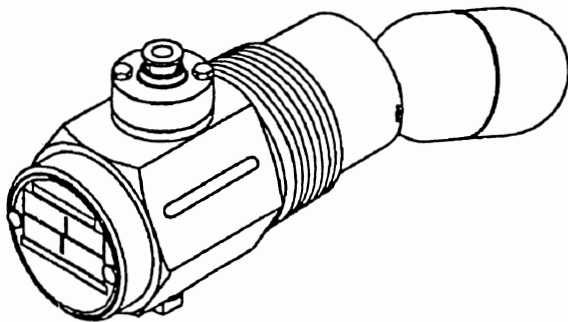


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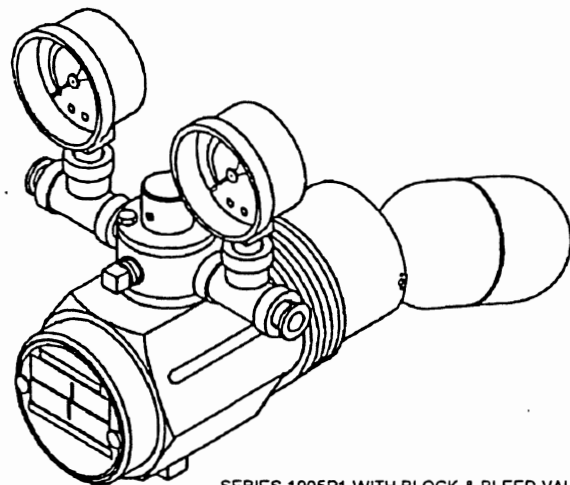
NORRISEAL[®]
A **DOVER** RESOURCES COMPANY

OPERATING AND MAINTENANCE MANUAL
1005P1 LIQUID LEVEL SWITCH

701007M



SERIES 1005P1 WITH BLOCK & BLEED VALVE



SERIES 1005P1 WITH BLOCK & BLEED VALVE
AND INTEGRAL 3-WAY PILOT

Caution: Before disassembly or maintenance, all pressures in this device must be relieved. Failure to relieve pressures may result in personal injury or device damage. The resulting uncontrolled venting or spilling of line fluids may cause personal injury, loss of process control or environmental contamination.

1 INTRODUCTION

The Series 1005P1 LLS is a pneumatic switch consisting of a block and bleed snap acting valve actuated by pivotal movement of a float. Model "O" (refer to the cover) with block and bleed valve only, can be used as a high or low level alarm for pneumatic panels. Model "P" (refer to the cover) features an optional 3-way air pilot integrally couples to the block and bleed valve that can be used to operate a pneumatic valve in the cont of liquid in separators, scrubbers, etc.

1.1 MODEL DESIGNATION

Model 1018 - V P

BODY MATERIAL	CODE
1018 Carbon Steel	1018
316 Stainless Steel	0316

CODE	PILOT OPTIONS
P	With Pilot
O	Without Pilot

AIR/STEM FLOAT MATERIAL			
SERVICE	AIR/STEM	FLOAT	CODE
Standard	316 SST	304 SST	—
H2S*	316 SST	304 SST	N

CODE	SEAL MATERIAL		MAX. TEMP.
	WETTED	NONWETTED	
V (Std)	Fluorocarbon	Nitrile	180°F
B	Nitrile	Nitrile	180°F
F	Fluorocarbon	Fluorocarbon	250°F

1.2 SPECIFICATIONS

1.2.1 Performance Characteristics

Pilot

Type	3-Way
Connections	0.125" NPT Female
Pressure Gauges	0-30 psig (Std.) 0-60 psig (Opt.)

Supply Pressure

Minimum Operating	15 psig
Max. Operating	50 psig
Max. Allowable	100 psig

Flow Coefficients

Block & Bleed Output	Cv 0.11
Pilot Output	Cv 0.28
Pilot Consumption	Cv 0.007

Temperature (dependent on material selection

- see section 1.2.2)	250°F
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Pressure Rating

Body	1500 PSIG
Float (dependent on float selection - see section 1.2.3)	1500 PSIG

Specific Gravity (minimum is dependent on Float,

Arm & Counterbalance - see section 2.1.2)	0.35 SG min.
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1.2.2 Material

Body	1018 Carbon Steel (Std.) 316 Stainless Steel (Opt.)
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Float	304/316 Stainless Steel
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Seals

Wetted	Fluorocarbon (Std.) Nitrile (Opt.)
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Non-Wetted	Nitrile (Std.) Fluorocarbon (Opt.)
------------------	---------------------------------------

1.2.3 Configuration

Body

Sizes	2.0"
NPT Male	1500 PSIG

Vent connection	0.25" NPT Female
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Float (color dependent on weight designation & intended service)

Standard/General Purpose	Yellow (1500 PSIG)
Standard/H2S	Black (800 PSIG)
Heavy/General Purpose	Orange (1500 PSIG)
Heavy/H2S	Green (1050 PSIG)

Options/Accessories

Float Extension Arms, 40 Micron Air Filter, Pipe Adapters, External Float Chamber

2 INSTALLATION AND START-UP

2.1 CONFIGURATION

2.1.1 Level Sensing Mechanism

The level sensing mechanism consisting of a float, a counterbalance and, as an option, a float extension arm, is available in numerous configurations that directly effect:

- The minimum fluid specific gravity in which the unit will operate.
- The installation clearance necessary for full pivotal float movement.

Examine the following to determine the minimum allowable fluid specific gravity and installation clearance requirements.

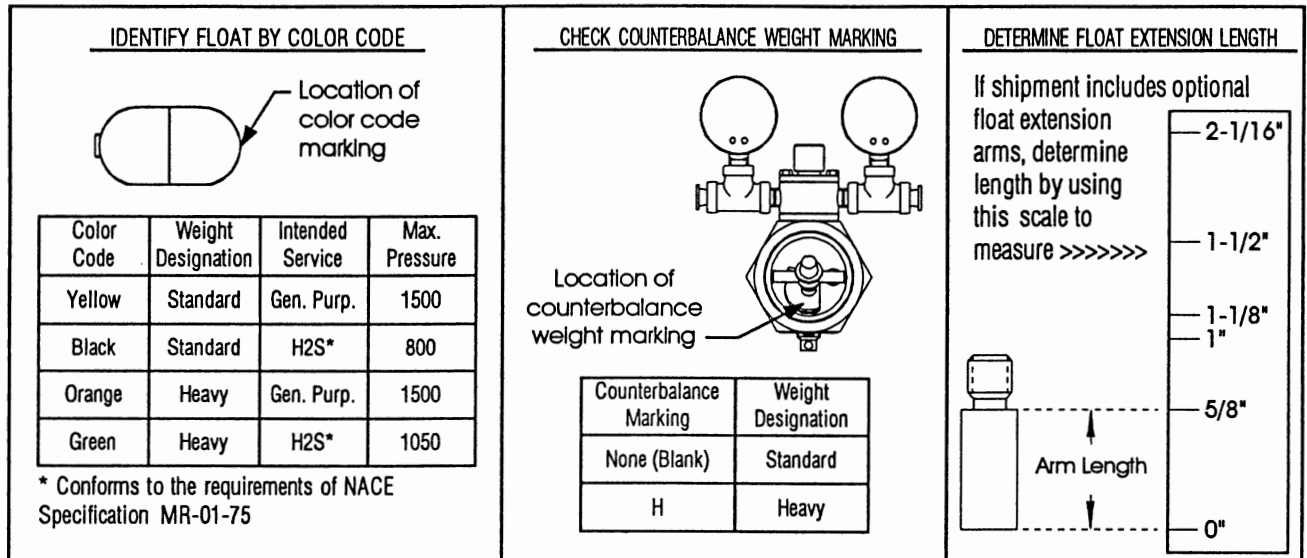


Figure 1. Level Sensing Mechanism Identification

2.1.2 Fluid Specific Gravity

Having identified the components of level sensing mechanism, use the following table to ensure that the minimum allowable fluid specific gravity value shown in Table 1 is equal to or lower than that of the process fluid being sensed by level switch.

FLOAT WEIGHT DESIGNATION	COUNTERBALANCE WEIGHT DESIGNATION	MINIMUM ALLOWABLE FLUID SPECIFIC GRAVITY					
		Float Extension Arm Length					
		None	5/8"	1"	1-1/8"	1-1/2"	2-1/16"
Standard	Standard	0.60	0.63	0.66	0.67	0.7	0.75
Standard	Heavy	N/A	0.35	0.4	0.42	0.47	0.54
Heavy	Standard	0.78	0.79	0.8	0.8	0.82	0.88
Heavy	Heavy	N/A	0.48	0.51	0.52	0.55	0.61

N/A - Not Applicable; Incompatible Combination

Table 1. Minimum Allowable Process Fluid Specific Gravity

2.1.3 Vessel Clearance Requirements

Use the following table to ensure that the minimum operational clearance requirements are within the confines of vessel nozzle, baffles and walls to allow for full pivotal movement of float and arm.

2.1.3 Vessel Clearance Requirements (Continued)

Table 2. Minimum Operational Clearance Requirements

FLOAT CLEARANCE DIMENSIONS WITH STANDARD COUNTERBALANCE												
NOZZLE I.D.	WITHOUT EXTENSION ARM				WITH 5/8" LONG EXTENSION ARM				WITH 1" LONG EXTENSION ARM			
	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. P
2.22	2.22	↑	↑	↑	2.63	↑	↑	↑	2.92	↑	↑	↑
2.50	2.37	5.60	4.11	4.32	2.69	6.23	4.68	4.89	2.95	6.60	4.99	5.22
2.75	2.60				2.78				3.00			
3.00	2.85	↓	↓	↓	2.90	↓	↓	↓	3.06	↓	↓	↓

NOZZLE I.D.	WITH 1-1/8" LONG EXTENSION ARM				WITH 1-1/2" LONG EXTENSION ARM				WITH 2-1/16" LONG EXTENSION ARM			
	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. P
2.22	3.03	↑	↑	↑	3.36	↑	↑	↑	3.69	↑	↑	↑
2.50	3.05	6.73	5.10	5.33	3.36	7.10	5.43	5.67	3.76	7.67	5.93	6.18
2.75	3.09				3.38				3.87			
3.00	3.16	↓	↓	↓	3.41	↓	↓	↓	3.87	↓	↓	↓

DIM. A = 52.24 DEG.

- NOTES: 1. Dimensions shown assume an unchamfered nozzle thread machined to a plug gauge tolerance of ± 1 turn.
2. Dimensions T, D and H are maximums; Dimension P is subject to a tolerance of ± 0.13 ".

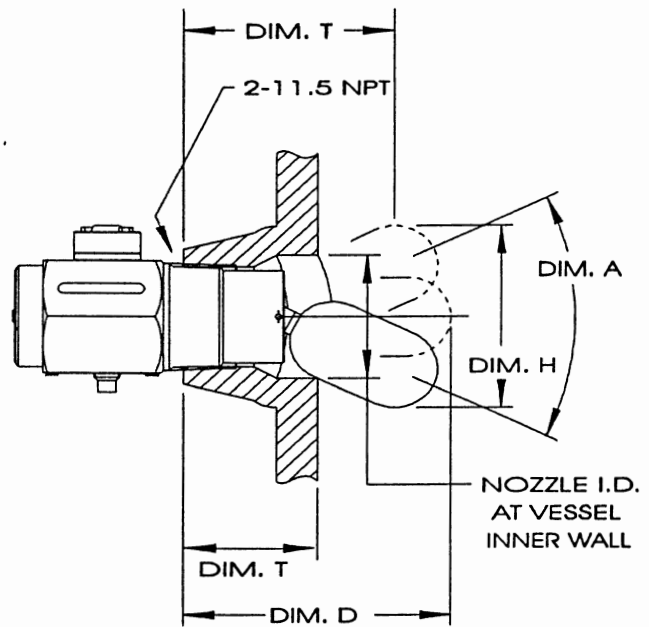


Table 2. Minimum Operational Clearance Requirements (Continued)

FLOAT CLEARANCE DIMENSIONS WITH HEAVY COUNTERBALANCE														
NOZZLE I.D.	WITHOUT EXTENSION ARM				WITH 5/8" LONG EXTENSION ARM				WITH 1" LONG EXTENSION ARM					
	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. P		
2.22					2.79	↑	↑	↑	3.07	↑	↑	↑		
2.50	INCOMPATIBLE COMBINATION				2.90	6.23	4.03	5.02	3.15	5.60	4.28	5.37		
2.75					3.05			3.25			3.40			
3.00					3.33	↓	↓	↓	↓	↓	↓	↓	↓	↓

NOZZLE I.D.	WITH 1-1/8" LONG EXTENSION ARM				WITH 1-1/2" LONG EXTENSION ARM				WITH 2-1/16" LONG EXTENSION ARM			
	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. F	DIM. T	DIM. D	DIM. H	DIM. P
2.22	3.18	↑	↑	↑	3.49	↑	↑	↑	4.01	↑	↑	↑
2.50	3.24	6.73	4.37	5.49	3.53	7.10	4.63	5.84	4.01	7.67	5.02	6.37
2.75	3.33				3.59				4.04			
3.00	3.48	↓	↓	↓	3.67	↓	↓	↓	4.09	↓	↓	↓

DIM. A = 40.29 DEG.

