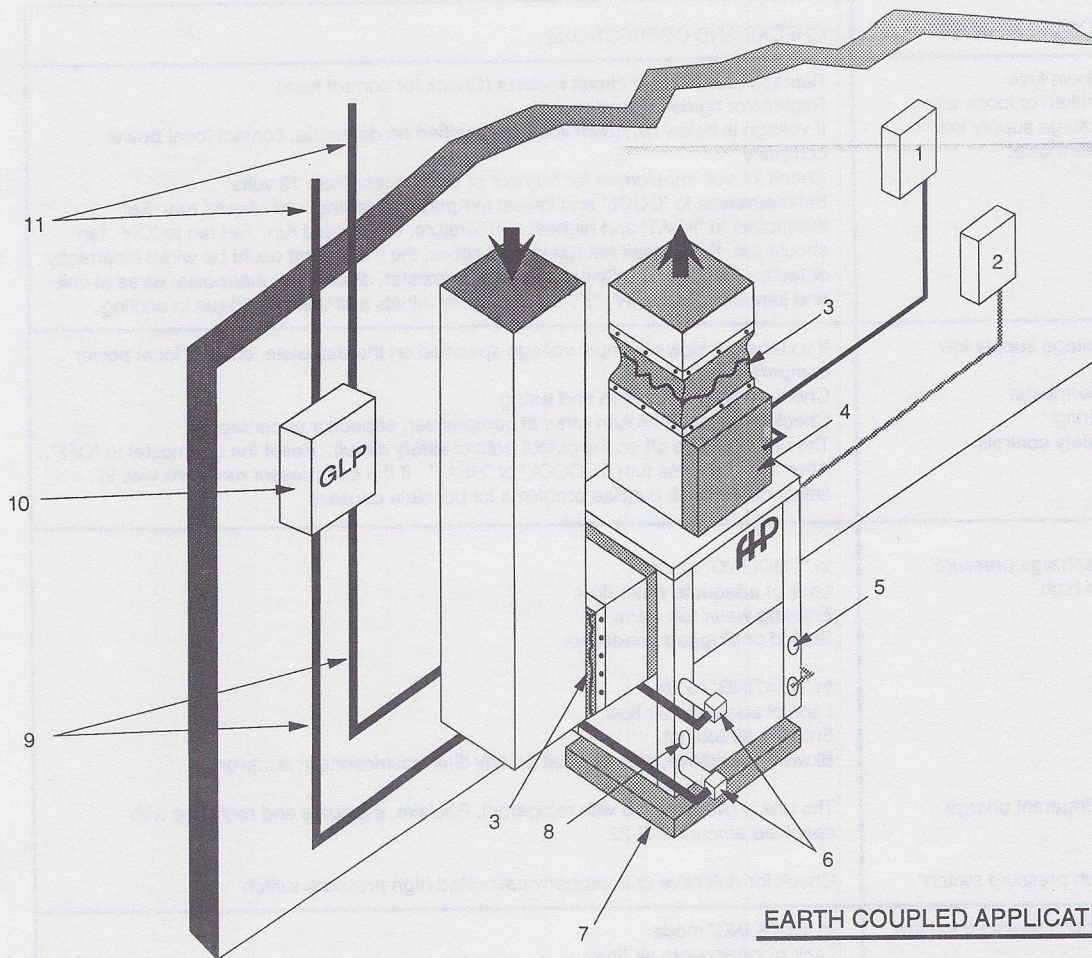


TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE	CHECKS AND CORRECTIONS
ENTIRE UNIT DOES NOT RUN	Blown fuse Broken or loose wires Voltage supply low Thermostat	Replace fuse or reset circuit breaker (Check for correct fuse) Replace or tighten the wires If voltage is below minimum voltage specified on dataplate, contact local power company. Check 24 volt transformer for burnout or voltage less than 18 volts Set thermostat to "COOL" and lowest temperature setting, unit should run. Set thermostat to "HEAT" and highest temperature, unit should run. Set fan to "ON", fan should run. If unit does not run in all 3 cases, the thermostat could be wired incorrectly or faulty. To ensure faulty or miswired thermostat, disconnect thermostat wires at unit and jumper between "R", "Y", "G" and "W" terminals and unit should run in cooling.
BLOWER OPERATES BUT COMPRESSOR DOES NOT	Voltage supply low Thermostat Wiring Safety controls	If voltage is below minimum voltage specified on the dataplate, contact local power company. Check setting, calibration and wiring Check for loose or broken wires at compressor, capacitor or contactor. The unit could be off on the cutout control safety circuit. Reset the thermostat to "OFF". After a few minutes turn to "COOL" or "HEAT". If the compressor runs, unit was in safety control lock out (See problems for possible causes)
UNIT OFF ON HIGH PRESSURE CONTROL	Discharge pressure too high Refrigerant charge High pressure switch	In "COOLING" mode: Lack of adequate water flow. Entering water too warm. Scaled or plugged condenser. In "HEATING" mode: Lack of adequate air flow. Entering air too hot Blower inoperative, clogged coil or dirty filter, restrictions in ductwork The unit is overcharged with refrigerant. Reclaim, evacuate and recharge with specified amount of R-22. Check for defective or improperly calibrated high pressure switch
