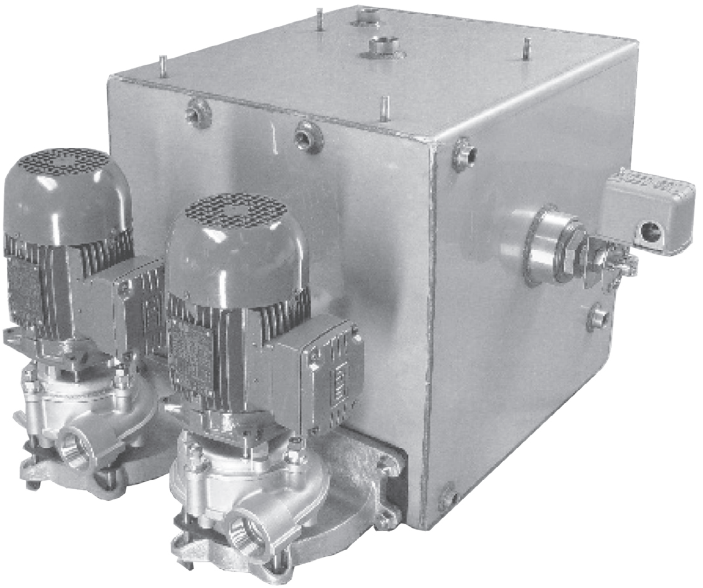
IM-P216-03-US
Issue 1

spirax sarco

Stainless Steel Electric Condensate Return Units SSCRU Series

Installation and Maintenance Instructions



1. Safety information

 **Warning**	**This safety alert symbol will be used in this manual and on the unit safety instruction decals to draw attention to safety related instructions. When used, the safety alert symbol means:** **Attention!** **Become alert!** **Your safety is involved!** **Failure to follow these instructions may result in a safety hazard**

 **Warning**	**Explosible** **Isolate tank during leak test**	

 **Warning**	**Explosible** **Do not pressurize.** **Isolate tank during leak test.** **Do not restrict vent.** **Do not plug overflow.** **Open inlet valves slowly.** **Do not use as a flash tank** **Failure to follow instructions could result in serious injury of death**	

2. General product information

2.1 Description

Pumps are float operated to return accumulated condensate to a boiler feed tank.

Condensate pumps are used in low pressure heating systems to collect and quickly return condensate to the boiler feed unit. Their pumping action is controlled by the water level in the receiver.

Available in either simplex or duplex configuration, simplex units consist of an electric motor close-coupled to a centrifugal pump mounted on a receiver with a float operated pump control, duplex units are used when greater pumping capacity or back-up pump protection is required.

The SSCRU Series is designed for long-life, low maintenance and reliable service.

Stainless Steel Washdown Duty, Epoxy Washdown Duty and Explosion Proof Options Available. (from TI-P216-02-US)

Warning

Explosible

Do not pressurize receiver.

Isolate receiver during leak test.

Do not plug overflow.

Do not restrict vent opening to atmosphere.

Open valves slowly.

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

2.2 Inspection, handling and location

Assure that there is no shipping damage, use care when installing the unit and place the unit for easy access to all parts. Allow adequate space for servicing and check ambient conditions.

2.3 Notice/temperature

Motors are designed to operate in 104°F. (40°C) max.ambient. Insulate or ventilate as required.

2.4 Piping (General)

Pipe the unit per the Elementary Piping Diagram. Locate and support piping so as to not load the pump discharge.

2.5 Piping (Returns)

Gravity return lines from system should be properly pitched down to unit inlet. Returns must also be trapped to prevent steam entry into the unit. An inlet basket strainer is recommended. Bypass piping to a drain is recommended per the piping diagram.

