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DWN	S.WILLIS	2-04-94	MAINTENANCE INSTRUCTIONS TYPE 9390 PRESSURE/VACUUM RELIEF VALVE WITH FLOWING MODULATING PILOT TYPE 95 - CHLORIDE SERVICE		
CHK	R.VIRGIL	2-15-94			
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APPR			SIZE	REPORT NUMBER	REV
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APPR			PAGE 1 OF 23		

FORM NO. 910 J 5/93

REVISIONS		
REV.	**DESCRIPTION**	**APPROVALS/DATE**
A	ECN #01-1056	S.WILLIS 8-01-01 S.CONNALLY 8-02-01 E.TEZZO 8-06-01

INSTRUCTIONS – MAINTENANCE FOR TYPE 9390 PRESSURE/VACUUM RELIEF VALVE WITH FLOWING MODULATING PILOT TYPE 95 CHLORIDE SERVICE

The intent of these instructions is to acquaint the user with the storage, installation and operation of this product. **Please read these instructions carefully before installation.**

WARNING

Removal of the seal wires in an attempt to adjust and/or repair this product by unauthorized or unqualified persons voids the product warranty and may cause damage to equipment and serious injury or death to persons.

The product is a safety related component intended for use in critical applications. The improper application, installation or maintenance of the product or the use of parts or components not manufactured by Anderson Greenwood Crosby may result in a failure of the product.

Any installation, maintenance, adjustment, test, etc. performed on the Product must be done in accordance with the requirements of all applicable Anderson Greenwood Crosby Procedures and Instructions as well as applicable National and International Codes and Standards.

SAFETY PRECAUTIONS

When the pressure/vacuum relief valve is under pressure never place any part of your body near the pilot exhaust nor the outlet of the main valve.

The main valve outlet should be piped or vented to a safe location.

Always wear proper safety gear to protect head, eyes, ears, etc. anytime you are near pressurized valves.

Never attempt to remove the pressure/vacuum relief valve from a system that is pressurized.

Never make adjustments to or perform maintenance on the pressure/vacuum relief valve while in service unless the valve is isolated from the system pressure. If not properly isolated from the system pressure, the pressure/vacuum relief valve may inadvertently open resulting in serious injury.

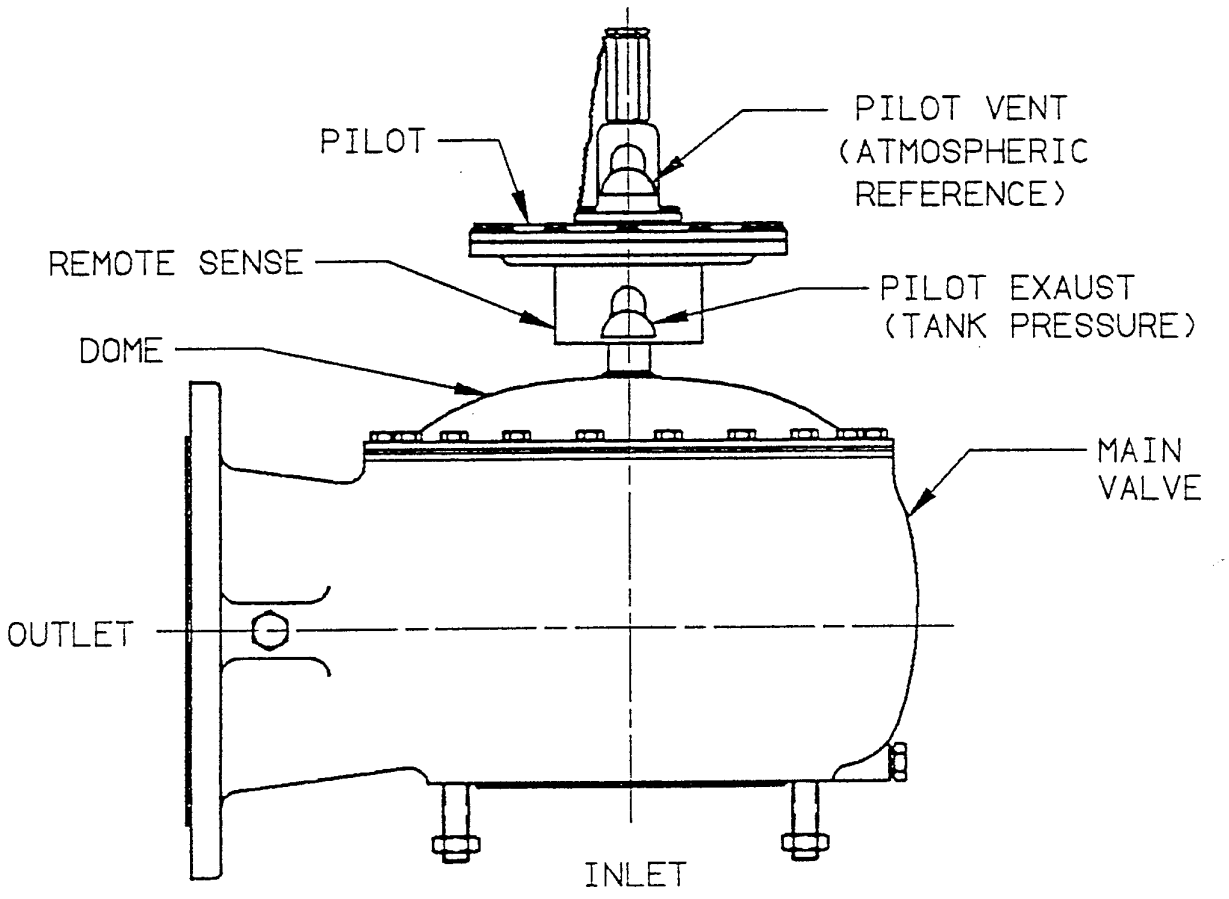
Remove the pressure/vacuum relief valve prior to performing any pressure testing of the system.

The safety of lives and property often depends on the proper operation of the pressure/vacuum relief valve. The valve must be maintained according to appropriate instructions and must be periodically tested and reconditioned to ensure correct function.

STORAGE AND HANDLING

Pressure/vacuum relief valve performance may be adversely affected if the valve is stored for an extended period without proper protection. Rough handling and dirt may damage, deform, or cause misalignment of valve parts and may alter the pressure setting and adversely affect valve performance and seat tightness. It is recommended that the valve be stored in the original shipping container in a warehouse or as a minimum on a dry surface with a protective covering until installation. Inlet and outlet protectors should remain in place until the valve is ready to be installed in the system.