UNIT OFF ON LOW PRESSURE CONTROL	Suction pressure too low Refrigerant charge Low pressure switch	In "COOLING" mode: Lack of inadequate air flow. Entering air too cold. Blower inoperative, clogged coil or dirty filter, restrictions in duct work. In "HEATING" mode: Lack of adequate water flow. Entering water too cold. Scaled or plugged condenser. The unit is low in charge of refrigerant. Locate the leak repair evacuate and recharge with specified amount of R-22 Check for defective or improperly calibrated low pressure switch.
UNIT SHORT CYCLES	Thermostat Wiring and controls Compressor overload	The differential is set too close in the thermostat. Readjust heat anticipator. Loose connections in the wiring or the control contactors defective Defective compressor overload, check and replace if necessary. If the compressor runs too hot it may be due to the deficient refrigerant charge
INSUFFICIENT COOLING OR HEATING	Unit undersized Loss of conditioned air by leaks Thermostat Airflow Refrigerant charge Compressor Reversing valve Operating pressure Refrigerant system	Recalculate heat gains or losses for space to be conditioned. If excessive rectify by adding insulation shading etc. Check for leaks in ductwork or introduction of ambient air thru doors and windows Improperly located thermostat (e.g. near kitchen sensing inaccurately the comfort level in living areas) Lack of adequate airflow or improper distribution of air. Low on refrigerant charge causing inefficient operation. Check for defective compressor, If discharge pressure is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor. Defective reversing valve creating bypass of refrigerant from discharge to suction side of compressor. Incorrect operating pressure (See chart) Check capillary tube metering device for possible restrictions to flow of refrigerant. The refrigerant system may be contaminated with moisture, noncondensables, and particles. Dehydrate, evacuate and recharge the system



(Figure #10)