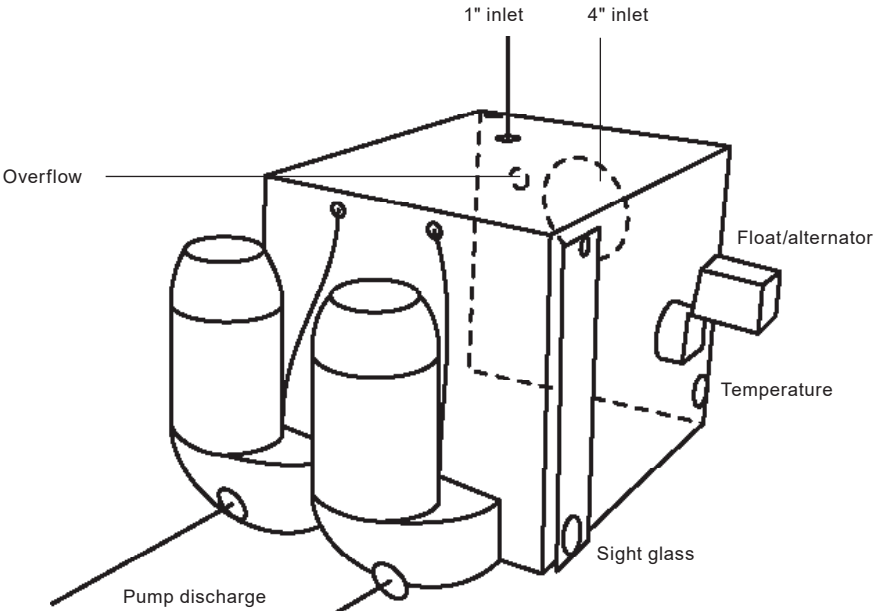


Fig. 1 Typical installation

Caution	**Not a chemical pump** Inject boiler feed compounds from chemical feed tank into boiler feed piping - never into condensate tank. Failure to follow these instructions could result in injury or property damage.

2.6 Piping (Vent)

Install a vent pipe to atmosphere.
Pipe to be size of vent port on unit.
Do not restrict or reduce vent opening or exceed 20 inch vertical height unless an overflow connection is provided

2.7 Piping (overflow)

Pipe overflow port to drain using an overflow loop when condensate temp will exceed 200 ºF (93 ºC).

2.8 Float switches and mechanical alternators

Floats are locked in place to prevent damage during shipment.
Remove shipping locks. Check factory settings. Floats and mechanical alternators are adjustable for various levels of operation.

The lead pump should start with tank 3/4 full and shut off at 2” or more above pump inlet. Lag pump should start before the tank overflows. Settings should avoid “short cycling” of the pump.

 **Warning**	**High voltage electricity** Disconnect and lock out power before connecting or servicing unit. Failure to follow these instructions could result in serious injury or death.

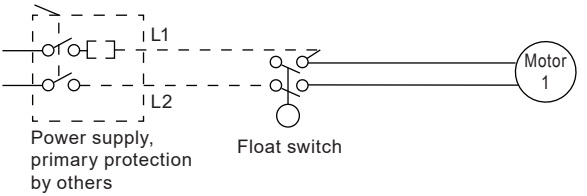
2.9 Electrical wiring and controls

Connect power wiring per NEC.
Recheck nameplate vs. specifications and conditions.
All single phase motors have internal thermal protection.
Three phase motors must use starters with properly sized overload relays. Overload relays furnished are designed for manual reset.