1.0 GENERAL VALVE DESCRIPTION



1.1 Operation

The 9390 Pilot Operated Safety Relief Valve uses the principle of pressurizing a large diaphragm area, referred to as dome, with tank pressure to hold the main valve seat closed up to set pressure. At set pressure the pilot actuates to partially reduce the pressure in the dome, and the downward force acting on the main seat. The seat then lifts to relieve tank pressure. When the tank pressure is reduced, the pilot actuates to repressure the dome with tank pressure to close the main valve.

1.2 Installation

Inlet and outlet flanges are designed for use with 150 class ANSI flanges. Studs are provided in the inlet of the valve. Remote pressure pickup is required.

1.3 Start-Up

There must be pressure at the valve inlet to establish a closing force across the main valve element. Pressure must pass through the pilot supply tube and pilot and exert force on the main diaphragm. On normal plant start-up the valve loads itself without incident as tank pressure increases. It is not uncommon that slight leakage past the seat occurs until system pressure reaches the dome chamber.

If block valves are used under the safety valve, be sure all block valves are open. If block valves are opened after system start-up the safety valves briefly vent to the atmosphere past the main seat before the dome gets pressurized. It will close off positively once dome pressure has been established. Open the block valve slowly to minimize venting.

2.0 MAIN VALVE MAINTENANCE (Refer to Figures 1 and 2)

2.1 General

The 9390P is for pressure relief only. The 9390C is for pressure relief and weight loaded vacuum relief.

2.2 Main Seat Replacement

-- Remove bolts (41) that connect the main diaphragm cases (14) and (23) to body.

-- Remove the diaphragm case assembly (14) and (23) FIGURE 1 with seat plate assembly as a single unit. NOTE: Use a hoist on large sizes.

-- Unscrew the seat plate assembly from the shaft (18). This is normally a hand operation, however a 9/16" (14.3 mm) wrenching flat is provided on the seat hub (52) if required. The connecting thread will run free then tighten and run free again as it disengages from a locking helicoil in the vertical shaft (18).

-- Refer to FIGURES 3,4 and 5 DETAILS D and E for the appropriate valve seat plate size, material and pressure range. Remove the seat jam nut (50) and screws (31) and nuts (28) or seat band clamp (56). Remove the seat retainer (37) and secondary seat (57). NOTE: Secondary seat used only on high pressure stainless steel. Remove seat film (29).

-- Install new seat film (29) and reassemble hub (52) in accordance with Detail "D". NOTE: On reassembly pay special attention to the stack-up sequence to make sure the parts are assembled properly.

-- Install seat retainer (37) and secondary seat (57) where used over new film per Detail "E" and cross tighten seat screws (31) and nuts (28) until secure.

-- On the low pressure stainless steel seat plate with band clamp (56), tighten clamp before tightening seat jam nut (50).

-- Reinstall seat plate assembly to main shaft (18).

-- The thread on the seat plate assembly will at first run free then tighten, then run free again. The seat plate assembly is then in place and will swivel to provide good seat contact on the nozzle (33). NOTE: Seat hub (52) must not be tightened to shoulder tightly on the shaft (18).

2.3 **Diaphragm Replacement** (Refer to Figure 1)

-- Remove pilot and tubing from the diaphragm case.

-- Remove the upper main diaphragm case (14).

-- Remove the main diaphragm assembly, lower main diaphragm case (23) and seat plate assembly from the body (34). NOTE: On valves with high pressure stainless internals (refer to Figure 5 for configuration), an outer (60) and inner (61) diaphragm slipper is used to protect the diaphragm (15) from wear. The outer slipper is installed between the diaphragm (15) and the lower diaphragm case (23). The inner slipper is installed between diaphragm (15) and the main pressure plate (21).

-- See Figure 6, Detail C. Remove jam nut (42) and disassemble. Repace diaphragm (15). NOTE: Pay special attention to stack sequence shown.

-- Remove remaining internal assembly as a unit including lower diaphragm case (23), and internal assembly.

-- Replace diaphragm (15) as shown in FIGURE 1. NOTE: Pay special attention to stack-up sequence on reassembly.

-- If cap gasket (16) is to be replaced, apply Teflon gasketing to upper diaphragm case (1) and top of body (34) where lower main diaphragm case (23) fits, as shown in FIGURE 7.

-- Reassemble in reverse order. Apply a light film of Dow Corning No. 33 silicone grease or equivalent to all threaded parts. NOTE: For oxygen service valves, use only lubricants suitable for this service, such as Fluorolube LG-160.

2.4 <u>Nozzle Replacement</u>, 3" Through 12" Valve Inlet Size (Refer to Figure 1)

-- Remove nozzle retaining screws (36) and gently tap nozzle (33) with soft face mallet.

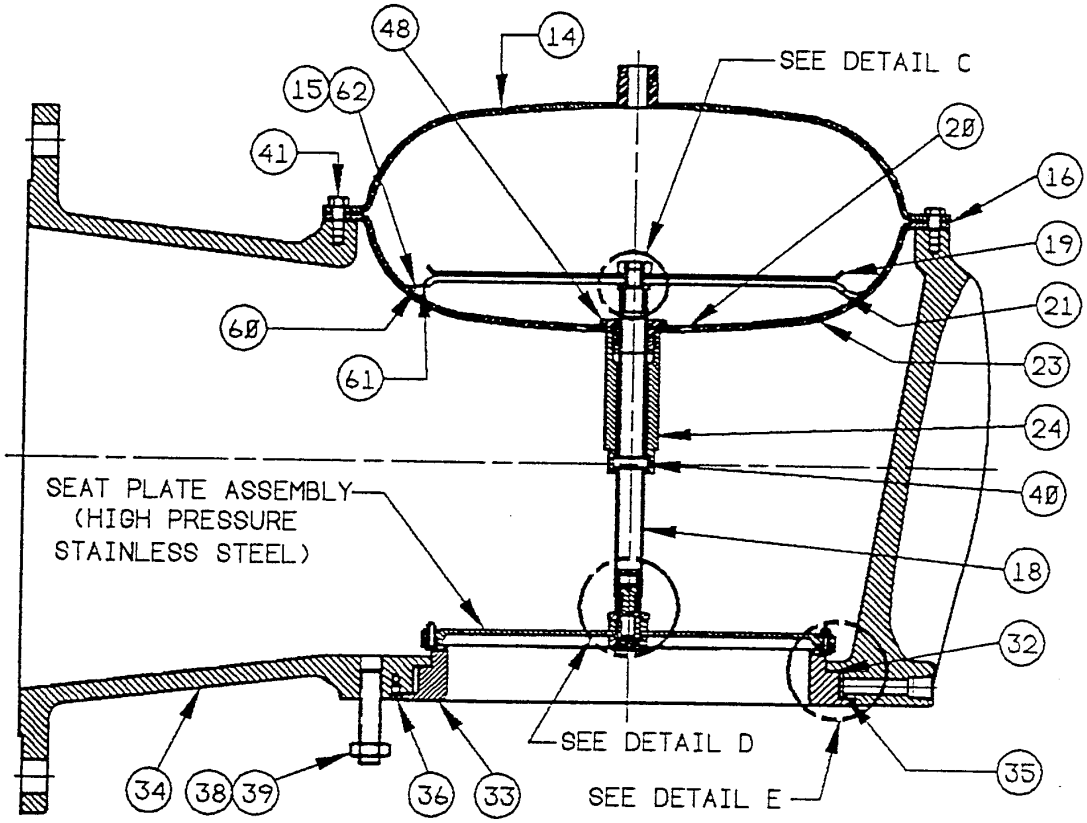
-- NOTE: Inspect nozzle seating surface for nicks or scratches. If they cannot be removed with crocus cloth or fine sandpaper, the nozzle must be recoated.

