



CONDENSATE PUMPS TYPE HT & HT-PMV

Caution: This Unit is designed for atmospheric operation. DO NOT Pressurize Receiver.

IOM MANUAL

INSTALLATION, OPERATION AND MAINTENANCE (IOM) INFORMATION

PLEASE LEAVE THIS MANUAL FOR OWNER'S USE

SAFETY INSTRUCTIONS

Read this manual carefully to learn how to safely install and operate your pump. Throughout this manual there are a number of SAFETY HAZARDS that must be read and adhered to in order to prevent possible personal injury and/or damage to the equipment.

Three keywords, "DANGER", "WARNING", and "CAUTION", are used to indicate the potential severity of the hazard, and are preceded by a SAFETY ALERT SYMBOL. Failure to follow the safety-related instructions may result in a safety hazard.

DANGER Indicates an imminently hazardous situation which, if not avoided, WILL result in serious injury or death.

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

CAUTION Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.



Introduction:

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the responsibility and the duty of all personnel involved in the installation, operation and maintenance of the equipment to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity is compromised by the installation.

Description of Equipment:

Units consists of an ASME code stamped steel receiver (permitting operation under pressure up to 15 PSIG and equivalent temperature up to 250°F), typically fitted with centrifugal pump(s) and designed for the required NPSH of the supplied pump, corrosion inhibitor (anode), water level gauge, thermometer, pressure relief valve, thermostatic air vent trap, compound gauge, valve(s) in pump suction, and a drain (gate) valve. In addition to the above components, the HT-PMV units are fitted with a proportioning regulator and valve (electric or pneumatic). Both HT & HT-PMV units use float switch controls. Control panels and components supplied per specification.

When HT units are furnished with ASME Code stamped receiver, relief valve and air vent trap to permit pressurization, then the receiver inlet is directly connected to the outlet of the steam absorption unit or other steam process equipment without steam traps in the return line. When used in this manner, a separate HT unit is usually required for each independently controlled heating unit.

It is, however, possible to use a single HT unit with multiple heating units. Detailed information and drawings will be furnished on request.

The relief valve on the unit is normally set at 15 PSIG and normally rated at 1900 lbs./hr steam. Any additional system protection must be provided as required by others.

Pre-Installation Check:

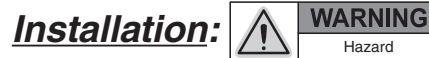
Open all cartons and inspect for shipping damage. Report any damage to your shipping carrier or SHIPCO® sales representative immediately.

Always verify that the pump nameplate Voltage, Phase, and Horsepower ratings as well as Amps rating on motor match your control panel and power supply. Warranty does not cover damage caused by connecting pumps and controls to an incorrect power source (i.e., voltage and phase).

Site Inspection:



The pump should be of the proper size and capacity for the proposed installation. Refer to nameplate for rated capacities. Check motor voltage against available power supply.



Electrical connections are to be made by a qualified electrician in accordance with the National Electrical Code (NEC) or the Canadian Electrical Code, as well as all national, state and local codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's

installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void the manufacturer's warranty.

Motor must have a properly sized starter with a properly sized heater to provide overload and under voltage protection unless motor meets following two conditions: single phase and motor horsepower is 1 HP or less. Motors that satisfy these two conditions have built-in thermal overload protection.

Operating personnel should be trained in the operation of the pump and any associated system.

Unit and/or Pump Location: 

Units are furnished with motors classified as either Open Drip Proof (ODP) or Totally Enclosed Fan Cooled (TEFC) motors. Controls can be NEMA 1 or NEMA 4. Other classifications, such as explosion proof, are available upon request. Locate unit only in areas of the proper classification based on motor data and NEMA classifications of the equipment purchased

A high ambient temperature *will cause* thermal overload protection to shut off the pump. To facilitate maintenance, place unit for easy access to all parts. Allow adequate space for servicing.

Notice/Temperature Limits: 

Motors are designed to operate in 104°F maximum ambient. Insulate and ventilate as required.


Do Not exceed pressure rating of relief valve (normally 15 PSIG). Do not alter or tamper with relief valve. Pipe relief valve discharge to a safe location. Failure to follow these instructions could result in serious injury or death.

Returns:

Gravity return lines from system should be properly pitched to drain to unit by gravity. A "Y" strainer and gate valve should be installed in the return line.

Piping (General):

Pipe Model HT per the Typical Piping Diagram (see Figure 2); pipe Model HT-PMV per Typical Piping Diagram (see Figure 3). Locate and support piping so as to not load the pump discharge.

Piping (Relief Valve): 

The discharge from the relief valve should be piped to a location safe for potential full flow steam. There must also be provision for drainage of the liquid discharged.

For safe operation the system requires a relief valve. The relief valve discharge must be piped to a location where steam can be safely discharged. Do not restrict, reduce or valve the relief valve discharge line. Failure to follow these instructions could result in death or serious injury.

