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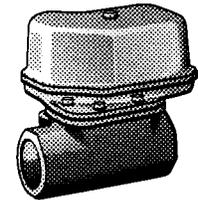
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FSW-31A and FSW-32A Industrial Flow Switches

INSTRUCTION
SHEET

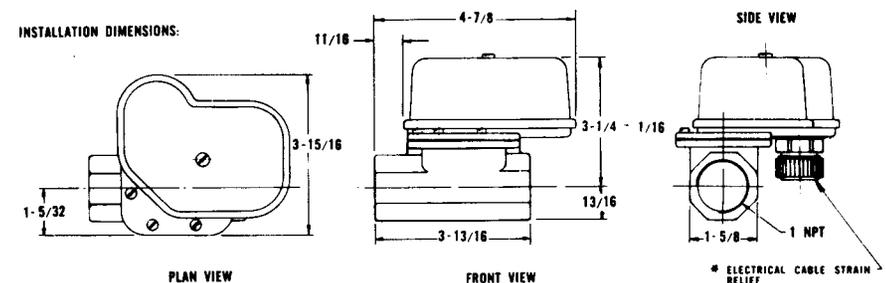
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FEATURES

- Model FSW-31A Supplied With 3 Drag Disks to Provide 3 Overlapping Ranges From 6 to 70 GPM for Water
- Responds to Flow, Independent of a Broad Range of Environmental Conditions
- Rugged Industrial Design
- Switch Point Adjustable Without Removing Unit From Line
- Mount in Any Position
- Maintains Calibration Limits When Subjected to Reasonable Line Hydraulic Hammer or Surge Pulses
- Line Pressure to 400 PSIG
- Temperature to 180° F Continuous
- 15A SPOT Switch Directly Controls Pump
- Easy Screw Terminal Wiring-No Soldering
- NPT Threaded to Pipe Directly In-Line
- Working Fluids: Pure Water, Tap Water, Filtered Sewage Water, Alcohols, Oils, Gasolenes, Glycols, Soap Solutions

INSTALLATION DIMENSIONS



It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification. The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