-- If nozzle gaskets (32, 35) are to be replaced, install Teflon gasketing as shown in Figure 7.

-- Reinstall nozzle and retaining screws.

PARTS LIST
MAIN VALVE

ITEM	DESCRIPTION	ITEM	DESCRIPTION
2	NUT	35	GASKET-NOZZLE, LOWER
3	NUT	36	SCREW-NOZZLE RETAINER
4	O-RING/TEFLON	37	RETAINER-SEAT
13	STUD	38	STUD-INLET
14	CASE-UPPER, MAIN DIAPHRAGM	39	NUT-INLET
15	DIAPHRAGM-MAIN	40	BUSHING-SPLIT
16	GASKET-DIAPHRAGM CASE	41	BOLT-CASE
18	SHAFT, SEAT PLATE ASSEMBLY	42	NUT-JAM
19	PLATE-MAIN VACUUM	43	WASHER
20	SCREEN, LOWER MAIN CASE	44	WASHER
21	PLATE-MAIN PRESSURE	45	GASKET-PLATE
23	CASE-LOWER, MAIN DIAPHRAGM	48	BUSHING-GUIDE
24	SLEEVE-GUIDE	50	NUT-JAM, SEAT
25	PLATE-SEAT	52	HUB-SEAT
27	PROTECTOR-PLATE	53	O-RING-SEAT
28	NUT-LOCK	54	SPACER-SEAT
29	SEAT-FILM	55	GASKET-PLATE
31	SCREW-SEAT	56	CLAMP-BAND, SEAT
32	GASKET-NOZZLE, UPPER	57	SEAT-SECONDARY
33	NOZZLE	60	SLIPPER-DIAPHRAGM OUTER (HIGH PRESSURE SS INTERNALS)
34	BODY	61	SLIPPER-DIAPHRAGM, INNER (HIGH PRESSURE SS INTERNALS)
		62	DIAPHRAGM, REINFORCEMENT, MAIN (LOW PRESSURE 3" VALVE INLET SIZE)



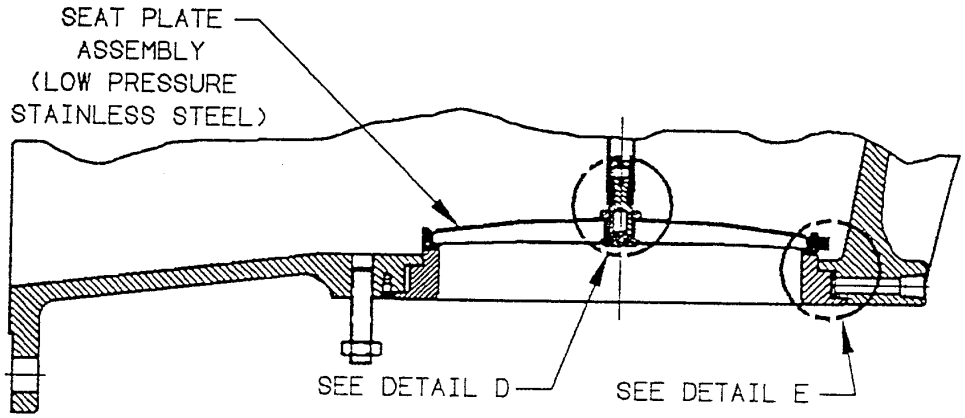
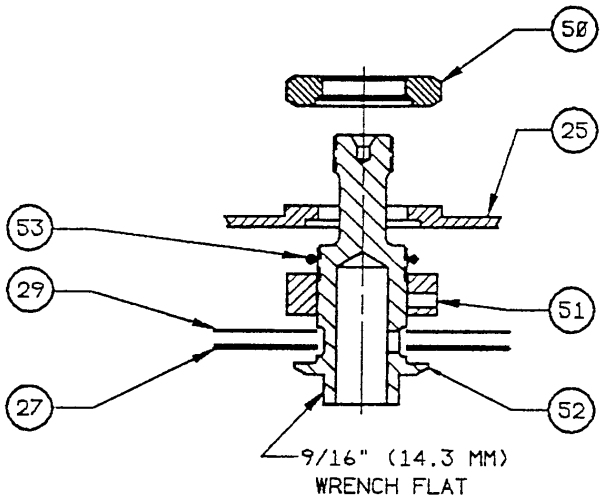


