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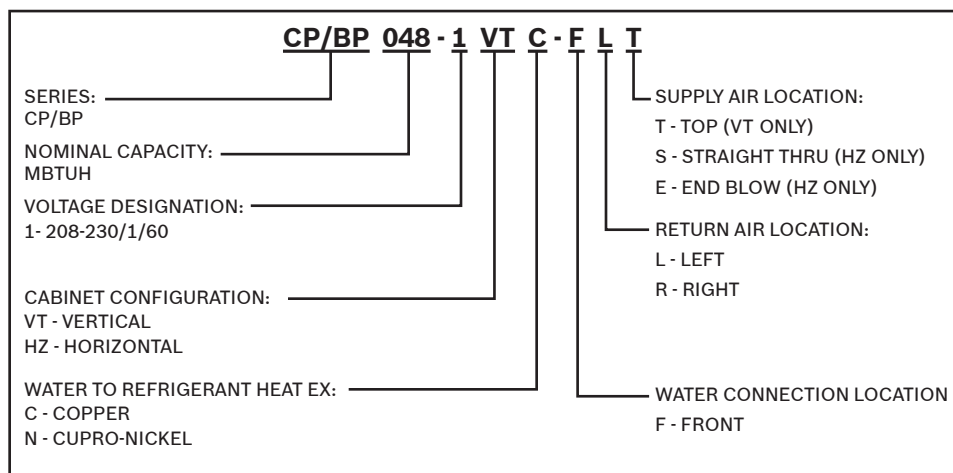


BOSCH

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MODEL NOMENCLATURE



INITIAL INSPECTION

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

These Packaged System 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.

The CP/BP Water-to-Air Heat Pumps are Underwriters Laboratories (UL) and (cUL) listed for safety. The water-to-Air Heat Pumps are designed to operate with entering fluid temperature between 25°F to 80°F in the heating mode and between 50°F to 110°F in the cooling mode. Efficiencies and capacities will vary as entering fluid and return air temperatures vary.



50°F Min. EWT for well water applications sufficient water flow to prevent freezing. Antifreeze solution is required for all closed loop applications where the fluid temperature may drop below 50°F. Cooling Tower/Boiler and Earth Coupled (Geo Thermal) applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. Frozen water coils are not covered under warranty.



This product should not be used for temporarily heating/cooling during construction. Doing so may affect the unit's 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. If unit stacking is required, stack units as follows: Vertical units less than 6 tons, no more than two high; horizontal units less than 6 tons, no more than three high. Do not stack units larger than 6 tons.

SAFETY CONSIDERATIONS

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. Untrained personnel can perform basic functions of maintenance such as cleaning coils and replacing filters.



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

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.

The blower motor should only be operated when a duct is installed and secured to heat pump duct collar in order to avoid possible injury.

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 space. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping. These units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned.

Do not locate units in areas that are subject to freezing.



INSTALLATION



*Remove shipping block under blower housing.
Loosen compressor mounting bolts.*

The installer should comply with all local codes and regulations which govern the installation of this type of equipment. Local codes and regulations take precedent over any recommendations contained in these instructions. In lieu of local codes, the equipment should be installed in accordance with the recommendations made by the National electric code, and in accordance with the recommendations made by the National Board of Fire Underwriters. All local seismic codes for seismic restraint of equipment, piping, and duct work shall be strictly adhered to.

MOUNTING VERTICAL UNITS

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 #1).

If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space.

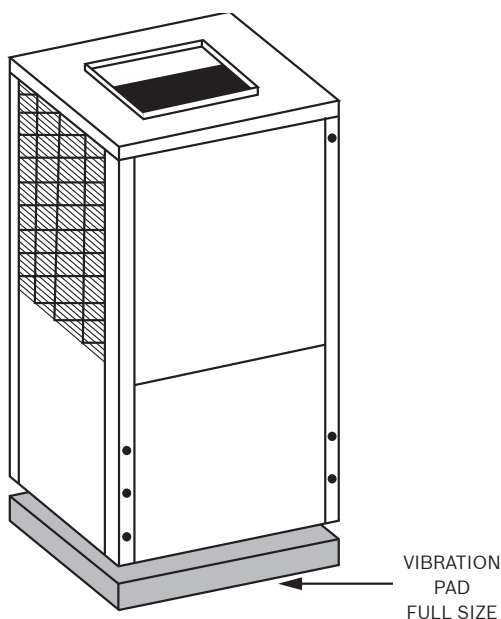


Figure #1 – Vertical unit on vibration pad

MOUNTING HORIZONTAL UNITS

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 (P/N 930-008). (See Figure #2). 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. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

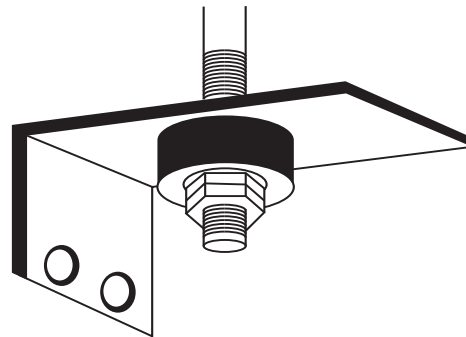


Figure #2 – Typical horizontal unit hanging bracket

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 and able to drain to a location that will be noticeable. If the 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.

Locate the heat pump unit in an area that provides sufficient room to make water and electrical connections, allowing easy removal of the access

panels, and replacement of air filters for routine maintenance. This will ensure proper work space for service personnel to perform maintenance or repair. See Unit Specifications for replacement filter sizes in the back of this manual to ensure proper clearances are provided during installation. Allow adequate room below the unit for a condensate drain trap on horizontal units.



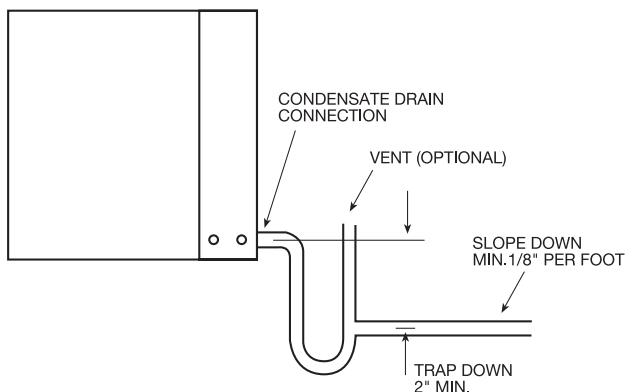
Water freezes at 32°F. Frozen water coils are not covered under the limited product warranty. It is the installer's responsibility to insure that the heat pump unit is installed in a location or have taken the proper precautions in order to prevent rupturing the water coil due to freezing conditions.

The heat pump unit is designed for conditioned space installation only. If the source water is subjected to conditions where ambient temperatures can fall below freezing, some form of freeze protection should be employed. In an open loop system this may entail running the water pump continuously to prevent freezing. An antifreeze solution wherever possible should be used if water will be subject to freezing. Consult the factory in these instances for guidance.

CONDENSATE DRAIN

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.

Figure #3 – Heat Pump Condensate Trapping



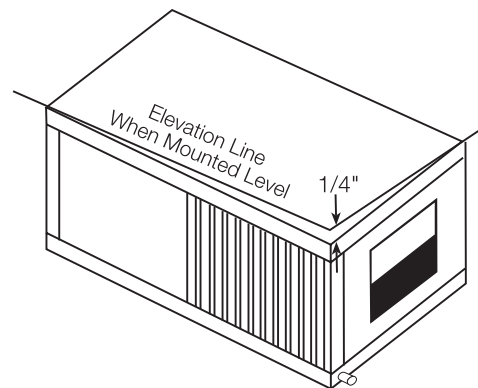
This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow.

(Heat Pumps are not internally trapped). A vertical air vent is sometimes required to avoid air pockets (See Figure #3). 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 4 below.

Figure #4 – Sloped horizontal unit installation

DUCT SYSTEM



A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. See Unit Specifications for duct collar connection sizes in the back of this manual.

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. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected. Do not connect ducts directly to the blower outlet; factory supplied duct collars should be used for connection. 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 air system.