2.2 NAMEPLATE LOCATON AND INFORMATION MARKINGS

Before installing level switch or ordering spare parts, review the information on the pressure/temperature nameplate and model/serial number nameplate, examples of which are shown in Figure 2.

Working & Supply Pressure Nameplate Information

Maximum Working Pressure: The maximum pressure at which the level switch can safely be operated.

Supply Air Pressure:

Min. Opera. - The minimum supply pressure at which the 3-way air pilot will reliably operate.

Max. Oper. - The maximum supply pressure at which the level switch can continually operate.

Max.Allow - For momentary over pressure protection; may result in a loss of 3-way air pilot pressure gauge accuracy.

Max. Temp - The maximum process fluid temperature to which the unit can be exposed without damage.

Model & Serial Number nameplate Information

Model Code - Refer to section 1.1 for explanation.

Serial No - A unique number assigned to each unit for the purpose of identification & traceability.

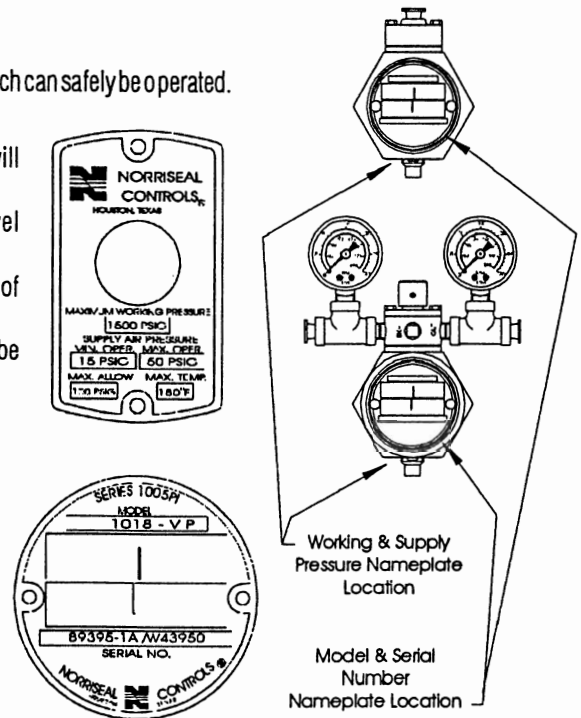


Figure 2. Pressure/Temperature & Model/Serial Number Nameplates

2.3 ORIENTATION

The 1005P1 Level Switch can be operated in either a direct acting or reverse acting mode that is governed by the direction in which the block & bleed valve (and 3-way pilot if so equipped) is oriented relative to the float position. Keeping in mind that a rising level causes float to pivot up and a falling level allows float to pivot down, review Figure 3 to determine the orientation required to provide the desired operation.

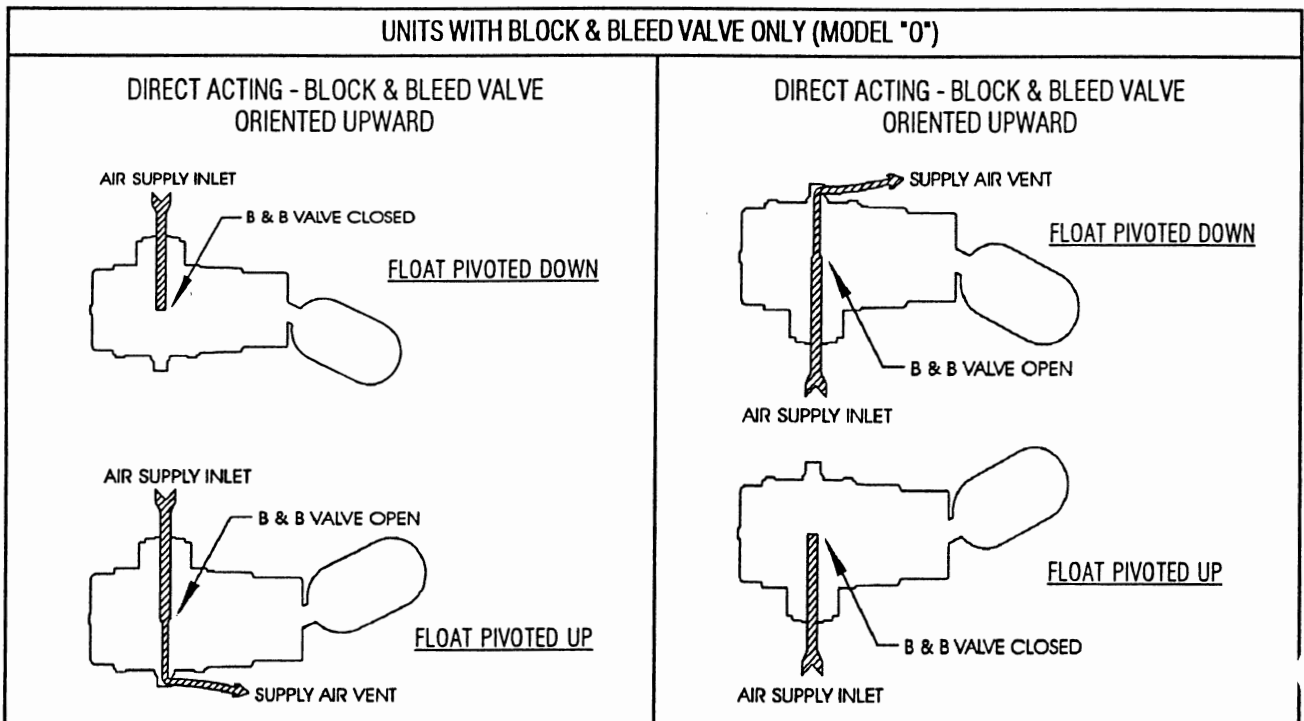
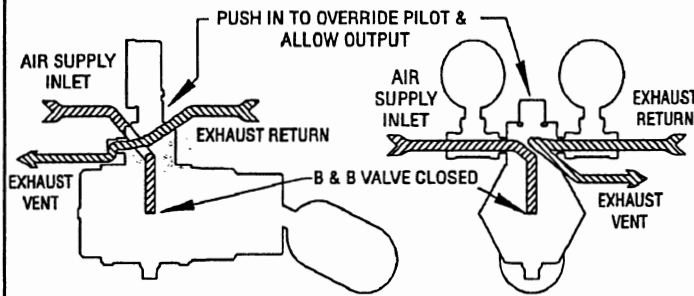


Figure 3. Orientation

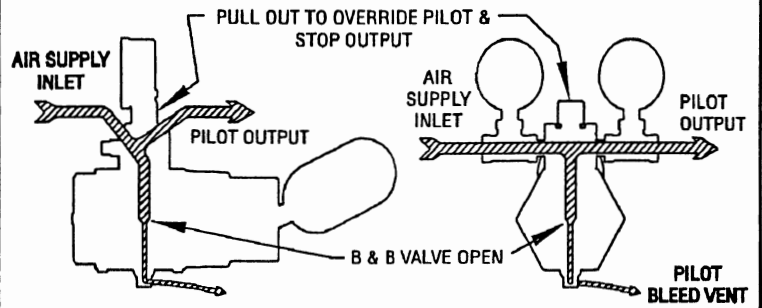
UNITS WITH BLOCK & BLEED VALVE AND OPTIONAL 3-WAY PILOT (MODEL "P")

DIRECT ACTING - BLOCK & BLEED VALVE AND OPTIONAL 3-WAY PILOT ORIENTED UPWARD

FLOAT PIVOTED DOWN

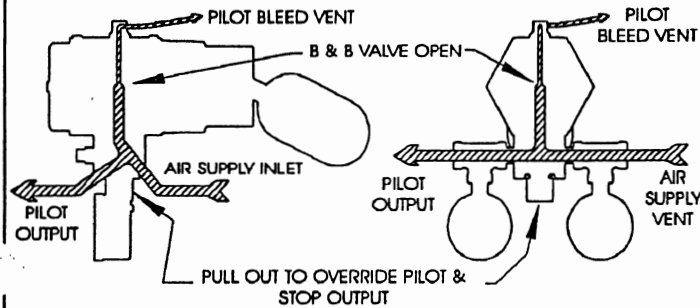


FLOAT PIVOTED UP

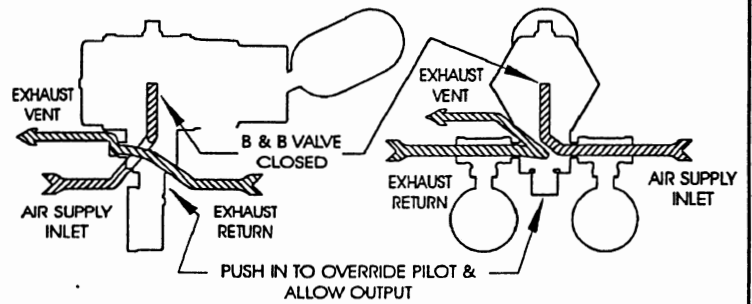


DIRECT ACTING - BLOCK & BLEED VALVE AND OPTIONAL 3-WAY PILOT ORIENTED UPWARD

FLOAT PIVOTED DOWN



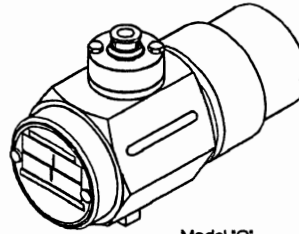
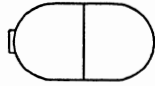
FLOAT PIVOTED UP



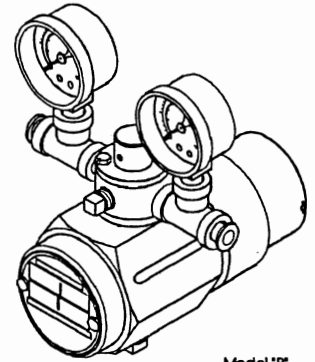
2.4 START-UP

Unpack shipment contents and inspect; included are the following items:

- (1) Factory calibrated and tested Series 1005P1 Liquid Level Switch less float; Model "O" if equipped with block and bleed only (below), or Model "P" if equipped with optional 3-way air pilot (below right).
- (1) Prepackaged .02 Fl.Oz. tube of Loctite Corp. Threadlocker 242
- (1) Colored coded float.



Model "O"



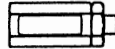
Model "P"

Available as options or accessories, shipment may also contain one or more of the following:

Float Extension arm(s)



40 micron air supply filter



1/8"NPT male x 1/4"NPT female pipe adapter(s) for air connection size conversion.



2.5 INSTALLATION

2.5.1 Attachment of Float & Extension Arm

As shown in Figure 4, remove the counterbalance thread protector and apply Threadlocker 242 to the screw threads of counterbalance, float and, if used, extension arm in accordance with manufacturer's instructions on the back of package.