FIGURE 1

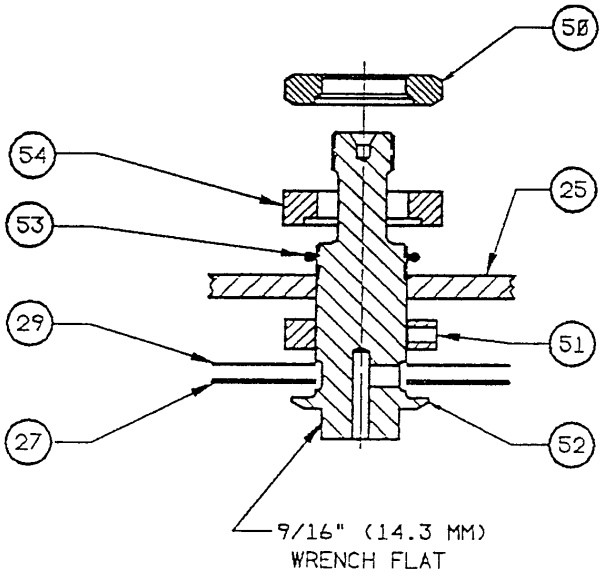
9300 VALVE ASSEMBLY

3" THRU 12" INLET SIZE

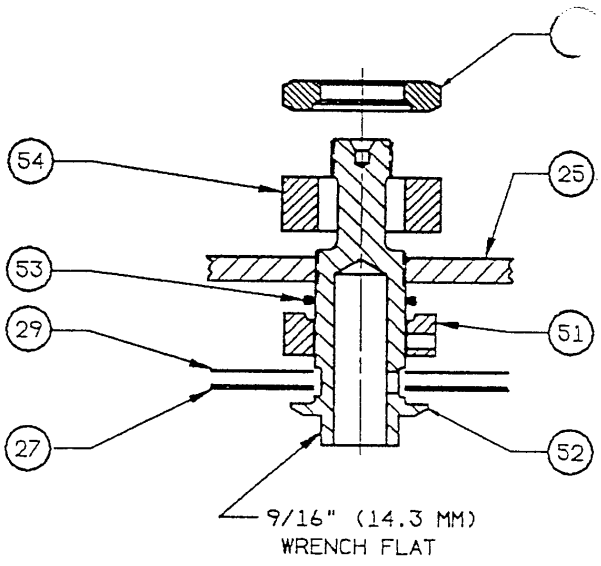
DWG: D_059040233_PG7
DB: DB059040233
LIB: GER90_IB



3" THRU 4" VALVE INLET SIZE



6" VALVE INLET SIZE

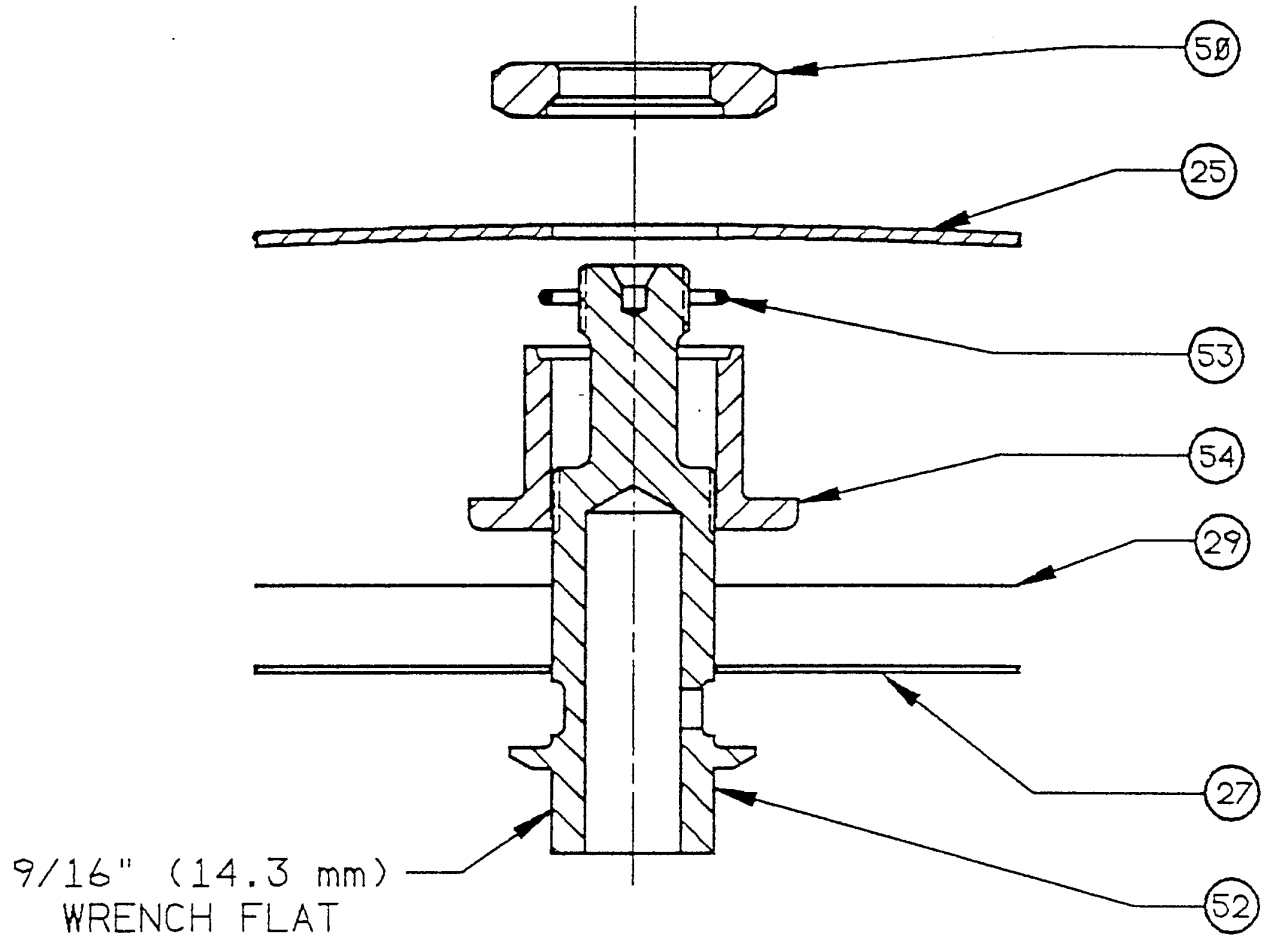


8" THRU 12" VALVE INLET SIZE

MAIN VALVE SEAT PLATE HUB ASSEMBLY
(HIGH PRESSURE STAINLESS STEEL)

DETAIL D
FIGURE 3

G: D_059040233_PG8
: DB059040233
B: SEP90LIB



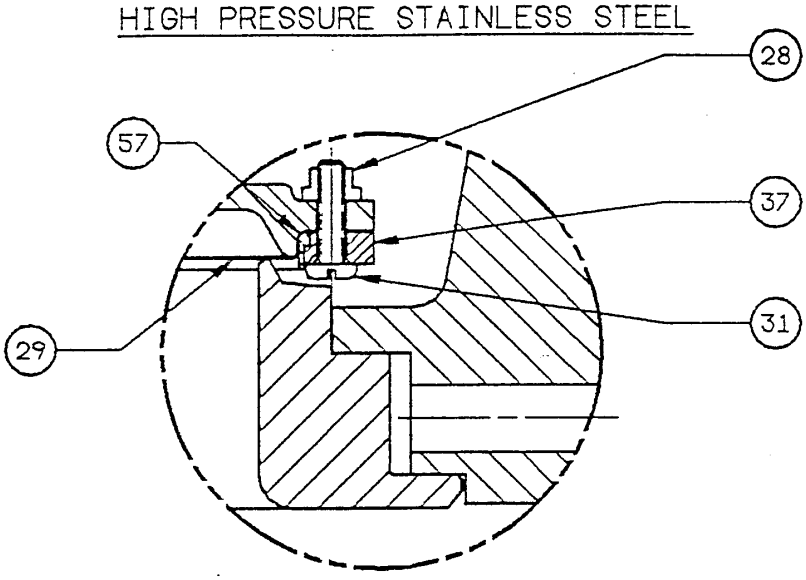
MAIN VALVE SEAT PLATE HUB ASSEMBLY
(LOW PRESSURE STAINLESS STEEL)

