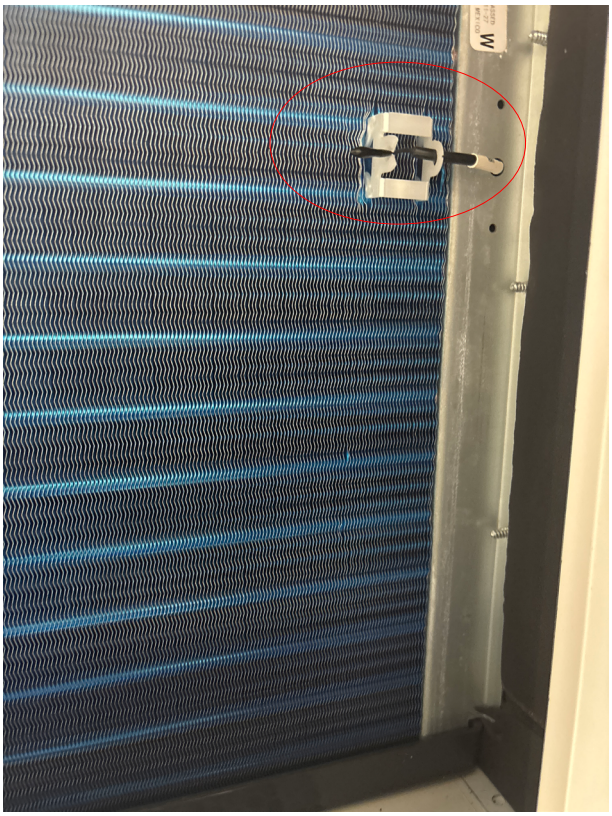


Figure 406 (Return Air Temp. Sensor, T6), located in front of the evaporator coil. If communication is lost between the thermostat and the VRP, it will use the return air sensor with the last known communicated setpoint as the thermostat.



Figure 407 (Compressor Discharge Temp. Sensor, T4), located on the compressor discharge line.

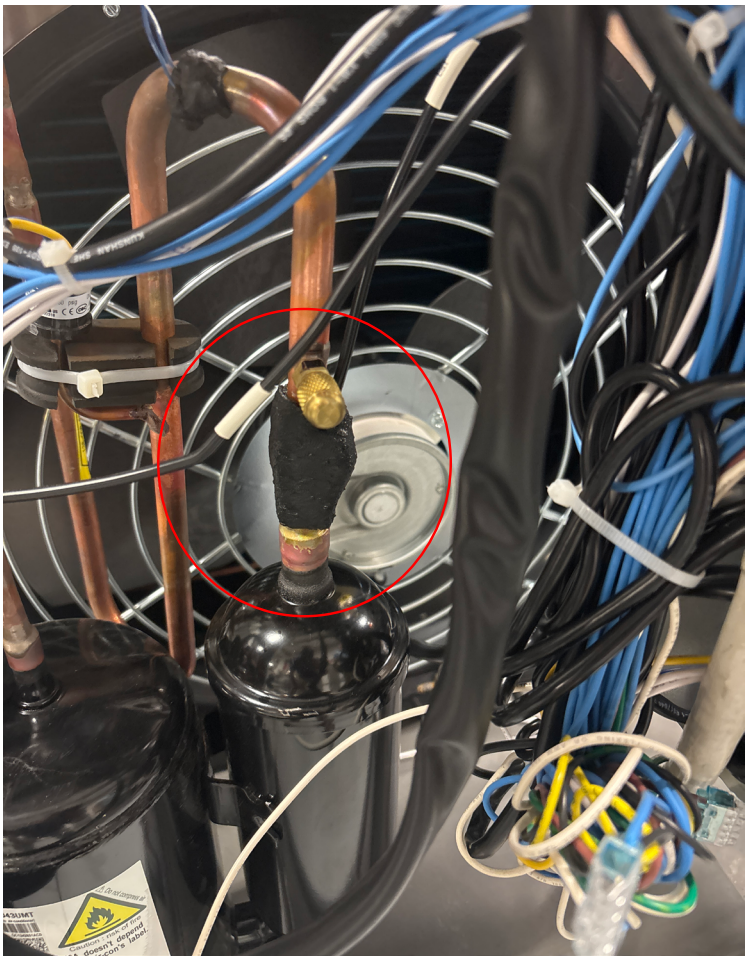


Figure 408 (Compressor Suction Temp. Sensor, T3) attached to the compressor suction line.

Temperature Sensors

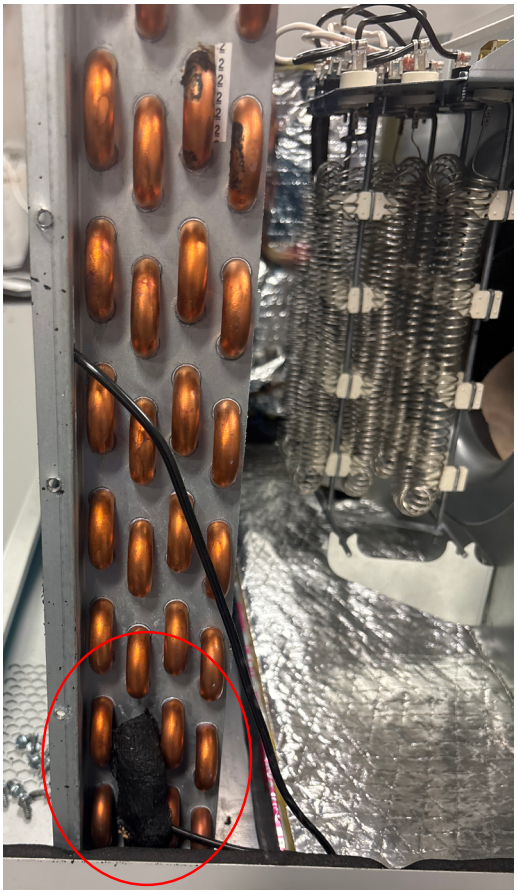


Figure 409 (Indoor Coil Temp. Sensor, T2) To access the evaporator coil sensor remove the top panel and right side upper panel.



Figure 410 (Discharge Air Temp. Sensor, T5) The discharge air sensor is located inside the blower housing.

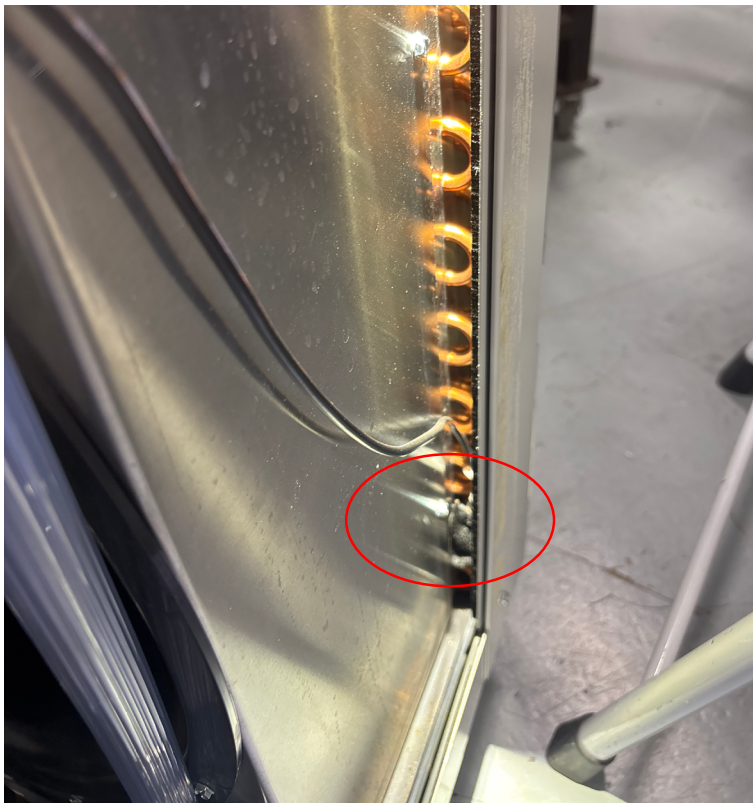


Figure 411 (Outdoor Coil Temp. Sensor, T1) Outdoor Coil Sensor is attached to the Condenser coil on the right hand side). This sensor initiates temp at predetermined temps and terminates defrost at 46.

DESCRIPTION, OPERATION, AND TESTING

Temperature Sensors

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 the Appendix.

⚠ WARNING

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

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

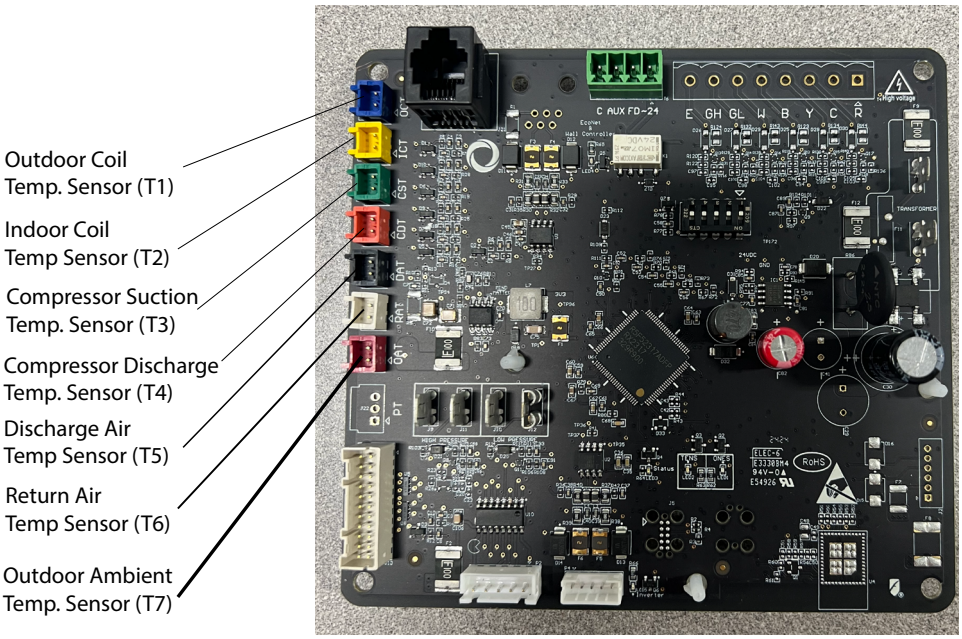


Figure 412 (Temp Sensor Connections)

Rule out Logic PCB - Continuity Check

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

Rule out Logic PCB - 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

DESCRIPTION, OPERATION, AND TESTING

Refrigeration Components

Evaporator Coil
Reheat Coil (when equipped)
Condenser Coil
Compressor
Reversing Valve
Reheat Valve
Check Valves
High Pressure Switch
Low Pressure Switch

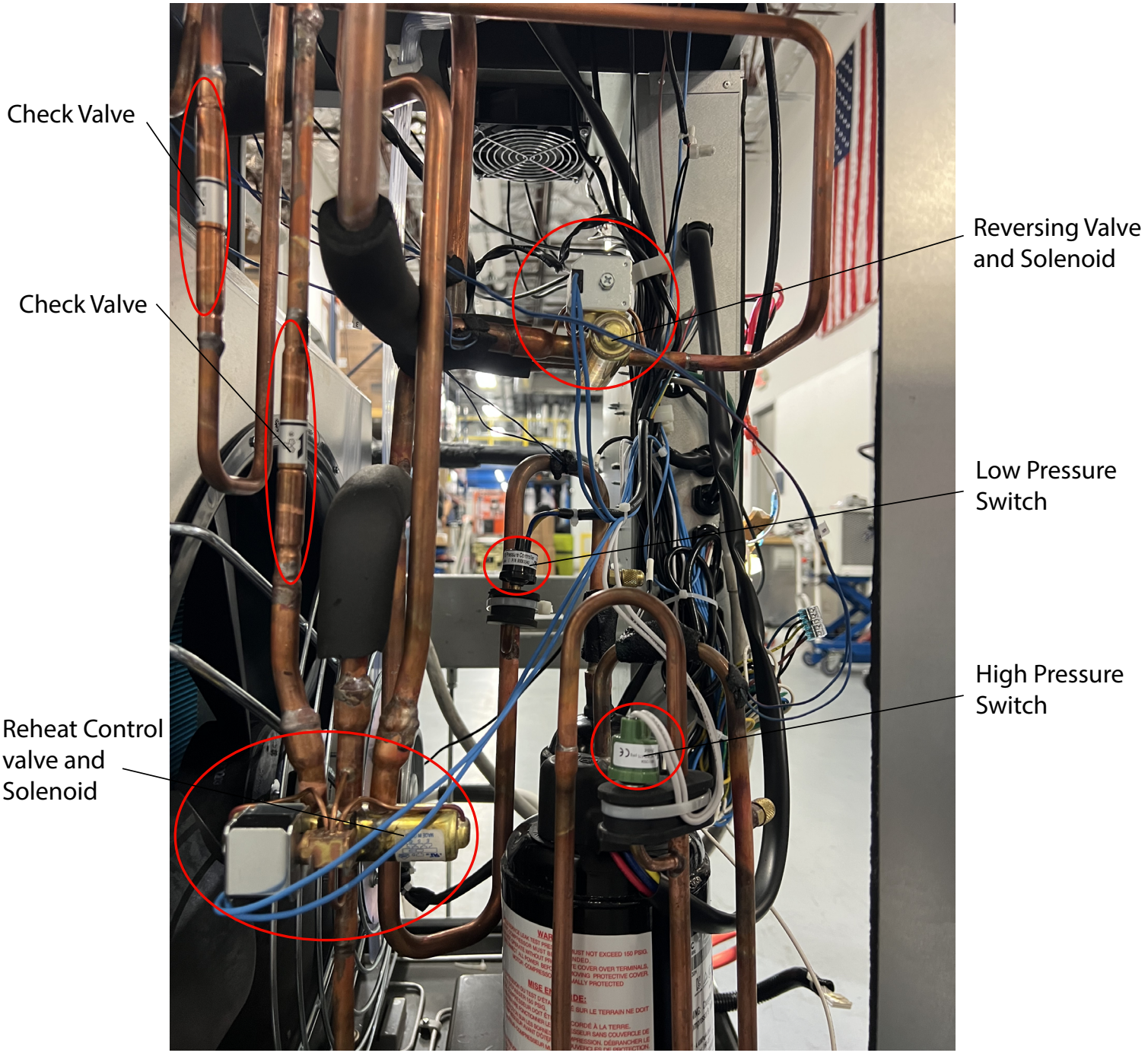


Figure 413 (Refrigeration Components)

DESCRIPTION, OPERATION, AND TESTING

Reversing Valve

A reversing valve is a component of a heat pump that changes the direction of refrigerant flow, allowing the system to function in both heating and cooling modes.

It consists of a pressure-operated, main valve and a pilot valve actuated by a solenoid plunger. The solenoid is energized by 208.230/265 vac during the heating cycle only.

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.

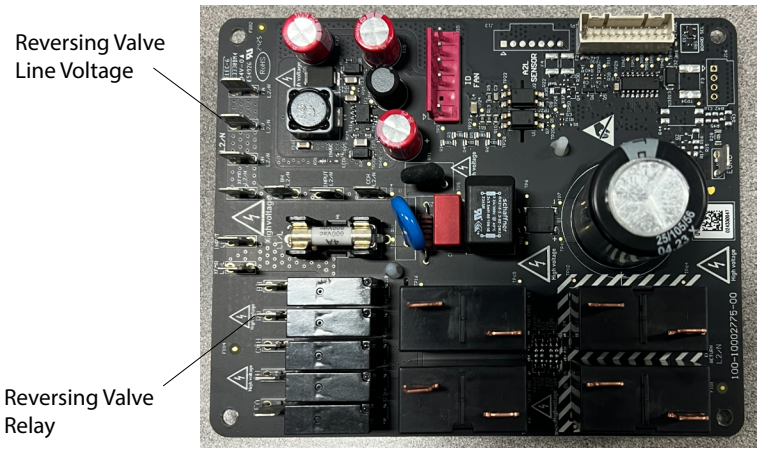
The plunger assembly in the main valve can only be shifted by the pressure differential between the high and low sides of the system. The pilot section of the valve opens and closes ports for the small capillary tubes to the main valve to cause it to shift.

Checking the Reversing Valve

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

1. Run the unit in the heating mode.

2. Verify that the relay on the Relay PCB is energized by checking for line voltage across the reversing valve terminals. See Figure 414.



3. Disconnect one of the 208/230/265 vac wires at the Relay PCB and the valve should shift to cooling mode. If valve does not shift

a. - Check the Reversing Valve Solenoid.

b. Replace the valve(verify the unit is properly charged before replacing valve.) For a stuck valve diagnosis run in the cooling mode, check the temp difference between the suction line from the evaporator and the common suction line at the compressor, if there is more than a 3 °F difference then change the valve.

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

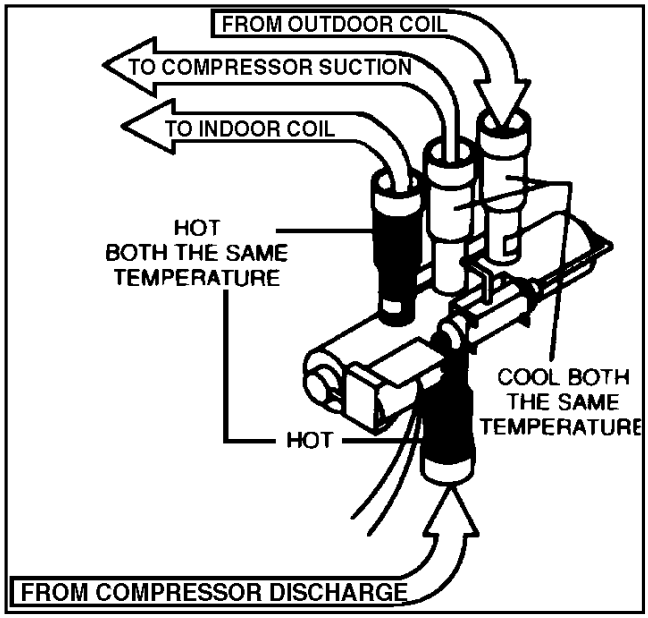


Figure 415.1 (Reversing Valve Flow in Heating Mode)

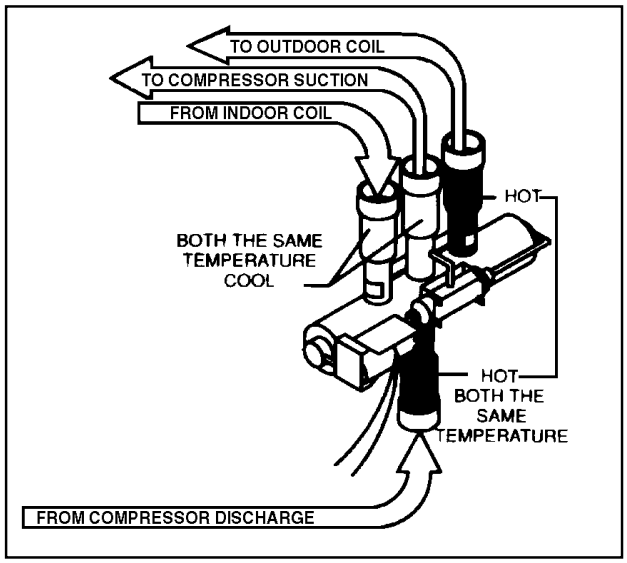


Figure 415.2 (Reversing Valve Flow)

DESCRIPTION, OPERATION, AND TESTING

Checking The Reversing Valve Solenoid

⚠ 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.