MADE
USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

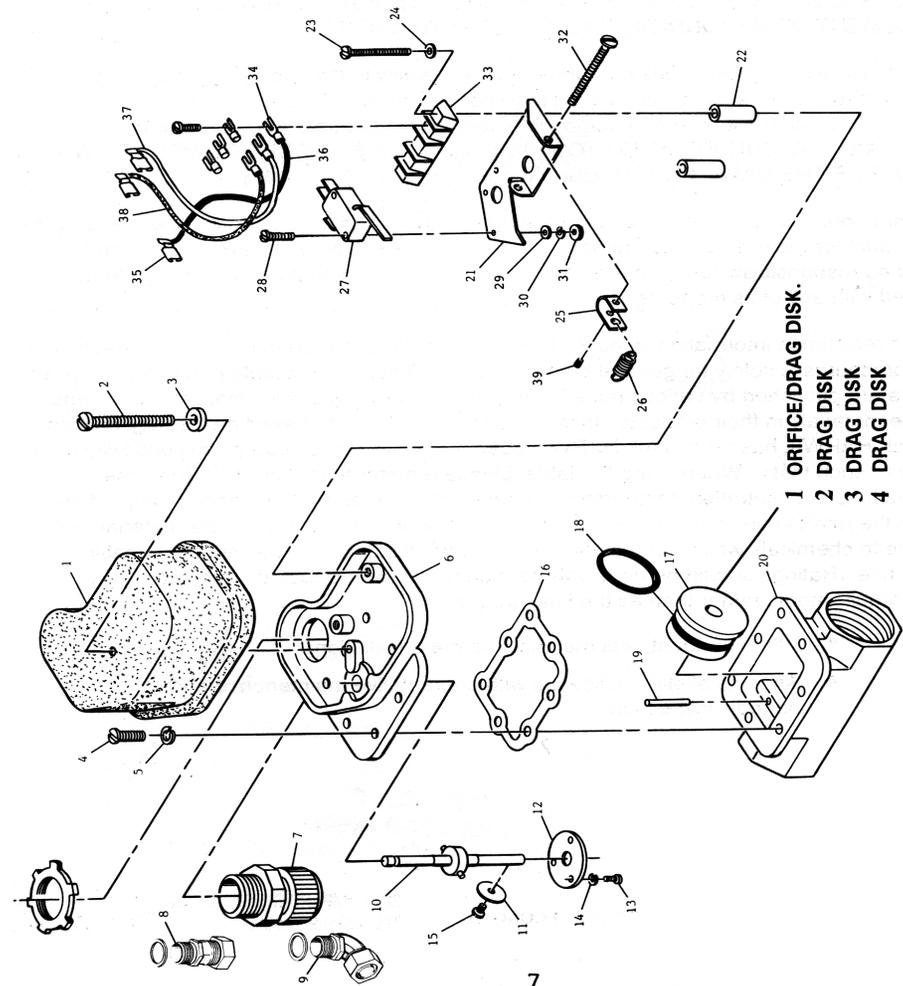
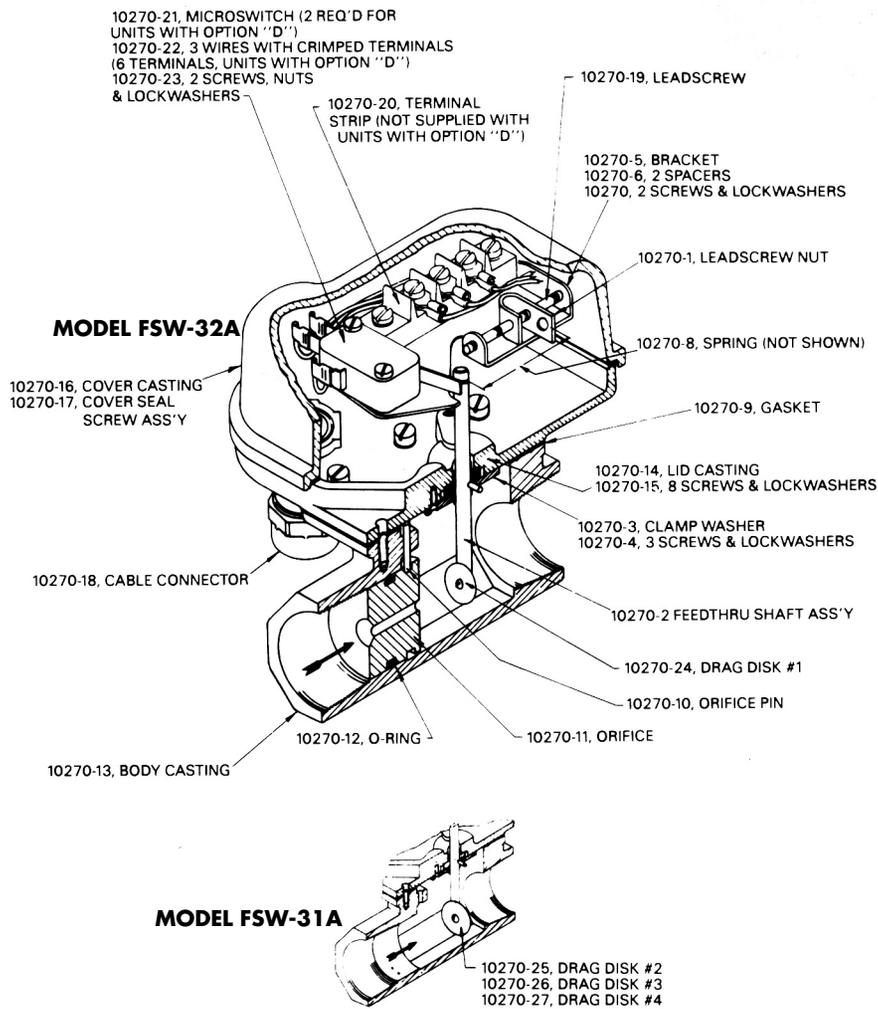
1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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M0764/0102