3. Wiring diagrams

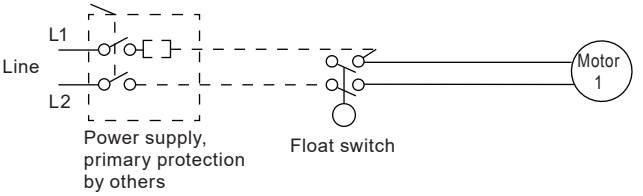
3.1 Simplex units, single phase

1DW 120A



Field wiring should be in accordance with national electric code

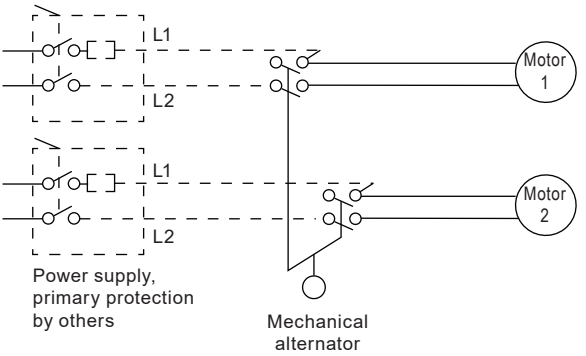
1DW 130A



Dashed line wiring and components by others

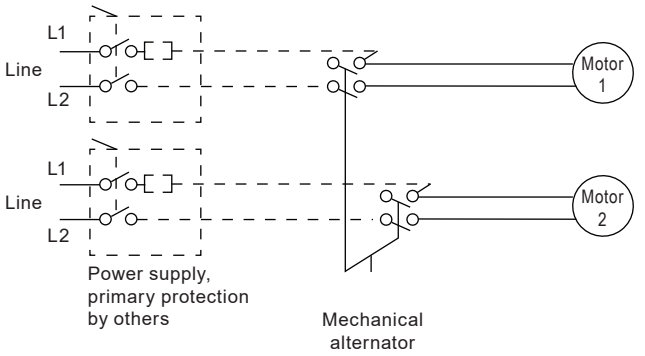
3.2 Duplex units, single phase

1DW 120A



Field wiring should be in accordance with national electric code
Dashed line wiring and components by others

1DW 130A



230/1/60 voltage permissible if motor is reconnected per 'high voltage' diagram on motor and applicable primary protection is supplied

Note: For 3 phase units, see wiring diagram inside control panel furnished with system.

4. Putting the unit into service

1. Assure that the unit is piped in accordance with instructions in this manual.

 **Warning**	**Explosible** Do not pressurize receiver. Isolate receiver during leak test. Do not plug overflow. Do not restrict vent opening to atmosphere. Open valves slowly. Failure to follow these instructions could result in serious injury or death.

2. Isolate tank before performing any system leak test. Do not pressurize the tank as part of the leak test. Failure to do this can result in serious injury or death.

 **Warning**	**High voltage electricity** Disconnect and lock out power before connecting or servicing unit. Failure to follow these instructions could result in serious injury or death.

3. Check floats and alternators for free operation
4. Wire unit per National Electrical Code. See representative wiring diagrams.
5. Install drain plugs if necessary.
6. 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.
7. 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).

 **Caution**	**Do not reverse** Reverse operation can cause extensive damage to pumps. Jog the motor to test for direction of rotation. Failure to follow these instructions could result in injury or property damage.

Caution

Do not run dry. Seal damage may occur

Inspect pump seal regularly for leaks.

Replace as required.

Failure to follow these instructions could result in injury or property damage.

8. Assure all shipping locks have been removed from all

9. If possible, observe operation thru several cycles.

5. 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.
- Check motor nameplate for any lubrication requirements.
- Pumps require no lubrication.

6. Servicing

Pump ends

6.1 Preliminary

Before attempting any service on the pump or motor, disconnect the electrical power to the pump motor. If the pump and motor are to be removed as a unit, note the wiring configuration.

1. Disconnect the inlet and outlet piping before unbolting the pump and motor.
2. Unbolt the motor from the base and remove the unit. All work on the unit should be performed on an elevated workbench whenever possible.

The disassembly and reassembly procedures are broken into two sections. An exploded view of the unit, Figure 2, is provided for referencing the numbers in the following procedures, i.e. (84), motor bracket.