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 ductwork, 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 ductwork should be installed. Check for existing leaks and repair as necessary to ensure a tight air seal within duct. 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 speeds and settings in Table #1)



Always disconnect power to the unit before changing motor speed to prevent damage to the motor, injury or death due to electrical shock.

ELECTRICAL



Always disconnect power to the unit before servicing to prevent injury or death due to electrical shock or contact with moving parts.

All field wiring must comply with local and national fire, safety and electrical codes. Power to the unit must be within the operating voltage range indicated on the unit's nameplate. On three phase units, phases must be balanced within 2%.



Operating the unit with improper line voltage or with excessive phase imbalance is hazardous to the unit and constitutes abuse and is not covered under warranty.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See equipment rating plates for proper size.

The heat pump units are provided with a concentric knock-out in the front right corner post for attaching common trade sizes of conduit. Route power supply wiring through this opening. Flexible wiring and conduit should be used to isolate vibration and noise from the building structure. Be certain to connect the ground lead to the ground lug in the control box. Connect the power leads as indicated on the unit wiring diagrams.

Table 1: CP/BP Motor CFM Selection (ECM Motor)

| Units | Motor Part Number | Motor HP | Tap1 | Tap2 | Tap3 | Tap4 | Tap5 |
|----------|-------------------|----------|------|------|------|------|------|
| CP/BP015 | 450-153 | 1/3 | LOW | MED | HIGH | - | - |
| CP/BP018 | 450-153 | 1/3 | - | LOW | - | MED | HIGH |
| CP/BP024 | 450-157 | 1/3 | LOW | MED | HIGH | - | - |
| CP/BP030 | 450-154 | 1/3 | LOW | MED | HIGH | - | - |
| CP/BP036 | 450-158 | 3/4 | LOW | MED | HIGH | - | - |
| CP/BP042 | 450-155 | 3/4 | LOW | MED | HIGH | - | - |
| CP/BP048 | 450-155 | 3/4 | - | LOW | MED | HIGH | - |
| CP/BP060 | 450-156 | 1 | LOW | MED | HIGH | - | - |
| CP/BP070 | 450-156 | 1 | LOW | - | - | MED | HIGH |

THERMOSTAT CONNECTIONS

Thermostat wiring is connected to a 7 position low voltage terminal block in the electrical box. The thermostat connections and their functions are as follows:

- Y** Compressor Operation
- G** Fan
- O** Reversing Valve (energized in cooling)
- C** Transformer 24 VAC Common – 3 Connections
- R** Transformer 24 VAC Hot

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

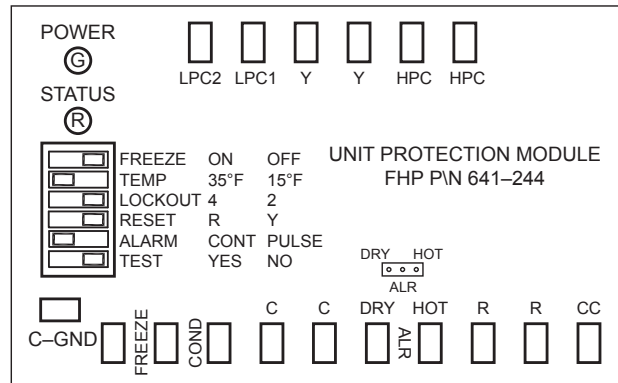
i If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, the UPM board “ALR” jumper setting must be set to “HOT”.

i If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, the unit must be provided with a malfunction relay (Bosch option # 660-006) to properly energize the light. The relay coil will be wired across the (ALR) and (C) contacts on the unit's UPM board and the relay's normally open contacts across (ALR) and the malfunction light connection on the thermostat. If the thermostat is provided with a malfunction light powered off of the hot (R) side of the transformer, then the thermostat malfunction light connection should be connected directly to the (ALR) contact on the unit's UPM board.

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

SAFETY DEVICES AND THE UPM CONTROLLER

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.
- Optional freeze protection sensor located on the leaving side of the water coil prevents unit operation below 35°F or 15°F (depending on dip switch setting). The freeze dip switch must be set to “ON”.

i The factory default for the Freeze setting is in “ON” position. If the freeze stat option is not ordered, the switch must be repositioned to the “OFF” position.

- Condensate overflow protection sensor located in the drain pan of the unit and connected to the ‘COND’ terminal on the UPM board.

The UPM includes the following features:

- **ANTI-SHORT CYCLE TIME**—5 minute delay on break timer to prevent compressor short cycling.
- **RANDOM START**—Each controller has a unique random start delay ranging from 270 to 300 seconds to reduce the chances of multiple units simultaneously starting after initial power up or after a power interruption, creating a large electrical spike.
- **LOW PRESSURE BYPASS TIMER**—If the compressor is running and the low pressure switch opens, then the control will keep the compressor on for 120 seconds. After 2 minutes if the low pressure switch remains open, the control 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 lock out and 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 till the voltage goes above 18 VAC and the anti short cycle timer (300 seconds) times out. The unit will not go into a hard lockout.

- **MALFUNCTION OUTPUT**—The controller has a set of wet contacts for remote fault indication or dry contacts for communication with a DDC controller or BMS. The fault output will depend on the dip switch setting for “ALARM”. If it 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 explanations. The remote device must have a malfunction detection capability when the UPM board is set to “PULSE”.

- **TEST DIP SWITCH**—A test dip switch is provided to reduce all time delay settings to 5 seconds during troubleshooting or verification of unit operation. Note that operation of the unit while in test mode can lead to accelerated wear and premature failure of the unit. The “TEST” switch must be set back to “NO” for normal operation.

- **FREEZE SENSOR**—This is optional and can be set to ignore or monitor a freeze sensor. There are 2 configurable freeze points, 35°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 may not provide protection in the case of loss of flow in the heating mode. A flow switch or pressure differential switch is recommended to prevent unit operation in case of loss of flow.



If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the “Freeze” switch set to 35°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 at the board.
- Red: Fault indicator with blink codes as follows:
 - One blink—High pressure lockout
 - Two blinks—Low pressure lockout
 - Three blinks—Freeze sensor lockout
 - Four blinks—Condensate overflow
 - Five blinks—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.

- **UPM BOARD DEFAULT SETTINGS**—Your UPM board will come from the factory with the following default settings:

- **Freeze**—“ON”
- **Temp**—35°F
- **Lockout**—2
- **Reset**—“Y”
- **Alarm**—“CONT”
- **Test**—“NO”
- **Hot/Dry Alarm**—“HOT”

Considerations

1. Always check incoming line voltage power supply and secondary control voltage for adequacy. 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. Bosch 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.

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.

When the thermostat calls for cooling (Y), the loop pump or solenoid valve if present is energized and compressor will start.

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.

Note that a fault condition initiating a lockout will de-energize the compressor.

Heating Mode

Heating operate in the same manner as cooling, but with the reversing valve de-energized. The compressor will run until the desired set temperature on the thermostat is achieved.

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. Auxiliary electric heating coils are not available on the CP/BP product line.

UNIT OPTIONS

HOT GAS REHEAT (HGR)

Hot gas reheat allows the user to not only control space temperature, but also humidity levels within the conditioned space. An excess of moisture in the space can allow mold growth leading to damage in the structure or interior surfaces as well as reducing the air quality and creating an unhealthy environment.

The typical control of a unit is by a thermostat that senses the temperature in the space. By utilizing a humidistat in addition to the thermostat we are able to monitor the humidity levels in the space as well. The HGR option allows cooling and dehumidification to satisfy both the thermostat and humidistat.

Once the thermostat reaches set point temperature and the humidity is above set point the unit will operate in the hot gas reheat mode first by cooling and dehumidifying then reheating the air using hot refrigerant gas before delivering it to the space usually 2°F to 5°F below room temperature. The unit is operating as a dehumidifier. By reheating the air along a constant sensible heat line the relative humidity of the supply air is reduced.

The moisture removal capacity of a specific heat pump is determined by the unit latent capacity rating. A heat pump's latent capacity can be determined by reviewing the heat pump specification data sheets. Depending upon the entering water and air conditions a total and sensible capacity can be interpolated from the data sheets. Subtracting sensible capacity from total capacity yields latent capacity. Dividing the latent capacity by 1069 (BTU/LB of water vapor at 80° DB and 67° WB) yields the amount of moisture removal in pounds per hour.