NO.	PART NAME	QTY	PART NUMBER
1	COVER CASTING	(1)	20300
2	SCREW	(1)	22-S
3	WASHER	(1)	317-S
4	SCREW	(1)	107-S
5	WASHER	(7)	319-W
6	LID CASTING	(1)	20301
7	CONNECTOR CABLE-optional BODY	(1)	60116 10429
8	NUT	(1)	10430
9	GROMMET A-optional GROMMET AA-optional	(1)	10440 10441
10	GROMMET B-optional GROMMET C-optional	(1)	10442 10443
11	LOCK NUT	(1)	20113C
12	FEEDTHRU SHAFT CONNECTOR CABLE-optional (Assembly Only)	(1)	20115 20116
13	RUBBER MOLDED PIN	(1)	20302
14	DRAG DISK #1-optional DRAG DISK #2-optional DRAG DISK #3-optional	(1)	20303 20303 20303
15	WASHER	(1)	20304
16	SCREW	(1)	20305
17	SCREW	(1)	324-W
18	ORIFICE-optional optional	(1)	318-LO 152-S
19	O RING	(1)	20307
20	PIN - ORIFICE optional	(1)	20308
21	BRACKET	(1)	20310
22	SCREW	(1)	20311
23	SCREW	(1)	20312
24	WASHER	(1)	20313
25	LEAD SCREW	(1)	20314
26	SPRING	(1)	117-S
27	MICRO SWITCH	(1)	313-W
28	SCREW	(1)	20107
29	WASHER	(1)	20316
30	WASHER	(2)	116-S
31	NUT	(2)	311-W
32	SCREW	(1)	201-N
33	TERMINAL SWITCH	(1)	132-S
34	TERMINAL	(1)	20102
35	WIRE	(1)	708-T
36	WIRE	(1)	708-T
37	WIRE	(1)	20317
38	WIRE	(1)	20318
39	SHRINK WRAP	(1)	20319
40	LABEL	(1)	901-F
41	INSTRUCTION SHEETS	(1)	20320

SPECIFICATIONS

FLOW RANGE (WATER CALIBRATED @ 70°F):

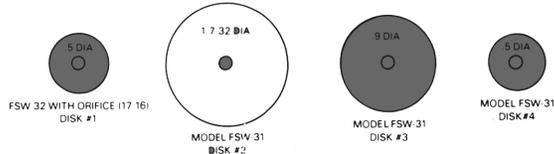
<u>MODEL</u>	<u>GPM</u>
FSW-32A	4 to 8
FSW-31A With Drag Disk #2	6 to 20
FSW-31A With Drag Disk #3	15 to 35
FSW-31A With Drag Disk #4	25 to 70

NOTE

The Model FSW-32A employs an orifice, and Drag Disk #1. The FSW-31A uses Drag Disks of varying sizes, and no orifice. The orifice may be removed and/or Drag Disks switched to vary flow range within the limits shown.

DRAG DISKS:

<u>DRAG DISK NO.</u>	<u>DRAG DISK O.D. (INCHES)</u>
1 (Model FSW-32A)	1.25"
2 (Model FSW-31A)	1.185
3 (Model FSW-31A)	0.9
4 (Model FSW-31A)	.05



SENSITIVITY 1% FLOW CHANGE

TO ACTIVATE SWITCH):

5% at upper end if flow range; 25% at lower end of flow range

DIFFERENTIAL PRESSURE

DRIP ACROSS UNIT:

(Under normal operating conditions) Model FSW-32A: 2 PSI at the lower end of flow range; 15 PSI at the upper end of flow range; Model FSW-31A: less than 2 PSI

WORKING LINE PRESSURE:

400 PSIG max. 180°F max. (proof tested to 1200 PSIG @ 180°F)

MAXIMUM CONTINUOUS

TEMPERATURE:

180°F

RELAY SWITCH:

SPDT 15A@ 125 or 250 Vac, 10,000,000 operations median; switch may be overloaded to 20 amps @ 125 or 250 Vac for a minimum of 20,000 operations

OPTION "D":

Dual SPDT relays; nominal difference flow between the two relay actuation points is 5%

ELECTRICAL CABLE

FITTINGS:

Water resistant for cable diameter .250" ±.025"

MATERIALS:

Wetted Parts: red brass, 302-304 stainless steel, phosphor bronze, PVC, Buna-N; Other materials of construction: brass body, aluminum cover, stainless steel and plastic hardware

WEIGHT:

3.5 lb

INSTALLATION AND OPERATION INSTRUCTIONS

INSTALLATION

WARNINGS

1. THESE UNITS ARE NOT COMPATIBLE WITH GASOLINE; NOR ARE THEY INTENDED FOR USE WITH FLAMMABLE LIQUIDS WITHOUT PROPER SAFETY PRECAUTIONS, SUCH AS THE USE OF INTRINSIC SAFETY RELAYS.

