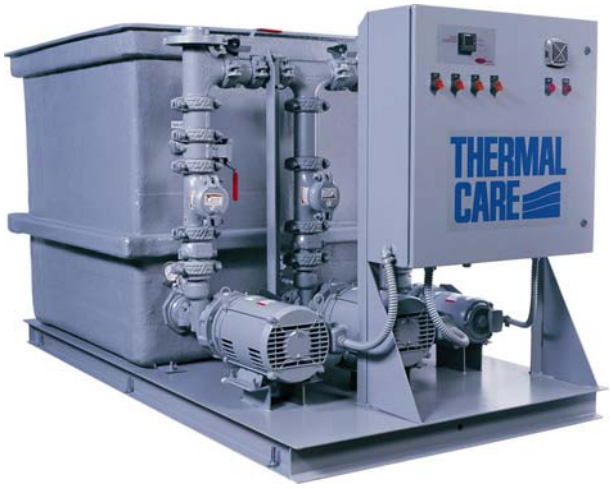
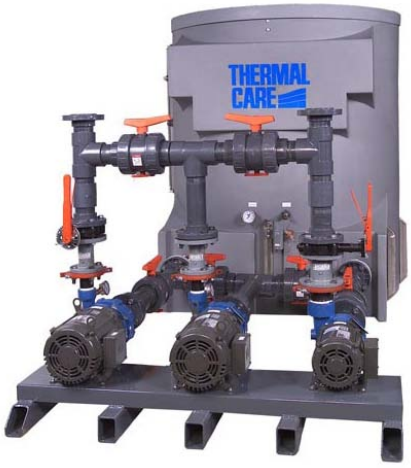
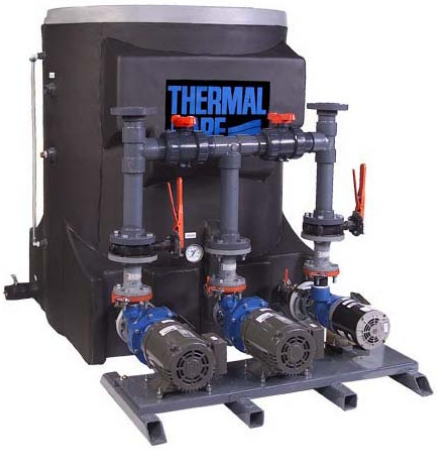
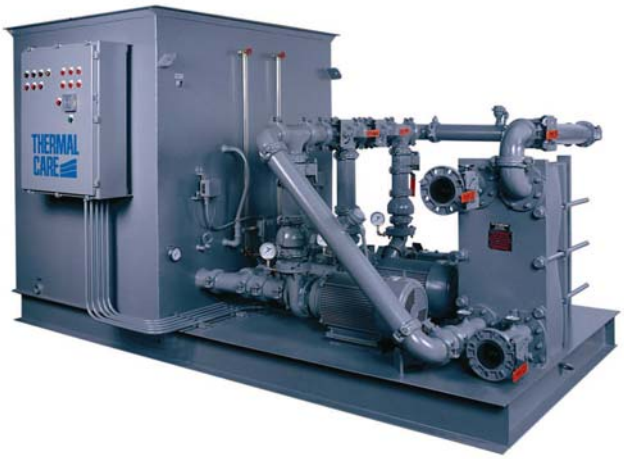
THERMAL CARE

PT, PTS & PTP Series Pump/Reservoirs









Installation, Operation and Maintenance Manual

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Foreword

The intent of this manual is to serve as a guide for placing your pump/reservoir in service and operating and maintaining it properly. This manual is supplemented as required to accommodate any special items that may have been provided for a specific application. The written information contained in this manual, as well as various drawings, are intended to be general in nature. The schematics included in this manual are typical only. Actual schematics are included in the electrical enclosure of the pump/reservoir and should be referred to for troubleshooting and servicing of the unit. Additional copies of wiring diagrams are available upon request. We strive to maintain an accurate record of all equipment during the course of its useful life. While every effort is made to standardize the design features of these reservoir, the various options may make it necessary to rearrange some of the components; therefore, some of the general drawings in this manual may differ from your specific unit.

