

INSTALLATION OPERATION & MAINTENANCE INSTRUCTIONS

FOR YOUR

PENN PUMP & EQUIPMENT COMPANY, INC.

CONDENSATE RETURN UNIT

This completely assembled, tested, packaged pumping system is of the highest quality and design. To obtain optimum performance from this system, it is important that you read these instructions carefully and pay particular attention to any highlighted instructions. We are confident that you will receive many years of trouble-free service from your **Penn Pumping System**.

www.pennpump.com

I. SELECTION OF DISCHARGE PIPING

In selecting condensate pumps and making proper piping connections, the friction in the discharge line from the pump is very important. In some cases, using larger discharge piping will make it possible to use a less expensive pump with a lower pressure rating. In all cases, adequate discharge piping will mean longer life and better service from your pump.

The pressure drop due to friction should always be estimated carefully, using the gallons-per-minute rating of the pump as a basis and referring to any standard pipe-friction tables or charts (be sure to make extra allowances for elbows, valves, etc.). The discharge pipe size and pump pressure rating should be selected so that the pump pressure rating will provide a generous margin of safety over and above the friction pressure drop plus the lift from pump to the discharge point.

Usually, the best discharge pipe size will be at least one size – sometimes two sizes – larger than the pump outlet tapping.

If possible, piping from the condensate pump outlet should be graded upward for the entire distance. In a downward run, or an 'up-and-down' run, air may be entrapped, restricting the flow of condensate. If an 'up-and-down' run cannot be avoided, it should be vented at the highest point.

II. FLOAT SWITCH SETTING

When condensate pumps are tested in our factory, float switches are set according to the capacity rating. At the time of installation, the float switch should be checked to see that settings have not been disturbed during shipment and that they are correct for the particular job.

The travel of the float switch between the upper (ON) position and the lower (OFF) position determines the amount of condensate delivered each time the pump operates. At our test, the float switch is set so that the amount is equal to or a little less than the GPM rating of the pump. For example, if the pump is rated 4000 sq. ft. EDR, 6 GPM, the switch is set to deliver about 4-6 gallons at each cycle. Depending upon the other characteristics of the heating system, this float switch setting may require modification for best results.

If the float switch travel is too short for the job, only a small amount of condensate will be discharged each time the pump operates and consequently the motor will have to start and stop too frequently. In normal operation, it is usually undesirable for a condensate pump to start and stop more than once every three minutes.

If the lower (OFF) position of the float switch is too low, the pump may continue running until it loses its prime and the rotary seal may be damaged by running dry. When starting up a new pump, always check the lower float switch position to be sure that the inlet from the tank to the pump is covered with water at all times.

Any condensate pump can be used for a smaller capacity than its nameplate rating by decreasing the travel of the float switch.

In addition, in the case of Penn Pump condensate pumps, all units of the same horsepower are identical except for float switch settings. Therefore, many of these units can be used for larger capacities than the nameplate ratings by increasing the float switch travel. The table below shows standard float switch settings.

	Capacity Sq. Ft. E.D.R.	G.P.M. Rating	Approx. Inches Travel
1/3 H.P. Pump 8 Gal. steel tank or 6 Gal. CI tank or 8 Gal. stainless steel tank	8,000	12	3"
1/3 H.P. Pump 15 Gal. steel tank or 13.5 Gal. C.I. tank or 15 Gal. stainless steel tank	2,000	3	3"
	4,000	6	5"
	6,000	9	7"
	8,000	12	8"
1/2 H.P. Pump 30 Gal. steel tank or 24 Gal. C.I. tank or 30 Gal. stainless steel tank	10,000	15	7"
	15,000	22.5	10"

The "travel" as listed is the vertical displacement between the water levels at the "On" and "Off" positions of the switch. The method of adjustment is indicated in the float switch instruction sheet or card that accompanies the pump. The "travel" distance can be checked by inserting a yardstick into the vent opening at the top of the tank.

III. SELECTION

Be sure to select a pump that is big enough for the job. Select a capacity rating adequate for the maximum amount of condensate expected under the most severe conditions. Remember that pressure rating must be sufficient to operate against back pressure, plus lift and friction in piping between the pump and the discharge point.

Penn Pump pumps have rated capacities of three times the maximum flow of condensate for the specified amount of radiation; in other words, when the heating system is running at maximum capacity, the pump should not be operating more than one-third of the time. This is a minimum factor of safety. If heavy overloads are possible, an oversized condensate pump should be selected.

IV. HEATING PLANT

Before a condensate pump can operate satisfactorily, the heating plant itself must be in good order.

