

GreenSource i Series SV Model



BOSCH

Installation and Maintenance Manual

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KEY TO SYMBOLS

Warnings



Warnings in this document are identified by a warning triangle printed against a grey 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 hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, 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.



DANGER: Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.



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.



WARNING: 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.

MODEL NOMENCLATURE

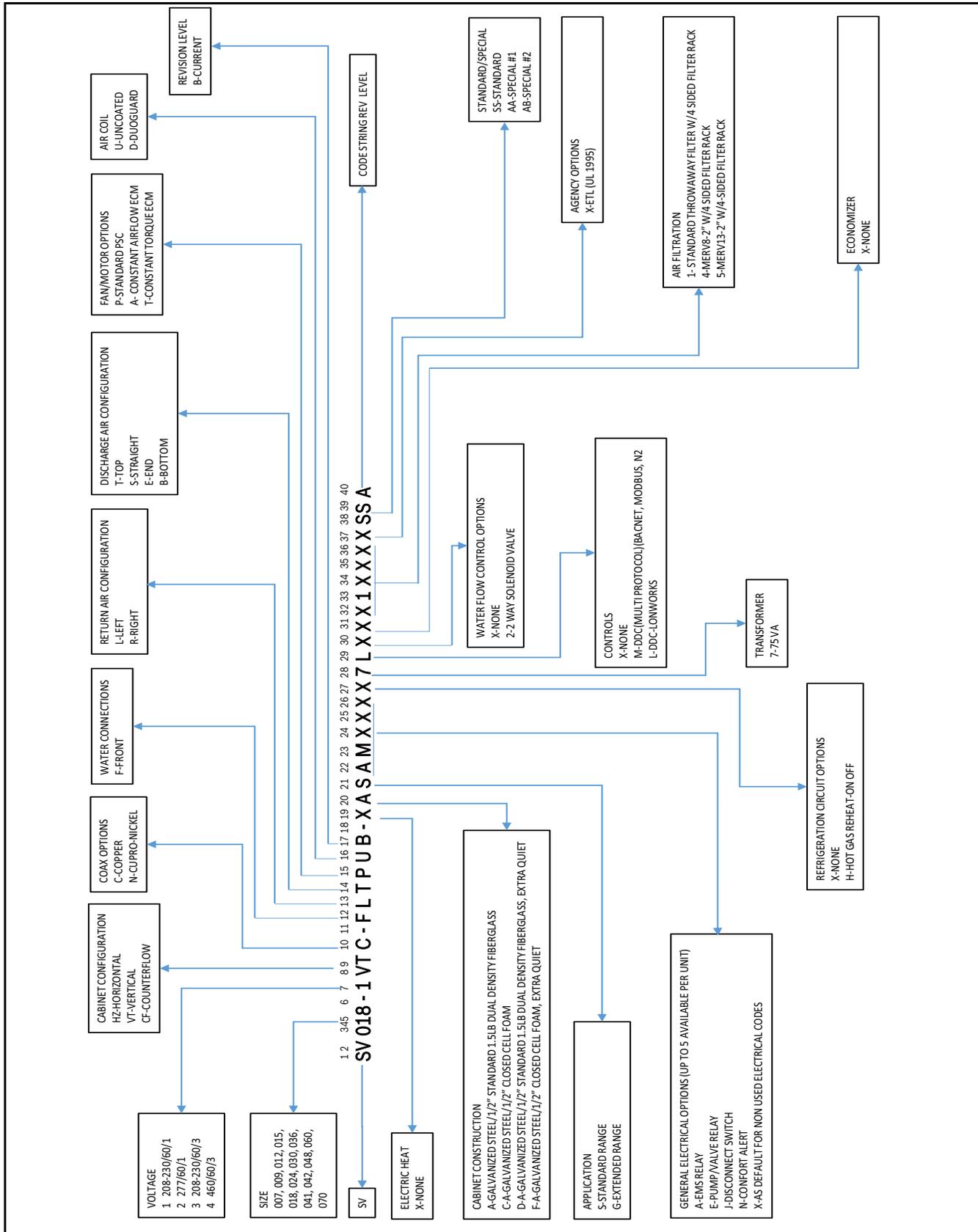


Figure # 1

Not all Options are available on all models.

GENERAL DESCRIPTION

The SV series water-to-air heat pump provides an unmatched combination of performance, features and flexibility for both high performance new construction applications and replacement of existing water-to-air heat pumps. All units are certified by the Air conditioning, Heating and Refrigeration Institute (AHRI) to AHRI/ANSI/ASHRAE/ISO standard 13256-1 for water-to-air and brine-to-air heat pumps at both Water Loop Heat Pump and Ground Loop Heat Pump application points.

All Water-to-Air Heat Pumps conform to UL 1995 standard and are certified to CAN/CSA C22.2 No 236 by Intertek-ETL.

These units meet all current applicable requirements of ASHRAE 90.1.

SV series units are designed to operate with entering fluid temperatures between 50°F and 100°F in cooling and 50°F and 80°F in heating with the base configuration. With the extended range option, SV series models can operate with entering fluid temperatures between 50°F and 110°F in cooling and between 20°F and 80°F in heating. SV units can accommodate a wide range of air temperatures, however, standard SV models should not be used for 100% outside air without consulting the factory applications group. 100% outside air routinely requires higher levels of dehumidification than is available from equipment designed for return air applications.

SV series units are available in three basic configurations: vertical top supply air (VT), horizontal end supply air or straight through supply air (HZ) and counter flow down supply air (CF). Each of these configurations are available with either left or right hand return air. HZ models can have the supply air field converted from end discharge air to straight through with no extra parts required.

SV units are designed and rated for indoor installation only. SV units should not be installed in environments that fall below freezing or exceed 100°F ambient. SV cabinets are constructed of heavy gauge galvanized steel and will resist most common types of corrosion for the life of the equipment.

SV series units are offered with a wide range of factory installed options including: PSC, constant torque ECM or constant air flow ECM fan motors; hot gas reheat; hot gas bypass; internal 2 way valves; tin plated air coils; 2"4-sided filter racks; MERV 13 filters (with constant airflow ECM motors); on board DDC controls; copper or cupro nickel water coils; water-side economizers and more refer to the unit model number for installed options..



Note that some options are offered in limited sizes and/or voltages.



On board safety features will protect the major unit components from damage under most foreseeable installation and operation problems.

MOVING AND STORAGE

If the equipment is not needed for immediate installation upon arrival at the job site, it should be left in its packaging and stored in a clean, dry area.

Units must be moved and stored in the normal upright position at all times.

Use caution to avoid damage to filter racks and duct flanges when storing or handling units.

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

NOTICE: Transportation:

Vertical units should not be stacked during transportation.

Horizontal units 060 and smaller may be stacked two units high if securely banded together.

NOTICE: When storing units:

Do not stack units larger than 6 tons capacity!

Do not stack vertical or counter flow units under 6 tons capacity more than 2 high

Do not stack horizontal units 6 tons capacity more than 3 high

INSTALLATION

Step 1- Check Job Site

Installation, operation and maintenance instructions are provided with each unit. Before unit start-up, read all manuals and become familiar with unit and its operation. Thoroughly check out the system before operation. Complete the inspections and instructions listed below to prepare a unit for installation.

Horizontal Units

SV units are designed for **indoor installation only**. Be sure to allow adequate space around the unit for servicing.

Vertical Counter flow Units

SV Units are designed for **indoor installations only**. While vertical units are typically installed in a floor-level closet or a small mechanical room, the unit access guidelines for these units are very similar to those described for horizontal units.

Step 2- Check Unit

Upon receipt of shipment at the job site, carefully check the shipment against the bill of landing. Make sure all units have been received. Inspect each unit for damage. Ensure the shipping company makes proper notation of any shortages or damage on all copies of the freight bill.

Concealed damage not discovered during unloading must be reported to the shipping company.

Please inspect the product carefully for any defects or discrepancies.