DETAIL D

FIGURE 4

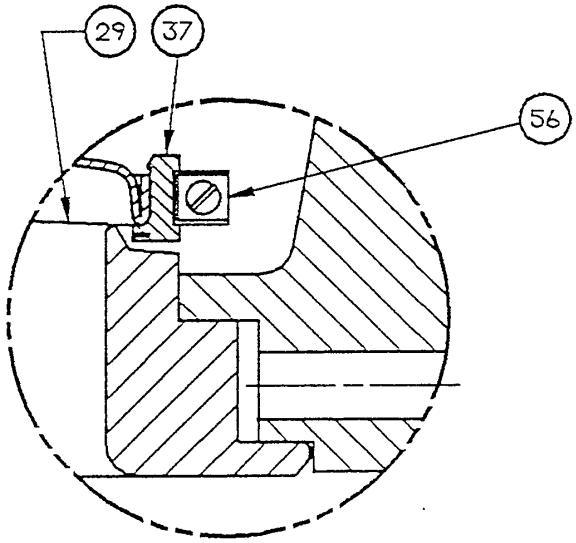
DWG: D_059040233_PG9
DB: DB059040233
LIB: SER90LIB

HIGH PRESSURE STAINLESS STEEL



3" THRU 12" INLET SIZE

LOW PRESSURE STAINLESS STEEL



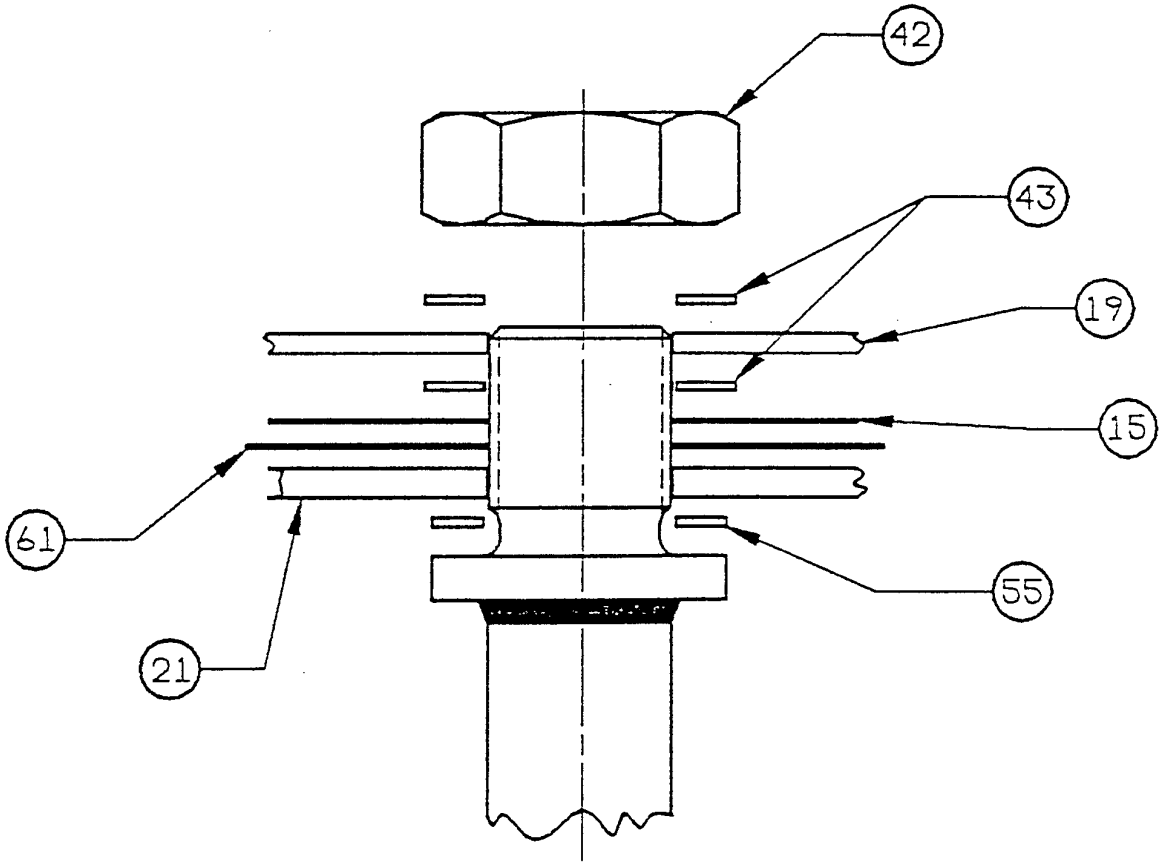
3" THRU 12" INLET SIZE

MAIN VALVE SEAT PLATE ASSEMBLY

DETAIL E

FIGURE 5

DWG: D_Ø59Ø4Ø233_PG1Ø
DB: DBØ59Ø4Ø233
LIB: SER9ØLIB



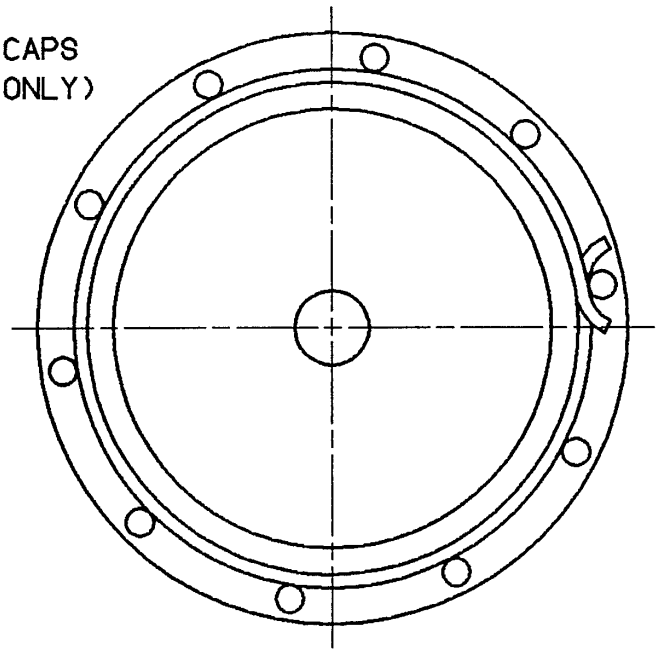
DETAIL "C"

