INSTALLATION

EV SERIES

AND MAINTENANCE MANUAL

TABLE OF CONTENTS

MODEL NOMENCLATURE

EV 036 -1 VT C - F L T

SERIES:
EV-ENVIRO SERIES

NOMINAL CAPACITY:

VOLTAGE DESIGNATION:
1 - 208/1/60 & 230/1/60
3 - 208/3/60 & 230/3/60

CABINET CONFIGURATION:
VT - VERTICAL
HZ - HORIZONTAL
CF - COUNTERFLOW

HEAT EXCHANGER MATERIAL:
C - COPPER
N - CUPRO-NICKEL

WATER CONNECTION LOCATION
F - FRONT

RETURN AIR LOCATION:
L - LEFT
R - RIGHT
B - BACK
F - FRONT

SUPPLY AIR LOCATION:
T - TOP
F - FRONT
R - REAR
S - STRAIGHT THRU
E - END BLOW
B - BOTTOM

INTRODUCTION:

The EV Series uses a scroll compressor and refrigerant R-410A to achieve high efficiency levels, quiet operation and reliable performance.

The new refrigerant provides performance similar to that of R-22 with one major advantage. Refrigerant R-410A is an HFC so it does not contain any ozone depleting HCFC's or CFC's.

INITIAL INSPECTION:

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 15 days of receipt.

GENERAL DESCRIPTION:

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

The EV Water-to-Air Heat Pumps are Underwriters Laboratories (UL) and (cUL) listed for safety. The EV Water-to-Air Heat Pumps are designed to operate with entering fluid temperature between 25°F to 75°F in the heating mode and between 50°F to 110°F in the cooling mode.

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

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

MOVING AND STORAGE:

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the "UP" arrows on each carton at all times. If unit stacking is required, stack units as follows: Vertical units, no more than two high. Horizontal units, no more than three high.

SAFETY CONSIDERATIONS:

CAUTION: R-410A systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.

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

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.

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.

LOCATION:

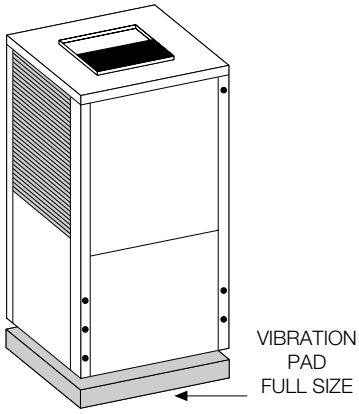
Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make fluid, electrical, and duct connection(s). If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping. These units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned. Do not locate in areas that are subject to freezing.

INSTALLATION:

WARNING: Remove all shipping blocks under blower housing. Loosen compressor mounting bolts.

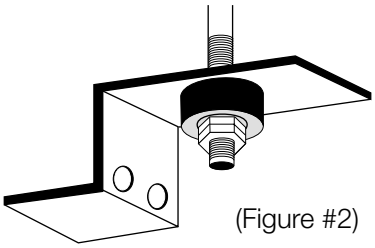
MOUNTING VERTICAL UNITS: (Figure #1)

Vertical units up to five tons are available in left, right, front, or rear air return configurations. Vertical units should be mounted level on a vibration (Figure #1) 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.



MOUNTING HORIZONTAL UNITS:

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger Bracket kits (P/N 930-004, or 006). (See Figure #2). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details. (See unit horizontal detail drawing). Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc..

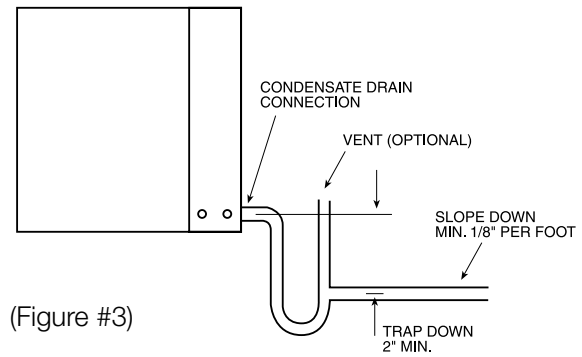


(Figure #2)

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

CONDENSATE DRAIN:

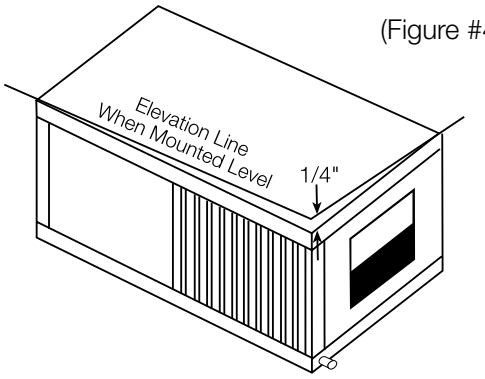
A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit.



