



Greensource CDI Series SM Model Water-to-Air Heat Pumps

Greensource

SM024 | SM036 | SM048 | SM060 | SM070



BOSCH

Installation, Operation, and Maintenance Manual

8733819578 (2019/02)

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DOCUMENT CONVENTIONS

Key to Symbols

Warnings



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

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

- **DANGER** indicates a situation that, if not avoided, will result in death or serious injury.
- **WARNING** indicates a situation that, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a situation that, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important Information



This symbol indicates important information where there is no risk to property or people.

SAFETY WARNINGS



IMPORTANT: Read the entire instruction manual before starting installation.



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.

NOTICE: 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.

NOTICE: 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.

NOTICE: 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 or failure.



WARNING: This product can expose you to chemicals including Lead and Lead components, which are known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information go to www.P65Warnings.ca.gov.

GENERAL DESCRIPTION

The Greensource CDi Series SM Model Water-to-Air Heat Pumps provide the best combination of performance and efficiency available. The heat pump comes equipped with Bosch's commitment to Creative Design and Innovation (CDi).

All units are performance certified to American Heating and Refrigeration Institute (AHRI) ISO Standard 13256-1. All SM units conform to UL1995 standard and are certified to CAN/CSA C22.2 No 236 by Intertek-ETL. The SM units are designed to operate with entering fluid temperature between 20°F to 80°F in the heating mode and between 40°F to 110°F in the cooling mode for continuous operations.



A heat pump operating under extreme conditions will have limitations on air/fluid flow rates and/or temperatures.

NOTICE: 50° F Minimum Entering Water Temperature (EWT) is recommended for well water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed-loop applications and EWT below 50°F.

Geothermal applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. Frozen water coils are not covered under warranty. Other equivalent methods of temperature control are acceptable.

SM Series Water-to-Air Heat Pumps are available in Vertical (VT) and Horizontal (HZ) configurations. HZ units can be field configured from end blow to straight through using a field-installed accessory kit. See page #8 for more information.

A limited number of field-installed options are available:

- Thermostats
- Internally-mounted Electric Heat Kits (5kW, 10kW, 15kW, and 20kW)
- Smart Start Assist
- HZ Discharge Air Conversion Kit
- Stainless Steel Hose Kits
- Flow Centers
- Swivel Fittings

See page #40 for details.

Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained. Each unit has an

externally-mounted Wireless Interface Module (WIM) that allows a technician to commission and troubleshoot the unit wirelessly via Wi-Fi.

The basic Horizontal (HZ) unit layout and connections are shown in Fig. 2. Refer to Dimensional Drawings for further detail, as well as Vertical (VT) unit details. See page #63 to page #65.

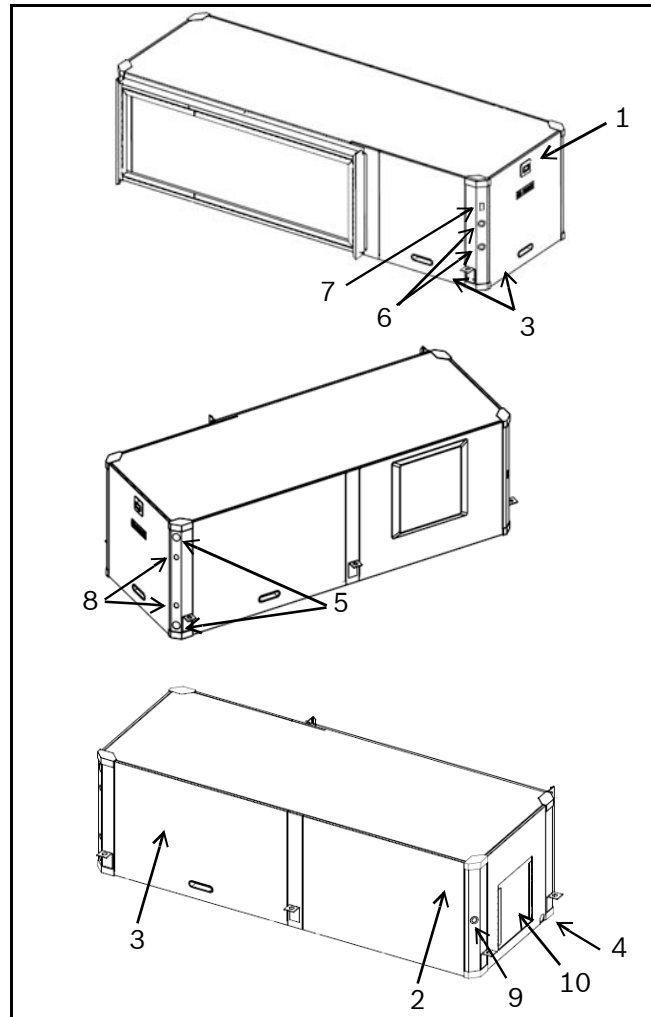


Fig. 2

- [1] Wireless Interface Module (WIM)
- [2] Blower access panel
- [3] Condensing section access panel
- [4] Condensate drain connection
- [5] Water connection, Swivel type (VT—field installed, HZ—factory installed). Refer to piping on page #18.
- [6] Heat Recovery water connection
- [7] Heat Recovery disconnect switch
- [8] Electrical connection knockout
- [9] Electrical connection knockout for field-installed Electric Heat
- [10] Blower outlet (based on discharged air configuration)

INSPECTING AND STORING THE EQUIPMENT

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 and 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.

NOTICE: Never lift or move units by filter racks, external piping, or attached options/ accessories.

WARNING: Follow instructions for stacking limit for transit as well as storage as per unit packaging label.



Fig. 4 Installation and Operation Manual (Note: Actual IOM may differ from the above photo.)



Fig. 5 Corner Caps Package (HZ units only)

Initial Inspection

Inspect the product carefully for any defects or discrepancies.

Should you identify any issue, contact the Bosch Wholesaler/Distributor from which you purchased the unit.



Fig. 6 Hanging Bracket kit (HZ units only)

Standard Package

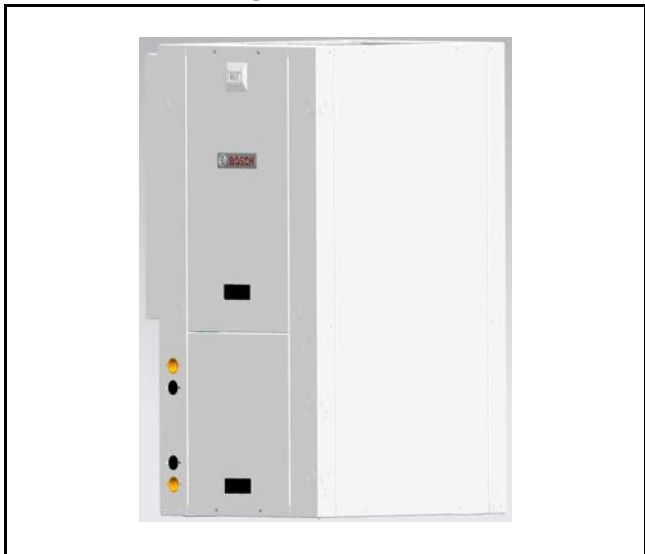


Fig. 3 SM Series Water-to-Air Heat Pump



Fig. 7 Field-Installed Swivel Fittings (VT units only)

UNIT INSTALLATION

This section contains information on the following:

- Location Selection—page #8
- Blower Configurations—page #8
- Return and Discharge Air Duct Flange Preparation—page #14
- Corner Cap Installation (for HZ only)—page #14
- Mounting Vertical (VT) Units—page #16
- Mounting horizontal (HZ) Units—page #16
- Hanging Bracket Kit—page #16
- Condensate Drain—page #18
- Duct System—page #18
- Piping—page #18
- Electrical—page #21
- Electronic Thermostat Installation—page #21
- Heat Recovery Package (HRP) Setup—page #22
- Specific Application Considerations—page #24
- Post-Installation System Checkout—page #27
- Unit Start-up—page #27

LOCATION SELECTION

Install 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 the return air to freely enter the face of the 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.

Service clearance for SM units up to 6 tons includes the following recommendations.

- 18" minimum, 24" optimum in front of the blower access panel for access to the blower and blower motor if needed.
- 24" minimum, 36" optimum in front of the front access panel for access to electrical components, compressor, and service valves if needed.

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

BLOWER CONFIGURATIONS

Horizontal (HZ) Blower Configuration

The HZ configuration water source heat pump is designed to have a field-configurable blower orientation: end blow to straight through. An accessory kit is required to make this conversion.

NOTICE: Discharge air configuration change is not possible on Heat Pumps equipped with field-installed Electric Heat (end blow).

| Part # | FLE to FLS End to Straight Through | FRE to FRS End to Straight Through |
|--------------|------------------------------------|------------------------------------|
| SM024 HZ | 8733951152 | 8733951155 |
| SM036/048 HZ | 8733951153 | 8733951156 |
| SM060/070 HZ | 8733951154 | 8733951157 |

Table 1 Conversion Kit Part Numbers Required

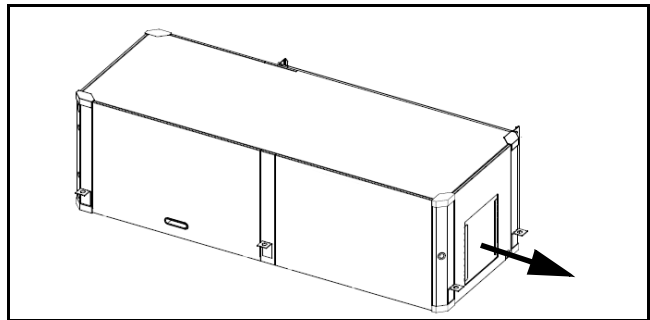


Fig. 8

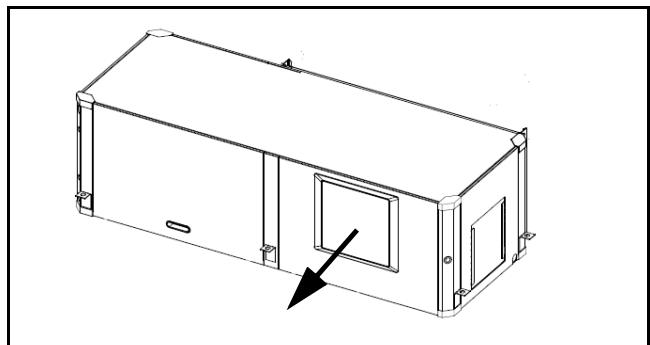


Fig. 9



Left-hand and right-hand Horizontal (HZ) units have different Blower Configuration instructions. Left-hand unit instructions refer to page #9 and right-hand unit instructions refer to page #11.



Blower configuration changes should be done prior to unit being installed in the final location.

Required Tools

- 5/16" hex head driver
- 3/8" hex head driver
- 7/16" hex head driver
- Flat screw driver
- Phillips screw driver
- 1/4" hex head driver
- Needle nose pliers
- 5/16"-1/4" ratchet wrench

Instructions—Left-Hand Unit (SM0**-1HZ-*L*-**)

1. Remove and discard the end [1] and side [2] panels. (See Fig. 10.)

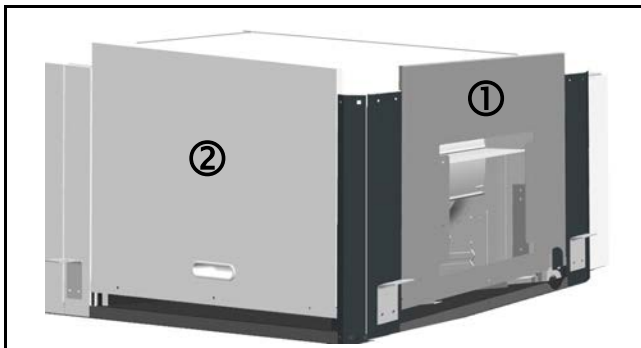


Fig. 10

2. Disconnect the blower motor wiring and ground wire fastened to blower housing. (See Fig. 11.)

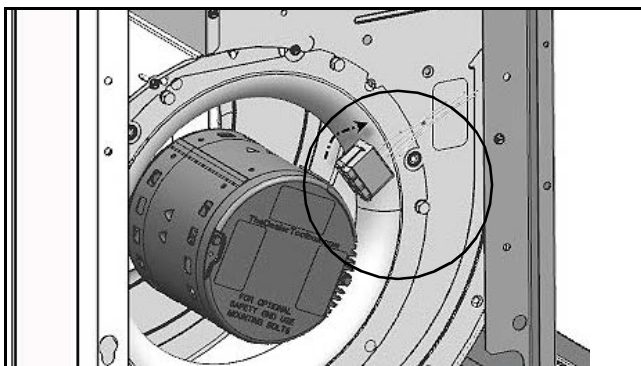


Fig. 11

3. Remove the bracket by removing the three screws securing it and retain the bracket. (See Fig. 12.)

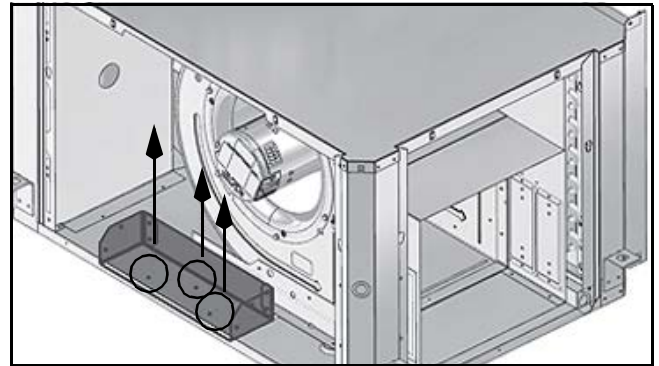


Fig. 12

4. Loosen the blower assembly by removing the four screws securing it. (See Fig. 13.)

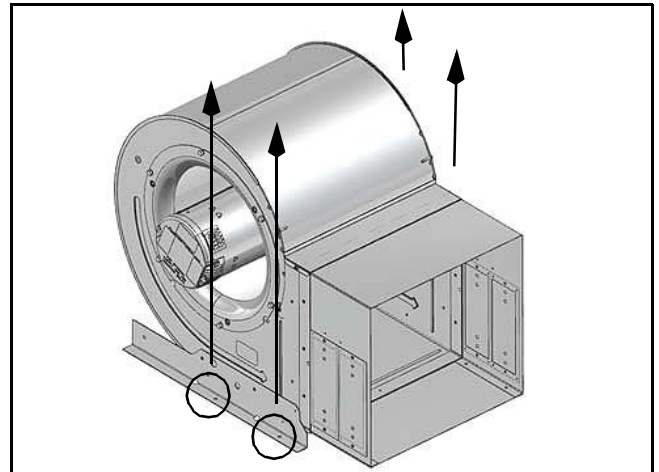


Fig. 13

5. Remove the bracket by removing the two screws securing it and retain the bracket. (See Fig. 14.)

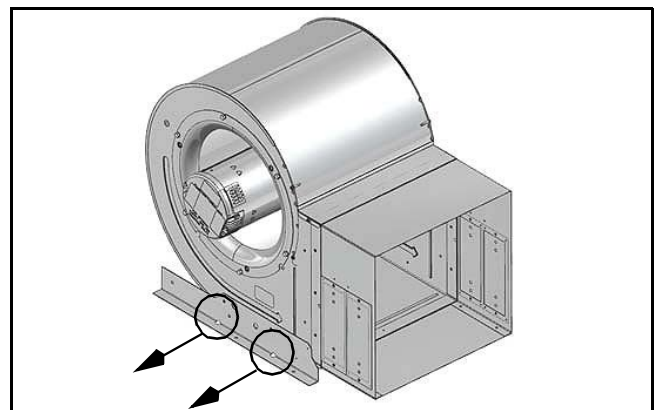


Fig. 14

6. Rotate the blower into its new position. (See Fig. 15.)

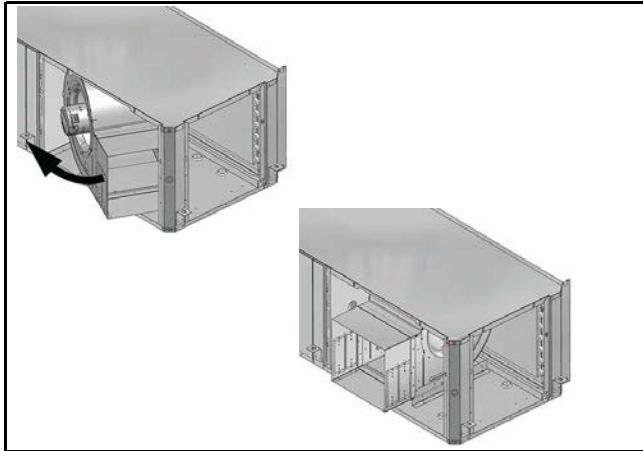


Fig. 15

7. Remove the remaining bracket by removing the two screws securing it and retain the bracket. (See Fig. 16.)

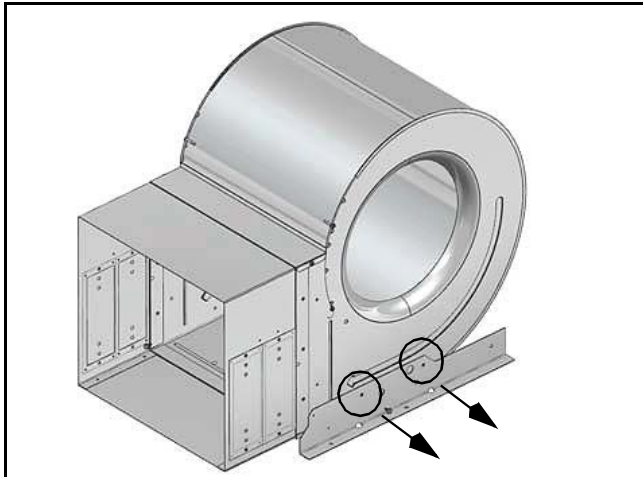


Fig. 16

8. Remove the blower assembly by sliding it forward. (See Fig. 17.)



The unit's top is notched to allow blower to slide through.

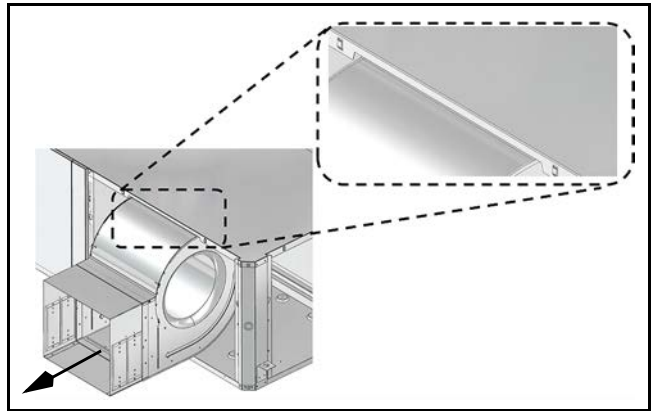


Fig. 17

9. Remove the blower collar by removing the eight screws securing it and discard. (See Fig. 18.)

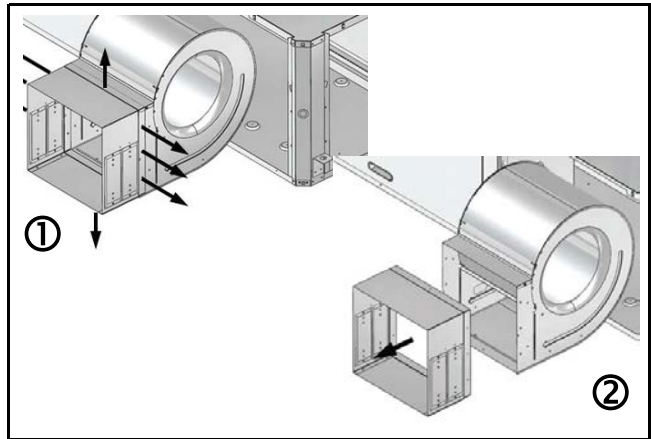


Fig. 18

10. Reorient the blower assembly 180 degree with the blower "belly" down [1] and slide it back into the cabinet [2]. (See Fig. 19.)

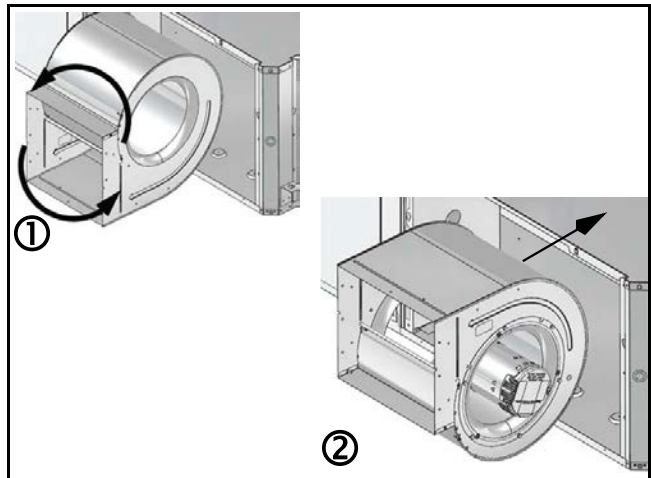


Fig. 19

11. Reinstall the bracket in its new vertical position using two screws. (See Fig. 20.)

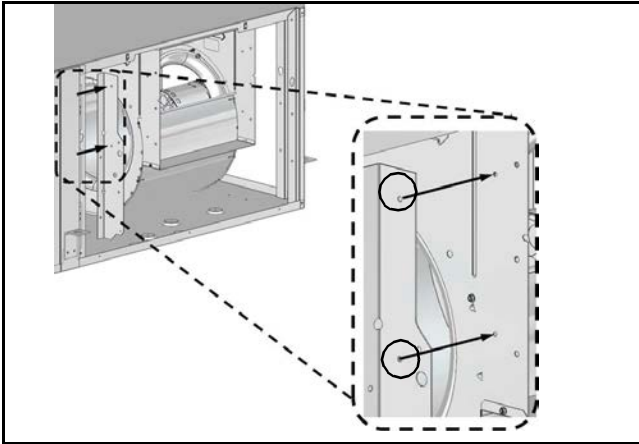


Fig. 20

12. Reinstall the bracket removed in step Fig. 3 to the same location using three screws. (See Fig. 21.)

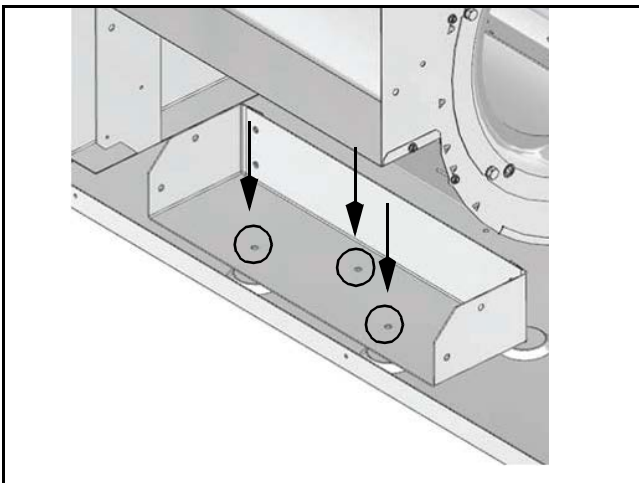


Fig. 21

13. Reinstall the remaining bracket using two screws. (See Fig. 22.)

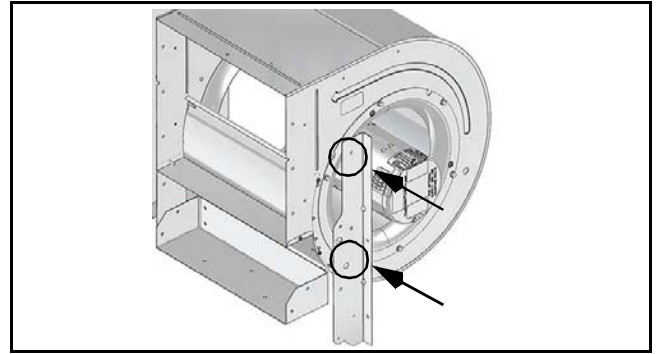


Fig. 22

14. Connect the vertical and horizontal brackets using four screws. (See Fig. 23.)

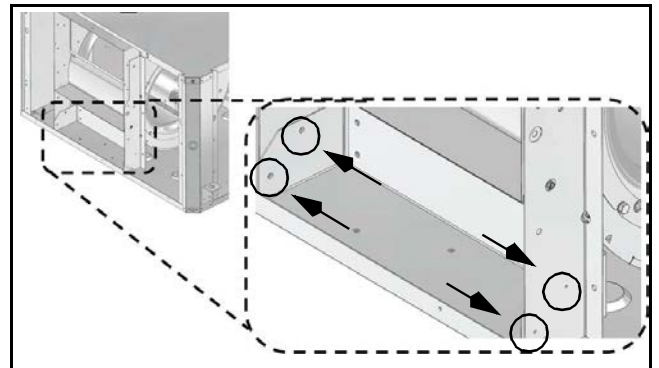


Fig. 23

15. Reconnect blower motor wiring and ground wire.
16. Install the new blower panel from the accessory kit.

Instructions—Right-Hand Unit (SM0-1HZ-*R*-**)**

1. Remove and retain end and side panels. (See Fig. 24.)

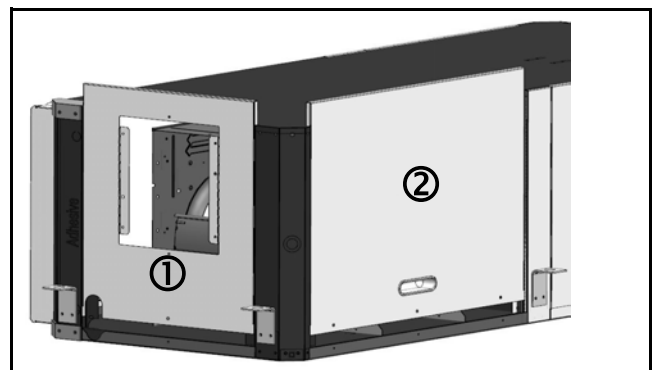


Fig. 24

2. Disconnect blower motor wiring and ground wire fastened to blower housing. (See Fig. 25.)

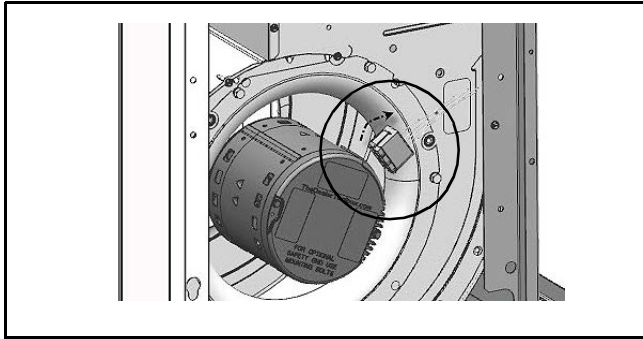


Fig. 25

3. Remove and retain the four screws under the blower collar. (See Fig. 26.)

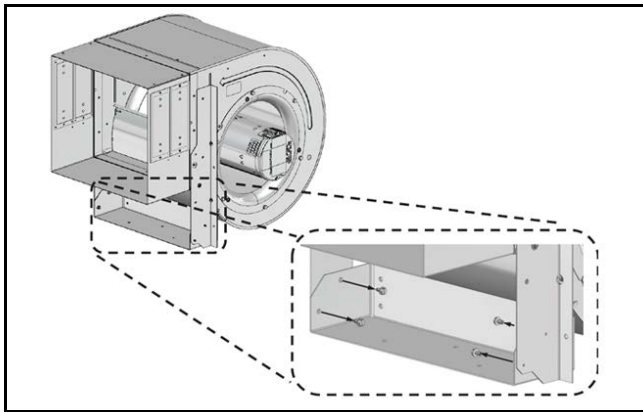


Fig. 26

NOTICE: The air coil is in close proximity to the blower. The air coil fins are easily damaged. Great care must be taken during this step to avoid coil damage. Shipping cardboard can be used as protection during blower removal and installation.

