



FRIEDRICH

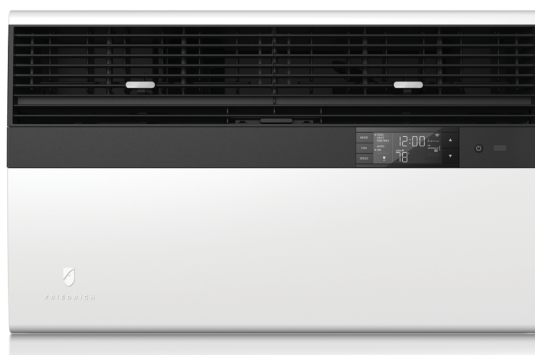
Room Air Conditioners

Kühl®

Kühl® Q

Wallmaster®

PRECISION
INVERTER®



Standard Chassis Models Using R-32 Refrigerant

Kühl

115-Volt: KCVS08B10A, KCVS12B10A, KCVS14B10A, KCVQ08B10A

230-Volt: KCVS12B30A, KCVS16B30A, KCVS18B30A, KCVS24B30A, KCVL28B30A, KCVL36B30A

Kühl +

Heat Pump and Electric Heat

115-Volt: KHVS10B11A, KHVQ10B11A

230-Volt: KHVS12B33A, KHVM24B34A, KHVL28B35A

Wallmaster

115-Volt: WCVT10B10A, WCVT12B10A

230-Volt: WCVT10B30A, WCVT12B30A, WCVT16B30A

Wallmaster+

Heat Pump and Electric Heat

230-Volt: WHVT14B33A

TABLE OF CONTENTS

INTRODUCTION	4
Important Safety Information	4
Personal Injury Or Death Hazards	6
Model Number Reference Guide	8
Serial Number Reference Guide	8
Model And Serial Number Location	9
Component Identification- Kuhl	10
Component Identification- Wallmaster	11
SPECIFICATIONS	12
Dimensions	13
Electrical Data	14
Electrical Data -Power Cord	15
OPERATION	16
Airflow Selection and Adjustment -Kuhl	16
Airflow Selection and Adjustment -Kuhl Q	17
Airflow Selection and Adjustment -Wallmaster	18
User Interface-Kuhl	19
User Interface - Kuhl Q	20
User Interface- Wallmaster	21
User Interface - All Models	22
Control Panel	33
Remote Control	34
Unit	35
Unit Cooling Mode	36
Refrigeration schematic - Cooling	40
Refrigeration schematic - Heating	41
General Knowledge Sequence Of Refrigeration	42
ROUTINE MAINTENANCE	43
Remove and Install Front Cover -Kuhl	43
Remove and Install Front Cover -Kuhl Q	44
Remove and Install Front Cover -Wallmaster	45
Cord Routing Change-Kuhl	46
Cord Routing Change-Kuhl Q	48
Standard Filter Removal / Installation Instructions - Kuhl	51
Premium Carbon Filter Removal / Installation Instructions -Kuhl	52
Filter Removal / Installation Instructions - Kuhl Q	53
REMOVE AND INSTALL THE CHASSIS	54
Remove The Chassis - Kuhl	54
Install The Chassis -Kuhl	55
Kuhl Q	56
Wallmaster	57
DISASSEMBLY	58
Kuhl-Open Electrical Box (To access Power Cord and Fixed Orifice)	58
Replace the Main PCB (Kuhl)	59
Replace the User Interface	59
Replace the Main PCB (Kuhl Q)	60
Replace the User Interface (Kuhl Q)	60
Replace the Main PCB (Wallmaster)	61
Replace the User Interface (Wallmaster)	62
TROUBLESHOOTING	63
Room Air Conditioner Unit Performance Test Data Sheet	63
Cooling Sizing Guide	63
Diagnostic Codes	64
Diagnostic Codes-Inverter	66
Basic Troubleshooting	69
For loss of compressor motor control, compressor startup faults, and compressor phase overcurrent	72
Compressor Module Over Current	73
Reversing Valve	74
Checking the Reversing Valve	74
Checking The Reversing Valve Solenoid	74
Compressor Checks	75
Fan Motor	76
Heating Element	77
Drain Pan Valve	77
Thermistors Description	78

TABLE OF CONTENTS

R-32 SEALED SYSTEM REPAIR	79
General Information	79
Required Equipment	81
Refrigerant Removal, Recovery, and Evacuation	82
Component Replacement/Brazing	83
Refrigerant Charging	84
Compressor Replacement	85
Compressor Replacement -Special Procedure in Case of Compressor Burnout	86
Replace The Reversing Valve	87
WIRING DIAGRAMS	88
Appendix	92
Available Accessories-Kuhl	92
Available Accessories-Wallmaster	93
Interactive Parts Viewer	94
Limited Warranty	94
Thermistor Resistance Values (This Table Applies to All Thermistors)	95
Friedrich authorized parts depots	96

INTRODUCTION

Important Safety Information

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

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

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

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

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

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

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

Installation procedures are not given in this manual. They are given in the Installation/Operation manual which can be acquired on the Friedrich [website](#). Click the Link or scan the QR code to be directed to the Professional page where you can locate our technical literature.



SAFETY IS IMPORTANT

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



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

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

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



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



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

NOTICE

Indicates property damage can occur if instructions are not followed.



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



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



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



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

INTRODUCTION

Important Safety Information

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

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

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

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

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

⚠ WARNING: Electrical Shock Hazard

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



⚠ WARNING: Read Installation Manual

Read this manual thoroughly prior to equipment installation or operation. It is the installer's responsibility to properly apply and install the equipment. Installation must be in conformance with the NFPA 70-2023 national electric code or current edition, International Mechanic code 2021 or current edition, and any other local or national codes.



⚠ WARNING: Safety First

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

⚠ WARNING: This Product uses R-32 Refrigerant

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

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

Do not pierce or burn.

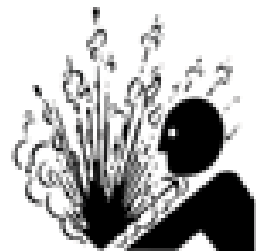
Be aware that refrigerants may not contain an odor.



Refrigerant
Safety Group
A2L

⚠ WARNING: Refrigeration System under High pressure

Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R454B systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.



⚠ CAUTION: Do Not Operate Equipment During Active Stages Of Construction

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

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

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

INTRODUCTION

Personal Injury Or Death Hazards

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

 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.

INTRODUCTION

PERSONAL INJURY OR DEATH HAZARDS

- **REFRIGERATION SYSTEM REPAIR HAZARDS:**

- Use approved standard refrigerant recovering procedures and equipment to relieve high pressure before opening system for repair. Reference EPA regulations (40 CFR Part 82, Subpart F) Section 608.
- Do not allow liquid refrigerant to contact skin. Direct contact with liquid refrigerant can result in minor to moderate injury.
- Be extremely careful when using an oxy-acetylene torch. Direct contact with the torch's flame or hot surfaces can cause serious burns.
- Make certain to protect personal and surrounding property with fire proof materials and have a fire extinguisher at hand while using a torch.
- Provide adequate ventilation to vent off toxic fumes, and work with a qualified assistant whenever possible.
- Always use a pressure regulator when using dry nitrogen to test the sealed refrigeration system for leaks, flushing etc.

- **MECHANICAL HAZARDS:**

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

- **PROPERTY DAMAGE HAZARDS**

- **FIRE DAMAGE HAZARDS:**

- Read the Installation/Operation Manual for the air conditioning unit prior to operating.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- 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

- This service manual is designed to be used in conjunction with the installation and operation manuals provided with each air conditioning system.
- This service manual was written to assist the professional service technician to quickly and accurately diagnose and repair malfunctions.
- Due to continuing research in new energy-saving technology, all information in this manual is subject to change without notice.
- **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.

Model Number Reference Guide

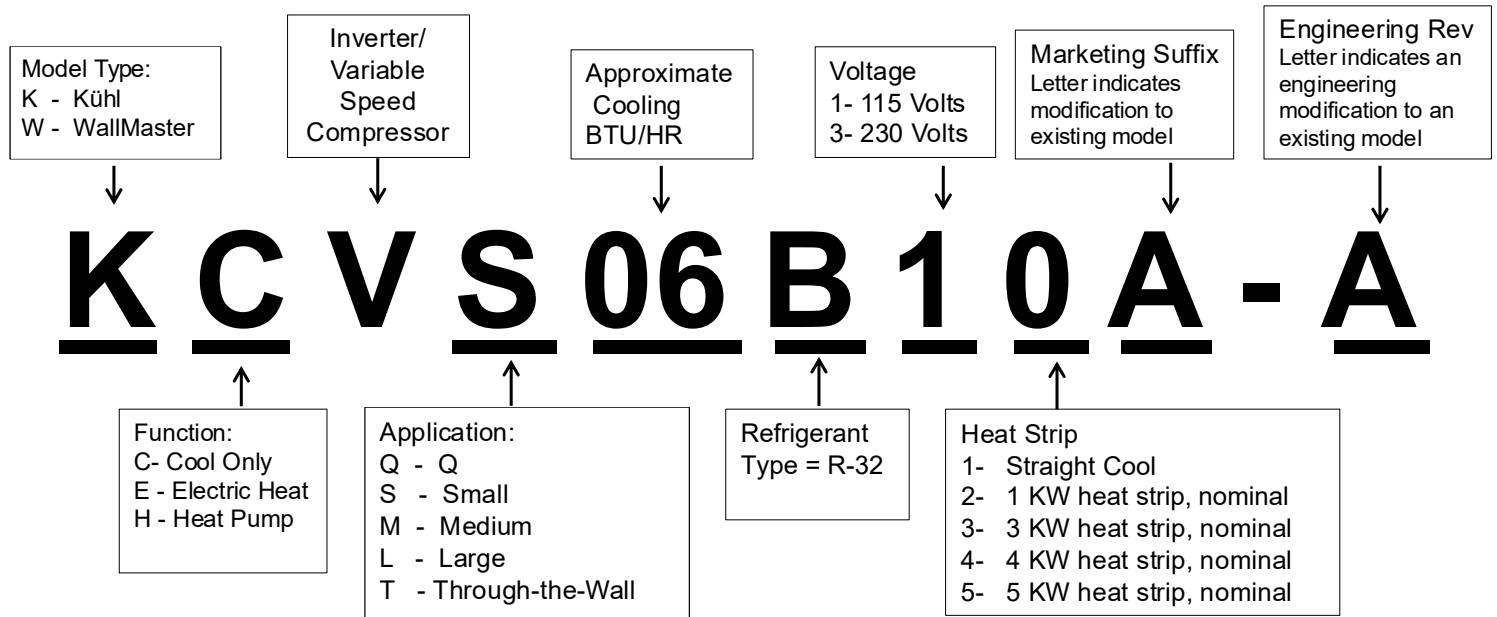


Figure 101 (Model Number Reference Guide)

Serial Number Reference Guide

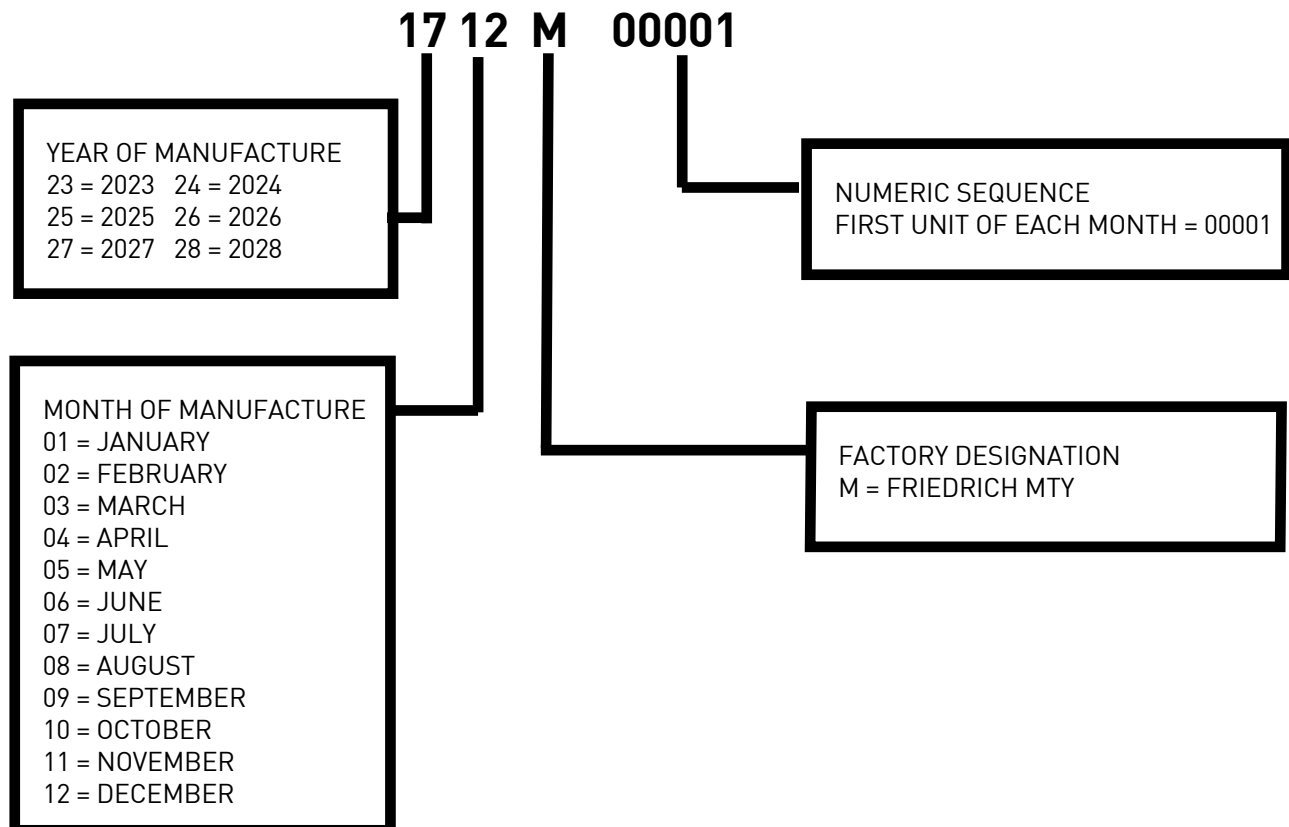


Figure 102 (Serial Number Reference Guide)

INTRODUCTION

Model And Serial Number Location

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.

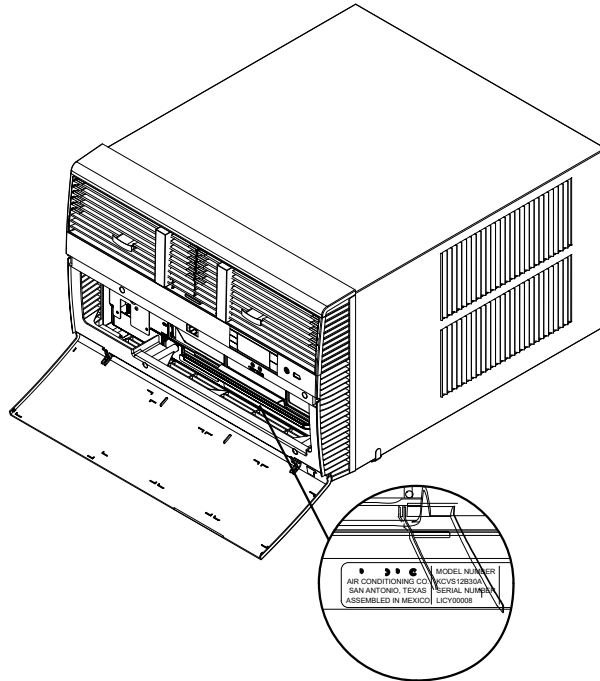


Figure 103 (Kuhl Model and Serial Number Location)

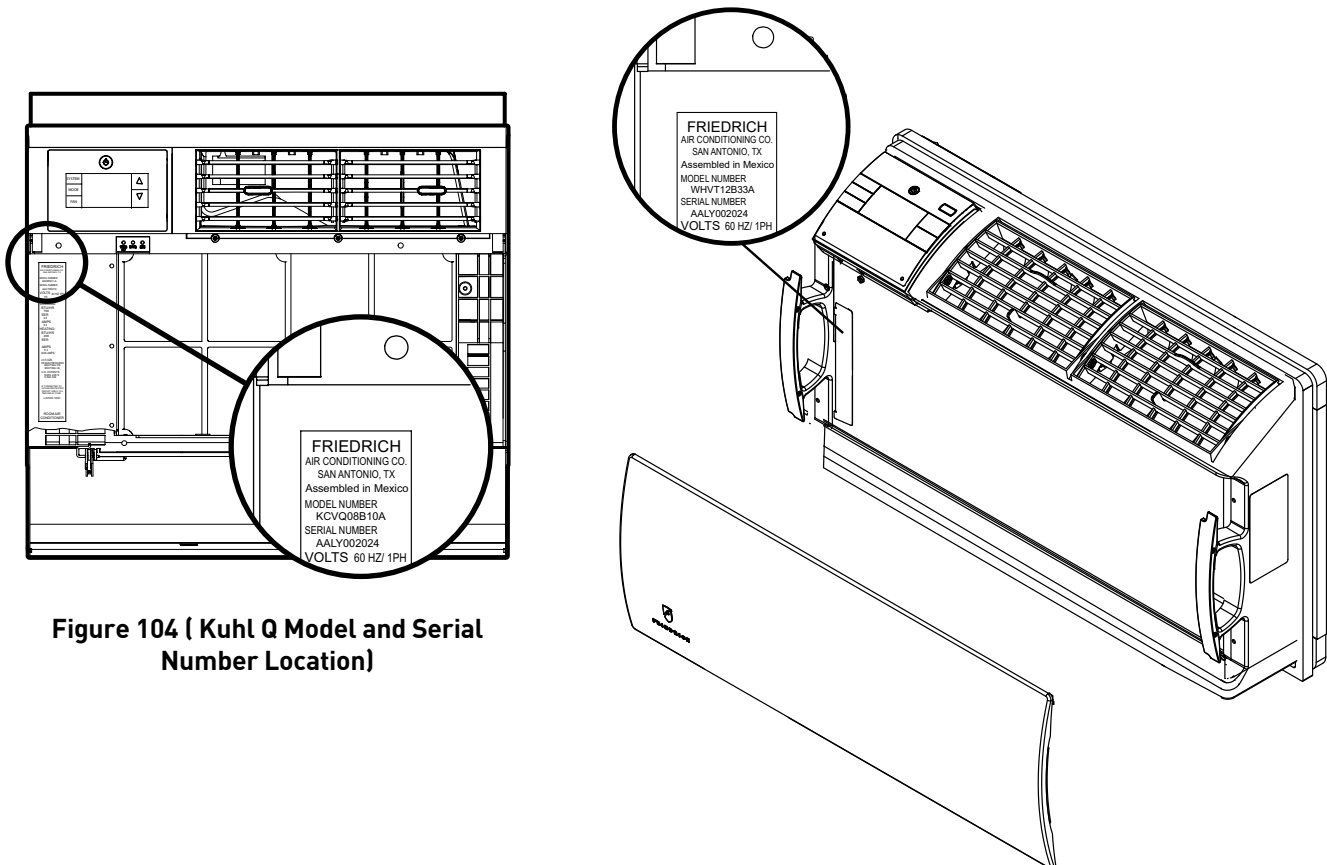


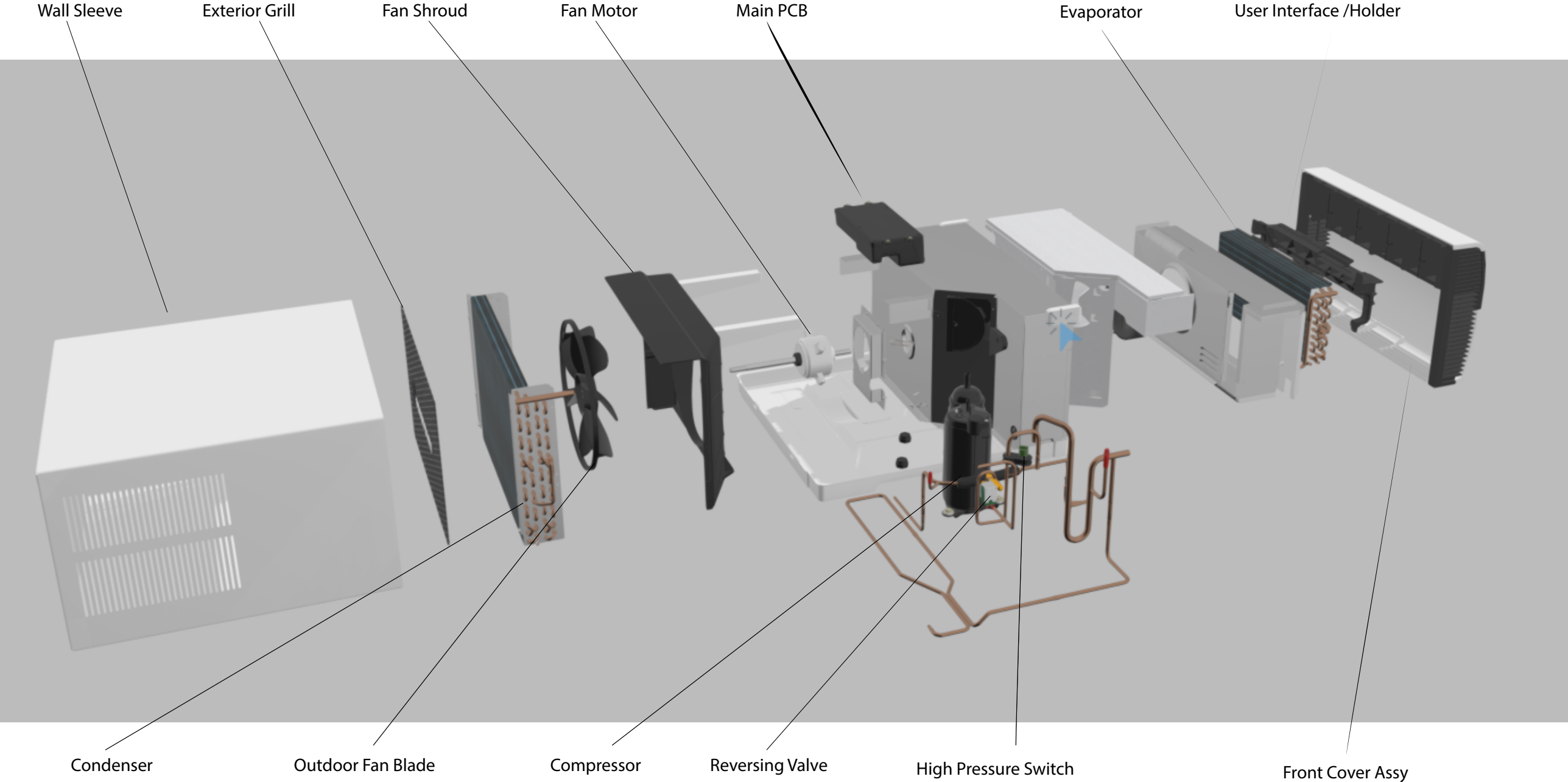
Figure 104 (Kuhl Q Model and Serial Number Location)

Figure 105 (Wallmaster Model and Serial Number Location)

INTRODUCTION

Component Identification- Kuhl

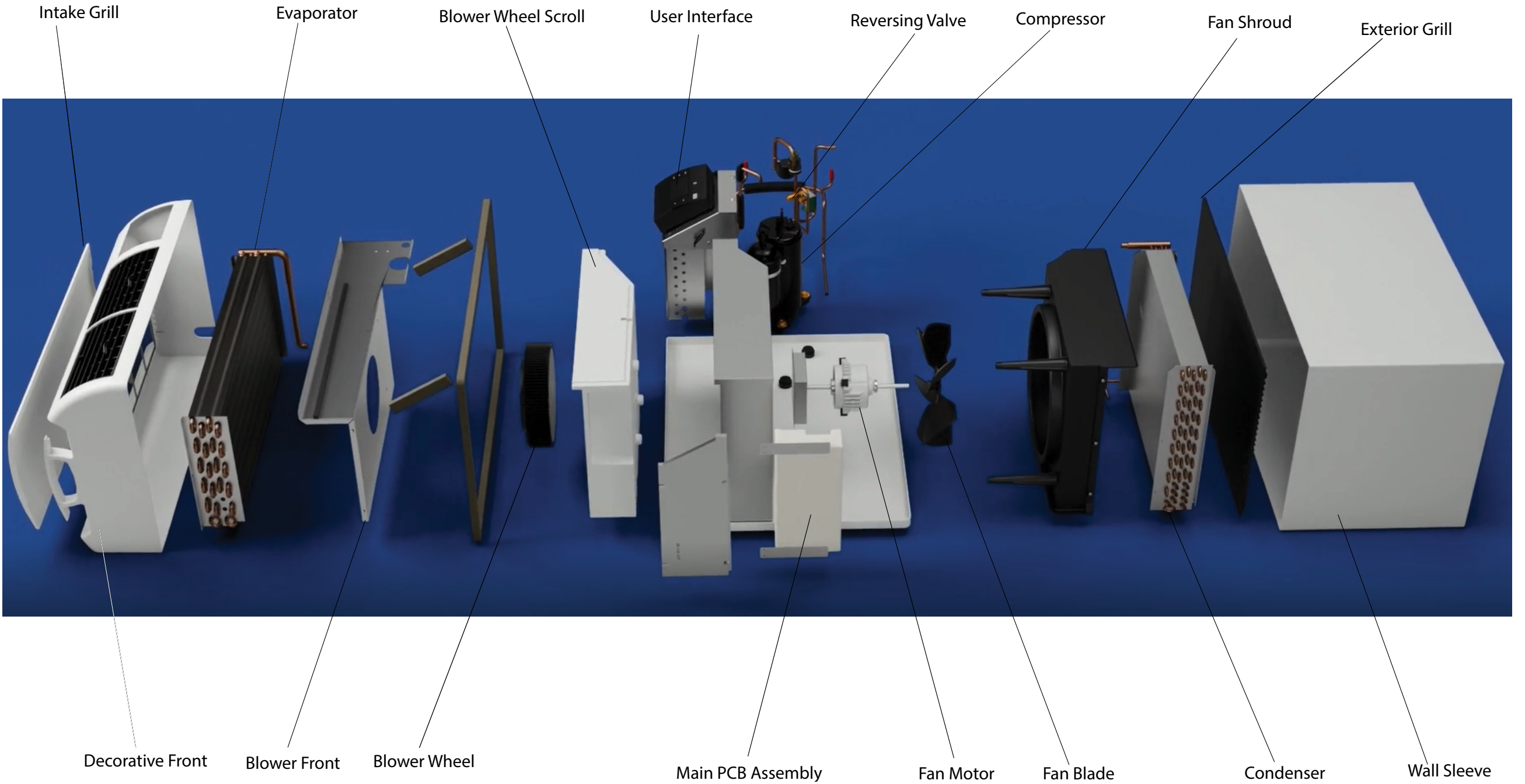
Figure 106



INTRODUCTION

Component Identification- Wallmaster

Figure 107



SPECIFICATIONS

Model	Max Cooling BTU	Low Cooling BTU	HP Heat- ing BTU	Electric Heating BTU	Volts	Cooling Amps	Cooling Watts	Heating Amps	Heating Watts	Electric Heating kW	Max Power Consumption (Watts)	EER	CEER	Energy Star Y/N	Estimated yearly Energy Cost	COP	Moisture Re- moval Pints/ HR	CFM	Net/ Ship Weight	Sleeve Size	REFRIG- ERANT CHARGE (OZ.)
Kuhl Cooling Only Units																					
KCVQ08B10A	9,700	4,000	—	—	115V	9.9	502	—	—	—		10.8	13.9	N	\$51	—	2.9	200	70/77	Q	14
KCVS08B10A	8,700	4,000	—	—	115V	8.4	370	—	—	—		12.3	16	Y	\$50	—	3	255	100/110	S	19
KCVS12B10A	12,500	6,000	—	—	115V	11.8	624	—	—	—		11.1	15	Y	\$62	—	4.2	300	110/120	S	20
KCVS12B30A	12,700	6,000	—	—	230V	6.3	624	—	—	—		11.9	15	Y	\$62	—	4.5	300	110/120	S	20
KCVS16B30A	16,200	7,750	—	—	230V	8.6	833	—	—	—		10.6	14.4	Y	\$83	—	6	350	110/120	S	20
KCVM14B10A	13,900	6,750	—	—	115V	11.6	680	—	—	—		10	14.7	Y	\$89	—	5.6	360	120/135	M	34
KCVM18B30A	19,100	9,000	—	—	230V	10	990	—	—	—		11	14.4	Y	\$98	—	7.2	425	130/145	M	34
KCVM24B30A,	23,200	11,500	—	—	230V	12	1,349	—	—	—		9.5	13	Y	\$133	—	8.9	450	130/145	M	36
KCVL28B30A,	28,900	14,000	—	—	230V	14.3	1,577	—	—	—		10.3	13.2	Y	\$155	—	11.1	600	155/185	L	42.5
KCVL36B30A	34,100	17,000	—	—	230V	16	2,153	—	—	—		8.6	12.2	Y	\$281	—	12.5	700	155/185	L	52
Kuhl Heat Pump Units																					
KHVQ10B11A	9,400	4,250	6,600	4,000	115V	9.5	580	9.9	682	1.1		8.9	12.2	N	\$58	2.6	3.2	255	73/80	Q	17
KHVS10B11A,	10,200	5,000	8,700	4,000	115V	10.2	501	11.2	895	1.1		11.2	14	Y	\$50	3	3.3	300	105/115	S	21
KHVS12B33A,	12,600	6,000	11,400	10,700	230V	6.2	612	4.3	1,139	3.2		11.4	14.4	Y	\$61	2.9	4.2	375	115/125	S	20
KHVM24B34A	22,900	11,250	18,000	13,000	230V	12.6	1,358	10.9	2,000	4.0		9	12.6	Y	\$134	2.6	9	450	135/150	M	36
KHVL28B35A	28,200	14,000	21,700	17,300	230V	15.5	1,566	11.5	2,137	5.0		10.1	12.6	Y	\$156	3	11.2	600	160/190	L	43
Wallmaster Cooling Only Units																					
WCVT10B10A	11,000	5,000	—	—	115V	11.6	585	—	—	—		9.8	13	Y	\$59	—	3.4	275	90/95	-	16
WCVT12B10A	11,100	5,000	—	—	230V	5.4	585	—	—	—		10.4	13	Y	\$59	—	3.4	275	90/95	-	24
WCVT10B30A	13500	6,000	—	—	115V	11.6	621	—	—	—		11.1	13.2	Y	\$68	—	4.6	300	110/115	-	16
WCVT12B30A	13600	6,000	—	—	230V	6.5	621	—	—	—		11.7	13.2	Y	\$68	—	4.6	300	110/115	-	24
WCTV16B30A	16800	8,000	—	—	230V	10.4	964	—	—	—		9.4	12.6	Y	\$96	—	6.2	350	110/115	-	23
Wallmaster Heat Pump Units																					
WHVT14B33A	15200	7,000	10,000	10,900	230V	8.7	906	5	1,207	3.2	9	12	12	Y	\$90	2.4	5	350	115/120	-	30
Friedrich room air conditioners are designed to operate in cooling mode with outdoor temperatures from 60°F to 115°F. **Rating Conditions: 80 degrees F, room air temp. & 50% relative humidity, with 95 degree F, outside air temp & 40% relative humidity, all systems use R-32. Test done at highest unit fan speed.																					

Figure 201 (Specifications)

SPECIFICATIONS

Dimensions

Sleeve	Height Inches	Width Inches	Depth with Front Inches	Shell Depth to Louvers Inches	Minimum Extension Into Room*	Minimum Extension Outside * Inches	Window Width INCHES		In-wall Installation Finished Hole Inches			Carton Dimensions Inches		
			A	B	Inches	Inches	Minimum**	Maximum	Height	Width	Max. Depth C	Height	Width	Depth
S	15 15/16"	25 15/16"	29"	8 3/4"	5 3/4"	16 15/16"	27 3/8"	42"	16 3/16"	26 3/16"	7 3/8"	19"	29"	34 1/2"
M	17 15/16"	25 15/16"	29"	8 3/4"	5 3/4"	16 15/16"	27 3/8"	42"	18 3/16"	26 3/16"	7 3/8"	21"	29"	34 1/2"
L	20 3/16"	28"	35 1/2"	16 1/2"	5 3/8"	18 15/16"	29 7/8"	42"	20 3/8"	28 1/4"	15 1/8"	24 1/2"	31 5/8"	38 7/8"
Q	14 1/4"	19 3/4"	21 3/8"	8 1/2"	5 1/2"	10 3/4"	22"	42"	14 1/2"	20"	8 1/2"	18 3/4"	22"	25 1/2"

Figure 202 (Kuhl Dimensions)

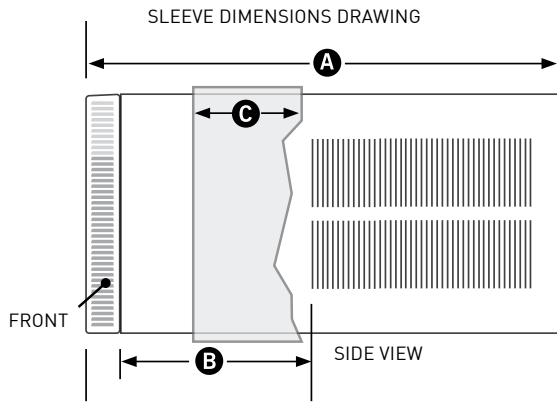


Figure 203 (Kuhl Sleeve Dimensions)

Height	Width	Depth	Height of Front	Width of Front	Depth with Front	Minimum Extension Into Room with Front
15 3/4"	26 1/2"	21"	17 1/4"	27 1/2"	23 1/4"	7 1/2"

Figure 204 (Wallmaster Chassis Dimensions)

Height	Width	Depth	Depth with Front	Minimum Extension Outside	Thru-the-wall Finished Hole		
					Height	Width	Max. Depth
16 3/4"	27"	16 3/4"	24 1/4"	9/16"	17 1/4"	27 1/4"	15 5/16"

Figure 205 (Wallmaster WSE Sleeve Dimensions)

Sleeve Dimensions			
	Freiedrich WSE Sleeve	Fedders A Sleeve	Fedders B Sleeve*
Height	16 3/4"	16 3/4"	16 3/4"
Width	27"	27"	27"
Depth	16 3/4"	16 3/4"	19 3/4"
*Installation in a Fedders B sleeve requires a baffle adapter kit-BAK			

Figure 206 (Wallmaster WSE Sleeve Dimensions)

Installation Clearances

Improper installation of the Air Conditioner can cause poor performance and premature wear of the unit.

