INSTALLATION INSTRUCTIONS

AIR HANDLERS

(-)BHP

- **MODELS FEATURING EARTH-FRIENDLY R-410A REFRIGERANT** *R-410A*
- **MODELS FEATURING ELECTRIC HEAT WITHOUT INDOOR COOLING COIL**



RECOGNIZE THIS SYMBOL AS AN INDICATION OF IMPORTANT SAFETY INFORMATION!

⚠WARNING

These instructions are intended as an aid to qualified licensed service personnel for proper installation, adjustment and operation of this unit. Read these instructions thoroughly before attempting installation or operation. Failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, property damage, personal injury or death.

c UL us LISTED

Accredited by the RvA

ABS Quality Evaluations, Inc. Management System Certification

ANAB ACCREDITED

ISO 9001:2008

Certificate Number: 30164

DO NOT DESTROY THIS MANUAL

PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICEMAN

92-20521-44-08
SUPERSEDES 92-20521-44-07

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1.0 SAFETY INFORMATION

⚠ WARNING

Duct leaks can create an unbalanced system and draw pollutants such as dirt, dust, fumes and odors into the home causing property damage. Fumes and odors from toxic, volatile or flammable chemicals, as well as automobile exhaust and carbon monoxide (CO), can be drawn into the living space through leaking ducts and unbalanced duct systems causing personal injury or death (see Figure 1).

- **If air-moving equipment or ductwork is located in garages or off-garage storage areas - all joints, seams, and openings in the equipment and duct must be sealed to limit the migration of toxic fumes and odors including carbon monoxide from migrating into the living space.**
- **If air-moving equipment or ductwork is located in spaces containing fuel burning appliances such as water heaters or boilers – all joints, seams, and openings in the equipment and duct must also be sealed to prevent depressurization of the space and possible migration of combustion byproducts including carbon monoxide into the living space.**

⚠ WARNING

These instructions are intended as an aid to qualified, licensed service personnel for proper installation, adjustment and operation of this unit. Read these instructions thoroughly before attempting installation or operation. Failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, property damage, personal injury or death.

⚠ WARNING (SEE SECTION 3.2.2: VERTICAL DOWNFLOW)

The RXHB-17, RXHB-21 or RXHB-24 combustible floor base is required when some units with electric heat are applied downflow on combustible flooring. Failure to use the base can cause a fire resulting in property damage, personal injury or death. See CLEARANCES (Section 3.4) for units requiring a combustible floor base. See the accessory section in this manual for combustible floor base RXHB.

⚠ WARNING (SEE SECTION 3.10.2: GROUNDING)

The unit must be permanently grounded. Failure to do so can result in electrical shock causing personal injury or death.

⚠ WARNING (SEE SECTION 4.0: ELECTRICAL WIRING)

Disconnect all power to unit before installing or servicing. More than one disconnect switch may be required to de-energize the equipment. Hazardous voltage can cause severe personal injury or death.

⚠ WARNING (SEE SECTION 12.5: BLOWER ASSEMBLY REMOVAL & REPLACEMENT)

If removal of the blower assembly is required, all disconnect switches supplying power to the equipment must be de-energized and locked (if not in sight of unit) so the field power wires can be safely removed from the blower assembly. Failure to do so can cause electrical shock resulting in personal injury or death.

⚠ WARNING

Because of possible damage to equipment or personal injury, installation, service, and maintenance should be performed by a trained, qualified service personnel. Consumer service is recommended only for filter cleaning/replacement. Never operate the unit with the access panels removed.

⚠ WARNING (SEE SECTION 7.0: MAINTENANCE)

Units with circuit breaker(s) meet requirements as a service disconnect switch, however, if access is required to the line side (covered) of the circuit breaker, this side of the breaker(s) will be energized with the breaker(s) de-energized. Contact with the line side can cause electrical shock resulting in personal injury or death.

⚠ WARNING (SEE SECTION 3.5: DUCTWORK)

Do not, under any circumstances, connect return ductwork to any other heat producing device such as fireplace insert, stove, etc. Unauthorized use of such devices may result in fire, carbon monoxide poisoning, explosion, personal injury or property damage.

⚠ WARNING (SEE SECTION 3.6: AIR FILTER)

Do not operate the system without filters. A portion of the dust entrained in the air may temporarily lodge in the duct runs and at the supply registers. Any circulated dust particles could be heated and charred by contact with the heating elements. This residue could soil ceilings, walls, drapes, carpets and other articles in the house.

Soot damage may occur even with filters in place when certain types of candles, oil lamps or standing pilots are burned.

⚠ WARNING

The first 36 inches of supply air plenum and ductwork must be constructed of sheet metal as required by NFPA 90B. The supply air plenum or duct must have a solid sheet metal bottom directly under the unit with no openings, registers or flexible air ducts located in it. If flexible supply air ducts are used they may be located only in the vertical walls of a rectangular plenum, a minimum of 6 inches from the solid bottom. Metal plenum or duct may be connected to the combustible floor base, if not, it must be connected to the unit supply duct flanges such that combustible floor or other combustible material is not exposed to the supply air opening from the downflow unit. Exposing combustible (non-metal) material to the supply opening of a downflow unit can cause a fire resulting in property damage, personal injury or death.

Exceptions to downflow warnings:

• Installations on concrete floor slab with supply air plenum and ductwork completely encased in not less than 2 inches of concrete (See NFPA 90B).

⚠ CAUTION (SEE SECTION 3.3: AUXILIARY OVERFLOW PAN)

In compliance with recognized codes, an auxiliary drain pan must be installed under all equipment containing evaporator coils that are located in any area of a structure where damage to the building or building contents may occur as a result of an overflow of the coil drain pan or a stoppage in the primary condensate drain piping. See Section 6.6 of this manual for auxiliary horizontal overflow pan accessory information (model RXBM).

⚠ NOTICE

Improper installation, or installation not made in accordance with the Underwriters Laboratory (UL) certification or these instructions, can result in unsatisfactory operation and/or dangerous conditions and are not covered by the unit warranty.

⚠ WARNING (SEE WARNINGS IN REGARD TO DUCTWORK)

DO NOT INSTALL THIS UNIT IN MANUFACTURED (MOBILE) HOMES. IMPROPER INSTALLATION IS MORE LIKELY IN MANUFACTURED HOUSING DUE TO DUCTWORK MATERIAL, SIZE, LOCATION, AND ARRANGEMENT. INSTALLATIONS IN MANUFACTURED HOUSING CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

EXCEPTION: MANUFACTURED HOUSING INSTALLATIONS ARE APPROVED ONLY WITH DOCUMENTATION BY A RECOGNIZED INSPECTION AUTHORITY THAT THE INSTALLATION HAS BEEN MADE IN COMPLIANCE WITH THE INSTRUCTIONS AND ALL WARNINGS HAVE BEEN OBSERVED.

Continued on next page ›

⚠ WARNING

PROPOSITION 65: This appliance contains fiberglass insulation. Respirable particles of fiberglass are known to the State of California to cause cancer.

All manufacturer products meet current Federal OSHA Guidelines for safety. California Proposition 65 warnings are required for certain products, which are not covered by the OSHA standards.

California's Proposition 65 requires warnings for products sold in California that contain or produce any of over 600 listed chemicals known to the State of California to cause cancer or birth defects such as fiberglass insulation, lead in brass, and combustion products from natural gas.

All "new equipment" shipped for sale in California will have labels stating that the product contains and/or produces Proposition 65 chemicals. Although we have not changed our processes, having the same label on all our products facilitates manufacturing and shipping. We cannot always know "when, or if" products will be sold in the California market.

You may receive inquiries from customers about chemicals found in, or produced by, some of our heating and air-conditioning equipment, or found in natural gas used with some of our products. Listed below are those chemicals and substances commonly associated with similar equipment in our industry and other manufacturers.

- **Glass Wool (Fiberglass) Insulation**
- **Carbon Monoxide (CO).**
- **Formaldehyde**
- **Benzene**

More details are available at the websites for OSHA (Occupational Safety and Health Administration), at www.osha.gov and the State of California's OEHHA (Office of Environmental Health Hazard Assessment), at www.oehha.org. Consumer education is important since the chemicals and substances on the list are found in our daily lives. Most consumers are aware that products present safety and health risks, when improperly used, handled and maintained.

⚠ WARNING

IF UNIT IS TO BE INSTALLED WITHOUT AN INDOOR COIL, RETURN DUCT OR PLENUM, IT MUST NOT BE INSTALLED DIRECTLY OVER COMBUSTIBLE MATERIAL. IF INSTALLED WITHOUT AN INDOOR COIL WITH A RETURN DUCT OR PLENUM, THE AIR PLENUM OR DUCT MUST HAVE A SOLID SHEET METAL BOTTOM WITH NO RETURN AIR OPENINGS, REGISTERS OR FLEXIBLE AIR DUCTS LOCATED DIRECTLY UNDER THE UNIT. EXPOSING COMBUSTIBLE MATERIAL TO THE RETURN OPENING OF AN UPFLOW UNIT WITHOUT AN INDOOR COIL CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

⚠ WARNING

THE SUPPLY AIR PLENUM OR DUCT MUST HAVE A SOLID SHEET METAL BOTTOM WITH NO SUPPLY AIR OPENINGS, REGISTERS OR FLEXIBLE AIR DUCTS LOCATED IN IT FOR THE FIRST 36 INCHES OF HORIZONTAL SURFACE ON UNITS WITH ELECTRIC HEATERS. FAILURE TO OBSERVE SUPPLY PLENUM, DUCT WARNINGS CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

⚠ WARNING (SEE SPECIFIC AIRFLOW POSITION FOR ADDITIONAL WARNINGS)

UNITS ARE FOR DUCTED APPLICATIONS ONLY. A MINIMUM OF 36 INCHES OF SUPPLY AIR PLENUM AND DUCTWORK IS REQUIRED. NO SUPPLY AIR OPENINGS, REGISTERS OR FLEXIBLE AIR DUCTS MAY BE LOCATED WITHIN THE FIRST 36 INCHES OF SUPPLY PLENUM AND DUCTWORK ON UNITS WITH ELECTRIC HEATERS. FAILURE TO OBSERVE SUPPLY PLENUM/DUCT WARNINGS CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

⚠ CAUTION

When used on cooling applications, excessive sweating may occur when unit is installed in an unconditioned space. This can result in property damage.

- **Some building codes require extra cabinet insulation and gasketing when unit is installed in attic applications.**
- **If installed in an unconditioned space, apply caulking around the power wires, control wires, refrigerant tubing and condensate line where they enter the cabinet. Seal the power wires on the inside where they exit conduit opening. Caulking is required to prevent air leakage into and condensate from forming inside the unit, control box, and on electrical controls.**
- **Install the unit in such a way as to allow free access to the coil/filter compartment and blower/control compartment.**
- **Install the unit in a level position to ensure proper condensate drainage. Make sure unit is level in both directions within 1/8".**
- **Install the unit in accordance with any local code which may apply and the national codes. Latest editions are available from: "National Fire Protection Association, Inc., Batterysmarch Park, Quincy, MA 02269." These publications are:**
  - **ANSI/NFPA No. 70-(Latest Edition) National Electrical Code.**
  - **NFPA90A Installation of Air Conditioning and Ventilating Systems.**
  - **NFPA90B Installation of warm air heating and air conditioning systems.**
- **The equipment has been evaluated in accordance with the Code of Federal Regulations, Chapter XX, Part 3280.**

⚠ CAUTION (SEE SECTION 3.2.3: HORIZONTAL APPLICATIONS)

HORIZONTAL UNITS MUST BE CONFIGURED FOR RIGHT HAND AIR SUPPLY OR LEFT HAND AIR SUPPLY. HORIZONTAL DRAIN PAN MUST BE LOCATED UNDER INDOOR COIL. FAILURE TO USE THE DRAIN PAN CAN RESULT IN PROPERTY DAMAGE.

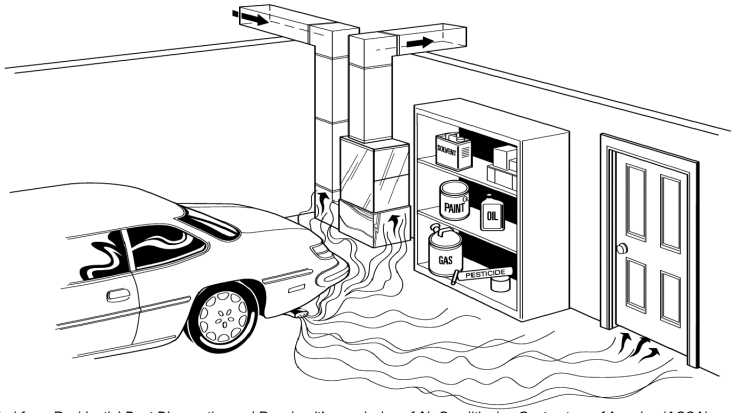
⚠ NOTICE

Use of this air-handler during construction is not recommended. If operation during construction is absolutely required, the following temporary installation requirements must be followed:

Installation must comply with all Installation Instructions in this manual including the following items:

- **Properly sized power supply and circuit breaker/fuse**
- **Air-handler operating under thermostatic control;**
- **Return air duct sealed to the air-handler;**
- **Air filters must be in place;**
- **Correct air-flow setting for application**
- **Removing the coil and storing it in a clean safe place is highly recommended until construction is completed and the outdoor unit is installed.**
- **Clean air-handler, duct work, and components including coil upon completion of the construction process and verify proper air-handler operating conditions according as stated in this instruction manual.**
- **NOTE: Electric strip heater elements tend to emit a burning odor for a few days if dust has accumulated during construction. Heater elements are easily damaged. Take great care when cleaning them. Low pressure compressed air is recommended for cleaning elements.**

FIGURE 1
MIGRATION OF DANGEROUS SUBSTANCES, FUMES, AND ODORS INTO LIVING SPACES



Adapted from *Residential Duct Diagnostics and Repair,* with permission of Air Conditioning Contractors of America (ACCA).

⚠ WARNING

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⚠ NOTICE

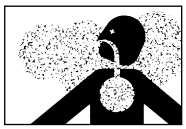
Improper installation, or installation not made in accordance with the Underwriters Laboratory (UL) certification or these instructions, can result in unsatisfactory operation and/or dangerous conditions and are not covered by the unit warranty.

2.0 GENERAL INFORMATION

2.1 IMPORTANT INFORMATION ABOUT EFFICIENCY & INDOOR AIR QUALITY

Central cooling and heating equipment is only as efficient as the duct system that carries the cooled or heated air. To maintain efficiency, comfort and good indoor air quality,

⚠WARNING



Carbon Monoxide (CO) Poisoning Can Cause Severe Injury or Death.

Carbon Monoxide from the exhaust of motor vehicles and other fuel burning devices can be drawn into the living space by the operation of the central heating and air conditioning system.

Exhaust from motor vehicles, generators, garden tractors, mowers, portable heaters, charcoal and gas grills, gasoline powered tools, and outdoor camping equipment contains carbon monoxide, a poisonous gas that can kill you. You cannot see it, smell it, or taste it.

- **Do NOT operate an automobile or any engine in a garage for more than the few seconds it takes to enter or exit the garage.**
- **Do NOT operate any fuel-burning device in an enclosed or partly enclosed space, or near building windows, doors or air intakes.**

The U.S. Consumer Product Safety Commission (CPSC) and Health Canada recommend the installation of UL or CSA certified Carbon Monoxide Alarm(s) in every home.

it is important to have the proper balance between the air being supplied to each room and the air returning to the cooling and heating equipment.

Proper balance and sealing of the duct system improves the efficiency of the heating and air conditioning system and improves the indoor air quality of the home by reducing the amount of airborne pollutants that enter homes from spaces where the ductwork and/or equipment is located. The manufacturer and the U.S. Environmental Protection Agency's Energy Star Program recommend that central duct systems be checked by a qualified contractor for proper balance and sealing.

2.2 CHECKING PRODUCT RECEIVED

Immediately upon receipt, all cartons and contents should be inspected for transit damage. Units with damaged cartons should be opened immediately. If damage is found, it should be noted on the delivery documents and a damage claim filed with the delivering carrier.

After unit has been delivered to the job site, remove the unit from the carton taking care not to damage the unit. Check the unit rating plate for unit model number, unit size, coil model, voltage, phase, etc. to assure the unit matches the job specifications.