The most important point to remember is that all heating units and return lines must be equipped with properly selected traps in good working order. With improper or malfunctioning steam traps, steam or water above 190°F may return to the condensate pump. For best operation, condensate should be 160°F

or less. Although Penn Pump pumps can operate at higher temperatures, we cannot guarantee full capacity or satisfactory operation if condensate is allowed to go above 190°F.

For unusually hot condensate, a specially designed unit may be required.

It is equally important to provide strainers on all lines, to keep scale and dirt out of the tank and pumps.

V. LOCATION

Locate the pump as close to the discharge point as is practical. A more powerful pump will be needed if it must be far away from the level discharge point.

Locate the pump above floor if possible, in a position where it will be clean, dry, and easily accessible.

Locate the tank inlet below the lowest point of return lines. If the pump must be below floor level, take all possible precautions to keep the motor and electrical equipment dry.

Set the pump on a substantial, level foundation – preferably off the floor, on a raised concrete base.

VI. PIPE CONNECTIONS

No two individual installations will be exactly alike, but certain essentials apply to all:

- The condensate inlet should be equipped with a strainer to keep scale and dirt out of the tank, unless all return lines are exceptionally well protected with strainers. In addition, there should be some means (such as the isolation valve arrangement shown in the diagrams) of disposing of condensate temporarily when the condensate pump is disconnected.
- At the pump outlet, there should be a check valve (reasonably close to the pump) to prevent water from flowing back out of the boiler. In addition, an isolation valve should be provided for use when the pump is disconnected.
- The vent opening at the top of the tank must be left open to the atmosphere. Good practice is to run a pipe from the vent up to the ceiling, then down to a point near the floor drain. This keeps dirt out of the tank and helps keep the motor dry. For priming the pump when starting up or testing, a union or a plugged tee at the vent opening is desirable.
- Many variations in piping arrangements are possible; and local codes vary widely. For example, in some cities there must be a bypass around the condensate pump with gate valves, so that the return line can be connected directly to the boiler when the pump is disconnected.

VII. ELECTRICAL CONNECTIONS

Check the motor characteristics (phase, cycles, voltage) to be certain that they are correct for your power supply; otherwise, you may burn out the motor by running it on too high a voltage.

Be sure that only a qualified electrician makes the electrical connections to the pump. With small, single-phase units, the pump motor is commonly controlled directly by the float switch. On three-phase units, the float switch operates a motor starter, which starts and stops the pump motor. When a pump with a make-up water valve is used, the pump motor is controlled by a boiler water level control.

Be sure that all wiring is well protected from moisture.

Be sure that the motor is connected so that the pump rotates in the correct direction.

VIII. **STARTING AND OPERATION**

Do not operate the pumps without priming. If the pumps are run dry, even for a very short time, they may be severely damaged.

Be sure to keep the motor dry.

CAUTION

When starting up a pump, always rotate it by hand to be sure it turns freely, before turning on the power.

IX. **ORDERING REPLACEMENT PARTS**

When ordering replacement parts for Penn Pump Condensate Return Units, only the following information is needed:

The name of the part assembly.

The pump model number and serial number, from the brass nameplate on the tank.

Note: If you believe that your trouble is caused by defective equipment, please return the complete pump and motor unit or other assembly to us as-is. An attempt to adjust or repair such equipment on the job may destroy evidence of defective workmanship or material, thus making it difficult or impossible for us to handle your claim properly.

X. TROUBLESHOOTING

If the motor overheats or burns out, if the pump does not deliver enough condensate, or if the pump runs continuously or almost continuously:

- Check the capacity and pressure rating of the pump; it may be too small for the job.
- Check the temperature of condensate; the pump may not handle it if it is too hot.
- Check the float switch; it may be damaged and jammed in the “on” position.
- Check the lines and valves between the pump and boiler for clogging; check the pump for clogging.