Ensure that the KUHLE unit is installed with proper clearances as described below.

Ensure no obstructions or enclosures are within clearances limits to allow for proper airflow.

Ensure no open flames, or surfaces that will exceed 1000 degrees Fahrenheit are within clearances limits.

Clearances

Top and Bottom of Unit - One (1) foot

Sides of Unit - One (1) foot

Front of Unit - Three (3) feet

Rear of Unit - Three (3) feet

SPECIFICATIONS

Electrical Data

⚠ 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.

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

MODEL	CIRCUIT RATING OR TIME DELAY FUSE		REQUIRED WALL RECEPTACLE	
	AMP	VOLT	NEMA NO.	
KCVS08B10A, KCVS12B10A, KCV14B10A, KHVS10B11A, KCVQ08B10A, KHVQ10B11A WCV10B10A, WCV12B10A	15	125	5-15R	
KCVS12B30A, KCVS16B30A, KCV18B30A WCV10B30A, WCV12B30A WCV16B30A	15	250	6-15R	
KHVS12B33A, KCV12B30A, KCVL28B30A, KEVS16B33A, WHVT14B33A	20	250	6-20R	
KHVM24B30A, KHVL28B35A, KCVL36B30A, KEVL36B35A	30	250	6-30R	

Figure 207 (Circuit Breaker / Plug / Receptacle / Cord Rating)

Wire Size - Use ONLY wiring size recommended by the National Electric Code (NEC) for single outlet branch circuit.

Fuse/ Circuit Breaker - Use ONLY the correct HACR type and size fuse/circuit breaker. Read electrical ratings on unit's rating plate. Proper circuit protection is the responsibility of the homeowner.

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.

Receptacle - The field supplied outlet must match plug on service cord and be within reach of service cord. Do NOT alter the service cord or plug. Do NOT use an extension cord. Refer to the table above for proper receptacle and fuse type.

SPECIFICATIONS

Electrical Data -Power Cord

⚠ WARNING	
	Electrical Shock Hazard Make sure your electrical receptacle has the same configuration as your air conditioner's plug. If different, consult a Licensed Electrician. Do not use plug adapters. Do not use an extension cord. Do not remove ground prong. Always plug into a grounded 3 prong outlet. Failure to follow these instructions can result in death, fire, or electrical shock.

NOTICE
Do not use the LCDI device as an ON/OFF switch. Failure to adhere to this precaution may cause premature equipment malfunction.

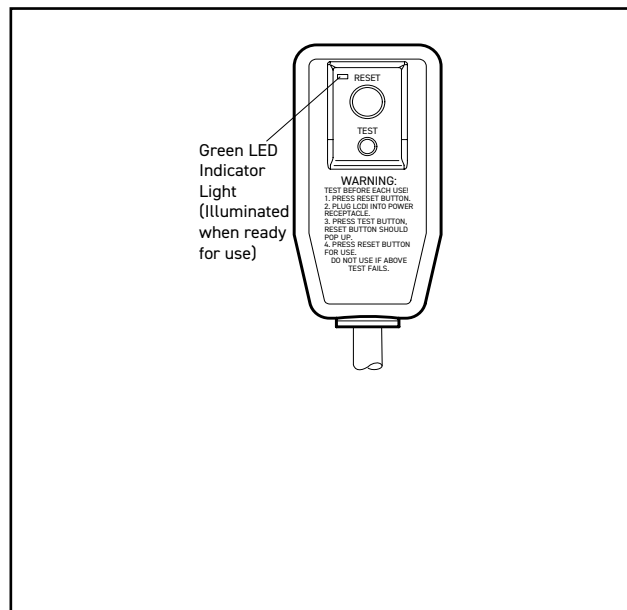


Figure 208 (LCDI Power Cord)

Make sure the wiring is adequate for your unit.

If you have fuses, they should be of the time delay type. Before you install or relocate this unit, be sure that the amperage rating of the circuit breaker or time delay fuse does not exceed the amp rating listed in Table 206.

DO NOT use an extension cord.

The cord provided will carry the proper amount of electrical power to the unit; an extension cord may not.

Make sure that the receptacle is compatible with the air conditioner cord plug provided.

Proper grounding must be maintained at all times. Two prong receptacles must be replaced with a grounded receptacle by a certified electrician.

The grounded receptacle should meet all national and local codes and ordinances. You must use the three prong plug furnished with the air conditioner. Under no circumstances should you remove the ground prong from the plug.

Test the power cord.

All Friedrich room air conditioners are shipped from the factory with a Leakage Current Detection Interrupter (LCDI) equipped power cord. The LCDI device on the end of the cord meets the UL and NEC requirements for cord connected air conditioners.

To test your power supply cord:

1. Plug power supply cord into a grounded 3 prong outlet.
2. Press RESET (see Figure 207).
3. Press TEST, listen for click; the 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 light is on. The power cord is ready. for use.

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 power supply cord from the manufacturer.

OPERATION

Airflow Selection and Adjustment -Kuhl

The airflow path may be adjusted to distribute air independently from the left or right side of the discharge opening. Each of the banks of louvers can be directed left, right, up, or down in order to achieve the most optimum airflow positioning.

To adjust airflow direction, grab the lever in the center of the louver bank and move it in the direction that you would like the air to be directed. Please note that it is normal that airflow may be stronger out of one side of the louvers than the other.

Fresh air and exhaust control

Your air conditioner has the ability to bring fresh air into the room or exhaust stale air out of the room. The control slide is found on the upper part of the unit (see Figure 301).

TO BRING IN FRESH AIR – Move the lever to the Fresh Air  position which allows outside air to enter the room. This is useful in fall and spring as a means of bringing in fresh outside air when using FAN ONLY. It can also be used in the summer with the compressor in the Cooling Mode if you wish.

TO EXHAUST INDOOR AIR – Move the lever to the Exhaust  position. This will allow stale air to be expelled to the outside of the dwelling. This is especially handy in the spring or fall when indoor air tends to get stale, or after a social gathering involving smokers, or to remove cooking odors.

BEST PERFORMANCE – Move the lever to the **Re-Circulate Position**.  This is the most efficient mode for cooling and heating. In this mode the unit will not bring air in or exhaust air.

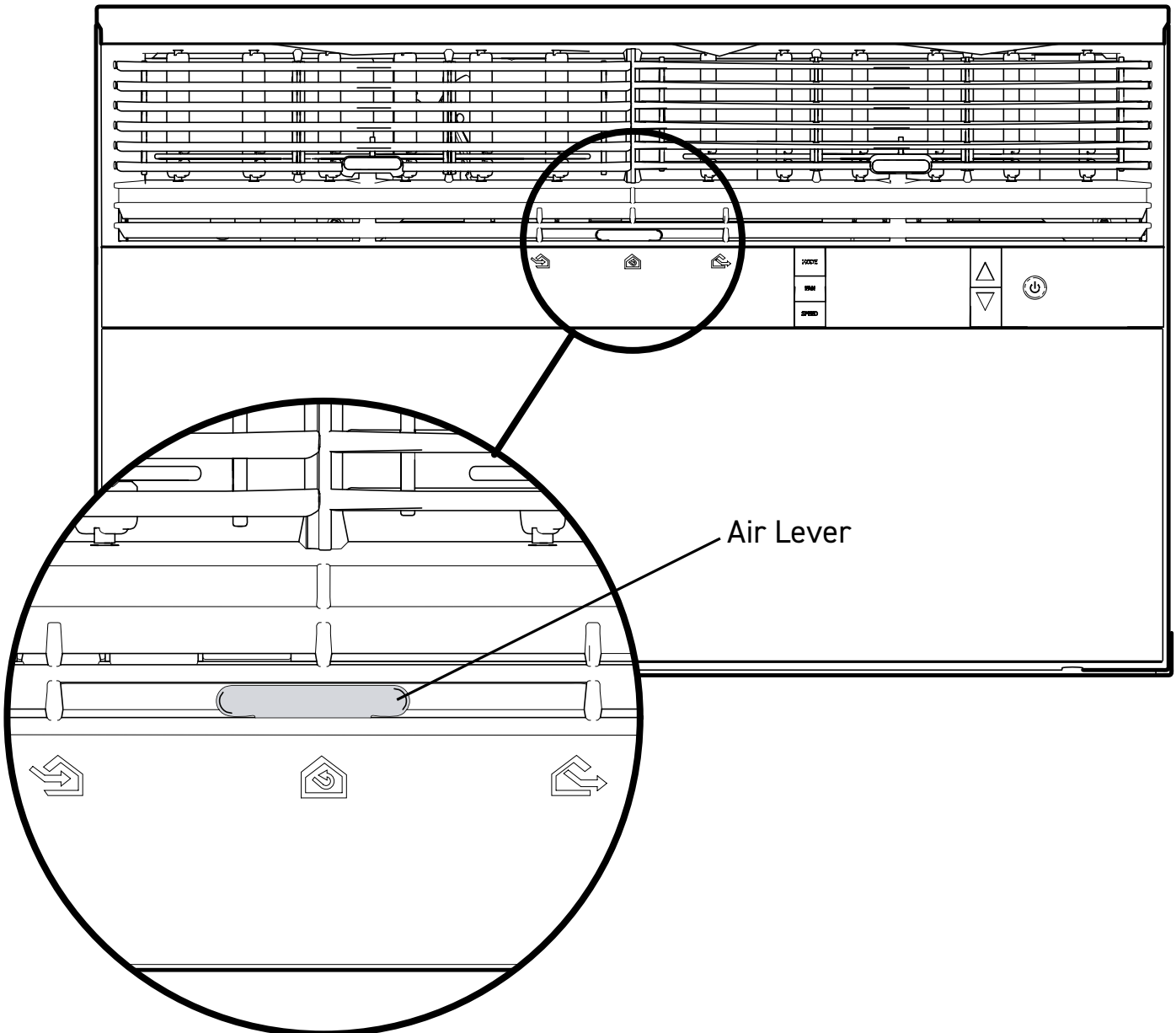


Figure 301.1 (Airflow Selection And Adjustment)

OPERATION

Airflow Selection and Adjustment -Kuhl Q

The airflow path may be adjusted to distribute air independently from the left or right side of the discharge opening. Each of the banks of louvers can be directed left, right, up, or down in order to achieve the most optimum airflow positioning.

To adjust airflow direction, grab the lever in the center of the louver bank and move it in the direction that you would like the air to be directed. Please note that it is normal that airflow may be stronger out of one side of the louvers than the other.

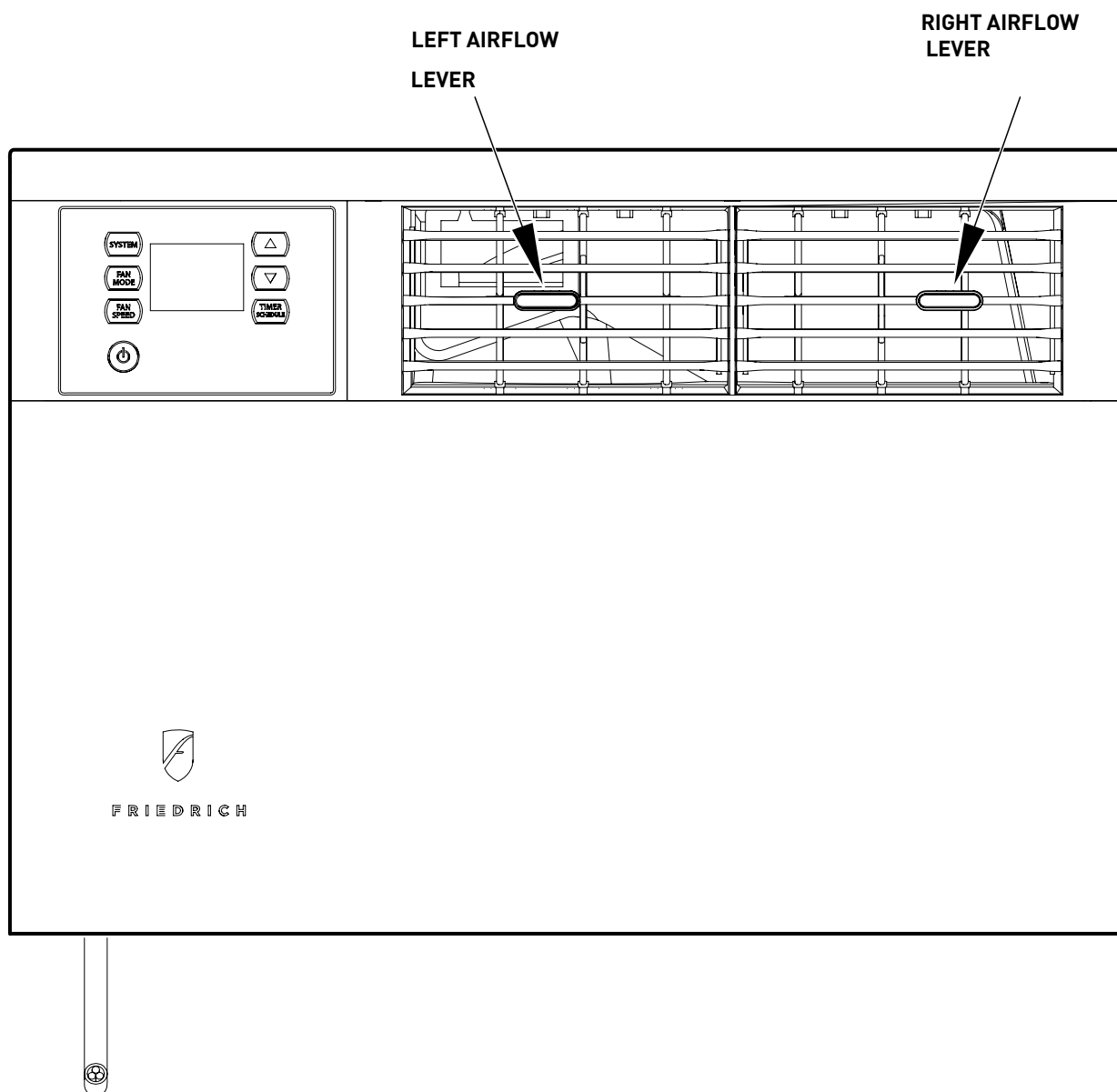


Figure 301.2 (Airflow Adjustment)

OPERATION

Airflow Selection and Adjustment -Wallmaster

The airflow path may be adjusted to distribute air independently from the left or right side of the discharge opening. Each of the banks of louvers can be directed left, right, up, or down in order to achieve the most optimum airflow positioning.

To adjust airflow direction left or right, grab the lever in the center of the louver bank and move it in the direction that you would like the air to be directed. To adjust the airflow up or down, rotate the entire vent to the desired position. Please note that it is normal that airflow may be stronger out of one side of the louvers than the other.

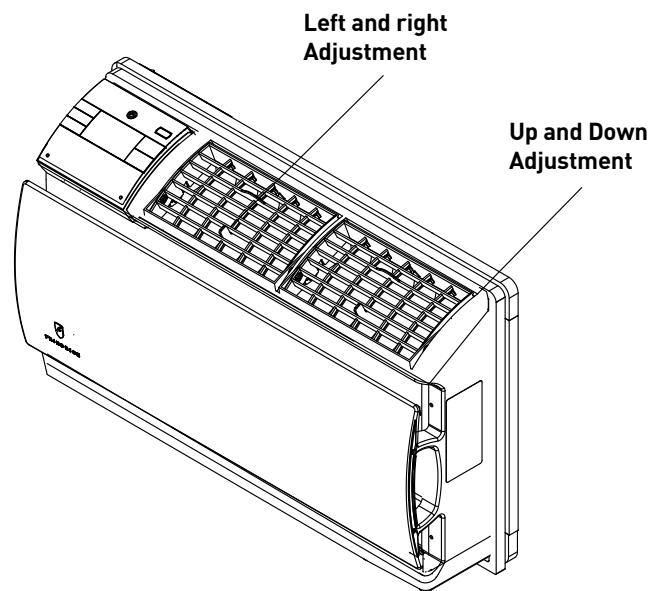


Figure 303 (Airflow Selection And Adjustment)

OPERATION

User Interface-Kuhl

All of the control panel function buttons and mode icons can be viewed in Figures 302 and 303.

Power On – Press the button to turn on the air conditioner. The power button illuminates to indicate that the power is on. The backlight on the power switch will automatically turn off after 20 seconds of inactivity. The remote control can also be used to turn power ON / OFF (see Remote Control).

Display – The display is a high efficiency LCD with a built-in backlight. After 20 seconds of inactivity, the display switches off. Touching any button automatically changes the display to full brightness.

There are three control push buttons on each side of the display.

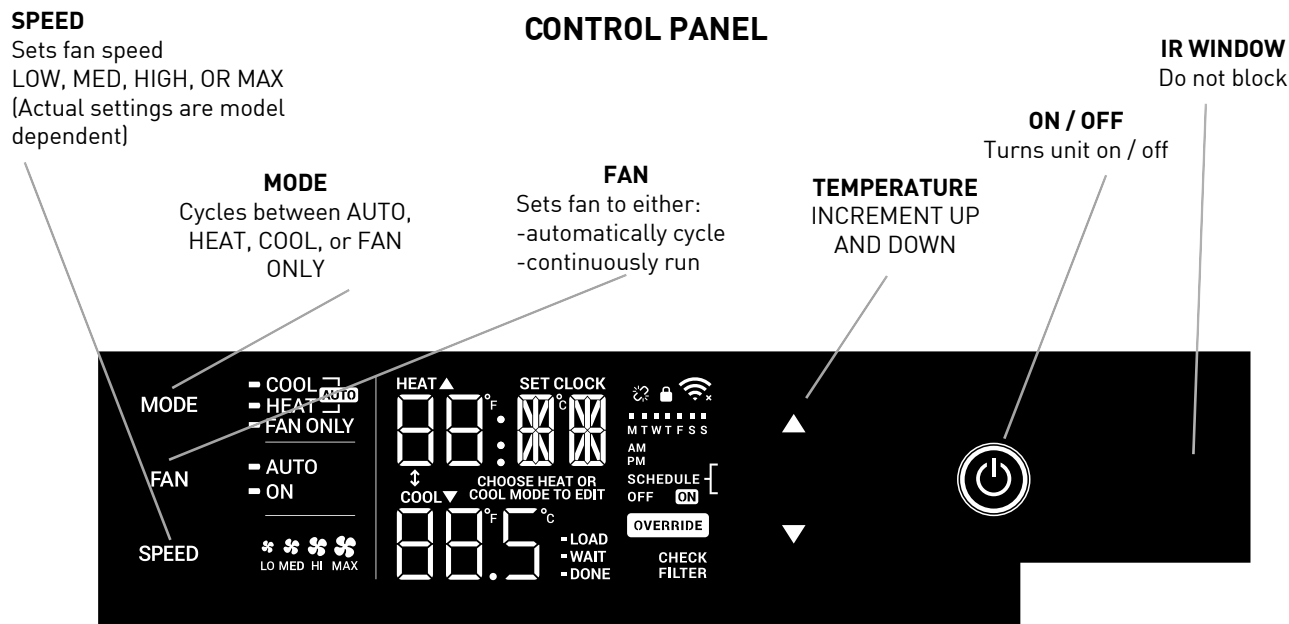


Figure 303

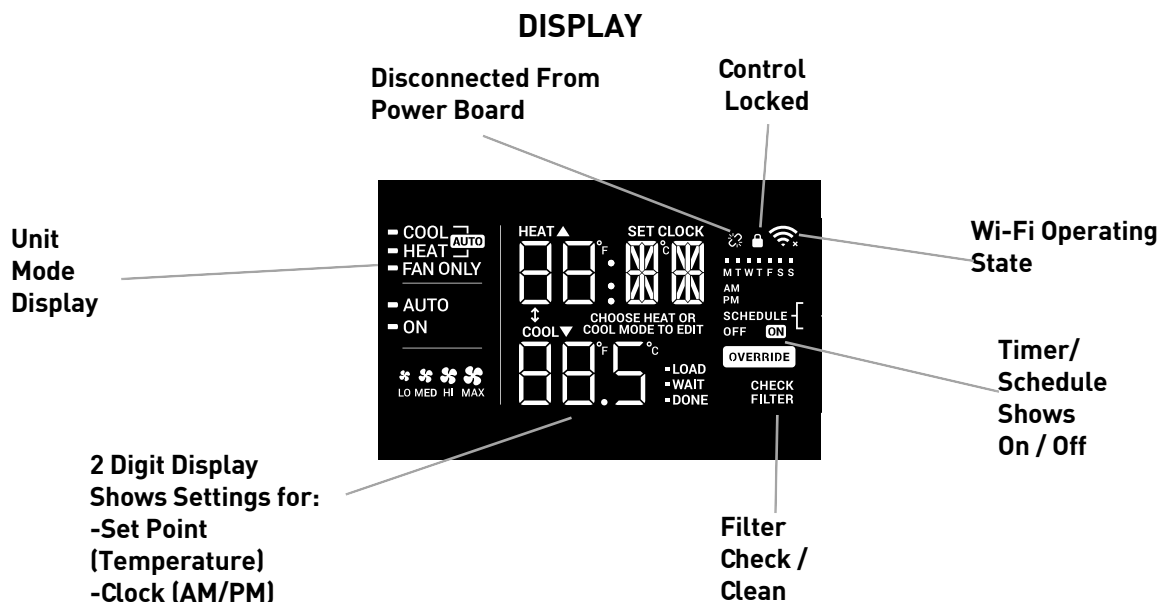


Figure 304

OPERATION

User Interface - Kuhl Q

All of the control panel function buttons and mode icons can be viewed in Figure 305.

Power On – Press the button to turn on the air conditioner. The power button illuminates to indicate that the power is on. The backlight on the power switch will automatically turn off after 20 seconds of inactivity. The remote control can also be used to turn power ON / OFF (see Remote Control).

Display – The display is a high efficiency LCD with a built-in backlight. After 20 seconds of inactivity, the display switches off. Touching any button automatically changes the display to full brightness.

There are three control push buttons on each side of the display.

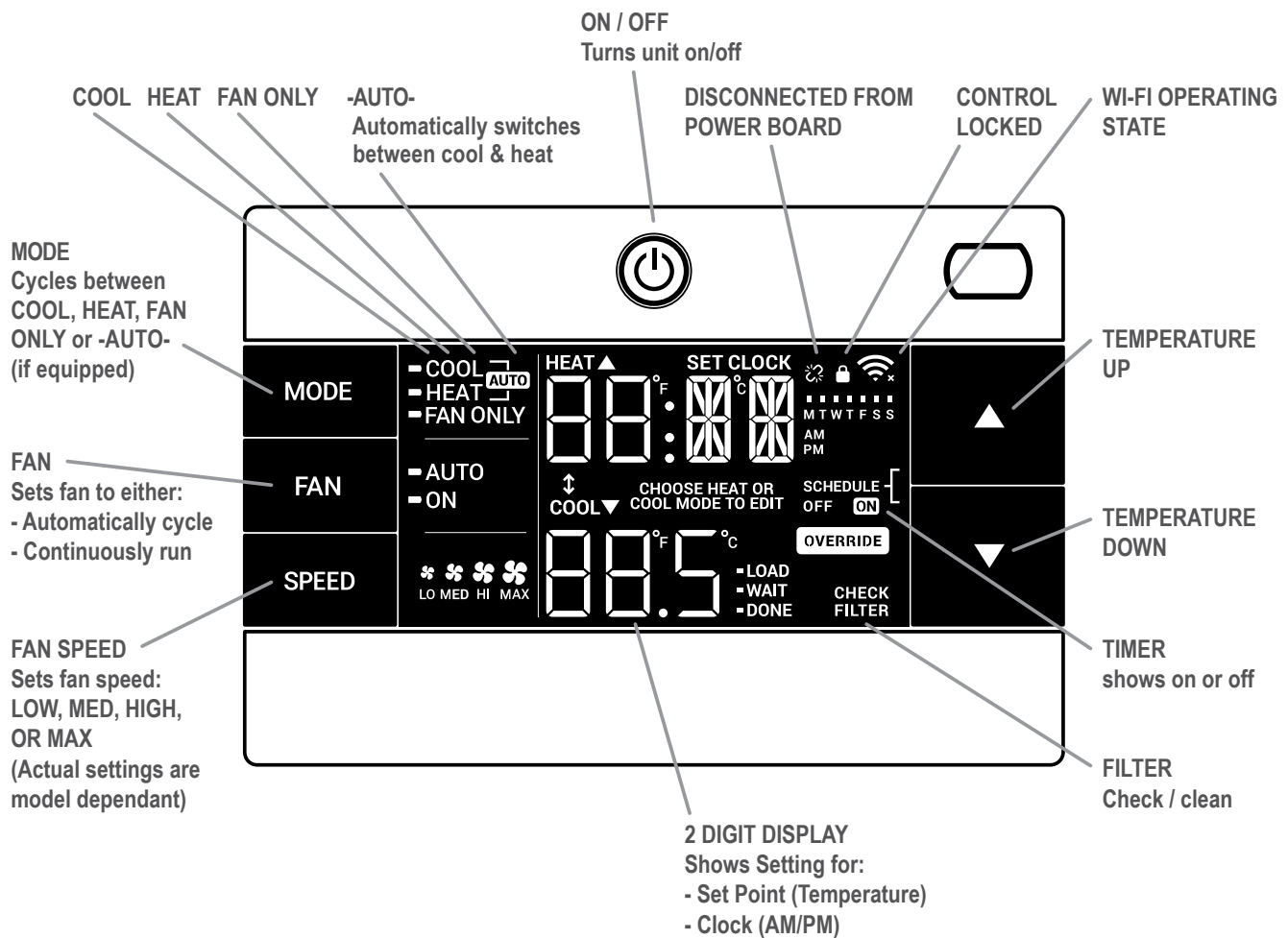


Figure 305 (Control Panel and Display)

OPERATION

User Interface- Wallmaster

All of the control panel function buttons and mode icons can be viewed in Figures 307.

Power On – Press the button to turn on the air conditioner. The power button illuminates to indicate that the power is on. The backlight on the power switch will automatically turn off after 20 seconds of inactivity. The remote control can also be used to turn power ON / OFF (see Remote Control).

Display – The display is a high efficiency LCD with a built-in backlight. After 20 seconds of inactivity, the display switches off. Touching any button automatically changes the display to full brightness. There are three control push buttons on each side of the display.

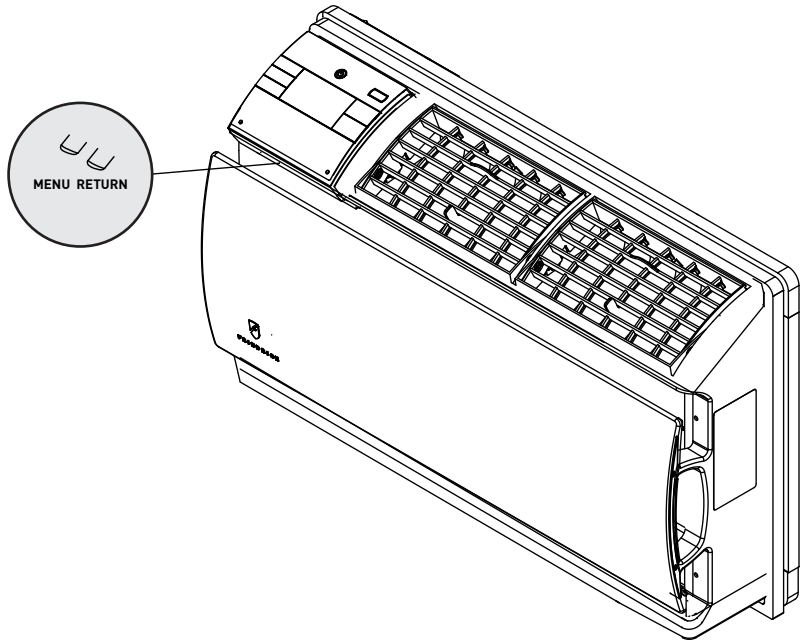


Figure 306 (Wallmaster Menu Buttons)

CONTROL PANEL AND DISPLAY

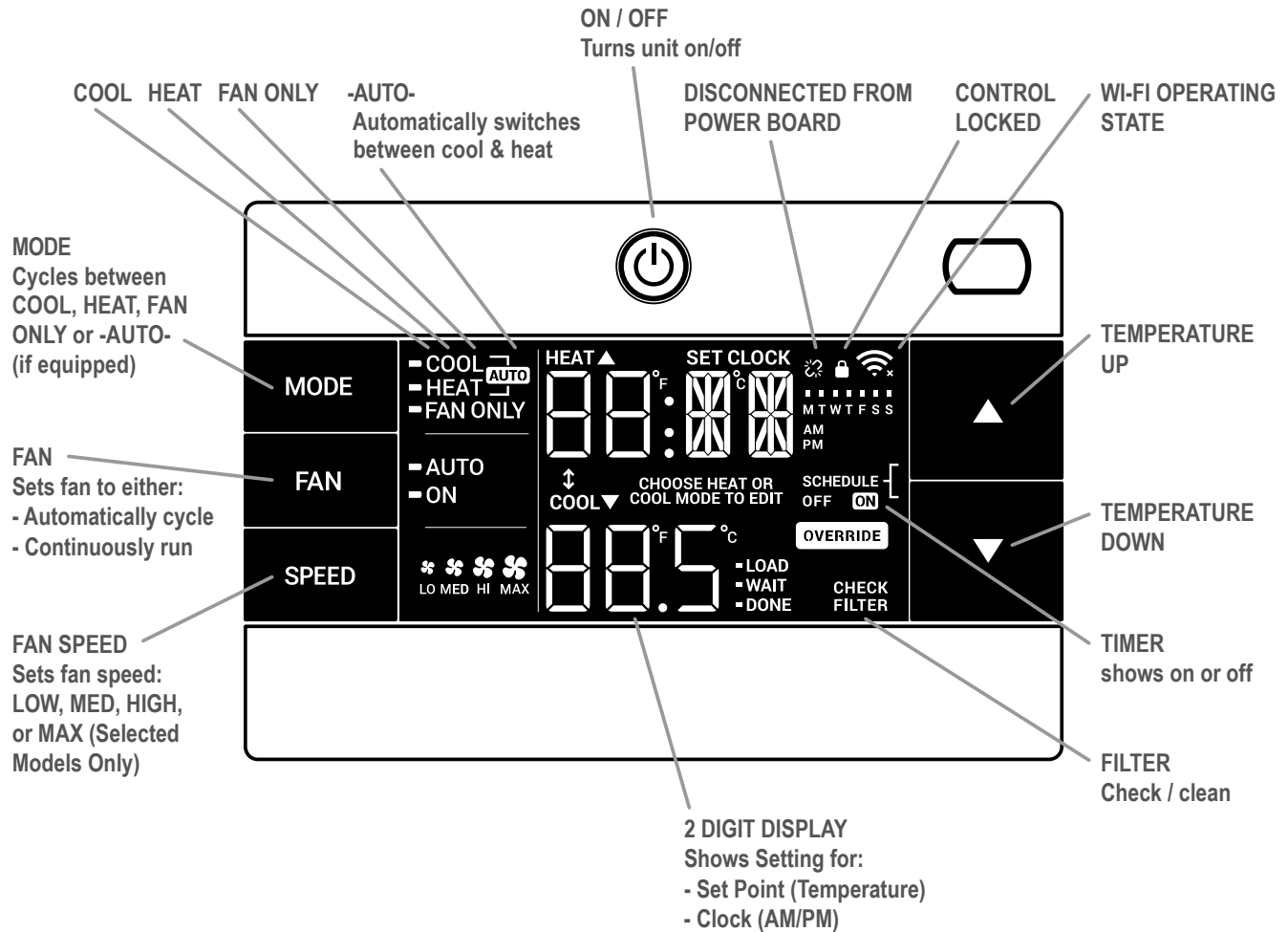


Figure 307 (Display Panel)

OPERATION

User Interface - All Models

Accessing Sub-Menus

The MENU button accesses the sub-menu.

Press the Menu Button to enter the Menu. See Figure 308.

The arrow buttons navigate the 6 menu options. See Figure 309

- LIM
- TM
- F-C
- LOCK
- CnCT
- diAG

The return button exits the menu. See Figure 310.