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 resistance through the coil. If the coil is open 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.

DESCRIPTION, OPERATION, AND TESTING

Reheat

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.

When equipped with the reheat option, increase room dehumidification capability is increased.

The reheat option has a coil installed downstream of the main indoor evaporator coil.

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. Reheat is activated by applying line voltage to the reheat valve solenoid. 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.

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.

If equipped with reheat and humidity remains high, check to ensure the reheat valve solenoid is energized. See figure 417

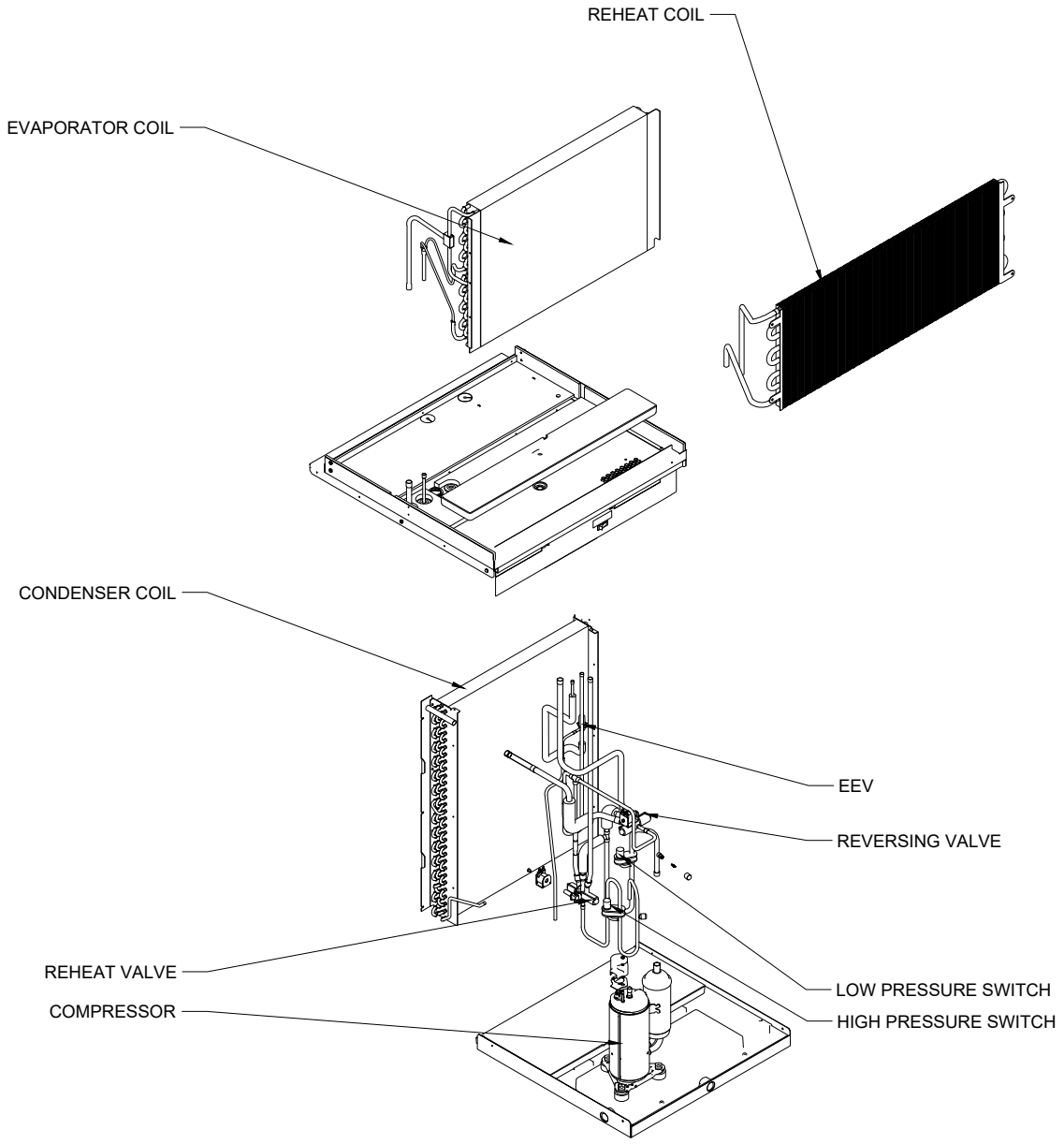


Figure 416 (Reheat)

Reheat Refrigeration Schematic

VRP Reheat Schematic

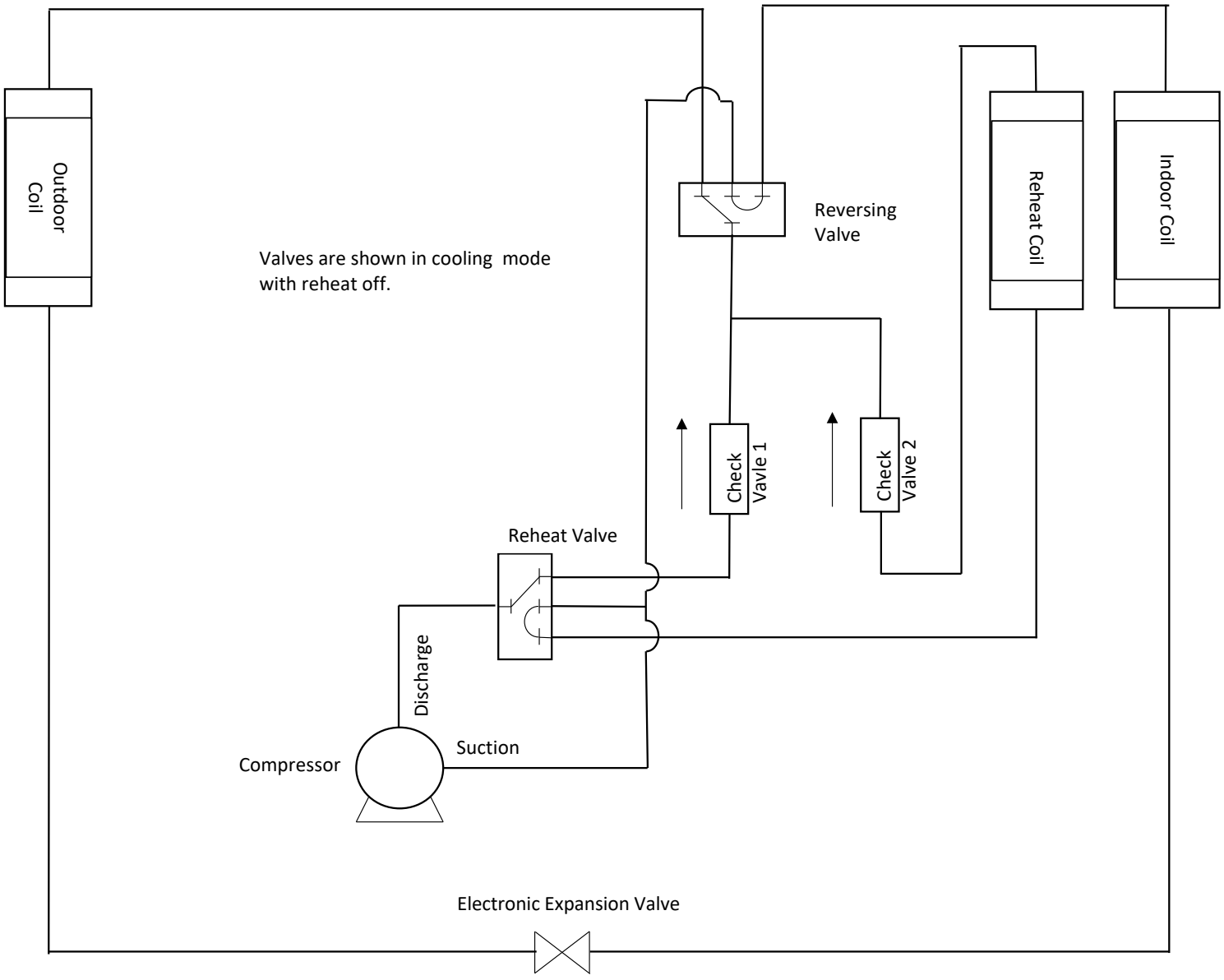


Figure 416.1 (Reheat)

DESCRIPTION, OPERATION, AND TESTING

Testing The Reheat Valve Solenoid Coils

⚠ 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.

Check the Reheat Valve:

1. If Cooling Demand is satisfied, and humidity remains high, check that the Reheat Relay is energized by checking for line voltage on the Relay PCB (See Figure 417). If Relay is not energized; check wiring, communication cable relay PCB, Logic PCB and Wall Controller. Replace as required.

If relay is energized check by hand to see if temperature is even on both sides of the valve (Indicting the valve has opened. If valve has not opened;

1. Turn off high voltage electrical power to unit.
2. Disconnect the two blue wires from the terminals of the Relay PCB (Variable Board).
3. Check for electrical continuity through the coil. If you do not have continuity replace the coil.
4. Check from each lead of coil to the copper liquid line as it leaves the unit or the ground lug. There should be no continuity between either of the coil leads and ground; if there is, coil is grounded and must be replaced.

5. If coil tests okay, reconnect the electrical leads.

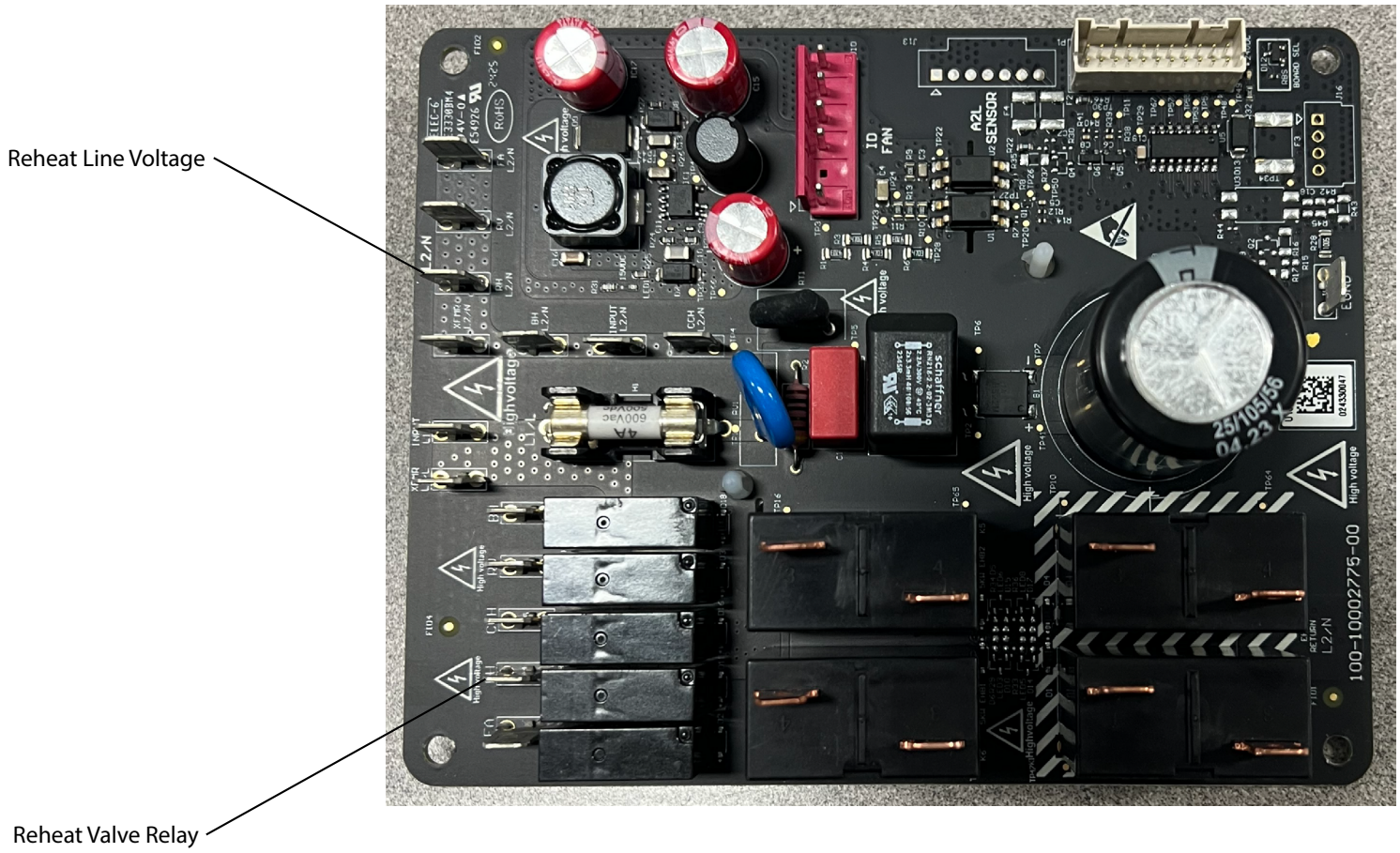


Figure 417 (Testing Reheat)

DESCRIPTION, OPERATION, AND TESTING

Compressor
All C model VRP units are equipped with a Dual Rotor Compressor.

The rate of change of the space conditions is assessed and transmitted every 5 seconds by the wall controller to the logic pcb , which communicates to the driver PCB to increase or decrease DC voltage. The compressor frequency is changed accordingly.·

The compressor will operate in some capacity any time there is a cooling or heat pump demand.



Figure 418 (Compressor)

⚠ 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

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

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

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

1. Remove front panel from unit , and electrical box cover, and gain access to the driver PCB.

2. Locate and disconnect the motor winding leads shown in the figure below.

   U= Blue V= Yel W= Red

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.

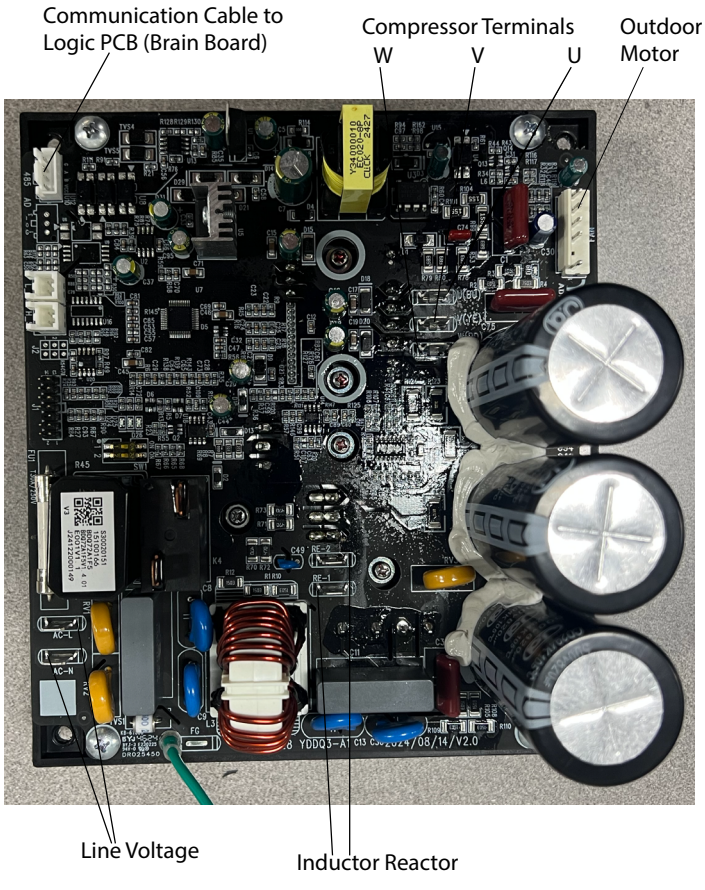


Figure 419 (Driver PCB)

Outdoor Coil (Condenser)

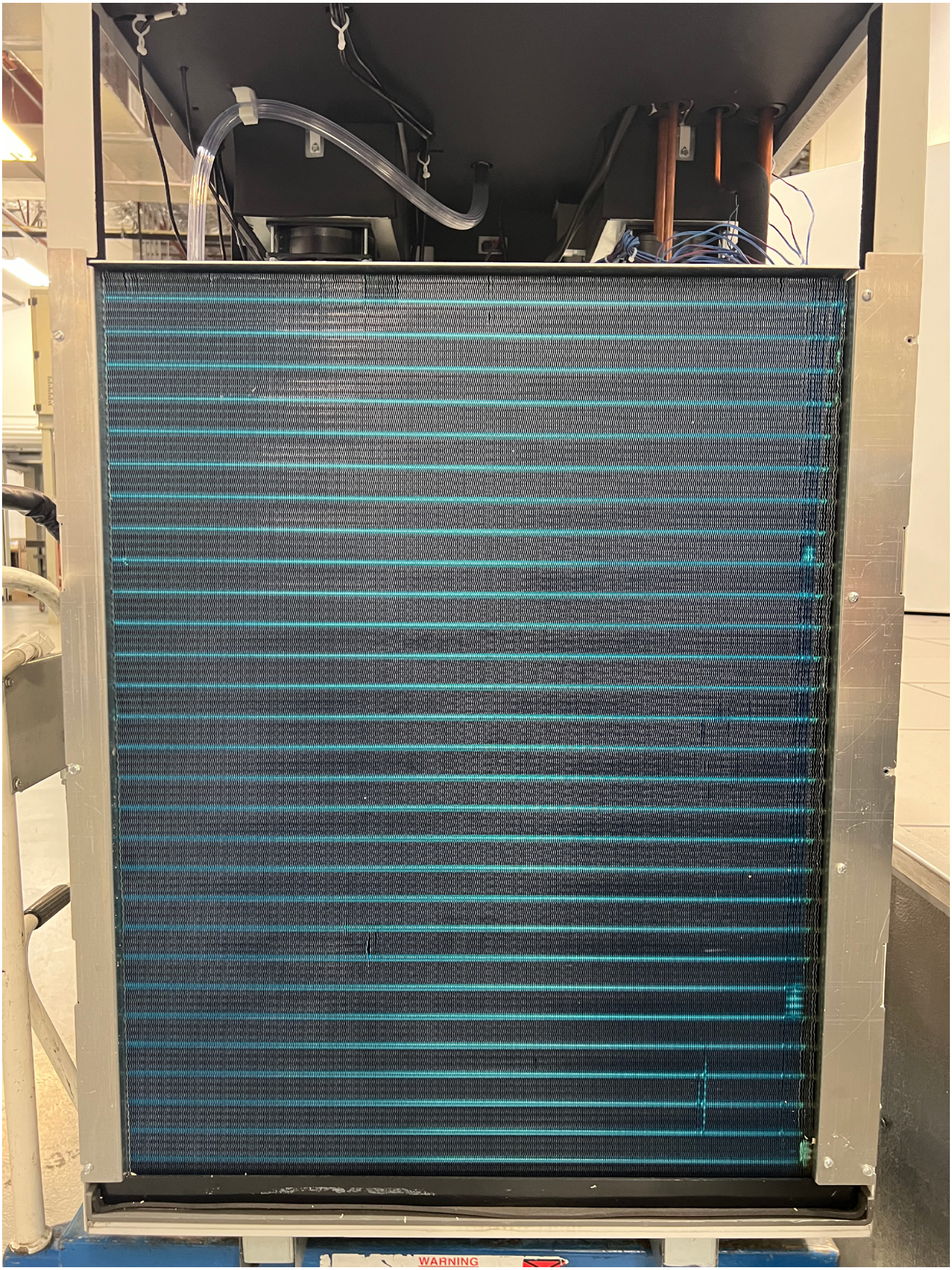


Figure 420 (Condenser)

Indoor Coil (Evaporator)



Figure 421 (Condenser)

DESCRIPTION, OPERATION, AND TESTING

Electronic Expansion Valve (EEV)

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

The (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.

