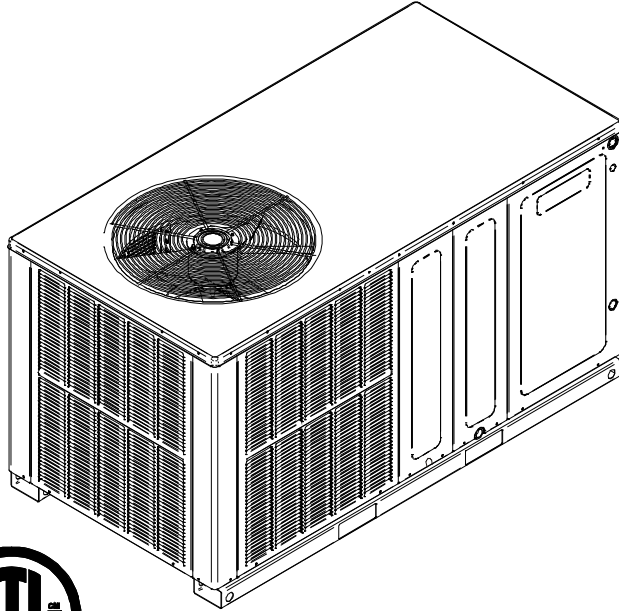


INSTALLATION INSTRUCTIONS FOR *PHH5 15.2 SEER2 “H” SERIES SELF-CONTAINED PACKAGE HEAT PUMP UNITS WITH R-410A



ATTENTION INSTALLING PERSONNEL

Prior to installation, thoroughly familiarize yourself with this Installation Manual. Observe all safety warnings. During installation or repair, caution is to be observed.

It is your responsibility to install the product safely and to educate the customer on its safe use.



These installation instructions cover the outdoor installation of self contained package air conditioner and heating units. See the Specification Sheets applicable to your model for information regarding accessories.

***NOTE:** Please contact your distributor or our website for the applicable Specifications Sheets referred to in this manual.



WARNING

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR (HEREINAFTER, “SERVICE”) THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

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Our continuing commitment to quality products may mean a change in specifications without notice.

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TO THE INSTALLER

Carefully read all instructions for the installation prior to installing unit. Make sure each step or procedure is understood and any special considerations are taken into account before starting installation. Assemble all tools, hardware and supplies needed to complete the installation.

Some items may need to be purchased locally. After deciding where to install unit, closely look the location over - both the inside and outside of home. Note any potential obstacles or problems that might be encountered as noted in this manual. Choose a more suitable location if necessary.

IMPORTANT NOTE: IF A CRANKCASE HEATER IS USED, THE UNIT SHOULD BE ENERGIZED 24 HOURS PRIOR TO COMPRESSOR START UP TO ENSURE CRANKCASE HEATER HAS SUFFICIENTLY WARMED THE COMPRESSOR. COMPRESSOR DAMAGE MAY OCCUR IF THIS STEP IS NOT FOLLOWED.

Before using this manual, check the serial plate for proper model identification.

The installation and servicing of this equipment must be performed by qualified, experienced technicians only.

SHIPPING INSPECTION

CHECKING PRODUCT RECEIVED

Upon receiving the unit, inspect it for damage from shipment. Claims for damage, either shipping or concealed, should be filed immediately with the shipping company. Check the unit model number, specifications, electrical characteristics and accessories to determine if they are correct. In the event an incorrect unit is shipped, it must be returned to the supplier and must NOT be installed. The manufacturer assumes no responsibility for installation of incorrectly shipped units.

MESSAGE TO THE HOMEOWNER

These instructions are addressed primarily to the installer; however, useful maintenance information is included and should be kept, after installation, for future reference.

REPLACEMENT PARTS

ORDERING PARTS

When reporting shortages or damages, or ordering repair parts, give the complete unit model and serial numbers as stamped on the unit's nameplate. Replacement parts for this appliance are available through your contractor or local distributor. For the location of your nearest distributor, consult the white business pages, the yellow page section of the local telephone book or contact:

HOMEOWNER SUPPORT
GOODMAN MANUFACTURING COMPANY, L.P.
19001 KERMIER ROAD WALLER
WALLER, TEXAS 77484
855-770-5678

IMPORTANT SAFETY INSTRUCTIONS

RECOGNIZE SAFETY SYMBOLS, WORDS, AND LABELS

The following symbols and labels are used throughout this manual to indicate immediate or potential hazards. It is the

owner's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of serious personal injury or death, property damage and/or product damage.



WARNING

TO AVOID PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, DO NOT USE THIS UNIT IF ANY PART HAS BEEN UNDER WATER. IMMEDIATELY CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE FURNACE AND TO REPLACE ANY PART OF THE CONTROL SYSTEM AND ANY GAS CONTROL HAVING BEEN UNDER WATER.



WARNING

THIS UNIT MUST NOT BE USED AS A "CONSTRUCTION HEATER" DURING THE FINISHING PHASES OF CONSTRUCTION ON A NEW STRUCTURE. THIS TYPE OF USE MAY RESULT IN PREMATURE FAILURE OF THE UNIT DUE TO EXTREMELY LOW RETURN AIR TEMPERATURE AND EXPOSURE TO CORROSIVE OR VERY DIRTY ATMOSPHERES.



WARNING

TO PREVENT THE RISK OF PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH, DO NOT STORE COMBUSTIBLE MATERIALS OR USE GASOLINE OR OTHER FLAMMABLE LIQUIDS OR VAPORS IN THE VICINITY OF THIS APPLIANCE.



WARNING

DO NOT CONNECT TO OR USE ANY DEVICE THAT IS NOT DESIGN CERTIFIED BY THE MANUFACTURER FOR USE WITH THIS UNIT. SERIOUS PROPERTY DAMAGE, PERSONAL INJURY, REDUCED UNIT PERFORMANCE AND/OR HAZARDOUS CONDITIONS MAY RESULT FROM THE USE OF SUCH NON-APPROVED DEVICES.



WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



WARNING

CONNECTING UNIT DUCT WORK TO UNAUTHORIZED HEAT PRODUCING DEVICES SUCH AS A FIREPLACE INSERT, STOVE, ETC. MAY RESULT IN PROPERTY DAMAGE, FIRE, CARBON MONOXIDE POISONING, EXPLOSION, PERSONAL INJURY OR DEATH.



WARNING

THIS PRODUCT CONTAINS OR PRODUCES A CHEMICAL OR CHEMICALS WHICH MAY CAUSE SERIOUS ILLNESS OR DEATH AND WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

CODES AND REGULATIONS

GENERAL

The *PHH series heat pumps are designed for OUTDOOR USE ONLY. This series is available in cooling Capacities of 2, 2 ½, 3, 3 ½, 4 and 5 nominal tons of cooling. Optional field installed heat kits are available in 5,8,10,15 and 20 KW. The units can be easily installed in manufactured or modular homes with existing high-static duct work. The units can also be easily converted to accommodate a plenum for normal or low-static applications. The *PC & *PH series are self contained packaged units so the only connections needed for installation are the supply and return ducts, the line and low voltage wiring and drain connection. Rated performance is achieved after 20 hours of operation. Rated performance is delivered at the specified airflow. See outdoor unit specification sheet for split system models or product specification sheet for packaged and light commercial models. Specification sheets can be found at www.goodmanmfg.com for Goodman® brand products or www.amana-hac.com for Amana® brand products. Within either website, please select the residential or commercial products menu and then select the submenu for the type of product to be installed, such as air conditioners or heat pumps, to access a list of product pages that each contain links to that model's specification sheet.

EPA REGULATIONS

IMPORTANT: THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA) HAS ISSUED VARIOUS REGULATIONS REGARDING THE INTRODUCTION AND DISPOSAL OF REFRIGERANTS IN THIS UNIT. FAILURE TO FOLLOW THESE REGULATIONS MAY HARM THE ENVIRONMENT AND CAN LEAD TO THE IMPOSITION OF SUBSTANTIAL FINES. BECAUSE REGULATIONS MAY VARY DUE TO PASSAGE OF NEW LAWS, WE SUGGEST A CERTIFIED TECHNICIAN PERFORM ANY WORK DONE ON THIS UNIT. SHOULD YOU HAVE ANY QUESTIONS PLEASE CONTACT THE LOCAL OFFICE OF THE EPA.

NATIONAL CODES

This product is designed and manufactured to permit installation in accordance with National Codes. It is the installer's responsibility to install the product in accordance with National Codes and/or prevailing local codes and regulations.

MAJOR COMPONENTS

GENERAL

The unit includes a hermetically sealed refrigerating system (consisting of a compressor, condenser coil, evaporator coil with flowrator), an indoor blower, a condenser fan and all necessary internal electrical wiring. The heat pump also includes a reversing valve, solenoid, defrost thermostat and control and loss of charge protection. The system is factory-evacuated, charged and performance tested. Refrigerant amount and type are indicated on rating plate.

INSTALLATION

PRE-INSTALLATION CHECKPOINTS

Before attempting any installation, the following points should be considered:

- Structural strength of supporting members
- Clearances and provision for servicing
- Power supply and wiring
- Air duct connections
- Drain facilities and connections
- Location may be on any four sides of a home, manufactured or modular, to minimize noise

CLEARANCE

The unit is designed to be located outside the building with unobstructed condenser air inlet and discharge. Additionally, the unit must be situated to permit access for service and installation. Condenser air enters from three sides. Air discharges upward from the top of the unit. Refrigerant gauge connections are made on the right side of the unit as you face the compressor compartment. Electrical connections can be made either on the right or left sides of the unit. The best and most common application is for the unit to be located 10" from wall (4" minimum) with the connection side facing the wall. This "close to the wall" application minimizes exposed wiring.

Close to the wall application assures free, unobstructed air to the other two sides. In more confined application spaces, such as corners provide a minimum 12" clearance on all air inlet sides. Allow 36" minimum for service access to the compressor compartment and controls. The top of the unit should be completely unobstructed. If units are to be located under an overhang, there should be a minimum of 48" clearance and provisions made to deflect the warm discharge air out from the overhang.

LOCATION

Consider the effect of outdoor fan noise on conditioned space and any adjacent occupied space. It is recommended that the unit be placed so that condenser air discharge does not blow toward windows less than 25 feet away.

