Hydro-Temp
GEOTHERMAL NATURALLY.®

Single & Two Speed Series Installation Manual

ETL LISTED C US

ENERGY STAR PARTNER

TABLE OF CONTENTS

Explanation of Terms / Acronyms used in Manual

AWG = American Wire Gauge
DHW = Domestic Hot Water
AHW = Auxiliary Hot Water (Infloor, Pool, etc.)
CFM = Cubic Feet per Minute
UV = Ultra Violet
Vac = Volts Alternating Current
Vdc = Volts Direct Current
BAS = Building Automation System
VA = Volt Amps
GPM = Gallons per minute
PVC = Polyvinyl Chloride
CPVC = Chlorinated Polyvinyl Chloride
Relay reference to C = common terminal
Relay reference to NO = Normally open terminal
Relay reference to NC = Normally closed terminal
E-Heat = Emergency heat / strip heat only, compressor locked off.
Aux heat = Auxiliary heat / strip heat running with compressor.

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Do not install, operate, or maintain this equipment before carefully reading this instruction manual. Additional copies of this manual are available from the installing dealer or from *Hydro-Temp™* Corporation.
Save these and any other operating instructions for yourself and any future owners of this equipment.
A trained Hydro-Temp installer must perform all installation practices.
A licensed refrigeration technician must perform all refrigeration repairs / modifications. Hydro-Temp must approve all service repairs if system is covered under manufacturer warranty.

Installation Manual Print Date: June 16, 2016

MODEL NOMENCLATURE

V	X	X	1	XXXX	X	X	X	1	X	X	XXX

SERIES:
C = COMMERSIAL
R = RESIDENTIAL
V = V-STAR

COMPRESSOR SPEEDS:
A = SINGLE SPEED
B = TWO SPEED
C = THREE SPEED
D = FOUR SPEED
E = FIVE SPEED
F = SIX SPEED
G = SEVEN SPEED
H = EIGHT SPEED
M = MULTI-SPEED
V = VARIABLE
X = NON-APPLICABLE

CONFIGURATION:
C = CORNER CONSOLE
H = HORIZONTAL
L = LONG CONSOLE
N = NARROW CONSOLE
O = COMPACT HORIZONTAL
P = COMPACT VERTICAL
R = ROOF TOP
S= SPLIT
V= VERTICAL
W = WATER TO WATER
F = COUNTER FLOW

REFRIGERANT:
1 = R410A
2 = R22
3 = R134A
4 = R407C
X = IF NON-APPLICABLE

UNIT BTU OUTPUT:
BTU X 1000

AIR FLOW DIRECTION:
X= Unknown at the time of submittal
A = UPFLOW-RIGHT RETURN
B = UPFLOW-LEFT RETURN
C = UPFLOW-BACK RETURN
D = UPFLOW-TOP RETURN
E = UPFLOW FRONT (CORNER CONSOLE ONLY)
F = HORIZONTAL FLOW-RIGHT RETURN
G = HORIZONTAL FLOW-LEFT RETURN
H = HORIZONTAL FLOW-BACK RETURN
I = HORIZONTAL FLOW/ FRONT
J = COUNTER FLOW-RIGHT RETURN
K = COUNTER FLOW-LEFT RETURN
L = COUNTER FLOW-COUNTER RETURN
M = COUNTER FLOW-BACK RETURN
N = END RETURN & SUPPLY – LEFT RETURN, RIGHT SUPPLY
O = END RETURN & SUPPLY – RIGHT RETURN, LEFT SUPPLY

STRIP HEAT:
XXX = NO STRIP HEAT
005 = 5KW
010 = 10KW
015 = 15KW
020 = 20KW
OR TOTAL KW

WATER SOURCE:
W = OPEN LOOP/WELL WATER
C = CLOSED LOOP
T = COOLING TOWER
X = IF NON-APPLICABLE

Microprocessor:
X = TERMINAL STRIP
1 = GEORGIA CONTROL/HYDRO-TEMP
2 = AUTOMATED LOGIC/583
3 = AUTOMATED LOGIC/6126
4 = END USER DDC

VOLTAGE/PHASE:
1 = 208/230Vac-1 PHASE
2 = 115Vac-1PHASE
3 = 208/230Vac-3 PHASE
4 = 460Vac-3 PHASE
5 = 575Vac-3 PHASE
6 = 265/277Vac-1 PHASE
7 = 380Vac- 3 PHASE

HOT WATER OPTIONS:
X = NO HOT WATER
B = DESUPERHEATER AND INFLOOR*
C = DESUPERHEATER AND POOL HEATING*
D = DESUPERHEATER
E = HYDROZONE AND DESUPERHEATER*
F = HYDROZONE AND INFLOOR*
G = HYDROZONE AND POOL HEATING*
H = HYDROZONE
I = INFLOOR
J = INFLOOR AND POOL HEATING*
O = DHW PRIORITY AND HYDROZONE*
P = DHW PRIORITY
Q = DHW PRIORITY AND INFLOOR*
R = DHW PRIORITY AND POOLING HEATING*
S = POOL HEATING
(SELECT ONLY ONE)

*THIS OPTION IS NOT AVAILABLE IN CONSOLE OR COMPACT MODELS

WATER PLUMBING LOCATION:
R = WATER THROUGH RIGHT SIDE
L = WATER THROUGH LEFT SIDE
B = WATER THROUGH BACK
C = WATER THROUGH BOTTOM
T = WATER THROUGH TOP
F = WATER THROUGH THE FRONT
X = NO WATER/UNKNOWN PLUMBING LOCATION

1.0 Transportation & Storage

Move and store units in an upright position. Do not stack units. Inspect shipment for shipping damage and check packing slip for accuracy. Any equipment or cartons in question should be removed from the packing and physically inspected. If any damage is detected, the carrier should make a note on the delivery slip acknowledging the damage. In some cases smaller items like thermostat or temperature sensors will be packed and shipped inside the system.

During freezing conditions special consideration should be made to prevent unit damage. **If a unit is taken to the job site or put in storage, anti-freeze will need to be pumped into the water coils to prevent freezing.** Failure to do this will void warranty.

2.0 Electrical Hazard Warnings

THE FOLLOWING IS A GENERAL WARNING STATEMENT WHICH SHOULD BE READ AND UNDERSTOOD BEFORE INSTALLING AND OR OPERATING YOUR NEW HYDRO-TEMP UNIT

ELECTRIC SHOCK CAN KILL!!

- Always protect yourself and others. Always turn off system power before removing panels. Some units may have more than one or two power supplies.
- Keep all covers and panels in place at all times. When removed for install or service purposes never leave the cover off when left un-attended.
- Do not stick hands into return or any other opening.
- All repairs, electrical or mechanical, should be attempted only by trained Hydro-Temp technicians. In the event of a unit problem, do not reset the equipment before correcting the problem. Equipment failure due to resetting without first correcting the problem will not be covered by the warranty.
- The presence of water around the base of the unit constitutes an electrical hazard. Turn off the power to the unit as soon as water leakage is discovered and call a service technician immediately.
- STRIP HEAT WARNING: On systems with auxiliary/emergency heat strips, be aware that the heat strip contactor may be wired on a separate circuit. Therefore an additional breaker must be shut off before removing panels and servicing unit.
- All breakers/fuses supplying power to this equipment should be clearly labeled at time of installation.
- All wiring and plumbing should be done in strict accordance with local and national codes and ordinances.

2.1 Electrical Connections

Power to the Hydro-Temp System and back-up electric heater may be two or sometimes three circuits (Some large dual compressor systems will require a circuit per compressor). A standard system requiring one circuit for compressor and one circuit for strip heat can be wired with 2 breakers in the main breaker panel or one circuit feeding a sub breaker panel near the system. All circuits must have its own power disconnect near the system. The electrical installation must be performed by a licensed electrician, except for the low voltage wiring (Class 2) (i.e. T-Stat) which can be done by the heat pump contractor. **Note:** In most areas high voltage can be taken from disconnect to the unit by the mechanical contractor if allowed by local codes. All wiring and plumbing should be done in strict accordance with local and national codes and ordinances.

