



BP Series

BP007, BP009, BP012, BP015, BP018, BP024, BP030, BP036, BP042, BP048, BP060



Installation and Maintenance Manual

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Warnings



Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk s are not taken.

The following keywords are defined and can be used in this document:

- **NOTE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.

G - Painted Steel / 1/2" Standard 1.5 LB Dual Density Fiberglass General Electrical Options (up to 5 available per unit) X - As default for non used electrical codes H - Painted Steel / 1/2" Closed Cell Foam 4 - MERV8 - 2" w/ 4-SIDED FILTER RACK G - EXTENDED RANGE (Geothermal) Electric Heat (Dual Power Connection) H - Hot Gas Reheat - On/Off **Refrigeration Circuit Options** D - Heat Recovery Package H - Flow proving switch J - Disconnect Switch E - Pump/valve relay A - Current until 7/13 Cabinet Construction A - EMS relay AIR FILTRATION D - 15 kW E - 20 kW A - 5 kW C - 10 kW Transformer
 7 - 75 VA **Revision Level** D - DuoGuard X - None B - Current Application X - None Air Coil 5 A X X X 1 X X X SBA × AMXXX S × × . ∢ ⊃ ⊢ H щ υ 5 . . Discharge Air Configuration T - Constant Torque ECM A - Constant Airflow ECM 018 Return Air Configuration **Cabinet Configuration** ВР C - Copper N - Cupro-Nickel Fan/Motor Options Water Connections HZ - Horizontal P - PSC Motor Coax Options T - Top S - Straight E - End R - Right VT - Vertical L - Left 007 009 012 015 018 024 030 030 036 042 048 F - Front Voltage Size ВР

MODEL NOMENCLATURE



WARNING: Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment.



WARNING: Before performing service or maintenance operations on the system, turn off main power to the unit. Electrical shock could cause personal injury or death.



CAUTION: When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.



NOTE: All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.



NOTE: To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. Doing so may affect the unit's warranty. The mechanical components and filters will quickly become clogged with construction dirt and debris, which may cause system damage.



NOTE: To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

Figure # 1

INITIAL INSPECTION



Figure # 2

[1] BP Series Water-to-Air Heat Pump

[2] Installation and Operation Manual

[3] Hanging Bracket kit (HZ unit only)

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 24 hours of receipt.

GENERAL DESCRIPTION

BP Series Water-to-Air Heat Pumps provide the best combination of performance and efficiency available. Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

All BP water to Air Heat Pumps conform to UL1995 standard and are certified to CAN/CSA C22.2 No 236 by Intertek-ETL.The Water-to-Air Heat Pumps are designed to operate with entering fluid temperature between 20°F to 90°F in the heating mode and between 30°F to 120°F in the cooling mode.

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NOTE: 50° Minimum Entering Water Temperature (EWT) for well water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed loop applications. Cooling Tower/Boiler and Geothermal applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. Frozen water coils are not covered under warranty.



NOTE: This product should not be used for temporarily heating/cooling during construction. Doing so may affect the units warranty.

MOVING AND STORAGE

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the "UP" arrows on each carton at all times.



For storage If unit stacking is required, stack units as follows:

Do not stack units larger than 6 tons.

Vertical units less than 6 tons, no more than two high.

Horizontals units less than 6 tons, no more than three high.

LOCATION

Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make fluid, electrical, and duct connection(s). If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the face of unit's air coil. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping.



NOTE: These units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned. Do not locate in areas that are subject to freezing.

INSTALLATION

MOUNTING VERTICALLY

Vertical units up to six tons are available in left or right air return configurations. Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. It is not necessary to anchor the unit to the floor. (See Figure #3).



Figure # 3

MOUNTING HORIZONTALY

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kits.

The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details. Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump.

Some applications require an attic floor installation of the horizontal unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4" drain connected to this secondary pan should be run to an eave at a location that will be noticeable.



NOTE: IF unit is located in a crawl space, the bottom of the unit MUST be at least 4" above grade to prevent flooding of the electrical parts due to heavy rains.

HANGING BRACKET KIT

Installation instructions

All horizontal units come with Hanging Bracket Kit facilitate suspended unit mounting using threaded rod. Hanging brackets are to be installed as shown in Figure#4.



Figure # 4

This Kit includes the following:

- (5) Brackets
- (5) Rubber Vibration isolators

(8) Screws #10x1/2

(10) Bolts 1/4-28x12" Hex Bolt (not used for these models)

The following are needed and are to be field provided:

Threaded rod (3/8" max dia)

Hex Nuts

Washers (1-3/4" min O.D.)

1. Remove and discard factory provided screws from locations where hanging brackets will be installed shown in Figure# 5.



Figure # 5

2. Mount 4 Brackets to unit corner post using the bolts provided in the kit as shown on Figure#6.



WARNING: Do not re-use screws removed from the unit on step 1 to mount the Hanging brackets to the unit.



Figure # 6



WARNING: Follow all applicable codes and requirements when hanging this unit, selecting threaded rod material, etc.

3. Install rubber grommet onto the Brackets as shown in Figure#7.

4. Hang the unit and assemble the field provided threaded rod, nuts and washers on to the brackets as shown in Figure#7



WARNING: Rods must be securely anchored to the ceiling.



Figure # 7



NOTE: Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

CONDENSATE DRAIN



If equipped with float style condensate

overflow switch, final adjustment must be made in the field.

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit.

This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow.

(Heat Pumps are not internally trapped).

A vertical air vent is sometimes required to avoid air pockets.(See Figure #8).

The length of the trap depends on the amount of positive or negative pressure on the drain pan. A second trap must not be included.



The horizontal unit should be pitched approximately 1/4" towards the drain in both directions, to facilitate condensate removal. (See Figure #9)



Figure # 9

DUCT SYSTEM

Sup Sup

Supply air duct and return air duct flanges are shipped unfolded with unit.

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Fold the duct flange outwards along the perforated line. Refer to unit Dimensional Drawings for physical dimensions of the collar and flange. (Pg#33 through Pg#34)

A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate forming during the cooling operation.



NOTE: Application of the unit to no insulated duct work is not recommended as the unit's performance will be adversely affected.

NOTE: The factory provided air filter must be removed when using a filter back return air grill. The factory filter should be left in place on a free return system



NOTE: Do not connect discharge ducts directly to the blower outlet.

If the unit will be installed in a new installation which includes new duct work, the installation should be designed using current ASHRAE procedures for duct sizing.

If the unit is to be connected to existing duct work, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application. If the duct system is too small, larger duct work should be installed. Check for existing leaks and repair.

The duct system and all diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenums should be insulated. There should be no direct straight air path thru the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille.

If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow.

(Refer to ECM motor interface board section in Figure#11)

PIPING

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs).



NOTE: Never use flexible hoses of a smaller inside diameter than that of the fluid connections on the unit.

BP units are supplied with either a copper or optional cupro-nickel condenser. Copper is adequate for ground water that is not high in mineral content. See page#16 and #19 for reference.



NOTE: Proper testing is recommended to assure the well water quality is suitable for use with water source equipment.

In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended.



NOTE: Both the supply and discharge water lines will sweat if subjected to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics.



NOTE: Never exceed the recommended water flow rates as serious damage or erosion of the water-to-refrigerant heat exchanger could occur.

Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult Unit Dimensional Drawings. (Pg#33 through Pg#34)



NOTE: Teflon tape sealer should be used when connecting water piping connections to the units to insure against leaks and possible heat exchanger fouling.