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

1. Be sure that the location chosen for unit installation provides ambient temperatures maintained above freezing.
2. Be sure the installation location is isolated from sleeping areas, private offices and other acoustically sensitive spaces.
3. Be sure unit is mounted at a height sufficient to provide an adequate slope of the condensate lines. If an appropriate slope cannot be achieved, a field-supplied condensate pump may be required.
4. On horizontal units, allow adequate room below the unit for condensate drain trap and do not locate the unit above supply piping.
5. Provide sufficient space for duct connection. Do not allow the weight of the duct work to rest on the unit.
6. Provide adequate clearance for filter replacement and drain pan cleaning. Do not allow piping, conduit, etc. To block filter access.
7. Provide sufficient access to allow maintenance and servicing of the fan and fan motor, compressor and coils. Removal of the entire unit from the closet should not be necessary.
8. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow return air to freely enter the space.
9. Provide ready access to water valves, fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections.
10. Where access to side panels is limited, pre-removal of the control box side mounting screws may be necessary for future servicing.

Protection

Once the units are properly positioned on the job site, cover them with either a shipping carton, vinyl film, or an equivalent protective covering. Cap open ends of pipes stored on the job site. This precaution is especially important in areas where painting, plastering or spraying of fireproof material, etc. Is not yet complete. Foreign material that accumulates within the units can prevent proper start-up and require costly clean-up operations. Before installing any of the systems components, be sure to examine each pipe, fitting valves and remove any dirt or foreign material found in or on these components.

Inspect Unit

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Verify that the unit is the correct model for the entering water temperature of the job.
3. Do not remove the packaging until the unit is ready for installation.

4. Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
5. Inspect all electrical connections. Be sure connections are clean and tight at the terminals.
6. Remove any blower support styrofoam from underneath the blower.
7. Remove any shipping brackets from the unit attached to the pallet.

Step 3- Locate the Unit

Locate the unit in an indoor area that allows easy access to the filter, front access panel and blower access panel, and has enough room for service personnel to perform maintenance and repair work. Provide sufficient room to make fluid, electrical and duct work connections.

Locate the unit in conditioned space and avoid installation in corrosive environments.

If the unit is installed in a confined space, such as a closet, provisions must be made for return air to freely enter the face of the unit's air coil.

Unit condensate drains are not internally trapped.

Allow room below the unit base for horizontal and counter flow models for an adequate condensate trap.

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

NOTICE: Do not locate the unit above supply piping. Do not locate the unit in areas subject to freezing or in areas subject to temperature or humidity extremes.

NOTICE: SV series packaged units are not approved for outdoor installation. Units must be installed in conditioned space that is not subject to extremes of temperature or humidity to avoid cabinet sweating and/or equipment damage.

NOTICE: Do not use SV series units for temporary heating, air conditioning or ventilation during construction, especially when plastering, sanding or painting. Care should be taken to avoid introduction of dust, paint or debris into the air coil.

Step-4 Mount The Unit

Duct Flanges

The Unit heat pump feature foldout return and supply air duct flanges. These fold-out flanges allow the heat pumps to more easily fit through doorways and other tight spaces, and also prevent damage in shipping and handling.

It is recommended that all fold-out flanges be folded out once the heat pump is installed to ensure that return and supply airflow is not obstructed. These Flanges can be easily folded using standard or duckbill pliers. Once folded out these flanges can be used to support light duct work loads.

Mounting Vertical Units

SV Series vertical and counter flow units should be mounted level on a vibration absorbing pad slightly larger than the unit base in order to minimize vibration transmission from the unit to the building structure. See Figure #2 It is generally not necessary to anchor the unit unless required by local code.

All major service access for the SV Series vertical and counter flow models is from the front side of the unit. When installing the unit in a confined space such as a closet, ensure that the service panel screws are accessible, that the filter can be replaced without damage and that water and electrical connections are accessible. For models with a unit mounted disconnect switch, make sure the switch can be easily seen and operated.

To reduce sound transmission, units should be installed using flexible electrical conduit and hose kits. Care should be taken to ensure that no part of the unit cabinet is touching part of the building structure. For ducted return applications, a flexible duct connection should be used.

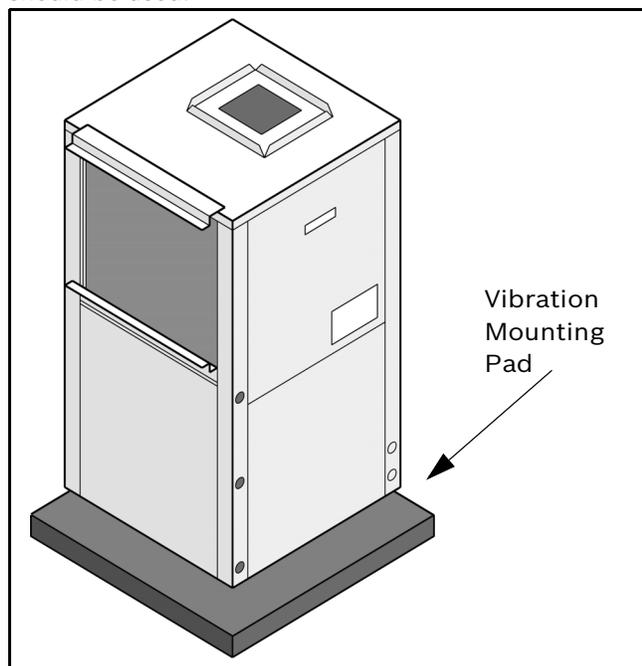


Figure # 2 Mounting Vertical Units

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

Mounting Horizontal Units

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

NOTICE: Horizontal (HZ) units must be installed pitched toward the condensate drain connection 1/8" per foot.

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 this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh.

The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4" drain connected to this secondary pan should be run to an eaves at a location that will be noticeable.

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

Hanging Bracket Kit

Installation instructions

All horizontal units come with Hanging Bracket Kit to facilitate suspended unit mounting using threaded rod. Hanging Brackets are to be installed as shown in Figure#3

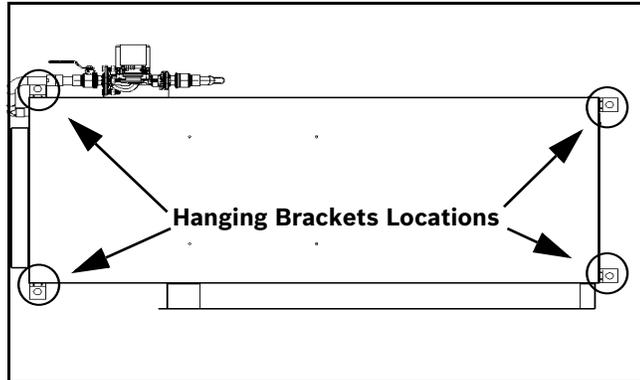


Figure # 3

This kit includes the following:

- (5) Brackets
- (5) Rubber Vibration Isolators
- (8) Screws # 10x1/2"
- (10) Bolts 1/4-28x1/2" hex Bolt (not used on this model)

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 location where Hanging Brackets will be installed shown in Figure#4

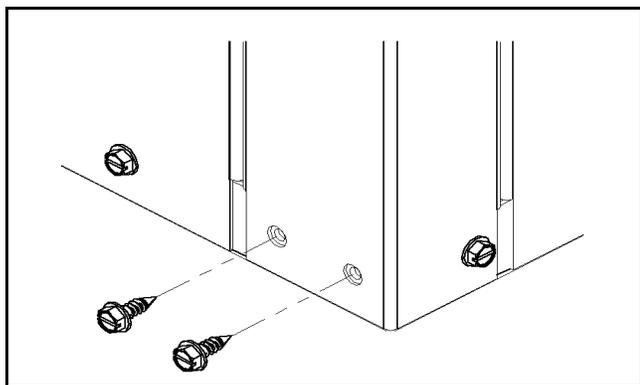
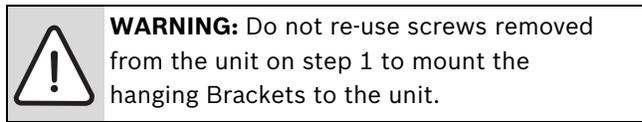