(Figure #3)

This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow. (Heat Pumps are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See Figure #3). The length of the trap depends on the amount of positive or negative pressure on the drain pan. A second trap must not be included.

(Figure #4)



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

DUCT SYSTEM:

All EV models are provided with a return air duct flange and a supply air outlet collar to facilitate duct connections. Refer to the individual data specification sheet for physical dimensions of the collar and flange.

A flexible connector is recommended for supply and return air connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate forming during the cooling operation. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected. Do not connect 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 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 thru the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow.

ELECTRICAL:

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

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. Be certain to connect the ground lead to the ground lug in the control box. Connect the power leads as indicated on the unit wiring diagram.

NOTE: Units supplied with internal electric heat require two (2) separate power supplies. One for the unit compressor circuit and one for the electric heater elements which also powers the unit blower motor and control circuit.

Refer to the ELECTRIC HEATER PACKAGE OPTION section on page 6 and figure #8. for wiring instructions, minimum circuit ampacities and maximum fuse/breaker sizing.

THERMOSTAT CONNECTIONS:

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

C	Transformer 24 VAC Common
O	Reversing Valve (energized in cooling)
Y	Compressor contactor
R	Transformer 24 VAC Hot
W2	Auxiliary Electric Heat (2nd stage heat) runs in conjunction with the compressor
G	Fan
E	Emergency heat

SAFETY DEVICES AND THE LOCKOUT CIRCUIT:

Each EV Series unit is factory provided with a CCMI solid state controller. The CCMI controller incorporates the standard functions of electromechanical controls while adding several useful features commonly needed in water source and geothermal heat pump applications. In addition to the normal control functions, the CCMI controller includes the following features:

- **RANDOM START** - Each controller features a random start ranging from 30 - 60 seconds.
- **ANTI-SHORT CYCLE TIMER** - 5 minute delay on break timer to prevent compressor short cycling.
- **LOW PRESSURE BYPASS TIMER** - Bypasses the low pressure switch for 90 seconds to avoid nuisance lockouts during cold start up.
- **HIGH PRESSURE SWITCH DELAY** - One (1) second delay provides switch stabilization on start up to prevent nuisance lockouts.
- **BROWNOUT/SURGE/POWER INTERRUPTION PROTECTION** - A 20 millisecond window is monitored for the above condition. After the condition is detected, the 5-minute delay on break timer is initiated in conjunction with the random start timer before a restart is allowed.
- **MALFUNCTION OUTPUT** - The controller has a set of N.O. wet contacts for remote fault indication.
- **TEST/SERVICE PIN** - A jumper pin is provided to reduce all time delay settings to 6 seconds during troubleshooting or operation verification.
- **L.E.D. INDICATORS** - Two L.E.D. INDICATORS are provided as follows:
  GREEN: Power L.E.D. indicates voltage present at the board.
  RED: Fault indicator with blink code as follows:
  1 BLINK - HIGH PRESSURE LOCKOUT
  2 BLINK - LOW PRESSURE LOCKOUT
- **INTELLIGENT RESET** - If a fault condition is initiated the 5-minute delay on break period and the random start timer are initiated and the unit will restart after the delays expire. If the same fault condition is initiated a second time . The unit will be locked out and requires lockout reset.
- **LOCKOUT RESET** - Power must be removed from the controller then reapplied for the reset. This can be achieved by turning the unit thermostat off and then back on or by shutting off unit power at the unit disconnect.

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 fluid connections on the unit. EV 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. Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment. In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended.
Both the supply and discharge water lines will sweat if subject to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics. Never exceed the recommended water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.

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 insure against leaks and possible heat exchanger fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

Pressure / temperature ports are recommended in both 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.

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

WELL WATER SYSTEMS: (50°F EWT Min.) (Figure #5)

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 upsized VA transformer may be required in either case.

When using a single water well to supply both domestic water and water to the heat pump, care must be taken to insure that the well can provide sufficient flow for both.