2. THE GASKET SEAL LOCATED BETWEEN THE MAIN BODY CASTING AND THE LID CASTING IS A CORK-RUBBER COMPOSITION WHICH IS SUBJECT TO A SLIGHT CREEP FOR A SHORT PERIOD AFTER APPLICATION OF INITIAL CLAMPING LOAD. ALL GASKETS ARE PROPERLY CLAMPED BEFORE SHIPMENT, HOWEVER, DURING SHIPPING AND STORAGE, THE GASKETS MAY COMPRESS ALLOWING THE BODY-LID CLAMPS TO BECOME SLIGHTLY LOOSE. TIGHTEN THESE BOLTS BEFORE ASSEMBLING THE FLOW SWITCH IN THE SYSTEM. NO FURTHER CREEP OF THE GASKET WILL OCCUR AFTER THE SECOND TIGHTENING.

The FSW-31A and FSW-32A Fluid Flow Switches are supplied with tapped holes for standard 1" pipe. Insert the FSW-31/32 Switch in line with the arrow on the side of the casting pointed in the direction of the flow. (Refer to FLOW TURBULENCE EFFECTS for additional installation considerations.)

NOTE

Care should be exercised to prevent pipe thread sealant (putty, Teflon tape, etc.) from entering the flow switch and restricting flow through the calibrated orifice (Model FSW-31 only).

TERMINAL STRIP WIRING

1. Loosen the round gland nut located on the strain relief cable connector.
2. Insert the cable through the grommet in the strain relief cable connector and tighten the gland nut sufficiently to seal the cable in place.
3. Strip the conductor ends approximately 3/16".
4. Loosen the appropriate terminal strip screw and remove the empty terminal. Insert the bare wire in the terminal barrel and crimp. Place the terminal on the strip in the SAME orientation as received. This is important since the terminals and wires may interfere with the cover if orientation is changed.

ELECTRICAL WIRING SCHEMATICS

Figure 1: Wiring Schematic for power applied to load when flow is GREATER than set point (power to load interrupted when flow is LESS than set point).

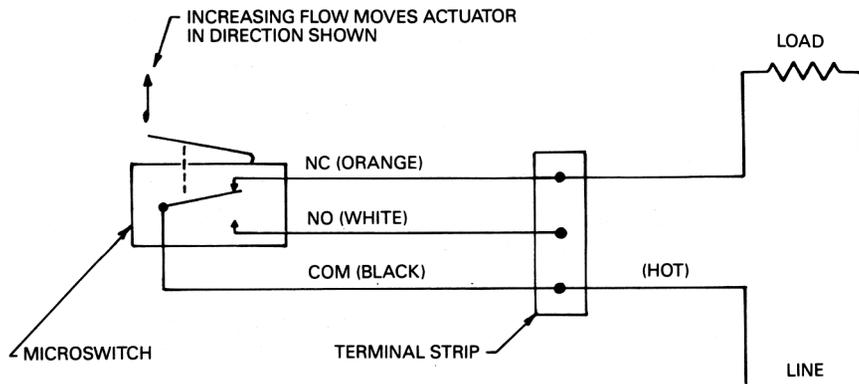
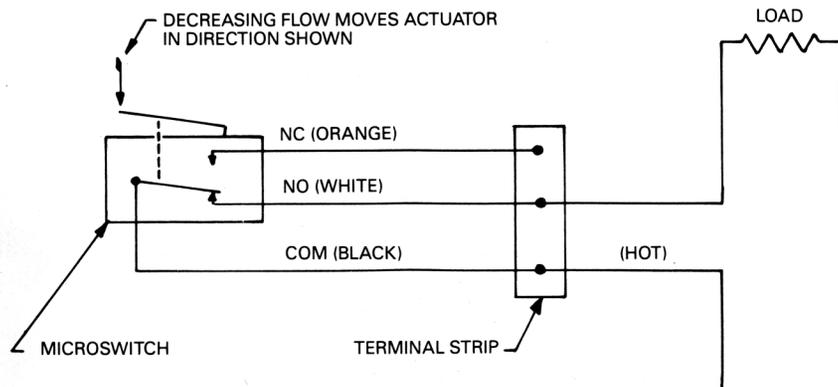


Figure 2: Wiring Schematic for power applied to load when flow is LESS than set point (power to load interrupted when flow is GREATER than set point).