The pressure relief valve supplied on the unit may not be sufficient to relieve rated capacity of the unit or full output of the boiler. Relief valve supplied is normally rated at 1900 lbs/hr of steam. The tank is rated to withstand 125 PSIG, **but the normal operating pressure must not exceed the safely relief valve setting.** Professional system design or evaluation, by others, must evaluate the upstream and provide for necessary additional protection. Discharge thru the pressure relief valve is a symptom of a system failure. The unit must be valved off immediately. Failure to follow these instructions could result in serious injury or death.

Thermostatic Vent Trap or Atmospheric Vent:



Connect piping from drain line, thermostatic vent trap, and mechanical drain valve (if so equipped) to drain. Occasionally, units are furnished

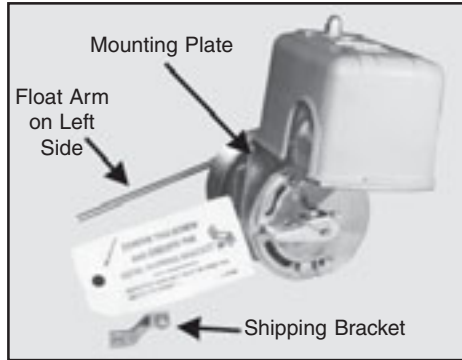
fully vented, without thermostatic vent trap. Oversize vent openings are then supplied; install full size vent pipe to atmosphere.

*Inject boiler feed compounds from chemical feed tank into boiler feed piping—never into condensate tank. **The unit is NOT a chemical feed pump.** Failure to follow these instructions may result in minor or moderate injury.*

Float Switches (HT Unit):

Float switch and/or displacer switches, standard or proportional, are provided to meet system requirements.

Floats are locked in place during shipment by a shipping bracket to prevent damage. Shipping brackets must be removed before start-up. Check factory settings. The lead pump should start with tank approximately 3/4 full and shut off set at 2" or more above pump inlet. Lag pump should start before the tank overflows. This should avoid "short cycling" of the pump.



WARNING!
Switch is shipped with a bracket attached to the mounting plate to prevent the float from moving in the tank during shipment. When installing the unit, this bracket, clearly marked with a tag, **MUST** be removed for float switch to operate.

FIGURE 1—Float Switch



*The pressure limit within the closed tank **must not exceed 50 pounds per square inch (psi).***

Proportioning Electric Regulator and Proportioning (Slide Wire) Electric Valve (HT-PMV):

The regulator is actuated by a float-operated mechanism. Its function is to regulate the action of the proportioning type of motor operated valve, so the amount of flow through the valve is in balance with the water level change.

By accurately following the changes in the water level, the float actuates a potentiometer slide wire located in the proportioning regulator. Connected to a similar potentiometer in a relay and valve operator, the regulator causes the valve to open, close, or hold in a fixed position. Displacer positions are adjusted by removing the controller from the top of the tank and changing cable lengths.

Bypass Lines:



*Pump bypass line contains **HOT** condensate. Failure to close valve or drain line will result in serious injury (i.e., burns) or death.*

Failure to connect bypass line will cause mechanical seal and motor failures.

If the following conditions are met—pump *runs continuously* and motor horsepower is 7-1/2 or larger and temperature of liquid in tank is 212°F or higher—then a bypass line is required. On assembled unit at factory, the manufacturer will install the bypass line. The isolation valve must remain open during operation of pump.

Seal Flush Line (or Bleed Line): 

SHIPCO® pumps are manufactured with provisions for seal flush line. This line helps prevent the pump from vapor binding and allows the pump to operate against a dead shut-off for periods of time without

burning the seals. The ball valve in the bleed line must remain open during operation.

Overflow:

Install overflow piping to drain. (An overflow loop and anti-siphoning orifice can be installed to prevent venting through the overflow.)

Return Piping:

An isolation valve should be installed for servicing. An inlet strainer should be installed to remove foreign material and prolong the pump life.

Suction Piping:



An isolation valve will be installed in the suction piping between the receiver and pump suction for servicing the pump. The valve will be sized to allow an adequate flow of water to meet the Net Positive Suction Head (NPSH) requirement of the pump.

Discharge Piping for HT:

If the pump does not have a flanged discharge, install a union immediately beyond the pump discharge.

A spring-loaded check valve should be installed in the discharge piping near to the pump to prevent backflow into the unit. Next, a manual flow control valve (e.g., ball valve, globe valve, or steam cock) must be installed after the spring-loaded check valve and near to the pump discharge flange or union (see figures 2 and 3) to “balance the pump” (i.e., adjusting discharge flow of the pump to keep it running at the design operating conditions for flow rate and discharge pressure). A gate valve should not be used as a manual flow control valve. Note that some people refer to the term “balancing the pump” as either “throttling the pump” or “choking the pump.”