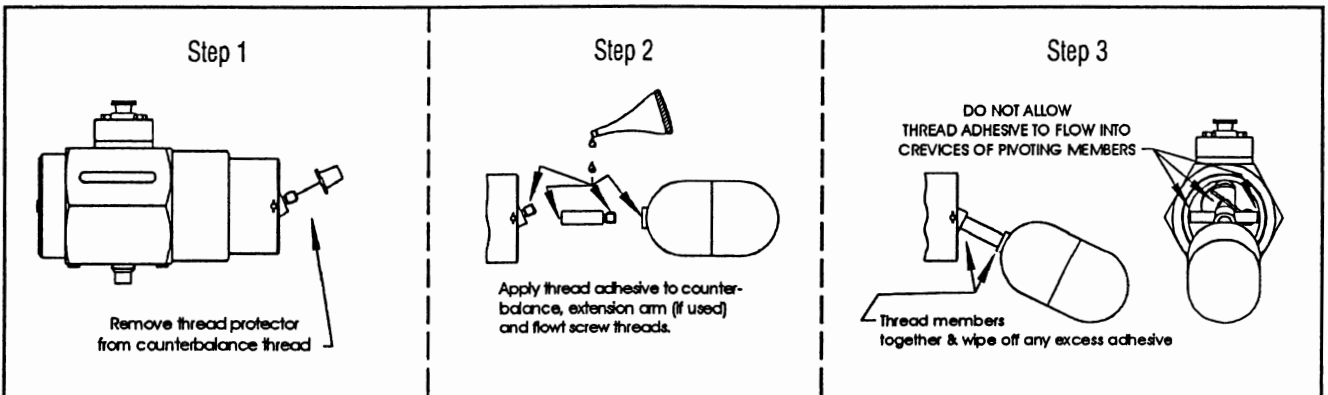


Figure 4. Float & Extension Arm Attachment

CAUTION

Do not allow threadlocking adhesive to overflow onto adjacent pivot components. Seized mechanisms due to over application or misuse of thread adhesive are not covered by level switch warranty.

2.5.2 Install the Level Switch

As shown in Figure 5 remove thread protector from LLS body threads, apply a suitable pipe thread sealant or wrap threads with TFE pipe tape and thread switch into vessel connection. Make-up such that when tight, block & bleed valve (or 3-way pilot) is oriented to provide the desired operation as described in Figure 3.

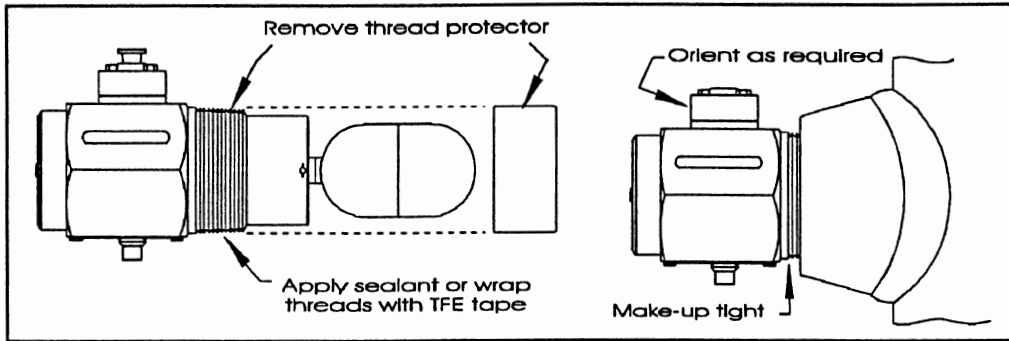


Figure 5. Installing Level Switch

2.5.3 Installing Air Supply Connections

Apply pipe thread sealant to the male threads of air connection fitting(s) and connect airline(s) to the block & bleed valve inlet (Model "O") or the pilot inlet and outlet connections (Model "P"). If required, remove vent and/or exhaust plugs and connect additional line(s) if piping away vent/exhaust air. Connect a regulated source of clean, dry supply air not exceeding the maximum operating supply pressure (refer to Figure 2).

CAUTION
For maximum service life, supply air should be filtered to prevent passage of particles large than 40 micron.

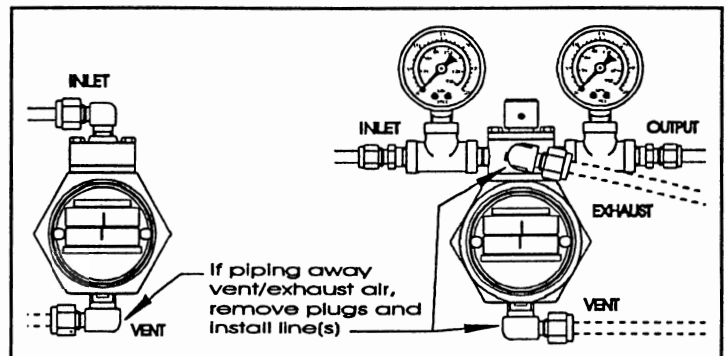


Figure 6. Air Supply Connections

2.5.4 Installing Optional Filters and Pipe Adapters

If shipment includes optional air filter or if pipe adapters are being used to enlarge level switch air connections from 1/8" to 1/4" NPT, apply a suitable pipe thread sealant to these items, remove thread protectors from switch and install as shown in Figure 7.

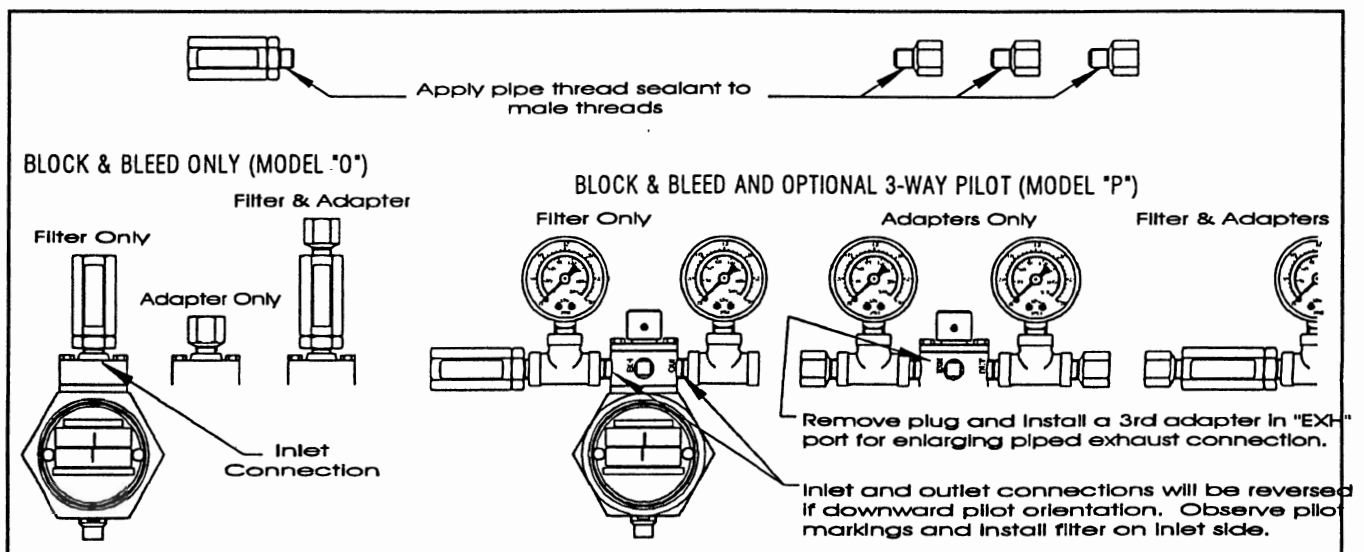


Figure 7. Optional Filter and Adapters

CAUTION
Do not wrap air connection fittings with pipe tape as tape fragments can become entrapped within small orifices of block & bleed valve and pilot causing possible malfunction of level switch.

3 OPERATION

3.1 MOTION TAKE-OFF MECHANISM

As shown in Figure 7, the short leg of the level switch shaft, connected to the counterbalance and float with a wire retainer, rotates as the float pivots. This in turn rotates the cam attached to the shaft's opposite end. The rotation of cam by the shaft and float allows the block & bleed valve (only partially shown in this view) to open and close.

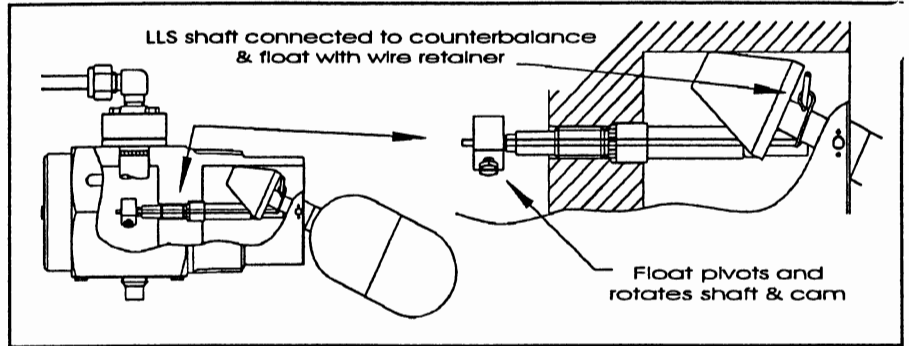


Figure 7. Optional Filter and Adapters

3.2 BLOCK & BLEED VALVE

Remove the knurled LLS body end cap to observe block & bleed valve. The valve consists of an orifice through which the flow of supply air is governed by the movement of a flapper that is controlled by a float driven cam. When float is pivoted to the Side Opposite that of inlet connection (Figure 8a), the cam rotates to move flapper against nozzle orifice and close valve. When float is pivoted to the same side as inlet connection, (Figure 8b), cam rotates allowing air pressure to push flapper away and open valve.

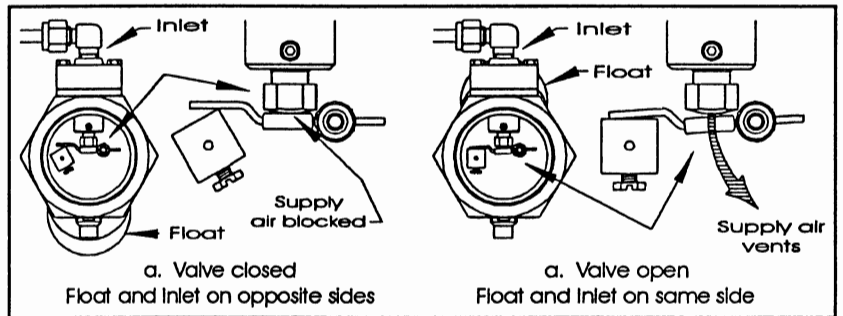


Figure 8. Block & Bleed Valve

3.3 3-WAY AIR PILOT

The 3-way pilot operates on a differential pressure area principle and is actuated by the opening and closing of the block & bleed valve. Pilot action can be switched at any time by use of the manual override. Supply air passes from the inlet connection through a small hole in lower diaphragm and into pilot lower chamber. When the block & bleed valve is closed (Figure 9a), the captured supply air acts on the differential area of lower diaphragm simultaneously causing:

1. The lower diaphragm to move against lower seat shifting pilot closed to prevent output.
2. The upper diaphragm to move away from upper seat opening pilot exhaust and allowing return air to vent from pilot "EXH" port (cutaway from this view).

Pushing in manual override knob reverses pilot action to deliver output and close exhaust until override knob is released.

When the block & bleed valve is open (Figure 9b), the air pressure on underside of the lower diaphragm vents relieving the pressure force imbalance and simultaneously causing:

1. The lower diaphragm to move away from lower seat shifting pilot open to deliver output.
2. The upper diaphragm to move against upper seat closing pilot exhaust port.

Pulling out manual override knob reverses pilot action to stop out put and allow exhaust until override knob is released.

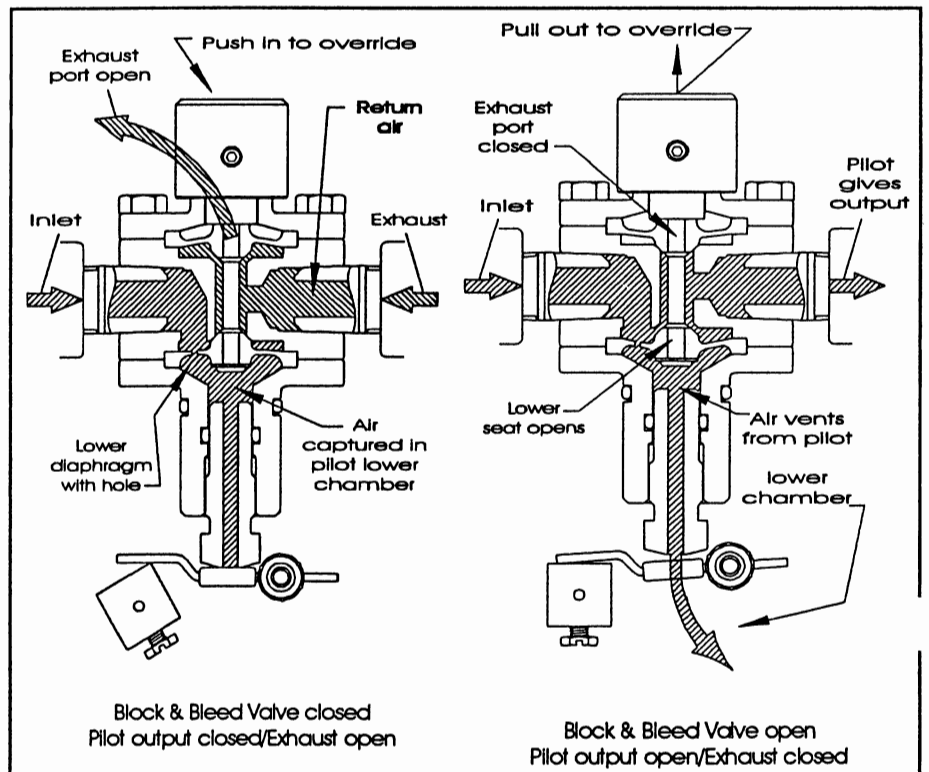


Figure 9. 3-Way Pilot

3.4 CONTROL ADJUSTMENT

Each 1005P1 level switch is factory set and tested for proper function and leakage and is unlikely to require adjustment. It is recommended that the following sections on cam and nozzle adjustment be reviewed before changing factory settings.