FLOW TURBULENCE EFFECTS

The FSW-31A and FSW-32A Flow Switches are sensitive and fast acting. They respond to pipe system steady state flow and also to local time variable turbulent flow caused by valves, pumps, elbows, orifices, etc. For instance, the average steady state flow in a 4" line immediately downstream of a gate valve may be 100 GPM, however, the gate valve may produce turbulence which rapidly changes the downstream flow in a random fashion in the range 90 to 110 GPM. A flow switch set at 100 GPM steady state will chatter in the 90 to 110 GPM turbulent environment. Several different procedures can be employed to correct the chatter condition.

1. Locate the flow switch at least 5 (and preferably 10) pipe diameters downstream of the source of turbulence.
2. Place a turbulence reducing section between the turbulent source and the flow switch, e.g. fill the main pipe with a bundle of small diameter thin wall tubes for 1 or 2 pipe diameters, or fill the pipe for 1 or 2 diameters with a metal or plastic gauze similar to a scouring pad. Both techniques reduce turbulence effects by breaking large intense flow swirls into a multitude of small less intense flow swirls. A suitable screen will have to be employed to retain the tubes or gauze. Consideration will have to be given to pressure loss effects.
3. Another approach is to "de-tune" the flow switch, i.e., set it to operate below the lower turbulence induced flow rate. In the 4" example cited above, the adjusting spring could be relaxed so that the switch is activated at 90 GPM or slightly lower. In any given field situation, this is simply accomplished by relaxing the adjusting spring until the chattering ceases.

NOTE

To retain the proper sensitivity some spring action is required, i.e., approximately 25% extension minimum (approximately 1/4"). If this 25% spring extension condition is reached and chattering still occurs then the next size larger drag disk (drag disk number 3 is larger than drag disk number 4, etc.) will have to be used (for the Model FSW-31A only).

MODEL FSW-32A ADJUSTMENT:

If the procedure in Step 4 has been followed and the microswitch has not been actuated even though the spring is completely relaxed, then the flow rate is too low, and another type flow switch with a lower range must be used. If the adjustment screw has been turned clockwise until the lead screw nut is at the extreme right-hand end of the bracket with the spring fully extended and the microswitch still has not been actuated, then the flow rate is greater than 8 GPM and the Model FSW-32A can not be used. A flow switch with a higher flow range, such as the FSW-31A, should be used. The FSW-32A can be converted into a Model FSW-31A.

To convert a Model FSW-32A into a Model FSW-31A:

- a. Remove the cover.

NOTE

It is not necessary to remove the main body of the switch from the line.

- b. Remove the lid casting from the main body casting.
- c. Remove the orifice pin.
- d. Insert a small screwdriver blade in the groove located in the exposed end of the orifice and pry the orifice toward the body cavity. Remove the orifice and attach Drag Disk #2.
- e. Reassemble without the orifice and orifice pin and proceed as outline below.

