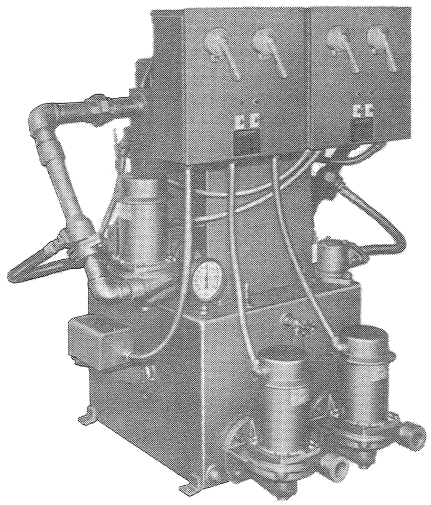
Skidmore™

BULLETIN SM8J
October 2000

INSTALLATION, OPERATION AND SERVICE INSTRUCTIONS

JVC Condensate Return
and JVBF Boiler Feed
Vacuum Units



INDEX

OPERATION - CONDENSATE RETURN

1. Condensate is returned to the vacuum receiver through 3" return inlet.

2A. When receiver water level reaches set high level float switch operates return pump, pumping water from receiver to boiler feed system.

2B. A mechanical alternator replaces float switch on duplex or semi-duplex units or an optional electrical alternator can be used with 2 float switches.

3. When vacuum in receiver reaches low level, vacuum switch (through motor control) turns on vacuum pump which circulates water in hurling tank. This water passing through a venturi creates a vacuum in the receiver; this, in turn, draws off air and vapor from the receiver through a check valve into the hurling tank. Vacuum Switch can be set for Float Only - Vacuum & Float - Continuous.

4. When water in hurling tank reaches low level, float switch operated solenoid make-up valve opens, allowing water to reach high level. A temperature regulation switch is installed in parallel with the make-up valve, adding cooling water when temperature of hurling water reaches set high temperature. Excess water passes through the overflow to drain.

OPERATION - BOILER FEED

1. Condensate is returned to the vacuum receiver through 3" return inlet.

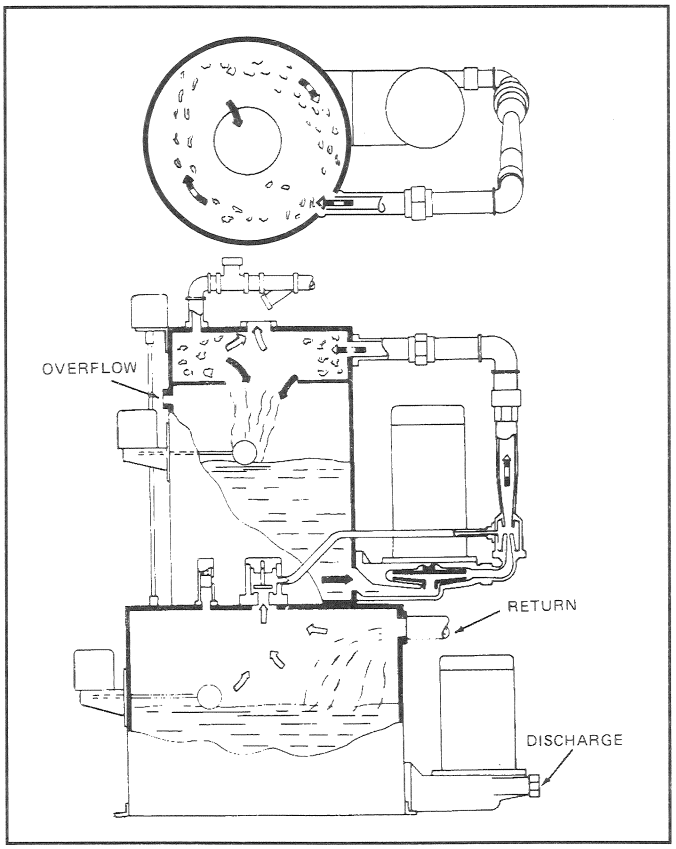
2A. When water level switch in boiler(s) reaches set low level, receiver return pump is turned on, pumping water from receiver to boiler(s).

2B. On duplex or semi-duplex units, the water level switch may control an electric alternator in motor control circuit.

3. When water level in receiver reaches set low level, the reverse acting float switch in receiver turns on solenoid valve, allowing water to feed from hurling tank to receiver.

4. Vacuum in reservoir and water level in hurling tank are maintained as per 3 and 4 in above Condensate Return System.

BOILER FEED DIAGRAM - FIGURE 1



⚠ WARNING

DO NOT USE TO PUMP FLAMMABLE OR EXPLOSIVE FLUIDS SUCH AS GASOLINE, FUEL OIL, KEROSENE, ETC. DO NOT USE IN FLAMMABLE AND/OR EXPLOSIVE ATMOSPHERES. PUMP SHOULD ONLY BE USED WITH LIQUIDS COMPATIBLE WITH PUMP COMPONENT MATERIALS. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE.

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INSTALLATION INSTRUCTIONS

1. Set and bolt unit to concrete base.
2. Install piping - return lines above floor. Figure 2.
   A. Connect return line to condensate receiver through gate valve and strainer. Pitch all returns toward receiver to provide gravity flow. Install gate valves in all branch return lines for testing purposes. Install bypass line and gate valve from main return line to drain. Note: Use vacuum tight galvanized pipe and fittings on all receiver connections.
   B. Install equalizing line with vent from vacuum receiver to boiler (optional).
   C. Connect the hurling tank drain line and overflow line to drain. Use a gate valve between drain line and drain.
   D. Connect vacuum receiver tank drain line to drain (through a vacuum tight gate valve (optional). Receiver may be drained by removal of drain plug.
   E. Connect fresh water line to hurling make-up supply.

⚠ DANGER

HAZARDOUS PRESSURE CAN CAUSE DEATH OR SERIOUS INJURY. THIS TANK IS NOT A PRESSURE VESSEL AND MUST BE VENTED AT ALL TIMES.