NOTICE

The cam and nozzle have one correct setting and are not intended as adjustments for varying control characteristics such as level change span or pilot output pressure.

3.4.1 Cam Adjustment

IMPORTANT

Cam adjustment must be performed with the float pivoted to either the full upward or full downward position. If adjustment is made with level switch installed in a vessel, make certain as to the float's actual position.

Unless the cam has been removed for switch maintenance or repairs, or the securing screw has vibrated loose, it is strongly recommended that the following adjustment procedure be reviewed and the correct setting be compared to the Actual setting of the switch unit BEFORE loosening cam screw.

As shown in Figure 10a, when the float is fully pivoted to the SAME SIDE as the block & bleed connection or pilot (the preferred position for cam adjustment), the cam must be rotated horizontal. A slight deviation of a couple of degrees in either direction will not impair operation. Having the float attached is not required for cam adjustment; if the block & bleed inlet connection (or pilot) is oriented upright, counterbalance will automatically pivot to the correct position for horizontal cam setting.

When the float is FULLY pivoted the Side Opposite that of the block & bleed connection or pilot, cam must be rotated approximately 30 degrees in the correct direction from horizontal as shown in Figure 10b. Proper positioning will occur when the flapper is lifted parallel to the nozzle seal face.

Use a 3/16" open end wrench to loosen cam screw. Hold cam in the proper position and tighten screw.

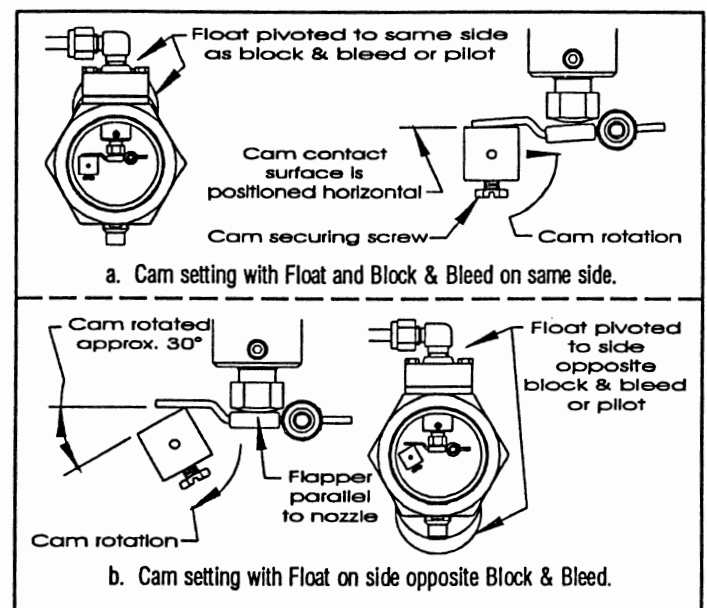


Figure 10. Cam Adjustment

CAUTION

Use extreme care when tightening cam screw. Excessive torque can bend LLS shaft.

If your installation contains many Series 1005P1 level switches and/or maintenance program is such that frequent cam adjustment is required, a special cam and shaft holding tool is available from Norriseal Controls (see page 13).

3.4.2 Nozzle Adjustment

IMPORTANT

Cam must be correctly set and float must be fully pivoted to the side opposite that of the block & bleed inlet connection (or pilot) placing valve in the closed position for the most accurate nozzle adjustment.

Loosen nozzle set screw with a 1/16" hex (allen) wrench. Use a 5/16" open end wrench to turn nozzle outward for firm contact against flapper seat as shown in Figure 11. Nozzle-to-flapper seat contact pressure NEED ONLY BE SUFFICIENT TO PREVENT SUPPLY AIR LEAKAGE.

CAUTION
Do not adjust nozzle outward beyond that necessary to achieve tight shut-off with flapper seat as it can restrict float movement and impair operation.

Retighten set screw after completing adjustment.

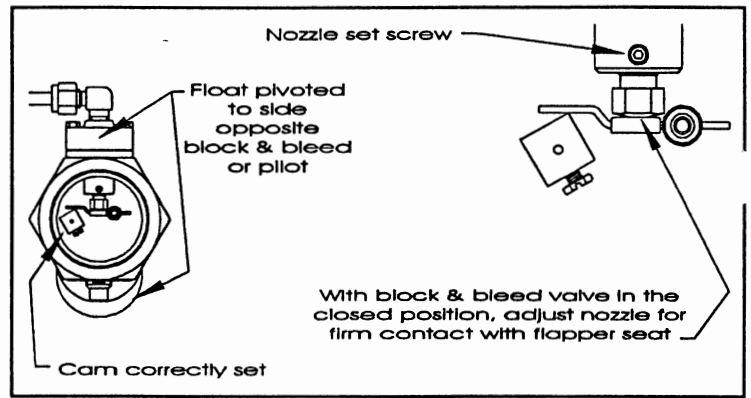


Figure 11. Nozzle Adjustment

4 MAINTENANCE

4.1 PREVENTIVE MAINTENANCE

The frequency of periodic maintenance will largely depend on the type of service in which the level switch operates. Obviously, harsh conditions such as high pressure, high or low temperature, corrosive fluid, environmental extremes, etc., will dictate a different maintenance program than that of a light or moderate service. It is because of these variables that a regimented maintenance schedule is impractical to prescribe and must be left to the judgement of the user/operator.

Assuming the appropriate seals and body materials have been selected, the float, extension arm (if used) and counterbalance have been properly sized for the fluid specific gravity and adequate vessel clearance has been provided, there is little more required than an occasional cleaning and seals replacement. See model nameplate (page 5) to identify seal materials.

4.1.1 Spare Parts

It is suggested that one set of components identified as "recommended spare parts" in the accompanying parts lists be available for each level switch. For best resistance to ageing, elastomeric spares such as gaskets, diaphragms, orings, etc., should be stored in poly-ethylene bags then placed in cardboard boxes. When so protected, nitrile seals can be stored for 2 to 5 years and fluorocarbon for 10 to 20 years.

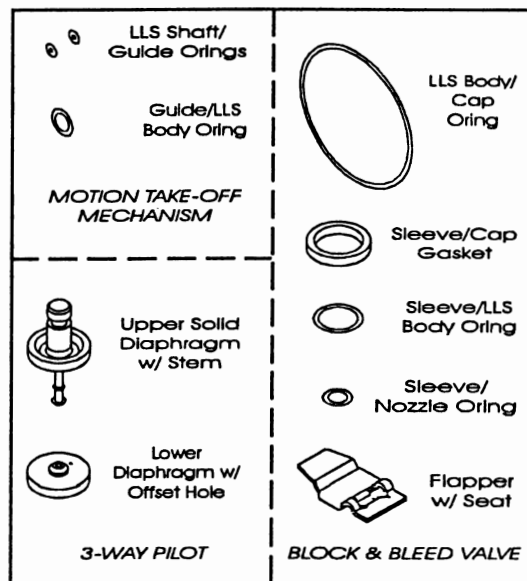


Figure 12. Recommended Spare Seals

Some non-wearing items can also qualify as spare parts because they are easily lost or damaged if proper care is not exercised during maintenance. Examples of such parts is shown Figure 13. The need to maintain this type of spares is left to the judgement of the user/operator.

4.1.1 Spare Parts (continued)

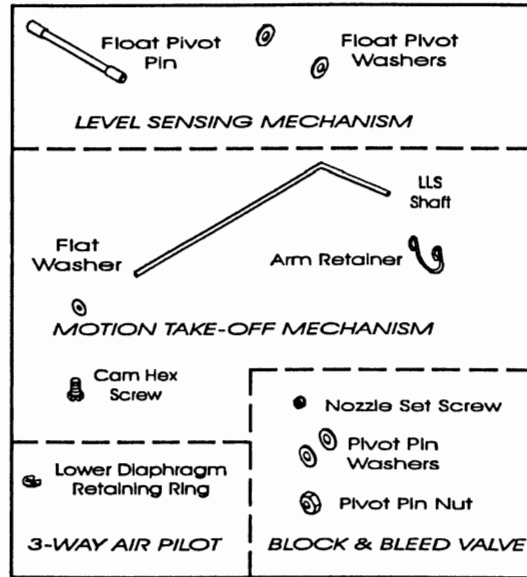


Figure 13. Optional Non-wearing Spares

4.2 TOOLS & SUPPLIES

Maintenance of the Series 1005P1 requires no "special" equipment, however, certain tools and supplies are essential for some repairs and a particular class of lubricant and thread adhesive is recommended. While not an absolute must for level switch operation, block & bleed valve (or pilot) securing screws should be torqued to 30-35 lbs. in. for safety and protection against loosening. Within the repair procedures, references to specific tools and materials are made only where such items are essential or best suited for the particular task. Review the following table before proceeding with repairs.

4.2.1 Essential Adhesives and Lubricant

Thread adhesive	Loctite 242 Threadlocker or equivalent. MAKE CERTAIN THAT THE ADHESIVE IS SERVICE REMOVABLE.
Lubrication	a high viscosity, petroleum based lubricant such as Lubriplate 105 or a high quality bearing grease. DO NOT USE SILICONE BASED LUBRICANT.
Pipe thread sealant	Loctite Pneumatic/Hydraulic Thread Sealant 545 or some other suitable sealant. DO NOT USE PIPE TAPE.

4.2.2 Essential Tools for Servicing Level Sensing Mechanism (Float, counterbalance, pivot pin and washers.)

Hand drill or dill press and 1/8" twist drill.	Hammer and center punch.
Bench vise or other means of fixturing level switch.	Needle nose pliers.
3/16" open end wrench.	Thread adhesive.

4.2.3 Essential Tools for Servicing Motion Take-Off Mechanism (Shaft, retainer, washer, guide, orings and cam.)

All of the tools noted above for level sensing mechanism.
 1/4" drive x 1/4" wrench bolt clearance (deep well) socket.
 1/4" drive hand driver or ratchet and extension.
 Lubricant.

4.2.4 Essential Tools for Servicing Block & Bleed Valve (Flapper nut, washers, flapper & seat, pivot pin, securing screws, cap, gasket, sleeve, nozzle and orings.)

1/4" drive hand driver or ratchet and extension.	1/8" wide flat tip screwdriver
1/4" drive x 1/4" wrench bolt clearance (deep well) socket.	Thread adhesive.
1/6" hex (allen) wrench.	Lubricant.
5/16" open end wrench.	Pipe thread sealant.

4.2.5 Essential Tools for Servicing 3-Way Air Pilot (Securing screws, retaining ring, lower diaphragm, pilot body, stem & upper diaphragm, cap, override knob & set screw, gauges and fittings.)

Needle nose pliers.
1/6"hex (allen) wrench.

External pipe wrench with 1"minimum jaw capacity.
Pipe thread sealant.

4.3 SEALS REPLACEMENT AND GENERAL REPAIRS

Switch maintenance, repairs and seals replacement are straightforward requiring full or partial mechanism disassembly, inspection, cleaning and/or replacement of failed or damaged part(s), and, if necessitated by the repair, resetting of the cam and/or nozzle. Follow the procedures as they apply to the specific repair being performed; it may not be necessary to completely disassemble an entire mechanism even though the procedure provides for such. In some instances it may be more cost efficient to spend the extra few minutes and replace all seals once a mechanism is disassembled, even if only one oring has failed, due to the expense of repetitive maintenance and/or system downtime. In the following repair procedures, item numbers refer to those shown on the accompanying parts lists.