The electronic Expansion valve is used to control superheat during both cooling and heat pump operation. Magnetic pulses are sent from the Logic PCB (Brain Board) to control the size of the orifice and meter the amount of refrigerant that is passed through the valve.

Superheat (cooling) = Compressor Suction temp (T3) –Indoor Coil (T2).

Superheat (heat pump) = Compressor Suction (T3) –Outdoor Coil Temp (T1)

The EEV will open if the super heat is too high and will meter if the super heat is too low.

⚠ 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.

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 Logic PCB (See figure x)

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.

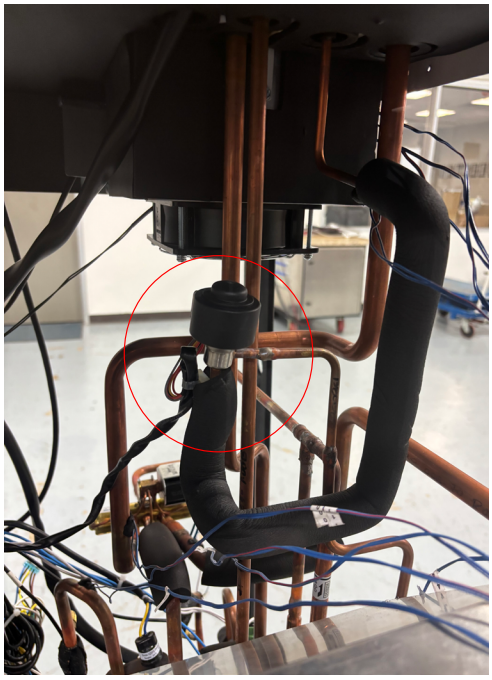


Figure 423 (EEV Location)

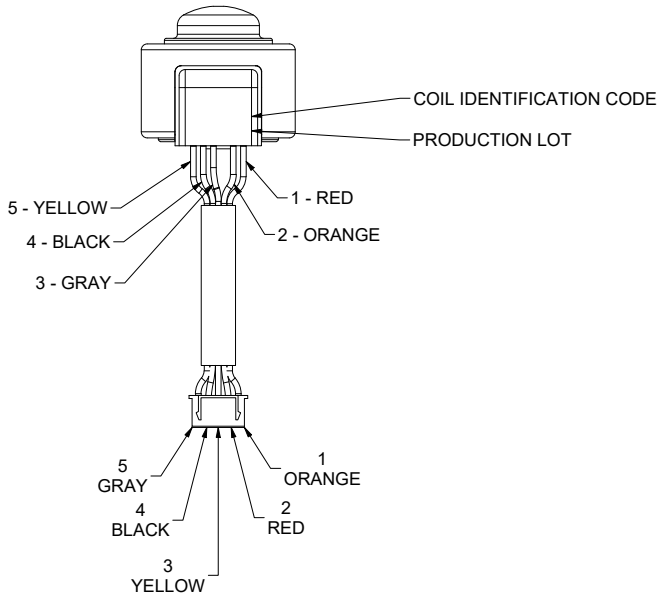


Figure 424 (EEV Details)

DESCRIPTION, OPERATION, AND TESTING

High and Low Pressure Limit Switches

High pressure and low pressure switch are installed on the refrigeration system to shut down the unit and provide a fault code if the system pressures fault outside of normal.

The high pressure switch is a normally closed switch at 0 psig. It is designed to open at designed to open Open at 675 +-25 psig and Close at 475 +-20 psig.

The low pressure switch is normally open at 0 psig and will close at 50 +-7 psig and opens 30 +-7 psig.

To check switches



Figure 425.1 (Pressure Switches)

⚠ 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.

1. Ensure power is removed from the unit.

2. To Check the high pressure switch; At Logic PCB (Brain Board) disconnect the wires at the (J9) and(J11) wires.

3. To Check the low pressure switch; At Logic PCB (Brain Board) disconnect the wires at the (J10) and(J12) wires.

8. An ohms reading of open indicates a faulty switch or low refrigerant pressure.

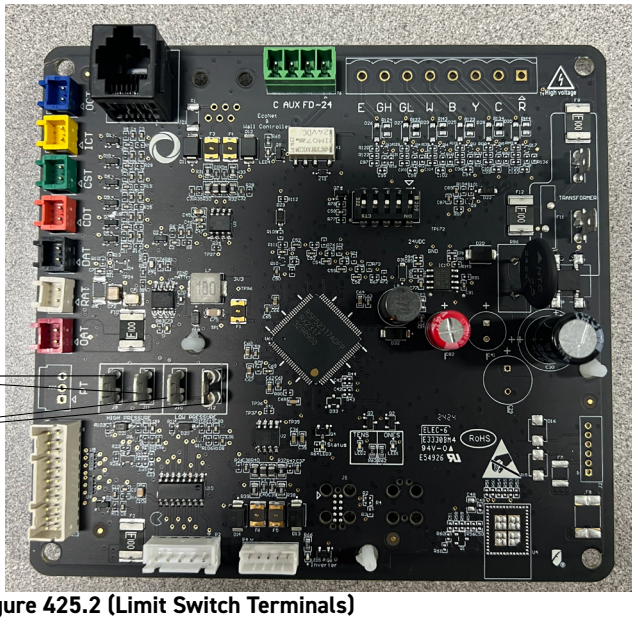


Figure 425.2 (Limit Switch Terminals)

DESCRIPTION, OPERATION, AND TESTING

Indoor Blower (7-24k BTU)

The indoor blower has a counterclockwise impeller rotation.

The Motor is an ECAC type motor.

Line voltage is supplied from unit terminal strip.

Control voltage is supplied by the Relay PCB (Variable board).

This speed of the blower is determined by the following conditions.

1. When the wall controller is placed in low or medium, the blower will run at low speed.

2. When the unit enters a defrost condition, the blower will run at low speed.

3. When the wall controller is placed in high speed, the blower will run at high speed.

4. When the unit enters into a reheat condition, the blower will run at high speed.

5. When the unit runs on electric heat, the blower will run at high speed.

6. Auto

   a. (effictive date 12/ 25 and prior)
   Based on the wall controller , if the delta between the set point and room temperature is greater than 1.5 °F the unit will run at high speed.
   if the delta is less than 1.5 °F - the blower will run at low speed.

   b. (effective date 01/26 and later)

   The indoor blower speed will vary according to the load, tracking in variable increments along with the compressor.

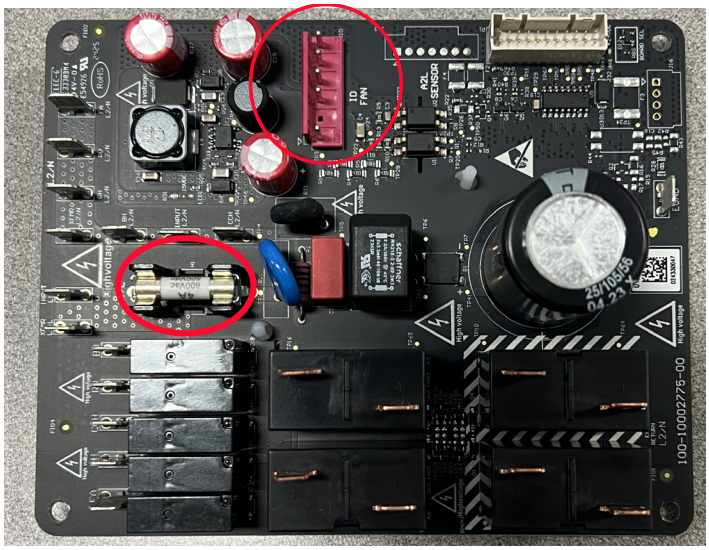


Figure 426 (Relay PCB)

Check Motor

1. Check terminals at terminal block for secure connection/ broken terminals.

2. Check for 208/230/265 on those terminals.

3. Remove power from the unit and check the Relay PCB fuse. See figure 426.

4. Check for 0-6.5 vdc on yellow to black

5. Check for fluctuating dc voltage from blue to ground

⚠ WARNING

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

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

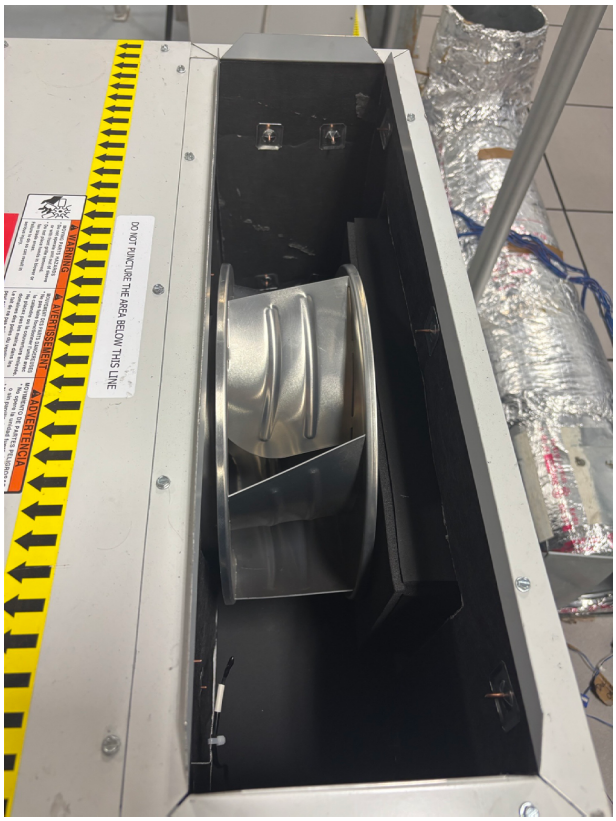


Figure 428 (Indoor Blower)

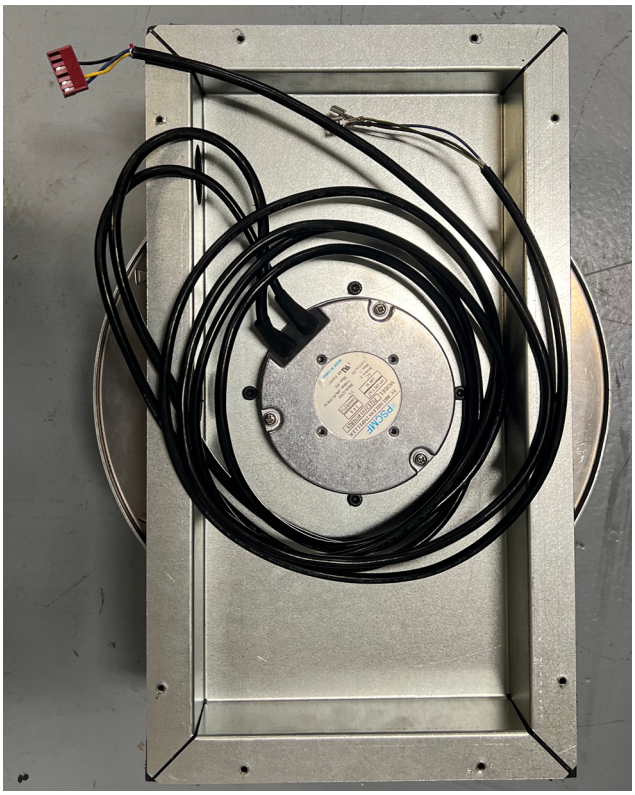


Figure 429 (Indoor Blower Motor)

DESCRIPTION, OPERATION, AND TESTING

Indoor Blower (36k BTU)

The indoor blower has a counterclockwise impeller rotation.

The Motor is a BLDC type motor.

Control voltage is supplied by the Relay PCB (Variable board).

This speed of the blower is determined by the follwing conditions.

1. When the wall controller is placed in low or medium, the blower will run at low speed.

2. When the unit enters a defrost condition, the blower will run at low speed.

3. When the wall controller is placed in high speed, the blower will run at high speed.

4. When the unit enters into a reheat condition, the blower will run at high speed.

5. When the unit runs on electric heat, the blower will run at high speed.

6. Auto

   a. (effictive date 12/ 25 and prior)
   Based on the wall controller , if the delta between the set point and room temperature is greater than 1.5 °F the unit will run at high speed.
   if the delta is less than 1.5 °F - the blower will run at low speed.

   b. (effective date 01/26 and later)

   The indoor blower speed will vary according to the load, tracking in variable increments along wit the compressor.

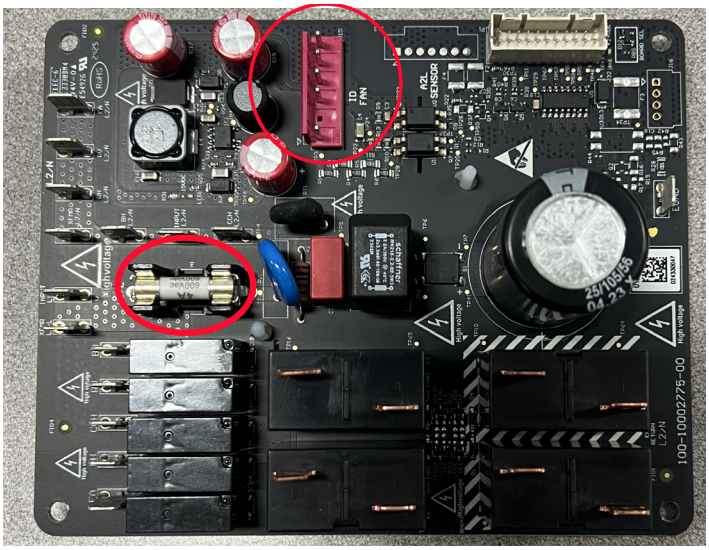


Figure 426.1 (Relay PCB)

Check Motor

1. Remove power from the unit and check the Relay PCB fuse. See figure 426.

2. Check the indoor motor inline fuse (See figure 401.1

3. Turn unit on.

4. Check indoor fan connector on Relay PCB..

   There are 4 wires:

   Voltage for Power (Pin 1) to Ground (Pin 6) = 310VDC

   VCC low voltage power to ground (Pin 4) to Ground (Pin 6) = 15VDC

   PWM (Pin 5) to Ground (Pin 6) = 0-6.5VDC (Oscillating)

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

⚠ WARNING

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

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



Figure 428.1 (Indoor Blower)

DESCRIPTION, OPERATION, AND TESTING

Indoor Blower

Replacement 7-24k

1. Remove unit from closet.

2. Unplug indoor fan connector at Relay pcb (Variable Board),

3. Cut zips on wiring from indoor fan motor to line voltage terminal blocks and trace back wires to identify and disconnect. The blower high ac voltage uses spade connectors and are the blue, brown, and green wires..See Figure430

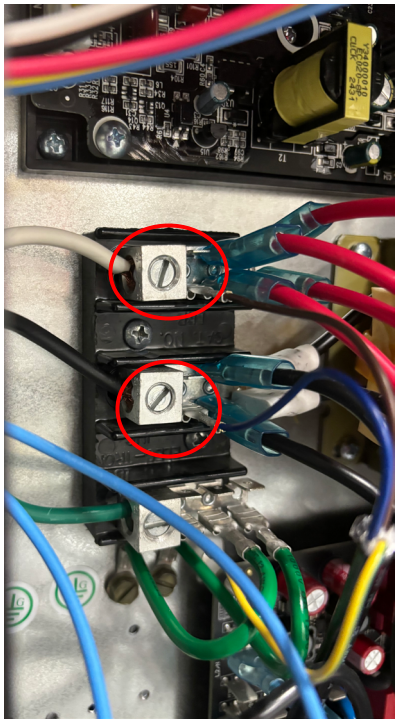


Figure 430 (Terminal Block)

4. Remove duct collar.

5. Remove rear panel by removing perimeter screws.

6. Remove rear panel from fan by removing 10 fan attachment screws. See figure 431.

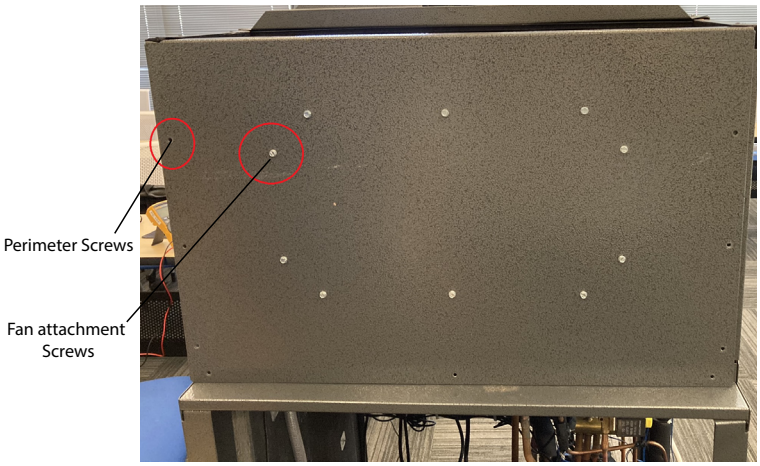


Figure 431 (Indoor Fan)