FIGURE 6

DWG: D_059040233_PG11
DB: DB059040233
LIB: SER90LIB

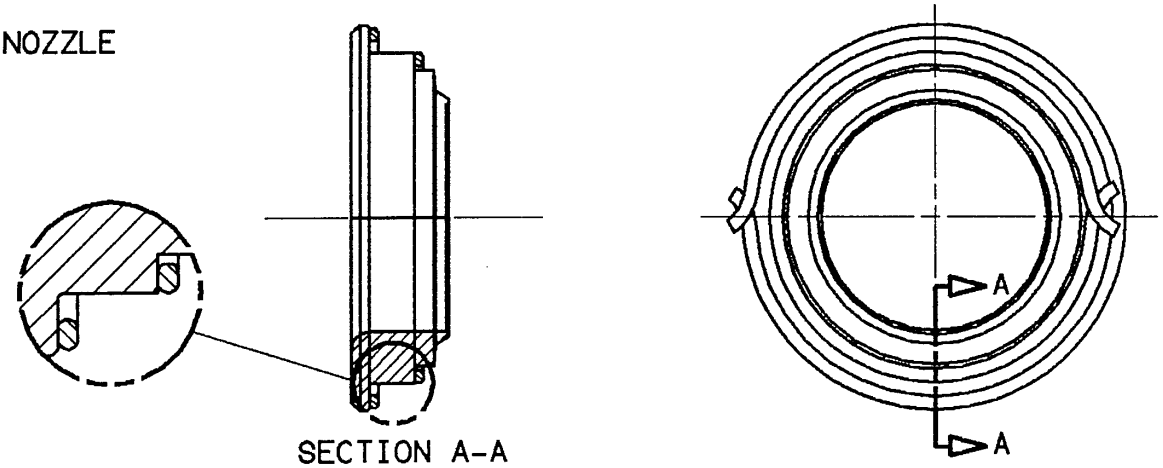
1. THE CONTACT SURFACES MUST BE CLEAN, FREE FROM GREASE, AND DRY.
2. REMOVE THE PROTECTIVE STRIP ON THE ADHESIVE TAPE.
3. LIGHTLY PRESS IN PLACE AS SHOWN BELOW.

UPPER MAIN VALVE CAPS AND BODIES (9300 ONLY)



PUT TAPE JUST INSIDE OF BOLT HOLES, OVERLAPING ENDS AT A BOLT HOLE PUT TAPE ON TOP CAP ONLY. PUT TAPE ON TOP SURFACE OF BODY (TYPE 9300 ONLY). DO NOT PUT ON LOWER CAP OF MATING PAIR.

NOZZLE



SECTION A-A

PLACE TAPE TOWARD OUTER EDGE OF EACH GASKET LEDGE. PUT OVERLAPS ON OPPOSITE SIDES. USE 1/8" TAPE ON 3" AND 4" NOZZLES. 3/16" TAPE ON ALL CAPS AND LARGER NOZZLES.

DWG: D_059040233_PG12
DB: DB059040233
LIB: SER90LIB

TEFLON TAPE MOUNTING INSTRUCTIONS

FIGURE 7

3.0 PILOT MAINTENANCE (Refer to Figures 8 & 9)

3.1 Disassembly

To facilitate assembly, place all parts removed in an orderly arrangement so the correct parts are assembled in the proper sequence.

3.1.1 Begin by removing spring bonnet (Remove the spring compression before attempting to remove bonnet). Remove case bolts and upper case. Remove spindle nut while holding hex spacer. Remove diaphragm, sense plate and spacer. Remove lower case and spindle/seat assembly. Remove blowdown adjustment screw and supply port tube fitting.

3.1.2 Clean all parts and replace all soft goods. The spindle/seat assembly is factory assembled and must be replaced as a unit. If the nozzle is nicked or scratched. it should be replaced. To remove it, use a deep socket.

3.2 Assembly

Assembly is done in the reverse order of disassembly. Lubricate all screw threads and end of spring adjusting screw that bears against spring washer. Use Dow Corning No. 33 Silicone grease or equivalent. When assembling pilot, the following should be observed.:

3.2.1 The holes in spindle diaphragm must be aligned with all holes in the body. The small hole in lower case must be aligned with hole in the body.

3.2.2 Before tightening spindle nut, align holes in lower case, spacer ring and diaphragms with case bolts.

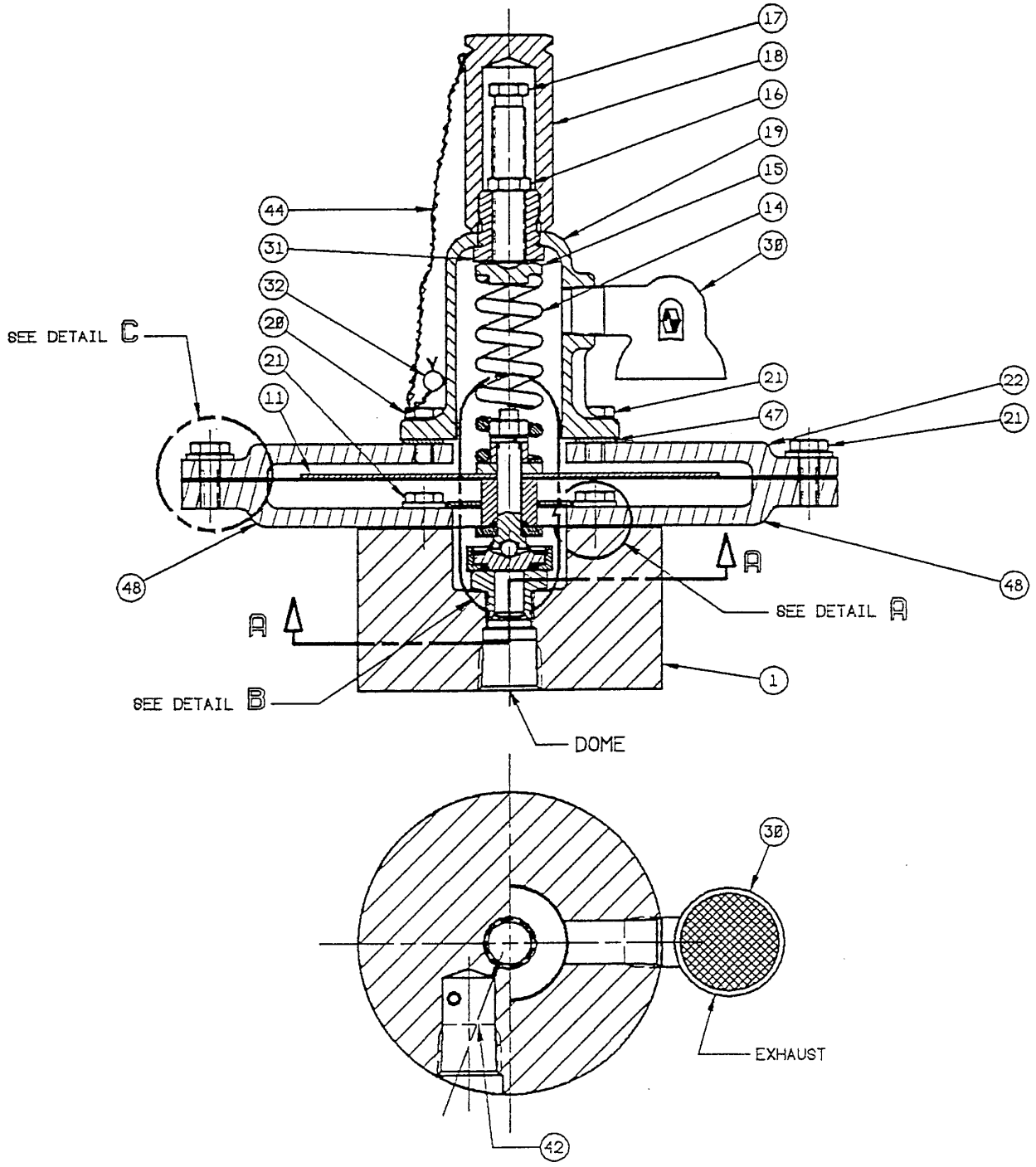
Tighten spindle nut snugly but not excessively. Two diaphragms are sandwiched in the spindle/stack assembly and excessive tightening will damage them. Hold the hex spacer when torquing spindle nut to prevent the stack from rotating.