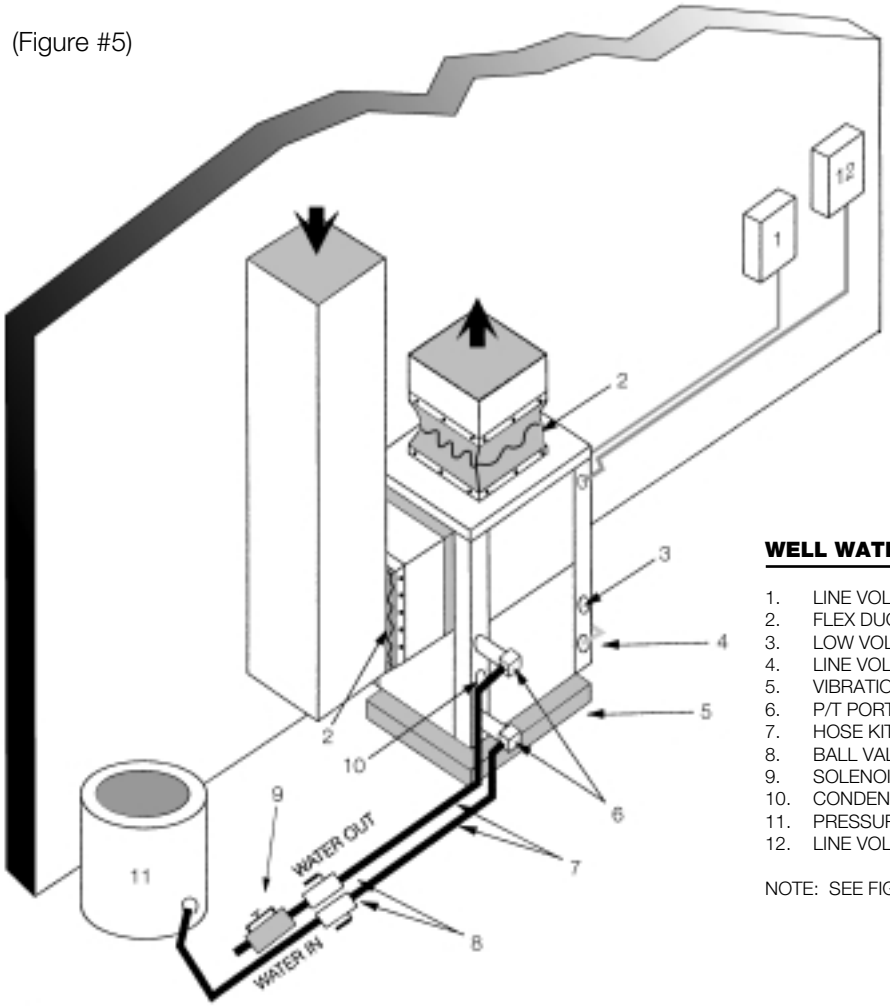
In well water applications, water pressure must always be maintained in the heat exchanger. This can be accomplished with either a control valve or a bladder type expansion tank.
Also, a slow closing 24-volt solenoid valve must be utilized to prevent water hammer.

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.)

COOLING TOWER / BOILER APPLICATION: (Figure #6)

To assure adequate cooling and heating performance, the cooling tower and boiler fluid loop temperature should be maintained between 50° F to 75° F in the heating mode and 60° to 110° in the cooling mode. In the cooling mode, heat is rejected from the unit into the water loop. A cooling tower provides evaporative cooling to the loop fluid; thus, maintaining a constant supply temperature to the unit.
When utilizing an open cooling tower, chemical water treatment is mandatory to ensure the water is free of corrosive materials.

(Figure #5)