7. Remove fan mount bolts (Allen Head bolts (4 places). See figure 432.

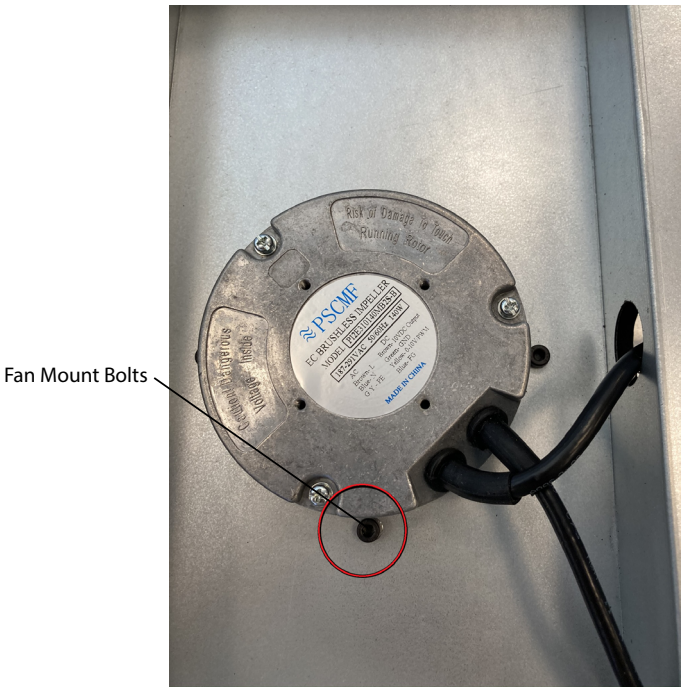


Figure 431 (Fan Mounting Bolts)

8. Install new fan motor in reverse sequence.

DESCRIPTION, OPERATION, AND TESTING

Indoor Blower

Replacement 36k

1. Remove unit from closet.

2. Unplug indoor fan connector at molex connector.,

3. Remove rear panel by removing perimeter screws.

4. Remove rear panel from fan by removing 10 fan attachment screws. See figure 430.1

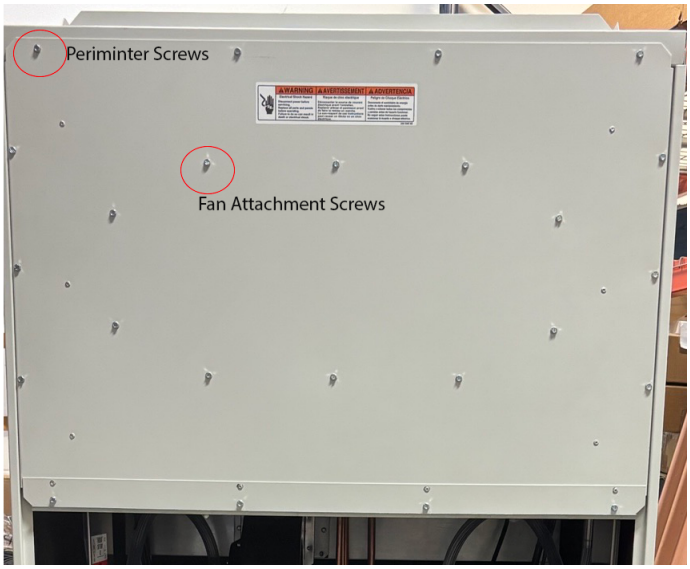


Figure 430.1 (Indoor Fan)

7. Remove fan mount bolts (Allen Head bolts (4 places).) See figure 431.1.

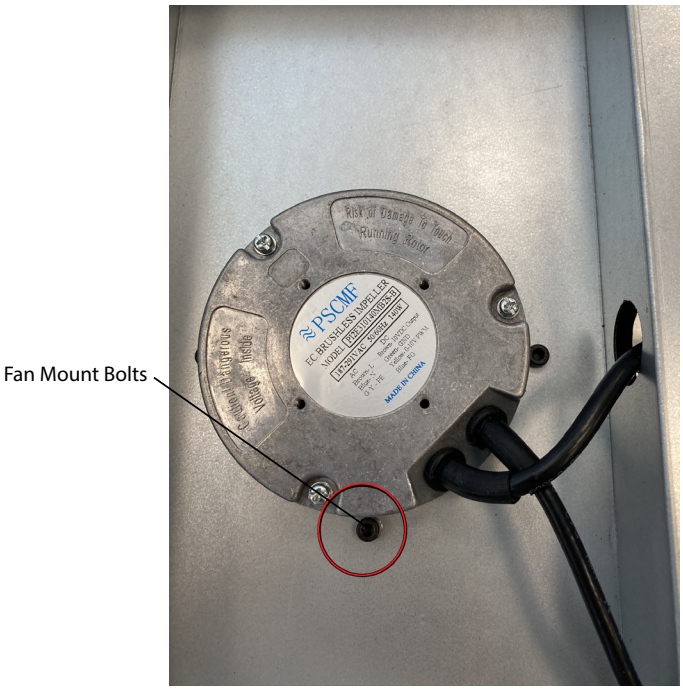


Figure 431.1 (Fan Mounting Bolts)

8. Install new fan motor in reverse sequence.

DESCRIPTION, OPERATION, AND TESTING

Outdoor Fan

The condenser fan uses a fan blade with slinger ring attached to ad additional cooling/heating efficiency(!2k BTU and 24k BTU only). The VRP07 traps water in the drain pan when temperatures are above 40F using a condensate drain valve. The 7k and 12k BTU models use a 16" fan, while the 24k BTU model uses a 20" fan. The 36k BTU unit uses a 24" fan.

The fan motor is a BLDC type which operates on demand from the Logic PCB (Brain Board, and is powered by the DC bus Voltage on the Driver PCB.

⚠ 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.

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

1. Remove Power from the Unit.

Note: The wires change color from black to red , and red to black at the molex connector. This is due to manufacturing requirements.

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 molex plug on electrical control box as shown in figure below.

There are 4 checks:

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

VCC low voltage power to motor (White) to Ground (Red) = 15VDC

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

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

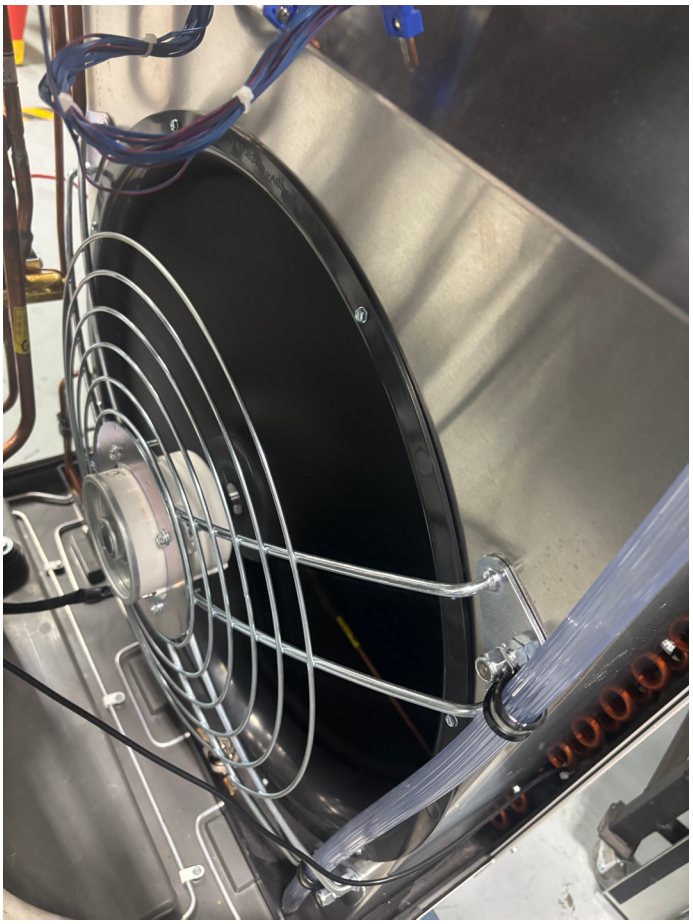


Figure 433 (Outdoor Fan)

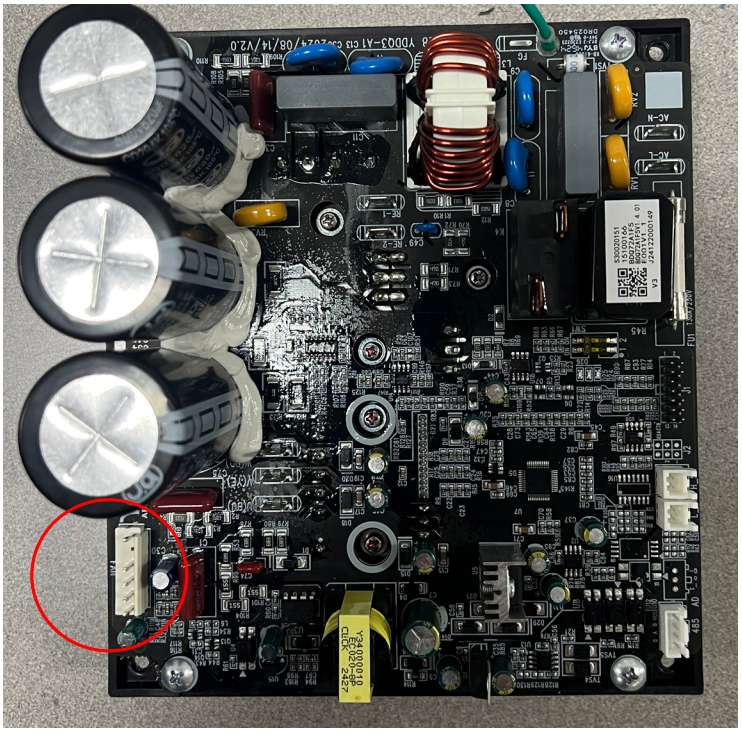


Figure 434 (Driver PCB)

DESCRIPTION, OPERATION, AND TESTING

Outdoor Fan

Replacement

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

⚠ 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.

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) .See Figure 435.

Note: The wires change color from black to red , and red to black at the molex connector. This is due to manufacturing requirements).

4. Remove nuts from fan motor mount at 4 places. See Figure 436.
5. Remove 8 screws from fan inlet ring.
6. Fan assembly can be removed through the right side of the unit.
7. Mark the position of the fan blade on the shaft.
7. Loosen the set screw to remove the fan blade.
8. Remove fan blade from motor shaft.
9. Remove motor from mount.
10. Install new fan motor in reverse sequence.

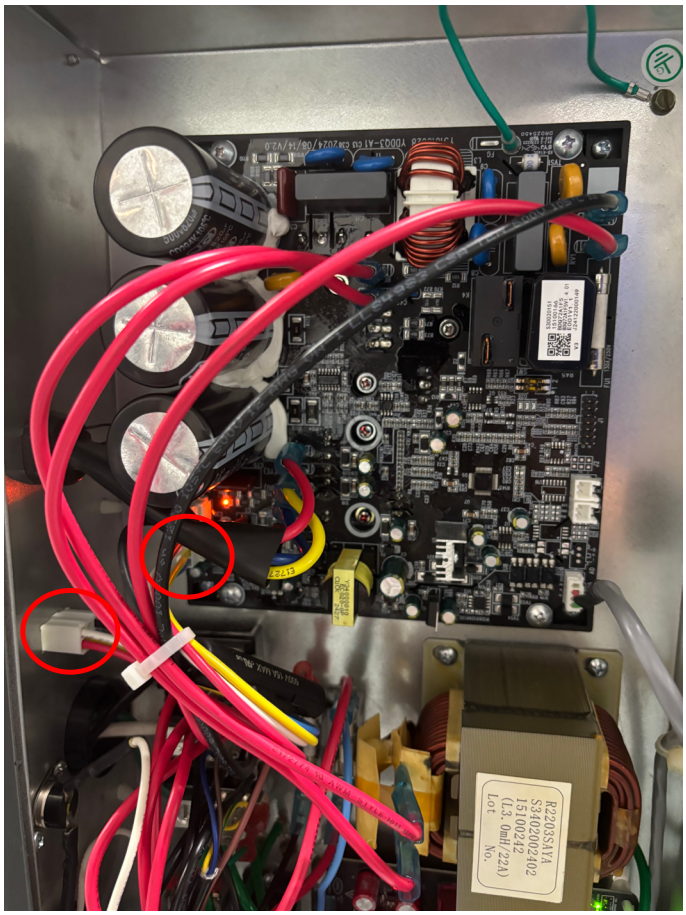


Figure 435 (Outdoor Fan)

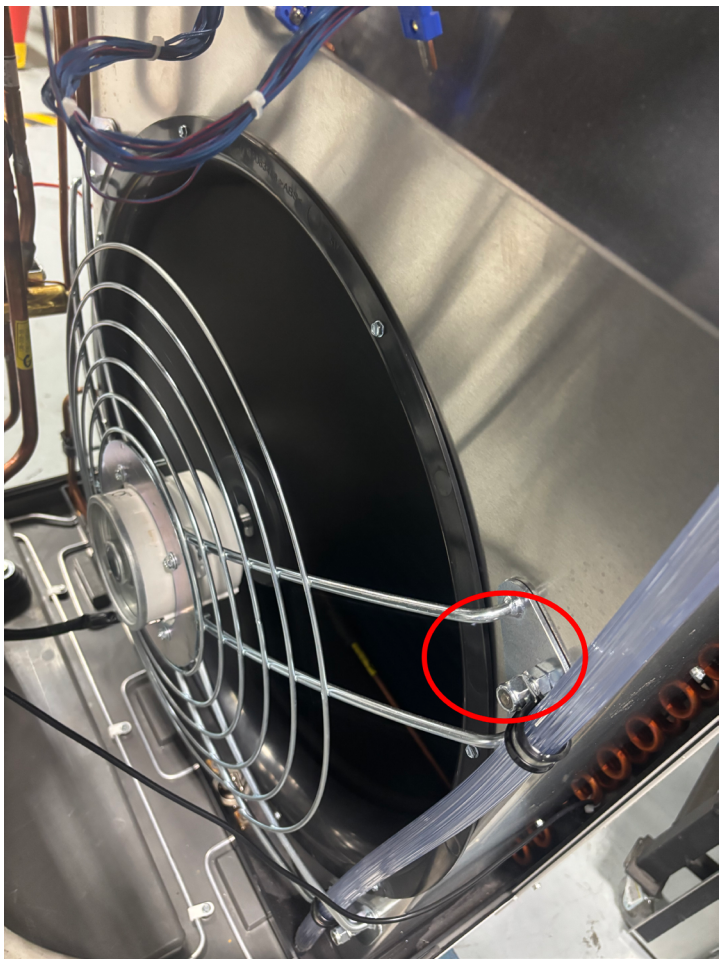


Figure 436 (Outdoor Fan)

DESCRIPTION, OPERATION, AND TESTING

Electric Heater

7k BTU units 2.5 and 3.4 Kilowatt single bank Heaters.

12k BTU Units, 2.5, 3.4, and 5.0 Kilowatt Multi bank Heaters Exact configuration is determined at the factory by electrical jumpers

24k BTU Units, 2.5, 3.4, and 5.0 Kilowatt Multi bank Heaters Exact configuration is determined at the factory by electrical jumpers

24k BTU Units, 7.5 / 10.0 Kilowatt Multi bank Heaters Exact configuration is determined at the factory by electrical jumpers.

36k BTU Units, 10 Kilowatt heater.

36k BTU Units, 15 Kilowatt heater.

Located directly behind the indoor coil and in front of the indoor blower

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.

Check Electric Heater Operation.

⚠ 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.

1. Place a demand on the system by increasing temperature requirement at the wall controller.

2. Check for Line Voltage on heater Relay Output terminals (see figure 437)

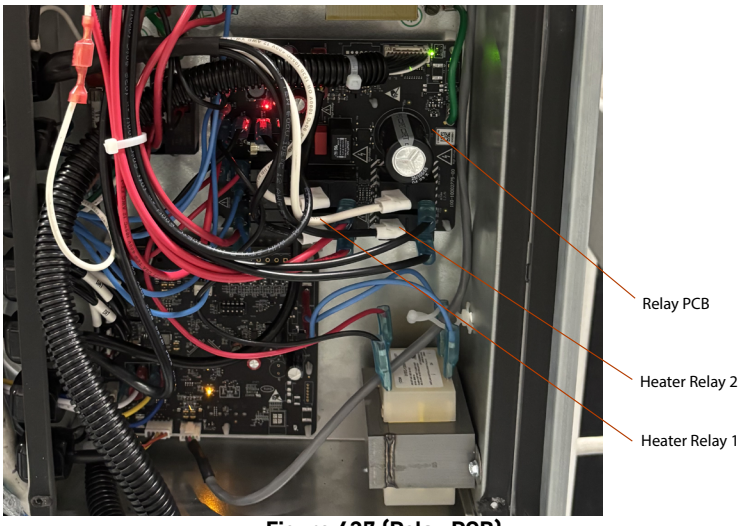


Figure 437 (Relay PCB)

3. If no line voltage is available , check for line voltage on heater relay input terminals. If input voltage is available but relays are not engaged, remove power from the unit, and check wiring connections, Logic to Relay PCB communication cable, Logic PCB , Wall Controller, and Relay PCB for Proper operations. Repair or replace components as required.

4. If line voltage is applied, Remove power from unit , disconnect input wiring (See figure 438), and Ohm out coils for proper resistance values. An indication of an open or shorted coil will be the most likely result of a coil that has malfunctioned. See Figure 439. Replace Heater if coils are open, shorted, or out of tolerance.

Check electric heat operation; (36k BTU 15kW)

1. Place a demand on the system by increasing temperature requirement at the wall controller.

2. Check for Line Voltage on heater Relay Output terminals (see figure 437.1) If voltage is available on relays input and output, proceed to step 5.. If no voltage is avialble proceed to step 3.

