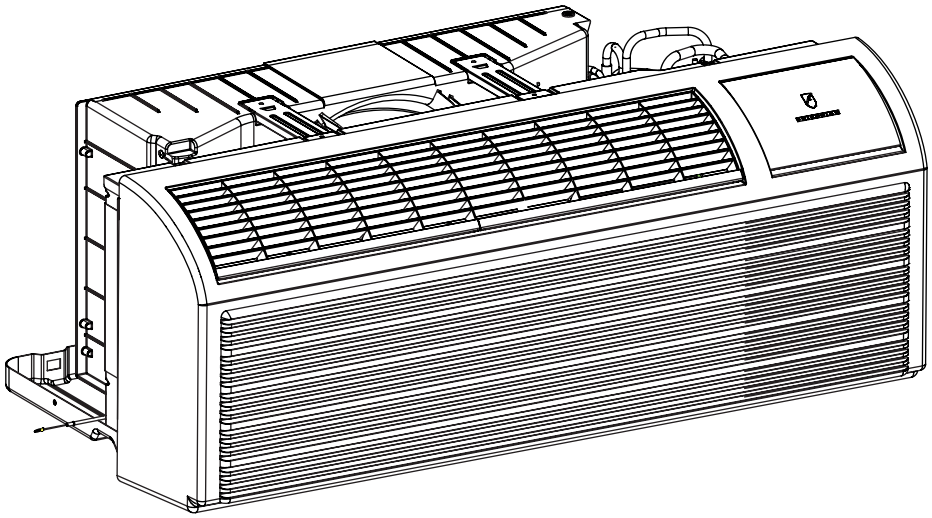
Service Manual

FRIEDRICH

Freshaire® R-410A Series PTAC Packaged Terminal Air Conditioners & Heat Pumps



Standard Chassis Models Using R-410A Refrigerant

9K	**PVH09K3FA, PVH09K3FB, PVH09R3FA, PVH09R3FB**
12K	**PVH12K3FA, PVH12K3FB, PVH12R3FA, PVH12R3FB**

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INTRODUCTION

Important Safety Information

The information in this manual is intended for use by a qualified technician who is familiar with the safety procedures required for installation and repair, and who is equipped with the proper tools and test instruments required to service this product.
Due to continuing research in new energy-saving technology, all information in this manual is subject to change without notice.

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

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

Your safety and the safety of others is very important.

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

This is a safety Alert symbol.
This symbol alerts you to potential hazards that can kill or hurt you and others.
All safety messages will 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.

⚠ WARNING

Refrigeration system under high pressure

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

Only certified refrigeration technicians should service this equipment.

R-410A systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.

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

INTRODUCTION

Personal Injury Or Death Hazards

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

⚠ WARNING

ALWAYS USE INDUSTRY STANDARD PERSONAL PROTECTIVE EQUIPMENT (PPE)

ELECTRICAL HAZARDS:

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

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Personal Injury Or Death Hazards

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

• PROPERTY DAMAGE HAZARDS

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

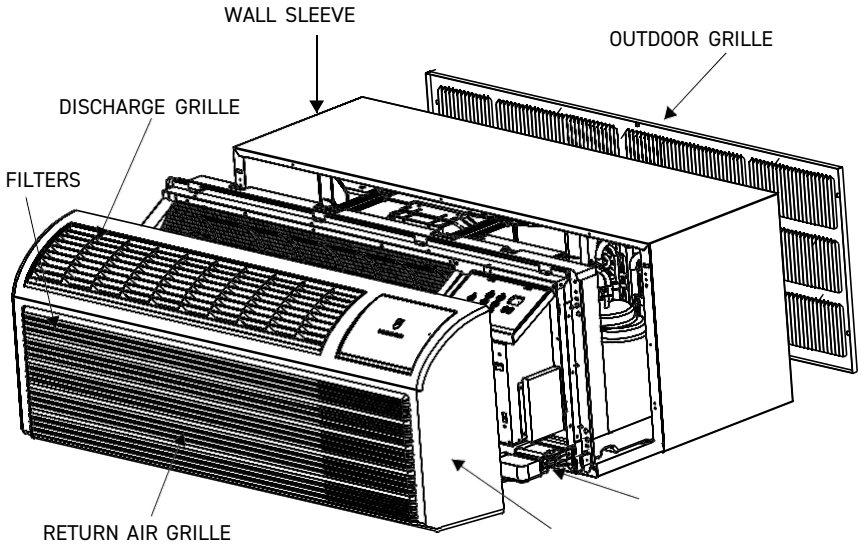
INTRODUCTION

Operation of Equipment in During Construction

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

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

Typical Unit Components and Dimensions



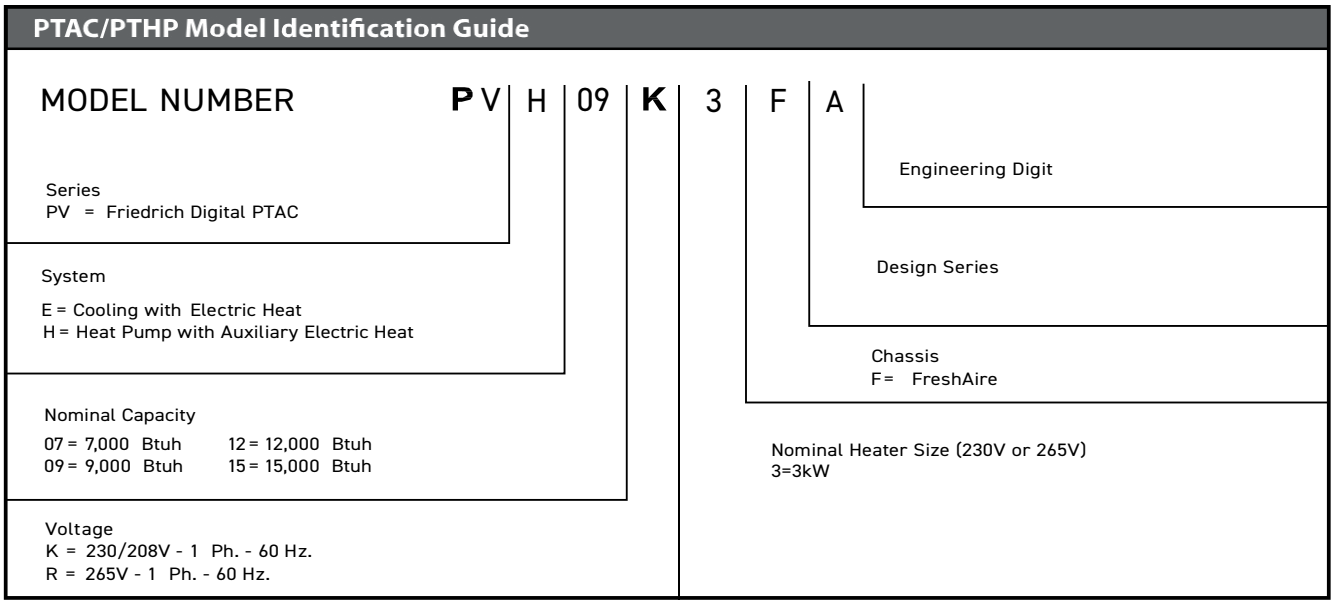
PDXWS Wall Sleeve
Dimensions: 16" H x 42" W x 13-¾" D
Front Cover Dimensions:
16" H x 42" W x 7-¾" D

Cut-Out Dimensions:
16-¼" x 42-¼"

INTRODUCTION

This service manual is designed to be used in conjunction with the installation and operation manuals provided with each air conditioning system.
This service manual was written to assist the professional service technician to quickly and accurately diagnose and repair malfunctions.
Installation procedures are not given in this manual. They are given in the Installation and Operation Manual which can be acquired on the Friedrich website (www.friedrich.com).

Model Number Reference Guide

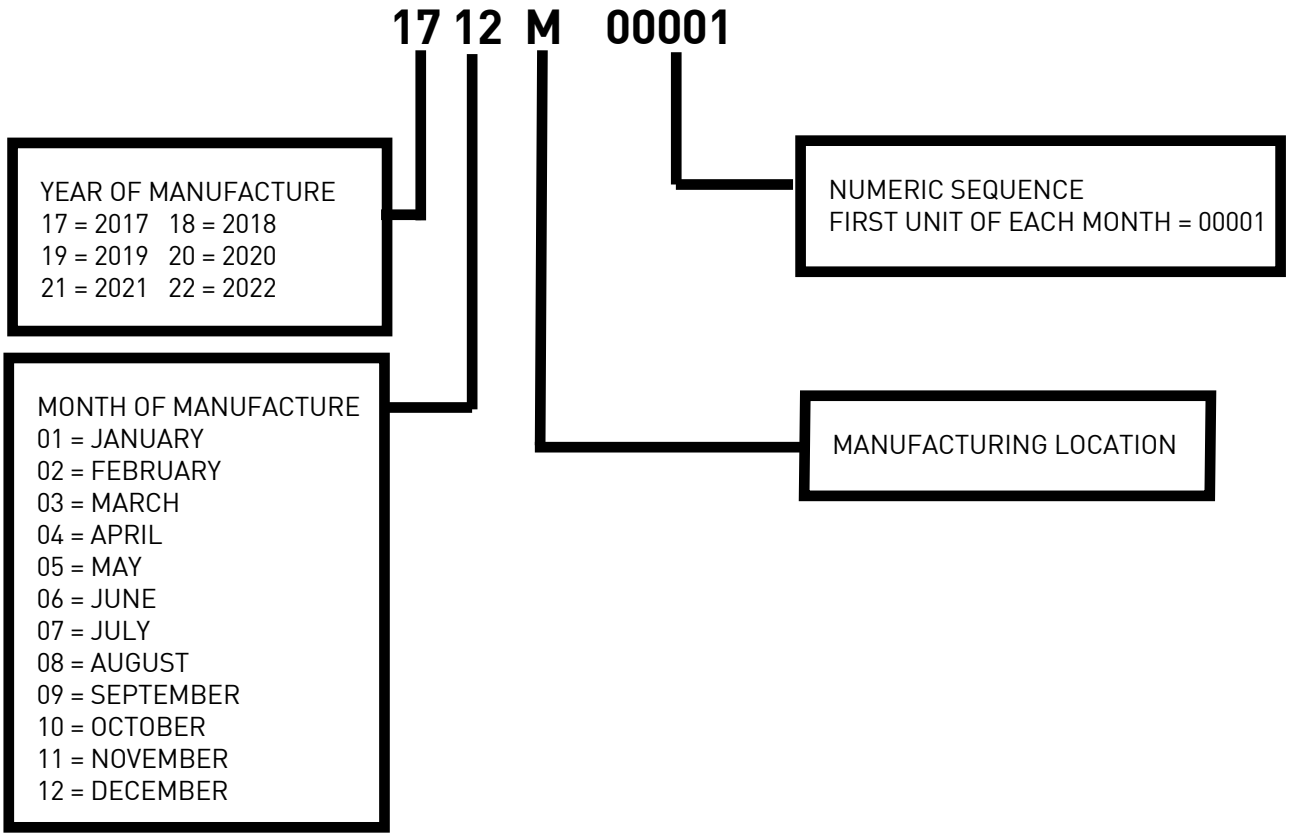


IMPORTANT: It will be necessary for you to accurately identify the unit you are servicing, so you can be certain of a proper diagnosis and repair.

Figure 103

INTRODUCTION

Serial Number Reference Guide



Refer to the Chart below for Serial Numbers beginning with an Alpha Sequence

PTAC Serial Number Identification Guide

SERIAL NUMBER	A	K	A	M	00001

YEAR MANUFACTURED

LJ = 2009 AE = 2015
AK = 2010 AF = 2016
AA = 2011 AG = 2017
AB = 2012
AC = 2013
AD = 2014

PRODUCTION RUN NUMBER

PRODUCT LINE
M = PRODUCT CODE

MONTH MANUFACTURED

A = Jan	D = Apr	G = Jul	K = Oct
B = Feb	E = May	H = Aug	L = Nov
C = Mar	F = Jun	J = Sep	M = Dec

Figure 104

INTRODUCTION

Product Features

ONLY TWO MODELS	With only two models in both 230/208V and two in 265V ranging from 6000btu – 17000btu, the FreshAire PTAC meets your needs without the complicated buying decisions.
BETTER DEHUMIDIFICATION	With longer run times, the indoor coil stays colder longer resulting in better overall dehumidification outside of standard conditions.
SOFT START OPERATION	With the benefit of an inverter compressor there is no longer a sudden and noisy start up of compressors. Compressor starts up slowly gradually ramping up to the required speed to control the conditioned space.
REMOTE THERMOSTAT OPERATION	Some applications require the use of a wall-mounted thermostat. All-new FreshAire® PTACs may be switched from unit control to remote thermostat control easily without the need to order a special model or accessory kit.
INTERNAL DIAGNOSTIC PROGRAM	The FreshAire® PTAC features a self-diagnostic program that can alert maintenance to component failures or operating problems. The internal diagnostic program saves properties valuable time when diagnosing running problems.
SERVICE ERROR CODE STORAGE	All FreshAire® PTAC units have self-diagnostic features that will store trouble codes in the case of an event. Storing the codes allows the property to see the trouble codes at a future time after the condition may have corrected.
ELECTRONIC TEMPERATURE LIMITING	By limiting the operating range, the property can save energy by eliminating “max cool” or “max heat” situations common with older, uncontrolled systems. The new electronic control allows owners to set operating ranges for both heating and cooling independently of one another.
ROOM FREEZE PROTECTION	When the PTAC senses that the indoor room temperature has fallen to 40˚F, the unit will cycle on the fan (high) and the electric strip heat to raise the room temperature to 46˚F, and then cycle off again. This feature works regardless of the mode selected and can be turned off. The control will also store the Room Freeze cycle in the service code memory for retrieval at a later date. This feature ensures that unoccupied rooms do not reach freezing levels where damage can occur to plumbing and fixtures.
CONDENSATE REMOVAL SYSTEM	Condenser fan utilizes slinger ring technology to pick up condensate from the base pan and disperse it on to the condenser coil where it evaporates. This helps to cool the coil and increase the energy efficiency of the unit.
SUPERIOR OPERATION AND CONTROL	Paired with Friedrich VRPXEMRT2 wired controller, or VRPXEMWRT2 wireless controller, designed for use with the FreshAire PTAC, maximizes full inverter compressor control, enhances humidity and dehumidification control, and optimizes comfort.
FRESHAIRE® IAQ	A full complement of Indoor Air Quality Products has been certified through installation and testing to ensure exceptional air quality is achieved when optional FreshAire IAQ accessories are added.

INTRODUCTION

Product Features

DIGITAL DEFROST THERMOSTAT	The PV-Series uses a digital thermostat to accurately monitor the outdoor coil conditions to allow the heat pump to run whenever conditions are correct. Running the PTAC in heat pump mode saves energy and reduces operating costs. The digital thermostat allows maximization of heat pump run time.
INSTANT HEAT HEAT PUMP MODE	Heat pump models will automatically run the electric heater to quickly bring the room up to temperature when initially energized, then return to heat pump mode. This ensures that the room is brought up to temperature quickly without the usual delay associated with heat pump units.
EVEN HEAT CONTROL	With the Inverter control, the FreshAire® PTAC will adjust capacity to better satisfy the space and the demand requirement.
SEPARATE HEAT/COOL FAN CYCLE CONTROL	The owner may choose between fan cycling or fan continuous mode based on property preference. (Note: Even heat monitoring and quiet start/stop fan delay only operate in fan cycle mode) Fan continuous mode is used to keep constant airflow circulation in the room during all times the unit is 'ON'. Fan cycle will conserve energy by only operating the fan while the compressor or electric heater is operating. The ability to set the fan cycling condition independently between heating and cooling mode will increase user comfort by allowing the choice of only constantly circulating air in the summer or winter time (unlike other PTAC brands that only allow one selection).
EMERGENCY HEAT OVERRIDE	In the event of a compressor failure in heat pump mode, the compressor may be locked out to provide heat through the resistance heater. This feature ensures that even in the unlikely event of a compressor failure, the room temperature can be maintained until the compressor can be serviced.
CENTRAL DESK CONTROL READY	All Friedrich PTACs have low voltage terminals ready to connect a central desk control energy management system. Controlling the unit from a remote location like the front desk can reduce energy usage and requires no additional accessories on the PTAC unit.
INDOOR COIL FROST SENSOR	The frost sensor protects the compressor from damage in the event that airflow is reduced or low outdoor temperatures cause the indoor coil to freeze. When the indoor coil reaches 30°F, the compressor is disabled and the fan continues to operate based on demand. Once the coil temperature returns to 45°F, the compressor returns to operation.
ULTRAQUIET AIR SYSTEM	The PV-Series units feature an indoor fan system design that reduces sound levels without lowering airflow or preventing proper air circulation.
INVERTER HIGH EFFICIENCY	The FreshAire® PTAC has been engineered using the latest Inverter technology to provide the highest EERs in the part load hours of cooling/heating.
DUAL MOTOR	The dual-motor design means that the indoor motor can run at slower speeds which reduces sound levels indoors.
INVERTER ROTARY COMPRESSOR	High-efficiency, inverter rotary compressors are used on the FreshAire PTAC to maximize durability and efficiency.
TOP-MOUNTED WASHABLE AIR FILTERS	All Friedrich PTAC return air filters are washable, reusable and easily accessed from the top of the unit without the removal of the front cover.
MERV 8 FILTERED CONDITIONED FRESH AIR	The FreshAire® PTAC meets ASHRAE 62.1 for conditioned air intake, providing up to 52 CFM of conditioned air into the space. Air is filtered through a Merv 8 replaceable filter to prevent debris from entering the air stream.
R-410A REFRIGERANT	Friedrich PTAC units use environmentally-friendly refrigerant.
2-SPEED FRESHAIRE INTAKE FAN	Maximizes operational control of the make-up air system ensuring a more comfortable indoors
RS-485 COMMUNICATION PLUG	Enables a better balanced communication signal which allows the FreshAire® PTAC to communicate fully with the VRPXEMRT2 12V wired controller, or VRPXEMWRT2 wireless controller, allowing full variable control of the inverter compressor and brings access to our feature rich energy management suite of options including room occupancy.

SPECIFICATIONS

General Specifications 9-12k Heat Pump Models

PVH Series Cooling with Heat Pumps					
Model		PVH09K	PVH12K	PVH09R	PVH12R
PERFORMANCE DATA:					
Cooling Capacity	Btu	9600/9400	12000/11800	9600	12000
Cooling Capacity Min./Max	Btu	6462-12099	7929-17142	6462-12099	7929-17142
Cooling	Watts	790/775	1040/1025	800	1040
Energy Efficiency Ratio	EER	12.1/12.1	11.5/11.5	12.0	11.5
Reverse Heating Capacity	Btu	8200/8500	11600/11800	8500	11800
Reverse Heating Capacity Min./Max.	Btu	5606-11475	6995-16187	5606-11475	6995-16187
Heating	Watts	710/685	970/950	710	970
COP		3.51/3.51	3.57/3.58	3.51	3.57
Moisture Removal	Pts./Hr.	1.4	1.9	1.23	2.43
Sensible Heat Ratio		80%	78%	82.7%	73.7%
ELECTRICAL DATA:					
Voltage (1 PHASE, 60 Hz)		230/208	230/208	265	265
Operational Voltage Range		253-187	253-187	292-239	292-239
Current	Amps	4.4/4.5	4.5/5.0	3.8	4.7
Reverse Heat	Amps	4.0/4.1	4.6/4.9	3.6	4.3
Power Factor		0.80	0.96	0.82	0.90
Compressor LRA		N/A	N/A	N/A	N/A
Compressor RLA		3.2	4.1	4.2	6.2
Outdoor Fan Motor	HP	1/14	1/12	1/14	1/12
AIRFLOW DATA:					
Indoor CFM, HIGH		400	470	400	470
Indoor CFM, LOW		250	360	290	360
Make-up Air CFM@0.05" wc		52	52	52	52
PHYSICAL DATA:					
Sleeve Dimensions H x W x D		16" x 42" x 13 3/4" (all models)			
Dimensions with front H x W x D		16" x 42" x 21" (all models)			
Cut Out Dimensions H x W		16 1/4"x 42 1/4" (all models)			
Net Weight	Lbs.	115	120	115	120
Shipping Weight	Lbs.	137	142	137	142
R-410A Charge	Oz.	30.34	32.80	32.1	32.8

Figure 202 (General Specs)

SPECIFICATIONS

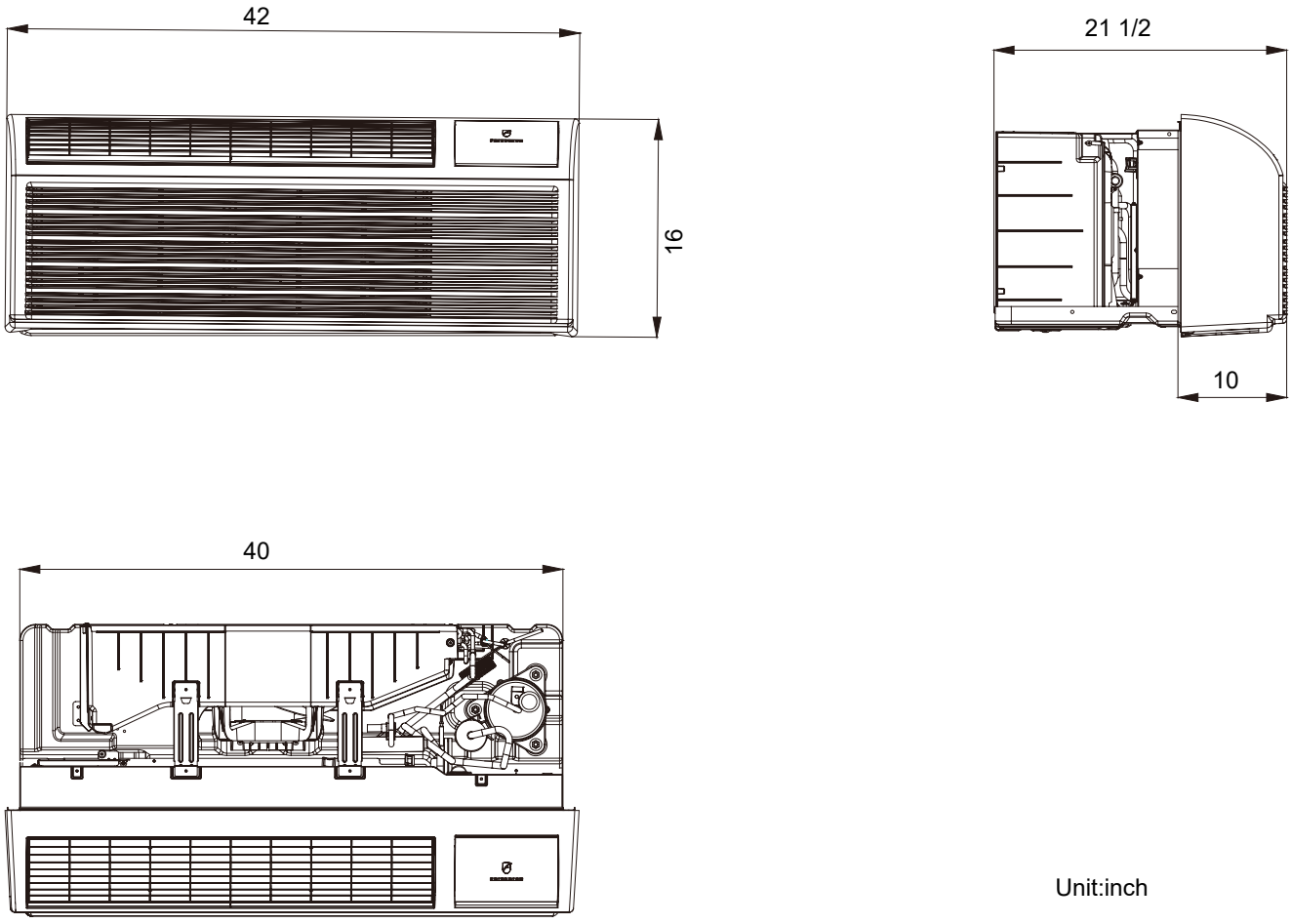
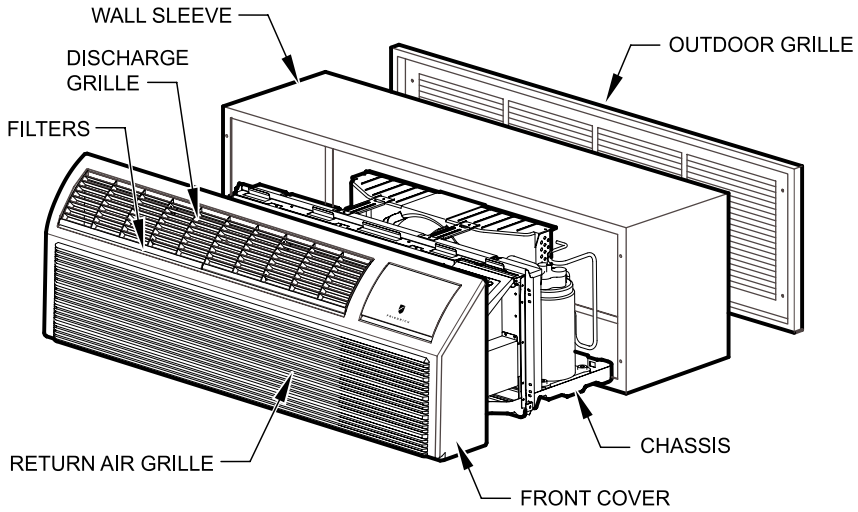


Figure 205 (Chassis Specs)



PDXWS Wall Sleeve Dimensions:
16" H x 42" W x 13-¾" D

Front Cover Dimensions:
16" H x 42" W x 7-¾" D

Cut-Out Dimensions:
16-¼" x 42-¼"

Figure 206 (Typical Unit Components and Dimensions)

SPECIFICATIONS

Electrical Data

All 230/208 volt units are equipped with LCDI power cords.

All 265 volt units are equipped with non-LCDI power cords.

NOTE: Use Copper Conductors ONLY. Wire sizes are per NEC, check local codes for overseas applications.

NOTE: Use on single dedicated circuit within specified amperage rating.

Table 1 RECEPTACLES AND FUSE TYPES

Voltage	230V			265V		
Amps	15	20	30	15	20	30
Heater Size	2.5 kW	3.5 kW	5.0 kW	2.5 kW	3.5 kW	5.0 kW
Receptacles						
NEMA# Receptacle	6-15R	6-20R	6-30R	7-15R	7-20R	7-30R
NEMA# Plug	6-15P	6-20P	6-30P	7-15P	7-20P	7-30P

⚠WARNING

Electrical Shock Hazard

Turn off electrical power before service or installation.

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, personal injury and/or death.

FUSE/CIRCUIT BREAKER	Use ONLY type and size fuse or HVAC/R circuit breaker indicated on unit's rating plate. Proper current protection to the unit is the responsibility of the owner. NOTE: A time delay fuse is provided with 265V units.
GROUNDING	Unit MUST be grounded from branch circuit through service cord to unit, or through separate ground wire provided on permanently connected units. Be sure that branch circuit or general purpose outlet is grounded. The field supplied outlet must match plug on service cord and be within reach of service cord. Refer to Table 1 for proper receptacle and fuse type. Do NOT alter the service cord or plug. Do NOT use an extension cord.
RECEPTACLE	The field supplied outlet must match plug on service cord and be within reach of service cord. Refer to Table 1 for proper receptacle and fuse type. Do NOT alter the service cord or plug. Do NOT use an extension cord.

B. Power Cord Information (230/208V models only)

All Friedrich 230/208V PTAC units are shipped from the factory with a Leakage Current Detection Interrupter (LCDI) equipped power cord. The LCDI device meets the UL and NEC requirements for cord connected air conditioners effective August 2004.

To test your power supply cord:

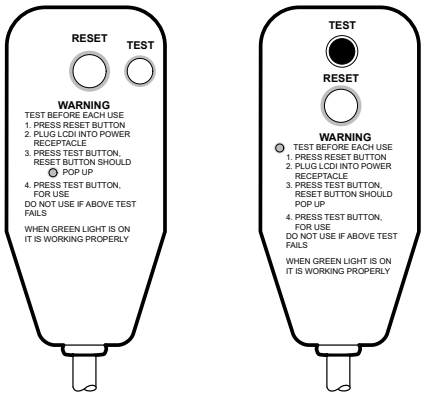
1. Plug power supply cord into a grounded 3 prong outlet.
2. Press RESET.
3. Press TEST (listen for click; Reset button trips and pops out).
4. Press and release RESET (listen for click; Reset button latches and remains in). Check that the green LED indicator is on. The power supply cord is ready for operation.

NOTE: The LCDI device is not intended to be used as a switch.

Once plugged in the unit will operate normally without the need to reset the LCDI device.

If the LCDI device fails to trip when tested or if the power supply cord is damaged it must be replaced with a new supply cord obtained from the product manufacturer, and must not be repaired.

Figure 14
Typical LCDI Devices



15/20A LCDI Device **30A LCDI Device**

FRP014

SPECIFICATIONS

Electrical Data

203/208 Electric Heater Rating (Configuration Based on Power Cord0				
POWER CORD	VOLTAGE	BRANCH CKT AMPS	MCA	WATTS
PXPCFA23015A	230/208	15	13.9	2500
PXPCFA23020A	230/208	20	19.9	3600
PXPCFA23030A	230/208	30	27.5	5000
PXPCFA26515A	265V	15	12.0	2500
PXPCFA26515A1	265V	15	7.3	1500
PXPCFA26520	265V	20	16.8	3500
PXPCFA26530	265V	25	23.8	5000

TABLE 2					
MODEL	HEATER kW	Power Cord Kit	Voltage	Amperage	Receptacle
PVH09K	2.5(optional)	PXPCFA23015	230/208	15	NEMA 6-15r
	3.5(default)	PXPCFA23020	230/208	20	NEMA 6-20r
PVH12K	1.5(optional)	PXPCFA23015	230/208	15	NEMA 6-15r
	3.5(default)	PXPCFA23020	230/208	20	NEMA 6-20r
	5.0(optional)	PXPCFA23030	230/208	30	NEMA 6-30r
PVH09R	2.5(optional)	PXPCFA26515	265/277	15	NEMA 7-15r
	3.5(default)	PXPCFA26520	265/277	20	NEMA 7-20r
PVH12R	1.5(optional)	PXPCFA26515	265/277	15	NEMA 7-15r
	3.5(default)	PXPCFA26520	265/277	20	NEMA 7-20r
	5.0(optional)	PXPCFA26530	265/277	30	NEMA 7-30r

Electrical Wiring for 265 Volt Models

Power Cord Installation

All 265V PTAC/PTHP units come with a factory installed non-LCDI power cord for use in a subbase. If the unit is to be hard-wired refer to the instructions below.

NOTE: It is recommended that the PXSB subbase assembly, the PXCJA conduit kit (or equivalent) be installed on all hardwire units. If installing a flush-floor mounted unit, make sure the chassis can be removed from the sleeve for service and maintenance.

⚠WARNING

Electrical Shock Hazard

Turn off electrical power before service or installation.
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, personal injury and/or death.