6.2 Disassembly

The following tools and equipment are needed for disassembly:

- Soft plastic or wooden mallet.
- ⅝" wrench or socket
- 10 mm socket wrench
- 13 mm wrench or socket
- 5 mm Allen wrench
- Penetrating oil.
- ¾" wood dowel (Approx. 6" long).
- Small O.D. Snap Ring Pliers.
- Cealube G or similar glycol base lubricant. (DO NOT use petroleum products.)

6.2.1 To disassemble the pump:

- Remove all liquid from the pump
- Remove the casing (108) by removing the jam nuts (20) from the casing studs (5). Slide the casing off and rest it on the studs
- Remove the impeller (11) by removing the 10mm Bolt (19) and washer (41), then sliding forward. (may require a gear puller)
- Remove the snap ring (4) from the shaft using snap ring pliers.
- Remove the impeller key (23) from the shaft
- Remove the rotating element from the shaft.
  The element normally adheres tightly to the shaft and some force may be necessary to emove it. This is common and, if care is taken, the element can be reassembled and reused. it is recommended that a new rotating element be used for reassembly.
  DO NOT attempt to remove the seal using a screwdriver or other sharp object.
  Extensive damage to the shaft or element could occur

7. Remove the motor bracket. Loosen and remove the four socket head screws (33A) with a 5 mm Allen wrench. Note: The rotating element must be removed before the motor bracket can be removed. It is not necessary to remove the adjusting screws (33).

8. Remove the seat portion of the seal from the motor bracket

   - Place the motor bracket face down on a flat surface
   - Look into the opening in the center of the motor bracket, you will see a portion of the seat
   - Insert the ¾" dowel and, very gently, tap the seat until it drops out.
   - Care must be taken with the seats. They are often a brittle material and are prone to breakage. It is recommended that a new replacement seat be installed during reassembly.

6.2.2 Inspection of Components

Thoroughly clean all parts. All components should be examined for wear and corrosion. Replace any parts that show visible wear.

The "O" rings and other elastomeric components should be replaced if they have been deformed or cut.

If seal components must be reused, carefully inspect for microscopic cracks and nicks. Scratches that might be ignored elsewhere can produce leakage if they are on seal carbons and seat wearing surfaces.

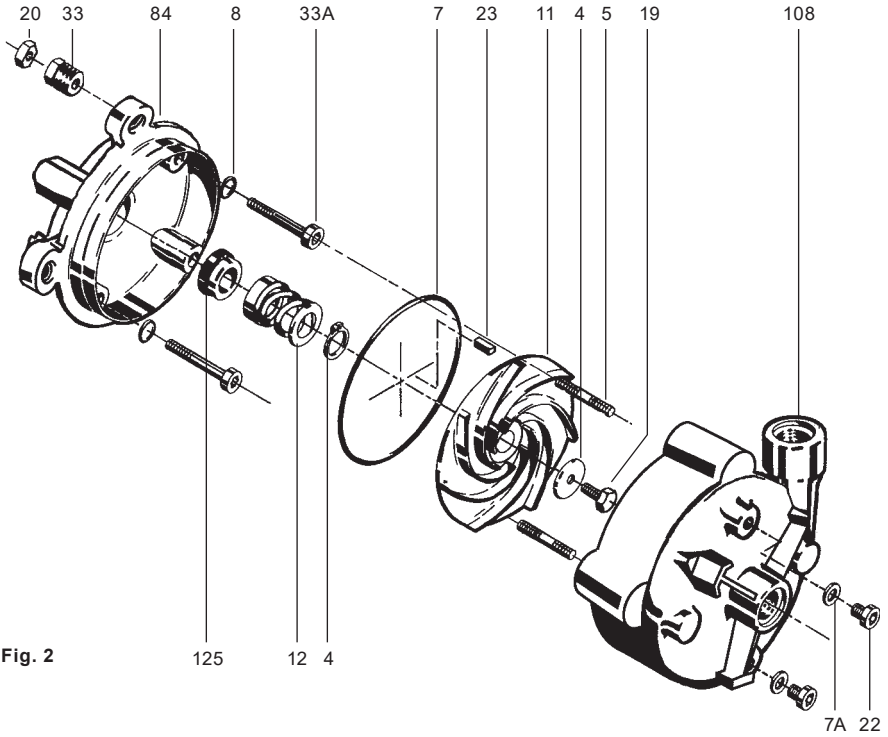


Fig. 2

C Series pumps

Cleanliness is imperative when working with mechanical seals. Microscopic grit and particles between seal faces can be, and often are, the cause of early seal failures.

