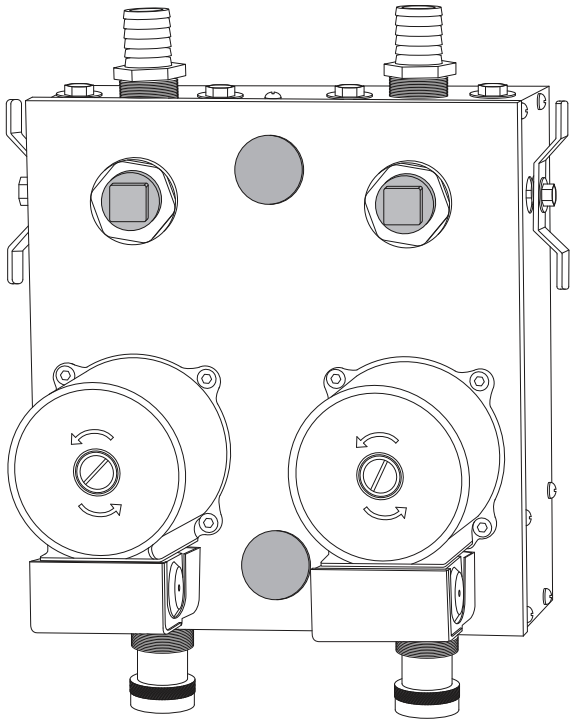
Installation Instructions

# Distributed Pump Kit



**Model:** PMCA

**⚠ SAFETY WARNING**

**Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.**

December 2020 **WSHP-SVN001A-EN**

# Introduction

Read this manual thoroughly before operating or servicing this unit.

## Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

**⚠WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**⚠CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

***NOTICE*** Indicates a situation that could result in equipment or property-damage only accidents.

### Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

### Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

**⚠WARNING**

### Proper Field Wiring and Grounding Required!

**Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.**

**⚠WARNING**

### Personal Protective Equipment (PPE) Required!

**Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:**

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

**⚠WARNING**

**Follow EHS Policies!**

**Failure to follow instructions below could result in death or serious injury.**

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

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# Table of Contents

# General

The pump module (PM) and hose kit together make a complete self-contained pumping package for earth-coupled heat pump systems. These kits contain the components for the operation of a closed-loop earth-coupled heat pump water circuit system.

Standard PM features include insulated Grundfos™ pump(s) available in cast iron, insulated cabinet, 3-way brass valves, and the choice of 1- or 2- pump, PM kits.

## Application

The one-pump, pump module (PM1) and the two-pump, pump module (PM2) are complete pumping packages designed for circulating residential and light commercial loops that require a maximum flow rate of 20 gpm. Each PM is fully assembled for connection to water and electrical points.

The PM1 comes equipped with one Grundfos™ cast iron 1/6 hp, 230 V, 1-phase, flanged circulating pumps.

## Inspection

At delivery, inspect all equipment for damage. If damage is discovered, note the damage on the shipping documents and file a claim with the freight company.

# Model Number Description

**Digit 1— 2**

PM = Pump Module

**Digit 3— Pump Material**

C = Cast Iron

**Digit 4 — Development Sequence**

A = Current Development Sequence

**Digit 5 — Number of Pumps**

1 = 1 Pump
2 = 2 Pumps

**Digit 6— Open**

0

**Digit 7— Open**

0

**Digit 8— Voltage (Volts/Phase/ Hertz)**

1 = 208-230/60/1

**Digit 9— Open**

0

**Digit 10— Design Sequence**

A = Current Design Sequence

**Digit 11— Open**

0

**Digit 12— Company**

T = Trane

# Installation

## Accessories

Hose kits are no longer a part of the pump module. Hose kits must be ordered separately.