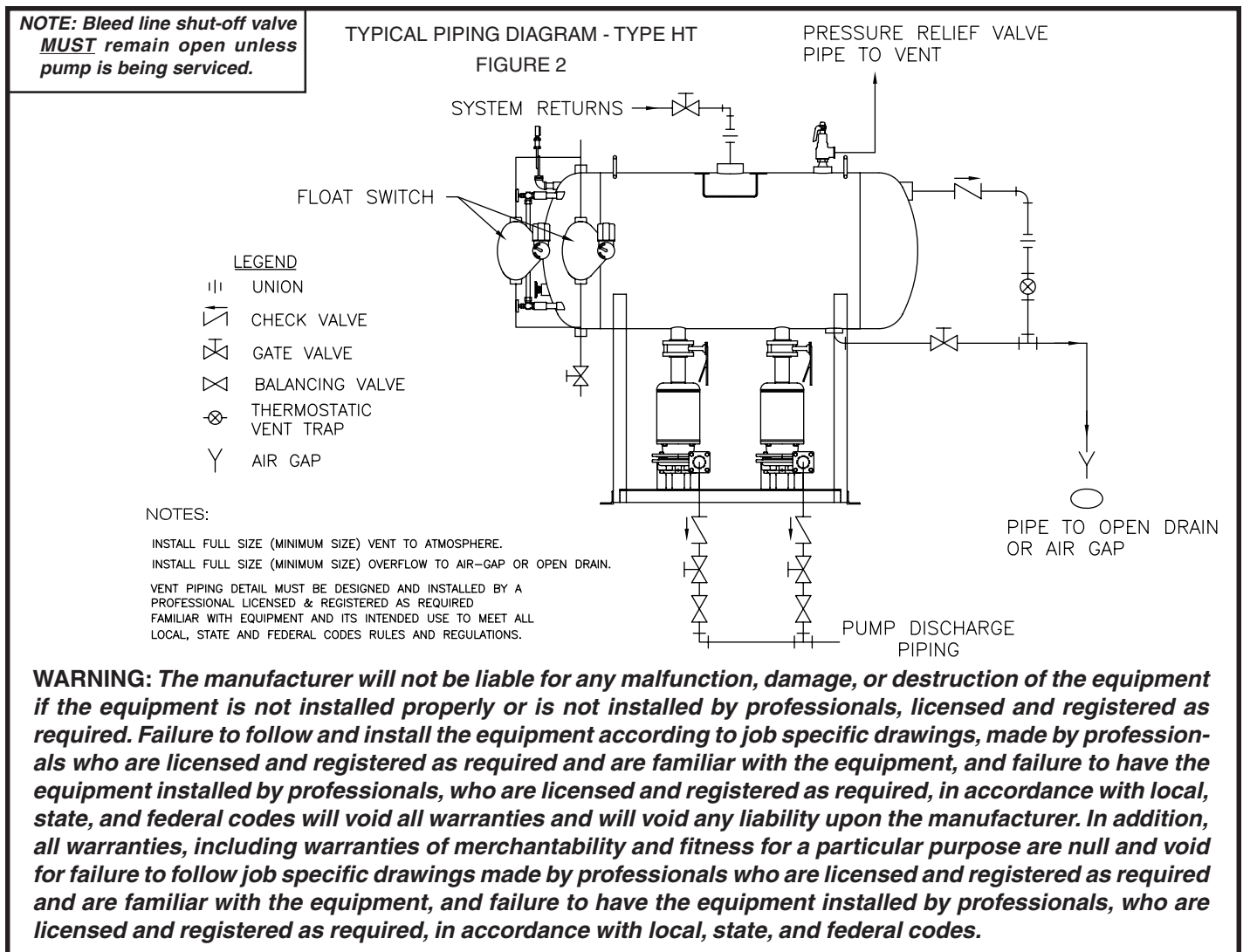
The balancing valve(s) may be omitted on units equipped with proportioning discharge valves. If discharge line is more than 100 ft. long, it should usually be one size larger than the pump tapping. When the pump discharges to a vented receiver at approximately the same elevation, the steam pressure in the receiver may be greater than the static head at the pump discharge, causing condensate and steam to be forced through the pump. This condition can be corrected by installing a back-pressure valve with a spring pressure approximately equal to the maximum receiver pressure.

If pump discharge is rated for 75 PSIG or greater, the pump may be equipped with an automatic flow control valve that functions as the balancing valve. When an automatic flow control valve is included, it must be installed in the discharge piping immediately after the pump’s discharge flange or union and before any other valves. The automatic flow control valve is used to set the pump at the design operating conditions to prevent motor overload and pump cavitations. Note that the sequence of piping when using an automatic flow control valve is different from the manual flow control valve piping.

Notes on Piping:

1. When installing the pump, if the discharge flange of the pump does not include a tapping for a discharge pressure gauge port, a gauge port should be installed in the discharge piping.
2. The piping should include isolation valves on both the suction and discharge sides of the pump and have a drain valve in the suction line.

When installing the suction and discharge connections to a threaded pump housing, a Teflon tape sealer or a high quality thread sealant is recommended.



For specific instructions on installation, operation and maintenance of pump/motor assemblies fitted to receiver, refer to IOM Manual for pump Model (e.g., D, P, etc.) supplied.

Discharge Piping for HT-PMV:

Discharge piping is prepiped at factory.

Pneumatic Proportioning Regulator and Control Valve:

The pneumatic proportional control utilizes controlled air pressure to modulate the discharge valve opening. An air pressure switch set at 2–3 PSIG starts and stops the pump(s) while the discharge valve is essentially closed.