If the impeller can be rocked or wobbled on the shaft, it is too loose and must be replaced.

Check the shaft for galling, pit- ting, and corrosion. If the shaft is corroded where the seal elasto- mer comes in contact with it, the motor must be replaced. Surface corrosion must be removed so that seals can slide freely during assembly. The shaft diameter should be no smaller than .002" below the nominal fractional seal sizes. Remove any nicks or burrs which may have occurred during disassembly. Re-clean parts as necessary

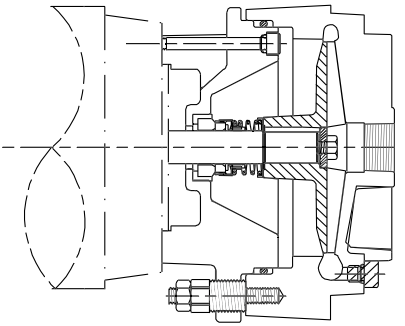


Fig. 3

Name/description	Item no.	Qty
Motor Bracket	84	
Casing	08	
"O" Ring - Casing**	7	
Impeller		
Seal - Rotating Element**	2	
Seal - Stationary Seat**	25	
Stud - Casing	5	4
Jam Nut	20	4
Adjusting Screw	33	4

Name/description	Item no.	Qty
Socket Head Screw	33A	4
"O" Ring - Screw**	8	4
Snap Ring**	4	
Drive Key**	23	
Impeller Screw	9	
Washer	4	
Drain Plug (SAE)	22	
"O"Ring - Drain**	7A	

**Included in SKC4100, SKC5100, SKC6100 Mechanical Seal / O Ring Kits

6.3 Reassembly

All parts should be visually inspected and cleaned or replaced as outlined previously

- The seal seat (125) must be installed in the motor bracket before the bracket is installed on the motor.

6.3.1 To install the seat

- Place the motor bracket face up on a flat surface.
- Carefully press the seat, smooth side up, into the seat cavity of the motor bracket. To make the instal- lation of the seat easier, apply a very thin coating of compatible seal lubricant to the elastomer portion of the seat prior to installation. Care must be taken not to damage the seat face. Thumb pressure is usually sufficient to install the seat. Make sure the seat is installed firmly and squarely and that it is then carefully cleaned.

6.3.2 Install the motor bracket (84).

- This is best done with the motor standing on end.
- From the motor side: If removed during disassembly, thread the four (4) adjusting screws (33) into the mounting flanges of the motor bracket until they are flush with the front faces of the flanges.
- Slide the four (4) small “O”-rings (8) fully onto the socket head screws (33A).
- Place the motor bracket (84) on the motor. Slide the bracket back until the feet are resting against the motor face. The orientation of the motor bracket is not critical unless a flush line is used. In that case, align the flush line to meet system requirements.
- Insert the four (4) socket head screws (33A) into the motor bracket holes and thread into the motor face. Tighten securely using a 5 mm allen wrench. Do not exceed 7 ft-lbs of torque or damage to the motor “C”- face may occur.

