

## DISASSEMBLY OF 3081 CHECK VALVES

2 1/2-10"

### CHECK VALVE COVER REMOVAL

It is suggested that jack screws be used when removing or replacing the covers (item 2) of 8" and 10" check valves. 8" check valves use two 5/8-11 althread approximately 8" long, with one wing nut or lever nut on each length of althread. 10" check valves use two 3/4-10 althread approximately 8" long.

Remove two cover bolts (item 22) on opposite side of the bolt circle, and install althread (jack screws) and nuts. Remove remaining cover bolts. Simultaneously, back the wing nut or lever nut off until the spring tension is released. Remove the cover.

NOTE: Carefully examine interior of check valve. Note position of clapper assembly, knee, freedom of movement; and remove all foreign material therein.

### TOGGLE-LEVER (CLAPPER) ASSEMBLY REMOVAL

Remove the two pipe plugs (item 31) on each side of the check valve body above the centerline, to expose the lever arm pin (item 13) and the hinge pin (item 11). Using a brass rod (smaller in diameter than the pins), gently tap out the rear (lever arm) pin first.

CAUTION: Support the lever arm (item 10) while completely removing the lever arm pin. Let the lever arm rest gently in the bottom of the check valve.

NOTE: On 8" and 10" sizes, a lever arm spacer (item 26) is installed between the two lever arms to maintain proper distance between them, and prevent binding.

Grasp the yoke (item 7) with one hand, while removing the front (hinge) pin (item 11). Lift out the toggle-lever (clapper) assembly, being careful that the brass seat (item 3) is not dented.

Prior to disassembly of the clapper assembly, thoroughly and closely examine the area of the disc (item 6) that meets the seat. Pay particular attention to the indentation in the disc made by the seat. Ensure that equal distances between all sides of the disc guide (item 5) and the indentations are present, indicating proper alignment. Inspect for indentations caused by foreign materials between the seat and the disc.

**CAUTION:** If indentations are discovered on the disc, examine this same relative area of the seat for dents/nicks.

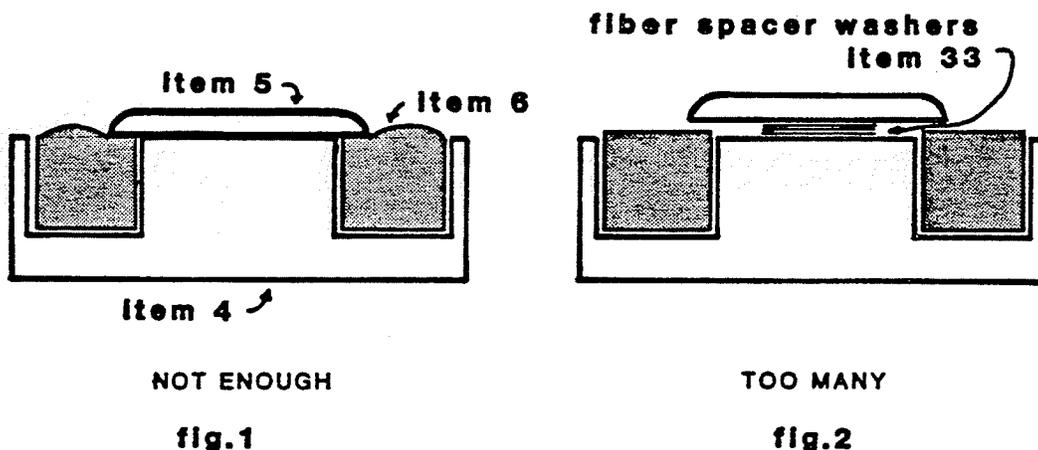
TOGGLE-LEVER (CLAPPER) DISASSEMBLY

Removing the disc guide bolt (item 23) from the center of the disc guide (for 2" through 8"), or sixteen disc guide screws (item 25) from the periphery of the disc guide (item 5) (for 10" only); permits separation of the disc guide from the disc retainer (item 4), and provides access to the disc (item 6).

**NOTE:** An O-Ring (item 20) is installed on the disc guide bolts in sizes 2½", 3", 4", 6" & 8".

When installing a new disc, fiber spacer washers between the disc retainer and the disc guide MAY or MAY NOT be required. The fiber spacer washers (item 33) are installed, IF REQUIRED, to ensure that the proper "squeeze" on the disc (item 6) is obtained by the disc guide and the disc retainer. Too many fiber spacer washers between the disc guide and disc retainer will not generate sufficient squeeze on the disc (not a water-tight seal), permitting water to get between the disc and disc retainer; pushing the disc out of the disc retainer, giving the disc a "swollen" appearance and resulting in insufficient pressure drop (too little head loss) across that particular check valve.