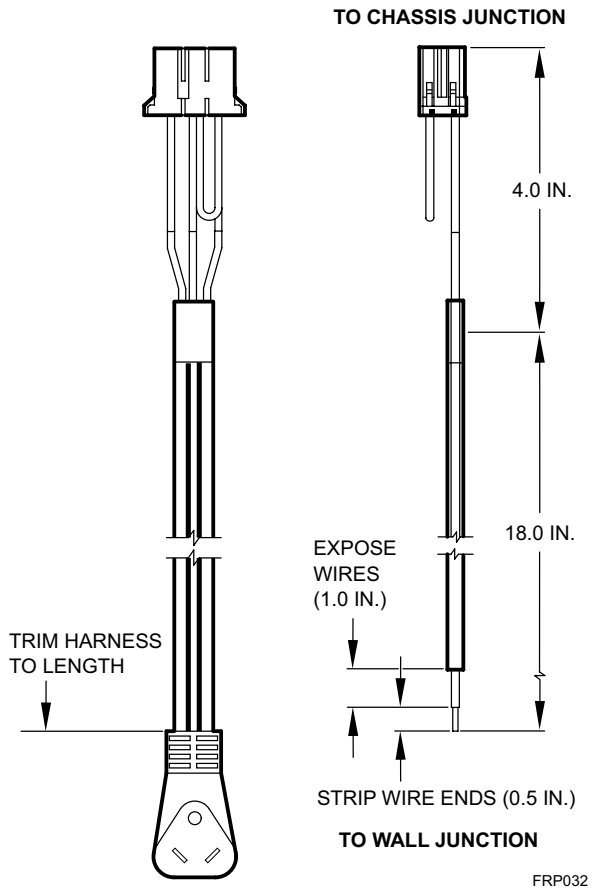
To install the line voltage power leads and conduit to chassis, follow the instructions below and refer to Figures 25-27 on page 19. PXCJA Conduit Kit is required with this setup.

1. Follow the removal process of the chassis's junction box (Figure 25).
2. Prepare the 265V (or 230V) power cord for connection to the chassis' power cord connector by cutting the cord to the appropriate length (refer to Figure 26 and follow Figure 15). Power cord harness selection shown on Table 2

SPECIFICATIONS

Electrical Data

Figure 15



3. Route the cut ends of harness through the conduit connector assembly and flex conduit sleeve. Be sure to use the supplied conduit bushing to prevent damage to the cord by the conduit. The cord should pass through the Locknut, Spacer, Chassis Junction Box, Conduit Connector, Bushing, then the Conduit Sleeve. See Figure 17.
4. Route the cut ends of the power cord through the elbow connector at the other end of the conduit. Tighten screws on elbow connector to secure conduit sleeve.
5. Fasten and secure the elbow connector to the wall junction box cover with locknut. Place and mount the wall junction box with the four wall mounting screws making sure to pass the wall lines through the junction box. Connect and join all wall lines with the stripped ends using wire nuts. Tighten both screws of the wall junction box cover to junction box.
6. Follow steps 4-6 and refer to Figure 27.

Figure 16

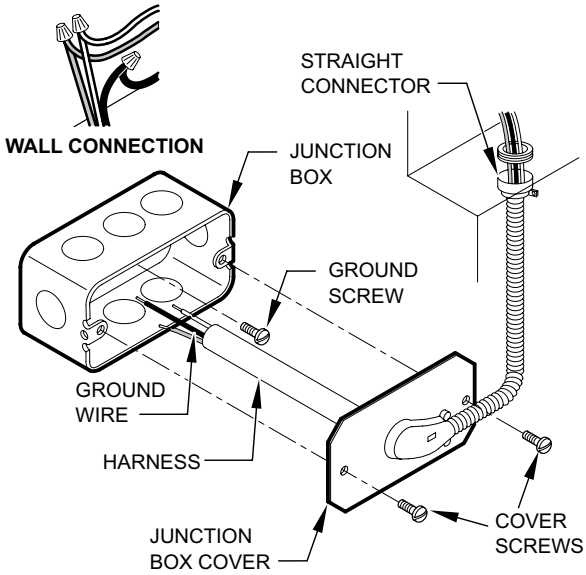
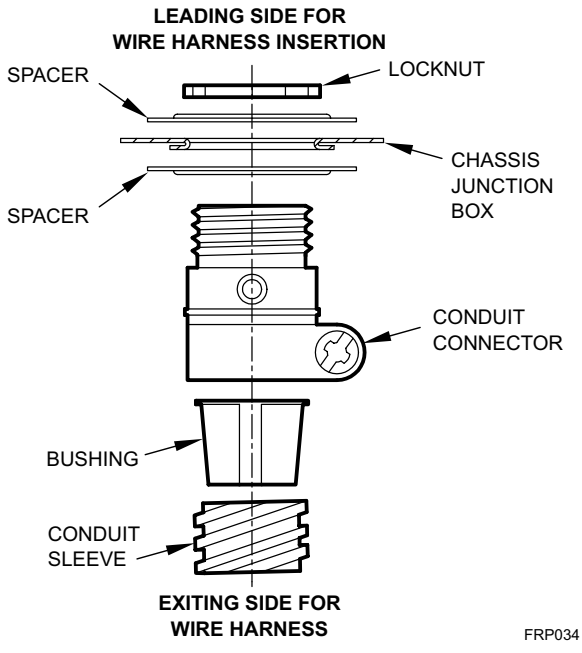


Figure 17



OPERATION

Function and Control
Buttons and Display

1) Buttons

There are ON/OFF, UP, DOWN, HEAT, COOL, CONSTANT FAN and fan speed of HIGH, LOW, AUTO buttons.

1. ON/OFF: Press to turn power on or off to the unit.
2. COOL, HEAT: choose the mode of operation
3. HIGH, LOW, AUTO: choose the fan speed.
4. UP, DOWN: Adjust the setting temperature , default: 60-90°F(16~32°F).

2) Dual 8 Digital Tube Displayer and LED

Two 8 digital tube and 7 LEDs (ON/OFF, HIGH, LOW, AUTO, HEAT, COOL, CONSTANT FAN)

1. Mode LED display: when the unit is running in a certain mode, the corresponding LED is lit up.
2. ON/OFF LED: at ON status, the LED is lit up.
3. CONSTANT FAN LED: when this function is enabled, the LED is lit up.
4. Fan speed LED: when the unit is running at HIGH, LOW or AUTO fan speed, the corresponding LED is lit up.
5. Dual 8 digital tube displayer: normally, it displays the indoor ambient temperature. When the UP/DOWN button is pressed it displays the setting temperature. When some error occurs, it displays the ERROR CODE.

Temperature Definition

Indoor setting temperature (Ts)
Indoor ambient temperature (T1)
Indoor coil temperature (T2)
Outdoor coil temperature (T3)
Outdoor ambient temperature (T4)
Compressor discharge temperature (T5)
Indoor outlet air temperature (T6)

System Basic Function

Once the compressor starts, the compressor won't stop with the change of the indoor temperature. Once the compressor stops, it can only start after a 3 mins delay. (The compressor can stop immediately at the time of mode switchover, turning off the unit, adjusting setting temperature and turning off from a function error.) Depending on the different ambient temperatures and setting temperatures, the compressor runs at different frequencies to achieve the best energy savings and comfort. This is the advantage over traditional A/C compressors.

1) Cooling Mode

Working conditions and process for cooling:

When Indoor ambient temperature ≥Indoor setting temperature +2°F(1°C), cooling turns on.
When Indoor ambient temperature ≤Indoor setting temperature -2°F(1°C), cooling turns OFF.
When Indoor setting temperature - 2°F(1°C)<Indoor ambient temperature <Indoor setting temperature + 2°F(1°C), the unit keeps previous running status.

Indoor fan control in cooling mode:

The indoor fan will run synchronously with cooling demand. During no demand period if the CONSTANT FAN button is turned off, it will run for 30s and then turn off..When CONSTANT FAN is ON, it will always be running.

Outdoor fan control in cooling mode:

The outdoor fan has two speeds, low and high. When Outdoor ambient temperature is above 80°F, the fan operates in high speed.
When Outdoor ambient temperature drops to 77°F the fan operates in low speed.

2) Heating Mode

Working conditions and process for heating:

When Indoor ambient temperature ≤Indoor setting temperature -2°F(1°C), the unit is running in heating mode. The heat pump or electric heating will start depending on the ambient temperature condition
When Indoor ambient temperature ≥Indoor setting temperature + 4°F(2°C), the heating is turned OFF.
When Indoor setting temperature -2°F(1°C) <Indoor ambient temperature <Indoor setting temperature +

OPERATION

Function and Control

4°F(2°C), the unit keeps at the previous running status.
Electric heater does not work with heat pump at the same time.
When Outdoor ambient temperature >44°F 7°C, unit will run heat pump all the time.
When 32°F < Outdoor ambient temperature < 44°F, unit will run in electric heating mode to meet the first cycle demand. From the second cycle on, heat pump will operate.
When Outdoor ambient temperature ≤32°F, the E-heater will operate exclusively.
During heat pump mode, once Outdoor coil temperature freezes to 5°F, or any fault occurs, unit will switch over to electric heating mode.

Outdoor fan control in heat pump mode:

When Outdoor ambient temperature is above 57°F, outdoor fan runs at low speed to lower the noise;
When Outdoor ambient temperature drops to 53°F, outdoor fan runs at high speed, in order to ensure the heating capacity.

Electric heating mode:

The unit is equipped with a universal E-heater, which contains two independent heating elements. The 20A heater incorporates a 2.5kW and a 1.0kW element. The 30A heater incorporates a 3.5kW and a 1.5kW element.

Power Cord Selection

Use the appropriate power cord for each heating configuration as shown in the table below.

Power Cord	15A	20A	30A
9K BTU Unit	2.5kW	3.5kW	N/A
12k BTU Unit	1.5kW	3.5kW	5kW

Indoor fan control in heating mode:

The indoor fan will run synchronously with the heating demand. During no demand period, it will run for 30s (heat pump) or 1 min (E-heating) after CONSTANT FAN button is turned off, then turns OFF. When CONSTANT FAN is ON, it will always run.

Defrost

In heat pump mode, if the compressor runs continuously for over 30 minutes and Outdoor coil temperature < 26°F, or runs continuously for 90 minutes and Outdoor coil temperature <32°F the unit will enter defrost stage. Indoor fan will shut down. After the defrosting cycle is finished, the unit turns to E-heating for the first cycle to heat up quickly.

3) Room Freeze Protection (AUTO HEATING)

This is valid only in standby mode. The dual 8 digital tube displays "L0".
Entry condition: #5 DIP SWITCH is set to ON to enable the indoor freeze protection and the main board detects the indoor ambient temperature is lower than 50°F(10°C) for 3 consecutive minutes.
Quitting condition: When indoor ambient temperature rises to 55 °F(13°C), the heating will stop.

4) Temperature Sensor Open Circuit or Short Circuit Protection

If the temperature sensor has an open circuit or a short circuit, the ERROR CODE will display on the digital tube. If the malfunction of the temperature sensor is detected for 30 seconds, the unit will turn off.

5) Power cut protection

After power cut recovery, unit will have a time delay of 2 to 4 minutes to restart E-heating. The DC-inverter soft start compressor will restart after 3 mins.

6) Compressor and DC-inverter features

The DC-inverter compressor has a high efficiency rating and energy savings can be 30% to 80%. Operation voltage range is 160VAC~270VAC, making the unit operation more stable under a wider voltage range power input. With its soft start feature, power surges can be avoided, and also lower the noise level. Without the frequent start-stop, room temperature will be more stable and more comfortable.

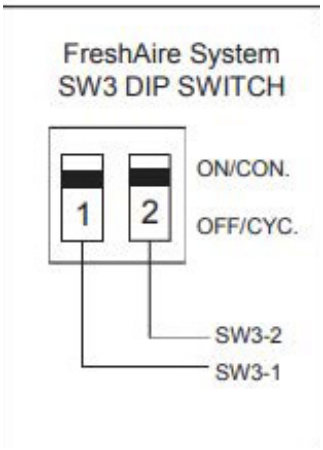
The high performance IPM contains a PFC module and under heavy loading PF can be up to 99%, thus decreases EMI pollution to power supply system, and also decreasing power surges.
The compressor driver chip is high performance, making the compressor more stable and reliable.

OPERATION

Function and Control

7) Smart fresh air system

The control logic as the below table 1 and table2 , the DIP switch is SW3 on the main board.



DIP switch SW3 function			
Freshaire System	"Engagement Method"	Mode	Description
	Sw3 Dip Switch 1	ON/ OFF	FA fan runs only when Dip Switch is set to "ON"
			FA fan NEVER RUNS when Dip Switch is set to "OFF"
	Sw3 Dip Switch 2	Cycle/ Continuous	FA fan cycles On/ Off with the unit indoor fan when Dip Switch 1 is set to "ON" & Dip Switch 2 is se to "Cycle"
			"FA fan runs continuously when Dip Switch 1 is set to ""ON"" & Dip Switch 2 is set to ""Continuous"""

Relationship Between Inputs and Outputs						
INPUTS			OUTPUT			
FreshAir Mode		"24V wall Therm ostat"	In Demand		No Demand	
Enable	Continuous	"ID Fan Speed Selection"	ID Fan Operation	"Fresh-Air Fan Operation"	ID Fan Operation	"Fresh-Air Fan Operation"
YES	NO	High	High	ON	High	ON
		low	low		low	
		Auto	Auto		OFF	OFF
	YES	High	High		High	O N
		low	low		low	
		Auto	Auto		low	
NO	NO	High	High	OFF	High	OFF
		low	low		low	
		Auto	Auto		OFF	
	YES	High	High		High	
		low	low		low	
		Auto	Auto		OFF	

OPERATION

Function and Control

Relationship Between Inputs and Output by 24V Wall Thermostat						
INPUTS			OUTPUT			
FreshAire Mode		"24V wall Thermostat"	In Demand		No Demand	
Enable	Continuous	"ID Fan Speed Selection"	ID Fan Operation	"Fresh-Air Fan Operation"	ID Fan Operation	"Fresh-Air Fan Operation"
YES	NO	High	High	ON	High	ON
		low	low		low	
		Auto	Auto		OFF	OFF
	YES	High	High		High	O N
		low	low		low	
		Auto	Auto		low	
NO	NO	High	High	OFF	High	OFF
		low	low		low	
		Auto	Auto		OFF	
	YES	High	High		High	
		low	low		low	
		Auto	Auto		OFF	

Relationship Between Inputs and Output by 12V Wall Thermostat						
INPUTS			OUTPUT			
FreshAire Mode		"12V wall Thermostat"	In Demand		No Demand	
Enable	Continuous	"ID Fan Speed Selection"	ID Fan Operation	"Fresh-Air Fan Operation"	ID Fan Operation	"Fresh-Air Fan Operation"
YES	NO	High	High	ON	High	ON
		low	low		low	
		Auto	Low		OFF	OFF
	YES	High	High		High	ON
		low	low		low	
		Auto	Low		low	
NO	NO	High	High	OFF	High	OFF
		low	low		low	
		Auto	Low		OFF	
	YES	High	High		High	
		low	low		low	
		Auto	Low		OFF	

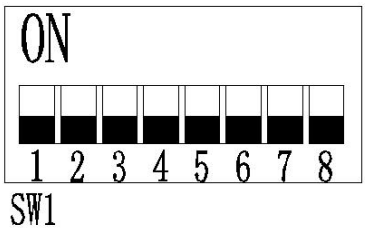
Return to Basic Troubleshooting

OPERATION

Function and Control

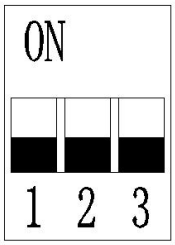
Advanced Functions

1) DIP Switch Function [after reprogramming, disconnect the power cord and wait 2 minutes for the electronic components (capacitors/resistors) to cool down or bleed off. Then power up again to make changes effective]



SW1

1 Reserved
2 Heat pump
ON- valid; OFF-invalid
3 E-heater
ON- valid; OFF-invalid
4 Reserved - (Humidity Control & Fresh Air Activate ON - only used on PTACS Produced after April 2023 - with a serial number greater than 2304G06121.
5 Room freeze protection
ON- valid; OFF- invalid
6 Auto-restart
ON- valid; OFF- invalid
7 Reserved
8 Reserved



SW2

⚠ CAUTION

SW2 DIP switch must be matched with the unit capacity, otherwise the compressor will fail to operate correctly. Do not change dip switches on SW2!

Advanced Settings

Under OFF mode, hold [COOL] and [LOW] two keys at the same time continuously for 5 seconds. 'd0' will be dis played, indicating that the system has entered the advanced operation status.

[COOL] key is used to switch parameter code and parameter value;

[+] or [-] keys are used to switch parameter code or set parameter value;

[ON/OFF] key is used to save and exit settings.

Menu NO.	Function	"Parameter value"	Explanation
do	Unit of temperature	F	Fahrenheit (default)
		C	Celsius
dl	Control master	p	By control panel or IR remote thermostat(default)
		r	By 24V universal remote thermostat
		rE	By12V smart wired controller
		rF	VRPXEMRT2 and VRPXEMWRT2
d2	Max temperature setting	d3 to 90°F	The Min value is d2 (default 90°F)
d3	Min temperature setting	60°F to d2	The Max value is d3 (default 90°F)
d4	Indoor temperature calibration	-9°C to 9°C	If unit of temperature is changed, calibration should be done again. If using the default value, it can be ignored. (default 0°C/0°F)
		-9°F to 9°F	
d5	Temperature display selection	0 o r 1	0-displays room temperature (default),
			1-displaysset point.

OPERATION

Function and Control

Advanced Settings Example
Setting target: d0(C), d1(r), d2(30°C), d3(18°C), d4(-1°C), d5(1).

Step 1: hold [HEAT] and [FAN SPEED] two keys at the same time continuously for 5 seconds.	Display:'d0''
Step 2: short press [HEAT] key.	Display: 'F'
Step 3: short press [+] or [-] key.	Display: 'C' (setting d0 has finished)
Step 4: short press [HEAT] key.	Display:'d0'
Step 5: short press [+] key.	Display:'d1'
Step 6: short press [HEAT] key.	Display: 'P'
Step 7: short press [+] or [-] key.	Display: 'r' (setting d1 has finished)
Step 8: short press [HEAT] key.	Display:'d1'
Step 9: short press [+] key.	Display:'d2'
Step10: short press [HEAT] key.	Display:'32'
Step11: short press [-] key twice.	Display:'30' (setting d2 has finished)
Step12: short press [HEAT] key.	Display:'d2'
Step13: short press [+] key.	Display:'d3'
Step14: short press [HEAT] key.	Display:'16'
Step15: short press [+] key twice.	Display:'18' (setting d3 has finished)
Setp16: short press [HEAT] key.	Display:'d3'
Step17: short press [+] key.	Display:'d4'
Setp18: short press [HEAT] key.	Display:'0'

Memory Function

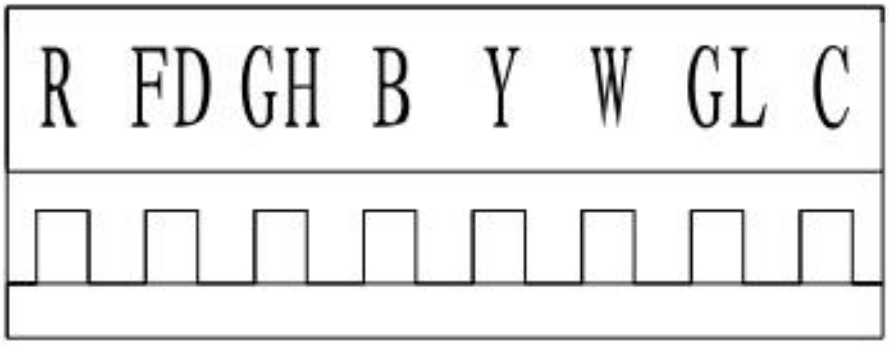
The unit will run the same status from the last moment before power down.

FD Control (front-desk control) & 24V REMOTE THERMOSTAT

The unit can be turned ON/OFF by front desk control switch. The control terminal is located on the remote thermostat interface, FD.

OPERATION

Function and Control



Control logic
(a). Turn ON unit: short R and FD then release one time within 5s.
(b). Turn OFF unit: short R and FD then release twice within 5s.
(c). Force unit shut down for one time: short R and FD short over 5s.

NOTE: After forcing unit shut down, you can turn on the unit again by control panel.

For the 24V remote thermostat compressor runs in different frequencies according to different temperature conditions and capacity demands. You don't need to change the wiring.

Protection Functions

To ensure the system running safely, electric control has following protections. For problem solving, please refer to TROUBLE SHOOTING sections.

1) Outdoor unit overload protection in COOLING mode
When condenser coil temperature exceeds the 140°F, compressor decreases the operating frequency to 30Hz. If this protection is not enough and condenser coil temperature reaches 149°F, compressor will be turned off.

2) Evaporator Freeze protection (will not display error code)
When evaporator coil temperature drops to 1°C and lasts for 5 minutes, compressor and outdoor fan will stop,but indoor fan keeps on running.

3) Compressor discharge overheat protection
When compressor discharge temperature reaches 226°F, compressor will decrease operating frequency to 30Hz. If this protection is not enough and discharge temperature reaches 239°F, compressor will be turned off.

4) Evaporator overheat protection in HEAT PUMP mode
When evaporator coil temperature exceeds 140°F, compressor decreases the operating frequency to 30Hz. If this protection is not enough and evaporator coil temperature reaches 149°F, compressor will be turned off. At this time the back-up electric heater will be turned on.

5) Input over-current protection
When input current exceeds 8 amps, compressor will decrease the operating frequency to 30Hz. If this protection is not enough and current reaches 9 amps, compressor will be turned off.

6) Compressor over-current protection.
When compressor operating current exceeds 7.5 amps, the compressor will be shut down.

OPERATION

Function and Control

7) IPM fault protection
When IPM faults, include overheat or over current, unit will be shut down and all outputs are shut down. Control panel displays the error code.

8) Temperature sensor fault protection
Any temperature sensor faults will shut down unit. The error code will be displayed
.
9) Communication fault protection
If communication faults between indoor unit and outdoor unit for continuously 2 minutes, unit will shut down and display error code on display panel.

10) Compressor starting fault
If compressor fails to start, it will try to restart after 3 minutes. Error code will not be displayed on display panel for the first 3 attempts to restart. If the compressor fails to start on the 4th try, it will not attempt restart any more and an error code will occur.

11) DC-BUS overvoltage/undervoltage protection
If the unit senses the DC-BUS is overvoltage or undervoltage, the unit stops and an error code will occur. and be displayed on display panel.

12) EEPROM fault
When the unit is powered up, if system monitors the EEPROM chip fault (broken chip or incorrect data), control panel displays error code and will not operate any more.

OPERATION

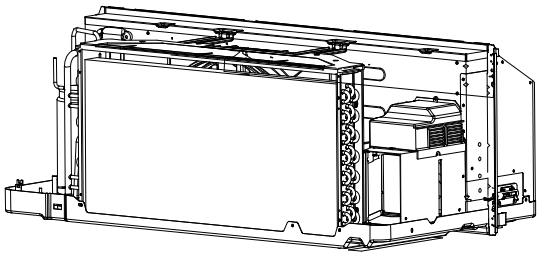
System Configuration Fresh Air Vent Control

System Configuration

Fresh Air Vent Control

To operate the FreshAire module please see Dip switch #3. With dip switch in the "on" position FreshAire module will be on continuously. With dip switch in the "OFF" position FreshAire module will be not be activated.

Figure 25
Air Vent Control



POWER-DRIVEN VENT DOOR

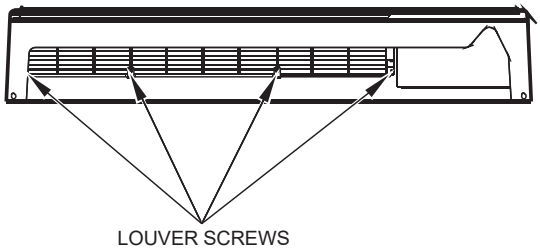
FRP025

Adjusting Air

To adjust air direction:

1. Removefrontpanel.SeeFigure21.
2. Remove louver screws that hold louver insert in place(from back side of front panel).See Figure 29.
3. Turn louver insert and rotate 180°.See Figure 30.
4. Replace louver insert.
5. Replace screws and front panel.

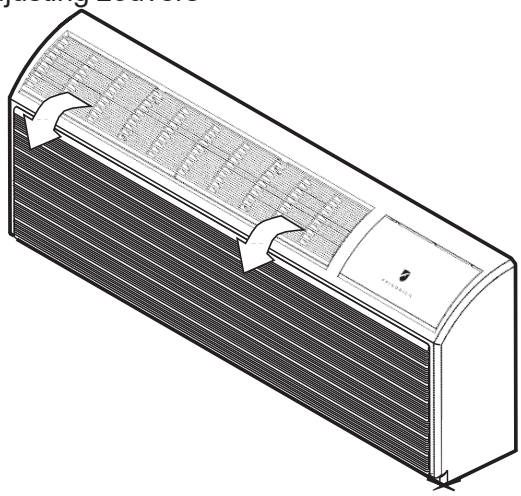
Figure 26
Backside of Front Panel



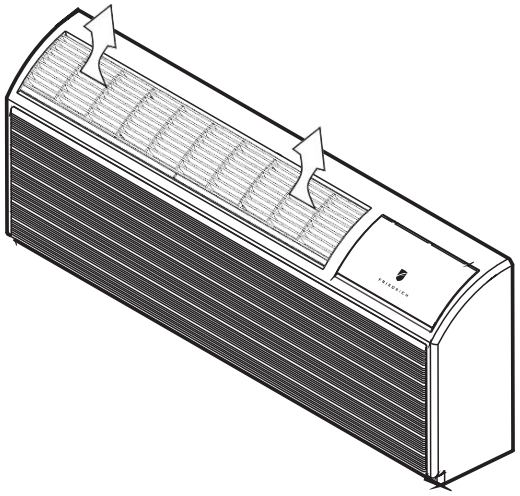
LOUVER SCREWS

FRP026

Figure 27
Adjusting Louvers



AIR DISCHARGE OUTWARD (Default)



AIR DISCHARGE UPWARD

FRP027

OPERATION

System Configuration Fresh Air Vent Control

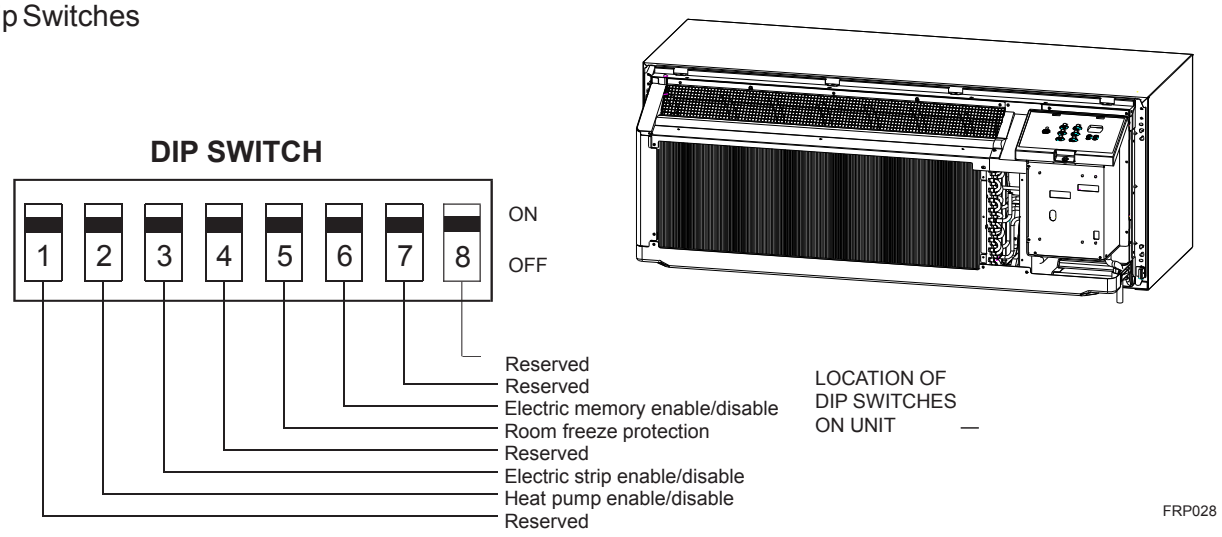
Digital Control User Input Configuration

The adjustable control dip switches are located at the front portion of the digital Smart Center. The inputs are only visible and accessible with the front cover removed from the PTAC.

Dip Switch Setting

Switch 1-Reserved.
Switch 2-Heat pump enable/disable.
Moving Dip Switch #2 to "OFF" can be set as Emergency Heat Override. In the unlikely event of a compressor failure, a heat pump unit may be switched to operate in only the electric heat mode until repairs can be made.
Switch 3-Electric strip enable/disable.
Switch 4-Reserved.Humidity control fresh air (Factory set: ON) (on models produced after April 2023
Switch 5-Room Freeze Protection Units are shipped from the factory With the room freeze protection enable.Room Freeze Protection can be switched off at the owner's preference by moving Dip Switch 5 to "OFF".This feature will monitor the indoor room conditions and in the event that the room falls below 50°F, the unit will automatically run "heating". This occurs regardless of mode.
Switch 6-Electric memory enable/disable
The factory setting is enabled. The smart center will remember user's setting. After power cut recovery, the unit will operate the same status as before power cut. Moving Dip Switch 6 to "OFF"will disable this feature, smart center will no more remember settings.
Switch 7,Switch 8-Reserved.

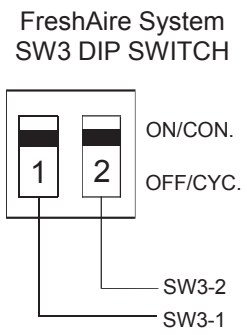
Figure 28
Dip Switches



Switch	Description	Function	Factory setting	Option
#1	Reserved	/	OFF	/
#2	Heat pump	ON-enable heat pump; OFF-disable heat pump, run electric heat only.	HP models-ON Electric heat only-OFF	OFF-Overrides compressor operation(HP models only)
#3	Electric strip	ON-enable electric heat; OFF-disable electric heat.	ON	Factory set. Do not change.
#4	Reserved	Humidity Control/ Fresh Air Function	ON	/
#5	Room Freeze Protection	ON-Allows the unit to ensure the indoor room temperature does not fall below 50℉ even when turned off; OFF-disable freeze protection.	ON	OFF
#6	Electric memory enable/disable	ON-enable; OFF-disable.	ON	OFF
#7	Reserved	/	OFF	/
#8	Reserved	/	OFF	/

OPERATION

System Configuration Fresh Air Vent Control



	Engagement Method	Mode	Description
FreshAire System	SW3-1	ON / OFF	Fresh-Air Fan runs only when Dip Switch is set to 'ON'
			Fresh-Air Fan NEVER RUNS when Dip Switch is set to 'OFF'
	SW3-2	Cycle / Continuous	Fresh-Air Fan runs continuously when SW3-1 is set to 'ON' & SW3-2 is set to 'ON'
			Fresh-Air Fan cycles On/Off with the Unit Indoor Fan when SW3-1 is set to 'ON' & SW3-2 is set to 'OFF'

OPERATION

Digital Control User Input Configuration

Digital Control Panel

FRP029

Cooling Mode

Pressing the “Cool” button after turn the unit on will put the unit into cooling mode. Press “UP” or “DOWN” button to adjust the set point, the unit will start the compressor and run appropriate frequency to maintain a comfortable room temperature. The compressor will come on anytime that the room temperature is 2℉above the set point. The fan will come on with compressor.

Heating Mode

After turn on the unit, press the “Heat” button will put the unit into heating mode.

Heat Pump Models (PVH)

When the “Heat” button is pressed initially the unit may call for electric strips to bring the room to the set point. When the room temperature falls 2℉below the set point, the unit will turn on the compressor or electric strip. The fan will run with compressor or electric strips. When the outdoor ambient temperature falls below 32°F or outdoor coil temperature drops to 5℉, the unit will operate the electric strip instead of heat pump. During heat pump mode, CPU detects the outdoor coil gets freeze, unit will go to defrost. During the defrost operation (10min at most), there will be no heating provide. After finishing defrost, electric heating will come on to warm the room quickly.