   F. Install hurling tank air vent line. Run vent up to at least 8' above floor and then down to drain or to within 6" of floor.
   G. Connect receiver discharge line(s) to boiler (or into Hartford Loop if one is used) through check, flow balancing and gate valves.
3. Install piping - return lines below floor with receiver in pit and vacuum producer at floor level.
   A. Install return, drain, vent and water lines as above 2-A through G.
   B. Connect receiver vacuum port to Venturi through check valve. All connections must be vacuum tight.
4. Electrical connections:
   A. Connect power lines to motor starter and/or power control center in accordance with local codes. Use fused disconnect switches for each panel or starter.
   B. If receiver and vacuum producer are mounted as separate units (section 3 above) the return pump(s) float switch(es) and vacuum switch mounted on the receiver will have to be wired to the motor switch(es) or the power control panels mounted on the vacuum producer.

START-UP PROCEDURE

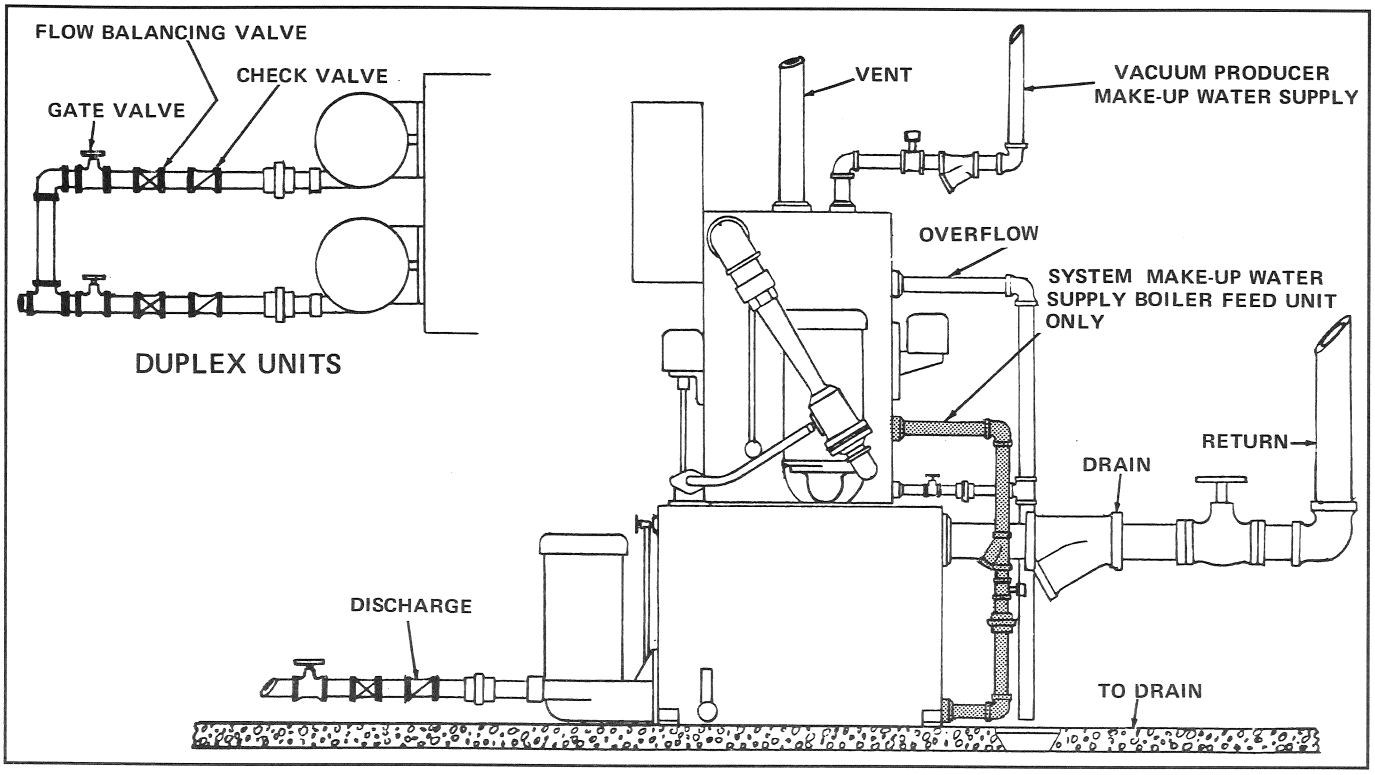
1. Flush system thoroughly to drain; to remove all foreign material before starting pump. Clean inlet strainer on a regular basis.
2. Fill hurling tank to water line indicated on side of tank or half full on the gauge glass.
3. Remove shipping brackets from float switches. Caution: Do not run any motor dry as it will destroy the seals. Make sure tanks are full.
4. Turn power on and set vacuum pump motor(s) switch(es) to 'test'.
5. Remove motor cover and observe C.W. rotation of motor. Vacuum switch is set to turn pump on at predetermined low level of approximately 2 HG and preset high of 7 HG. See instructions for adjusting vacuum switch if settings are off.
6. Hurling water temperature is regulated to reach maximum temperature to maintain optimum efficiency.
7. When hurling water reaches low level, float switch operated solenoid make-up valve will open, until water reaches preset high level. Water level should always remain at approximately the marked water line. See instructions for resetting float switch, if necessary.

8A. UNIT USED AS A CONDENSATE RETURN PUMP
When condensate water reaches the set high level on the gauge, the float switch (or mechanical alternator on duplex units) turns on pumps returning condensate to boiler feed or boiler pumps are turned off when condensate reaches low set level. See instructions for resetting float switch(es) or alternator, if necessary.

8B. UNIT USED AS A BOILER FEED
When condensate in boiler reaches the low set level, boiler water level controller at the boiler will turn on the condensate return pump(s). Pump(s) will turn off when condensate in boiler reaches set high level.

9. Set vacuum switch(es) to "vacuum & float" position.
10. Set panel selector switch(es) to automatic position.
11. Switch all fuse disconnects to 'on' position. Unit is now in operating mode as described above.