4. Slide the blower assembly away from mounting bracket. (See Fig. 27.)

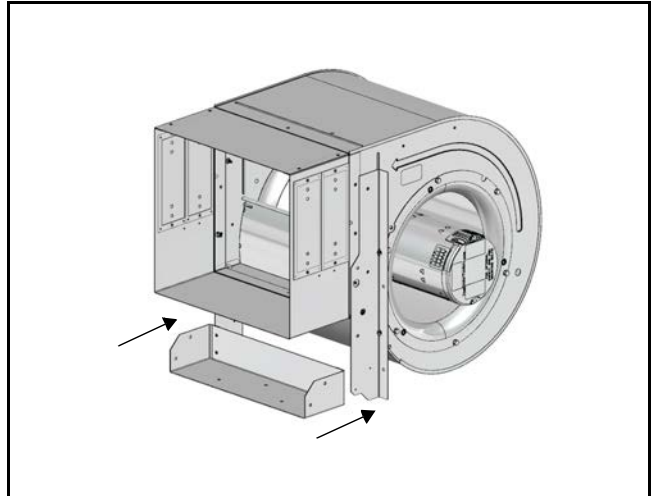


Fig. 27

5. Remove one vertical bracket by removing the two screws and retain the bracket. (See Fig. 28.)

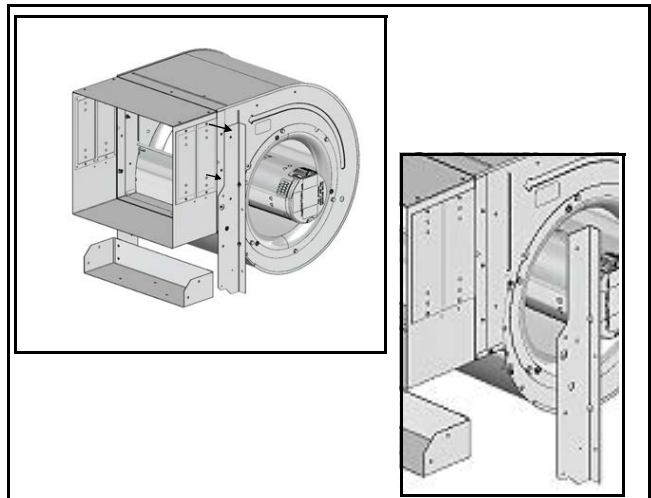


Fig. 28

6. Remove the horizontal blower bracket by removing the three screws and discard. (See Fig. 29.)

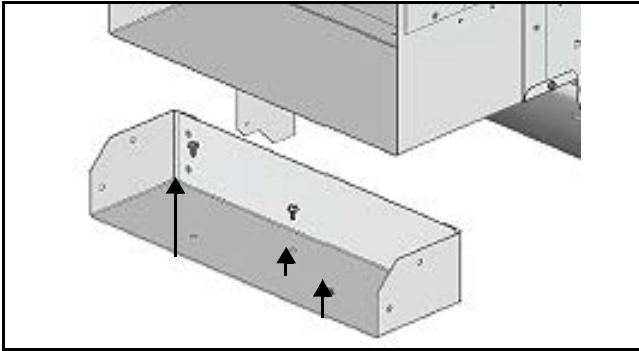


Fig. 29

7. Rotate the blower into its new position. (See Fig. 30.)

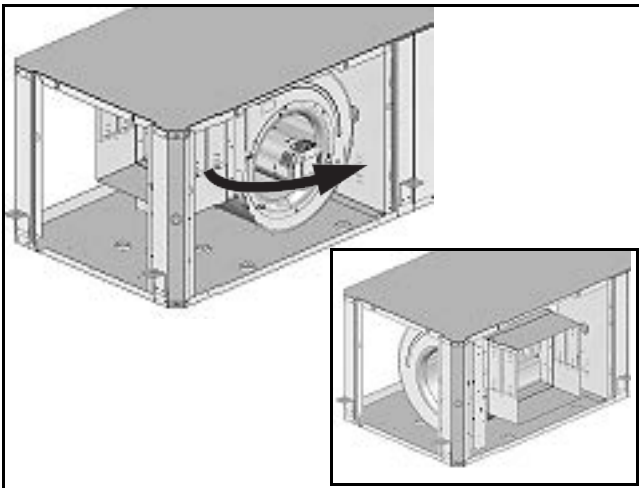


Fig. 30

8. Remove the remaining vertical blower bracket by removing the two screws and retain. (See Fig. 31.)

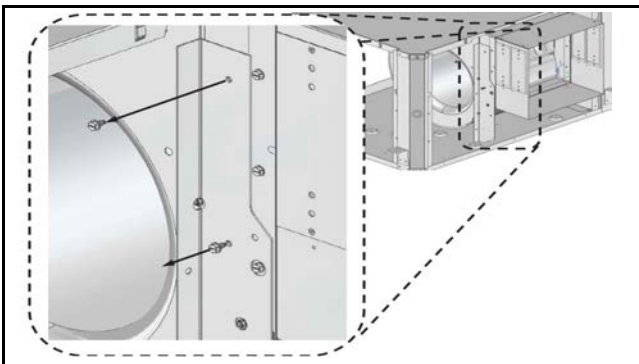


Fig. 31

9. Remove the blower assembly by sliding it forward. (See Fig. 32.)



The unit's top is notched to allow blower to slide through.

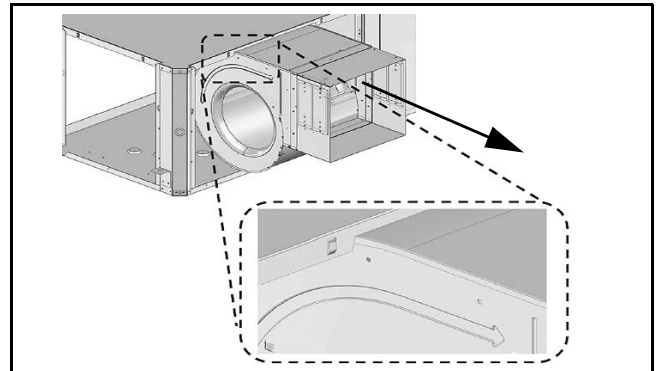


Fig. 32

10. Remove the blower collar by removing its eight screws and discard the collar. (See Fig. 33.)

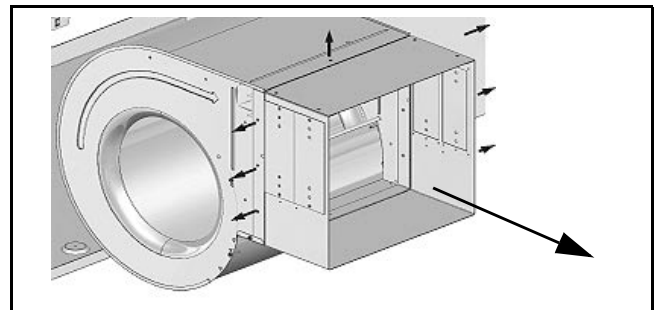


Fig. 33

11. Reorient the blower assembly 180 degree with the blower "belly" up. (See Fig. 34.)

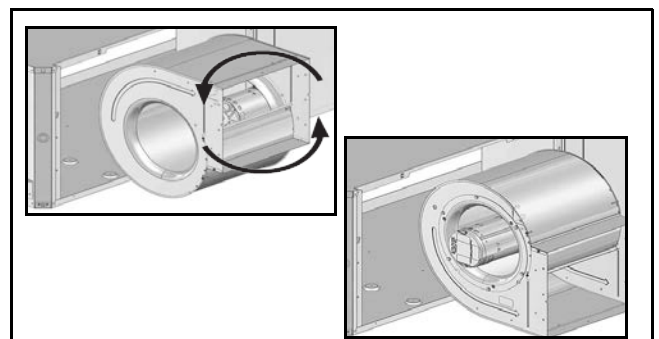


Fig. 34

12. Slide the blower back into the cabinet. (See Fig. 35.)

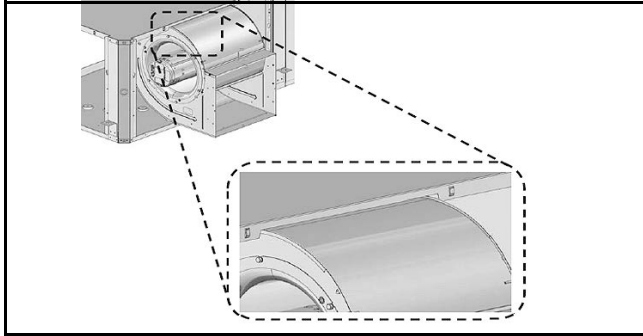


Fig. 35

13. Reinstall the two vertical blower brackets in the new horizontal position using four screws. (See Fig. 36.)

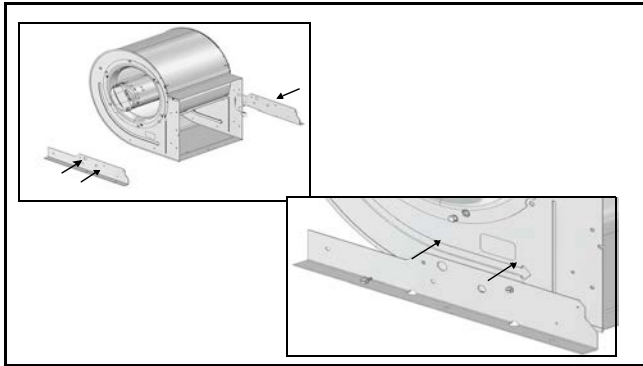


Fig. 36

14. Secure the two horizontal blower brackets to the unit base using four screws. (See Fig. 37.)

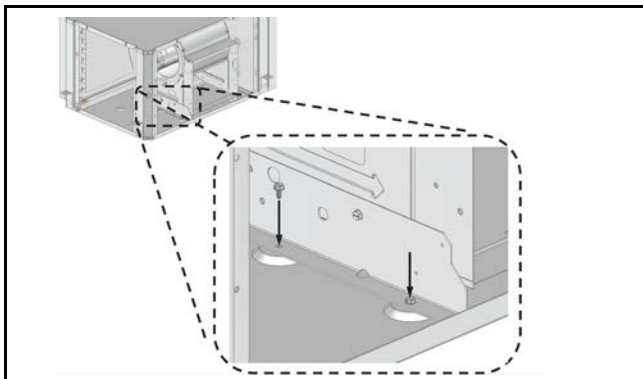


Fig. 37

15. Reconnect blower motor wiring and ground wire.
16. Install the new blower panel from the accessory kit.

Vertical (VT) Blower Configuration

The Vertical (VT) configuration water source heat pump is a dedicated up-flow configuration. Available from the factory in left-hand and right-hand return air configurations.

RETURN AND DISCHARGE AIR DUCT FLANGES PREPARATION

Return and Discharge Air Duct Flanges are shipped unfolded. Flange bend lines are perforated allowing easy bending using standard sheet metal pliers or channel locks. (See Fig. 38.)

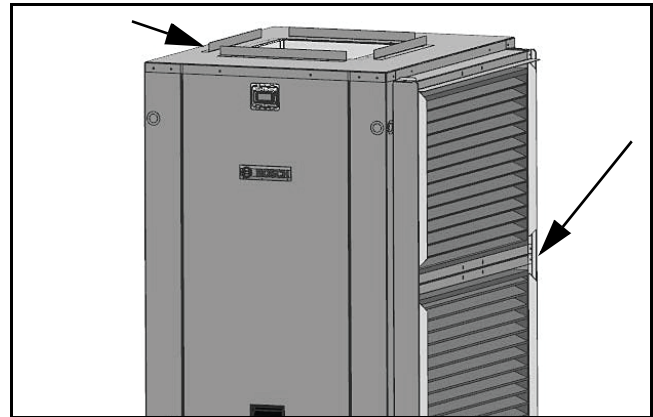


Fig. 38

Fold the duct flanges outwards along the perforated lines.



Bend flanges one at a time.

CORNER CAP INSTALLATION INSTRUCTIONS (FOR HZ UNITS ONLY)

Each corner cap is stamped with one of the following identifiers: T, T1, T2, B, B1, B2, A.



Corner cap installation only applies to HZ units. VT units do not require corner caps.

1. Identify Letter code on each corner cap. (See Fig. 39.)

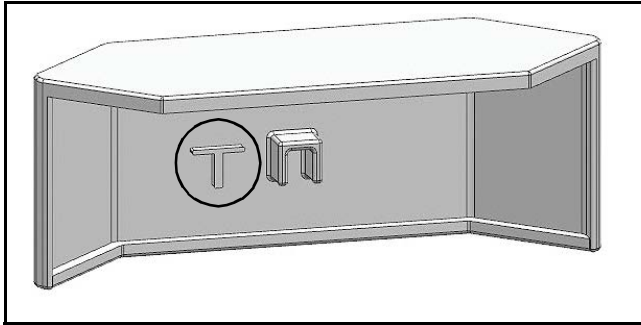


Fig. 39

2. In preparation for installation identify each corner cap location. (See Fig. 40.)

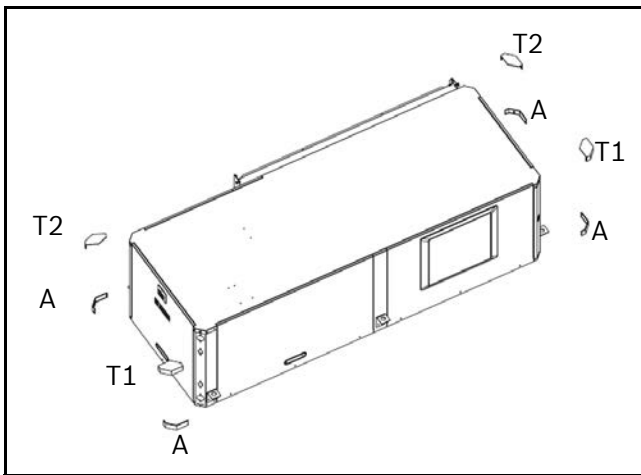


Fig. 40



Ensure cabinet surface is clean and free of debris to ensure proper corner cap adhesion.

3. Remove adhesive backing and install each corner cap. (See Fig. 41 and Fig. 42.)

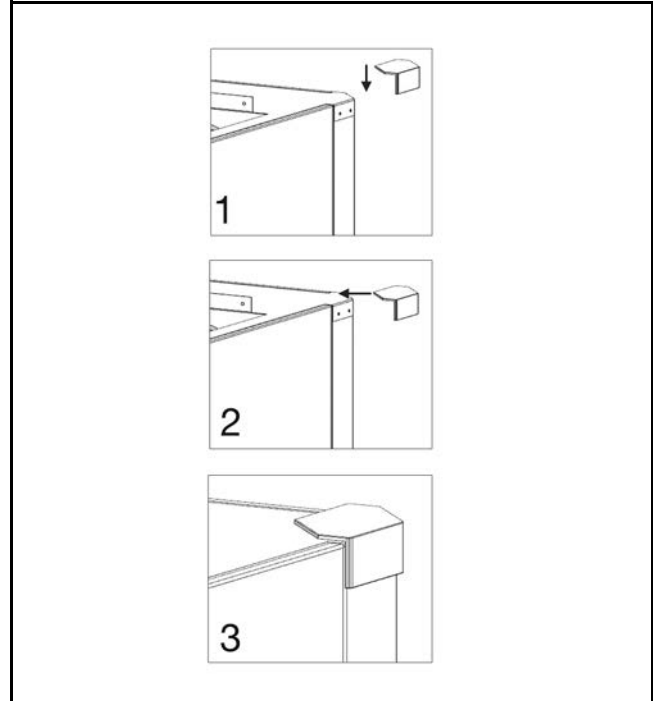


Fig. 41

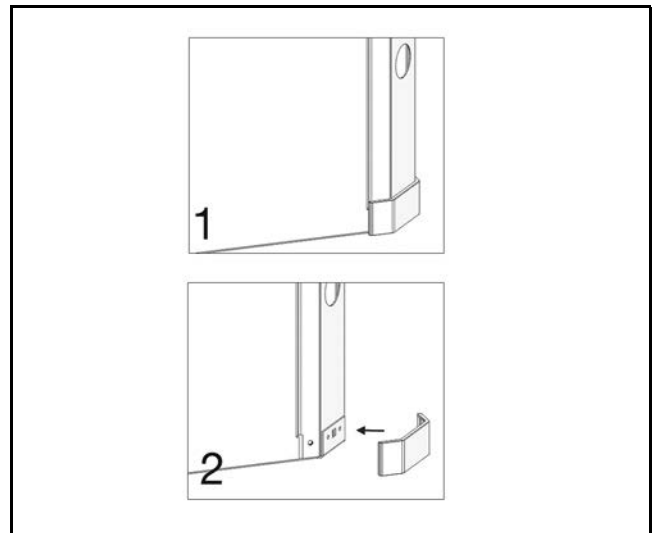


Fig. 42

MOUNTING VERTICAL (VT) UNITS

VT 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 Fig. 43.)



The vibration absorbing pad is not supplied with the unit.



On VT units, the condensate drain pan is internally sloped. There is no internal P-Trap.

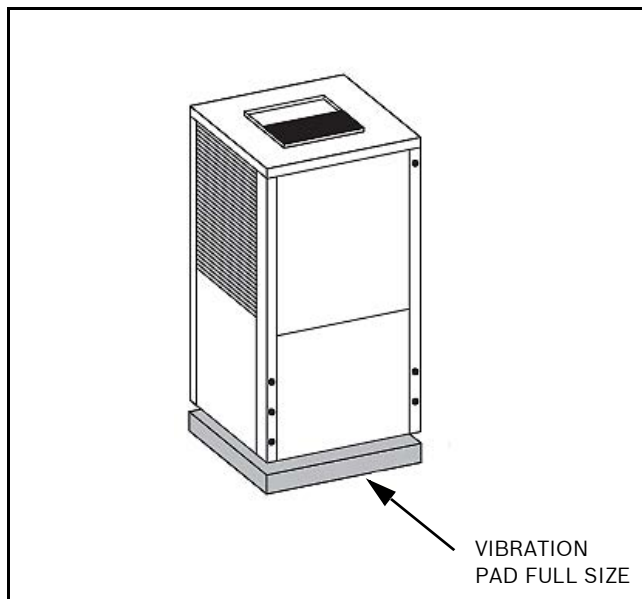


Fig. 43

NOTICE: Vertical Units should be mounted on a vibration absorbing pad. The unit must be supported along the entirety of its base.

MOUNTING HORIZONTAL (HZ) UNITS

While HZ 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 manufacturer recommends these be attached to the unit corners using a hanging bracket kit supplied with HZ units. The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details.

NOTICE: 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. Some applications require an attic floor installation of the horizontal unit. In those cases, the unit should be set in a full-sized secondary drain pan on top of a vibration absorbing mesh.



The HZ units condensate drain pans are NOT internally sloped.

NOTICE: HZ units must be installed pitched approximately 1/4" towards the condensate drain connection in both directions to facilitate condensate removal. (See Fig. 44.)

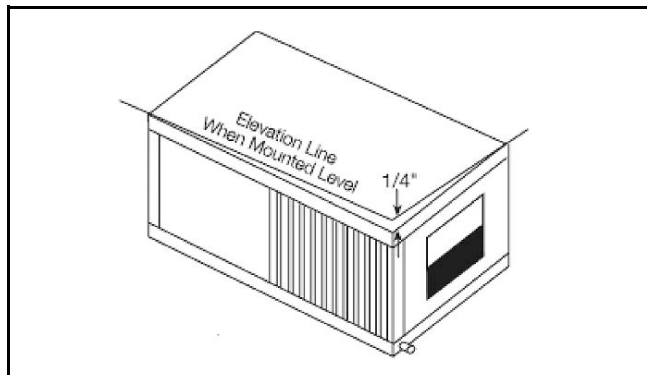


Fig. 44

HANGING BRACKET KIT

Installation Instructions

All HZ units come with hanging bracket installation kit to facilitate suspended unit mounting using threaded rod. Hanging brackets are to be installed as shown in Fig. 45.

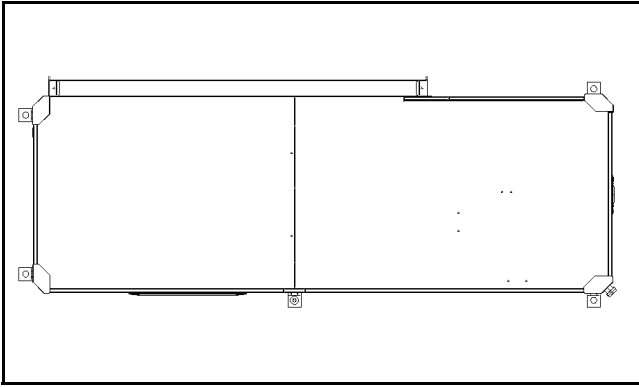


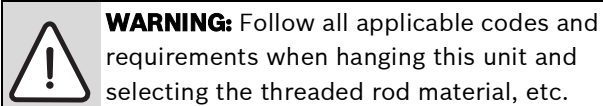
Fig. 45

This kit includes the following:

- (5) Brackets
- (5) Rubber Vibration Isolators
- (8) Screws: #10 x 1/2 (not used for these models)
- (10) Bolts: 1/4–28 x 12” Hex bolt

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 as shown in Fig. 46.

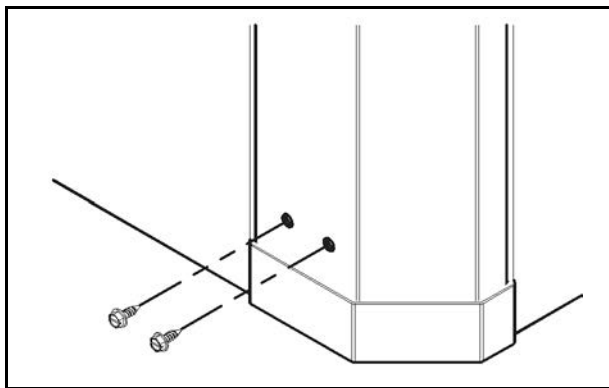


Fig. 46

2. Mount the five brackets to unit corner post using the bolts provided in the kit as shown in Fig. 47.

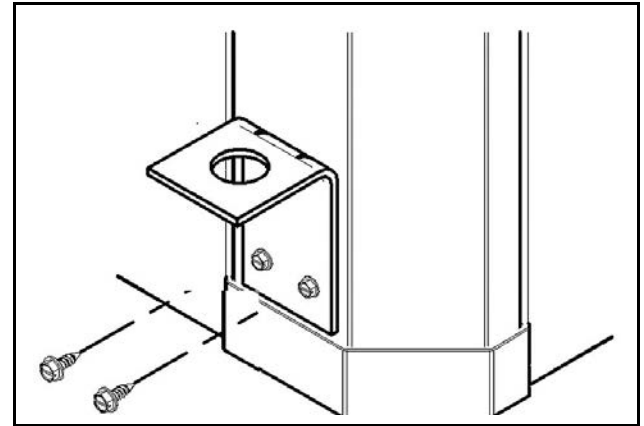
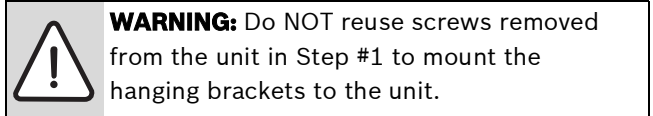


Fig. 47

3. Install rubber grommet onto the brackets as shown in Fig. 48.

4. Hang the unit and assemble the field-provided threaded rod, nuts, and washers on to the brackets as shown in Fig. 48.

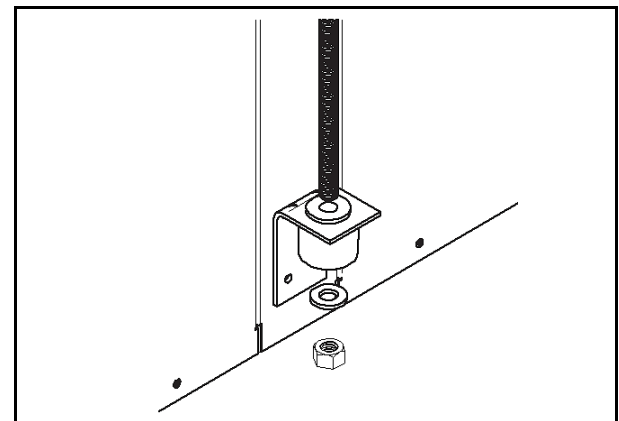
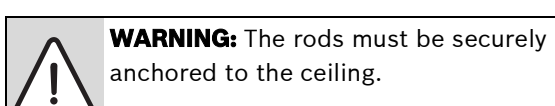


Fig. 48

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.

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

A vertical air vent is sometimes required to avoid air pockets. The length of the trap depends on the amount of positive or negative pressure that is on the drain pan. A second trap must not be included. (See Fig. 49.)

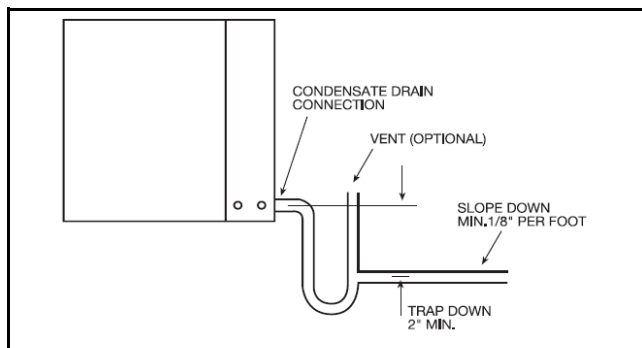


Fig. 49

DUCT SYSTEM

A supply air outlet collar and return air duct flanges are provided on all units to facilitate duct connections.



Supply air duct and return air duct flanges are shipped unfolded with the unit. They need to be folded. See "Return and Discharge Air Duct Flanges" on page #14 for details.

Refer to unit Dimensional Drawings for physical dimensions of the collar and flange. (See page #63 through page #65.)

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 1-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.

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

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.

If the unit will be installed in a new installation that 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 ensure that the duct system has the capacity to handle the air required for the unit's application. If the duct system is too small, larger duct work should be installed. Check for any leaks in the existing duct work and repair as needed.

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

PIPING

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

Flexible hoses should be used between the unit and the rigid system to avoid possible vibration.

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

Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

SM 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.

NOTICE: Proper testing is required to ensure the well water quality is suitable for use with water source equipment. When in doubt, use cupro-nickel.

In conditions anticipating moderate scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. (Refer to the water quality table on page #20.) Water quality must meet the standards stated in the table. 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 drops and poor throttling characteristics.

NOTICE: 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 swivel female pipe thread fittings. Swivel fittings are used in typical residential installation where water pressure ratings are below 125 psi. For higher-pressure ratings that are typical to commercial installations, swivel fittings **MUST** not be used. (For VT units, the swivel fitting is shipped

loose. For HZ units, the fitting is factory brazed.) Consult Unit Dimensional Drawings on page #63 through page #65.



Water side pressure rating is 450 psi for FPT fittings and 125 psi for field or factory-installed swivel fittings.

NOTICE: Do not overtighten the connections.

Swivel Fitting Gasket Installation

Swivel fittings include a gasket that must be used. To install, remove the gasket from the plastic bag attached to the swivel fitting, align the gasket with swivel fitting, and push in until fully seated. See Fig. 50.