Sequence of Operation - On/Off Control

The sequence of operation in the cooling and heating mode is the same as a regular heat pump.

In the reheat mode on a call from the humidistat the reheat relay coil is energized through the “H” circuit. The blower relay, reversing valve and compressor

contactor are energized through the contacts of the reheat relay. See Typical Wiring Diagram page 25. The cooling relay remains de-energized enabling the reheat solenoid (Note: The reheat mode always operates in the cooling mode.) Should the temperature in the space increase above set point the compressor terminal Y is energized which will de-energize the reheat valve putting the unit into the straight cooling mode. A call for cooling or heating will always take precedence over hot gas reheat.

Hot Gas Reheat Controllers

There are several ways to control heat pumps with hot gas reheat. You should choose the means that best suits your specific application. The Typical Wiring Diagram on page 25 illustrates one possible control sequence. Most heat pump compatible thermostats in conjunction with a humidistat are acceptable for use, (Note: "O" output for reversing valve energized in cooling mode is required.) Combination thermostats/humidistat are also available.

Special Considerations

Some applications require special consideration to maximize the performance of the hot gas reheat function:

- Low Temperature Well Water
- Indoor Pool Dehumidifying During Winter Months

Consult the factory for special application considerations.

Low Temperature Well Water

When low temperature well water is utilized as the water source (below 55°F), a means of establishing two flow rates, one for the cooling/reheat mode and one for heating mode is recommended. In the cooling mode at low entering water temperatures and standard flow rates discharge pressures and corresponding discharge gas temperatures are relatively low. At these conditions when the reheat mode is initiated the low temperature discharge gas can reduce reheat capacity. A means to reduce the water flow rate and elevate the discharge pressure/temperature in cooling/reheat mode should be provided. Conversely, at low entering water temperatures in the heating mode system suction

pressure is reduced causing a loss in heating capacity. A means of providing higher flow in the heating mode should be provided. The simplest way to accomplish the above is to install water regulating valves.

Indoor Pool Dehumidifying During Winter Months

It is important to remember that when in the reheat mode the heat pump is cooling and reheating. A secondary means of heating the space during the dehumidification mode should be provided. The indoor space temperature should be kept at least 2°F above the pool water temperature. If this is not done the warm pool water attempts to heat the space and the humidity levels increase exponentially. The heat pump is normally sized to handle the design latent load moisture removal. A second heat pump or resistance heat should be provided to handle the structural loss load.



A protective coating is highly recommended for all pool applications due to the highly corrosive chemical environment.

FLUID DIFFERENTIAL PRESSURE SWITCH (DPS)

The function of the differential switch is to prevent or stop compressor operation should the water supply fail. This will prevent the unit from locking out on a safety requiring manual reset to restart.

The switch is piped between the water entering and leaving connections. Should the pressure drop fall below set value the switch will open de-energizing the DPS relay thereby stopping the compressor.

The controller has an adjustment to change the minimum pressure differential required to open the switch and may require field adjustment.

The blower operation will not be affected by this option.



The start-up process should include checking the operation of the switch when installed. This should be done after the system is balanced. Adjustment should be made if necessary.

Operating Pressures and Temperatures

Operating pressures and temperatures in the reheat mode vary slightly from standard cooling mode operating characteristics. The variations are as follows:

Discharge Pressure: (-) 5 to 20 PSIG

Discharge Gas Temperature: (-) 5°F to 15°F

Suction Pressure: (+) 5 to 10 PSIG

Suction Gas Temperature: (+) 5°F to 10°F

WATER PIPING



Water piping exposed to extreme low ambient temperatures are subject to freezing. Remember water freezes at 32°F.

Supply and return piping must be as large as the water connections on the heat pump (larger on long runs). Never use flexible hoses of a smaller inside diameter than that of the water connections on the unit. The heat pump units are supplied with either a copper or optional cupro-nickel condenser.



Galvanized pipe or fittings are not recommended for use with these units due to the possible galvanic corrosion.

Both the supply and discharge water lines will sweat if subject 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.

Never exceed the recommended water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.



Improper heat exchanger water flow due to piping, valve arrangement or improper pump operation is hazardous to the unit and constitutes abuse which will void the heat exchanger and compressor warranty.

All heat pump units are equipped with female pipe thread fittings. Consult the specification sheets for sizes. Teflon tape sealer should be used when connecting water piping connections to the units to ensure against leaks and possible heat exchanger fouling. Do not over tighten 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.

No unit should be connected to the supply or return piping until the water system has been completely cleaned and flushed to remove any dirt, piping chips or other foreign material. 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.

WELL WATER SYSTEMS

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 (Refer to recommended methanol concentration table in back of this manual). 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 well water is used exclusively for supplying water to the heat pump, the pump should operate only when the heat pump operates. A 24 volt double pole-single throw (DP/ST) contactor (Figure #6) can be used to operate the well pump with the heat pump.

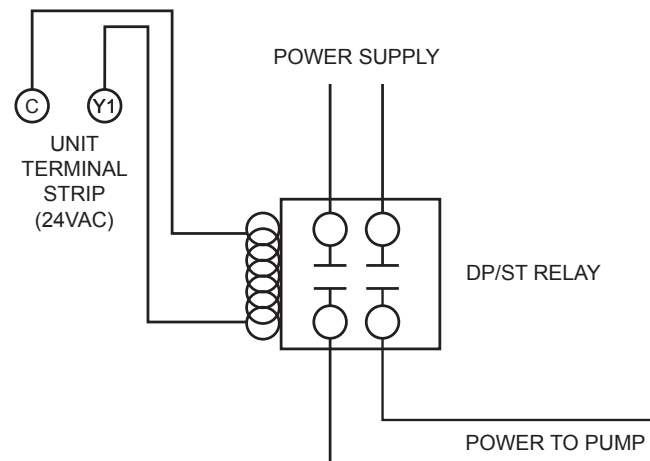


Figure #6



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Subject to change without prior notice

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When two or more units are supplied from one well, the pump can be wired (Figure #7) to operate independently from either unit. An upsized VA transformer may be required in either case.

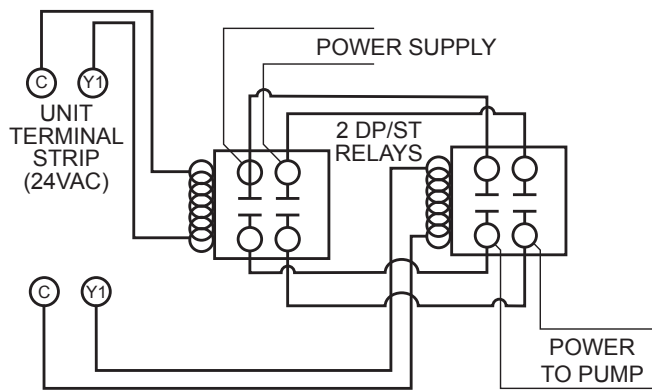


Figure #7

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing. The water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See the unit specification sheets for the water flow and pressure drop information in the back of this manual.

The discharge water from the heat pump is not contaminated in any manner and can be disposed of in various ways depending on local codes (i.e. discharge well, dry well, storm sewer, drain field, stream, pond, etc.)

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

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

FRESH WATER SYSTEMS

The Units shall be designed to operate throughout the range of entering fluid temperature of 50°F to 110°F in the cooling mode and 50°F to 80°F in the heating mode. Units shall have an operating range of 25 °F to 80°F in the heating mode when equipped with the optional extended range. In the cooling mode, heat is rejected from the Bosch 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.



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

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 in the back of this manual.

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 Bosch's Ground Loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions are utilized when low operating conditions are expected to occur. Refer to the GLP installation manuals for more specific instructions. A wrapped water coil option is required for this application.

System Checkout

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

- 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

- 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
- Verify that the blower support has been removed
- Verify that duct work has been properly fastened to supply and return duct collars
- Make sure return air filters are positioned correctly in the filter rack if removed during installation

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-energized
6. Leave the unit off for approximately (5) minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting. The compressor and fan should not run.
8. Set the thermostat switch to "HEAT".
9. 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...
13. Instruct the owner on the unit and thermostat operation

HEAT RECOVERY PACKAGE

The Heat Recovery package 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 air 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.