The unit should be set on a solid, level foundation - preferably a concrete slab at least 4 inches thick. The slab should be above ground level and surrounded by a graveled area for good drainage. Any slab used as a unit's foundation should not adjoin the building as it is possible that sound and vibration may be transmitted to the structure. For rooftop installation, steel or treated wood beams should be used as unit support for load distribution.

Heat pumps require special location consideration in areas of heavy snow accumulation and/or areas with prolonged continuous subfreezing temperatures. Heat pump unit bases have holes under the outdoor coil to permit drainage of defrost water accumulation. The unit must be situated to permit free unobstructed drainage of the defrost water and ice. A minimum 2" clearance under the outdoor coil is required in the milder climates.

Heat Pump Elevation Chart	
Design Temperature	Suggested Minimum Elevation
+ 15° and above	2 - 1/2"
-5° to + 14°	8"
Below -5°	12"

OUTSIDE SLAB INSTALLATION (FIGURE 1)

1. The unit must be mounted on a solid, level foundation.
2. Select a location that will minimize the length of the supply and return ducts.
3. Select a location where external water drainage cannot collect around the unit.
4. Consideration should also be given to shade, appearance and noise.

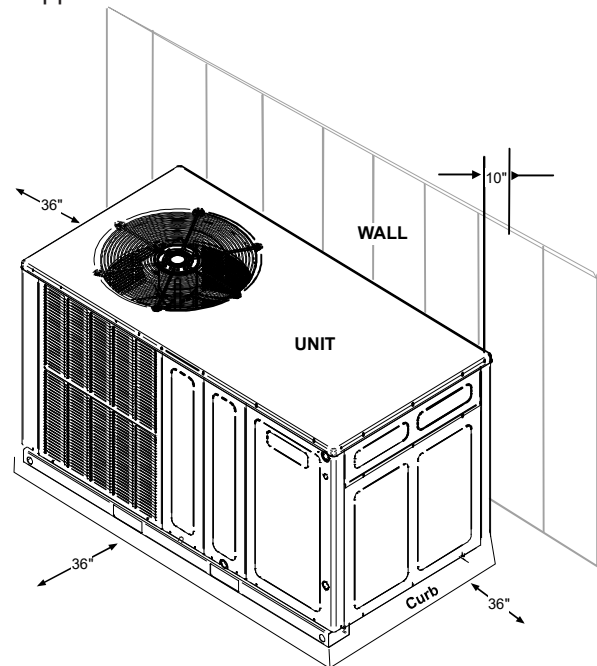


FIGURE 1

ROOFTOP INSTALLATION (FIGURE 2)

1. Before locating the unit on the roof, make sure that the strength of the roof and beams is adequate to support the weight involved (See specification sheet for weight of units). This is very important and the installer's responsibility.
2. Make proper consideration for the weather-tight integrity of the roof and proper drainage of condensate.
3. To ensure proper condensate drainage, unit must be installed in a level position.

4. Consideration should also be given to shade, appearance and noise.

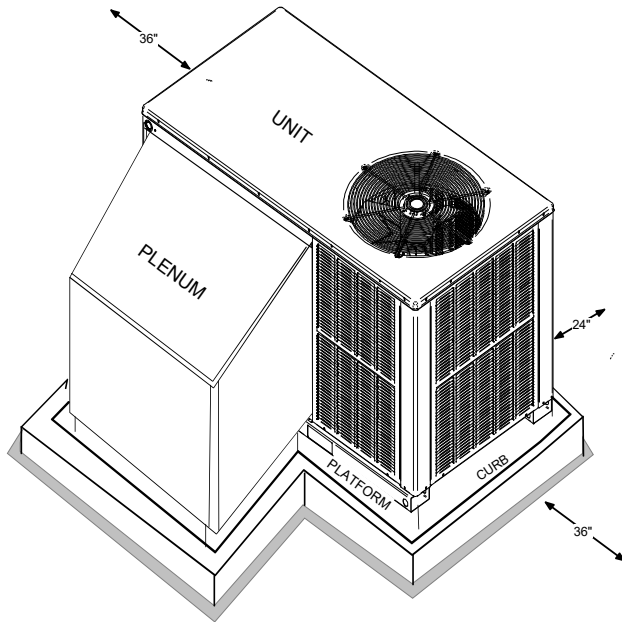


FIGURE 2

RIGGING

RIGGING DETAILS



WARNING

TO PREVENT PROPERTY DAMAGE, THE UNIT SHOULD REMAIN IN AN UPRIGHT POSITION DURING ALL RIGGING AND MOVING OPERATIONS. TO FACILITATE LIFTING AND MOVING WHEN A CRANE IS USED, PLACE THE UNIT IN AN ADEQUATE CABLE SLING.



CAUTION

IF UNITS ARE LIFTED TWO AT A TIME, THE FORK HOES ON THE CONDENSER END OF THE UNIT MUST NOT BE USED. MINIMUM FORK LENGTH IS 42" TO PREVENT DAMAGE TO THE UNIT; HOWEVER, 48" IS RECOMMENDED.

NOTE: PROVISIONS FOR FORKS HAVE BEEN INCLUDED IN THE UNIT BASE FRAME. NO OTHER FORK LOCATIONS ARE APPROVED.



WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

Unit must be lifted by the four lifting holes located at the base frame corners.

- Lifting cables should be attached to the unit with shackles.
- The distance between the crane hook and the top of the unit must not be less than 60".

- Two spreader bars must span over the unit to prevent damage to the cabinet by the lift cables. Spreader bars must be of sufficient length so that cables do not come in contact with the unit during transport. Remove wood struts mounted beneath unit base frame before setting unit on roof curb. These struts are intended to protect unit base frame from fork lift damage. Removal is accomplished by extracting the sheet metal retainers and pulling the struts through the base of the unit. Refer to rigging label on the unit.

Refer to the Roof Curb Installation Instructions for proper curb installation. Curbing must be installed in compliance with the National Roofing Contractors Association Manual.

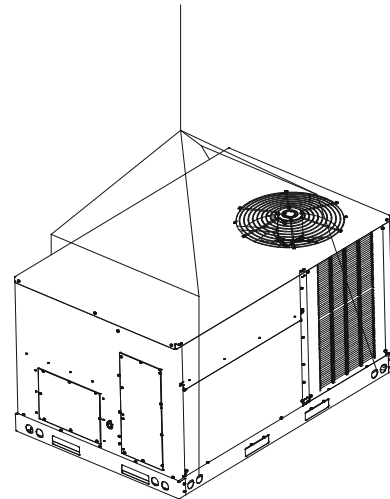


FIGURE 3



WARNING

DO NOT, UNDER CIRCUMSTANCES, CONNECT RETURN DUCTWORK TO ANY OTHER HEAT PRODUCING DEVICES SUCH AS A FIREPLACE INSERT, STOVE, ETC. UNAUTHORIZED USE OF SUCH DEVICES MAY RESULT IN PROPERTY DAMAGE, FIRE, CARBON MONOXIDE POISONING, EXPLOSION, PERSONAL INJURY OR DEATH.

DUCTING

Ducting work should be fabricated by the installing contractor in accordance with local codes. Industry manuals may be used as a guide when sizing and designing the duct system - such as NESCA (National Environmental Systems Contractors Association, 1501 Wilson Blvd., Arlington, Virginia 22209).

The unit should be placed as close as possible to the space to be air-conditioned allowing clearance dimensions as indicated. Ducts should run as directly as possible to supply and return outlets. Use of non-flammable weatherproof flexible connectors on both supply and return connections at the unit to reduce noise transmission is recommended.

It is preferable to install the unit on the roof of the structure if the registers or diffusers are located in the wall or ceiling. A slab installation is recommended when the registers are low on the wall or in the floor.

CONNECTING THE RETURN AND SUPPLY FLEXIBLE DUCT IN MANUFACTURED OR MODULAR HOUSING APPLICATION

The return and supply fittings are to be attached at the unit to a suitable square to round duct converter. Your distributor has a factory designed square to round converter transition. The model #'s of these kits are as follows: Small Chassis 25" SQRPCH101, Medium Chassis 27.5" SQRPCH102, Large and Extra Large Chassis 32.5" and 36" SQRPCH103 (See Specification Sheets for Dimension details). The SQRPCH101 has 14" duct collar on supply and 16" duct collar (equivalent diameter, opening is oval) on the return. The SQRPCH102 and SQRPCH103 have 14" duct collar on supply and 18" duct collar (equivalent diameter, opening is oval) on the return. The collars are to be slipped into the openings, and the flanges bent around the converter. The square to round converter is attached to the flanges of the square duct openings. The flexible duct is then clamped on to the collars. Once the duct is affixed to the unit, seal the collars and flanges with a proper waterproof sealant (See Figure 4).

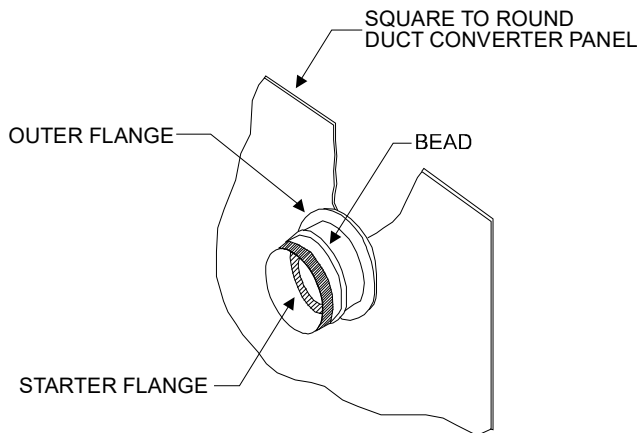


FIGURE 4

It is strongly encouraged to use appropriately sized ducts based upon the CFM for your application (unit's CFM). If duct sizing through industry manuals or air duct calculators require larger ducts than converter openings, run larger duct size up to unit converter openings and reduce with a reducer duct fitting or transition right at the unit.

PLENUM APPLICATION

A suitable plenum or square duct must be constructed. The duct cross-sectional area should be determined by industry duct sizing manuals or air duct calculators.

On ductwork exposed to outside air conditions of temperature and humidity, use an insulation with a good K factor, and a vapor barrier. Industry practices should be followed. Balancing dampers are recommended for each branch duct in the supply system. Ductwork should be properly supported from the unit.