Figure # 4

2. Mount 4 Brackets to unit corner post using the bolts provided in the kit as shown on Figure # 5



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

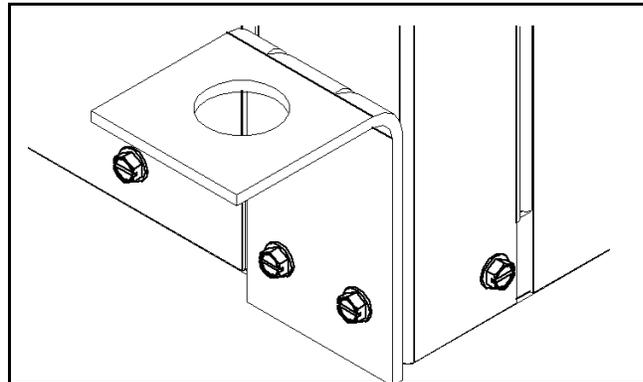
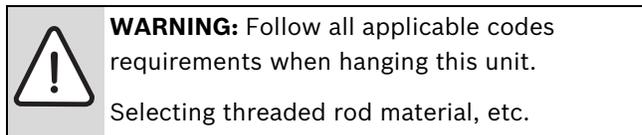
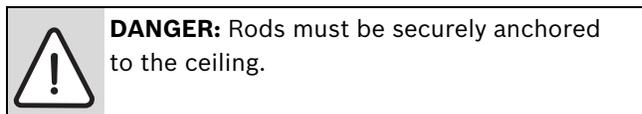


Figure # 5



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

3. Install Rubber Grommet on the bracket as shown in Figure# 6.
4. Hang the unit and assemble the field provided Thread Rod, Nuts and Washers on to the Brackets as shown in Figure# 6.



DANGER: Rods must be securely anchored to the ceiling.

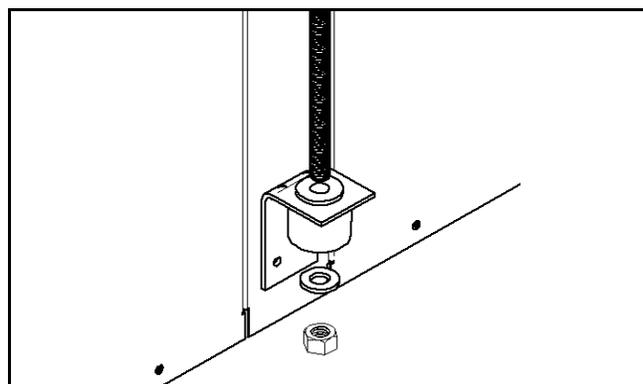


Figure # 6

Step-5 Check Duct System

All units are provided with a return air duct flange and supply air duct connections. Refer to unit dimensional drawings (Page# 56).

A flexible duct 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 from 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.

If the unit will be installed in a new installation with new duct work, the installation should be designed using current ASHRAE procedures for duct sizing. If the unit will be connected to an existing duct system, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application. If the duct system is too small, larger duct work must be installed. Be certain to check for existing leaks and repair.

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

NOTICE: Do not connect discharge ducts directly to the blower outlet. Use ASHRAE guidelines for duct sizing

The factory filter rack should be left in place on a free return system.

Horizontal Supply Air Configuration Conversion

The supply air location on horizontal units can be quickly field converted from end blow to straight through or vice versa. To convert the supply air direction, follow the steps below:

1. If connected to power, shut off the unit and disconnect switch or circuit breaker.
2. Unscrew and remove the blower access panel.
3. Disconnect the wires from the unit electrical box to the blower motor. Note which speed taps are wired for units with PSC or constant torque motors.
4. Unscrew and carefully remove the blower panel with the blower and motor attached. Be careful not to damage the refrigerant coils or any other internal unit components.
5. Remove the blower support brackets from the bottom of the blower housing and relocate them to the top of the blower housing.

6. Turn the blower panel 180° so that the blower support brackets are now at the bottom of the blower.
7. Insert the blower panel with the blower and motor into the desired location. Be careful not to damage the refrigerant coils or any other internal unit components. Screw the panel into place.
8. Replace the wires between the blower motor and electrical box. Make sure to connect wires to the proper speed taps.
9. Replace the blower access panel.
10. Reconnect power to the unit.

Step 6-Install Condensate Drain.

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8-inch 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. (Heat pumps are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See figure # 7)

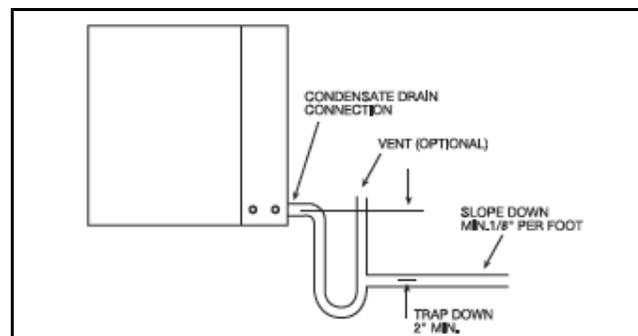


Figure # 7 Condensate Drain

The depth of the trap depends on the amount of positive or negative air pressure on the drain pan while the unit fan is operating. A second Trap must not be included. The Horizontal unit should be pitched approximately 1/4 inch towards the drain in both directions, to facilitate condensate removal. (see figure # 8)

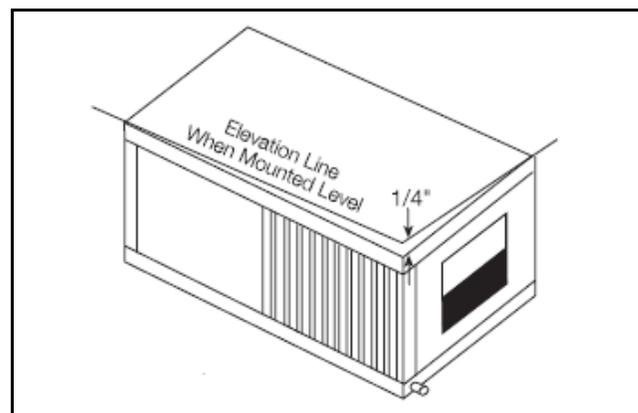


Figure # 8 Pitched Unit

Step 7-Pipe Connections

Depending on the application there are 3 types of WSHP piping systems to choose from: water loop, ground water-and ground loop.

All WSHP units use female pipe thread fittings for water connections. When making piping connections considered the following:

- Insulation may be required on piping to avoid condensation in the case where fluid in loop piping operates at temperatures below dew point of surrounding air.
- Piping systems that contains steel pipes or fittings may be subject to galvanic corrosion. Dielectric fittings may be used to isolate the steel parts of the system to avoid galvanic corrosion.

Water Loop applications

Water loop applications usually include a number of units plumbed to a common piping system. Maintenance of any of the units can introduce air into the system. Therefore, air elimination equipment comprises a major portion of the mechanical room plumbing.

The flow rate is usually set between 2.25 and 3 GPM per ton of cooling capacity. For proper maintenance and servicing, pressure-temperature (P/T) ports are necessary for temperature and flow verification.

In addition to complying with any applicable codes, consider the following for system piping:

- Piping systems using water temperatures below 50°F require 1/2 inch closed cell insulation on all piping surfaces to prevent pipe sweating.
- Avoid all plastic to metal threaded fittings due to the potential for leaks.
- Teflon tape thread sealant is recommended to seal pipe threads.
- Use Backup wrench. Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Flush the piping system prior to operation to remove dirt and foreign materials from the system.

Ground Loop Applications

Temperatures between 20° and 110°F and a cooling capacity of 2.25 to 3 GPM of flow per ton is recommended. In addition to complying with any applicable codes, consider the following for system piping:

- Limit piping materials to only polyethylene fusion in the buried sections of the loop.
- Do not use galvanized or steel fittings at anytime due to corrosion.
- Avoid all plastic to metal threaded fittings due to the potential for leaks. Use a flange fitted substitute.
- Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Use pressure-temperature (P/T) plugs to measure flow and pressure drop.