3. Check for Line Voltage on PCB heater Relay Output terminals (see figure 437.1)

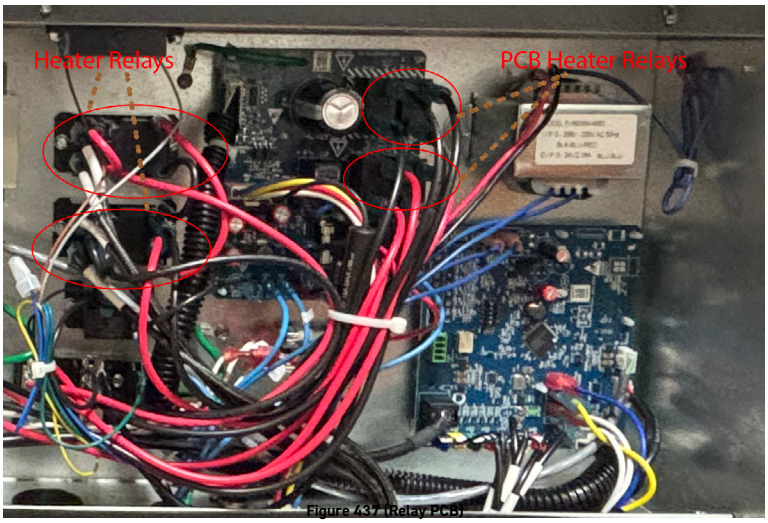


Figure 437 (Relay PCB)

4. If no line voltage is available , check for line voltage on heater relay input terminals. If input voltage is available but relays are not engaged, remove power from the unit, and check wiring connections, Logic to Relay PCB communication cable, Logic PCB , Wall Controller, and Relay PCB for Proper operations. Repair or replace components as required.

5. If line voltage is applied, Remove power from unit , disconnect input wiring (See figure 438), and Ohm out coils for proper resistance values. An indication of an open or shorted coil will be the most likely result of a coil that has malfunctioned. See Figure 439. Replace Heater if coils are open,

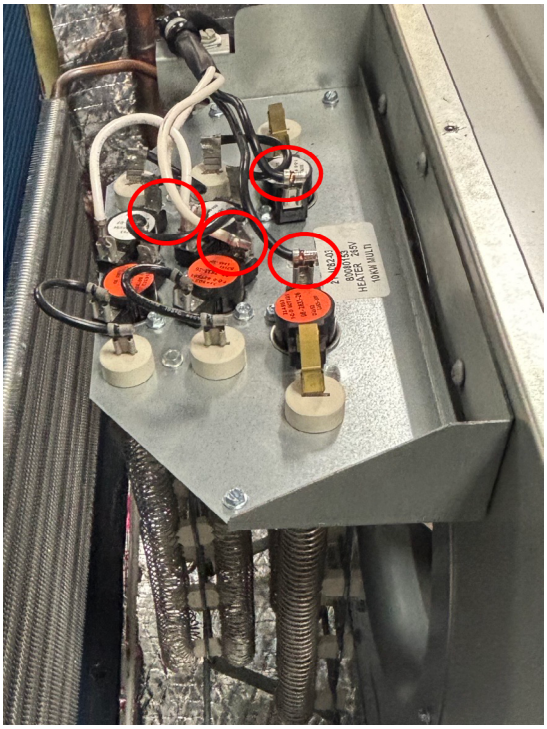


Figure 438 (Heater)

Electric Heater

COIL 1	COIL 2	COIL 3	THERMAL DISC LIMITER	THERMAL DISC FUSE
24k BTU 265V 10 kW MULTI				
5000 W 12.35 OHMS +-5%	2500 W 24.71 OHMS +- 5%	2500 W 24.71 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 200°F
12k/ 24k BTU 265V 5 kW MULTI				
2450 W 27.54 OHMS +-5%	800 W 84.35 OHMS +- 5%	1500 W 44.99 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 200°F
24k BTU 230V 10 kW MULTI				
5000 W 9.03 OHMS +-5%	2500 W 20.23 OHMS +- 5%	2500 W 18.61 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 200°F
12k/ 24k BTU 230V 5 kW MULTI				
2500 W 19.06 OHMS +-5%	900 W 51.69 OHMS +- 5%	1600 W 29.08 OHMS +- 5%	OPEN 165°F CLOSE 135°F	OPEN 200°F
7k BTU 230V 2.5 kW Single				
2500 W 18.61 OHMS +-5%	N/A	N/A	OPEN 155°F CLOSE 125°F	OPEN 190°F
7k BTU 230V 3.4 kW Single				
3400 W 13.68 OHMS +-5%	N/A	N/A	OPEN 155°F CLOSE 125°F	OPEN 190°F
7k BTU 265V 2.5 kW Single				
2500 W 24.71 OHMS +-5%	N/A	N/A	OPEN 155°F CLOSE 125°F	OPEN 190°F
7k BTU 265V 3.4 kW Single				
3400 W 18.17 OHMS +-5%	N/A	N/A	OPEN 155°F CLOSE 125°F	OPEN 190°F
36k BTU 230V 10 kW Single				
4800 W 11.26 OHMS +-5%	4800 W 11.26 OHMS +-5%	N/A	OPEN 165°F CLOSE 135°F	OPEN 240°F
36k BTU 230V 15 kW Single				
4800 W 11.26 OHMS +-5%	4800 W 11.26 OHMS +-5%	4800 W 11.26 OHMS +-5%	OPEN 165°F CLOSE 135°F	OPEN 240°F

Figure 439

DESCRIPTION, OPERATION, AND TESTING

Electric Heater

Replace Heater

1. Ensure Power is removed from the Unit
2. Remove duct work as necessary to gain access to top panel.
3. Remove top panel.
4. Disconnect input wires . See Figure 438.1.
5. Remove Mounting screws (4 places).
6. Lift heater element assembly straight up and out of unit.

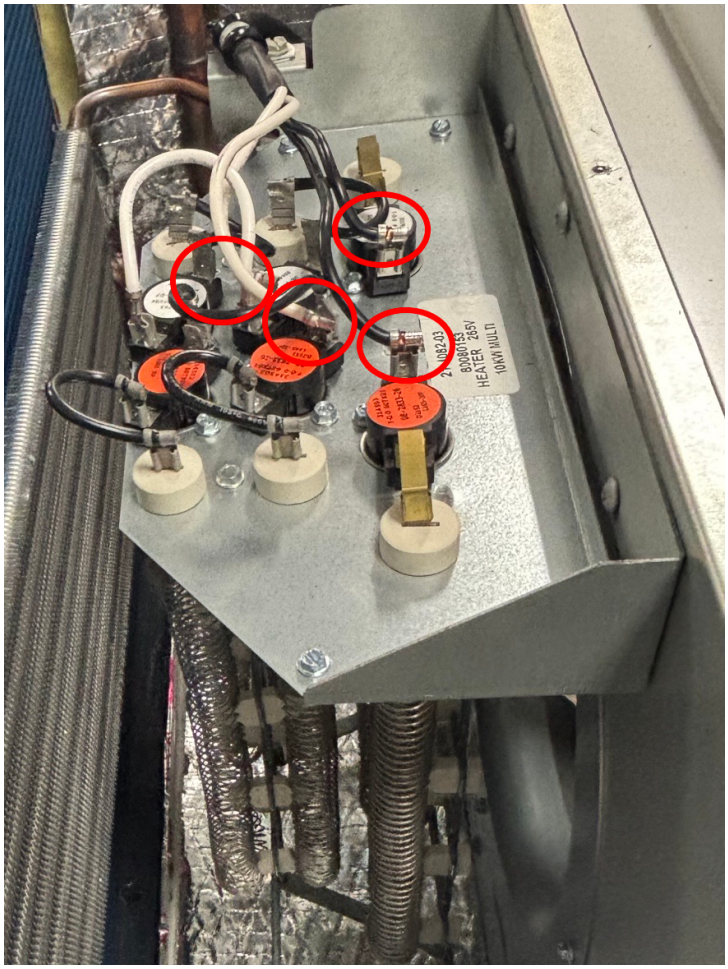


Figure 438.1 (Heater)

DESCRIPTION, OPERATION, AND TESTING

Basepan Heat

Basepan heat is available as a low ambient option for the VRP. An aluminum tube basepan heater will supply 85 watts of power for 7k BTU models, and 129 watts of power for the 12k -36k BTU units.

When outside air temperature falls to 31˚F (As read by the Outside air ambient temperature sensor) See Figure 405, the Logic PCB will communicate to the Relay PCB to energize the Basepan heat relay and apply line voltage to the basepan heater. When the sensor reads 32˚F power will be removed from the relay on the Relay PCB.

A 1/2" Disc type thermostat is installed inline with the line voltage circuit. The thermostat will close at 32°F ± 11°F and open on rise 50°F ± 5°F.

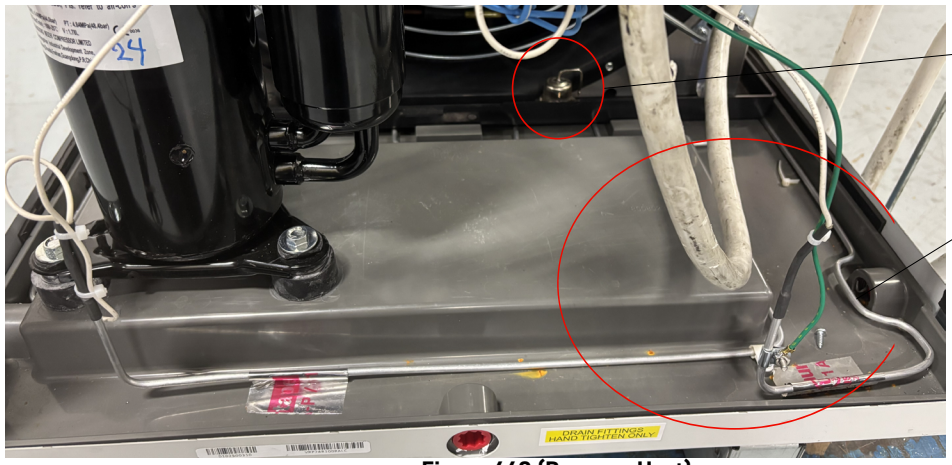


Figure 440 (Basepan Heat)

Both the Logic PCB (by means of the temp sensor) and the inline thermostat need to be activated in order for the basepan heat to be activated in order for he heater to be powered.

If temperatures are below freezing and basepan heat is not activated.

⚠WARNING

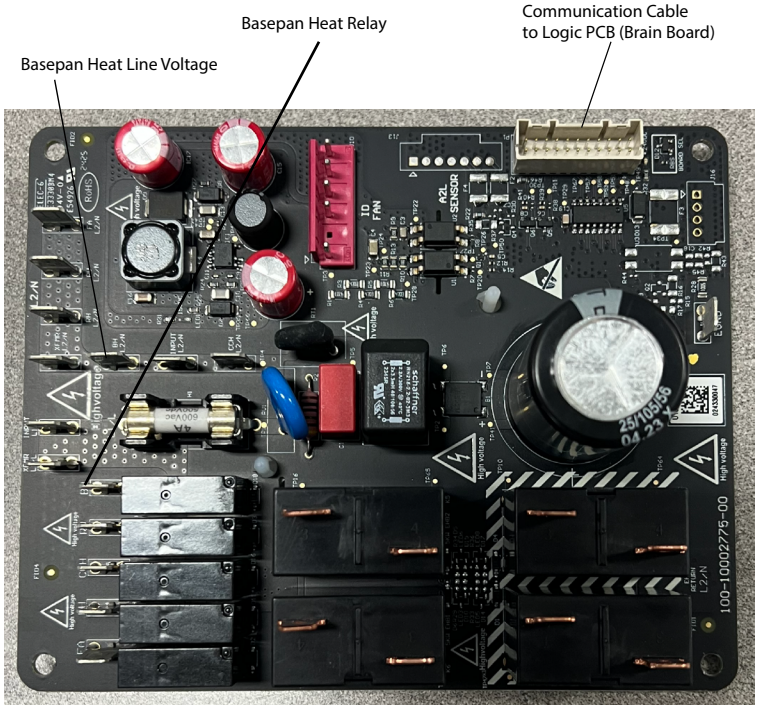
ELECTRIC SHOCK HAZARD

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.

1. Check for line voltage at Relay PCB. See figure 441.

Figure 441 (Relay PCB)



2. If no Voltage found, check Outside air temp sensor, Logic PCB to Relay PCB communication cable, Logic PCB and Relay PCB. Replace faulty component(s).

3. If Voltage is available at the relay , check power on both side of the inline thermostat. See figure 442. Strip back heatshrink and check that switch is closed if below 32 degrees and open if above 50 degrees. Reinstall heatshrink.

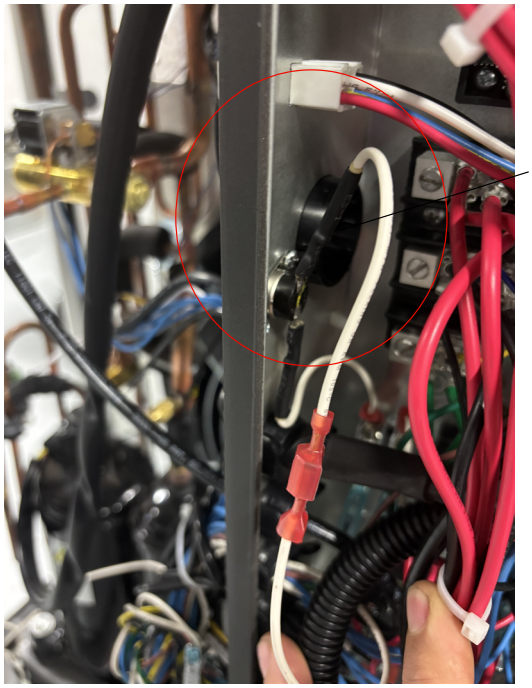


Figure 442 (Basepan Thermostat)

If thermostat is faulty, replace,

4. If no power is available at the thermostat, remove power from the unit.

5. Ohm out he basepan heat fuses.

6. OHM out basepan heater element for resistance. If element is open, or shorted to ground replace heater.

7. Replace fuse(s) if required. Refer to Figure 401.

NOTE: The basepan heater will come in a 2 piece kit for he 12k and 24k BTU units to facilitate easier replacement. 7k basepan heaters will be in 1 piece.

DESCRIPTION, OPERATION, AND TESTING

FreshAire (7k-24k BTU)

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.)

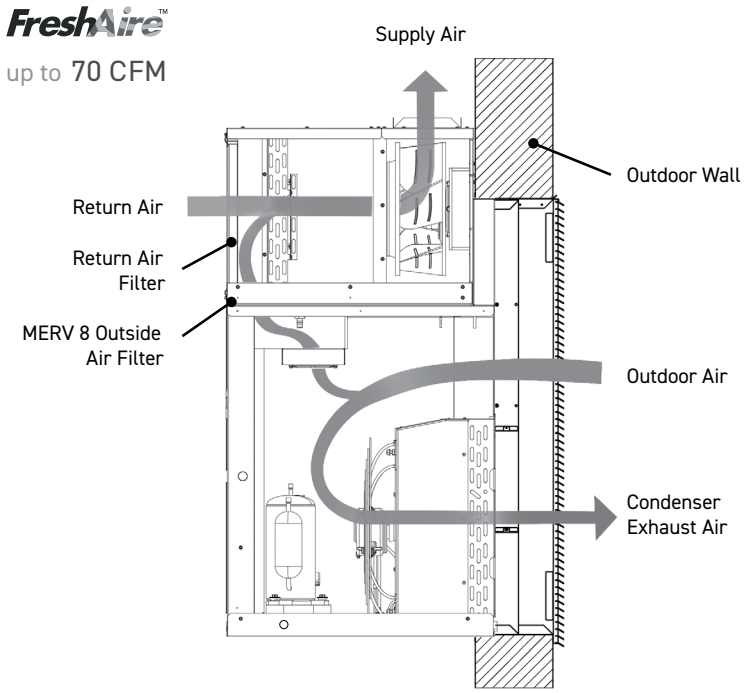


Figure 443 (FreshAire Flow)

IAQ (Freshair) 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.

To engage the fan(s), place the fresh air switch to ON.

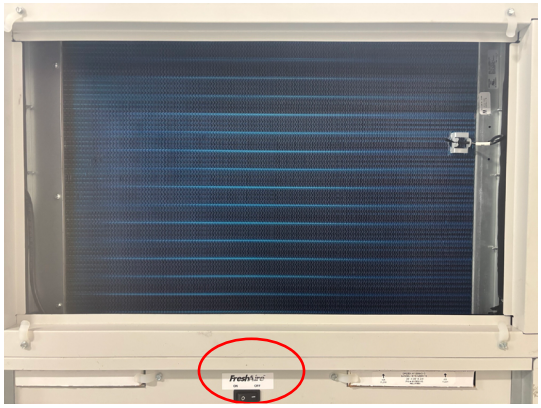


Figure 444 (FreshAire Switch)

Line Voltage will be supplied to the fresh air fan(s) and fresh air dampener motor(s) via the Relay PCB (Variable board). See figures 445 and 446. 265v units with a double freshair box configuration may have an additional relay installed. See figure 401.

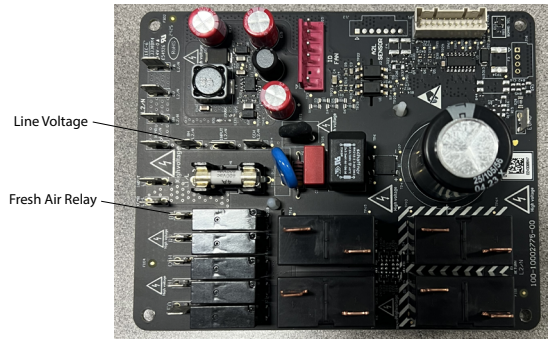


Figure 445 (Relay PCB)

To check for proper operation ensure that the occupancy sensor is sensing room occupancy and that the fresh air switch is in the ON position.

⚠ 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.