Figure 308

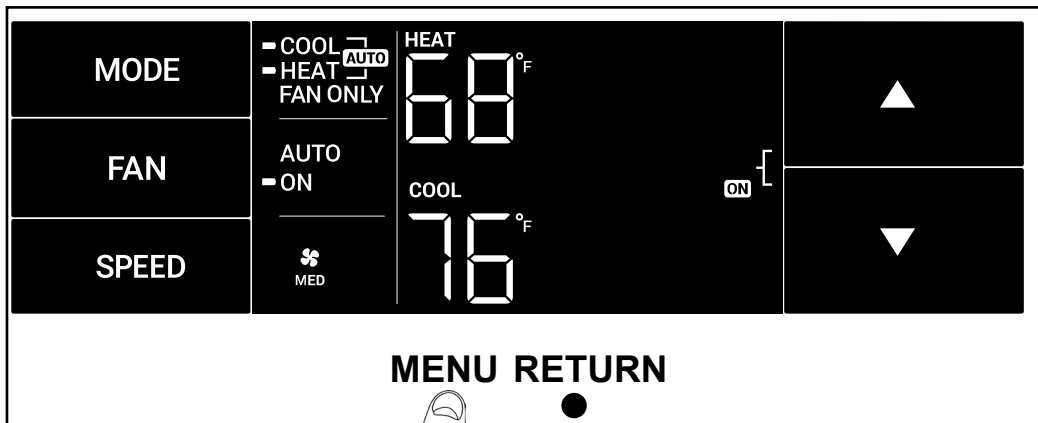


Figure 309

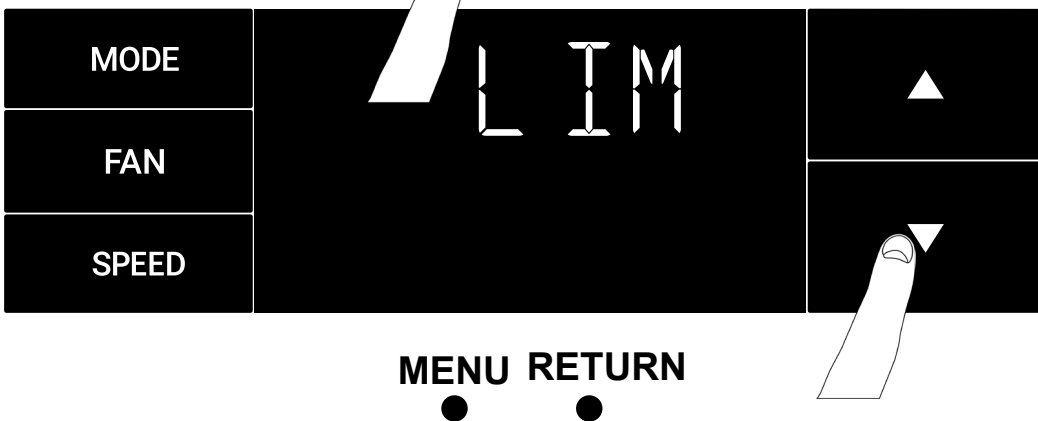
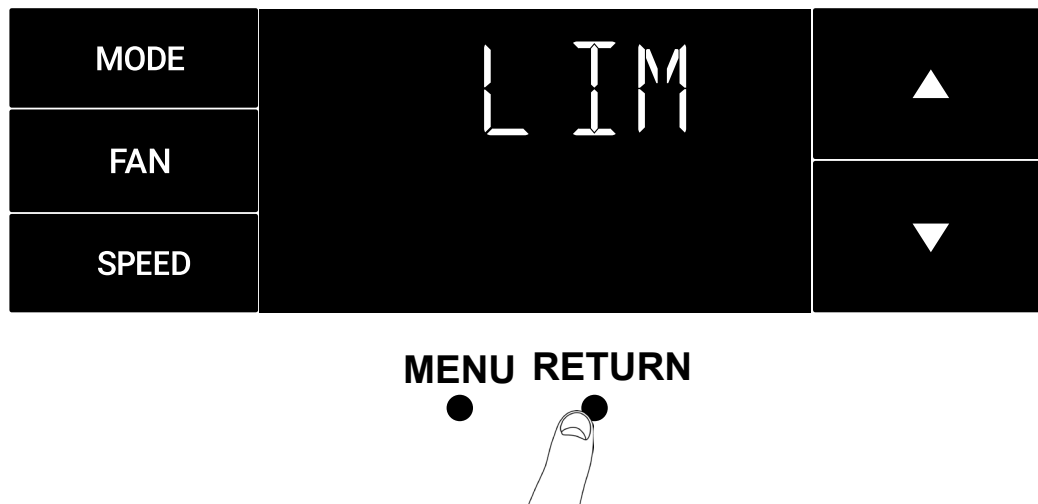


Figure 310



OPERATION

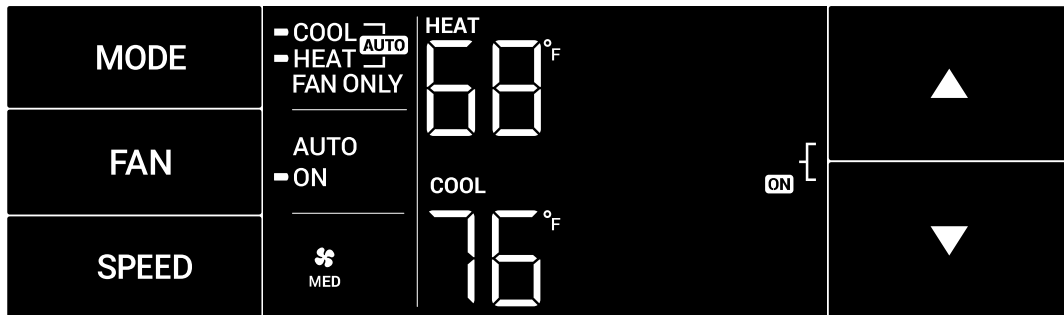
User Interface - All Models

Navigating Inside the Sub-Menus

The MENU button moves you forward through the sub-menu. See Figure 311

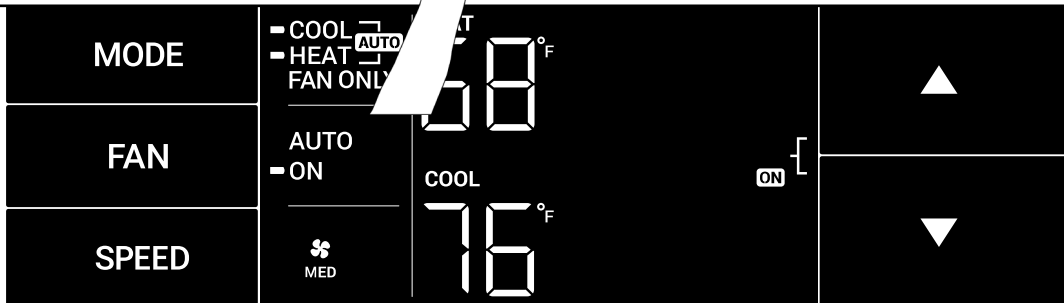
The return button moves you backward once inside the LIM and TM menus. See Figure 312.

Figure 311



MENU RETURN

Figure 312



MENU RETURN

OPERATION

User Interface - All Models

The LIM Menu (LIMIT)

This is the limit menu. See Figure 313.

Upon entering the menu, the first option will be to set the lower set-point limit using the arrow buttons. See Figure 314.

Then you can set the higher set-point limit using the arrow buttons. See Figure 315.

Pressing the menu button completes the limit setting. See Figure 316.

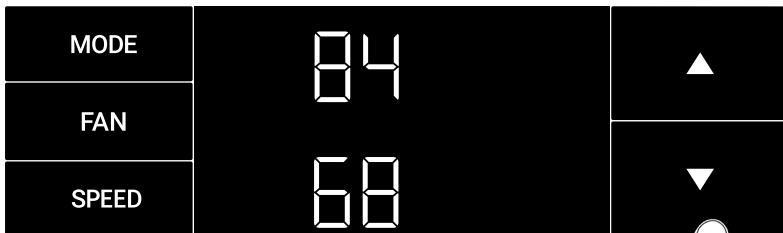
Figure 313



MENU RETURN



Figure 314



MENU RETURN



Figure 315



MENU RETURN



Figure 316



MENU RETURN



OPERATION

User Interface - All Models The TM Menu (Timer)

This is the TM menu used to set a timer. See Figure 317.

In the menu, you set the current time using the arrow buttons. See Figure 318. (Note: These two “set clock” steps will be skipped if the unit is already connected to Wi-Fi.)

First, set the hour.

Using the MENU button, you switch to the minutes and complete setting the time. See Figure 319.

You select your mode. Either cool, heat, or auto. Toggle these using the mode button. See Figure 320. (Note: cooling-only models skip this step.)

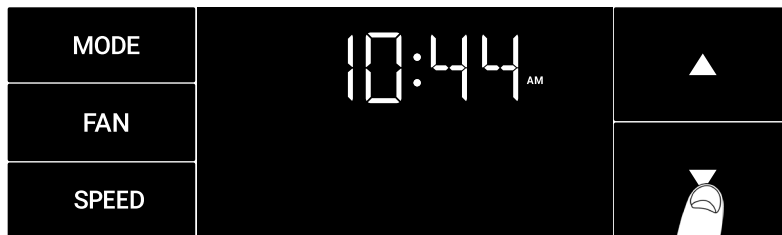
The process is the same for all three modes. Auto mode will be shown as the example.

Figure 317



MENU RETURN

Figure 318



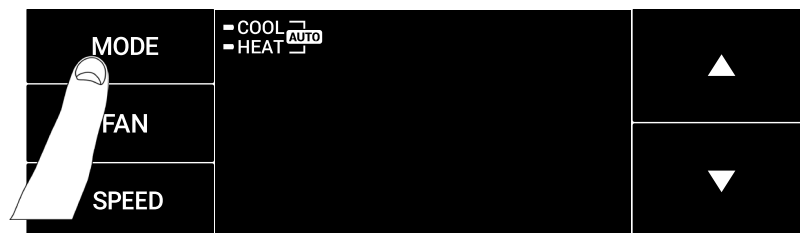
MENU RETURN

Figure 319



MENU RETURN

Figure 320



MENU RETURN

OPERATION

User Interface - All Models

The TM Menu (Timer) continued

Auto mode selected. See Figure 321.

Set the cool set-point for your first timer period using the arrow buttons. The cooling mode timer only sets the cool set-point. See Figure 322.

Next, set the heat set-point for your first timer period. The heating mode timer only sets the heat set-point. See Figure 323.

Note: The auto mode timer sets both the cool and heat set-point.

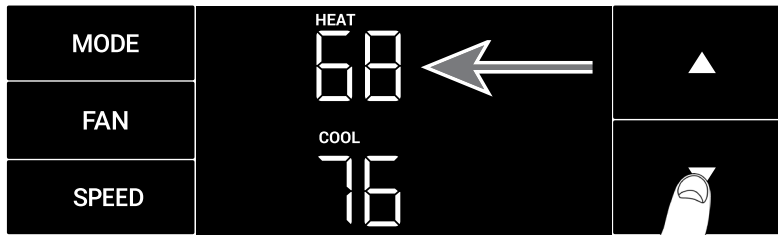
Set the time to start the first timer period. See Figure 324.

Figure 321



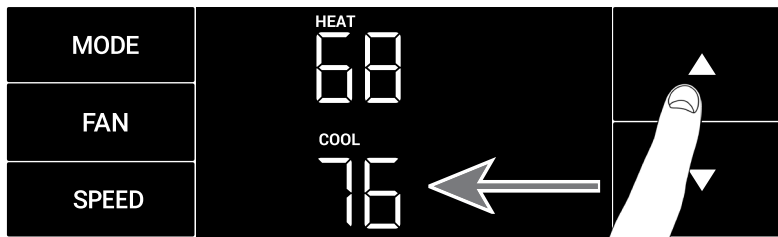
MENU RETURN

Figure 322



MENU RETURN

Figure 323



MENU RETURN

Figure 324



MENU RETURN

OPERATION

User Interface - All Models

The TM Menu (Timer) continued

Set the cool set-point for the second scheduled timer. See Figure 325.

Set the heat set-point for the second timer.

Set the time to start the second timer period. See Figure 326.

Press the MENU button to complete the time timer setup.
See Figure 327

Figure 325

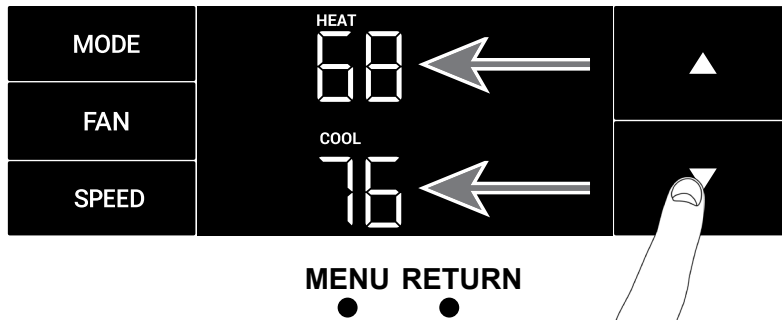
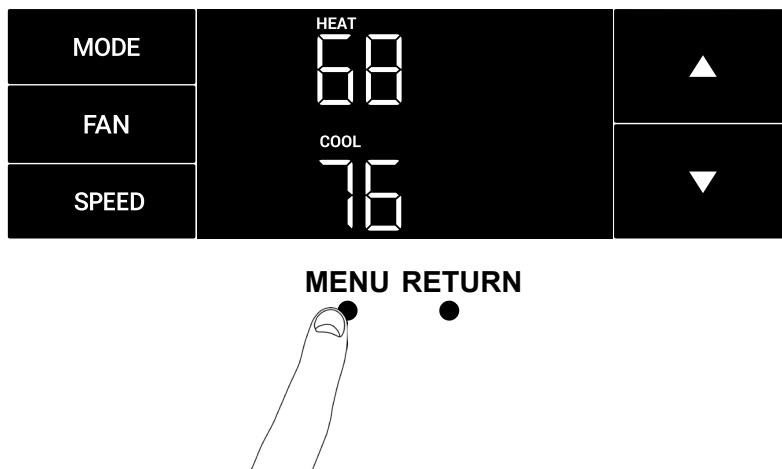


Figure 326



Figure 327



OPERATION

User Interface - All Models

The F-C Menu (Fahrenheit/Celsius)

This menu is used to toggle between Fahrenheit and Celsius. See Figure 328.

Using the arrow buttons on the right side switches it from Fahrenheit to Celsius. See Figures 329 and 330.

Figure 328

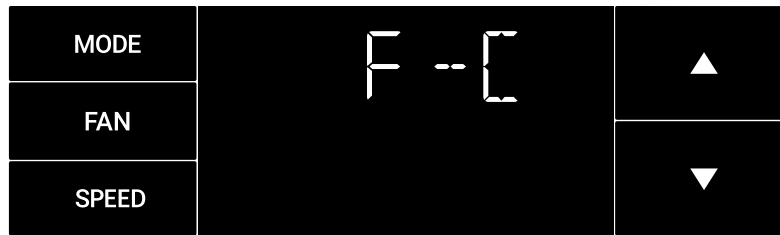


Figure 329

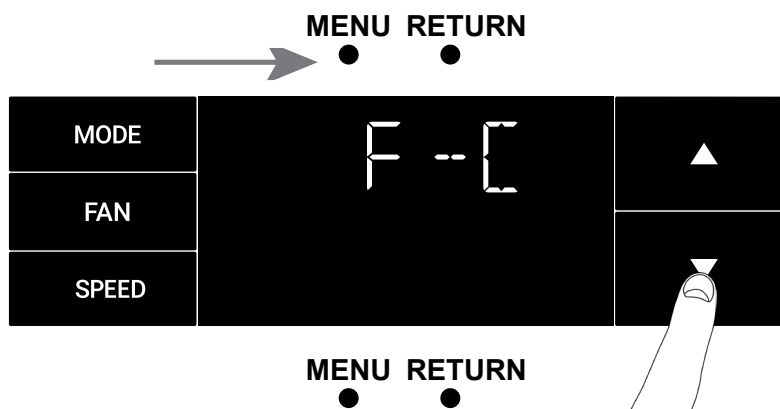
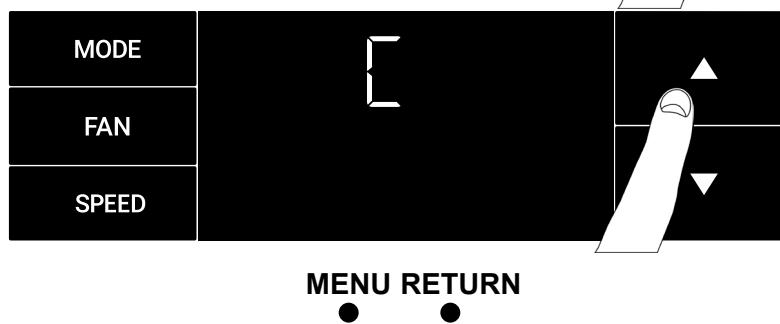


Figure 330



OPERATION

User Interface - All Models The Lock Menu

This menu is used to lock the settings with a four(4) digit passcode.

This is the Lock Menu. See Figure 331.

The menu lock default is off. Use the arrows to toggle between off and on. See Figure 332.

This is LOCK on. See Figure 333.

Set the first digit of the password using the arrow buttons. Use the menu button to proceed to the next digit. See Figure 334.

Repeat the previous step for the remaining three(3) digits.

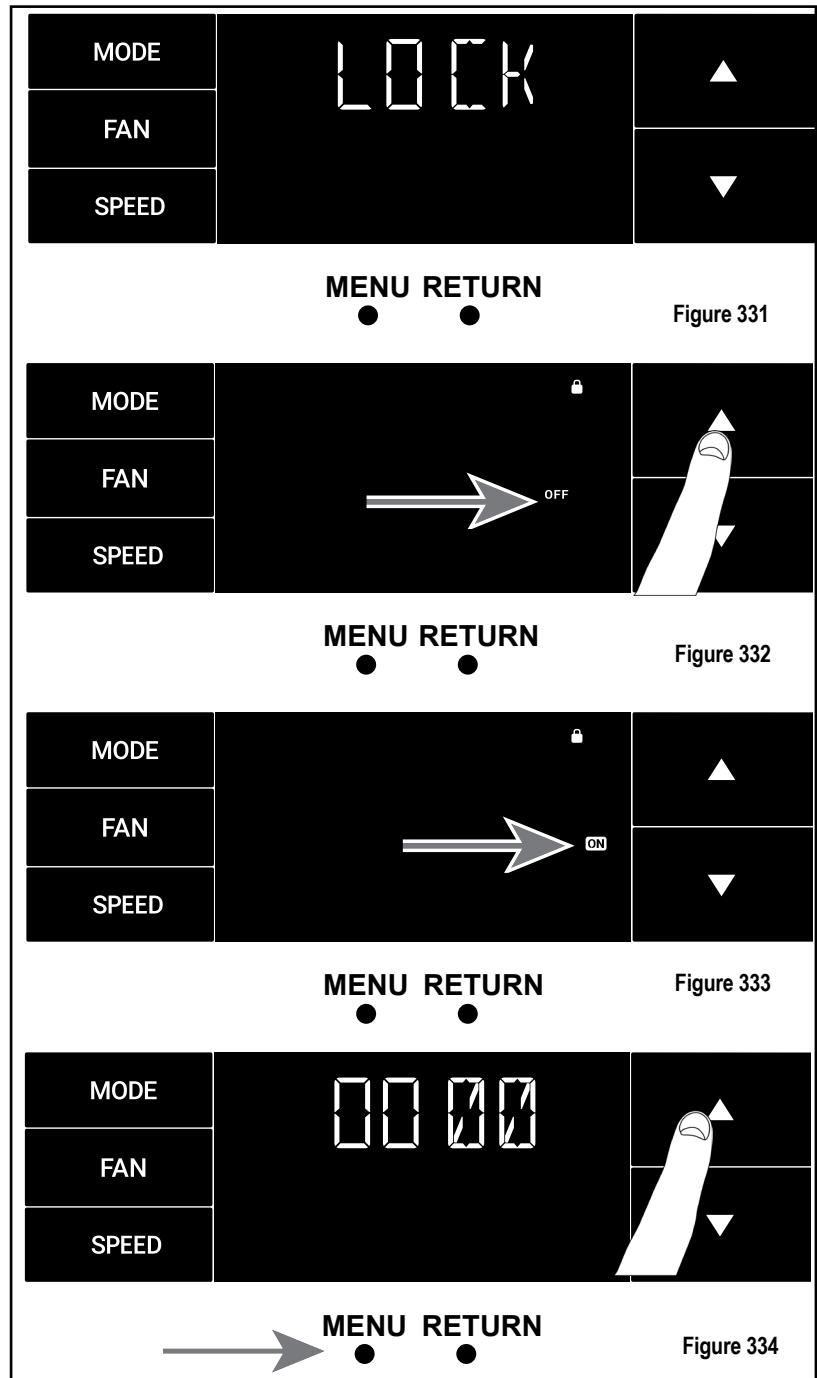
Press the menu button to complete the lock setting process..

NOTICE

Be Sure to write down your passcode if you activate this feature.

Please contact Technical Support if you have lost your lock code.

1-800-541-6645



OPERATION

User Interface - All Models

The Lock Menu continued

The ON on the right side of the display shows the lock function is active. To go back into the menu, select the menu button again. See Figure 335. Enter the password in the same manner it was created. See Figure 336. Entering the correct password will give the user access to all of the sub-menus. See Figure 337. Accessing the lock menu will allow you to toggle lock OFF if needed. See Figure 338.

Figure 335

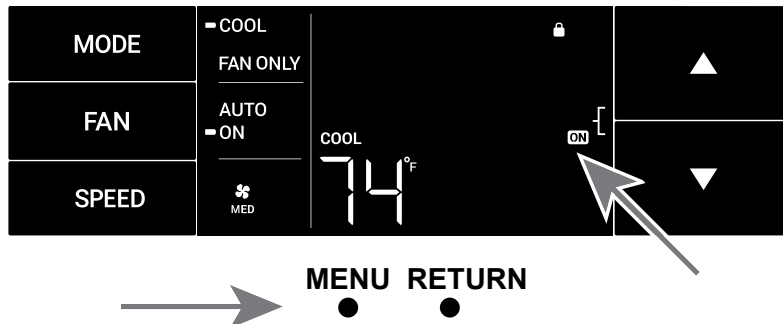


Figure 336



Figure 337



Figure 338



OPERATION

User Interface

The diAG Menu

- This menu is used to access the diagnostic codes. See Figure 339.
- Selecting this sub-menu shows the E that represents “Error.” See Figure 340.
- Toggle through the error codes using the arrow keys. See Figure 341.

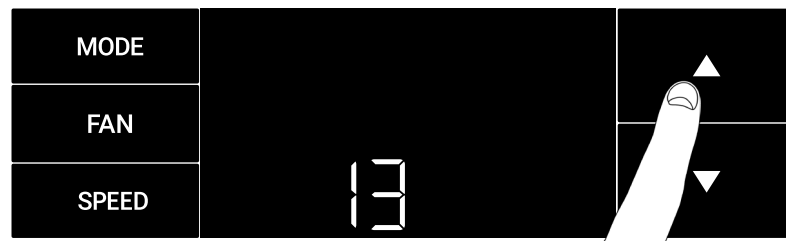
Figure 339



Figure 340



Figure 341



OPERATION

User Interface

The CnCT Menu (WiFi Connection)

This menu is used to turn on Wi-Fi connection.

This is the CnCT menu. Pressing the menu button will activate Wi-Fi. See Figure 342.

To setup WiFi, refer to Wi-Fi setup instructions.

The Wi-Fi symbol in the top right corner of the display shows Wi-Fi connection is on. See Figure 343.

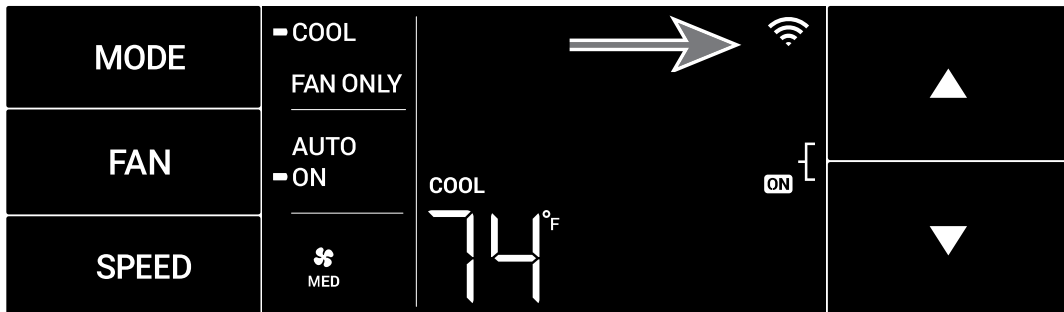
Figure 342



MENU RETURN



Figure 343



MENU RETURN



OPERATION

Control Panel

SYSTEM - The MODE button allows you to sequentially select up to four modes of operation:

- AUTO Available on select models
- COOL
- HEAT Available on select models
- FAN ONLY

AUTO FAN (No Cooling Demand)

When in AUTO mode, the fan only operates when the system has a demand to cool or heat the room.

In the ON fan mode, the fan operates all the time. The system periodically cools or heats the fan's airflow but the flow of air does not stop.

UP and DOWN Arrows - Pressing either an UP or DOWN button changes the system's set-point (desired room temperature). These buttons are also used to make system parameter changes later in this manual.

One press equals 1 degree of change in Fahrenheit mode. One press equals 0.5 degree change in Celsius mode.

TIMER

The timer can be engaged or disengaged from the control panel. This is done by pressing or holding the UP and DOWN arrows simultaneously for three seconds.

OTHER FUNCTIONS

°F – °C Select

To switch from degrees Fahrenheit (F) to Celsius (C), press the MENU button and enter the F-C sub-menu.

FAN SPEED - Depending on your model, the FAN SPEED button allows you to toggle between three or four modes of operation: LOW, MEDIUM, HIGH and MAX.

Alerts

When the filter needs to be cleaned or replaced, the CHECK FILTER icon displays. Refer to Routine Maintenance for filter maintenance requirements.

The alert can be dismissed by pressing the FAN and SPEED buttons for 3 seconds.

Lock Control Panel

To lock/unlock the front panel controls, navigate to the "LOCK" sub-menu found after clicking the MENU button. The lock requires a four digit pass code to lock/unlock the unit. This pass code will be required to enter the menu to unlock the unit. Be sure to write the password down and retain for future use. The LOCK icon illuminates to indicate the locked status.

The LOCK icon disappears to indicate unlocked status.



External Control Status

The Wi-Fi icon illuminates to indicate that the system is receiving a Wi-Fi connection. The Wi-Fi icon also provides information about the signal strength.



Advanced Functions

The functions mentioned in the following section may or may not be available depending on the air conditioner model.

Modify the TIMER Function

Navigate to the TIME menu to set the timer.

OPERATION

Remote Control

Remote Control - Refer to Figure 344 during operation description.

Getting Started - Install two (2) AAA batteries in the battery compartment located on the back of the unit.

Operation - The remote control should be within 25 feet of the air conditioner for operation (refer to Figure 345 for effectiveness). Press the power button to turn the remote on. The remote will automatically power off after 15 seconds if the buttons are not being pressed. The remote must be on to control the unit.

POWER Button - Turns remote and unit on and off.

MODE Button - Allows the user to sequentially select the following: AUTO, COOL, HEAT, and **FAN ONLY** operations. When the button is pressed, the display indicates which mode has been selected via a display message. Note that when the heating function is not available, the system will automatically skip the HEAT mode.

FAN Button - Selects between automatic (AUTO FAN) or CONTINUOUS operation. In the AUTO FAN mode, the fan only turns on and off when the compressor operates or the heat function is enabled.

NOTE: AUTO FAN is not available in the FAN ONLY Mode, the display indicates CONTINUOUS. In the CONTINUOUS mode, fan speed is determined by your selection on the FAN SPEED button.

SPEED Button - Used to sequentially select new fan speed, plus AUTO operation. When the **FAN SPEED** button is pressed, the fan speed icon (triangle) changes to indicate the new speed level. Fan speed automatically varies depending on the set temperature on the control panel and the actual room temperature. For example, if there is a big difference between your set temperature and the actual room temperature, the system fan speed increases to HIGH. It remains at this speed until the room temperature matches the set temperature.

UP and DOWN Arrows - Pressing either the UP or DOWN button changes the desired room temperature. The factory preset lower and upper limits are 60°F (16°C) and 99°F (37°C). These buttons are also used to navigate between function options when using the User Menu or Maintenance Mode.

NOTE: Some units may have been provided with an alternate remote control, which contains an LCD. Basic functions are the same.

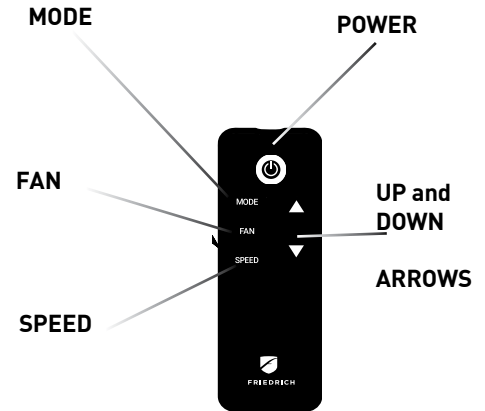


Figure 344 (Remote Control)

Remote Effectiveness

Handheld Remote - Has an operating range of up to 25 ft. The infrared remote control signal must have a clear path to transmit the command to the air conditioning unit. The remote signal has some ability to “bounce” off of walls and furniture similar to a television remote control. The diagram below shows the typical operating range of the control in a standard room with 8 ft high ceilings.

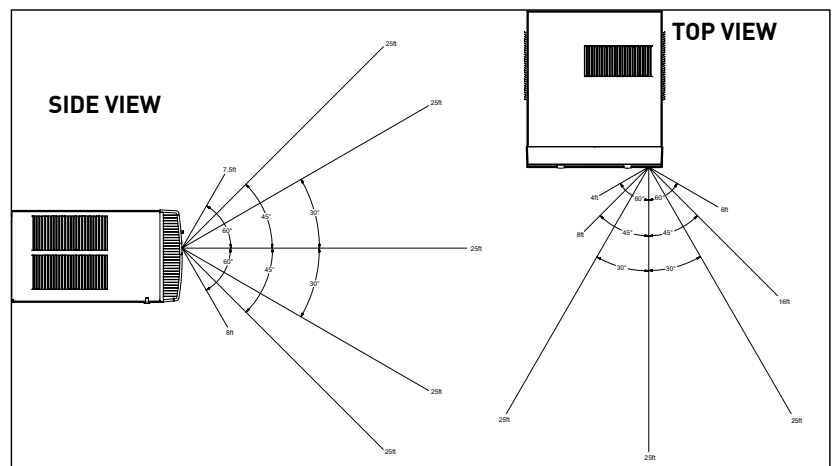


Figure 345 (Remote Control Effectiveness)

OPERATION

Unit Cooling

Your air conditioner is designed to cool in warm weather when the outside temperature is above 60°F (15.6°C) and below 115°F (46.1°C), so it won't cool a room if it is already cool outside. If you want to cool a room in the spring or fall, select the FAN ONLY mode and set the Fresh Air/Exhaust air control to Fresh Air. This will bring in a supply of cooler outside air.

Condensation is normal

Air conditioners actually pump the heat and humidity from your room to the outside. Humidity becomes water, and your air conditioner will use most of the water to keep the outside coil cool. If there is excessive humidity, there may be excess water that will drip outside. This is normal operation.

Frosting

This usually occurs because of insufficient airflow across the coils, a dirty filter, cool damp weather, or all these. Set the SYSTEM mode to FAN ONLY and the frost will disappear. Setting the thermostat a little warmer will probably prevent the frosting from recurring.

Noises

Friedrich units are designed to operate as quietly as possible. An air conditioner mounted in a wall is quieter than one mounted in a window. It is important to ensure that the chassis seal gasket is properly installed (refer to SPECIFICATIONS FIGURE 205).

Compressor and Reversing Valve Control

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

Figure 346 (Compressor Operation)

Reversing Valve

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

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

OPERATION

Unit Cooling Mode

Once the indoor ambient temperature rises past the cool demand threshold (Cool Set Point + 1.5 °F) (see figure below), and the compressor is not locked out, the cooling cycle begins. As shown in the figure below, the fan is started 5 seconds prior to the compressor. Once the indoor ambient temperature has been lowered to the cool set point (Cool Set Point minus .25 °F), the cooling cycle starts to terminate by shutting off the compressor. After a 30 seconds delay, the fan is shut off. (See figure below for graphic details)

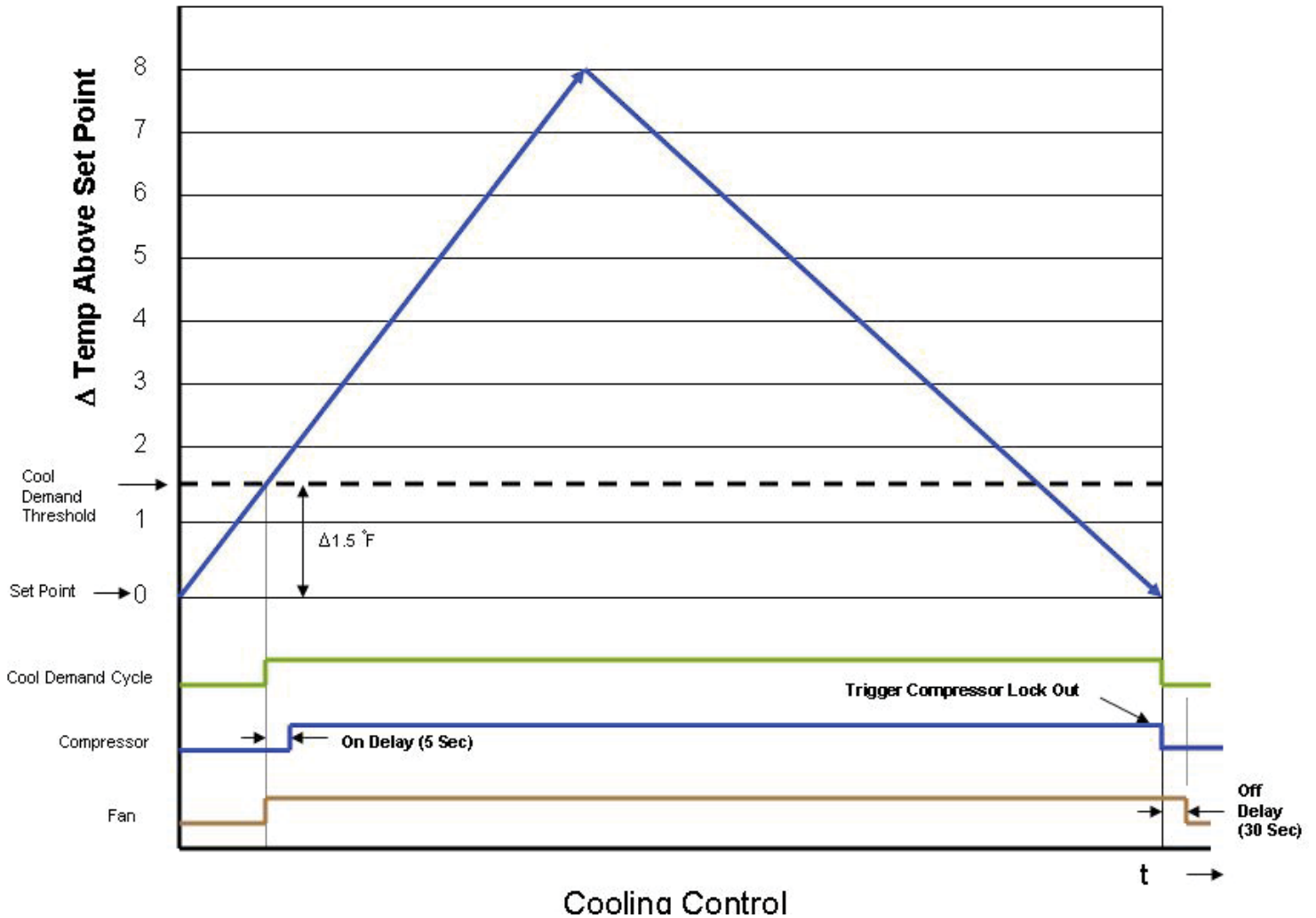


Figure 347 (Cooling Control)

Unit Heating Mode Control Operation

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

There are 2 types of units that provide heating:

Heat Pump with Electric Heat (KHVS10B11A , KHVS12B33A, KHVM24B34A, KHV128B35A , KHVQ10B11A WHVT12B33A, WHVT14B33A)

Cool with Electric Heat

OPERATION

Unit Heat Control Operation - HeatPump With Electric Heat

If the ambient indoor temperature is below the heat demand threshold (1.5°F below the heat set point temperature), and the compressor is not locked out, turn on compressor. If the ambient indoor temperature is .25°F above the heat set point turn off the compressor..