NOTE: Do not overtighten the connections.

Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

ELECTRICAL

Refer to electrical component box layout. (Figure#10)



WARNING: Field wiring must comply with local and national electric codes.



WARNING: Power to the unit must be within the operating voltage range indicated on the unit nameplate or on the performance data sheet.



WARNING: Operation of unit on improper line voltage or with excessive phase imbalance will be hazardous to the unit, constitutes abuse and may void the warranty.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See unit nameplate for maximum fuse or breaker size.

The unit is provided with a concentric knock-out for attaching common trade sizes of conduit, route power supply wiring through this opening. Always connect the ground lead to the grounding lug provided in the control box and power leads to the line side of compressor contactor as indicated on the wiring diagrams..



NOTE: Units supplied with internal electric heat require two (2) separate power supplies:

1) Unit compressor

2) Electric Heat, blower motor and control circuit.



NOTE: Refer to the ELECTRIC HEATER PACKAGE OPTION section and Figure # 11 for wiring diagrams. See data plate for minimum circuit ampacities and maximum fuse/breaker sizing.



Figure # 10

ECM INTERFACE BOARD



Figure # 11

THERMOSTAT CONNECTIONS

Thermostat wiring is connected to the 10 pin screw type terminal block on the lower center portion of the ECM Interface Board. In addition to providing a connecting point for thermostat wiring, the interface board also translates thermostat inputs into control commands for the Electronic Commutated Motor (ECM) DC fan motor and displays an LED indication of operating status. The thermostat connections and their functions are as follows:

Y1	First Stage Compressor Operation
G	Fan
0	Reversing Valve (energized in cooling)
W1	Auxiliary Electric Heat (runs in conjunction with compressor)
EM/W2	Emergency Heat (electric heat only)
NC	Transformer 24 VAC Common (extra connection)
C1	Transformer 24 VAC Common (primary connection)
R	Transformer 24 VAC Hot
HUM	Dehumidification Mode (Feature only available for ECM cost air flow motor option)

If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit malfunction output or relay.

> If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, a jumper between "R" and "COM" terminal of the "ALR" contacts must be made.



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If the thermostat is provided with a malfunction light powered off of the hot (R) side of the transformer, then the thermostat malfunction light should be connected directly to the (ALR) contact on the unit's UPM board.

To the left of the thermostat connection block are a row of 2 red and 4 green LED's. These LED's indicate the operating status of the unit. They are labeled as follows:

EM (Red)	Emergency Heat On
W1 (Red	Auxiliary Heat On
O (Green)	Reversing Valve Energized, unit is in Cooling Mode
Y2 (Green)	Second Stage Compressor On
Y1 (Green)	First Stage Compressor On
G (Green)	Fan On

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Just above the connector block is a single red LED labeled CFM that will blink intermittently when the unit is running and may flicker when the unit is off.

This LED indicates the air delivery of the blower at any given time. Each blink of the LED represent approximately 100 CFM of air delivery so if the LED blinks 12 times, pauses, blinks 12 times, etc. the blower is delivering approximately 1200 CFM. for factory programmed air delivery settings for the BP Series.

To the right of the thermostat connection block is a green LED labeled dehumidify.

Just above and to the right of the thermostat connection block are two sets of dip switches labeled ADJUST, CFM..The ADJ set of pins are labeled NORM, (+), (-) and TEST. BP units will all be set on the NORM position from the factory, however, airflow can be increased (+) or decreased (-) by 15% from the pre-programmed setting by relocating the jumper in this section.

The TEST position is used to verify proper motor operation. If a motor problem is suspected, move the ADJ jumper to the TEST position and energize G on the thermostat connection block. If the motor ramps up to 100% power, then the motor itself is functioning normally. Always remember to replace the jumper to NORM, (+) or (-) after testing and reset the unit thermostat to restore normal operation.



NOTE: Do not set the ADJ DIP switch to the (-) setting when electric heaters are installed. Doing so may cause the heaters to cycle on their thermal overload switches, potentially shortening the life of the switches.

The other DIP switch bank is used to select the proper program in the ECM motor for the unit. Refer to Figure #7 for the proper jumper placement.



WARNING: Always disconnect power before changing jumper positions on the interface board and reset the unit afterward.



WARNING: Remember to always turn off unit power at the circuit breaker before attaching or disconnecting any wiring from these connections to avoid accidental short circuits that can damage unit control components.

To the left of the red and green status LED's is a row of 1/4" male quick connects. These are used to pass thermostat inputs on to the rest of the control circuit.

SAFETY DEVICES AND THE UPM CONTROLLER



Figure # 12

- [1] Board power indicator
- [2] UPM Board LED indicator
- [3] Water coil freeze protection temperature selection (FREEZE1)
- [4] Air coil freeze protection temperature selection (FREEZE 2)
- [5] UPM board settings
- [6] Water coil freeze connection
- [7] Air coil freeze connection
- [8] LCD connection
- [9] 24VAC power hot
- [10] To compressor contactor
- [11] High pressure switch connection
- [12] Call for compressor
- [13] Low pressure switch connection
- [14] 24VAC power common



NOTE: If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit malfunction output or relay.

Each unit is factory provided with a Unit Protection Module (UPM) that controls the compressor operation and monitors the safety controls that protect the unit.

Safety controls include the following:

- High pressure switch located in the refrigerant discharge line and wired across the HPC terminals on the UPM
- Low pressure switch located in the unit refrigerant suction line and wired across terminals LPC1 and LPC2 on the UPM.



 Water side freeze protection sensor, mounted close to condensing water coil, monitors refrigerant temperature between condensing water coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressor and enter into a soft lockout condition. The default freeze limit trip is 26°F, however this can be changed to 15°F by cutting the R42 resistor located on top of DIP switch SW1. (Figure #13)



-igure # 13

 The optional condensate overflow protection sensor (standard on horizontal units) is located in the drain pan of the unit and connected to the 'COND' terminal on the UPM board. (Figure #14)



Figure # 14

UPM Board Factory Default Settings		
TEMP	26°F	
LOCKOUT	2	
RESET	Y	
ALARM	PULSE	
TEST	NO	
HOT/DRY ALARM	NO	

UPM DIP SWITCH DEFAULT POSITION			
	lockout	4	2
	reset	R	Y
	alarm	Cont	pulse
a	test	yes	no

The UPM Board includes the following features:

- **ANTI-SHORT CYCLE TIMER**: 5 minute delay on break timer to prevent compressor short cycling.
- **RANDOM START**: Each controller has an unique random start delay ranging from 270 to 300 seconds on initial power up to reduce the chance of multiple unit simultaneously starting at the same time after power up or after a power interruption, thus avoiding creating large electrical spike.
- LOW PRESSURE BYPASS TIMER: If the compressor is running and the low pressure switch opens, the controller will keep the compressor ON for 120 seconds. After 2 minutes if the low pressure switch remains open, the controllers will shut down the compressor and enter a soft lockout. The compressor will not be energized until the low pressure switch closes and the anti-short cycle time delay expires. If the low pressure switch opens 2-4 times in 1 hour, the unit will enter a hard lockout. In order to exit hard lockout, power to the unit would need to be reset.
 - BROWNOUT/SURGE/POWER INTERRUPTION PROTECTION: The brownout protection in the UPM board will shut down the compressor if the incoming power falls below 18 VAC. The compressor will remain OFF until the voltage is above 18 VAC and ANTI-SHORT CYCLE TIMER (300 seconds) times out. The unit will not go into a hard lockout and does not need to be reset.