Refer to Page 23 for Soft Goods Repair Kits.

PILOT PARTS LIST

ITEM	DESCRIPTION
1	BODY
2	NOZZLE
3	BASE-SEAT*
4	SPACER-HEX
5	DIAPHRAGM-SPINDLE*
6	SPACER-PILOT
7	GASKET-SPINDLE DIAPHRAGM*
9	BALL* (INCLUDED WITH ITEM 3)
10	DIAPHRAGM-PILOT*
11	PLATE-SENSE
12	DISC-SPRING
13	NUT-.250-28 HEX
14	SPRING
15	WASHER-SPRING
16	NUT-HEX LOCK (ADJUSTING)
17	SCREW-PRESSURE ADJUST
18	CAP-BONNET
19	BONNET-ASSEMBLY
20	BOLT-.250-28, DRILLED HD
21	BOLT-.250-28
22	CASE-DIAPHRAGM
23	SPINDLE* (INCLUDED WITH ITEM 3)
30	VENT-3/8
31	INSERT-BONNET (INCLUDED W/ITEM 19)
32	SEAL
42	SCREEN ASSEMBLY
43	GASKET-DIAPHRAGM*
44	WIRE-SEAL
45	SEAL-SPINDLE*
46	SPACER-SPINDLE
47	GASKET-BONNET*
48	CASE-DIAPHRAGM
49	CHECK DIAPHRAGM
50	CHECK PLATE
51	WASHER-LOCK .250
52	WASHER-PLAIN .250
53	RETAINER-SEAT
54	RING-RETAINING
55	O-RING (-113)

* INCLUDED IN SOFT GOODS KIT.

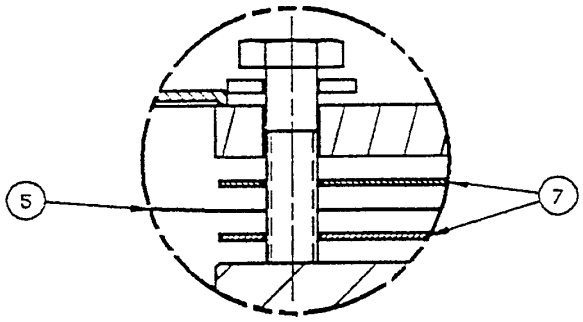


SECTION A-A

FIGURE 8

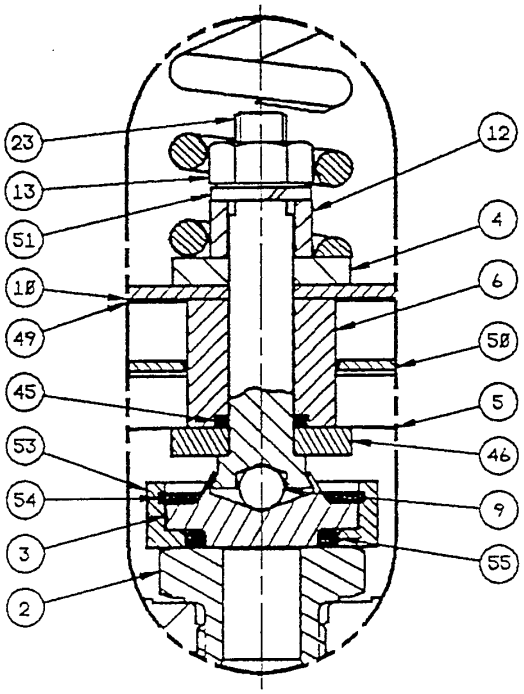
TYPE 95 CHLORIDE SERVICE PILOT

DWG: D_059040233_PG15
DB: DB059040233
LIB: SER90LIB

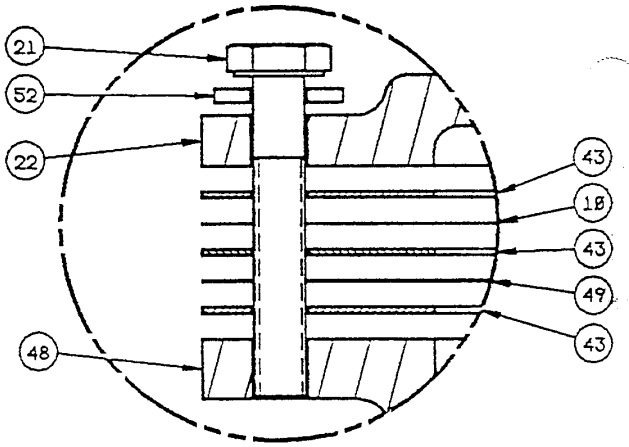


DETAIL A

SHOWN EXPLODED FOR DETAIL



DETAIL B



DETAIL C

SHOWN EXPLODED FOR DETAIL

FIGURE 9

TYPE 95 CHLORIDE SERVICE PILOT

DWG: D_059040233_PG16
DB: DB059040233
LIB: SER90LIB

4.0 PILOT ADJUSTMENT

4.1 General

Two adjustments are provided; one for varying the pressure at which the pilot opens and one for varying the pressure at which the pilot closes. The first adjustment controls the "set" of "popping" pressure, the second the "reseat" or "blowdown" pressure. To adjust set pressure, a test set-up similar to that shown in Figure 10 should be used.