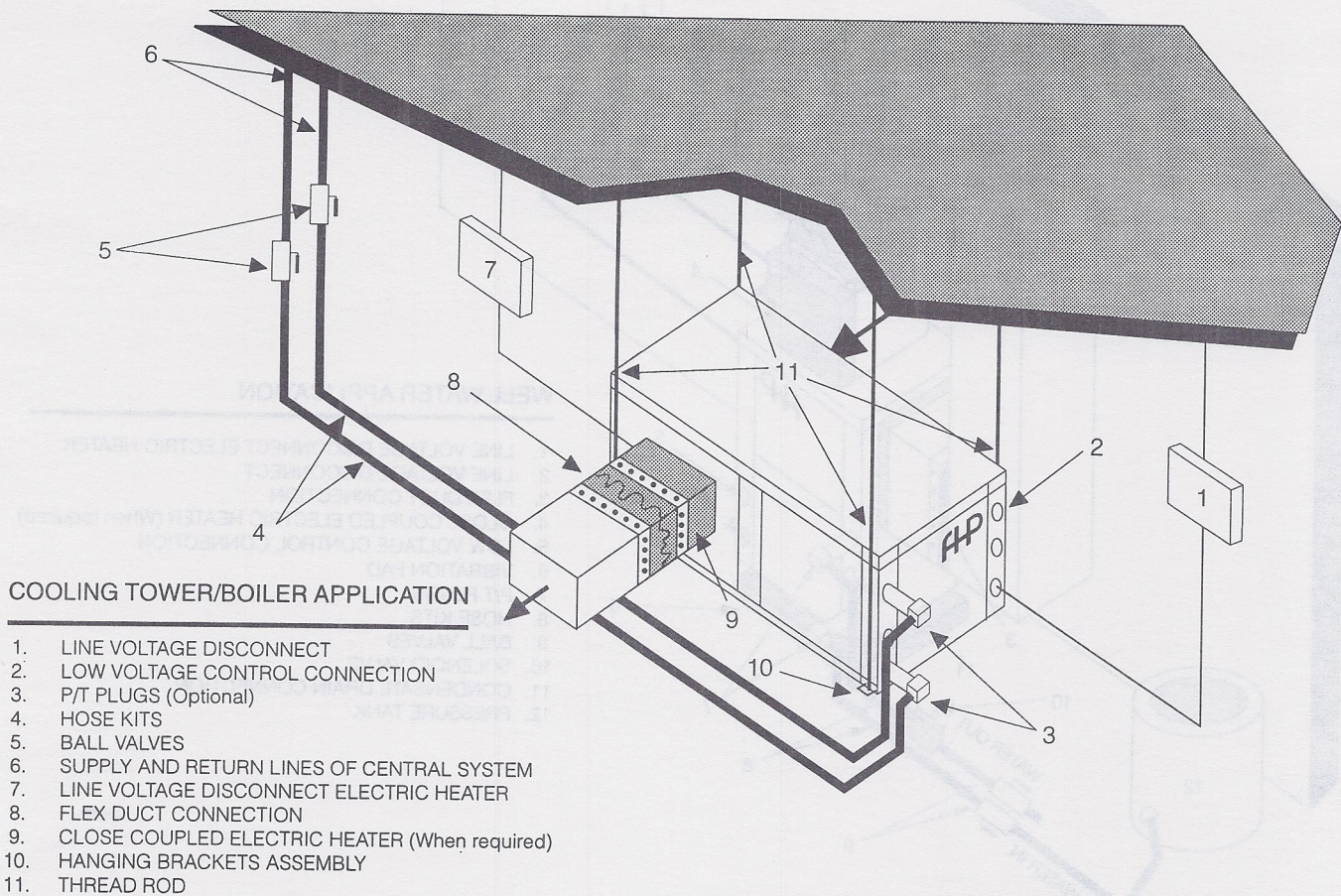
EARTH COUPLED APPLICATION

1. LINE VOLTAGE DISCONNECT ELECTRIC HEATER
2. LINE VOLTAGE DISCONNECT
3. FLEX DUCT CONNECTION
4. CLOSE COUPLED ELECTRIC HEATER (When required)
5. LOW VOLTAGE CONTROL CONNECTION
6. P/T PLUGS (Optional)
7. VIBRATION PAD
8. CONDENSATE DRAIN
9. GROUND LOOP CONNECTION KIT
10. GROUND LOOP PUMPING PACKAGE
11. POLYBUTYLENE OR POLYETHELENE WITH INSULATION

designated on the "Returned Goods" tag, freight charges prepaid. The return of the part does not constitute an order for replacement. Therefore, a purchase order must be entered through your nearest FHP representative. The order should include the part number, model number and the serial number of the unit involved. If the part is within the warranty period, and after our inspection of the returned part proves that the failure is due to faulty material or workmanship a credit/or replacement part will be issued.

OPTIONS:

- **HEAT RECOVERY PACKAGE** – A factory installed heat recovery package is available for water heating. See HRP literature.
- **HOT GAS BYPASS** – A factory installed hot gas bypass option is available for capacity control.
- **ECONOMIZER COILS** - A factory installed water side economizer for cooling and heating.
- **HOT GAS REHEAT** - A factory installed option for humidity control.
- **GROUND LOOP PUMPING PACKAGE** – is available for field installation. See GLP literature.
- **CONTROL OPTIONS** – Various control options are available such as time delays relays, random start relays, aquastats, etc. Consult factory for application assistance.



(Figure #9)

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 and pressure drop information.

Before final connection to the unit, the supply and return hose kit must be connected together and the system flushed to remove dirt, piping chips and other foreign material.