1. Check for line voltage across the line voltage terminal and relay terminal of the Relay PCB. See Figure 445.

a. If line voltage is not present;

1. Check the, Communication cables, wiring terminal connections. repair or replace wiring /or terminals as required.

2. Check Logic PCB, Relay PCB and the wall controller for proper operation. Replace defective components as required.

b. If line voltage is present;

1. Check Freshair fuses and freshair fan relay if installed. Replace as required. See figure 401.

2. Check wiring and terminals to Freshaire motor and fan and repair as required.

3. Replace fan or motor as required.

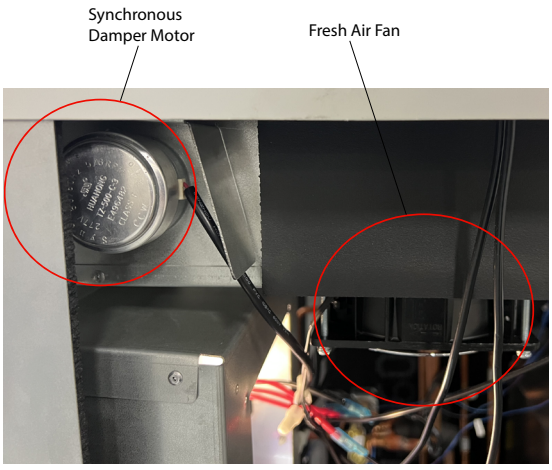


Figure 446 (FreshAire Motor and Fan)

DESCRIPTION, OPERATION, AND TESTING

FreshAire (36k BTU)

FreshAire is a dedicated fresh air system that brings in up to 130 CFM of outdoor air into the VRP® unit. The 36k BTU unit FreshAire system uses on freshair motor which can be configured for 80 or 130 CFM (depending on outdoor air CFM volume requirements. Connect Yellow wire at ref A for 80 CFM , or blue wire for 130 CFM, see wiring diagram) 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.)

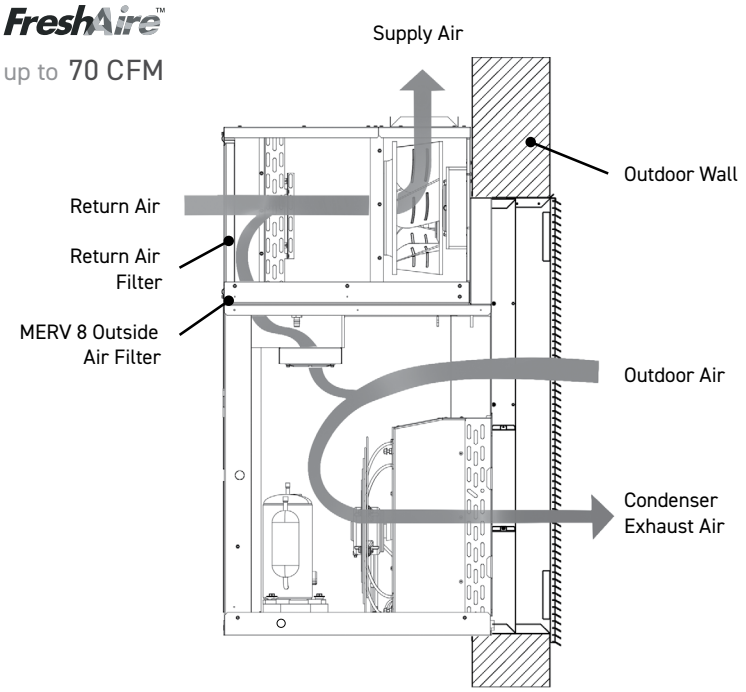


Figure 443.1 (FreshAire Flow)

IAQ (Freshair) 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.

To engage the fan(s), place the fresh air switch to ON.

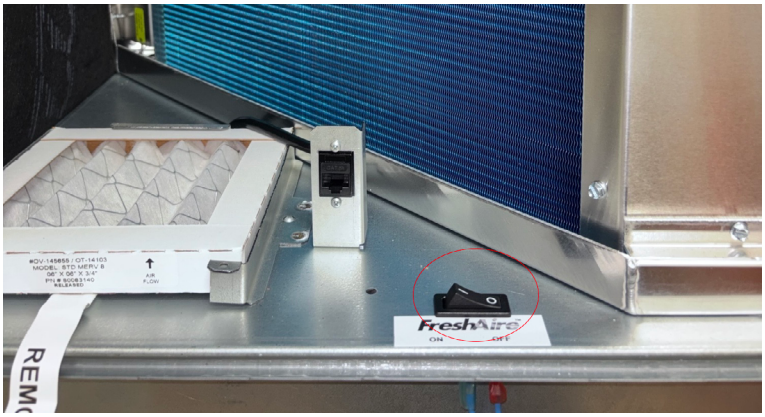


Figure 444.1 (FreshAire Switch)

Line Voltage will be supplied to the fresh air fan(s) and fresh air dampener motor(s) via the Relay PCB (Variable board). and the fresh Air Relay. See figures 445.1 and 446.1. See figure 401 for relay..

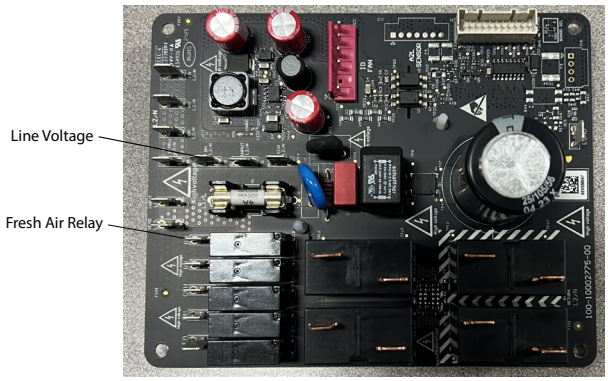


Figure 445.1 (Relay PCB)

To check for proper operation ensure that the occupancy sensor is sensing room occupancy and that the fresh air switch is in the ON position.

⚠ 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.

1. Check for line voltage across the line voltage terminal and relay terminal of the Relay PCB. See Figure 445.1.

a. If line voltage is not present;

1. Check the, Communication cables, wiring terminal connections. repair or replace wiring /or terminals as required.

2. Check Logic PCB, Relay PCB and the wall controller for proper operation. Replace defective components as required.

b. If line voltage is present;

1. Check Freshair fuses and freshair fan relay. Replace as required. See figure 401.1.

2. Check wiring and terminals to Freshaire motor and fan and repair as required.

3. Replace fan or motor as required.

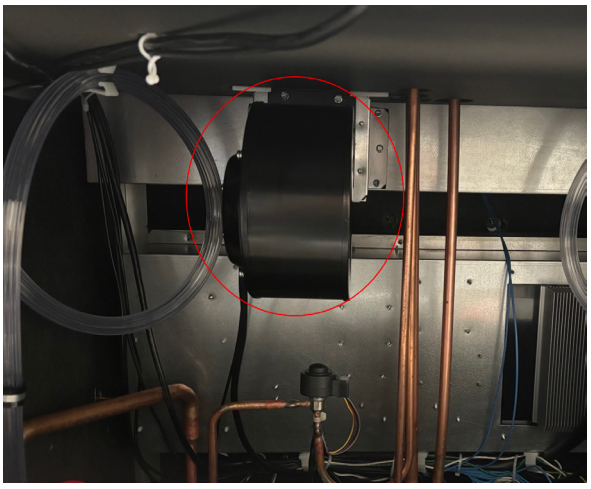


Figure 446.1 (FreshAire Motor and Fan)

R-32 SEALED SYSTEM REPAIR

General Information

⚠WARNING: Electrical Shock Hazard



Disconnect all power to the unit before starting maintenance. All electrical connections and wiring MUST be installed by a qualified electrician and conform to all codes which have jurisdiction. Failure to do so can result in property damage, severe electrical shock or death.

⚠WARNING: This Product uses R-32 Refrigerant

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

When not installed, the appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

Do not pierce or burn.

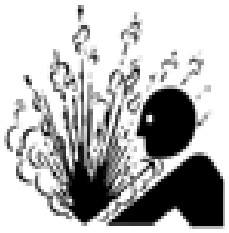
Be aware that refrigerants may not contain an odor.



Refrigerant Safety Group A2L

⚠WARNING: Refrigeration System under High pressure

Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R-32 systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.



⚠ **Warning:** Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized.

NOTICE: Individuals working on these units must be EPA 608 Certified along with A2L Refrigerant Training.

⚠ **Warning:** Refrigerant R-32 cannot be used as a retrofit for R-410A refrigerant. The mixing of refrigerant across classes is prohibited. R-32 is not a drop in replacement for R-410A.

General Work Area: All maintenance staff and others working in the installation area shall be instructed on the nature of work being carried out. Work in confined spaces as defined by the Occupational Safety And Health Administration shall be avoided.

⚠ **Warning:** Job site should be examined for safety hazards such as flammable vapors, ignition sources, ventilation and confined spaces. Create a safe perimeter with barriers and signs designating a flammable area.

⚠ **Warning:** Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapor being present while the work is being performed.

Check for presence of refrigerant:

- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres.
- Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- The following leak detection methods are deemed acceptable for all refrigerant systems:

  1. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. 2. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

  If a leak is suspected, all flame sources shall be removed/extinguished.

  If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system per EPA guidelines.

R-32 SEALED SYSTEM REPAIR

General Information

Presence of fire extinguisher: If any hot work is to be conducted on the refrigerating equipment or any associated parts, a class ABC Rated fire extinguishing equipment shall be available to hand. Have a class ABC Rated fire extinguisher adjacent to the charging area.

⚠ Warning:

No ignition sources: No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.

Ventilated Area: Ensure that the area is in the open or that it is adequately ventilated before accessing the refrigerant in the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant away from the work area or external to building envelope.

During Repairs To Sealed Components: All power must be removed from the equipment being worked on prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a constant leak detector shall be located at the most critical point to warn of a potentially hazardous situation.

Checks And Repairs To Electrical Devices:

- Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected remove power supply to unit. **DO NOT OPERATE.**
- Initial safety checks shall include:
  - ·That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
  - ·That no live electrical components and wiring are exposed while charging, recovering or purging the system;
  - ·Verify unit is properly grounded.
- Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
- Ensure that the apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.
-

The following is a list of important considerations when working with R-32 equipment:

- R-32 pressure is similar to R-410A and approximately 60% higher than R-22 pressure.
- R-32 cylinders must not be allowed to exceed 125°F, they may leak or rupture.
- R-32 must never be pressurized with a mixture of compressed air, it may become MORE flammable.
- Servicing equipment and components must be specifically designed for use with R-32 and dedicated to prevent contamination.
- 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.
- Gauge hoses must have a minimum 750-psig service pressure rating.
- Recovery cylinders must have a minimum service pressure rating of 400 psig, (DOT 4BA400 and DOT BW400 approved cylinders).
- POE (Polyol-Ester) lubricants must be used with R-32 equipment.

R-32 SEALED SYSTEM REPAIR

Required Equipment

- To prevent moisture absorption and lubricant contamination, do not leave the refrigeration system open to the atmosphere for extended periods of time.
- If unit refrigerant is low, recover the refrigerant, evacuate, and recharge unit to nameplate amount.
- If there is any amount of refrigerant in the system charge from the low side.
- Always charge by liquid inverted.

Verify with tool manufacturers that all tools used during this repair are non-sparking and can be used with A2L Refrigerants.

No halide torches for leak testing.

Refrigerant monitors or detectors must be used to detect refrigerant in the work area.

- R-32 A2L Refrigerant Recovery System.
- Vacuum Pump rated for A2L refrigerant (capable of 300 microns or less vacuum.)
- Nitrogen bottle with purging and pressurizing capabilities up to 550 psi.
- Oxy/ Acetylene torch or similar equipment utilized for brazing.
- Non-Sparking (Not Halide)Electronic Leak Detector rated for detecting A2L refrigerant.
- Digital refrigerant scale
- Refrigeration Gauges rated for A2L Refrigerants with temp scales for R-32 refrigerant.
- Gauge Manifold (Right handed threads).
- A2L compatible Vacuum Gauge capable of 300 microns or less.
- Nitrogen regulator for purging and testing, rated to 800 psi. (Capable of low psi flow)
- Pipe tubing cutter.



ABC Fire Extinguisher



Recovery Machine



Vaccum Pump



Nitrogen



Guage Manifold



Nitrogen Regulator



Vaccum Guage

- Refrigerant recovery cylinder. (Flammable A2L label)
- Ventilation fan.
- Class ABC fire extinguisher.
- Process Tube adapter kit
- Recovery access tool.
- Purge hose fittings
- Pinch off and opening tools





Recovery access tool







Process tube adapter kit





Purge hose fittings





Pinch off and opening tools

R-32 SEALED SYSTEM REPAIR

Refrigerant Removal, Recovery, and Evacuation

NOTE: When accessing the refrigerant in the system 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 refrigerants) it is important that best practice is followed since flammability is a consideration. Follow all EPA 608 regulations and procedures along with AHRI 15 Best Practices for A2L refrigerants.

⚠ **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.

NOTICE: Ensure that the following precautions are taken prior to opening the sealed system.

- Verify Recovery machine is rated for A2L refrigerants.
- Mark the Job site inspection area as flammable work zone using appropriate signs.
- Utilize a Refrigerant leak detector or refrigerant monitor to sense the area for the presence of refrigerants.
- Disconnect all power supply to unit.
- Properly ground all equipment and hoses along with tank to prevent a static build up .
- Ensure adequate ventilation is provided for the job site.
- Do not mix A2L refrigerant Gages and hoses with other refrigerants.
- Keep exposure of refrigerant to Air to as minimum as possible (creates a dangerous condition).
- Under no circumstances is the mixing of refrigerants in the recovery cylinders allowed and should be strictly avoided at all times. Do not introduce oxygen into any recovery cylinders.

1. Recover refrigerant to EPA sec. 608 standards. If a low charge is suspected weigh recovered refrigerant and compare to unit nameplate.

NOTE: DO NOT RECOVER TO A VACUUM PRIOR TO FLUSHING WITH NITROGEN. STOP RECOVERY AT 0-5 PSI.

2. Flush refrigerant out of system with a dry nitrogen purge, make sure you energize and de-energize all reversing valves and solenoid valves to release any trapped refrigerant.(3-5 minutes).

3. Perform an evacuation to 29.9 in. hg. and break vacuum with Dry Nitrogen.

4. Re-purge the unit for 3-5 mins or until the nitrogen flows out both process tubes.

5. Re-evacuate unit to 29.9 in. hg. and break vacuum with Dry Nitrogen.

6. Open the refrigerant circuit by cutting out components.

Transportation

Be aware that local, state, and national codes exist that regulate the transportation of flammable gases. Be sure to become informed of the regulations and always stay compliant.

R-32 SEALED SYSTEM REPAIR

Component Replacement/Brazing

Warning: Ensure sufficient ventilation at the repair place.

Warning: Presence of fire extinguisher. If any hot work is to be conducted on the refrigerating equipment or any associated parts, have a ABC class fire extinguisher available to hand.

Warning: No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.

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

NOTE: When brazing is required, the following procedures shall be carried out in the right order:

1. Remove and recover refrigerant, and evacuate the system. Refer to the refrigerant removal, recovery, and evacuation section of this manual.

Warning: Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

2. Perform a check of the work area for the presence of flammable refrigerant prior to brazing or performing any hot work. Use a non-Sparking (Not Halide) A2L certified Electronic Leak Detector rated for detecting R-32 refrigerant.

3. Re-pipe all repairs and install all components to sealed system.

4. Purge nitrogen through the unit. at approximately 2-3 psi through the duration of the brazing process. (Nitrogen must be purging through the unit while any brazing is being performed.)

5. Pressure test unit to 550 psi minimum and hold pressure for 30 minutes minimum. Inspect for any leaks with a leak detection fluid and repair as required. Repeat as required until system passes leak test.

6. Triple evacuate the unit to achieve a 500 micron level.

7. Pressurize nitrogen to 550 psi and leak test all connections with a leak detection fluid. Repair any leaks found.

8. Reassemble sealed enclosures accurately. If seals are worn, replace them.

9. Charge the system with the amount of refrigerant specified on the model nameplate. Refer to the refrigerant charging section of this manual for charging procedures.

R-32 SEALED SYSTEM REPAIRS

Refrigerant Charging

⚠WARNING: Electrical Shock Hazard



Disconnect all power to the unit before starting maintenance. All electrical connections and wiring MUST be installed by a qualified electrician and conform to all codes which have jurisdiction. Failure to do so can result in property damage, severe electrical shock or death.

⚠WARNING: This Product uses R-32 Refrigerant





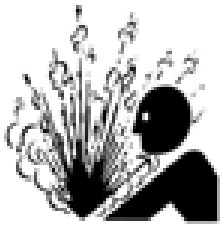
Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

When not installed, the appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

⚠WARNING: Refrigeration System under High pressure



Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R32 systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.

⚠WARNING: Freeze Hazard



Proper safety procedures must be followed, and all PPE must be utilized when working with liquid refrigerant. Failure to comply could result in minor to moderate injury.

NOTE: Always weigh in refrigerant based on the model nameplate.

⚠Warning:

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Charge unit with refrigerant cylinder in the inverted position to obtain liquid refrigerant.
- Charge the unit according to the amount on the name plate matching the unit.
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.
- Prior to recharging a system, it shall be pressure-tested with the dry nitrogen.

The 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:

⚠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.

1. Recover Refrigerant in accordance with EPA regulations. (Refer to Refrigerant Removal, Recovery, and Evacuation Section).

NOTE: If a low charge is suspected weigh recovered refrigerant and compare to unit nameplate.

2. Weigh in the refrigerant charge with the proper quantity of R-32 refrigerant per model nameplate.

4. Start unit, and verify performance.

NOTE: EPA Section 608 regulations require that if a system is charged with flammable refrigerant it must have red markings on the access ports.

R-32 SEALED SYSTEM REPAIRS

Compressor Replacement

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

⚠ 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.

PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED.

2. After all refrigerant has been recovered, cut and remove compressor. Be certain to have both suction and discharge process tubes open to atmosphere.

⚠ 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.

3. 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, refer to Compressor Replacement -Special Procedure in Case of Compressor Burnout.

7. Install the replacement compressor.

⚠ WARNING



EXPLOSION HAZARD
The use of nitrogen requires a pressure regulator. Follow all safety procedures and wear protective safety clothing etc.

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

CAUTION: Seal all openings on the defective compressor immediately. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.

8. Braze all connections. Refer to the Component Replacement/Brazing section of this manual.

9. Charge system with proper amount of refrigerant per the model nameplate. Refer to the Refrigerant charging section of this manual.

⚠ 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



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.

R-32 SEALED SYSTEM REPAIRS

Compressor Replacement -Special Procedure in Case of Compressor Burnout

1. Recover all refrigerant and oil from the system. Refer to Refrigerant Removal, Recovery, and Evacuation Section of this manual.

2. Cut and remove compressor and EEV from the system.

⚠ 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.

CAUTION: Seal all openings on the defective compressor immediately. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.