Specific references to current applicable codes, ordinances, and other local laws pertaining to the use and operation of this equipment are avoided due to their ever-changing nature. There is no substitute for common sense and good operating practices when placing any mechanical equipment into operation. We encourage all personnel to familiarize themselves with this manual's contents. Failure to do so may unnecessarily prolong equipment down time.

CAUTION: The interior of the PT Series steel tanks are lined with a special coating for corrosion protection to provide many years of trouble-free service. Protect your investment by observing the following:

Do not weld on or near the tank as hot welding slag or sparks will burn a hole through the tank coating.

Do not drill on any tank surface, including the top wall supports.

Do not support piping or any other material by attaching it to the tank.

Do not drop piping, tools, etc into the tank bottom.

Do not place ladders on the tank floor.

Use caution when working in or near the tank.

Install return water piping just below the operating level of the tank, at the rear of the tank away from the pump suction leg (s).

It is recommended that good piping practices are followed and that the information in this manual is adhered to. We cannot be held responsible for liabilities created by substandard piping methods and installation practices external to the chiller.

We trust your equipment will have a long and useful life. If you should have any questions, please contact our Customer Service Department specifying the serial number and model number of the unit as indicated on the nameplate.

Installation

Receiving Inspection

Each unit is skid mounted and wrapped with plastic to protect it during shipping. Before accepting delivery, check reservoir for visible damage. If damage is evident, it should be properly documented on the delivery receipt and the plastic wrap should be immediately removed to allow for detailed inspection of the unit. Check for broken gauges, broken lines, damaged controls, or any other major component torn loose from its mounting point. Any sign of damage should be recorded and a claim filed immediately with the shipping company. In order to expedite payment for damages it is important to record and document damage. An excellent way to do this is by taking pictures. Our Customer Service Department will provide assistance with the preparation and filing of your claims, including arranging for an estimate and quotation on repairs.

Rigging, Handling, and Locating Equipment

The units have a welded frame (except PTP Series Tank which just set on the floor) that has been designed to allow the unit to be positioned with a forklift. Proper rigging methods must be followed to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the reservoir. Use pads where abrasive surface contact is anticipated.

The unit is designed for indoor use unless specifically designed otherwise. If it is necessary to store the reservoir in an unheated area when not in use, be sure that all water is drained or that an adequate amount of antifreeze is added to prevent freeze-up of the unit. A primary concern when designing your unit was serviceability, therefore, the reservoir should be located in an accessible area.

Electrical Power

All wiring must comply with local codes and the National Electric Code. Minimum circuit ampacities

and other unit electrical data are on the unit nameplate in the control panel and on the drawings that are provided in the control panel. Some reservoirs are provided without any controls so this section may not apply to your reservoir. If you did receive a control panel, a specific electrical schematic is shipped with the unit. Measure each leg of the main power supply voltage at the main power source. Voltage must be within the voltage utilization range given in Table 1.

Table 1 - Voltage Utilization Range

Rated Voltage	Utilization Range
230	208 to 254
460	414 to 506
575	516 to 633

If the measured voltage on any leg is not within the specified range, notify the supplier and correct before operating the unit. Voltage imbalance must not exceed two percent. Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. Voltage imbalance is determined using the following calculations:

% Imbalance = $(V_{avg} - V_x) \times 100 / V_{avg}$

$V_{avg} = (V_1 + V_2 + V_3) / 3$

V_x = phase with greatest difference from V_{avg}

For example, if the three measured voltages were 442, 460, and 454 volts, the average would be:

(442 + 460 + 454) / 3 = 452

The percentage of imbalance is then:

(452 – 442) x 100 / 452 = 2.2 %

This exceeds the maximum allowable of 2%.