4.4 ACCESSORIES & MAINTENANCE SUPPLIES

DESCRIPTION	STOCK NO.	DESCRIPTION	STOCK NO.
LOCTITE CORP. 242 SERVICE REMOVAABLE THREAD ADHESIVE - .02 FL. OZ.	426122	1/4 NPT FEMALE X 1/8 NPT MALE PIPE ADAPTER CARBON STL	426169
AIR SUPPLY FILTER WITH REPLACEABLE 40 MICRON BRONZE ELEMENT	426226	EXTERNAL FLOAT CHAMBER 1.00 NPT PROCESS CONNECTIONS CARBON STL	412754
REPLACEMENT ELEMENT AND SEAL KIT FOR SUPPLY AIR FILTER ABOVE	426227	CAM AND SHAFT HOLDING TOOL FOR MOTION TAKE-OFF MECHANISM	422051

IMPORTANT

Always refer to the Model and Serial Numbers located on Item 47 Model & Serial Nameplate when ordering spare parts or accessories. See page 4, Figure 5.

4.5 LEVEL SENSING MECHANISM

WARNING

To avoid personal injury and property damage, be absolutely certain that all process and supply pressure has been vented prior to removal and disassembly of level switch.

4.5.1 Disassembly

- Unthread and remove Item 48 Float and, if used, Item 57 Arm Extension.
- Clamp LLS Assembly in a bench vise allowing access for removal of item 2 Pivot Pin.
- Use an 1/8" twist drill to drill out deformed hole edges of Pivot Pin stake (Figure 14). Position drill on Pin Center. It is only necessary to drill out stake on one side of LLS body and no deeper than that required for pin removal.
- As shown in Figure 15, remove Item 8 cap for LLS body then use a 3/16" open end wrench to loosen Item 28 Cam Screw. Remove Item 27 Cam from Shaft. Provide shaft/cam support to prevent bending LLS shaft when loosening cam securing screw.
- Push out Item 2 Pivot Pin, remove Item 17 Washers, then gently pull the entire Counterbalance/Retainer/LLS Shaft Assembly (Items 11, 18 & 12) straight outward from End of Body only far enough to slide Counterbalance/Retainer sideways and disengage from Short Leg of Shaft as shown in Figure 16.

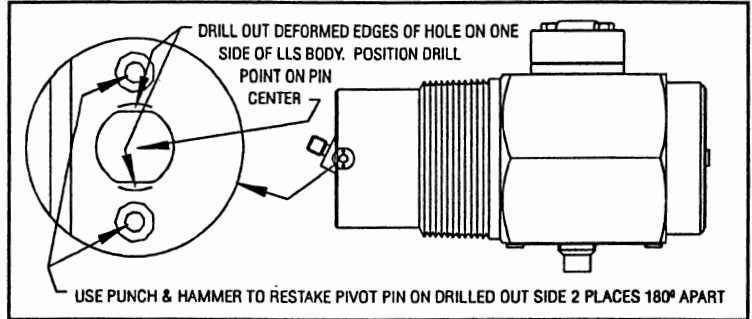


Figure 14. Drilling removal and restaking of Float Pivot Pin.

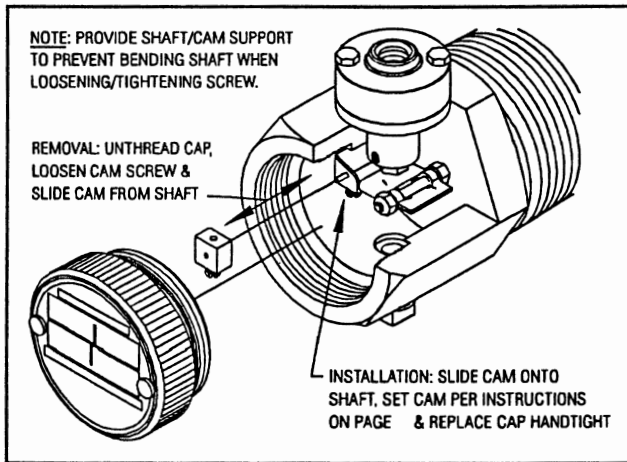
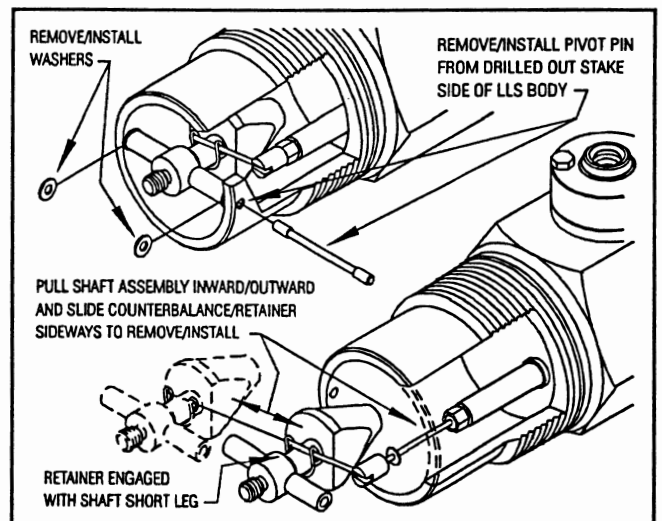


Figure 15. Cap and Cam removal/installation

4.5.2 Reassembly

- As shown in Figure 16, orient LLS with block & bleed (or pilot) upright and gently pull Item 12 LLS Shaft out until extended about 1" from End of Item 37 LLS Body.
- Rotate Short Leg of Shaft to the 9 o'clock position and place Loop of Item 18 Retainer around underside of Item 11 Counterbalance Shank with Retainer Hooks facing inward as shown. While maintaining engagement, slide Counterbalance/Retainer sideways and hook Retainer onto Short Leg of Shaft then gently push the entire Counterbalance/Retainer/Shaft Assembly inward into Item 3 Guide.
- On the side of LLS body that stake was drilled out, install on Item 17 Washer between End of Bushing Portion of Counterbalance and Inner Wall of LLS Body, align holes and insert Item 2 Pivot Pin until End of Pin projects just beyond Opposite End of Counterbalance Bushing, install remaining Washer and push Pin through and against staked hole.

Figure 16. Level Sensing Mechanism removal/installation



4.5.2 Reassembly (continued)

- d. Perform the assembly checks shown in Figure 17 then clamp LLS in a bench vise and use a center punch and hammer to restake Pivot Pin on side previously drilled out (Figure 14).
- e. As shown in Figure 15, install Cam and set per Cam Adjustment on page 10. Install Item 8 Cap and make-up handtight.
- f. Reattach items 48 Float and 57 Arm per page 4 instructions.

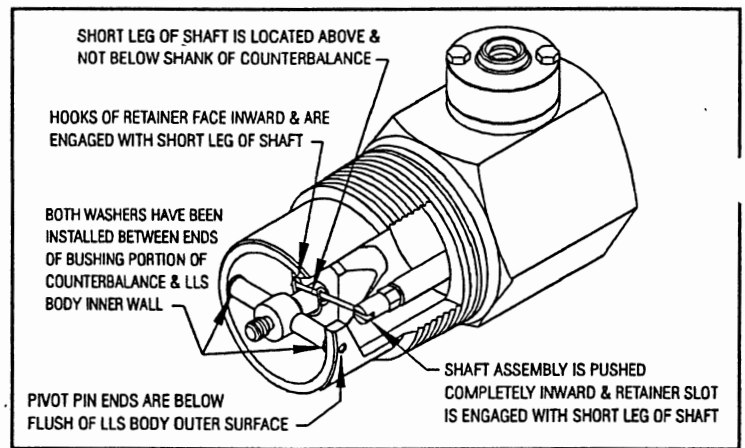


Figure 17. Assembly checks prior to restaking pivot pin

4.6 MOTION TAKE-OFF MECHANISM

4.6.1 Disassembly

- Complete steps a. through e. of Level Sending Mechanism disassembly on page 14.
- As shown in Figure 22, gently pull entire Shaft/Retainer/Washer Assembly (Items 12, 1 & 16) straight outward from Item 3 Guide.

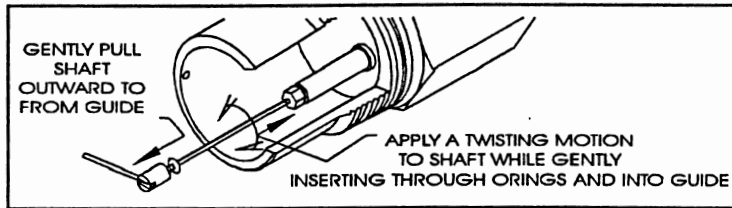


Figure 18. Removal/installation of Shaft Assembly

Disassemble Washer and Retainer from Shaft as shown in Figure 19.

- Use a 1/4" drive bolt clearance (deep well) socket and hand driver or ratchet and extension to unthread and remove Item 3 Guide from Item 37 LLS Body as shown in Figure 20. Remove Item 19 External Oring and Items 14 Internal Orings from Guide as shown in Figure 21.

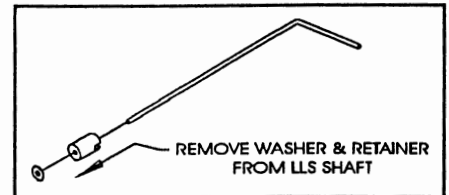


Figure 19. Disassembly of Shaft Components

Figure 20. Guide Assembly removal/installation

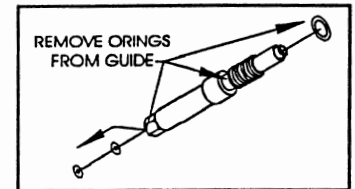
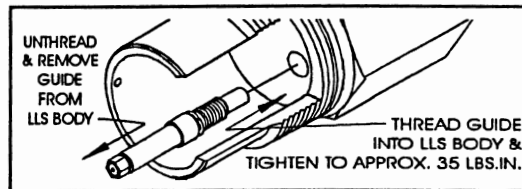


Figure 21. Disassembly of Guide Components

4.6.2 Reassembly

- Clean all exposed surfaces of Item 1 Retainer, item 16 Washer, Item 12 Shaft, Item 3 Guide and offset Counterbore of Item 37 LLS Body from which Guide was removed.
- Slide Retainer, slotted end first, onto shaft followed by Washer; Slot must engage Short Leg of Shaft (Figure 22).
- As shown in Figure 23, apply lubricant to the following:
 - All surfaces of Items 14 and 19 Orings.
 - Internal Counterbore and External Groove of item 3 Guide.
 - Exposed Long Leg of Item 12 Shaft Assembly.
 - Offset Counterbore of item 37 LLS Body.

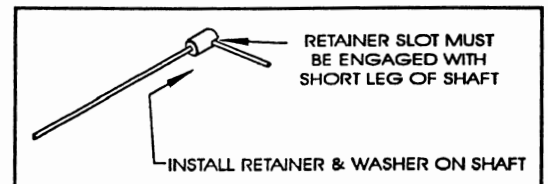


Figure 22. Assembly of Shaft Components

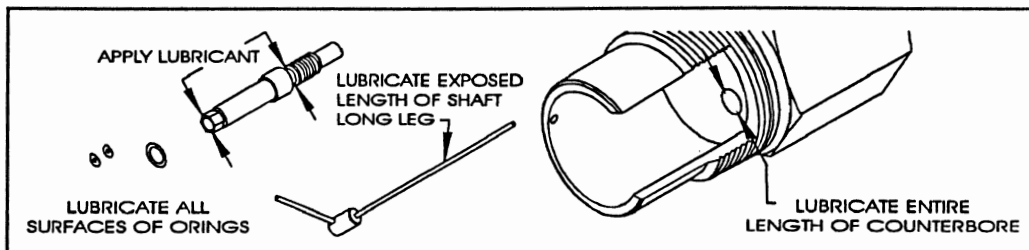


Figure 23. Lubrication application

- Install Item 14 Orings into Internal Counterbore and Item 19 Oring into External Groove of guide as shown in Figure 28. When properly installed, outer Internal Oring will be approximately flush with End of Guide and External Oring must not be spirally twisted in groove.
- Install Guide with orings into Offset Counterbore of LLS Body as shown in figure 24. Tighten to approximately 35 lbs.in.
- As shown in Figure 22, carefully install LLS Shaft Assembly into Guide. To help prevent bending Shaft, apply a twisting motion to Shaft when inserting through Orings.
- Complete steps a. through f. of Level Sending Mechanism Reassembly on page 14.