2.3 MODEL NUMBER EXPLANATION & AVAILABLE MODELS

FIGURE 2
MODEL NUMBER EXPLANATION

(-) B H P — 17 J 06 N H I

BRAND

CLASSIFICATION
B = BLOWER UNIT

APPLICATION
H = HEAT PUMP AIR HANDLER

DESIGN SERIES
P = CONSTANT TORQUE MOTOR

CABINET SIZE
17 = 17.5"
21 = 21.0"
24 = 24.5"
25 = 24.5"

VOLTAGE
A = 115V-1-60
J = 208/240V-1-60

ELECTRIC HEAT
00 = NO HEAT
06 = 4.9 KW
07 = 7.0 KW
11 = 10.0 KW
14 = 14.0 KW
18 = 17.5 KW
21 = 21.0 KW

CONTROL
N = NO CIRCUIT PROTECTION (SINGLE CIRCUIT)
S = CIRCUIT BREAKER (SINGLE CIRCUIT)

AIRFLOW
HORIZONTAL MULTI-POSITION

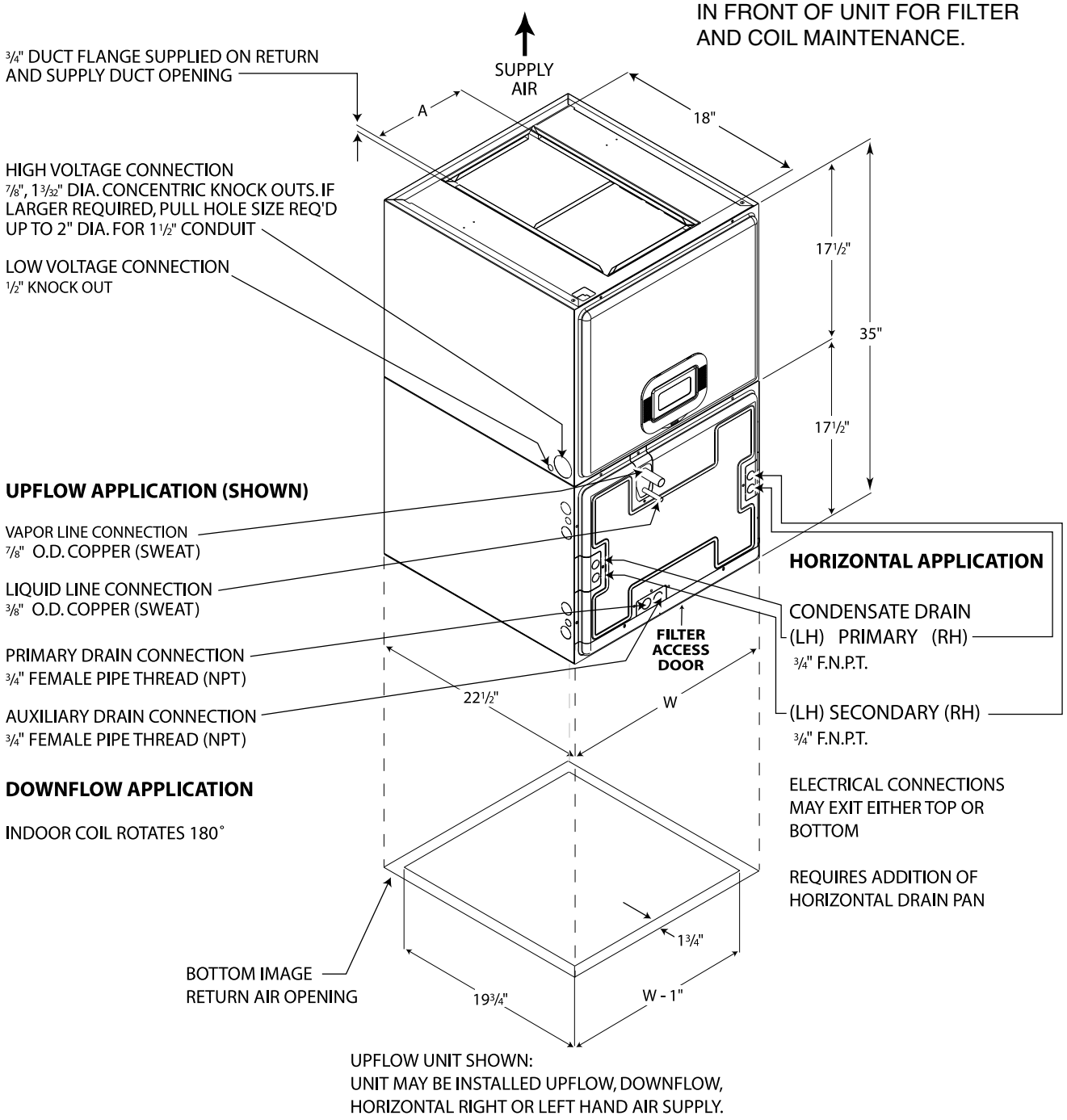
COIL CODE
A = NO COIL

Coil Code	Refrigerant Type	Cabinet Width 17	21	24	25
1	R-410A	RCHL-24A2GH17			
2	R-410A		RCHL-36A1GH21		
4	R-410A			RCHL-48A1GH24	
7	R-410A				RCHL-60A1GH24

AVAILABLE MODELS FEATURING R-410A REFRIGERANT
(-)BHP-17A00NH1
(-)BHP-17J06SH1
(-)BHP-17J07SH1
(-)BHP-17J11SH1
(-)BHP-21A00NH2
(-)BHP-21J06SH2
(-)BHP-21J07SH2
(-)BHP-21J11SH2
(-)BHP-24A00NH4
(-)BHP-24J06SH4
(-)BHP-24J07SH4
(-)BHP-24J11SH4
(-)BHP-24J18SH4
(-)BHP-25A00NH7
(-)BHP-25J11SH7
(-)BHP-25J18SH7
AVAILABLE MODELS SHIPPED WITH NO COIL
(-)BHP-17J11SHA
(-)BHP-21J14SHA
(-)BHP-24J18SHA
(-)BHP-25J21SHA

2.4 DIMENSIONS & WEIGHTS

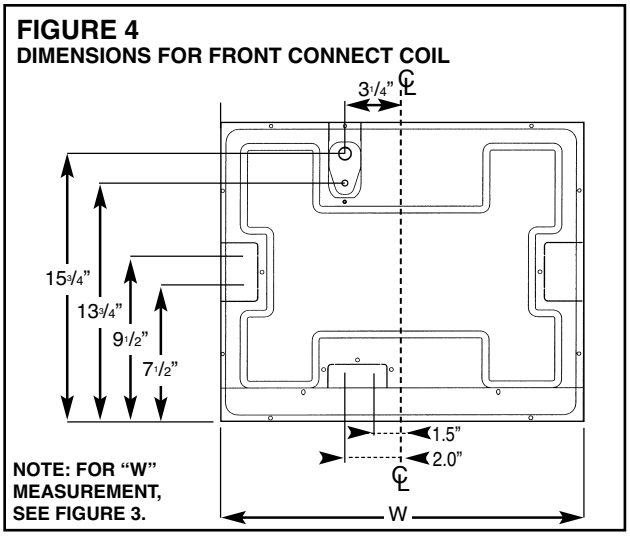
FIGURE 3
DIMENSIONS & WEIGHTS



DIMENSIONAL DATA

MODEL CABINET SIZE	UNIT WIDTH "W" IN.	SUPPLY DUCT "A" IN.	UNIT WEIGHT / SHIPPING WEIGHT (LBS.)*	
			UNIT WITH COIL (MAX. kw.)	UNIT WITHOUT COIL (MAX. kw.)
17	17½"	7 9/16"	92/99 [323.6/348.2]	66/75 [232.1/263.8]
21	21"	9 7/16"	109/117 [383.3/411.5]	79/87 [277.8/306]
24	24½"	11¾"	125/134 [439.6/471.3]	88/97 [309.5/341.1]
25	24½"	11¾"	125/134 [439.6/471.3]	88/97 [309.5/341.1]

FIGURE 4
DIMENSIONS FOR FRONT CONNECT COIL



NOTE: FOR "W" MEASUREMENT, SEE FIGURE 3.

2.5 IMPORTANCE OF PROPER INDOOR/OUTDOOR MATCH-UPS

To assure many years of reliable operation and optimum customer comfort and to assure the outdoor unit warranty remains valid, an air-handler model should be selected that is properly matched to the outdoor unit. This is especially critical for heat pump systems to assure proper refrigerant charge balance between the cooling and heating modes. The recommended approach is to select an air-handler model that has an AHRI match with the outdoor unit. Refer to the AHRI directory at **www.ahridirectory.org** to confirm the air-handler and outdoor unit are a certified combination in the AHRI Directory.

2.6 IMPORTANCE OF QUALITY INSTALLATION

A quality installation is critical to assure safety, reliability, comfort, and customer satisfaction. Strict adherence to applicable codes, the information in this installation manual, the outdoor unit installation manual, and the thermostat installation manual are key to a quality installation. Read the entire instruction manuals before starting the installation.

IMPORTANT: This product has been designed and manufactured to meet certified AHRI capacity and efficiency ratings with the appropriate outdoor units. However, proper refrigerant charge, proper airflow, and refrigerant line sizing are critical to achieve optimum capacity and efficiency and to assure reliable operation. Installation of this product should follow the manufacturer's refrigerant charging and airflow instructions located in the outdoor unit installation instructions and the charging chart label affixed to the outdoor unit. Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.

The equipment has been evaluated in accordance with the Code of Federal Regulations, Chapter XX, Part 3280.

Install the unit in accordance with applicable national, state, and local codes. Latest editions are available from: "National Fire Protection Association, Inc., Batterymarch Park, Quincy, MA 02269." These publications are:

- ANSI/NFPA No. 70-(Latest Edition) National Electrical Code.
- NFPA90A Installation of Air Conditioning and Ventilating Systems.
- NFPA90B Installation of warm air heating and air conditioning systems.

Install the unit in such a way as to allow necessary access to the coil/filter rack and blower/control compartment.

3.0 INSTALLATION

3.1 TOOLS & REFRIGERANT

3.1.1 TOOLS REQUIRED FOR INSTALLING AND SERVICING R-410A MODELS

Manifold Sets:

- Up to 800 PSIG High-Side
- Up to 250 PSIG Low-Side
- 550 PSIG Low-Side Retard

Manifold Hoses:

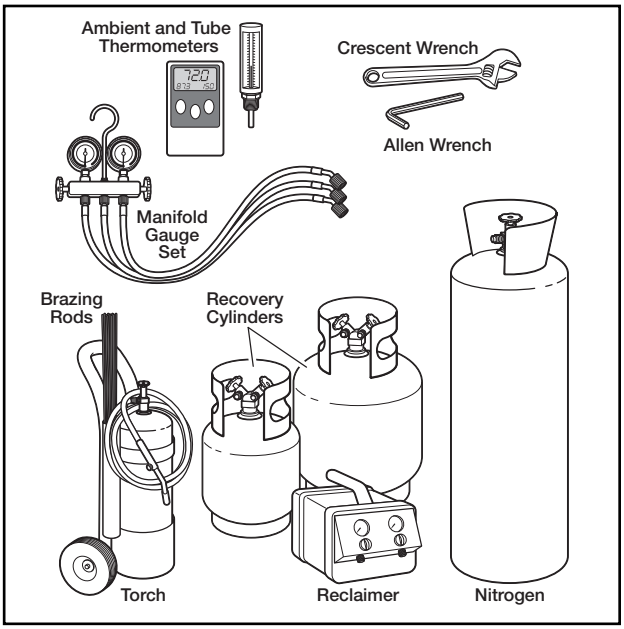
- Service Pressure Rating of 800 PSIG

Recovery Cylinders:

- 400 PSIG Pressure Rating
- Dept. of Transportation 4BA400 or BW400

⚠ NOTICE

R-410A systems operate at higher pressures than R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.



3.1.2 SPECIFICATIONS OF R-410A

Application: <u>R-410A is not a drop-in replacement for R-22.</u> Equipment designs must accommodate its higher pressures. It cannot be retrofitted into R-22 heat pumps.

Physical Properties: R-410A has an atmospheric boiling point of -62.9°F [-52.7°C] and its saturation pressure at 77°F [25°C] is 224.5 psig.

Composition: R-410A is a near-azeotropic mixture of 50% by weight difluoromethane (HFC-32) and 50% by weight pentafluoroethane (HFC-125).

Pressure: The pressure of R-410A is approximately 60% (1.6 times) greater than R-22. Recovery and recycle equipment, pumps, hoses, and the like must have design pressure ratings appropriate for R-410A. Manifold sets need to range up to 800 psig high-side and 250 psig low-side with a 550 psig low-side retard. Hoses need to have a service pressure rating of 800 psig. Recovery cylinders need to have a 400 psig service pressure rating, DOT 4BA400 or DOT BW400.

Combustibility: At pressures above 1 atmosphere, a mixture of R-410A and air can become combustible. **<u>R-410A and air should never be mixed in tanks or supply lines or be allowed to accumulate in storage tanks. Leak checking should never be done with a mixture of R-410A and air.</u>** Leak-checking can be performed safely with nitrogen or a mixture of R-410A and nitrogen.

3.1.3 QUICK-REFERENCE GUIDE FOR R-410A

- R-410A refrigerant operates at approximately 60% higher pressure (1.6 times) than R-22. Ensure that servicing equipment is designed to operate with R-410A.
- R-410A refrigerant cylinders are light rose in color.
- R-410A, as with other HFCs, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from POE oil used in R-410A systems.
- R-410A systems are to be charged with liquid refrigerants. Prior to March 1999, R-410A refrigerant cylinders had a dip tube. These cylinders should be kept upright for equipment charging. Post-March 1999 cylinders do not have a dip tube and should be inverted to ensure liquid charging of the equipment.
- Do not install a suction line filter drier in the liquid line.
- A factory-approved outdoor liquid line filter drier is shipped with every unit and must be installed in the liquid line at the time of installation. If only the air-handler is being replaced on an existing system, the existing filter drier must be replaced at the time of installation with a field supplied filter drier. **IMPORTANT:** A bi-flow filter drier must be used for heat pump applications. Filter driers must be rated for minimum working pressure of 600 psig. The filter drier will only have adequate moisture-holding capacity if the system is properly evacuated.
- Desiccant (drying agent) must be compatible for POE oils and R-410A refrigerant.

3.2 APPLICATIONS AND ORIENTATION

3.2.1 VERTICAL UPFLOW APPLICATIONS

- Electrical connections can be made from either the left or right side of the unit. Refrigerant and condensate drain connections are made on the front of the unit (see Figures 3 & 4).
- If return air is to be ducted, install duct flush with floor. Use fireproof resilient gasket 1/8 to 1/4 in. thick between duct, unit and floor. Set unit on floor over opening.

⚠ WARNING

IF UNIT IS TO BE INSTALLED WITHOUT AN INDOOR COIL, RETURN DUCT OR PLENUM, IT MUST NOT BE INSTALLED DIRECTLY OVER COMBUSTIBLE MATERIAL. IF INSTALLED WITHOUT AN INDOOR COIL WITH A RETURN DUCT OR PLENUM, THE AIR PLENUM OR DUCT MUST HAVE A SOLID SHEET METAL BOTTOM WITH NO RETURN AIR OPENINGS, REGISTERS OR FLEXIBLE AIR DUCTS LOCATED DIRECTLY UNDER THE UNIT. EXPOSING COMBUSTIBLE MATERIAL TO THE RETURN OPENING OF AN UPFLOW UNIT WITHOUT AN INDOOR COIL CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

3.2.2 VERTICAL DOWNFLOW APPLICATIONS

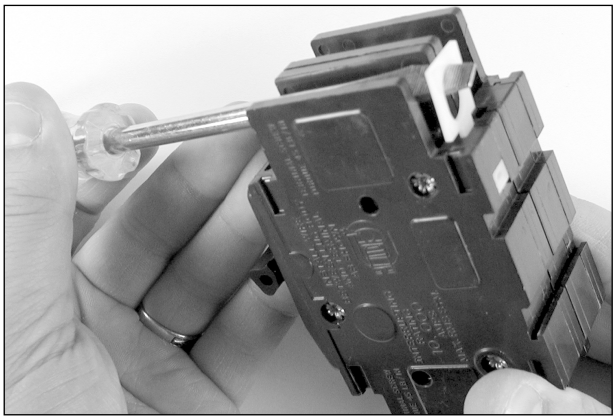
Conversion to Vertical Downflow: A vertical upflow unit may be converted to vertical downflow. (See Figure 3)

- Remove the indoor coil.
- Install coil rails in the top of the coil box (supplied).
- Rotate unit into the downflow position, with the coil compartment on top and the blower compartment on bottom.
- Reinstall the indoor coil in its new position.
- Rotate the circuit breaker(s) 180° (see instructions for rotating breaker(s) that follow).

IMPORTANT NOTE:

- **In a downflow configuration the internal air filter must not be used.**
- A remote air filter should be installed in the return air system
- The remote air filter should be sized for a maximum of 300 feet per minute of air velocity for the CFM required.

FIGURE 5
ROTATING CIRCUIT BREAKER



IMPORTANT: To comply with certification agencies and the National Electric Code, units with circuit breaker(s) on vertical units must have circuit breakers installed so that the breaker switch "on" position and marking is up and, "off" position and marking is down.