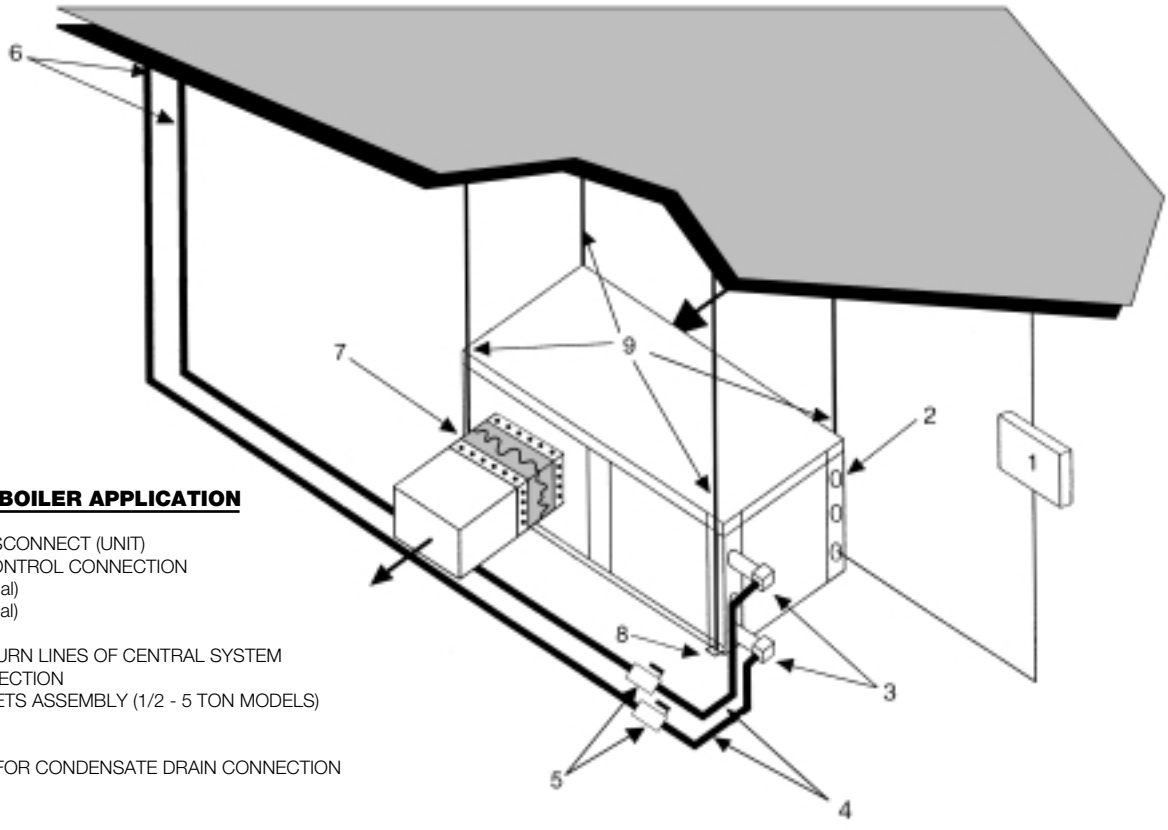


WELL WATER APPLICATIONS (50°F EWT MIN.)

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

NOTE: SEE FIGURE #3 FOR CONDENSATE DRAIN CONNECTION

(Figure #6)

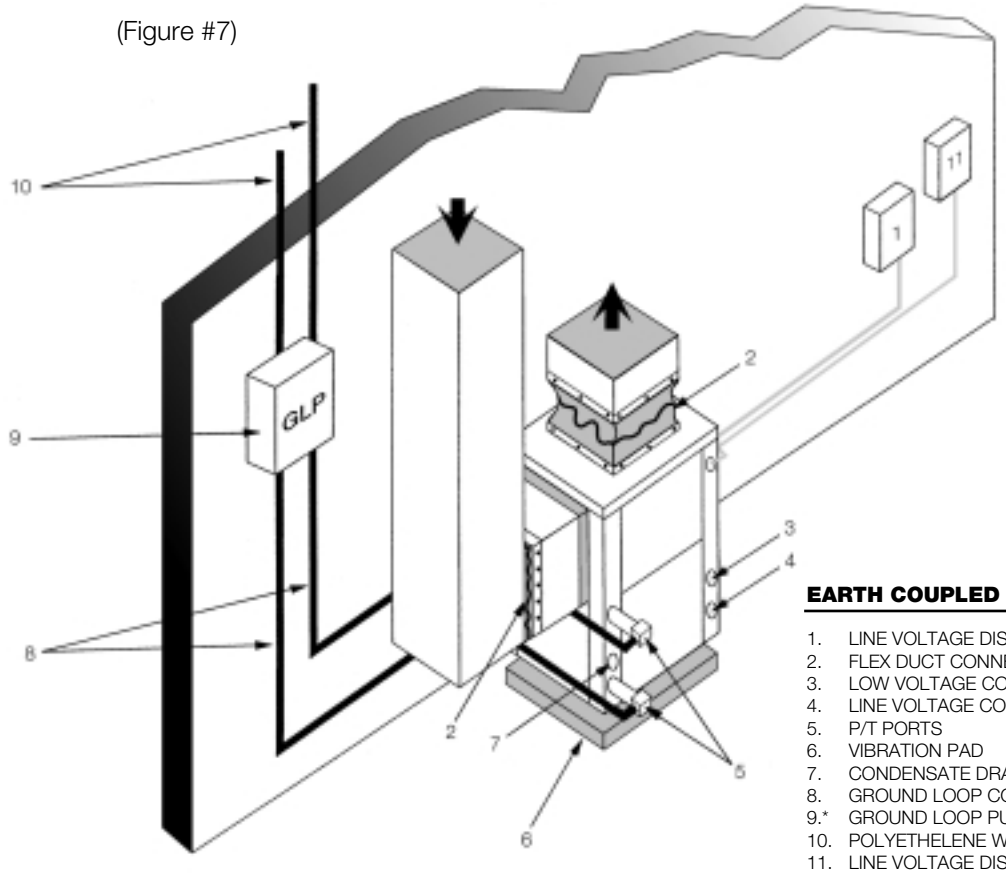


COOLING TOWER/BOILER APPLICATION

1. LINE VOLTAGE DISCONNECT (UNIT)
2. LOW VOLTAGE CONTROL CONNECTION
3. P/T PLUGS (Optional)
4. HOSE KITS (Optional)
5. BALL VALVES
6. SUPPLY AND RETURN LINES OF CENTRAL SYSTEM
7. FLEX DUCT CONNECTION
8. HANGING BRACKETS ASSEMBLY (1/2 - 5 TON MODELS)
9. THREADED ROD