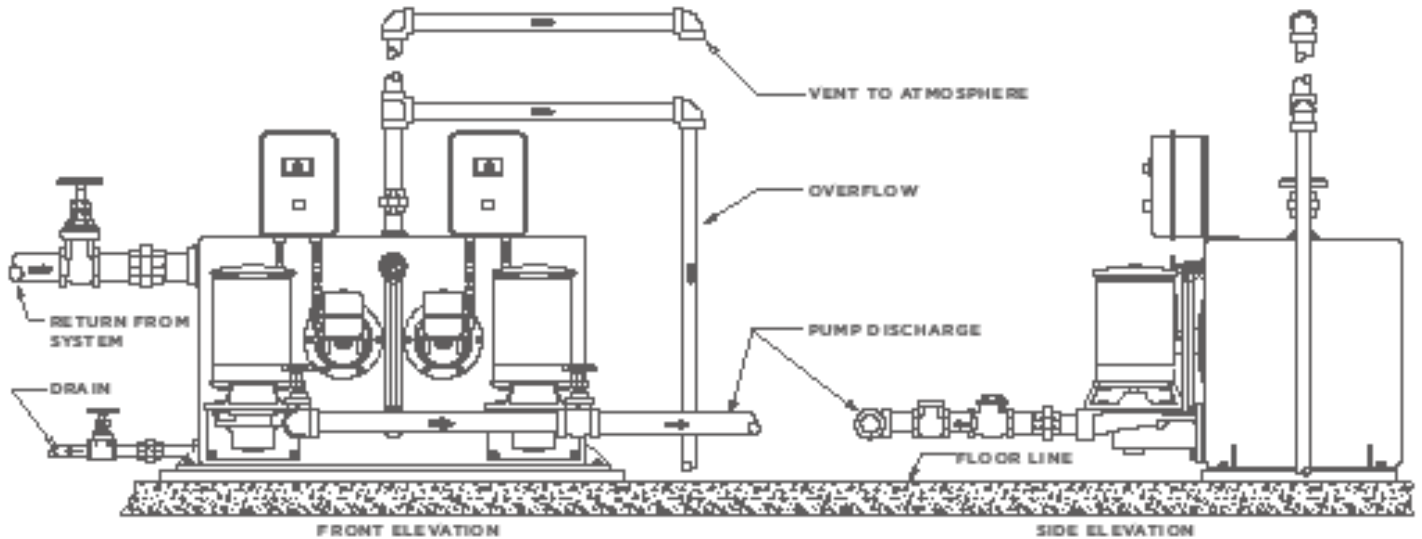
If the pump starts and stops too frequently:

- Check the float switch adjustment; there may be too little travel between “on” and “off” positions.

If the pump leaks:

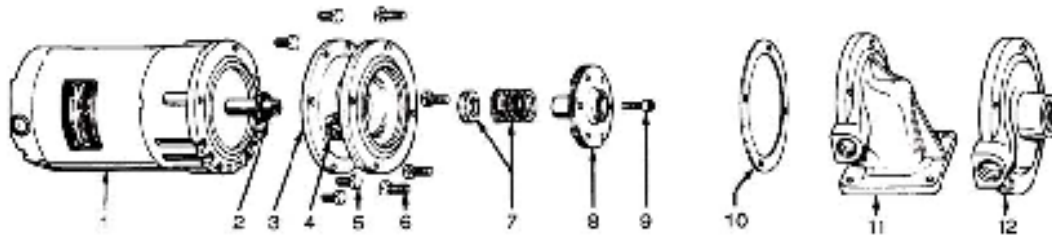
- Unit may have been disassembled and reassembled improperly.
- The rotary seal may be worn or scored or may have been installed improperly. If worn, has this been caused by abrasive material in lines?

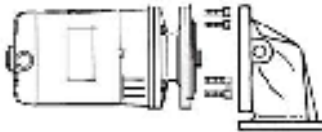
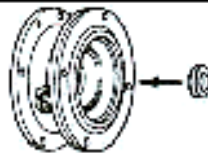

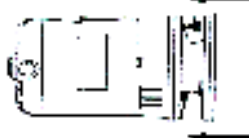


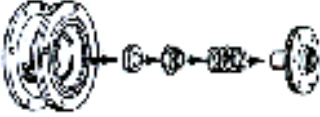
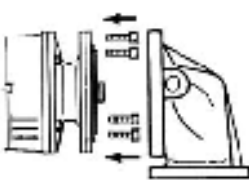
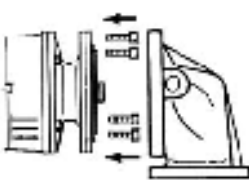
XI. TYPICAL DUPLEX INSTALLATION



XII. REPLACING THE ROTARY SEAL ASSEMBLY ON 3/4" PUMPS: 1/3, 1/2, AND 3/4 H.P.

1. Motor	4. Tube Fitting	7. Rotary Seal Assembly	10. Housing Gasket
2. Water Slinger	5. Motor Screws (4)	8. Impeller	11. Pump Housing
3. Motor Bracket	6. Pump Screws (4)	9. Impeller Screw	12. Threaded Inlet Casting