3.0 Hydro-Temp System Installation

Locate the unit in a conditioned, indoor area that allows for easy servicing. Make sure that the air filter access and unit access panels are easily accessible. Provide sufficient room to make all ground loop, well water, DHW, condensate, electrical, and if applicable refrigeration connections.
If the unit is placed in a closet, make provision for adequate return air flow to the unit.

Some installations may require a condensate pump to take the condensate to a suitable drain location. Do not locate the unit in an area that is subject to freezing. The minimum recommended room temperature for equipment location is 60°F. Provide a heated, insulated enclosure for the unit where necessary.

4.0 Ductwork Considerations

Important Note: If ductwork is installed in an attic area, it needs to be built "low profile" and laid directly on the ceiling joist. After being installed and insulated with R6 insulation, it must be covered with six to eight inches of cellulose. If the attic ductwork is not covered with cellulose it can lose a significant amount of its heating and cooling capacity!!

Inadequate ductwork will cause poor system performance and customer dissatisfaction. In the USA, ductwork sizing methods should follow ACCA "Manual D".

Install ductwork within the conditioned space of the building to minimize duct heat loss or gain, wherever possible. To minimize air velocity noise transferring to the air supply grills, flex duct should be installed from the supply grill back six feet.

Ductwork should be designed to handle CFM delivery for the system while running in High Speed. Supply duct should be based on .08 inches of pressure drop per 100 feet. Return duct should be based on .05 inches of pressure drop per 100 feet.

Note: Always check register CFM requirements against register manufacturer's data for register performance. It is extremely important to ensure that duct system return air is NOT undersized. Undersized return air can cause poor system performance and in some cases can cause the blower to "pulse". Further, it is also important to provide adequate sized supply air plenums. Make all turns as smooth as possible avoiding any restrictions.
For residential design the target static pressure should not be greater than 0.3".

Caution: Observe the location where your ductwork is being attached to the unit. Ensure that drilling and screws do not damage the air coil.

4.1 Hydro-Temp System Noise and Vibration Isolation

A quality installation should be one where noise is not a complaint. A number of inexpensive features can be added to reduce noise and also aid in installation and maintenance. Flexible hose kits to the hot water loop will make for easy connection to the heat pump and the hot water tank and also reduce any noise being transmitted from the heat pump to the indoor plumbing. Next the heat pump and all associated water pumps should be installed on a shock-absorbing pad to isolate the heat pump from a hard surface floor. This pad will help stop the possibility of the cabinet being rusted out by trapped moisture under the unit. Flexible duct connections help to stop noise from the heat pump being transmitted through the metal ductwork. This collar also makes the connection of the heat pump to the ductwork a much simpler task. It is not recommended to hang the Hydro-Temp unit from the floor joist, but if this becomes necessary, adequate isolation MUST be provided to reduce unit noise and vibration from being transmitted to the rest of the building.

4.2 Air Filtering

To maintain good indoor air quality in a tight building, the air distribution system should have a high-efficiency air filter. To ensure proper unit operation, be sure to inform the building owner of the importance of proper maintenance and the maintenance schedule for the filter installed. Most air filters require monthly attention.

4.3 Construction / Remodeling

The Hydro-Temp system should never be run during any kind of construction or remodeling that would allow drywall, hard wood, or any kind of dust to be pulled in the system. Even with extra filtering dust particles can accumulate in the duct system causing unwanted dust for years to come. It can also cause air coil clogging, condensate drain clogging, blower dust accumulation and many other problems to the system. Running the system during construction / remodeling will void the system warranty.

5.0 DHW Heating

The desuperheater method of heating hot water will incorporate a desuperheater coil as shown on this page. The coil is plumbed in-line with the hot gas circuit to heat water any time the system is on heating or cooling the space.

5.1 DHW Tank Preparation

If a hot water heating option is to be installed, electric domestic hot water (DHW) tanks are regularly used, although other fuel types are sometimes acceptable. Begin DHW installation by:

1. Turn off the power supply or the fuel supply to the DHW tank.
2. Close the cold water supply valve to the DHW tank.
3. Attach water hose to the tank drain connection and empty the tank to a drain or outside.
4. Open the pressure relief valve or faucet nearby to break the vacuum inside the water system to speed up the draining process.
5. After the tank has been drained disconnect the hose and remove the DHW tank drain fitting.

5.2 Desuperheater Option Installation (Only copper tubing should be utilized)

Install the desuperheater circuit similar as shown in Fig. 5.2. Include isolation valves and two boiler drain valves for tank draining and DHW system purging. Valves allow for pump service without draining the DHW tank. A horizontal swing check valve must be used to prevent over heating of the tank. Use 1/2" copper tubing if up to 30' tank distance. Over 30' adapt up to 3/4" copper pipe for lower DHW pressure drop.

Remove existing drain port from the hot water tank and insert a standard dielectric fitting (thread the male end of the fitting into the water heater drain port using a P. T. F. E. based thread sealer) and continue with installation as shown. Insulate all desuperheater circuit piping with pipe insulation.

5.3 DHW Pump

On desuperheater hot water systems the pump is normally mounted and wired by the factory inside the unit. The pump can be turned off for servicing of the tank by turning off the toggle switch on the front of the system.

5.4 Purging the air from the DHW System

All the air must be purged from the DHW lines before the system can be run to make hot water. Improper purging will result in air in the pump causing the pump to cavitate and damage the pump. Systems are shipped from the factory with biodegradable RV antifreeze pumped into the DHW coils. If proper purging methods are followed this anti-freeze will easily be purged from the system.

5.5 Filling the Hot Water Tank

Close boiler drain valves and the isolation valves to the Hydro-Temp system. Open the cold water supply feeding the DHW tank. Open a hot water tap in the building and allow air to bleed out of tank. Alternatively you can depress lever on the tank relief valve to remove air trapped in the tank. Once the building plumbing is purged it is important to purge the air that is remaining in the Hydro-Temp system and plumbing between the hot water tank and the Hydro-Temp system. *Purging the building plumbing even with the isolation valves open to the Hydro-Temp system will not purge the air from the Hydro-Temp system.*

5.6 Purging the Hydro-Temp Hot Water Loop

Attach a hose to the boiler drain A (refer to figure 5.2) and run the hose to a floor drain or outside. Close the isolation valve B at the bottom of the DHW tank. Open the isolation valve A at the cold-water inlet on the DHW tank and allow the water to flow out the hose. Allow the water to run for a few minutes while checking for air leaving the drain hose. Once all of the air has been purged, close isolation valve A and open the isolation valve B. Allow the water to flow through the system and out the hose. Run for approximately 5 to 10 minutes while checking for air leaving the drain hose. To insure no air is trapped anywhere, open both valve A and valve B to allow flow both ways. Allow water to run for approximately one minute. Once purging is complete, close the boiler drain valve, remove the hose and ensure that both isolation valves "A & B" are open. Wiring to the DHW pump is normally left unwired in the Hydro-Temp's electrical box and tagged with the proper reconnection location. This wire should only be hooked up after the system is properly purged to prevent pump damage.