NOTE: PROPER SEALING OF ALL DUCT WORK AND AIR HANDLING COMPARTMENTS IS EXTREMELY IMPORTANT TO OVERALL UNIT EFFICIENCY.

FILTERS

Filters are not provided with unit, and must be supplied and installed in the return duct system by the installer. A field installed filter grille is recommended for easy and convenient access to the filters for periodic inspection and cleaning. Filters must have adequate face area for the rated quantity of the unit. See air delivery tables (Figure 5) for recommended filter size.

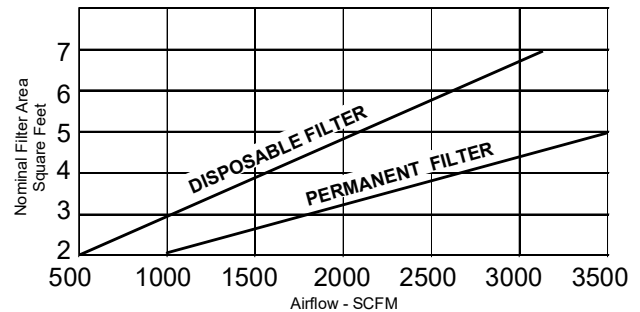


FIGURE 5

MINIMUM FILTER SIZE	
NOMINAL SIZE (INCHES)	NOMINAL AREA (SQ. FT.)
10x20	1.4
14x20	1.9
14x25	2.4
15x20	2.1
16x20	2.2
16x25	2.8
20x20	2.8
20x25	3.5
25x25	4.3

TABLE 1

PIPING

CONDENSATE DRAIN

The condensate drain connection of the evaporator is a half coupling of $\frac{3}{4}$ " N.P.T. A trap must be provided to have Proper condensate drainage.

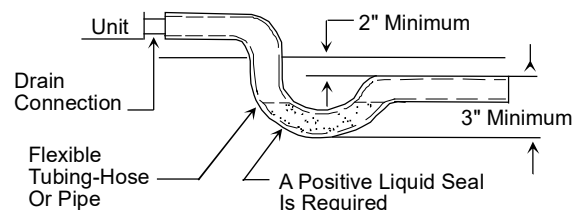


FIGURE 6

Install condensate drain trap as shown. Use $\frac{3}{4}$ " drain connection size or larger. Do not operate without trap. Unit must be level or slightly inclined toward drain.

ELECTRICAL WIRING



CAUTION

TO AVOID PROPERTY DAMAGE OR PERSONAL INJURY DUE TO FIRE, USE ONLY COPPER CONDUCTORS.

All wiring should be made in accordance with the National Electrical Code. The local Power Company should be consulted to determine the availability of sufficient power to operate the unit. The voltage, frequency, and phase at the power supply should be checked to make sure it corresponds to the unit's RATED VOLTAGE REQUIREMENT.

Install a branch circuit fused disconnect near the unit, in accordance with the N.E.C. or local codes. Wire sizes and overcurrent protection should be determined from the unit nameplate ampacity and in accordance with Table 2 (page 7) or the N.E.C. Under no circumstances should wiring be sized smaller than is recommended by either of these two sources.

Fuses smaller than that recommended on the wiring diagrams could result in unnecessary fuse failure or service calls. The use of protective devices of larger size than indicated could result in extensive damage to the equipment. The manufacturer bears no responsibility for damage caused to equipment as result of the use of larger than is recommended size protective devices.

All units have undergone a run test prior to packaging for shipment. This equipment has been started at minimum rated voltage and checked for satisfactory operation. Do not attempt to operate this unit if the voltage is not within the minimum and maximum voltages shown on nameplate.

The units are designed for operation on 60 hertz current and at voltages as shown on the rating plate. All internal wiring in the unit is complete. It is necessary to bring in the power supply to the contactor as shown on the unit wiring diagram which is supplied with each unit. The low voltage wiring must be connected between the unit control panel and the room thermostat.

All exterior wiring must be within approved weatherproof conduit. The unit must be **permanently grounded** in accordance with local codes, or in absence of local codes, with N.E.C ANSI/ NFPA NO. 70-1984 or latest edition by using ground lug in the control box.

DO NOT EXCEED THE MAXIMUM OVERCURRENT DEVICE SIZE SHOWN ON UNIT DATA PLATE.

Fuses or HACR type circuit breakers may be used where codes permit.

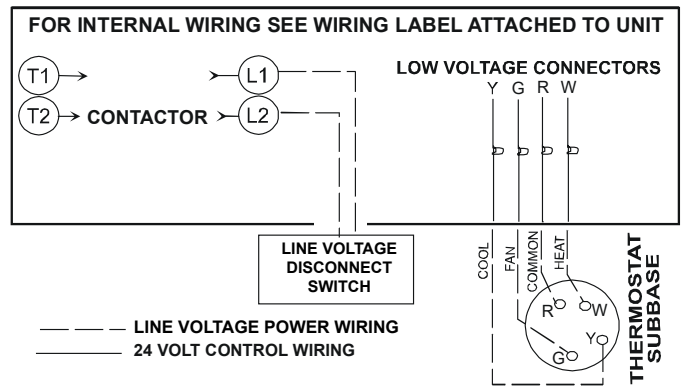


FIGURE 7

NOTE: UNITS ARE EQUIPPED WITH A SINGLE POLE CONTACTOR. CAUTION MUST BE EXERCISED WHEN SERVICING AS ONLY ONE LEG OF THE POWER SUPPLY IS BROKEN WITH THE CONTACTOR.

To wire the unit, make the following high and low voltage connections.



WARNING

HIGH VOLTAGE!

DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



LINE VOLTAGE WIRING: (SEE FIGURE 7)

Rated Voltage	Minimum Supply Voltage	Maximum Supply Voltage
208/230V	197	253

UNIT VOLTAGE

NOTE: THE UNIT TRANSFORMER IS FACTORY CONNECTED FOR 230V OPERATION. IF THE UNIT IS TO OPERATE ON 208V, RECONNECT THE TRANSFORMER PRIMARY LEAD AS SHOWN ON THE UNIT WIRING DIAGRAM.

Connect incoming power leads to terminals L1 & L2 on contactor in the electrical control section, using wire sizes specified in wiring table.

BRANCH CIRCUIT AMPACITY	15	20	25	30	35	40	45	50
SUPPLY WIRE LENGTH - FEET								
200	6	4	4	4	3	3	2	2
150	8	6	6	4	4	4	3	3
100	10	8	8	6	6	6	4	4
50	14	12	10	10	8	8	6	6

TABLE 2

LOW VOLTAGE WIRING: (SEE FIGURE 7)

Heat Pumps - Connect 24V wires from the thermostat to the corresponding wires in the control box using No. 18AWG as shown in TABLE 3.

TERMINAL	THERMOSTAT
Red	R (24V)
Green	G (Fan)
Orange	O (Rev. Valve)
White	W1 (Heat, 2nd)*
Brown	W2 (Heat 3rd)*
Yellow	Y (Cool)
C (Blue)	C (Common)

*OPTIONAL FIELD INSTALLED HEAT CONNECTIONS
TABLE 3

INTERNAL WIRING:


A diagram detailing the internal wiring of this unit is located on the electrical box cover. If any of the original wire supplied with the appliance must be replaced, the wire gauge and insulation must be the same as the original wiring.


1. For branch circuit wiring (main power supply to unit disconnect), the minimum wire size for the length of the run can be determined from Table 2 using the circuit ampacity found on the unit rating plate. From the unit disconnect to unit, the smallest wire size allowable in Table 2 may be used for the ampacity, **as the Disconnect must be in sight of the unit.**
2. Wire size based on 60°C rated wire insulation and 30°C Ambient Temperature (86°F).
3. For more than 3 conductors in a raceway or cable, see the N.E.C. for derating the ampacity of each conductor.

OPERATION

START-UP PROCEDURE AND CHECKLIST

Begin with power turned off at all disconnects.


 WARNING
HIGH VOLTAGE! DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.




AIR CONDITIONER START-UP PROCEDURE

1. Turn thermostat system switch to "Cool," and fan switch to "Auto" and turn temperature setting as high as it will go.
2. Inspect all registers and set them to the normal open position.
3. Turn on the electrical supply at the disconnect.
4. Turn the fan switch to the "ON" position. The blower should operate after a 10 second delay.
5. Turn the fan switch to "Auto" position. The blower should stop after a 60 second delay.

6. Slowly lower the cooling temperature until the unit starts. The compressor, blower and fan should now be operating. Allow the unit to run 10 minutes, make sure cool air is being supplied by the unit.
7. Turn the temperature setting to the highest position, stopping the unit. The indoor blower will continue to run for 60 seconds.
8. Turn the thermostat system switch to "OFF" and disconnect all power when servicing the unit.

 WARNING
HIGH VOLTAGE! DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



HEAT PUMP START-UP PROCEDURE

1. Check the cooling mode for the heat pump in the same manner as above. The reversing valve is energized when the thermostat is placed in the cooling position. A clicking sound should be noticeable from the reversing valve. By lowering the temperature setting to call for cooling, the contractor is energized. The compressor, blower and fan should then be running. After the cooling mode is checked out, turn the thermostat system switch to "OFF".
2. Turn the thermostat system switch to "HEAT" and fan switch to "AUTO".
3. Slowly raise the heating temperature setting. When the heating first stage makes contact, stop raising the temperature setting. The compressor, blower and fan should now be running with the reversing valve in the de-energized (heating) position. After giving the unit time to settle out, make sure the unit is supplying heated air.
4. If the outdoor ambient is above 80°F, the unit may trip on its high pressure cutout when in heating mode. The compressor should stop. The heating cycle must be thoroughly checked, so postpone the test to another day when conditions are more suitable but - **DO NOT FAIL TO TEST.**
5. If the outdoor ambient is low and the unit operates properly on the heating cycle, you may check the pressure cutout operation by blocking off the indoor return air until the unit trips. If unit operates properly in the heating cycle, raise the temperature setting until the heating second stage makes contact. Supplemental resistance heat, if installed should now come on. Make sure it operates properly.
NOTE: If outdoor thermostats are installed the outdoor ambient must be below the setpoint of these thermostats for the heaters to operate. It may be necessary to jumper these thermostats to check heater operation if outdoor ambient is mild.
6. For thermostats with emergency heat switch, return to step 3. The emergency heat switch is located at

the bottom of the thermostat. Move the switch to emergency heat. The heat pump will stop, the blower will continue to run, all heaters will come on and the thermostat emergency heat light will come on.