MALFUNCTION OUTPUT: Alarm output is Normally Open (NO) dry contact. If pulse is selected the alarm output will be pulsed. The fault output will depend on the dip switch setting for "ALARM". If it is set to "CONST", a constant signal will be produced to indicate a fault has occurred and the unit requires inspection to determine the type of fault. If it is set to "PULSE", a pulse signal is produced and a fault code is detected by a remote device indicating the fault. See L.E.D Fault Indication below for blink code explanation. The remote device must have a malfunction detection capability when the UPM board is set to "PULSE".

If 24 VAC output is needed R must be wired to ALR-COM terminal; 24 VAC will be available o the ALR-OUT terminal when the unit is in the alarm condition.

- **DISPLAY OUTPUT**: The Display output is a pulse output connected to the Unit Diagnostic Display (UDD) and it pulses 24VAC when the unit is in an lockout alarm condition.
- **TEST DIP SWITCH**: A test dip switch is provided to reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation.



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NOTE: Operation of unit in test mode can lead to accelerated wear and premature failure of components. The "TEST" switch must be set back to "NO" after troubleshooting/servicing.

• **FREEZE SENSOR**: The freeze sensor input is active all the time, if a freeze option it not selected the freeze terminals will need a jumper. There are two (2) configurable freeze points, 26°F & 15°F. The unit will enter a soft lock out until the temperature climbs above the set point and the anti-short cycle time delay has expired. The freeze sensor will shut the compressor output down after 90 seconds of water flow loss and report a freeze condition.

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It is recommended to have a flow switch to prevent the unit from running if water flow is lost.



R42 resistor set to 26°F in order to shut down the unit at the appropriate leaving water temperature and protect your heat pump from freezing if a freeze sensor is included.

L.E.D. FAULT INDICATION: Two L.E.D. indicators are provided: Green: Power L.E.D. indicates 18-30 VAC present on board.

Red: Fault indicator with the following blink codes:

- 1 High Pressure Lockout
- 2 Low Pressure Lockout
- 3 Freeze Sensor Lockout
- 4 Condensate Overflow
- 5 Brownout
- **INTELLIGENT RESET:** If a fault condition is initiated, the 5 minute delay on break time period is initiated and the unit will restart after these delays expire. During this period the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 setting for Lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset. A single condensate overflow fault will cause the unit to go into a hard lockout immediately, and will require a manual lockout reset.
- LOCKOUT RESET: A hard lockout can be reset by turning the unit thermostat off and then back on when the "RESET" dip switch is set to "Y" or by shutting off unit power at the circuit breaker when the "RESET" dip switch is set to "R".

The blower motor will remain active during a lockout condition.

NOTE: Always check incoming line voltage power supply and secondary control voltage for adequacy

ELECTRONIC THERMOSTAT INSTALLATION

Position the thermostat subbase against the wall so that it is level and the thermostat wires protrude through the middle of the subbase. Mark the position of the subbase mounting holes and drill holes with a 3/16-inch bit. Install supplied anchors and secure base to the wall. Thermostat wire must be 8-conductor, 18-AWG wire. Strip the wires back 1/4-inch (longer strip lengths may cause shorts) and insert the thermostat wires into the connector as shown. Tighten the screws to ensure secure connections. The thermostat has the same type connectors, requiring the same wiring. See instructions in the thermostat for detailed installation and operation information



Figure # 15 Thermostat Wiring

NOTE: When using a 2-cool, 3-heat thermostat W1 and W2/EM must be connected together via a jumper. (Figure#16)

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UPM SEQUENCE OF OPERATION



CON - CONDENSATE OVERFLOW CONDITION

CC - COMPRESSOR COIL ASC - ANTI SHORT CYCLE

Figure # 17 UPM Sequence of Operation

ELECTRIC HEATER PACKAGE OPTION

WARNING: The HP series heater package requires its own electrical service separate from the heat pump's power supply. DO NOT attempt to wire the package into the same circuit as the heat pump.

Factory installed internal electric heater packages are available for BP Series units. Two power supplies are required when heater packages are utilized. The power supply for the heater package (located in the electric heater package control box) provides power for the heater elements, the blower motor and the control circuit for the unit. The power supply for the unit provides power for the compressor. This allows the electric heaters to continue to operate along with the blower motor in the case of unit compressor and/or compressor power supply failure.

Each BP Series model has a number of heater sizes available. Refer to Figure #18 for heater package compatibility with specific BP series units, model nomenclatures and electrical data.

Electric Heather compatibility				
Model	5 kW	10 kW	15 kW	20 kW
BP018	\checkmark			
BP024	\checkmark	\checkmark		
BP030	\checkmark	\checkmark		
BP036	\checkmark	\checkmark	\checkmark	
BP042	\checkmark	\checkmark	\checkmark	
BP048	\checkmark	\checkmark	\checkmark	\checkmark
BP060	\checkmark	\checkmark	\checkmark	\checkmark

Figure	#	18
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NOTE: If heat recovery unit is installed in an area where freezing may occur, the unit must be drained during winter months to prevent heat exchanger damage. Heat exchanger ruptures that occur due to freezing will void the heat recovery package warranty along with the heat pump warranty.

WATER QUALITY

NOTE: Failure to insure proper water quality and flow rates can shorten the life of the heat pump and potentially void the unit warranty.

Maintaining proper water quality is important for insuring a long and trouble free service life for an LV series heat pump.

For closed loop and boiler/tower systems water chemistry can be checked and easily maintained to insure that corrosive elements, dissolved oxygen and pH levels are kept in check. It is important to insure that any additive, antifreeze or corrosion inhibitor that is added to the water loop is compliant with all applicable laws and regulations and is compatible with copper, brass and bronze alloys. Insure that all recommended safety precautions are followed when handling or adding chemicals to the water loop.

For open loop systems, water quality is very important. Refer to Quality Table on page# 6 shows acceptable ranges for a variety of water quality factors. The three main concerns in open loop installations are scaling, corrosion and fouling.

In installations with hard water, scaling due to a buildup of carbonates on the heat exchanger wall can gradually degrade the heat pump performance over time. Heat pumps that are affected by scaling may exhibit low suction pressures in heating and high head pressures in cooling with a gradual loss of capacity and efficiency. Scaled heat exchangers can be cleaned by a qualified technician but care should be taken to avoid scaling in the first place. To limit scaling, water flow rates should be kept at 3 gallons/minute per nominal cooling ton (a 10°F temperature rise in cooling) and care should be taken to avoid air in the water lines from suction side leaks. Cupro-nickel coils are generally recommended.

In installations with high hydrogen sulfide, chlorine or ammonia, corrosion is a potential problem. In these installations a cupro-nickel heat exchanger is recommended along with maintaining proper flow and keeping air out of the system. If water quality is outside of the values in water quality table, then a closed loop is recommended.

Fouling due to iron bacteria can also pose problems in some open loop installations. Iron bacteria fouling can quickly degrade system performance and plug heat exchangers.

Air in the water system will greatly accelerate the fouling or corrosion process.