Electrical Wiring:

Units are furnished with single-phase or three-phase motors. Single-phase motors are usually furnished as dual 115/230/1/60. Three-phase motors are usually furnished as tri-voltage 208/230/460/3/60. Motors should be connected according to manufacturer’s instructions for correct voltage.

Three phase motors must use starters with properly sized overload relays. Overload relays furnished are designed for manual reset.

Single phase drip proof motors up to and including 1 HP have built-in thermal overload protection. Magnetic starters are not required on these

motors. Single phase drip proof motors larger than 1 HP and all three phase motors require magnetic starters.

Confirm that the nameplate data on the control panel[s] matches the supply current. If the nameplate data does not match the power source, consult factory.

Verify controls, starter coils, etc., match the control voltages before installing. The secondary side of transformer is the control circuit.

Wire in accordance with the National Electrical Code, state and local codes where applicable. A variety of electrical controls are available to meet system specifications. Wiring diagrams are enclosed in electrical panel when the panels are furnished as part of the unit. Consult wiring diagram for specific electrical control information.

Short Circuit Protection:

According to the National Electrical Code, branch circuit over-current protection must be provided for each contactor or starter. The following table is provided as a guide. **DO NOT EXCEED MAXIMUM PROTECTIVE DEVICE RATINGS.** (See Figure 4.)

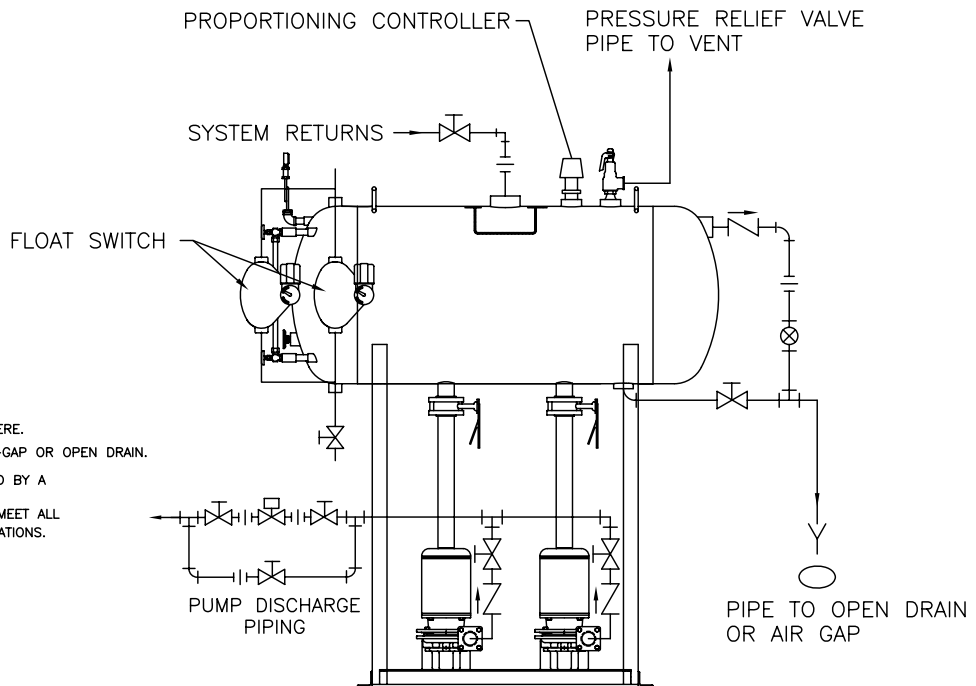
NOTE: Bleed line shut-off valve *MUST* remain open unless pump is being serviced.

TYPICAL PIPING DIAGRAM - TYPE HT-PMV
FIGURE 3

- LEGEND**
- ||| UNION
 - ∇ CHECK VALVE
 - ⊞ GATE VALVE
 - ⊞ BALANCING VALVE
 - ⊗ THERMOSTATIC VENT TRAP
 - Y AIR GAP

NOTES:

- INSTALL FULL SIZE (MINIMUM SIZE) VENT TO ATMOSPHERE.
- INSTALL FULL SIZE (MINIMUM SIZE) OVERFLOW TO AIR-GAP OR OPEN DRAIN.
- VENT PIPING DETAIL MUST BE DESIGNED AND INSTALLED BY A PROFESSIONAL LICENSED & REGISTERED AS REQUIRED FAMILIAR WITH EQUIPMENT AND ITS INTENDED USE TO MEET ALL LOCAL, STATE AND FEDERAL CODES RULES AND REGULATIONS.



WARNING: The manufacturer will not be liable for any malfunction, damage, or destruction of the equipment if the equipment is not installed properly or is not installed by professionals, licensed and registered as required. Failure to follow and install the equipment according to job specific drawings, made by professionals who are licensed and registered as required and are familiar with the equipment, and failure to have the equipment installed by professionals, who are licensed and registered as required, in accordance with local, state, and federal codes will void all warranties and will void any liability upon the manufacturer. In addition, all warranties, including warranties of merchantability and fitness for a particular purpose are null and void for failure to follow job specific drawings made by professionals who are licensed and registered as required and are familiar with the equipment, and failure to have the equipment installed by professionals, who are licensed and registered as required, in accordance with local, state, and federal codes.