NOTE: SEE FIGURE #3 FOR CONDENSATE DRAIN CONNECTION

(Figure #7)



EARTH COUPLED APPLICATION

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
8. GROUND LOOP CONNECTION KIT (550-016, 017)
9.* GROUND LOOP PUMPING PACKAGE
10. POLYETHELENE WITH INSULATION
11. LINE VOLTAGE DISCONNECT (ELECTRIC HEATER)

NOTE: SEE FIGURE #3 FOR CONDENSATE DRAIN CONNECTION

* Optional Internal Installed

TABLE 1 - HP Series Electrical Data

	EV MODEL	HEATER MODEL	KW	HEATER AMPS		CIRCUIT	MCA		MAX FUSE		AWG MIN
				208V	240V		208V	240V	208V	240V	
❍	EV030 thru 042	HP050-1XS	4.8	17.3	20.0	L1/L2	27.1	30.4	30	30	8
❍	EV048 thru 060	HP050-1XM	4.8	17.3	20.0	L1/L2	27.1	30.4	30	30	8
❍	EV030 thru 042	HP075-1XS	7.2	23.6	30.0	L1/L2	34.9	42.9	40	45	8
❍	EV048 thru 060	HP075-1XM	7.2	23.6	30.0	L1/L2	35.7	43.8	40	45	8
❍	EV030 thru 042	HP100-1XS	9.6	34.7	40.0	L1/L2	48.8	55.4	50	60	6
❍	EV048 thru 060	HP100-1XM	9.6	34.7	40.0	L1/L2	49.5	56.3	50	60	6
❍	EV048 thru 060	HP150-1XM	14.4	52.0	60.0	SINGLE	71.2	81.3	80	90	4
		HP150-1XM	14.4	34.7	40.0	L1/L2	49.5	56.3	60	60	6
				17.3	20.0	L3/L4	21.7	25.0	25	25	10
❍	EV048 thru 060	HP200-1XM	19.2	69.3	80.0	L1/L2	92.9	106.3	100	110	2
		HP200-1XM	19.2	34.7	40.0	L1/L2	49.5	56.3	50	60	6
				34.7	40.0	L3/L4	43.4	50.0	45	50	6

All heaters rated single phase 60hz, and include unit fan load. All fuses type “D” time delay or HACR type breaker or HRC FORM 1 Wire size based on 60 deg. C copper conductors.

* All 15 and 20 kW heaters can be separated into two individual circuits. The wiring information listed presumes the unit transformer and blower motor will be wired to the first circuit.

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

In the heating mode, heat is absorbed from the water loop to the unit. A boiler can be utilized to maintain the loop within the proper temperature range.

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

EARTH COUPLED SYSTEMS: (Figure #7)

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

ELECTRIC HEATER PACKAGE OPTION:

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

Factory or field installed internal electric heater packages are available for all EV Series units with the exception of horizontal straight through configuration models.

Two power supplies are required when utilizing the heater package option.

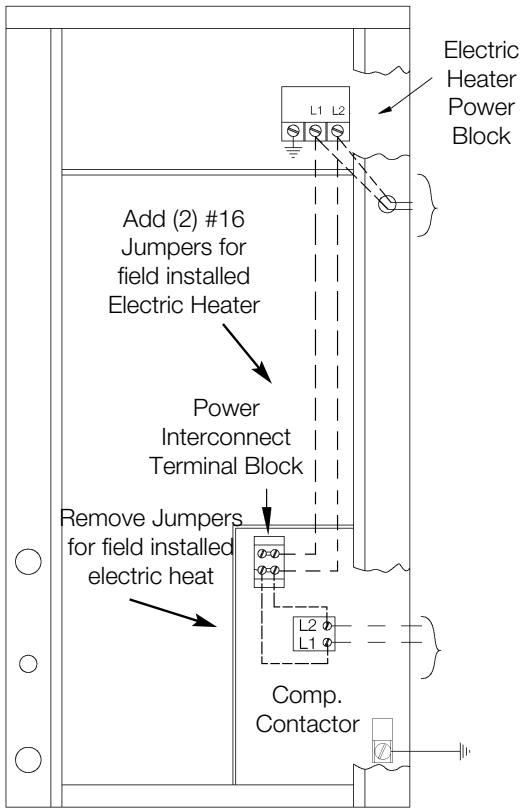
Disconnect all power supplies when servicing or installing heater packages or heat pumps. Failure to do so could result in serious injury or even death.

When a heater package is utilized the power supply to the heater package also powers the heat pumps control transformer primary and the blower motor. This allows control circuit and motor operation in case of the heat pumps compressor or associated power supply failure.