WATER QUALITY TABLE

POTENTIAL	Water Characteristic	Acceptable Value		
PROBLEM		Copper	Cupro-Nickel	
	pH (Acidity/Alkalinity)	7-9	7-9	
SCALING	Hardness (CaCO3, MgCO3)	< 350 ppm	< 350 ppm	
	Ryznar Stability Index	6.0 - 7.5	6.0 - 7.5	
	Langelier Saturation Index	-0.5 - +0.5	-0.5 - +0.5	
Table 1: Water Quali	ty			
	Hydrogen Sulfide (H2S)	< 0.5 ppm *	10-50 ppm	
CORROSION	Sulfates	< 125 ppm	< 125 ppm	
	Chlorine	< 0.5 ppm	< 0.5 ppm	
	Chlorides	< 20 ppm	< 150 ppm	
	Carbon Dioxide	< 50 ppm	< 50 ppm	
	Ammonia	< 2 ppm	< 2 ppm	
	Ammonia Chloride	< 0.5 ppm	< 0.5 ppm	
	Ammonia Nitrate	< 0.5 ppm	< 0.5 ppm	
	Ammonia Hydroxide	< 0.5 ppm	< 0.5 ppm	
	Ammonia Sulfate	< 0.5 ppm	< 0.5 ppm	
	Dissolved Solids	< 1,000 ppm	< 1,500 ppm	
IRON FOULING	Iron (Fe2+ Iron Bacteria Potential)	< 0.2 ppm	< 0.2 ppm	
	Iron Oxide	< 1 ppm	< 1 ppm	
	Suspended Solids	< 10 ppm, < 600 µm size **	< 10 ppm, < 600 µm size **	
EROSION	Maximum Water Velocity	6 ft/sec	6 ft/sec	
* No "rotten egg" smell present at < 0.5 ppm H2S.				
** Equivalent to 30 mes	h strainer			

HEAT RECOVERY PACKAGE

The Heat Recovery Package (HRP) is a factory mounted option. It consists of a forced pumped unit that employs a circulating pump to move water through a double wall/vented heat exchanger and returns the heated water to the water tank. The water is heated by superheated refrigerant discharge gas from the compressor. This waste heat of the cooling mode captured by the heat recovery increases the capacity and efficiency of the heat pump unit. If the air temperature is uncomfortable coming from the vents in the heating mode the heat recovery may need to be turned off. In the heating mode, the heat recovery captures heat that would normally be used for space heating.

Typical Connection Piping (HRP)

Water Tank Preparation:

- 1. Turn off electrical or fuel supply to the water heater.
- 2. Attach garden hose to water tank drain connection and run other end of hose out doors or to an open drain.

- 3. Close cold water inlet valve to water heater tank.
- 4. Drain tank by opening drain valve on the bottom of the tank, then open pressure relief valve or hot water faucet.
- 5. Once drained the tank should be flushed with cold water until the water leaving the drain hose is clear and free of sediment.
- 6. Close all valves and remove the drain hose.
- 7. Install HR water piping.

Concentric water fitting (P/N: 8733907119) is recommended.

HR Water Piping

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All hot water piping should be a minimum of 3/8t O.D. copper tube to a maximum distance of fifteen (15) feet. For distances beyond fifteen feet but not exceeding sixty (60) feet use 1/2" copper tube. Separately insulate all exposed surface of both connecting water lines with 3/8" wall closed cell insulation. Install isolation valves on supply and return to the heat recovery. (Figure #19)



Figure # 19



NOTE: Diagram is for illustration purposes only. Ensure access to heat Pump is not restricted.



NOTE: All piping from HRP to domestic water tank must be copper or any metal of stronger alloy.

WATER TANK REFILL

- 1. Open the cold water supply to the tank.
- 2. Open a hot water faucet to vent air from the system until water flows from the faucet, then close.
- 3. Depress the hot water tank pressure relief valve handle to ensure there is no air remaining in the tank.
- 4. Carefully inspect all plumbing for water leaks. Correct as required.
- 5. Purge all air from HR through an external purge valve. Allow all air to bleed out until water appears at the valve. Locate the external purge value at the highest point in installation.
- 6. Before restoring the power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to ensure maximum utilization of the heat available from the refrigeration system and conserve the most energy. On tanks with both upper and lower elements and thermostats, the lower element should be turned down to 100° F, while the upper element should be adjusted to 120° F. Depending upon the specific needs of the customer, you may need to adjust the upper element differently. On tanks with a single thermostat lower the thermostat setting to 120° F or the "LOW" position.



NOTE: After thermostat adjustments are completed, replace access cover and restore electrical or fuel supply to water heater.

Initial Start-Up



NOTE: Make sure all valves in heat recovery water piping system are open. NEVER OPERATE HR PUMP DRY.

- 1. Turn on the heat pump. The HR pump should not run if the compressor is not running.
- 2. Turn HR switch to the "ON" position. The pump will operate if entering water temperature to HR is below 120° F.
- 3. The temperature difference between the water entering and leaving the heat recovery should be 5° to 15° F.
- 4. Allow the unit to operate for 20 to 30 minutes to ensure it is functioning properly. The pump should shut off when the water temperature entering the heat recovery reaches 120°F.

Hot Gas Reheat (HGRH)

Hot gas reheat is an active dehumidification option available on the BP series that cools and dehumidifies return air, and then reheats it back to approximately entering dry bulb temperature using waste compressor heat. In this way, a unit with Hot Gas Reheat can efficiently remove humidity from the return air without altering the sensible temperature of the space.

There are several ways to control the heat pumps with hot gas reheat. You should choose the means that best suits your specific application. The Typical Wiring Diagram illustrates one possible control sequence. Most heat pump compatible thermostats in conjunction with a humidistat are acceptable for use.



NOTE: Heat pumps with hot Gas Reheat need to be connected to a humidistat along with a traditional thermostat or a combination thermostat/humidistat.



NOTE: "O" output for reversing valve energized in cool mode is required.

SEQUENCE OF OPERATION

Cooling Mode

Energizing the "O" terminal energizes the unit reversing valve in the cooling mode. The fan motor starts when the "G" terminal is energized.



The fan motor will take 30 seconds to ramp up to operating speed and will run at fan only rated air flow as long as there is no call for compressor or heater operation.

When the thermostat calls for first stage cooling (Y1) the loop pump or solenoid valve if present is energized and the first stage of compressor capacity starts. The fan ramps up to first stage cooling air flow in 30 seconds.

When the thermostat calls for second stage cooling (Y2) the second stage (or full compressor capacity) is initiated. The fan ramps up to full cooling air flow.

Once the thermostat is satisfied, the compressor shuts down accordingly and the fan ramps down to either fan only mode or off over a span of 30 seconds.



A fault condition initiating a lockout will deenergize the compressor irrespective of which stage is engaged.

Heating Mode

The first two stages of heating (Y1 & Y2) operate in the same manner as cooling, but with the reversing valve de-energized. On a call for auxiliary heat (W1), the fan ramps up to auxiliary heat air flow immediately and the electric heater package is energized along with the compressor. As the thermostat is satisfied, the heaters will shut off as soon as W1 is de-energized, and the compressors will remain on until the thermostat stages are satisfied. Note that if the unit compressor lock out for any reason at this time, the electric heaters will continue to function normally.

Once the thermostat is satisfied, the compressor shuts down and the fan ramps down either fan only mode or off over a span of 30 seconds.

If thermostat has two different output points one for Auxiliary heat and a different one for Emergency heat the two outputs must be terminated on W1 units equipped with one stage of Electric heat.

APPLICATION CONSIDERATIONS

Well Water Systems

NOTE: In well water applications a slow closing solenoid valve must be used to prevent water hammer.

Copper is adequate for ground water that is not high in mineral content. Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment. In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended.