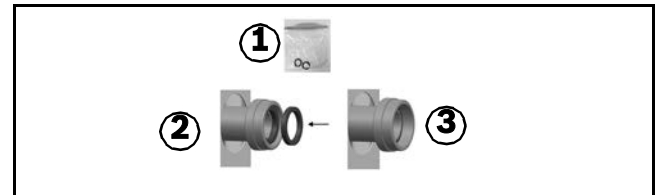



Fig. 50


- [1] Plastic bag
- [2] Align gasket
- [3] Push in to seat gasket

| Water Quality | | | |
|--|---|---------------------------|---------------------------|
| POTENTIAL PROBLEM | Water Characteristic | Acceptable Value | |
| | | Copper | Cupro-Nickel |
| | pH (Acidity/Alkalinity) | 7–9 | 7–9 |
| SCALING | Hardness (CaCO ₃ , MgCO ₃) | < 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 |
| CORROSION | Hydrogen Sulfide (H ₂ S) | < 0.5 ppm* | 10–50 ppm |
| | 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 (Fe ²⁺ Iron Bacteria Potential) | < 0.2 ppm | < 0.2 ppm |
| | Iron Oxide | < 1 ppm | < 1 ppm |
| EROSION | Suspended Solids | < 10 ppm, < 600 µm size** | < 10 ppm, < 600 µm size** |
| | Maximum Water Velocity | 6 ft/sec | 6 ft/sec |
| * No "rotten egg" smell present at < 0.5 ppm H ₂ S. | | | |
| ** Equivalent to 30 mesh strainer | | | |

Table 2 Water Quality

ELECTRICAL


 **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’s nameplate or on the performance data sheet.

NOTICE: 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 the 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 diagram page #58.

 Units supplied with internal electric heat require two separate power supplies:

- 1) Unit compressor
- 2) Electric Heat, blower motor, and control circuit.

 Refer to the ELECTRIC HEATER PACKAGE OPTION section and page #59 through page #60 for wiring diagrams. See data plate for minimum circuit ampacities and maximum fuse/breaker sizing.

Electrical Component Box

Refer to the electrical component box layout on page #74.

Alarm Terminal Wiring


Refer to “Alarm Terminal Wiring” on page #61.

ELECTRONIC THERMOSTAT

Installation

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 heat pump connector as shown below. The thermostat should have the same type connectors as shown below, requiring the same wiring. If thermostat connectors are different than below, refer to thermostat’s installation and operations manual for detailed installation and operation. All thermostats should be configured according to the specifications outlined in the installation and operation manual for proper commission and operations.

Refer to “Thermostat Connections” on page #61.

 If you would like to use two stages of electrical heat with a single terminal on your thermostat, place a jumper cable between W1 and W2 cable as shown below. (See Fig. 51.)

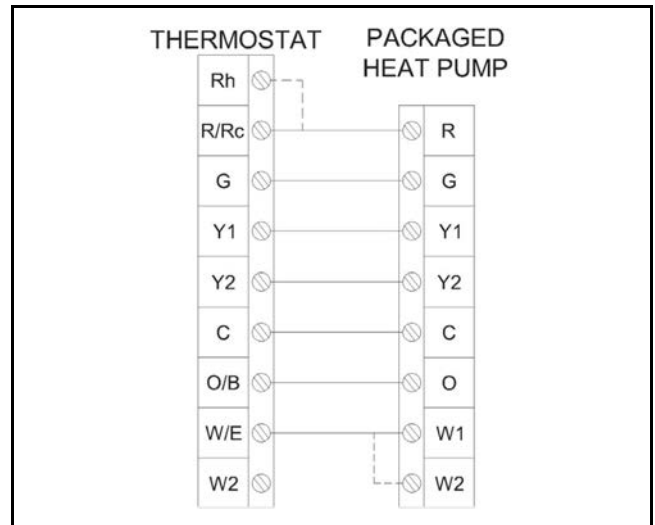




Fig. 51

 Packaged heat pumps are equipped with detachable Thermostat connectors located on the HPC board.

 Depending on the options selected, some wires in the Wiring Harness may be utilized. See the Wiring Harness Drawing notes for further details.

HEAT RECOVERY PACKAGE (HRP) SETUP

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 8733907779) is recommended.

HRP Water Piping

All hot water piping **MUST** be a minimum of 3/8" O.D. copper tubing to a maximum distance of 15 feet. For distances beyond 15 feet but not exceeding 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. (See Fig. 52 below.)

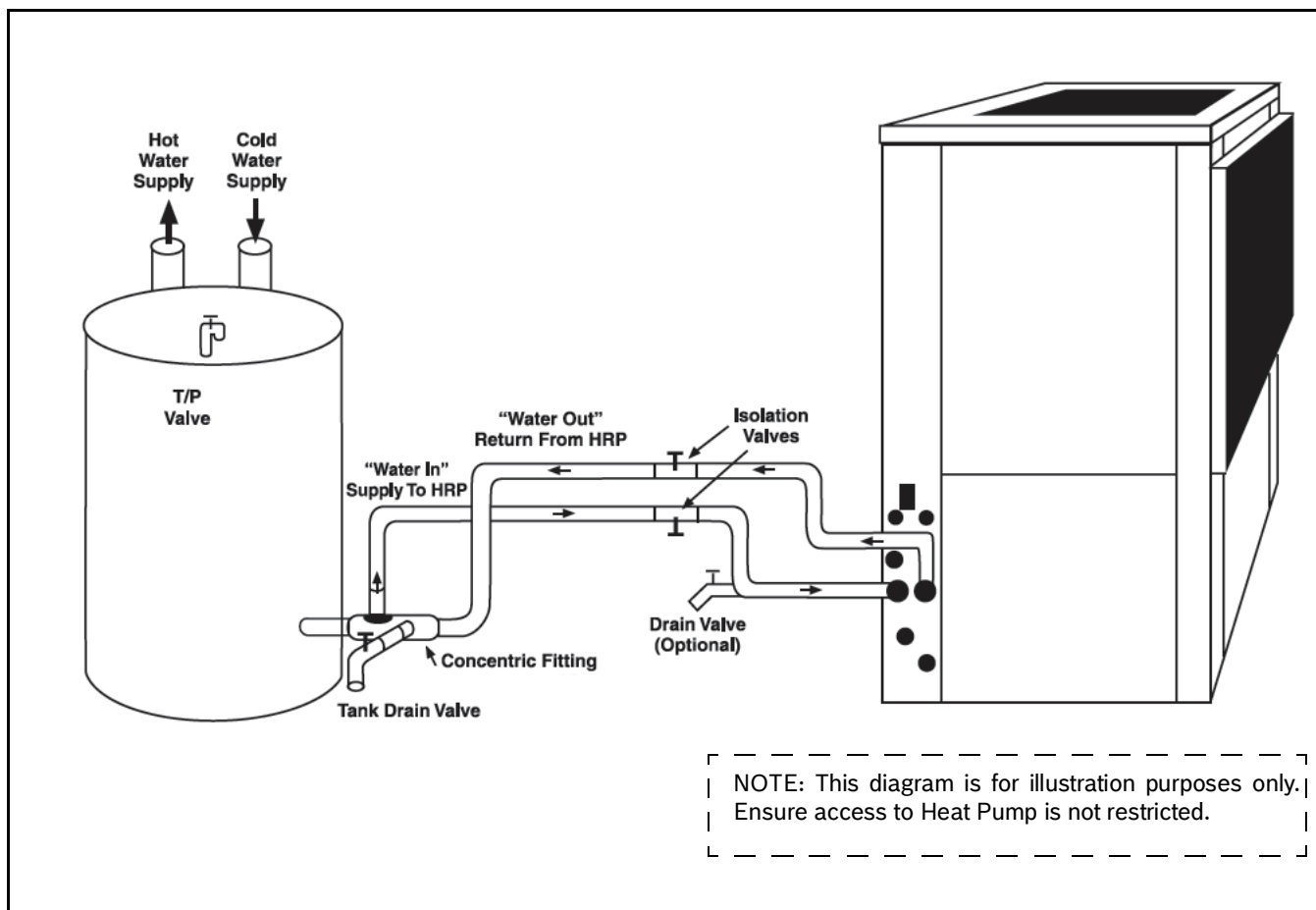


Fig. 52 HR Water Piping

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. Press 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 valve at the highest point in installation.

NOTICE: All piping from HRP to domestic water tank must be copper.

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



For schematics of the HRP, see page #58 and page #59.

NOTICE: NEVER OPERATE HR PUMP DRY. See “Initial Start-Up of a HRP System” on page #27.

SPECIFIC APPLICATION CONSIDERATIONS

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 ensure the well water quality is suitable for use with water source equipment. (See the Water Quality table on page #20.) 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 a 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 ensure that the well can provide sufficient flow for both. In well water applications, a slow-closing solenoid valve must be used and installed on the leaving-water side of coaxial to prevent water hammer. 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.

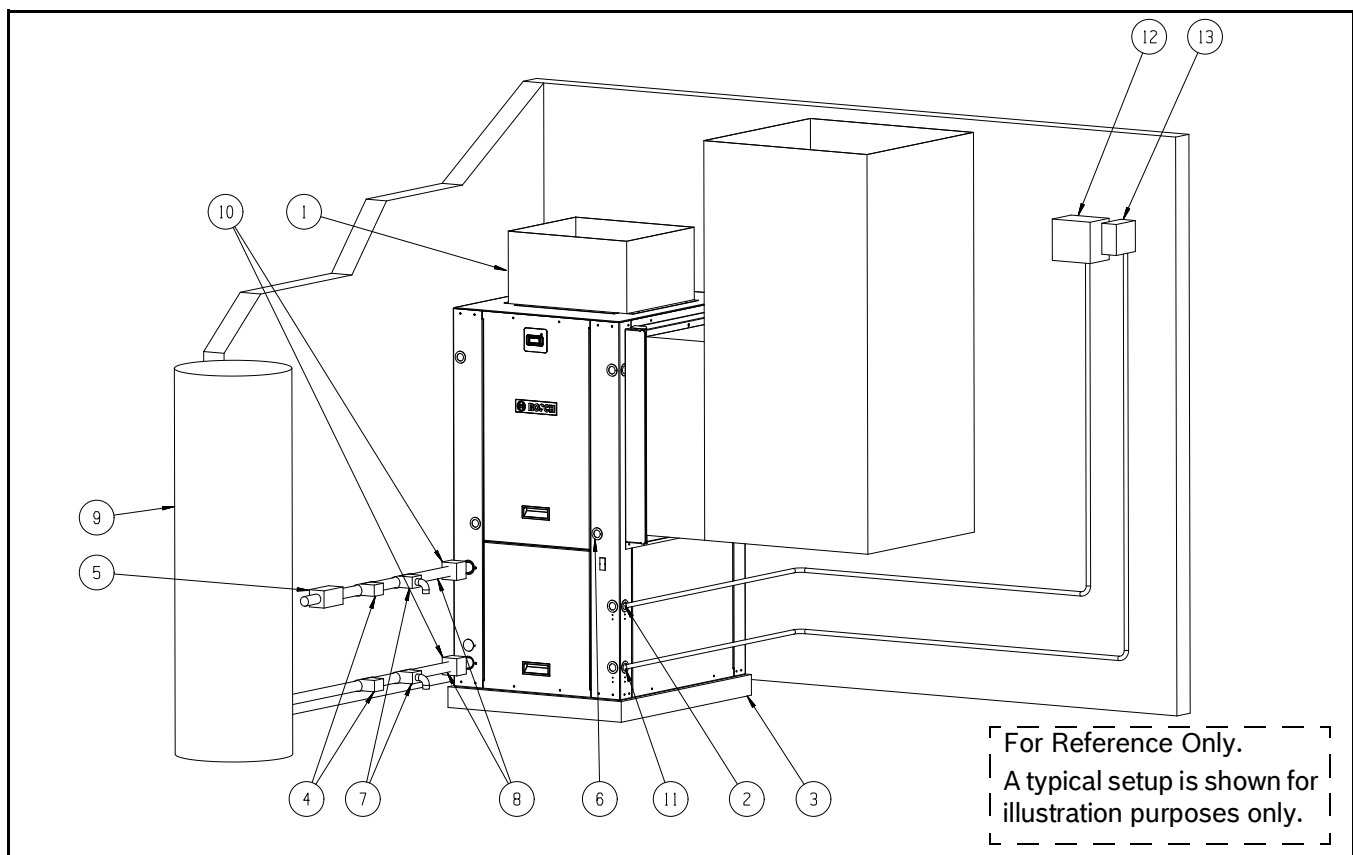


Fig. 53 Typical Well Water Setup

- | | |
|------------------------------------|--|
| [1] Flex Duct Connection | [10] P/T Ports (optional) |
| [2] Low Voltage Control Connection | [11] Line Voltage Connection |
| [3] Vibration Pad | [12] Electric Heater Line Voltage Disconnect |
| [4] Ball Valves | [13] Unit Line Voltage Disconnect |
| [5] Solenoid Valve Slow Closing | |
| [6] Condensate Drain Connection | |
| [7] Drain Valves | |
| [8] Hose Kits (optional) | |
| [9] Pressure Tank (optional) | |

Cooling Tower/Boiler Systems

The cooling tower and boiler water loop temperature is usually maintained between 50°F to 100°F to ensure adequate cooling and heating performance. In the cooling mode, heat is ejected 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 ensure 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.

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

NOTICE: Gaskets are used with swivel fittings. See Swivel Fitting Gasket Installation on page #19.

Cooling Tower/Boiler Systems Piping

Consult the specification sheets for pipe connection sizes.

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.)

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.

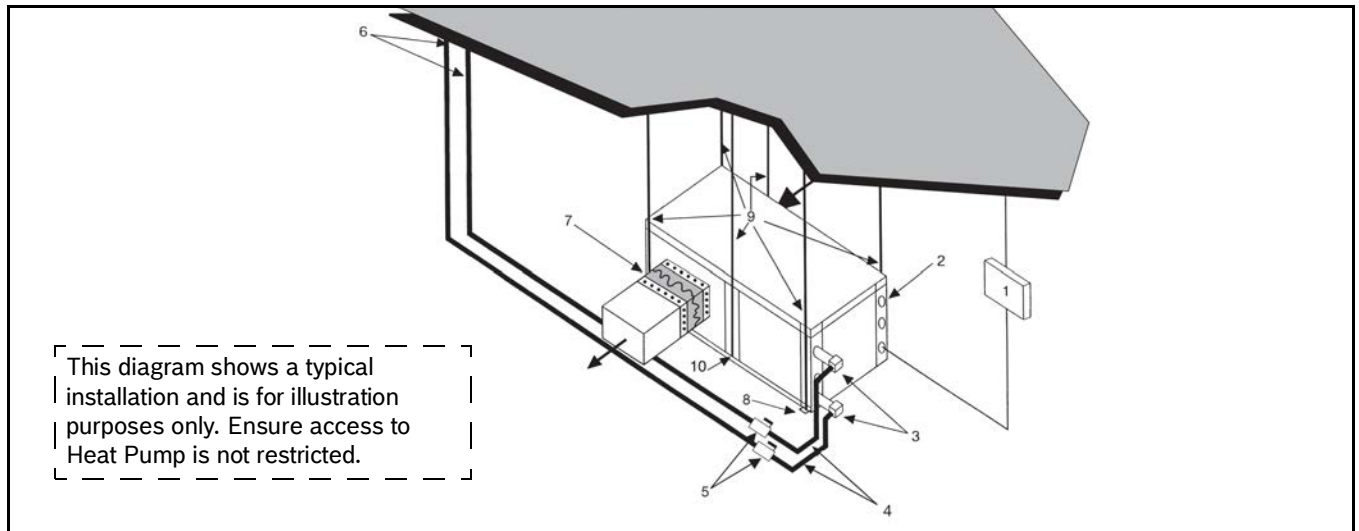


Fig. 54 Typical Cooling Tower and Boiler System Setup

- [1] Line voltage disconnect (unit)
- [2] Low voltage control connection
- [3] P/T ports (optional)
- [4] Hose kits (optional)
- [5] Ball valves
- [6] Supply and return line of central system
- [7] Flex duct connection
- [8] Hanging bracket assembly
- [9] Threaded rod
- [10] Hanging bracket assembly

Geothermal 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 a Bosch flow center, hose kit, and connection accessories will simplify the installation process. Anti-freeze solutions are utilized when low-evaporating conditions are expected to occur.

Refer to the Bosch flow center installation manuals for specific instructions.

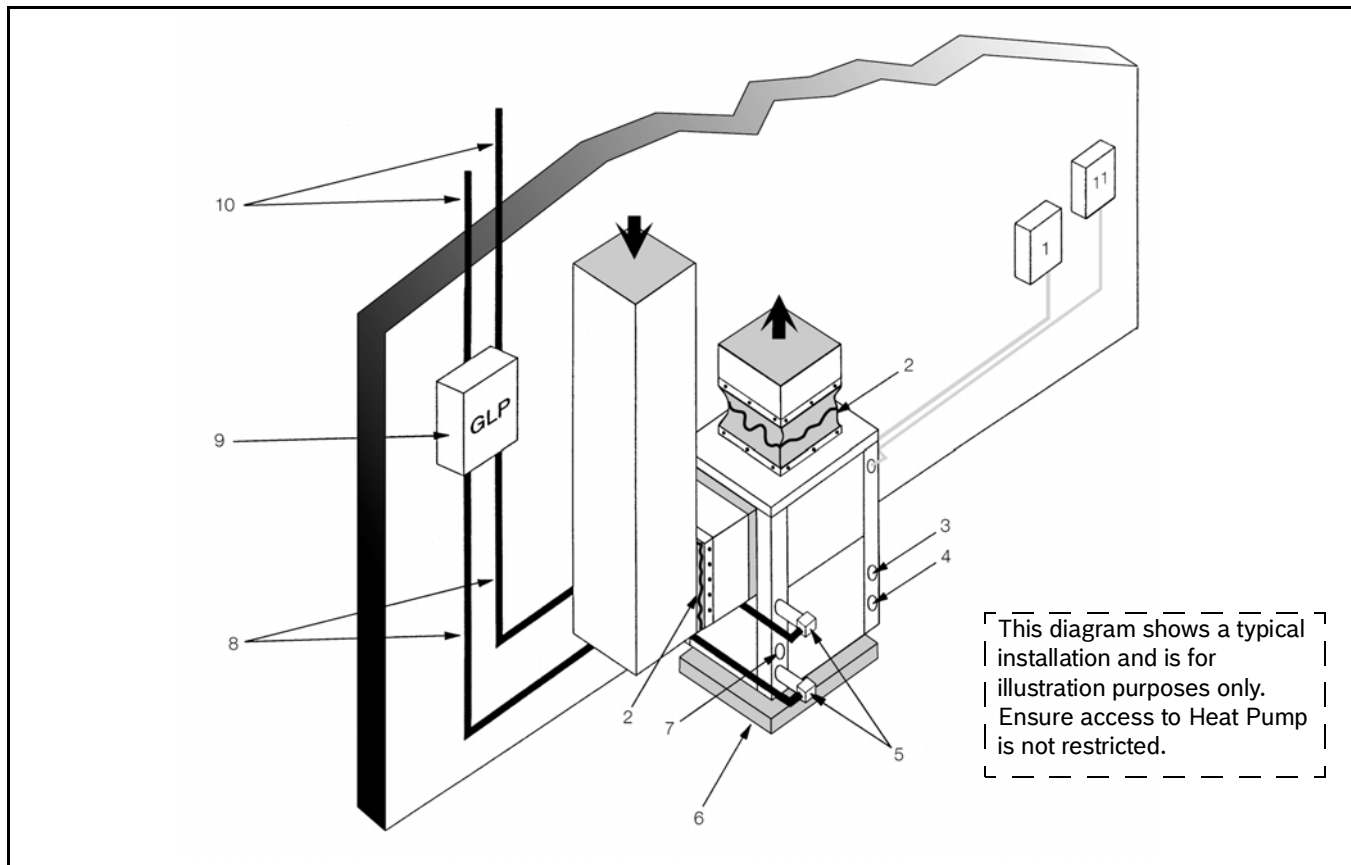


Fig. 55 Typical Geothermal System Setup

- [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)

POST-INSTALLATION SYSTEM CHECKOUT

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

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



DANGER: Ensure the cabinet and electrical box are properly grounded.

4. Verify that the low-voltage wiring between the thermostat and the unit is correct.
5. Verify that the water piping is complete and correct.
6. Check that the water flow is correct and adjust if necessary.
7. Check the blower for free rotation and that it is secured to the shaft.
8. Verify that vibration isolation has been provided.
9. Confirm that all access panels are secured in place.



IMPORTANT:

- 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 secondary control voltage of 18 volts. 24 volts is ideal for best operation.
- Long-length thermostat and control wiring leads may create voltage drop. Increase wire gauge or up-size transformers may be required to ensure minimum secondary voltage supply.
- 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.
- Do not apply additional controlled devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.
- 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 five 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 five minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting.
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.

Initial Start-Up of a HRP System

NOTICE: Make sure all valves in the heat recovery water piping system are open. NEVER OPERATE THE 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.

UNIT CONFIGURATION

Bosch EasyStart App

The Bosch EasyStart app is a digital interface that allows access to information from the Heat Pump Controller (HPC) making commissioning, configuring, and troubleshooting easier. This application is available in the Google Playstore, the Apple App Store, as well as the Bosch Pro HVAC website (www.boschprohvac.com). Search for “Bosch EasyStart” in the appropriate store for your device to download and launch the app. Once launched, navigate through the legal information, and then the user guide displays, explaining how to connect the App and the heat pump, as well as how to explore the features of the Bosch EasyStart app.

The Bosch EasyStart app will only work on the following devices: Android tablets with Android 4.0 operating system or higher, Apple iPads with iOS 8 or higher, and Windows 7.0 or higher laptops/PCs.



For more information refer to the website list in the Bosch EasyStart app’s Installation, Operation, and Maintenance Manual (IOM).

Settings

The Bosch EasyStart app is used to configure the available features of the HPC as follows:

| HPC Settings | | Default Settings |
|--|---|------------------|
| Freeze Protection Strategy | 15°F–26°F | 26°F |
| Cooling CFM per TON | 300–450 | 400 CFM/Ton |
| Heating CFM per TON | 300–450 | 375 CFM/Ton |
| Fan Only CFM reduction | 50–100% | 80% |
| Dehumidification CFM reduction | 15–40% | 15% |
| Heat Recover Package | Enabled or Disabled | Disabled |
| Heat Recovery Setpoint | 110°F–140°F | 120°F |
| Heat Recovery Sample Rate | 2–6 Samples/Hr | 3 Samples/Hr |
| Electric Heat Size | None, 5kW, 10kW, 15kW, 20kW | None |
| Low Loop Water Protection | Enabled or Disabled | Disabled |
| Low Loop Control Setpoint | 20°F–50°F | 34°F |
| Loop Pump Compressor Delay | 30–240 seconds | 30s |
| Mode of Compressor Operation | Comfort or Economy | Comfort |
| Down-Staging | Latched or Unlatched | Unlatched |
| Number of Lockouts | 2–4 Strikes | 3 Strikes |
| Lockout Reset | (Y1) signal or (R) | (Y1) |
| Units of Temperature | °F or °C | °F |
| Alarm Type | Constant or Pulse | Pulse |
| Date | MM/DD/YYYY | |
| Time | HH:MM | |
| High Efficiency Mode | Enable or Disabled | Disabled |
| Compressor Runtime Reset | Write Only | |
| Model Number (from the Unit Data Plate) | SM036-1VTC-FRTADC-CMGXXXXD7HXXX4XXXXSNA | |
| Serial Number (from the Unit Data Plate) | 1234-567-891011-1213141516 | |

Table 3 HPC Settings

NOTICE: Keep the HRP configuration setting disabled if there is no domestic water supply available.

Alarm Mode

The HPC has a fault alarm that can be configured (via the Bosch EasyStart app) as constant or pulsed. Constant configuration will energize and latch the alarm output. The pulse alarm setting will allow the alarm relay to pulse the alarm in sync with the status LED indicator.

The alarm, display, and status LED indicator outputs should only pulse the latest fault. Once the latest fault is cleared, the HPC will pulse for any remaining faults recorded.

Refer to “Alarm Terminal Wiring” on page #61. Also, see the “Clearing a Hard Lockout” section below.

Fan Motor

The installer can modify the total Cubic Feet per Minute (CFM)/Ton via the Bosch EasyStart app as shown in the table below.

| State | Max Installer CFM per Ton | Min Installer CFM per Ton | Step | Installer CFM Default |
|---------|---------------------------|---------------------------|------|-----------------------|
| COOLING | 450 | 300 | 25 | 400 |
| HEATING | 450 | 300 | 25 | 400 |

Table 4 CFM Configuration

The controller calculates the required flow rate (CFM) based on the unit’s model and size. The controller has a cooling CFM/Ton lower limit of 270. If effective CFM is lower than this value, the controller will override the effective CFM with the verified CFM preventing it from being lower than 270 CFM/Ton. The cooling verified CFM will apply to the cooling and the dehumidification modes of the operation.

The controller has a heating CFM/Ton low limit of 400 for electric heat operation. If the effective CFM is lower than this value the controller will override the effective CFM with the verified CFM value and latch it to 400 CFM/Ton. The controller has a “Most Efficient Mode” configuration. The function of this is to enable the unit to run at the most efficiently rated CFM values as tested in our labs.

Configurable Hard Lockout

The control can be configured from two to four faults for a hard lockout condition (configurable via the Bosch EasyStart app). If the control senses the same fault for the number of times configured within one hour from the first fault, the control will enter a hard lockout. Example: When configured to four strikes, if the control experiences four of the same faults within one hour then the control will enter a hard lockout.

Clearing a Hard Lockout

To clear a hard lockout condition, power to the (R) terminal may be reset at the circuit breaker panel, or the heat/cool call to the (Y1) terminal may be reset from a connected thermostat (default). The HPC can be configured for either reset option using the Bosch EasyStart app.

SYSTEM OPERATION

Timers and Faults

Random Start-Up Delay

This delay prevents multiple units sharing the same electrical circuit or network from starting at the same time. It ensures that the Heat Pumps connected to the same electrical circuit do not demand a high inrush of current simultaneously when starting up after a power failure. The random start time delay is in the range of 200–300 seconds. In test mode, the random start time delay is reduced to 10 seconds. Random Start-Up delay only runs during start up or after power has been completely removed. It does not take effect after a brownout condition.

Test Mode

Test mode decreases all delay timers to 10 seconds. Test mode is only for testing purposes and serves no function to the end user of the equipment. In test mode, the alarm relay and display relays will pulse during both soft lockout and hard lockout. If a soft lockout alarm is cleared, both relays will stop pulsing. The controller will exit test mode after 20 minutes or upon a power cycle.



The test mode command can only be set via the Bosch EasyStart app.



If the controller is set to “TEST” mode via Bosch EasyStart app, the safety delays will be reduced to 10 seconds. The controller will automatically exit test mode after 20 minutes.

Anti-Short Cycle Delay (ASC)

This feature protects the compressor from short cycling if the (Y1) call is removed and set or if a refrigerating circuit level fault is sensed to the point that the compressor shuts down. The ASC is 300 seconds during normal operation and 10 seconds in test mode. The ASC will not be in effect during a Random Start-Up delay.



If the HPC is set to “TEST” mode via the Bosch EasyStart app, the ASC delay will only be 10 seconds.