7. If checking the unit in the wintertime, when the outdoor coil is cold enough to actuate the defrost control, observe at least one defrost cycle to make sure the unit defrosts completely.

FINAL SYSTEM CHECKS

Check to see if all supply and return air grilles are adjusted and the air distribution system is balanced for the best compromise between heating and cooling.

Check for air leaks in the ductwork.

See Sections on **Air Flow Measurement and Adjustment and Checking Charge**.

Make sure the unit is free of “rattles”, and the tubing in the unit is free from excessive vibration. Also make sure tubes or lines are not rubbing against each other or sheet metal surfaces or edges. If so, correct the trouble.

Set the thermostat at the appropriate setting for cooling and heating or automatic changeover for normal use.

Be sure the Owner is instructed on the unit operation, filter, servicing, correct thermostat operation, etc.

The foregoing “Start-up Procedure and Check List” is recommended to serve as an indication that the unit will operate normally.

COMPONENTS

1. **Contactor** - This control is activated (closed) by the room thermostat for both heating and cooling. The contactor has a 24V coil and supplies power to the compressor and outdoor fan motor.
2. **Crankcase Heater** - This item is “ON” whenever power is supplied to the unit and the crankcase heater thermostat is closed. Crankcase heater thermostat closes at 67° and opens at 85°. It warms the compressor crankcase thereby preventing liquid migration and subsequent compressor damage. The insert type heater is self regulating. It is connected electrically to the contactor L1 and L2 terminals.
3. **Condenser Motor** - This item is activated by the contactor during heating and cooling, except during defrost and emergency heat operation.
4. **Compressor** - This item is activated by the contactor for heating and cooling, except during emergency heat. It is protected by an internal overload.
5. **Contactor Relay** - This control is activated by the thermostat (24V coil) and supplies power to the contactor.
6. **Defrost Control** - The Defrost control provides time/temperature initiation and termination of the defrost

cycle. When a Defrost cycle is initiated, the defrost control shifts the reversing valve to “cooling” mode, stops the outdoor fan and brings on supplemental heat. Normally, a Defrost cycle will take only 2-3 minutes unless system is low on charge or outdoor conditions are severe (windy and cold). The defrost control also provides for a 3 minute off cycle compressor delay.

7. **Outdoor Thermostat** - These optional controls are used to prevent full electric heater operation at varying outdoor ambient (0° F-to 45° F). They are normally open above their set points and closed below to permit staging of indoor supplement heater operation. If the outdoor ambient temperature is below 0°F (-18°C) with 50% or higher RH, an outdoor thermostat (OT) must be installed and set at (0°) on the dial. Failure to comply with this requirement may result in damage to the product which may not be covered by the manufacturer's warranty.
8. **Reversing Valve Coil** - This coil is activated by the thermostat, in the cooling mode and during defrost. It positions the reversing valve pilot valve for cooling operation.
9. **Indoor Blower Motor**
Units with ECM Motors - The ECM model indoor blower motor is activated by the room thermostat by cooling/HEATING or fan ON position. The motor is energized by a 24 volt control signal (from thermostat Y, G or W) for ECM motors. ECM motors are constant torque motors with very low power consumption.
(See **Air Flow Measurement and Adjustment** for speed adjustment instructions).
10. **Blower Interlock Relay** - This relay is used to energize the blower during the electric heat operation. Some room thermostats do not energize the motor during electric heat. This relay insures blower operation when the room thermostat energizes heat. This relay has a 240 volt coil and an 8 amp contact relay. This relay is energized by the electric heat kit sequencer.

EXPLANATION AND GUIDANCE (HEAT PUMP)

The heat pump is a relatively simple device. It operates exactly as a Summer Air Conditioner unit when it is on the cooling cycle. Therefore, all the charts and data for service that apply to summer air conditioning apply to the heat pump when it is on the cooling cycle, and most apply on the heating cycle except that “condenser” becomes “evaporator”, “evaporator” becomes “condenser”, “cooling” becomes “heating”.

When the heat pump is on the heating cycle, it is necessary to redirect the refrigerant flow through the refrigerant circuit external to the compressor. This is accomplished with a reversing valve. Thus, the hot discharge vapor from the compressor is directed to the indoor coil (evaporator on the

cooling cycle) where the heat is removed, and the vapor condenses to liquid. It then goes through the expansion device to the outdoor coil (condenser on the cooling cycle) where the liquid is evaporated, and the vapor goes to the compressor.

When the solenoid valve coil is operated either from heating to cooling or vice versa, the piston in the reversing valve to the low pressure (high pressure) reverse positions in the reversing valve.

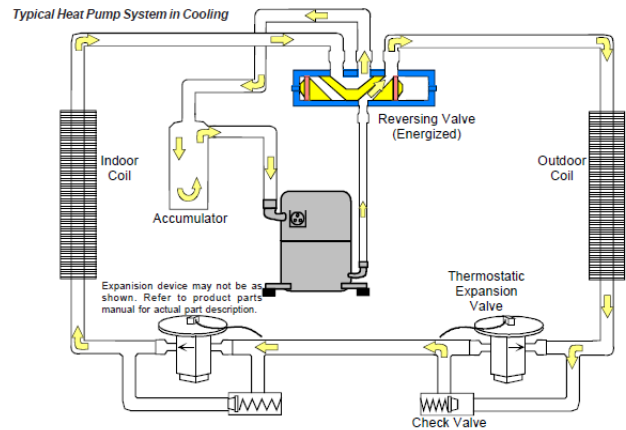
Figure 8 shows a schematic of a heat pump on the cooling cycle and the heating cycle. In addition to a reversing valve, a heat pump is equipped with an expansion device and check valve for the indoor coil, and similar equipment for the outdoor coil. It is also provided with a defrost control system. The expansion devices are flowrator distributors and perform the same function on the heating cycle as on the cooling cycle. The flowrator distributors also act as check valves to allow for the reverse of refrigerant flow.

When the heat pump is on the heating cycle, the outdoor coil is functioning as an evaporator. The temperature of the refrigerant in the outdoor coil must be below the temperature of the outdoor air in order to extract heat from the air. Thus, the greater the difference in the outdoor temperature and the outdoor coil temperature, the greater the heating capacity of the heat pump. This phenomenon is a characteristic of a heat pump. It is a good practice to provide supplementary heat for all heat pump installations in areas where the temperature drops below 45°F. It is also a good practice to provide sufficient supplementary heat to handle the entire heating requirement should there be a component failure of the heat pump, such as a compressor, or refrigerant leak, etc.

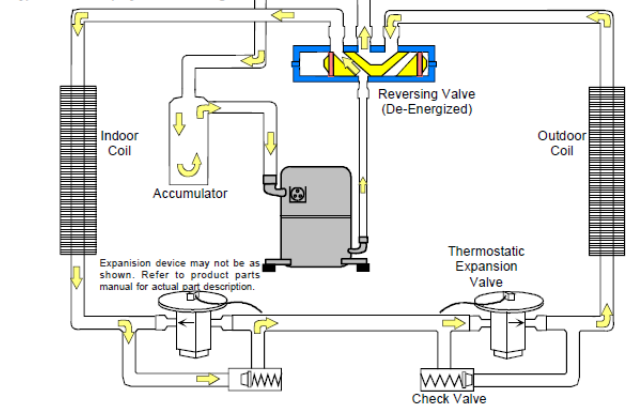
Since the temperature of the liquid refrigerant in the outdoor coil on the heating cycle is generally below freezing point, frost forms on the surfaces of the outdoor coil under certain weather conditions of temperature and relative humidity. Therefore, it is necessary to reverse the flow of the refrigerant to provide hot gas in the outdoor coil to melt the frost accumulation. This is accomplished by reversing the heat pump to the cooling cycle. At the same time, the outdoor fan stops to hasten the temperature rise of the outdoor coil and lessen the time required for defrosting. The indoor blower continues to run and the supplementary heaters are energized.

SYSTEM OPERATION

Typical Heat Pump System in Cooling



Typical Heat Pump System in Heating



HEAT PUMP REFRIGERANT CIRCUIT

FIGURE 8

DEFROST CONTROL

During operation the power to the circuit board is controlled by a temperature sensor, which is clamped to a feeder tube entering the outdoor coil. Defrost timing periods of 30, 60 and 90 minutes may be selected by setting the circuit board jumper to 30, 60 and 90 respectively. Accumulation of time for the timing period selected starts when the sensor closes (approximately $30 \pm 5^\circ\text{F}$), and when the wall thermostat calls for heat. At the end of the timing period, the unit's defrost cycle will be initiated provided the sensor remains closed. When the sensor opens (approximately $60 \pm 5^\circ\text{F}$), the defrost cycle is terminated and the timing period is reset. If the defrost cycle is not terminated due to the sensor temperature, a twelve minute override interrupts the unit's defrost period.

SUGGESTED FIELD TESTING/ TROUBLESHOOTING

TESTING DEFROST CONTROL

NOTE: PCBDM133 DEFROST CONTROLS HAVE A THREE (3) MINUTE COMPRESSOR OFF CYCLE DELAY.

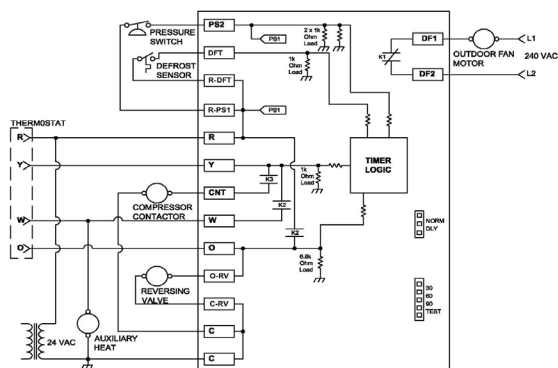
NOTE: THE PCBDM133 DEFROST CONTROLS ARE SHIPPED FROM THE FACTORY WITH THE COMPRESSOR DELAY OPTION SELECTED. THIS WILL DE-ENERGIZE THE

COMPRESSOR CONTACTOR FOR 30 SECONDS ON DEFROST INITIATION AND DEFROST TERMINATION. IF THE JUMPER IS SET TO NORMAL, THE COMPRESSOR WILL CONTINUE TO RUN DURING DEFROST INITIATION AND DEFROST TERMINATION. THE CONTROL WILL ALSO IGNORE THE LOW-PRESSURE SWITCH CONNECTED TO R-PS1 AND PS2 FOR 5 MINUTES UPON DEFROST INITIATION AND 5 MINUTES AFTER DEFROST TERMINATION.