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 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.



TYPICAL CONNECTION PIPING

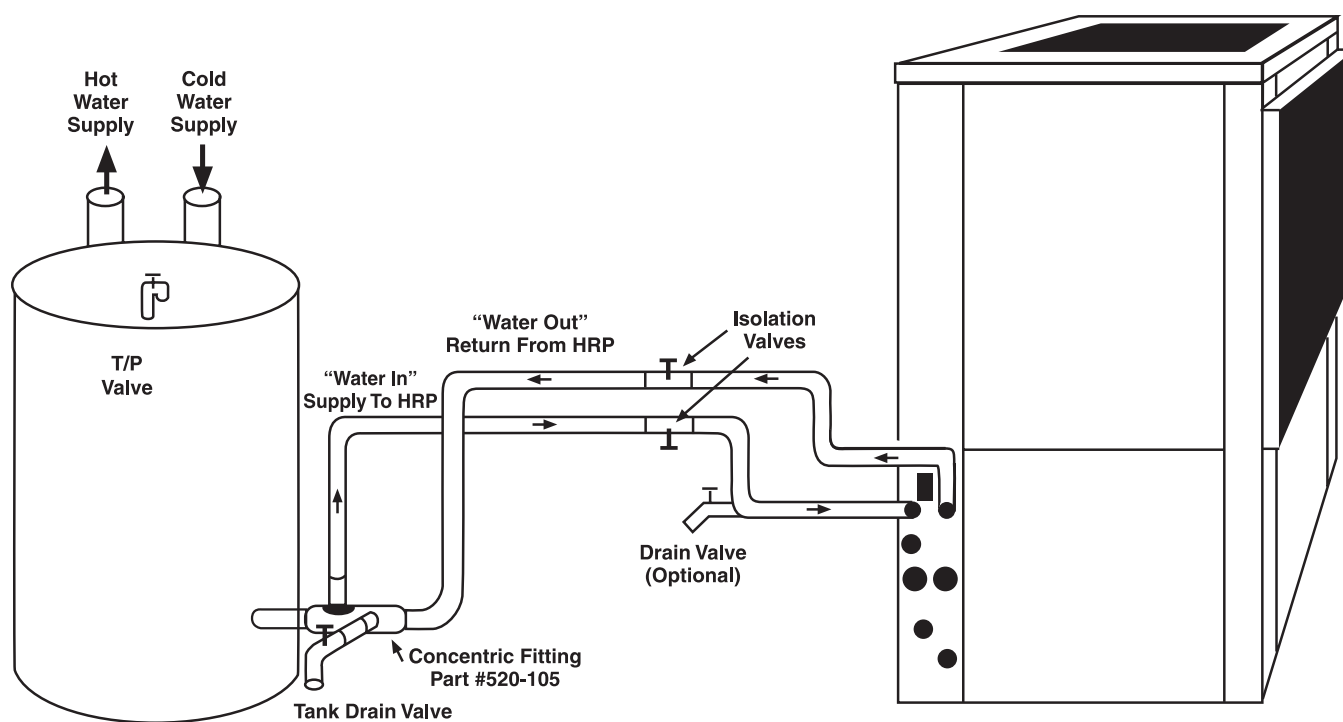


Figure 8

HR WATER PIPING

All hot water piping should be a minimum of 3/8" 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 #8)

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 by depressing the schrader valve on the HR Unit. Allow all air to bleed out until water appears at the valve.

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

INITIAL START-UP:

1. Make sure all valves in heat recovery water piping system are open. NEVER OPERATE HR PUMP DRY.
2. Turn on the heat pump. The HR pump should not run if the compressor is not running.

3. Turn HR switch to the "ON" position. The pump will operate if entering water temperature to HR is below 120° F.
4. The temperature difference between the water entering and leaving the heat recovery should be 5° to 15° F.
5. 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.

MAINTENANCE

1. Filter changes or cleanings 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 may be 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. See unit specifications for replacement filter sizes. Note that horizontal units containing two filters are taped together at the factory to facilitate removal. This should be done by end user as new filters are installed.



Operating the unit with improper line voltage or with excessive phase imbalance is hazardous to the unit and constitutes abuse and is not covered under warranty.

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.
3. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.
4. 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.

IN-WARRANTY MATERIAL RETURN

When contacting your Representative for service or replacement parts, refer to the model and serial number of the unit as stamped on the data plate attached to the unit.

Material may be returned to the factory only with permission of an authorized factory representative. A "Warranty Return Material" tag must be attached to the returned material. Assure that all of the information as called for on the tag is filled out completely and accurately to expedite handling and insure prompt issuance of credits.

Freight charges for all items returned to the factory shall be prepaid. The return of the part does not constitute an order for a replacement. Therefore, a purchase order must be entered through your nearest representative. The order shall include the part number, model number, and serial number of the unit involved. If the part is within the warranty period, and after our inspection of the returned part proves that the failure is due to faulty material or workmanship a credit or replacement part will be issued.



Parts returned without a completed "Warranty Return Material" tag will not be credited.



UNIT SPECIFICATIONS

Table 2: Dimensions

| Model | Vertical Unit (In) | | | Horizontal Unit (In) | | | Supply Air Connection (In) | | Return Air Connection* (In) | | Replacement Filter Nominal Size* (In) |
|-----------------|--------------------|-------|--------|----------------------|-------|--------|----------------------------|---------------------|-----------------------------|--------------------|--|
| | Width | Depth | Height | Width | Depth | Height | Width | Height | Width | Height | |
| BP007 | 21.50 | 21.50 | 32.75 | 21.50 | 43.00 | 17.00 | 11.75 | 7.75 | H: 18.0 V: 17.5 | 14.0 | H: 15"x20"x1" (1) V: 15"x20"x1" (1) |
| BP009 | 21.50 | 21.50 | 32.75 | 21.50 | 43.00 | 17.00 | 11.75 | 7.75 | H: 18.0 V: 17.5 | 14.0 | H: 15"x20"x1" (1) V: 15"x20"x1" (1) |
| BP012 | 21.50 | 21.50 | 32.75 | 22.00 | 45.00 | 19.50 | 7.75 | H: 7.75 V: 11.75 | H: 18.0 V: 17.5 | 14.0 | H: 18"x20"x1" (1) V: 20"x20"x1" (1) |
| BP015 | 21.50 | 21.50 | 39.50 | 22.00 | 45.00 | 19.50 | 13.75 | 13.75 | 18.0 | H: 16.0 V: 18.0 | H: 18"x20"x1" (1) V: 20"x20"x1" (1) |
| BP018 | 21.50 | 21.50 | 39.50 | 22.00 | 45.00 | 19.50 | 13.75 | 13.75 | 18.0 | H: 16.0 V: 18.0 | H: 18"x20"x1" (1) V: 20"x20"x1" (1) |
| CP/BP024 | 21.50 | 26.25 | 47.50 | 26.00 | 54.50 | 22.00 | 13.75 | 15.75 | H: 30.0 V: 22.0 | H: 18.5 V: 22.0 | H: 16"x20"x1" (2) V: 24"x24"x1" (1) |
| CP/BP030 | 24.25 | 33.50 | 47.50 | 30.00 | 68.00 | 22.00 | 15.75 | 15.75 | H: 34.0 V: 28.0 | H: 18.5 V: 22.0 | H: 18"x20"x1" (2) V: 24"x30"x1" (1) |
| CP/BP036 | 24.25 | 33.50 | 47.50 | 30.00 | 68.00 | 22.00 | 15.75 | 15.75 | H: 34.0 V: 28.0 | H: 18.5 V: 22.0 | H: 18"x20"x1" (2) V: 24"x30"x1" (1) |
| CP/BP042 | 26.00 | 33.50 | 58.50 | 30.00 | 79.00 | 22.00 | 17.75 | 17.75 | H: 46.5 V: 28.0 | H: 18.5 V: 30.0 | H: 24"x20"x1" (2) V: 16"x30"x1" (2) |
| CP/BP048 | 26.00 | 33.50 | 58.50 | 30.00 | 79.00 | 22.00 | 17.75 | 17.75 | H: 46.5 V: 28.0 | H: 18.5 V: 30.0 | H: 24"x20"x1" (2) V: 16"x30"x1" (2) |
| CP/BP060 | 26.00 | 33.50 | 66.50 | 30.00 | 89.00 | 22.00 | 17.75 | 17.75 | H: 54.0 V: 28.0 | H: 18.5 V: 38.0 | H: 28"x20"x1" (2) V: 20"x30"x1" (2) |
| CP/BP070 | 26.00 | 33.50 | 66.50 | 30.00 | 89.00 | 22.00 | 17.75 | 17.75 | H: 54.0 V: 28.0 | H: 18.5 V: 38.0 | H: 28"x20"x1" (2) V: 20"x30"x1" (2) |