EARTH COUPLED SYSTEMS (Figure #10)

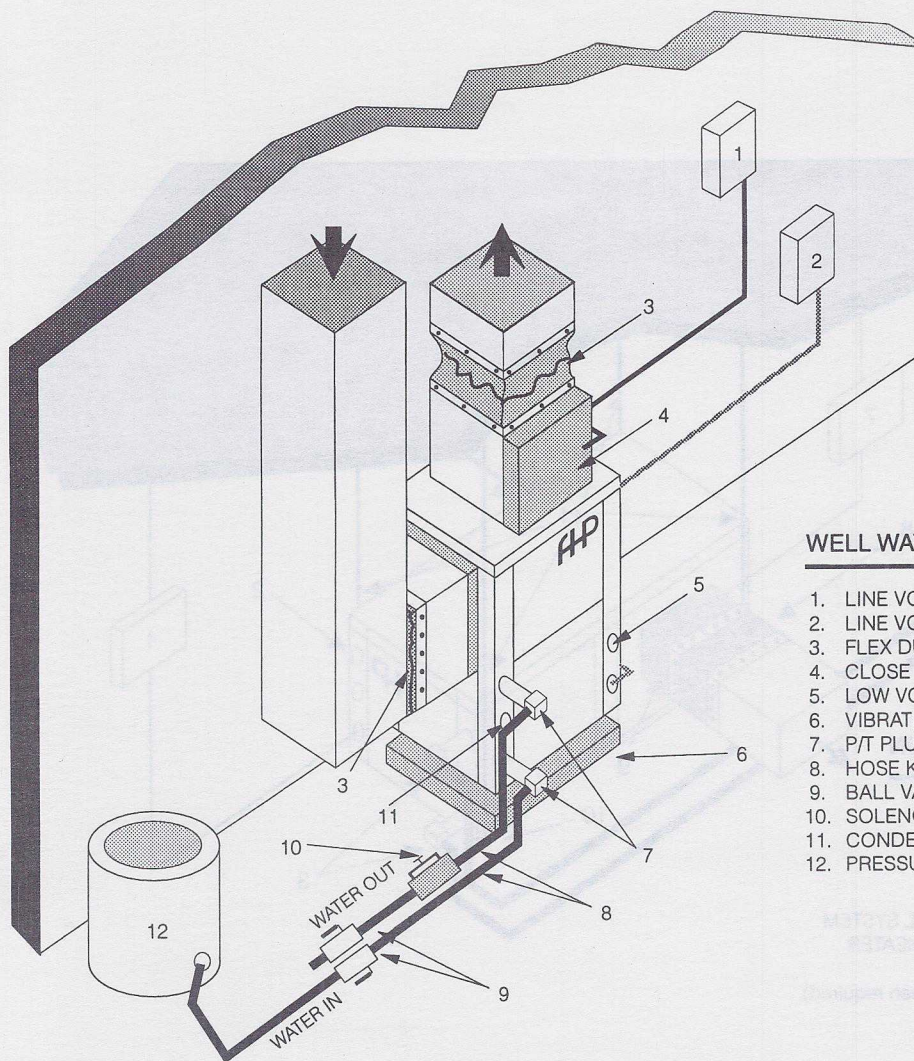
Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training.

Utilizing FHP's Ground Loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions are utilized when low evaporating conditions are expected to occur. Refer to the installation manuals for more specific instructions.

IN-WARRANTY MATERIAL RETURN

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

Material may be returned only with permission by an authorized factory representative. A "Returned Goods" tag will be forward to be attached to the returned material. Enter the information as called for on the tag in order to expedite handling and insure prompt issuance of credits. All parts shall be returned to the FHP factory as



WELL WATER APPLICATION

1. LINE VOLTAGE DISCONNECT ELECTRIC HEATER
2. LINE VOLTAGE DISCONNECT
3. FLEX DUCT CONNECTION
4. CLOSE COUPLED ELECTRIC HEATER (When required)
5. LOW VOLTAGE CONTROL CONNECTION
6. VIBRATION PAD
7. P/T PLUGS
8. HOSE KITS
9. BALL VALVES
10. SOLENOID VALVE
11. CONDENSATE DRAIN CONNECTION
12. PRESSURE TANK

(Figure #5)

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

COOLING TOWER/BOILER APPLICATION:

Cooling Tower and Boiler Loop Systems: (Figure #9)

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

In the cooling mode, heat is rejected from the FHP 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 minerals. A

secondary heat exchanger (plate frame between the unit and the open cooling tower may also be used. It is imperative that all air be eliminated from the closed loop side of the heat exchanger to insure against fouling.

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

CAUTION: Water piping exposed to extreme low ambient temperatures are subject to freezing.