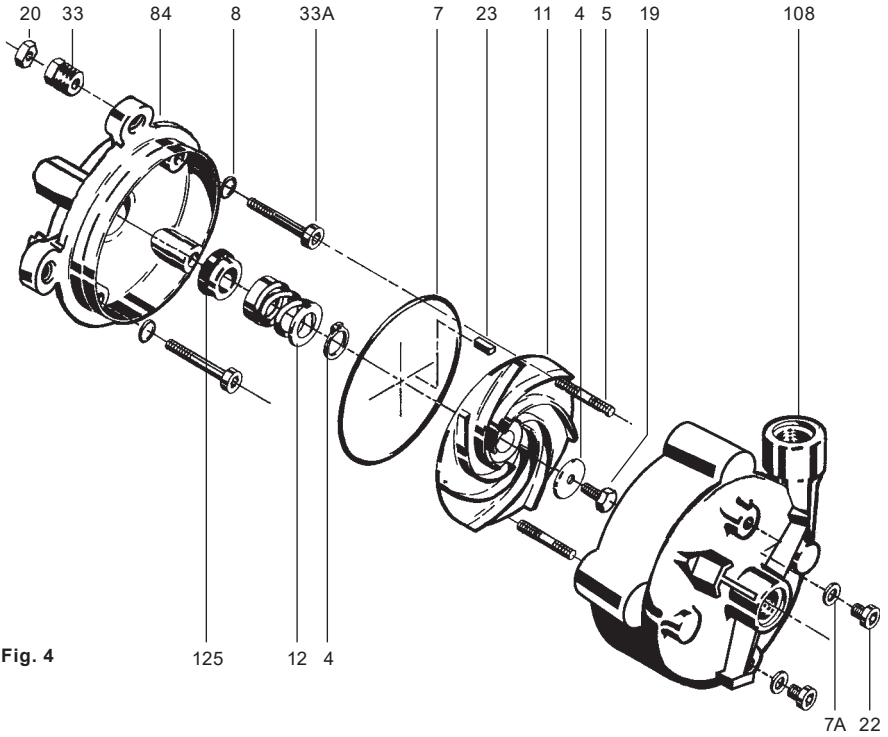


Fig. 4

6.3.3 Install rotating element (12)

- Tip the pump assembly over into a horizontal position on the work area.
- Lightly lubricate the motor shaft. Push the rotating element, spring, and then spring holder over the shaft.
- Prepare the snap ring in the snap ring pliers and then compress and hold the seal spring slightly below the snap ring groove. Install the snap ring (4). Make sure the snap ring is locked in the groove.

6.3.4 Install the impeller (11)

- Place the key (23) in the shaft sleeve.
- The impeller should slide on firmly, but easily, until it stops. Force should not be required to install the impeller in the correct position.
- The impeller hub should be facing toward the motor.
- Fasten the impeller using the washer (41) and screw (19). Tighten the screw securely (do not exceed 7 ft- lbs of torque), while holding the impeller stationary. The impeller should not have any play or wobble.