In well water applications water pressure must always be maintained in the heat exchanger. This can be accomplished with either control valve or a bladder type expansion tank. When using a single water well to supply both domestic water and the heat pump, care must be taken to insure that the well can provide sufficient flow for both.

Solenoid valves should be connected across Y1 and C1 on the interface board for all. Make sure that the VA draw of the valve does not exceed the contact rating of the thermostat.

- [1] Line voltage disconnect (unit)
- [2] Flex duct Connection
- [3] Low voltage control connection
- [4] Line voltage connection
- [5] Vibration pad
- [6] P/T ports
- [7] Hose kits (optional)
- [8] Ball valves
- [9] Solenoid valve slow closing
- [10] Condensate drain connection
- [11] Pressure tank (optional)
- [12] Line voltage disconnect (electric heater)

INSTALLATION OF PRESSURE REGULATING VALVES

Pressure regulating valves are used to increase or decrease water flow through the heat pump in response to refrigerant pressure. In some cases more water may be required in heating than in cooling, or vice versa. With the BP heat pumps these valves are not required.

However, if installed, a pair of valves are required for proper operation, one valve for cooling (direct acting) and another valve for heating (indirect acting). A refrigerant tap is provided in the refrigerant line located between the reversing valve and the waterto-refrigerant heat exchanger for proper monitoring of the refrigerant pressures.

The discharge water from the heat pump is not contaminated in any manner and can be disposed of in various ways depending on local building codes (i.e. discharge well, dry well, storm sewer, drain field, stream or pond, etc.) Most local codes forbid the use of a sanitary sewer for disposal. Consult your local building and zoning department to insure compliance in your area.

COOLING TOWER/BOILER SYSTEMS

The cooling tower and boiler water loop temperature is usually maintained between 50° F to 100 ° F to assure adequate cooling and heating performance.

In the cooling mode, heat is rejected from the unit into the water loop. A cooling tower provides evaporative cooling to the loop water thus maintaining a constant supply temperature to the unit. When utilizing open cooling towers, chemical water treatment is mandatory to ensure the water is free from corrosive elements. A secondary heat exchanger (plate frame) between the unit and the open cooling tower may also be used. It is imperative that all air be eliminated from the closed loop side of the heat exchanger to insure against fouling.

In the heating mode, heat is absorbed from the water loop. A boiler can be utilized to maintain the loop at the desired temperature.



NOTE: Water piping exposed to extreme low ambient temperatures is subject to freezing.

Consult the specification sheets for piping sizes. Teflon tape sealer should be used when connecting to the unit to insure against leaks and possible heat exchanger fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing. Pressure/ temperature ports are recommended in both supply and return lines for system flow balancing. Water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See specification sheets for water flow vs. pressure drop information.



Supply and return hoses should be connected together during this process to ensure the entire system is properly flushed. After the cleaning and flushing has taken place the unit may be connected to the water loop and should have all valves wide open. (Figure #21)



- [2] Low voltage control connection
- [3] P/T ports (optional)
- [4] Hose kits (optional)
- [5] Ball valves

- [7] Flex duct connection
- [8] Hanging bracket assembly
- [9] Threaded rod
- [10] Hanging bracket assembly

Geothermal (Earth-Coupled) Systems

Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training. Utilizing the Ground Loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions are utilized when low evaporating conditions are expected to occur. Refer to the GLP installation manuals for more specific instructions. (Figure #22)



Figure # 22

- [1] Line voltage disconnect (unit)
- [2] Flex duct Connection
- [3] Low voltage control connection
- [4] Line voltage connection (unit)
- [5] P/T ports
- [6] Vibration pad
- [7] Condensate drain connection
- [8] Ground loop connection kit
- [9] Ground loop pumping package
- [10] Polyethylene with insulation
- [11] Line voltage disconnect (electric heater)

SYSTEM CHECKOUT

After completing the installation, and before energizing the unit, the following system checks should be made:

- Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
- Make sure that all electrical connections are tight and secure.
- Check the electrical fusing and wiring for the correct size.

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WARNING: Ensure cabinet and Electrical Box are properly grounded.

- Verify that the low voltage wiring between the thermostat and the unit is correct.
- Verify that the water piping is complete and correct.
- Check that the water flow is correct, and adjust if necessary.
- Check the blower for free rotation, and that it is secured to the shaft.
- Verify that vibration isolation has been provided.
- Unit is serviceable. Be certain that all access panels are secured in place.

Considerations:

WARNING: Always check incoming line voltage power supply and secondary control voltage for adequacy

- 1. Transformer primaries are dual tapped for 208 and 230 volts. Connect the appropriate tap to ensure a minimum of 18 volts secondary control voltage. 24 volts is ideal for best operation.
- 2. Long length thermostat and control wiring leads may create voltage drop. Increase wire gauge or up-size transformers may be required to insure minimum secondary voltage supply.
- 3. FHP recommends the following guidelines for wiring between a thermostat and the unit: 18 GA up to 60 foot, 16 GA up to 100 ft and 14 GA up to 140 ft.
- 4. Do not apply additional controlled devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.
- 5. Check with all code authorities on requirements involving condensate disposal/ over flow protection criteria.

UNIT START-UP

- 1. Set the thermostat to the highest setting.
- 2. Set the thermostat system switch to "COOL", and the fan switch to the "AUTO" position. The reversing valve solenoid should energize. The compressor and fan should not run.
- 3. Reduce the thermostat setting approximately 5 degrees below the room temperature.
- 4. Verify the heat pump is operating in the cooling mode.
- 5. Turn the thermostat system switch to the "OFF" position. The unit should stop running and the reversing valve should de energize.
- 6. Leave the unit off for approximately (5) minutes to allow for system equalization.
- 7. Turn the thermostat to the lowest setting.
- 8. Set the thermostat switch to "HEAT".
- Increase the thermostat setting approximately
 5 degrees above the room temperature.
- 10. Verify the heat pump is operating in the heating mode.
- 11. Set the thermostat to maintain the desired space temperature.
- 12. Check for vibrations, leaks, etc.

MAINTENANCE

 Filter changes or cleaning are required at regular intervals. The time period between filter changes will depend upon type of environment the equipment is used in. In a single family home, that is not under construction, changing or cleaning the filter every 60 days is sufficient. In other applications such as motels, where daily vacuuming produces a large amount of lint, filter changes may be need to be as frequent as biweekly.



NOTE: Equipment should never be used during construction due to likelihood of wall board dust accumulation in the air coil of the equipment which permanently affects the performance and may shorten the life of the equipment.