***Note:*** *Most units will use the 1-inch hose kit. Verify equipment water in/out sizing prior to selecting the hose kit accessory.*

**Table 1. Hose kit assembly number**

| Pipe | Assembly Number |
|---|---|
| 1-inch Hose | 447920280100 |
| 3/4-inch Hose | 447920490100 |

***Note:*** *Kits can be ordered from the factory.*

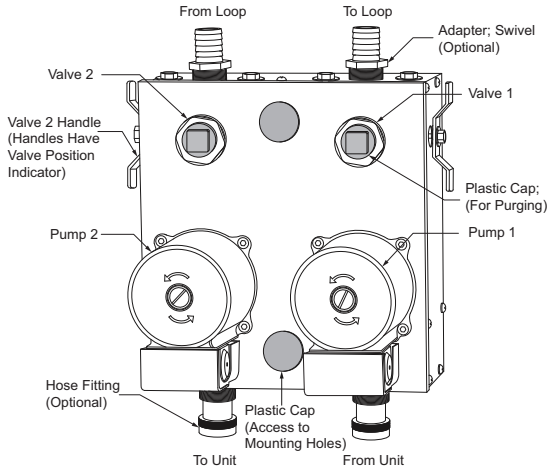
## Hose Kit Parts List:

- (2) brass 1-inch MPT-by-barb fittings
- (2) brass 90 degree 1-inch MPT-by-barb elbows with Pressure/ Temperature Ports (P/T Plug or Pete's Plug)
- (4) hose clamps
- (1) 10 feet of rubber hose with
- 2 pieces of 1-inch and 3/4-inch reducers

## Individual Accessories:

- 1-inch brass quick-connect fitting
- 1-inch brass MPT-by-barb fitting
- 1-inch brass MPT-by-barb 90
- degree elbow with Pressure/Temperature Port
- 10 feet of rubber hose

**Figure 1. Pump module front view**




## Choosing a Location

The PM should be located as close to the geothermal heat pump as possible. Mounting holes are located on the back of the pump assembly enclosure and can be accessed by removing the two black plastic caps on the front of the PM, as shown in the below figure, PM mounting brackets.

**⚠CAUTION**

**Equipment Damage!**

**The PM can be mounted in any position except on its back (the pump shafts in the vertical position) will result in bearing failures.**

***Note:*** *Use the least amount of piping between the PM and the unit as possible to ensure a minimum amount of pressure drop. A higher pressure drop may exceed the PM's pumping capabilities.*

The factory recommends the installation of the PM with the pumps oriented below the valves (illustrated in Figure 7). The recommended orientation has the pump shafts in the horizontal position.

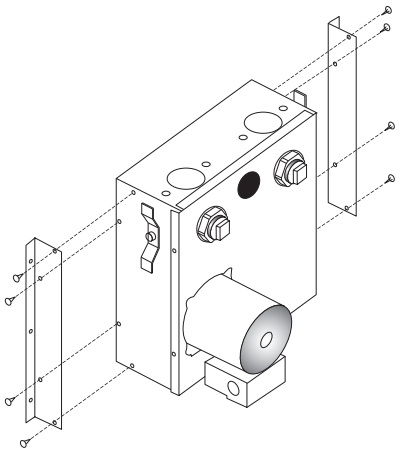
## Mounting the Pump Module

The PM has been designed for two methods of installation. The first method is to use the two mounting holes on the back side of the PM. The second method uses mounting brackets.

## Masonry Wall

1. Mount a piece of 3/4-inch plywood to the (typically concrete) basement wall.
2. Mounting Holes: Attach the PM with two lag-screws to the plywood using the mounting holes located on the back of the pump assembly enclosure.
3. Mounting Brackets: Remove the four screws from each side of the PM and retain for later use as shown below. Install the supplied mounting brackets to the PM using the four retained screws. Mount the PM with brackets by using six lag screws through the mounting brackets into the plywood that has been mounted to the wall's surface.

**Figure 2. PM mounting brackets**



## Drywall/Stud Wall

1. Mounting Holes: Attach the PM with two lag screws through the drywall into a wall stud using the mounting holes located in the back of the pump assembly enclosure.
2. Mounting Brackets: Mount a piece of 3/4-inch plywood to the wall making sure that the plywood is secured tightly to the wall studs for support.
3. Remove the four screws from each side of the PM and retain for later use as shown in figure, PM mounting brackets.
4. Install the supplied mounting brackets to the PM using the four retained screws.
5. Mount the PM with brackets by using six lag screws through the mounting brackets into the plywood that has been mounted to the wall's surface.