Step 8 Wire Field Power Supply

High Voltage

All field-installed wiring must comply with the National Electric Code as well as all applicable local codes. Refer to the unit electrical data on the unit nameplate for wire and branch circuit protection sizing. Supply power voltage and phasing should match the required voltage and phasing shown on the unit nameplate. Operating the unit below the minimum voltage, above the maximum voltage or with incorrect phasing can result in poor system performance or damage to the heat pump. All field wiring should be installed by qualified and trained personnel. Refer to the unit wiring diagram for field connection requirements.

Power wiring to the heat pump should be enclosed in flexible conduit to minimize the transmission of vibration from the unit cabinet to the building.

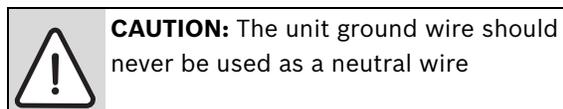
For heat pumps with unit mounted disconnect switches, field power should be connected to the marked terminals on the disconnect switch. For heat pumps without unit-mounted disconnect switches (except for 460-volt units noted below and units with dual power supply), power is connected to the line (L) side of the compressor contactor and the ground lug in the unit electrical box.

Units with Dual Power Supplies

For models with dual power supplies, one power supply feeds the compressor and a second power supply feeds the unit fan motor and control circuit. The compressor power supply should be connected to the line (L) side of the compressor contactor. The fan motor and control circuit power supply meets the voltage, amperage and phase requirements of its load. Refer to the unit name plates for requirements.

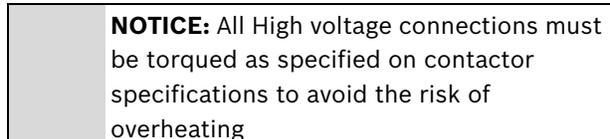
460-V Models with Constant Airflow Motors

The 460-V heat pumps with the constant airflow motor option require a properly sized neutral wire with the power supply wiring in addition to the three high voltage wires and the ground wire. These units employ a 265-V motor that requires power from one phase of the 460-V supply and the neutral wire.



Transformer Settings for 208/230-V Units

As a factory built, all 208/230-V operation unless the wire for 208-v option is ordered. For Job sites with a 208-V power supply, the primary leads on the unit transformer will need to be changed from 240-V to 208-V. Refer to the unit wiring diagram for details.



Low Voltage

For heat pumps with PSC or constant torque fan motors, all thermostat wiring is connected to a terminal block located in the unit electrical box. For heat pumps with a constant airflow fan motor thermostat wiring is connected to a removal terminal strip located on the ECM (Electronically Commutated Motor) control board located in the electrical box. Refer to the unit wiring diagram for connection details.



CAUTION: Never route control wiring through the same conduit as power supply wiring.

Unless provided with DDC controls, the unit heat pump can be controlled by most commonly available single-stage heat pump thermostats. Note that the reversing valve on the unit is energized when the unit is in the cooling mode. Thermostats should be located on an interior wall away from supply ducts. Avoid locations subject to direct sunlight, drafts, external walls. Thermostat wiring should be 18AWG (American Wire Gage). Refer to the installation instructions of the thermostats for further details.

NOTICE: Exceptionally long runs of thermostat wire should be avoided to prevent voltage drops in the control circuit.

See Table #1 and #2 for recommended length

Unit heat pumps are supplied with a 50VA control transformer as a standard. Models with DDC, hot gas reheat or an economizer are supplied with a 75 VA transformer. The 75 VA and 100 VA transformers are available as optional components for most models (size 018 and larger for 100 VA). The VA capacity of the transformer should be considered when connecting low voltage accessories to the heat pump such as thermostats or solenoid valves. Table # 3 shows the VA draw of factory mounted components in the low voltage heat pump. The total VA draw of the heat pump internal components plus attached accessories must be lower than the VA capacity of the unit control transformer.

NOTICE: Exceeding the transformer capacity can result in low control voltage, erratic unit operation or damage to the heat pump.

Thermostat to HVAC Equipment

The thermostat may not function properly if the total resistance of any of the thermostat to HVAC equipment wires exceeds 2.5 ohms. To ensure that wire length does not cause excess resistance, refer to Table # 1 and ensure that the wires from the thermostat to the HVAC equipment are not too long.

Table 1: Copper wire size	Maximum recommended wire length
22 AWG (0.33mm ²)	150 ft (46m)
20 AWG (0.50mm ²)	240 FT (73m)
18 AWG (0.75mm ²)	385 FT (117m)

Remote Sensor to Programmable Thermostat

Because remote temperature sensors measure resistance, very long cable runs can cause slight errors in the measurement. For the highest temperature reading accuracy, avoid exceeding the maximum recommended wire lengths show in Table # 2.

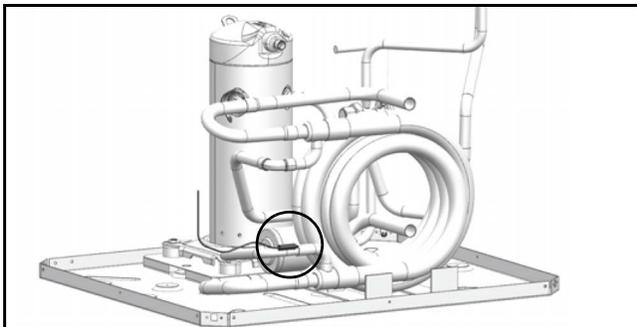
Table 2: Copper wire size	Maximum recommended remote sensor wire length
22 AWG (0.33mm ²)	1000 ft (300m)
20 AWG (0.50mm ²)	1500 FT (450m)
18 AWG (0.75mm ²)	2500 FT (750m)

Table 3: Low Voltage VA Draw

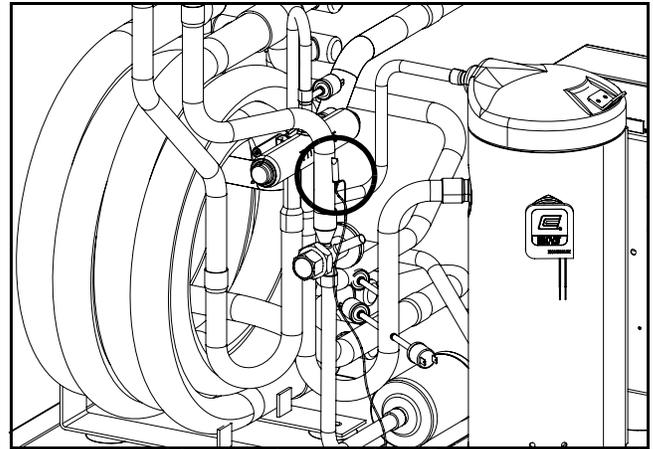
STANDARD CONSTRUCTION		HOT GAS REHEAT OR ECONOMIZER		OPTIONAL COMPONENTS	
Component	VA	Component	VA	Component	VA
Blower Relay (PSC motors only)	6-7	Total from 'Standard'	22-26	Monitor Relay (VA draw per relay)	6-7
Reversing Valve Solenoid	8-9	Additional Control Relays	12-14	Internal 2 Way Motorized Valve	7
Compressor Contactor	6-8	Hot Gas Reheat Solenoid	8-9	LED Annunciator	1
UPM Board	2				
Total VA draw	22-26	Total VA draw	42-49		

Safety features includes the following:

- High pressure switch located in the refrigerant discharge line and wired across the HPC terminals on the complete UPM board
- Low pressure switch located in the unit suction line and wired across terminals LPC1 and LPC2 on the complete UPM Board
- Complete UPM board dry contacts are normally open (NO).
- Water side freeze protection sensor, mounted close to condensing water coil, monitors refrigerant temperature between condensing water coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressor and enter a soft lockout condition. The default freeze limit trip is 26°F, however this can be changed to 15°F by cutting the R30 or Freeze1 resistor located on top of DIP switch SW1. For resistor location. If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze 1 R30 resistor set to 26°F in order to shut down the unit at the appropriate leaving water temperature and protect heat pump from freezing if a freeze sensor is included.
- Evaporator freeze sensor, mounted between the thermal expansion device and the evaporator, monitors refrigerant temperature between the evaporator coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shutdown the compressor and enter into a soft lockout condition. The default freeze limit trip is 26°F See Figure # 10
- The condensate overflow protection sensor is located in the drain pan of the unit and connected to the COND terminal on the complete UPM board.