Snapshot Record

The HPC constantly monitors all thermostat sensors and thermostat demand values. The controller also has an additional feature where the latest fault snapshot will be saved to the controller. When a new fault occurs the snapshot will be saved and overwrite the previous snapshot. The following faults in the table below will be available in the snapshot record.

| Available Fault Snapshots |
|--|
| High-Pressure Hard Lockout Fault |
| Low-Pressure Hard Lockout Fault |
| Freeze Coaxial Hard Lockout Fault |
| Condensate Overflow Hard Lockout Fault |
| Brownout Voltage |
| Freeze Evaporator Hard Lockout Fault |
| Freeze Evaporator Temp Sensor Open |
| Freeze Coaxial Temp Sensor Open |
| Freeze Evaporator Temp Sensor Open |
| High Leaving Water Temperature Fault |
| Fan Motor Hard Lockout Fault |
| Fan Motor Soft Lockout Fault |
| Freeze Evaporator Soft Lockout Fault |
| Freeze Coaxial Soft Lockout Fault |
| High-Pressure Soft Lockout Fault |
| Low-Pressure Soft Lockout Fault |

Table 5 Available Fault Snapshots

Sequence of Operation

Cooling Mode

Energizing the “O” terminal energizes the unit reversing valve thus placing the unit into 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 the compressor capacity starts. The fan ramps up to the first stage of cooling air flow in 30 seconds.



Some options will have a built in delay, so compressor operation is not immediate. See the Options section on page #40 for more details.

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 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 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.



If the unit compressor locks 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 the 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.



When using a 2-cool, 3-heat thermostat both the W1 & W2 on the Heat Pump and W2 & EM on the thermostat must be connected together via a jumper.

Fan Operation

The fan starts anytime the fan command signal (G) or a demand for cooling/heating is received on the thermostat interface block. The fan will run at its minimum factory speed of 80% in Fan-Only Mode. The fan remains on during lockouts if there is a demand from the thermostat. The fan motor will take 10 seconds to ramp up to operating speed.



The fan will be commanded to run at fan-only air flow as long as there is no call for mechanical heating/cooling or electric heating operations.

The fan can be configured via the Bosch EasyStart app to run in a range of CFM from 300 to 450 in 25 CFM increments. The controller has airflow profiles (CFM) for both heating and cooling operations.

Loop Pump Operation

The Loop Pump (LP) energizes 30 seconds (configurable from 30 seconds to 240 seconds via the Bosch EasyStart app) prior to compressor operation during a mechanical heating or cooling demand. The LP remains on during low loop water temperature protection and a high Leaving Water Temperature (LWT) warning. The loop pump stays off for the following faults and delay timers:

- High Pressure Switch fault
- Low Pressure Switch fault
- Freeze Coaxial Coil fault
- Freeze Evaporator Coil fault
- Brownout fault
- Condensate Overflow fault
- Anti-Short Cycle delay
- Flow delay

HPC will command the Loop Pump (LP) output to energize the pump motor whenever a heating or cooling command (Y1) is received.

The Loop Pump output of the HPC will energize the pump directly. 230 VAC to 208 VAC on the HPC pump outputs will be present (voltage dependent on supply).



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

Reversing Valve Operation

The Reversing Valve (RV) is energized when the controller receives a command on the (O) terminal. The unit will run in cooling mode when the (RV) is energized and heating when the (RV) is not energized. The HPC checks for an (RV) demand every 30 seconds.

Comfort Mode

In comfort mode the controller satisfies demand as call is presented, regardless of energy consumption, to satisfy space comfort levels. In comfort mode, after the first stage of cooling/heating the system turns on the second stage of cooling/heating, with a 10-second delay, following a call for second stage of cooling/heating.

Economy Mode

In economy mode the controller satisfies demand as call is presented, taking energy consumption into consideration to operate the compressor. In economy mode after the first stage of cooling/heating, the second stage is initiated by calculating progress of the current state, regardless of a call for the second stage of cooling/heating. If there is gradual progress with first stage, the controller will not initiate second stage of the compressor. Economy mode is only available if the Discharge Air Temperature (DAT) sensor is functional.



If the DAT sensor fails, a warning message will broadcast to the Bosch EasyStart app and economy mode will be disabled.

Emergency Heating Mode

Emergency heating mode is an electrical heating feature that is used in place of mechanical heating when the mechanical heating (Y1 or Y2) is not available. The unit will initiate the first stage of electric heat immediately and will start the next stage of electric heat (stage 2) after a 180 second delay.

Heat Recovery Package (HRP)

The HRP can be used to heat potable water during unit operation (heat that would otherwise be wasted from the compressor discharge gas). The HRP consists of three major components:

- Double wall, vented refrigerant to water heat exchanger
- HRP pump

- Control circuit

The heat exchanger is rated for use with potable water and is acceptable for use as a domestic water heating device in most building codes. The pump circulates water between the domestic hot water tank and HRP heat exchanger in the heat pump. The control circuit ensures that the HRP only operates when there is available heat from the compressor. The HRP pump will run under the following conditions:

1. When the Discharge Refrigerant Temperature (DRT) is at least 10°F greater than the domestic hot water temperature (DWT). The DWT set point is configurable between 110–140°F, via the Bosch Easy Start app.
2. When the Loop Pump (LP) and compressor are both energized.
3. When the domestic water temperature drops 2°F below set point (default is 120°F). The controller will run the pump until the demanded set point is satisfied. The pump will run four times/hour via (configurable from two to six times/hour via the Bosch EasyStart App) in 90-second intervals to determine whether or not demand for hot water is needed.

When the heat pump compressor operates, the HRP will monitor the temperature of the discharge gas from the compressor. Once discharge gas is hot enough to provide useful heat to the domestic water tank, the circulating pump will be enabled, drawing water from the tank, through the HRP heat exchanger and the depositing the heated water back into the tank. If the water temperature reaches the set point (default is 120°F), the circulating pump is disabled to prevent over heating of the domestic water. The HRP is provided with an on/off switch in case the end user desires that the HRP be inactivated (typically during the winter months when space heating is most important).



In case of DWT/DRT sensor failure, the HRP operation will be disabled.

NOTICE: Keep the HRP configuration setting set to disabled if there is no domestic water supply available.



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

Dehumidification

During cooling operation only, if the controller senses a signal on the (H) terminal of the thermostat interface block, the fan CFM output will be reduced by 15% (adjustable). The fan CFM reduction percentage is adjustable from 15% to 40% reduction from nominal via the Bosch EasyStart app.



The controller has a minimum 270 CFM/Ton requirement. The controller will not allow the CFM/Ton to fall below this minimum even if the reduction percentage calls for a lower CFM/Ton amount.

Latching Mode Operation

The latching feature enforces how a HPC stages down the multiple stages of heating and cooling. A WSHP condenser coil uses water as medium for exchanging heat with the refrigerant. Controlling the stage down process will result in benefits to the performance and efficiency of the system. As the name implies, the maximum demanded stage is latched on until the thermostat is satisfied at which time all heating or cooling calls are terminated. Many thermostats are designed for Air Source appliances and the medium for exchange (air) can usually provide heat exchange; however, for ground loops used in WSHP can become saturated after long run times. Latching is used in WSHP applications as a means to “rest” the ground loop between cooling and heating cycles thus increasing the capacity for heat exchange. Performance, efficiency, and comfort provided by a WSHP will largely be maintained by preventing the degradation of the loop’s physical heat exchange properties.

During latching mode operation, the unit will fasten the two compressor outputs together until the demand is satisfied. If the thermostat removes the second-stage demand, the HPC will keep the second stage of compressor enabled until demand is satisfied.

Unlatching Mode (Factory Default)

During unlatching mode the unit will cycle the compressor outputs according to the thermostat demand. The unit will downstage from second-stage compression to first stage when the demand for second stage is dropped by the thermostat (Y2 and Y1 call to only Y1 call).

SYSTEM PROTECTION

Consumer Enhanced Security

The unit has been engineered according to Bosch consumer information protection standards, and it has built-in security features that prevent unauthorized users from changing unit configuration and other settings.

Compressor Demand (Y1 Call)

The HPC will constantly monitor the thermostat interface P8. Upon receiving a (Y1) demand from the thermostat, it will verify that all safety switches are in normal condition prior to initiating the compressor start sequence.

Pressure Protection

High Pressure Switch (HPS)

The HPS prevents the unit from running in a condition of high-refrigerant pressure. If the HPS is open upon a cooling or heating call, the HPC will not energize the compressor output. If the compressor is already running in normal operation and the HPS opens, the HPC will shut down the compressor output and will keep it off until the switch closes and the Anti-Short Cycle (ASC) delay has expired.

The Status Indicator will flash one time and the controller will keep track of the number of times the HPS opens. If within one hour the HPS strike counter exceeds the configured soft-lockout counter (set via the Bosch EasyStart app, see page #28) the HPC will shutdown the compressor and enter a hard lockout.

When the HPC enters lockout the LED flashes the alarm code in such a way the observer can count the number of flashes. The alarm code is represented by a grouping of successive flash with a two second pause in between the flash sequence. The sequence or flash grouping will be repeated until the fault is cleared. The LED will only flash one error code until it is cleared. See “Clearing a Hard Lockout” on page #29.

Low Pressure Switch (LPS)

The LPS prevents the unit from running in a condition of low refrigerant pressure. If the LPS is open, the compressor will not energize even if there is a demand for heating or cooling and the status indicator will flash two times during an LPS

fault. If the compressor is running during normal operation and the low pressure switch is opened, the HPC will keep the compressor running for two minutes. If the LPS remains open after two minutes, the compressor will shutdown and the unit will enter a soft lockout. The compressor will not energize until the LPS closes and the ASC delay expires.

The controller will keep track of the number of times the switch opens. If within one hour the LPS strike counter exceeds the configured soft lockout counter (set via the Bosch EasyStart app) the HPC will shut down the compressor and enter a hard lockout.

When the HPC enters lockout the LED flashes the alarm code in such a way the observer can count the number of flashes. The alarm code is represented by a grouping of successive flash with a two second pause in between the flash sequence. The sequence or flash grouping will be repeated until the fault is cleared. The LED will only flash one error code until it is cleared. See “Clearing a Hard Lockout” on page #29.

Operating Envelopes of the Pressure Switches

Operating envelopes of both switches are shown in the table below.

| High Pressure Switch | |
|----------------------|------------|
| Open Circuit | 600±15 PSI |
| Closed Circuit | 420±15 PSI |
| Low Pressure Switch | |
| Open Circuit | 40±5 PSI |
| Closed Circuit | 60±5 PSI |

Table 6 Pressure Switches

Brownout Protection

The HPC controller will constantly monitor the power supply. If the nominal voltage supplied to the HPC drops below 18 VAC, the unit will enter brownout protection mode. All outputs will be de-energized, the controller will enter the soft lockout mode, and the status LED indicator will flash five times as an error code. ASC is engaged when de-energized. The controller will pulse the brownout code at the display and alarm outputs for 20 seconds. The unit's brownout fault history can be found in the Fault Log when connected with the Bosch EasyStart app.

Low Loop Water Protection Control (LLWPC) (Boilerless Control)

The LLWPC prevents a condition of low loop water during heating operation. The HPC constantly monitors the Leaving Water Temperature (LWT sensors) and Entering Water Temperature (EWT sensors). If the entering water temperature falls below 34°F (configurable between 20°F to 50°F via the Bosch EasyStart app) the controller will disable compressor operation for 15 minutes to allow the loop to warm up to the operational temperature range. If a call for heating is still present, the unit will run auxiliary heat by energizing AUX1 and AUX2. The controller will resume mechanical heating operation when EWT has increased at least 10°F from the temperature at which the fault occurred and a 15-minute timer has expired. Low Loop Water Protection Control is disabled if the EWT or the LWT sensors are out of their operational range.



If the EWT or LWT sensor fails, a warning message will be broadcast to the Live Monitor screen on the Bosch EasyStart app and LLWPC mode will be disabled.

Water Flow Detection

The HPC constantly monitors the Freeze Coaxial (FZC), EWT, and LWT sensors to diagnose potential problems associated with water flow. The HPC will enter a hard lockout when it senses a condition of no water flow. See “Clearing a Hard Lockout” on page #29.

Cooling Mode

The controller evaluates the following after the unit has run in cooling mode for 90 seconds:

- If LWT is 5°F to 15°F higher than the EWT, the unit is running in nominal operating conditions.

- If LWT and EWT are the same and the compressor is enabled (CS1), the FZC and Freeze Evaporator Coil (FZE) temperatures are sampled every 10 seconds for 30 seconds. Rapid temperature changes on the freeze sensors will be used by the controller to report a “No Water Flow” fault and de-energize all compressor outputs.
- If the LWT is at least 20°F higher than the EWT, the FZC in and out temperatures are sampled every 10 seconds for 30 seconds. The rapid temperature changes on the freeze sensors will be used by the controller to report a low water flow fault.

Heating Mode

The controller evaluates the following after the unit has run in heating mode for 90 seconds:

- If LWT is 4°F to 12°F lower than the EWT, the unit is running in nominal operating conditions.
- If LWT and EWT are the same and the compressor is enabled (CS1), rapid temperature changes on the freeze sensors will be used by the controller to report a “No Water Flow” fault and de-energize all compressor outputs.
- If the LWT is at least 20°F lower than the EWT.



If the EWT or LWT sensor fails, a warning message will be broadcast to the Live Monitor screen on the Bosch EasyStart app and LLWPC mode will be disabled.

Sensor Monitoring

Condensate Overflow Sensor

The Condensate Overflow Sensor monitors the condensation present in the drain pan. When the condensation reaches the overflow level (water touching the sensor) the HPC will enter a hard lockout and de-energize the compressor outputs. The status LED indicator will flash four times, and the alarm output will pulse four times as well, if configured to do so. (See the Alarm Mode section on page #29.) The compressor will remain off until the ASC delay has expired and the condensate has been removed. See “Clearing a Hard Lockout” on page #29. Location of the Condensate Overflow Sensor is shown in Fig. 56.

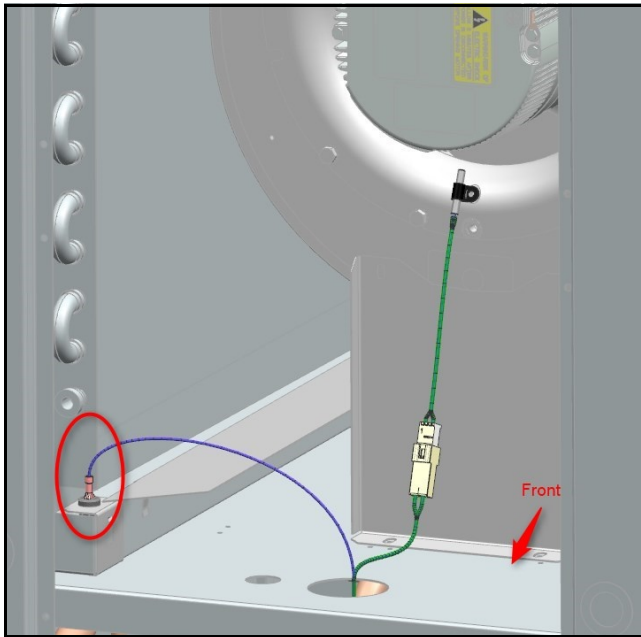


Fig. 56 Condensate Overflow Sensor Location

Discharge Air Temperature (DAT) Sensor

The DAT sensor is installed at the inlet attached to a motor mount (leg) and connected to the HPC. It reads the supplied air temperature to determine whether the unit is operating in the correct state according to the thermostat demand. The DAT works together with the Return Air Temperature (RAT) sensor to determine if there is a heating/cooling fault. These faults will appear on the monitor interface when paired with the Bosch EasyStart app. Location of the DAT Sensor is shown in Fig. 57.

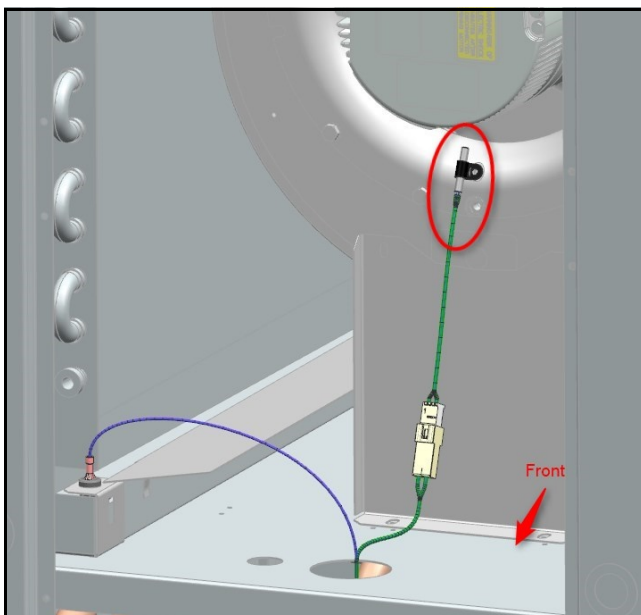


Fig. 57 DAT Sensor Location

Return Air Temperature (RAT) Sensor

The RAT sensor is installed in front of the filter (bottom-right corner) and connected to the HPC. It reads the RAT to determine whether the unit is operating in the correct state according to the thermostat demand. The RAT works together with the DAT sensor to determine if there is a fault either Not Cooling, Heating with Cooling Demand, Not Heating, or Cooling with Heating Demand. This information will appear on the monitor interface when paired with the Bosch EasyStart app. The factory location of the RAT is shown in Fig. 58.

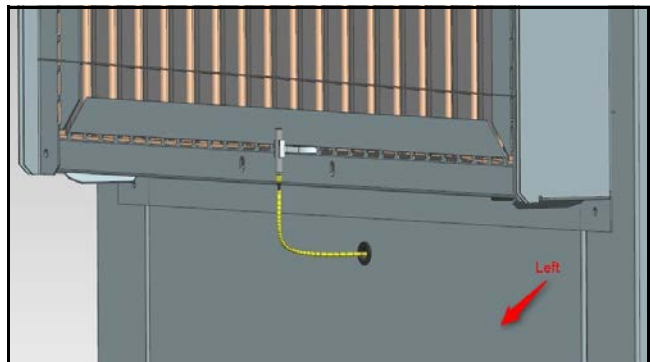


Fig. 58 RAT Sensor Factory Location

Proper operation of the unit requires field modification of the RAT sensor by removing the sensor from the provided clip, drilling a $\sim 1/4$ " hole 12"–18" from the evaporator coil in the ductwork, and securing the RAT sensor in this hole for the most accurate RAT readings as shown below in Fig. 59.

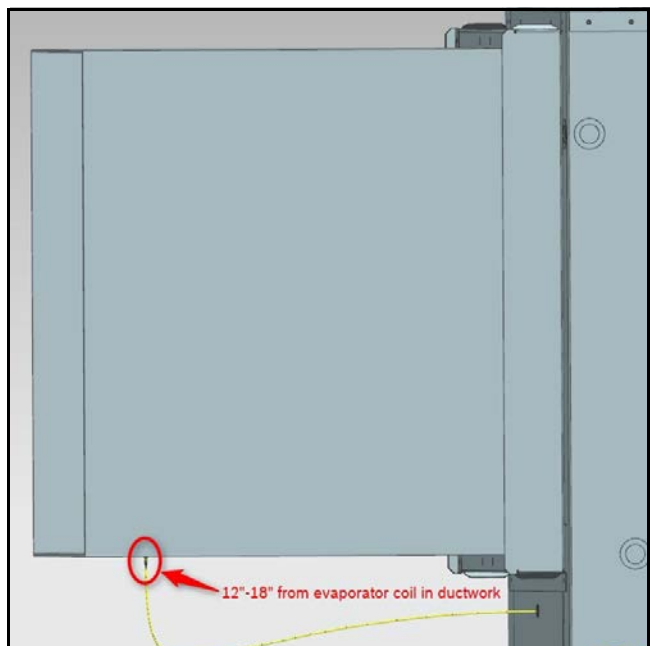


Fig. 59 RAT Sensor Field Location

Leaving Water Temperature (LWT) Sensor

The LWT sensor is installed on the Leaving Water pipe of the coaxial water coil. In the case of a high LWT, above 125°F for one minute, the HPC will issue a warning and save it to memory. The compressor and loop pump will remain running once the LWT decreases below 100° F, the warning will be cleared and the compressor and loop pump will remain running. The HPC will record this condition in memory without impeded operation.

Cooling Mode

During cooling operation, if the LWT is equal to or less than the Entering Water Temperature (EWT), the HPC will issue a warning that the unit is not cooling.

Heating Mode

During heating operation, if the LWT is equal to or greater than the EWT, the HPC will issue a warning that the unit is not heating. Location of the LWT Sensor is shown on Fig. 60.

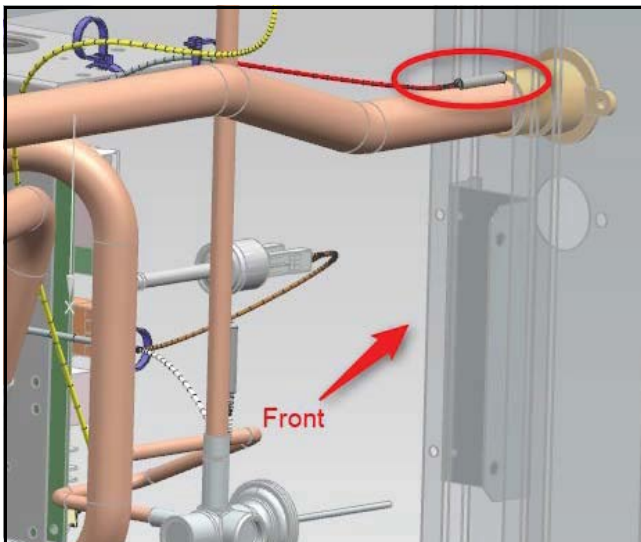


Fig. 60 LWT Sensor Location

Entering Water Temperature (EWT) Sensor

An EWT sensor is installed on the entering water pipe of the coaxial water coil.

Cooling Mode

High EWT, above 110.5°F for one minute, will result in a warning message indicating an high EWT fault.

Heating Mode

This fault will reset when EWT drops below 105°F.

Low EWT activates the LLWPC. Low EWT can only occur when the EWT is low during heating operation. Refer to Low Loop Water Protection Control (LLWPC) on page #35. Location of the EWT sensor is shown on Fig. 61.



There is no EWT freeze-limit trip. However, if the application has both electric heat and LLWPC enabled, the controller will have a low limit for EWT. (Refer to the LLWPC section on page #35.) Otherwise, there is no EWT low-limit trip. (If EWT is frozen/cold, another fault will likely occur such as FZC trip/No water flow, High Pressure, etc.)

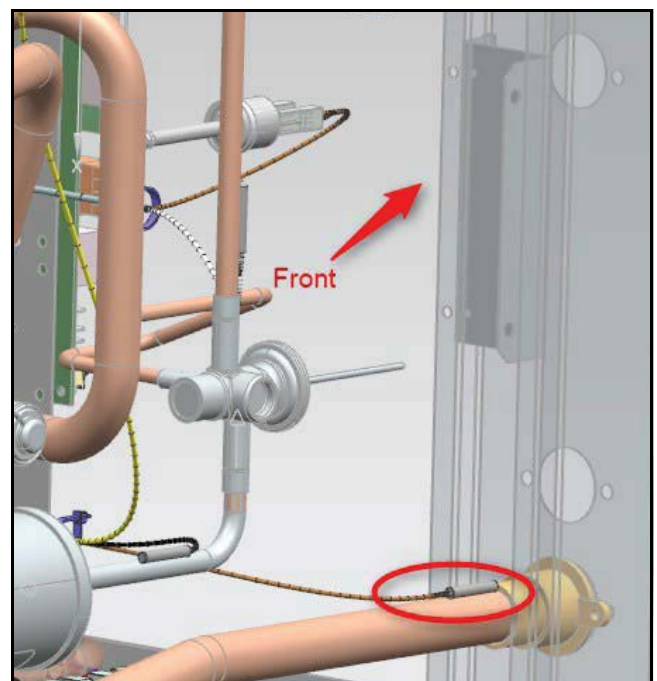


Fig. 61 EWT Sensor Location

Coaxial Water Coil Freeze (FZC) Sensor

The Freeze Coaxial (FZC) Water Coil sensor is installed on the refrigerant pipe of the coaxial water coil between coaxial coil and TXV. The freeze limit trip is factory set for open-loop protection (26°F) but can be set for all values between (26°F) and (15°F) via the Bosch EasyStart app. If the temperature drops below or remains constant at the configured freeze point for more than 30 seconds after the compressor is energized, the control will shutdown the compressor to prevent the water coil from freezing. The compressor will not be re-energized until the temperature increases 10°F above the freeze point and the anti-short cycle (ASC) delay has expired.

Lockout

If the number of freeze faults detected exceeds two to four times (based on configuration set via the Bosch EasyStart app) within one hour, the controller will go into hard lockout. The status LED indicator will flash three times and the alarm relay will pulse three times as well, if configured for pulse. See Table 9: HPC Status LED Information on page #45. Also see “Clearing a Hard Lockout” on page #29.

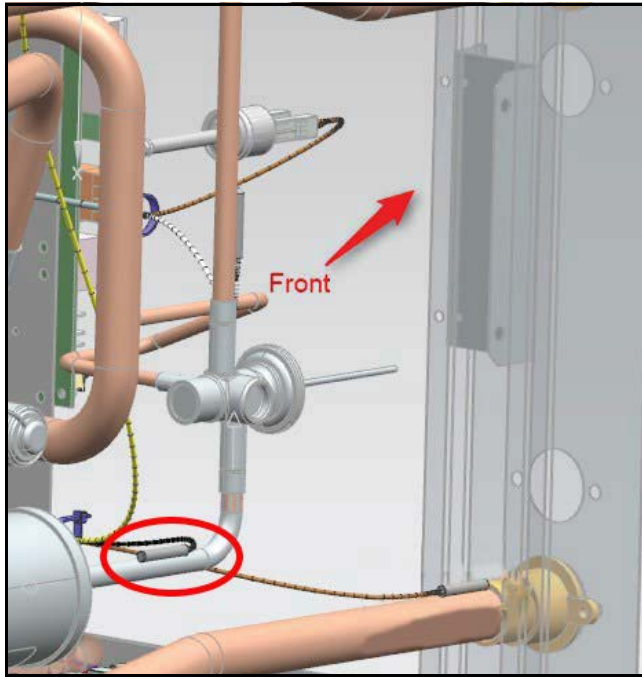


Fig. 62 FZC Sensor Location

Evaporator Air Coil Freeze (FZE) Sensor

The FZE sensor is installed on the entering refrigerant pipe after the thermal expansion device and before the air coil. The freeze limit trip is set to factory default at 30°F. If the temperature drops below or remains constant at the freeze point for more than 30 seconds after the compressor is energized, the controller will shut down the compressor to prevent freezing the air/evaporator coil. The compressor will not be re-energized until the temperature increases 10°F above the freeze limit and the ASC delay has expired.

If the number of freeze faults detected exceeds two to four times (configurable via the Bosch EasyStart app) within one hour, the controller will go into hard lockout. The status LED indicator will flash six times, alarm relay will pulse six times as well, if configured for pulse. To clear the hard lockout condition, power must be reset at the (Y) terminal (factory settings) or (R) terminal (configurable via the Bosch EasyStart app). Location of the FZE is shown on Fig. 63.



The Freeze Evaporator sensor limit trip is not configurable.

