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 are compromised by the installation.

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:

CAUTION
Hazard

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.

Installation:

WARNING
Hazard

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 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:

CAUTION
Hazard

If pump and motor are operating at extremely high or low temperatures, insulate and ventilate as required.

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.

PC models are furnished with cast iron receivers; PS models are typically furnished with black steel receivers. Other receiver options such

as stainless steel are available. Steel receivers can also be made thicker or lined. For most applications, stainless steel offers superior resistance to corrosion than black steel. However if the water contains "ides" such as chloride, stainless steel tanks can be subject to stress corrosion cracking that will lead to premature failure of tank.

Unit is designed for atmospheric operation. ***DO NOT pressurize receiver!***

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.

Seal Flush Line (or Bleed Line):

SHIPCO® pumps are manufactured with provisions for a 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 bleed line must remain open.

Vent Connection:

Install a full sized vent to atmosphere from the receiver. DO NOT install any shut-off valves or other type of valves in the vent line.

Overflow:

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

Return Piping:

Properly pitched gravity return lines are piped to the unit as shown in the Typical Piping Diagram (Figure 2). 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:

The elevated units (PES or PEC) are fitted with a suction isolation valve in the suction piping between the receiver and the pump suction for servicing the pump. On floor-mounted units (PS or PC), an isolation valve may 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:

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 Figure 2) 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".

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 (See Figure 2)*. 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 the 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 the IOM Manual for Model P pumps.

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.

If control panel is furnished, 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. See typical wiring diagrams (Figure 1).

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.

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.

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					
⅓	1	1½	1½	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	7½	7½	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

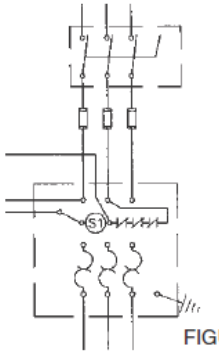

FIGURE 1

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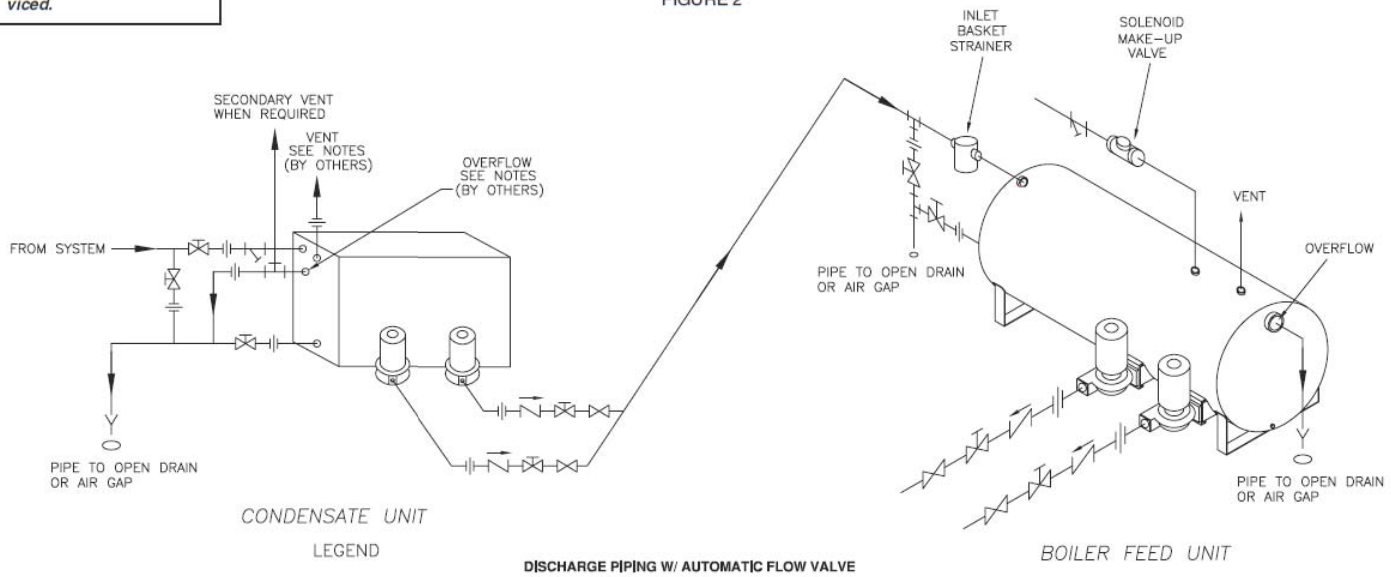
*NOTE: Bleed line shut-off valve **MUST** remain open unless pump is being serviced.*

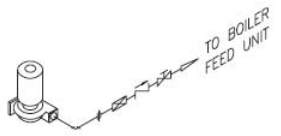
TYPICAL PIPING DIAGRAM
FIGURE 2



LEGEND

- AUTOMATIC FLOW CONTROL VALVE
- BALANCING VALVE
- GATE VALVE
- CHECK VALVE
- INLET STRAINER
- UNION
- AIR GAP

DISCHARGE PIPING W/ AUTOMATIC FLOW VALVE



If centrifugal feed pump is operating at 75 PSIG or greater a Automatic Flow Valve typically is utilized.