5.7 Plumbing to a Marathon Hot Water Tank.

When plumbing the Hydro-Temp DHW system to a Marathon hot water tank you need to keep a couple of things in mind. All fittings must be mechanical fittings at the tank; due to the tank being plastic you cannot solder or braze close to the tank. The direction of flow in and out of the tank and plumbing is the same as with a steel tank. **Never use plastic fittings (CPVC or Pex) when connecting between the tank and the Hydro-Temp system.**

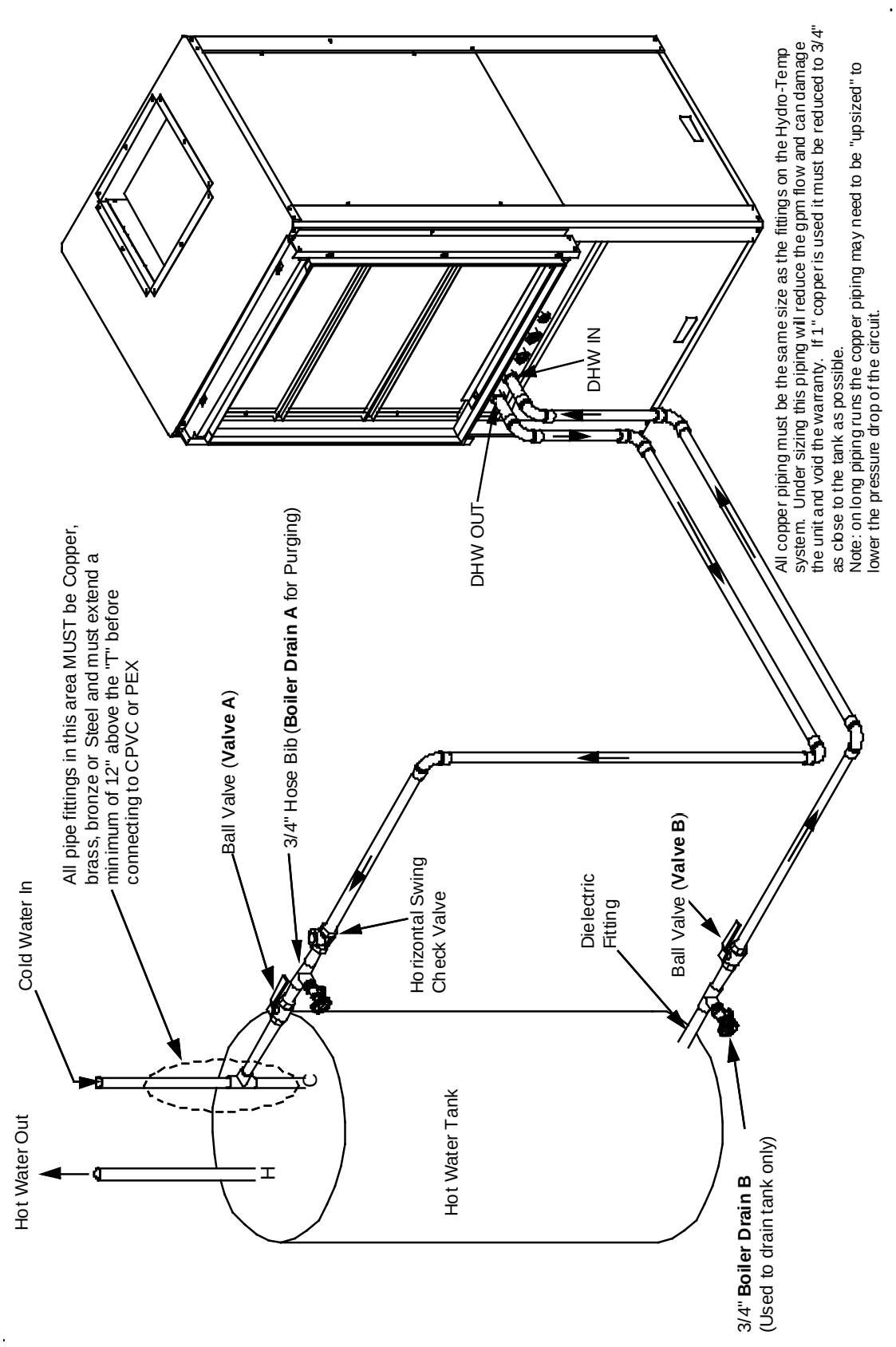


Figure 5.2 Hot Water Tank **<u>Only copper tubing should be utilized</u>** (H005672E)

6.0 The Ground Loop System

IMPORTANT! Do **NOT** use PVC or CPVC piping on any connections to your Hydro-Temp unit. The only exception where PVC or CPVC piping may be used is on the condensate lines.

6.1 Closed Loop Systems Plumbing

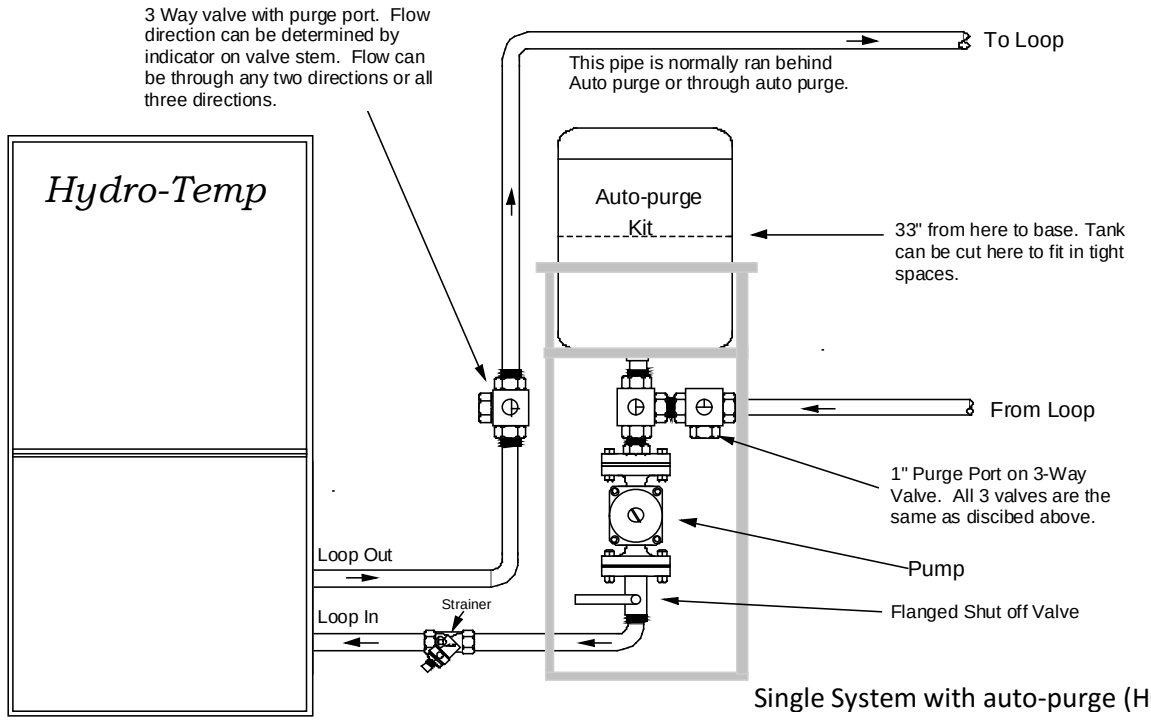
Closed loop systems will require a minimum of 3 G.P.M. per ton if the ground loop is designed to maintain a loop temperature above 32ºF and below 90ºF. If design temperatures are outside of these temperatures more flow will be needed.

On residential systems typically a pump is required for each unit. The loop pump requirement will depend upon the loop design for a given application. The ground loop piping system must provide suitable access for purging the outside loop and require isolation valves for purging the inside plumbing including the system. To properly purge a closed loop system, a **minimum** velocity of 2 feet per second in every branch of the ground loop must be achieved. The purge ports will also be used for anti-freeze charging.

IMPORTANT NOTICE: UNITS THAT UTILIZE GROUND LOOPS MUST MAINTAIN A MINIMUM OF 20% METHANOL OR 25% PROPYLENE GLYCOL AS ANTIFREEZE SOLUTION IN THE UNIT AND GROUND LOOP AT ALL TIMES. FAILURE TO DO SO WILL FREEZE THE SYSTEM AND CAUSE SEVERE DAMAGE TO THE UNIT. DAMAGE TO THE UNIT CAUSED BY THE FAILURE TO MAINTAIN PROPER ANTIFREEZE LEVELS IS NOT COVERED UNDER THE WARRANTY.