**Figure # 11 Water side Freeze Protection Sensor**

NOTICE: If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze1 R30 resistor set to 26°F in order to shutdown the unit at the appropriate leaving-water temperature and protect your heat pump from freezing if a freeze sensor is included.

**Figure # 12**

The UPM Board includes the following features:

- **ANTI-SHORT CYCLE TIMER:** 5 minute delay on break timer to prevent compressor short cycling.
- **RANDOM START:** Each controller has a unique random start delay ranging from 270 to 300 seconds on initial power up to reduce the chance of multiple units simultaneously starting at the same time after power up or after a power interruption, thus avoiding creating large electrical spike.
- **LOW PRESSURE BYPASS TIMER:** If the compressor is running and the low pressure switch opens, the controller will keep the compressor ON for 120 seconds. After 2 minutes if the low pressure switch remains open, the controllers will shutdown the compressor and enter a soft lockout. The compressor will not be energized until the low pressure switch closes and the anti-short cycle time delay expires. if the low pressure switch opens 2-4 times in 1 hour, the unit will enter a hard lockout power to the unit would need to be reset.
- **BROWNOUT/SURGE/POWER INTERRUPTION:** The brownout protection in the UPM board will shut down the compressor if the incoming power falls below 18 VAC. The compressor will remain OFF until the voltage is above 18 VAC and ANTI-SHORT CYCLE TIMER (300 seconds) times out. The unit will not go into a hard lockout.
- **MALFUNCTION OUTPUT:** Alarm output is normally open (NO) dry contact. If pulse is selected the alarm output will be pulsed. The fault output will depend on the on the dip switch setting for "ALARM". If it is set to "CONST", a constant signal will be produced to indicate a fault and the unit requires inspection to determine the type of fault. If is set to "PULSE", a pulse signal is produced and a fault code is detected by a remote device indicating the fault. See LED fault indication for blink code explanation. The remote device must have a malfunction detection capability when the UPM board is set to "PULSE".



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

- **DISPLAY OUTPUT:** The display output is a pulse output connected to the Unit Diagnostics Display (UDD) and it pulses 24VAC when the unit is in an lockout alarm condition.
- **TEST DIP SWITCH:** A test dip switch is provided to reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation. In test mode the fault LED will flash 5 times in cooling or 3 times in heating for five minutes.

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

Table 4: UPM Fault Blink Codes

LED Blinks	Fault	Fault Criteria
None	None	All fault conditions nominal
1	High Pressure	Refrigerant discharge pressure has exceeded 600 PSIG
2	Low Pressure	Refrigerant suction pressure has fallen below 40 PSIG
3	Water Coil Freeze Condition	Refrigerant temperature to the water coil has fallen below 26°F for 30 seconds
4	Condensate Overflow	Condensate levels in the unit drain pan are too high
5	Air Coil Freeze Condition	Refrigerant temperature to the air coil has fallen below 26°F for 30 seconds
6	Brown Out	Control voltage has fallen below 18 VAC

UPM Board Factory Default Settings

TEMP	26°F
LOCKOUT	2
RESET	Y
ALARM	PULSE
TEST	NO

Freeze Sensor

The default setting for the freeze limit trip is 26°F (sensor number 1); however this can be changed to 15°F by cutting the R30 resistor located on top of the DIP switch SW1, freeze limit trip should only be changed to 15°F when a closed loop system with appropriate antifreeze mixture is used. Since freeze sensor 2 is dedicated to monitor the evaporator coil it is recommended to leave the factory default setting on the board. The complete UPM controller will constantly monitor the refrigerant temperature with the sensor mounted close to the condensing water coil between the thermal expansion valve and water coil. If temperature drops below or remains at the freeze limits for 30 seconds. The controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the alarm contact will be active. The LED will flash three times the code associated with this alarm condition. If this alarm occurs 2 times (or 4 if DIP switch is set to 4) within an hour the complete UPM controller will enter into a hard lockout condition. It will constantly monitor the refrigerant temperature with the sensor mounted close to the evaporator between the thermal expansion valve and evaporator coil as shown in figure # 11

If temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the alarm contact will be active. The LED will flash three times the code associated with this alarm condition. If this alarm occurs 2 times (or 4 if DIP switch is set to 4 within an hour the controller will enter into a hard lockout condition.

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

Intelligent Reset

If a fault condition is initiated, the 5 minute delay on break time period is initiated and the unit will restart after this delays expire and if the fault condition has been resolved. During this period the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 settings for lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset. A single condensate overflow fault will cause the unit to go into hard lockout immediately, and will require a manual lockout reset.

Lockout Reset

A hard lockout can be reset by turning the unit thermostat off and then back on. When the RESET dip switch is set to “Y” or by shutting off power at the circuit breaker when the RESET DIP switch is set to “R”.

THERMOSTAT OPTIONS	
Y1	First Stage Compressor Operation
G	Fan
O	Reversing Valve (energized in cooling)
W1	Auxiliary Electric Heat (runs in conjunction with compressor)
NC	Transformer 24 VAC Common (extra connection)
C1	Transformer 24 VAC Common (primary connection)
R	Transformer 24 VAC Hot
H	Dehumidification Mode

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

PRE-START-UP

System Checkout

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

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.
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. Unit is serviceable. Be certain that all access panels are secured in place.
10. Verify that the blower support has been removed.
11. Verify that duct work has been properly fastened to supply and return duct collars.
12. Make sure return air filters are positioned correctly in the filter rack if removed during installation.

Air coil

To obtain maximum performance, clean the air coil before starting the unit. A 10% solution of dishwasher detergent and water is recommended for both sides of the coil. Rinse thoroughly with water.

START-UP



Use the procedure below to initiate a proper start-up

NOTICE: This equipment is designed for indoor installation only

Operating Limits

Environment

This equipment is designed for indoor installation only. Extreme variations in temperature, humidity and corrosive water or air will adversely affect the unit performance, reliability and service life.

Power Supply

A voltage variation of $\pm 10\%$ of nameplate utilization voltage is acceptable.

Unit Starting Conditions

Minimum ambient temperature for heating operation is 45°F. Minimum entering air for heating is 40°F. Minimum entering water temperature for heating with standard range units is 50°F and for extended range units is 20°F. Air and water flow rates must be within the cataloged range.



These operating limits are not suitable for continuous operating conditions. Assume that such start up conditions are for the purpose of bringing the building space up to occupancy temperature.



WARNING: When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with the energized equipment.

1. Restore power to system.
2. Turn thermostat fan position to ON. Blower should start.
3. Balance airflow at registers.
4. Adjust all valves to the full open position and turn on the line power to the heat pump unit.
5. Operate unit in the cooling cycle first, then the heating cycle. for unit operating limits. Allow 15 minutes between cooling and heating tests for pressure to equalize.



Two factors determine the operating limits of a unit: entering air temperature and water temperature. Whenever any of these factors are at a minimum or maximum level, the other two factors must be at a normal level to ensure proper unit operation.

Scroll Compressor Rotation (4 and 5 Tons only)

It is important to be certain that the compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction see as follows:

1. Connect services gases to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Turn off power to the unit. Install disconnect tag.
2. Reverse any two of the unit power leads.
3. Reapply power to the unit and verify pressures are correct.

The suction and discharge pressure levels should now move to their normal start-up levels.

When the compressor is rotating in the wrong direction, the unit makes more noise and does not provide cooling.

After a few minutes of reverse operation, the scroll compressor internal overload protection will open, thus activating the unit lockout. This requires a manual reset. To reset, turn the thermostat on and then off.



There is a 5 minute time delay before the compressor will start.