4.2 Set Pressure

This adjustment is obtained by turning the pressure adjusting bolt, clockwise (in) to increase set pressure and counter-clockwise (out) to decrease set pressure.

4.3 Reseat Pressure

This adjustment is obtained by turning the blowdown needle adjusting screw, clockwise (in) to increase blowdown, counter-clockwise (out) to decrease blowdown. A small interaction between set pressure and reseat pressure adjustments will occur, therefore it may be necessary to readjust the set pressure after setting reseat pressure.

NOTE: If the blowdown adjusting screw has been moved or turned to either extreme, positioning it midway will aid in obtaining the correct blowdown. There are approximately 7 to 8 turns to obtain full travel of the adjustment. Midway from either end should produce a blowdown for "snap action". For "modulating pilot action", back the adjustment screw out (counter-clockwise) to obtain the adjustment limits given in paragraph 4.5.

4.4 Range of Adjustment

All pilots can be adjusted +/- 10% beyond the nameplate setting.

4.5 Adjustment Tolerances

(1) PILOT ACTION	SET PRESSURE	SET PRESSURE TOLERANCE (2)	MINIMUM CRACK PRESSURE AS % OF NAMEPLATE SET	SUPPLY PRESSURE AS % OF SET FOR DOME PRESSURE RECOVERY (3)
MOD-		± 2"WC	75	100
ULATING	10"WC TO 1.0 PSIG	± 3%	90	100
	ABOVE 1.0 PSIG	± 3%	95	100

NOTES:

(1) MODULATING ACTION - DOME PRESSURE DECREASES SLOWLY TO 30% ± 5% OF SET PRESSURE AND RECOVERS TO 60% ± 10% OF SET PRESSURE AT SET PRESSURE.

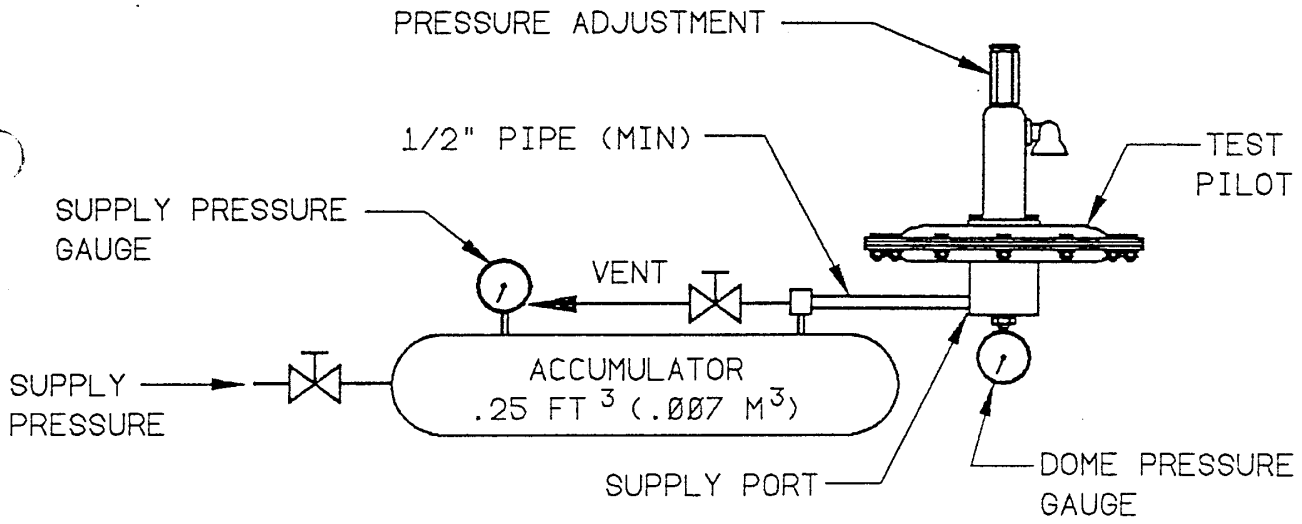
(2) ADJUST SET PRESSURE ON TEST STAND TO 101% ± 1% OF NAMEPLATE SETTING TO ALLOW FOR SPRING TENSION RELAXATION CAUSED BY COMPRESSION OF THE ELASTOMER IN THE DIAPHRAGM STACK.

(3) PILOT SEAT SHOULD BE BUBBLE TIGHT AT 90% OF SET PRESSURE ON DECREASING PRESSURE.

4.6 Definitions

Set Pressure is defined as that pressure when the dome pressure is 15% of the supply pressure.

Crack Pressure is defined as the supply pressure where gas flow begins at the pilot exhaust.



POSITIVE PRESSURE PILOT

FIGURE 1Ø

DWG: D_Ø59Ø4Ø233_PG19
DB: DBØ59Ø4Ø233
LIB: SER9ØLIB

5.0 LEAK TESTING THE ASSEMBLY

5.l General

The complete valve assembly should be leak tested for internal and external leaks using a pressure equal to 30% and 90% of set.

5.2 Internal Leak Test

Spray leak test solution around nozzle/seat area to locate a leak. Seat leakage may be caused by a damaged nozzle seat or seat film. Pilot internal leakage may be checked by blocking one pilot exhaust vent and using a leak test bubble bottle on the other.

5.3 External Leak Test

Apply leak test solution to all joints and seals. Tighten bolts or fittings as required.

7.0 REPAIR KITS

Soft goods repair kits contain all the diaphragms, seals, and seats to repair a valve. To order a kit, specify the base number and select the last three digits from the following tables. To ensure the purchase of the correct repair kit, the order should specify the valve model and serial number. For chloride rich environments, the bolts in the main valve and pilot exposed to the environment should be replaced during routine maintenance or at least every five years.

PILOT REPAIR KITS

KIT BASE NUMBER 06.0235.XXX

KIT TYPE	PRESSURE	MATERIAL	DASH NUMBER
SOFT GOODS	10" WC THRU 15 PSIG	VITON (1)	573
BOLT	10" WC-15 PSIG	SST	574

(1) TEFLON DIAPHRAGMS

MAIN VALVE REPAIR KITS

KIT BASE NUMBER 06.0235.XXX

TYPE 9390P
SINGLE CHAMBER

KIT TYPE	INTERNALS	MATERIALS	3"	4"	6"	8"	10"	12"
SOFT GOODS	SST-LP	TEFLON	498	500	527	504	506	508
	SST-HP	TEFLON	360	364	528	372	376	380
BOLT	SST-LP	SST	340	341	342	343	344	345
	SST-HP	SST	347	348	570	350	351	352