- 2. An annual "checkup" is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit's data plate and the data taken at the original startup of the equipment.
- Lubrication of the blower motor is not required, however may be performed on some motors to extend motor life. Use SAE-20 nondetergent electric motor oil.
- 4. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.
- 5. Periodic lockouts almost always are caused by air or water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur call a mechanic immediately and have them check for: water flow problems, water temperature problems, air flow problems or air temperature problems. Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

UNIT CHECK-OUT SHEET

Customer Na Customer Na Address	Data ame	Date	
Phone		Unit Numbe	er
Unit Name Unit Make Model Numb Refrigerant (Compressor Blower Moto	eplate Data Der Charge (oz) Charge (oz) IRA LRA Dr: FLA (or NPA)	Serial Number	
Maximum Fu Maximum Ci	use Size (Amps) ircuit Ampacity		
Operating	; Conditions	Cooling Mode	Heating Mode
Entering / Lea Entering Air M Leaving Air M	aving Air Temp Measured at: Measured at:	/	/
Entering / Lea Fluid Flow (gj Compressor '	aving Fluid Temp pm) Volts / Amps	/ /	/
Blower Motor Source Fluid Fluid Flow (g	r Volts / Amps Type pm)*	/	/
Fluid Side Pro Suction / Disc Suction / Disc Suction Sup Entering TXV Liquid Subcov * Required fo	essure Drop* charge Pressure (psig)* scharge Temp* berheat* V / Cap Tube Temp* oling* or Troubleshooting ONLY	//	/ /
Auxiliary I	Heat		
Unit Make Model Numbe Max Fuse Siz	er: ze (Amps)	Serial Number	
Fotoring Air 7		Bosch	
Leaving Air T	emperature	555 NW 65th Fort Lauderda	Court ale, FL 33309
	MAIL TO: Bosch.Fhp.TechSupport@us.bosch.com or scan the QR code and attach picture of this form with the information requested.	Phone: (954) Fax: (800) 77	776-5471 6-5529

TROUBLESHOOTING

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NOTE: Troubleshooting Information Solution column may reflect a possible fault that may be one of, or a combination of causes and solutions. Check each cause and adopt "process of elimination" and or verification of each before making any conclusion.

UPM Board LED Indications

Indication Color	Blinks	Description
GREEN	Solid	18-30 VAC Power is present
RED	1	High pressure lockout
RED	2	Low pressure lockout
RED	3	Freeze sensor lockout
RED	4	Condensate overflow
RED	5	Brownout
RED	6	Evaporator Freeze condition

Unit Troubleshooting			
Problem	Possible Cause	Checks and Correction	
ENTIRE UNIT	Power Supply Off	Apply power, close disconnect	
DOES NOT KUN	Blown Fuse	Replace fuse or reset circuit breaker. Check for correct fuses	
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.	
	Thermostat	Set the fan to "ON", the fan should run. Set thermostat to "COOL" and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to "HEAT" and the highest temperature setting, the unit should run in the heating mode. If neither the blower or compressor run in all three cases, the thermostat could be miswired or faulty. To ensure miswired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between "R" and "C", "Y" and "C", and "O" and "C". If the blower does not operate, verify 24 volts between terminals "G" and "C" in the air handler. Replace the thermostat if defective.	
BLOWER	Thermostat	Check setting, calibration, and wiring	
COMPRESSOR	Wiring	Check for loose or broken wires at compressor, capacitor, or contactor.	
DOES NOT	Safety Controls	Check UPM board red default L.E.D. for Blink Code	
	Compressor overload open	If the compressor is cool and the overload will not reset, replace compressor.	
	Compressor motor grounded	Internal winding grounded to the compressor shell. Replace compressor. If compressor burnout, install suction filter dryer.	
	Compressor windings Open	After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor	

		Unit Troubleshooting
Problem	Possible Cause	Checks and Correction
UNIT OFF ON HIGH PRESSURE CONTROL	Discharge pressure too high	In "COOLING" mode: Lack of or inadequate water flow. Entering water temperature is too warm. Scaled or plugged condenser. In "HEATING" mode: Lack of or inadequate air flow. Blower inoperative, clogged filter or restrictions in duct work
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factor recommended charge.
	High pressure	Check for defective or improperly calibrated high pressure switch.
UNIT OFF ON LOW PRESSURE CONTROL	Suction pressure too low	In "COOLING" mode: Lack of or inadequate air flow. Entering air temperature is too cold. Blower inoperative, clogged filter or restrictions in duct work. In "HEATING" mode: Lack of or inadequate water flow. Entering water temperature is too cold. Scaled or plugged condenser.
	Refrigerant charge	The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.
	Low pressure switch	Check for defective or improperly calibrated low pressure switch.
UNIT SHORT	Unit oversized	Recalculate heating and or cooling loads.
CICLES	Thermostat	Thermostat installed near a supply air grill; relocate thermostat. Readjust heat anticipator.
	Wiring and controls	Check for defective or improperly calibrated low pressure switch.
INSUFFICIENT COOLING OR	Unit undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem
HEATING	Loss of conditioned air by leakage	Check for leaks in duct work or introduction of ambient air through doors or windows
	Airflow	Lack of adequate air flow or improper distribution of air. Replace dirty filter
	Refrigerant charge	Low on refrigerant charge causing inefficient operation
	Compressor	Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge of suction side of compressor. Replace reversing valve
	Operating pressures	Compare unit operation pressures to the pressure/temperature chart for the unit.
	ТХV	Check TXV for possible restriction or defect. Replace if necessary.
	Moisture, non condensable	The refrigerant system may be contaminated with moisture or non condensable. Reclaim refrigerant, replace filter dryer, evacuate the refrigerant system, and recharge with factory recommended charge.

28	Troul	bles	hooti	ing
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	HRP Troubleshooti	ng			
Problem	Possible Cause	Checks and Corrections			
NO FLOW	No Power	Check power supply			
LOW FLOW	On/Off Switch Position	Set switch to "ON" position			
	Compressor Contactor	Engage heat pump contactor			
	Broken or loose wires	Repair or tighten wires			
	Air Lock	Purge air from piping system			
	Stuck pump shaft/impeller	Remove pump cartridge and clean			
	Defective pump	Replace pump			
	Kinked or under sized water piping	Repair kink and check for proper line size			
HIGH WATER TEMPERATURE	Water temp limit closed	Stuck limit switch Sensor not attached securely to line			
LOW HEAT OUTPUT	Scaled or fouled heat exchanger	Clean heat exchanger			

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STANDARD MOTOR-PSC

For 007-012, Constant torque for 015-060

Available External Static Pressure (inches of Water)													
Model	Motor Speed	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2
	High	430	420	390	360	335	310	260	-	-	-	-	-
BP007	Medium	420	390	365	335	310	270	-	-	-	-	-	-
	Low	370	360	340	315	285	245	-	-	-	-	-	-
	High	430	420	390	360	335	310	260	-	-	-	-	-
BP009	Medium	420	390	365	335	310	270	-	-	-	-	-	-
	Low	370	360	340	315	285	245	-	-	-	-	-	-
	High		435	415	400	385	360	330	305	-	-	-	-
BP012	Medium	425	405	385	375	360	335	310	-	-	-	-	-
	Low	390	380	365	350	335	315	290	-	-	-	-	-
	High	710	685	650	610	575	545	460	370	-	-	-	-
BP015	Medium	530	510	480	445	405	360	-	-	-	-	-	-
	Low	430	410	370	335	290	245	-	-	-	-	-	-
55040	High	730	700	660	615	580	545	505	460	-	-	-	-
BP018	Medium	615	575	540	500	460	420	-	-	-	-	-	-
	Low	540	510	480	445	405	360	-	-	-	-	-	-
55001	High	975	945	910	880	855	825	790	750	-	-	-	-
BP024	Medium	905	885	855	825	790	755	700	650	-	-	-	-
	Low	725	700	670	640	585	530	-	-	-	-	-	-
	High	1225	1195	1170	1140	1110	1075	1010	940	745	-	-	-
BP030	Medium	1110	1075	1045	1015	985	955	915	880	700	-	-	-
	Low	955	925	890	860	825	790	750	715	685	-	-	-
	High	1440	1420	1400	1380	1345	1315	1240	1165	1005	845	-	-
BP036	Medium	1340	1315	1290	1270	1245	1225	1180	1135	990	845	-	-
	Low	1190	1165	1140	1115	1090	1065	1040	1020	915	810	-	-
	High	1645	1635	1610	1585	1560	1535	1510	1485	1460	1430	-	-
BP042	Medium	1455	1425	1400	1375	1345	1320	1290	1260	1225	1190	-	-
	Low	1220	1190	1160	1130	1100	1070	1015	955	895	830	-	-