- To turn breaker(s): Rotate one breaker pair (circuit) at a time starting with the one on the right. Loosen both lugs on the load side of the breaker. Wires are bundles with wire ties, one bundle going to the right lug and one bundle going to the left lug.
- Using a screwdriver or pencil, lift white plastic tab with hole away from breaker until breaker releases from mounting opening (see Figure 5).
- With breaker held in hand, rotate breaker so that "on" position is up, "off" position is down with unit in planned vertical mounting position. Insert right wire bundle into top right breaker lug, ensuring all strands of all wires are inserted fully into lug, and no wire insulation is in lug.

- Tighten lug as tight as possible while holding circuit breaker. Check wires and make sure each wire is secure and none are loose. Repeat for left wire bundle in left top circuit breaker lug.
- Replace breaker by inserting breaker mounting tab opposite white pull tab in opening, hook mounting tab over edge in opening.
- With screwdriver or pencil, pull white tab with hole away from breaker while setting that side of breaker into opening. When breaker is in place, release tab, locking circuit breaker into location in opening.
- Repeat above operation for remaining breaker(s) (if more than one is provided).
- Replace single point wiring jumper bar, if it is used, on line side of breaker and tighten securely.
- Double check wires and lugs to make sure all are secure and tight. Check to make sure unit wiring to circuit breaker load lugs match that shown on the unit wiring diagram.

• Electrical connections can be made from either the left or right side of the unit. Refrigerant and condensate drain connections are made on the front of the unit (see Figure 4).

⚠ WARNING

A COMBUSTIBLE FLOOR BASE IS REQUIRED WHEN SOME UNITS WITH ELECTRIC HEAT ARE APPLIED DOWNFLOW ON COMBUSTIBLE FLOORING. FAILURE TO USE THE BASE CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. SEE CLEARANCES (SECTION 3.4) FOR UNITS REQUIRING A COMBUSTIBLE FLOOR BASE.

3.2.3 HORIZONTAL APPLICATIONS

Models shipped from the factory with a coil include a horizontal drainpan positioned for horizontal right supply air discharge and require no modification for this orientation. If a coil is installed in a model shipped from the factory without a coil, a Horizontal Drain Pan Accessory (RXBD-CB, See Section 6.5) will need to be purchased and installed in the field along with the coil if the unit is being installed in the horizontal orientation.

⚠ CAUTION

HORIZONTAL UNITS MUST BE CONFIGURED FOR RIGHT HAND AIR SUPPLY OR LEFT HAND AIR SUPPLY. HORIZONTAL DRAIN PAN MUST BE LOCATED UNDER INDOOR COIL. FAILURE TO USE THE DRAIN PAN CAN RESULT IN PROPERTY DAMAGE.

To convert a unit from horizontal left supply air discharge, remove the coil access panel and slide the coil out of the cabinet. Remove the horizontal drainpan and install it on the other side of the coil so it will be under the coil in the horizontal right supply air discharge orientation as shown in Figure 7 and described in the procedure below. If a coil and horizontal drainpan kit are being installed in unit shipped from the factory without a coil in a horizontal application, position the horizontal drain pan so it is under the coil for the applicable application as shown in Figures 6 and 7.

FIGURE 6
INDOOR COIL AND DRAIN PAN SET-UP
HORIZONTAL LEFT-HAND AIR SUPPLY

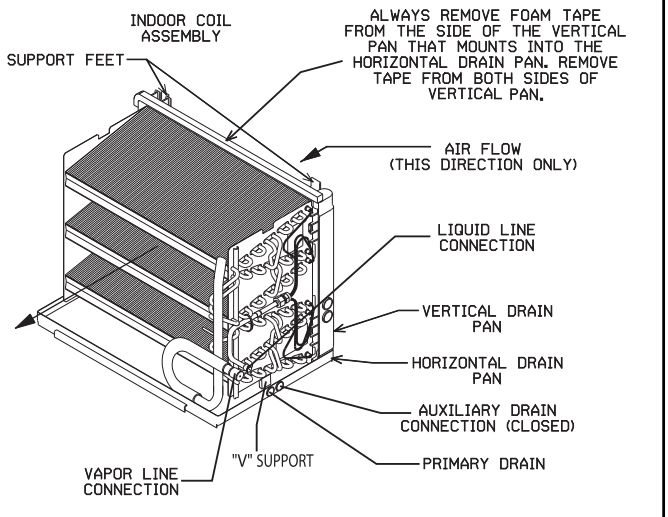
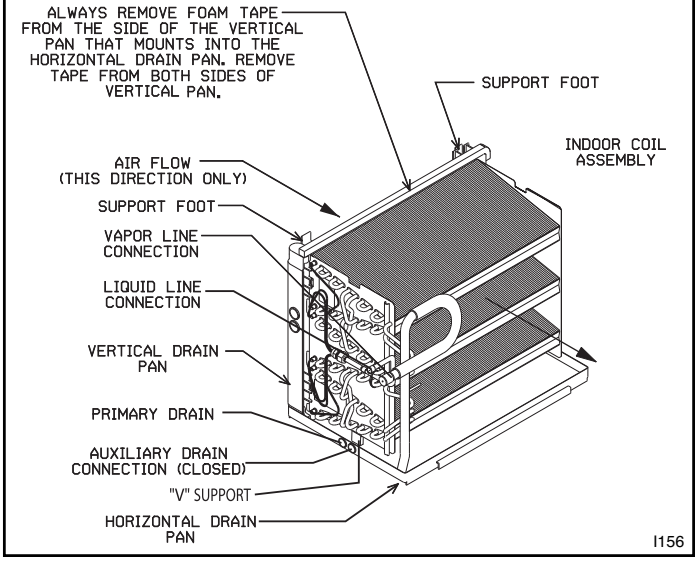


FIGURE 7
INDOOR COIL AND DRAIN PAN SET-UP
HORIZONTAL RIGHT-HAND AIR SUPPLY



- Install horizontal drain pan as shown for right hand or left hand supply. Drain pan connections must be toward front of coil (header connection end). Install coil assembly into horizontal pan as shown with coil endplates fitting into “V” shaped supports in the front and back of the horizontal pan. Mounting tabs on vertical drain pan fit over the air inlet side of the horizontal pan with vertical pan inside horizontal drain pan. Horizontal pan must be under indoor coil when in the installed position. Note primary and auxiliary drain pan positions for horizontal right vs. horizontal left. Drain connection with 3/4” hole must be connected to primary drain. Connection with 3/8” knockout is the secondary drain connection.

  Electrical connections may be made from the top or bottom of the unit. Refrigerant and condensate drain connections must be made on the front of the unit. (See unit dimensions and horizontal right hand supply and horizontal left hand supply, Figures 3, 6 & 7.)

IMPORTANT: Units cannot be installed horizontally laying on or suspended from the back of the unit. Horizontal units must be supported or suspended from one side or the other when in the horizontal position.

- Support along the length of the unit, all units installed horizontally. Do not support or suspend unit from both ends without support in the center of the cabinet. If unit is to be supported or suspended from corners, run two reinforcing rails length of unit and support or suspend from reinforcing rails.

NOTE: When converting a vertical upflow to horizontal, the foam tape must be removed from both sides of the vertical pan going into the horizontal pan. When converting a horizontal left-hand to horizontal right-hand, the foam tape must be moved to the appropriate location.

⚠ WARNING

THE SUPPLY AIR PLENUM OR DUCT MUST HAVE A SOLID SHEET METAL BOTTOM WITH NO SUPPLY AIR OPENINGS, REGISTERS OR FLEXIBLE AIR DUCTS LOCATED IN IT FOR THE FIRST 36 INCHES OF HORIZONTAL SURFACE ON UNITS WITH ELECTRIC HEATERS. FAILURE TO OBSERVE SUPPLY PLENUM, DUCT WARNINGS CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

3.2.4 INSTALLATION IN AN UNCONDITIONED SPACE

The exterior cabinet of an air handler has a greater risk of sweating when installed in an unconditioned space than when it is installed in the conditioned space. This is primarily due to the temperature of the conditioned air moving through the air handler and the air circulating around the unit where it is installed. For this reason, the following is recommended for all air handler applications, but special attention should be paid to those installed in unconditioned spaces:

- Duct sizing and airflow are critical and must be based on the equipment selected.
- Supply and return duct attachment: If other than the factory flanges are used, the attachment of ducting must be insulated and tight to prevent sweating.
- No perimeter supply flanges are provided. If a full perimeter supply duct is used, it is the responsibility of the installer to provide duct flanges as needed, to secure and seal the supply duct to prevent air leakage and the sweating that will result.
- Apply caulking around all cabinet penetrations such as power wires, control wires, refrigerant tubing and condensate line where they enter the cabinet. Seal the power wires on the inside where they exit conduit opening. Sealing is required to prevent air leakage into the unit which can result in condensate forming inside the unit, control box, and on electrical controls. Take care not to damage, remove or compress insulation when applying the caulk.
- In some cases, the entire air handler can be wrapped with insulation. This can be done as long as the unit is completely enclosed in insulation, sealed and service access is provided to prevent accumulation of moisture inside the insulation wrap.
- An auxiliary overflow pan is recommended to protect the structure from excessive cabinet sweating or a restricted coil drain line. (See Section 3.3)
- If an electric heater kit is installed, be sure the breaker or disconnect cover is sealed tightly to the door panel.

3.2.5 INSTALLATION IN CORROSIVE ENVIRONMENTS

The metal parts of this unit may be subject to rust or deterioration if exposed to a corrosive environment which can shorten its life. In addition to exposure to the exterior of the cabinet, chemical contaminants inside the building that can be drawn into the unit from the return air grille and attack structural metal parts, electrical components and the indoor coil, causing premature failure of the unit. If the unit is to be installed in an area where contaminants are likely to be a problem, special attention should be given to isolate the unit and return grille from contaminants.

3.2.6 MODULAR UNIT CONFIGURATION

All units are modular construction allowing installer to disassemble unit into two 17-1/2" high components, coil casing and blower unit, for ease of installation, then reassemble in location.

TO DISASSEMBLE:

Remove both access panels and remove six screws holding coil casing to blower unit, lift blower unit from coil casing.

TO REASSEMBLE:

To attach coil casing to blower unit, make sure 3/4" flanges on back and sides of return air opening of blower casing are bent along perforated edge to inside of casing. Clearance holes in flange should match up with drive holes on inside of blower casing. Make sure 3/4" flanges on coil casing are bent up (back and 2 sides only) on supply air side of coil casing along perforated edge. Do not bend flange on front of coil casing. Set supply air side of coil casing (3/4" flanges) into return air opening of blower casing. Replace 6 - #8 screws through flange in coil casing, flange in blower casing and into drive holes on inside of blower casing, two screws in back and two screws in each side. Do not overtighten sheet metal screws, they will strip easily if overtightened.

IMPORTANT: Configure the unit with the indoor coil casing installed on air inlet (return) side of the blower section. Do not try to configure unit with indoor coil on discharge (supply) side of blower section.

3.3 AUXILIARY OVERFLOW PAN

In compliance with recognized codes, an auxiliary overflow pan must installed under all equipment containing evaporator coils that are located in any area of a structure where damage to the building or building contents may occur as a result of an overflow of the coil drain pan or a stoppage in the primary condensate drain piping. See Section 6.6 of this manual for information regarding the recommended auxiliary horizontal overflow pan (model RXBM) for this air-handler.

3.4 CLEARANCES

- All units are designed for "0" inches clearance to combustible material on all cabinet surfaces except for downflow application with higher kW electric heat as noted below.
- Some units require a combustible floor base depending on the heating kW if installed in the downflow configuration on a combustible surface. The following table should be used to determine these requirements.

Model Cabinet Size	**17**	**21**	**24**	**25**
Maximum Model Designation kW	11	11	18	18

- Units with electric heating kW equal to or less than the values listed in the table do not require a combustible floor base. See Section 6.1 for Combustible Floor Base RXHB-XX.
- Units with electric heat require a one inch clearance to combustible material for the first three feet of supply plenum and ductwork.
- Vertical downflow applications require clearance on at least one side of the unit for electrical connections. Refrigerant and condensate drain connections are made on the front of the unit.
- All units require 24 inches minimum access to the front of the unit for service.
- These units may be installed in either ventilated or nonventilated spaces.

3.5 DUCTWORK

Field ductwork must comply with the National Fire Protection Association NFPA 90A, NFPA 90B and any applicable local ordinance.

⚠ WARNING (SEE SPECIFIC AIRFLOW POSITION FOR ADDITIONAL WARNINGS)

UNITS ARE FOR DUCTED APPLICATIONS ONLY. A MINIMUM OF 36 INCHES OF SUPPLY AIR PLENUM AND DUCTWORK IS REQUIRED. NO SUPPLY AIR OPENINGS, REGISTERS OR FLEXIBLE AIR DUCTS MAY BE LOCATED WITHIN THE FIRST 36 INCHES OF SUPPLY PLENUM AND DUCTWORK ON UNITS WITH ELECTRIC HEATERS. FAILURE TO OBSERVE SUPPLY PLENUM/DUCT WARNINGS CAN CAUSE A FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Sheet metal ductwork run in unconditioned spaces must be insulated and covered with a vapor barrier. Fibrous ductwork may be used if constructed and installed in accordance with SMACNA Construction Standard on Fibrous Glass Ducts. Ductwork must comply with National Fire Protection Association as tested by U/L Standard 181 for Class I Air Ducts. Check local codes for requirements on ductwork and insulation.

- Duct system must be designed within the range of external static pressure the unit is designed to operate against. It is important that the system airflow be adequate. Make sure supply and return ductwork, grills, special filters, accessories, etc. are accounted for in total resistance. See airflow performance tables in this manual.

- Design the duct system in accordance with “ACCA” Manual “D” Design for Residential Winter and Summer Air Conditioning and Equipment Selection. Latest editions are available from: “ACCA” Air Conditioning Contractors of America, 1513 16th Street, N.W., Washington, D.C. 20036. If duct system incorporates **flexible air duct,** be sure **pressure drop** information (straight length plus all turns) shown in “ACCA” Manual “D” is accounted for in system.
- Supply plenum is attached to the 3/4” duct flanges supplied on the unit around the blower outlet. Flanges are flat for shipping purposes and must be bent up along perforated edge around blower opening. Be sure to bend flanges completely up so they do not interfere with air being discharged from blower.

IMPORTANT: Flanges around blower opening for attaching supply duct must be bent up out of blower discharge even if not used so they do not restrict airflow from blower.

- Supply plenum should be the same size as the flanges provided around the blower outlet. Ideally, it should extend 3 feet from the unit before turning or branching off plenum into duct runs. The plenum forms an extension of the blower housing and minimizes air expansion losses from the blower. Changing the size, shape or length will degrade blower performance. If supply discharges directly into a larger duct or plenum as much as .1” W.C., static pressure will be lost. If 3 feet is not possible, even 6, 12 or 18 inches will help.

IMPORTANT: If an elbow is included in the plenum close to the unit, it must not be smaller than the dimensions of the supply duct flange on the unit.

- Some units with electric heaters require 1 in. clearance to supply plenum and branch ducts to combustible material for the first 3 feet from the unit. See CLEARANCES.
- A 3/4” return duct flange is supplied on all sides of the air inlet opening of the unit coil casing. If the unit is to be installed without a coil casing (no indoor coil), a 3/4” flange is supplied on the back and sides of the air inlet opening of the blower casing. No flange is provided on the front of the opening to the blower casing. If return duct is attached to the inlet of the blower casing, the front flange of the duct should be run up into the opening or 90° brake made on the front flange to tape to the front of the blower casing.
- **IMPORTANT: The front flange on the return duct if connected to the blower casing must not be screwed into the area where the power wiring is located. Drills or sharp screw points can damage insulation on wires located inside unit.**
- Return duct flanges on blower or coil casing are flat for shipping purposes and must be bent out along perforated edge around opening.
- Secure the supply and return ductwork to the unit flanges, using proper fasteners for the type of duct used and tape the duct-to-unit joint as required to prevent air leaks.

3.6 RETURN AIR FILTER

The unit internal air filter should only be used if the unit is readily accessible for filter cleaning or replacing.

- If unit is not readily accessible for filter maintenance, a remote filter should be installed in the return air system.
- If a remote filter is installed, it should be sized for a maximum of 300 feet/min. air velocity for the CFM required.
- See unit position figures for location of filter in unit cabinet and service panel giving access to unit filter.

IMPORTANT NOTE:

- **In a downflow configuration the internal air filter must not be used.**
- A remote air filter should be installed in the return air system
- The remote air filter should be sized for a maximum of 300 feet per minute of air velocity for the CFM required.

⚠ WARNING

Do not operate the system without filters. A portion of the dust entrained in the air may temporarily lodge in the duct runs and at the supply registers. Any circulated dust particles could be heated and charred by contact with the heating elements. This residue could soil ceilings, walls, drapes, carpets and other articles in the house. Operating the system without a filter will also allow lint and dirt particles to accumulate on the indoor coil fin and restrict air-flow through the coil. Soot damage may occur even with filters in place when certain types of candles, oil lamps or standing pilots are burned.