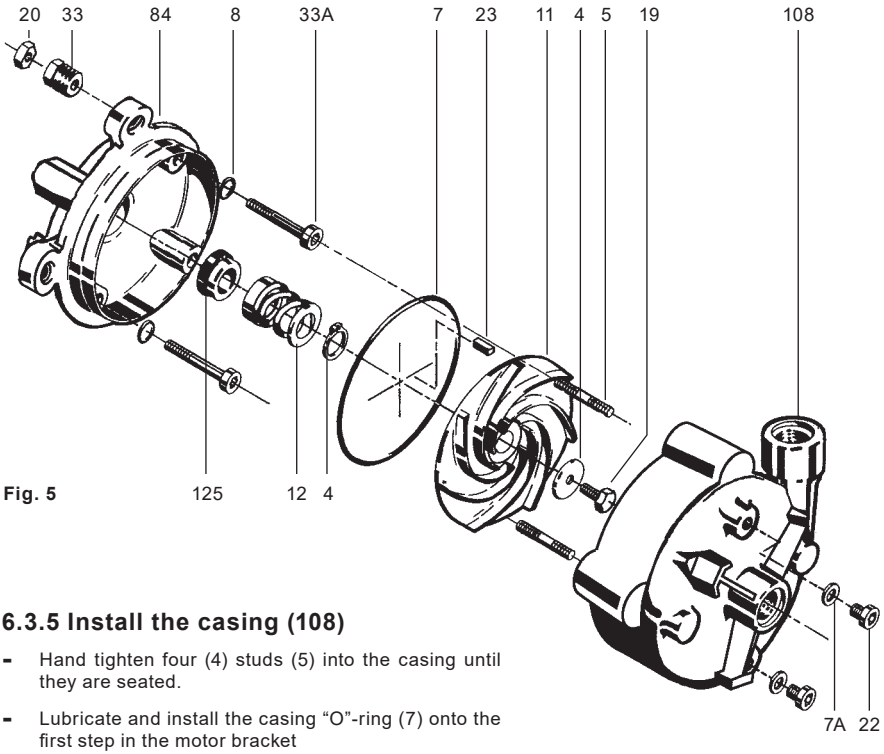


Fig. 5

6.3.5 Install the casing (108)

- Hand tighten four (4) studs (5) into the casing until they are seated.
- Lubricate and install the casing “O”-ring (7) onto the first step in the motor bracket
- Place the casing over the motor bracket being careful not to pinch the “O”-ring. The casing discharge should be oriented to meet system requirements.
- Loosely thread four (4) jam nuts (20) onto the casing studs.

6.4 Adjusting Impeller/Casing Clearance

- Seat the casing down against the impeller with light hand pressure.
- * Turn the adjusting screws until they just touch the back face of the casing. The casing should not move during this adjustment. This will de- termine the zero clearance position. Set the minimum free running clearance as follows
  - ** Viewing from the back of the motor bracket, (rear of motor) turn each adjusting screw clockwise exactly 30° (1/12 of a full revolution).

    Securely tighten the four (4) jam nuts against the adjusting nuts using a 9⁄16” wrench and a 5⁄8” wrench, being careful to prevent the adjusting nuts from turning
- *** Turn the impeller clockwise and listen for any scraping noises or interference. This may be done by turning the impeller screw with a 10 mm socket through the inlet port (Be careful not to loosen the screw), and listening through the discharge. If any contact is detected between the impeller and casing, perform the following steps:
  - Loosen the jam nuts, being careful not to turn the adjusting nuts.
  - Repeat steps *, ** and *** above

6.5 Testing and final adjustment

The pump is now ready for installation

- Reconnect the electrical connections referring to the colored or numbered tape used to mark the wires during disassembly.
- Connect all piping and fill the pump with fluid.
- Make sure all suction valves are opened and fluid will flow through the system. Discharge valve should be partially opened.
- Start the pump and check for leaks on the pump and piping. Special attention should be given to the seal area at the rear open- ing in the motor bracket.
- Using an amprobe or similar device, check for motor overload. If motor is overloading it is possible that the impeller clearence was not properly set as outlined in Step 6 outlined in “D” Reassembly.

7. Notice/auto restart

Single phase motors will restart automatically after thermal overload protector trips.

 **Warning**	**Explosible** Do not pressurize receiver. Isolate receiver during leak test. Do not plug overflow. Do not restrict vent opening to atmosphere. Open valves slowly. Failure to follow these instructions could result in serious injury or death.

 **Warning**	**High voltage electricity** Disconnect and lock out power before connecting or servicing unit. Failure to follow these instructions could result in serious injury or death.

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 operations are highly recommended.

Refer to trouble shooting section when necessary.

A variety of control options are available and are furnished in accordance with user 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.

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

8. Tank float switch instructions

7.1 Application
For automatically controlling the liquid level in a closed tank by float movement.

7.2 Mounting
Screw-in Tank Float Switches are mounted directly to the tank by means of the 21/2" I.P.S. threaded fitting (D).
Before screwing this fitting into 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).