A Y-Strainer must be installed on the "Loop In" line as shown in the drawings below. Failure to do so could cause severe damage to the unit and void unit warranty.

It is recommended to always mount the ground loop pump **vertically** so air will not be trapped in the pump if not properly purged. A dry or air locked pump will quickly burn out.
The recommended auto purge kit (shown below) is designed with the pump mounted vertically and tees strategically placed to purge air from the system and into the auto purge tank automatically while running (this should be used to remove small amounts of air left after purging the system with the purge pump, or a system pump replacement). The auto purge kit is **not** used in place of purging the system but is left on the system to purge the loop continuously. Systems with the auto purge kit are not pressurized.

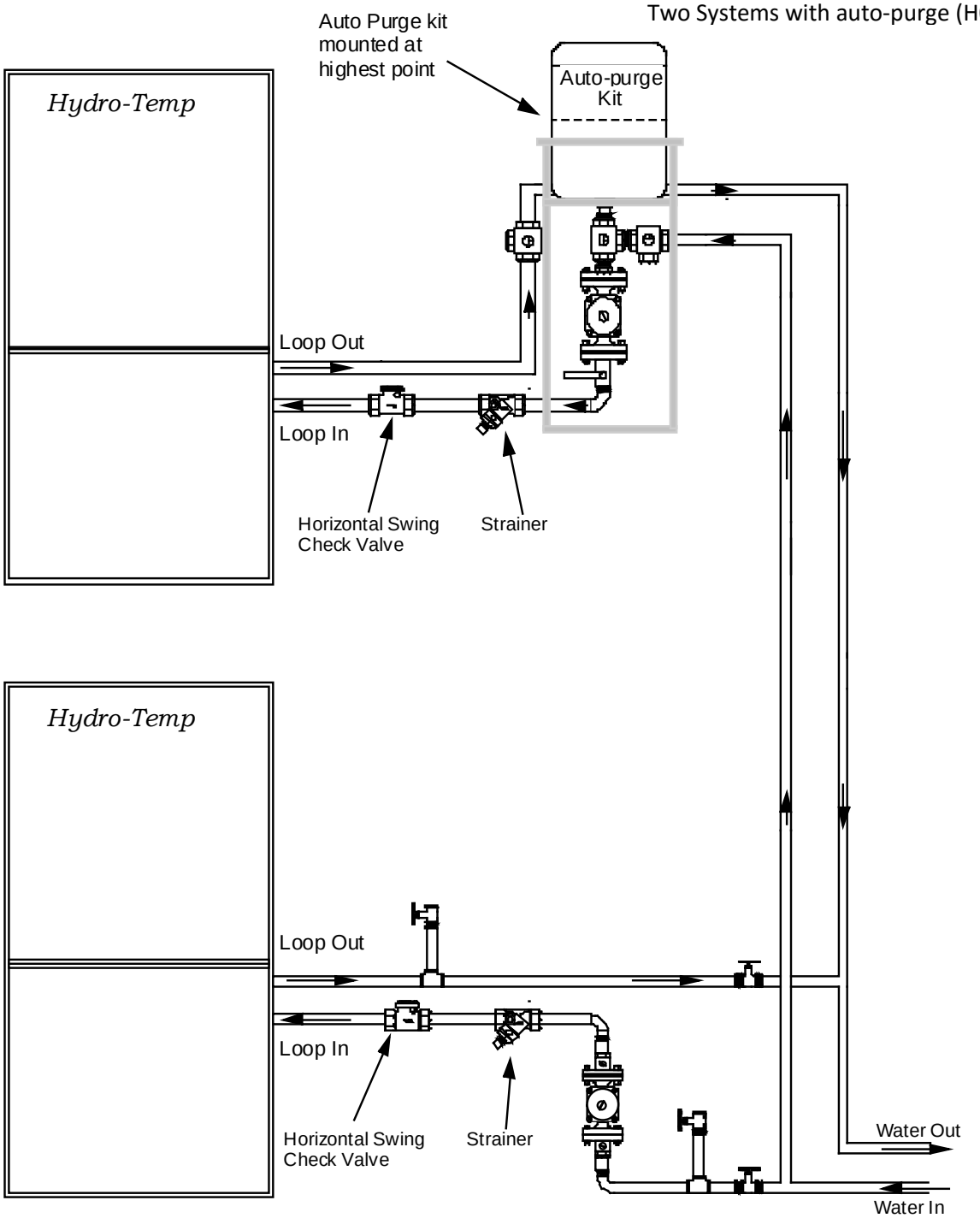


Single System with auto-purge (H000047A)

6.2 Closed Loop with two or more Systems

When two or more units are connected to one loop, **ONLY ONE** auto purge kit is used. It is best if installed on the highest unit at the highest point but does not have to be higher than the loop field. Check valves and a Y-strainer must be installed on each unit to prevent backward water flow when the unit is off. The auto purge keeps proper pressure on the suction side of the pump to prevent air locking or cavitation from occurring. The tank must be kept ½ to ¾ full at all times. As shown in the drawing below, the other unit(s) simply need to have a pump for each unit.

Two Systems with auto-purge (H0001776)



6.3 Purging the Closed Loop

Purging of the ground loop and system should only be done after it has passed the air pressure check and all leaks have been repaired. Purging should be done by installing dealer or sub-contractor.

1) Connect purging unit to purge ports.
2) Close both isolation valves to the unit, close the isolation valve to the optional auto purge tank, open both isolation valves to the loop and open both purging ports connected to the purging unit. Be aware most pump flange kits have built in isolation valves. In some cases as shown in most of our drawings a three way valve will be used where flow can be straight through only, straight through and through tee, or completely off.
3) Fill the purging unit water reservoir so that the water level is above the return line. (If possible your anti-freeze should be added here as required. When purging in methanol it should be diluted to 50% methanol and 50% water for safety until the required amount has been added
4) Start the purge pump. Make sure the water is always above the supply water line. This will prevent any splashing and prevent extra air from entering the loop. Use a strainer to try and catch any debris returning to the purging unit. Turn the purge pump off and on as needed while refilling the reservoir. Once a solid flow is established it is EXTREMELY important to maintain a minimum flow velocity in any section of pipe of 2 ft/second. It may be necessary on very large residential loops to close off some sections of the loop field to maintain this velocity. Most very large residential or commercial loop fields are purged one section at a time.
5) Purge the loop for about 10 minutes after all micro air bubbles are gone. Micro air bubbles will often appear milky and restrict the view to the bottom of the purge reservoir. Close the inlet valve of the purging unit with the pump running for about 5 seconds. This will "dead head" the system. In other words the internal pressure of the loop will be increased. Important: Watch for any significant drop in the water level of the reservoir, if the water level in the purger drops more than one or two inches, this will indicate the presence of air in the loop. If there is a large water level drop continue purging in the same direction. "Dead heading" the system will provide bursts of high pressure through the system. This will help dislodge any difficult air pockets. "Dead heading" can be done at any time and can speed up the whole purging procedure.
6) Keep purging until no more air is seen coming out of the loop into the Purging unit reservoir. "Dead head" the system again and watch for any significant drop in the purger's water level. If after “dead heading” multiple times the water level still drops more than an inch then you may need to reverse the purger lines to purge through the loop in reverse repeating steps 4 – 6. Be aware of any check valves that may be between the purge ports and the ground loop.
7) Once the outdoor loop is purged and free of debris, the indoor loop can be purged. The first step is to perform a cleansing purge of the indoor piping. This is done by bypassing the equipment by either using a bypass valve at the unit or having the supply and return hose kits connected together. The important thing is not to allow any debris to enter the unit. Once the cleansing purge has been completed, attach the hose kits to the units and purge the units. All of the indoor purging will follow the same procedure as described for the outdoor loop.
8) If no auto purge is used the system will have to be pressurized. Most purging units will generate enough pressure by “Dead heading” the system with both the unit and the ground loop isolation valves open.
9) If an auto purge is used you can now disconnect the purging unit. Use the left over water from the purging unit reservoir to fill the auto purge tank. Open the isolation valve on the Auto purge tank.