### Side of the Unit

**⚠CAUTION**

**Equipment Damage!**

**Do not puncture any internal parts of the unit. Never mount the PM on the air coil side of the unit.**

1. Remove the four screws from each side of the PM and retain.
2. Install the supplied mounting brackets to the PM using the four screws removed from each side earlier.
3. Mount the PM and brackets to the unit by using six standard sheet metal screws through the mounting bracket into the unit's wall. *The PM must be mounted on the lower portion of the unit for ideal support.*

## Installing the Hose Kit

1. Screw the two brass 1-inch, MPT-by- barb fittings into the holes on the bottom side of the PM.
2. Thread separate Pete's plugs into the 90 degree, MPT-by-barb fittings.
3. Screw the two brass 90 degree, 1- inch, MPT-by-barb elbows into the unit's entering and leaving water connections.
4. Cut the 10-foot, 1-inch rubber hose in half.
5. Slip one end of the rubber hose over one of the MPT-by-barb fittings on the bottom side of the PM.
6. Install one hose clamp around the hose and MPT-by-barb fitting.
7. Repeat steps 4 and 5 for the other hose and MPT-by-barb fitting on the bottom side of the PM unit.
8. Slip the right hose connected to the by-barb fittings on the unit.
9. Install one hose clamp around the hose and 90 degree MPT-by-barb.
10. Slip the left hose connected to the PM over the opt 90 degree MPT-by-barb fittings on the unit.
11. Install one hose clamp around the hose and 90 degree MPT-by-barb fitting.
12. Install the ground loop piping to the fittings on the top side of the PM.

## Pipe Insulation

Insulation must be used on all inside piping to prevent sweating. Reference the following table to select the proper insulation.

**Table 2. Pipe Insulation**

| Piping | Description |
|---|---|
| 1-inch IPS Rubber Hose | 1-3/8-inch ID x1/2-inch Wall |
| 1¼-inch IPS PE Pipe | 1-5/8-inch ID x1/2-inch Wall |
| 2-inch IPS PE Pipe | 2-1/8-inch ID x1/2-inch Wall |

## Antifreeze

In areas of the country where entering water temperatures drop below 45°F or where piping is being run through areas subject to freezing, the loop *MUST* be freeze protected by using an approved antifreeze solution to prevent the earth loop water from freezing inside the heat exchanger. Alcohol and glycol are the most commonly used antifreeze solutions. Consult your geothermal unit supplier for the best solutions in your local area.

Propylene glycol is not recommended in installations where the water temperatures are expected to fall below 30°F. At extreme temperatures, the viscosity increases to the point where normal loop circulating pumps cannot maintain proper flow.

Calculate the approximate volume of water in the system by using the requirements detailed in the following table. Add three gallons to that total to allow for the water contained in the hose kit and geothermal unit.

**Table 3. Antifreeze by volume**

| Type | Min. Temp. for Freeze Protection | | | | |
|---|---|---|---|---|---|
| | 10F | 15F | 20F | 25F | 30F |
| **Methanol** | 25% | 21% | 16% | 10% | 3% |
| **Propylene Glycol** | - | - | - | - | 6% |

## Filling the System

Once in the loop, the PM and the unit are fully connected, the system will need to be filled with water or water/antifreeze solution.

The factory recommends filling the outside portion of the loop first. The hose kit as well as the unit should be filled next. Check the system by trying to fill both sides at the same time to assure that the system was adequately filled.

## Filling the Outside Loop

Refer to the pump module, front view for valve identification. Refer to Figure 3 to Figure 6 for valve positioning.

1. Attach a water hose to the 1-inch FPT brass valve port(s) located on the front of the PM.
2. Rotate both valve 1 and valve 2 to the "B" position shown in Figure 4 to prevent water from going to the unit.
3. Turn on the water and allow the earth loop to slowly fill with water.
4. Run the water until a steady flow of water without air bubbles is observed coming out of the discharge hose. If no air bubbles appear, the loop has been successfully filled.

## Filling the Hose Kit and Unit

1. Reposition valve 1 to the "A" position (see Figure 3) so the hose kit and unit can be filled.
2. Turn the water on and allow the earth loop to fill slowly with water.
3. Run the water until a steady flow of water without air bubbles is observed coming out of the discharge hose. At this point, the hose kit and unit have been successfully filled.