Sequence Of Operation

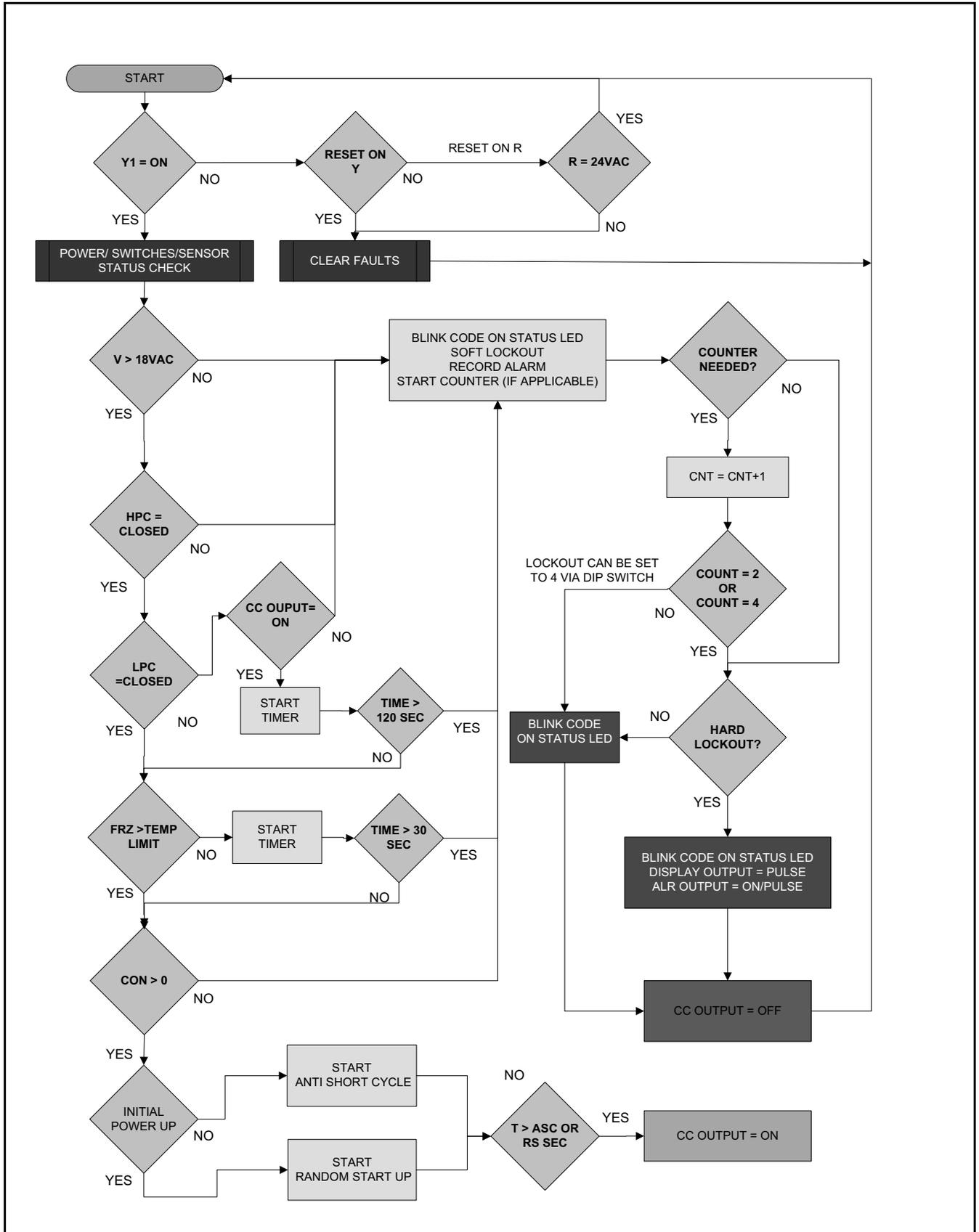


Figure # 13

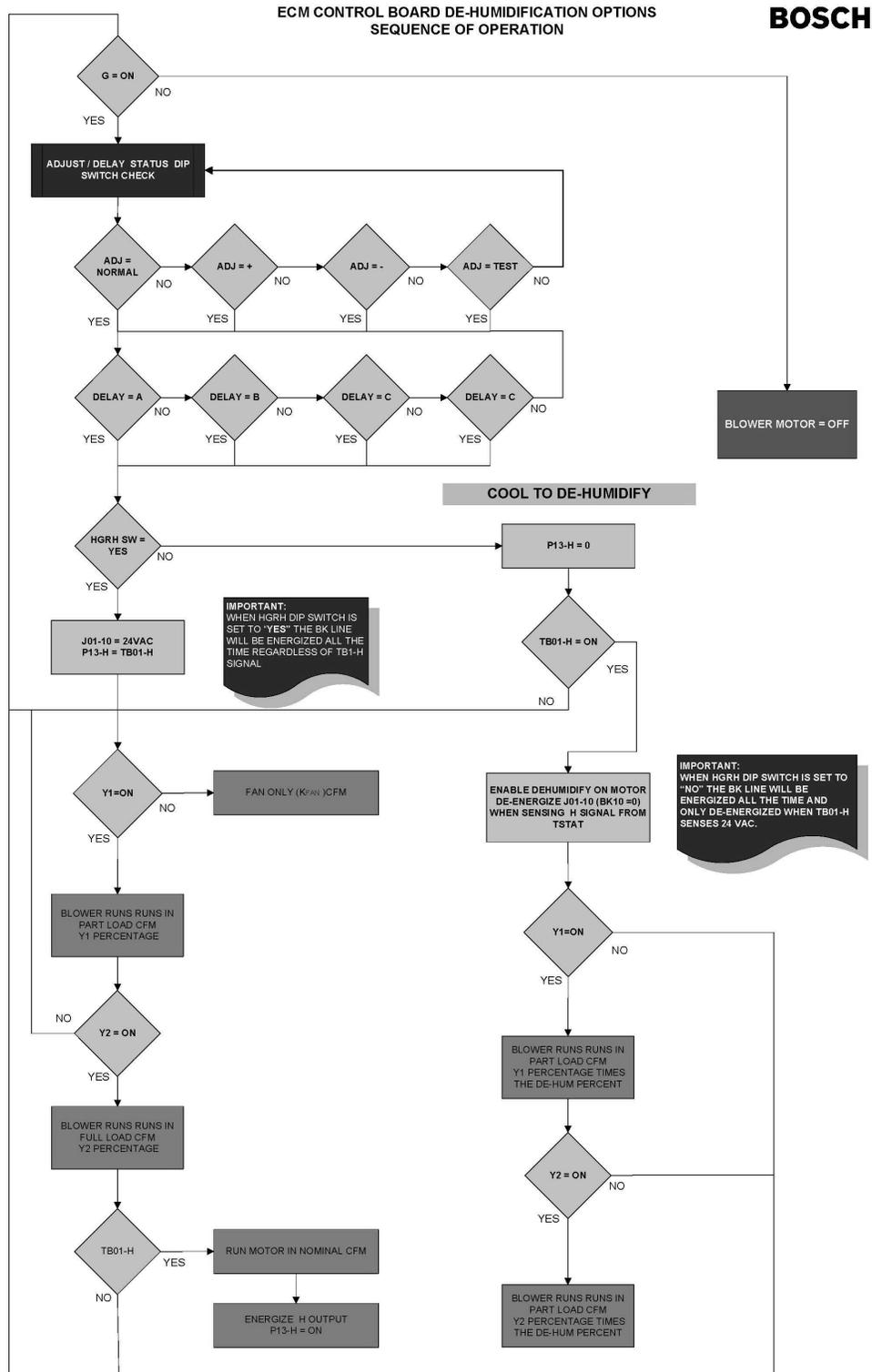


Figure # 14

Unit Start Up Cooling Mode

1. Adjust the unit thermostat to the warmest position. Slowly reduce the thermostat position until the compressor activates.
2. Check for cool air delivery at unit grille a few minutes after the unit has begun to operate.
3. Verify that the compressor is ON and that the water flow rate is correct by measuring pressure drop through the heat exchanger using P/T plugs. Check elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line. Be sure the condensate trap includes a water seal.
4. Check the temperature of both supply and discharge water.
5. Check air temperature drop across the coil when compressor is operating. Air temperature drop should be between 15° and 25°F.

Unit Start Up Heating Mode



Operate the unit in heating cycle after checking the cooling cycle. Allow 5 minutes between tests for the pressure or reversing valve to equalize.