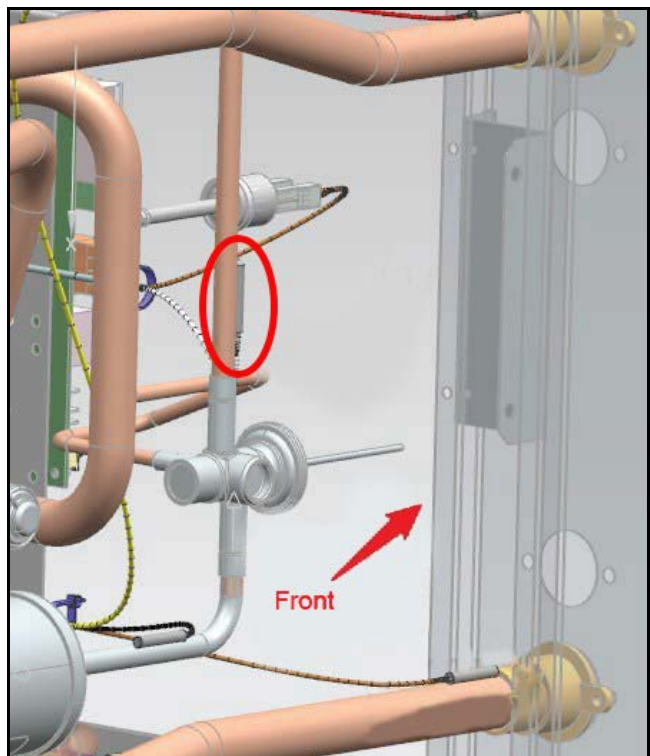


Fig. 63 FZE Sensor Location

Discharge Refrigerant Temperature (DRT) Sensor

The Heat Recovery Package (HRP) controller will monitor the DRT sensor and only allow the HRP pump to run when the DRT is suitable for hot water production or enabled via the Bosch EasyStart app. The HPC will issue a warning if the DRT sensor is invalid or not within range (via the live monitor screen on the Bosch EasyStart app). Location of the DRT sensor is shown on Fig. 64. It is mounted on the discharge line of the compressor.

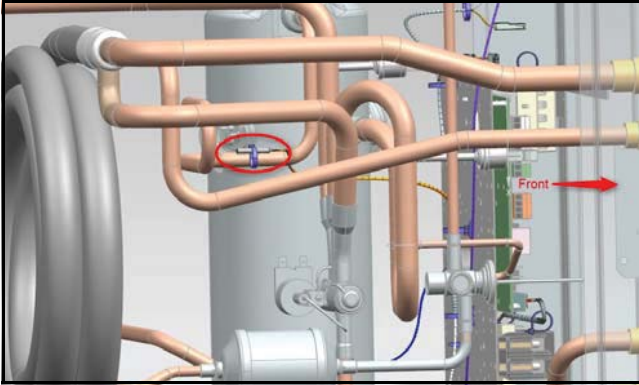


Fig. 64 DRT Sensor Location

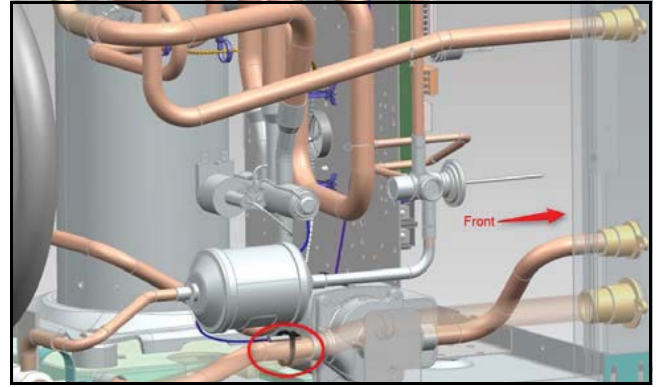


Fig. 65 DWT Sensor Location



If the DRT sensor fails at any time during normal unit operation, HRP operation will be terminated.

NOTICE: Keep the HRP configuration setting set to disabled if there is no domestic water supply available.

Domestic Water Temperature (DWT) Sensor

The Heat Recovery Package (HRP) controller will constantly monitor the DWT sensor and only allow the HRP pump to run when the water temperature in the tank is below the set point and the refrigerant temperature is suitable for hot water production. The minimum and maximum allowed temperature set points are 110°F and 140°F respectively and can be adjusted via the Bosch EasyStart app. The controller will run the pump four times/hour (adjustable two to six times/hour via Bosch EasyStart app) to determine whether or not domestic hot water production is needed.



The controller will enable domestic hot water production only when the loop pump and the compressor are running.

If the DWT sensor is invalid or not within range a warning message will be sent to the Bosch EasyStart app.



If the DWT sensor fails at any time during normal unit operation HRP operation will be disabled.

Location of the DWT sensor is shown in Fig. 65.

OPTIONS

A number of field-installed options are available on SM Series of Heat Pumps. The following details the purpose, function, and components of each option.

Electric Heat

Internally-mounted supplemental electric heat is available on select models of the SM series. Electric heating elements can operate along with reverse cycle heating as auxiliary heat or in lieu of mechanical heating (refrigeration heating) as emergency backup heat. The availability matrix, including available nominal kW capacities are shown in the table below.



Internally-mounted Electric Heat is only available on top-blow vertical cabinets or end-blow horizontal cabinets.



In cases where Electric Heat is not available in a desired configuration but is needed, contact your Bosch distributor or local sales rep. for the available Duct Mounted Electric Heat Package.

NOTICE: Units with internal electric heat must have two field power supplies.

| Part Number | Heater Model | kW | | Stgs | Btu/h | | Product Series Compatibility | | | | |
|----------------------|--------------|------|------|------|-------|-------|------------------------------|-------|-------|-------|-------|
| | | 208V | 230V | | 208V | 230V | SM024 | SM036 | SM048 | SM060 | SM070 |
| 7738003204 (5kW) | HK050-1201 | 3.6 | 4.8 | 1 | 12300 | 16300 | x | x | x | x | x |
| 7738003205 (10kW) | HK100-1201 | 7.2 | 9.6 | 2 | 24600 | 32700 | x | x | x | x | x |
| 7738003206 (15kW) | HK150-1201 | 10.8 | 14.4 | 2 | 36900 | 49100 | | x | x | x | x |
| 7738003207 (20kW) | HK200-1201 | 14.4 | 19.2 | 2 | 49200 | 63400 | | | x | x | x |

x = Available

Table 7 Availability Matrix

Smart Start Assist

The SM series is available with the Smart Start Assist device as a field-installed accessory. This device reduces starting (in-rush) current for compressors by 45% to 65%. This reduction in starting current can eliminate or greatly reduce “light flickering” during compressor starts and can reduce the required size of back-up transformers. The adaptive technology of the device can also extend compressor life by providing smoother, lower currents starts and by protecting the compressor from transient over voltage and under voltage after ramp up. The Smart Start is designed for single-phase scroll compressors and can also optimize algorithms for high-pressure starts. The Smart Start Assist device is depicted in Fig. 66.

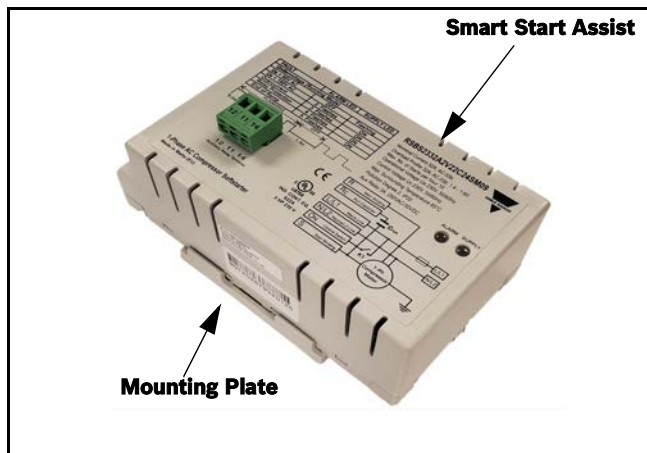


Fig. 66 Smart Start Assist Device

Smart Start Assist Specifications

| Smart Start Assist Specifications | |
|--|---|
| Rated Operational Voltage: | 208/230VACrms +/- 15% 50-60 Hz |
| Environmental Operating Range: | -4° to 149°F (-20° to 65°C); < 95% @ 40 C relative humidity, non-condensing |
| Degree of Protection: | IP20 |
| Overvoltage: | Category II |
| Operational Rated Current: | 32 Amps |
| Max Starting Current: | 80A ACrms |
| Min Full Load Current: | 80A ACrms |
| Min time between starts: | 6 minutes |
| Min time between stop to start: | 3 minutes |

Table 8 Smart Start Assist Specifications

Smart Start Assist Modes of Operations

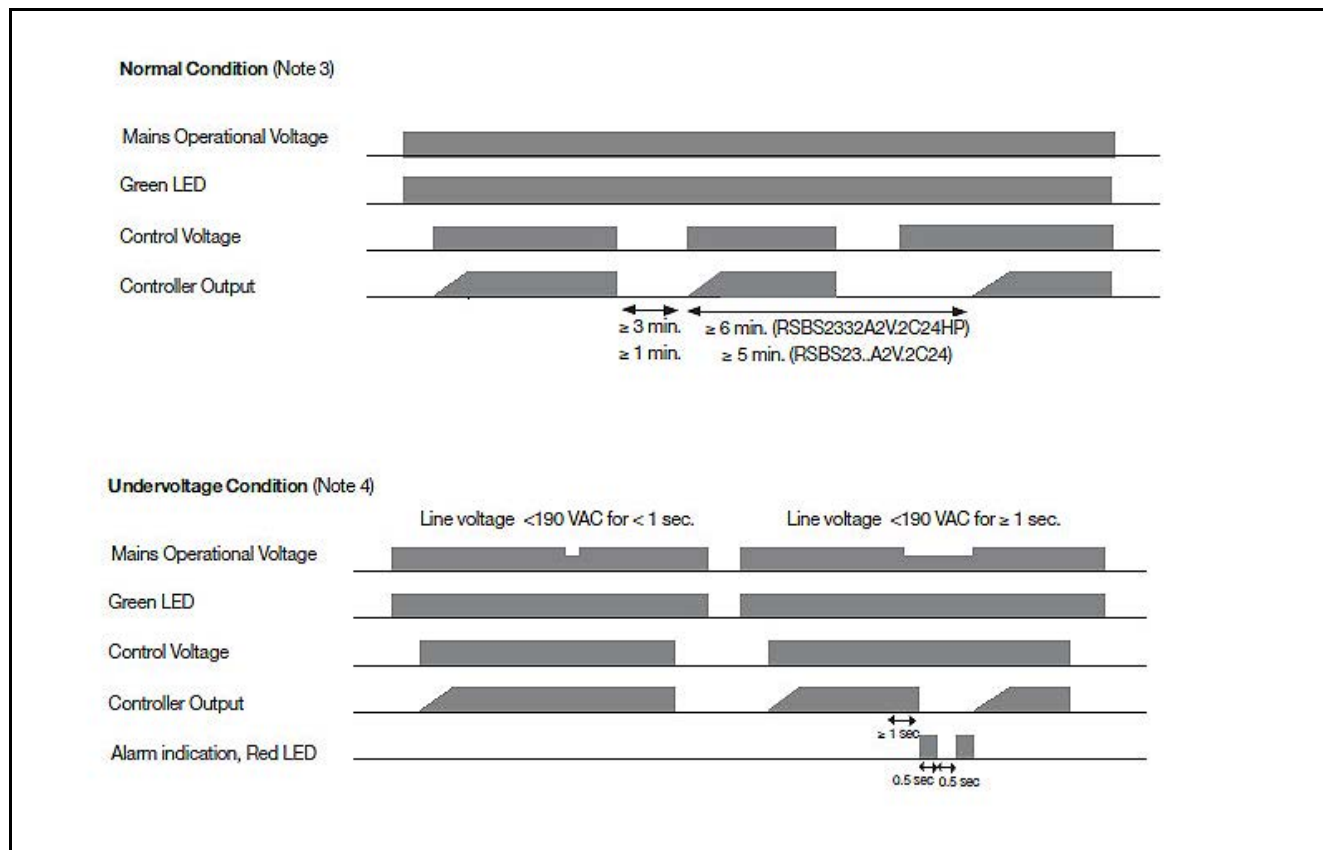


Fig. 67 Smart Start Assist Modes of Operations (Normal and Undervoltage Condition)

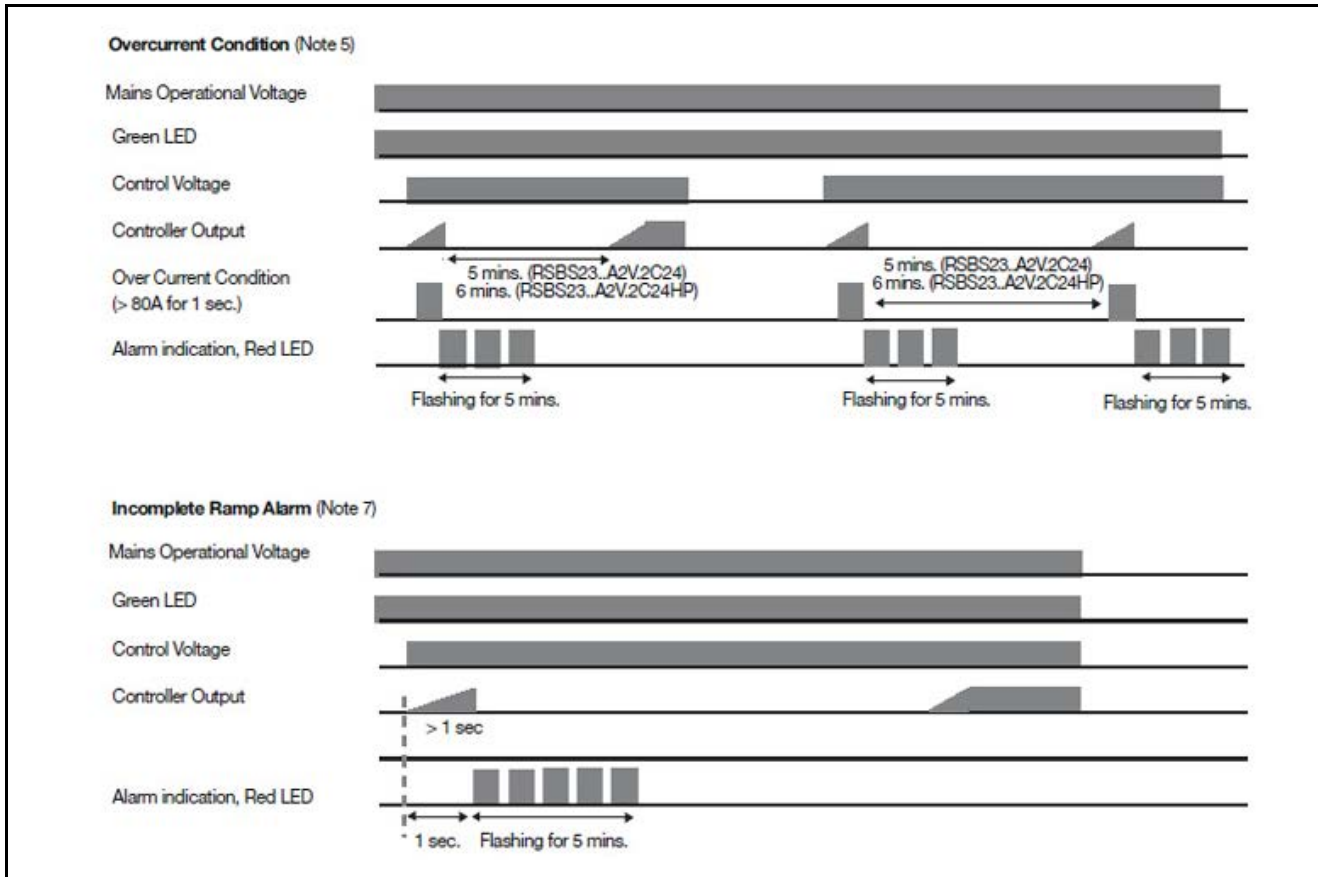


Fig. 68 Smart Start Assist Modes of Operations (Overcurrent Condition and Incomplete Ramp Alarm)

Smart Start Assist Modes of Operation Notes

1. The Smart Start Assist has two indication LEDs on board. The green LED indicates the status of the on-board power supply while the red LED indicates an alarm condition or the recovery time between starts.
2. Once the main voltage is present, the green LED will be fully ON. In case the main voltage is less than the stated pickup voltage alarm value, the green LED will be flashing. In case main voltage is higher than the stated pick-up voltage and green LED is flashing, then this may indicate that the on-board power supply is faulty. (Power Supply Alarm)
3. Upon closing L/L1, the Smart Start Assist will start ramping, duration of which is < 1 second, provided that the minimum time from stop to start is respected. When opening L/L1, the Smart Start Assist will stop without any ramp down.
4. In the case of an under voltage, the Smart Start Assist will shut down and the red LED flashes two times as long as the under voltage is present. Once the main voltage is restored the red LED will continue flashing for five minutes. Following these five minutes (six minutes for HP versions), the Smart Start Assist will start ramping function in the case L/L1 is closed. The device can be reset at any time by removing power on L2/N connection. When the power is reapplied, the soft starter will start ramping up as soon as L/L1 is closed, provided that the minimum time from stop to start are respected.
5. If an over current (>80A for 1 sec.) is sensed, the Smart Start Assist will shut down and the red LED will flash three times indicating an over current situation. This continues for five minutes. In the case that the over current is still present at the second attempt, user intervention is required to reset the controller by cycling power for the device to operate again as this implies that there are problems in the system.

6. A detection circuitry provides protection in case of a faulty starting capacitor EMR. In such situations, the red LED will flash four times for five minutes. Smart Start Assist will check the status of the starting capacitor EMR before attempting a ramping function (in the case L/L1 is closed). If at the second attempt, the starting capacitor EMR is found to be faulty, user intervention is required to reset the controller by cycling power for the device.
7. In the case of incomplete ramping of the Smart Start Assist, the red LED will flash five times. The flashing will be indicated by the red LED for five minutes. If after the second attempt, there is another incomplete ramp alarm, user intervention is required to reset the controller.
8. During the recovery from under-voltage, overcurrent, and incomplete ramp alarms, the red LED will flash twice the normal flashing frequency using the same number of flashes. Fig. 67 shows the flashing in case of a recovery from an undervoltage alarm.
9. During the recovery time between starts, the Smart Start Assist will be continuously ON until the necessary recovery time elapses.
10. If Power supply on Smart Start Assist is removed before the recovery period has elapsed, when supply is restored, the delay will continue until the remaining recovery time from the last start/stop (before supply removal) is over. Following this, another start may be attempted. If supply is removed during alarm recovery (red LED flashing), when supply is restored, the alarm will be reset and the Smart Start Assist will only wait for the respective delays between starts and/or stop to start to elapse before attempting another start (assuming L/L1 is closed).

Loop Pump Control (former Pump Valve Relay Kit)

A loop pump control relay has been integrated into the HPC board. The loop pump control can be used to energize a field-installed pump or solenoid valve when there is a call for compressor operation. This loop pump control relay is used to switch 208/240 VAC signals ON/OFF (depending on the supply voltages).

NOTICE: The loop pump control relay output is 208/240 VAC at 5 A; ensure the pump or valve being connected is rated to this specification.



For Smart Start Assist troubleshooting information, see page #54.

WIRELESS INTERFACE MODULE (WIM)

SM Series Water Source Heat Pumps are equipped with an externally-mounted WIM that will provide a Wi-Fi connection between the appliance and the Bosch EasyStart app. (Refer to page #28.) The WIM's mounting location can be seen in Fig. 69 and Fig. 70:



Fig. 69 Vertical (VT) Unit WIM Mounting Location

On VT units, the WIM is mounted on the blower access panel.

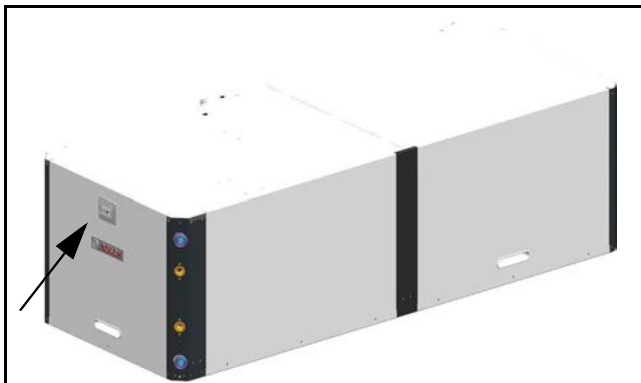


Fig. 70 Horizontal (HZ) Unit WIM Mounting Location

On HZ units, the WIM is mounted on the electrical box access panel.

On the WIM is a label that displays the SSID, Password, and a QR code on a button as well as a LED indicator that will glow RED when the WIM is active. This is shown in Fig. 71.

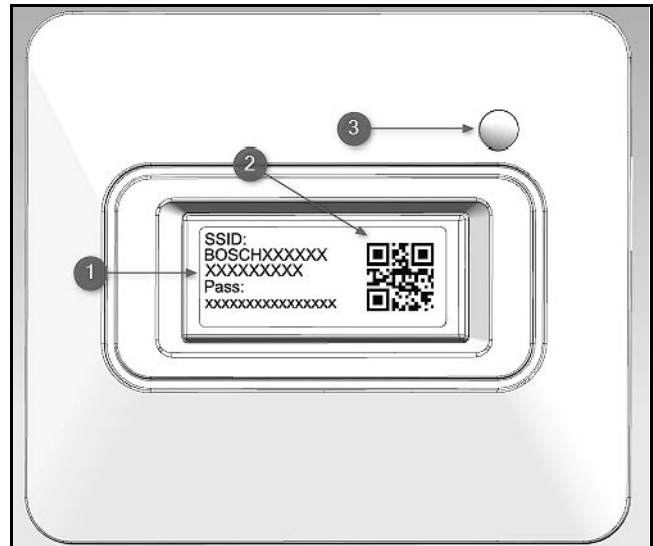


Fig. 71 WIM

- [1] SSID and Password
- [2] QR Code
- [3] LED indicator

The operation of the WIM is very simple—press the button on the face (where the label is affixed) and the WIM will broadcast the unique Wi-Fi network signal so the Bosch EasyStart app can connect and communicate with the WIM. The WIM's operation is explained within the Bosch EasyStart app and in its IOM.

TROUBLESHOOTING

HPC LED Status Indicator (Blink Code) Information

The HPC LED status indicator is found on the HPC board and is labeled "STATUS."

| Indication Color | Blinks | Description |
|------------------|---------------------|----------------------------|
| N/A | Status LED is OFF | No Fault |
| RED | Status LED solid ON | Invalid Call |
| RED | 1 | High pressure lockout |
| RED | 2 | Low pressure lockout |
| RED | 3 | Coax Freeze sensor lockout |
| RED | 4 | Condensate overflow |
| RED | 5 | Brownout |
| RED | 6 | Evaporator Freeze lockout |

Table 9 HPC LED Status Indications

Compressor Ohms

| Model | Start Winding | Run Winding |
|---|---------------|-------------|
| SM024 | 1.64 | 1.3 |
| SM036 | 1.50 | 0.85 |
| SM048 | 1.90 | 0.53 |
| SM060 | 1.68 | 0.42 |
| SM070 | 1.91 | 0.36 |
| Tolerance +/- 7%. All resistance values must be measured with compressor at room temperature. | | |

Table 10 Compressor Ohm

UNIT TROUBLESHOOTING

| Unit Troubleshooting | | | |
|---|-----------------------------------|---|--|
| Problem | Check | Possible Cause | Action |
| NO COMPRESSOR OPERATION BUT FAN RUNS | No fault LED—Contractor Energized | Open compressor overload | Check for supply voltage at the load side of the contractor. For 3-phase models, check phase rotation and voltage at all three phases. |
| | | Poor wiring connections | Look for signs of heat on the wiring insulation. Check that all wiring connections are secure and properly torqued. |
| | | Burned out compressor | Does compressor hum when power is applied? If not check the resistance of the compressor winding using the values shown in the compressor characteristics chart. Note that the compressor must be cool (70°F) when checking the windings. |
| NO COMPRESSOR OR FAN OPERATION | Power LED blinking steadily | Bad thermostat connection/faulty thermostat | Check thermostat and wiring. Check unit terminal block for 24 VAC between “Y” and “C” and “G” and “C.” |
| | Power LED OFF | Low or no supply power | Ensure that the supply voltage to the unit is within the range shown on the unit data plate. Check for continuity across fuse F4. |
| | | Faulty control transformer | Check for 24 VAC between “R” and “C” on the unit terminal block. For 75 and 100 VA transformers, check that the transformer circuit breaker has not tripped. Check low voltage circuit for overload conditions or short circuits before replacing the transformer. |
| NO FAN OPERATION—ECM CONSTANT AIRFLOW MOTOR | See Action | No fan operation signal | Check for 24 VAC between “G” and “C.” Check all wiring connections. Make sure that the thermostat connection plug is securely connected. |
| | | Loose wiring | Check all wiring connections at motor and control box. Check that power and control harnesses are securely connected. |
| | | Faulty motor | Check supply voltage to the motor. Check that all the motor wires are secure. With the power off, spin the motor shaft—noise, resistance, or uneven motion can be signs of motor failure. |

| Unit Troubleshooting | | | |
|---|---|--|---|
| Problem | Check | Possible Cause | Action |
| FAN OPERATES BUT THE MOTOR DOES NOT CHANGE SPEED—ECM CONSTANT AIRFLOW MOTOR | Is the motor behavior only observed during startup? | Ramp-up programming delays are still in effect | Wait at least 5 minutes after the start-up and then change the fan operation based on thermostat call. |
| | Is the motor not stopping when there is no call for cooling or heating from thermostat? | Thermostat is in continuous fan mode | Change the thermostat setting to ON/OFF (auto) fan operation instead of continuous fan operation. |
| | High-external static | Dirty air filter, closed dampers, grills, dirty air coil | Remove the air filter and check that all of the dampers, register, and grills are open and free flowing. If removing the filter corrects the problem, clean or replace it with a less restrictive filter. Also check and clean as needed the blower wheel and secondary heat exchanger (if applicable). |
| UNIT NOT SHIFTING INTO COOLING AND HEATING | Reversing valve solenoid energized | Faulty solenoid | Check that the reversing valve solenoid is receiving 12 VAC. |
| | | | Check the resistance of the solenoid—an open circuit may indicate a burned out solenoid. |
| | Reversing valve solenoid NOT energized | Miswired/faulty thermostat | Check that the reversing valve thermostat wire is connected to the “O” terminal of the thermostat. |
| | | | Check for a contact closure between “O” and “R.” |
| | Loose wire on “O” terminal | Check that the wires from the thermostat to the unit are securely connected and that the wires from the electrical box to the reversing valve are connected. | |
| EXCESSIVELY COLD SUPPLY AIR TEMPERATURE IN COOLING OR EXCESSIVELY HOT SUPPLY AIR TEMPERATURE IN HEATING | Reduced air flow | Dirty Filter | Replace filter. |
| | | Fan speed too low | Consult blower performance table and increase fan speed if possible. |
| | | Excessive duct pressure drop | Consult blower performance table and increase fan speed if possible. |