3. Flush evaporator condenser and all connecting tubing with dry nitrogen or equivalent. Use A2L approved flushing agent to remove all contamination from system. Inspect suction and discharge line for carbon deposits. Remove and clean if necessary. Ensure all acid is neutralized.

⚠ 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.

4. Reassemble the system, including a new EEV and strainers.

5. Install a dual port suction line drier on the common suction line and remove when the pressure differential across the drier ports reaches 3 psi. or greater.

6. Braze all connections. Refer to the Brazing section of this manual.

⚠ 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.

7. Charge system with proper amount of refrigerant per the model nameplate. Refer to the refrigerant charging section of this manual.

⚠ 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.

R-32 SEALED SYSTEM REPAIR

Replace The Reversing Valve/ Reheat 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.

⚠ 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.

NOTICE

FIRE HAZARD

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

1. Recover all refrigerant from the system. Refer to Refrigerant Removal, Recovery, and Evacuation Section of this manual).

PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED.

2. Remove solenoid coil from valve. If coil is to be reused, protect from heat while changing valve.

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 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 valve will eliminate conduction of heat to the valve body when brazing the line connection.

3. Cut all lines from valve. Refer to the Brazing section of this manual.

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.

8. Braze all connections. Refer to the Brazing section of this manual.

9. Pressurize with nitrogen to 550 psi and leak test all connections with a leak detection fluid. Repair any leaks found.

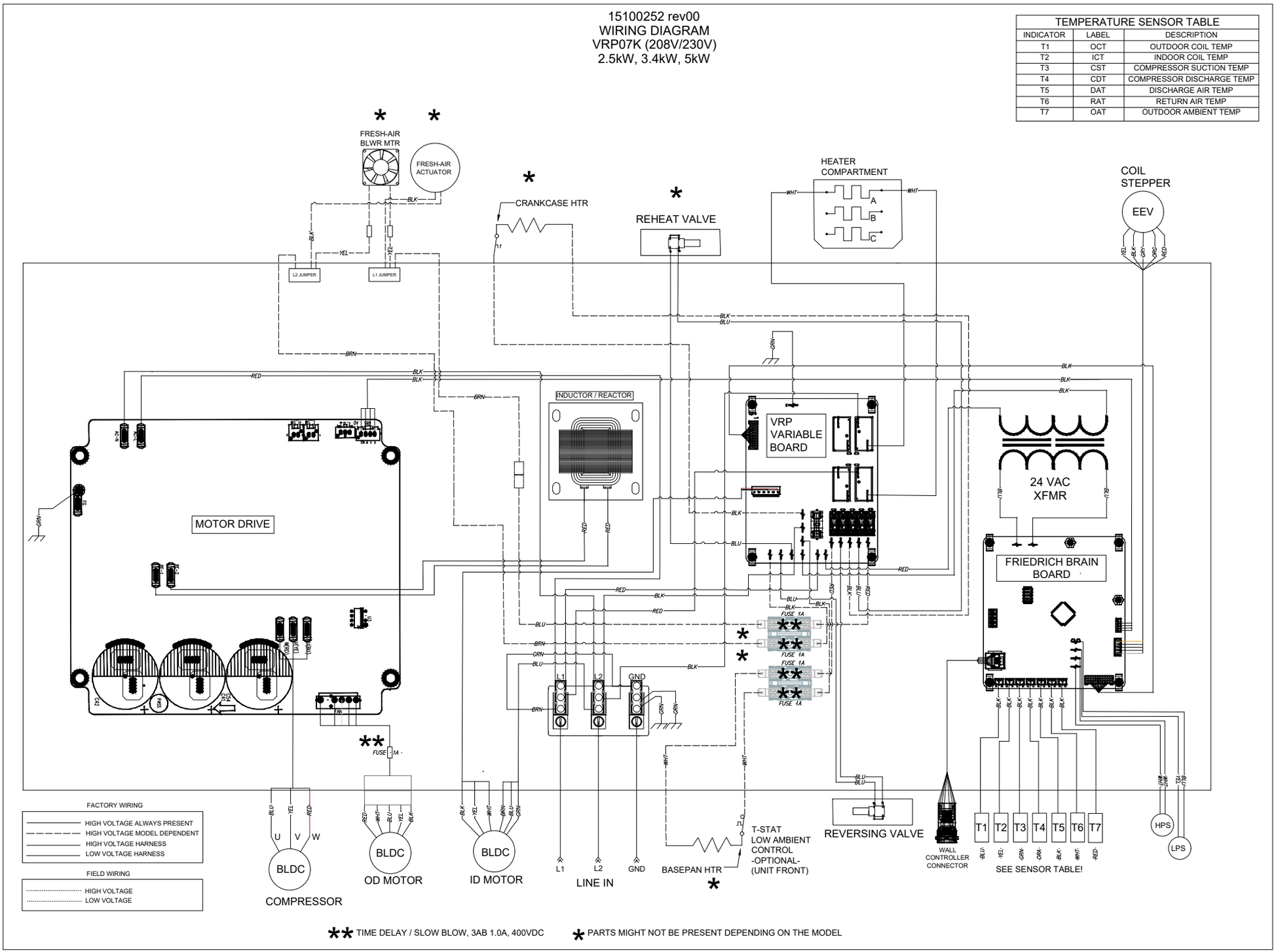
10. Once the sealed system is leak free, install solenoid coil on new valve.

11. Charge system with proper amount of refrigerant per the model nameplate. Refer to the refrigerant charging section of this manual.

WIRING DIAGRAMS

7K BTU (208/230V 2.5 and 3.4 KW)

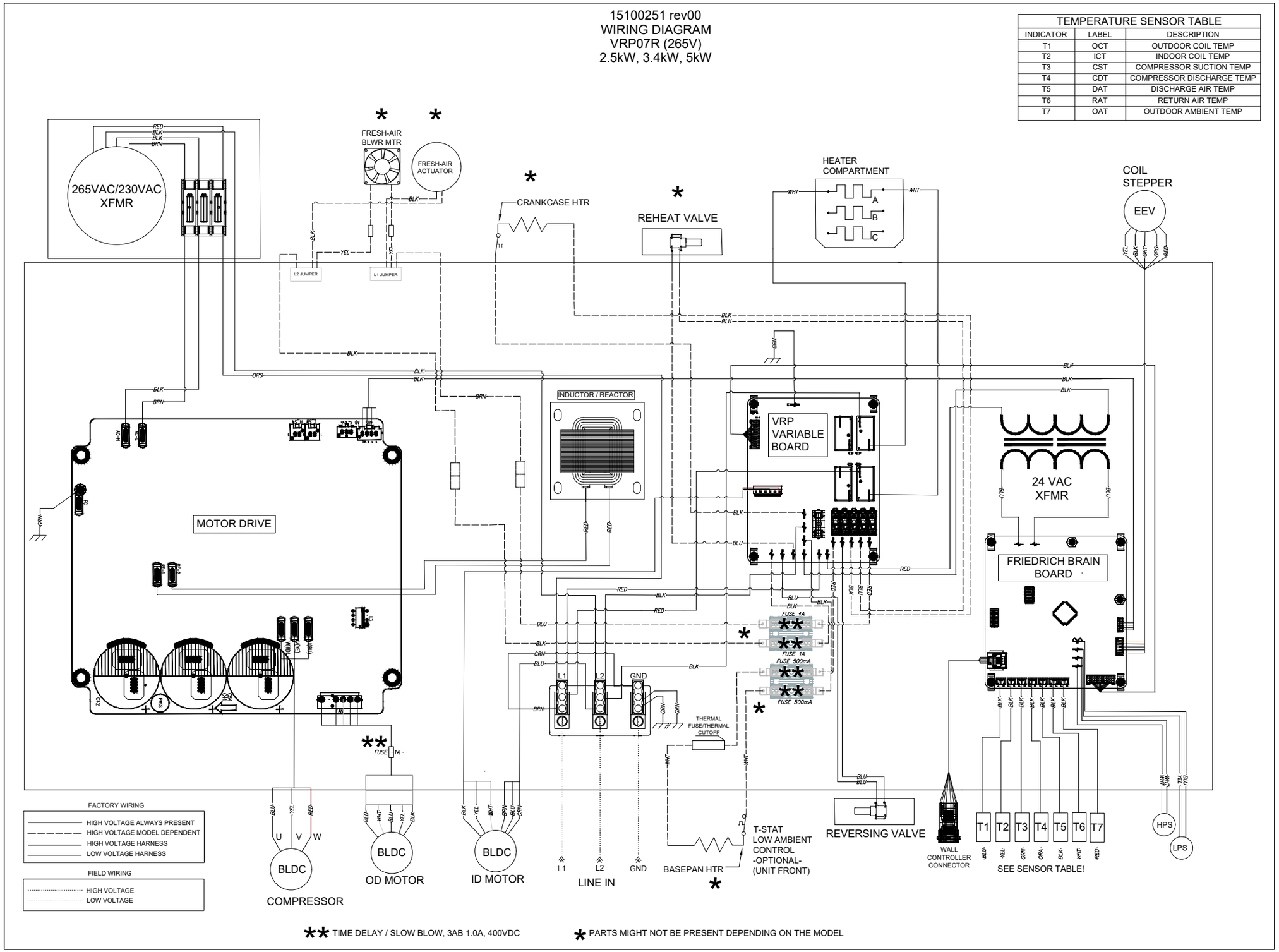
Figure 801 (Wiring Diagram)



WIRING DIAGRAMS

7K BTU (265V 2.5 and 3.4 KW)

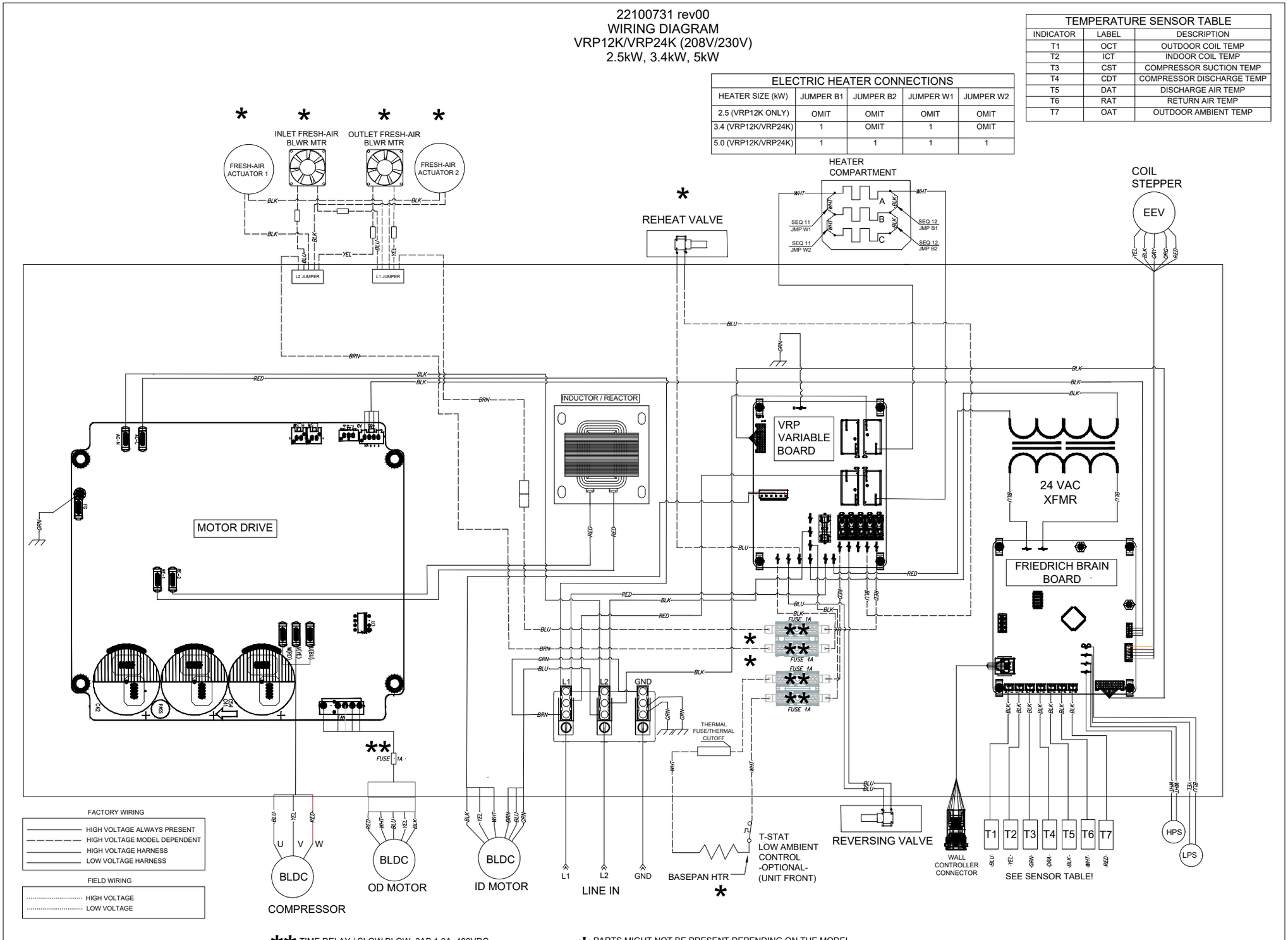
Figure 802 (Wiring Diagram)



WIRING DIAGRAMS

12K/24k BTU (230V 2.5, 3.4, & 5.0 kW)

Figure 803 (Wiring Diagram)

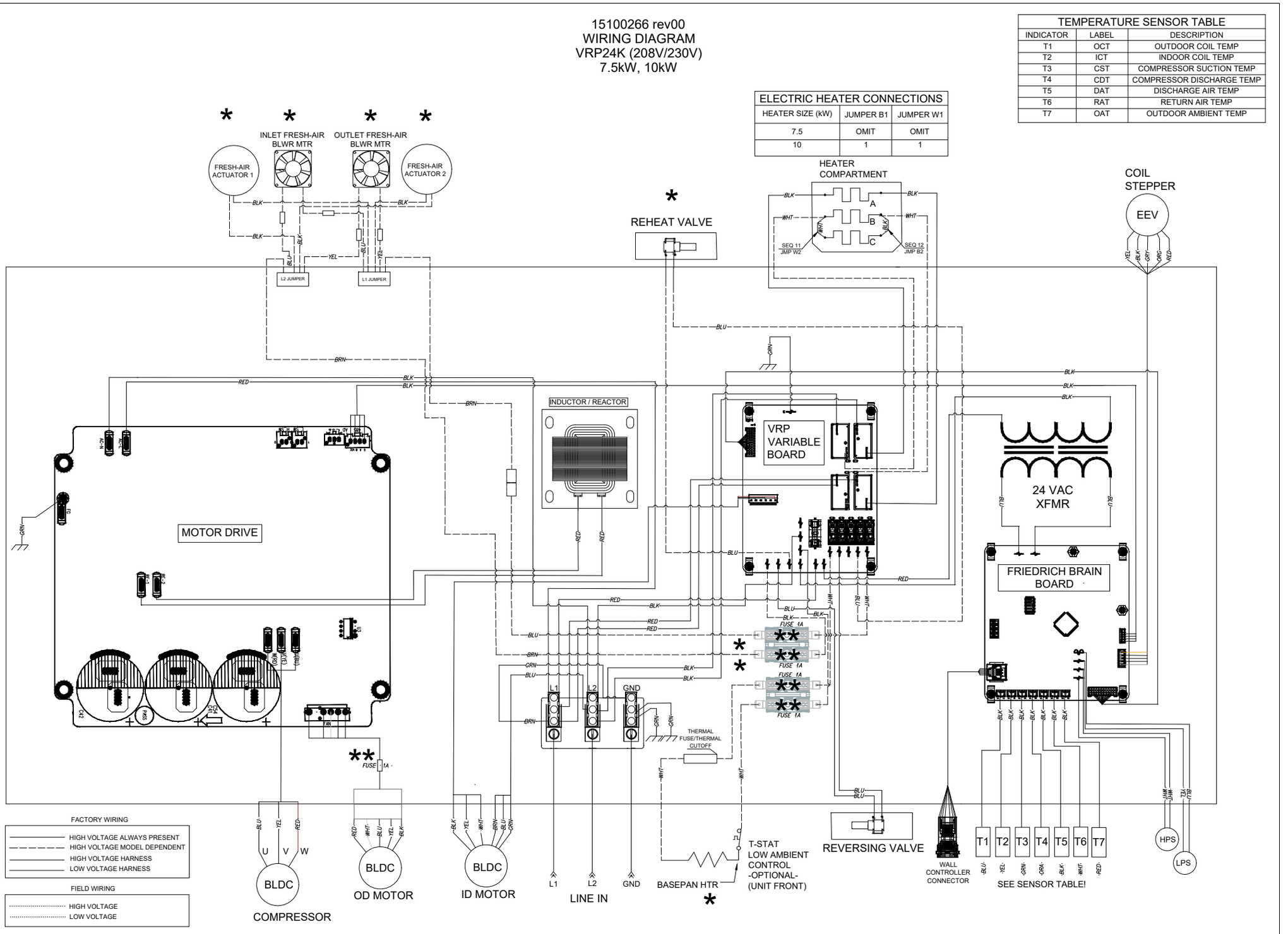


A

WIRING DIAGRAMS

24k (230v 7.5, 10 kW)

Figure 804 (Wiring Diagram)