PIPING DIAGRAM - FIGURE 2



THREE LIFT PIPE DETAILS - FIGURE 3

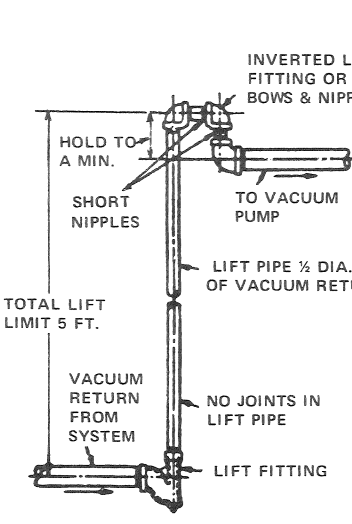


FIG. 3-(1) METHOD OF CONSTRUCTING A LIFT IN A RETURN LINE

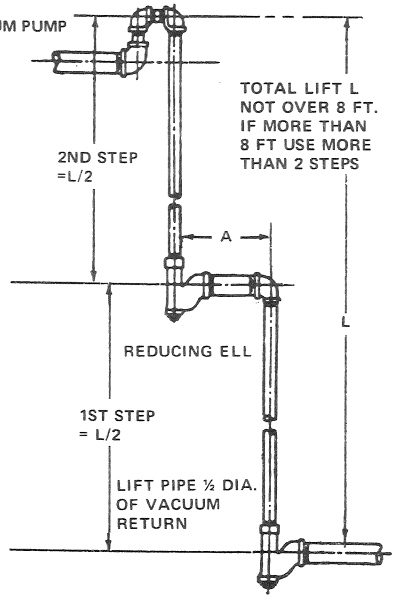


FIG. 3-(2) CONSTRUCTION OF A STEP LIFT

VACUUM RETURN PIPE SIZE INCHES	A IN.
1	7
1¼	8
1½	9
2	10
2½	14
3	15
4	18
5	21
6	24

MAXIMUM LENGTH A

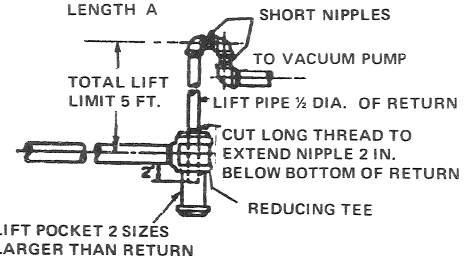
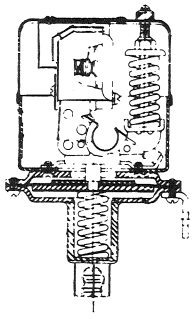


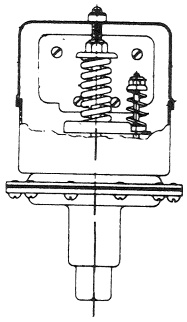
FIG. 3-(3) HOW TO BUILD A LIFT FITTING

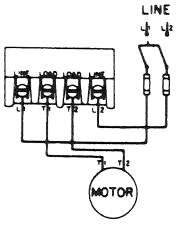
NOTE — A valve or cock is recommended to drain lift fitting.

VACUUM SWITCH ADJUSTMENT

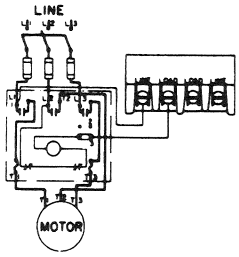
GVG-1







Single Phase
Inherent Protection



A.C. Automatic Starter
with Pressure Switch

INSTRUCTIONS

WORKING RANGE – Contacts open on an increase in vacuum. To INCREASE the cut-out point (i.e. from 4" to 8" of Hg) turn the range adjustment nut (Item "A") COUNTERCLOCKWISE. To LOWER the cut-out point, turn the range nut CLOCKWISE.

In setting this control always adjust the range first to establish the cut-out point. The desired cut-in point can then be set by adjusting the differential.

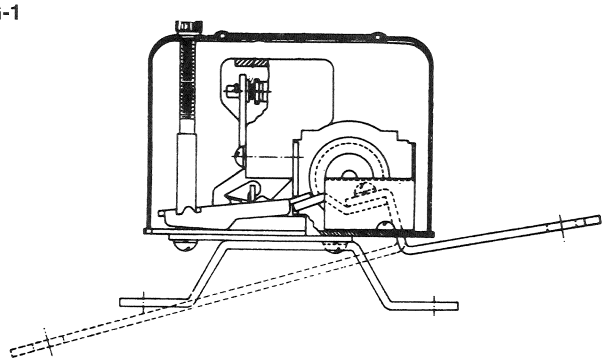
DIFFERENTIAL – Refers to the inches of vacuum between opening and closing of the switch. (Cut-out and cut-in points). Differential adjustment affects cut-in point only. To the differential spring. To DECREASE the differential turn the differential nut COUNTERCLOCKWISE.

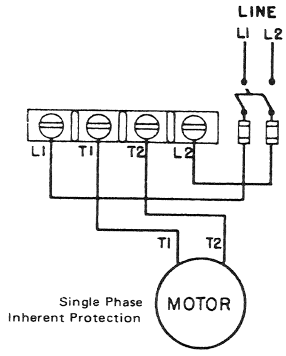
MOUNTING – The class 9016 Type GVG vacuum switch may be mounted in any position directly on a ¼" I.P.S. pipe, or by the convenient mounting bracket supplied with Form F switches.

REPAIR – Minor repairs can be made in the field if desired (see above table of parts which can be replaced in the field). To facilitate diaphragm replacement the flange should be held in place by clamps or No. 10 machine screws of sufficient length to engage flange when vacuum spring is free. This will ease compression of vacuum spring in the assembly of lower flange to upper flange.

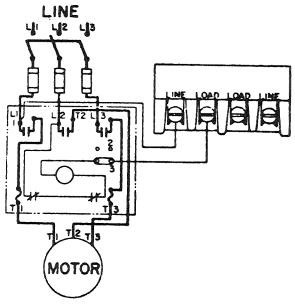
FLOAT SWITCH ADJUSTMENT

FG-1





Single Phase
Inherent Protection



Float Switch with
A.C. Starter

INSTRUCTIONS

APPLICATION – Opens and closes an electric circuit by an upward or downward movement of the lever arm, as in controlling the liquid level in a receiving tank or sump.