Table 3: Fluid Pressure Drops

| Model | Flow Rate (GPM) | Pressure Drop (FOH) | Pressure Drop (PSI) | Model | Flow Rate (GPM) | Pressure Drop (FOH) | Pressure Drop (PSI) |
|-------|-----------------|---------------------|---------------------|-------|-----------------|---------------------|---------------------|
| 007 | 1 | 1.4 | 0.61 | 030 | 4 | 1.2 | 0.51 |
| | 1.5 | 2.9 | 1.26 | | 5.5 | 2.1 | 0.91 |
| | 2 | 4.9 | 2.11 | | 7 | 3.2 | 1.41 |
| | 3 | 10.1 | 4.38 | | 10 | 6.1 | 2.67 |
| | 4 | 16.9 | 7.34 | | 13 | 9.9 | 4.28 |
| 009 | 1.5 | 2.3 | 1.00 | 036 | 5 | 2.3 | 1.01 |
| | 2 | 3.9 | 1.68 | | 7.5 | 4.8 | 2.09 |
| | 2.5 | 5.8 | 2.51 | | 10 | 8.1 | 3.51 |
| | 3.25 | 9.3 | 4.03 | | 12.5 | 12.1 | 5.25 |
| | 4 | 13.5 | 5.85 | | 15 | 16.8 | 7.29 |
| 012 | 2 | 1.7 | 0.72 | 042 | 7 | 2.8 | 1.22 |
| | 3 | 3.4 | 1.50 | | 8.75 | 4.2 | 1.82 |
| | 4 | 5.8 | 2.51 | | 10.5 | 5.8 | 2.53 |
| | 5.5 | 10.2 | 4.45 | | 13.25 | 8.9 | 3.85 |
| | 7 | 15.8 | 6.88 | | 16 | 12.4 | 5.41 |
| 015 | 2 | 1.6 | 0.69 | 048 | 8 | 3.6 | 1.55 |
| | 3 | 3.3 | 1.44 | | 10.67 | 6.0 | 2.61 |
| | 4 | 5.5 | 2.41 | | 12 | 7.4 | 3.22 |
| | 5.5 | 9.8 | 4.28 | | 14 | 9.8 | 4.25 |
| | 7 | 15.2 | 6.60 | | 16 | 12.4 | 5.41 |
| 018 | 3 | 4.1 | 1.80 | 060 | 9 | 3.7 | 1.60 |
| | 4 | 7.0 | 3.02 | | 12 | 6.2 | 2.69 |
| | 5 | 10.4 | 4.52 | | 15 | 9.2 | 4.02 |
| | 6.5 | 16.7 | 7.25 | | 17.5 | 12.2 | 5.30 |
| | 8 | 24.2 | 10.53 | | 20 | 15.5 | 6.74 |
| 024 | 3 | 2.0 | 0.87 | 070 | 10 | 2.8 | 1.24 |
| | 4.5 | 4.1 | 1.80 | | 13.5 | 4.9 | 2.12 |
| | 6 | 6.9 | 3.01 | | 17 | 7.4 | 3.22 |
| | 8 | 11.6 | 5.06 | | 20.5 | 10.4 | 4.50 |
| | 10 | 17.4 | 7.56 | | 24 | 13.8 | 5.98 |

Note

1- Temperature at which pressure drop applies (PD varies as the fluid temperature)

2-Data is for Water



Table 4: Physical Data

| Model | Front Clearance (in) | Water Coil Volume (gals) | Installation Weight (Vertical / Horizontal) (lbs) | Shipping Weight (Vertical / Horizontal) (lbs) |
|----------|-------------------------|-----------------------------|---|---|
| BP007 | 36 | 0.46 | 140 / 165 | 160 / 185 |
| BP009 | 36 | 0.46 | 154 / 172 | 174 / 192 |
| BP012 | 36 | 0.66 | 166 / 173 | 186 / 205 |
| BP015 | 36 | 0.66 | 191 / 190 | 208 / 218 |
| BP018 | 36 | 0.66 | 195 / 198 | 212 / 222 |
| CP/BP024 | 36 | 0.81 | 229 / 307 | 242 / 340 |
| CP/BP030 | 36 | 1.14 | 269 / 358 | 292 / 404 |
| CP/BP036 | 36 | 1.14 | 281 / 369 | 304 / 415 |
| CP/BP042 | 36 | 1.11 | 334 / 400 | 360 / 465 |
| CP/BP048 | 36 | 1.11 | 340 / 405 | 366 / 470 |
| CP/BP060 | 36 | 1.13 | 396 / 452 | 422 / 520 |
| CP/BP070 | 36 | 2.27 | 444 / 494 | 470 / 562 |



Table 5: Air Temperature Rise/Fall

| Entering Fluid Temp °F | COOLING | | HEATING | |
|------------------------|----------------------|------------------|----------------------|------------------|
| | Entering Air Temp °F | Air Temp Drop °F | Entering Air Temp °F | Air Temp Rise °F |
| 30 | | | 60 | 16-8 - 25.1 |
| | | | 70 | 15.9 - 23.7 |
| | | | 80 | 14.8 - 22.1 |
| 40 | 75/63 | 21.9 - 27.2 | 60 | 20.0 - 28.5 |
| | 80/67 | 22.9 - 28.5 | 70 | 19.0 - 27.0 |
| | 85/71 | 23.8 - 29.5 | 80 | 17.7 - 25.2 |
| 50 | 75/63 | 20.5 - 25.8 | 60 | 23.3 - 32.8 |
| | 80/67 | 21.5 - 27 | 70 | 22.0 - 31.0 |
| | 85/71 | 22.3 - 28.1 | 80 | 20.5 - 29.0 |
| 60 | 75/63 | 19.2 - 24.7 | 60 | 26.5 - 37.1 |
| | 80/67 | 20.1 - 25.8 | 70 | 25.1 - 35.1 |
| | 85/71 | 20.9 - 26.8 | 80 | 23.4 - 32.7 |
| 70 | 75/63 | 17.9 - 23.8 | 60 | 29.8 - 41.4 |
| | 80/67 | 18.7 - 24.9 | 70 | 28.2 - 39.1 |
| | 85/71 | 19.5 - 25.8 | 80 | 26.3 - 36.4 |
| 80 | 75/63 | 16.6 - 23.0 | 60 | 32.7 - 45.7 |
| | 80/67 | 17.4 - 24.0 | 70 | 30.9 - 43.1 |
| | 85/71 | 18.1 - 25.0 | 80 | 28.8 - 40.2 |
| 85 | 75/63 | 16.0 - 22.6 | | |
| | 80/67 | 16.8 - 23.6 | | |
| | 85/71 | 17.4 - 24.5 | | |
| 90 | 75/63 | 15.4 - 22.2 | | |
| | 80/67 | 16.1 - 23.2 | | |
| | 85/71 | 16.8 - 24.1 | | |
| 100 | 75/63 | 14.2 - 21.4 | | |
| | 80/67 | 14.9 - 22.4 | | |
| | 85/71 | 15.4 - 23.3 | | |
| 110 | 75/63 | 13.0 - 21.1 | | |
| | 80/67 | 13.7 - 22.1 | | |
| | 85/71 | 14.2 - 23.0 | | |