	Available External Static Pressure (inches of Water)													
Model	Motor Speed	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	
	High	1840	1820	1795	1775	1745	1720	1695	1670	1645	1615	-	-	
BP048	Medium	1655	1635	1610	1585	1560	1535	1510	1485	1460	1430	-	-	
	Low	1455	1425	1400	1375	1345	1320	1290	1260	1225	1190	-	-	
	High	2225	2195	2165	2135	2105	2075	2045	2015	1980	1945	1900	1850	
BP060	Medium	2070	2045	2015	1990	1960	1925	1895	1870	1840	1810	1685	1600	
	Low	1815	1785	1755	1725	1695	1665	1630	1595	1555	1515	1425	-	

BP motor-CFM Selection (constant torque ECM)

Units	Motor HP	Tap 1	Tap 2*	Тар З						
BP015	1/3	LOW	MED*	HIGH						
BP018	1/3	LOW	MED*	HIGH						
BP024	1/3	LOW	MED*	HIGH						
BP030	1/2	LOW	MED*	HIGH						
BP036	3/4	LOW	MED*	HIGH						
BP042	3/4	LOW	MED*	HIGH						
BP048	3/4	LOW	MED*	HIGH						
BP060	1	LOW	MED*	HIGH						
*Factory default setting.										

CONSTANT CFM MOTOR

		Av	ailable	Externa	al Static	Pressu	re (incl	nes of W	/ater)				
Model	Motor Speed	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2
	+	575	575	575	575	575	575	575	575	-	-	-	-
BP015	Normal	500	500	500	500	500	500	500	500	-	-	-	-
	-		425	425	425	425	425	425	425	-	-	-	-
	+	745	745	745	745	745	745	745	745	-	-	-	-
BP018	Normal	650	650	650	650	650	650	650	650	-	-	-	-
	-	555	555	555	555	555	555	555	555	-	-	-	-
	+	1095	1095	1095	1095	1095	1095	1095	1095	1095	-	-	-
BP024	Normal	950	950	950	950	950	950	950	950	950	-	-	-
	-	810	810	810	810	810	810	810	810	810	-	-	-
	+	1150	1150	1150	1150	1150	1150	1150	1150	1150	-	-	-
BP030	Normal	1000	1000	1000	1000	1000	1000	1000	1000	1000	-	-	-
	-	850	850	850	850	850	850	850	850	850	-	-	-
	+	1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	-	-
BP036	Normal	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	-	-
	-	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	-	-
	+	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	-	-
BP042	Normal	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	-	-
	-	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	-	-
	+	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	-	-
BP048	Normal	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	-	-
	-	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	-	-
	+	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
BP060	Normal	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
	-	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	-

WATER SIDE PRESSURE DROP

Model	Water Flow Rate (GPM)	Water Side Pressure Drop (PSI)	Water Side Pressure Drop (ft of H2O)							
	1.5	1.3	2.9							
BP007	2	2.1	4.9							
	3	4.4	10.1							
	2	1.7	3.9							
BP009	2.5	2.5	5.8							
	3.25	4.0	9.3							
	3	1.5	3.4							
BP012	4	2.5	5.8							
	5.5	4.5	10.2							
	3	1.4	3.3							
BP015	4	2.4	5.5							
	5.5	4.3	9.8							
	4	3.0	7.0							
BP018	5	4.5	10.4							
	6.5	7.3	16.7							
	4.5	1.8	4.1							
BP024	6	3.0	6.9							
	8	5.1	11.6							
	5.5	0.9	2.1							
BP030	7	1.4	3.2							
	10	2.7	6.1							
	7.5	1.4	3.3							
BP036	10	2.4	5.6							
	12.5	3.6	8.4							
	8.75	1.9	4.4							
BP042	10.5	2.7	6.1							
	13.25	4.0	9.3							
	10.67	2.7	6.3							
BP048	12	3.4	7.8							
	14	4.5	10.3							
	12	3.4	7.8							
BP060	15	5.0	11.7							
	17.5	6.7	15.4							
All values based upon pure water at 70 deg F										

AIR TEMPERATURE RISE/FALL

Entering	COOL	NG	HEA	TING
Fluid Temp [°] F	Entering Air Temp [°] F	Air Temp Drop [°] F	Entering Air Temp $^\circ$ F	Air Temp Rise [°] F
			60	15.9-23.5
			70	13.5-22.9
30			80	14.8-22.4
	75/63	20.6-25.0	60	18.5-26.7
	80/67	21.6-25.6	70	17.9-26
40	85/71	22.5-26.2	80	17.2-25.5
	75/63	20.3-24.4	60	21.3-30
	80/67	20.6-24.4	70	23.3-33
50	85/71	21.5-25.2	80	22.5-32.3
	75/63	19.0-23.2	60	27-37.6
	80/67	20.2-23.8	70	26.1-37.1
60	85/71	20.8-24.5	80	25.2-36.2
	75/63	18.5-22.5	60	30-41.7
	80/67	19.3-23.2	70	29-40.8
70	85/71	20.5-23.9	80	28-39.9
	75/63	18.8-22.2		
	80/67	19.1-23		
80	85/71	20.3-23.6		
	75/63	18.8-22.2		
	80/67	19.1-23		
85	85/71	20.3-23.6		
	75/63	19-21.8		
	80/67	18.9-22.7		
90	85/71	20-23.3		
	75/63	17.2-21.3		
	80/67	18.4-22.1		
100	85/71	19.5-22.7		
	75/63	16-20.7		
	80/67	17.1-21.4		
110	85/71	18.2-22.2		
This chart s	hows approximate air temper	ratures rise/fall for a unit	in good repair. The values sho	wn are meant as a guide only

and should not be used to estimate system charge. This chart assumes rated flow air and rated water flow. Heating data at entering fluid temperatures below 50° assumes the use of antifreeze. as a result of continuing research and development, specifications are subject to change without notice.