## System Pressurization

1. Rotate both valves 1 and 2 to the "D" position (see Figure 6) so that the entire system can be pressurized.
2. Examine all internal unit fittings or connections for leaks.
3. After checking for leaks, the system is ready to be flushed.

***Note:*** *There will always be a certain amount of entrained air left in the loop system.*

***Important:*** *The square black plastic 1- inch, MPT valve plugs must be replaced after filling and/or flushing is completed.*

## Flushing the System

All installations **must be thoroughly flushed** to remove all air and dirt from the earth loop system before running for the first time. The pumps used in the PMs are not adequate to use for the flushing out of the unit. A secondary pump capable of delivering 50 gpm at 60 feet of head (a 1½ hp or larger pump) is normally suitable for jobs up to six-tons. The loop must be flushed with a high volume of water at a high velocity (2 feet per second) in both directions. See the following table for flow rates required to flush earth loops.

Flush the geothermal heat pump and the earth loop **until no air bubbles** are observed returning to the water container. This flushing process normally takes between 20 to 30 minutes. It is imperative that flushing the system be done properly.

**Table 4. Flow rates for system flush**

| Pipe | Gallons per 100 ft. | Minimum Flush gpm |
|---|---|---|
| 3/4-inch PE | 3.02 | 3.8 |
| 1-inch PE | 4.73 | 6.0 |
| 1¼-inch PE | 7.55 | 9.5 |
| 1½-inch PE | 9.93 | 13.0 |
| 2-inch PE | 15.36 | 21.0 |

**Figure 3. Unit system flush (left side view)**

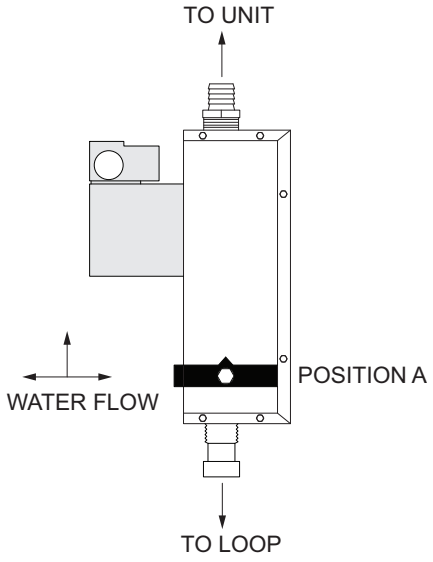



**Figure 4. Loop system flush (left side view)**

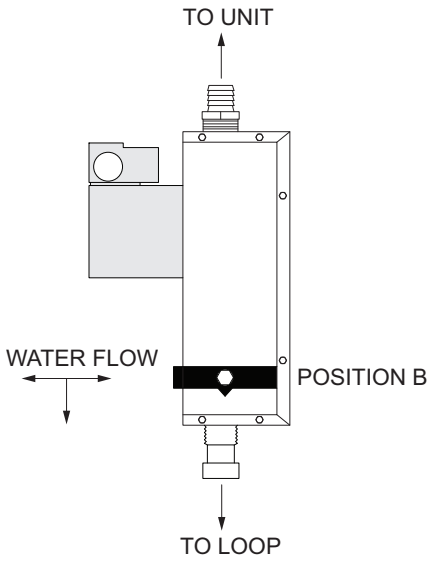


**Figure 5. Run system (left side view)**

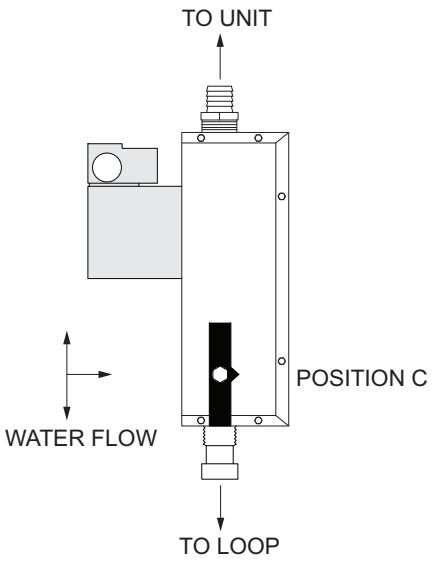
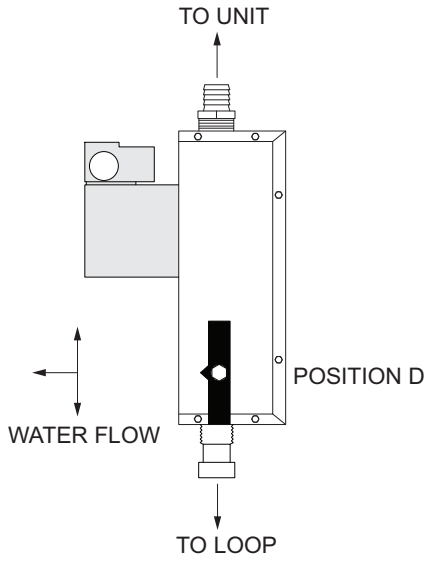