Maximum HP Maximum Volts					NEMA Size	Maximum Voltage	Class K5 or R Fuse (Ampere)	Class K1 or J Fuse (Ampere)	Inverse-Time Circuit Breaker (Ampere)
Single Phase		Three Phase							
115v	230v	208v	250v	600v					
1/3	1	1 1/2	1 1/2	2	00	600	10	15	15
						250	12	15	15
1	2	3	3	5	0	600	20	30	20
						250	25	30	35
2	3	7 1/2	7 1/2	10	1	600	30	60	40
						250	40	60	60
-	-	10	15	25	2	600	60	100	80
						250	60	100	90
-	-	25	30	50	3	600	100	200	125
						250	125	200	150

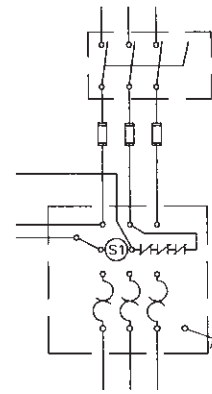


FIGURE 4

PUTTING THE PUMP INTO SERVICE:

(See Step B below)



Pressure in tank should not exceed 15 PSIG since the relief valve is normally set at 15 PSIG. Do NOT restrict relief valve discharge. Failure to follow instructions and safety procedures could result in serious injury or death.

- A. Flush unit to drain to remove any debris from total system (i.e., pipes, radiators, receivers, etc.). Make sure all debris has been removed from inlet strainer after start-up of system. Reinstall drain plug.
- B. Assure that the unit is piped in accordance with above instructions and Typical Piping Diagram. **Pressure in tank should not exceed 15 PSIG since the relief valve is normally set at 15 PSIG. Do NOT restrict relief valve discharge.** Open valves slowly. Failure to follow these instructions could result in serious injury or death.
- C. Remove shipping brackets on float switches. Per instructions on tag attached to float switch, remove shipping bracket from each float switch as per manufacturer's instructions. The float switch has been factory set for maximum capacity of the receiver. Should an alternate setting be required, refer to the float switch manufacturer's instructions. If needed, reference Technical Articles section on the SHIPCO® website (www.shipcopumps.com) for instructions on how to adjust a float switch.
- D. Check power leads in accordance with wiring diagram enclosed in control cabinet (when furnished).
- E. *Priming of Pump:* Fill receiver half full of water to prime pump(s) and prevent possible damage to pump seals. Avoid freezing conditions after unit receiver has been filled. Refer to IOM Manual for pump model installed on unit for more instructions.
- F. Check for proper rotation of all three-phase motors. Rotation must be clockwise looking down on the motor as indicated by directional arrow on pump casting. If pump runs backwards, interchange two wires (3 phase only). Do NOT run motor in reverse. Jog the motor to test for direction of rotation. Reverse operation can cause extensive damage to pumps.
- G. Do NOT run motor dry. Seal damage may occur.
- H. Adjust throttling valve in discharge line until pressure at pump (while pump is discharging) approaches pump rated pressure. Tighten plug nut to secure adjustment.
- I. Inspect pump seal regularly for leaks. Seal damage may occur. Replace as required.
- J. *Motor Lubrication:* The pump is a close-coupled centrifugal unit. The pump has no internal bearings. Refer to IOM Manual for model of pump supplied on unit for additional information.
- K. **Bleed line shut-off valve MUST REMAIN OPEN unless pump is being serviced.**

OPERATION AND MAINTENANCE

Operators must be familiar with all sections of this manual to understand the operation of the unit. Hot water, steam and electricity can be hazardous.



Pressure in tank should not exceed 15 PSIG since the relief valve is normally set at 15 PSIG. Do NOT restrict relief valve discharge. Open valves slowly. Failure to follow instructions and safety procedures could result in serious injury or death.



Disconnect and lock out power before connecting or servicing this unit. Failure to follow these instructions and lock-out/tag-out procedures could result in serious injury or death.

Check motor nameplate for any lubrication requirements. Pumps require no lubrication.

Auto Restart

Single-phase motors will restart automatically after thermal overload protector trips. Overload thermal relays in starters must be reset manually.

A properly installed unit should function unattended for long periods of time. Periodic checks to assure proper operation are highly recommended. Refer to troubleshooting section when necessary.

A variety of control options are available and are furnished in accordance with use specifications. Refer to wiring diagrams (when furnished) to determine control switch settings.

The inlet strainer (when furnished) is intended to protect the pump and system. Periodic cleaning should be included in the maintenance schedule. Check frequently in new systems.

A unit showing symptoms of possible problems (overflow, noise, leaks, vibrations, continual operation, etc.) must be corrected immediately. Failure to follow this instruction may result in full liability for subsequent injury or property damage.

TROUBLESHOOTING CHECKLIST

All units are thoroughly tested at the factory before shipment. They should operate satisfactorily without further adjustment if properly installed and not been damaged by rough handling in transit. If system or unit performance is not satisfactory, refer to the following check list.