A terminal block is provided for main power connection to the main power source. The main power source should be connected to the terminal block through an appropriate disconnect switch. A separate lug for grounding the unit is also provided in the main control panel. Electrical phase sequence must be checked at installation and prior to start-up. Operation of the system with incorrect electrical phase sequencing can result in mechanical damage to the equipment. The phasing must be checked with a phase sequence meter prior to applying power. The proper sequence should read “ABC” on the meter. If the meter reads “CBA”, open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). All components requiring electric power are wired in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals.

WARNING: It is imperative that L1-L2-L3 are connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

WARNING: The control panel and safeties are wired such that connecting the appropriate power source to the main terminal block energizes the entire electric circuitry of the chiller. A control transformer has been factory wired to step down the incoming power to the 115-volt control power. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance. The unit must be properly grounded in compliance with local and national codes.

Piping System

It is very important that the proper sized pipe be used for the supply and return piping for the process equipment and the cooling tower or chiller. See the ASHRAE Handbook or other suitable design guide for proper pipe sizing. We recommend water velocities of between 5 feet/sec and 10 feet/sec (see Table 2 – Suggest Pipe Line Sizing). In general, run full size piping out to the process equipment and chiller or cooling tower and then reduce the pipe size to match the connections on the process equipment. One of the most common causes of unsatisfactory reservoir system performance is poorly designed piping. Avoid unnecessarily long lengths of hose or quick disconnect fittings that offer high resistance to water flow. When manifolds are required for water distribution, they should be located as close to the use point as possible. Provide flow-balancing valves at each machine to assure adequate water distribution in the entire system.

Table 2 – Suggest Pipe Line Sizing

Pipe Diamerter (inches)	Recommended Flow Range (GPM)
½	
¾	
1	
1¼	
1½	
2	
2½	
3	
4	
6	
8	
10	
12	
14	
16	

For cooling tower systems we recommend tower return lines over 10 feet in length be pitched with a minimum of ¼ inch drop per foot of run. If pipes are to be hung from bar joists; always check the load bearing capacity to insure there is enough strength to support the operating weight of the pipe when filled with water. We also suggest each pipe run be marked with color coded arrows that indicate the direction of flow.

Note: All piping must be supported from the building. The reservoir is not designed to support piping. Supporting piping on the reservoir can result in fiberglass fractures that will develop into a leak or a complete loss of the water reservoir structural integrity.

If the reservoir is part of a chilled water system, glycol must be added to the water if the system will operate below 45°F. The surface temperature in a chiller evaporator is normally 10°F to 15°F lower than the chilled water temperature. When the desired chilled water temperature is set at 42°F, the heat exchange surface temperature is at the freezing point of water. Icing may begin to cover the tube sheets which reduces the heat transfer rate and may eventually damage the chiller. To prevent this condition, a sufficient amount of antifreeze must be added to the chilled water circuit in order to prevent freeze-ups (see Table 3 - Recommended Glycol Solutions).

Note: All chilled water piping systems should be adequately insulated to prevent condensation. Condensation on piping will occur when water vapor in the air comes in contact with the cool surface of the uninsulated chilled water piping and the water vapor changes state to a liquid. The heat that is removed during the change of state is picked up by the chilled water flowing inside the pipe and becomes an additional heat load for the system that will substantially reduce the ability of the chiller to cool the process equipment.

Note: For all chilled water systems requiring a glycol mixture, if an automatic make-up system is included, the make-up water must contain the appropriate glycol mixture.

Note: If the reservoir will operate with an outdoor air cooled chiller, the water must contain a sufficient glycol percentage to protect it from freezing down to the coldest winter temperatures for the installation.

Table 3 - Recommended Glycol Solutions

Chilled Water Temperature	Percent Glycol By Volume
50°F (10°C)	Not required
45°F (7.2°C)	5 %
40°F (4.4°C)	10 %
35°F (1.7°C)	15 %
30°F (-1.1°C)	20 %
25°F (-3.9°C)	25 %
20°F (-6.7°C)	30 %
15°F (-9.4°C)	35 %
10°F (-12.2°C)	35 %
5°F (-15°C)	40 %
0°F (-17.8°C)	40 %

Start-Up

Due to variables involved with different applications and different installations, minor adjustments may be required during the initial start-up to ensure proper operation. The following start-up procedure should be followed in sequence. If trouble is encountered during start-up, the fault can usually be traced to one of the control or safety devices. This outline can be used as a checklist for the initial start-up and for subsequent start-ups if the chiller is taken out of service for a prolonged period of time.