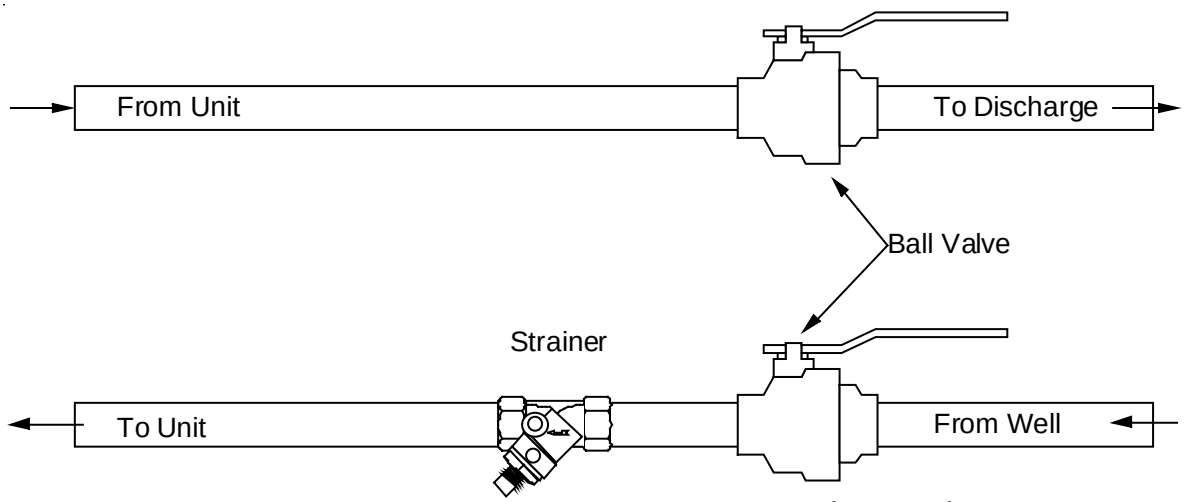


Figure 7.1 Typical Open loop plumbing Components (H00046B)

7.0 Open Loop Systems

A well of sufficient capacity and good water quality are the only acceptable water sources for Open loop Systems.

Caution: To prevent unreliable operation and component damage, do not pump pond or lake water directly through the units.

7.1 Open Loop System Plumbing

Assemble well water components in the same order as shown in fig. 7.1. A 18 to 20 mesh strainer is recommended. Use a water strainer to keep debris out of water regulating valves and heat exchanger. Ensure strainer is situated to provide easy access and maintenance. Provide isolation valves and instruct end user on how to isolate the system and clean strainer. Some wells have excess debris which can restrict the unit's strainer in a short period of time. If this is the case replace the existing strainer with a larger capacity 18-20 mesh strainer. A strainer with more surface area will have to be cleaned less often.
Ensure the water flows through the unit and out the discharge with no leaks.
Discharge water should run outside with no restrictions, to a discharge well, creek, pond or where ever water is needed. Never connect the discharge water line directly to a sprinkler as this will restrict the water flow and lower the unit's efficiently, and possible cause damage to the unit. ***Check local state and county codes for proper discharge of water.*** Discharge tubing must be prepared in a manner that will not freeze.

Normally 1 to 2.5 US G.P.M. per heating or cooling ton (in high speed) is required for open loop systems. Water flow is regulated with pressure regulated water control valves. On all well water systems a Belimo motorized water valve is also provided to turn off the water flow when the unit shuts down. In installations where the groundwater temperature is expected to fall below 50°F during any part of the heating season, perform a calculation to anticipate higher flow rate requirements. A higher water flow rate results in a lower temperature drop through the liquid to refrigerant heat exchanger. This prevents the Freeze stat from activating unnecessarily. The Freeze stat helps protect the liquid to refrigerant heat exchanger from freezing internally. Freeze protection is accomplished by measuring the refrigerant temperature exiting the water coil in the heating mode. If this temperature drops below the freeze set point the system will activate the freeze / defrost routine then lock out until manually reset.

7.2 Open Loop System Pressure Regulating Valves

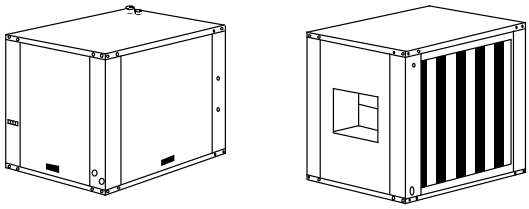
Open Loop system will come standard with pressure regulating water valves to be field installed. These valves (one for heat and one for cooling) will come plumbed together and will need to be field installed into the loop inlet water line between the system and the water strainer. Refrigerant access fittings will be provided next to the loop in and loop out lines for the refrigerant connection. Fittings and lines are labeled accordingly. Water flow settings are factory set.

8.0 Condensate Considerations

Make provision for a condensate drain connection. Some installations require a condensate pump to take the condensate to a suitable drain. All Hydro-Temp systems have a negative pressure on the condensate drain so a P-trap is required on all systems. A vent is only necessary if possible double p-trap conditions apply. Double p-trap is commonly caused by un-level drain piping that allows standing water to create a second p-trap condition. If the system has two or more p-traps an "air lock" will occur and the system will not drain. The vent should only be installed downstream of the p-trap at the unit. Never install a vent between the unit and the p-trap as this will negate the purpose of the p-trap. It's common practice to install extra tees near the Hydro-Temp system to allow access for pouring drain cleaner down the condensate drain, insure all extra openings are capped off or are plugged.

Never run the condensate drain in to the same line as the discharge water of a well water system. If the discharge were to become clogged the back pressure would backup through the condensate and cause severe water damage.

8.5 Split System installation



8.5.1 Split System Pipe Sizing

The installing technician must use acceptable refrigeration trade piping practices such as correct pipe sizing, liquid / oil trapping and line set gradients for reliable operation. Blower sections can be located up to 100 equivalent feet away from the compressor section with a maximum of 30' of rise.

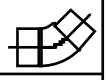
Nominal Pipe Size (ins)	90° Std	90° Long	90° Street	45° Std.	45° Street
					
3/8"	1.4'	0.9'	2.3'	0.7'	1.1'
1/2"	1.6'	1.0'	2.5'	0.8'	1.3'
5/8"	1.8'	1.0'	2.9'	0.9'	1.5'
3/4"	2.0'	1.4'	3.2'	0.9'	1.6'
7/8"	2.3'	1.6'	3.7'	1.1'	1.9'
1"	2.6'	1.7'	4.1'	1.3'	2.1'
1-1/8"	3.0'	2.0'	4.9'	1.5'	2.6'
1-1/4"	3.3'	2.3'	5.6'	1.7'	3.0'
1-3/8"	3.7'	2.5'	6.0'	1.9'	3.2'

Table 8.5.2 Equivalent Lengths of Pipe Fittings

Determine the pipe sizes required for split system line sets from the unit by using the following "Equivalent Footage" calculation.

Total length of line set = Pipe Length (ft.)
+ Equivalent Length of Fittings (ft.)