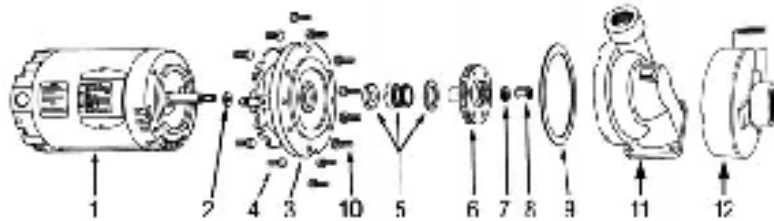
REMOVAL OF OLD SEAL ASSEMBLY	INSTALLATION OF NEW SEAL ASSEMBLY
 <p>A) Remove pump housing from motor bracket and impeller assembly by removing pump screws.</p>	 <p>F) Coat outside edge of new seat with seal lubricant and slip it into the bracket. Press into bracket with thumbs or wooden dowel. Handle seat carefully so seating surfaces are not scratched or chipped... be sure it is squarely seated.</p>
 <p>B) Remove impeller screw and motor screws. (Note: opposite end of motor shaft is fitted with screwdriver slot to hold shaft securely while impeller screw is being removed.)</p>	 <p>G) Remount bracket on motor.</p>
 <p>C) Insert two of the pump screws into the two threaded holes in the bracket. Tighten them slowly and evenly to force the impeller and bracket off the shaft. Do not pry the impeller or bracket.</p>	 <p>H) Lubricate impeller hub with seal lubricant. Slip new bellows and spring onto impeller hub. Be sure bellows slides freely on impeller hub.</p>
 <p>D) Remove old seal parts from impeller hub and bracket. Be sure water slinger is in place. E) Clean impeller hub thoroughly...remove all loose particles of dirt, grease, etc. Use fine emery cloth if necessary. Also clean the recess in the bracket so the new seat will fit perfectly. Remove all particles and dirt on gasket surfaces of the two castings.</p>	 <p>I) Replace impeller on motor shaft and secure with impeller screw. Hold shaft with screw driver slot while tightening screw.</p>
	 <p>J) Replace pump housing onto bracket, using a new housing gasket. Secure with pump screws. Be certain gasket is seated properly.</p>

XIII. REPLACING THE ROTARY SEAL ASSEMBLY ON 1-1/2" PUMPS: 1/2 HP – 3 HP

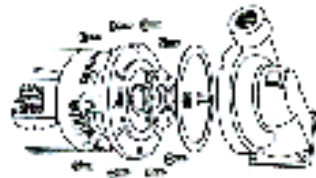
- | | | |
|---------------------|-------------------------|------------------------------|
| 1. Motor | 5. Rotary Seal Assembly | 9. Housing Gasket |
| 2. Water Slinger | 6. Impeller | 10. Pump Screws (8) |
| 3. Bracket | 7. Lock Washer | 11. Vertical Inlet Casting |
| 4. Motor Screws (4) | 8. Impeller Nut | 12. Horizontal Inlet Casting |

Tools Needed:

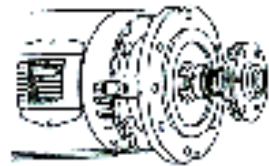
Large Screwdriver
7/16" Wrench
9/16" Wrench
5/8" Socket
1" Socket



REMOVAL OF OLD SEAL ASSEMBLY



A) Remove 8 pump screws and lift out pump and motor; remove drip cover. Insert large screwdriver into slot at end of motor shaft; hold shaft steady and remove impeller nut and washer from nose of impeller by turning counterclockwise.



B) While still holding motor shaft steady with screwdriver, use 1" socket to remove impeller by turning counterclockwise.

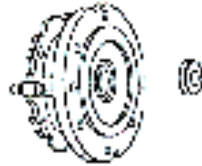


C) Remove the 4 motor screws and separate the bracket from the motor.

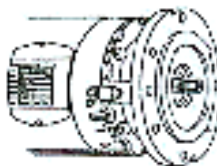


D) Remove old seal parts from impeller hub and bracket. Be sure water slinger is in place. Clean the recess in the bracket so that the new seat will fit perfectly and make a watertight joint. If bracket is badly eroded at recess, through severe use, casting should be replaced. Clean all gasket surfaces. Clean impeller hub thoroughly; remove loose particles of dirt, etc. Check prime tube or seal flush line and clean as required.

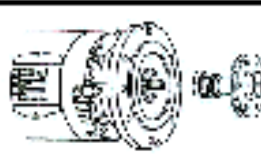
INSTALLATION OF NEW SEAL ASSEMBLY



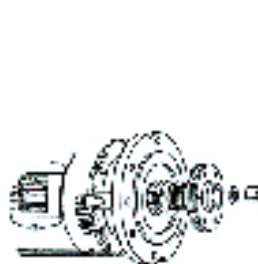
E) Coat outside edge of new seat with seal lubricant and slip it into the bracket. Press into bracket with thumbs or wooden dowel. Handle seat carefully so sweating surfaces are not scratched or chipped...be sure it is squarely seated.