| Unit Troubleshooting | | | |
|---|--------------------------------|--|--|
| Problem | Check | Possible Cause | Action |
| EXCESSIVELY WARM SUPPLY AIR TEMPERATURE IN COOLING AND/OR EXCESSIVELY COOL AIR IN HEATING | Air flow too high | Fan speed setting too high | Consult blower performance table and reduce fan speed if possible. |
| | High or low water temperature | Inlet water temperature out of range | Check unit capacity vs. water temperature. |
| | Air leakage | Leaky duct work | Inspect the duct work. |
| | Loss of refrigeration capacity | Low refrigerant | Check refrigerant pressures with gauge set. |
| HIGH HUMIDITY | Air flow is too high | Fan speed setting is too high | Consult the blower performance table and reduce fan speed if possible. |
| | Low refrigeration capacity | Low refrigerant | Check refrigerant pressures with gauge set. |
| | Short cycling | Unit oversized | Check unit performance against building load calculations. |
| Poor thermostat location | | Make sure that the thermostat is not located near a supply air duct. | |
| HIGH-PRESSURE FAULT | Compressor, Loop Pump | Reduced or no water flow | Check pump operation/check flow rate |
| | | Water temperature out of range | Bring water temperature within range. |
| | | Reduced airflow | Check for dirty air filter or coil. Check fan motor operation and airflow restriction. |
| | | Overcharged with refrigerant | Check and service system refrigerant. |
| | | RAT outside of nominal range | Bring air temperature within range. |
| | | Bad high pressure switch | Verify continuity and/or replace switch. |

| Unit Troubleshooting | | | |
|---------------------------|-----------------------|--------------------------------|--|
| Problem | Check | Possible Cause | Action |
| LOW-PRESSURE FAULT | Compressor, Loop Pump | Reduced or no water flow | Check pump operation/check flow rate. |
| | | Water temperature out of range | Bring water temperature within range. |
| | | Reduced airflow | Check for dirty air filter or coil. Check fan motor operation and airflow restriction. |
| | | Undercharged with refrigerant | Check and service system refrigerant. |
| | | RAT outside of nominal range | Bring air temperature within range. |
| | | Bad low pressure switch | Verify continuity and/or replace switch. |
| FREEZE COAXIAL FAULT | Compressor, Loop Pump | Reduced or no water flow | Check pump operation/check flow rate. |
| | | Inadequate antifreeze level | Check antifreeze density with hydrometer/service. |
| | | Temperature limit setting | adjust freeze protection setting 15–26°F. |
| | | Water temperature out of range | Bring water temperature within range. |
| | | Bad thermistor | Check temperature and impedance correlation. Service/replace. |
| CONDENSATE OVERFLOW FAULT | Compressor, Loop Pump | Blocked drain | Check for blockage and clean the drain. |
| | | Improper trap | Check trap dimensions and location ahead of vent. Service/replace. |
| | | Poor drainage | Check pipe sloping and check venting. Service/replace. |
| | | Moisture on sensor | Check for moisture shorting to air coil. Service/replace. |
| | | Plugged air filter | Replace air filter. |
| | | Restricted return air flow | Find and eliminate restriction. Increase return duct/grill size. |

| Unit Troubleshooting | | | |
|---------------------------|---|---|--|
| Problem | Check | Possible Cause | Action |
| BROWNOUT FAULT | Compressor, Loop Pump, Blower, Auxiliary Heat | Nominal voltage below recommended value | Check power supply and 24 VAC voltage before and during operation. Check power supply wire size are in accordance with local codes. Check compressor starting load. Check 24 VAC and unit transformer tap for correct power supply voltage. Service/replace. |
| | | Nominal voltage above recommended value | Check power supply and 24 VAC voltage before and during operation. Check 24 VAC and unit transformer tap for correct power supply voltage. Service/replace. |
| FREEZE EVAPORATOR FAULT | Compressor, Loop Pump | Reduced airflow | Check for dirty air filter or coil. Check fan motor operation and airflow restrictions. |
| | | Undercharged with refrigerant | Check and service system refrigerant. |
| | | RAT outside of nominal range | Bring air temperature within range. |
| | | Bad thermistor | Check temperature and impedance correlation. Service/replace. |
| HIGH-VOLTAGE WARNING | Appliance | Controller sensed power increase of 25% above recommended operation range | Shut down the appliance and check the loop and HRP fuse continuity. Service/replace. |
| NOT COOLING FAULT | Appliance | Discharge temperature greater than return air temperature | Verifying reversing valve operation. Service/replace. |
| HEATING ON COOL DEMAND | Appliance | RAT-DAT <-10°F | Verifying reversing valve operation. Service/replace. |
| NOT HEATING FAULT | Appliance | Discharge temperature less than return air temperature | Loop has reached a temperature outside the unit operating range. Verify reversing valve operation. Service/replace. |
| COOLING ON HEATING DEMAND | Appliance | RAT-DAT >10°F | Loop has reached a temperature outside the unit operating range. Verify reversing valve operation. Service/replace. |
| LWT HIGH-LIMIT TRIP | Warning | High loop temperature detected. LWT above 120°F | Verify loop pump and appropriate water flow. Service/replace. |
| EWT HIGH-LIMIT TRIP | Warning | High loop temperature detected. EWT above 110.5°F. | Verify loop pump and appropriate water flow. Service/replace. |

| Unit Troubleshooting | | | |
|--------------------------------|---------------------------------------|--|--|
| Problem | Check | Possible Cause | Action |
| EWT LOW-LIMIT TRIP | Compressor, Loop Pump, Auxiliary Heat | Low loop temperature detected. Entering water temperature falls below low loop water protection setpoint. $EWT < LLWP$ Setpoint. | Loop has reached a temperature outside the unit operating range compressor has been disabled, and Auxiliary Heat is enabled for heating operation. Loop pump will run to allow loop temperature to recover. |
| NOT COOLING FAULT, $LWT < EWT$ | Warning | LWT is less than EWT | Unit is operating in cooling mode, but LWT is lower than EWT : Check RV. Service/replace. |
| NOT HEATING FAULT, $LWT > EWT$ | Warning | LWT is greater than EWT | Unit is operating in heating mode, but LWT is higher than EWT : Check RV. Service/replace. |
| NO WATERFLOW CONDITION | Compressor, Loop Pump | No water flow has been detected. No difference between LWT and EWT . | Verify water supply and associated components. Verify recommended factory water flow. Verify loop pump, fuse, and operation. Service/replace. |
| WATERFLOW LOW CONDITION | Warning | Low water flow has been detected. Minimal difference between LWT and EWT . | Verify water supply and associated components. Verify recommended factory water flow. Verify loop pump, fuse, and operation. Service/replace. |
| POWER FAILURE DETECTED | Appliance | Controller has sensed sudden power loss. Nominal voltage is lower than 21 VAC. | Check line voltage is between 208–240 VAC. Verify P1 – 1, 2 is greater than 21 VAC. Verify continuity of fuse F4. Service/replace. |
| LOW LOOP WATER FAULT | Compressor, Loop Pump, Auxiliary Heat | LWT has fallen below $LLWP$ setpoint. Controller has initiated Low Loop Water Protection. | Loop has reached a temperature outside the unit operating range, compressor has been disabled, and Auxiliary Heat is enabled for heating operation. Loop pump will run to allow loop temperature to recover. |
| FAN ERROR FAULT | Blower, Compressor | Fan motor is not running. Controller has attempted to start motor and is receiving no feedback signal. | Verify blower line voltage. Verify ECM motor is connected to P4. |
| OVERVOLTAGE | Appliance | Overvoltage condition detected. Power supply voltage is 10% above nominal value. | Check line voltage is between 208–240 VAC. Verify P1 – 1, 2 is 24 VAC. Verify continuity of fuse F4, Service/replace. |
| UNDERVOLTAGE | Appliance | Brownout voltage condition detected. Power supply voltage is 10% below nominal value. | Check line voltage is between 208–240 VAC. Verify P1 – 1, 2 is 24 VAC. Verify continuity of fuse F4, Service/replace. |

Table 11 Unit Troubleshooting

Unit Noise Troubleshooting

| Problem | Mode | | Check | Possible Cause | Action |
|----------------------------|---|--------------------------------------|-----------------------|--|---|
| | Cooling | Heating | | | |
| OBJECTIONABLE NOISE LEVELS | X | X | Air noise | Poor ductwork/ grill design | Ensure the ductwork and grills are properly sized for the unit air flow. |
| | | | | Fan speed setting too high | Consult blower performance table and reduce fan speed if possible. |
| | | | Structure-borne noise | Unit not mounted on full vibration pad | Mount unit on vibration pad. See “Mounting Vertical (VT) Units” on page #16. |
| | | | | Unit not connected with flexible conduit, water lines, and/or ductwork | Install unit in accordance with the instructions on page #8 through page #27. |
| | | | | Unit cabinet touching wall or other building components | Adjust unit location to avoid unit touching structure. |
| | | | X | X | Compressor noise |
| | Scaled or fouled water coil elevating heat pressure | Clean/descale water coil. | | | |
| | Low air flow elevating head pressure | Check filter. Increase fan speed. | | | |
| | X | X | Water hammer | Fast-closing valves installed | Change valves to slow-close type. |

Table 12 Unit Noise Troubleshooting

HRP Troubleshooting

| Problem | Possible Cause | Checks and Corrections |
|---------------------------|-----------------------------------|--|
| NO FLOW LOW FLOW | No Power | Check power supply |
| | 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 undersized 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 |

Table 13 HRP Troubleshooting

Smart Start Assist Troubleshooting

| Red Led | Relay Contact* | Condition | Action |
|------------|----------------|--|---|
| FULLY ON + | 11/12 | Min. recovery time between starts and/or recovery time between stop to start | Auto reset when minimum recovery time elapses |
| 2 FLASHES | 11/14 | Undervoltage (Ue<190VAC) | Auto reset with 5 mins. recovery ** |
| 3 FLASHES | 11/14 | Overcurrent (>80A for >1 sec.) | Auto reset with 5 mins. recovery |
| 4 FLASHES | 11/14 | relay protection | Auto reset with 5 mins. recovery*** |
| 5 FLASHES | 11/14 | incomplete ramp | Auto reset with 5 mins. recovery |
| N/A | 11/12 | Supply phase loss | Physical check |
| N/A | 11/12 | Idle state | |
| N/A | 11/12 | Ramping state | |
| N/A | 11/12 | Bypass mode | |
| Green Led | Relay Contact* | Condition | Action |
| FLASHING | 11/12 | Power supply alarm | Replace Smart Start device |
| FULLY ON | 11/12 | Idle State | RSBS waiting for control signal to start |

+ APPLICABLE TO RSBS2332A2V.2C24HP. FOR MODELS,NO INDICATION ON THE RED LED IS PROVIDED
 *APPLIES ONLY TO RSB23XXA2V22C24..MODELS
 **MONITORED DURING IDLE AND BYPASS
 ***REFER TO NOTE 6 IN MODE OF OPERATION SECTION OF THE SSA IOM
 ****REFER TO VOLTAGE DIPS AND INTERRUPTIONS SECTION FOR MODE OF OPERATION OF THE SSA IOM

Table 14 Smart Start Assist Troubleshooting

Smart Start Assist Flashing Sequence

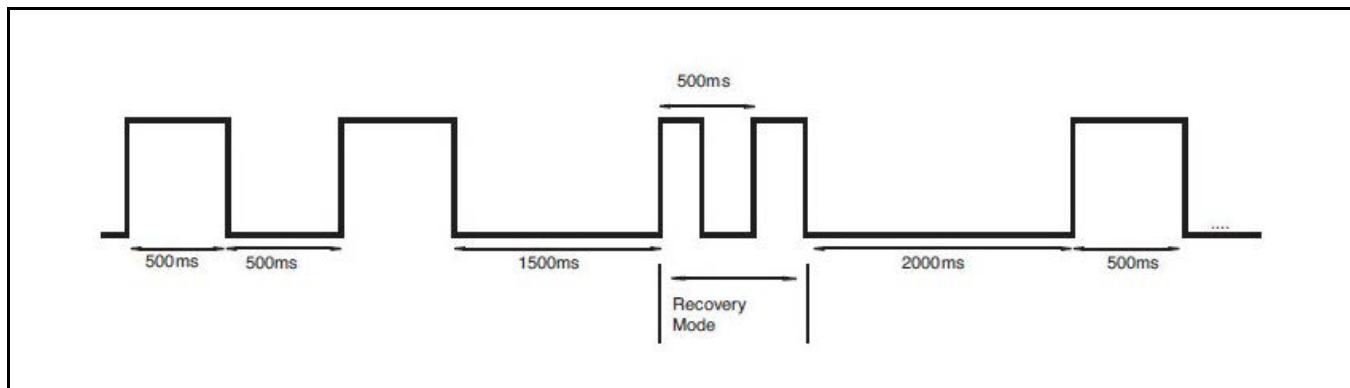


Fig. 72 Smart Start Assist Flashing Sequence



During recovery from an alarm condition, the red LED will flash at twice the normal flashing frequency between successive flashing cycles as shown above to indicate that the Smart Start Assist is in recovery mode, which lasts for five minutes.

Water Side Pressure Drop Table for HZ Units

| MODEL | GPM | Heat Pump Water Pressure Drop | Additional Pressure Drop in Hose Kit* |
|-------|------|-------------------------------------|---------------------------------------|
| | | Water PD @ 77°EWT with Water in PSI | Water PD in PSI |
| SM024 | 3 | 0.7 | 0.04 |
| | 4 | 1.2 | 0.04 |
| | 5 | 1.7 | 0.09 |
| | 6 | 2.4 | 0.09 |
| | 7 | 3.2 | 0.13 |
| | 8 | 4.0 | 0.17 |
| SM036 | 4.5 | 1.3 | 0.09 |
| | 6 | 2.2 | 0.09 |
| | 7.5 | 3.2 | 0.17 |
| | 9 | 4.5 | 0.22 |
| | 10.5 | 5.9 | 0.30 |
| | 12 | 7.5 | 0.35 |
| SM048 | 6 | 1.1 | 0.09 |
| | 8 | 1.8 | 0.17 |
| | 10 | 2.7 | 0.26 |
| | 12 | 3.7 | 0.35 |
| | 14 | 4.9 | 0.48 |
| | 16 | 6.2 | 0.61 |
| SM060 | 7.5 | 1.1 | 0.17 |
| | 10 | 1.9 | 0.26 |
| | 12.5 | 2.8 | 0.39 |
| | 15 | 3.9 | 0.52 |
| | 17.5 | 5.2 | 0.69 |
| | 20 | 6.6 | 0.91 |
| SM070 | 9 | 2.4 | 0.22 |
| | 12 | 4.0 | 0.36 |
| | 15 | 6.0 | 0.53 |
| | 18 | 8.3 | 0.72 |
| | 21 | 3.9 | 0.95 |
| | 24 | 5.0 | 1.21 |

* Hose kit pressure drop based on straight hose. Pressure drop may vary depending on installation of hose kits.

Table 15 Water Side Pressure Drop Table for HZ Units

Water Side Pressure Drop Table for VT Units

| Model | GPM | Heat Pump Water Pressure Drop | Additional Pressure Drop in Hose Kit* |
|-------|------|-------------------------------------|---------------------------------------|
| | | Water PD @ 77°EWT with Water in PSI | Water PD in PSI |
| SM024 | 3 | 0.9 | 0.03 |
| | 4 | 1.5 | 0.05 |
| | 5 | 2.2 | 0.08 |
| | 6 | 3.0 | 0.11 |
| | 7 | 4.0 | 0.14 |
| | 8 | 5.0 | 0.18 |
| SM036 | 4.5 | 0.9 | 0.07 |
| | 6 | 1.5 | 0.11 |
| | 7.5 | 2.2 | 0.16 |
| | 9 | 3.1 | 0.22 |
| | 10.5 | 4.0 | 0.28 |
| | 12 | 5.1 | 0.36 |
| SM048 | 6 | 1.3 | 0.11 |
| | 8 | 2.2 | 0.18 |
| | 10 | 3.3 | 0.26 |
| | 12 | 4.5 | 0.36 |
| | 14 | 5.9 | 0.47 |
| | 16 | 7.6 | 0.59 |
| SM060 | 7.5 | 1.7 | 0.16 |
| | 10 | 2.9 | 0.26 |
| | 12.5 | 4.3 | 0.38 |
| | 15 | 6.0 | 0.53 |
| | 17.5 | 7.9 | 0.69 |
| SM070 | 9 | 2.4 | 0.22 |
| | 12 | 4.0 | 0.36 |
| | 15 | 6.0 | 0.53 |
| | 18 | 8.3 | 0.72 |

* Hose kit pressure drop based on straight hose. Pressure drop may vary depending on installation of hose kits.

Table 16 Water Side Pressure Drop Table for VT Units

MAINTENANCE



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

1. Filter changes or cleaning are required at regular intervals. The time period between filter changes will depend upon type of environment where the equipment is used. 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 need to be as frequent as bi-weekly.

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

2. An annual “checkup” by a trained and qualified HVAC mechanic is required. We recommend completing the check-out sheet on page #79 when performing the annual maintenance checkup. Recording the performance measurements of volts, amps, and water temperature differences for 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. Check the condensate drain twice a year by cleaning and flushing to ensure 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. Have the mechanic complete the unit checkout sheet located on page #79 and call 866-642-3198 for support.

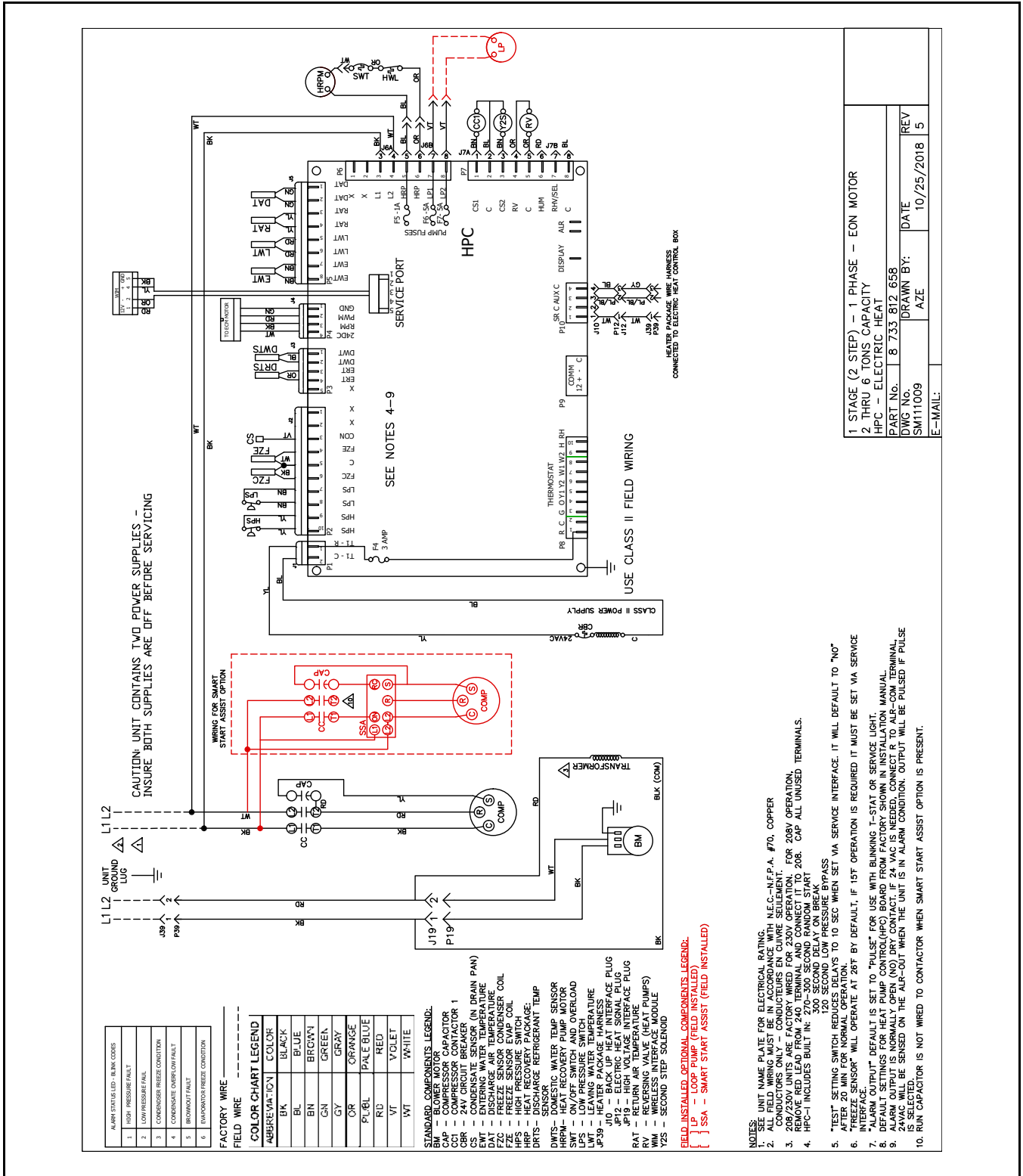


Fig. 74 One Stage (2-Step) Single-Phase Unit with EON Motor and Electric Heat



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

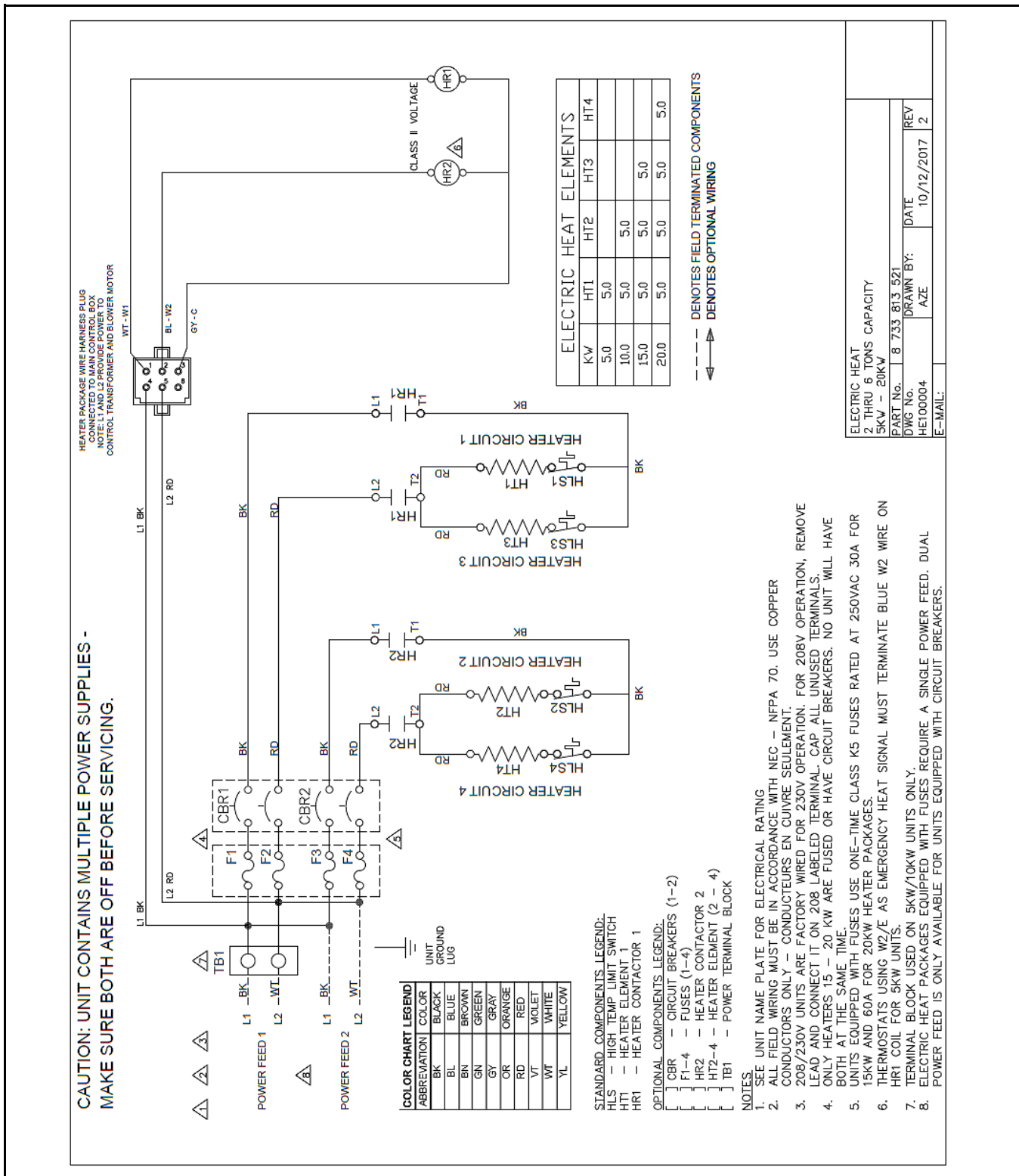


Fig. 75 Electric Heat Wiring



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

THERMOSTAT CONNECTIONS

The HPC is equipped with standard coded thermostat interface connectors. Refer to the figures below.

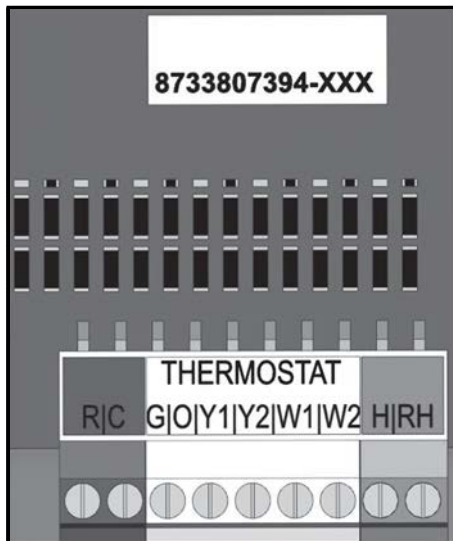


Fig. 76 HPC Thermostat Connector

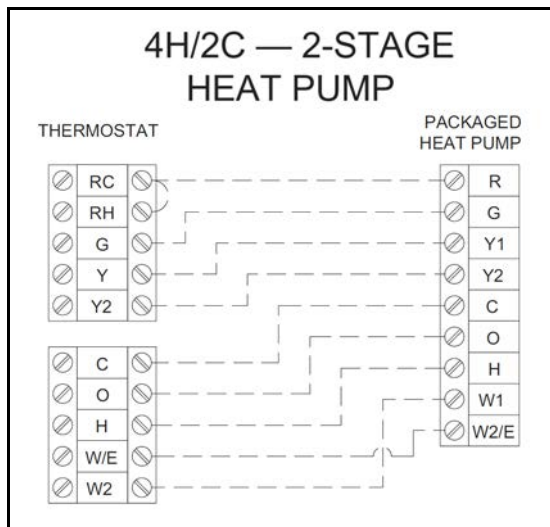


Fig. 77 Generic Thermostat Connections



When using a 2-cool, 3-heat thermostat both the W1 and W2 on the Heat Pump and W2 and EM on the thermostat must be connected together via a jumper.

The HPC also provides visual indication (Green LED) when the Thermostat has a call for a signal.