Emergency Heat Operation

In the event of a compressor failure in heat pump mode, the compressor may be locked out to provide heat through the electric strip heater automatically. This feature ensures that even in the unlikely event of a compressor failure, the room temperature can be maintained until the compressor can be serviced. If the unit still can’t run electric heater stably, switch Dip switch 2 to OFF, it controls the emergency heat setting.

Constant Fan

Pressing the “Constant Fan” button will provide constant or cycle fan operation in cooling or heating modes. The fan speed selection is made by pressing either “High” or “Low” fan speed button.

OPERATION

Settings- Detailed Configurations

This section is about how to set the unit operating parameter, include display temperature unit, Fahrenheit or Celsius, control master, temperature limit, temperature calibration, display set point or room temperature.
Under OFF mode, hold [Cool] and [Low] two keys at the same time continuously for 5 seconds. This time displays 'd0', indicates that system has entered the senior operation status.
[Cool] key is used to switch parameter code and parameter value;
[UP] or [DOWN] keys are used to switch parameter code or set parameter value; [Power] key is used to save and exit settings.

Menu NO.	Function	"Parameter value"	Explanation
do	Unit of temperature	F	Fahrenheit (default)
		C	Celsius
dl	Control master	p	By control panel or IR remote thermostat(default)
		r	By 24V universal remote thermostat
		rE	By 12V smart wired controller
		rF	VRPXEMRT2 and VRPXEMWRT2
d2	Max temperature setting	d3 to 90°F	The Min value is d2 (default 90°F)
d3	Min temperature setting	60°F to d2	The Max value is d3 (default 90°F)
d4	Indoor temperature calibration	-9°C to 9°C	If unit of temperature is changed, calibration should be done again. If using the default value, it can be ignored. (default 0°C/0°F)
		-9°F to 9°F	
d5	Temperature display selection	0 o r 1	0-displays room temperature (default),
			1-displaysset point.

One example:
Setting target:d0(C),d1(r), d2(88),d3(58),d4(-1),d5(1).
Step1: hold [Cool] and [Low] two keys at the same time continuously for 5 seconds. Display:'d0'
Step2: short press [Cool] key. Display: 'F'(setting d0 has finished)
Step3: short press [Cool] key. Display:'d0'
Step4: short press [UP] key. Display:'d1'
Step5: short press [Cool] key. Display: 'P'
Step6: short press [UP] or [DOWN] key. Display: 'r' (setting d1 has finished)
Step7: short press [Cool] key. Display:'d1'
Step8: short press [UP] key. Display:'d2'
Step9: short press [Cool] key. Display:'90'
Step10: short press [DOWN] key twice. Display:'88' (setting d2 has finished)
Step11: short press [Cool] key. Display:'d2'
Step12: short press [UP] key. Display:'d3'
Step13: short press [Cool] key. Display:'60'
Step14: short press [UP] key twice. Display:'58' (setting d3 has finished)
Step15: short press [Cool] key. Display:'d3'
Step16: short press [UP] key. Display:'d4'
Step17: short press [Cool] key. Display:'0' (setting d4 has finished)
Step18: short press [Power] key to exit.

OPERATION

General Knowledge Sequence Of Refrigeration

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

1. "Heat always flows from a warmer body to a cooler body."

2. "Heat must be added to or removed from a substance before a change in state can occur"

3. "Flow is always from a higher pressure area to a lower pressure area."

4. "The temperature at which a liquid or gas changes state is dependent upon the pressure."

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

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

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

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

The refrigerant leaves the condenser coil through the liquid line as a warm high pressure liquid. I

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

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

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

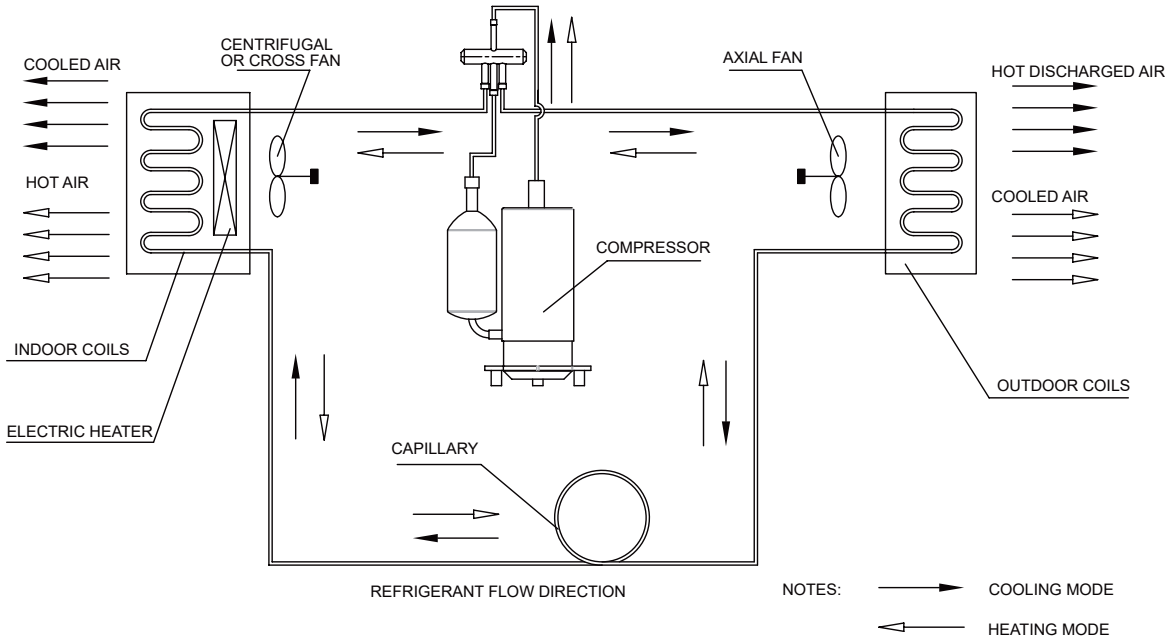
The low pressure (suction) created by the compressor causes the refrigerant to leave the evaporator through the suction line as a cool low pressure vapor. The refrigerant then returns to the compressor, where the cycle is repeated.

OPERATION

Refrigerant System Diagram

(1)Cooling + Heat Pump + Auxiliary Electric Heater

PDH07R3SG PDH09R3SG PDH12R3SG PDH15R5SG



(2) Cooling + Electric Heater

PDE07R3SG PDE09R3SG PDE12R3SG PDE15R5SG

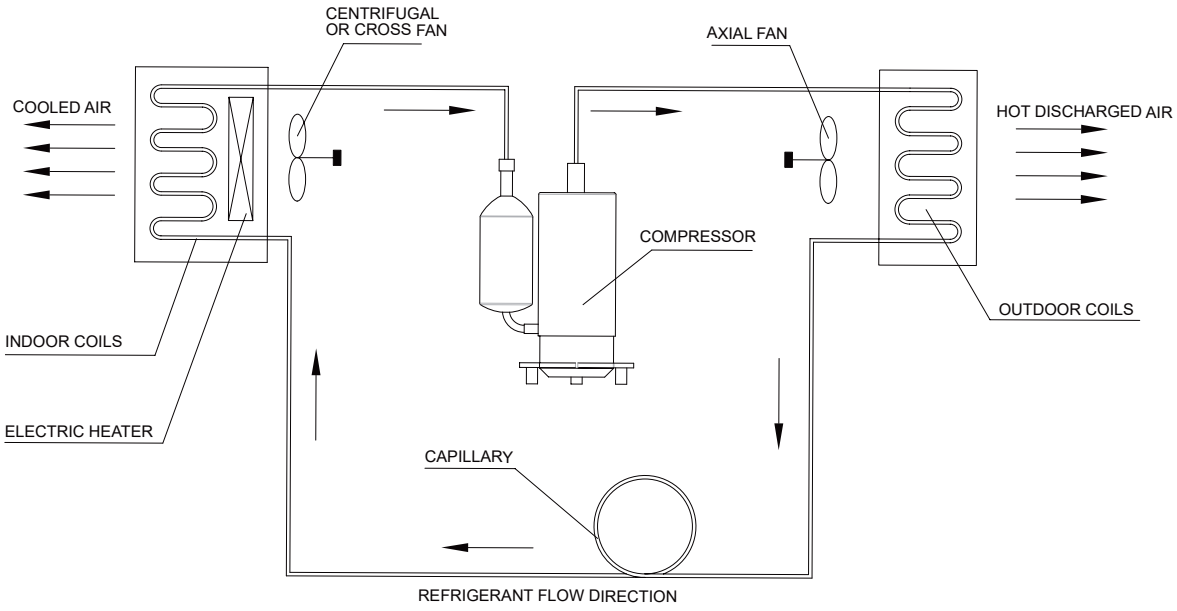


Figure 301 (Sequence of Operation)

Routine Maintenance

Coils & Chassis

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

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

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

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

Decorative Front

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

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

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

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

Fan Motor & Compressor

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

Wall Sleeve

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

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

Blower Wheel / Housing / Condensor Fan / Shroud

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

Electrical / Electronic

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

Air Filter

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

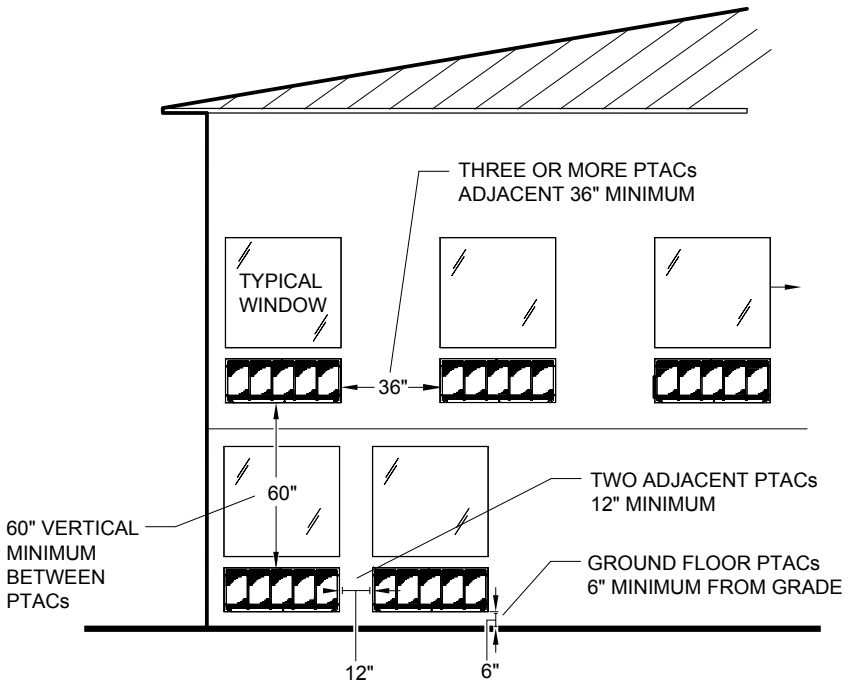
INSTALLATION

PTAC Installation Recommendations

For proper PTAC unit performance and maximum operating life refer to the minimum installation clearances below:

Figure 1

PTAC units should be installed no closer than 12" apart when two units are side by side. If three or more PTAC units are to operate next to one another allow a minimum of 36" between units. Also,a vertical clearance of 60" should be maintained between units installed. In the interior of the room the unit should be located a minimum of 1/4" from the floor and a minimum of 36" from the ceiling.



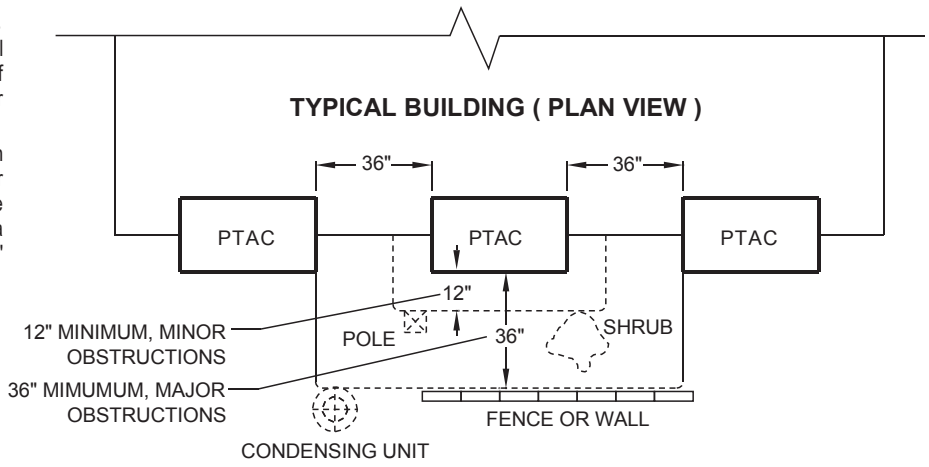
VIEW: OUTSIDE BUILDING ELEVATION

FRP001

For PTACs on the ground floor or anytime obstructions are present, use the following guidelines:

Figure 2

- For minor obstructions such as lamp poles or small shrubbery a clearance of 12" from the outdoor louver should be maintained.
- For major obstructions such as a solid fence, wall or other heat rejecting device like a condensing unit, a minimum distance of 36" should be kept.



FRP002

INSTALLATION

Wall Sleeve Installation Instructions (PDXWS)

NOTE: Insure that the unit is only installed in a wall structurally adequate to support the unit including the sleeve, chassis and accessories.If the sleeve projects more than 8" into the room, a subbase or other means of support MUST be used. Please read these instructions completely before attempting installation.

⚠WARNING

Falling Object Hazard

Not following Installation Instructions for mounting your air conditioner can result in property damage, injury, or death.

NOTICE

DO NOT allow any pitch toward the inside.

Flashing on all 4 sides of the opening is recommended.

Potential property damage can occur if instructions are not followed.

For Deep Wall Installation (Greater than 13 1/4")
See Page 9

The following instructions apply ONLY to walls less than 13 ¼" in depth.

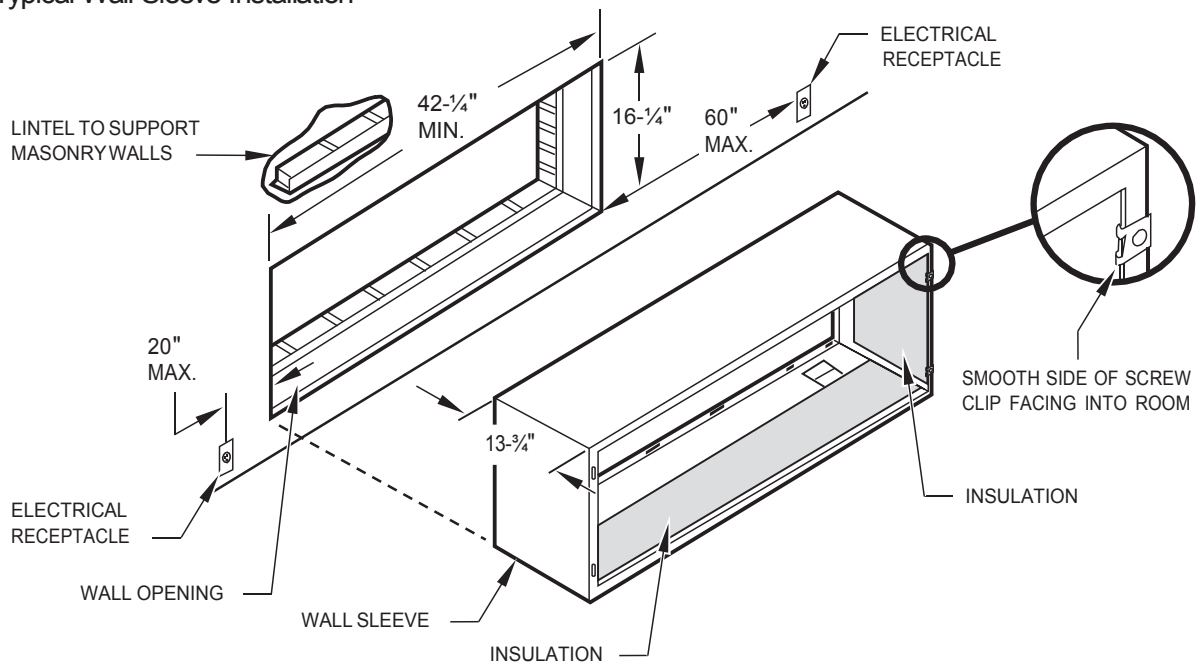
1 The PXDR10 Drain Kit,(optional for new construction) see page 10 if applicable, must be installed before the wall sleeve is installed into the wall.

2 The External Drain (for new construction or unit replacement) see page 11 if applicable, must be installed before the wall sleeve is installed into the wall.

3 From inside the building, position the wall sleeve in the opening and push it into the wall until it protrudes at least ¼" on the outside (See Figure 9, Page 8).

4 Position the wall sleeve with a slight tilt towards the outside to facilitate condensate drainage. It should be level side-to-side and the front should be ¼ bubble higher than the back.

Figure 3
Typical Wall Sleeve Installation



NOTE: All 230/208V units are manufactured with a 60" power cord and all 265V units with a 18" power cord.

FRP003

INSTALLATION

Alternate Wall Installations

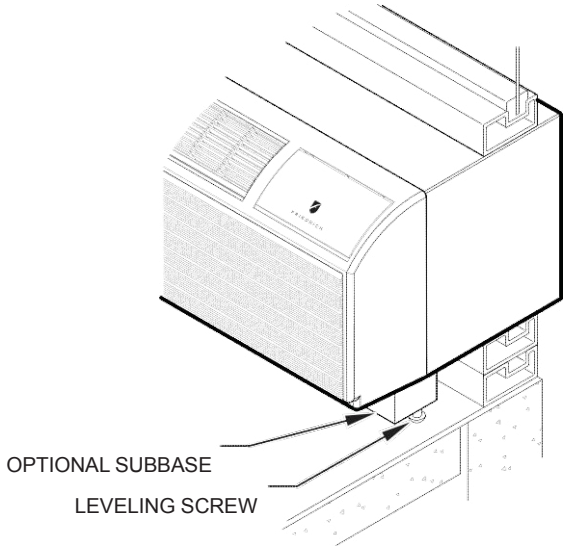


Figure 5
Frame and Brick Veneer

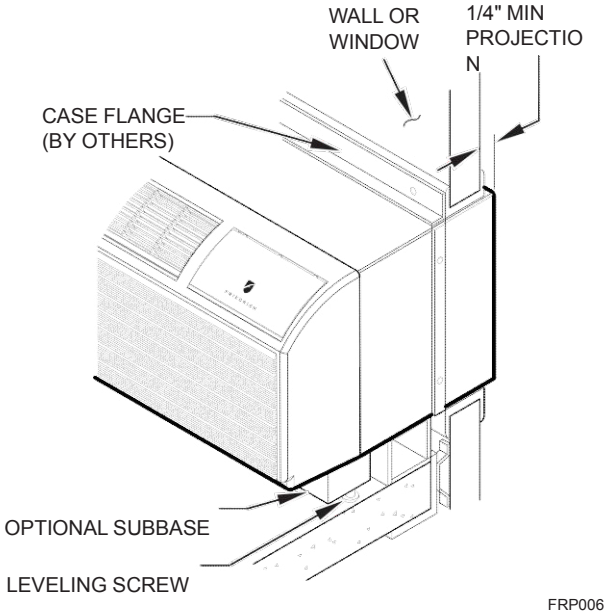
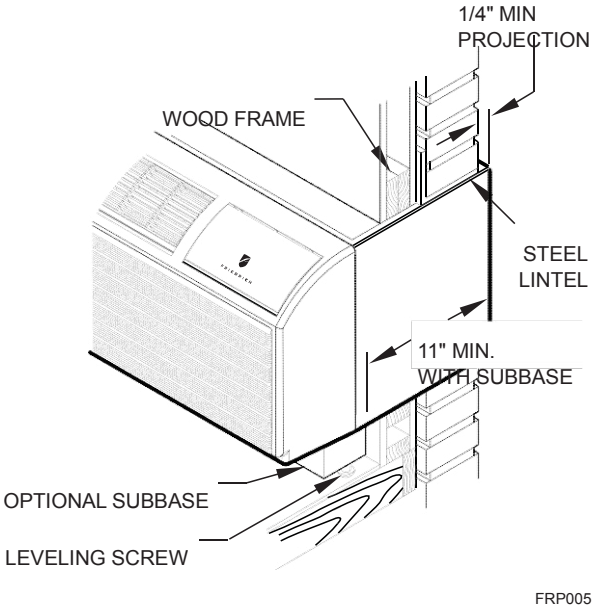
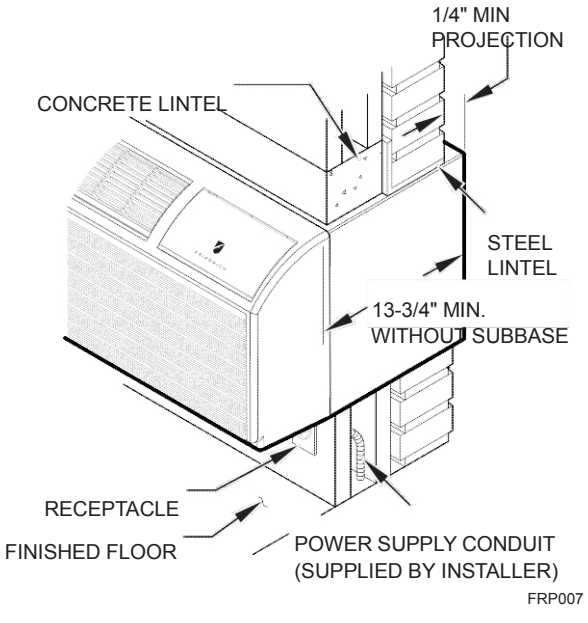


Figure 7
Block and Brick Veneer



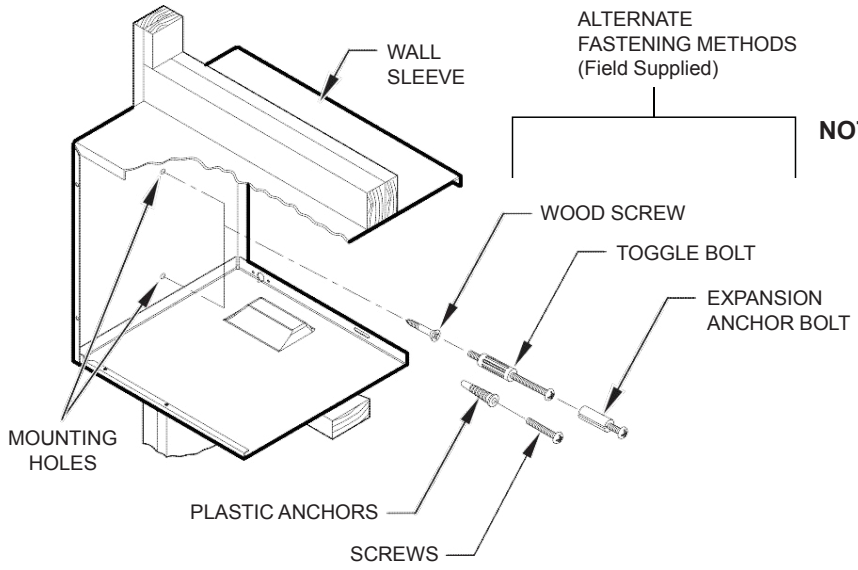


NOTE: Follow all wall system manufacturer installation instructions. For sunrooms and modular buildings, adhere to their installation instructions for supporting and sealing sleeve to their frames. All wall and window/wall installations must provide for proper drainage. In applications where the drain holes on the PTAC wall sleeve are not exposed beyond the wall an internal drain system is recommended. It is the installer's responsibility to ensure there is adequate drainage for the PTAC unit.

INSTALLATION

Alternate Wall Installations

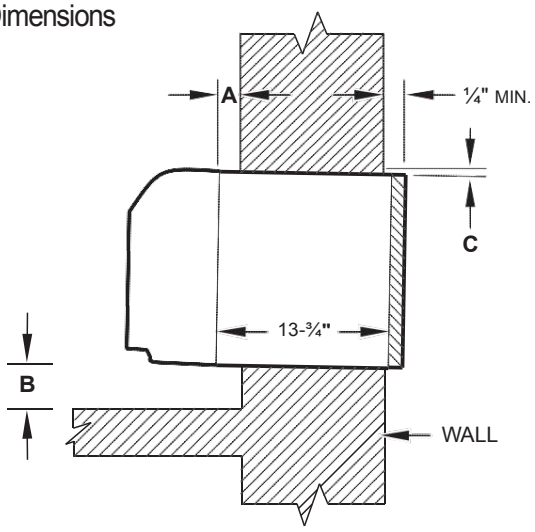
Figure 8
Wall Sleeve Attachment



NOTE: The Wall Sleeve must be horizontally level (side-to-side) and pitched 1/4 bubble to the outside when installed in an opening.
The mounting hole location should be approximately 2-4" from the top and bottom of the sleeve.

FRP008

Figure 9
Dimensions



Dimension*	A Allow for wall finishing	B Allow for floor finishing		C Allow for proper drainage
	(Minimum)	Min.	Max.	(Front-to-Back)
No Accessories	¼"	¼"	---	---
With Subbase	1-¾"	3-½"	5"	---
With Lateral Duct	¾"	¼"	---	---
Wall Sleeve Tilt	---	---	---	¼"

* If more than one accessory is to be used, use the maximum dimension. If the wall thickness is more than 13-¾" - (A+ ¼"), a sleeve extension must be used.

FRP009

INSTALLATION

Alternate Wall Installations

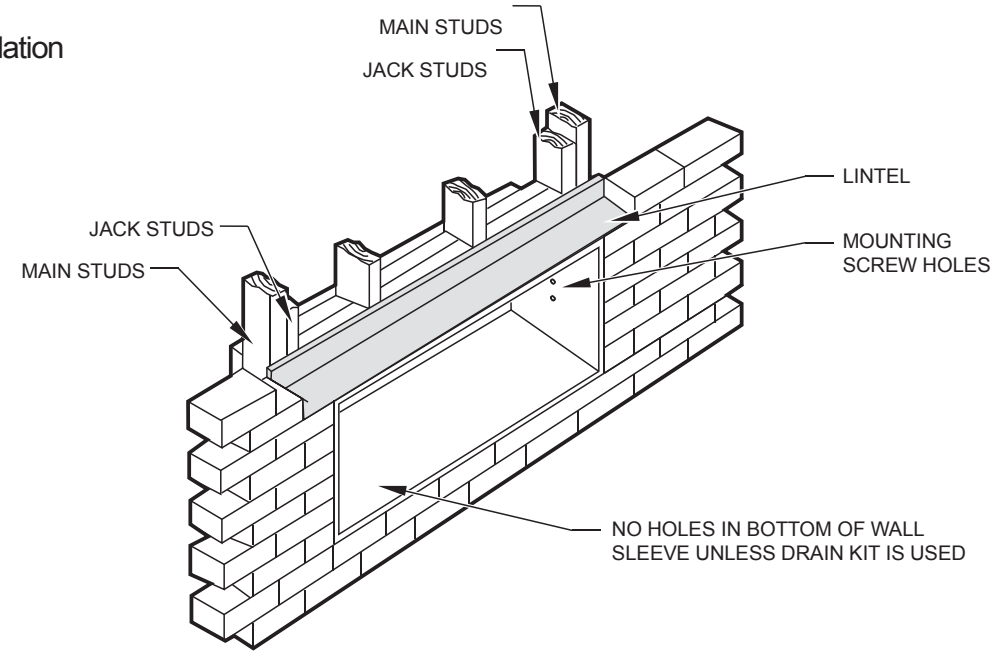
5. Drill two 3/16" holes through each side of the sleeve approximately 4" from top and 4" from bottom of sleeve. Screw four #10 x 1" screws (included) or appropriate fasteners for your installation, through the holes in the sides of the wall sleeve.

6. Apply sealant around the wall sleeve where it projects through the inside and outside wall surfaces. Apply the sealant to the screw heads or the tops of the fasteners used in Step #5.

7. If the chassis and exterior grille are to be installed later, leave the weatherboard and center support in place, otherwise remove and dispose of them. (See Figure 13, Page 12).

8. Provide a support lintel if the wall sleeve is installed in a concrete or masonry wall (See Figure 10, Page 9).

Figure 10
Lintel Installation



NOTE: Construct wall opening to comply with all applicable building codes.

FRP010

One-Piece Deep Wall Sleeve Installation (PDXWSEXT)

If the wall is thicker than 13 1/4" a deep wall sleeve or wall sleeve extension MUST be used. The deep wall sleeve may be special ordered through your Sales Representative.

INSTALLATION

PXDR10 Drain Kit Installation

PXDR10 Drain Kit Installation Instructions (optional for new construction)

NOTE: Determine whether drain will be located within the wall, on the indoor side, or will drain to the exterior of the building. Follow appropriate instructions below depending on your particular type of installation.

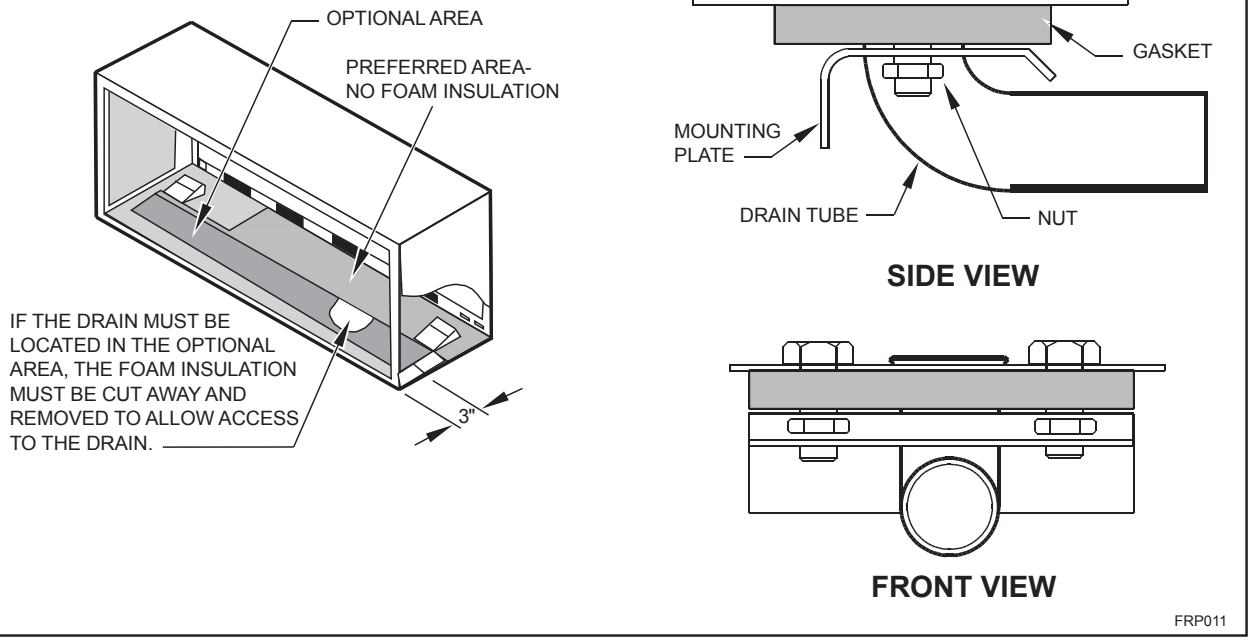
Internal Drain

NOTE: If installing an internal drain, you MUST install a drain kit on the wall sleeve before the wall sleeve is installed.