7.3 Reverse action
To change, relocate operating link to the opposite slot in base plate and corresponding hole in adjusting plate.

7.4 Adjustment
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).

Loosen 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.

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

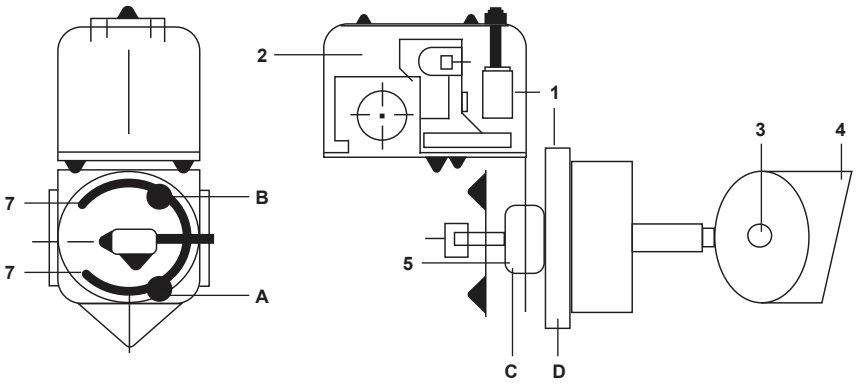


Fig. 6

9. Mechanical alternator instructions

9.1 Application

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 liquid 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.

9.2 Mounting

Mechanical alternators are mounted directly to the tank by means of the 2½" I.P.S threaded fitting (D). Before screwing this fitting into 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).

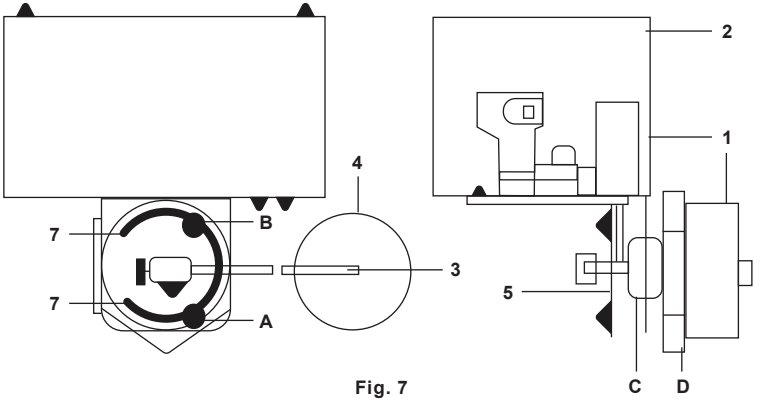


Fig. 7

9.3 Standard operation

Contacts are arranged for sump action. In this form the contacts will close on increase in liquid level.

9.4 Reverse action

To change, relocate operating link to the opposite slot in base plate and corresponding hole in adjusting plate.

9.5 Adjustment

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).
Loosen 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.

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

10. Troubleshooting

All units are thoroughly tested at the factory before shipment.

They should operate satisfactorily without further adjustment if properly installed and providing they have 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 and 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	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. Steam traps are blowing through causing condensate to return at excessive temperatures. This may reduce the capacity of pump below its rating, depending on the unit and type of pump furnished. Traps should be repaired or replaced.
	3. 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.
	4. A valve in the discharge line is closed or throttled too tightly. Check valve is installed backwards.
	5. The impeller eye is clogged.
	6. Pump is too small for system.
Condensate Pump is Noisy	1. Excessive condensate temperature. Correct system conditions.
	2. Magnetic hum or bearing noise in motor. Consult motor manufacturer's authorized service station nearest unit location.
	3. Starter chatters. Trouble is caused by low line voltage, poor connections, defective starter coil, or burned contacts.
	4. Pump is running backward.
The System is Noisy	1. Banging in 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 th 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.
	4. A defective trap is holding condensate in steam supply line.