ALARM TERMINAL WIRING

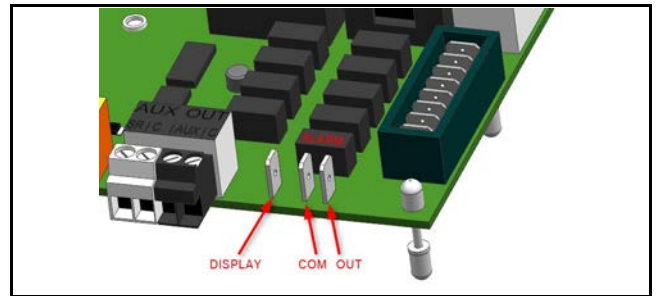


Fig. 78 Alarm Terminal Connectors on the HPC Board

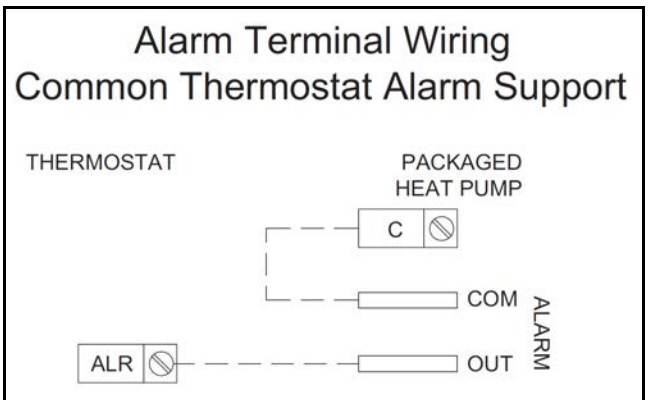


Fig. 79 Generic Thermostat Connections

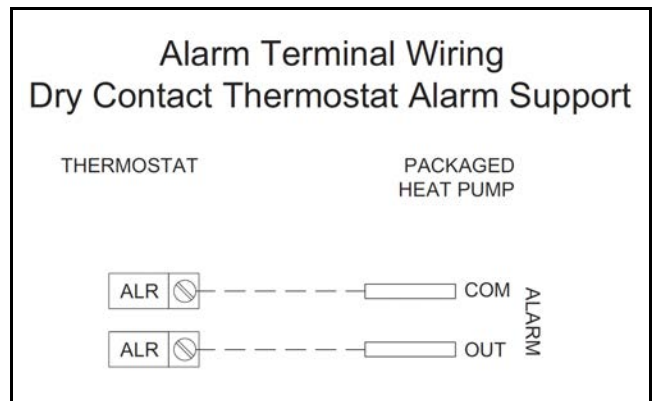


Fig. 80 Alarm Support for Dry Contact Thermostats

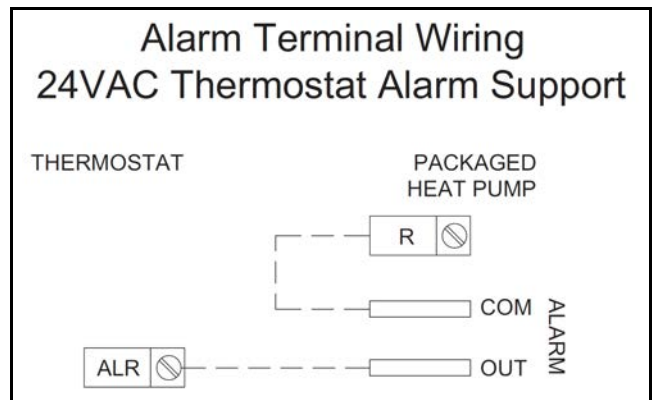
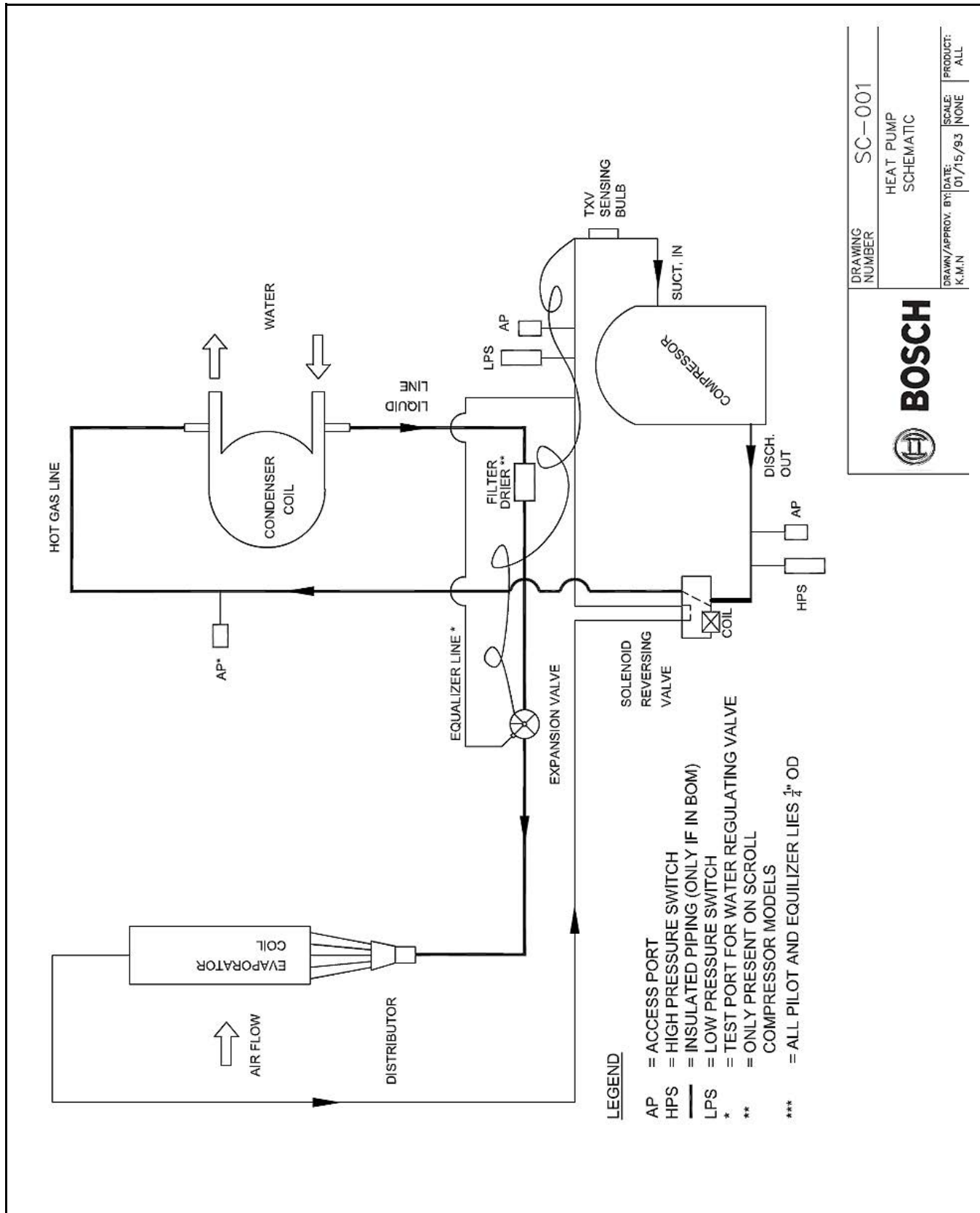


Fig. 81 Alarm Support for 24VAC Thermostats

Basic Piping Diagram



| | |
|---------------------|----------|
| DRAWING NUMBER | SC-001 |
| HEAT PUMP SCHEMATIC | |
| DRAWN/APPROV. BY: | K.M.N. |
| DATE: | 01/15/93 |
| SCALE: | NONE |
| PRODUCT: | ALL |



Fig. 82 Basic Piping Diagram

DIMENSIONAL DRAWINGS

Horizontal—Straight-Through Configuration

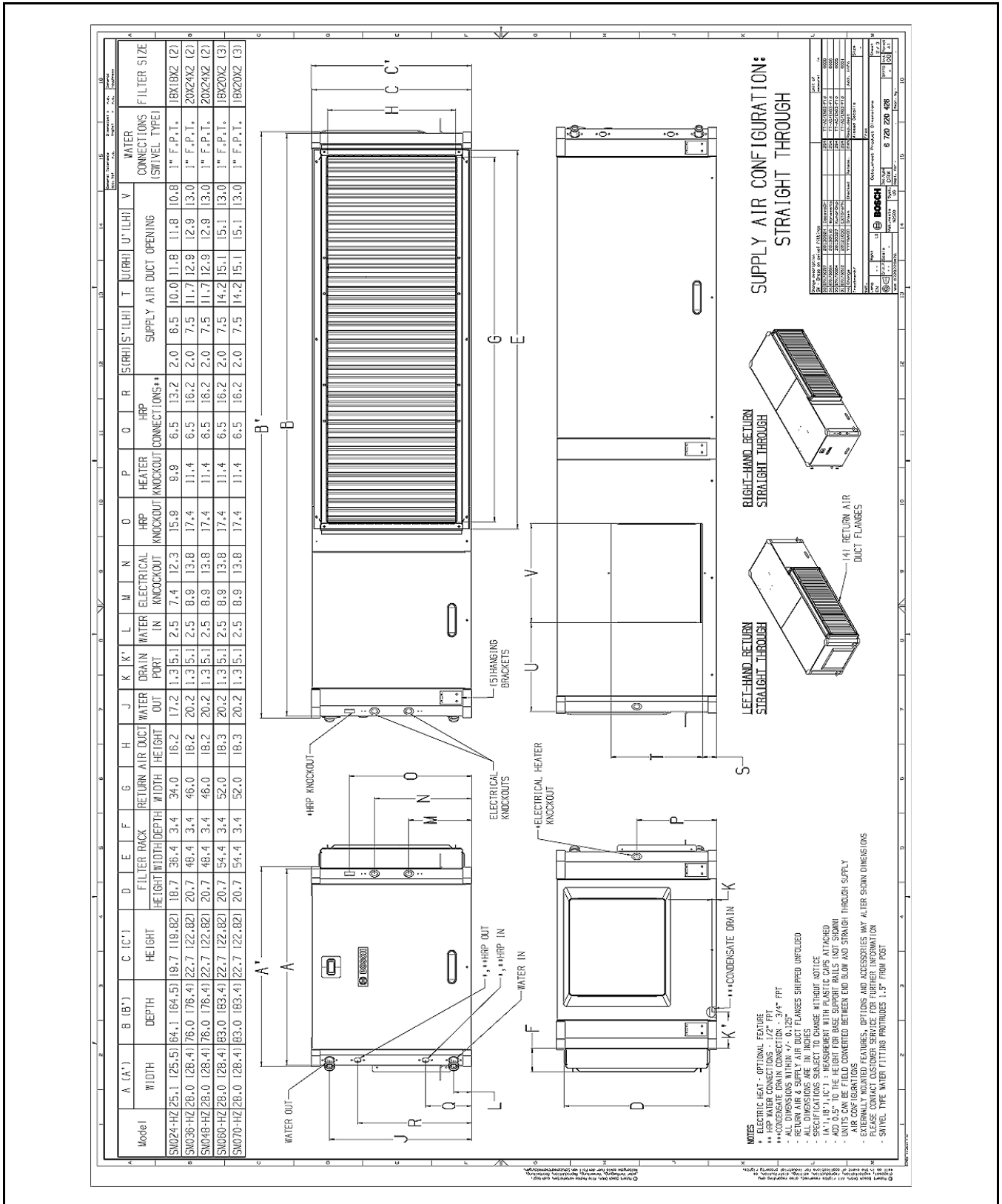


Fig. 83 HZ Straight-Through Configuration

Horizontal Hanging Bracket Locations

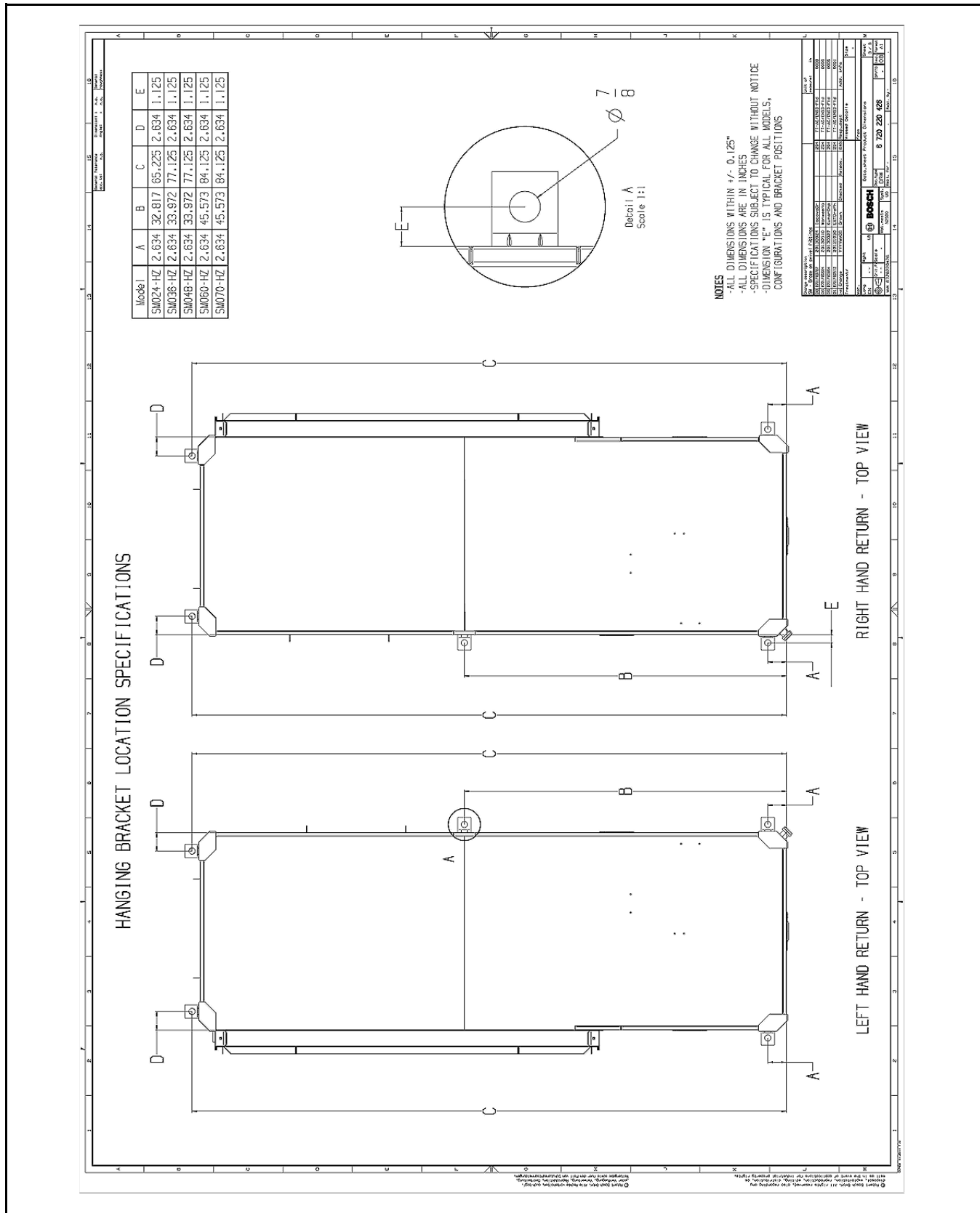


Fig. 84 HZ Hanging Bracket Locations

EXPLODED VIEWS

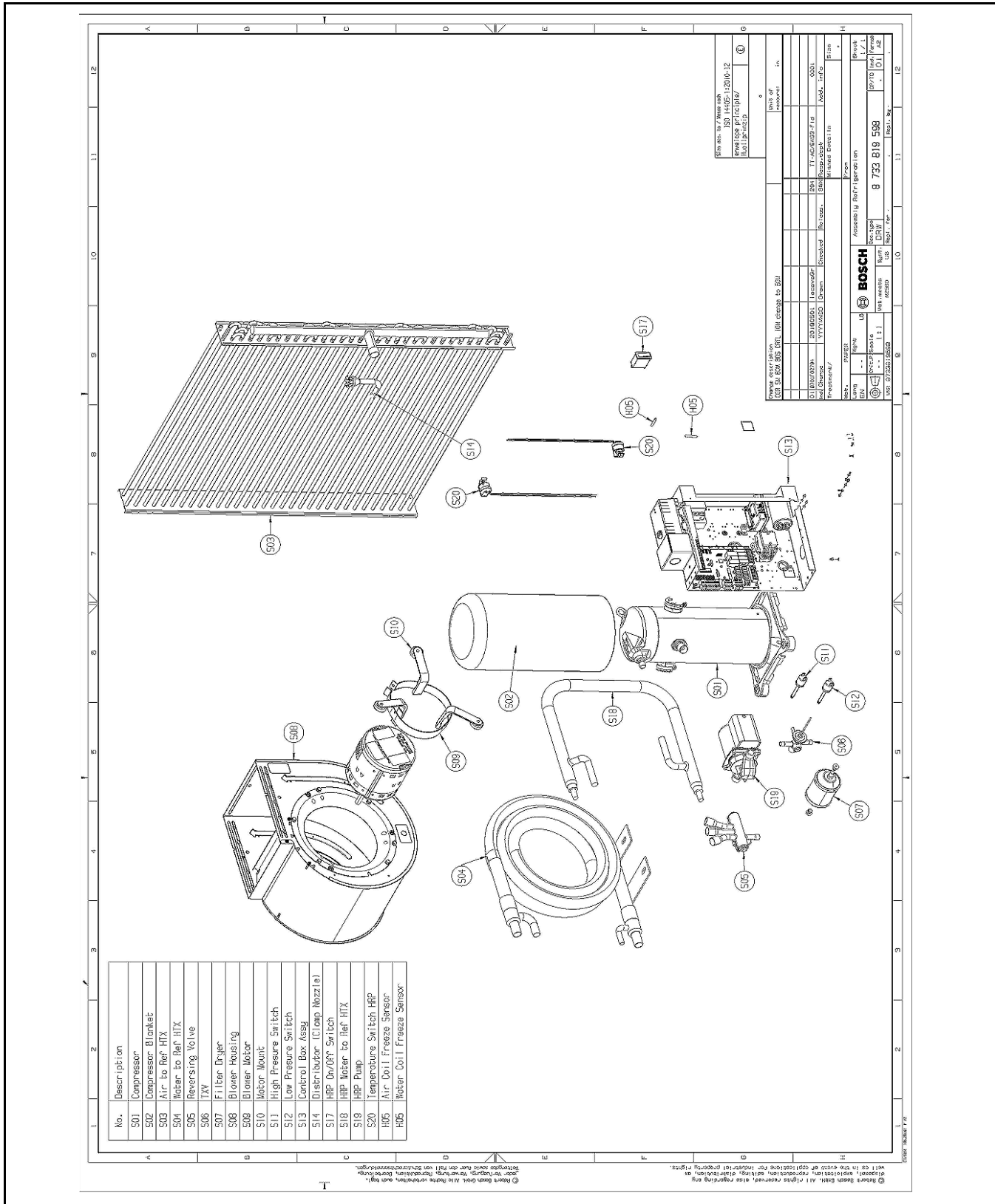


Fig. 86 Exploded View

HZ Unit Exploded View

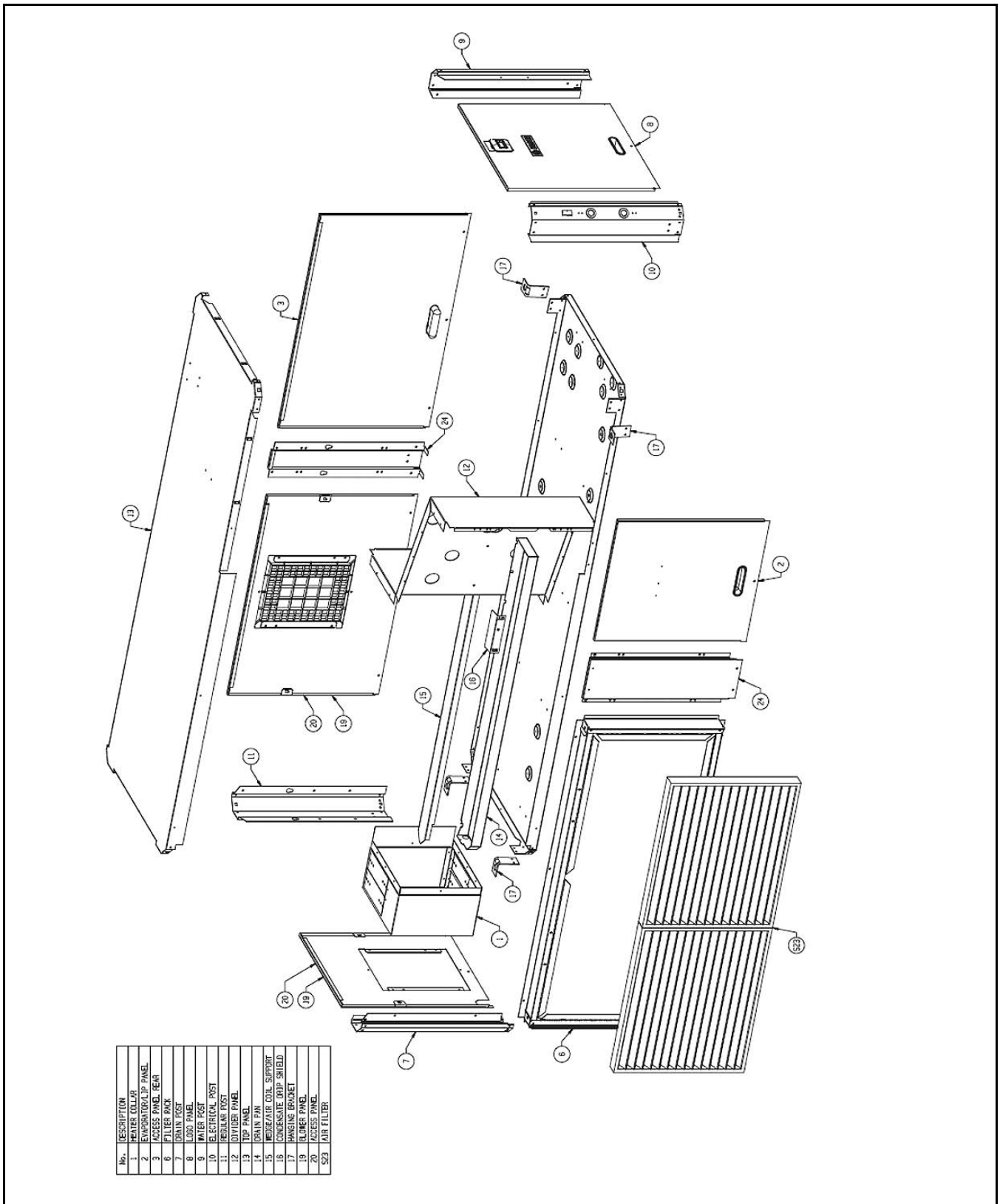
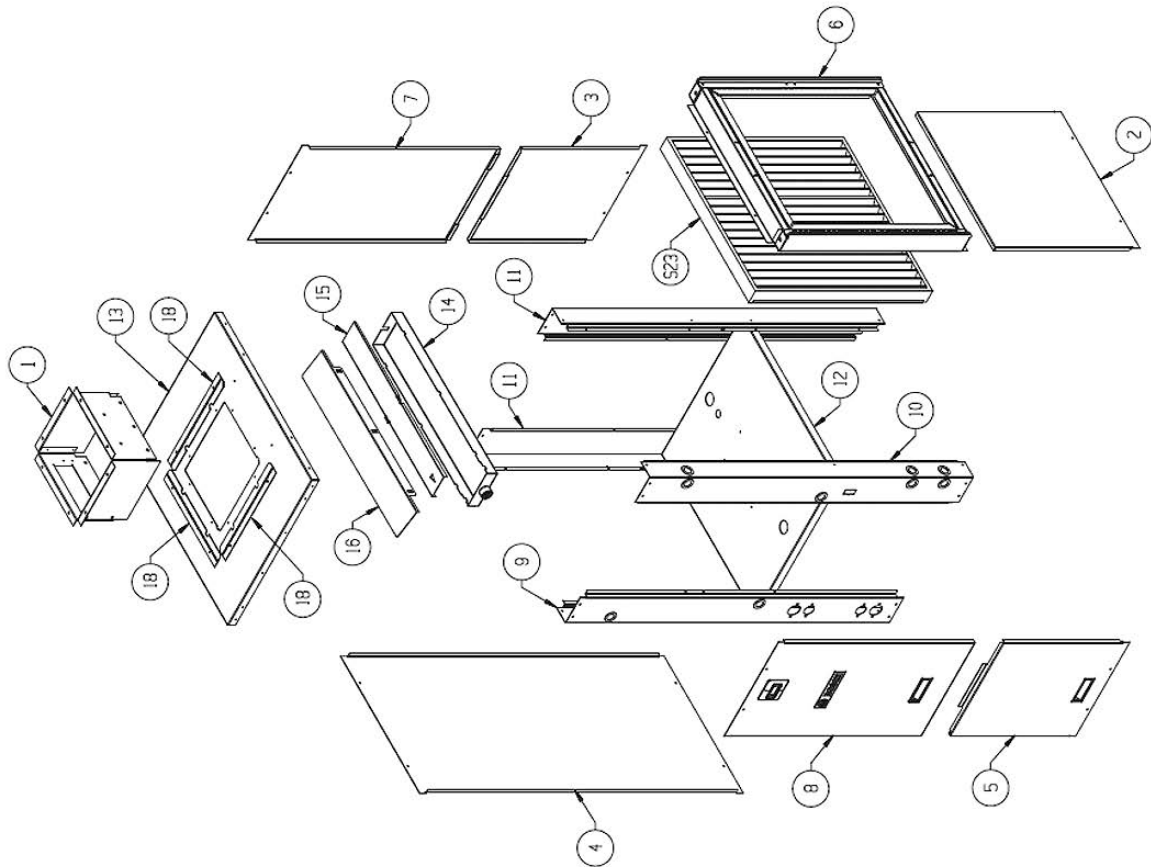


Fig. 87 HZ Exploded View

VT Unit Exploded View



| No. | DESCRIPTION |
|-----|------------------------|
| 1 | HEATER COLLAR |
| 2 | EVAPORATOR/LIP PANEL |
| 3 | ACCESS PANEL REAR |
| 4 | SIDE PANEL FULL |
| 5 | ACCESS PANEL |
| 6 | FILTER RACK |
| 7 | REAR PANEL |
| 8 | LOGO PANEL |
| 9 | WATER POST |
| 10 | ELECTRICAL POST |
| 11 | REGULAR POST |
| 12 | DIVIDER PANEL |
| 13 | TOP PANEL |
| 14 | DRAIN PAN |
| 15 | WEDGE/AIR COIL SUPPORT |
| 16 | CONDENSATE DRIP SHIELD |
| 18 | DUCT COLLAR |
| S23 | AIR FILTER |

Fig. 88 VT Exploded View

TERMINOLOGY

Acronyms

AHJ – Authority Having Jurisdiction

ASC – Anti-Short Cycle

CFM – Cubic Feet per Minute

COP – Coefficient of Performance. The COP provides a measure of performance for heat pumps that is analogous to thermal efficiency for power cycles.

DAT – Discharge Air Temperature

DRT – Discharge Refrigerant Temperature

DWT – Domestic Water Temperature

ECM – Electronically Commutated Motor

EER – Energy Efficiency Ratio

EWT – Entering Water Temperature

FLA – Full Load Amps

FZC – Freeze Coax Temperature

GLHP – Ground Loop Heat Pump

HP – Heat Pump

HPC – Heat Pump Controller

HPS – High Pressure Switch

HRP – Heat Recovery Package

IOM – Installation, Operation, and Maintenance Manual

LED – Light Emitting Diode

LLWPC – Low-Loop Water Protection Control

LPS – Low Pressure Switch

LRA – Locked Rotor Amps

LWT – Leaving Water Temperature

NPA – Name Plate Amps

PCB – Printed Circuit Board

(R/A) – Return Air

RAT – Return Air Temperature

RLA – Running Load Amps

SSA – Smart Start Assist

SSID – Service Set Identifier

WDT – Watch Dog Timer

Wi-Fi – Wireless Network

WIM – Wireless Interface Module

Terms

Conditioned space – Space within a building provided with heated or cooled air or both (or surfaces) and, where required, with humidification or dehumidification means to maintain conditions for an acceptable thermal environment.

Decommissioning – Means the final shut-down and removal from operation or usage of a product or piece of equipment containing fluorinated greenhouse gases.

Discharge Pressure – Referring to the pressure leaving compressor.