1. Refer to Figure 11 and locate the drain within the "Preferred" area of best drainage.Maintain at least a ½" clearance from the embossed area.
2. Using the mounting plate with the ½" hole as a template, mark and drill two, 3/16" mounting holes and a ½" drain hole in the sleeve bottom.
3. Remove the backing from the gasket and mount it on the flat side of the mounting plate (See Figure 12, Page 11). Insert the drain tube through the hole in the gasket and mounting plate so the tube flange will be against the wall sleeve.
4. Position the assembly beneath the drilled holes and secure it with #10-24 x ½" machine screws and lock nuts provided. Seal the tops of the screws with silicone caulking.
5. Use ½" I D copper tube, PVC pipe, or vinyl hose (obtained locally) to connect the internal drain tube to the drain system in the building.
6. Referring to Figure 12, Detail A, Page 11, locate and assemble the two cover plates and gaskets over the drain holes at the rear of the wall sleeve. Attach them with the #10 sheet metal screws provided. Make certain that the four overflow slots at the rear of the wall sleeve are not blocked (See drawing of the back of the sleeve Figure 12, Page 11).
7. If a deep wall extension (PDXWSEXT) is used, after installing the field supplied flashing,caulk as required. Be sure to caulk around the flashing and the wall sleeve where the hole was drilled for the drain tube.

Figure 11

Drain Kit Location and Installation



PXDR10	
QUANTITY	**DESCRIPTION**
2	COVER PLATES
1	MOUNTING PLATE
1	DRAIN TUBE
3	MOUNTING PLATE GASKET
4	#10 X ½" SHEET METAL SCREWS
2	#10-24 X ½ " MACH. SCREWS
2	#10-24 X ½" LOCKNUTS

INSTALLATION

External Drain

External Drain (for new construction or unit replacement)

When using an external drain system, the condensate is removed through either of two drain holes on the back of the wall sleeve. Select the drain hole which best meets your drainage situation and install the drain kit. Seal off the other with a cover plate.

Drain Tube Installation (See Figure 12)

1. Peel the backing tape off the gaskets and apply the sticky side to one cover plate and one mounting plate as shown in Details A and B.
2. Place the drain tube through the gasket and the mounting plate with the flange toward the wall sleeve.
3. Attach the drain tube assembly to one of the two drain holes at the rear of the wall sleeve. The large flange on the mounting plate is positioned at the bottom of the sleeve facing toward the sleeve, Detail B. When the drain tube is positioned at the desired angle, tighten the screws.

Cover Plate Installation

4. Mount the foam gasket to the cover plate. Using two #10 x ½" sheet metal screws (provided), attach the cover plate to the remaining drain hole. Make certain the large flange on the plate is positioned at the bottom of the sleeve.
5. Discard the additional cover plate, gasket, machine screws, and locknuts.

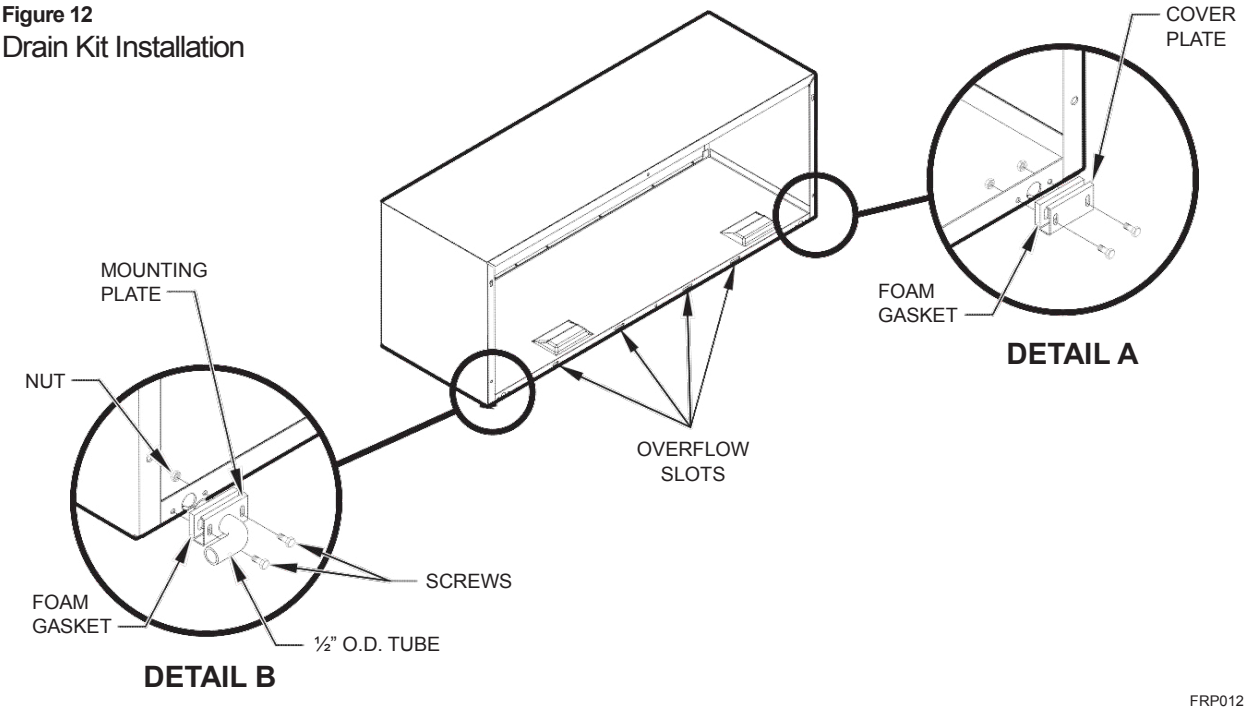
NOTICE

If the wall sleeve has not been installed, the drain tube must be rotated to a horizontal position until after the sleeve is installed. Tighten the mounting plate screws when the tube is in the proper position. Make certain that the four overflow slots at the rear of the wall sleeve are not blocked (See Figure 12).

When sealing the sleeve on the outside of the building, be careful NOT to let the sealant block the two condensate drain holes or the four overflow slots at the bottom flange of the sleeve.

Potential property damage can occur if instructions are not followed.

Figure 12
Drain Kit Installation



NOTE: The large flange on the mounting plate is positioned at the bottom of the sleeve facing toward the sleeve. The drain tube must be rotated to a horizontal position to allow for the wall sleeve to be installed into the wall. Once the wall sleeve is installed, return the drain tube to a downward angle.

INSTALLATION

PXGA Standard Grille

PXGA Standard Grille Installation Instructions

1. Remove the center support and weatherboard if still installed in the sleeve.
2. Insert six plastic grommets into the grille openings from the outside of the grille as shown in Figure 13.
3. Insert two #8 x ⅜" sheet metal screws (provided) in the top two outside edge plastic grommets, and tighten them half way into the grommets.
4. Grasp the grille by the attached plastic handles. Position it with the condensate drain knockouts facing down.

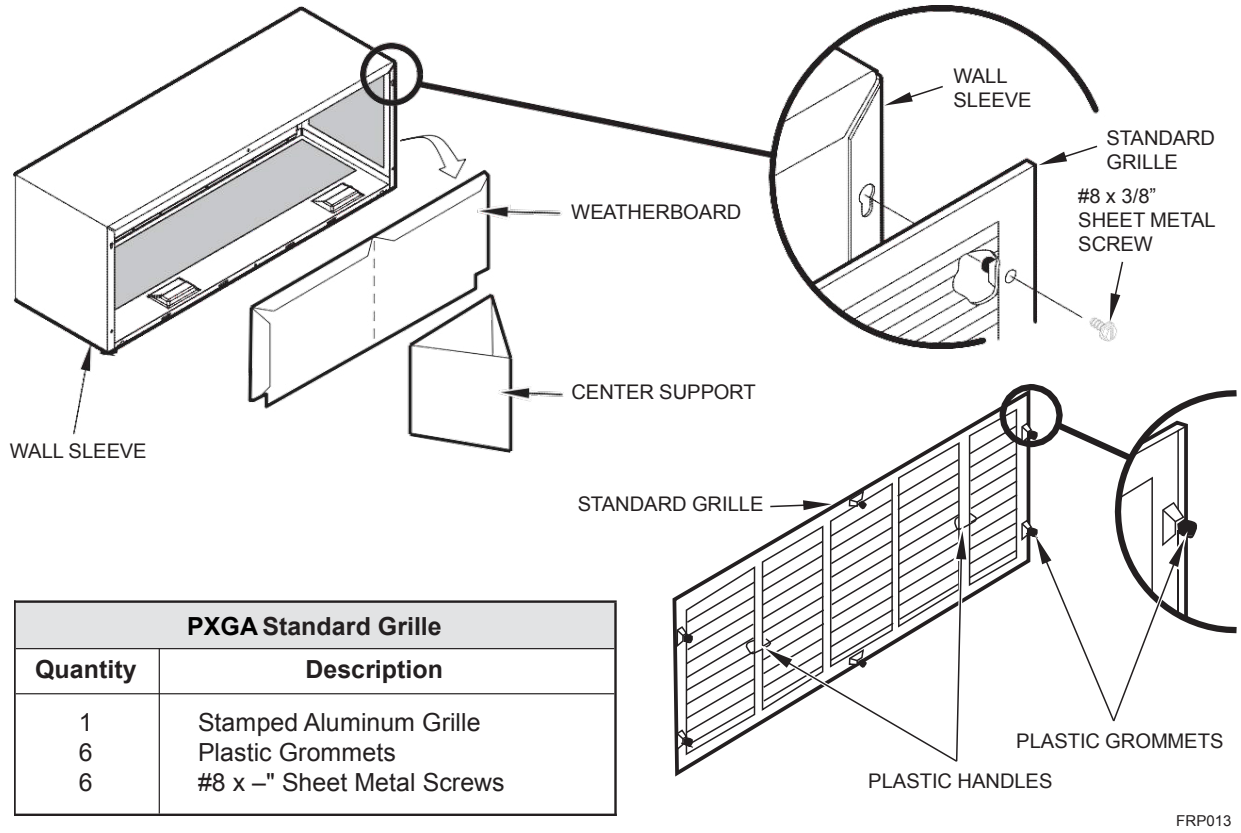
   From inside the building, maneuver the grille through the wall sleeve and pull toward you until the screw heads are inserted into the keyhole slots at the top of the wall sleeve. Tighten the two screws completely.
5. Insert the remaining screws into the remaining holes and tighten securely.

⚠ WARNING

Falling Object Hazard

Not following Installation Instructions for mounting your air conditioner can result in property damage, injury, or death.

Figure 13
Standard Grille



PXGA Standard Grille	
Quantity	**Description**
1	Stamped Aluminum Grille
6	Plastic Grommets
6	#8 x –" Sheet Metal Screws

INSTALLATION

PXGA Standard Grille

CAUTION

Unit Damage Hazard

Failure to follow this caution may result in equipment damage or improper operation.

3. Carefully remove shipping tape from the front panel and power vent door. See Figure 20.

Figure 20
Shipping Tape Location

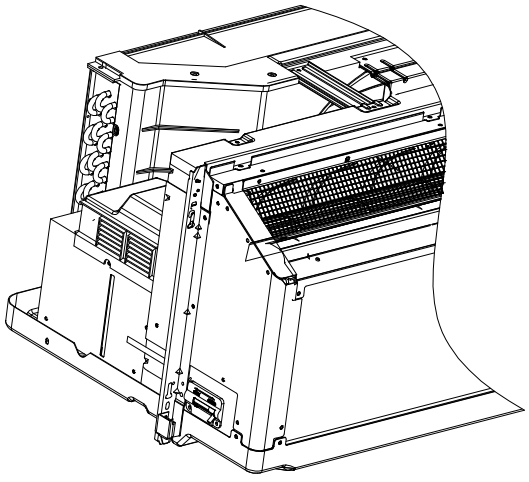
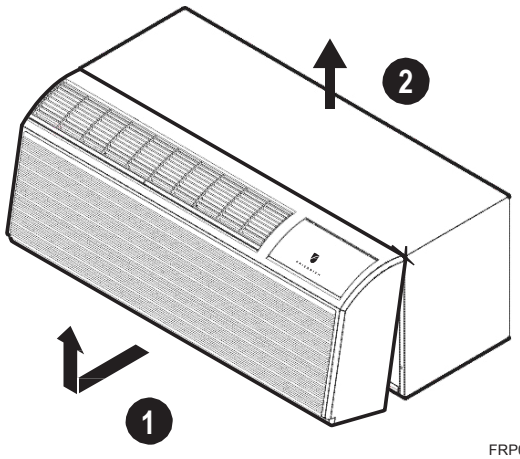


Figure 21
Removing Front Panel



4. Remove front panel,see Figure 21.

Pull out at the bottom to release it from the tabs (1). Then lift up (2).

NOTE: If the unit is mounted flush to the floor, the service cord MUST be rerouted at the bottom of the front cover on the side closest to the receptacle. A notch MUST be made in the front cover side where the cord exits the unit. It is the responsibility of the installer to create an exit notch.

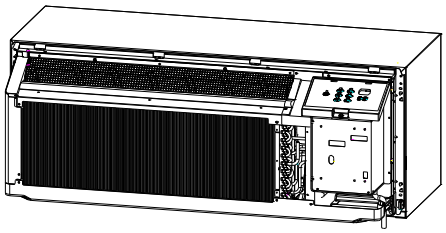
INSTALLATION

Chassis Install

Chassis Installation

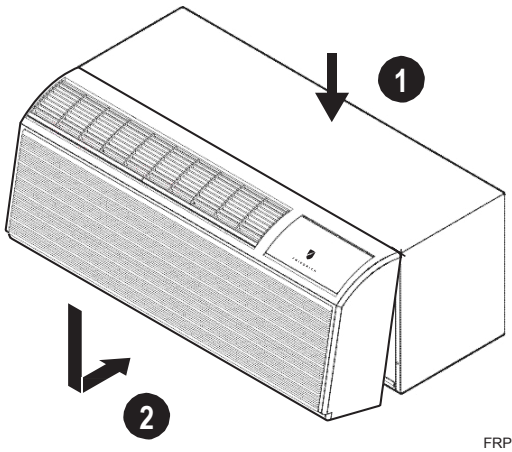
1. Lift unit level and slide unit into wall sleeve until seal rests firmly against front of wall sleeve.

Figure 22
Securing Unit



2. Locate the four supplied chassis mounting screws.Insert the screws through the chassis mounting flange holes that are aligned with the speed nuts in the wall sleeve.Tighten all four screws(two per side).

Figure 23
Replacing Front Panel



3. Place tabs over top rail.(1)Push inward at bottom until panel snaps into place(2).
4. Reinstall front panel.See Figure 23.

⚠CAUTION

Excessive Weight Hazard

Use two or more people when installing your air conditioner.

Failure to do so can result in back or other injury.

NOTICE

Copper refrigerant tubes are NOT handles.
Do NOT use tubing to lift or move chassis.

To remove the front cover,pull the bottom end forward and lift it up to clear the L bracket across the top of the chassis.

5. Plug the cord(if applicable)into the appropriate receptacle. Restore power to the unit.

INSTALLATION

Remote Control Thermostat Installation

Install Thermostat

1. Approximately 5 ft from the floor.
2. Close to or in a frequently used room,preferably on an inside wall.
3. On a section of wall without pipes or ductwork.

The Thermostat should NOT be mounted:

1. Close to a window, on an outside wall, or next to a door leading outside.
2. Where it can be exposed to direct sunlight or heat, such as the sun, a lamp,fireplace or any other temperature radiating object which may cause a false reading.
3. Close to or in the direct airflow of supply registers and/or return air grilles.
4. Any areas with poor air circulation, such as a corner, behind a door,or an alcove.

Remote Thermostat and Low Voltage Control Connections

Remote Thermostat

All Friedrich PV model PTAC units are factory configured to be controlled by either the chassis mounted Smart Center or a 24V remote wall mounted thermostat.The thermostat may be auto or manual changeover as long as the control configuration matches that of the PTAC unit.

NOTE: All PV models require a single stage cool, dual stage heat thermostat with an B reversing valve control. The Friedrich RT6 and RT7 thermostats can be configured for either model.

To control the unit with a wall mounted thermostat follow the steps below:

1. Unplug the unit before doing any work
2. Remove the low voltage terminal block from the unit.
3. Connect the corresponding terminals from the wall thermostat to the terminal block
4. Plug the terminal block on the unitk.
5. Restore power to the unit.
6. Under OFF mode, set menu NO.'d1' to “r”, details refer to the previous section "Settings- Detailed Configurations" on page 25.
7. The unit is now controlled by the wall thermostat only.
8. If the accessory escutcheon kit (PDXRTA) is to be used, install it over the existing control panel.

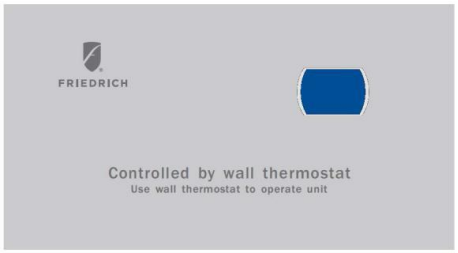
NOTE: The unit control panel no longer controls the unit. To restore the control panel, set menu NO.'d1' back to "P", details refer to the previous section "Settings- Detailed Configurations" on page 2 .

Thermostat Connections

R = 24V Power from Unit
Y = Call for Cooling
W = Call for Heating
B = Reversing Valve Energized in Heating Mode
GL = Call for Low Fan
GH = Call for High Fan
C = Common Ground

*If only one G terminal is present on thermostat connect to GL for low speed fan or to GH for high speed fan operation.

Figure 30
Control board with optional **PDXRTB** escutcheon kit installed



FRP030

INSTALLATION

Front Desk Control Terminal

⚠WARNING

Electrical Shock Hazard

Turn off electrical power before service or installation.
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.
Improper connection of the thermostat control wiring and/or tampering with the units internal wiring may result in property damage, personal injury or death.

Front Desk Control Terminal
(ONLY FOR UNIT CONTROL)

The Friedrich PV model PTAC has built-in provisions for connection to an external switch to control power to the unit. The switch can be a central desk control system.
For front desk control operation, connect one side of the normal open switch to the R terminal and the other to the FD terminal.

The control logic as below:
(a). Turn ON unit: short R and FD then release for one time within 5s.
(b). Turn OFF unit: short R and FD then release for twice within 5s.
(c). Force unit shut down for one time: short R and FD short over 5s.
NOTE: After forced shut down, you can turn on the unit again by control panel.

NOTE: The desk control system and switches must be field supplied.

Energy Management

Sometimes known as Front Desk Control, an input is provided so that the unit can be manually disabled from a remote location. If the unit detects 24Vac on this input, it will automatically turn itself off. If no voltage is detected on the input , the unit will run normally.

NOTE: It is the installer's responsibility to ensure that all control wiring connections are made in accordance with the installation instructions. Improper connection of the thermostat control wiring and/or tampering with the unit's internal wiring can void the equipment warranty. Other manufacturer's PTACs and even older Friedrich models may have different control wire connections. Questions concerning proper connections to the unit should be directed to Friedrich.

INSTALLATION

Final Inspection & Start-up Checklist

Final Inspection & Start-up Checklist

- ❑ Inspect and ensure that all components and accessories have been installed properly and that they have not been damaged during the installation process.
- ❑ Check the condensate water drain(s) to ensure they are adequate for the removal of condensate water, and that they meet the approval of the end user.
- ❑ Ensure that all installations concerning clearances around the unit have been adhered to.Check to ensure that the unit air filter, indoor coil, and outdoor coil are free from any obstructions.
- ❑ Ensure that the entire installation is in compliance with all applicable national and local codes and ordinances that have jurisdiction.
- ❑ Secure components and accessories, such as the chassis, decorative front cover and control door.
- ❑ Start the unit and check for proper operation of all components in each mode of operation.Instruct the owner or operator of this units operation, and the manufacturer's recommended routine maintenance schedule.

NOTE: A log for recording the dates of maintenance and/or service is recommended.

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

Routine Maintenance

To ensure proper unit operation and life expectancy the following maintenance procedures should be performed on a regular basis.

⚠WARNING

Electrical Shock Hazard
Unplug Unit or turn off electrical power to unit prior to performing maintenance procedures

Failure to do so can result in electrical shock or death

Front Panel Air Filter

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

To remove the air filters,filter grasp the top of the filters and lift out of the front cabinet.Reverse the procedure to reinstall the filters.

Clean the filters with a mild detergent in warm water, and allow them to dry thoroughly before reinstalling.

Fresh Air Filter

The fresh air filter should be cleaned or replaced after 3 months of use for maximum effectiveness The unit must be turned off before the filters are replaced.

To replace the fresh air filters,drag the unit from wall sleeve and pull the tape sticked to fresh air filter.

Coils & Chassis

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

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

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

Decorative Front

The decorative front and discharge air grille may be cleaned with a mild soap or detergent.Do NOT use solvents or hydrocarbon based cleaners such as acetone, naphtha, gasoline, benzene, etc , to clean the decorative front or air discharge grilles.

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

Fan Motor & Compressor

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

Wall Sleeve

Inspect the inside of the wall sleeve and drain system periodically (annually or semi-annually) and clean as required.

Under extreme conditions, more frequent cleaning may be necessary. Clean both of these areas with an antibacterial and antifungal cleaner. Rinse both items thoroughly with water and ensure that the drain outlets are operating correctly. Check the sealant around the sleeve and reseal areas as needed.

TROUBLESHOOTING

Figure 711

Basic Troubleshooting

Malfunction	Possible Reasons	Solution
Start Failure	Unit does not have power; Power line damaged or power not available.	"Check the indicator LED on the LCID power head, it should be lit up, if not, push the RESET button, if still no voltage, but power grid has output, you need to change the power cord."
	Power cord protection trip.	Check the power cord for damage, push the RESET button. If not solved, replace the power cord.
	Power cord isn't plugged in correctly.	Plug in cord correctly.
	PCB fuse is broken.	Check if any load (in fan, out fan, reversing valve, power transformer) has a short circuit. Eliminate the error and replace the fuse with the same type.
	Bad contact between main board and control panel.	Check the contact wires, make sure all contact well.
	Compressor delay start.	It's normal, compressor will start after 3 minutes
	Power fail protection.	When power on, because of auto-restart, unit will delay starting in 120~240s
	Unit in protection mode.	Please check the ERROR CODE
	Main board or Control panel is bad.	Replace the main board or control panel
Control panel does not work	When the unit is switched to 24V remote thermostat or 12V smart controller, the control panel will not be functioning.	If you need to use control panel to take control, you need to switch the control master. See the ADVANCED SETTINGS section.
Indoor fan/outdoor fan does not function or runs slowly	Fan is locked by something or the power wires are poorly connected; fan capacitor is poorly connected; fan capacitor is out of service life.	Disconnect the power cord, check whether the fan can run smooth by hand or other tools, whether motor wire is connected well. If fan has slow running speed replace capacitor.

TROUBLESHOOTING

Figure 711

Basic Troubleshooting

Malfunction	Possible Reasons	Solution
Not cooling/heating adequately	Something is blocking the indoor/ outdoor air outlet.	Make sure that there are no obstacles at the indoor/outdoor air outlet.
		Make sure that the grill is suitable for the unit, inappropriate grill will cause the compressor to fault; make sure that the grill has more than 70% .
	Set unsuitable temperature.	Set higher/lower temperature by the control board. NOTE: temperature setting restriction will restrict the setting temperature. See the ADVANCED SETTINGS section.
	Indoor air filter is dirty.	Should clean the filter at least every month.
	Room is hot/cold.	Let unit run a little longer that room temperature will be lower/higher.
	Heat leakage between indoor and outdoor.	Block the leakage place.
	Indoor coil not cold/heat.	Charge the refrigerant.
Unit has noise	"Some moving parts of the unit are loose causing bad vibration. Something in the air way."	Make sure that all moving parts are assembled well, and nothing is in the air way.
Bad smell when heating	The dust on the E-heater is heating.	The bad smell will disappear a little later.
Outlet temperature is not always cooling/heating	Outlet temperature is not high enough when heating by heat pump.	When outdoor ambient temp is low, the heat pump will not be able to offer enough heat. Soon after that, the E-heater will come on to heat.. Possible Maintenance is required.
	Fan stops when cooling/heating.	It is normal when the CONSTANT FAN is OFF. You can enable the CONSTANT FAN.
Water dripping outdoors.	Drain pipe kit not installed.	Install the drain pipe kit.
Water dripping indoors.	Wall sleeve is not installed correctly.	Install the wall sleeve according to the installation manual.
Indoor coil freeze	Outdoor temperature is too low in cooling mode.	When outdoor temperature is drop to 55°F (12.8°) or below, it will cause that indoor coil to freeze. Open the fresh air door, and running at fan mode.
	Filter is dirty.	Clean the filter to recover the normal air flow

TROUBLESHOOTING

Figure 712

Error code and solutions

ERROR CODE	Meaning	Solutions	Click link for reference
E1	Communication Error between Power, IPM, Main, & or Display electronic boards+B2:C14	Check all Communication Cables; MOD_Com, MB_Com, Display_ com& Power Relay_com.	See "Unit does not operate" in troubleshooting section"
E2	Indoor Temp Sensor Open/Shorted	Check if properly connected. Check resistance values. Check for loose wires/broken wires in Molex connectors.	Check Thermistors
E3	Indoor Evaporator Coil Sensor Open/Shorted	Check if properly connected. Check resistance values. Check for loose wires/broken wires in Molex connectors.	Check Thermistors
E4	Indoor Supply Air Sensor Open/Shorted or Overheating of electric heater	Check if properly connected. Check resistance values. Check for loose wires/broken wires in Molex connectors. Check for Over Heating. Check for low air flow or no air flow due to evap coil clog. Evap fan motor compromised, Fan Capacitor compromised, blower wheel compromised. Heater relays compromised.	Check Thermistors Check Heater control
E5	IPM Board in protection mode	Check if compressor wiring is incorrect, IPM PCB compromised, Power PCB compromised, or if compressor compromised. Check for airflow obstructions. Check CN 13 on Power PCB for 15VDC at pins 1 and 2. Check compressor coil resistance. Check IPM PCB for arcing or odors of overheating. Check and monitor power supply stability and ensure proper NEC code grounding at the main breaker and power supply.	Remove IPM PCB (Inverter Board) Power PCB Identification Compressor Checks Remove Power PCB
E6	Outdoor Temp Sensor Open/Shorted	Check if properly connected, check resistance values, check for loose wires/broken wires in Molex connectors.	Check Thermistors
E7	Outdoor Condenser Coil Sensor Open/Shorted	Check if properly connected, check resistance values, check for loose wires/broken wires in Molex connectors.	Check Thermistors
E8	Communication failure to wall controller	Check all connectors between PTAC and wall controller are properly connected. Shutdown unit, and then remove power plug from wall or open fuse/ circuit breaker. Wait 3 or 4 minutes and then reapply power and restart the unit. If E8 error persists, contact Friedrich Technical Support at (1-800-541-6645). for further assistance.	
EC	Compressor attempted to start but failed to start	Check Dip Switch SW2 on Main Board is correct for the BTU of the unit model. Check Compressor wiring is properly connected. Check compressor for Short/Ground, Check IPM Board.	See Operation section for details on dip switches Compressor Checks
EH	EEPROM Error	Replace Main Board, Check for compromised electrical wires to Main Board	Replace Main Board
EF	30 amp power cord installed on PVH09 (230 or 265 volt) Not Allowed	Replace the power cord to 15A or 20A supply cord as required. See Accessory section.	Replace Power Cord

TROUBLESHOOTING

Figure 712

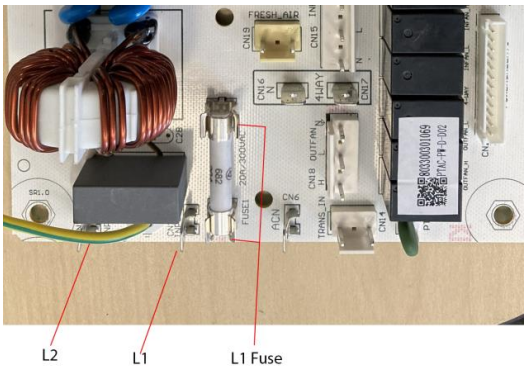
Error code and solutions

ERROR CODE	Meaning	Solutions	Click link for reference
P1	Cooling or Heating overload	Check for low air flow or no air flow due to evaporator or condenser coil blocked with debris. Evap/Cond motor fan motor compromised, Fan Capacitors compromised, blower wheel/fan blade compromised. Check Resistance values for indoor and Outdoor coil thermistors.	Check indoor fan motor Check outdoor fan motor Check Fan Capacitors Check Thermistors
P2	IPM Over Heat or Over Current Protection invoked	Check for low air flow or no air flow due to evaporator or condenser coil blocked with debris. Evap/Cond motor fan motor compromised, fan Capacitors compromised, blower wheel/fan blade compromised. Check Dip Switch SW2 on Main Board is correct for the BTU of the unit model. Check Compressor wiring is properly connected, Check compressor for Short/Ground, Check IPM PCB.	See Operation section for details on dip switches. Check indoor fan motor Check outdoor fan motor Check Fan Capacitors Check Compressor Check IPM PCB
P4	Compressor Discahrge Over Heat Protection invoked	Check for low air flow or no air flow due to evaporator or condenser coil blocked with debris. Evap/Cond motor fan motor compromised, Fan Capacitors compromised, blower wheel/fan blade compromised. Check Dip Switch SW2 on Main Board is correct for the BTU of the unit model Check Compressor wiring is properly connected, Check compressor for Short/Ground, Check IPM Board,	See Operation section for details on dip switches. Check indoor fan motor Check outdoor fan motor Check Fan Capacitors heck Compressor Check IPM PCB
P7	DC Over/Under Supply Power Voltage Protection invoked	Check for low air flow or no air flow due to evaporator or condenser coil blocked with debris. Indoor blower/ outdoor fan compromised, fan capacitors compromised. Blower wheel/ fan blade compromised. Check dip switch SW2 on main pcb is correct for the BTU of the model. Check compressor wiring is properly connected. Check compressor for short. Check IPM PCB. Check Power Supply is within the required power supply tolerances of +/- 10% Check and monitor power supply stability and ensure proper NEC code grounding at the main breaker and power supply.	See Unit does not Operate Check indoor fan motor Check outdoor fan motor Check Fan Capacitors Check Compressor Check IPM PCB

TROUBLESHOOTING

Figure 713

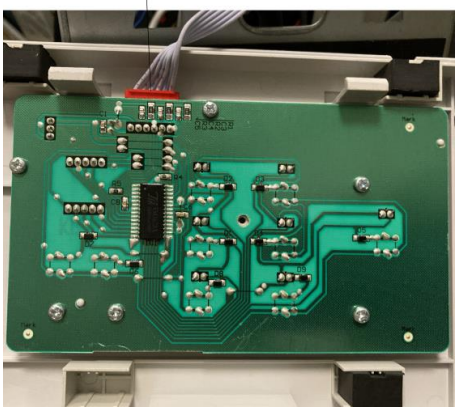
Unit Does Not Operate

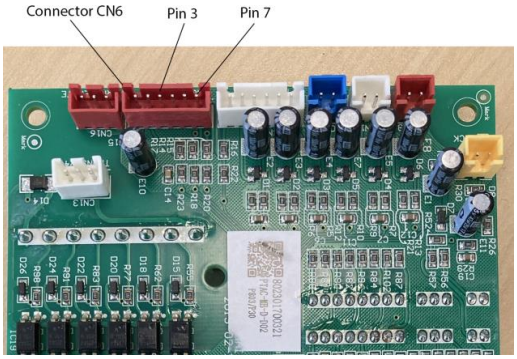


TROUBLESHOOTING

Figure 713

Unit Does Not Operate





TROUBLESHOOTING

Figure 714

Check Heater Coil

The unit is equipped with a universal E-heater, which contains two independent heating elements. Two limit switches are incorporated into the heater assembly. The primary opens at 155°F and closes at 125°F. The secondary's open temp is 200°F. They can not be replaced independently. If they are found to be faulty the entire heater assembly must be replaced as a unit. The 9K BTU unit incorporates a 2.5 kW and a 1.0 kW element. The 12K BTU unit incorporates a 3.5 kW and a 1.5 kW element.