**Figure 6. Full system flush (left side view)**




## Closed Loop Setup

1. Fill a 30-gallon or larger volume, heavy-duty container with water as illustrated in Figure 7. The large water volume is necessary due to the high gpm flow rate required to flush the system. A small volume of water recirculates so rapidly that it does not allow small entrained air bubbles to separate and rise to the surface.

***Note:*** *The pump suction should be near the bottom of the barrel A suction line strainer should be used to prevent sediment or debris discharged into the barrel from being returned to the system.*

2. Referencing Figure 7, connect the flush pump discharge line to valve 1.
3. Connect the return hose to valve 2. The return hose discharge must be below the barrel water level, but not at the bottom or near the pump suction to prevent aeration of the water.
4. Placing the return hose at the bottom or near the pump suction would result in the entrained air being returned to the system.

***Important:*** *Keep the barrel at least half-full during flushing to prevent drawing air back into the system.*

## Flushing the Earth Loop

1. Rotate valve 1 and 2 to the "B" position (see Figure 4).
2. Pump water from the heavy-duty water container into the PM until no air bubbles are present in the container.
3. Upon completion, turn valves 1 and 2 to the "A" position (see Figure 3).

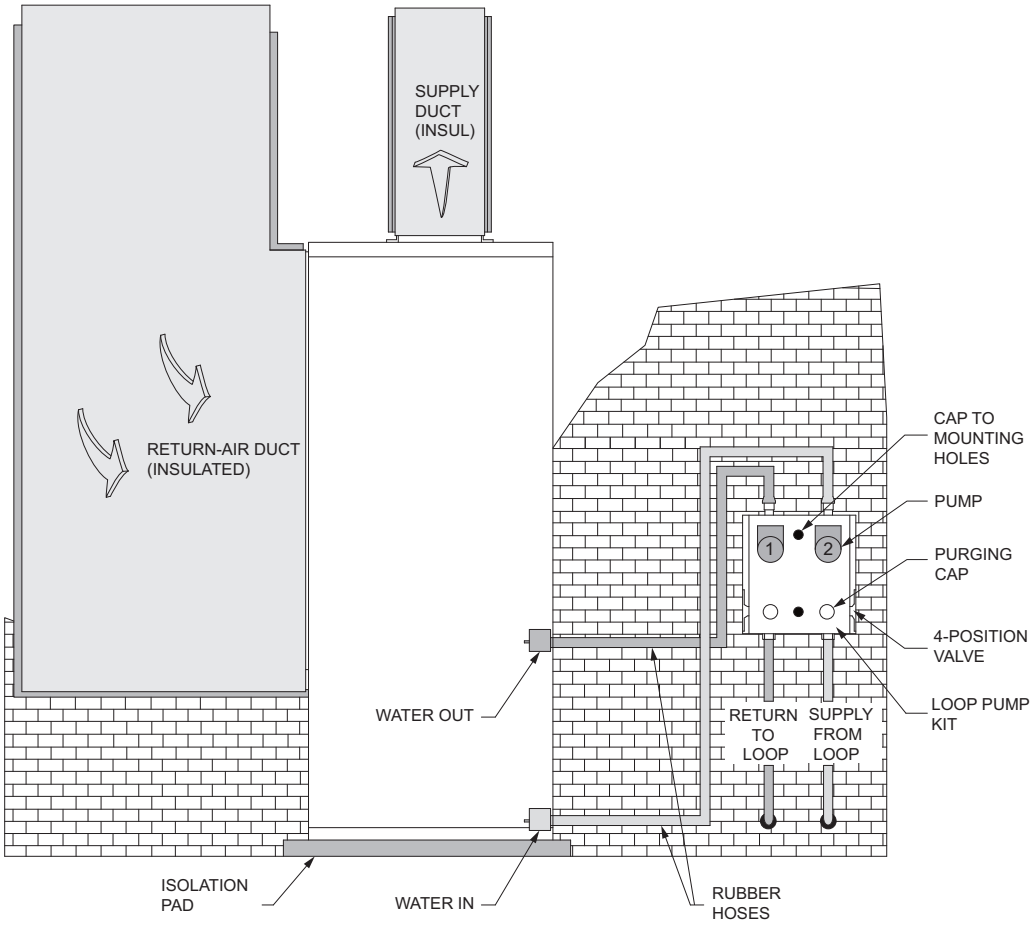
## Flushing the Geothermal Unit

1. Slowly rotate valve 1 to the "A" position shown in Figure 3 to allow the water hose line pressure to bleed-off.
2. Rotate Valve 2 to the "A" position (see Figure 3).
3. Start the flush pump and operate until there are no air bubbles siting the return line.

## Checking the Flush Job

1. Rotate Valve 1 to the "D" position shown in Figure 6.
2. Leave Valve 2 in the "B" position shown in Figure 4 with the flush pump running.
3. Container's water level:
   a. If the container's water level does not fall, then the flush job is complete. Rotate Valve 2 to the "D" position (see Figure 6). Before operating the PM, be sure to bleed air contained inside the pump. Remove the inspection port bleed screw found on the front of the pump and allow a small amount of water to drip out.