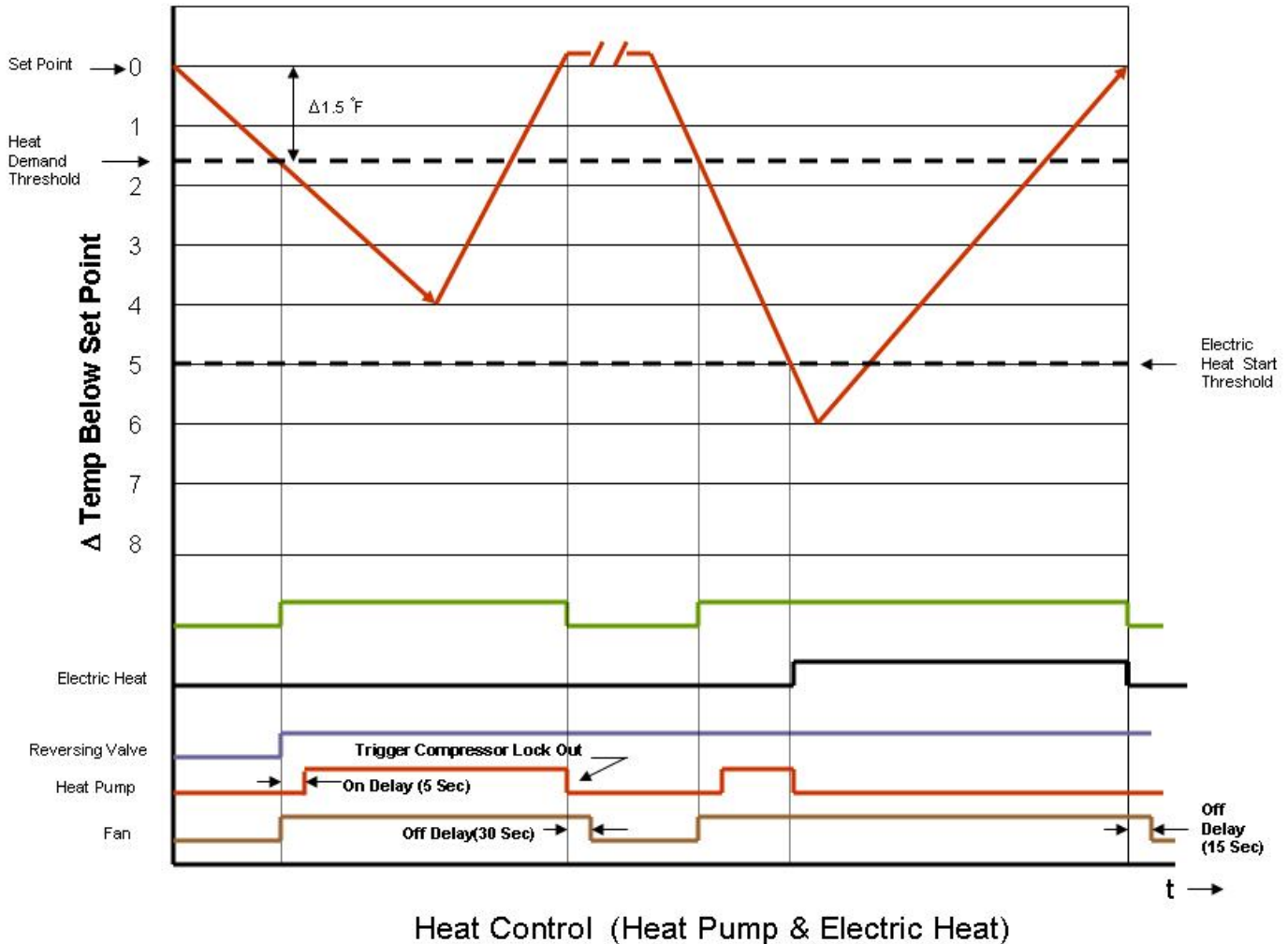


Figure 348 (Heat Control (Heat Pump & Electric Heat))

If the compressor is locked out & electric heat is available:

1. Turn on the electric heat until the compressor is not locked out.
2. After lockout, turn off the electric heat, wait 5 seconds, then turn on the compressor.

If Electric Heat is Available: After the Heat button is initially pressed, the unit will run the electric heater first until the initial set point is satisfied (**Hot Start Feature**). After the initial start, the unit will switch to Heat Pump heat and decide between Heat Pump heat and Electric heat based on the following two monitored conditions:

Condition 1

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

If Electric Heat is not available (out of order) and the outdoor coil temperature sensor drops to 30 °F or less for 2 consecutive minutes, then the compressor and fan will turn off. Thereafter, the unit will switch back to Heat Pump heat if the outdoor coil temperature rises to 45 °F or greater.

Condition 2

If the delta (set point temperature minus the ambient indoor temperature) is greater than 5 °F, then the unit will switch to electric heat, if available. The unit will continue to operate with electric heat until the heat demand is satisfied. Note that the electric heat switches on after the delta temp passes 5°F and the heat pump switches off. Also note that the electric heat will run until the heat demand is satisfied. When another heat demand cycle is initiated, the heat pump will run unless the delta temp is greater than the electric heat threshold.

OPERATION

Unit Heat Control Operation - Heat Pump With Electric Heat (Continued)

Automatic Emergency Heat

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

1) If the indoor coil thermistor senses a 5 degree temperature drop as compared to the ambient temperature thermistor and this lasts up to 5 minutes, the control board will switch the unit to electric heat and continue heating with it.

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

Heat Control Operation - Electric Heat Only

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

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

System Mode Auto

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

Notes:

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

Automatic Change Over Delay (Cool with Heat Units)

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

Compressor Lock Out Time

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

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

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

Cooling Fan Delay

Fan cycle/Auto mode only

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

OPERATION

Heating Fan Delay

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

Fan Speed Change Delay

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

System Mode Fan Only

The fan is turned on and runs at the specified manually set speed.

Only the Fan is turned on. Cool or Heat operation are off.

(This is different than FAN MODE ON where the fan is on with the cool or heat operation).

Fan Only Rules

1. If the SYSTEM FAN ONLY MODE is selected, the Auto fan mode is disabled, and the fan mode is forced to continuous. In addition, the auto fan speed is disabled. If the user presses the fan speed key, the menu will skip over the auto selection. The set point temperature display is off.
2. Any fan speed may be manually selected during Fan Only Mode.

Fan Operation (Front Panel Mode)

Heat – Cool – Auto – Fan Only

Cooling only models (Model numbers with the prefix KCS or KCM) have 4 speeds. All other Models have 3 speeds.

Fan ICON Detail

The system may have a 3 or 4 speed fan. The Fan Speed ICON will Display as LOW, MED, HI, or MAX depending on which speed is selected .

OPERATION

Refrigeration schematic - Cooling

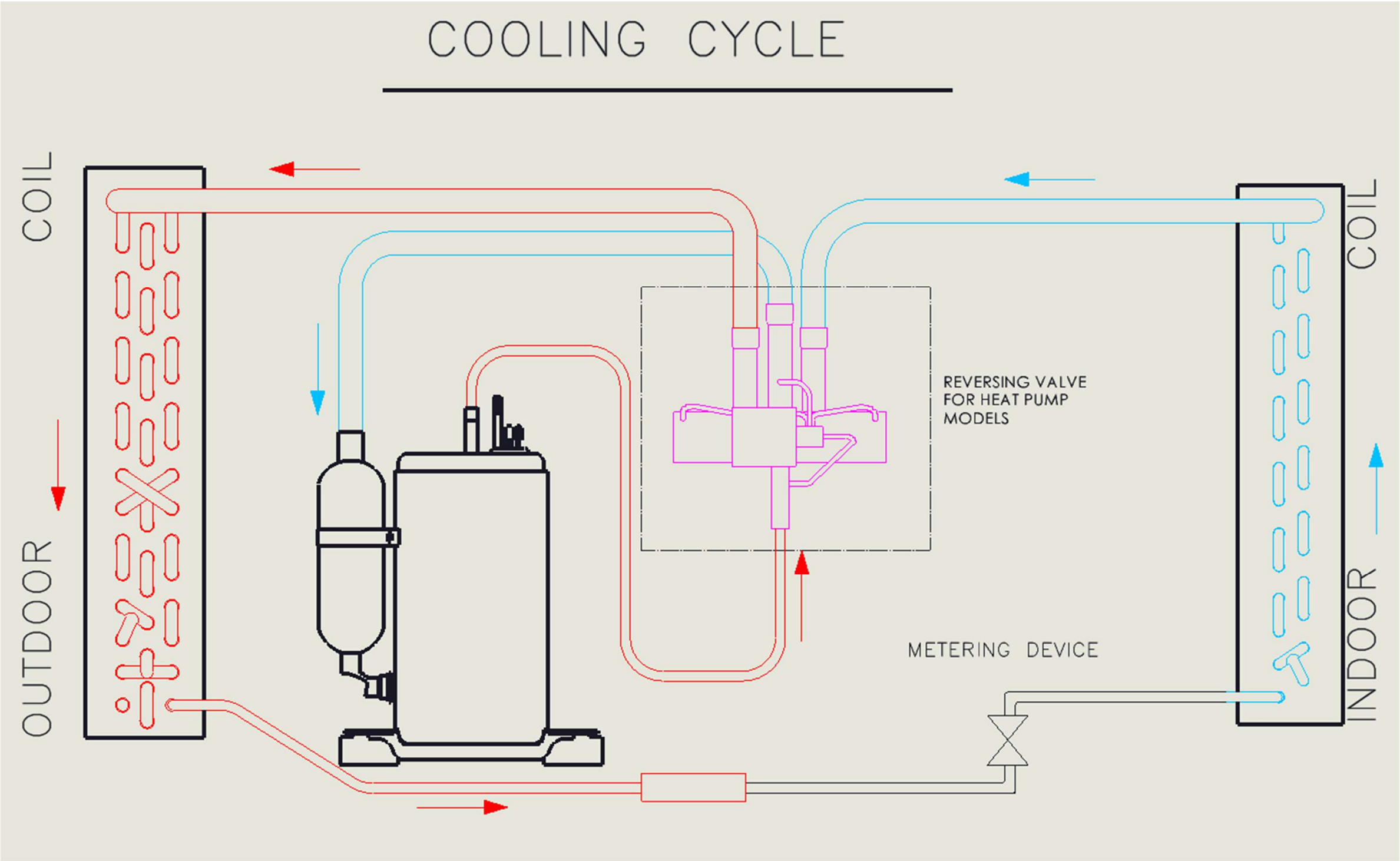


Figure 349 (Refrigeration Schematic - Heating)

OPERATION

Refrigeration schematic - Heating

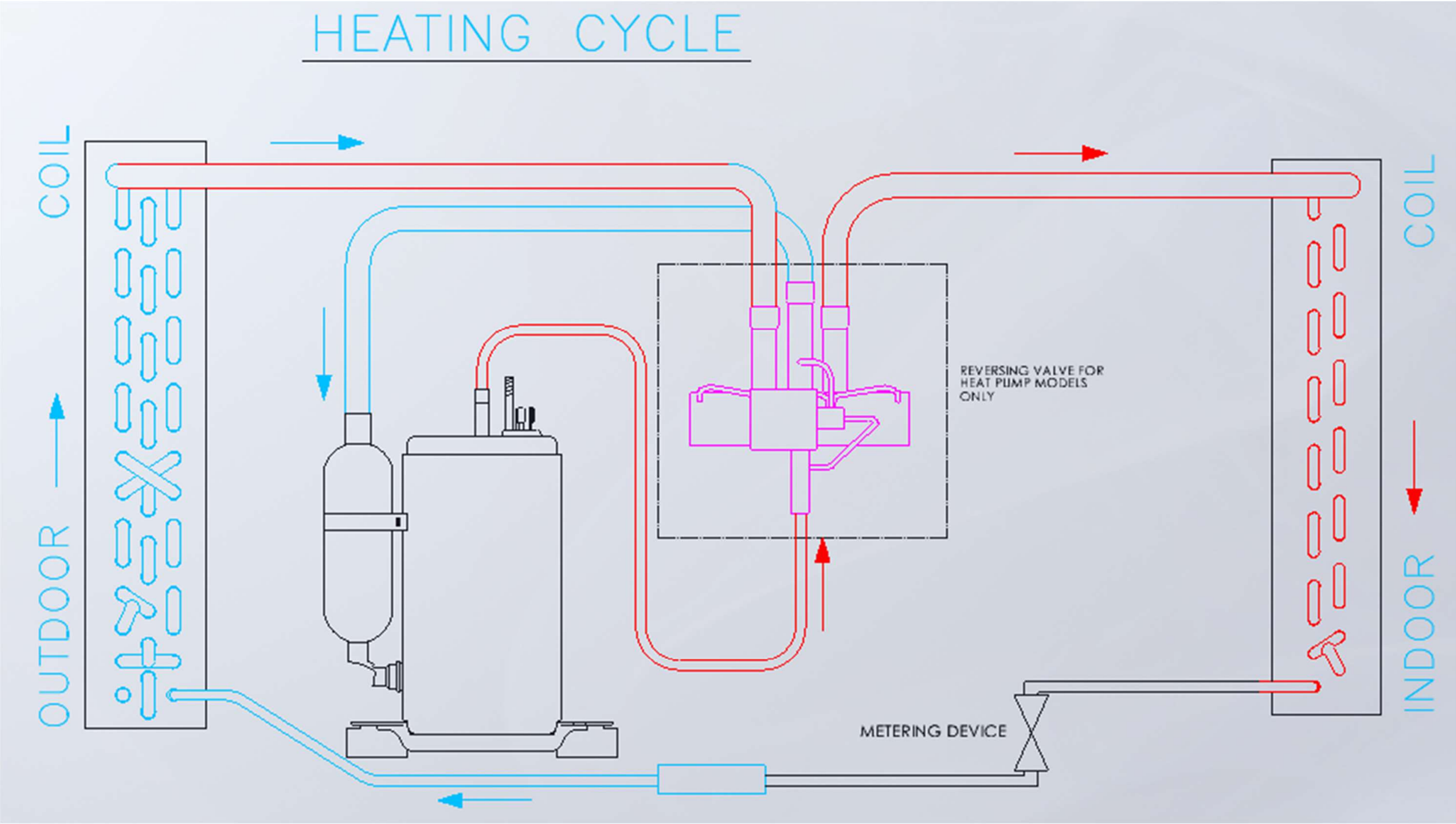


Figure 350 (Refrigeration Schematic - Heating))

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 (laws) in its operation they 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. Starting the compressor creates a low pressure in the suction line which draws refrigerant gas (vapor) into the compressor. The compressor then "compresses" this refrigerant vapor, raising its pressure and its (heat intensity) temperature.

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

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

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

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

The liquid refrigerant next enters the metering device. The metering device is a fixed orifice. 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 fixed orifice this is accomplished (by design) through size of the orifice, 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.

ROUTINE MAINTENANCE

Remove and Install Front Cover -Kuhl

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

Remove the decorative front cover.

1. Using a 1/4" nut driver loosen the four (4) captive screws as shown in figure 401

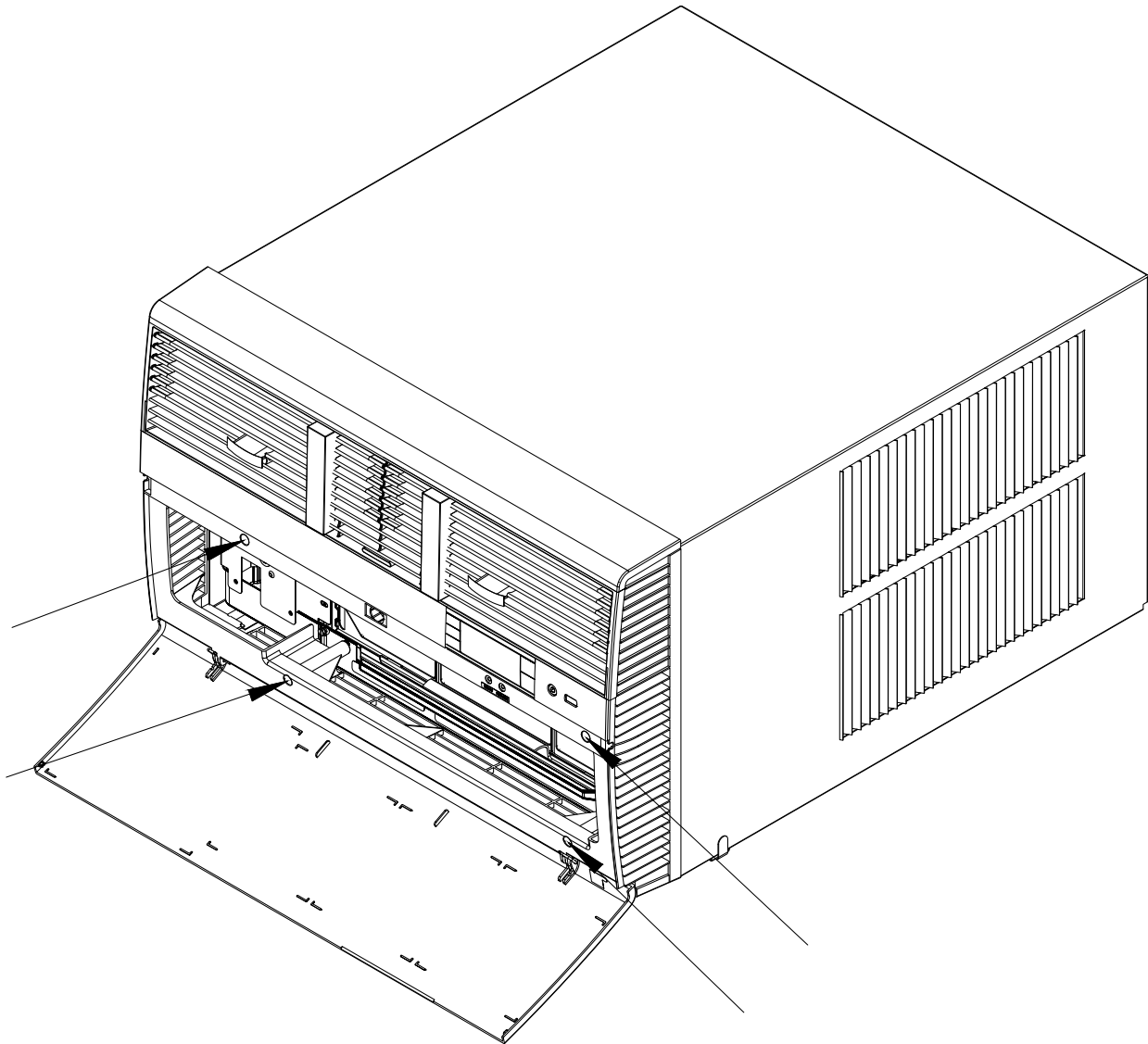


Figure 401 (Remove and Install the Front Cover)

Install the decorative front cover.

OPTIONAL: The factory assembles the supply cord so that it exits the left side of the unit at the bottom. At the consumer's discretion, pull the supply cord taut through the loops (refer to Cord Routing Change, Section C.6) and route the cord down.

STEP 14. To attach and prevent damage to the front grille, align the cord notch over the cord and center the fresh air lever, then align and tighten the four (4) captive screws as indicated by the arrows in Figure 401 before closing the front panel, be sure the filter is in place. Make sure curtains do not block the side air intakes.

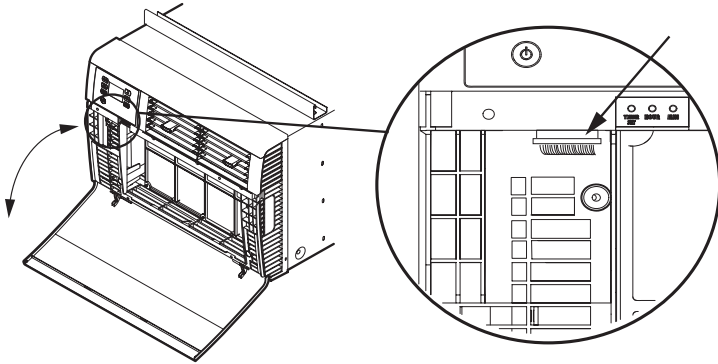
ROUTINE MAINTENANCE

Remove and Install Front Cover -Kuhl Q

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

Remove the decorative front cover.

1. Remove EntryGard™ screws if installed.
2. Open the decorative front cover door.
3. Locate and disconnect electronic control power cable harness.
4. Using a 1/4" nut driver, remove 4 screws attaching decorative front cover.
Save to reinstall later.
5. Remove decorative front cover. Store in a safe place to reinstall later.



Install the decorative front cover.

1. Reinstall the 4 screws attaching decorative front cover.
2. Locate and reconnect electronic control power cable harness
3. Close the decorative front cover door.
4. Reinstall the EntryGard™ screws if installed.

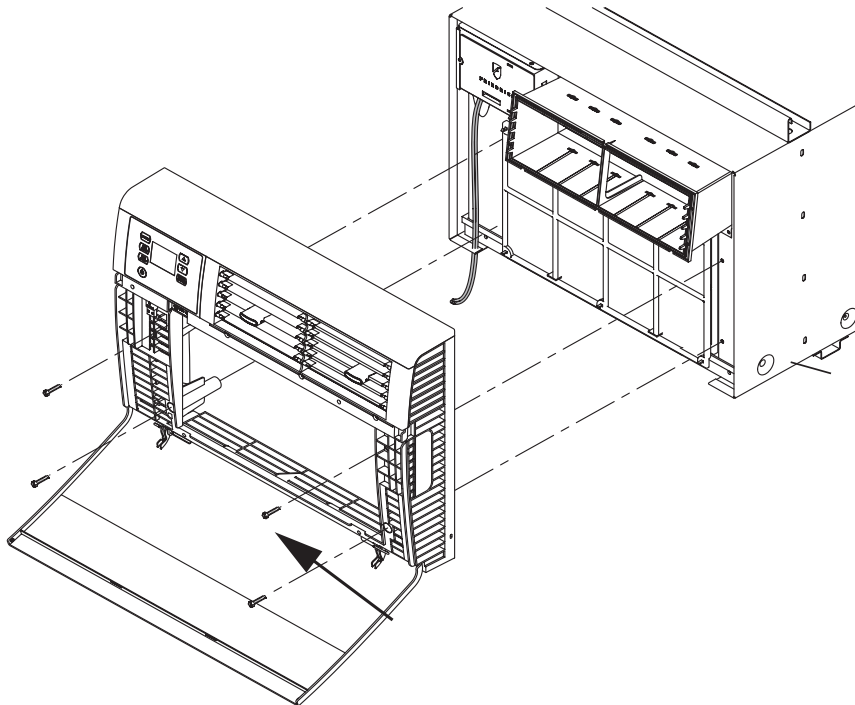


Figure 402 (Remove and Install the Front Cover)

ROUTINE MAINTENANCE

Remove and Install Front Cover -Wallmaster



Remove the decorative front cover.

1. Remove the FRONT PANEL. Using the handles, pull panel out until it is released from the two retaining snaps. Place the cover aside carefully.
2. Remove the filter by pulling it from the handles releasing it from the slots on the frame. Wash the filter with water to remove all dust and then rinse, remove water excess and let it dry. Do not twist. Remove the intake grill by applying slight outward pressure on the chassis removal handles and popping grill out of slots.
3. Remove the 4 screws and remove the decorative front assembly.

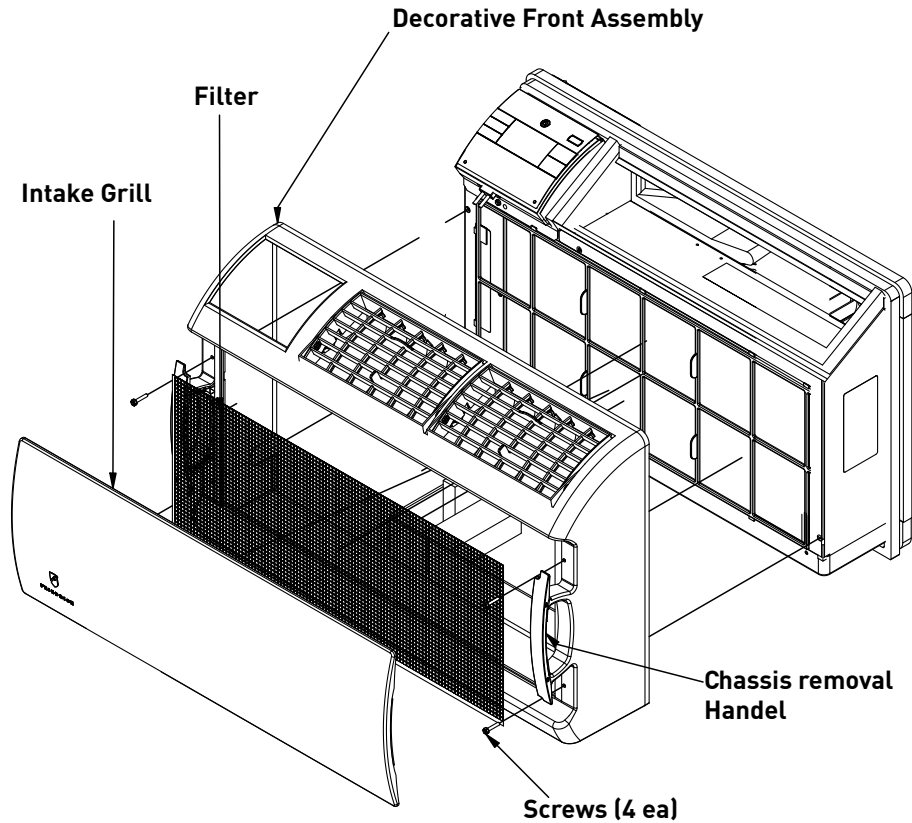


Figure 403 (Remove and Install the Decorative Front Assembly)

Install the decorative front cover.

1. Install the front decorative assembly with 4 screws .
2. Install the filter by inserting each tab in their respective slot.
3. Install Intake grill by applying slight outward pressure on the chassis removal handle.

ROUTINE MAINTENANCE

Cord Routing Change-Kuhl

Unplug unit.

⚠ WARNING	
	Electrical Shock Hazard
	Make sure your electrical receptacle has the same configuration as your air conditioner's plug. If different, consult a Licensed Electrician.
	Do not use plug adapters. Do not use an extension cord. Do not remove ground prong.
Always plug into a grounded 3 prong outlet. Failure to follow these instructions can result in death, fire, or electrical shock.	

For convenience and optimum appearance, the direction that the power cord exits the unit may be changed from left to right by following the procedure below. Select the exit location on the left or right based on proximity to the power outlet.

The 30 Amp power Cord installation is shown in Figure 404. If your unit plug is in this configuration, you do not need to rotate plug in order to change the routing. You can skip to step 5.

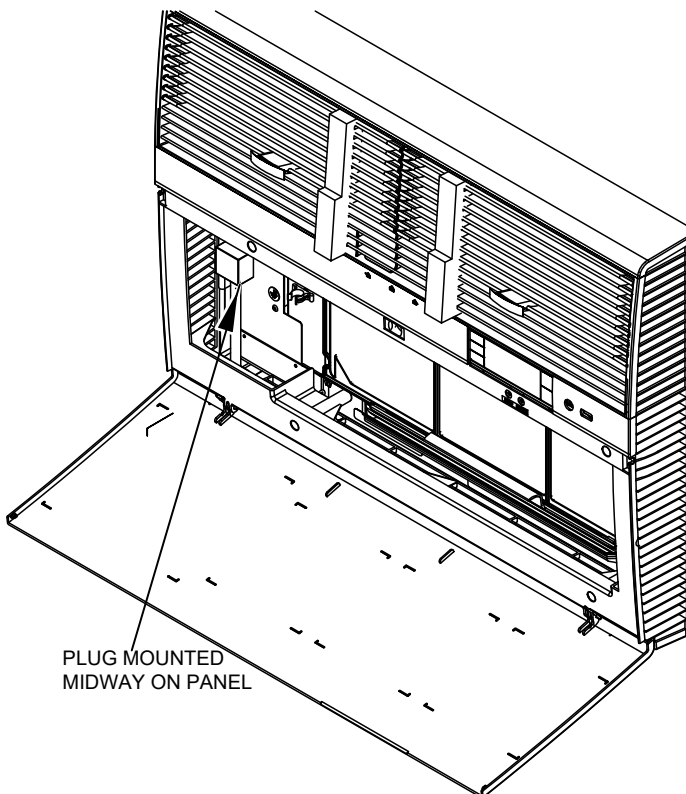


Figure 404

STEP 1 Remove the 3 screws as shown from the access panel. Save to reinstall later.

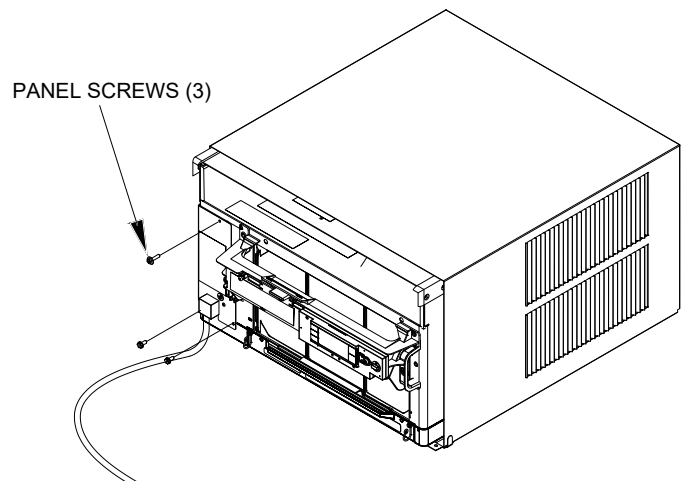


Figure 405

STEP 2. Pull electrical cord strain relief downward until free and rotate 90 degrees to the right.

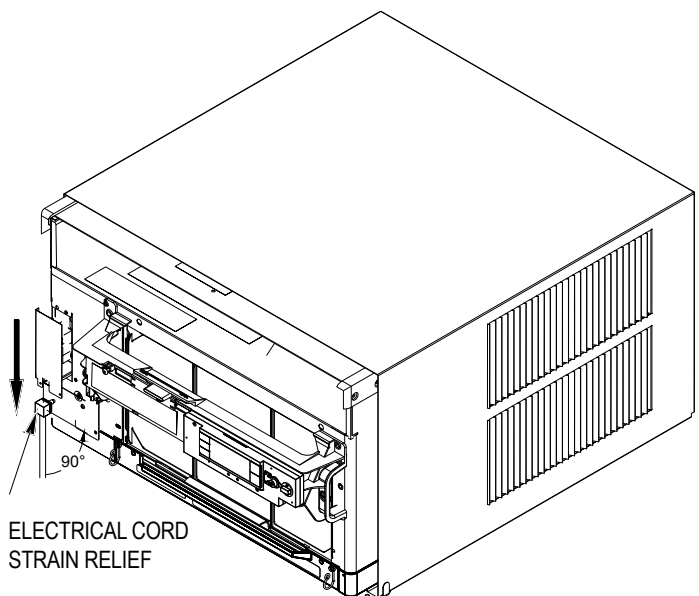
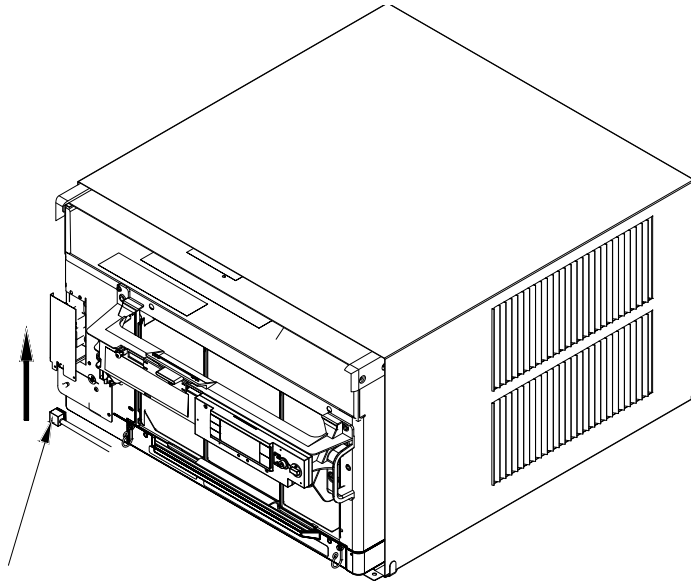


Figure 406

ROUTINE MAINTENANCE

Cord Routing Change-Kuhl

STEP 3. Push electrical cord strain relief back upward into the electrical control panel.