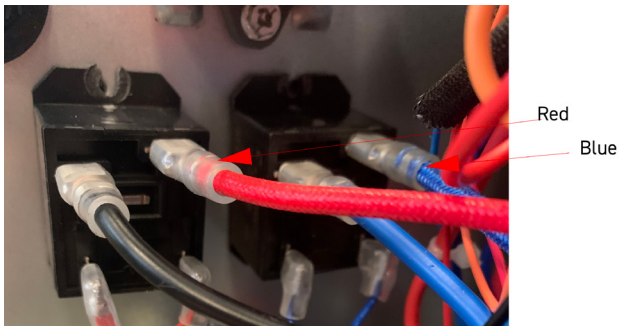


Figure 714 (Check Heater Coil Resistance)

Gain Access to Main PCB (logic) board
1. Remove front panel (Figure 501).
2. Remove User Interface (Figures 502 thru 504).
3. Open electrical Control Box (Figure 505)
4. Disconnect Red and Blue wires from the Heater relays (Figure 714)
5. Disconnect black wire from Power PCB (Figure 715)

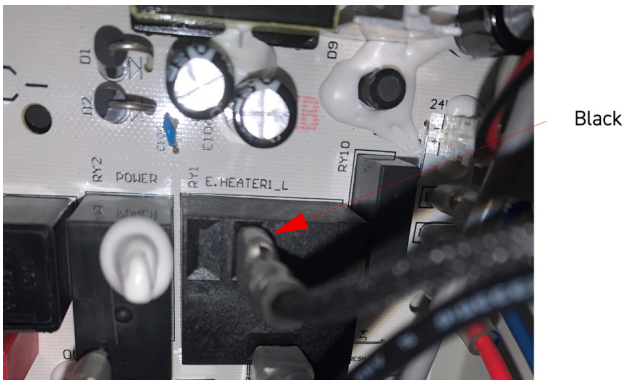


Figure 715 (Check Heater Coil Resistance)

Testing The Heating Element

Testing of the elements can be made with an ohmmeter across the terminals after the 3 heater wires have been disconnected. Readings should always been taken when coil is cold.

The 9K BTU unit incorporates a 2.5 kW and 1.0 kW heater coils.

1) Check 2.5 kW coil
Blue (Heater Common) to Black (Heater 1)
230v = 18.61 ohms +-3%
265v = 24.70 ohms +- 3%

2) Check 1.0 kW coil
Blue (Heater Common) to Red (Heater 2)
230v = 46.52 ohms +-3%
265v = 61.73 ohms +- 3%

The 12K BTU unit incorporates a 3.5kW and 1.5kW heater coils.

1) Check 3.5 kW coil
Blue (Heater Common) to Black (Heater 1)
230v = 13.29ohms +-3%
265v = 17.64 ohms +-3%

2) Check 1.5 kW coil
Blue (Heater Common) to Red (Heater 2)
230v = 31.01 ohms +-3%
265v = 41.76 ohms +-3%

If a reading is open or out of tolerance replace the heater assembly.

Reconnect wires and operate heat to place electric heater in demand- See sequence of operation for details.

Check 230/265v at output terminals on heater relays. If 230/265 volts is present and heater element does not operate correctly, replace heater assembly. If 230/265 volts in not present, proceed to figure 717 (Check electric heater control)

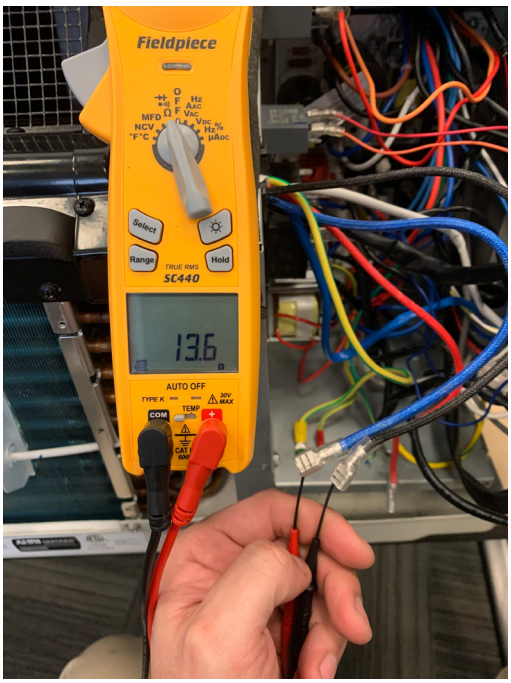


Figure 716 (Check Heater Coil Resistance)

TROUBLESHOOTING

Check Electric Heater Control

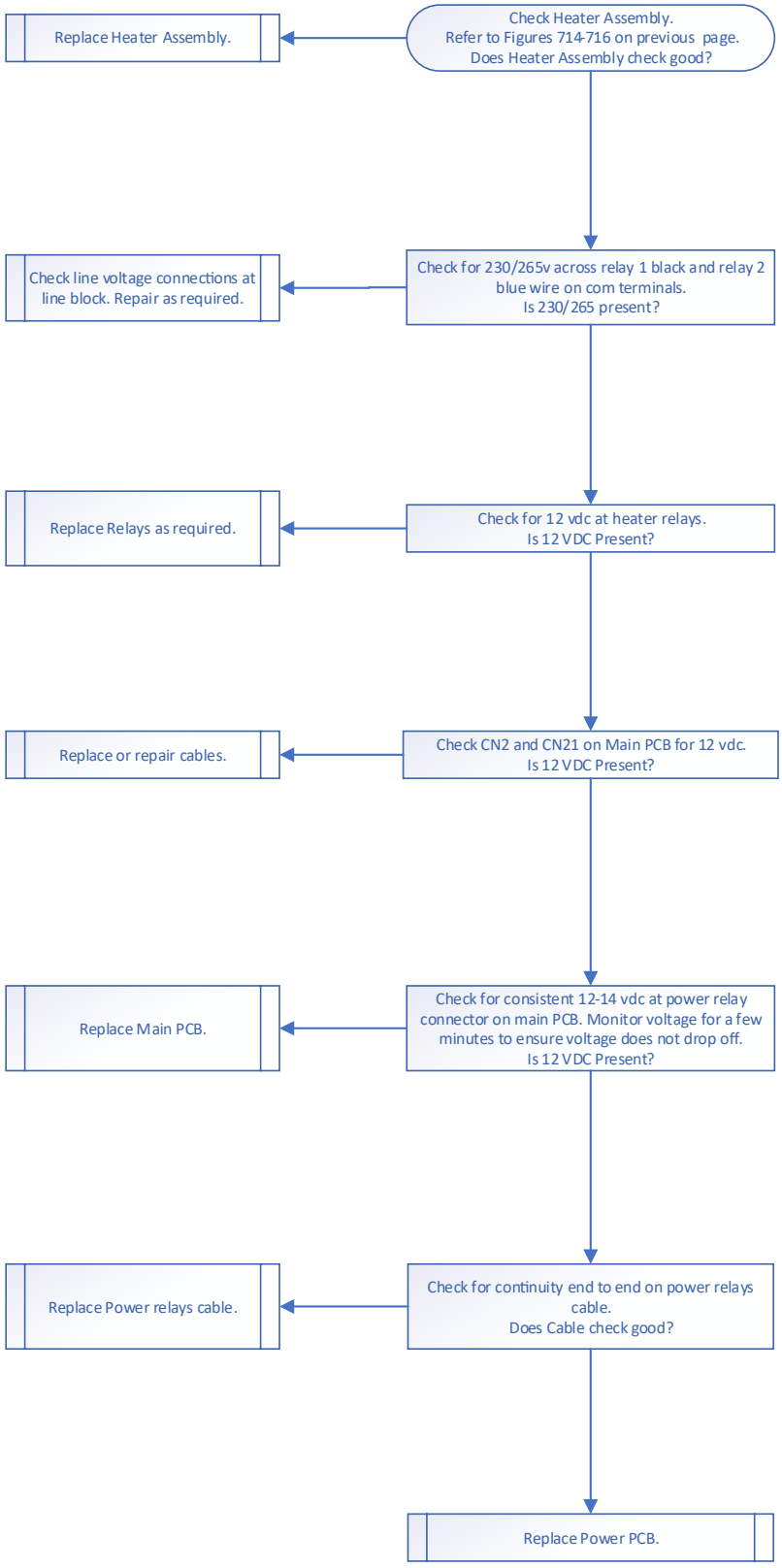
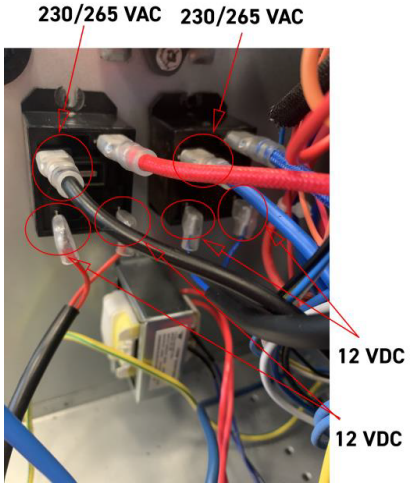
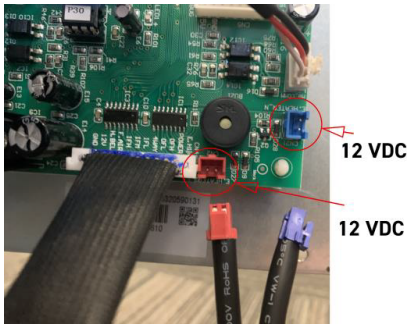
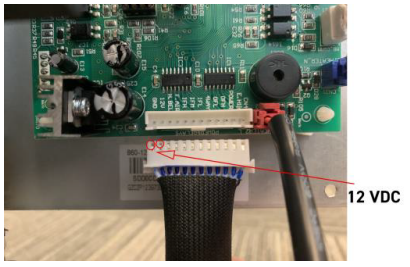


Figure 717







TROUBLESHOOTING

Figure 718

Check Thermistors

Gain Access to Main PCB (logic) board
1. Remove front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Using a multi meter ohm across applicable pins for the sensor you are checking.

5. Refer to thermistor charts in Appendix for resistance and temperature deviation.
5k Indoor ambient temperature (T1) Figure 719
5k Indoor coil temperature (T2) Figure 719
5k Outdoor coil temperature (T3) Figure 719
5k Outdoor ambient temperature (T4) Figure 719
50k Compressor discharge temp (T5) Figure 720
5k Indoor outlet air temperature (T6) Figure 19

6. Replace sensor if open or if resistance values deviate by more than 10% of the listed values.

Figure 719 (Thermistor Connections on Main PCB)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Chassis

⚠ 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 501 (Chassis Removal)

The Front Panel needs to be removed prior to any repair or troubleshooting procedures.

1. Front panel is removed by lifting up and rotating back and down.

⚠ CAUTION

Unit weighs approximately 120 pounds. Use caution when removing to prevent personal injury or damage to the equipment.

2. Remove 4 mounting screws and slide unit out of sleeve.

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove User Interface

⚠ 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 1 screw securing User Interface to the control box. (Figure 502)

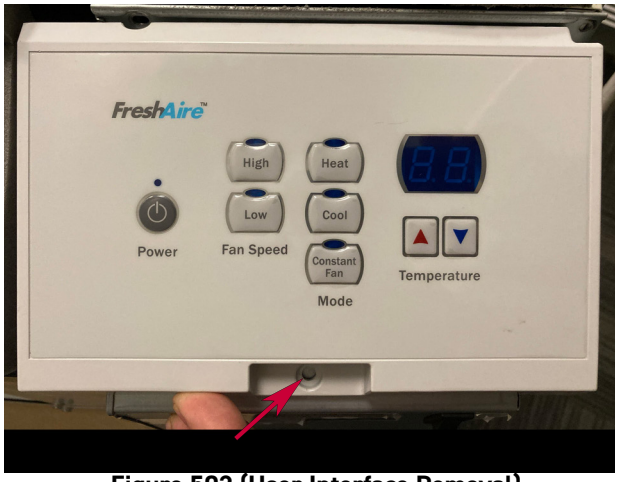


Figure 502 (User Interface Removal)

2. Remove 7 screws attaching display board to user interface. (Figure 503)

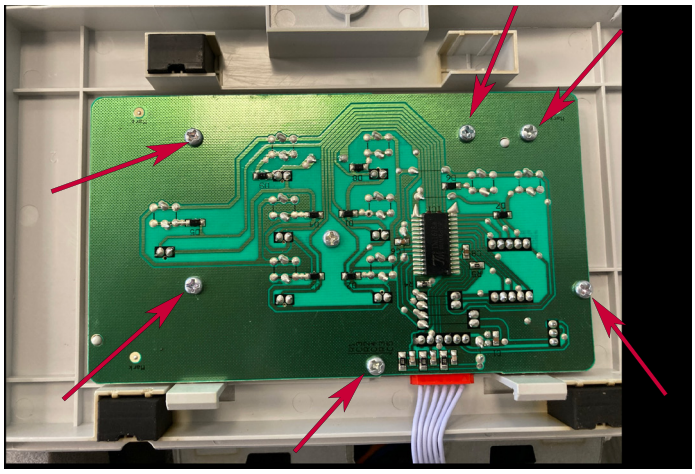


Figure 503 (User Interface Removal)

3. Disconnect plug. (Figure 504)

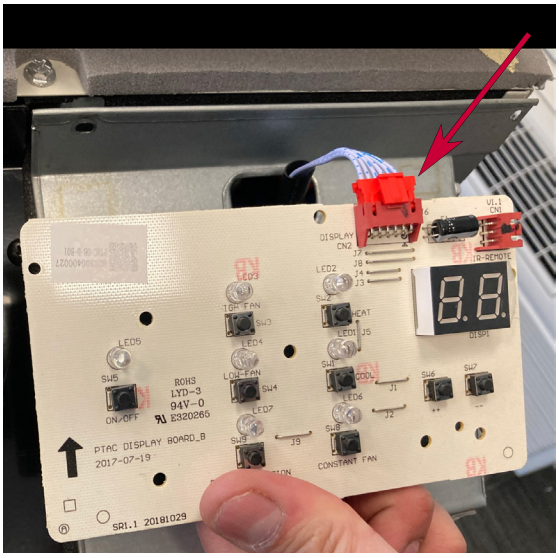


Figure 504 (User Interface Removal)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Open Electrical Control Box

⚠ 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 front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Remove 7 screws.(Figure 505)

4. Unhinge electrical box.

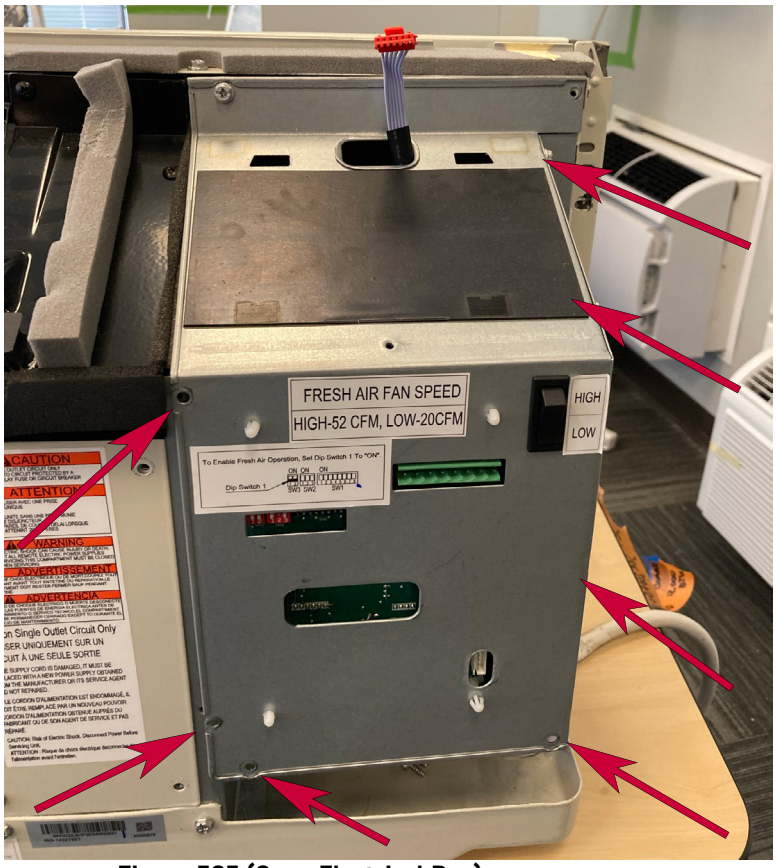


Figure 505 (Open Electrical Box)

Remove Main PCB (logic) Board

1. Remove front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Snip wire ties to loosen wire bundles. (Figure 506).

NOTE: It is a good practice to take pictures of the wiring connections to facilitate reinstallation.

2. Disconnect wire connectors from Main PCB (logic) board one at a time. Identify plugs for reinstallation.

3. Remove 4 standoffs by pinching tip and applying slight upwards pressure to the board.

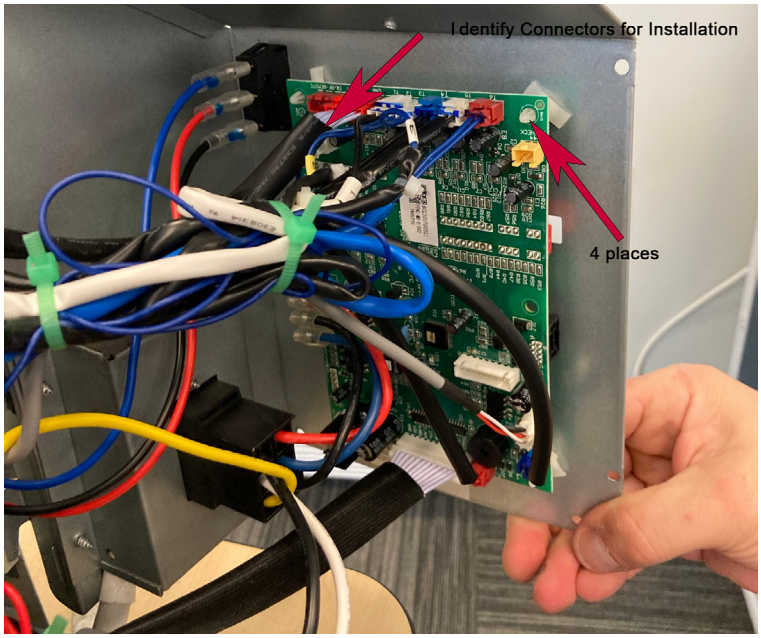


Figure 506 (Remove Main PCB (logic board)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Power Cord

⚠ 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 front panel (Figure 501).

1. Remove power cord access panel located on right side of control box(2 screws) Figure 507)

Figure 507 (Remove Power Cord)

2. Pinch retainer clips on top and bottom of power cord plug to disconnect (Figure 508).

3. Remove cord grommet (2 screws).

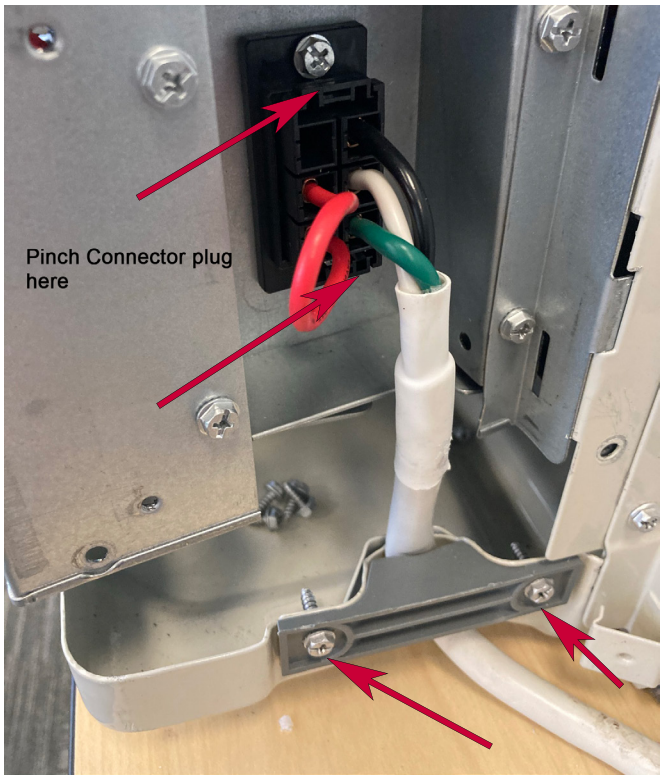


Figure 508 (Remove Power Cord)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Power 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.

1. Remove front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Snip wire ties to loosen wire bundles (Figure 509).

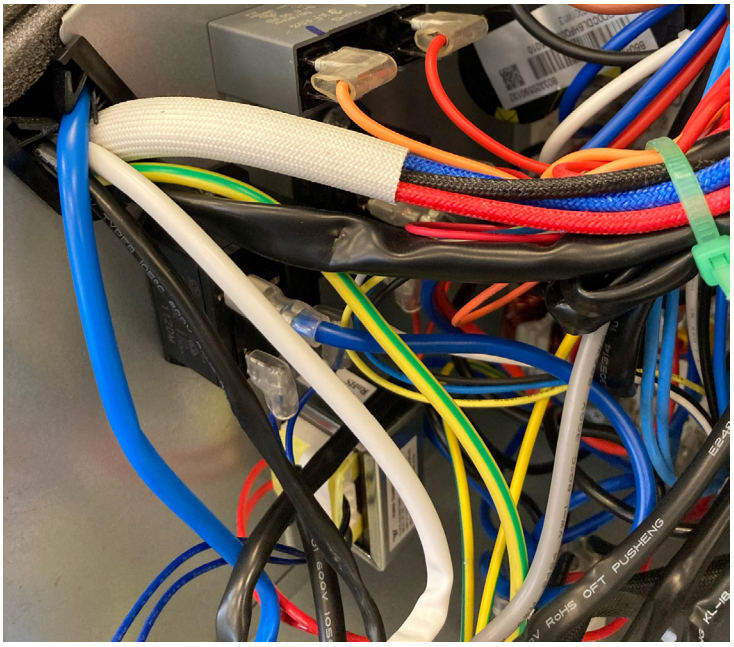


Figure 509 (Remove Power PCB)

NOTE: It is necessary to unmount components to gain access for Power PCB (Power Board removal.

5. Remove 2 capacitors, 2 heater board relays, and 1 transformer but **DO NOT** disconnect connections (Figure 510).

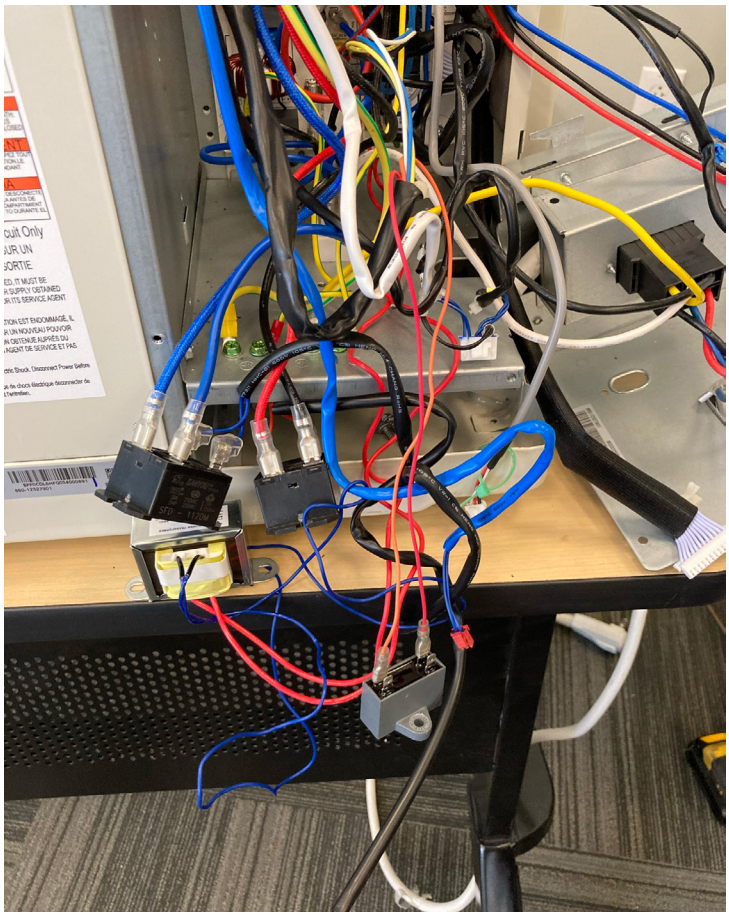


Figure 510 (Remove Power PCB)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Power PCB (Continued)

NOTE: It is a good practice to take pictures of the wiring connections to facilitate reinstallation.

6. Disconnect wire connectors from Power PCB (Power Board) one at a time. and identify plugs for reinstallation (Figure 511).

7. Remove Power PCB (Power Board) (4 screws).

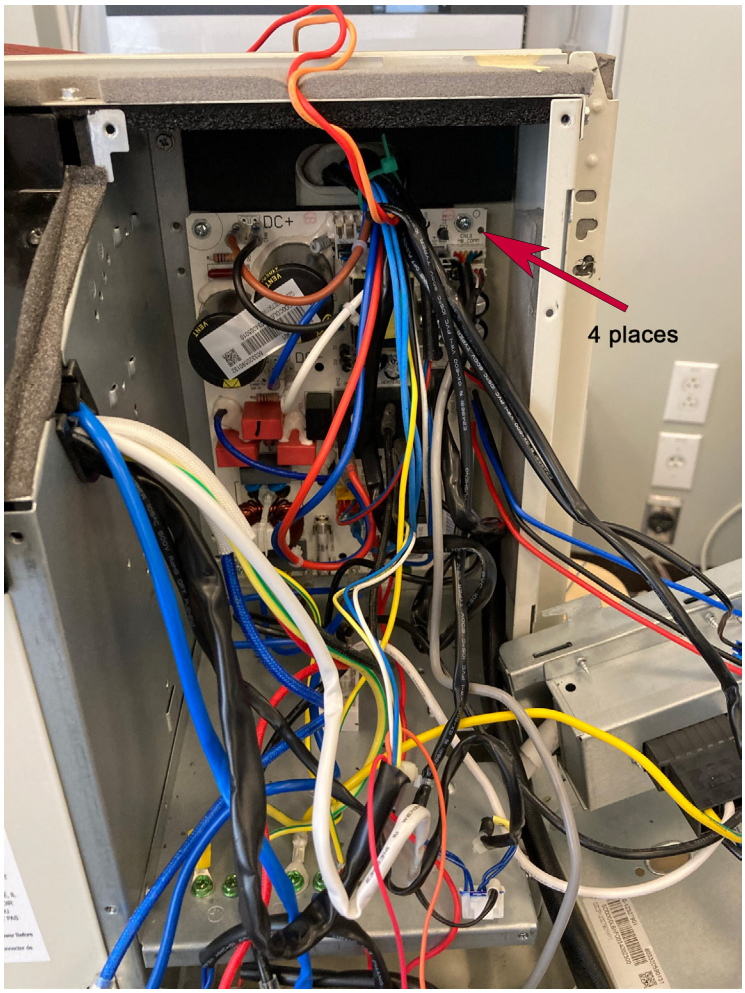


Figure 511 (Remove Power PCB (Power Board)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove IPM PCB (Inverter Board)

1. Remove front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Disconnect CN 13 from the Power PCB.

5. Remove Chassis from Wall (Figure 501).

6. Remove shroud support (2 screws) (Fig 512).
7. Remove IPM PCB Cover (3 screws) (Fig 512).

NOTE: It is a good practice to take pictures of the wiring connections to facilitate reinstallation.

8. Disconnect all wires. (Fig 513)

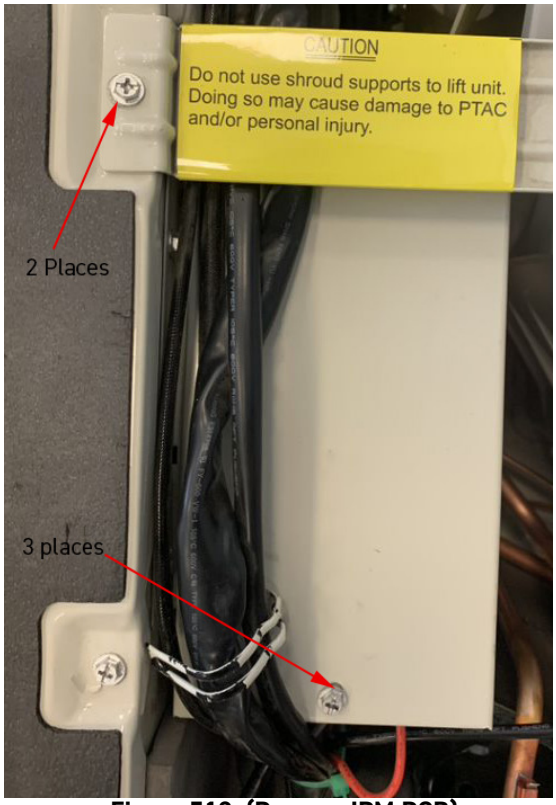


Figure 512 (Remove IPM PCB)

> **⚠ CAUTION**
>
> IPM PCB is attached to a heavy heat sink with thermal paste or a thermal mat which is required to dissipate heat from the IPM PCB. Use care when removing.
> PCB needs to drop down through housing. It can fall and be damaged if care is not taken.

8) Remove 4 mounting screws (Figure 513).

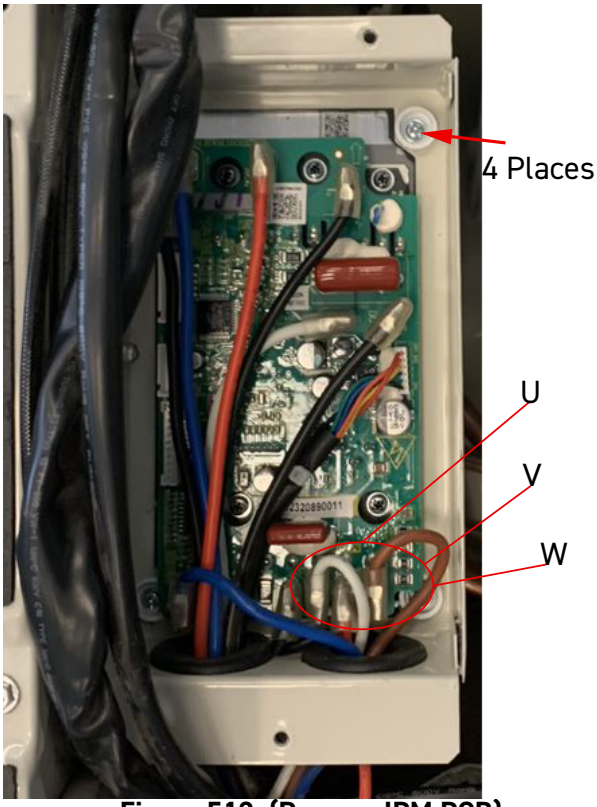


Figure 513 (Remove IPM PCB)

> **⚠ CAUTION**
>
> The replacement Invert Board (PCB) you have received may have the position of the U, V, and W terminals reversed. Pay attention to the order of terminals as marked on the board to ensure proper connections.

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Blower Wheel

⚠ 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 front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Remove indoor fan guard (6 screws) (Figure 514).