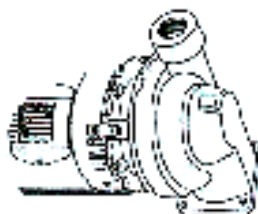
F) Remount bracket on motor.



G) Lubricate impeller hub with seal lubricant. Slip new bellows and spring onto impeller hub. Be sure bellows slide freely on impeller hub.

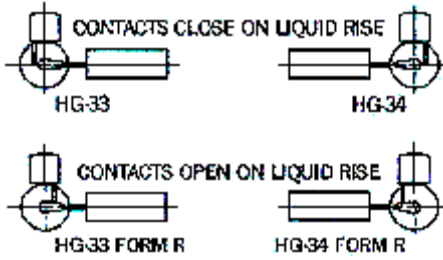


H) Thread impeller on motor shaft extension and secure with washer and impeller nut. Hold shaft with screwdriver slot while tightening.



I) Replace motor assembly onto volute; using new housing gasket. Secure with pump screws. Be certain gasket is seated properly.

XIV. FLOAT AND LINK POSITIONS

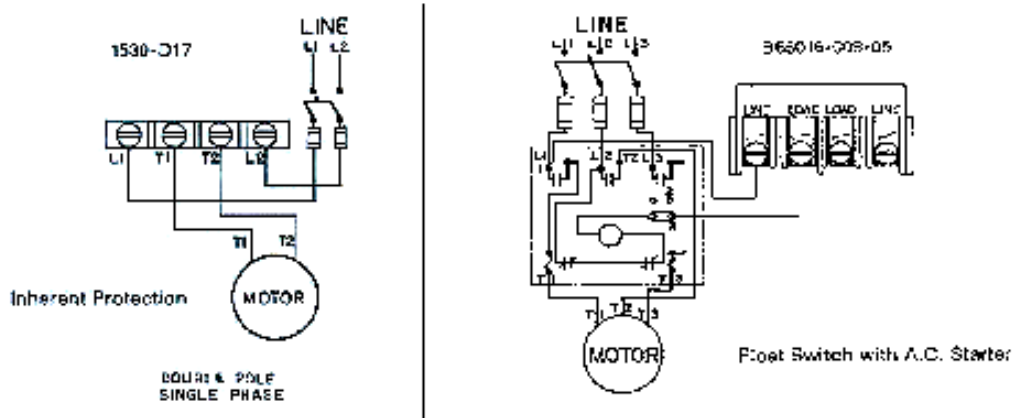


Pressure: In the use of any of these Float Switches, the pressure limit within the closed tank must not exceed 100 lbs.

Motor Protection: A float switch of this type does not afford motor protection; however, it is quite frequently used as a pilot to operate a starter providing these desirable features.

Reverse Action: To change, relocate operating link as shown in the above diagram to the opposite slot in the base plate and corresponding hole in the adjusting plate.

XV. TYPICAL WIRING DIAGRAMS

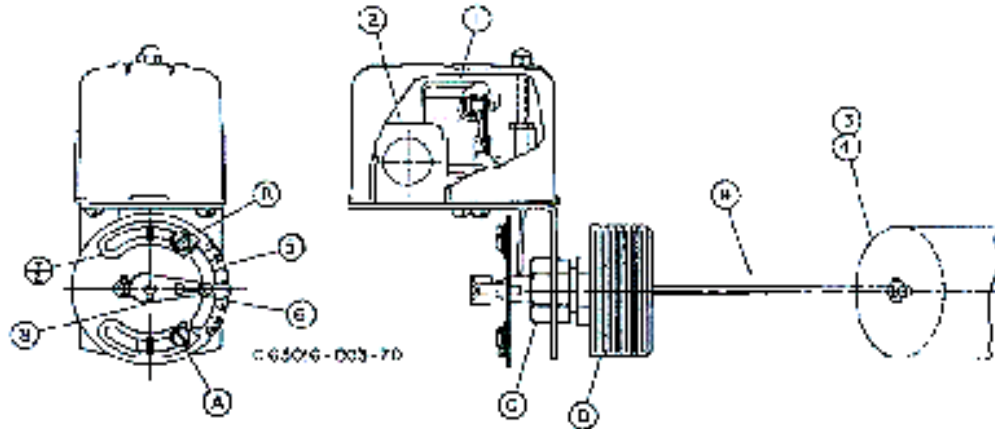


XVI. ELECTRICAL RATINGS (HORSEPOWER)

Voltage	Single Phase AC	Polyphase AC	DC
115	2 HP	3 HP	½ HP
230	3 HP	5 HP	¾ HP
460/575		1 HP	
32			¼ HP

Control Circuit Rating: A600

XVII. CLASS 9037 TYPE HG SERIES A FLOAT SWITCH



CAUTION: Switches are shipped with a bracket attached to the mounting plate. This bracket prevents the float and rod from moving in the tank during shipment. When installing the system, this clearly marked shipping bracket must be removed and discarded.