An internal filter rack is not provided with this air-handler. Therefore, an external means of filtering the return air is required. External filters should be sized for a maximum of 300 feet/min air velocity or the maximum velocity recommended by the type of filter installed. One or more return air filter grilles, a filter rack attached to unit return air intake, or a filter rack installed between a sealed return air platform and the return duct are all acceptable means of filtration. All return ducts must be filtered, either at each return grille or at a common filter near the unit.

Important: Do not install a return air filter grille **and** a filter rack at the unit and do not install a filter in the supply duct system.

Filter type, sizing, and placement are critical to heating and cooling system performance. Reduced air-flow can shorten the life of system components such as the compressor, indoor coil, heater elements, over temperature limits, and relays. As filters near the end of their useful life, the pressure drop through them increases. Therefore, it is important to factor the "end of life" (dirty) pressure drop of filters into the external static pressure of the duct system when selecting blower speeds and designing ductwork to assure the system is operating at the design CFM and system reliability is not compromised. Always verify that the system's air-flow is within specifications by performing a temperature rise (heating mode) and/or temperature drop (cooling mode) with all filters in place.

Important: High efficiency pleated filters and electronic air cleaners typically have significantly higher pressure drop than standard efficiency fiberglass filters, especially when they get dirty. Do not use high efficiency filters or electronic air cleaners unless adequate filter area is provided to lower the filter pressure drop to an acceptable level.

3.7 REFRIGERANT LINE CONNECTIONS & CHARGING

3.7.1 PREPARATION

The coil is shipped with a low pressure (5-10 psig) charge of dry nitrogen which will be released when the rubber plugs are removed. Leave the rubber plugs in the refrigerant connection stubs on the air-handler until the refrigerant lines are ready to be brazed to the refrigerant connection stubs to prevent contaminants from entering the coil. Clean the ends of the tubing and coil connection stubs (inside and outside) with an alcohol wipe before inserting the line set tubes into the coil connection stubs to assure a quality leak-free braze joint.

Refer to the outdoor unit installation instructions for details on refrigerant line sizing and installation. Be sure to follow long line length guidelines if they apply.

Route the refrigerant tubing in a manner than does not block service access to the front of the air-handler. 24 inch clearance is required for filter, coil, or blower removal and service access.

3.7.2 LIQUID LINE FILTER DRIER

A new liquid filter drier must be installed every time any part of the system has been open to the atmosphere, even if it's for a short period of time. The filter drier should be installed close to the air-handler for a system started up in the cooling mode and near the outdoor unit for a heat pump system started up in the heating mode. This allows the filter drier to catch any contaminants in the liquid line before they can enter the indoor or outdoor TXV inlet screen.

3.7.3 BRAZING

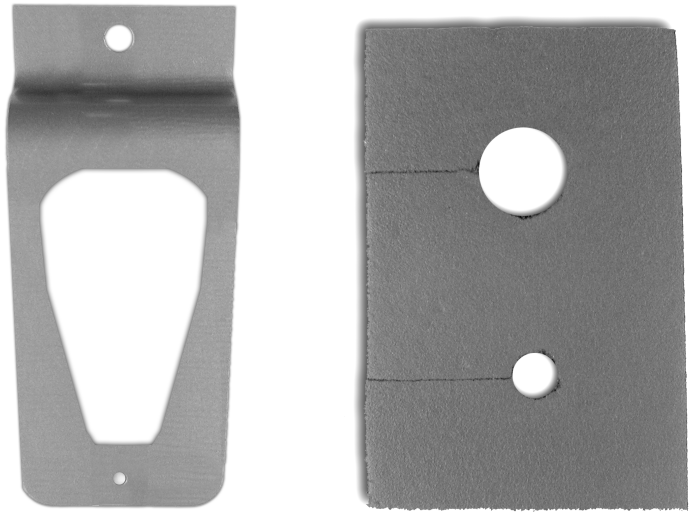
Air inside the tubing and coil should be displaced with dry nitrogen prior to the brazing process to prevent the formation of harmful copper oxide inside the tubing. It is very important not to pressurize the system with nitrogen while brazing or pin-hole leaks will form in the braze joint. This is accomplished by removing the gauge port valve core on one of the outdoor unit service valves to allow the pressure to be relieved as the heated nitrogen expands. Fill the system with dry nitrogen through the other service valve gauge port and then turn the nitrogen flow off just before brazing is begun.

Protect the TXV, copper to aluminum suction header joint, and outdoor unit service valves from overheating using a wet rag or heat sink compound. Leave the wet rag or heat sink material in place until the joint and surrounding tubing cools down to a safe temperature. Double tip torches can help minimize brazing time and heat conduction to the heat sensitive components if the flame is turned down and held on the joint just long enough to make the braze joint. With both single and double tip torches, turning the flame up too much and keeping the flame on the joint too long will damage the heat sensitive components even when a wet rag or heat sink compound is used.

Use a sheet metal shield to protect the cabinet's paint from the torch flames during the brazing process. The vapor line insulation should be pushed back on the line about 12 inches from the joint and retained to prevent it from igniting or melting during the brazing process.

- To install the refrigerant connections, first install the refrigerant block-off plate (located in the Parts Bag, see Figure 8) around the refrigerant connections. Braze all fittings. When refrigerant lines have cooled, insert the foam gasket (located in the parts bag, see Figure 8) around the refrigerant lines, between the coil and the refrigerant block-off plate.

FIGURE 8
REFRIGERANT BLOCK-OFF PLATE AND FOAM GASKET



After the foam gasket has been installed, the vapor line insulation should be pulled back in place so it contacts the air-handler cabinet to prevent condensate from forming on the cold tube and dripping off. A loosely fitting zip-tie placed around the insulation ½" from the end can be used to hold it in place so it doesn't move away from the cabinet.

3.7.4 LEAK TESTING

After all braze joints are completed, replace the valve core removed when purging with nitrogen and then leak test the system by pressurizing to 150 psig with dry nitrogen and allow the system to sit for at least 15 minutes (longer if possible) to assure the pressure does not drop.

3.7.5 EVACUATION

If no leaks are detected, evacuate the system down to 500 microns or below before charging the system or opening the service valves on the outdoor unit which will release the charge stored in the outdoor unit into the line set and air-handler coil. Failure to reach 500 microns of vacuum is a sign of a leak or excessive moisture inside the system.

3.7.6 REFRIGERANT CHARGING

Once the evacuation process is completed, break the vacuum with the refrigerant from a refrigerant cylinder or with refrigerant stored in the outdoor unit by opening the outdoor unit service valves. The charging process cannot be completed until the remaining steps in the installation process are completed and the indoor air-flow is adjusted to the proper level. See Section 4.7 for further details.

3.8 CONDENSATE DRAIN

Consult local codes or ordinances for specific requirements that may apply.

- The coil door is shipped from the factory with the condensate drain knockout attached. Knockout must be removed and the condensate block-off plate (included in parts bag, see Figure 11) must be installed to access the front drain.
- Vertical units (vertical drain pan) are supplied with a 3/4" female pipe thread primary drain connection and a 3/4" female pipe thread auxiliary drain connection. (See unit dimensions figures for drain locations.)

IMPORTANT: Side drain connections on vertical drain pans have a plastic web covering opening. Connection(s) used must be broken out before connection(s) are made. Break out only connection(s) to be used. Front drain connections have removable threaded plastic plugs factory installed. Plugs must be removed before connections are made; do not remove plugs if these connections are not used.

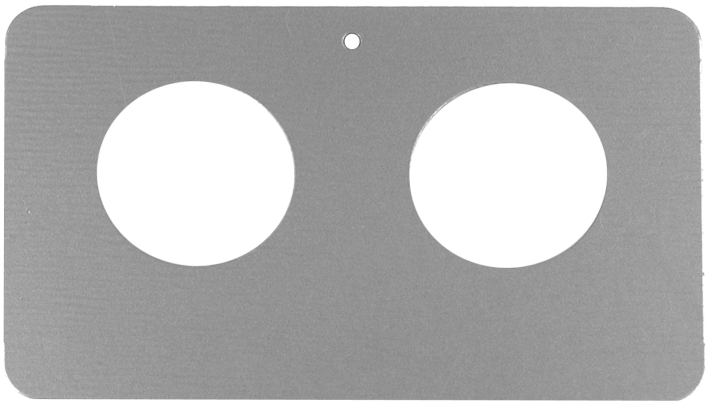
- Horizontal units (horizontal drain pan) are supplied with a 3/4" female pipe thread primary drain connection and a 3/4" female pipe thread auxiliary drain connection. (See unit dimensions and position figures for drain locations).

IMPORTANT: All horizontal pans have plastic web over the secondary drain connection. Plastic web covering secondary connection must be broken out if used. Secondary connection is lowered by 3/8". Do not get primary and secondary connections interchanged.

- Removal of door knockouts required for drain connections can be made much easier with the door removed from the cabinet.

- Install drain lines so they do not block service access to front of unit. 24 in. clearance is required for filter, coil or blower removal and service access.
- Make sure unit is level or pitched slightly toward primary drain connection so that drain pan will drain completely without water standing in pan.

FIGURE 9
CONDENSATE BLOCK-OFF PLATE



IMPORTANT: 2-6" PVC lengths are provided for making drain connection. When making drain fitting connections to drain pan, use a thin layer of teflon paste, silicone or teflon tape and install hand tight.

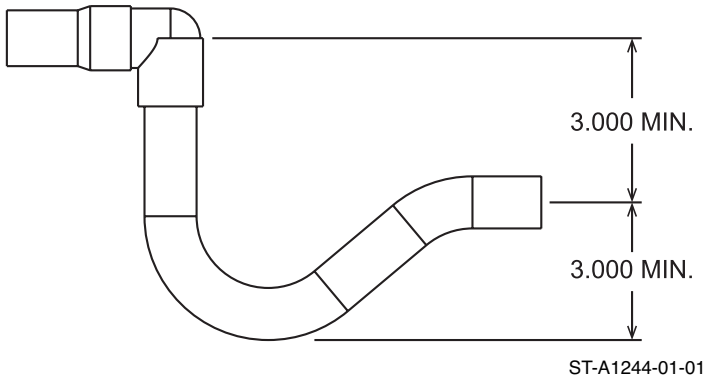
IMPORTANT: When making drain fitting connections to drain pan, do not over torque. Overtorquing fittings can split pipe connections on drain pan.

- Do not reduce drain line size less than connection size provided on condensate drain pan.
- All drain lines must be pitched downward away from the unit a minimum of 1/8 in. per foot of line to ensure proper drainage.
- Do not connect condensate drain line to a closed or open sewer pipe. Run condensate to an open drain or outdoors.
- The drain line should be insulated where necessary to prevent sweating and damage due to condensate forming on the outside surface of the line.
- Make provisions for disconnecting and cleaning of the primary drain line should it become necessary.
- Install a 2 in. trap in the primary drain line as close to the unit as possible. Make sure that the top of the trap is below connection to the drain pan to allow complete drainage of pan.

IMPORTANT: Do not operate unit without a drain trap (see Figure 10). The condensate drain is on the negative side of the blower, therefore, air being pulled in through the condensate line will prevent positive drainage without a proper trap.

- Auxiliary drain if used should be run to a place where it will be noticeable if it become operational. Occupant should be warned that a problem exists if water should begin running from the auxiliary drain line.
- Test condensate drain pan and drain line after installation is complete. Pour several quarts of water into drain pan, enough to fill drain trap and line. Check to make sure drain pan is draining completely, no leaks are found in drain line fittings, and water is draining from the termination of the primary drain line.

FIGURE 10
CONDENSATE DRAIN TRAP



3.9 THERMOSTAT

See instructions for the condensing unit or heat pump for recommended room thermostats.

- On units with one electric heat sequencer (HR_1) (see wiring diagram for electric heater), heat anticipator setting should be .16.
- On units with two electric heat sequencers (HR_1 & HR_2) (see wiring diagram for electric heater), heat anticipator setting should be .32 if both are connected to same stage on thermostat. Setting should be .16 if (HR_1 & HR_2) are connected to separate stages.

  NOTE: Some thermostats contain a fixed, non-adjustable heat anticipator. Adjustment is not permitted.
- The thermostat should be mounted 4 to 5 feet above the floor on an inside wall of the living room or a hallway that has good air circulation from the other rooms being controlled by the thermostat. It is essential that there be free air circulation at the location of the same average temperature as other rooms being controlled. Movement of air should not be obstructed by furniture, doors, draperies, etc. The thermostat should not be mounted where it will be affected by drafts, hot or cold water pipes or air ducts in walls, radiant heat from fireplace, lamps, the sun, T.V. or an outside wall. See instruction sheet packaged with thermostat for mounting and installation instructions.

3.10 ELECTRICAL WIRING

Field wiring must comply with the National Electric Code (C.E.C. in Canada) and any applicable local ordinance.

3.10.1 CONFIGURING UNIT FOR 208 VOLT POWER

The control transformer in 208/240V air-handlers must be configured in the field to operate on a 208 volt electrical supply to assure adequate control voltage (24+ volts) with the reduced supply voltage. The units are shipped from the factory for 220-240 volt applications. For 208 volt applications, disconnect electrical power to the unit and remove the blower access panel and then the control box cover located on the blower housing. Then remove the insulated cap from the 208 volt transformer terminal and move the BLACK wires that are connected to the 240 volt transformer terminal to the 208 volt transformer terminal. Plug the insulated cap onto the transformer 240V terminal.

3.10.2 GROUNDING

- This product must be sufficiently grounded in accordance with National Electrical Code (C.E.C. in Canada) and any applicable local ordinance.

⚠ WARNING

The unit must be permanently grounded. Failure to do so can result in electrical shock causing personal injury or death.

- Grounding may be accomplished by grounding metal conduit when installed in accordance with electrical codes to the unit cabinet.
- Grounding may also be accomplished by attaching ground wire(s) to ground lug(s) provided in the unit wiring compartment.
- Ground lug(s) are located close to wire entrance on left side of unit (upflow). Lug(s) may be moved to marked locations near wire entrance on right side of unit (upflow), if alternate location is more convenient.
- Use of multiple supply circuits require grounding of each circuit to lug(s) provided in unit.

3.10.3 POWER WIRING

It is important that proper electrical power is available for connection to the unit model being installed. See the unit nameplate, wiring diagram and electrical data in the installation instructions.

- If required, install a branch circuit disconnect of adequate size, located within sight of, and readily accessible to the unit.
- Units with factory installed circuit breaker(s) meet UL and CSA requirements as a service disconnect and should make above requirement for a field installed branch circuit disconnect unnecessary.
- **IMPORTANT:** Units may be equipped with one, two, or three 60 amp. circuit breakers. These breaker(s) protect the internal wiring in the event of a short circuit and serve as a disconnect. Circuit breakers installed within the unit do not provide over-current protection of the supply wiring and therefore may be sized larger than the branch circuit protection.
- Supply circuit power wiring must be 75°C minimum copper conductors only. See electrical data for ampacity, wire size and circuit protector requirement. Supply circuit protective devices may be either fuses or “HACR” type circuit breakers.
- Power wiring may be connected to either the right or left side (vertical) top or bottom (horizontal). A 7/8”, 1-3/32” dia. concentric knockout is provided for connection of power wiring to unit. If a larger opening is required, dependent upon kW electric heat supplied, pull appropriate size hole required for conduit size being used. Using a con-

duit hole punch (Greenlee type), center punch using outside cabinet around 7/8" knockout as a template to center punch location and punch desired hole size. Holes may be punched for any size conduit up to a 2" hole for 1-1/2" conduit.

- Power wiring is connected to either the power terminal block or circuit breaker(s) in unit control compartment.
- Single phase units above 11 kW may be supplied with circuit breaker(s) requiring separate supply circuits. Units come standard with a jumper bar assembly connecting separate circuits into one single supply circuit.
- Jumper bar assemblies are connected to the line side lugs of the circuit breakers. Jumper bar is assembled for left (upflow) cabinet power wiring entrance. To convert to right (upflow) power entrance: Remove jumper cover, remove jumper bar from circuit breakers, remove screw on back holding left lug in upper hole to bar, reassemble lug in lower hole and retighten screw. Use the same procedure to move the right lug to the upper mounting hole. Reassemble jumper bar into circuit breakers and tighten lugs. Jumper bar is now ready for wiring from the opposite side.
- If a factory supplied jumper bar for single supply circuit is removed from unit to make multiple supply circuits the line side of the individual circuit breakers must be covered with finger safe covers. (See information on accessories for part numbers.)
- After wiring is complete, make sure finger safe cover(s) are replaced over circuit breaker(s) lugs covering lug where field connections are made. On units with jumper bar, make sure jumper bar cover is replaced and secured in place. Covers provided for jumper bar must have side of cover broken off on the side wiring has been connected so that field supply will clear under appropriate side of cover. Units with circuit breakers must have covers in place to meet requirements as a service disconnect.