   b. If the container's water level falls, air is being compressed somewhere in the system confirming that the flush job is incomplete. Rotate both valves to the "B" position (see Figure 4) and turn off the pump. Keep both hoses full and reverse them on both valves and re-flush the system as explained earlier in the "Flushing the Earth Loop", the "Flushing the Geothermic Unit", and the "Checking the Flush Job". Keep performing these steps until the system has been properly flushed.

**Figure 7. Typical closed loop setup**




## Pressurizing the System

Once the system has been properly flushed, place a pressure gauge in the P/T port and charge the system to at least 60 psi in the winter, and 50 psi in the summer. The loop static pressure will fluctuate with the change in seasons. Pressure will be higher during the winter and lower in the summer. Fluctuation is normal and should be considered when charging the system for the first time.

## Adding Antifreeze to the System

The antifreeze solution is added to the loop using the same water container that was used during the flushing process (see Figure 7). Take care that no air is introduced into the loop system during the antifreeze process.

1. Add the required amount of antifreeze solution to the water container (see Table 4).
2. Circulate the system with both valves in the "D" position (see Figure 6) for approximately 20 minutes to mix water and antifreeze.
3. When antifreeze mixing is completed, put a pressure gauge in the P/T port and charge the system as described in “Charging the System”.

## System Check

After the system is flushed and, if required, freeze protected, the unit and PM should be started and loop-water flow measurements taken to determine if the system is operating properly.

## Temperature Check

The temperature method is only useful when used in conjunction with the pressure method described below.

Using the P/T ports and one P/T thermometer measure the entering and leaving water temperatures. In the heating mode that will normally be 5°F to 9°F drop (based on an average of 3 gpm per ton). In the cooling mode, the water temperature difference will be approximately 9°F to 12°F rise.

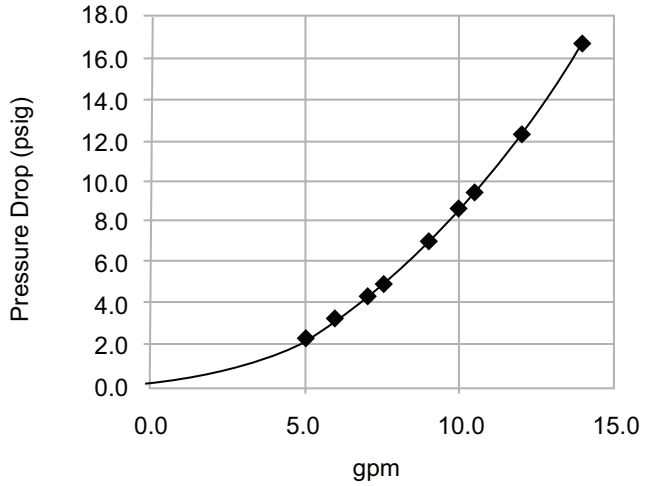
## Pressure Check

Check for proper flow by measuring the difference in loop pressures between the entering and leaving water lines. Use the P/T ports supplied with the PM and a standard pressure gauge (0 psi to 60 psi) equipped with a P/T probe.