Units are equipped with female pipe thread fittings. Consult the specification sheets for sizes. Teflon tape sealer should be used when connecting to the unit to insure against leaks and possible heat exchanger fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

the control box. Connect the power leads as indicated on the wiring diagram.

PIPING:

Supply and return piping must be at least as large as the unit connections on the heat pump (larger on long runs). Unit may be furnished with either a copper or optional cupro-nickel coil. Copper is adequate for closed loop systems and ground water which is not high in mineral content. Should your well driller express concern regarding the quality of well water available or should any known hazards exist in your area, we recommend proper testing to assure well water quality suitable for use with water source equipment. In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended. In situations where scaling could be heavy, or where biological growth such as iron bacteria will be present a closed loop system is recommended. Never use flexible hoses of a smaller inside diameter than that of the water connection on the unit. Check carefully for water leaks.

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

Pipe will sweat if low temperature water is run through the supply and discharge lines. These lines should be insulated to prevent damage from condensation.

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

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 or poor throttling characteristics.

Do not exceed recommended condenser water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.

WELL WATER SYSTEMS: (Figure #5)

Water pressure must always be maintained in the heat exchanger by placing a water control valve on the outlet of the unit. A bladder type expansion tank may be used to maintain pressure on the system.

When a water well exists for the purpose of supplying domestic water providing the well is of sufficient flow, it may be used to supply water to the heat pump. With this type of installation an electric slow closing on-off solenoid valve is required. When using a low voltage solenoid valve (24 volt) it may overload the unit transformer or interfere with the lock-out impedance circuit. If a low voltage

solenoid valve is used, an upsized VA transformer may be required. Low voltage solenoid valves should be hooked to Y & C on the unit low voltage terminal board. If using a line voltage solenoid valve connect to the load side of the compressor contactor T1 & T2.

When a water well is used exclusively for the heat pump, the well pump will operate only when the unit operates. A double pole single throw (DP/ST) relay (Figure #6) can be used to control the well pump. Two or more units (Figure #7) may be supplied from one well pump.

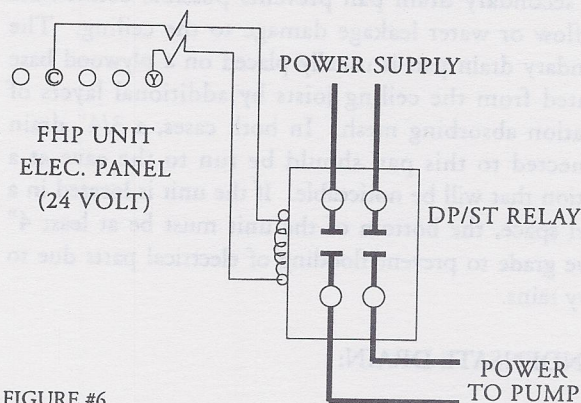
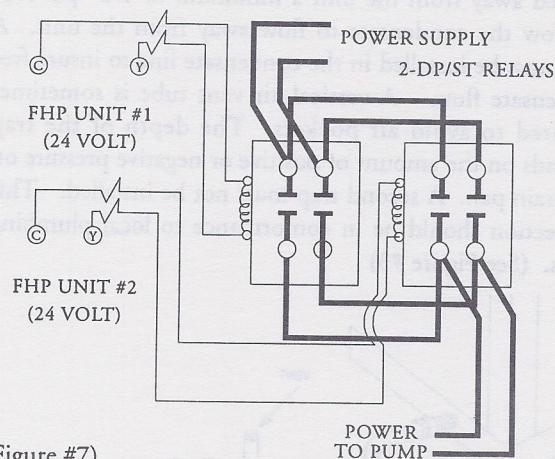
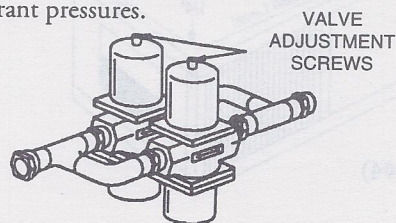


FIGURE #6



(Figure #7)

Pressure regulating valves are used to increase or decrease water flow through the heat pump in response to refrigerant pressure. (Figure#8) In some cases more water may be required in heating than in cooling, or vice versa. With the HE and SE heat pumps these valves are not required. However, if installed, a pair of valves are required for proper operation. One valve for cooling (direct acting) and another valve for heating (indirect acting) are required. A refrigerant tap is required in the refrigerant line located between the reversing valve and the water-to-refrigerant heat exchanger for proper monitoring of the refrigerant pressures.