ENSURE THE ELECTRICAL CORD STRAIN RELIEF IS FLUSH WITH THE TOP OF ELECTRICAL CONTROL PANEL.

Figure 407

STEP 4. Reinstall the 3 screws removed earlier to secure electrical control panel.

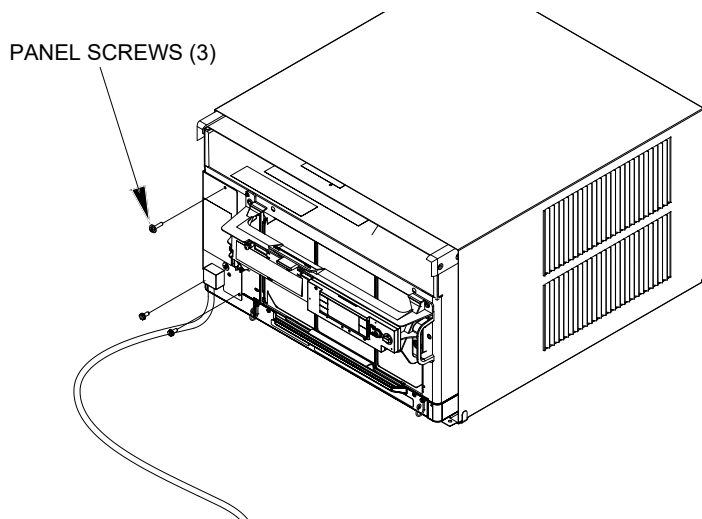


Figure 408

STEP 5. If running power cord to the right of the unit, install the cord into the cord retainer clips along the bottom front of the unit.

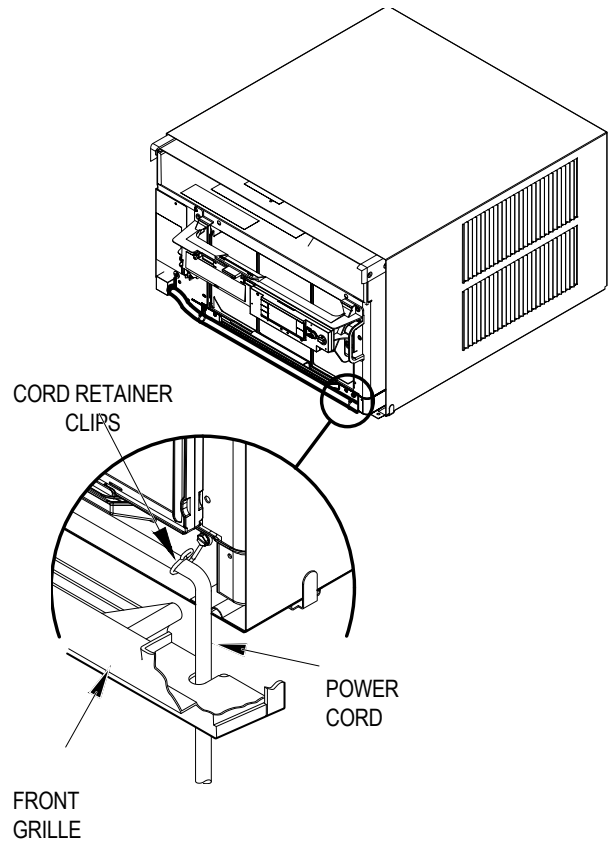


Figure 409

ROUTINE MAINTENANCE

Cord Routing Change-Kühl Q

Unplug unit.

Your Kühl Q unit will come with the power cord already installed and routed to the left side of the unit.

For convenience and optimum appearance the direction of the power cord can be changed from left to right by following the procedure below. Select the exit location on the left or right based on proximity to the power outlet.

STEP 1. Remove the decorative front cover.

- A. Open the decorative front cover.
- B. Locate and disconnect electronic control power cable harness.
- C. Remove 4 screws attaching decorative front cover. Save to reinstall later.
- D. Remove decorative front cover. Store in a safe place to reinstall later.

⚠ WARNING	
	Electrical Shock Hazard
	Make sure your electrical receptacle has the same configuration as your air conditioner's plug. If different, consult a Licensed Electrician.
	Do not use plug adapters. Do not use an extension cord. Do not remove ground prong. Always plug into a grounded 3 prong outlet. Failure to follow these instructions can result in death, fire, or electrical shock.

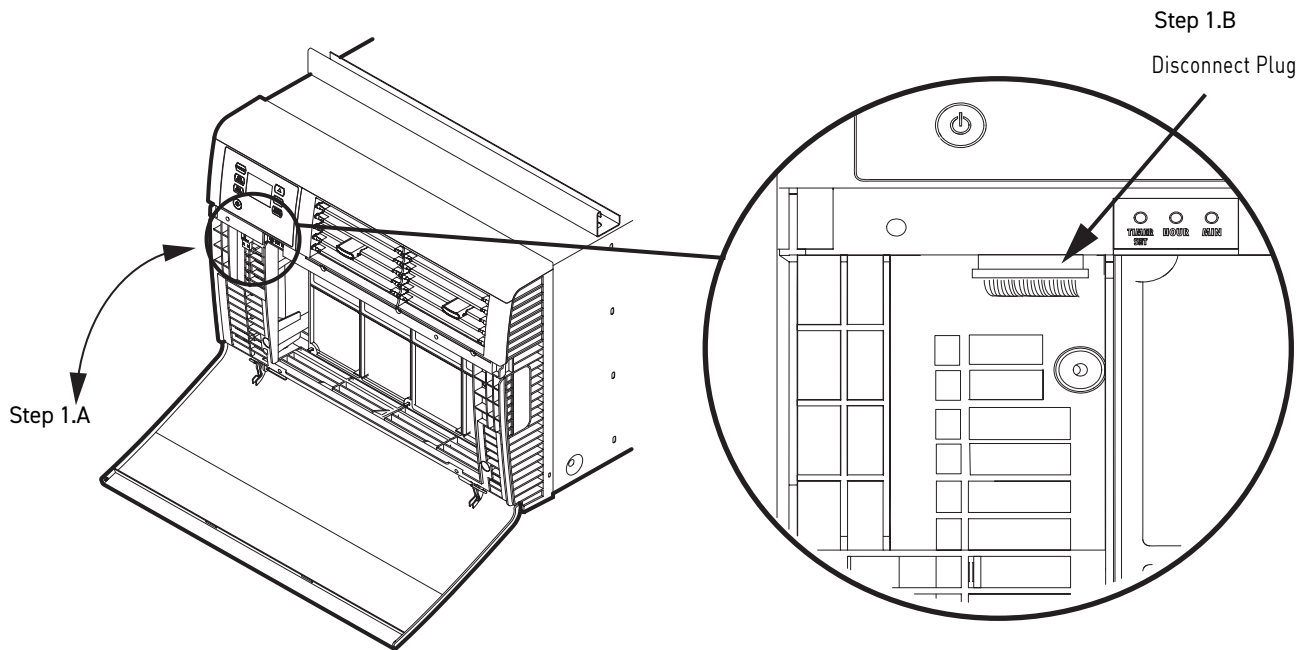


Figure 410

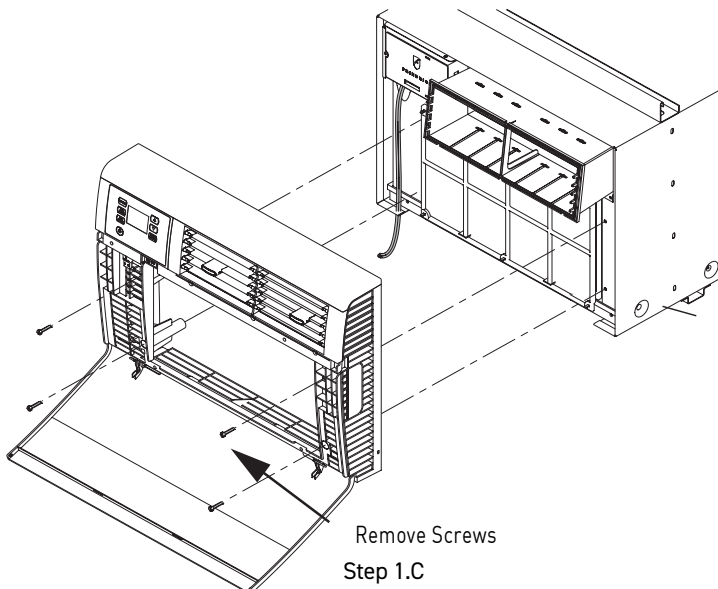


Figure 411

- STEP 2.** Route the cord along bottom inside of the unit (see Figures 412 and 413), under the lower left mounting screw embossments and exit the cord through right side cord opening (see Figure 413) of the decorative front cover. Decorative front cover will keep cord in place.
- STEP 3.** Reinstall the 4 screws removed earlier to secure decorative front cover with cord exiting to the front bottom of the unit (4 screws retained from Step 1).

ROUTINE MAINTENANCE

Cord Routing Change-Kuhl Q

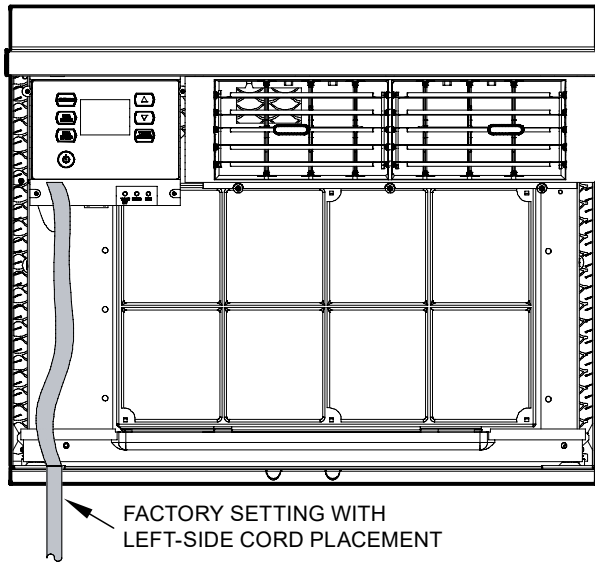


Figure 412

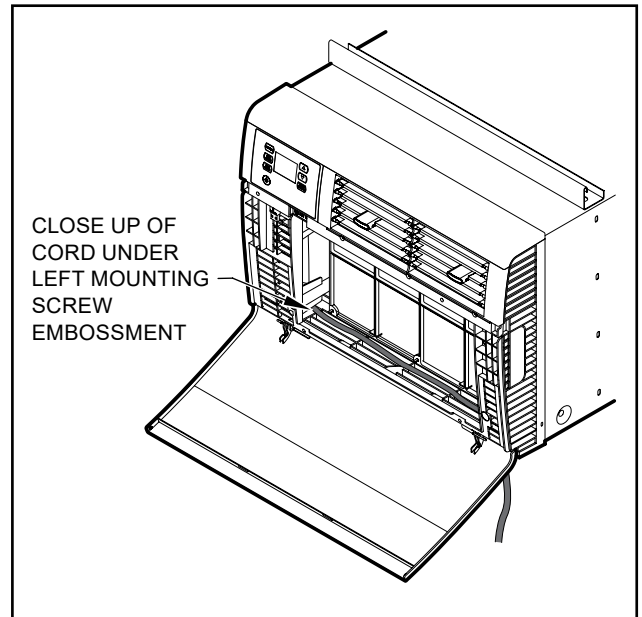


Figure 414

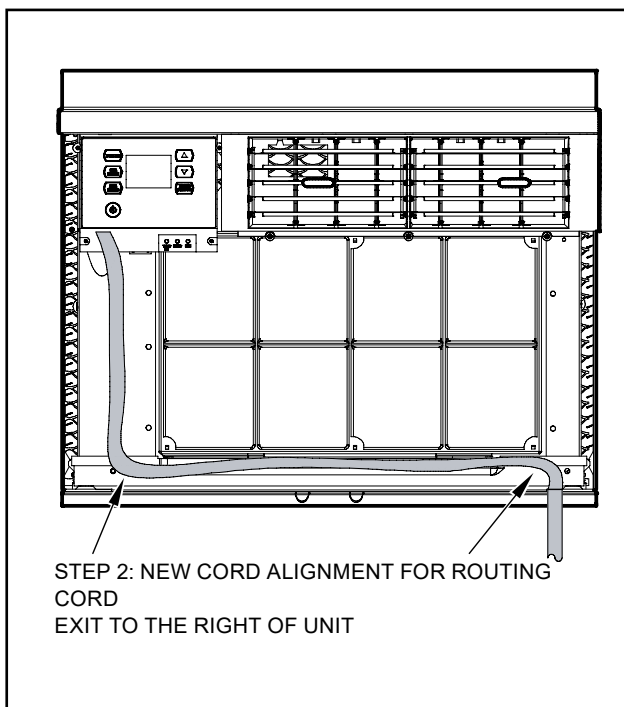


Figure 413

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.

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 periodically and cleaned if needed by vacuuming with a dust attachment or by cleaning in the sink using warm water and a mild dish washing 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.

Blower Wheel / Housing / Condenser 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 de greaser 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.

ROUTINE MAINTENANCE

Standard Filter Removal / Installation Instructions - Kuhl

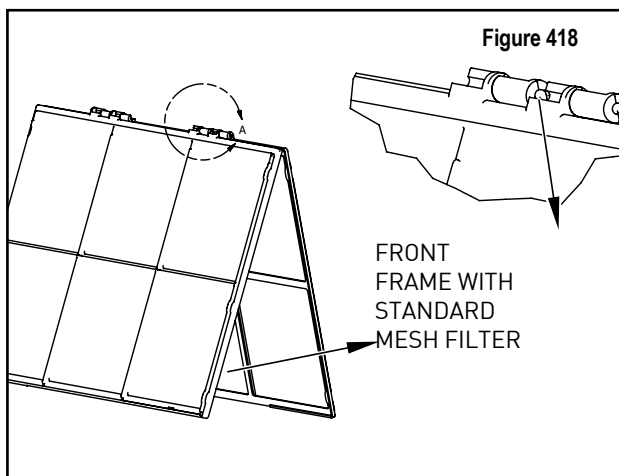
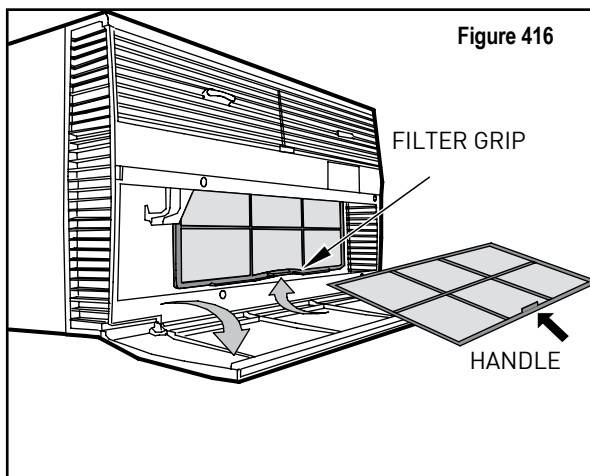
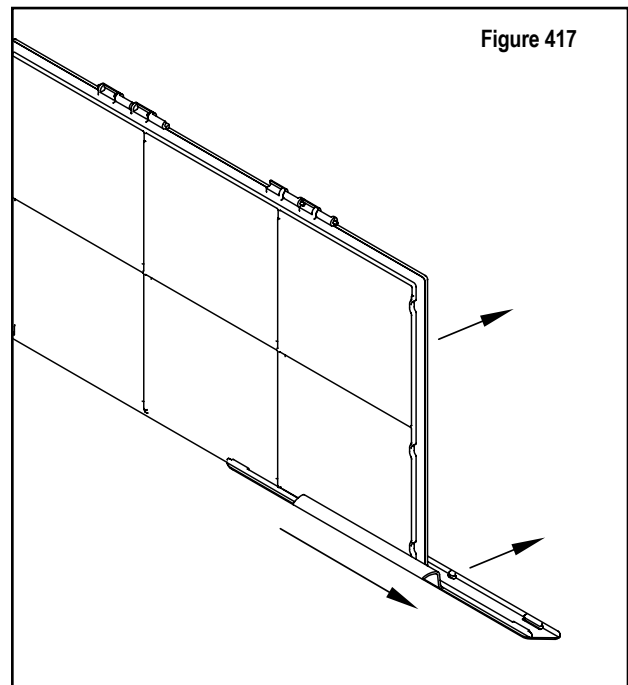
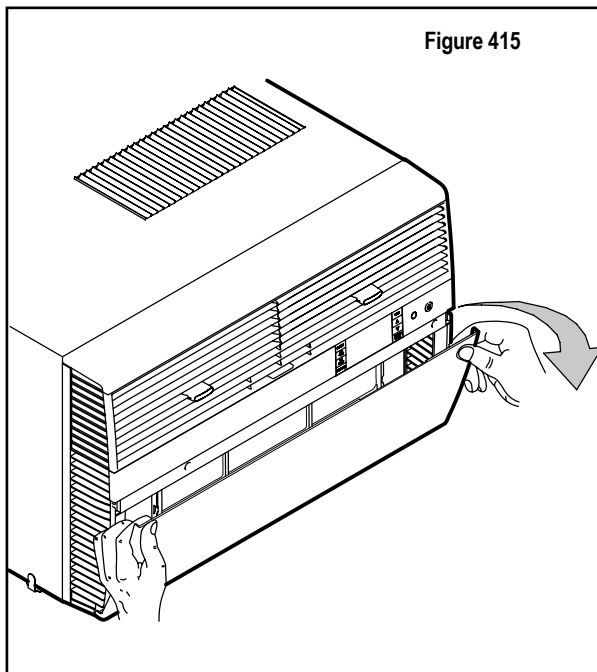
1. Swing the door open, See Figure 404, and remove the filter by grasping the filter grip and pushing the filter holder upward and outward. See Figure 416.
2. Slide the filter grip out from the filter as shown in Figure 417.

NOTE: Make sure the front frame with the mesh filter is facing you.

3. Swing the front frame open. See Figure 418. Clean the front frame by washing the dirt from the filter. Use a mild soap solution if necessary. Allow filter to dry.
4. Install the filter grip back into the filter by sliding it into the filter.

NOTE: The filter handle slides into the frame in only one direction. If the tab in the frame stops the handle from sliding in, slide the handle from the other direction. **DO NOT FORCE THE HANDLE INTO THE FRAME.**

5. Install the filter back into the unit. Follow the instructions on the inside of the front door.



ROUTINE MAINTENANCE

Premium Carbon Filter Removal / Installation Instructions -Kuhl

1. Remove the filter per Standard Filter Removal Installation Refer to Figure 415 and 416.
2. Hold the filter at the top and slide the grip out as shown on Figure 417.
3. If you already have a carbon filter installed remove the dirty filter by laying the filter down and swinging open the front frame as shown in Figure 419.

NOTE: Make sure the frame with the mesh is facing toward you.

4. Place the new carbon filter on the top of the back filter frame. The carbon filter has been cut to the correct dimension and should fit within the frame as shown in Figure 420.

NOTE: The carbon filter is not a reusable filter, and needs to be replaced every three months for optimum efficiency.

5. Slide the filter handle back on to hold the frames together and slide the assembly into the unit as per the instructions on the door.

NOTE: The filter handle slides into the frame in only one direction. If the tab in the frame stops the handle from sliding in, slide the handle from the other direction. DO NOT FORCE THE HANDLE INTO THE FRAME.

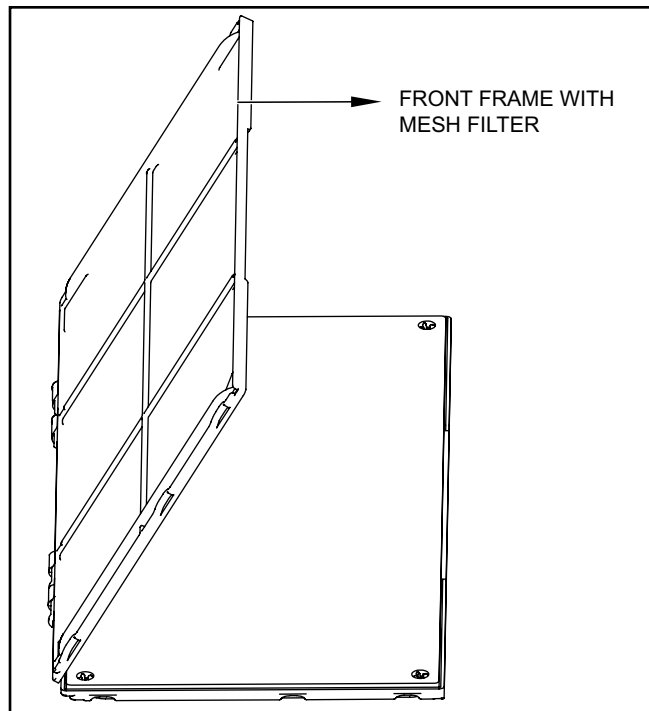


Figure 419

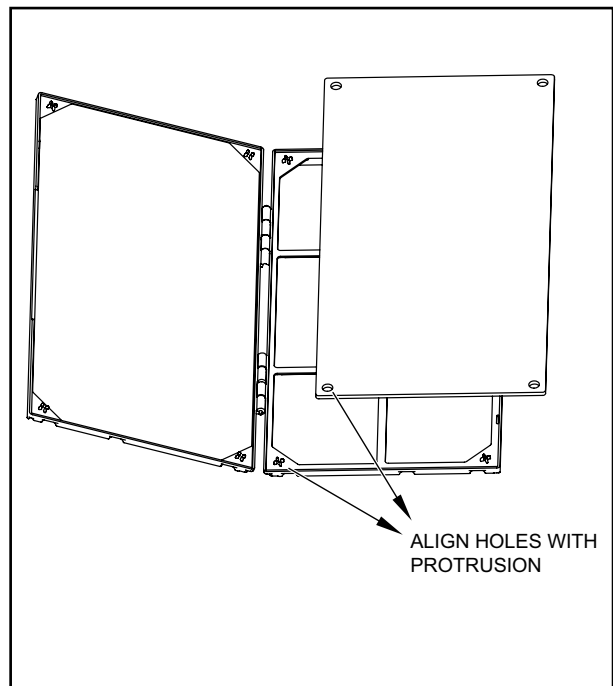
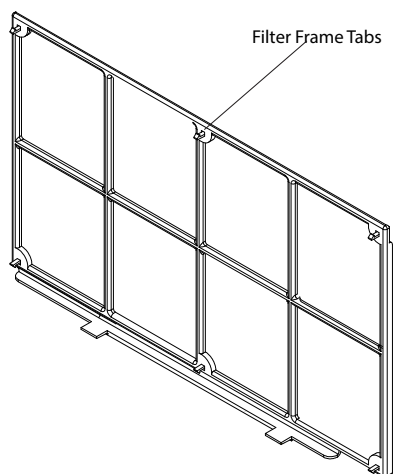
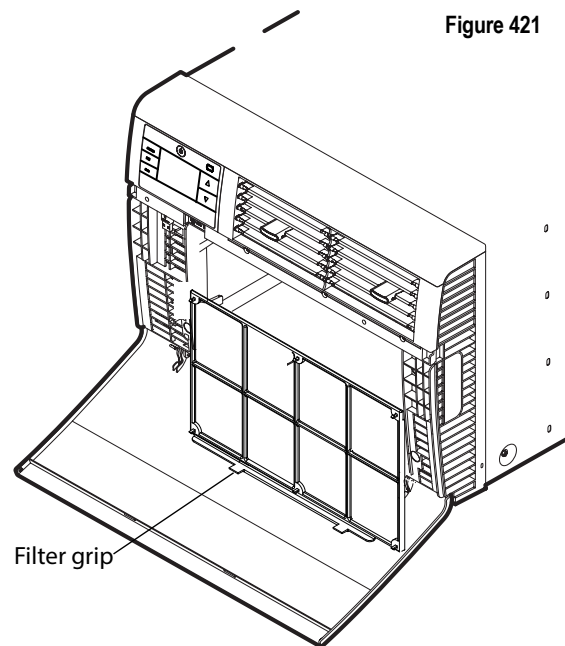
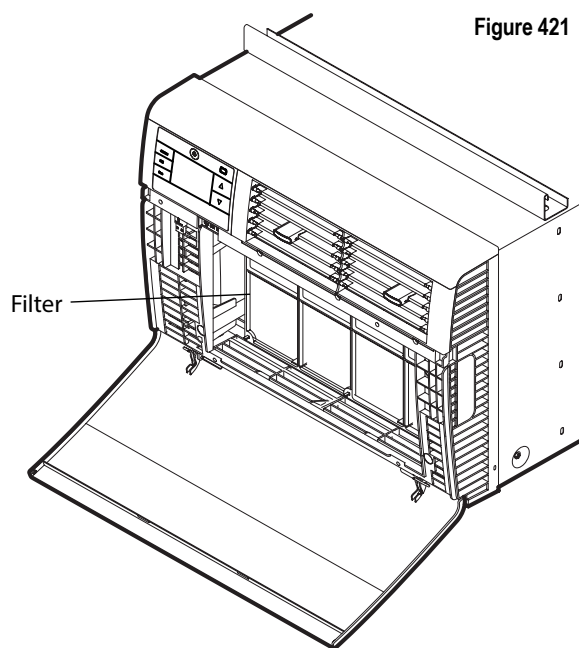


Figure 420

ROUTINE MAINTENANCE

Filter Removal / Installation Instructions - Kuhl Q

1. Swing the door open, See Figure 410, and remove the filter by grasping the filter grips and pulling the bottom towards you. . See Figure 411.
 2. Clean the front frame by removing the carbon filter (if installed) and washing the dirt from the filter. Use a mild soap solution if necessary. Allow filter to dry.
- NOTE:** The carbon filter is not a reusable filter, and needs to be replaced every three months for optimum efficiency.
3. Install new carbon filter (optional) by aligning holes on carbon filter with tabs on mesh filter. (See Figure 422).
 4. Install filter and close door. See Figures 421 and 422.



REMOVE AND INSTALL THE CHASSIS

Remove The Chassis - Kuhl

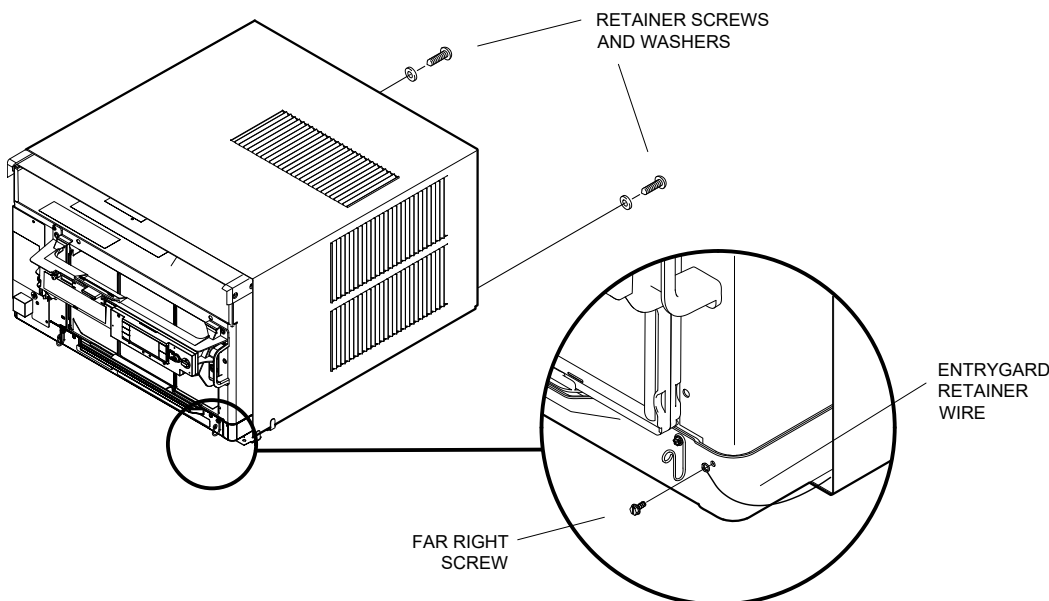
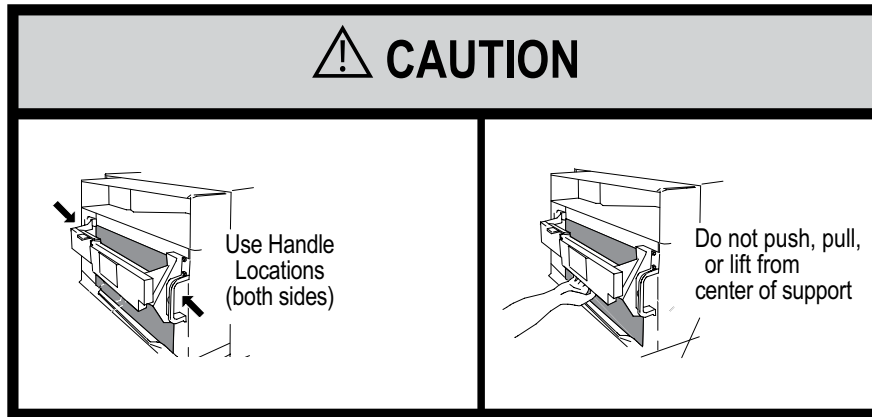


Figure 423 (Chassis Removal and Installation)

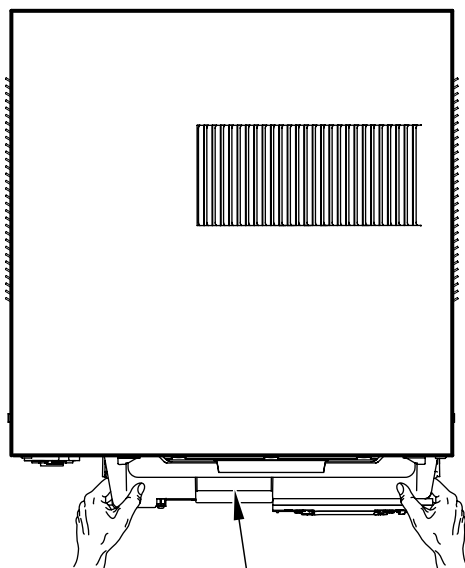
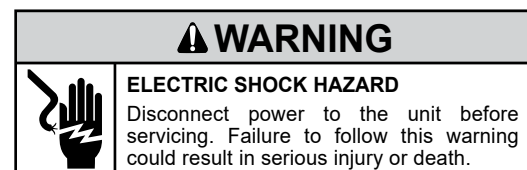


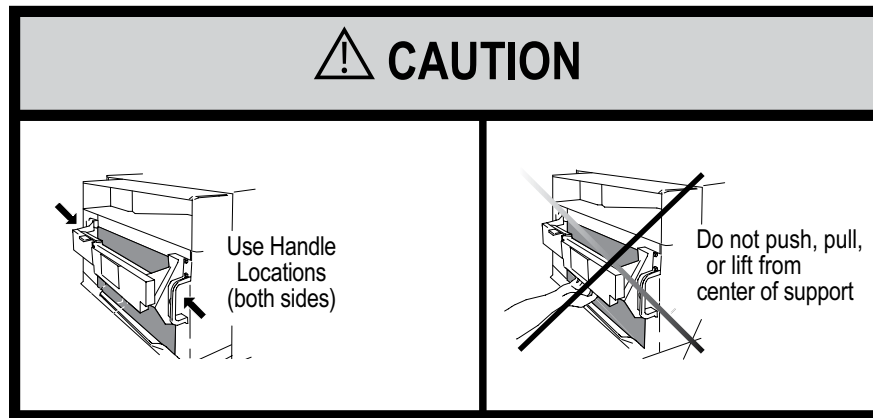
Figure 424 (Support Bracket)



1. [Remove the decorative front cover.](#) See Routine Maintenance Figure 401.
2. Remove the chassis Entrygard Retainer Wire by removing the screw at the front right bottom corner. Save this screw for reattachment after reinstalling the chassis. See Figure 423.
3. Hold the cabinet stationary then use the hand grips on both ends of the control unit support bracket to pull the chassis out of the cabinet. See figure 424.

REMOVE AND INSTALL THE CHASSIS

Install The Chassis -Kuhl



1. Carefully team lift the chassis and set it into the cabinet.
2. Slide the chassis stopping approximately 3" from full insertion.
3. Insert the chassis seal gasket (See Figure 425) one inch deep between the chassis and the cabinet. A paint stir stick or ruler might be helpful here. Begin inserting the gasket at either bottom corner and go up the side, across the top, and down the opposite side. Then push the chassis all the way into the cabinet.

NOTE: If the chassis seal gasket is not installed or installed improperly, the operation of the unit will be negatively affected. Operational noise and outside noise will also be amplified.

4. Slide the chassis in the remaining three (3) inches.
5. Reattach the EntryGard™ chassis and EntryGard™ retainer wire..