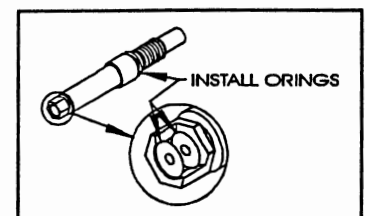


Figure 24. Guide Orings installation

4.7 BLOCK & BLEED VALVE

4.7.1 Disassembly

- As shown in Figure 25, loosen and remove Item 41 Cap Screws then separate and remove item 40 Cap and Item 39 Gasket from Item 24 Sleeve. Remove Sleeve Assembly from item 37 LLS Body by prying between Body Surface and Sleeve Flange with a flat tip screwdriver.
- Remove Item 8 Cap from LLS Body then remove Item 15 Oring from Cap. Unthread Item 23 Flapper Hex Nut and remove item 17 Outboard Washer, item 38 Flapper with Seat and Item 17 Inboard Washer from Item 6 Pivot Pin.
- With a 1/16" hex (allen) wrench loosen Item 25 Set Screw then unthread and remove Item 26 Nozzle from Sleeve as shown in Figure 26.
- Remove Item 13 External Oring and Item 36 Internal Oring from Sleeve (figure 27).

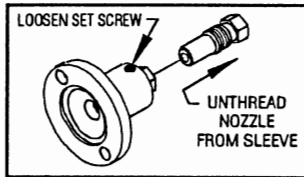


Figure 26. Nozzle removal

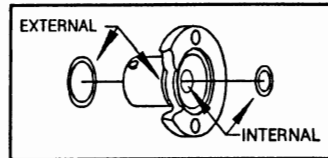


Figure 27. Sleeve Orings removal/installation

- With a 1/4" bolt clearance (deep well) socket and hand driver or ratchet and extension, unthread Item 6 Flapper Pivot Pin from LLS Body as shown in figure 28.

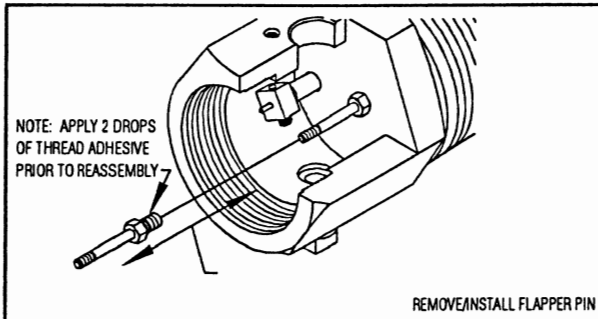


Figure 28. Pivot Pin removal/installation

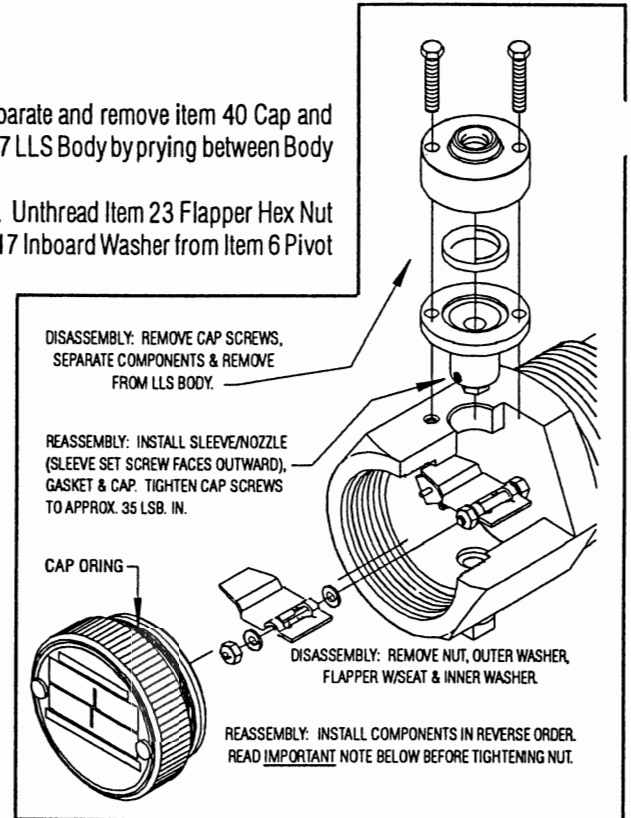


Figure 25. Block & Bleed Valve disassembly/reassembly with LLS Body

4.7.2 Reassembly

- Clean all accessible surfaces of block 7 bleed valve components being reused.
- Apply thread adhesive to the larger threads of Item 6 Flapper Pivot Pin. Thread Pin into LLS body as shown in Figure 28. Tighten to approximately 35 lbs. in. then wipe off excess adhesive from around thread joint.
- As shown in Figure 25, onto Flapper Pivot pin install Item 17 inboard Washer, Item 38 Flapper with Seat, Item 17 Outboard Washer and Item 23 Flapper Hex Nut.

IMPORTANT

Do not tighten flapper hex nut to an extent which prevents free pivoting movement of the flapper. If sufficient play has been provided and flapper still binds, check for interference between edges of flapper seal band and outboard washer. If necessary, slide seat band on flapper to relocate farther away from edge of washer.

- Install Item 36 Internal Oring and Item 13 External Oring into Grooves of Item 24 sleeve as shown in Figure 27. Install Item 15 Oring into Groove of Item 8 Cap as shown in Figure 25. Inspect; Orings must not be spirally twisted. Apply lubricant to the exposed Surfaces of Orings and unthreaded Shank portion of Item 26 Nozzle.
- As shown in Figure 29, thread Nozzle into end of Sleeve and make-up thread completely until nozzle Hex contacts Sleeve; wipe off excess lubricant from Opposite End of Nozzle then back-out Nozzle No more than 1/6" to prevent bending LLS shaft during sleeve/nozzle reassembly with LLS body.
- As shown in Figure 25, into Top Bore of LLS Body install Sleeve/Nozzle Assembly (with Item 25 Set Screw oriented OUTWARD for access) followed by Item 39 Gasket and Item 40 Cap. Align bolt holes with those of LLS Body, install Item 41 Cap Screws and tighten to approximately 35 lbs. in.
- Set Nozzle in accordance with Nozzle Adjustment instructions on page 10.
- Install Item 8 Cap with Oring into LLS Body and make-up handtight.

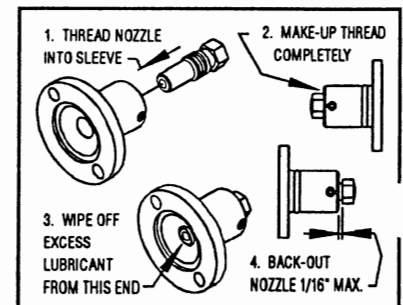


Figure 29. Nozzle installation

4.8 3-WAY AIR PILOT

NOTICE

Inspection/replacement of pilot internal components does not require the removal of pressure gauges or pipe fittings from the pilot; however, such steps have been sequentially included as part of the disassembly/reassembly instructions for the purpose of defining the recommended procedure.

4.8.1 Disassembly

- As shown in Figure 30, unthread Item 4 lower mount gauges (if standard Gauge Mounting) or Item 4A Center Back Mount Gauges and Item 50 Street Elbows (if Alternate Gauge Mounting) from Item 5 Pipe tees. Unthread Pipe tees and Item 33 Pipe Nipples from Item 10 Pilot Body. Unthread Item 20 Exhaust Plug from Pilot Body Port marked "EXH".
- With a 1/16" hex (allen) wrench loosen Item 9 Set Screw and remove Item 30 Override Knob from Pilot Assembly (Figure 31).
- As shown in Figure 32, unthread Item 7 Cap Screws and Remove Pilot Assembly from the Top of Item 24 Sleeve.

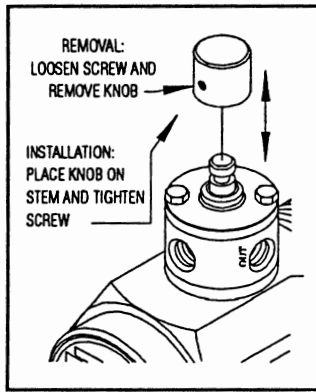


Figure 31. Override Knob removal/installation

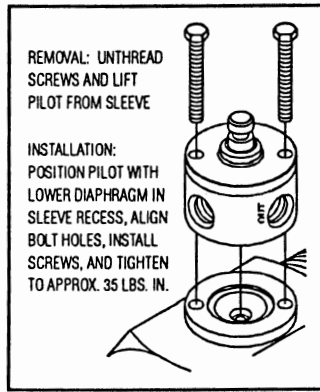


Figure 32. Pilot Assembly removal/installation

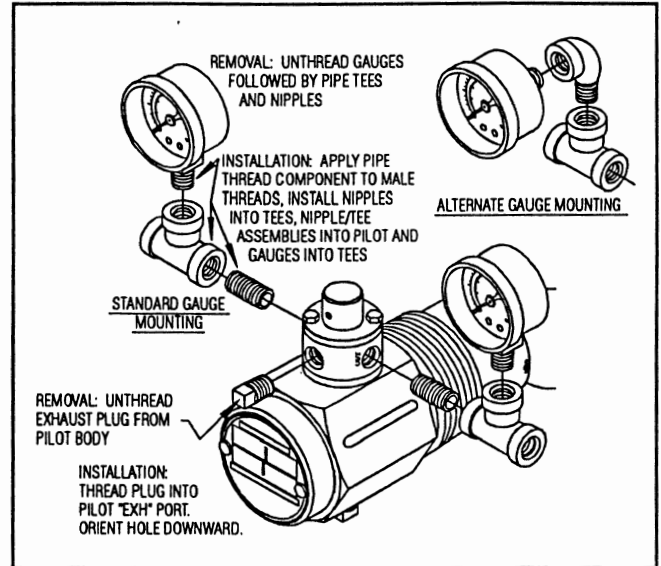


Figure 30. Pilot Gauge and Fittings removal/installation

- Remove Item 31 Cap then invert pilot Assembly and remove Item 21 Retaining Ring as shown in Figure 33. Use the ends of slightly opened needle nose plier jaws to push Ring far enough out from stem to grasp from Opposite End and remove.

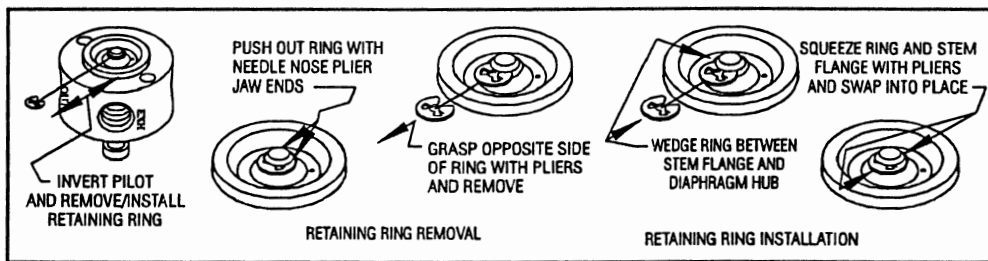


Figure 33. Retaining Ring removal/installation

- As shown in Figure 34, gently push inward on Pilot Stem while peeling off Lower Diaphragm from Opposite End.
- Remove Items 32 and 34 Stem/Upper Diaphragm from Item 10 pilot Body as shown in Figure 35.

Figure 34. Lower Diaphragm removal/installation

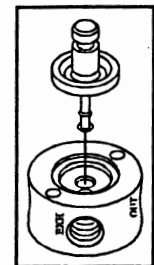
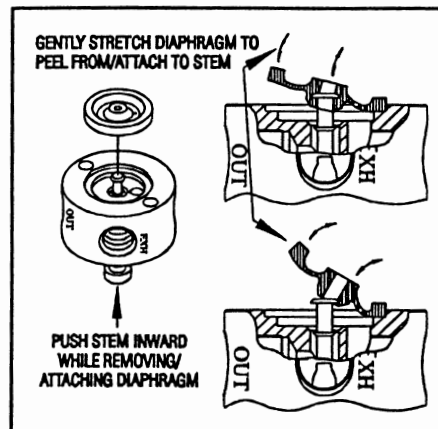


Figure 35. Stem/Upper Diaphragm disassembly

4.8.1 Disassembly (continued)

- g. As shown in Figure 36, gently pull Item 34 Upper Diaphragm to the Opposite End of Item 32 pilot Stem and remove in the same manner as done for the Lower Diaphragm in Figure 34.