When field installing heater packages (refer to the HP Series Heater Package Installation Instructions), remove the two factory jumper wires between the comp. contactor (L1 and L2) and the power interconnect terminal block. Connect (2) two #14 gauge wires in conjunction with a #16 gauge wire to the power interconnect terminal block and the electric heater power block (L1 and L2). (Figure #8).

The heater package power supply is connected to L1 and L2 in the heater package electrical control box and the heat pump power supply is connected to L1 and L2 of the compressor contactor. (See figure #8)
Each EV Series heat pump has specific heater packages available. Nameplate information for wire sizing and fusing are shown in the above table. All heater packages are 208/240 volt single phase only. For three phase requirements an inline duct heater from an independent heater manufacturer is recommended.

(Figure #8)



SYSTEM CHECKOUT:

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

- Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
- Make sure that all electrical connections are tight and secure.
- Check the electrical fusing and wiring for the correct size. Verify that the low voltage wiring between the thermostat and the unit is correct.
- Verify that the water piping is complete and correct.
- Check that the water flow is correct, and adjust if necessary.
- Check the blower for free rotation, and that it is secured to the shaft.
- Verify that vibration isolation has been provided.
- Unit is serviceable. Be certain that all access panels are secured in place.

UNIT START-UP:

1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to "COOL", and the fan switch to the "AUTO" position. The reversing valve solenoid should energize. The compressor and fan should not run.
3. Reduce the thermostat setting approximately 5 degrees below the room temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Turn the thermostat system switch to the "OFF" position. The unit should stop running and the reversing valve should deenergize.
6. Leave the unit off for approximately five (5) minutes to allow for system pressure equalization.
7. Turn the thermostat to the lowest setting.
8. Set the thermostat switch to "HEAT".

9. Increase the thermostat setting to approximately five (5) degrees above the room temperature.
10. Verify the heat pump is operating in the heating mode.
11. Set the thermostat to maintain the desired space temperature.
12. Check for vibrations, leaks, etc…
13. Instruct the homeowner on the unit and thermostat operation.

IMPORTANT NOTES WHEN SERVICING AN EV SERIES UNIT:

CAUTION: This system uses refrigerant R-410A which has higher pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gage set, hoses, and recovery system must be designed to handle R-410A.

The high pressure switch is set to open at 600 PSI. This is much higher than the opening pressure in an R-22 unit.

The Compressors used in this product is specifically designed for R-410A and that refrigerant's higher operating pressures. It contains a polyolester lubricating oil that is compatible with the new refrigerant. The required oil is Mobil EAL Arctic 22CC. The polyolester (POE) oil is very hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

Preventing moisture from entering the system should be a top priority when servicing an EV series heat pump. To help do this: Never leave the refrigerant system open to the atmosphere for more than 15 minutes.

If the sealed refrigeration circuit must be opened for a service procedure such as replacing a compressor or any other refrigerant component, steps must be taken to minimize the introduction of moisture into the refrigerant circuit.

The following procedure should be followed:

- After recovering the refrigerant from the system, break the vacuum with dry nitrogen. Use a regulator-equipped nitrogen cylinder. Never exceed 5 PSI in the sealed system.

This procedure "floods" the inside of the system with dry nitrogen. Once the system is flooded, the defective component can be cut from the system.

Residual nitrogen remaining in the system minimizes moisture entry.

- After removing the component from the system, **immediately** seal the rest of the system with tape to prevent any further introduction of moisture. Only remove the tape when ready to install the replacement component.

NOTE: Always replace the Bi-Flow liquid line filter drier when opening the refrigerant circuit for servicing. Never install a suction line drier in the liquid line. The rated working pressure is not adequate for liquid line applications.

If the system is contaminated with moisture, the moisture must be removed before putting the system back into operation. Moisture that has not been absorbed by the POE oil can only be removed by replacing the liquid-line drier. Evacuating the system with a vacuum pump WILL NOT remove moisture from the POE oil.
No special vacuum pump is required for R-410A.

The gauge manifold and hoses must be rated to handle the higher pressures present with refrigerant R-410A. DO NOT use a conventional gauge manifold or hoses to service this product because they are not rated to handle the higher pressures.

MAINTENANCE:

1. Air Filter changes or cleanings are required at regular intervals. The time period between filter changes will depend upon type of environment the equipment is used in. In a single family home, that is not under construction, changing or cleaning the filter every 60 days 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 biweekly.

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

2. A bi-yearly “checkup” is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit’s data plate and the data taken at the original startup of the equipment.

3. Lubrication of the blower motor is not required, however may be performed on some motors to extend motor life. Use SAE-20 non-detergent electric motor oil.