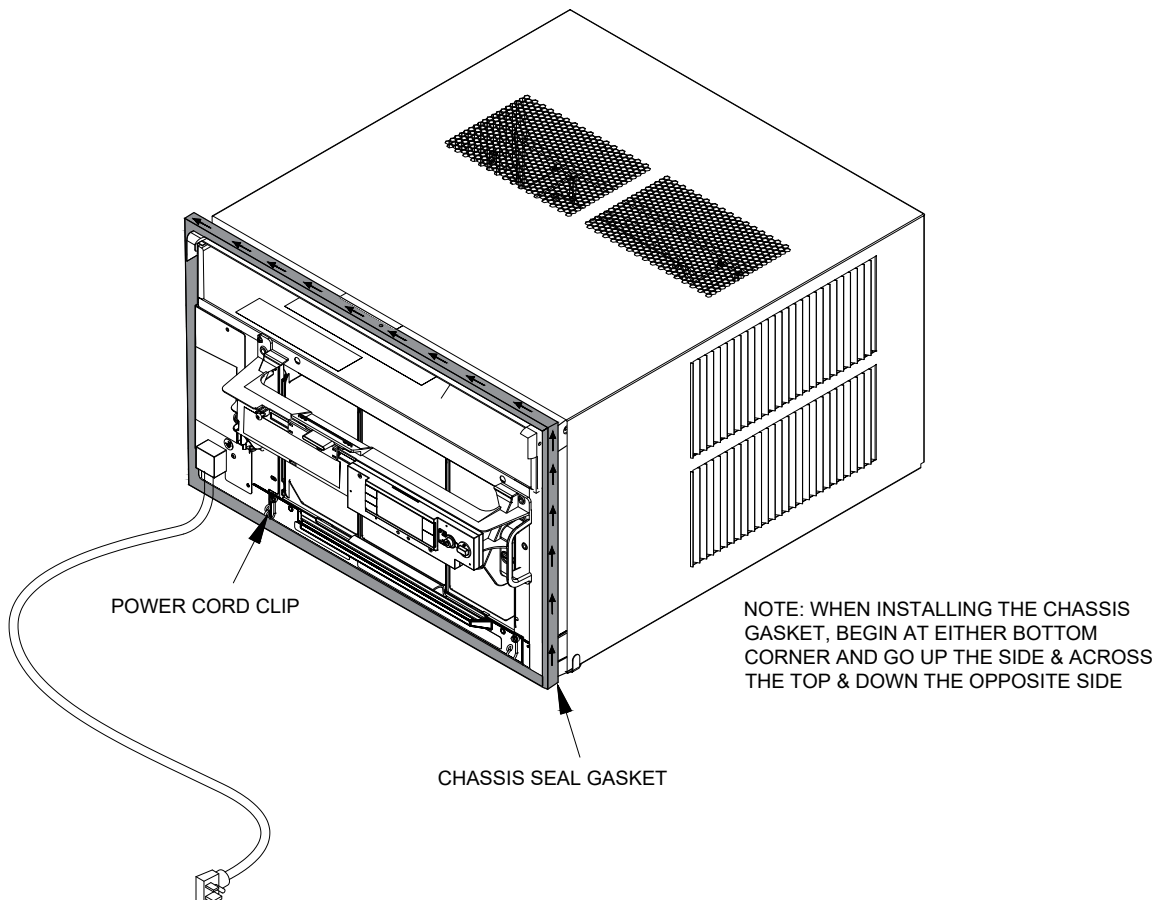


Figure 425 (Chassis Installation)

REMOVE AND INSTALL THE CHASSIS

Kuhl Q

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

Remove the chassis

1. Remove the EntryGard™ Screws. (Refer to Figure 426)
2. Hold the cabinet stationary then carefully slide the unit out of the sleeve. Make sure to fully support the unit. (Refer to Figure 417)

Install the Chassis

1. Carefully team lift the chassis and set it into the cabinet. (Refer to Figure 427)
2. Slide the chassis into the cabinet
4. Reinstall the EntryGard™ screws.. (Refer to Figure 426)

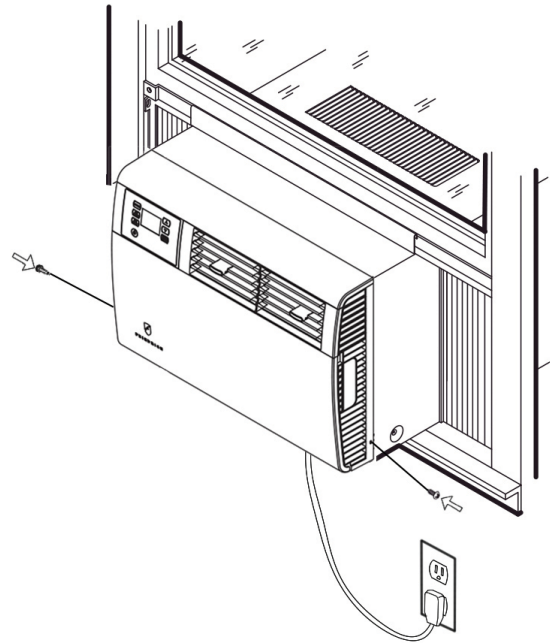


Figure 426 (Remove Entry Gard Screws)

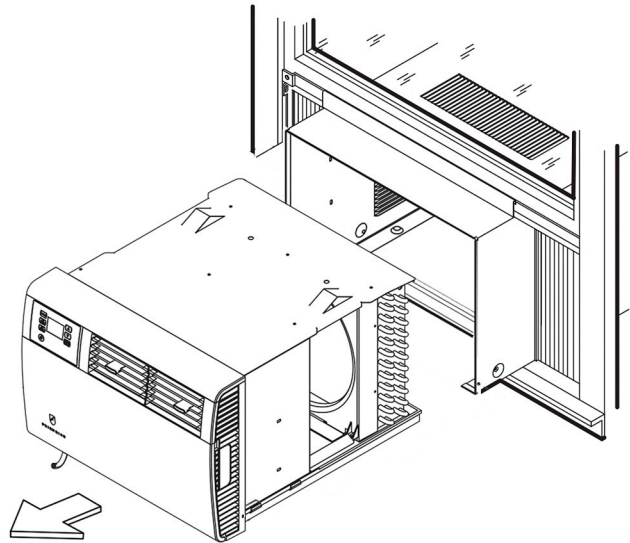
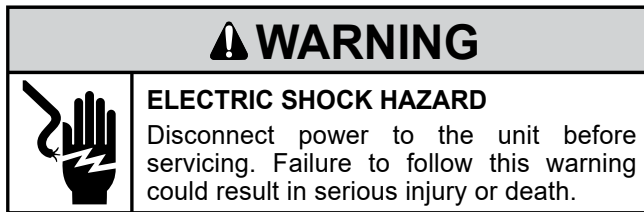


Figure 427 (Remove Chassis)

REMOVE AND INSTALL THE CHASSIS

Wallmaster



Remove Chassis

1. Unplug the unit..
 2. Remove the front grill. See Routine Maintenance Figure 403.
 3. Remove the clamped drain hose from the nipple if installed.
 4. Hold the cabinet stationary then use the hand grips on both ends of the decorative front assembly to pull the chassis out of the cabinet .
- Note:** If Ground wire is screwed into the Sleeve, disconnect before attempting to pull unit all the way out..

Reinstall Chassis

1. Check the sleeve to be certain it has been correctly installed in the wall.
Remove the front panel on the WSE SLEEVE. Remove the rear WEATHER PANEL. Reverse grille. Place lower edge into sleeve tab (Friedrich logo facing out). Align slots with the screw holes. Secure grille with screws.
 - A. Check the anchor screw. There should be four (4) in the WSE SLEEVE (two in each side).
 - B. Determine if the sleeve has a downward slope of 3/8 bubble to the outside..
 - C. Check to be sure the sleeve has been sealed around all edges with an industrial type caulking on both the outside and inside to prevent rain entry.
2. Check the electrical receptacle to see that it conforms to the requirements

for the chassis model to be installed. See figure 207 for the receptacle requirements.

3. Remove the chassis from the shipping carton.
4. Remove the FRONT PANEL. Using the handles, pull panel out until it is released from the two retaining snaps. Place the cover aside carefully.
5. Lift the chassis by the basepan and slide it into the front of the sleeve. (Obtain assistance as needed.)
6. Turn the unit at an angle to allow clearance to secure the grounding wire which has a red tag on it. Drive a grounding screw through the lug on the grounding wire, through the wall sleeve, and into the wall frame.
7. Push the chassis all the way into the sleeve, using the plastic front handles, so that the front panel meets the front edge of the shell.

NOTE: Chassis comes with pre-installed seal gasket.

8. Check that filter is properly installed, and reinstall front panel.

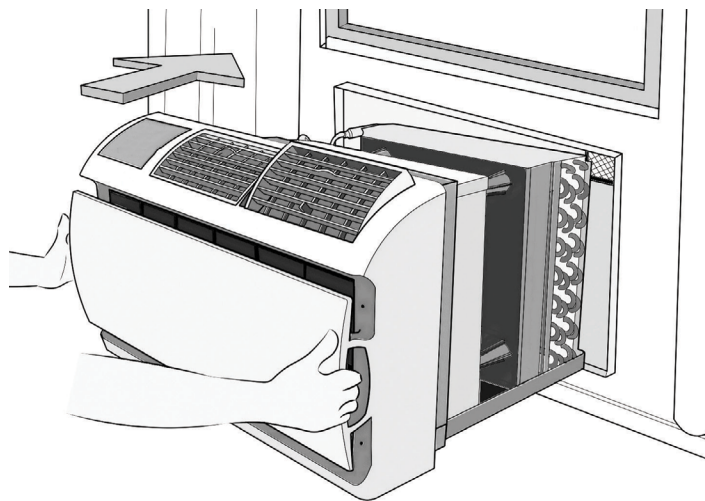


Figure 428 (Remove and Install the Chassis)

DISASSEMBLY

Kuhl-Open Electrical Box (To access Power Cord and Fixed Orifice)

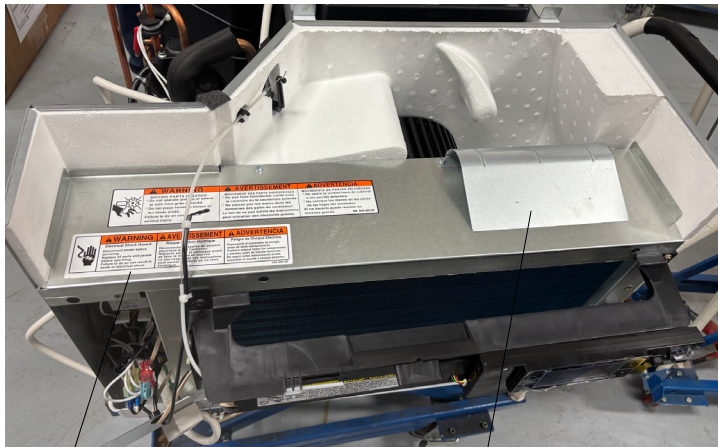
1. [Remove the front cover.](#)
2. [Remove the chassis from the sleeve.](#)
3. Remove 4 screws holding PCB assy to brackets. Slide PCB assy back to access electrical box cover screws. See figure 501.



Remove top screws (4 places)

Figure 501

4. Remove Air Foil and top cover. See Figure 502.



Top Cover

Airfoil

Figure 502

4. Remove electrical box cover (3 screws). See figure 503.



Remove Screws (3 Places)

Figure 503

5. Remove 3 screws holding box to evaporator coil. See figure 504



Evaporator screws (3 places)

Figure 504

6. Snip the zip ties holding the hp switch wiring and the indoor coil sensor.
7. Remove indoor coil sensor from evaporator.
8. When reinstalling be sure grommet is correct.

DISASSEMBLY

Replace the Main PCB (Kuhl)

⚠ 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. Unplug the unit
2. Remove the Front Cover. [Refer to Routine Maintenance, Figure 401.](#)
3. Remove the chassis from the sleeve. Refer to [Remove The Chassis-Kuhl.](#)
3. Remove three (4) screws from Control Box Panel .(See Figure 712



Remove top screws (4 places)

Figure 712

4. The top cover will remain attached to the PCB. Separate from the bottom tray and rotate the PCB assembly up. See Figure 713.
5. Swap wires one for one from old PCB to new PCB. If swapping wires one for one is not possible, identify and tag wires.
6. Place PCB back in the bottom tray and reinstall the 4 screws.
7. Ensure wiring is routed correctly and replace any zip ties that were cut.
8. [Reinstall the Chassis - Kuhl.](#)
- 9.. Install the Front Cover. ([Refer to Routine Maintenance, Figure 401.](#)
10. Plug in the unit and test the unit for proper operation. Refer to operation section.

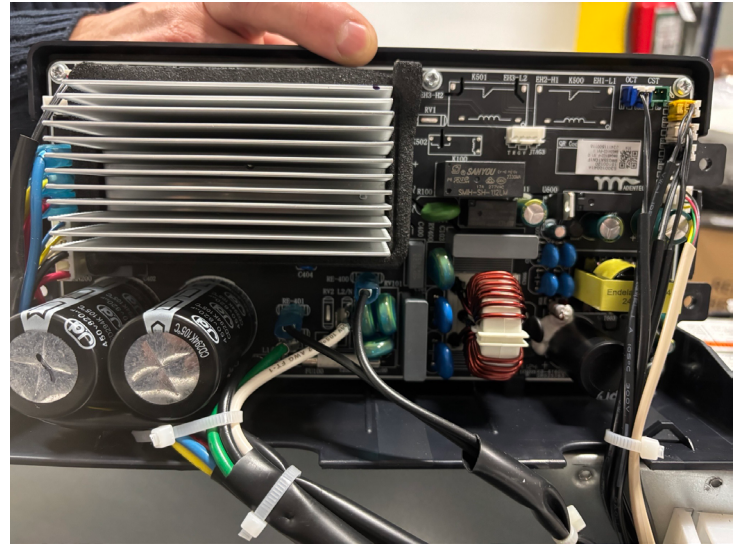


Figure 713

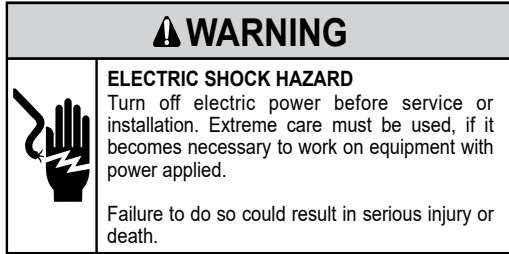
Replace the User Interface

1. Unplug the Unit
- [Remove the Front Cover. Refer to Routine Maintenance, Figure 401.](#)
2. Remove 2 -mounting screws securing UI and disconnect ribbon cable.
3. Inspect ribbon cable for obvious signs of damage.
4. If ribbon cable is damaged, or damage is suspected, disconnect cable from User Interface and PCB. Refer to Replace the Main PCB for ribbon cable connection.
5. Paying careful attention to the ribbon cable routing, remove the old cable and replace with a new ribbon cable.
5. Connect ribbon cable to the main PCB and user interface as required.
6. Install new UI using the 2-screws.
7. Plug in the unit and verify control operation. Refer to Operation Section.

DISASSEMBLY

Replace the Main PCB (Kuhl Q)

1. Unplug the unit



2. Remove the front Cover [\[Refer to Routine Maintenance, Figure 402\]](#)

3. Remove the unit from the sleeve. [\[Refer to Figure 504\]](#)

4. Remove top cover (8 screws). Refer to figure 715.

NOTE: Be careful not to break styrofoam during removal process.

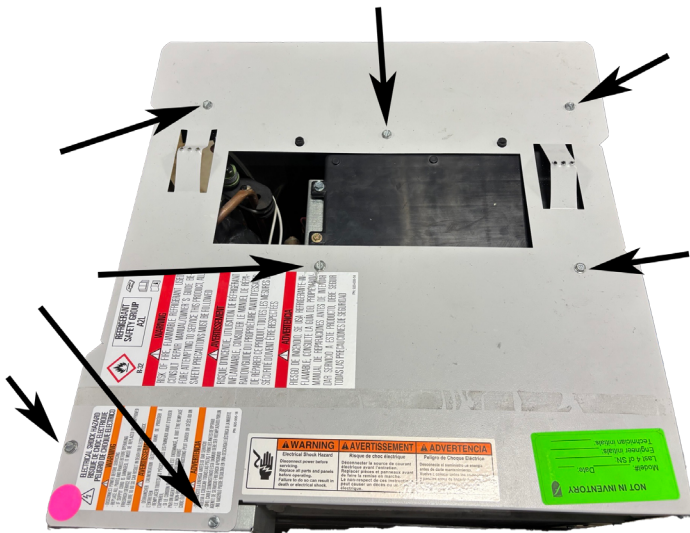


Figure 715 (Remove Top Cover)

5. Remove the 4 mounting screws from the main pcb assembly.

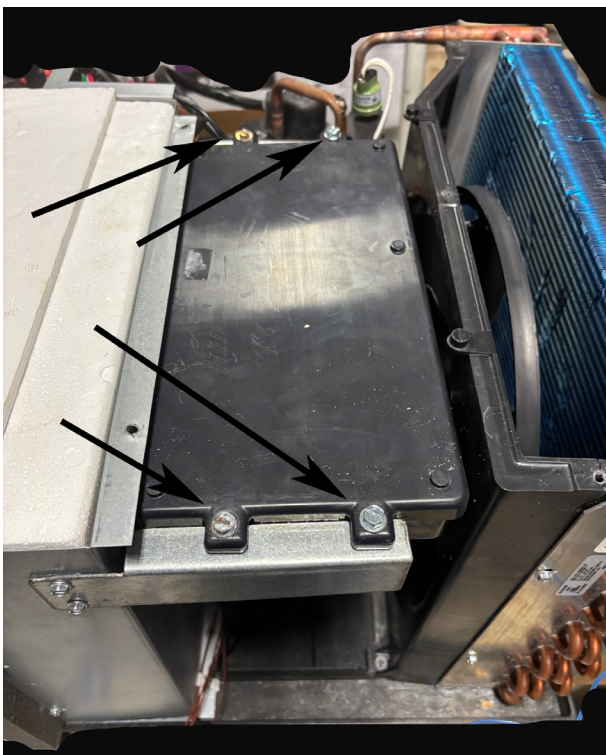


Figure 716 (Remove Mounting Screws)

5. Flip main PCB assy over and remove cover.

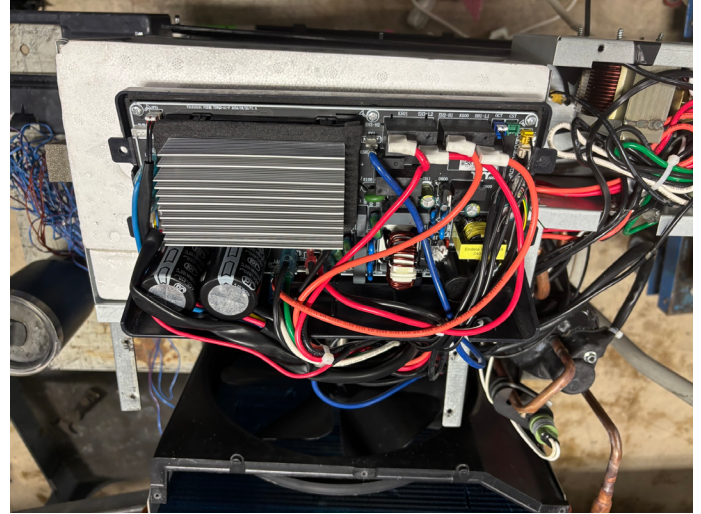


Figure 717 (Open Control Box)

6. Interchange wires from old Main PCB assy to new Main PCB assy. board

7. Reinstall Main PCB cover and install the 4 mounting screws. (Refer to figure 716.

8. Reinstall top cover. (Refer to figure 716)

9. Slide chassis in.

10. Install the Front Cover [\[Refer to Routine Maintenance, Figure 402\]](#)

11. Plug in the unit and test the unit for proper operation. Refer to operation section.

Replace the User Interface (Kuhl Q)

1. Unplug the Unit.

2. Remove the front Cover [\[Refer to Routine Maintenance, Figure 402\]](#)

3. Remove the 4 corner screws from the rear of the user interface. Refer to Figure 717.

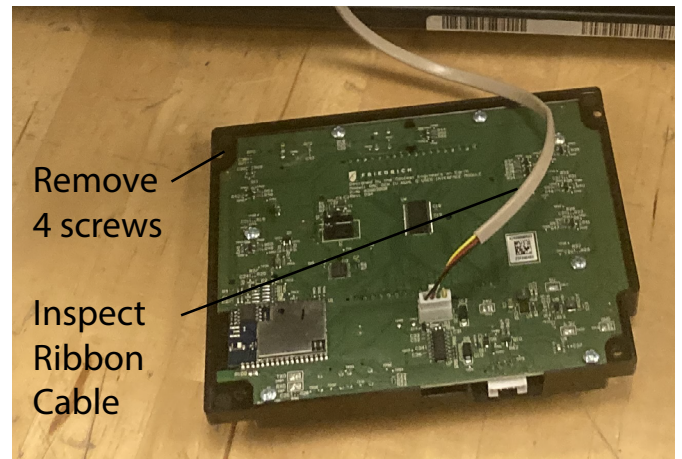


Figure 717

4. Inspect ribbon cable for obvious signs of damage.

5. If ribbon cable is damaged, or damage is suspected, disconnect cable from User Interface and Control Board.

6. Paying careful attention to the ribbon cable routing, remove the old cable and replace with a new ribbon cable.

7. Connect ribbon cable to the power board and user interface as required.

8. Install new UI using the 4 screws.

9. Plug in the unit and verify control operation. (Refer to Operation Section)

DISASSEMBLY

Replace the Main PCB (Wallmaster)

⚠ 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. Unplug the unit
2. Remove the Front Cover.
[Refer to Routine Maintenance, Figure 403.](#)
3. Slide the unit out approximately 3 inches from the sleeve.
[Refer to figure 506 for chassis removal.](#)
4. Remove the four(4) PCB assembly screws



Figure 720

5. Remove cover from pcb assy by depressing the black tabs and carefully flip around to facilitate wire disconnection. Refer to Figure 721..

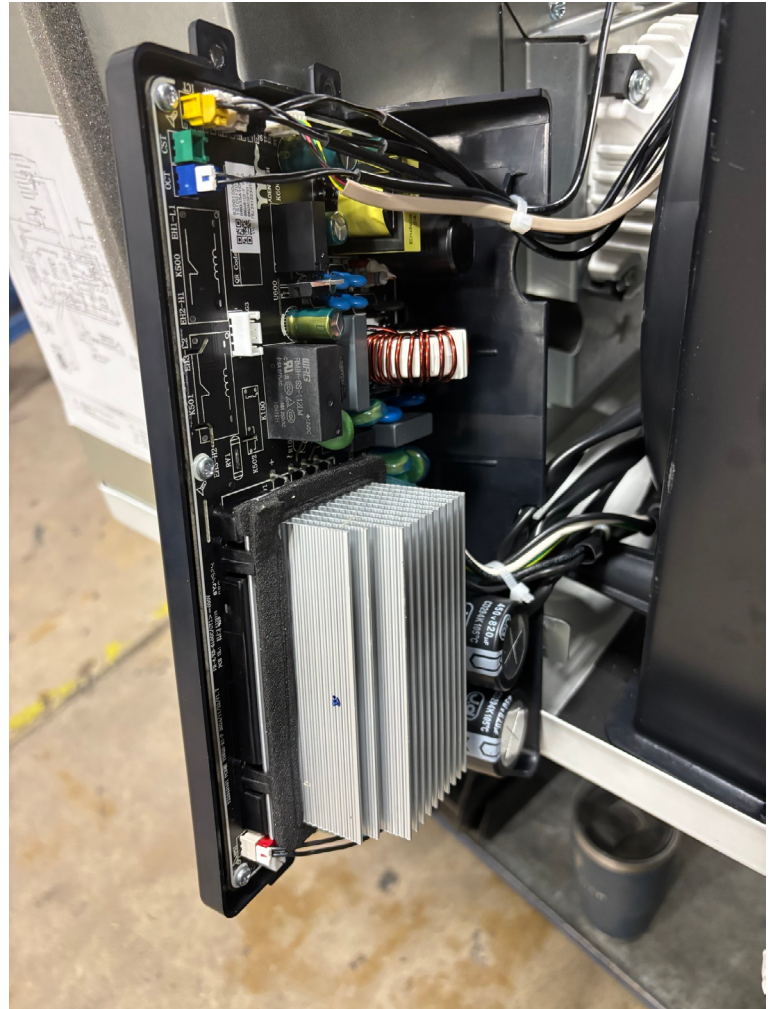


Figure 721

6. Swap wires one for one from old Main PCB assy to new Main PCB assy. If swapping wires one for one is not possible, identify and tag wires. Refer to the wiring diagrams as required.
9. Install the Front Cover.
[\[refer to Routine Maintenance\].](#)
10. Plug in the unit and test the unit for proper operation. Refer to operation section.

DISASSEMBLY

Replace the User Interface (Wallmaster)

⚠ 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. Unplug the Unit
2. Remove the Front Cover.
- [Refer to Routine Maintenance, Figure 403.](#)
3. Slide the unit out approximately 3 inches from the sleeve.
- [Refer to figure 506 for chassis removal.](#)
4. Using a sharp knife, cut slits in the Chassis gasket seal where the control board panel will be opened to avoid damaging the gasket.
5. Disconnect Room air sensor from the evaporator coil. Refer to figure 718.



Figure 718

5. Remove three (3) screws from the top, and one (1) from the front of the control board panel and open panel. Refer to figures 718 and 719.

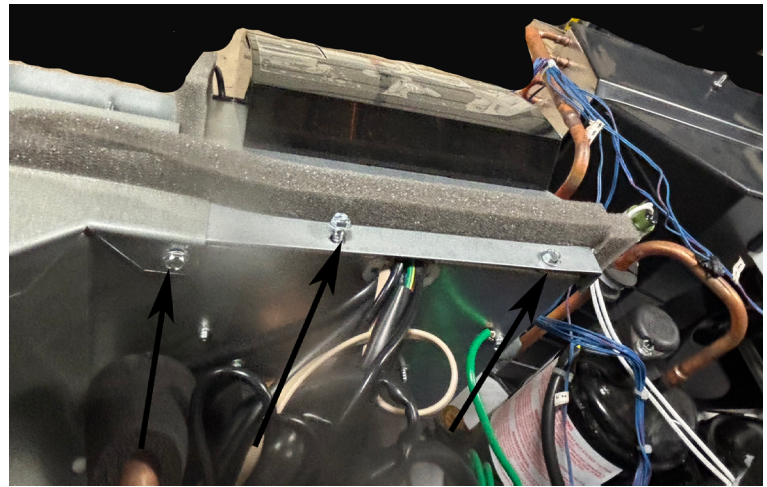


Figure 719

6. Remove two (2) mounting screws securing UI and disconnect ribbon cable.. Refer to Figure 720

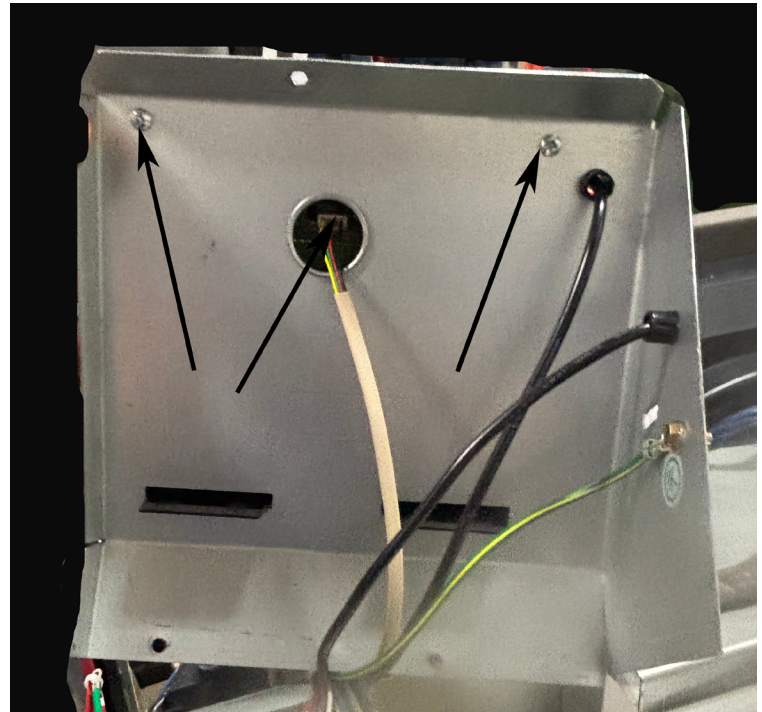


Figure 720

7. Carefully depress 2 black tabs by squeezing towards the bottom of the interface. Refer to Figure 721. Inspect ribbon cable for obvious signs of damage.
8. If ribbon cable is damaged, or damage is suspected, disconnect cable from User Interface and Control Board.
9. Paying careful attention to the ribbon cable routing, remove the old cable and replace with a new ribbon cable.
10. Connect ribbon cable to the main pcb and user interface as required.
11. Install new UI using the 2 screws. Refer to figure 720.
12. Install the 3 Control Panel Screws. Refer to figures 718 and 719.
13. Reinstall chassis and front cover.
14. Plug in the unit and verify control operation. Refer to Operation Section.

TROUBLESHOOTING

Room Air Conditioner Unit Performance Test Data Sheet

JOB NAME _____ TECH'S NAME _____

DATE _____ MODEL# _____ SERIAL # _____

CHECK THE INSTALLATION

ACCEPTABLE
YES

NOT ACCEPTABLE
NO

IS A CHASSIS GASKET INSTALLED? _____

IS THE FRESH / EXHAUST AIR VENT OPEN? _____

IS A FRIEDRICH SLEEVE INSTALLED? _____

IS A FRIEDRICH OUTDOOR GRILLE INSTALLED? _____

IS MAINTENANCE BEING PERFORMED? _____

ELECTRICAL

LINE VOLTAGE (STATIC) _____ VOLTS

START UP VOLTAGE _____ VOLTS

AMPERAGE DRAW (COOL) _____ AMPS

AMPERAGE DRAW (HEAT) _____ AMPS

COMPRESSOR

RUNNING AMPERAGE DRAW _____ AMPS

INDOOR CONDITIONS

INDOOR AMBIENT TEMPERATURE _____ F

RELATIVE HUMIDITY (RH) INDOOR _____ %

DISCHARGE AIR TEMPERATURE (INDOOR)(COOL) _____ F

DISCHARGE AIR TEMPERATURE (INDOOR)(HEAT) _____ F

RETURN AIR TEMPERATURE (INDOOR)(COOL) _____ F

RETURN AIR TEMPERATURE (INDOOR) (HEAT) _____ F

OUTDOOR TEMPERATURE

OUTDOOR AMBIENT TEMPERATURE _____ F

RH OUTDOOR RELATIVE HUMIDITY _____ %

DISCHARGE AIR TEMPERATURE (OUTDOOR)(COOL) _____ F

DISCHARGE AIR TEMPERATURE (OUTDOOR)(HEAT) _____ F

INTAKE AIR TEMPERATURE (OUTDOOR)(COOL) _____ F

INTAKE AIR TEMPERATURE (OUTDOOR)(HEAT) _____ F

COOLING OR HEATING AREA

AREA W _____ * L _____ = FEET SQUARED

FOR A GENERAL GUIDE REFER TO SIZING GUIDE TO THE RIGHT

FOR EXACT LOAD CALCULATIONS CONSULT MANUAL J OR M.

Cooling Sizing Guide

AREA TO BE CONDITIONED IN SQ. FT.	APPROXIMATE COOLING BTU REQUIRED
100 - 150	5000
150 - 250	6000
250 - 300	7000
300 - 350	8000
350 - 400	9000
400 - 450	10000
450 - 550	12000
550 - 700	14000
700 - 1000	18000
1000 - 1200	21000
1200 - 1400	23000
1400 - 1500	24000
1500 - 2000	30000
2000 - 2500	34000

Guide based on normal
room insulation, average
number of sun exposed
windows and two person
occupancy.