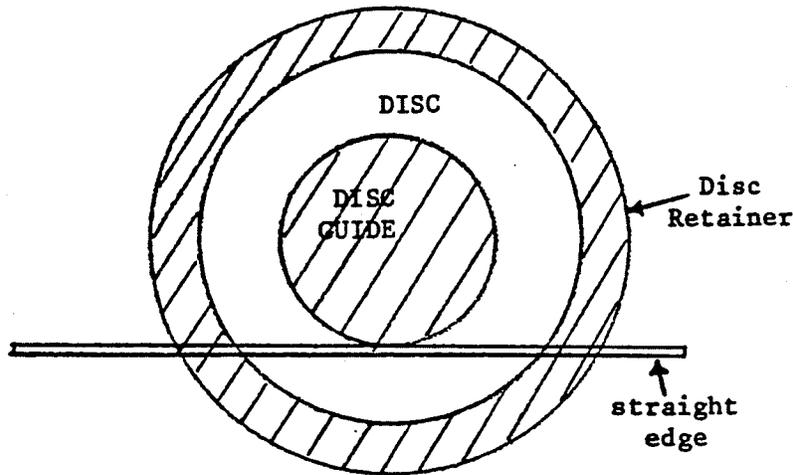
Not enough fiber spacer washers between the disc guide and disc retainer can generate TOO MUCH squeeze on the disc, causing it to "round off" around the disc guide, resulting again in insufficient pressure drop (too little head loss) across that particular check valve.



In Fig 1 above, ADD fiber spacer washers (item 33) between the disc guide (item 5) and disc retainer (item 4), until bulge disappears, but disc cannot be rotated.

In Fig 2 above, REMOVE fiber spacer washers between disc guide and disc retainer, until disc cannot be rotated and no bulge appears.

A straight edge just touching the disc guide, the disc and the disc retainer will indicate proper squeeze on the disc WHEN NO LIGHT CAN BE SEEN BETWEEN THE BOTTOM OF THE STRAIGHT EDGE AND THE DISC.



Two grey (thin) and one red (thick) spacer washers with each kit.

Inspect all internal parts for wear, corrosion, erosion or mineral buildup. Thoroughly clean all parts and bearing surfaces; replace any damaged parts.

#### TOGGLE-LEVER (CLAPPER) REASSEMBLY

Insert disc in disc retainer. Install fiber spacer washers as required, to give the correct amount of squeeze. Insert and tighten the disc guide bolt or disc guide screws as required. Lay the toggle-lever (clapper) assembly aside.

Inspect the seat (item 3) for nicks and cleanliness. In the event the seat is nicked or dented, very fine wet-or-dry sandpaper may be used to "polish out" the blemish. Remove the seat only if damage cannot be polished out.

**CAUTION:** Use a very fine grade of sandpaper that will retain the abrasive properties when wet.

Polish the inside diameter of the throat and the beveled area of the seat.

Polish in as wide an arc as possible, to ensure a proper and continuous match between the seat and the disc.

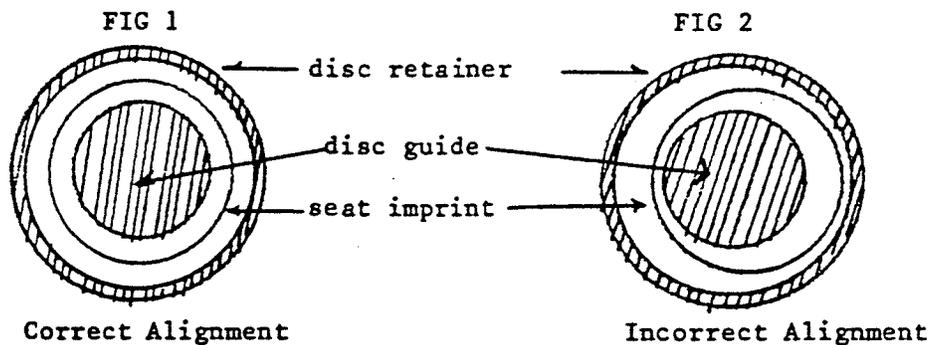
ALIGNMENT OF THE CLAPPER ASSEMBLY

Re-install clapper assembly. Do not permit disc guide to come in contact with the seat. Damage to seat may occur.