To check the defrost control for proper sequencing, proceed as follows: With power ON; unit not running.

1. Jumper defrost thermostat by placing a jumper wire across the terminals "DFT" and "R"/"R-DFT" at defrost control board.
2. Remove jumper from timer pins and jump across test pins on defrost control board.
NOTE: Do not use screwdriver or field supplied jumper to test the control.
3. Set thermostat to call for heating. System should go into defrost within 21 seconds.
4. Immediately remove jumper from test pins.
5. Using VOM check for voltage across terminals "C & O". Meter should read 24 volts.
6. Using VOM check for voltage across fan terminals DF1 and DF2 on the board. Should read line voltage (208-230 VAC) indicating the relay is open in the defrost mode.
7. Using VOM check for voltage across "W"/"W2" & "C" terminals on the board. Should read 24 volts.
8. If not as above, replace control board.
9. Set thermostat to off position and disconnect power. Remove jumper from defrost thermostat and replace timer jumper to the desired defrost time.

NOTE: REMOVE JUMPER ACROSS DEFROST THERMOSTAT BEFORE RETURNING SYSTEM TO SERVICE.



PCBDM133 DEFROST CONTROL
FIGURE 8

TESTING DEFROST THERMOSTAT

1. Install a thermocouple type temperature test lead on the tube adjacent to the defrost control. Insulate the lead point of contact.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. It should close at approximately 30°F.

3. Check the temperature at which the control opens its contacts by raising the temperature of the control. It should open at approximately 60°F.
4. If not as above, replace control.

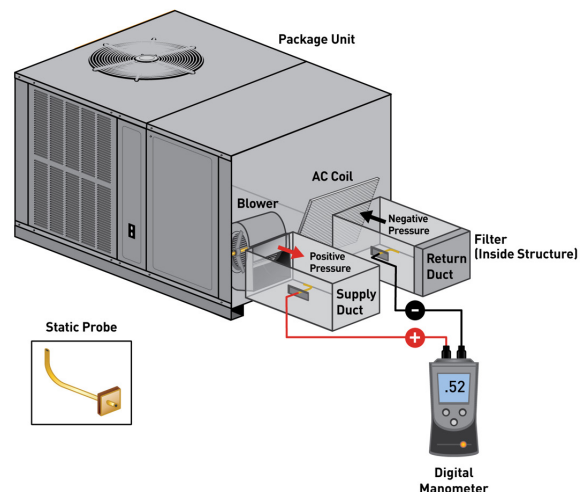
AIR FLOW MEASUREMENT AND ADJUSTMENT

After reviewing section on DUCTING, proceed with airflow measurements and adjustments. Unit's blower curves (in Specification Sheets) are based on external static pressure (ESP, in. of W.C.). The duct openings on the unit are considered internal static pressure, so as long as ESP is maintained, the unit will deliver the proper air up to the maximum static pressure listed for the CFM required by the application (i.e. home, building, etc.).

In general 400 CFM per ton of cooling capacity is a rule of thumb. Some applications depending on the sensible and latent capacity requirements may need only 350 CFM or up to 425 CFM per ton. Check condition space load requirements (from load calculations) and equipment expanded ratings data to match CFM and capacity. After unit is set and ducted, verify ESP with a 1" inclined manometer with pitot tubes or a Magnahelic gauge and confirm CFM to blower curves in the specification sheets. All units have multiple speed blower motors. If factory selected speed is not utilized, the speed tap can be changed. Never run CFM below 350 CFM per ton, evaporator freezing or poor unit performance is possible.

TOTAL EXTERNAL STATIC PRESSURE

1. Using a digital manometer measure the static pressure of the return duct at the inlet of the unit (Negative Pressure).



TOTAL EXTERNAL STATIC

2. Measure the static pressure of the supply duct (Positive Pressure).
3. Add the two readings together.
NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.
4. Consult proper table for quantity of air.

If the external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, dirty filter, undersized or poorly laid out ductwork.

ADJUSTING SPEED TAP FOR INDOOR BLOWER MOTOR

ECM Motor

The blower motor speed for the ECM motor is controlled by three 24V low voltage leads: green, yellow, and white. The green lead sets the speed for fan-only mode. The yellow lead sets the speed for cooling and heat pump heating mode (if applicable). The white lead sets the speed for electric heat mode (emergency heat and second stage heat, if applicable).

The leads are factory connected as follows: Green to T1, Yellow to T2, and White to T3. T1 is the low speed setting and is dedicated to fan-only mode. T2 is medium speed cooling and T3 is medium speed heating. T4 is high speed cooling and T5 is high speed heating. To adjust the blower speed, move the yellow and/or white wires to T4 and T5.

NOTE: IF MORE THAN ONE LEAD IS ENERGIZED AT THE SAME TIME, THE MOTOR WILL USE THE HIGHER SPEED SETTING.

NOTE: GPC15 AND GPH16 UNITS ARE RATED FOR A MAXIMUM E.S.P. OF 0.8 EXCEPT WHEN USING A 20KW ELECTRIC HEATER (THE MAXIMUM STATIC FOR 20 kW ELECTRIC HEAT IS 0.5 E.S.P.). WHEN THESE UNITS ARE INSTALLED IN THE 0.5 - 0.8 E.S.P. RANGE, THE WHITE LEAD (ELECTRIC HEAT) MUST BE MOVED TO T5 FOR PROPER OPERATION OF THE ELECTRIC HEATERS.

See CFM vs ESP tables in this manual.

DEHUMIDIFICATION WIRING

24 VOLT DEHUMIDISTAT WIRING

The optional usage of a dehumidistat allows the unit's circulator blower to operate at a slightly lower speed (approximately 80% of desired cooling speed) during a combined thermostat call for cooling and dehumidistat call for dehumidification. This can be done through an independent dehumidistat. This lower blower speed enhances dehumidification of the conditioned air as it passes through the air conditioning coil. For proper function, a dehumidistat applied to this package unit must operate on 24 VAC and utilize a switch which opens on humidity rise. Refer to the unit wiring diagram for additional wiring details.

To install/connect a dehumidistat:

1. Turn OFF power to unit.



WARNING

HIGH VOLTAGE!

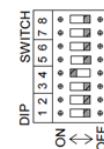
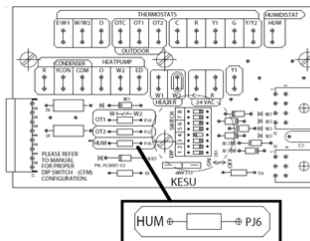
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



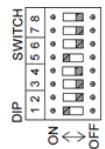
2. To enable the dehumidify function, locate the ECM blower motor interface module in the unit's blower section. Locate the jumper labeled "HUM" on the interface module. Cut the jumper to enable dehumidification (see ECM Blower Motor Interface Module).
3. Secure the dehumidistat neutral wire (typically the white lead) to the gray, unstripped wire in the unit's control box.
4. Secure the dehumidistat low voltage wire (typically the black lead) to the ignition control's "R" terminal.
5. Secure the dehumidistat ground wire (typically the green lead) to the ground screw to the unit's sheet metal control box.

NOTE: Ground wire may not be present on all dehumidistats.

6. Turn ON power to unit. Once the HUM jumper is cut at the ECM motor interface module, the dehumidify function is enabled during a combination call for cooling (T-Stat) and dehumidification (DEHUMStat).



SWITCH DETAIL FOR PCBEM12
SWITCH #1 & #2 MUST BE IN THE ON POSITION. ALL OTHER SWITCHES MUST BE IN OFF POSITION.



SWITCH DETAIL FOR PCBEM12
SWITCH #1 & #2 MUST BE IN THE ON POSITION. ALL OTHER SWITCHES MUST BE IN OFF POSITION.

ECM BLOWER MOTOR INTERFACE MODULE

REFRIGERANT CHARGE CHECK

(UNITS WITH FIXED ORIFICE DEVICES)

After completing airflow measurements and adjustments the unit's refrigerant charge must be checked. All package units with fixed orifice devices are charged using the superheat method at the compressor suction line. After superheat is adjusted it is recommended to check unit subcooling at the condenser coil liquid line out. For charge adjustments, see superheat and subcooling charts shown for each model.

SUPERHEAT CAN BE DETERMINED AS FOLLOWS:

SUPERHEAT

CHECKING SUPERHEAT

Refrigerant gas is considered superheated whenever its temperature is higher than the saturation temperature corresponding to its pressure. The degree of superheat equals the degrees of temperature increase above the saturation temperature at existing pressure.

Procedure:

1. Run system at least 10 minutes to allow pressure to stabilize.
2. Install a low side pressure gauge on the suction line access fitting.
3. Temporarily install thermometer on suction (large) line near compressor with adequate contact and insulate for best possible reading.
4. Record the gauge pressure corresponding temperature and the temperature of the suction line.
5. Refer to the superheat table for proper system superheat. Add charge to lower superheat recover charge to raise superheat.

Ambient Condenser Inlet Temp (°F Drybulb)	Return Air Temp. (°F Drybulb)				
	65	70	75	80	85
100	-	-	-	10	10
95	-	-	10	10	10
90	-	-	12	15	18
85	-	10	13	17	20
80	-	10	15	21	26
75	10	13	17	25	29
70	10	17	20	28	32
65	13	19	26	32	35
60	17	25	30	33	37

SUPERHEAT TABLE
TABLE 5

EXAMPLE:

- a. Suction Pressure = 143
- b. Corresponding Temp. °F. = 50
- c. Thermometer on Suction Line = 59°F

To obtain the degrees temperature of superheat, subtract 50.0 from 59.0°F. The difference is 9° Superheat. The 9° Superheat would fall in the ± range of allowable superheat.