MOUNTING – Switch is mounted in a horizontal position, using mounting feet provided.

STANDARD OPERATION – The standard setting for the Class 9036 float switch is so arranged as to close the circuit at high liquid level and open at low liquid level.

REVERSE ACTION – Standard operation can be reversed, that is, open the circuit at high liquid level and close at low liquid level. Reverse action (Form R) is accomplished by using Item 5 instead of Item 4 (see reverse side). Changing action on this control in the field can be accomplished by ordering the proper lever from the factory.

ACCESSORIES – The standard accessories (9049A-6) furnished with this switch (when specified) consist of a 7 inch tapped-at-top float, 5 feet of 3/8" tubing and 2 adjustable stop collars.

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. This company manufactures a complete line of motor protective switches, information on which will be sent upon request.

⚠ CAUTION

DO NOT HANDLE A PUMP OR PUMP MOTOR WITH WET HANDS OR WHEN STANDING ON WET OR DAMP SURFACE, OR IN WATER.

TROUBLE SHOOTING GUIDE

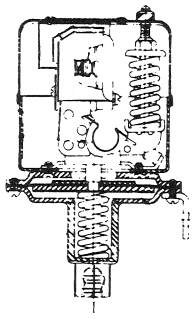
⚠ WARNING

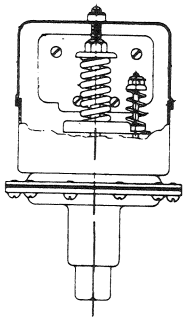
MAKE CERTAIN THAT THE POWER SOURCE IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR DISASSEMBLE ANY COMPONENTS! LOCK IT IN THE OPEN POSITION AND TAG TO PREVENT APPLICATION OF POWER.

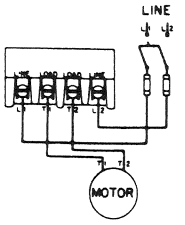
TROUBLE **1. Pump will not start.**	
CAUSE Reset button tripped or blown fuse.	**REMEDY** Check line voltage to be sure it agrees with motor nameplate voltage. High peak power demand may cause low voltage condition.
	Turn pump shaft by hand. If it is tight check packing box glands.
Float switch of vacuum switch may be stuck in off position.	Check both switches and adjust according to control instruction page 5 and 6.
TROUBLE **2. Vacuum producer pump runs continuously or does not produce enough vacuum.**	
CAUSE Hurling water temperature above 180° F. causes hurling water to flash to vapor.	**REMEDY** Check solenoid valve making sure it is in the open position adding cooling water to the hurling tank.
	Hurling water in excess of 180° F. caused by leaking traps. Check all steam traps.
Excess air leaking into system.	Close gate valve on main return line to pump inlet. If pump stops, check for leaks in traps, fittings or returns.
Pump not primed.	Check water level in hurling tank. Level must be to water line or half way in gauge glass - see starting instructions page 2.
Relief valve set too low.	This will admit air to system. Shut off gate valve at receiver inlet note vacuum at which pump stops. Put vacuum switch lever on continuous and adjust relief valve at 1-2" hg higher than vacuum switch cut off.
Vacuum producer nozzle worn.	Check to see if pump is primed. Close return line valve at receiver inlet. Put vacuum switch lever to "continuous". Block relief valve inlet - start pump. If pump does not develop 15" on the vacuum gauge in 2-3 minutes, nozzle or venturi need replacing.
Motor operating in wrong direction.	Remove motor cover to make sure motor is running in a clockwise rotation. See starting instructions page 2.
Mild weather operation where traps remain cool and stay open.	Operate pump on float only unless there are lifts in the return line. See figure 3, page 3 - Explaining Lifts.
TROUBLE **3. Condensate return pump runs continuously.**	
CAUSE Float switch out of adjustment, not shutting off at low level.	**REMEDY** Check float switch and refer to adjustment page 5.
TROUBLE **4. System does not hold vacuum.**	
CAUSE Condensate temperature over 180° F.	**REMEDY** Check for faulty traps.
Excess air leaking to system.	See above.
Suction check valve between receiver and vacuum producer leaking.	Check to see that seat is clean and disc in good condition - replace disc if necessary.
Relief valve not set high enough.	See relief valve setting as shown above. If more than 2" above vacuum switch setting - readjust valve.
Condensate held up in radiation due to vacuum on boiler.	Install equalizer line as shown in installation instructions.
Pump has lost prime.	Check water level in hurling tank. Level must be to water line or half way in gauge glass - see starting instructions page 2.
	Recheck check valve - see above.
	Drain valve on pump casing may be open or leaking - tighten.
Inlet strainer clogged.	Remove strainer cover and clean basket - wash basket thoroughly before replacing.
Motor not up to speed.	Check voltage and RPM of motor.
TROUBLE **5. Pump starts and stops in rapid succession.**	
CAUSE Clogged inlet strainer basket.	**REMEDY** Remove strainer cover and clean screen.
Partially closed valve in return line.	Check all return line valves.
Water trap or low spot in return line.	Install ¾" pipe from top of receiver to a point beyond the low spot.
TROUBLE **6. Excessive water discharges from hurling tank overflow.**	
CAUSE Make-up valve stuck in open position.	**REMEDY** Check float switch and adjust. See instructions page 5 or check solenoid valve for malfunction or check aquastat for malfunction. See adjustment page 2.
System pressure higher than designs of boiler feed impeller.	Check pressure on discharge of pump. If higher than nameplate of pump check for closed valves or other restrictions.

VACUUM SWITCH ADJUSTMENT

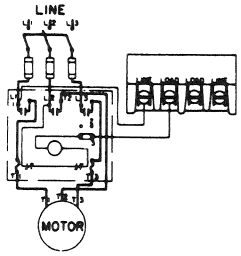
GVG-1







Single Phase
Inherent Protection



A.C. Automatic Starter
with Pressure Switch

INSTRUCTIONS

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In setting this control always adjust the range first to establish the cut-out point. The desired cut-in point can then be set by adjusting the differential.