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.***

NES COMPANY

PUTTING THE PUMP INTO SERVICE:

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. Remove shipping brackets on float switches. Per instructions on tag attached to float switch, remove shipping bracket (See Figure 3) from each float switch or mechanical alternator 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 on how to adjust a float switch or mechanical alternator:

Adjusting a Nema 1 Square-D, 9037 Series Float Switch

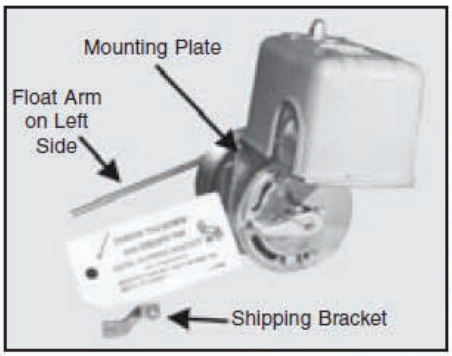
Adjusting a Nema 1 Square-D, 9038 Series Mechanical Alternator

C. Adjust the throttling valve (closed) installed in pump discharge to bring pump discharge pressure to design conditions. When proper conditions have been met, tighten valve and remove handle.

D. *Priming of Pump:* Refer to IOM Manual for Model P pump.

E. *Motor Lubrication:* The pump is a close-coupled centrifugal unit. The pump typically has no internal bearings. Refer to the IOM Manual for Model P pump for additional information.

F. ***Bleed line shut-off valve MUST REMAIN OPEN unless pump is being serviced.***



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 3—Float Switch

MECHANICAL SEAL REPLACEMENT INSTRUCTIONS FOR MODELS PC, PS, PEC, AND PES

When it is necessary to replace a mechanical seal refer to the procedures in the Installation, Operation, and Maintenance Manual for Model P pump.

Note: Seals will be damaged if operated dry.

TROUBLESHOOTING CHECKLIST

PUMP WILL NOT RUN

1. Power supply has been interrupted. Disconnect switch is open or selector switch improperly positioned.
2. Improper voltage supplied to motor. Check voltage and wiring with motor characteristics.
3. Incorrect starter coil for power supply.
4. Overload relays in starter have tripped out and must be reset. Ambient temperature may be excessive.
5. Wiring to power source is incorrect or connections may be loose.
6. Control signals are for pump to be "off."

PUMP GPM CAPACITY IS REDUCED

1. Pump is running backwards. Rotation should be clockwise looking down upon motor toward the pump. Rotation of three-phase motors can be corrected by interchanging any 2 of the 3 wires. (*Note: Any electrical service should be performed by a qualified electrician.*)
2. Pump is **not throttled** to the design condition for the pump.
3. Total pressure at pump discharge is greater than that which the pump was designed for. Check pressure requirements which include system back pressure, and friction and static head.
4. Excessive suction lift, incorrect piping or undersized piping from the pump.
5. A valve in the pump suction line or discharge line is closed or throttled too much. Check valve in the pump discharge piping is installed backwards.
6. The impeller eye is blocked with trash or debris.
7. Pump is undersized for the system.
8. A strainer is dirty, causing a reduction in flow.
9. Pump has lost its prime. Release trapped air in the pump and reprime.
10. Steam traps are blowing through, causing the condensate to return at excessive temperatures. Depending on the unit and type of pump furnished, this could greatly reduce the capacity of the pump below its stated rating. Traps should be repaired or replaced.
11. Excessive temperatures. Capacity of pump may be reduced below its rating. Elevate receiver.

EXCESSIVE PUMP NOISE

1. Pump is running backwards. Check rotation by bumping the motor. Rotation should be clockwise while looking down at the rear of the motor.
2. Pump is working against a lower pressure than it was designed for. (The pump is not balanced or throttled.) Install a balancing valve, plug cock or steam cock in the discharge line following the gate valve. **Do not use a gate valve for balancing the pump. The seats in the valve will wear over time, causing the valve to lose its design condition point.** Throttle the balancing valve until the operating pressure at the pump discharge approaches the rated pump pressure.
3. Magnetic hum or bearing noise in motor. Consult the motor manufacturer's authorized service technician.
4. Starter chatters. Trouble is caused by low line voltage, poor connections, defective starter coil, or burned contacts.
5. Excessive ambient temperature. Correct the system conditions.
6. Entrained air. Release the trapped air pocket.