3.10.4 COPPER WIRE SIZE - AWG. (3% VOLTAGE DROP)

SUPPLY WIRE LENGTH FEET																		
200 [61]	12	10	8	8	8	6	6	6	4	4	3	3	2	2	1	0	00
150 [46]	12	10	10	10	8	8	6	6	6	4	4	3	3	2	1	0	00
100 [30]	14	12	10	10	8	8	8	6	6	4	4	3	3	2	1	0	00
50 [15]	14	12	10	10	8	8	8	6	6	4	4	3	3	2	1	0	00
	15	20	25	30	35	40	45	50	60	70	80	90	100	110	125	150	175
SUPPLY CIRCUIT AMPACITY																	

NOTE: WIRE BASED ON COPPER CONDUCTORS 75°C MINIMUM RATING.
FOR MORE THAN 3 CONDUCTORS IN A RACEWAY OR CABLE, SEE N.E.C. FOR DERATING THE AMPACITY OF EACH CONDUCTOR.

3.10.5 ELECTRICAL DATA: BLOWER MOTOR ONLY WITHOUT ELECTRIC HEAT

MODEL SIZE/ELEC. DESIGNATION	VOLTAGE	PHASE	HERTZ	HP [W]	RPM	SPEEDS	CIRCUIT AMPS.	MINIMUM CIRCUIT AMPACITY	MAXIMUM CIRCUIT PROTECTOR
(-)BHP-17A00NH*	115	1	60	1/3 [249]	300-1100	5	3.3	5.0	15
(-)BHP-21A00NH*	115	1	60	1/2 [373]	300-1100	5	5.0	7.0	15
(-)BHP-24A00NH*	115	1	60	3/4 [559]	300-1100	5	5.8	8.0	15
(-)BHP-25A00NH*	115	1	60	3/4 [559]	300-1100	5	7.7	10.0	15
(-)BHP-17J00NH*	208/240	1	60	1/3 [249]	300-1100	5	2.0	3.0	15
(-)BHP-21J00NH*	208/240	1	60	1/2 [373]	300-1100	5	3.1	4.0	15
(-)BHP-24J00NH*	208/240	1	60	3/4 [559]	300-1100	5	4.2	6.0	15
(-)BHP-25J00NH*	208/240	1	60	3/4 [559]	300-1100	5	5.7	8.0	15

3.10.6 ELECTRICAL DATA: WITH ELECTRIC HEAT

Model Size/ Elec./KW Designation	Heater KW Volts 208/240	PH/HZ	Heater No./KW @ 240V	Type Supply Circuit Single Circuit Multiple Circuit	Circuit Amps.	Minimum Circuit Ampacity	Maximum Circuit Protector
(-)BHP-17J06SH*	3.7/4.9	1/60	2/2.5	Single Circuit	19.8/22.4	25/29	25/30
(-)BHP-17J07SH*	5.3/7.0	1/60	2/3.5	Single Circuit	27.5/31.2	35/39	40/40
(-)BHP-17J11SH*	7.5/10.0	1/60	3/3.3	Single Circuit	38.1/43.7	48/55	50/60
(-)BHP-21J06SH*	3.7/4.9	1/60	2/2.5	Single Circuit	20.9/23.5	27/30	30/30
(-)BHP-21J07SH*	5.3/7.0	1/60	2/3.5	Single Circuit	28.6/32.3	36/41	40/45
(-)BHP-21J11SH*	7.5/10.0	1/60	3/3.3	Single Circuit	39.2/44.8	49/56	50/60
RBHP-21J14SH*	10.5/14.0	1/60	4/3.5	Single Circuit	55.2/62.5	69/79	70/90
	5.3/7.0		2/3.5	Multiple Ckt. 1	29.7/33.4	38/42	40/45
	5.3/7.0		2/3.5	Multiple Ckt. 2	25.5/29.2	32/27	35/40
(-)BHP-24J06SH*	3.7/4.9	1/60	2/2.5	Single Circuit	22.0/24.6	28/31	30/35
(-)BHP-24J07SH*	5.3/7.0	1/60	2/3.5	Single Circuit	29.7/33.4	38/42	40/45
(-)BHP-24J11SH*	7.5/10.0	1/60	3/3.3	Single Circuit	40.3/45.9	51/58	60/60
(-)BHP-24J18SH*	13.2/17.5	1/60	5/3.5	Single Circuit	67.7/77.1	85/97	90/100
	5.3/7.0		2/3.5	Multiple Ckt. 1	29.7/33.4	38/42	40/45
	7.9/10.5		3/3.5	Multiple Ckt. 2	39.0/43.8	48/55	50/60
(-)BHP-25J11SH*	7.5/10.0	1/60	3/3.3	Single Circuit	91.8/47.4	53/60	60/60
(-)BHP-25J18SH*	13.2/17.5	1/60	5/3.5	Single Circuit	69.2/78.6	87/99	90/100
	5.3/7.0		2/3.5	Multiple Ckt. 1	31.2/39.9	39/44	40/45
	7.9/10.5		3/3.5	Multiple Ckt. 2	38.0/43.8	48/55	50/60
RBHP-25J21SH*	15.0/20.0	1/60	6/3.3	Single Circuit	77.8/89.0	98/112	100/125
	7.5/10.0		3/3.3	Multiple Ckt. 1	41.8/47.4	53/60	60/70
	7.5/10.0		3/3.3	Multiple Ckt. 2	36.1/41.7	46/53	50/60

Supply circuit protective devices may be fuses or “HACR” type circuit breakers. Largest motor load is included in single circuit and circuit 1 multiple circuit.
If non-standard fuse size is specified, use next size larger standard fuse size.

3.10.7 CONTROL WIRING

IMPORTANT: Class 2 low voltage control wire should not be run in conduit with power wiring and must be separated from power wiring, unless class 1 wire of proper voltage rating is used.

- Low voltage control wiring should be 18 AWG color-coded (105°C minimum). For lengths longer than 100 ft., 16 AWG wire should be used.
- Control wiring should be routed through 1/2” dia. knockout near power wiring entrance on either left or right side of unit. After opening selected knockout, install bushing (supplied in parts bag) in openings.
- If control wiring is routed through right side (upflow), it must be routed through extruded holes in lower front of blower housing behind power raceway to the left side of blower housing. If routed through left side (upflow), it should be routed through extruded hole in lower front left blower side.
- Field control connections are made to terminals extending from left side of control compartment (upflow position).
- See wiring diagrams attached to indoor and outdoor sections to be connected, control wiring diagram booklet supplied with outdoor heat pump section, or Figures 8 and 9.
- Do not leave excess field control wiring inside unit, pull excess control wire to outside of unit and provide strain relief for field control wiring on inside of cabinet at point wiring penetrates cabinet.
- Make sure, after installation, separation of control wiring and power wiring has been maintained.

3.10.8 THERMOSTAT & CONTROL WIRING CONNECTIONS

NOTE: These low voltage application diagrams are generic. Your indoor/outdoor units may not have all the characteristics shown or may not wire exactly as shown. Refer to the diagrams and information sent with your indoor/outdoor sections.

WIRE COLOR CODE:

BK - BLACK	G - GREEN	P - PINK	W - WHITE
BR - BROWN	GY - GRAY	PR - PURPLE	Y - YELLOW
GL - BLUE	O - ORANGE	R - RED	

FIGURE 11
TYPICAL THERMOSTAT: STRAIGHT COOLING W / ELECTRIC HEAT

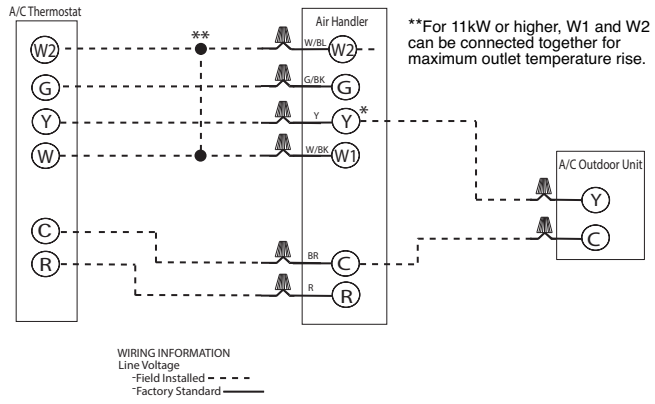
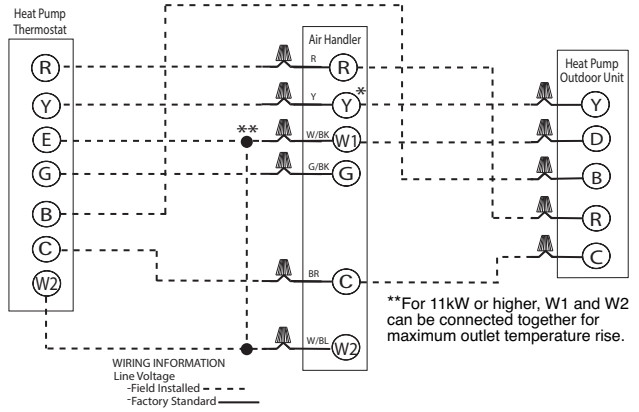


FIGURE 12
TYPICAL THERMOSTAT: HEAT PUMP W / ELECTRIC HEAT



3.11 AIRFLOW

Airflow performance data is based on a dry indoor coil and return air filter in place. Select performance table for appropriate unit size, voltage and number of electric heaters to be used. Make sure external static applied to unit allows operation within the minimum and maximum limits shown in Section 3.11.1 below for both cooling and electric heat operation. For optimum blower performance, operate the unit in the .3 to .7 in W.C. external static range. Units should be applied with a minimum of .1 in W.C. external static pressure.

NOTE: The air-flow performance data tables (see Section 3.11.3) list air-flow information for air-handlers without heater and with maximum heater kW allowed for each model. The following formula can be used to calculate the adjusted CFM for smaller kW heaters.

$$\text{Adjusted CFM} = \text{No Heat CFM} - [(\text{No Heat CFM} - \text{Max kW CFM}) \times \frac{\text{Actual kW}}{\text{Max kW}}]$$

3.11.1 GENERAL AIRFLOW OPERATING LIMITS

Model/Cabinet Size	17		21		24		25	
Cooling BTU/H Cooling Tons Nominal	18000 1.5	24000 2	30000 2.5	36000 3	42000 3.5	48000 4	60000 5	60000 5
Heat Pump or Air Conditioning Maximum Heat/Cool CFM (37.5 CFM/1,000 BTUH) (450 CFM/Ton Nominal)	675	900	1125	1350	1575	1800	2025	2250
Heat Pump or Air Conditioning Nominal Heat/Cool CFM (33.3 CFM/1,000 BTUH) (400 CFM/Ton Nominal)	600	800	1000	1200	1400	1600	1800	2000
Heat Pump or Air Conditioning Minimum Heat/Cool CFM (30.0 CFM/1,000 BTUH) (360 CFM/Ton Nominal)	540	720	900	1080	1260	1440	1620	1800
Maximum kW Electric Heating & Minimum Electric Heat CFM	11 560	11 560	11 900	11 1220	18 1220	18 1220	18 1460	18 1460
Maximum Electric Heat Rise °F	85	85	35	35	65	65	43	43

3.11.2 SELECTING INDOOR BLOWER MOTOR SPEED

(-)BHP air-handlers must be configured in the field to assure proper air-flow is delivered for the particular application it is being used in. Refer to the AIR-FLOW PERFORMANCE DATA in Section 3.11.3 to determine which speed tap is appropriate for the application.

Each model can be matched with 2 different outdoor unit capacities, 1.5 - 2.0 tons, 2.5 - 3.0 tons, 3.5 - 4.0 tons, & 4.0 - 5.0 tons depending on the model. (-)BHP models have constant torque ECM motors with 5 blower motor speed taps, labeled T1 through T5. Speed selections are made on a terminal block located on the motor housing. Speed tap T1 is always dedicated to continuous fan operation and delivers approximately 50% of the speed tap T4 air-flow. Speed taps T2 & T4 are for applications with an external static pressure up to 0.5" W.C. (speed tap T2 for lower tonnage & speed tap T4 for higher tonnage). Speed taps T3 & T5 are for applications with an external static pressure above 0.5" W.C. (speed tap T3 for lower tonnage & speed tap T5 for higher tonnage). All models are shipped from the factory with speed tap T5 selected. For optimum performance, efficiency, dehumidification, and the lowest possible noise level, select the appropriate speed tap for the specific application at the time of installation.

To change the indoor blower speed on (-BHP air-handlers, move the BLUE wire connected to terminal T5 located on the motor housing to the appropriate terminal (T2 – T5) on the same terminal block.

3.11.3 AIRFLOW PERFORMANCE DATA

Model Cabinet Size	Tonnage	Electric Heaters	Blower Motor		CFM [L/s] (Watts)/External Static Pressure-Inches W.C. [kPa] with filter & indoor coil									
			Nominal Speed Tap	Volts	0.1 [.02]	0.2 [.05]	0.3 [.07]	0.4 [.10]	0.5 [.12]	0.6 [.15]	0.7 [.17]	0.8 [.20]	0.9 [.23]	1.0 [.25]
-17	1.5-ton Air Flow	none	2	208/240	659 [311] (74)	625 [294] (80)	581 [274] (84)	539 [254] (88)	-	-	-	-	-	-
		none	3	208/240	790 [372] (98)	759 [358] (105)	722 [340] (113)	687 [324] (119)	650 [306] (126)	615 [290] (131)	573 [270] (139)	552 [260] (145)	507 [239] (150)	460 [217] (155)
		3 (max.)	2	208/240	649 [306] (79)	615 [290] (84)	571 [269] (88)	529 [249] (92)	-	-	-	-	-	-
		3 (max.)	3	208/240	773 [365] (110)	736 [347] (113)	699 [330] (118)	677 [320] (126)	640 [302] (132)	605 [286] (141)	563 [266] (146)	542 [256] (154)	497 [235] (157)	450 [212] (162)
		none	2	115	651 [307] (76)	627 [295] (82)	583 [275] (86)	541 [255] (90)	-	-	-	-	-	-
		none	3	115	776 [366] (105)	743 [351] (109)	724 [342] (118)	687 [324] (122)	658 [311] (131)	617 [291] (136)	595 [281] (144)	555 [262] (148)	517 [244] (152)	460 [217] (162)
	2.0-ton Air Flow	none	4	208/240	844 [398] (141)	819 [386] (146	799 [377] (155)	764 [360] (160)	-	-	-	-	-	-
		none	5	208/240	958 [452] (162)	934 [440] (172)	914 [431] (176)	888 [419] (186)	855 [403] (189)	816 [380] (210)	785 [370] (204)	760 [358] (214)	708 [334] (223)	672 [317] (226)
		3 (max.)	4	208/240	834 [393] (146)	809 [831] (150)	789 [372] (159)	754 [355] (164)	-	-	-	-	-	-
		3 (max.)	5	208/240	946 [446] (179)	922 [435] (189)	902 [426] (193)	876 [413] (203)	843 [398] (206)	804 [380] (216)	773 [365] (221)	748 [353] (231)	696 [328] (240)	660 [311] (243)
		none	4	115	846 [399] (143)	821 [387] (148)	801 [378] (157)	766 [361] (162)	-	-	-	-	-	-
		none	5	115	964 [455] (167)	945 [446] (178)	914 [431] (181)	888 [419] (191)	861 [406] (196)	821 [387] (205)	787 [372] (210)	761 [359] (218)	726 [342] (220)	690 [326] (230)
-21	2.5-ton Air Flow	none	2	208/240	1068 [504] (138)	1041 [491] (147)	1001 [472] (153)	972 [458] (161)	-	-	-	-	-	-
		none	3	208/240	1187 [560] (180)	1162 [548] (188)	1125 [530] (192)	1099 [518] (200)	1058 [499] (208)	1013 [478] (215)	982 [463] (223)	951 [448] (232)	899 [424] (234)	855 [403] (237)
		4 (max.)	2	208/240	1035 [488] (143)	1007 [475] (152)	966 [455] (158)	936 [441] (169)	-	-	-	-	-	-
		4 (max.)	3	208/240	1157 [546] (182)	1132 [534] (192)	1095 [517] (198)	1069 [505] (209)	1028 [485] (218)	983 [464] (228)	952 [449] (239)	921 [435] (250)	869 [410] (255)	825 [389] (262)
		none	2	115	1070 [504] (138)	1043 [492] (147)	1004 [473] (153)	974 [459] (161)	-	-	-	-	-	-
		none	3	115	1138 [537] (175)	1113 [525] (186)	1075 [507] (191)	1053 [497] (203)	1004 [474] (210)	957 [451] (216)	932 [440] (226)	901 [425] (231)	855 [404] (242)	800 [378] (252)
	3.0-ton Air Flow	none	4	208/240	1269 [598] (207)	1236 [583] (219)	1174 [554] (226)	1149 [542] (236)	-	-	-	-	-	-
		none	5	208/240	1397 [659] (287)	1377 [649] (307)	1346 [635] (317)	1318 [622] (320)	1291 [609] (322)	1264 [596] (319)	1234 [582] (312)	1190 [561] (326)	1155 [545] (351)	1126 [531] (368)
		4 (max.)	4	208/240	1241 [585] (222)	1208 [570] (234)	1174 [554] (241)	1149 [542] (251)	-	-	-	-	-	-
		4 (max.)	5	208/240	1366 [645] (302)	1346 [635] (313)	1315 [621] (323)	1287 [608] (331)	1260 [595] (341)	1233 [582] (346)	1203 [568] (358)	1159 [547] (371)	1124 [530] (381)	1095 [517] (387)
		none	4	115	1269 [598] (207)	1236 [583] (219)	1174 [554] (226)	1149 [542] (236)	-	-	-	-	-	-
		none	5	115	1370 [646] (292)	1343 [634] (302)	1309 [618] (309)	1285 [607] (319)	1258 [594] (330)	1221 [576] (336)	1182 [558] (348)	1147 [542] (357)	1117 [527] (366)	1080 [510] (375)