Support clapper assembly in one hand, insert through cover cavity and install hinge pin.

With clapper assembly supported by hinge pin only, exert pressure to force disc against the seat, and leave an imprint of the seat in the disc. Remove clapper assembly. Inspect disc to ascertain that alignment is correct.

NOTE: Alignment is correct if seat leaves imprint on disc equidistant on all sides of disc guide, as indicated by FIG. 1.



In the event the seat imprint resembles FIG. 2, adjust hinge pin bushing OUT, on side corresponding to least distance between seat imprint and disc guide. In FIG 2 above, adjust hinge pin bushing on your RIGHT out. (For proper perspective, assume that you are looking into the inlet check valve).

REASSEMBLY

To reassemble, reverse the order of disassembly. When installing the toggle-lever (clapper) assembly in the valve body, use care that the valve seat is not nicked or otherwise damaged. When the two pins that hold the toggle-lever (clapper) assembly are installed, be sure to note that the knee (yoke, item 7) of the toggle-lever (clapper) assembly pivots upward freely into the opening.

NOTE: If the toggle-lever (clapper) assembly is installed with the knee pivoting downward, the valve will fail to function.

If both check valve #1 and #2 are disassembled simultaneously be sure that the HEAVY spring is installed in the #1 check valve cover cavity; and in sizes 2½", 3", 4", 6" & 8", ensure that the finned clapper assembly is installed in the #1 check valve body.

Follow instructions, "To place in service" and "Testing", as set forth in the appropriate technical manual.

CDHS-20 Relief Valve Repair Information

Flat in shape. Manufactured in three sizes, for use on different size reduced pressure principle backflow prevention devices, as follows:

<u>CDHS-20</u>	<u>RP-2/RP-1 Size</u>
3/4"	3/4", 1", 1½" & 1¾" RP-2
1½"	2", 2½" & 3" RP-1
2"	4", 6", 8" & 10" RP-1

Supply (inlet) pressure is transmitted through the high pressure sensing line, and introduced into the intermediate body through the high pressure sensing port. It is directed against the top of the diaphragm, overcomes the spring tension and pushes the disc down against the seat, closing the discharge port.

Pressure from the zone between the two check valves is transmitted through the opening connecting the CDHS-20 to the body of the first check valve, and is directed against the bottom of the diaphragm. This pressure combines with the spring action to push the diaphragm up. This carries the disc away from the seat, and opens the discharge port.

The area of the piston (exposed to atmospheric pressure through the vent in the cover) essentially equals the area of the disc (that is exposed to atmospheric pressure through the discharge port). The pressures exerted on these areas tend to cancel each other, thereby balancing the relief valve.

Disassembly of the CDHS-20

To remove cover (item 3), remove cover screws (item 20). Four used on 3/4", six on 1½" and 2" sizes. Remove cover.

To remove intermediate body (item 2), remove all intermediate body cap screws (6 on 3/4", 8 on 1½" & 12 on 2"), except two, Leave these two on opposite sides of bolt circle.

While exerting pressure downward on the intermediate body to prevent the forcible ejection of the intermediate body by the spring, remove the two remaining intermediate body cap screws. Remove the intermediate body.

Examine the intermediate body assembly closely. Pay particular attention to the condition of the bellofram and diaphragm. Inspect for small pinholes, tears, cleanliness.

Examine the areas near the stem nuts for cleanliness.

To Remove Stem Assembly from the Intermediate Body

With wrenches or sockets of the proper size, on both upper and lower stem nuts (item 16), remove the upper stem nut.

Lift off the piston (item 5), the upper stem o-ring (item 15), the bellofram (item 12) and the retainer plate (item 6). Notice the machined recess in the bottom of the piston that accommodates the upper stem o-ring.

The stem (item 4) may be removed from the intermediate body.

Clean and replace all parts as necessary.

#### To Remove Diaphragm Assembly from Stem

Using a vice with brass jaws, or two pieces of wood between the jaws of a regular vice, or a wrench; Grasp the stem as near the diaphragm washer (item 7) as possible. With a wrench or socket of the proper size, remove the lower stem nut.

The disc guide (item 10), the disc (item 9) and the disc retainer (item 8) are removed as an assembly. Remove the diaphragm (item 13), the lower stem o-ring (item 15) and the diaphragm washer (item 7) from the stem.