Table 6: Refrigerant Pressure Ranges

| Entering Fluid Temp °F | Fluid Δ T | COOLING | | | | | | HEATING | | | |
|------------------------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|
| | | Entering Air Temp (Dry Bulb) | | | | | | Entering Air Temp (Dry Bulb) | | | |
| | | 70 °F | | 75 °F | | 80 °F | | 60 °F | | 70 °F | |
| | | Suction | Discharge | Suction | Discharge | Suction | Discharge | Suction | Discharge | Suction | Discharge |
| 30 | 5 | | | | | | | 68 - 79 | 233 - 266 | 71 - 84 | 246 - 281 |
| | 10 | | | | | | | 65 - 76 | 222 - 255 | 68 - 80 | 235 - 269 |
| | 15 | | | | | | | 59 - 71 | 216 - 248 | 62 - 75 | 228 - 261 |
| 40 | 5 | 113 - 147 | 138 - 156 | 117 - 152 | 142 - 161 | 119 - 155 | 145 - 164 | 80 - 95 | 244 - 282 | 85 - 100 | 257 - 297 |
| | 10 | 113 - 147 | 145 - 164 | 117 - 152 | 150 - 170 | 119 - 155 | 153 - 173 | 77 - 91 | 237 - 274 | 82 - 96 | 250 - 289 |
| | 15 | 113 - 147 | 151 - 170 | 117 - 152 | 156 - 175 | 119 - 155 | 159 - 179 | 72 - 86 | 226 - 262 | 76 - 90 | 238 - 276 |
| 50 | 5 | 115 - 149 | 164 - 185 | 119 - 154 | 170 - 191 | 121 - 157 | 173 - 195 | 95 - 113 | 255 - 302 | 100 - 119 | 269 - 319 |
| | 10 | 115 - 149 | 173 - 194 | 119 - 154 | 178 - 200 | 121 - 157 | 182 - 204 | 91 - 109 | 248 - 290 | 96 - 115 | 261 - 306 |
| | 15 | 115 - 149 | 179 - 200 | 119 - 154 | 184 - 207 | 121 - 157 | 188 - 211 | 86 - 103 | 237 - 282 | 90 - 108 | 250 - 297 |
| 60 | 5 | 117 - 151 | 194 - 218 | 121 - 156 | 200 - 224 | 123 - 159 | 204 - 229 | 111 - 133 | 270 - 324 | 117 - 141 | 285 - 342 |
| | 10 | 117 - 151 | 204 - 228 | 121 - 156 | 211 - 235 | 123 - 159 | 215 - 240 | 106 - 129 | 258 - 311 | 112 - 136 | 273 - 329 |
| | 15 | 117 - 151 | 211 - 235 | 121 - 156 | 218 - 242 | 123 - 159 | 222 - 247 | 101 - 122 | 251 - 302 | 106 - 128 | 265 - 319 |
| 70 | 5 | 119 - 153 | 228 - 254 | 122 - 158 | 235 - 262 | 125 - 161 | 240 - 267 | 129 - 158 | 282 - 343 | 136 - 167 | 297 - 362 |
| | 10 | 119 - 153 | 238 - 265 | 122 - 158 | 246 - 273 | 125 - 161 | 251 - 279 | 124 - 150 | 274 - 333 | 131 - 159 | 289 - 351 |
| | 15 | 119 - 153 | 246 - 273 | 122 - 158 | 254 - 281 | 125 - 161 | 259 - 287 | 117 - 146 | 262 - 320 | 123 - 154 | 276 - 337 |
| 80 | 5 | 121 - 155 | 265 - 294 | 124 - 160 | 273 - 303 | 127 - 163 | 279 - 309 | 148 - 184 | 299 - 366 | 156 - 194 | 315 - 387 |
| | 10 | 121 - 155 | 276 - 306 | 124 - 160 | 285 - 316 | 127 - 163 | 291 - 322 | 143 - 176 | 286 - 352 | 151 - 185 | 302 - 371 |
| | 15 | 121 - 155 | 285 - 315 | 124 - 160 | 294 - 325 | 127 - 163 | 300 - 332 | 136 - 169 | 278 - 343 | 143 - 179 | 294 - 362 |
| 90 | 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 | | | | |
| | 15 | 123 - 157 | 329 - 362 | 126 - 162 | 339 - 373 | 129 - 165 | 346 - 381 | | | | |
| 100 | 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 | | | | |
| | 15 | 124 - 159 | 376 - 413 | 128 - 164 | 388 - 426 | 131 - 167 | 396 - 435 | | | | |
| 110 | 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 | | | | |
| | 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.

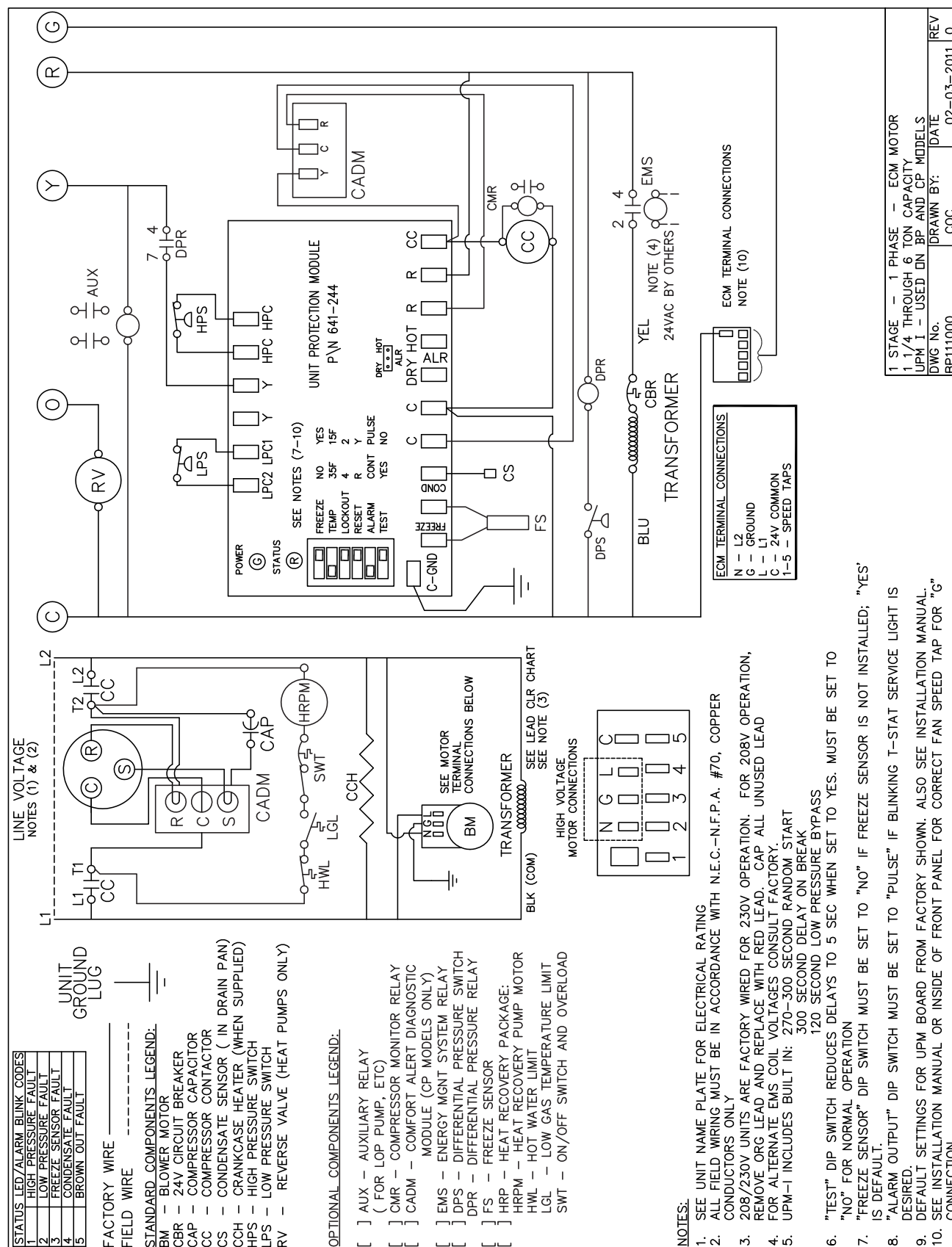
As a result of continuing research and development, specifications are subject to change without notice.