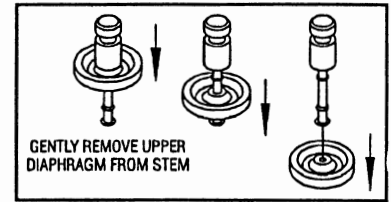


Figure 36. Upper Diaphragm removal from Pilot Stem

4.8.2 Reassembly

IMPORTANT

When reassembling diaphragms and stem to pilot body, it is imperative that the following be closely observed:

1. The upper and lower diaphragms are different; the upper diaphragm has only a center hole whereas the lower diaphragm has a center hole and a small offset hole.
2. Diaphragms must be oriented such that when installed, the beveled seating surface of each diaphragm is facing inward toward the companion seating surface of pilot body.
3. Stem/upper diaphragm assembly must be installed into the pilot body from the correct end as established by the orientation of pilot body port markings "IN", "OUT" and "EXH" and location of "reference hole".

- a. Clean all surfaces of pilot components being reused.
- b. Orient Item 34 Upper Diaphragm relative to Item 32 Stem as shown in Figure 41. Gently stretch Diaphragm over stem and pull up until captured between stem shoulder and flange.
- c. Orient Item 10 Pilot Body exactly as shown in figure 42, "IN" on left, "OUT" on right, "EXH" in front and Offset "REFERENCE HOLE" on top in front above "EXH" Port.
- d. Install Items 32 and 34 Stem and Upper Diaphragm Assembly into top of item 10 pilot body when oriented as shown in Figure 42.
- e. As shown in Figure 38 (page 15), invert Pilot Body and push inward on Large End of Item 32 pilot Stem while attaching Item 35 Lower Diaphragm with Offset Hole to the Opposite End of Stem. Dished side of diaphragm must face outward away from pilot body with beveled seat side facing inward. Offset hole in diaphragm may be oriented at random.
- f. Use needle nose pliers to install Item 21 Retaining Ring between pilot Stem Flange and Lower Diaphragm Hub as shown in Figure 37.
- g. As shown in Figure 36, install Item 31 Cap over Large End of Pilot Stem then place Pilot Assembly on top of Item 24 sleeve with Lower Diaphragm positioned in Sleeve Recess and Pilot Ports oriented as shown in Figure 34. Align Bolt Holes with those of Item 37 LLS Body. Install Item 7 Cap Screws and tighten approx. 35 lbs. in.
- h. As shown in Figure 35, place Item 30 Override Knob over End of Pilot Stem and tighten Item 9 Set screw using a 1/16" hex (allen) wrench.
- i. Apply pipe thread sealant to one end of each Item 33 Pipe Nipple then thread Nipples handtight into Side Connections of Item 5 Pipe Tees. Apply pipe thread sealant to Opposite End of Nipples, Male Threads of Item 50 Street Elbows (if Alternate Gauge Mounting) and Threads of Item 4 or 4A Pressure Gauges (Figure 34). Thread Pipe Nipple/Tee Assemblies into Pilot Body making-up both Ends of Pipe Nipple Simultaneously. Install Item 50 Street Elbows into Top Connections of Pipe Tees (Alternate Gauge Mounting only). Install Item 4 or 4a Pressure Gauges into Tees or Elbows as applicable.
- j. Thread Item 20 Exhaust Plug into Pilot Port marked "EXH" (no pipe thread sealant required) and make-up such that when snug, Side Hole in Plug is facing toward Hex flat of LLS Body (Figure 34).

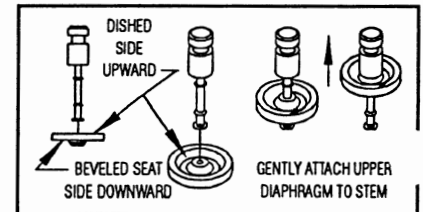


Figure 37. Attaching Upper Diaphragm to Pilot Stem

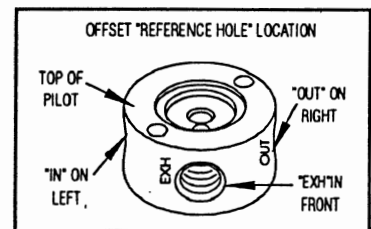


Figure 38. Pilot Body orientation for installing Stem/Diaphragm

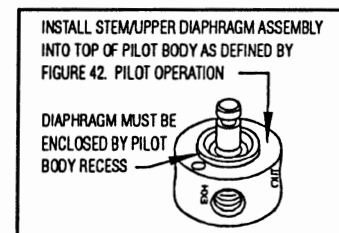


Figure 39. Stem/Upper Diaphragm installation with Pilot Body

4.8 TROUBLESHOOTING

WARNING

The following section refers to maintenance and repairs that require the removal of level switch and/or switch components that are under pressure during normal operation. To avoid personal injury and property damage, be absolutely certain that all supply and process pressure has been completely vented prior to level switch removal and disassembly.

If and when problems arise, use the following table and attempt to establish with what level switch mechanism does the fault pertain before changing cam or nozzle settings or removing parts.

PROBLEMS INVOLVING LEVEL SENSING MECHANISM			
SYMPTOM(S)	POSSIBLE CAUSE(S)	HOW TO VERIFY	CORRECTIVE ACTION
Cam does not fully rotate or rotate at all during significant changes in liquid level. Block & bleed valve (and/or pilot) may or may not operate.	Vessel dimensions interfere with float movement.	Remove switch and measure vessel. Refer Table 3. Clearance requirements.	Reconfigure switch: Change arm, float (Figure 6.) and/or counterbalance (pages 11-12); install an external chamber (see page 16); or modify vessel.
	Float, extension arm (if used) and/or counterbalance not properly sized for fluid specific gravity.	If unknown, remove switch and identify level sensing mechanism (Figure 4.). Check against Table 2. Specific gravity.	
	Foreign material has been allowed to collect on the level sensing mechanism to the extent of restricting movement.	Remove switch and inspect.	Thoroughly clean all surfaces especially pivot contacts. See pages 11-12 if disassembly is necessary.
	Arm retainer is not connected to counterbalance.		Reattach or replace arm retainer (pages 11-12).
Float has collapsed or contains process fluid.		Replace float and secure all threads with adhesive (Figure 6.). Do not exceed maximum working pressure (Figure 5.).	

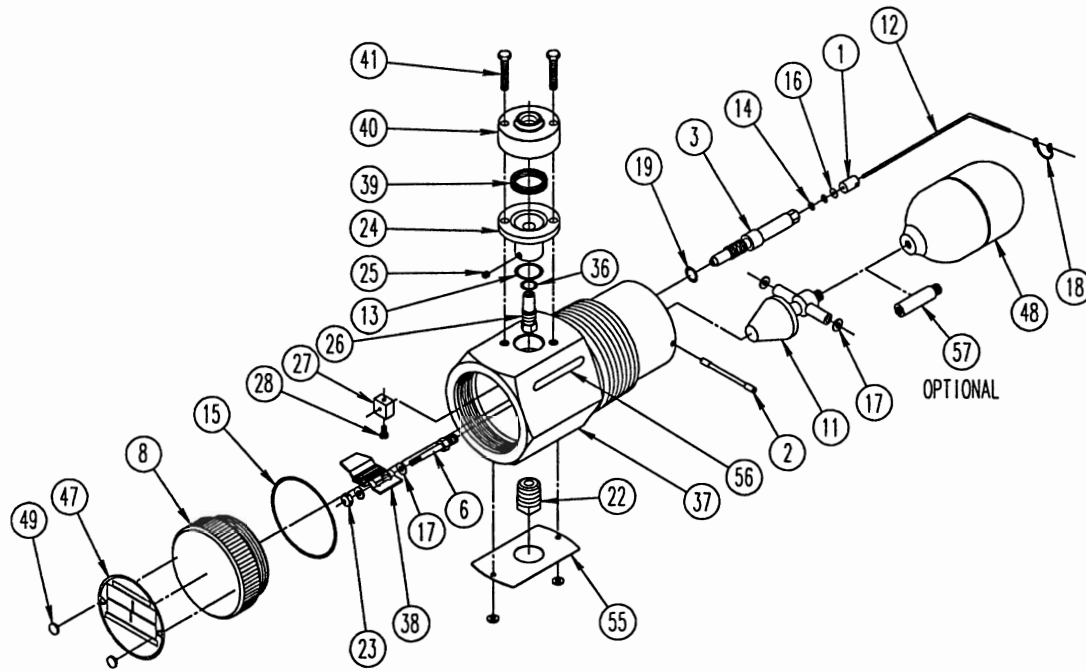
PROBLEMS INVOLVING MOTION TAKE-OFF MECHANISM			
(LEVEL SENSING MECHANISM OKAY)			
SYMPTOM(S)	POSSIBLE CAUSE(S)	HOW TO VERIFY	CORRECTIVE ACTION
LLS Body cavity that houses flapper and seat contains process fluid.	Shaft/guide and/or guide/LLS body oring failure.	Remove switch and inspect.	Disassemble mechanism and replace orings. See pages 11-13.
Cam does not fully rotate or rotate at all during significant changes in liquid level. Block & bleed valve (and/or pilot) may or may not operate.	Cam is improperly set.	Inspect cam operation and positioning (Figure 14.). If necessary, remove switch and actuate float by hand while observing cam operation.	Readjust cam and tighten screw. Refer to page 8.
	Cam screw is not sufficiently tight to prevent independent LLS shaft rotation.		
Liquid level changes and cam rotates but block & bleed (and/or pilot) is sluggish or shut-off is marginal.	LLS shaft is bent beyond that which can be compensated for by cam lift.	Remove switch and observe concentricity of LLS shaft while actuating float by hand.	Straighten shaft if possible or replace. See pages 11-13.

PROBLEMS INVOLVING BLOCK & BLEED VALVE			
(LEVEL SENSING MECHANISM AND MOTION TAKE-OFF MECHANISM OKAY)			
SYMPTOM(S)	POSSIBLE CAUSE(S)	HOW TO VERIFY	CORRECTIVE ACTION
Block & bleed valve does not open or does not open fully after a significant change in liquid level. Sluggish operation; pilot may or may not respond. Flapper operation okay and not binding.	Nozzle is improperly adjusted. Contact pressure against nozzle sealing face is too great.	Refer to Figure 15. and determine if nozzle is properly set.	Adjust nozzle. Refer to page 8.
	Foreign material has been allowed to collect inside nozzle orifice.	Inspect flapper seat and nozzle orifice.	Disassemble, clean, reassemble and adjust nozzle. See pages 11, 14 & 8.
Block & bleed valve does not fully close or leaks after a significant change in liquid level. Sluggish operation; pilot may or may not respond. Flapper okay and not binding.	Nozzle is improperly adjusted. Contact pressure against nozzle sealing face is inadequate.	With supply air applied, press flapper against nozzle with finger pressure and hold to increase contact force between seat and nozzle sealing face. Inspect; if leak stops, adjust nozzle outward. If leak persists, remove flapper and inspect seat for imperfections (Figure 29). If seat is okay, replace oring(s).	Adjust nozzle. Refer to page 8.
	Nozzle/flapper seat seal failure.		Replace flapper and seat assembly. See page 11 & 14.
	Nozzle/sleeve and/or sleeve/body oring failure.		Replace oring(s). See pages 11 & 14.
Flapper remains stationary against nozzle or does not fully pivot when cam rotates to the horizontal position. Pilot may or may not operate.	Flapper pivot pin hex nut is too tight inducing friction and limiting movement.	Check outboard pivot pin washer; if little or no play, nut is too tight.	Adjust flapper hex nut tension per reassembly instructions on page 14.
	Flapper seat edge is interfering with pivot pin outboard washer inducing friction and limiting movement.	Check proximity of flapper seat edge to edge of pivot pin outboard washer.	Remove flapper (page 14) and slide seat band on flapper to relocate farther away from edge of outboard washer.
	Residue has been allowed to collect at flapper seat/nozzle interface and/or flapper/pivot pin interface to the extent of causing members to adhere.	Inspect flapper seat/nozzle area and flapper/pivot pin contact surfaces.	Remove hex nut, flapper and washers (page 14). Clean all contact and pivot surfaces. Rotate seat band to a clean position or replace flapper/seat.
Float does not fully pivot to one or the other extreme. Pilot may or may not operate.	Nozzle is improperly adjusted. Contact pressure against nozzle sealing face is too great preventing full cam rotation.	Refer to figure 15 and determine if nozzle is properly set. Travel must be limited only by counter-balance swing.	Adjust nozzle. Refer to page 8.