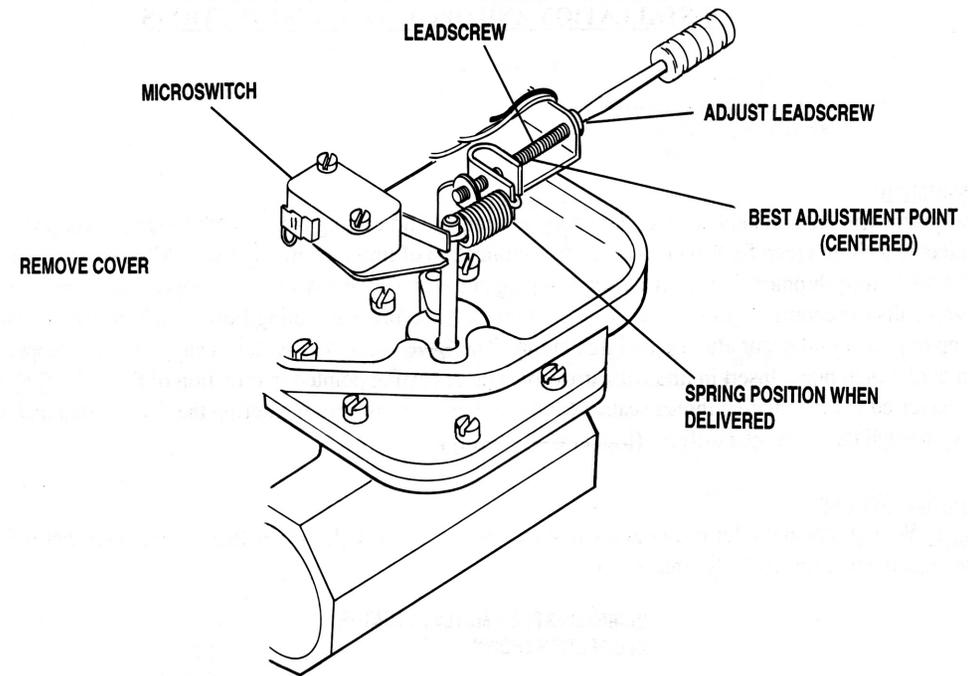
MODEL FSW-31A ADJUSTMENT:

Proceed as in Steps 4 through 6 above. If microswitch action is not obtainable even though the adjusting spring is fully extended, then the flow is too great for the drag disk size and the next smallest drag disk (#3) must be used. If there is still no switch action, then the next smallest drag disk (#4) must be used.

It is possible to convert the Model FSW-31A into a Model FSW-32A as follows:

- a. Remove the cover.
- b. Remove the lid casting from the main body casting.
- c. Remove the drag disk from the end of the feedthrough shaft and replace it with Drag Disk #1(11/4" dia.).
- d. Insert the orifice into the body casting with the 0-ring toward the upstream hole and press into place.
- e. Insert the orifice retaining pin. Ensure that the pin is properly inserted in the groove in the orifice.
- f. Re-assemble and follow the procedure in Step 4.

FLOW SWITCH OPERATIONAL ADJUSTMENT



GENERAL SWITCH POINT ADJUSTMENT

1. Remove the anodized aluminum cover.
2. Adjust the fluid flow in the system to the desired rate without regard to the switch point setting.
3. The switch point adjusting mechanism consists of an adjusting screw (Leadscrew), a "U" shaped leadscrew nut, and a helical spring. CLOCKWISE rotation of the adjusting screw changes the microswitch actuation point toward HIGHER flow rates (COUNTERCLOCKWISE rotation toward LOWER flow rates).

NOTE

All units are factory set at the lower end of the flow range, i.e., the adjusting screw is set at the low flow COUNTERCLOCKWISE position. The "U" shaped nut locks the adjusting screw in position, maintaining the flow switch set point under all environmental conditions.

4. Turn the adjusting screw in a clockwise direction until the microswitch is actuated while maintaining the desired fluid flow rate in the system. Turn the adjusting screw TWO additional turns in the clockwise direction and then slowly back off in a counterclockwise direction until the microswitch is again actuated. The flow switch is now set for maximum sensitivity for detecting small flow changes.
5. When set for maximum sensitivity (100% point) as described in step 4 above, flow turbulence may cause rapid on/off switching (dithering) of the microswitch contacts, resulting in reduced switch contact life and "noise" in the electrical circuit. This is eliminated by turning the adjusting screw in a counterclockwise direction.
6. Microswitch actuation point may be monitored during the adjustment procedure detailed in Step 4 above by an audible click or with an Ohm meter before connecting line power to the terminal strip or by monitoring the voltage supplied to the load through the microswitch.
7. If the system flow rate is changed to a rate that is within the orifice or drag disk range presently installed in the unit, the unit may be adjusted to monitor the new flow rate by turning the adjustment screw in a counterclockwise direction until the spring is fully relaxed to the minimum flow position. Then proceed as in Step 4 above.