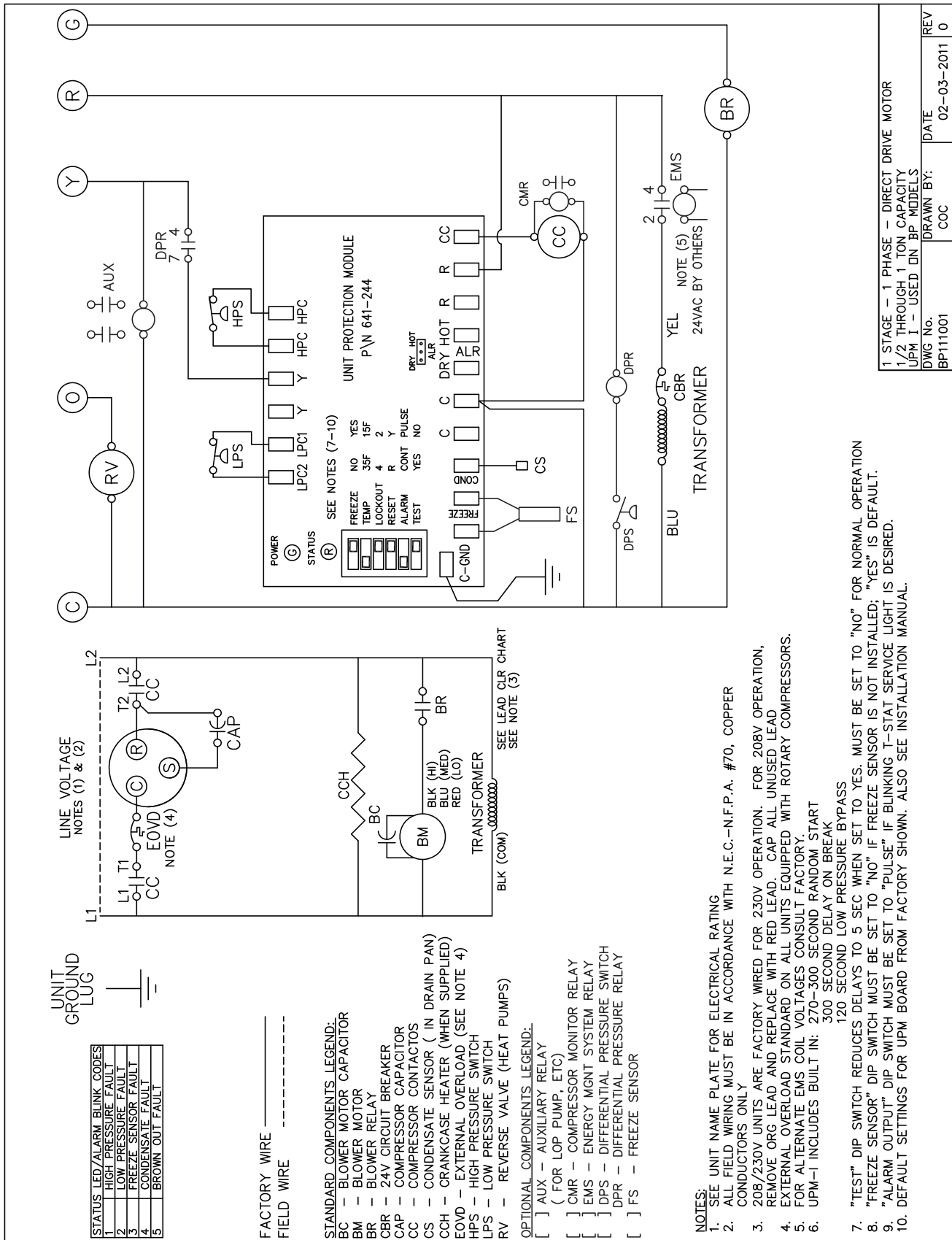
Table 7: Blower Performance

| Model | Motor Speed | Available External Static Pressure (ins., Gauge. Wet coil and filter included) | | | | | | | | | | | |
|----------|-------------|--|------|------|------|------|------|------|------|------|------|------|------|
| | | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 | 1.10 | 1.20 |
| BP007 | High | 430 | 420 | 390 | 360 | 335 | 310 | 260 | - | - | - | - | - |
| | Medium | 420 | 390 | 365 | 335 | 310 | 270 | - | - | - | - | - | - |
| | Low | 370 | 360 | 340 | 315 | 285 | 245 | - | - | - | - | - | - |
| BP009 | High | 430 | 420 | 390 | 360 | 335 | 310 | 260 | - | - | - | - | - |
| | Medium | 420 | 390 | 365 | 335 | 310 | 270 | - | - | - | - | - | - |
| | Low | 370 | 360 | 340 | 315 | 285 | 245 | - | - | - | - | - | - |
| BP012 | High | 450 | 435 | 415 | 400 | 385 | 360 | 330 | 305 | - | - | - | - |
| | Medium | 425 | 405 | 385 | 375 | 360 | 335 | 310 | - | - | - | - | - |
| | Low | 390 | 380 | 365 | 350 | 335 | 315 | 290 | - | - | - | - | - |
| BP015 | High | 590 | 555 | 500 | 475 | 450 | 435 | 415 | 390 | - | - | - | - |
| | Medium | 530 | 490 | 455 | 425 | 400 | 365 | 335 | - | - | - | - | - |
| | Low | 440 | 395 | 360 | 325 | 290 | 250 | - | - | - | - | - | - |
| BP018 | High | 700 | 665 | 635 | 605 | 560 | 525 | 510 | 475 | 440 | - | - | - |
| | Medium | 615 | 590 | 550 | 510 | 480 | 440 | 400 | - | - | - | - | - |
| | Low | 520 | 490 | 440 | 400 | 380 | 360 | - | - | - | - | - | - |
| CP/BP024 | High | 950 | 920 | 900 | 885 | 855 | 830 | 800 | 780 | 720 | 690 | 630 | - |
| | Medium | 830 | 810 | 780 | 750 | 735 | 690 | 630 | 610 | 590 | - | - | - |
| | Low | 700 | 675 | 650 | 615 | 550 | 520 | - | - | - | - | - | - |
| CP/BP030 | High | 1200 | 1190 | 1180 | 1155 | 1130 | 1110 | 1080 | 1060 | 1035 | 995 | 925 | 900 |
| | Medium | 1070 | 1040 | 1015 | 1005 | 980 | 960 | 935 | 920 | 910 | 885 | 850 | 815 |
| | Low | 930 | 905 | 880 | 855 | 840 | 815 | 790 | 755 | 745 | 675 | - | - |
| CP/BP036 | High | 1440 | 1410 | 1385 | 1360 | 1290 | 1225 | 1165 | 1095 | 1030 | 940 | 860 | - |
| | Medium | 1310 | 1275 | 1270 | 1250 | 1220 | 1190 | 1150 | 1075 | 1000 | 930 | 840 | - |
| | Low | 1155 | 1120 | 1080 | 1050 | 1035 | 1020 | 1000 | 975 | 950 | 920 | - | - |
| CP/BP042 | High | 1710 | 1680 | 1650 | 1630 | 1600 | 1530 | 1440 | 1350 | 1300 | 1250 | - | - |
| | Medium | 1500 | 1470 | 1440 | 1400 | 1360 | 1345 | 1330 | 1275 | - | - | - | - |
| | Low | 1275 | 1240 | 1195 | 1185 | 1125 | 1085 | - | - | - | - | - | - |
| CP/BP048 | High | 2000 | 1885 | 1870 | 1845 | 1815 | 1770 | 1745 | 1720 | 1710 | 1700 | 1680 | - |
| | Medium | 1750 | 1700 | 1660 | 1625 | 1615 | 1590 | 1565 | 1540 | 1500 | - | - | - |
| | Low | 1500 | 1470 | 1440 | 1400 | 1360 | 1345 | 1330 | - | - | - | - | - |
| CP/BP060 | High | 2370 | 2325 | 2300 | 2275 | 2255 | 2200 | 2190 | 2150 | 2100 | 2060 | 2050 | 2030 |
| | Medium | 2090 | 2080 | 2030 | 1995 | 1950 | 1925 | 1900 | 1865 | 1820 | 1770 | 1730 | 1680 |
| | Low | 1745 | 1700 | 1650 | 1620 | 1590 | 1560 | 1530 | 1490 | 1450 | 1390 | - | - |
| CP/BP070 | High | 2400 | 2350 | 2325 | 2300 | 2260 | 2205 | 2200 | 2195 | 2167 | 2105 | 2085 | 2060 |
| | Medium | 2125 | 2100 | 2050 | 1990 | 1975 | 1950 | 1890 | 1850 | 1815 | 1810 | 1780 | 1730 |
| | Low | 1800 | 1750 | 1700 | 1675 | 1620 | 1580 | 1565 | 1510 | 1470 | 1410 | - | - |