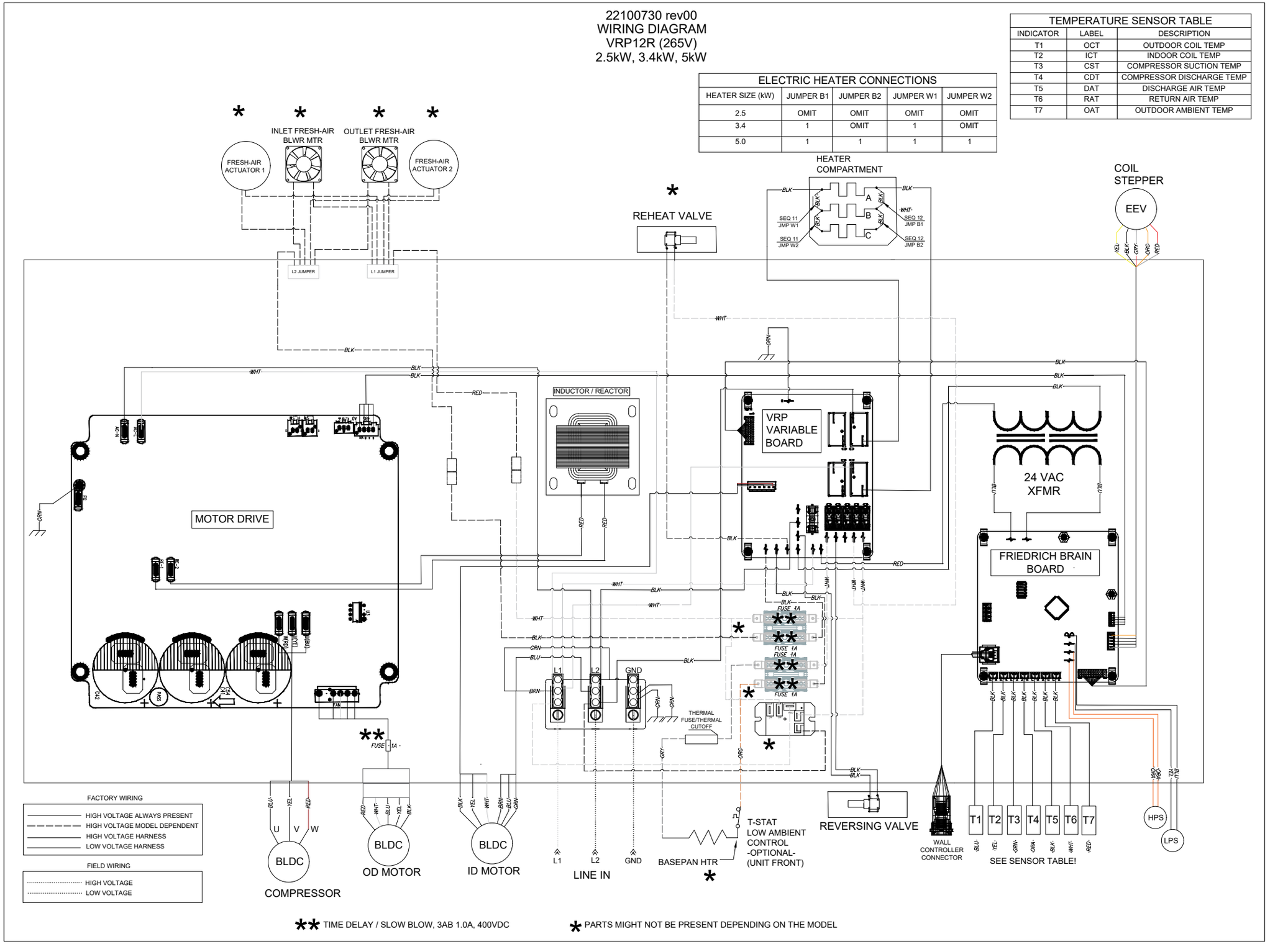


A

WIRING DIAGRAMS

12K BTU (265v 2.5, 3.4, & 5.0 KW)

Figure 805 (Wiring Diagram)



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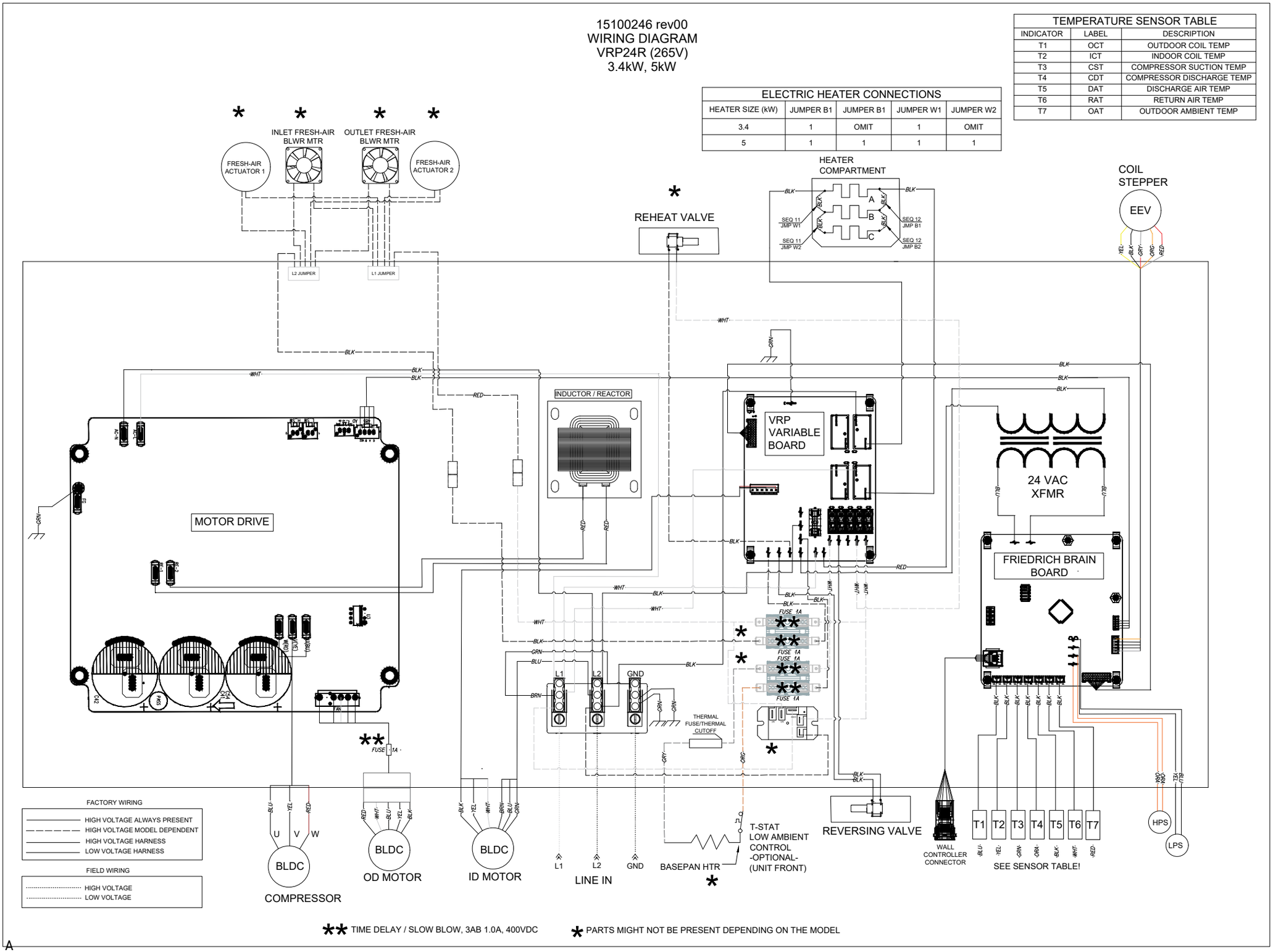
WIRING DIAGRAMS

24K BTU (265V 3.4 & 5 kW)

Figure 806 (Wiring Diagram)



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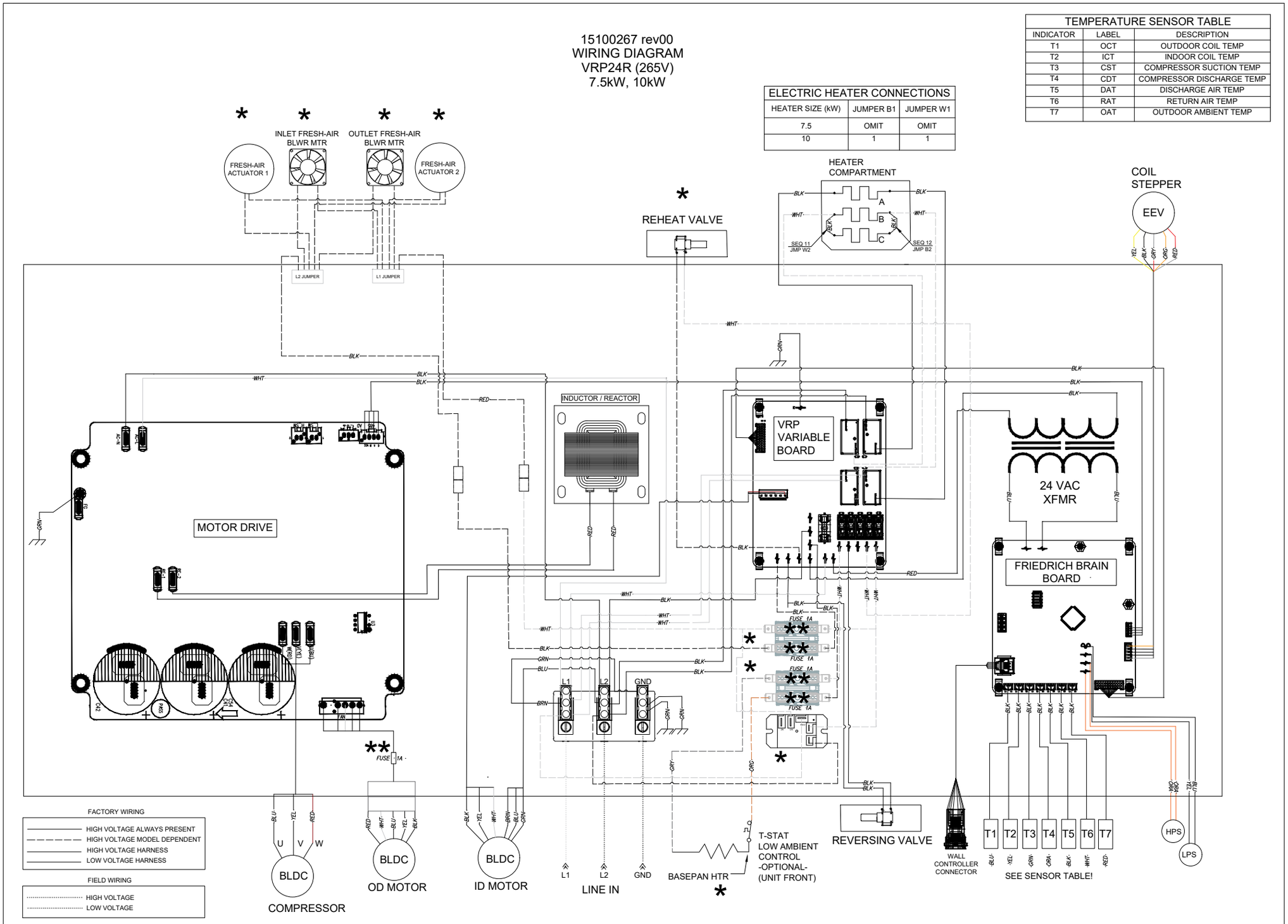
WIRING DIAGRAMS

24K BTU (265V 7.5 & 10 kW)

Figure 807 (Wiring Diagram)



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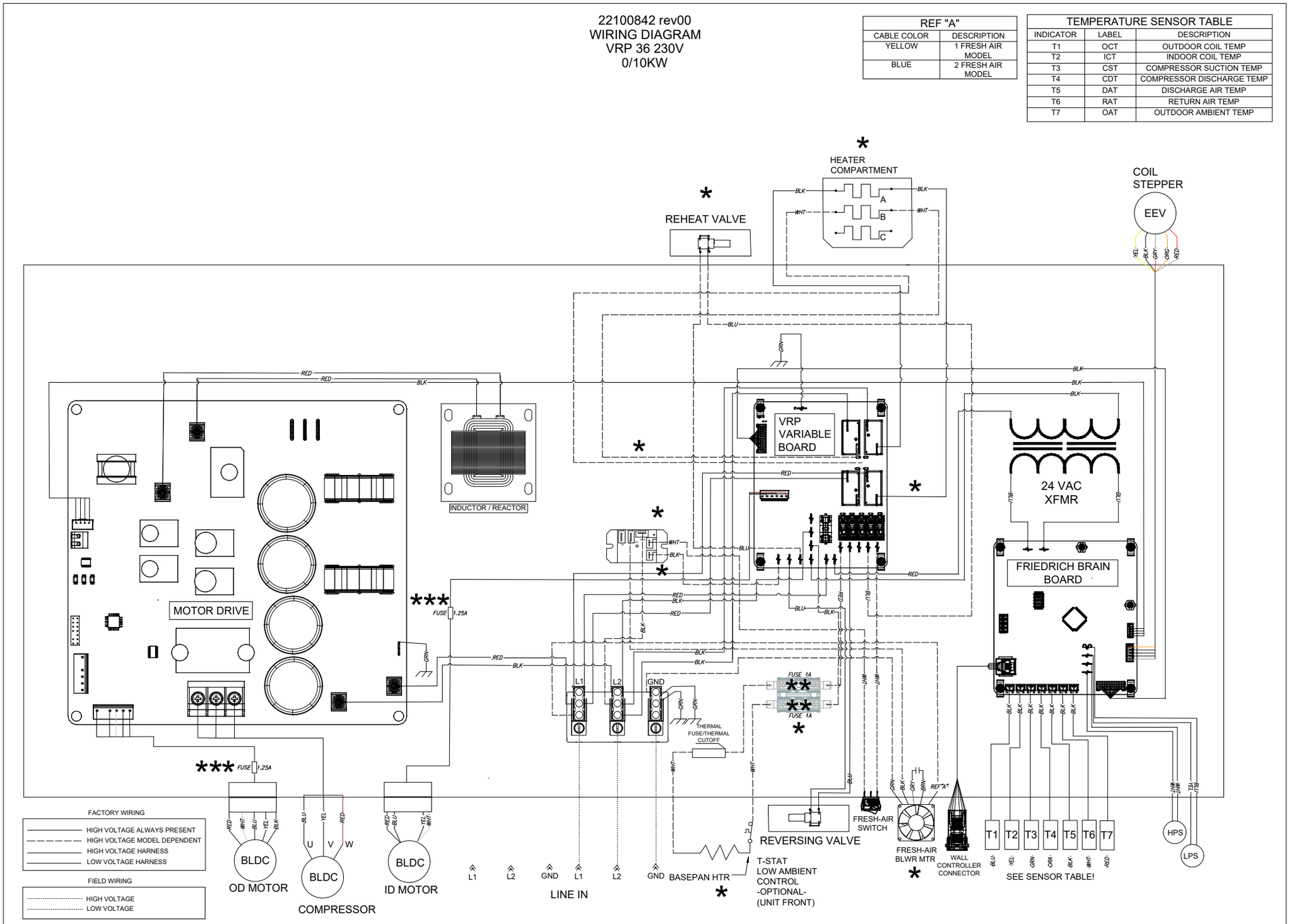
WIRING DIAGRAMS

36K BTU (230V 0 & 10 kW)

Figure 808 (Wiring Diagram)



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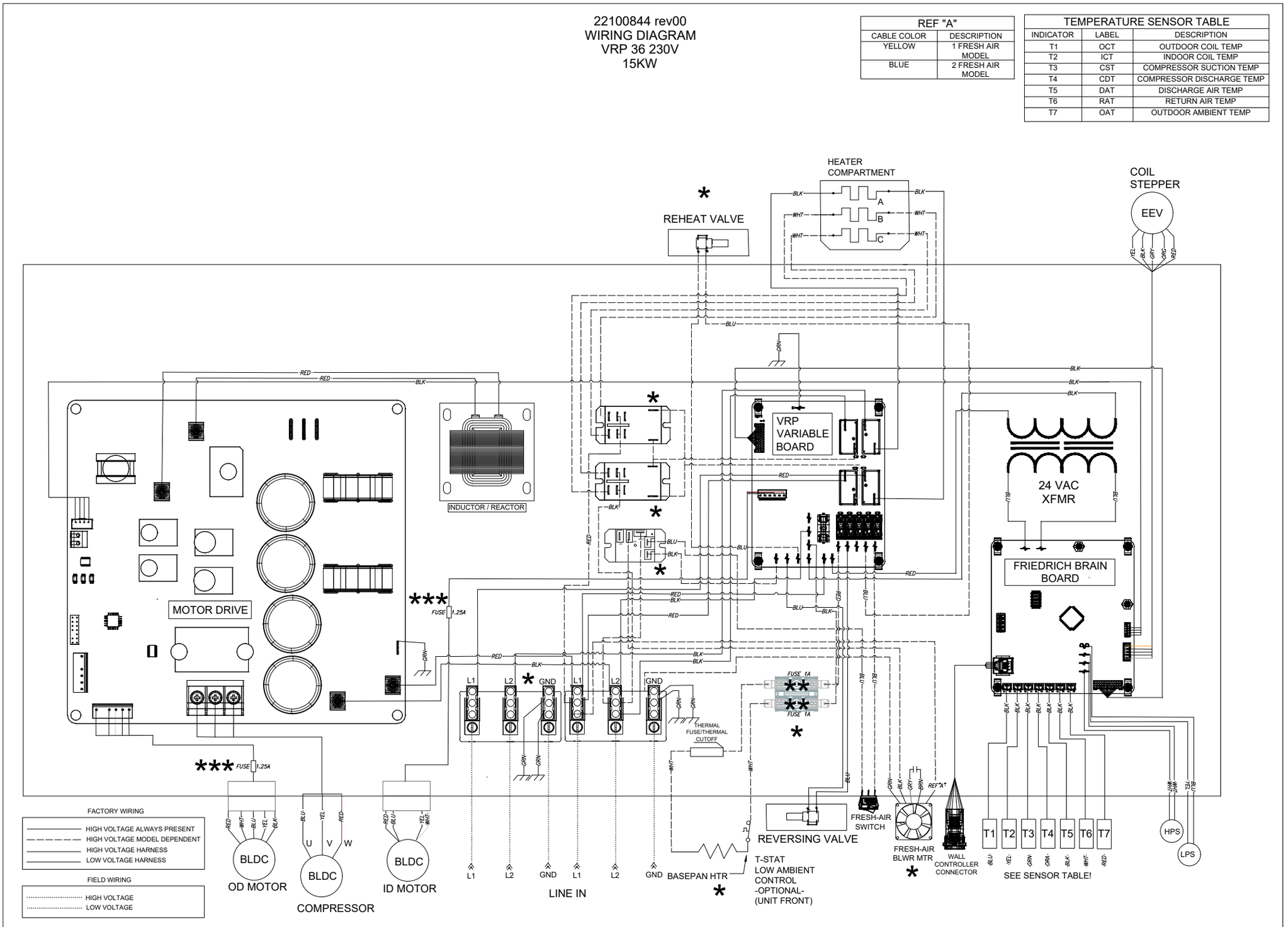
WIRING DIAGRAMS

36K BTU (230V 15 kW)

Figure 809 (Wiring Diagram)



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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 901 (Thermistor Values)

Sustainability

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