1. Assure the main power source is connected properly, that it matches the voltage shown on the nameplate of the unit, and that it is within the voltage utilization range given in Table 1. Electrical phase sequence must be checked at installation and prior to start-up. Operation of the equipment with incorrect electrical phase sequencing can result in mechanical damage to the equipment and improper performance. The phasing must be checked with a phase sequence meter prior to applying power. The proper sequence should read “ABC” on the meter. If the meter reads “CBA”, open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). Do not interchange any load leads that are from the unit contactors or the motor terminals. Once proper power connection and grounding have been confirmed, turn the main power on.

WARNING: It is imperative that L1-L2-L3 are connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

2. Completely drain the reservoir and make sure it is clean and free of any debris. Inspect the water piping to ensure it has been installed correctly. Refer to Installation section for further instructions.

3. Close the drain valve. Fill the reservoir with water (or a water/glycol solution for chilled water reservoirs) to a level just below the overflow connection. For cooling tower reservoirs that include a water makeup valve, this can be automatically accomplished by opening the city water supply valve to the water make-up valve. For chilled water system a proper water/glycol solution should be used to ensure the proper level of freeze protection is provided. Please refer to Table 3 – Recommended Glycol Solutions for recommended glycol solutions.

Note: If the reservoir includes a make-up valve and the make-up water supply pressure is above 50 PSI, the float make have a hard time shutting off the water. If this is the case, a pressure-reducing valve will be required.

4. Adjust the suction valve of each pump to be fully open (parallel to the suction leg pipe). Adjust the discharge of each pump to be fully closed (perpendicular to discharge pipe).

5. Adjust the valve to each pump pressure gauge to be fully open (parallel to the pilot tube).

6. Switch on the main power disconnect.

7. Momentarily start each pump individually. Note the pressure reading on the pump discharge pressure gauge. If the pressure reading is lower than design it may be an indication that the pump is running backwards. If the pump is running backwards you can correct rotation by performing the following:

    a. Stop the pump
    b. Shut off disconnect
    c. Switch any two leads of the three-phase power to the pump motor
    d. Reconnect wiring
    e. Switch on disconnect
    f. Start the pump again and check for proper rotation. If pump rotation is correct and the pressure is still too low, contact the Customer Service Department for assistance before proceeding further.

    Once the proper pump rotation and operation is verified proceed to the next step. If you encounter problems getting the pump(s) to produce the pressure, stop the start-up procedure and contact our Customer Service Department for assistance.

Note: Reservoir systems typically control the Cooling Tower Pump (P2) thermostatically. To start the Cooling Tower Pump, turn the Cooling Tower Pump on and lower the set point of the reservoir thermostat until the Cooling Tower Pump energizes.

8. Check to make sure the suction valve is still open (parallel to suction leg) and then open the discharge valve to about the 10% open position (100% open position is parallel to discharge pipe).

9. Run each pump circuit for short periods of time to allow the system to slowly fill. Slowly filling the system will all for the removal of any air that may be in the system piping. Failure to do so can result in excessive water hammer and broken piping connections.

Note: Monitor the water level in the reservoir during system pipe filling to ensure the water level always remain above the suction legs of the pumps. Operating a pump without water will cause cavitation and pump seal failure.

10. Once water starts to return to the reservoir from the system return lines, turn the pump on and leave it on.

11. Open the discharge valve slowly until the pump discharge pressure gauge is at the desired pressure. Refer to the pump curves to help in determining the proper pressure associated with the desired flow.

12. Allow the system to operate for about 15 minutes. During this period of time carefully monitor the water level in the reservoir to ensure the pump suction legs remain under water. If a low-level condition occurs, stop the pumps and add fluid to the reservoir.