1. Start the system.

2. Measure the pressure between the entering and leaving water lines.
3. Calculate the pressure difference in psi between the entering and leaving water lines.
4. Using pressure drop vs. gpm, calculate the flow rate measured in (gpm) by using the psi difference of the entering and leaving water lines.

**Figure 8. Pressure drop vs gpm**



# Wiring Diagram

Refer to the following figures for typical electrical wiring connections to be made in the field.

**Figure 9. Pump Module (PM2) - single unit**

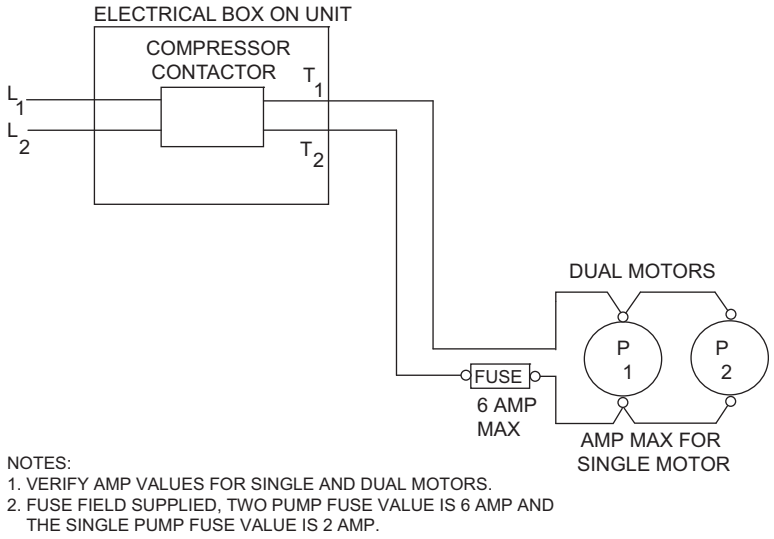



**Figure 10. Pump Module (PM2) - two units**

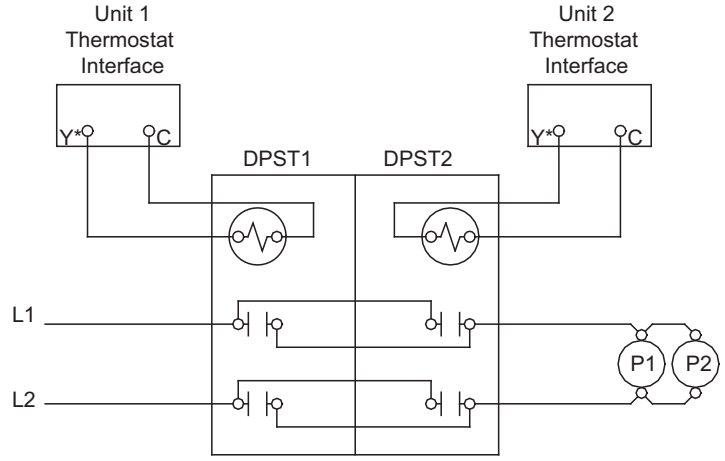



**Table 5. Data plate**

| | Number of Pumps | Rated Voltage | Hz | Ph. | FLA ea. | Total FLA | MCA | MOP |
|---|---|---|---|---|---|---|---|---|
| Single pump @ 230V | 1 | 230 | 60 | 1 | 1.1 | 1.1 | 1.4 | 15 |
| Dual pump @ 230V | 2 | 230 | 60 | 1 | 1.1 | 2.2 | 2.5 | 15 |