1. Turn thermostat to lowest setting and set thermostat switch to HEAT position.
2. Slowly turn the thermostat to a higher temperature until the compressor activates.
3. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.
4. Check the temperature of both supply and discharge water. If temperature is within range, proceed. If temperature is outside the range, check the heating refrigerant pressures.
5. Once the unit has begun to run, check for warm air delivery at the unit grille.
6. Check air temperature rise across the coil when compressor is operating. Air temperature rise should be between 20°F and 30°F after 15 minutes load.
7. Check for vibration, noise and water leaks.

Flow Regulation

Flow regulation can be accomplished by two methods. Most water control valves have a flow adjustment built into the valve. By measuring the pressure drop through the unit heat exchanger, the flow rate can be determined. Adjust the water control valve until the desired flow is achieved. Since the pressure constantly varies, two pressure gages may be needed in some applications.

An alternative method is to install a flow control device. These devices are typically an orifice of plastic material designed to allow a specified flow rate that are mounted on the outlet of the water control valve. Occasionally these valves produce a flow noise that can be reduced by applying some back pressure. To accomplish this, slightly close the leaving isolation valve of the well water setup.



WARNING: Open the disconnect switch and secure it in an open position before flushing the system.

Flushing

Once the piping is complete, units require final purging and loop charging. A flush cart pump of at least 1.5 hp is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop. Flush the loop to purge air and dirt particles from the loop. Flush the loop in both directions with a high volume of water at a high velocity.

Follow the steps below to properly flush the loop:

1. Verify that the power is off.
2. Fill loop with water from the hose through flush cart before using flush cart pump to ensure an even fill. Do not allow the water level in the flush cart tank to drop below the pump inlet line to prevent air from filling the line.
3. Maintain a fluid level in the tank above the return tee to avoid entering back into the fluid.
4. Shutting off the return valve that connects into the flush cart reservoir it will allow 50 psig surges to help purge air pockets. This maintains the pump at 50 psig.
5. To purge, keep the pump at 50 psig until maximum pumping pressure is reached.
6. Open the return valve to send a pressure surge through the loop to purge any air pockets in the piping system.
7. A noticeable drop in fluid level will be seen in the flush cart tank. This is the only indication of air in the loop.



If air is purged from the system while using a 10 inch PVC flush tank, the level drop will only be 1 to 2 inches, since liquids are incompressible. If the level drops more than this, flushing should continue since air is still being compressed in the loop. If level is less than 1 to 2 inches, reverse the flow.

8. Repeat this procedure until all air is purged.
9. Restore power.

Antifreeze may be added before, during or after the flushing process. However, depending on when it is added in the process, it can be wasted. refer to the Antifreeze section for more detail.

Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the warmer months. this fluctuation is normal and should be considered when charging the system initially. Run the unit in either heating or cooling for several minutes to condition the loop to a homogenous temperature.

When complete, perform a final flush and pressurize the loop to a static pressure of 40 to 50 psig for winter months or 15 to 20 psig for summer months.

After pressurization, be sure to remove the plug from the end of the loop pump motor to allow trapped air to be discharged and to ensure the motor housing has been flooded. Be sure the loop flow center provides adequate flow through the unit by checking pressure drop across the heat exchanger.

Antifreeze

In areas where entering loop temperatures drop below 40°F or where piping will be routed through areas subject to freezing, antifreeze is needed. Alcohols and glycols are commonly used as antifreeze agents. Freeze protection should be maintained to 15°F below the lowest expected entering loop temperature. For example, if the lowest expected entering loop temperature is 30°F, the leaving loop temperature would be 22°F to 25°F. Therefore, the freeze protection should be at 15°F (30°F-15°F=15°F).

NOTICE: All alcohols should be pre-mixed and pumped from a reservoir outside the building or introduced under water level to avoid build up of fumes.

Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Freeze Protection Selection

The 26°F FP1 factory setting (water) should be used to avoid freeze damage to the unit. Once antifreeze is selected, the (FP1 jumper) should be clipped on the control to select the low temperatures (antifreeze 15°F) set point to avoid nuisance faults.

APPLICATION CONSIDERATIONS

Well Water Systems

Copper is adequate for ground water that is not high in mineral content. Should your well driller express concerns regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment. (See water quality table on page #23) 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 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 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.

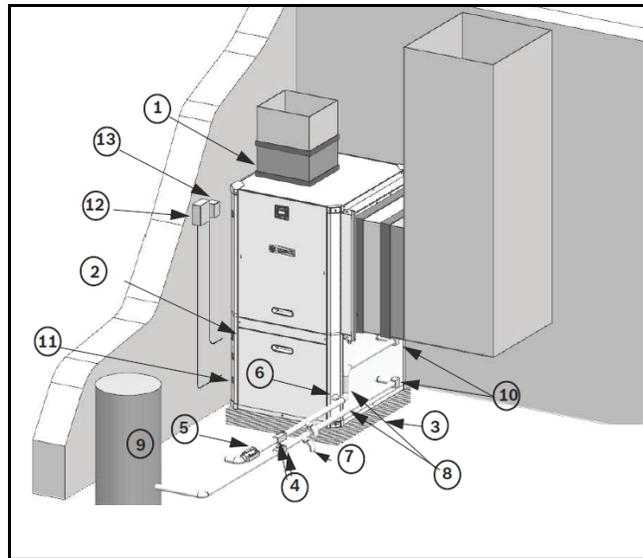


Figure # 15

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

Cooling Tower/Boiler Systems

These systems typically use a common loop temperature maintained at 50°F to 100°F. To assure adequate cooling and heating performance.

In the cooling mode, heat is rejected from the unit into the water loop. A cooling tower provides 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.

Consult the specification sheets for piping sizes.

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



Teflon tape thread sealant should be used against leaks and possible heat exchanger fouling. (Teflon is a registered trademark of DuPont).

Consult the specifications sheets for piping 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.

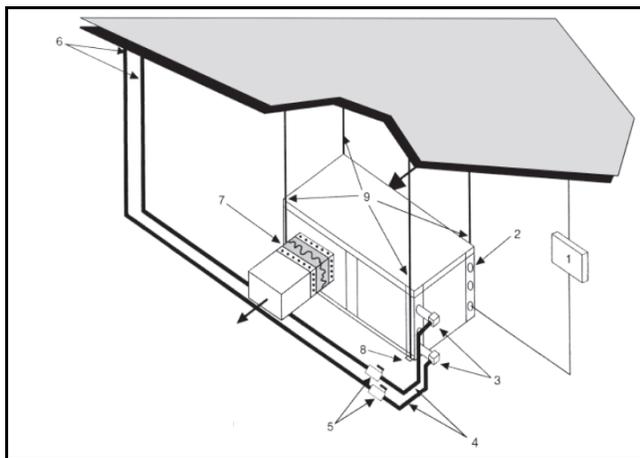


Figure # 16 Cooling/Boiler Application

1. Line Voltage Disconnect
2. Low Voltage Control Connection
3. P/T Plugs (Optional)
4. Hose Kits
5. Ball Valves
6. Supply and Return Lines of the central system
7. Flex Duct Connection
8. Hanging Brackets Assembly
9. Threaded Rod

Geothermal Closed Loop Systems

Operation of an SV Series unit on a closed loop application requires the extended range option

NOTICE: Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training.

Utilizing the Ground loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions must be utilized when low loop temperatures are expected to occur.



Refer to Ground Loop installation manuals for more specific instructions.