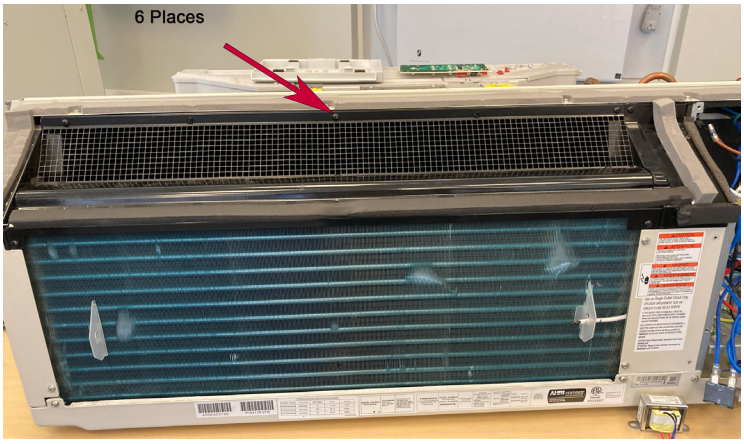


Figure 514 (Remove Indoor Fan Guard)

5. Remove top air guide (6 screws) (Figure 515).

Figure 515 (Remove Top Guide)

6. Remove fresh air intake housing (2 screws) (Figure 516).

Figure 516 (Remove Fresh Air Housing)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Blower Wheel (Continued)

9. Remove left panel (7 screws) (Figure 517).

Figure 517 (Remove Left Panel)

10. Loosen set screw **(DO NOT REMOVE)** from blower motor shaft. (Figure 518).

NOTE: Set screw is a metric type “Allen Head” screw.

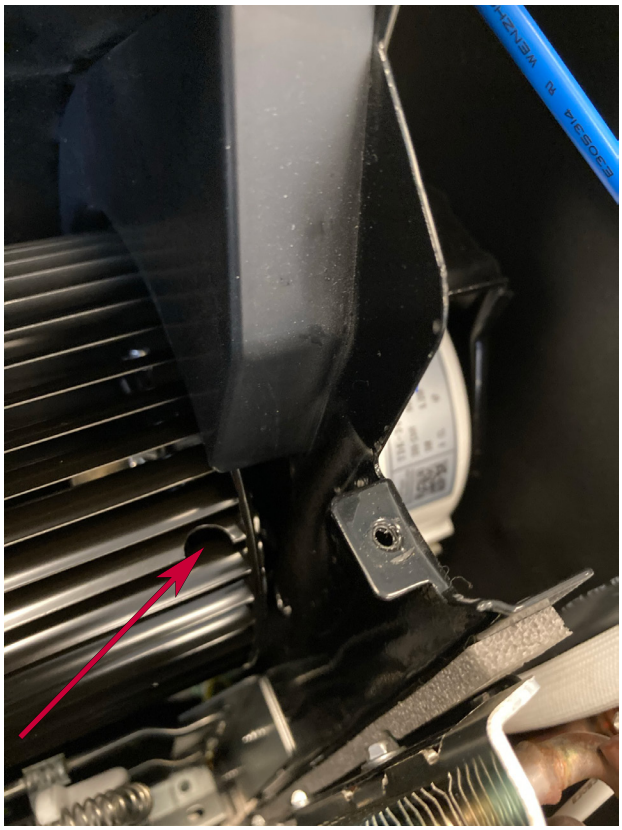


Figure 518 (Blower Wheel Set Screw)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Blower Wheel (Continued)

11. Remove blower end plate (3 screws)(Figure 519).

12. Slide blower assembly out of left side of unit.

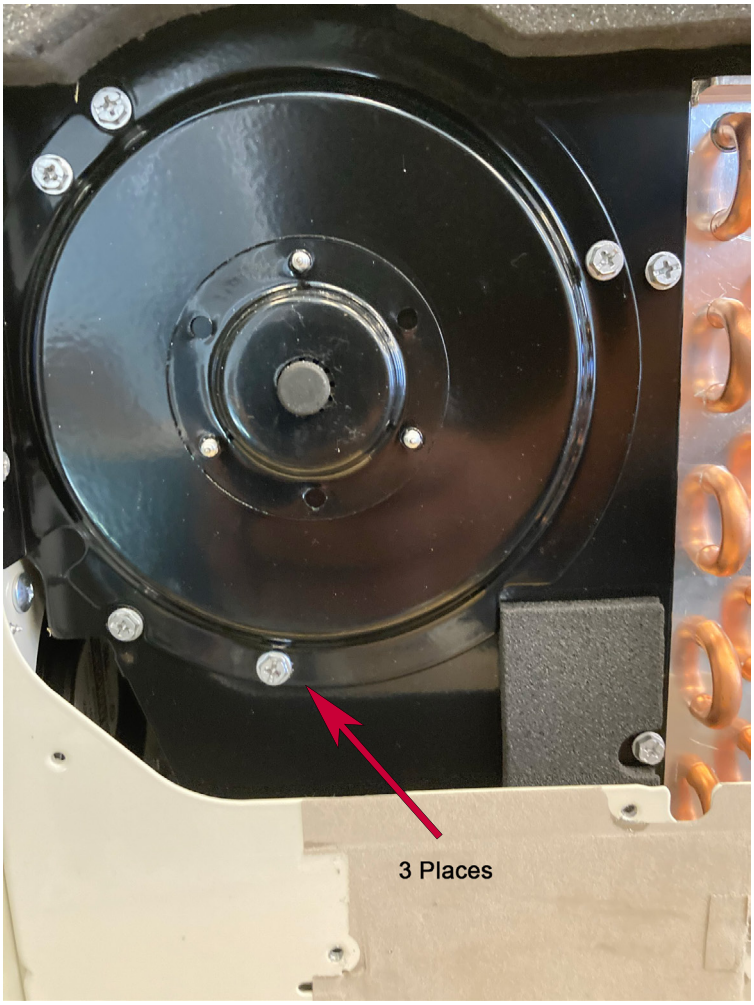


Figure 519 (Blower End Plate)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Blower Wheel Motor

⚠ 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 front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Snip wire ties to loosen wire bundles. (Figure 521)

NOTE: It is a good practice to take pictures of the wiring connections to facilitate reinstallation.

5. Disconnect indoor blower connector on Power PCB (Power Board). (Figure 520).

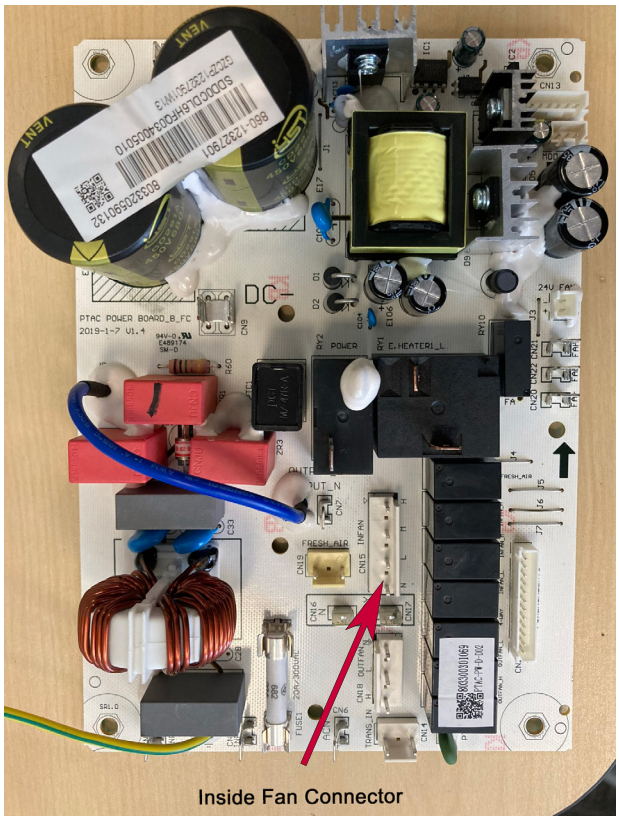


Figure 520 (Disconnect Indoor Blower Connector)

6. Disconnect Indoor blower capacitor connector (Figure 521).

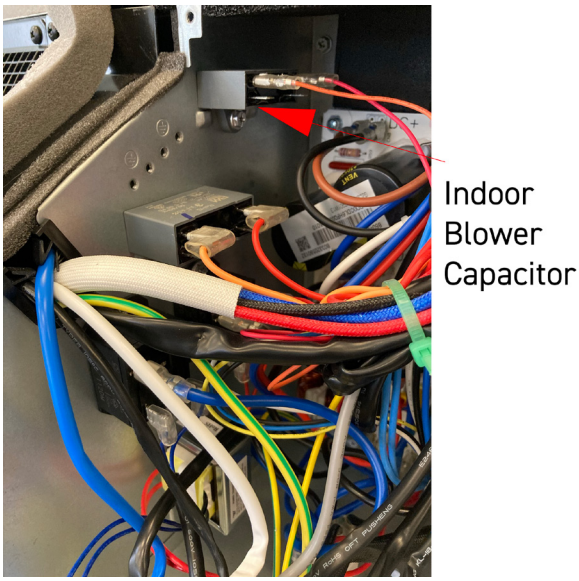


Figure 521 (Disconnect Indoor Blower Capacitor)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Blower Wheel Motor (Continued)

7. Remove mounting screws from electrical box rear and side covers and slide out of way to facilitate blower motor replacement (Figure 522).

8. Remove fan motor bracket (3 screws).

9. Remove motor.

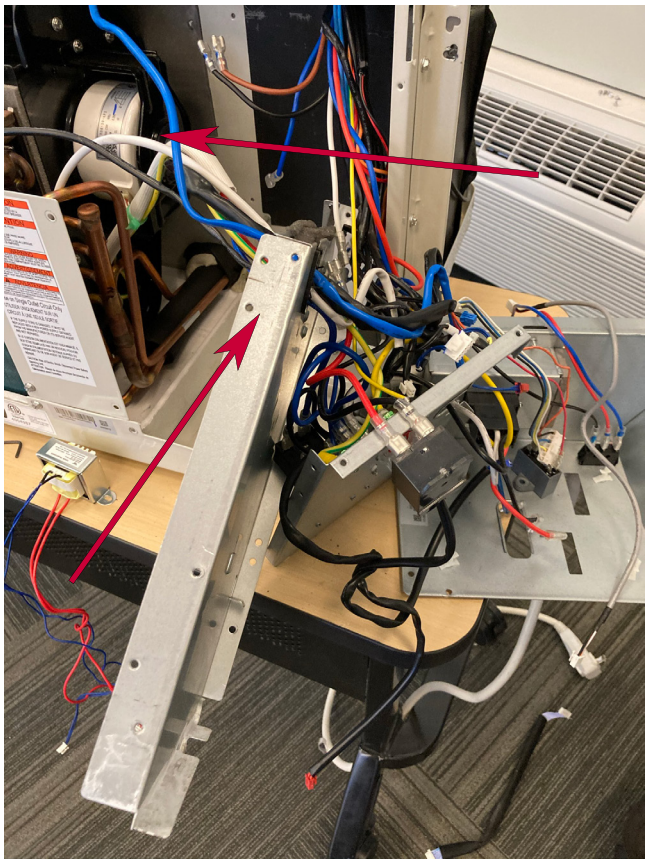


Figure 522 (Remove Indoor Blower Motor Bracket)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Heating Element

⚠ 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 front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

4. Remove Chassis from Wall (Figure 501)

4. Remove indoor fan blower (Figures 514 thru 519).

5. Remove top support bracket (12 screws) (Figure 523)

6. Disconnect blower housing sensor from blower housing (Figure 524).

7. Disconnect Indoor motor capacitor wiring and power connector at Power PCB.

8. Disconnect power leads from heater relays.

9. Disconnect heater ground wire.

10. Remove indoor blower housing (4 screws).

11. Remove heater element assembly from housing (4 screws).

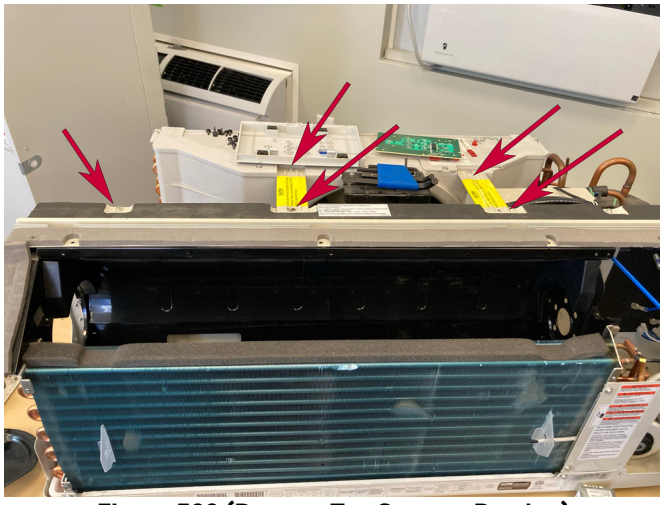


Figure 523 (Remove Top Support Bracket)

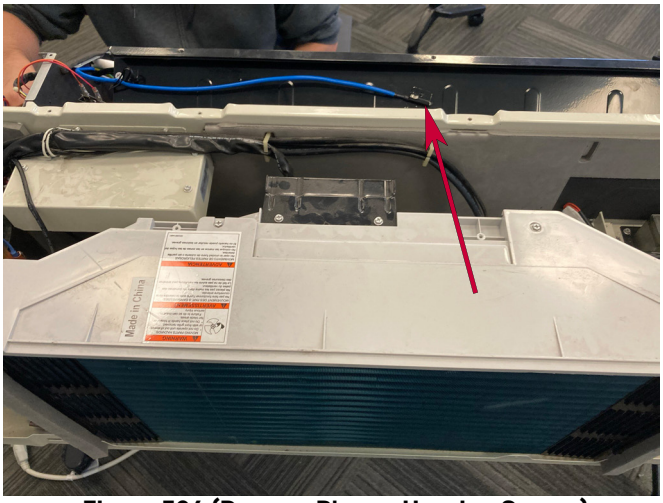


Figure 524 (Remove Blower Housing Sensor)

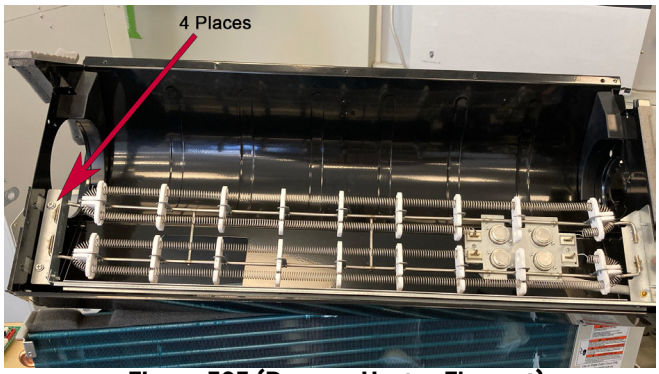


Figure 525 (Remove Heater Element)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Fresh air Components

⚠ 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 Chassis From wall. (Figure 501).

2. Remove Fresh air Cover (Figure 526).

Figure 526 (Remove Fresh Air Housing)

3. Cut wire ties as required.

4. Remove 4 screws from reactor and unplug 2 terminal wires (Figure 527).

5. Remove bracket (2 screws).

6. Remove freshair filter by sliding out.

7. Remove all screws from fresh air housing.

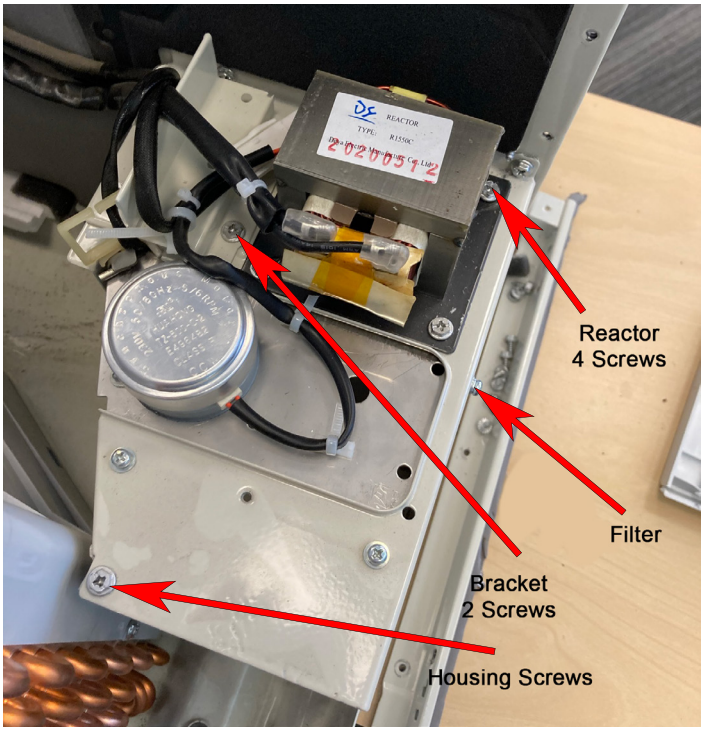


Figure 527 (Remove Fresh Air brackets)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Fresh air Components (Continued)

8) Remove fresh air actuator assembly (1 screw).

9) Remove fresh air fan assembly (2 screws).

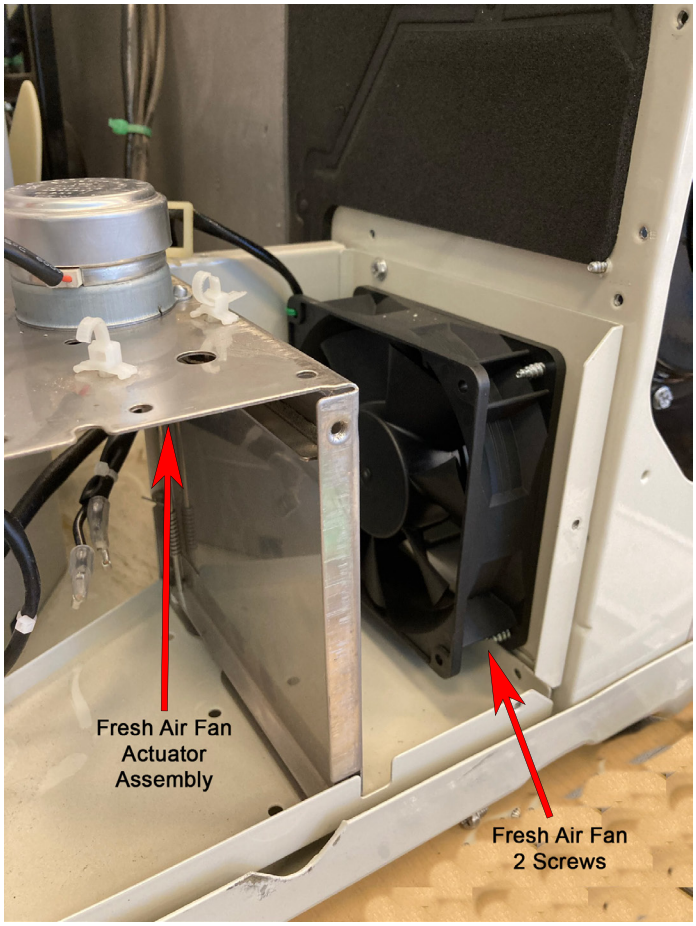


Figure 528 (Remove Fresh Air Actuator and Fan)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Outdoor Fan

⚠ 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 Chassis from wall (Figure 501).

2. Remove front panel (Figure 501). (Not required for Blade replacement)

3. Remove User Interface (Figures 502 thru 504). Not required for Blade replacement)

4. Open electrical Control Box (Figure 505). Not required for Blade replacement)

5. Cut wire ties as required. Not required for Blade replacement)

6. Disconnect outdoor blower connector on power panel. (Figure 529). Not required for Blade replacement)

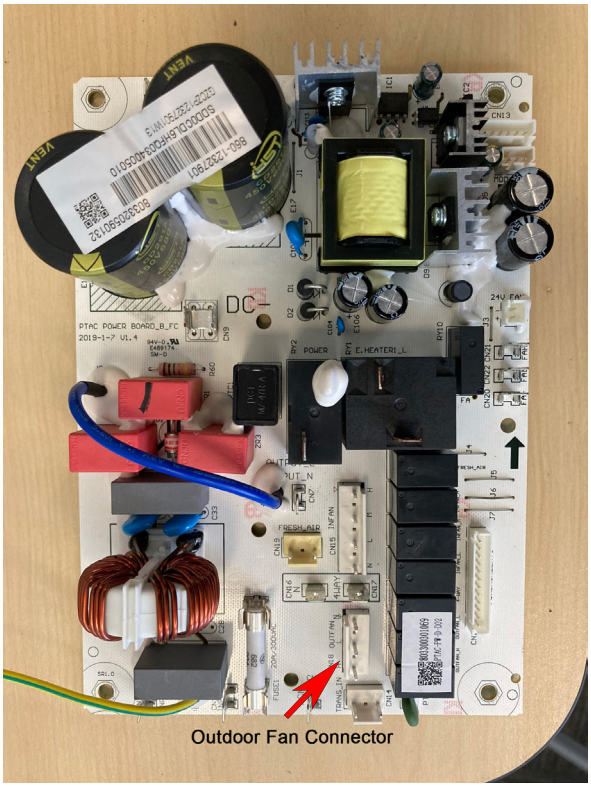


Figure 529 (Disconnect Outdoor Fan Connector)

7. Disconnect Outdoor blower capacitor connector (Figure 530). Not required for Blade replacement)

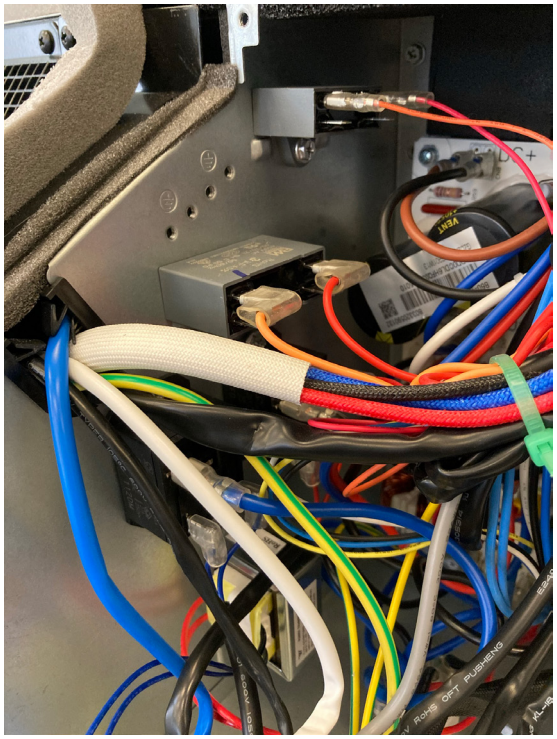


Figure 530 (Disconnect Outdoor Fan Capacitor)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Outdoor Fan (Continued)

8. Remove Brackets and Shrouds (12 screws)(Figure 531 and 532).

9. Remove Mounting screws (4 places) (Figure 533).

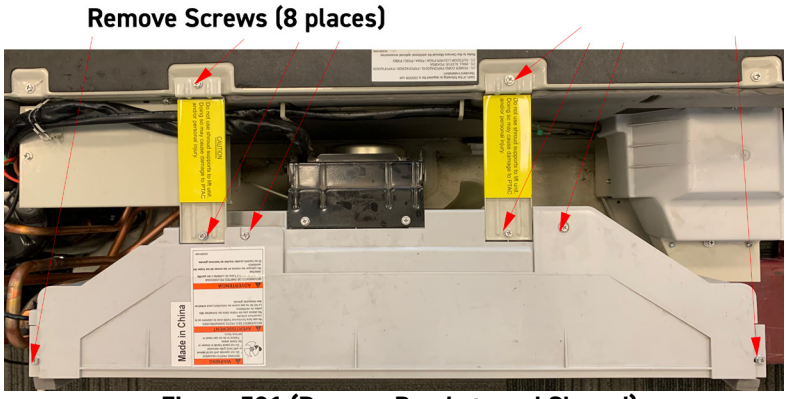


Figure 531 (Remove Brackets and Shroud)

Figure 532 (Remove Brackets and Shroud)

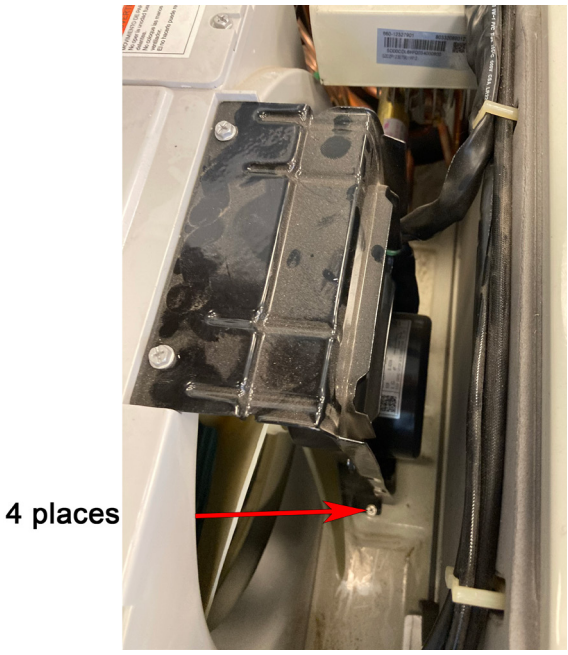


Figure 533 (Remove Mounting bolts)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Outdoor Fan (Continued)

10. Pull up and remove fan housing (Figure 534).

11. Remove shaft nut and fan blade (Figure 535).

12. Remove motor (4 places) (Figure 536).

Figure 534 (Remove Assembly)

Figure 535 (Remove fan blade)

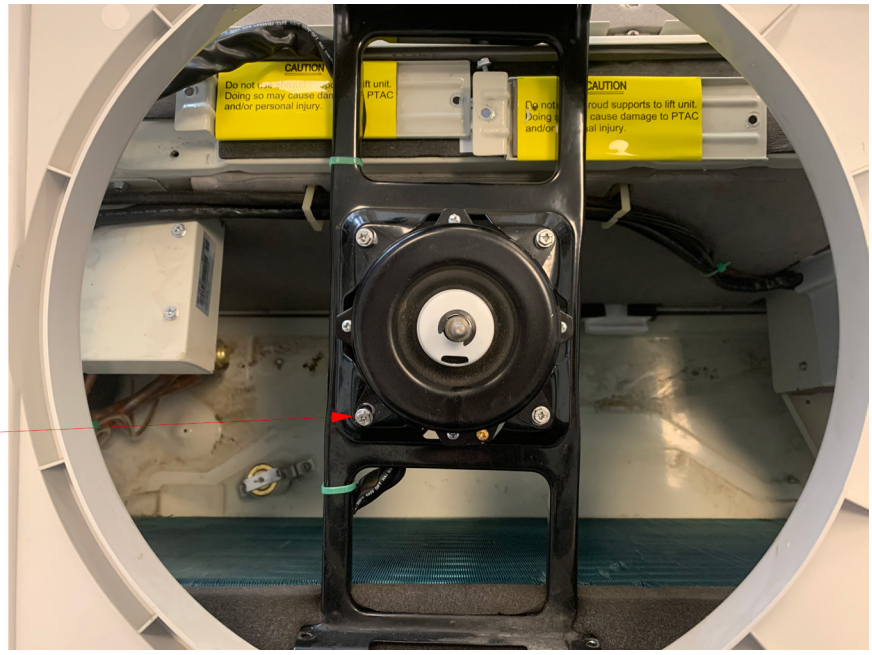


Figure 536 (Remove Fan Motor)

UNIT DISASSEMBLY AND COMPONENT REPLACEMENT

Remove Reversing valve Solenoid

1. Remove Chassis from wall (Figure 501).

2. Remove front panel (Figure 501). (Not required for Blade replacement)

3. Remove User Interface (Figures 502 thru 504). Not required for Blade replacement)

4. Open electrical Control Box (Figure 505). Not required for Blade replacement.

5. Cut wire ties as required. Not required for Blade replacement.

6. Disconnect connector from Power PCB (Power Board) cn 16 and 17 and feed wire through control box housing (Figure 537).

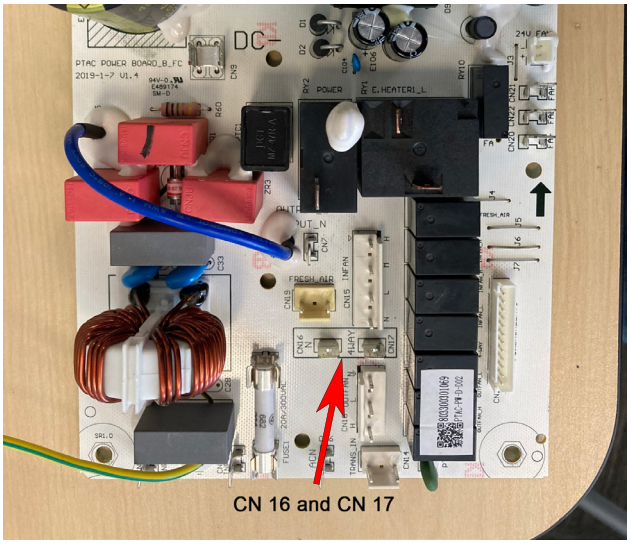


Figure 537 (Disconnect Solenoid Connector)

7. Remove cover (3 screws) (Figure 538).

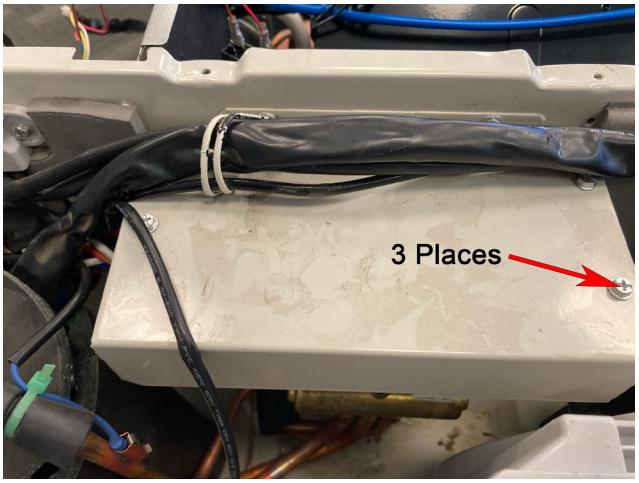


Figure 538 (Remove solenoid cover)

8. Remove 1 bolt and separate solenoid from valve (Figure 539).

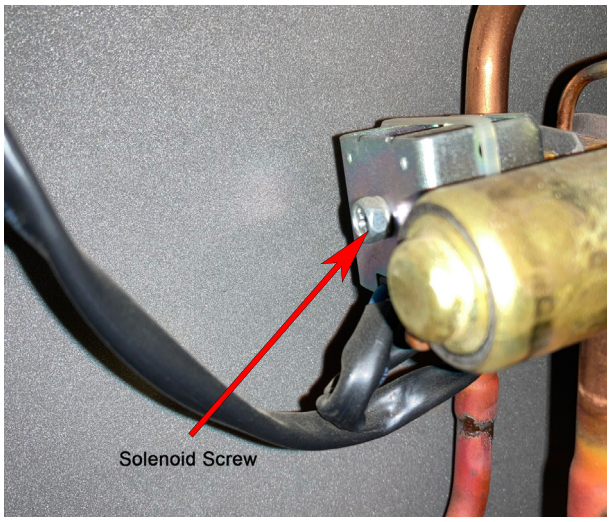


Figure 539 (Remove solenoid)

COMPONENT TESTING

Hermetic Components Check

⚠ WARNING

BURN HAZARD

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

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

⚠ WARNING

CUT/SEVER HAZARD

Be careful with the sharp edges and corners. Wear protective clothing and gloves, etc.

Failure to do so could result in serious injury.