3.11.3 AIRFLOW PERFORMANCE DATA – continued

-24	3.5-ton Air Flow	none	2	208/240	1438 [678] (205)	1409 [664] (217)	1375 [648] (229)	1341 [632] (252)	-	-	-	-	-	-
		none	3	208/240	1568 [740] (279)	1538 [725] (290)	1507 [711] (303)	1471 [694] (313)	1435 [677] (333)	1403 [662] (338)	1362 [642] (358)	1318 [622] (365)	1287 [607] (374)	1250 [589] (405)
		5 (max.)	2	208/240	1414 [667] (230)	1384 [653] (242)	1350 [637] (254)	1315 [620] (277)	-	-	-	-	-	-
		5 (max.)	3	208/240	1548 [730] (304)	1518 [716] (316)	1487 [701] (328)	1451 [684] (338)	1415 [667] (358)	1383 [653] (368)	1342 [633] (388)	1298 [612] (395)	1267 [597] (409)	1230 [580] (455)
		none	2	115	1448 [683] (205)	1419 [669] (217)	1385 [653] (229)	1351 [637] (252)	-	-	-	-	-	-
		none	3	115	1559 [735] (294)	1527 [720] (308)	1497 [706] (322)	1466 [691] (335)	1431 [675] (349)	1378 [650] (367)	1349 [636] (379)	1306 [606] (393)	1271 [599] (406)	1250 [589] (417)
	4.0-ton Air Flow	none	4	208/240	1640 [773] (311)	1604 [757] (326)	1587 [748] (335)	1559 [735] (376)	-	-	-	-	-	-
		none	5	208/240	1789 [844] (413)	1762 [831] (427)	1731 [816] (433)	1699 [801] (449)	1667 [786] (462)	1635 [771] (482)	1602 [756] (498)	1546 [729] (516)	1515 [715] (529)	1465 [691] (542)
		5 (max.)	4	208/240	1613 [761] (331)	1574 [742] (346)	1557 [734] (355)	1529 [721] (396)	-	-	-	-	-	-
		5 (max.)	5	208/240	1759 [830] (433)	1732 [817] (447)	1701 [802] (453)	1669 [787] (469)	1637 [772] (482)	1605 [757] (502)	1572 [741] (518)	1516 [715] (536)	1485 [700] (549)	1435 [677] (562)
		none	4	115	1642 [774] (311)	1606 [757] (326)	1589 [749] (335)	1561 [736] (376)	-	-	-	-	-	-
		none	5	115	1811 [854] (423)	1791 [845] (436)	1760 [830] (451)	1730 [816] (464)	1700 [802] (479)	1669 [787] (492)	1606 [757] (516)	1573 [742] (529)	1538 [725] (542)	1462 [689] (555)
-25	5.0-ton Air Flow	none	2	208/240	1872 [883] (373)	1837 [866] (393)	1798 [848] (407)	1763 [832] (419)	-	-	-	-	-	-
		none	3	208/240	2075 [979] (497)	2036 [960] (511)	2017 [951] (533)	1984 [936] (553)	1944 [917] (563)	1910 [901] (582)	1889 [891] (599)	1846 [871] (617)	1805 [851] (626)	1783 [841] (638)
		5 (max.)	2	208/240	1831 [854] (393)	1795 [847] (413)	1756 [828] (427)	1720 [811] (439)	-	-	-	-	-	-
		5 (max.)	3	208/240	2043 [964] (517)	2004 [945] (531)	1985 [936] (553)	1951 [920] (573)	1912 [901] (583)	1878[886] (602)	1857 [876] (619)	1814 [856] (637)	1773 836] (646)	1751[826] (658)
		none	2	115	1872 [883] (373)	1837 [866] (393)	1798 [848] (407)	1763 [832] (419)	-	-	-	-	-	-
		none	3	115	2075 [979] (497)	2036 [960] (511)	2017 [951] (533)	1984 [936] (553)	1944 [917] (563)	1910 [901] (582)	1889 [891] (599)	1846 [871] (617)	1805 [851] (626)	1783 [841] (638)
		none	4 or 5	208/240	2102 [992] (550)	2072 [977](568)	2042 [963] (584)	2011 [949] (593)	1974 [931] (610)	1949 [919] (631)	1916 [904] (644)	1884 [889] (662)	1851 [873] (669)	1810 [854] (692)
		5 (max.)	4 or 5	208/240	2070 [976] (560)	2040 [962](578)	2010 [948] (594)	1979 [933] (613)	1942 [916] (620)	1917 [904] (641)	1884 [889] (654)	1852 [874] (672)	1819 [858] (679)	1778 [839] (702)
		none	4 or 5	115	2102 [992] (550)	2072 [977](568)	2042 [963] (584)	2011 [949] (593)	1974 [931] (610)	1949 [919] (631)	1916 [904] (644)	1884 [889] (662)	1851 [873] (669)	1810 [854] (692)

If application exceeds 0.5" of static, adjust the motor speed to the high static speed as described below:

All constant torque motors have 5 speed tabs. Speed tab 1 is for continuous fan. Speed 2 (Low static) and speed tab 3 (High static) are lower tonnage. Speed tab 4 (Low static) and Speed tab 5 (High static) are for higher tonnage.

The lower static speed 2 (Lower tonnage) and speed tab 4 (Higher tonnage) are used for external static below 0.5".
For external static exceeding 0.5", move the blue wire from the motor to appropriate high static speed tab 3 (Lower tonnage) or speed tab 5 (Higher tonnage).

4.0 START-UP

4.1 PRE-START CHECKLIST

PRE-START CHECKLIST	
❍ YES ❍ NO	Is unit properly located, level, secure and serviceable?
❍ YES ❍ NO	Has auxiliary pan been provided under the unit with separate drain? (Units installed above a finished ceiling).
❍ YES ❍ NO	Is condensate line properly sized, run, trapped, pitched and tested?
❍ YES ❍ NO	Is ductwork correctly sized, run, taped and insulated?
❍ YES ❍ NO	Have all cabinet openings and wiring been sealed with caulking?
❍ YES ❍ NO	Is the filter clean, in place and of adequate size?
❍ YES ❍ NO	Is the wiring tight, correct and to the wiring diagram?
❍ YES ❍ NO	Is the unit properly grounded and protected (fused)?
❍ YES ❍ NO	Is the thermostat heat anticipator been set properly?
❍ YES ❍ NO	Is the unit circuit breaker(s) rotated properly “on” up - “off” down?
❍ YES ❍ NO	Are the unit circuit breaker(s) line lug cover(s) in place?
❍ YES ❍ NO	Are all access panels in place and secure?
Refer to outdoor unit installation instructions for system start-up instructions and refrigerant charging instructions.	

4.2 SYSTEM START-UP AND OPERATIONAL CHECK-OUT

After the air-handler and other system components have been installed and the Pre-Start Checklist has been completed, the system should be started up and an operational check-out should be performed. The operational check-out includes checking sequence of operation of the controls, air-flow, and refrigerant charge. If the controls are not found to be functioning properly, or the air-flow or refrigerant charge are not within specifications, corrective action must be taken. The following sections are provided to assist the installer with the operational check-out.

4.3 SEQUENCE OF OPERATION

4.3.1 COOLING MODE

When the thermostat calls for cooling, the G terminal on the blower control board is energized which in turn energizes the indoor blower motor. This causes the indoor blower to circulate air through the air-handler and duct system during the cooling cycle. The Y terminal on the blower control board is also energized which tells the blower control board to energize the cooling speed on the motor instead of the reduced CFM continuous fan speed.

When the thermostat call is satisfied or the thermostat is turned to the off position. The G and Y terminals on the blower control board are de-energized. A time delay programmed into the motor keeps the blower motor energized for an additional 30 seconds to extract the residual cooling from the cold indoor coil.

4.3.2 ELECTRIC HEAT MODE

When the thermostat calls for the 1st stage of heat, the W1 terminal on the blower control board is energized. This energizes the indoor blower motor and all of the electric heater elements for heater kits with 7kW of heat or less and the 1st stage elements for 11kW heater kits and higher. If W1 and W2 thermostat pigtails at the air-handler are wired together on 11kW heater kits and higher, all of the elements to be energized. For 11kW heater kits and higher, a 2-stage heat thermostat can be used to energize the W2

terminal on the blower control board upon a call for a 2nd stage of heat which will in turn will energize the 2nd stage heater elements. The heater kit will cycle between the 1st and 2nd stages of heat at the direction of the thermostat.

When the thermostat call for heat is satisfied or the thermostat is turned to the off position, the W1 terminal on the blower control board is de-energized which will de-energize the heating elements in a few seconds as the bimetallic disc in the sequencer cools. The blower motor will be de-energized 75 seconds after the call for heat ends.

4.3.3 HEAT PUMP HEATING MODE

When the heat pump thermostat is set to "heat" mode, the "B" terminal on the outdoor unit is energized which energizes the reversing valve and switches it to the heating position. When the thermostat calls for heat, the G terminal on the blower control board is energized which in turn energizes the indoor blower motor. This causes the indoor blower to circulate air through the air-handler and duct system during the heating cycle. The Y terminal on the blower control board is also energized which tells the blower control board to energize the heating speed on the motor instead of the reduced CFM continuous fan speed. The heating speed on the motor is the same as the cooling speed.

Should the room temperature continue to fall when the system is operating in the heat pump heating mode, the thermostat energizes the W2 terminal on the blower control board which energizes supplemental electric heat. For 11kW heater kits and larger, the W1 and W2 pigtails can be connected together for maximum supplemental heat for 2nd stage or wired to the W1 and W2 terminals on the thermostat separately to provide a 3rd stage of heat as needed. For models equipped with a Watt Restrictor (See Section 5.5), if the air temperature leaving the indoor coil is above a set level, the Watt Restrictor will allow only a portion of the supplemental electric heat to be energized regardless of the thermostat input.

When the thermostat call for heat is satisfied, the G and Y terminals on the blower control board are de-energized. A time delay programmed into the motor keeps the blower motor energized for an additional 30 seconds to extract the residual heat from the warm indoor coil.

4.3.4 SUPPLEMENTAL ELECTRIC HEAT DURING DEFROST

Supplemental electric heat during the defrost cycle can be provided by running a wire from the purple pigtail wire (from D terminal on defrost control) on the outdoor heat pump unit to the W1 pigtail on the air-handler. This will energize the electric heat during the defrost cycle to prevent cold air from being discharged from the supply registers in the home. For models equipped with a Defrost Heat Control (See Section 5.6), the Defrost Heat Control senses the supply air temperature and cycles the supplemental electric heat as required to maintain a 75°F - 85°F supply air temperature to conserve energy and to prevent the call for heat to be satisfied before the defrost cycle is completed.

For the most economical operation and if cold discharge air is not a concern, do not run the wire from the purple pigtail on the outdoor unit to the W1 pigtail on the air-handler. In this case, supplemental heat will only be energized if the thermostat energizes the 2nd stage of heat during the defrost cycle due to a significant drop in room temperature.

4.3.5 EMERGENCY HEAT (HEAT PUMP)

If heat pump thermostat is set to the "Emergency Heat" mode, the outdoor unit will be prevented from operating and heat will be provided solely by the electric heater. The electric heater elements and indoor blower motor will be energized any time there is a call for heat with no compressor and outdoor fan operation. A jumper should be installed between the W1 and E terminals on the thermostat sub-base so a call for emergency heat will be transferred to the 1st stage of heat of the thermostat. The indoor blower will cycle on and off with the electric heater elements when the thermostat fan setting is set to the "auto" mode, although there will be a 75 second delay off period for the blower motor after the call for heat ends.

4.3.6 THERMOSTAT FAN SETTING

If the thermostat "FAN" setting is adjusted to the "AUTO" position, the indoor blower motor will only operate when there is a call for cooling or heating. If the setting is adjusted to the "ON" position, the indoor blower motor will operate continuously at a reduced speed when there is no call for cooling and heating to reduce power consumption and noise.

4.4 CORRECTING ELECTRIC HEAT kW FOR VOLTAGE

The actual electric heat kW varies with the supply voltage. Use the following formula to correct the heater rated kW at voltages other than rated voltage.

Actual kW = Rated kW × (Actual Voltage^2 / Rated Voltage^2).

4.5 CALCULATING ELECTRIC HEAT CAPACITY IN BTUH

Use the following formula to convert heater kW to heating capacity in BTUH.

BTUH Capacity = kW x 3412

(Where 3412 = BTUH per kW)

4.6 CHECKING INDOOR AIR-FLOW

4.6.1 ESTIMATING CFM USING EXTERNAL STATIC PRESSURE

A common method of checking indoor is to measure the external static pressure that the air-handler is working against and then referring to the air-flow data in Section 3.13.3. Measuring external static pressure to a high degree of precision in the field is challenging, so keep in mind that the CFM determined by this method is an estimate, but is accurate enough for all practical purposes.

To determine external static pressure, the static pressure should be measured in inches of water column across the air-handler using an incline manometer, digital static pressure meter, or a Magnahelic. The static pressure inside the return plenum should be measured as close to the air-handler as possible and must be measured between any external filter rack and the unit so the pressure drop across the filter is accounted for. The static pressure inside the supply plenum should be measured at a point about halfway between the air-handler and the first elbow or the end of the plenum. Total external static pressure is the sum of the return and supply plenum static pressures. Even though the return plenum static pressure is a negative pressure, it must be added to the supply plenum static pressure, ignoring the negative sign. The supply and return plenum static pressure tubing can also be connected to both pressure ports of the pressure measuring device which will automatically add the two pressures together.

4.6.2 ESTIMATING CFM USING ELECTRIC HEAT TEMPERATURE RISE

If the air-handler is equipped with an electric heater, the CFM can be estimated using the air temperature rise across the air-handler with the heater and blower both energized once the unit has run long enough for the temperatures to stabilize. As with determining CFM using external static pressure, the CFM determined by this method is an estimate, but is accurate enough for all practical purposes. Measure the return air temperature as close to the unit as possible and the supply air temperature about half way from the air-handler to the first elbow or end of the supply plenum. Use the following formula to calculate CFM once the temperature rise is determined.

CFM = Heating BTUH / (Elevation Factor × Temp Rise °F)

Note: Refer to Section 4.5 to determine Heating BTUH and the following chart for Elevation Factor.

Elevation (Feet)	Elevation Factor
Sea Level	1.08
500	0.98
1000	0.96
1500	0.95
2000	0.93
2500	0.91
3000	0.90
3500	0.88
4000	0.86
5000	0.83
6000	0.83
7000	0.77
8000	0.74
9000	0.72
10000	0.69

4.7 CHECKING REFRIGERANT CHARGE

System refrigerant charging should only be performed after the indoor air-flow is confirmed to be correct for the application. Once the air-flow is confirmed, refer to the manufacturer's outdoor unit charging chart and installation manual for the proper charging procedure for the system.

Note: The charging method for systems with a fixed orifice (piston) will likely be different than systems with TXV's.

5.0 COMPONENTS & CONTROLS

5.1 BLOWER MOTOR

All (-)BHP models have 5-speed constant torque electronically commutated (ECM) style motors that are significantly more efficient than PSC motors.

- The motor has a control module mounted on the end of the motor opposite the shaft end which is replaceable should only the control module itself fail.
- Constant torque ECM motors do not require a run capacitor.
- A terminal block on the motor shell is provided for the 5 speed taps, labeled T1 – T5. The speed taps are 24VAC inputs. **Do not connect line voltage to these speed taps.** T1 provides the slowest speed and is dedicated to continuous fan operation. T2 – T5 are for cooling & heating operation and are selectable at the terminal block using a single wire with an insulated terminal that plugs onto the terminals in the terminal block. Speed change instructions are detailed in Section 3.11.2.
- The constant torque motor has a built in soft start that will ramp the motor up to speed gradually.
- An off-delay is built into the control of the motor that keeps the motor energized for 30 seconds after 24 volts is removed from all speed tap terminals.
- If two of the speed tap terminals (T1 – T5) are energized with 24 volts simultaneously, the motor will operate at the higher of the 2 speeds. An example of this is when the G and Y thermostat inputs are both energized in the cooling or heat pump heating mode. In this case, T1 (continuous fan) and a higher numbered speed tap will both be energized resulting in the motor operating at the higher speed to support the cooling or heat pump heating air-flow requirement.
- The air-flow delivery rate for a constant torque ECM motor will not decrease as much as it does with a PSC motor as external static pressure increases.