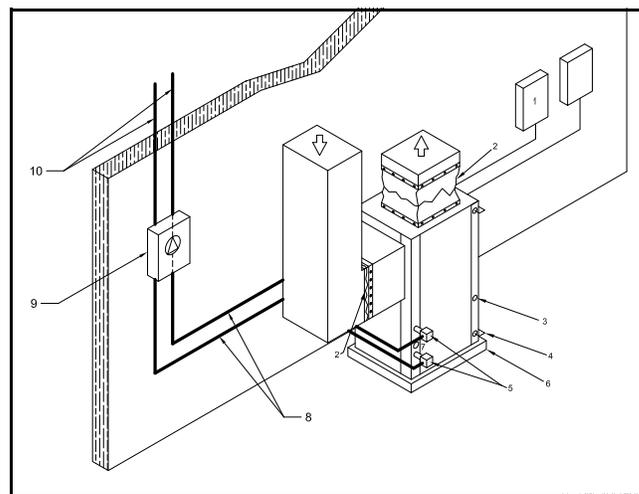


Figure # 17 Earth Coupled Application

1. Line voltage disconnect unit
2. Flex Duct Connection
3. Low voltage Control Connection
4. Line Voltage Connection
5. P/T Ports
6. Vibration Pad
7. Condensate Drain
8. Ground Loop Connection Kit
9. Ground Loop Pumping Package
10. Polyethylene With Insulation

Open Well Water Systems

When a water well is used exclusively for supplying water to the heat pump, the pump should operate only when the Heat Pump operates. A 24 volt, double pole single throw (DP/ST) contactor can be used to operate the well pump with the heat pump. When two or more units are supplied from one well, the pump can be wired to operate independently from either unit. Two 24-volt double pole single throw relays wired in parallel are required.

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

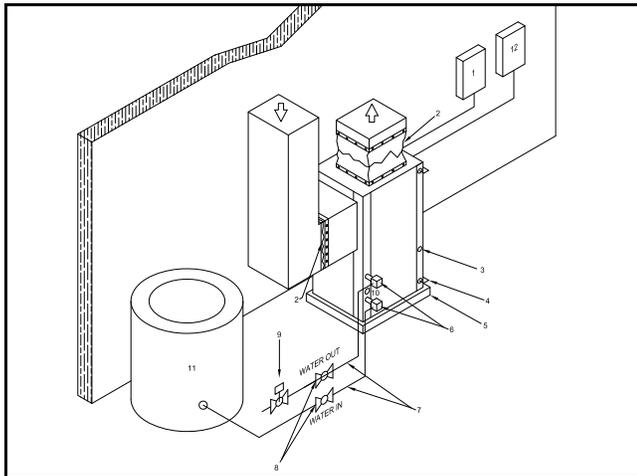


Figure # 18 Well Water Applications

1. Line Voltage Disconnect
2. Flex Duct Connector
3. Low Voltage Control Connection
4. Line Voltage Connection
5. Vibration Pad
6. P/T Ports
7. Hose Kits (Optional)
8. Ball Valves
9. Solenoid Valve Slow Closing
10. Condensate Drain Connection
11. Pressure Tank (Optional)

WATER QUALITY

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

Maintaining proper water quality is important for ensuring a long service life for an SV series heat pump. For closed loop and boiler/tower systems water chemistry can be checked and easily maintained to ensure that corrosive elements, dissolved oxygen and pH levels are kept in check. It is important to ensure that any additive, antifreeze or corrosion inhibitor that is added to the water loop is compliant with all applicable laws and regulations and is compatible with copper, brass and bronze alloys. ensure that all recommended safety precautions are followed when handling or adding chemicals to the water loop.

For open loop systems, water quality is very important. Refer to the Water Quality Table on page# 23, for acceptable ranges for a variety of water quality factors. The three main concerns in open loop installations are scaling, corrosion and fouling.

In installations with hard water, scaling due to a buildup of carbonates on the heat exchanger wall can gradually degrade the heat pump performance over time.

Heat pumps that are affected by scaling may exhibit low suction pressures in heating and high head pressures in cooling with a gradual loss of capacity and efficiency. Scaled heat exchangers can be cleaned by a qualified technician but care should be taken to avoid scaling in the first place.

To limit scaling, water flow rates should be kept at 3 gallons/minute per nominal cooling ton (a 10°F temperature rise in cooling) and care should be taken to avoid air in the water lines from suction side leaks. Cupro-nickel coils are generally recommended.

In installations with high hydrogen sulfide, chlorine or ammonia, corrosion is a potential problem. In these installations a cupro-nickel heat exchanger is required along with maintaining proper flow and keeping air out of the system. If water quality is outside of the values in the water quality table, then a closed loop is required. Fouling due to iron bacteria can also pose problems in some open loop installations. Iron bacteria fouling can quickly degrade system performance and plug heat exchangers.

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

WATER QUALITY TABLE

Table 5: 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 H₂S.

** Equivalent to 30 mesh strainer

Condensate Connections

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. (Heat Pumps are not internally trapped).

A vertical air vent is sometimes required to avoid air pockets.

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

The horizontal unit should be pitched approximately 1/4" towards the drain in both Duct System

PIPING

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs). Never use flexible hoses of a smaller inside diameter than that of the water connections on the unit. SV 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. (refer to Water Quality table on page#23)



Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment.

(refer to Water Quality table on page#23)

In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is required. Both the supply and discharge water lines will sweat if subjected to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics. Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult the specification sheets for sizes.

Teflon tape sealer should be used when connecting water piping connections to the units to ensure against leaks and possible heat exchanger fouling. Do not 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 the supply and return lines for system flow balancing. The water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See the unit specification sheets for the water flow and pressure drop information.

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

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

OPTIONS

Extended Range Option

SV heat pumps are supplied standard with capillary style expansion device tuned to typical boiler/tower system operating conditions. For applications that will experience more extreme fluid flow rates or temperatures (heating fluid temperatures below 50°F and/or cooling fluid temperatures below 60°F or above 100°F), an extended range option is required.

The extended range option on the SV consists of a bi-flow, balanced port thermal expansion valve and an insulated water-to-refrigerant heat exchanger. With the extended range option installed SV units can provide heating with fluid temperatures as low as 20°F and as high as 80°F and cooling with fluid temperatures as low as 50°F and as high as 110°F.

Unit Mounted Non-Fused Disconnect Switch

SV heat pumps can be supplied with an optional unit mounted disconnect switch mounted to the electrical corner post of the unit.

Field electrical wiring is connected to the switch and the switch then routes power to the heat pump electrical box. When the switch is in the "OFF" position, the heat pump electrical box is completely de-energized.

Hot Gas Reheat

(Available on size 015 and larger)

SV series heat pumps size 015 and larger can be provided with hot gas reheat for active dehumidification. In operation hot gas reheat dehumidifies space by cooling the air and removing moisture and then reheating the air back to a neutral temperature using waste heat from the compressor. The net effect is to decrease the relative humidity of the space without changing the sensible temperature.

The major components of the hot gas reheat option are the hot gas reheat coil, the reheat solenoid valve and the control circuit. When the control circuit energizes the heat pump in reheat mode, the heat pump will operate in the cooling mode. The hot gas solenoid valve diverts the compressor discharge gas to the reheat coil which is mounted downstream of the unit evaporator. This hot gas re-heats the cooled air coming off of the evaporator.

To function, heat pumps with hot gas reheat must be controlled by both a thermostat and a humidistat (or a combination thermostat/humidistat). The humidistat must provide a dry contact closure on a rise in humidity above set point.



Note that the ability of the reheat coil to reheat cooled air back to a neutral temperature is affected by the water temperature of the system.

At water temperatures of 85° F, the reheat coil can recover 95% to 100% of the sensible capacity of the evaporator. At water temperatures below 60°F, the reheat coil can only recover 5% to 25% of the sensible capacity of the evaporator.

Refer to the unit wiring diagram for control circuit details.



Note that the hot gas bypass valve is inoperative in the heating mode.

Internal 2-Way Water Valve

In many applications, including variable pumping and well water installations, a motorized water valve is required on the heat pump water circuit. On the SV series this water valve can be factory mounted and wired internally to the unit.

The SV series internal water valve option features a 24VAC motorized water valve rated to 450 psig working pressure. This valve is wired to open on a thermostat call for compressor operation (heating or cooling) and will remain open as long as the thermostat calls. The valve can remain seated with up to 20 psi of back pressure on all sizes.

The valve consists of two main parts: the valve body and the actuator. The valve body is brazed into the leaving water line of the heat pump and is a permanent part of the unit. The valve actuator can be easily removed from the valve body for service.

Refer to the water side pressure drop table in the troubleshooting section of this manual to determine the appropriate pressure drop across the heat pump with and without the water valve option.



Note that the 2-Way Water Valve option will add additional pressure drop between the water in and water out connections of the heat pump.



Note that this water valve cannot be used as an isolation valve.