APPLICATIONS: For automatically controlling the liquid level in a closed tank by float movement.

MOUNTING: The Type HG Screw-In Tank Float Switches are mounted directly to the tank by means of the 2 1/2" I.P.S. threaded fitting (D). Before screwing this fitting into the tank, loosen Nut (C) so that the fitting (D) is free to rotate in the switch bracket. Tighten the fitting (D) so that there will be no leak past the threads. Then revolve the switch case until it is horizontal and tighten Nut (C).

ENCLOSURE RATING: NEMA 1 ENCLOSURES ARE INTENDED FOR INDOOR USE PRIMARILY TO PROVIDE A DEGREE OF PROTECTION AGAINST CONTACT WITH THE ENCLOSED EQUIPMENT IN LOCATIONS WHERE UNUSUAL SERVICE CONDITIONS DO NOT EXIST.

WARNING: TO AVOID SHOCK HAZARD, DISCONNECT ALL POWER BEFORE INSTALLING OR SERVICING DEVICE.

ADJUSTMENTS: Switches are shipped from the factory set for a specified float travel. Reasonable adjustment of float travel can be made in the field by moving adjusting strips (7) which are held in place by Screws (A) and (B). Loosening Screw (B) and moving upper adjustment strip (7) will affect the upper limit of float travel only. Loosening Screw (A) and moving lower adjustment strip (7) will affect the lower limit of float travel.

REPLACEMENT PARTS LIST

Item Number	Description	Number Req'd.	Part Number
1	Set of Moveable and Stationary Contacts	2	9998 PC-242
2	Switch Mechanism ^N	1	65079-502-51
3	Float (304 SS)	1	9049 HF3
4	Float (316 SS)	1	9049 HF4
5	Adjusting Plate Assembly	1	2810-D7-G1
6	Operating Lever	1	65079-042-01
7	Adjusting Strip	2	2810-X8
8	Set Screw	1	21801-14080
9	45° - Connector and Rod Assy.....	1	2810-C3-G9
9	90° Offset 3" Connector and Rod Assy.....	1	2810-C3-G15
9	90° Offset 4-1/4" Connector and Rod Assy.....	1	2810-C3-G19
9	90° Offset 5" Connector and Rod Assy.....	1	2810-C3-G18
9	90° Offset 7" Connector and Rod Assy.....	1	2810-C3-G6
-	Seal and Installation Kit (BUNA-N)	1	9998 PC-337
-	Seal and Installation Kit (VITON)	1	9998 PC-338

^N Orders for mechanisms must show Class and Type so nameplate on replacement can be correctly stamped.

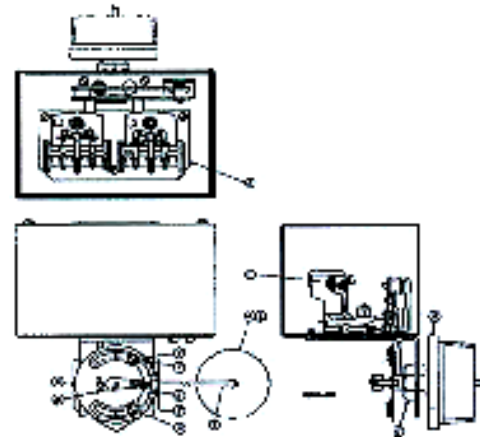
XVIII. CLASS 9038 TYPE CG SERIES A MECHANICAL ALTERNATOR

CAUTION: Switches are shipped with a bracket attached to the mounting plate. This bracket prevents the float and rod from moving in the tank during shipment. When installing the system, this clearly marked shipping bracket must be removed and discarded.

APPLICATIONS: The Class 9038 Type C Mechanical Alternators serve to open and close an electric circuit by an upward and downward float movement. The forces are applied by means of a float operating between different fluid levels. The action is such that two switch units are alternated on successive cycles. If the liquid level continues to rise or fall with one pump in operation, the lever will continue to travel to a further position at which point the "second" switch will be operated, throwing the stand-by pump across the line.

MOUNTING: The Class 9038 Type C Mechanical Alternators are mounted directly to the tank by means of the 2 1/2" NPT threaded fitting (D). Before screwing this fitting into the tank, loosen Nut (C) so that the fitting (D) is free to rotate in the switch bracket. Tighten the fitting (D) so that there will be no leak past the threads. Then revolve the switch case until it is horizontal and tighten Nut (C).