PROBLEMS INVOLVING 3-WAY AIR PILOT			
(LEVEL SENSING MECHANISM, MOTION TAKE-OFF MECHANISM AND BLOCK & BLEED VALVE OKAY)			
SYMPTOM(S)	POSSIBLE CAUSE(S)	HOW TO VERIFY	CORRECTIVE ACTION
Pilot does not shift closed or leaks as evidenced by audible hissing.	Foreign material has collected in lower seat orifice or plugged offset hole in lower diaphragm.	With supply air applied, operate manual override several times and try to dislodge obstruction if the cause of malfunction. If no improvement, disconnect and vent supply air, remove and disassemble pilot. Inspect; seating surfaces of diaphragms and pilot body must be free of imperfections. Offset hole in lower diaphragm must be clear of debris and about .020" in diameter.	Clean pilot interior and reassemble; install air filter (pages 11, 15-16 & 6).
	Lower diaphragm and/or pilot body seat damaged or lower diaphragm has ruptured.		Replace lower diaphragm and/or pilot body (pages 11, 15-16 & 6).
Supply air flows from pilot exhaust port when pilot delivers output.	Foreign material has collected in upper seat orifice.		Clean pilot interior and reassemble; install air filter (pages 11, 15-16 & 6).
	Upper diaphragm and/or pilot body seat damaged or upper diaphragm has ruptured.	Replace upper diaphragm and/or pilot body (pages 11, 15-16 & 6).	
Pilot just barely shifts open or does not open at all.	Lower diaphragm offset hole has worn too large to induce force imbalance.		Replace lower diaphragm (pages 11, 15-16).

Solutions through engineered products.
NORRISEAL **SERIES 1005P1 LEVEL SWITCH** **LLS**
 A DOVER RESOURCES COMPANY

PARTS LIST
BLOCK and BLEED ONLY



ITEM	PART DESCRIPTION	MATERIAL	STOCK No.	QTY.	ITEM	PART DESCRIPTION	MATERIAL	STOCK No.	QTY.
1	RETAINER BUSHING	316	411421	1	27	CAM FLAPPER	303	421790	1
2	PIN PIVOT FLOAT	316	411427	1	28	SCREW MACHINE CAM 4-40 x .19	18-8	426115	1
3	GUIDE SHAFT	316	411886	1	* 36	O-RING (Sleeve/Nozzle) 010	NITRILE	415103	1
6	PIN PIVOT FLAPPER	303	411899	1			FLUOROCARBON	415855	
8	CAP BODY LLS	1018	411901	1	37	BODY LLS 2.00" NPT	STANDARD 1018	421792	1
11	COUNTERBALANCE	316	412233	1			OPTIONAL 316	421998	
12	SHAFT LLS	316	412275	1	* 38	FLAPPER w/SEAT	304/NEOPRENE	421794	1
* 13	O-RING (Sleeve/Body) 014	NITRILE	415828	1	* 39	GASKET (Sleeve/Cap)	NITRILE	426110	1
		FLUOROCARBON	426218				FLUOROCARBON	426219	
* 14	O-RING (Guide/Shaft) 003	NITRILE	416095	2	40	CAP B&B	ALUMINUM	421788	1
		FLUOROCARBON	415512		41	SCREW CAP B&B 8-32 x .88	18-8	426118	2
* 15	O-RING (Cap/Body) 032	NITRILE	426116	1	47	NAMEPLATE MODEL & SERIAL No.	316	----	1
		FLUOROCARBON	415513		48	FLOAT	STD. SERV./STD. WGT. 304	416712	1
16	WASHER FLAT	NYLON	415514	1			H ₂ S SERV./STD. WGT.	412935	
17	WASHER FLAT	TFE	415515	4			STD. SERV./HVY. WGT. 316	416726	
18	RETAINER ARM	INCONEL	425029	1			H ₂ S SERV./HVY. WGT.	412257	
	COUNTERBALANCE		415805		49	TACK NAMEPLATE	CSTL	----	4
* 19	O-RING (Guide/Body) 010	NITRILE	415103	1	55	NAMEPLATE WORKING PRESSURE	316	----	1
		FLUOROCARBON	415855		56	LABEL MATERIAL WETTED SEALS	VINYL	----	1
22	PLUG PIPE VENT	A105	416069	1	57	ARM EXTENSION FLOAT (OPTIONAL)	0.63" LG 304	411538	1
23	NUT HEX FLAPPER	SST/NYLON	416083	1			1.00" LG	412201	
24	SLEEVE NOZZLE B&B	ALUMINUM	421787	1			1.13" LG	410927	
25	SCREW SET SLEEVE 6-32 x .13	CSTL	426114	1			1.50" LG	412164	
26	NOZZLE B&B	303	421791	1			2.06" LG	411481	

* Recommended Spare Part

Due to the constant improvement program at NORRISEAL, specifications and/or prices are subject to change without notice or obligation.

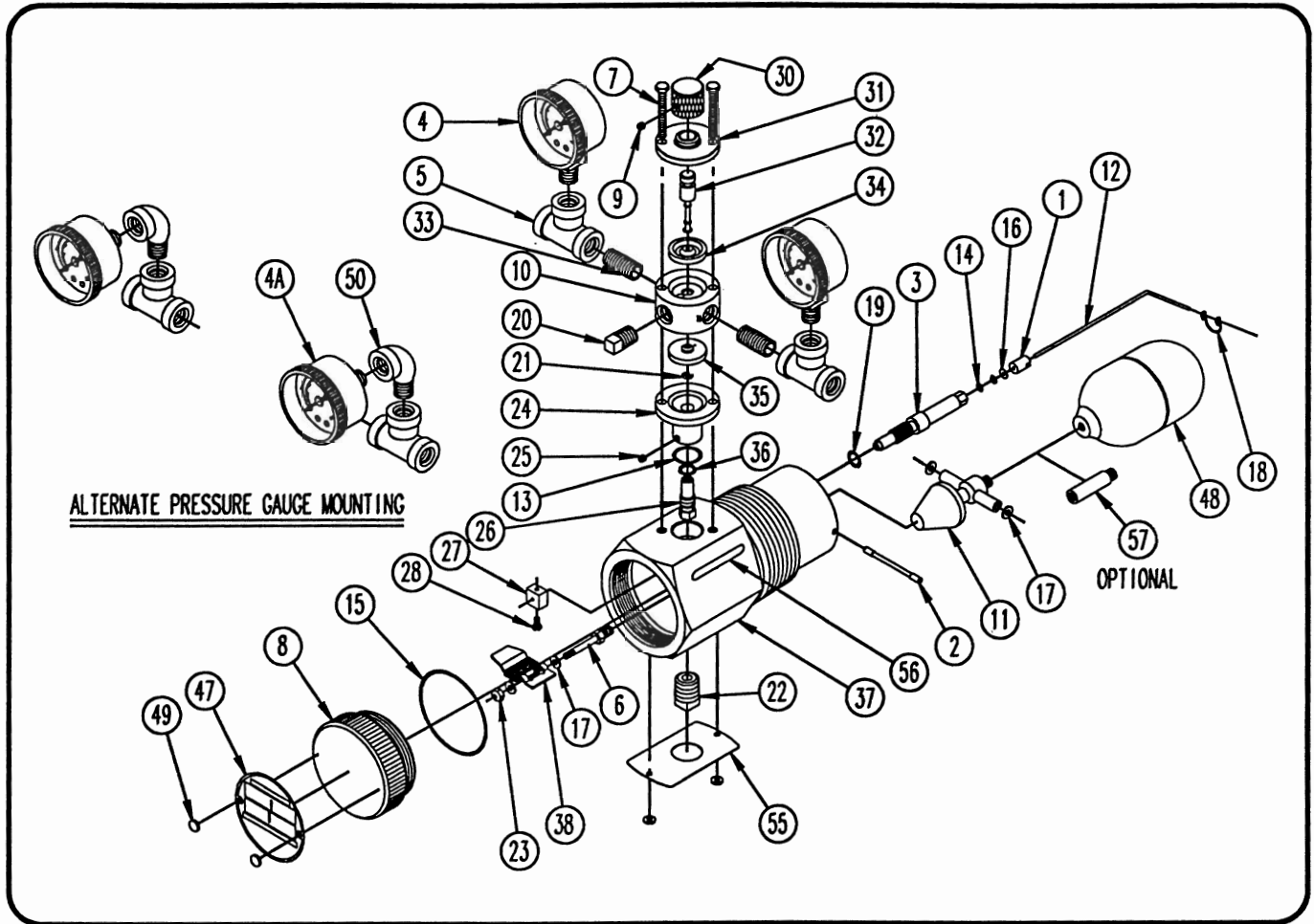


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SERIES 1005P1 LEVEL SWITCH

LLS

PARTSLIST BLOCK and BLEED w/3-WAY PILOT





SERIES 1005P1 LEVEL SWITCH

LLS

PARTS LIST BLOCK and BLEED w/3-WAY PILOT

ITEM	PART DESCRIPTION	MATERIAL	STOCK No.	QTY	ITEM	PART DESCRIPTION	MATERIAL	STOCK No.	QTY	
1	RETAINER BUSHING	316	411421	1	27	CAM FLAPPER	303	421790	1	
2	PIN PIVOT FLOAT	316	411427	1	28	SCREW MACHINE CAM 4-40 x .19	18-8	426115	1	
3	GUIDE SHAFT	316	411886	1	30	KNOB OVERRIDE	ALUMINUM	421786	1	
4	GAUGE PRESSURE LM STD. MTG.	BRONZE	426119	2	31	CAP PILOT F/KNOB	ALUMINUM	421785	1	
	GAUGE PRESSURE CB ALT. MTG.		415230		32	STEM PILOT	303	421814	1	
5	TEE PIPE .125	MALL IRON	415384	2	33	NIPPLE PIPE .125	CSTL	416407	2	
6	PIN PIVOT FLAPPER	303	411899	1	* 34	DIAPHRAGM SOLID	NITRILE	426108	1	
7	SCREW CAP PILOT 8-32 x 1.25	18-8	426117	2			FLUOROCARBON	426197		
8	CAP BODY LLS	1018	411901	1	* 35	DIAPHRAGM w/OFFSET HOLE	NITRILE	421806	1	
9	SCREW SET KNOB 5-40 x .19	CSTL	425400	1			FLUOROCARBON	426198		
10	BODY PILOT	ALUMINUM	421793	1	* 36	O-RING (Sleeve/Nozzle) 010	NITRILE	415103	1	
11	COUNTERBALANCE STANDARD HEAVY	316	412233	1			FLUOROCARBON	415855		
			412999							
12	SHAFT LLS	316	412275	1	37	BODY LLS 2.00" NPT STANDARD OPTIONAL	1018 316	421792 421998	1	
* 13	O-RING (Sleeve/Body) 014	NITRILE	415828	1	* 38	FLAPPER w/SEAT	304/NEOPRENE	421794	1	
		FLUOROCARBON	426218		47	NAMEPLATE MODEL & SERIAL No.	316	----	1	
* 14	O-RING (Guide/Shaft) 003	NITRILE	416095	2	48	FLOAT	STD. SERV./STD. WGT.	304	416712	1
		FLUOROCARBON	415512				H ₂ S SERV./STD. WGT.	412935		
* 15	O-RING (Cap/Body) 032	NITRILE	426116	1			STD. SERV./HVY. WGT.	316	416726	
		FLUOROCARBON	415513				H ₂ S SERV./HVY. WGT.	412257		
16	WASHER FLAT	NYLON	415514	1	49	TACK NAMEPLATE	CSTL	----	4	
17	WASHER FLAT	TFE	415515	4	* 50	ELBOW STREET	MALL IRON	426140	2	
18	RETAINER ARM STANDARD	INCONEL	425029	1	55	NAMEPLATE WORKING PRESSURE	316	----	1	
	COUNTERBALANCE HEAVY		415805		56	LABEL MATERIAL WETTED SEALS	VINYL	----	1	
* 19	O-RING (Guide/Body) 010	NITRILE	415103	1	57	ARM EXTENSION FLOAT (OPTIONAL)	0.63" LG	304	411538	1
		FLUOROCARBON	415855				1.00" LG	412201		
20	PLUG PIPE EXHAUST	POLYETHYLENE	426111	1			1.13" LG	316	410927	
21	RING RETAINING	SST	426109	1			1.50" LG	412164		
22	PLUG PIPE VENT	A105	416069	1			2.06" LG	411481		
23	NUT HEX FLAPPER	SST/NYLON	416083	1	* Recommended Spare Part + Required only for alternate gauge mounting					
24	SLEEVE NOZZLE B&B	ALUMINUM	421787	1						
25	SCREW SET SLEEVE 6-32 x .13	CSTL	426114	1						
26	NOZZLE B&B	303	421791	1						

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Solutions through engineered products.

 A DOVER RESOURCES COMPANY

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