Metering Device - Capillary Tube Systems

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

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

Check Valve

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

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

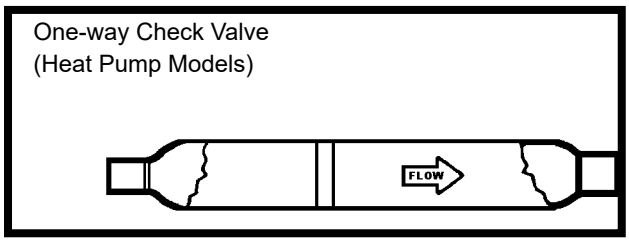


Figure 701 (Check Valve)

CHECK VALVE OPERATION

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

In the heating mode of operation, high pressure refrigerant enters the check valve from the opposite direction, closing the port (liquid line) to the outdoor coil. The flow path of the refrigerant is then to the heating capillary to the outdoor coil. Failure of the slide in the check valve to seat properly in either mode of operation will cause flooding of the cooling coil. This is due to the refrigerant bypassing the heating or cooling capillary tube and entering the liquid line.

COOLING MODE

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

HEATING MODE

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

COMPONENT TESTING

Reversing Valve Description And Operation

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

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

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

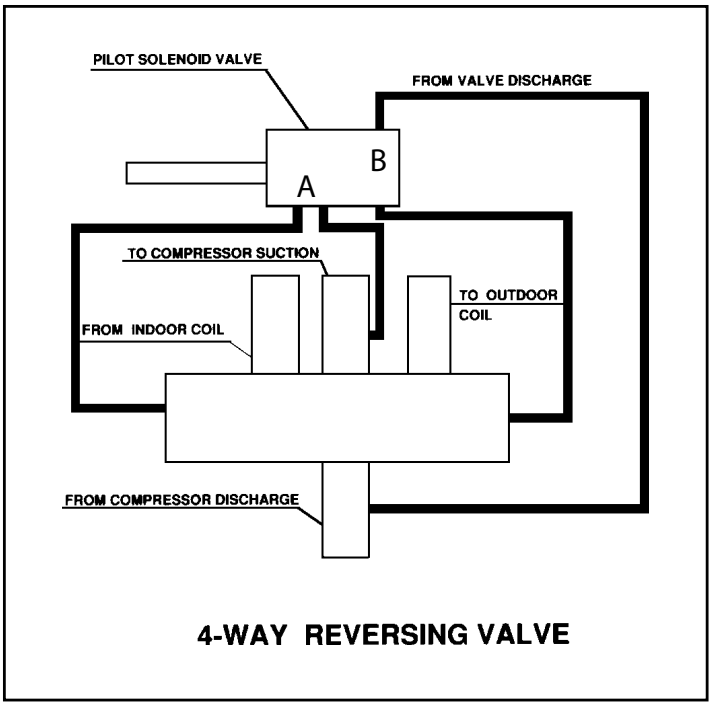


Figure 702 (Reversing Valve)

COMPONENT TESTING

Testing The Reversing Valve Solenoid Coil

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

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

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

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

Touch Test in Heating/Cooling Cycle

⚠ WARNING

BURN HAZARD

Certain unit components operate at temperatures hot enough to cause burns.

Proper safety procedures must be followed, and proper protective clothing must be worn.

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

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

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

COMPONENT TESTING

Checking The Reversing Valve

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

Test reversing valve solenoid for proper voltage and resistance readings.

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

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

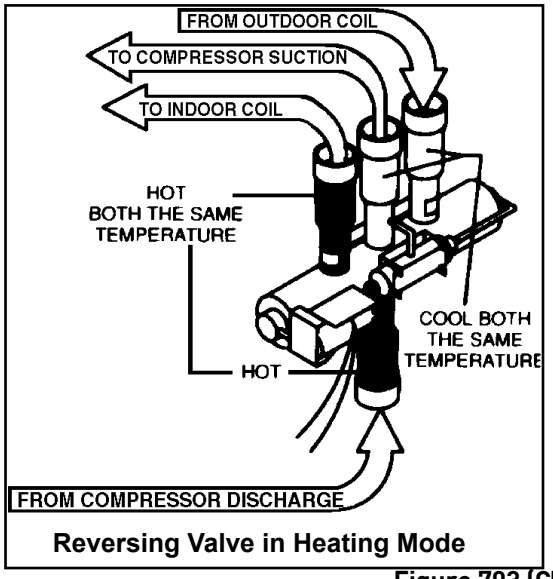
Should the valve fail to shift from cooling to heating, block the air flow through the outdoor coil and allow the discharge pressure to build in the system. Then switch the system from heating to cooling.

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

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

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

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



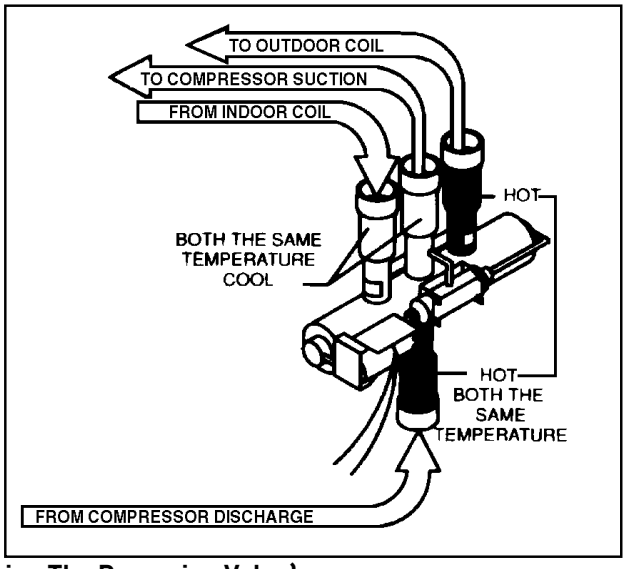


Figure 703 (Checking The Reversing Valve)

COMPONENT TESTING

Touch Test Chart : To Service Reversing Valves

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

Figure 704 (Touch Test Chart)

Return to Error Codes and Solutons

COMPONENT TESTING

Compressor Checks

⚠ WARNING

ELECTRIC SHOCK HAZARD

Turn off electric power before service or installation.

All electrical connections and wiring MUST be installed by a qualified electrician and conform to the National Electrical Code and all local codes which have jurisdiction.

Failure to do so can result in personal injury or death.

⚠ WARNING

BURN HAZARD

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

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

Overloads

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

Checking the Overloads

External Overloads

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

Internal Overloads

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

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

Checking the Internal Overload

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

COMPONENT TESTING

Compressor Checks

⚠ WARNING

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

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

⚠ WARNING

HIGH PRESSURE HAZARD
Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

Gain access to compressor and IPM PCB (Inverter Board) by removing chassis from wall.

1) Disconnect terminals R(U), S(V), and T(W) from the compressor.

Resistance Test.

2) Set Ohm meter to the lowest scale and check continuity between pins R(U), S(V), and T(W).
At room temperature (70°- 95°F) the resistance should be approximately 2.2 ohms. The Ohm values will change significantly at different temperatures. This **does not** indicate that the compressor windings are faulty. A reading of open (infinity), or a significant difference in the resistance between the windings **does** indicate that the compressor windings are faulty.

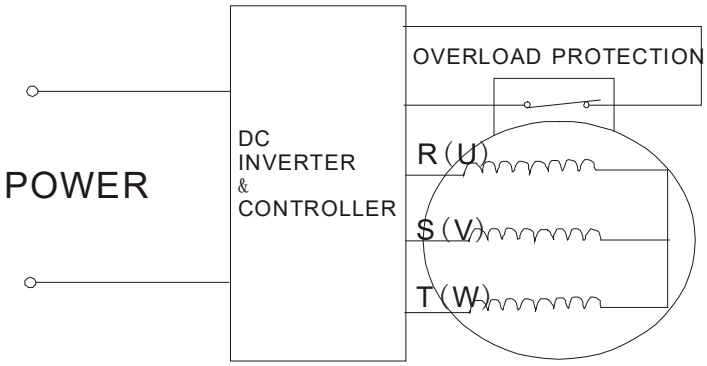


Figure 705 (Compressor Windings)

3) Check for continuity from between pins R(U) to ground, S(V) to ground, and T(U) to ground)
The compressor windings are faulty if the there is continuity from the compressor windings to ground.

4) Common signs compressor is faulty:
- Compressor motor lock.
- Discharge pressure value approaches static pressure value .
- Compressor motor winding abnormality.

Note:
- Don't put a compressor on its side or turn over.
- Assemble the compressor quickly after removing the plugs. Prolonged exposure will damage the internal components of the compressor
- Ensure wiring is correct before operating. Reverse operation will permanently damage the compressor.

- **Electric Reactor**

Common Problems:
- Sound abnormality
- Runs in a sporadic rhythm.

COMPONENT TESTING

Check Indoor Fan Motor

Gain Access to the Power PCB (Power Board).
1. Remove front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

Indoor fan control in cooling mode:
The indoor fan will run synchronously with cooling demand. During no demand period if the CONSTANT FAN button is turned off, it will run for 30s and then turn off. When CONSTANT FAN is ON, it will always be running.
1) Check voltage between Neutral and High, medium, or low.
Voltages should be 208-230 vac.
If no voltage is present check cable and resistance values on motor.

2) Check for continuity between pins on fan plug connector.
N-H = 65.4 ohms +- 10%
N-L = 126.6 ohms +- 10%

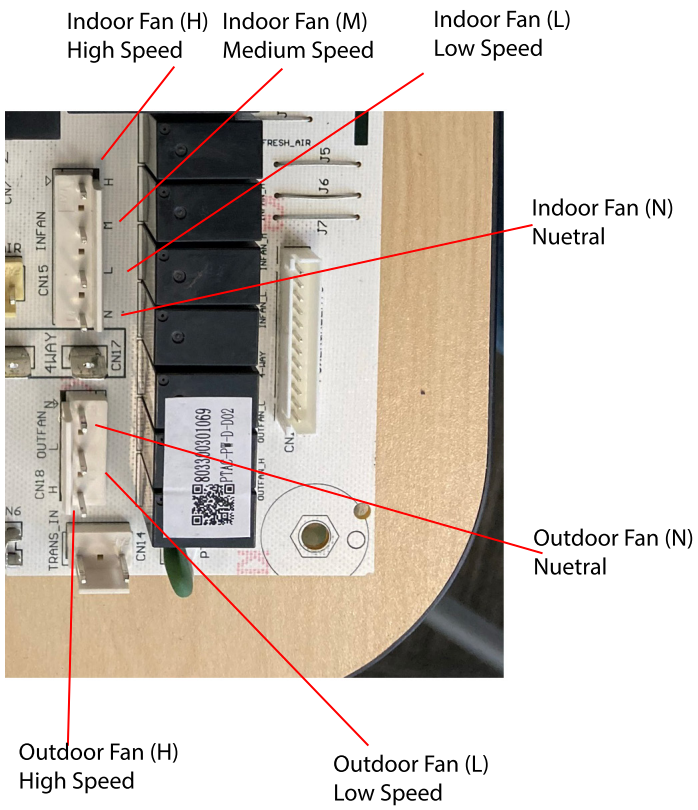


Figure 706 (Check Indoor and outdoor Fans)
For full view of Power PCB (Power Board) and connections view Figure 7xx

Check Outdoor Fan Motor

Outdoor fan control in cooling mode:
The outdoor fan has two speeds, low and high. When T4 is above 80°F, the fan operates in high speed.
When T4 drops to 77°F the fan operates in low speed.

1) Check voltage between Neutral and High, or low.
Voltages should be 208-230 vac.

If no voltage is present check cable and resistance values on motor.

2) Check for continuity between pins on fan plug connector.

N-H = 189.6 ohms +-10%
N-M = 216.2 ohms+-10%
N-L = 240.6 ohms +-10%

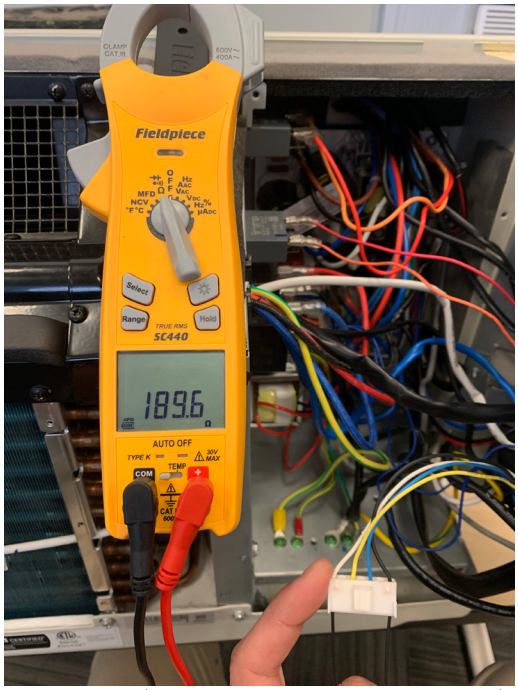


Figure 707 (Check Indoor and outdoor Fans)

Return to Error Codes and Solutons

COMPONENT TESTING

Check Fan Motor Capacitors

Gain Access to the Power PCB (Power Board).

1. Remove front panel (Figure 501).

2. Remove User Interface (Figures 502 thru 504).

3. Open electrical Control Box (Figure 505).

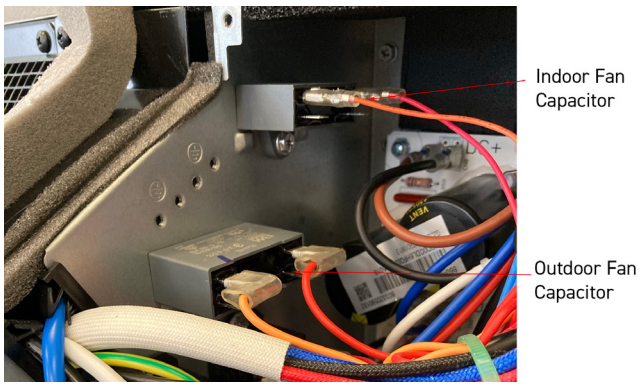


Figure 708 (Fan Capacitors)

⚠ WARNING

RISK OF ELECTRIC SHOCK

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

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

NOTE: Many motor capacitors are internally fused. Shorting the terminals will blow the fuse, ruining the capacitor. A 20,000 ohm 2 watt resistor can be used to discharge capacitors safely. Remove wires from capacitor and place resistor across terminals.

1. Disconnect leads to capacitor that you are checking.
2. Bleed down capacitor with 2 watt resistor.
3. Set multi-meter to diode check setting.
4. Check Resistance across capacitor terminals by placing the red lead on the run terminal and the black lead on the common terminal. (The meter will send a small charge into the capacitor)
5. The meter should show a certain amount of resistance initially and then increase in resistance as the charge in the capacitor dissipates until infinity is reached.
6. If the meter shows continuity, or does not bleed back down to infinity, the capacitor is shorted and should be replaced.
7. If the meter initially shows infinity the capacitor is open and should be replaced.

Check Capacitance values in micro Farads using capacitor analyzer.
1. Indoor fan capacitor should read 1.5 uf.
2. Outdoor fan capacitor should read 3.0 uf.

COMPONENT TESTING

Main PCB (logic) Board Connector Identification

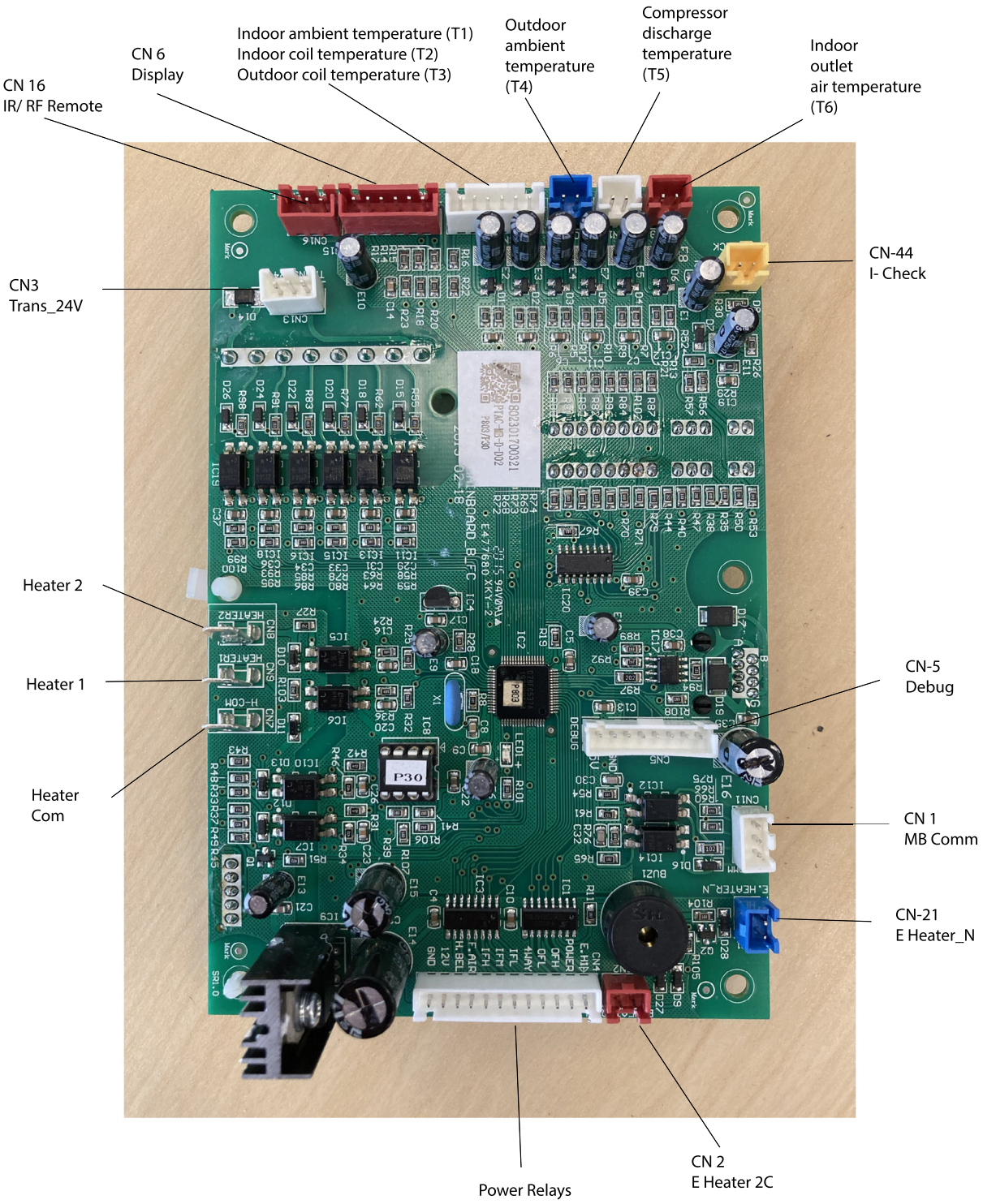


Figure 709 (Main PCB (logic) Board)

Return to Error Codes and Solutons

COMPONENT TESTING

Power PCB (Power Board) Connector Identification

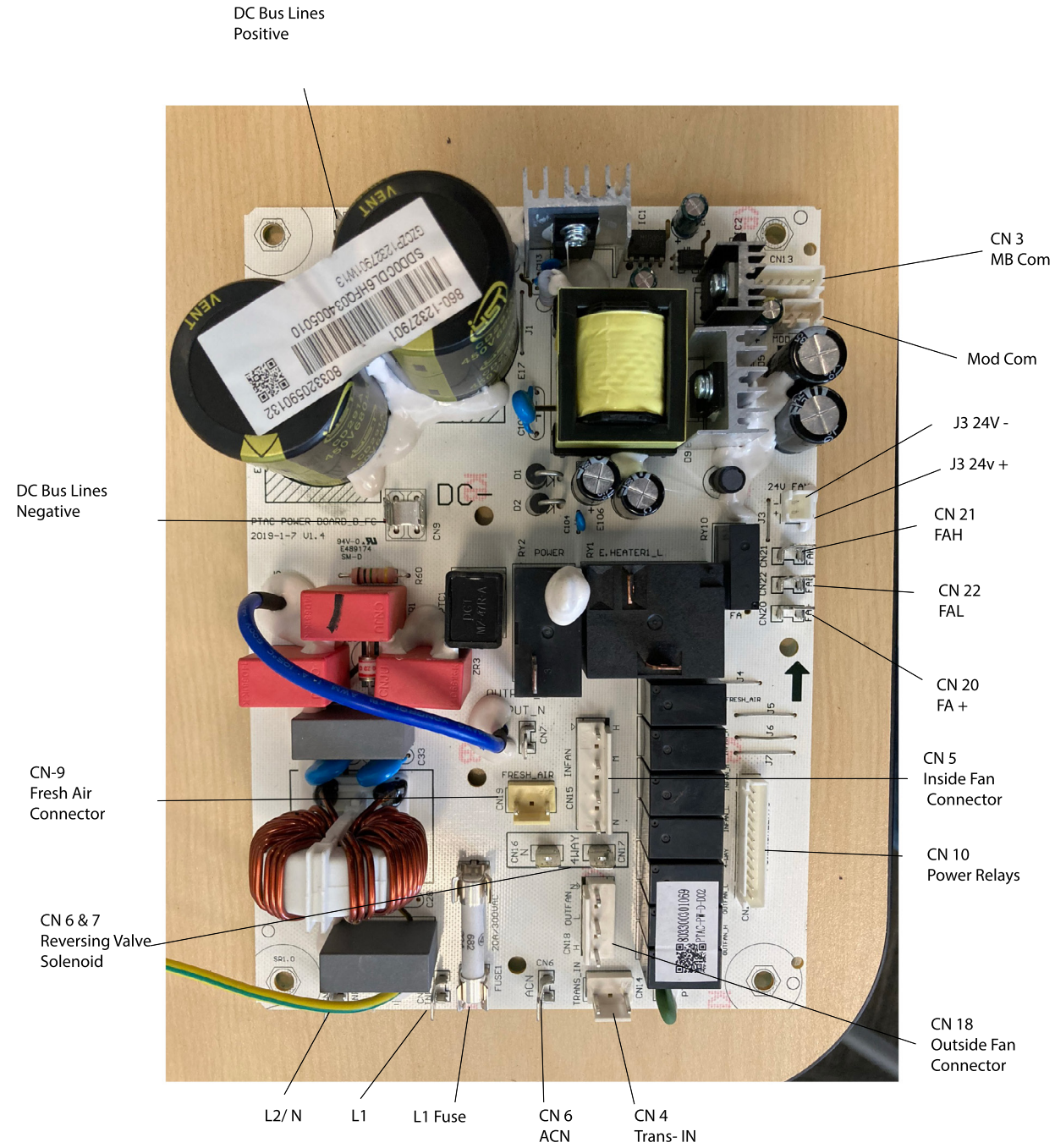


Figure 710 (Power PCB (Power Board)

R-410A SEALED SYSTEM REPAIR

⚠ WARNING

Refrigeration system under high pressure

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

Only certified refrigeration technicians should service this equipment.

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

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

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

1. R-410A pressure is approximately 60% higher than R-22 pressure.
2. R-410A cylinders must not be allowed to exceed 125 F, they may leak or rupture.
3. R-410A must never be pressurized with a mixture of air, it may become flammable.
4. Servicing equipment and components must be specifically designed for use with R-410A and dedicated to prevent contamination.

⚠ WARNING

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

5. Manifold sets must be equipped with gauges capable of reading 750 psig (high side) and 200 psig (low side), with a 500-psig low-side retard.
6. Gauge hoses must have a minimum 750-psig service pressure rating
7. Recovery cylinders must have a minimum service pressure rating of 400 psig, (DOT 4BA400 and DOT BW400 approved cylinders).
8. POE (Polyol-Ester) lubricants must be used with R-410A equipment.
9. To prevent moisture absorption and lubricant contamination, do not leave the refrigeration system open to the atmosphere longer than 1 hour.
10. Weigh-in the refrigerant charge according to the unit nameplate into the high side of the system.
11. Introduce liquid refrigerant charge into the high side of the system.
12. For low side pressure charging of R-410A, use a charging adaptor.

EQUIPMENT REQUIRED:

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

EQUIPMENT MUST BE CAPABLE OF:

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

R-410A SEALED SYSTEM REPAIRS

Refrigerant Charging

⚠ WARNING

RISK OF ELECTRIC SHOCK

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

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

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

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

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

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

NOTE:Factory sealed units will not be overcharged

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

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

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

R-410A SEALED SYSTEM REPAIRS

⚠ WARNING

RISK OF ELECTRIC SHOCK

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

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

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

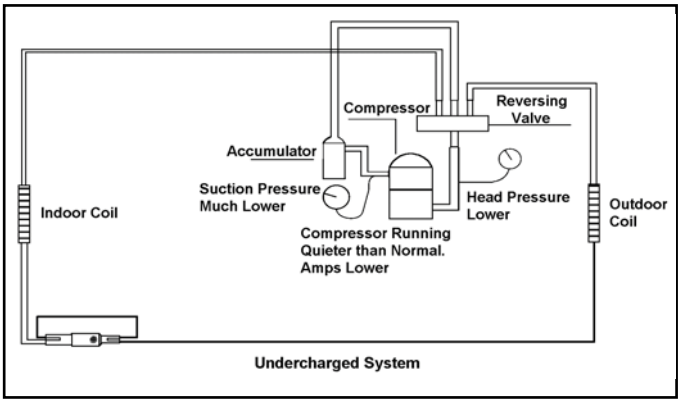


Figure 601 (Undercharged System)

Undercharged Refrigerant Systems

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

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

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

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

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

If the compressor reads low amperage and has a high discharge line temperature at the compressor, it is an indication of low system refrigerant.

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

R-410A SEALED SYSTEM REPAIRS

⚠ WARNING

RISK OF ELECTRIC SHOCK

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

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

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

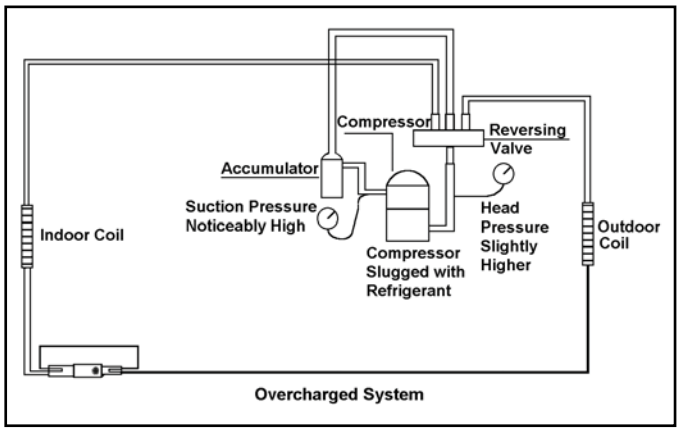


Figure 602 (Overcharged System)

Overcharged Refrigerant Systems

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

NOTE:Factory sealed units will not be overcharged

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

Compressor amps will be near normal or higher. Non-condensables can also cause these symptoms. To confirm, recover refrigerant and recharge according tot he model nameplate, if conditions improve, system may be overcharged. If conditions don't improve, Non-condensables are indicated.

R-410A SEALED SYSTEM REPAIRS

Restricted Refrigerant System

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

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

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

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

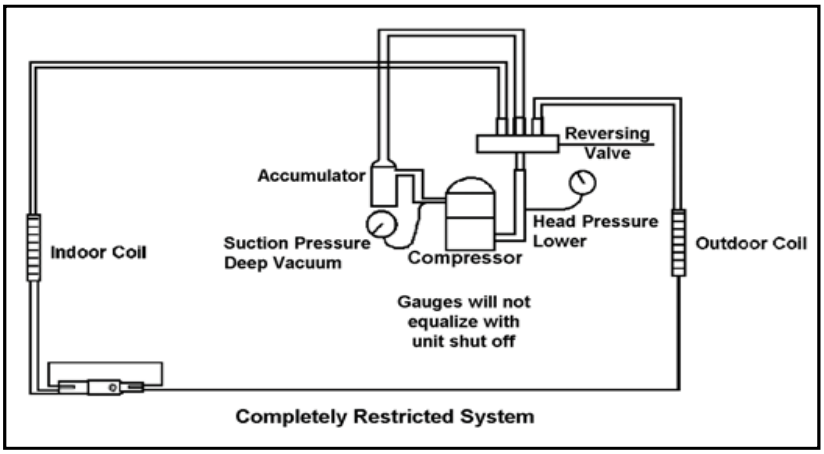
Often a partial restriction of any type can be found by feel, as there is a temperature difference from one side of the restriction to the other. There will usually be a difference felt at the capillary tube. This does not indicate a restricted condition.

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

Make all checks possible before tapping into the system and installing gauges.

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

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



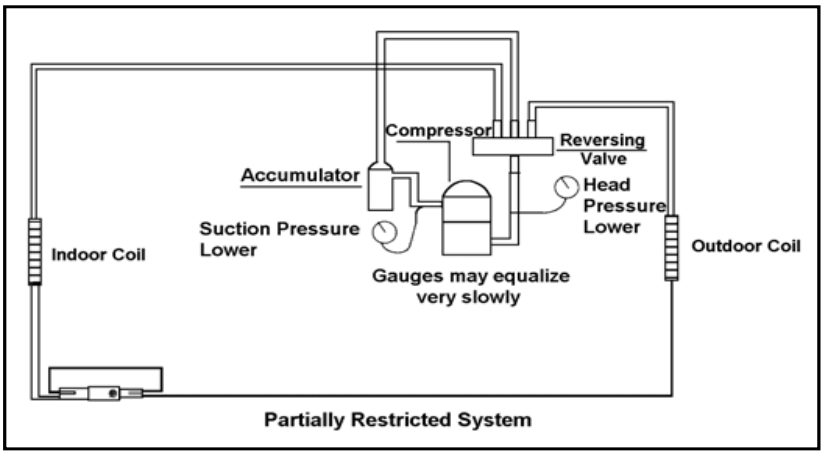


Figure 603 (Restricted System)

R-410A SEALED SYSTEM REPAIRS

Sealed System Method of Charging/ Repairs

⚠ WARNING

BURN HAZARD

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

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

⚠ CAUTION

FREEZE HAZARD

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

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

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

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

1. Install a piercing valve to remove refrigerant from the sealed system. (Piercing valve must be removed from the system before recharging.)
2. Recover Refrigerant in accordance with EPA regulations.
3. Install a process tube to sealed system.
4. Make necessary repairs to system.
5. Evacuate the system to 1500 microns
6. Repressurize to 50 PSI with nitrogen
7. Evacuate the system to 1000 microns
8. Repressurize to 50 PSI with nitrogen
9. Evacuate the system to below 500 microns
10. Weigh in the refrigerant charge with the property quantity of R-410A refrigerant per model nameplate.
11. Start unit, and verify performance.
12. Crimp the process tube and solder the end shut.

R-410A SEALED SYSTEM REPAIRS

Compressor Replacement

⚠ WARNING

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

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

⚠ WARNING

HIGH PRESSURE HAZARD
Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

⚠ WARNING

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

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

⚠ CAUTION

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

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

⚠ WARNING

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

1. Be certain to perform all necessary electrical and refrigeration tests to be sure the compressor is actually defective before replacing.
2. Recover all refrigerant from the system though the process tubes. **PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED**. Do not use gauge manifold for this purpose if there has been a burnout. You will contaminate your manifold and hoses. Use a Schrader valve adapter and copper tubing for burnout failures.
3. After all refrigerant has been recovered, disconnect suction and discharge lines from the compressor and remove compressor. Be certain to have both suction and discharge process tubes open to atmosphere.
4. Carefully pour a small amount of oil from the suction stub of the defective compressor into a clean container.
5. Using an acid test kit (one shot or conventional kit), test the oil for acid content according to the instructions with the kit.
6. If any evidence of a burnout is found, no matter how slight, the system will need to be cleaned up following proper procedures.
7. Install the replacement compressor.

CAUTION: While the unit is being evacuated, seal all openings on the defective compressor. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.