1. If heavily shaded, reduce cooling Btus required by 10%
2. If very sunny, increase cooling Btus required by 10%
3. Add 500 Btus per person over 2 people
4. Add 4,000 Btus if the area is a kitchen

Figure 602 (Cooling Sizing Guide)

Figure 601 (Test Data Sheet)

TROUBLESHOOTING

Diagnostic Codes

Figure 603

DIAG CODE	PROBLEM	DESCRIPTION	CORRECTIVE ACTION
1	Front Panel Button Stuck For More Than 20 Seconds.		1. Ensure front cover does not depress buttons. 2. Check wiring connections from UI to Inverter board. 3. Replace UI and Cable. 4. Replace Inverter Board.
2	Inverter firmware check.	Active when firmware version is less than the desired version number.	Contact Customer Support.
3	Indoor Temperature Sensor is Open or Shorted.	Unit will set temp to 75°F in COOLING or 68°F in HEATING. Unit continues to operate.	Check for open or shorted temp sensor. Refer to Appendix for temp. sensor values.
4	Indoor Coil Temperature Sensor is Open or Shorted.	Control Board sets temp to a default of 40°F. Override sensor. Unit continues to operate.	Check for open or shorted temp sensor. Refer to Appendix for temp. sensor values.
5	Outdoor Coil Temperature Sensor is Open or Shorted.	Unit sets temp to 20° F. and overrides sensor. Operation continues. Unit uses electric heat if available for heating. If not available uses heat pump if outdoor temp allows.	Check for open or shorted temp sensor. Refer to Appendix for temp. sensor values.
6	Outdoor Coil greater than 175° F.	Unit turns compressor off. Waits for the outdoor coil to be less than 150° F for more than 2 consecutive minutes.	
7	Indoor Coil less than 30° F for 2 consecutive minutes.	Unit turns compressor and electric heat off. Operation resumes after lockout time or when coil temp reaches 45°F.	
8	Unit Cycles greater than 9 Times per hour.	Unit continues operation. Unit is oversized for the space. Windows or doors to the outside are open. 3. Operating in Cooling mode while the outside temperature is below 60°F (16°C).	1. Check the cooling capacity of your unit to ensure it is properly sized for the room in which it is installed. Room air conditioners are not designed to cool multiple rooms. 2. Ensure that all windows and doors are closed.
9	Unit Cycles less than 3 Times per Hour.	Unit continues operation. 1. Unit is undersized for the space. (The air conditioner has insufficient cooling capacity to match the heat gain or loss of the room.) 2. Unit is undersized for the space. (The air conditioner has insufficient heating capacity to match the heat loss of the room.) 3. The return/discharge air grille is blocked. 4. The filter is dirty or obstructed. 5. The indoor coil or outdoor coil is dirty or obstructed. 6. There is excessive heat or moisture (cooking, showers, etc.) in the room. 7. The temperature of the room you are trying to cool is extremely hot or cold. 8. The digital control is set to fan cycling mode. 9. The temperature is not set at a cool enough/ warm enough setting. 10. This may be due to an excessive heat load in the room.	1. Check the cooling capacity of your unit to ensure it is properly sized for the room in which it is installed. Room air conditioners are not designed to cool multiple rooms. 2. Check the heating capacity of your unit. Air conditioners are sized to meet the cooling load, and heater size is then selected to meet the heating load. In extreme northern climates, room air conditioners may not be able to be used as a primary source of heat. 3. Ensure that the return and/or discharge air paths are not blocked by curtains, blinds, furniture, etc. Remove obstructions. 4. Clean the filter, (see Routine Maintenance), or remove obstruction. 5. Clean the coils, (see Routine Maintenance), or remove obstruction. 6. Be sure to use exhaust vent fans while cooking or bathing and, if possible, try not to use heat producing appliances during the hottest part of the day. 7. Adjust the Temperature control to a cooler or warmer setting as necessary. Allow additional time for the air conditioner to cool off a very hot room. 8. Since the fan does not circulate the room air continuously at this setting, the room air does not mix as well and hot (or cold) spots may result. Using the continuous fan setting is recommended to obtain optimum comfort levels. 9. Adjust the Temperature control to a cooler or warmer setting as necessary. 10. If there are heat producing appliances in use in the room, or if the room is heavily occupied, the unit will need to run longer to remove the additional heat.

TROUBLESHOOTING

Diagnostic Codes

Figure 603

DIAG CODE	PROBLEM	DESCRIPTION	CORRECTIVE ACTION
12	Discharge Air greater than 185°F.	Unit Shuts down electric heater. When discharge air temperature is less than 100°F. operation resumes.	
13	High Pressure Switch Open.	Unit shuts down compressor. Operation resumes after lockout time and pressure switch closes.	1. With unit power off, disconnect terminal pins of HPS1 and ohm check to see if circuit is open. 2. If open replace HP switch. 3. If closed check for restriction in refrigeration system causing high pressure.
14	Discharge Air Temperature Sensor is Open or Shorted.	Unit overrides sensor and sets temp to 75°F.	Check for open or shorted temp sensor. Refer to Appendix for temp. sensor values.
15	Inverter communication lost.	No communication with inverter board	1. Check wiring from UI to inverter board. 2. Replace UI and cable. 3. Replace Inverter board.
16	Temperature Beyond Operating Limits.	Ambient temp is less than 0°F or greater than 130°F. Unit turns off compressor, electric heat, and fan. Operation resumes after fault is cleared.	Do not operate unit outside of maximum conditions.
22	Outdoor Coil Temperature less than 30°F for 2 consecutive Minutes .	Only applicable to units with heat pump and electric heat. Unit turns off heat pump operation. Uses electric heat to satisfy all heating demands. Cleared when outdoor coil temp is greater than 45°F.	
23	Frost Protection.	Only applicable to heat pump only units. Active when Heat Pump run time exceeds 60 minutes with the outdoor coil temp less than 26°F. Runs active defrost for up to 6 minutes.	

TROUBLESHOOTING

Diagnostic Codes-Inverter

Figure 604

DIAG CODE	PROBLEM	CONDITIONS	POSSIBLE CAUSES	CORRECTIVE ACTION
17	Inverter fan fault	The feedback signal of outdoor fan cannot be detected. 1. Start detection when the ODU fan is running. 2. The feedback signal of outdoor fan cannot be detected. 3. If the above conditions are met, the unit will shut down for 3 minutes, error will be reported.	1. Fan blade is stuck. 2. PCB and motor unconnected. 3. PCB is faulty. 4. DC fan motor is faulty.	1. Remove object from condenser fan or evaporator blower wheel. 2. Check wiring and connections between motor and PCB. 3. Replace Inverter board PCB. 4. Replace Fan motor.
18 Inverter immediate fault 1	7810 Loss of Compressor Motor Control	Loss of Compressor Motor Control. 1. Detects the fault when the compressor is running; 2. PCB detected abnormal operation of compressor. 3 If the above conditions are met, the unit will shut down for 3 minutes, and error will be reported.	1. PCB and Compressor disconnected. 2. PCB is faulty. 3. Compressor is faulty	1. Check wiring and connections from PCB to compressor. 2. Disconnect the compressor before power up the unit and check for fault. If fault is removed replace compressor. 3. Check the voltage of power supply. 4. Check the radiator ventilation is normal. 5. Check whether the IPM is in good contact with the radiator. 6. Check refrigeration system for abnormalities. 7. Replace Inverter PCB. 8. Replace Compressor.
	7813 Compressor Startup Fault	Compressor start failure. 1. Start detection when compressor starts; 2. A start failure is detected and the system starts again after a delay of 20s; 3. If the start-up fails for three consecutive attempts. The unit will be shut down for 3 minutes. Error will be reported.	1. PCB and Compressor disconnected. 2. System abnormal. 3. PCB is faulty. 4. Compressor is faulty	For loss of compressor motor control, compressor startup faults, and compressor phase overcurrent see figure 607.
	7800 Compressor Phase Over Current	The compressor current exceeds the set software limit value. 1. Detect the fault when the compressor is running; 2. The compressor Peak current is detected to exceed the set limit value. 3. If the above conditions are met, the unit will shut down for 3 minutes, and error will be reported.	1. PCB and Compressor disconnected. 2. System abnormal. 3. PCB is faulty. 4. Compressor is faulty	
	7801 AC Input Over Current	The AC RMS current is detected to exceed the set limit value. 1. Detect the fault when the compressor is running. 2. The AC RMS current is detected to exceed the set limit value. 3. If the above conditions are met, the unit will shut down for 3 minutes, and error will be reported	1. Supply voltage is unstable. 2. The system is overloaded due to poor heat dissipation	
See following page for continuation of fault code 18.				

TROUBLESHOOTING

Diagnostic Codes-Inverter

Figure 604

DIAG CODE	PROBLEM	CONDITIONS	POSSIBLE CAUSES	CORRECTIVE ACTION
18 (CONT) Inverter immediate fault 1 Continued	7802 DC Bus Over Voltage	The DC voltage on the electrolytic capacitor exceeds the set limit value 1. After power is on. 2. The DC voltage on the electrolytic capacitor exceeds the set limit value. 3. If the above conditions are met. it will report the fault to Display Board for 3 minutes continuously.	1. The voltage of power supply is too high. 1. Power supply voltage > 230 VAC for 115 V power. 300 VAC for 230V power.	1. Check wiring and connections from PCB to compressor. 2. Disconnect the compressor before power up the unit and check for fault. If fault is removed replace compressor. 3. Check the voltage of power supply. 4. Check the radiator ventilation is normal. 5. Check whether the IPM is in good contact with the radiator. 6. Check refrigeration system for abnormalities. 7. Replace Inverter PCB. 8. Replace Compressor.
	7803 DC Bus Under Voltage	The DC voltage on the electrolytic capacitor is lower than the set limit value. 1. After power is on. 2. The DC voltage on the electrolytic capacitor exceeds the set limit value 3. If the above conditions are met. it will report the fault to Display Board for 3 minutes continuously.	1. The voltage of power supply is too low. 1. Power supply voltage < 78 VAC for 115V power. 120 VAC for 230V power. 2. PCB is faulty.	
	7811 Compressor Power Module Over Temperature	IPM module temperature exceeds the set limit value. 1. Detect the fault when the compressor is running; 2. IPM module temperature exceeds the set limit value. 3. If the above conditions are met. the unit will shut down for 3 minutes, error will be reported.	1. The radiator ventilation is abnormal 2. Poor contact between IPM and radiator or screws are loose. 3. PCB is faulty.	
	7815 Pre-Charge Relay Open	This fault occurs when the voltage between DC + and DC -is lower than 100V when power on for the first time. 1. Detection at initial power on of ODU; 2. the voltage between DC + and DC -is lower than 100V. 3. If the above conditions happed, error will be reported, and unit will be shut down.	1. The voltage of power supply is too low. Power supply voltage < 70 VAC; 2. PCB is faulty.	
	7807 PFC Desaturation	1. Detect the fault when the PFC is on. 2. The AC Peak current is detected to exceed the set limit value. 3. If the above conditions are met. the unit will shut down for 3 minutes, error will be reported.	1. The voltage of power supply is too low or too high. 2. Wiring loose or disconnected. 3. Inverter PCB Faulty.	

TROUBLESHOOTING

Diagnostic Codes-Inverter

Figure 604

DIAG CODE	PROBLEM	CONDITIONS	POSSIBLE CAUSES	CORRECTIVE ACTION
19 Inverter immediate fault 2	8212 Compressor Module Over Current	1. Detect the fault when the compressor is running; 2. The peak current of compressor exceeds the set hardware limit value. 3. If the above conditions are met, the unit will shut down for 3 minutes, error will be reported.	1. AC power out of range. 2. System abnormal. 3. Wiring loose disconnected or in wrong sequence. 4. PCB faulty. 5. Compressor damaged.	See figure 608
	8206 Compressor Model Configuration Error	Compressor code showed in display is out of the setting ranges. 1. Power on the unit. 2. Compressor code showed in display is out of the setting range.	Wrong compressor code	Contact customer support.
20 Inverter controlled fault 1	7907 Modbus Communications Lost modbus	1. User Interface and Inverter PCB power on. 2. Display Board cannot receive data from PCB or received wrong data. 3. Communication errors between the user interface and the inverter PCB. 4. If the above conditions are met 30s, error will be reported.	1. Loose or disconnected wiring. 2. User Interface faulty. 3. Inverter PCB faulty.	1. Check for loose, damaged, or disconnected wiring. 2. Replace User interface. 3. Replace Inverter PCB.
21 Inverter controlled fault 2	7913	Unit detects the HPS is open	1. System pressure exceeds the HPS limits. 2. HPS switch circuit has failed.	1. Determine refrigeration system fault. 2. Check if switch has malfunctioned by Checking for continuity with no system pressure.

TROUBLESHOOTING

Basic Troubleshooting

Figure 605

Problem	Possible Cause	Possible Solution
Unit does not operate.	The power button is off or the set point temperature is satisfied.	Push the power button on and raise or lower temperature setting (as appropriate) to call for operation.
	The LCDI power cord is unplugged.	Plug into a properly grounded 3 prong receptacle. (See Electrical Rating Tables, Figure 206) for the proper receptacle type for your unit.
	The LCDI power cord has tripped (Reset button has popped out).	Press and release RESET (Listen for click. Reset button latches and remains in.) Check that the green LED light is on to resume operation.
	The circuit breaker has tripped or the supply circuit fuse has blown.	Reset the circuit breaker, or replace the fuse as applicable. If the problem continues, contact a licensed electrician.
	There has been a local power failure.	The unit will resume normal operation once power has been restored.
Unit Trips Circuit Breaker or Blows Fuses.	Other appliances are being used on the same circuit. (115 Volt only)	The unit requires a dedicated outlet circuit, not shared with other appliances.
	An extension cord is being used.	Do NOT use an extension cord with this or any other air conditioner.
	The circuit breaker or time-delay fuse is not of the proper rating.	Replace with a circuit breaker or time-delay fuse of the proper rating. (See Electrical Rating Tables, Figure 206) for the proper circuit breaker/fuse rating for your unit. If the problem continues, contact a licensed electrician.
LCDI Power Cord Trips (Reset Button Pops Out).	The LCDI power cord can trip (Reset button pops out) due to disturbances on your power supply line.	Press and release RESET (Listen for click. Reset button latches and remains in.) Check that the green LED light is on to resume normal operation.
	Electrical overload, overheating, or cord pinching can trip (Reset button pops out) the LCDI power cord.	Once the problem has been determined and corrected, press and release RESET (Listen for click. Reset button latches and remains in.) to resume normal operation.
	NOTE: A damaged power supply cord must be replaced with a new power supply cord obtained from the product manufacturer and must not be repaired.	
Does not cool or only cools slightly	Undersized unit	Refer to industry sizing chart.
	Indoor ambient thermistor open or shorted	See diagnostic codes and replace thermistor if needed.
	Dirty filter	Clean as recommended in Owner's Manual
	Dirty or restricted condenser or evaporator coil	Use pressure wash or biodegradable cleaning agent to clean
	Poor air circulation	Adjust discharge louvers. Use high fan speed
	Fresh air or exhaust air door open	Close doors. Instruct customer on use of this feature
	Low capacity - undercharge	Check for leak & make repair
	Compressor not pumping properly	Check amperage draw against nameplate. If not conclusive, make pressure test
Unit does not run	Fuse blown or circuit tripped	Replace fuse, reset breaker. If repeats, check fuse or breaker size. Check for shorts in unit wiring & components.
	Loose or disconnected wiring control board or other components	Check wiring & connections. Reconnect per wiring diagram.
	The LCDI power cord has tripped (Reset button has popped out).	Press and release RESET (Listen for click. Reset button latches and remains in.) Check that the green LED light is on to resume operation.
Evaporator coil freezes up	Dirty filter	Clean filter (see Routine Maintenance)
	Restricted airflow	Check for dirty or obstructed coil. Clean coil (refer to routine Maintenance)
	Inoperative thermistor	Check Diagnostic Codes. Check Thermistors and replace as necessary.
	Short of refrigerant	De-ice coil & check for leak
	Inoperative fan motor	Test fan motor & replace if inoperative
	Partially restricted capillary tube	De-ice coil. Replace capillary tube

TROUBLESHOOTING

Figure 606

Troubleshooting Tips

Problem	Possible Cause	Possible Solution
Compressor runs continually & does not cycle off	Excessive heat load	Unit undersized. Test cooling performance & replace with larger unit if needed. See sizing chart.
	Restriction in line	Check for partially iced coil & check temperature split across coil
	Thermistor shorted	Replace thermistor or electronic control board
Electronic control board does not turn unit off	Compressor relay contacts stuck	Replace electronic control board
	Incorrect wiring	Refer to appropriate wiring diagrams
	Unit undersized for area to be cooled	Refer to industry standard sizing chart
	Defective thermistor	Replace thermistor or electronic control board
Compressor runs for short periods only.	Incorrect wiring	Refer to appropriate wiring diagram
	Shorted or incorrect capacitor	Test capacitor and replace if needed.
	Restricted or low air flow through condenser coil or evaporator coil	Check for proper fan speed or blocked coils. Correct as needed.
	Compressor running abnormally hot	Check for kinked discharge line or restricted condenser. Refrigerant over-charge. Check amperage, connections.
Unit does not turn on	No power	Check power supply. Check LCDI plug. Check wire connections. Check if panel is locked.
	Incorrect wiring	Refer to appropriate wiring diagram.
	Defective thermistor	Replace thermistor or electronic control board.
Noisy operation	Poorly installed	Refer to Installation Manual for proper installation.
	Fan blade striking chassis	Reposition - adjust motor mount.
	Compressor vibrating	Check that compressor grommets have not deteriorated. Check that compressor mounting parts are not missing.
	Improperly mounted or loose cabinet parts refrigerant tubes	Check assembly & parts for looseness, rubbing & rattling pipes, etc.
Water Leaks into Room	Evaporator drain pan overflowing	Clean obstructed drain trough.
	Condensation forming underneath base pan	Evaporator drain pan broken or cracked. Reseal or replace. No chassis gasket installed. Install chassis gasket.
	Poor installation resulting in rain entering the room	Check installation instructions. Reseal as required.
	Condensation on discharge grille louvers	Dirty evaporator coil. Clean coils (See Routine Maintenance) Environmental phenomena: point supply louvers upward. Put on high fan.
	Chassis gasket not installed	Install gasket, per Installation manual.
	Downward slope of unit is too steep inward	Refer to installation manual for proper installation.
Water "spitting" into room	Sublimation: When unconditioned saturated, outside air mixes with conditioned air, condensation forms on the cooler surfaces	Ensure that foam gaskets are installed in between window panes & in between the unit & the sleeve. Also, ensure that fresh air/exhaust vents (on applicable models) are in the closed position & are in tact.
	Downward pitch of installation is too steep towards back of unit	Follow installation instructions to ensure that downward pitch of installed unit is no less than 1/4" & no more than 3/8"
	Restricted coil or dirty filter	Clean & advise customer of periodic cleaning & maintenance needs of entire unit
Excessive moisture	Insufficient air circulation thru area to be air conditioned	Adjust louvers for best possible air circulation
	Inadequate vapor barrier in building structure; particularly floors.	Advise customer

TROUBLESHOOTING

Figure 606

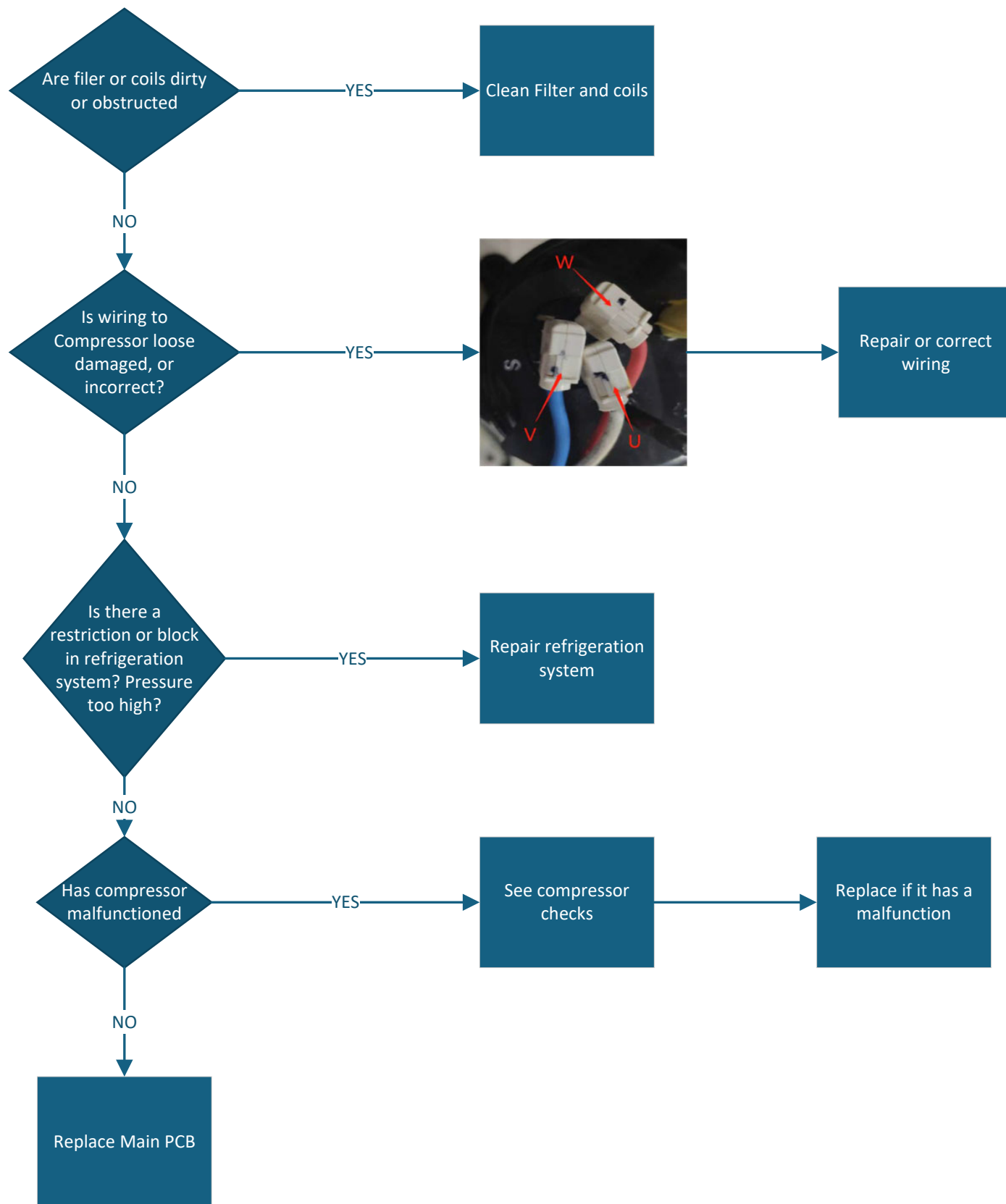
Troubleshooting Tips

Problem	Possible Cause	Possible Solution
Unit short cycles	Defective thermistor	Replace thermistor or electronic control board
	Unit oversized	See sizing chart. Correct as needed.
	Chassis seal gasket not sealing or absent causing unit to short cycle	Check gasket. Reposition or replace as needed
	Restricted coil or dirty filter	Clean & advise customer of periodic cleaning & maintenance needs of entire unit
Prolonged off cycles	Defective indoor ambient thermistor or electronic control board	Check alarms. Replace thermistor or electronic control board
Outside water leaks	Evaporator drain pan cracked or obstructed	Repair, clean or replace as required
	Obstructed condenser coil	Use pressure wash or biodegradable cleaning agent to clean
	Fan blade/ slinger ring improperly positioned	Adjust fan blade to 1/2" of condenser coil fin pack
Room temperature uneven (Heating cycle)	Bad indoor ambient thermistor	Check diagnostic codes. Check Thermistors. Replace as needed.
	Fan speed too low	Set at higher fan speed.
Does not heat adequately	Exhaust or fresh air door open	Check if operating properly. Instruct customer on proper use of control
	Dirty filter	Clean (See Routine Maintenance)
	Unit undersized	Check heat rise across coil. If unit operates efficiently, check if insulation can be added to attic or walls. If insulation is adequate, recommend additional unit or larger one
	Heater hi-limit control cycling on & off	Check for adequate fan air across heater. Check for open hi-limit control.
	Shorted or open supplementary heater	Do ohmmeter check.
	Incorrect wiring	Check applicable wiring diagram
Unit cools when heat is called for	Incorrect wiring	Refer to applicable wiring diagram
	Defective solenoid coil	Check for continuity of coil
	Reversing valve fails to shift	Block condenser coil & switch unit to cooling. Allow pressure to build up in system, then switch to heating. If valve fails to shift, replace valve.
Cooling adequate, but heating insufficient.	Reversing valve failing to shift completely; bypassing hot gas	De-energize solenoid coil, raise head pressure, energize solenoid to break loose. If valve fails to make complete shift, replace valve.

TROUBLESHOOTING

For loss of compressor motor control, compressor startup faults, and compressor phase overcurrent

Fault Code 18: Inverter Immediate Fault 1 (7810, 7813, 7800) Loss of Compressor Control, Compressor Startup Fault, Compressor Phase Over Current

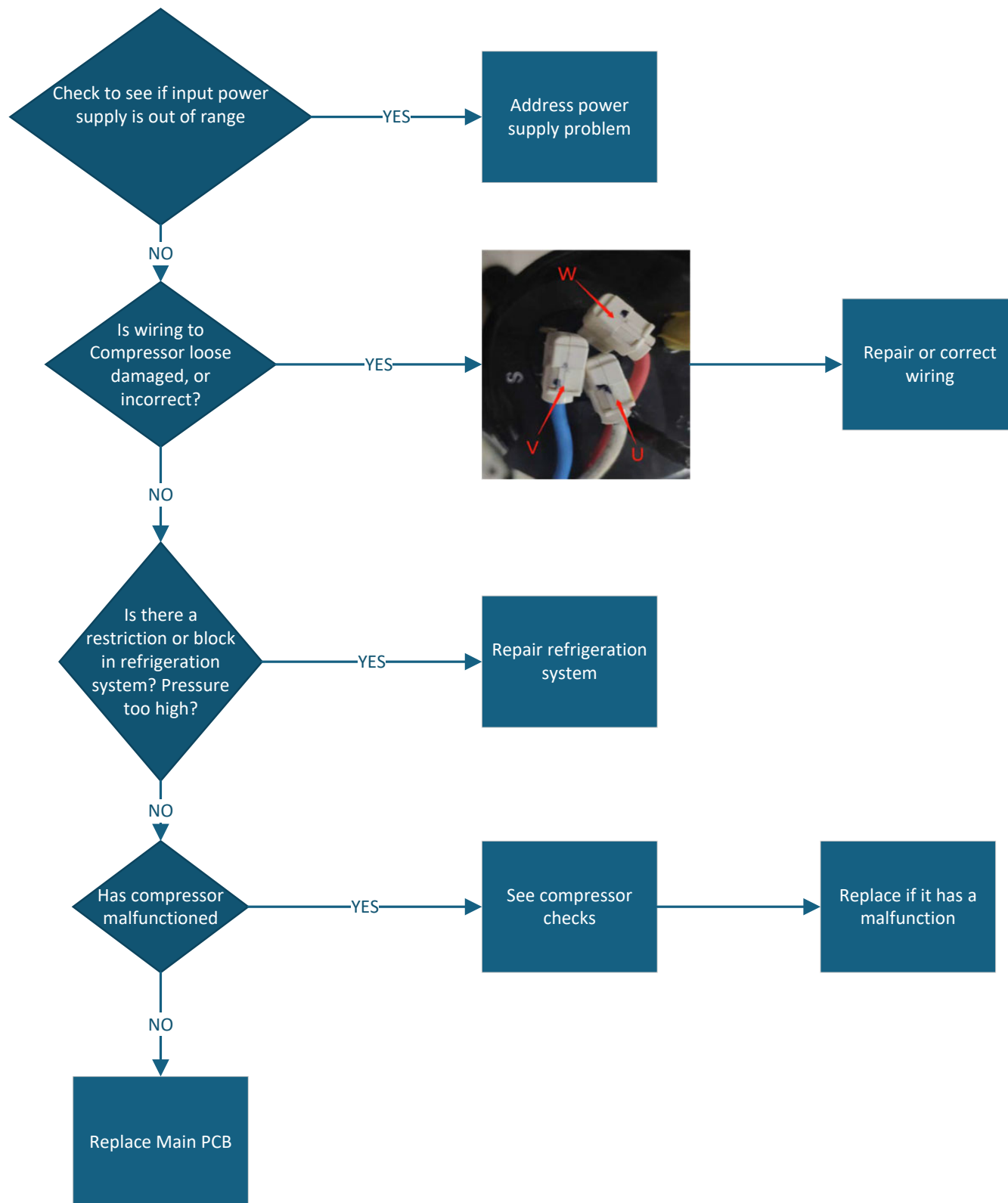


TROUBLESHOOTING

Compressor Module Over Current

Figure 608

Fault Code 19: Inverter Immediate Fault 2 (8212) Compressor Module Over Current



COMPONENT TESTING

Reversing Valve

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

It consists of a pressure-operated, main valve and a pilot valve actuated by a solenoid plunger. The solenoid is energized by 24 vac during the heating cycle only.

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

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

Checking the Reversing Valve

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

Run the unit in the heating mode then disconnect one of the 24 vac wires at the reversing valve and the valve should shift to cooling mode. If valve does not shift - replace the valve (verify the unit is properly charged before replacing valve.) For a stuck valve diagnosis run in the cooling mode and check the temp difference between the suction line from the evaporator and the common suction line at the compressor, if there is more than a 3 °F difference then change the valve.

Checking The Reversing Valve Solenoid

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

1. Turn off high voltage electrical power to unit.
2. Unplug line voltage lead from reversing valve coil.
3. Check for electrical resistance through the coil. If the coil is open replace the coil.
4. Check from each lead of coil to the copper liquid line as it leaves the unit or the ground lug. There should be no continuity between either of the coil leads and ground; if there is, coil is grounded and must be replaced.
5. If coil tests okay, reconnect the electrical leads.
6. Make sure coil has been assembled correctly.

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

⚠ WARNING



ELECTRIC SHOCK HAZARD

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

⚠ WARNING



HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

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

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

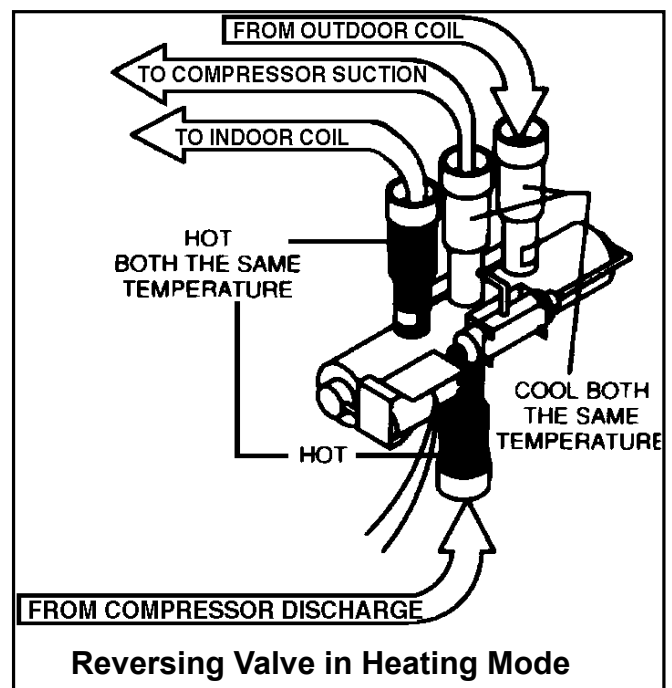


Figure 701

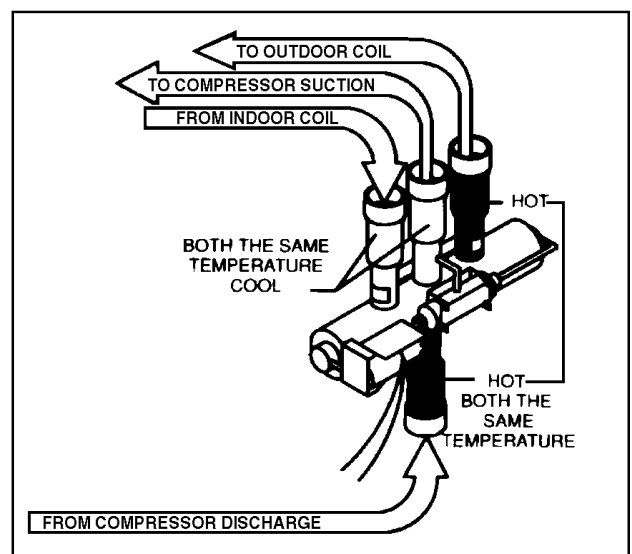


Figure 702

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.

Resistance Test.

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

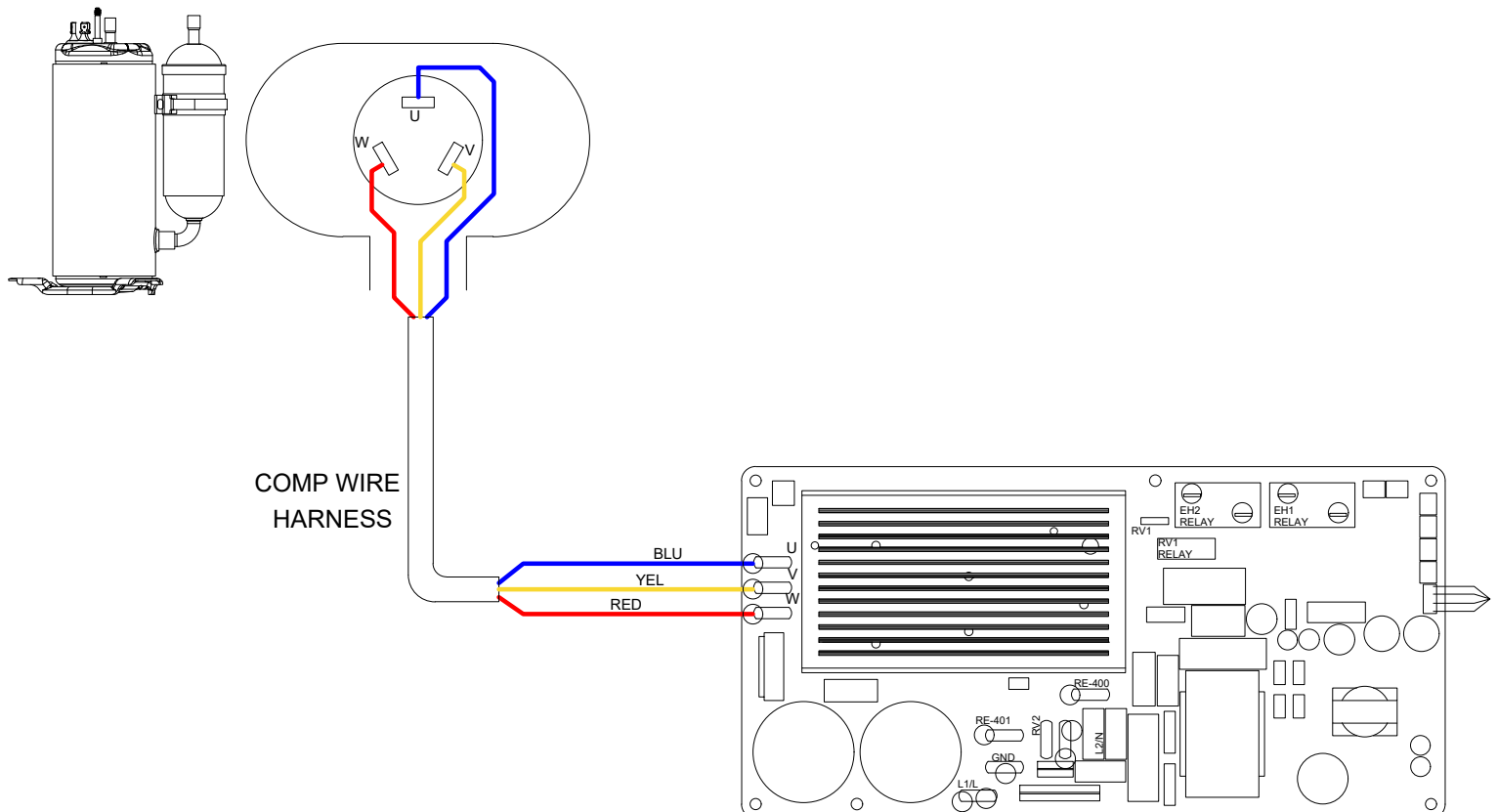


Figure 703

COMPONENTS TESTING

Fan Motor

The Fan Motor installed in your Kuhl or Wallmaster unit is a dual shaft bldc motor driving both the condenser fan and the indoor blower wheel. The procedure for checking a 115 vac motor is also the same as checking a 230 vac motor.