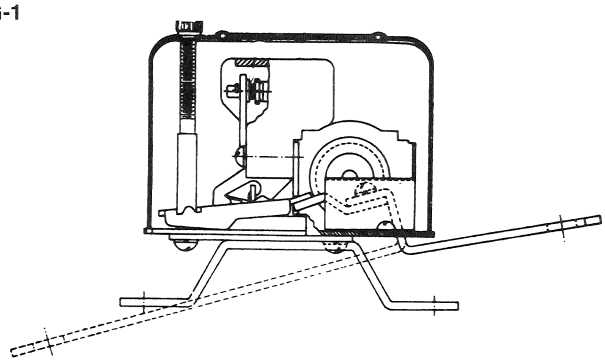
DIFFERENTIAL – Refers to the inches of vacuum between opening and closing of the switch. (Cut-out and cut-in points). Differential adjustment affects cut-in point only. To the differential spring. To DECREASE the differential turn the differential nut COUNTERCLOCKWISE.

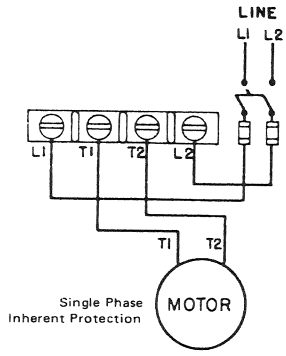
MOUNTING – The class 9016 Type GVG vacuum switch may be mounted in any position directly on a ¼" I.P.S. pipe, or by the convenient mounting bracket supplied with Form F switches.

REPAIR – Minor repairs can be made in the field if desired (see above table of parts which can be replaced in the field). To facilitate diaphragm replacement the flange should be held in place by clamps or No. 10 machine screws of sufficient length to engage flange when vacuum spring is free. This will ease compression of vacuum spring in the assembly of lower flange to upper flange.

FLOAT SWITCH ADJUSTMENT

FG-1





Single Phase
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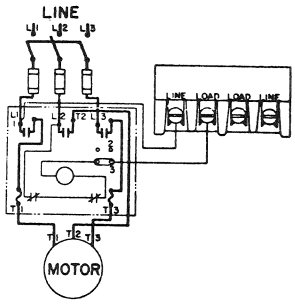

Float Switch with
A.C. Starter

INSTRUCTIONS

APPLICATION – Opens and closes an electric circuit by an upward or downward movement of the lever arm, as in controlling the liquid level in a receiving tank or sump.

MOUNTING – Switch is mounted in a horizontal position, using mounting feet provided.

STANDARD OPERATION – The standard setting for the Class 9036 float switch is so arranged as to close the circuit at high liquid level and open at low liquid level.

REVERSE ACTION – Standard operation can be reversed, that is, open the circuit at high liquid level and close at low liquid level. Reverse action (Form R) is accomplished by using Item 5 instead of Item 4 (see reverse side). Changing action on this control in the field can be accomplished by ordering the proper lever from the factory.

ACCESSORIES – The standard accessories (9049A-6) furnished with this switch (when specified) consist of a 7 inch tapped-at-top float, 5 feet of 3/8" tubing and 2 adjustable stop collars.

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. This company manufactures a complete line of motor protective switches, information on which will be sent upon request.

⚠ CAUTION

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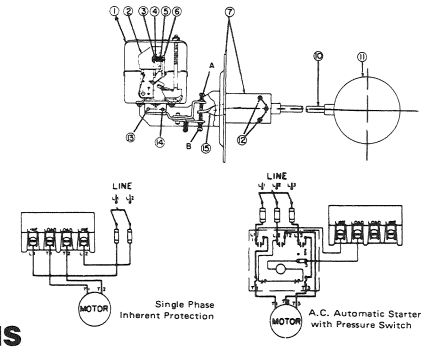
TANK FLOAT SWITCH ADJUSTMENT

GG-1 to 18



INSTRUCTIONS

APPLICATION – For automatically controlling the liquid level in a closed tank.

MOUNTING – Type GG-1-18. The flange should be bolted to a properly prepared plate on the tank. Flange gaskets are not provided, but may be found desirable.

ADJUSTMENT – Switches as shipped from the factory are set for a specified float travel (internal stop pins, 12, are set for maximum possible travel irrespective of actual switch setting).

In adjusting float travel, note that the switch actuating lever, 15, moves in the same direction as float; i.e., movement is upward with rising float, downward with falling float. Adjustment screw, A, will affect switch operation for downward float movement. Narrowest travel results when screws, A and B, are closest together (do not bind on lever) and conversely wider travel with relatively greater distances between screws. (To limit of internal stops.)

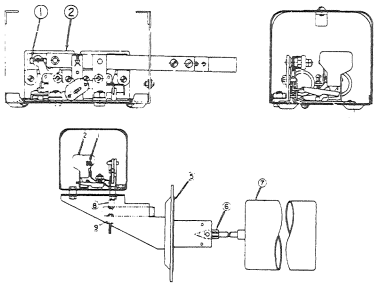
NOTE – Internal switch adjustments are factory set and sealed and require no further change.

OPERATION – The position of the bearing pin, 13, determines the operation of the switch. When this pin is in position, 13, of the drawing above, the contacts open with the lever in the "up" position. When the pin is in position, 14, the contacts close when the lever is in the "up" position.

MOTOR PROTECTION – A float switch of this type does not include motor protection, but may be used as a piloting device to operate a starter which may provide this feature. The Square D Company manufactures a complete line of motor protective switches and motor control, information on which will be furnished on request.

MECHANICAL ALTERNATOR ADJUSTMENT

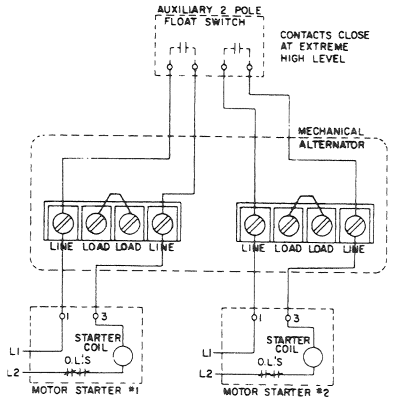
AG-1, BG-7-15



INSTRUCTIONS

WIRING – See wiring diagrams inside cover for single and polyphase motor control and pilot operation.