For example -
Length of Liquid (7/8" Material) = 50.0'
Fittings are 4 long elbows, (4 x 1.6' each)

Equivalent Length of fittings, from Table 8.5.2 = 1.6' each x4 fittings = 6.4' Equivalent Length
Total Equivalent Length =50.0' pipe plus 6.4' in fittings so Total Equivalent Length equals 56.4'

8.5.2 Split System Line Sizes

Tonnage	20 -100 Equivalent Ft.	
	Hot Gas	Liquid
1 – 2 Ton	5/8"	1/2"
2 ½ - 6 Ton	7/8"	5/8"

Table 8.5.1 Split System Pipe Sizes

Line sizes can be selected from Table 8.5.1 after performing the "Equivalent Footage" Calculation.

8.5.3 Split System Electrical connections.

Split System High voltage connections: The high voltage required for the blower section is 230 volt AC. This is normally powered from the compressor section but can be supplied from any 230 volt supply. A terminal block is located in the blower section and the compressor section labeled P1, P2, and P3 (P3 = ground). Wire P1 from the compressor section to P1 in the blower section, wire P2 from the compressor section to P2 in the blower section and so on.
Split System Low voltage connections: A low voltage terminal strip is located in the blower section and in the compressor section labeled S1, S2, S3 and so on. Depending on system model these terminals control the blower speed, optional strip heat and optional temperature sensors. Just like the high voltage block these two terminal strips must be wired together by wiring S1 in the compressor section to S1 in the blower section, S2 in the compressor section to S2 in the blower section and so on.

9.0 Low & High voltage Connections

Always use caution when working with or around electrical wiring or connections!

When running high and low voltage wire into electrical box always leave enough slack to swing out or remove the electrical box. The electrical box can be swung out by removing one screw from the bottom of the box. Then if desired the **box can be lifted out** for easy servicing behind box. This only works if slack is left in the field wiring.
The controller is mounted on a **Swing out panel** that hinges out to provide access behind the panel. Some terminal strips or electrical components are normally located behind the controller swing out panel.

9.1 Main system Power

Size all wire in accordance to local electrical code. Main power will land on the top of the Compressor contactor. If the system is a dual compressor system a jumper will exist between the tops of the two contactors. A green ground lug will also be provided for the ground wire.

9.2 Pump outputs

A terminal strip will be provide for each pump output that applies. Each will be labeled as needed. Examples are:

- DHW Pump 230Vac
- Loop Pump 230Vac

9.3 Belimo motorized valve (Open loop or well water)

As mentioned in section 7.2 pressure regulated water valves are used to regulate the water flow, a belimo on/off valve is used on all well water systems to start and stop the water flow. The water valves and belimo may be shipped with the unit and require field installation and wiring. If field wiring is required a terminal strip labeled Belimo valve will be provided. This is a 3 wire connection including common, power open and power close.

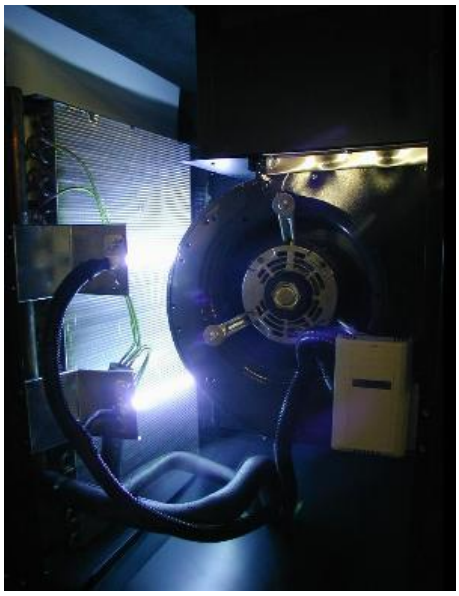
9.4 Optional Ultra Violet Sanitizer.

A Hydro-Temp Option for a Healthier Environment

The Purifying Power of Sunlight

For more than 50 years, scientists have known that one of the most effective sterilizers of airborne contaminants is natural sunlight. Not the light we see when we look out the window, but the invisible ultraviolet rays. The most powerful part of the UV wave is called the “C” band, and that’s what the ultraviolet air purifying system uses to destroy and reduce micro-organisms in the air.

The Air Purifying System is a safe, silent, and proven way to make your conditioned space a healthier place to live. The Air Purifying System has been proven effective in hospitals, schools, daycare centers, restaurants and hotels, and homes.



Installed directly inside your Hydro-Temp System, the Air Purifying System silently and effectively reduces airborne contaminates such as:

Molds

Dust Mites

Yeasts

Bacteria

Viruses associated with Allergies and Sick Building Syndrome

FACTS YOU SHOULD KNOW

The air circulating through the Hydro-Temp system in your home or office can be some of the poorest quality anywhere. Molds, bacteria, yeasts, dust mites, viruses—all could be present in every breath you take. You fill your lungs up to 20,000 times each day. Over time, these contaminants become concentrated causing allergies, inflammation of the mucous membrane, upper respiratory problems, asthmatic conditions, headaches and even flu-like symptoms.

Indoor air can contain up to 100 times more airborne contaminants than outside air.

Indoor air quality problems, often referred to as Sick Building Syndrome, cost North Americans over $100 billion each year in health care, absenteeism, lost production and lost revenue.

65 to 75 percent of infections and allergy sources are passed from person to person through the air.

Airborne contaminants cause diseases such as influenza, hepatitis, tuberculosis and pneumonia.

HOW DOES THE SYSTEM WORK?

The Ultraviolet Air Purifying System uses the energy from a specially designed, high-intensity UV-C bulb to kill micro-organisms that cycle through your heating and cooling system. Mounted inside the unit, the Ultraviolet Air Purifying System sterilizes contaminants as they pass by the UV bulb.

The process requires very little maintenance and costs just pennies a day to operate. The Ultraviolet Air Purifying System could be one of the best health and comfort investments you will ever make.

The ultraviolet bulb needs to be replaced every 18 months.

A factory mounted UV on/off switch is located on the front of the system for servicing the blower section.

Caution: Exposure to UV light when in operation with the blower section cover removed can cause Sever burn / eye damage. Always remove power when servicing UV light.

The Ultraviolet system can be factory installed into all Hydro-Temp systems or retro-fitted into any Hydro-Temp system. The UV bulb ships

The UV light mounting bracket and plug will be located in the blower chamber. The UV blub will ship uninstalled, in a box in the blower chamber in order to prevent breakage.

9.5 Mounting the Thermostat

Mount the thermostat on a piece of Rubatex™ or similar foam tape, to seal around the wire penetration. Sometimes silicone may be used to help seal this hole. This prevents drafts from affecting the thermistor, and thus helps prevent short cycling of the equipment from errant air movement. Thermostat operating instructions and wiring options are enclosed with the thermostat and should be kept for future operation and set up needs.

9.6 Thermostat selection

The standard Hydro-Temp thermostat is the LuxPro PSP722E. Upon request other thermostats can be substituted for the LuxPro. Most will have the same terminals and will wire exactly the same way. Only Heat pump thermostats or thermostats that can be programmed for heat pump mode will work on the terminal strip driven Hydro-Temp System.