1. Unplug the unit.
2. Remove front cover. [Refer to Routine Maintenance.](#)

4. Remove Chassis from the sleeve.

- 3.

⚠ 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.

Turn unit on.

4. Check outdoor fan connector from Driver at J8 as shown in figure below.

There are 5 wires:

No.	Color	Function	Remark
1	Red	Vm	310 VDC
2	Black	Gnd	Ground
3	White	Vcc	15 VDC
4	Yellow	Vsp	0-6.5 VDC
5	Blue	FG	12 pulses per revolution

RESIN PACK BRUSHLESS DC MOTOR

塑封无刷直流电动机

ZKSP-129-8-1

DC310V 129W

E CL ☒ 8P 极

1300(r/min)

ROTATION (☒向) ←

CPN:20100020

广东威灵电机制造有限公司

GUANGDONG WELLING MOTOR MANUFACTURING CO.,LTD.

Q.C.Pass RoHS

YYYYMMDD

NNNNNN WWZZ

ZKSP-129-8-1

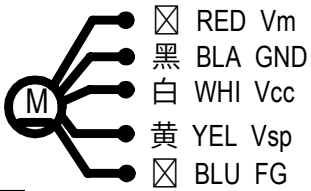


Figure 704 [Motor Nameplate (Typical)]

COMPONENTS TESTING

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.

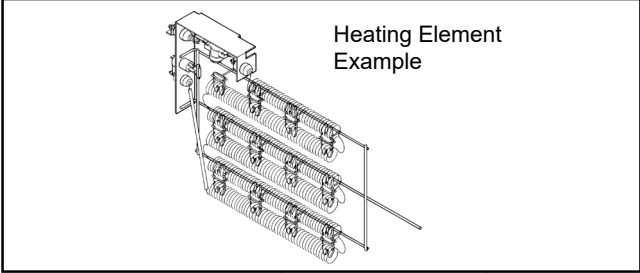


Figure 705 (Heating Element)

All heat pumps and electric heat models are equipped with a heating element. The heating element contains a fuse link and a heater limit switch. The fuse link is in series with the power supply and will open and interrupt the power when the temperature reaches 199°F or a short circuit occurs in the heating element. Once the fuse link separates, a new heater element must be installed.

NOTE: Always replace the heating element with the exact replacement.

The heater element has a high limit control. This control is a bimetal thermostat mounted in the top of the heating element. Should the fan motor fail or filter become clogged, the high limit control will open and interrupt power to the heater before reaching an unsafe temperature condition. The control is designed to open at 110°F ±6°F. Test continuity below 110°F or when it is cooled off.

HEATING ELEMENT

The heating element is energized by an outdoor thermistor via the electronic control board. The outdoor defrost thermistor is adjusted at a predetermined temperature of approximately 30 degrees Fahrenheit and sensed for two consecutive minutes, to stop the compressor and turn on the heating element.

	KHVS10B11A	KHVQ10B11A	KHVS12B33A	WHVT14B33A	KHVM24B34A	KHVL28B35A
kW	1.15	1.15	3.3	3.4	4.0	5.2
cold resistance (ohms)	10.11 +- 3%	10.11 +- 3%	14.10 +-3%	13.7 +- 3%	11.63 +-3%	8.95 +- 3%

TESTING THE HEATING ELEMENT

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

Drain Pan Valve

During the cooling mode of operation, condensate which collects in the drain pan is picked up by the con-denser fan blade and sprayed onto the condenser coil. This assists in cooling the refrigerant plus evaporating the water. During the heating mode of operation, it is necessary that water be removed to prevent it from freezing during cold outside temperatures. This could cause the con-denser fan blade to freeze in the accumulated water and prevent it from turning. To provide a means of draining this water, a bellows type drain valve is installed over a drain opening in the base pan. This valve is temperature sensitive and will open when the outside temperature reaches 40°F. The valve will close gradually as the temperature rises above 40°F to fully close at 60°F.

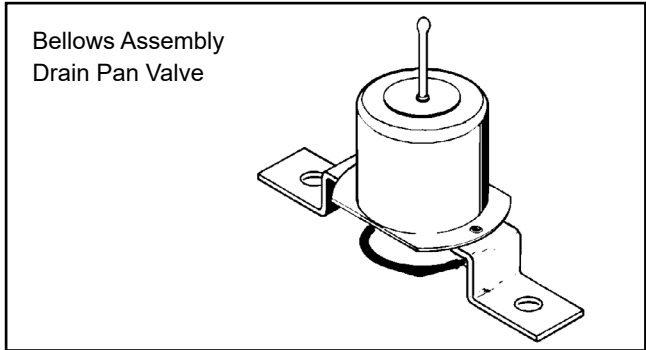


Figure 706 Drain Pan Valve

COMPONENTS TESTING

Thermistors Description

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

The units have 4 sensors (Thermistors). Each thermistor is color coded and has a different function.

1. Indoor Coil (Yellow) - located on the evaporator coil.
2. Outdoor Coil (Blue) - located on the condenser coil.
3. Discharge Air (Black) - located on the front of the unit in the discharge air port.
4. Ambient Air (White) - located on the front of the unit in front of the air intake.

Thermistor Testing

1. Gain access to Main PCB (Refer to Main PCB Replacement.
[For Kuhl](#)
[For Kuhl Q](#)
[For Wallmaster](#)
2. Locate thermistor plug and disconnect from Main PCB. (Refer to Control Board Identification, Fig 711)
3. Check for proper resistance. ([Refer to Thermistor Resistance values](#)).
4. If thermistor is out of tolerance, replace thermistor.

R-32 SEALED SYSTEM REPAIR

General Information

WARNING: Electrical Shock Hazard

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



WARNING: This Product uses R-32 Refrigerant

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

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

Do not pierce or burn.

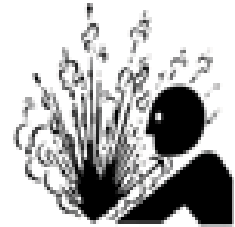
Be aware that refrigerants may not contain an odor.



**Refrigerant
Safety Group
A2L**

WARNING: Refrigeration System under High pressure

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



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

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

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

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

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

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

Check for presence of refrigerant:

- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres.
- Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- The following leak detection methods are deemed acceptable for all refrigerant systems:
 1. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of **FLAMMABLE REFRIGERANTS**, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.
 2. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

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

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

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

R-32 SEALED SYSTEM REPAIR

General Information



Warning:

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

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

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

Checks And Repairs To Electrical Devices:

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

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

- R-32 pressure is similar to R-410A and approximately 60% higher than R-22 pressure.
- R-32 cylinders must not be allowed to exceed 125°F, they may leak or rupture.
- R-32 must never be pressurized with a mixture of compressed air, it may become MORE flammable.
- Servicing equipment and components must be specifically designed for use with R-32 and dedicated to prevent contamination.
- Manifold sets must be equipped with gauges capable of reading 750 psig (high side) and 200 psig (low side), with a 500-psig low-side retard.
- Gauge hoses must have a minimum 750-psig service pressure rating.
- Recovery cylinders must have a minimum service pressure rating of 400 psig, (DOT 4BA400 and DOT BW400 approved cylinders).
- POE (Polyol-Ester) lubricants must be used with R-32 equipment.
- To prevent moisture absorption and lubricant contamination, do not leave the refrigeration system open to the atmosphere for extended periods of time.
- If unit refrigerant is low, recover the refrigerant, evacuate, and recharge unit to nameplate amount.
- If there is any amount of refrigerant in the system charge from the low side.
- Always charge by liquid inverted.

NOTE: Sealed system repairs to cool-only models require the installation of a liquid line drier.

NOTE: Sealed system repairs to models with a heat pump require the installation of a suction side drier.

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

No halide torches for leak testing.

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

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

R-32 SEALED SYSTEM REPAIR

Required Equipment

- Ventilation fan.
- Class ABC fire extinguisher.
- Process Tube adapter kit
- Recovery access tool.
- Purge hose fittings
- Pinch off and opening tools



ABC Fire Extinguisher



Recovery Machine



Vaccum Pump



Nitrogen



Guage Manifold



Nitrogen Regulator



Vaccum Guage



Process tube adapter kit



Recovery access tool



Purge hose fittings



Pinch off and opening tools



R-32 SEALED SYSTEM REPAIR

Refrigerant Removal, Recovery, and Evacuation

NOTE: When accessing the refrigerant in the system to make repairs or for any other purpose, conventional procedures shall be used. However, for FLAMMABLE REFRIGERANTS (R-32 is classified in the A2L group for mildly flammable refrigerants) it is important that best practice is followed since flammability is a consideration. Follow all EPA 608 regulations and procedures along with AHRI 15 Best Practices for A2L refrigerants.



Warning: Ensure sufficient ventilation at the repair place.



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



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

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

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

1. Install a piercing valve to recover refrigerant from the sealed system. (Piercing valve must be removed from the system before recharging.)
2. Recover refrigerant to EPA sec. 608 standards. If a low charge is suspected weigh recovered refrigerant and compare to unit nameplate.

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

3. Flush refrigerant out of system with a dry nitrogen purge, make sure you energize and de-energize all reversing valves and solenoid valves to release any trapped refrigerant.(3-5 minutes).
4. Perform an evacuation to 29.9 in. hg. and break vacuum with Dry Nitrogen.
5. Re-purge the unit for 3-5 mins or until the nitrogen flows out both process tubes.
6. Re-evacuate unit to 29.9 in. hg. and break vacuum with Dry Nitrogen.
8. Open the refrigerant circuit by cutting out components.
9. Cut off the crimp on the process tubes and install a 5/16 copper access fitting to the process tube.

Transportation

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

R-32 SEALED SYSTEM REPAIR

Component Replacement/Brazing

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

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

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

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

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

1. Remove and recover refrigerant, and evacuate the system. Refer to the [refrigerant removal, recovery, and evacuation section](#) of this manual.

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

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

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

NOTE: Sealed system repairs require the installation of a liquid line drier upstream of the condenser.

NOTE: Sealed system repairs to models with a heat pump require the installation liquid line drier on the cooling liquid line.

Refer to Figure 701 for installation location of liquid line drier on unit with heat pump.

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

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

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

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

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

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

R-32 SEALED SYSTEM REPAIRS

Refrigerant Charging

WARNING: Electrical Shock Hazard

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



WARNING: This Product uses R-32 Refrigerant

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

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

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.



Refrigerant
Safety Group
A2L

WARNING: Refrigeration System under High pressure

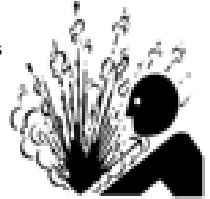
Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R32 systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.

WARNING: Freeze Hazard

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



to



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

Warning:

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

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. Refer to the [Refrigerant removal section](#) of this manual for procedures.

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

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

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

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

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

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

NOTE: Access valves must be removed after charging is complete to return this unit to a sealed system.

2. Weigh in the refrigerant charge with the proper quantity of R-32 refrigerant per model nameplate.
3. Crimp the process tube and solder the end shut.
4. Start unit, and verify performance.

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

R-32 SEALED SYSTEM REPAIRS

Compressor Replacement

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

2. Recover all refrigerant from the system through the process tubes. Refer to [Refrigerant Removal, Recovery, and Evacuation](#) Section of this manual).

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

3. After all refrigerant has been recovered, cut 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, refer to [Compressor Replacement -Special Procedure in Case of Compressor Burnout](#).

7. Install the replacement compressor.

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

8. Braze all connections. Refer to the [Component Replacement/Brazing section](#) of this manual.

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

⚠ 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 PPE must be utilized 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.

R-32 SEALED SYSTEM REPAIRS

Compressor Replacement -Special Procedure in Case of Compressor Burnout

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

2. Cut and remove compressor and fixed orifice from the system.

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

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

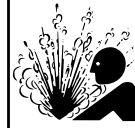
4. Reassemble the system, including a new metering device and strainers.

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

6. Braze all connections. [Refer to the Brazing section of this manual.](#)

7. Charge system with proper amount of refrigerant per the model nameplate. [Refer to the refrigerant charging section of this manual.](#)

⚠ WARNING



HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

Proper safety procedures must be followed, and PPE must be utilized 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-32 SEALED SYSTEM REPAIR

Replace The Reversing Valve

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

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

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

1. Recover all refrigerant from the system through the process tubes. Refer to [Refrigerant Removal, Recovery, and Evacuation](#) Section of this manual).

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

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

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

Wrap the 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.

3. Cut all lines from reversing valve. [Refer to the Brazing section of this manual.](#)

4. Clean all excess braze from all tubing so that they will slip into fittings on new valve.

5. Remove solenoid coil from new valve.

6. Protect new valve body from heat while brazing with plastic heat sink (Thermo Trap) or wrap valve body with wet rag.

7. Fit all lines into new valve and braze lines into new valve.

8. Braze all connections. Refer to the [Brazing section of this manual.](#)

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

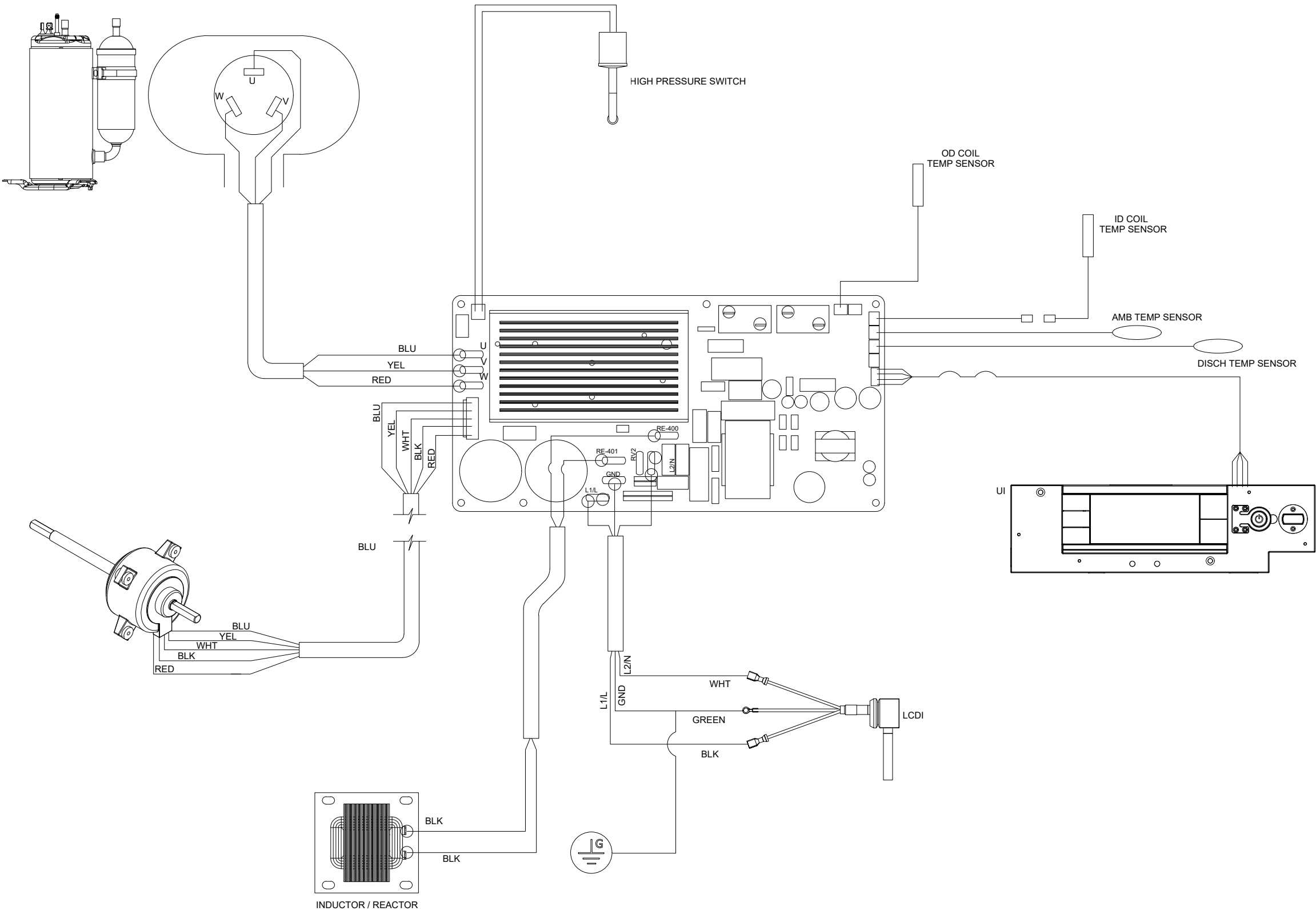
10. Once the sealed system is leak free, install solenoid coil on new valve.

11. Charge system with proper amount of refrigerant per the model nameplate. Refer to the [refrigerant charging section of this manual.](#)

WIRING DIAGRAMS

Figure 901

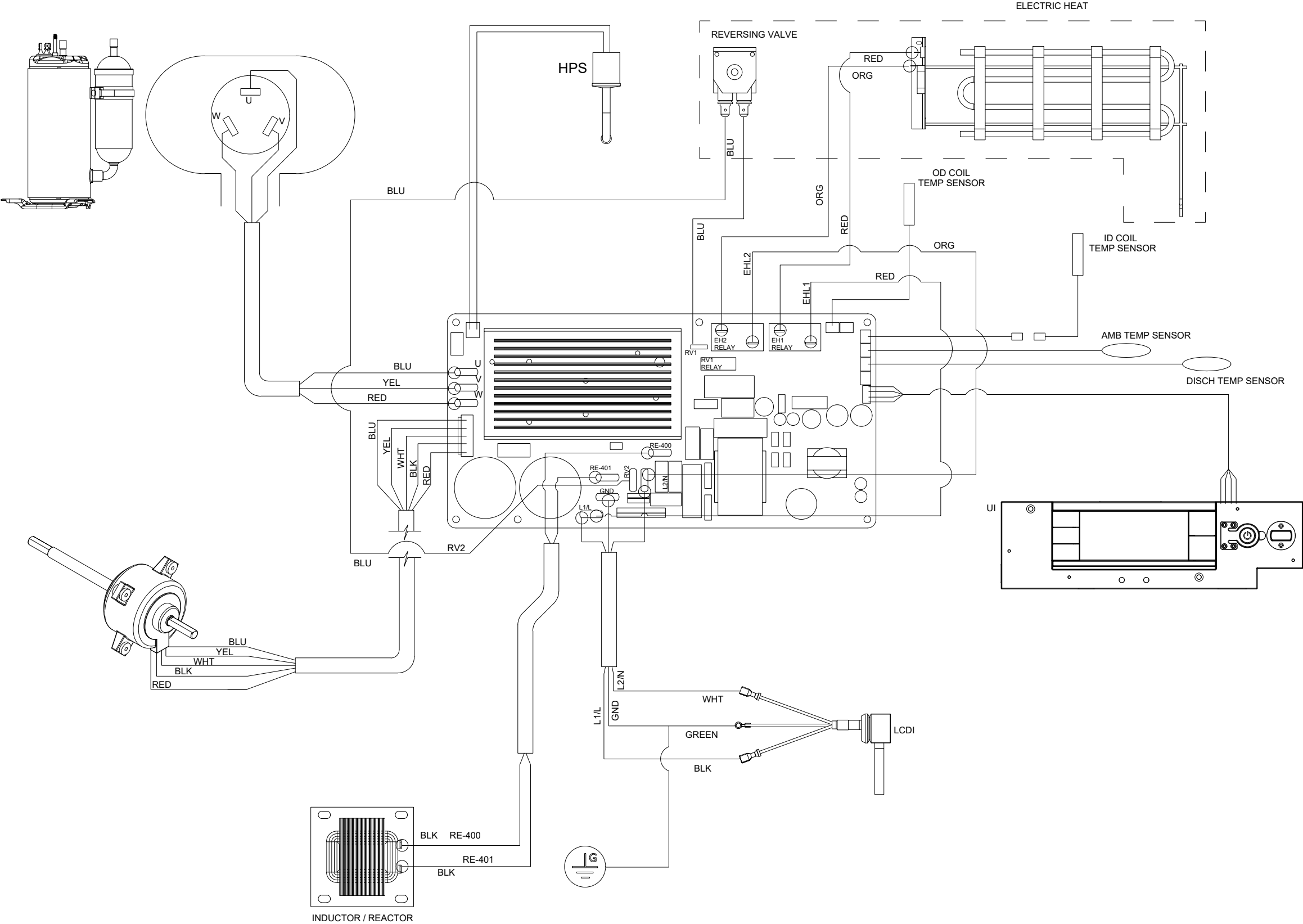
KCVS08B10A
KCVS12B10A
KCVM14B10A
KCVS12B30A
KCVS16B30A
WCVT12B10A
WCVT10B10A
WCVT10B30A
WCVT12B30A
WCVT16B30A



WIRING DIAGRAMS

Figure 902

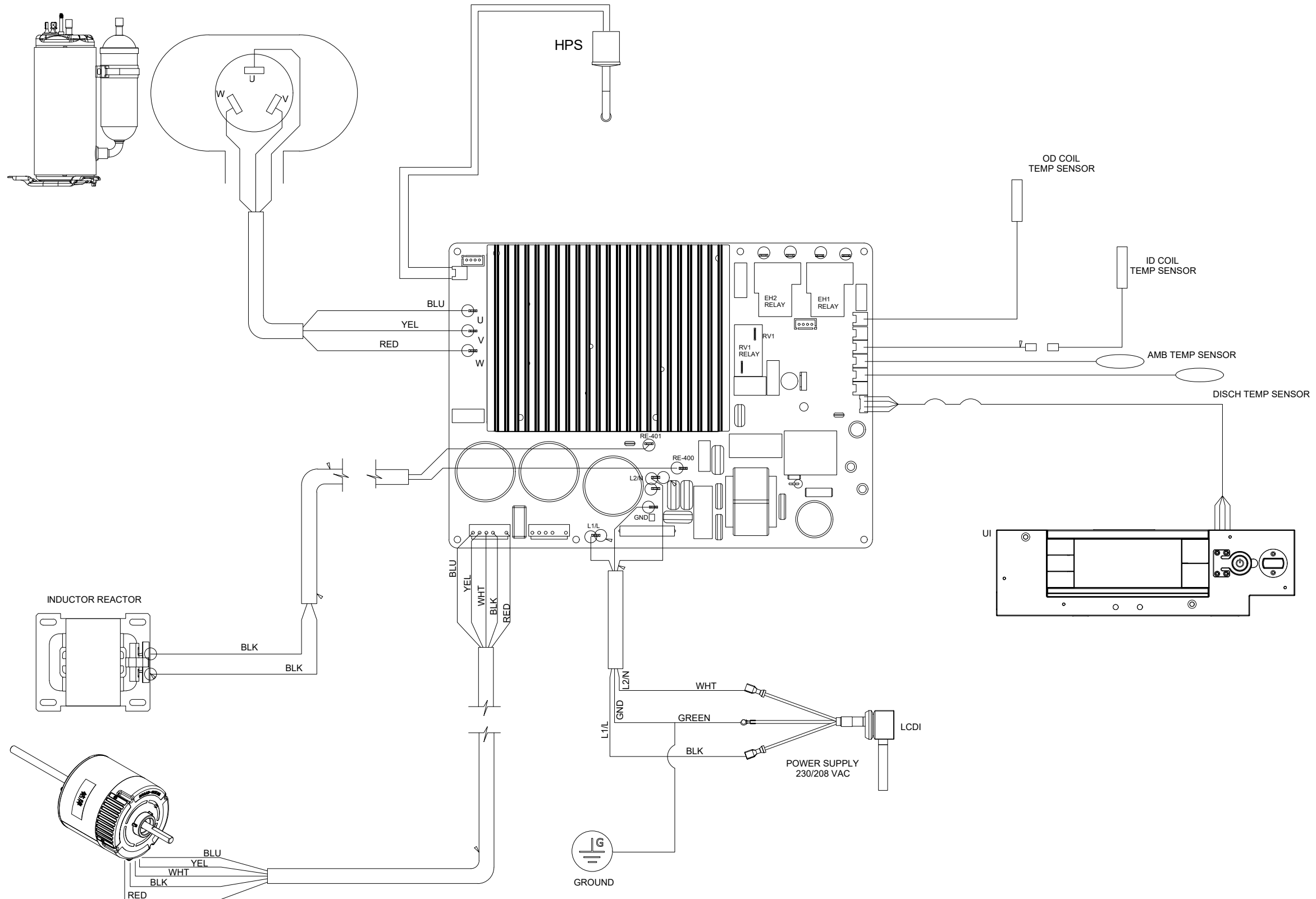
KHVS10B11A
KHVS12B33A
WHVT14B33A
KHVQ10B11A



WIRING DIAGRAMS

Figure 903

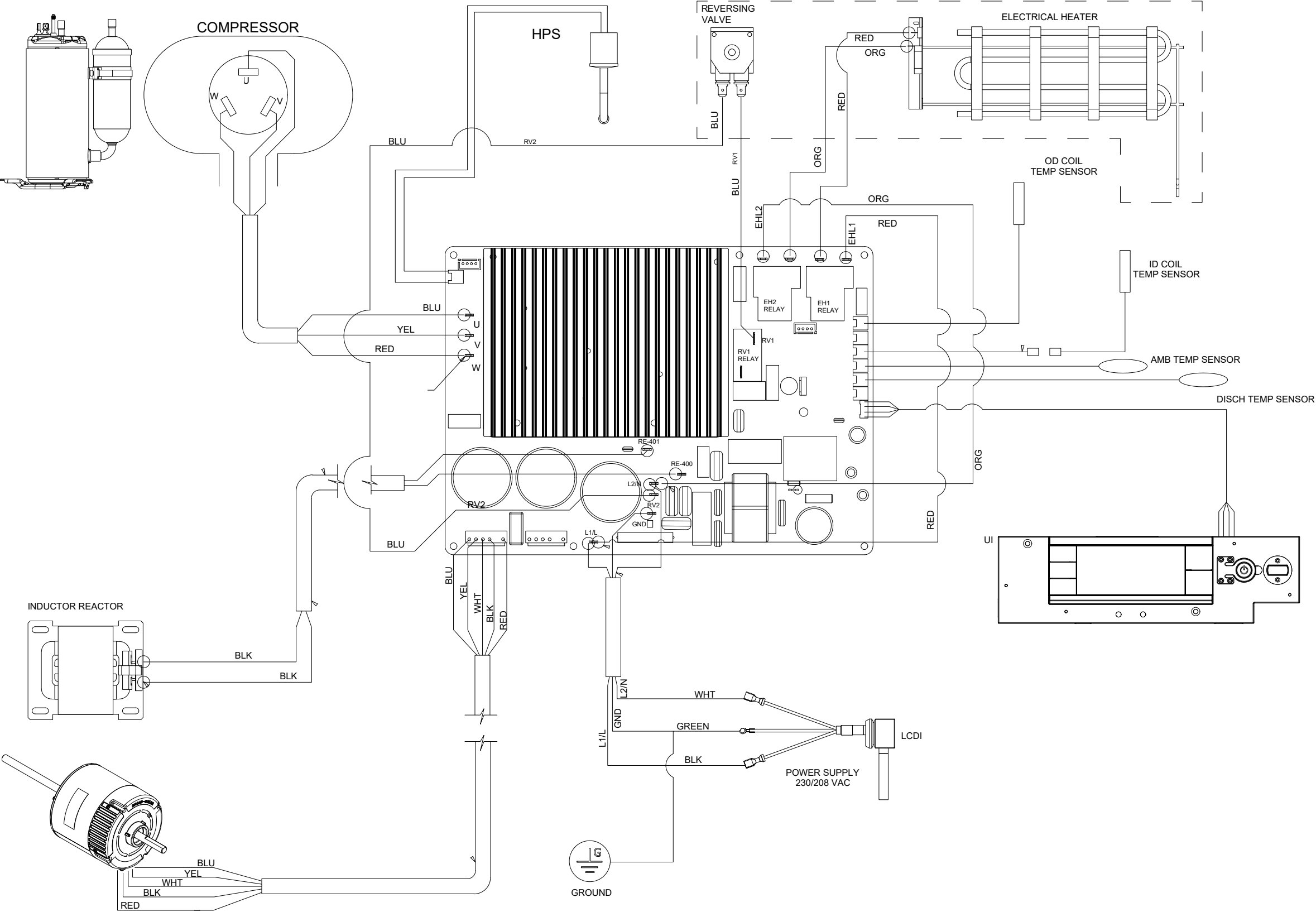
KCVM18B30A
KCVM24B30A
KCVL28B30A
KCVL36B30A



WIRING DIAGRAMS

Figure 904

KHVM24B34A
KHVL28B35A



APPENDIX

Available Accessories-Kühl

FreshAir® IAQ

MERV 13 Filters/Filter Brackets

Kühl® air conditioners can utilize an optional FreshAir® MERV 13 air filter that's effective at capturing and removing microorganisms from the air, which according to ASHRAE¹, the leading authority on the science behind advanced indoor air quality, include harmful airborne viruses.

¹Based on ASHRAE Guidance for Building Operations during the COVID-19 Pandemic.

Model No.	UPC	Description
KMFB1PK	724587440553	Kühl MERV filter bracket 1 pack
KMFBQ1PK	724587440546	Kühl Q MERV filter bracket 1 pack
KMFQ3PK	724587440560	Kühl MERV filter – Q chassis 3 pack
KMFS3PK	724587440577	Kühl MERV filter – S chassis 3 pack
KMFM3PK	724587440584	Kühl MERV filter – M chassis 3 pack
KMFL3PK	724587440591	Kühl MERV filter – L chassis 3 pack

NOTE: Filter bracket required for MERV 13 filter installation; Minimum bracket order of 24; Minimum filter order quantity of eight.



Window Mounting Kits²: Kühl®+

Window kits are included with cooling only models, but are an accessory item for Kühl®+ heat/cool models.

Heat / Cool Models	Kit No.
KHVQ10B11A ³	KWIKQA
KHS10B10A, KHVS10B11A, KHVS12B33A, KEVS16B33A	KWIKSB
KHVM24B34A	KWIKMB
KHVL28B35A, KEVL36B35A	KWIKLB

²Window kits are required for installation of Kühl®+ models in a window.

³Does not include window brackets.



KWIKQA



KWIKSB, KWIKMB, KWIKLB

Drain Kit

Drain kits allow the field-installed drain tube to be installed to the bottom of the sleeve to route the condensate from the unit.

Model	Kit No.
All Kühl® Series Models	DC2



Premium Carbon Filters

Premium carbon filters remove odors and volatile organic compounds (VOC) and can achieve up to a MERV 6 rating when used with a standard filter.

NOTE: Sold as a 3 pack.

Model	Kit No.
KCVQ and KHVQ	KWCFQ
KCVS, KHVS, and KEVS	KWCFB
KCVM and KHVM	KWCFM
KCVL, KHLV, and KEL	KWCFL



APPENDIX

Available Accessories-Wallmaster

WSE Sleeve/Exterior Grilles



Standard Grille

Premium, expanded metal grille with powder coat paint. Ships with WSE sleeve.



Optional Architectural Grille – AG

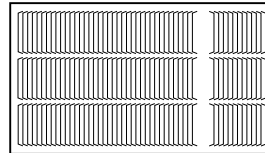
Premium extruded aluminum grille.

IMPORTANT:

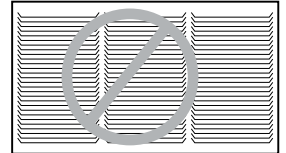
Operating the air conditioner with incorrect rear grille or without Baffle Adapter Kit (on 19 $\frac{3}{4}$ " deep sleeve) will recirculate discharge air and cause compressor overload to trip.

This will cause the unit to shut down temporarily and may lead to premature compressor failure.

CORRECT: Vertical Louvers



INCORRECT: Horizontal Louvers



WSE Wall Sleeve

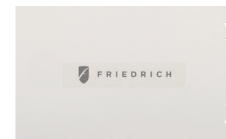
Ships with standard grille (shown above) and standard galvanized steel inner panel and painted steel outer panel.



WSE sleeve



Steel inner panel



Outer weather panel

Installation Accessories

DK (Drain Kit)

Installed at the back of the unit and allows for attachment to condensate disposal system, if necessary or desired.



IDK (Internal Drain Kit)

New construction applications where a condensate drain system has been built into the wall interior.



BAK (Baffle Adapter Kit)

Necessary when installing in a sleeve deeper than 16 $\frac{3}{4}$ " deep, such as Fedders B sleeve (19 $\frac{3}{4}$ " deep).



APPENDIX

Interactive Parts Viewer

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

Please click on the link below:

[Interactive Parts Viewer](#)

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

Limited Warranty

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

APPENDIX

Thermistor Resistance Values (This Table Applies to All Thermistors)

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

Figure 711 Thermistor Values

APPENDIX

Friedrich authorized parts depots

United Products Distributors Inc.

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

Shivani Refrigeration & 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