1 Stage - 1 Phase - Direct Drive Motor



BOSCH

6 720 220 045

Subject to change without prior notice

Revised 05-11

BOSCH

STATUS LED/ALARM BLINK CODES

| | |
|---|---------------------|
| 1 | HIGH PRESSURE FAULT |
| 2 | LOW PRESSURE FAULT |
| 3 | FREEZE SENSOR FAULT |
| 4 | CONDENSATE FAULT |
| 5 | BROWN OUT FAULT |

FACTORY WIRE

FIELD WIRE

STANDARD COMPONENTS LEGEND:

- BM - BLOWER MOTOR
- CBR - 24V CIRCUIT BREAKER
- CAP - COMPRESSOR CAPACITOR
- CC - COMPRESSOR CONTACTOR
- CR - COOLING HEATING RELAY
- CS - CONDENSATE SENSOR (IN DRAIN PAN)
- CCH - CRANKCASE HEATER (WHEN SUPPLIED)
- HPS - HIGH PRESSURE SWITCH
- LPS - LOW PRESSURE SWITCH
- RH - REHEAT RELAY
- RV - REVERSE VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:

- [] AUX - AUXILIARY RELAY (FOR LOP PUMP, ETC)
- [] CMR - COMPRESSOR MONITOR RELAY
- [] CADM - COMFORT ALERT DIAGNOSTIC MODULE (CP MODELS ONLY)
- [] EMS - ENERGY MGMT SYSTEM RELAY
- [] DPS - DIFFERENTIAL PRESSURE SWITCH
- [] DPR - DIFFERENTIAL PRESSURE RELAY
- [] FS - FREEZE SENSOR
- [] HRP - HEAT RECOVERY PACKAGE: HRP - HEAT RECOVERY PUMP MOTOR HWL - HOT WATER LIMIT LGL - LOW GAS TEMPERATURE LIMIT SWT - ON/OFF SWITCH AND OVERLOAD

LINE VOLTAGE NOTES (1) & (2)

UNIT LUG

FACTORY WIRE

STANDARD COMPONENTS LEGEND:

- BM - BLOWER MOTOR
- CBR - 24V CIRCUIT BREAKER
- CAP - COMPRESSOR CAPACITOR
- CC - COMPRESSOR CONTACTOR
- CR - COOLING HEATING RELAY
- CS - CONDENSATE SENSOR (IN DRAIN PAN)
- CCH - CRANKCASE HEATER (WHEN SUPPLIED)
- HPS - HIGH PRESSURE SWITCH
- LPS - LOW PRESSURE SWITCH
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WIRING DIAGRAM:

Diagram showing electrical connections for a 208/230V unit. It includes a line voltage section with L1, L2, and L3 lines, a unit lug section with T1, T2, and T3 terminals, and a factory wire section with various components like BM, CBR, CAP, CC, CR, CS, CCH, HPS, LPS, RH, and RV. The diagram also shows a transformer with terminals N, G, L, C, 1, 2, 3, 4, 5 and a motor terminal block with terminals N, G, L, C, 1, 2, 3, 4, 5. A legend for ECM terminal connections is provided: N - L2, G - GROUND, L - 24V COMMON, 1-5 - SPEED TAPS.

NOTES:

- SEE UNIT NAME PLATE FOR ELECTRICAL RATING
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY
- 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEAD
- FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
- UPM-I INCLUDES BUILT IN: 270-300 SECOND RANDOM START 300 SECOND DELAY ON BREAK 120 SECOND LOW PRESSURE BYPASS
- "TEST" DIP SWITCH REDUCES DELAYS TO 5 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION
- "FREEZE SENSOR" DIP SWITCH MUST BE SET TO "NO" IF FREEZE SENSOR IS NOT INSTALLED; "YES" IS DEFAULT.
- "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
- SEE INSTALLATION MANUAL OR INSIDE OF FRONT PANEL FOR CORRECT FAN SPEED TAP FOR "G" CONNECTION

| | | | | | | | |
|------------|-------|---------|------|-------|----------|-----------|-----|
| 1 | STAGE | - | 1 | PHASE | - | ECM MOTOR | |
| 1 | 1/4 | THROUGH | 6 | TON | CAPACITY | - | HOT |
| UPM | I | - | USED | ON | BP | AND | CP |
| DWG | No. | | | | | | |
| DATE | | | | | | | |
| DRAWN BY: | | | | | | | |
| COC | | | | | | | |
| BP111003 | | | | | | | |
| 02-03-2011 | | | | | | | |
| REV | | | | | | | |

UNIT CHECK-OUT SHEET**Customer Data**

Customer Name _____

Date _____

Address _____

Phone _____

Unit Number _____

Unit Nameplate Data

Unit Make _____

Model Number _____

Serial Number _____

Refrigerant Charge (oz) _____

Compressor: RLA _____ LRA _____

Blower Motor: FLA (or NPA) _____ HP _____

Maximum Fuse Size (Amps) _____

Minimum Circuit Ampacity (Amps) _____

Operating Conditions

| | Cooling Mode | Heating Mode |
|-------------------------------------|---------------|---------------|
| Entering / Leaving Air Temp | _____ / _____ | _____ / _____ |
| Entering Air Measured at: | _____ | _____ |
| Leaving Air Measured at: | _____ | _____ |
| Entering / Leaving Fluid Temp | _____ / _____ | _____ / _____ |
| Fluid Flow (gpm) | _____ | _____ |
| Fluid Side Pressure Drop | _____ | _____ |
| Suction / Discharge Pressure (psig) | _____ / _____ | _____ / _____ |
| Suction / Discharge Temp | _____ / _____ | _____ / _____ |
| Suction Superheat | _____ | _____ |
| Entering TXV / Cap Tube Temp | _____ | _____ |
| Liquid Subcooling | _____ | _____ |
| Compressor Volts / Amps | _____ / _____ | _____ / _____ |
| Blower Motor Volts / Amps | _____ / _____ | _____ / _____ |



TROUBLESHOOTING

| Problem | Possible Cause | Checks and Corrections |
|---|-----------------------------|---|
| Entire unit does not run | Power Supply Off | Apply power, close disconnect |
| | 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 (reversing valve deenergized). 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 that 24 volts is available at the 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". Replace the thermostat if defective. |
| Blower operates but compressor does not | Thermostat | Check setting, calibration, and wiring |
| | Wiring | Check for loose or broken wires at compressor, capacitor, or contactor |
| | 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. |
| | Compressor windings Open | After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor |
| 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 cycles | Unit oversized | Recalculate heating and or cooling loads. |
| | 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 heating | Unit undersized | Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem |
| | 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. |
| | TXV | Check TXV for possible restriction or defect. Replace if necessary. |
| | Moisture, noncondensables | The refrigerant system may be contaminated with moisture or noncondensables. Reclaim refrigerant, replace filter dryer, evacuate the refrigerant system, and recharge with factory recommended charge. |
| UPM board trouble shooting | Compressor will not run, no fault blink code | <pre> graph TD A[Is Green Power LED light on and no Red Blink Code?] -- Yes --> B[Is there power to the "Y" Call (C-Y)?] A -- No --> C["- Check all power supplies - Check all safety switches"] B -- Yes --> D[Is there 24 V power from C to CC?] B -- No --> E[Check thermostat settings and configurations for heat pumps, and wiring] D -- Yes --> F[UPM Board is Good] D -- No --> G[Check for Red Blink Code. If Red Blink Code is not present, replace UPM Board] E --> G </pre> |







BOSCH

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