PUMP WILL NOT START

1. The power supply has been interrupted, disconnect switch is open, or selector switch is improperly positioned.
2. Incorrect voltage for motor. Check voltage and wiring with motor characteristics.
3. Incorrect starter coil for power supply.
4. The overload relays on the starter have tripped out and must be reset. Ambient temperature may be too high.
5. Check pump controls or other controls for proper operation.
6. Wiring to control cabinet is incorrect or connections are loose.
7. The strainer is dirty thus retarding flow. Clean periodically.

PUMP RUNS CONTINUOUSLY *on Model HT*

(Note: Pumps *are designed to RUN CONTINUOUSLY on Model HT-PMV*)

1. Pump is running backward. Rotation of three phase motors may be corrected by interchanging any two of the three wires. Rotation should be clockwise looking down on motor.
2. The total required pressure at the pump discharge is greater than the pressure for which the pump was designed. Check the total pressure which includes atmospheric pressure, the friction head and the static head.
3. A valve in the discharge line is closed or throttled too tightly. Check valve is installed backwards.
4. The impeller eye is clogged.
5. Pump is too small for system.

CONDENSATE PUMP IS NOISY

1. The pump is working against a lower pressure than designed for. While pump is discharging, adjust plug cock in discharge line until pressure at pump approaches pump rated pressure.
2. Excessive condensate temperature. Correct system conditions. However, this applies to certain units only; others are designed to handle boiling water.
3. Magnetic hum or gearing noise in motor. Consult motor manufacturer's authorized service station nearest unit location.
4. Starter chatters. Trouble is caused by low line voltage, poor connections, defective starter coil, or burned contacts.
5. Pump is running backwards.

SYSTEM IS NOISY

1. Banging in the steam mains is usually caused by steam "imploding" in condensate lying in low points in lines. These problems can be eliminated by dripping low points, properly supporting the pipe, or by increasing the pitch of the lines.
2. Improper dripping of the steam mains and risers; where there is a rise in the steam main, or where it branches off into a riser, a drip trap must be installed in the drain line.
3. The piping is too small to drain properly.

STEAM FLOW IS RESTRICTED

1. Thermostatic vent not open when cold.
2. Valve closed between vent line and drain or check valve installed backwards.

RELIEF VALVE DISCHARGING

1. Incoming steam pressure exceeds setting of pressure relief valve. Upstream pressure must not exceed relief valve setting. Correct system.

PUMPS DON'T START (on Model HT-PMV)

1. If pneumatic system, check pressure setting of pneumatic pressure switch. Air pressure to engage switch at 2-3 PSI.
2. If electric, check displacer adjustments.

MECHANICAL SEAL REPLACEMENT INSTRUCTIONS FOR HT and HT-PMV Condensate PUMPS

When it is necessary to replace a mechanical seal refer to the procedures in the Installation, Operation, and Maintenance Manual (IOM) for pump model supplied on unit.

Note: Seals will be damaged if operated dry.

Representative Servicing:

If trouble occurs that cannot be rectified, contact your local SHIPCO® representative who will need the following information in order to provide assistance:

1. Provide all information on pump and motor from SHIPCO® name-plate (see example).
2. Suction and discharge pipe pressure gauge readings.
3. Ampere draw of the motor.
4. A sketch of the pump hook-up and piping.

UNIT MODEL		[REDACTED]	
MANUFACTURED BY		P.O. BOX 279, SHIPPENSBURG, PA 17257	
SHIPCO® PUMPS		PHONE: (717) 532-7321 • FAX: (717) 532-7704	
		WWW.SHIPCOPUMPS.COM	
RATED	[REDACTED]	GPM @	[REDACTED] PSIG
MOTOR HP	[REDACTED]	VOLTAGE	[REDACTED]
UNIT SERIAL NO.		[REDACTED]	
PUMP TYPE		[REDACTED]	

Notes/Comments

TERMS AND CONDITIONS OF SALE

AGREEMENT

By entering your order or requesting a quote, you confirm that the following terms and conditions of sale are the legal agreement governing your purchase, and that no changes or additional or different terms will apply unless you have previously established a different written contract for these purchases with Shippensburg Pump Company, Inc., hereafter referred to as the Seller.

ORDER ACCEPTANCE

All orders are subject to acceptance by Seller at its general office in Shippensburg, Pennsylvania. Acceptance will be evidenced by Seller issuing its Sales Acknowledgement Form. The Sales Acknowledgement Form, together with any documents incorporated therein, shall constitute the entire agreement and may not be changed except in writing signed by Seller and Buyer. Publication and circulation of current price lists, catalogues and related literature by Seller shall not be deemed an offer to sell, but rather an invitation for offers to buy. Acceptance by Seller of the Buyer's order is expressly limited to the Terms and Conditions stated herein; any additional, inconsistent or different terms and conditions contained in the Buyer's purchase order or other documents supplied by Buyer are expressly rejected.