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

5. Periodic lockouts almost always are caused by air or water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur call a mechanic immediately and have them check for: water flow problems, water temperature problems, air flow problems or air temperature problems. Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

OPTIONAL GROUND LOOP PUMPING PACKAGE:

An optional internally mounted ground loop pumping package is available for the EV unit (Figure #10).

Before operating the unit it is imperative that the system be purged of air and foreign material. This is accomplished by flushing the loop in both directions with a high volume of water at a high velocity. A flush cart and associated equipment will be required for this operation. Please follow the steps outlined below for proper flushing procedures:

1. Connect the flush cart discharge to the LOOP PURGE IN connection (see Figure #9) and the LOOP PURGE OUT connection. Close valves BV2 and BV3, and open valves BV1 and BV4. Liquid must be present in the supply lines at all times.
2. Flush the loop in both directions to ensure that all air and foreign matter is eliminated. Allowing the water level to drop below the pump inlet line on the flush cart will allow air back into the loop. When air bubbles are no longer

present in the return line, flow should be reversed. This procedure should be repeated several times until no air is present. If air is left in the loop, it will have an immediate effect on the unit's coaxial heat exchanger causing corrosion of it and any associated ferrous metal components. It is absolutely imperative that the system is clean and completely free of air.

3. With the flush cart running, close BV1 and BV4. This will create a positive pressure on the loop and the flush cart may be shut off. It is important to close the valve on the outlet side of the loop (BV4) first to obtain this required positive pressure.

4. The heat pump also requires purging. With all valves open repeat steps 2 and 3. For normal heat pump operation, open valves BV2 and BV3, close valves BV1 and BV4. Replace caps in purge connections.

OPTIONAL HEAT RECOVERY PACKAGE WATER PIPING:

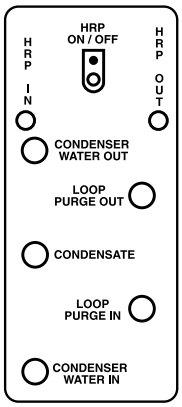
All hot water piping should be a minimum of 3/8" O.D. copper tube to a maximum distance of fifteen (15) feet. For distances beyond fifteen feet but not exceeding 60 feet, use 1/2" copper tube. Separately insulate all exposed surfaces of both connecting water lines with 3/8" wall closed cell insulation.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

IMPORTANT NOTE: The water from the HR unit may be in excess of 140° F. Local codes may require a mixing valve in the hot water system to prevent water in excess of 120°F from reaching a faucet. This valve is not part of the HR package and should be installed separately.

HR START UP:

1. Make sure all valves in the heat recovery water piping system are open. Never operate HR Pump dry.

(Figure #9)



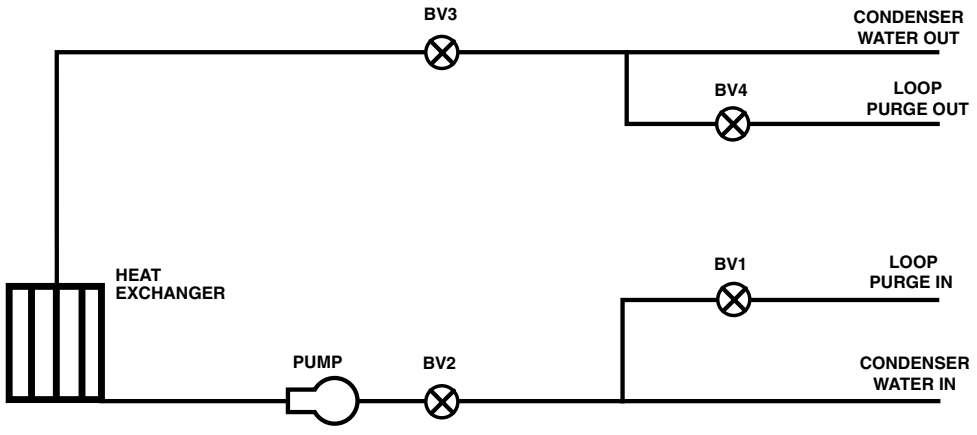
2. Turn on the heat pump. The HR Pump should not run if the compressor is not running.

3. Turn the HR switch to the "ON" position. The indicator light will illuminate indicating pump operation if the entering water temperature is below 140° F.

4. The temperature difference between the water entering and leaving the heat recovery unit should be between 5° to 15° F.

5. Allow the unit to operate for 20 to 30 minutes to ensure it is functioning properly. The pump should shut off when the water temperature entering the heat recovery unit reaches approximately 140° F.

VALVE POSITION DIAGRAM (Figure #10)



TO PURGE LOOP: BV1 - OPEN
BV2 - CLOSED
BV3 - CLOSED
BV4 - OPEN

UNITS SHIPPED WITH VALVES SET IN "LOOP PURGE" POSITION

TO PURGE HEAT PUMP: ALL VALVES OPEN

TO OPERATE SYSTEM: BV1 - CLOSED
BV2 - OPEN
BV3 - OPEN
BV4 - CLOSED

REPLACE CAP PLUGS AFTER PURGING.