# Dimensional Data

**Figure 11. Side view**

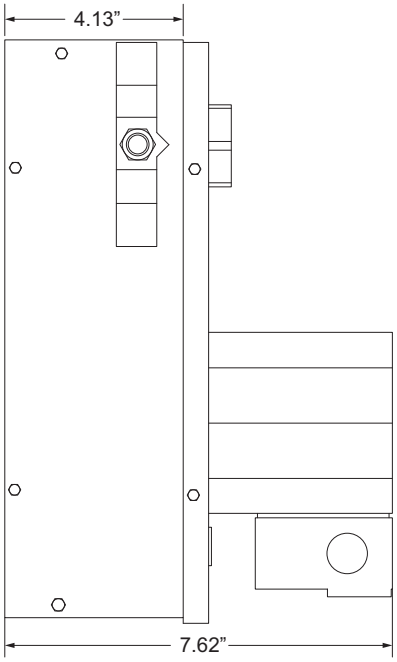



**Figure 12. Single pump kit**

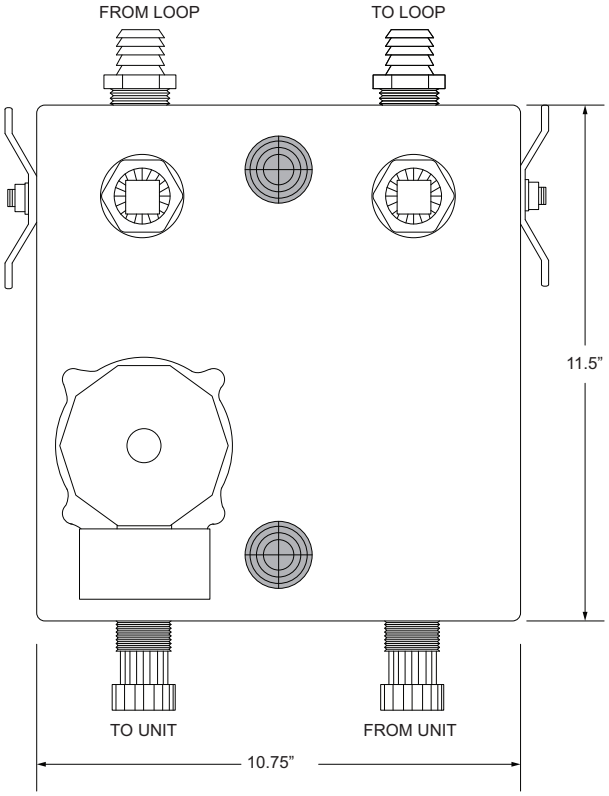
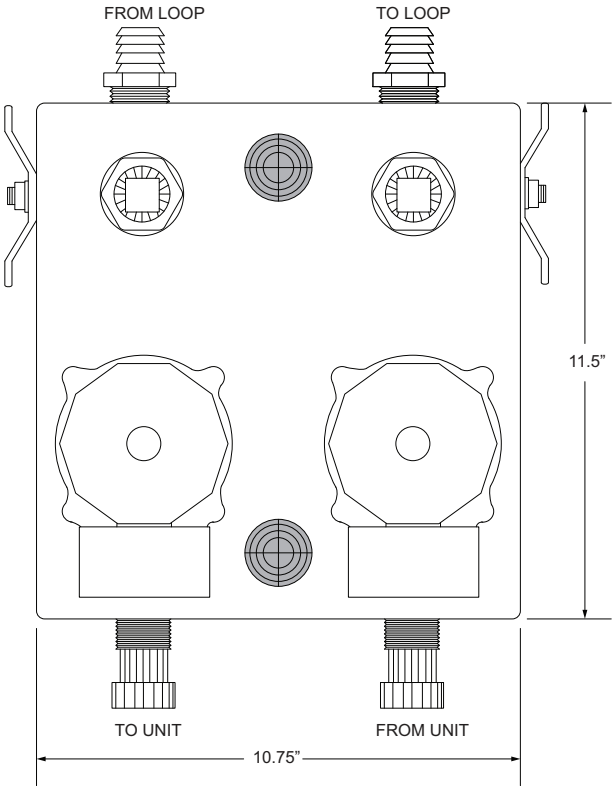



**Figure 13. Dual pump kit**



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