SUPERHEAT = SUCTION LINE TEMP - SAT. SUCTION TEMP.

SATURATED SUCTION PRESSURE TEMPERATURE CHART	
SUCTION PRESSURE	SATURATED SUCTION TEMPERATURE °F
PSIG	R-410A
50	1
52	3
54	4
56	6
58	7
60	8
62	10
64	11
66	13
68	14
70	15
72	16
74	17
76	19
78	20
80	21
85	24
90	26
95	29
100	31
110	36
120	41
130	45
140	49
150	53
160	56
170	60

SATURATED LIQUID PRESSURE TEMPERATURE CHART	
LIQUID PRESSURE	SATURATED LIQUID TEMPERATURE °F
PSIG	R-410A
200	70
210	73
220	76
225	78
235	80
245	83
255	85
265	88
275	90
285	92
295	95
305	97
325	101
355	108
375	112
405	118
415	119
425	121
435	123
445	125
475	130
500	134
525	138
550	142
575	145
600	149
625	152

SUBCOOLING

UNITS WITH TXV DEVICES

All package units with TXV devices are charged using the SUBCOOLING method at the liquid line. After subcooling is adjusted it is recommended to check unit superheat at the evaporator coil suction line. For charge adjustments, see superheat and subcooling charts shown for each model.

Systems with TXV applications should have subcooling and superheat within the range listed on the chart.

The TXV should NOT be adjusted at light load conditions 55° to 60°F, under such conditions only the subcooling can be evaluated. This is because suction pressure is dependent on indoor air flow, and wet bulb temperature.

NOTE: Do NOT ADJUST CHARGE BASED ON SUCTION PRESSURE UNLESS THERE IS A GROSS UNDERCHARGE.

EXPANSION VALVE (TXV) SYSTEM

SINGLE SPEED APPLICATION (GPHH524-36)

Purge gauge lines. Connect service gauge manifold to access fittings. Run system at least 10 minutes to allow pressure to stabilize.

6. Temporarily install thermometer on liquid (small) line near liquid line access fitting with adequate contact and insulate for best possible reading.
7. Check subcooling and superheat. Systems with TXV application should have a subcooling and superheat within the range listed on the chart.
 - a. If subcooling and superheat are low, adjust TXV then check subcooling.
 - b. If subcooling is low and superheat is high, add charge to raise subcooling then check superheat.
 - c. If subcooling and superheat are high, adjust TXV valve then check subcooling.
 - d. If subcooling is high and superheat is low, adjust TXV valve superheat and remove charge to lower the subcooling.

The TXV should NOT be adjusted at light load conditions 55° to 60°F, under such conditions only the subcooling can be evaluated. This is because suction pressure is dependent on indoor air flow, and wet bulb temperature.

NOTE: Do NOT ADJUST CHARGE BASED ON SUCTION PRESSURE UNLESS THERE IS A GROSS UNDERCHARGE.

8. Disconnect manifold set. Installation is complete.

TWO SPEED APPLICATION (*PHH542-60)

Run the unit on low stage cooling for 10 minutes until refrigerant pressures stabilize. Follow the guidelines and methods below to check unit operation and ensure that the refrigerant charge is within limits. Charge the unit on low stage.

1. Purge gauge lines. Connect service gauge manifold to access fittings. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install thermometer on liquid (small) line near liquid line access fitting with adequate contact and insulate for best possible reading.
3. Check subcooling and superheat. Two stage systems running on low stage with TXV application should have a subcooling and superheat within the range listed on the chart.

- a. If subcooling and superheat are low, adjust TXV superheat, then check subcooling.
NOTE: To adjust superheat, turn the valve stem clockwise to increase and counter clockwise to decrease.
- b. If subcooling is low and superheat is high, add charge to raise subcooling then check superheat.
- c. If subcooling and superheat are high, adjust TXV valve superheat, then check subcooling.
- d. If subcooling is high and superheat is low, adjust TXV valve superheat and remove charge to lower the subcooling.

NOTE: Do NOT adjust the charge based on suction pressure unless there is a gross undercharge.

4. Disconnect manifold set, installation is complete.

*PHH5		
Design superheat @ 95°F outdoor ambient temperature		
Model	Superheat ± 2°F	Supercooling ± 2°F
*PHH52441	12°	-
*PHH53041	9°	-
*PHH53641	10°	-
*PHH54241	13°	15°
*PHH54841	11°	17°
*PHH56041	13°	19°

TABLE 6

ELECTRIC HEAT INSTALLATION & ADJUSTMENT

HEATER KIT

NOTE: A SEPARATE POWER SUPPLY IS REQUIRED FOR THE HKR/HKP HEATER KITS.

Refer to the Heat Kit Electrical Data (Blower Only, Heat Mode) specification table below for heater kit match up and heater kit electrical data information. See specific kit installation manual for installation instructions.

This series of electric heat pump package equipment is designed to accept a field installed electric heat kit. The unit is equipped to easily install the HKR/HKP Series Electric Heat Kit. Full Installation Instructions are included in this kit. Please use this document for guidance in field equipping the package unit with electric heat. Choose the heat kit that fits the application for the specific installation. Permanently mark the unit's nameplate with the model being installed. High and low voltage connections are detailed in the heat kit instructions. Indoor Blower motor speed tap selection may need to be modified to accommodate normal continuous operation to prevent a nuisance trip. See following tables.

Model and Heat Kit Usage	Circuit #1		Circuit #2		Single-Point Kit		Actual kW / BTU@ 240V
	MCA ¹	MOD ²	MCA ¹	MOD ²	MCA ¹	MOP ²	
*PHH52441**	4.3	---	---	---	---	---	---
HKP-05C*	21 / 25	25 / 25	---	---	46	50	4.75 / 16,200
HKR-08C*	32 / 36	35 / 40	---	---	58	60	7 / 23,800
HKP-10C*	43 / 49	45 / 50	---	---	71	80	9.5 / 32,400
*PHH53041**	4.3	---	---	---	---	---	---
HKP-05C*	21 / 25	25 / 25	---	---	48	50	4.75 / 16,200
HKR-08C*	32 / 36	35 / 40	---	---	60	60	7 / 23,800
HKP-10C*	43 / 49	45 / 50	---	---	73	80	9.5 / 32,400
HKP-15C*	43 / 49	45 / 50	21 / 25	25 / 25	97	100	14.25 / 48,600
*PHH53641**	4.3	---	---	---	---	---	---
HKP-05C*	21 / 25	25 / 25	---	---	49.8	60	4.75 / 16,200
HKR-08C*	32 / 36	35 / 40	---	---	61.5	70	7 / 23,800
HKP-10C*	43 / 49	45 / 50	---	---	74.5	80	9.5 / 32,400
HKP-15C*	43 / 49	45 / 50	21 / 25	25 / 25	99.2	100	14.25 / 48,600
*PHH54241**	6.8	---	---	---	---	---	---
HKP-05C*	21 / 25	25 / 25	---	---	53	60	4.75 / 16,200
HKR-08C*	32 / 36	35 / 40	---	---	65	70	7 / 23,800
HKP-10C*	43 / 49	45 / 50	---	---	78	80	9.5 / 32,400
HKP-15C*	43 / 49	45 / 50	21 / 25	25 / 25	102	110	14.25 / 48,600
HKP-20C	43 / 49	45 / 50	43 / 49	45 / 50	127	150	19.0 / 64,800
*PHH54841**	6.8	---	---	---	---	---	---
HKP-05C*	21 / 25	25 / 25	---	---	59	70	4.75 / 16,200
HKR-08C*	32 / 36	35 / 40	---	---	71	80	7 / 23,800
HKP-10C*	43 / 49	45 / 50	---	---	84	90	9.5 / 32,400
HKP-15C*	43 / 49	45 / 50	21 / 25	25 / 25	109	110	14.25 / 48,600
HKP-20C	43 / 49	45 / 50	43 / 49	45 / 50	134	150	19.0 / 64,800
*PHH56041**	6.8	---	---	---	---	---	---
HKP-05C*	21 / 25	25 / 25	---	---	59	70	4.75 / 16,200
HKR-08C*	32 / 36	35 / 40	---	---	71	80	7 / 23,800
HKP-10C*	43 / 49	45 / 50	---	---	84	90	9.5 / 32,400
HKP-15C*	43 / 49	45 / 50	21 / 25	25 / 25	109	110	14.25 / 48,600
HKP-20C	43 / 49	45 / 50	43 / 49	45 / 50	134	150	19.0 / 64,800

¹ Minimum Circuit Ampacity @ 208 / 240 V

² Maximum Overcurrent Protection Device @ 208 / 240 V

* Revision level that may or may not be designated

C Circuit breaker option

HKP-15C and HKP-20C replace HKR-15C and HKR-20C respectively to meet new UL1995 requirements.

HEATER KIT ELECTRICAL DATA

*PHH5 (24-60) Models (0 - 0.5 E.S.P.)					
Unit Model Number	Electric Heat KW				
	5	8	10	15	20
*PHH52441**	T3	T3	T3	T5	NA
*PHH53041**	T3	T3	T3	T5	NA
*PHH53641**	T3	T3	T3	T5	NA
*PHH54241**	T3	T3	T3	T3	T5
*PHH54841**	T3	T3	T3	T3	T3
*PHH56041**	T3	T3	T3	T3	T3

*PHH5 (24-60) Models (0.5 - 0.8 E.S.P.)					
Unit Model Number	Electric Heat KW				
	5	8	10	15	20
*PHH52441**	T5	T5	T5	T5	NA
*PHH53041**	T5	T5	T5	T5	NA
*PHH53641**	T5	T5	T5	T5	NA
*PHH54241**	T5	T5	T5	T5	NA
*PHH54841**	T5	T5	T5	T5	NA
*PHH56041**	T5	T5	T5	T5	NA

T1 - Fan Only; T2 - Normal Speed Cooling

T3 - Normal Speed Heating

T4 - High Speed Cooling; T5 - High Speed Heating

TABLE 7A & 7B

MAINTENANCE



WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



The Self Contained Package Heat Pump should operate for many years without excessive service calls if the unit is installed properly. However it is recommended that the homeowner inspect the unit before a seasonal start up. The coils should be free of debris so adequate airflow is achieved. The return and supply registers should be free of any obstructions. The filters should be cleaned or replaced. These few steps will help to keep the product up time to a maximum. The Troubleshooting Chart (on page 16) should help in identifying problems if the unit does not operate properly.