PAYMENT TERMS—PRICES

Payment terms are as follows: If the Buyer is a Credit Card Customer, the Buyer agrees to pay at the time of purchase the price, shipping and handling charges, taxes and duties quoted by the Seller. If the Buyer is an Account Holder, the Buyer agrees to pay invoices with payment terms of net thirty (30) days after date of invoice unless otherwise specifically agreed to in writing. If the Seller believes that the Buyer's financial condition requires it, the Seller reserves the right to require full or partial payment prior to manufacture or shipment. If the Buyer fails to make any payment when due, (1) the seller reserves the right to suspend performance and the Buyer agrees that any charges incurred prior to the suspension will be assessed to the Buyer and payable to the Seller; (2) the Buyer further agrees to pay a charge on the amount past due at the rate of 1½% per month (18% per year) or the maximum lawful rate, whichever is less. In the event of non-payment, the Buyer agrees to pay the Seller reasonable attorney's fees and court costs, if any incurred by the Seller to collect payment and interest charges. These terms shall apply to partial, as well as complete shipments of Product. Published prices are subject to change without notice and the right is reserved to invoice at prevailing prices at time of shipment unless otherwise specifically agreed to in writing. All quotations are conditional on 30 days acceptance unless stipulated otherwise in writing and to approved credit rating or reference, otherwise payment terms are cash with order or C.O.D.

DELIVERY—DELAYS

Shipping dates represent estimates only and are based on projected production schedules and commitments by suppliers. Seller shall not be liable for failure or delay in manufacturing or shipping Products, nor shall such failure or delay constitute grounds for cancellation if such failure or delay is directly or indirectly due to shortages of fuel or energy; acts of omissions of the Buyer; acts of God; war, riot, civil disturbances; labor difficulties; accident; inability to reasonably obtain materials; acts of transportation companies; or other causes of any kind whatever beyond the control of Seller. In the event of such delays, Seller reserves the right to make adjustments in price and delivery schedules.

FREIGHT TERMS

Prices are f.o.b. factory unless otherwise stated. Seller's responsibility ceases upon delivery to the transportation company at shipping point. It is the Buyer's responsibility to examine shipment upon arrival to ascertain if in good order. Any shortage or damage claims must be pursued by the Buyer. All weights shown on price sheets and literature are approximate. All packaging is standard domestic boxing, slat and wire crating and/or skidding. An additional charge will be made for full wooden crating or special packaging when specified on the order.

Seller will make every effort to consolidate orders and backorders wherever possible. Seller will not be responsible for excess charges due to their inability to consolidate shipments.

When requested by Buyer, shipments may be routed using premium carriers such as express or airfreight or the Buyer may specify the method or route of shipment. In such cases the shipment will be made on a "collect" basis and where applicable the freight allowance will appear as a separate line item on the product invoice, Seller reserves the right to select the transportation company where freight is allowed.

TAXES

In addition to the price stated, the amount of any present or future sales, use, excise or other similar tax applicable to the production, sale, use or transportation of the Products shall be paid by Buyer. In lieu of paying such taxes to Seller, Buyer may furnish Seller a Tax Exemption Certificate or Certificates acceptable to appropriate taxing authorities at any time prior to Seller's shipment of the Products.

CANCELLATIONS

Any order placed with Seller may be cancelled by the Buyer only upon payment of reasonable cancellation charges that shall include but not be limited to expenses already incurred, as well as material and labor commitments made by Seller.

SHIPMENT—TITLE—RISK OF LOSS

Shipment terms are f.o.b. Seller's facility, unless otherwise specifically agreed to in writing. Notwithstanding the granting of any allowances for shipping, title to and risk of loss for Products will pass to the Buyer when delivered to the Common carrier at the Seller's facility.

BACK CHARGES

All invoices shall be due and payable when submitted for payment in accordance with the provision entitled "Payment Terms—Prices." No withholding of funds, back charges, or credits against amounts otherwise due Seller will be permitted unless specifically agreed to in writing by Seller. Settlement of any amounts due Buyer will be negotiated as separate items and not as offsets against amounts otherwise due Seller from Buyer for Products sold hereunder.

RETURNED GOODS

Unused material of current manufacture can only be returned for credit with the written consent of Seller, under return goods policies existing at the date of the return. Products that are obsolete or made to special order are not returnable.

PATENT INDEMNITY

a. Patent Indemnity by Seller to Buyer

Seller agrees to indemnify and hold harmless the Buyer from and against all legal expenses which may be incurred, as well as all damages and costs (except all consequential and special damages and costs) which may be finally assessed against Buyer in any action for infringement of any United States Letters Patent by the Products delivered to Buyer hereunder; provided that the Buyer shall give Seller prompt written notice of any action, claim or threat of patent infringement suit, either oral or written, or of the commencement of any patent infringement suit against Buyer relating to Products sold by Seller to Buyer hereunder; and provided Buyer shall give Seller opportunity to elect to take over, settle, or defend any such claim, action or suit through counsel of Seller's own choice and under

its sole direction, and at its sole expense, and provided that in the event Seller elects to take over, defend or settle same. Buyer will make available to Seller all defenses against any such claim, action, suit or proceeding known to or available to Buyer; and provided further that Seller shall have the right to substitute for any such Product or any part thereof claiming to infringe the patent right of others, non-infringing Products which will give equally good service. If the use of any such Product or any part thereof should be enjoined, Seller shall have the right at its own expense, to take any of the following courses of action:

- i. To procure for Buyer the right to continue using such Product;
- ii. To replace said Product with a non-infringing Product;
- iii. To modify the Product so that it becomes non-infringing; or
- iv. To remove said Product and refund the purchase price, transportation costs and installation costs thereof.