APPLICATION – The Class 9038 Mechanical Alternator serves to open and close an electric circuit by an upward and downward movement of the lever arm. The forces are generally applied by means of a float operating between two 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 standby pump across the line.

MOUNTING – Type AG-1. The alternator is mounted in a horizontal position by means of the four holes located in base of the frame. Types BG-7 to 15 are flange mounted.

LEVER ARM – The alternator Type AG is equipped with an adjustable float rod guide. This piece can be adjusted from a minimum of 3½ inches to a maximum of $4\frac{3}{16}$ inches.

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

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.

ADJUSTMENT – These alternators are pre-set at the factory for proper operation. Adjustments should not be attempted on the AG Types. Vertical float travel of the BG Types may be varied by means of adjusting nuts 8 and 9. Nut 8 controls the lower limit of float travel, at which the switch is actuated, and Nut 9 controls the upper limit. Extreme caution should be exercised in making this adjustment. For maximum vertical float travel, ultimately limited by internal stops, the adjusting nuts should be spaced so that both switch units have been actuated at the point of full float travel. For minimum float travel do not bind nuts 8 and 9 on actuating lever.

MOTOR PROTECTION – A control of this type does not afford motor protection. However, it is quite frequently feature. The Square D Company manufactures a complete line of motor protective devices, information on which will be sent upon request.

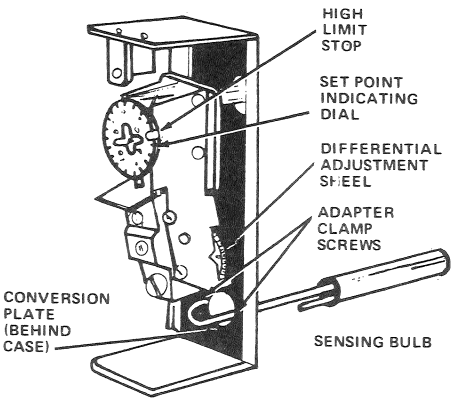
MANUAL TRANSFER (LEAD-LAG) SELECTOR – Form N3 switches have a manually engaged selector which voids alternation. The pump selected to lead always comes on first. With selector disengaged, the unit reverts to normal alternation.

NON-ALTERNATING MECHANISM – On Form N4 switches, the pump wired to lead always comes on first, with the second pump operating only under peak demand conditions, or when first pump fails.

HIGH WATER ALARM – On Form N5 switches an additional snap switch mechanism is tripped initiating a high water alarm circuit if for any reason both pumps are unable to control the rising of liquid in the tank.

AUXILIARY FLOAT SWITCH – In certain applications an auxiliary float switch is required set at an extreme level beyond the limits of the alternator to provide emergency operation. Below is a wiring diagram showing use of an auxiliary float switch in an AC pilot application.

L6006A1145 AQUASTAT CONTROLLER



ADJUSTING

DIFFERENTIAL

Set the differential to correspond with the old control. To adjust, rotate the wheel on the back of the snap switch until the differential adjustment desired reading is aligned with the "V" notch in the frame. The wheel provides an adjustment from 5 to 30 degrees F. Replace the Aquastat cover.

CONTROL POINT

Adjust the control point to correspond with the old control. To adjust, insert a screwdriver in the slotted screw-type head located beneath the window in the cover. Turn the scale to the desired control point.

HIGH LIMIT STOP

The high limit stop on these controllers is factory set at 240° F. Readjust to the stop setting specified by the boiler manufacturer, or to the same setting as the old control, as follows:

The stop lever is locked by means of posts on the back of the dial which engage with teeth on the hub of the lever plate. Insert a screwdriver between dial and plate, separate sufficiently to disengage the locking posts, and move stop lever to the desired setting. Be sure posts engage teeth when screwdriver is removed. See Figure at left.

REMEMBER – Follow the boiler manufacturer's instructions for recommended settings or use the same settings as the old control.

CHECK OUT – IMPORTANT:

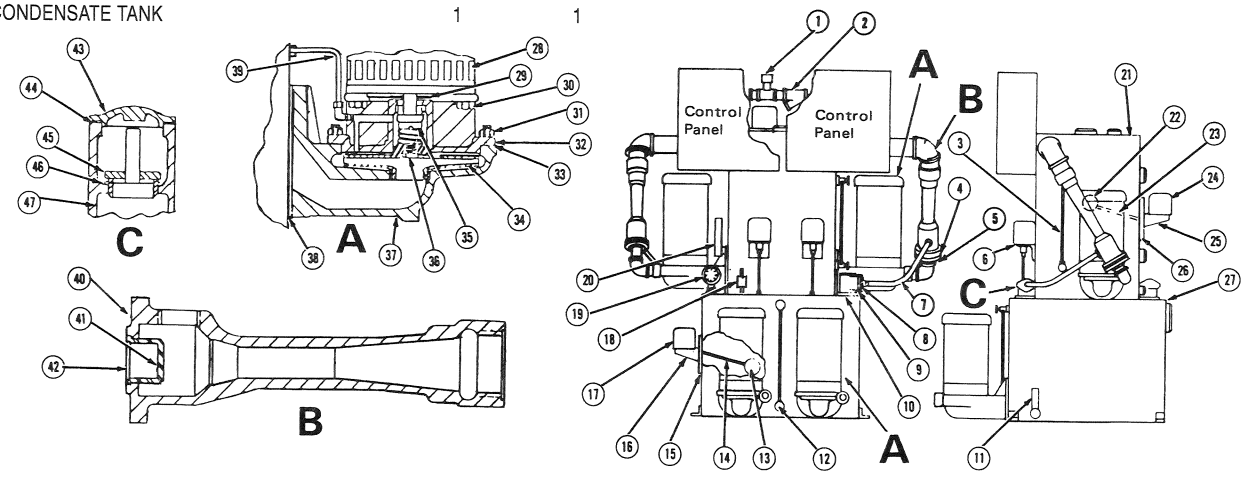
Always check out entire system immediately following replacement or installation.