REFRIGERANT PRESSURE RANGES

				coc	DLING				HEA	TING	
Enteri	Eluid	Entering A	Air Temp (Dry	Bulb)				Entering Ai	r Temp (Dry E	Bulb)	
ng Fluid	Fluid	70 ° F		75 ° F		80 [°] F		60 ° F		70	° _F
Temp		Suction	Discharge	Suction	Suction Discharge Suction Discharge		Suction	Discharge	Suction	Discharge	
	5							68-79	233-266	71-84	269-316
	10							65-76	222-255	68-80	255-291
30	15							59-71	216-248	62-75	245-283
	5	113-147	138-156	117-152	142-161	119-155	145-164	80-95	244-282	85-100	289-317
	10	113-147	145-164	117-152	150-170	119-155	153-173	77-91	237-274	82-96	269-306
40	15	113-147 151-170		117-152	156-175	119-155	159-179	72-86	226-262	76-90	258-297
	5	115-149	164-185	119-154	170-191	121-157	173-195	95-113	255-302	100-119	287-337
	10	115-149	173-194	119-154	178-200	121-157	182-204	91-109	248-290	96-115	281-323
50	15	115-149	179-200	119-154	184-207	121-157	188-211	86-103	237-282	90-108	269-316
	5	117-151	194-218	121-156	200-224	123-159	204-229	111-133	270-324	117-141	302-360
	10	117-151	204-228	121-156	121-156 211-235		215-240	106-129	258-311	112-136	294-341
60	15	117-151	211-235	121-156	218-242	123-159	222-247	101-122	251-302	106-128	283-337
	5	119-153	228-254	122-158	235-262	125-161	240-267 129-158 282-34		282-343	136-167	314-378
	10	119-153	238-265	122-158	246-273	125-161	251-279	124-150	274-333	131-159	307-362
70	15	119-153	246-273	122-158	254-281	125-161	259-287	117-146	262-320	123-154	294-355
	5	121-155	265-294	124-160	273-303	127-163	279-309	148-184	299-366	156-194	331-405
	10	121-155	276-306	124-160	285-316	127-163	291-322	143-176	286-352	151-185	322-383
80	15	121-155	285-315	124-160	294-325	127-163	300-332	136-169	278-343	143-179	311-378
	5	123-157	306-337	126-162	316-348	129-165	322-355				
	10	123-157	319-351	126-162	329-363	129-165	336-370				
90	15	123-157	329-362	126-162	339-373	129-165	346-381				
	5	124-159	351-387	128-164	363-399	131-167	370-407				
	10	124-159	367-403	128-164	378-416	131-167	386-424				
100	15	124-159	376-413	128-164	388-426	131-167	396-435				
	5	126-161	403-441	130-166	416-455	133-169	424-464				
	10	126-161	419-458	130-166	432-472	133-169	441-482				
110 15 126-161		429-470	130-166	443-485	133-169	452-495					

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge.

This chart assumes rated air flow and 80° d.b./67° w.b. entering air temperature in cooling, 70° d.b entering air temperature in

heating. Heating data at entering fluid temperatures below 50° assumes the use of antifreeze.

As a result of continuing research and development, specifications are subject to change without notice.

	ierided ement nal Size	0 x 2	0 x 2	0 x 2	0 x 2	0 x 2	4 x 2	0 x 2	0 x 2	x 2 (2)	x 2 (2)	x 2 (2)
m moood	Replace Nomi Filter 3	15 × 2(15 × 2(18 × 2(20 × 2(20 × 2(24 × 2⁄	24 × 3(24 × 3(16 × 30	16 × 30	20 × 30 ;
	Condenser Water Connections	3/4" FPT	1" FPT	1" FPT	1" FPT	1" FPT	1" FPT					
Ø	Right Side to Discharge	5.32	5.32	5.32	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Ч	Filter Rack Height	15.00	15.00	18.00	20.00	20.00	24.00	24.00	24.00	32.00	32.00	40.00
z	R/A Duct Flange Height	13.00	13.00	16.00	18.00	18.00	22.00	22.00	22.00	30.00	30.00	38.00
Μ	R/A Duct Width	18.00	18.00	18.00	18.00	18.00	22.00	28.00	28.00	28.00	28.00	28.00
×	Water Out	13.75	13.75	12.50	12.25	12.25	15.00	14.50	14.50	13.25	13.25	13.25
ſ	Bottom to Condensate Drain	8.00	8.00	7.50	7.50	7.50	8.75	8.50	8.50	8.50	8.50	8.50
Т	Water In	2.25	2.25	2.62	2.25	2.25	2.50	2.50	2.50	3.25	3.25	3.25
ŋ	Left Side to Discharge	8.50	8.50	8.50	6.12	6.12	4.87	7.00	7.00	6.75	6.75	7.00
щ	Cabinet Edge to Discharge	5.00	5.00	5.00	4.00	4.00	6.25	8.87	8.87	7.87	78.7	7.87
ш	Discharge Width	7.75	7.75	7.75	13.75	13.75	15.75	15.75	15.75	17.75	17.75	17.75
D	Discharge Depth	11.75	11.75	11.75	13.75	13.75	13.75	15.75	15.75	17.75	17.75	17.75
ပ	Height	32.75	32.75	32.75	39.25	39.25	47.25	47.25	47.25	58.25	58.25	66.25
В	Depth	21.75	21.75	21.75	21.75	21.75	26.25	33.50	33.50	33.50	33.50	33.50
A	Width	21.75	21.75	21.75	21.75	21.75	21.75	24.25	24.25	26.25	26.25	26.25
	Model	BP007	BP009	BP012	BP015	BP018	BP024	BP030	BP036	BP042	BP048	BP060



VERTICAL DIMENSIONS

36 | Horizontal Dimensions

HORIZONTAL DIMENSIONS

	Condenser Water Connections	3/4" FPT	1" FPT										
F	R/A Duct Flange Height	13.00	13.00	16.00	16.00	16.00	18.00	18.00	18.00	18.00	18.00	18.00	ening condensate S)
ĸ	Filter Rack Height	15.00	15.00	18.00	18.00	18.00	20.12	20.12	20.12	20.12	20.12	20.12	a Return rough (FLs rough (FRs
Ø	Top to Discharge (FRE & FLS)	4.62	4.62	4.75	2.87	2.87	4.25	2.25	2.25	2.12	2.12	2.12	ight Han ight Thursday
٩	End to Discharge	3.50	3.50	3.62	2.75	2.75	3.75	4.50	4.50	4.50	4.50	4.50	Strai te B
z	Discharge Height	7.75	7.75	7.75	13.75	13.75	15.75	15.75	15.75	17.75	17.75	17.75	
Σ	Top to Discharge (FLE & FRS)	4.62	4.62	7.12	3.12	3.12	2.12	4.00	4.00	2.25	2.25	2.25	Conder Conder Bra
×	Discharge Width	11.75	11.75	11.75	13.75	13.75	13.75	15.75	15.75	17.75	17.75	17.75	itow (FF
۔ ا	Side to I Discharge	3.50	3.50	3.62	2.75	2.75	3.75	4.50	4.50	4.50	4.50	4.50	Right H
т	Water Out	13.87	13.87	12.50	12.50	12.50	15.12	13.25	13.25	13.25	13.25	13.25	A A A A A A A A A A A A A A A A A A A
ი	Water In	2.25	2.25	2.50	2.50	2.50	2.62	2.50	2.50	2.75	2.75	2.62	Access Panel Access Knoo
ш	Cab Front to Filter Rack	22.25	22.25	24.25	23.25	23.25	23.00	31.25	31.25	29.62	29.62	31.00	
ш	R/A Duct Width	20.25	20.25	20.25	20.25	20.25	30.25	35.00	35.00	48.25	48.25	56.25	Hand F
D	Cab End to Filter Rack	0.50	0.50	0.62	1.62	1.62	1.25	2.00	2.00	0.75	0.75	1.87	Right
с	Height	16.75	16.75	19.75	19.75	19.75	22.00*	22.00*	22.00*	22.00*	22.00*	22.00*	
В	Depth	43.25	43.25	45.25	45.25	45.25	54.75	68.25	68.25	79.00	79.00	89.25	ndense /ater Out Mater In Acce Pane
A	Width	21.75	21.75	22.25	22.25	22.25	26.25	30.25	30.25	30.25	30.25	30.25	0 × 0 -
	Model	BP007	BP009	BP012	BP015	BP018	BP024	BP030	BP036	BP042	BP048	BP060	

WIRING DIAGRAMS



Figure # 23



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the





FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.





BP Series

FOR REFERENCE ONLY Actual unit wiring

may vary from this example. Always refer to the





FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the





BP Series

BP Series

FOR REFERENCE ONLY Actual unit wiring

may vary from this example. Always refer to the



Figure # 28



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.

NOTES

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