Notice that the diaphragm washer in the 3/4" CDHS-20 is flat, and DOES NOT have a machined recess to accommodate the lower stem o-ring, while the diaphragm washer on the 1½" and 2" CDHS-20 DOES have a machined recess to accommodate the lower stem o-ring.

#### To Remove Disc from Disc Retainer

Remove the disc guide. It should fall out. Insert a flat, blunt tool through the hole in the disc, between the disc and disc retainer, and pry the disc out.

#### Reassembly of the CDHS-20

Reassembly is the reverse of disassembly.

Ensure that the disc is completely and firmly under the machined lip of the disc retainer on all sides.

With the stem (long end up) held in a vice with brass jaws, etc., install the diaphragm washer, lower stem o-ring, diaphragm, disc retainer assembly, disc guide and lower stem nut (1½" and 2" CDHS-20).

For 3/4" CDHS-20 - With the stem (either end up), install the diaphragm washer, diaphragm, lower stem o-ring, disc retainer assembly, disc guide and lower stem nut.

Note that the serrated area of the disc retainer is placed against the diaphragm.

Make certain the stem is free of nicks and burrs.

Insert stem, with diaphragm and disc retainer intact, through the delrin bushing in the intermediate body.

## CDHS 20

Install the retainer plate, bellofram (with GLOSSY surface out; side with printing inside, next to piston), upper stem o-ring, piston and upper stem nut.

Do not over-tighten upper and lower stem nuts. Ensure that they are both snug.

On older 1½" CDHS-20 only: Ensure that the gasket is between the diaphragm and intermediate body. Gasket not required on newer versions.

Insert all but two intermediate body cap screws; through the intermediate body and diaphragm. Leave these two out on opposite side of the bolt circle.

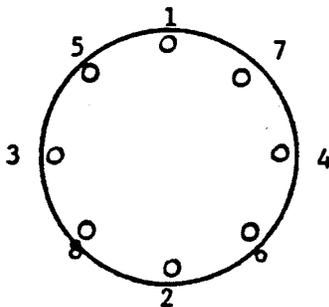
On ¾" CDHS-20 only: Ensure that the internal sensing port in the cover, the diaphragm and body are properly aligned, and that the diaphragm does not "fold over" and block the sensing port.

Position the the spring over the seat in the main body. Position the body of the CDHS-20, so that the opening to the check valve body (low pressure sensing) is pointing away from you.

On 1½" and 2" CDHS-20: The sensing line will be properly positioned if the sensing port of the intermediate body is positioned between the first and second bolt hole (to your left) of the low pressure sensing opening.

Press the intermediate body down on the body, and hold until two bolts on opposite sides of the bolt circle have been started. Start, and finger-tighten all remaining bolts.

Final tightening of the body bolts should follow the sequence below:



Position the bellofram flat against the upper portion of the intermediate body. Position the cover so that the vent hole is on the opposite side of the sensing line & port. Insert, and tighten the cover retaining screws.

Follow instructions, "To place in Service" and "Testing", set forth in the appropriate technical manual each and every time the pressure differential relief valve is repaired.



# Supplemental Instructions

Proper installation of the upper rolling diaphragm ("Bellofram") is important on all sizes of the CDHS-20 and CDHS-24 Pressure Differential Relief Valves. These valves are used on CLA-VAL backflow preventers Model RP-1, RP-2, RP-1EX and RP-4. After a repair kit has been installed, the symptom of the relief valve leaking out of the weep hole in the cover often occurs very soon (e.g. - "I think that the diaphragm is defective. The relief valve cycled only a very few times after I installed the repair kit and then it started leaking"). This problem is due to improper re-assembly of the relief valve and not the rolling diaphragm. Please note the following tips:

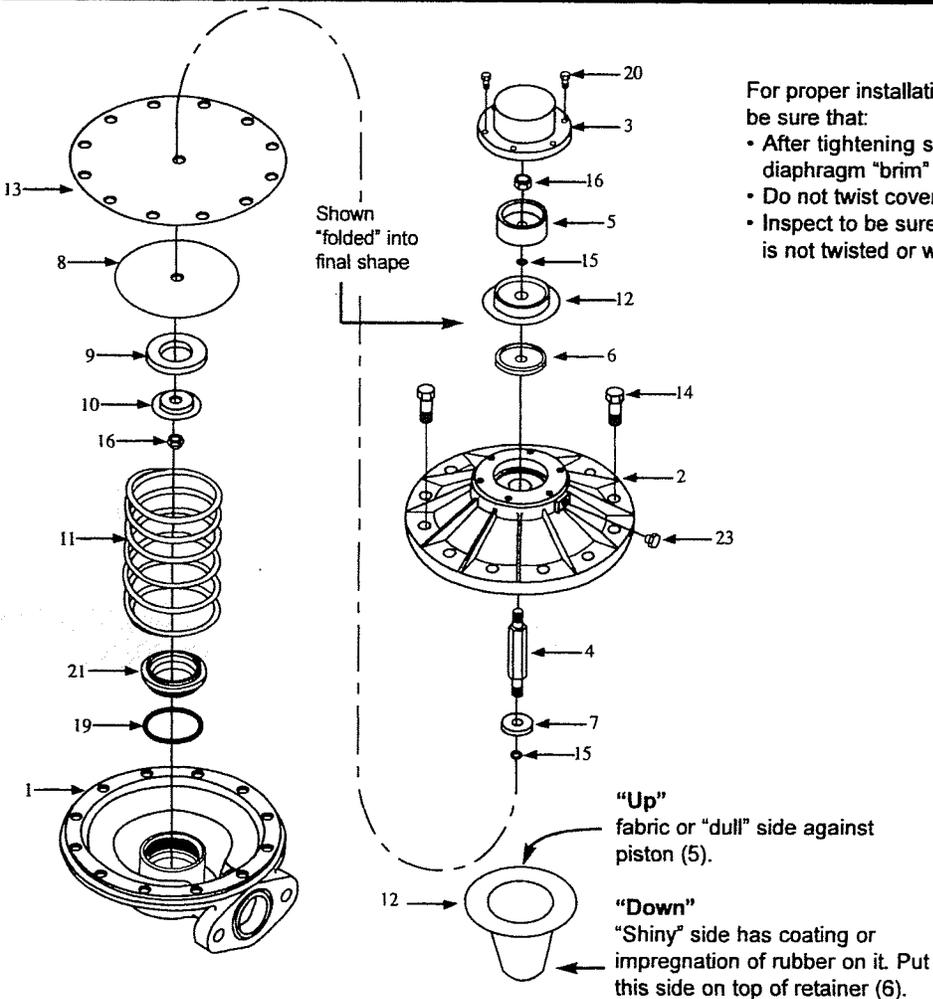
- 1.) Be sure that the stainless steel retainer plate (6) goes down against the shoulder of the stem (4) (upper end) with its outer lip facing up (or 'concave' side up).
- 2.) The rolling diaphragm (12) has a 'top hat' shape and is installed next on the stem upside down with the top of the 'hat' down onto the retainer plate. (6) The rolling diaphragm is made with a rubber coating or impregnation on one side only of a fine nylon fabric as it is molded into its shape. It is this rubber coating which must be against the water pressure coming up from the intermediate body of the relief valve, otherwise, the rubber coat will be pushed away

from the nylon fabric and fail. Be sure that the "shiny" side or coated side of the rolling diaphragm is down on top of the retainer plate and facing outward (OR the fabric or "dull" side is to be against the piston or inside the 'top hat'). You may have to turn the rolling diaphragm inside out to install it.

3.) Next, Install the O-ring on (15) the stem. Install the piston (5) with the recess around the stem hole facing down towards the O-ring. Install self-locking nut (16) and tighten after installing parts on lower end of stem.

4.) After tightening stem nut, carefully push rolling diaphragm "brim" straight down over itself, so that the "brim" is flat and smooth against the intermediate body (2). Be sure that the rolling diaphragm is not twisted or wrinkled.

5.) Install cover (3) so that weep hole faces out and away from backflow assembly. When installing cover screws (20), alignment of cover screw holes is critical. Do not rotate cover after placing over rolling diaphragm "brim", this will twist the rolling diaphragm and cause it to fail quickly after cover screws are tightened.



For proper installation of rolling diaphragm (12), be sure that:

- After tightening stem nut (16) carefully fold rolling diaphragm "brim" down to shape shown.
- Do not twist cover (3) when installing it.
- Inspect to be sure rolling diaphragm (12) is not twisted or wrinkled. It must be smooth as shown.

Item No.	Description
1	Body
2	Intermediate
3	Cover
4	Stem
5	Piston
6	Retainer
7	Diaphragm Washer
8	Disc Retainer
9	Disc
10	Disc Guide
11	Spring
12	Rolling Diaphragm
13	Diaphragm
14	Hex Head Screw
15	Stem O-Ring
16	Self Locking Nut
19	Seat O-Ring
20	Fill Head Screw
23	Pipe Plug