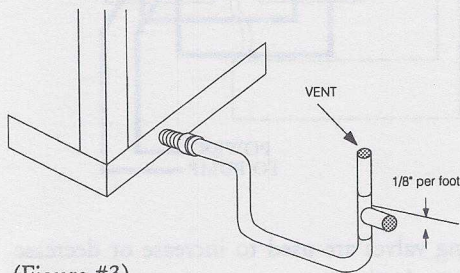
(Figure #8)

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 horizontal units. In this case the unit is 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 pan should be run to the eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4" above grade to prevent flooding of electrical parts due to heavy rains.

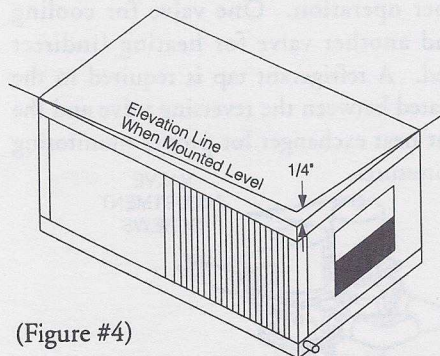
CONDENSATE DRAIN:

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. A trap must be installed in the condensate line to insure free condensate flow. A vertical air vent tube 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 installed. This connection should be in conformance to local plumbing codes. (See Figure #3)



(Figure #3)

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



(Figure #4)

DUCT SYSTEM:

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to the FHP individual data specification sheet for physical dimensions of the collar and flange.

A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and or forming condensate during cooling operation. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected. The factory filter is to be removed when using a filter back return air grill. The factory filter should be left in place with a free return system.

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

The duct system and diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return plenums should be insulated. There should be no direct straight air path thru the return air grille into the heat pump. The return air inlet to the heat pump should have at least one 90 degree turn away from the space return air grille. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow.

ELECTRICAL:

Field wiring must comply with local and national fire, safety and electrical codes. Power to the unit must be within the operating voltage range indicated on the nameplate or on the performance data sheet. On three phase units, phases must be balanced within 2%.

CAUTION: Operation of unit on improper line voltage or with excessive phase imbalance will be hazardous to the unit and constitutes abuse and is not covered by warranty.

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

The unit is supplied with an opening for attaching conduit. Connect the ground lead to the ground lug in

GENERAL DESCRIPTION:

The FHP HE and SE Water-to-Air Heat Pumps provide the best combination of performance and efficiency available. Safety devices are built into each unit to provide the maximum system protection possible when equipment is properly installed and maintained.

The FHP HE and SE Water-to-Air Heat Pumps are Underwriters Laboratories (UL) listed and Canadian Standards Association (CSA) certified for safety. The FHP HE and SE Water-to-Air Heat Pumps are designed to operate with entering liquid temperature between 55°F and 95°F.

SAFETY CONSIDERATIONS:

Installation and servicing of this system can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service equipment. Untrained personnel can perform basic functions of maintenance such as cleaning coils and replacing filters.

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

When working on this 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 operations and place a fire extinguisher close to the work area.

MOVING AND STORAGE:

Move units in the normal "up" orientation as indicated by the arrows on each carton. Horizontal units may be moved and stored per the information on the carton, "Do Not Stack More Than 3 Units in Total Height". Vertical units are not to be moved, but may be stored one upon another at a maximum height of two units. When the equipment is received all items should be carefully checked against the bill of lading to be sure all crates and cartons have been received. Examine units for shipping damage, removing the units from the cartons if necessary. Units in question should also be internally inspected. If unit is damaged, the carrier should make the proper notation on the delivery receipt acknowledging the damage.

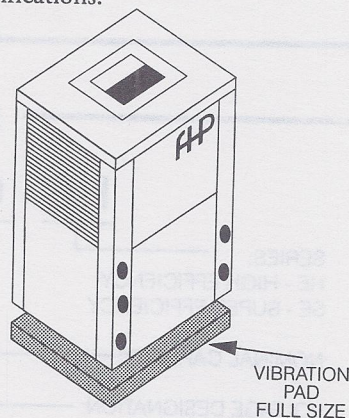
LOCATION:

Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough space for service personnel to perform maintenance or repair.