5.2 BLOWER CONTROL

An electronic blower control is provided to control blower motor & electric heat operation and is located inside the controls compartment.

- There are two 24V outputs on the blower control for controlling the motor, one for continuous fan and one for cooling & heating operation.
- Motor speed changes are made at the motor speed terminal block instead of on the blower control.
- The control has an on-board 3 amp automotive style fuse to protect the control circuit.
- There is a 6-pin connector for the thermostat pigtail harness to connect to. Wires from the thermostat do not connect directly to the blower control, but rather to the pigtails that are routed to the left side of the controls compartment.
- There is no on-delay for blower operation when there is a call for blower operation.
- There is no blower off-delay provided by the blower control when a call for cooling or heat pump heating ends since a 30 second off-delay is programmed into the constant torque ECM motor.
- There is a blower off-delay programmed into the blower control when a call for electric heating ends. The delay is 45 seconds for the White-Rodgers control and 30 seconds for the UTEC control. This off-delay is added to the 30 second off delay programmed into the motor for a total off-delay of 75 or 60 seconds. This allows time for the contacts in the bi-metallic disc type heating sequencer to open which de-energizes the heater elements.

5.3 BLOWER ASSEMBLY

The blower utilizes a forward curved centrifugal wheel. The blower housing is constructed from galvanized sheet metal. The motor is attached with a 4-arm wire basket belly band type mount that screws into the side of the blower housing. The blower slides into place on a track and is secured by 2 sheet metal screws. The controls and electric heater are integral with the blower housing.

5.4 ELECTRIC HEATER

- 208/240V (-)BHP air-handlers are available with a factory installed electric resistance heater ranging from 6 kW – 21 kW. Refer to Section 2.3 for the available kW for each cabinet size.
- Field installed electric resistance heater kits are not available.
- The sheath (cal-rod) style heating elements are mounted inside the blower housing wrap.
- The heating elements are controlled by either sequencers or relays depending on the total kW of the heater.
- Automatic reset bimetallic disc limits de-energize the heating elements should the air-flow become too restricted or should the blower motor fails.

- 11 kW and higher are designed to operate in 2-stage heat mode if so desired or can be operated as single-stage if the W1 and W2 thermostat pigtails are wired together.
- All models with electric heat are equipped with a circuit breaker style disconnect where the incoming line voltage power is connected.

5.5 WATT RESTRICTOR

The higher kW models for each cabinet size, (-)BHP-17J11SH*, (-)BHP-17J11SH*, (-)BHP-24J18SH*, (-)BHP-25J18SH*, and (-)BHP-25J21SH*, come equipped a Watt Restrictor. The Watt Restrictor reduces the amount of supplemental electric heat that can be energized during the heat pump heating mode if the temperature leaving the indoor coil is above a set level. The Watt Restrictor is an automatic reset bimetallic disc style sensor mounted on the blower assembly. If the temperature of the coil leaving the indoor coil is above a set level, the Watt Restrictor contacts open and will not allow a portion of the heater elements to be energized regardless of the thermostat input. For 11 kW heaters and higher, the 2nd stage of heat is restricted. For the single stage 7 kW heater, only one of the two heating elements is allowed to be energized. Since the heat output of the indoor coil is dependent upon the outdoor air temperature, the Watt Restrictor only functions when the outdoor temperature is mild and maximum supplemental heat is not necessary. An additional benefit of the Watt Restrictor is that it can sense a degradation in heat pump performance due to causes other than outdoor temperature and react accordingly to allow the maximum supplemental electric heat as needed.

5.6 DEFROST HEAT CONTROL

The higher kW models for each cabinet size, (-)BHP-17J11SH*, (-)BHP-17J11SH*, (-)BHP-24J18SH*, (-)BHP-25J18SH*, and (-)BHP-25J21SH*, also come equipped with a Defrost Heat Control. The Defrost Heat Control is an automatic reset bimetallic disc style sensor mounted in the controls compartment on the blower housing near the blower discharge. It senses the supply air temperature and cycles the supplemental electric heat as required to maintain a comfortable 75°F - 85°F supply air temperature during the defrost cycle to conserve energy and to prevent the call for heat to be satisfied before the defrost cycle is completed.

5.7 TRANSFORMER

A 40VA transformer is located inside the controls compartment and is attached to the blower housing which provides 24V control voltage for both the air-handler & the outdoor unit. The transformer in 208/240V models is wired from the factory for 240V applications, but has a separate 208V tap for 208V applications. The black wires connected to the 240V tap must be moved to the 208V tap when installing the air-handler in 208V applications to assure full 24V+ control voltage for reliable operation of the system controls.

5.8 INDOOR COIL ASSEMBLY

- The indoor coil slabs are a fin & tube design with enhanced aluminum fins and internally grooved copper tubing.
- Most models have 6-10 individual slabs depending on the cabinet size.
- All models have non-bleed thermal expansion valves (TXV) for refrigerant control.
- All models have a self-draining composite condensate drain pan to eliminate standing water and a composite horizontal drain pan to catch any water drips from the coil when the air-handler is oriented in the horizontal position.
- All models have built-in sheet metal channels in various locations designed to manage condensate when the air-handler is oriented in the horizontal position, thus preventing water “blow-off”.
- Copper stubs are provided for field tubing connections.
- The coil assembly slides into the air-handler on sheet metal rails.
- The horizontal drain pan is installed at the factory for horizontal left supply air discharge applications. It must be moved to the other side of the coil for horizontal right supply air discharge applications. (See Section 3.2.3)

6.0 ACCESSORIES & KITS

6.1 COMBUSTIBLE FLOOR BASES

For high heat downflow applications. (See Section 3.2.2.)

Model Cabinet Size	Combustible Floor Base Model Number
17	RXHB-17
21	RXHB-21
24	RXHB-24

6.2 JUMPER BAR KITS

- **Jumper Bar Kit 3 Ckt. to 1 Ckt. RXBJ-A31** is used to convert single phase multiple three circuit units to a single supply circuit. Kit includes cover and screw for line side terminals.
- **Jumper Bar Kit 2 Ckt. to 1 Ckt. RXBJ-A21** is used to convert single phase multiple two circuit units to a single supply circuit. Kit includes cover and screw for line side terminals.

  NOTE: No jumper bar kit is available to convert three phase multiple two circuit units to a single supply circuit.

  If a factory supplied jumper bar for single supply circuit is removed from unit to make multiple supply circuits, the line side of the circuit breakers must be covered with finger safe covers. Each circuit breaker pole must be covered with a finger safe cover.

6.3 FINGER SAFE CIRCUIT BREAKER COVER

- **Finger Safe Circuit Breaker Cover - Part number 45-23203-01**. One is required for each circuit breaker pole, if jumper bar is removed to provide multiple supply circuits.

6.4 REPLACEMENT FILTERS

Model Cabinet Size	Filter Size	Part Number
-17	16.25 x 21	54-23217-02
-21	19.75 x 21	54-23217-03
-24	23.25 x 21	54-23217-04
-25	23.25 x 21	54-23217-04

6.5 EVAPORATOR COIL HORIZONTAL DRAIN PAN

- **Evaporator Coil Horizontal Drain Pan Model RXBD-CB:** all unit sizes. See section of this manual covering horizontal drain pan.

6.6 AUXILIARY HORIZONTAL OVERFLOW PAN

- **External Auxiliary Horizontal Overflow Pan RXBM-AA06** - Fits all models.

7.0 MAINTENANCE

For continuing high performance, and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment. Consult your local dealer as to the proper frequency of maintenance and the availability of a maintenance contract.

IMPORTANT: Before performing any service or maintenance procedures, see "WARNINGS" in SECTION 1.0 SAFETY INFORMATION in these installation instructions.

⚠ WARNING

UNITS WITH CIRCUIT BREAKER(S) MEET REQUIREMENTS AS A SERVICE DISCONNECT SWITCH, HOWEVER, IF ACCESS IS REQUIRED TO THE LINE SIDE (COVERED) OF THE CIRCUIT BREAKER, THIS SIDE OF THE BREAKER(S) WILL BE ENERGIZED WITH THE BREAKER(S) DE-ENERGIZED. CONTACT WITH THE LINE SIDE CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

7.1 AIR FILTER

Check the system filter every ninety days or as often as found to be necessary and if obstructed, clean or replace at once.

IMPORTANT: Do not operate the system without a filter in place.

- The filter in the unit is a cleanable type. Clean filter using cold water and allow filter to dry. no oiling or coating of the filter is required or recommended.

- New filters to replace those supplied in unit are available from your local distributor or home supply store.

TO ACCESS AIR FILTER:
1. Locate thumb screws on filter access door and remove.
2. Remove filter access door by tilting it down from the top.
3. Slide filter out.

- Internal filter is NOT used in downflow air configuration.

7.2 INDOOR COIL, DRAIN PAN, DRAIN LINE

Inspect the indoor coil once each year for cleanliness and clean as necessary. It is necessary to remove the filter and check the return air side of the coil for debris.

- Generally, the coil can be easily cleaned when it is dry. If the coil is coated with dirt or lint, blow compressed air or nitrogen through the supply side of the coil fins blowing dirt or lint from the return air side of the coil onto the filter or cardboard placed between filter and coil. Be sure lint and dirt is removed from the filter and return air system.
- If the coil is coated with oil or grease, clean it with a mild detergent and water solution. Rinse the coil thoroughly with clear water. Be careful not to splash water excessively into unit and system.
- Inspect the drain pan and condensate drain at the same time the cooling coil is checked. Clean the drain pan and condensate drain by removing any foreign matter from the pan. Flush the pan and drain tube with clear water.
- If the drain tube is restricted, it can generally be cleaned with high pressure water. Remove the drain line from the unit away from the pan and coil to clear the drain line.

IMPORTANT: Do not use caustic household drain cleaners in the condensate pan or near the indoor coil. Drain cleaners will quickly damage the indoor coil.

7.3 BLOWER MOTOR & WHEEL

Inspect the blower motor and wheel for cleanliness. With the system air filter in place, it should be several years before it would become necessary to clean the blower motor and wheel.

- If it becomes necessary to remove the blower assembly from the unit, see instructions on removal and disassembly of motor, blower and heater parts.
- The blower motor and wheel may be cleaned by using a vacuum with a soft brush attachment. Remove grease with a mild solvent such as hot water and detergent. Be careful not to disturb the balance weights (clips) on the blower wheel blades. Do not drop or bend wheel as balance will be affected.

7.4 MOTOR LUBRICATION

The blower motor sleeve bearings are pre-lubricated by the motor manufacturer and do not have oiling ports. Motor should be run for an indefinite period of time without additional lubrication.

7.5 BLOWER ASSEMBLY REMOVAL & REPLACEMENT

Removing the blower assembly is not required for normal service and maintenance. Removal is necessary for replacement of components such as motor, blower wheel and electric heater(s). After extended use, removal of the blower assembly may become necessary for a thorough cleaning of the blower motor and wheel.

⚠ WARNING

IF REMOVAL OF THE BLOWER ASSEMBLY IS REQUIRED, ALL DISCONNECT SWITCHES SUPPLYING POWER TO THE AIRHANDLER MUST BE DE-ENERGIZED AND LOCKED (IF NOT IN SIGHT OF UNIT) SO THE FIELD POWER WIRES CAN BE SAFELY REMOVED FROM THE BLOWER ASSEMBLY. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

- Mark field power supply wiring (for replacement) attached to terminal block or circuit breaker(s) on blower assembly. Remove wiring from terminal block or circuit breaker(s).
- Mark low voltage control wiring (for replacement) where attached to unit control terminals on left side of blower housing.
- Remove two screws holding blower assembly to front channel of cabinet and pull blower assembly from cabinet.
- To replace blower assembly, slide blower assembly into blower deck. Make sure blower assembly engages lances in deck properly. If assembly hangs up, check to make sure top and bottom are lined up in proper locations.
- Slide blower assembly to back of cabinet and make sure it is completely engaged.

- Replace two screws holding blower assembly to front channel of cabinet. Take care not to strip screws, just snug into place.
- Replace low voltage control wiring with wire nuts and make sure wiring is to wiring diagram and a good connection has been made.
- Replace field power wiring to terminal block or circuit breaker(s) on control area of blower assembly. Make sure wires are replaced as they were, check wiring diagram if necessary. Tighten supply power wiring securely to terminals lugs.
- Make sure wiring is within cabinet and will not interfere with access door. Make sure proper separation between low voltage control wiring and field power wiring has been maintained.
- Replace blower assembly control access panel before energizing equipment.

7.6 MOTOR REPLACEMENT

With the blower assembly removed, the indoor blower motor can be removed and replaced using the following procedure:

- Remove motor leads from the motor high and low voltage plugs. Note the lead locations for ease of re-assembly.
- Loosen the set screw holding the blower wheel onto the motor shaft. The shaft extends through the blower hub so that a wrench can be used on the extended shaft to break the shaft loose if necessary. Be careful not to damage the shaft. Use a wheel puller on the groove in the hub if necessary.
- Loosen the bolt holding the wire motor band around the motor shell and pull the motor from the motor mount. Note the motor position in the mount for re-assembly.
- To re-assemble, insert the motor shaft through the hub in the blower wheel and orient the motor to original position.
- For proper motor cooling, it is important that the motor be mounted the same as the original, as far into the blower as practical.
- The dimension from the face of the motor end plate (shaft end) to the first wire on the motor mount band around the shell should be:

  1.25” for (-)BHP-17
  1.25” for (-)BHP-21
  1.25” for (-)BHP-24
  1.5” for (-)BHP-25

- With motor held to above position and motor lead plugs oriented to the original position (the wire connectors on the motor must point straight to the supply air end of the unit and away from the return air [filter] end of the unit). Securely tighten the bolt on the mount band to the motor shell.
- Turn the motor shaft so that the flat on the shaft is located under blower wheel setscrew, and the blower wheel is centered in the blower housing with the same distance on each side between the inlet venturi and the outside of the blower wheel.
- Re-assemble the motor wiring (high and low voltage plugs) into the motor.

  IMPORTANT: <u>DO NOT FORCE POWER PLUG INTO THE MOTOR CONNECTOR BACKWARDS.</u> The A.C. power plug to the motor has locking tabs. It has been proven that by applying excessive force to the A.C. cable half of the connector it is possible to force the connector in backwards. It will not seat and “click” properly but will make connection. If A.C. power is applied with the connector reversed the motor will be immediately destroyed.

7.7 BLOWER WHEEL REPLACEMENT

With the blower assembly removed and the motor assembly removed (see above instructions), remove the screws holding the blower wrap (cutoff) to the blower sides.

- With wrap (cutoff) screws removed, cut off end of blower wrap will spring up. Lifting wrap blower wheel is removed through the discharge opening in the blower housing.
- To replace, make sure wheel is oriented properly with hub to the opposite side from the motor. Lift blower wrap and insert blower wheel through discharge opening in the blower housing.
- Hold blower wrap down into position and replace screws holding blower wrap to blower sides.
- See motor replacement and blower assembly instructions for remaining assembly procedure**.**

7.8 ELECTRIC HEATER ELEMENT REPLACEMENT

With the blower assembly removed, electric heater(s) can be removed and replaced from the blower housing without disturbing the motor or blower wheel.

- Remove both wires from the heater to be removed and remove three screws from outside of blower wrap holding heater brackets to blower wrap.
- One screw is located under the control mounting plate and is a little difficult to get at. A 1/4" box end or open end wrench should be used to remove and replace this screw
- With three screws removed, lift heater element and heater terminals through mounting holes in top of blower wrap.
- Lift heater from blower wrap and with terminal end of heater headed for blower cut off and to the outside of the blower side, remove heater.
- To replace the heater element, reverse the above process to replace heater.
- Make sure bend on heater near terminals end is down in place flush or below outlet flanges on blower assembly. Replace screws in heater brackets and tighten.
- Make sure terminals on heater are straight with at least 1/2" clearance to control mounting plate and 1/2" clearance to access panel. Use a straight edge across front flanges on blower assembly to check clearance (bend if necessary for proper clearance).
- Replace wiring, make sure connections are tight and are made in accordance with the unit wiring diagram**.**

7.9 REPLACEMENT PARTS

Any replacement part used to replace parts originally supplied on equipment must be the same as or an approved alternate to the original part supplied. The manufacturer will not be responsible for replacement parts not designed to physically fit or operate within the design parameters the original parts were selected for.

These parts include but are not limited to: Circuit breakers, heater controls, heater limit controls, heater elements, motor, motor capacitor, blower relay, control transformer, blower wheel, filter, indoor coil and sheet metal parts.