Check to make certain that the Aquastat control has been installed and adjusted properly. Put the system into operation and observe the action of the controller through several cycles to make certain that it provides proper high or low limit cut-out protection or circulator control. Further adjustments then can be made to meet more exact requirements.

	PARTS LIST	NUMBER REQUIRED Simplex	Duplex
1	MAKE-UP SOLENOID VALVE	1	1
2	MAKE-UP "Y" STRAINER	1	1
3	GAUGE GLASS ASS'Y. (Hurling Tank)	1	1
4	VENTURI MANIFOLD GASKET	1	2
5	VENTURI COMPANION FLANGE	1	2
6	VACUUM SWITCH	1	2
7	FLEXIBLE VACUUM HOSE	1	2
8	CHECK VALVE HOUSING COMPANION FLANGE	1	2
9	COMPANION FLANGE GASKET	1	2
10	MANIFOLD GASKET	1	2
11	THERMOMETER	1	1
12	GAUGE GLASS ASS'Y. (Condensate Tank)	1	1
13	FLOAT BALL	1	1
14	FLOAT ROD	1	1
15	FLOAT SWITCH GASKET	1	1
16	FLANGE AND BELLOWS ASS'Y.	1	1
17	FLOAT SWITCH (Mechanical Alternator on Duplex)	1	1
18	VACUUM RELIEF VALVE	1	1
19	COMPOUND VACUUM GAUGE	1	1
20	TEMPERATURE SENSOR	1	1
21	HURLING TANK	1	1
22	FLOAT BALL	1	1
23	FLOAT ROD	1	1
24	FLOAT SWITCH	1	1
25	FLOAT SWITCH BRACKET w/MECHANISM	1	1
26	FLOAT SWITCH GASKET	1	1
27	CONDENSATE TANK	1	1

	PARTS LIST	NUMBER REQ'D PER PUMP Motor Assembly
28	VERTICAL ELECTRIC MOTOR	1
29	WATER SLINGER	1
30	HEX HEAD BOLT	4
31	HEX NUT	4
32	MOTOR BRACKET	1
33	PUMP HOUSING GASKET	1
34	IMPELLER	1
35	MECHANICAL SEAL ASSEMBLY	1
36	IMPELLER LOCKSCREW (Lock Collar also required on Fractional HP Motors)	1
37	PUMP HOUSING	1
38	GASKET VOLUTE TO RECEIVER	1
39	VENT LINE ASSEMBLY	1

	PARTS LIST	NUMBER REQUIRED Simplex	Duplex
40	VENTURI	1	2
41	NOZZLE	1	2
42	NOZZLE WASHER	1	2
43	CHECK VALVE MANIFOLD COVER	1	2
44	CHECK VALVE MANIFOLD GASKET	1	2
45	CHECK VALVE DISC	1	2
46	CHECK VALVE SEAT	1	2
47	CHECK VALVE MANIFOLD	1	2



FIELD REPAIR INSTRUCTION

CHANGING VENTURI NOZZLE

1. Remove two bolts holding pipe flange to Venturi
2. Break union between Venturi discharge and hurling tank.
3. Pull Venturi to one side and remove nozzle part No. 41 and nozzle washer Part No. 42.
4. Replace parts and reassemble.

REMOVE PUMP AND MOTOR UNIT

No return piping or pump discharge piping need be disturbed to remove pump and motor unit, simply proceed as follows:

1. Loosen and remove hexagon nuts from vent line fittings Part No. 39 and swing copper tube vent line away from receiver.
2. Disconnect wiring and flexible conduit at motor terminal box and swing away from pump.
3. Remove stud nuts No. 31 and lift motor and pump unit from pump housing No. 37 for inspection or repair.

DISMANTLING PUMP AND MOTOR UNIT

FOR PUMP UNIT WITH FRACTIONAL H.P. ELECTRIC MOTOR. Proceed as follows:

1. Remove drip cover from top end of motor and receiver plug from center of motor top end-bell. Note slot in top end of motor shaft (or two flats on motor shaft if it extends above end-bell.) Use either a heavy wide blade screwdriver, or open end wrench, to hold motor shaft securely.
2. Remove No. 36 impeller lockscrew with socket head wrench by turning locknut COUNTERCLOCKWISE. Also remove bronze lockwasher.
3. Still holding motor shaft securely, remove No. 34 impeller by turning COUNTERCLOCKWISE. Impeller hub is threaded and screws onto threaded motor shaft.
4. Remove No. 35 mechanical seal assembly with spring by sliding along motor shaft. Spring seats against impeller hub.
5. Remove No. 30 hex cap screws, holding No. 32 bracket to motor, and remove bracket from motor. Water slinger No. 29 is now visible and can be removed.

FOR PUMP UNIT WITH INTEGRAL H.P. ELECTRIC MOTOR. Proceed as follows:

1. Insert blade of screwdriver in one of the peripheral vane openings of impeller to keep shaft from turning. With another screwdriver or socket wrench remove No. 36 impeller lock screw by turning COUNTERCLOCKWISE. Impeller lock screw may be slotted round head type or hexagon head type.
2. Remove No. 36 impeller retaining collar and with two (2) screwdriver blades 180° apart and between impeller No. 34 and bracket No. 35, pry impeller from motor shaft. The impeller hub has a straight bore and motor shaft is straight with a key and keyway.
3. Remove No. 35 mechanical seal assembly with spring by sliding along motor shaft. Spring seats against impeller hub.
4. Remove No. 30 hex cap screws, holding bracket to motor, and remove bracket No. 32 from motor. Water slinger No. 29 is now visible and can be removed.

⚠ WARNING

MAKE CERTAIN THAT THE POWER SOURCE IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR DISASSEMBLE ANY COMPONENTS! LOCK IT IN THE OPEN POSITION AND TAG TO PREVENT APPLICATION OF POWER.