SERVICE

THE FOLLOWING INFORMATION IS FOR USE BY QUALIFIED SERVICE AGENCY ONLY: OTHERS SHOULD NOT ATTEMPT TO SERVICE THIS EQUIPMENT.

Common Causes of Unsatisfactory Operation of Heat Pump on the Heating Cycle.

INADEQUATE AIR VOLUME THROUGH INDOOR COIL

When a heat pump is in the heating cycle, the indoor coil is functioning as a condenser. The return air filter must always be clean, and sufficient air volume must pass through the indoor coil to prevent excessive discharge pressure, and high pressure cut out.

OUTSIDE AIR INTO RETURN DUCT

Do not introduce cold outside air into the return duct of a heat pump installation. Do not allow air entering the indoor coil to drop below 65°F. Air below this temperature will cause low discharge pressure, thus low suction pressure, and excessive defrost cycling resulting in low heating output. It may also cause false defrosting.

UNDERCHARGE

An undercharged heat pump on the heating cycle will cause low discharge pressure resulting in low suction pressure and frost accumulation on the outdoor coil.

POOR "TERMINATING" SENSOR CONTACT

The unit's defrost terminating sensor must make good thermal contact with the outdoor coil tubing. Poor contact may not terminate the unit's defrost cycle quickly enough to prevent the unit from cutting out on high discharge pressure.

MALFUNCTIONING REVERSING VALVE

This may be due to:

1. Solenoid not energized - In order to determine if the solenoid is energized, touch the nut that holds the solenoid cover in place with a screwdriver. If the nut magnetically holds the screwdriver, the solenoid is energized and the unit is in the cooling cycle.
2. No voltage at unit's solenoid - Check unit voltage. If no voltage, check wiring circuit.
3. Valve will not shift:
 - a. Undercharged - check for leaks;
 - b. Valve Body Damaged - Replace valve;
 - c. Unit Properly Charged - If it is on the heating cycle, raise the discharge pressure by restricting airflow through the indoor coil. If the valve does not shift, tap it lightly on both ends with a screwdriver handle. Do Not Tap The Valve Body. If the unit is on the cooling cycle, raise the discharge pressure by restricting airflow through the outdoor coil. If the valve does not shift after the above attempts, cut the unit off and wait until the discharge and suction pressure equalize, and repeat above steps. If the valve does not shift, replace it.

*PHH5(24 - 60)41 BLOWER PERFORMANCE

*PHH5[24-60]41 BLOWER PERFORMANCE

Model	Speed	Volts		NEW E.S.P. (In. of H ₂ O)							
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
*PHH52441**	T1	230	CFM	914	866	818	770	722	674	626	578
			Watts	69	80	91	102	114	125	136	147
	T2 / T3	230	CFM	1138	1079	1030	978	922	858	799	735
			Watts	139	148	159	168	178	189	197	206
	T4 / T5	230	CFM	1231	1179	1127	1074	1022	969	917	865
			Watts	168	180	193	205	218	230	243	255
*PHH53041**	T1	230	CFM	1005	961	918	874	831	787	744	700
			Watts	91	102	114	125	137	149	160	172
	T2 / T3	230	CFM	1342	1288	1236	1185	1135	1082	1010	949
			Watts	190	200	211	221	230	240	251	260
	T4 / T5	230	CFM	1462	1409	1357	1305	1252	1200	1147	1095
			Watts	241	253	266	278	291	303	315	328
*PHH53641**	T1	230	CFM	1151	1097	1042	988	933	879	824	770
			Watts	132	144	156	169	181	194	206	219
	T2 / T3	230	CFM	1432	1377	1329	1282	1237	1188	1141	1092
			Watts	224	235	245	255	263	271	280	288
	T4 / T5	230	CFM	1577	1525	1472	1420	1367	1315	1263	1210
			Watts	277	290	302	314	327	339	352	364
*PHH54241**	T1	230	CFM	1208	1162	1114	1067	1023	978	928	868
			Watts	150	161	171	180	188	197	205	215
	T2 / T3	230	CFM	1535	1496	1453	1409	1367	1323	1282	1242
			Watts	277	287	297	309	318	327	336	344
	T4 / T5	230	CFM	1645	1602	1560	1517	1475	1433	1390	1347
			Watts	285	297	309	321	333	346	358	370
*PHH54841**	T1	230	CFM	1239	1184	1146	1091	1049	1001	948	890
			Watts	152	163	175	184	194	205	220	235
	T2 / T3	230	CFM	1837	1789	1748	1706	1665	1623	1577	1531
			Watts	408	419	432	442	454	464	471	480
	T4 / T5	230	CFM	2002	1935	1885	1827	1767	1732	1669	1618
			Watts	498	521	516	534	551	567	571	574
*PHH56041**	T1	230	CFM	1555	1485	1425	1375	1329	1277	1221	1167
			Watts	242	248	257	264	274	284	294	305
	T2 / T3	230	CFM	1986	1933	1874	1817	1770	1730	1689	1645
			Watts	472	479	488	496	503	508	515	526
	T4 / T5	230	CFM	2049	1948	1914	1851	1811	1770	1738	1685
			Watts	506	522	528	548	544	548	556	568

NOTES:

1. Data shown is dry coil. Wet coil pressure drop is approx.
2. Data shown does not include filter pressure drop, approx. 0.08" H₂O.
3. Reduce airflow by 2% for 208V operation.
4. For high static applications, see blower performance table above for selecting appropriate speed tap.

TROUBLESHOOTING CHART



WARNING

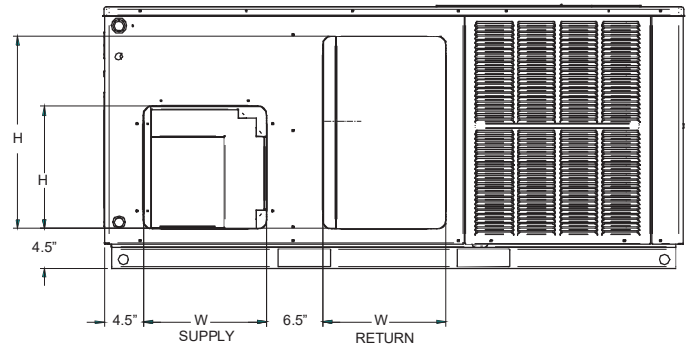
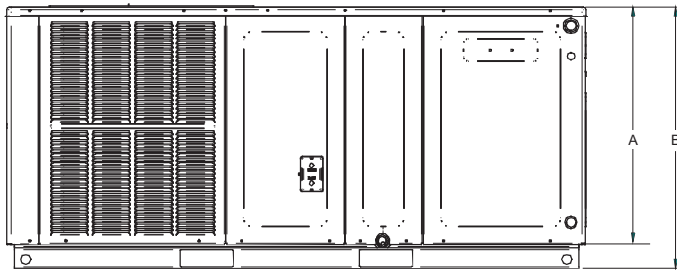
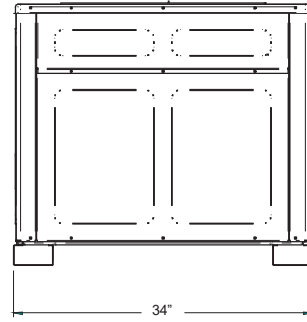
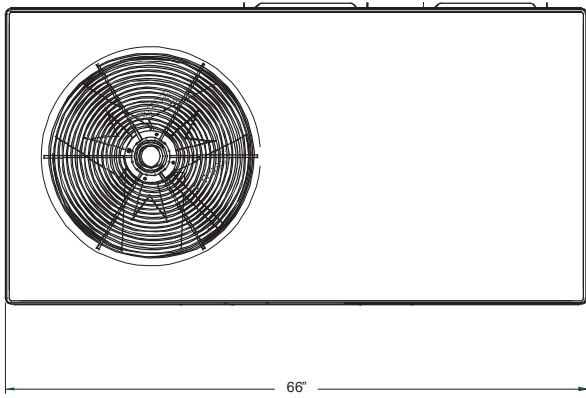
HIGH VOLTAGE!

DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



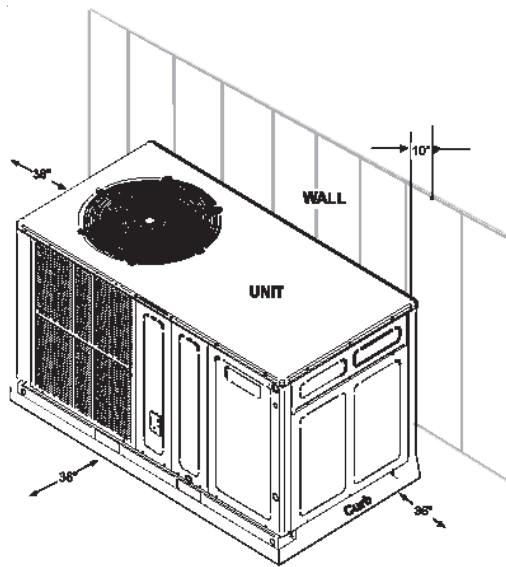
SYMPTOM	POSSIBLE CAUSE	REMEDY
High head - low suction	a. Restriction in liquid line or flowrator	a. Remove or replace with proper size flowrator.
High head - high or normal suction	a. Dirty condenser coil b. Overcharged c. Condenser fan not running	a. Clean coil b. Correct Svstem charge c. Repair or Replace
Low head - high suction	a. Incorrect flowrator b. Defective compressor valves c. Flowrator not seating properly	a. Replace with correct flowrator b. Replace compressor c. Check for debris under flowrator or deformed flowrator. Remove debris or replace flowrator.
Unit will not run	a. Power off or loose electrical connection b. Thermostat out of calibration set too c. Defective contactor d. Blown fuses or tripped breaker e. Transformer defective f. High or low pressure control open (Optional) g. Compressor overload contacts open	a. Check for unit voltage at contactor in unit b. Reset c. Check for 24 volts at contactor coil replace if contacts are open d. Replace fuse or reset breaker Check wiring - replace transformer f. Reset high pressure control or check unit charge High pressure control opens at 610 psig Low pressure control opens at 22 psig g. Replace compressor NOTE: Wait at least 2 hours for overload to reset
Condenser fan runs, compressor doesn't	a. Loose connection b. Compressor stuck, grounded or open winding open internal overload c. Low voltage connection d. Capacitor weak, open, or shorted	a. Check for unit voltage at compressor check & tighten all connections b. Wait at least 2 hours for overload to reset If still open, replace the compressor. c. At compressor terminals, voltage must be within 10 % of nameplate volts when unit is operating d. Check capacitor. If defective, replace.
Low suction - cool compressor Iced evaporator coil	a. Low indoor airflow	a. Increase speed of blower or reduce restriction - replace air filters
Compressor short cycles	a. Defective overload protector b. Unit cycling on low pressure control c. High pressure switch cuts out	a. Replace - check for correct voltage b. Check refrigerant charge and / or airflow c. Check airflow (Indoor & outdoor)
Registers sweat	a. Low airflow	a. Increase speed of blower or reduce restriction replace air filters
High suction pressure	a. Excessive load b. Defective compressor c. Reversing valve not seating properly.	a. Recheck load calculation b. Replace c. Replace
Insufficient cooling	a. Improperly sized unit b. Improper airflow c. Incorrect refrigerant charge. d. Incorrect voltage	a. Recalculate load b. Check - should be approximately 400 CFM per ton c. Charge per procedure attached to unit service panel d. At compressor terminals, voltage must be within 10% of nameplate volts when unit is operating
Evaporator coil freezing or frosting	a. Low airflow b. Low refrigerant charge c. Operating unit in cooling mode below 65°F outdoor temperature	a. Check - should be approximately 400 CFM per ton, dirty air filters, all duct outlets open b. Properly charge unit c. Install or check low ambient control, should be open below 65°F outdoor temperature

UNIT DIMENSIONS



BACK VIEW
(DUCT OPENINGS)

Minimal Clearances



Model	Unit Dimensions				Chassis Size
			Height		
	W	D	A	B	
*PHH52441**	66	34	27½	30	Small
*PHH53041**	66	34	27½	30	Small
*PHH53641**	66	34	32½	35	Medium
*PHH54241**	66	34	32½	35	Medium
*PHH54841**	66	34	32½	35	Medium
*PHH56041**	66	34	36	38½	Large

Model	Duct Openings			
	Supply		Return	
	W	H	W	H
*PHH52441**	14	14	14	22
*PHH53041**	14	14	14	22
*PHH53641**	14	14	14	24
*PHH54241**	14	14	14	24
*PHH54841**	14	14	14	24
*PHH56041**	14	14	14	24

PACKAGE UNITS - HEAT PUMP AND AC UNITS

HOMEOWNER'S ROUTINE MAINTENANCE RECOMMENDATIONS

We strongly recommend a bi-annual maintenance checkup be performed by a qualified service agency before the heating and cooling seasons begin.

REPLACE OR CLEAN FILTER



WARNING

HIGH VOLTAGE!

DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



IMPORTANT NOTE: NEVER OPERATE UNIT WITHOUT A FILTER INSTALLED AS DUST AND LINT WILL BUILD UP ON INTERNAL PARTS RESULTING IN LOSS OF EFFICIENCY, EQUIPMENT DAMAGE AND POSSIBLE FIRE.

A return air filter is not supplied with this unit; however, there must be a means of filtering the return air. An indoor air filter must be used with your comfort system. A properly maintained filter will keep the indoor coil of your comfort system clean. A dirty coil could cause poor operation and/or severe equipment damage.

The installer of your unit can tell you where your filter(s) are and how to clean or replace them.

Check your return filter(s) at least once every two months. When they are dirty, replace or clean as required.

Disposable type filters should be replaced. Reusable type filters may be cleaned.

NOTE: REUSABLE TYPE FILTERS SHOULD BE WASHED WITH WARM WATER, DRIED COMPLETELY AND SPRAYED WITH AN ADHESIVE ACCORDING TO THE MANUFACTURERS RECOMMENDATIONS.

You may want to ask your dealer about high efficiency filters. High efficiency filters are available in both electronic and non-electronic types. These filters can do a better job of catching small airborne particles.

Improper filter maintenance is the most common cause of inadequate heating or cooling performance. Filters should be cleaned (permanent) or replaced (disposable) every two months or as required. When replacing a filter, it must be replaced with a filter of the same type and size and always make certain the air flow arrows on the filter point in the proper direction.

CONDENSER AND EVAPORATOR MOTORS

The bearings on the air circulating blower motor and condenser motor are permanently lubricated and require no further lubrication.

COMPRESSOR

The compressor motor is hermetically sealed and does not require additional oiling.

ALUMINUM INDOOR COIL CLEANING (QUALIFIED SERVICER ONLY)

This unit is equipped with an aluminum tube evaporator coil. The safest way to clean the evaporator coil is to simply flush the coil with water. This cleaning practice remains as the recommended cleaning method for both copper tube and aluminum tube residential cooling coils.

An alternate cleaning method is to use one of the products listed in the technical publication TP-109 (shipped in the literature bag with the unit) to clean the coils. The cleaners listed are the only agents deemed safe and approved for use to clean round tube aluminum coils. TP-109 is available on the web site in Partner Link > Service Toolkit.

NOTE: ENSURE COILS ARE RINSED WELL AFTER USE OF ANY CHEMICAL CLEANERS.

ANNUAL INSPECTION (QUALIFIED SERVICER ONLY)

Your package unit should be inspected by a qualified installer, or service agency at least twice every year. This check should be performed before the heating and cooling seasons begin. This will ensure that the system is performing properly and safely. Repair as necessary.

- Check physical support of the unit. Ensure it is sound without any sagging, cracks, or gaps, around the base.
- Check for obvious signs of deterioration of the unit.
- Check both condenser and evaporator coil to make sure each are clean.
- **Return Air Connection.** Check for physical soundness and ensure that the connection is firmly sealed to the package unit casing.
- **Wiring.** Check wires for damage. Check electrical connections for tightness and/or corrosion.
- **Filters.** Check that filters are clean and in the proper placement in the unit or duct system.
- **Louvers.** Inspect air inlet louvers inside the heat exchanger compartments. Ensure the area is clean and free of dirt and debris.

BEFORE CALLING YOUR SERVICER

- Check the thermostat to confirm that it is properly set.
- Check the disconnect switch near the unit to confirm that it is closed.
- Check the electrical panel for tripped circuit breakers or failed fuses. Reset the circuit breakers or replace fuses as necessary.
- Check for blockage of the indoor air inlets and outlets. Confirm that they are open and have not been blocked by objects (rugs, curtains or furniture).
- Check for obstructions on the unit. Confirm that it has not been covered on the sides or the top. Remove any obstruction that can be safely removed. If the unit is covered with dirt or debris, call a qualified servicer to clean it.
- Check the filter. If it is dirty, clean or replace it.

START-UP CHECKLIST

Residential Package - (Indoor Section)

Model Number _____
Serial Number _____

ELECTRICAL

Line Voltage (Measure L1 and L2 Voltage) L1 - L2 _____
Secondary Voltage (Measure Transformer Output Voltage) R - C _____
Blower Amps _____
Heat Strip 1 - Amps _____
Heat Strip 2 - Amps _____

BLOWER EXTERNAL STATIC PRESSURE

Return Air Static Pressure _____ IN. W.C.
Supply Air Static Pressure _____ IN. W.C.
Total External Static Pressure (Ignoring +/- from the reading above, add total here) _____ IN. W.C.

TEMPERATURES

Return Air Temperature (Dry bulb / Wet bulb) _____ DB °F _____ WB °F
Cooling Supply Air Temperature (Dry bulb / Wet bulb) _____ DB °F _____ WB °F
Heating Supply Air Temperature _____ DB °F
Temperature Rise _____ DB °F
Delta T (Difference between Supply and Return Temperatures) _____ DB °F

GAS PRESSURES

Gas Inlet Pressure _____ IN. W.C.
Gas Manifold Pressure (Low Fire) _____ IN. W.C.
Gas Manifold Pressure (High Fire) _____ IN. W.C.
Gas Type (NG) = Natural Gas / (LP) = Liquid Propane _____

Residential Package - (Outdoor Section)

ELECTRICAL

Supply Voltage (Measure L1 and L2 Voltage) L1 - L2 _____
Compressor Amps _____
Condenser Fan Amps _____

PRESSURES / TEMPERATURES

Suction Circuit (Pressure / Suction Line Temperature) PSIG _____ TEMP _____ °F
Liquid Circuit (Pressure / Liquid Temperature) PSIG _____ TEMP _____ °F
Outdoor Air Temperature (Dry bulb / Wet bulb) _____ DB °F _____ WB °F

SUPERHEAT / SUBCOOLING

SH _____ SC _____

Additional Checks

Check wire routings for any rubbing _____
Check product for proper draining _____
Check for kinked pressure switch tubing. _____
Check flue elbow for alignment and clamp tightness. _____
Check screw tightness on blower wheel. _____
Check factory wiring and wire connections. _____
Check screw tightness on Outdoor Motor and Blade _____
Check product for proper clearances as noted by installation instructions _____

°F to °C formula: (°F - 32) divided by 1.8 = °C °C to °F formula: (°C multiplied by 1.8) + 32 = °F

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CUSTOMER FEEDBACK

We are very interested in all product comments.

Please fill out the feedback form on one of the following links:

Goodman® Brand Products: (<http://www.goodmanmfg.com/about/contact-us>).

Amana® Brand Products: (<http://www.amana-hac.com/about-us/contact-us>).

You can also scan the QR code on the right for the product brand you purchased to be directed to the feedback page.



GOODMAN® BRAND



AMANA® BRAND

PRODUCT REGISTRATION

Thank you for your recent purchase. Though not required to get the protection of the standard warranty, registering your product is a relatively short process, and entitles you to additional warranty protection, except that failure by California and Quebec residents to register their product does not diminish their warranty rights.

For Product Registration, please register as follows:

Goodman® Brand products: (<https://www.goodmanmfg.com/product-registration>).

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