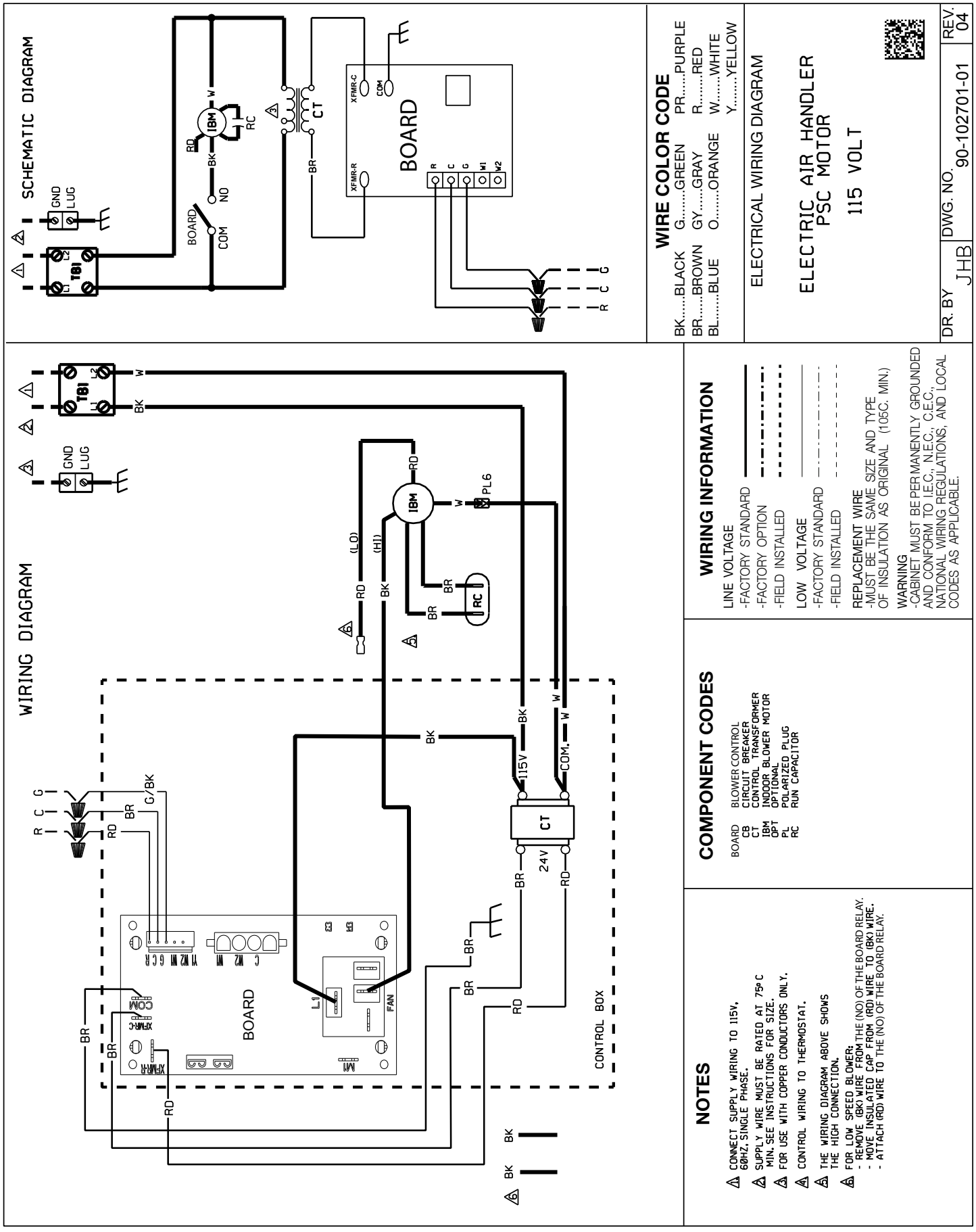
When ordering replacement parts, it is necessary to order by part number and include with the order the complete model number and serial number from the unit data plate. (See parts list for unit component part numbers).

8.0 DIAGNOSTICS

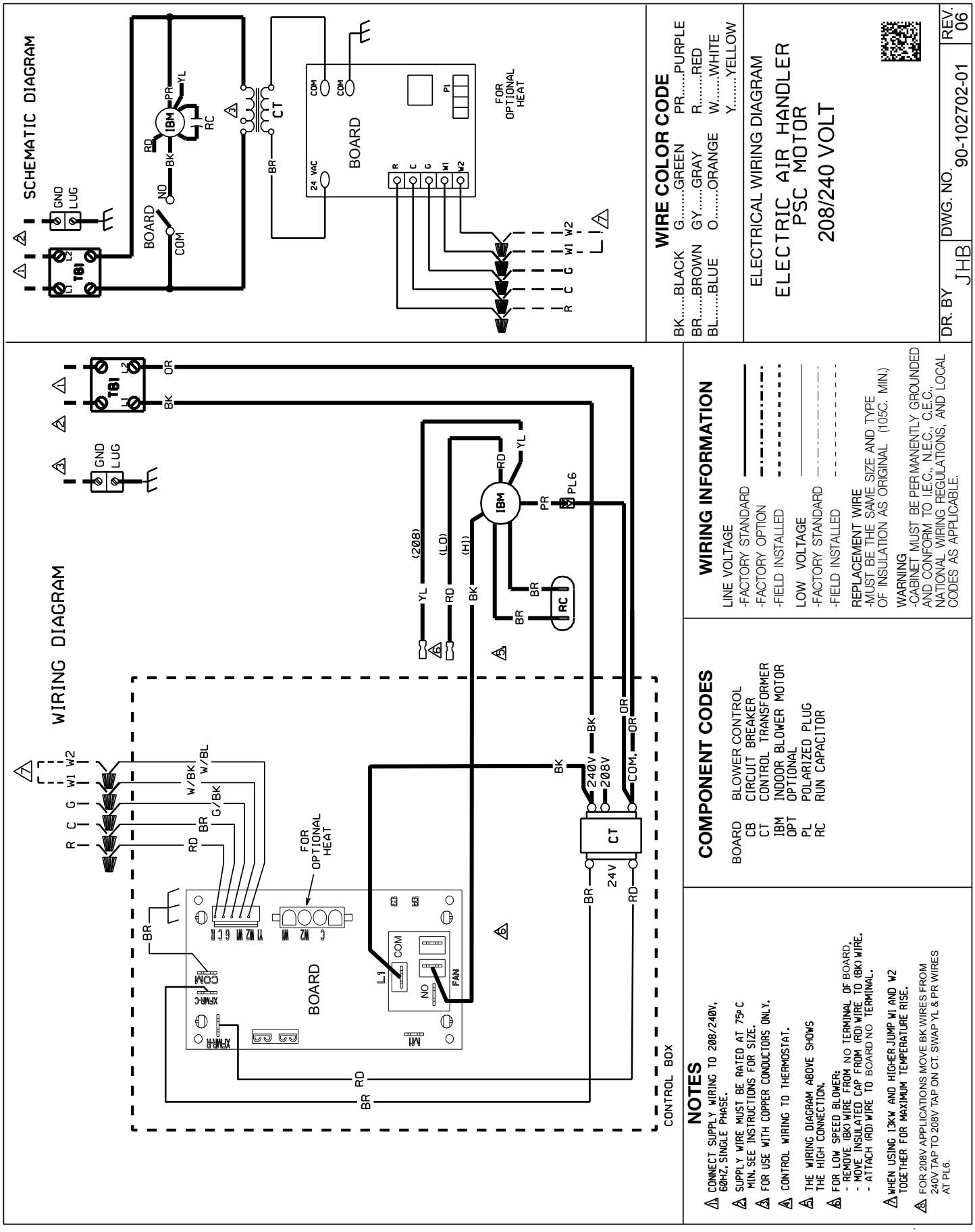
Problem	Possible Cause (Suggested Fix)
Blower motor will not operate	• Failed motor (replace) • Failed motor control module (replace module) • Blown 3A fuse on blower control (check for control circuit short, replace fuse) • Loose wiring connection or broken wire (check connections & wiring) • Failed transformer (replace) • Failed blower control (replace) • Disconnect breaker is turned off or has tripped due to overcurrent or shorted circuit (check for shorts, reset breaker)
Excessive vibration	• Blower wheel out of balance (replace or clean blower wheel)
Water overflowing drainpan	• Plugged drain (clear drain) • Unit not level (level unit)
Electric heater not heating properly or not heating at all, but blower motor is operating	• Over temperature limit has tripped (check for low air-flow) • Over temperature limit has failed (replace) • Sequencer or contactor has failed (replace) • One or more heating elements have burned out (replace)
Coil is frozen up	• System low on refrigerant charge (check for leaks & adjust charge) • Dirty return air filter (replace filter) • Inadequate air-flow due to incorrect blower motor speed selected (select higher speed) or excessively restrictive duct system (correct duct system)
Excessive air-flow	• Incorrect blower motor speed selected (select lower speed)
Water blow-off from coil	• Excessive air-flow (select lower blower motor speed) • Contaminants on coil fins (clean coil) • Damaged coil fins (comb out fins or replace coil)
TXV not controlling properly	• TXV bulb not positioned correctly or clamp not tight (Check position of TXV sensing bulb and tightness of clamp) • Failed TXV (replace) • Plugged TXV inlet screen (clean or replace screen or replace TXV)

9.0 WIRING DIAGRAMS

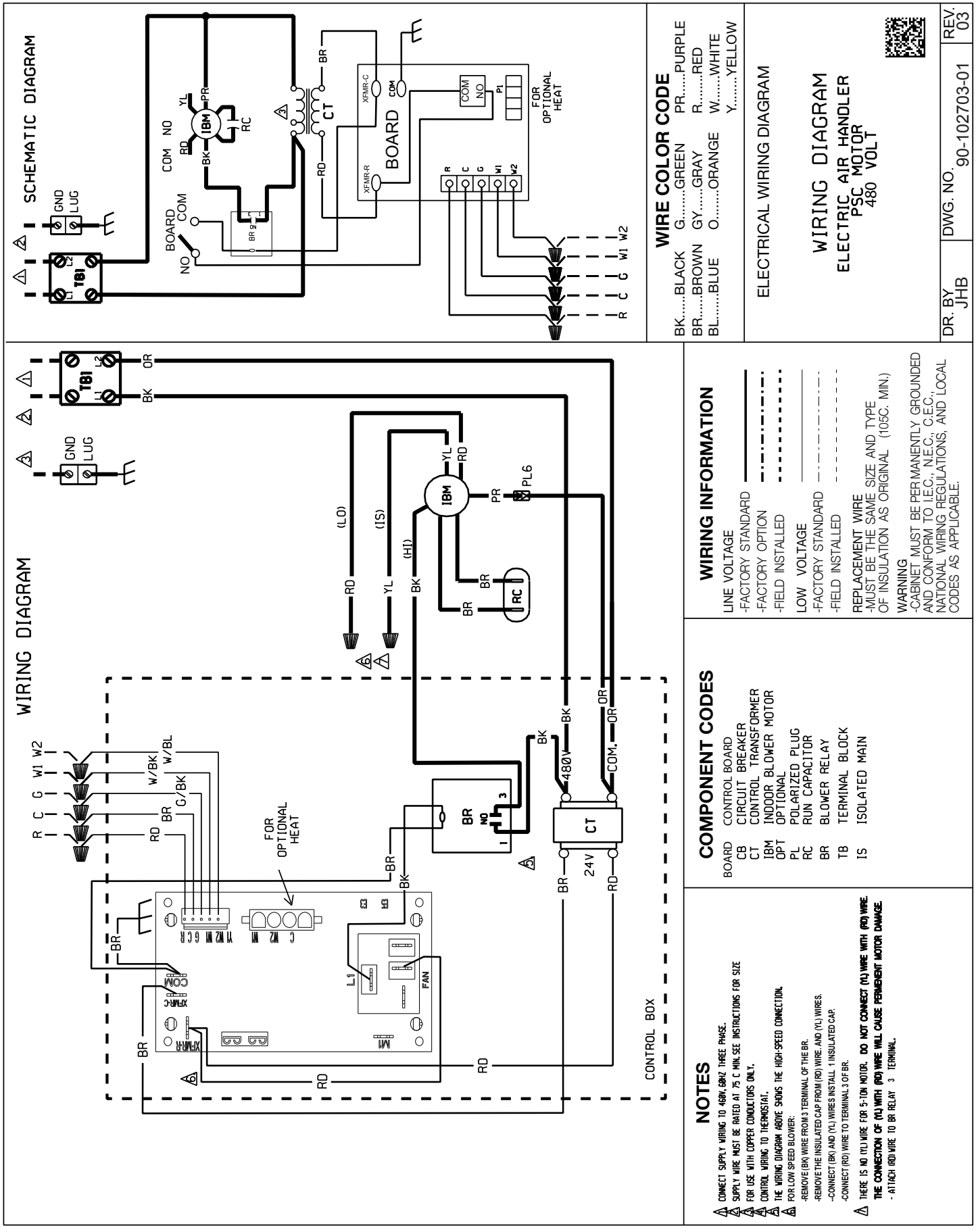
9.1 WIRING DIAGRAM 115V – NO HEAT



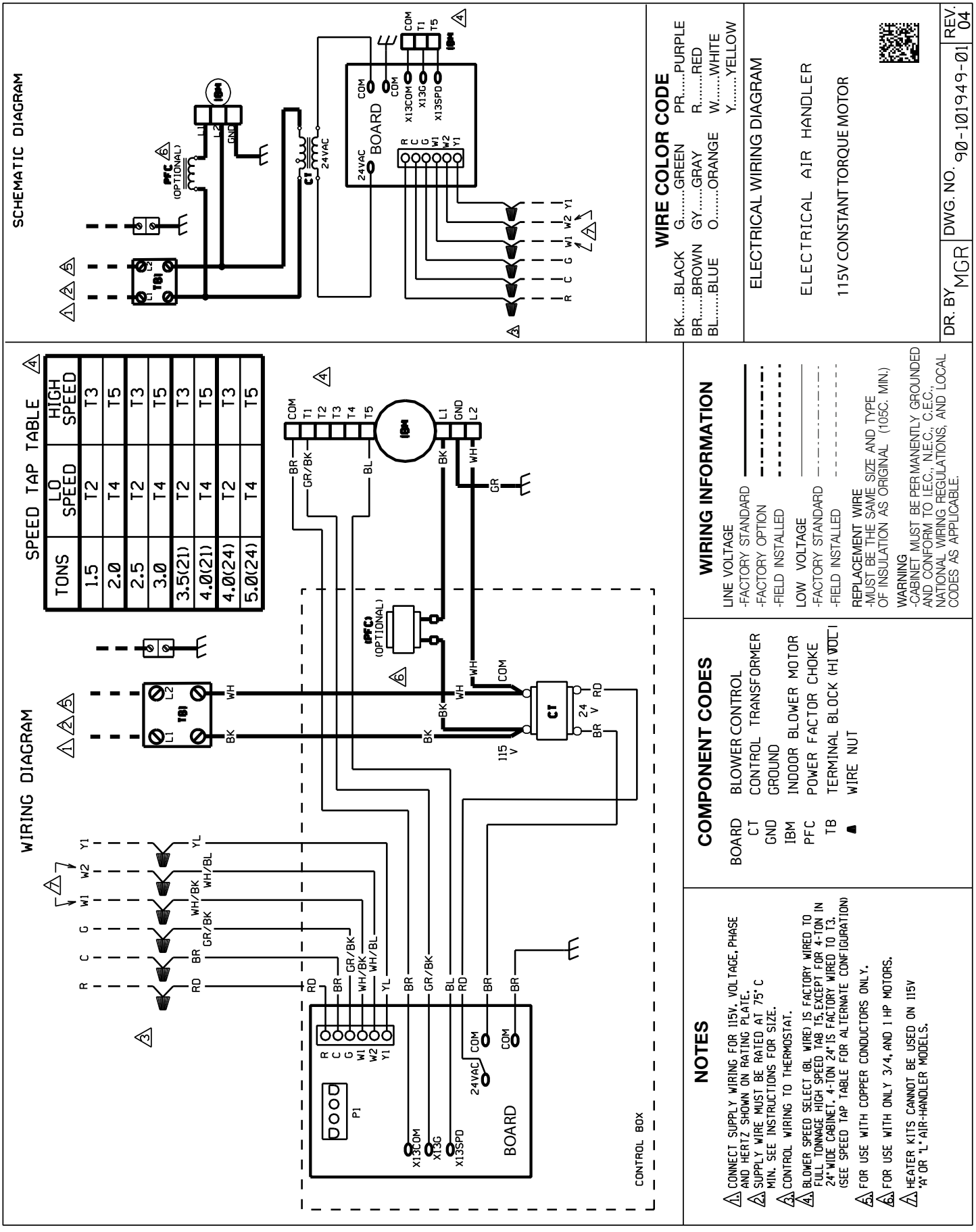
9.2 WIRING DIAGRAM 208/240V – 6kW



9.3 WIRING DIAGRAM 208/240V – 7kW



9.4 WIRING DIAGRAM 208/240V – 11kW HEATER



9.5 WIRING DIAGRAM 208/240V – 18kW HEATER