The LuxPro PSP722E is a two heat plus aux heat and two cool, 7 day programmable thermostat.
This thermostat must be programmed as a heat pump t-stat to work on the Hydro-Temp syste.
Follow the instruction in the next section for programming the t-stat for heat pump mode. The following instructions can be found in the installer manual for the LuxPro PSP722E:

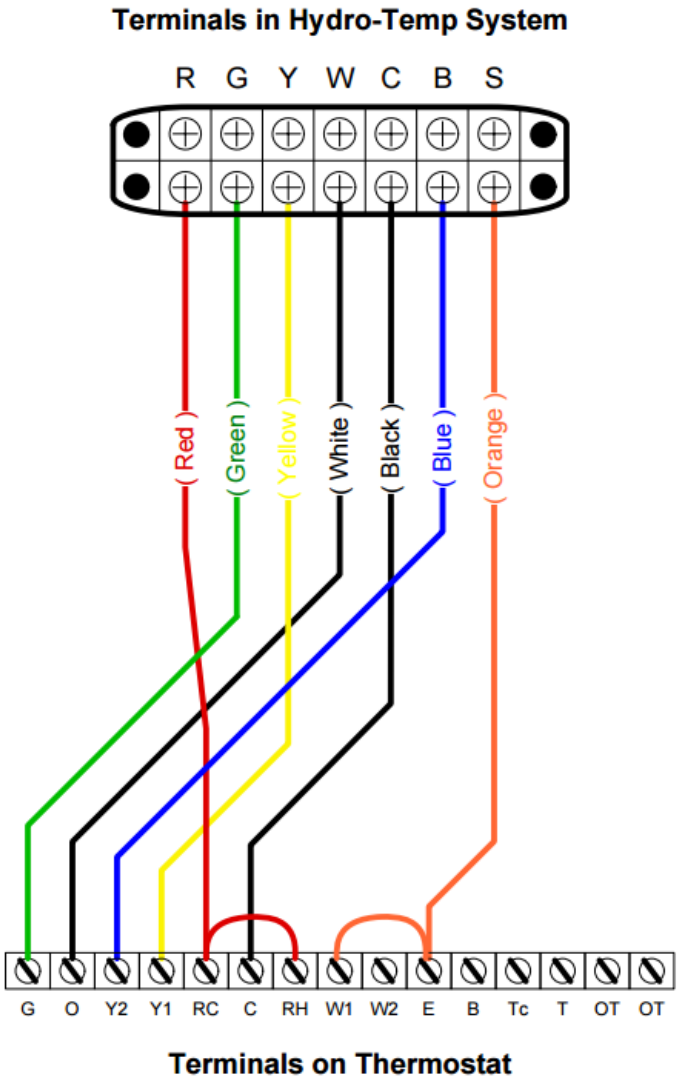
To enter the Installer Setup Menu press and hold the Setup button for 10 seconds.
Use the NEXT button to scroll through its options. As you proceed, the menu item number will be displayed in the left portion of the screen.
Selections can be changed by pressing the UP/DOWN button.
Moving from one menu item to the next and acceptance of changes is done by pressing the NEXT button.
All changes become effective when the unit exits the Installer Setup mode.
The Installer Setup mode will be exited when the Setup button is pressed again, or if no other keys are perssed for 20 seconds.

The following installer setup settings must be changed to operate the Hydro-Temp system.

Menu Item	Display	Change to
01	System Type	Heat Pump
03	Compressor Stages	2

9.7 Thermostat Wiring

The Lux PSP722E should be wired as shown on this page for any terminal strip unit (single speed, dual compressor or single compressor with two speeds). The B terminal on the system terminal strip is used for the optional stage 2 heating or cooling. If your system is a single speed system nothing is wired to the B terminal. The S terminal on the system terminal strip is used for the optional strip heater. If you system doesn't have strip heat (AKA Auxiliary heat) this terminal will have nothing wired to it.



13.0 Recommended *Hydro-Temp*™ Start-Up Procedure

13.1 Start-Up Check List.

Verify the following items **are addressed before** starting the unit:

- If closed loop system, loop is purged and auto purge is filled to 3" from top of tank and all valves are open. Ensure a minimum of 20% methanol or 25% Propylene glycol is purged into the loop and properly mixed. Ensure all piping is verified to provide designed flow rate and all valves are open.
- If open loop system, well has pressure (20PSI – 50 PSI) and all valves are open. Make sure water flow stops when system is off.
- All air is purged from hot water loop lines and all valves are open. A dry pump will quickly burn up.
- Optional U.V. light installed. (UVC must be powered down if panel is removed to area where light is installed. Severe eye burn could occur)
- All supply and return grills are installed and unrestricted.
- Return duct and grills are installed and unrestricted with filter installed.
- All service panels to air chamber are secured to unit.
- Supply voltage is correct and matches nameplate.
- Fuses, breakers, and wire sizes are correct.
- Low voltage wiring complete including thermostat and field safeties.
- Unit is level for proper condensate drainage and a condensate drain is open, correctly pitched, and p-trap is installed.
- Service / Access panels are in a place with proper clearance to allow service to front and sides.

13.2 Start Unit

- Turn on main power.
- Adjust thermostat up or down to bring system on
- Check to ensure blower is running. If 3 phase voltage ensure blower rotation is correct.
- Check to ensure compressor is running. 3 phase voltage ensure compressor rotation is correct.
- Check that auxiliary heat (if applicable) is pulling proper amperage.
- Check for water flow.
- Check hot water loop for water circulation.
- Reinstall all panels.
- Set thermostat to desired temperature.
- If well water system, water flow should be approximately 1 GPM to 2.5 GPM per ton.
- If closed loop system, check the temperature of the water in and out. This should not exceed a 10°F difference. If more than 10ºF then check pump and try to increase water flow.
- Reinstall all panels.

13.3 Charging a *Hydro-Temp*™ System

To get optimal performance from your *Hydro-Temp™* system, proper charging is essential. Ensure that the refrigerant used is of the proper type. Consult the unit label or call the factory for assistance.

For proper charging consult the unit label and weight in the name plate rated amount of refrigerant.

14.0 Preventative Maintenance

YOUR *HYDRO-TEMP™* WATER SOURCE HEAT PUMP HAS BEEN BUILT TO BE VIRTUALLY MAINTENANCE FREE IF PROPERLY MAINTAINED. THERE ARE ONLY A FEW THINGS YOU NEED TO DO TO KEEP YOUR SYSTEM RUNNING AS EFFICIENTLY AS POSSIBLE.

IT'S STRONGLY RECCOMMENDED TO HAVE THE SYSTEM CHECKED ONCE A YEAR BY A TRAINED SERVICE PROFESSIONAL. MANY INSTALLING DEALERS OFFER PREVENTATIVE MAINTENANCE CHECKS.

WARNING! ⚠ BEFORE PERFORMING SERVICE OR MAINTENANCE ON SYSTEM, TURN OFF ALL BREAKERS INCLUDING MAIN POWER AND POWER TO OPTIONAL AUXILIARY HEATER. WAIT FIVE MINUTES BEFORE REMOVING ANY PANELS TO ALLOW POWER TO DISSIPATE FROM VARIABLE FREQUENCY DRIVES. ELECTRICAL SHOCK CAN CAUSE PERSONAL INJURY OR DEATH.

DO **NOT** OPEN PANELS/DOORS! DANGER OF ELECTRICAL SHOCK AND/OR PINCH HAZARD!

- Be aware of thermostat setting. In some cases, programmable thermostats will mistakenly be programmed to set the temperature back when not desired. Check the programming to insure the correct time of day and desired temperature is programmed or set the thermostat on hold. Which will stop the programming and allow a constant setting.
- **Keep a clean** air filter on your unit. Air filters need to be changed about once every 30 days. Always buy the best air filter available. Air filters can be purchased through *Hydro-Temp™* if necessary. *Hydro-Temp™* recommends a lifetime electrostatic air filter that can be taken out once a month and cleaned by back flushing / washing with water. If filter is not changed / cleaned on a regular basis expensive air coil cleaning may be required during preventative maintenance checks.
- Give the unit an occasional visual check. Look for water around the base of the unit and listen for any unusual noises.
- Closed loop systems are a sealed system unless an auto purge tank is used. If totally sealed they require no physical maintenance short of visual inspection for leaks. If your system was installed with an auto purge tank / kit it is recommended to check the fluid level in the tank once a month when you replace the air filter. Ensure the fluid level in the tank is between ½ and ¾ of the way full. It should be rare to have to add fluid after the first year. If you are required to add fluid more than a few times after the first year contact the installing dealer to have the anti-freeze levels checked. Never fill more than ¾ of the way full to prevent over flow.