13. After the system has been operating for 15 minutes, check for leaks, vibration or excessive noise in the pumps or system piping. If there are signs of any of these stop the system and make repairs before proceeding.

14. Before turning off the pumps, measure the amperage on each power lead for each pump (and cooling tower fan motor is applicable). The measured amperage on any lead must not exceed the amperage listed on the pump motor nameplate(s).

The unit is now ready to be placed into service.

Operation

Each reservoir system us custom designed for a particular application and therefore the control and operation of the reservoir system can not be univerally desribed in this manual. The reservoir should have been provided with a suggest piping schematic, wiring diagram and mechanical layout diagram. These drawings are usually shipping inside the control panel of the unit. If the system was ordered without a control panel these drawings would have been shipped with the unit. Please refer to these drawings for specific information about the system design and operation of your particular system.

Preventive Maintenance

Once the pump/reservoir system has been placed into service, the following maintenance procedures should be adhered to as closely as possible. The importance of a properly established maintenance program can not be over emphasized. Taking the time to follow these simple procedures will result in substantially reduced down time, reduced repair cost, and an extended useful lifetime for the equipment. Any monetary costs associated with implementing these procedures will almost always more than pay for themselves.

To help make the preventive maintenance as simple as possible, a checklist should be prepared which lists the recommended service operations and the time at which they are to be performed. With this information, maintenance personnel may be able to correct a potential problem before it causes significant down time. For best results, these readings should be taken with a full heat load from

process, preferably with similar operating conditions each time.

The following is a list of suggested periodic maintenance.

Once a Week

1. Check the interior of the reservoir for dirt and debris.

2. Check all pumps in the system for signs of leaks in the pump seal area. Replace pump seal if necessary.

3. Check the pump discharge pressure on the gauges of each pump in the system. Investigate further if the pump discharge pressure starts to stray away from the normal operating pressure. This could be a sign that the pump impeller is worn or damaged. Replace if necessary.

4. Check the coolant level in the reservoir. Replenish if necessary making sure to take proper precautions to maintain the appropriate glycol concentration for chilled water system reservoirs.

Repeat items 1 through 4 listed above and continue with the following.

Once a Month

5. With the main disconnect shut off and locked out, check the condition of all electrical connections at the contactors, starters and controls. Check for loose or frayed wires and make repairs as necessary.

6. Check the incoming voltage to make sure it is within 10% of the design voltage for the system.

7. Check the amp draws to each leg of all motors in the system and confirm that they are drawing the proper current.

Troubleshooting

Problem	Cause	Remedy
Pump does not produce enough discharge pressure	Pressure gauge defective	Replace pressure gauge
	Pump operating at the end of the operating curve	Throttle back the discharge valve unit the gauge reads design pressure
	Backwards pump rotation	Check rotation and change any two wired to reverse rotation
Pump runs rought and makes pinging sound indicating cavitation	Water level too low in the reservoir	Fill to proper level
	Debris in suction line	Clean suction line of any debris
	Suction valve partially closed	Make sure suction valve is fully open
Motor runs excessely hot	Overload	Reduce number of starts per hour or increase motor size
	Blocked ventilation	Clean external ventilation system
	TEFC Motor	Check fan
	ODP Motor	Blow out internal ventilation passages
	Ambient temperature over 105°F	Reduce ambient temperatire or provide source of cooler air
	Unbalanced current draw	Balance supply voltage
	Single-phasing	Eliminate single-phasing
Pump will not start (hums and heats up)	Single-phasing	Eliminate single-phasing
	Rotor ir bearings locked	Check motor and replace if needed
Pump runs noisy under load (excessive electrical noise or chatter under load)	Single-phasing	Be sure proper sized overload relays are in each of the three phases
Excessive pump vibration	Motor mount loose	Check motor mount is tight
	Motor bearing failure	Replace motor
	Couling loose	Check coupling is tight and properly aligned (if base-mount pump coupling)