Provide sufficient room to make water, electrical and duct connection(s). If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping. These units are not approved for outdoor installation and therefore must be installed inside the structure being conditioned. Do not locate in the areas subject to freezing.

INSTALLATION:**MOUNTING VERTICAL UNITS:**

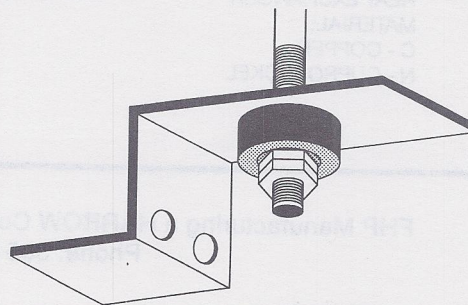
Vertical units are available in left, right, back, or front air return configurations. Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to provide isolation between the unit and the floor. (See Figure #1). It is not necessary to anchor the unit to the floor. Vertical units larger than five tons are available with front or back air return configurations. These units should be vibration isolated according to the design engineers specifications.



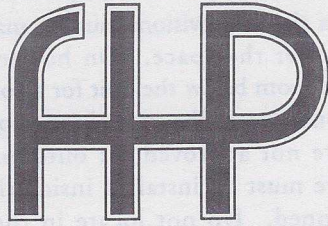
(Figure #1)

MOUNTING HORIZONTAL UNITS:

Horizontal units are available with side or end discharge. Horizontal units are normally suspended from a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kits. (See Figure # 2). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details.



(Figure #2)



FHP MANUFACTURING
Florida Heat Pump Environmental Equipment

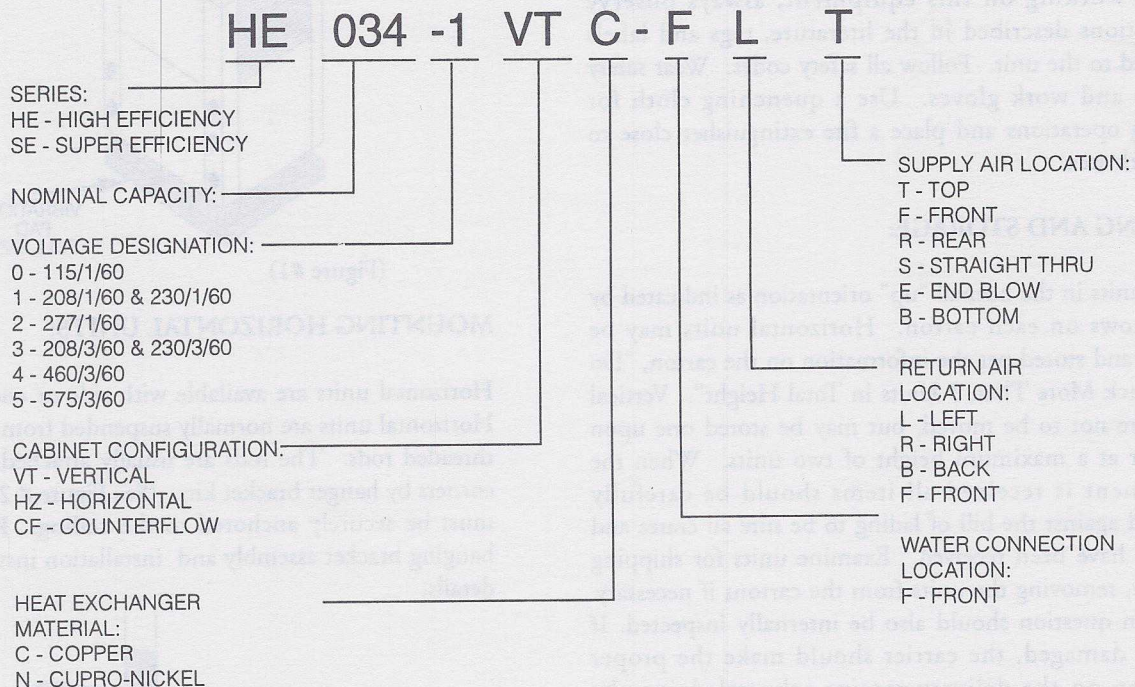
INSTALLATION MANUAL

HE & SE SERIES

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MODEL NOMENCLATURE



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