PRESSURE: In the use of the CG Alternators, the pressure limit within the closed tank must not exceed 100 psl.



ELECTRICAL RATINGS (HORSEPOWER)

Voltage	Single Phase AC	Polyphase AC	DC
115	2 HP	3 HP	1/2 HP
230	3 HP	5 HP	1/2 HP
460/575		1 HP	
32			1/4 HP

Control Circuit Rating: A600

REVERSE OPERATION: Form R controls are arranged for reverse action. In this form, the contacts will open on increase in liquid level. It is not recommended that a change be made in the field from standard to reverse operation or vice versa.

MANUAL TRANSFER (LEAD-LAG) SELECTOR: Form N3 switches have a manually engaged selector which voids alternation. The pump selected to lead always comes on first. With selector disengaged, the unit reverts to normal alternation.

MOTOR PROTECTION: A control of this type does not afford motor protection. However, it is quite frequently used as a pilot to operate a starter providing this desirable feature. The Square D Company manufactures a complete line of motor protective devices, information on which will be sent upon request.

ENCLOSURE RATING: NEMA 1 ENCLOSURES ARE INTENDED FOR INDOOR USE PRIMARILY TO PROVIDE A DEGREE OF PROTECTION AGAINST CONTACT WITH THE ENCLOSED EQUIPMENT IN LOCATIONS WHERE UNUSUAL SERVICE CONDITIONS DO NOT EXIST.

WARNING: TO AVOID SHOCK HAZARD, DISCONNECT ALL POWER BEFORE INSTALLING OR SERVICING DEVICE.

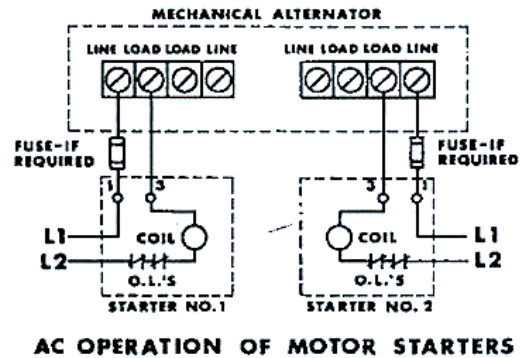
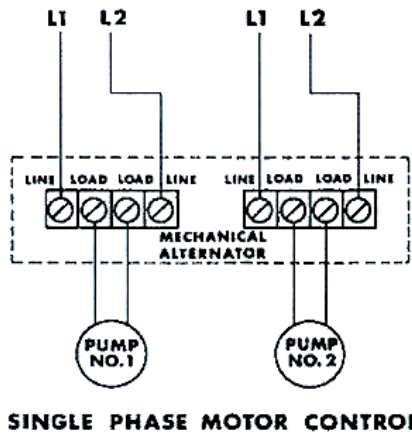
ADJUSTMENTS: Switches are shipped from the factory set for a specified float travel. Reasonable adjustment of float travel can be made in the field by moving adjusting strips (7) which are held in place by Screws (A) and (B). Loosening Screw (B) and moving upper adjusting strip (7) will affect the upper limit of float travel only. Loosening Screw (A) and moving lower adjusting strip (7) will affect the lower limit of float travel.

REPLACEMENT PARTS LIST

Item Number	Description	Number Req'd.	Part Number
1	Set of Movable and Stationary Contacts	2	9998 PC-242
2	Switch Mechanism CG Types (Including Form R)	1	1551-C7-G1
3	Float (304 SS)	1	9049 HF3
4	Float (316 SS)	1	9049 HF4
5	Adjusting Plate Assembly	1	2810-D7-G1
6	Operating Lever	1	65079-042-01
7	Adjusting Strip	2	2810-X8
8	Set Screw	1	21801-14080
9	4 1/2"	1	2810-C3-G19
9	5"	1	2810-C3-G18
9	7"	1	2810-C3-G6
-	Seal and Installation Kit (Buna-N)	1	9998 PC-337
-	Seal and Installation Kit (Viton)	1	9998 PC-338

XIX. CLASS 9038 MECHANICAL ALTERNATOR – WIRING DIAGRAMS*

Where separate power supplies are provided, the disconnect means for each motor must be grouped together and provided with suitable warnings in accordance with the National Electric Code and all other applicable codes and standards.