TEMPERATURE PRESSURE CHART

Refrigerant R-410A
(Vapor Pressure)

Temp (ºF)	Press (PSIG)
1.0	50
4.8	55
8.3	60
11.6	65
14.8	70
17.9	75
20.8	80
23.6	85
26.3	90
28.9	95
31.4	100
33.8	105
36.2	110
38.5	115
40.7	120
42.8	125
44.9	130
47.0	135
49.0	140
50.9	145
52.8	150
54.7	155
56.5	160
58.3	165
60.0	170
61.7	175
63.4	180
65.0	185
66.6	190
68.2	195
69.8	200
71.3	205
72.8	210

Temp (ºF)	Press (PSIG)
74.2	215
75.7	220
77.1	225
78.5	230
79.9	235
81.3	240
82.6	245
83.9	250
86.5	260
89.0	270
91.5	280
93.9	290
96.3	300
98.5	310
100.7	320
102.9	330
105.0	340
107.1	350
109.1	360
111.1	370
113.1	380
115.0	390
116.9	400
120.5	420
124.1	440
127.5	460
130.8	480
134.0	500
137.2	520
140.2	540
143.2	560
146.0	580
148.8	600

TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE	CHECKS AND CORRECTIONS
ENTIRE UNIT DOES NOT RUN	Power supply off	Apply power, close disconnect.
	Blown fuse	Replace fuse or reset circuit breaker. Check for correct fuses.
	Broken or loose wires	Replace or tighten the wires.
	Voltage supply low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
	Thermostat	Set the fan to "ON", the fan should run. Set thermostat to "COOL" and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to "HEAT" and the highest temperature setting, the unit should run in the heating mode. If neither the blower or compressor run in all three cases, the thermostat could be miswired or faulty. To ensure miswired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between "R" and "C", "G" and "C", "Y" and "C", and "O" and "C" (cooling only). Replace the thermostat if defective.
BLOWER OPERATES BUT COMPRESSOR DOES NOT	Thermostat	Check setting, calibration, and wiring.
	Wiring	Check for lose or broken wires at compressor, capacitor, or contactor.
	Safety controls	Check CCMI board red fault L.E.D. for blink code (See problem for possible causes)
	Compressor overload open	If the compressor is cool and the overload will not reset, replace compressor *.
	Compressor motor grounded	Internal winding grounded to the compressor shell. Replace compressor and liquid line drier. If compressor burnout, install suction drier.
	Compressor windings open	After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor and liquid line drier.
UNIT OFF ON HIGH PRESSURE CONTROL	Discharge pressure too high	In "COOLING" mode: Lack of or inadequate water flow. Entering water temperature too warm. Scaled or plugged condenser. In "HEATING" mode: Lack of or inadequate air flow. Entering air temperature too warm. Blower inoperative, clogged filter, or restrictions in ductwork.
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factory recommended charge.
	High pressure switch	Check for defective or improperly calibrated high-pressure switch.
UNIT OFF ON LOW PRESSURE CONTROL	Suction pressure too low	In "COOLING" mode: Lack of or inadequate air flow. Entering air temperature too cold. Blower inoperative, clogged filter, or restrictions in ductwork. In "HEATING" mode: Lack of or inadequate water flow. Entering water temperature too warm. Scaled or plugged condenser.
	Refrigerant charge	The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.
	Low pressure switch	Check for defective or improperly calibrated low-pressure switch.
UNIT SHORT CYCLES	Unit oversized	Recalculate heating and or cooling loads.
	Thermostat	Thermostat installed near a supply air grill, relocate thermostat. Readjust heat anticipator.
	Wiring and controls	Loose connections in the wiring or a defective compressor contactor.
INSUFFICIENT COOLING OR HEATING	Unit undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem.
	Loss of conditioned air by leaks	Check for leaks in duct work or introduction of ambient air through doors or windows.
	Airflow	Lack of adequate air flow or improper distribution of air. Replace dirty filter.
	Refrigerant charge	Low on refrigerant charge causing inefficient operation.
	Compressor	Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor and liquid line drier.
	Reversing valve	Defective reversing valve creating bypass of refrigerant from discharge to suction side of compressor. Replace reversing valve and liquid line drier.
	Operating pressures	Compare unit operating pressures to the pressure / temperature chart for the unit.
	TXV	Check TXV for possible restriction or defect. If replacement is necessary, replace liquid line drier as well.
	Moisture, noncondensables	The refrigerant system may be contaminated with moisture or noncondensables. Reclaim refrigerant, evacuate and recharge with factory recommended charge. Note: a liquid line drier may require replacement.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