REPLACING MECHANICAL SHAFT SEAL AND REASSEMBLING PUMP

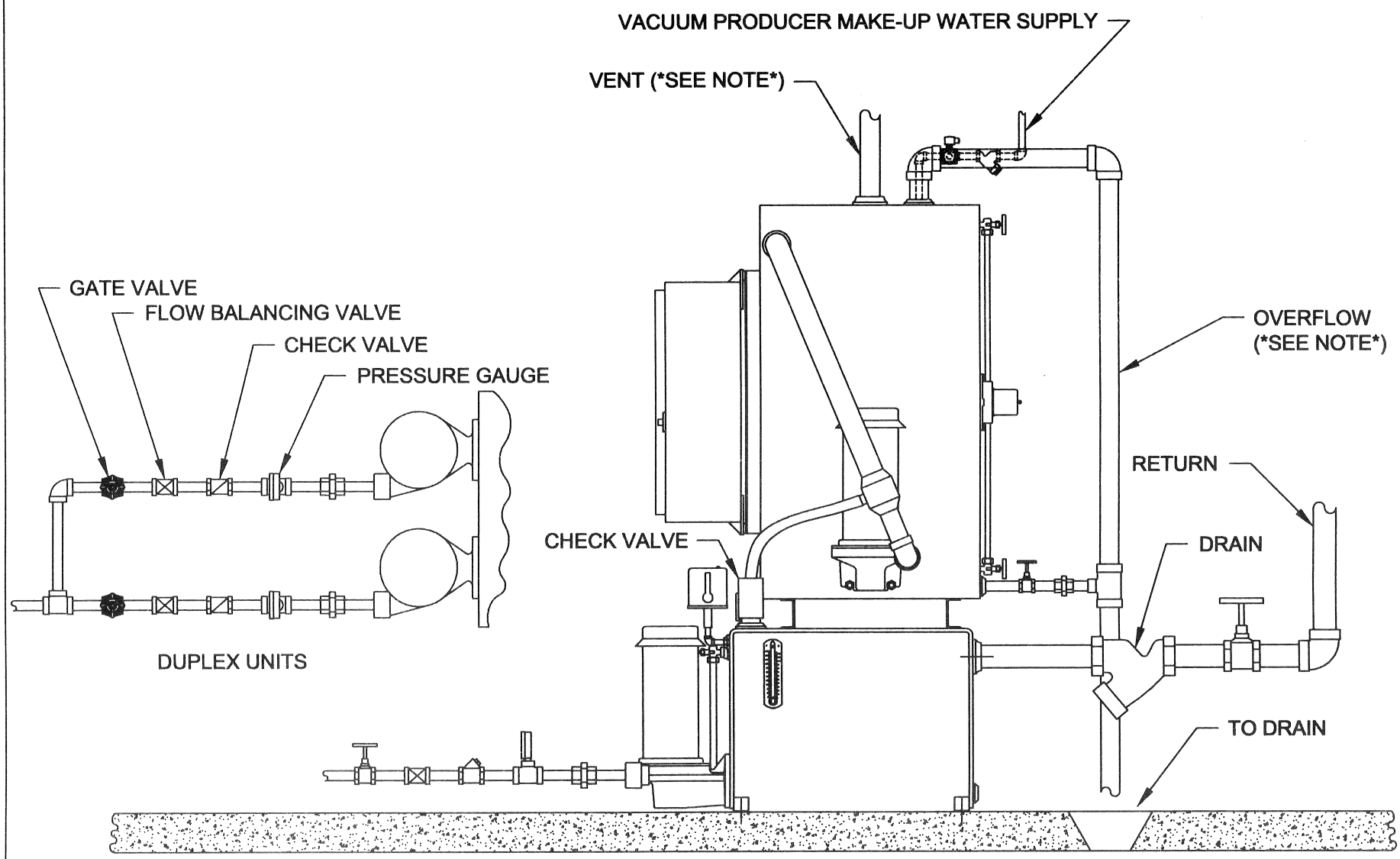
1. Pump and motor unit must be completely dismantled as indicated above.
2. Remove ceramic stationary seal seat and vibration ring part of 35 seal assembly from bracket No. 32.
3. Be sure counter-bore in bracket No. 32 is perfectly clean before inserting new ceramic seat and ring.
4. Use a light oil on the entire diameter of vibration ring and press it together with the ceramic seat into the machined bore of bracket No. 32. Press as far as it will go and be sure it is in proper place with seat surface at a perfect 90° angle with respect to motor shaft. Use caution so as NOT to SCRATCH or MAR lapped surfaces of ceramic seat.
5. Attach No. 32 bracket to motor and replace screws No. 30.
6. Use light oil on lower end of motor shaft and slip mechanical seal assembly No. 35 onto motor shaft as far as it will go. CAUTION: Be careful not to SCRATCH or MAR lapped surface of carbon ring.
7. Insert seal spring and be sure it seats properly against shaft seal.
8. FRACTIONAL H.P. MOTORS: Hold top end of motor shaft with screwdriver or open end wrench and screw impeller No. 34 CLOCKWISE onto motor shaft until it is tight. The seal spring will center itself on hub of impeller and it will be properly compressed for sal tension.
9. Replace lockwasher and lockscrew No. 36 and turn locknut CLOCKWISE until tight.

8A. INTEGRAL H.P. MOTORS: Replace impeller key in motor shaft and replace impeller on shaft. With impeller in proper place, the inside hub will be almost flush with end of motor shaft and seal spring will have proper compression.

9A. Insert screwdriver blade in one of the impeller peripheral openings to keep it from turning, and replace No. 36 retaining collar and No. 36 locking screw. Tighten locking screw by turning CLOCKWISE.

10. Replace gasket No. 33 and set pump and motor unit onto pump housing No. 37 and replace stud nuts No. 31 and tighten securely.
11. Replace copper tube vent line No. 38 and tighten hex nut fittings.
12. Reconnect wiring and flexible conduit at motor terminal box and unit is now ready for operation.
13. CAUTION: NEVER RUN PUMP WITH RECEIVER EMPTY. BECAUSE BOTH ELEMENTS OF MECHANICAL SHAFT SEAL WILL BE DAMAGED.

SKIDMORE
BENTON HARBOR, MI



* NOTE: DO NOT REDUCE VENT OR OVERFLOW LINES. *

PIPING DIAGRAM