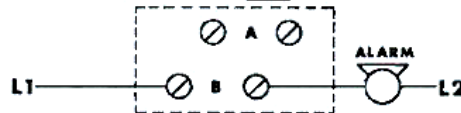


ELECTRICAL RATING OF ALARM SWITCH ONLY
CLASS 9007 TYPE AO1

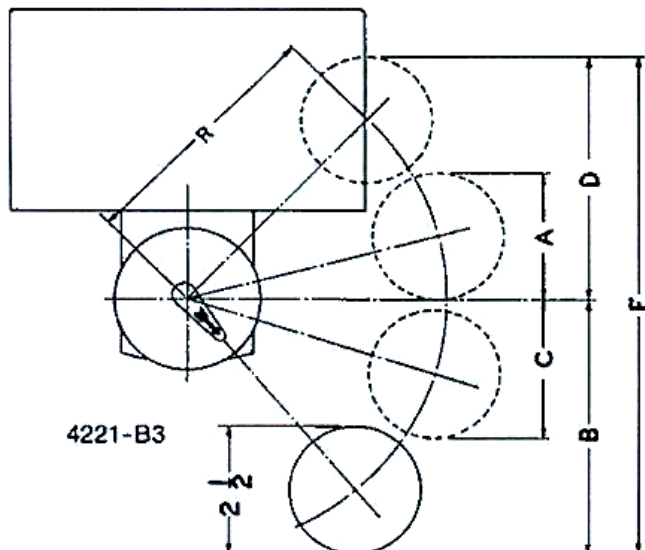
C65016-004-33

AC PILOT DUTY			D.C. PILOT DUTY SINGLE THROW			
VOLTS	BREAK	MAKE	VOLTS	115	220	600
110	15A	40A	AMPS	0.5 A	0.25A	0.05A
220	10A	20A	DOUBLE THROW			
440	6A	10A	VOLTS	115	220	600
400	5A	8A	AMPS	0.25A	0.1	—

C65016-004-33



CIRCUIT A CLOSSES ON FALLING LIQUID LEVEL
CIRCUIT B CLOSSES ON RISING LIQUID LEVEL
(SWITCH CONTACTS MUST BE SAME POLARITY)
FORM N5 HIGH LEVEL ALARM



Explanation of Float Travel and Position

Normal Operation: Switches will cut in and out at the high point and low point of distance A plus B, given in the tables. Under normal conditions, as long as one pump alone is able to handle the incoming water, the pumps will alternate at this distance. With the water level continuing to rise, the second switch will cut in and start the second pump when the float reaches the top of distance D. Both pumps will continue to run until the float returns to the low point of distance D plus C, where one pump will cut out. The other pump will continue until the float reaches the low point of distance B.

WARRANTY

The components of each Penn Pump Condensate Return Unit, when purchased as regular factory selections, are warrantied against failure due to defects in design, material, or construction, from date of factory shipment within the periods and under the conditions noted below:

PUMPS

All Penn Pump pumping assemblies are warrantied against mechanical failure for a period of One (1) year. If any component of the pumping assembly fails within this period, Penn Pump & Equipment Company, Inc., will, at its option, repair or replace the pump assembly on a no-charge exchange basis FOB factory, Hatfield, Pennsylvania.

MOTORS

Motors, when equipped with standard Penn Pump overload protection systems and maintained according to factory instructions, are warrantied for One (1) year. Penn Pump & Equipment Company, Inc., will make, at its option, a no-charge repair or replacement at the factory or at the authorized motor service station.

COMPLETE SYSTEM

The complete Penn Pump system as a whole, including all accessories and components not mentioned above, is warrantied functionally and mechanically for a period of One (1) year, when installed, operated, and maintained in accordance with the Company's recommendations.

Penn Pump & Equipment Company, Inc., is responsible only for repairing or replacing its products in accordance with the terms and conditions set forth above. There are no warranties, either expressed or implied, extending beyond those stated on the face hereof, and Penn Pump & Equipment Company, Inc. expressly disclaims all other warranties, including any implied warranties of mechanical ability or fitness for a particular purpose. Penn Pump & Equipment Company, Inc. also disclaims any liability whatsoever for incidental or consequential damages, including damages to property, damages for loss of use, loss of time, loss of profits, loss of income, or any other incidental or consequential damages. Penn Pump & Equipment Company, Inc. neither assumes nor authorizes any other person to furnish any warranties, or assume for it any liability in connection with the sale of its products.

This warranty does not include mechanical seals, gauges, transportation, or labor costs for exchange or installation or repaired or replaced material. Final determination of warranty shall be made only by the factory upon return and inspection of returned material. No material is to be returned without a return of materials authority (RMA) tag which may be obtained by calling or writing the factory, advising what will be shipped and the reason for the return.

SPECIFY WITH CONFIDENCE, SPECIFY PENN PUMP SYSTEMS