⚠ IMPORTANT NOTICE: UNITS THAT UTILIZE GROUND LOOPS MUST MAINTAIN A MINIMUM OF 20% METHANOL OR 25% PROPYLENE GLYCOL AS AN ANTIFREEZE SOLUTION IN THE UNIT AND GROUND LOOP AT ALL TIMES. FAILURE TO DO SO WILL ALLOW REFRIGERANT TEMPERATURES TO DROP, CAUSING INTERNAL FREEZING OF THE UNIT TO OCCUR, CAUSING SEVERE DAMAGE TO THE UNIT. **DAMAGE TO THE UNIT CAUSED BY FAILURE TO MAINTAIN PROPER ANTIFREEZE LEVELS IS NOT COVERED UNDER WARRANTY.**

- Open loop systems require well water to be pumped through the system. For this reason Hydro-Temp recommends the installing dealer to install isolation valves and a water strainer on the entering water line feeding water to the Hydro-Temp system. Be aware of the location of these components in the event the strainer needs to be cleaned more often than once a year during your preventive maintenance check. Be aware of all isolation valves so cleaning can be done with minimal water spillage. It's a good idea to be familiar with the location of the isolation valves in the

event of a major water leak. All open loop systems have a discharge water line that discharges the water to a discharge well, creek, pond, etc. ***Check local state and county codes for proper discharge of water.*** Be aware of discharge location and check occasionally to insure proper drainage is occurring. During the winter, insure discharge is protected from freezing. Do not attach any kind of sprinkler to the end of the discharge water line as the increase in back pressure will result in decreased water flow and damage the Hydro-Temp system.

- Fan motors are permanently lubricated and do not need further lubrication. Motors and fan assemblies will be inspected on a yearly basis for wear during preventative maintenance checks.
- DHW plumbing consist of a closed recirculating loop which is purged free of air by the installing dealer. If any maintenance or hot water tank replacement is done, insure the DHW plumbing is properly purged of air. Consult with your installing dealer before draining the hot water tank for proper procedures.
- During your annual preventative maintenance check, inspect the drain pans for debris to avoid condensate tubing blockage. Tubing needs to be checked at both ends to ensure blockage doesn't clog up the pipe from the inside or outside of the house if exposed.
- If the system is equipped with a ultra-violet light, the bulb will need to be replaced every 18 months. Due to the hazard of UV exposure, the bulb should only be replaced by a trained professional.
- Be aware of all breaker locations. Some systems may have two breakers for the compressor section. If the system is equipped with auxiliary heat a separate breaker will be needed to supply power to auxiliary heat strips.

ADDITIONAL REMINDERS:

Chemicals, cleaners, inhibitors or other products that corrode or attack copper (such as Trisodium Phosphate) should never be placed into the water circulation loop(s) connected to the Hydro-Temp equipment or stored in the same room as the Hydro-Temp equipment. Failure to follow this requirement will void the equipment warranty.

Protect the *Hydro-Temp™* unit from freezing temperatures. If the system is in your attic or outside special precautions may need to be taken to ensure freeze protection.

The *Hydro-Temp™* unit should never be exposed to a dirty or dusty air environment. Dust, such as sawdust or sheet rock dust, can damage the electrical components, fan motor, and air coil on the unit. Simply place a cover (tarp, etc.) over the unit when construction or any other dust producing job is being done in the area of the *Hydro-Temp™* unit. Never run the system during construction. Not only will sheet rock dust plug up and cause damage to the air coil but it will also accumulate in the duct system and slowly be blown out over the years.

- If the unit is ever moved from its original location, never lay it on its side. Never jar or drop the unit during transport. This is a sealed refrigeration system; rough handling may cause the system to develop a leak. Once removed, protect the system from freezing. Anti-freeze may need to be flushed into the plumbing. When being reinstalled, anti-freeze levels will need to be checked.
- All plumbing from the Hydro-Temp system to the hot water tank may require a licensed plumber. If any repairs are ever needed, insure all plumbing is done / maintained with **copper tubing only**. Do not use PVC, CPVC, PEX or any other plastic pipe.
- Keep an accurate service record. Keep a copy of all service reports with this booklet.

15.0 Basic Trouble Shooting Chart For The Hydro-Temp System

SYMPTOM	*POSSIBLE CAUSE*	*CORRECTIVE ACTION*
Water around base of unit	*1. Water leak.* *2. Condensate from water coil or accumulator.* *3. Condensation pan not draining.* *4. Air coil freezing.*	*1. Find and repair leak.* *2. Insulate these items.* *3. Check for algae. Blow out restriction in condensate pipe.* *4. Check for dirty air filter or restriction in ductwork*
Noisy operation	*1. Normal after recharging unit.* *2. Defective fan motor.* *3. Defective compressor mounts.* *4. Defective compressor (internal damage).* *5. Refrigerant line vibrating.* *6. Loose blower wheel.* *7. Foreign material in blower housing.* *8. Duct work leaking or loose duct (causing a whistle noise)* *9. Excessive water pressure on well, (thumping noise).* *10. Duct work Vibrating*	*1. Initial operation after recharging may be noisy as refrigerant separates from oil.* *2. Repair or replace motor.* *3. Replace mounts.* *4. Replace compressor.* *5. Reposition and secure.* *6. Realign and tighten.* *7. Clean housing.* *8. Repair and secure duct work properly* *9. Install 25 lbs. Pressure reducer on well water supply line.* *10. Install flex connectors on supply and return duct.*
Low air flow	*1. System running in low speed.* *2. Leaks in duct work.* *3. Dampers and/or registers closed.* *4. Obstruction in system.* *5. Clogged filters.* *6. Dirty air coil.*	*1. No Action needed. This is normal operation.* *2. Repair duct work.* *3. Open dampers and/or registers.* *4. Remove obstruction.* *5. Clean or replace filters.* *6. Clean air coil.*

Fan runs continuously, compressor runs normal	1. Thermostat fan setting turned to "on" position.	1. Switch thermostat selector to off.

Unit inoperative	1. No power to unit. 2. Defective control wiring or thermostat. 3. Defective transformer.	1. Check unit electrical supply, fuses, breakers, etc. Restore power. 2. Repair wiring. Check thermostat wiring. Replace thermostat. 3. Reset or replace transformer.

Fan operates, but compressor inoperative	1. Thermostat not set properly. 2. Low or high pressure limit tripping and or locked out due to excess trips. 3. Internal protector activating, operating. 4. Faulty internal protector. 5. Freeze protector activating (well water systems only) 6. Defective Compressor Drive. 7. Defective compressor.	1. Read thermostat instructions. 2. Repair condition causing excessive pressures. 3. Repair condition causing extreme temperatures. 4. Replace compressor. 5. Check water flow / replace protector 6. Replace drive. 7. Replace compressor.

Reversing valve will not switch	1. No voltage to solenoid. 2. Bad solenoid coil. 3. Stuck valve.	1. Correct voltage problem. 2. Replace coil. 3. Tap valve with hammer until it switches or replace valve.

Operating pressures too high and/or high pressure limit tripping Check duct sizes.	1. Too little water flow (cool cycle). 2. Clogged air filter (heat cycle). 3. Air restriction (heat cycle). 4. Bad high pressure limit. 5. Unit overcharged.	1. Check loop pump and flow. 2. Clean or replace air filter. 3. Check duct work for collapsed duct line. 4. Replace limit. 5. Adjust charge.

Operating pressure too low and/or low pressure limit tripping	1. Refrigerant leak. 2. Too little water flow (heat cycle). 3. Air restriction (cool cycle). 4. Bad low pressure limit.	1. Find and repair leak. 2. Check loop pump and flow or water supply. 3. Check air filter, duct work, etc. 4. Replace limit.

Freeze switch activating (Reversing valve switches During heating mode) ** Well water systems only**	1. Too little water (heat cycle). 2. Freeze set too high. 3. Bad freeze sensor.	1. Follow procedure previously described. 2. Lower setting. Call factory. 3. Replace sensor.