b. Limitation

The foregoing provisions as to patent protection by Seller to Buyer shall not apply to any of the following:

- i. To any Product manufactured to the design or specification furnished by the Buyer;
- ii. To orders for special non-commercial Products which Seller has not sold or offered for sale to the public on the open commercial market;
- iii. To any infringement occasioned by modification by Buyer of any Product without Seller's written consent, or any infringement arising from the use of a Product with any adjunct or device added by the Buyer without Seller's written permission.

c. Patent Indemnity by Buyer to Seller

To the extent that Products delivered hereunder are manufactured pursuant to detailed designs furnished by Buyer, Buyer agrees to indemnify Seller and hold Seller harmless from all legal expenses which may be incurred, as well as all damages and costs, which may finally be assessed against Seller in any action for infringement of any United States Letters Patent by such Products delivered hereunder. Seller agrees to promptly inform the Buyer of any claim for liability made against Seller with respect to such Products and Seller agrees to cooperate with the Buyer in every way reasonably available to facilitate the defense against any such claim.

GOVERNING LAW

The validity, interpretation and performance of any order shall be governed by the Uniform Commercial Code ("UCC") as adopted by the state in which the Products are manufactured by Seller.

WARRANTY AND LIMITATION OF LIABILITY

Seller warrants for a period of eighteen (18) months from date of shipment from its factory or one (1) year from date of installation, whichever occurs first, that all Products furnished by it are free from defects in materials and workmanship.

Seller's liability for any breach of this Warranty shall be limited solely to replacement or repair, at the sole option of Seller, of any part or parts found to be defective during the Warranty period providing the Product is properly installed and is being used as originally intended. Buyer must notify Seller of any breach of this Warranty within the aforementioned Warranty period; defective parts must be shipped by Buyer to Seller, transportation charges prepaid.

IT IS EXPRESSLY AGREED THAT THIS SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER. UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR ANY COSTS, LOSS, EXPENSE, DAMAGES, SPECIAL DAMAGES, INCIDENTAL DAMAGES OR CONSEQUENTIAL DAMAGES ARISING DIRECTLY OR INDIRECTLY FROM THE DESIGN, MANUFACTURE, SALE, USE OR REPAIR OF THE PRODUCT WHETHER BASED UPON WARRANTY, CONTRACT, NEGLIGENCE OR STRICT LIABILITY. IN NO EVENT WILL LIABILITY EXCEED THE PURCHASE PRICE OF THE PRODUCT.

THE WARRANTY AND LIMITS OF LIABILITY CONTAINED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, EXPRESSED OR IMPLIED. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY SELLER AND EXCLUDED FROM THIS WARRANTY.

Seller neither assumes, nor authorizes any person to assume for it, any other Warranty obligation in connection with the sale of the Product. This Warranty shall not apply to any Product or parts of Products which (a) have been repaired or altered outside of Seller's facilities; or (b) have been modified or damaged through misuse, abuse, accident, neglect or mishandling by Purchaser or Purchaser's customer, erroneous voltage, modification, acts of God, or any other act not specifically stated; or (c) have been used in a manner contrary to Seller's instructions.

Products covered by this warranty are for the intended uses as described in the corresponding seller's instructions. Before using for any other application, user shall determine the suitability of the product for its intended use and user assumes all risk and liability in connection therewith.

No oral statement made by the seller, its agents, employees, or other representatives, concerning the product, its value, description, condition, design, specifications, performance, capability, durability, adaptability, or accuracy, shall be relied upon by the purchaser and is specifically and expressly excluded and invalidated as the basis for any bargain or warranty.

In the case of Products not manufactured by Seller, there is no Warranty from Seller, but Seller will extend to the Buyer any Warranty of Seller's supplier of such Products.

FORCE MAJEURE

Seller shall have no liability in respect of failure to deliver or perform, or delay in delivering or performing any obligations due to causes such as acts of omissions of Buyer; acts of God, fire, flood, war and civil disturbances; riot, acts of governments, currency restrictions, labor shortages or disputes, unavailability of materials, fuel, power, energy or transportation facilities, failures of suppliers or subcontractors to deliver on time and every other circumstance outside the reasonable control of Seller.

MODIFICATIONS

Unless otherwise provided, Seller reserves the right to modify the specifications of Products ordered by the Buyer providing that the modification will not materially affect the performance.

STORAGE CHARGE

If Buyer is unable to accept products in accordance with the applicable shipping schedule then Seller may arrange to store ordered Products and the cost of storage will be charged to Buyer.

ENTIRE CONTRACT

These provisions constitute all the terms and conditions agreed upon by the parties and shall replace and supersede any provisions on the face and reverse side of Purchase Order and any attachment thereto, or any prior general agreement inconsistent with the provisions hereof except that orders by Representatives with whom Seller has an Agreement shall be subject to the provisions of the Agreement. No modification hereof shall be valid unless in writing and duly signed by a person authorized by Seller. The provisions hereof shall not be modified by any usage of trade, or any course of prior dealings or acquiescence in any course of performance.