Reclamation – Means the reprocessing of a recovered fluorinated greenhouse gas in order to match the equivalent performance of a virgin substance, taking into account its intended use.

Recovery – Referring to the collection and storage of fluorinated-greenhouse gases from products (including containers and equipment) during maintenance or servicing or prior to the disposal of the products or equipment.

Recycling – Referring to the reuse of a recovered fluorinated-greenhouse gas following a basic cleaning process.

Repair – Referring to the restoration of damaged or leaking products or equipment that contain, or whose functioning relies upon, fluorinated-greenhouse gases, involving a part containing or designed to contain such gases.

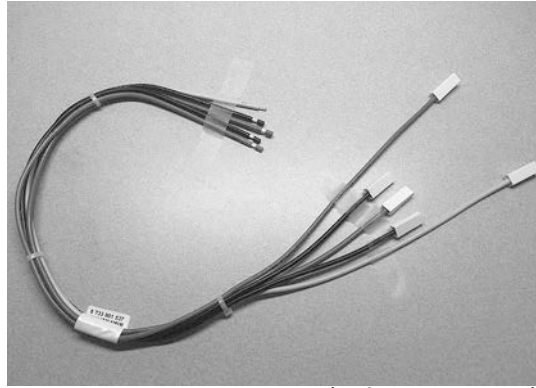
Suction Pressure – Referring to the pressure entering compressor.

SPARE PARTS LIST

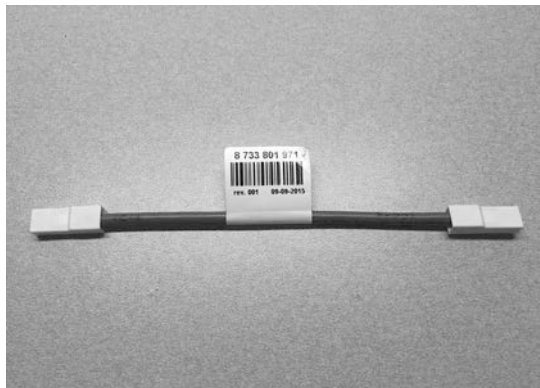
Wiring Harness



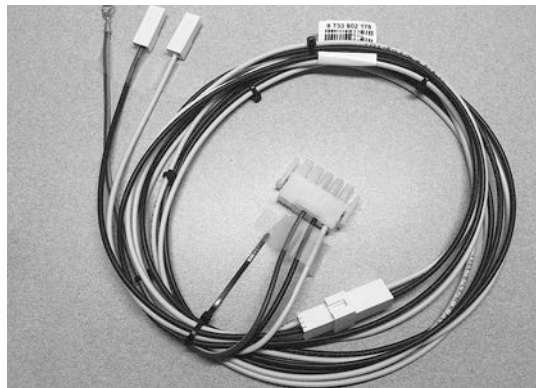
8733802671 SP Harness (Ref. #8733819378)



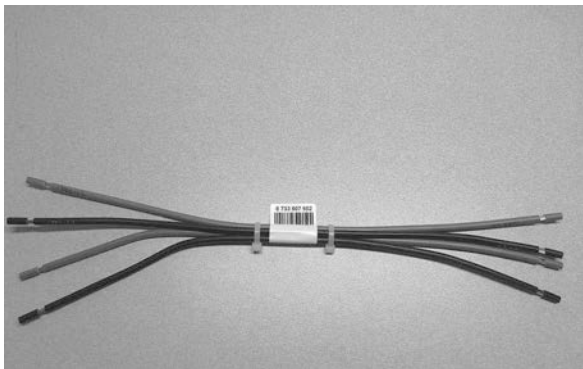
8733933738 SP Harness (Ref. #8733801537)



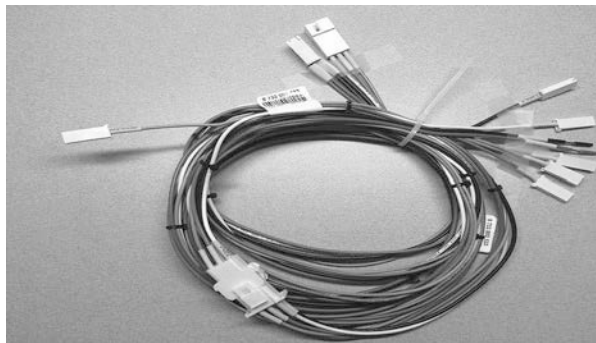
8733933755 SP Harness (Ref. #8733801971)



8733904563 SP Harness (Ref. #8733802178)



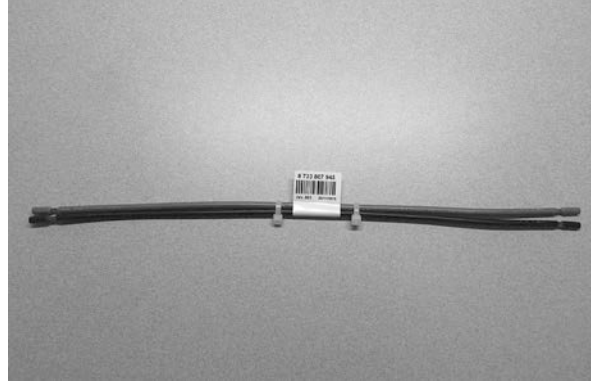
8733933912 SP Harness (Ref. #8733807952)



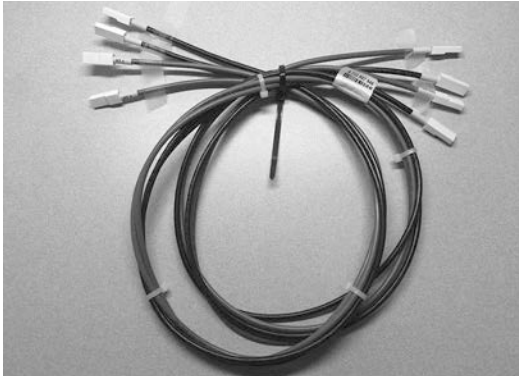
8733933761 SP Harness (Ref. #8733802133)



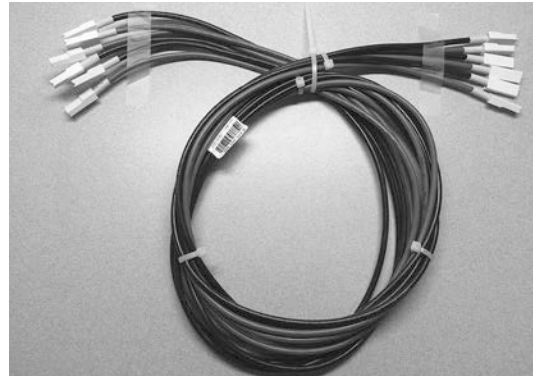
8733933897 SP Harness (Ref. #8733807732)



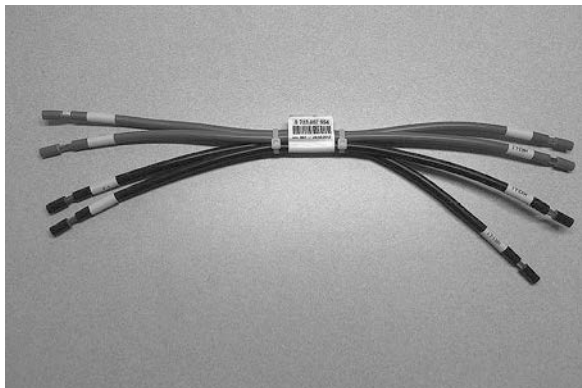
8733933907 SP Harness (Ref. #8733807945)



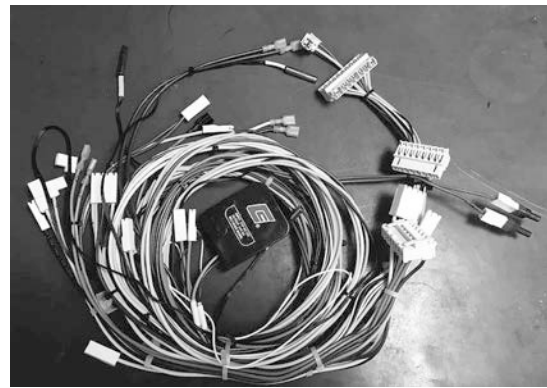
8733933908 SP Harness (Ref. #8733807946)



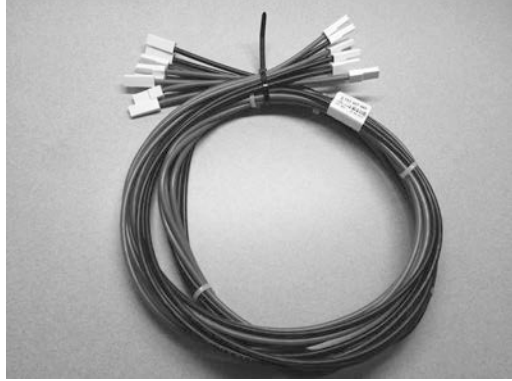
8733933910 SP Harness (Ref. #8733807948)



8733933914 SP Harness (Ref. #8733807954)



8733940330 SP Harness (Ref. #8733812173)



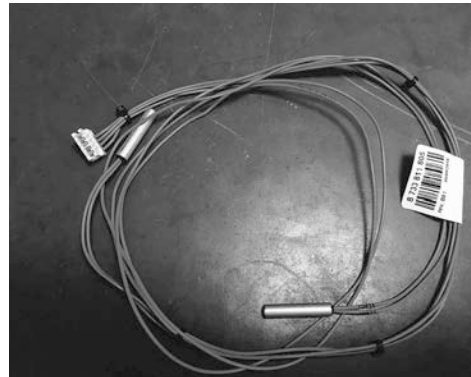
8733933911 SP Harness (Ref. #8733807950)



8733916835 SP Harness (Ref. #8733810489)



87339802783 SP Harness (Ref. #8733815708)



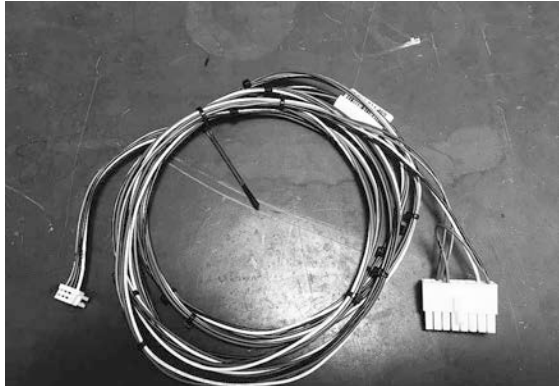
8733948333 SP Harness (Ref. # 8733811805)



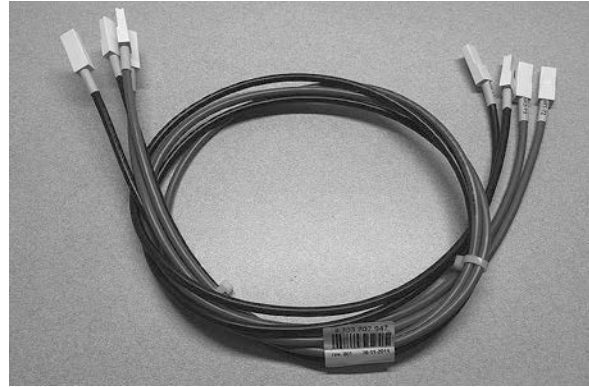
8733942486 SP Harness (Ref. # 8733811804)



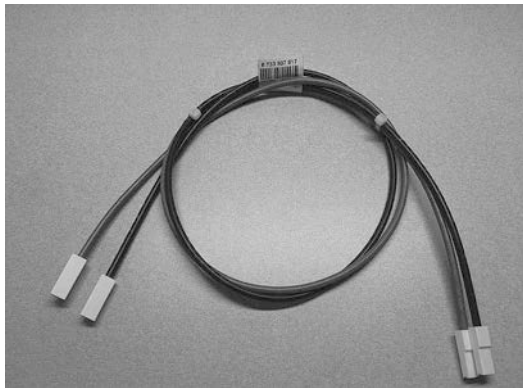
8733908133 SP Harness (Ref. # 8733815707)



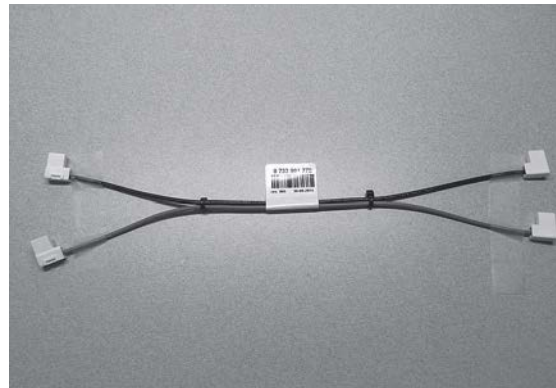
8733948332 SP Harness (Ref. #8733811469)



733933909 SP Harness (Ref. #8733807947)



8733933904 SP Harness (Ref. #8733807817)



8733802675 SP Harness (Ref. #8733901778)

Electrical Box Typical Layout and Spare Parts List

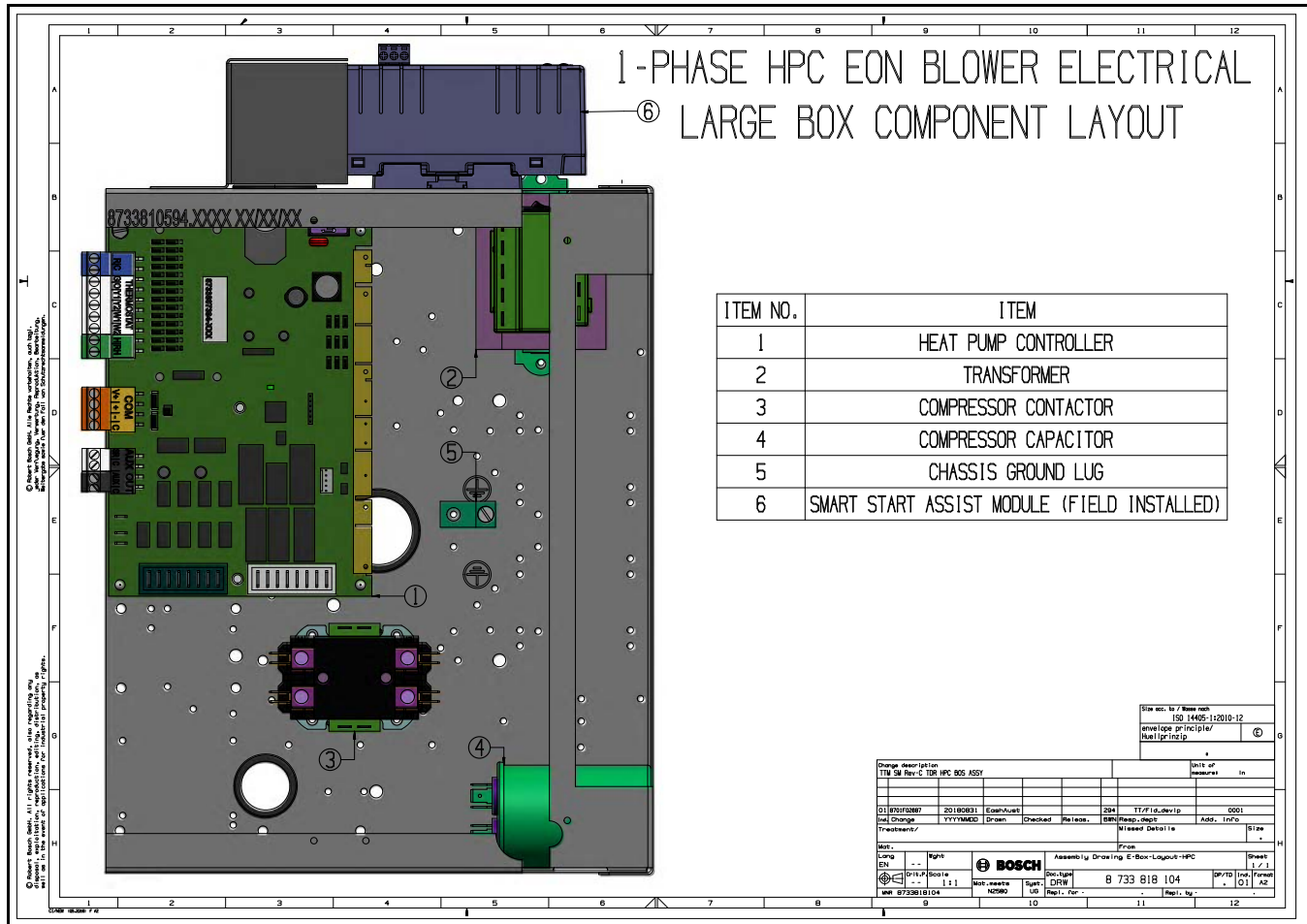


Figure # 89 Typical Electrical Box Layout

Table 17: Electrical Box Spare Part List

| # | Description | Part Number |
|---|--------------------|--|
| 3 | Contractor | 8733907959—Contactor 40A 2-Pole |
| 1 | Control Board | 8733807394—Heat Pump Controller |
| 2 | Transformers | 8733802669—Transformer 75 VA 208/240 |
| 2 | Transformers | 8733933694—Transformer 75VA - 120—208—240—480V |
| 4 | Capacitors & Boots | 8733802668—Capacitor 35/370 |
| 4 | Capacitors & Boots | 8733802759—Capacitor 40/370 |
| 4 | Capacitors & Boots | 8733802760—Capacitor 30/370 |
| 4 | Capacitors & Boots | 8733802761—Capacitor 40/440 |
| 7 | Smart Start Cntl | 8733920430—Control Unit Smart Start Assist |

Table 17: Electrical Box Spare Part List

| # | Description | Part Number |
|-----|------------------------|--------------------------------------|
| 5 | Ground Lugs | 8733908044–Terminal Ground Lug |
| N/A | Heater Elements | 8733907944–Heater 5KW Insert |
| N/A | Heater Elements | 8733907946–Heater 10KW Insert |
| N/A | Terminal Blocks (High) | 8733908032–Terminal |
| N/A | Fuse Blocks | 8733802802–Fuse Block Dual 60A–30A |
| N/A | Fuse Blocks | 8733906362–Fuse Block Dual 60A |
| N/A | Fuses | 8733908200–Fuse 60 AMP |
| N/A | Fuses | 8733935561–Fuse 30 Amp |
| N/A | WIM | 8733948331–Wireless Interface Module |

REFRIGERATION COMPONENTS**Rev. C HZ****Table 18: Rev. C HZ Refrigeration Components**

| # | Part Group | SM024-1HZ*-*A | SM036-1HZ*-*A | SM048-1HZ*-*A | SM060-1HZ*-*A | SM070-1HZ*-*A |
|-----|-------------------------|---------------|---------------|---------------|---------------|---------------|
| S01 | Compressor | T111105489 | T111105413 | T111105414 | T111105415 | T111105490 |
| S03 | Air to Ref HTX | 8733929998 | 8733929642 | 8733929642 | 8733929999 | 8733929999 |
| S04 | Water to Ref HTX (Cu) | 8733929626 | 8733929625 | 8733929623 | 8733929627 | 8733929622 |
| S04 | Water to Ref HTX (CuNi) | 8733929628 | 8733929629 | 8733929624 | 8733929630 | 8733929631 |
| S05 | Reversing Valve | 8733930009 | 8733907671 | 8733907670 | 8733907670 | 8733907670 |
| S06 | TXV | 8733930004 | 8733930005 | 8733930006 | 8733930008 | 8733930010 |
| S07 | Filter Dryer | 8733802650 | 8733802650 | 8733802650 | 8733802650 | 8733802650 |
| S08 | Blower Housing | 8733802657 | 8733802745 | 8733802745 | 8733802746 | 8733802746 |
| S09 | Blower Motor | 8733802693 | 8733802784 | 8733802785 | 8733802786 | 8733802787 |
| S10 | Blower Motor Mounts | 8733908418 | 8733908418 | 8733908418 | 8733908418 | 8733908418 |
| S10 | Blower Motor Mounts | 8733916152 | 8733916153 | 8733916153 | 8733916153 | 8733916153 |
| S11 | High Pressure Switch | 8733802652 | 8733802652 | 8733802652 | 8733802652 | 8733802652 |
| S12 | Low Pressure Switch | 8733802651 | 8733802651 | 8733802651 | 8733802651 | 8733802651 |
| S14 | Distributor Clamp | 8733933702 | 8733933702 | 8733933702 | 8733933742 | 8733933707 |
| S14 | Distributor Nozzle | 8733933704 | 8733933705 | 8733933706 | 8733933748 | 8733933742 |
| S16 | Shraeder Valves | 8733907804 | 8733907804 | 8733907804 | 8733907804 | 8733907804 |
| S17 | HRP Switch | 8733908203 | 8733908203 | 8733908203 | 8733908203 | 8733908203 |
| S18 | HRP Water to Ref HTX | 8733929618 | 8733929618 | 8733929618 | 8733929619 | 8733929619 |
| S19 | HRP Pump | 8733907663 | 8733907663 | 8733907663 | 8733907663 | 8733907663 |
| S20 | Temperature Switches | 8733908087 | 8733908087 | 8733908087 | 8733908087 | 8733908087 |
| S20 | Temperature Switches | 8733908136 | 8733908136 | 8733908136 | 8733908136 | 8733908136 |
| S21 | Diff Pres Switch | 8733908153 | 8733908153 | 8733908153 | 8733908153 | 8733908153 |
| S23 | Air Filters | 8733911386 | 8733920334 | 8733920334 | 8733911390 | 8733911390 |

Rev. C VT**Table 19: Rev. C VT Refrigeration Components**

| # | Part Group | SM024-1HZ*-A | SM036-1HZ*-A | SM048-1HZ*-A | SM060-1HZ*-A | SM070-1HZ*-A |
|-----|-------------------------|--------------|--------------|--------------|--------------|--------------|
| S01 | Compressor | T111105489 | T111105413 | T111105414 | T111105415 | T111105490 |
| S02 | Compressor Blanket | 8733906355 | 8733906355 | 8733906355 | 8733906355 | 8733906355 |
| S03 | Air to Ref HTX | 8733942480 | 8733942481 | 8733942481 | 8733942482 | 8733942482 |
| S04 | Water to Ref HTX (Cu) | 8733942466 | 8733942467 | 8733942468 | 8733942469 | 8733942469 |
| S04 | Water to Ref HTX (CuNi) | 8733942470 | 8733942471 | 8733942472 | 8733942473 | 8733942473 |
| S05 | Reversing Valve | 8733930009 | 8733907670 | 8733907670 | 8733907670 | 8733907670 |
| S06 | TXV | 8733942474 | 8733942475 | 8733942476 | 8733942477 | 8733942478 |
| S07 | Filter Dryer | 7738005186 | 8733927516 | 8733927516 | 8733927516 | 8733927516 |
| S08 | Blower Housing | 8733942483 | 8733942484 | 8733942484 | 8733942484 | 8733942484 |
| S09 | Blower Motor | 8733942490 | 8733942491 | 8733942492 | 8733942493 | 8733942494 |
| S10 | Blower Motor Mounts | 8733802661 | 8733908418 | 8733908418 | 8733908418 | 8733908418 |
| S10 | Blower Motor Mounts | 8733908418 | 8733916153 | 8733916153 | 8733916153 | 8733916153 |
| S11 | High Pressure Switch | 8733802652 | 8733802652 | 8733802652 | 8733802652 | 8733802652 |
| S12 | Low Pressure Switch | 8733802651 | 8733802651 | 8733802651 | 8733802651 | 8733802651 |
| S15 | Condensate Sensor | 8733933701 | 8733933701 | 8733933701 | 8733933701 | 8733933701 |
| S16 | Shraeder Valves | 8733907804 | 8733907804 | 8733907804 | 8733907804 | 8733907804 |
| S17 | HRP Switch | 8733908203 | 8733908203 | 8733908203 | 8733908203 | 8733908203 |
| S18 | HRP Water to Ref HTX | 8733907523 | 8733907524 | 8733907524 | 8733907524 | 8733907524 |
| S19 | HRP Pump | 8733942479 | 8733942479 | 8733942479 | 8733942479 | 8733942479 |
| S20 | Temperature Switches | 8733908087 | 8733908087 | 8733908087 | 8733908087 | 8733908087 |
| S20 | Temperature Switches | 8733908136 | 8733908136 | 8733908136 | 8733908136 | 8733908136 |
| S23 | Air Filters | 8733927483 | 8733920364 | 8733920364 | 8733927485 | 8733927485 |

DECOMMISSIONING INFORMATION

Only trained and qualified technicians are allowed to decommission and dispose of equipment following the requirements of the Local Authority Having Jurisdiction (AHJ).



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

Protecting the Environment



By disposing of this product correctly you will help ensure that the waste undergoes the necessary treatment, recovery, and recycling, thus preventing potentially negative effects on the environment and human health, which could otherwise arise due to inappropriate waste handling.

Components



Many parts in the Heat Pump can be fully recycled at the end of the product life. Contact your city authorities for information about the disposal of recyclable products.

Refrigerant



At the end of the service life of this appliance, and prior to its environmental disposal, a person qualified to work with refrigerant circuits and [AHRI Certified](#)[®] Refrigerant Recovery/ Recycling Equipment must recover the refrigerant from within the sealed system.

Hazardous Waste



Some components in the Heat Pump may be considered as hazardous waste, such as batteries. For their disposal contact your local household hazardous waste collection site.

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) _____

Maximum Circuit Ampacity _____

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) | _____ | _____ |
| Compressor Volts / Amps | _____ / _____ | _____ / _____ |
| Blower Motor Volts / Amps | _____ / _____ | _____ / _____ |
| Source Fluid Type | _____ | _____ |
| Fluid Flow (gpm)* | _____ | _____ |
| Fluid Side Pressure Drop* | _____ | _____ |
| Suction / Discharge Pressure (psig)* | _____ / _____ | _____ / _____ |
| Suction / Discharge Temp* | _____ / _____ | _____ / _____ |
| Suction Superheat* | _____ | _____ |
| Entering TXV / Cap Tube Temp* | _____ | _____ |
| Liquid Subcooling* | _____ | _____ |

* Required for Troubleshooting ONLY

Auxiliary Heat

Unit Make _____

Model Number _____ Serial Number _____

Max Fuse Size (Amps) _____

Volts / Amps _____

Entering Air Temperature _____

Leaving Air Temperature _____

EASYSTART CHECK-OUT SHEET

| EasyStart Configuration | Default Value | New Value |
|---------------------------------------|----------------------|------------------|
| Freeze Protection Strategy | 26°F | |
| Cooling CFM per TON | 400 CFM/Ton | |
| Heating CFM per TON | 375 CFM/Ton | |
| Fan Only CFM reduction | 80% | |
| Dehumidification CFM reduction | 15% | |
| Heat Recover Package | Disabled | |
| Heat Recovery Setpoint | 120°F | |
| Heat Recovery Sample Rate | 3 Samples/Hr | |
| Electric Heat Size | None | |
| Low Loop Water Protection | Disabled | |
| Low Loop Control Setpoint | 34°F | |
| Loop Pump Compressor Delay | 30s | |
| Mode of Compressor Operation | Comfort | |
| Down-Staging | Unlatched | |
| Number of Lockouts | 3 Strikes | |
| Lockout Reset | (Y1) | |
| Units of Temperature | °F | |
| Alarm Type | Pulse | |
| High Efficiency Mode | Disabled | |

NOTES



BOSCH

Bosch Thermotechnology Corp.
65 Grove Street, Watertown, MA 02472
Phone: +1 (800) 283-3787 | Fax: +1 (603) 965-7568
www.bosch-climate.us.com
Revised 02/19

8733819578