8. Pressurize with trace amounts of R-410A and nitrogen and leak test all connections with a leak detector. Repair any leaks found.
8a. If leak detector is unavailable remove all refrigerant from system and pressurize with nitrogen to 550 psi. Check that system holds pressure.
Repeat Step 8 to ensure no more leaks are present
9. Evacuate the system with a good vacuum pump capable of a final vacuum of 200 microns or less. The system should be evacuated through both liquid line and suction line gauge ports.
   - 9a. Evacuate the system to 1500 microns.
   - 9b. Repressurize to 50 PSI with nitrogen.
   - 9c. Evacuate the system to 1000 microns.
   - 9d. Repressurize to 50 PSI with nitrogen.
   - 9e. Evacuate the system to below 500 microns.

10. Weigh in the refrigerant charge with the property quantity of refrigerant per model nameplate.
11. Start unit, and verify performance.
12. Crimp the process tube and solder the end shut.

R-410A SEALED SYSTEM REPAIRS

Compressor Replacement -Special Procedure in Case of Compressor Burnout

1. Recover all refrigerant and oil from the system.
2. Remove compressor and capillary tube from the system.

3. Flush evaporator condenser and all connecting tubing with dry nitrogen or equivalent. Use approved flushing agent to remove all contamination from system. Inspect suction and discharge line for carbon deposits. Remove and clean if necessary. Ensure all acid is neutralized.
4. Reassemble the system, including new drier strainer and capillary tube.

5. Pressurize to 550 psi with trace amounts of R-410A and nitrogen and leak test all connections with a leak detector. Repair any leaks found.
5a. If leak detector is unavailable remove all refrigerant from system and pressurize with nitrogen to 550 psi. Check that system holds pressure.

Repeat Step 5 to insure no more leaks are present.

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

9. Evacuate the system with a good vacuum pump capable of a final vacuum of 500 microns or less. The system should be evacuated through both liquid line and suction line gauge ports.

- 9a. Evacuate the system to 1500 microns.
- 9b. Repressurize to 50 PSI with nitrogen.
- 9c. Evacuate the system to 1000 microns.
- 9d. Repressurize to 50 PSI with nitrogen.
- 9e. Evacuate the system to below 500 microns.

7. Recharge the system with the correct amount of refrigerant. The proper refrigerant charge will be found on the unit rating plate. The use of an electronic scale is necessary.

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

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

⚠ WARNING

EXPLOSION HAZARD

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

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

⚠ WARNING

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

R-410A SEALED SYSTEM REPAIRS

Replace The Reversing Valve

⚠ WARNING

HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

NOTICE

FIRE HAZARD

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

1. Install Process Tubes. Recover refrigerant from sealed system. PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED.

NOTE: The use of flowing nitrogen must be utilized during welding or brazing procedures to prevent oxidation of the copper tubing.

2. Remove solenoid coil from reversing valve. If coil is to be reused, remove solenoid and protect from heat while changing valve.
3. Un-braze all lines from reversing valve.
4. Clean all excess braze from all tubing so that they will slip into fittings on new valve.
5. Remove solenoid coil from new valve.
6. Protect new valve body from heat while brazing with plastic heat sink (Thermo Trap) or wrap valve body with wet rag.
7. Fit all lines into new valve and braze lines into new valve.
8. Pressurize sealed system with trace amounts of R-410A and nitrogen up to 550 psi. Perform Triple evacuation and leak processes, using a suitable leak detector according to HVAC industry standards.
9. Once the sealed system is leak free, install solenoid coil on new valve and charge the sealed system by weighing in the proper amount and type of refrigerant as shown on rating plate. Crimp the process tubes and solder the ends shut. Do not leave Schrader or piercing valves in the sealed system.

⚠ 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.

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

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

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

WIRING DIAGRAMS

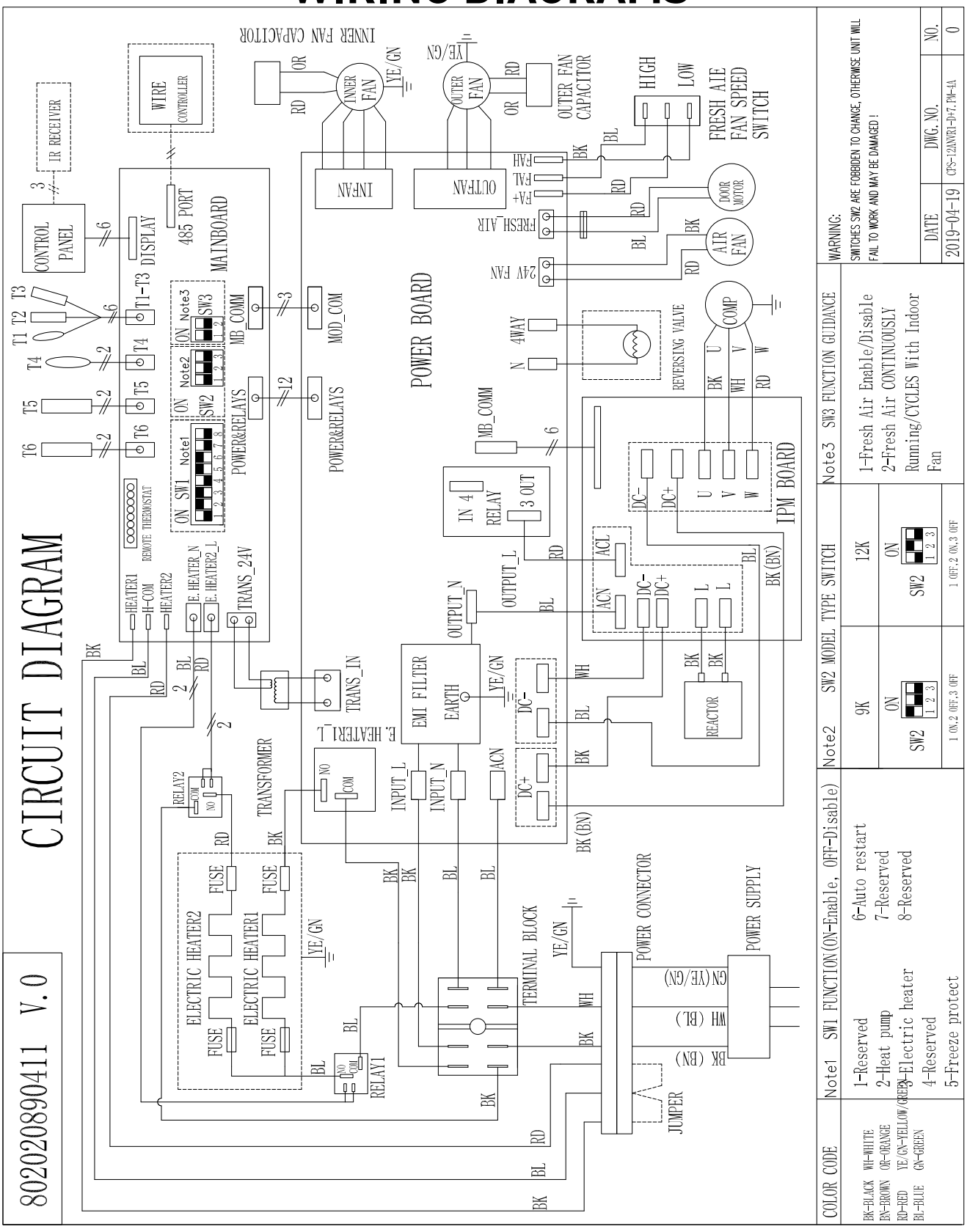


Figure 801 (Version 1 U,V, W)

WIRING DIAGRAMS

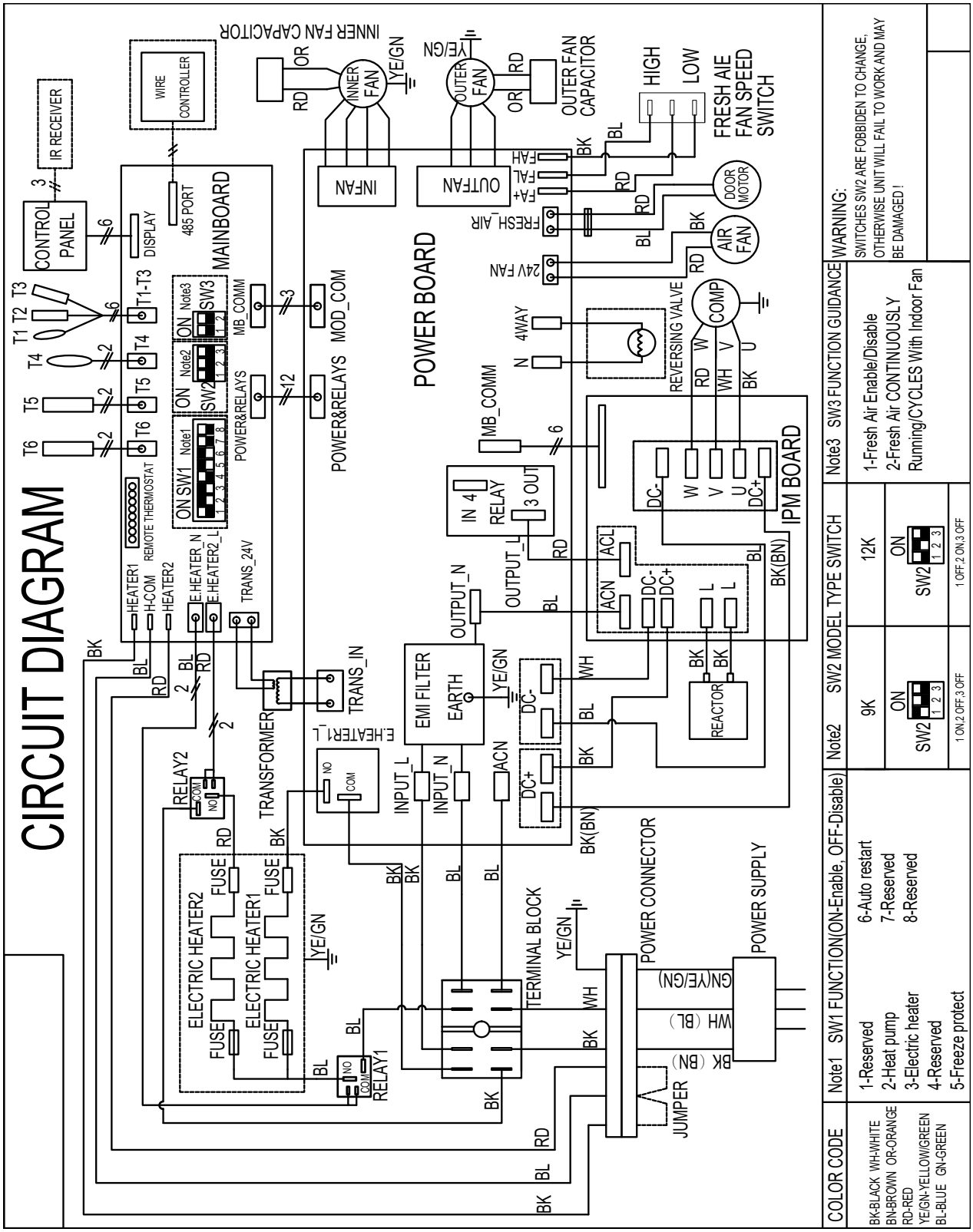


Figure 802 (Version 2 (W,V,U)

INTERACTIVE PARTS VIEWER

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

Please click on the link below:

Interactive Parts Viewer

For Further Assistance contact Friedrich Technical Support at **(1-800-541-6645)**.

ACCESSORIES

New Construction Accessories

PDXWSA

WALL SLEEVE Galvanized zinc coated steel is prepared in an 11-step process, then powder coated with a polyester finish and cured in an oven for exceptional durability. The wall sleeve is insulated for sound absorption and thermal efficiency, 16" H x 42" W x 13 3/4" D.

PDXWSA

PDXWSEXT18

DEEP WALL SLEEVE For walls up to 17 1/2" deep.

PDXWSEXT24

DEEP WALL SLEEVE For walls up to 23 1/2" deep.

PDXWSEXT

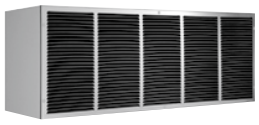
CUSTOM DEEP WALL SLEEVE One piece extended wall sleeve for walls from 13 1/4" to 25 1/2" deep are available by special order.

Deep wall sleeve PDXWSEXT18 shown with weather panel

PXGA

GRILLE Standard, stamped aluminium, anodized to resist chalking and oxidation.

PXGA



PXAA
PXBG
PXSC

ARCHITECTURAL GRILLES Consist of heavy-gauge 6063-T5 aluminum alloy: 42" W x 16" H x 1 1/8" D

PXAA – Clear, extruded aluminum
PXBG – Beige acrylic enamel
PXSC – Also available in custom colors.

PXAA

PXDR10

CONDENSATE DRAIN KIT Attaches to the bottom of the wall sleeve for internal draining of condensate or to the rear wall sleeve flange for external draining. Recommended on all units to remove excess condensate. Packaged in quantities of ten.

PXCJA

CONDUIT KIT WITH JUNCTION BOX Hard wire conduit kit with junction box for 208/230V and 265V units (subbase not required). Kit includes a means of quick disconnect for easy removal of the chassis. *Required for 265V installations.

PDXDAA

LATERAL DUCT ADAPTER Attaches to the Friedrich PTAC/PTHP unit to direct up to 35% of the total airflow to a second room. The unit-mounted duct plenum features a front-mounted aluminum grille that has two positions to provide the most optimal air direction. The air may be directed to either the left or the right of the unit through the supplied 3 1/2" H x 7" W x 47" L plenum. Plenum may be cut to length by the installer. Kit includes duct plenum, front grille, 47" duct extension, duct discharge grille, duct end cap and all necessary mounting hardware.

PDXDEA

LATERAL DUCT EXTENSION Additional 3 1/2" H x 7" W x 47" L plenum for use with the LATERAL DUCT ADAPTER. A maximum of 3 duct extensions total may be used. Note: Ducted airflow is reduced as duct length is increased.

ACCESSORIES

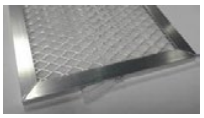
New Construction Accessories

PXFTA

REPLACEMENT FILTER PACK These are original equipment return air filters. They are reusable and can be cleaned by vacuuming, washing, or blowing out, and are sold in convenient ten-packs. (Two filters per chassis).

PXFAFT10

REPLACEMENT FILTER PACK Merv 8 filters. 10 pack. Each PTAC requires 1 filter.



PXSBA

DECORATIVE SUBBASE Provides unit support for walls less than six inches thick. Includes leveling legs, side filler panels and mounting brackets for electrical accessories. Accepts circuit breaker, power disconnect switch, or conduit kit.

PXSB

ELECTRICAL SUBBASE Provides unit support for walls less than six inches thick. Includes leveling legs, side filler panels, mounting brackets, a plug-in receptacle and field-wiring access. The subbase also includes electrical knockouts for a power disconnect switch or circuit breaker.

PXSB23020	Electrical Subbase - 230V 15 & 20A
PXSB23030	Electrical Subbase - 230V 30A
PXSB26515	Electrical Subbase - 265V 15A
PXSB26520	Electrical Subbase - 265V 20A
PXSB26530	Electrical Subbase - 265V 30A

PXPCFA

POWER CORDS

Universal power cords enable properties to select the appropriate heater size. Reference the adjacent table for power cord options

*Cannot be used on PVH09K3FA.

		Length
PXPCFA23015	LCDI 230V 15A Cord - 2.5 kW	67 in.
PXPCFA23020	LCDI 230V 20A Cord - 3.5 kW	67 in.
PXPCFA23030*	LCDI 230V 30A Cord - 5.0 kW	67 in.
PXPCFA26515	Non-LCDI 265V 15A Cord - 2.5 kW	27 1/2 in.
PXPCFA26520	Non-LCDI 265V 20A Cord - 3.5 kW	27 1/2 in.
PXPCFA26530*	Non-LCDI 265V 30A Cord - 5.0 kW	27 1/2 in.

RT7
RT7P

DIGITAL REMOTE THERMOSTATS

RT7 Wired single stage cool, single stage heat for PDE models or single stage cool, dual stage heat for PDH model thermostat features high/low fan speed switch. Thermostat is hard wired and can be battery powered or unit powered. Features backlit display and multiple configuration modes. For use on Friedrich PTACs and Vert-I-Paks.

RT7P Wired, programmable single stage cool, single stage heat for PDE models or single stage cool, dual stage heat for PDH model thermostat features high/low fan speed switch. Thermostat is hard wired and can be battery powered or unit powered. Features backlit display and multiple configuration modes. For use on Friedrich PTACs and Vert-I-Paks.

ACCESSORIES

New Construction Accessories		
WRT2	**WIRELESS DIGITAL REMOTE THERMOSTAT** Single stage cool, single stage heat for PDE models or single stage cool, dual stage heat for PDH model thermostat features high/low fan speed switch. Thermostat is wireless and is battery powered. Features backlit display and multiple configuration modes. For use on Friedrich PTACs and Vert-I-Paks.	
PDXRTB	**REMOTE THERMOSTAT ESCUTCHEON KIT** This kit contains ten escutcheons that can be placed over the factory control buttons when a remote wall mounted thermostat is used. The escutcheon directs the guest to the wall thermostat for operation and retains the LED window to display error codes and diagnostic information.	
EMRT2 EMWRT2	ENERGY MANAGEMENT THERMOSTATS EMRT2 Wired thermostat with occupancy sensor. EMWRT2 Wireless thermostat with occupancy sensor. EMOCT Online connection kit. EMRAF Remote access fee. EMRHCF Remote humidity control fee.	
VRPXEMRT2 (Preferred FreshAire Thermostat) VRPXEMWRT2	Wired and wireless thermosat and occupancy sensor 12v. Full inverter control. Designed to maximize features and benefits of FreshAire system. Wireless wall controller and occupancy sensor-12v. Full inverter control. Designed to maximize features and benefits of FreshAire system.	

*NOTE: The FreshAire PTAC must be paired with wall controller **VRPXEMRT2** or **VRPXEMWRT2** to operate as a fully variable speed unit. When used with other compatible thermostats, the unit will operate at multiple speeds in either cooling or heating mode.

ACCESSORIES

Friedrich PTAC with FreshAire® IAQ

The COVID-19 global pandemic transformed the way the lodging industry meets the comfort and safety needs for guests. As your room air experts, Friedrich remains committed to improving guest comfort and safety with our newest innovation, FreshAire® IAQ solutions - a suite of indoor air quality accessories for use with Friedrich Air Conditioners, all with one dedicated purpose - healthy indoor air. FreshAire® IAQ solutions incorporate ASHRAE-recommended protocol* to address indoor air quality and airborne transmissions.

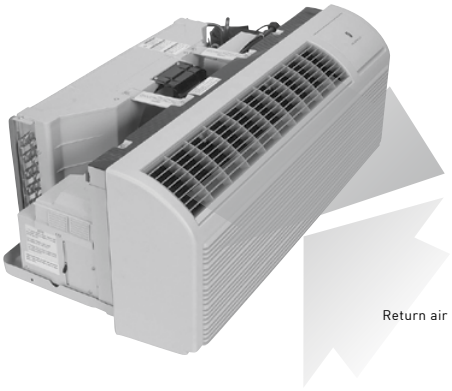
This suite of products include industry-leading air quality technologies such as MERV 13 filtration,UV germicidal light and bi-polar ionization. Together, they represent a major leap forward in integrated HVAC air purification and rebuilding confidence for indoor environments.

*Based on ASHRAE Guidance for Building Operations During the COVID-19 Pandemic

FreshAire® Make Up Air (MUA) & Filtration

Award-winning FreshAire MUA system helps achieve ASHRAE 62.1-2013 requirements, and brings up to 52 CFM of conditioned, MERV 8 filtered, outside air into the space. Patented FreshAire technology uses the Precision Inverter compressor and main cooling system to optimize temperature and humidity level of incoming air while MERV 8 filtration traps particles and pollutants.

Standard on FreshAire PTAC



FreshAire® Purifier APWM1

FreshAire Purifier by iWaves features needlepoint bi-polar ionization to address any mold, bacteria, virus, allergens, and VOC's that may be in your air stream to ensure delivery of healthy, clean, purified air.

Friedrich® UV UVT1

Germicidal UV light kits have been tested and certified for use on Friedrich PTACs. The UV kit can be installed on the fan coil and is designed to disinfect surfaces and the air as it circulates through the ventilation system. UV light can kill airborne bacteria, viruses, mold, reduce maintenance costs and extend the life of an HVAC system

APPENDIX

Appendix 1 Reference Sheet of Celsius and Fahrenheit

Conversion formula for Fahrenheit degree and Celsius degree: Tf=Tcx1.8+32

Set temperature

Fahrenheit display temperature (°F)	Fahrenheit (°F)	Celsius(°C)		Fahrenheit display temperature (°F)	Fahrenheit (°F)	Celsius (°C)		Fahrenheit display temperature (°F)	Fahrenheit (°F)	Celsius (°C)
61	60.8	16		69/70	69.8	21		78/79	78.8	26
62/63	62.6	17		71/72	71.6	22		80/81	80.6	27
64/65	64.4	18		73/74	73.4	23		82/83	82.4	28
66/67	66.2	19		75/76	75.2	24		84/85	84.2	29
68	68	20		77	77	25		86	86	30

Ambient temperature

Fahrenheit display temperature (°F)	Fahrenheit (°F)	Celsius(°C)		Fahrenheit display temperature (°F)	Fahrenheit (°F)	Celsius(°C)		Fahrenheit display temperature (°F)	Fahrenheit (°F)	Celsius(°C)
32/33	32	0		55/56	55.4	13		79/80	78.8	26
34/35	33.8	1		57/58	57.2	14		81	80.6	27
36	35.6	2		59/60	59	15		82/83	82.4	28
37/38	37.4	3		61/62	60.8	16		84/85	84.2	29
39/40	39.2	4		63	62.6	17		86/87	86	30
41/42	41	5		64/65	64.4	18		88/89	87.8	31
43/44	42.8	6		66/67	66.2	19		90	89.6	32
45	44.6	7		68/69	68	20		91/92	91.4	33
46/47	46.4	8		70/71	69.8	21		93/94	93.2	34
48/49	48.2	9		72	71.6	22		95/96	95	35
50/51	50	10		73/74	73.4	23		97/98	96.8	36
52/53	51.8	11		75/76	75.2	24		99	98.6	37
54	53.6	12		77/78	77	25				

APPENDIX

Appendix 2 Resistance Table of Thermistors (5K)

Temp	Resis	Temp	Resis	Temp	Resis	Temp	Resis	Temp	Resis
-33	130100	7	34252	47	10785	57	8275	97	3119
-32	125518	8	33209	48	10499	58	8063	98	3048
-31	121114	9	32202	49	10221	59	7857	99	2980
-30	116881	10	31228	50	9952	60	7657	100	2913
-29	112811	11	30288	51	9690	61	7462	101	2848
-28	108898	12	29378	52	9437	62	7273	102	2785
-27	105131	13	28499	53	9190	63	7090	103	2723
-26	101511	14	27650	54	8952	64	6911	104	2662
-25	98029	15	26828	55	8720	65	6738	105	2604
-24	94676	16	26034	56	8494	66	6569	106	2546
-23	91453	17	25266	57	8275	67	6406	107	2491
-22	88349	18	24523	58	8063	68	6247	108	2436
-21	85362	19	23805	59	7857	69	6092	109	2383
-20	82486	20	23110	60	7657	70	5942	110	2331
-19	79719	21	22437	61	7462	71	5796	111	2281
-18	77052	22	21787	62	7273	72	5654	112	2231
-17	74486	23	21158	63	7090	73	5515	113	2183
-16	72014	24	20548	64	6911	74	5381	114	2137
-15	69633	25	19959	65	6738	75	5251	115	2091
-14	67338	26	19388	66	6569	76	5124	116	2046
-13	65127	27	18836	67	6406	77	5000	117	2003
-12	62996	28	18301	68	6247	78	4880	118	1960
-11	60943	29	17783	69	6092	79	4763	119	1919
-10	58965	30	17282	70	5942	80	4649	120	1878
-9	57055	31	16796	71	5796	81	4538	121	1839
-8	55216	32	16325	72	5654	82	4431	122	1800
-7	53442	33	15870	73	5515	83	4326	123	1763
-6	51732	34	15428	74	5381	84	4224	124	1726
-5	50082	35	15001	75	5251	85	4125	125	1690
-4	48490	36	14586	76	5124	86	4028	126	1655
-3	46955	37	14184	77	5000	87	3934	127	1621
-2	45473	38	13795	48	10499	88	3842	128	1588
-1	44044	39	13418	49	10221	89	3753	129	1555
0	42664	40	13052	50	9952	90	3666	130	1524
1	41332	41	12698	51	9690	91	3582	131	1493
2	40047	42	12354	52	9437	92	3499	132	1462
3	38805	43	12021	53	9190	93	3419	133	1433
4	37607	44	11698	54	8952	94	3341	134	1404
5	36450	45	11384	55	8720	95	3265	135	1375
6	35332	46	11080	56	8494	96	3191	136	1348

APPENDIX

Appendix 2 Resistance Table of Thermistors (5K) (Cont)

Temp	Resis	Temp	Resis	Temp	Resis	Temp	Resis	Temp	Resis
137	1321	162	812	187	517	212	339	237	229
138	1294	163	797	188	508	213	334	238	226
139	1269	164	782	189	499	214	329	239	222
140	1244	165	768	190	491	215	323	240	219
141	1219	166	754	191	482	216	318	241	216
142	1195	167	740	192	474	217	313	242	212
143	1171	168	727	193	466	218	308	243	209
144	1148	169	713	194	458	219	303	244	206
145	1126	170	700	195	450	220	298	245	203
146	1104	171	688	196	443	221	294	246	200
147	1083	172	675	197	435	222	289	247	197
148	1062	173	663	198	428	223	285	248	194
149	1041	174	651	199	421	224	280	249	191
150	1021	175	640	200	414	225	276	250	189
151	1001	176	628	201	407	226	271		
152	982	177	617	202	400	227	267		
153	964	178	606	203	394	228	263		
154	945	179	595	204	387	229	259		
155	927	180	585	205	381	230	255		
156	910	181	574	206	374	231	251		
157	893	182	564	207	368	232	247		
158	876	183	554	208	362	233	244		
159	859	184	545	209	356	234	240		
160	843	185	535	210	351	235	236		
161	828	186	526	211	345	236	233		

APPENDIX

Appendix 2 Resistance Table of Thermistors (50K)(Compressor Discharge Sensor)

Temp. (°F)	Resistance (kΩ)	Temp. (°F)	Resistance(kΩ)	Temp. (°F)	Resistance (kΩ)	Temp. (°F)	Resistance (kΩ)
-20.2	853.5	50	98	120.2	18.34	190.4	4.754
-18.4	799.8	51.8	93.42	122	17.65	192.2	4.609
-16.6	750	53.6	89.07	123.8	16.99	194	4.469
-14.8	703.8	55.4	84.95	125.6	16.36	195.8	4.334
-13	660.8	57.2	81.05	127.4	15.75	197.6	4.204
-11.2	620.8	59	77.35	129.2	15.17	199.4	4.079
-9.4	580.6	60.8	73.83	131	14.62	201.2	3.958
-7.6	548.9	62.6	70.5	132 4/5	14.09	203	3.841
-5.8	516.6	64.4	67.34	134.6	13.58	204.8	3.728
-4	486.5	66.2	64.33	136.4	13.09	206.6	3.619
-2.2	458.3	68	61.48	138.2	12.62	208.4	3.514
-0.4	432	69.8	58.77	140	12.17	210.2	3.413
1.4	407.4	71.6	56.19	141.8	11.74	212	3.315
3.2	384.5	73.4	53.74	143.6	11.32	213.8	3.22
5	362.9	75.2	51.41	145.4	10.93	215.6	3.129
6.8	342.8	77	49.19	147.2	10.54	217.4	3.04
8.6	323.9	78.8	47.08	149	10.18	219.2	2.955
10.4	306.2	80.6	45.07	150.8	9.827	221	2.872
12.2	289.6	82.4	43.16	152.6	9.489	222.8	2.792
14	274	84.2	41.34	154.4	9.165	224 3/5	2.715
15.8	259.3	86	39.61	156.2	8.854	226.4	2.64
17.6	245.6	87.8	37.96	158	8.555	228.2	2.568
19.4	232.6	89.6	36.38	159.8	8.268	230	2.498
21.2	220.5	91.4	34.88	161.6	7.991	231.8	2.431
23	209	93.2	33.45	163.4	7.726	233.6	2.365
24.8	198.3	95	32.09	165.2	7.47	235.4	2.302
26.6	199.1	96.8	30.79	167	7.224	237.2	2.241
28.4	178.5	98.6	29.54	168.8	6.998	239	2.182
30.2	169.5	100.4	28.36	170.6	6.761	240.8	2.124
32	161	102.2	27.23	172.4	6.542	242.6	2.069
33.8	153	104	26.15	174.2	6.331	244.4	2.015
35.6	145.4	105.8	25.11	176	6.129	246.2	1.963
37.4	138.3	107.6	24.13	177.8	5.933	248	1.912
39.2	131.5	109.4	23.19	179.6	5.746	249.8	1.863
41	125.1	111.2	22.29	181.4	5.565	251.6	1.816
42.8	119.1	113	21.43	183.2	5.39	253.4	1.77
44.6	113.4	114.8	20.6	185	5.222	255.2	1.725
46.4	108	116.6	19.81	186.8	5.06	257	1.682
48.2	102.8	118.4	19.06	188.6	4.904	258.8	1.64

WARRANTY

FRIEDRICH

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

FRESHAIRE® SERIES
PACKAGED TERMINAL AIR CONDITIONERS LIMITED WARRANTY

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

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

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

Unless specified otherwise herein, the following applies:

FRIEDRICH PACKAGED TERMINAL AIR CONDITIONERS AND HEAT PUMPS

LIMITED WARRANTY - TWO YEARS (Twenty-four (24) months from the date of installation). Any part found to be defective in the material or workmanship will be repaired or replaced free of charge by our authorized service center during the normal working hours; and

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

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

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

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

1. Service calls to:

   A) Instruct on the unit operation. B) Replace house fuses or correct house wiring. C) Clean or replace filters. D) Remove the unit from its installed location when not accessible for service required. E) Correct improper installations.

2. Parts or labor provided by anyone other than an authorized service center.

3. Damage caused by:

   A) Accident, abuse, negligence, misuse, riot, fire, flood, or acts of God. B) Operating the unit where there is a corrosive atmosphere containing Chlorine, Fluorine, or any damaging chemicals (other than in a normal residential environment). C) Unauthorized alteration or repair of the unit, which in turn affects its stability or performance. D) Failing to provide proper maintenance and service. E) Using an incorrect power source. F) Faulty installation or application of the unit. G) Operation of the unit during construction.

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

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

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

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

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

CUSTOMER SATISFACTION and QUALITY ASSURANCE

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

FRIEDRICH AUTHORIZED PARTS DEPOTS

United Products Distributors Inc.
4030A Benson Ave
Halethorpe, MD 21227
888-907-9675
c.businsky@updinc.com

Shivani Refigeration & Air Conditioning Inc.
2259 Westchester Ave.
Bronx, NY 10462
sales@shivanionline.com

NEUCO Inc.
515 W Crossroads Parkway
Bolingbrook, IL 60440
312.809.1418
borr@neuco.com

The Gabbert Company
6868 Ardmore
Houston, Texas 77054

713-747-4110
800-458-4110

Johnstone Supply of Woodside
27-01 Brooklyn Queens Expway
Woodside, New York 11377

718-545-5464
800-431-1143

Reeve Air Conditioning, Inc.
2501 South Park Road
Hallandale, Florida 33009

954-962-0252
800-962-3383

Total Home Supply
26 Chapin Rd Ste 1109
Pine Brook, NJ 07058
877-847-0050
support@totalhomesupply.com
https://www.totalhomesupply.com/brands/Friedrich.html

FRIEDRICH

TECHNICAL SUPPORT CONTACT INFORMATION

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